Archaeobotanical analysis of samples from the site Sandarna, Göteborg 15:1, L1969:1130, Göteborg Socken, Västergötland

Ivanka Hristova, Sofi Östman
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Ivana Hristova, Sofi Östman

Sample information
Analysis type: Macrofossil analysis of unfloated samples.
Number of samples: 20 macrofossil samples.

Introduction
Twenty macrofossil samples from the site Sandarna (Gothenburg 15:1) were analysed at the Environmental Archaeological lab, Umeå university. The context of the samples varies: five derive from cooking pits (four – Late Mesolithic and one – Bronze Age) and the rest fifteen come from cultural layers and hearths from the Middle Mesolithic.

The aim of the analysis is to answer questions about the local environment and possible diet of the population and if possible, give evidence about available and/or preferred tree species. Special interest is the amount of hazelnut shells per sample as it could possibly indicate roasting facilities and would give opportunities to compare the results with other contemporary sites.

The samples were provided by Magnus von der Luft, Rio Göteborg Natur- och kulturkooperativ.

Materials and Methods
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 1,2 and 2,6 liters and after it – between 7 to 400 ml. The sieved material was sorted and identified under stereomicroscope. The results from the analyses are presented in Table 1. 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 = up to 100%.

The determination of plant species was done using reference literature for seeds (Cappers et al. 2012) and (Sabato & Peña-Chocarro 2021) as well as the laboratory reference collections. The names of the identified plants are given according to the Nordens flora (Mossberg and Stenberg 2018). Swedish names of the identified plants are included in Table 1.

The analysis of the samples was performed by Ivanka Hristova and Sofi Östman.
Results
Twenty samples were analysed for macro remains. The amount of charcoals is relatively high in most of the samples, usually between 50% and 100% of the floated samples volume. Some of the samples contain plant macro remains but others consist mainly of charcoals and no seed/fruits were preserved. The overall preservation of the material is poor, many of the preserved macros are fragmentated and some have lost their outer surface. The result from the analysis is presented in Table 1.

Sample 22_0015_0001/ 10602/ M160 St1
The sample volume before floatation was 2,6 litres and after flotation – 7 ml. The amount of charcoals was estimated to about 75% from the floated sample volume. The charcoals contain a lot of small twigs and branches. The preserved botanical remains represent single seeds of fat-hen (*Chenopodium album*), grasses (Poaceae), black-bindweed (*Fallopia convolvulus*) and two unidentifiable remains of small-seeded plants. Apart from the macro remains, one small fragment (ca 1 mm) of burnt bone was found.

Sample 22_0015_0002/ 10643/ M167 St1
The sample volume before floatation was 1,7 litres and after flotation it was 20 ml. The charcoals comprised about 75% of the floated sample volume. The identified macro remains include seeds of fat-hen (*Chenopodium album*), sedges (*Carex* sp.), bedstraw (*Galium* sp.), and black-bindweed (*Fallopia convolvulus*). A fragment of seaweed was also identified. Apart from the archaeobotanical remains a fragment of flint has been found.

Sample 22_0015_0003/ 10676/ M167 St2
The sample volume before floatation was 2 litres and after floatation it was 30 ml. The amount of charcoals in the sample was about 75% of the floated sample volume. The preserved plant remains contains fragments of hazelnut shells (*Corylus avellana*) and seeds of bedstraw (*Galium* sp.), fat-hen (*Chenopodium album*), wood fescue (*Drymochloa sylvatica*), curled dock (*Rumex* sp. *crispus*), sedges (*Carex* sp.), vetches (*Vicia* sp.), legumes (Fabaceae). Remains of inner parts of seeds have also been found which cannot be identified. Small twigs and two fragments of seaweeds were registered. A flint fragment was also found.

Sample 22_0015_0004/ 10715/ M167 St3
The sample volume before floatation was 2 litres and after flotation – 11 ml. The amount of charcoals was estimated to about 75% of the floated sample volume. The sample contains thirty-four hazelnut shell fragments. The rest of the archaeobotanical remains represent inner parts of small seeds which cannot be identified, some wild seeds from legume family (Fabaceae), and small twigs. Ten flint fragments were registered in the sample.

Sample 22_0015_0005/ 10731/ M167 St4
The sample volume before floatation was 1,6 litres and after flotation – 11 ml. Charcoal fragments comprise about 75% of the floated sample volume. The archaeobotanical remains were presented by fragments of hazelnut shell fragments (*Corylus avellana*), a seed of bearberry (*Arctostaphylos uva-ursi*), a pine (*Pinus sylvestris*) cone scale. Apart from the botanical remains two burnt bones and twenty-six flint fragments were found.
Sample 22_0015_0006/ 10519/ M153 St1
The sample volume before floatation was 2,5 litres and after flotation – 30 ml. The amount of charcoals was about 75% of the floated sample volume. The preserved botanical remains include hazelnut shell fragments (*Corylus avellana*), seeds of vetches (*Vicia* sp.), fat-hen (*Chenopodium album*), and small twigs. Five flint fragments were found.

Sample 22_0015_0007/ 10546/ M153 St2
The sample volume before floatation was 2,5 litres and after flotation – 30 ml. The charcoals took about 75% of the floated sample volume. The archaeobotanical remains comprise of twenty-seven hazelnut shell fragments (*Corylus avellana*). Five pieces of flint were found.

Sample 22_0015_0008/ 5125/ M32 Övre del
The sample volume before floatation was 1,8 litre and after flotation – 25 ml. The floated sample consisted of 75% charcoals. A big amount of hazelnut shell fragments (*Corylus avellana*) and flint fragments have been found. Apart from that, single seeds of umbelliferous plants (Apiaceae), legumes (Fabaceae), and few unidentifiable ones, as well as few twigs/stem fragments have been registered in the sample.

Sample 22_0015_0009/ 5126/ M32Undre del
The volume of the sample before floatation was 2 litres and after it 20 ml. The floated sample consists of about 75% of charcoals. A significant number of hazelnut shell fragments (153) were found. It is important to mention that most of the fragments are very small and the total volume of the fragments is about 3 ml. A lot of flint fragments (31) and small twigs were also registered.

Sample 22_0015_0010/ 5505/ M99 A5085 Härd, ovanpå anl.
The volume of the sample before floatation was 2 litres and after it 9 ml. The sample volume contained about 75% charcoals. The botanical remains consist of few seeds from the bean family (Fabaceae), small twigs, and three unidentifiable seeds. One flint fragment was found.

Sample 22_0015_0011/ 5510/ M99 A5085 Härd, mellan stenar
The sample volume before floatation was 2 litres and after floatation – 16 ml. The floated samples contained about 75% charcoals and no other botanical remains were registered. A piece of flint was found.

Sample 22_0015_0012/ 5511/ M99 A5085 Härd, under stenar
The volume of the sample before floatation was 1,8 litres and after it – 20 ml. The charcoals took about 75% of floated sample volume. Two root tubers of lesser celandine (cf. *Ficaria verna*) and a small twig were the only botanical remains in the sample.

Sample 22_0015_0013/ 4862/ A4796 Härd
The sample volume before floatation was 1,4 litres and after flotation – 400 ml. The number of charcoals was almost 100% of the floated sample volume. Two small twigs were the only botanical remains found in the sample.
Sample 22_0015_0014/ 2933/ A2874 G2976 Härd
The sample volume before floatation was 2 litres and after flotation – 30 ml. The charcoals took about half of the floated sample volume. The botanical remains are presented by hazelnut shell fragments (Corylus avellana), one seeds of vetches (Vicia sp.), and small twigs. A piece of flint was also found.

Sample 22_0015_0015/ 2783/ M15 G2785
The sample volume before floatation was 1,2 litres and after flotation – 30 ml. About 75% of the floated sample volume is charcoals. No other botanical remains were found.

Sample 22_0015_0016/ 2644/ A2067 Kokgrop
The sample volume before floatation was 1,4 litres and after flotation – 60 ml. Almost entire sample comprises of charcoals. The sample does not contain botanical remains. Two pieces of flint were registered. Quick screening of the charcoals shows diversity of the wood species comprising of ring porous ones, like Quercus, diffuse porous (e.g. Corylus), and coniferous ones.

Sample 22_0015_0017/ 2635/ A2076 Härd
The sample volume before floatation was 1,4 litres and after flotation – 18 ml. Almost entire sample comprises of charcoals. No other botanical remains were found. Only a small twig/stem fragment was registered.

Sample 22_0015_0018/ 2649/ A2116 Kokgrop
The sample volume before floatation was 2,5 litres and after flotation – 45 ml. Almost entire sample comprises of charcoals. No other botanical remains were found.

Sample 22_0015_0019/ 2651/ A2145 Grop
The sample volume before floatation was 2,2 litres and after flotation – 17 ml. The charcoals took about half of the floated sample volume. No other botanical remains were found.

Sample 22_0015_0020/ 2653/ A2154 Kokgrop
The sample volume before floatation was 2 litres and after flotation – 75 ml. Almost entire sample comprises of charcoals. The identified botanical remains are seeds of fat-hen (Chenopodium album) and black-bindweed (Fallopia convolvulus), and a fragment of straw/stem. The wood charcoals represent both coniferous and deciduous wood.

Discussion and Conclusions
The analysed samples come from different contexts: cultural layers, hearths, and cooking pits. The amount of charcoals in all samples is quite high, mainly between 75% and 100%, which infers intensive fire or high level of burning activities in or around the studied features and well corresponds to contexts like hearths and cooking pits. The preservation of the other botanical material is poor. Some of the seeds have lost their outer layer which makes them unidentifiable. In almost half of the analysed samples hazelnut shell fragments have been found and, in some samples, they are in quite significant numbers (e.g. Sample 22_0015_0009/ 5126/ M32 Undredel) but the fragments are usually very small. The hazelnut shell fragments mainly derive from
cultural layers and in only one case they were found in a fireplace. Other interesting findings are root tubers of lesser celandine (cf. *Ficaria verna*) and a seed from bearberry (*Arctostaphylos uva-ursi*), which could have been part of the human diet. The root tubers of *F. verna* are edible and rich in starch. Charred finds of it have been found primarily in Mesolithic and Neolithic sites. Their occurrence in fireplaces could mean that they have been intentionally gathered and prepared for consumption (Klooss et al. 2016). In two samples fragments of seaweeds were found. Their presence indicates a close connection to water and use within the community. Evidence from later periods shows diverse usage of the seaweeds: as fertilizers, fodder, flavouring and preservation of food, textile processing, fuel, building material, etc. (Mooney 2018).

The other plants found in the samples represent the surrounding vegetation. Most common among them are plants like fat-hen (*Chenopodium album*), black-bindweed (*Fallopia convolvulus*), vetches (*Vicia* sp.), legumes (Fabaceae), sedges (*Carex* sp.), etc.

In order to reconstruct the local woodland vegetation and the tree species used by the population a detailed anthracological analyses is required. A quick screening of the charcoals from few samples shows diversity of the tree species belonging to ring porous, diffuse porous and coniferous wood. Further analyses are recommended for a thorough overview of the local wood vegetation and usage.

**References**


Figures and tables

Table 1. Archaeobotanical results from the studied sites.

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