A second Late Mesolithic date for the fluvial deposits at Cork (Ovens Formation)

Radiocarbon Dates Scheme 2012

Royal Irish Academy

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1. RESULTS

This short report discusses the significance of a radiocarbon date (UBA-20749: Woods Street) that was obtained from wood fragments preserved in the fluvial deposits of the Lee valley. The sample was recovered from an engineering borehole in Cork City (Carraigex Ltd. 1997). The date, which was awarded by the Royal Irish Academy, was obtained by running the sample on the AMS facility at the \(^{14}\)Chrono Centre, Queen’s University Belfast.

An earlier wood date (UBA-18069: Grattan Street), funded by the Royal Irish Academy (Beese 2010), is also included in the discussion because it was recovered from a similar context in a second engineering borehole (Carraigex Ltd. 1992). The separation between the two boreholes is approximately 315m (Figure 1). The stratigraphy of the floodplain of the River Lee may be summarized as anthropogenic deposits (land-claim), overlying estuarine alluvium, overlying fluvial sand and gravel (Figure 2).

Results for the two samples are presented in Table 1. The dates were calibrated by the \(^{14}\)Chrono Centre using IntCal 2009 (Reimer et al. 2009).

<table>
<thead>
<tr>
<th>Context</th>
<th>BH</th>
<th>Material</th>
<th>Lab No.</th>
<th>(^{14})C yrs</th>
<th>±</th>
<th>cal. BC (≥95%)</th>
<th>(\delta^{13}C)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Sand</td>
<td>1</td>
<td>wood</td>
<td>UBA-18069</td>
<td>5,925</td>
<td>32</td>
<td>4,850 to 4,719</td>
<td>-28.9</td>
</tr>
<tr>
<td>Gravel</td>
<td>1</td>
<td>wood</td>
<td>UBA-20749</td>
<td>5,462</td>
<td>22</td>
<td>4,360 to 4,249</td>
<td>-25.9</td>
</tr>
</tbody>
</table>

Table 1. Results of the radiocarbon dating.

Both radiocarbon dates were obtained from broken segments of small branches, measuring between 15 and 20 mm in diameter and up to 75mm long. The wood was recovered at elevations of –3.0 and –6.3m OD (Figure 2). These elevations are relative to the Malin Head datum and are derived from nearby spot heights shown on Ordnance Survey maps. Wood identifications based on macro characteristics were not possible, although the sample from Woods Street is reported as being akin to alder (Ellen O’Carroll, personal communication). The difference in age between the samples is 463 ± 54 years.
2. STRATIGRAPHY

The chronostratigraphy of the Holocene sequence at Cork is poorly known despite the fact that organic material is present both in the fluvial deposits (sand and gravel) and in the overlying estuarine mud. In a new lithostratigraphy, the fluvial deposits have been included as Member 2 of the Ovens Formation, while the estuarine mud has been assigned to the Cork Harbour Formation (Davis et al. 2006). A preliminary evaluation of engineering borehole records has shown that organic material is significant in the upper part of the Ovens Formation, occurring as thin lenticular beds in approximately 25% of boreholes. The silt and peat beds are typically less than 0.5m thick, although thicknesses of more than one metre have been recorded occasionally.

The calibrated dates for the two samples (4,850-4,719 and 4,360-4,249 cal. BC) both fall within the Late Mesolithic. The Woods Street sample, recovered at only 1.7m deeper than the base of the estuarine deposits (~3.0m OD), provided a date that was between 400 and 500 years younger than the Grattan Street sample, collected from 3.9m below the mud (~6.3m OD). Clearly, deposition of the sand and gravel was relatively rapid. Unfortunately, the context for the samples is not ideal in the sense that the wood is eroded and therefore may be older than the fluvial sediment in which it is preserved. Consequently, the radiocarbon dates represent *termini post quem* for the sand and gravel deposition. Therefore, in order to achieve more certainty, it was decided to obtain a proxy date from the sandy peat directly overlying the sampled sand at Grattan Street (UBA-18069). The thin peat, which was intersected at ~5.6m OD, is thought to have resulted from the same cycle of deposition as the sand (Figure 2). Professor Devoy, who completed the analysis, reports that the pollen assemblage indicates an age for the peat that is certainly older than 5,000 BP and possibly between c. 7,500 and 6,500 BP.

Therefore, all three results provide firm evidence that a fluvial environment was characteristic of Cork during the mid-Holocene. There is also some degree of correspondence with the only other proxy date from the Ovens Formation, which was obtained from borehole CH1 at Custom House Quay (Scourse et al. 1992). The borehole was located approximately 1km to the east of Grattan Street. The assessment, which was accessory to a major investigation of the interglacial silts at Custom House Quay, consisted of determining pollen assemblages in three samples of organic silt (~5.8 to ~6.5 m OD). The interpreted age of between 8,500 and 7,500 BP is somewhat earlier than the radiocarbon dates reported here and means that period of deposition of the Ovens Formation (Member 2) extends back to at least to the early Holocene (early Mesolithic).

Some allowance must be made for the diachronous nature of the change from fluvial to estuarine conditions. Thus, although the stratigraphy appears to be
straightforward, the contact between the Ovens and Cork Harbour Formations being marked by a sharp, erosional contact, or at least, only limited interfingering of lithologies, the chronology must be more complex because marine conditions probably arrived from the east in a series of pulses and with minor transgressions and regressions. There must also have been reactivation of certain channels during episodes of flooding. A temporary excavation, formed for a deep basement in a development between St Patrick’s Street and Emmet Place, illustrates the potential for erroneous interpretation of the stratigraphy. During archaeological monitoring (Sutton 2008), a sand-filled palaeochannel (Figure 1) was discovered immediately below estuarine mud. The sand contained organic laminations rich in wood and plant debris, eroded mud balls derived from an earlier estuary, and surprisingly, a worked timber post. Based on its dendrochronology, the felling date of the post was estimated to be 8th century by David Brown of Queen’s University Belfast. Subsequent radiocarbon analysis also demonstrated that the woody material was relatively young, dating from the 8th to 10th century AD (see Allen et al. 2008). This evidence is taken to indicate that the channel was reactivated during the early medieval period. Reconstruction of the course of the channel is based on borehole data (Beese 2012). The channel was also exposed at Corn Market Street (Beese 2006).

Nevertheless, the two radiocarbon dates introduced here are considered to be representative. Firstly, they are consistent, and secondly, the sampled wood fragments were preserved well below the unconformity (Figure 2). Indeed, the shallow, gravel-dominant lithologies at Woods Street indicate a river bar rather than a channel.

3. CORK’S MESOLITHIC ENVIRONMENT

The fluvial sequence has many of the sedimentary characters of a braided river with dominant sand/gravel and minor silt facies that show both vertical and lateral variation. Analogous environments are discussed by Williams and Rust (1969) and Selley (1970). Some sedimentary structures were visible in the deep basement excavation at Corn Market Street (Beese 2006). A recent model of the subsurface topography of the fluvial deposits, which was gleaned from borehole data, demonstrates how the floodplain was characterized by bars and channels of different orders of scale (Beese 2012). Coarse sediments such as cobble gravel seem to be more frequent at depth, and although the sand and gravel lithologies are often repeated, clear-cut fining upward cycles, such as that observed at Grattan Street (Figure 2), are not common. Based on current research, the sand and gravel is interpreted as being deposited in a series of active channels, while the minor beds of organic silt and peat accumulated in abandoned channels. Organic material is present
at scattered locations across the full width of the valley but not in areas where there were active channels, nor in the eastern part of the study area, which appears to have been eroded out by the marine incursion.

This scenario fits with the type and preservation of diatoms from the peat bed at Grattan Street. Dr Robert Devoy states the assemblage is consistent with slow-moving channels in a freshwater environment:

*The diatoms are very broken in the main, which may indicate significant in-washing of the minerogenic fraction in the sediment sample. The diatom assemblage shows a freshwater environment (oligohalobous indifferent) as found in the lower reaches of a river [with] slow/sluggish flow. There is indication of some contribution of possibly stagnant pool/pond environments as well, as might be found in a river margin, ‘floodplain’ setting. However there is no indication of any salt influence – brackish water and marine diatoms are absent.*

And based on the pollen content of the same sample, he considers that the wider area included a wet, wooded environment, dominated by pine, alder, elm, oak and hazel together with lower frequencies of other plants.

4. DISCUSSION

Based on the new radiocarbon dates, it is reasonable to assume that estuarine conditions did not reach the part of the Lee valley occupied by Cork City until after 6,300 cal BP (late Mesolithic). Recent research has demonstrated a sustained rise in relative sea level (RSL) during the mid-Holocene along the south coast of Ireland (Brooks et al. 2008). The results also fit with the archaeological evidence. For example, two prehistoric monuments have been described in the intertidal zone in the vicinity. These are a portal tomb at Rostellan, on the east side of Cork Harbour (Rynne 1993) and a passage tomb at Ringarogy Island, near Baltimore (Shee Twohig 1995). Both have been tentatively assigned to the Neolithic. In addition, there is the evidence of shell middens from Cork Harbour itself. Milner and Woodman (2007) dated several sites and showed that full marine conditions characterized the inner harbour about 2000 bp RCY (Iron Age), a view that corresponds to an earlier interpretation of RSL rise in Cork Harbour (Carter et al. 1989). It is hoped that future research will extend the story of the Lee valley back to the early post-glacial period and forwards to the estuarine phase. Further samples are to be identified for radiocarbon dating.
5. REFERENCES


IntCal09 and Marine09 radiocarbon age calibration curves, 0-50,000 years cal BP. *Radiocarbon*, 51: 1111-1150.


Figure 1. Borehole locations.

The floodplain is shown in white while the higher ground is shaded grey and the palaeochannel is shaded blue.
Figure 2. Borehole stratigraphy.