Archaeology Research Excavation Grant Scheme 2021

Interim report

Submission Date	Oct 27, 2021
1. Title:	Professor
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2.	
3. Grant programme	Archaeology Research Excavation Grant
4. Year awarded	2021
5. Title of project	Eagle's Nest, Lambay, post-excavation and publication
6. Summary of report (Min. allowed 100 words)	The site is a Neolithic stone axe quarry site of international importance. Source material quarried for the production of stone axes was porphyritic andesite or porphyry. Quarrying and axe production began in the Early Neolithic. In the Middle Neolithic activity intensified. Significant amounts of cultural material, including pottery and stone tools, were deposited. This was a complement to the continued production of axes. Activity in 2021 focused on quarrying and production of stone axes, including the coarse stone tools, microwear analysis of a sample of the flint assemblage and work on the ceramic assemblage; report, organic residue analysis and dating.

7.

8. Please provide two appropriate images

1. Cobble_rubber from C107_93E144_5093

2.Carrowkeel sherd_ Feature 1_pit fill-93E144-1145

9. Please outline the objectives of the project

Research context and dating
Alongside providing a database of axeheads, the Irish Stone Axe Project (ISAP) sought to identify quarry sites. Porphyritic andesite/porphyry axes form a small but significant component (some 250 axes) in the database. Survey on Lambay was undertaken in the context that porphyry outcrops on the island and identification of axeheads (found 1920s) as being of porphyry. This led to the discovery of the site in 1993.

Dating of the site, based on radiocarbon dates from charcoal samples, is presented in Cooney et al. 2011. Quarrying and production of stone axeheads commenced in the Early Neolithic, around 3800 BC (with earlier dates indicating possible activity in the early Mesolithic). Complementary activity took the form of pits in the eastern valley floor, adjacent to a worked outcrop.

The radiocarbon dates focus on before 3600 BC. In some cases they occur with Middle Neolithic material, indicating charcoal from earlier activity being disturbed. During the Middle Neolithic, complementing the quarrying and production of axes, a range of material was brought to and deposited at the site in features on the eastern valley floor.

•Improving the dating framework is a continuing focus of work, with particular regard to; the commencement of quarrying, the focus of activity within the Middle Neolithic and whether activity continued into the Late Neolithic. This will be addressed by direct dating of ceramic sherds.

Quarrying and production of stone axes

Production of axes from porphyritic andesite was not on purely 'functional' grounds. Porphyry is a medium to coarse-grained rock, worked by 'flaking' to produce a roughout, followed by pecking and grinding, completing the production process. Predictable controlled removals cannot be made, making it difficult to recognise stages in the reduction sequence. A further challenge is posed by multiple fracture lines within the material.

Porphyritic andesite has a striking appearance when polished. This emphasizes the contrast between white/yellow feldspar crystals and the background green (more occasionally purple) matrix. A distinctive feature is that all stages of axe production are present, including miniature axes. In 2015 Karen O'Toole produced an MSc thesis (UCD) on the production of miniature stone axes. This suggested quarried material and porphyry pebbles were utilized and proposed production sequences; with early, middle and late stages.

•The work done by O'Toole was developed through analysis of the debitage in key areas (Cutting 1 and 11), developing a rigourous model of the quarrying and production sequence.

A small sample of the 800 potential coarse stone tools (CSTs) was examined by Niamh Kelly in her doctoral thesis (UCD), Coarse Stone Tools in Early Irish Prehistory (2020). The assemblage contains a range of CST types; hammer stones, rubbers, grinding stones and polishing stones. These fit with different stages of the axe production process. Kelly commented that 'the quantity of coarse stool tool material at Lambay is unmatched' (by any other Irish site).

•Kelly undertook a review and analysis of all identified and possible CSTs from the site to understand the role of CSTs in the production process and other functions of the CSTs.

The lithic assemblage

Brian Dolan and Graeme Warren's preliminary report (2006) indicated a chipped stone assemblage (99% flint) of over 15,000 objects (not including over 800 pieces left wrapped for microwear analysis). Results include; the dominance of bipolar working/reworking, the high number of tertiary flakes and blades, the dominance of scrapers and the possibility of an early Mesolithic component to the assemblage. The majority appears to be Neolithic in date.

The 2006 report recommended the analysis of elements of the assemblage in their entirety. Techo-functional analysis of material from discrete, distinctive contexts is being undertaken as part of Sol Mallia Guest's doctoral thesis (UCD), The use of flint in the Irish Early and Middle Neolithic.

•In collaboration and integrating with Ms Mallia Guest's research Dr Aimée Little, Department of Archaeology, University of York undertook a targeted microwear study of a number of discrete contexts:
•Context 107, in an area associated with quarrying and working of porphyritic andesite for axe production
•Flint cache in Context 414
•Context 904, beach gravel with significant quantity of lithics
•Flint spread in Context 904.

The ceramic assemblage

Currently located in the National Museums Collection Centre, Edinburgh, in the care of Dr Alison Sheridan, Research Associate, Department of Scottish History & Archaeology, National Museums Scotland. This follows on the granting of an export licence from the National Museum of Ireland in 2012. Dr Sheridan retired in 2019 and is now positioned to write a detailed report and catalogue.

There is an Early Neolithic Carinated Bowl (CB) element, directly related to the working of porphyritic andesite in Cutting 11, in the western valley. The majority is Middle Neolithic Carrowkeel (C'Keel) Ware pottery, from features on the floor of the eastern valley. Non-funerary finds of Carrowkeel pottery are uncommon. This relatively large assemblage demonstrates links with the builders and users of the Irish passage tomb tradition and across to Wales, specifically to sites in Anglesey.

•Dr Sheridan, an expert in the Neolithic pottery of Ireland and Britain provided an illustrated report and catalogue on the ceramic assemblage. This will be developed to include petrological analysis of thin-sections.

As part of a programme of molecular and compound-specific stable isotope analysis of nearly 500 Irish Neolithic vessels (Smyth, J. and Evershed, R.P. 2015 The molecules of meals: new insight into Neolithic foodways PRIA 115C, 1-20) Dr Jessica Smyth, UCD School of Archaeology analysed 21 sherds from Lambay. While the lipid concentrations were relatively low, the results were consistent with the wider results of the programme which yielded a strong dairy signal, indicating high dairy production and consumption.

•Under the auspices of the IRC-funded project, Passage Tomb People (PTP), Principal Investigator, Dr Smyth, further lipid analysis will undertaken. A further sample of 20 sherds was selected in 2021. This will form part of the doctoral work of Lilly Olet at the Organic Geochemistry Unit, University of Bristol, funded under the PTP project. It will involve additional analysis, including the direct radiocarbon dating of lipids.

10. Please describe the methodology used in conducting the research

Quarrying and production of stone axes

Porphyry debitage
Work focused on debitage in Cutting 11. Experimental work provided a reference collection. Baseline size groupings and features were tested against the archaeological evidence for axe production at the site. Mass aggregate analysis was used to analyse material by size, alongside characteristic features of working including diagnostic flake features, as an indicator of production stage. There was comparison of the frequencies of different size groups by context. The presence of roughouts, finished axes and CSTs provides an unparalleled opportunity to reconstruct the production process.

CSTs
A total of 1126 possible CSTs were identified. The 351 utilised tools were analysed by Dr Kelly. Information including tool type, physical properties, tool attributes, damage location and wear traces was recorded. This were used in interpretive analysis of the assemblage. Database entries and artefact labels will now be updated. The CSTs provide a key complement to the debitage analysis, as well as insights into other activities.

Lithics

Low and high power microscopy were used to analyse archaeological traces on flint artefacts from a range of contexts. Analysis was undertaken by Dr Little in the PalaeoHub Microscopy Lab, University of York. This enabled the identification of 1) Whether lithics were used prior to deposition and 2) If traces were preserved the contact material was recorded (hide, meat, bone, wood, siliceous plant or other material).

Out of the sample of 100 lithic artefacts, a sub-sample of 50 pieces, consisting of debitage and more formal retouched tools, is being analysed microscopically for archaeological wear traces. The aim is two-fold; to interpret the function of the lithics prior to their deposition and at a broader level interpretation of features in which the lithics were located.

Pottery

Pottery Analysis
The pottery was examined, macro- and microscopically, by Dr Sheridan in accordance with standards set out by the Prehistoric Ceramics Research Group. An estimate of the MNI of vessels is difficult, but several tens of vessels are represented. All aspects relating to the manufacture and use of the vessels were examined. Photomicroscopy of features was undertaken.

Petrological examination of representative sherds will be undertaken by Dr Patrick Quinn (University College London), who will prepare ceramic thin sections. Illustration will be undertaken by Marion O'Neil.

Organic residue analysis
An examination of the pottery assemblage through ORA will probe the nature of activity at the site, in particular comparing lipid residues from Early Neolithic and Middle Neolithic pottery. In addition to providing valuable new information on subsistence and consumption practices, lipid analysis could assist in resolving the temporal connectedness of Lambay with the wider passage tomb phenomenon. Fatty acids in animal fats absorbed into pottery offer a unique source of short-lived radiocarbon, derived directly from the commodities processed in the vessels, and hence provide potential for additional radiocarbon dates. Following on the granting of licences to export and alter by the National Museum of Ireland (permit number 7410 and 7411) ORA and dating will take place in late 2021/early 2022.

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

Quarrying and production of axes

Porphyry debitage
Work is ongoing but key observations were made. From excavated evidence an initial quarrying stage can be recognised; blocks whose outer face was glacially striated were removed. Experimental work and analysis of site contexts indicate this was followed by an initial reduction phase using 'flaking', producing little diagnostic debitage. In a roughing out stage there is an increase in diagnostic debitage. Experimental work indicates a high probability of roughout breakage at this stage when attempts are made to create new angles to knap material. Hence there was a shift to pecking in the production process, which is difficult to recognise in excavation deposits. Experimental work demonstrates that grinding porphyritic andesite is less time-consuming and commenced earlier in the production process compared to other lithologies.

Coarse Stone Tools

● Dr Kelly's report appended – Annex 1

Hammer stones, rubbers, grinding stones, ground porphyry chunks, anvils and polishers are major categories. A range of lithologies were used for hammerstones, rubbers and grinding stones. There is a predominant use of secondary sources, utilizing the range of lithologies on the island's beaches with a preference for rounded, sub-rounded and sub-angular material relating to tool function. Complementing these are angular 'porphyry chunks', material derived from the quarrying and processing of porphyry for axes that was utilized for CSTs. Anvils (and perhaps some smaller hammer stones) are related to bipolar flint technology. The majority of CSTs are associated with the quarrying and working of porphyritic andesite for axe production.

Lithics

● Dr Little's report appended - Annex 2

To date 23 pieces have been fully analysed. There is a predominance of wood-working traces across different contexts, mostly from scraping, though sometimes resulting from cutting, playing and whittling. Wood hardness varies, suggesting working of different wood types. Tools are rarely used intensively and very occasionally were used to work other materials, such as bone and meat. Dominance of woodworking evidence indicates material not derived from settlement activities, where a wider range of contact materials would be expected. Microwear analysis suggests specialised tool-using activity, focused on crafting wooden objects. It is tentatively suggested that some of the flints may have been used to produce hafts or other wooden objects involved in quarrying and axe production.

Pottery

● Dr Sheridan's report appended - Annex 3.

Excavation produced between 500-600 sherds and numerous fragments. Estimating the number of vessels is difficult due to the assemblage's highly fragmented nature; several tens of vessels are represented. A distinction can be made between a small assemblage of fine, thin-walled Early Neolithic traditional Carinated Bowl pottery, mostly in Cutting 11-11W-11E; an even smaller assemblage that may represent modified Carinated Bowl pottery, in TP13, Main Area (North), Cutting 6; and the remainder of the assemblage, concentrated in the Main Area (South) plus the adjacent area, Main Area (North), with its pottery-rich Feature 1 pit fill. This comprises thicker-walled, mostly coarse decorated vessels referred to as 'Carrowkeel Ware', dating to the Middle Neolithic. Associated are some other vessels, lacking the characteristic 'stab' and 'stab and drag' decoration of 'Carrowkeel' bowls.

12. a) Please provide details of the dissemination of the outcomes from this project (inc. publications, presentations, outreach, media etc.) including details of any social media/web platforms used to publicise this project

The Principal Investigator organized a field trip to the Eagle's Nest site on Lambay on Monday 5 July 2021. This was intended for all members of the project team who could attend and other interested colleagues. It was a very useful opportunity for site familiarization for those who had not visited the island or site before and contributed to discussion of key issues, not least the extent and nature of Neolithic quarrying and other activities beyond the excavation area at the Eagle's Nest site.

From 14 August-23 August 2021 the Principal Investigator was on Lambay. During this period he contributed discussion of the Eagle's Nest site and the current project to both residents and visiting groups to the island, including those organized by Malahide Charter Boat (the Naomi Leigh).

On 10 September 2021 Dr Brendan O'Neill led a field class in a UCD School of Archaeology undergraduate module;
ARCH30500: Experimental Archaeology and Ancient Technologies.
The class made miniature stone axes from porphyritic andesite pebbles collected during field trips to Lambay in July and August 2021. The approach taken by Dr O'Neill was to explain the process of production in line with Karen O'Toole's previous research on miniature axes, and to demonstrate the links between research and teaching. Each member of the class recorded weight loss over time through grinding, gaining an appreciation of the signifiance of this process in the overall production sequence.

As part of the St Anne's Park Community Archaeology Programme September to November 2021 (organised by Dublin City Council, supported by the Heritage Council's Heritage Plan Grant Scheme 2021 and Creative Ireland) on 18 September 2021 Dr Brendan O'Neill demonstrated the technology of stone axe manufacture and used the Eagle's Nest, Lambay as a local and relevant case-study to talk about how people in the past used resources not just because they were accessible and functional but also for other, 'special' reasons, and/or because they came from a special placeThis event was attended by the Lord Mayor of Dublin, Councillor Alison Gilliland.

St Anne's Park Community Archaeology Programme 2021

Lord Mayor of Dublin, Alison Gilliland and Dr O'Neill at Stone Axe making in St Anne's Park

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

Peer reviewed publications

The significance of the site and the scale and range of archaeological evidence discovered over the course of the excavation merit final publication, after the completion of post-excavation analysis, discussion and interpretation, as a peer-reviewed monograph. It is anticipated that this would be with a publisher with an international reach and peer-review process. It is intended that this would be both in hardcopy and digital format, insuring access and international reach. Possible publishers include the Royal Irish Academy, Sidestone Press (Leiden) and Oxbow.

Anticipating that final publication awaits the end of the process of post-excavation and acknowledging the range of expertise among the project team members, the potential research value of the results of work streams and active encouragement to publish results, the production of up to three high impact peer-reviewed journal articles is seen as realistic. The following journals have been identified: Antiquity, Proceedings of the Prehistoric Society, European Journal of Archaeology and the Journal of Archaeological Methods and Theory.

The Antiquity Project Gallery showcases archaeological research from around the world in the form of short, well-illustrated and free-to-access articles, https://antiquity.ac.uk/open/projgall. A paper will be submitted in 2022 profiling the significance of the site and ongoing post-excavation analysis.

All publications will be deposited in and accessible via the UCD research repository. Regarding the monograph individual chapters will be given a DOI so they are more accessible.

Conference papers

It is anticipated that results would be presented at the following conferences, which regularly feature sessions on the Neolithic period and/or quarries:
European Association of Archaeologists
Society for American Archaeology (Prehistoric Quarries Working Group)
Neolithic Studies Group
Lithic Studies Society

Colleagues on the team may wish to present conference papers on the results of their research at more specialist or subject specific conferences. This will be strongly encouraged.

Public engagement

Team members have come up with a number of initiatives that will be given active consideration. These include:

After discussion with the editor the Principal Investigator is committed to publishing an article in the Autumn 2022 issue of Archaeology Ireland. This will be an opportunity to update a piece written close to the start of the excavation (1995) and to present and focus on the results of ongoing post-excavation analysis.

A recorded lecture by the team. This would be available digitally and permanently (for example on the UCD School of Archaeology website), intended for education and public outreach.

A public engagement event in Spring/early summer 2022 which will focus on the story of the Eagle's Nest site, its role on Lambay and beyond and its connection to the passage tomb tradition. This would aim to encourage people to think beyond artefacts to the people who made the axes and other objects and created this special place. This will be conducted as a hybrid event; online and in person, and held in the Fingal County Council area.

[NOTE: It is planned that this event will be organized to complement a project team workshop to discuss and integrate ongoing research in the Eagle's Nest site, as an element of work in 2022.]

Talks with local societies and/or at a larger scale through a display of site material and work at an event such as the UCD Festival (June) or potentially working with an organization participating in Heritage Week 2022.

How did the grant enhance your professional development (e.g. in terms of specific opportunities, opportunities for enhancing skills, collaborations with others etc.)?

Development of the project has led to the formation of a very strong project team with enthusiastic involvement of a number of Irish and international colleagues with relevant specialist expertise.

Professor Gabriel Cooney, Emeritus Professor of Celtic Archaeology, UCD School of Archaeology, director of the project.
Professor Graeme Warren, UCD School of Archaeology, Mesolithic and lithic specialist.
Dr Neil Carlin, UCD School of Archaeology, Neolithic specialist.
Ms Joanne Gaffrey, National Museum of Ireland, archive and data management.
Dr Bernard Gilhooly, National Museum of Ireland, stone axe specialist.
Dr Niamh Kelly, National Print Museum, specialist in coarse stone tools (and education and outreach).
Dr Aimée Little, Department of Archaeology, University of York; Lecturer in Material Culture, Experimental Archaeology and Early Prehistory, Director of the YEAR Centre, specialist in microwear analysis, Director of the PalaeoHub Microwear Laboratory.
Dr Brendan O'Neill, UCD School of Archaeology, lecturer in Experimental Archaeology, Deputy Director, CEAMC, specialist in lithic technologies and tools.
Ms Lilly Olet, doctoral researcher (Passage Tomb People Project), Organic Geochemistry Unit, University of Bristol.
Dr Alison Sheridan, Research Associate, Department of Scottish History and Archaeology, National Museums Scotland, Neolithic and ceramics specialist.
Dr Jessica Smyth, UCD School of Archaeology, Principal Investigator; Passage Tomb People (PTP) project, IRC Consolidator Laureate Grant 2018-2022, Neolithic and biomolecular approaches, with particular expertise in organic residue analysis.
In addition to the key members of the project team; with anticipated involvement in the project Mr Conor McDermott, Laboratory and Field O
Ms Sol Maria Guest, doctoral researcher, UCD School of Archaeology, techno-functional analysis of lithics.
Marion O'Neil, Edinburgh, pottery illustrator.
Mr Martin Moucheron, doctoral researcher, UCD School of Archaeology, lithics.
Ms Karen O'Toole, doctoral researcher, UCD School of Archaeology (advice on the production process).
a) Dr Patrick Sean Quinn, Principal Research Fellow in Ceramic Petrography, UCL Institute of Archaeology.

On the basis of ongoing research at the Eagle's Nest quarry site, and on the North Roe Felsite Project, Shetland, both of which demonstrate the importance of stone quarrying in north-west Atlantic European prehistoric societies, the Principal Investigator has been asked to be a project member on the LAST (Life After the Storegga Tsunami (c. 6150 BC)) project, funded by the Norwegian Research Council. This project is led by Professor Astrid J. Nyland, Archaeology Museum, University of Stavanger, Norway. Professor Nyland and a number of Norwegian colleagues visited the Eagle's Nest, Lambay quarry site in March 2019.

Lambay Island, Co. Dublin (93E144): Course Stone Tool Report

Niamh Kelly

October 2021

1. Introduction

This report details coarse stone tools excavated on Lambay Island, Co Dublin. The survey and excavation project on Lambay focused on a Neolithic stone axe quarry and production site that was carried out between 1996 and 2001. The main concentration of Neolithic material comes from the area known as the Eagle's Nest, and the surrounding valley floor (Cooney 1997; 1999), with the earliest activity in this area starting around 3800BC (Cooney 2009, 13). The Eagle's Nest is located close to the centre of the island, just to the west of the island's highest point and sits approximately 110 metres above sea level. This complex of archaeological features has been interpreted as a Neolithic axe factory with associated depositional material and activities. During this excavation and post-excavation process, numerous coarse stone tools were identified and entered into the site's databases. This report focuses on this coarse stone tool material, re-examines this material, and provides up-to-date classifications and interpretation of tool use and function.

2. Methodology

A total of 1126 possible coarse stone artefacts were identified in the Lambay site database for analysis. The majority of these possible tools were initially identified by their database classifications and artefact descriptions, though a small number were also identified through visual inspection of material. All of these tools have been macroscopically analysed and, from this number, 351 utilised tools were identified. All objects have been individually recorded with all relevant data, including name, number, context, dimensions, weight, damage type, and damage location noted as well as classifications, descriptions and other relevant information from the original database to allow for this data to be crosschecked and integrated easily with it. The Wentworth (1922) sediment grain size scale has been used to classify pebbles and cobbles within this report. A fragment is defined, in this instance, as representing less than 50% of the original object. There is no published standardised classification system for coarse stone tools from Britain and Ireland. This report has used those classifications and tool descriptions that appear most commonly in archaeological reports (see Table 2.1) and were identified in this author's 2020 doctoral thesis (Kelly 2020). This allows for comparisons between this material and other materials from similar periods.

Table 2.1. Range and number of coarse stone tools present at the site

Tool Type	Number
Hammerstones	108
Rubber	96
Grinding Stone	30
Ground porphyry chunks	76
Spalls	27
Anvils	18
Polishers	8
Maul	1
TOTAL	**351***

***Some tools appear in multiple categories; this number represents the total number at the site**

3. Hammerstones

Hammerstones were the most numerous tool-type identified within the coarse stone tool assemblage. These are handheld tools used primarily for percussive action but can have a multitude of different functions. A total of 108 examples of hammerstones were identified at Lambay, with thirteen of these showing evidence of multifunctional tool use. They are the most varied tool category for damage type and geology and are discussed in further detail in the sections below.

Table 3.1. Range of geologies used in hammerstones

Geology	Number
Sandstone	68
Quartzite	10
Tuff	7
Porphyry	6
Conglomerate	5
Quartz	4
Flint	2
Mudstone	2
Limestone	1
Unidentified	1
Old red sandstone	1
Granite	1
TOTAL	**108**

3.1 Raw material selection

All the tools from this category are composed of secondary source geologies, most likely gathered from the beaches below and transported to the site. The majority are from rounded or sub-rounded pebbles and cobbles (55%), with only four examples composed from angular pebbles. There are several benefits for selecting these materials for use as tools and, in particular, hammerstones. The use of rounded and sub-rounded material with their smoothed working surfaces allows for the comfortable grip of stones in the hand, making them easier to utilise (accepting size and weight as factors that can impact this) (Kelly 2020, 87-88). The majority of the raw material selected for these hammerstones also fall into a consistent size range, which is reflective of the handheld nature of these tools (see Fig. 3.1). Water rolled pebbles and cobbles have multiple working surfaces that can be utilised for various tasks without any or only minimal alteration. These water rolled surfaces can be helpful for many coarse stone tool types but are particularly important when it comes to hammerstones. Where these tools are being used for high impact tasks (such as flint knapping), the rounded surfaces of water rolled pebbles are better suited than flat surfaced materials as these rounded surfaces allow for the better absorption and diffusion of energy created by impact, and the stone is less likely to break during this process (Finlay 2008, 74; Kelly 2020 87-88).

Water rolled material comes in a range of geologies, sizes, morphologies and weights; the variety among the stone allows for a broad selection of material to choose from and allows for the expedient creation and use of a tool (Clarke 2006, 1). This diversity is reflected in the hammerstone assemblage from Lambay, which represent the broadest range of geologies from a coarse stone tool type from this site (see Table 3.1). Sandstone makes up 63% of all geological types, with quartzite, tuff and porphyry being the next most frequently used geologies at 9%, 6% and 5%, respectively (see Fig. 3.2). Sandstone is frequently used geology for hammerstones, as depending on granularity, it can be quite a hard geology (Attewell & Farmer 1976; Kelly 2020, 136-137). Quartzite is a well-recognised geology for hammerstones, as it is capable of absorbing high-impact damage without breaking (Anderson *et al.* 1996, 172). Tuff and porphyry are both native geologies to Lambay, so their inclusion is also unsurprising. As porphyry is the primary geology being worked on Lambay due to the production of stone axes, using a porphyry hammerstone (or knapping any lithologies with a hammerstone of the same lithology) is sensible as the tensile strengths of the knapped material, and the hammerstone is the same.

3.2 Tool use

Pecking was the damage found most frequently on these hammerstones. It occurs on 97 out of 108 (90%) tools. Those tools that did not have evidence of pecking all had evidence of flaking; flaking occurred on 24 out of 108 (22%) of tools. Both flaking and pecking are damage characteristic of hammerstone use, and both are caused through high-impact use. These types of damage, along with their form and size, allow hammerstones to be categorised. These damage types can be seen on (93E144:9623) (see Fig. 3.3 and 3.4). Two other damage types seen in these tools are crushing (found on eight examples) and strike damage (found on six examples). Again, these types of damage are (like pecking) fatigue wear and are associated with hammerstones, though they are less frequently seen. The final type of damage seen is grinding, which is found on five examples, and this damage is linked to these tools being multifunctional. An example of this is (93E144:77810), a multifunctional hammerstone and rubber (see Figs. 3.5 and 3.6). The ends of this artefact are pecked and ground and possibly intentionally shaped, giving one end a 'pestle' like appearance. Approximately 50% of these tools have damage in multiple locations. The most frequent location for damage is the tool ends, which is present in 80% of the hammerstones analysed. This is followed by tool faces on 50% of hammerstones and tool sides on 31% of examples.

Hammerstones were recovered from across the site as demonstrated by their recovery from eleven different test pits across the excavated area (TP2, TP4, TP6, TP7, TP9, TP10, TP17, TP18, TP20, TP24, TP26). However, a core concentration of these tools comes from the main contexts at Eagle's Nest (C408, C409, C410, C107, C108, C110), where 23 tools were recovered. A further seven hammerstones were recovered from the interface layers directly above the cairn and pit material in Cutting 5 (C502), while another hammerstone was recovered directly from the fill of F7. Seven hammerstones were also found in the fill of F1 – a pit lying northwest of Cutting four which a cairn would have originally overlain. This cairn has been greatly disturbed by cultivation (Cooney 1996, 7-8), and an additional three hammerstones were found in this overlying disturbed context. A total of 28 hammerstones were also recovered from disturbed/ cultivation layers, topsoils or rabbit burrows (C801, C902, C401, C112, C601, C602, C406, C402, C802, C901, C702, C501, C1W01). Contexts for a small number of hammerstones are still trying to be resolved; this section will be updated accordingly to reflect this information.

The range of geology and damage types found on hammerstones often indicate that these tools are multifunctional and could be used to complete a wide range of tasks. For example, larger hammerstones may represent pounders for breaking open hazelnuts on an anvil stone (Clarke 2013), and other possible uses include opening nuts, breaking open bones or for breaking open other rocks (VanGijn and Houkes 2001, 203). Given the strong association of these hammerstones with the main areas of activity at the Eagle's Nest and the surrounding pits and disturbed cairn material, the examples from Lambay are likely associated with stone axe production and the knapping of porphyry.

Some of the examples are also likely associated with flint knapping and used in association with the anvils recovered from the site. Very small or lighter examples may have been used for blade or flake production (Anderson *et al.* 1996).

4. Maul

A single example of a maul was recovered from Lambay (93E144: 9842) (see Fig. 4.1). This tool is best seen as almost a subcategory of hammerstones. Mauls, like hammerstones, are percussive tools; they accrue the same damage and use-wear as seen in hammerstones (Adams 2002, 152). However, they are distinguished from their percussive counterpart in the groove or waisting around the middle of the tool, allowing it to be hafted (ibid). The example from Lambay is discussed further below.

4.1 Raw material selection

The single example of a maul from Lambay makes use of a coarse-grained sandstone water-rolled cobble, most likely collected from the shoreline below and carried to the site. This follows the pattern seen with the general hammerstones, where sandstone was the preferred geology for percussive tools at the site, and with all of the examples of hammerstones using secondary source geologies. The cobble is ovoid in shape and section and sub-round overall. This again follows the pattern seen above, and as already highlighted, rounded, and sub-rounded pebbles and cobbles are preferred for high impact percussive tools, as the rounded surfaces of these materials are better suited for the absorption and diffusion of energy created by impacts sustained through use and as such the tool less likely to break during use (Finlay 2008, 74; Kelly 2020 87-88). The maul has maximum dimensions of 88x50x26mm (LxWxD) and a weight of 182g.

4.2 Tool manufacture and use

There is substation evidence of damage to this tool; however, not all of it is from its use. This maul shows significant evidence of pre-use manufacture. This tool's working end and butt end have been ground to provide a more distinct shape and working edge to this tool and comparable to pre-use manufacture seen in other Irish examples (Woodman *et al.* 2006, 189). The working end is the widest point in the tool at approximately 50mm across the butt end, in contrast, is only 27mm across. The maul also has evidence of waisting on both sides, approximately starting one-third of the way down from the use end. This is characterised by notches to both sides, which have been created through pecking. These notches cover an area of 15x12mm on one side and 13x11mm on the other. There is some pecking in the centre of both faces, and this may have been an attempt to extend the waisting around the entirety of the pebble. While this wasting or notching is not as well defined as other examples seen in the broader archaeological record (Adams 2002, 162), it serves the same purpose; to allow the maul to be easily hafted (ibid. 152). Like an axe, the working end of the head of the maul would have been hafted parallel to the handle (ibid. 160).

This maul was recovered from C707, a palaeosoil from Cutting 7. A number of other coarse stone tools were also recovered from this context including four hammerstones (93E144:9733; 93E144:9734; 93E144:9744; 93E144:9910), a rubber (93E144:9134), a spall (93E144:9136) and a ground porphyry chunk (93E144:6670). Mauls can be used in various percussive tasks, such as pounding in stakes or driving edges into wood (Adams 2002, 173). It is possible that this tool was used to remove porphyry from its parent outcrop either directly using impact damage or indirectly by driving in wedges into fractures in the outcropping to remove material.

5. Spalls

A total of 27 spalls were identified from the Lambay database. While spalls are not tools in and of themselves, they are a product of tool use. Spalls are usually thin, often disk-shaped pieces of stone that have been removed from their parent stone through percussive action (Anderson *et al.* 1996, 172). They have a rounded outer weathered surface visible on one side and the rough inner surface of the stone visible on the other (Kelly 2020, 142). Spalls also generally occur where the sides or face meets the ends of the pebble or cobble (ibid.). This section discusses these 27 spalls and their associated attributes.

Table 5.1. Range of geologies used in spalls

Geology	Number
Sandstone	24
Quartz	1
Granite	1
Conglomerate	1
TOTAL	**27**

5.1 Raw material selection

Of the 27 spalls recovered from Lambay, all of them appear to have come from secondary source geologies and are consistent with being removals from water rolled pebbles or cobbles. The majority of these spalls (24 out of 27) were composed of sandstone (see Table 5.1), with the remaining three examples composed of quartz, granite and conglomerate geologies, respectively. This predominance of sandstone follows the pattern of geology use seen across all coarse stone tool categories, but significantly the dominance of this geology within the hammerstone category will be further discussed below.

5.2 Tool use

Of the 27 spalls, only eight (30%) show evidence of damage. In those instances, strike damage is the most frequently seen and is present in five examples (e.g. (93E14:77713) see Fig. 5.1). Pecking is visible in two examples; flaking is visible in one example, as is grinding. As spalls are typically removed from their parent stone through percussive action (Anderson *et al.* 1996, 172), these spalls are likely due to the parent stone being used as a hammerstone. This fits in well with other evidence from Lambay, with 78 examples of hammerstones identified from the site and associated debitage from the manufacture of stone axes (Cooney 1998, 115). This also fits with the other damage visible on the spalls – flaking, pecking and grinding; flaking and pecking are also damage characteristic of hammerstone use. While grinding indicates a different use (most likely as a rubber or grinding stone), approximately 10% of hammerstones from the site indicate multifunction use, so this grinding damage is likely reflective of this.

Of these 27 spalls, contexts were identifiable for 18 of them. Of these 18 spalls, 16 came from contexts that also contain hammerstones. The majority of these came from C408, C602 and C503. C408 is from cutting one and is located at the central area of activity at the Eagle's Nest site. A significant portion of the coarse stone tools from Lambay come from this context. C602 is a general cultivation soil, which contained other coarse stone tools, struck flint and Neolithic pottery (Cooney 1996, 8-9). C503 is an interface of this cultivation soil. Of the remaining 2, one was recovered from F8 in Cutting 5, which was a low-lying cairn of stone material (Cooney 1996, 9), and the other was recovered from a stone sample which was taken from F1, a large pit in Cutting three which contained carefully arranged surfaces of stone, and deposits of flint and pottery (ibid. 7-8). The recovery locations of these spalls highlight their close association with hammerstones and their association with axe manufacturing and flint knapping as the large proportion of flint from the site was recovered in these cultivated soils. The contexts of the remaining nine examples are still trying to be resolved, and this section will be updated accordingly to reflect this information.

6. Rubbers

Rubbers are handheld, abrasive tools utilised for a range of tasks and activities (Clarke 2006, 45). While rubbers, like most coarse stone tools, can vary somewhat in form, a combination of distinct characteristics allows for their categorisation, primarily their use-wear, the use-wear locations and the size of the artefact. There are one of the more frequently occurring coarse stone tool types, and there are 96 examples identified in the Lambay assemblage. These rubbers and their associated attributes are discussed below.

Table 6.1. Range of geologies used in rubbers

Geology	Number
Sandstone	80
Porphyry	11
Old red sandstone	2
Tuff	1
Mudstone	2
TOTAL	**96**

6.1 Raw material selection

The rubbers recovered from Lambay make predominant use of secondary source geologies, with 84% of all tools in this category making use of it. The majority of the raw material selected for these rubbers fall into a consistent size range, which is reflective of the handheld nature of these tools (see Fig. 6.1). There is also a preference for sub-angular (55% of all secondary source geologies) and sub-rounded material (17% of all secondary source geologies). This material would be more comfortable to hold in the hand than angular material and provide useful faceted surfaces to be worked (Kelly 2020, 118).

The most commonly used geology for these tools is sandstone, representing 83% of all rubber examples (see Table 6.1 and Fig. 6.2). Sandstone is a useful geology for abrasion due to its softness and texture and is often utilised by rubbers (VanGijn and Houkes 2002, 203; Clarke 2006, 45; Kelly 2020, 93-94). Old red sandstone outcrops on Lambay and sandstone outcrops on the mainland shoreline nearby at Portrane (Parkes 2012, 12-13; 26). The next most frequently used geology is porphyry which represents 11% of rubbers from this site. Of the porphyry examples recovered from the site, seven use primary source geology, indicating that these are likely advantageously reused pieces of waste material that are by-products of stone axe manufacture happening at the site (Cooney 2009, 13; Kelly 2020, 89-90). It is unsurprising waste material is being used in this way, considering the quantity of material that would have been available at the site. However, perhaps more interesting is the use of secondary source water rolled material which is seen in four rubber examples. While the waste porphyry material could be argued as purely advantageous due to its ready availability, the curation and transport of the same people from the shoreline below to the site itself indicates that the geology itself held value too. The use of this material is discussed further below.

One final note on the use of porphyry for rubbers; likely, the quantity of porphyry rubbers discussed in this section is not a true reflection on the number of porphyry rubbers from this site. There are many other porphyry pieces from the site which show evidence of grinding and rubbing; however, at this time, it is unclear if this damage represents human-made damage through use or natural damage through glacial scarping. These pieces are discussed in more detail in a section below.

6.2 Tool use

Grinding damage is obviously visible on all rubber examples as this damage is one of the features which defines these tools identification (e.g. (93E144:5093) see Fig. 6.3). However, other damage types are visible in a couple of instances, including polishing (in one example), pecking (in five examples) and two tools also shows possible strike damage. Two examples also show evidence of incised lines. In 81% of tools, damage occurs in only one location, and in the remaining 19%, damage occurs in multiple locations on the tools. Damage is most frequently located on the face of these tools (61% of tools), followed by the ends (40% of tools) and finally, the sides (22% of tools).

Because sandstone is the most dominant raw material used for these tools, it should be noted that grain size for sandstones can vary from coarse to fine-grained; damage and wear traces on these tools can vary. Wear traces are influenced by geology, grain size and the material the rubber is worked against (Adams 2002, 28-29). Therefore, rubbers can possess a range of wear traces on their worked surfaces, including abrasion, grinding and polishing. As mentioned above, two examples (93E144: 78390; 93E144: 5603) also show evidence of being incised (see Fig. 6.4). This is not a typical damage type associated with rubbers. These incised marks run in parallel lines on the side, ends, and faces of these tools, which may result from using these tools to sharpen a blade edge. The five examples which have pecking (93E144:7939; 93E144:77810; 93E144:5096; 93E144:78742; 93E144:19391) indicate that these were multipurpose tools that were also used as hammerstones. The two examples have possible strike damage; the first example is one of the previously mentioned hammerstones (93E144: 19391). The second example (93E144:5833) is represented by only a fragment of the original tool and is in quite a bad condition; however, this strike damage may be an indicator of this tool being used as a hammerstone or of this rubber being purposely broken. The purposeful breaking of rubbers is not a phenomenon frequently seen in prehistory; however, the purposeful breaking of grinding stones is (Kelly 2020 163-167). This phenomenon is discussed in great detail in the grinding stone section below.

Rubbers were recovered from across the site, as demonstrated by their recovery from nine different test pits across the excavated area (TP2, TP6, TP7, TP8, TP10, TP12, TP14, TP15, TP18, TP21). However, the core concentration of these tools comes from the primary contexts at Eagle's Nest (C408, C409, C410, C111, C912, C404), where 25 tools (or 26% of all rubbers) were recovered. A further fifteen tools (or 16% of all rubbers) were recovered from the interface layers directly above the cairn and pit material in Cutting 5 (C503), while another four were recovered directly from the fill of these features themselves (F3, F7 and F8). A total of 32 rubbers were also recovered from disturbed/ cultivation layers, topsoils or rabbit burrows (C1W01, C902, C502, C401, C602, C402, C507, C702, C901). Contexts for a few rubbers, five in total, are still trying to be resolved; this section will be updated accordingly to reflect this information.

Rubbers can be used for various tasks, including the grinding/ crushing of seeds and grain or preparing mineral inclusions for ceramic production (Clarke 2006, 45-46). However, the evidence from Lambay does not support these suggested functions. None of these rubbers have been found directly associated with grinding stones, which might be expected if used to process grains or seeds. Further, as discussed above, a very significant number of these tools have been found in direct association with axe production material deposits, suggesting that these tools were used in this process. These rubbers can be interpreted as tools used for finishing or fine polishing of axes in the final stages of their production and the sharpening of the axe blade. Further, using the same lithology as the axe in these stages of the production process can be highly effective for finishing and polishing an axe (Gilhooly 2017). This is perhaps the reason why porphyry is a frequently used geology for these tools and why such effort was made to transport water rolled examples from the shoreline when so much waste material was readily available.

7. Polishers

Within this class of rubbers, there is a sub-class of burnishers/polishers. Like the general class of rubbers, these are handheld abrasive tools. However, the only wear traces visible on these tools is polishing or burnishing. This polish or sheen is caused by tribochemical wear. Tribochemical wear results from a combination of mechanical and chemical interactions and is visible on the surface of the tool as a polish of sheen (Adams 2002, 27-33; Adams et al. 2019, 45-46). These tools would have been used in a very similar way to rubbers and are discussed in more detail below.

Table 7.1. Range of geologies used in polishers

Geology	Number
Sandstone	4
Chert	2
Jasper	1
Porphyry	1
TOTAL	**8**

7.1 Raw material selection

Of the eight identified polishers/ burnishers four are composed of sandstone (93E144:7372; 93E144:2570; 93E144:6562), two are composed of chert (93E144:8250; 93E144:7734), one is composed of porphyry (93E144:9841), and one is composed of jasper (93E144:5727) (see Table 7.1). Raw material selection for polishers is important from two perspectives; firstly, the geology is appropriate to the task it is being used for. As discussed above, both sandstone and porphyry are useful geologies for rubbers. Secondly, not all geologies will polish or sheen; the propensity for a geology to take on a sheen is affected by mineral composition and granularity of the stone as well as the duration and intensity of use of the worked material (Adams *et al.* 2019, 50). Both chert and jasper are geologies that can be polished.

These polishers all make use of secondary source geology water rolled pebbles or cobbles. Again, this is important as they contain naturally smoothed surfaces due to their water rolling, and flatter surfaces are more likely to be reflective, so they are better for retaining a polish (Adams *et al.* 2019, 50). This makes secondary source geology more suitable for polishers/ burnishers.

7.2 Tool use

Polishing/ burnishing damage is obviously visible on all tool examples (as this is one of the features that defines these tools identification) and is the only damage type identified on these tools. This damage occurs on the tool's faces (in seven out of eight examples) and ends (in two out of eight examples). Three of the eight examples also have damage in multiple locations. As mentioned above, this polish is caused by tribochemical wear. Tribochemical wear occurs when adhesive wear, abrasive wear and fatigue wear work together to create an environment that allows for chemical reinteractions (Adams *et al.* 2019, 47). These chemical interactions produce 'reaction products'; films and oxides that build up on surfaces of stone which create a sheen or polish (Adams *et al.* 2019, 47; Adams 2002, 31).

Three polishers (93E144: 9841; 93E144: 5727; 93E144: 18073) were recovered from contexts in the Eagle's Nest area (C904, C107). Three further examples (93E144: 2570; 93E144: 8250; 93E14: 7372) were recovered from test pits (TP2, TP08, TP22). One more example (93E144: 77734) was found within the pit fill of F7 in Cutting five, and the final example (93E144: 6562) was recovered from cultivation soils (C502) overlying these Neolithic cairn and pit features in Cutting 5. Like the rubbers discussed above, these polishers can be interpreted as tools used for finishing or fine polishing of axes in the final stages of their production and the sharpening of the axe blade. One of the polishers (93E144: 9841) is quite striking and similar to polishers found at Dalkey Island (see Fig. 7.1 and Fig. 7.2).

8. Grinding stones

Grinding stones are a common class of coarse stone tool and are one of the more easily recognised tool types. They are abrasive tools characterised by one or more utilised surfaces. These surfaces are typically flat, saddled or concave in form (Kelly 2020, 122). These tools were not utilised in the hand but instead braced against a rigid surface, while another tool, object or material was worked against it (Adams 2002, 99-113). A total of 26 examples were identified from Lambay; they and their associated attributes are discussed below.

Table 8.1. Range of geologies used in grinding stones

Geology	Number
Sandstone	15
Porphyry	9
Old red sandstone	4
Tuff	1
Pumice	1
TOTAL	**30**

8.1 Raw material selection

The choice of primary or secondary source geologies is evenly split, with 50% of grinding stones composed of primary source geology and 50% composed of secondary source. A slab or tabular shape was also frequently favoured in eleven out of 30 examples of these grinding stones.

Tabular shaped stones are particularly useful for grinding stones as they offer a flattened underside for the worked face, which keeps the tool steady and stable during use as it allows for the grinding stone to be braced against an even surface (Kelly 2020, 124). Sandstone is also the preferred geology for these grinding stones with nineteen examples (or 63%); this is followed by porphyry with nine examples (or 30%) and with 1 example each of tuff and pumice (see Table 8.1 and Fig. 8.1). The link between grinding stones and sandstone is well understood at both an Irish and European level (e.g., VanGijn and Houkes 2001, 203; Clarke 2006, 45; Holst 2010, 2873; Kelly 2020, 93-94). It is a combination of the softness and the texture of this geology that makes it suitable for grinding and rubbing.

The frequency of porphyry being used is also unsurprising as porphyry is by far the most frequently worked geology at the site due to the manufacture of stone axes. As a by-product of this, waste material was utilised for coarse stone tools across this site (Cooney 2009, 13; Kelly 2020, 89-90). The use of waste raw material in this way is unsurprising considering the quantity of material that would have been available.

8.2 Tool Use

Grinding damage is obviously visible on all grinding stone examples (as this damage is one of the features which defines these tools identification). However, other damage types are visible in a couple of instances, including polishing (in two examples), pecking (in three examples), strike damage (in two examples) and incised damage (in one example). This damage most frequently occurs on the face of the tool (in 90% of examples), followed by the sides (in 23% of examples) and finally, the ends (in just 3% of examples). Most of these tools only have damage in one location (67%), but where damage occurs in more than one location, it is most often on the tools second face. The majority of the damage visible on these tools can be directly attributed to its use as a grinding stone, but one of the tools (93E144:13315) has also been used as an anvil; this use is discussed further below.

Of the three types of face profiles which occur for these tools (flat, saddled and dished), dished is the most frequently seen type which is present in 46% of examples (see Figs. 8.2 and 8.3), followed closely by flat in 43% of examples and finally saddled in only 11% of examples. Face profiles vary based on how material is worked against the grinding stone. Flat faces can be the result of two reasons; the first is that the grinding stone was used infrequently or for only a limited amount of time, thus not creating a great deal of wear, and the second is that the entirety of the surface has been used for grinding and therefore the surface has eroded consistently rather than differentially as is the case with saddled and concave grinding stones (Kelly 2020, 124). Dished profiles are created through a predominance of circular grinding and is characterised by a shallow, dished appearance, usually in the centre of the worked face. A saddled face is created through a predominance of linear grinding and is characterised by a linear groove where the stone's surface has been worn down significantly more than the surface on either side of the groove, creating a saddle-like appearance (ibid). Interestingly, in one grinding stone example (93E144:8642) has evidence of pre-grinding surface preparation. There is pecking visible across one face surface, just under the grinding damage. This is a feature sometimes seen on grinding stones as it is done to help provide more purchase on the surface of the tool while it is in use.

Grinding stones can be used for a range of different tasks, but they are most frequently attributed to grinding seeds or grains or stone axe manufacture (Adams 2002, 98). Looking at the location these grinding tools are recovered from at Lambay, and given the predominance of stone axe manufacture, the latter of these tasks is the most likely. Grinding stones have been recovered from numerous contexts across the site, with fifteen being recovered in the vicinity of the central area of activity at the Eagles Nest site and within adjacent pits and cairn material (C107, C404, C408, C410, C904, C111, CW101, C511, C514). These contexts are heavily associated with stone axe manufacturing and the deposition of material associated with this process with complete and roughout axes, as well as axe manufacture debitage and hammerstones coming from these areas (Cooney 1998, 115), so the grinding stones recovered from these areas are undoubtedly associated with these activities. In addition, dished grinding stones are most prevalently associated with axe production (Gilhooly 2017, 282), and it is these types of grinding stones appear most frequently in this assemblage, further supporting their association with this activity. An additional nine were recovered from the disturbed cultivation soils directly overlying Neolithic pit and cairn material (C502, C702). The contexts of the remaining six examples are still trying to be resolved, and this section will be updated accordingly to reflect this information.

Finally, a brief mention of one of these grinding stones (93E144:11312) and its end of use-life. This grinding stone fragment came from a cultivation furrow in an unknown portion of the site. It is a triangular fragment of an old red sandstone grinding stone. This fragment has been ground on one face and covers an area of 52x24mm. This ground surface is smoothed and level, tapering towards the thin end of this fragment, suggesting the profile of the original grinding stone would have been saddled or bowl-shaped. There is a possible impact point also on the surface of this grinding stone which covers an area of 7x2mm and is characterised by a notch along the ground edge (see Fig. 8.4). If this is an impact point, then this may indicate this grinding stone was purposely broken. Given this geology's fine to medium-grained matrix, it is unlikely a large crystal has caused this notch in the geology's matrix. If this griding stone was purposely broken, it could point towards the decommissioning of tools and their ritual deposition, reflecting the more extensive ritual and depositional process happening within the pits at this site (Cooney 1998, 110). The purposeful breaking and deposition of grinding stones have been noted at other Irish prehistoric sites, most notably at Dalkey Island, where an old red sandstone grinding stone (NMI E046: I232) was purposely broken into (at least) three pieces and deposited with the midden and within a pit at this site (Liversage 1968, 146; Kelly 2020, 169).

9 Anvils

Anvils are a well-established coarse tool-type recognised from prehistory until the medieval period and beyond. They are percussive tools and used in tandem with other tools; during early prehistory, they were used primarily with hammerstones in the production of lithics and other stone tools such as axes. They have a hard surface against which another object is struck. These tools are not handheld but rather braced against a rigid surface (Kelly 2020, 126-127). They can have one or more working faces, which are usually flat, at a shallow angle, or moderately rounded (ibid). A total of eighteen examples of anvils were identified within the Lambay database, and they are discussed in detail below.

9.1 Raw material selection

Of the eighteen examples of anvils, seventeen of them utilise secondary source geology, and one example uses primary source geology. Likewise, of these anvils, seventeen are composed of sandstones, and one is composed of tuff (see Table 9.1). Old red sandstone and tuff are native geologies to the island and sandstone outcrops on the mainland shoreline near Portrane (Parkes 2012, 12-13; 26). This predominance of sandstone follows the pattern of geology use seen across all of the coarse stone tool categories, but sandstone has been noted as a useful geology for anvils and in percussive action (Holst 2010, 2873) as it generally sits between medium and hard on the rock hardness scale (40-80 MPa and 80-160 MPa respectively) (Attewell & Farmer 1976).

Table 9.1. Range of geologies used in anvils

Geology	Number
Sandstone	15
Old red sandstone	2
Tuff	1
TOTAL	**18**

9.2 Tool use

Unsurprisingly, pecking is the most dominant form of damage on these tools. It is present on all tools and is mainly located on the tools primary face (in seventeen out of eighteen examples). Half of all examples have evidence of damage in multiple locations. This secondary location is most often the secondary tool face or sides (present in 33% of both locations) followed by the ends in 28% of examples. Five anvils also have other damage types present; two have been flaked, one example has been ground, one example has been ground and polished prior to pecking (93E114: 5632), and one example has been incised. This damage, and some of the other pecked damage, suggests that at least six of these anvils were multifunctional tools; 2 were also used as grinding stones (for example, (93E144:13315) see Fig. 9.1), while the other four were also used as hammerstones.

Not only can anvils be used for bipolar knapping, but they can also be used to reduce very large sections of stone in the initial stages of stone axe manufacturing (Bunch and Fell 1949, 3-4). However, the anvils identified at Lambay are relatively small in size. Considering this, it is likely that these anvils were used for smaller lithic production rather than in the production of axes. Analysis of excavated lithic material from the site suggests that there is a prevalence of bipolar knapped material from the Eagle's Nest location in particular (Dolan and Cooney 2010, 12-14).

However, the lack of larger anvils does not mean that bipolar knapping was not used for larger porphyry pieces. During the Eagles Nest site excavations, stone settings of the large blocks of porphyry were identified (Cooney, 2001,12). These settings had artefactual material built up against them, and the large blocks which form the setting showed evidence of use. Cooney (2018, pers. Comm) has suggested that these were the anvils used during the manufacture of stone axes, and they had been placed in these settings after use, similar to how other material from the site had been deposited. These large blocks were left in-situ during excavations due to their large size.

The majority of the contexts where anvils were recovered from were also cultivation soils (C1W01, C2W02, C602, C501, C502, C503, C403, TP902, TP1701, TP2001) though a couple were also recovered from stone samples taken from TP2 (which was in a large pit) and from over a stone setting in the main area (F27). Just one example (93E144: 5632) comes from a main Eagles Nest site context (C107). This is the anvil that has previously been used as a grinding stone. The contexts for a small number of anvils are still trying to be resolved, and this section will be updated accordingly to reflect this information. Of the eighteen anvils recovered during excavation, fourteen (78%) were recovered from contexts containing hammerstones. The contexts from which the majority of these anvils were recovered (away from the main deposition of materials associated with axe production), alongside their frequency of occurrence in the same contexts are hammerstones, further supports the theory that these anvils were not used in the production process for stone axes, but were instead used in the manufacture of bipolar flint technology.

10. Ground porphyry chunks

While not a coarse stone tool category in and of itself, the abundance of ground porphyry chunks recovered from Lambay, which are not macroscopically recognisable as tools, also need to be discussed. There are 76 examples of these ground porphyry chunks, and they can be very significant in size. These chunks have a similar characteristic; they are ground across the entirety of one portion of the piece's face, ends or sides. Sometimes linear striations are visible, highlighting the direction in which this was ground. However, these ground chunks are problematic because it is unclear whether or not these pieces are naturally or intentionally ground (see Fig. 10.1).

Lambay has many geological features which are products of the last glaciation (Parkes 2012, 11-13); one of these products is glacial striation. This is a process whereby scratches or gouges cut into bedrock by glacial abrasion (McLellan 1971). These striations are usually multiple, straight and parallel and represent the direction of the glacier. The exposed outcrops which had been glacial striated were then, several thousand years later, quarried into for the production of axes and associated tools as discussed previously. This glacially striated material becomes part of the debitage of this stone axe manufacturing process, and it become difficult to differentiate been it, and other porphyry that has been intentionally ground as macroscopically, they appear very similar.

There are a couple of ways in which this material can be differentiated macroscopically. The first is observing if the grinding takes place on one or multiple locations on the porphyry chunk. If it appears in more than one location, it is an indicator that at this grinding is (at least partly) human-made, as glacial striation would only take place on one exposed surface. A second way of differentiating natural and human-made wear is by observing if the linear striations are at cross or perpendicular angles. As mentioned above, with glacial striation, these lines run parallel and in one direction. The final way of differentiating is if the porphyry shows evidence of dishing, saddling or the ground surface is not flat and level. The process of glacial striation leaves a scarped and relatively flat surface, so grinding that appears on concave surfaces is likely, again, human-made. However, when the above methods do not work, there remains a body of material in limbo, where it is unclear whether the damage visible is archaeological or natural, which is the case for the 70 examples in this category.

It is likely, however, that this material could be resolved with some additional research. Microscopic analysis of material would likely differentiate between damage caused by glacial abrasion and that caused by humans. It is suggested that a comparison should be made between glacial abraded porphyry material that has been removed directly from a (non-archaeological) outcrop on Lambay, ground porphyry chunks from the site which have been identified as archaeological using the methods outlined above and the material in this section whose origin is unclear. Experimental archaeology could also offer some control samples for comparison by grinding both undamaged and glacial striated samples and comparing the results. These processes should be able to differentiate the damage caused by glacial abrasion and that caused by human activity.

11. Future Research

While this report provides an overview of the material from this site, there is still further research that needs to be completed. This material would benefit from a more robust examination of their parent contexts and associated materials. Work is currently ongoing on the site matrix. While this report has endeavoured to highlight the locations of these materials within the site wherever possible, better spatial data would likely allow for the identification of discrete pockets of activity happening at this site.

As discussed above, a more thorough investigation into the abundance of ground porphyry chunks recovered from Lambay should be completed. This material, which is presently not macroscopically recognisable as tools, is currently in a state of limbo, and it is unclear if the damage on this material is archaeological or geological.

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13. Lambay Island, Co. Dublin (93E144): Course Stone Tool Report Figures

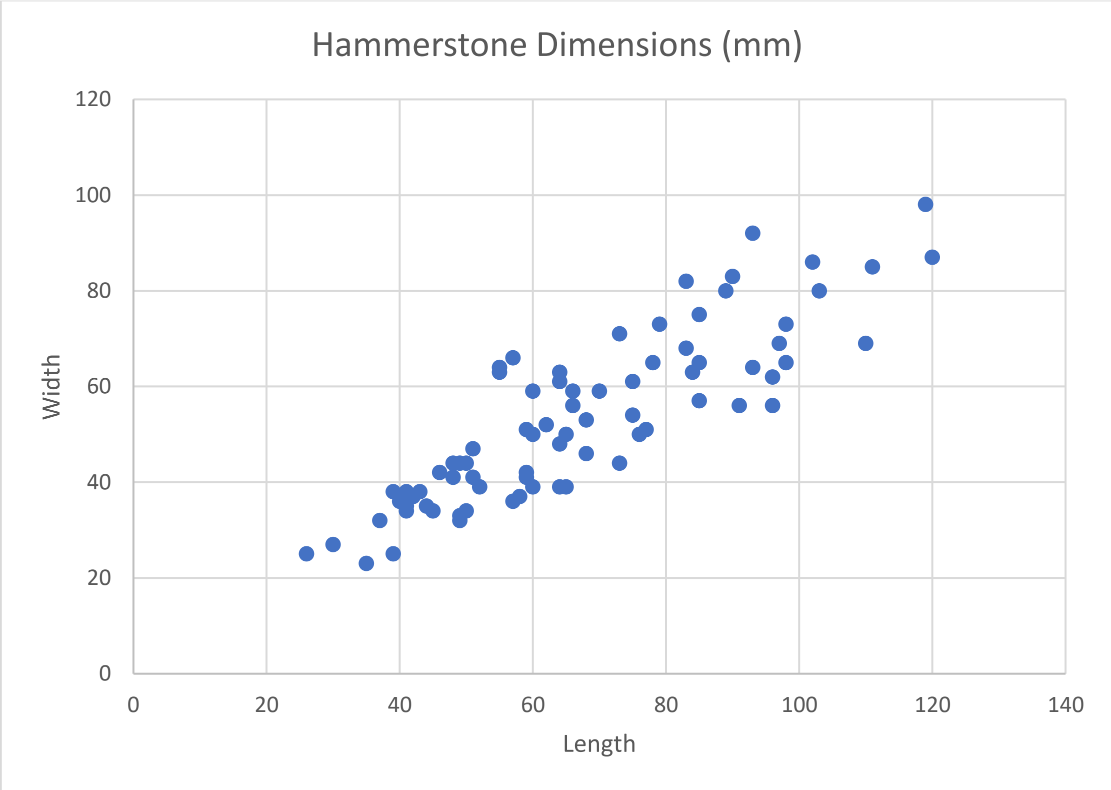

Fig 3.1 Dimensions of hammerstones recovered from Lambay

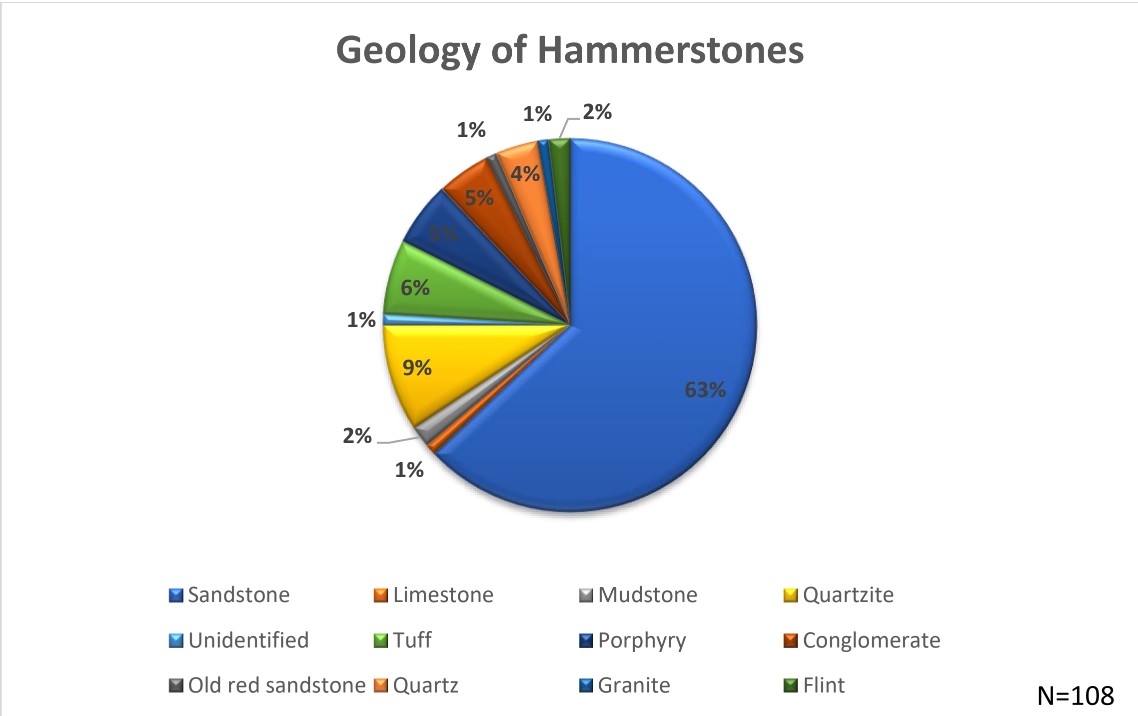

Fig. 3.2 The percentage and range of geologies used in hammerstones from Lambay

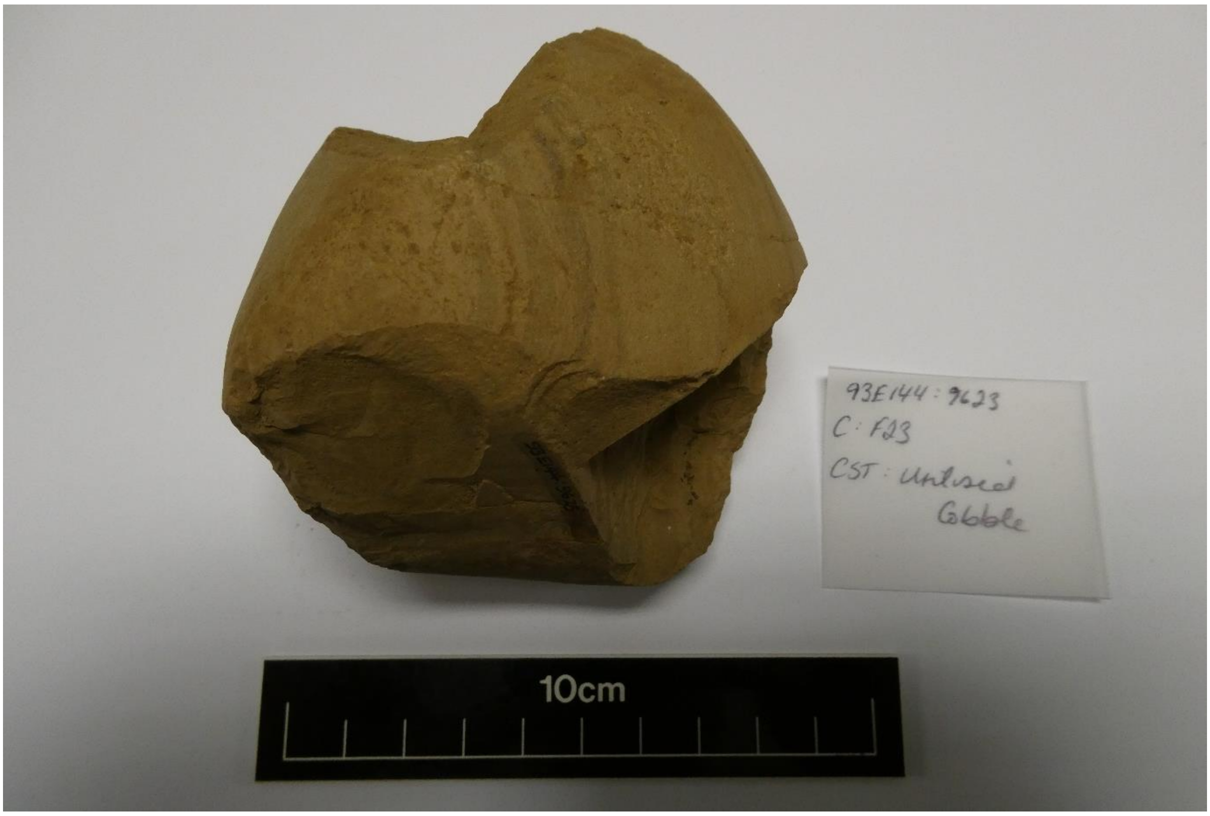

Fig. 3.3 A heavily flaked and pecked hammerstone (93E144:9623)

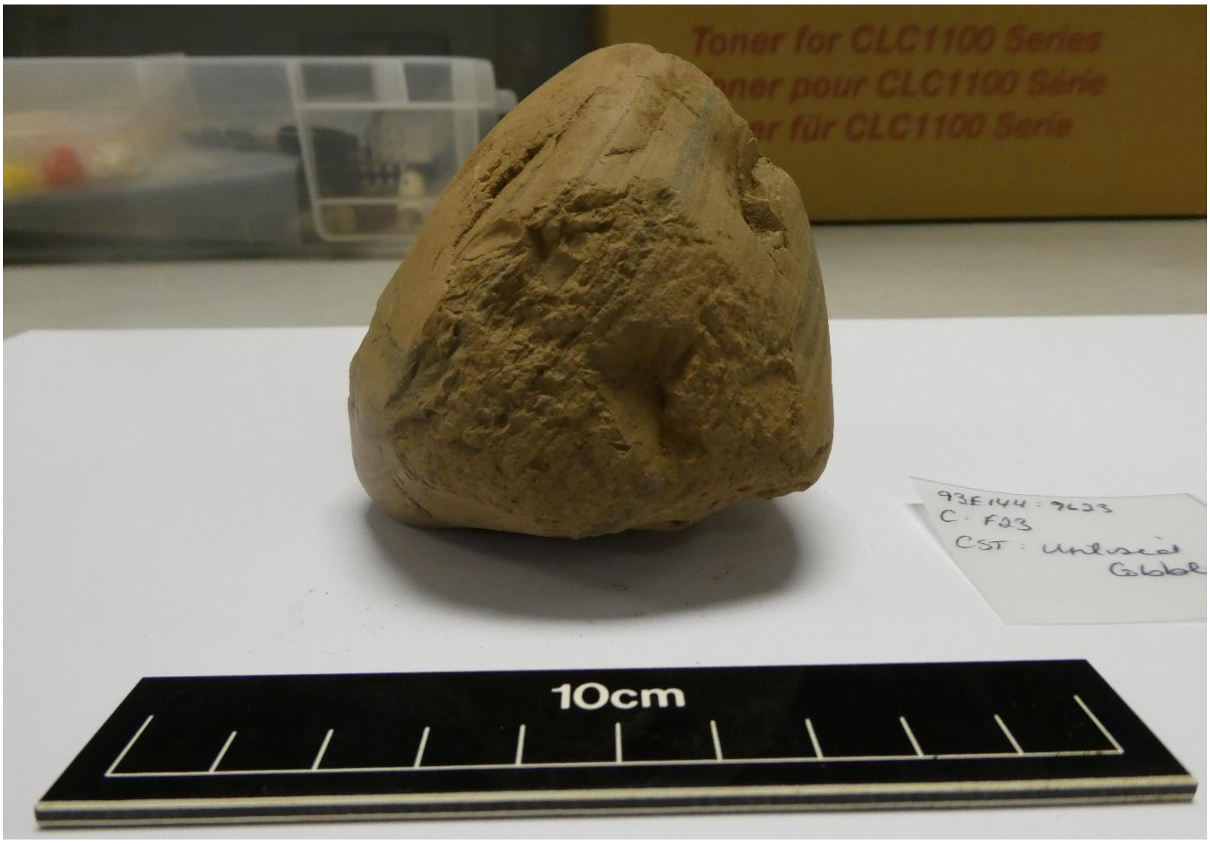

Fig. 3.4 A heavily flaked and pecked hammerstone (93E144:9623)

Fig 3.5 A multifunctional hammerstone and rubber (93E144:77810). The ends are pecked and ground and possibly intentionally shaped. It gives one end a 'pestle' like appearance similar to rubbers found at Dalkey island (see Fig. 7.2).

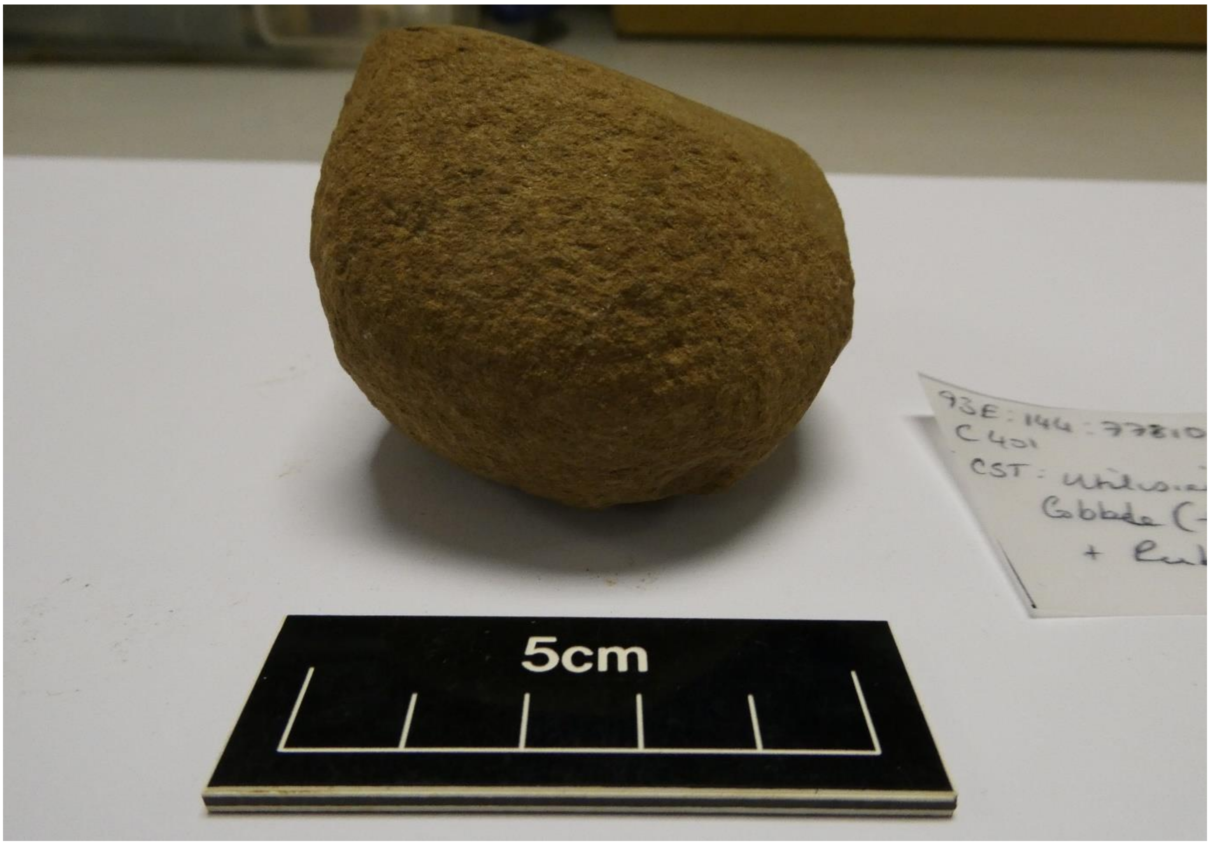

Fig 3.6 A multifunctional hammerstone and rubber (93E144:77810). The ends are pecked and ground and possibly intentionally shaped. It gives one end a 'pestle' like appearance similar to rubbers found at Dalkey island.

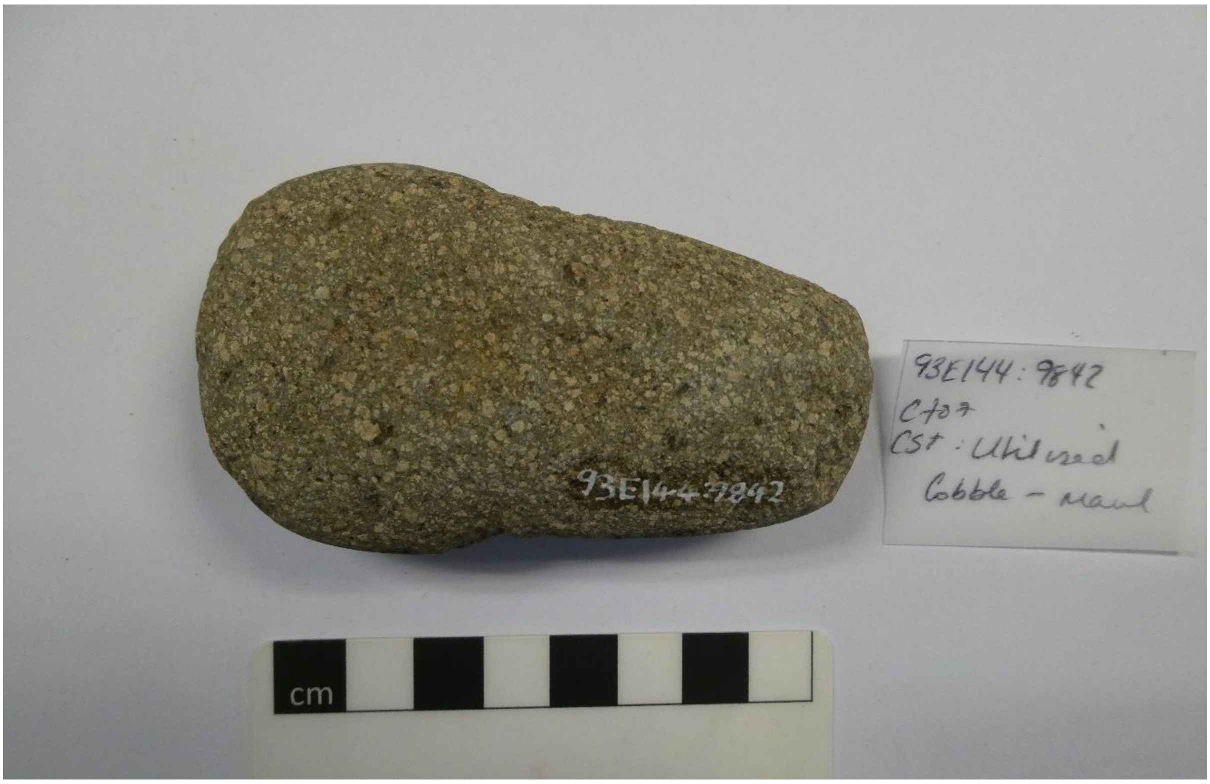

Fig. 4.1 A maul from Lambay (93E144: 9842) which has been shapped at both ends and shows evidence of waisting in the middle

Fig 5.1 A sandstone spall (93E144:77713) with a possible impact point on one side meassuring 5x3mm

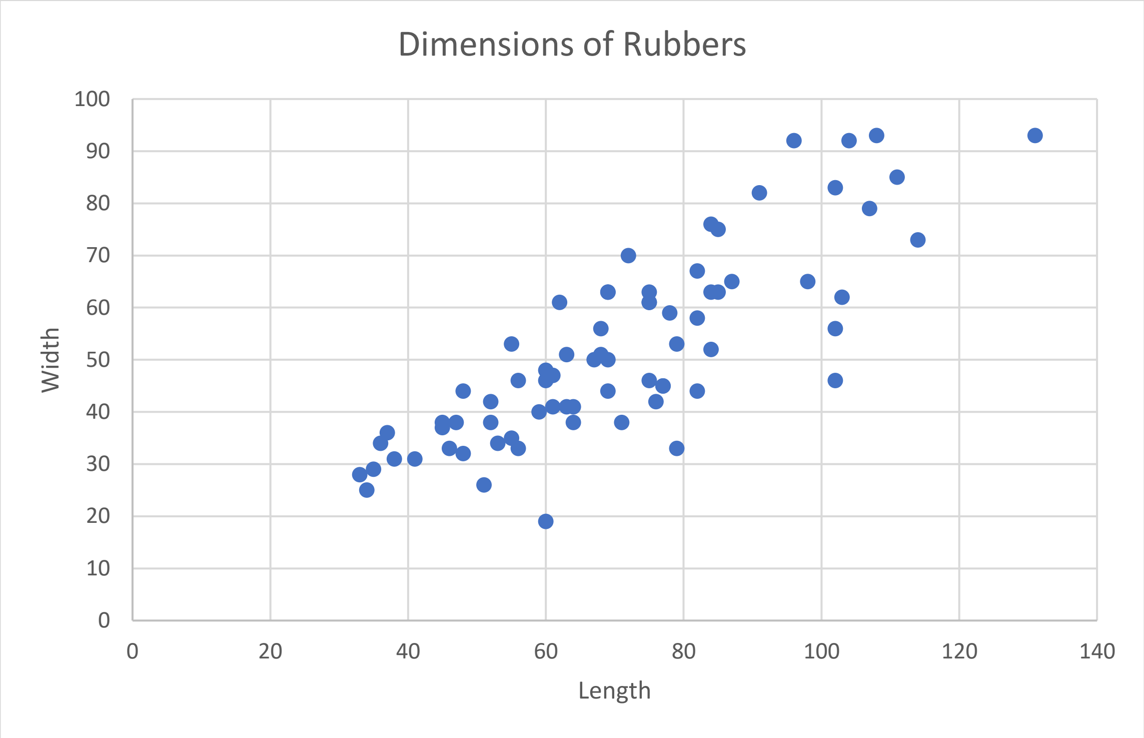

Fig. 6.1. Dimensions of rubbers recovered from Lambay

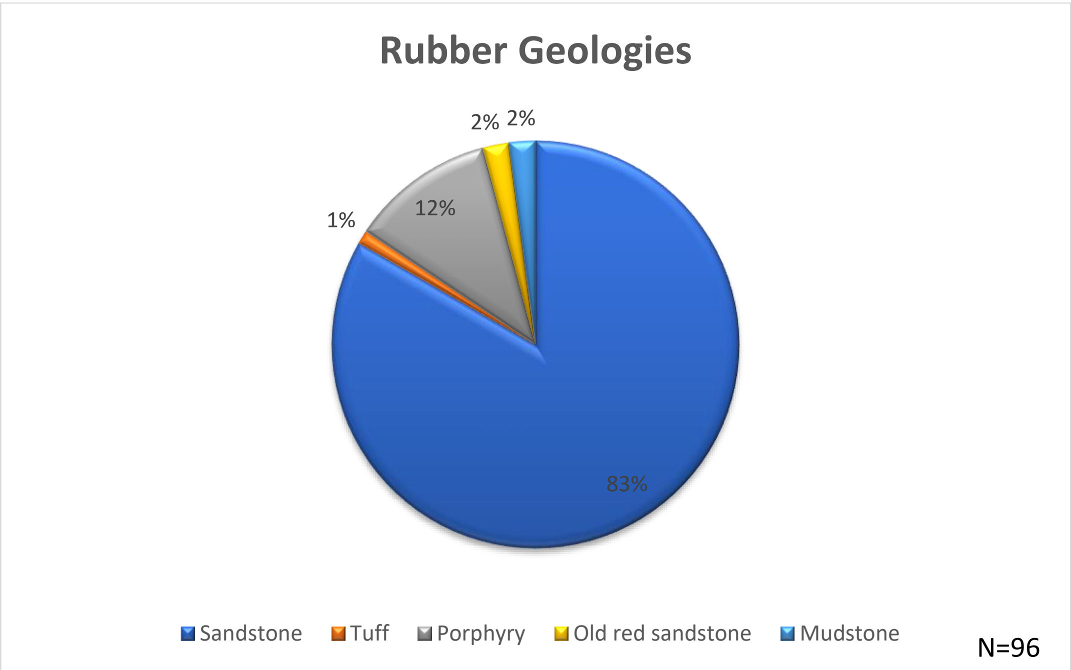

Fig. 6.2 The percentage and range of geologies used in rubbers from Lambay

6.3 An angular cobble which has been been used as a rubber (<u>93E144:5093</u>) and ground at one end. This grinding is very distictive and has created a facets due to its grinding at various angles.

Fig 6.4 A small rubber (<u>93E144:5603</u>) with a series of incised parrallel lines on one face and one end. It is possible this pebble was used as a sharpening stone.

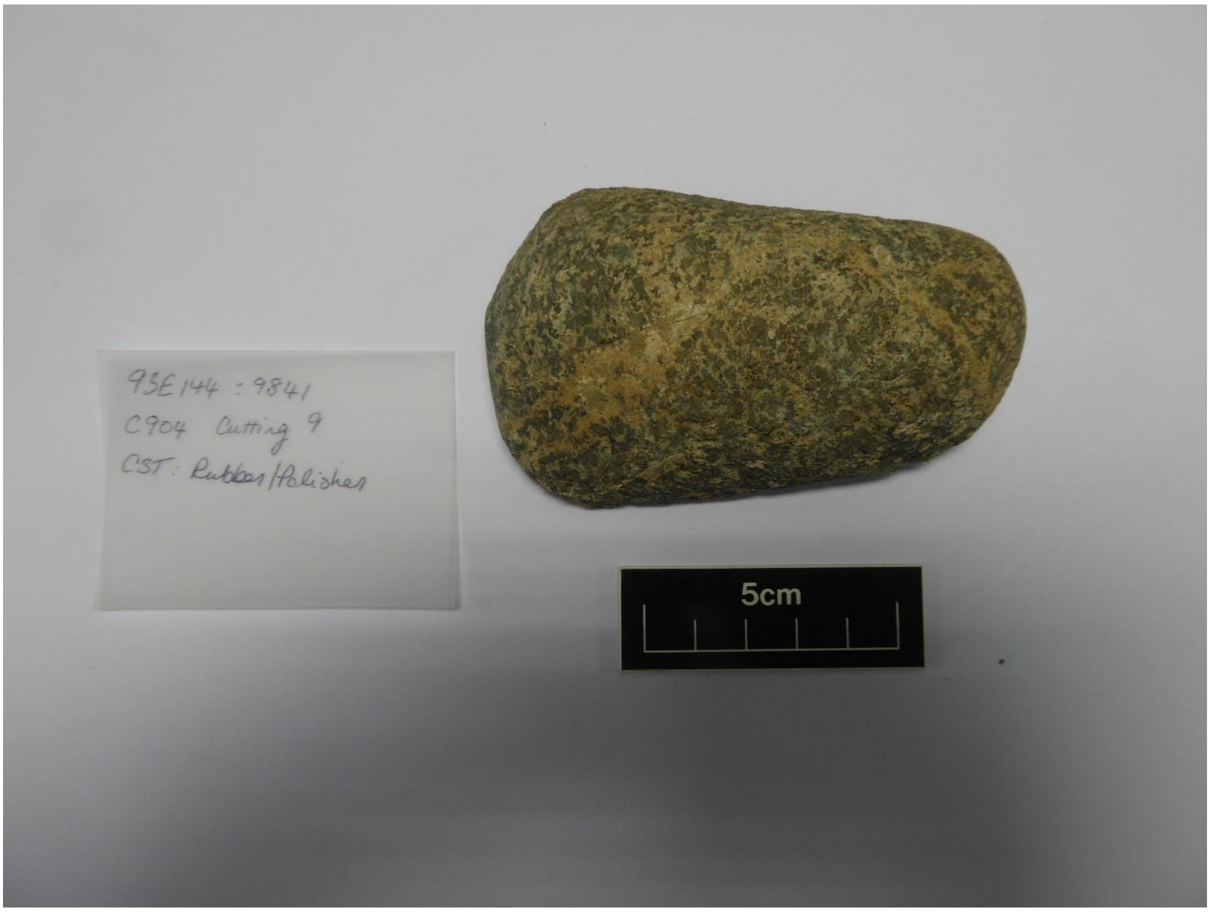

Fig. 7.1 A porphyry polisher which has been split down the middle. No obvious evidence of strike location causing the break. Evidence of polishing at both ends, with the break cutting through this polish on both ends.

Fig. 7.2 Limestone polisher/ rubber from Dalkey Island

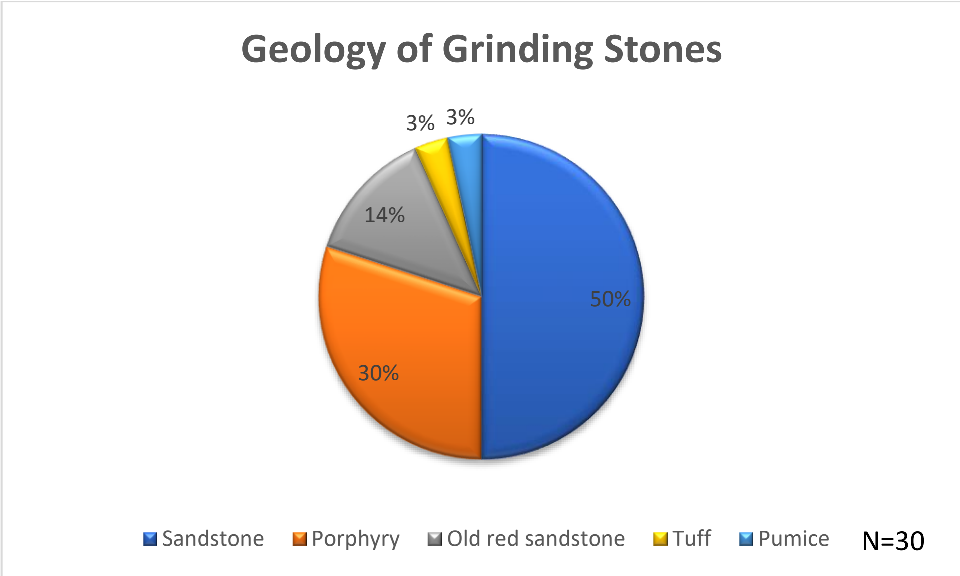

Fig. 8.1 The percentage and range of geologies used in grinding stones from Lambay

Fig 8.2 A fragment of an old red sandstone grinding stone which has been worked on both faces showing evidence of a dished or concave surface likey as a result of circular grinding

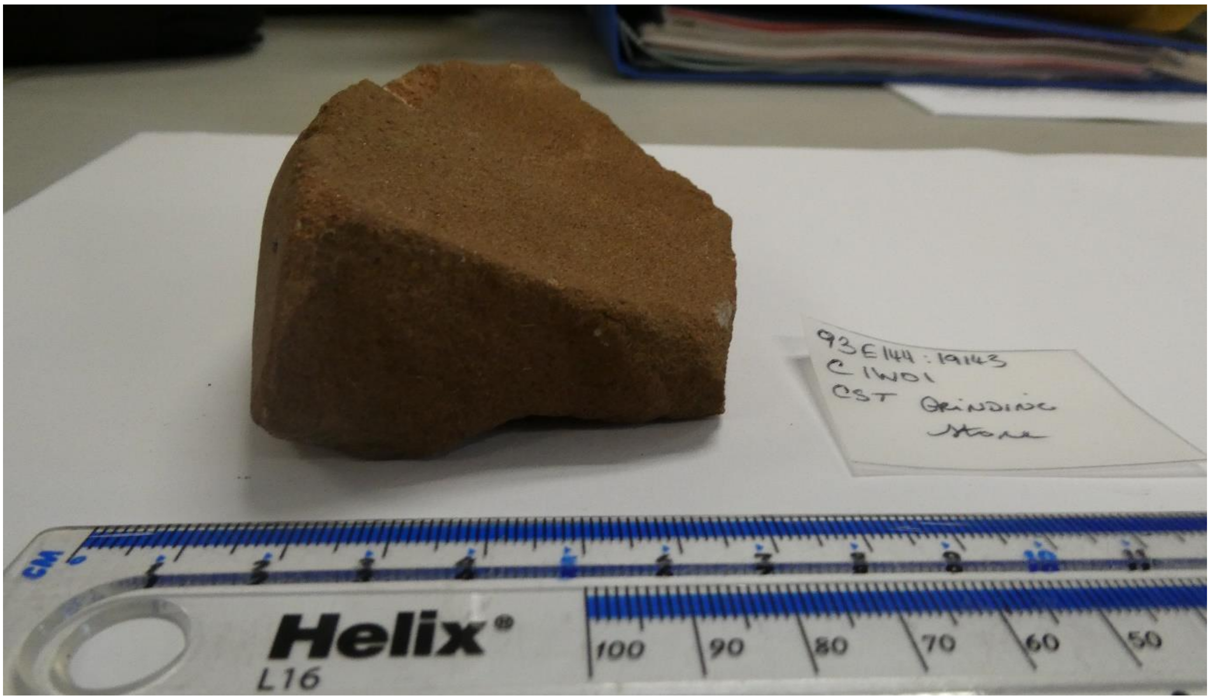

Fig 8.3 A fragment of an old red sandstone grinding stone which has been worked on both faces showing evidence of a dished or concave surface likey as a result of circular grinding

Fig. 8.4 A fragment of an old red sandstone grinding stone (93E144:11312) which has evidence of stike damage on one face posibly indicating this toold was purposely broken.

Fig. 9.1 A concave grinding stone which has been reporposed as an anvil (<u>93E144:13315</u>)

Fig. 10.1 Ground porphyry chunk (<u>93E144:7275</u>). Unlclear if damage is geological or human-made

14. Appendix 1: Wear traces and damage description for coarse stone tools

This appendix contains a description of wear traces and damage identified on coarse stone tools In this report. It is reflective of the material examined from this site, and as such should not be considered a definitive guide to damage and wear traces for all coarse stone tool material.

Wear traces

There are four primary types of wear traces relating to coarse stone tools; adhesive wear, fatigue wear, abrasive wear and tribochemical wear (Adams 2002, 27-33; Adams *et al.* 2019, 45-46).

- Adhesive wear is the result of residues adhering to the surface of the tool, such as lose grains from a different tool.
- Fatigue wear is the collapse of elevations on the surface of a tool a result of external pressure and is visible as fractures, cracks and pits on the surface of the tool.
- Abrasive wear is the result of loose particles rubbing against the surface of a tool which can be as a result of either (or both) adhesive and fatigue wear and can be seen as striations and scratches and levelling on tool surfaces.
- Tribochemical wear is a result of a combination of mechanical and chemical interactions and is visible on the surface of the tool as a polish of sheen (Adams 2002, 27-33; Adams *et al.* 2019, 45-46).

All of these play a role in the types of damage visible on coarse stone tools examined for this report.

Damage descriptions

Grinding

Grinding is a form of adhesive and abrasive wear, and it caused when two surfaced are moved against each other causing one or both surfaces to wear down to a consistent level (Adams 2002, 29). The movement of the two surfaces can cause lose grains to break free from the surface of the tool as a result of friction heat. These loose grains cause can further cause striations which can indicate the direction of movement of the worked material (ibid.). Grinding damage can be challenging to identify macroscopically on tools which have only been lightly used, or on tools which are very light in colour or composed of very hard or very soft minerals (Adams 2019, 49).

Crushing

Crushing is a form of fatigue wear which results in the collapse and crushing of the surface of a tool as a result of pressure or stress through use (Adams 2002, 30). This type of damage is visible both macroscopically and microscopically as cracks, step fractures and pits along the surface of the tool (ibid). This type of fatigue wear can destroy earlier wear traces. This type of damage can be best seen when coarser-grained tools are used for a pounding or impact task—for example, crushing or breaking open hazelnuts.

Pecking

Pecking is another form of fatigue wear (Adams 2002, 30). It is created when one surface is brought into forceful contact with another creating impact fractures and chips, known as pecking (Adams 2002, 41-42). Pecking can be characterised by uniformly shallow fractures and chips which are uniformly distributed across the surface of the stone (ibid.). The depth of these chips and fractures can be an indicator of the force of pressure during the use of the tool (ibid.)

Strike/ impact damage

Like crushing and pecking, strike damage is a form of fatigue wear. Strike damage creates a deep impact fracture on the surface of the tool, which can result in a larger fracture across the surface of the tool or a complete break. In instances of a break, part of the strike/ impact damage is usually, though not always, visible on both portions of the tool.

Incised

Incised damage is characterised by scratches or gouges across the surface of the tool (Adams 2002, 30). This damage can be caused in one of two ways. The first way is from particles of stone which have become loose through either fatigue or adhesive wear which remain trapped between the surface of the stone and the material it is being worked against. This causes smaller scratches or gouges to appear (ibid.). The second way this can be caused is if the surface of the tool is worked against a more durable surface, which digs into the surface of the tool, displacing the softer tools surface. This creates scratches and gouges on the tools surface in the same direction the material was being worked (ibid.; Czichos 1978, 126; Teer and Arnell 1975, 106).

Flaking

Flaking is used to describe a piece of stone which has detached from the main stone tool either during manufacture as part of the modification process or accidentally through use (Andrefsky 1998, 11). Flaking is identified through the scars left behind on the surface of the artefact. These are identifiable as concave depressions. The removal of flakes (either intentional or accidental) is usually caused by percussion or pressure (ibid.). While flaking is not typical of many coarse stone tools, it can be seen as accident damage on hammer stones.

Polishing

Polishing is usually a result of a combination of mechanical and chemical interaction (Adams *et al.* 2019, 46). This type of wear is called tribochemical wear (ibid.; Adams 2002, 31). Tribochemical wear occurs when adhesive wear, abrasive wear and fatigue wear work together to create an environment which allows for chemical reinteractions (Adams *et al.* 2019, 47) (e.g. Fig. 7.25). These chemical interactions produce 'reaction products'; films and oxides that build up on surfaces of stone which create a sheen or polish (ibid.; Adams 2002, 31). Polish and sheen is however affected by mineral composition and granularity of the stone as well as the duration and intensity of use of the worked material. Flatter surfaces are also more likely to be reflective (Adams *et al.* 2019, 50).

93E144 Lambay Microwear Analysis Report
October 2021

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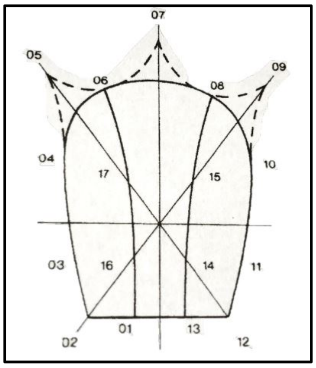
Summary
In total 100 pieces were hand washed then scanned using low power magnification (stereoscope) for macro wear traces (e.g., use retouch, rounding). The condition of the material (fresh versus patinated or burnt) was also taken into consideration. Fifty pieces were then selected for more detailed analysis. The flint was excavated some time ago and came unwashed. This meant that as well as gentle handwashing, the 50 flints selected required further individual cleaning in an Ultrawave U300 ultrasonic tank for 15 minutes in individual bags containing washing detergent and water to remove persistent dirt/grease from their surfaces (Keeley, 1980). To date 23 of the 50 pieces have been fully analysed.



A combination of low and high-power microscopy were used to observe the 23 flint artefacts (van Gijn, 1990; Jensen, 1988; Odell, 2001; Vaughan, 1985). An Olympus SZ61 stereoscope and Olympus LC30 camera were used for low power observations (<100x magnification), alongside an Olympus BX53M with an Olympus DP74 camera for high power observations (100-400x magnification).
Wear traces have been documented using the Laboratory for Artefact Studies, Leiden University, coordinate system (see also van Gijn 1990).

Microwear results

20271

Possibly used to cut a soft material for a short duration of time. Traces only visible on 03/04 dorsal surface.

20277

Used to scrape wood, with a restricted distribution at 08 of ventral.

20269

Used for a very short duration of time to cut a soft material, possibly meat. Traces contained to 03 and only visible on the ventral surface.

20060

Not a well utilised piece. Only some possible poorly developed traces of a soft-medium indeterminate material on 05-06. Has a high frequency of post depositional surface modification - area of trampling (see also 19940)?

20059

Used to drill wood. This tool was probably hafted. Breakage of distal tip probably end its use-life - there's no evidence of working at the tip post this breakage. Traces most developed on 04 which must have had the most contact when drilling.

20056

Used primarily to scrape but also possibly cut a woody plant and/or wood. Both lateral margins are used. Interestingly, the natural protrusion at distal end has been used to engrave/cut wood.

20054

Probably used to scrape, plane or whittle wood. Both lateral margins have been used at a low working angle.

19940

No visible signs of use, probably unutilised. Lots of post surface modification visible - area of trampling?

19923

Used for a short duration of time, probably to scrape or shave soft wood. High working angle. Traces visible on both lateral margins but are poorly developed. Some post depositional surface modification.

19843

Butchery tool. Used to scrape meat, possibly fresh hide, with some evidence for contact with bone. Traces on the left lateral margin are very well-developed, suggesting this was a tool used relatively intensively.

19818

Used to cut and scrape wood. Well-developed wood-working traces contained to the left lateral margin.

19820

Used to scrape/plane (low working angle) a soft to medium hard wood. Traces are restricted to 08 and are most developed on the ventral surface.

19812

Used for a relatively short duration of time to scrape a woody plant or soft wood. Invasive polish suggests a low working angle - the tool may have been used to whittle or plane.

19928

Used to scrape wood for a short duration of time. Lightly developed traces, restricted to left lateral margin, suggest a short duration of use.

19929

Probably used for a short duration of time to scrape a hard wood. Traces are most developed on the right lateral margin but all of the scraper's lateral edges, except the proximal end, appear to have been used.

19922

No visible wear trace; most likely not utilised.

19932

Used primarily for cutting, but possibly also piercing and scraping wood: making this a multi-functional wood-working tool. Traces of wood-working, but also another hard material which may also be wood, were identified. The cutting traces on the right lateral margin (both ventral and dorsal surfaces) are the most well developed.

5453

Used to scrape a hard wood. Tool used for a moderate duration of time.

5450

Used for a short duration of time to cut bone. Traces restricted to left lateral margin.

5638

No visible wear traces; most likely not utilised.

5636

Used for scraping a wood of soft-medium hardness. Both lateral margins used for a short duration of time.

5454

Used to scrape soft wood - traces are well-developed on ventral, less on dorsal. Traces restricted to the right lateral margin.

5631

Used relatively intensively as a wood-working tool. All but the proximal edge of the scraper has been used to scrape a medium-hard wood from a moderate to intensive duration of time. The working angle is high.

Summary of results to date

Although only approximately half of the fifty flights selected have been fully analysed to date, there is a clear pattern emerging. There is a predominance of wood-working traces, mostly always from a scraping action, though sometimes also resulting from cutting, playing and whittling actions. The hardness of the wood differs, perhaps suggesting different wood types were being worked. Rarely are the tools used intensively, which may relate to availability of local flint beach cobbles and the high rate of bipolar technology. Only very occasionally tools were used to work other materials, such as bone and meat. Because of the near total dominance of woodworking evidence on this assemblage, it can be assumed that these flints are not derived from settlement activities where a much more diverse range of contact material would be expected. Rather, the microwear evidence so far points to very specialised tool-using activity focussed on the crafting of wood objects. Given the evidence for axe production at Lambay, and accepting that more microwear analysis is required, it is tentatively suggested that at least some of the flints analysed may have been used to produce hafts or other wood objects involved in quarrying activities.

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Lambay, Eagle's Nest	93E144:	**5393**	4		412		Flint
Lambay, Eagle's Nest	93E144:	**5394**	4		412		Flint
Lambay, Eagle's Nest	93E144:	**5395**	4		412		Flint
Lambay, Eagle's Nest	93E144:	**5396**	4		412		Flint
Lambay, Eagle's Nest	93E144:	**5397**	4		412		Flint
Lambay, Eagle's Nest	93E144:	**5398**	4		412		Flint
Lambay, Eagle's Nest	93E144:	**5399**	4		412		Flint
Lambay, Eagle's Nest	93E144:	**5400**	4		412		Flint
Lambay, Eagle's Nest	93E144:	**5450**	1		107		Flint
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Lambay, Eagle's Nest	93E144:	**5452**	1		107		Flint
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Lambay, Eagle's Nest	93E144:	**5636**	1		107		Flint
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Site Name	Licence No.	Find_No	Cutting	Feature	Context	Grid Sq.	Classification
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Lambay, Eagle's Nest	93E144:	**19815**	Main Area		904	B3	Flint
Lambay, Eagle's Nest	93E144:	**19816**	Main Area		904	B3	Flint
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Lambay, Eagle's Nest	93E144:	**19840**	Main Area		904	B4	Flint
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Lambay, Eagle's Nest	93E144:	**19848**	Main Area		904	A3	Flint
Lambay, Eagle's Nest	93E144:	**19849**	Main Area		904	A3	Flint
Lambay, Eagle's Nest	93E144:	**19850**	Main Area		904	A3	Flint
Lambay, Eagle's Nest	93E144:	**19920**	Main Area		904	F2	Flint
Lambay, Eagle's Nest	93E144:	**19921**	Main Area		904	F2	Flint
Lambay, Eagle's Nest	93E144:	**19922**	Main Area		904	F2	Flint
Lambay, Eagle's Nest	93E144:	**19923**	Main Area		904	F2	Flint
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Lambay, Eagle's Nest	93E144:	**19925**	Main Area		904	F2	Flint
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Lambay, Eagle's Nest	93E144:	**19928**	Main Area		904	F2	Flint
Lambay, Eagle's Nest	93E144:	**19929**	Main Area		904	F2	Flint
Lambay, Eagle's Nest	93E144:	**19930**	Main Area		904	F2	Flint
Lambay, Eagle's Nest	93E144:	**19931**	Main Area		904	F2	Flint
Lambay, Eagle's Nest	93E144:	**19932**	Main Area		904	F2	Flint
Lambay, Eagle's Nest	93E144:	**19933**	Main Area		904	F2	Flint
Lambay, Eagle's Nest	93E144:	**19934**	Main Area		904	F2	Flint

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Site Name	Licence No.	Find_No	Cutting	Feature	Context	Grid Sq.	Classification
Lambay, Eagle's Nest	93E144:	**20121**	Main Area		912	F3	Flint
Lambay, Eagle's Nest	93E144:	**20122**	Main Area		912	F3	Flint
Lambay, Eagle's Nest	93E144:	**20123**	Main Area		912	E3	Flint
Lambay, Eagle's Nest	93E144:	**20124**	Main Area		912	F4	Flint
Lambay, Eagle's Nest	93E144:	**20125**	Main Area		912	E3	Flint
Lambay, Eagle's Nest	93E144:	**20126**	Main Area		912	F3	Flint
Lambay, Eagle's Nest	93E144:	**20127**	Main Area		912	B3	Flint
Lambay, Eagle's Nest	93E144:	**20128**	Main Area		912	B4	Flint
Lambay, Eagle's Nest	93E144:	**20129**	Main Area		912	F4	Flint
Lambay, Eagle's Nest	93E144:	**20130**	Main Area		912	B4	Flint
Lambay, Eagle's Nest	93E144:	**20257**	Main Area	F19	912		Flint
Lambay, Eagle's Nest	93E144:	**20258**	Main Area	F19	912		Flint
Lambay, Eagle's Nest	93E144:	**20259**	Main Area	F19	912		Flint
Lambay, Eagle's Nest	93E144:	**20260**	Main Area	F19	912		Flint
Lambay, Eagle's Nest	93E144:	**20261**	Main Area	F19	912		Flint
Lambay, Eagle's Nest	93E144:	**20262**	Main Area	F19	912		Flint
Lambay, Eagle's Nest	93E144:	**20269**	Main Area	F28	912		Flint
Lambay, Eagle's Nest	93E144:	**20270**	Main Area	F28	912		Flint
Lambay, Eagle's Nest	93E144:	**20271**	Main Area	F28	912		Flint
Lambay, Eagle's Nest	93E144:	**20272**	Main Area	F28	912		Flint
Lambay, Eagle's Nest	93E144:	**20273**	Main Area	F28	912		Flint
Lambay, Eagle's Nest	93E144:	**20274**	Main Area	F28	912		Flint
Lambay, Eagle's Nest	93E144:	**20275**	Main Area	F28	912		Flint
Lambay, Eagle's Nest	93E144:	**20276**	Main Area	F28	912		Flint
Lambay, Eagle's Nest	93E144:	**20277**	Main Area	F28	912		Flint

Interim report on the pottery found at Eagle's Nest, Lambay Island

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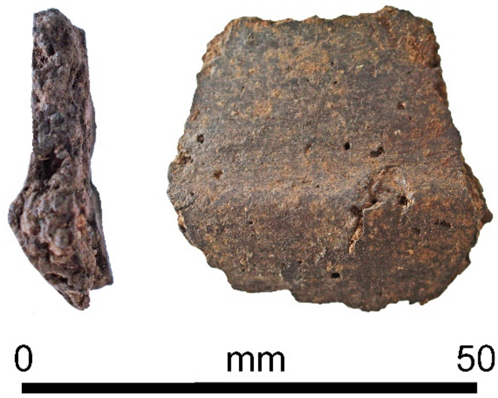
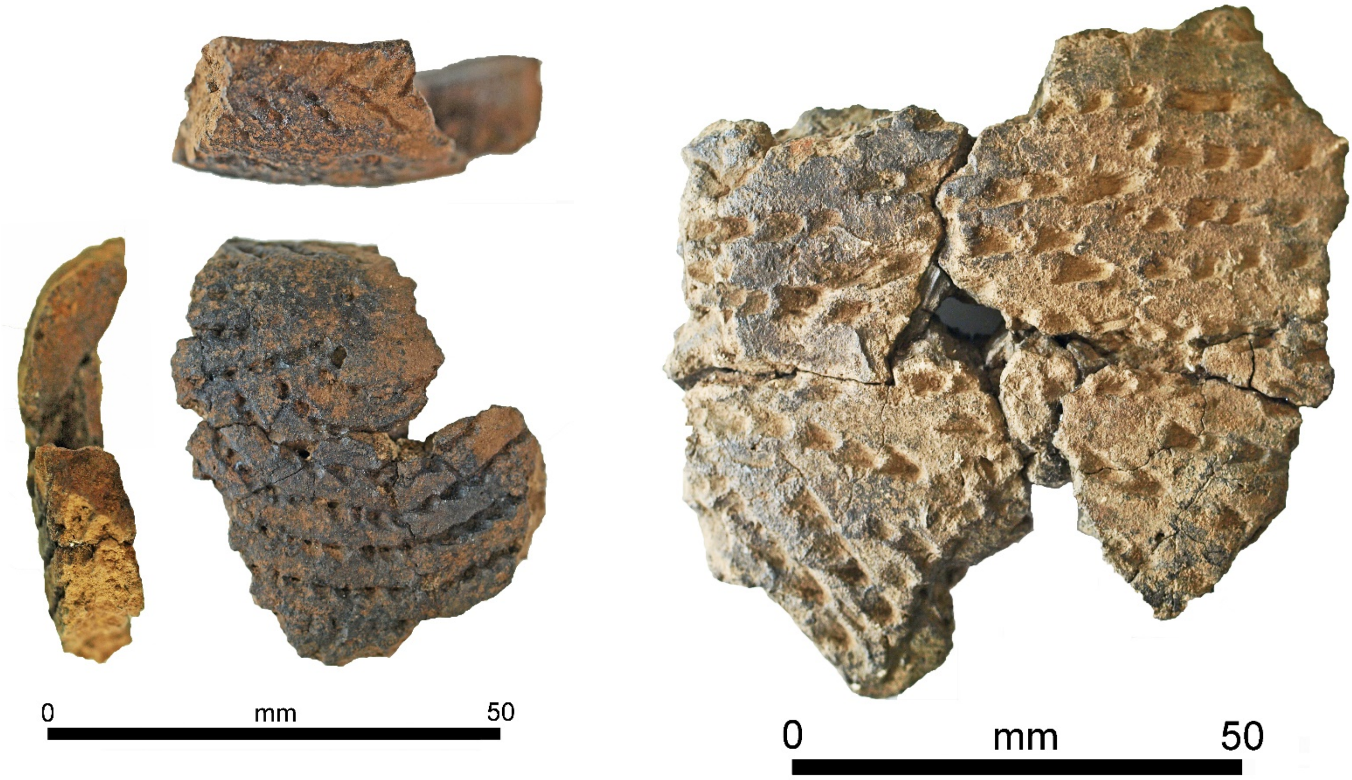
and current Research Associate, National Museums Scotland



93E144:**1231** Traditional Carinated Bowl Pot 1 from Cutting 11, C1109



Left: 93E144: **1145** Fine 'Carrowkeel' bowl, and right 93E144:**1134/36/39**: refitted sherd from large 'Carrowkeel' bowl; both from pit F1 in Test Pit 2 SW/Cutting 3

October 2021

Introduction

The excavations at Eagle's Nest produced around 600 sherds and several hundred fragments (pieces smaller than 10 x 10 mm) of prehistoric pottery, weighing an estimated 3 kg overall. Arriving at a definitive estimate of the number of vessels represented is difficult due to the highly fragmented nature of the assemblage – with fewer than 30 sherds exceeding 50 mm in width or breadth, and with no more than c. 15% of any single vessel being represented, most pots being represented by just one or a few sherds – and due to the relative homogeneity of much of the Middle Neolithic pottery in the assemblage. Moreover, many of the sherds are in poor condition – friable, many heavily abraded, and many with one surface spalled off – but it is nevertheless clear that several tens of vessels are represented. In addition, at least two lumps of potter's clay are present in the assemblage, and there is a curious 'roundel', seemingly of pottery, which will be dealt with below.

Regarding the spatial and contextual distribution of the pottery, there appear to be two main areas where it was deposited: Cutting 11-11W-11E in the western valley, and the Main Area in the eastern valley, including the TP2-TP2W-TP2SW area in Main Area North, with its pottery-rich fill of a pit (Feature 1). Elsewhere, just a handful of sherds were found in Cuttings 3, 5, 6, 7 and 8 and just one or two sherds in each of Test Pits 1, 3 and 9; sherds were slightly more numerous in Cuttings 1-1W and 4, but still far less abundant than in the Main Area. The sherds in Cutting 11-11W-11E mostly occur in clusters associated with the earliest documented phase of porphyry working, whereas most of the pottery in the eastern area comes from the 'depositional area' on the floor of the eastern valley west of the debitage layers, suggesting a possible camp-like site associated with the exploitation of the porphyry.

It appears that all of the pottery is Neolithic, and a clear distinction can be made between a small assemblage of fine, thin-walled Early Neolithic traditional Carinated Bowl pottery, found mostly in Cutting 11-11W-11E (with the remaining few sherds found in the Main Area and TP13); an even smaller assemblage that may be modified Carinated Bowl pottery, in TP2, Cuttings 5, 6 and 7 and possibly within the Main Area; and the remainder of the assemblage, mostly found in the Main Area, comprising thicker-walled and mostly coarse decorated vessels conventionally referred to as 'Carrowkeel Ware', dating to the Middle Neolithic. Associated with the latter are some other vessels of similar fabric but, lacking the characteristic 'stab' and 'stab-and-drag' decoration of 'Carrowkeel' bowls; these, and their relationship to the 'Carrowkeel' bowls, will be discussed below.

The pottery was laid out in trays (Fig. 1) and examined and recorded in accordance with the recommendations of the Prehistoric Ceramics Research Group's *General Policies and Guidelines for Analysis and Publication*, albeit with less emphasis than the PCRG recommends on using fabric as the main classification criterion (even though it is a good discriminator); classification also took into account other aspects including sherd thickness, technique of manufacture and presence/absence of decoration. Over 50% of the assemblage was examined under a binocular microscope at magnifications of up to x40. The density of inclusions was calculated using Matthew *et al.*'s visual comparison charts (Matthew *et al.* 1991). A database was created and added to the locational data already recorded by the excavation team. This captures data from 35 fields, including details of dimensions, colour, condition, inclusions (shape, size, type and density), presence/absence of visible organic residues, presence/absence of decoration, manufacture traces, and whether sherds have been analysed, drawn, photographed or conserved. The complete Database will be made available once the remaining parts of the assemblage have been fully documented. The work of examination and documentation is painstaking and time-consuming, and unfortunately a series of factors, most recently the restrictions of pandemic lockdown, have meant that not all of the assemblage is yet fully documented, even though every sherd has been inspected macroscopically. For that reason, the statements in this Interim Report should be regarded as provisional, even though it is not anticipated that any surprises lurk in the parts of the assemblage that are not yet fully documented. In addition to documenting the pottery, all non-ceramic material was separated out – in a few cases, natural stone had been mis-identified in the field as pottery – and the assemblage is in the course of being re-bagged, because: i) in many cases the labelling on the original plastic bags has faded in the c 20 years since excavation (Fig. 2) and ii) in some cases, small sherds had been stored in unnecessarily large bags. When finally re-packed for return to NMI, the assemblage will be more efficiently stored, with safeguards against future fading of the 'indelible' ink now used to label the bags.

Left: Fig. 1. Example of a tray with sherds laid out. Right: Fig. 2. Example of a finds bag with faded labelling; the 93E144 number has recently been inked over

The pottery will now be described and discussed in two sections, the first dealing with the sherds that definitely and probably fall within the Early Neolithic Carinated Bowl tradition, and the second dealing with the 'Carrowkeel' and associated pottery. Numerical references to specific sherds are the 93E144 numbers, presented in **bold**. Unless specified otherwise, all illustrations are by Alison Sheridan.

Pottery definitely and probably belonging to the Early Neolithic Carinated Bowl tradition

A distinction can be made between the earliest variant of this type of pottery, 'traditional Carinated Bowl' (CB), and 'modified CB' which represents 'style drift' away from the 'traditional' canon.

Traditional Carinated Bowl

Around 100 sherds and nearly 70 fragments (plus crumbs) can be attributed to this variant. The vast majority of the sherds belong to two sherd clusters in Cutting 11-11W-11E in the western valley, with only a few (22 or 23) being found elsewhere: in Cutting 12 (cultivation soil, including context 1202); Test Pits 2 and 13; and in Squares B3, F1 and F4 in the Main Area (Table 1). Unfortunately it is impossible to tell whether the single small sherd found in the Early Neolithic pit F57 in Square E2 of the Main Area belongs to this ceramic tradition, but such an attribution cannot be ruled out, and it is included as a 'possible' in Table 1.

Some 60 sherds (plus nearly 50 fragments), from contexts 1103, 1106, 1108 and 1109 in Cutting 11, appear to belong to one fine, thin-walled carinated bowl, Pot 1 (illustrated on the title page and in Fig. 3); their dispersal across several contexts suggests some vertical post-depositional movement. While the largest sherd (**1231**) is only c. 35 x 35 mm, enough diagnostic sherds are present to estimate the vessel's rim and carination diameters at 203 and 202 mm respectively, and the height as 101 mm. The thickest parts of the pot are at the top of the rim (whose surviving width is 9.5 mm and original estimated width is c. 10.5mm) and at the carination (8.7 mm); elsewhere, the vertical, straight neck is c. 6 mm thick and the belly thins to just 4.25 mm (**1240**). The rim is upright, gently flattened-rounded, and seamlessly folded over to the exterior; the carination is gentle, with a marked horizontal hollow on its interior along a coil joint that marks the junction between the carination and neck. The surfaces had been carefully smoothed and buffed to a low sheen using a hard tool such as a bone spatula or pebble. The colour is blackish-brown throughout, with dark brown patches in the core. Inclusions are small (up to 1.7 x 1.5 mm) and sparse (<3% density), and they comprise a few tiny mica platelets and angular and sub-angular fragments of a whitish and black speckled rock. It is likely that the pot had been built up using narrow coils, which would account for the small size of the sherds; coil joints are visible at the carination-neck junction, as noted above, and at the top of the neck, where the interior surface of the rim-and-upper neck sherd has spalled off along a sinuous diagonal plane (visible on Fig. 3).

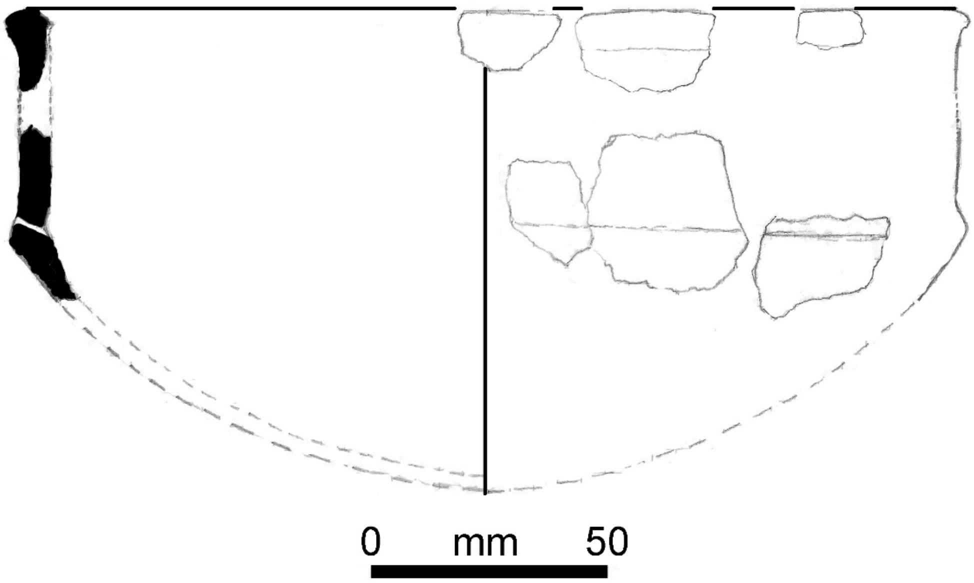


*Fig. 3 Top: sketch reconstruction of Traditional CB Pot 1, from Cutting 11 (and note: there are many additional sherds from this vessel that have not been included in the drawing as their precise locations on the pot cannot be specified). Bottom: photograph of the neck-carination-upper belly sherd **1231***

Several other vessels – possibly as many as 14 – are represented among the traditional CB sherds listed in Table 1, and while they vary somewhat in thickness, colour, surface finish and density and size of inclusions, they are all thin-walled (up to 11.1 mm, mostly 5.2–7.7 mm) and have been carefully made. Pot 2 (Fig. 4), whose six constituent sherds plus fragment were all found in context 1103, is slightly thicker-walled than Pot 1: its flattened-rounded rim-and-neck sherd (**1221**) is 10.5 mm wide at the top of the rim and 9.8 mm wide at the slightly concave neck immediately below the rim, while its carination sherd (**1219**) is 11.1 mm wide at the carination. There is a distinct horizontal depression immediately above the slightly pointed carination on the exterior but the sherd is too small to suggest whether this was just a localised feature. The surface is not quite as smooth as that of Pot 1, and it has not been polished.

Fig. 4 Rimsherd (top) and carination sherd (bottom) of Pot 2

As for the other definite and possible examples of traditional CB pottery, the sherds are all featureless body sherds but it is possible that they are from carinated bowls; put differently, there is no positive evidence for the presence of the uncarinated or S-profiled vessels that form part of the traditional CB repertoire elsewhere (Sheridan 1995, 2007, 2016). The 'grittiest' of the traditional CB sherds are **1306** and **1314**, with an inclusion density of c. 7%. The nature of the lithic inclusions is consistent, with mica platelets and fragments of white and black speckled rock being the commonest (with variability in the size and frequency of the dark mineral that constitutes the speckles). Feldspar, quartz and sand occur occasionally, with mica attaching to some of the feldspar (and clear quartz being present in **1266)**; and a dull grey stone was noted in **1242**. Unusually for the overall Eagle's Nest assemblage, several of the traditional CB sherds appear scorched or burnt (**1303**, one sherd of **1327**, **1331 bis**), and thin black organic residue is present on the interior surfaces of **1242, 1273** (Pot 1) and on the pot represented by sherds **1306** and **1314.** The presence of the visible organic residue suggests the use of these pots for cooking, and the scorching and burning is also consistent with such an interpretation: the exterior of a pot can be scorched by its proximity to a heat source during cooking, and more thorough burning can occur if sherds from a broken pot lie around in a hearth, being repeatedly heated. In order to investigate the use of this traditional CB pottery further (and in the hope of obtaining a radiocarbon date from the pottery itself), one sherd from the aforementioned Pot 1 (belly sherd **1295**), and one from Pot 2 (neck sherd **1218**), were selected for the analysis of absorbed lipids by Lilly Olet in September 2021.

Modified Carinated Bowl

One vessel that can, with some confidence, be attributed to the 'modified CB' tradition is that represented by sherds **1080–83**, found in Cutting 6, square 2 (Fig. 5). The two largest, and loosely conjoining sherds (**1083**, Fig. 5) are 10.5–12 mm thick and have faint vertical incised lines on their exterior. The straightness of the wall suggests that these could possibly come from the neck of a vessel, and if that is the case, a diameter at this point of 220–240 mm is suggested and it is likely that the pot had been a carinated bowl. Lithic inclusions are small (up to c. 1.5 x 1 mm), sub-angular and rounded, consisting of white and black speckled stone and dark clear quartz (possibly smoky quartz), at a density of c. 5%. One small sherd was subjected to lipid analysis by Jessica Smyth in 2012, but without yielding any lipids; a second sherd – the one on the right in Fig. 5 – was selected for further analysis and possible dating by Lilly Olet in September 2021.

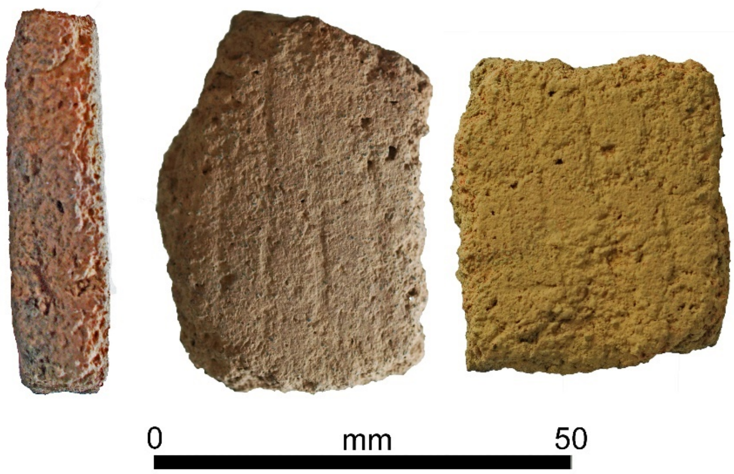


*Fig. 5. Sherds **1083** from modified CB pot with faint vertical lines from Cutting 6. Note: the slight colour variations relate to different lighting conditions in the three constitutent photographs and are not present in the pot; the actual colour is a slightly reddish orange-brown. The two sherds conjoin loosely. The photo of the RH sherd is by Lilly Olet*

A further 13 sherds are candidates for inclusion (with varying degrees of confidence) within the 'modified CB' category (Table 2). These were found in Cuttings 5, 6 and 7, in TP2 and in Square G5 in the Main Area. These are generally slightly thicker-walled than the traditional CB sherds, but thinner-walled than most of the Middle Neolithic pottery, and more compact in their fabric; all are small and several are heavily abraded. The overall shapes of the pots from which they came cannot be determined.

Middle Neolithic pottery

As noted above, this was mostly found in the Main Area, with the fill of pit Feature 1 in TP2 producing c. 175 sherds and c. 450 fragments, from several pots. Just one Middle Neolithic sherd was found in the western valley (**1206**, from context 1103, a major spread of porphyry debitage in Cutting 11). All the vessels will have been round-based.

While many of the sherds are spalls lacking their exterior surface, their attribution to the Middle Neolithic assemblage can be confidently made due to the distinctive fabric, texture, thickness and breakage characteristic of this pottery – which contrasts with that of the Early Neolithic CB pottery – as well as to the close spatial association of many with sherds whose outer surface is intact. It is clear that a different ceramic tradition from that of CB pottery is represented, as detailed below.

A large proportion of the Middle Neolithic pottery is decorated with stab- or stab-and-drag impressions, and would traditionally be described as 'Carrowkeel' pottery. There are, however, at least two thick-walled pots with different decoration. One, **1206** from the western valley (Fig. 6), has finger- or thumbnail impressions (although one cannot rule out the possibility that these are accidental markings on the pot's surface, rather than deliberate decoration). The other is a pot decorated with deep, roughly vertical incised lines, represented by sherds **1195–6, 1305 and 1398** from Main Area South (with **1195–6** from Cutting 9, context 904; **1305** from Square E3; and **1398** from Square F2: Fig. 7). The sherds were found sufficiently close to each other for their attribution to a single pot to be reasonable.

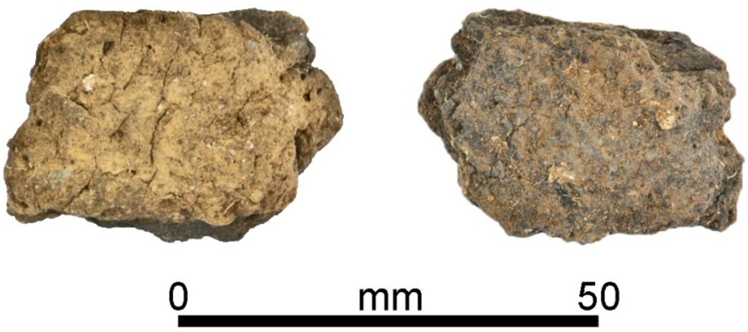


Fig. 6 Sherd ***1206****, from Cutting 11; thickness 16.5 mm. Left: front view, showing finger- or thumbnail impressions; right: back view. Photos by Jessica Smyth. The sherd has been lipid-analysed by Jessica Smyth*

*Fig. 7 Thick sherds from pot/s with incised roughly vertical lines; from L to R: **1305**; **1196** (refitted conjoining sherds); **1195** (conjoining the top of **1196**); **1398.** Photo of 1398 by Jessica Smyth, who analysed that sherd for lipids; the apparent difference in colour between this and the others is a result of different lighting conditions during photography*

In addition, there is at least one thick-walled vessel that appears to be undecorated – at least as far as its surviving portion is concerned. This is the basal portion of a bowl, **1126** (Fig. 8), from the fill of pit F1 in TP2; its surface irregularities are more likely to relate to wear and burnt-out organic inclusions than to be deliberate decoration. Incidentally, **1126** includes the largest single sherd in the assemblage, at 86.3 x 59.8 x 16.8 mm; refitted to a conjoining sherd, together they make a sherd measuring 101.3 x 83.6 x 19.7 mm. The fact that this was found in pit F1, alongside heavily-decorated 'Carrowkeel' pots (and indeed a sparsely-decorated 'Carrowkeel' bowl, **1108,** Fig. 9), confirms that the Middle Neolithic repertoire included partly- or wholly-undecorated vessels.

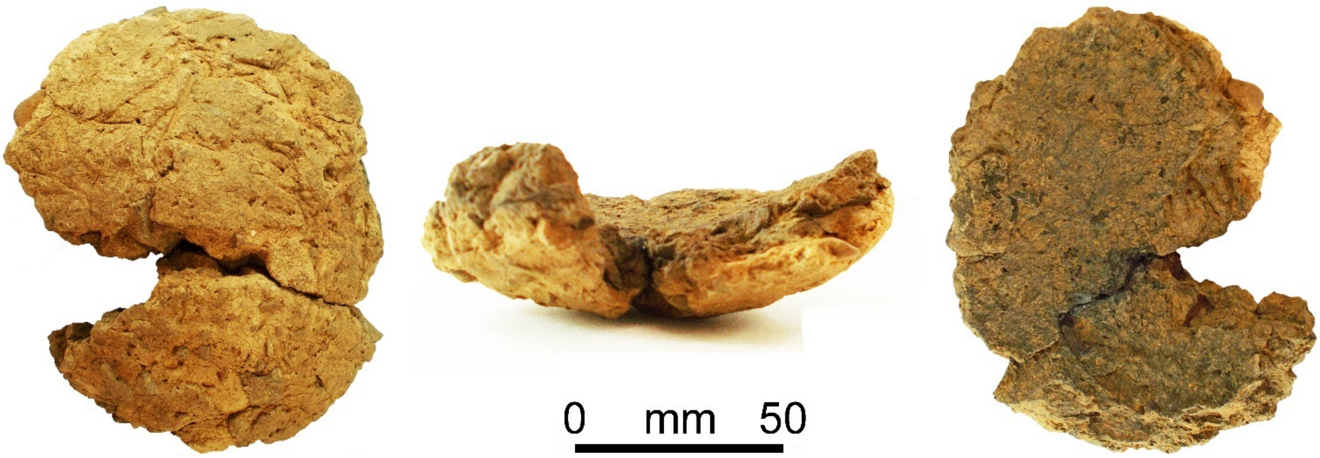


*Fig. 8 Undecorated basal portion of a large, thick-walled pot, **1108**, from Pit F1 in TP 2: outer, side and inner views*

*Fig. 9 Rimsherd **1108** from Pit F1 in TP2. This has sparse stab and stab-and-drag decoration in a single short diagonal line running down the upper right area of the exterior, albeit not clearly visible in this photograph. Note: the hollow in the bottom right corner is a socket for a lithic inclusion, and the curving hollow is a socket for a burnt-out organic inclusion such as grass. Note also that the sherd had broken along a coil joint at its lower edge, visible in the side view. From a large pot; estimated rim diameter: possibly c. 260 mm, but the sherd is too small for reliable estimation*

Regarding the 'Carrowkeel' vessels, two clear size classes can be identified: i) small, relatively fine bowls, such as **1145** (cover and Fig. 10 left), with its estimated rim diameter (ERD) of c. 130 mm, and **1356**, with its ERD of c. 170 mm; (Fig. 10 right) and ii) large vessels, represented for example by the relatively thin-walled rimsherd **1412** (Fig.11; ERD possibly as large as c. 300 mm) and by numerous thick-walled body sherds, such as **1134/36/39** (cover and Fig. 12). While the wall thickness range of the thinnest 'Carrowkeel' bowls overlaps with that of the CB pottery at Eagle's Nest, most of the 'Carrowkeel' pots are considerably thicker, up to c. 20 mm.

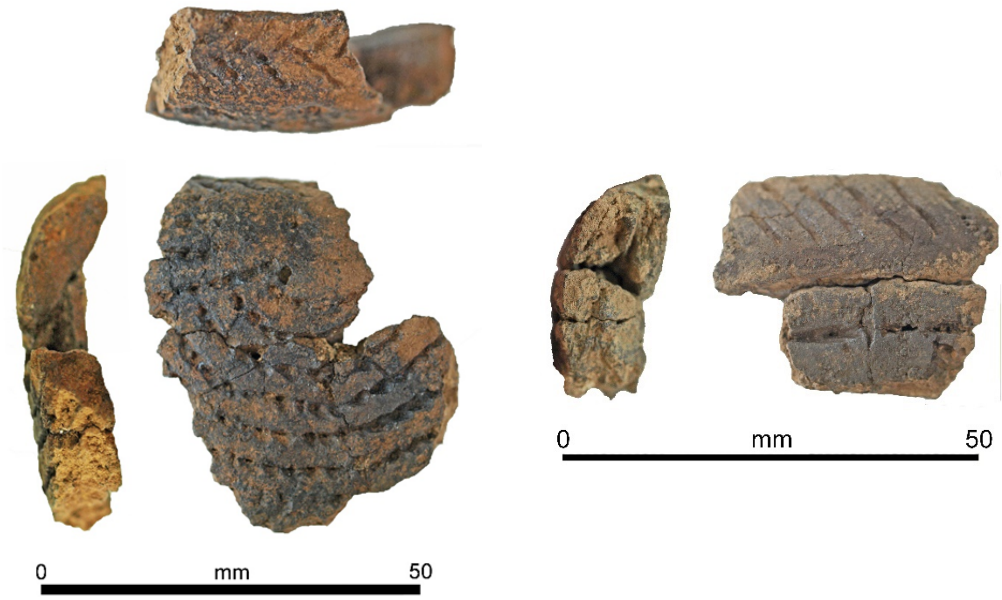


*Fig. 10 Examples of small, relatively fine 'Carrowkeel' bowls. Left: **1145** from pit F1; ERD c. 130 mm, Th up to 9.5 mm; right:**1356** from Main Area South Square B4, F26; ERD c. 170 mm, Th up to 12 mm*

*Fig. 11 Large but relatively thin-walled (11–13.5 mm) 'Carrowkeel' bowl, **1412**, from Main Area South Square E4, context 910; ERD possibly 300 mm*

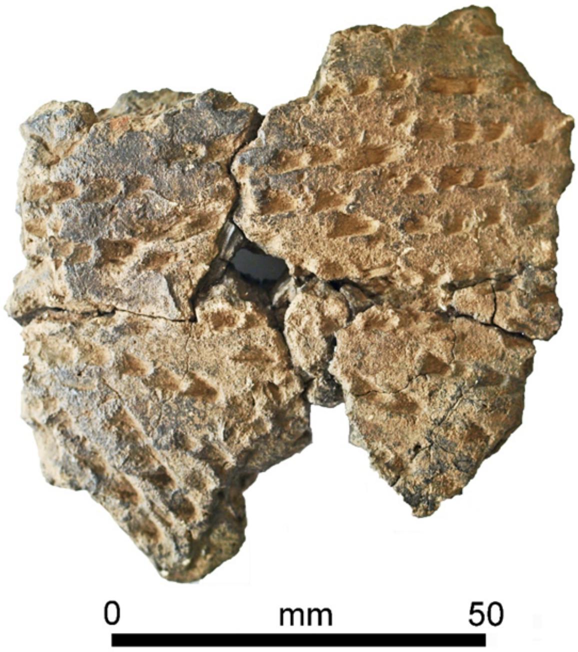


*Fig. 12 **1134/36/39**: refitted sherd from large, thick-walled 'Carrowkeel' bowl from pit F1 in TP2; max Th 16 mm*

The rim forms represented among the 'Carrowkeel' bowls range from gently pointed and inturned – as in **1108** (Fig. 9), **1145** and **1356 (Fig. 10),** and with an external facet, in **1279** (Fig. 13, left) – to upright and rounded, as in **1406** (Fig. 13, right) and upright and squared off, with **1412** also being slightly expanded to the exterior (Fig. 11).

Fig. 13 Examples of rim forms: left: ***1279****, from Cutting 6, F7 – bevelled and inturned; right: sketch of* ***1406****, from Main Area Square G4, F25D – upright, rounded. (The horizontal lines are of stab-and-drag decoration.) Note: both have broken along coil joints*

The stab and stab-and-drag decoration on the 'Carrowkeel' bowls has been made with various tools, some pointed-ended, others square, rectangular or triangular-ended. The width and depth of the impressions vary, with those forming the faint diagonal lines on the rim bevel of **1279** being narrow and very shallow (Fig. 13, left) in contrast to the deep, roughly triangular hollows on **1134/36/39** (Fig. 12). The arrangement of the decoration also varies, from roughly horizontal lines (e.g. on **1412**, Fig. 11 and **1406**, Fig. 13 right), diagonal lines (e.g. on **1279**, Fig. 13 left) and horizontal and sloping lines (e.g. on **1356**, Fig. 10 right), to multi-directional lines (e.g. **1134/36/39**, Fig. 12) and more haphazard arrangements. In a few cases, the stab-and-drag lines curve and are arranged as swags (e.g. on **1145**, Fig. 10 and **1127–9**, Fig. 14). In several cases it has been possible to infer, from the direction in which the stab-and-drag impressions had been made, that the potter was right-handed.

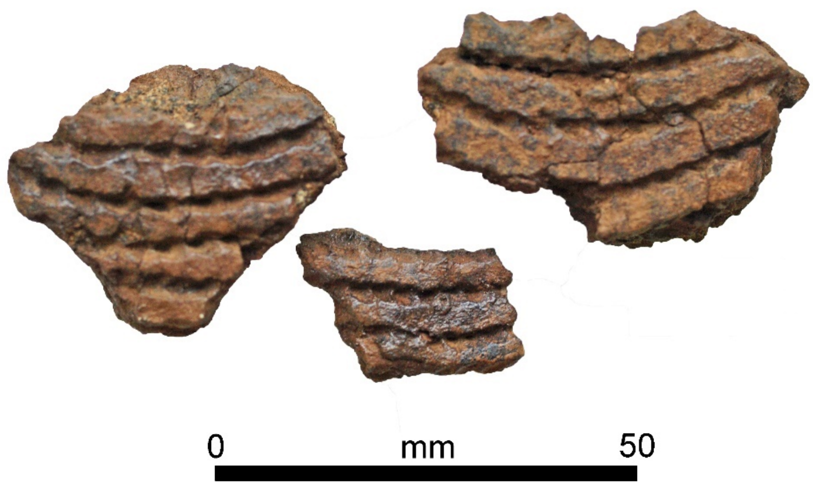


Fig. 14 ***1127–9****, from pit F1 in TP 2: deep and fairly narrow stab-and-drag decoration arranged in swags. Note: the dark colour and slight sheen are due to the application of consolidant to the sherds*

The way in which the Middle Neolithic pottery was made differs from that used to make the CB pottery. While in both traditions vessels were built up by the successive addition of coils of clay, with the CB pots the coils were thinner (and probably also narrower) and the coil joints were carefully secured and smoothed over, making a compact fabric, whereas in many

Middle Neolithic pots the coil joints have not been sufficiently strong to prevent pots from breaking along these joints, and the texture of the clay appears looser. The coil joints are often broad and of an inverted U or V shape; in some cases, where the convex top of a coil has been exposed through breakage, this has produced a 'false rim' effect, where the top of the coil resembles a rounded rim. Examples of coil joints can be seen in Figs 9, 10 right, 13, 15 and 16, and Fig. 17 illustrates the loose, non-compact texture of sherd **1256**. This tendency for the fabric to be somewhat 'loose' accounts for the frequency of spalling and for the hackly nature of the fracture in many of the Middle Neolithic sherds. The surface finish also contrasts with that of the traditional CB pottery, with cursory wet-smoothing appearing to be the commonest practice. Some surfaces are uneven and no sherd has the polished finish of traditional CB Pot 1.

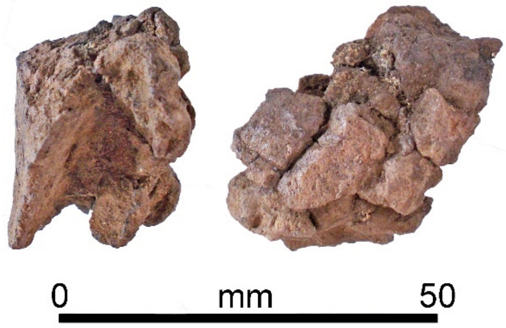


Fig. 15 ***1103****, from pit F1, TP 2, showing deep inverted V-shaped coil joint along the lower edge of the sherd*

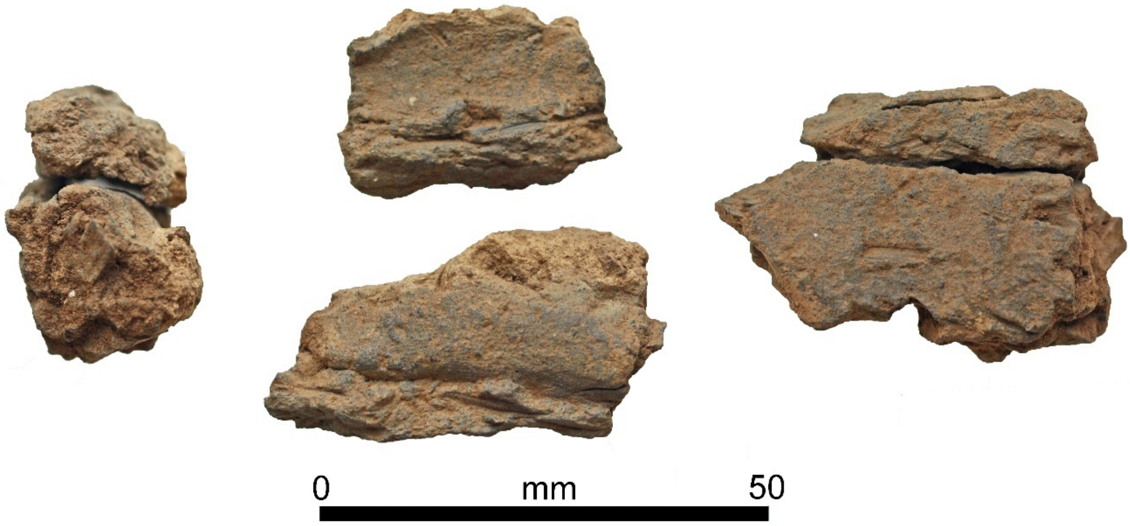


Fig. 16 **No no.***, from Main Area, F25: sherd that had broken along a coil joint; central image shows the articulating surfaces*

Fig. 17 Loose, non-compact texture of the clay, as shown in the section view of sherd ***1256****, from Cutting 12*, *Square 10*

As regards the inclusions that are present in the sherds – most of which will have been deliberately added as filler (although sand-sized particles may have been present naturally in the clay) – the Middle Neolithic pottery contrasts with the Early Neolithic pottery in several respects. Mica platelets do not feature; the inclusions are generally much larger, and occur at a somewhat greater density; and in many cases, plant material – probably grass or straw – has been used alongside crushed stone (Fig. 18 left). This has burnt out to leave characteristically-shaped voids. The commonest lithic inclusion is a white and black, finely speckled rock (Fig. 18 right); its presence was also noted in some of the CB pottery. A few Middle Neolithic sherds contain crushed quartz (with one sherd containing half a pebble of quartz), and in a few cases sherds contain fragments of slate. In no case has the use of Lambay porphyry as a filler been noted.

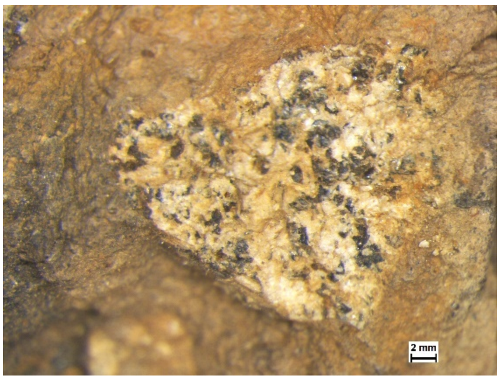


Fig. 18. Inclusions: left: impression of burnt-out grass or straw inside sherd ***1056****; right: example of a white and black speckled lithic inclusion, in sherd* ***1317***

The fact that the same kind of speckled stone (suspected to be in the granitic family) is present in both the Early Neolithic and Middle Neolithic pottery suggests that the source of the raw material may be local; this can be investigated further when petrological analysis is undertaken. The slate is very likely to have come from the island, as it outcrops there. The presence of at least two lumps of what look to be potter's clay, accidentally fired (**1316** and possibly **1416**, Fig. 19) in the Main Area South suggests that at least some of the pottery was indeed made at Eagle's Nest.

*Fig. 19 Lump of what is probably potter's clay, **1316**, from Main Area South Square E1, context 904*

Regarding the use of the Middle Neolithic pots, while virtually no instances of visible organic residue have been noted, and while scorching or burning appears to be very rare, the results of Jessica Smyth's analysis of absorbed lipids has confirmed that some pots were indeed used for cooking meat and/or dairy fat. (These results are detailed in a separate report by Smyth.) The small, fine 'Carrowkeel' bowls are unlikely to have been used for cooking and seem more suited to the serving of drink.

Discussion

The Eagle's Nest ceramic assemblage is important in two key respects. Firstly, the traditional CB pottery is among the earliest pottery to be found in Ireland, to judge from the radiocarbon date of 4990±35 BP (SUERC-4131, 3940–3660 cal BC/*3810–3665 cal BC* at 95.4% probability) from short-lived species charcoal from the traditional CB pottery-bearing context 1109 in Cutting 11 in the western valley (Cooney *et al*. 2011, table 12.4). Its direct association with porphyry quarrying debitage confirms the early start of porphyry exploitation on the island. This phase of activity is likely to be contemporary with the pre-passage tomb phase of occupation in Brú na Bóinne (Eogan and Roche 1997), and it overlaps with the Early Neolithic 'House Horizon' (Smyth 2014). Whether the modified CB pottery from Eagle's Nest is contemporary with the several dates calibrating to c. 3750–3650 cal BC (SUERC-4129, 4134, 4139 and 4141) remains to be seen; it is indeed a possibility. The discovery of CB tradition pottery on Lambay Island fits within the overall distribution pattern for this ceramic tradition, as mapped by Grogan and Roche (2010, illus 2, reproduced here as Fig. 20).

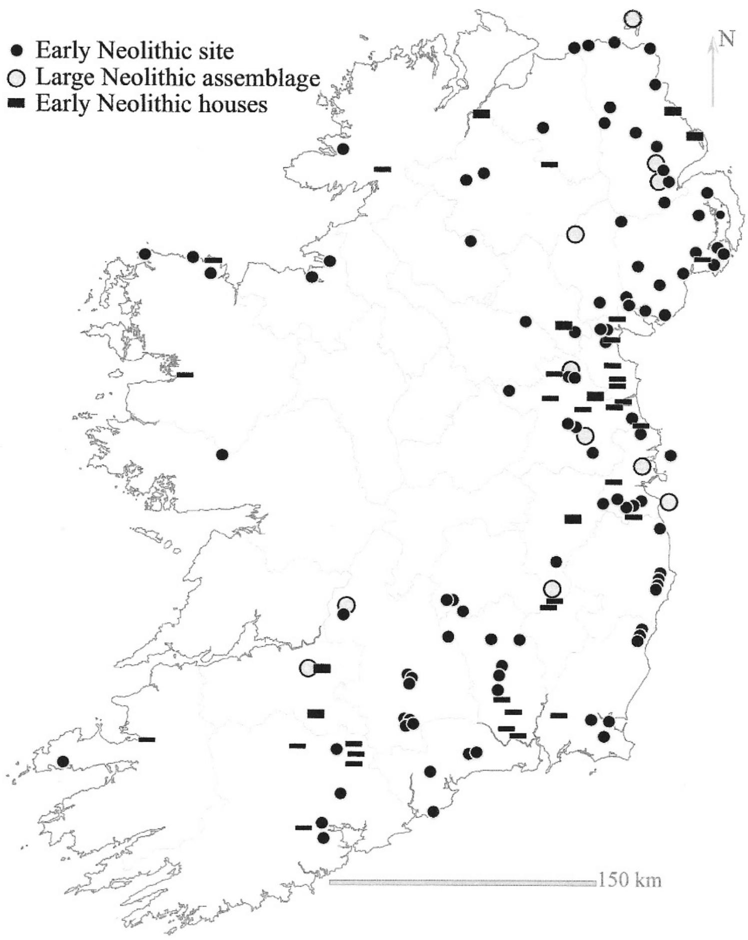


Fig. 20 Distribution of Carinated Bowl pottery and other Early Neolithic evidence in Ireland. From Grogan and Roche 2010, reproduced with permission

Secondly, the Middle Neolithic assemblage constitutes the largest assemblage of 'Carrowkeel' pottery in Ireland, and its association with undecorated and differently-decorated pottery sheds light on the overall Middle Neolithic repertoire in this part of Ireland. The direct radiocarbon dating that is hoped to take place once the current round of absorbed lipid analysis has been undertaken will, it is hoped, provide much-needed direct dating of 'Carrowkeel' pottery; the existing range of charcoal dates from Eagle's Nest includes just one determination that is likely to be relevant in this regard: 4460±35 BP (SUERC-4138, 3350–3010 cal BC at 95.4% probability).

There are numerous *comparanda* for the 'Carrowkeel' vessels in terms of their shape and decoration and, once again, the findspot is consistent with the overall distribution for this style of pottery (Fig. 21). 'Carrowkeel' pottery is mostly (but not exclusively) associated with passage tombs, and indeed the assemblage from the Mound of the Hostages, Tara, includes a good parallel for the use of very small vessels as well as large bowls (O'Sullivan 2005, plate 1). This type of pottery is also known from a few occupation sites, including Townleyhall II, Co. Louth (Eogan 1963). The new dates that may emerge from the current analysis of the Eagle's Nest assemblage will provide valuable information on the currency of 'Carrowkeel' pottery – a topic that has long required clarification (Sheridan 1985, 1995).

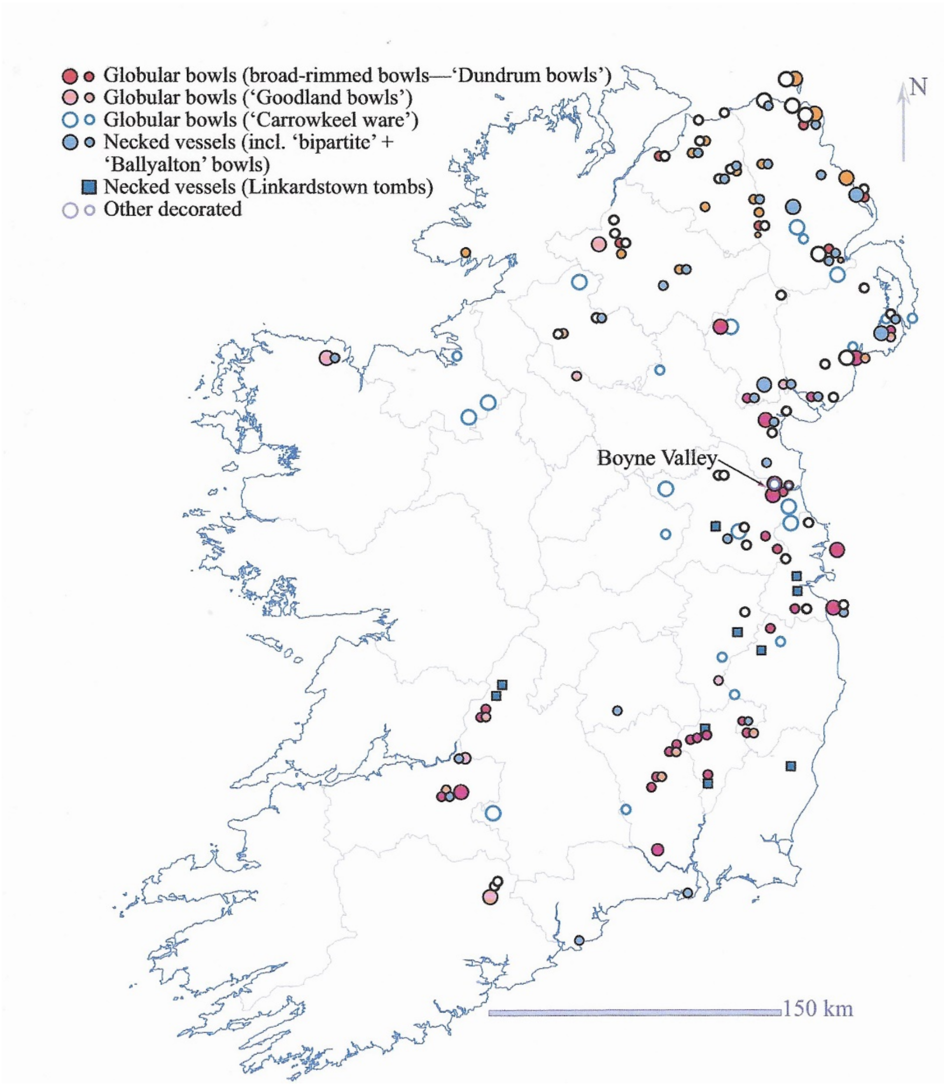


Fig. 21 The distribution of Middle Neolitbic pottery styles in Ireland, from Grogan and Roche 2010; reproduced with permission

The Eagle's Nest assemblage is as important for what it does not contain as for what it does. Interestingly, there is none of the broad-rimmed/collared Neolithic pottery that was found on the western coast of Lambay during the 1920s (Macalister 1929); nor is there any Grooved Ware or Beaker pottery. (There are two small, abraded sherds [**1312**] that appear to have narrow cordons, but they are so small and so abraded that it is impossible to be certain whether these are indeed cordons.) This suggests that the episodes of porphyry extraction occurred at discrete times over the course of the fourth millennium BC.

The assemblage also holds a mystery, in the form of a curious 'roundel' that appears to be of fired clay (**1067**, from Cutting 1, context 10; Fig. 22). Application of consolidant by the conservator who refitted its constituent parts has darkened and hardened the object and made it very shiny, but it does look to have been deliberately cut from a larger sherd, probably of CB pottery. Its function and significance remain unknown.

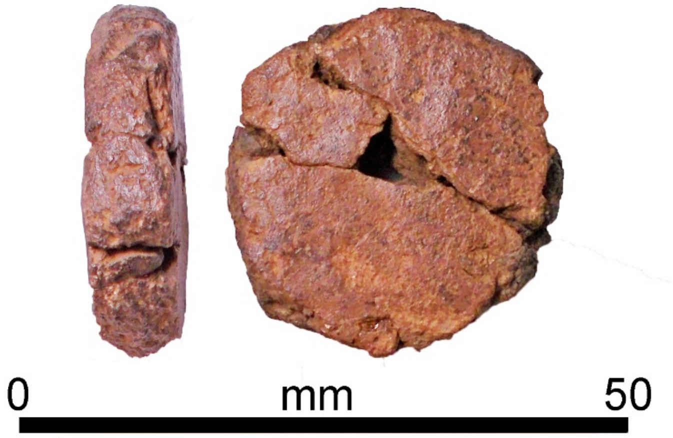


Fig. 22 The mysterious 'roundel', ***1067****, from Cutting 1, context 10*

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Table 1: Carinated Bowl pottery at Eagle's Nest, Lambay: traditional CB

Cutting or Test Pit (TP)	Context	93E144 no.	No. of sherds	No of frags/ crumbs (where specified)	Location on pot (blank indicates indeterminate)	Pot no	Comment
11	1103	**1207**	1	1		1	
11	1103	**1209**	3			1	
11	1103	**1210**	1			1	
11	1103	**1211**	2 conjoining (cj), refitted			1	
11	1103	**1212**		2		1	
11	1103	**1213**	1			1	
11	1103	**1217**	2		One S: car	1	
11	1109	**1231**	1		Neck, car, belly (cj with 1236)	1	
11	1109	**1232**	1			1	
11	1109	**1233**	5			1	
11	1109	**1234**	1		Rim	1	
11	1109	**1235**	2	1		1	
11	1109	**1236**	1		Neck, car, belly (cj with 1231)	1	
11	1109	**1237**		1		1	
11	1109	**1238**		3		1	
11	1109	**1239**	1			1	
11	1109	**1240**	3	3		1	
11	1109	**1241**	1		Bottom of neck	1	
11	1109	**1243**	1		Rim	1	
11	1109	**1244**	2			1	
11	1109	**1245**	1	1		1	
11	1109	**1246**	1	1 crumb		1	
11	1109	**1247**		1		1	
11	1109	**1248**	1	4		1	
11	1109	**1249**	1		Belly	1	
11	1109	**1250**	2		One S car	1	
11	1108	**1251**	1			1	
11	1109	**1252**	2	1		1	
11	1109	**1253**	4, incl 1 that cj with one sherd from 1321	5		1	
11	1109	**1254**	2	20 and crumbs		1	
11	1109	**1255**	1			1	
11	1109	**1273**	2			1	
11	1106	**1274**	1			1	
11	1106	**1276**	1			1	
11	1106	**1277**	1	1		1	
11	1109	**1294**	2	2		1	
		1295	3			1	

11	1109	**1321**	5, incl one that cj with 1253			1	
Totals for Pot 1:			**60**	**46 and crumbs**			
11	1103	**1208**	1	1		2	
11	1103	**1218**	1			2	Analysed by Lilly Olet
11	1103	**1219**	1	1		2	
11	1103	**1220**	1			2	
11	1103	**1221**	1			2	
11	1103	**1222**	1			2	
Total for Pot 2:			**6**	**1**			
11	1109	**1242**	1			3	
11W	Cult. soil	**1266**	1			Poss 3	
Total for poss Pot 3:			**2**				
11X (= 11E)	1105	**1306**	3, cj and refitted			4	Th 5.2
11X (= 11E)	1105	**1314**	1			4	Th 7
Total for Pot 4:			**4**				
11 Sq 9		**1303**	1	5		5	Th 7.7. Scorched on E and I
Total for Pot 5:			**1**	**5**			
Other trad CB:							
11	1103/1106 rabbit burrow	**1192**	5			6	
Total for Pot 6:			**5**				
Possible trad CB:							
TP2	F1	**1160**	1			7	
TP13	Cult soil spit 2	**1201**	1			8	
12	Base of cult soil	**1263**	9	10		9	Max Th 7.2
12 Sq 9	Cult soil, 1202	**1324**	1			10	
12, Sq 12	Cult soil	**1331 bis**	1			11	Bright red, scorched or burnt
Main area, Sq F1	Context 912	**1410**	1			12	Poss CB. E surface uneven and abraded. Th 10.5
Main area, Sq F4	F36, upper fill	**1414**	1			13	Th 6.1
Main area, Sq F4	F36, upper fill	**1415**	1			14	Th 7.7
Main area, Sq B3	F41	**1419**	4	5		15	
Main	F57	**1424**	1				See note

area, Sq E2							below
12, Sq 20	Cult soil, 1202	**1327**	1				Th 6.2; but this find no. also has a thicker sherd, and the poss CB sherd may be a spall, so its ID as CB is tentative.

Key: cj = conjoin; Th = thickness; car = carination; cult = cultivated; E = exterior; poss = possible

Notes

1. Other finds on the excavators' list of pottery from Cutting 11-11W-11E:

1206 (context 1103): is 'Carrowkeel' (analysed by Jessica)

1275 and **1278** (context 1106): is charcoal, not pottery

1296 (context 1109): is stone, not pottery

1319 (context 1109): item/s not present/not found

2. The single sherd **1424** from the Early Neolithic pit F57 (whose fill is associated with the C14 date SUERC-1412, 5180±45 BP, 4050–3930 cal BC, determined from oak charcoal), is unfortunately small and undiagnostic.

3. In addition to CB sherd **1160**, the Feature 1 pit in TP 2 contained two items whose identification as pottery is not certain; they could conceivably be soft stone. If they are pottery, they are within the thickness range for traditional CB pottery. Note: all the other pottery from F1 is definitely Middle Neolithic 'Carrowkeel' and associated ware.

Table 2: Carinated Bowl pottery at Eagle's Nest, Lambay: definite and possible examples of modified CB

Cutting or Test Pit (TP)	Context	93E144 no.	No. of sherds	No of frags/ crumbs (where specified)	Location on pot (blank indicates indet-erminate)	Pot no	Comment
Definite example: pot with shallow vertical incised lines							
6, Sq 2 baulk	Cult. Soil spit 5, 602	**1080**	1				Analysed by Jessica Smyth
6, Sq 2 baulk	Cult. Soil spit 5, 602, baulk 1	**1081**	1				
6, Sq 2 baulk	Cult. Soil spit 5, 602, baulk 2	**1082**	1				
6, Sq 2 baulk	Cult. Soil spit 5,	**1083**	2 cj				One analysed by Lilly Olet

	baulk 1						
Possible examples:							
5, Sq 11	Cult. Soil/Neo interface	**1071 bis**	1				Poss has incised line but is abraded. Superficially similar to the pot represented by **1080–3** but not sufficiently similar to be attributed to it
5, Sq 13	502	**1077**	1				
5, Sq 9	502/Neo surface	**1078**	1				
5, Sq 11	502/Neo surface	**1079**	1				
5	F20	**1205**	3				Tentatively included. All are spalls, max Th 7.2 (but original Th will have been greater)
6, Sq 2	Pit	**1164**	2				One sherd analysed by Lilly Olet
7, Sq 9	702	**1177**	1				Analysed by Jessica Smyth
7, Sq 12	708	**1186**	1				Analysed by Lilly Olet
TP2	Baulk TP2/2W02	**1187**	1				Th 10.5
Main Area, Sq G5	904	**1307**	1		Poss a rim		Th 10.1. Analysed by Lilly Olet

Note: three sherds, **1377** (from Main Area, Sq G5), that were selected for potential lipid analysis of one of them by Lilly Olet, were initially considered to be possible candidates for modified CB pottery but the exterior surfaces are abraded and it is equally or more possible that they are of Middle Neolithic date; if a lipid date can be obtained, this should help to resolve the matter