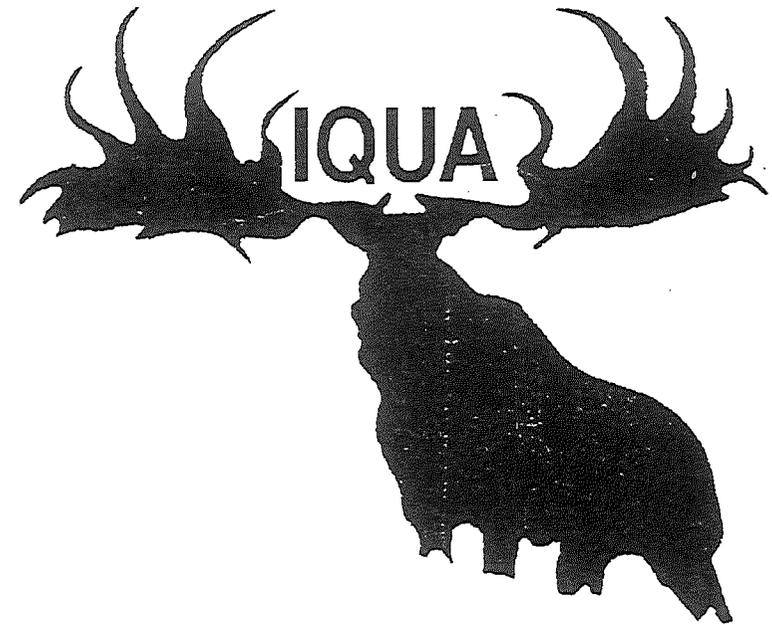


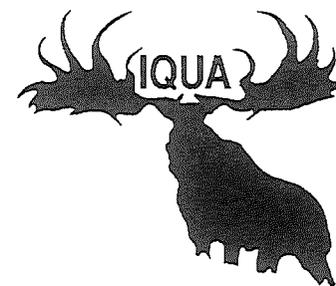
McLennan

Irish Quaternary Association



Field Guide No. 27

Aran Islands / Oileáin Árann



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2007

Edited by

Stephen McCarron

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PREFACE

This field guide complements the annual field meeting of the Irish Quaternary Association (IQUA), held on the Aran Islands, 7-9th September 2007.

Despite its international reputation as a location of spectacular archaeology, geology and geomorphology, this is the first visit by IQUA to the Aran Islands (Oileáin Árann). The island groups' location, forming an upwind buffer in the outer reaches of Galway bay, has protected the waters of the embayment by offering a cliffed shoulder set against the strength of North Atlantic weather and waves. The easterly, land looking shores of the islands thus offer a degree of lee-side shelter for ancient communities which have relied on these and further Atlantic waters as the source of a tough maritime livelihood. This location is thus critical to the islands' geomorphology, their relative abundance of important national archaeological treasures and store of palaeoclimatic archives.

It is hoped this Field guide serves to stimulate even more research into the Quaternary history of the Islands.

Sheet 51 of the 1:50000 Discovery Series and 1:25000 Aran Islands sheet produced by the Ordnance Survey of Ireland are recommended for use with this field guide.

Stephen McCarron
Maynooth, August 2007

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INTRODUCTION

Bedrock geology (Mike Philcox)

The Carboniferous Limestone that forms the Aran Islands is an extension of part of the succession in the Burren, more specifically the upper part of the (Asbian-aged) Burren Limestone Formation and all but the top of the overlying, commonly cherty (Brigantian) Slievenaglasha Formation (Pracht *et al.*, 2004). The limestones in both formations are cyclic in sedimentary and biotic composition, reflecting repetitive shallowing-up sea-level changes during deposition of shallow-water carbonate sediments. (The sea-level changes probably reflect glacial/interglacial cycles in Gondwanaland [South Africa, Australia, etc] during the extensive Permo-Carboniferous Glaciation.) Compositional differences within each cycle have led to weathering of the limestones into distinctive terraces, clearly visible in the drift-free Burren. The limestone succession on the Aran Islands was mapped in detail by the late Conor MacDermot, but his appealing maps remain unpublished (Geological Survey of Ireland, 1997).

The terraces in the Burren Limestone are separated by clay wayboards up to 2 m thick, some of which rest on karstified surfaces with local relief of tens of cm (rarely 60 cm). The wayboards have been interpreted as palaeosoils, developed at the end of each shallowing-up cycle, when the sediments were exposed above sea level. However, volcanic ash is also present, and the upper part of at least one wayboard consists of marine shale. Clay wayboards are not present in the Slievenaglasha Formation. The top three terraces, out of nine, have been recognized on Inishmore/Árainn.

The limestones dip very gently south. Faults are rare, but joints are conspicuous, having been enlarged as karstic grikes. Larger-scale karstic features are also present, such as the deep (>30 m), lake- and sediment-filled hole on Inisheer/Inis Oírr, investigated by Molloy, O'Connell and others (see bibliography at rear of guide).

A number of erratic boulders consist of reddish conglomerate and grit, containing quartz pebbles <3 cm across, which cannot have been derived from the islands. It is most likely that these erratics were transported southwards or south-eastwards by ice moving across Galway Bay from basal Carboniferous beds outcropping on the sea floor.

Quaternary geology (Stephen McCarron)

In a national Irish context, the Aran Islands are remarkable for their virtual absence of Quaternary sediment cover. They are situated at the mouth of a marine embayment that acted as a major conduit for the drainage of ice from Quaternary Irish ice sheets which radiated outwards from dispersal centres in the central lowlands and Connemara uplands. Similar embayments e.g. Clew Bay, Donegal Bay and Dundalk Bay acted as major centres of glacial sediment accumulation during the ice sheet oscillations to and from limits on the continental shelf. Similar sediment-poor conditions however exist on the flanks of the Burren uplands to the south and the coastal lowlands along the northern shore of Galway Bay, reflecting perhaps the dominance of ice erosion in this area associated with rapid deglaciation of the last ice sheet from its offshore limits during the Late Midlandian/Devensian (≥ 22 ka B.P.). The passage of thick, erosive ice during ice sheet growth and rapid deglaciation would result in a thin sediment cover and the deposition of a thin 'ground moraine'. If such a deposit once covered the Aran Islands, the finer fractions of it have all but been removed in the intervening period, leaving the larger blocks on the down wasting karst surface. Such an exposed limestone surface does not readily preserve erosional striae.

The low-lying plain along the northern margin of Galway bay is blanketed in such an angular, blocky, poorly sorted morainic-type sediment, the content of which has gone on to form the source

material for field walls. The nearest significant thicknesses of onshore Quaternary sediment accumulation occur on the lower flanks of the inner northern Galway Bay margins (i.e. the Silverstrand/Derrylone, Knocknacarragh and Seaweed Point/Illeunaafamona drumlins, Barna). The well-exposed landforms visible from Salthill's promenade are associated with the streamlining of a glaciomarine sediment apron probably during the final stages of deglaciation from ice limits on the shelf (McCabe and Dardis, 1989; McCabe, 2005).

That the Aran Islands have been glaciated is most clearly demonstrated by the erratic, red conglomerate boulders that litter the karst surface of the island and add colour to the predominately limestone field walls (see Bedrock geology section above). Former ice sheet extents beyond the islands on the shelf remain poorly constrained (c.f. King *et al.*, 1998). Multiple overlapping iceberg scour marks traverse the marginal slopes of the Porcupine Bank to the west, hinting at nearby ice marginal sources during the Late Midlandian (Monteys *et al.*, 2005). Possibly glaciogenic, westward dipping sediment wedges west of the Islands on the relatively shallow (<300m) water depths of the eastern Porcupine Bank are currently under investigation as part of the Geological Survey of Ireland's INFOMAR programme (McCarron and Monteys, in prep.).

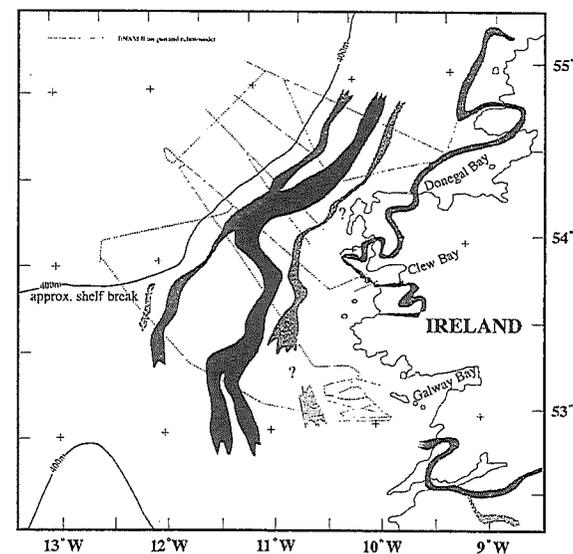


Fig. 1 Proposed belts of offshore moraines after King *et al.*, (1998). Onshore limits principally based on Syge (1968, 1969).

Settlement History of the Islands (Michael Gibbons)

The earliest possible evidence for human settlement on the Aran Islands is a Palaeolithic hand-axe (several hundred thousand years old) discovered by a visiting English Archaeologist among the chevaux-de-frise at Dun Aonghasa. It remains one of only two diagnostic Palaeolithic artefacts from Ireland and may have been brought to Aran during a glacial period or just-possibly as a prestigious gift or trinket during later- prehistory (it is a particularly fine example of a hand axe). There is now extensive evidence for late-Mesolithic hunter-gatherer activity throughout Western

Connacht (Gibbons *et al.*, 2005). Over the years, a large number of stone axes have been found throughout the Aran Islands, with a significant group on Inisheer (Waddell, 1994). It is likely that at least some of these date back to the Later Mesolithic although the settlement history of the islands can be traced with certainty only back to the Neolithic.

Neolithic remains include a possible court tomb on Inisheer and numerous stone axes, together with a number of intact cairns which are likely to date to the span the late Neolithic and early Bronze Ages. The wedge tomb at Eochail on Inis Mór is likely to date to early Bronze Age. Bronze Age burials dating to c.1,500 BC have been identified at 'Knockgrannie' on Inisheer (Gosling, 1993) and the earliest phase of activity at Dun Aonghasa also seems to date to the late Bronze Age (c.1,200 BC) (Jones and Carleton, 2004). A number of spectacular standing stones are likely to date to this period also. The islands' position at the mouth of Galway Bay gave them a continuing strategic importance from at least the Bronze Age onwards and it is likely that the available harbours at Killeany and Kilronan have been in use in one form or another since at least this date.

The Early Christian period saw a change in the importance of the islands, as the ecclesiastic settlements on *Ara na Naomh* or Aran of the Saints came to define its significance although Dun Aonghasa was also reused during the early Christian period and Dun Eoghanachta dates to this period as well (c.500-1000AD) (Carleton-Jones, 2004, 169). Large numbers of settlement mounds and isolated clocháns, some with attached field systems, are indicative of a large unenclosed population in the early Christian period (Waddell, 1994). The monastic settlement at Killeany was long-lasting, ranging from the earliest arrival of the Saint himself to the Elizabethan period and is likely to have seen the repeated reuse of stone from secular, ecclesiastical and military buildings in secondary positions in later structures.

After the foundation of the Anglo Norman port town of Galway the islands were held by first the O'Briens and then briefly by the O'Flaherties at the close of the Gaelic period. By agreement the Gaelic Lordships received a fixed tribute from the town in return for leaving shipping unmolested in the Bay. The English presence on the island first took the form of an Elizabethan fortress on the present site of Arkin Castle, which was later replaced by the Cromwellian structure in existence today. Killeany remained the principal port of Aran until the mid-nineteenth century when it was replaced by Kilronan (Robinson), both ports have nineteenth century piers and the foundations of an earlier pier, likely to be 17th century or older, is visible in the intertidal zone on front of the surviving wall of Arkin Castle at Killeany.

FIELD SITES

Inishmore/Árainn/Inis Mór

Early Co-Axial Field System at Killeany

Areas of this field system were first identified in the intertidal zone of *Trá Mhór* and in the adjacent machair dunes along with some associated clocháns to the east of *Trá Mhór* by Rev Kilbride in the 19th century (Kilbride, 1868).

Further fieldwork by Dr. Aidan O'Sullivan, Mary Deevy, and the author and analysis of vertical aerial photography identified both additional areas of the field systems to that northeast and southwest in addition to a series of enclosures and possible house sites. Interestingly the sandbar c.700m long to the north of *Trá Mhór* does not appear on the earliest accurate map of the islands, a French Maritime chart dating from 1690 (Fig. 2), suggesting that it is a relatively recent feature or at least that it was far less prominent three centuries ago. The map itself is a reasonably accurate representation of the three islands and is an important source of information for any discussion of coastal geomorphology. Comparison of the islands as portrayed in 1690 with the current Discovery Series Map Sheet suggests relatively little change in the outline of any of the main islands.

Fig 2. Detail of Killeany area from Monteguy's maritime chart of 1690.

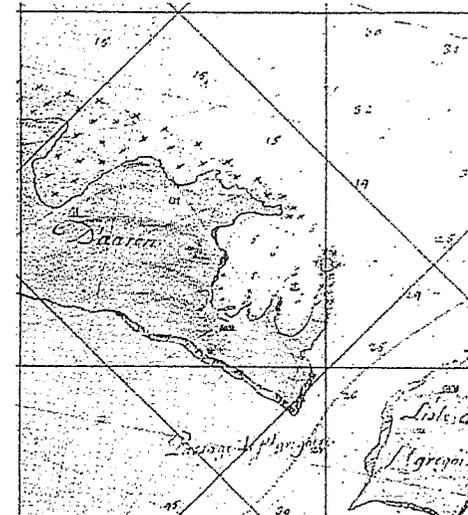


Fig. 2. Detail of Monteguy's chart, Killeany area.

The field system (Fig. 3) appears to be coaxial and terrain oblivious, consisting of large rectangular blocks that run from the north coast through the northern sloping ground and dip southward over a portion of the largely open karst landscape south of Killeany lodge. The enclosures, including one, quite large example (c. 20m in diameter) are visible throughout the system. One very fine example

is visible on the NE shore of the island. These early field systems appear to be ancestral to some of the large, apparently modern, block-fields that remain in use to this day.



Fig. 3. Buried field wall in dune system, Trá Mhór, Killeany.

Elsewhere on the island early relict field systems can be found immediately to the south and west of Dun Eoghanacta and, once again, some of the modern field systems in this area appear to be on the line of the earlier system, suggesting that the enclosure of the Aran uplands or plateau area took place at an early date. The Aran sites are as yet undated but the uplands are also home to a large number of settlement mounds which judging from Goulde's excavations, seem in the main to be settlement sites (Waddell, 1994). The precise date and chronology of the sites remains obscure and the figure of eight plan displayed by some of the sites is an early Christian phenomenon found elsewhere in Ireland and in the islands of northern and western Scotland. Co-axial field systems can be found covering much of the uplands in the Burren (Jones, Carleton, 2003, 188). Elsewhere such fields can date to the early Neolithic (c. 5,500BC) as at Céide fields (Waddell, 2000) on the North Mayo Coast and in Dartmoor similar field systems have been dated to the early Bronze Age (Fleming, 1983). In Kilkenny co-axial field systems are associated with ring-ditches of possible Bronze-Age date (Gibbons and Higgins, 1993). Relict field systems of Bronze Age date also carpet the islands of Inishboffin, Inishark and Inish Lyon (Hogan and Gibbons, 1992). Field systems of unknown date are also found embedded in the coastal dunes of Omey Island in Connemara, in association with midden deposits. Finds including a pebble hammer mace head dating from the Neolithic have been found associated with these midden deposits (Gibbons et al., 2004).

The intertidal field systems at Killeany and elsewhere are clear evidence of sea-level rise and there are also credible accounts of Bog-timber being found on a low Spring-tide on the north coast of Inis Maan over 50 years ago (these timbers were used in the construction of a number of houses and provide supporting evidence to vegetational history that has emerged from recent pollenological research.). The partial drowning of this coastal landscape due to sea-level rise can also be seen at a recently discovered intertidal peat bog on a disconnected section at the northern end of Inishkea north, Co Mayo. This field system also has a strong spatial relationship with circular house sites (Gibbons and Higgins, 1993). As at Killeany, virtually the entire dune system

contains a relict field system and associated house sites. Further south on the Peninsulas of Kerry other examples of intertidal field systems are visible on the Iveragh Peninsula, at Emlaghnamuck on Inny Strand on the North shore of Ballinskelligs Bay (O'Sullivan, and Sheehan, 1996). Another, and perhaps better, parallel for the Inis Mor field system is that explored by the late Professor O'Kelly of UCC who mapped a similar landscape on Beginish Island, Co Kerry, in association with a series of unenclosed Early-Christian house-sites (O'Kelly, 1956). One of these has recently been re-assessed as a potential Hiberno-Scandinavian structure although the evidence for this is highly speculative (Sheehan *et al.*, 1996; Gibbons, 2006).

Arkin Castle

The earliest reference to the harbour at *aircín* is found in the life of St Enda, one of the giants of early Irish Monasticism. Hagiography was “The Science Fiction of the Middle Ages” and contains few reliable details but the importance of Enda is reflected in the series of miraculous events recounted about him. Corban, “a second pharaoh *obduratus in malicia*” opposed Enda’s arrival. He was discredited and forced to yield Inis Mor by a series of miracles. An angel cut a path through solid rock with a flaming knife to give Enda a safe landing place on the island. Saints traditionally traveled by stone boat and this rock from the Connemara mainland, now on the shore at Killeany, is reputed to be the one that brought Enda to Aran. He declared that he would only give up Aran to Enda if a cask of corn on the coast of Clare transported itself to the Island. It duly did so and the name Port Daibhche (the port of the Cask) supposedly records the event to this day. The severe austerity of Enda’s regime, which attracted some of the key pioneers of Irish Monasticism, is remembered in an account which claims that, in order to test their sanctity, he instructed his disciples to go “naked into the frame of a currach”. If water entered they were said to be in a state of sin (O’Connell, J.W, 1994b). Viking Raids on Aran are recorded from 1015, 1020 and in 1095 but they were probably more frequent however as there are no records for any of the 10th century after 917 (Robinson, 1997).

While there may have been little direct contact with the continent after the early Christian Period Aran remained in the imagination of Christian Europe as one of the more important places in Ireland. Aran’s wealth in the Middle Ages was partially drawn from its importance as a major pilgrimage destination. Medieval Portolan charts from Italy show both of Aran and Inishboffin in spite of the lack of coastal detail and the absence of the city of Galway (Robinson, 1986). After the foundation of Galway by the De Burgo Lords in 1235 the islands acquired a strategic and commercial significance along with their earlier religious and prestige value. While the religious aspect of the island remained important the Medieval History of the islands was increasingly dominated by rivalry between the O’Brien Lordship that held Aran with three castles (one at Killeany), the O’Flaherty Lordship of Connemara (which coveted Aran), and the Norman City State of Galway. Galway paid a yearly tribute of wine to the O’Briens on Aran for “protecting” their shipping (Robinson 1986, 241-246). In 1333 the De Burgos, now Gaelicised and known as the Burkes, rebelled against the crown and seized much of Connacht. Galway retained its links with England except for a brief period in 1388 when the city joined the rebels. As a result Aran was said in London to ‘always lie full of galleys to ensnare, capture and plunder our liege English.’ (Robinson, 1986, 241) The O’Brien Lordship retained Aran against O’Flaherty rivalry for most of the Middle Ages.

The O’Flaherties received Aran in 1569 at a period of increasing intervention by Elizabethan soldiers and officials in the affairs on Western Connacht. O’Flaherty control was brief as the islands were seized as Church and hence Crown land in 1581 and garrisoned shortly afterwards by a Robert Harrison. The Elizabethans built a fort at *aircín*, probably replacing the earlier O’Brien Castle (Robinson, 1986, 241-246). During the Civil War the city of Galway and the Garrison on Aran sided with the Royalist faction in England and hence with the Irish Confederate forces. Galway fell to Commonwealth troops in 1652 and Aran surrendered with it. Though islanders and forces from Inishboffin briefly recaptured the island. It was retaken by 1,300 men and refortified. The new fortress was built incorporating elements of the churches of the nearby monastery (Robinson, 1986). Analysis of the early stonework incorporated into the sea wall of the castle identified 12th century stonework, the first recognition of an important aspect of the history of Killeany (Gibbons and Higgins, forthcoming).

The remains of a harbour of unknown date are visible beneath the surviving sea wall of Arkin Castle. These remains were discovered as part of a preliminary survey of intertidal zone remains on the Galway Coast and followed the earlier discovery of a harbour on Inishboffin Island close to the remains of Don Boscoe’s Castle/Cromwell’s Fort. The remains at Arkin consist of a series of walls, now reduced to one course high, constructed in the main of large ashlar blocks. One 20m long section forms a probable quay-side immediately adjoining the sea gate of Arkin’s Castle. Another section, over 30m in length runs at roughly a right angle to the probable quay-side and the cliff face. In addition to this, smaller sections of walling are also visible running parallel to the 30m section and inside it. The shore in this area has a number of large ashlar blocks, evidently the disturbed remains of the quay. No trace of the eastern section of the harbour survives above ground and it seems likely that the building of the large early 19th century quay at Killeany resulted in the destruction of the earlier structure as also happened with the large round tower which was cannibalised for building purposes. Traces of a late-medieval market cross were also found in the intertidal zone (Waddell, 1994) but the harbour adjacent to this discovery was not recognised at the time. Examination of the surviving sea wall of Arkin’s Castle by Architectural Historian and Archaeologist Jim Higgins revealed further details of the architectural history of the site including a series of “mooring loops” built into the sea wall of the castle (Gibbons and Higgins forthcoming). The inner harbour protected by the newly discovered features has silted up over the years but would have provided an additional layer of protection from the prevailing winds in an already extremely well-sheltered location. The angelic engineering at the mouth of the harbour, combined with the built inner harbour, insured that Killeany possessed one of the finest harbours on the west coast – befitting the island’s strategic importance.

Geographically the closest parallel to the harbour at Killeany is on Inishboffin which also featured a Cromwellian Fort. The harbour which accompanied it is still visible but it has a very different, crescentic, form to the Killeany example and was not built with ashlar blocks (Gibbons and Higgins, 1993, 23). The Inishboffin harbour is likely to be Cromwellian, or at the earliest 15th/16th century. The Arkin Castle Harbour however, may be considerably earlier, although the surviving stonework does not allow close dating. Recent thinking has been that the native Irish did not build permanent landing places as their galleys could simply be beached (see Breen, 2001). However, recent discoveries at Doon Castle on Streamstown Bay and at Oranmore are challenging this view. The shoreline beneath the O’Flaherty Castle at Doon has been modified by the addition of an artificial quay and the remains of an early quay forming an extension to the present quay which dates to the 17th century, are visible at low tide. Oranmore Castle is a towerhouse probably dating to the 15th-16th century and also has a set of mooring loops similar to those at Killeany (Gibbons and Gibbons, unpublished).

Whatever its original form or date, the harbour at Arkin’s Castle underwent a series of changes over the succeeding centuries. The ‘Petit Flambeau de la Mer’ (1684) shows a crude and stylised representation of a fort and an anchorage and a later chart by Monteguy (1690) shows a pier extending from Arkin’s Castle into the harbour which appears to correspond to the recently discovered remains (Conroy, 1997). A survey of Galway Bay was commissioned and undertaken by an officer named Robertson in the late 1790s to review the defensive readiness of the area. He expressed concern that Galway Bay was an obvious landing place for a French expedition and produced a plan of Arkin’s Castle. This plan shows two Quay or breakwater-like structures extending from beneath the eastern and western towers on the northern side of the fort (O’Connell, J.W, 1998). Although the plan itself is slightly inaccurate this suggests that at least some of the harbour was still visible in the late 18th century. A drawing by Wakeman from 1839 (reproduced in Walsh, 1994) shows the area large as an open shore indicating that by this time the earlier harbour

had been cannibalised – probably to build the major new pier built by Alexander Nimmo in the 1820s. It is possible however that two boats being caulked in the centre of the picture are lying up against the remains of the quay wall.

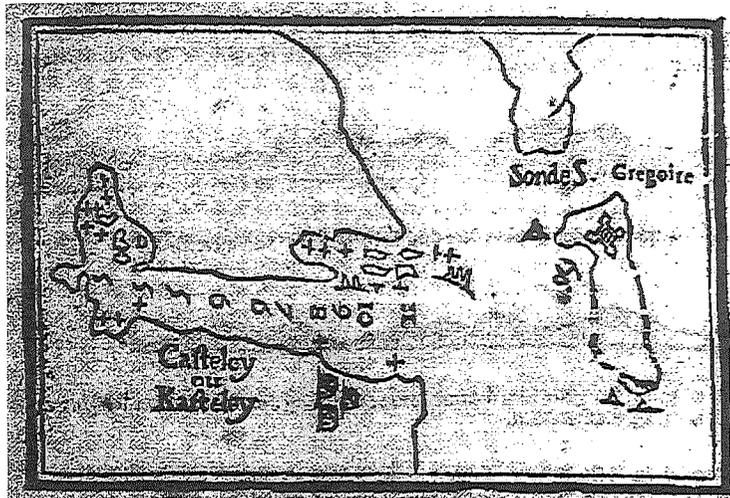


Fig. 4 Petit Flambeau de La Mer, 1684.

Dun Ducathair - Archaeology (*Michael Gibbons*)

Dun Dúcahair (Fig 5) is one of seven large stone forts and several smaller examples on the Aran islands. These include Dun Aonghasa, Dun Ducathair, Dun Eoghanachta and Dun Eochla on Inishmore; Dun Chonchúir and Dun Fearbhai on Inishmaan, and Dun Formna on Inisheer (Jones, Carleton, 2004, 169). Located on a sheer cliff on the SW side of Inis Mor this Univallate coastal promontory fort consists of an irregular boulder-strewn area of limestone pavement (110m by 80m max.) defined to landward (NE) by a massive drystone rampart (L c. 73m, Wth 7.2m, H 3.7m).

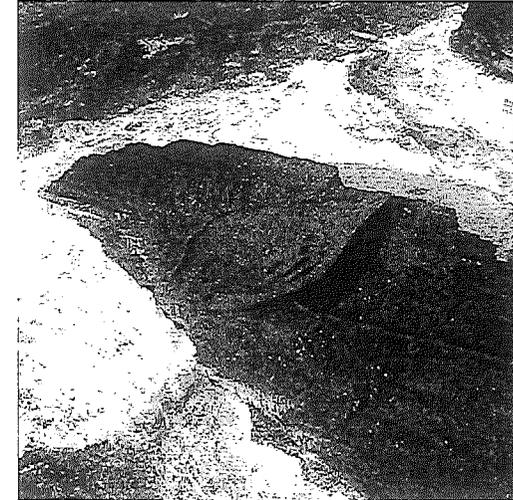


Fig. 5. Dun Dúcahair.

The inner face of the rampart now has three terraces connected by steps and the outer face is buttressed but the ramparts were heavily restored in the 19th century (a practice which regrettably is still all too common – most spectacular at Cahergal, Co Kerry which has grown by roughly 3m in the last decade) and are no longer in their original form. Traces of an entrance c.2.2m in width survive at the E end but according to Petrie a “perfect entrance” to the W was destroyed by a cliff-fall prior to 1839. The fort contains the remains of conjoined huts immediately inside the wall and the foundations of a large group of ovoid houses further along the promontory which could easily be mistaken for an entirely natural storm beach (Jones, Carleton, 2004, 181). These house sites contain intact soil horizons with midden deposits. A dense band of chevaux-de-frise, an area of upended stones designed to impede an attack on the fort, survives outside the ramparts. On Aran, Chevaux de Frise are also found outside Dun Aonghasa and there is a surviving oral account of Chevaux-de-frise at Dun Beag (pers comm. Tim Robinson), one of a group of smaller stone forts located across the valley on a prominent opposite Dun Aonghasa although no remains are currently visible. Caherballykinvarga near Kilfenora in the Burren has a similar defensive band of Chevaux de Frise (Jones, Carleton, 2004, 108) and there are disputed examples at Dun na mBó on the Mullagh Peninsula and at Lough Feagh north of Newport (Redmond, 2002, Gibbons, 2003). Outside Ireland Chevaux de Frise are a characteristic of the Atlantic Fringe of Europe and are found on the North West Coasts of Iberia, on the Isle of Man, Scotland and South Wales (Cunliffe,

2001). On the Aran Islands the Chevaux-de-frise have their own indigenous local name (*Gráin-Catha* – battle spikes), a superbly descriptive term (pers comm. Padraig O’Tuarisc, OPW Manager, Aran).

Dun Dúchathair was evidently a major fortified settlement at a time when Aran probably still had a substantial soil cover. The main visible phase of the site is likely to date to the early Christian period. Excavations by the Discovery Programme at Dun Eoghanacta further west on the island and Dun Aonghasa revealed that the construction and first occupation of Dun Eoghanacta dated to the early Medieval Period and that while Dun Aonghasa originally dated to the Bronze Age it was probably substantially remodeled at this time. Finds from Dun Eoghanacta were similar to those from Cahercommaun in the Burren. Dun Eoghanacta continued to be occupied into the late Medieval period and it seems likely that this was true for the other Aran forts as well (Jones and Carleton, 2004).

Dun Duchathair - Megaclast ridges. (Mike Williams)

There is considerable controversy in recent literature concerning the identification of sediments deposited by tsunami in the sedimentary record (e.g. Bryant 2001, Bryant & Haslett 2006, Hall et al 2006, Saintilan & Rogers 2005, Williams & Hall 2004). Some authors employ the existence of large boulders (megaclasts) at some height above mean sea level to indicate the action of palaeotsunami, some so large as to be only explainable by asteroid impact into nearby seas (e.g. Bryant et al. 1996).

On the Aran Islands, and elsewhere, extensive ridges of megaclasts are present from sea level to 50m a.s.l. Analysis of these ridges has demonstrated that they are storm generated cliff top deposits (C.T.S.D.) and thus such deposits are not necessarily indicative of tsunami activity.

Estimating the frequency and intensity of the extreme waves that generate these ridges is obviously of importance in predicting environmental impact. At Dun Duchathair [L869073] there is evidence of the timing of one of these events. Some of the megaclasts have buried enigmatic archaeological structures on the cliff-top platform. This occurred on the Night of the Big Wind, January 6th. 1839 (O’Donovan, 1839). There is evidence elsewhere on the island of a similar event on the 31st. January 1953. Precise dating of the extreme events that emplaced these ridges is difficult. Modern debris trapped by the clasts may be of some use and relative dating may be aided by lichen growth on the clasts (*Caloplaca Marina*) and by the building and destruction of cliff-top walls.

The method of emplacement of the clasts is a complicated mathematical problem involving the impact of extreme waves onto vertical obstacles, an aspect of marine engineering which has direct relevance to human safety and erosion rates of coastal areas. A possible scenario, according to the author, may involve the downward collapse of a water column onto the cliff platform immediately after wave impact. This collapsing mass would convert into a landward-traveling bore with enough momentum to pick up large loosened clasts on the cliff edges. It may be possible to calculate the heights of these extreme waves. The highest wave ever recorded in the North Atlantic was 29.1 metres (Holliday et al. 2006). Modeling at a nearby locality suggests inshore waves of 17 metres with a repeat time of 50 years (Aqua-Fact, 2002).

Under such extreme conditions, coastal erosion of the Aran Islands is rapid. This is partly due to the heavily jointed nature of the Carboniferous limestones and shales. The intersection of two principal vertical joint sets with subhorizontal bedding planes results in the production of tabular blocks of rock. A recent cliff collapse just north of this locality involved almost 4000 tonnes in the past decade or so (Williams, 2004). In some areas the rates of coastal recession have overtaken the rates of creation of the megaclast ridges (Fig. 6). Such rates of erosion may suggest that the construction of the forts, which today are perched on cliff-top localities, may have taken place in quite different environments some 2,500 years ago.

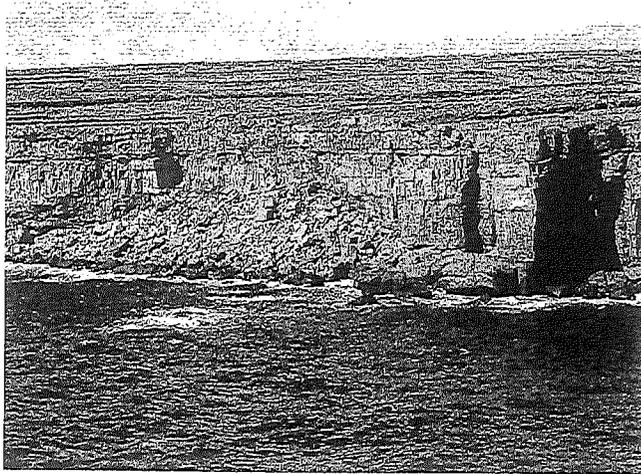


Fig. 6 Recent cliff collapse just north of the Black Fort, Inishmore. This involved almost 4000 tonnes of rock and a cliff top recession of approximately 5 metres.

Dún Aonghasa (Claire Cotter)

Dún Aonghasa (Fig. 7) is the largest and most spectacularly sited of the seven large stone forts on the islands. It stands at the edge of steep cliffs (up to 87m in height) on the southern coast of Inis Mór and on clear days, there is an unrestricted view southwards towards Kerry Head, northwards to the Connemara coast, and eastwards to the cliffs of Moher. Approach is from the Visitor Centre, Kilmurvey, run by the Department of the Environment, Heritage and Local Government.

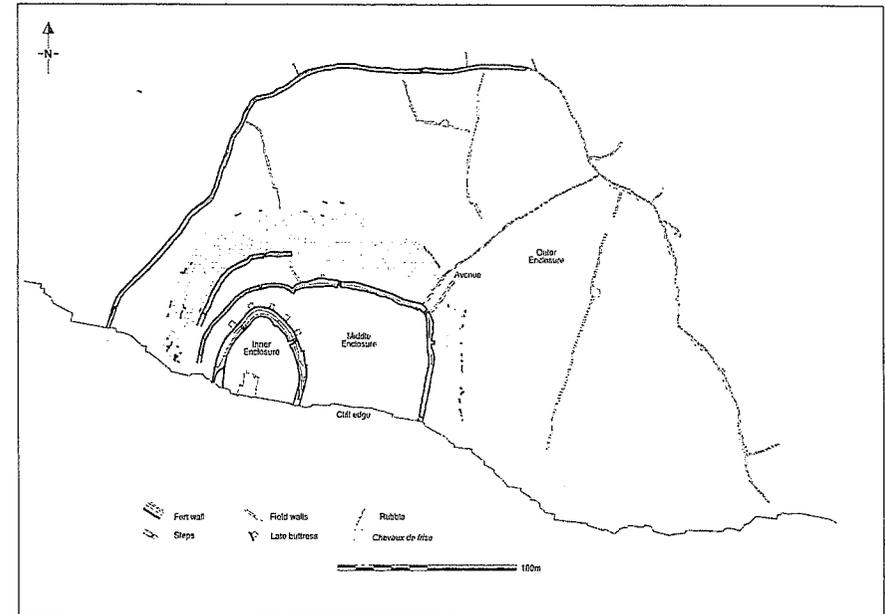


Fig. 7 Plan of Dún Aonghasa

The landscape of the monument

The fort overlooks the inlet of Port Mhuirbhig, and a broad area of machair directly behind it (Na Muirbhig Móra) that runs inland to a small lake, Loch Mhuirbhig. The current working model for machair development is one of a dune system consisting initially of ridges, but which, through severe exposure to frequent strong winds, coupled with heavy grazing, is eroded down to the water table to produce a level surface (Hildebrand, 2001). The date of the formation of machair is likely to vary from place to place. The evidence from the very extensive machair zone on South Uist, in the Outer Hebrides, suggests that settlement there intensified in the late prehistoric period, possibly following stabilisation of the dune system related to climatic deterioration. The date of the formation of the Aran machair is unknown, but, as grazing formed an important component in its formation, perhaps the people who built Dún Aonghasa also contributed to the development of Na Muirbhig Móra. The prehistoric animal bone assemblage from the fort was unusual (in an Irish context), in that there was a very high incidence of sheep. Finbar McCormick, who analysed the

faunal assemblage, notes that this is quite typical of sites along the north Atlantic fringe as sheep are far better able to withstand exposure, shortages of winter fodder etc.

The route to the fort

The path up to the fort runs through the ecclesiastical complex of Kilmurvey before continuing uphill across the limestone terraces. Further uphill, the track runs between two small undated hut sites. A low mound (An Móinín Glas – the green hillock) situated on a terrace west of the fort is probably the collapsed remains of another hut site.

Siting

As well as being located along the highest section of the cliffs, Dún Aonghasa lies at the point where a series of northnorthwest - southsoutheast terraces run out at the cliff edge. The western part of the fort stands on the highest of these rugged terraces and there is a marked contrast between the relatively level western half of the interior and the broken sloping ground in the east sector. It took c. 30,000 m³ of stone to build the three innermost walls of the fort. Some proportion of that is likely to have been surface-collected rock debris, but a great deal of the stone was manually quarried. The stripping away of that stone has considerably modified the hilltop, particularly the upper plateau and middle enclosure areas.

The archaeological excavations (see below) indicated that there was no substantial soil cover on the hilltop when the fort was constructed. The excavated stretches of walling stood, for the most part, on bare rock, and, only occasionally, on natural gravels, boulder clays / buried soil horizons. In the inner enclosure, the colonised old ground surface consisted of weathered expanses of bare rock, spreads of rock debris and quarry clays, and patches of in situ weathered clays.

The main features of the fort.

The fort (area: 5.8ha / 14 acres) has three main enclosing walls and fragment of a fourth wall along the west side. The walls become progressively more substantial and the most massive, the terraced inner wall, measures almost 5m high and 6m wide. All the walls terminate at the cliff edge. The three principal walls divide the interior into three unequal enclosures. The largest of these, the outer enclosure, was probably used solely for livestock. A broad band of chevaux de frise, made up of upright pillars of stone, runs outside the middle enclosure. The semi-oval inner enclosure (48.20m by 45.60m) is elevated above the remainder of the fort and dominates the hilltop. There is no demonstrable evidence to support the popular theory that the inner enclosure wall was originally circular, with part of it now fallen into the sea. Undoubtedly, some protective walling existed along the cliff edge during the occupation of the site, but we have no way of knowing just how substantial that wall might have been. The original approach to the fort was from the north and the earliest entrances through the outer and middle walls face in this direction. The modern approach (from the north-east) seems to have come into existence after the chevaux de frise was constructed. The present walled pathway from the Visitor Centre up to Dún Aonghasa was built in the mid-1990's.

Repairs to the fort

All seven large forts on the Aran Islands were 'restored' or 'repaired' in the late nineteenth century, mostly during the period 1884-6. The contemporary records are sparse and we depend largely on pre- and post-restoration accounts to determine exactly what works were carried out. The 1839 Ordnance Survey letters of John O'Donovan, the photographs taken by Lord Dunraven around 1875 (Fig 8), and the detailed articles and sketches by Thomas Westropp in the period 1875 – c. 1910, together make up the bulk of the useful evidence regarding the pre-restoration condition of Dún Aonghasa. From those accounts, we know that the north-west part of the inner enclosing

wall had collapsed, the terraces and steps were in very poor condition and the inner doorway was buried in rubble. The western flank of the middle enclosure wall was also fairly dilapidated. The comparatively low outer wall was generally ignored by commentators, but its present condition is probably relatively unchanged from what it was in the nineteenth century.



Fig. 8. Lord Dunraven's photograph of pre-restoration condition of Dún Aonghasa, 1875.

The Archaeological Excavations

As part of the Western Stone Forts project, undertaken by The Discovery Programme, four seasons of excavation were carried out at Dún Aonghasa between 1992 and 1995. The results of the excavations can be summarised as follows: the earliest record of activity on the site is food refuse that has been radiocarbon dated to the Middle Bronze Age (c. 1500 – 1100BC). Enclosure of the hilltop commenced around 1000 BC and the floruit of that Late Bronze hillfort phase was c. 800 BC. The remains of houses and high status goods (amber beads, bronze tools, weapons and ornaments, and clay moulds for casting some of these items) point to a small resident population, probably of elites. During this period, Dún Aonghasa is likely to have been the political, economic and ritual centre of a group of people who shared a common ancestry. The territory of the group may have been limited to Inis Mór, or, it could have taken in all three islands. It is possible also that the territory included other groups living in adjacent coastal areas of the mainland. Maritime resources formed an important component of the diet of these people. Wrasse and bream made were the most common fish species represented at Dún Aonghasa and these would have been caught mainly by handline fishing (O'Connell, forthcoming). The prehistoric finds assemblage from the fort is comparable to contemporary assemblages from mainland hillforts (e.g. Rathgall, Co. Wicklow and Haugheys Fort, Co. Armagh), and wealthy lake settlements such as Lough Gara, Co. Sligo and Moynagh Lough, Co. Meath. Far from being a marginal society, the Late Bronze Age occupants of Dún Aonghasa were fully in touch with their mainland counterparts.

By the end of the Late Bronze Age, changing social and, possibly environmental, conditions appear to have made hillforts peripheral, rather than central places in the settled landscape. The radiocarbon dating evidence from the excavations indicates that there was a marked decline in activity at Dún Aonghasa during the period 700-500BC and, for the following thousand years, there is very little evidence on which to build up a picture of what was happening at the site. It is very likely, however, that the fort continued to be occupied periodically during the Iron Age. Whether or not any significant changes were made to the layout of the hillfort during that time is

more difficult to say. No dating evidence was forthcoming for the chevaux de fries; its location, well inside the outer wall, points to a contraction in the size of the fort, suggesting that the role of the monument had changed. Iberian examples of chevaux de frise date to the late prehistoric period. The Irish sites show a much greater element of 'display', however, and the feature may have been adopted here at a much later date.

The final remodeling of the fort took place sometime during the second half of the first millennium AD. What had been a gentle rise up to the inner enclosure was quarried back to form a vertical-sided plateau, and the existing inner enclosure wall was thickened and heightened. The overall result was an impressive citadel that overlooked the outer defenses. The settlement horizon associated with this phase was again very poorly preserved, but sufficient survived to indicate that there had been a small resident population in the fort at this time. The residents are likely to have consisted of a chief, and members of his immediate kin group, with their retainers. The fort probably also functioned as an administrative centre, where tribute was collected, goods redistributed etc. Who 'Aonghus' was is uncertain – he may have been Aonghus Mac Natfraich, King of Cashel, who had dynastic connections with Aran in Early Historic times.

Sunda Caoch (the narrow sound) depression. (Michael Gibbons)

An intact soil-section (L 083E 097 N) occurs close to the cliff edge at the edge of a small seasonal locháin next to *Sunda Caoch* (blind sound) in the saddle below Dun Aonghasa, on its eastern side, at one of the lowest points of the southern cliffs. This is of considerable interest in that it has intact stratigraphy and survives within the remains of a small field with intact soil horizons. The section, is up to 60 cm in depth and 10-12m in length. It consists of a modern sod horizon overlying a peaty horizon over a brown earth which rests on a layer of boulder clay. A number of accounts mention the presence of red soils elsewhere on the island, in particular near Turlough More, south of Kilronan (O'Connell and Roden, 1994). These soils were noted in the last century (by Kinehan) but have not been described since.

Part of a relict limestone field wall is visible protruding from the soil section. The wall is visibly running in a roughly E-W direction for c.20-30m. The western portion (c.12m) is still relatively intact but the longer eastern section runs into Turlough More and is barely visible in addition to being subject to seasonal flooding. Overall the wall is in a collapsed and eroded state but may be of critical importance in looking at the farming history of Aran. In association with the soil section the wall is tangible proof of a more extensive soil horizon on Aran in the past and may be part of a more extensive early field system adjacent to and coeval with the outer rampart of Dún Aonghasa.

Mainistir Chiaráin (*Claire Cotter*)

Teampall Chiarán (Ciarán's Chapel) is located near the village of Mainistir and stands in an ecclesiastical complex known in medieval times as *Mainistir Connachtach* (the monastery of Connacht). According to tradition, the monastery was founded by Ciarrán who spent some years in Árainn under the tutelage of Eanna (Enda). Ciarrán subsequently went on to found the monastery of Clonamnoise, Co. Offaly.

The church is medieval in date, with a trabeate door in the west wall and an arched doorway in the north wall. The tall, narrow east window is in the transitional style – transitional between the round-arched Romanesque, and the pointed Gothic, styles. Three other buildings survive within the monastic complex; there are also a number of carved cross slabs, one of which also functioned as a sun dial. A burial ground and some additional carved stones lie a short distance away to the east. The eastern crosses may mark the limits of the sanctuary area of the monastery.

Four seasons of archaeological excavations were carried out at the site in the period 1996-1999. The excavations were directed by Sinéad Ní Ghabhláin, Research Associate at the Institute of Archaeology, UCLA and the work was jointly funded by the University of California and the National Committee for Archaeology, Ireland. From a research point of view, the main objective was to investigate the layout and organisation of a non-reformed monastery in the medieval period. The following account is based on the summaries in the annual *Excavations Bulletin* (1996-99) and on information supplied by Sinéad Ní Ghabhláin.

The excavated cuttings were concentrated on the south side of the church. The earliest feature found, a pit filled with charcoal-rich clays, dates to the opening centuries of the first millennium AD and it therefore clearly predates the monastery.

Remains from the monastery phase include a possible timber building constructed on a clay platform. The finds assemblage, and the radiocarbon dates place this period of activity in the mid – late first millennium AD. The present church is of multi-phase construction and appears to have been preceded on the same site by at least one other building. Features related to the construction of the church included a large pit, possibly a clay extraction pit, a lime-pit and builders rubble. Roughly contemporary with the church, and running at right angles to its south-western end, was a stone house. This was partly enclosed along the west and had an external working area. The building seems to have fallen into disrepair and, in the late sixteenth /seventeenth century, it was replaced by the present structure. This was also a house and, in the vernacular style typical of the islands, it had opposing doors.

Inisheer/Inish Oírr

Knockgrannie (*Michael Gibbons*)

'Knockgrannie,' known locally as *Cnoc Raitihni*, was revealed in 1885 by the shifting sands and later "'excavated' and 'restored' by the Board of Works". It is a circular cairn revetted by a drystone wall (D 21m, H >1.5m) located on a sandy rise above the beach close to the N shore of the island. Traces of slab-lined graves are visible protruding above S half of the flat top of the cairn and the N half is occupied by a small rectangular kerbed platform (H 0.9m) surmounted by two small limestone pillars. Excavations of a circular cist (D c. 1.5m, H c. 1.2m) in the body of the cairn in the 1880s identified two early Bronze Age cremations in pottery vessels including a cordoned urn (the most western example in Britain or Ireland), a smaller vessel, a bronze artifact (probably an urn) and bone. (Carleton, Jones, 2004, 160)

Dun Formna/ Caislean Ui Bhriain (*Michael Gibbons*)

Although described as a Univallate ringfort, Dun Formna might be more correctly described as a hillfort with its probable origins in the Bronze Age as with those of Dun Aonghasa. It is located on the summit of a low terraced limestone hillock overlooking the beach and overlooks the strategic narrows that divide Inishmaan and Inisheer. The fort consists of a roughly oval cashel (N-S 52m; E-W 41m) defined by a massive drystone wall which follows the line of the limestone scarp. What appears to be an outer rampart can be traced in the curving field boundaries to the South and East of the fort (see photo - Jones, Carleton, 2004, 183) A number of possible clochans were described in the interior in 1887 no trace of these are visible today (Gosling, 1993).

The SE corner of the fort contains the remains of Caislean Ui Bhriain, a two-storey rectangular keep (L 13.2m, Wth 7.6m) associated with the O'Briens. The castle is probably of 14th-C date and was in use in 1574 when it was in the possession of 'Domynick Lynch' but was apparently destroyed by Cromwellian troops in 1652 (Gosling, 1993). Two very fine primitive stone heads are built into the eastern and northern walls of the castle. These are undated and are probably medieval in date but are vaguely reminiscent of Celtic stone idols and may be in a secondary position.

St Cavan's Church (*Michael Gibbons*)

Known locally as *Teampall Chaomhain* the church consists of a nave (E-W; L 6.65m, Wth 5.07m ext.) of early Christian date with a later medieval sacristy (L 3.49m, Wth 3.36m ext.) at the western end set within a modern graveyard in sand-dunes close to NE shore of island. The saint's grave, marked with a cross slab is visible almost buried in sand just to the NE and there is a possible clochan nearby. The remains of a large 'kitchen midden' (L c. 137m, Wth c. 46m -1938) composed of limpet shells, 'split bones and pieces of charcoal' are also visible on the N-facing slope of the sand dunes outside the graveyard gate (Gosling, 1993). Most midden sites on the Galway Coast but there are some significant prehistoric examples also, most notably at Truska on the west Connemara coast (McCormack et al, 1996) as well as possible Neolithic examples on Omey Island (Gibbons and Higgins).

The EU FP4 TIMECHS project (Timing and Mechanisms of Holocene Climate Change in NW Europe, 1998-2000) investigated the Holocene part of a thick lake sediment sequence collected from An Loch Mór, a 23 m deep lake on Inis Oírr. TIMECHS involved some twenty scientists from thirteen laboratories. Investigations included pollen, plant macrofossils and ostracods, geochemistry, and the use of a variety of techniques to establish a reliable chronology including AMS and conventional ¹⁴C dating, uranium/thorium dating, and varve and tephra analyses. Details of various aspects of these investigations are given in the publications listed below.

The Late-glacial part of the sedimentary sequence has been investigated within the context of the PRTL3-funded project, Late Glacial and Holocene Climate Change – Multidisciplinary Investigations of Calcareous Lake Sediments from Western Ireland.

A 45 minute feature film entitled 'Fields of Demeter', which features sequences shot during summer 2006 by a film unit from the University of Bergen in the Burren and Inis Oírr, was made within the context of the project ECL: Our Common European Cultural Landscape Heritage (EU Culture 2000 Project). This project was co-ordinated by Professor Knut Krzywinski, Institute of Biology, University of Bergen, Norway, and involved institutes in Austria, Italy, Portugal, Spain and Sweden as well as the Palaeoenvironmental Research Unit, NUI, Galway. The 'Fields of Demeter' highlights well the importance of the Aran Islands and the Burren as cultural landscapes of European significance.

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