The Archaeological and Historical Significance of Intertidal Fish Traps at Llanon, Cardigan Bay: a west Wales case study



Remains of 'V'-shaped fish trap, Llanon.

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Nikola Vousden

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Abstract

Examples of intertidal fish traps from Britain and Europe are discussed in order to provide a context for intertidal fish traps in Wales. The results of the RCAHMW's intertidal fish trap mapping project for Wales are discussed with reference to existing research, in order to provide a context for the fish traps of Cardigan Bay. Mapped fish traps in Cardigan Bay are discussed in detail, in order to provide context for those at Llanon. Fish traps at Llanon are identified and surveyed. The results are then compared to those obtained by the desk-top mapping project. Land use and ownership in Llanon is examined in order to set the Llanon fish traps within their local landscape and social context.

Introduction

'The use of traps has been one of the most important and efficient ways of catching fish since people first started to eat seafood as part of their diet' (Langouët & Dare, 2009:132). Fish traps in Britain are often referred to as weirs. In Scotland they were historically known as 'yairs' and in Wales, the terms 'Gored', 'Gorad' (singular), Goredau' and 'Goredi' (plural) were historically used.

Prior to the 2011-2012 intertidal fish trap mapping project undertaken on behalf of the Royal Commission on the Ancient and Historical Monuments of Wales (RCAHMW), the presence of fish traps around the Welsh coast had already been noted by both the RCAHMW and the four Welsh Archaeological Trusts. In the 1990s-2000s the four Welsh Archaeological Trusts undertook a rapid archaeological survey of the Welsh coastline,

concentrating on the intertidal zone and a land strip that extended for about 150m inland, as well as the lower reaches of the main river estuaries. 'Early records, maps and other documentary sources were studied followed by a rapid field survey, achieved by walking the entire coastline to visit sites and identify additional features' (cpat.org.uk, 2011). The RCAHMW's aerial reconnaissance programme had also identified a number of further fish traps. The need was therefore recognised for a systematic desk-top survey of the whole of the coast of Wales, using modern and historic aerial photographic (AP) survey and Ordnance Survey (OS) mapping coverage.

Once the extent and character of features was understood, it became clear that, in order to fully understand the context in which fish traps were used at a particular location, in-depth analysis of their landscape and cultural context is essential. And in order to glean anything useful about the use of particular methods and chronology of fish trap construction, it would be necessary to have a thorough knowledge of other fish trap research, in Wales, Britain and further afield. This dissertation therefore examines fish traps at Llanon, Ceredigion in the context of fish traps around the Welsh coast, using comparative examples from Britain and Europe. The Llanon fish traps are placed within their context within the wider landscape, using regressive map analysis, examination of historical documents and oral evidence from Llanon residents. The results of the RCAHMW desk-based survey are combined with those of subsequent field work.

Sources used

Modern research (discussed below) has highlighted the importance of historic documents in informing us of ownership and use of fish traps. The earliest documentary evidence we have for land ownership in Wales is the twelfth century Acts of the Welsh Rulers, mainly consisting of land grants and later confirmations. The diocese of St Davids (covering Pembrokeshire, Ceredigion and Carmarthenshire) is still, to a large extent, coterminous with the Norman diocese (www.stdavids.churchinwales.org.uk). The fourteenth century Black Book of St Davids, translated from Latin in 1902, is 'an extant of all the land and rents of the Lord Bishop of St. David's' It provides us with the best record we have of land tenure in the fourteenth century: 'it shows not merely the customs prevailing in each county, but the extent to which English law and English feudalism had penetrated into each district of the

county' (Willis-Bund, 1902: iii). The Episcopal Registers (1397-1518), detailing land belonging to the Bishop of St Davids, are also a useful source of information regarding land ownership at that time.

With regards to information on the fish traps themselves and their associated local historic environment, the first serious attempts to record the historic environment in a comprehensive manner are those of post-medieval travel writers from the sixteenth century onwards. Unfortunately, Lhuyd's 1697-1701 Grand Tour (to gather information for the Archaeologia Britannica) missed out much of Wales's west coast (Edwards, N & Roberts, B.F., 2010: 33). The Old (1791-1799) and New (1834 and 1845) statistical Reports for Scotland were produced by the General Assembly of the Church of Scotland and are based on detailed parish reports in much the same style as Lhuyd's Parochial Queries and were been utilised by HER highland when compiling a report on fish traps at Ardersier, on the Beauly Forth, north-east of Inverness.

From around the late sixteenth century antiquarians first began systematically recording archaeological sites and finds. John Leland, Antiquary to Henry VIII is thought to have journeyed through Wales between the years of 1536 and 1543 and is known to have visited Llansantffraid. George Eyre-Evans, founder member of the Carmarthenshire Antiquarian Society and Cambrian Archaeological Society, was also one of the first Commissioners of the Royal Commission on the Ancient and Historical Monuments of Wales. As the Royal Commissioners at that time 'confined their labours to antiquities of a pre-seventeenth century date' (Carmarthenshire Antiquary, 1941: 5-10), they may not have paid them any attention if they had been in use since that time. No Inventory was produced for Cardiganshire, although Eyre-Evans did publish *Cardiganshire: its antiquities* in 1903 and does describe Llanon.

There is, therefore, a wealth of documents in which fish traps are mentioned, and it is possible to build a reasonable picture of the use of fish traps around the UK from the late medieval into the modern period. It is not often, however, that fish traps are described in detail. An exception to this is The Salmon Fisheries Act of 1861, which provides a valuable insight into fishing methods at that time.

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Until recently, 'the question of how seafood was collected during prehistoric and early historic times is scarcely mentioned in archaeological literature and 'methods used for catching fish have only very recently become a research target' (Langouët & Dare, 2009:132). However, 'there is a much longer tradition of recording folk history and surviving traditions of fishing in tidal waters' (Turner, 2002: 95). 'Some of these studies were written in response to the rapid disappearance of these traditional fishing practices in the face of new technologies and diminishing fish stocks' (ibid). For example, in 1991 Geraint Jenkins published The Inshore Fishermen of Wales, in which he set out to 'record and present the wisdom of centuries in the coastal communities of Wales' (Geraint Jenkins, 2009: vii). This work is invaluable in helping to reconstruct the use of fish traps in early modern times. It is, however, important to note that studies such as this 'record the end of a process that documentary history may indicate was several hundreds of years old' (Turner, 2002: 95).

'Recent years have seen an explosion of interest in the archaeology of ancient coastal fish weirs around the world. They have been the subject of investigations in Canada...the northwest coast of America...Australia...and New Zealand...In Europe, Mesolithic and Neolithic fish traps have been recorded in the Netherlands...and Denmark' (O'Sullivan, 2003: 449).

Archaeological investigation can, where scientific dating is possible, verify the longevity of existing structures. Where this is not possible, a detailed study of the material remains within their landscape context can still sometimes provide an indication of age and chronology. During the 1980s and 1990s some of the pioneering work was undertaken in Wales (Turner in Davidson (ed), 2002: 95).

Wales' rapid coastal survey of the historic environment was funded by Cadw and carries out by the four Welsh Archaeological Trusts. It involved an archaeological survey of the entire coastline. The survey found that fish traps 'were once common on the Welsh shoreline and their contribution to the coastal economy is now more widely recognised' (Cadw, 1999: 3). Similarly, between 1996 and 1999 the Royal Commission on the Ancient and Historic Monuments of Scotland commissioned sixteen coastal assessment surveys, ' with the aim of quantifying the coastal archaeology and assessing the condition of the remains'. Many sites have also been identified by aerial photography, as is evident on Canmore, RCAHMS's online database. There are 381 fish trap records for Scotland (RCAHMS, 2014). More recent work has been undertaken in Brittany. Since 2007 the Maritime Fish Traps of Brittany project has formed a methodology for the study of fish traps. The resulting database comprises 570 references to fish traps.'Due to various problems linked to the origin and conservation of the raw materials making up the fish traps, radiocarbon dating or dendrochronology is only feasible in some cases...' (Langouët & Dare, 2009:145).

In order to reach conclusions about fish traps in a particular location, it is important that all available kinds of resources are exploited and combined, 'including a wide diversity of texts, the analysis of aerial photographs and maps, archaeological field observations and survey and characteristics of the geographical and maritime setting (Langouët & Dare, 2009:134).

Pan-Wales desk-based mapping project

Initial desktop mapping involved the identification of features using National Assembly of Wales 2005 and 2009 aerial photographic coverage and modern and historic Ordnance Survey mapping, all available as GIS layers on the RCAHMW's GIS mapping. Selected historic Admiralty charts and historic aerial photographic coverage were also georeferenced onto the GIS mapping. Following English Heritage guidelines, polylines were drawn to represent each individual feature comprising a fish trap.

Subsequent field work was undertaken at Llanon in order to test the effectiveness of the desktop mapping. Initial field work, undertaken during my four-week work placement at the RCAHMW, resulted in DGPS survey of several dry stone walls comprising the remains of fish traps in two distinct areas. The end result was a GIS layer showing the survey results placed onto the current OS map using ArcGIS software. A thorough photographic survey was also carried out. It was not possible to complete the mapping project at that time as the amount of work involved was significantly beyond the scope of a four-week placement.

In September 2011 I was employed for six months as Assistant maritime Officer at the RCAHMW. I was therefore able to complete the project. This resulted in a GIS layer of fish trap features for the whole of Wales and in each feature being allocated to a fish trap. Each fish trap was given an 'extent' (the total area, often consisting of several features, in which a fish trap was thought to have operated). Each extent was regarded as one fish trap and given a unique reference number (NPRN) on the RCAHMW's online database, Coflein. The GIS fish trap mapping layer was used as a reference in producung a Coflein description of

each trap and its features. Subsequently, six high resolution 1km square Lidar tiles were obtained by the RCAHMW, covering the foreshore at Llanon and some of Aberarth. The purpose of this was to assess whether Lidar was a suitable tool for identifying stoneconstructed features on a stony foreshore.

Because mapping took considerably longer than expected, during the four-week placement it was only possible to map fish traps in Swansea Bay and those along the coastline from North Wales to Aberaeron in Cardigan Bay. Anglesey remained to be completed, as did the remainder of the Welsh coast. The project was not completed until the end of my 6-month job as Assistant maritime Officer in April 2012. The end result was the identification of 173 fish traps for wales, with some 100 more than recorded previously by the RCAHMW.

The resulting GIS shapefile has been archived with the National Monuments Record of Wales (NMRW). The completion of the project means that we now have a good general idea of the extent and types of fish trap found on the Welsh coast. It is therefore now possible to compare Welsh intertidal fish traps with national and international examples.

Intertidal Fish traps

On the flood tide, fish often make their way to the intertidal area to feed on the nutrients found there, particularly where there are rivers or streams entering the sea. Fish traps operate so as to allow fish to enter a trap, usually on the flood tide, at which point they are unable to escape when the tide turns. They are commonly 'V' or 'C' shaped, with the two arms pointing shoreward and the apex pointing seaward. A sluice is often placed in the apex to allow water through whilst retaining any fish caught within the trap. The distance which the structure extended from the foreshore would be such as to make it 'appear or to *crown*, as the fishers term it, about two hours before low water. Were it placed further into the sea, or built higher, the surf would be constantly beating it down...' (Hooper, 2001:9). Although there are many variations in the morphology of fish traps, the manmade materials used are generally wood or stone.

Construction materials

Wooden fish traps typically consist of lines of wooden fencing with woven baskets or nets, into which fish would be funnelled by tidal currents. Wooden stakes can either support

wattle fences which direct fish into single woven basket traps, or support ranks of basket traps. This type of fish trap is often located in estuarine areas, where roundwood posts are driven into the estuarine clay. Upon entering a basket's funnel, 'fish are unable to turn and are caught in the narrow end' (Crowther & Dixon, 2008: 48). Sometimes 'a continuous trap of two or three miles in length would be formed by a line of these weirs, the inner ends of the adjacent arms being in some cases united' (Geraint Jenkins, 2009: 122).



Figure 1: Reconstruction of the seaward side of a 'V'-shaped post-and-wattle fish trap, with basket at sluice

Bannerman & Jones, 1999

In Denmark, the 'remains of permanent fishing structures built of wood are commonly found when digging in marine sediments in the near-shore areas of Mesolithic settlements... '(Fisher, A., 2007: 58). They span the Late, Middle and early Mesolithic and appear to have consisted of wickerwork fences typically made of long slender hazel rods... and basketry traps made of willow withies' (Fisher, A., 2007: 59). These had been rebuilt numerous times over a period spanning the Late Mesolithic into the Mid-Neolithic, and an associated settlement close to the fish traps was also excavated and found to span the same period of use. At the island of Nekselø, on the north-eastern coast, the Neolithic structures would have stretched at least 250m out into the sea from the contemporary shoreline (Fisher, 2007: 59).

At Wootten-Quarr on the Isle of Wight, 'radiocarbon dating of intertidal wooden structures produced dates ranging from the early Neolithic to the post-medieval period' (Crowther & Dixon, 2008: 74). Structures at the Blackwater Estuary, the Shannon Estuary and Strangford

Lough consist mainly of post and wattle structures- often 'V' shaped with a single-piece basket. These structures have also been found at Magor Pill and Sudbrook. 'V'-shaped fish traps average 100-300m in the Blackwater estuary, 200-400m in Strangford Lough and much smaller in the Shannon Estuary. '...fish traps of Anglo-Saxon date have been recorded within the Severn Estuary, for example, at Redwick...but also more widely within the Blackwater Estuary, Thames estuary, Shannon Estuary and Strangford Lough. However, in all these locatons, the majority of medieval fish traps are of 12th-14th century date' (Brown et al, 2007:15).

At the Blackwater Estuary in Essex, hundreds of wooden fish traps have been identified, with radiocarbon dating indicating that 'they date to the Anglo-Saxon period, typically between c.AD 650 and 800, although there was clearly also activity in the ninth and tenth centuries' (O'Sullivan, 2003:452). At the mouth of the estuary, a fish trap was found to have been rebuilt up to four times, with radiocarbon dates spanning 250 years (ranging from AD 650 to 900) (O'Sullivan, 2003:454).

Similar fish traps in Brittany are known to have been in use during the nineteenth century.



Figure 2: Painting of eighteenth-century wooden 'V'-shaped fish traps in Brittany by Duhamel du Monceau 1769

Nayling, 2009

Intriguingly, there are no known examples of fish traps on the Danish archipelago post-dating the Neolithic until c. AD1900, when fish traps 'very similar to the Neolithic ones are known to have been erected in large numbers every autumn along the coasts of the Danish archipelago' (Fisher, 2007: 59).

Hale notes that stake net traps, designed to trap flounders and salmon, consisted of timber or iron posts and were operated on the tidal flats of the north side of the Solway Firth until at least the 1950s (Hale, 2003: 123). Variations in this locality included poke nets (with a wide opening to catch fish on both flood and ebb tides) and bag nets, which consist of lines of stakes at either side of the main nets, with further stakes forming 'attendant rooms' (Hale, 2003: 123). In the 1990s the remains of a bag net trap, consisting of thirteen wooden piles forming a roughly diamond shape, was excavated and radiocarbon dated, producing a date range of 1530-1790 and 1489-1947 (ibid).

In Scotland, after the introduction of stake nets, the number of adult salmon caught in the Conon was reduced from 7656 to 633. This resulted in fixed nets being banned from rivers and estuaries in 1812. They were banned from the Cromarty Firth in the 1840s (Hooper, 2009:10).

Two post and wattle fish traps on gently sloping shoreline close to the confluence of the Cromarty Firth and river Conon appear to represent different phases of the same trap. Additional short lines of posts occur, all of which 'comprise alder stakes that survive only as eroded stumps, protruding through the estuarine muds and the pieces of wattle are willow rods' (Hale, 2003: 122). Posts were found to have been revetted with stones at the base of the posts and there are at least four piles of stones close to the site (ibid). Similarly, Hale notes that stake net fish traps on the Solway Firth consisted of 'lines of stone mounds into which wooden stakes were driven and between which nets were strung' (Hale, 2003:123).

Similar structures also exist at Strangford Loch in Northern Ireland. Wooden 'V'-shaped fish traps at Cunningburn and Gregstown have fences made of lines of posts with 'stone walls along the base of the fence to protect them from erosion and undercutting' (O'Sullivan, 2003:454).



Beach substrate

Figure 3: Illustration of stone wall-base with wooden posts and wattle panelling

Bannerman & Jones, 1999

Semi-permanent fish trap structures are also known. 'In Germany, a weir on the Schei ford is still worked. Every year posts are driven into the seabed from a barge to form a shallow 'V' with a hoop and net attached at the openings. Willow is used as a barrier and the whole structure is moved at the end of the season' (Fisher, 2007: 59).

Although wooden elements do provide the potential for dating, ascertaining the age of a fish trap is not always possible. 'Due to various problems linked to the origin and conservation of the raw materials making up the fish traps, radiocarbon dating or dendrochronology is only feasible in some cases...' (Langouët & Dare, 2009:145). In addition, changes in the morphology of the seashore mean that some fish traps are now only accessible at exceptionally low tide. In a few cases, fish traps are permanently covered by water.

Crowther & Dixon note that there is a transition from traps constructed of wood and stone around Blue Anchor Bay to mostly stone-built traps around Minehead and Madbrain Sands. They attribute this to the fact that beaches at the former are covered in thick deposits of mud, necessitating weir construction from wood, whereas those at the latter are covered in beach pebbles and shingle ridges (Crowther & Dixon, 2008: 71). Around the Beauly Firth, '…analysis of cartographic sources…depicts the locations of various types of fish-traps and shows that they were situated on both the firth shorelines and the exposed, rocky coastal shores. However, during a recent coastal survey the fish-traps were found to only survive in the firths and none survived on the coastal exposures' (Hale, 2003:123-126). Survival of features, therefore, is likely to be dependent on location.

Stone fish traps tend to be linear, 'V' or 'C'-shaped, often with a sluice at the apex. Drystone walling or banks of boulders sometimes supported a wattle fence. Structures vary in shape and size, with walls of the larger ones extending for 100s of meters and often containing more than one sluice.

There are numerous stone fish traps to be found on the shores of the Severn Estuary. They appear to be mostly large, V-shaped fish weirs, many of which have a constriction at the apex producing a wishbone-shape. A fish weir of this type located to the north of Minehead along with a few others is still in use today by two local families but the type may originally date to the medieval period when they were first specifically mentioned in a document dating from AD 1424-5 (Crowther & Dixon, 2008: 96).



Figure 4: Working stone fish trap, north of Minehead, undergoing repair in 2007

(Crowther & Dixon, 2008).

In 1948 largely intact fish traps were described in Ross, Sutherland, Inverness, Orkney, Caithness and Shetland, being particularly numerous in the former three. Fish traps in those counties were described as being 'strongly built of rocks and large stones' (Bathgate, 1948:

99). Such features would necessitate considerable investment in terms of manpower, and 'must have been constructed when there was plenty of labour on the spot...' (Bathgate, 1948-1949: 101)

Caution should, however, be exercised when attempting to identify relict stone features around the low water mark. Bannerman & Jones note that, sometimes, apparent rows of boulders visible in the intertidal zone are not manmade, but are a result of a process known as "kelp rafting", where seaweed, usually laminarians, settle on the stone and grow to a size which creates a drag that moves the stones along the seabed until they encounter the shore where they are deposited (Bannerman & Jones, 1999: 72).

A significant number of fish traps also utilised naturally occurring features, such as rocks and islands, in their construction, which were supplemented by the addition of manmade structures such as wooden fencing or stone walls.

For example, in the Outer Hebrides, the remains of a fish trap at Benbecula comprise 'three stoney walls drawn between the rock outcrops known as Eileanan Airde' (Canmore, 2014). These were identified by aerial reconnaissance in 2005.



Figure 5: Fish trap constructed of natural and manmade features, Eileanan Airde, Benbecula, outer Hebrides

Crown Copyright: RCAHMS

Where it is not possible to date features by scientific means, in theory, their elevation contains chronological information related to marine transgressions and regressions. This is demonstrated by some fish traps observed on aerial photographs along the coasts of Brittany, which are currently unreachable on foot...the building of such weirs must date from a time when sea level was much lower than today' (Langouët & Dare, 2009:144). Fish traps in such positions have also been observed in Wales (discussed below). Provided mean low tide level is known throughout a chronological period, the topographic level of the sluice should, in theory, be a good indicator of when the trap was in use. In order to be effective, fish traps would have to be positioned so that the sluice was always accessible at low water. It would therefore seem likely that fish traps in use at a certain time would have to be positioned slightly further inshore than mean low water at that time, so as to account for the lowest neap tides.

This should be considered in conjunction with other influencing factors, such as changes in foreshore topography and the type of fish species the trap was intended for (Langouët & Dare, 2009:145). Although this dating method is far from precise, it has the potential for giving us an indication of possible periods of use.

Ownership, use and decline

Because documentary evidence is rare before the medieval period, it is not usually possible to trace specific ownership further back in time. It is possible that the large number of locations with fish traps dating to the twelfth to fourteenth centuries relate to 'the growth of urban centres within the later medieval period and the wealth and power associated with fishing, many fisheries being owned by monasteries and the nobility, and the importance of fish within the medieval diet' (Brown et al, 2007:15). Numerous examples of fish traps and associated monasteries and ecclesiastical sites exist in Britain.

On the north-west coast of Scotland, 'At a short distance from the church and manse of Lochbroom, there remains part of a very strongly-built yair. This being on the extensive glebe of a once rich ecclesiastical site, it was a private affair and the property of the church' (Bathgate, 1948: 99-100).

Although there is often no direct evidence either for dating or ownership of a fish trap, its close proximity to such a site indicates that the two were associated. For example,

'ownership, use and management of Blackwater Estuary fish traps is poorly understood, but studies have suggested links with two small Anglo-Saxon churches, in addition to the probable existence of an important monastery at the mouth of the estuary' (O'Sullivan, 2003:454). Another example is Castle Coeffin, located on the shore of Loch Linne in the Inner Hebrides. Thought to date to the thirteenth century, the castle is situated on a narrow promontory to the south-west of which is a small shingle bay in which there is a curvilinear stone-walled fish trap.



Figure 6: Oblique aerial view of stone fish trap adjacent to Castle Coeffin, Linmore Crown Copyright: Canmore

The trap would have dominated the bay, consisting of 'a roughly faced wall with rubble infill, enclosing about two-thirds of the...bay sheltered by the headland on which the castle stands. The castle would have overlooked the fish trap, which would have been advantageous when the two were in use, making that particular trap an unlikely target for would-be poachers. An entrance in the castle's south-west wall gave access to the shore.



Figure 7: Castle Cofein, overlooking its adjacent bay with associated fish trap

Crown Copyright: Canmore

The trap is noted to have angled straight sides and is degraded in places' (Canmore, 2014). Although the castle remained in the hands of the same family from 1469 to the eighteenth century, 'there is no evidence to suggest it was occupied in post-medieval times (Canmore, 2014), so it is surprising that the trap is still intact. It is possible that the stone walls are medieval construction which has stayed intact due to the sheltered nature of its location. It is also possible that the fish trap was in use until more recently, possibly being leased out by the owners of the castle, which would also explain the fact that it is in good condition.

O' Sullivan points out that researchers tend to 'turn first to contemporary documentary sources to try to reconstruct who owned and used these places. Unfortunately, as these texts virtually always emphasize the powerful and wealthy in medieval society (whether they be secular or ecclesiastical authorities), archaeologists go right to the top of the social hierarchy, simply state who the likely original owners were and ignore the muddy labourers who did the work' (O'Sullivan, 2003:451). Although this is a valid point, this is the nature of the majority of documentary sources, whether medieval or more recent- they were produced by and for the powerful as a tool for controlling resources. Relatively recent documentary sources of this type can often provide valuable evidence of both structural maintenance and rights to the fish caught. In 1790, in Kinkardine parish, the Old statistical Account noted that maintenance was undertaken on an annual basis, with the tenants being

rewarded with small fish of various kinds, although 'the salmon were the preserve of the laird or tacksman' (Hooper, 2001:9). At the Church-held fish trap of Lochbroom, Bathgate states that 'When the Rev. Dr Ross was in charge no less than 1000 baskets of herring entered this trap, or were left in it, after all the people in the district were supplied. These fish...decayed and polluted the whole upper end of Lochbroom, and local fishermen, blaming this as the cause of the fish leaving that part of the loch, broke down much of the outer wall of the trap; but the foundations remain, covered by seaweed' (Bathgate, 1948: 99-100). From 1732, information regarding ownership, construction and use of a previously ruinous fish trap at Dingwall are contained in the Dingwall Town Council Session Minutes (Hale, 2003:122). At this time, the town granted William Fraser permission to construct a new fish trap with no rent for a period of ten years, provided he built and maintained it at his own expense (ibid). However, the fish trap appears to have become profitable: by 1813 the rental to build, erect and fish was £1 11 shillings, in addition to there being 'additional conditions such that the Magistrates, members of the Council and a list of particular town inhabitants were supplied with salmon at the rate of nine shillings per pound in the Spring months and six shillings per pound, during the rest of the year' (Hale, 2003: 123). The trap ended up a victim of its own success, with landowners upstream claiming it and other yairs at the mouth of the river were stopping salmon from migrating downstream. Consequently, a series of litigation cases ended in the House of Lords and the town lost its fishing rights. It was shortly after this time, around 1827, that static fishing, which included yairs, was outlawed in the Cromarty Firth' (Hale, 2003: 123).

In 1860 salmon fishing around Chanonry Point, at the entrance to the Beauly firth, was said to be worth £70, with numerous stake nets are shown in 1860 on either side of the promontory'. Rent from the two stake nets in Ardersier parish, on the south side, amounted to £60. (Hooper, 2001:8). It is evident from these accounts that fish traps could be an extremely valuable asset, and that they often prevented fish from reaching the rivers, either to spawn or to be caught in river-traps. It was probably as a result of this that The Salmon Fisheries Act of 1861 was introduced in Britain. The Act made it an offence to catch salmon 'the first day of September and the first day of February following' (www.books.google.co.uk: 11). Furthermore, it stated that 'No dam except such fishing weirs and fishing mill dams are lawfully in use at the time of the passing of this Act, by virtue of a grant or charter if immemorial useage, shall be used for the purpose of catching or facilitating the catching of salmon' (www.books.google.co.uk: 11). This means that all fish traps not in use, and all fish traps unable to demonstrate immemorial usage, would have passed out of use forever in 1861. The Act also stated that all weirs that remained in lawful use should have a gap wide enough for salmon to pass through (www.books.google.co.uk: 9), which would have put an end to the large catches of salmon previously known.

From the nineteenth century, it seems that fish trap keeping became less profitable and was carried out by individuals or families. Local inventories from Nefyn show that '...herring fishing was widely practised as a supplementary occupation to farming' (Jenkins, 2009: 50). In Scotland, the New Statistical Account for Scotland mentions 'the "peculiar brevity" of female clothing in Ardersier, which was seen as resulting from the fact that they had 'to carry the heavy creels of fish back into the shore' (Hooper, 2001:15). This suggests that the man was carrying out other work elsewhere. It seems it was not unusual for a woman to be in charge of a fish trap. In 1924, Lewes stated that he was well acquainted with a retired gored keep from Aberarth: 'a certain Miss Davies who still holds a gored in her own right...She told me how hard, for a woman is the life of a gored-keeper; for she had often to keep night-watches, alert with lantern and net, that she might be ready when the tide receded to secure her haul; for if she delayed a poacher might be there before her. In the spring of every year she was obliged, as she expressed it, to "codi gored", raise the gored, or, in other words, repair the ravages of the storms, and this was no mean effort, for it entailed occasionally the lifting and replacing of some exceedingly heavy stones' (Lewes, 1924: 399).



Figure 8: Fish trap at Minehead undergoing repair, 2001 (Crowther & Dixon, 2008

Although dried fish would keep for 'up to ten years if properly dried, but was understandably often unpleasant to eat' (Mac Con Iomaire, 2006: 9). It is therefore likely that the majority of fish was distributed whilst fresh. At the mouth of the Blackwater Estuary a fish trap was associated with evidence of the processing and filleting of particularly large fish. 'The evidence consisted of a thick (15cm in depth) deposit of fish bone and shell fragments spread over an area of 6m by 4m...next to a "pound"...' (O'Sullivan, 2003:454). Given the inconvenience of transporting large numbers of fish elsewhere before processing, it would seem reasonable to expect the existence of associated buildings close to the foreshore. There is a nineteenth-century fish-curing house at the long-established fish trap, Ynys Gorad Goch, Anglesey. However, there is no apparent evidence of a fish-processing building having been there prior to the present one. Nefyn is known to have had numerous curing houses on the foreshore. At Aberporth two salting houses were located close to the beach (Davies, 2009: 38). Milford Haven had a fish market and associated buildings including smoke houses and an ice factory (Geraint Jenkins, J, 2009: 148). Although the latter are known to have been associated with offshore fishing, they could also have been associated with fish traps.

In the days before refrigeration, unpreserved fish would require rapid distribution. This would have necessitated good supply routes and an established customer base. In

nineteenth-century Ireland, according to Mac Con Iomaire, '...salesmen travelled in horsedrawn carts, selling fish to locals, travelling many miles until their load was sold' (Mac Con Iomaire, 2006: 5). Lewes describes a Miss davied of Aberarth 'coming with her basket early in the morning to my home, she having tramped some four miles over the hills to sell a fine salmon just taken from the gored' (Lewes, 1924: 399).

In Ireland, 'Transportation and refrigeration were key factors in the commercialisation of seafood', with the railways opening up inland markets for fresh fish (Mac Con Iomaire, 2006: 11). Prior to this, 'most inland counties would rarely have seen fresh fish' (Mac Con Iomaire, 2006: 18). With the introduction of the railways in Ireland in the mid-nineteenth century, fish could be transported in bulk from the coast to inland areas. 'In 1911 alone, 25,590 tonnes of fish were conveyed inland from Irish ports' (Mac Con Iomaire, 2006: 13). The increased commercialisation of sea fishing is likely to have been a contributory factor in the decline of the utilisation of fish traps. The Dublin Fishing Company, for example, was established in 1918 to supply the Dublin Fish Market. Before this time, trawling was unknown...' ((Mac Con Iomaire, 2006: 7).

Once a fish trap had ceased to be in use, a number of factors would have contributed to its survival, including erosion and human interference. 'It is known that stones were removed from the Gorad Ddu walls to build up the trap at Ynys Gorad Goch and it is likely that some were utilised for building the Belgium promenade opposite Ynys Tysilio' (Jones, 1983: 34). In Scotland Hale states that the fact that fish traps did not survive in exposed coastal locations as opposed to in estuarine conditions 'is a good indicator of survival and destruction in exposed coastal conditions compared with those in the firth environments'. Hale suggests that this may also be due to the type of structures used to fish off rocky coastal shorelines'.

Summary

Fish traps were historically constructed of wood or stone and sometimes combine natural features. Posts seem to have commonly comprised oak or alder, with willow or hazel used for Watling. Fish traps seem to be constructed of whatever local material was available and best suited to their environment. Structures range in date from Mesolithic to twentieth century. The same site is often used over a period of hundreds (or, in some cases, thousands) of years, but not always continuously. Many fish traps are known to have been

associated with ecclesiastical and monastic establishments and it appears likely that this also applies to numerous others. Decline in fish trap use in Britain may be due to several contributory factors, the introduction of the Salmon Fisheries Act being a major one. There may be a tendency for researchers to have overlooked the individual owners/keepers of more modern times. Evidence for fish processing in situ or in the vicinity is scarce. Evidence for fish transportation is similarly scarce, although what is available suggests it was carried out on a small scale from the nineteenth century onwards. Only a handful of fish traps are still in operation and this appears to be on a small scale. Once abandoned the majority of structures are broken down fairly quickly by natural or manmade forces.

Fish traps in Wales

Fish traps in Wales have been considered using the RCAHMW's desk-based fish trap mapping project as a basis. However, aerial survey has its limitations. It 'cannot identify scatterd or buried features such as baskets or stake scatters partially buried in sediments. Research by others, based on field work, desk-top survey and oblique aerial photography, has also played an important part in the identification and understanding of fish trap features and this is taken into account alongside the AP mapping. Because Llanon, in Cardigan Bay is the main study area, the results have been divided in order to reflect this. The results for Wales to the north of Cardigan Bay and Wales to the south of Cardigan Bay are broadly discussed. Lastly, Cardigan Bay itself is discussed in more detail, in order to provide greater context for the research on fish traps at Llanon.

North of Cardigan Bay

'The majority of mainland coast from the English border westwards towards the Llyn is composed of various built coast edges, and is either north or north-west facing' (Jones, 2002: 12). In north wales, it has been observed that a substantial number of surviving fish traps are located on beaches consisting of eroded glacial till (or boulder clay). Observations '...indicate that a subtle process of consolidation operates in such locations...', with the finer constituents being washed away, leaving the larger pebbles or boulders, which form a protective layer above the underlying glacial till (Bannerman & Jones. 1999: 72). Therefore, in addition to a firm surface, the natural beach material also provides the material with which to build.

In north Wales, it is estimated that a sea level rise of only about half a metre has occurred over the last thousand years. However, it should be noted that 'Changes can occur in the level of the seabed even if the surface level remains constant. This is especially so in area where strong currents can deposit sediment (Bannerman & Jones, 1983: 37). This has implications if attempting to analyse the relationship between location and high water at a given period.

In the Dee and Clwyd estuaries, local regulations forbade the use of fixed nets. The 'historic fishing method involved using trammel and drift nets operated from small rowing boats' (Turner, 2002: 97). Becasuse the Dee Estuary 'has been silting up for centuries', the remains of any earlier fish trap structures are likely to have been buried.

A mile to the north of Colwyn Bay, at Rhos on Sea, is the fish trap known as 'Rhos Fynach Weir' and depicted as 'Royal weir' on modern Ordnance Survey mapping. This fish trap is 'A'-shaped in structure, consisting of stone banks standing up to 0.7m in height, set with round wooden posts approximately 50-75cm apart. Evidence for Watling has been found within the bank of its main arm. Constructed of compacted cobles, it begins at the high tide line and extends some 400m in a north-easterly direction, terminating at the present low water line. The trap still holds a pool of water at low tide (RCAHMW, 2014).

A second fish trap located some 500m to the south was probably part of the 'fisheries' mentioned below. It is 'P'-shaped and consists of 'cobbles measuring 20-30cm across reinforced by wooden posts measuring 18-25cm diameter' (Turner, 2002: 96). The main section, a bank extending to 50cm height, extends from near the high water mark for some 260m. Its spread is now approximately 12m in width (RCAHMW, 2014).

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Figure 9: Drawing from around 1910 depicting Rhos Fynach fish trap www.byegones.co.uk, 2014

The earliest documentary reference is a 1230 charter, identifying fisheries at Rhos Fynnach as part of property later transferred to the Cistercian Abbey of Aberconwy (Turner, 2002: 97). After its dissolution, Aberconwy's property reverted to the Crown. In 1550 the fish trap had fallen into disrepair and its wooden posts had been removed to render it unuseable (Turner, 2002: 97). In 1575 the Earl of Leicester granted Rhos Fynach, together with its lands and fishing rights, to a Captain Henry Morgan for the sum of sixpence' in recognition of 'services rendered at sea' (www.Historypoints.org). Excavation of sections of the bank comprising the landward end of the main arm provided a sample of wattling which gave a radiocarbon date of approximately AD 1660 (310 =/- 60BP). A document of 1767 refers to two weirs. Rhos fynach was also referred to in Thomas Pennant's 1783 'Tour of Wales', in which he described the church as being entitled to the fish of every tenth tide and mentioned that forty pounds worth of mackerel had been caught in two successive tides (www.ports.org.uk)..



Figure 10: Postcard depicting inside of Rhos Fynach Weir, with mackerel lying in pool of water ready for collection

Image: www.byegones.co.uk

In 1850 a record catch of 35,000 herrings was recorded (RCAHMW, 2014). Ten tons of mackerel were removed in one tide in 1907 (www.ports.org.uk). The fish trap appears to have continued to be profitable until the nineteenth century. A sturgeon, reportedly weighing over 200 lbs was caught in the early 1860, and in 1865 'an eight foot shark was reportedly caught in the weir 'and exhibited in Llandudno market place, and then sent to be stuffed (www.byegones.co.uk). In the quarter ending September 30th, 1907 Rhos Fynach Weir produced the record catch of mackerel (www.byegones.co.uk). However, although ten tons were taken on one tide, this amount only realised £20 (ibid). The weir continued to provide livelihood for various leaseholders until the First World War (RCAHMW, 2014). The fact that Rhos Fynach Weir continued in use until the twentieth century means that the current remains are likely to represent later phases of use.

Another example of association with a monastic site that of the Thirteenth Century Bishop's palace at Gogarth, near Llandudno, belonged to the Bishops of Bangor, and is known to have had substantial associated fish traps (RCAHMW, 2014), although their location is no longer known.

In Llandudno Bay, at least two fish traps appear to be depicted on historic Ordnance Survey mapping, with a possible smaller one or two partially obscured by the end of the pier.



Figure 11: Llandudno Bay with v-shaped features extending towards pier

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Although the features do not appear on modern Ordnance Survey mapping, a field visit confirmed that lines of boulders still exist (see Figure 12). Rather than being in the form of walls, they appear to lie in scattered lines, close to the high water mark and may represent the remains of banks of boulders, similar to those already discussed in north Wales.



Figure 12: Llandudno Pier with line of boulders (defined by water either side of it) extending towards it from centre-right.

At Conwy Bay, a fish trap is depicted as 'Cored Faelgwn on a Lewis Morris chart of 1823 (Dyfed Archaeological Trust, 2011). The trap curves towards the flood tide and consists of 'a well-defined line of stones, some possibly the remnants of facing, running in a slightly curving line at ninety degrees to the shore' (ibid). This was not mapped during the RCAHMW mapping project as it was not visible. On the eastern shores of Conwy Bay, Bannerman has noted fish trap features, one of which comprised a 60cm high artificial ridge of red Irish Sea glacial clay, 150m in length. The wall had been constructed upon the substrate of the clay and was reinforced with rounded stones, thought to have eroded naturally out of the boulder clay. The ridge itself had support posts set into it, one of which produced a radiocarbon date of 1460 (cal) (Bannerman & Jones, 1999: 74).

Ogwen Weir fish trap, depicted as 'Ogwen Weir' on modern and historical OS mapping, is situated on the Bangor mud flats. It lies east of Cegin Weir fish trap, which extends from Porth Penrhyn. Both are similarly shaped and extend seaward for over 800m. Remains are still highly visible and consist of a narrow stone bank defined by slate and oak posts.



Figure 13: Ogwen Weir fish trap, Bangor mud flats

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Wooden posts have been dendrochronologically dated to the sixteenth century (RCAHMW, 2014). Geraint Jenkins, writing in 1992, notes that 'a weir at Penrhyn Castle, near the mouth of the Ogwen, was in use in recent years. A twentieth-century photograph shows its wattle walls. In this weir there was no special cage for the fish but they were caught in the apex made by the arms of the weir' (Geraint Jenkins, 2009: 123).



Figure 14: Ogwen Weir in the twentieth century, showing wall construction

Nayling, 2009

Historic mapping (1885-1947) depicts a footpath, whose purpose was probably to service the fish traps. The footpath extends from Porth Penrhyn and crosses through the south arm of Cegin Weir. At this point a gap or gate is shown. The footpath then extends through the first arm of Ogwen Weir, at which point a gap or gate is again depicted. The footpath then runs parallel to the first arm and terminates at the apex. Approximately 200m from the apex the footpath branches into two, with the second path heading northeast to link up to the point where the second hook converges with the first.



Figure 15: Ogwen (right) and Cegin (left) Weirs

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The hooks seem to have undergone several changes in form. 1885-1947 OS mapping depicts a second hook, which runs parallel to the first. An historic Admiralty chart may depict earlier phasing of the fish trap. The chart depicts the trap, also with two hooks, in a slightly different position. The mapping reflects this.

According to Evans, the two fish traps were extremely profitable at one time. He cites Hugh Derfel Hughes: 'In Lord Penrhyn's time more fish were caught there than these districts could receive, therefore they were sent to other places...It was almost too much to clear the weir before the second tide...it was common to hear of the weir being choked with fish, particularly when the wind blew in force from the land direction, and a number of men with horses and carts would be unable to clear them before the second tide, and they would bring fish by the load to Clodfa y cae and other places; but the reporter had seen the contents of the two present weirs carried by only two men, and they had no more than a single load' (Evans, 1995: 37).

Although the Anglesey coastline consists predominantly of rocky cliffs, it is interspersed with sandy bays, a number of which have associated fish traps. At Treath Bychan, on Anglesey's east coast, there is what appears to be a linear feature extending from rocks at the high water mark. The feature extends for some 100m to a point just below the low water mark. Some 6km to the east, in Red Wharf Bay, a 'V'-shaped fish trap at Llanddonna is visible in its entirity on historic 1886-1925 Ordnance Survey mapping, where it is depicted as a scattered line of stones, whose western arm extends for some 200m. It is situated with its upper section (including the apex) some 100m further into the sea than the current low water mark, and some 40m further than that shown on 1889 mapping. This is suggestive of its antiquity. Two nearby dwellings are depicted on both 1889 and modern Ordnance Survey mapping as 'Godreddi Bach' and 'Godreddi Mawr'. The name appears to have been corrupted from 'Goreddi' (meaning more than one gored). This indicates possible association of buildings with the fish trap and the fact that there may have been more than one.



Figure 16: Fish trap at Llanddonna, with houses 'Goreddi Bach' and 'Goreddi Mawr'

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The north-east and south-west shores of the Skerries (a series of rocky islets some 3km off the northern shore of Anglesey, accessible to one another at low tide and via small bridges), are thought to have been utilised as a fish trap. It is suggested that a central lagoon forms the main fishery, with 'its feeder channels netted off with wattle structures' (Bannerman, 1999: 75). The water surrounding the islets, with its very strong tidal streams and offshore reefs and sholes, is not suitable for boat-based fishing. 'in 1498 the Bishop of Bangor sent an expeditionary force to regain the Skerries from a usurper. In 1748 Lewis Morris noted that 'the lighthouse keepers on the Skerries caught many fish' (Bannerman & Jones, 1999: 75).

Just south of Holyhead, Newlands Fish Weir is situated on the sandy foreshore of Bedd Manarch Bay, and is still clearly visible as a curving line of stones, which together with natural rocks, encloses an area at the south eastern edge of the foreshore. The inner edge of walling is depicted as a 'Fish Weir' on 1889 and 1900 Ordnance Survey mapping. 'The section of walling runs north-east along the edge of the River Alaw channel for approximately 280m, before terminating at the point where the channel curves to the east. The trap is open at its north-west end, and is defined by rocks (bordering the coastline) on its south and south-western edges' (RCAHMW, 2014). 1889 Ordnance Survey mapping depicts a farmhouse to the east of the fish trap as 'Gored', whereas 1925 mapping depicts a smaller dwelling to the west of the farmhouse and immediated east of the fish trap as 'Plas Gored'. On modern mapping, the road leading towards the fish trap is depicted as Gorad Road'.



Figure 17: Location of Newlands Fish Weir, showing nature of remains

Crown Copyright: RCAHMW, 2005

Such roads would, undoubtedly, have formed an important part of the infrastructure used in the distribution of the catch. Jenkins describes the method by which herring fishermen sold their catch on the east coast of Anglesey in the nineteenth and early twentieth centuries: 'The fish was usually sold to merchants...who then sold the fish around the countryside. The fishermen themselves sold a certain amount directly to the public and young local boys were often given the task of walking the countryside selling from door to door' (Jenkins, 2009: 54).

On the west side of the bay, two fish traps at Penrhos are constructed of rocks and boulders (RCAHMW, 2014). Some 300m to the north is Cerrig yr Adar, which utilises the natural rocks in its construction.



Figure 18: Fish traps at Penrhos (bottom centre) and Cerrig yr Adar (top centre), visible as lines of stones.

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At Church Bay, on Anglesey's west coast, a series of 'V's are visible on 2009 AP mapping. They extend some 400m and appear to be accessed from series of very small bays separated by rocky cliffs.


Figure 19: Zig-zag line of 'V'-shaped fish traps at Church bay, with current low water mark (blue)

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The sluice areas of the traps are currently located some 130m west of the low water mark. Becasue 1888 Ordnance Survey mapping shows the position of low water as only some 30m further west, it could be inferred that the traps are of significantly greater antiquity. However, shifting sediment could also be a contributory factor.

The Menai Strait 'has an unusual tidal pattern, with the tide coming from the Caernarfon Bar, to the south-west, through the Swelles, one and a quarter hours earlier than the tide coming from the north, which it meets in the vicinity of Bangor. The average tidal range is 6-7m, which leaves a broad foreshore exposed at low tide (Turner, 2002: 98). There are a number of fish trap structures along the shores of the Menai Strait, with eleven identified during Cadw's Coastal Survey. The majority consist of stone walls, often combining natural features such as rocks and islets. Due to the sheltered nature of the Menai Strait, fish trap features here are not prone to wave-action in the same way as those at exposed coastal locations.

Ynys Gorad-goch is probably the most unusual of these. It is an islet located in the middle of the Swellies, an area known for the force of its tides. It operates by having a holding area and leading walls on both north and south sides, with the force of the tide acting to trap the fish on both flow and ebb tides. Another example of this is given by Bathgate, who describes a 'double yair' at Beauly Firth, close to Inverness, and suggests that the double line was '...laid to suit neap and spring tides and [therefore] to ensure continuity of a supply of fish' (Bathgate, 1948: 99).

It consists of two islands, each containing a building, linked by a causeway some 20m long.



Figure 20: Ynys Gorad Goch fish trap and curery

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One building is a house and the other a small fish curing building with a smoke tower. The fish trap walls are stone and curve around the east and west sides of Ynys Gorad goch, enclosing most of the rocky area exposed at low water. The walls were reportedly set with nets, which were accessed by walkways built out from the island. The angles of the walls are set to catch fish passing through the Menai Straits on the ebb tide, and the fish would be held by the strength of the tide. The west wall is set with a series of iron-grid outlets (RCAHMW,2014).

Local tradition has it that the island supplied fresh and smoked herring to a number of monasteries from the thirteenth century. The earliest known document referring to this fish trap and fishery dates from 1590 and refers to the Bishop of Bangor leasing the island and fishery to Thomas fletcher of Treborth. The rent was three pounds and one full barrel of herrings during herring fishing season. The present fish trap structure is thought to be nineteenth century and the fish curing building was built after 1811. The island and its fishing rights were sold by the Ecclesiastical Commissioners in 1988. It is now in private ownership (RCAHMW, 2014). Often a weirs belonging to a monastic or ecclesiastical establishment would be leased out. For example, the Bishop of Bangor gave Ynys Fadog Goch and the fish collecting rights for the weir there on lease to Thomas Fletcheron 1st april 1590, for £3 a year, with a barrelful of herring during the herring catching season' (Evans, 1995: 37).

Two other fish traps are situated in close proximity to Ynys Gorad Goch, on the western shore of the Swellies.



Figure 21: Ynys Gorad goch (bottom right), Coed Mor (bottom left) and Gorad Ddu (top right), the Swellies

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This map is based upon Ordnance Survey Material with permission of Ordnance Survey on behalf of the Controller of her Majesty's Stationery Office ©Crown Copyright. Unauthorised reproduction infringes Crown copyright and may lead to prosecution or civil proceedings. Licence number 100017916 Gorad Ddu consists of two arms adjoined to either side of a rock outcrop. 'Here the fish could pass round the outside of the island and towards the shore on flood tide but were held back by the wattle barrier of the weir as they made their way through the channel on the ebb (Bannerman & Jones, 1999: 79). Gorad Ddu fish trap is known to have been operational in the fifteenth century (Bannerman & Jones, 1999: 74). Jones states that the 3m high walls are covered by at least 4m of water at high tide (Jones, 1983: 31).



Figure 22: Gorad Ddu, showing height of wall

Bannerman & Jones, 1999

The larger, curving wall has 'a well-cut "sluice" or netted outlet in the apex of the oval, [into which] the wattle or wooden lathe sluice gate fitted' (Jones, 1983: 32). A further wall of small stones, some 4m wide, is situated between the rock outcrop and the western arm. It is thought that this is the remains of an earlier feature. Approximately 30m west of the western arm is a fish holding pool and possible dock. Jones has noted a number of holding pools in the Swellies (Jones, 1983; 29).



Figure 23: Gorad Ddu, with its black mantle of seaweed, looking shoreward Bannerman & Jones, 1999

Coed mor fish trap utilises a small island some 20m from the shore, and is constructed from three dry stone walls. The first wall measures approximately 80m and extends from the island's north-eastern tip. Together with the second wall it forms a funnel shape. The second wall measures approximately 1m height and extends from the northern tip of the island. It then runs parallel to the shore with the wall and the island together forming a channel running parallel to the shore for some 140m. The third Wall measures some 70m and is situated at the western end of the channel, creating a dam. Fish would presumably have been funnelled into the channel and prevented from escaping by the dam.

Gorad y Gut is situated on the shore of the Menai Straits, immediately north of Bangor. A road leading from the town to the foreshore is still known as Ffordd Gorad. The trap consists of a long, hooked arm (visible on an 1839 Admiralty chart), which extends in a north-easterly direction, parallel to the high water mark. It also has a rectilinear cellular structure at its south-west end (visible of 2009 aerial photographic coverage).



Figure 24: Gorad y Gut, viewed from the north-east, 2006

Crown Copyright: RCAHMW

The cellular structure represents square enclosures used for oyster-culture in the midnineteenth century (Bannerman & Jones, 1991: 71).



Figure 25: Gorad-y-Gut with hook-shaped arm extending to north-east and cellular structure at its south-west end.

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This map is based upon Ordnance Survey Material with permission of Ordnance Survey on behalf of the Controller of her Majesty's Stationery Office ©Crown Copyright. Unauthorised reproduction infringes Crown copyright and may lead to prosecution or civil proceedings. Licence number 100017916 Gored Bach is some 500m north-east of Llanfaes Priory, which was founded in 1245. It is one of a complex of five fish traps, which share the same alignment and are almost identical in size and shape. Gored Bach was formerly referred to as 'Gorad Friars' and it seems likely that the entire complex is associated with the adjacent Llanfaes Friary, which was founded in 1245. Penmon fish trap is the northern-most of the group. Aberlleiniog is some 40m south. Gored Tre-castell is a further 70m or so south. Gored Bach is located some 800m further south. Some 900m to the south is a trap at Beaumaris.



Figure 26: Fish trap complex from Aberlleiniog to Beaumaris Crown Copyright: RCAHMW, 2009

Also on the southern shore of the Menai Strait, to the south of Caernarfon, is Cored Gwyrfai. Along with St Baglan's Church, Cored Gwyrfai was reputedly held by Clynnog Fawr in the later medieval period (Driver & Davidson, 2005: 105). The site of St Baglan's Church is thought to have been in use from the later-fifth to early-sixth century, and also may be situated within a later prehistoric enclosure (Driver & Davidson, 2005: 105).



Figure 27: St Baglan's Church (top left) and Cored Gwyrfai (bottom right)

Crown Copyright: RCAHMW, 2009

The 'C'-shaped fish trap at Clynnog fawr was first identified during aerial reconnaissance in 1989, and subsequently surveyed by Gwynedd Archaeological Trust. It is thought that the fish trap dates to the early thirteenth century, at which time it would have been further inland, the cliff possibly having receeded some 118m (Momber, 1991: 98). Momber suggests that this is the 'Aber Saint' fish trap mentioned in a charter of Edward I (1272-1307), and also in the record of Caernarfon 1461-83.

On the Llŷn peninsular, it is noted that in some places, notably the Aberdaron district, 'it was customary to build small, temporary stone weirs that were dismantled at the end of the season' (Turner, 2002: 98) and would therefore leave no archaeological footprint. Two fish

traps at Boulder bank and Porth Bodeilas exist within close proximity. The tide line at Boulder Bank fish trap is depicted as significantly further inshore in 1889. The fish trap comprises two conjoined 'C'-shapes making an 'S'. Within the lower hook of the 'S' is a large boulder or rock outcrop.



Figure 28: Boulder Bank fish trap with modern (blue) and 1889 (grey) low water marks

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However, just 400m to the south-west, at Porth Bodeilas, the tide line appears not to have changed since 1889. A large outcrop of rock separated the two locations, and conditions either side of this must be differently affected by offshore drift. The fish trap, comprising two conjoined 'L'-shapes, was identified during RCAHMW aerial reconnaissance in 2009. And measures some 130m from end to end. Due to the lack of an apex, it seems probable that this type of trap operated in strong currents rather than by the force of the tide alone.



Figure 29: 'L'-shaped fish trap at Porth Bodeilas Crown copyright, RCAHMW: 2009

Just south of Abersoch, a fish trap at Penrhyn Du was identified by aerial reconnaissance in 2007. Having the appearance of a line of boulders, the original fish trap may have curved towards the point. However, it is also possible that the line of boulders is related to a former harbour structure.



Figure 30: possible fish trap remains at Penrhyn Du

Crown copyright: RCAHMW

South of Cardigan Bay

At the southern end of Wales, the Severn Estuary is known for its fish traps and is considered to contain some of the best-preserved archaeological evidence for fishing in the British Isles, extending from the Mesolithic to the twentieth century' (Brown et al, 2007:1). The earliest evidence is in the form of fish bones found in Mesolithic contexts, where the presence of many smaller species of fish indicates the use of fish baskets. Bronze Age fish trap remains have been found preserved in palaeochannels at Peterstone great Wharf, Redwick and Caldicot (ibid). From the English side of the Bristol Channel, a Saxon charter of 690 AD records a fish weir off Aust. On the Welsh side,' a charter dated by Professor Wendy Davies to c. 895 records goredi at the mouth of the Troggy at Caldicot, Gwent' (James & James, 2003).

'On one occasion, in about 1330, Abbot de Camme had several of his weirs raised by up to 2m. This obvious hazard to navigation en route to Monmouth Castle caused the Earl of Lancaster to protest to the King...The consequence of these encumbrances was a Crown edict in 1535, ordering the demolition of weirs in the Thames and many other major waterways' (Momber, 1991: 97). There is extensive later historical documentation (from 1861 onwards) relating to fish traps in the Severn Estuary. 'Much information came from the Annual reports of the Inspectors of Salmon Fisheries which were associated with the Salmon Fishery Acts of 1861 and 1865. They investigated the evidence for "immemorial usage" of the sites where "fixed engines" or larger ranks of fish traps were then in use' (Turner, 2002: 101).

Significant concentrations of features have been recorded at Magor Pill. A series of posts comprising the remains of a series of 'V'-shaped structures, some overlying one another, have been radiocarbon dated to the early-late twelfth century (Nayling, 1999: 93). In 1990 the foreshore at Sudbrook Point was the subject of an intensive archaeological survey in advance of construction of the second Severn Crossing. Evidence of both types of putts, including V-shaped post settings, baskets and hurdling were identified. Close to the River Troggy, a number of baskets were identified in the 1990s. Associated with the baskets were roundwood stakes- some thought to hold the baskets in place, others thought to possibly form 'part of a larger fishing structure such as a hurdle or leader, used to channel fish into the basket' (Brown et al, 2007:9). Within the Severn estuary, fish traps 'are constructed of

wood and appear in a number of forms, including V-shaped post settings, linear post alignments, lengths of hurdling and baskets...' (Brown et al, 2007:1).

Putts are thought to be unique to the Severn Estuary. Putts were either arranged in ranks or placed at the apex of a V-shaped trap whose fences were constructed of wattle. They have been found at several locations along the northern foreshore, dating from the eleventh century. Putcher ranks continued in use until the mid-twentieth century, with remains still visible at Goldcliff. At Goldcliff, modern Ordnance Survey mapping depicts two linear features, both referred to as 'Salmon Catch'. The most westerly begins some 80m from the high water mark and extends approximately 130m in a southerly direction. The 'salmon catch' is situated some 400m south-west of the second 'salmon catch', which has two other, parallel linear features, immediately north of it. Sources suggest a fishery was established on the foundations of Goldcliff Priory, and the visible features may be the remnants of this. However, putcher ranks are known to have been in use here until the 1990s (Turner, 2002: 101).



Figure 31: linear features mapped using OS mapping and AP coverage

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Figure 32: Putcher ranks at Goldcliff, 1994

Turner, 2002

More putcher ranks are recorded at Portland grounds, to the west of Goldcliff and at Ball Bay, some 80m east of Sully Island. As putchers appear to have been an eighteenth century development, it is probable that fish trap remains of greater antiquity would be different in form to those now in situ. A decline in the use of putchers and putts on the River Severn has arisen from a combination of factors. 'The Severn Estuary has suffered from falling fish stocks, tight regulations on fishing and potential modifications of the estuary's hydraulic regime that made the upkeep of fishing site impractical. Further contributory factors were regional changes to the socio-economic focus, away from the Severn itself towards larger urban areas such as Bristol or Gloucester, as well as the industrialisation of the local landscape' (Crowther & Dixon, 2008: 74).

In the Cardiff district, it was common for a single net in the form of a bag fixed with poles buried in sand (Geraint Jenkins, 2009: 120). As with other traps of this type, there are unlikely to be associated archaeological remains.

A possible 'C'-shaped fish trap at Dunraven Bay measures some 32m from end to end. The 'C'-shape is more usual of a stone-built trap. At Swansea Bay, both wooden and stone fish traps are known to have been utilised. At its eastern end, at Baglan Bay, two linear features extend from the shoreline. They are depicted on an historic Admiralty Chart as 'stones and Watling'.

By far the largest feature mapped in Swansea Bay was the 'V'-shaped possible fish trap whose site is now docks. The south-east pointing arm measured some 2km in length, with the south-west pointing arm measuring some 960m.



Figure 33: Location of 'V'-shaped boulder-spread outline, mapped as visible on an 1879 historic Admiralty chart. Now obscured by dock area

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Remains at the western end of the bay consist of a palimpsest of 'V' shaped traps located either side of the low water line. Rows of 'V' shapes often follow the same line and appear to be joined together to form zig-zags. These 'V' and zig-zag shapes are often overlain with additional 'V's and zig-zags, which appear to represent different phases of use. Archaeological remains represent two types of fish trap.



Figure 34: Oblique aerial photograph of 'V'-shaped fish traps forming a palimpsest of zig-zags, probably representing different phases of use.

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In Swansea Bay, particularly in the Oystermouth-Mumbles district, there were still thirteen stone and wattle weirs operating in the late nineteenth century (Jenkins, 2009: 122). Fish traps in Swansea Bay are mentioned in a 1650 survey of the manor of Oystermouth. The fish traps were identified by Gwent Glamorgan Archaeological Trust (GGAT) during their 1998 Swansea Bay intertidal survey (GGAT, 2011). Fish trap features have been mapped using historic Admiralty charts and historic aerial photographic coverage which were overlaid onto modern Ordnance Survey mapping by georeferencing using ArcGIS software.



Figure 35: The Swansea Bay fish trap complex, mapped during RCAHMW fish trap project

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The arms of earlier traps consist of low stone walls, measuring some 1-2m in width. Their inner faces were set with roundwood posts, approximately 50cm height and 20cm width. Wooden posts continue beyond the walls to form a gradually narrowing snout running for a further 20m or so. These posts supported wattle fences. The apex of the 'V ', would have held a closely woven conical basket with its entrance facing the shoreward (Turner, R, 2002: 101). This type of fish trap was in use in Swansea Bay until late nineteenth century, when they were superseded by stake nets, which were laid out in similar patterns (Geraint Jenkins, 2009: 117).

Stake-nets consisted of wooden posts with nets tied to them. Posts were approximately 6ft height and set about 10-12m apart. At the apex of each 'V' was a sluice containing a circular roofed cage reported to measure about 12yds circumference. Nets are described as being constructed of 1 inch bar mesh, some 300yds length and 7ft height. Theses later nets allowed smaller fish to escape, and 'local by-laws require the cage to be in such a position

that a pool is left at low water' (Geraint Jenkins, 2009: 117). Stake nets were mainly used on mud flats with a relatively wide tidal range, and until the mid-20th century Swansea Bay was renowned for stake-netting, which persisted until around 1940 (ibid). At this time the area between Swansea Bay and mumbles Head was known as the location of the largest stake-nets found in the county, referred to locally as 'stop nets' or 'kettle nets'. A rental map thought to date to around 1914 illustrates thirteen 'V's and also appears to record the names of those who fished them, providing a rare insight into who they were used by at that time.



Figure 36: Map of Swansea Bay weirs naming owners/tenants, redrawn from 1914 original.

Image: Turner, 2002

At Oxwich bay, Glamorgan, a group of three V' shaped fish traps were identified by the RCAHMW during aerial reconnaissance in 2009. The largest of the three (Oxwich bay fish trap 2) is adjacent to the low water mark, with its apex pointing seaward and arms pointing shoreward. The arms consist of what appears to be a series of posts, infilled with stones or seaweed.



Figure 37: 'V'-shaped fish traps at Oxwich Bay, showing two adjacent fish traps, with a third, smaller, possible fish trap further inshore.

Crown Copyright: RCAHMW, 2006

The northern arm of the largest 'V' measures some 170m and points north-west, with its southern arm measuring some 120m. The trap is adjacent to a smaller and less complete example. The probable remains of a similar fish trap are visible slightly further towards the shore, The three may represent three different phases of use at the site.

According to James and James, 'numerous fish weirs have been identified in medieval and early modern records of the Marcher Lords of Llansteffan and Kidwelly. Both Carmarthen and Whitland Abbey possessed fish weirs in the estuaries of the Táf, Towy and Gwendraeth' (James & James, 2003). Rees (1947) states that, around 1170-1180, the Lord of Llansteffan gifted the church of Llansteffan, a carcucate and fifty acres of land, a boat at the Ferry and a fishery in the Tâf to the Knights St John of Jerusalem. In 1139 the Lord of Llansteffan had the right to 'free fishery in the River Towy with nets and other engines and weirs... ' (James & James, 2003). The weirs continued to be leased out until sometime between 1411 and 1481-1482, by which time they were broken and disused (James & James, 2003). As James and James state that there is 'no mention within all the modern 'regulatory' literature dealing with the fish and fisheries in the estuaries of the three rivers of stone fish traps or fish weirs' (James & James, 2003), perhaps they fell at of use before fish traps elsewhere.

The Salmon and Pastoun Scar fish trap complex, near St Ishmael's, was photographed and recorded extensively by Heather and Terry James from the 1980s-2003. The complex, possibly once associated with the remains of a nearby coastal settlement, is situated upon and between the two scars, in a natural sandy basin covering an area of submerged forest within a peat shelf, extending some 700m east-west and 800m north-south (RCAHMW, 2014). 'There is little doubt that some of the weirs on the scars today are medieval in origin, and the besanded medieval settlement at St. Ishmael's...could relate to a fishery belonging to Whitland Abbey' (James & James, 2003:).



Figure 38: Fish trap features (red) mapped with the aid of oblique aerial photographs at salmon and Pastoun Scars

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At Penrhyn Castle, south of cardigan, a curving 'V'-shaped structure appears to be built of individual piles or posts (although this has not been verified) and is mostly complete (RCAHMW, 2014). Both arms measure some 130m in length. The RCAHMW suggest a possible relationship with St Dogmaels Abbey just under 4km to the south.



Figure 39: Fish trap at Penrhyn Castle, viewed from the north Crown Copyright: RCAHMW, 2007



Figure 40: Mapped fish trap at Penrhyn castle showing current (blue) and 1889 (grey) low water marks. N.B. southern section of fish trap is also depicted on 1889 mapping

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As the entire fish trap is beyond the low water mark, the only way to verify what material was used in its construction would be by diving. 1888 OS mapping does not show much change in sea level, indicating far greater antiquity.

The Scandinavian name Fishguard, Fiskigardr , means 'enclosure for catching or keeping fish' (RCAHMW, 2009), indicating the existence of fish traps during the Viking period. Two stone-built fish traps flank the north and south sides of Fishguard's harbour. The north-west fish trap lies just below the entrance road to the ferry terminal. It is first shown on the early maritime charts of Lewis Morris dating from 1748, and is depicted on the first edition Ordnance Survey 25in map of 1889 as an inverted 'V'-shaped submerged stone wall, adjoining coastal rocks north of the village of Goodwick at its west end.



Figure 41: 1748 plan of Fishguard Harbour depicting fish trap at Goodwick

www.liv.ac.uk

The second fish trap is also 'V'-shaped and stone-built, extending from coastal rocks on its south side. It is not mapped on any sea-charts or historic maps. It measures approximately 34m from base to apex, with equally-spaced arms measuring 40m in length and up to 9m in width. It is constructed from large boulders, which are now partially dispersed. The trap is only exposed at the lowest tides, of 0.5m and under. It is likely that a build-up of sand behind the trap's shoreward side may obscure further parts making it considerably larger.



Figure 42: 'V'-shaped Fish trap on south-east side of Fishguard harbour, no longer exposed except at exceptionally low tides

Crown Copyright: RCAHMW, 2009



Figure 43: 'V'-shaped Fish trap on south-east side of Fishguard harbour, partially exposed at low tide

Crown Copyright: RCAHMW, 2009

Current sea level would make it difficult to regularly use and make repairs to this fish trap, indicating an early construction date (RCAHMW, 2009).

The commercial port of Fishguard Harbour at Goodwick was largely constructed towards the end of the nineteenth century and the start of the twentieth (RCAHMW, 2009). It seems likely that the quantities of fish subsequently caught by fishing from boats echoed the quantities caught by fish trap before the construction of the harbour. A report from 1888 states 'On Monday great quantities of fish were caught, all the numerous boats having several mace, some about 12. Some difficulty was experienced in disposing of quantities, as the carriers from the adjoining villages had not made their appearance. New Quay boasts a better fleet of fishing-boats than any in Cardiganshire, and the fish caught are among best of their kind' (The Aberystwyth Observer and Merionethshire News, 13 November 1886).

Summary

Fish traps are numerous along Welsh shores to the north of Cardigan Bay, particularly around the Menai Strait. Where they exist, natural wall-like features (e.g. rocky outcrops) are often utilised. The structure of manmade features is predominantly stone, often consisting of large boulders. Fish traps are often located in close proximity to ecclesiastical and monastic foundations and are often to be found on the shores of larger estates (e.g. the Penrhyn Estate). Fish traps are sometimes depicted on modern and historic Ordnance Survey mapping, which also sometimes signifies their prominence in the locality (e.g. footpaths at Ogwen and Cegin Weirs, naming of roads at Newlands Weir and dwellings at Llanddonna). A few wood elements exist and have produced late medieval dates. However, documentary evidence suggests that fish traps were an important part of life from at least the thirteenth century (Rhos Fynach) until the twentieth century (e.g. Ogwen Weir).

A proliferation of wooden fish traps have been recorded around the Severn Estuary, as far as Swansea Bay. They consist of 'V'-shaped or linear traps with baskets for catching fish. They range in date from the Bronze Age (e.g. Redwick, Caldicott) to the late twentieth century (e.g. Goldcliff, Swansea Bay, Salmon and Pastourn Scars. In Swansea Bay, later fish traps appear to be wooden, with earlier ones constructed of stone and wood. Documentary evidence hints at the presence of fish traps along the coasts of Pembrokeshire and Carmarthenshire, although only a scattering have been identified archaeologically.

Cardigan Bay

The indented character of Cardigan Bay coast is the result of 'the post-glacial drowning of the lower parts of former river valleys'. '...it is almost certain that substantial subsidence took place in Cardigan Bay before the advent of the Bronze Age, i.e. probably in Neolithic times...' (Howe & Thomas, 1963: 108). Therefore, any fish trap remains would not be of an earlier date than this. Iron Age Wales 'was a land of small regions linked by common architecture and settlement patterns but also displaying marked local distinctiveness' (Driver, 2013: 42). There are no coastal promontory forts in Ceredigion north of the Aeron Valley, and 'settlement evidence suggests that the favourable locations of the lowland basins where abundant resources were found...combined with encircling high ridges for observation or protection and overland contact, formed ideal settings for agricultural communities to flourish' (Driver, 2013:47). It is therefore possible that the coast of Cardigan Bay was not controlled by the elite and powerful until after the Iron Age, although it may simply be that underlying geology was not suitable for the construction of promontory forts. Although Geraldus Cambrensis journeyed through Wales in the 1180s he left the coast at Cardigan and did not re-join it until they reached the Ystwyth Estuary, therefore missing out Cardigan Bay (www.swanseamass). As has been seen, in recent years significant research has been conducted in fish traps around some areas of the Welsh coasts. However, fish traps in Cardigan Bay have not been studied in detail.



Figure 44: Map of Cardigan Bay with known fish trap locations highlighted in red

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Cardigan Bay has 'a mainly open coastline, exposed to the prevailing south-westerly and westerly winds' (Countryside Council for Wales, 2009). It consists largely of a soft coastal edge, composed of either glacial or drift sand, with a generally wide, sandy foreshore (Jones, 2002:15). From Pwllheli to Porthmadog the coast consists mainly of drift sand with small rocky outcrops. Turner states that fish traps along the coast of Cardigan bay are of a distinctive type: 'These are wide arcing walls of boulders and cobbles taken from the beach, and laid out along steeply shelving gravel and sand beaches' (Turner, 2002: 99).

The most northerly of the mapped Cardigan Bay fish traps is Penychain, on the eastern tip of Pwllheli bay.



Figure 45: Penychain, constructed at least partially of natural features

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Cerrig y Barcdy, some 6km west of Cricieth in Tremadoc Bay, was identified during RCAHMW aerial reconnaissance in 2007. The structure measures some 82m x 74m is open to the south-west. When identified, the fish trap was partially obscured by seaweed, but was noted to have small D-shaped cells at its west end (RCAHMW, 2014). It is possible that these were nineteenth century additions similar to those at Gorad y Gyt, used for oyster-culture.



Figure 46: Cerrig y Barcdy, with 1889 Ordnance survey mapping overlaid onto modern Ordnance Survey mapping, highlighting difference between current (blue) and historic (grey) low water

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South of Porthmadog, a generally wide, sandy coastal plain continues to the Mawddwch Estuary. South of the Mawddwch estuary the hills drop sharply to the coast, which is composed of drift rock with drift cover, with dunes between Tywyn and Aberdyfi (Jones, 2002:15). At Llwyngwril there are a series of fish traps, identified by RCAHMW aerial reconnaissance.



Figure 47: Fish traps at Llwyngwril, with at least six 'V' and 'C'-shaped features visible as darker lines amongst surrounding material

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At Llangelynin, a 'V'-shaped fish trap is visible to the west of St Celynin's Church. 1889 Ordnance Survey mapping depicts the low water mark some 70m higher up the foreshore than modern Ordnance Survey mapping. The arms of the fish trap are situated just west of the current low water mark, with the sluice area now some 100m further into the sea. In 1889 the sluice would have been even further out to sea. Given the absence of detailed earlier mapping, it is impossible to trace the movement of the shifting foreshore back any further.



Figure 48: Llangelynin fish trap, with modern low water mark (blue) and 1888 low water mark (grey). With sluice now some 150m from 1888 low water mark and some 100m from modern low water mark

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Beyond Llangelynin, no extant fish trap remains are known, or were apparent during the desk-top survey, until Aberdyfi. However, the right conditions exist at Tonfannau, with 1888 Ordnance Survey mapping depicting an area of shingle extending to the north and south of the Afon Dysynni river-mouth, with the coastline extending some 80m further into the present sea. Modern Ordnance Survey mapping depicts sand on this section of the foreshore). There are known to have been fish traps at Tywyn (Jenkins, 2009: 122), although the Tywyn foreshore is now a sandy expanse, apparently devoid of areas of boulders. It therefore seems that the morphology of the foreshore along this stretch of coast may have altered so as to have eradicated any sign of former fish traps.



Figure 49: Possible fish trap features at Aberdyfi

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South of the Dyfi Estuary a wide, sandy foreshore stretches as far as Borth and Ynyslas, also backed by dunes. 'Gored Wyddno', described as being on the beach between the Dyfi and Aberystwyth, is noted in the ninth century Hanes Taliesin' (James & James, 2003). After the January- February storms of 2014, a double post alignment was noted on a peat exposure at Lower Borth. At the shoreward end, the line of posts disappears into the sand as the beach slopes upwards. At the seaward end, the posts disappear into the sea. Although the orientation is roughly aligned with that of the surrounding groins, the posts are not exactly aligned and are narrower in width. Some were alder, although some were also noted to be of oak. The alignment was also noted by Wessex Archaeology (RCAHMW, 2014).



Figure 50: Double post-alignment at Lower Borth, protruding from sand-covered peat, left-right foreground (with prehistoric tree remains also protruding from peat shelf)

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Although other known fish traps in Cardigan Bay are constructed of stone, it is possible that the peat exposures at Borth were utilised as a base for driving in the posts of wooden fish trap fences, as at Salmon and Pastourn Scars.

South of Borth, the coast then changes to a broad wave-cut platform in front of rocky cliffs with drift cover which extends beyond Aberystwyth, before 'giving way to a coast edge of boulder clay with shingle or pebble beaches as far as Newquay' (Jones, 2002:15). The remains of fish traps along this section of coast have been found to be 'V', 'C' or rectilinear in shape and consist of stone walling a single boulder high. Just south of Aberystwyth, at Tan y Bwlch, what appears to be a V-shape is visible on 1947 and 2005 and 2009 aerial photographic coverage. The 'enclosed' area within the 'V' appears boulder-free, as with the larger fish trap at Mynachdu'r Graig. Another short linear feature is visible some 10m further west and could represent a different phase of the same trap.



Figure 51: Possible fish trap at Tan y Bwlch

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At Mynachdy'r Graig, Llanfarian, two fish traps were identified during RCAHMW aerial reconnaissance in 2009. Both are 'V'-shaped, with each arm of the larger one measuring some 130m in length. A further arm is visible running parallel to its northern arm but extending further inshore. The second lies some 120m to its south-east and is considerably further inshore, although orientated along the same alignment as the larger one. Each arm measures some 35m in length. It is probable that all features represent phases of use.



Figure 52: Mynachdu'r Graig 'V'-shaped fish traps

Crown Copyright: RCAHMW, 2009

What appears to be the remains of a 'C'-shaped fish trap is visible at Llanrhystud on both vertical and oblique aerial photographic coverage.



Figure 53: Exposed (southern) half of possible 'C'-shaped fish trap at Llanrhystud Crown Copyright: RCAHMW, 2009 'In the Llanddewi Aberarth district of central Cardiganshire...it is said that there were about a dozen fish weirs operating in 1861; by 1896 these had declined to nine and in 1924 only two weirs remained in operation. All of these were concentrated between the mouth of the Aeron and the mouth of the Arth...' (Jenkins, 2009:122). Mapping identified numerous possible fish trap features along this stretch of coast.



Figure 54: Mapped fish trap features, Aberarth to Llansantffraid

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According to Lewes, there were twelve fish traps operating in the Llanddewi Aberarth district in 1861; by 1896 these had declined to six and in 1924 only two weirs remained in operation (Lewes, 1924: 397). Fish traps at Aberarth were described in some detail in the earlier twentieth century in an article published in the Cambrian News and in an article by

Lewes published in Archaeologia Cambrensis in the same year. They were described as '...built up of loose stones, 'known locally as "Goredau" and are constructed for the purpose of catching salmon' (Cambrian news, 1924). Fish trap features at Aberarth are rectilinear and 'V'-shaped and they survive as stone walls, a single boulder high (RCAHMW, 2014). The wall remains are well preserved and are visible from the nearby coast road. A group of three structures is scheduled.



Figure 55: Mapped fish traps at Aberarth

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Lewes describes the fish traps thus: 'a strong wall of stones, taken from the beach and piled upon one another, is erected on the shore, until it encloses a large oval-shaped portion of the beach; the extension of the wall usually being 200 yards or more. At the deepest point in the gored between two of the lower stones, there is an opening bridged by one very large stone supporting others. A drain is thus provided and across the drain are placed strong, slender stakes, or sometimes in these later days an iron grating' (Lewes, 1924: 398).

At Aberaeron, two curved and two linear feature were visible on 2009 AP coverage and mapped accordingly. The curved features are located to the immediate north of the mouth of the Aeron. The linear features are located to the south of the mouth of the river mouth, and are aligned with groins on that section of foreshore. The C-shaped feature appears to
have two arms, one of which is hooks round to point shoreward. The 'C' measures some 100m across at its widest point.



Figure 56: Possible fish trap features at Aberaeron

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St Ina's Church at Cei Bach is located on south-east section of the point that separates Little Quay Bay and New Quay Bay. On the foreshore to the north and east of the church, what appears to be the remains of fish trap walls are visible on 2005 aerial photographic coverage. The walls were also identified during RCAHMW aerial reconnaissance in 2000 (RCAHMW, 2014).



Figure 57: Modern Ordnance Survey mapping (with foreshore in pink and modern high and low water marks outlined in blue) of Cei Bach overlaying 1888 Ordnance Survey mapping

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What appears to be the remains of a 'C'-shaped fish trap extends in a gentle curve from the groins at the east side of the point towards its tip. What appears to be a second, 'V'-shaped structure either underlies or overlies the first. The possible remains of wall-sections are also visible at the point's north-west end. Interestingly, having undertaken preliminary ground-truthing, it was not possible to identify any features, although the scatter of boulders certainly looked similar to those used to construct fish trap walls. The lack of any definite features was also noted by Dyfed Archaeological Trust during field walking as part of the coastal assessment survey (Fran Murphy, Dyfed Archaeological Trust, pers. Comm.).

1888 Ordnance Survey mapping indicates a dramatic change in the morphology of the foreshore. Given that prevailing winds in Cardigan Bay are from the south and west, this this is probably due to shift of sediment as a result of longshore drift.

Historic mapping shows a spit projecting some 100m further seaward than the present point, where it curves westward towards a rock depicted as Careg Ina. It seems probable that any further fish trap remains would have been significantly further seaward than the present low water mark. Boulders piled up on the point may represent these remains.

West of the point at St Ina's, lies New Quay Bay. The foreshore here can also be seen to have receded, although in 1888 the low water mark would still have been well inland of the fish trap. The 'V'-shaped feature is located amongst what appears to be a natural rock and/or boulder spread and it is possible that it tooo may be natural.



Figure 58: New Quay Bay, with possible 'V'-shaped fish trap (centre foreground)

Crown Copyright: 2009

Another 'V'-shaped feature, apparently devoid of debris, is visible on vertical AP coverage, some 150m to the north-west.



Figure 59: New Quay Bay with 1888 Ordnance Survey mapping overlying 2009 AP coverage. With modern (blue) and historic (grey) high water marks

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Summary

Sea level seems to have fluctuated at some localities in Cardigan Bay, with a number of fish traps now significantly far out to sea. Known fish traps are constructed of stone, excepting the possible wooden feature identified at Borth. Other than possible features at Borth and Aberdyfi, all known fish traps seem to be 'V' or 'C'-shaped. A lack of coastal promontory forts suggests that the coast may not have been fully controlled by the powerful of the Iron Age, although this does not mean that the coastal resources were not exploited at this time. Documentary evidence indicates that fish traps were an important part of the Cardiganshire economy from the thirteenth century onwards. However, unless wood (suitable for dating) is present within a fish trap structure, there is no potential for dating the physical remains. The presence of iron fittings may be indicative of a later date. Historic OS mapping indicates significant fluctuation of sea level at certain localities, which may be partially due to

longshore drift. The greatest proliferation of fish traps occurs on the coast between Llansantffraid (Llanon) and Aberarth.

Landscape and settlement at Llanon

The parish of Llansantffraid, to which Llanon belongs, covers an area of some 4500 acres. It is flanked by Llanddewi Aberarth parish to the south, Llanrhystyd parish to the north and Llanbadarn Tref eglwys parish to the east. The settlement of Llanon is located along the A487 Aberystwyth-Cardigan road, between Aberarth and Llanrhystud. The settlement of Llansantffraid is located at the northern end of Llanon, between the A487 and the sea. The two were formerly distinct, but from the nineteenth century buildings were erected along either side of the road linking the two, both of which are now considered to form the village of Llanon. The third settlement within the parish is Nebo, located some 2km to the east east of Llanon on the eastern edge of the parish boundary. The parish is bisected by the rivers Cledan and Peris, which divide it roughly into thirds. Both rivers are also fed by two tributaries.

The 1.6km stretch of coastal cliffs, referred to as Traeth Llanon is noted for the Pleistocene/Quaternery sediments exposed within it. It is considered to 'provide a unique profile through a sequence of gravels that were deposited on an alluvial fan by the Afon Peris and Afon Cledan towards the end of the last Ice Age, approximately 18,000 years ago' (Countryside Council for Wales, undated: 3). The village of Llanon sits upon this fan. Some 3.5km north, the line of the Ystwyth fault links the coast at Llanrhystud with the upper and middle Ystwyth Valley... This cut through the rugged terrain of the region provided an advantageous route for human movement during prehistory and later history' (Driver, 2013: 67). Llanon is bordered by hills rising to the east, from which point two hill forts, Pant Wilog (between the rivers Peris and Cledan) and Troed-y-rhiw (north of the Peris), overlook the settlement area. To the north, at Llanrhystud, the hill forts of Castell-Bach and castell Mawr also overlook the coastal plain.



Figure 60: Map of Llansantffraid Parish (Ordnance Survey Mastermap and LiDAR), showing topography and settlements (with red lines representing parish boundaries and red and black spots representing buildings) and locations of hillforts

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Troed y Rhiw and Pant Wilog, flanking the Afon Peris and Afon Cledan, are situated some 2.5km south-west of Castell-Mawr and Castell-Bach. On the ground, it was common for geographical features, especially water courses, to be utilised as boundaries for all types of administrative unit (Dogshon, 1994: 357). Whether the land upon which Llanon sits formed

part of any territorial unit at that time is speculative, but it is probable that whoever controlled the land also controlled its adjoining intertidal area.

The earliest known documentary references to distinct parcels of land in the locality are twelfth and thirteenth-century confirmations of land to the Cistercians of Strata Florida Abbey. A charter dating to 1184 grants 'all fishing to the monastery forever as well as one day and night each week from Rhys's own fishing' (Pryce, H, 2005:172). The charter was confirmed by Rhys's son, Maelgwn in 1198. A later grant, dated 1280-1282 states that '...In order that all uncertainty is removed regarding all the said grants, especially all goods which arrive on the monks' lands through shipwreck, and above all on the monks' coastal lands of Morfa-mawr, namely from the mouth of the Cledan to Aberarth...he has granted on behalf of himself and his heirs and successors, fully and without any challenge, all goods thrown, found or seized on these lands or shores or river banks...' (Pryce, 2005 200). It is therefore clear that Strata Florida not only controlled the Llanon foreshore from the River Cledan southwards (at least from 1184-1282), but that rights to fishing there were important. Morfa Mawr (see Figure 62) is a parcel of land first mentioned in a 1215-1222 confirmation by Rhys leuanc ap Gruffudd of all the gifts of his father, Gruffudd and Grandfather, Rhys (Pryce, 2005: 193). It is also mentioned in a confirmation by Maelgwn Fychan ap Maelgwn, dating to 1198-1227 (Pryce, 2005: 199). It is noted that '...one night, early in Advent 1256, [Prince Llywelyn ap Gruffydd] stayed with 'a large army' at the abbey's Morfa Mawr grange, on the shores of Cardigan Bay' (Williams, 2011: 247). In 1810 Meyrick wrote that the parish was 'so advantageous for barley, that when manured with the sea-weed mixed with dung, successive crops of that same corn have been raised on it for upwards of sixty years' (Meyrick, 1907: 263). In all likelihood, barley was grown at Morfa Mawr, on the land adjoining the foreshore. It is probable that this land, in conjunction with the adjacent fish traps, was of significant value.

In 1215 Grant to Bishop lorwerth of St Davids by Rhys leuanc ap Gruffudd: 'Grant, inspired by love, in perpetual alms, of the land of Rhandir Llanon in its ancient bounds, free of all secular exaction and custom (Pryce, 2005: 195). In 1326 The Black Book of St. David's, which lists the lands and rents of the Bishop of St David's, has an entry for Llanon, although there is not one for Llansantffraid. It is therefore apparent that the parcel of land known as Rhandir Llanon was the property of the Bishop from 1215 to at least 1326. It is not, however, clear whether this parcel of land bordered the foreshore and we do not know who the tenants were. In 1905 Eyre Evans writes that Llanon is divided into three parts, to wit: Llanon proper, the portion nearest to Aberarth, and in which is the ruined chapel; Penrheol, the centre of the three, and Llanprisc, round about the bridge over river Perris' (Eyre Evans, 1905: 177). It is possible that these divisions represent older parcels of land.

Eyre Evans states that 'Llanon tells at once of the mother of St David, who, it is believed, was a native of this place, and eventually owned much land here, including all the flats, known as Morfa Esgob-Bishop's Land- lying between the two streams, Perrin and the high road, and the sea. These lands St. David portioned out into numerous "slangs" still remaining, and allowed them to fisherman of the place; and in many cases fisherman are still the freeholders of these very "slangs" (Eyre Evans, 1905: 176). This indicates that tenants of the slangs may have had fishing rights included in their tenancy.



Figure 61: Map showing slangs and Heol yr Esgob leading from Llansantffraid Church (top right) to the foreshore (bottom left). Possible fish trap features (red polylines) are visible near the highwater mark

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A path known as Heol yr Esgob (Bishop's Road) leads from St Ffraid's Church, diagonally across the slangs to the foreshore just north of the River Cledan. This indicates that access

from the church to that section of the foreshore was important, and at the time the road was given its name, the slangs were probably under control of the Bishop.



Figure 62: Map showing Morfa Mawr and Morfa Esgob, separated by the River Cledan (centre)

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No mention of parishes is made in the Black Book of St Davids, although parishes are known to have existed in Wales at this time. In the diocese of St Davids, '...the whole arrangement is civil, not ecclesiastical; the Bishop has nothing to do with the parishes in which the district is situated, only with the district itself' (Willis-Bund, 1902: xxiv). It is therefore apparent that Llansantffraid parish did not exist in the form we know it today until after 1326, and probably comprised smaller units of land. In 1895, Kelly's Directory of South wales described Llanon as containing some remains of monastic buildings...' Leland notes that, at Llansantffraid '...ther hath bene great building' and goes on to say 'But whether this was the Abbay of Llanfride of wich mention is made in the booke "De Docatione Ecclesiae S. Davidis" or no, I can not telle.' (Toulmin Smith, L., 1906: 123). He suggests that the monastery mentioned by Gerald of Wales is, in fact, '...a nother Llansanfrid in Cornytother: 'peraven- ture this is that Llansanfride Nunncri made in a newer world, of the which Giraldus spekith' (Toulmin Smith, L., 1906: 123). Llansanffraid Cwmteuddwr, however, was known as Rhayader at that time (Pryce, 2005: 174). According to the Dictionary of the Place-names of Wales (Owen, H.W & Morgan, R, 2008) there are, in fact, eight other places in Wales with Llansantfraid being all of part of their name. (Owen & Morgan, 2008: 277-278), meaning it is not impossible that the nunnery referred to was elsewhere. The female dedication to St Bride, however, is indicative of the siting of a nunnery.

The Order of the Knights Hospitaller had become firmly established in West Wales by the second half of the twelfth century, with the Slebach Commandery being its headquarters (Rees, 1947: 28). 'Roger de Clare during his period of occupation of the lordship of Ceredigion, 1158-1164, bestowed upon the Order...the church and manor of Llansantffraid' (Rees, 1947: 28). Shortly afterwards, when Llandantffraid and Ystradmeurig had come into the hands of the Lord Rhys (ruler of Deheubarth) in 1231-1232, he regranted them ' the church of Llansanffraid (Lansanffreit) and all the land which pertains to the township of Llansanffraid (Lansanfreit)' (Pryce, 2005: 166). The Hospitallers would therefore have controlled Llansantffraid at the same time as the Cistercians had control of land to the south of the Cledan. 'A valuable source of revenue were the spiritualites which had come to be vested in the order by the grant of certain churches' (Rees, 1947: 35). In Cardiganshire, these churches comprised those at Ystrad Meurig, Llanrhystud and Llandantffraid, although the estates of Ystrad Meurig and Llanrhystud 'were as early as 1338 being farmed, together with their churches...' (ibid). In addition to these spiritualities, 'A church was often appurtent to a manor so that a grant of such a manor usually carried with it the right of advoswson. By the impropriation of these benefices, the order through its Prior, nominated to the living, when it became vacant, the brethren assuming the place of the Rector and claiming the revenue, but usually maintaining there only a vicar or chaplain to carry out the

duties of the cure' (Rees, 1947: 36). It is likely, therefore, that if fish traps existed near the church at that time, at least some of their revenue would have been appropriated in this way. Tithes were also appropriated by the Church, being 'the tenth of all things titheable...the great tithes of corn, hay and wood, the small tithe of lambs, calves, pigs, geese, chickens, doves, butter and cheese, fruit and vegetables, honey and wax, flax and wool, hemp and rushes, the yield of the hunt and profits from the sale of fish' (Rees, 1947: 37).

It is possible that records from ecclesiastical and monastic establishments still exist. '...the mediaeval records of the hospice should, in the ordinary course, have passed into Crown hands at the time of the Dissolution (Rees, 1947: 36). In addition to the Crown, the Church in Wales holds historical muniments at its offices at Llandaff (Rev. Chris Web, Lampeter Parish, pers. Comm.). This highlights the potential for further investigation of Crown and Church records.

Llansantffraid church stands some 100m from the foreshore. The remains of a building, first noted at the turn of the twentieth century (Wiles, 2011) are visible protruding from the cliff edge some 100m east of St Ffraid's Church. The two appear to be linked by a raised causeway.



Figure 63: Remains of building in cliff (left) and St Ffraid's Church (right), linked by causeway

In 1947 it was recalled that 50 to 60 years before, 'the foundation of an inperentially large building could be seen in the cliff side' (ibid).



Figure 64: Exposed cliff-section adjacent to river Peris, with building remains exposed below current ground level

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Figure 65: Close-up of stone wall exposed in cliff-section

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Wiles (2011) suggests that the building could have belonged to a manorial centre of the Knights Hospitaller, although it is equally possible that it belonged to a group of monastic buildings belonging to the abbey of 'Llanfride'. Wiles states that a photograph taken in 2010 'shows what appears to be a large iron object protruding from the internal rubble layer' and surmises that 'This may be thought to hint at a relatively recent date for the building's

abandonment' (Wiles, 2011). He notes that 'Children of that day spoke of the ruin in question as Yr Hen Vicarage', and the land between the ruin and the church was known as 'Llain Person' (Parson's slang).

The 1842 tithe map depicts this field as Maes yr Eglwys, at which time it was in the ownership of a David Jones, as was a small rectilinear parcel of land abutting the north side of the churchyard (presumably subsumed by the churchyard when it was extended in 1885). A dwelling is depicted abutting the eastern side of the old 'pilgrim's road' (leading past the church). However, a curvilinear parcel of land within Maes yr Eglwys is depicted as a slang belonging, along with the church, to the vicar. A curvilinear feature within Maes yr Eglwys is highlighted by Lidar and appears to be approximately coterminous with the slang depicted on the tithe map. This is almost certainly the 'Llain Person' referred to. At this time either David Jones or the vicar are equally likely to have rights to the foreshore immediately west of the church.



Figure 66: High resolution Lidar, showing Maes yr Eglwys. With causeway from northern end of churchyard to remains of building and curvilinear feature within Maes yr Eglwys. Two fish traps are visible on the foreshore to the north

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The nature of the underlying cliff-edge means that it is eroding fairly quickly. Historic Ordnance Survey mapping confirms this. At the period when the fish traps were in use, land adjoining the foreshore would have is likely to have extended for tens of meters further than at present, meaning that the fish traps pictured above are likely to have been easily accessible from Maes yr Eglwys.

It is evident that fish trap ownership was hereditary in later times. 'In oldern times the ownership of a gored would pass from father to son and remain in the same family for generations; and occasionally it would pass into possession of a woman (Lewes, 1924: 398). The 1841 tithe map and apportionment show that, by this time, slangs were in individual ownership. 'Most householders supplemented their living by renting slangs for agricultural use with the advantage of common grazing rights in winter' (Ceredigion District Council: 30). The tithe map does not depict the foreshore and there is no mention of fish traps in its schedule. The Hughes family of Allt-Llwyd and Lord Lisburne of Crosswood, were both substantial post medieval landowners in the parish. Analysis of the Allt-Llwyd estate papers and Crosswood estate papers may provide evidence of fishing rights. 1841 to 1901 census records do not record mention 'fish trap keeper' or similar as an occupation for any of the settlement's inhabitants. In 1907 the Royal Commission on welsh Churches stated that the inhabitants of Llanon and Llansantffraid were 'chiefly sea-faring people' (Dockerty & Dockerty, 2013: 4).

The logistics of fish processing, transportation and distribution at Llanon are still unclear, although it is possible that any associated buildings were ephemeral and could have been obscured by later developments along the foreshore. Activities 'at the mouth of the River Cledan were at one time sufficient to warrant the presence of a customs officer and the remains of a wooded wharf can still be seen. Associated activities included a mill, a brewery and a limekiln'. (Ceredigion District Council: 31).

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There was, according to the Black Book of St Davids, a three-day fair once a year at the feast of St Mary Magdalene, and also that the lord 'has there a market every Saturday throughout the year...' (Willis-Bund, 1902: 211). A weekly market would certainly have provided the means to distribute of large amounts of fish, and the 'old pilgrims' road', which once led from St ffraid's Church to Llanrhystud, would have been the most direct route.



St Ffraid's Church, Llansantffraid, looking north-east. With 'old 'pilgrims' road' towards Llanrhystud

(January 2014).

Because, in later times, fish traps seem to have been less profitable, this was probably not an issue. According to Lewes, '...the villagers when questioned on the subject of present gains and past profits will shake their heads sadly, and leave the stranger to imagine that it was never anything but a poor business at best; indeed a ceratin air of mystery ever surrounds the gored keeper at Aberarth' (Lewes, 1924: 399).

Field work at Llanon

Methodology

Desktop survey

Because subsequent high-resolution Lidar data was obtained for the foreshore at Llanon, Llanrhystud and Aberarth, it was possible to map features in more detail than aerial photographic coverage would allow, and to consider discounting features which did not show up on the Lidar as possibly being superficial (e.g. lines of seaweed). It is possible, however, that certain features were not highlighted by Lidar for other reasons. Excessive reflectivity from wet stones, or the presence of less well-defined features are both factors to take into consideration. The Lidar was also useful in highlighting coastal landscape features, such as Maes yr Eglwys.

Field work

Three phases of field work were undertaken in June 2011, September 2011 and May 2012, focusing on three sections of foreshore. The three areas surveyed on days 1,2 and 3 will be referred to as Area 1 (from some 500m south of the River Cledan to the River Cledan), Area 2 (from the River Cledan northwards to the Peris) and Area 3 (from the River Peris northwards to some 500m north of the River Peris.



Figure 67: Map of Llanon foreshore divided into areas 1, 2 and 3

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The first phase was part of my work placement in June 2011 and consisted of two consecutive days' identification and Digital GPS (DGPS) survey, focusing on two different areas of the foreshore. On Day 1 we focused on Area 1, the section of foreshore north of the River Peris.





Figure 68: Area 1 showing mapped features and DGPS survey results

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Field workers consisted of myself, Royal Commission staff members Deanna Groom (Maritime Officer), Louise Barker (Survey Team Leader) and Oliver Davies, in addition to local resident, Rowan O'Neill. We surveyed some 300m of foreshore from immediately

south of the River Cledan. Water level at low tide was 0.8m. On Day 2 we focused on the section of foreshore immediately north of the River Peris, between the two outfall pipes. Field workers consisted of myself and Deanna Groom, later assisted by Rowan O'Neill. The second phase of field work, in September 2011, was undertaken by myself and volunteers, Roderick Bale and Rowan O'Neill. Water level at low tide was 0.2m we took the opportunity to investigate in more detail the (seaward) apex of the large, V-shaped fish trap, Fish Trap in Area 1. A detailed photographic survey was completed. We then field-walked the section of foreshore between the rivers Cledan and Peris. The third phase was undertaken by myself, Roderick Bale, Brian Manley, Linda Cox and Rowan O'neill. We focused on the section of foreshore to the north of that surveyed during phase 2. A photographic survey was undertaken and the approximate locations of further features were noted on a paper map.

There are two obvious fish traps in Area 1, one of had been previously recorded by the RCAHMW and had been mapped by me using modern AP coverage. The previously recorded fish trap is the most southerly of the two. The 'C' shaped structure consists of the remains of dry stone walls, a single boulder high and measured some at its 173m at its widest point. All fish trap walls were digitally recorded using a DGPS. Readings were taken every 5 meters and at any visible sluice.



Figure 69: 'C'-shaped fish trap (NPRN), as mapped during RCAHMW fish trap mapping project and surveyed (black and red) with DGPS during field survey

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The walls are orientated roughly north-south and the arm still retains a pool of water at low tide.



Figure 70: 'C'-shaped fish trap on Llanon's southern foreshore, showing curving wall of boulders and pool of water retained by them

September 2011

Where front and back facing stones could be seen together on the southern section, the wall appeared to be well over 1m in width.



Figure 71: Stone wall section (with 1m ranging rod for scale)

Crown Copyright: RCAHMW, 2011

Field work highlighted the fact that walls are most clearly when the tide reaches the point where it meets them. This would probably be the optimum time for aerial photographic survey of such features, especially those that are more ephemeral in nature.



Figure 72: 'V'-shaped fish trap with arms highlighted by surrounding water

September 2011

Field walking continued in a southerly direction. Some m further south, there is a disused breakwater. The breakwater is depicted on 1888 Ordnance Survey mapping. Some of the stones used in its construction are barnacle-covered boulders, and it seems probable that they were originally part of a fish trap.



Figure 73: Remains of breakwater with lighter, barnacle-covered stones (1m ranging rod for scale, May 2011

Crown Copyright: RCAHMW

Some m south of the 'C'-shaped fish trap we identified a large 'V' shaped fish trap, also mapped as part of the mapping project. This fish trap had not been previously recorded in the National Monuments Record.



Figure 74: 'V'-shaped fish trap as mapped (red) and surveyed using DGPS (black and red)

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The walls are orientated north-south and east-west, and, as the 'C'-shaped fish trap, are the height of a single boulder. The north-south arm is straight, and measures approximately 87m in length.



Figure 75: Straight north-south arm, looking south (with person standing at southern end of stone alignment)

June 2011

The east-west arm curves gently, and measures approximately 93m in length. Sections of dry stone wall retain their aligned facing stones. The most visible sections, where front and back facing stones could be seen together in amongst the debris, were on the southern section of the north-south arm. These sections show that the wall was originally

approximately 3m in width. The arms are separated by a gap consisting of the sluice. This is at the apex of the 'V' is a sluice which sticks out into the sea. By the time we got to the sluice, it was already disappearing, as the tide was coming in. Although it is only exposed at exceptionally low tides, we were able to get to the sluice on another visit in May 2012 (when the tide was 0.2m), and observe that the remains consist of an oblong spread of stones, extending seaward for a few meters.



Figure 76: Standing at seaward end of spread of stones within possible sluice area. Outer ranging rods and person define extent of stone wall remains. Inner ranging rod and blue spade define extent of stone walls and approximate shoreward edges of sluice

May 2012

Subsequent investigation of the sluice revealed what appeared to be an iron fitting set into two of the large boulders which seemed to define edge of the wall where it met the sluice.



Figure 77: Remains of stone wall with iron fitting (right foreground) attached to two possible corner stones (with 1m ranging rods for scale) Horizontal ranging rod aligned with facing stones of wall, with iron fitting parallel to its bottom end

May 2012

The Cambrian News in 1924 described iron gratings, 'provided at the centre and ends to let the water out at ebb tide so that the Salmon which have got inside are stranded and are easily caught' (Cambrian news, 1924). Use of iron is also noted at the Anglesey Skerries, where 'the remains of iron rings set in rocks are thought to have been used to secure nets' (Bannerman & Jones, 1999: 73).

Apart from the 'V'-shaped fish trap, all features noted in this section are currently situated well below the low water mark. 1888 Ordnance Survey mapping depicts the low water mark some 7m further seaward, meaning that its sluice would have been exposed on all but the highest tides.





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The trap, however, would not have been ideally placed even then. This is suggestive of the fish trap having been constructed some time before 1888, although the presence of an iron fitting signifies relatively recent useage.

Area 2

Area 2 was not surveyed, as preliminary field walking did not reveal any possible fish trap remains, despite the mapping of what appeared to be features visible on AP coverage.



Figure 79: Map of Area 2

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This may be because the remains were too ephemeral to be spotted from the ground. It should also be noted that there was a shipyard at the mouth of the Peris until 1864, with a total of fourty six ships built (and, presumably, launched) there. The shoreline does not appear to have changed significantly since 1888, although the low water mark is now a few meters further shoreward.



Figure 80: Map of Area 2, with current low water mark (blue) and 1888 low water mark (grey)

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Area 3

Area 3 is located to the north of the River Peris. Field walking revealed numerous sections of wall in this area.



Figure 81: Map of Area 3 with mapped features (red), DGPS survey results (black & red) and handheld GPS points (green)

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On Day 2 Deanna and I surveyed features between two outfall pipes using DGPS (see Figure 80). They consisted of numerous sections of stone walling, the most substantial of which seemed to be three 'V's, possibly representing different phases of the same fish trap.

AP mapping suggests that the complex has had a change in alignment over time, as the 'V's appear to overlie each other. The walls are orientated approximately east-west and north-south. Again they can be seen from beach level as a curve of slightly larger, more lightly-coloured boulders covered with barnacle growth. We came across several possible sluices-implying that at least some of the structures had more than one sluice. Slightly north of them we encountered numerous small sections of wall, but the stones were so diffuse it was impossible to discern the shape or extent of any other complete fish traps.

Subsequent field work was carried out in September 2011. Two smaller, but more complete fish traps than those previously recorded in Area 2 were located. Both sit on the point at the northern end of the foreshore. The more southerly of the two retains a pool of water at low tide, which gives it the appearance of being 'C'-shaped. In fact, at least one of the walls extends much further than the pool of water and is linear in character. Although it was not possible to survey these using DGPS, we were able to return to the features in March 2014, in order to record them using a hand-held GPS. Readings were taken at 5m intervals (see Figure 81).



Figure 82: Fish traps recorded on Day 2 (with black DGPS points) and Day 3 (with green hand-held **GPS points)**

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A photographic survey was also carried out.



Figure 83: 'V'-shaped fish trap still retaining water at low tide. Wall 1 extends from left foreground to centre background (with person for scale). Wall 2 extends from centre to left background, at right angles to wall 1 (with person for scale)

May 2011



Figure 84: Fish trap arm with several alignments of stone walling, extending from left-foreground, centre-foreground and right-foreground (with people for scale and definition)

May 2011



Figure 85: Alignment of (facing?) stones (with person for scale)

September, 2011





September 2011

The remains of another 'V'-shaped fish trap were then located some 40m to the north. Although the two arms became ephemeral at their shoreward ends, the trap's apex-area was very apparent. A distinct sluice, however, was not visible.



Figure 87: Seaward (outer) side of 'V', looking towards apex with sluice

September 2011



Figure 88: Shoreward (inner) side of 'V', looking towards apex with sluice (with people for scale and definition)

September 2011

The two 'V'-shaped fish traps above can be seen very clearly on high-resolution Lidar data.

It is Area 3 that has undergone most change in foreshore morphology. The larger fish traps surveyed on Day 2 would, in 1888, have been positioned some 90m further inshore. The more northerly, smaller fish traps are located at the edge of the point and are the furthest west of all the fish traps recorded. They would have been situated below the low water mark in 1888, but may be of greater antiquity than the larger ones.



Figure 89: Area 3, showing modern (blue) and 1888 (grey) high water mark

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All features recorded consisted of single lines of stones, wedged into a compacted surface of smaller cobbles. They are sturdily held in place with what appears to be natural cement.



Figure 90: Stone walling detail, with stones appearing to be cemented together. The top row of boulders appears to be fitted into the stones of a lower row which comprise part of the ground-surface

September 2011

'Beach and cliff material from New Quay to Aberarth is of a mobile and friable nature...' (Countryside Council for Wales, 2005, 32/125), consisting of boulder clay, which is rapidly eroding. It is possible that this clay was utilised in order to strengthen the boulder-walls used in fish trap construction at Llanon.



Figure 91: Layering of boulder clay and alluvial clay at Aberarth, Ceredigion, showing process of boulder erosion

September 2011

It is also of note that 'Honeycomb worm reefs are extensive at Llanon and 'play an important role in stabilising the otherwise mobile cobble and boulder' (Countryside Council for Wales, 2005, 32/125). The presence of the Cledan and Peris river-mouths at either end of the central foreshore is able to provide a plentiful supply of nutrients for fish to feed upon. In addition, Bannerman & Jones point out that the biotype of the trap would have been important in the case of the stone-built structure which contained interstices between the stones making up the wall of the trap'. These cavities, he argues, would have provided habitats for small marine creatures which may have acted as prey for the fish, thus luring them to the fish trap. This may also be true of barnacle-covered stones such as those comprising the Llanon fish traps. Barnacle larvae, released into the water from February to May, float around in much the same way as plankton (www.Encyclopedia of Life). When mature enough, the larvae find a suitable surface upon which to attach, and begin reproducing within 1-2 years. Therefore, where there is barnacle habitation, there is also
likely to be a plentiful supply of free-floating larvae every year during the spring months. A combination of ecological factors may, therefore, provide the perfect site for fish traps of this nature.

The decline of the fish traps at Llanon seems broadly coterminous with the decline of fish traps elsewhere in Britain and is almost certainly the result of a number of factors. Lewes reported that 'Salmon, whiting, grey-mullet, sprats and rock-salmon' (Lewes, 1924: 399) were caught in the fish traps of Aberarth. However, the productivity of fishing grounds has always fluctuated with the natural movement of fish. There has certainly been a reduction in fish due to over fishing, with '...some species once forming an important industry in the area are now hardly fished at all as a result of over exploitation'. Countryside Council for Wales, 2005: 21/125). Significant levels of contaminants are also present within Cardigan Bay, including raised levels of biocides and metals such as lead, copper and zinc. In 2005 the Countryside Council for Wales considered that 'diffuse run off and effluent from agricultural land and the continuing impact from historic mining activity provide the major landward inputs in central Cardigan Bay'. Countryside Council for Wales, 2005, PDF, 20/125). These conditions would be less than ideal for fish and have probably contributed to the decline of some species.

Geraint Jenkins echoes Lewes in stating that from 1861 to 1924 all fish traps 'were constructed between the mouth of the Aeron and the mouth of the Arth' (Geraint Jenkins, 2009: 122), it is, however, evident that the traps actually continued up the coast to the mouth of the River Cledan, in addition to the traps to the north of the River Peris and beyond. It is possible that, at the time of Lewes' writing in 1924, the Llanon fish traps had not been in use since before 1861 time). However, the existence of the iron fitting found set into boulders comprising the sluice-section of the 'V'-shaped fish trap in Area 1, is indicative of relatively recent use.

If, as it seems, likely, the fish traps at Llanon were contemporary with those at Aberarth, they are not necessarily in the same form as the medieval fish traps. The walls would have been 'subjected to continuous modification to accommodate changes in their immediate surroundings, such as coastal erosion effects and sea-level alterations, so that the existing shape and size do not reflect the original structure of the trap' (Bannerman & Jones, 1999: 76). The palimpsest of walls in Area 3 almost certainly reflects several phases of use.

Fish trap remains at Llanon are under constant threat of erosion by the sea. Stormsat Llanon in July 1836 swept away a total of four houses, part of the Methodist chapel and two bridges. The 8ft high churchyard wall was also swept away and part of the churchyard was swept out to sea along with a number of coffins, five of which had to be rescued and reinterred (Dockerty & Dockerty, 2013: 13). This highlights the damage that can be done by the sea during a short period of stormy weather. Following the recent storms of January 2014, aerial reconnaissance suggests significant changes to Wales' shoreline (Toby Driver, pers. Comm.), including minor changes at Llanon and Aberarth. Subsequent field walking confirms that the beach at Llanon has been scoured by the sea, defining trap features very clearly. A 'new' feature appears to be uncovered, consisting of what appears to be the northern end of a large, 'C'-shaped fish trap.



Figure 92: Foreshore north of River Peris after January 2014 storms. Showing part of Area 2 with newly-appeared possible 'C'-shaped fish trap wall (centre-left)

Crown Coyright: RCAHMW

Conversely, at Aberarth, it appears that effect of scouring may have eroded some of the fish trap walls.



Figure 93: Fish traps at Aberarth after January 2014 storms

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Summary

The Llanon fish trap complex consists of a several complete 'V'- shaped and one 'C'-shaped fish trap, in addition to numerous relict features constructed of boulders comprising dry stone walls a single boulder high. Some of the more complete examples retain pools of water at low tide. Walls can be seen from beach level as lines of slightly larger boulders, usually covered with barnacle growth. Some sections of former wall consist of boulders and stones that are firmly packed together, whereas other sections consist of no more than a diffuse scattering of stones. Sections where front and back facing stones can be seen together show that the walls were originally some 2-6m wide. The length of walls ranges from sections of less than a meter to stretches measuring up to 173m in length. The number and positioning of walls identified by AP evidence and ground-truthing suggests that fish traps within the complex have undergone changes in position and alignment. No wood has been located amongst any structural remains, so the potential for absolute dating is non-existent at present.

A 'V'-shaped fish trap and a 'C'-shaped fish trap are present in Area 1 and are the most complete examples recorded. If fish traps have been present here since monastic times, they would, along with Morfa Mawr, have formed part of the fisheries named in the grant to Strata Florida Abbey. The 'V'-shaped fish trap appears to have been constructed before 1888. The condition of structural remains and presence of an iron fitting are suggestive of relatively recent use. The southern section of Area 2 is devoid of fish traps, although this may be as a result of the later boat-building and launching activites taking place around the River Peris. Fish traps in Area 3 are likely to have been under the control of whoever possessed the land belonging to St Ffraid's Church. The Hospitallers and the Church are both known to have held land here. Historic mapping indicates that there has been a significant change in sea level over the last 120 or so years, meaning some fish traps in Area 3 are now some 90m further seaward. As with a number of other examples in Wales, fish traps at Llanon are constructed from materials readily available on the foreshore. Ecological conditions appear to be favourable to the siting of fish traps at this location.

Conclusions and recommendations for further work

The aims of this dissertation, as set out in the original proposal (see Appendix 1) have been broadly achieved. Chapter 1 details the sources used, including a description of the RCAHMW pan-Wales desk-based fish trap mapping project. Chapter 2 discusses intertidal fish traps in Britain and further afield. It is apparent that fish traps are a common feature throughout Britain and Europe and that they share the same common characteristics. Variation in construction and design tends to reflect local intertidal conditions and the building materials available at that location. It is therefore possible to use these factors in order to help predict whether a location is likely to have been used for fish traps and the form they are likely to have taken. Although fish trap remains range in date from the Mesolithic to modern day, the most prolific phase of fish trap use seems to have been the Middle Ages. Chapter 3 focuses on fish traps around the coast of Wales in the context of RCAHMW mapping project results and earlier research. Wooden fish trap remains are common in estuarine environments, particularly the Severn Estuary. Use of stone is particularly apparent in north Wales. Chapter 4 examines evidence for fish traps in Cardigan Bay, detailing all known intertidal fish traps on the Cardiganshire coast. Chapter 5 considers the evidence for Llanon. This has emphasized the fact that fish trap use does not feature prominently in contemporary documents. In order to further understand the context of fish

traps at this location, a thorough analysis of a variety of documentary sources relevant to the locality could be undertaken. It is possible that further documents held in the National Library (e.g. personal documents, estate deeds) may at least refer to fish traps in the locality. Field walking and digital survey results reflect the fact that detailed survey is necessary. Used together, desktop survey and field work are an effective way to identify features. In order to fully record all features it would be necessary to field walk the entire foreshore in short transects whilst carrying out a thorough DGPS survey.

Changes in seabed level, caused by shifting sediment or erosion are likely to have a dramatic impact on fish trap structures, possibly causing those in use to be abandoned or rebuilt along different alignments. Storms can also change the shape of the foreshore. Analysis of historic OS mapping has highlighted the fact that changes in the shoreline occur differently, even at locations in close proximity to one another. 'Foreshore areas and cliff edges are at risk from accelerating rates of erosion making all historic assets...in these areas vulnerable' (Historic Environment Group Climate Change Subgroup: 2013: 4). 'The rate of erosion...will increase as sea levels rise and storms become more frequent'. (Countryside Council for Wales, undated: 4). A handful of sites are currently scheduled ancient monuments, including Ogwen , Gorad Ddu, Ynys Gorad Goch, Gored Bach and two at Aberarth. Those in exposed locations are at risk of erosion. Detailed survey of fish trap features in the intertidal zone should therefore be considered a priority. Where there are more complete examples it may be possible to recommend scheduling.

The RCAHMW's intertidal fish trap mapping layer has proved a good starting point for more detailed research. Recently Dyfed Archaeological trust was able to consult the red fish trap layer, following a coastal survey, in order to correlate RCAHMW records with theirs. The fact that the records matched very closely highlighted the value of using field work and desktop survey side-by-side.

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<u>Maps</u>

Lewis Morris, Fiscard Bay and Harbour, Pembrokeshire, Sept 29th 1748

http://www.liv.ac.uk/~cmi/lewismorris/lm20.jpg

Ordnance Survey mapping layers on RCAHMW ArcGIS mapping software

Tithe Map & Schedule for Llansantffraid Parish. 1841. National Library of Wales

Appendix 1

Nikki Vousden: Dissertation Proposal

The archaeological and historical significance of intertidal fish traps at Llanon, Ceredigion: a west Wales case study

- 1. An overview of examples from Britain and Europe (Bibliography and selection of relevant material)
- 2. Description of RCAHMW desk-based survey of fish traps around the Welsh coast (Methodology and results)
- 3. The Llanon fish traps
 - a) Description (RCAHMW desk-based survey results; field walking in order to identify/disprove as many fish trap features as possible; DGPS survey of dry stone walls comprising the remains of fish traps on the foreshore at Llanon- the aim being to record as many walls as possible. The end result will be a GIS layer showing the survey results placed onto the current Ordnance Survey map using ArcGIS; photographic survey)
 - b) Comparison with other examples (using British and European material collected for chapter 1)
 - c) What can they tell us about their immediate environment? (e.g. rate of erosion, tidal currents, topography- using coastal monitoring data, LIDAR and any other information available)
 - d) What is their context within the wider landscape? (regressive map analysis using historical and modern maps (e.g. Ordnance Survey, Tithe and Estate maps); historical documents (e.g. rental roles and other documents relating to local land ownership); oral and documentary evidence from local residents, starting with the Llanon History Society; investigation of landscape features as indicators of precise land divisions (e.g. the rivers Peris and Cledan and their relationship to land belonging to Llansantffraid nunnery and Strata Florida)