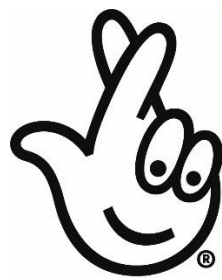


# A Race Against Time

## The Story of Swandro



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## Introduction

The mound and settlement of Swandro consists of a large early to mid-Iron Age roundhouse forming a central focus to the site surrounded by houses dating from the Iron Age, Pictish and possibly Viking periods and enclosed by an early stone-lined ditch. There are strong indications that this central roundhouse had undergone major structural rebuilds. The site was originally thought to be a single small Iron Age house but investigations have shown that it is a much bigger structure and that the surrounding settlement extends under the beach; much of it has already been destroyed and it is being constantly eroded by the sea. The site is being excavated by the University of Bradford and the Swandro-Orkney Coastal Archaeology Trust with funding from Historic Environment Scotland, Orkney Islands Council, support from Rousay Egilsay and Wyre Development Trust, and other sources derived from fund raising by Dr Caz Mamwell of the Swandro Orkney Coastal Archaeology Trust, to gain as much information as possible before it is lost.



*Fig 1 The location of the eroding archaeological sites of Swandro, South Howe and Yorville burnt mound.*

The research project by the University of Bradford commenced in 2010. Its aim was to look at several small sites along the Rousay coastline which were being eroded by the sea. The sites had been suggested by Julie Gibson, the then County Archaeologist and a resident of Rousay, who has long been concerned about the loss of archaeological sites to rising sea levels. The project eventually settled on examining and recording the coastal erosion at South Howe broch and examining the surviving remains endangered by the sea at the Knowe of Swandro.

## Investigations at South Howe

The aim of the 2010 season at South Howe broch was the characterisation and examination of the potential of the surviving archaeology in the cliff exposure. The large expanse of exposed wall core that forms the apex of the visible mound was not cleaned and was left untouched in order to maintain the stability of the wall. Turf and slippage was removed to reveal the outer wall face and the exposed wall core. To the east of this truncated wall a wall face ran north; this wall face turned at 90° into a second wall that appeared to run west into the mound and form the inner wall of a broch-like roundhouse. The north-oriented face is interpreted as the side of an entrance passage. The remains of a broken lintel stub could be seen projecting from this wall.



*Fig 2. The broch at South Howe, eroding from the cliff.*

The active area of erosion here extends for at least 70m along the low cliff face. In the centre of this eroding area are the remains of walling which appears to be the outer wall and entrance passage of a broch. This wall survives to a height of 2.5m and varies in width from 4.2m at its base to just under 3m at its highest point. Erosion to the west of this structure appears to be recent, with a cove-like zone extending 2m inland. This zone contained orthostats and flagging. A second zone of active erosion appears c.20m to the east. Examination of this area revealed a number of walls; their different construction strongly suggests that these remains represent a later phase of settlement, probably dating to the later medieval or early post-medieval period. South Howe, then, is a multiperiod settlement mound with a broch at its centre and settlement extending into the historical period.



*Fig. 3 South Howe: the later medieval or post medieval buildings eroding from the cliff face.*

## The Knowe of Swandro

The Knowe of Swandro consists of a large mound situated immediately behind a boulder beach on the Bay of Swandro; although it is hard to make out the size of this mound in the current landscape, when viewed from the bottom of the mound on the landward side its true size becomes apparent. On the eastern flank of the Knowe are two Norse (late Viking period) houses known as the site of Westness, excavated by Walter Grant in 1946 and re-excavated by Sigrid Kaland in the 1970's (Radford 1962; Kaland 1993).

The excavations by Kaland suggest that some of the trenches went to the foot of the Swandro mound and possibly in some cases into the underlying prehistoric archaeology but no evidence of either the Grant or Kaland investigations has yet been found in the modern excavations.

The Knowe of Swandro was first recorded in the 1946 Inventory of the Ancient Monuments of Orkney and Shetland published by The Royal Commission on the Ancient Monuments of Scotland. The entry describes the site as being "The much-disturbed remains of a stony mound. To judge from a series of large slabs set on edge over an area measuring roughly 72 ft by 24 ft there may have been a group of graves here, possibly of Viking origin."

A later description of the Knowe, by the archaeological division of the Ordnance Survey in a field visit on the 8th of June 1967, described it as being "a mutilated turf-covered mound 1.5 m. high, apparently containing the remains of a drystone structure. Unable to classify, but possibly associated with the nearby Viking hall".

A later entry field visit by the Ordnance Survey on the 10th of October, 1972 indicates that the mound contained a structure. "The size and shape of this turf-covered mound suggests it to be the NE half of a broch, and a trench cut across it (but now filled in) revealed enough surviving walling to support this classification. Paving reaching from the nearby Viking hall for

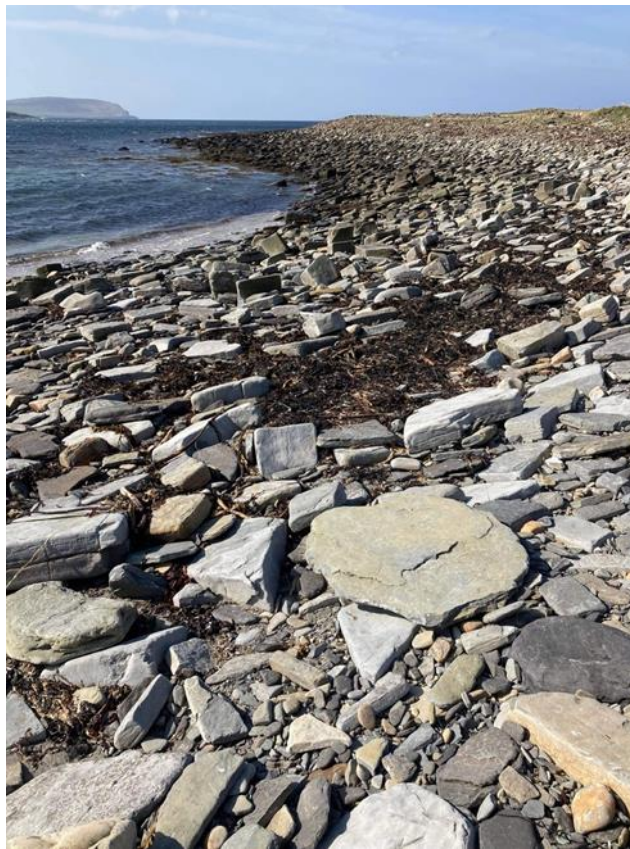
several yards towards this mound suggests that the mound provided a source of building material for the hall and farmstead”.



*Fig. 4 The Knowe of Swandro before excavation.*



## Coastal Erosion at Swandro



*Fig 5. The boulder beach at Swandro  
(Photography Kathryn Marwick)*

Our work started in 2010, with the discovery of set upright stones (or orthostats) protruding from the boulder beach. Investigation of these stones indicated that they formed the remains of a building that had been truncated by the sea. This led to a programme of work from 2011 to 2017 of evaluative archaeological excavations of the beach in order to determine the archaeological survival of the eroding deposits.

These evaluative investigations between 2010–17 defined the extent and nature of the archaeological survival on the eroding beach. They revealed a series of partially destroyed buildings together with midden deposits, in places intact and in other parts of the beach they were partly destroyed by the sea. This work has provided an important understanding of the erosion processes and the archaeological survival and has enabled the

development of recording methods applicable to this project and a plan to investigate the remains that were most at risk. This research will also help to understand and plan the future management of other such sites across the North Atlantic.

The evaluation demonstrated that the seaward deposits surviving at the lowest of the sea-cut erosion terraces have suffered from extensive erosion, with much of the midden material having been washed away and the larger structural stones having been smoothed by the movement of water and beach material. Approximately 40–50% of the central roundhouse is already destroyed or subject to attack by the sea. The seaward elements of the walling associated with the roundhouse have in particular been subject to erosion from tidal movement, the effects of scouring on the stone and removal by suction of the softer archaeological deposits being most apparent in this area. This has resulted in only the more substantial stone elements being left in place in some areas. Even some of the large facing stones have been lost to the sea; this is obvious when a comparison is made between the survival of remains uncovered in 2012 and again in 2015 and in 2019. Much of the core material retained by the lower casement wall faces has also been lost over this period.



*Fig 6. Under the boulder beach at Swandro: the outer walls of the central roundhouse.*

Excavation revealed that the sea had scoured out all of the original deposits that would have been associated with these structural features. The area to the south-east (seaward) had been scoured out and then infilled by mixed redeposited beach material. A number of redeposited large boulders were found in this area. These appeared to be embedded, having been thrown down with some force presumably by high-energy wave action during storm events. It was hoped that an old ground surface might have survived but the scouring effect of the sea had removed all evidence of this.

Re-examining the effects of coastal erosion in 2022, after two years of absence due to Covid, indicated that the seaward side of the central roundhouse, which is under high tide level, had suffered greatly from erosion during this intervening period. An observation made in previous years suggested that the loss of finer archaeological deposits occurs through tidal action in addition to the more obvious erosion from high energy waves. The effects of tidal action combined with the through-flow of groundwater leads to the constant loss of finer deposits such as those with high ash or silt content which are being removed by tidal suction. Where the deposits are between or underlying walls, the effect is to enhance movement and slippage of the walls which will lead to their eventual collapse. These effects have resulted in a significant loss of archaeology. Some wall faces have partially collapsed and the wall coursing is tipping towards the sea due to the loss of underlying material.

The loss of finer material from the waterlogged underlying deposits due to tidal suction has also had an effect on the more substantial walling that survives above the high tide level. Here there was visible movement of structures, including the opening of joints in walling and cracks in large stones, together with a measurable loss of height due to the removal of underlying sediments by tidal action. The excavation and recording of the eroding part of the site is important in providing a record of movement, stone wear, and sediment loss. The use of new technology such as laser scanning is allowing us to compare the current situation with previous data sets from the site and to build up a model of the day to day loss of archaeology due to coastal erosion. Research by Nicola Burton using laser scanners

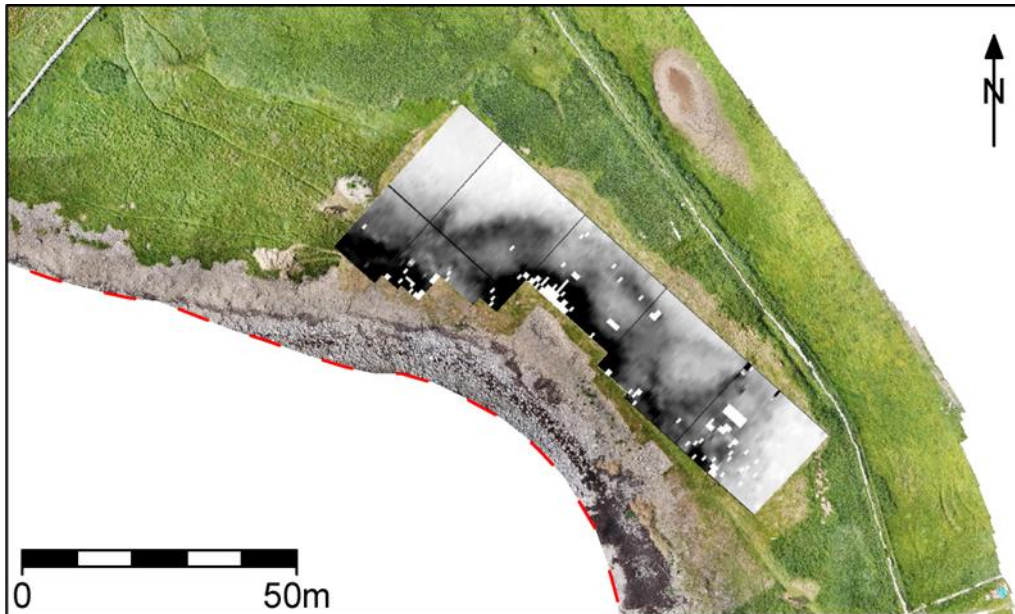
has enabled 3D recording to take place, allowing these changes to be recorded and monitored over several years.

## What Survives Beyond the Excavation: The Geophysical Investigation

A geophysical survey around the Knowe of Swandro was carried out by Professor Chris Gaffney and Tom Sparrow (Visualising Heritage, School of Archaeological & Forensic Sciences, University of Bradford) in order to assist with the interpretation of the ongoing excavations at the site. These surveys were carried out at the start of the 2019 excavation season and build upon previous surveys of the area. The 2019 surveys investigated the landward side of the site, which is not currently affected by erosion.

A number of integrated geophysical survey techniques including detailed earth resistance survey (Geoscan Research Twin-Probe), electromagnetic survey (GF Instruments CMD-Mini-Explorer), Ground Penetrating Radar (Mala X3M) and Electrical Tomography (ZZGeo FlashRES64) were used. These techniques allow data to be collected at multiple depths to allow for a better understanding of this multi-phase and multi-period site.

The detailed earth resistance survey indicated that the large roundhouse forming the main component of the Knowe of Swandro was surrounded by subsidiary buildings like those which had been seen in fragmentary form under the boulder beach, suggesting a significant nucleated settlement of village proportions around the large central roundhouse (Figure 7).

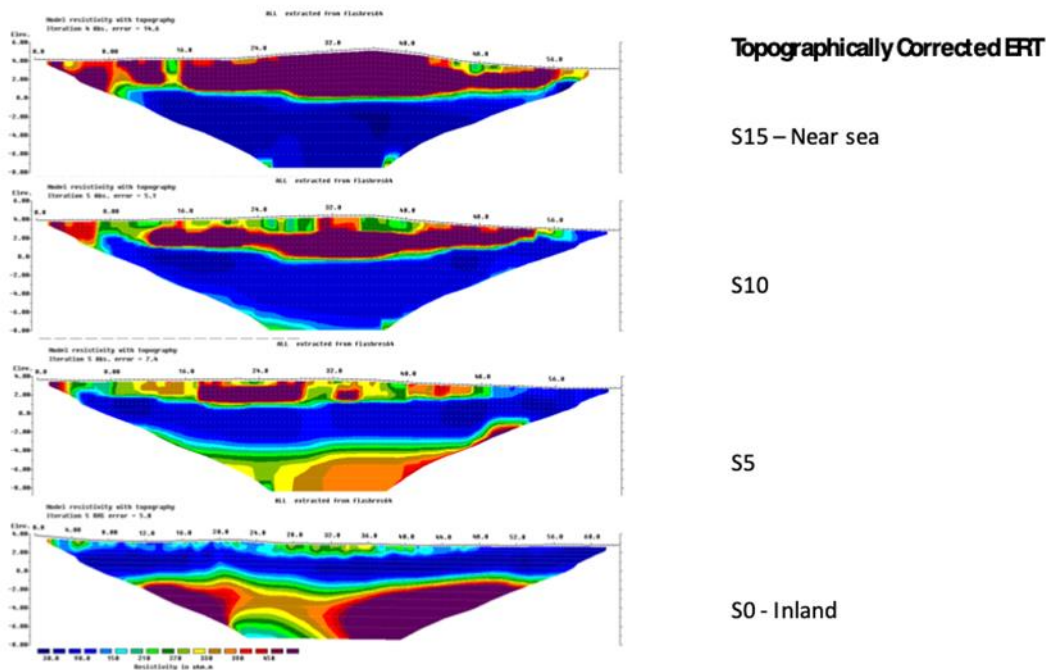


*Figure 7. The georeferenced earth resistance survey showing the extent and form of the settlement next to the eroding coastline. The anomalies indicate that the roundhouse appears to be the focus for a nucleated settlement (Visualising Heritage, University of Bradford).*

The Ground Penetrating Radar confirmed elements of results indicated by the area Earth resistance survey; particularly, showing archaeology concentrated around the physical mound of the Knowe of Swandro. However, the data collected from the GPR proved to be ambiguous and this is likely to be the result of the presence of saline water that inhibits the passage of energy through the soil.

The Electrical Resistivity Tomography (ERT) data was collected on the Knowe of Swandro in parallel traverses with their positions recorded in x,y and height to allow the data to be topographically corrected. This technique allows a vertical section through the ground to be investigated. The traverses using the ERT were extremely successful and provide an extended view of the site by comparison with the other techniques. The ERT indicated the depth and extent of the archaeology and confirmed the focus of settlement on the coastal strip. This technique clearly indicates the depth of archaeology representing the settlement by the anomalies at the top of each traverse (Figure 8). These anomalies can be

seen to diminish, becoming thinner as the traverses progress inland. The blue in these images is indicative of a low resistance response, interpreted as saturated material below the water-table. This has been corroborated in the excavation area where the water-table has been reached. More importantly in terms of future management and understanding, this survey demonstrates that the coastal strip is of great significance, containing the greatest depth of stratigraphy and that it is a finite resource, enhancing the value of the archaeological investigation before the site's destruction by the sea.



*Figure 8. The ERT traverses of the Electrical Tomography survey showing the depth slices or profiles with the archaeology depth diminishing away from the sea and the presence of the water table. (Visualising Heritage, University of Bradford)*

## The Central Roundhouse

The central Iron Age roundhouse (Structure 8) is monumental in size, and is the main structure forming the Knowe of Swandro. The landward side survives as a visible earthwork or mound, but towards the coast the mound is less visible due to a combination of later buildup and coastal erosion. A good half of the building is on the seaward side of the erosion line; it has been reduced to a few courses of walling in places and is now under the boulder beach.

The building has a long use and shows signs of a number of significant modifications and rebuilding events. The structure was possibly only dismantled with the arrival of Viking age settlers. Radiocarbon dates suggest that this building was first constructed in the Early Iron Age, probably 2,800 – 2,400 years ago. If this is correct the Central Roundhouse survived as a standing structure for a thousand years.



*Figure 9. The central Iron Age roundhouse.*

The excavation indicated that this large Central Roundhouse (Structure 8) is monumental both in size together with its focal position in the centre of the settlement. The roundhouse has an internal diameter (in its reduced rebuilt phase) of 12 metres and an estimated outer diameter of 17 metres. This parallels the proportions of many Orcadian broch sites such as the nearby broch of Midhowe. However the construction of this roundhouse, although monumental in proportion, does not provide any clear evidence of the architecture indicative of a broch. This may be due to the fact that the original roundhouse predates the broch form, and the structure was later modified to be more 'broch like'. In many ways this building probably functioned within the social system of the Iron Age in the same way as a broch despite the architectural differences.

The outer wall of this large roundhouse (Structure 8) overlies earlier material and it is possible that this may represent a thickening of the wall base of the original wall by the addition of a cladding wall. Material contained in the core infill between the outer wall forming the cladding on the seaward arc of the roundhouse and inner concentric wall face, returned an AMS radiocarbon date of 732–401 cal BC at 95.4% probability (SUERC-88535 (GU52307)). Material architecturally later than this outer cladding wall of the roundhouse and sealed by a later wall butting the roundhouse outer wall again returned an Early Iron Age AMS radiocarbon date of 760–430 cal BC at 95.4% probability (SUERC-88540 (GU52309)). A third date was obtained from the material clearly later than the construction of the roundhouse wall and contained by this later wall and thus stratigraphically above SUERC-88540; this returned a date of 788–541 cal BC at 95.4% probability (SUERC-88536 (GU52308)). This series of dates suggests the origin of this building may be in the Early Iron Age, with some evidence of underlying settlement going back into the Late Bronze Age. These dates in part explain some of the unusual characteristics of this roundhouse. The evidence suggests that this building represents a monumental Early Iron Age roundhouse form, with evidence that the building continues in use into the 1st millennium AD.



The removal of much of the structural evidence by erosion on the seaward side limits further interpretation; there is no intention to excavate the landward part of the structure at present as it is not threatened by the sea. The diameter of the building and its central position, within a village-like settlement surrounding indicated by the geophysical survey, suggests that this building has a degree of monumentality and indicates a high-status settlement pre-dating the development of more complex forms of Atlantic roundhouses, which include fully-fledged brochs.

The southern area of the roundhouse under the boulder beach had been severely affected by the sea. Here much of the finer grained material forming the depositional sequence had been removed by tidal action. Survival was better on the landward side. However, in the central zone of the building a major collapse event was evident from the position of slumped or fallen structural stones which had originally been set upright ('orthostats'). The structure of this collapse was three-dimensionally recorded by photogrammetry and laser imaging. Several truncated hearths were identified and sampled for archaeomagnetic dating.

The northern circuit of the building provided a better insight into the archaeological complexity and potential of the site as it has not yet been exposed to the sea and the effects of tidal action. The interior of the later inner phase of the roundhouse (termed as Structure 6) dating to the later iron Age (or Pictish period) provided evidence for later rooms associated with the construction of a medial wall and passageway in alignment with the entrance passage. On the north eastern circumference of the roundhouse, an earlier room formed by upright stone orthostats (Structure 5) had been backed by the walling of this medial passage which bisected the centre of the roundhouse.

Structure 5 is a cell or room on the northern circumference of the Central Roundhouse, dating to the mid Iron Age. This room was defined by the roundhouse's inner wall face with the use of large upright orthostats to form the boundary on the internal side. The tops of these set upright stones seemed to have been

carefully shaped to form a level. These might have supported an upper floor at this point on the circumference of the roundhouse, one which was not present in the Early Iron Age building but had been produced by these later modifications of the building. This room seems to have had a long usage and in the Later Iron Age the orthostats had in places been removed and replaced by walling or the orthostats had been backed by walling associated with the Structure 6 modification of the central corridor, leading from the entrance of the roundhouse into its interior.

At the end of 2019, a floor level was identified in Structure 5 and in 2022, when excavation resumed after the Covid pandemic, it formed the focus of definition and excavation, revealing several hearths and floor layers.



*Fig. 10. Excavating Structure 5*

In 2023 the excavation saw the further definition of features and excavation of the floor to reveal the presence of an earlier floor level and a doorway into the cell from the central passageway, which had been blocked in the Later Iron Age re-

configuration of the interior of the roundhouse. The doorway consisted of a threshold stone with an in situ pivot stone (a stone with a carved hollow into which the bottom post of a door could be inserted so that it could swing open and shut). The floors were fully sampled and the large hearth butting the interior circumference wall of the roundhouse was also sampled for archaeomagnetic dating. Excavation of this room is revealing a long and intriguing history of use; finds included Iron Age glass toggle beads and worked bone artefacts associated with textiles including long-handled weaving combs of whalebone and antler, a spindle whorl and bone needles. Two fragments of Roman glass bottles provide a sense of both status and the trading connections with a much wider world. Soot staining can still be seen on some parts of the inner wall. There is also a suggestion that there may have been an upper floor or mezzanine to at least this part of the roundhouse. This room seems to have had walls partially covered with bright yellow clay, also found at Old Scatness in Shetland and at other contemporary sites, which would have made it a much brighter and more colourful space than we perhaps imagine when we think of the prehistoric period.



*Fig 11. Structure 5 showing the orthostatic boundary forming the room, with a later floor surface to the right and an earlier floor surface to the left of the section line*



*Fig 12. Two Iron Age glass toggle beads from Structure 5.*



*Fig 13. Decorated weaving comb made of antler with a 'fish tail' handle. The colour is due to partial burning.*

In 2023 the excavation saw the further definition of features and excavation of the floor to reveal the presence of an earlier floor level and the doorway into the cell, which had been blocked in the Later Iron Age re-configuration of the interior of the roundhouse (Figure 11).

At the end of its life, Structure 5 was infilled by a complex tipping sequence of rubble and midden infilling the shell of this building. These deposits included midden layers rich in animal bone (mammal, bird and fish) and burnt stone. Some of the animal bone was articulated, while others showed evidence of butchery with a large metal blade. The bird species included a number of bones from White Tailed Sea Eagles (Figure 14) and the now-extinct Great Auk.



*Fig 14. Skull of a White-Tailed Sea Eagle found in the structured midden infilling of Structure 5.*

This room (Structure 5) within the roundhouse seems to be contemporary with other activity dating to the first century AD at Swandro. The partly-eroded building Structure 1 is connected to the roundhouse by a passage and has also produced radiocarbon and archaeomagnetic dates for the first century AD. The 'smithy' (Structure 3) was also in use during the first century AD, indicating activity dating to this period across the settlement.

After Structure 5 went out of use, the rest of the building including the central passage, was remodeled. The passage led to (now partially-eroded) occupation levels which included paving, hearths and an iron smelting furnace surrounded by fragments of glassy slag. This Late Iron Age or Pictish phase links to other areas of activity within the settlement such as the corn dryer and threshing floor in Structure 4 (below) and the phase sealing the stone tank in Structure 2.

In the western quadrant of the Central Roundhouse at the end of the 2022 season, the remains of the top of a fired structure thought to be a furnace was identified. This structure, which was made of brick-sized stones and clay, was excavated in 2023 and 2024 and archaeomagnetic samples together with samples of slag were taken. Preliminary X-Ray Fluorescence of the slag by Dr Gerry McDonnell confirmed the assumption that the furnace had been used for iron smelting. A complete handled bowl carved from steatite (soapstone), with evidence of heating on the side and bottom, was found in deposits associated with the furnace. No dated parallels for this vessel have yet been found; the nearest sources of steatite are in Shetland and artefacts of steatite of this size are unusual in the Iron Age. This furnace, together with the adjacent area, may be Late Iron Age or Pictish in date.



*Fig. 15. Alan Braby excavating the iron smelting furnace.*

In the north western quadrant of the Central Roundhouse, excavation of an inner room revealed a rectangular hearth and intact floors. On either side of the hearth were two whale vertebrae set into pits in the floor. These vertebrae had sockets worked into the bodies and seem to have acted as the bases for two uprights for a spit or bar above the fire, to support a suspended cauldron or other feature. Several unfinished handles made of antler were found on the hearth stones.



*Fig 16. The inner room of the Central Roundhouse; the two whale vertebrae can be seen either side of the hearth.*

## The Earliest Evidence at Swandro

The erosion of the archaeology by the sea caused by tidal action revealed that some archaeological evidence survived in the area of the low tide. This survival provided a glimpse of some of the earliest archaeology at the site (Figure 17). Some of these archaeological deposits predated the outer wall of the Central Roundhouse, with layers clearly running under the facing stones of the outer wall. An early wall was found to butt up against the roundhouse wall and the early deposits were also sealed by the construction of this butting wall, giving a glimpse into the sequence of activities at this early date.





*Fig 17. The Central Roundhouse at low tide. The outer face of the roundhouse wall curves across the upper part of the photograph, with the butting wall to the right. The earliest deposits can be seen under both these walls. The red and white scale is placed over an area where all the earliest deposits have been scoured out by the action of the sea and replaced by large boulders.*

## The Surrounding Settlement

The first building excavated at Swandro was not the large Central Roundhouse but a much smaller building, Structure 1, which lay quite far down the beach towards the sea and which had been truncated by the severity of the erosion in this area. There were also earlier midden and structural material below this fragment of a house. The severe erosion meant it was necessary to sample the earlier material, which included an earlier building, a clay floor and material overlying an even earlier sequence of midden material; an early dump of domestic rubbish (Figure 18).



*Figure 18. Structure 1 (top) showing truncated floor, hearth and oven with the underlying stratigraphic sequence showing an earlier building belonging to the Early Iron Age.*

The deposits were excavated stratigraphically and fully sampled for environmental remains and for dating material. The sequence produced Early Iron Age pottery containing temper-rich rim sherds with a flat splayed rim form, and a perforated seal tooth interpreted as a pendant (Figure 19). The pottery can be paralleled by a number of examples found in contexts associated with the Early Iron Age roundhouse at Tofts Ness, Sanday.



*Fig 19. The perforated seal tooth pendant from the Early Iron Age deposits below Structure 1.*



*Fig 20. Pottery from the Early Iron Age deposits*



*Fig 21. Alan Braby drawing the section through the Early Iron Age deposits; a combination of high tide and the water table made for damp conditions.*

## Structure 1: A Truncated Mid Iron Age Roundhouse

Structure 1 itself, which overlies the early features, is represented by just one segment of its circumferential cells, the interior and southern portion of the building having been lost to the sea. The circumference of the building is represented by set upright stone flags (orthostats). The inner kerb of a paved cell was formed by a single long orthostat. The floor of this cell was formed by a single flagstone, which was dressed to fit the cell. Several notches had been cut into the flagstone which are thought to be for post settings. It seems likely that, if this assumption is correct, these posts would have supported a mezzanine level; a kind of upper floor around the circumference of the structure.



*Fig 22. The paved floor of the cell in Structure 1 and the two post settings, recorded in 2015.*

To the west of this cell is a stone oven which is closely paralleled by a more complete example excavated by the authors at the Iron Age settlement of Old Scatness in Shetland (Dockrill et al. 2015). It was constructed against the inside wall

of Structure 1 and was made by the construction of a stone box of upright stone flags forming the sides of the oven (Fig. 23). A dry-stone wall formed the sides of the oven structure to provide a chamber. Adjacent to this oven feature was a substantial hearth. It seems likely that hot ash created on the hearth was placed into the chamber. This would have heated the missing oven chamber that would have been located above the surviving features.

A series of truncated floor and hearth deposits were recorded in the central area of this building. Much of the central zone had been truncated by the sea, leaving fragmentary remains of the floor sequence. A layer of yellow clay formed a distinctive floor surface. A flagstone appears to have been associated with this floor though as a later addition. This all overlaid the remains of flagging and an orange-brown clay and a red clay that had been modified by heating. This appeared to be the clay base for a hearth and was sampled in 2019 for archaeomagnetic dating.



*Fig 23. The oven and hearth are visible on the left, the entrance and passage beyond are marked by the horizontal red and white scales.*

The area to the north of Structure 1 revealed a flag floor and threshold stone leading into the building. This linked Structure 1 to the main building via a passage leading to the Central Roundhouse.



*Fig 24. The doorway represented by a second threshold stone indicating a second door.*

## Structure 2

Another small building, listed as Structure 2, was also found eroding onto the beach. Excavation showed it to be a small roundhouse which was in use, rebuilt and modified over several centuries. It is possible, from the evidence of the fragmentary remains, that it was constructed within the walls of a much larger building. Under a later flagged floor was a large stone tank made of dressed flagstones. A decorated copper alloy pin known as a 'proto hand pin' of the second or third century AD was found in this building (Fig 27) as well as a coin (nummus) of the Roman emperor Constans dating to 348-350 AD, which was found beneath the flags, showing that this building was still in use in the fourth century AD or later.



*Fig 25. Structure 2 under excavation*



*Fig 26. The stone tank in Structure 2.*



*Fig 27. The copper alloy proto hand pin from Structure 2 (photographs by Dr Sonia O'Connor).*

## Structure 3: The Iron Age Smithy

Structure 3 was a small semi-subterranean building entered by a set of steps in a narrow passageway, leading down from ground level to a doorway and into a space with a central hearth. In the 2017 season, excavation of the fills of this building revealed its upper floor surface, which was carefully recorded and sampled to help determine usage. The central hearth had originally been furnished with a back slab (a set upright stone to protect the hearth from draughts from the doorway) which had been broken before the building was infilled with rubble. The doorway had a threshold stone and door pivot; a stone with a cup hollowed out of the centre to take a projection at the bottom of the door so it can swing open and shut. The floor surface was examined by recording magnetic susceptibility across the area; higher values were observed adjacent to the hearth and entrance. Magnetic susceptibility is a measure of the magnetic properties of soil and other deposits, which can be affected by e.g. small particles of iron in the soil, so higher values might indicate areas where ironworking activity took place. Excavation of the



central zone revealed a distinct ash-rich deposit. Further excavation revealed that this was a hearth deposit sealing a heat-cracked hearthstone. The ash surrounding this hearthstone was subdivided for sampling to provide even greater spatial understanding of activity in the building, the samples being 3-dimensionally recorded. The hearthstone sealed another ash-rich layer, which in turn sealed the remains of an earlier hearthstone.



*Fig. 28. Structure 3 (facing north); the two anvil stones are located between the central hearth and the cupboard on the left.*

The building has yielded a significant assemblage of metalworking debris suggesting both iron and copper working, with spheroidal slag and hammerscale suggestive of sophisticated blacksmithing processes including fire welding. The presence of a significant number of crucible fragments strongly pointed to the structure having been used for copper alloy working. Subsequent analysis of the crucible fragments by Dr Gerry McDonnell using X-Ray Fluorescence (XRF) indicated that the crucibles were used to cast an alloy with a high zinc composition, forming a brass rather than a bronze.

In the summer of 2018, Dr McDonnell supervised the further excavation and sampling of the floor of this building. The floor was carbon-rich and the hearth showed two phases of use. In between the upper hearth fragment and the lower primary hearth, a further fragment of crucible was found. Two in situ stone anvils were found between the hearth and the cupboard (aumbry) set in the wall (visible in Fig. 28, above).

The ash floor sequence was excavated spatially to allow a better understanding of where activities took place within the building. The floor behind the hearth and the two anvils was formed of further layers of ash material which were examined in detail.

The 2018 excavation revealed further evidence of metalworking, with crucible fragments and the remains of several fragments of fired clay from a tuyère, which would have protected the snout of the bellows from the heat. Magnetic susceptibility and XRF survey (Fig. 29) of the floor, together with the in situ remains of the furnishings of the building, have provided a unique understanding of the use of space within this structure and confirmed its identification as a smithy for the working of copper and iron.



*Fig.29. XRF Analysis of the lower floor levels of Structure 3 with a scan (upper right) of the stairs and entrance and a plan of the building.*

The building was clearly semi-subterranean in nature, with a shallow set of steps leading into a passage flanked on the left-hand side by the curving wall of the structure and by a large orthostatic slab on the opposing side. A door would have opened into the structure, the doorway being defined by an in situ threshold stone and door pivot (visible to the right in Fig.29, above). Anyone entering the building would have to turn to the left (clockwise) because of the hearth and the back-slab protecting it from drafts (which were situated immediately in front of the entrance) and to avoid the anvils on the right. The strongest signatures of copper working determined by Dr McDonnell's detailed XRF analysis of the floor surface indicated the working position of the smith would have been behind the stone cobble anvils on the right as one entered from the door, on the left-hand side of hearth, facing the doorway and hearth back-slab and with the aumbry to their left (see Fig.29; Dr McDonnell is kneeling in the hearth facing the door, with the anvils and aumbry to his left).

The cobble anvils, one an elongated block and the other smaller and squarer in shape, had clear percussion damage on their upper surfaces, indicating their use as anvils. Beach cobbles are naturally stronger than quarried and dressed stone, and for this reason are also often found as threshold and lintel stones at sites such as Old Scatness in Shetland and (as threshold stones) at Swandro itself. This natural strength would be necessary in an anvil. Whilst preparing to illustrate the larger cobble, archaeological illustrator Mr Alan Braby noted carbon staining appearing to represent the finger or hand marks of the smith, on the edge closest to where they would have been working (Fig. 30). Dr McDonnell's survey of the floor and the presence of the tuyère fragments suggest the bellows (and presumably whoever worked them) were located on the opposite side of the hearth to the anvils. A cupboard or aumbry constructed within the wall of the building would have been to the left of the smith and may have been used either for storage or as the location of a lamp. The layout and sophisticated design of the building strongly suggests that this was a purpose-built smithy. The hearth furnishings seem to have been constructed as part of the building's primary usage. The semi-subterranean nature of the building and the location of the doorway formed an effective means of reducing natural light. Added to this, the doorway

presented clear evidence of two means of barring the door, one from the inside, further reducing any light incursion; the observation of colour by the smith would have been critical to enable them to gauge metal temperature while working. It is worth noting that a second bar hole was present, indicating that the door could also be secured from the outside.

Dating of this smithy by a sequence of radiocarbon samples gave a period of use in the C1st BC-C1st AD. There is little evidence of such metalworking structures in the Northern Isles, the closest parallel being from Mine Howe, where a less well-preserved fragment of a similar structure was found. The date explains the zinc content of the copper alloy, which Dr McDonnell thinks is due to the addition of scrap Roman metal to the mix; the addition of zinc to copper alloys to make brass occurs in Europe in the late C1st BC and it is commonly thought that the main source of this alloy was the Roman Empire.



*Fig. 30. The anvil with carbon staining (SF4018)*



*Fig. 31. Closeup of one of the sets of handprints*

## The Ditch Around the Settlement Site

The metalworking building (Structure 3) had been constructed within two earlier parallel single faced stone walls that had in previous years suggested the presence of an earlier building. Further investigation in 2018 suggested that this earlier stonework might actually represent the stone revetments of a ditch (Fig. 32). The fill of this suspected ditch was investigated. Below the ash and carbon-rich floors of the Iron Age smithy, the infill of the 'ditch' comprised of layers with a high stone content. The deposit underlying these stony layers was recognisably different and had been compromised by the tidal action of the sea, forcing its way under and through the archaeological layers. This material consisted of vacuous rubble with lenses of beach sand. A small fragment of plastic was found within this material,

although surprisingly the archaeological layers of floor above this fill were intact and undamaged. The pressure of the sea from tidal and storm surges appears to have horizontally penetrated the archaeology below Structure 3, removing finer archaeological sediments and depositing the plastic. This erosive action has affected the walling of Structure 3 on the seaward side and seems to be responsible for the subsidence of the wall into the top of the suggested infilled ditch (Fig. 32).



*Fig. 32. The southern face of the ditch revetment wall, which runs under Structure 3*

In 2012 and 2013, excavation of the eroded deposits along the beach revealed two stone walls with a distinct rubble infill, which appeared to be a continuation of the feature (the revetment and fill) found under the floor of the Iron Age smithy, Structure 3. The unusual nature of the 'wall' seen in this trench suggested it might actually be one side of a ditch revetment.

Following geophysics work in 2022 which seemed to suggest there may originally have been a ditch around the whole Iron Age settlement, this eroded section was re-examined in 2023 in order to test the hypothesis of this being a stone-revetted ditch with a rubble infill. Excavation revealed that this was indeed a ditch with

several phases of construction, including the relining of the ditch with a drystone revetment forming a clear secondary phase of use. This evidence indicates that the Early Iron Age settlement at Swandro was enclosed by a defensive ditch. The revetment lining on the south-east appears to have slipped in antiquity and was buttressed by a relining, represented by a much coarser build. Part of the early ditch fill was a silty clay rich in animal bone, presumably waste from the settlement which was tipped into the ditch. The form of the dry-stone revetment of the ditch at Swandro is very similar to that surviving at Midhowe Broch, just along the coast from Swandro.

Animal bone within the infill will provide dating material but it is clear the ditch went out of use, being infilled by the early first century AD or even possibly earlier, as Structure 3 was then built within the infill. The significance of these results is that the multiple phases of use and reconstruction suggest a long use but Structure 3, which dates to C1st BC-C1st AD, is built directly into the top, marking a definite end to the ditch as a working defensive feature. It will be interesting to see what dates we can obtain from this ditch and what it tells us about its relation to the monumental roundhouse and the development of the settlement.



*Fig. 33. The section of ditch excavated on the eroding beach. The revetted stone lining is visible on either side of the rubble and earth infill.*

## Structure 4: A Pictish Building

Structure 4 appears to be a Late Iron Age agricultural building, stratigraphically post-dating Structure 1. The building was characterised by a stone-flagged floor and a hearth constructed within the northern wall (Fig. 34). This floor seems to be of two phases with evidence to the east that the floor had a secondary layer of flags overlaying part of the original surface. The nature of the flagging in a building also containing a small wall hearth interpreted as a corn dryer was suggestive of use as a threshing or processing floor. Archaeomagnetic dating samples and samples of carbon-rich ash were taken from the bowl of the hearth. This building clearly appeared to be a secondary construction post-dating the outer passage leading into the large Central Roundhouse and to Structure 1.

The presence of the wall oven and flagged floor leads to an interpretation as a corn drying kiln with the floor forming a threshing floor. A strong parallel to this structure was found at Old Scatness, dating to the early centuries AD (Dockrill 2015, 140-1).



*Fig. 34. Structure 4 showing the paved surface. The hearth bowl associated with the corn drier is marked by the horizontal 0.5m black and white scale (top left).*



An adjacent area to the north-east (inland) of Structure 4 was investigated and remains of midden material were excavated. This midden included deposits of winkle shell not seen elsewhere within the Iron Age deposits at the site. A decorated spindle whorl made from the femoral head sawn from a cattle femur and part of a decorated bone needle case were recovered from this midden. This midden and its characteristics suggest a Late Pictish or Viking date. The midden sealed the rubble infilling another earlier Iron Age building, Structure 7 (Fig. 35).



*Fig. 35. Late midden overlying the rubble infill and top of the walling in Structure 7.*

This building (Structure 7) as with other structural elements within this north-eastern section of the site, displayed evidence of structure within the collapse or demolition rubble. The rubble infill contained visible structural integrity suggestive of an anthropogenic origin, indicating that this was more likely to represent a demolition event having taken place in a short period of time rather than natural decay associated with prolonged abandonment processes involving natural agencies. The walls containing this rubble infill had construction details strongly suggesting that they were corbelled and that the surviving building was potentially of some height (Fig. 36). The excavation of Structure 7 was discontinued at this stage in 2019 due to both time and safety concerns.



*Fig. 36. Structure 7: the rubble infill of the building displaying a high degree of structure and an indication of the corbelling of the internal wall face.*

## The End of the Iron Age Settlement

The rubble in the Central Roundhouse proved to be structured, which suggested a major structural collapse in the Late Iron Age, probably representing a single event marking the end of the main Roundhouse use. This seemed to be a major destruction event during which whole walls had collapsed. Careful recording indicated that this event was one that took place over a short period of time and appeared to represent anthropogenic demolition rather than natural collapse over a longer period of time from abandonment.

Excavation in 2019 and 2022 revealed evidence of an ordered collapse; cracked orthostats and whole sections of drystone walling which had fallen or been pushed back against the north-eastern landward wall of the passage. These layers of collapse had provided a degree of protection for the landward side of the passage. Much of the south-western and western wall elements of the central passage, leading into the centre of the Roundhouse and the radial rooms beyond, did not survive due to the dismantling event and more recent erosion on the seaward side.

The collapse that was not affected by the sea showed blocks of stones still in their alignments as if whole sections of demolished roofing and walls had fallen still in their relative positions. In places complete walls appeared to have been pulled or pushed over, with clear signs of the coursing still visible. A number of the set upright stones (orthostats) were either dislodged or broken and followed the same angle of collapse as the walling.

The entrance passage to the roundhouse located on the upper beach terrace was also infilled by rubble. The infill displayed a similar structure to other demolition areas. The upper infill of the entrance passage contained some midden material, seen overlying the structural collapse within the Roundhouse. Within the entrance passage, a copper alloy coin, a styca of Eanred of Northumbria (a ninth-century king) was found with animal bone (Figure 37). The animal bone included two semi-articulated skeletons of domestic cats which show cut marks possibly indicative of skinning. This evidence together with other artefacts including a decorated bone needle case and a cattle femur head spindle whorl, supports the possibility that the infill might be associated with Viking re-organisation of the settlement prior to the later construction of the surviving Norse longhouses.

## The Viking period

Archaeological work in 2023 also included a detailed survey of the Norse longhouse which overlays part of the Swandro site, often known as the 'Westness' longhouse. The survey included the recording of exposed stonework and earthworks as both contour and hachure surveys along with new aerial photographs and digital recording. The site was originally investigated by Walter Grant in the 1940's and later by Sigrid Kaland in the 1970's but unfortunately neither of these excavations has been published. Work at Swandro over many seasons has made it clear that the Norse structures are actually the last phase of the Swandro settlement and so a plan was essential to tie this structure into the wider archaeological context.



*Fig. 37. The passageway of the Central Roundhouse with infill containing the Eanred coin.*

The Norse longhouse runs in a south-western – north-eastern orientation, sloping gently to the north-east. The building has a strong resemblance to Jarlshof House 1 and as with that structure, the exposed walling suggests that this longhouse was not a single-phase building but was modified over time and may well be earlier than usually suggested. The structure seems to terminate just before a drystone wall belonging to the nineteenth century enclosure of the fields of Westness and a more recent ditch which separates the house from the wall. The nineteenth century enclosure wall has a distinct hump where it is built over a slight rise in topography, in line with the end of the longhouse. This rise in the wall coincides with a slight mound and a distinct vegetational change in the field beyond. The area on both sides of the drystone wall is extremely wet and bog-like, apart from this slight mound. This higher and dryer area is in alignment with the centre of the longhouse and was targeted for excavation in 2023 after the farmers, Russell and Kathryn Marwick, kindly allowed us to open a limited area in their field to allow investigation of the nature of the underlying sequence and any archaeological survival that might be associated with the longhouse.



*Fig. 38. Aerial view of the Westness/Swandro longhouse*

A trench was excavated in the field behind the Swandro settlement and in line with the longhouse, outside the scheduled area. This revealed a paved surface and some midden material (Figure 39). Although no secure finds of datable artefacts were found stratigraphically associated with the paving, a fragment of characteristically Norse steatite vessel was recovered from the layer above it and animal bone from associated contexts should produce radiocarbon dates. Tying in these Viking/Norse features to the Swandro sequence will help us understand the full history of this settlement and possibly also the reason for its final abandonment.



*Fig. 39. The paving associated with the longhouse*

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