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Project Gallery

At the cutting edge: biographies of Orcadian Neolithic axes

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Polished stone axes are one of the most iconic types of tools of Europe's first farmers. Despite their ubiquity, we know relatively little about how they were used. Here, the authors outline how macroscopic wear analysis is revealing diversity in the use and treatment of axe-heads from Neolithic Orkney.

Keywords: Western Europe, Neolithic, use-wear analysis, artefact biography, polished stone axes

Introduction

First made and used during the Mesolithic (*c.* 10 000–4000 BC) in Northern Europe, polished stone axes were widely circulated in Britain and Ireland during the Neolithic (*c.* 4000–2500 BC). Central to the earliest discussions of prehistory, they maintain a high profile in current research (Risch *et al.* 2024). In Britain, a long history of petrological studies means that we can identify the raw-material sources and distributions of many Neolithic axe-heads (Clough & Cummins 1979, 1988; Bradley & Edmonds 1993; Davis & Edmonds 2011). The patterns of circulation are sometimes striking, suggesting that axes had a dual importance as everyday tools and as tokens of identity and value (Edmonds 1995). Yet, only recently have we begun to understand the activities in which axe-heads were used. While it was long assumed they were instruments of forest clearance, research now suggests that their uses were often more varied (Masclans *et al.* 2017; Roy *et al.* 2023). Our project draws on these advances in knowledge, exploring variations of use and treatment, through a regional lens, by examining axe-heads from Neolithic Orkney (Figure 1). Here, we present an outline of the project and summarise results from the first stage of our analyses.

Axe-heads in Neolithic Orkney

The Orkney archipelago has produced a substantial inventory of Neolithic stone axe-heads, most sourced from local outcrops, though a few have more distant origins (Figure 2). Prior work on morphology has shown that while Orcadian axe-heads vary

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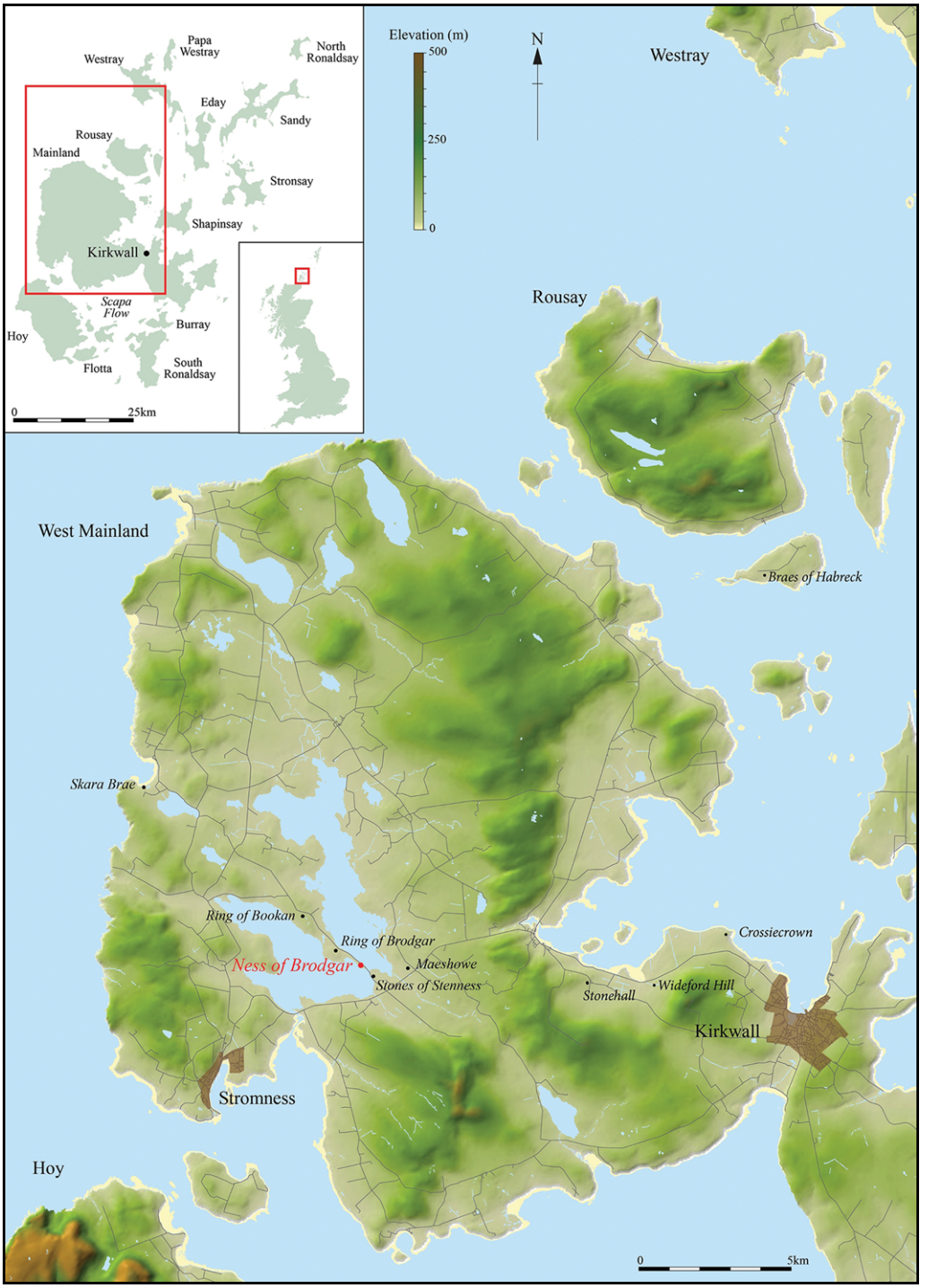

Figure 1. Map of Orkney with selected Neolithic sites (figure by authors).

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Figure 2. Neolithic axe-heads from the Ness of Brodgar, Orkney (figure by Woody Musgrove).

considerably in their form and size, regional traditions favoured relatively small axe-heads (Clarke 2011).

Our project builds on these earlier observations, taking a biographical approach (Gosden & Marshall 1999) to establish how axe-heads were used and treated in Neolithic Orkney. A key concern is the systematic characterisation of the wear patterns on the axe-heads; traces reflecting patterns of use, reuse, hafting and handling. Our integrated approach combines morphological analyses with experimental archaeology and wear-trace characterisation, the latter taking in the entire surface of axe-heads, not just the cutting edges. Together with data on site use and context, our work will track the lives of axe-heads at local and regional scales.

A total of 71 axe-heads were selected for the current study. These were recovered from settlements, including Crossiecrown (two axes), Stonehall (five axes), Wideford Hill (four axes) and Braes of Ha'Breck (13 axes). The majority, 47 axe-heads, were recovered from the Ness of Brodgar, a specialised Neolithic settlement of monumental stone buildings (Figure 3) (Edmonds 2019; Card *et al.* 2020).

Most of these axe-heads are made of local igneous (camptonite) and sedimentary rock (sandstone, siltstone, mudstone), with examples also made of gneiss and quartzite. The axe-heads are divided into three broad categories: large axes (>75 mm in length, n = 38, all except four are completely ground); small axes (<74 mm in length, n = 24, these small axes of varied form are common in Orkney); chisel axes (typically <40 mm in width, long, narrow and parallel sided pieces, n = 4).

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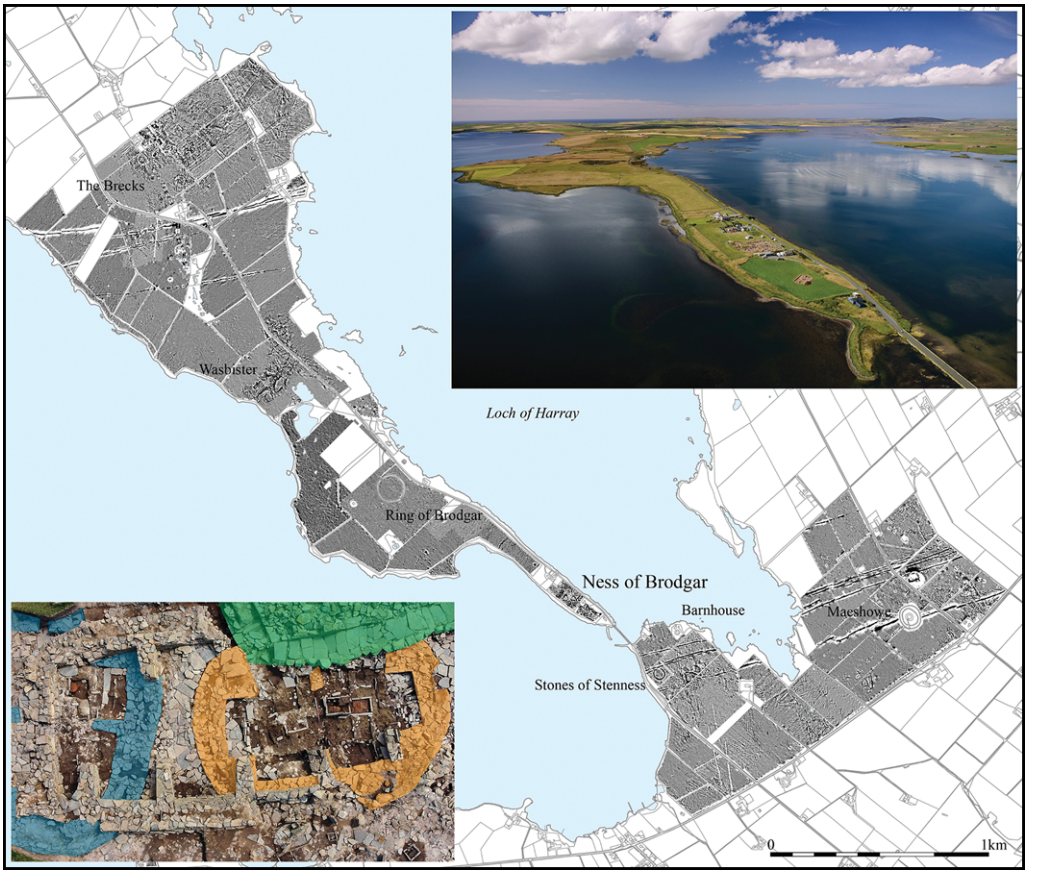

Figure 3. Overview of the Ness of Brodgar site, with the results of gradiometer survey. Inset shows palimpsest of four buildings (structures 17, 18, 8 & 10) in one small area of Trench P. (figure by authors).

To date, we have carried out macroscopic wear analyses, employing naked-eye observations and low-power microscopy (0.5–40×, using a Motic SMZ-143 Stereomicroscope). Our study draws upon existing classification schemes, enabling a broad-scale assessment of possible uses and treatment, including the general character of contact materials (Masclans *et al.* 2017; Iwase *et al.* 2024). Specific features of axe-head morphology have also been examined, including the presence of post-use reworking of ground surfaces, visible in the form of faceting and pecking.

Low-power analysis

Large axes saw sustained use in a variety of tasks. Of the 21 complete examples, all except four have cutting-edge damage consistent with percussive activities such as chopping, cutting and the splitting of wood, stone or bone, while seven have transverse breaks indicating work in tree-felling or heavy-duty timber working. In contrast, two axe-heads of quartzite and one of mudstone have macroscopic edge-rounding and

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Figure 4. Wear on a quartzite axe-head (figure by authors).

reflective gloss, indicating use for the scraping of softer materials, possibly hide-processing (Figure 4).

Wear on 10 of the 24 small axes consists only of scratches, striations and small flake scars (Figure 5). This suggests a use on softer materials and, perhaps, less sustained percussive use over time. Similar patterns are seen on the chisel axes, which often have crushing at the butt-ends, substantiating their use as chisels. We also identify contrasts between sites. At Braes of Ha'Breck, five of the seven small axe-heads have wear traces consistent with percussive use on hard materials. This suggests a flexibility in how axes of different shapes and sizes were used from one setting to another.

Evidence is also emerging for changes across the use-lives of individual axe-heads, particularly on the larger tools. This is seen, for instance, in the presence of indented zones of pits and linear scratches, often concentrated towards the middle of the artefact (Figure 6). Found on nine large axes, these traces cut through the original ground surfaces and hint at their (unhafted) reuse as anvils for the bipolar reduction of flint cores. Some large axe-heads—complete and broken—were also reused as hammers and abraders.

Several small axe-heads also show evidence for later pecking around their butt-ends and regrinding of their sides. This may reflect modifications associated with the fitting of existing axe-heads into new, replacement hafts.

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Figure 5. Wear on a small camptonite axe-head (figure by authors).

Figure 6. Axe-head with 'anvil wear' (figure by authors).

Discussion

Our project is at an early stage; low-power observations need to be complemented by analysis at higher magnifications and verified via an experimental programme to interpret patterns of use and treatment. Our preliminary analysis indicates that axe-heads saw

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a much wider diversity of uses than hitherto supposed, and that the character of those uses often changed across a tool's life history. There is more to explore—for example, the different ways smaller axe-heads were employed from one site to another and whether this variation relates to raw material choices or to other factors.

Conclusions

Our observations hint at local ways of making and using axe-heads within broader regional traditions. Earlier observations that Neolithic people in Orkney were deliberately making axe-heads of varying sizes, and that size influenced their use and reuse over time (Clarke 2011), hold true. This is seen in the different wear patterns on small axe-heads compared to larger specimens. Furthermore, some blunt-edged 'axe-heads' were probably employed in scraping rather than percussion. Planned high-power use-wear analysis and experiments will allow us to assess specific contact materials and strengthen our understanding of how individual axe-heads were used, reused and reworked over the course of their lives.

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Patrick Nørskov Pedersen: Conceptualization-Lead, Data curation-Lead, Formal analysis-Lead, Funding acquisition-Lead, Investigation-Lead, Methodology-Lead, Project administration-Lead, Validation-Lead, Visualization-Equal, Writing - original draft-Lead, Writing - review & editing-Equal. **Aimée Little:** Conceptualization-Supporting, Investigation-Supporting, Methodology-Supporting, Writing - review & editing-Equal. **Mark Edmonds:** Conceptualization-Supporting, Data curation-Supporting, Investigation-Supporting, Visualization-Equal, Writing - original draft-Supporting, Writing - review & editing-Equal. **Ann Clarke:** Writing - review & editing-Equal.

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