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The Little Ice Age: Blowing Sand and a Lost Township

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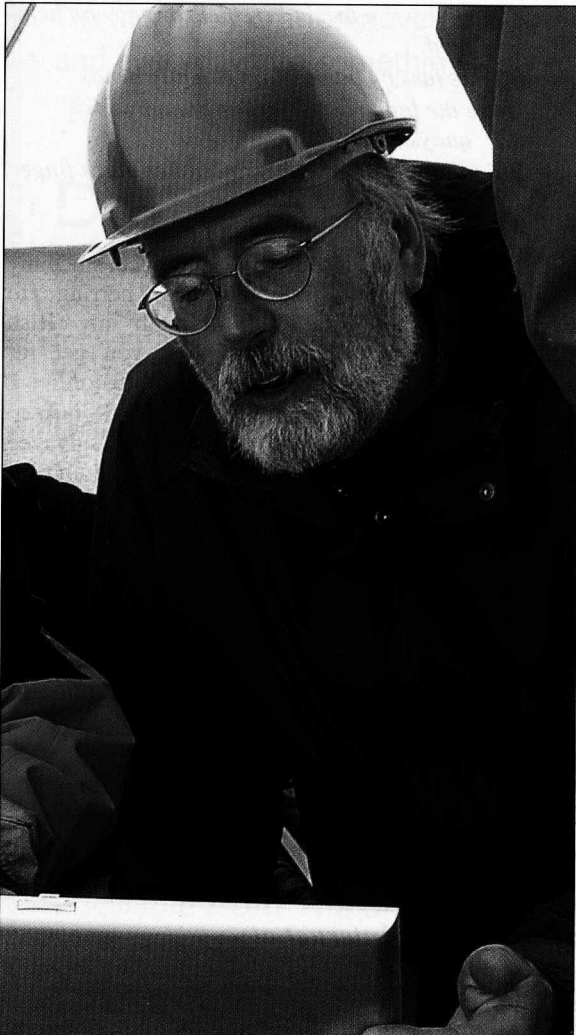
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The Little Ice Age, blowing sand and a lost township

by *Gerald F. Bigelow, Michael Jones, Michael Retelle*

There is a place in Dunrossness that today is a quiet sheep pasture. But it has been the site of two environmental disasters; the latest was the wreck of the tanker *Braer* in 1993, which created a 25 million gallon oil spill (Wills 1993). If you visit the area today you would never guess that event ever happened. But signs of a much earlier catastrophe are everywhere, and they dominate the landscape and much of the local ecology.



Gerry Bigelow.

Photograph: Andy Duffus

The place is Quendale Links, with its beautiful beach, backed by a vast area of grass-covered sand dunes that stretch far inland. Quendale Links is now the largest coastal sand environment in Shetland, but that was not always the case. A large part of the Links and the surrounding grazings area were once the thriving community of Broo (often spelled Brow or Brew), one of the region's most prosperous and valuable townships. Broo was eventually completely destroyed by blowing sand from Quendale Beach, and today the lost township is the subject of an international and interdisciplinary research project that is attempting to uncover when, how and why this spectacular environmental disaster occurred.

The project

The project is called the *Shetland Islands Climate and Settlement Project* (SICSP), and it is an outgrowth of the investigation of the Sandwick South Site, on Unst, which was excavated by a team led by Gerald Bigelow in the late 1970s. That excavation, whose long-awaited final report is nearing publication, revealed fifth century Pictish burial cairns that were buried by almost a metre of aeolian, or wind-blown, sand before a Norse farmstead was established there in the twelfth century (Bigelow 1984). The medieval farm was in turn covered over much of its surface by a more modest layer of sand, sometime between 1250 and 1300. The farm survived that event, and lasted for approximately a century longer before it was abandoned, and its remains were finally buried by further sand blows (Bigelow 1985). Like the Sandwick South farm, the Jarlshof site also experienced pronounced periods of sand deposition between Late Norse Phases VI and VII, i.e. in the twelfth or thirteenth centuries (Hamilton 1956, 173).

The overall pattern of aeolian sand deposition at Sandwick fits roughly a chronology for coastal sand movements around Britain and the North Sea that was developed by H.H. Lamb, a pioneering climate historian (Lamb 1991). Lamb thought that massive movements of coastal dunes in places such as the Sands of Forvie, Aberdeenshire, where a village was buried over several weeks in 1413 (Lamb 1991, 18), were products of several processes related to climate

change. Lamb associated the destabilisation of vegetated dunes with increasing frequencies and intensities of storms that would damage fragile shorelines, and deflate sand where plant cover was disturbed. Jonathan Wills has recently published a paper in this journal that discusses how such mega-storms, and unrelated tsunamis, may have drastically reshaped Shetland's coast over the past six thousand years (Wills 2007).

However, Lamb went much further in his theories by proposing that the increased frequency of storms during certain periods was a product of climatic cooling, and he thought that these phases of cooling, storm generation and sand blows clustered between a) about 1700 to 500 BC; about AD 400 to 700; and about AD 1300-1700 (Lamb 1977, 129). That last period is now considered the final, major climatic cooling episode before our modern, increasingly warm times, and it is often called the 'Little Ice Age' (Fagan 2000). As outlined below, the Broo township met its end during the Little Ice Age, and its story may help to refine Lamb's theories. Also, it is far from impossible that humans themselves may have made some places more vulnerable to sand movements through changes in land use, such as over-grazing by sheep, over-cultivation in raising cereal crops, or the introduction of rabbits. Therefore, this research may also help us to learn more about how interacting economic and political factors could have amplified the effects of climate to trigger past environmental disasters. Finally, there are hundreds, possibly thousands, of archaeological sites on coastal sands around the North Sea and the North Atlantic, and this research may shed light on the more general human impacts of abrupt, short-term environmental challenges – such as sand storms – in these past maritime settlements, as well as the effects of long-term processes such as sea level rises.

The SICSP was formed to investigate these various possibilities, and it has now spent four summers doing preliminary studies of the area of Quendale Links, searching for Broo and its secrets. The Project is comprised of archaeologists, historians, and environmental scientists from the United States, Shetland and mainland Britain, who are working with local residents, the Shetland Museum and Archives and the Shetland Amenity Trust to learn more about the historical ecology and settlement history of the Quendale area.

The historical record

Some modern histories, including James Irvine's *The Dunrossness Story* (1987), and Hance

D. Smith's *Shetland Life and Trade 1550-1914* (1984) include excellent discussions of Broo and the Quendale area that provide important leads for in-depth historical investigations of the township. There is also a relatively detailed and poetic description of a fully devastated Broo in the Reverend George Low's account of his visit to Shetland in 1774:

Here lay the estate of Brow, once worth 3000 Merks (near £200 Ster.) a year, now a mere wilderness; occasioned by the blowing of a small dusty kind of sand, which never possibly can rest, as the least puff of wind sets it all in motion, in the same manner as the drifting snows in winter. We still see the foundations of the farm houses, but the ridges, &c., have entirely disappeared. In a windy day this spot is an Arabian desert in miniature, here the clouds of sand flying as far as the eye can reach, there the crowds of travellers, scarce to be seen for the drifting sand, riding to church ... (Low 1879, 184-185).

This account makes clear that the sand movements at Broo were well-established before 1774, and were still ongoing at that time. Additional information on Cross Kirk, the church that Lowe mentioned, is provided by the *Diary of Reverend John Mill* (Goudie 1889). During Mill's tenure as pastor, Cross Kirk was replaced by the current church, which is located far from the Quendale sands, near the croft of Brow – the last tangible settlement of the lost township.

These sources are useful for describing the end of the disaster, but they tell little of its beginning and progression. Thus in 2005, Michael Jones, the project's historian, worked with Brian Smith and Angus Johnson at the Shetland Archives to uncover further primary sources that discuss Broo, sand movements and storms. This work is in an intermediate stage, and further research is needed both locally and in collections in mainland Scotland. However, a petition to the Privy Council from 1635 discusses massive damage to Orkney and Shetland by storms in 1634, with ensuing famines. Most importantly, a document from 1706 states that lands belonging to Robert Sinclair of Quendale 'were totally blasted and over blown with sand so that they were rendered altogether useless ...' (Shetland Archives D24/108/23). Although the record relates to the neighbouring township of Quendale, it may provide a conservative and definitive terminus for the occupation of the Broo township. As it was located to the east and north of Quendale, Broo would have been even more vulnerable to sand

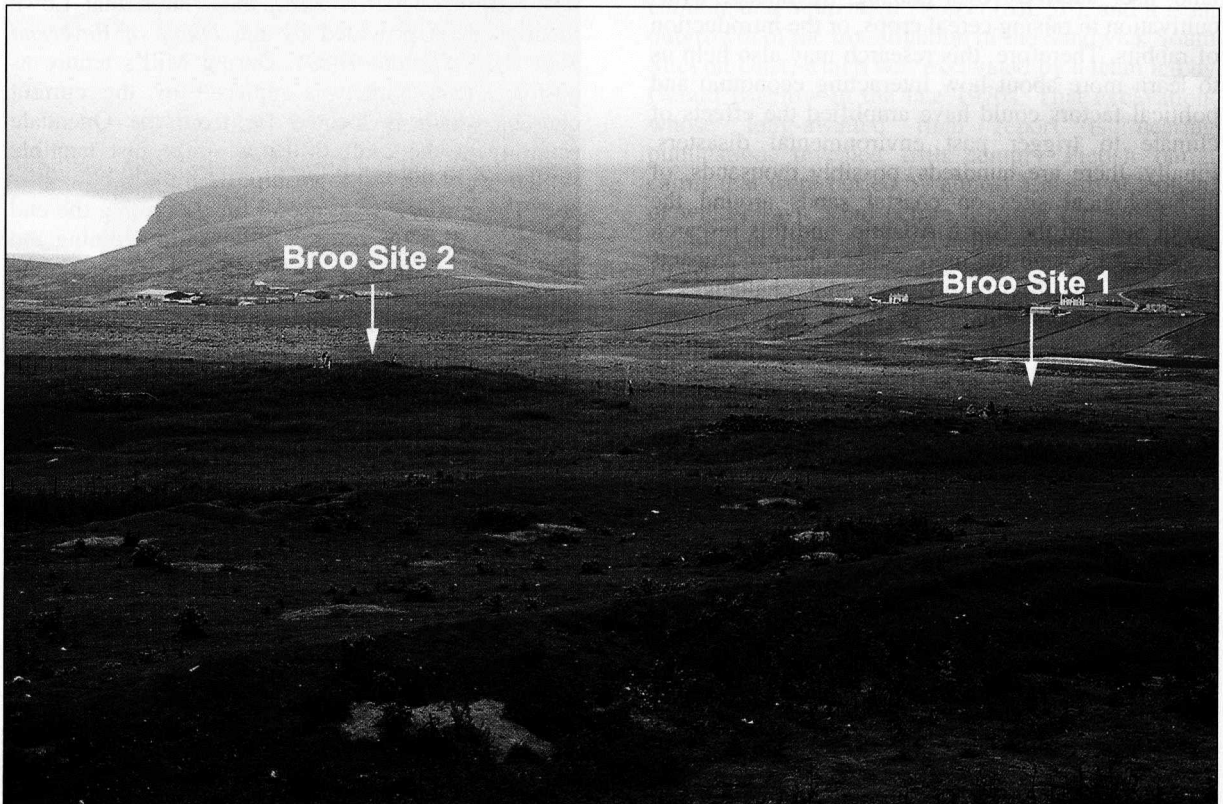
transported from the beach by the prevailing southwesterly winds.

The historical record so far examined therefore indicates that sand was wreaking havoc at Broo and Quendale in the later seventeenth and early eighteenth centuries. The beginning of the sand disaster is unclear, but we know that it could have started with intensive storms in the 1630s.

Brian Smith has also assembled additional historical information about Broo that may well explain one long-standing memory of its settlements. Today, the only place-names that relate to the pre-disaster township are 'Huesbreck', attached to a croft on the A970 near the road to Boddam, and 'The Old House of Brow', which appears on the first Ordnance Survey map of 1882, marking a now-featureless spot in a sheep pasture to the southwest of Huesbreck. Field surveys have not yet revealed archaeological remains at that spot, but a 1636 mortgage of Broo indicates that the township originally comprised four farms or sections: 'Quindista', 'Vislagarth', 'Heughe' and ... 'Housabrow'. It seems very likely that the 'Housabrow' farm name eventually evolved linguistically into the 'Old House-of-Brow' place name on the map (B. Smith personal communication).

The archaeological record

Before this project began the Broo township was unknown in terms of its exact location and the nature of its settlements: the 'Old House of Brow' and 'Huesbreck' place-names were the only geographical reference points on the landscape for the once-powerful property. The available records indicated that Broo lay somewhere in the area of Quendale Links and the neighbouring higher lands to the east. So, in 1997 and 2002, researchers from Bates College, of Lewiston, Maine, USA, and a field course from the University of Southern Maine, surveyed extensive areas of Quendale Links. Several archaeological sites were found, but only one appeared to be a potentially early historic farm site. The site consists of two rectilinear, stone-walled enclosures that have building ruins on one corner. The enclosures were actually recorded on the first Ordnance Survey map, as the wall tops are even today visible in many places, though grassed over. They have been given the names Broo Sites 1 and 2, although they may have been residential and agricultural components of a single, original settlement.



The Broo sites. Quendale in the left background.

Photograph: Gerry Bigelow

Broo Site 1 today appears as an enclosure or pund that has had much of its covering sand blown out from the interior, with a still largely buried building ruin on its southwest corner. The rectangular building, which is roughly 18 X 5 metres in size, has a well-defined, circular corn-drying kiln at one end. The other end is missing its gable wall, and part of the long walls, probably because the stone was salvaged to build an adjacent 'bøl' or sheep windbreak at a later time.

The stone enclosure wall of Broo Site 2 is more fully covered with sand, but its plan is revealed by exposed wall tops at intervals. Unlike Broo Site 1, the interior of the enclosure is filled with a great mound, and we now know that over two metres of windblown sand were trapped there, and protected from later remobilisation by massive stone architecture, the remains of at least two buildings.

In 2003 a field course from the University of Southern Maine excavated two very small test trenches in the two sites, recovering a few pottery fragments and pipe stems that appeared to be seventeenth century in date. In 2004 a research team of students from the previous year's course conducted larger test excavations that located a clay floor in the Broo Site 1 building near the corn-drying kiln. A 4 X 4 metre exploratory trench along the stone wall of a structural ruin in Broo Site 2 revealed the corner of a building in a remarkable state of preservation: the 1 metre thick dry-laid walls stand 1.85 metres high in many places, probably close to their original height, in what we call 'Building B' (Bigelow, *et al.* 2005). As a result, a window opening is preserved in one gable, a window that is now completely filled with wind-blown sand.

Subsequent excavations of this building in 2005 and 2006 showed that it is about 11 X 6 metres in size, and that it went through at least two phases of use. The latest use occurred after the building had been abandoned for a while, and it had been largely filled with sand. The sand in the west end was removed and a cross wall was built against the remaining fill to create a small square room. A simple hearth was constructed against the southwest gable, and a small stone-enclosed pit or box was built into the south corner (we do not yet know that feature's purpose because it has been uncovered, but not yet excavated). A packed peat ash floor formed in this room, and the only finds recovered from it have been small fragments of pottery, clay pipe stems and glass wine bottle fragments.

In its first phase, Building B had a stone-paved floor. We do not know what that floor looked like in the west end of the building because the late peat ash

floor and the cross wall have not been excavated, but we expect that the building was not a residence because of its relatively small interior, and because it had only one, small window. The building could have been a stable in its first phase, but the exposed areas of the floor do not have features typical of either earlier medieval (Bigelow 1987) or later cowbyres (Tait 2005). The building also could have been a storehouse.

In the last phase, however, the east end of the building was clearly a place for humans to stay warm. The most remarkable aspect of that small room was revealed in 2006 when a field class from Bates College and local volunteers removed tonnes of overlying sand to expose the last surface of a courtyard or unroofed passageway located outside the room. A door led out from the room into the courtyard in the last phase, and it appears that makeshift stone steps were built in the doorway to allow the occupants to climb out of the room onto an ever-rising surface as sand and midden material accumulated during the last days. By the time the settlement was finally abandoned, over half a metre of sand and waste had been allowed to build up in the passageway, and we are thus uncovering adaptations made by the last occupants of the site before the sands closed over it forever.

There is evidence that the farm's occupants in the main phase of use continued to live there during several cycles of sand deposition before they gave up and left. We know this from comparing the stratigraphic layers within the buildings in both Broo Sites 1 and 2 with strata outside the buildings' walls: the interiors are filled with grey sand sterile of any organic layers that would indicate vegetation growth. The exterior stratigraphy in contrast consists of alternating layers of grey sand and brown layers of organically enriched soil with traces of peat ash and carbon from household fires. This pattern is exactly what one would expect if sand accumulated in phases outside the buildings while their interiors were protected by their roofs, until the farm was abandoned, the roofs caved in or were removed, and the ruined shells then immediately filled during a final period of catastrophic sand blows.

What is extraordinary about this grim scenario is that one trench on the 'lee-side' of the Broo Site 2 Building B revealed that over a metre of sand accumulated there in several rapid and slow cycles before the site was abandoned. If you have ever experienced a snow storm, or series of storms, that caused metre-high snow drifts to build up around your house, toon, grazings and fields, then you may be able to imagine the feelings of Broo's inhabitants;



The Broo excavation.

Photograph: Gerry Bigelow

only they were facing burial in a sediment that would not melt away, but smothered their crops and grazings, filled their sheep's wool with grit, and caused their grazing animals' teeth to wear prematurely. This was the state of the former Broo lands and parts of Quendale until the nineteenth century, when marram grass was planted, the Links were finally stabilised, and pasture grasses were re-established over the rest of the area, including the Broo sites.

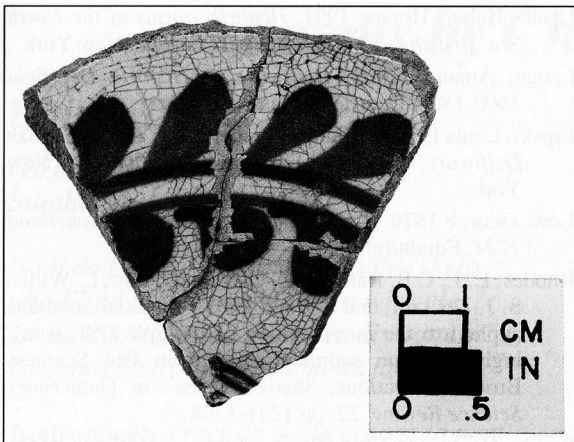
Soils analyses planned for next year's field research may allow us to estimate the time period over which the sands affected the Broo Site settlements. The evidence we have uncovered so far suggests that the settlement may have lasted through three or four annual cycles of extreme sand blows in the winter, followed by relatively stable conditions in the less windy months. In other words, the farmers endured a few years of increasing economic hardship until they had to move, possibly to the croft now called Brow, located at the east end of the Loch of Brow. The Loch of Brow is called the Loch of Skelberry on Timothy Pont's map from c.1600, which was published in Blaeu's Atlas of 1654, and

the shift in place-names may also reflect the re-focusing of the township sometime in the late 1600s and 1700s. Fortunately, our archaeological research has provided some unusually precise information on this final evacuation of Broo.

Chronology

The excavations have produced relatively few artefacts so far, a trend that may reflect the relatively small area that has been exposed, or perhaps it relates to an originally short occupation of this specific farm. However, the pottery, pipe-stems and glass that we have found all point to an occupation and abandonment in the second half of the 1600s. In particular, there is a fragment of an English tinglazed earthenware, or delftware, plate of a specialised type that was most likely manufactured sometime between 1690 and 1715 (Lange 2002; Lipski and Archer 1984).

We have also employed a new type of geological dating called Optically Stimulated Luminescence (OSL) dating, and the work has been done by the same Oxford University lab that has



The delft ware.

Photograph: Gerry Bigelow

performed analyses for the Old Scatness Broch Excavation analyses (e.g. see Rhodes, *et al.* 2003). This method measures the time elapsed since a sediment was buried and obscured from light. There are three OSL dates from Broo Sites 1 and 2: AD1670, 1680 and 1712. Given the locations of the OSL samples, the method's rough precision in this time range, and the artefact dates, it seems very likely that Broo Sites 1 and 2 were destroyed by sand sometime between 1690 and 1710.

If this dating is correct, we are uncovering one of the latest surviving farms of the township. This identification and the dating are logical, as the Broo Sites are located almost two kilometres from the beach, the source of the sand, and they sit on a terrace about 40 metres above sea level: it may have taken quite a few years for the advancing dunes to reach and finally destroy this part of the township. In this regard it is interesting that Jonathan Wills' recent paper on storms and coastal destruction cited the work of David Smith, of Oxford University, and Jim Hansom, of Glasgow University, who have proposed that there were extreme storms in October 1634 and October 1669 that affected Shetland (Hansom and Smith 2005): the latter event may have accelerated a process that eventually led to the end of the settlement we are currently investigating

Conclusion

The SICSP has uncovered historical, archaeological and geological evidence of the Broo township and its demise from blowing sand. We have found a farm that was abandoned just before the township was declared valueless, and we know that the farms' inhabitants did not leave it fully until they were almost submerged by the sand. In the future we

should be able to trace the more subtle impacts of the advancing sand on the farmers' economy and lifeways. Our research team will also examine the sequence of sand deposits closer to the beach to construct the master chronology of sand movements we need for comparison with the climate history record, in order to explore the relationship between phases of cooling, storminess and sand blows.

We know from various types of climate history information that the 1690s was one of the coldest decades in the past millennium, as was the 1630s when storms were clearly ravaging the Northern Isles (Jones *et al.* 1998). With luck, examining patterns like this will clarify whether past climate changes were a significant reason why, for the past several thousand years, coastal sands were valued places to live during some periods, but were avoided entirely at other times.

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The authors would like to hear about any traditions or local knowledge concerning the Broo township, and the effects of weather on lands around Shetland's sand beaches. Please write to Dr Gerald Bigelow, Program in Environmental Studies, 100 Bardwell Street, Bates College, Lewiston, Maine 04086 USA. E-Mail: gbigelow@bates.edu

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