A Holocene channel at Aston Mill, Kemerton, Worcestershire: environment and biota.

Paul F. Whitehead.
Moor Leys, Little Comberton, Pershore, Worcestershire, WR10 3EH. Email: paulpfw@outlook.com

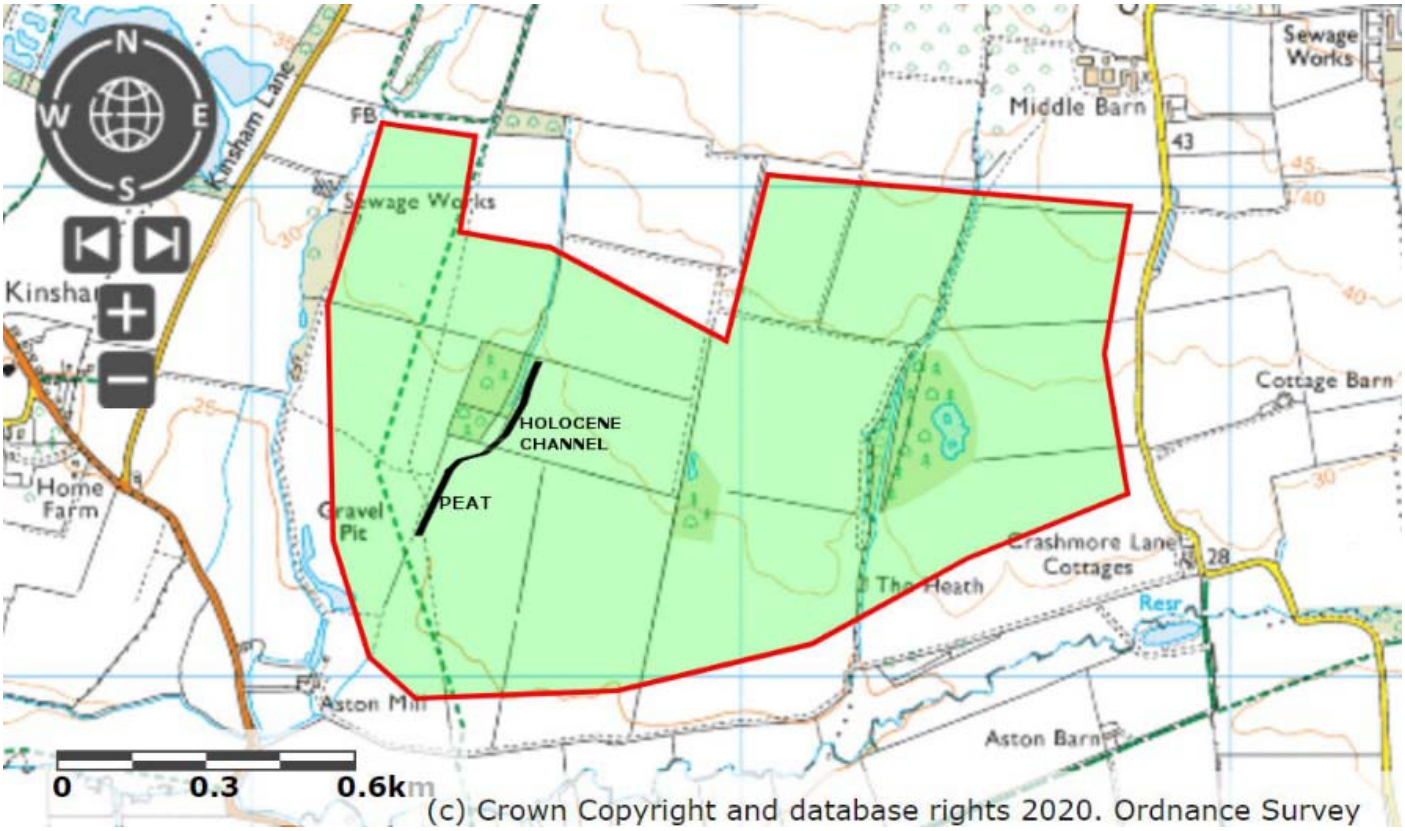
Preamble

During a study of the biota and stratigraphy of the Carrant Main Terrace that commenced in 1970 an extensive Holocene channel fill was observed incised into the terrace surface sediments at Aston Mill gravel pit, Kemerton, Worcestershire 52°01'N 02°08'W VC33 (01,02) in May 1975. The stratigraphy and material evidence from the channel, parts of which remained visible until 1978, is now described. I apologise for the length of time it has taken to bring this to a conclusion which required a certain amount of application; the wider study was financed privately by me with the constructive support of landowners and gravel extraction companies. The *Worcestershire Record* demonstrates a degree of topic width and remains a useful platform for authors who have no interest in impact factors; this publication was not available until 1996 and developed its present format more recently so the time lapse may well have been fortuitous. The sedimentology, archaeology and biota of this terrace has resulted in a number of outputs (Briggs, Coope & Gilbertson, 1975; Dinn & Evans, 1990; Greig & Colledge, 1988; Jackson, 2015; Reynolds, 1971; Russell & Daffern, 2014; Shaw, Daffern & Russell, 2015; Whitehead, 1977, 1979, 1988, 1989a, 1989b, 1989c, 1990) and this account further demonstrates why Bredon Hill should be accorded World Heritage Site status. I have little doubt that in time this may become a reality.

Nomenclature generally follows Gentry, Clutton-Brock & Groves, 2004. The name Aurochsen is used in preference to Giant Ox because 'ox' is sometimes used generically to imply castrates.

Sequential sedimentology of the Holocene channel

The dip slope streams that descend the southern slopes of Bredon Hill now do so primarily in a network of canalised courses that broadly follow historically enclosed field systems. During 1975 it became apparent that one such dip stream had transgressed the terrace surface at Aston Mill and re-sorted its sediments typically to a depth of about 1.3 metres. This transgression occurred presumably episodically over much of Holocene time.

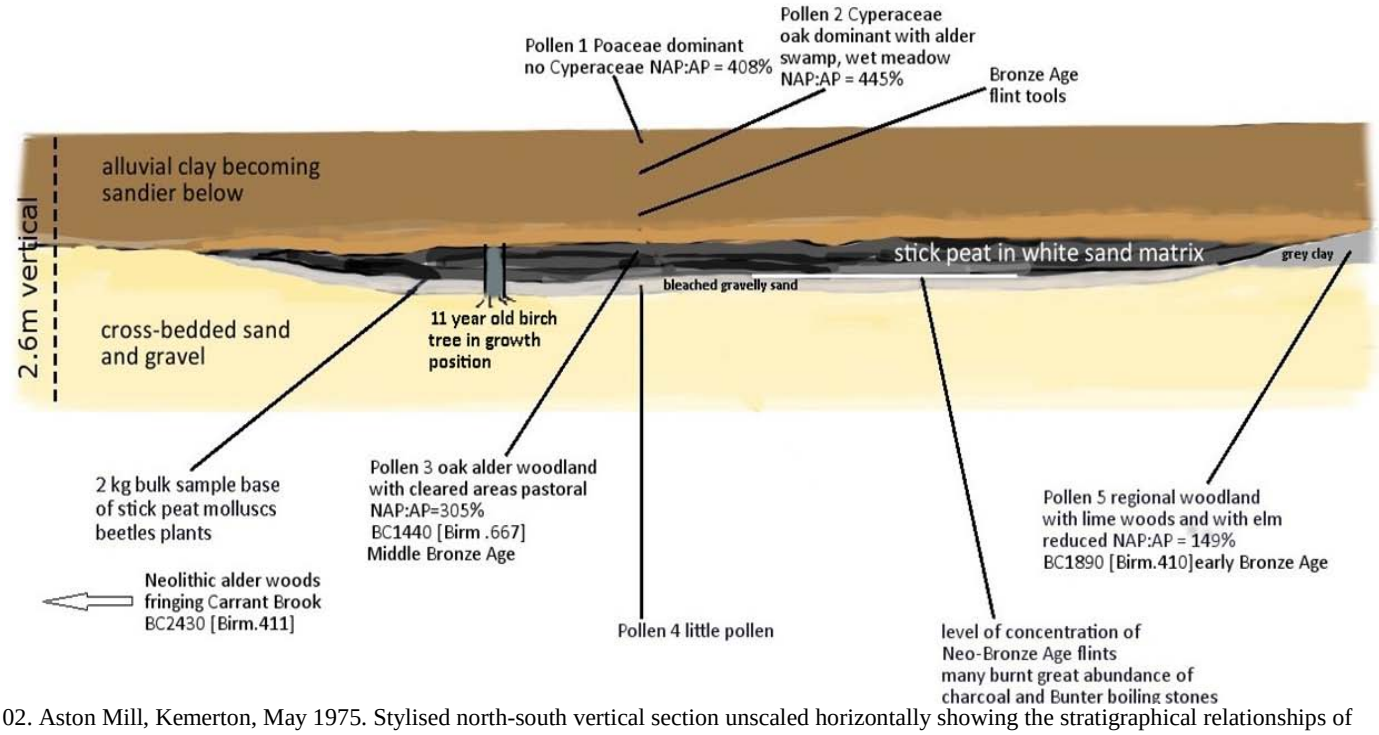


01. Location and extent of Aston Mill gravel pit, Kemerton, showing the course of the Holocene channel.

The diagram 02 is a somewhat stylised impression of the channel sedimentology centred on SO944354 during May 1975 when much of the material evidence described here was visible. Biotic and archaeological evidence was recorded from all the major sediments although the biota from the gravel bed of the pre-Bronze Age channel is limited to a few valves of the aquatic mollusc *Pisidium amnicum* (O. F. Müller, 1774) and one mammalian tooth fragment. This was a clean clear watercourse that flowed over the sands and gravels but transported no in-washed sediment, this together with the absence of terrestrial molluscs suggesting that landforms upslope were then comparatively stable. The mammalian tooth fragment is an infundibulum from an upper molar of a Wild Horse *Equus ferus* Boddaert, 1785 which was located *in situ* in orange sandy gravel that may have marked an even earlier 'proto-channel'. Its stratigraphical position is shown in 03 which implies that the animal was living on the terrace after its formation and is one of the few large wild animal remains to have occurred **within** the terrace, rather than from much earlier land surfaces once beneath it. These early land surfaces existed as recently as 26000BP at Aston Mill but Wild Horse persisted very much later on regional hillsides (Whitehead, 1989d, 2006a). Judging from its condition this example could well fall into the Late Upper Palaeolithic and conform in time with artefacts of that stage from the surface of the same terrace (Jackson, 2015). The age of a human thumb bone from a related context (Powers & Whitehead, 2018) remains unknown.

By the early Bronze Age the stream had begun to transport clay and to scour the remains of butchered wild and domestic animals from its

floodplain. Fig. 03 depicts a bed of grey silty clay which attained thicknesses of up to 30 cms in places demonstrating that flow rate and efficiency were subject to change. In places these sediments were somewhat glutinous; on 10 April 1977 an oak pile was observed driven in to them at SO94483552 (04) and traded grit stones and large nodules of chalk-mine flint (10 top row), a precious valued commodity, were lost in them. The depth of the minerogenic channel fill at that point was 2.43 metres. A radiocarbon date of 3840 ± 130BP = BC1890 (Birm. 410) on cleft crown wood of alder *Alnus glutinosa* (L.) Gaertn. extracted from this sediment at SO94463509 on 30 October 1972 confirmed that alder woods were nearby during or before the Early Bronze Age. This in-washed sediment seems to have been a response to the clearance of woodland and its understorey and some of the transported mammal bones are likely to be of Neolithic age. A period of declining flow rate followed during the Middle Bronze Age and the channel became ponded nearer to the Carrant Brook. This could have been due to rising sea level and natural obstructions to flow in the primary river valley woodlands, but the mollusc fauna demonstrates that inflow was also reduced allowing the formation of a large pool or pools >350 metres in extent fringed by alder, oak and hazel woodland. The surface depression could also have resulted from tectonic modification near the front of the terrace.



02. Aston Mill, Kemerton, May 1975. Stylised north-south vertical section unscaled horizontally showing the stratigraphical relationships of the Carrant Main Terrace sediments, the Holocene Channel, its fill and salient features.

The bed of the pool became swamp-like and finally in-filled with vegetation and fallen branch wood. Fine sand continued to be in-washed and was intercalated with what became stick peat which itself came to rest on a bed of bleached podzolised fine gravelly sand. Flint artefacts from this sand included several bladelets and typologically significant flint micro-tools that demonstrate the nearby presence of Mesolithic people earlier than BC4000. In the field the stick peat bed was a conspicuous feature in vertical section (06, 07) which ultimately limited the extraction of gravel but which was not totally compressed by the in-washed oxidised clay, derived from Charmouth Mudstone higher upslope on Bredon Hill (02, 04, 06) that finally sealed it. This fill process was evidently rapid, the sediments being brought up close to the modern land surface either by the late Bronze Age or early Iron Age.

The Holocene channel as a marker of landscape change

The sedimentary fill of the channel provided a series of five pollen samples (02) analysed by Professor G. W. Dimbleby and his colleagues at the University of London, Institute of Archaeology, during June 1980. There was generally insufficient pollen to permit the construction of spectra but the relative proportions of contemporary non-arboreal to arboreal pollen suggested increasing woodland clearance from the Neolithic to the late Bronze Age. Pollen sample 5 is from clayey sediment from inside an in-washed metatarsus of a Celtic Shorthorn Oxen '*Bos longifrons* Owen, 1844'. This taxon has been described by Dawkins (1867) and Jewell (1963) and equates with the 'small-horned cattle' of Armitage & Clutton-Brock (1976); it is synonymous with *Bos taurus* L., 1758. The pollen from the metatarsus indicates that the grey silty clay is likely to have been initiated in the late Neolithic since it contained significant amounts of lime (*Tilia* sp.) pollen (Professor G.W. Dimbleby, *in litt.*, 30 June 1980) marking the regional thermal maximum of the Holocene as described by Godwin (1975). This sediment may therefore mark a period of active change in the contemporary vegetational matrix.

While pollen samples 2 and 3 showed herb dominance with nearby *Carex* beds and wet meadows not one of the samples showed any trace of cereal pollen or arable agriculture (Professor G. W. Dimbleby, *in litt*., 30 June 1980). The pastoral landscape referred to by Professor Dimbleby is supported by the mammalian faunal evidence. The rather short-lived late Bronze Age settlement at Huntsman's Quarry, spanning the parishes of Kemerton and Bredon (Jackson, 2015) on the surface of the same terrace one kilometre north-east of Aston Mill, although regarded as pastoral, was sited in a managed landscape with existing field systems and droves and therefore complements and supersedes in time the findings described here.

03. Aston Mill, Kemerton, October 1972, SO94493549. Grey clayey silt in Holocene channel incised into mid-Devensian gravels, the location of early Bronze Age alder wood. The red star marks the vertical position of a Wild Horse tooth fragment.

04. Aston Mill, Kemerton, 10 April 1977, SO94483552. Tip of pointed oak pile 440 mm x 90 mm driven into Neolithic channel fill.

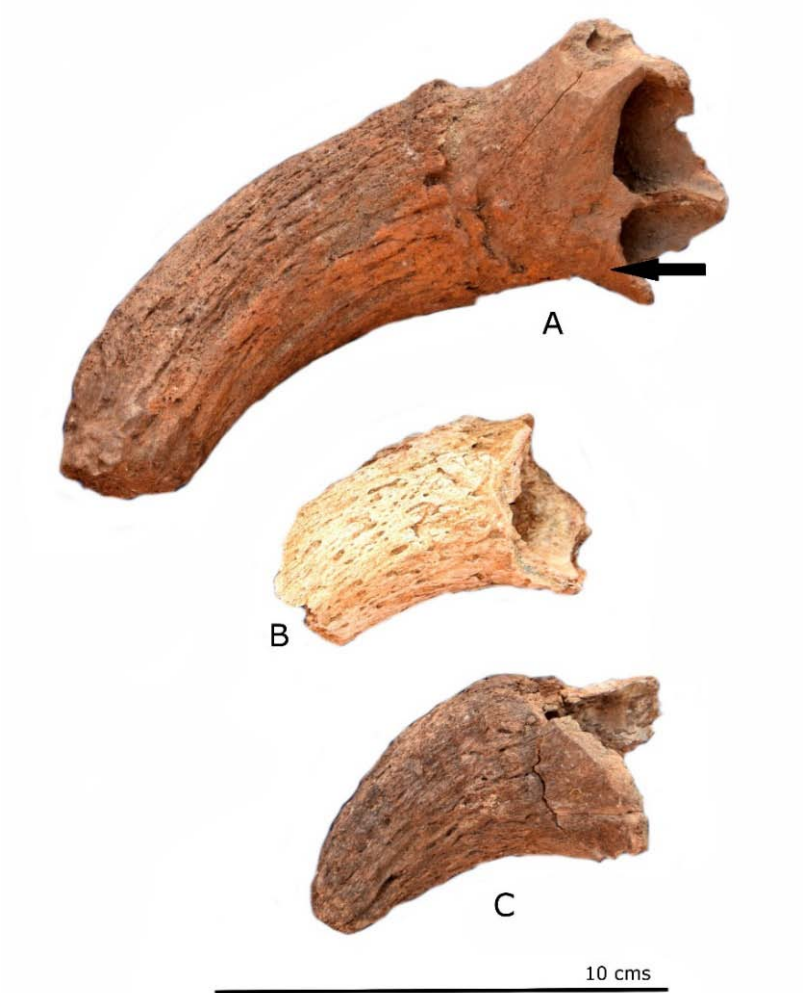
Mammal bones and artefacts from basal minerogenic channel sediments

These are the sediments that contained early Bronze Age alder wood dated to 3840 ± 130BP = BC1890 (Birm. 410). The animal bones are represented by Aurochsen *Bos primigenius* (minimum of six, see ensuing paragraph), domestic cattle '*Bos longifrons*' (four) and sheep *Ovis aries* L., 1758 (one). As the stream episodically traversed the hill slopes and terrace surface it scoured mammalian remains that had probably lain there for centuries, including the butchered remains of Aurochsen. Some of these pre-Bronze Age bull Aurochsen were enormous animals (11B, 14A) rivalling any from continental Europe (*vide infra*).

The small horn core depicted in 05A is from an immature female believed to be about 18 months old, the parietal sutures being unfused. It has been butchered and fragmented to remove the usable horn and perhaps also to access the brain. If this horn-core represented a Neolithic domesticant is would be a matter of particular interest. Jewell (1963) refers to domestic cattle in the British Bronze Age that are distinct from the Celtic Shorthorn '*Bos longifrons'* while Jarman (1970) refers to "*a large wild group*" of Neolithic domestic cattle. The density of this horn core and its skull fragment are remarkable, the horn core being solid throughout its length. It aligns with the statement regarding Aurochsen in Degerbøl & Fredskild (1970): "*….in the older cow, where the horn cores are compact right to the tip, and grooved, as generally seen in adult bulls*." Following Grigson (1969; 1982, Fig. 2) the basal circumference of the horn core, 145 mm, places it firmly within the size range of domestic cattle and not Aurochsen.

Higham and Message (1969) were confident that Danish Neolithic domestic cattle were biometrically distinct from sympatric Aurochsen. It is observed also that the animal was killed at less than two years of age which may further indicate livestock managed for meat. The great bone density of this together with clear basal circumferential basal bone lipping render it distinct amongst domestic cattle horn cores seen by me; the possibility that it is an Aurochsen-like domesticant introduces a topic which would require further research. Bishop (2016) makes some apposite comments: "*It could be proposed that animals may not have been viewed as either domesticated and totally interlinked with human society, or wild, and totally outside of it, but rather there may have been degrees of 'wildness' according to the nature of the contact between them. In the case of Red Deer, which provided a resource important to many aspects of Neolithic life, they may have been seen as more closely connected with society and therefore less 'wild' than aurochs, which may have interacted with humans on more irregular occasions.*"

This horn core is of further interest because much of its tip has been removed by a robust carnivore. This and other tooth marks on it imply the presence of wolf (*Canis lupus* L., 1758) suggesting that this animal has a place in the Neolithic or pre-Neolithic of Bredon Hill environs. This is the only evidence of that animal in the Holocene channel suggesting its local decline soon after is likely to have been associated with loss of the mammalian megafauna, especially Red Deer, and the disruption of the system. Its existence at Aston Mill was confirmed by Dinn & Evans (1990) who described an incomplete skeleton in a pit assigned to the Bronze Age where it may have been celebrated as a declined and vanquished species.



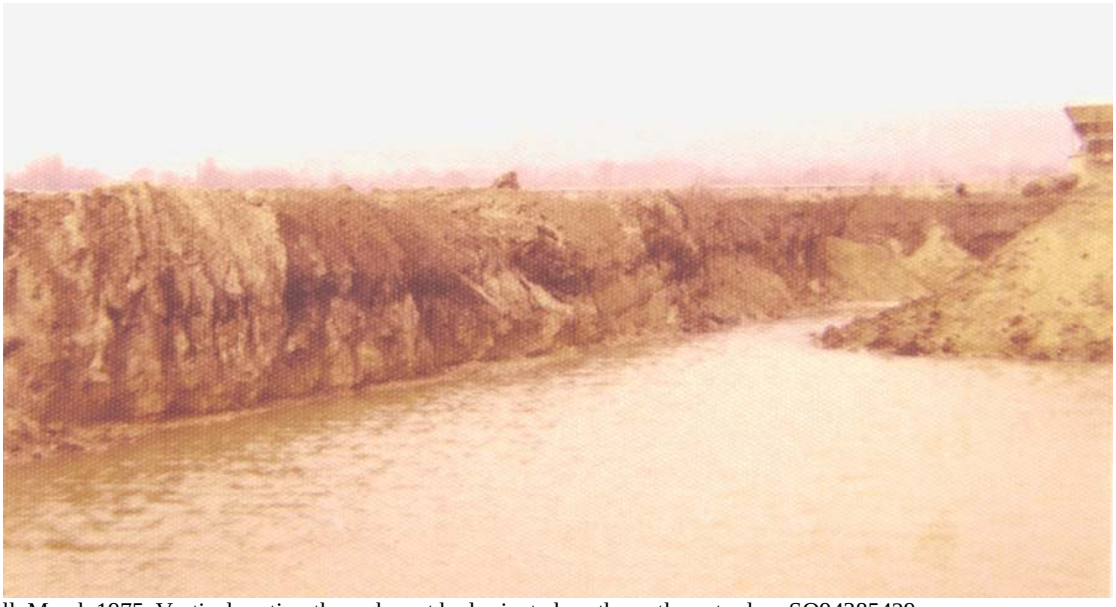
05. Aston Mill, Holocene channel. Right horn cores *Bos* spp. A, ?Aurochsen *Bos primigenius* immature female (see text), minerogenic channel sediments, SO944354, 3 August 1975, arrow indicates chop marks; B & C, Celtic Shorthorn Oxen '*Bos longifrons*', B, ?early Iron Age alluvium overlying stick peat; C, middle Bronze Age stick peat, SO944354, 27 July 1975.

The change from fluvial to lacustrine conditions

The existence of a young birch (*Betula* sp.) tree preserved in its growth position (02) in re-sorted Devensian gravels is significant since it may mark changing channel hydrology. A ring count on this tree showed that it was 11 years old at death, its trunk sharply truncated transversely at the contact between the stick peat and the overlying clay alluvium. This suggests that the change in flow was sudden and that the birch tree was preserved by waterlogging in what eventually became somewhat anaerobic pool bed sediments; its xylem tissues were sound and it appears to have been 'embalmed' by the peat bed. Molluscs recovered from a two kilogram bulk sample of peaty sand from the base of the peat confirm that channel flow was greatly reduced at the time of their deposition.

The peat bed and its wood content produced neither direct nor indirect evidence of Beaver (*Castor fiber* L., 1758) so it appears that this animal had no role in modifying flow, at least not at the site.

It is well-known that the major western river valleys supported prehistoric riparian woodlands (Whitehead, 2006b) with a high content of alder *Alnus glutinosa* (L.) Gaertn.,the proliferation and position in time of which was confirmed by Godwin (1975). At Aston Mill, closer to the Carrant Brook at SO94383506, a radiocarbon date of 4380 ± 100BP = BC2430 (Birm. 411) on an alder root mass penetrating 2.44 metres deep into Devensian clay beds (02) showed that alder woods were well-developed during the late Neolithic; traces of them dated 3570±110BP = BC1620 (HAR 3954) were found as far upstream as Beckford (Dr J. R. A. Greig, *in litt*., 28 August 1984; Greig & Colledge, 1988), but it should not be assumed that they were ubiquitous. In the River Avon valley at Pensham (Whitehead, 2006b) the riparian woodland habitat had been seriously compromised by about 3540±90 BP = BC1590 (Birm-1228). Alder holts present on the dip slope of Bredon Hill at Aldwick Wood, Westmancote SO941388, may be significant relicts of regional prehistory.

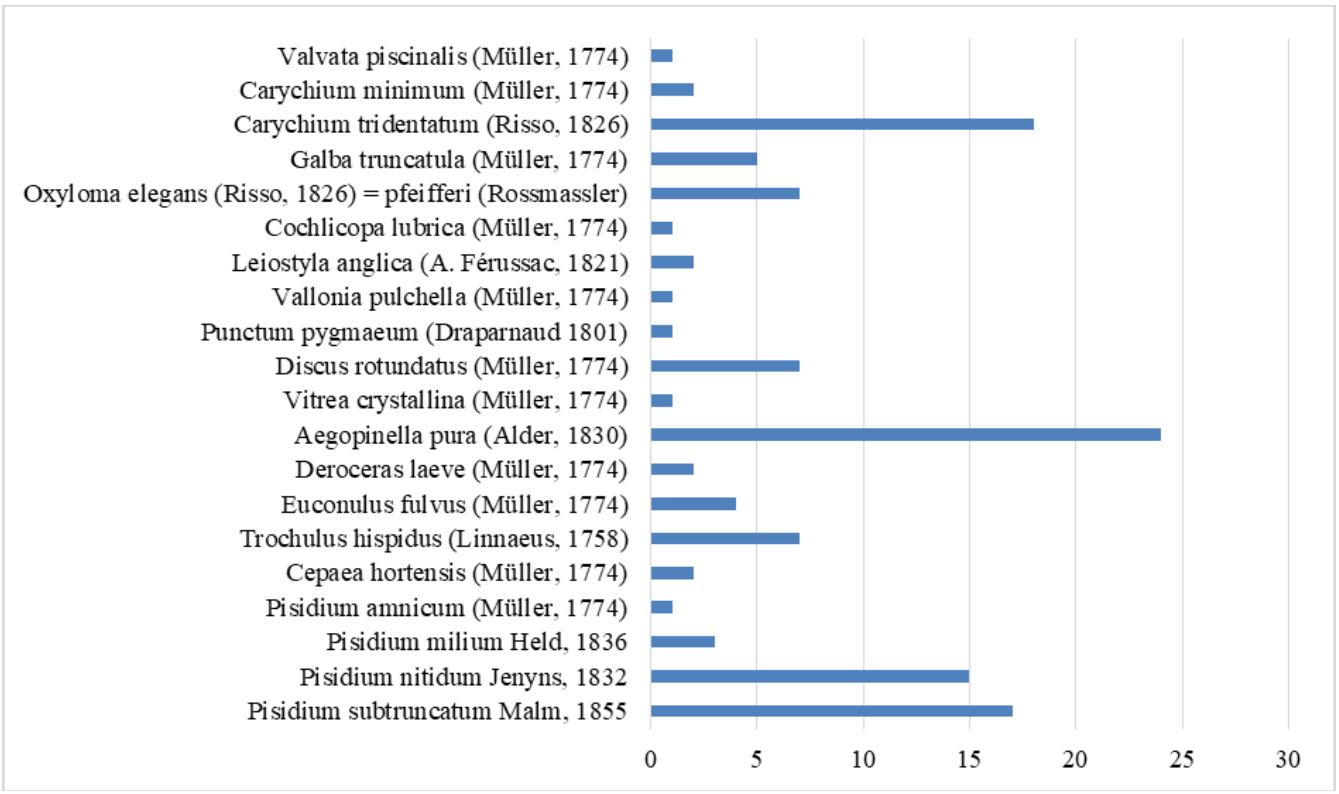


06. Aston Mill, March 1975. Vertical section through peat bed oriented north-south centred on SO94385429.

07. Aston Mill, Holocene channel, 4 September 1977. From the top down: plough soil, later prehistoric alluvium, middle Bronze Age stick peat, podzolised silty sand and gravel, reworked terrace surface with slumping. This sedimentary sequence is apparently unique in the River Avon catchment archive.

Biotic evidence from peaty sand at the base of the stick peat

A bulk sample of peaty fine sand weighing two kilograms was retrieved on 27 May 1975 from immediately beneath the stick peat above it. Although the stick peat rested diffusely on it, the sand must have floored the pool that the wood accumulated in; it must therefore be regarded as an integral part of the bed fill and representative of conditions during its evidently rapid development. Its biota is therefore entirely autochthonous. Additionally it should be noted that over time some artefacts will certainly have settled downwards through it. The sample was wet sieved through 0.5 mm apertures and was found to contain aquatic and terrestrial molluscs (08), fragments of the beetles *Hydrochara caraboides* (L., 1758), *Geotrupes* sp. and *Plateumaris sericea* (L., 1758) and a single pupa of a phorid fly. Seeds of raspberry (*Rubus idaeus* L.), elder (*Sambucus nigra* L.), sedge *Carex* sp. and *Stachys* sp. were recovered as well as fragments of oak and elm wood and a small fragment of cancellous bone tissue from a large mammal. *Hydrochara caraboides* provides regional evidence of a water beetle that was more widespread during Holocene prehistory. It has a predilection for base-rich water often overlying peat, as on the Somerset Levels (Duff, 1993) and also occurs in Cheshire marl-pits.



08. Aston Mill, Holocene channel. Numbers and species of molluscs recovered from two kilogram bulk sample of peaty sand at base of stick peat, 27 May 1975.

09. Aston Mill, Holocene channel, Bronze Age bulk sample 27 May 1975. Left: *Leiostyla anglica* adult and juvenile shell. Right: Internal shells of the slug *Deroceras leave*.

The mollusc fauna confirms the existence of a large sluggish pool or pools. It is dominated by *Pisidium* spp. and hygrophilous terrestrial species. *Aegopinella pura*, in the sample dominated by small juvenile shells and *Carychium* spp. prefer shaded wet habitats shrouded with moisture retentive plant material such as fallen leaves or moss. *Oxyloma elegans* and the leaf beetle *Plateumaris sericea* imply wet marginal or emergent tall herbs, the latter often associated with Cyperaceae. As an oceanic west Palaearctic species the snail *Leiostyla anglica* (09, left) is of particular interest. Its British status was aptly summarised by Kerney (1999): "*This is a declining species. Fossils show that it was more widespread during the forest optimum of the postglacial and began to recede from the English lowlands by the time of the first forest clearances.*" The amphibious species *Galba truncatula* and the hygrophilous slug *Deroceras leave* (09, right) remain widespread in England today. The three *Pisidium* spp. together, counted here as valves divided by two, imply good quality well-oxygenated water with a reasonable growth of hydrophytes. The absence of planorbids and aquatic gastropods such as *Lymnaea* spp. and *Bithynia* spp. is curious making this a rather distinctive mollusc facies evidently adapted to quite specific conditions.

Artefacts from peaty sand at the base of the stick peat

At SO954354 considerable evidence of human activity was found around the fringes of the developing pool basin during May 1975. The upper levels of the bleached gravelly sand (at the tip of the spade in 07) provided abundant evidence of fire with prolific charcoal particles. A five gram spot sample produced several hundred charcoal fragments ranging in size from <1 mm to 5 mm in diameter suggestive of in-washed charcoal 'rain.' This may be due to extensive burning of woody vegetation to facilitate pastoral activity; the stick peat also contained an abundance of charred incompletely burnt wood. This widespread burning is also reflected in the scatter of calcined flint, burnt Oolitic Limestone, burnt Jurassic bivalves, burnt vein quartz, grit stones and Bunter quartzite pebbles. These may be regarded as indicators of human activity on the edge of a water course which doubtless would originally have been an important source of fresh water. A single cerithid gastropod mollusc would have been scoured from nearby Jurassic soft rocks. It has already been described how grey silty clay was introduced to the channel during the early Bronze Age.

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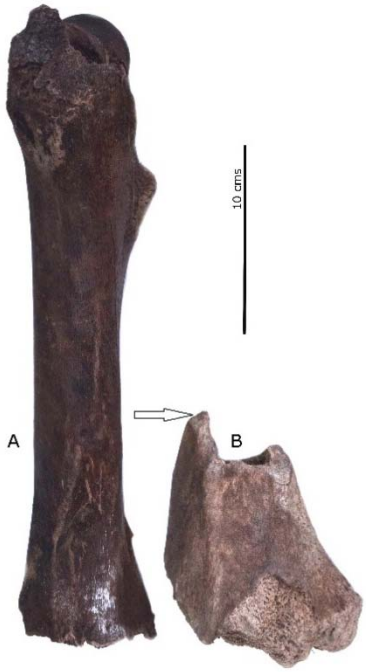
A further radiocarbon date of 3390±100BP = BC1440 (Birm. 667) (Middle Bronze Age) was obtained on collagen from a rib bone of a disarticulated butchered Aurochsen (*Bos primigenius* Bojanus, 1827) from the stick peat. Within its chronological framework of finite radiometric dates the channel would have supported more than 13 human generations and was no doubt axiomatic in sustaining prehistoric human activity and occupation at the site. Apart from burnt rock that had been subject to human intervention 14 flint artefacts were recovered from the gravelly sand at the base of the stick peat. Small bladelets and microliths of later Mesolithic affinity (10, centre row) point to human activity earlier than BC4000. These may ultimately have been derived from nearby land surfaces but may also imply that the ponded basin originated as a topographic feature somewhat earlier than its radiometrically dated history implies. There is evidence that some of the earlier bladelets and microtools had been heat-fragmented (10); all of the flakes show evidence of utilisation which is apparent at x40 magnification if not to the naked eye. It cannot be asserted that any of these were hafted as edge utilisation often extends widely around the edges of the flakes. Reynolds (1971) in a somewhat inconclusive archaeological excavation at Aston Mill in 1970 found three microliths of similar affinity 'in the subsoil.' Jackson (2015) raised the possibility of a Mesolithic settlement 'in the area' based on a few flint implements from excavations at Huntsman's Quarry, in the parishes of Bredon and Kemerton parishes, between 1994 and 1996.

A second distinct group of artefacts (10, bottom row) recovered from the top of the bleached sand, effectively at the base of the stick peat and below the skeletal remains of the Aurochsen, include well resolved scrapers and knives rooted in Neolithic technologies. These were clearly precious items and some have been re-used over a long time period; this later usage may approximate more closely in time with the Middle Bronze Age and the development of woodland around the pool. Some of these artefacts were worked on large traded flint nodules from Cretaceous Chalk (10, top row), of late Neolithic or early Bronze Age date, which were lost 2.43 metres deep in the clayey channel fill. Finally and evidently yet more recent is a small group of very sharp rather shapeless utilised flakes fashioned in brown flint, the thick unweathered cortex implying that this too was traded to the site

10. Aston Mill, Holocene channel. Top row: large Neolithic or early Bronze Age chalk mine flint nodules from clayey channel fill, 15 May 1975. Centre row: Mesoliths from sand beneath Bronze Age stick peat; left and centre, burin-like point with extensively worked edge SO943353 27 May 1975; right, nosed burin worked on distal end of heat-fragmented bladelet SO94543550 15 June 1975. Bottom row**:** base of Bronze Age stick peat. A, Neolithic (in origin) re-cut end and side scraper worked on Cretaceous chalk-mine flint SO94343517 27 July 1975; B, re-trimmed side scraper SO94513553 15 June 1975; C, re-trimmed knife SO94493549 15 June 1975.

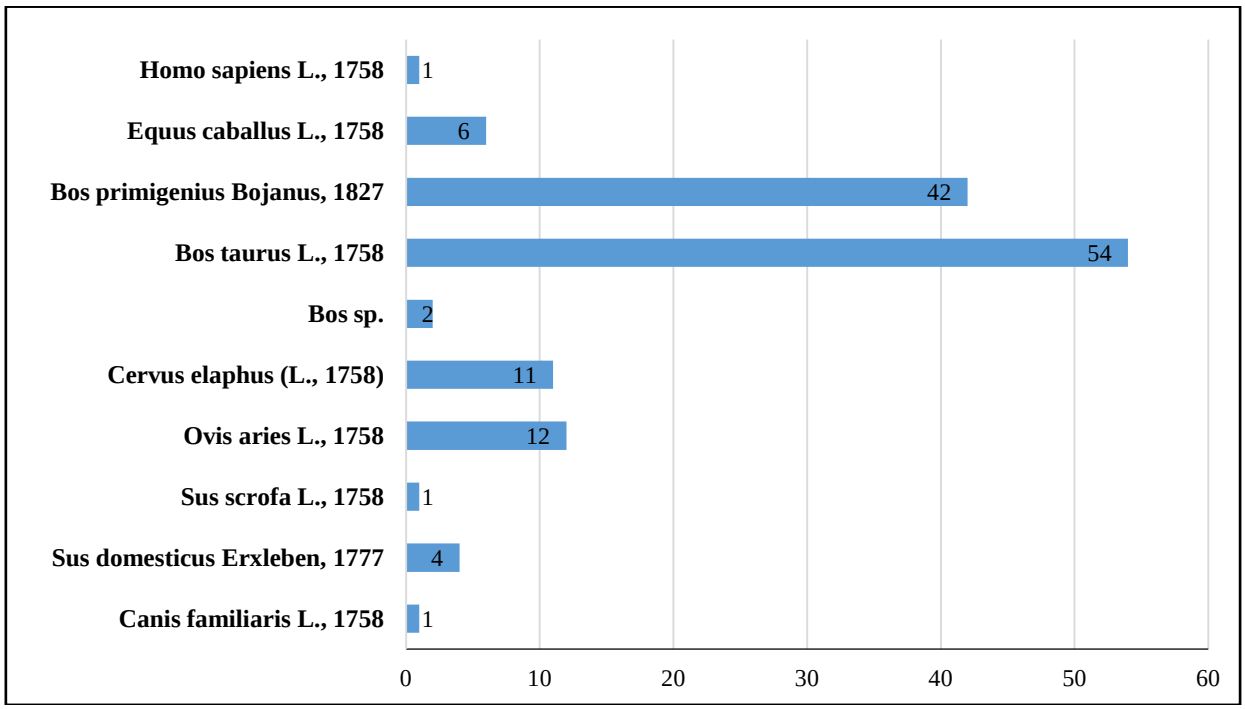


11. Aston Mill, Holocene channel. Left femora of ♂♂ Aurochsen *Bos primigenius*. A, mid-Bronze Age stick peat; B, probably Neolithic derived in early Bronze Age Channel fill. Arrow marks point of percussive lateral impact in butchering.

12. Aston Mill, right tali of ♂♂ Aurochsen *Bos primigenius*. A, derived in early Bronze Age channel fill. B, clayey alluvium of modern Carrant Brook, SO944347, 10February 1974.

The stick peat

The stick peat formed a conspicuous feature in vertical section varying from about 19 cms to 39 cms in thickness; it is here regarded broadly as Middle Bronze Age because collagen from the bone of an Aurochsen has been radiocarbon dated to that time period. Clearly, not everything contained within the peat will be of precisely the same age. The contact with alluvium above it was highly diffuse (07) pointing to a continuity of infill. The peat contained an abundance of branch wood of trees and pieces of wood, many of which were charred and some of which were humanly cleft, as well as flint, wood and antler artefacts and the remains of wild and domesticated animals, many of which were Neolithic derived in early Bronze Age Channel fill. Hazel *Corylus avellana* (L.) may have been cultivated and its nuts occurred commonly. Other plants have already been mentioned and it seems that the riparian woodland that created the peat persisted for longer than regional dry-land woodland; pollen samples and roots in growth positions confirm the wider presence of riparian woodland but point also to regional clearances. The peat was sealed by up to 53 cms of alluvial clay thus effectively conserving its organic content; the rapidity of sedimentation is attested to by a small number of pristine Bronze Age flint artefacts in this alluvial clay.



13. Aston Mill, Holocene channel, Middle Bronze Age stick peat, 1975. Numbers of individual determinable skeletal elements (teeth, bones, antler) attributable to seven mammalian genera.

Mammal remains from the stick peat amount to 134 determinable items and 17 indeterminate ones. The faunal analysis is shown in 13 which reflects a society supported by both wild and domestic species during the Middle Bronze Age but primarily bovids. Many of the bones are in pristine condition yielding abundant evidence of human intervention.

There are at least three notable features surrounding this assemblage of bones *viz*.

1. An incomplete disarticulated skeleton of a male Aurochsen, a denticulate flint knife in contact with a femur (21), other flint artefacts, introduced non-flint rocks and a wooden projectile point (15) close by.

2. Almost every mammal bone shows traces of butchery the soft tissues having been removed comprehensively with flint tools revealing intensive patterns of striae on the compact bone tissue. Evidence of this is illustrated 20, 22 and 23, the latter two depicting the diaphysis of a left human femur indicating that this was also the subject of butchery thereby providing limited evidence of cannibalism.

3. Bones of Aurochsen derived in the earlier minerogenic channel fill show clear evidence of having been cleft with edged, bladed (14) or pointed tools (11B). Many of the appendicular bones of oxen from the stick peat have had their extremities removed by pecking or chipping (11A, 14B, 14C), possibly with rocks. In my experience this is unusual.

14. Aston Mill, Holocene channel, SO945354. A, distal end of right humerus of ♂ Aurochsen *Bos primigenius* removed by powerful blows from a bladed implement, peaty silt underlying peat 27 May 1975. B, C, left humeri of domestic cattle, May and July 1975, middle Bronze Age stick peat, the proximal extremities removed by chipping of the compact bone.

The incomplete Aurochsen skeleton

The incomplete skeleton of a male Aurochsen was found bedded into the stick peat at SO94433545 on 27 May 1975 disposed over an area of 2.1m^2. The two front leg bones were represented by phalanges, metacarpals and associated small carpal bones, a radius, ulna, femur, three ribs, a humerus, two scapulae, one cervical and two thoracic vertebrae (16-20). Most of the bones were horizontal and the two lower front leg bones (19) were five cms apart at the base of the peat in positions of articulation with their phalanges and smaller carpal bones. In contrast the radius was disposed vertically supported by the peat stick content. The radius and ulna were 10 cms apart disposed horizontally and fragments of the ulna were observed between the two bones. Aleft lower M2 tooth appeared to have been broken from its alveolus. The fore limb bones were all arranged in front of the femur and vertebrae and the assemblage extended over a length of 1.87 metres.

The right humerus had been perforated in life, shortly prior to death, by a projectile of circular cross section and most of the bones showed traces of butchery; apart from the flint tools found in sandy sediment below the bones a single flint flake and a range of intact and fragmented rocks was found directly associated with the bones. A subspherical flint core-scraper was found close to the skeleton, one edge of which was undercut. Tool marks on some of the bones (20) show that almost all of the soft tissue had been removed meticulously from them.

Taphonomy of the incomplete Aurochsen skeleton

A key question is what became of the rest of the Aurochsen skeleton. The stick peat developed in a water body which in terms of flow was at best sluggish, therefore the animal bones could not have been moved significantly by water. It seems that the animal was the subject of a planned hunt and when injured retreated into the peaty morass where it either died or was killed. The animal was then dismembered with large parts of the skeleton apparently removed, no other directly associated parts, such as the head, could be located nearby. There is no evidence of carnivore activity on the bones.

There is clear evidence that parts of the carcass were prepared *in situ*; possibly the conditions were such that it could not all readily be removed or needed to be. It is difficult to create an exact scenario for the events that took place in the peaty morass; one can scarcely

imagine the difficulties of overcoming such an animal and then working on the carcass in such conditions. A flint knife, one edge of which has been deliberately denticulated (21) was found in association with the bones as was a wooden projectile point (15) and a range of large pebbles which must have been introduced to the sediment by man. A re-sharpened tine-tip flint tool fabricator from the antler of a Red Deer (27) was presumably used to retouch the flint tools during use. The associated rocks included heat-shattered fragments of gritstones, an important lithological resource of Bronze Age Aston Mill (Whitehead, 2013), and large unmodified pebbles of quartzite.

One fist-sized heated fragment of non-feldspathic grit with sharp edges found in direct association with the Aurochsen skeleton could have been used to dress the bones, the removal of the extremities by repeated chipping (11A, 14B, 14C, 18) being unusual in my experience. It may have been that a high value was placed on the tendons, ligaments, and joint fluids which could have been rendered, perhaps into glue. Butchering Aurochsen *in situ* in a pool bed with the loss of valuable associated artefacts suggests that the overall operation may have been somewhat fraught, requiring intense application.

The wooden projectile point

This carved wooden item, here termed a projectile point (15), is a rectangular piece of wood 420 mm long, 40 mm wide and 20 mm thick carefully sharpened to a well resolved circular point. It may well have created the perforation of the right side Aurochsen humerus (16, 17) situated on the external side of the bone; it was found in direct association with the bone scatter of that animal.

A notch has been cut into one face of the projectile point 10 mm deep, 25 mm wide and 160 mm from the blunt end; the area of the notch may have been fire-charred. The notch could have been used to secure bindings to a larger projectile thrower, there is a suggestion that the blunt end was compressed laterally. The blunt end demonstrates that the item has been cut from the original source wood carefully and circumferentially with a fine blade; a small eminence in the centre (15) of this end marks its final point of fracture. No dendrological examination of this artefact has been made but it demonstrates some clear features. The wood is dense and the grain is very fine and closely disposed matching few native British woods other than yew *Taxus baccata* L. This is a provisional identification only.

15. Aston Mill, Holocene channel, stick peat, SO94433545, 27 May 1975. Middle Bronze Age notched wooden artefact believed to be a projectile point.

Nilsson (1847) reports on the complete skeleton of a gigantic bull Aurochsen from Önnarp, Skåne, Sweden, now known to be about 10300 years old, *viz*. "*This animal had, some few years previous to its death, been hit in the back by a javelin, fitted to all appearances, with a flint point. The javelin, which must have been thrown at the animal from in front, probably when rushing upon the hunter, struck the* processus spinosus *of the first* vertebra lumbaris *at an angle so acute with the surface of the bone, that it appears almost incredible that the spear could have penetrated; and this would have been impossible, had it not been exceedingly sharp-pointed and propelled with great speed. It passed through the* processus spinosus *of the first* vertebra lumbaris *from front to back, and penetrated into the second.*"

It seems that essential hunting techniques of Aurochsen in Europe demonstrate some consistency over an extended time period.

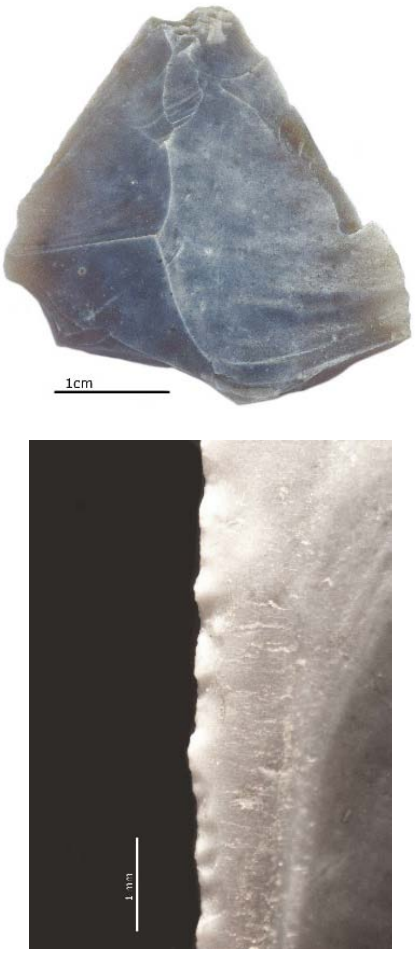
16. Aston Mill, Holocene channel, stick peat, SO94433545, 27 May 1975. Perforated right humerus *Bos primigenius* ♂ incomplete skeleton.

17. Aston Mill, Holocene channel, as 16. Proximo-external perforation right humerus *Bos primigenius* ♂ incomplete skeleton.

18. Aston Mill, Holocene channel, stick peat SO94433545, 27 May 1975. Right and left scapulae, the blades trimmed, *Bos primigenius* ♂ incomplete skeleton.

19. Aston Mill, Holocene channel, stick peat SO94433545, 27 May 1975. Metacarpals and phalanges, *Bos primigenius* ♂ incomplete skeleton.

20. Aston Mill, Holocene channel, stick peat, SO94433545 27 May 1975, *Bos primigenius* ♂ incomplete skeleton, defleshed right scapula showing intensive swirls of flint implement striae.



21. Aston Mill, Holocene channel, stick peat, SO94433545 27 May 1975. Denticulate flint knife and magnified edge directly associated with *Bos primigenius* ♂ incomplete skeleton.

Observations on other animal remains from the stick peat

Man *Homo sapiens* L., 1758. A single shaft of an adult left femur (22, 23), apparently male, was recovered from the stick peat on 27 July 1975 at SO943354. The extremities have been forcibly removed for the extraction of the marrow and the bone shows clear evidence of having been defleshed with flint tools. The bone was shattered by man shortly after death and its ends have been gnawed by a small dog. Burial or cremation was a normal part of life in the British Bronze Age where cannibalism is uncommon. This bone should be viewed in relation to the human right femur from the Bronze Age riparian woodland of Pensham, Worcestershire (Whitehead, 2006b) which approximates to a radiocarbon age of 3540±90 BP = BC1590 (Birm-1228) and is also associated with a wild megafauna. The evidence for defleshing in this case is less clear, but these finds together raise some interesting questions. At a time of diminishing resources in a rapidly changing landscape were these humans perceived by some elements of the population as a recyclable commodity?

Were Aurochsen hunters selected from their own communities or where they specialists that moved widely through the riparian woodlands? Did the hunters butcher their own carcasses? The evidence at Aston Mill is that Aurochsen butchers were skilled and had access to good tool kits. Flint striae left by a butcher on a scapula of a middle Bronze Age domestic oxen *Bos taurus* from the stick peat are less fluid, more irregular, more incisive and apparently less competently executed. The stick peat at Aston Mill and the organic bed at Pensham are aceramic and are not strictly archaeological features. However an Aurochsen bone was recovered from an archaeological feature on the surface of the Carrant Main Terrace at Beckford on 25 September 1973 at SO984363 263 metres from the Carrant Brook (Whitehead, 1979). This was a thoracic vertebra from a sub-adult animal which was radiocarbon dated to 3578±48BP = BC1628 (BM-1445) i.e. early Bronze Age. Perhaps semi-settled communities did organise their own large mammal hunts.

22. Aston Mill, Holocene channel, stick peat, SO944354, 27 July 1975. Diaphysis of butchered left femur of human *Homo sapiens.*

23. Aston Mill, Holocene channel, stick peat, SO944354, 27 July 1975. Diaphysis of butchered left femur of human *Homo sapiens* showing flint tool striae made during defleshing.

Apart from the incomplete Aurochsen skeleton, animal remains were randomly discarded in the pool and its environs. The few equid remains are dominated by teeth from fully mature notably small animals. Sheep were scarcely represented and domestic pigs, slaughtered at a comparatively young age, were evidently not yet kept in quantity (13). A diaphysis of a femur 25 mm in transverse width is provisionally ascribed, on the basis of its surface features, ligament attachments, condition and size to Wild Boar (24). A comprehensive overview of domestic pig and Wild Boar bone structure (Zedda, Brits, Giua & Farina, 2018) demonstrates that mammalian bone condition and structure is strongly influenced by domestication and lifestyle. This species may have been in decline in the River Avon catchment by the Middle Bronze Age and/or become more difficult to locate.

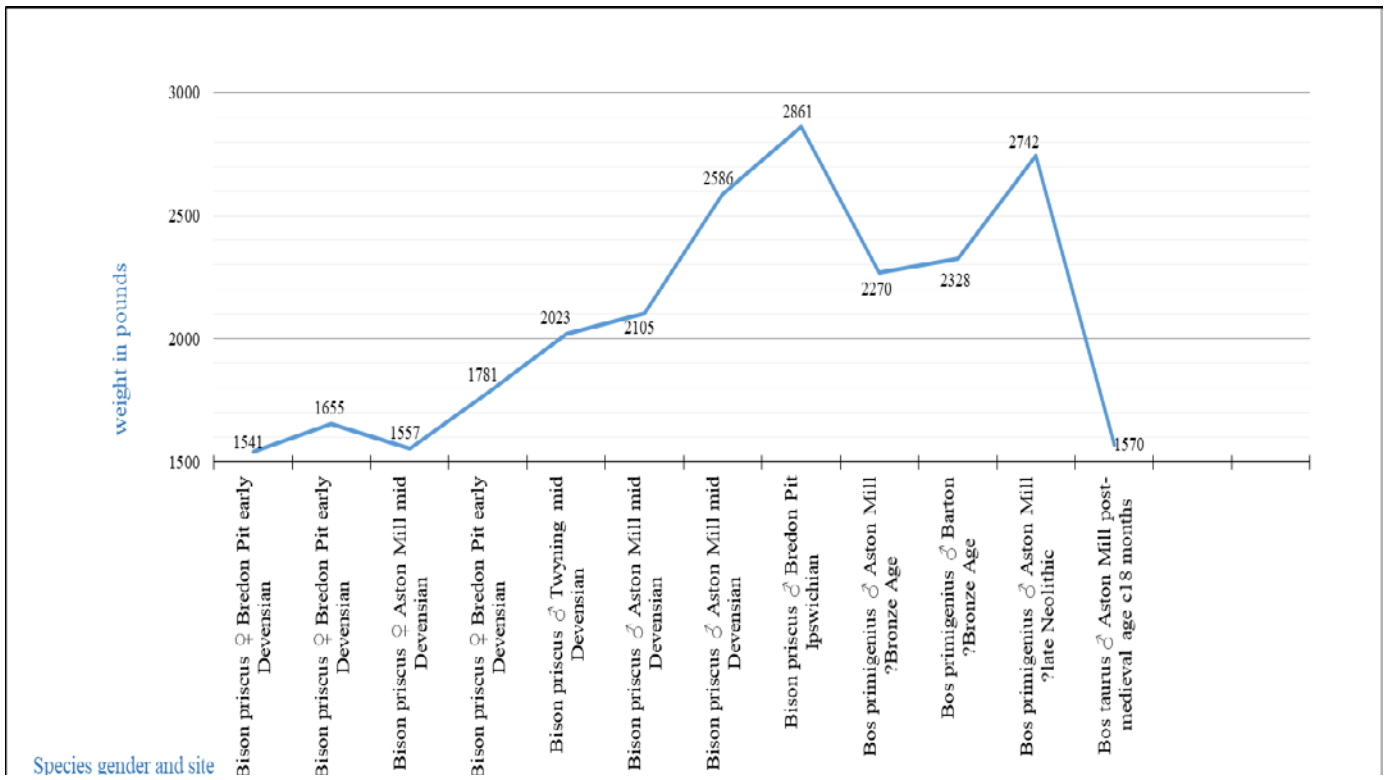
24. Aston Mill, Holocene channel, stick peat, SO944354 27 July 1975. Diaphysis of left femur probably of Wild Boar *Sus scrofa*

Some of the isolated cattle teeth and bones from the stick peat polarise quite clearly into two groups on the basis of fine details. Teeth of Aurochsen that could in theory be confounded metrically with those of large domestic bulls can in this instance be distinguished by their weight, by the quality and thickness of their enamel and by the thickness of their cement. The compact tissue of appendicular bones of Aurochsen from the channel is also denser than that of domestic cattle and it is clear that Aurochsen were functioning optimally; their meat must have been of very high quality as anyone who has consumed meat from wild-caught Wild Boar or Wisent will know. The compact appendicular bone tissue of Aurochsen recovered from Holocene fluvial sediments of the River Avon are frequently observed to be of greater density then those of domestic cattle; Zedda, Brits, Giua & Farina (2018) demonstrate that mammalian bone condition and structure is strongly influenced by domestication and an experienced osteologist will discern this. Bronze Age domestic cattle husbandry at Aston Mill may very much have been work in progress; 25 illustrates a mandibular ramus of a domestic oxen *Bos taurus* recovered from the stick peat which developed significant periodontal infection and resorption of alveolar tissue.

25. Aston Mill, Holocene channel, stick peat, SO944354, 27 July 1975. Left mandibular ramus Middle Bronze Age domestic '*Bos longifrons*' (syn. *Bos taurus*) with molars in place showing effects of chronic periodontal disease

According to Grigson (1969) and Wright (2013, p. 259) the size of Aurochsen did not reduce in Britain until after the Neolithic and this is confirmed at Aston Mill. The butchered skeleton in the stick peat was initially assigned by me to a bull and subsequently confirmed by reference to gender measurements given by Degerbøl & Fredskild (1970). 11B and 12A illustrate appendicular bones from enormous animals that on stratigraphic grounds are likely to be pre-Bronze Age; in size they rival any that ranged across Europe. It is astonishing that, as a measure of Holocene woodland productivity, the butchered femur from the huge sub-adult bull illustrated in 11B attained this size in less than three years.

During the 1970s Miss Barbara Noddle, a veterinary osteologist, developed a method of calculating the carcass and live weight of domestic cattle from bone biometrics (Noddle, 1971). I engaged with Miss Noddle to determine whether or not her calculations might be applied to Aurochsen or even to bison and deer. The value of her work, even if the fat and muscle content of the animals differ widely, is that if the metrication is applied uniformly and is spatially constrained a useful **comparative estimation** of body weight can be achieved even if it is not accurate to the nearest pound.



26. Live weights of Bovidae from the Carrant Main Terrace based on the size of their tali following Noddle (1971). Tali are illustrated in 13.

Figure 26 compares the live weights of individual bovids from the Carrant Main terrace based on the size of their tali (illustrated in 12). Female Steppe Bison *Bison priscus* Bojanus, 1807 of the last ice age cluster between 1500 pounds and 1800 pounds in weight with presumably young males attaining 2000 pounds in weight. Two male *Bison priscus* exceed this, one attaining 2861 pounds or 1.43 tons in weight. Animals of this size that function in large social units could be old patriarchs that have lost the drive to migrate. The Aston Mill pre-Bronze Age Aurochsen (12A) was clearly a huge animal attaining 1.37 tons in weight based on these metrications. The more recent example (12B) dredged from the bed of the modern Carrant Brook weighed 2270 pounds or 1.13 tons.

27. Aston Mill, Holocene channel, Bronze Age stick peat, SO94433545. Red Deer *Cervus elaphus*. Left: repointed antler tine flint tool fabricator found with incomplete skeleton of ♂ *Bos primigenius*, 27 May 1975. Right: indeterminate basally chamfered antler tine tool, 27 July 1975.

28. Aston Mill, Holocene channel, SO94433545, 27 July 1975, Middle Bronze Age stick peat. Red Deer *Cervus elaphus*, cast antler burr ad brow tine, the bez tine (arrowed) removed by circumferential cutting.

Red Deer *Cervus elaphus* (Linnaeus, 1758) is represented by three butchered lower leg bones, a complete talus, a vertebra, a fragmentary scapula and five antler fragments of which three (27, 28) are artefacts. The flint tool fabricator (27) found in association with the incomplete Aurochsen skeleton has been re-sharpened more than once.

The overlying clay alluvium

The infill of the channel that brought it up to the modern land surface seems to have happened rapidly, perhaps at great speed. The grey-brown clay is largely oxidised Charmouth Mudstone introduced by erosion of exposed sediments higher upstream, as a result of either cultivation or more probably by destabilisation of sediments through a combination of woodland clearance, increased precipitation and gravitational impacts. This alluvium corresponds in time and sedimentology to similar sediments that overlie evidence of the Bronze Age in the River Avon valley (Shotton, 1978; Whitehead, 2006b).

The clay contained a small scatter of very well preserved sharp flint tools of undoubted late Bronze Age affinity and a few rather shapeless flint flakes but there was no evidence of stratified archaeological activity or of livestock. Terrestrial and aquatic molluscs were observed, especially within the top 15 cms of the fill. These include a few compressed fragmented valves of aquatic *Pisidium* spp, and also shells of the planorbid *Anisus leucostoma* (Millet, 1813), a species that tolerates somewhat turbid or sluggish water-bodies. The synanthropic Garden Snail *Cornu aspersum* (O. F. Müller, 1774) also makes its first appearance and there were fragments of *Arianta arbustorum* (L., 1758) a helicid snail often of riverside herbage. The widespread hygrophilous *Trochulus hispidus* (L., 1758) also occurred commonly. As an assemblage this suggests that the impact of the human fingerprint had become more apparent.

Pollen samples were taken from a section of uniformly structured alluvial clay 53 cms deep. At a depth of 40 cms there was still evidence of sedges Cyperaceae and while oak and alder maintained a presence, clearing had accelerated. At a depth of 15 cms there was no real evidence of surviving woodland and the pollen was dominated by wild grasses Poaceae indicative of clearance.

Summarising comment

Sequential channel fills at Aston Mill, Kemerton, Worcestershire, hallmark human activity on the Main Terrace of the Carrant Brook over much of Holocene time. The riparian landscape of the Bronze Age was dominated by alder, oak and Hazel woodland which was progressively cleared until by the Late Bronze Age or early Iron Age the channel was obliterated by in-washed clay and its content sealed. Evidence implies that the Middle Bronze Age inhabitants of Aston Mill were living in an economic twilight zone; one in which hunting and gathering was by no means entirely superseded (the large-scale consumption of wild elder berries at Aston Mill persisted until at least AD250) by pastoralism. Evidence from skeletal remains suggests that as Aurochsen became scarcer, due to both direct human persecution and loss of habitat, stocks of domesticated cattle increased, presumably as a direct response to need.

It may not be generally understood that once the bases of mature trees are permanently encircled by water or wet sediments death may follow with great rapidity in the course of just three or four years; **the riparian valley woodlands discussed here may have been extinguished like a flash of light.**

The combined evidence from the Holocene Channel points clearly to rapid major habitat loss. Under these circumstances the domestication of cattle would have acquired some urgency. In terms of cattle 'breeds', with the possible exception of the item shown here as 05A, only the Celtic Shorthorn Oxen '*Bos longifrons*' has been identified at a time when Aurochsen were simultaneously still being hunted. Celtic Shorthorn cattle persisted as a feature of the domestic economy of Aston Mill

more or less continuously until at least AD250 (Whitehead, unpublished). The integrated evidence for landscape and biota indicates that the Middle Bronze Age of the Worcestershire River Avon catchment was a time of rapid profound change in human activity and the fabric of society as well as in the landscape, vegetation, and biodynamic; for the last of the hunter-gatherers confronted with diminishing resources these changes are unlikely to have been implemented seamlessly but may have been favoured by the availability of deep productive well-drained loams capping the terrace sediments. Riparian contact was not abandoned but the integrated dynamic of risk, sustainability and dietary quality that hallmarked an extended period of prehistory was never regained. On and beneath the Carrant Main Terrace sediments, the essential techniques of butchery that were applied to bison 40-60000 years ago were indistinguishable from those applied to Aurochsen 3500 years ago.

Repository

Formal arrangements have been made for the physical items described here to be lodged in a regional public repository.

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Postscript
According to Whitehead (forthcoming), an invertebrate assemblage from the floodplain of the River Severn may be a parallel for later prehistoric woodland clearance-phase entomofaunas of the English midland floodplains.
Reference: Whitehead .P.F., 2022 (in press). A notable humanly compromised Worcestershire floodplain entomofauna.