



## Archaeology Research Excavation Grant Report

Recipient name:	Dr Richard Jennings
Discipline and subject area:	Archaeology Research Excavation Grant
Year awarded:	2023
Title of project:	Castlepook Caves Project

### Summary of findings:

This report summarises the results of two weeks of excavation and survey work at Kilcolman Cave from April 1-15, 2023, and three days of geophysics at Castlepook Cave from September 12-14, 2023. At Kilcolman Cave we undertook the first excavation at this cave in more than 100 years. The fieldwork focused on an area measuring 20m x 8m wide outside the front of the current cave entrance. This area, itself once part of the cave system, had been disturbed by recent farming activity. The excavation focused on cleaning back Pleistocene sediments exposed by this activity. It revealed large amounts of glaciofluvial sediments with a depth of up to 4m and extending for at least 30m into the cave. These sediments were deposited at a slow to moderate speed and contained no traces of Pleistocene fauna or archaeology, which was not a surprise given how the material accumulated. As part of our research, the Cork Speleology Group generated the first detailed map of the cave floor surface. We foresee no further excavations at this cave.



At Castlepook Cave, the aim of our geophysical survey was to record the nature and extent of the cave system from on the ground surface using Electrical Resistance Tomography (ERT) and Ground Penetrating Radar (GPR). The preliminary results are promising because with the combined techniques we can distinguish the underlying limestone bedrock from the overlying glacial till. We can also identify potential cave chambers that have been recently mapped by the Cork Speleological Group. Furthermore, the geophysics has identified a possible cliff edge and a buried cave entrance to the 'Hyaena land' chambers of the cave system. Further survey work is highly recommended. Finally, reports have been submitted to the National Monuments Service concerning these two phases of fieldwork.

### Please outline the objectives of the project.

The discovery of a brown bear bone (patella) that was butchered in the Late Upper Palaeolithic at Alice and Gwendoline Cave, Co Clare (Dowd and Carden, 2016) has energized the search for an Irish Palaeolithic. However, not a single stone or bone tool that can with certainty be said to represent a human occupation of this island prior to 10,000 cal. BP and thus the origin of human settlement here must remain far from resolved. This discovery makes a compelling case for archaeological excavations at places where Palaeolithic archaeology could be present. We



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undertook excavations at Ballynamindra Cave from 2014- 2018 and in 2023 (Jennings et al in prep) and are now exploring Castlepook Cave, Co Cork. The main reason for targeting Castlepook Cave is because Dr Ruth Carden recently identified bones with cutmarks from no less than three phases of the last ice age cycle. These bones derived from excavations undertaken in the cave in the early 20th century and constitute the best evidence documented thus far for a Pleistocene hominin presence in Ireland. We are looking for signs of human occupation such as charcoal, lithics, cave art, and more modified bone, in both Castlepook and Kilcolman Cave, which lies 2km west of Castlepook. Our research intends to firmly place Ireland on the northwestern margins of Late Palaeolithic population movements into Europe.

Our strategy for Castlepook Cave fieldwork since 2022 has been fivefold: (1) we wish to map the cave interior and exterior environments using laser scanning technologies. This will provide us with an excellent digital recording platform and heritage record prior to any excavation work taking place in the cave. The exterior survey strategy, coupled with fieldwalking, is designed to help locate hidden or infilled entrances that otherwise are indistinguishable to the naked eye. One hypothesis we have for the passages of the new section of the cave is that these were also accessible via now blocked entrances. (2) we want to explore the multitude of chambers that were excavated in the early 20th century to see whether we can identify any extant deposits within them. If we locate them, we intend to take palaeoenvironmental, soil micromorphology, dating and sedimentary DNA samples, which will help us to align and integrate the archived animal bones held in the National Museum of Ireland with the original field notebook and the laser scanning of the cave system within a GIS system. (3) we wish to excavate and sample test trenches in the relatively unexplored new section of the cave, where sediments and fauna are known to survive. (4) we wish to use RTI photography to explore the cave walls for traces of rock art. (5) we wish to apply geophysical survey techniques to help locate buried entrances. The improved dating and sediment DNA profiles that will come from the proposed dating and analysis of freshly excavated Pleistocene fauna will also be important in terms of refining the chronology of the last glacial period, which will in turn allow more accurate understanding of the timing of the potential influxes of fauna into Ireland and the presence of land-bridges. It is intriguing that sediments pre-dating the LGM survive in the cave when current glacial ice sheet models indicate that the whole of Ireland was covered in ice sheets. We wish to explore the idea that there was a refugium in Ireland and that the models may be inaccurate. The way to do this is to take new samples in the cave using the latest scientific techniques such as radiocarbon dating with ultrafiltration, and advanced micromorphology procedures to fully begin to understand cave sediment formation. As we know from our research at Ballynamindra Cave, Co. Waterford, this is something that will take intensive and patient research, but with every chance of success.

### **Please describe the methodology used in conducting the research.**

Kilcolman Cave survey and excavation methods:

1. Bat monitoring survey (Late March to April 2023) – No bats were detected so no derogation licence was required.
2. Cave mapping (April-May 2023) – Mr Stan Drapala, Ms Monika Jur and Mr Daniel Drozd from the Cork Speleological Group used a Leica Disto to plan the cave floor surface and provide elevation profiles.
3. Excavation (April 1-15, 2023) – The team cleaned two profiles outside of the cave entrance and excavated two cuttings to establish the nature and extent of sediments. This fieldwork was led by Dr Jennings who was assisted by three experienced archaeologists: Phil Kenny (supervisor), Dr Kevin Cootes and Ms Rea Carlin, and three students from Liverpool John Moores University (UK).
4. Cave structure and sediment interpretation (April 2023) – Dr Michael Simms undertook inspections of Kilcolman Cave and Castlepook Cave and described their sediments.
5. Sampling – A portion of the deposits were dry sieved and a portion wet sieved to 100 microns

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### 6. Surveying - Mr Nick Hogan, UCC, plotted survey points.

Castlepool Cave geophysics methods, Sept 12-15:

Because of the nature of the geology and the questions posed by this project, the most suitable geophysical methods were electrical resistance tomography (ERT) and ground penetrating radar (GPR). Both methods rely for their success on the presence of geophysical contrasts, in electrical resistivity and dielectric permittivity respectively, which would be expected to be caused by the nature and structure of the geological materials found at the site. A strong electrical resistivity contrast would be expected between the glacial till and the underlying limestone, and the cave roofs, especially those formed by horizontal bedding planes, would be expected to create strong dielectric boundaries and thus strong GPR reflection signals. In combination the two methods allow us to identify the underlying relationship of the till, rock, and voids of the cave system itself so we could address the aims of the project.



The ERT survey was carried out using a Syscal ProSwitch system with 72 electrodes. These were laid out along lines with 1m or 2m electrode separation to allow for a range of depth and resolution, as required in various parts of the survey. Measurements were made with a standard combination of Double-Dipole and Schlumberger arrays to provide both surface detail and deep penetration. The data was gathered using strict quality criteria and total recorded error of less than 1% over four measurement cycles was obtained for almost all measurements. The ERT results are being examined for quality using ProSys software and inverted to produce electrical resistivity profiles using DC2DInvRes software.

The GPR survey was carried out with a Mala bistatic system with a nominal antenna centre frequency of 250 MHz. Measurements were recorded at 10cm intervals along lines 2.5m apart running downslope (to maximise contrast across the structure of the cave system) and 2m apart running along the lines of cultivation (to reduce noise due to antenna movement). The GPR results are being processed using GPRViewer software.

### **Please outline the findings of your research and/or milestones achieved.**

Kilcolman cave survey and excavation: This cave has been mapped for the first time. It comprises an entrance chamber (17 m x 8 m) with collapsed boulders (break down) in the rear preventing deeper access. There is a passage on the right side of the entrance that stretches for 9 m. Another passage exists close to the end of the entrance chamber on the right-hand side that extends for c.10 m. There is sediment and rock collapse on the cave floor inside, so the potential for the cave to be more expansive is high. Outside the cave, the remnants of an older part of the cave system, no longer containing a roof but with visible sides, extends for at least 16 m in length and 7 m in width.

The cave is now largely filled with poorly sorted sands and gravels dominated by Old Red Sandstone debris. The sediments are coarse and form an even surface along the main passage. Overall, their composition and poorly sorted nature suggests that these are fluvio-glacial sediments that were emplaced into a truncated, largely sediment-free, cave remnant in Late Glacial times, when large volumes of unconsolidated and unvegetated sediment were mobilised by meltwaters associated with the decay of the ice sheets in this part of Ireland. Scalloping is visible on the walls. A thin sand layer above them may have been formed by minor reworking subsequently of finer components of the



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coarser underlying sediments, but thereafter the only material to accumulate was the angular limestone breccia that probably formed through freeze-thaw spallation in the entrance zone of the cave. No archaeological or palaeoenvironmental evidence was discovered.

Castlepook cave geophysical survey:

(1) The ERT results show that the limestone containing the cave forms a ridge with well-defined edges forming steep rock-faces of the order of 4-5m high running along the ridge-side about 50-60m to the south-west and 30m to the north-east of the ridge top. The glacial till overlies the limestone rock across the ridge-top to a depth of about 2m and lies against the cliffs, potentially filling what may be former rock shelters penetrating the cliff-faces. The sharp topography of the cliff themselves is therefore smoothed out by the overlying and abutting glacial material to form the smooth slopes found today. Variations in the ERT profile through the edges of the ridge suggest that the rock face itself may have collapsed in places thus burying once open shelters.

(2) Although they lie close to the maximum GPR detection depth, the cave roofs are visible as strong, consistent reflections in the GPR profiles across most of the ridge but disappear precisely at the point, descending the hillslope, where the ERT survey indicates the line of the buried limestone face. Thus, not only do the GPR results confirm the interpretation of the ERT they provide specific confirmation that there may be rock-shelters, now filled with glacial deposits, penetrating the cliff faces – including immediately to the south-west, downslope from the “Hyaena Land” area of the cave.

### Please provide details of the dissemination of the outcomes from this project.

- Ruth Carden (RC): Community 1hr talk, Doneraile, Co. Cork 13 April 2023, 70+ people attended.
- RC: Online 1hr talk to Ulster Archaeological Society 24 April 2023; 1.2k views on YouTube (<https://www.youtube.com/watch?v=QHnroS6gU0s>)
- RC: 1 week take-over of @IrelandsEnviro 19.1k twitter account 01-07 May 2023 Reached 65k engagement and views
- RJ: Online talk to Research Centre of Evolutionary Anthropology and Palaeoecology, Liverpool JMU, June 2023
- RC: Native Woodland Trust Magazine Summer 2023 5 pages article. Multiple reach to wide audience, 750 members+
- RC ran a daily set of Tweets from our Kilcolman Cave fieldwork in April 2023 two weeks, with photos from her own Twitter/X account. She Mentioned RIA funding and their own Twitter account liked and reposted some of these daily tweets.

No. of Lectures given/outreach events: 6

Media Coverage (article in local newspaper, feature on University website etc.): RC: Online 1hr talk to Ulster Archaeological Society 24 April 2023; 1.2k views on YouTube (<https://www.youtube.com/watch?v=QHnroS6gU0s> )

### How will you continue to communicate the results of your project and what are your publication plans?

Once the specialist analyses are all completed, including the integration of the cave internal and external 3D environments and the geophysics, we will be in a strong position to promote our results. The forthcoming paper on the human-modified bones from Castlepook Cave (submission plan December 2023) will generate considerably publicity. The paper will include some elements of the research that the RIA has funded at Castlepook Cave.



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### **How did the award enhance your professional development?**

Considerably and hugely appreciated. The grant money I apply for may not be substantial but it enables research teams to form with those specialists bringing their expertise mostly at no cost. This means the project can achieve goals well above what they would be if full economically costed. Bringing in external funding is a great box to tick in terms of career development. I have also involved colleagues and students from work in our project. I am also engaging with a commercial project in Cork that draws on my cave expertise, and I have held discussions with National Monuments Service about wider projects concerning the Pleistocene across Ireland and offshore.

### **What plans (if any) do you have to further your proposal/project?**

I have applied for the 2023 archaeological research grant application. Please see my proposal where we set out our plans to undertake further geophysical surveying at Castlepook Cave given the success of the results to date in terms of identifying a potential entrance to 'Hyaena Land' buried beneath 2m+ of glacial till. Given these results, and a detailed study of the cave system by Mike Simms, we propose to undertake a two-week field season inside the cave in 'Hyaena Land' itself. The Cork Speleological Group, when mapping the cave system in 2022 and 2023 as part of my 2022 grant application, also identified potential extant deposits in this part of the cave. Bones recovered from the early 20th century excavations in this area include two reindeer bones that not only exhibit signs of human modifications (i.e., cut marks) but they have been recently radiocarbon dated and pre-date the last glacial maximum. These observations support the premise of a buried entrance in two ways: 1) cave hyaena activity normally occurs towards a cave entrance and never deep inside a cave - the same of which could be said for human occupation activity. 2) the overlying glacial till was most almost certainly deposited during the last glacial maximum, thus postdating the hyaena and human activities and sealing the entrance and preserving archaeological and palaeoenvironmental remains.