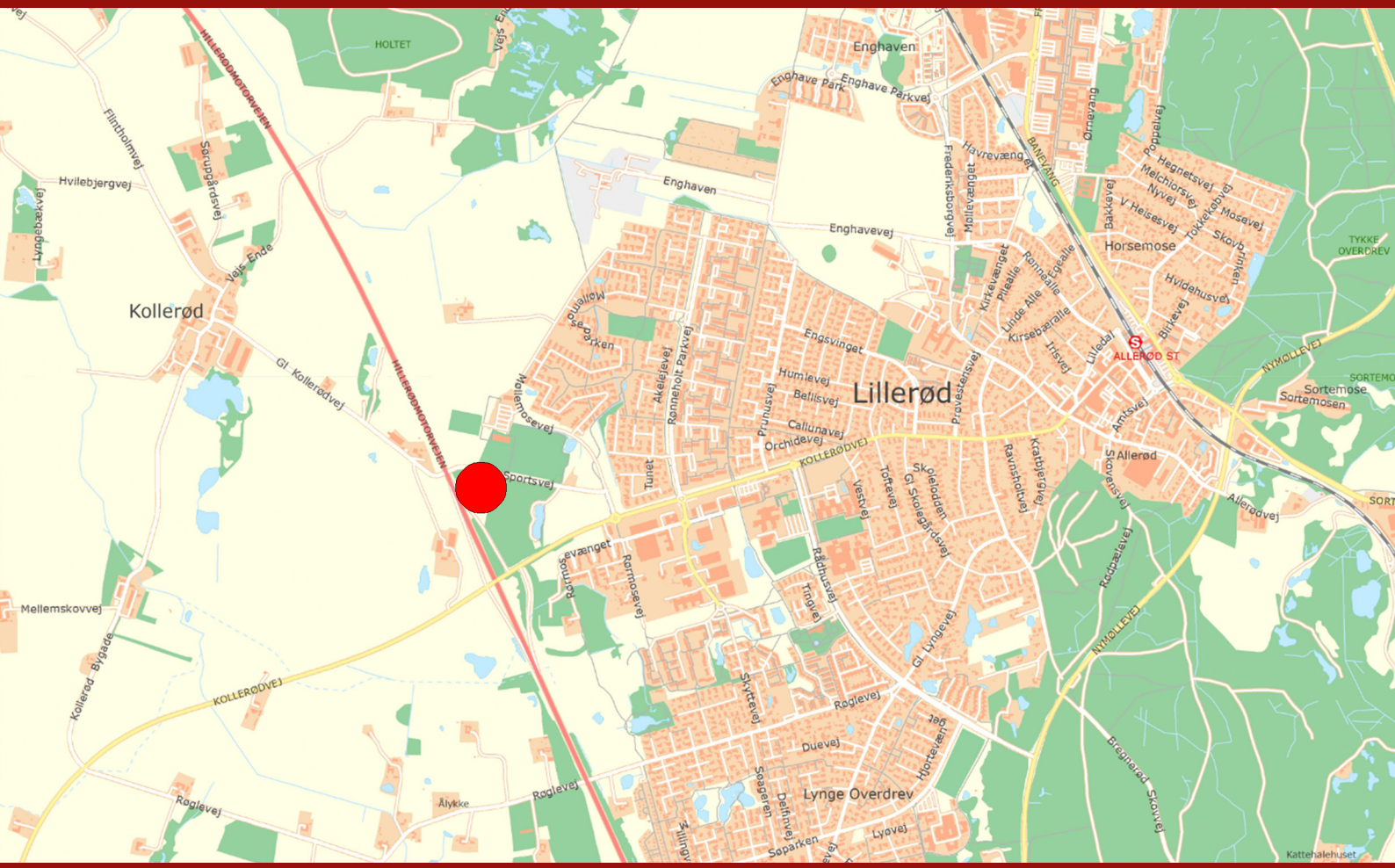
NFHA 2377, Allerød boldbaner (FHM 4296/1641)



Wood analysis of three Middle Neolithic pits interpreted as cooking/fire pits.

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Afdeling for Konservering og Naturvidenskab, Moesgaard Museum

Nr. 7 2016

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MOESGAARD MUSEUM

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1. Introduction

The excavation at the locality of Allerød boldbaner revealed three pits (A590, A591 and A592). The pits contained stones and charcoal and are interpreted as cooking pits or hearths. Based on the material found elsewhere at the site, the pits are expected to date to beginning of the Middle Neolithic. From each pit, a soil samples was collected to obtain charcoal for wood analysis and 14C dating. Table 1 provides the feature numbers, the sample numbers and the sample volume (liters of flotated sediment).

Feature	Sample	Volume (l.)
A590	JP57	9
A591	JP56	11
A592	JP59	8

Table 1. Context and volume in liters of the investigated samples.

2. Materials and methods

The charcoal was extracted from the soil samples by means of flotation at Museum Nordsjælland, location Hillerød. After flotation, the samples were dried and sent to Moesgaard Museum for wood analysis and selection of material for 14C dating.

Per sample, 30 charcoal fragments were taken out for analysis. The analysis was carried out by means of a binocular microscope and a microscope at a magnification of up to 500x. The analysis concerned the taxonomic identification after Schweingruber (1990) and the identification of the tree part (trunk, branch or twig). Concerning the tree part, it needs to be underlined that the classification is only an approximation, especially when taking in consideration the small size of the investigated fragments. In a few cases it was not possible to identify from which part of the tree a fragment derived.

From each sample, charcoal fragments were taken out for 14C dating (see Appendix 1). Preference was given to fragments of taxa that tend to reach relative young ages only, such as hazel (*Corylus* sp., hassel), alder, (*Alnus* sp., el) or birch (*Betula* sp., birk), and if available to twigs or branches, to minimize the old wood-effect (Bartolin et al. 2003;Waterbolk 1971). Because of the small size of the charcoal fragments of the investigated samples, several fragments were taken out per sample. Single samples should however provide sufficient material.

3. Results

3.1 Identifications

While sample 56 consisted of hundreds of charcoal fragments (500-1000), samples 57 and 59 contained thousands of fragments (1000-5000). All three samples consisted of fragments with an approximate size of 0.5 cm. The raw data per sample are provided in appendix 2.

Table 2 provides the results of the 90 charcoal identifications. Sample 56 (A591) contains primarily oak (*Quercus* sp., eg, n=18) and additionally hazel (n=9), apple/pear/hawthorn/rowan (Pomoideae, kernefrugt) and lime (*Tilia* sp., lind). Sample 57 (A590) contains primarily hazel and ash (*Fraxinus* sp., ask). Sample 59 (A592) is highly similar to sample 57 but additionally contains also single fragments of oak and presumably lime. Overall, hazel is dominant (43%), followed by ash (30%) and oak (21%).

Art (English)	Art (Danish)	Art (Latin)	56	57	59	Sum
Hazel	Hassel	*Corylus* sp.	9	16	14	39
Ash	Ask	*Fraxinus* sp.	-	13	14	27
Cf. ash	Cf. ask	Cf. *Fraxinus* sp.	-	1	-	1
Apple, pear, hawthorn, rowan	Kernefrugt	Pomoideae	1	-	-	1
Oak	Eg	*Quercus* sp.	18	-	1	19
Lime	Lind	*Tilia* sp.	1	-	-	1
Cf. lime	Cf. lind	Cf. *Tilia* sp.	-	-	1	1
Indet., bark	Indet., bark	Indet., bark	1	-	-	1
Sum	Sum	Sum	30	30	30	90

Table 2. Allerød boldbaner, charcoal identifications.

3.2 Attested tree parts

Figure 1 and Table 3 provide the results of the identification of the tree parts. Fragments that derived from trunk and branch wood dominated. Most fragments were just small fragments of larger pieces of wood and did show neither bark nor the center of the branch or trunk, except for a few twig fragments.

Sample 56 was dominated by trunk fragments (n=22) and contained only small quantities of other tree parts. The wood of oak concerned exclusively trunk wood with occasionally very narrow annual rings, while the wood of the other taxa concerned various tree parts (see Appendix 2). The wood of hazel existed of trunk wood, branch wood and one twig. Sample 57 consisted of trunk wood, branch wood and one twig. The hazel wood of this sample consisted of trunk wood, branch wood and one twig, and the fragments often represented only two annual rings (two years). The ash wood of sample 57 was clearly dominated by mostly young trunk wood, with very narrow annual rings, and single fragments regularly represented 5 to 10 annual rings. Sample 59 contained both trunk and branch wood and two twigs. Both the hazel and the ash wood of this sample included trunk wood, branch wood and a twig. The ash wood showed rather dense annual rings.

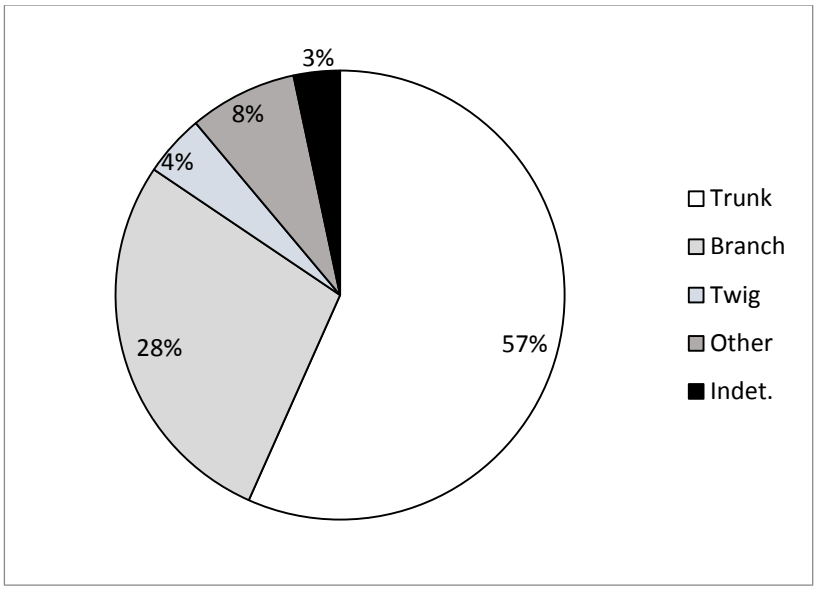

Figure 1. Allerød boldbaner, summary of the identified tree parts.

Art/ Jpnr.	Trunk	Branch	Twig	Other	Indet.	Sum
Art/ Jpnr.	Stamme	Gren	Kvist	Andet	Indet.	Sum
56	22	3	1	1	3	30
57	15	12	1	2	-	30
59	14	10	2	4	-	30
Sum	51	25	4	7	3	90

Table 3. Allerød boldbaner, identified tree parts per sample. Other: old branch/ young trunk. Indet.: Indeterminatae, unidentifiable.

4. Discussion

4.1 Interpretation of the results from Allerød boldbaner

Charcoal of hazel, ash and oak was dominant in the assemblages from three pits interpreted as cooking pits or hearths. Both the dominance and the characteristics of the wood indicate that these taxa may have been used as the main source of fuel in the investigated pits. The wood of oak and ash are indeed well known as fuel wood because of their dense wood (Risør 1966), resulting in a high combustion quality. Ash burns with a steady, long-lasting flame and a long-lasting glow (Kreuz 1992). Also oak burns slowly. Moreover, the attested wood of these taxa that was attested predominantly represented trunk wood, and partially showed very dense annual rings, which are further characteristics that make the wood very suitable to create a long-lasting fire. Hazel, dominant in two of the samples, is also suitable as firewood, but burns faster than oak and ash.

Taxa that have only been found in small quantities are apple/pear/hawthorn/rowan and lime. The small quantities and the fact that this wood mostly consisted of branch wood suggests that these taxa may have served as kindling wood to light the fire. Wood of apple/pear/hawthorn/rowan is indeed very suitable as firewood because of its high heating power (Kreuz 1992). In contrast, lime wood is hardly suitable at all as fuel (ibid.).

The charcoal assemblage shows some differentiation between the three samples. Sample 56 from pit A591 was dominated by oak, and shows the largest variety of taxa, while the other two samples were dominated by hazel and ash wood, did not contain oak at all, and did contain only one other taxon (sample 59), or no other taxa (sample 57). In this regard, it should be realised that the number of fragments identified per sample is rather small and that a larger number of identifications may reveal a larger variety of taxa per sample, thus possibly affecting the representativity of the results. Nevertheless, the differential importance of oak seems to be a true result. Possible explanations for this difference between the pits could be a functional difference between the pits or a chronological difference (perhaps in combination with differences in the nearby vegetation through time).

4.2 Comparison with the charcoal assemblages from similar features at other sites

A comparison with features interpreted at cooking pit or hearth at other prehistoric sites in Denmark provided below shows that wood of various trees and shrubs was used as fuel in these features. At most sites also other taxa were used (not provided here).

-At a Neolithic passage grave of Strandholm (FHM 4296/1491), the charcoal assemblages from five cooking pits located around the grave were dominated by maple (*Acer* sp., løn), ash, alder and hazel (Holm Larsen 2014).

-At Bæklund I of the Late Funnel Beaker / Early Single Grave Culture (FHM 4296/1127), the charcoal in nine cooking pits/hearths was domina-

ted by birch, oak, hazel and lime (Holm Larsen 2015a).
-In nine cooking pits at the site of Støvring Ådale, preliminary dated to the Late Neolithic/Older Bronze Age, the attested wood taxa included oak, birch and ash (Mikkelsen 2008).
-At Hårup Østergård of the Funnel beaker Culture and Younger Bronze Age (FHM 4296/1438), the charcoal assemblages from nine cooking pits were dominated by oak, mixed with small quantities of other taxa including maple and hazel (Bloch Holm 2014).
-At Hundstrupgård I and Hulgård Vest (FHM 4296/941), charcoal in seven samples from presumably prehistoric cooking pits was dominated by hazel and ash (Holm Larsen 2015b).
There is clearly variation in selection of firewood for prehistoric features interpreted as cooking pits/hearths. The fact that it is not always the same species that is dominant in the investigated features or site may well be related to the availability of taxa (principle of least effort, Shackleton and Prince 1992). On the other hand, the taxa that tend to be dominant, including maple, birch, oak, ash and hazel, are reasonably to well suitable as firewood. This points to the selective use of wood for fuel based on the characteristics of the wood. At each site however, people always used various taxa, and also single samples from single features often yield multiple taxa. This suggests that the selection was not that strict (although it remains unknown whether an assemblage represents a single burning event or multiple events).
The taxa that are dominant at Allerød boldbaner, hazel, ash and oak, are taxa that are also regularly used in similar features at other sites. The other taxa found at Allerød boldbaner, lime and apple/pear/hawthorn/rowan, are not dominant at other sites either. The charcoal assemblage from Allerød boldbaner is thus well comparable with the assemblages of the other sites. Overall, the charcoal assemblages from this small selection of prehistoric features interpreted as cooking pits or hearths point to substantial similarity in firewood collection strategies.

5. Conclusions

The charcoal from three pits at Allerød boldbaner that were interpreted as cooking pits or hearths was subjected to wood analysis. One sample contained primarily oak and hazel, while two other samples were clearly dominated by hazel and ash. While all three taxa are suitable as fuel, ash and oak are particularly well known for their combustion qualities. The attested taxa have regularly been identified in features at other prehistoric sites, mostly dating to the Neolithic and Bronze Age, that have also been interpreted as cooking pits and/or hearths. A short overview of the charcoal assemblages from these sites points to similarity in the firewood collection strategies based a combination of availability and selection based on the suitability of taxa as firewood.

6. Taxa attested in the samples

The investigated samples contained wood from various deciduous trees and shrubs. The text below provides a general description of the attested taxa.

Corylus avellana, hassel
Lyskrævende busk, som dog også vokser i blanding med andre træarter og senere som underetage under de mindst skyggegivende af disse. Klarer sig ikke på mager bund. Sår sig let og formerer sig gerne med stubskud. Væksten er hurtig. Veddet er tæt og hårdt og har en alsidig anvendelse i husholdningen og landbruget. Nødderne er vigtige i husholdningen. Løv og kviste anvendes til foder.

Fraxinus excelsior, ask
Lyskrævende. Ask vokser på de bedste jordbundstyper, helst med bevægeligt og højtliggende grundvand. Klarer sig ikke godt i konkurrencen med andre træarter. Sår sig let. Væksten er hurtig. Veddet er tæt og hårdt, og har en alsidig anvendelse i husholdningen og landbruget. Løv og kviste anvendes til foder.

Pomoideae, kernefrugt (rogn, hagtorn, æble, pære)
Rogn, *Sorbus* sp., hagtorn, *Crataegus monogyna* og æble/pære, *Malus*/*Pyrus* sp., kan vedanatomisk ikke skelnes fra hinanden. Lyskrævende buske og træer. Rogn, *Sorbus aucuparia* (og sølvasal, S. rupicola og rognasal, S. hybrida) er et moderat lystræ, klarer sig dog ofte med mindre lys.
Vokser på åben mark eller i blanding med andre træarter. Klarer sig på mager bund. Sår sig let. Væksten er langsom. Veddet er tæt og hårdt og har en alsidig anvendelse i husholdningen. Løv og kviste anvendes til foder. Bær anvendes som foder og i folkemedicinen.

Quercus sp., eg
Lyskrævende træ. Eg vokser på næsten alle jordbundstyper og de mindste krav til jordbunden stiller vinteregen. Klarer sig nogenlunde i konkurrencen med andre lyskrævende træarter. Sår sig let. Væksten er hurtig. Veddet er tæt og hårdt og har en alsidig anvendelse i husholdningen og landbruget. Den unge bark er eftertragtet til garvning og oldenproduktionen er vigtig for svineavlen. Løv og kviste kan anvendes til foder. Veddet svinder og kvælder kun moderat.

Tilia sp., lind
Skyggetålende og skyggegivende træ. Vokser bedst på vandholdig, stærkt leret jordbund. Sår sig vanskeligt, men genvækst finder gerne sted fra stubbe og væltede stammer med nogen rodforbindelse. Væksten kan være hurtig. Veddet er let og anvendes til træskærerarbejder o. l. i husholdningen. Rester af små stammer findes ofte, antagelig stammer, der er afbarkede med henblik på bastproduktion. Løv og kviste anvendes til foder.

7. Literature

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Appendix 1.

Allerød boldbaner, material selected for C14-dating. The A-samples, all representing twigs, are recommended for dating in the first place. The quantity of material is in all cases rather small.

JPnr.	Subnr.	Taxon	Comments
56	A	*Corylus* sp.	Twig, bark present, centre present, max. 2 years old.
56	B	*Corylus* sp.	Branch, no bark, no centre, 2 years.
56	C	*Corylus* sp.	Trunk, no bark, no centre, 3 years.
57	A	*Corylus* sp.	Twig, no bark, centre present, 1 year old?
57	B	*Corylus* sp.	Young branch, no bark, no centre, 3 years old.
57	C	*Corylus* sp.	Old branch, no bark, no centre, 6 years old.
59	A	*Corylus* sp.	Twig, no bark, centre present, 3 years old.
59	B	*Corylus* sp.	Young branch, no bark, no centre, 6 years old.

Appendix 2.

Allerød boldbaner, charcoal identifications and tree part identifications per sample.

JP56

Taxon/Jpnr.	Trunk	Branch	Twig	Other	Indet.	Sum
Corylus sp.	3	2	1	-	2	8
Quercus sp.	18	-	-	-	-	18
Pomoideae	-	-	-	1	-	1
Tilia sp.	-	1	-	-	-	1
Indet.	1	-	-	-	1	2
Sum	22	3	1	1	3	30

JP57

Taxon/Jpnr.	Trunk	Branch	Twig	Other	Indet.	Sum
Corylus sp.	2	12	1	1	-	16
Fraxinus sp.	12	-	-	1	-	13
Cf. *Fraxinus* sp.	1	-	-	-	-	1
Sum	15	12	1	2	0	30

JP59

Taxon/Jpnr.	Trunk	Branch	Twig	Other	Indet.	Sum
Corylus sp.	8	2	1	3	-	14
Fraxinus sp.	6	6	1	1	-	14
Quercus sp.	-	1	-	-	-	1
Cf. *Tilia* sp.	-	1	-	-	-	1
Sum	14	10	2	4	0	30

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