Introduction

Site Name: Belderrig
Townland: Belderg More
Parish: Belderg
County: Co. Mayo
Excavation NGR: F992415
Licence Number: 04E:0893

This report provides a retrospective review of research carried out in Belderrig, North Co. Mayo (Figure 1) from 2004-2008 and primarily funded via the National Committee for Archaeology of the Royal Irish Academy and with support in kind from the UCD School of Archaeology and ITAS Bealdeirg. The project began in 2004 as a small test pit investigation of a lithic scatter with associated organic remains, and has expanded to include a wide range of aspects. Preliminary reports on some of these developments are included here.

Figure 1: location map

Background

The site at Belderrig lies immediately above the present shoreline on peat covered west facing slopes of a sheltered bay near the exit of the Belderg River (Figure 2, 3). The site is on the edge of a notable shelf on the peninsula, giving way to gentle slopes to north, east and, at some distance, south. The site was initially identified through surface collection of artefacts. Substantial erosion, caused by changes in the up-slope drainage regime, has left a clear scar in the cliff edge at Belderrig, and it was in this erosion scar that Prof. Caulfield and his father first noted the site. The surface collection, dominated by quartz but including other materials, was of recognisably Mesolithic character (Costa et al. 2005; Woodman 2005, 136-137, Fig 9.16). At Prof Caulfield’s invitation I visited the site in 2002 and designed the fieldwork programmes that have taken place since that time.
This region is internationally famous for the presence of substantial areas of pre-bog neolithic enclosures surveyed and excavated by Caulfield, most famously at “Céide Fields” (Caulfield 1970; Caulfield 1971a; Caulfield 1978; Caulfield 1981; Caulfield 1983; Caulfield et al. 1998) but also in Belderrig itself (Caulfield 1971b; Caulfield 1972; Caulfield 1974; Caulfield 1976; Caulfield unk.), as well as numerous neolithic funerary monuments (e.g.
Ó Nualláin 1998). These monuments, and especially the field-systems, have played a key role in discussions of the nature of the neolithic occupation of Ireland and Britain (Cooney 2000).

**Original Proposal**
The original proposal to the RIA was made in autumn 2003. It argued that:

“There are five strong reasons for undertaking this research project.

- The project offers a chance to study the mesolithic in an area that is mainly a blank on our distribution maps. The study of the mesolithic in Ireland is subject to strong geographical biases, and the research proposal offers an important opportunity to expand our understanding of the spatial and temporal variation of mesolithic settlement in Ireland.
- The presence of neolithic field-systems in the region is especially significant. Dykes of the Belderg system begin immediately upslope of the Belderg site. A fuller understanding of the mesolithic settlement in the area can only assist our interpretations of the nature of the mesolithic-neolithic transition in the region and beyond.
- The location of the site underneath peat with bone and stone tools suggests that a well-preserved prehistoric site is present, with potential for structural remains and intra-site spatial analyses.
- At present, our understanding of the character of prehistoric quartz working in Ireland is very limited. Often perceived as an intractable material, quartz has received little analytical attention. Yet across northwest Europe quartz forms an important part of stone tool industries (notably, for example, in Scandinavia), and the chance to obtain a detailed understanding of quartz working in Ireland offers a powerful corrective to the systematic imbalance created by flint-derived expectations of stone working. Beyond the possibility of structural remains, and the organic preservation on site, the fuller understanding of quartz working gained would be a very valuable research project in its own right, facilitating wider surveys of erosive contexts in the region and beyond. The use of varied raw materials at the site also enables comparative analysis of prehistoric technological decisions. Given the presence of diverse neolithic lithic industries in the region a powerful diachronic analysis would also be possible. Further, a well-excaved lithic assemblage would also enable microwear and other functional analyses to be undertaken.
- Finally, the site is at risk from erosion and if no action is taken it will soon be destroyed.

The excavation programme would run for two or three years with post-excitation to follow. The first year’s work would be devoted to survey and test pit excavation, in order to establish the extent of the site, and to establish more clearly the nature of the sub-peat archaeology. The results from this first year would inform the extent and duration of following field seasons. All appropriate specialists will be consulted after the trial excavations in order to develop a research and sampling strategy for larger area excavation. The Belderg Study Centre would provide our field base, and be used for the initial processing of all samples. I would direct the excavation, with supervision from postgraduate research students, with opportunities for undergraduates to volunteer on the programme.”

These specific aims will be returned to below.

**Methodology**
In every year the project has been directed by GW with supervision and assistance from colleagues in the UCD School of Archaeology. In each year funds have been used to hire
supervisors or assistant directors and, where possible, continuity has been established. The first three seasons saw Mark Gordon act as one of the supervisors, whilst Kim Rice has been senior supervisor for the last two years. Dr Thomas Kador has been assistant director of the project for the last two years. The backbone of the workforce for the project has come through student volunteers, frequently from UCD but also from Universities across Ireland, Britain, Europe and North America (Figure 4). Approximately 100 volunteers have worked on the site at different times, many choosing to return for second, third and in some cases fourth years. In each year the research team has resided in Belderrig for the duration of the field season. We have rented cottages from members of the local community and use the catering facilities at the study centre for cooking. We have frequently presented evening lectures to volunteers or have been led on tours of the Belderrig landscape by Prof Caulfield.

In each of its years the project has rented the Belderrig Research and Study Centre, often availing of a considerable discount offered by the centre. This centre has been essential to the project: it provides space for equipment to be stored, catering and other facilities to assist in many other aspects of running a field project, but most importantly, large, fully equipped archaeological laboratories. Our programmes of flotation sieving and processing of retents are ongoing, with student volunteers splitting their time between lab and field. The lab also means that on wet days – of which there have been many – our time is still used productively (Figure 5).
Five field seasons, with a total of 16 weeks of fieldwork have been undertaken, on the following dates. We have worked five or six days a week.

17 – 30 July 2004 (2 weeks)
9 – 29 July 2005 (3 weeks)
12 June – July 5 2006 (4 weeks)
25 June – 20 July 2007 (4 weeks)
31 May – 20 June 2008 (3 weeks)

In each year we have welcomed visitors to the site, often advertising the excavations at the Céide Visitors Centre. We have also provided an evening lecture for the local community, with artefacts and ecofacts on display and students dealing with queries. Radio and press coverage in 2008 led to an especially successful evening with people travelling from Castlebar to participate in the event.

Survey
The project has involved four aspects of survey, three formal and one informal. This survey, and the excavation, has been greatly facilitated by the use of a survey framework tied into the Irish National Grid, provided through GPS survey from the Discovery Programme.

In 2004 a programme of topographic survey focused on the immediate region of the erosion scar. This was constructed on a 1m grid, and provided models of the surface of the peat and the sub-peat topography. Following from this, and as a key focus in 2006, an extensive survey of features in the region of the site – walls, ditches etc – was undertaken. This has facilitated rectification of old OS maps of the region, allowing some monitoring of coastal erosion. Further survey work is planned, utilising UCD School of Archaeology’s new GPS system. The informal survey has taken place since 2005, and, building on our understanding of quartz in the Belderrig site, focuses on examination of mineral soil exposures in the region for further quartz scatters: this work has been unsystematic, and really reflects areas we
have happened to have been passing through. Five further scatters have been identified to date (Figure 6)

![Figure 6: Quartz scatters identified in casual survey. The linear character is explained by exposure created by construction of a bog road.](image)

Volunteers on the site have also put their knowledge of quartz to good use: a student in 2005 identified a quartz scatter in their Grandmother’s garden in Donegal - duly reported to the NMI.

![Figure 7: Magnetometer Survey, carried out by Dr Blaze O’Connor](image)

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The final formal aspect of survey was a geophysical assessment of the immediate region of the erosion scar, carried out by Dr Blaze O’Connor in 2004. Two geophysical survey techniques, earth resistance and magnetometry, were employed over a series of grids straddling a central fence line, with the magnetometry operating at an unusually high resolution to maximize the potential for identifying small and ephemeral traces of activity. Resistivity readings were taken along 0.5 traverses at 0.5m intervals. The magnetometry survey was conducted at 0.125m intervals. The anomalies to the north of the modern fence line show a clear linear pattern (Figure 7) – which probing indicated corresponded to peaks in the sub-bog topography. Three of the anomalies have been examined, and it appears that they derive from the presence of large iron-rich sandstone cobbles in the wall. These are a feature of the local geography (and may explain something of the place name Beal Deirg). The noise to the south is derived from post medieval forging activity and corresponds closely to a structure visible on the ground.

**Excavation**

![Figure 8: distribution of all excavation 2004 - 2008](image)

In 2004 – 2005 a total of 35 test pits were excavated aiming to investigate the distribution of lithics as a proxy for activity. Test pits were located on a 10m grid system, laid out by hand with the location of the pits later tied in by total station survey. The grid system was flexible and areas of peat flushes or obvious peat domes were avoided. All pits were excavated by hand, with all spoil dry-sieved through 5mm meshes. Soil profiles were recorded in detail, and plans and photographs taken as appropriate (Figure 9). These test pits varied between 0.5x1m and 1x1m in size, depending on depth and features identified. Two test pits identified sub-bog structural evidence in the form of stone walls (discussed below).
Following the test pit survey a larger excavation programme began in 2005. Trench one was initially 30 x 2m in dimension, running down slope from the area of sub-big structural evidence to the concentration of mesolithic stone working. This trench was later extended (Tr 1 Annex/An) in 2007 and 2008 to further examine a complex of sub-structural features.

Trench Two (4 x 3m) was opened and completed in 2005. It focused on an area of notable erosion near the cliff edge, and near a visible area of fish bone.

Trench Three and Test Pit ‘Cliff’ (1 x 0.5m) targeted small exposures of fish bone immediately visible in the cliff section.

All excavation has been by hand with the exception of years when we have been reopening trenches, when a machine was used to remove backfill. Machines have been used, where possible, to assist in backfilling. Excavation in all trenches was within a 50cm grid system, with spits or contexts being removed as appropriate. Such a system offers good spatial control whilst not being as time consuming as individual recording of find spots – a very difficult task given the nature of the surfaces and the artefacts. In 2005 an attempt was made to individually record the location of finds and their angle of rest in Trench 2, but the difficulties of recognition of quartz and the irregular form of many artefacts rendered this exercise meaningless.

Initial field interpretations of test pit stratigraphy and cliff exposures raised some questions about the taphonomic status of some of the artefact bearing layers on site – notably the ‘stony layers’ discussed below. Following field observations and advice in 2005 increasing evidence appeared to support the interpretation of these layers as in situ (see below for extensive discussion). Following from this, a rigorous sampling strategy was developed and has been applied to the following years of excavation in Trench One. With the 50cm grid system, every second square was 100% sampled, with 2L control samples from the other squares. These samples are then flotation sieved, or sub sampled as appropriate. In Trench one, the upper layers (predominantly erosive) have therefore not been sampled as
consistently as lower deposits, but this is unlikely to have led to substantial loss of information. Trench Two was selectively sampled, rather than systematically, whereas Test Pit Cliff and Trench Three were both 100% sampled.

**Results**

Detailed stratigraphic accounts have been presented in the annual interims. An overall narrative is presented here.

A total of 16 radiocarbon dates (including one duplicate date obtained as calibration of the new Chrono14 AMS facility) have been obtained from the site so far (Figure 10). These dates are perceived as the first stage of our chronological modelling, and we hope to incorporate Bayesian analysis of multiple dates in order to refine our chronology more precisely (Bayliss et al. 2007; Whittle and Bayliss 2007). The full stratigraphic matrix for the site is very complex, notably because of episodes of erosion during and after the active life of the site.

Figure 10: all C14 dates from Belderrig, see Appendix One
To date the excavations have demonstrated the presence of significant concentrations of artefacts and ecofacts of mesolithic date. These are in association with an extensive stony layer(s) (Figure 11), arguably used to consolidate damp ground or to fill tree hollows – these functions of course not being exclusive. The nature of these stony layers is in broad terms paralleled on other Mesolithic sites in Ireland, Britain and Europe (Woodman 1977; Bonsall et al. 1990; Gustin et al. 1994; Van der Sloot et al. 2003) and further comparisons can be sought with the stone component of lake edge platforms from the Irish midlands, e.g. at Derragh, Lough Kinale (Fredengren 2007). At Belderrig the taphonomic status of these deposits still requires some consideration, with the possibility of some soil movement and truncation of a soil profile, through aeolian or other winnowing processes still to be assessed via micromorphological analysis. Small amounts of mesolithic activity appear to have been
sealed by these deposits, perhaps having taken place before the tree falls or paludification, but the difficulty in identifying cuts through these layers is considerable, and some sequences remain ambiguous. The stony layers have returned a stratigraphically consistent sequence of three dates from Trench Three (UB-7587, 7588, 7589) falling between 4300 and 3950 cal BC. Preliminary Bayesian modelling of this sequence suggests that it postdates 4160 cal BC. Dates from Trench One include a date from low within the stony layers of 4328-4053 cal BC (UB-7584), and the stony layers seal a date of 4353-4180 cal BC (UB-7583).

Some problems are raised by dates for a pit, seemingly cut through the stony layers in Trench One and with an 86.8% chance of dating to 4620 - 4490 cal BC (UBA-10266, 10267; Figure 13: combined C14 date for C173). This pit was identified beneath the stony layers, and corresponded to a clear feature visible in earlier plans and photographs of those layers, but no cuts were visible during excavation. It is possible that the pit was not identifiable in these layers, but was initiated from their surface; some possible late mesolithic parallels include Woodman et al recording difficulties in the identification of features within silts at Ferriter’s Cove (Woodman et al. 1999). Alternatively, the pit pre-existed the stony layers, was truncated and then sealed by these layers, which settled into the pit through subsidence or the fill contains material from these layers. This question is being addressed in post excavation analysis.
Interpretation of the stony layers, of which only small areas have been excavated, remains provisional. Aspects of the deposit appear ‘midden’ like in character and in parts is associated with elevated phosphate levels (Ullrich pers. comm.). It also appears to have acted as a focus for a range of deliberate deposits before, during and after its construction: with a mica schist Moynagh point and imported flint blade deposited beneath the layer and
artefacts are deposited in/on top of the layers, including a small cache of mudstone axes (Figure 15).

Figure 15: BDG07, Trench One: cache of mudstone axes on surface/within C111.
© G Warren/UCD

Following the construction of the layers soils continue to accumulate. In places directly above the stony layers this is a worm cast soil. Elsewhere, it is more clearly an occupation soil, with extensive charcoal flecking. At a larger scale, the hill side is transformed by the appearance of architectural features: field walls, cairns and a horseshoe-shaped structure.

Figure 16: BDG08, Overview of wall (C151) and cobble layer (C188).
© G Warren/UCD
The wall(s) appear to have been constructed first, with a spread of cobbles being placed onto the surface, sealing in part small accumulations of occupation soil (Figure 16). This spread was then used to provide the footing for large orthostats, these in turn arguably capped by dry stone walling. A polished stone axe was either placed onto, or into, these stony layers (Figure 17). A fire, in an informal setting, was placed on the cobble layer on the downslope, coastal side of the wall. This has returned a surprisingly young date of 2620 – 2475 cal BC (UBA-10268).

North Mayo is, of course, famed for its field systems, but the layout of the field system is not directly dated in any part of North Mayo. Caulfield offers evidence of a Neolithic date for the field systems through terminus ante quems provided by tree growth (Caulfield et al. 1998). However, the origins of the systems are harder to pin down. Based on palynological evidence O’Connell & Molloy argue that “landnam as a well-defined event begins approximately a century after the Elm Decline” (2001, 116) with smaller scale activity preceding this: within the Céide system, pollen records from Glenultra basin provide a local signal, covering parts of the main field system and a court tomb. Using the dating provided by O’Connell and Molloy (2001, 103) suggests that the elm decline at c. 3890 BC was followed by an ‘early phase of the main landnam event’, followed by, at 3700 BC, “widespread deforestation … as a result of intensive farming and presumably a relatively dense settlement pattern … it is likely that the main field system was laid out during this time”. The relationship of the wall excavated at Belderrig to any field system is not established at this stage and all the comparisons with Céide allow is that it probably post dates 3800 cal BC.

In our trench, the wall then forms the focus for the construction of two small D-shaped cairns (The more formal of which is shown in Figure 18), both associated with burning in the form of charcoal spreads or informal fire settings and both on the upslope side of the wall. The function of these cairns is not clear. A date from a burning spread associated with, and
probably predating the more formal of the D-Shaped cairns is 3020 – 2890 cal BC (UBA-10265).

To the southwest of the wall a horseshoe shaped structure was constructed, backing up against the wall itself Figure 19 Figure 20. This structure was characterised by low stone footings and a central post hole – from which the post was removed in antiquity. The superstructure was likely of timber. Parallels exist in the region for these D-shaped structures, at Ballyglass, the Céide Fields centre (Byrne 1991; Ó Nualláin 1998 ) and the postulated timber superstructure is broadly paralleled at Piperstown, Co. Dublin (Rynne and Ó'hÉailidhe 1965; Rice 2006).
At some stage late in this sequence, access through the walls was changed, with the larger orthostatic components thrown to one side, sealing one of the D-shaped cairns. Throughout these phases of activity the accumulation of an occupation soil continues, especially in the area of the structure: in places this spreads onto the stony layers. The occupation soil is thickest upslope of the wall, although this is in association with apparently truncated features. Dating this activity is difficult, which is confirmed by dates for the fireplace C115/116. Here, two separate, but comparable dates can be combined which have a 84% chance of dating to 3640-3510 cal BC. This predates collapse, and probably but not certainly, predates the re-working of the walls.

Following this phase of activity is a period of erosion and abandonment. This is characterised by the formation of a colluvial deposit, itself containing artefacts, across site and the collapse of stone architecture (Figure 21, C407). The cause of this erosion is important: Verrill, based on a long coring profile in Belderg Beg (c.1.5km away), notes that
"... a soil profile developed over the entire Belderg Beg hillslope, and that much of it was lost prior to the earliest peat initiation at c. 5465 cal. BP. Loss of this soil could have occurred by erosion. Sub-peat pockets of soils remaining in topographically suitable positions were covered by peat at different times, leaving open the question as to whether erosion was a single event or progressive, multiple events occurred." (103)

This includes accumulations of over 10cm on the upslope side of walls at the base of the hill-slope (Verrill 2006, 104). The possibility of the loss of soils having taken place through Neolithic farmers stripping turves (ibid. 121) is noted, but erosion appears to be her preferred interpretation and is argued to have an important impact on local peat development. Verrill argues that this is a primary cause of agricultural collapse in Belderrig:

“soils gradually became exhausted as a result of long-term agriculture, perhaps even overgrazing; a situation amplified by the continuing climatic regime of relative dryness in the sixth millennium cal. BP. Water shortage could have been a problem … Droughty soils would decline in productivity and the resulting reduction in vegetation cover would increase susceptibility to erosion.” (197)

Palynological evidence suggests the collapse of Neolithic agriculture in Belderg Beg by 3375 cal BC.

This demonstrably predates continued activity in Belderg More, suggesting considerable localised diversity in the timing and character of activity. The extensive erosion at Belderrig post dates at least c. 2700 and probably c. 2500 cal BC. In terms of erosion, it is also important to consider that many different features at Belderrig have now been dated, many of which are lying on the same soil horizon, but span at least 500 years, if not more. It is hard to postulate extensive erosion during the time that these features were accumulating.

![Figure 22: BDG08, end of excavation, looking to SE. Note flatter shelf to right of photograph. Wall, visible in foreground curves on slopes above this area. © John Sunderland/UCD](image)

It is important to note that this neolithic erosion cannot be considered to provide a cause for the erosion and redeposition of the ‘stony layers’ which are down slope of a significant wall, which shows little evidence for the accumulation of stone against it. More likely, it appears that the wall deliberately encloses the area of the ‘stony layer’ and associated structures. In part this may be because this flatter shelf provided a primary focus for habitation (Figure 22), but the possible significance of the long history of occupation in this area should be noted.
There is little sense of cultivation on top of the stony layers themselves, as observed in some other instances of ‘midden cultivation’ (Guttmann 2005).

Following these episodes of erosion, peat formation took place on the hill slopes of Belderg More. Peat formation in the region and within Belderrig is demonstrably diachronic, with Verrill (Verrill 2006) suggesting peat formation in the valley bottom, below the field systems, from 3465 cal BC. Caulfield et al (Caulfield et al. 1998) provide dates from a tree 5cm within peat at Geevraun of 4770 – 4360 cal BC (C-46; 5710±90 bp), a short distance above the main focus of the Belderg Beg systems. Preliminary analyses of peat from monoliths extracted from the Belderrig site, undertaken by C Langdon, suggest a Bronze Age date, and this is broadly in keeping with dates obtained by Caulfield et al from 500m upslope of the Belderrig excavations. These include a date of 3360 – 2940 cal BC from a pine stump on 30cm of peat 550m from the current site (C-04; 4480±60).

Peat accumulation is sometimes described as sealing or preserving a ‘fossil’ landscape, yet it is clear that the archaeological remains at Belderrig have continued to be transformed beneath the bog, most notably through the walls acting as channels for sub-bog movement of water and associated sediments. The movement of sediments through and underneath the wall has implications for our observations and interpretation of sediments underlying these features as well as dating implications. Field observations by Thomas Cummins suggest that the drainage associated with the walls may have important soil formation consequences, notably in terms of formation of iron pans (Figure 23).

The extent of sub-bog drainage is clearly demonstrated through the presence of sub-peat pipes (Evans 2007), with very clearly apparent water-borne sediments within them (Figure 24).
Material culture

A wide range of stone tools have been identified in the recent excavations, from coarse and polished/ground through to chipped. Given the difficulties of identifying worked quartz in the field, a policy of total retention has been adopted, this, alongside the extensive sampling strategies utilised, means that it is impossible to give a total number of artefacts – but this will be counted in the tens of thousands. Much of this material is the waste from manufacture of implements.

The dominant raw material for chipped stone is quartz (including rock crystal) which is locally abundant (Figure 25, Figure 26), and this is being analysed as part of an IRCHSS funded PhD at the UCD School of Archaeology by Killian Driscoll, a project that has arisen directly from the RIA funded excavations. Other materials include very rare flint, chert, basalt,
porphyritic andesite (?) and siltstone as well as possible flakes of travertine and psammite, many of which were geologically sourced through an MA dissertation carried out by Declan Kelly at UCD (Kelly 2005). The siltstone most likely originates from the Minnaun (Carboniferous) formations 2-5 kilometres east of the site, but further work is required to identify a definitive source (Kelly 2005). Some pebble flint and chert may be available in the region, but very large flint and the porphyritic andesite are exotic, and, although glacial movements must be taken into account, these likely originate from over 150km away. A Moynagh point (Woodman 2005) of mica schist, available in the region, and a total of five polished axes, three of mudstone and two of currently unknown material, are also present as well as psammite hammerstones and possible bevel ended pebbles.

The analysis of the quartz is especially significant. Quartz has traditionally been accorded little significance in Ireland as a possible raw material for tool manufacture (Driscoll and Warren 2007) despite being recognised as such in other areas of Europe (Knutsson 1998; Lindgren 1998; Saville and Ballin 2000; Ballin 2004; Ballin 2005). Our developing understanding of the use of quartz is of considerable importance. In this context it is also important to stress that many of the other raw materials at Belderrig are very poor, sometimes notably degraded, or with highly irregular fracture characteristics, they are unlikely to be systematically retained unless the excavators are experienced lithics specialists.

The character of the lithic assemblage is difficult to assess in detail at this stage, as it is demonstrably mixed chronologically and requires context by context classification in order to separate out different industries. The majority of the ‘mesolithic’ stone working suggests the importance of primary production of large blades and flakes in a variety of locally abundant raw materials – providing very clear parallels to the structure of stone working at sites such as Ferriter’s Cove (Woodman et al. 1999) or Bay Farm (Woodman and Johnson 1996). The difficulty of recognising retouch on quartz is well recognised (Lindgren 1998) but the paucity of retouched pieces at Belderrig is paralleled at the sites mentioned above. The ‘neolithic’ stone tool industry appears to be different in character, with smaller flakes and more
recognisable retouched pieces – including concave scrapers, again, well paralleled in the region and beyond (Woodman et al. 2006).

The context of several of these finds is notable. A cache of three polished mudstone axes was placed on/in the stony layers (Figure 15). Another axe, seemingly of local materials, was placed in the stony foundation layer of the main Neolithic wall in the Tr 1 Annex (Figure 17). The Moynagh point (Figure 27) was placed at the base of a tree throw, pointing directly down slope, whilst the single largest flint blade, almost certainly an import, was also discovered underneath the stony layers. The latter finds appear to suggest some kind of deliberate deposit.

Figure 27: Moynagh point. © John Sunderland/UCD

Ecofacts
A range of ecofacts are present in the samples processed to date from Belderrig. These include plant macrofossils (charred wood, seeds etc) and faunal remains. Occasional insect remains have been identified but it is not clear whether these are intrusive. Limited analysis has been carried out on any of the ecofact samples to date.

The most detailed work has been undertaken on the bone assemblage. Preliminary analyses by Rachel Parks (Fishlab, University of York) suggest that the assemblage is almost exclusively comprised of fish bone, much of it highly fragmentary (Figure 28). Root action has had a significant effect on the fragmentation of some of the bone; a wrasse infraphryngeal was in the process of being broken up beyond recognition by roots. Some of the bone was demonstrably burnt. Only two species have been definitely identified, a wrasse, most likely ballan wrasse (*Labrus bergylta*), and conger eel (*Conger conger*) and a possible identification of a mackerel has also been made, but remains to be confirmed. Both wrasse and eel are inshore species characteristic of rocky coasts: indeed the best pools for fishing for these species in Belderg harbour today lie immediately beyond the site. Given likely sea level change, it is hard to believe that exactly the same pool was utilised in prehistory. Fish bone is present in targeted excavations on the cliff, and is very occasionally represented in Trench One – a few stray teeth. In retrospect it is likely that a systematic sampling strategy in Trench Two would have recovered more bone than the selective strategy did.
A very small number of wood macrofossil assemblages have been examined, primarily to identify suitable C14 samples. Carbonised hazelnut shells are frequently found, especially in the 'stony layers'.

Climate and palaeoenvironment

Figure 28: preliminary pollen diagrams for two monoliths from Trench One, analysis undertaken by Catherine Langdon

A range of preliminary work has been carried out in collaboration with Dr Stephen Davis (UCD School of Archaeology) examining the climate, palaeoenvironment and landscape
change at Belderrig. To date this includes two primary components, preliminary on-site pollen analysis, and examinations of the history of the Belderg River.

Preliminary pollen work, carried out by Dr Catherine Langdon (University of Southampton), focused on two monoliths from trench one. The analysis targeted the peats accumulating after the cessation of archaeological activity and is currently undated. Both profiles Figure 29 indicate a broadly treeless acid bog/heath environment, possibly Bronze Age in date, with some suggestion of erosion. Human presence, in the form of pastoral indicators, is limited, but present in some phases on both cores. Inconsistencies between the samples, and the absence of absolute dates should be noted however, and more work is needed in this regard.

Collaboration with Dr Jonathan Turner (UCD School of Geography, Planning and Environmental Policy) focuses on the history of the Belderg River. Field investigations have shown that a significant depth (c. 5 m) of exceptionally well preserved organic material exists on the floodplain of the Belderg River, extending at least 2 m. below current sea level. Preliminary investigations of an augur core have revealed a wide diversity of biological remains. Plant macrofossils are abundant and show distinct variation up core; pollen and diatoms are present and well preserved and an adjacent core yielded abundant ostracod remains. Insect remains are also present, both in the form of Coleoptera and Chironomidae (non-biting midges). There are also some indications of possible marine influence, in particular the presence of a puparium of the fly Thoracochaeta zosterae, which lives in seaweed at high water. Wood recovered at the base of this preliminary augur sample dates to 375-175 cal BC (2195±35 bp; UBA-8287), surprisingly young for the depth of sediment represented. Further work in this location has included sampling using a percussion corer (Figure 30), and analysis of these samples using the new ITRAX facilities at UCD is ongoing.

Field observations suggest that much of the very lowest section of the Belderg River is underlain by a relict beach deposit. A complex sequence of ice edge deposits colloquially described as the Belderg Shelly Drift also characterise this area, dating to 16000 bp (McCabe et al. 2005), and the relationship of the beach and drift deposits has not yet been
established. In its lower stretches the channel of the Belderg river appears to have been quite constrained within the parameters established by the beach deposit, and preservation of early Holocene deposits is unlikely. However, the 5 m of sedimentation in the last 2000 years suggests that the river channel was originally much steeper than seen at present. Further work examining the cores obtained from this area has much to contribute to understanding recent landscape change in the region. Sea level in early prehistory remains hard to assess in the absence of good base line data for the region (Brooks and Edwards 2006).

In October 2008 Drs Warren and Davis received a substantial grant (€99,000) from the IRCHSS Research Development Initiative scheme to fund a new 18 month project examining the question of how past human societies in North Co. Mayo responded to changes in climate and their environment. The project will generate new palaeoclimatic and palaeoenvironmental data focusing on earlier prehistory through multiple proxies obtained through analysis of lake cores (Figure 31), and relate this to the archaeological sequences of Belderrig and Céide Fields. It brings a post-doc, Dr Naomi Holmes, to UCD and will include the first use of an Itrax core scanner in an Irish context and the first quantitative chironomid-based climate reconstructions from Ireland. Both the adoption and abandonment of early agriculture in the region have been linked to climate change (O’Connell and Molloy 2001; Molloy and O’Connell 2004; Caseldine et al. 2005; Verrill 2006), and the new study allows a detailed examination of these processes in well understood small to medium scale archaeological landscapes. The project derives directly from the RIA funded excavations at Belderrig.

![Figure 31: lake coring at Cregganmore in 2008. © John Sunderland/UCD](image)

**Status of post-excavation programme**

The excavations have resulted in considerable numbers of samples, many of which await processing. These will form the primary focus of post excavation work in 2009, allowing a detailed post-exavcation and publication strategy to be formulated.

**Outcomes and expectations**

The initial proposal offered five main areas of contribution. These are discussed in turn.
“The project offers a chance to study the mesolithic in an area that is mainly a blank on our distribution maps. The study of the mesolithic in Ireland is subject to strong geographical biases, and the research proposal offers an important opportunity to expand our understanding of the spatial and temporal variation of mesolithic settlement in Ireland.”

Work at Belderrig has demonstrably added detail to our understanding of the later mesolithic in this region of Ireland (Driscoll 2006). In due course and following post excavation analysis, full comparisons with other mesolithic sites in Ireland and beyond can be made. At this stage, it is already clear that the site fits well in our broader understanding of the mesolithic in Ireland.

“The presence of neolithic field-systems in the region is especially significant. Dykes of the Belderg system begin immediately upslope of the Belderg site. A fuller understanding of the mesolithic settlement in the area can only assist our interpretations of the nature of the mesolithic-neolithic transition in the region and beyond.”

In retrospect, the implication of this statement, that the mesolithic site was separated from the neolithic, appears rather naïve. The excavations at Belderrig have focused on mesolithic and neolithic activity within the same trench; in places the latter activity has certainly modified or removed the earlier archaeology, but in other places much survives. It is certainly impossible to attempt to understand the former without the latter. Notwithstanding this, the site provides a sequence of activity spanning the critical years of the Mesolithic – Neolithic transition in the region, from the mid-fifth to the mid-fourth millennium including comparative structural, lithic and macrofossil assemblages. More broadly, the possibility of very early neolithic influence, including strong continental influences, has been raised by recent discoveries at Magheraboy (Danaher 2007) and long-standing debates about the age of Carrowmore (Sheridan 2003b; Sheridan 2003a). The Belderrig sequence, with a strong ’indigenous’ mesolithic and regionally distinctive middle neolithic has much to contribute in this broader context.

“The location of the site underneath peat with bone and stone tools suggests that a well-preserved prehistoric site is present, with potential for structural remains and intra-site spatial analyses.”

Expectations in this regard have clearly been fulfilled. Structural remains of varying kinds have been recovered and observations of variability in the character of artefact and ecofact evidence across the small areas excavated suggest that post-excavation analyses will continue to refine our understandings in this regard.

“At present, our understanding of the character of prehistoric quartz working in Ireland is very limited. … the fuller understanding of quartz working gained would be a very valuable research project in its own right, facilitating wider surveys of erosive contexts in the region and beyond. The use of varied raw materials at the site also enables comparative analysis of prehistoric technological decisions. Given the presence of diverse neolithic lithic industries in the region a powerful diachronic analysis would also be possible. Further, a well-excavated lithic assemblage would also enable microwear and other functional analyses to be undertaken.”

The award of a three-year IRCHSS PhD Scholarship to create frameworks for the analysis of prehistoric quartz working in Ireland is clear acknowledgement of the significance of the
problem, and the critical role Belderrig will play in generating a solution. Killian Driscoll is currently utilising extensive experimental work to devise an analytical framework that will then be tested on a sample of the Belderrig material (Driscoll and Warren 2007). As noted above, casual fieldwalking in the region has identified five other sub-bog quartz scatters. As noted above, the variety of raw materials allows for powerful comparative analyses. Preliminary examinations undertaken by GW of Neolithic assemblages on the North Mayo coast from Behy, Ballyglass, Belderg More and Céide Fields, for example, indicate changed networks of procurement. No use wear has been carried out to date, although it is anticipated to include this within the post excavation programme, control samples for phytolith and starch analysis have been obtained.

“Finally, the site is at risk from erosion and if no action is taken it will soon be destroyed.”

Erosion continues to be a problem, and there are significant long-term management issues to be resolved. Coastal erosion is not the major problem, with most of the damage being caused by downslope drainage, and the channelling of access across this sensitive area. We are rescuing as much information as possible, but it is demonstrable that we are engaging with a small portion of a much wider landscape.
Acknowledgements

I would like to thank all of those who have supported the research at Belderrig. The main funding derives from the National Committee for Archaeology of the Royal Irish Academy, and I very grateful for their support. UCD School of Archaeology and ITAS Bealdeirg have also provided significant support. The IRCHSS fund Killian Driscoll's PhD, and have recently supported the climate work in the region.

Many people have formed part of the Belderrig Research Team over the last five years, too many to name individually. I am especially grateful to Thomas Cummins, Steve Davis, Brian Dolan, Killian Driscoll, Dominik Fuchs, Mark Gordon, Thomas Kador, Sonja Laus, Conor McDermot, Julian Menuge, Emmett O’Keeffe, Patrizia la Piscopia, Rachel Parks, Paula Reimer, Kim Rice, Rob Sands, John Sunderland and Jonathan Turner.

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Caulfield, S. unk. Céide and Belderg Beg: a guide to two prehistoric farms in North Mayo, unk.


## Appendix One: radiocarbon dates from Belderrig

<table>
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<tr>
<th>Trench</th>
<th>Context</th>
<th>Description</th>
<th>Material</th>
<th>Code</th>
<th>estimate</th>
<th>error</th>
<th>δ13C</th>
<th>Cal BC (95% confidence)</th>
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