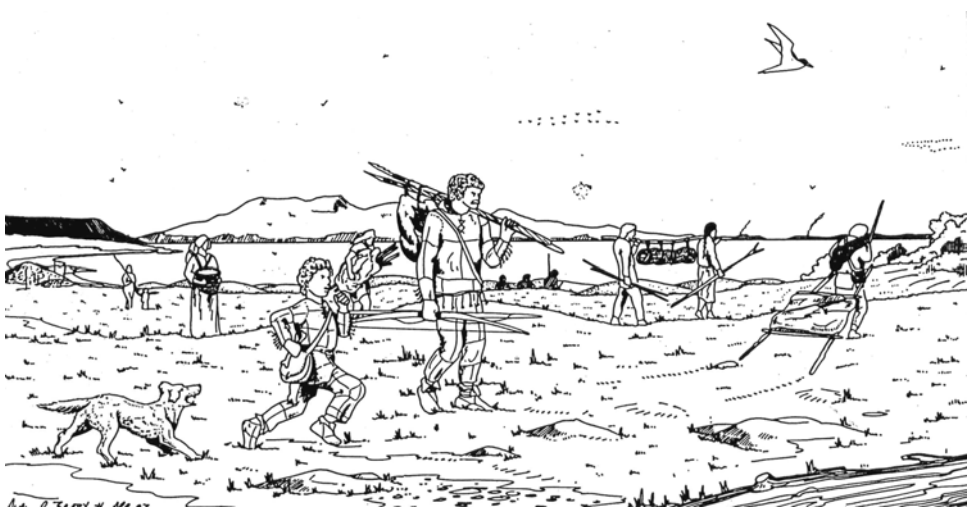
Modern Human Evolution - 2008

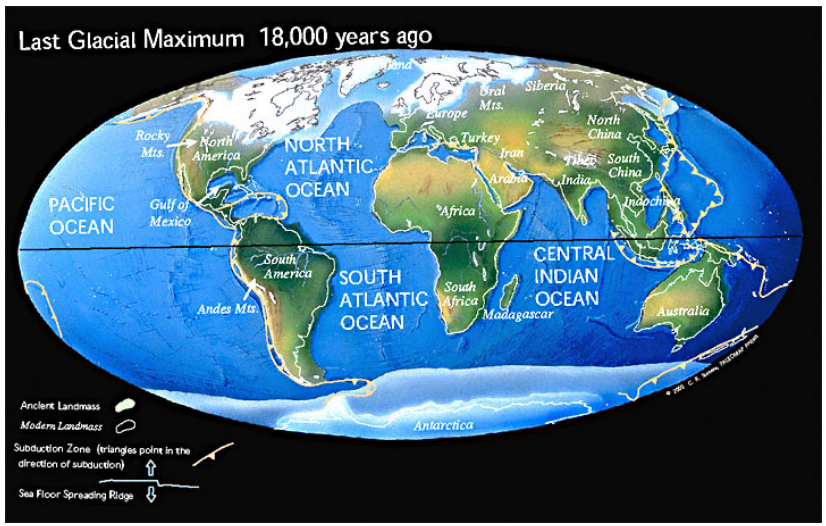
Lecture 6 – post-glacial expansions

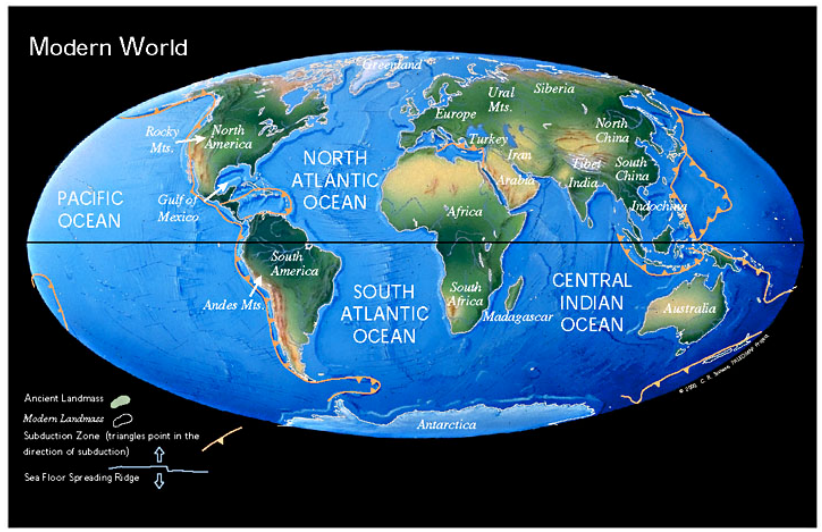
- LGM, late glacial, post-glacial
- Hunter-gatherers: some generalities and examples
- Environmental change in post-glacial Europe
- The re-colonisation of Europe
- Complex Hunter-gatherers
- The colonisation of the Americas (background for seminar)



Reconstruction of a Mesolithic (postglacial) community on the move along the West coast of Scotland

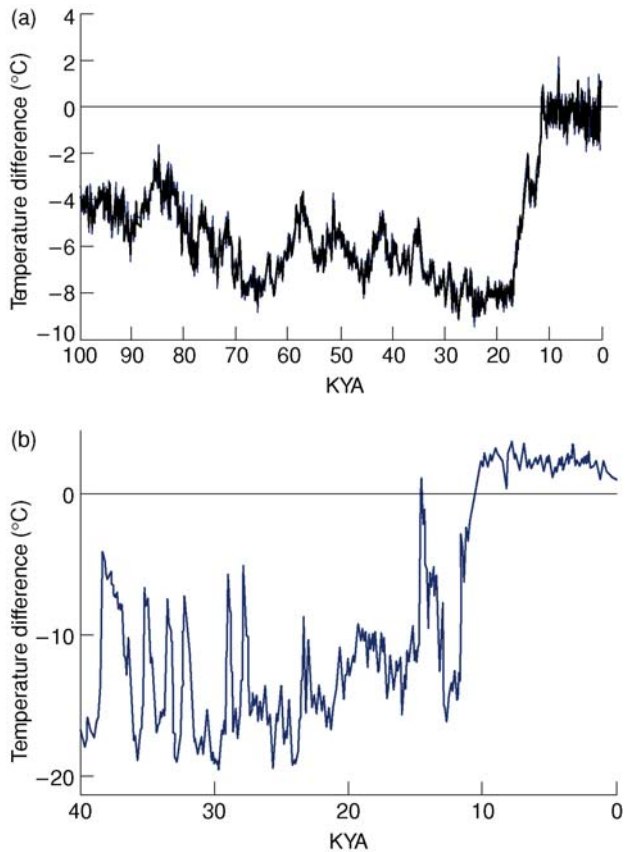
The Paleomap project: Quaternary





http://www.scotese.com

Temperature variation over the last 100 ky



(Figure 9.11; Jobling et al, 2004)

The upper graph shows the data from the Vostok ice core in Antarctica, plotted as difference from today. Note the rapidity of the rise after the last glacial maximum (20ky) to the conditions of the Holocene (10ky onwards)

The lower graph shows the data from one of the Greenland ice cores (GISP2) at a higher resolution. Again, temperature is plotted as difference from today. This core indicates that there were a number of very rapid fluctuations of temperature which then shows a rise. Note the sharp dip just before 10ky and the increase to sustained higher temperatures in the Holocene.

European cultural periods from LGM to Holocene

LGM 20ky

Upper Palaeolithic industries
e.g. Magdalenian (France & Spain)
e.g. Creswellian (a late regional variant of this in Britain)

Tools from Gough's cave, Cheddar; engraving of a horse, Robin Hood Cave, Derbyshire; Engraving of bison, Creswell Crags

The last Upper Palaeolithic industries
e.g. Azilian (France & Spain)
e.g. Ahrensburgian (northern France, Germany, Britain)

Tools from Avington, Cheshire and "bruised blade" from Riverdale, Kent. Decorated horse jaw from Kendrick's Cave, North Wales. Hypothesized reindeer migration routes

Start of the Holocene c.10ky

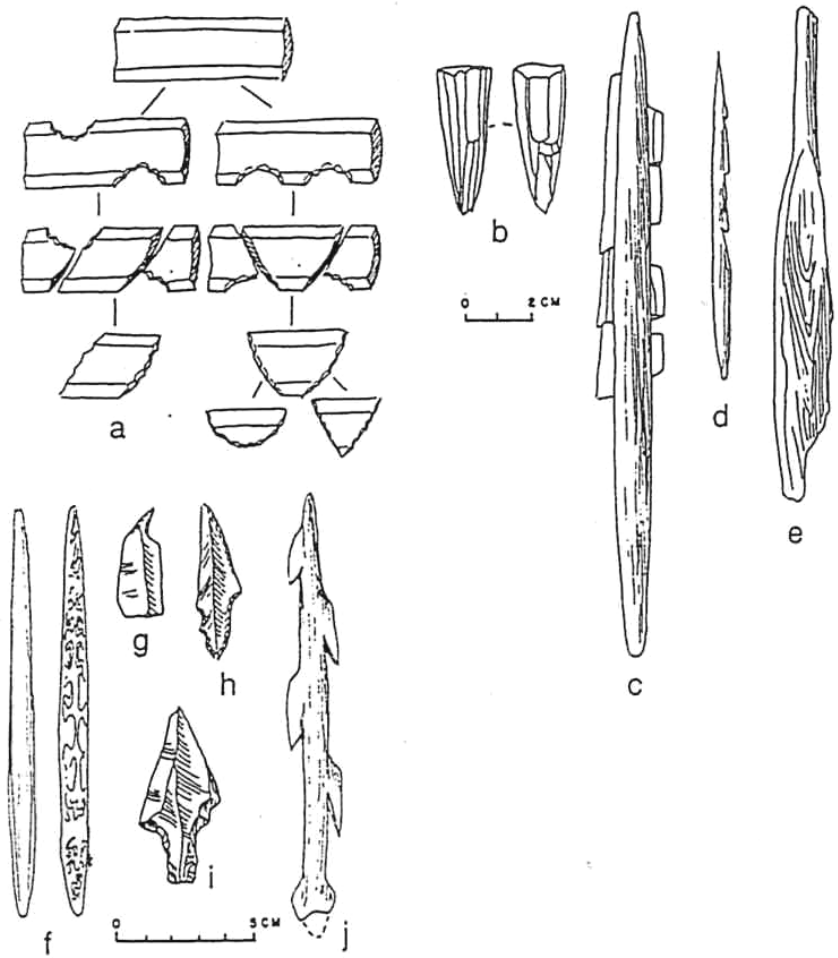
Images from Barton (2005) Ice Age Britain

Technological change in the European Postglacial

The main change was from the large blade-based industries of the Late Upper Paleolithic (Mode 4) to industries based on small blades and composite tools (Mode 5)

The diagram shows microliths and composite tools:
a. production of geometric microliths from segmented blades;
b. microblade core;
c. antler spear with hafted stone barbs;

Examples of tools:
d. barbed antler point (Star Carr);
e. antler mattock (Star Carr);
f. carved half-round bone wand (Ahrensburgian);
g. perforator (Ahrensburgian);
h. tanged point (Lyngby culture);
i. Tanged point (Lyngby culture)
j. biserial barbed antler point (Ahrensburgian).



From Tattersall et al (1988) Encyclopedia of Human Evolution & Prehistory

Post-glacial expansions

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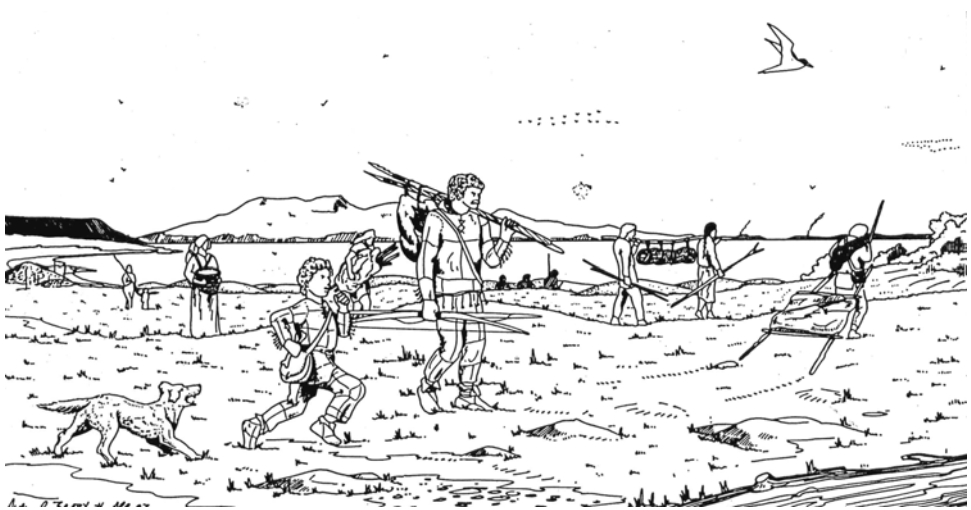


Reconstruction of a Mesolithic (postglacial) community on the move along the West coast of Scotland

A brief sketch of human ecological history

1. Hunter-gatherers (big game focus)
2. Broad Spectrum Foragers
3. Farmers

Upper right – Horse vertebra from Solutre with embedded blade
Lower right – section through the shell midden at Krabbesholm, Denmark (For project description see: http://www.york.ac.uk/depts/arch/middens/resources/denmark/index.htm)
Above – saddle quern from French Neolithic site

Key Hunter-Gatherer characteristics used in interpreting the archaeological record.

CHARACTERISTIC	COMMENT
Hunter-gatherers live at very low densities (usually below 0.1 persons/km^2)	*Even where the distribution of resources is such as to encourage the formation of population aggregates, the overall density of the population remains low – i.e. aggregations are widely spaced.*
Hunter-gatherers distribute themselves according to the distribution of resources.	*An even distribution of resources leads to an even distribution of the population. Clumped resources will lead to local aggregations.*
Hunter-gatherers will tend to seek the nutritionally most valuable foods that can be obtained for the least effort.	*Sometimes other benefits than the merely calorific will lead to more effort being expended.*
Hunter-gatherer populations are often below the critical carrying capacity of an area.	*This gives an allowance for "bad years."*
Hunter-gatherers usually participate in open, or exogamous, breeding networks.	*This arises from the low population density and the need to draw marriage partners from a large population. As a result, populations may be biologically homogenous over wide areas.*
Hunter-gatherer populations have very low growth rates (usually about 0.001%).	*These low rates lead to long periods of demographic stability. In exceptional circumstances rates of 0.1% may be attained.*

Willow smoke and dog’s tails

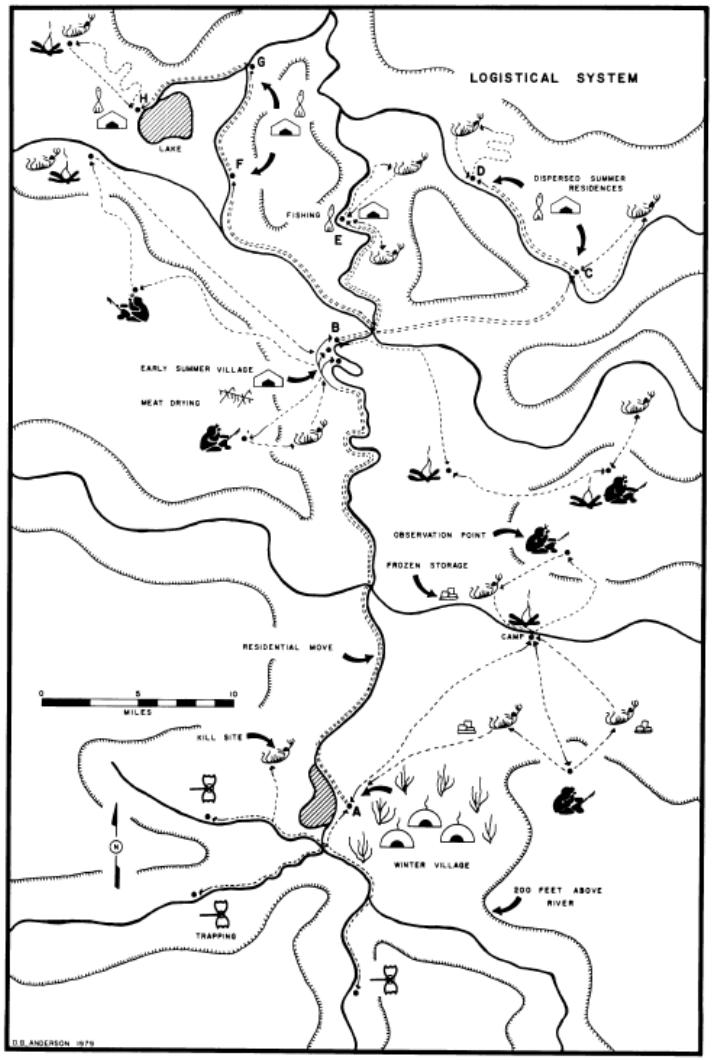


Figure 3. Characterization of a collector subsistence-settlement system.

“An old Eskimo man was asked how he would summarize his life; he thought for a moment and said, ‘Willow smoke and dogs' tails: when we camp it's all willow smoke, and when we move all you see is dogs' tails wagging in front of you. Eskimo life is half of each.’

This man was capturing in a few words a way of life now largely vanished from man's experience: mobile man pursuing food, shelter, and satisfaction in different places in his environment. This paper is a discussion of patterns that I have recognized through direct field study as well as long-term research in the historical and ethnographic literature dealing with hunting and gathering adaptations. I am interested in what, if anything, renders differences in man's mobility patterning, and in turn the archaeological ‘traces’ of this behavior in the form of spatial patterning in archaeological sites, both ‘understandable’ and ‘predictable.’”

Binford (1980) American Antiquity **45** 4-20

Foraging as a way of life

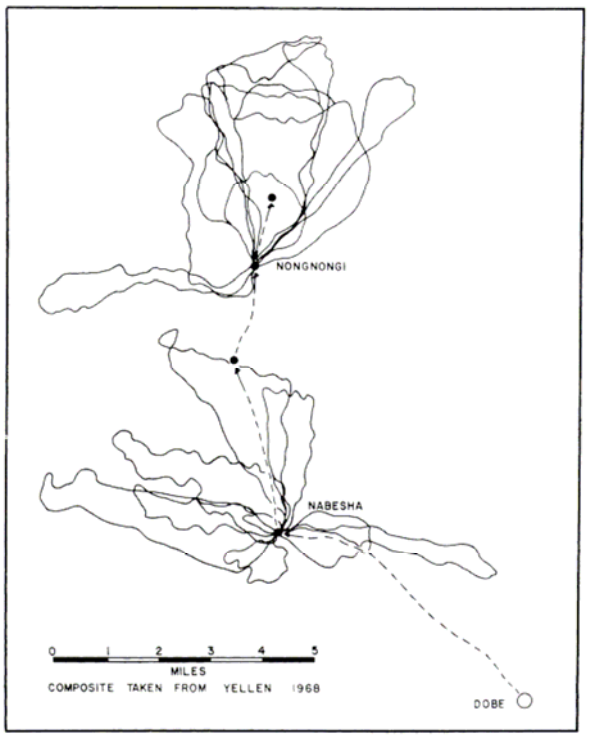


Figure 2. Actual map of foraging trips made by !Kung San around base camps.

Two further figures from Binford (1980) showing (above) the observed pattern of daily activity observed by John Yellen and (right) a summary of the characteristics of a foraging system within which such movement would be habitual.

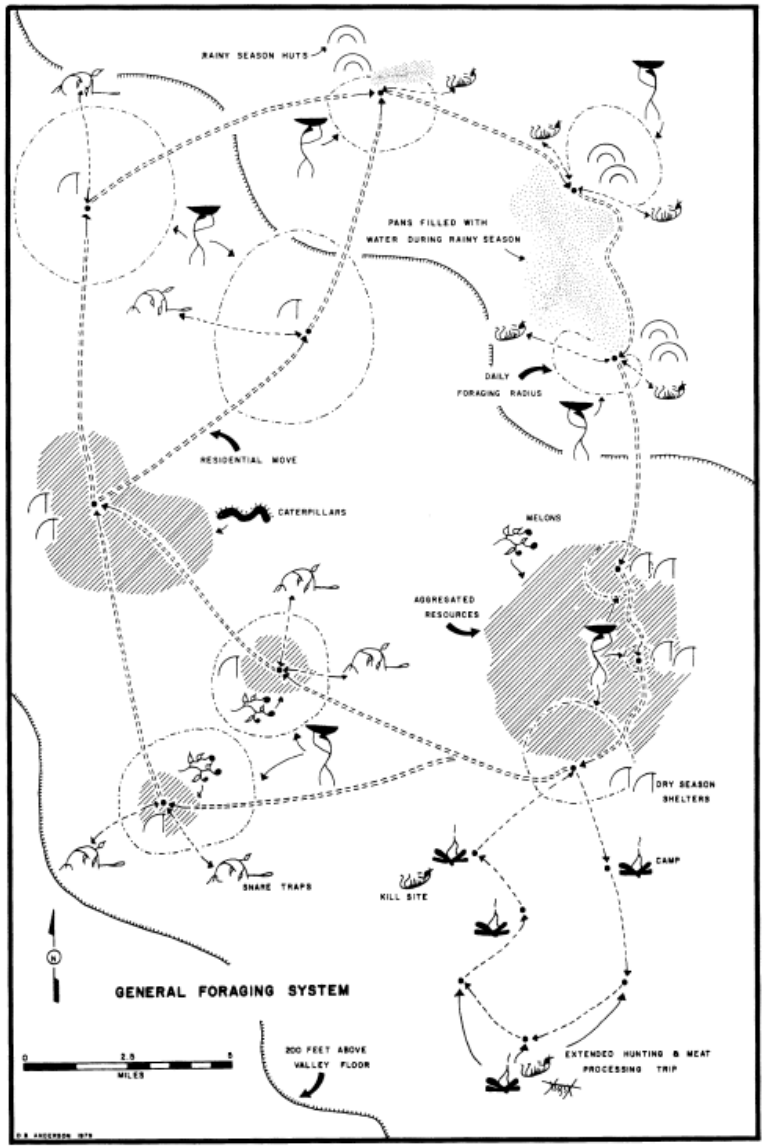


Figure 1. Characterization of a foraging subsistence-settlement system.

Information from individuals: Ishi

Ishi was the last survivor of his people, the Yahi. He spent the last five years at the San Francisco Museum demonstrating his skills and talking to the anthropologists.
We have most information on hunting, as shown here by photographs of Ishi using a bow (1); chewing sinew for binding points to arrows (2); knapping (3). Tellingly, Ishi's knapping tools (e.g. 4) incorporated European elements such as discarded nails.

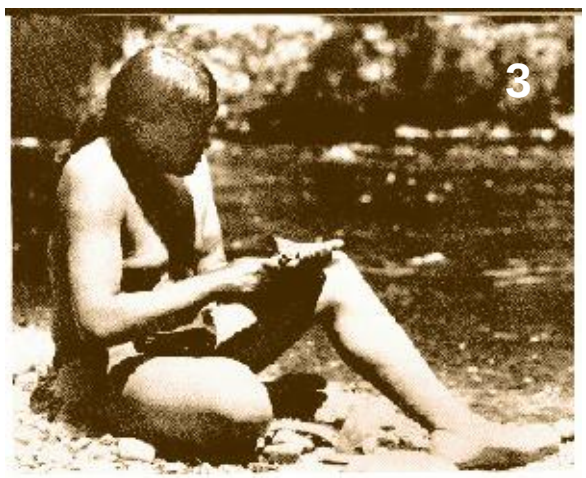
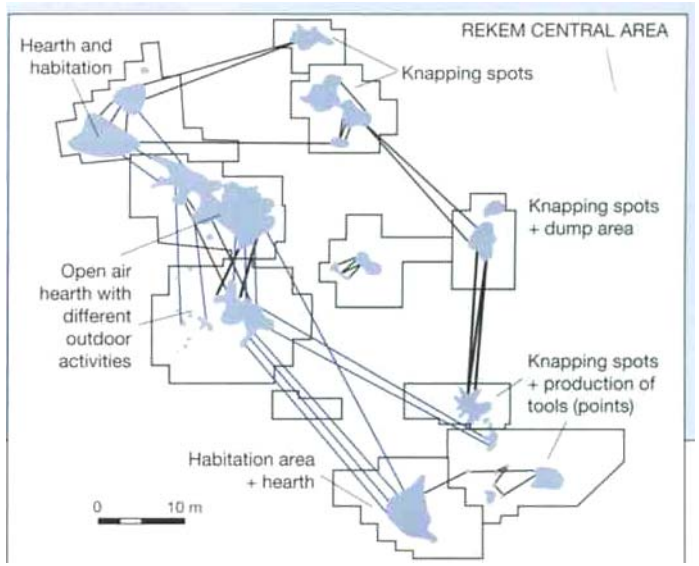
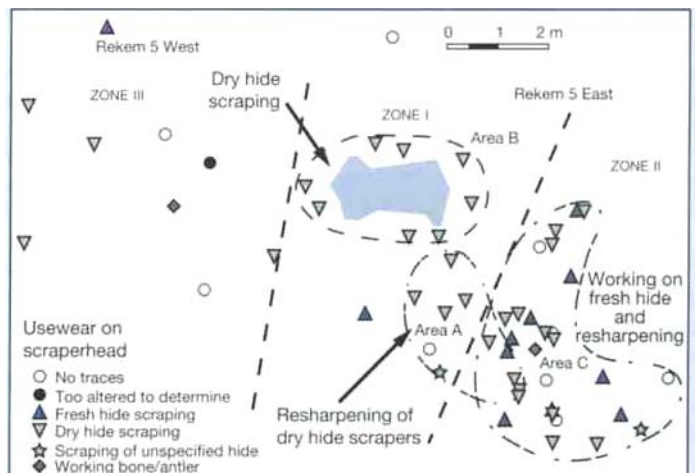


Image sources
1. http://history.library.ucsf.edu/imagelib/imagelib_portraits_ishi3.html; 2, 4. http://hearstmuseum.berkeley.edu/exhibition/ncc/4_2_2.html; 3. http://www.geocities.com/knappersanonymous/ishi.html

Rekem, a Late Upper Palaeolithic camp in Belgium

Rekem was occupied about 13,500 years ago. The site is on a sand dune along the river Meuse. 16 concentrations of artefacts were found in an area of 4.2 acres. However, 12 of these concentrations were quite close together and are shown above right. The separation of knapping areas and habitation zones are the basis for the reconstruction (above) of a hunter preparing arrows in a quiet spot. The lines linking the artefact concentrations show where flint (black) and other stone (blue) could be refitted – showing that the site needs to be considered as a whole. Analysis of the wear traces on scrapers (right) indicate that different stages of hide processing were carried out at different locations within the main habitation areas.

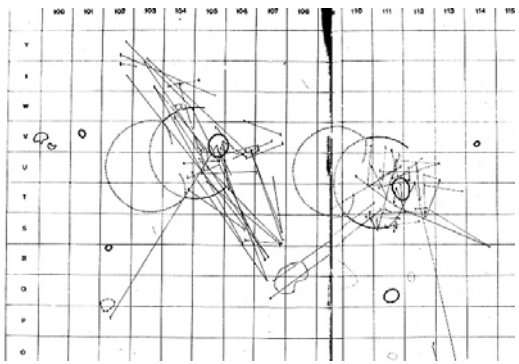


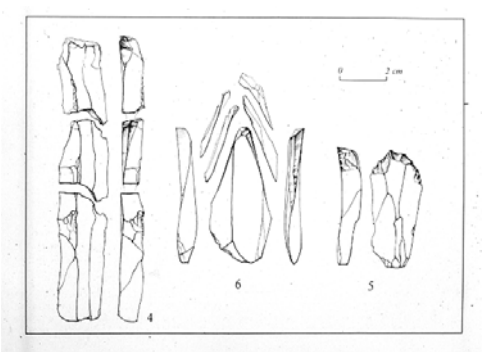


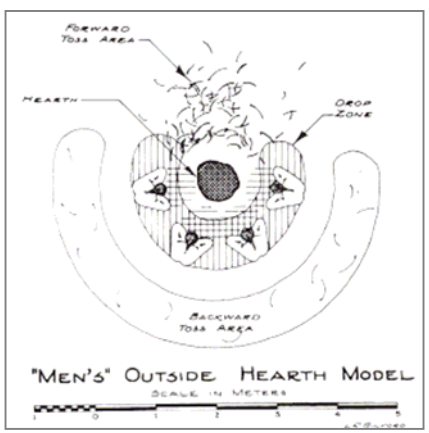
Images & information from Renfrew & Bahn (2004)

Pincevent – Magdalenian reindeer hunters c. 12,300bp

The site at Pincevent is well-preserved because it was covered by fine silts and sands from the river Seine. Careful excavation (left) has revealed a number of episodes of camps at the site – these have hearths (centre of the picture) and a pattern of debris which suggests the use of tents (see reconstruction below), although Binford has suggested that simply sitting around a hearth could produce the same pattern (below). Refitting of stone tools (below left) tells us about use and discard and some sharing (not shown) of tools amongst people around different hearths.







Reindeer hunters at Pincevent – an artist's impression of the scene at this Upper Paleolithic camp in southern France.

Direct evidence for diet from stable isotopes

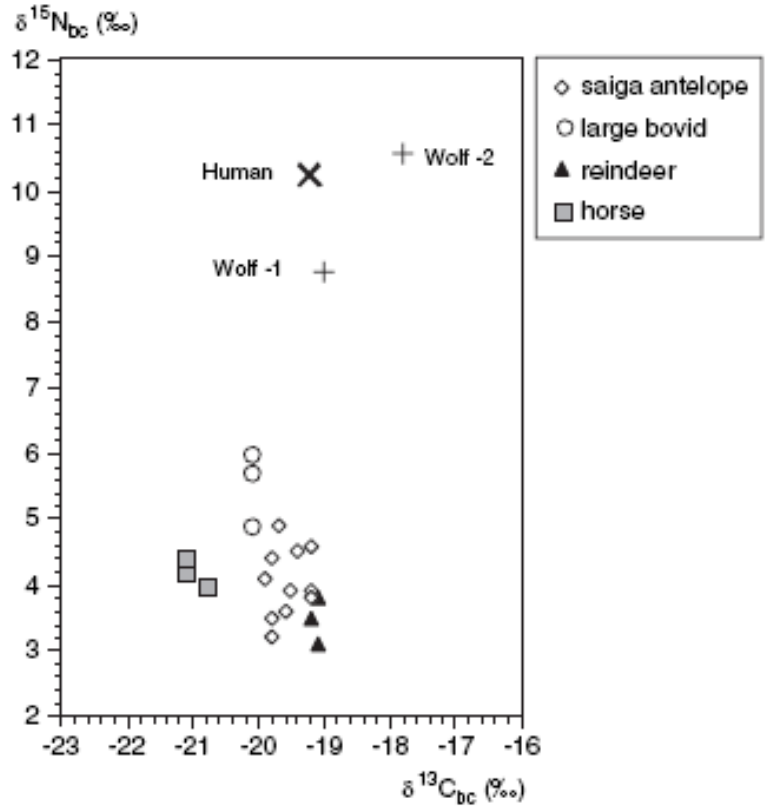
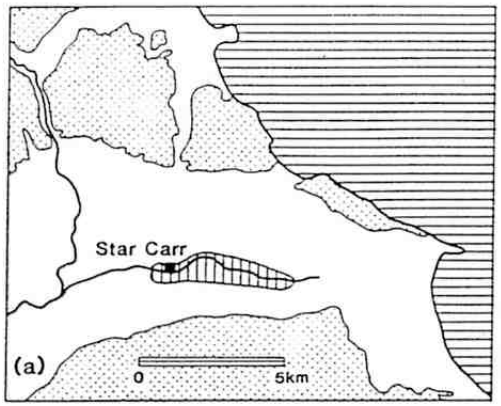
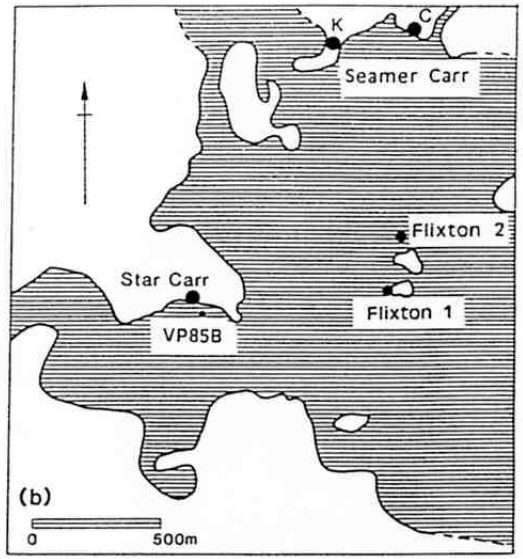


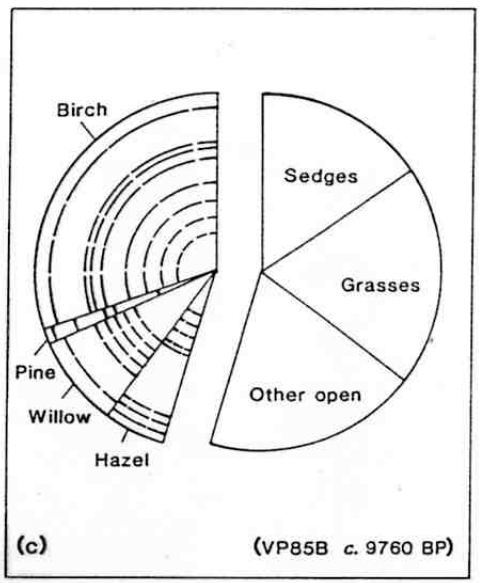
Fig. 2. Values of $\delta^{13}C_{bc}$ and $\delta^{15}N_{bc}$ for collagen extracted from herbivores (saiga antelope, reindeer, large bovids, horse), carnivores (wolf), and the human woman from Saint-Germain-la-Rivière.

Drucker & Henry-Gambier (2005) J. Hum Evol **49** 19-35

Star Carr, a Mesolithic site in Yorkshire c. 9,600bp - 1

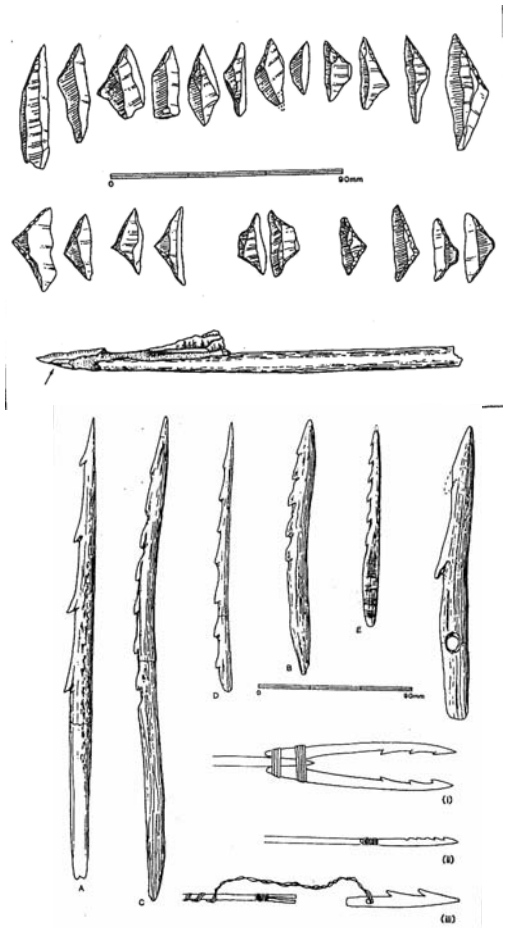






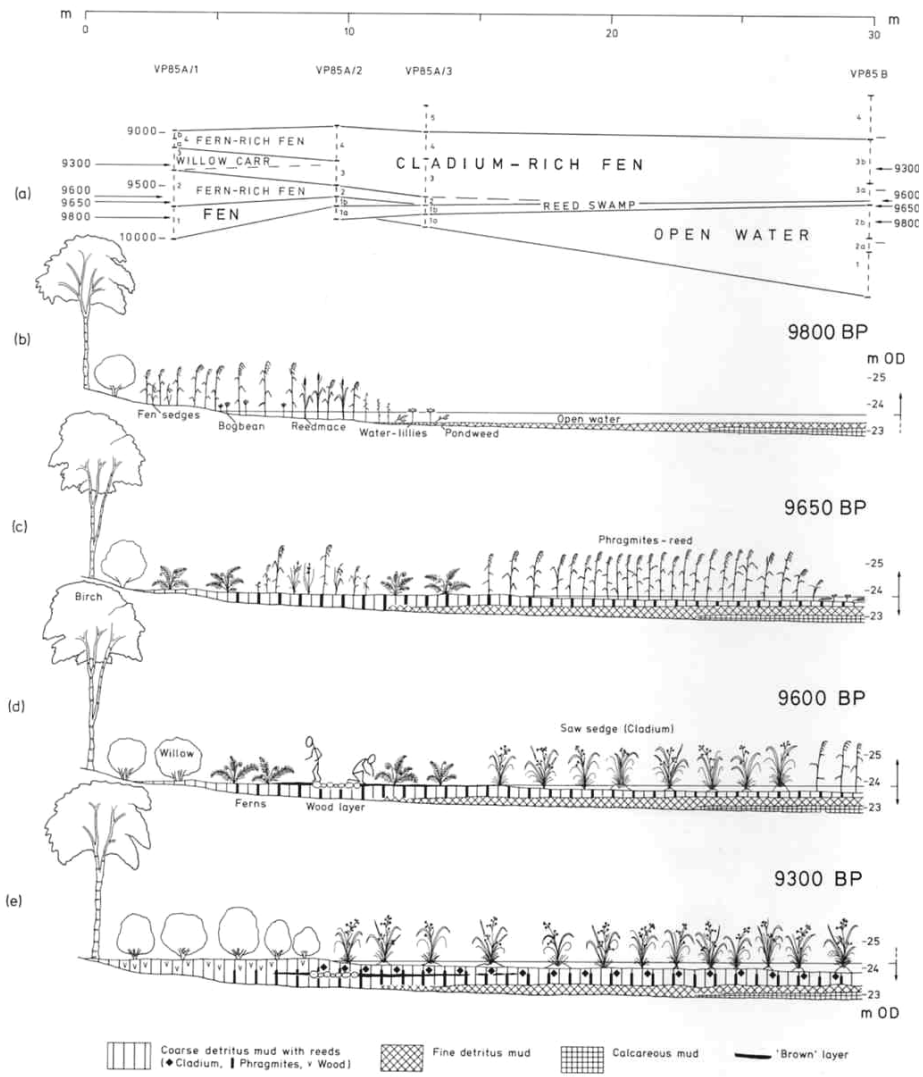
Location – on the edge of "Lake Pickering", together with other sites of a similar age. The pollen core from VP 85B is interpreted as a pie diagram showing the prevalence of different types of pollen for the time of occupation of the site.

All figures from Smith (1992)



Examples, and reconstructions, of microliths (above) and antler tools (below).

Star Carr, a Mesolithic site in Yorkshire c. 9,600bp - 2



An interpretation of the ecological sequence at the site, with the evidence for human presence mainly attested by the timber platform at c. 9600bp. Charcoal from burning off reeds also peaks at this point in the sequence.

Figure from Cloutman & Smith (1988) Proceedings of the Prehistoric Society **54** 37-58

Star Carr, a Mesolithic site in Yorkshire c. 9,600bp - 3

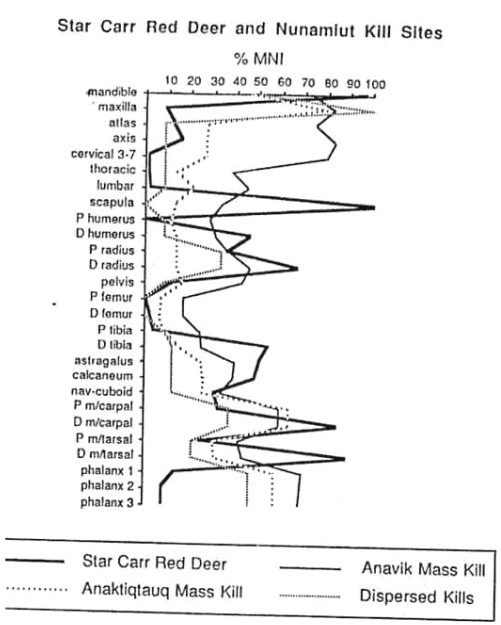


Fig. 35. Percent MNI of the Star Carr red deer, compared with caribou from three Nunamiut Eskimo kill-butchery sites: Anavik (from Binford 1978b, table 2.9 column 2); Anaktiqtauq (ibid., table 2.9 column 4); dispersed spring kills (ibid., table 2.8 column 6).

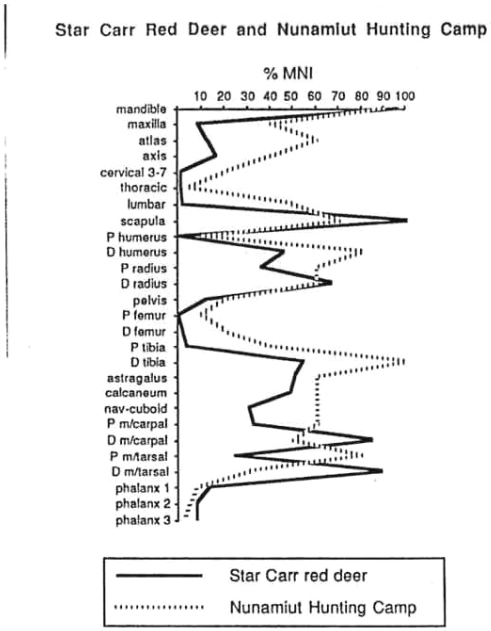


Fig. 37. Percent MNI of the Star Carr red deer, compared with caribou from the Kongumuvuk hunting camp (caribou data from Binford 1978b, table 6.6 column 5).

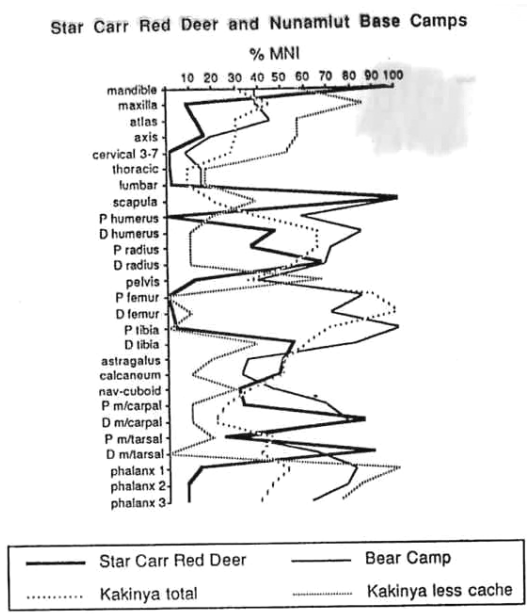


Fig. 36. Percent MNI of the Star Carr red deer, compared with caribou from three Nunamiut Eskimo residential base camps; Bear Camp (from Binford 1978b, table 8.1 column 11); Kakinya Camp total (ibid., table 7.13 column 12); and Kakinya Camp not including the bone cache (ibid., table 7.13 column 14).

These plots, from Legge & Rowley-Conwy (1988) show how ethnographic evidence can be used to assist the deductions made from remaining bones. The relative abundance of red-deer bones is plotted for Star Carr and compared against ethnographic data from three types of sites: kill-butchery sites; hunting camps; base camps. The closest agreement is with the hunting camp (centre panel).

Star Carr, a Mesolithic site in Yorkshire c. 9,600bp - 4

As well as worked and unworked antler, the finds from Star Carr included 21 frontlets from red-deer, which had holes made through the skull and all or part of the antlers still attached. These are interpreted as head-dresses, whether for hunting or for ritual purposes is unknown.

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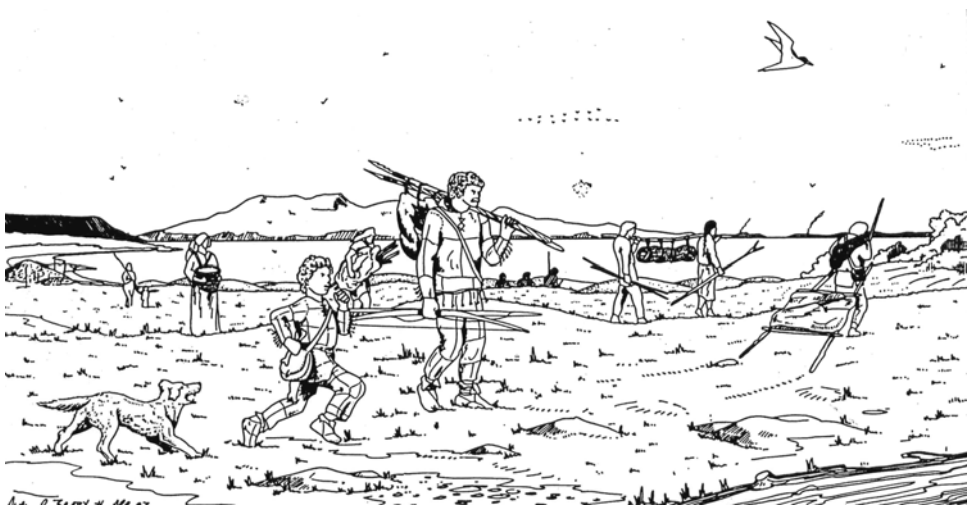
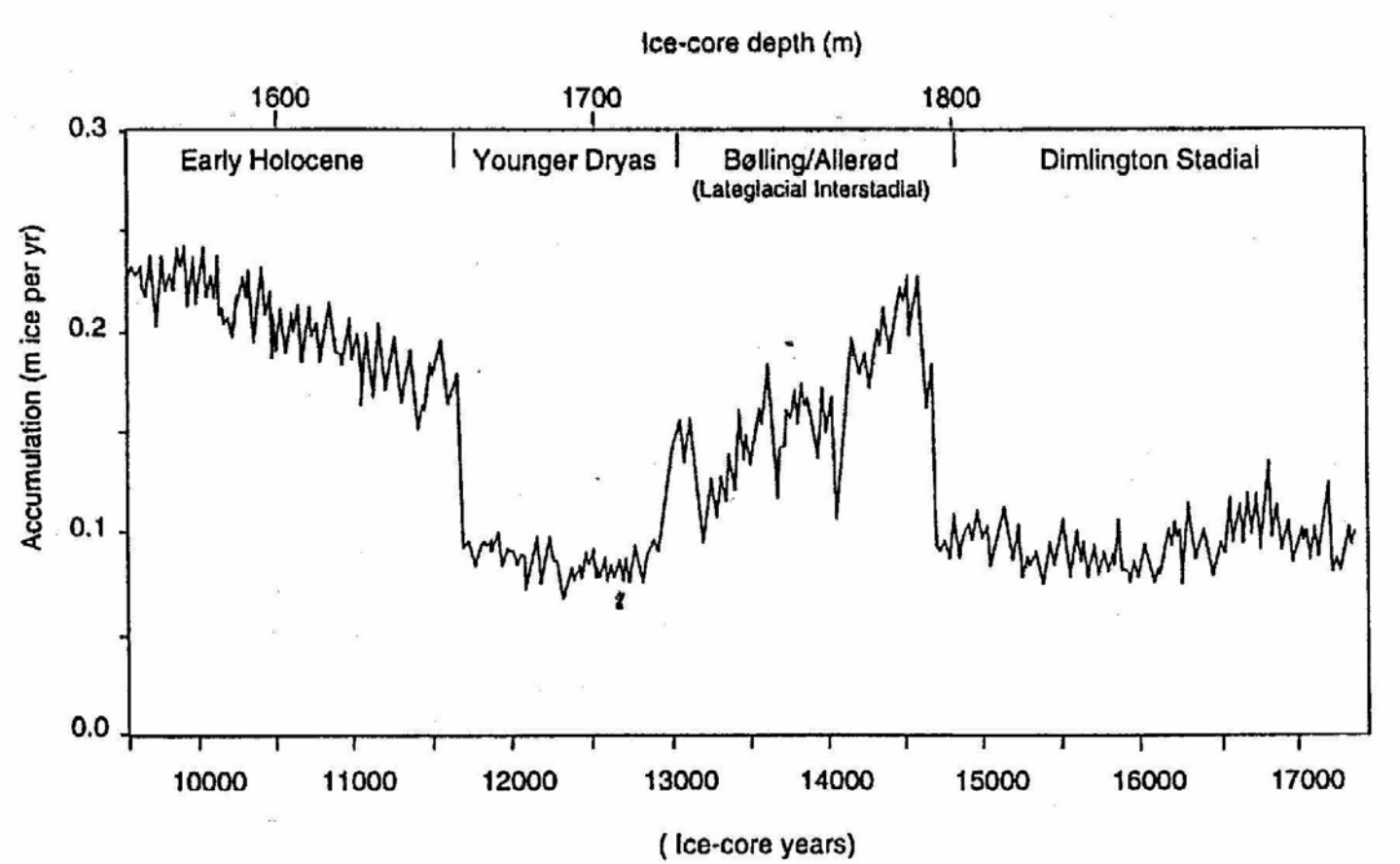


Reconstruction of a Mesolithic (postglacial) community on the move along the West coast of Scotland

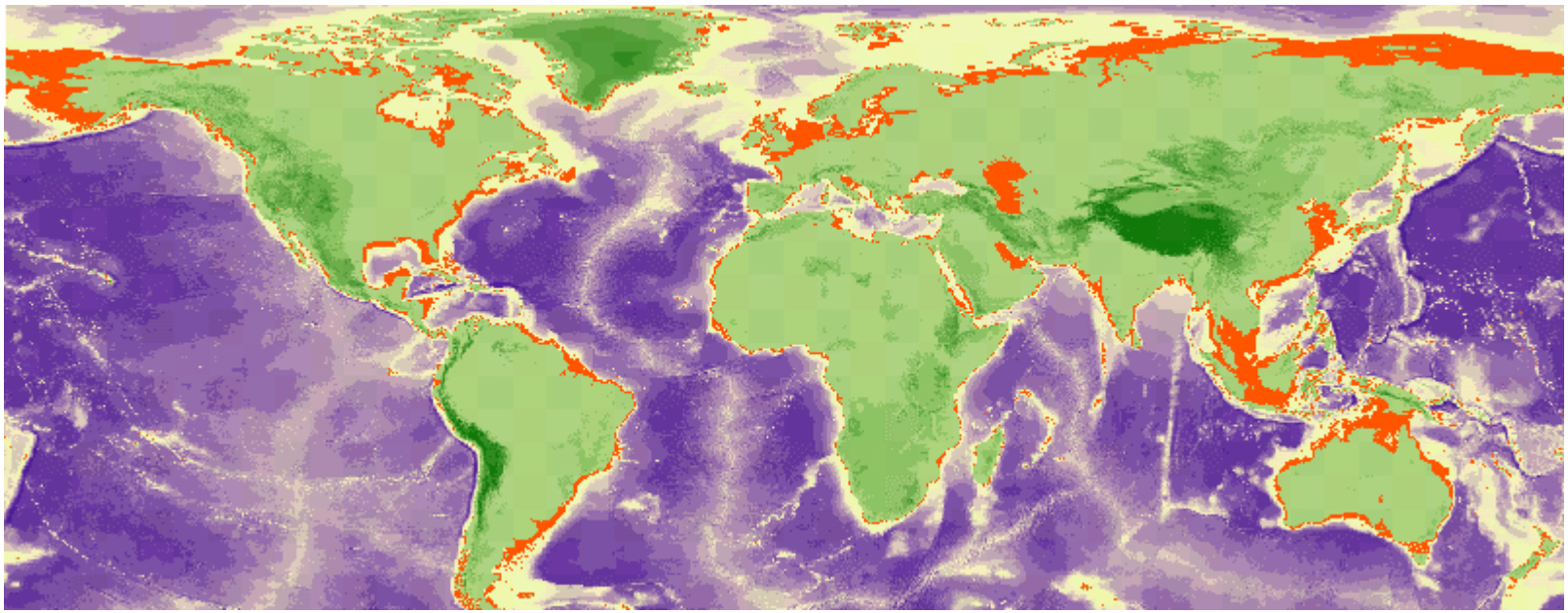
Temperature records for the transition from glacial to post-glacial



Temperature curve derived from the Greenland Ice Core with the equivalent stages of the land-based pollen record for North-west Europe. The gradual cooling trend during the Lateglacial interstadial and the oscillations at its end are notable, as is the rapid warming at the end of the Younger Dryas.
Stadial = cold phase; Interstadial = warmer phase.

From Barton (2005)

As the ice melted the seas rose …



Map illustrating the emergent parts (orange) of the continental shelves worldwide during the last glacial maximum. The figure assumes a glacial eustatic lowstand of 120m below present sea level and does not take into account the effect of uplift after the ice-sheets retreated or any Holocene uplift/subsidence.

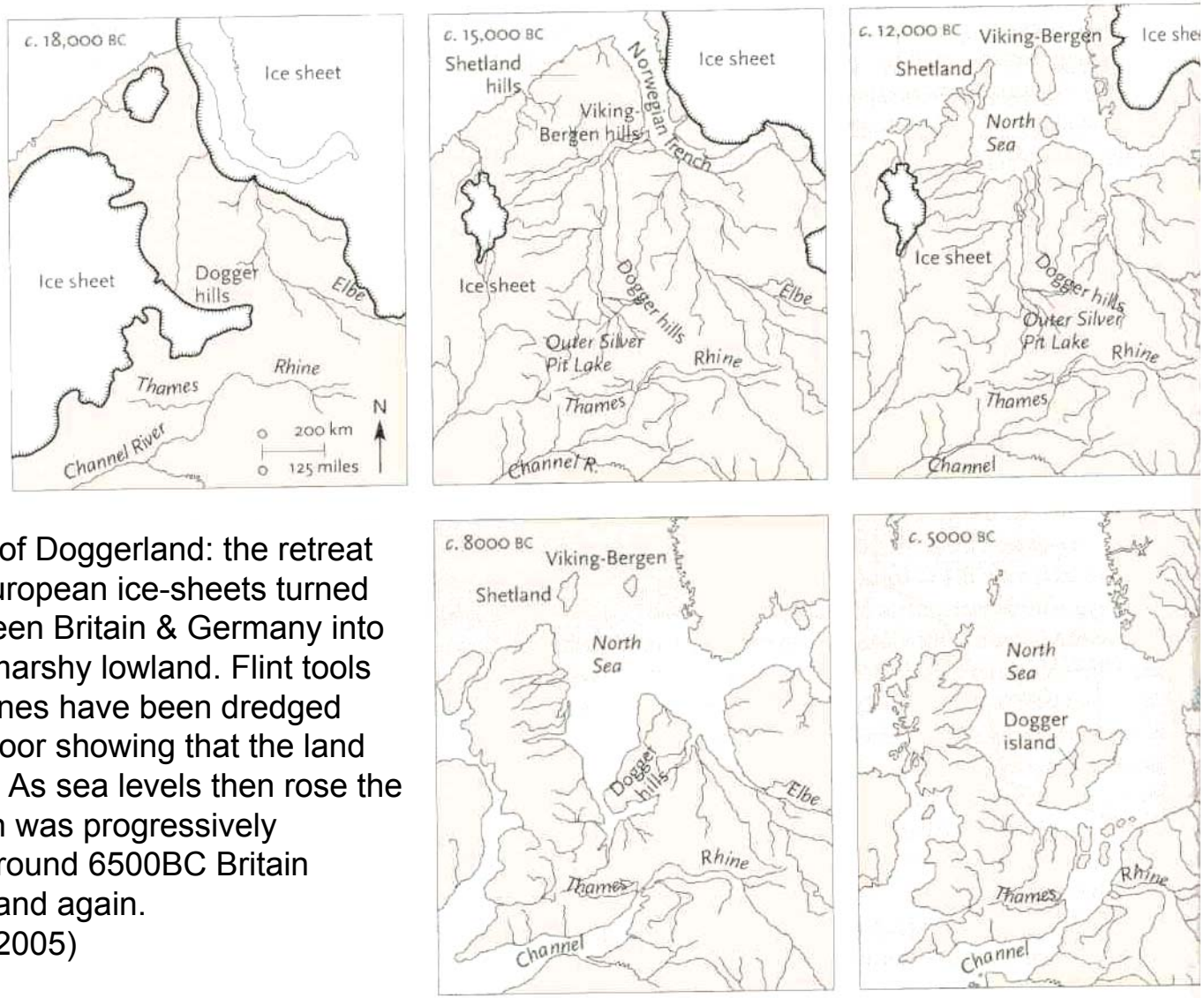
Fitch et al (2007) Internet Archaeology **22**

Reconstructing drowned landscapes

By using information from sea-bed surveys, the extent of “Doggerland” and a more detailed reconstruction of the river channels and land surface (orange area) has been made. Mesolithic artefacts (above, right) are frequent finds in this area. Recent work shows that Doggerland would have been a good place to live (reconstruction, right).

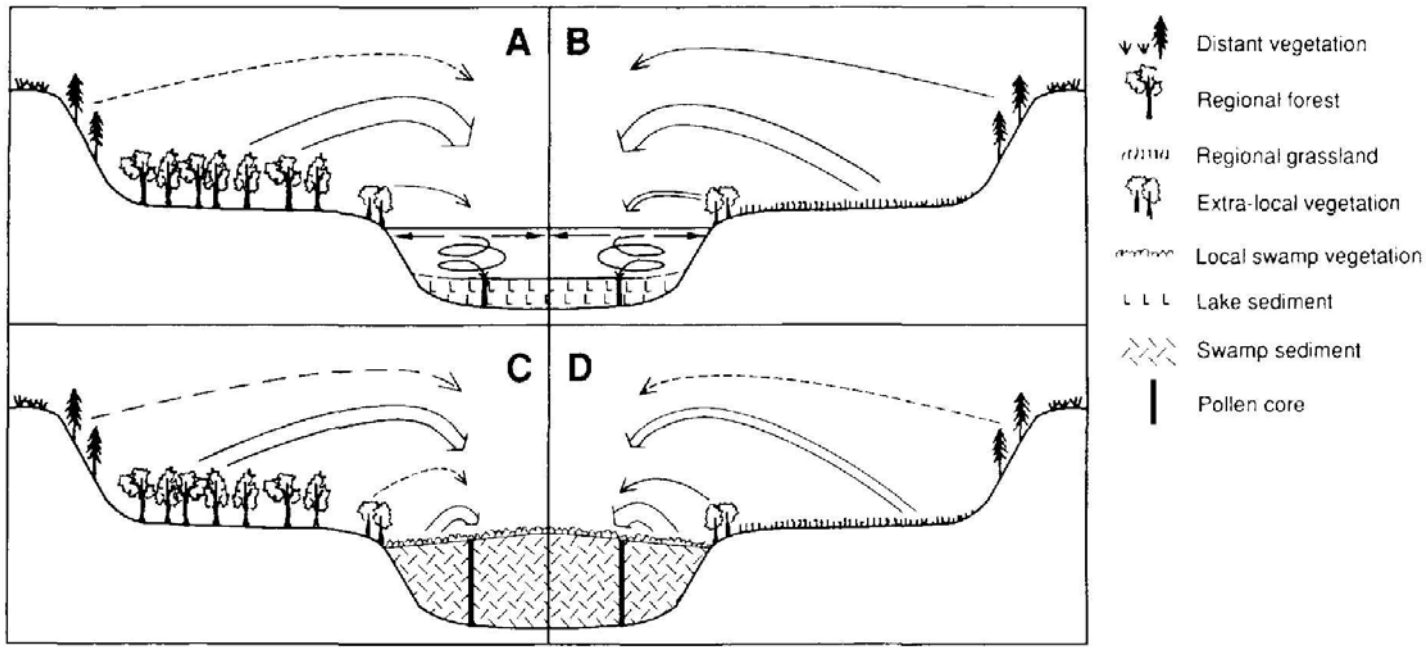
Images from Spinney (2008) Nature **454** 151-153

Sea-level rise and the loss of Doggerland



The drowning of Doggerland: the retreat of the north European ice-sheets turned the area between Britain & Germany into an extensive marshy lowland. Flint tools and animal bones have been dredged from the sea floor showing that the land was occupied. As sea levels then rose the low-lying basin was progressively submerged. Around 6500BC Britain became an island again.
From Scarre (2005)

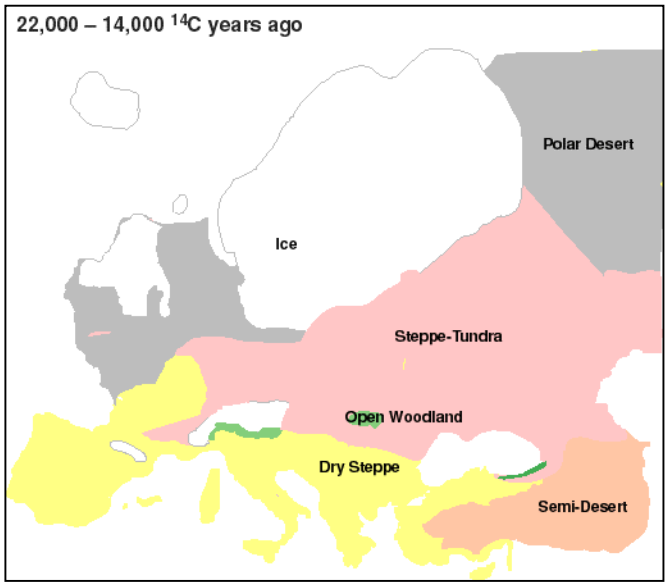
Using Pollen to recreate past vegetation

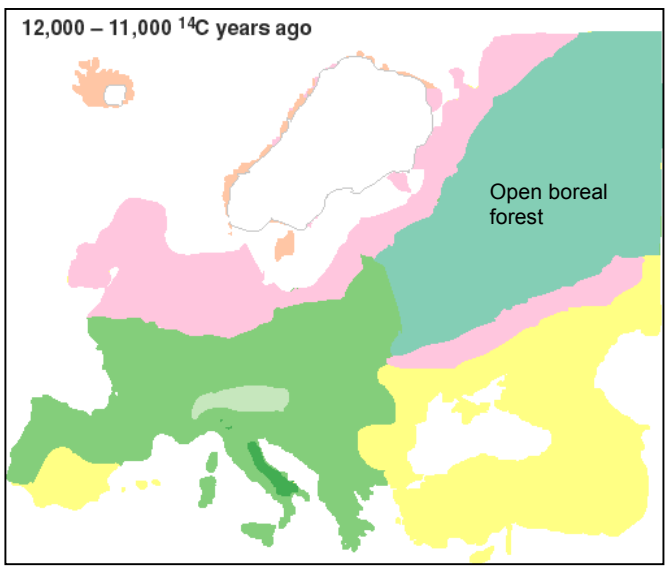


Pollen grains are preserved well in lake sediments (top) and in mires (bottom). In both cases the pollen grains are derived from a number of sources and the scales involved can be very large for the distant vegetation. By knowing the likely travel distances for pollen and also using some common sense about where different types of plants may grow it is possible to sort out the different signals. However, a lot of detailed work is needed to use pollen records to get anything other than a very “broad-brush” view of past vegetation.

Diagram from Williams et al (1998) Quaternary Environments 2nd Ed.

Vegetation maps for Europe showing the changes in the early postglacial.



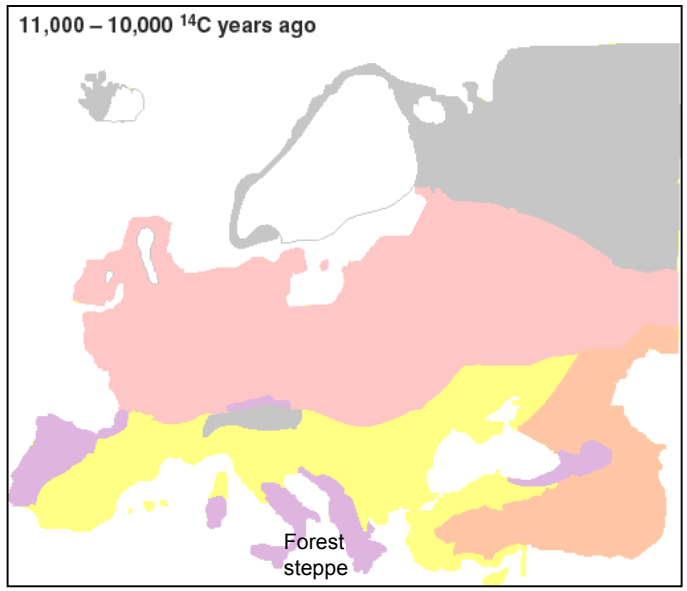


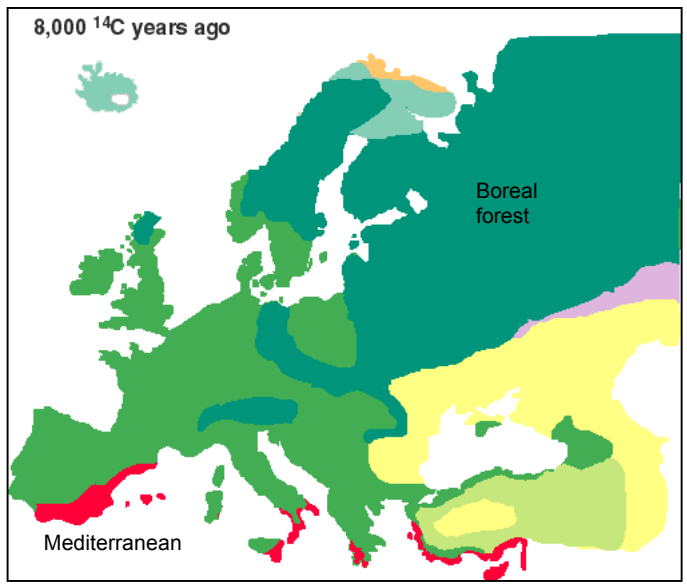
Top left – Full glacial conditions

Bottom left – Interstadial (warm period) shortly before the Younger Dryas

Top right – Cold interval of the Younger Dryas

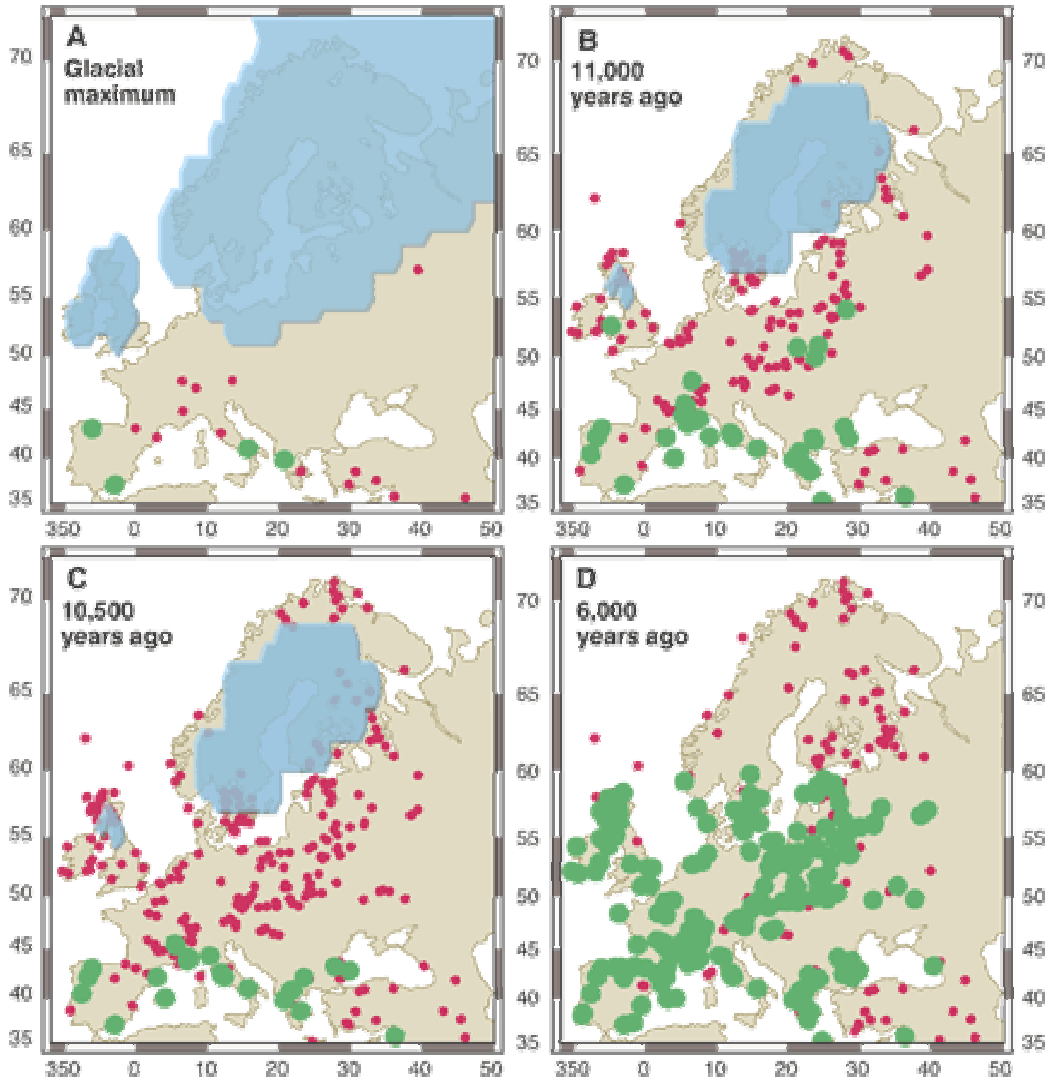
Bottom right – Early Holocene, establishment of very temperate conditions which allow forest to spread further north than today.





Maps from: http://www.esd.ornl.gov/projects/qen/nercEUROPE.html

The spread of Oak in the post-glacial



Distribution of deciduous oaks as shown in the European Pollen Database.

Green dot – oak pollen present, red dot – oak pollen absent from cores

A. Glacial maximum, survival in a few refugia

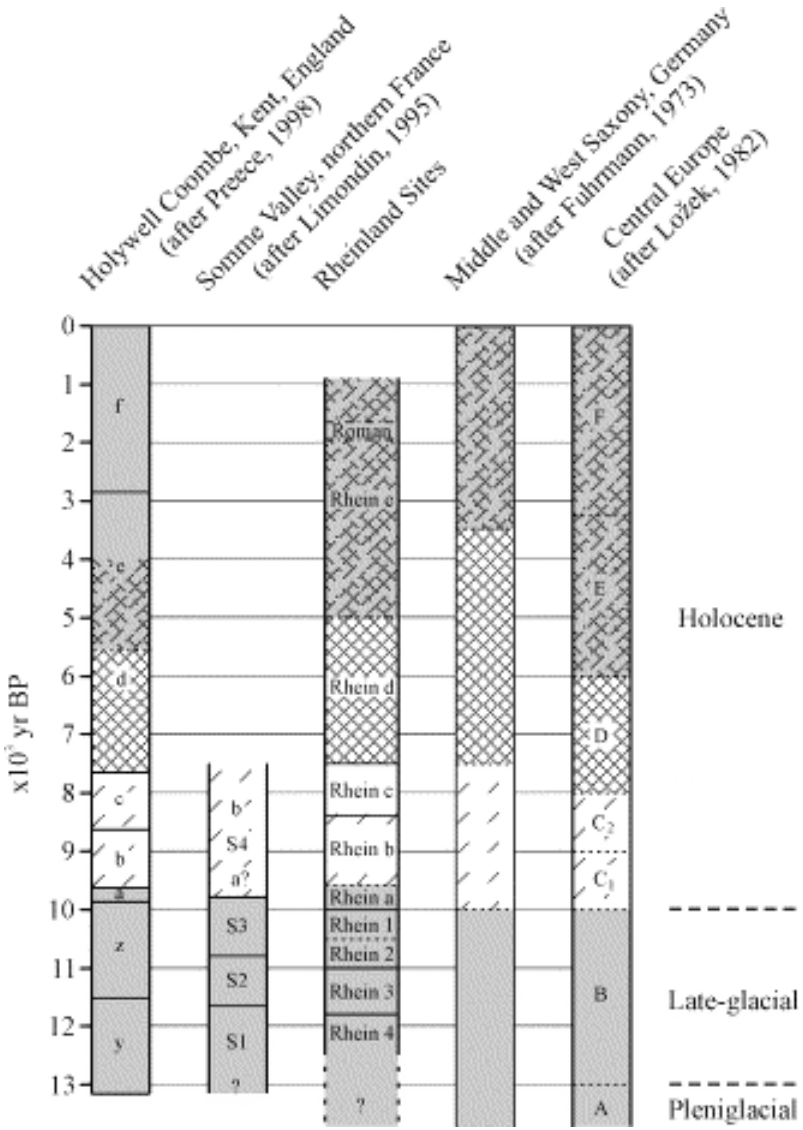
B. Spread northwards during the initial warming

C. Southward retreat during the Younger Dryas

D. Expansion to maximum extent in mid-Holocene optimum.

Taberlet & Cheddad (2002) Science **297** 2009-2010

Snails also show how the woods returned in Europe



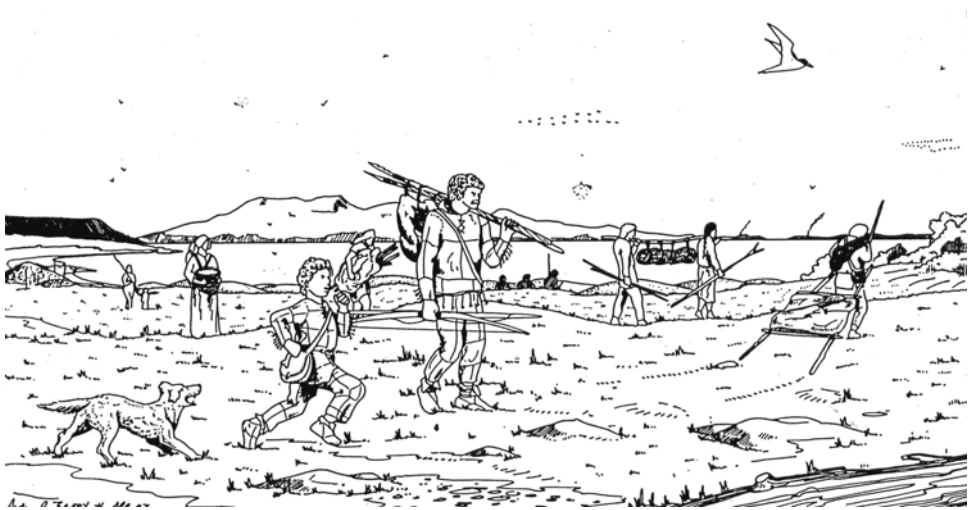
Above: *Pomatias elegans* This snail likes disturbed ground and spread markedly in Europe at the start of farming.
Image source: http://www.weichtiere.at/Mollusks/Schnecken/land/landschn.html

The diagram, left, shows Lateglacial and Holocene regional mollusc zones for north-west and central Europe. Shading indicates broad ecological categories: light shading–open-ground; diagonal hatching–open woodland; cross-hatching–optimum forest; broken cross-hatching–undetermined mixture of post-clearance open-ground and forest.

Meyrick (2001) Quat Sci Rev 20 1667-1675

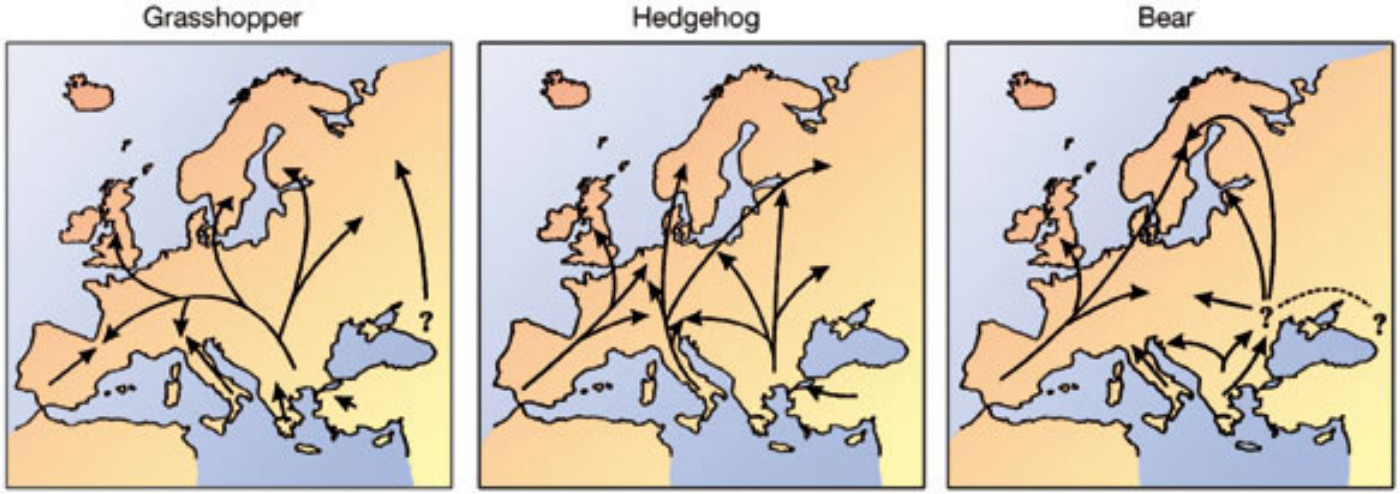
Post-glacial expansions

- LGM, late glacial, post-glacial
- Hunter-gatherers: some generalities and examples
    - Rekem; Pincevent; Star Carr
- Environmental change in post-glacial Europe
- The re-colonisation of Europe
- Complex Hunter-gatherers
- The colonisation of the Americas (background for seminar)



Reconstruction of a Mesolithic (postglacial) community on the move along the West coast of Scotland

Refugia and expansions in a number of species

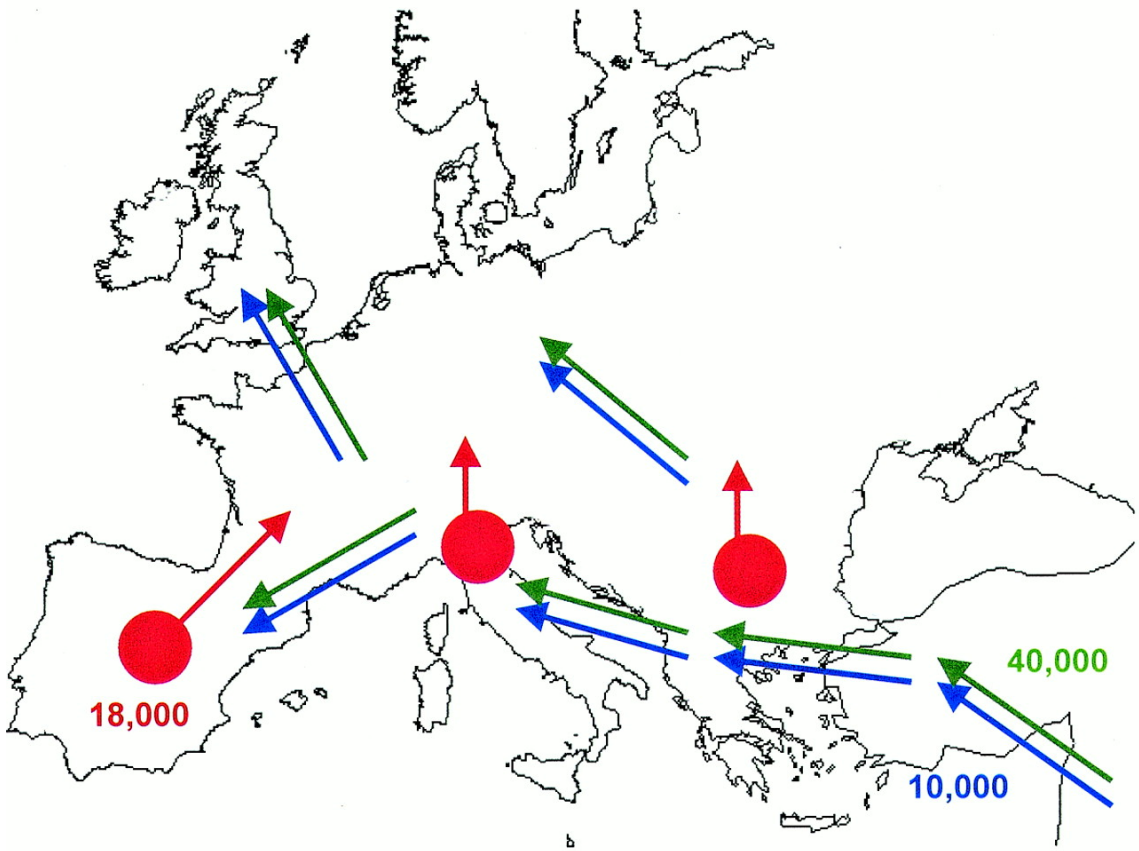


Above: Three paradigm postglacial colonizations from southern Europe deduced from DNA differences for the grasshopper, *Chorthippus parallelus*, the hedgehog, *Erinaceus europeus/concolor*, and the bear, *Ursos arctos* . The main refugial areas, Iberia, Italy, the Balkans and Caucasus, contributed differently to the repopulation of northern parts.

Left: The general position of some well-known hybrid zones in Europe, which show major clustering in Scandinavia, central Europe and the Alps. These suture zones are caused by commonalities of ice-age refugia, rate of postglacial expansion and physical barriers.

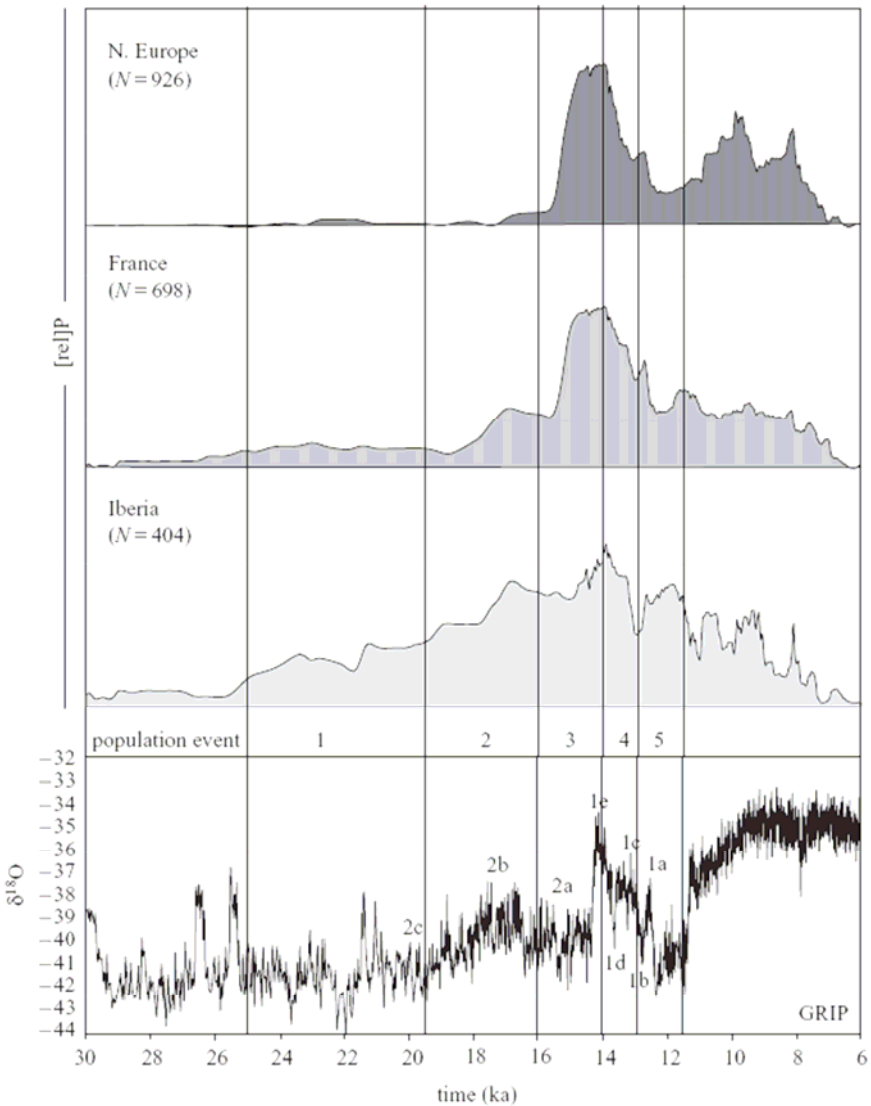
From: Hewitt, G. (2000) The genetic legacy of the Quaternary Ice Ages. Nature **405** 907-913

The main demographic processes documented in the archaeological record in Europe with approximate dates.



Green arrows show the early Upper Palaeolithic colonisation by *H. sapiens*. Red arrows show the late Paleolithic and Mesolithic re-population from glacial refugia (circles). Blue arrows show the Neolithic “wave of advance” (of which more next week!)
Barbujani & Bertorelle (2001) PNAS **98** 22-25

Moving North in Europe

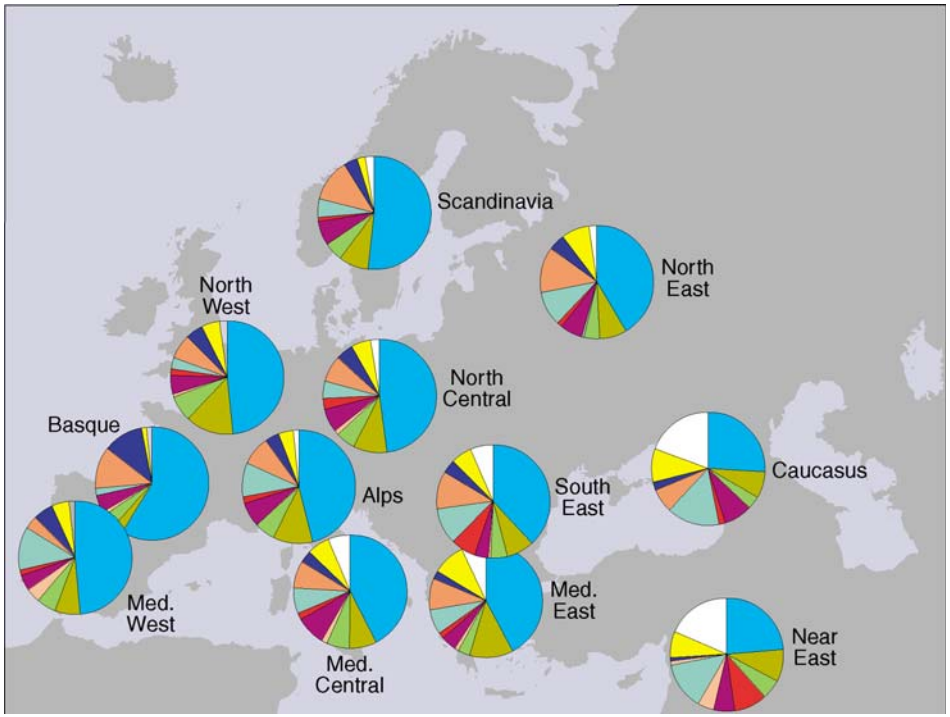


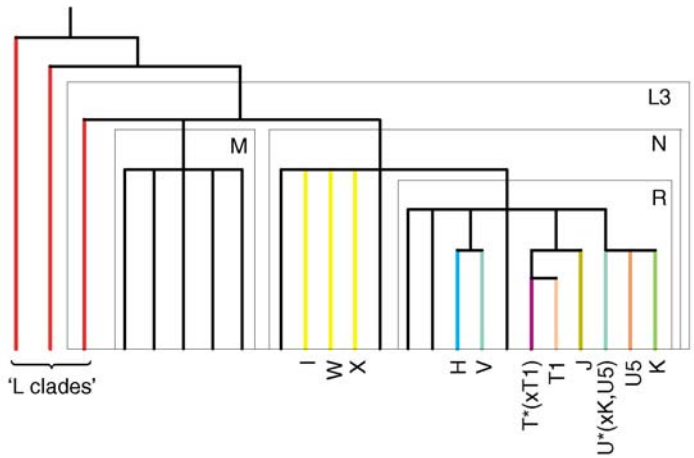
The figure shows at the bottom the oxygen isotope curve from GRIP (a Greenland Ice-core). Less negative values mean warmer temperatures. The three curves show a proxy for human population size by using the proportion of radiocarbon dates for sites falling at that time. The population events shown by this are (1) Refugium; (2) initial “pioneer” expansion; (3) main demic expansion; (4) population stasis; (5) population contraction during the Younger Dryas.

Since the database used only extends to 8ka, it is difficult to make much sense of the apparent later expansion in Northern Europe and contraction in Iberia.

Gamble et al (2004) Phil Trans Roy Soc B **359** 243-254

Mitochondrial DNA in Europe - 1



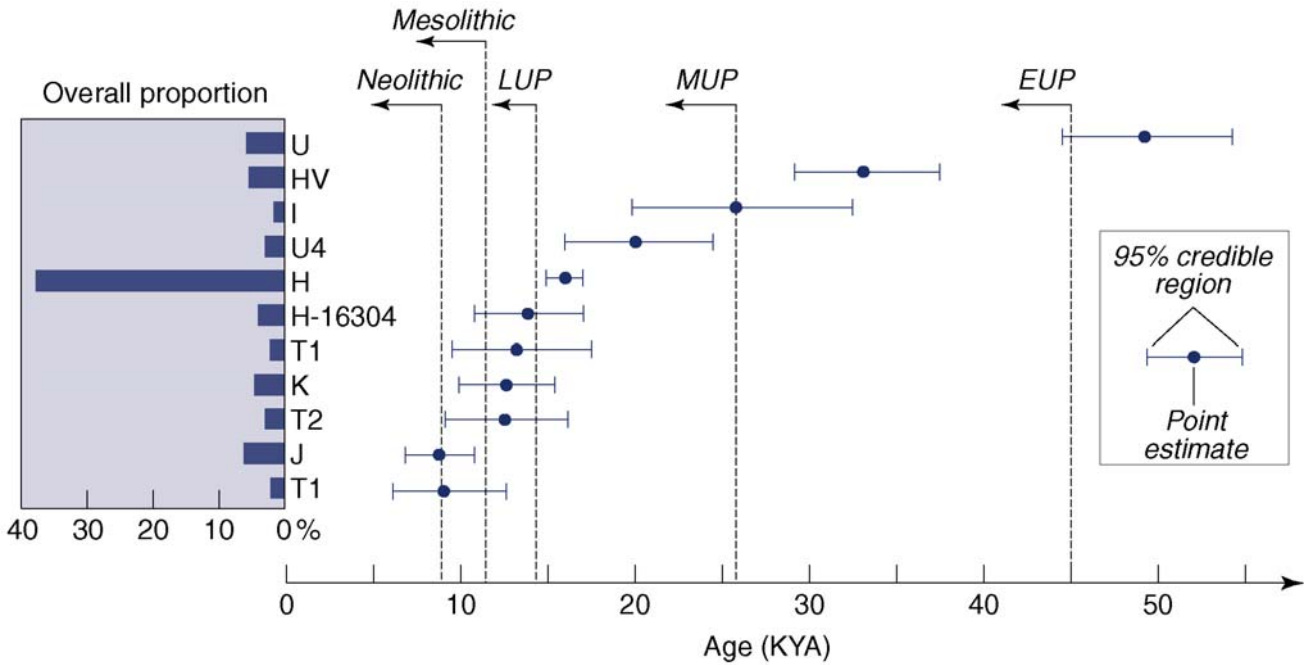


The map shows the distribution of the major mtDNA haplogroups in Europe. The data (Richards et al, 2000) have been reworked by Jobling et al (2005) to fit the subregions used by Clive Gamble (1999) in considering palaeolithic societies in Europe. Only the major haplogroups are shown – see tree on right - white sectors indicate a collection of minor haplogroups.

There is an overall similarity in these populations, although H increases as you move NW, and is greatest in the "Basques". L-clades are most common in the Near East.

(Figure 10.14: Jobling et al, 2005)

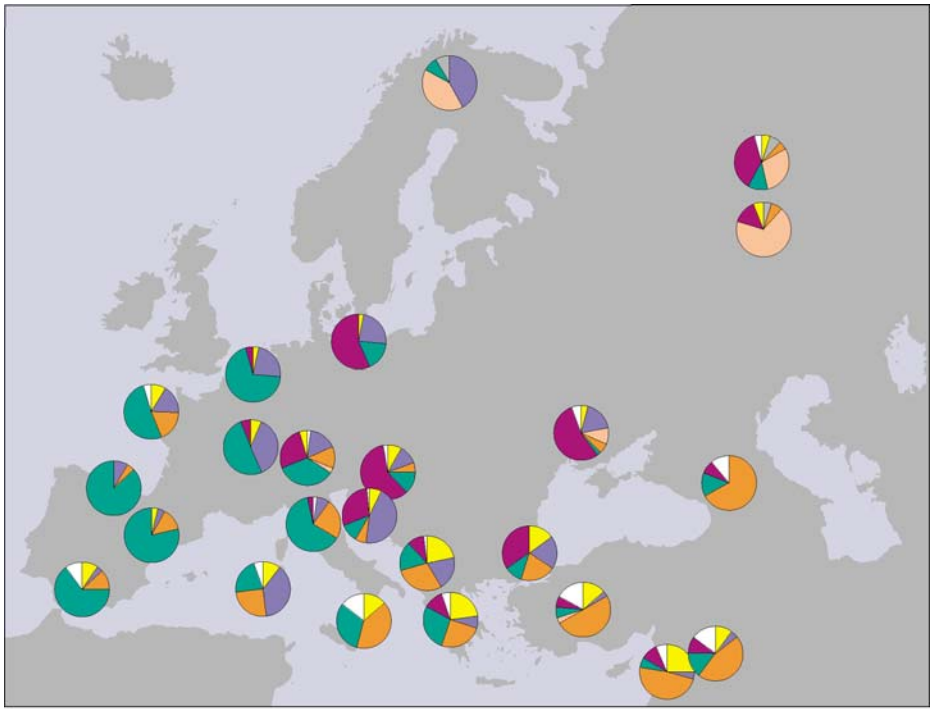
Mitochondrial DNA in Europe - 2

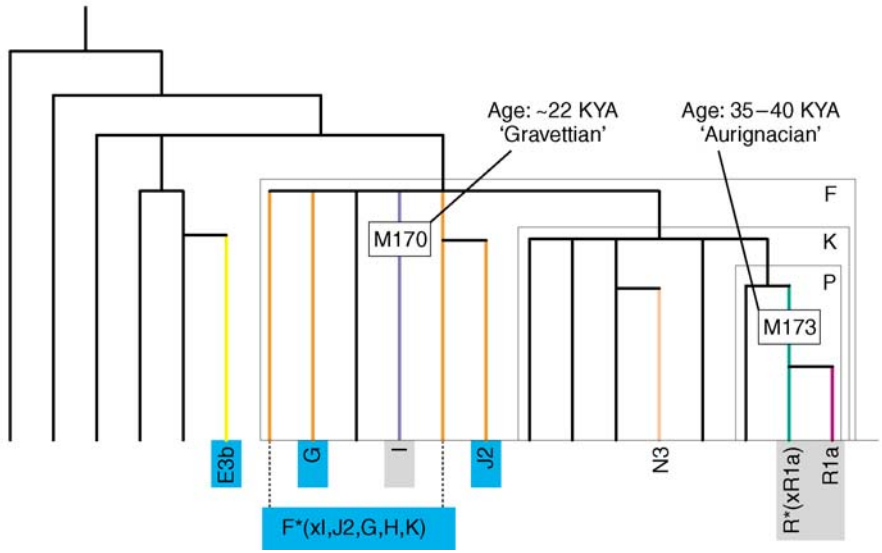


This diagram (reworked from Richards, 2003) puts the time-depths on the major mtDNA haplogroups by giving the estimated ages of their founders. This was calculated using the ρ statistic (mean number of mutations to the root of a cluster) and assuming a mutation rate of 1 transition per 20,180 years. J and T1 are the only Neolithic lineages by this criterion, but allowance has to be made for multiple dispersals of the common H lineage.

(Figure 10.15: Jobling et al, 2005)

Y-chromosome haplogroups in Europe





Pie charts show the relative frequencies of the major haplogroups with white sectors indicating a collection of other minor haplogroups. Clades associated with a Paleolithic contribution are shaded in grey on the tree, those associated with a Neolithic contribution in blue. Data redrawn from Semino et al (2000). The linkage of the lineages with specific Palaeolithic cultures is rather arbitrary, and the dating overall is not secure. Nonethless, there is a clinal pattern visible across Europe with the “Palaeolithic” lineages becoming more frequent to the North and West.

(Figure 10.16: Jobling et al, 2005)

Post-glacial expansions

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- Environmental change in post-glacial Europe
- The re-colonisation of Europe
- Complex Hunter-gatherers
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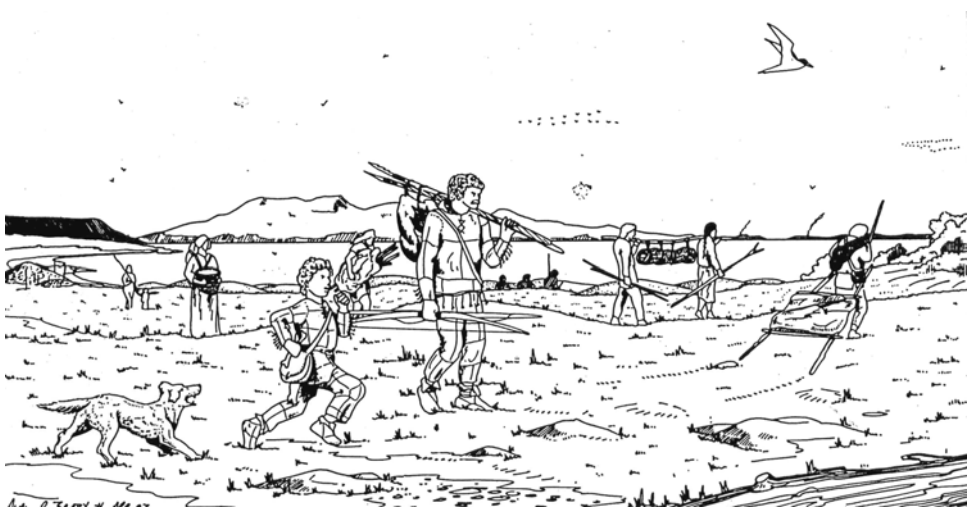
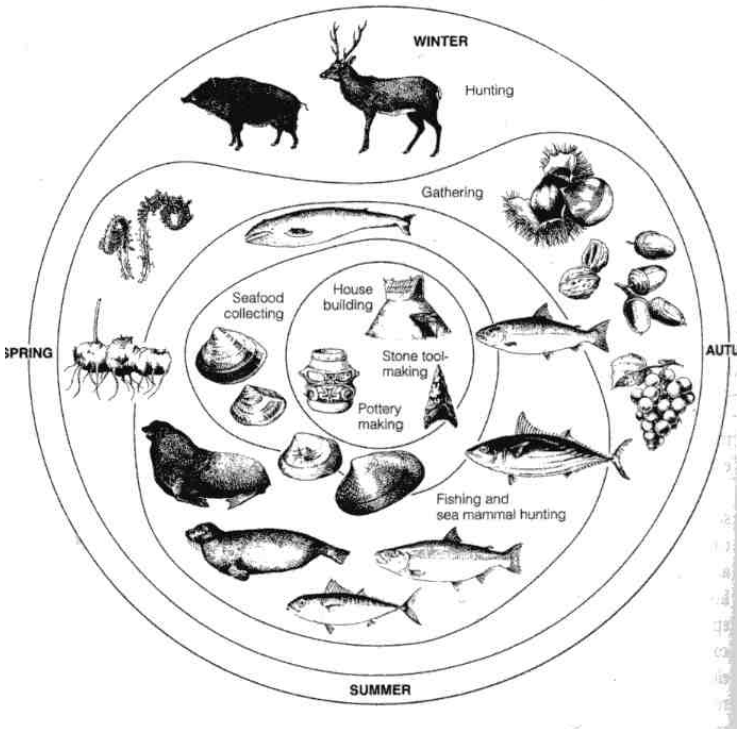
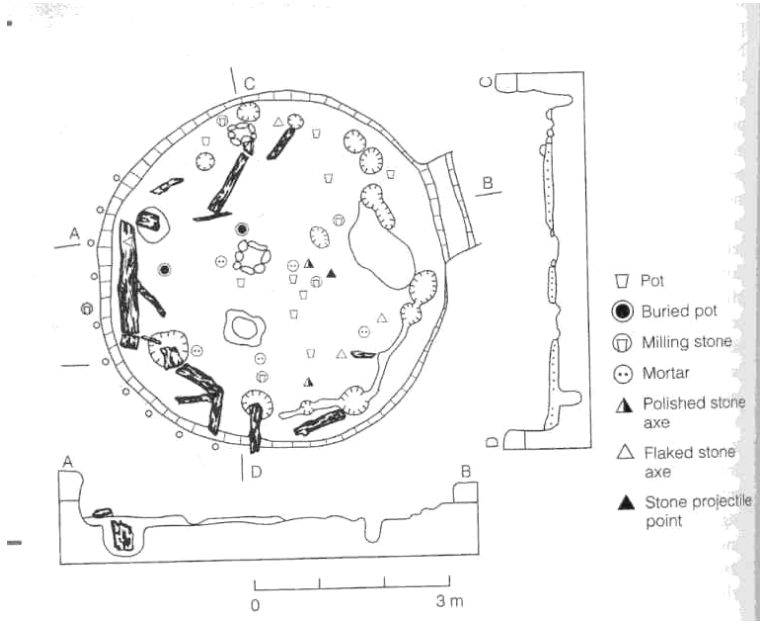


Reconstruction of a Mesolithic (postglacial) community on the move along the West coast of Scotland

Complex hunter-gatherers – the Jomon period, Japan

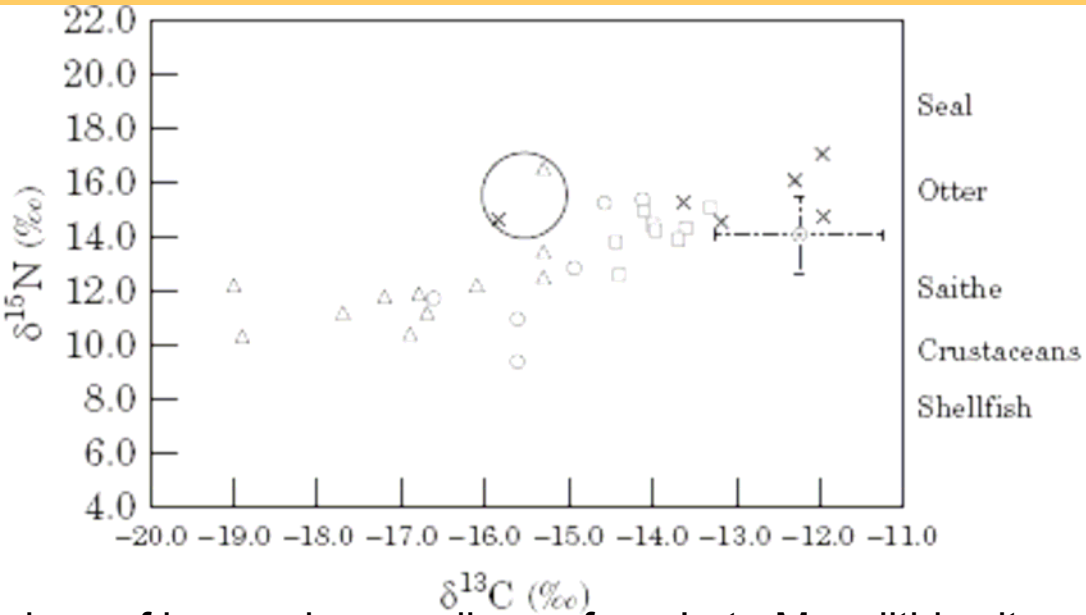




The Jomon period in Japan lasts from 10,000 to 300 BC. The site illustrated here comes from the Middle Jomon period (4000 – 3000BC). Although the people were hunter-gatherers, they lived in villages with substantial houses (top right) and made sizeable pottery vessels (bottom right) which were distinctively decorated. This pot is 39cm high. Work on the animal and plant remains from the villages enable us to reconstruct (above) an annual cycle/ The width of the bands shows the relative importance of different activities throughout the year.

Figures from Price & Feinman (2003)

Stable isotope evidence for marine food in the European Mesolithic diet

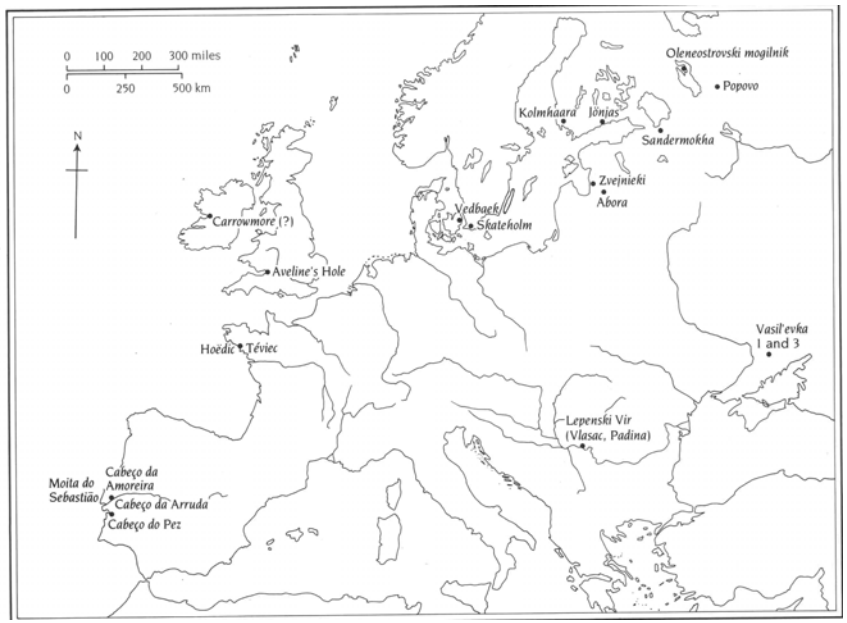


Stable isotope values of human bone collagen from Late Mesolithic sites along the Atlantic coast of Europe. The names of various marine organisms are also plotted at a level corresponding roughly to their average δ^{15}N value. (Téviec – open circle - & Höedic – open square - are sites in Brittany; Oronsay – x - is on the west coast of Scotland; open triangle, Portuguese sites; circle with dot and indicated range, Danish sites. Dates range from approx 7500BP for Portugal to 5000-4000BP for Brittany, Oronsay and Denmark.)

All the values are consistent with a diet which included some fish protein. The two individuals circled may have eaten seal as well. The amount of marine protein in the diet increases from the left to right of the graph. δ^{13}C of –20‰ is considered to indicate a fully terrestrial diet and δ^{13}C of 12‰ a fully marine diet.

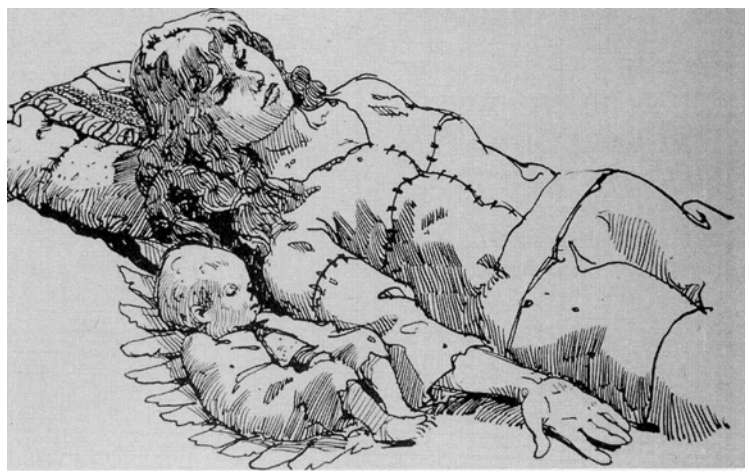
Richards & Hedges (1999). J.Arch.Sci. **26** 717-722

A coastal/riverine/lacustrine focus in Mesolithic Europe

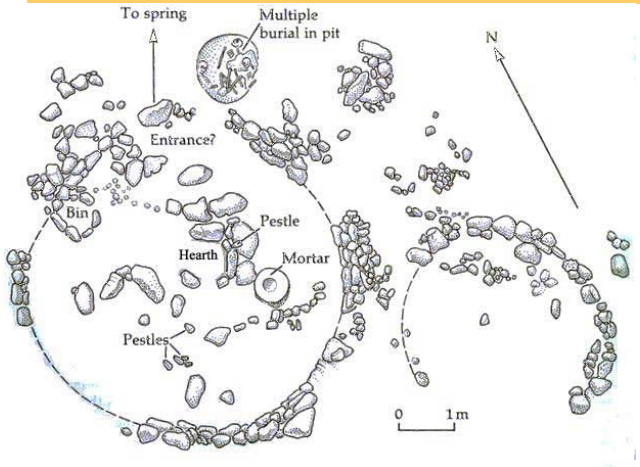


The map shows the location of Mesolithic cemeteries in Europe. Although there may be some preservational bias here, there is also a notable focus on coasts, rivers and lakes which probably reflects a true pattern of social complexity in these areas of high resource abundance and diversity. The photograph and reconstruction drawing show one of the burials from the Danish site of Vedbaek.

Map from Mithen in Cunliffe ed (1994); Images of Vedbaek from Price & Feinman (2003).

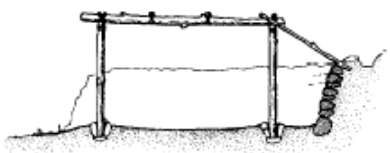


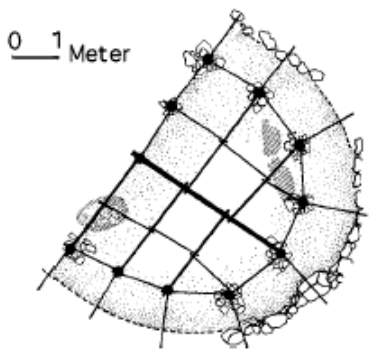
The Natufian period – sedentary foragers in the Levant c. 13,000bp – 10,500bp



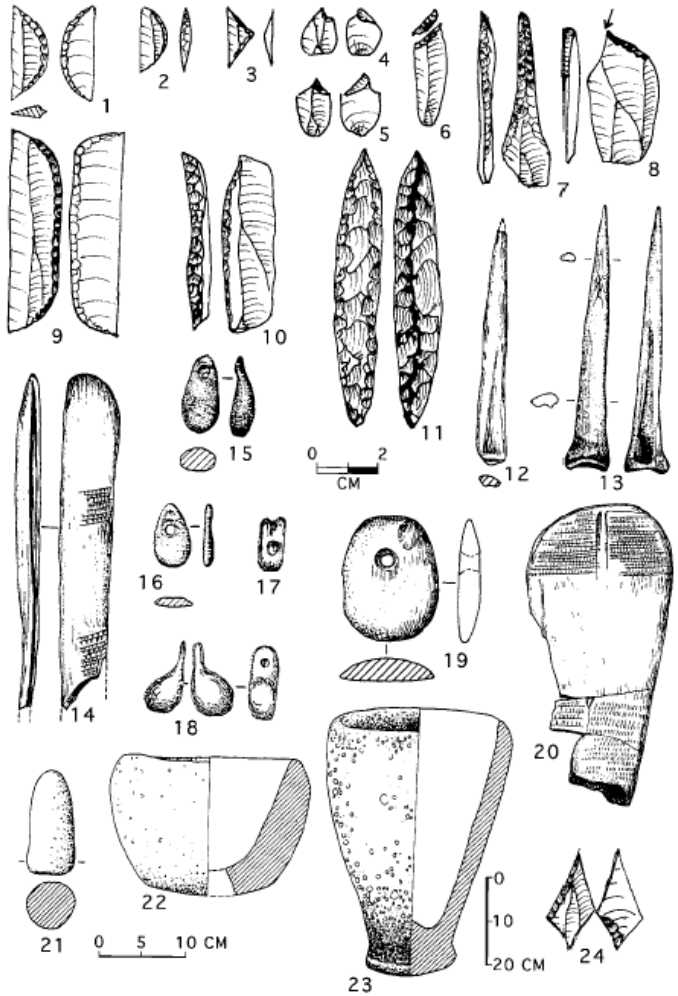
Left: Plan of excavated houses at ‘Ain Mallaha, showing location of stone pestles & mortars.

Carved limestone head from ‘Ain Mallaha.
www.metmuseum.org/toah/hd/eyna/hd_eyna.htm



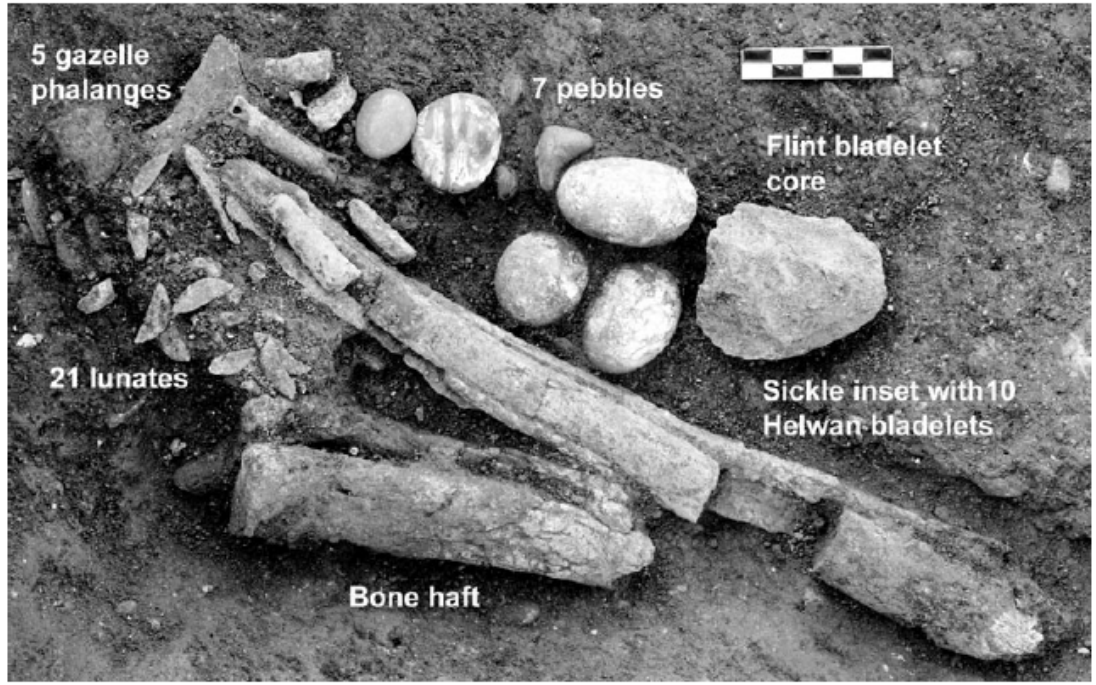


Reconstruction of large Natufian house at ‘Ain Mallaha showing semi-subterranean nature of the building.
From Bar-Yosef (1998) Evol Anth **6** 159-177

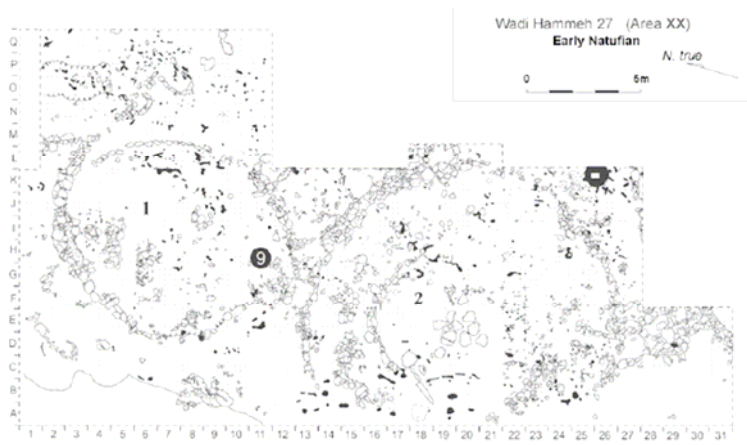


Natufian lithic, bone and ground-stone assemblage. NB varying scales.
From Bar-Yosef (1998) Evol Anth **6** 159-177

A 14,000 year-old hunter-gatherer's tool kit from Wadi Hammeh



The Natufian site of Wadi Hammeh is in the Jordan valley (see location map, right). Two large oval huts were excavated from the site's last phase (see plan, right). In one of these, a cluster of artefacts (9 on plan, & shown *in situ* in the photograph, right), was discovered close to the entrance. These were possibly originally held within an organic container. The group includes both finished tools, a bladelet core and bladelets, as well as 5 gazelle toes which may have been intended as raw material for beads and a group of pebbles one of which may have been a hammerstone, the others included possible slingshots.



Edwards (2007) Antiquity **81** 865-876

Evidence of intensification of use of a terrestrial resource

$$\%\ U = \frac{\text{unfused (radii+metapodia+femora+tibiae+calcanea)}}{\text{total}} \times 100$$

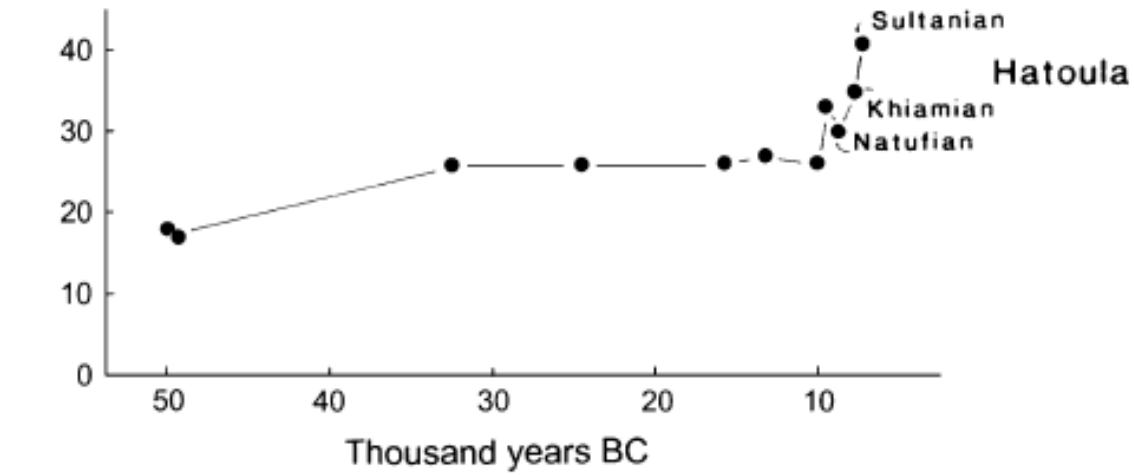


Fig. 4. The age shift of gazelles culled in Israel between Mousterian and PPN times. This is a plot of the percentages of unfused limb-bone epiphyses (distal radius, distal metacarpal, distal metatarsal, distal femur, distal tibia, and calcaneum-tuber calcis) plotted against time. *Total* includes these unfused epiphyses plus specimens of the same bone-parts with fused epiphyses. Data come from the following sites, from left to right: Mousterian: Kebara cave; Mousterian: Hayonim cave level E; Upper Palaeolithic: Kebara cave; Aurignacian: Hayonim cave level D; Kebaran: Ein Gev I; Kebaran: Hayonim cave level C; Natufian: Hayonim cave level B; Natufian: Hayonim terrace; Natufian: Hatoula; Khiamian (PPNA): Hatoula; Sultanian (PPNA): Hatoula. Data for Hatoula are in refs. [10,15]. Data for other sites are in ref. [9].

Davis (2005) J. Arch Sci **32** 1408-1416

Göbekli Tepe

Left: View of one of the cellars or pits containing the T-shaped pillars which are carved from the local limestone bedrock

Currently four of these pits/cellars - or “shrines” – have been excavated by the German Archaeological Institute, which has a base in Istanbul.

Right: View of one of the pillars in another pit/cellar showing a relief of a fox-like animal.

The concentration of effort required to build Göbekli Tepe would have brought many people together.

Images from:
http://www.urgeschichte.org/DieBeweise/GobekliTepe/gobeklitepe.htm

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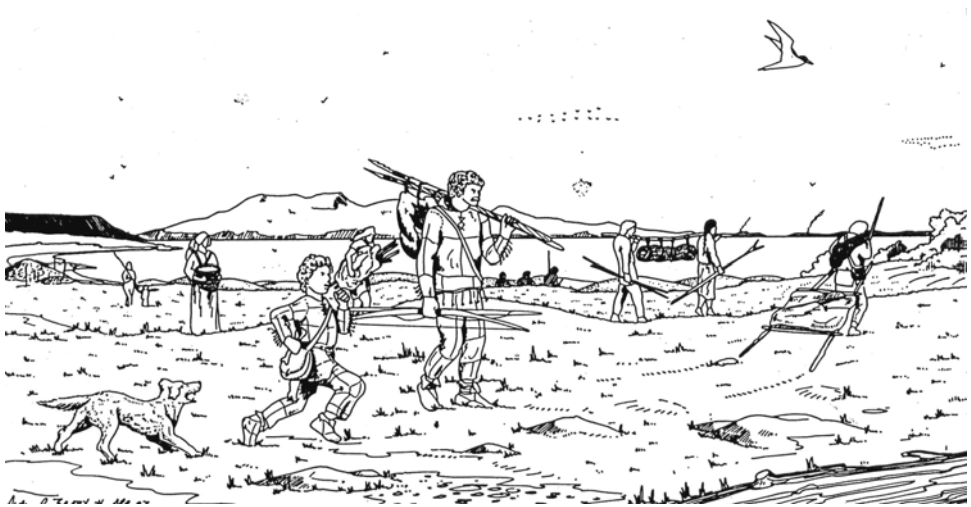
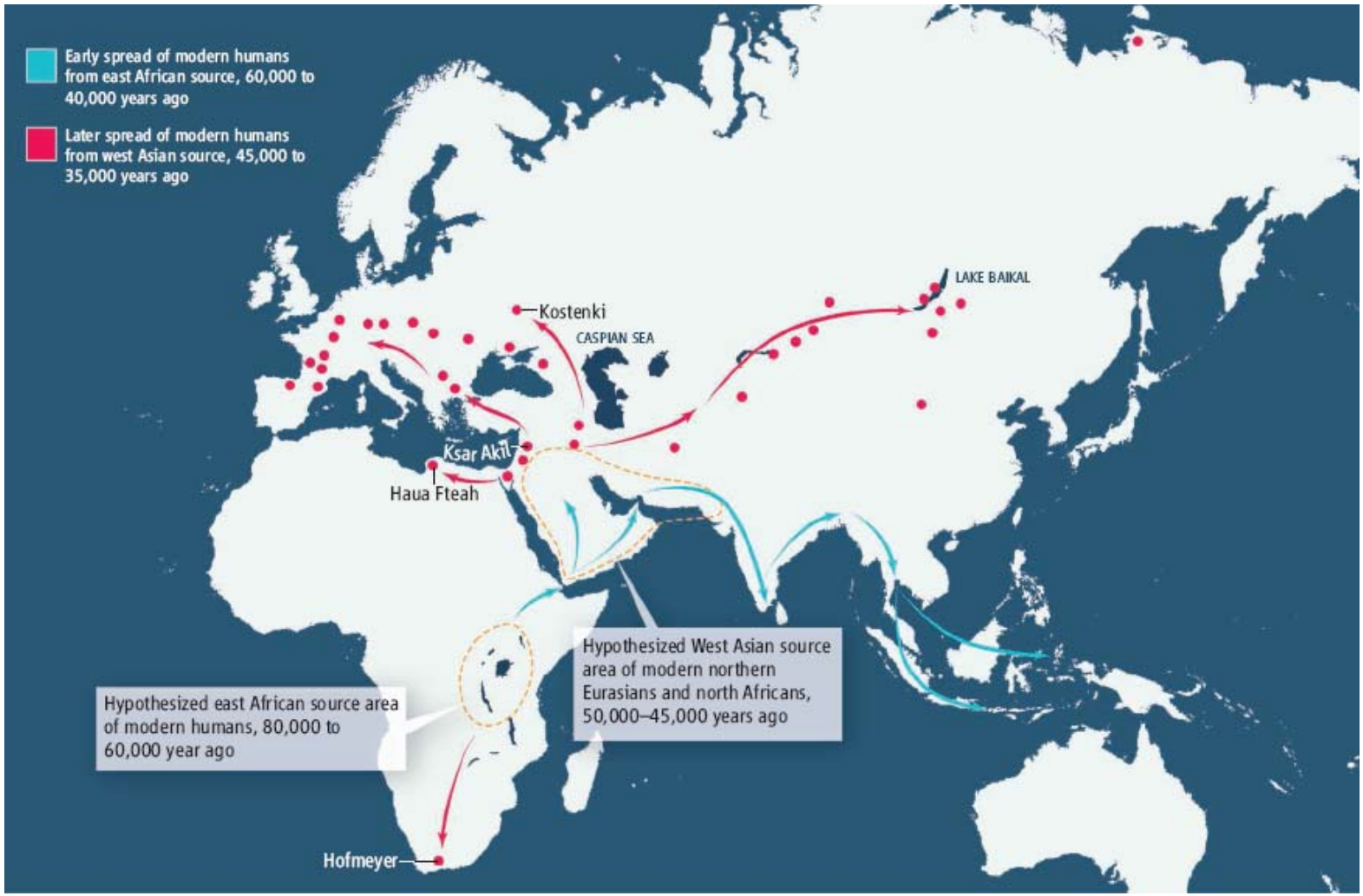


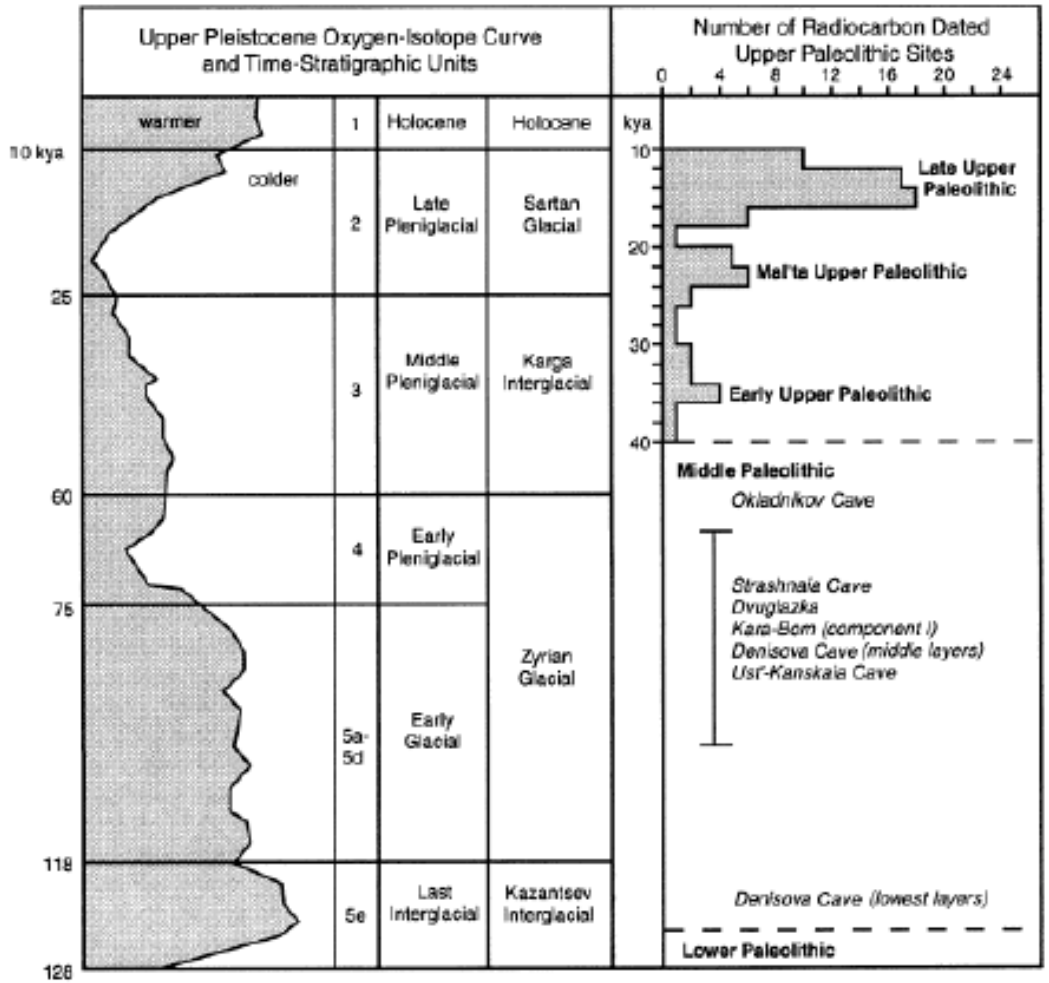
Reconstruction of a Mesolithic (postglacial) community on the move along the West coast of Scotland

Southern and northern journeys



Goebel (2007) Science **315** 194-196

Moving north into Siberia



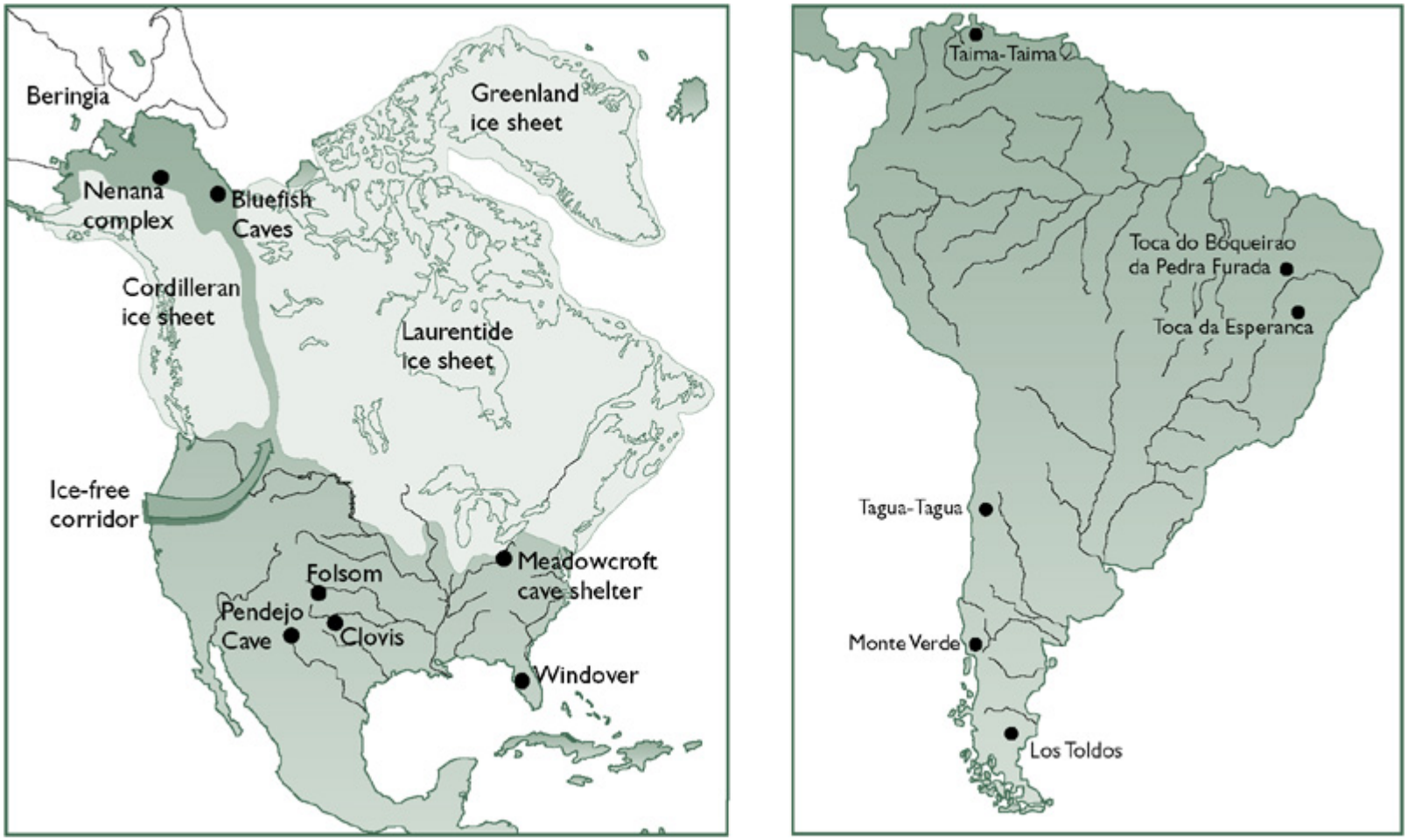
Bird figurine in ivory from Mal'ta

Image from Hermitage Museum: http://www.hermitagemuseum.org/html_En/03/hm3_2_1.html

This shows that we have very little evidence for the occupation of Siberia prior to the arrival of modern humans (Upper Paleolithic). Further, this presence is rather limited until after the last glacial maximum. NB More sites have been discovered since this was compiled in 1999, but the basic picture hasn't changed.

Goebel (1999) Evol Anth **8** (6) 208-227

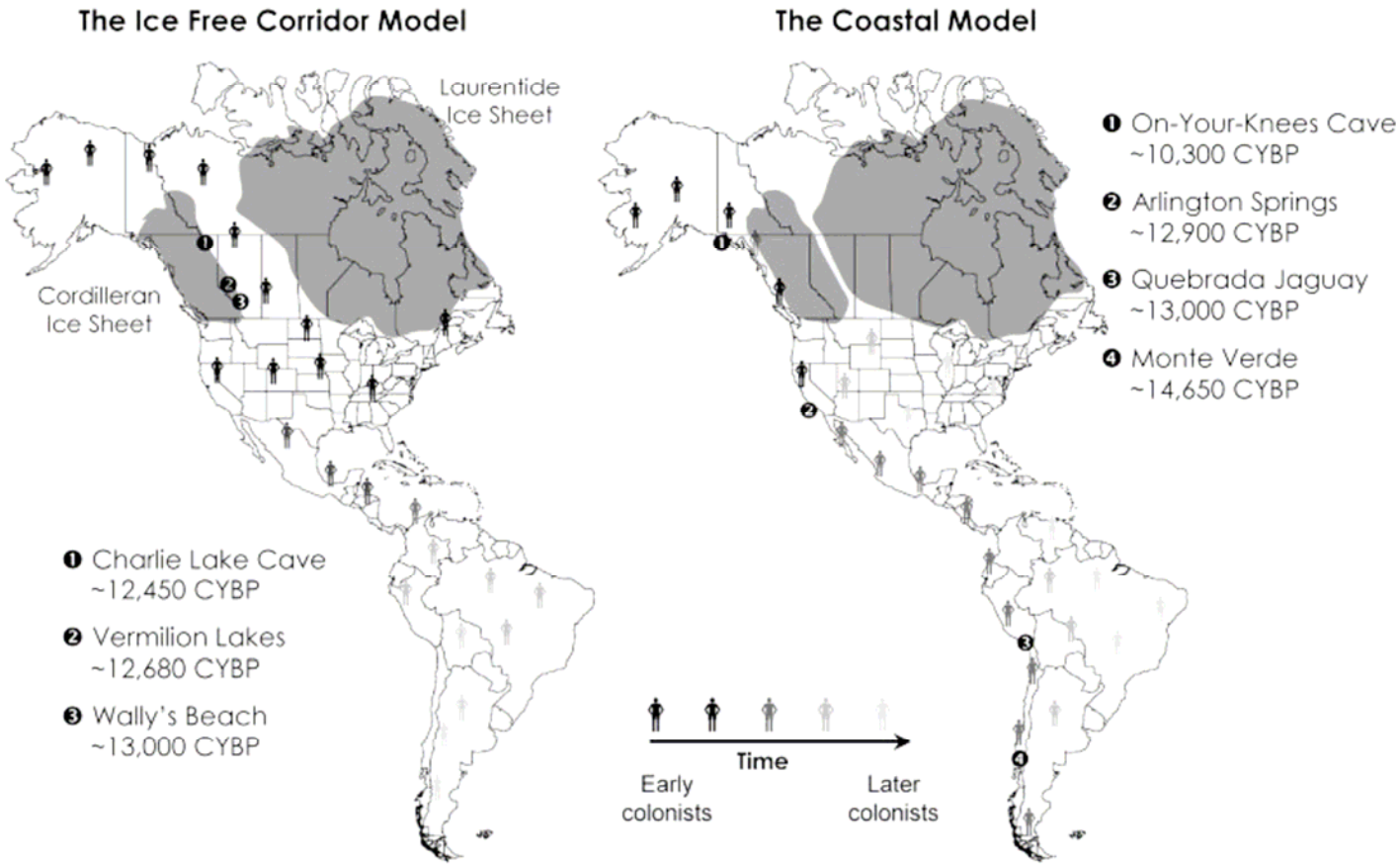
Early post-glacial America



This shows the extent of the ice-sheets in North America and the location of the “ice-free corridor” between them. A selection of early archaeological sites in North and South America are shown. Other than Clovis and Folson, these sites are claimed to predate the Clovis culture – i.e. are older than 13ky (or 11.5^{14}Cky). The Alaskan sites are relatively uncontentious – debate is sharper about the sites south of the ice.

Lewin & Foley (2003) Figure 19.4

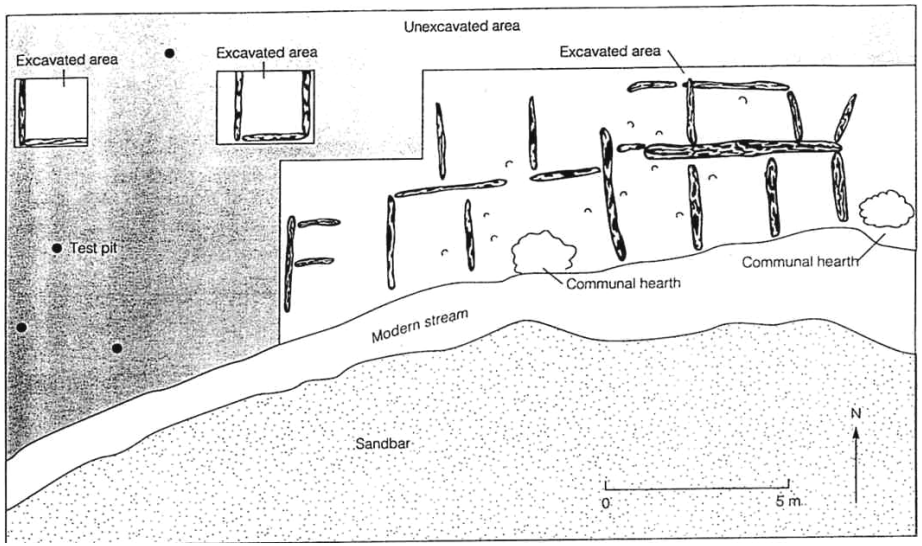
Entering the Americas

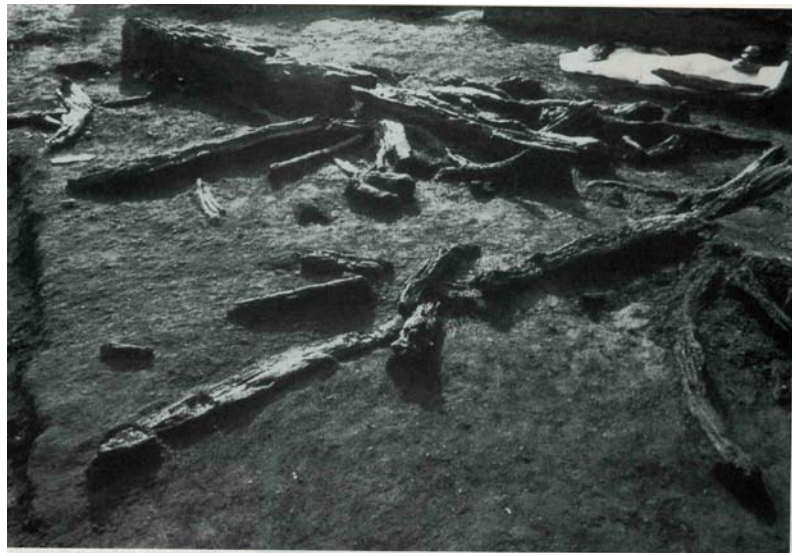


This shows the two main models. Although both models give clear predictions about the location of earliest sites, so far the dates of the earliest sites known do not help us to distinguish the two models.

Waguespeak (2007) Evolutionary Anthropology **16** 63-74

Monte Verde, Chile c. 14,650BP

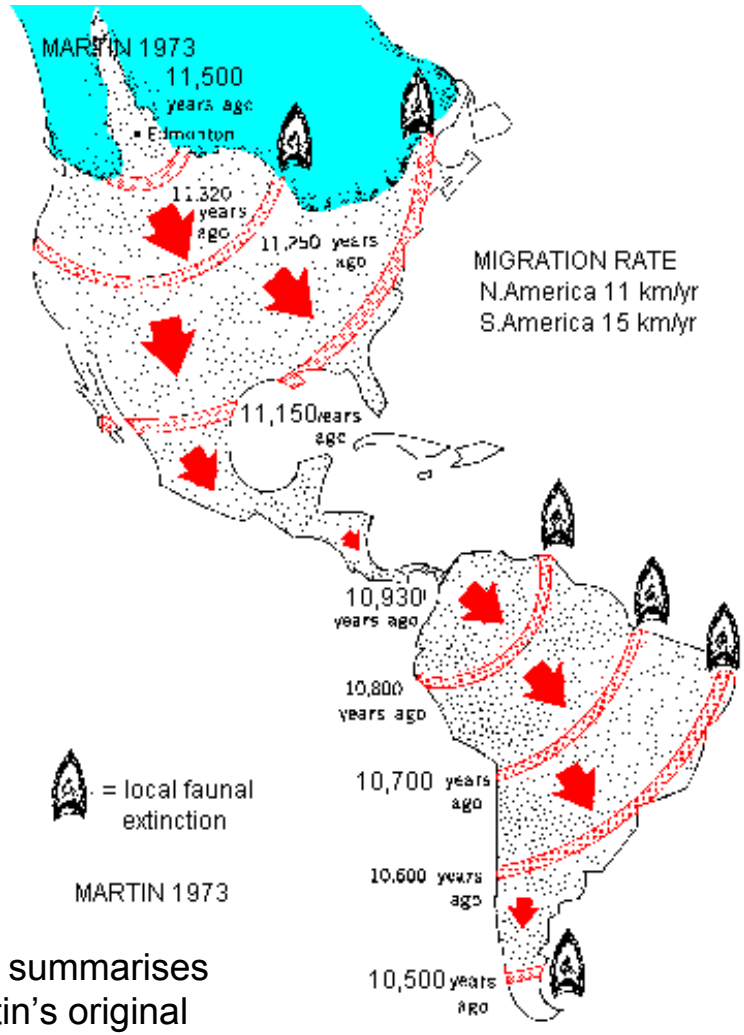




Plan of the excavations. Logs were set in place using wooden pegs to make the foundations of huts and shallow clay-lined hearths were found inside some of these. Photographs of the logs *in situ* are shown on the right, and some of the artifacts, including a “bola” are shown below.

Diagram and top photograph from Price & Feinman (1993). Lower photographs from Scarre ed (2005).

Clovis hunters and megafaunal extinction - 1

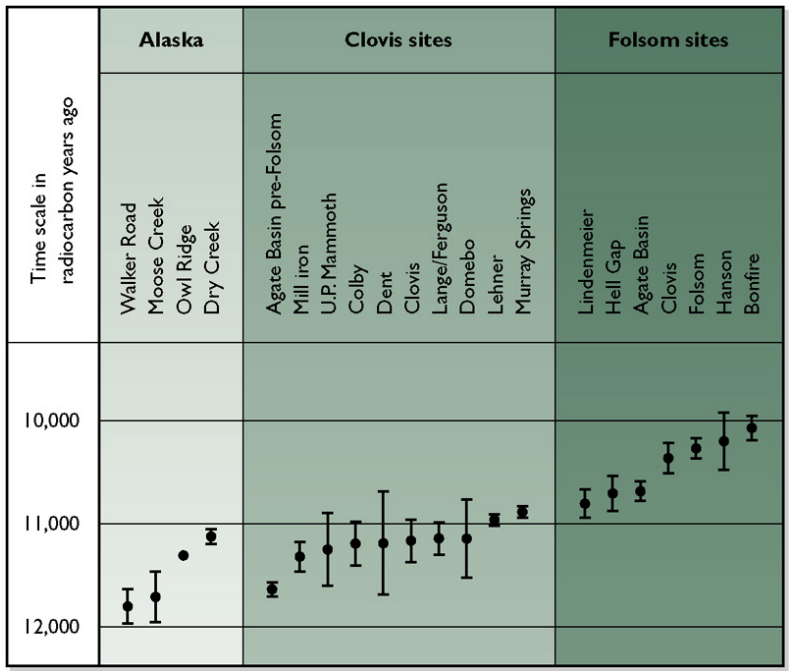


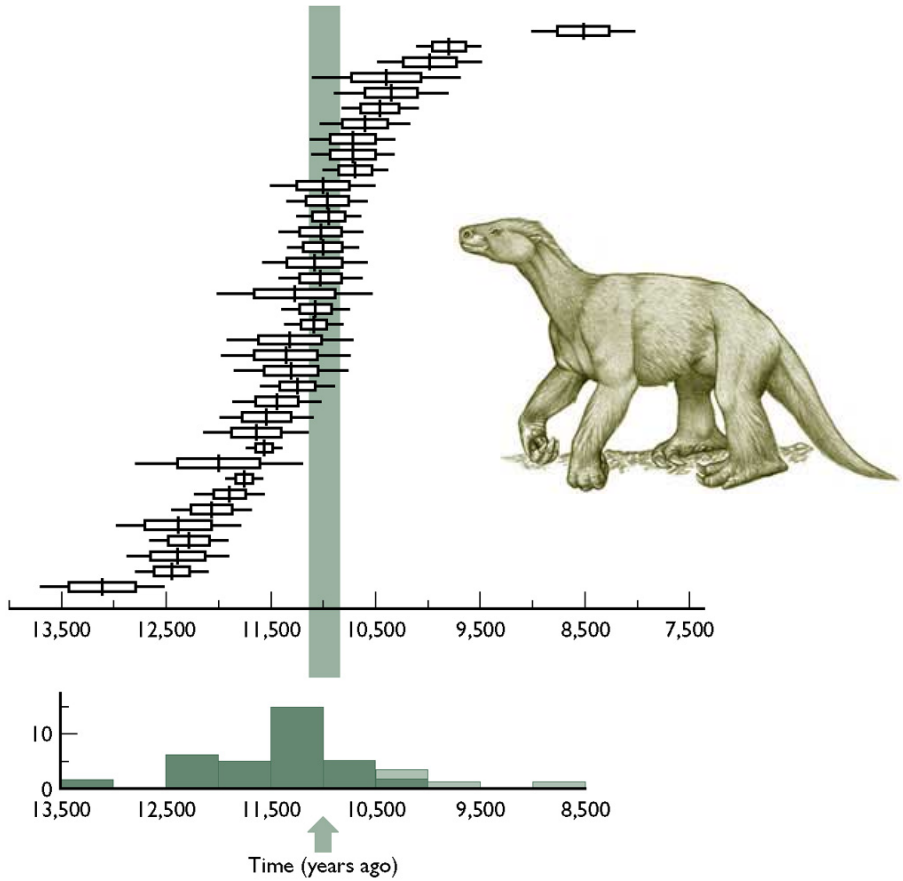
MIGRATION RATE
N.America 11 km/yr
S.America 15 km/yr

This summarises Martin's original (1973) "overkill" or "blitzkrieg" hypothesis.

The Clovis industry includes distinctive fluted points (above) and far left (below). It was followed by the Folsom (2nd left, below) and later Palaeoindian cultures.

Clovis hunters and megafaunal extinction - 2

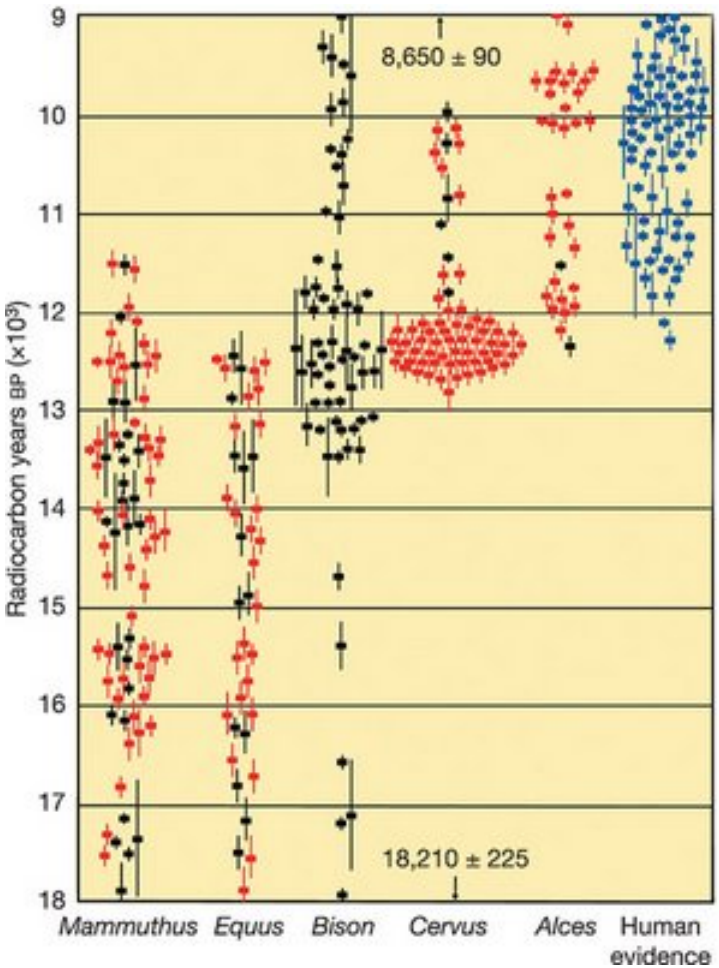




Clovis sites are very tightly grouped in time in North America (above left). In the American South-West (right) the dates for Clovis sites (arrow and bar) coincide closely with the dates for the last appearance of the Shasta Ground Sloth (inset).

Diagrams from Lewin & Foley (2003). Reconstruction of the Shasta Ground Sloth from http://www.tarpits.org

Humans & megafauna in eastern Beringia



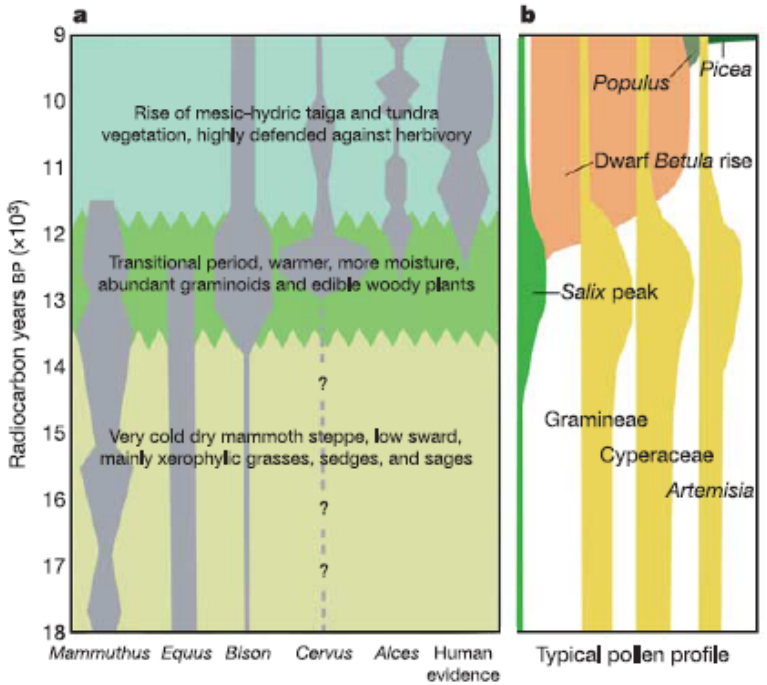


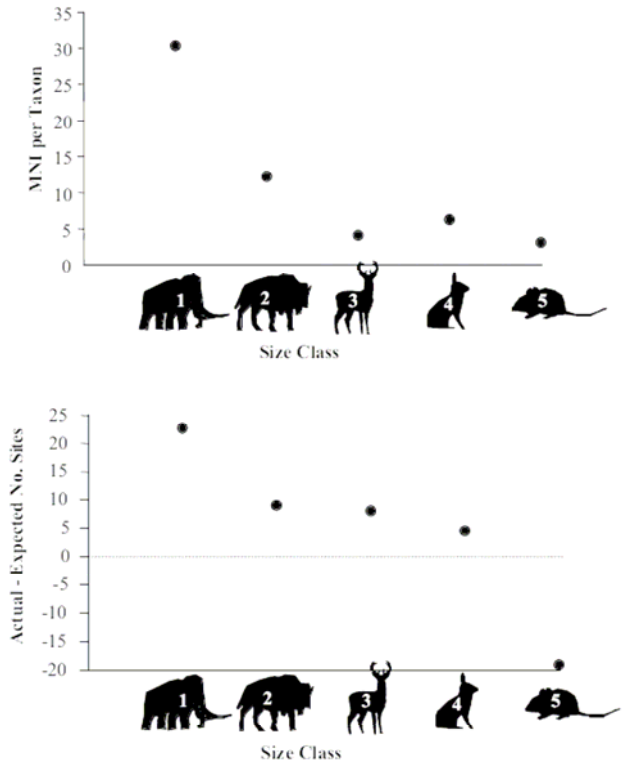
Figure 2 | A visual model linking large mammal date patterns (Fig. 1) to a changing ecological context. **a**, Previous interpretations of the climate–vegetation events are overlain with 'ghost forms' of the large mammal chronology patterns from Fig. 1. The central green band highlights the episode that I refer to as the 'transitional period'. **b**, Generalized pollen influx profiles from several pollen studies in interior AK–YT, using key plant groups[9–11] with emphasis on sites that used the more precise AMS core dating (because conventional radiometric dating of core grab samples generally overestimates time[9]). Patterns from individual pollen cores vary somewhat, yet all have common features; I have smoothed and stressed those regular characters in this generalized graph.

The megafauna don't just go extinct south of the ice, they disappear from the north as well. These two diagrams show how there is a coincidence in the timing of the arrival of humans in Alaska and the Yukon Territory (left) with the disappearance of Mammoths. This is occurring in a period of considerable ecological change (right).

Guthrie (2006) Nature **441** 207-209

Evidence for Clovis hunting strategies

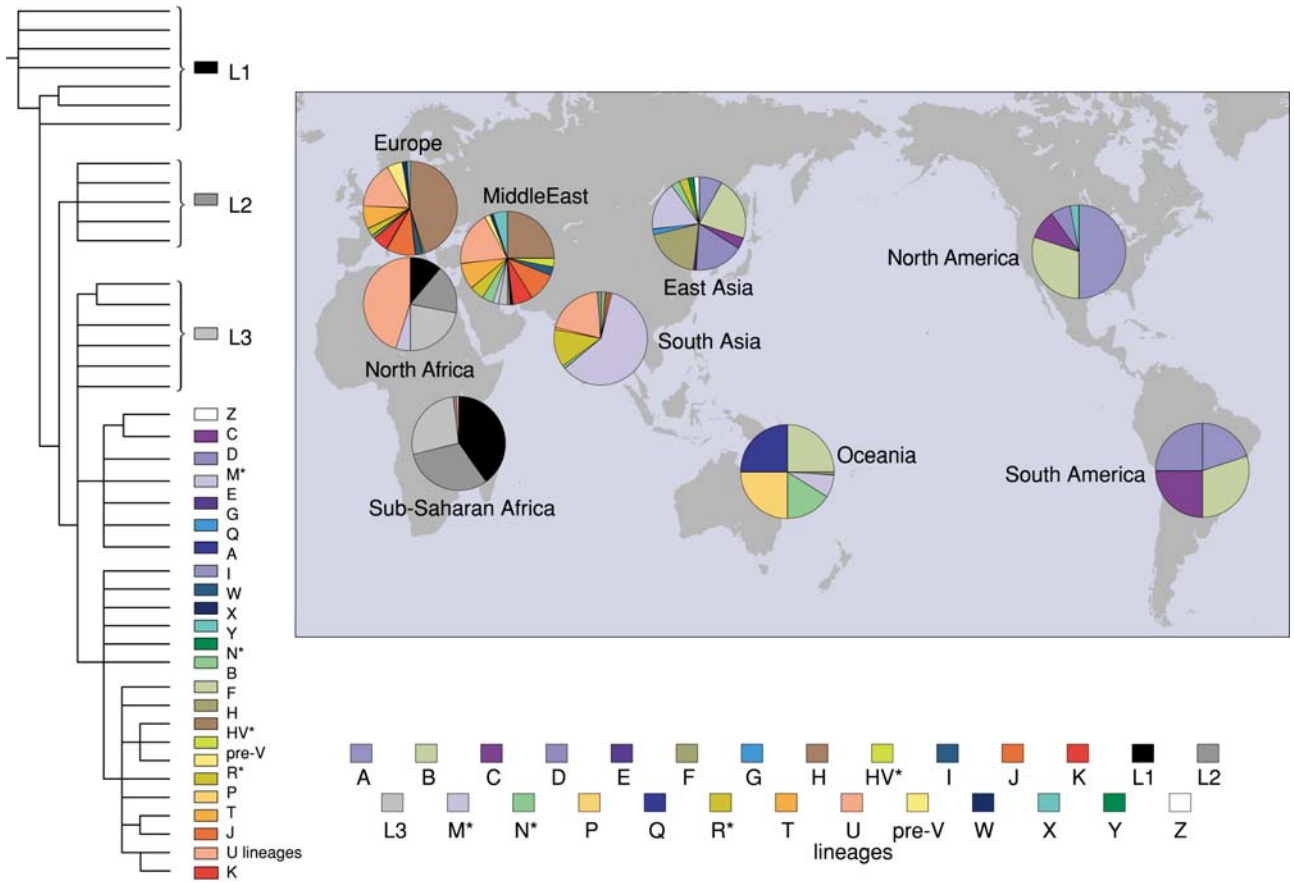
Figure 3. Map of sites included in this study. (1) Mannis; (2) Murray Springs, Lehner, Naco, Escapule, Leikem; (3) Colby; (4) Dent; (5) Charlie Lake Cave; (6) Blackwater Draw; (7) McLean; (8) Kincaid; (9) Lubbock Lake; (10) Miami; (11) Domebo; (12) Lange Ferguson; (13) Aubrey, Lewisville; (14) Gault; (15) Kimmswick; (16) Boaz; (17) Schaefer, Hebior; (18) Holcombe Beach; (19) Hiscock; (20) Martins Creek; (21) Shawnee-Minnisink; (22) Bull Brook; (23) Whipple; (24) Wacissa River; (25) Guest; (26) Little Salt Spring.



The traditional characterization of Clovis is a focus on big-game. In surveying the faunal data from 33 Clovis sites (left) Waguespeak & Surovell (2003) looked to see how many individuals (MNI) in each of five size classes of prey were present (top graph, right). If Clovis peoples followed a generalist subsistence strategy, prey would be taken in proportion to abundance – the expected value used for the reworking of the data in the bottom graph (right). This shows that large prey are over-represented at Clovis sites, but for this subsistence strategy to be successful, a necessary condition is that human population density is low.

Waguespeak & Surovell (2003) American Antiquity **68** 333-352

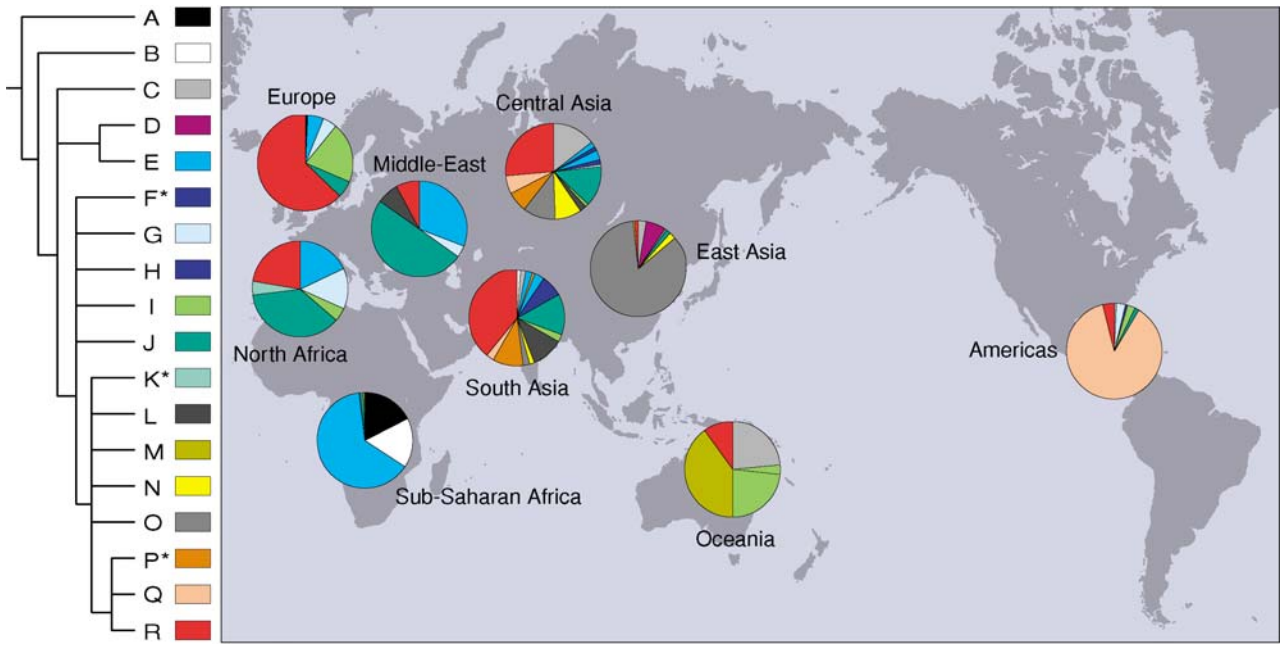
Global geographical distribution of the major mtDNA clades



Each major clade (haplogroup) is assigned a colour which is also used to show its position in the phylogeny (left). The details of lineages within U are not shown. The frequency in modern population samples is shown in the pie charts.

(Figure 9.16; Jobling et al, 2004)

Global geographical distribution of the major Y-chromosome haplogroups



Each major clade (haplogroup) is assigned a colour which is also used to show its position in the phylogeny (left). The frequency in modern population samples is shown in the pie charts.

(Figure 9.18; Jobling et al, 2004)

Kennewick Man

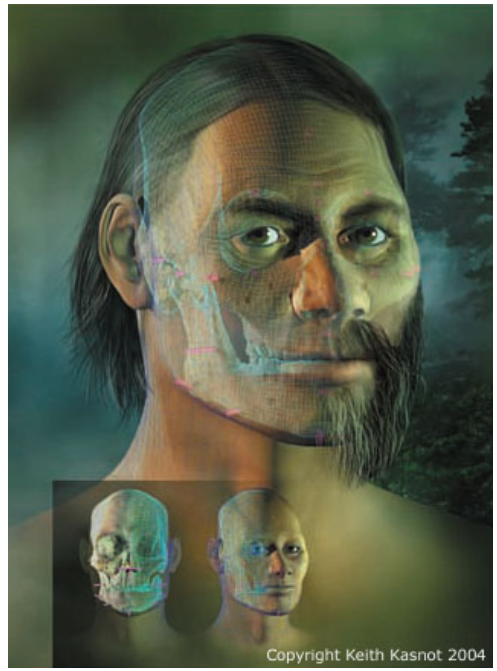
http://www.msnbc.msn.com/id/7432967/

http://www.pbs.org/wgbh/nova/first/kennewick.html

Images: Top left: cast of skull. Bottom left: the face of Kennewick Man, as reconstructed by Jim Chatters and Thomas McClelland. Top right: the reconstruction by Kasnot & Owsley for National Geographic

"The Kennewick skeleton can be excluded, on the basis of dental and cranial morphology, from recent American Indians. More importantly, it can be excluded … from **all** late Holocene human groups. There are indications, however, that the Kennewick cranium is morphologically similar to Archaic populations from the northern Great Basin region, and to large Archaic populations in the eastern woodlands. … only a regional time series analysis of a sequence of well-dated human remains from east-central Washington spanning the past 9,000 years can provide direct evidence of biological continuity between Kennewick and modern American Indian tribes."

http://www.nps.gov/history/archeology/kennewick/powell_rose.htm (1999)



http://www.iup.edu/publications/iupmag/BACKISSUES/Sum04/kasnot.shtm

Right: A team of scientists, lead by Owsley (Smithsonian) prepare to study Kennewick Man in 2005

http://www.si.edu/opa/insideresearch/articles/V13_KennewickMan.html