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Making Yourself at Home on an Island: The First 1000 Years (+?) of the Irish Mesolithic

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This paper is based on the 2009 Europa lecture which concentrated on the issues surrounding the Early Holocene colonisation of Ireland and placed it both in a broader European context as well as asking why the initial settlement of Ireland should take place so late. It also reconsidered the reasons why there was a significant change in technology within the Irish Mesolithic. This paper suggests that over-emphasis has been placed on the Irish 'Early'–Later Mesolithic change which had been thought to take place at a very specific point in time. Instead it is suggested that changes began to take place soon after settlement began in Ireland and that many of the classic Mesolithic type fossils, most notably microliths, began to vanish, perhaps around or just after 9000 years cal BP. It seems preferable to redefine the chronology of the Irish Mesolithic into two main phases the EARLIER and LATER Mesolithic with an, as yet undefined, chronological boundary between 8800 and 8600 cal BP. At the same time it recognises that there are significant changes (facies) within each of the major phases, some of which could even be regional. It should also be noted that not all of the facies need necessarily be associated with a distinct range of obvious type fossils.

Being awarded the Europa Prize for contributions to European Prehistory provides one with a reason to be reflective about one's career, as well as an opportunity to think about new directions in which research can take us. The obvious question that comes to mind is 'What is the most significant change that has happened within Irish Mesolithic Research in the 50 years since I first went searching for flints?' It would be tempting to say that it was a) extending back the known time period in which people have lived in Ireland, b) showing that the whole of the Island was used throughout the Irish Mesolithic, or c) that we now have a much better understanding of the environment in which these people had lived. However, the biggest change is something which is much simpler. Unlike the early 1970s, when my first paper on the Irish Mesolithic appeared (Woodman 1974), it is now impossible to write an article which encapsulates the whole of the discourse on the Irish Mesolithic.

For that reason I have decided to write about the issue that has always fascinated me, namely; how and when, during the Early Holocene did people first come to the island of Ireland and how did they adapt to living in a very different part of Europe as well as taking a fresh look at the issue of the division of the Irish Mesolithic into Early and Later phases.

At the moment the Irish Mesolithic is conventionally divided into two phases which are:

1. An Early Mesolithic phase which is characterised by geometric microliths and a soft hammer blade technology that is similar to that found in the English later Mesolithic. It is also associated with a range of axes and core tools. This phase was thought to date from around 9800 to about 8400 cal BP[1].
2. A Late Mesolithic phase in which the composite tools based on the use of microliths is replaced by a series of larger macrolithic, hand-held (?) tools and a hard hammer blade technology. This was thought to last from 8400 to 6000 cal BP (Fig. 1, a & b).

It will be argued later in this paper that the two phases of the Irish Mesolithic should both be altered slightly in name, ie, to Earlier and *Later* Mesolithic and that the chronological division should be placed

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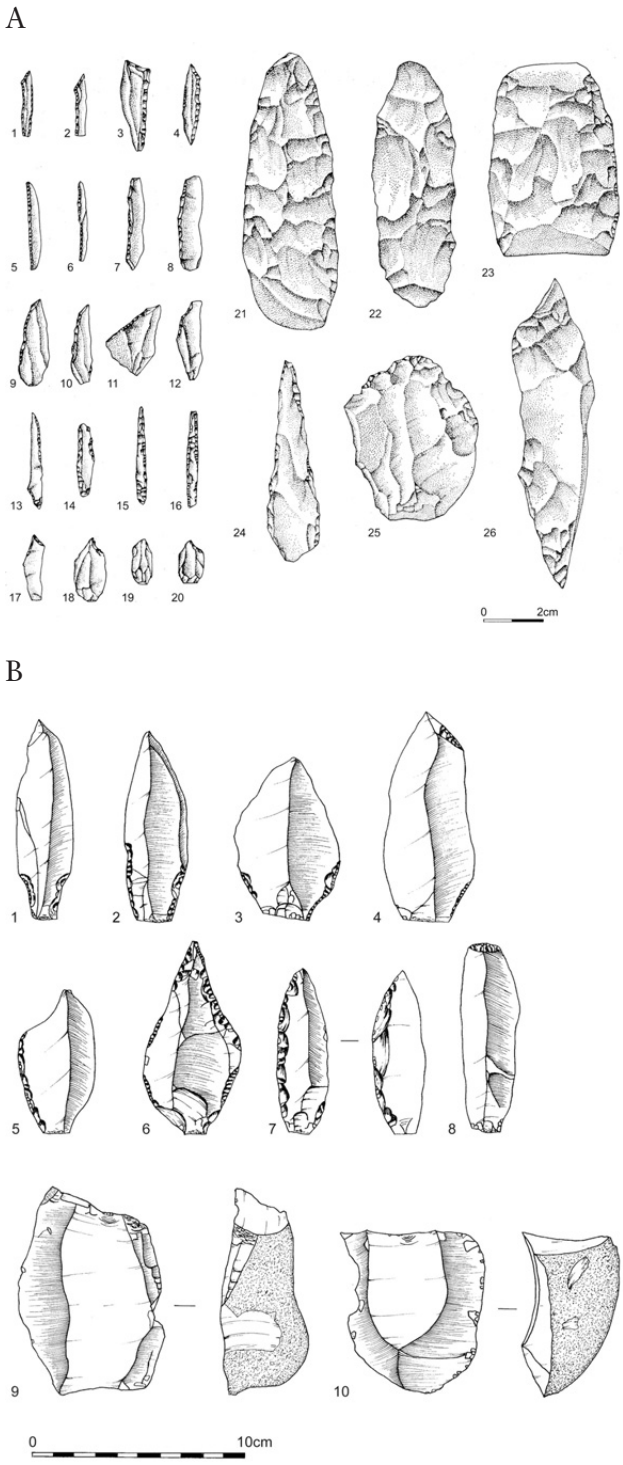

Fig. 1.
Selection of artefacts from the conventional a) 'Early' and b) Later Mesolithic

somewhere about 8800–8700 cal BP. This will also allow discussion of the fact that the Irish Mesolithic is not made up of two static technological and/or economic phases but, rather, that changes began to take place almost as soon as people first created more or less permanent settlements within Ireland.

WHAT IS THE EARLIEST KNOWN EVIDENCE OF IRISH SETTLEMENT?

Obviously one other issue which cannot be ignored is the matter of when people first set foot in Ireland. It is tempting to leave to one side the equally interesting question as to whether there could have been an earlier human presence in Ireland, especially before the Last Glacial Maximum (LGM) 24–19 kya cal BP. However, there are lessons to be drawn from that phase, even if there was no human presence in Ireland at that time. It is becoming apparent that Ireland may have, at one time or another, been totally covered in ice. Yet traces of a surprisingly rich mammalian fauna dating to 50–5 kya cal BP have survived. These faunal remains were mostly recovered from four caves in the small area of north Cork and east Waterford (Woodman *et al.* 1997). They range from hyaena, reindeer, and mammoth to horse and red deer. Virtually every large mammal species that was living in adjacent parts of mainland Europe was present in Ireland during MIS-3. The two notable absences are woolly rhinoceros and humans. This is a clear indication that, even if the traces of a human presence were later totally obliterated, it is just possible that there had been an Earlier Upper Palaeolithic presence (Aurignacian or Gravettian) in Ireland.

1. The lessons drawn from this phase are quite simple. One never knows when something might be found that suggests a much earlier human presence than conventional wisdom has led us to believe.
2. It is also apparent that one of the most important vectors for colonising an island is time itself. When such an opportunity lasts for up to 25,000 years or more, then the event is much more likely to take place than if that lasted for only a few hundred years. Furthermore, the diverse fauna of MIS-3 in Ireland is an indication that the Irish Sea, which is likely to have existed at that date, was not an insurmountable barrier.

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However, what happened after the LGM was even more curious in that, remarkably, Ireland was basically ice free by 16,000 cal BP but it was *c.* 6000 years before the first documented human presence here. Thus Ireland, with such a late human colonisation, provides a striking contrast to other adjacent regions of north-western Europe.

In trying to understand the reasons for such an apparent late arrival of people into Ireland one might begin by arguing that the division between the final Palaeolithic cultures of the 'Lateglacial' and the Mesolithic of the Holocene has created an unfortunate fault line in assessing how most parts of north-western Europe were re-occupied by 14,000 cal BP or shortly afterwards. As can be seen from Figure 2a, numerous sites dating to the Lateglacial Interstadial have been found in much of England and parts of Wales. In south-west Britain what appears to be a local version of the Magdalenian Culture (*pace* Jacobi & Higham 2009) was present by 13,500 cal BP in Mendip, while short term seasonal settlement reached the Peak district as well as north and west to Kendricks Cave on the present day north coast of Wales. What now appears to be a Havelte assemblage has been found at Howburn Farm on the northern slopes of the southern uplands in Scotland (Ballin *et al*. 2010). In this first phase of the Lateglacial Interstadial, when annual temperatures were relatively high and extensive grasslands existed, these regions contained the rich horse and reindeer faunas on which early hunter-gatherers survived. The latter half of the interstadial seems to have been associated with the Penknife/Federmesser assemblages which are less common in caves and more frequent as surface finds from open air sites, predominantly along the western periphery of Britain, as at Priory Farm Cave on what is today the sea inlet of Milford Haven, West Pembroke (David 1990); Kirkhead Cave in Cumbria (Gale & Hunt 1990), which Smith, O'Regan and Wilkinson (Palaeolithic/Mesolithic Conference London November 2011) have suggested is also of a similar date; and Kilmelfort Cave in Argyll (Saville & Ballin 2009). The Poulton Le Fylde elk skeleton (Barnes *et al.* 1971), found close to the Lancashire coast near Morecombe, would also fall into the latter half of the Lateglacial Interstadial. It would seem that although temperatures were slightly lower, there was, in many parts of southern Britain, a greater extent of birch woodlands with a fauna that may have contained more elk, auroch, and red deer. Obviously the five species listed so far are those on which various Lateglacial hunters would have relied quite heavily. Price (2003) has shown that, besides the 'Big Five', there numerous other smaller species present and one could also assume that wolves, bears, and hares would have been present.

Ireland, in contrast, would have seemed very barren (Fig. 3). As Edwards and Brooks (2008) and others have pointed out, the rise in the actual levels of the world's oceans would have led to Ireland's isolation by, at the very latest, well before 14,000 cal BP (Fig. 4), Therefore, unlike the peninsular edge of Europe (ie, Britain), there was at the very least a sea barrier between Ireland and the rest of Europe. So it is not surprising that one of the major characteristics of Irish Lateglacial mammalian fauna is its poverty. Not only were horse, elk, and auroch not present but red deer appears to have had a very limited presence. Based on the work of the Irish Quaternary Faunas Project, the Irish faunal record, at it's the earliest, is also almost entirely confined to the latter half of the Lateglacial Interstadial (Woodman *et al*. 1997 149–54). On the basis of the existing evidence it may initially have consisted of species such as bears, wolves, and hares and been dominated by herds of grazing giant deer. Obviously one can argue that the fascination with giant deer has led to more specimens of that species being preserved in ideal environments, collected, and more radiocarbon dates being obtained. Conversely, that interest was stimulated by the profusion of remains of this species that has been found in Ireland. It could be argued, albeit on a limited number of dates, that giant deer were wiped out by the onset of the Younger Dryas and that, for a period, reindeer may have become the dominant species. Stratigraphic evidence shows that, in some instances, reindeer occur in later deposits than giant deer (Mitchell 1941) supporting the suggestion that reindeer were, in general, chronologically later. Ireland's floral record for the Lateglacial Interstadial was somewhat similar, in that the usual sequence begins with a *Rumex*/*Salix* phase followed by a *Juniperus* phase with, during the second half of the interstadial, a much more limited spread of *Betula* woodland than in Britain. As Hall noted (2011, 30–3) the resultant grasslands were perfect for giant deer.

Unlike the possibility of a human presence in MIS-3, the chance of such a presence during the Lateglacial Interstadial seems less. The sea barrier and the short duration of the interstadial must have created a

Fig. 2.
Distribution maps of sites producing artefacts from a) British Magdalenian; b) British Federmesser:
1) Kendricks Cavern, 2) Howburn Farm, 3) Priory Farm Cave, 4) Poulton le Fylde,
5) Kirkhead Cave, 6) Kilmelfort Cave

context in which Ireland was hardly an attractive place. There is also the question as to whether groups based in Britain, which may have concentrated more on hunting land mammals, would have had the capacity to utilise the resources of the Irish Sea. In particular, would they have had the ability to range out into the deeper offshore waters and visit that 'other' place that lay across a very hostile sea? Kendrick's Cave, which today lies on the inner edge of an area of high ground ('the Great Orme'), would then have overlooked a flat coastal plain stretching towards a much smaller Irish Sea (Fig. 4a). While the location could not be regarded as coastal, Jacobi and Higham have noted that the $\delta^{13}C$ results from the human remains cluster around –17 to –18‰ which suggests a marine component to their diet.

Perhaps there should be more emphasis in understanding how and when marine and freshwater resources began to flourish within the Irish Sea Basin and, as well as in the rivers and lakes, whose waters fed it. If there were any exploratory visits from an area like Wales, then it seems much more likely that it may

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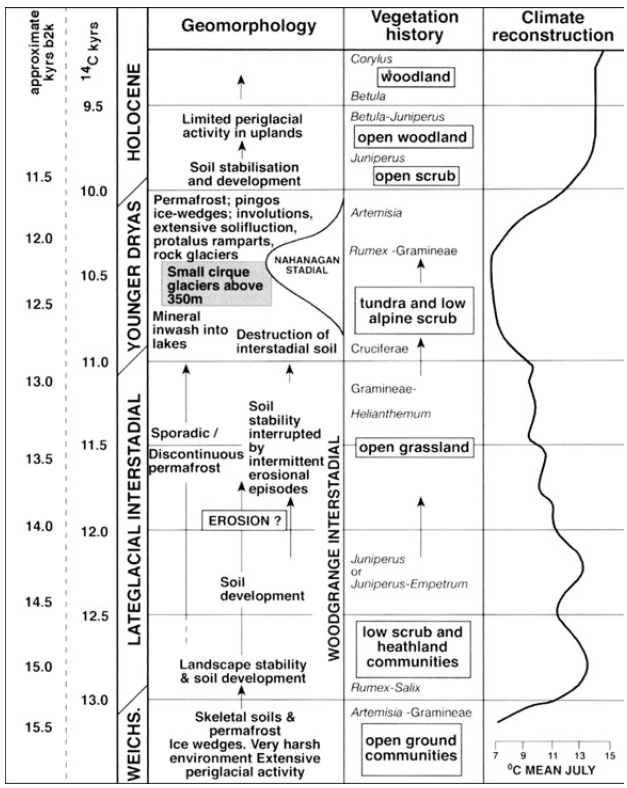


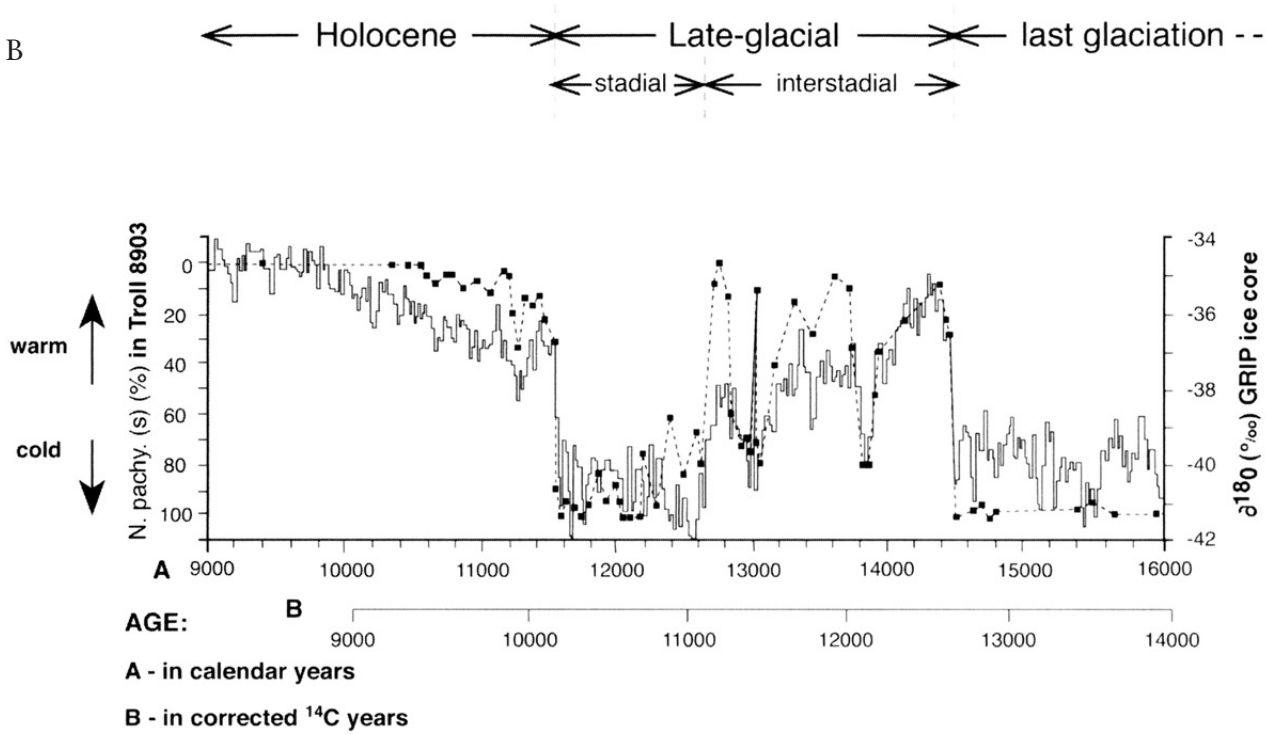
have taken place at a time when the Federmesser/Penknife point technology was in use. Given the numbers of locations that have produced lithic assemblages of possible Mesolithic age in Ireland – perhaps more than 900 groups of material of varying quality – and if one assumes at least a roughly similar number of Neolithic assemblages, then one might have expected that some trace of distinctive Magdalenian artefacts would have been found. However, there is always the possibility that small groups of the less distinctive Federmesser artefacts could go unrecognised.

Of course whatever chance of a Lateglacial Interstadial presence, the impact of the Younger Dryas virtually reduced completely the opportunity to colonise Ireland for a considerable period.

Many authors have emphasised the quite sudden and dramatic change that took place at the commencement of the Younger Dryas. This may have taken place in less than 10 years but the impact of the

Fig. 3.
A) Lateglacial environmental history of Ireland;
B) stable isotope (O^{18}) record from GRIP ice core (after Coxon 2008)

B



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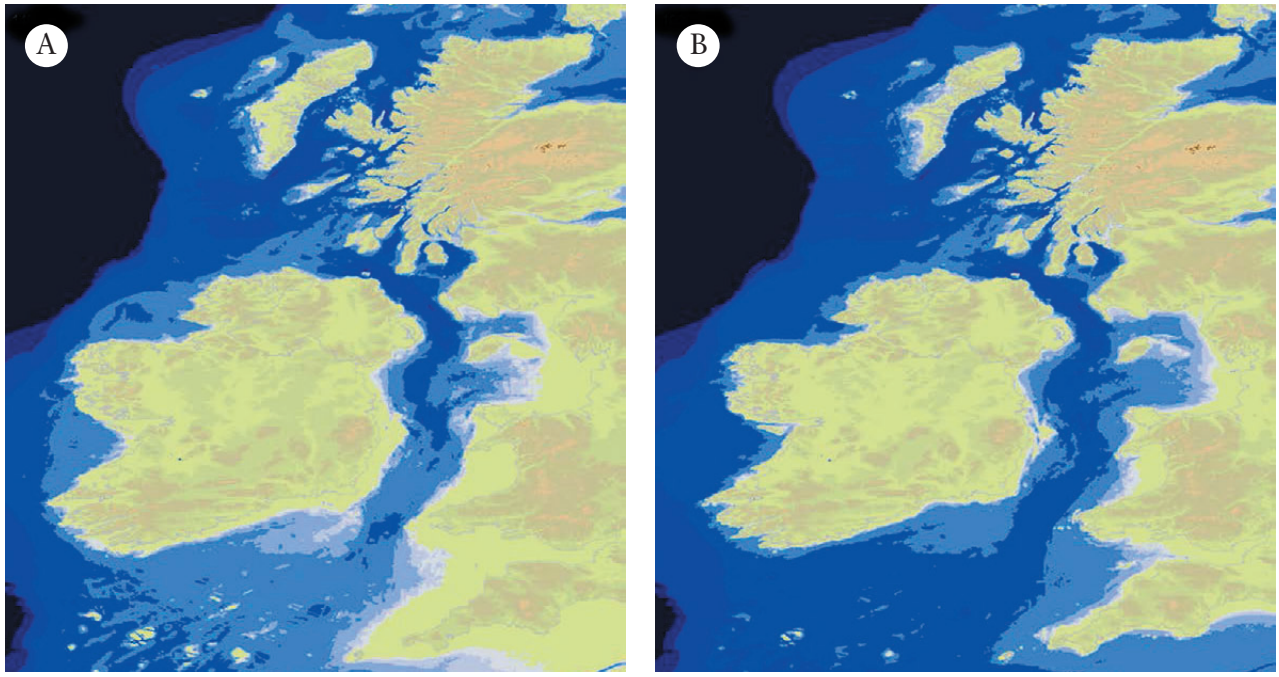

Fig. 4.
Reconstruction of sea level in Irish Sea Basin A) 14,000 and B)10,000 years ago (after Brookes *et al.* 2011)

change lasted for a millennium and possibly well into the first millennium of the Holocene. The chances of people establishing a presence in Ireland for up to 1000 years or more into the Holocene were, therefore, seriously impaired.

A few simple facts illustrate how Ireland was exceptionally inhospitable at that time. The annual average temperature was up to 12°C lower than in the preceding interstadial. It has also been suggested (Isarin *et al.* 1998), through a series of multiproxy climatic reconstructions, that conditions were more hostile than in most other parts of western Europe with temperatures slightly lower than in most of Britain and, at times, even colder again than in parts of western Europe – with a mean annual temperature 16°C lower than today while, in Belgium for instance, it was only 13° lower. At its most extreme in the coldest part of the Younger Dryas the difference between Ireland and Belgium may have been almost 10°C. Winters, in particular, were brutally cold and, aside from the south of England, conditions in much of Britain would have been almost as harsh. Growing seasons were reduced by 30 days and soil conditions extremely poor while, as can be seen in many of the pollen diagrams from lakes and kettle holes, there was extensive soil erosion. Consequently, as Hall points out (2011, 33–4) only the hardy species that could live on poor soils survived and Ireland had its own version of the Tundra.

It would seem likely that the herds of giant deer were quickly wiped out and it is possible that even reindeer did not survive the full extent of the Younger Dryas. Some species such as wolves, bears, hares, and stoats may have survived, along with arctic lemming.

Perhaps more importantly, in terms of the human history of these islands, conditions in Britain were not much better. Isarin *et al.* (1998, 449) have suggested that the final part of the Younger Dryas was slightly warmer and that it is only towards the end of the stadial that human settlement was re-established in Britain. This took place, primarily, along the most easterly part of England and in parts of the south-east (Fig. 5a). Claims for Ahrensburgian Points in parts of Scotland as evidence of a Younger Dryas settlement must be viewed with some suspicion!

Surprisingly, nearly 40 years after initial excavation, the upper site at Mount Sandel, dated to just after 9800 cal BP (Bayliss & Woodman 2009) is

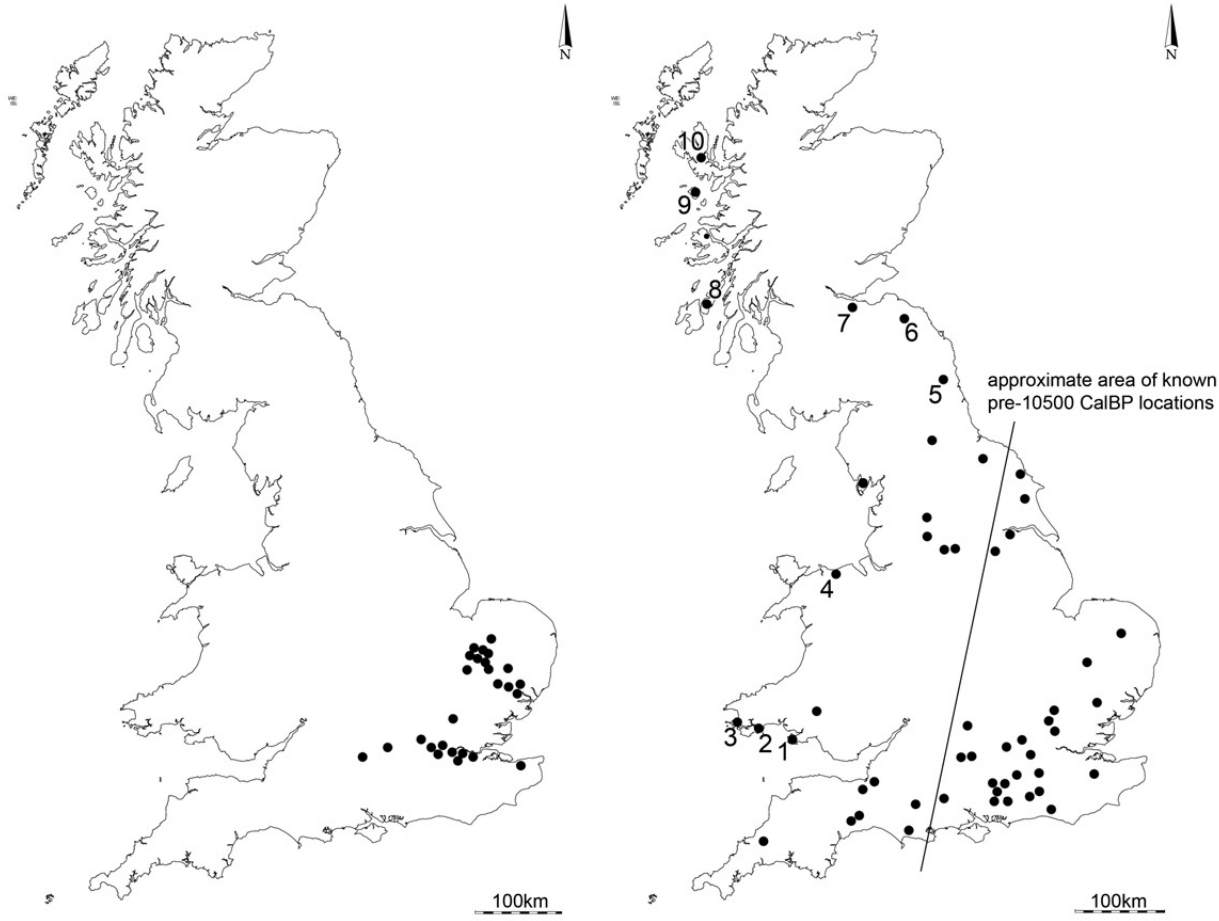

Fig. 5.
a) Location of sites containing Long Blade industries (after Barton 1997); b) British Early Mesolithic sites (after Reynier 2005, with additions). 1) Worm's Head, 2) Caldey Island, 3) Nab Head, 4) Prestatyn, 5) Howick, 6) East Barnes, 7) Crammond, 8) Lussa Bay & Glenabatrick, 9) Rhum, 10) An Corran

still the oldest, unequivocal, known trace of human settlement of Ireland – nearly 2000 years after the commencement of the Holocene.

One can start with the observation that, so far, excavations in Ireland have not produced an assemblage that resembles those that would be characteristic of the first 1500 years or more of the Mesolithic of adjacent areas of western Europe. This is equally true of the very large collections lodged in both the Ulster Museum and the National Museum of Ireland. There is a series of radiocarbon dates that suggest that there could be a presence that pre-dates Mount Sandel, though, most are not that much older. These dates are often problematic, associated with re-used older material, or seem to be early dates obtained from stratigraphically much later contexts. The six dates listed in Table 1 are typical of this problem.

For various reasons none of these dates can be regarded as satisfactory or reliable. None can be associated with any artefacts that would be seen as diagnostic of the initial 1500 years of the Mesolithic. Both the Lough Boora (Ryan 1980) and the Clynacartan dates (Mitchell 1989) are only marginally earlier but have such large standard deviations that it is more likely that they should be considered contemporaneous with the Early Mesolithic. The Lufferton date (Burenhult 1984) was associated with a beach deposit that may have been created at least

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TABLE 1. SELECTION OF SUSPECT PRESUMED 'EARLY' MESOLITHIC DATES FROM IRELAND

Site	*Lab. ref.*	*Material*	*Determination* BP	*Date cal* BP
Toome By-Pass	BT219463	charcoal	9720±50	10,578–10,288
Ballyoran	UB-6780	wood	8958±53	10,231– 9915
Lufferton	LU1809	charcoal	9440±100	11,106–10,466
Clynacartan	I13641	wood	8910±150	10,373–9550
Lough Boora	UB-2268	charcoal	8980±350	11,174–9694
Port of Larne	UB-11668	charcoal	8806±29	10,119–9694

5000 years later, if not more. It was also presumed to be associated with a chert artefact that is probable natural and which was found roughly 100 m from the location of the date. The Toome By-pass date (Dunlop forthcoming) was one of several associated with a rectangular structure, which range from the later Mesolithic through to the early medieval. No artefacts that could date earlier than 10,000 cal BP were recovered. The Ballyoran date (Hanley & Hurley forthcoming) was taken from a possible brushwood platform above which was a humanly altered giant deer bone. A date from overlying deposits was significantly later in the Mesolithic. The Port of Larne date (Woodman 2009) was one of several from a context (5110) recovered from a chipping floor (CF2) in the storm shingle that overlay an extensive area of settlement activity. A series of dates, based on charcoal, lie between *c.* 10,300 and 9500 cal BP. The beach deposits, as well as the later Mesolithic assemblage with which the charcoal was associated, are likely to date to around 8000 cal BP (see below for further discussion on this site).

It is difficult to define what should be expected as typical of the earliest Mesolithic of north-west Europe. Indeed it might almost be easier to identify what should not be there. As discussed below, it would not be expected that it was a simple monolithic and homogeneous phase that was then replaced, in one event, by something different (ie, the British early and later Mesolithic). In essence, in Britain, assemblages that resemble Star Carr and include large isosceles or trapezoid microliths, or the simpler range of forms dominated by oblique points such as those found at Thatcham or Deep Carr, would be regarded as typical of the first millennium or more of the British Mesolithic. These same elements would be identifiable within much of the earliest phases of the Mesolithic of many regions across western Europe. Also, as will be discussed in more detail below, in most regions of the western half of Europe, changes in the types of microliths used are usually seen as part of a more gradual sequence of change that took place over several thousand years.

Trying to understand the apparent delay for an initial Mesolithic presence in Ireland might, in part, be best explained by looking at the extent to which Mesolithic settlement was established in Britain during the first 1000 years of the Holocene. Reynier (2005) (Fig. 5b) noted that the earliest phase of the English Mesolithic is in general limited to sites that lie south and east of the limits of the Devensian Ice Sheet. He suggested the main reason for this restricted distribution was that the soils within the area glaciated during the LGM were quite poor and that this may have inhibited the spread of human populations to the north and west. Given the difficulty in using typology, especially of microliths, to fine-tune the dates and chronological sequences of sites within what is usually called the British Early Mesolithic, it may be better to note the limited number of sites that can be dated to 10,500 cal BP or earlier. There is no doubt that, even with the limited number of dates available, the first millennium of the Holocene would have seen human settlement confined to the south and east. In fact, with the exception of Worms Head (Schulting 2009) there is little convincing evidence of a human presence in Wales at that early date. Sites such as Nab Head and Caldey Island date much closer to 10,000 cal BP. One can argue that there may have been a more significant early presence in coastal areas that have now been engulfed by sea level rise. However, as inland sites are known at this date in eastern Britain, where coastal sites would also have been engulfed, one might have expected that, if they existed, early inland sites would also have been found in the west, unless settlement here was achieved by a more coastal sea-faring route!

In mainland Europe Terberger (2004, 215) and others (Hansen & Pedersen 2006) have noted the difficulty in identifying sites during the early pre-Boreal. This is often referred to as the 'Missing Millennium' which, in part, seems to have been a product of a period when many river and lake shoreline sites became buried under significant depths of later Quaternary deposits. Similarly the steep curve evident in calibration of radiocarbon dates for the early pre-Boreal creates a difficulty in obtaining reliable dates for sites. In general one has a sense that, at that point in time, population levels would have been quite low. However, these reasons alone, while they would contribute to the scarcity of sites, would not have created the more confined distribution of the earliest Mesolithic in Britain.

It may also be that the delayed and apparent slow spread of settlement had as much to do with the impact of the Younger Dryas as well as with the conditions left behind at the end of the Devensian. As noted earlier, settlement at the end of the Younger Dryas was extremely confined in extent. When combined with probable poor soil development (Reynier 2005), and the loss of reindeer and horse faunas, it is not surprising that there was a time lag. It is also usual to focus on the remarkably rapid temperature rise that took place within a decade at the beginning of the Holocene but while there was an initial significant rise, in general, the annual temperature did not reach its normal levels for about 1000 years and, during that time, there was a significant short period of climatic downturn known as the Pre-Boreal Oscillation (*ibid.*, 99)

In looking at this initial, quite late, Mesolithic settlement of Ireland, the usual focus is on the presence of the Irish Sea. Yet, leaving aside the occasional Lateglacial presence, it would seem that the start of the Mesolithic settlement in Scotland, which could also be regarded as delayed, cannot necessarily be interpreted in the same way. Two aspects of the Scottish Mesolithic present a problem. On the one hand, Crammond (Saville 2008), a 'narrow blade' later Mesolithic assemblage, has produced dates that centre on 10,400 cal BP. The problem here is that throughout much of adjacent regions of Europe, as Saville has noted (*ibid.*, 1212–3), assemblages of this type are usually several hundred years later in date. However Crammond is on the eastern side of Scotland, not too far from East Barns, Lothian (Gooder 2003; 2007) which has produced the second oldest assemblage dominated by scalene triangles.

Ironically, the site which initiated the debate on the age and the character of the earliest stage assemblages of the Scottish Mesolithic also lies in the east at Morton, Fife (Coles 1972). In this instance, a location that produced a series of radiocarbon dates mostly concentrated on 8000–7300 cal BP produced a lithic assemblage which included a series of large isosceles triangles (site A). It has been suggested by Myres (1988) and others that the dates are not actually associated with the assemblage, which bears some resemblance to that from Star Carr. However, this is primarily based on the presence of oblique microliths and isosceles triangles whereas Star Carr has a much broader range of forms of both microliths and other artefacts. On the other hand, smaller isosceles triangles and oblique forms occur in later contexts after *c.* 8500 cal BP, as at Cass ny Hawin (Woodman 1987). In this case an entirely different range of other forms was also found. There has often been other concern, expressed by many, that the Morton dates were based on combined samples that could contain old wood. The problem is that, even if the Morton assemblage belongs to the British earlier Mesolithic, that period lasted for 1500 years or more. In many ways the Morton assemblage (and others) finds better parallels with the evidence from south Wales where similar oblique and isosceles assemblages have been recovered. Dates on burnt hazel nutshells from Caldey Island Daylight Cave or Nab Head I lie close to 10,000 cal BP (Reynier 2005, table 4.1); the one exception is Worms Head, where dates on human remains pre-date 10,500 cal BP (Schulting 2009) – but is this associated with an 'early' distinctive suite of microliths?

In the west of Scotland, assemblages from Jura, notably Lussa Wood and Glenabatrick A (Mercer 1970; 1974), could be considered to be older than 10,000 cal BP. In both cases numerous oblique and isosceles triangles have been recovered. A somewhat similar assemblage is reported to have been discovered at the base of the An Corran midden site. The very fact that the Lussa Bay assemblage, in particular, was collected from an intertidal context, implying that it pre-dated the quite early Holocene rise in relative sea level, could suggest a date early in the Mesolithic, as is the case of the relatively early assemblage from the beach at Eleven Ballyboes, Co Donegal (Costa *et al.* 2001).

There are several possibilities here:

1. These assemblages were to be considered contemporaneous with Star Carr which could suggest an occupation at or well before 10,500 cal BP.
2. A more likely explanation would be that they were late in the Early Mesolithic and could be dated to much closer to 10,000 cal BP.
3. Alternatively should they be considered to be assemblages of a different and much later age that coincidentally resemble the Star Carr ensemble?

For a fuller discussion of the issue of the problems associated with the initial Holocene settlement of Scotland see Finlay (*et al.*) 2002 and http://www.scottishheritagehub.com.

In other words, should the Mesolithic human presence in Scotland, in particular on the west coast, be presumed to begin before or after 10,000 cal BP? If it is a late initial settlement, then it implies that both Scotland and Ireland were only reached at a late date due to a slow expansion from the south and east. If these assemblages are significantly earlier, then it would suggest that the delay is more associated with the lack of a technology and relevant skills that would have allowed these coastal communities to venture, with some confidence, across the Irish Sea on a regular basis.

It may be that both Scotland and Ireland are best seen as regions that, for the most part, lay well beyond the boundary of human occupation at the commencement of the Holocene. This does not imply an exceptionally late arrival on the western coast. As well as the Early Mesolithic material from Nab Head and Caldey Island in south Wales that date to before 10,000 cal BP, slightly younger sites like Rhum (Wickham Jones 1990) and even the Prestatyn assemblage (David 1990) or the recently dated human bone from Kent's Bank Cavern in southern Cumbria of 10,400–10,200 cal BP (Smith *et al.* pers. comm) are a clear indication of an early presence along the west coast of Britain before 10,000 cal BP. From an Irish perspective it is curious that, in spite of intensive investigations, there is as yet no indication of a human presence on the Isle of Man at such an early date (McCartan 2003).

If settlement in Ireland and, perhaps, Scotland was delayed then there is an interesting contrast between these regions and the rapid movement of human populations northwards through Scandinavia and into the Arctic Circle. There can, of course, be problems with radiocarbon dates obtained both from open sites and charcoal, especially in areas where drift wood of a considerable age might have been used. Even with these problems the rapid spread of humanity into the Arctic Circle is still apparent. This starts with a presence in the extreme south of Norway with Galta, which may date to the latest stages of the Younger Dryas just before 11,600 cal BP, and with a series of dates in Troms and Finnmark, above the Arctic Circle, by at the latest 10,600 cal BP (Woodman 1999; Hesjedal *et al.* 1996, 192–6). This was along a coast line where extensive ice sheets lay within tens of kilometres. Although it has often been suggested that these early hunter-gatherers were following reindeer northwards, the location of most sites, including those in East Finnmark (Woodman 1999, 305) was on small islands which suggests that marine resources formed the main staple. This seems to indicate that these initial settlers had an already developed a reliable maritime technology (Bjerck 1995).

So, within a period that could have been less than 500 years, a rapid movement of people by boat took place along the Atlantic edge of Norway and beyond, well into the Arctic Circle. In contrast, a land-based spread of human populations through southern Britain to eventually reach the Irish Sea basin may have taken longer and, in this instance, the sea may have represented a barrier rather than a vector for rapid movement (Fig. 6).

In the case of Ireland, the two issues that would most affect settlement would be the role of the sea and the attractiveness of Ireland as a place to live. Perhaps the most difficult aspect of any analysis of Ireland's initial settlement must be the role of the sea in terms both of its productivity and the capacity of Early Mesolithic communities to use it. Many of these issues require extensive further investigation. They include matters such as:

1. *The role of the Gulf Stream:* at what point did the Gulf Stream become fully established around Ireland with the upwelling and mixing of warm and cold waters that leads to a very nutrient rich marine environment and consequent increases in all aspects of marine life?
2. *The nature of the Irish Sea: w*ould lower levels of water in the Irish Sea basin and narrower channels have increased fresh water runoff and,

Fig. 6.
North-western Europe showing spread of human settlement in the Early Holocene

perhaps, mineral input which would inhibit productivity of the Irish Sea Basin?

3. *A maritime technology?* If we assume that log boats may not have been the appropriate means of sea-faring which took Mesolithic communities out into deeper waters, rather than being just shoreline foragers (Bjerck 2005; 2009) what type of boats would have been used to explore and bring people to Ireland?

In respect of the last point we can, at least, along with the fact that people made it to Ireland, assume that the visits to the small island of Inishtrahull, as represented by the presence of Early Mesolithic artefacts on that island, indicate a significant level of confidence in use of the sea. However, the absence of evidence of an early rapid movement up the Irish Sea in the first millennium of the Holocene could be used to suggest that a fully developed maritime technology and economy was not something that was present at the end of the Younger Dryas.

At the moment there is one question to which there is no easy answer. This is the matter of which route any first group of settlers would have taken. There is now evidence of what would be called the Irish Earlier Mesolithic from throughout much of Ireland and, in particular, throughout the eastern and southern half of the country. Mesolithic settlement, even at its earliest stages, was not confined to the north (Fig. 7). Therefore, the idea that Mesolithic settlement was initially in the north-east and that people first arrived from Scotland has no more validity than any other possible route. As was suggested by the author (Woodman 1981, 96–9) initial visitors or settlers could equally have started out from western Scotland, from the Isle of Man basin, and/or from north or south Wales. In nearly all cases, Ireland would have been visible from their starting point. The fact that there seems to have been a relatively rapid spread of settlement throughout the whole of Ireland is probably far more important than where they initially came from or, especially when the issue is stripped from its quasi-political undertones, where the search for the area in which initial settlement took place was given undue prominence.

What has changed, however, is a clearer understanding of the chronology and typology of the British Mesolithic in and around the time of this apparent initial settlement. On the one hand, the re-dating of Mount Sandel using primarily AMS dates obtained from hazel nutshells and Bayesian modelling (Bayliss & Woodman 2009) has demonstrated that the initial occupation of that site took place between 9800 and 9700 cal BP. When these dates are combined with those of more than 9800 cal BP from Howick in Northumbria (Waddington *et al.* 2007) and East Barns (Gooder 2007) in south-east Scotland, it shows that many forms of microliths, namely scalene triangles and rods, combined with smaller narrower blades, were in use at a time which pre-dates Mount Sandel.

This does not mean that settlement of Ireland was initiated from the sites listed above. The discovery and documentation of the spread of Mesolithic settlement is not like documenting the spread of causewayed enclosures or megalithic tombs. The discovery of Mesolithic sites is often much more random and conditioned by other factors such as the changing environment throughout the Holocene. With the limited number of dated sites, there is a danger of 'joining up the dots' and thinking that it represents a population movement. Other sites of significance, equal to those discussed earlier, yet remain to be discovered.

Similarly it has been suggested that the rising sea level and the loss of Doggerland (Coles 1998) may have been the impetus for population movement and the change from the early to later Mesolithic microlith technology (Waddington *et al.* 2007, chap. 15).

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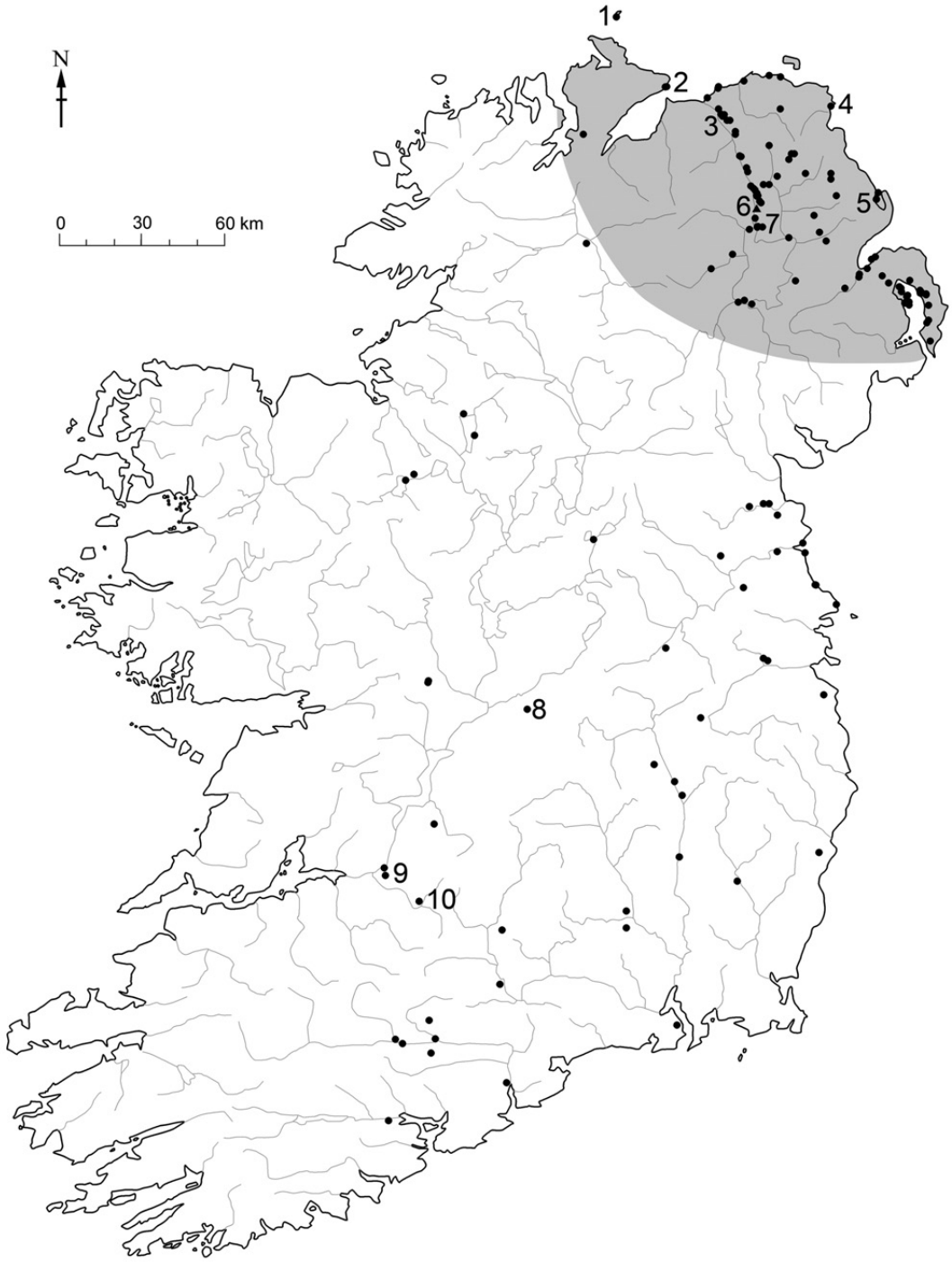

Fig. 7.
Locations in Ireland that have produced presumed confident and probable 'Early' Mesolithic assemblages or individual artefacts. Significant sites/areas: 1) Inistrahull, 2) Eleven Ballyboes/Greencastle, 3) Mount Sandel, Castleroe, 4) Cushendun, 5) Larne, Glynn, Ballylumford, 6) Newferry, 7) Toome area, 8) Lough Boora, 9) Hermitage, 10) Killuragh Cave. The shaded area indicates the region in which flint flake axes have been found

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Obviously the loss of such a huge area of land over a period of at least a millennium must have had an impact. It is, however, questionable as to whether there is any correlation between the loss of Doggerland and change in the types of microliths. In one sense, in drawing a line across middle of his figure 10, Mellars (1976) created an inadvertent impression that there was a relatively sudden shift from one suite of microliths to another. Yet, across the adjacent region from south Scandinavia through the Benelux countries, Germany and beyond, the first half of the Mesolithic is characterised by a series of gradual replacements rather than a single major shift. The association of the inundation of the North Sea Basin with this pan-European gradual change in microliths is unlikely. The same general changes in microliths can be documented from the Low Countries to regions as far away as Switzerland and Poland. Conversely, it is probable that it could have had an impact through moving groups of hunter-gatherers up out of Doggerland and pushing them to the west.

Consequently, it is likely that Mesolithic populations spread gradually through England and Wales and that between 10,500 and 10,000 years ago perhaps, in part, driven by the loss of the North Sea Basin. But, as witnessed in south Wales where an already existing spread westwards was taking place, there would eventually have been a significant presence along the west coast of Britain. Of course many of those coastal areas now lie below the sea.

This still leaves open the question of how and when the initial settlers got to Ireland. Takimaya (2006) has observed that, in the context of the Pacific, islands were often more easily colonised by farmers who brought much of their life's package with them while hunter-gatherers are conventionally thought to need to adapt to conditions as they found them. In other words, we can assume that they could have faced much greater challenges. This would be most evident in islands where pre-existing resources were limited. It could be argued that Ireland is the type of island that falls into that category.

HOW DID THEY ADAPT TO LIVING IN IRELAND?

If we accept, for the moment, that initial settlement of Ireland did not begin before 10,000 cal BP, then the environment into which these people came is and was equally mysterious to both us and them. We can presume that the forests would have been made up of birch, hazel, and Scot's pine and that the island would have, aside from the creation of a number of sea loughs, been roughly the same size and shape as it is today. The major lakes and river systems that exist today would have existed, though the extensive bog and other shoreline deposits, would not.

Our knowledge of Ireland's Early Holocene fauna is caught in a paradox. As archaeologists we rely on knowledge of the local fauna to help understand how people lived but, in this case, the knowledge of our early fauna is heavily reliant on evidence which derives from archaeological excavations! The only major alternative sources derive from the faunal remains recovered from caves and here, in the absence of any fine stratigraphy from the majority of Irish caves, these consist of a vast array of bones whose individual date can only be determined by a programme of radiocarbon dating. But a better understanding of which species were native to Ireland by the early Holocene would require in excess of 200 dates!

Based on what we know and presuming that species such as bears, stoats, hares, and wolves were present from the beginning the Holocene, the question remains about a range of woodland temperate fauna such as squirrels, foxes, badgers, and also otters. When did they arrive? Obviously the wild pig represents a different problem. The range of fish is well known: salmon, trout, and eels were present from at least the time when people arrived and several other relict species from the Lateglacial would also have been present, notably in Loughs Neagh, Melvin, and Leane. Perhaps the main characteristic of Ireland's fauna must be the absences. Virtually all the large ruminants found in mainland Europe, including the former peninsula that is now mainland Britain, are missing from Ireland. Again, the most obvious characteristic amongst the fish must be the absence of pike from Irish waters. Pike often form 50% or more of the fish remains found on mainland European Mesolithic sites.

Of course, settlement may not have begun with a wave of people who, on arrival, intended to stay. As suggested by Housley *et al.* (1997) and Fuglesveldt (2003), settlement was more likely to be a process which took place of over a period of time.

The model that is suggested is:

1. Exploratory visits to an unknown landscape.
2. Pioneering visits to use and exploit the resources of a new land.
3. Based on the knowledge acquired, a movement towards long term settlement.

Of course, there should be a fourth stage, namely the adaptation of the technology of the new arrivals to the particular resources available in their new landscape.

As Ackerlund *et al.* (2003) have pointed out, Phase 3 is a time for decisions about what to retain and what to change. In other words, would they retain the technology that they brought with them and make limited adaptations to local circumstances? Would they abandon their traditional methodologies and simply create a material culture that was more suitable to their new life styles? In the case of the Tyrrhenian Islands (Costa 2004; Costa *et al.* 2003) a very simple flake tool technology was used by the presumed new arrivals. These were an alternative to that which had been used on the Italian mainland, where there seems to have been an extensive reliance on composite tools that required a large numbers of microliths. In contrast, in Sweden and Norway, the movement of peoples northwards at the beginning of the Holocene during the earliest phases of the Mesolithic/older stone age seems, in the technology of the Fosna, to be associated with a technology that is initially strongly related to the earlier Ahrensburgian of the North European Plains. This observation may even be valid for the earliest assemblages found in the Arctic Circle. Yet again, within a relatively short period of time, the local technologies of the Hensbakka, Fosna, and Komsa began to mutate into something that was more suited to local conditions. In the case of Ireland, the questions must be: 'Which scenario did Ireland follow?' and 'Why does it appear to have taken so long for the change from the Earlier to the Later Mesolithic?'

The conventional explanation, referred to earlier, is that it is the change from the Earlier to the Later Mesolithic that represents local adaptation to the island of Ireland. There have been various suggestions as to why this change took place, including a range of technological, social, and environmental explanations (Woodman 1981; Mallory & Hartwell 1997; Warren 2003) but the present review suggests that this issue should be approached from a different perspective. It would appear from recent research at Lough Cooney in County Sligo that there is growing evidence that the 8.2 kya cal BP event had a significant impact on Ireland, in fact a phase of extreme cold may have lasted for 100 years (Ghilardi & O Connell 2012) and it would, of course, be tempting to explain the change from 'Early' to later Mesolithic as being a consequence of that event. However, rather than seeing the 'Early' Mesolithic as a homogeneous phase that lasted for over 1000, possibly 1500, years, it seems likely that change started within a very short time after people arrived in Ireland. It also seems probable that the most significant changes within Irish Mesolithic lithic technologies had mostly taken place before 8200 cal BC!

At this stage we can only begin with Mount Sandel, but it is probable that the initial settlement took place before its occupation began and there is no reason why it should not have taken place in another part of Ireland. Again, it is likely that permanent residence only began after a phase during which exploratory and pioneering trips took place.

What is of interest, however, is that assemblages and finds that can be associated with the 'Early' Mesolithic can be found throughout most of Ireland. The absences in parts of the west of the country are simply caused by factors that bedevilled the discovery of any prehistoric settlement sites in that region (Fig. 7).

One of the most significant aspects of the Mount Sandel type assemblages that distinguishes them from the British assemblages are the axes. Of course, the most striking examples of something different are the flake axes (Fig. 1). These implements are deliberately created on a large flake which retains a straight, relatively high-angled edge that became the leading edge of the tool. It seems probable (Dumont 1985 61–4) that these were used as adzes. Flake axes also occur in the very early Holocene in many parts of Scandinavia. However, the process of their production is slightly different and it has been suggested that they may have been used as butchery tools rather than for woodworking. Even the core axes which served as chopping tools are different from those that were found at British Early Mesolithic sites, i.e., pre-10,000 cal BP, such as Star Carr (Clark 1954) and Thatcham (Wymer 1962). The Mount Sandel core axes and many others that have been recovered in the north-east of Ireland are often smaller and usually more bifacially symmetric and were finished with a narrow cutting edge. Again, these small axes do not have parallels in

Britain. There is also little evidence that they still in use in northern England as late as 10,000 cal BP. These forms of axes which, in general, are manufactured from flint, tend to be found very much in the north and, to a lesser extent, along the east coast.

Of course, ground stone axes were also found at both Mount Sandel and Lough Boora. Throughout much of Ireland, where good quality, large flint nodules were often not easily available, ground stone axes were probably preferred. The problem at this stage is that there is no single simple way of distinguishing ground stone axes that belong to the earliest phases of the Irish Mesolithic. One can assume that they were used extensively, even at an early date. They occurred at both Mount Sandel (Woodman 1985) and at Lough Boora (Ryan 1980).

As Saville (2003) has pointed out, the presence of a distinctive range of core tools must have, at least in part, been due to the absence of large mammals such as auroch, elk, and red deer which, elsewhere, would have provided much of the raw material for axes, wedges, and other heavy duty implements.

It is possible, therefore, that, in the absence of antler from red deer and, more broadly, large bones from deer, elk, or auroch, implements of stone in either flint or other coarser-grained rocks would have been used much more frequently in Ireland as raw material for the manufacture of a broad range of implements. One could argue that this is only one of many ways in which Ireland's very different ecology would have required changes to human life ways.

Thus, the major change that took place immediately after the initial settlement of Ireland would have been in food procurement. As referred to earlier, the absence of large mammals and fish such as pike would have required entirely different strategies that may have relied more on resources such as salmon, trout, and, in particular, eels. A major conundrum is the presence of 'wild' pig bones in relatively large numbers not only in the Early Mesolithic but throughout the Irish Mesolithic as a whole. It is extremely unlikely that this species would have been present during the Lateglacial Interstadial and survived through the Younger Dryas. It seems rather anomalous that pig would be the only one of the five major species that were relied upon across Europe by Early Mesolithic hunter-gatherers which managed to reach Ireland in the early Holocene. The possibility that it was a deliberately introduced species should not be entirely discounted.

In effect one can, on one hand, look at the Irish 'Early' Mesolithic and note similarities in the lithic technology that can be matched in Britain and in many ways across much of north-western Europe. On the other hand one can also note that, shortly after the initial settlement of Ireland, there were already distinctly local elements in the lithic technology and that these were developed to suit needs that were particular to any community living in Ireland.

WHY AND WHEN DID MAJOR CHANGES TAKE PLACE?

In discussing change and adaptation within the Irish Mesolithic, obviously the major problems to address must be when, how, and why the change from what we have called the 'Early' Mesolithic took place. There is a tendency, when examining a transition, to look for something very specific ie, the archetypal 'Missing Link', especially if one believes that the transition will be marked by type fossils. Of course, in many cases transitions may contain elements that are much less distinctive.

Until now the tendency has been to identify the gap within the Irish Mesolithic and assume that it would be filled by extending one or both phases in time so that there would be a sudden rapid change (Woodman 1978; Costa *et al.* 2005). Research in the last decade has, however, shown that there seems to have been a gradual change over a period of perhaps a millennium.

This first alternative perspective became apparent with the observation that the blades on 'Early' Mesolithic sites were not produced using a punch. This was combined with the realisation that red deer had, at best, a very limited presence in Early Holocene Ireland; therefore it was unlikely that antler punches had been used. Instead, blades were produced through a combination of soft and hard hammer stone percussion (Costa *et al.* 2001): the change to using only hard hammer stones that was typical of the Later Mesolithic was, therefore, not as radical as first thought.

The hard hammer production of large, initially relatively elongated, blades that is presumed to be typical of the first part of the Later Mesolithic has long been evident from Movius's excavations at the Warren, Cushendun (Movius 1940). Two radiocarbon dates, on wood and charcoal, suggest that this could

have been in existence by 8500 cal BP. These were obtained from the Lower Lagoon Silts which contained a series of large blades (Woodman 1978, 14). This confirms Jessen suggestion that the Lower Lagoon Silt dated to well before the end of his Boreal PZ VI. Although not necessarily as early as the Cushendun material, somewhat similar blades, along with some butt trimmed forms, were found in Zone 8 of Newferry Site 3 (Woodman 1977a). This material certainly pre-dated 8000 cal BP.

The main problem, therefore, has been the question: 'How late did the use of microliths continue in Ireland?' Researching this question is not helped by the scarcity of Irish microliths. While over 100 locations are notionally regarded as 'Early' Mesolithic, fewer than ten have produced ten or more microliths and only Lough Boora and Mount Sandel (upper and lower) more than 25. In many instances identification has been based on the presence of, usually, single and dual platformed blade cores and the presence of a number of blades with platform edge preparation. When, in particular, only a few blades (1–5) are found these are regarded as being 'possible' rather than 'probable' 'Early' Mesolithic. There must be, at least in part, methodological explanations for the absence, or low rate of recovery, of microliths from so many sites. These could include the role of collector/purchasers, many of whom were relatively unaware of the existence of microliths, and material coming from a broad range of geological contexts where microliths may not have survived. Perhaps, due to the lack of awareness of their potential presence during the numerous salvage excavations that took place over a 15 year period, the absence of a careful recovery strategy (sieving) would lead to a very low rate of recovery. In parallel, there are only four sites where there are reliable dates that are significantly close to or earlier than 9000 years cal BP. These are Mount Sandel upper, Castleroe (Woodman 1985), Lough Boora (Ryan 1980), and Hermitage (Collins 2009).

At Mount Sandel the main focus of discussion has been on when the site was first occupied and the date of the huts but re-use of the site continued until perhaps close to 9500 cal BP. Features from these later phases included pits that contained numerous microliths (Woodman 1985; Bayliss & Woodman 2009). There was one anomalous date from pit (109), to the north of the main site. This is a charcoal date of 9014–8434 cal BP (UB 2359; 7885±120 BP) along with a number of small blades and microliths. With the loss of the overlying occupation layers in this part of the site, it was never possible to ascertain whether the microliths were from the main phase of occupation or if the charcoal came from later use. In the more extreme case of a palisade that was also recovered at Mount Sandel, the mixture of activities from two very different phases was evident. This was a later feature associated with an Iron Age date but which also contained numerous microliths. It had evidently cut through the much older Mesolithic occupation layer.

The other site was Killuragh Cave Woodman 1997 (see also excavations/3.2html). Here a small number of very simple microliths were recovered in mixed deposits along with a large number of animal and human bones. Up to eight individuals were represented in the cave deposits but each by only a limited number of bones. Dates obtained from the human bones ranged from the Mesolithic to the Bronze Age. Among the artefacts recovered was a small selection of very simple microliths and blades that would have been typical of the 'Early' Mesolithic. Neolithic hollow scrapers and Bronze Age pottery were also recovered. Dates from two of the individuals lay within the conventional Irish 'Early' Mesolithic (Table 2). This appears to suggest that microliths, which in this case also came from the same highly disturbed layer, continued in use until around 9000 cal BP or slightly later. However, extensive mixing of the deposits means that there is no clear association between the microliths and the radiocarbon dated 'Early Mesolithic' human remains.

A case can also be made for a suggestion that, in Ireland, the use of microliths began to wane relatively quickly and that this took place, possibly, before 9000 cal BP. This case is based on excavations at The Port of Larne Container Park and on the excavations on the Toome By-pass, as well as the re-examination of other assemblages from earlier work in the Toome area.

Excavation evidence

THE PORT OF LARNE

The excavations at the Port of Larne, Larne Container Park, entailed the removal of extensive areas of the famous Larne Raised Beach. These shingle and gravels deposits have, in the last 150 years, produced a huge quantity of rolled and battered flint artefacts of predominantly Mesolithic age. This material led Hallam Movius (1940, 75) to suggest that 'Larnian' be used as the definitive name for the Irish Mesolithic. During excavations of the beach shingle (primarily in 2000), it became apparent that the raised

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TABLE 2. RADIOCARBON DATES ON HUMAN BONE FROM KILLURAGH CAVE

Excavation date	*Bone*	*Lab. ref.*	*Determination BP*	$\delta^{13}C$	*Date cal BP*
1993	Human metatarsal Robust individual	GrA2433	7880±60	-19.95	8979–8590
1993	Human metatarsal Robust Individual	GrA2434	8030±60	-20.86	9085–8649
1996	Human vertebra	GrA27215	7955±45	-21.13	8990–8647

beach material covered a ridge of glacial deposits. Initially this ridge may have formed a high point on a peninsula protruding into a marshy valley floor that pre-dated the formation of Larne Lough. As sea levels rose, this area became an island (hereafter Praeger's Island) in the entrance to Larne Lough. As sea levels rose further the island became covered with several metres of beach shingle (Fig. 8).

In one location, a complex series of layers, most notably Context 5012, extended across the ridge to cover an area *c.* 30 x 25 m. Within this layer, or associated with it, was a series of stone tools and a number of pits and hollows, dotted around numerous boulders. A very small residual and often weathered scatter of blades was recovered, typical of those associated with the earliest Mesolithic such as at Mount Sandel. These pieces were more likely to be found in the overlying beach gravels. The main phase of use of this island (associated with 5012) seems to post-date Mount Sandel. As this surface existed for a considerable period of time it is hardly surprising that numerous traces of activities of different dates had accumulated (Fig. 9). A number of radiocarbon dates were obtained, based primarily on charcoal that occurred within a chipping floor (CF2) in the base of the overlying storm beach shingle. Given their stratigraphic context, these, including UB-11668 (Table 1) and another on bone (UBA-14826; 7072±30 BP/7961–7945 cal BP) must be put to one side. The beach deposit shingles within which CF2 lay are several thousand years later in date. Indeed, another date on pig bone, which came from the underlying 5012 at the same spot, produced a date of 7673–7590 cal BP (UBA-14827; 6788±25 BP).

The absence of later dates suggests that Praeger's Island began to become buried in storm shingle and ceased to exist just after 8000 years ago. It shows that activity on the island, ie, mainly within 5012, took place between 9200 and about 7500 cal BP.

The number of distinct retouched tools recovered from 5012 was relatively small and these were often scattered across the area excavated, consisting primarily of cores, cortical flakes, and other knapping by-products as well as a series of blades. These varied in character from large, sometimes cylindrical cores to smaller, more irregular examples and with smaller irregular blades and bladelets occurring as well as much larger examples.

The scatter of retouched tools included a number of artefacts, in particular a core borer and large core axe that would also be typical of the Later Mesolithic (Fig. 10). One complete example of a schist ground stone axe was also found as were several other possible fragments. Similar axes were found in the lower half of the Newferry sequence. Interestingly no butt trimmed forms were recovered.

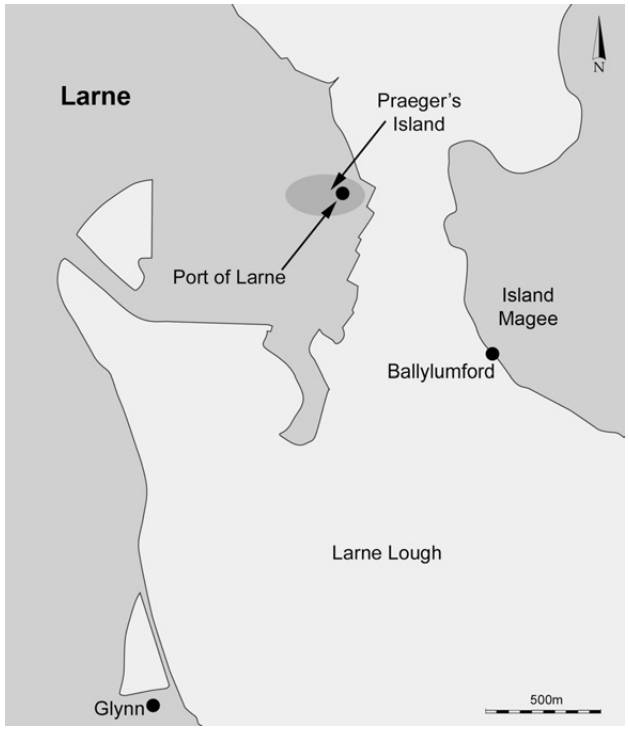

Fig. 8.
The entrance area to Larne Lough

Two major concentrations were noted within this spread. These were a chipping floor (CFI) and associated pit 5129, with, *c.* 10 m to the east, a series of pits and artefacts. These represented two distinct phases of activity. A slightly less concentrated scatter of material appeared to be associated with the eastern area, which was dominated by large blades and cores that would have been expected from the Later Mesolithic. However, instead of the flat, so-called 'Larnian Uniplane' cores that are found in the latter part of the Later Mesolithic, this area produced a significant number of large, more elongated and cylindrical cores, which suggested an

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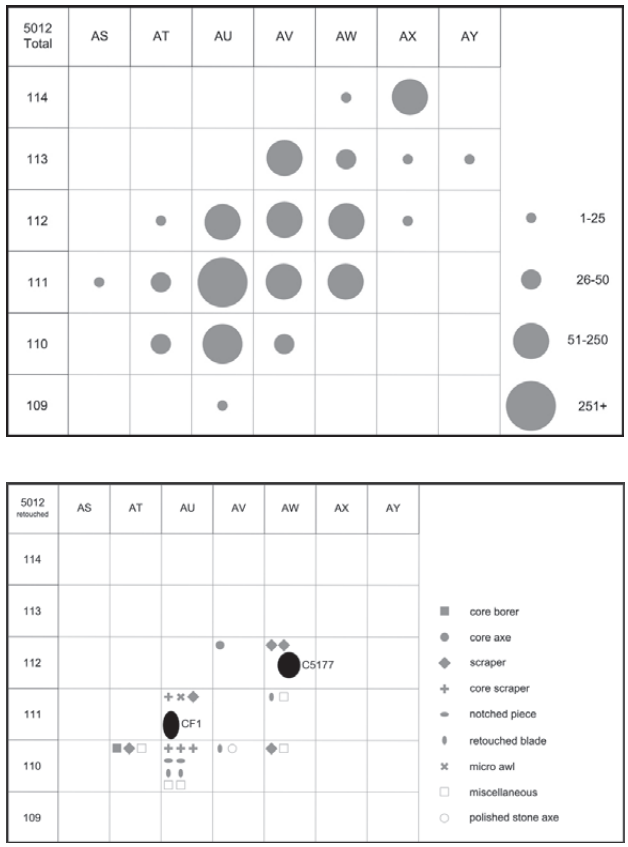

Fig. 9.
Port of Larne, Container Park Site (POL): location of the main activity areas in context 5012; above) total no. of artefacts recovered from within context 5012; below) location of retouched flint tools

earlier date (Fig.11a), while a series of large blades was also found in the same area (Fig. 11b). This can be confirmed by the fact that a pre-war investigation carried out by Burchell (1931) across Larne Lough at Ballylumford on Island Magee, had produced cores and blades from a series of so-called 'Early Atlantic' deposits. These were of similar character to those from the eastern portion of context 5012.

Also in the eastern area, the excavation uncovered a complex series of pits centred on contexts 5127–8/5144/5177. Besides producing a range of fish bones and charred wood and hazel nutshells, these pits also produced a number of typically Later Mesolithic large blades and cores. The pig bone date UBA-14827 came from the same area (Fig. 16). This pit complex produced a series of dates from burnt hazel nutshells which range from 8952–8595 cal BP (UBA-12034; 7891±30 BP) to 8635–8550 cal BP (UBA-12308; 7788±35 BP), suggesting that lithic reduction strategies, now reliant on hard hammer percussion, were already orientated towards the production of blades similar to those from the bottom of the Newferry sequence and from the Lower Lagoon Silts at Cushendun.

Unlike the somewhat diffuse activities in the eastern area, the key portion of the western concentration, CFI, which contained material from both context 5012 and 5106, was mostly confined to an area of 6 m^2. It was dominated by the production of small blades. Unlike the cores from sites such as Mount Sandel, which consist primarily of very regular single platform and some dual platformed cores, much larger numbers of more irregular cores were present in CFI, many of which were dual platformed (Fig. 12 a, b). Again, the blades differed from those at Mount Sandel in that there was a profusion of blades less than 30 mm in length (Fig. 13a, b) that lacked platform edge preparation and seemed rather more irregular in outline (Figs 14 & 15). The small scatter of retouched tools in the vicinity did not include any type fossils that would provide a clear indication of age. In particular there were no microliths. Besides one retouched blade and a small micro-awl, there were a number of small convex end scrapers and notched pieces, and a small series of what were originally taken to be large heavy 'Carinated' scrapers. After micro-wear examination (Van Gijn 2009), it seems more likely that they are the remnants of a distinct type of core (see below).

Had it not been for the stratigraphic location under several metres of raised beach shingle the material from CF1 might have been considered as just another *ad hoc* variant of Neolithic knapping techniques. Indeed the presence of many multiple platformed cores on several Neolithic sites would have led the author to ascribe a Neolithic date to assemblages where no type fossils had been recovered. Fortunately it was possible to obtain five dates on burnt hazel nutshells from within CF1 and the nearby pit 5129. These range between 9256–9020 cal BP (UBA-12298; 8173±31 BP) and 9011–8775 cal BP (UBA-12300; 8019±30 BP).

It might have been expected, given the availability of flint in the vicinity on beaches and in the nearby cliffs, that assemblages in the Larne area might always contain larger blades than elsewhere. It is, therefore, interesting that, as shown in Figures 13–15, if blade lengths of CF1 and a sample from Mount Sandel are compared the trend is for a higher percentage of small blades ie, less than 30 mm in length within the CF1 assemblage. The flint used at Mount Sandel may have been brought from coastal locations up to 10 km away.

Unfortunately, the other local Early Mesolithic assemblage, Glynn, was in a secondary context having been washed up into raised beach deposits so that the assemblage had been geologically sorted and the finer elements were missing (Woodman 1977b). Platform edge preparation is not effected by marine sorting, however, and it is also possible to see that at both Glynn and Mount Sandel the blades had small reduced platform which would usually be associated with platform edge preparation (Fig. 15).

The dates from the Port of Larne from CF1 and 5129 indicate that before or, at the latest by, 9000 years ago, techniques of blade production had begun to change and that large numbers of very small blades may have been produced

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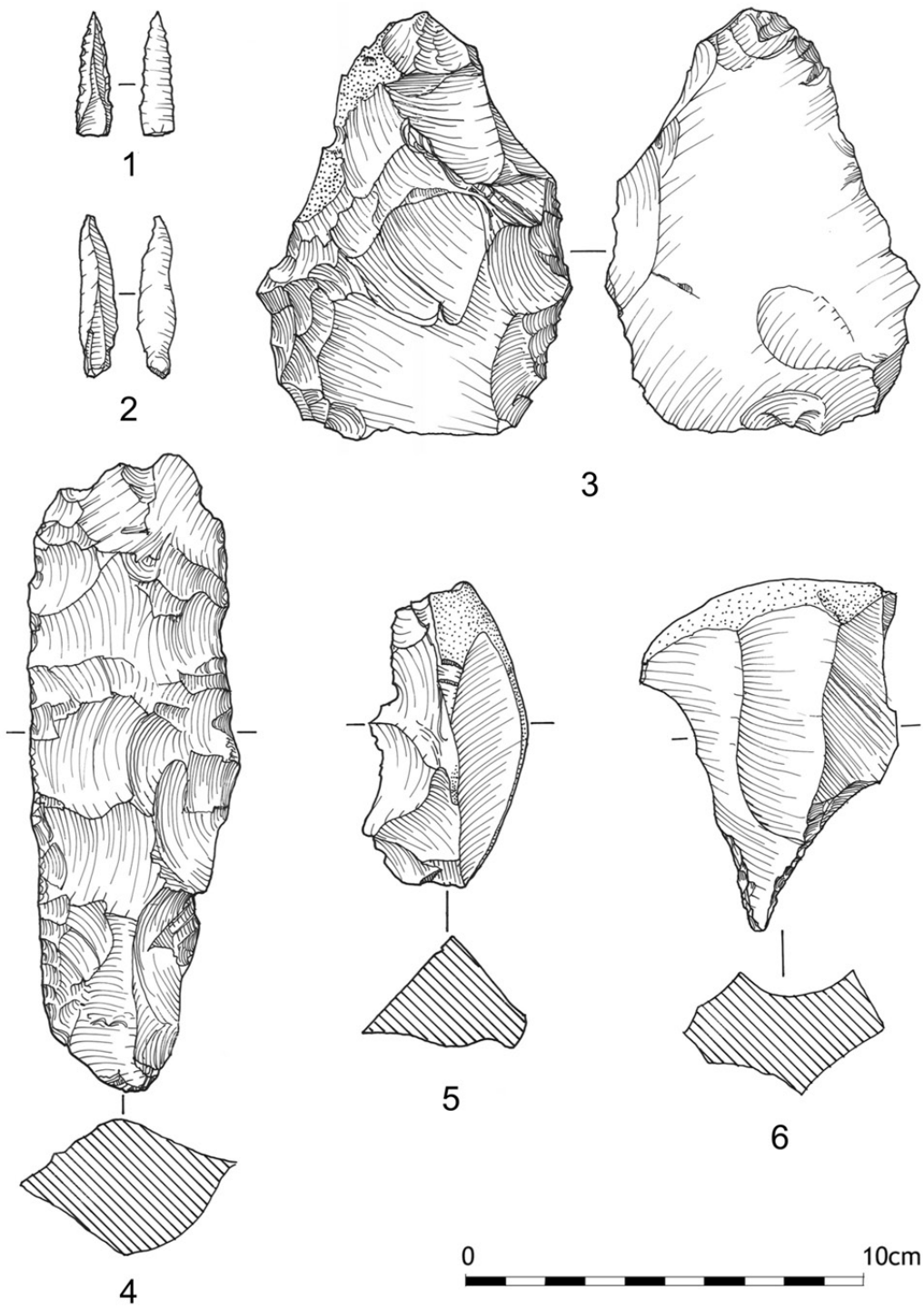

Fig. 10.
Selected artefacts from POL context 5012

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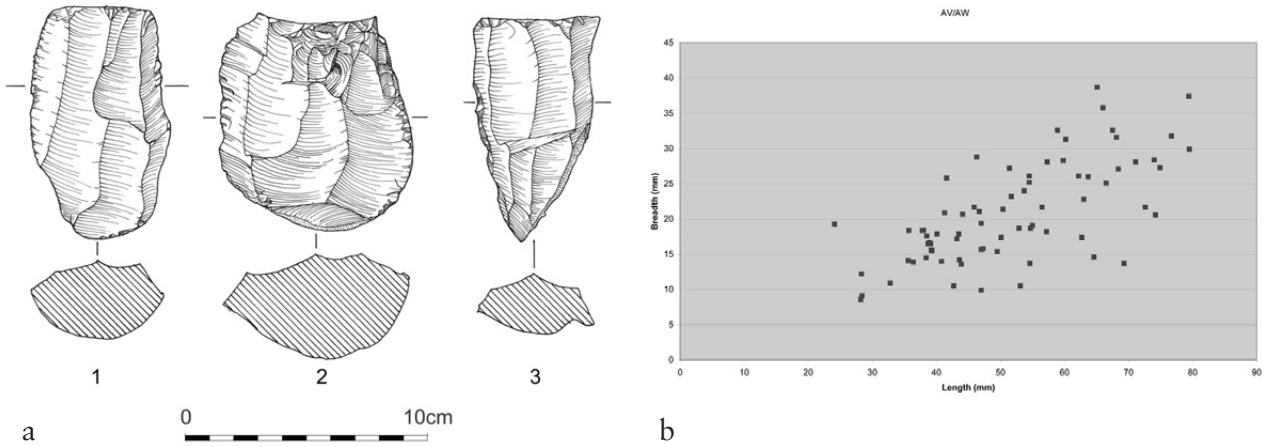

Fig. 11.
a) Cores and b) blade length/breadth scatter diagram, based on artefacts from the eastern concentration in context 5012, POL

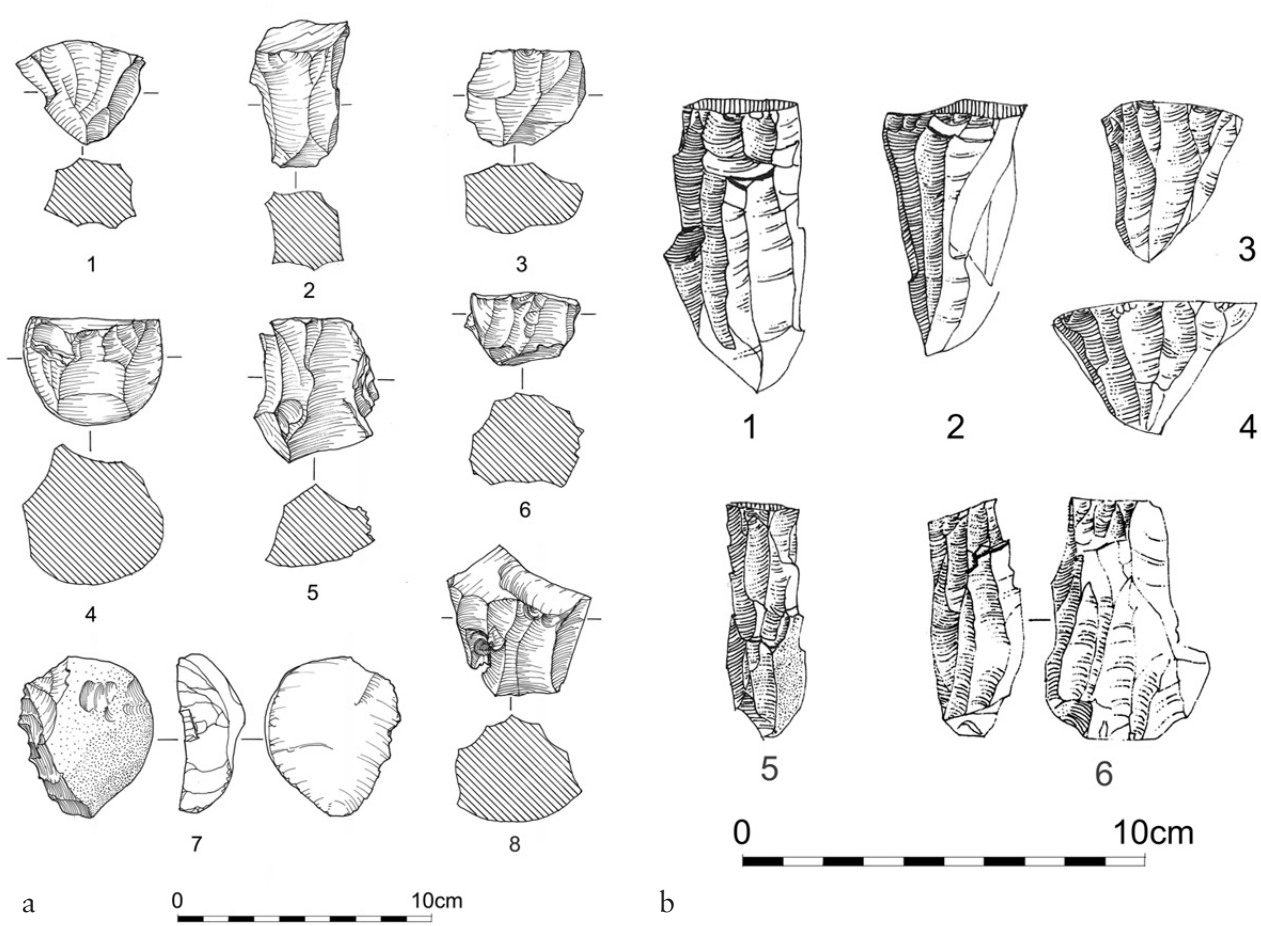

Fig. 12.
a) Cores from POL CF1; b) selection of cores from Mount Sandel lower (after Collins 1983)

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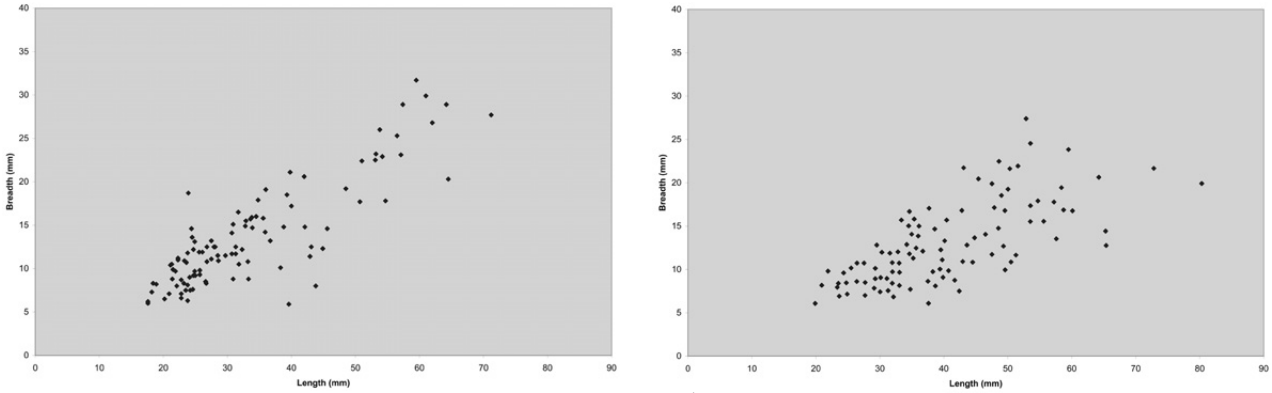

Fig. 13.
Length/breadth scatter diagrams of blades from a) POL CF1 (context 5012); b) Mount Sandel Upper

to serve the same needs as microliths. Thereafter, on the basis of the dates from 5177 and other contexts, by at least 8600 years ago the hard hammer technology producing larger, probably hand held, tools was in existence (Fig. 16)

Of course in each instance it could be argued that these sites were primarily industrial and that the evidence recovered consisted of discards. Thus, selected blanks for microliths on the one hand and a range of later Mesolithic forms on the other would be removed from this area. However, sites in different types of locations where flint is not so easily available show the same pattern. There are, therefore, clear indications that the technology associated with Port of Larne CF1 was used elsewhere, although the complete absence of microliths cannot be verified.

Much of the evidence is located at the northern end of Lough Neagh in the area around Toome. Three sites on the northern shores of the Lough are important (Fig. 17).

TOOME BY-PASS (FEATURE 1)

Excavation of a 350 m long drumlin revealed numerous traces of mostly Later Mesolithic activity among other phases (Woodman in Dunlop forthcoming; Fig. 18a), mostly concentrated on the northern end of the Drumlin (Fig. 18b). Aside from the general scatter of Later Mesolithic material and the occasional microlith, material from the most northerly Feature 1 seemed to be similar to that from CFI, described above. Feature 1 was centred on a small stone platform which may have extended into open water. It appeared to be stratified below two organic layers. The upper layer (1657) produced a date of 7850–7650 cal BP (Beta 219463; 5970±40 BP) and the lower (1598) one of 8058–7687 cal BP (Beta 219465; 6900±50 BP). Stratified in and below these layers was a simple undiagnostic industry which is thought to be earlier than these dates. Most of the *in situ* material came from a lower layer (1021) and consisted of a mixture of small flakes and debitage, with one possible fragment of a small blade core (5246) and a polyhedral core (5247) along with one weathered small bladelet (5238) of the type normally found in the 'Early' Mesolithic. The overlying layer (957) produced a less rolled but slightly weathered fragment of the distal end of a larger blade (7661). Crucially, a small number of small stubby blades lacking platform edge preparation, similar to those from CF1, were also recovered.

At this particular location, it appears that only the lower part of this complex stratigraphy had survived where it dipped into the surrounding bog. The spot was probably used for convenient access at a time when Lough Neagh was more extensive but also before the lough level reached its maximum height, that is, some time after 6000 cal BP. The slightly higher adjacent area that overlooked the stone platform produced a much larger selection of artefacts, though these were recovered from topsoil contexts. Some quite weathered remnants of what might be an Early Mesolithic blade assemblage were found but, in contrast to the types of cores that were usually found on so called 'Early' Mesolithic sites, there was a very large concentration (24), of small cores of polyhedral type (generally <50 mm across). Though heavily patinated, they are much fresher than the occasional, more distinctive, classic Early Mesolithic material. As noted earlier, multiple platformed cores do occur in the Neolithic as do small irregular blades. They occur, for example, under the passage tomb at Townley Hall, where they were associated with globular decorated Middle Neolithic Bowls and diagnostic flint tools such as transverse arrowheads and hollow scrapers (Eogan 1963). It is unlikely that this material represents a mixed Mesolithic and Neolithic assemblage. Multiple platformed cores are also known to occur in other areas within the European Mesolithic. Although it may seem an outlandish comparison, multi-platformed cores were the dominant core type at the Early Mesolithic site of Tollevik in Finmark, north Norway (Woodman 1992). While they appear to be part of some *ad hoc* reduction strategy, in this case, the nodules are worked beyond their use as blade cores. Yet numerous small, slightly irregular blades had been produced at Tollevik. Similarly, therefore, the case of the Toome By-

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Fig. 14.
Selection of blades from POL CF1 arranged by platform depths

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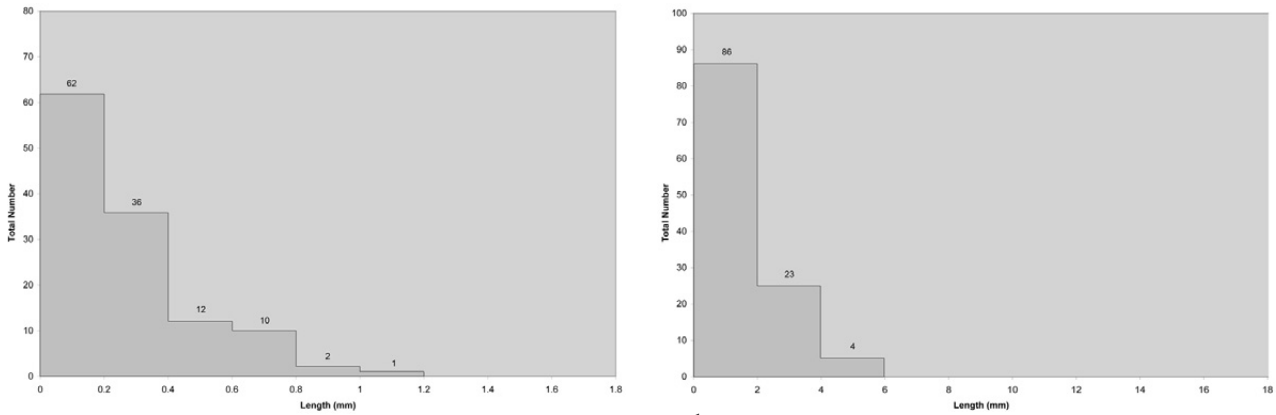

a b

Fig. 15.
Schematic representation of platform depth as well as depth vs blade length from a) POL CF1; b) Mount Sandel Upper

Fig. 16.
Selection of blades recovered from POL context 5177

pass site, instead of being of Neolithic date, could the whole assemblage from in and around Feature 1 not be Mesolithic, pre-dating the two radiocarbon dates referred to above and lie close to 9000 years cal BP?

This possibility led to the re-investigation of several other sites in the Toome area, all of which were located around a bay behind and on the shores of Lough Neagh (Fig. 19).

THE CREAGH TD (MITCHELL'S)

This site was excavated in 1951 and produced a small assemblage at a location where occupation had taken place on a sandy island. This island or ridge ran for over 100 m parallel with the existing shore. Over time, with the rising of water levels in Lough Neagh, the island became buried beneath a shoreline peat which was, in turn, eventually engulfed in diatomite deposits. Mitchell (1955) placed a series of small test pits across the island and identified an area where traces of fires and occupation had taken place. He also retrieved some possible worked wood and fractured unburnt hazel nutshells. A radiocarbon date of 8770–8207 cal BP (Yale 95; 7680±110 BP) was obtained from charcoal. He recovered a small lithic assemblage from *in situ* contexts which was described in less than one page and he ended with the statement (*ibid*., 16) that 'our excavations added little to our knowledge of the stone implements of the Larnian'. For Mitchell the one artefact worthy of comment was a piece whose fluting caused him recall a phrase of

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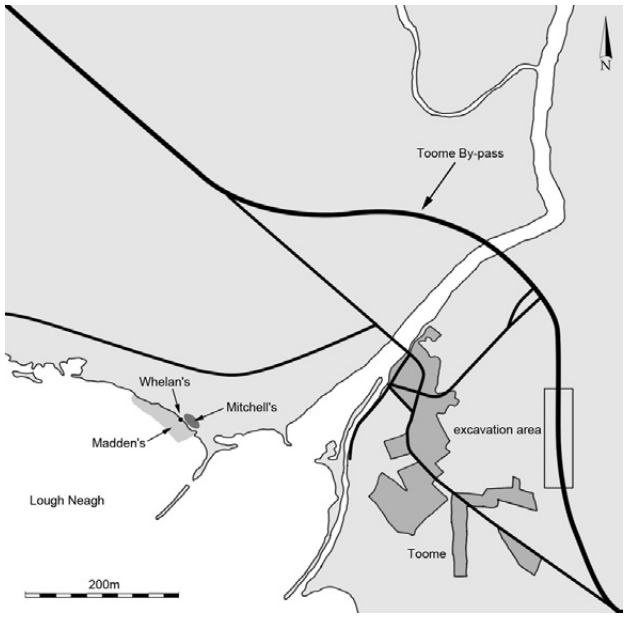

Fig. 17.
Schematic map of Toome area

Claude Blake Whelan and made him describe it as 'of Marked Aurignacian tradition'. Attention at that time focused on the fact that the radiocarbon date was the earliest, indeed the only, date for the Irish Mesolithic at that time. With the excavation of Mount Sandel, which appeared to be 1000 years older, this site and its date became sidelined as a curiosity.

In the context of the discoveries at the Port of Larne and as the Mitchell assemblage from the Creagh seemed to date to within the 'GAP' in the Irish Mesolithic the author returned to the assemblage. In total 68 pieces came from Mitchell's *in situ* levels while another 66 were found in lower levels. The assemblage was not identical to the Port of Larne CF1 assemblage. The small blades, of which 14 were recovered, were again quite irregular and usually without platform preparation (Fig. 20). Although some flakes removed from the face of cores showed signs of parallel removals of blades, the cores, of which six were found, were either reduced to multiple platformed or irregular cores and fragments. Only one retouched piece which may have been a burin (53) was noted.

In order to check the validity of the original date obtained by Mitchell, as the sample used was on wood charcoal, three hazel nutshells from *in situ* contexts were selected for dating (unfortunately when it came to publication Mitchell used a different series of letters and numbers than those used during the excavation). The artefacts lodged in the Ulster museum retain the original field notation which is used here. It is very apparent that the samples chosen came from the main area of occupation.

TABLE 3. ASSEMBLAGE COMPOSITION FROM BASAL PEAT AT WHELAN'S SITE, THE CREAGH TD

Type	*No.*	*Comment*
Cores	*18*	
single platform	84	made on flakes; only 1 could be described as a conical core (Fig. 21, 6)
dual platform	5	
multiple platform	5	
Flakes	20	varying sizes
Blades	9	only 1 has a prepared platform edge; Whelan's (1938, fig. 6, 8–9) are good examples of the short stubby blades recovered
Scrapers	6	small flake scrapers with denticulated edges
Burin like implements (?)	2	these were singled out by Whelan as burins (1938, fig. 6, 6–7)
Notched pieces	4	Fig. 21, 4 & 5
Small core borers	2	these are smaller than the usual large examples found in the Later Mesolithic but not dissimilar to others that may be associated with the Early Mesolithic (Fig. 21, 1)
Core axe	1	this is a small symmetric face trimmed core axe that is slightly more weathered than much of the remainder of the assemblage
Domed elongated & pointed retouched flakes	4	these are narrow almost like 'Carinated' domed scrapers (Fig. 21: 2, 3, 7). From these implements, Whelan's desire to find an Aurignacian element within the Irish Mesolithic can be understood
Miscellaneous retouched	6	

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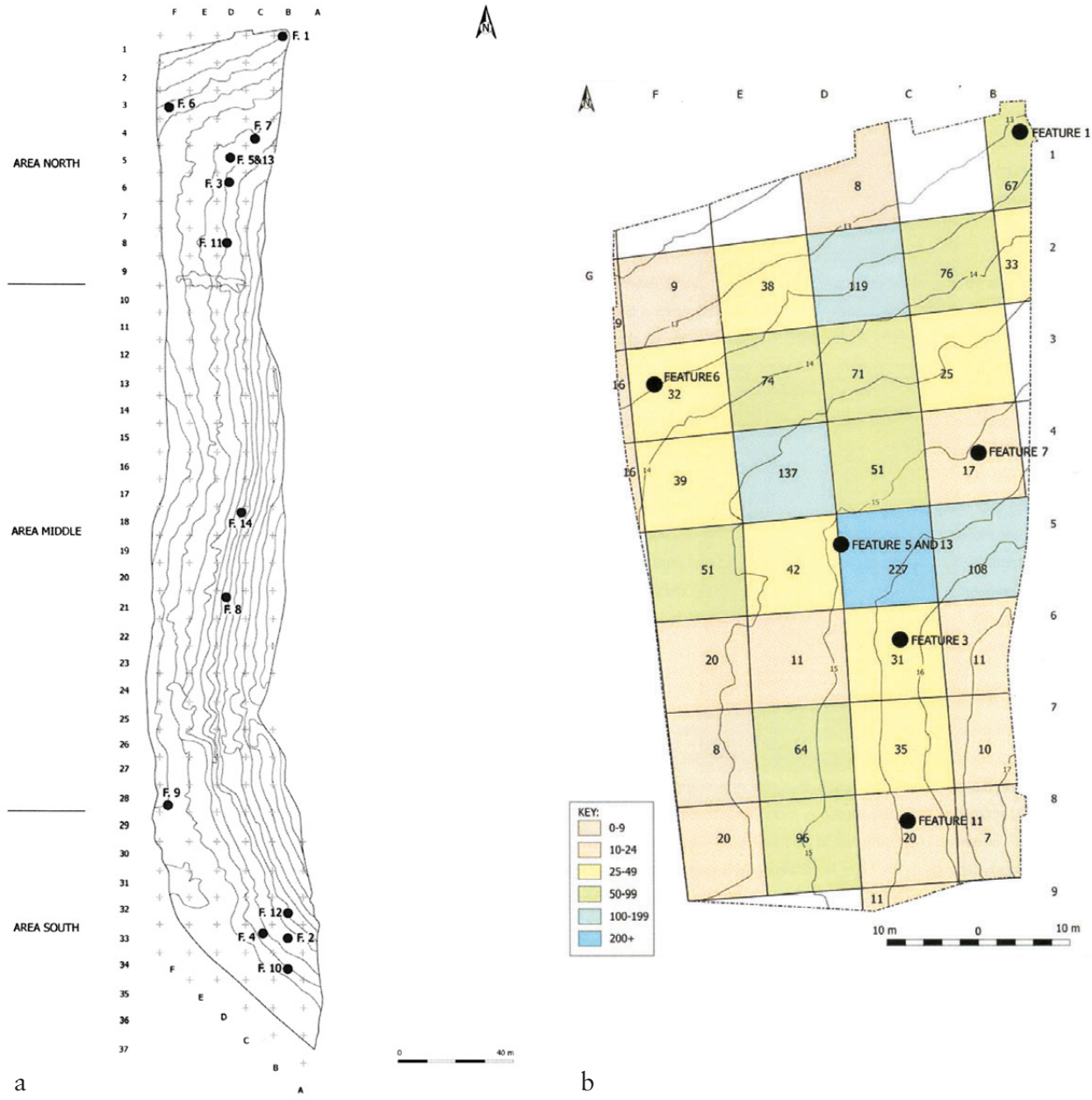

Fig. 18.
a) Overall plan of Toome Bypass site; b) northern area

The dates obtained were: 8999–8658 cal BP (D/4 mid sand: UBA-15653; 7980±37 BP); 8761–8646 cal BP (D/6 sandy mud: UBA-15654, 7844±36 BP); and 8751–8543 cal BP (J/6: UBA-15655; 7837±36 BP). These dates, especially those from D/4 and D/6, seem to suggest that the simple lithic technology from Mitchell's site, which appears somewhat similar to that from Port of Larne CFI, continued in existence after 9000 cal BP.

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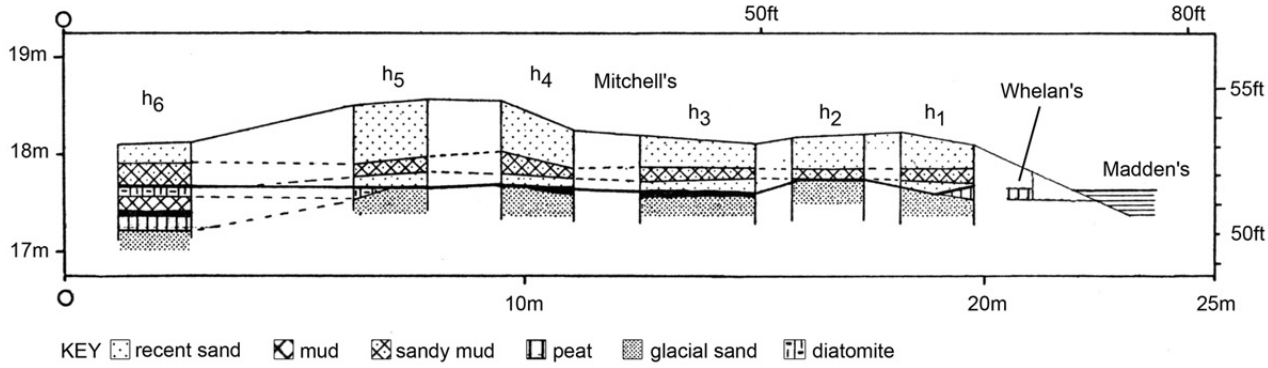

Fig. 19.
Schematic section showing position of the three sites, Mitchell's, Whelan's and Madden's

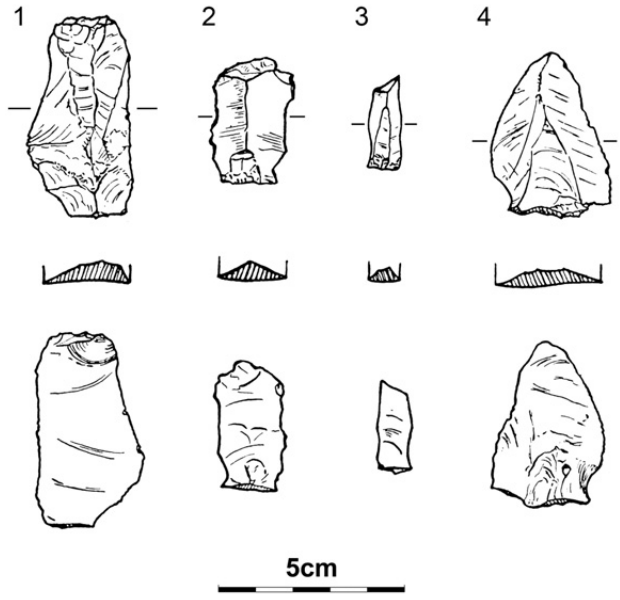

Fig. 20.
Selection of blades published by Mitchell (1955) from his excavation in Creagh td

THE CREAGH TD (WHELAN'S)

The second site from the Toome area that shows some similarity to CF1was that excavated by Whelan in 1930. He recovered a series of artefacts from a peat which was exposed on the shores of Lough Neagh. Jessen (1949, 120) suggested that the peat deposits had formed during the Boreal (PZ VIb/c) and undoubtedly at a time when the lough levels were lower. Today it is difficult to attribute an actual date to this layer but Jessen felt that it was older than the Lower Lagoon Silts at Cushendun. It is probable, therefore, that material from the Whelan site dates to roughly 9000 cal BP. Unlike the Mitchell site, which was the remnants of an actual point of occupation, Whelan's seems to contain material that had found its way into the peat deposits and which is occasionally slightly weathered. This assemblage also contains a much higher percentage of retouched tools. The composition of the assemblage is shown in Table 3.

It is probable that not all of the material recovered by Whelan was contemporaneous with the Boreal peat deposits. Indeed the presumed contemporaneous red deer bone (Whelan 1938, fig. 6) has produced a date from the early medieval period (cal AD 662–869; UBA-20318; 1269±44 BP). While the majority of items looked similar to the Port of Larne and Mitchell's material and many bear a striking resemblance to the other assemblages under discussion, some pieces such as the core axe and some of the cores would have seemed at home at Mount Sandel. Thus the deposits and the assemblage may not have been as much a product of one event as thought by Whelan and Jessen. A somewhat similar range of artefacts was recovered some 40 years later from an area of shallow waters that would have lain adjacent to the area of Whelan's excavation.

THE CREAGH TD (MADDEN'S)

The author returned to the same bay within Creagh td in 1972, after the Fleming collection had been donated to the Ulster Museum. This material had been gathered from the same area of shoreline adjacent to the other two excavations. After Newferry had shown that the 'Bann Culture' was primarily Mesolithic in date (Woodman 1977a) but post-dated the Toome assemblages, it seemed like a good idea to return to Toome, especially as material appeared to be washing out onto the lough's foreshore. Unfortunately, much of this material available in the 1970s

proved to have been dredged up while sand was being obtained from the floor of Lough Neagh and was a residue that was being spewed back out into the lough from the gravel graders!

Over the last 150 years, the shoreline around Toome has produced prolific quantities of material dominated by large Later Mesolithic artefacts. Upon discovery in 1972 that much of the material in the shallows was secondary in deposition, a few days were spent collecting material from the waters along the lough edge. In this case, the author noted (Woodman 1978, 248–50) that the assemblage from the edge of the Maddens property lacked the large later Mesolithic forms, but included a range of small irregular scrapers, burins, and, in one area in particular, cores that included single and dual platformed types as well as multiple platformed examples.

The problem with all the assemblages along the shore at Toome is that they contain material of all periods. Leaving aside the inclusion of much later material, in the case of Madden's site, there seem to be two possible explanations. Either there is a mixture of material from the classic Early Mesolithic phase, ie, the core and flake axes and good quality blade cores, along with something that would be more typical of a second phase that had more in common with sites such as the Whelan and Mitchell sites at Toome. The alternative is that it is the product of a single transitional phase that contained all these elements at the one time.

One element that seems to run through these sites is the presence of the so called 'Carinated or Domed' scrapers that may have been by products from the production of small blades. There is also a striking re-occurrence on these sites of small burinal like pieces and small denticulated scrapers.

There are other sites that may contain the same forms and which belong to this transitional phase.

THE WARREN, CUSHENDUN

The assemblage from the Lower Lagoon Silt at this site has already been described but the most enigmatic assemblage is that from the overlying Lower Gravel (Movius 1940). This is an assemblage made up of material in various conditions which was recovered in a 3.58 m thick gravel layer. These gravels formed a bar across the estuary to the Dun River. Obviously there will have been a certain amount of sorting during the deposition of the artefacts and it is possible that material from a multiplicity of activities over a period of time is represented. However, while use of pollen diagrams as an indicator of age is risky, Jessen had no doubt that the Upper Lagoon Silts which capped the Lower Gravel had begun to form during his PZ VI b/c and certainly before the 'rational' or significant rise in alder pollen that was often regarded as marking PZ VIc/VII transition. Even allowing for the slightly later spread of alder along the North Coast, this suggests that the Lower Gravel had formed by 8000 cal BP. This, of course, provides a *terminus ante quem* date for material recovered from the underlying Lower Gravel.

The assemblage probably contained a mixture of artefacts from quite early (ie, roughly contemporaneous with Mount Sandel or Lough Boora) through to shortly before the creation Zones 7 and 8 at Newferry.

1. The probable early part of the assemblage would include a portion of a small core axe, small scrapers (though as noted by Woodman (1978, 271) many of those identified by Movius could have been created by nature), and burins as well as many of the cores and small blades. The occurrence of two backed blades and one possible microlith may belong to the Early Mesolithic
2. The later element may consist primarily of a series of large, quite elongated blades that are reminiscent of the earliest blades found on the same site, in the Lower Lagoon Silts, as well as those from the base of the Newferry sequence

There were at least two of the large 'Carinated Scrapers' from Cushendun (Fig. 21, 8 & 10) as well as another from the assemblage that washed up on the shores of Lough Foyle at Eleven Ballyboes (Costa *et al.* 2001). Their consistent occurrence in a number of assemblages is again strongly suggestive that they were the by-product of a process intended to produce lots of smaller bladelets.

DISCUSSION

In summary, these assemblages, while by no means perfect, suggest that by around 9000 cal BP, the range of artefacts being produced and methods of blade production had, in comparison to those occurring at Mount Sandel, changed significantly. Platform edge preparation was a lot less careful, blades were often more irregular, and the classic conical and single platformed cores were also being replaced by more irregular forms. It is not clear whether the small cores axes, as well as the flake axes, continued to be manufactured and used as late as 9000 cal BP. It is of interest that small scrapers and occasional burins which had not been noted at Mount Sandel but were present in some numbers, were present at several of the sites described above. These also occurred at Lough Boora (Ryan 1980; Finlay pers. comm.). The main question which still cannot be resolved is the length of time over which microliths continued to be used in Ireland. While, as noted earlier, their paucity throughout Ireland is remarkable, their absence being due simply to methods of excavation, etc, seems to be only part of the explanation. Their use may have become more limited and they may have died out perhaps even before 9000 cal BP.

The latest date associated with microliths is that from Feature 109 at Mount Sandel. This material looks, in form and condition, suspiciously like that from the remainder of the Mount Sandel site and may, as suggested earlier, have been derived from the older site.

In contrast, the small group of microliths from Killuragh Cave seems to come from a very mixed site where the 'Early' Mesolithic is represented by a number radiocarbon dates on human bones. Again there is no certain association between the microliths and radiocarbon dates but it is noticeable that the microliths from this site are usually very small simple oblique forms. It is possible that the use of composite tools with microliths continued throughout the first 1000 years of human settlement but that, throughout that period, their usage became less common. Perhaps, even before the common usage of larger hand-held tools that were made from blanks struck using a hard hammer technology, another simpler alternative had emerged.

Evidence of absence is always more difficulty to identify, especially as an absence can often be explained by the possibility that at a particular site certain activities did not take place. Therefore, even allowing for curation and caching, some tool types may not be represented. In this instance the case can be made for the greater use of small blades rather than microliths throughout part of the Early Mesolithic. While these are not the perfect micro-blades produced, by pressure, such as from the Danish *Handtags Blokke* or Keeled Cores of the final stages of the Maglemose and early Kongemose of south Scandinavia, it must be remembered that most slotted bone points and daggers do not contain microliths but rather utilised micro-blades. Is it possible that a parallel phenomenon may have taken place in Ireland?

There is the presence of so many small blades less than 30 mm in length from CF1 at the Port of Larne but the evidence at the moment, for other sites with large numbers of similar tiny blades, is very partial, not least because so many of the assemblages come from secondary contexts. It could also be argued that the Port of Larne examples are little more than discards. However the key may be the so called 'Carinated Scrapers'. Recent research on similar scrapers with fluted leading edge from the Aurignacian has suggested that they and so called *Burin Busqué*, rather than being tools, were primarily intended for the production of small regular bladelets. The examples from Port of Larne are very crude but others from Cushendun and Eleven Ballyboes are much clearer examples of 'Carinated Scrapers' which could have served the same purpose. Again, the so-called Aurignacian elements of Whelan and Mitchell, such as Whelan's 'Carinated planes', from their sites at Toome, are more likely to have been small cores which may have been the last remnants of cores that were used to produce equally useful small irregular blades and flakes.

It is, of course, always tempting to explain these types of differences on the basis of availability of raw materials. In the case of, for example, the Port of Larne CF1 assemblage, those who created it had access to good, reliable raw materials that occurred with 1 km of the site as well as, in some cases, beach flint which lay even closer. Therefore miniaturisation due to poor resource availability seems unlikely

In contrast, a range of Mesolithic sites in and around Toome, especially the Toome By-pass site, showed that high quality blades typical of the 'Early' Mesolithic such as conical single platformed cores, microliths, and even axes were recovered. In some cases, the flint used may have been brought from a distance of 20 km or more. A similar pattern can be seen at numerous other locations where good quality flint was not easily available but where high quality blade production typical of the 'Early' Mesolithic material has been recovered.

This is very much a tentative first assessment of how lithic technology may have changed through what we should now, perhaps, refer to as the *Earlier* Mesolithic. One cannot be certain if there was a slow progression of synchronous changes throughout the whole of Ireland or whether there was a gradual shift from the typical Mount Sandel type assemblage, gradually abandoning microliths and simplifying the technology.

It is apparent, of course, based on the assemblage from the basal zones at Newferry Zones 7 and 8 that by shortly before 8000 cal BP the distinctive implements of the later Mesolithic, ie, the butt trimmed forms, were present alongside the elongated large blades which had begun to be produced much earlier, as is apparent from context 5177 at Port of Larne and probably in the Lower Gravel at Cushendun

Implications

The overall chronological schema presented in Figure 22 shows the state of play. This figure has had to rely

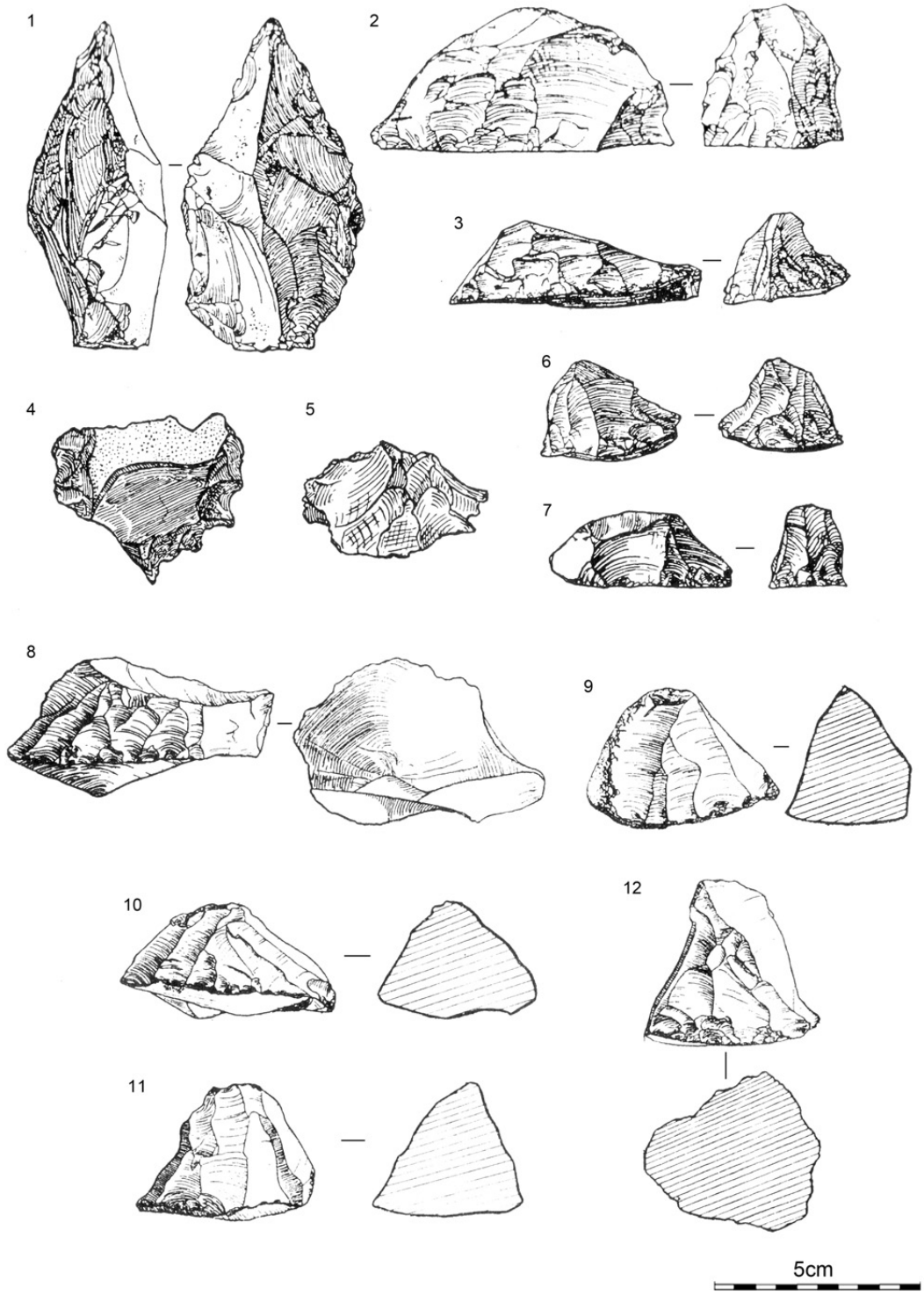

Fig. 21.
Selection of artefacts from Whelan's site (Nos 1–7), published by Whelan (1938) on the shore of Lough Neagh, and the Warren, Cushendun (Nos 8–11), published by Movius (1940)

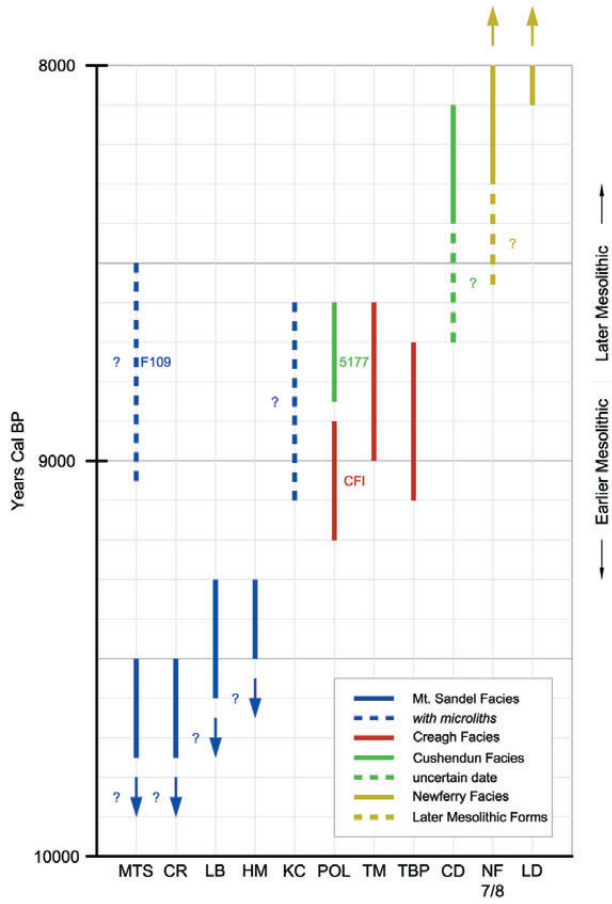

Fig. 22.
Suggested chronological sequence of industries 10,000–8000 cal BP.

on a series of dates of varying quality. In some cases the association between dates and artefacts is poor; while in others the dates were obtained at a time when errors quoted were much larger than is usual today. Again there is a mixture of dates obtained from wood as well as short lived materials such as hazel nuts.

As will be seen in Figure 22 there is no simple chronological sequence such as can be observed in the Danish Mesolithic. Instead the two major stages of the Irish Earlier and Later Mesolithic are retained, but it is also recognised that changes take place within each stage.

The proposed sequence for the Irish Mesolithic is as follows:

Irish Earlier Mesolithic 9800–88/8600(?) cal BP

Mount Sandel Facies: This is characterised by the range of implements found in the Mount Sandel excavations and includes a range of core and flake axes, microliths of varying forms, as well as platform edge preparation and soft hammer stone production.

Creagh Facies: This is based on the assemblages from both Port of Larne context 5012 (CF1) and in the Toome area, most notably by those found by Whelan and Mitchell in Creagh td. Assemblages are characterised either by a paucity in numbers or types of microliths or by their absence. Blade production seems to be by a simpler more *ad hoc* process that lacks core platform edge preparation and usually results in smaller, more irregular blades. One also has to be cautious and not assume that there was simple synchronous shift from Mount Sandel to Creagh facies. It is possible that blade technology changes and the abandonment of microliths proceeded across Ireland at a different rate.

Irish Later Mesolithic 88/8600–6000(?) cal BP

Cushendun Facies: This is based on the material recovered from the Lower Lagoon Silts at the Warren, Cushendun and the eastern assemblage in Port of Larne context 5012. It is typified by the use of hard hammer percussion leading to the creation of relatively elongated, though often irregular shaped, blades. It also lacks core platform edge preparation and appears to lack the diagnostic range of Later Mesolithic forms that are often regarded as typical of the Later Mesolithic.

Newferry Facies: Obviously this is based on the assemblage from Newferry Site 3 and is characterised by the range of Later Mesolithic forms recovered from that site. These include, most notably, the Butt Trimmed Forms that occur on so many Later Mesolithic sites. Blade production and platform edge preparation became more regular during this phase. It may also be associated with a greater use of ground stone tools.

It will be evident from Figure 22 that these facies cannot be assumed to be water-tight chronological phases; there are likely to be fuzzy boundaries and overlaps and changes may happen at different rates in different regions. In other words, it is as yet unclear if there is a simple sequential series of changes or phases of *ad hoc* experimentation. However, the assemblages

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at the beginning and the end of the Irish Mesolithic seem, throughout Ireland, to be remarkably similar. This is an attempt to show that lithic technology was changing continuously over the first 1000 years of the Irish Mesolithic and continued for the following 3000 years.

Although it is a subject for another time, it should not be forgotten that the Irish Later Mesolithic is much more than Bann Flakes/Butt Trimmed forms. It is also about the emergence of a greater range of ground stone implements, including a much greater use of ground stone axes, ground and chipped points, and, perhaps, the greater use of grinding and polishing stones. There also appears to be a shift towards a greater reliance on local raw materials. At the same time, there is significant evidence that Later Mesolithic assemblages were created with a strong sense of curation (Woodman & Anderson 1990).

However, it still leaves open for debate the reason *why* the change took place. It seems unlikely that it was due to the impact of a sudden event such as the 8.2 ka event. This event, which is thought to have been (in the North Atlantic especially) a major climatic deterioration, can be shown to have had a significant impact on Ireland (Ghilardi & O Connell 2012). Similarly it is unlikely that it was the availability of raw materials that brought about the change. All other options are still open to debate!

It is hoped that this paper also provides a few lessons. These include:

1. Not all phases of any period will be clearly associated with a distinct series of type fossils; therefore some phases may initially appear to be 'Dark Ages'. In this case it is also probable that there may be, somewhere, evidence of a slightly earlier initial Mesolithic settlement or visitations to Ireland which may not be easy to identify. There is an even more obvious lesson in that the transitional phases within the Irish Mesolithic may not contain numerous easily identified chronological markers and so can be easily dismissed as material coming from sites of no apparent significance.
2. There is a danger of assuming that any lithic reduction strategy will be particular to any one period.
3. Assemblages recovered 50 or more years ago can still provide new insights into today's problems. The opinions of their discoverers may also provide important signposts to those of us who would condescendingly regard them as slightly 'Whacky' outmoded ideas that have no place in our archaeological world!

Endnote

In this paper, when using a chronology based on radiocarbon dates, I have decided to use calibrated BP years rather than the more commonly used cal BC. One can put forward a case for either cal BP or cal BC and in general most papers dealing with the Mesolithic have tended to use cal BC. The common reason given for the use of cal BC is quite simple in that, when discussing the spread of farming/beginnings of the Neolithic, it is convenient to use the same manner of expressing a radiocarbon date as is used in Neolithic research ie, cal BC. However one must wonder why a period that in many areas lasts for nearly 6000 years should be constrained by the use of a method of expressing a radiocarbon date that is primarily relevant and convenient for its last few hundred years. If one is researching the Mesolithic in general then one is also likely to:

1. have an interest in researching its origins in the Late Upper Palaeolithic;
2. require reference to information on vegetational change as well as data associated with alterations to relative sea level;
3. a need to contextualise one's research in the various schema that make up the chronological framework that document climate change throughout the first half of the Holocene.

In this paper all radiocarbon dates are expressed as calibrated dates BP using Orau's online OxCal 4.1. The results are expressed to two sigma.

Acknowledgements: I am both honoured and touched by the decision of the Prehistoric Society to award me the Europa prize for contributions to European Prehistory. My research in the Mesolithic (not always Irish Mesolithic) has lasted for 50 years and has only been possible with the support of family, friends, teachers, and colleagues. I also will be eternally grateful to Queens University, The Ulster Museum, and UCC for their tolerance and help when I appeared to want to take off in unexpected directions! I would further like to thank the staff of two companies ADS and NAC for making the material and radiocarbon dates available to me while it should also be noted that Chronos through the Archaeology Committee of the Royal Irish Academy facilitated the acquisition of several radiocarbon dates that were crucial to researching this topic. This paper would not have been possible without Hugh Kavanagh who prepared the maps and diagrams as well as Rhoda Cronin who illustrated the artefacts

The paper, based in part on the lecture given at York, has been a long time reaching fruition. But, on the bright side, it is not as long as Adolf Mahr's 1937 Presidential Address to the Prehistoric Society!

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