Under The Glacier

2011 Archaeological investigations on the fishing station

at Gufuskálar, Snæfellsnes

Lilja Björk Pálsdóttir and Óskar Gísli Sveinbjarnarson

FS477-08232

Reykjavík 2011

GHEA

Fornleifavernd ríkisins

The Archaelogical Heritage Agency of Iceland

Front cover:

Photograph: Thomas H. McGovern.

Gufuskálar in June 2011

Bárugata 3

101 Reykjavík

Telephone number: +354 551 1033

Fa number: 551 1047

Email adress: fsi@instarch.is

Contents

List of Figures

Summary

The site of the fishing station Gufuskálar is located on the northern side of the western tip of Snæfellsnes peninsula in the West of Iceland. It sits at the shore of the Atlantic ocean which causes a major threat to the site. A dominant feature in the landscape is the cone-shaped 1446m high glacier Snæfellsjökull, known by many from Jules Vernes book "A Voyage to the Centre of the Earth". Underneath the glacier is a volcano which has shaped the surrounding area with several lavaflows, the last one 1750 years ago.[1]

Archaeology is abundant at Gufuskálar with two main mounds made up of structures and midden material right by the seafront along with a cleared landing spot. A little further inland are two farm mounds and at least 47 other structures which most likely are fishing booths, *þurrabúðs*[2] and other structures related to the fishing station. In a lava field East of Gufuskálar are 154 small, oval shaped structures made of lava stone. They are commonly believed to be for drying and storing fish.

Samples taken during the 2008 assessment were used for C14 dating and the results indicate the fishing stations time span might be longer than previously thought.

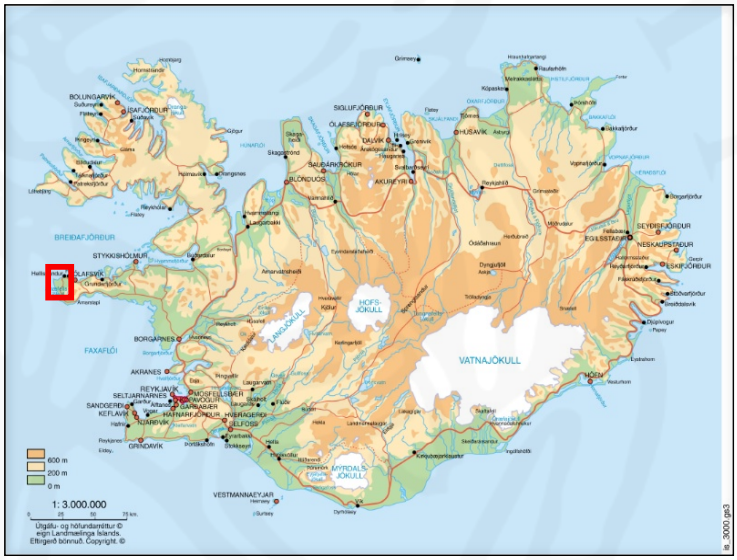


Figure 1 A map showing location of Gufuskálar. Map:Landmælingar Íslands.

Following assessment in 2008, when four erosion scars were cleaned back and sections drawn, an archaeological excavation took place in 2011. The focus within the site was on the two main mounds by the sea which are under threat by active marine and wind erosion. Based on work done in 2008[3], four trenches (Tr. Nr. 5,6,7 and 8) were placed in the most eroded areas of the two mounds. A new topographic survey was done on the two mounds but also on other visible structures such as the farm mounds and alleged þurrabúðs. In total, an area of about 7.2 hectares was covered and around 47 structures mapped in.

---

1 Thor Thordarson and Ármann Höskuldsson. 2002.

2 Þurrabúð is a house close to a fishing station. It has no land and the occupants live mainly off fishing all year round.

3 Lilja B. Pálsdóttir. 2009.

The Gufuskálar team of 2011 from left:

Óskar Gísli, Lilja Björk, Megan, Rachel, Grey, Rebecca, Lucretia, Lauren, Reaksha, Frank, Santmuk, George and Jeanette. Absent from the picture are Thomas McGovern, Inga Malene Bruun and Magnús A. Sigurðsson.

This investigation would not have been possible without the assistance of Dr. Sophia Perdikaris and Dr. Thomas H. McGovern and their hard working students at CUNY as well as Inga Malene Bruun from Tromsö University. Special thanks go also to Sæmundur Kristjánsson at Rif, Skúli Alexandersson at Hellissandur and Þór Magnússon at Gufuskálar, for valuable information, kind support and interest in the project. Thanks go also to the Icelandic Forest Service for permission to conduct the investigations within the Gufuskálar land.

Introduction

The archaeological investigations at Gufuskálar took place during a 3 week excavation season, between June 6th and June 24th 2011. This archaeological investigation is a collaboration of several institutions:

Fornleifastofnun Íslands (FSÍ), City University of New York (CUNY), The Archaeological Heritage Agency of Iceland (FVR) and the The National Park of Snæfellsjökull. It is a

GHEA project (http://Gheahome.org -Ghea: Global Human Ecodynamics Alliance) and NABO (Http://nabohome.org –North Atlantic Biocultural Organisation).

The investigation was funded by the National Science Foundation Research Experience for Undergraduates Islands of Change Program granted to Dr.Sophia Perdikaris with a contribution from the Icelandic National Festival Fund.

The investigation was directed by Lilja Björk Pálsdóttir (FSÍ) with assistance of an international team consisting of Frank Feeley (Cuny), Dr. George Hambrecht (Cuny), Dr. Thomas McGovern (Cuny), Megan T. Hicks (Cuny), Magnús A. Sigurðsson (FVR), Óskar Gísli Sveinbjarnarson (FSÍ), Inga Malene Bruun (Tromsö Univ.), Dr Sophia Perdikaris REU students: Reaksa Persaud, Santmukh Khalsa, Lucretia C. Williams, Jeanette Plummer, Rachel Adkins, Rebecca Riggle, Lauren Witter and Grey Ollavaria..

Aims and methods

The aim of the archaeological investigation was to further understand the archaeological remains through intrusive and non-intrusive methods.

A new topographic survey of the eroding mounds by the sea makes it possible to monitor the rate of erosion. The two mounds were therefore surveyed topographically, along with two farm mounds a little further inland and other structures visible on the surface. This new information was to be combined with data from the investigation in 2008 and survey data from the Archaeological Heritage Agency of Iceland to create a map of the farm and fishing station at Gufuskálar. The investigation is primarily a rescue investigation and therefore the most vulnerable areas were targeted for trenching in order to obtain information otherwise threatened by erosion. These are the areas that are most affected by the marine erosion. The targets of the excavation included material for radiocarbon dating (C14), bones and material culture from the midden deposits seen in sections.

The excavation was carried out using the single context planning and recording system developed by MOLAS but adapted for Icelandic archaeology.[4] All trenches were hand dug. Contexts formed the main unit of recording and were excavated stratigrafically, in sequence, within excavation areas. All cultural deposits were sieved 100 % using a 4 mm size mesh. Each find, environmental sample and record is related to the unit that it was found within or taken from.

[4] Spencer 1994; Lucas 2003; http://instarch.is/utgafa.htm

Fieldwork results

Excavation

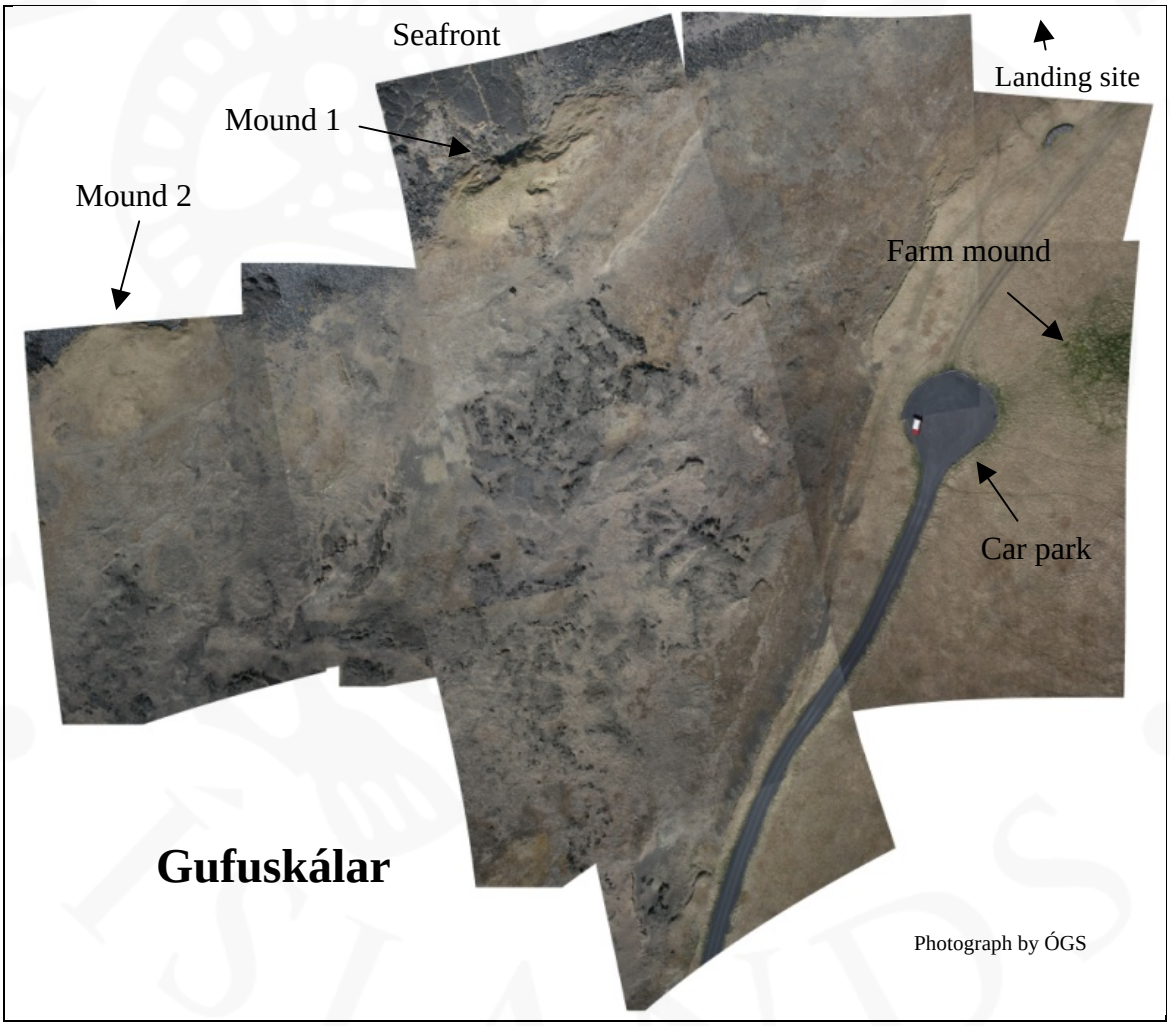


Figure 2 Kite photograph showing western part of the research area at Gufuskálar.

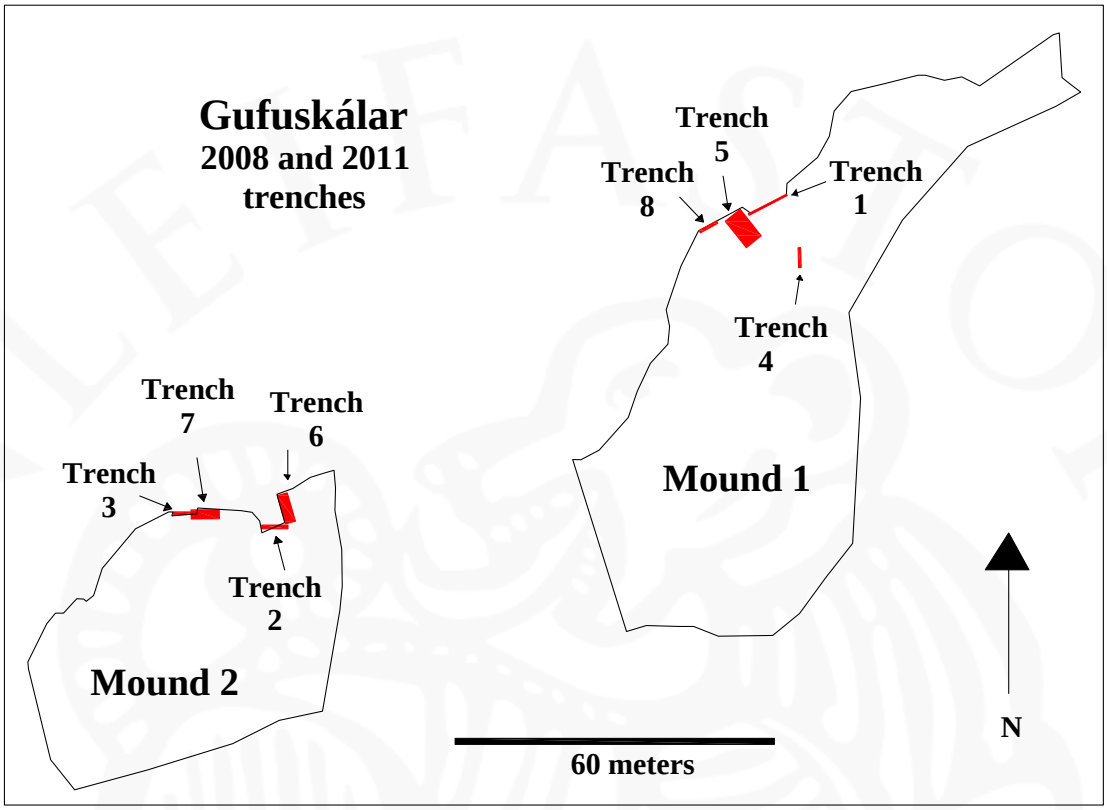


Figure 3 Location of trenches researched in 2008 and 2011.

The focus this year was again on the most eroded areas and therefore all four trenches were put on the seaside of the mounds, facing N-NW. The largest trench, Trench 5, is 6 by 4 meters and was placed next to Section 1 from 2008, as was Trench 8 measuring 2 by 0.5 meters. Trenches 6 and 7 were both 2 by 5 meters and were located close to Sections 2 and 3 from 2008.

Structures are visible on both mounds either as depressions or where structures are becoming visible due to erosion. Structures are also appearing around the mounds as the soil that seals them gets relocated due to constant and often very strong wind.

Trench 5

Figure 4 Mound 1. Trench 1 from 2008 is to the far left whilst Trench 5 is being deturfed next to it on the right. Trench 8 was located in the eroded area to the right of Trench 5.

Trench 5 is located on the highest mound and is made up of a thick stratified sequence of cultural deposits.

The excavation area is set in the steep Northern slope of the mound. It was therefore decided to excavate it in steps for health and safety reasons. The soil is very sandy and gives way easily so the excavators had to manouvre carefully in the 4 m x 3 m area which was the first step to be worked on. This area has been heavily truncated by marine erosion and wind, and the bottom layers of the mound show severe erosion.

Figure 5 Location of Trench 8 at the bottom layers of Mound 1.

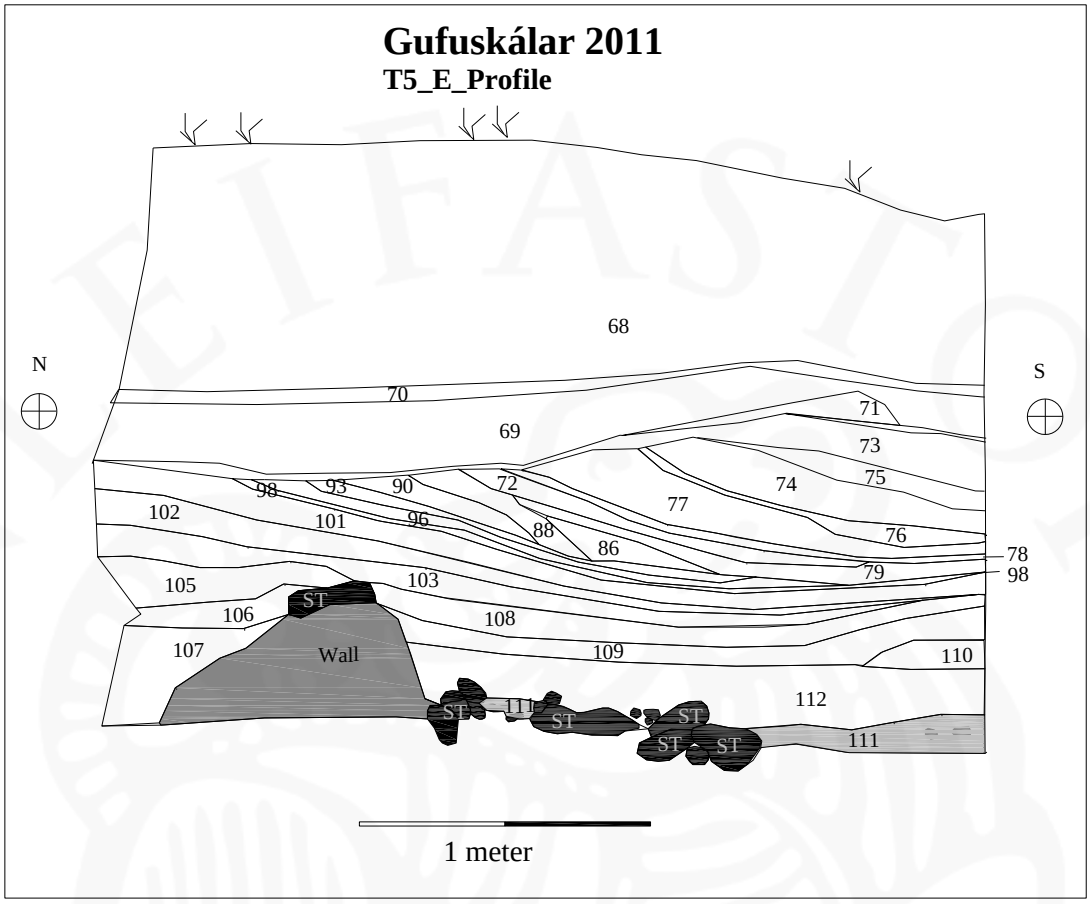


Figure 6 Section drawing of Trench 5.

Context	Trench	Type	Description
68	T5	Deposit	Possible trample
69	T5	Deposit	windblown material
70	T5	Deposit	midden deposit
71	T5	Deposit	midden deposit with shell sand
72	T5	Deposit	Midden deposit
73	T5	Deposit	Midden deposit
74	T5	Deposit	Midden
75	T5	Deposit	Surface (root layer)
76	T5	Deposit	aeolian sand
77	T5	Deposit	midden deposit
78	T5	Deposit	midden deposit
79	T5	Deposit	Turfy
86	T5	Deposit	Midden deposit
88	T5	Deposit	Midden deposit
90	T5	Deposit	midden deposit with a lot of bone
93	T5	Deposit	midden deposit with burnt bone
96	T5	Deposit	midden deposit with a lot of bones
98	T5	Deposit	sandy aeolian deposit
101	T5	Deposit	burnt bones, midden
102	T5	Deposit	burnt bones, midden- more sandy than 101
103	T5	Deposit	midden deposit, burnt bone
105	T5	Deposit	midden deposit. Sandy with bone
106	T5	Deposit	Black sand with midden
107	T5	Deposit	Sandy deposit
108	T5	Deposit	possible turf collapse
109	T5	Deposit	midden deposit
110	T5	Deposit	Turf, possible floor, charcoal rich
111	T5	Deposit	peat ash, possible floor surface
112	T5	Deposit	sandy, bone rich deposit

Figure 7 List of contexts in section drawing of Trench 5.

The first archaeological deposit (70) appeared at the depth of 0.93 m from the top. This was a 5 cm midden deposit made up of a mixture of burnt bone and sand. It might also be windblown midden material originating elsewhere on the site. Uniform bands of sand lying horizontally from the top of (70 and 71) were completely without any organic material. These represent the post-occupational phase of the site where aeolian sand has accumulated after the site was abandoned.

Another uniform, sterile sand lay beneath (Context 69) but at 1.19 m down from the surface, thick and bone rich midden deposits were unearthed.

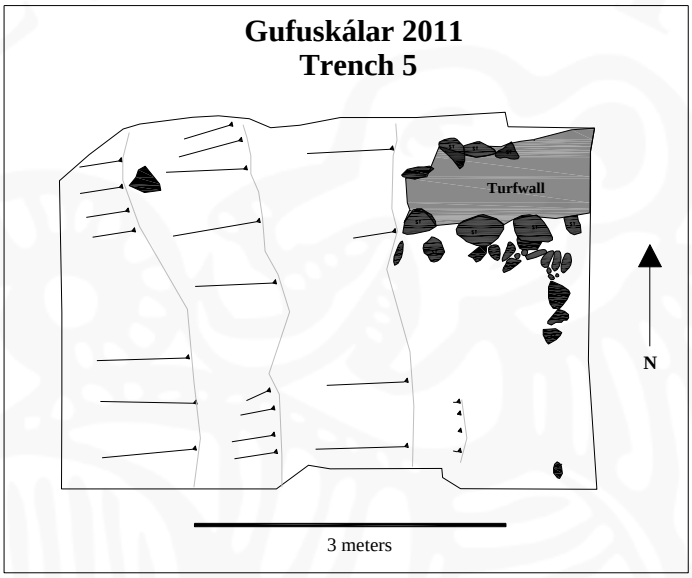


Figure 8 Plan illustration of Trench 5.

Figure 9 Working in Trench 5.

Figure 10 An account from 1711 of the destructive combination of sand and wind is easily understood when viewing the section in Trench 5. The account tells how after every northern storm at Gufuskálar, infields get ruined and sand has to be shoveled off houses. The thickness of the accumulated aeolian sand on top midden deposits reaches almost a meter.

The midden deposits now excavated are up to 70 cm thick in total and are made up of at least 8 bone rich deposits, mostly burnt bone but these are separated by thinner bands of unburnt animal bones. The refuse has been dumped into and around what seems to be an abandoned structure as a part of a wall was found in the northeastern part of the trench. It is made with two sides of stone with a core of sandy turf. So far, at least two rows of stones can be seen. The wall seems to be truncated towards the slope on the western side which may be because of the slope being washed down, or eroded by wind through time. On one side of the wall (South), small stones have been lined up against it as some kind of a paved or upraised area. Whether these are within the structure or outside is unknown as the excavation was ceased at this point.

Figure 11 Turf wall seen from above with a very sandy turf in the middle. Bands of midden that sealed the wall are to the right in the photograph.

Finds from Trench 5 included for example fish hooks, boat rivets, nails, knives, small sheets of cu alloy, a decorated cu alloy object (see figure 12), a few sherds of pottery and glass and several claypipes. At first glance, datable finds such as claypipes and pottery seem to suggest that midden deposits covering the structure were dumped there in the 17th century. The finds are in the process of being analysed.

Figure 12 From top: A decorated Cu Alloy object from a 17th century deposit. The condition is remarkably good as can be seen on both sides of the artefact. Below is the stem of a clay pipe.

Excavations in Trench 5 will continue in 2012.

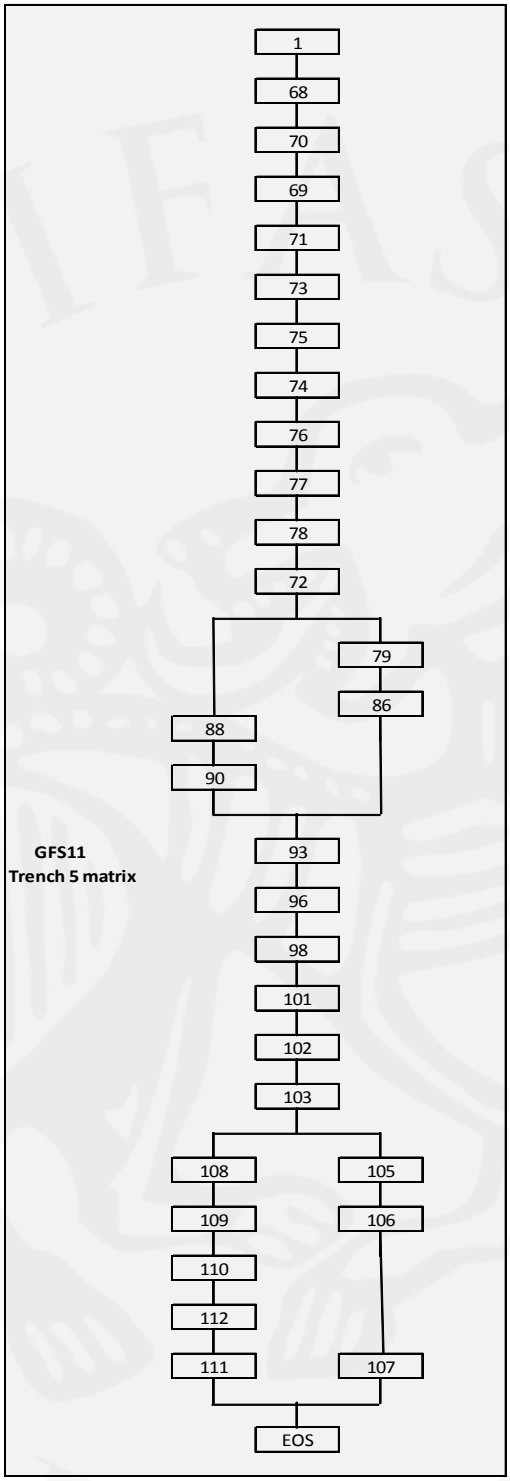


Figure 13 Matrix of Trench 5

Trench 6

Figure 15 Erosion on mound 2. View from Trench 7 over to Trench 6.

Trench 6 is located next to Trench 2 from 2008. This area is closer to the sea than Trench 5 and large strips of turf and archaeology are being torn off every year. For this reason two trenches (6 and 7) were placed in close vicinity to each other, near to Trenches 2 and 3 from 2008. Structures can be seen on the surface above both trenches and structural stones and midden deposits are visible in the sections. Trench 6 is a 2 meter extension to the north of Trench 2 from 2008. This location was chosen to target the midden deposits seen in the erosion scar, without risking wall collapse or causing further erosion in the visible ruin above the trench. Sandbags were used to support the stone wall as well as for health and safety reasons. An eroding wall next to the trench caused a risk of collapse to people working in the area.

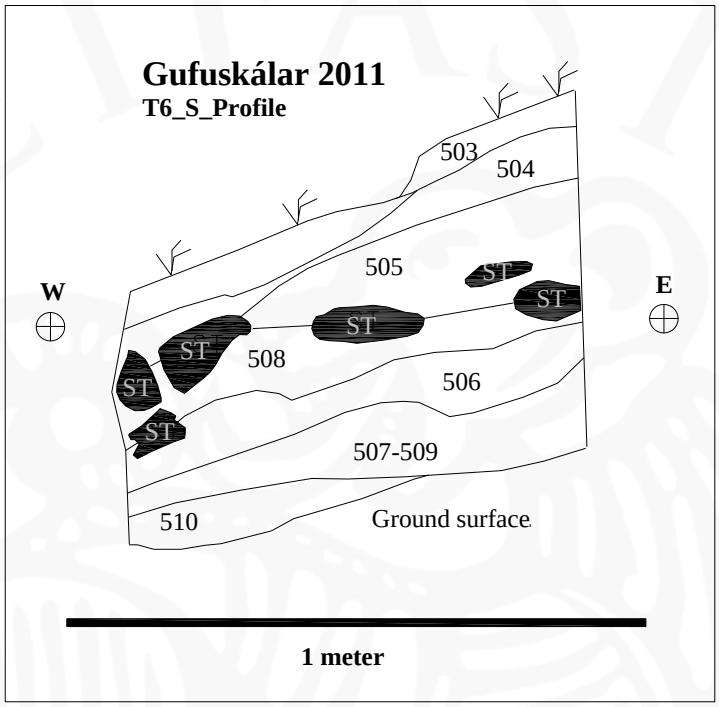
Figure 14 The location of Trench 6. Picture taken before deturfing. Structural stones are visible in the section.

Figure 16 Trench 6, work in progress. Collapsed boulders starting to appear and sandbags keeping the rest of the wall in place. Trench 5 can be seen in the background.

A thick banded deposit of sterile sand (502) lay on top of bone rich midden deposits which were mixed in and under beach boulders. The boulders are very likely wall collapse from the structure above the trench although they might also represent a revetment of the structure, protecting it from the sea. A part of the wall could be seen in the top corner of the trench. Midden deposits are present under the wall which gives a clue to the development of the site. Due to the active marine erosion it was decided not to fully remove the collapsed boulders and midden deposits underneath at this time as it would expose the wall and structure above the trench to further erosion.

Finds from Trench 6 included iron nails and roves, a few pottery sherds (including one rim fragment) and some Cu Alloy fragments. Initial study of the finds suggests that the collection from Trench 6 is of later medieval origin.

Figure 17 Wall seen from top of Trench 6.



Context	Trench	Type	Description
503	T6	Deposit	medium brown midden layer, lensed with peat ash, charcoal, windblown
504	T6	Deposit	light tan sand, natural, sterile aeolian
505	T6	Deposit	medium brown midden layer
506	T6	Deposit	grey black midden layer with burnt shell and bone
507	T6	Deposit	medium brown midden layer dense bone
508	T6	Deposit	light brown sand with diffuse midden
509	T6	Deposit	dense midden in mid brown silt
510	T6	Deposit	grey sand, sterile

Figure 18 Section drawing of Trench 6 and associated contexts.

.

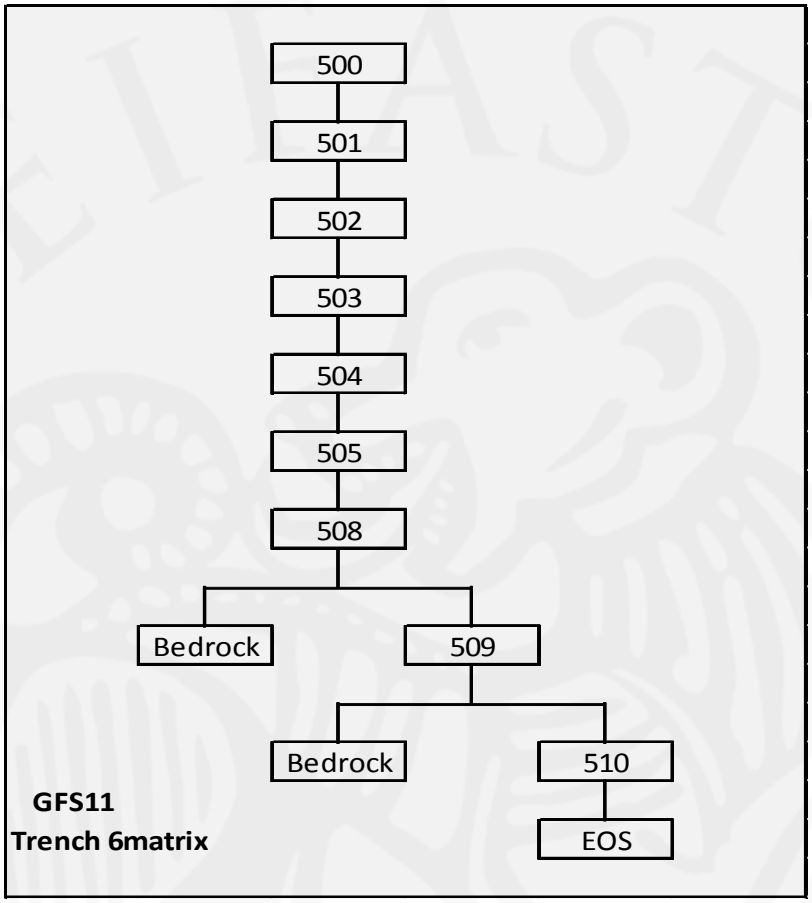


Figure 19 Matrix of Trench 6

Excavations in Trench 6 will continue in 2012.

Trench 7

Figure 20 Location of Trench 7. Trenches 6 and 5 in the background.

Figure 21 Deturfing Trench 7 in cold wind.

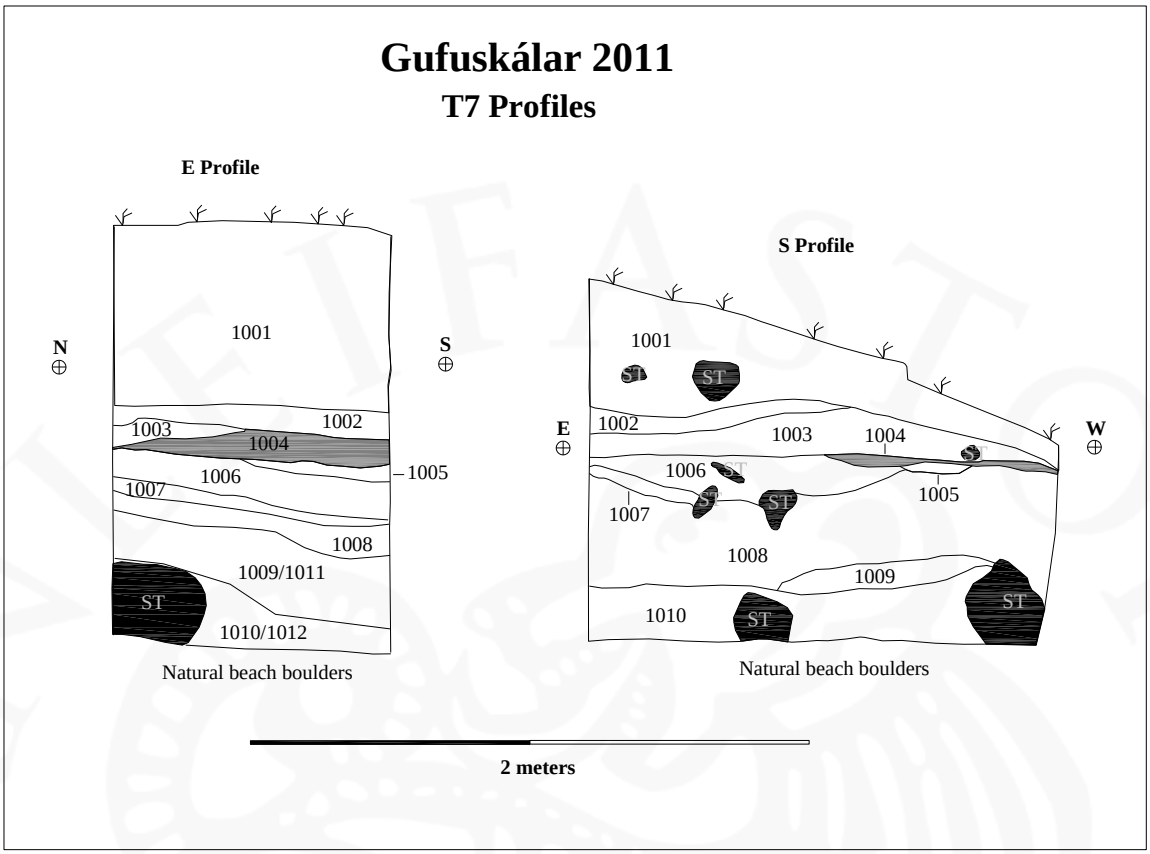
Trench 7 is located near to Trench 3 from 2008 and is 2 meters wide and extends 5 meters alongside the eroded seaside of Mound 2. As with Trench 6, structures can be seen on the surface above the erosion line but no structural remains are visible in the section. After the removal of a thick banded aeolian sand (1001), stones appeared which are probably collapsed from a structure above the trench. A small paved area was found underneath a thin deposit of midden material and is associated with the structure. It looks like a paved area outside the structure, however, it may well be the remnants of an eroded room with only this part of the floor surviving.

Figure 22 Part of wall on the left with stones laid against it, forming a pavement.

No other structural features were found in Trench 7 but the pavement had been laid on top of an earlier midden (1006). About 0.60 meter of midden deposits were in total excavated beneath the pavement but the lowest deposits had been thrown on natural beach boulders.

Finds in Trench 7 included amongst others iron nails and rivets, a knife, pottery sherds, fish hooks and hooks of Cu alloy. Several pieces of worked whalebone were retrieved but these are rather small. A glass bead broken in two was found in one of the earliest deposits, (1010). The artefacts seem to be of similar date as finds from Trench 6, i.e. later medieval.

Figure 23 Trenches 6 and 7 as seen from Trenches 5 and 8.



Context	Trench	Type	Description
1001	T7	Deposit	sterile lava and shell sand
1002	T7	Deposit	stones - wall collapse?
1003	T7	Deposit	medium brown midden layer
1004	T7	Structure	pavement made of flat and cobbled stones
1005	T7	Deposit	medium brown midden layer - between and underneath 1004
1006	T7	Deposit	light brown midden layer
1007	T7	Deposit	very dense midden layer - medium brown
1008	T7	Deposit	very dense midden layer - darker grey, more sand, more granular
1009	T7	Deposit	Midden layer with peat ash
1010	T7	Deposit	Dense midden - dark grey, sandy
1011	T7	Deposit	equals 1009 - portion of 1009 that was on far side of tumbled boulders
1012	T7	Deposit	equals 1010 - portion of 1010 that was on far side of tumbled boulders
1013	T7	Deposit	mixed midden - lenses of sand, peat ash, some burnt bone, bones directly on top of boulders and very mixed

Figure 24 Section drawings of trench 7 and associated contexts

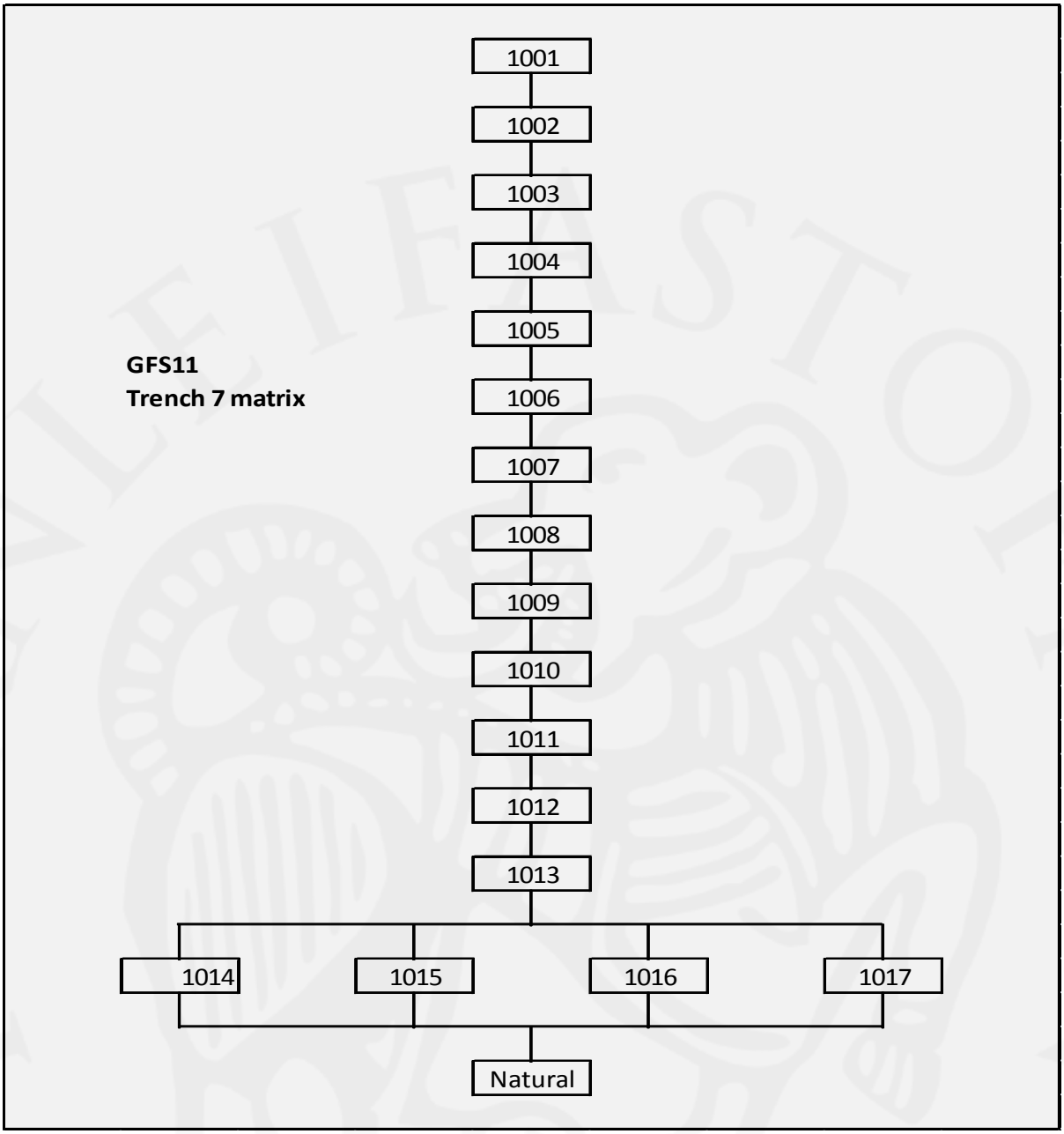


Figure 25 Matrix of Trench 7

Trench 8

Figure 26 Trench 8 during excavation. Trench 5 in the background.

Trench 8 is located next to Trench 5 in a very eroded area. It is 2 meters in length and half a meter deep. Very thick midden deposits were visible in the section which can, with good certainty, be traced back to Trench 1 from 2008, some 6 meters to the west. The midden accumulation (contexts 82-104) is 0.65 meter thick in this area with very thick bands of animal bone rich deposits. No structures are visible in the section but structures can be seen in Trench 5 not far away, as well as in Trench 1 from 2008. A piece of walrus ivory was recovered from context (85). This is a small but identifiable piece which appears to be from the tusk root area. It has saw marks on it which indicates that walrus ivory was being processed at the site[5].

Figure 27 Amber bead from context (83).

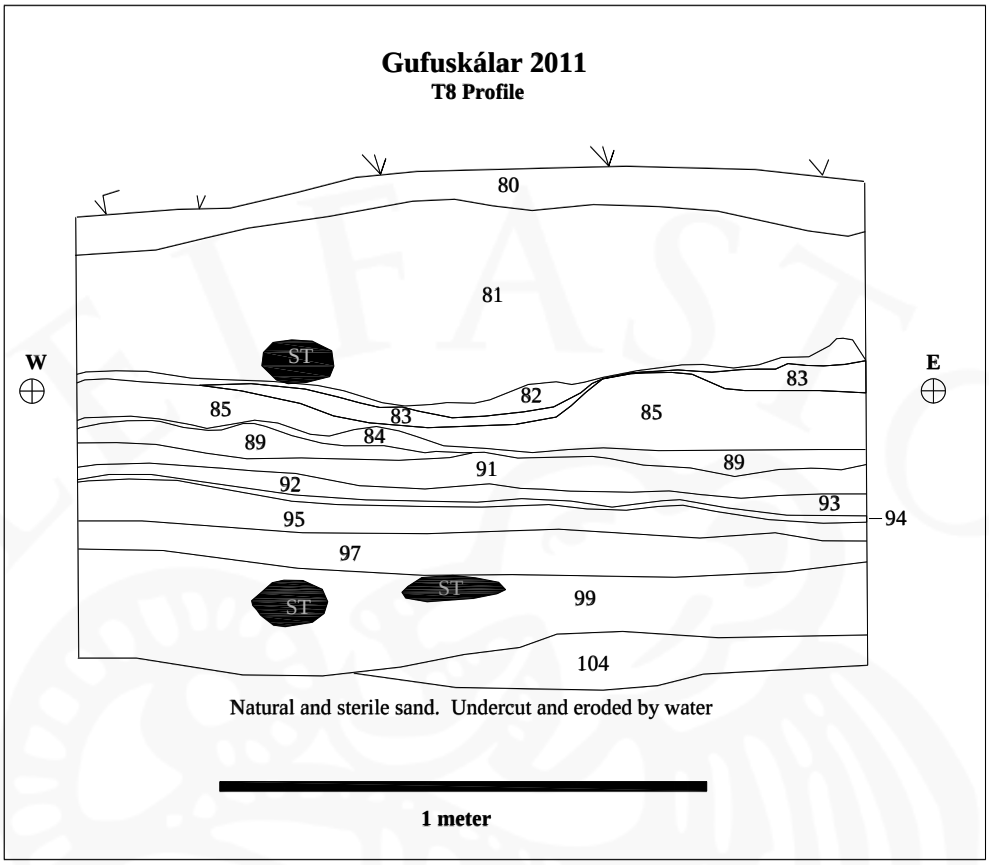
[5] Thomas McGovern, personal communication, June 2011.

Trench 8 produced some of the same finds as the other trenches such as iron nails, rivets and Cu alloy fragments or sheets. It also produced some finds not directly related to fishing or fish processing. A hair pin with a globular head made of copper or Cu alloy (figure 30), a complete amber bead (figure 27), and several worked objects of bone: three of which resemble gaming pieces (two are made of haddock bone and one is lathed out of whale bone - see figure 28) and a carved object of bone wich resembles a triple bead (figure 29). This is probably not a bead though, but the end of a handle or pin. The finer finds came from three deposits (83, 85 and 97).

Figure 28 above: Gaming pieces

Figure 29 to the left: Carved bone

Figure 30 below: Copper hair pin



Context	Trench	Type	Description
80	T8	Deposit	10 cm coarse shell sand
81	T8	Deposit	25 cm windblown sand and banded silt
82	T8	Deposit	Mid brown compact cultural layer
83	T8	Deposit	dark to mid brown shell sand and bone
85	T8	Deposit	compact red brown soil with peat ash and bone
87	T8	Deposit	Grey brown midden with shell, fish and mammal bone
89	T8	Deposit	Mid brown midden with dense bone
91	T8	Deposit	Silty midden, mid brown
92	T8	Deposit	midden in a matrix of grey sand
93	T8	Deposit	midden deposit with burnt bone
94	T8	Deposit	sand, burnt shell, midden
95	T8	Deposit	peat ash, charcoal, brown silty sand and dense midden
97	T8	Deposit	dark sand with midden and peat ash
99	T8	Deposit	sandy deposit with midden lenses
104	T8	Deposit	Sand with scant midden

Figure 31 Section drawing of Trench 8 and associated contexts.

Discussion

The 2011 season at Gufuskálar was very productive. The data gathered is exceptional, both in quantity as well as preservation.

The excavation this season gave an indication on how the fishing station at Gufuskálar developed through time. Preliminary results of the excavation show an incredible expansion of the fishing station during the medieval and late medieval periods but a retraction in the early modern times. Three structures associated with the fishing station were revealed and excavated this season. Although only one of them was partially excavated (Trench 7) the other two will be fully excavated next year. These three structures will without any doubt add richly to our knowledge on the structures of fishing stations in Iceland. Very little is known about the early fishing stations and structures, or if they had formal structures at all. In contrast, 18th-20th centurys fishing booths/seabooths are quite well known[6] although not many, if any, have been archaeologically excavated. Since it is not possible to assume that the type of structures used in the 18th, 19th or 20th century were also in use in the 11th-14th centuries these three structures now under investigation are of great interest.

The preservation of bones is remarkable[7] and bones that usually do not survive in the archaeological record in Iceland are found in abundance at Gufuskálar. This is the case with 17th century fish scales from Trench 5 and otoliths which were recovered from all trenches at all depths. Otoliths are useful for various reasons, they contain information on the growth rate of the fish, where the fish has fed and information on climate in its surroundings during its lifetime. Analysis on the otoliths will therefore add substantially to the story of fish catching and climate changes.

With over 500 kg of bones retrieved and 182 finds numbers given this season, the post excavation process will be substantial in the coming winter. The bone and artefact assemblages will help us understand what life may have been like for the men and women working and staying the fishing station at Gufuskálar in late medieval times as well as the 17th century.

Analysis on the animal bones will take place during the winter of 2011-2012, as will work on the finds.

[6] Descriptions for fishing booths in Lúðvík Kristjánsson Íslenskir sjávarhættir II Pp. 404-445.
[7] Frank Feeley et al. 2010.

The 2011 season at Gufuskálar added richly to our understanding of the site. It has also raised many new questions which will wait for another season.

Appendices

Context	Trench	Type	Description
500	T6	Deposit	Modern Turf and Roots
501	T6	Deposit	Sterile sand and darker humic sand all windblown
502	T6	Deposit	dark grey midden layer in profile
503	T6	Deposit	medium brown midden layer, lensed with peat ash, charcoal. windblown
504	T6	Deposit	light tan sand, natural, sterile aeolian
505	T6	Deposit	medium brown midden layer
506	T6	Deposit	grey black midden layer with burnt shell and bone
507	T6	Deposit	medium brown midden layer dense bone
508	T6	Deposit	light brown sand with diffuse midden
509	T6	Deposit	dense midden in mid brown silt
510	T6	Deposit	grey sand, sterile
1001	T7	Deposit	sterile lava and sehll sand
1002	T7	Deposit	stones - wall collapse?
1003	T7	Deposit	medium brown midden layer
1004	T7	Structure	pavement made of flat and cobbled stones
1005	T7	Deposit	medium brown midden layer - between and underneath 1004
1006	T7	Deposit	light brown midden layer
1007	T7	Deposit	very dense midden layer - medium brown
1008	T7	Deposit	very dense midden layer - darker grey, more sand, more granular
1009	T7	Deposit	Midden layer with peat ash
1010	T7	Deposit	Dense midden - dark grey, sandy
1011	T7	Deposit	equals 1009 - portion of 1009 that was on far side of tumbled boulders
1012	T7	Deposit	equals 1010 - portion of 1010 that was on far side of tumbled boulders
1013	T7	Deposit	mixed midden - lenses of sand, peat ash, some burnt bone, bones directly on top of boulders and very mixed
68	T5	Deposit	Possible trample
69	T5	Deposit	windblown material
70	T5	Deposit	midden deposit
71	T5	Deposit	midden deposit with shell sand
72	T5	Deposit	Midden deposit

Context	Trench	Type	Description
73	T5	Deposit	Midden deposit
74	T5	Deposit	Midden
75	T5	Deposit	Surface (root layer)
76	T5	Deposit	aeolian sand
77	T5	Deposit	midden deposit
78	T5	Deposit	midden deposit
79	T5	Deposit	Turfy
80	T8	Deposit	10 cm coarse shell sand and
81	T8	Deposit	25 cm windblown sand and banded silt
82	T8	Deposit	Mid brown compact cultural layer
83	T8	Deposit	dark to mid brown shell sand and bone
84	T5	Deposit	midden deposit
85	T8	Deposit	compact red brown soil with peat ash and bone
86	T5	Deposit	Midden deposit
87	T8	Deposit	Grey brown midden with shell, fish and mammal bone
88	T5	Deposit	Midden deposit
89	T8	Deposit	Mid brown midden with dense bone
90	T5	Deposit	midden deposit with a lot of bone
91	T8	Deposit	Silty midden, mid brown
92	T8	Deposit	midden in a matrix of grey sand
93	T3	Deposit	midden deposit with burnt bone
94	T8	Deposit	sand, burnt shell, midden
95	T8	Deposit	peat ash, charcoal, brown silty sand and dense midden
96	T5	Deposit	midden deposit with a lot of bones
97	T8	Deposit	dark sand with midden and peat ash
98	T5	Deposit	sandy aeolian deposit
99	T8	Deposit	sandy deposit with midden lenses
100	T5	Deposit	Sand, aeolian
101	T5	Deposit	burnt bones, midden
102	T5	Deposit	burnt bones, midden- more sandy than 101
103	T5	Deposit	midden deposit, burnt bone
104	T8	Deposit	Sand with scant midden
105	T5	Deposit	midden deposit. Sandy with bone
106	T5	Deposit	Black sand with midden
107	T5	Deposit	Sandy deposit
108	T5	Deposit	possible turf collapse
109	T5	Deposit	midden deposit
110	T5	Deposit	Turf, possible floor, charcoal rich

Context	Trench	Type	Description
111	T5	Deposit	peat ash, possible floor surface
112	T5	Deposit	sandy, bone rich deposit
113	T5	Deposit	midden with burned bones
114	T5	Deposit	sand
115	T5	PX	post excavation plan

Finds No.	Unit No	Trench	Material type	Object type	Quantity
200	68	T5	cu alloy	rivets	1
201	68	T5	cu alloy	strap end?	1
202	68	T5	cu alloy	pins with preserved cloth (leather)?	2
203	68	T5	fe	fish hook/nail	1
204	71	T5	flint	strike a lite	1
205	72?	T5	fe	fish hook	1
206	72	T5	fe	object	1
207	72	T5	fe	object	1
208	72	T5	fe	object	1
209	72	T5	fe	object	1
210	73	T5	fe	obj 2 pcs	1
211	76	T5	fe	nail/rivet	1
212	101	T5	fe	object	1
213	?	T5	fe	object	1
214	503	T6	fe	Nail	1
215	503	T6	fe	Nail Obj	1
216	503	T6	fe	Rove	1
217	503	T6	Cu	Obj/fragment	1
218	503	T6	Cu	Obj/Fragment	1
219	503	T6	fe	obj	1
220	503	T6	fe	rove	1
221	503	T6	fe	rove	1
222	503	T6	fe	rove frag	1
223	503	T6	fe	frags	1
224	503	T6	pottery	vessel frag	1
225	503	T6	pottery	vessel rim frag	1
226	503	T6	fe	frag	1
227	505	T6	fe	object	1
228	505	T6	Stone	sample of gravel dispersed through a midden context	1
229	508	T6	fe	rove	1
230	508	T6	Cu alloy	fragment	1

Finds No.	Unit No	Trench	Material type	Object type	Quantity
231	508	T6	pottery	sherd	1
232	508	T6	fe	Fragment	1
233	506	T6	pottery	fragments	I bag
234	508	T6	Cu alloy	fragment	1
235	508	T6	pottery	fragment	1
236	101	T5	stone	worked stone	1
237	102	T5	Cu alloy	alloy fastening	1
238	105	T5	glass	shard	1
239	1006	T7	fe	multiple roves and uni objects	9
240	1006	T7	bone	worked whale bone	2
241	1007	T7	stone	smooth stones, gaming pieces	3
242	1007	T7	ceramic	red paste pot stands	3
243	1007	T7	cu alloy	flat copper sheets	5
244	1007	T7	fe	roves and one nail	5
245	1008	T7	cu alloy	1 clothing hook and flat copper sheets	6
246	1008	T7	fe	rivets	4
247	1008	T7	ceramic	2 red paste yellow glaze and one leg	3
248	1009	T7	stone	gaming piece	1
249	1009	T7	fe	rove	1
250	1009	T7	cu Alloy	sheet	1
251	1009	T7	ceramic	base + 1 sherd yellow glaze	2
252	1010	T7	stone	gaming pieces	5
253	1010	T7	stone	bead	1
254	1010	T7	cu alloy	copper sheet and hook	2
255	1010	T7	fe	nail and unidentified	7
256	1010	T7	bone	worked whale bone	1
257	85	T8	ivory	worked walrus ivory	1
258	97	T8	bone	fish bone tripple bead	1
259	85	T8	Cu alloy	hair pin	1
260	83	T8	amber	bead	1
261	72	T5	fe	knife	1
262	83	T8	bone	chess piece	1
263	86	T5	fe	fish hook	1
264	86	T5	fe	rivets	3
265	86	T5	ceramic	pipe stem	1
266	86	T5	whale bone	frag	1
267	1005	T7	cu alloy	hooks	1
268	88	T5	ceramic	pipe bowl	1
269	88	T5	fe	nails and objs	3
270	90	T5	ceramic	pipe bowl	1
271	90	T5	ceramic	pipe stems	2
272	93	T5	fe	fish hook	1

Finds No.	Unit No	Trench	Material type	Object type	Quantity
273	93	T5	fe	rivets	3
274	95	T8	fe	flat iron piece	1
275	95	T8	cu alloy	flat copper sheet	1
276	95	T8	cu alloy	2 pices found together	2
277	96	T5	fe	fish hooks	2
278	95	T5	fe	two iron pieces	2
279	96	T5	stone	flint	1
280	96	T5	ceramic	pipe bowl	1
281	97	T8	fe	rivet	1
282	97	T8	cu alloy	sheet	1
283	101	T5	fe	rivets and unknown	6
284	101	T5	cu alloy	rolled copper	1
285	101	T5	wood	frag	3
286	102	T5	ceramic	pipe stems	2
287	102	T5	fe	rivet with back	1
288	102	T5	fe	nail	4
289	102	T5	stone	pumice	1
290	103	T5	stone	pumice	1
291	103	T5	fe	rove	1
292	103	T5	ceramic	red paste with yellow glaze pot sherd	1
293	109	T5	fe	rove	1
294	1010	T7	fe	piece of iron	1
295	1010	T7	cu alloy	various copper sheet	5
296	1010	T7	ceramic	pot sherd	1
297	1010	T7	cu alloy	coiled copper wire	1
298	1010	T7	fe	fish hook	1
299	1010	T7	cu alloy	sheet of copper	1
300	1012	T7	fe	rivet	1
301	1012	T7	bone	whale bone, worked	1
302	?	T5	stone	pumice	1
303	none	1	bone	surface find, drilled calcaneus	1
304	70	T5	fe	clothing hook	1
305	70	T5	cu alloy	copper sheet with hole	1
306	70	T5	fe	iron nails	1
307	70	T5	fe	fish hook	1
308	74	T5	ceramic	yellow glaze red pot sherd	1
309	74	T5	cu alloy	fragment, bit	1
310	74	T5	fe	iron nails	7
311	74	T5	bone	uniperforted metapodial	2
312	97	t8	bone	conical gaming piece or stopper	1
313	74	T5	fe	fish hooks	1
314	74	T5	fe	rivets roves, nails	12
315	77	T5	fe	iron stuff	4
316	77	T5	ceramic	red paste yellow glaze	1

Finds No.	Unit No	Trench	Material type	Object type	Quantity
317	1014	T7	bone	gaiming piece or stopper	1
318	1014	T7	fe	metal bits,	2
319	1003	T7	fe	iron rivet heads plus other bits	12
320	1003	T7	cu alloy	copper rivets plus sheet	2
321	1003	T7	ceramic	yellow glaze pot sherd	1
322	72	T5	fe	iron nails	2
323	78	T5	fe	unident metal bits	1
324	82	T8	fe	nail	1
325	none	1	fe	rivet loose find	1
326	1006	T7	bone	woked whale bone	1
327	76	T5	bone	biperforated metapodial	2
328	87	T8	cu alloy	copper hinge	1
329	88	T5	fe	rivets	3
330	89	T8	fe	rivets	1
331	90	T5	stone	worked and fired stone - pot lid?	1
332	92	T8	cu alloy	copper bit	1
333	93	T5	glass	sherd	1
334	86	T5	stone	flint	1
335	86	T5	fe	rivet	1
336	86	T5	glass	sherd	1
337	77	T5	fe	rivet	1
338	71	T5	fe	nail/rivet?	1
339	78	T5	fe	nails	2
340	83	T8	fe	nail	1
341	83	T8	cu alloy	copper frag	1
342	85	T8	fe	nails	5
343	84	T5	fe	rivet	1
344	84	T5	stone	flint	1
345	73	T5	ceramic	pipe stem	1
346	73	T5	fe	knife	1
347	73	T5	ceramic	pot sherd	2
348	73	T5	stone	pumice	1
349	73	T5	fe	nails	7
350	null				
351	73	T5	fe	fish hooks	4
352	73	T5	stone	curious stone, lava rock w/hole	1
353	74	T5	ceramic	red paste w yellow glaze	9
354	73	T5	bone	biperforated metapodial	1
355	74	T5	fe	nails	15
356	74	T5	fe	fish hooks	4
357	74	T5	ceramic	yellow glazed pot herd	2
358	74	T5	glass	bottle glass?	2

Finds No.	Unit No	Trench	Material type	Object type	Quantity
359	1013	T7	fe	iron spike with copper fittings?	1
360	1013	T7	cu	copper flat frag	3
361	1013	T7	ceramic	red paste w yellow glaze	4
362	1013	T7	bone	worked long bone	1
363	1013	T7	fe	knife blades	3
364	1013	T7	fe	rivets and nails	20
365	cleaning	T5	fe	rivets	2
366	cleaning	T5	stone	whet stone	1
367	cleaning	T5	brass	.22 caliber rifle casing	22
368	loose	T5	copper alloy	rivet with leather	1
369	?	T5	cu alloy	ring of copper	1
370	loose finds	T5	fe	flat iron	1
371	unstrat	T8	cu	copper frag	1
372	cleaning	T5	ceramic	pipe stem	1
373	111	T5	ceramic	pipe stem	1
374	111	T5	ceramic	red paste pottery	1
375	111	T5	fe	iron nails	2
376	112	T5	fe	iron nails	2
377	112	T5	ceramic	red paste pottery	1
378	113	T5	fe	nail	1
379	1016	T7	fe	rivets	2
380	1005	T7	ceramic	red paste pottery	1
381	1017	T7	fe	iron bar + 3 nails	4
382	1016	T7	fe	rivets	1

Bone No.	Trench	Context No.	# of bags	Description
001	T6	503	3	
002	T6	504	1	
003	T6	505	1	
004	T6	506	1	
005	T6	507	1	
006	T6	508	2	
007	T6	509	5	
008	T6	506/509 profile clean	1	
009	T6	unstratified	1	
010	5	84	3	
011	5	86	9	
012	5	87	1	

Bone No.	Trench	Context No.	# of bags	Description
013	5	88	2	
014	5	90	3	
015	5	93	2	
016	5	95	1	
017	5	97	1	
018	5	99	1	
019	5	100	3	
020	5	107	1	
021	5	108	1	
022	5	109	1	
023	8	83	1	
024	8	85	3	
025	8	87	4	
026	8	89	3	
027	8	91	1	
028	8	92	3	
029	8	94	2	
030	8	unstratified	3	
031	8	95	6	
032	8	97	2	
033	8	99	8	
034	7	1006	7	
035	7	1007	16	
036	7	1003	3	
037	7	1005	5	
038	7	1008	13	
039	7	1009	6	
040	7	1010	24	
041	5	68	1	
042	5	69	2	
043	5	70	6	
044	5	71	2	
045	5	72	3	
046	5	73	3	
047	5	74	17	
048	5	75	1	
049	5	76	4	
050	5	77	3	

Bone No.	Trench	Context No.	# of bags	Description
051	5	78	4	
052	5	79	2	
053	5	111	5	
054	5	112	4	
055	5	113	1	
056	5	114	1	
057	5	surface collection	1	
058	7	1001	1	
059	7	1011	1	
060	7	1012	1	
061	7	1013	6	
062	7	1014	5	
063	7	surface collection	1	
064	8	profile cleaning	1	
065	8	82	1	
066	8	104	1	
067	5	surface collection	1	modern
068	5	105	1	
069	5	106	1	
070	7	1015	1	
071	7	1016	10	
072	7	1017	2	
073	7	1003	1	sandbag
074	5	84	1	sandbag
075	5	90	2	sandbag

Bone No.	Trench	Context No.	# of bags	Description
076	5	105	2	sandbag
077	5	96	5	sandbag
078	5	88	2	sandbag
079	5	103	2	sandbag
080	5	98	2	sandbag
081	5	93	3	sandbag
082	5	106	1	sandbag
083	5	86	4	sandbag
084	5	102	2	sandbag
085	5	101	1	sandbag
086	5	74	3	sandbag
087	5	77	1	sandbag

References

Published

Árni Magnússon og Páll Vídalín. 1980. *Jarðabók Árna Magnússonar og Páls Vídalíns. V. Hnappadals- og Snæfellsnessýsla.* 2nd edition. Sögufélagið. Reykjavík.

Frank J. Feeley, Sophia Perdikaris, Megan Hicks, Konrad Smiarowski. 2010. *Preliminary Assessment of the faunal remains from the 2008 excavations at Gufuskálar, Snæfellsnes.* NORSEC Zooarchaeology Laboratory Report nr. 52.

Lilja B. Pálsdóttir. 2009. *Fornleifakönnun á verbúðarleifum á Gufuskálum, Snæfellsnesi. Bráðabirgðaskýrsla*. Fornleifastofnun Íslands (FS407-08231). Reykjavík.

Lucas, G. 2003. *FSÍ Archaeological Field Manual. 3rd ed*. Fornleifastofnun Íslands. Reykjavík

Lúðvík Kristjánsson. 1982. *Íslenzkir sjávarhættir. II*. Bókaútgáfa Menningarsjóðs. Reykjavík.

Spencer, B. 1994. *Archaeological Site Manual, Museum of London. 3rd ed*. MOLAS.

Thor Thordarson and Ármann Höskuldsson. 2002. *Classic Geology in Europe 3: Iceland.* Terra publishing. England.

Unpublished

Thomas H. McGovern, personal communication in June 2011.

Web links

http://instarch.is/utgafa.htm

Http://www.instarch.is/pdf/Archaeological%20Field%20Manual%20_3rd%20ed.pdf

Topographic survey

By Óskar Gísli Sveinbjarnarson

Digital Elevation Modelling (DEM) of Gufuskálar 2011

Over the period 6th – 24th June 2011 part of the land at Gufuskálar was measured in order to get high resolution elevation model of the area. The targets were the main farm mound and the area next to it. In addition two other mounds which were located at the coast were also measured and part of the area to the south of the road. These measurements were then used to create a heritage map of the area. Additionally, aerial photographs were mapped and new ones were acquired.

A) Modelling

The area

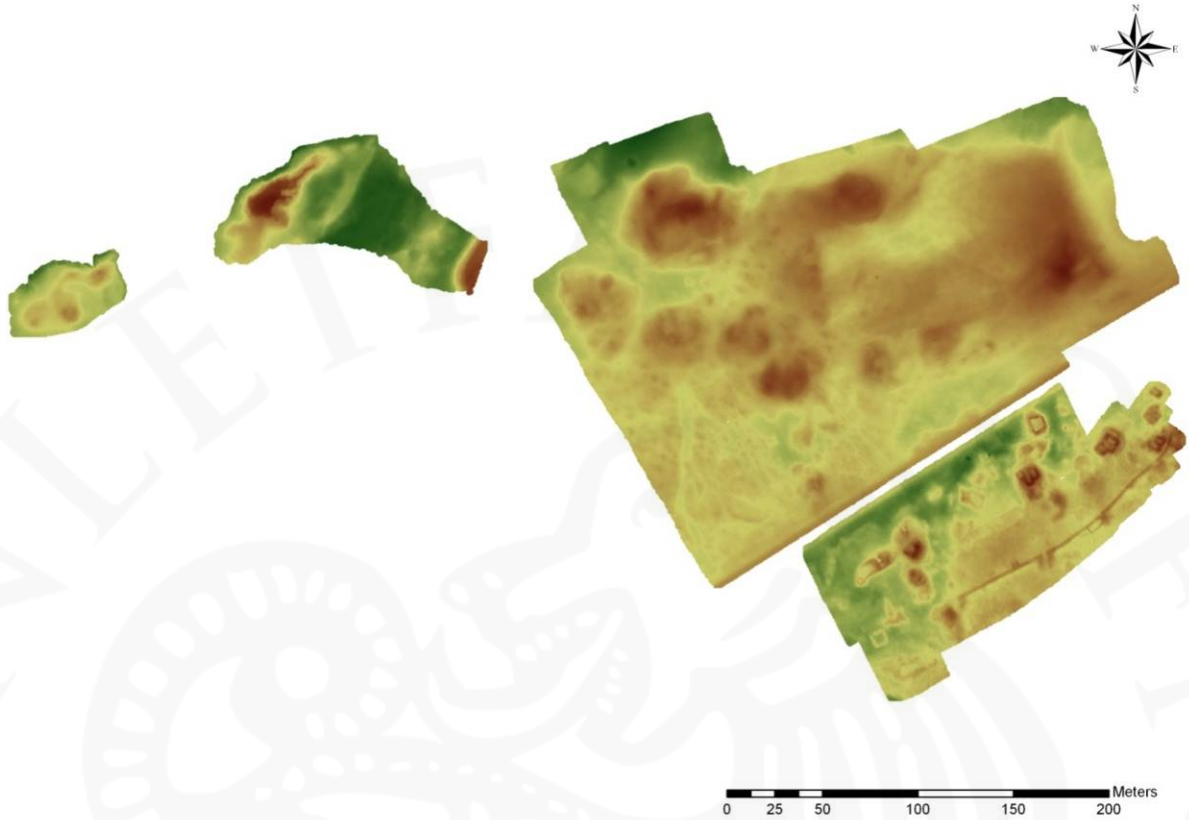
The area measured in 2011 was around 7.2 hectares. This area covers the main farm mound and a large part of the farm area north of the road as well as part of the ruin area to the south of the road. Two coastal mounds were also measured and the area between them and the parking lot to the west of the farm mound.

Methods

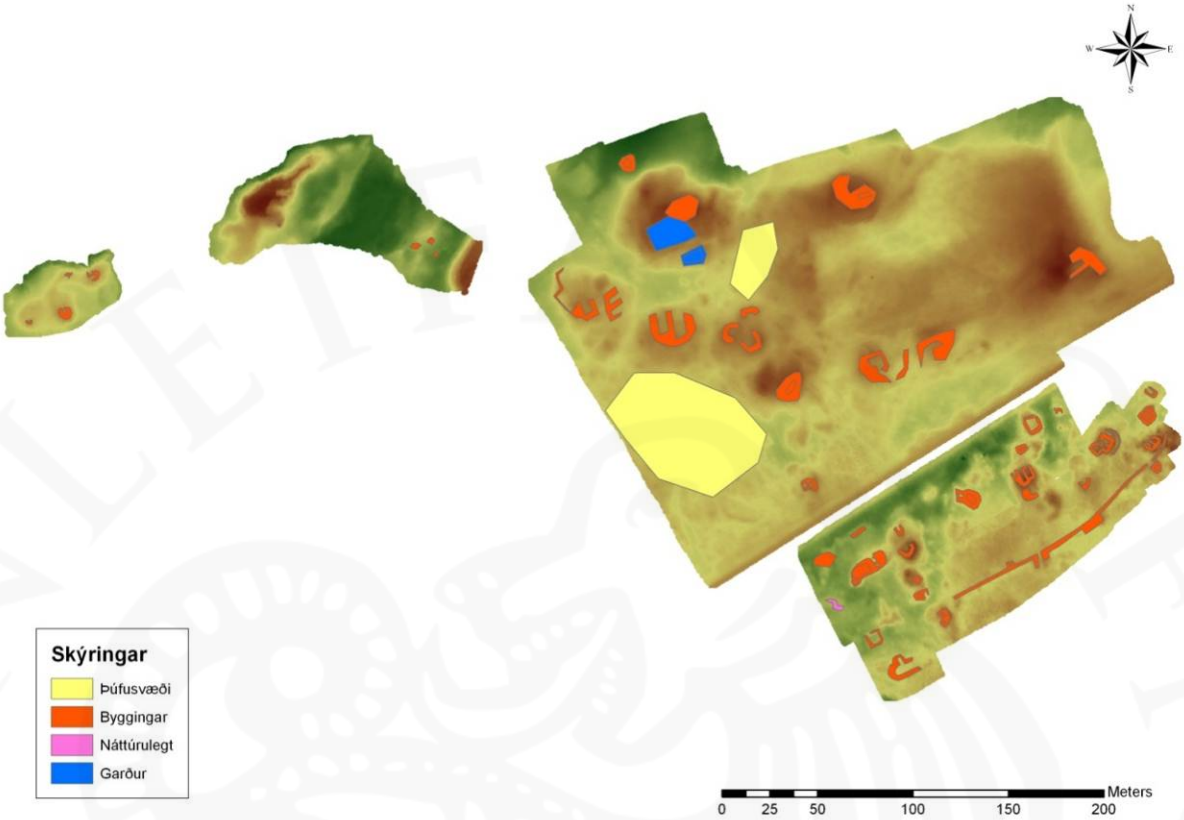
Both Trimble DGPS and a Trimble robotic station were used which can measure with around 1cm accuracy. The area was walked over in 0.5m transect lines and measurements were gathered every 1-2 seconds. In total around 122,000 points were measured. These measurements were processed in ArcGIS from ESRI and the model for the area generated.

Results

It was expected that each mound-like feature in the homefield would contain at least one ruin but due to high dry grass on site it was very difficult to define the shape of each ruin. The model manages to show that each mound does contain one ruin and the orientation is obvious. Most ruins have two or three internal spaces/rooms. The model also shows the extent of thufa formation, water channels and other geological features (picture 1).



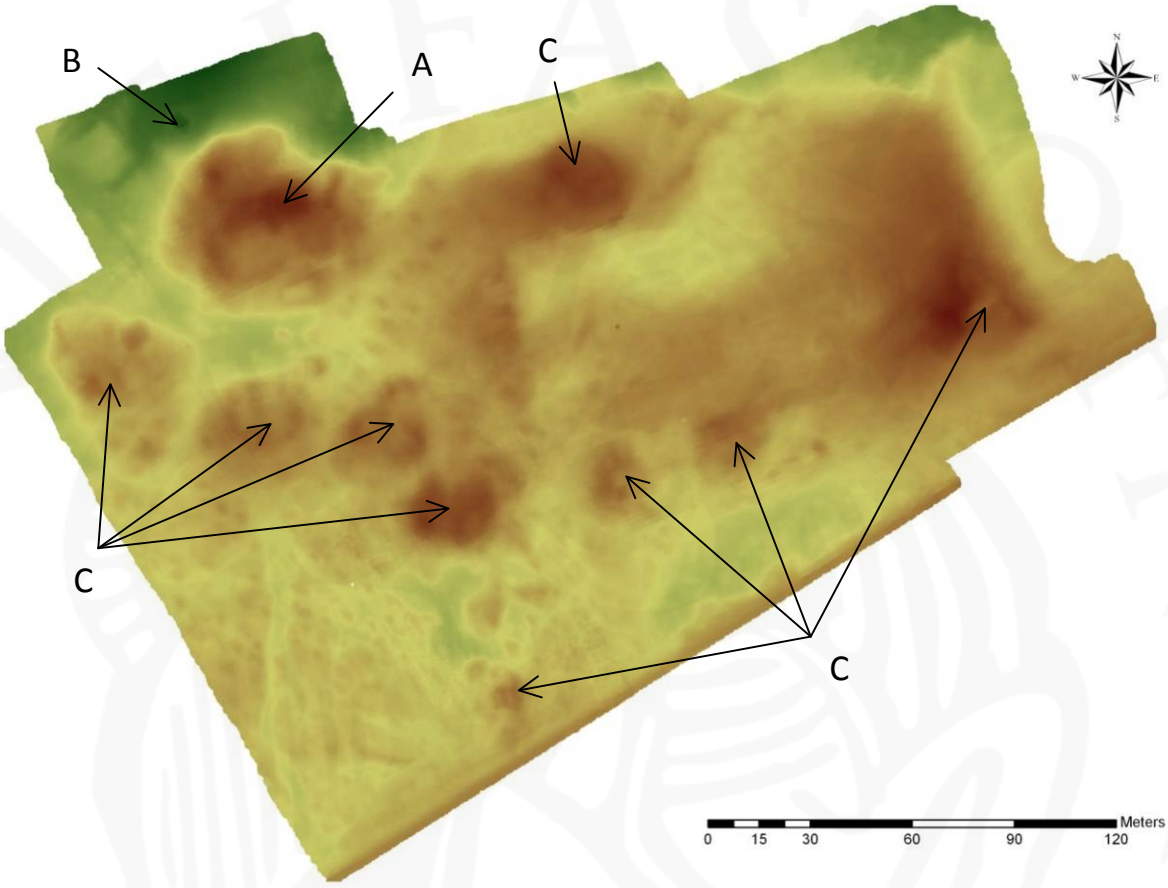
Picture 1: Digital Elevation Model of the study area.



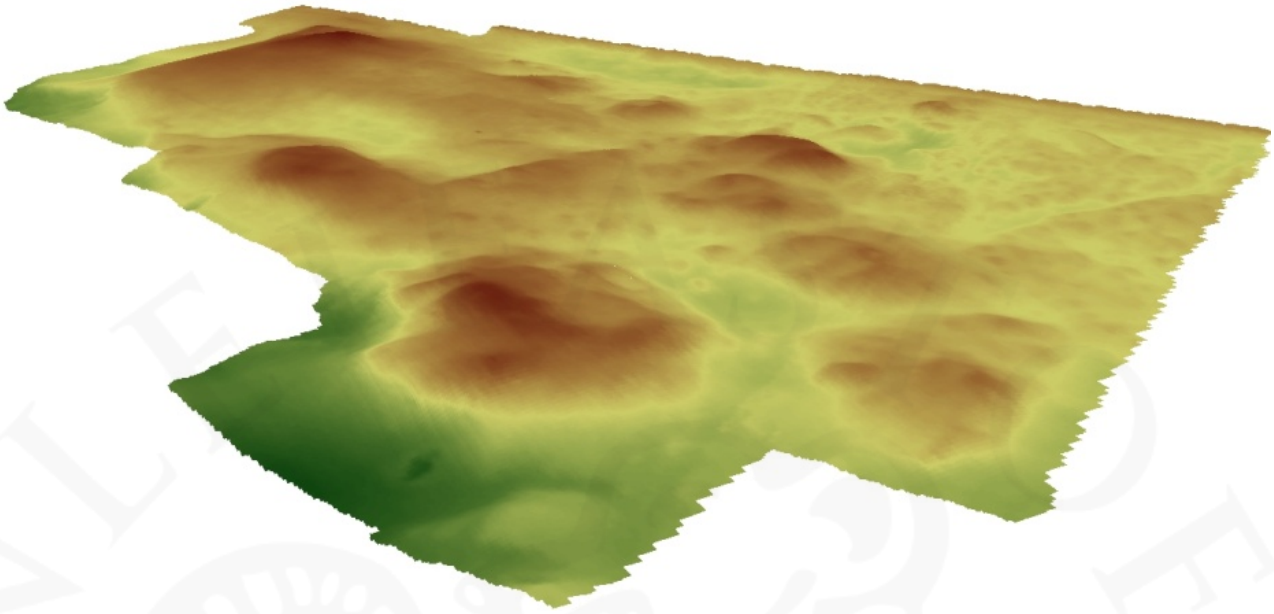
Picture 2: DEM of the research area with ruins mapped. Red = ruins, yellow = thufa, purple = natural feature, blue = cabbage/potato field.

Area north of the road

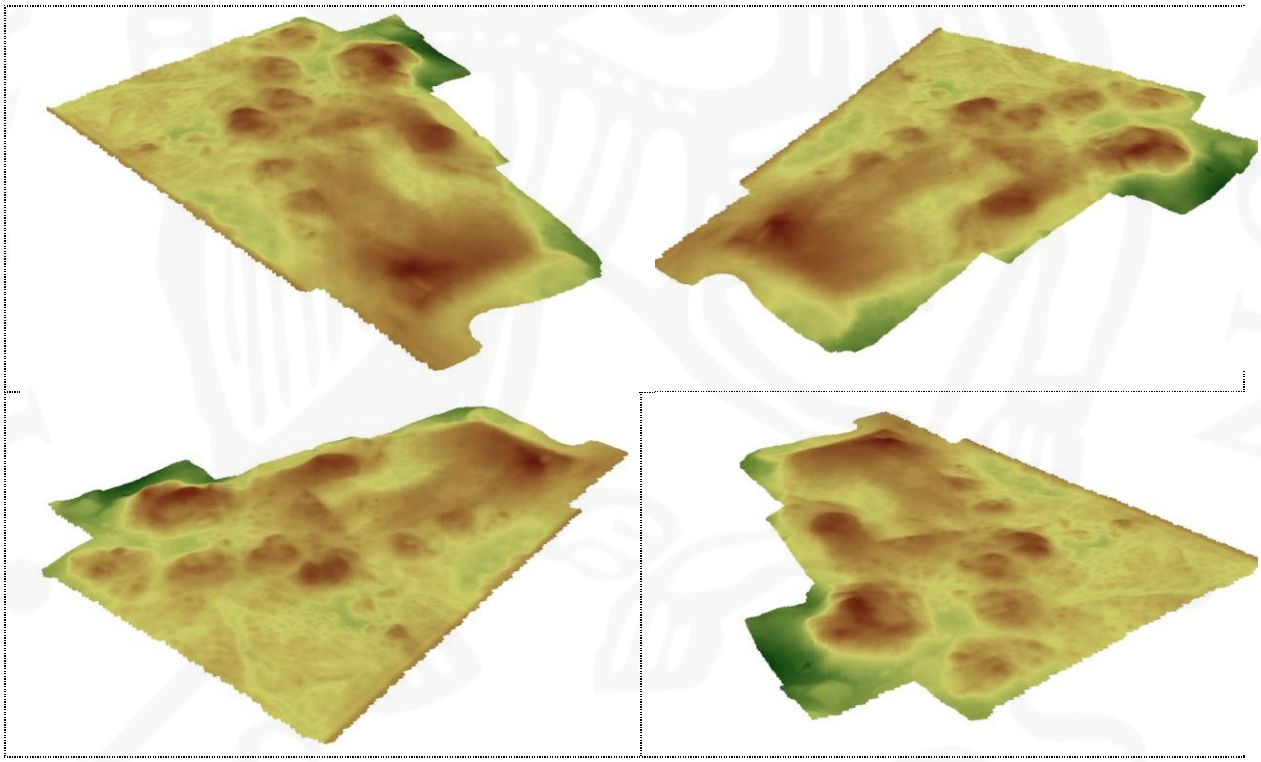
The homefield (a road forms the southern limit – picture 3) contains at least 8 mounds and each has at least one ruin. The area measured was around 5 hectares. The farm mound is in the northern part (A) with a possible small structure to the north of it (B). Other structures form roughly an east-west line. The area contains a lot of thufa formations.



Picture 3: Vertical view of the model. A shows the farm mound location along with small gardens. B shows the location of a small structure (possibly for fishing) and C shows other ruins in the area, mostly outhouses.



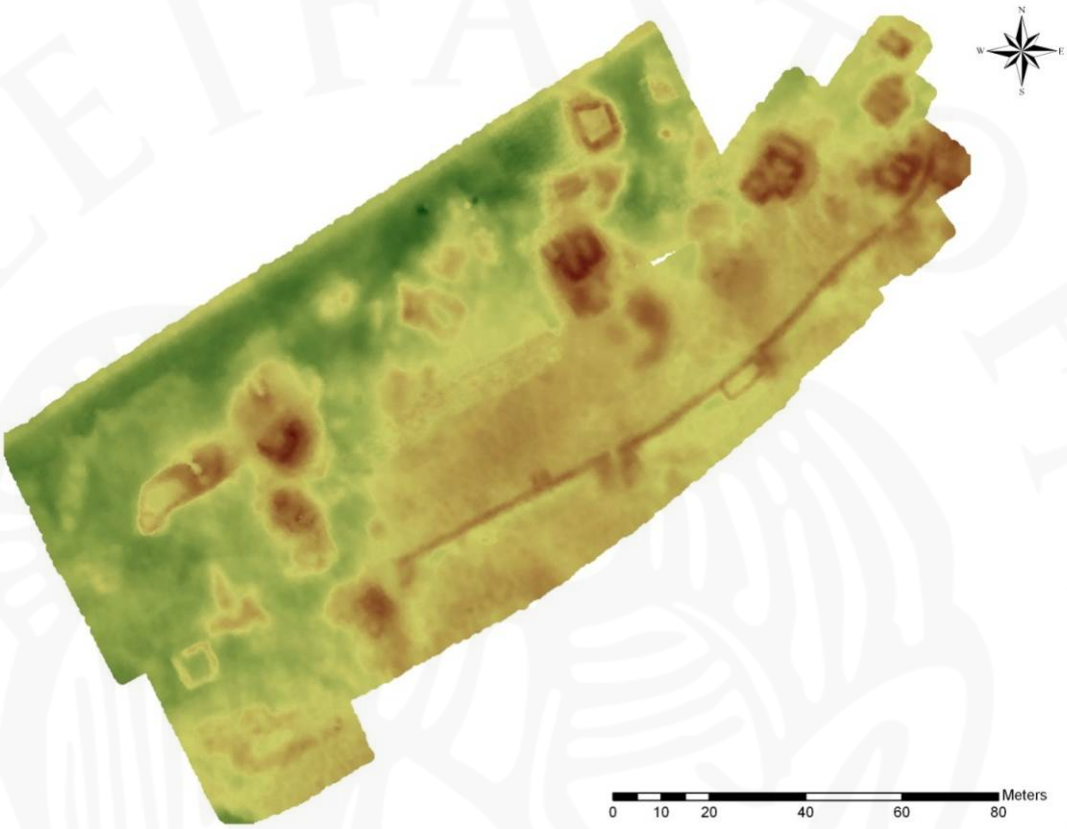
Picture 4: Looking over the area towards southeast.



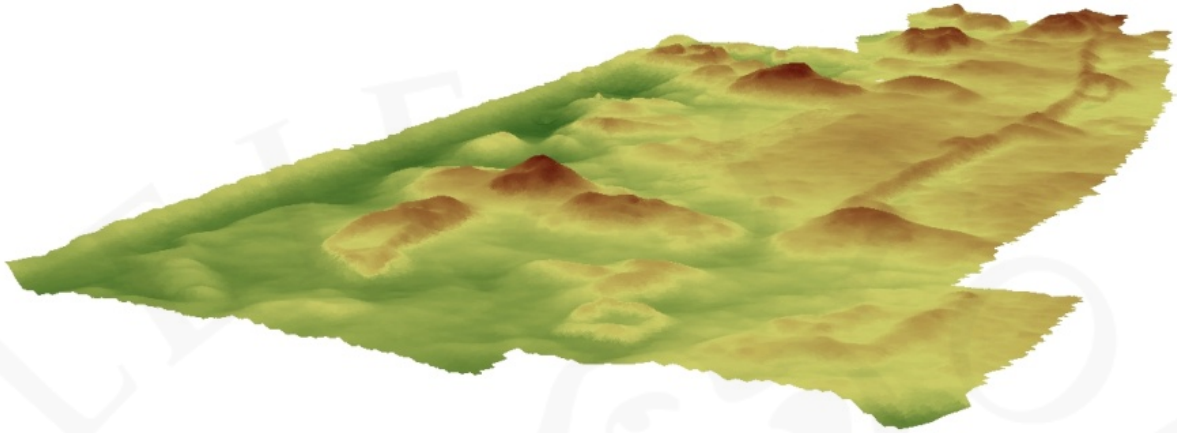
Picture 5: Four views over the area. Top left is looking over the area towards northwest, top right is looking over the area towards southwest, lower left is looking over the area toward northeast and lower right is looking over the area towards southeast.

Area south of the road

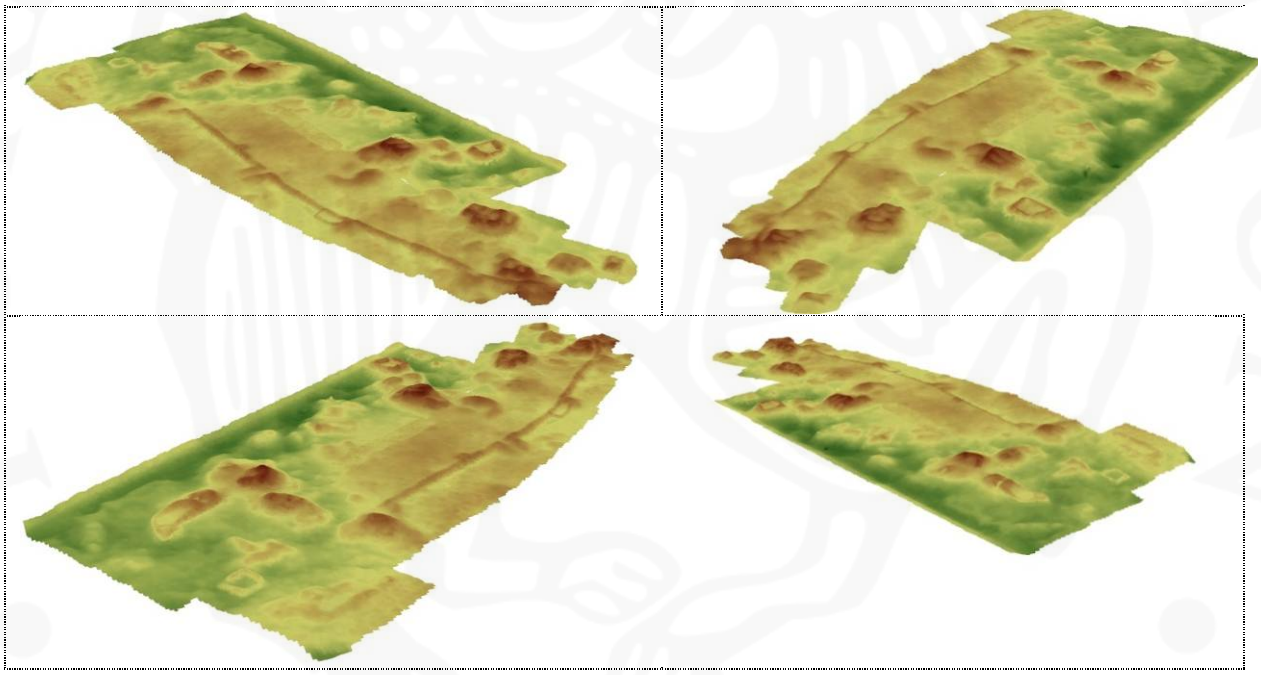
Around 1.5 hectares was measured (picture 6). The area contains large amount of ruins which are cattle-related structures, enclosures and small structures related to the fishing industry. A long boundary wall runs through the area with a few ruins and an enclosure attached to it. A few faint ruins were also discovered and mapped.



Picture 6: Vertical view of the model. The model shows the density of the ruins in the area.



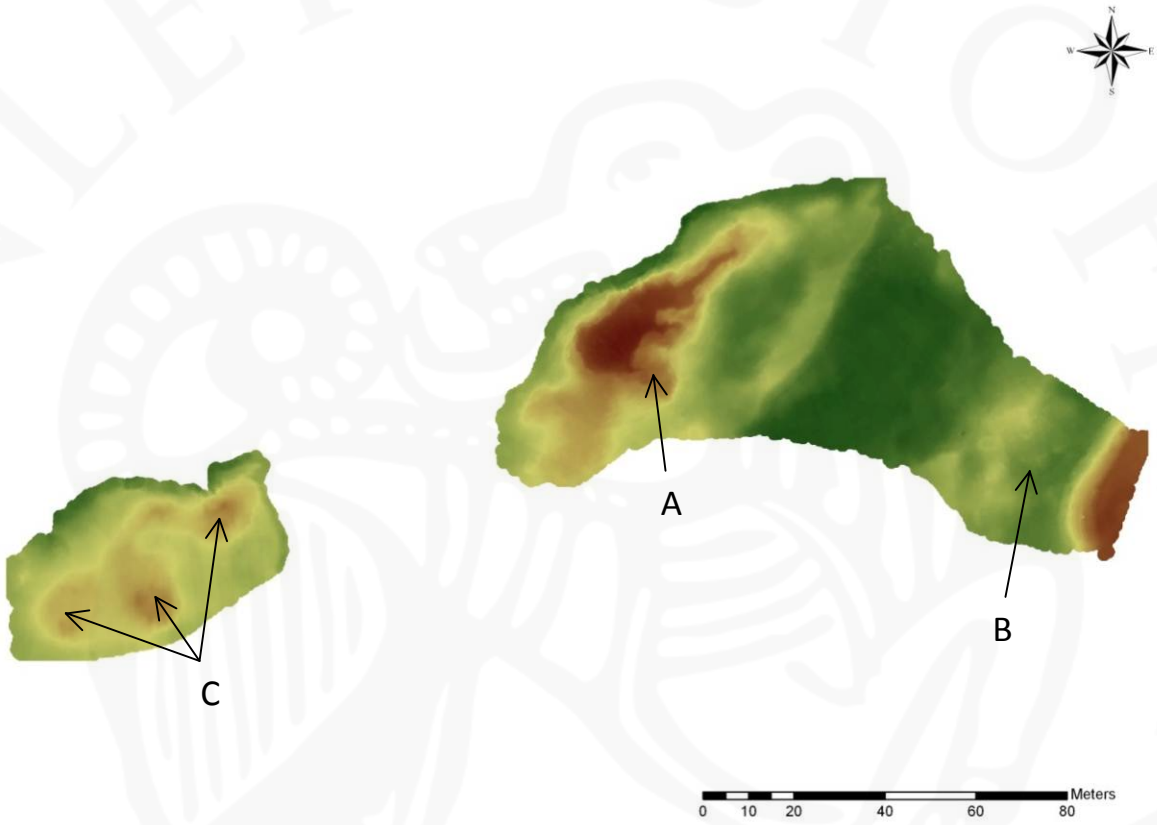
Picture 7: Looking over the area towards northeast.



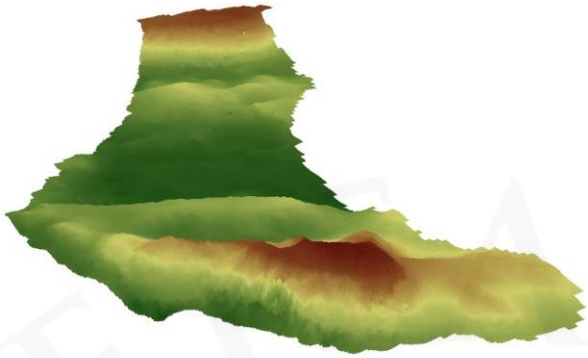
Picture 8: Four views over the area. Top left is looking over the area towards northwest, top right is looking over the area towards southwest, lower left is looking over the area toward northeast and lower right is looking over the area towards southeast.

The coastal area

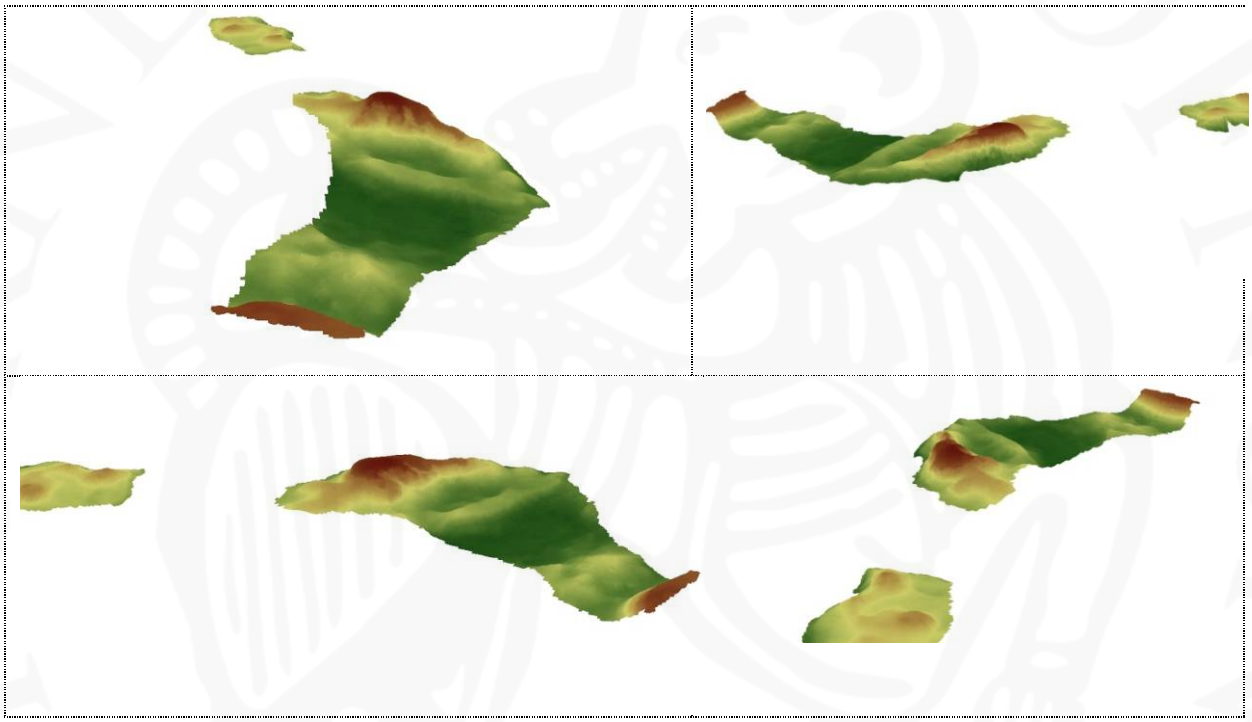
The measured area was around 0.7 hectares (picture 9). The main feature in this area is a large mound which contains large amounts of cultural layers. However, there are not many ruins visible on the mound itself but two ruins are visible on the southern side of it. The mound is being eroded by sea on the north side while the area south and southeast of the mound is being wind eroded and ”new“ ruins are re-surfacing. The western area contains three main mounds and they are eroding in same way as the main mound. The western area contains number of ruins which are clearly visible.



Picture 9: Vertical view of the model. A shows at least two ruins. B shows were number of ruins are re-surfacing and C are three structures.



Picture 10: Overview over the area.



Picture 11: Four views over the area. Top left is looking over the area towards northwest, top right is looking over the area towards southwest, lower left is looking over the area toward northeast and lower right is looking over the area towards southeast.

B) Kite photography

In addition to DEM measuring, kite photography was also undertaken. This method has been increasingly successful in the acquisition of new low altitude high resolution photographs of research areas. This method requires that some targets are distributed over the research area and that they are measured with high accuracy (DGPS or total station). It is also important that these targets will be visible on the photographs and dont blend in with the vegetation. Also at least three targets must be visible on each photograph. For this experiment small bright-orange paper plates were used as targets. A Canon EOS 400d camera was

suspended on the kite line and programmed to take photograph every 5 seconds until the memory card was full. Afterwards the photographs were checked and the best ones selected and rectified.

After the photographs had been rectified it is possible to use them for further mapping of archaeological features. They can also be overlaid on the DEM and thus creating a photographic model of the area.

Using the kite photographs at Gufuskálar proved to be a success. In places where sea and wind are eroding the area quickly, it is an asset to be able to get new high resolution photographs in a quick and cheap manner so new features can be mapped and the area monitored. Additional photographs will be taken in the coming years, and by comparing them to older ones it is possible to measure and estimate how much the area changes as well as map new archaeological features which might surface.

Picture 12: Composite photograph of the erosion area.


A

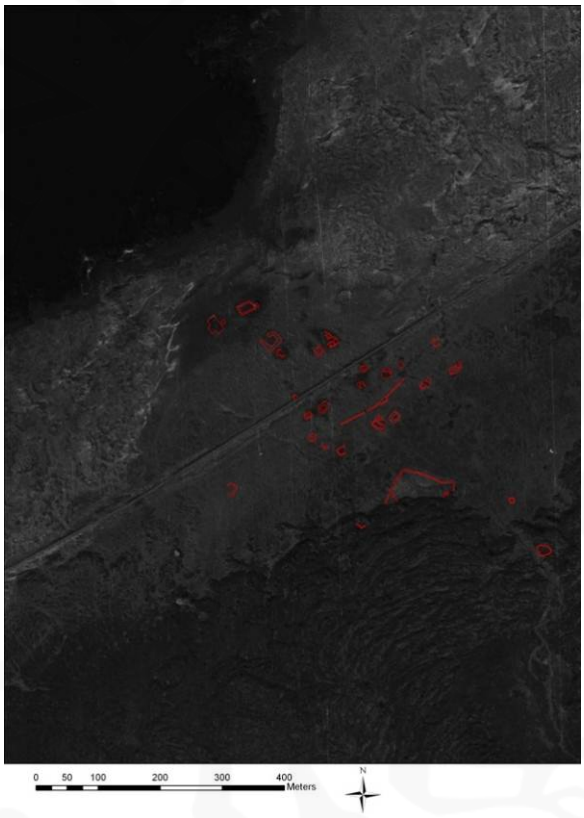
Picture 13: Crop of three frames which shows where archaeological features are re-surfacing (A). Some of these features might be natural ones.

C) Aerial photographs – methodology and data

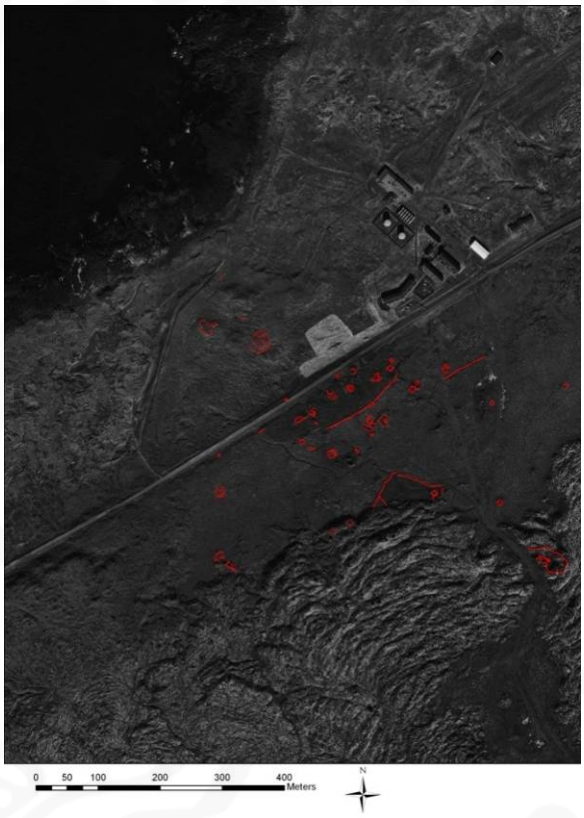
Vertical photographs

Two black-and-white photographs were selected which covers the main area of Gufuskálar. The reason these photographs were selected is that they are the sharpest photographs existing of the area. The older photograph was taken in 1957 from altitude of 4200 meters and the latter one was taken in 1984 from an altitude of about 2000 meters. The main gain of using these old photographs is that they show Gufuskálar before any major constructions took place in the area.

These photographs were rectified with natural features visible on SPOT-5 satellite imagery being used as reference points. ArcGIS was used for the rectification. After rectification the photographs were mapped and a database created (picture 14-15).



Picture 14: Vertical photograph from 1957 showing mapped ruins. 111



Picture 15: Vertical photograph from 1984 showing mapped ruins.

Results

Using aerial photographs has assisted in understanding the distribution and coverage of archaeological features at Gufuskálar. The aerial perspective makes it easier to grasp and understand the large amount of ruins over a large area. Addionally, the photograph from 1957 shows where the last building was located as well as other features which have disappered in later photographs. The photograph from 1984 is taken at lower altitude and is therefore sharper and clearer, helping to resolve the nature of both archaeological and natural features.

Certain problems did surface while the photographs were being rectified. The main problem was that the landscape has changed between 1957 and 2002-2007. This resulted in greater inaccuracy in the rectification of the photographs. It was therefore necessary to accept certain error margins – with control points locared within a 1 meter error margin.

Field survey using DGPS confirmed most of the ruins on the aerial photographs but a new knowledge was also gained, especially how some ruins exploit the natural features.

Comparing the DEM to the aerial photographs

Aerial photographs show a large area and they can be mapped in great detail in rather a short time. Meanwhile the model creation is a rather time consuming process but the results do justify the investement. Also the models illustratehow the surface is while being walked over, whilst aerial photographs are subject to different lightning conditions (time of year, time of day, shadows, clouds) and vegetation at the time of photography.