Quaternary Science Reviews 139 (2016) 158–163

Contents lists available at ScienceDirect

Quaternary Science Reviews

journal homepage: www.elsevier.com/locate/quascirev

Short communication

First evidence of a Late Upper Palaeolithic human presence in Ireland

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ARTICLE INFO

Article history:
Received 8 November 2015
Received in revised form
22 February 2016
Accepted 29 February 2016
Available online 21 March 2016

Keywords:
Final Palaeolithic
Archaeology
Human colonisation
Radiocarbon dating
Zooarchaeology
Megafauna
Ireland

ABSTRACT

The colonisation of North West Europe by humans and fauna following the Last Glacial Maximum (LGM) has been the subject of considerable discussion in recent decades and within multiple disciplines. Here we present new evidence that pushes back the date of human footfall in Ireland by up to 2500 cal BP to the Upper Palaeolithic. An assemblage of animal bones recovered from a cave in the west of Ireland during antiquarian excavations in 1903 included a butchered brown bear bone (patella) which was recently subjected to two independent radiocarbon dating processes; the resultant dates were in agreement: 12,810–12,590 cal BP and 12,810–12,685 cal BP. This find rewrites the antiquity of human occupation of Ireland and challenges the traditional paradigm that certain biota may have naturally colonised the island prior to human arrival.

1. Introduction

The colonisation of North West Europe by humans and biota following the amelioration of severe conditions after the Last Glacial Maximum (*circa* 28,200–20,400 cal BP; Clark et al. 2012) has been the subject of considerable discussion for many decades and within different disciplines (Corbet, 1961; Woodman, 1998; Yalden, 1999; Jacobi and Higham, 2011; Woodman, 2011, 2015; Montgomery et al., 2014). Evidence for the recolonisation of Britain by humans dates from *circa* 15,000 cal BP, represented by lithic assemblages, human remains and worked animal bones from at least 16 caves (Yalden, 1999; Pettitt and White, 2012). Until now, the earliest detected human presence on the island of Ireland has been the Early Mesolithic hunter-gatherer camp at Mount Sandel, Co. Derry—occupied from 10,290–9790 cal BP (UBA-2357, 8990 ± 80 BP) (Bayliss and Woodman, 2009) (Fig. 1). Even though an island since approximately 20,600–18,100 cal BP (Clark et al., 2012; Peters et al., 2015), that human colonisation of Ireland should take place so late has been considered improbable because of the potentially suitable environmental conditions and ecosystem present for several millennia prior to the Mount Sandel settlement (Woodman, 1986; Woodman et al., 1997; Wickham-Jones and Woodman, 1998; Woodman, 1998, 2011, 2015, 171–9). Furthermore, Palaeolithic settlements are known from along the Welsh coast (Pettitt and White, 2012), western Scotland (Mithen et al., 2015), Scandinavia (Aaris-Sørensen et al., 2007), and Iberia (Birks et al., 2015)—all locations that would have been navigable by boat.

This study involved dating three brown bear (*Ursus arctos*) bones, two of which have been humanly modified in the form of exhibiting butchery or cutmarks. The bones were recovered from two caves located just 380 m apart - Alice and Gwendoline Cave and the Catacombs - in County Clare in the west of Ireland, during excavations conducted by the *Committee Appointed to Explore Irish Caves* in 1902 and 1903 (Scharff et al. 1906) (Fig. 1). To date, at least 25 brown bear bones and 30 brown bear bones have been identified from Alice and Gwendoline Cave and the Catacombs respectively; many of these were previously unidentified or misidentified in the original antiquarian report (Carden, unpub. data). The bear patella, which forms the focus of this paper, was found in one of the deeper strata in Alice and Gwendoline Cave. The antiquarian report noted the find as, 'a knee-cap of a large bear (E.A. 131) [*which*] shows clearly the incisions of a knife, which was probably used to divide the tendons' (*ibid*., 44). The patella, along with the entire faunal assemblage from the site, was packed in cardboard boxes and deposited in the National Museum of Ireland (NMI) (Natural History Division) in the early 1920s. In 2011, one of the authors

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http://dx.doi.org/10.1016/j.quascirev.2016.02.029
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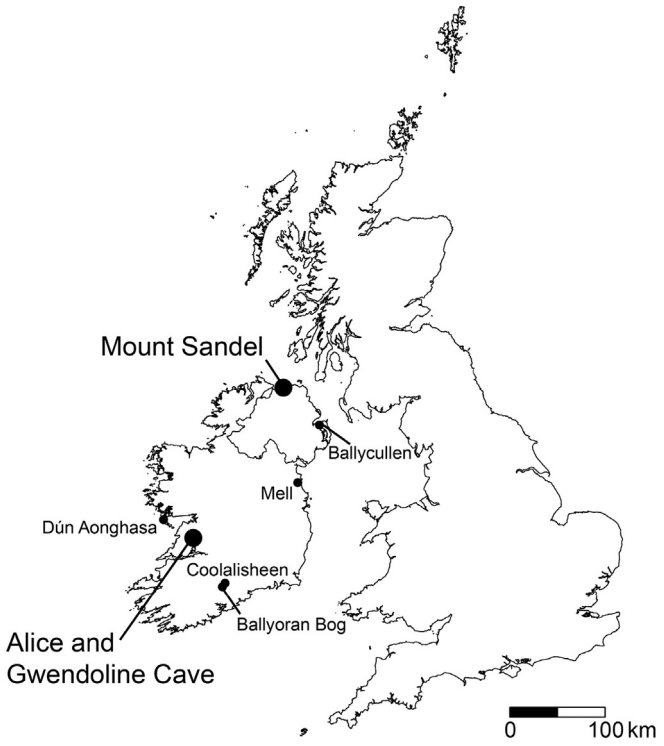

Fig. 1. Location of principal sites mentioned in text.

(RFC) rediscovered the patella during a project involving the reassessment of the antiquarian faunal cave assemblages from Ireland stored in the NMI collections. Modified or butchered bear bones are quite rare in Ireland which led one of the authors (MD) to propose a project to radiocarbon date these samples. At the inception of the project there was no idea of what dates to expect. Alice and Gwendoline Cave and the Catacombs had produced remains of Late Pleistocene fauna (Carden, unpub. data) as well as archaeological material suggesting Neolithic and Bronze Age activities (Dowd, 2015); thus the bear bones could conceivably have related to any such period as bear survived in Ireland until the Middle Bronze Age (Edwards et al. 2011).

In this study, we subjected the brown bear patella with human-induced cutmarks to two independent radiocarbon laboratory dating processes. The results are interpreted and discussed in light of current archaeological knowledge of a post-LGM human presence and faunal colonisation history of Ireland.

2. Study site, materials and methods

2.1. Site and context

The humanly modified (butchered) adult brown bear right patella (NMING: F23919) was one of several thousand bones recovered during antiquarian investigations at Alice and Gwendoline Cave in 1903 (*circa* 3.5 km southwest of Ennis town, County Clare in the west of Ireland). The standard of excavation and recording was exceptionally good for the early twentieth century. Each cave was divided into grids measuring 0.6 m in length and as wide as the cave passage. Grids were excavated stratigraphically with all recovered human bones, animal bones and artefacts numbered with the specific grid code. The excavation team recorded three strata in Alice and Gwendoline Cave. The uppermost 'brown earth, with calcareous tufa' contained moderate quantities of charcoal, bones of domesticated animals, and extinct faunal remains including Arctic lemming (*Dicrostonyx torquatus*), giant deer (*Megaloceros giganteus*) and brown bear (Scharff et al., 1906, 5). Most of the archaeological artefacts derived from this layer including a chert scraper and flint scraper (both now lost), at least four bone pins, worked bone, a gold Viking arm-ring, iron nails and iron debris. This uppermost stratum sealed a layer of reddish sandy clay that contained 'charred or gnawed' human bones. The lowermost stratum was a reddish tenacious clay that produced bones of extinct fauna. A bone point, worked antler, a 'ground' animal tooth and an amber bead were recovered from these lower strata, though only the point and bead can be located at present. Other finds included whetstones, quartz pebbles, 'sawn' bone, a copper alloy Viking arm-ring and a post-medieval coin of James II. Stratification was evidently quite disturbed with extinct faunal remains found through all three strata comingled with bones of domesticates and multi-period artefacts, a typical consequence of the active natural and cultural formation processes that take place inside caves; in the case of Alice and Gwendoline Cave, bioturbation due to badger activities was noted by the antiquarian team.

The numbers applied to the recovered bones and artefacts has made it possible to re-establish the original horizontal and vertical findspots of material. The code inked onto the bear patella (EA131) reveals that it came from the second or third stratum in the Alice passage, 10.4 m–10.9 m inside the entrance (Fig. 2). An undated antler fragment with cutmarks was found in the same grid (Scharff et al. 1906, 68). In addition, various skeletal remains from hare (*Lepus* sp.), fox (*Vulpes* sp.) and brown bear all displaying cutmarks and/or burning were recovered from within this cave (Carden, unpub. data). Human bones (now all missing) of unknown date were documented from nine different areas of the cave, and at the time of excavation were recorded as representing one individual. Bones of sheep/goat, pig (*Sus scrofa*), horse (*Equus* sp.), cow (*Bos* sp.), dog (*Canis familiaris*) and cat (*Felis* sp.) – many of which represented young animals–were also retrieved in addition to four unworked boars' tusks, three concentrations of dog bones, a seashell (*Patella vulgata*) and wrasse (Family Labridae) bones (Scharff et al. 1906, 23–34, 38). Skeletal remains of thrush (*Turdus* sp.), blackbird (*Turdus merula*), robin (*Erithacus rubecula*), starling (*Sturnus vulgaris*), mallard duck (*Anas platyrhynchos*), domestic duck (*Anas* sp.) and tufted duck (*Aythya fuligula*) were also recorded

Fig. 2. Alice and Gwendoline Cave; findspot of bear patella indicated (after Scharff et al., 1906).

(*ibid*., 57). The unpublished excavation notebooks refer to the discovery of charcoal, charred bones, 'split bones', burnt stones and burnt earth in various parts of the cave, but most of this material was not retained or recorded in detail.

2.2. Radiocarbon dating

The three butchered bear bones were submitted for AMS dating to Chrono, Queen's University Belfast, Northern Ireland (radiocarbon dates prefixed with 'UBA'), and following the return of those results, a second sample from the bear patella was sent to the ORAU, University of Oxford, UK (radiocarbon dates prefixed with 'OxA'). The radiocarbon dates are reported here as calibrated years before present (cal BP), at the 2-sigma (δ) precision, followed by the laboratory number and the raw uncalibrated date within parentheses. OxCal v.4.2 (IntCal 13) was used to calibrate the dates.

2.3. Patella cutmarks

The cutmarks on the patella were examined by the authors and we sought independent examination by three zooarchaeological specialists: Jill Cook (British Museum), Terry O'Connor (University of York, UK) and Alice Choyke (Central European University, Hungary). These specialists were unaware of the radiocarbon dating results prior to their examinations.

3. Results

3.1. Patella cutmarks

The patella is in fresh condition and shows no signs of weathering (Fig. 3). There are no signs of antiquarian conservation efforts, and the National Museum of Ireland records indicate the bone was not treated in any way since its acquisition in the 1920s. Five linear cutmarks (24–30 mm) on the anterior surface display asymmetrical cross-sections with sloping lower edges and vertical upper sides. Superficial bone diagenesis within the cutmarks is consistent with that on the adjacent bone surface. This, combined with the presence of sediment within the cutmarks and their darker older colour, confirms that these were ancient cutmarks made on fresh bone and could not have been produced by natural processes during or following deposition. The marks were made after a short *post mortem* interval and certainly prior to deposition within the cave sediment.

The absence of internal striations within the five ancient cutmarks, and their form, indicated kinematics of movement against the bone was obliquely downward rather than across the surface—as revealed by analysis under a digital imaging light microscope. The cutmarks were most likely the result of a chopping or sawing motion using a lithic tool, typical of the incisions a long sharp flint blade would make on fresh bone (T. O'Connor; A. Choyke; pers. comms.). The inturned crushing of the edges of some of the cutmarks suggested chopping through the knee tendon and/or ligaments in the process of disarticulating a carcass or stripping out the tendons for use (T. O'Connor; A. Choyke; pers. comms.).

By contrast, the patella also exhibits superficial incisions caused by a metal tool during or subsequent to the antiquarian excavations. This resulted in partial removal of the outer bone surface layer above and between the incisions, exposing a lighter, fresher surface. Three short superficial striations on the posterior surface, which have fresh internal surfaces, are also relatively modern.

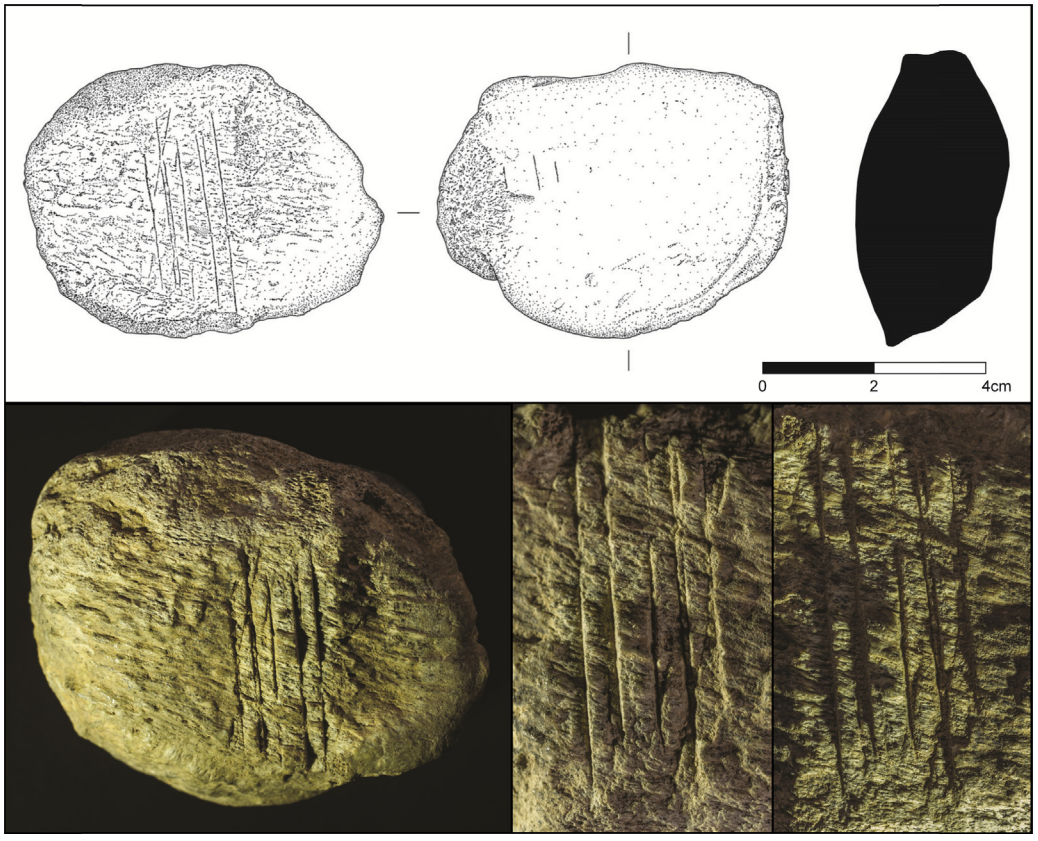

Fig. 3. Brown bear patella from Alice and Gwendoline Cave with detail of cutmarks (drawing Elaine Lynch; photos Thorsten Kahlert).

3.2. Radiocarbon dating

The two radiocarbon determinations from the patella are in agreement: 12,810–12,590 cal BP (UBA-20194, 10,798 ± 71 BP) and 12,810–12,685 cal BP (OxA-29358, 10,850 ± 50 BP) (Fig. 4).

4. Discussion and conclusions

The humanly modified patella from Alice and Gwendoline Cave has significant ramifications in terms of establishing the first human footfall or colonisation of Ireland. The calibrated dates fall within the Younger Dryas stadial (*circa* 12,900–12,550 cal BP) and would be considered Final Palaeolithic if, for instance, the find was from a site in England or Wales (P. Pettitt, pers. comm.). The possibility that Ireland was inhabited during the Upper Palaeolithic has been mooted since the 1860s and 1870s in attempts to interpret flint assemblages from Northern Ireland that have since been identified as Mesolithic (*circa* 10,200–6000 cal BP) (a period not then recognised) or Neolithic (*circa* 6000–4500 cal BP) in origin (Woodman et al., 2006). Genuine Palaeolithic lithics have occasionally surfaced in Ireland, such as a flint flake found in 1968 at Mell, Co. Louth, and a 'Levallois' flake recovered from a drumlin at Ballycullen, Co. Down in 2007; these implements, however, were deposited by glacial and geological processes (Mitchell and Sieveking, 1972; Stirland, 2008). Other Palaeolithic artefacts can be discounted as reflecting antiquarian activities, including Palaeolithic axes from Dún Aonghasa on Inis Mór, Co. Galway and Coolalisheen, Co. Cork (Murphy, 1977; Woodman, 2011).

One of the obstacles facing the identification of an Irish Palaeolithic (or a much earlier Mesolithic than has hitherto been recognised) has been an assumption of what sites of this period should look like, and specifically an expectation of encountering lithic assemblages resembling those from contemporaneous sites in Britain and Europe. However, modified animal bones and undiagnostic material such as charcoal may be all that survive–material that probably exists unrecognised in museum collections or assemblages from recent excavations. For instance, a giant deer antler fragment with multiple chopmarks and polishing was recently discovered in Ballyoran Bog, Co. Cork associated with an Early Mesolithic brushwood platform (Tierney et al., 2013). As giant deer had become extirpated in Ireland by *circa* 12,600 cal BP (Lister, 1994), the modified fragment was interpreted as evidence for the reuse of an ancient antler in the Mesolithic (McCormick, 2013; Tierney et al., 2013). However, because the cutmarks were not subjected to specialist analysis, this could potentially be further evidence for final Palaeolithic or very early Mesolithic activities on the island. Direct dating of worked bone and antler fragments, such as that from Ballyoran Bog, is a crucial step in identifying other new 'early' sites, or at least dismissing possible sites from consideration. The vast collections of faunal remains from Irish caves also need to be interrogated by radiocarbon dating, particularly bones of species that were potentially present in Upper Palaeolithic Ireland and that show signs of human modification.

How the bear patella entered Alice and Gwendoline Cave is uncertain. It may derive from a settlement site outside, but its fresh condition indicates it was not exposed to the elements and was not transported via water or ice. Rather, it suggests human occupation or activities within the cave (as originally suggested by Scharff et al., 1906), and/or butchering and processing activities in the immediate vicinity. Alternatively, individuals may have deliberately targeted a bear that was using the cave as a hibernaculum. Butchered bones indicating the hunting and consumption of bear and probable use of the fur, skin, tendons, teeth and bones are documented from Palaeolithic sites across Europe, as is the symbolic and ritual significance of bear (Charles, 1997; Germonpré and Hämäläinen, 2007).

While as yet no other artefacts or ecofacts from Alice and Gwendoline Cave have been identified as Palaeolithic, much of the surviving assemblage is undiagnostic and undated and certain elements could conceivably be contemporaneous with the bear patella, such as some of the butchered hare bones, charcoal, the burnt earth, 'split' bones, the simple bone pins, the bone point, and the 'ground' animal tooth which cannot be located at present. The absence of Palaeolithic lithics is unusual, but it is worth noting that this excavation took place over a century ago when less diagnostic pieces (e.g. debitage) may have been overlooked. Also relevant is the discovery of two scrapers, both now missing, which remain undated. Sediments of unknown depth survive intact in this cave and thus scientific archaeological excavation of the site may prove fruitful in establishing a Palaeolithic context for the patella. The two other radiocarbon dates obtained during this project are also significant (Supplementary Information). While the second bear bone from Alice and Gwendoline Cave, a metatarsal, did not display signs of human modification, it supports wider evidence for the abundance of brown bear in the Irish Early Mesolithic landscape (Woodman, 2015, 26–8). It is the bear vertebra with humanly made chopmarks from the Catacombs, however, which is of greater relevance to the present discussion. While it could not be considered Palaeolithic, it does pre-date activities at Mount Sandel thus providing yet another 'early' site. Taken together, these two sites highlight the likelihood that we need to concentrate our focus on caves, in conjunction with radiocarbon dating programmes, as the most likely archaeological contexts in which further Irish Palaeolithic sites will be encountered (Dowd, 2015, 262).

The brown bear patella dates to 12,800–12,600 cal BP which coincides with ameliorating climatic conditions across North West Europe (Deifendorf et al., 2006). Direct dates on humanly modified bone and antler artefacts indicate a human presence in Britain at

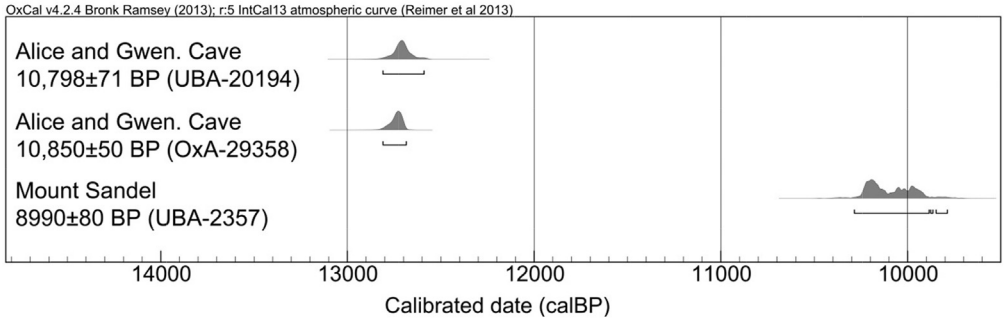

Fig. 4. Radiocarbon dates on bear patella from Alice and Gwendoline Cave compared to the earliest radiocarbon date from Mount Sandel.

this time, albeit sparse and concentrated principally in Southeast England (Pettitt and White, 2012), as well as in other parts of North West and Western Europe (Birks et al., 2015). It has been suggested that occupation in Britain may only have been for a few months at a time, possibly around the Pleistocene-Holocene transition, by very small human groups who exploited reindeer (*Rangifer* sp.) and horse (Pettitt and White, 2012). Human travellers 'visiting' Ireland at that time, presumably by boat, would have experienced a suite of terrestrial mammalian fauna similar, but deficient to, those found elsewhere in Europe (Yalden, 1999). As deglaciation was relatively unstable, we can assume a complex pattern of faunal recolonisation and a succession of disequilibrium faunas. The evidence of a human presence is not necessarily surprising and may reflect a brief small-scale human incursion (Pettitt and White, 2012). The Irish find parallels recent discoveries from the Isle of Islay of the first evidence of settlement in Western Scotland during the Younger Dryas in the form of 65 lithics from a layer dated by tephrochronology (Mithen et al., 2015). Following decades of disbelief, perhaps it is now time to accept that these regions on the periphery of Europe were indeed occupied during the Palaeolithic; the task now is to grow the number of known Palaeolithic sites. This is an exciting time for Irish and Scottish prehistory.

Following the LGM, a sparse terrestrial cold-adapted mammalian community existed: brown bear, giant deer, red deer (*Cervus elaphus*), reindeer, Arctic lemming, mountain hare *(Lepus timidus*), stoat (*Mustela erminea*) and possibly wolf (*Canis lupus*) (Montgomery et al., 2014). Whether these species derived from populations that survived the LGM and/or naturally colonised the island following deglaciation is not known. The early presence of humans in Ireland as exhibited by the cutmarked patella from Alice and Gwendoline Cave opens up new research avenues in terms of how, when and from where the island obtained its biota. Indeed, consideration of (any) megafaunal population dynamics and extirpations within Ireland must now consider potential anthropogenic related factors and impacts on such events that heretofore have not been considered. For example, giant deer, reindeer and red deer all disappeared from Ireland during or shortly following the Younger Dryas, presumably as the result of unfavourable climatic and subsequent ecosystem conditions (Woodman et al., 1997; Carden et al., 2012).

Previous studies indicate a link between Irish biota and those in south-west Europe in terms of species assemblages (Corbet, 1961) and genetic affiliations (Grindon and Davison, 2013; Beatty and Provan, 2014). This was proposed to have been associated with Early Mesolithic human mobility, though the model was criticised as too simplistic and unrealistic (Carden et al., 2012). Certainly the new evidence for a human presence in Ireland around 12,800–12,600 cal BP will influence future interpretations of colonisation and megafaunal extirpation theories, or at the very least will stimulate further debates regarding human-mediated (deliberate or accidental) introductions of species to Ireland. A multidisciplinary approach involving radiocarbon dating programmes of modified animal bones from antiquarian excavations, combined with modern re-excavation of certain caves, along with investigation into potential submerged sublittoral landscapes, is how further early occupation sites will be discovered in Ireland.

Acknowledgements

We thank the Royal Irish Academy and the Institute of Technology Sligo for funding the radiocarbon dates which were processed by the Chrono Centre, Queen's University Belfast and the ORAU, University of Oxford. Jill Cook, Alice Choyke and Terry O'Connor provided valued advice on the cutmarks. At the National Museum of Ireland we are grateful to Nigel Monaghan, Matthew Parkes, Pat Wallace, Raghnall Ó Floinn, Ned Kelly and Paul Mullarkey. Thanks to Thorsten Kahlert, Elaine Lynch, Eve MacSearraigh, Margaret McCarthy and Peter Woodman for their contributions to this project and paper. We are grateful to Paul Pettitt, Terry O'Connor, Chantal Conneller, Allan McDevitt and Robert Hensey for feedback on the text. This paper has benefitted particularly from the comments of the reviewers, Caroline Wickham-Jones and Rupert Housley.

Appendix A. Supplementary data

Supplementary data related to this article can be found at http://dx.doi.org/10.1016/j.quascirev.2016.02.029.

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