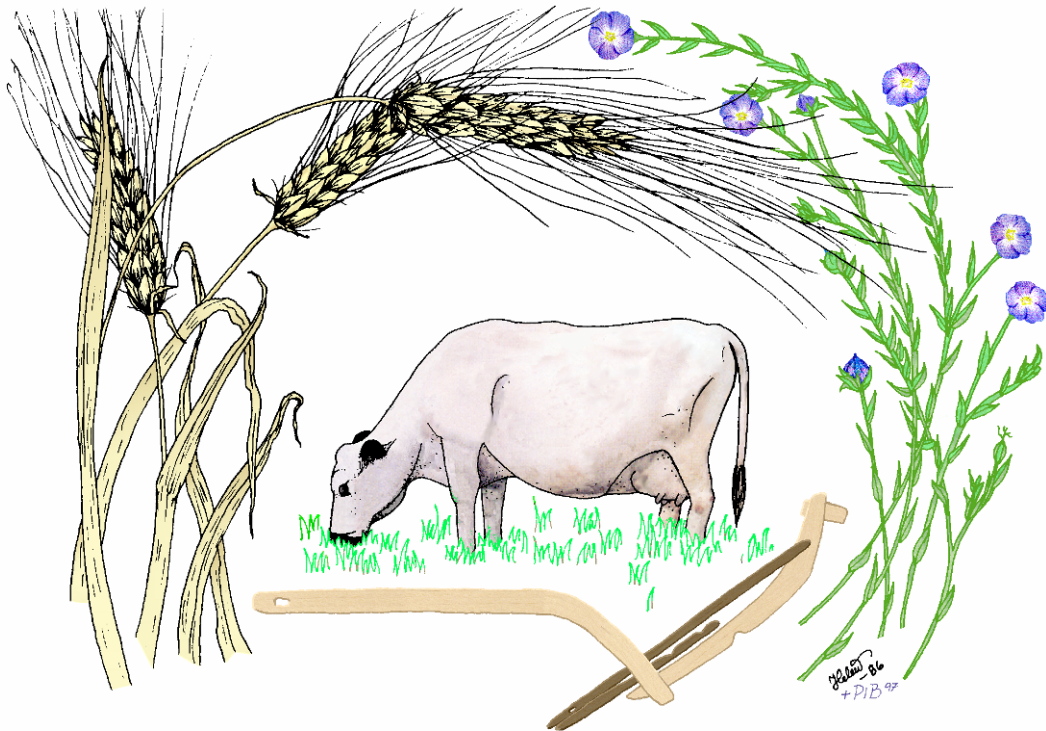


MILJÖARKEOLOGISKA LABORATORIET

RAPPORT nr. 2021-015



Environmental archaeological analyses
of samples from the site Tanum 2463/
L1959:4867, Tanum Socken, Bohuslän

Kristian Hristov, Samuel Eriksson, Jan-Erik Wallin,
Ivanka Hristova

INSTITUTIONEN FÖR IDÉ – OCH SAMHÄLLSSTUDIER



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Sample information

Analysis type: Macrofossil analysis of unfloatated samples, soil chemical analysis, and pollen analysis.

Number of samples: 13 macrofossil sample, 78 soil chemical samples and 2 pollen samples.

Introduction

Thirteen macrofossil, 78 soil chemical and 2 pollen samples from the excavations of the site Tanum 2463/ L1959:4867 were analyzed at the Environmental Archaeology Laboratory (MAL) at Umeå University.

The southern part of the survey area was more intensively used and probably for cultivation, while the north part was connected with housing, storing and crop processing. The Archaeobotanical samples, as well as part of the soil chemical samples were taken from a long house, mainly from postholes but also from two wall ditches. The main question concerns the function of the facility, whether the building was used for housing animals, storing, etc.

Botanical material from the samples was selected for ¹⁴C in order to enable the dating of the site.

Samples and related information were provided by Stig Swedberg, Kulturlandskapet, Fjällbacka.

Materials and Methods

Macrofossil analysis

Before the analysis the samples were stored in a drying room (+30°) until the moisture has disappeared. Afterwards they were floated using sieve meshes of 2 mm and 0,5 mm. The samples volume before floatation was between 1 and 2 liters and after it between 10 to 110 ml. The sieved material was sorted and identified under stereomicroscope. Charcoal fragments were identified under microscope with reflected light. The results from the analyses have been presented in Table 2&3.

The amount of woody charcoal was estimated as relative proportion of the floated sample volume as follows: x = up to 25%, xx = up to 50%, xxx = up to 75%, xxxx = about 100%. The determination of plant species was done using reference literature for seeds (Cappers et al. 2012) and wood (Schweingruber 1978; Schweingruber 1990) as well as the laboratory reference collections. The names of the identified plants are given according to the Nordens flora (Mossberg and Stenberg 2018) and the Virtual Flora (Anderberg and Anderberg, u.d.). Swedish

names of the identified plants are included in Table 2. The selected for 14C material is presented in table 3.

Sample processing and identification was performed by Kristian Hristov and Ivanka Hristova.

Soil chemistry

Prior to all analyses the samples were dried at 30°C. Samples were then passed through a 1.25 mm sieve and any presence of material of cultural significance noted (such as bone, charred material, ceramics etc.). The chemical methods employed here are the same as those used in Swedish soil chemical studies following the methodological approach of Engelmark and Linderholm (1996 and 2008). The parameters analysed and abbreviations used are explained in Table 1.

Table 1. Geoarchaeological methods and abbreviations as used in this report.

| Abbreviation | Method | Description |
|---------------------|---|--|
| MS | Magnetic Susceptibility | Magnetic susceptibility measured on 10g of soil, with a Bartington MS3 system with an MS2B probe (Dearing 1994). Data are reported as SI-units per ten grams of soil, (corresponding to X_{lf} , $10^{-8} \text{ m}^3 \text{ kg}^{-1}$) (Thompson & Oldfield 1986). |
| MS550 | Magnetic Susceptibility after burning at 550°C | Magnetic susceptibility after 550° C ignition (units as above) |
| LOI (%) | Loss On Ignition | Soil organic matter, determined by loss on ignition at 550° C, in percent (Carter, 1993). |
| Cit-P | Inorganic phosphate content (mg P/kg dry matter, ppm) | Extraction with 2% citric acid (corresponding to the Arrhenius method (Arrhenius 1934) |

These methods have been developed and adapted for soil prospection and the bulk analysis of occupation soils and features. Analysed parameters comprise organic matter (loss on ignition [LOI], Carter 1993), two fractions of phosphate (inorganic [Cit-P], and sum of organic and inorganic [Cit-POI]) (Engelmark and Linderholm 2008, Linderholm 2007) and magnetic susceptibility (MS- χ_{lf}) and MS550- χ_{lf} (Linderholm 2007, Engelmark and Linderholm 2008). These analyses provide information on various aspects concerning phosphate, iron and other magnetic components and total organic matter in soils and sediments, and their relation to phosphate.

Soil chemical analyses were undertaken by Samuel Eriksson and Kristian Hristov.

Pollen analysis

Pollen analysis was performed by Jan-Erik Wallin. The pollen report is in Swedish and attached in the end.

Results



Figure 1. Overview of samples and sampled features.

Macrofossil analysis

Thirteen samples were analysed for macro remains. The amount of charcoals in the floated samples is quite diverse. Some are entire charred while others contain less than 25% charcoals. The preserved botanical material is scarce. Six samples contained macro remains, comprised mainly by cereals. The results from the analyses are presented in Table 2&3.

Sample 20_0039_0001/ P16

The sample volume before floatation was 1,2 litres and after floatation – 15 ml. The floated sample consisted almost entirely of charcoals. Apart from the charcoals a needle fragment and a modern seed of raspberry (*Rubus idaeus*) were found. One wood fragment was selected for 14C dating and defined as birch/alder (*Betula/Alnus*).

Sample 20_0039_0002/ P19

The sample volume before floatation was 1,4 litres and after floatation it was 20 ml. The amount of charcoals was estimated to about 25% of floated sample volume. No other botanical material was found. The sample contained mainly modern vegetative parts such as roots and stems. A charcoal fragment of diffuse porous wood was selected for 14 C dating.

Sample 20_0039_0003/ P20

The sample volume before floatation was 1,8 litres and after floatation it was 25 ml. The amount of charcoals in the sample was about 50% of the floated sample volume. A modern seed of raspberry (*Rubus idaeus*) was identified. No other plant macro remains were detected. One wood fragment determined as birch/alder (*Betula/Alnus*) was sorted for 14C dating. Ceramic and bone fragments were also registered in the sample.

Sample 20_0039_0004/ P23

The sample volume before floatation was 1,7 litres and after floatation – 75 ml. The floated sample consisted almost entirely of charcoals. Two ceramic fragments were noticed. The botanical material is represented mainly by cereals: four grains of hulled barley (*Hordeum vulgare var vulgare*) and a few unidentified whole and fragmented cereal grains. A fragment of pine (*Pinus* sp.) needle was sorted. One grain of hulled barley was selected for 14C dating.

Sample 20_0039_0005/ P27

The sample volume before floatation was 2,1 litres and after floatation it was 20 ml. The amount of charcoals was about 25% of floated sample volume. No other botanical material was found. The sample contained mainly modern plant parts. A piece of flint was detected. A charcoal fragment of diffuse porous wood was selected for 14 C dating.

Sample 20_0039_0006/ P36

The sample volume before floatation was 1,6 litres and after floatation – 40 ml. The amount of charcoals was estimated to about 75% of the floated sample volume. The identified plant remains were comprised three fragments of unidentified cereals and a barley (cf. *Hordeum* sp.) grain. The barley grain was selected for 14C.

Sample 20_0039_0007/ P39

The volume of the sample before floatation was 1,6 litres and after it – 30 ml. Half of the floated sample volume was represented by charcoals. The rest was modern roots/stems. No preserved archaeobotanical remains were found. A charcoal fragment defined as birch/alder/hazel (*Betula/Alnus/Colylus*) was selected for 14C.

Sample 20_0039_0008/ P40

The volume of the sample before floatation was 1,2 and after it – 10 ml. Charcoals were about half of the floated sample volume. The only preserved macro remain was a cereal fragment. A charcoal fragment of diffuse porous wood was selected for 14 C dating.

Sample 20_0039_0009/ P43

The volume of the sample before floatation was 1,4 and after it – 20 ml. The amount of charcoals was less than 25% of the floated sample volume. No other botanical material was found. A charcoal fragment of diffuse porous wood was selected for 14 C dating.

Sample 20_0039_0010/ P52

The volume of the sample before floatation was 1,4 litres and after it – 110 ml. The whole sample was represented by charcoal fragments. The identified macros in the sample consisted of barley (*Hordeum vulgare*) grains, most of them hulled barley (*Hordeum vulgare* var *vulgare*), unidentifiable whole and fragmented cereals, and single finds of knotweeds (*Persicaria* sp.) and clover/burclover (*Trifolium/Medicago*). A hulled barley (*Hordeum vulgare* var *vulgare*) grain was selected for 14C.

Sample 20_0039_0011/ P75

The volume of the sample before floatation was 1,3 litres and after it – 10 ml. The amount of charcoals comprised half of the floated sample volume. No other botanical material was found. A charcoal fragment defined as birch/alder/hazel (*Betula/Alnus/Colylus*) was selected for 14C.

Sample 20_0039_0012/ P76

The volume of the sample before floatation was 1,4 litres and after it – 25 ml. The amount of charcoals was less than 25% of the floated sample volume. No other plant remains were detected. A charcoal fragment defined as birch/alder/hazel (*Betula/Alnus/Colylus*) was selected for 14C.

Sample 20_0039_0013/ P77

The volume of the sample before floatation was 1 litre and after it – 15 ml. About half of the floated sample consisted of charcoals. The identified plant remains were seven seeds of crowberry (*Empetrum nigrum*) and a chaff from einkorn/emmer (*Triticum monococcum/dicoccum*). A few seeds of crowberry (*Empetrum nigrum*) were selected for 14C.

Soil chemistry

In total, 78 samples were analysed: 27 grid samples, 32 samples from excavated features and 19 samples from 3 stratigraphies. The analysis results can be found in table 4.

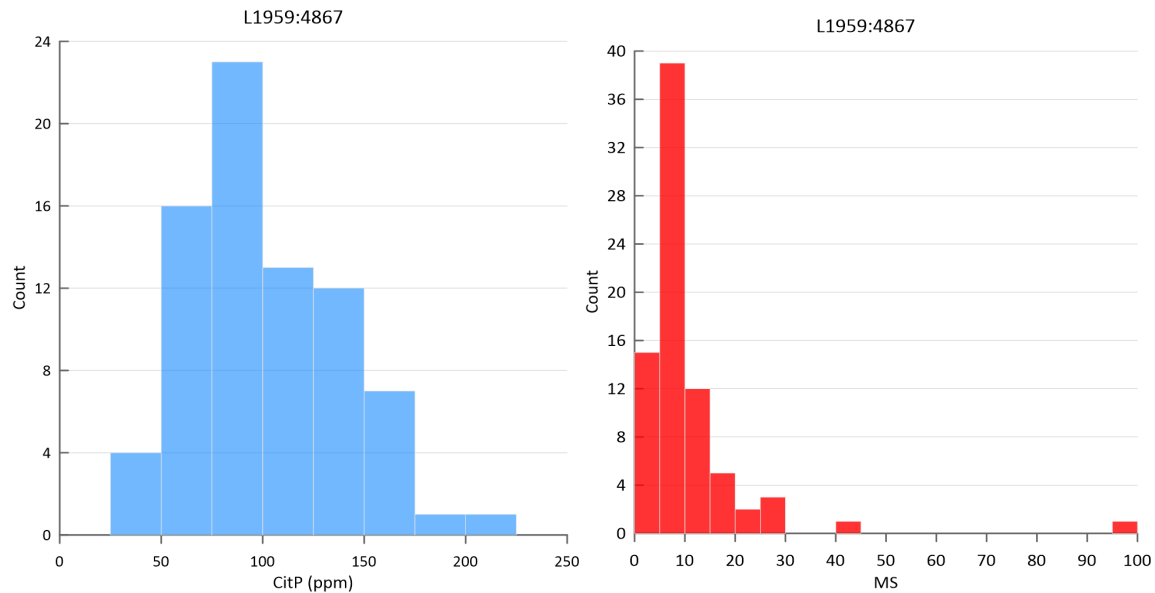


Figure 2. Distribution of CitP and MS in soil chemistry samples (sample from grave excluded)

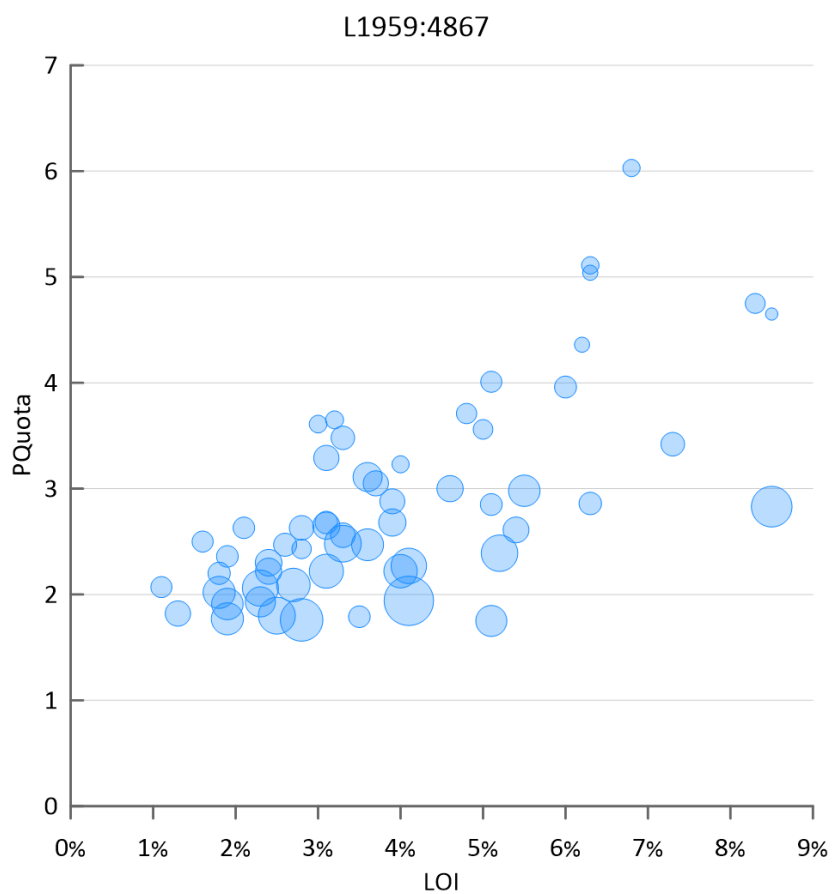


Figure 3. PQuota as function of LOI for grid and feature samples (one outlier excluded). Symbol size indicates relative amount CitP.

The variation in CitP and MS for all samples (sample 20_0039_003 from grave A31 excluded) is presented as histograms in figure 2. The amount of CitP shows a close to lognormal distribution with a median of 95ppm. The values for MS shows a lognormal distribution with a median of 7. This indicates a combination of natural variation in soil formation and cultural impact from phosphate accumulating and heat generating processes.

Figure 3 shows the relation between organic content, PQuota (relation between amount of organic and inorganic phosphates) and CitP in the samples which is helpful when discussing soil formation and different kinds of past land use on the site. Fertilisation of agricultural fields tends to raise PQuota and LOI whereas lower PQuota and higher amounts of CitP might indicate settlement related activities. Figure 4 shows a spatial representation of sample categories derived from figure 3.

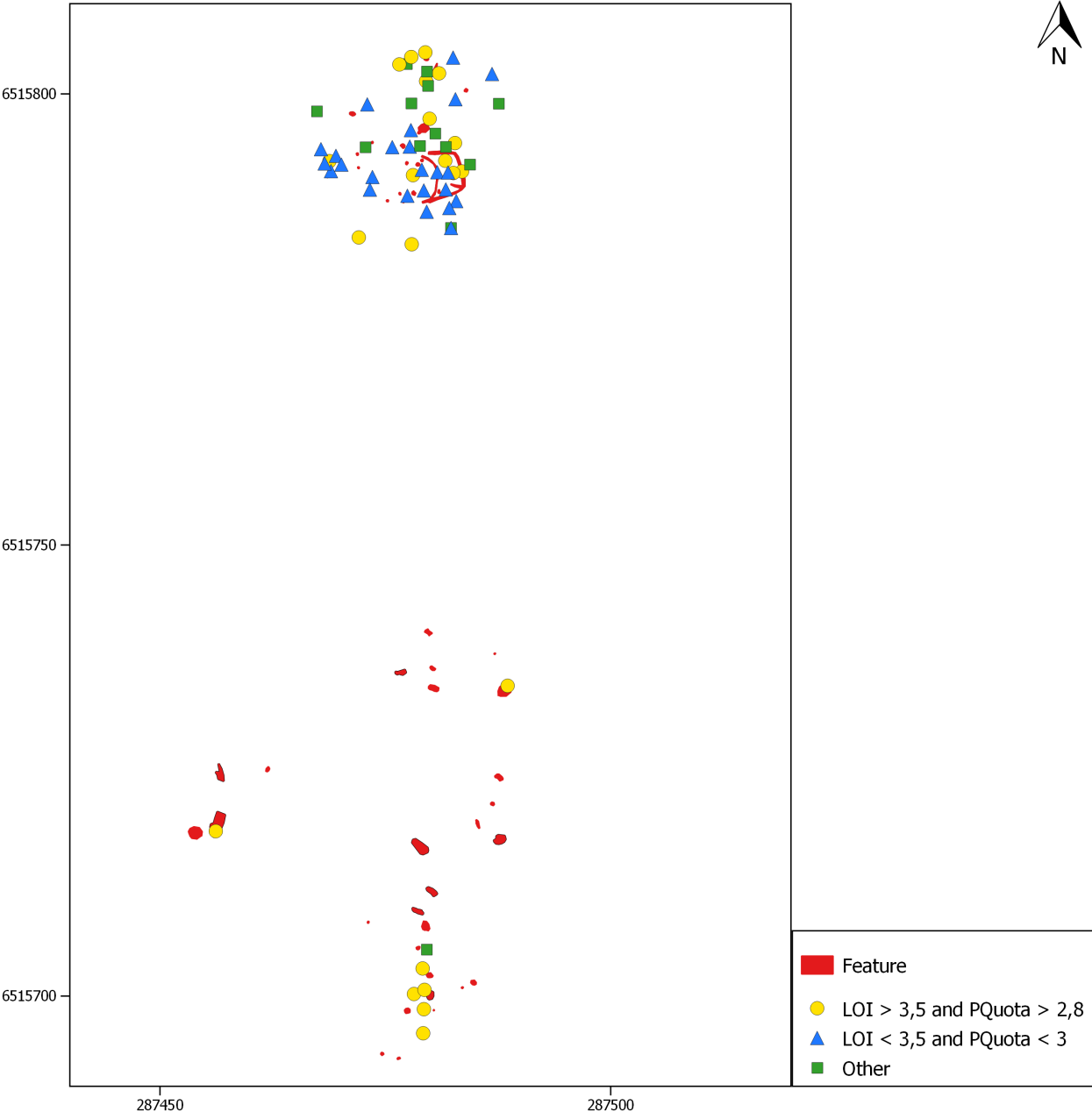


Figure 4. Samples categorised by LOI and PQuota

Northern area

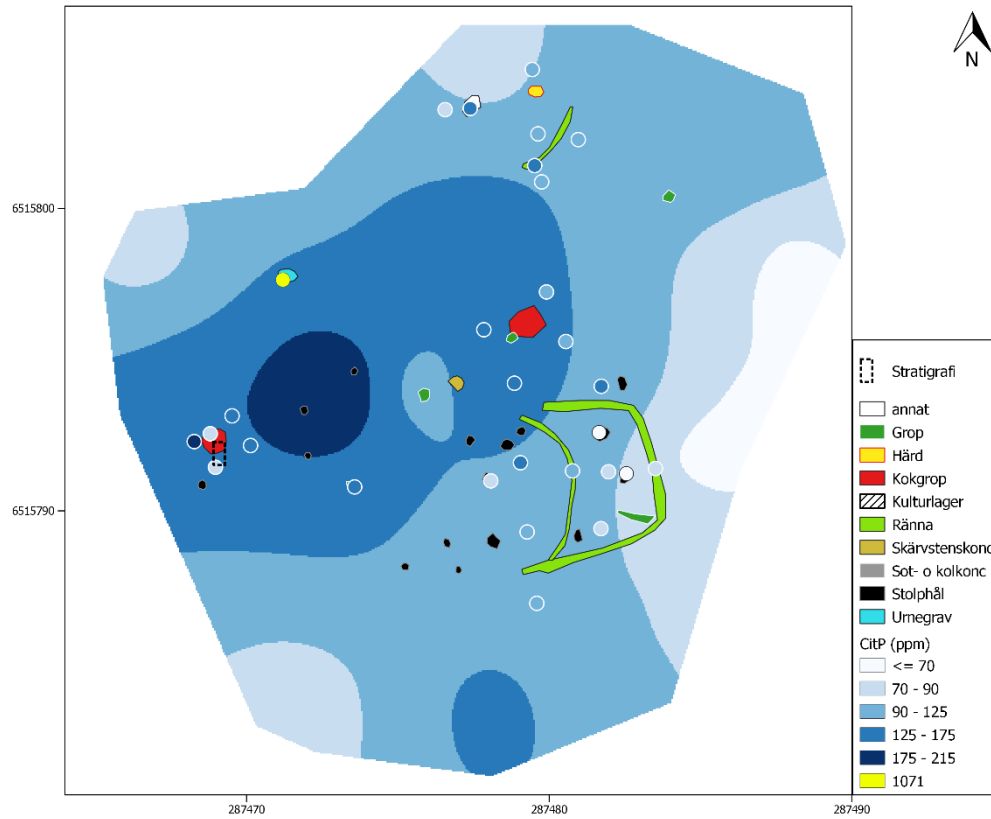


Figure 5. Interpolation from grid samples of CitP distribution combined with CitP amount in analysed feature samples

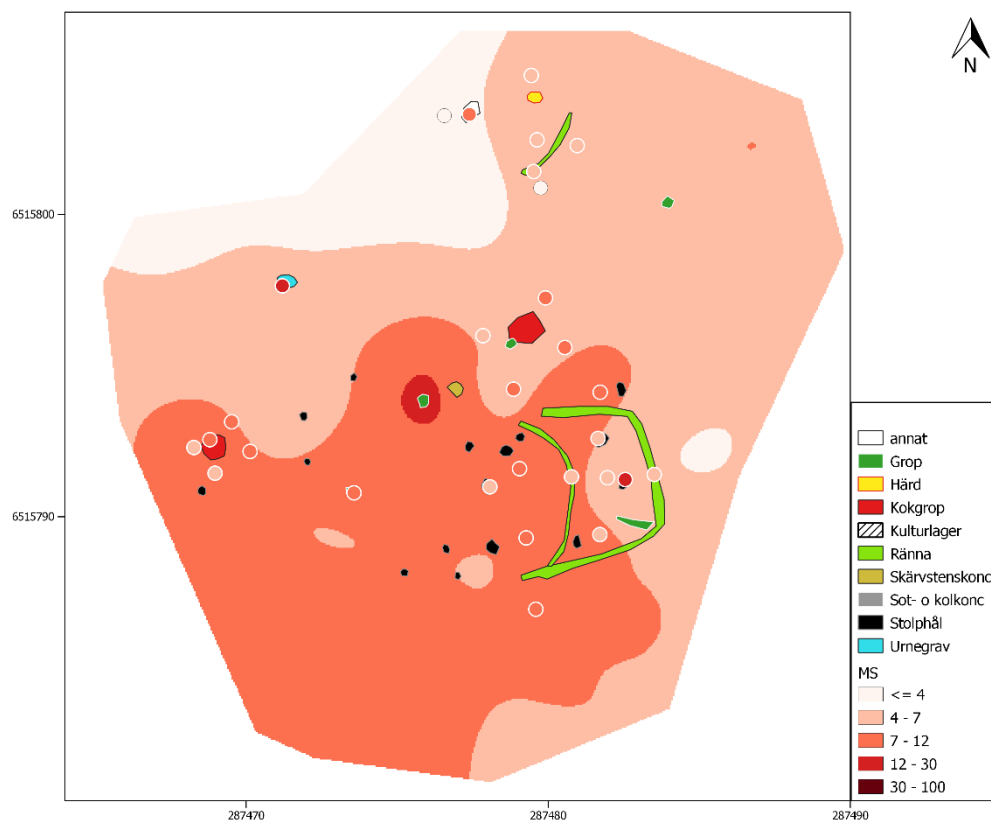


Figure 6. Interpolation from grid samples of MS distribution combined with MS in analysed feature samples

Figures 5 and 6 are interpolated maps showing the spatial distribution of amount of CitP and MS in the northern excavation area. The interpolations are overlaid with the analysis results for the analysed feature samples.

The variation in CitP is relatively small (59-215ppm), except for the sampled grave (1071ppm). A continuous area between and around the cooking pits (A30 and A51) shows raised amounts of CitP indicating phosphate generating activities possibly related to the cooking pits. The amounts of CitP in samples from the excavated features don't differ significantly from the surrounding sediments and offers little suggestion as for the functions of the features.

The variation in MS is very small, 4-7 in most samples. A weak gradient SW-NE is visible, whether this indicates different activities over the area or is a natural or sampling dependant variation is difficult to ascertain. One grid sample and one feature sample (A56) likely indicates heat generating activities.

Southern area

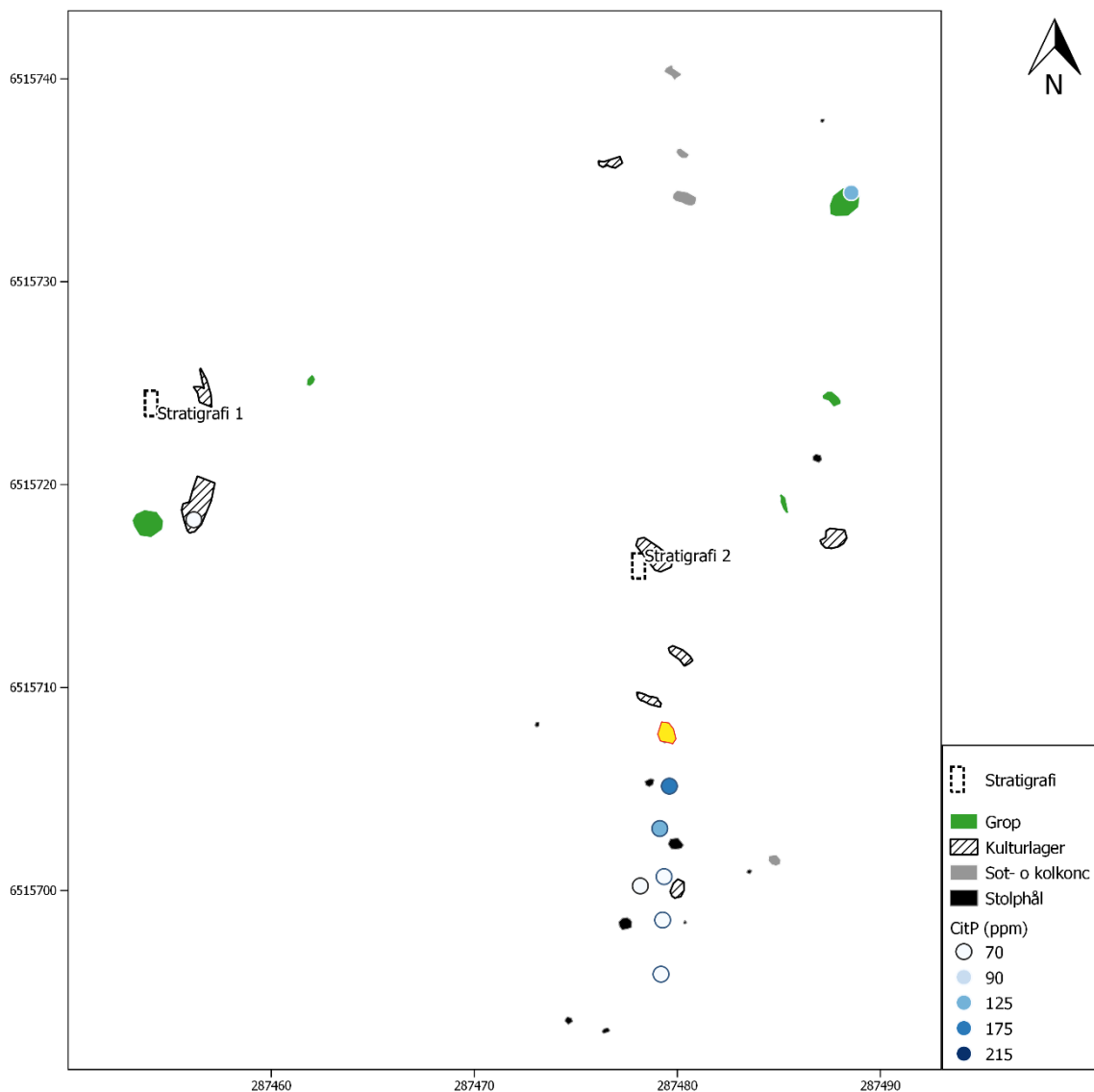


Figure 7. Amount of CitP in surface and feature samples

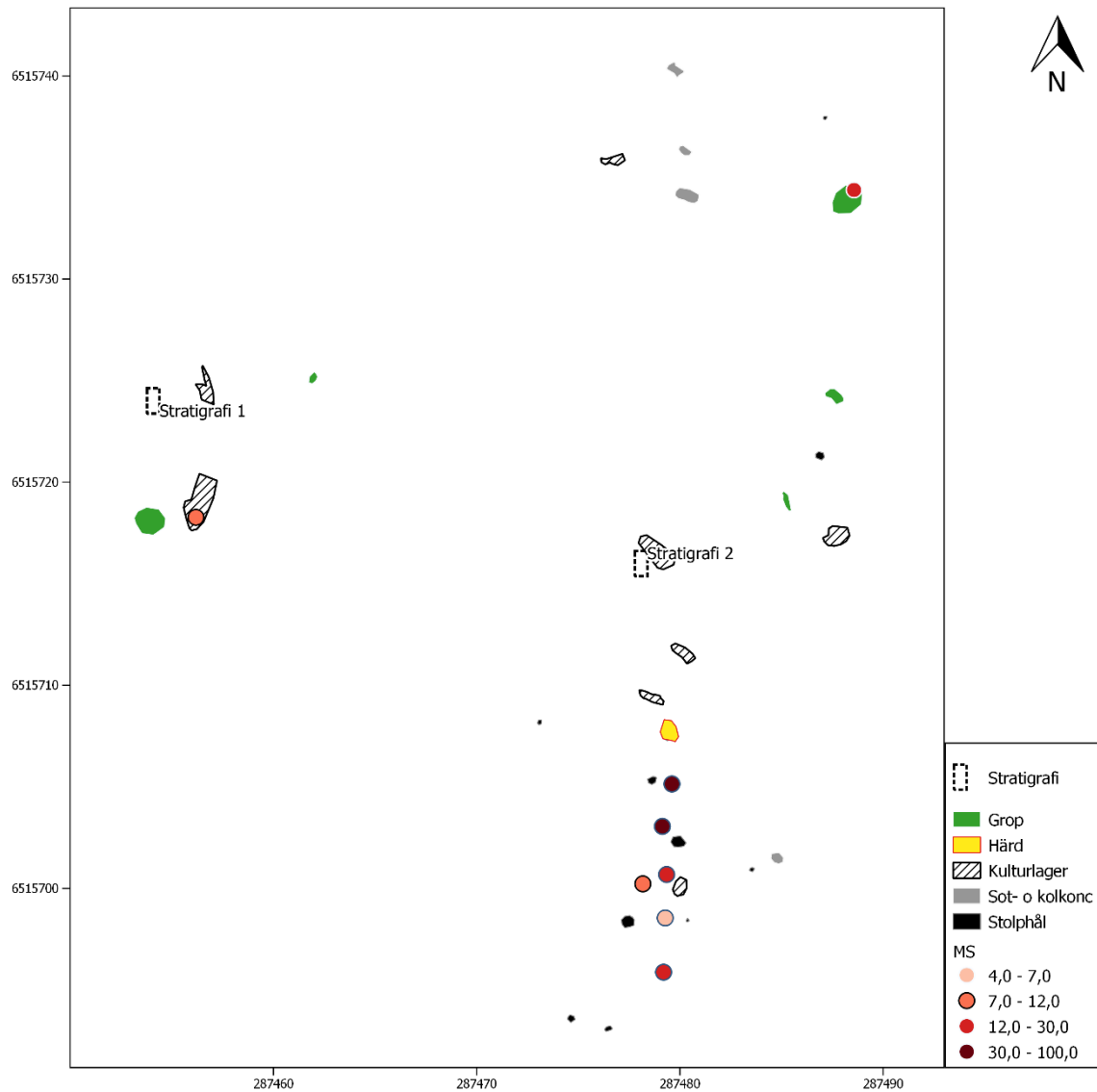


Figure 8. MS in surface and feature samples

The southern area is much less intensely sampled than the northern area with 5 surface samples, 3 sampled features and 2 stratigraphies. Noteworthy is that the surface samples south of the hearth (A9) shows a gradient in both amount of CitP and MS indicating phosphate and heat generating activities, possibly connected to the hearth.

Stratigraphy 1 was sampled from a colluvium downslope of the features. The variation in LOI MS indicates at least one erosion event or period of increased erosion. The sediments in the colluvium do not indicate large inflow of material with high amounts of CitP from phosphate accumulating activities.

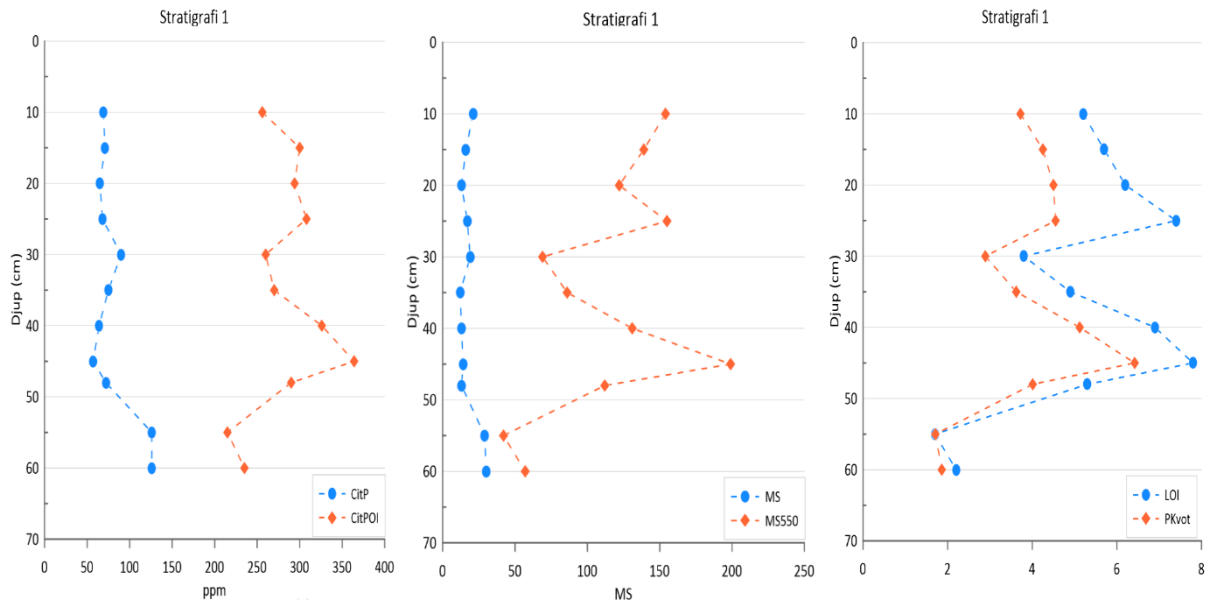


Figure 9. Stratigraphy 1

Discussion and Conclusions

The overall preservation of the botanical remains in the studied samples is scarce. The most common botanical remains were cereal grains found in four of the samples. Their preservation was not good and many of them remained unidentified. The only recognized cereal crop was barley (*Hordeum vulgare*). In few cases, the barley grains were not identified to species level, but still it looks like hulled barley was the prevailing cereal crop. A single find of chaff remain of einkorn/emmer (*Triticum monococcum/dicoccum*) gives a hint towards possible growing of other crops but as this is based on a single find its confirmation quite unstable.

Other type of plant remains are gathered plants represented by *Empetrum nigrum*. It is typical plant for scarce forests and sandy fields. It can also grow in shady and moist areas. One of its subspecies *Empetrum nigrum ssp. hermaphroditum* occurs in more northerly locations and at higher altitude (Mossberg & Stenberg 2018). It produces edible fruits and can be used as food dye.

An interesting observation is that preserved plant remains are presented mainly by cultivated plants and almost no weeds/ruderals. Only one sample contained single findings of weeds/ruderals (MAL20_0039_0010/ P52). This could be interpreted as evidence for household activities like cooking, storing of already processed crops rather than animal housing and fodder storage.

The amount of charcoals in the samples differs a lot, from less than 25% to almost 100%. Usually plant remains were found in samples where charcoals were more than 50% of the floated sample volume. Higher level of charring gives better chance of the botanical material to be preserved. It is hard to trace just by few samples whether the lack of macros in some of the samples is due to low level of burning or because of functional division of the area.

Due to the differing intensity in sampling it is difficult to do any in depth comparison between the northern and southern areas. It is likely however that the soil formation in parts of the northern area is more influenced by settlement related activities whereas the southern area is more affected by cultivation.

The geochemical results from sampled wall trenches and nearby post holes (A45, A56, A57 and A36) in the northern area do not indicate high levels of phosphate accumulation, the results for LOI and PQuota are more consistent with what would be expected from other activities such as storage, stabling etc. The area between and around the cooking pits shows more, although comparatively low intensity, typical signs of household activities accumulating inorganic phosphates. This could be connected to the cooking pits or, depending on the original extent of the house, activities connected to the western part of the house.

The collected samples in and around the wall trench A53 might indicate that this structure or area could have been used for stabling.

While the soil formation in the south is most likely influenced by cultivation there are also signs of phosphate accumulating and heat generating activities. The sampled colluvium however don't show any significant impact of such activities.

The results and interpretations in this reports highlights the value of a comprehensive and well thought out sampling strategy. While any single soil chemistry sample from the site would have provided very little opportunity for interpretation, the combination of grid samples, samples from features and stratigraphies provides us with a more robust understanding of soil formation and use of space on the site.

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Figures and tables

Table 2. Archaeobotanical results from the studied sites.

| | 20_0039_0001 | 20_0039_0002 | 20_0039_0003 | 20_0039_0004 | 20_0039_0005 | 20_0039_0006 | 20_0039_0007 | 20_0039_0008 | 20_0039_0009 | 20_0039_0010 | 20_0039_0011 | 20_0039_0012 | 20_0039_0013 |
|--|--------------|--------------|--------------|--------------|--------------|--------------|--------------|--------------|--------------|--------------|--------------|--------------|--------------|
| MAL nr | | | | | | | | | | | | | |
| Prov nr | 16 | 19 | 20 | 23 | 27 | 36 | 39 | 40 | 43 | 52 | 75 | 76 | 77 |
| Anläggning | A25 | A19 | A20 | A36 | A41 | A45 | A46 | A56 | A6 | A53 | A55 | A57 | A63 |
| Charcoal fragments | xxxx | x | xx | xxxx | x | xxx | xx | xx | x | xxxx | xx | x | xx |
| volume before flotation (L) | 1,2 | 1,4 | 1,8 | 1,7 | 2,1 | 1,6 | 1,6 | 1,2 | 1,4 | 1,4 | 1,3 | 1,4 | 1 |
| volume after flotation (ml) | 15 | 20 | 25 | 75 | 20 | 40 | 30 | 10 | 20 | 110 | 10 | 25 | 15 |
| <i>Rubus idaeus</i> (modern) - hallon/ raspberry | 1 | | 1 | | | | | | | | | | |
| <i>Hordeum vul</i> var <i>vulgare</i> - skalkorn/ hulled barley | | | | 4 | | | | | | 2 | | | |
| cf. <i>Hordeum</i> - most probably korn/ barley | | | | | | 1 | | | | | | | |
| <i>Hordeum vulgare</i> - korn/barley | | | | | | | | | | 1 | | | |
| Cerealia - cereals | | | | 2 | | | | | | 2 | | | |
| Cerealia (fragment) - cereal fragments | | | | 1 | | 3 | | 1 | | 2 | | | |
| <i>Empetrum nigrum</i> - kråkbär/ crowberry | | | | | | | | | | | | | 7 |
| <i>Triticum monococcum/dicoccum</i> - einkorn/ emmer | | | | | | | | | | | | | 1 |
| <i>Persicaria</i> sp. - pilörter/ knotweeds | | | | | | | | | | 1 | | | |
| <i>Trifolium/Medicago</i> - klövrar, luserner/ clover, burclover | | | | | | | | | | 1 | | | |
| <i>Pinus</i> (needle) - tall/ pine | | | | 1 | | | | | | | | | |
| needle - fragment | 1 | | | | | | | | | | | | |
| bones | | | x | | | | | | | | | | |
| ceramics | | | x | 2 | | | | | | | | | |
| flint | | | | | 1 | | | | | | | | |

Table 3. Botanical material selected for 14 C dating.

| MAL nr | Makro nr | Anläggning | Material | Vikt |
|--------------|----------|--------------------|---|---------|
| 20_0039_0001 | 16 | Norra delen av A25 | <i>Betula/Alnus</i> - charcoal | 64 mg |
| 20_0039_0002 | 19 | A30 | diffuse porous wood | 16 mg |
| 20_0039_0003 | 20 | A31 | <i>Betula/Alnus</i> - charcoal | 180 mg |
| 20_0039_0004 | 23 | A36 | <i>Hordeum vulgare</i> var <i>vulgare</i> | 12 mg |
| 20_0039_0005 | 27 | A41 | diffuse porous wood | 30 mg |
| 20_0039_0006 | 36 | A45 | cf. <i>Hordeum</i> | 8,5 mg |
| 20_0039_0007 | 39 | A46 | <i>Betula/Alnus/Cotylus</i> - charcoal | 24 mg |
| 20_0039_0008 | 40 | A56 | diffuse porous wood | 14,5 mg |
| 20_0039_0009 | 43 | A6 | diffuse porous wood | 13 mg |
| 20_0039_0010 | 52 | A53 | <i>Hordeum vulgare</i> var <i>vulgare</i> | 8 mg |
| 20_0039_0011 | 75 | A55 | <i>Betula/Alnus/Cotylus</i> - charcoal | 21 mg |
| 20_0039_0012 | 76 | A57 | <i>Betula/Alnus/Cotylus</i> - charcoal | 39,5 mg |
| 20_0039_0013 | 77 | A63 | <i>Empetrum nigrum</i> | 2,5 mg |

Table 4. Soil chemical analysis results

| MALNo | FieldN | FeatureNo | Northing | Easting | DepthFrom_cm | DepthTo_cm | MS | MS550 | CitP | CitPOI | PQuot | LOI |
|--------------|--------|---------------|------------|-----------|--------------|------------|----|-------|------|--------|-------|------|
| 20_0033_001 | P1 | Stratigrafi 1 | 6515724 | 287454,4 | 5 | 10 | 21 | 154 | 69 | 256 | 3,72 | 5,2 |
| 20_0033_002 | P1 | Stratigrafi 1 | 6515724 | 287454,4 | 10 | 15 | 16 | 139 | 71 | 300 | 4,25 | 5,7 |
| 20_0033_003 | P1 | Stratigrafi 1 | 6515724 | 287454,4 | 15 | 20 | 13 | 122 | 65 | 294 | 4,5 | 6,2 |
| 20_0033_004 | P1 | Stratigrafi 1 | 6515724 | 287454,4 | 20 | 25 | 17 | 155 | 68 | 308 | 4,55 | 7,4 |
| 20_0033_005 | P1 | Stratigrafi 1 | 6515724 | 287454,4 | 25 | 30 | 19 | 69 | 90 | 260 | 2,89 | 3,8 |
| 20_0033_006 | P1 | Stratigrafi 1 | 6515724 | 287454,4 | 30 | 35 | 12 | 86 | 75 | 270 | 3,62 | 4,9 |
| 20_0033_007 | P1 | Stratigrafi 1 | 6515724 | 287454,4 | 35 | 40 | 13 | 131 | 64 | 326 | 5,12 | 6,9 |
| 20_0033_008 | P1 | Stratigrafi 1 | 6515724 | 287454,4 | 40 | 45 | 14 | 199 | 57 | 364 | 6,42 | 7,8 |
| 20_0033_009 | P1 | Stratigrafi 1 | 6515724 | 287454,4 | 45 | 48 | 13 | 112 | 72 | 290 | 4,01 | 5,3 |
| 20_0033_010 | P1 | Stratigrafi 1 | 6515724 | 287454,4 | 48 | 55 | 29 | 42 | 126 | 215 | 1,71 | 1,7 |
| 20_0033_011 | P1 | Stratigrafi 1 | 6515724 | 287454,4 | 55 | 60 | 30 | 57 | 126 | 235 | 1,86 | 2,2 |
| 20_0033_012 | P2 | Stratigrafi 2 | 6515716 | 287478,4 | 13 | 18 | 15 | 319 | 35 | 426 | 12,05 | 18,3 |
| 20_0033_013 | P2 | Stratigrafi 2 | 6515716 | 287478,4 | 23 | 27 | 12 | 542 | 55 | 249 | 4,52 | 9,2 |
| 20_0033_014 | P2 | Stratigrafi 2 | 6515716 | 287478,4 | 28 | 35 | 21 | 200 | 94 | 247 | 2,63 | 5,6 |
| 20_0039_0001 | 16 | A25 | 6515734,39 | 287488,57 | | | 29 | 212 | 97 | 331 | 3,42 | 7,3 |
| 20_0039_0002 | 19 | A30 | 6515792,55 | 287468,8 | | | 7 | 93 | 79 | 281 | 3,56 | 5 |
| 20_0039_0003 | 20 | A31 | 6515797,64 | 287471,2 | | | 12 | 76 | 1071 | 1189 | 1,11 | 4,8 |
| 20_0039_0004 | 23 | A36 | 6515790,99 | 287478,07 | | | 6 | 116 | 89 | 252 | 2,85 | 5,1 |
| 20_0039_0005 | 27 | A41 | 6515790,79 | 287473,57 | | | 7 | 31 | 157 | 388 | 2,48 | 3,3 |
| 20_0039_0006 | 36 | A45 | 6515791,4 | 287483,51 | | | 5 | 111 | 82 | 304 | 3,71 | 4,8 |
| 20_0039_0007 | 39 | A46 | 6515791,32 | 287480,77 | | | 5 | 29 | 92 | 245 | 2,68 | 3,1 |
| 20_0039_0008 | 40 | A56 | 6515791,23 | 287482,55 | | | 16 | 168 | 59 | 259 | 4,36 | 6,2 |
| 20_0039_0009 | 43 | A6 | 6515718,27 | 287456,19 | | | 12 | 162 | 59 | 297 | 5,04 | 6,3 |
| 20_0039_0010 | 52 | A53 | 6515801,42 | 287479,52 | | | 5 | 179 | 175 | 495 | 2,83 | 8,5 |
| 20_0039_0011 | 75 | A55 | 6515803,31 | 287477,39 | | | 9 | 246 | 156 | 373 | 2,39 | 5,2 |
| 20_0039_0012 | 76 | A57 | 6515792,59 | 287481,65 | | | 5 | 83 | 68 | 408 | 6,03 | 6,8 |
| 20_0039_0013 | 77 | A63 | 6515700,22 | 287478,18 | | | 12 | 269 | 30 | 385 | 12,99 | 20,7 |
| 20_0040_001 | 55 | Grid | 6515794,1 | 287475,77 | | 20 | 13 | 18 | 105 | 191 | 1,82 | 1,3 |
| 20_0040_002 | 56 | Grid | 6515802,21 | 287486,84 | | | 7 | 17 | 111 | 256 | 2,3 | 2,4 |

| | | | | | | | | | | |
|-------------|----|--------|------------|-----------|----|-----|-----|-----|------|-----|
| 20_0040_003 | 58 | Grid | 6515785,14 | 287482,29 | 8 | 373 | 107 | 280 | 2,61 | 5,4 |
| 20_0040_004 | 57 | Grid | 6515798,91 | 287487,6 | 5 | 50 | 71 | 259 | 3,65 | 3,2 |
| 20_0040_005 | 59 | Grid | 6515785,14 | 287482,29 | 6 | 10 | 85 | 177 | 2,07 | 1,1 |
| 20_0040_006 | 60 | Grid | 6515788,12 | 287482,87 | 7 | 15 | 88 | 208 | 2,36 | 1,9 |
| 20_0040_007 | 61 | Grid | 6515794,55 | 287482,73 | 7 | 73 | 103 | 298 | 2,88 | 3,9 |
| 20_0040_008 | 62 | Grid | 6515799,41 | 287482,78 | 6 | 87 | 102 | 261 | 2,56 | 3,3 |
| 20_0040_009 | 63 | Grid | 6515804,03 | 287482,52 | 5 | 21 | 109 | 242 | 2,22 | 2,4 |
| 20_0040_010 | 64 | Grid | 6515804,09 | 287477,88 | 4 | 89 | 85 | 343 | 4,01 | 5,1 |
| 20_0040_011 | 65 | Grid | 6515798,94 | 287477,9 | 4 | 76 | 151 | 344 | 2,27 | 4,1 |
| 20_0040_012 | 67 | Grid | 6515788,71 | 287477,45 | 7 | 52 | 101 | 266 | 2,63 | 2,8 |
| 20_0040_013 | 66 | Grid | 6515794,16 | 287477,71 | 7 | 24 | 158 | 283 | 1,8 | 2,5 |
| 20_0040_014 | 68 | Grid | 6515783,33 | 287477,93 | 7 | 174 | 133 | 397 | 2,98 | 5,5 |
| 20_0040_015 | 69 | Grid | 6515784,09 | 287472,06 | 8 | 613 | 80 | 381 | 4,75 | 8,3 |
| 20_0040_016 | 70 | Grid | 6515789,39 | 287473,29 | 7 | 11 | 136 | 273 | 2,02 | 1,8 |
| 20_0040_017 | 71 | Grid | 6515794,08 | 287472,81 | 6 | 36 | 215 | 416 | 1,94 | 4,1 |
| 20_0040_018 | 72 | Grid | 6515798,84 | 287473 | 4 | 16 | 127 | 245 | 1,93 | 2,3 |
| 20_0040_019 | 73 | Grid | 6515798,06 | 287467,42 | 4 | 110 | 88 | 158 | 1,79 | 3,5 |
| 20_0040_020 | 74 | Grid | 6515793,87 | 287467,86 | 7 | 18 | 154 | 317 | 2,06 | 2,3 |
| 20_0040_021 | 78 | Grid | 6515695,87 | 287479,2 | 14 | 182 | 69 | 352 | 5,11 | 6,3 |
| 20_0040_022 | 79 | Grid | 6515698,54 | 287479,28 | 7 | 47 | 68 | 218 | 3,23 | 4 |
| 20_0040_023 | 80 | Grid | 6515700,68 | 287479,35 | 18 | 549 | 46 | 213 | 4,65 | 8,5 |
| 20_0040_024 | 81 | Grid | 6515703,05 | 287479,14 | 42 | 160 | 92 | 263 | 2,86 | 6,3 |
| 20_0040_025 | 82 | Grid | 6515705,14 | 287479,61 | 97 | 263 | 131 | 229 | 1,75 | 5,1 |
| 20_0040_026 | 83 | A45-46 | 6515786,94 | 287479,59 | 7 | 21 | 91 | 199 | 2,2 | 1,8 |
| 20_0040_027 | 84 | A46 | 6515789,3 | 287479,27 | 7 | 78 | 113 | 299 | 2,65 | 3,1 |
| 20_0040_028 | 85 | A46 | 6515791,59 | 287479,05 | 7 | 9 | 136 | 240 | 1,77 | 1,9 |
| 20_0040_029 | 86 | A45-46 | 6515794,22 | 287478,85 | 7 | 88 | 142 | 315 | 2,22 | 4 |
| 20_0040_030 | 87 | A51 | 6515795,99 | 287477,84 | 6 | 24 | 145 | 321 | 2,22 | 3,1 |
| 20_0040_031 | 88 | A51 | 6515797,24 | 287479,91 | 8 | 425 | 109 | 327 | 3 | 4,6 |
| 20_0040_032 | 89 | A51 | 6515795,6 | 287480,55 | 7 | 133 | 114 | 305 | 2,68 | 3,9 |
| 20_0040_033 | 90 | A45 | 6515794,12 | 287481,72 | 7 | 65 | 135 | 332 | 2,47 | 3,6 |

| | | | | | | | | | | | |
|-------------|-----|--------------------------|------------|-----------|----|---|-----|-----|-----|-------|------|
| 20_0040_034 | 91 | A45 | 6515791,29 | 287481,96 | | 6 | 32 | 88 | 230 | 2,63 | 2,1 |
| 20_0040_035 | 92 | A45 | 6515789,41 | 287481,71 | | 6 | 8 | 85 | 214 | 2,5 | 1,6 |
| 20_0040_036 | 93 | Grid | 6515787,35 | 287482,1 | | 8 | 32 | 95 | 233 | 2,47 | 2,6 |
| 20_0040_037 | 95 | A53 | 6515800,88 | 287479,75 | | 4 | 38 | 96 | 336 | 3,48 | 3,3 |
| 20_0040_038 | 96 | A53 | 6515802,28 | 287480,96 | | 5 | 57 | 104 | 318 | 3,05 | 3,7 |
| 20_0040_039 | 97 | A53 | 6515802,47 | 287479,63 | | 5 | 48 | 105 | 344 | 3,29 | 3,1 |
| 20_0040_040 | 98 | A54 | 6515804,6 | 287479,44 | | 5 | 59 | 122 | 379 | 3,11 | 3,6 |
| 20_0040_041 | 99 | A55 | 6515803,27 | 287476,56 | | 3 | 128 | 89 | 354 | 3,96 | 6 |
| 20_0040_042 | 100 | A30? | 6515793,14 | 287469,52 | | 7 | 12 | 133 | 255 | 1,91 | 1,9 |
| 20_0040_043 | 101 | A30? | 6515791,44 | 287468,97 | | 5 | 61 | 78 | 190 | 2,43 | 2,8 |
| 20_0040_044 | 102 | A30? | 6515792,29 | 287468,27 | | 6 | 29 | 184 | 323 | 1,76 | 2,8 |
| 20_0040_045 | 103 | A30? | 6515792,16 | 287470,13 | | 7 | 15 | 142 | 297 | 2,09 | 2,7 |
| 20_0040_046 | 94 | Grid | 6515792,16 | 287484,4 | | 4 | 22 | 70 | 254 | 3,61 | 3 |
| 20_0040_047 | 1 | profilbänk kanten av A30 | 6515791,89 | 287469,28 | 20 | 6 | 112 | 95 | 368 | 3,85 | 6,3 |
| 20_0040_048 | 2 | profilbänk kanten av A30 | 6515791,89 | 287469,28 | 30 | 3 | 101 | 34 | 391 | 11,64 | 11,6 |
| 20_0040_049 | 3 | profilbänk kanten av A30 | 6515791,89 | 287469,28 | 40 | 6 | 70 | 78 | 306 | 3,89 | 5,4 |
| 20_0040_050 | 4 | profilbänk kanten av A30 | 6515791,89 | 287469,28 | 50 | 7 | 21 | 165 | 342 | 2,07 | 3 |
| 20_0040_051 | 5 | profilbänk kanten av A30 | 6515791,89 | 287469,28 | 60 | 9 | 18 | 99 | 201 | 2,02 | 1,1 |

Pollenanalys

MAL 2020_0039_0014 och 0017

L2019:6367, Tanumshede, Bohuslän

INLEDNING

2 prover har analyserats på polleninnehållet.

| | | | |
|------------------|---------------|----------|----------------------|
| Pollen prov 0014 | Nr 107 | A25 Grop | Stor kolbemängd grop |
| Pollen prov 0017 | Nr subprov 54 | FU6 S. | ”sädgrop” |

METODER

Pollenanalys

Proverna är insamlad av utgrävningspersonal, i samband med den ordinarie utgrävningen.

Proverna behandlades enligt standardmetoden för pollenanrikning beskriven i t.ex. Moore et al. (1991).

Återstoden, det koncentrerade pollenmaterialet, färgades med saffraninfärgad glycerin. Vid identifiering av pollentyperna användes bestämningsnycklar av Beug (1961) och Moore et al. (1991). Vid pollenanalys av jordprover finns en viss risk för att vissa växtarter med tjockskaliga pollenkorner får en överrepresentation i analysen (t. ex korgblommiga växter). Att pollenkornen har ett tjockt skal minskar risken för nedbrytning jämfört med tunnskaliga pollenkorner. I prov 0014 har inte noterats att tjockskaliga pollen skulle vara överrepresenterade. Pollenprov 0017 har en mycket selektiv förekomst av pollen. Om pollenkorner har försvunnit på grund av nedbrytning är svårt att säga.

RESULTAT

Proverna innehöll sådan mängd av pollen att en analys var möjlig. Proverna innehöll även kolpartiklar samt vedpartiklar.

Pollenprov 0014

Pollensammansättningen i provet visar att trädvegetationen bestod av tall, björk och al. Dock var förekomsten av trädvegetation mycket sparsam. Hasselsnår förekom på lokalen. Inga granpollen hittades i provet, vilket skulle tyda på att provet är äldre än 1500 år (Berglund et al 1996). Granen etablerade sig vid västkusten ca 1500 år sedan.

I pollenprovet noterades stora mängder med pollen från ljunghed. Förekomsten av ljunghedspollen indikerar ljunghed. Pollen som indikerar odling eller bete har hittats i proverna. Sädesslagspollen från korn och vete har hittats i provet. Andelen sädesslagspollen och den stora andelen pollen från störningsindikerande växter skulle tyda på ett välutvecklat odlingslandskap förekommit i den omedelbara närheten.

Pollenprov 0017

Pollensammansättningen i provet visar att trädvegetationen bestod av tall, björk och al. Dock var förekomsten av trädvegetation mycket sparsam. Hasselsnår förekom på lokalen. Inga granpollen hittades i provet, vilket skulle tyda på att provet är äldre än 1500 år (Berglund et al 1996). Granen etablerade sig vid västkusten ca 1500 år sedan.

I pollenprovet noterades stora mängder med pollen från gräs (hela 75.4% av den totala andelen pollen). Andelen pollen från sädesslag (korn, vete och råg) är också högt (8.6%). Att det förekommer en så stor andel av gräs- och sädesslagspollen kan indikera att provet kommer från ett ställe där man förvarade hö och säd. I den arkeologiska beskrivningen noteras att prov 0017 kommer från en ”sädgrop”. Den mycket sparsamma förekomsten av övriga pollen styrker teorin att provet kommer från ett ställe där hö eller säd förvarades. Inblandningen av övriga pollen från växter i närmiljön är mycket lågt.

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Berglund, B.E. Birks, H.J.B., Ralska-Jasiewiczowa, M. and Wright, H.E. (1996) Eds. Palaeoecological Events During the Last 15000 Years.

Moore, P.D., Webb, J.A. & Collinson, M.E. (1991) Pollen analysis. Oxford.

**Tabell 1: Tanumshede, Bohuslän
MAL 2020-0039 Pollenanalys**

| Art/prov nr. MAL 2020-0039 | 0014 | 0017 |
|---|-------------|------------|
| Andel pollen i procent (%) Exkl. sporer | Grop | ”sädgrop” |
| Al (Or) | 4.6 | 0.7 |
| Björk | 6.5 | 1.4 |
| Tall (Furu) | 0.9 | 1.2 |
| Gran | | |
| Ek | 0.2 | |
| Lind | 0.2 | 0.2 |
| Alm | 0.2 | |
| Avenbok | 0.2 | |
| Hassel/Pors | 1.0 | 0.7 |
| Ljung (Lyng) | 22.4 | 0.2 |
| Risväxter (obest.) | 0.2 | |
| Sälg/vide (Vier) | 0.6 | |
| | | |
| Gräs (Gras) | 9.3 | 75.4 |
| | | |
| Korgblommiga växter (rörf.), (Turf) | 1.8 | 0.2 |
| Korgblommiga växter (Tungf.) (Tistel, Lövetann) | 4.9 | 0.7 |
| Smörblommor (Soleie) | 0.4 | 0.5 |
| Rosväxter (Mure) | 27.7 | 0.2 |
| Gråbo (Burot) | 0.4 | |
| Målla (Meldestokk) | 1.2 | 0.7 |
| Nejlikväxter (Smelle, tjärnblom) | 4.7 | 0.5 |
| Vänderot | 4.6 | |
| Skallra (Engkall) | 1.0 | 0.5 |
| Vicker (Vikke) | 0.3 | |
| Åkerspärgel | 2.1 | 1.2 |
| Groblad | 0.2 | 0.5 |
| Summa störnings indikerande växter (exkl. gräs) % | 49.3 | 5.0 |
| Korn (Bygg-typ) | 2.4 | 6.7 |
| Vete/Havre- typ (Hvete-typ) | 1.2 | 1.4 |
| Råg (Rug) | | 0.5 |
| Summa odlade växter % | 3.6 | 8.6 |
| | | |
| Starr (Storr) | 0.7 | 6.6 |
| Käx (Kjeks) | 0.2 | |
| Sporer | | |
| Lummer (Kråkefot) | 0.3 | |
| Ormbunkar (Telg) | 2.6 | 0.7 |
| Pollenanalys Antal räknade pollen | 677 | 430 |
| Analys Jan-Erik Wallin September 2021 Pollenlaboratoriet i Umeå AB | Kol+ved | Ved +kol |

Vilken vegetation indikerar dom olika växt-arterna

| Svensk (Norska) Latin | Lövskog | Barrskog | Ängsmark | Åkermark |
|--|---------|----------|----------|----------|
| Al (Or) <i>Alnus</i> | X | | | |
| Björk <i>Betula</i> | X | | | |
| Tall (Furu) <i>Pinus</i> | | X | | |
| Gran <i>Picea</i> | | X | | |
| Lind <i>Tilia</i> | X | | | |
| Ek (Eik) <i>Quercus</i> | X | | | |
| Alm <i>Ulmus</i> | X | | | |
| Ask <i>Fraxinus</i> | X | | | |
| Hassel/Pors <i>Corylus-type</i> | X | | | |
| Ljung (Lyng) <i>Calluna</i> | | | X | |
| Risväxter (ex Blåbär) <i>Ericaceae</i> | | | | |
| Sälg/vide (Vier) <i>Salix</i> | | | | |
| En (Einer) <i>Juniperus</i> | | | X | |
| Gräs (Gras) <i>Poaceae</i> | | | X | X |
| Korgblommiga växter (rörf.), (Turf) <i>Asteraceae undiff.</i> | | | X | X |
| Korgblommiga växter (Tungf.) (Tistel, Lövetann) <i>Cichoriaceae</i> | | | X | X |
| Blåklint (ex Kornblom) <i>Centaurea type</i> | | | | X |
| Smörblommor (Soleie) <i>Ranunculus type</i> | | | X | |
| Rosväxter (Mure) <i>Rosaceae undiff.</i> | | | | |
| Gråbo (Burot) <i>Artemisia vulgaris</i> | | | | X |
| Groblad <i>Plantago media/major</i> | | | X | |
| Syror (Syre) <i>Rumex</i> | | | X | |
| Målla (Meldestokk) <i>Chenopodiaceae</i> | | | X | X |
| Nejlikväxter (Smelle, tjärnblom) <i>Caryophyllaceae</i> | | | X | X |
| Mjölkkört (Geitrams) <i>Epilobium</i> | | | X | |
| Spärgel (Bendel) <i>Spergula</i> | | | | X |
| Nässla (Nesle) <i>Urtica</i> | | | | X |
| Måra (Maure) <i>Galium</i> | | | | |
| Humle/Hampa <i>Humulus-type</i> | | | | X |
| Skallra (Engkall) <i>Rhinanthus</i> | | | X | |
| Vicker (Vikke) <i>Vicia cracca type</i> | | | | X |
| Korn (Bygg-typ) <i>Hordeum</i> | | | | X |
| Vete/Havre – typ (Hvete-typ) <i>Triticum type</i> | | | | X |
| Råg (Rug) <i>Secale</i> | | | | X |
| Starr (Storr) <i>Cyperaceae</i> | | | X | |
| Älgört (Mjödurt) <i>Filipendula</i> | | | | |
| Kovall (Marimjelle) <i>Melampyrum</i> | | | X | |
| Käx (Kjeks) <i>Apiaceae</i> | | | X | |
| Sporer | | | | |
| Lummer (Kråkefot) <i>Lycopodium</i> | | | | |
| Ormbunkar (Telg) <i>Polypodiaceae</i> | | | | |
| Dvärglumner (Dvergjamne) <i>Selaginella</i> | | | | |



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