Appendix 4 –
Charcoal from the Eton Rowing Course

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Introduction

A total of twenty-seven samples from the Eton Rowing Course were chosen for charcoal analysis (see Fig. 5.52). The samples were selected from a range of prehistoric deposits of known feature types, including midden, 'burnt mound', tree-throw hole and pit deposits, all dating from the Neolithic to early Bronze Age (Tables App 4.1-2). Most of the samples are from the Area 6 middens, but they also include one middle Neolithic sample from Area 6, and others from late Neolithic and late Neolithic/early Bronze Age burnt flint spreads and pits. Some charcoals from the deposits analysed were sent for radiocarbon dating – the results are presented elsewhere in this volume but, where relevant, are discussed below. One sample was unphased (context 11238 in tree-throw hole 11237=11091) but was assumed to be early Neolithic in date by its association with similar dated features. The aims of the charcoal analysis were to determine the taxonomic composition of various deposits, in order to study context-related variation and consider the relationship between the number and type of taxa and the class of context.

Methodology

The samples were processed by flotation in a modified Siraf-type machine, with sample sizes mostly ranging from 13 to 40 litres in volume (Table App 4.1).

Table App 4.1 Summary of charcoal samples analysed

Phase	*Area*	*Feature type*	*Sample number*	*Context number*	*Total no. of fragments*	*Volume floated (litres)*
Early Neolithic	6	hollow	2314	11058	11	30
			2308	11151	4	30
			2307	11159	6	32
			2306	11160	47	30
			2321	11191	6	30
			2310	11238	10	29
		midden	1035	8186	15	-
			1037	8187	51	-
			1036	8192	6	-
			2319	11171	5	32
			2302	11172	37	30
			2309	11175	6	32
		treehole	2301	11176	11	37
			2304	11187	23	32
			2320	11193	10	15
			2317	11194	26	33
			2329	11316	45	30
			2332	11332	38	30
Middle Neolithic	6	channel	1147	8022	30	32
Late Neolithic	WB	burnt mound	2476	12177	101	128
	16		2711	12812	59	40
	16D	pit	2904	13651	46	40
	24		3084	14375	57	30
	16		3404	16024	94	40
Late Neolithic/early Bronze Age	11	burnt mound	2104	10700	40	16
			2108	10700	18	13
	24	pit	3005	14068	28	40

Table App 4.2 Results of the charcoal analysis by fragment count

Period		*Early Neolithic*										
Sample number		*2310*	*2314*	*2320*	*2321*	*2308*	*2307*	*2317*	*2304*	*2332*	*2329*	*1036*
Context number		*11238*	*11058*	*11193*	*11191*	*11151*	*11159*	*11194*	*11187*	*11332*	*11316*	*8192*
Clematis vitalba L.	Traveller's joy	1	-	-	-	-	-	-	-	-	-	-
Ulmus sp.	Elm	-	-	-	-	-	-	-	-	-	-	-
Fagus sylvatica L.	Beech	-	-	-	-	-	-	-	-	-	2	1
Quercus sp.	Oak	-	-	1	1	-	2	1	-	-	-	1
Alnus glutinosa Gaertn.	Alder	-	-	-	1	1	1	-	2	5	4	-
Corylus avellana L.	Hazel	-	-	1	-	-	-	-	-	7	-	-
Alnus/Corylus type	Alder/hazel	-	-	2	-	-	-	8	2	6	8	1
Prunus spinosa L.	Blackthorn	6	4	1	2	-	-	5	-	-	-	1
Maloideae	Pear, apple, hawthorn	-	-	1	-	1	1	3	6	8	8	1
Rhamnus cathartica L.	Buckthorn	-	-	-	-	-	-	-	3	-	1	-
Fraxinus excelsior L.	Ash	1	2	1	-	-	-	2	3	6	11	1
Indeterminate		2	5	3	2	2	2	7	7	6	11	-
Total no. of fragments		10	11	10	6	4	6	26	23	38	45	6

The resultant flots were air-dried and divided into fractions using a set of sieves. The charcoal was sorted from other remains (to 2mm) and then sorted into groups based on the anatomical features observed at X10 and X20 magnification. Representative fragments from each group were then selected for further examination using a Meiji incident-light microscope at up to X400 magnification. Identifications were made with reference to Schweingruber (1990), Hather (2000) and modern reference material. A total of 736 fragments were examined, consisting of 100% of the charcoals from each flot.

Combined methods of ubiquity or presence analysis and quantification by fragment count have been used in this report. It is acknowledged that there are differential rates of fragmentation in charcoal and that quantification by fragment count is not always reliable, but this method is considered necessary in this report to demonstrate relationships between individual taxa. Classification and nomenclature follow Stace (1997).

Results

The results by fragment count are given in Table App 4.2, grouped chronologically. The early Neolithic samples are listed in spatial order from west to east along the Area 6 hollow.

Ten taxa were positively identified. The taxonomic level of identification varied according to the biogeography and anatomy of the taxa:

Ranunculaceae:
Clematis vitalba (traveller's joy), woody climber common to hedgerows, scrub and woodland, sole native species.

Ulmaceae:
Ulmus sp. (elm) tree, several native species not distinguishable anatomically.

Fagaceae:
Fagus sylvatica (beech), tree, native status discussed below.

Quercus sp. (oak), tree, two native species, not distinguishable anatomically.

Betulaceae:
Alnus glutinosa (alder), tree preferring damp soils, only native species.

Corylus avellana (hazel), shrub or small tree, only native species.
These two species have a very similar anatomical structure and can be difficult to distinguish, hence the category *Alnus/Corylus*.

Rosaceae:
Prunus spinosa (blackthorn), shrub, one of several native species but distinguished by anatomical characteristics (large ray width).
Maloideae (pear, apple, hawthorn), subfamily of various shrubs/small trees, rarely distinguishable by anatomical characteristics.

Rhamnaceae:
Rhamnus cathartica (buckthorn), shrub, sole native species.

Oleaceae:
Fraxinus excelsior (ash), tree, sole native species.

In all samples, there were some charcoal fragments categorised as indeterminate, which were not identifiable because of poor preservation or an unusual cellular structure. In general, the preservation of the charcoal was quite poor – a number of fragments had become infused with sediment, obscuring the anatomical structure. It is likely that these indeterminate fragments represent additional specimens of taxa positively identified at the site.

Early Neolithic							*Middle Neolithic*	*Late Neolithic*				*Late Neolithic/early Bronze Age*			
1037 8187	*2302 11172*	*2319 11171*	*1035 8186*	*2309 11175*	*2301 11176*	*2306 11160*	*1147 8022*	*2711 12812*	*2904 13651*	*3404 16024*	*2476 12177*	*3084 14375*	*2104 10700*	*2108 10700*	*3005 14068*
-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
-	-	-	-	-	-	4	-	-	-	3	-	-	-	-	-
2	3	-	-	-	-	-	-	-	-	-	-	-	15	-	-
2	3	-	-	-	6	1	2	1	3	17	3	21	5	-	12
7	6	-	6	1	2	9	25	32	19	47	41	7	12	4	6
-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
11	4	-	-	-	-	3	-	3	-	-	-	-	-	-	-
-	-	-	-	-	-	6	-	-	-	8	1	5	-	-	-
8	6	4	3	3	-	4	-	7	9	2	35	9	1	3	5
3	-	-	-	-	-	1	-	-	4	-	3	-	1	-	-
6	1	-	3	1	-	9	-	-	-	10	-	-	3	-	-
12	14	1	3	1	3	10	3	16	11	7	18	15	3	11	5
51	37	5	15	6	11	47	30	59	46	94	101	57	40	18	28

Discussion

Given the problems inherent in the quantification of wood charcoal and its application to palaeoenvironmental reconstruction, charcoal tends to be used only indirectly as an ecological indicator (Murphy 2001, 23). For this reason, the following observations on the woody environment are made on the basis of taxa presence and on the assumption that wood for fuel is usually collected from the immediate vicinity of a settlement (eg Salisbury and Jane 1940; Western 1971; Miller 1985; Neumann 1989; Thompson 1996).

The woody environment

Charcoal should, then, provide a picture of the local arboreal environment (Thompson 1994, 23). The taxa presented in Figures App 4.1-2 show the woodland taxa represented, although potential selection bias means that it may not portray the full picture. The charcoal assemblage indicates the presence of mixed deciduous woodland, dominated by *Quercus*, with *Ulmus* and *Fraxinus*, with a shrubby understorey of *Corylus*, *Prunus* and Maloideae. *Alnus* and *Rhamnus* favour damp soil conditions and may have grown on the floodplain. There is evidence from the pollen record, plant macro- and invertebrate remains to show that *Alnus* woodland was typical of the Neolithic period at Dorney, along with *Tilia* (lime). It is striking, therefore, that *Alnus* is not better represented in the charcoal record and that there is no evidence of *Tilia* at all. Since *Tilia* charcoal tends to disintegrate rapidly when buried (M Robinson pers. comm.), its absence may be the result of a preservational bias. However, the paucity of *Alnus* may be the result of

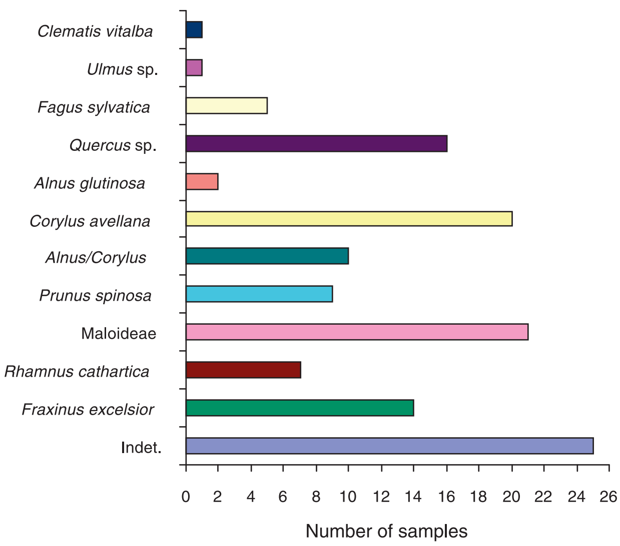

Fig. App 4.1 Charcoal: taxa presence by number of samples

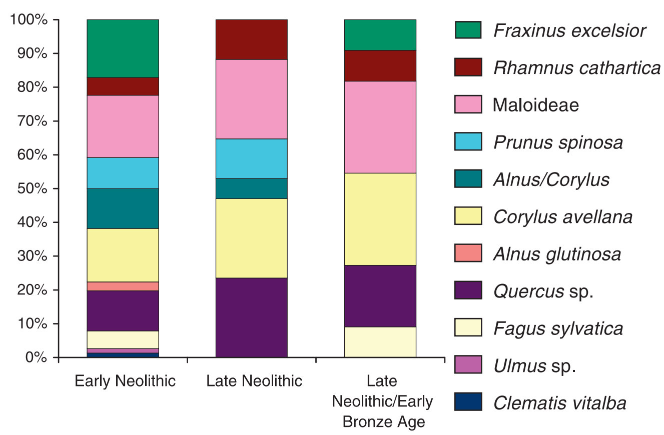

Fig. App 4.2 Charcoal: presence of taxa by phase a genuine selection bias as its wood does not burn well (Edlin 1949, 156).

The presence of several light-demanding species in the charcoal assemblage (eg *Rhamnus cathartica*, *Prunus spinosa*) suggests that any original woodland cover may have been modified. This is interesting as there was less evidence in the pollen record to indicate clearance activities. In addition, the potential for the grazing of domestic animals is suggested by the strong presence of thorny scrub which could withstand grazing. Other light-demanding species such as *Salix cinerea* or *S. caprea* (willow), might be expected if there were no pressure from grazing.

The identification of *Fagus sylvatica* (beech) in a number of samples and locations at the Eton Rowing Course is of particular interest since the native status of beech is the source of some debate (Smith 2001). While beech charcoal has been identified from Neolithic deposits at several sites (eg Abingdon: Dimbleby in Case 1956; Western in Case and Whittle 1982; Mount Pleasant: Morgan in Wainwright 1979), it has rarely been confirmed as dating to the early Neolithic period (Straker 1990, 215). At Eton, beech charcoals were present in five of the early Neolithic midden samples from Area 6. The assessment of the charred plant remains carried out by Robinson (this volume) showed that some degree of contamination by small particles of coal, clinker and modern seeds had occurred and it was because of the possibility of contamination that two samples of beech charcoal from the midden deposits were specifically selected for dating. Neither date confirmed the presence of beech in the early Neolithic. The material from one of the samples (2329) produced a late medieval date (cal AD 1440-1650; OxA-9860: 346±35 BP), the other (sample 2302) dated to the later Neolithic period (2880-2460 cal BC; OxA-9926: 4075±65 BP). The samples containing beech charcoal were all in close proximity to one another, and may all reasonably be discounted from the early Neolithic record.

Much greater quantities of beech charcoal were present in the 'burnt mound' deposit 10700 in Area 11, charcoal from which was radiocarbon dated to the early Bronze Age (2200-1930 cal BC; OxA-10228: 3666±40 BP). Beech was thus certainly present at Dorney by this time, and in the light of this, it is also likely that the earlier 3rd millennium date obtained from Area 6, where there is other evidence of contemporary human activity, is also genuine.

Fuelwood selection

Since there is no evidence of catastrophic fires at Dorney, it may be assumed that the charcoal assemblage represents the remains of fuelwood, burned intentionally. The collection of firewood is influenced by a number of criteria including species availability, physical properties, timber value, woodland management, cultural values and the availability of other fuels. In fact, there seems to have been little variation in the choice of fuelwood throughout the periods represented here. Figure App 4.2 demonstrates that there is more consistency than change in the fuel use between the early Neolithic and later periods, suggesting that both the local environment and collection practices remained more or less constant. Moreover, examination of the 4th Millennium assemblages shows that there are no significant differences in the taxa utilised between the middle Neolithic and the late Neolithic/early Bronze Age samples.

It is apparent that the charcoal assemblages are very mixed, regardless of phase or feature type. Certainly, no single taxon dominated the assemblages; on average, a sample contained five taxa. The range of taxa may be accounted for by the need for different wood types within a single fire; the use of a particular fuelwood provides specific burning properties, such as heat production or quantity of smoke (Smart and Hoffman 1988, 168). The presence of climbers, such as *Clematis*, in assemblages may be an accidental inclusion with the main tree timber, rather than deliberate selection (Cartwright 1996, 197).

However, charcoal from deposits such as the midden and pits, (where there is no evidence for burning *in situ*) must be redeposited and such mixed assemblages may represent multiple burning events. If the assemblages are the product of several burning events, then it sees likely that there was little consistent selection of fuelwood (ie the diversity of taxa indicates little consistent preference for the wood chosen for individual fires). Two of the 'burnt mound' samples at Dorney (Fig. App 4.3) were from deposits with evidence for *in situ* burning: deposit 10700 (see Chapter 9) had an area of burnt soil beneath the charcoal, and there were traces of charcoal dust across much of the contemporary floodplain surface, perhaps indicating a widespread burning episode. The presence of burnt flint shows

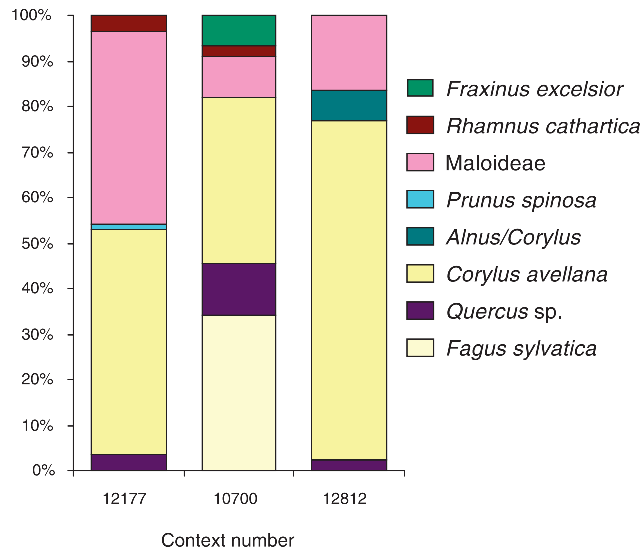

Fig. App 4.3 Composition of 'burnt mound' deposits that this was deliberate, not a natural catastrophe. There was also some burning within deposit 12177 in Area 14 (see Chapter 3). Interestingly, there is little variation in the composition of all the 'burnt mound' deposits (Fig. App 4.3). There is a clear dominance of shrub/small tree taxa and the *in situ* burnt deposits exhibit as great (if not greater) a range of species as the redeposited material from context 12812 in Area 16 (see Chapter 8).

Although few other deposits of this type and date have been published, there are Late Neolithic 'burnt mound' assemblages from Mildenhall, Suffolk, which provide comparable material (Murphy 2001, table 3). These assemblages exhibit a similar diversity and composition of taxa to the Eton material (*Alnus*, *Corylus*, Maloideae, *Prunus*, *Quercus*), as do 'burnt mound' deposits of middle Bronze Age date (eg Reading Business Park, Gale 2004; Anslow's Cottages, Burghfield; Gale 1992). In contrast to the Eton material, the assemblages at Anslow's Cottages were dominated by *Alnus* and *Salix*/*Populus*, neither of which make good fuelwood. They do, however, make very good charcoal (Edlin 1949, 165), which may have been beneficial for some activities. For example, if these features had functioned as steam baths, it would have been easier to provide heat on a bed of charcoal rather than open flames. Unfortunately the charcoal from the 'burnt mound' deposits at the Eton Rowing Course does not shed light on the function of these puzzling features.

A comparison of the number of taxa present in each feature type raises some interesting points (Fig. App 4.4). The midden deposits have greater taxonomic diversity than the other feature types, which is appropriate for a spread of material that is likely to represent multiple dumping events. The pit deposits, however, were much less diverse, which may suggest a single depositional event. This may be significant since the pits are more likely to have deliberate deposition of artefacts and ecofacts than

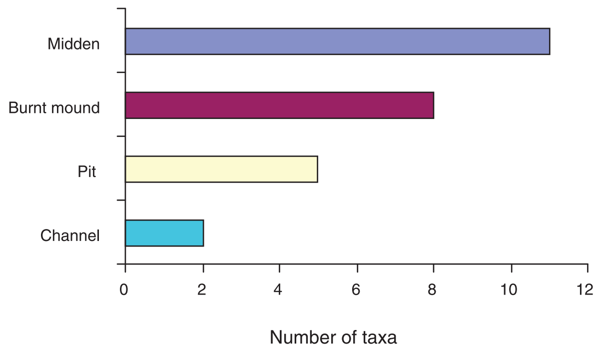

Fig. App 4.4 Charcoal: number of taxa positively identified in each feature type

other feature types. However, the pits were also in geographically different locations (Areas 16D and 24) from the majority of the samples and are limited to the later phases. Clearly the channel deposit produced the smallest number of taxa; this suggests that the charred patch found within the channel was a single dump of material but it is not possible to analyse further since it was the only sample from this feature type and phase. Moreover, this analysis may be biased since the number of taxa positively identified reflects the number of samples examined from each feature type.

Nevertheless, it is apparent from Figures App 4.4.-5 that there are some consistencies between feature types. *Corylus* is the most abundant taxa and there are generally larger quantities of shrubby taxa (Maloideae, *Rhamnus*, *Prunus*) than tree taxa. *Quercus* is surprisingly not that well represented but is certainly present in greater quantity in the pit deposits than elsewhere. Charcoal assemblages from Grooved Ware and Beaker pits at other sites have shown a similar taxonomic diversity with dominance of oak (eg Gravelly Guy (Gale 2004a); Barrow Hills, Radley (Thompson 1999, 252).

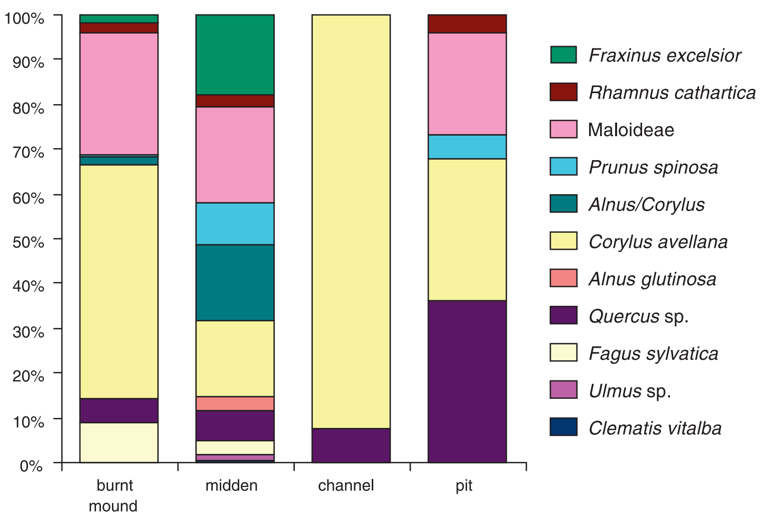

Fig. App 4.5 Charcoal: taxa by feature type

Conclusion

The charcoal assemblages from the Neolithic features at Dorney provide some information on the nature of the local environment and the specific selection of woods for use as fuel. All of the recorded taxa would have been locally available in this period including beech, the identification of which provides confirmation of the presence of this species in the Late Neolithic. The charcoal assemblages have been interpreted as representing the remains of several burning episodes (domestic or industrial) for which there was little consistent selection of fuelwood. Certainly, the range of species suggests that wood was gathered according to availability rather than a single preferred species being selected deliberately, although some species avoidance was probably practised. The charcoal assemblage also provides further evidence for land clearance and the potential for grazing of domestic animals in the Neolithic period at Dorney.