Homo sapiens or Castor fiber?

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This article shows how environmental evidence for European stone age forest clearance may require re-interpretation, and that change need not be attributed only to climate or man. Observations in North America and Europe show the beaver to be a significant agent of land transformation. The authors suggest that both hunters and farmers took advantage of the opportunities thus presented, and a few hints are provided about their detection and the implications for the Mesolithic and early Neolithic of north-western Europe. J. M. Coles is Professor of European Prehistory at Cambridge and B. J. Orme is Lecturer in Prehistory at Exeter. They are joint directors of the Somerset Levels Project, the source of the ideas for this article.

Following the development of pollen analysis in the earlier part of this century, much effort was devoted to unravelling the sequence of vegetational change during and after the retreat of the last European ice-sheets. The outlines established, questions of causation came to the fore, and the debate focused on factors such as climatic change, rate of species migration from glacial refuges, and natural vegetational succession. In more recent decades, a further factor has been widely investigated, namely the possible influence of humans on the landscape, principally as farmers and smiths. The development and modification of hypotheses is well illustrated by the Elm Decline of the Atlantic period, where climate (Iversen, 1941) or man (Troels-Smith, 1960) and occasionally disease (see refs in Simmons & Tooley, 1981, 134) have been held responsible for a widespread but by no means straightforward decline in elm pollen.

During the 1970s, anthropogenic interference with the natural forest cover was pushed back to the Mesolithic (e.g. Smith, 1970) and discussed in terms of hunting strategies and early attempts to control herbivores (e.g. Mellars, 1975, 1976). Inevitably, it now seems, similar effects have been observed in the Pleistocene, and sites as remote in time as Hoxne have their episodes of forest clearance possibly associated with human activity (Evans, 1975, 14–15). Today, few doubt that man influenced the landscape, and research is aimed at elucidating the details of where, when and for how long people have been affecting the natural course of events.

From time to time, it has been suggested that animals other than man could also have affected the growth and decline of the forest. In the influential paper that for many prehistorians first drew attention to mesolithic deforestation, Smith wrote that, 'While we have seen reason to believe that clearings were made by pre-neolithic man, it is possible that clearings were created by indigenous herbivores' (1970, 89). This possibility has been generally ignored. Environmentalists have recognized the difficulties of associating the pollen evidence for forest clearance with archaeological evidence for contemporary people who could have been responsible, and in numerous regions the evidence for clearance precedes the earliest known artifacts (e.g. Cumbria: Pennington, 1975; North York Moors: Spratt & Simmons, 1976; Netherlands: Groenman-van Waateringe, 1978). Similarly, the initiation of peat growth may be attributed to the detrimental effects of forest clearance for early farming, or it may occur before any farmers are known in the vicinity (Edwards, 1979). In both cases, the problem is seen as one of 'distinguishing between climatic and anthropogenic effects' (Simmons & Tooley, 1981, 141). The suggestions of a decade ago with regard to animals other than man have not been followed up, and although the needs and the habits of various herbivores have been explored in order to further the understanding of prehistoric subsistence, no animal species has been advanced as having an influence equal to or even approaching that of man. It is our purpose here to suggest that Castor fiber, the beaver, could have had such an influence.

A recent consideration of beaver (Coles & Orme,
1982), arose from evidence recovered from the peats of the Somerset Levels. There we described the activities of this aquatic, herbivorous mammal which dams running water with wood, mud and stones to create a pool where the lodge is built. The characteristics of beaver-felled wood were examined and it was shown that neolithic man had made use of willow felled by beaver in the construction of a shoreline platform. In the present context, it is the widespread effect of the beaver dam on the surrounding area which is of interest, together with the duration of the environmental change wrought by the species.

Beaver flourish in varied environments, given running water and sufficient food. They will dam tiny rivulets in wooded hills, or the relatively slow waters that meander through the willow scrub and reeds of a marsh or floodplain. In all cases, the dam raises the water level, creating a pool and killing the submerged vegetation. There is soon an abundance of dead wood as trees felled for food and building are added to those overcome by water (pl. xviib). The effect of the dam-builders is not wholly negative, however, for their pool provides a new environment that is rapidly colonized by both plants and animals: ‘... the dead trees and the new pond become ideal feeding and nesting places for a long list of new wild life. . . . When the trees eventually fall, some of these species are displaced but the pond, now home to frogs, minnows, and new aquatic vegetation, becomes ideal for black ducks, great blue herons, otters and moose. Should the pond be abandoned and the dam break, the area will become a grassy beaver meadow . . . ’ (Anon., 1978). Replace moose with their European counterpart, the elk, and the same effects may be postulated for the beaver dams of postglacial Britain and north-western Europe. Even a single tree, fallen across a stream, may form a barrier, catching debris and eventually causing floods.

The likelihood of such events being visible in the palaeo-environmental record will depend on the area opened up, and the duration of any break in the forest cover. These are the same factors that affect the chance of recognizing humanly-caused clearances. In hilly terrain, damming a small stream may create a deep pool some 20–30m across (pl. xviia). But dam a similar stream flowing through a broad valley and many acres may be flooded (pl. xviia). Fig. 1 shows the effect of dams
across a stream in the Algonquin National Park, Ontario, where beaver colonies have slowly moved upstream, building successive dams of varying length and creating substantial bodies of open water and later meadow, where previously there was only forest and stream (pl. xviiB). Lake Amikeus is now some 600–700m long, and is home to at least 10 colonies. The impact of each individual colony and its pool on the forest canopy may not always be detectable in the pollen record, but an overall decline in tree pollen is likely to be evident, and individual open spaces the size of Amikeus Lake would be reflected in any near-by pollen core. If these statements lack precision, it is because the pollen analysts themselves are still disentangling the complicated relationships of size, duration and location of clearings vis-à-vis visibility in the environmental record (Ashbee, Smith & Evans, 1979, 296; Sims, 1978; Barker & Webley, 1978 with Evans; Thomas, 1982; Edwards, 1982). One factor which could favour the preservation of evidence for beaver clearance above that for human clearance is that beaver regularly provide an environment conducive to the development of a pollen record, in their pool which slowly fills up with silts and peat, whereas people as farmers disturb the natural succession of deposits and hinder the development of any pollen record actually within their patch of open ground. Another factor to consider is the overall density of beaver colonies. Fig. 2 indicates that this can be high, and the corresponding effects on the pollen record are all the more likely to be evident.

The duration of beaver clearings is as variable as their size. The most common reason for abandonment is lack of food, and in woodlands with few of the favoured tree species (poplar and willow), the supply can be depleted in a year or so. In broad marshy areas with an abundance of edible aquatic vegetation including water lily, the beaver may be
The pollen evidence for the elm decline, there is an increase in deadwood feeders, followed soon afterwards by the appearance of aquatic beetles and seeds of aquatic plants, and dung beetles (Girling & Greig, 1977). The topography and the increases in these particular groups of beetles allow for interpretation in terms of a beaver pool, flooded trees and a local increase in food for herivores, a combination that then attracted human use of the area.

The early mesolithic occupation at Thatcham, in Berkshire (Wymer, 1962), is often merely quoted as an example of a settlement by water. But Evans has noted that, 'It is probable that the beaver were building dams, for the occupation at Thatcham was on the edge of a former lake whose existence is hard to explain solely on local topographical grounds' (Evans, 1975, 88; Peake, 1933). Wymer records a narrow trench in Site III, c. 3 ft wide and 18 in deep, running c.15 ft. . . . This artificial cutting was filled with the same black clay as the occupational surface but, when open, must have formed a narrow channel of water linked to the lake' (Wymer, 1962, 336). The suggestion was made that this was used for trapping fish. Beaver bones were identified from the site and beaver are known to dig channels of these dimensions to float wood down to their pool, and for quick escape routes when they are working away from the main body of water. One beaver channel we have observed is over 100m long, one metre wide and is remarkably uniform in its appearance (PL. xviiia); it would seem logical to attribute both channel and lake at Thatcham to them. This site therefore provides good direct evidence for beaver activity and the association of mesolithic people with the suggested beaver landscape is strong; who 'cleared the forest from the edges of the water' (ibid, 336) is uncertain, but it was as likely beaver as man.

Many other British mesolithic sites are good candidates for illustrating an association of man and beaver, none perhaps more so than the best-known of them all, Star Carr (Clark, 1952). The evidence relevant to beaver activity is varied. Their bones were identified from the faunal remains. The setting on the edge of a body of water would be as favourable to beaver as to man. The abundant pine in the pollen record and its absence in the macrofossil remains could be a reflexion of the beaver's distaste for conifers. The agglomeration of branches, together with heaps of stone and clay, are typical of beaver building methods (for a more detailed description, see Coles & Orme, 1982). The clearest evidence that beaver were more than man's prey at Star Carr comes from a single piece
of wood, illustrated in Pl. XX,G in the original report. It has been rephotographed and is shown here in Pl. xviii. The marks are blurred after 30 years pickling in alcohol, but they are those of beaver teeth, not mesolithic blades. Having mis-attributed similar wood from the Baker Platform to neolithic man (Coles, Fleming & Orme, 1980) and only subsequently recognized the mark of the beaver (Coles & Orme, 1982), we are confident that this branch from Star Carr platform was likewise cut by beaver. Beaver are unlikely to have been responsible for the whole platform at Star Carr, and the human activities upon and around it are not in question. What matters in the present context is that alteration of the landscape at this location may well have been initiated by beaver, and the mesolithic people were quick to occupy a favourable position, probably disposing of the original inhabitants.*

For the British Mesolithic we suggest, in the light of the above, that some of the clearances which are evident in the environmental record could have been produced by beaver, and that people were attracted to beaver clearings by the water, the dead wood for fuel, the varied plant life, and the likelihood that elk, aurochs and deer would also be drawn to the locality. Future research could usefully be directed to Ireland where beaver bones have yet to be found and where there does not seem to be the same body of evidence for early clearance as there is for Britain (Woodman, 1978, but see Smith, 1981).

Enough may have been said to indicate the possibilities for early farmers as well. The processes of initial clearance and maintenance of small plots for agriculture are not at all well understood for Britain, or for the wide expanses of fertile lands across the European plains. The neolithic environmental evidence is also generally recognized as being difficult to interpret, with climate and farmers entangled in the cause and effect of change (e.g. useful survey in Rowley-Conwy, 1982; Sjøvold 1982). Wherever the environmental record, e.g. pollen, molluscs, beetles, spores, can depict clearance at points in time coeval with recognizable sites of early farming communities, archaeologists have logically expressed the anthropogenic character of land transformation. Where archaeological material evidence is lacking, but where a decline in elm pollen is detectable, the same view is often advanced, but we would argue these cases as not proven. The increase in alder during early ‘landnam’ phases in Denmark suggests strongly that the decline of trees may be due, not to axe-clearance, but to wetland formation through flooding, with alder seizing its opportunity; the sequence could be explained by the activity of beaver. Such effects are not rare, but they are nonetheless complex (e.g. Welten, 1982; Balaam, Smith & Wainwright, 1982). In historic clearances in Canada, one technique used was to build a dam, flood the area upstream, kill all the trees in about eight years, then drain and cultivate. The havoc created over areas of up to 50,000 acres made the method unpopular with government, but think of the pollen record and the slender nature of the human presence!

We can be sure that the Atlantic forest was moth-holed with clearings wherever beaver were present, and the grassy meadows of relict pools (Pl. XVI & FIG. 1) would have provided ready grazing for the domestic animals of early farmers as well as attracting wild herbivores. Most meadows were probably too wet to grow cereals initially, but would be improved if the (abandoned) dam was broken through, and then the dead trees within the area of the pool could be easily burned and the land taken into cultivation. The problems of burning living forest in temperate Europe would thereby be avoided.

It is a well-recognized phenomenon that a majority of the early neolithic settlements across the loesslands of north and west Europe were positioned on relatively low ground, and often in small valleys draining into the major rivers. Many such sites of the Linearbandkeramik groups are near the headwaters of small streams, others are nearer their outlets (e.g. Netherlands: Modderman, 1970; Poland: Kulczycka-Leciejewiczowa, 1970; Czechoslovakia: Pavlu, 1977; Belgium: Roosens & Lux, 1969; France: Soudsky, 1974, 75–94). Many such sites are in precisely those positions where beaver would have lived, by shallow streams or meandering watercourses, and we think that some of the land-take of the first farming communities may have been influenced by and in some cases a stealing from the beaver.

A number of the earliest neolithic settlements have yielded bones of the animal (e.g. Yonne Valley, France: Poplin, 1975; W. Netherlands: have now been deposited in the University Museum of Archaeology and Anthropology, Cambridge.

* The original site-plans and notes from Star Carr, and also the wooden specimens, including the paddle,
Crookman-van-Waateringe, 1978; C. Germany: Müller, 1964; Vlasac, Yugoslavia: Bökényi, 1975), and their presence is attested in many areas well into the later expansionist phases of settled agriculture (e.g. Osovec, Belorussland: Šćeglova, 1975; Wessex, England: Coy, 1982). Pollen analysis of the loessland sites has not been marked by enormous success (Kruk, 1980, 40) but in a few places the record shows clearance just prior to any detectable human presence. Again we might suggest that beaver activity should be considered as potentially responsible, and the identification of water meadows in, for example, south Poland need not be 'wholly anthropogenic' as is generally assumed (Kruk, 1980, 43). Where a wide pond was drained by man, the beaver dispersed or killed, the exposed silts would soon support rough grasses and other introduced plants in hoe plots.

Turning back to Britain, we suggest that similar regimes and opportunities existed for early agriculturalists. One example may suffice. A variety of environmental analyses of the deposits from the base of a wide valley at Cherhill, Wiltshire, demonstrate a pre-neolithic disturbance of forest cover, explained as due to mesolithic activity or climatic deterioration. This soil was sealed by tufa with a molluscan fauna indicating 'a series of niches... leaf litter, fallen timber, marsh, and shallow pools—and an overall environment of woodland' (Evans, French & Leighton, 1978, 66); see Pl. xvib & xvia for a possible re-enactment of the scene. The subsequent neolithic activity at Cherhill may therefore have been unwittingly initiated by the totally non-human endeavours of another animal. The value here is the variety of analyses pointing to the possible activity of beaver, and other indicators could be followed up elsewhere (e.g. Girling, 1982; Sims, 1978). Such sites are not hard to find in the British or European Neolithic, and we suggest that woodland clearances as attested by pollen, molluscan or other evidence should not now be solely explained as 'presumably by Neolithic man', the 'Neolithic effect on primary vegetation', the 'advent of man in the primitive landscape', or 'mainly anthropogenic in origin'. We think it essential that topographic factors be carefully assessed on all such sites.

There is of course no implication in these remarks that Neolithic people were not entirely capable of selection, clearance and cultivation of the wooded loesseslands and other untouched areas of the northern half of Europe. But neolithic people were as interested as historic settlers were in choosing the best land, in relying upon wild resources both floral and faunal, and in reducing the energy needed to exploit new lands.

Patches of cleared woodland had existed for their hunting and gathering predecessors, with all the advantages of fuel and wild foods discussed above. Clearings of the same nature were available to the first farmers, with the added advantages of meadow grazing or stone-free, trunk-free soils to till, and early neolithic settlements can be shown to be as closely associated with beaver as those of the Mesolithic. Our attempts to understand human settlement and environmental change, in both the mesolithic and early neolithic periods, should therefore take account of the beaver as an agent of landscape change second only or equal to man. Homo sapiens as pioneer may be metaphorically a mangeur de bois, Castor fiber is literally so.

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NOTES ON THE PLATES

PLATE XVIA
Algonquin beaver lakes and meadow (see also FIG. 1). The meadow in the distance is a relict pool, partially drained when the beaver moved upstream and built a new, long dam to create the lake in the foreground. A lodge stands out of the water, and the spread of aquatic vegetation can be seen on the surface.

PLATE XVIB
Chaos in the forest, Copeland, Ontario. Beaver have been active, damming small rivulets flowing through a flat area of the forest. Widespread waterlogging has ensued, killing some trees while others have become unstable and blown over in gales. Repeated efforts by, in this case, the forest warden to break the dams have been as frequently repaired by the beaver, whose capacity for rapid building is gradually assuming the upper hand. The land around is now waterlogged, trees felled or dying, and clearance developing.

PLATE XVIIA
Small and deep beaver pool in wooded hills, Copeland, Ontario. Here the dam has been built across a trickle of water, and a few trees have been flooded and killed, but the surroundings remain largely wooded. The area
is topographically very uneven, with low hills and
pockets of sand and peat.

PLATE xv11b
View of the short beaver dam at Amikeus Lake, Algon­
quin, Ontario (see FIG. l). This is the most recent dam
constructed, and holds back the entire lake which houses
many colonies.

PLATE xv111a
Beaver channel, dug from one small pool to another in
wooded hills, Copeland, Ontario. The channel is about
one metre wide and 40 cm deep, and was still being
worked on when photographed. It appears to have been
dug to make the beaver’s journeys from pool to pool
safer and easier. Such channels may also be dug from
pool edge into the hinterland to float logs and branches
down to the water, and to give the beaver, working on
the land some distance from the safety of the pool, an
escape route. The uniform width, even edges, and direct
line of such channels might otherwise be taken as the
signs of orderly human working.

PLATE xv111b
Birch branch from the platform at Star Carr, Yorkshire.
The facets on this piece were made by beaver teeth. See
Clark, 1952, Pl. xx, 6 for original photograph.

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PLATE XVI: HOMO SAPIENS OR CASTOR FIBER?

(a) Algonquin beaver lakes and meadow (see also Fig. I). (b) Chaos in the forest, Copeland, Ontario.
See notes, p. 100, on both photos

See pp. 95–102 Photos: J. M. Coles
PLATE XVII: HOMO SAPIENS OR CASTOR FIBER?

(a) Small and deep beaver pool in wooded hills, Copeland, Ontario. (b) View of short beaver dam at Amikeus Lake, Algonquin, Ontario (see Fig. 1). See notes, p. 100, on both photos.

See pp. 95-102

Photos: J. M. Coles
PLATE XVIII: HOMO SAPIENS OR CASTOR FIBER?

(a) Beaver channel, dug from one small pool to another in wooded hills, Copeland, Ontario. (b) Birch branch from the platform at Star Carr, Yorkshire. See notes, p. 100, on both photos

See pp. 95-102

Photos: J. M. Coles