THE LOWER PALAEOLITHIC SITE AT HOXNE

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INTRODUCTORY NOTE

THIS ARTICLE HAS been prompted by the last and most extensive archaeological excavations undertaken on this famous site during 1971-1974 and 1978. These were directed in the field by the author, on behalf of Professor Ronald Singer of the Department of Anatomy, University of Chicago, in collaboration with numerous specialists. A detailed monograph is in the final stages of preparation. This will contain reports on the geo-stratigraphic context of the archaeology (B. G. Gladfelter), the distribution and associations of the archaeological features and flint industries (J. J. Wymer), palynology (W. W. Mullenders and C. Turner), the mammalian fauna (A. J. Stuart, R. Wolff and R. Singer), ostracods (E. Robinson), mollusca (M. P. Kerney) and others. This monograph is intended for Quaternary specialists, but it is thought that a summary of the results achieved, with an account of the history of the site's investigation since the end of the 18th century, would be of general interest. It is not an interim report on the excavations, and the supporting evidence for many of the statements contained in it must be sought in the forthcoming monograph.

There is no other Lower Palaeolithic site in Britain, or Europe, than this small brickyard in north Suffolk, where the history of its discovery and investigation, spanning nearly two centuries, so aptly epitomises the growth of the study of this branch of archaeology. The personalities involved have reflected the varying emphases on particular problems and the current approaches and thoughts of their periods. Undoubtedly, future work will do the same.

Acknowledgements and thanks are here restricted to the owners of the brickyard, Jack and Geoffrey Banham of W. A. Banham and Sons, and to the Suffolk County Council and Gerald Chambers, owners and tenant of the adjacent Home Farm. Without their permission, tolerance and co-operation, the recent work would not have been possible.

1. HISTORICAL

The annual excursion of the Institute, on 8 June 1888, was held at Hoxne, members arriving by way of train to Diss and travelling thence by carriages. It was conducted by the Rev. C. R. Manning, F.S.A. and, although the party did not actually visit the palaeolithic site at the brickyard, he read a paper in the church, published in our *Proceedings* for the following year, which included a brief account of the discoveries made there. He stressed their importance in assessing the antiquity of the human race, referring to the well-known letter sent by John Frere in 1797 to the Society of Antiquaries, published in *Archaeologia* for 1800. This letter has been reprinted in many articles, otherwise it would be included here for, apart from being a model of clarity and brevity, it marks the beginning of scientific archaeology. A slightly abridged version can be found in a recent summary of the life of this remarkable man by Paul Ashbee, in the *East Anglia Monthly.*

John Frere had observed flints which we would now call palaeolithic hand-axes being found by workmen in the brickyard at a depth of about 12 feet from the surface. It was not just that he recognised the flints as being of human handiwork and evidently 'fabricated and used by a people who had not the use of metals', but he saw the stratigraphical significance of their occurrence beneath water-laid deposits which were well above the flood plain of the Waveney, immediately to their north, and also that they 'did not lie at the foot of higher ground'. It was thus clear to him that the landscape had altered considerably since their deposition and that all this had happened since someone had made the hand-axes, thus prompting his famous remark that they would seem to belong 'to a very remote period indeed, even beyond that of the present world'.

It is difficult to conceive, nearly 200 years later, how these observations were received by his contemporaries. The only reaction of the Society of Antiquaries, one is ashamed to record, is that he was thanked for his 'curious and most interesting communication'. Popular thought, where it existed at all, was quite satisfied with the age of Man as assessed in biblical terms, and remains of extinct animals were explained away by the universal deluge. Prior to the Romans there were Ancient Britons. Yet, men of science were active. A Professor of Geology had been appointed in Cambridge in 1762 and had, in present day terms, no illusion about normal geological processes. William Smith was working on his identification of strata by fossils, although other notable geologists such as Conybeare and Buckland adhered tenaciously to the flood theory. They both became deans. Frere's brilliant deductions were ignored. A Fellow of the Royal Society, he seems to have cast his archaeological pearl and left to dwell on his many other interests. (Pl. VIII). He died in 1807 and is buried in the Frere family vault beneath the chancel of Finningham Church.

It was sixty years before Frere's observations received the attention they merited. In the meantime, Hoxne was not entirely forgotten. One of the hand-axes was illustrated by Skelton (1830) in his account of the ancient arms and armour from the collection of Llewelyn Meyrick, and the Norfolk antiquary, Samuel Woodward, left a very useful note recording an eye-witness description by a Rev. W. T. Spurdens of the same section that Frere had seen. This is preserved with his correspondence and compilation of drawings of 'Antiquities of East Anglia' at Norwich Castle Museum, published later by H. B. Woodward (1879) and A. S. Kennard (1916, 261). He records 'wood and vegetable matter, hazel nuts, etc' at the level where the flints were found, instead of the 'gravelly soil' described by Frere. He also recollected 'two loads of chippings [i.e. flakes] which were used to mend the roads', so his conclusion that the spot had been 'a manufactory of them' is undoubtedly correct. No such knapping floor has since been found again at Hoxne. However, such discoveries excited nothing but a little curiosity. There are a few records of hand-axes and bones being found in the mid-19th century (Chester 1855, 1857, 1860), one with a prescient reference to two forms of implements. A few hand-axes were occasionally picked up in other parts of southern Britain but attracted no archaeological attention. Worthington Smith (1894, 176) notes one found near Luton in 1830. There must have been others, for the digging of brickearth and gravel was becoming a considerable industry to meet the needs of roads and urban development. Scientific thought was concentrated on the problem of the antiquity of Man. Was he contemporary with the extinct animals of the 'Drift' deposits or not? Arguments raged, but they centred on the sites of northern France, mainly through the persistent positive claims of Boucher de Perthes of Abbeville. The famous visits of Falconer, Prestwich and Evans to the Somme Valley sites in 1858 and 1859 convinced both geologists and archaeologists that Man was contemporary with extinct forms of elephant, rhinoceros and other animals. Prestwich read his paper to the Royal Society in 1859. The following year saw its publication, and another by John Evans. Both referred to Hoxne, as the only site then known in Britain which was comparable to the Somme sites. Evans and Prestwich had lost no time upon their return from France in following up Frere's paper of 1800. Sections were cut in the brickyard, and a deep boring made. One of the results of this realisation that the evidence for early Man was as likely to be found in England as in France, was an immediate search. Suffolk again takes precedence, for the next discoveries were at Icklingham (Prestwich 1861, 1864; Evans 1861).

The latter half of the 19th century saw the accumulation of palaeoliths from pits all over south east England. For palaeolithic archaeology it was a period of collection and assimilation of the data, culminating in Evans's classic publication of 'Ancient Stone Implements, Weapons and Ornaments of Great Britain' in 1897. A few collectors visited Hoxne but, at this time, that part of the brickearth which was being dug appears to have yielded very little. C. B. Rose (1860) records a couple of hand-axes from 'strata above the bone bed', and some mint hand-axes in the Sedgwick Museum at Cambridge were donated by C. M. Doughty, author of 'Travels in Arabia Deserta',

with the note 'From the undisturbed clay in which the implements are commonly found at Hoxne. Dec. 1862'. The British Museum acquired a few specimens (Franks 1868).

The main problem was now, not to establish the antiquity of Man, but to determine what degree of antiquity was involved. Prestwich (1864) had already hinted that the age was likely to exceed greatly the usual considerations of his contemporaries although, in his opinion based on the study at Hoxne, he was satisfied that all the discoveries were more recent than the boulder clay, now recognised as evidence for the Ice Age in Britain. However, not everyone agreed with him, and it became a major question to determine whether this was really so. Again, Hoxne was chosen as the most likely site in Britain to settle the matter. Some geological work had already been done by Thomas Belt (1876) but it was inconclusive. The Geological Survey Memoirs, understandably, only repeated previous conclusions. An important contribution was made by Clement Reid and Ridley (1888) whose investigations demonstrated that the clay was lacustrine and contained a bed with fossil arctic plants. Already, it was clear that there was a long history of complicated sedimentation exposed in the Hoxne brickyard. Correspondingly, a committee was appointed by the British Association in 1895, with Sir John Evans as chairman 'to ascertain by excavations at Hoxne, the relation of the Palaeolithic deposits to the Boulder Clay, and to the deposits with Arctic and Temperate plants'. This work was directed by Clement Reid in the following year (Evans *et al.* 1896). Numerous boreholes allowed cross sections to be constructed of the lake beds and their report, with a few modifications, remains a valuable basis for any study of the site. In the words of their report it demonstrated that 'the Palaeolithic deposits at Hoxne are therefore not only later than the latest Boulder Clay of East Anglia, but are separated from it by two climatic waves, with corresponding changes of the flora. Such sweeping changes cannot have been local. They must have affected wide areas.'

By the latter part of the 19th century, the Hoxne brickyards had extended to both sides of the Hoxne – Eye road, the western more recent pit being known as the Oakley Park Pit. Further work at the site in the first half of the 20th century was conducted mainly by archaeologists, now primarily concerned with subdividing the palaeolithic period into 'cultures' and 'industrial stages'. Such was the preoccupation of most archaeologists of this time, evolving naturally from the works of de Mortillet, Montelius, Déchelette and others. As far as palaeolithic archaeology was concerned, the greatest proponent was the Abbé Breuil. In retrospect it can be seen that such a stage was unavoidable, but it divorced archaeology from geology and, in many cases, produced false chronologies and absurdities. This was certainly true at Hoxne, which now featured in the spate of text and popular books concerning Early Man. A few people seem to have continued collecting an occasional hand-axe from Hoxne. A. Mayfield exhibited a scraper, 'pot-boiler' and some bones to the Prehistoric Society of East Anglia meeting at Norwich in 1910 but, apart from some useful work on the mollusca by Kennard and Woodward (1922, 1928), Hoxne was dominated by the investigations of J. Reid Moir in 1924 – 26 and 1934 (Moir 1926, 1934, 1935).

J. Reid Moir was President of the Ipswich Museum from 1929 to 1944 (obituary in our *Proceedings,* vol. XXIV, 58-60) and a memorial seat bearing his name may be seen beneath a large oak tree on the green between Westwood Avenue and Valley Road in Ipswich. He was twice President of the Prehistoric Society of East Anglia and Vice-President of this Institute 1925 – 45. He first published in 1910 and became a Fellow of the Royal Society. Many of his numerous papers describe flints found in Pleistocene contexts much earlier than Hoxne, which he considered were human artifacts. This produced much controversy. Few archaeologists, if any, would now regard such flints as artifacts. At Hoxne, he allowed his typological judgement to take precedence over the stratigraphy he could observe. The result is that his reports are difficult to follow and, in parts, misleading or incorrect. Yet, when his interpretations have been unravelled from his observations and discarded, there is left a useful body of evidence which does not conflict with later work. He was the first person to record the existence of two separate Acheulian hand-axe industries at Hoxne, now referred to as the Lower and Upper Hoxne Industries.

In the early 1950s, Professor R. G. West of the Botany School, University of Cambridge, applied the method of pollen analysis to the sediments at Hoxne, made numerous boreholes and test sections to clarify the stratigraphy and published the results in a detailed paper in the *Philosophical Transactions of the Royal Society* for 1956. This critical study marks the new, multi-disciplinary approach which is now considered necessary for the investigation of such a site. With such a background of demonstrable stratigraphy, pollen analyses, the presence of faunal remains and a renewed emphasis on Quaternary studies in East Anglia and elsewhere, Hoxne obviously qualified as a site which would give information on the economy, culture and environment of the people represented by their well known flint tools. Previous assessments had been restricted or nullified (cf. McBurney in West and McBurney 1955) by insufficient data on the provenance of the artifacts examined. The recent work has partly rectified this and a summary of the present state of knowledge concerning various aspects of the site is given below. There are still several problems connected with the site, and some of the conclusions need substantiating, but there is little doubt that untouched areas on the fringes of the brickyard will one day yield further archaeological horizons.

2. MAJOR RESULTS OF 1971 - 1974 AND 1978 EXCAVATIONS

(i) *Extent of the excavations*

The majority of the work was conducted in the pit on the west side of the Hoxne – Eye road, known as Oakley Park Pit, and in a field of Home Farm, immediately adjacent. Clay was last dug commercially in Oakley Park Pit about 1955 and when work commenced in May 1971, grass and natural slip had obscured any sections. The plan, Fig. 39, shows the areas examined within the framework of a metre grid, aligned on the National Grid. The initial area excavation was referred to as 'Main Cutting'. Subsequently, all further cuttings were given Roman numerals in chronological order, with the exception of 'West Cuttings I – V' which were made in 1974 and 1978. Missing numbers within this sequence are of cuttings made in the old pit on the east side of the road. West Cutting III was a trial cutting, archaeologically sterile, just outside the area of the plan on the west side. Some further trial cuttings, S1 – S6, were made with a mechanical digger to establish some geological points to the south of Oakley Park Pit, on Home Farm, but only S6 is within the area of the plan. W1 – W6 were small cuttings made by Dr B. G. Gladfelter, also to establish the geological sequence.

Oakley Park Pit is now a landscaped garden with a large bungalow, the position of which is shown on the plan. The pit on the opposite side of the road serves as a contractor's yard for W. A. Banham and Sons.

(ii) *The geological and environmental sequence*

The basic geological sequence had already been established by previous workers, as detailed and clarified by R. G. West (1956) with the addition of pollen analyses. Nothing was seen to contradict this sequence, although much can now be added for the uppermost part, previously only tentatively assessed on borehole evidence. The present state of knowledge is expressed in the diagrammatic sketch section, Fig. 40, and the table below (p. 175).

The Hoxne lake formed in a basin estimated at about 570m across and up to 14m deep, within chalky boulder clay known as Lowestoft Till. This till is the residue of the glacial ice sheet which once covered East Anglia and extended as far south as the present Lower Thames Valley. On the retreat of the ice, numerous hollows would remain to become lakes, as in northern Canada or Scandinavia today. Similar, contemporary lakes to Hoxne are known to exist at Athelington, Saint Cross South Elmham and Sicklesmere in Suffolk, and others must await discovery. Lake Hoxne gradually filled with clay muds, the pollen from which indicates the amelioration of the climate from Late-glacial, through Pre-temperate and Late-temperate zones, and constitute the type site of the Hoxnian Stage of the British Quaternary sequence (Mitchell *et al.* 1973) although

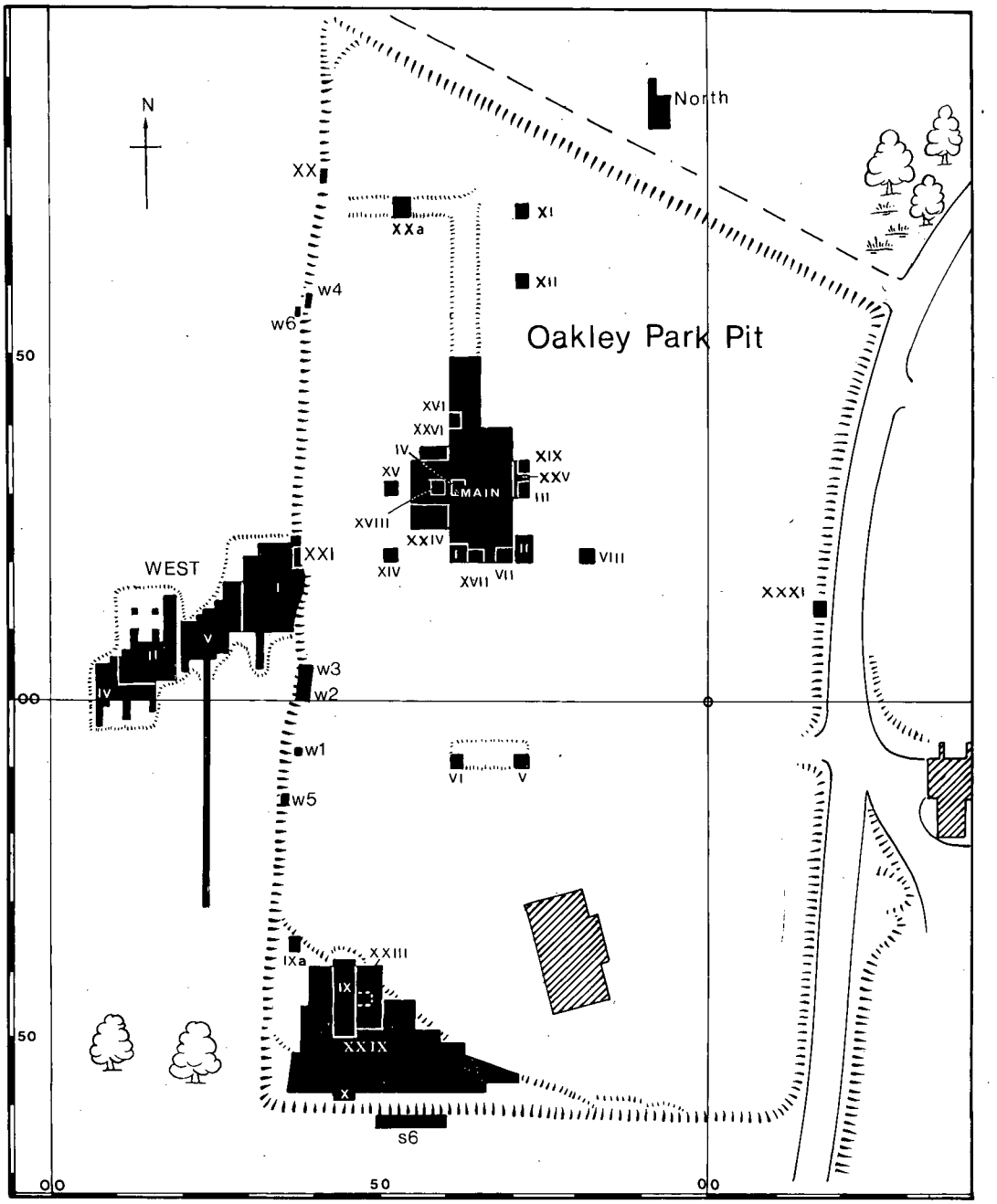

FIG. 39 — Plan of the excavated areas, shown in solid black, in Oakley Park Pit (1971 – 74) and on Home Farm (1974, 1978). The grid lines are 100m squares of the National Grid, the scale of which is shown on the west and south edges. The grid lines intersect within Oakley Park Pit in the south west corner of grid square TM 17507670.

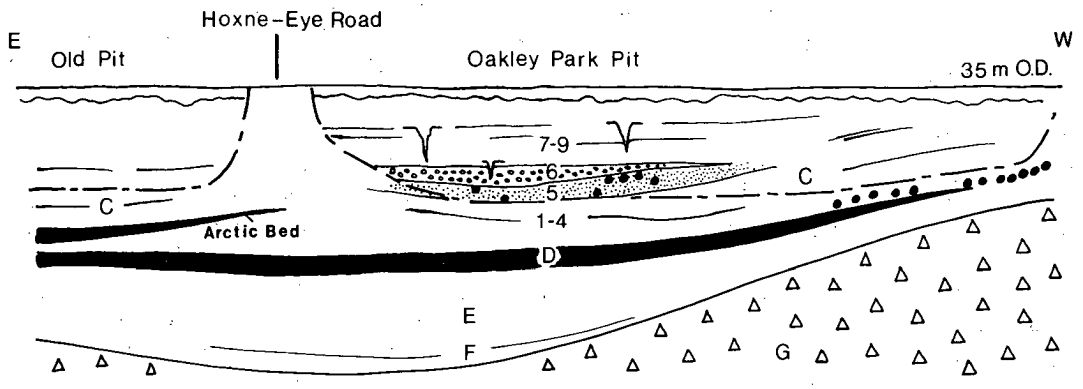

FIG. 40 — Diagrammatic, geological section across the lacustrine and fluviatile deposits at Hoxne. This covers about 100m of the southern part of the site. The vertical scale is exaggerated. The actual depth from the surface of the Hoxne – Eye Road at this point to the boulder clay (Stratum G) is about 14m. The levels with archaeological material in primary context are shown as black dots. The Hoxne Lower Industry is near the bottom of Stratum C, and the Hoxne Upper Industry within Bed 5. For explanation of Beds and Strata, see accompanying Table.

the Post-temperate zone is missing. All four zones are represented in lake deposits at Marks Tey, Essex (Turner 1970). As a drainage pattern became superimposed upon the post-glacial landscape, it is possible that small feeder streams drained through the lake, precursors of the present Goldbrook and Dove valleys.

Stratum D is a black, peaty, organic mud, representing a fall in the water table during the Late-temperate zone, which caused an alder carr to form around the fringes of Lake Hoxne. Stratum C is a complex series of sediments and is associated with much of the archaeological evidence. In stratigraphical terms it is post-Hoxnian and must belong to the beginning of the next geological stage, the Wolstonian. It would appear to mark the onset of much cooler conditions and contains within it the 'Arctic Bed' investigated in the 19th century, with its decayed leaves of three species of Arctic willow and the dwarf, Arctic birch. Micro-fauna, sieved from the upper part of Stratum C, in fine, chalky, clay-muds and gravels, produced some Arctic voles and lemming remains among other fauna. Pollen profiles from samples taken in 1973 and 1974 by W. W. Mullenders of the University of Louvain through Stratum C suggest a more open landscape, as would be expected in a cooler climate, but some specialists dispute the validity of the profiles (C. Turner, *pers. comm.*). The large mammals found near the base of Stratum C, such as elephant and deer, conflict with a treeless landscape, although horse is the most common animal found and is, of course, an animal of open grassland. However, it is very likely that it took some time for the cooler climate to have any drastic effect upon the environment. There is considerable evidence for human activity at this time.

The sediments of Stratum C are clearly fluviatile and a major river system had been imposed upon the old lake beds; this river would have been the ancestor of the modern Waveney. The river was very active, constantly changing its course and cutting new channels and filling old ones in the process. Chalky gravels and silts (Beds 4 and 5) at the very top of Stratum C may represent quieter and more clement conditions, for the Hoxne Upper Industry is found in Bed 5 and it is most likely that Frere's discoveries were in the equivalent of Bed 4. Large mammals were present in Bed 5 so it seems that interstadial conditions prevailed but not, it seems, for long. A very coarse gravel (Bed 6) overlies the flood plain silt of Bed 5, and it contains numerous flint tools and flakes swept off the surrounding river banks by torrential floods. Contemporary fossil, ice-wedge casts in the succeeding laminated sands and silts (Beds 7 and 8) demonstrate peri-glacial conditions. There is no evidence for actual glacial ice over the site, but an ice sheet of the Wolstonian

Stage may have reached north west Suffolk and west Norfolk at this time. By the time it had retreated, the Waveney had cut new channels at a much lower level, leaving the complex sequence at Hoxne well above its new flood plain, subject to erosion as the slopes weathered back.

(iii) *Flint industries and other human activity*

The stratigraphical positions of the flint industries found at Hoxne are shown on the diagrammatic section (Fig. 40) and table. They have been termed the Hoxne Upper and Lower Industries as it can be demonstrated that one is more recent than the other, but if Bed 5 is regarded as the uppermost part of Stratum C there is, in geological terms, no great interval of time between them. They are both of Acheulian tradition, in that they contain hand-axes, although there are considerable typological differences. These two industries are probably the flint litter left behind by two different groups of hunter-gatherers over periods of regular visitation to this very favourable and attractive site. There was fresh water in the river, fish and game abounding in what remained of the silting up Lake Hoxne, horses, deer, oxen and elephants grazing on the flood plain or in the nearby scrub and forest, flint for making tools on the edges of the river bed or to be grubbed from Chalk exposures only a few miles distant and, most imporant of all, a cultural tradition which allowed them to cope with weather that was probably colder or wetter than the present day.

THE SEQUENCE AT HOXNE*

Stratigraphy as per Fig. 40	Regime	Climate	Archaeology
Bed 9 pebbly sand	Solifluction	Very cold, periglacial	None
Bed 8	?Outwash from	Cold	None
Bed 7 laminated sands and silts with contemporary ice-wedge casts	melt-waters		
Bed 6 coarse, decalcified gravel	Aggradation of river channel	?Cold	Many derived artifacts of types found in underlying deposits
Bed 5 sandy silt	Flood plain	Warmer	Hoxne Upper Industry (Acheulian) in primary context, representing sporadic occupations of aggrading flood plain
Bed 4 sandy gravel	River bed	Warmer	Hand-axes in primary context or derived from nearby (?Hoxne Middle Industry)
Bed 3	Lake deposits	Cold	None
Bed 2	buried by		
Bed 1 chalky gravels, silt, clay and sand	fluviatile sediments		

The Sequence at Hoxne — *continued*

Stratigraphy as per Fig. 40	Regime	Climate	Archaeology
Stratum C mainly fine fluviatile sediments (Equivalent to Beds 1 – 3 and poss. 4 – 5)	Slight rise in water table. Lake incorporated in river system	Cool	Hoxne Lower Industry (Acheulian) in primary context near lakeside. Material found is probably a scatter within shallow water on very edge of lake
		HIATUS	
Stratum D peaty, detrital mud	Alder carr around lake caused by fall in water table	Warm Ho zone III Late-temperate	None
Stratum E lacustrine clay-muds	High water table with gradual silting up of lake	Warm Ho zone II Early-temperate	Sparse artifacts in upper 20 – 30cm may be intrusive, but could represent contemporary occupation
Stratum F lacustrine clay-muds	Initial silting of lake	Cool Ho zone I Late-glacial	None
Stratum G Chalky boulder clay — Lowestoft Till of Anglian Stage of British Quaternary sequence	Depression left in boulder clay causes lake to form	Glacial	None

*Based on West 1956, Gladfelter 1975 a and b and Gladfelter and Singer 1975.

The industry of superb, acutely-pointed hand-axes found by John Frere in the late 18th century presumably belonged to another group, and there could yet be many other groups with their distinctive or similar flint industries to be found within the river sediments of Stratum C. More of a problem is the question of what, if any, human activity can actually be related to the Hoxnian Interglacial Stage itself, when conditions would undoubtedly have been even more favourable for occupation. The evidence is equivocal. West (1956) showed the presence of flint flakes and at least one hand-axe, together with small bone fragments and pieces of charcoal, in the upper part of Stratum E, the lake muds of the Early-temperate zone. At precisely the same level, the pollen profile showed a deforestation zone and, such was the coincidence, that it seemed reasonable to attribute this to the work of man. However, the same deforestation zone has appeared in the

pollen profiles for Marks Tey and a site near Birmingham. Either these hunters were constantly clearing the forest with fire during a very restricted part of the Early-temperate zone or they or nature had been responsible for one enormous forest fire as sometimes happens in Australia today. Neither seems very likely and it is easier to accept a minor, climatic fluctuation over this part of what is now north west Europe. In 1971, excavations were made beneath Stratum D in the Main Cutting in order to check this matter and the result was positive: 14 flakes and 4 bone fragments were found in the lake clay of Stratum E, immediately below the peaty detrital mud of D. However, such finds were very sparse, for a metre wide trench through this horizon in E, 9m long, failed to produce any artifacts or bone fragments. In view of the plastic nature of wet clay it is just possible that the few artifacts and bones found at this level are naturally intrusive from the rich archaeological levels only 50 – 60cm above. If in genuine context, they could only be pieces which were flung into the lake. The actual lakeside at this time, long since eroded away by the processes which produced the sediments of Stratum C, was probably a considerable distance away. It might also be argued that the many battered and broken flakes and hand-axes found in the coarse gravel of Bed 6 had been washed off land surfaces of Hoxnian Interglacial age, but it is impossible to substantiate it. On present evidence it is best to accept the evidence for human occupation around Lake Hoxne during the actual Hoxnian Interglacial with caution, although it does seem very likely to have occurred.

The Hoxne Lower Industry was found on the west side of the Main Cutting immediately above Stratum D, in a breccia of mud and chalk. The artifacts contained within this breccia were in mint condition but must have moved slightly downhill under semi-frozen or saturated conditions. In the West Cuttings, however, everything was evidently in primary context at a particular level within the reworked lake muds of Stratum C (Pl. IXa), a few centimetres above its junction with Stratum E (D being absent in this part). The distribution of artifacts and bones in Stratum C formed a pattern of a narrow strip about 5m wide running north east – south west. This line is thought to be connected with the line of the contemporary lakeside. It is also concluded that the surface on which the material lay had not been dry land but shallow water, because if allowed to dry the mud cracks and if this had happened it would still show. Also, the excellent condition of the bone is consistent with a wet or damp environment. The favoured interpretation of the flint artifacts, bones and other features in the West Cuttings is of slow accumulation over a period of time on the bottom of shallow water close to the edge of the lake or secondary river channel.

In the area of the Main and West Cuttings, the Lower Industry was found and excavated over about 298 square metres. The majority of the worked flints were as fresh as the day they were made. Others, in somewhat worn or rolled condition, were considered residual and not included in the analysis of the industry.

The Lower Industry is an elegant, Acheulian hand-axe industry with a preference for ovate or cordate forms of hand-axes, often sharpened with tranchet flakes removed in the final stages of manufacture (e.g. Fig. 41, no. 2). Most of the flakes are the result of hand-axe manufacture, either from initial blocking-out or soft-hammer finishing, although a few cores suggest some intentional flake production. Secondary working on some of the flake tools is surprisingly elegant, but there are no apparent specialised or standardised tool forms. No Levalloisian technique was used. The following quantity of material was recovered:

11 hand-axes
1 wedge
1 rough-out for hand-axe
4 hand-axe sharpening flakes
17 cores
14 hammerstones
336 primary flakes
379 finishing flakes
131 spalls
30 flakes with secondary working
30 flakes with identifiable wear traces from use (see below)

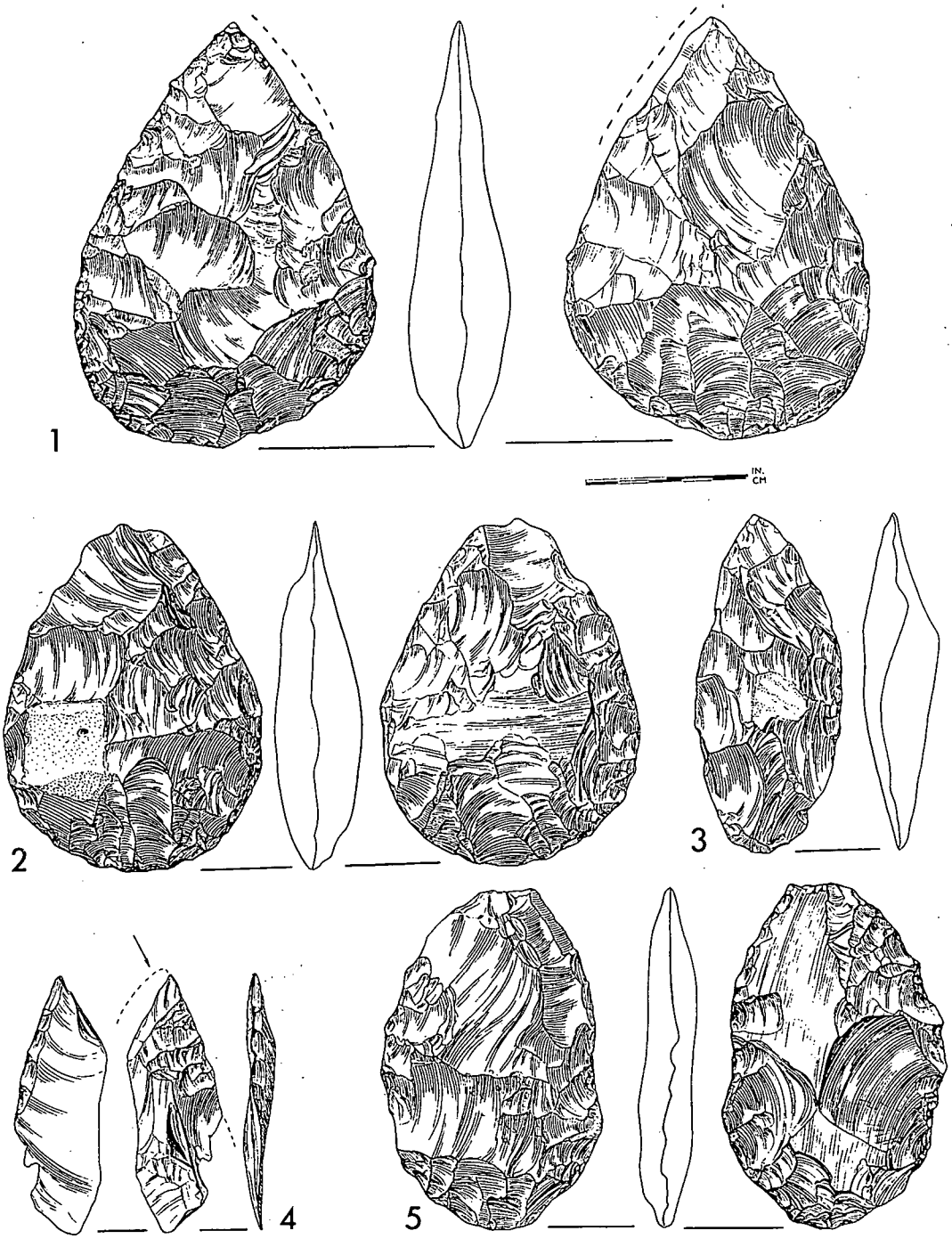

FIG. 41 — Hoxne Lower Industry: hand-axes. No. 4 is a final tranchet flake struck in the sharpening process. Microwear study of the elegant hand-axe, no. 1, suggests it was 'used for a heavy butchering task, like breaking joints, as well as for cutting up hunks of meat' (Keeley 1980, 146). The utilised edge is denoted by a dotted line.

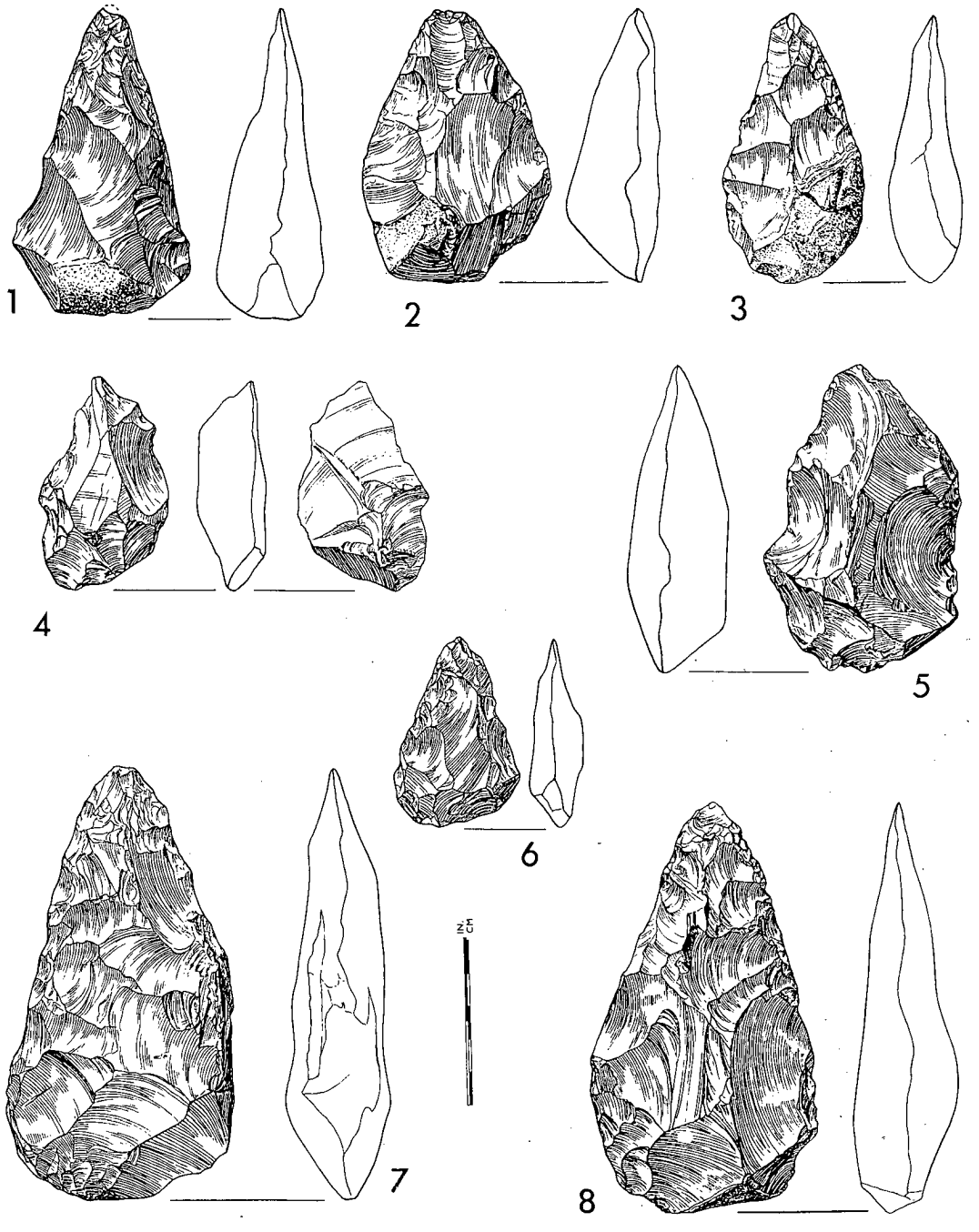

FIG. 42 — Hoxne Upper Industry: hand-axes.

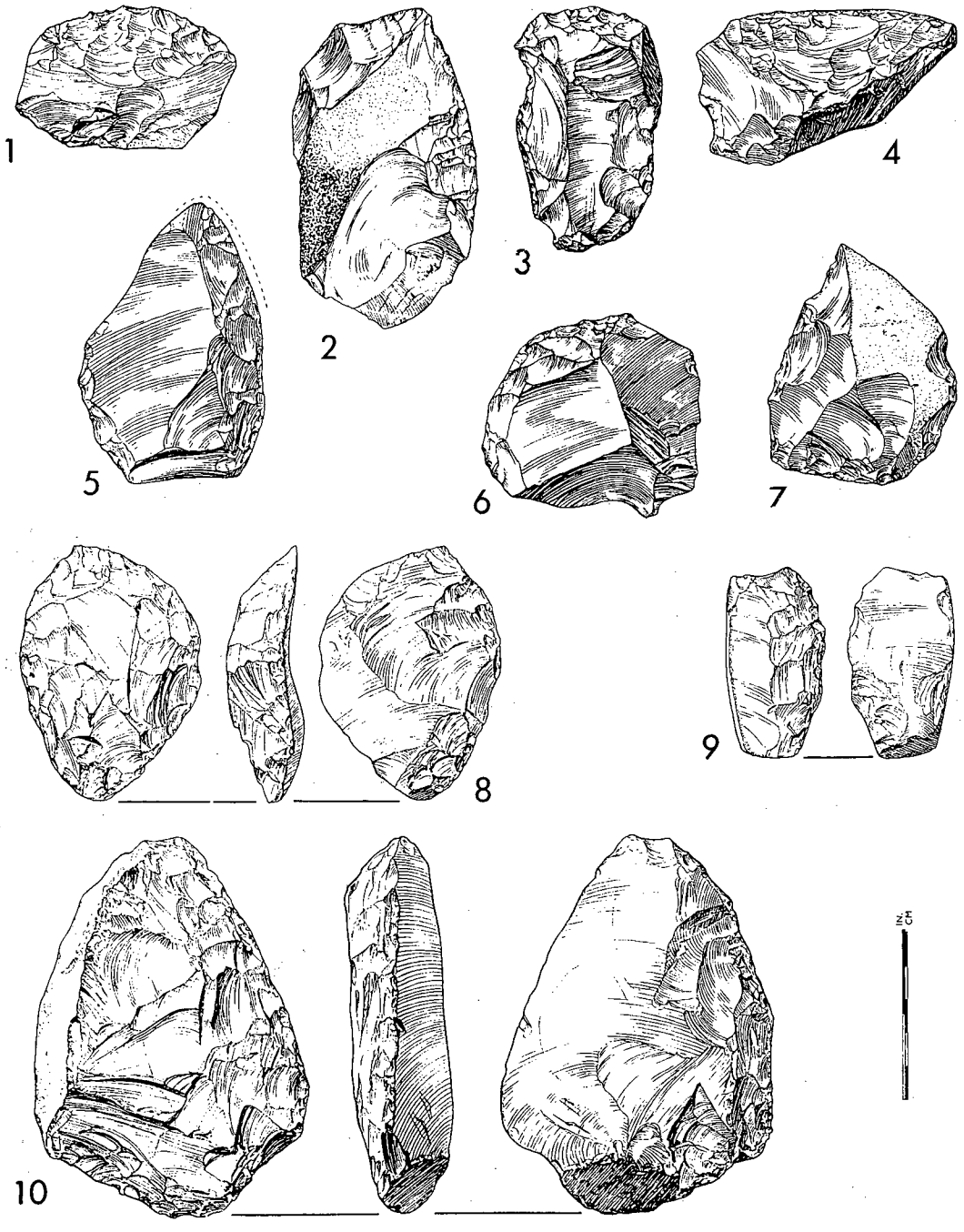

FIG. 43 — Hoxne Upper Industry: scrapers.

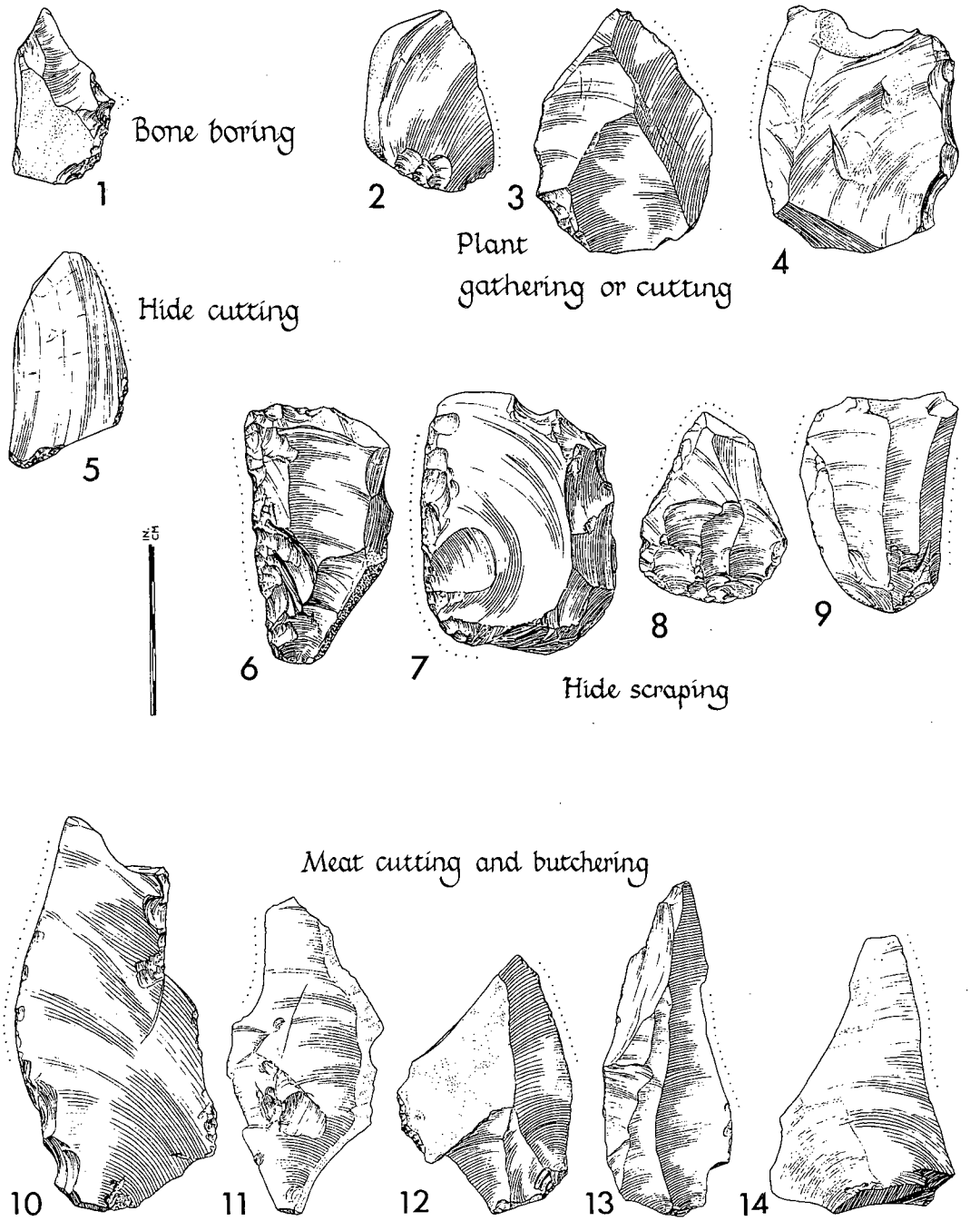

FIG. 44 — Hoxne Lower Industry: activities indicated by microwear studies of artifacts by Keeley (1980).

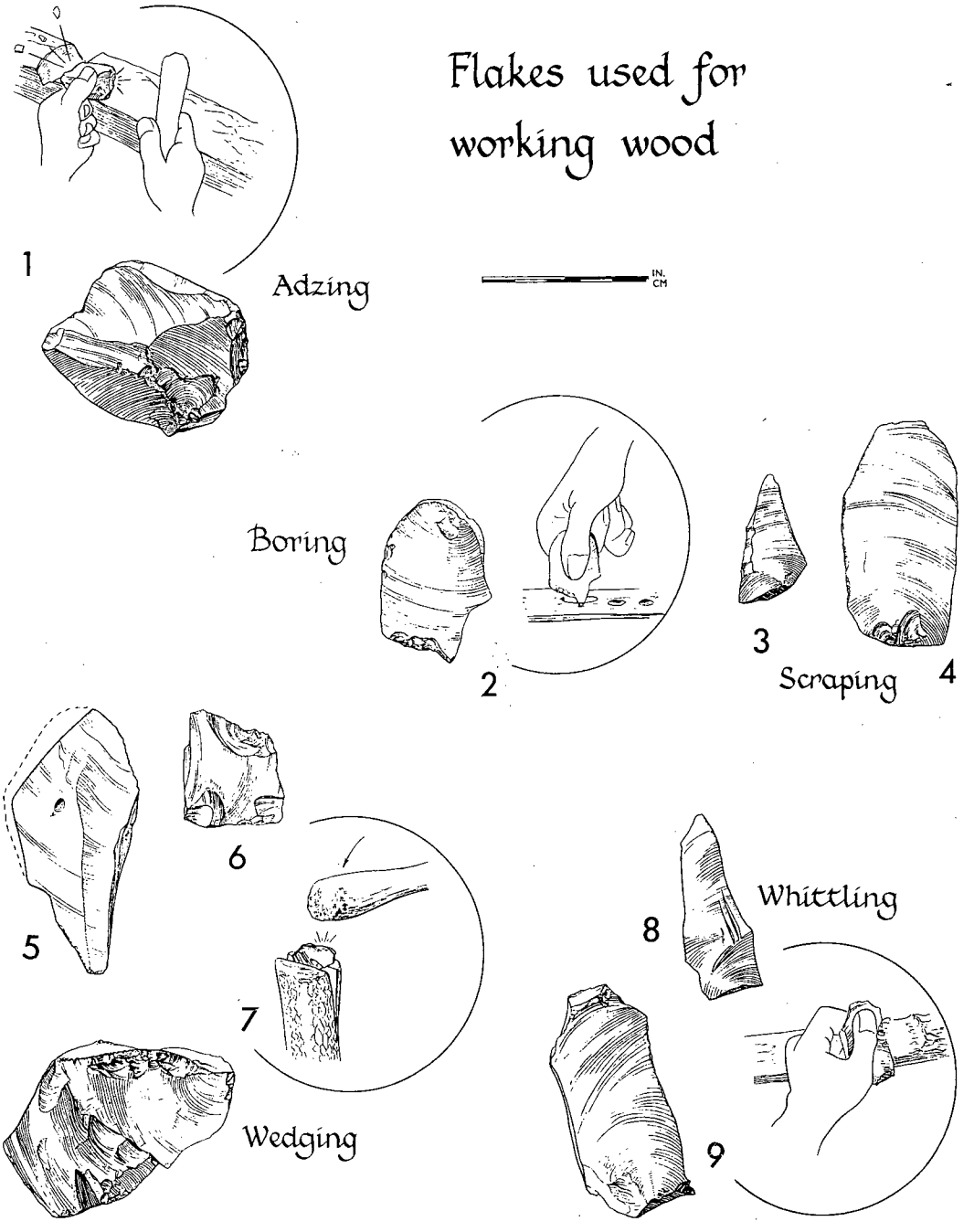

FIG. 45 — Hoxne Lower Industry: the use of flakes for working wood as determined by microwear studies by Keeley (1980).

The Upper Industry is defined as those artifacts in sharp or mint condition found within the body of Bed 5, a brown silt considered to represent an ancient flood plain alluvium (Pl. IXb). The material was distributed fairly generally at various levels in Bed 5 over an area of about 485 square metres, in the south west corner of Oakley Park Pit (see plan, Fig. 39), although for the most part it was in one level at the top of the silt, buried beneath the coarse gravel of Bed 6. This is interpreted as in primary context, on a genuine occupational horizon, i.e. the remains of human activity on a dry land surface. It is an Acheulian hand-axe industry with a preference for pointed forms of hand-axes (Fig. 42) with a greater variation in refinement than in the Lower Industry. Specialised flake tools (scrapers, Fig. 43) of various forms constitute a high proportion. Distinctive, bi-conical cores indicate intentional flake production and there is evidence of both anvil technique and free hammer blows for their removal. No Levalloisian technique was used. The secondary working on most of the scrapers was done with a soft hammer. The following quantity of material was recovered:

8 hand-axes	2 anvils	295 spalls
12 cores	257 primary flakes	75 scrapers
5 hammerstones	148 finishing flakes	20 other flakes with secondary working

A selection of artifacts from the Upper Industry are shown on Figs. 42 – 43.

Derived artifacts within Bed 5 or at other levels, and various isolated finds, neither contradict nor add anything to the classification of these two Hoxne industries.

The remarkably fresh state of the flint artifacts has rendered them suitable for the relatively new technique of microwear analysis. This technique involves the study under magnification of edge damage and polishes imparted on flints when they have been used as tools. Different actions and substances leave distinctive traces, although some of the early studies of this nature were not very convincing. Such meticulous examination as is required rules out the use of all artifacts that have suffered natural abrasion or chemical erosion even in the slightest degree, so the vast majority of palaeolithic flints cannot be used for microwear analysis, hence the importance of those from Hoxne. Samples from the Lower and Upper Industry have been examined and published by L. Keeley (1980), who concentrates on polishes and glosses seen under high magnification. Much of the Upper Industry proved unusable, as flowing water laden with fine sediment had clearly passed over many of the flints and destroyed the microscopic traces of wear. His results are summarised in the following list:

USE	LOWER INDUSTRY	UPPER INDUSTRY
Meat cutting and butchery	2 hand-axes 8 flakes	
Bone chopping	2 chopper-cores	
Bone boring	1 flake	
Plant gathering or cutting	3 flakes	
Hide scraping	4 scrapers 1 flake	3 convex side scrapers 1 end scraper
Hide cutting	1 flake	
Wood wedging	1 bifacial discoid 3 flakes	
Wood chopping/adzing	1 flake	1 straight sided scraper
Wood scraping	2 flakes	

USE	LOWER INDUSTRY
Wood boring	1 flake
Wood whittling or planing	2 flakes
Unknown	1 flake

Examples are shown on Figs. 44 – 45. Woodworking appears to have been far more sophisticated than might have been expected. The flake used for hide cutting (Fig. 44, no. 5) is of great interest, for Keeley interprets this as having been used for cutting up fresh hide laid over a piece of wood. This suggests precision cutting rather than casual slashing. It supports the idea of leather garments which, in view of the climatic evidence, would certainly have been necessary for most of the year. It is also satisfying to have the 'scrapers' of the Upper Industry identified as really having been used for hide scraping. There is a concentration of such scrapers in one part of the top of Bed 5, and their distribution around a relatively bare patch may denote some communal activity such as the cleaning of a large animal skin for protective clothing or roofing a shelter.

Perhaps the most enigmatical discovery at the level of the Lower Industry was a number of stone clusters, being concentrations of about a metre or less in diameter of natural flints mixed with a few broken bones, flint artifacts and occasional flecks of charcoal. Twelve such clusters were discovered. There is no possible geological process that could account for them; they can only be humanly dumped and, as such, constitute the earliest structures in the archaeological sense in Britain. Two examples are shown on Plates Xa – Xb. It is impossible to know for what they were used. Their distribution appears random and it is difficult to see how they could have been placed in shallow water in such a tight concentration unless they had originally been in some container like a sack of vegetable fibre netting. As such they may have served as weights for something. They do run along the line demarking the extent of the bones and artifacts on the side of deeper water and it is tempting to see them as a means of holding down fishing nets, but this is pure speculation.

Within Bed 5, associated with the Upper Industry was a somewhat sparse 'stone emplacement' (Pl. XIa). It is an artificial accumulation of natural flints which does not compare very well with the tightly-packed veritable pavements at such African sites as Olorgesailie, but it may have had an allied purpose. Possibly, it created a firmer surface on the soft and damp flood plain silt on which to lay bedding material.

Also with the Upper Industry were four, separate, small clusters of smashed bone (Pl. XIb). In each case the smashed bone was of a very large animal and, where identifiable, skull or vertebra. Some was certainly elephant. They may also have originally been within some container that has perished. A non-functional explanation may be indicated by a further, larger cluster at the base of Bed 5. The bone fragments were very dense and intensely smashed, almost pulverised, spread over about a metre with very few pieces larger than a finger nail. A few recognisable skull fragments, when examined by Dr R. Wolff, showed that the skulls of a horse, a deer and an ox had been so treated. These three animals were the mainstay of the food supply.

(iv) *The vertebrate fauna*

The majority of the bones found were in direct association with the flint industries and it was the human activity which presumably accounted for their presence. Examination by Mme Patou has discerned the cut marks of butchery on a few bones, and the intentional fracture of a few more. Remains of horse and deer predominate, and this presumably reflects the hunters' dietic preference, availability of the species and, indirectly, their hunting prowess. The species found are listed below (after Stuart 1982 and R. Wolff *pers. comm.*):

ANIMAL SPECIES FOUND AT HOXNE	With the Lower Industry	Upper part of Stratum C	With the Upper Industry	Various levels from previous investigations
PISCES				
Rutilus rutilus Roach		X		
Scardinius erythropthalmus Rudd		X		
Tinca tinca Tench		X		
Gasterostous aculeatus Three-spined stickleback		X		
Cyprinidae Carp		X		
Unspecified (Pl. XIIa)	X		X	
AMPHIBIA				
Unspecified		X		
REPTILIA				
? Snake		X		
AVES				
Unspecified aquatic	X	X		
MAMMALIA				
INSECTIVORA				
Sorex araneus Common shrew		X		
Desmana moschata Russian desman		X		
RODENTIA				
Castor fiber Beaver	X		X	X
Trogontherium cuvieri Giant beaver	X			
Lemmus lemmus Norway lemming		X		
Arvicola cantiana Extinct water vole		X		
Microtus arvalis Common vole		X		
Microtus agrestis Field vole		X		

Animal Species Found at Hoxne	With the Lower Industry	Upper part of Stratum C	With the Upper Industry	Various levels from previous investigations
PRIMATES				
Macaca sp. Monkey	X	X		
CARNIVORA				
Canis lupus Wolf				X
Lutra sp. Otter	X			
PROBOSCIDEA				
Palaeoloxodon antiquus Straight-tusked elephant	X		X	X
PERISSODACTYLA				
Equus sp. Horse	X		X	
Dicerorhinus sp. Rhinoceros	X			
ARTIODACTYLA				
Sus scrofa Pig				X
Megaceros giganteus Giant deer	X			
Cervus elaphus (Pl. XIIb) Red deer	X			X
Capreolus capreolus Roe deer	X			
Bos sp. or *Bison sp.*. Aurochs or bison	X			X

(v) *Dating*

There is no direct way for dating the sediments at Hoxne, either by methods which might give chronometric (absolute) dates, or stratigraphical (relative) dates, beyond a broad relegation of the entire sequence to the Middle Pleistocene period. This can be stated with confidence on the grounds of the mammalian fauna, i.e. the combination of such extinct forms as straight-tusked elephant, giant beaver, monkey and extinct rodents. The amount of erosion down to the present valley of the Waveney, after the deposition of the latest sediment in the Hoxne sequence is, as observed by Frere, evidence of great antiquity, but some assessment is required in calendar years. This is best done by considering the age of the Lowestoft Till underlying the Hoxnian Interglacial and later deposits.

The Oxygen isotope temperature scale calculated against the deep sea cores which cover the whole of the Pleistocene period enable some attempt to be made to date this glacial period. The oceanic temperature scale shows numerous fluctuations of climate from cool to warm, dated by the application of several methods: rate of sedimentation, radiocarbon dating, palaeomagnetism and cross-checks with potassium argon dates from terrestrial sediments which can be correlated. It presents the most reliable available time scale for the Pleistocene period, back to two million years and more. The periods of cool oceanic temperature must relate to glacial episodes, taking into consideration geographical factors, ocean currents, weather patterns and other matters which can or cannot be assessed. However, as yet there is no positive way in which the glacial deposits of one particular geological stage can be related with total confidence to any one cool period on the temperature scale. The best correlation for the last half million years is with the climatic events as recorded in the löess deposits of central Europe. On this basis, Kukla (1977) has estimated that the Holstein Interglacial of Germany relates to Stage 11 of the Temperature Scale, which is dated at 400,000 – 367,000 years before the present. The Hoxnian Interglacial is equated with the Holstein mainly on the basis of fauna. The next warmer stage, no. 9, is dated at 330,000 – 300,000 years. If this is accepted, the Lower Hoxne Industry dates to about 350,000 years, and the Upper to around 315,000 years.

Some workers prefer a 'shorter' time scale, with the Hoxnian equated with stage 7, estimated at 240,000 – 200,000 years. A misguided attempt to date Stratum D by the radiocarbon method was made by N. Page (1972) and resulted in the publication of two dates: 24,500 ±560 b.p. (T – 932) and 24,100 ±400 b.p. (T – 1030). These absurdly recent dates are explained by the samples being collected close to the present surface and thus radioactively enriched from modern humates. A sample from the same Stratum D, collected in 1972 at a depth of 4m beneath undisturbed deposits had such low radioactivity that the laboratory considered it 'dead'. Another sample from the same level measured by another laboratory gave a similar result. This is as expected from samples whose real date is clearly beyond the range of radiocarbon (Singer *et al.* 1973).

Measurements of the lake muds of Stratum E for palaeomagnetism demonstrated, as was expected, normal polarity (Thompson *et al.* 1974).

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