A LONG BLADE FLINT INDUSTRY BENEATH BOREAL PEAT AT TITCHWELL, NORFOLK

by J.J. Wymer and P.A. Robins

with contributions by P.G. Hoare, C.O. Hunt, J. Barnard,

J.E. Robinson, P. Murphy, V.R. Switsur, S.G.E. Bowman and N. Debenham

SUMMARY

The flint industry described in this report was mainly recovered on the surface of the beach at Titchwell on the north Norfolk coast over a period of several years. Similar material was eventually found in situ beneath a complex sequence of stratified peats and estuarine and marine clays, only visible at exceptionally low tides at TF 7560 4536. It was concluded that this was the source from which the material on the beach had come, washed by waves from its place of discard to near the High Water Mark. It is an industry based on elegant blade production (some of considerable length) with scrapers, burins, various retouched pieces but no microlithic or axe/adze element. Such is typical of the general tradition of flintwork produced by itinerant hunter-gatherers of north-west Europe during the Late Glacial – Early Post-glacial periods (c.10,000 – 8,000 bc). This is the first time that such an industry has been found in Norfolk in any quantity and which can be related to a stratified context. It indicates human activity or settlement on an inland, open site, possibly close to a river. The site was gradually inundated by the Post-glacial rise in sea level. Radiocarbon dating and palynological evidence shows that the site could not have been occupied after about 7000 bc.

Location of the Site and History of Discoveries

Titchwell lies about 8km to the east of Hunstanton and the Wash, and the site which is the subject of this report is on the coast below High Water Mark (Fig. 1) where Ordnance Survey maps mark 'Remains of Ancient Forest.' This is an area of the North Norfolk coast which has been studied extensively for the evidence it affords of the sedimentation that occurred in response to the rising sea level since the last glacial episode, especially at Brancaster which is the next parish along the coast (Murphy and Funnell 1980; Funnell and Pearson 1984). At about 8300 bc (NB: lower case 'bc' indicates dates based on radiocarbon years which, for this period, may be some centuries younger than calendar years) the level of the North Sea was at least 36m lower than it is today. The coastline was then correspondingly distant, somewhere near the present Dogger Bank (Oele et al. 1979, 233-248), and Titchwell well inland. At this time a landbridge would have existed between Norfolk and north-west Germany and Denmark. The major rivers such as the Elbe, Rhine and Thames would have found their way to the oceans through the English Channel, but this landbridge was probably very wet and marshy in places. Movement across it may have been hazardous but there is enough archaeological evidence to show that people did move across it in both directions. As the sea level rose, mainly because of the melting of the great northern ice sheets, so the landbridge gradually became inundated, although passable for some time with some form of watercraft. By about 6500 bc Britain was essentially an island. The flints found at Titchwell represent activity during an earlier part of this time, when the sea was still far away and small freshwater streams flowed across a plain to reach the coast.

The first indication of this early site was the discovery of a well-struck blade core on the foreshore at Brancaster recorded by Reid Moir (1931). Reid Moir has been considerably maligned in

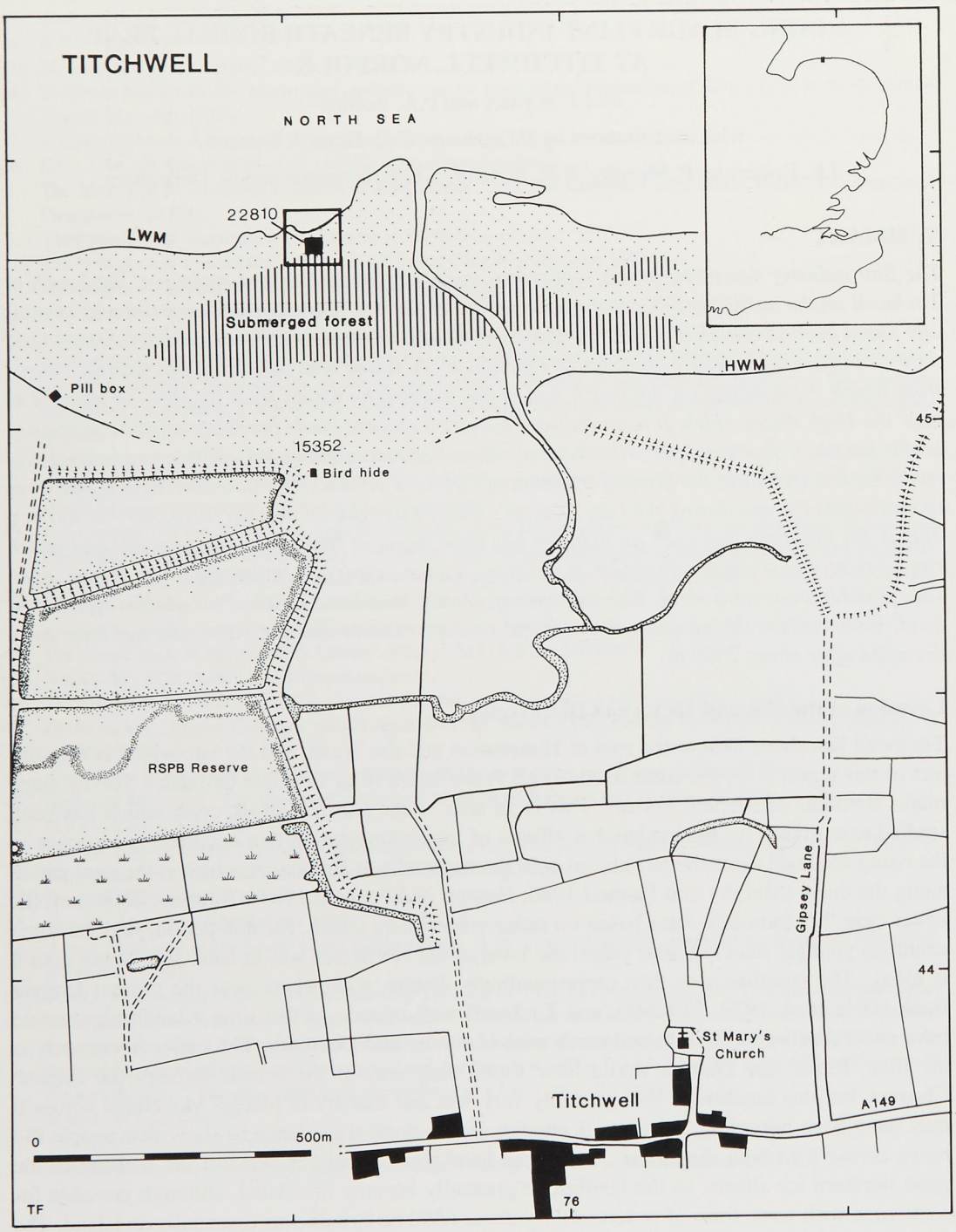


Fig. 1
Titchwell. Location of Late-Glacial – Early Holocene site near Low Water Mark

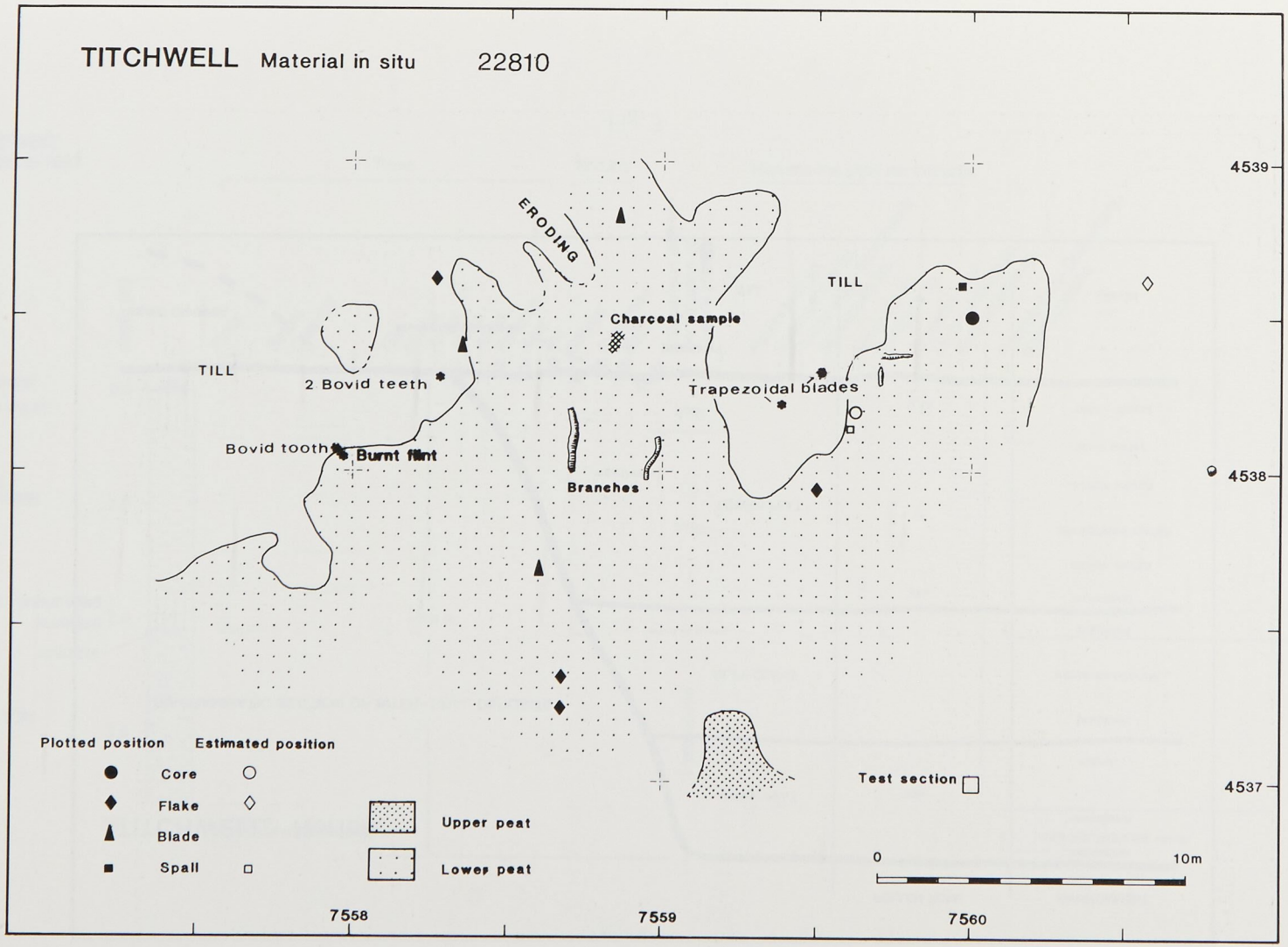


Fig. 2
Plan of flintwork and faunal remains found *in situ* beneath the Lower Peat

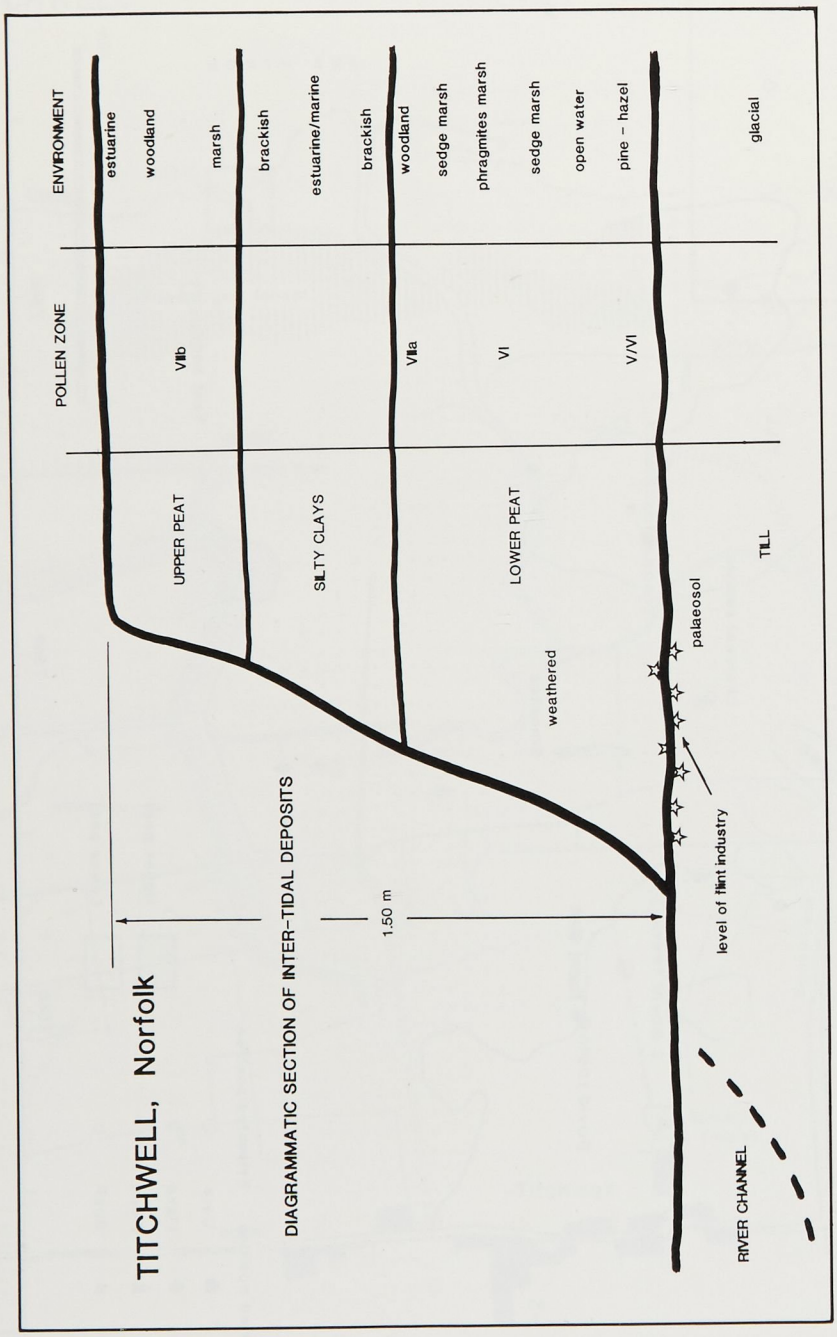

TITCHWELL, Norfolk
DIAGRAMMATIC SECTION OF INTER-TIDAL DEPOSITS
1.50 m
POLLEN ZONE
ENVIRONMENT
UPPER PEAT
VIIb
estuarine
woodland
marsh
SILTY CLAYS
brackish
estuarine/marine
brackish
LOWER PEAT
VIIa
VI
V/VI
woodland
sedge marsh
phragmites marsh
sedge marsh
open water
pine – hazel
weathered
palaeosol
level of flint industry
TILL
glacial
RIVER CHANNEL

Fig. 3

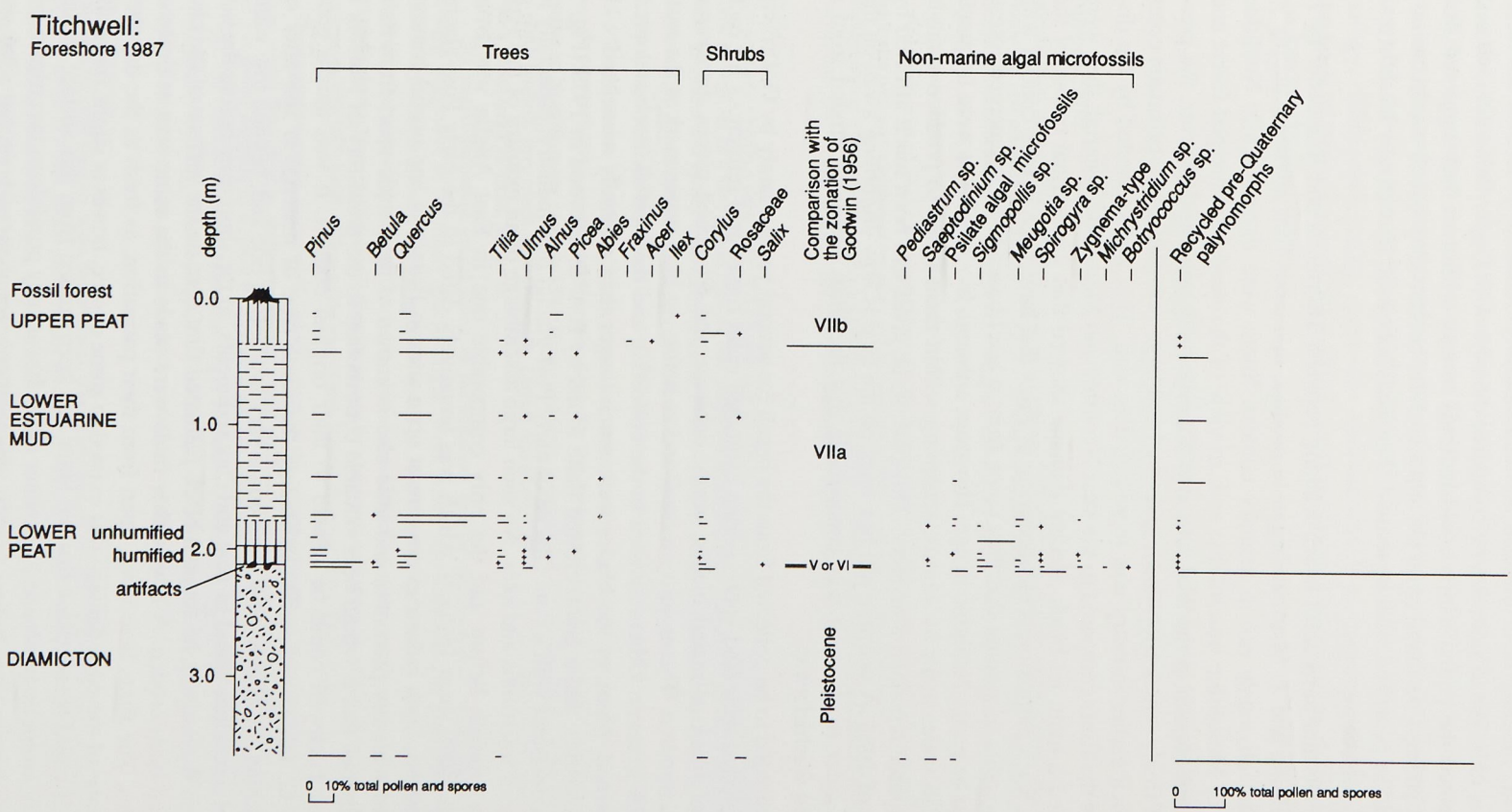


Fig.4
Diagrams of pollen and non-marine microfossils.

Tree and shrub pollen, non-marine algal microfossils and recycled pre-Quaternary palynomorphs from the Titchwell foreshore succession, calculated as percentages of the total Quaternary pollen and spores. Counts <1% of the total Quaternary pollen and spores, +.

the past because of his inability to distinguish between naturally-fractured stones and artefacts, so in his defence it is only fair to state that he compared the core with Upper Palaeolithic examples from France, noted the patina which could indicate contact with peat and suggested that such material might perhaps be found upon the surface of the boulder clay which was occasionally exposed beneath the peats and what he termed "Fen Beds" above it. He can now be shown to have been correct in his assumptions.

It was not until 1970 that purposeful beach-walking between Thornham and Brancaster by J. Smallwood, A.I. Gilding and T. Sharman began to produce numerous flint artefacts, mainly at high water mark and obviously not in primary context. Some were diagnostically Neolithic (axes, arrowheads) or Mesolithic (microliths) and, in view of the nearby submerged forest and long history of coastal erosion in the area, this was not especially unusual. However, the presence of a number of finely-struck flint blades and small and large two-platformed prismatic cores suggested that a much earlier industry was represented as well. This was supported by the distinctive condition of the flints compared to the later Neolithic and Mesolithic material; they were consistently patinated a matt, jet black. Recent damage showed that the original colour of the flint was light grey. Such patination is characteristic of flints that have been in long contact with peat, so it was reasonable to assume that they came from a level beneath the submerged forest, which was known to be partly Neolithic in age. However, although blocks of peat were frequently washed up to high water mark by storms, searching within them failed to produce a single struck flint. Their source remained a mystery. This part of the coast had been much affected by the severe flooding of 1953. A wartime pill box once on the land is now crumbling away on the beach below high water mark, so it was conceivable that the flints had been eroded from a deposit that had been washed away.

Flint artefacts continued to be collected from the beach for several years, mainly by G. Drown, who methodically plotted their find-spots, giving estimated eight figure grid references for each one. The number of black-patinated blades, cores, debitage and retouched pieces discovered increased to several hundred. The majority were found as before, at high water mark at the eastern end of the RSPB Reserve. Others assisted in the collecting and the Norfolk Archaeological Unit was kept informed. Many of the blades were much longer than normally associated with early Mesolithic industries, and a giant, crested flake found by E.A. Smallwood in 1979 (Fig. 9 no. 15) all seemed consistent with a Late Glacial or early Post-glacial flint industry, especially in view of the absence of microliths and axes. No such large assemblage of an industry of this type had been found in Norfolk before and the only comparable one in East Anglia was from Sproughton (Barton 1989), near Ipswich, which was tentatively dated to the early Post-glacial period, i.e. after 8300bc. Such industries are rare at open sites in Britain in any useful context, none has been dated with any precision, and little else is known of the people apart from their flintwork. It was obvious that it would be a valuable contribution to the prehistory of Norfolk if these discoveries at Titchwell could be related to their original context. It was thus a great achievement when G. Drown succeeded in finding the same type of material *in situ* after so many years of searching. In March 1986 there was a very low spring tide and, beyond low water mark on the edge of a residual island of peat and clay sediments, in the short time before the tide returned and covered it all again, he found a black patinated flint core on the surface of the clay from which peat had been eroded. A few further finds were made in the same area at times of subsequent low tides. The flints here were, apart from their patination, as fresh as the day they were struck, with none of the edge damage that existed to some degree, however slight, on all the beach discoveries. It could be accepted that the latter had been eroded from this surface during storms and gradually swept up to around high water mark. It was only possible to investigate this area of *in situ* material every three to four months, and then only for about an hour, but a 5m grid

of wooden pegs were hammered into the underlying clay . Remarkably, these survived in position for several months. This enabled material to be horizontally recorded, as shown in the plan (Fig.2). Apart from a small number of flints, including a relatively diagnostic, broken trapezoidal backed blade, there were discrete areas of burnt flint and charcoal, and three bovid teeth. There was also the opportunity for specialists to visit the site in May 1986 and obtain samples for palynology, radiocarbon dating, charcoals, diatoms and other marine organisms. Their reports form the basis of this account of the earliest dated occurrence of people in Norfolk after the retreat of the last ice sheet.

The stratigraphy of the Titchwell foreshore, north Norfolk

by P.G. Hoare and C.O. Hunt

Introduction

Investigation of the Titchwell site using Dutch gouge and Edelmann augers demonstrated that the artefacts lie upon a diamicton and are overlain by lower peat, lower estuarine mud and upper peat. (The succeeding upper estuarine mud is known to occur below other parts of the foreshore.) In this report, we concentrate upon certain sedimentological, palynological and chemical properties of the diamicton and the lower peat in an attempt to determine the age of the intervening flint industry. However, pollen diagrams for all major subdivisions of the succession are shown in Figure 4.

A deposit (named Bed 7 during fieldwork) which is thought to have accumulated at the same time as the upper part of the lower peat and which outcropped c.30m to the east of the core site is also described.

Representative slides of the pollen preparations are lodged with the Sedimentology & Palaeobiology Laboratory, Anglia Polytechnic University, and with the Norfolk Museums Service, Gressenhall.

The diamicton

The artefacts overlie a dark grey (7.5YR 4/0 and 10YR 4/1 on *Munsell Soil Color Charts*) deposit consisting of flint and chalk gravels set in a sandy mud matrix. The palynomorphs (organic-walled microfossils) from this diamicton are dominated by pollen and spores from Carboniferous, Permo-Triassic, Jurassic and Palaeogene rocks. The Quaternary group of palynomorphs is composed largely of Filicales (fern) spores, but also contains some *Pinus* and other tree pollen. Zygnemataceous (fiamentous algal) microfossils are present in the highest, weathered, part of the sediment.

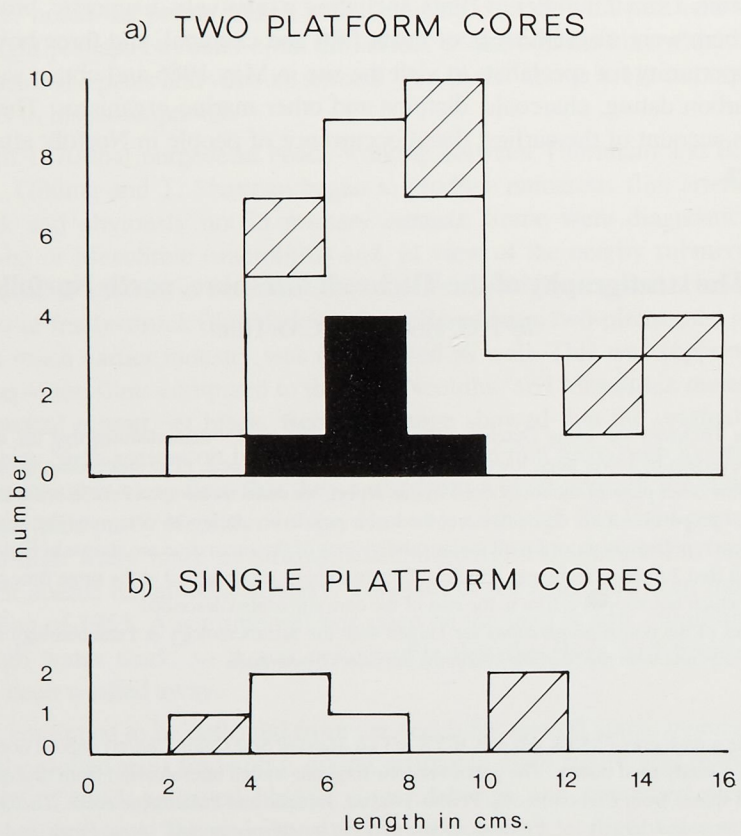
The diamicton is moderately calcareous: the mean $CaCO_3$-equivalent content of the <2.00mm fraction is 16.54% (range: 15.63-18.09%; number of determinations: 5). The corresponding figure for the Late Devensian Hunstanton Till of northwest Norfolk never exceeds 15% (Hoare and Gale, unpublished data), whilst that for the (?) Anglian Marly Drift till of north Norfolk may reach 96% (Banham, Davies and Perrin, 1975, 255) (see also Hoare and Gale 1986, 79 and Gale, Hoare, Hunt and Pye 1988, 525).

The matrix-supported gravel fabric of the sediment and the predominance of pre-Quaternary palynomorphs are strongly suggestive of a primary glacial origin. Work which was undertaken in May 1986 in the same area of the Titchwell foreshore showed that the artefacts rested on Marly Drift (P.L. Gibbard, personal communication, 1987). Thus, the diamicton is thought to have formed by partial decalcification of this highly calcareous till. Furthermore, the pre-Quaternary taxa from the Titchwell diamicton may be compared with those from the chalk-rich lower till in the Morston succession (TF 98714406), 23km to the east (Gale, Hoare, Hunt and Pye, 1988, 525).

The zygnemataceous microfossils which occur in the uppermost part of the diamicton were probably derived from algae which flourished in shallow, stagnant, sunlit pools of water. These microfossils may have been incorporated into the weathered material as a result of a process such as cryoturbation or by trampling, perhaps during human activity at the site. The absence of pollen types that might be matched with those found in the base of the lower peat suggests that weathering of the Marly Drift took place before the start of Flandrian pollen zone V (see below), and may well have preceded the increase in pollen production which marked the opening of the Flandrian.

The lower peat

This deposit rests directly upon the artefacts. The lower part of the well-humified base of this bed is characterised by a high incidence of *Pinus* pollen and Filicales spores with some *Corylus, Quercus* and Cyperaceae (sedge) pollen; *Tilia* and *Ulmus* are represented by single, very corroded grains. The higher part of the well-humified material contains a 'mixed' assemblage: Filicales spores, Cyperaceae and *Pinus* pollen are rather corroded, whereas *Quercus, Tilia, Ulmus* and *Alnus*



a) TWO PLATFORM CORES

Opposite platforms

Alternately opposite platforms

Plunging flakes

b) SINGLE PLATFORM CORES

Prismatic

Conical

Fig. 5
Titchwell. Number and lengths of blade cores

pollen are generally very 'fresh' in appearance. The middle part of the lower peat is highly weathered, probably as the result of a pause in sedimentation. The upper, unhumified, part of this bed contains a uniformly well-preserved assemblage dominated by Cyperaceae pollen at lower levels and by pollen of Graminae (grasses) with some Filicales spores and tree pollen at higher levels.

The base of the lower peat is comparable biostratigraphically with the later part of Flandrian pollen zone V or the early part of pollen zone VI (*sensu* Godwin 1956, 60-63). The upper part of the lower peat (and the lower estuarine mud) is comparable palynologically with pollen zone VIIa.

Summary

The Marly Drift is widely regarded as dating from the Anglian Stage of the Quaternary, *circa* 480 000-428 000 years ago (Rose, 1989, 46). It is impossible to determine the age of formation of the overlying diamicton, although it appears to pre-date the opening of the Flandrian Stage. The lower peat began to accumulate towards the end of Flandrian pollen zone V or at the beginning of pollen zone VI. The boundary between these two divisions of the Boreal period is placed at approximately 9000 bp (Godwin, 1984, 52). We may conclude, from the rather unsatisfactory evidence available to us, that the artefacts date from the interval separating the weathering of the till (which is of unknown date) and the Flandrian pollen zone V/VI boundary. Human activity cannot have persisted at the Titchwell site beyond this part of the Flandrian Stage.

Bed 7

In 1987, a medium gravel dominated by flint clasts, rich in plant matter and of probable fluvial origin, was exposed on the Titchwell foreshore approximately 30m to the east of the core site described above. The palynology of a sample of this material is given in Table 1. The Quaternary assemblage was dominated by fern spores. but also contained the pollen of trees, herbs and wetland plants and algal microfossils. The palynomorphs were generally well-preserved, although the pre-Quaternary taxa (pollen, spores and dinoflagellate cysts) were rather degraded.

The dominance of fern spores and the presence of pollen of wetland plants and algal microfossils is typical of a fluvially-deposited sediment (Hunt, 1987; Hunt, in press). Taphonomic processes in rivers destroy the less-obdurate pollen, so that resistant material such as fern spores becomes over-represented. Considering the tolerances of the taxa involved, a slow-moving river about 0.5-1.5m deep and fringed by sedges (*Cyperaceae*) and reeds (*Gramineae*) is most likely. The recycled palynomorphs were probably reworked from local till and till-derived sediments.

The overall aspect of the palynology suggests a regional mixed oak forest (alder, elm, hazel, lime and oak). The presence of tree pollen and the virtual lack of pollen of open-ground taxa points to deposition during late pollen zone VI or pollen zone VIIa of the Flandrian Stage, approximately 7500-5000 years ago. Thus, this fluvial sediment is considerably younger than the base of the lower peat but is probably coeval with the upper part of this unit.

Table 1

	Number	% of pollen and spores
Quercus sp.	10	7.4
Corylus sp.	9	6.7
Alnus sp.	4	3.0
Tilia sp.	2	1.5
Ulmus sp.	1	0.7
Total trees	**26**	**19.3**
Gramineae	4	3.0
Cyperaceae	14	10.4
Mentha sp.	1	0.7
Potamogeton sp.	1	0.7
Total herb/marsh/aquatic	**20**	**14.8**
Filicales	81	60.0
Pteridium sp.	5	3.7
Lycopodium selago	1	0.7
Polypodium sp.	1	0.7
Sphagnum sp.	1	0.7
Total 'ferns'	**89**	**65.8**
Spirogyra sp.	2	
Saeptodinium sp.	2	
Total algae	**4**	
Classopollis spp.	3	
Staplinisporites caminus	1	
Chytroeisphaeridia chytroeides	1	
Alisporites bilateralis	1	
Monolites sp.	1	
Densosporites sp.	1	
Total recycled	**8**	

The Flint Industry

A very small quantity of the flintwork that is described and figured was found in primary context on the weathered till beneath the Lower Peat, but the distinctive black patina of the majority found in a derived condition on the beach is regarded as adequate reason for accepting them as the same flint industry from the same context. This assumption is corroborated by the typology and technology of the artefacts and the totally different patinas and conditions of the few diagnostic Mesolithic or Neolithic artefacts also found on the same beach. Nothing is included in this section that does not possess this distinct black patina.

Taken as a whole, the flint industry has the aspect of being the product of one highly-specialised tradition. There is evidence to suggest that such a tradition, with only minor variants, may have persisted for millenia rather than centuries. Hence, it is impossible to know whether the material found at Titchwell is the result of relatively active occupation over a short period or the gradual accumulation produced by occasional short visits over a long period to a favoured area. It is an industry based on blade production with its roots in the Upper Palaeolithic technology of north-west Europe. The blades, often of considerable length, were either used without further retouch or as blanks for making tools such as scrapers, burins or semi-microlithic pieces for hafting as composite tools. No large core tools such as axes or adzes are present, or the flakes which could be regarded as debitage from their production or re-sharpening. Microliths are also absent. This may be the result of difficulties in the retrieval of such small flints, but some microliths *were* found on the beach, albeit in a different condition as stated above. There is also an absence of the 'bruised blades' that occur at the few places in East Anglia where similar industries have been found as at Sproughton, Suffolk (Barton 1989) and below, final section. In the absence of suitable contexts or dating evidence, the term 'Long blade industry' is preferred for most of the isolated finds of this nature as it precludes uncritical acceptance of their date and status.

Table 2 Totals of all artefacts

TOOLS	Number		% of tools	% of total artefacts
Scrapers	37		46.3	5.8
Burins	16		20.0	2.5
Retouched/ modified pieces	19		23.8	3.0
Small, backed blades	5		6.3	0.8
Hammerstones	3		3.8	0.5
Total tools	80			12.6
DEBITAGE				
Blades - complete	200	367		57.4
incomplete	167			
Flakes	126			19.7
Cores	40			6.3
Core trimmings				
crested flakes	18	24		3.8
tablets	6			
Burin spalls	2			0.3
Total debitage	559			

Total artefacts 639

Cores

The majority are blade cores, with two-platform examples predominating. Size ranges from large, c.160mm in length, to reduced residues of only 32mm length (Fig. 5). Many are heavily rolled, presumably by wave action after removal from original context.

Blade cores, one platform		
Prismatic	3	
Conical	3	
Two-platform cores		
Opposed platforms	22	(Nos. 1-3, 6-8, 14)
Alternately opposed	5	(No. 10)
Crossed (orthogonal)	2	
Multi-platform cores		
Globular	1	(No.13)
Irregular	2	

In addition, 8 large plunging flakes (mean size 101 mm; range 52-158 mm) carry a substantial fragment of the opposed platform of the core from which they were struck, thus giving a measurement of core size.

Core trimmings

Core tablets and crested flakes are both present, the former only in small numbers. One crested flake, 285mm long (No.15) is the largest artefact recovered and indicates the possible size of core utilised

Core tablets	6	(No.9)
Crested flakes	18	(Nos.4-5)

A mis-struck core, or the inclusion of faults in the raw material, may require further cresting to ensure further successful removal of blades. Core tablets were occasionally struck to remove platforms with badly-damaged edges. Thus, both crested flakes and tablets are sometimes referred to as rejuvenation flakes.

Blades (Nos.16-26)

The predominant artefact, ranging from 25mm to 130mm in length. An arbitrary exclusion of 29 examples, on the basis

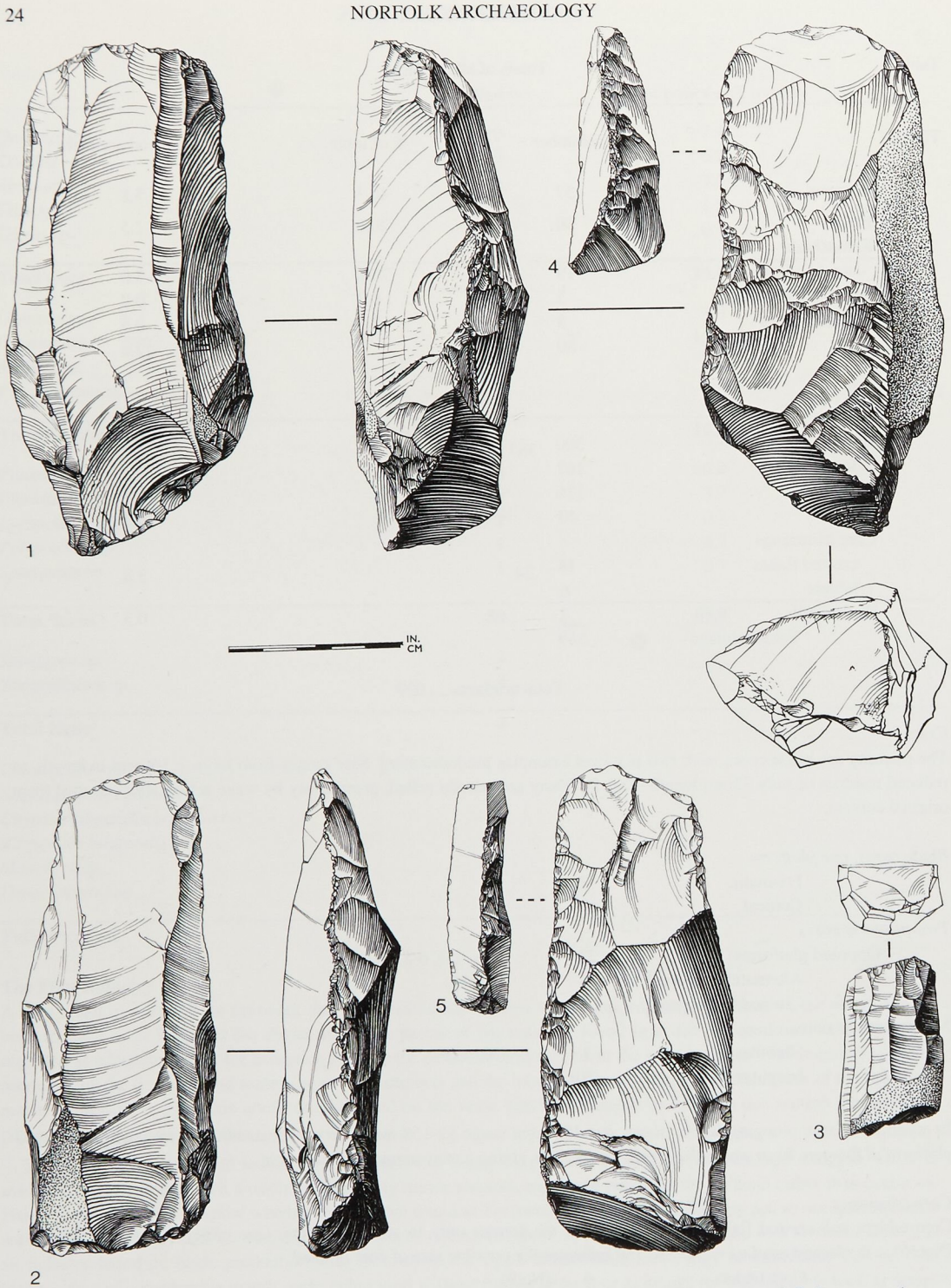


Fig. 6 Titchwell. Nos. 1-3 Blade cores; Nos. 4-5 Crested flakes. The crested flakes are shown on the appropriate edges of the cores to illustrate how the cresting made in the blocking out of the core gives a straight edge to facilitate the true running of the first blades which are struck. Those retaining the original retouch, as do the two figured, would normally be rejected. NB: the two figured have not been struck off the cores beside which they are shown.

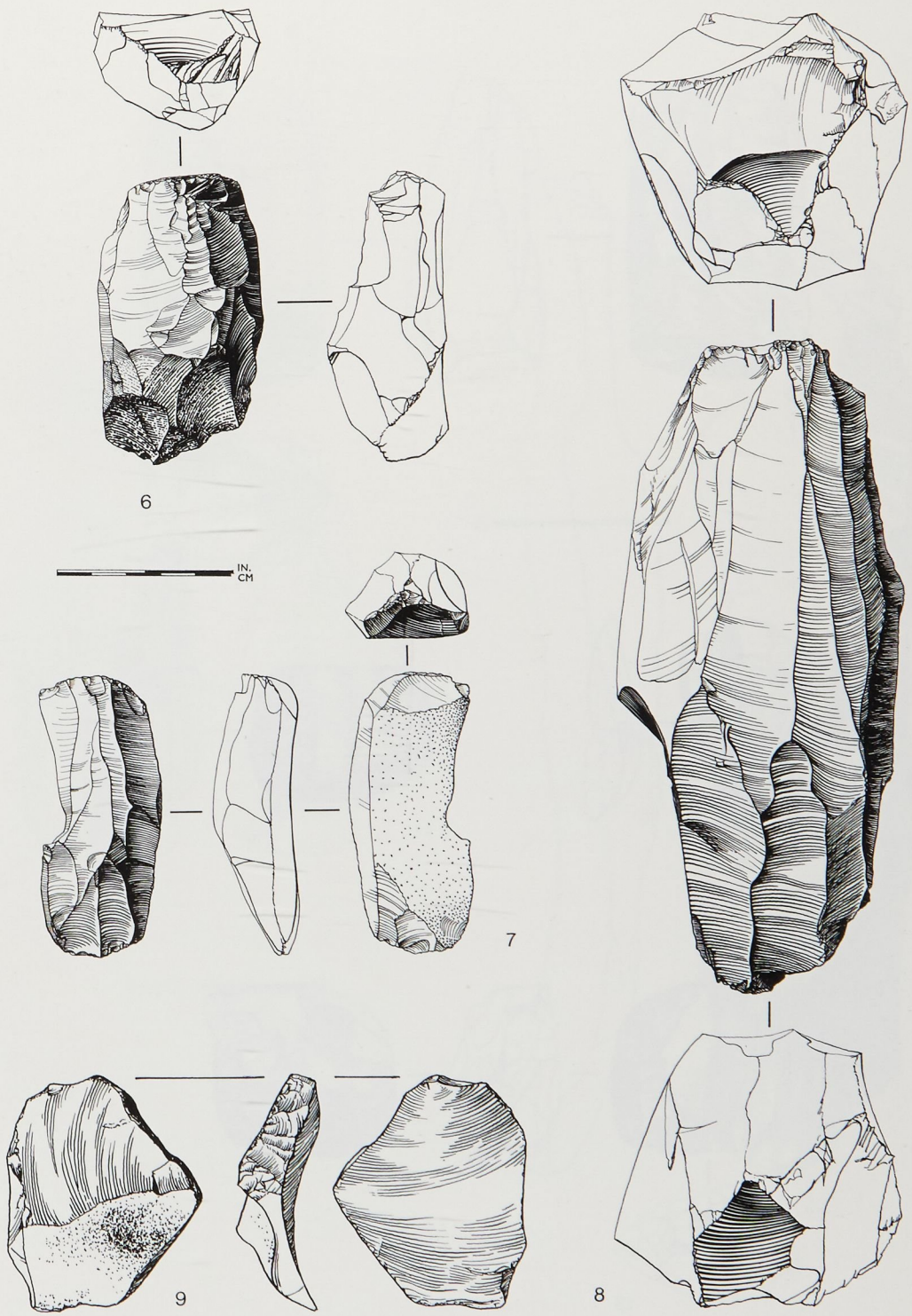


Fig. 7 Titchwell. Nos. 6-8 Blade cores. No.9 Core tablet. The latter has been struck at right angles across the top of a core to remove a striking platform that has become unsuitable.

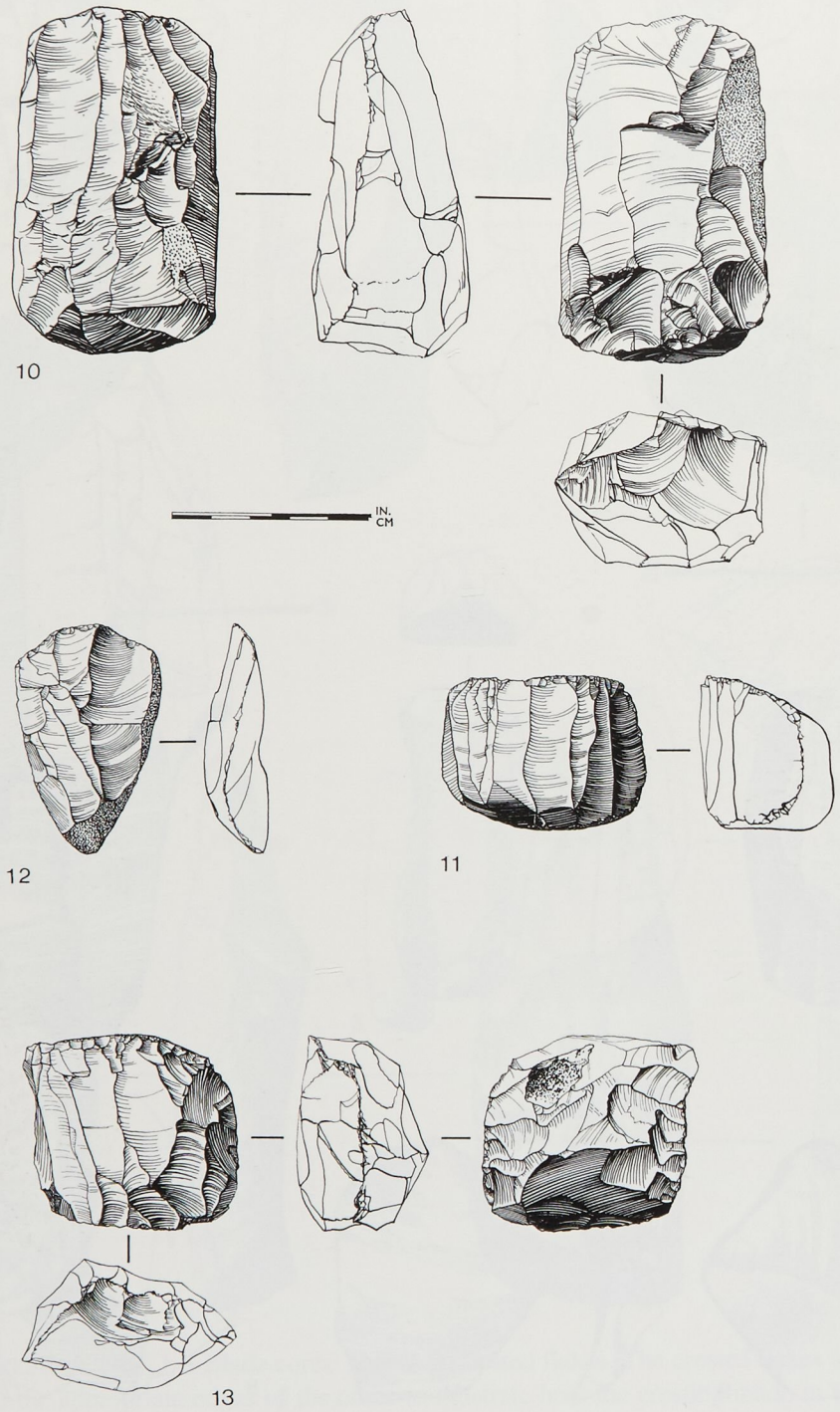


Fig. 8
Titchwell. Nos. 10-13 Blade cores

Fig. 9
Titchwell. No. 14 Blade core. No. 15 Massive crested flake

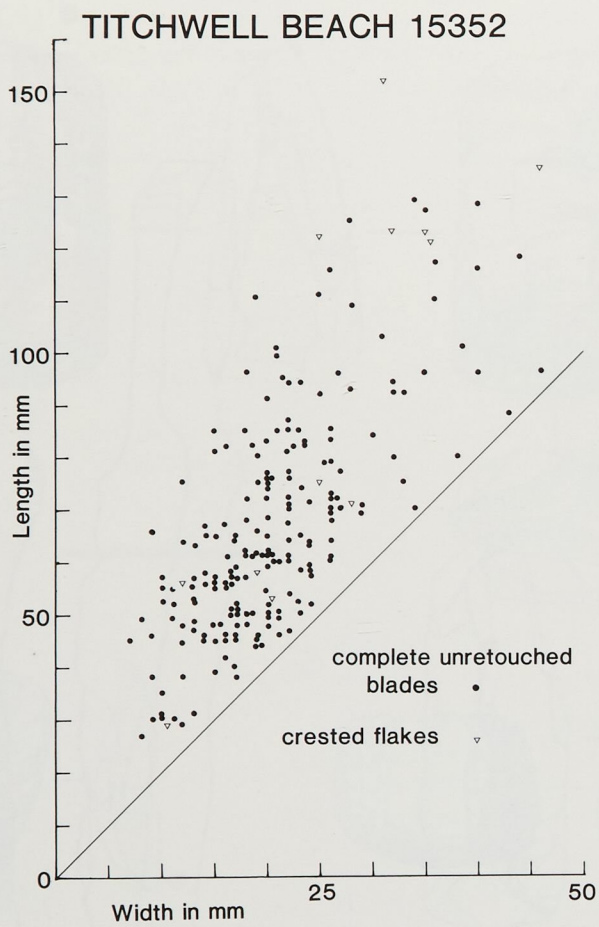


Fig. 10 Lengths and widths of complete unretouched blades. NB: excluded for reasons of space are two blades of exceptional length (as figured no. 23 203 x 52 mm, no. 24 164 x 33 mm) and crested flake (no. 15 286 x 65 mm)

of lack of black patina, leaves 193 complete and 153 incomplete (broken) blades, representing 57.3% of the total collected. The snapping of distal or proximal ends of the blades is not necessarily intentional, for the blades may break by so-called 'end- shock' when struck off the core. Many are rolled and have suffered varying degrees of edge damage, in some cases amounting to severe battering, which may have obscured any original retouch that may have been present. It is possible that some intentionally 'bruised' edges may also be obscured.

A plot of length against width is shown on Fig. 10

A detailed analysis of a sample of the blades, carried out by N. Barton included categorisation of the form of the butts, giving the following result:

Plain butt	32	56.1%
Punctiform	10	17.5%
Dihedral	5	8.8%
Faceted	5	8.8%
Linear	4	7.0%
Cortical	1	1.8%
	57	100%

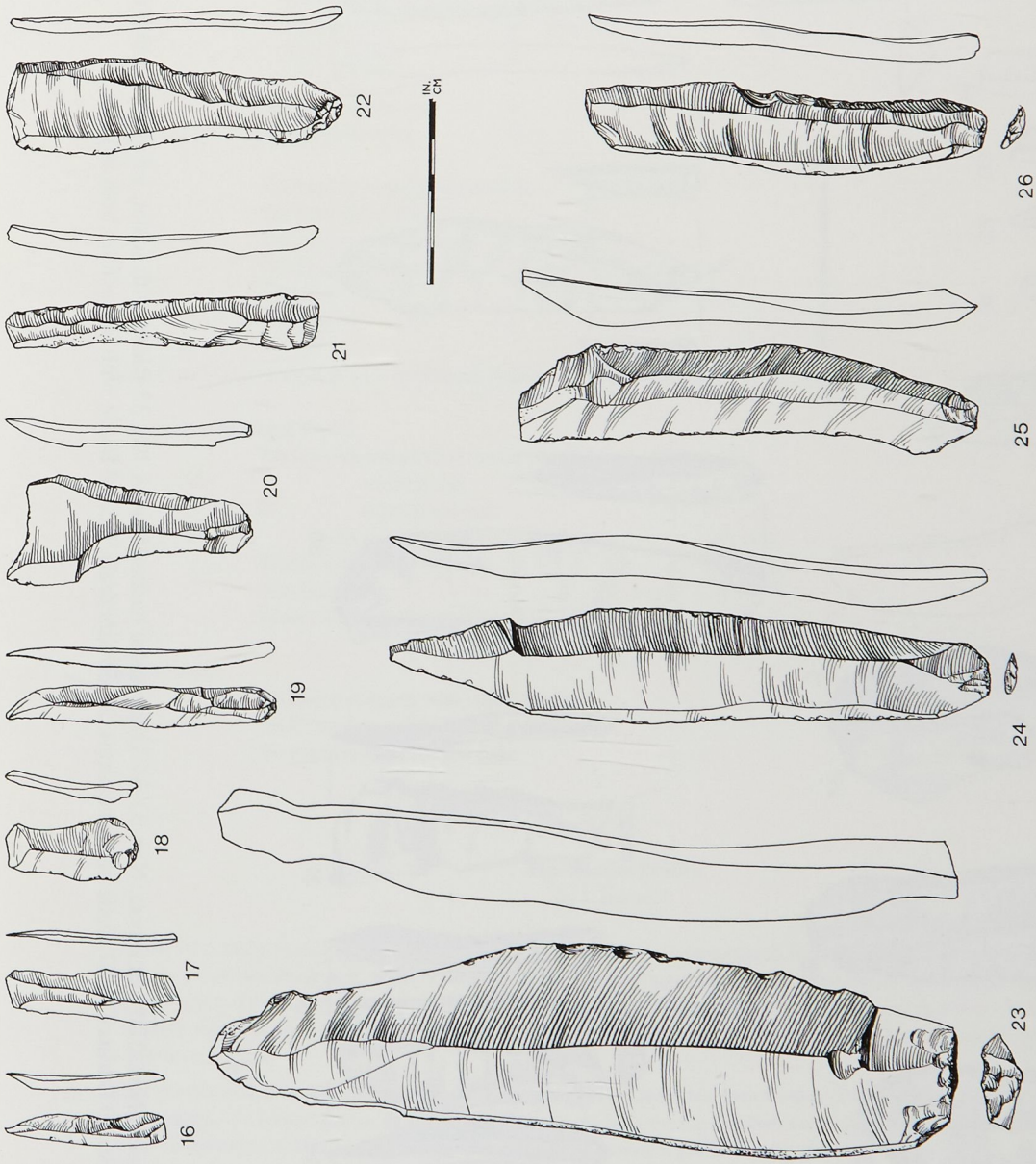


Fig. 11
Titchwell. Nos. 16-26 Blades

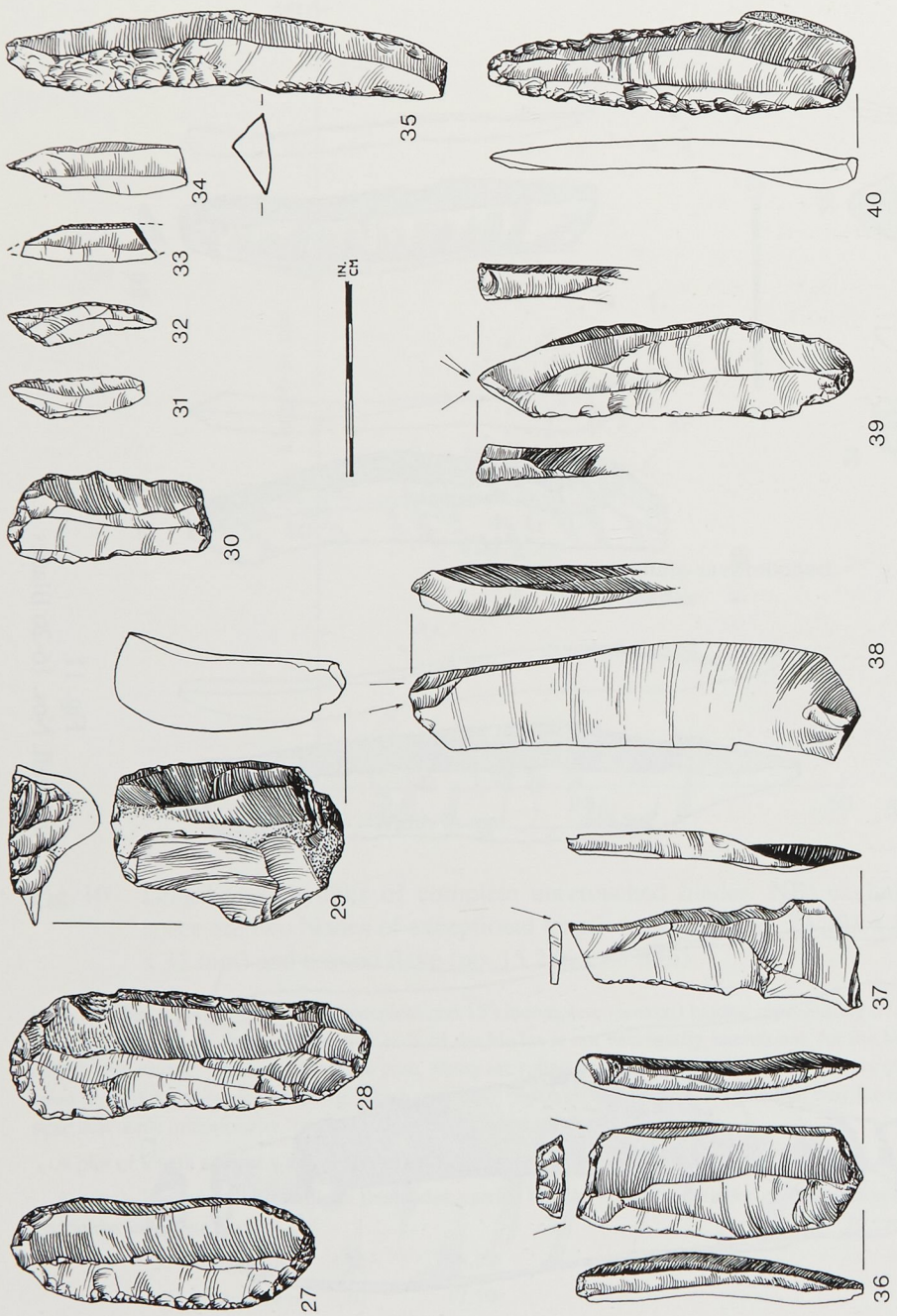


Fig. 12 Titchwell. Nos. 27-30 Scrapers. Nos. 31-34 Trapezoidal backed blades. No. 35 Blade with scalar, invasive retouch on part of one edge. Nos. 36-39 Burins (36-37 made on truncations, 38-39 dihedral). No. 40 Blade with retouch on both edges

Scrapers
Dominated by end scrapers on blades or elongated flakes

Double-ended on blade	4	(Nos. 27, 30)
End of blade/elongated flake		
without cortex	16	(No. 28)
with < 10% "	3	
with > 10% "	4	(No. 29)
with > 50% "	3	
End on ?broken core	1	
Rounded scrapers	6	

Burins

Double on retouched truncation	1	(No. 36)
On unmodified blank	9	
On retouched truncation	1	
On snapped truncation	1	(No.37)
Dihedral	3	(Nos. 38-39)
Core graver	1	

Small Trapezoidal Backed Blades or Oblique Points 5 (Nos. 31-34; Nos. 33-34 found *in situ*)

Retouched or Modified Pieces

Blades with truncated or retouched ends		
at distal end	7	
at proximal end	3	
with steep retouch on both edges	1	(No. 40)
Blades with lateral retouch	4	(No. 35)
Notched blade	1	
Blades with ground or polished edges	3	

Hammerstones

On flaked polygon with <10% cortex	1
On bifacial piece of triangular section	1
On possible large broken flake	1

The Diatom Profile

by J. Barnard

Samples were taken from the grey clay (Layer 2) at 10cm intervals downwards from the contact with the upper peat to the contact with the lower peat, some 9 samples in all. Diatoms were not numerous in any of the samples but counts of 200 individuals were achieved in all but one of the sub-samples. The number of species represented was relatively small, 27 in total; this may be a function of differential preservation, although the preservation of the represented taxa was, on the whole, very good.

The overall picture confirms what J.E. Robinson suggested from his examination of the forams from the site; it is a good example of a minor marine incursion (see below). At both the top and bottom of the clay there is a significant proportion of fresh/brackishwater taxa but the nature of these assemblages is slightly different. At the bottom of the profile, at the contact with the lower peat, the assemblage appears to indicate the presence of a terrestrial environment; >30% of the taxa fall into the category defined as "aerophilous". This type of diatom is characteristic primarily of soils, but also of splash zones and other places where intermittent aquatic conditions are to be found. A couple of the taxa found in the basal sample also demonstrate rather well the onset of the flow of (slightly) saline water; one of the characteristics of *Navicula cincta*, occurring in fairly small but still significant proportions, is its preference for flowing water of a slightly alkaline and saline nature. This particular species also demonstrates the improving nutrient status of the water presumably brought about by the increased mineral content. This improvement is further demonstrated by the dramatically

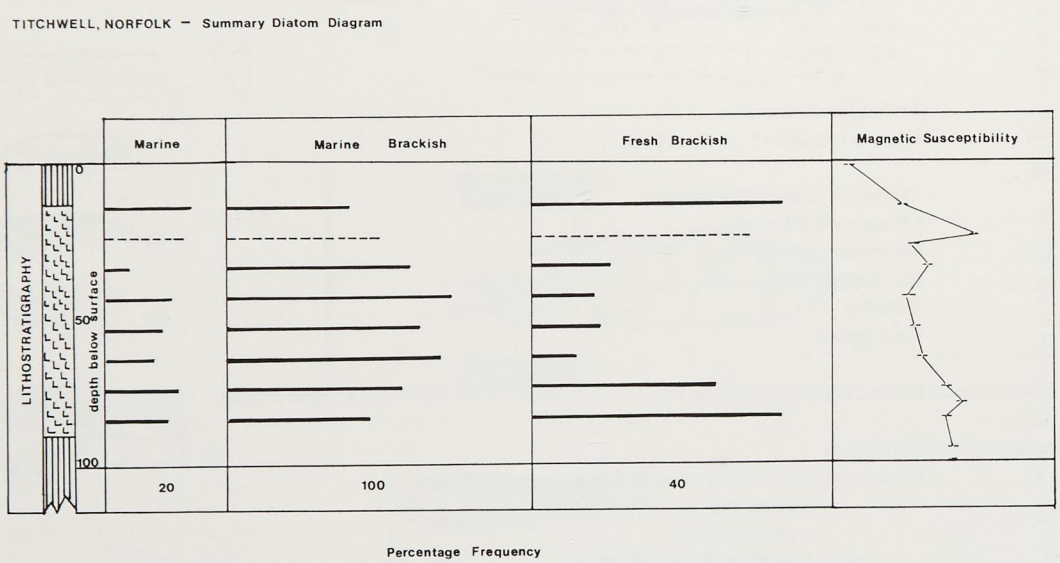


Fig. 13

increasing percentages of *Diploneis didyma*, a species also found in eutrophic conditions. There is a shift from an assemblage that is predominantly aerophilous in the basal sample to one that comprises almost exclusively benthic taxa, a situation that continues throughout the rest of the profile. This indicates two things; the beginning of the marine inundation has brought with it an increased amount of mineral matter, which is the kind of substrate preferred by these taxa, and also that the clay was probably laid down in fairly shallow water.

The relative weakness of the 'marine-ness' of the incursion is demonstrated by the fact that throughout the clay the balance of the assemblage has changed to accommodate individuals that prefer brackish conditions, not marine ones. Full marine conditions did not prevail at any time during the deposition of the clay, although there is a continuous presence of marine taxa throughout the profile. This does suggest that the sea was never too far away from the sampling point and that some mixing was always taking place.

The situation at the top of the profile is almost a mirror image of that at the bottom, although the decline in nutrient input seems to be even more dramatic than its increase. This coupled with the paucity of diatoms in the second sample going down the profile suggests that there has been a rapid alteration in conditions producing a situation in which it was very difficult for a diatom community to become established. (This might also explain the skewed distribution of the forams that Robinson describes).

On the summary diagram, the second sample is shown as a dotted line (representing the percentage breakdown of the assemblage, as usual) as there were insufficient individuals for a full count to be completed.

As an experiment, some Magnetic Susceptibility measurements were made on the core and there is indeed a peak on the curve at this point suggesting an alteration in the sedimentation regime, so it is pleasing to find that there appears to be an appropriate change in the diatom content too. It was hoped that this change might have indicated a brief fully-marine event, or some other more definite feature, but that appears not to be the case.

In summary then, as J.E. Robinson suggested, it is a neat and tidy example of a slight marine incursion, taking the form of the onset of estuarine conditions rather than that of a fully marine environment. The state of preservation of the diatoms suggests that the clay was laid down under fairly calm, shallow conditions of a predominantly marine-brackish nature, with the pH being slightly on the alkaline side of neutral.

It would have been quite interesting to see what happened after the contact with the upper peat, but unfortunately diatoms do not survive very well in peat, although they were no doubt plentiful when the peat was growing.

Table 3,
Titchwell Diatom Species List: (percentage frequency)

Sample Depth (cm)	16	26	36	46	56	66	76	90
Marine								
Diploneis bombus	1			0.5	4			
D. incurvata					0.5	3.5	3	
D. fusca	3.1			1.5		0.5	2.5	
D. smithii	1.5							
Melosira sulcata	9.2			8.5	0.5	1	5.5	9
M. westii			1			1		
Triceratium favus				0.5				
Podosira stelliger	1							0.5
Navicula marina	1							
Actinoptychus undulatus	0.5				1.5	1	0.5	1
Grammatophora undulatus	0.5		2		0.5		0.5	0.5
Surirella fastuosa			1		1			
Nitzschia acuminata	8.2							
Cocconeis scutteloides	0.5							1
Trachyneis aspera								1
Caloneis brevis			16.5	5	7.5	7.5	20.5	6.5
Marine-brackish								
Diploneis didyma	18.5		60	73	59.5	69.5	54.5	41
D. interrupta						0.5	2.5	1.5
Nitzschia navicularis	2			0.5	3	0.5		
N. punctata	2				0.5	0.5	0.5	
Scoliopleura tumida	8.7		6.8	0.5	3.5	5.5	2	
Achnanthes brevipes						0.5		0.5
Fresh-brackish								
Diploneis ovalis	24.6		12.5	9.5	10.5	6.5		29.5
D. ovalis var. oblongella				0.5	0.5			5.5
Navicula cincta	9.2						3.5	
Amphora spp	8.7							

Foraminifera

by J.E. Robinson

Samples of grey clay taken between the Lower and Upper Peats seem to be typical of deposits of tidal marshes, rich in plant debris like *Spartina*, and salt marsh flora. Sadly, there were no ostracods, but plenty of the one foram. *Trochammina inflata* which is very common in low salinity, inshore situations.

The tests are very delicate, and made of rather crumbly yellow-brown material. The shell is chambered, but when the specimens are dried after sieving, they tend to collapse, so delicate are the shell walls. There are illustrations in the book by John Murray, (1971 pl .10).

Overall, there were more specimens in the lower of the three samples, and they were of all sizes of growth from very small to full-grown. The upper sample in contrast, had more small specimens and fewer adults. It could be argued that the bottom sample represented the influx of salt water into a previous marsh of more terrestrial character. Later, the salt wedge was pushed back, the last phase being a skewed fauna of small tests.

It is a neat and simple situation of a slight marine incursion.

Charcoal

by P. Murphy

During small-scale excavation to obtain a peat monolith for pollen analysis charcoal fragments and heat-shattered flints were observed dispersed through the lower few centimetres of the 'Lower Peat' and the underlying clay, which appears to have been the upper part of a palaeosol. Although the Lower Peat is assumed to post-date the flint industry at the site by some considerable period it seemed possible that the charcoal might have been related to Late Upper Palaeolithic activity, some of it subsequently being moved from the palaeosol to the peat by root action. Alternatively, and perhaps more probably, the charcoal might be later in date, having moved down from the peat into the palaeosol. A 4kg. sample from layer 6, which contained the main charcoal concentration, was collected for examination.

The sample consisted of moist very dark greyish-brown clay loam with rare, rounded, subangular flint pebbles up to 28mm and woody and fibrous roots and rootlets penetrating from the overlying peat. It readily disaggregated on immersion in hot water and was then wet-sieved in a 0.5mm mesh. Charcoal fragments up to about 20mm were extracted from the dried sievings. All fragments identified are of hazel (*Corylus* sp).

A similar flint industry to that at Titchwell has been recovered from deposits dated probably to pollen zone IV at Sproughton, Suffolk (Wymer and Rose 1976). *Corylus* pollen frequently occurs in deposits of this date, though at frequencies of under 10% in southern and eastern England (Godwin 1975, 270). Much higher frequencies occur in the north-west of Britain and Godwin suggests that *Corylus* spread from a north-western centre becoming established over much of the country by zone V. *If* it was growing in this part of Norfolk in zone IV then the charcoal could be contemporary with the flint industry but on balance it seems more probable that the charcoal is of later date when hazel was certainly established in this area.

Dating: Radiocarbon and Thermoluminescence

by V. R. Switsur and N. Debenham and S.G.E. Bowman

Radiocarbon Dating

A sample of wood from the base of the Lower Peat was submitted to the Sub-Department of Quaternary Research, University of Cambridge for radiocarbon dating. The sample was pretreated to remove modern contaminants and efforts were made to remove possible contaminants that might come from substances in the sea. The cleaned carbon of the sample was converted to benzene for the radioactivity measurements.

The result, expressed as in accordance with the agreement reached at the International Radiocarbon Conference at Trondheim in 1986, is:

8950 ± 120 BP

Although this date is not calibrated to the Cal. BC scale, it would probably be close to 7000 ± 120 bc.

Thermoluminescence (TL)

The following samples were taken by the British Museum Department of Scientific Research and examined using thermoluminescence. Their reference numbers and the dates obtained from them are given beside them but the department stresses that the TL characteristics of the sample were rather unsatisfactory for yielding precise results, adding that: 'TL investigation of the burnt flint indicated that heating had occurred more recently than in the Upper Palaeolithic and that no TL age can be quoted with certainty since the results for different grain sizes of sample were not wholly consistent and indicated the presence of spurious (i.e. non-radiation induced) signals.' They also point out that if the flints lay unburied for a significant period after burning, the TL ages would be underestimated and significantly so.

Sample and Context	Ref. no	Date obtained (bp)
3 burnt flints, not artefacts, at the base of the Lower Peat on the surface of dark grey clay	TWL 3	7.5 ka ± 1.2
	TWL 4	———
	TWL 5	5.2 ka ± 0.9
Lower Peat	TWL 6	19.1 ka ± 1.8
Glacial till beneath the Lower Peat	TWL 2a	17.0 ka ± 1.7

Table 4

A full report on these measurements is included in the archive, but similar methodology was used as described in the report on the TL samples measured from the Lower Palaeolithic site at Hoxne (Bowman 1993, 208-210)

Interpretation – The date and nature of the human activity or settlement preceding the formation of the lower peat

The flintwork found *in situ* beneath the Lower Peat at Titchwell lies on the weathered surface of a glacial till. This till cannot be more recent than the maximum of the last glacial episode which deposited the Hunstanton Till, dated to around 16000 bc, but the till could belong to an earlier glacial episode. The base of the Lower Peat is radiocarbon dated to c. 7000 bc, which is broadly consistent with the date normally accepted for pollen chronozone V-VI. The flints therefore represent human activity or settlement on an inland site at a time prior to the formation of the Lower Peat and could be considerably older.

A river channel nearby may have attracted people, but it cannot be certain that a channel existed at this time. Such may have existed across the area from the high ground to the south which is considered to be the cliff line of the interglacial prior to the last glaciation, known as the Ipswichian Stage. Similar channels flow across the salt marshes and tidal flats at the present time. Geological study of the area has stressed the great lateral variation in the Post-glacial sediments, but indicates that 'some environments have been very persistent in time in the same place' (Funnel and Pearson 1984, 134).

Thin spreads of charcoal and burnt flints were found at the base of the Lower Peat, but no pits or other structures were detected, and the former could possibly date to later Mesolithic activity. There was nothing else to indicate the reason for, or manner of occupation on, what was clearly an open site. This can only be inferred from the flint industry that was recovered. Although the concentration of the flintwork along the present high water mark is consistent with where they might be expected from erosion of the area to the north where they were found *in situ*, similar flints have been found along the present beach between Thornham and Brancaster, although in smaller numbers. This suggests that it was a favoured area for groups of itinerant hunter-gatherers, if not semi-permanent settlement. A large quantity of good quality flint exposed in the glacial till may have been a particular attraction. Flint was seemingly being worked on a fairly large scale and there are enough scrapers, burins and other retouched pieces to reflect domestic or industrial activities such as the working of wood or bone. There is a conspicuous absence of flint projectile heads or a microlithic element. Archaeologically, the industry belongs to a Late

Upper Palaeolithic tradition of technology, variants of which are found in north-west Europe during the Late Glacial – Early Holocene span of time. As far as Britain is concerned there is nothing to confirm that there was any human presence after the recession of the last ice sheet until about 11000 bc, so the Titchwell industry presumably fits within this span. Most of its products can be paralleled by sites considered to date to either end of this time span, and similarities of or differences in methods of blade production and retouch may not indicate contemporaneity with any of them. The most distinctive items are the four small backed blades (Fig. 12, Nos. 31-34) which have been referred to in the past as Cheddar or Creswellian Points. Jacobi (1991) rejected this division for, as he points out, one form merges into another and both types occur together on some sites. 'Trapezoidal backed blades' is regarded as a better description. As the rejected names suggest, such pieces are well represented in the Late Upper Palaeolithic industries at Cheddar (Gough's Cave) and Creswell Crags. The former site is firmly radiocarbon-dated to around 10500 bc. He concludes that such backed blades had a life-span from sometime between 11000 and 10000 years bc (13000 and 12000 radiocarbon years before the present). Thus, Titchwell could belong to this period, but with only four examples it would be a dubious correlation. In any case, trapezoidal backed blades do occasionally occur in small numbers at other Late Upper Palaeolithic sites, such as Hengistbury Head, of about the same period but with many different aspects of its flintwork to either Cheddar or Titchwell. (Barton 1992). The Sproughton industry (Barton 1989) includes long blades and associated cores and is probably of Zone IV date (c.8500 bc). In common with several other long blade sites (Barton 1991, 234-245; Wymer and Rose, 1976) several of the heavier blades have much-damaged edges derived from use on a hard material, almost certainly bone or antler. Nothing of this nature has been detected on the Titchwell blades. Another site at Uxbridge in the Colne Valley west of London (Lewis 1991) has also produced such 'bruised blades' and initial study and radiocarbon measurements indicate a similar age. The same is found across the Channel at Belloy-sur-Somme (Fagnart 1993), dated to the Late Glacial – Pre-Boreal transition. Such matters have been extensively reviewed in recent publications (Bonsall 1989; Barton *et al*, 1991: Barton 1992) and it can only be concluded that the Titchwell Upper Palaeolithic industry is likely to belong to the end of the Late Glacial period or a little later when the climate was beginning to improve. The possibility has to be considered that during this time only a few groups of people, possibly even only one, may have been active in Britain at any one time. Favoured areas may have been exploited for a decade or until the natural resources had become so diminished it was necessary to move on. It is not impossible that there was group knowledge of good places passed on from one generation to another, and regular routes to them taken at intervals during a person's lifetime. Different environments and activities may have been responsible for the various minor changes in technology and tool types. Jacobi has commented on this and drawn attention to the clustering of Late Upper Palaeolithic findspots in different parts of Britain, such as the Derbyshire Peaks, the Mendips, the Weald, south-west Wales and the southern East Anglian fens. The western part of the North Norfolk Coast may qualify for another, but the evidence for it will be now under the sea for the most part. However, although only a small area at Titchwell was available for investigation in an undisturbed state beneath the Lower Peat, it seems certain that much of a buried land surface must be preserved under the more recent inter-tidal deposits, and perhaps even further south inland beneath the present salt marsh. Chance, or natural erosion, may well expose other sites of the same age on this surface in the future.

February 1994.

ACKNOWLEDGEMENTS

Thanks are extended to all those who conducted regular beach-walking over many years, and who maintained contact with the then Norfolk Archaeological Unit (now the Field Archaeology Division) of the Norfolk Museums Service, depositing all their finds and records there for identification, study and conservation. Special mention must be made of Mr. Glen Drown for his patience, perseverance and eventual discovery of the source of the flints found on the beach at Titchwell.

This report was undertaken by one of the authors (J.J.W.) when employed at the Unit and he wishes to express his gratitude to the Director, Dr Peter Wade-Martins, for making this possible.

A generous grant was obtained from the British Academy by the Unit for the drawing of the flint cores and site plans by Mr Hoste Spalding. The remainder of the flint drawings were made by J.J.W.

Thanks are also given to all the specialists who visited the site, several of whom have contributed to this report. Mr N. Barton examined the flint industry and his advice and collaboration were greatly appreciated.

THE ARCHIVE

All the material collected at Titchwell is now conserved at the King's Lynn Museum (Accession No. KL 1992. 274).

Information relating to the discoveries is entered on the Sites and Monuments Records of the Norfolk Museums Service: Nos. 15352 (Contexts c.1 – c.11), 19506, 20469, 20895 and 22810.

BIBLIOGRAPHY

Banham, P.H. Davies, H. and Perrin, R.M.S., 1975 'Short field meeting in North Norfolk', *Proceedings of the Geologists' Association* 86, 251-257.

Barton, R.N.E., 1989 'Long blade technology in Southern Britain', in Bonsall, C. (ed) *The Mesolithic in Europe*, 264-271 (Edinburgh).

Barton, R.N.E., 1991 'Technological innovation and continuity at the end of the Pleistocene in Britain', in Barton, N., Roberts, A. and Roe, D.A. (eds) The Late Glacial in north-west Europe. *Res. Rep. C.B.A., 77*, 234-245.

Barton, R.N.E., 1992 Hengistbury Head, Dorset. Vol 2: The Late Upper Palaeolithic and Early Mesolithic sites. *Monograph Oxford Univ. Comm. Archaeol., 34*, 1-299.

Bonsall, C. (ed), 1989 *The Mesolithic in Europe* (Edinburgh).

Bowman, S.G.E., 1993 'Thermoluminescence Dating of the Lower Industry', in Singer, R., Gladfelter, B.G. and Wymer, J.J., *The Lower Palaeolithic Site at Hoxne, England* (Chicago).

Fagnart, J-P., 1993 'Nouvelles observations sur le gisement palaeolithique superieur de Belloy-sur-Somme (Somme) *Gallia Prehistoire, 34,* 57-83.

Funnell, B.M. and Pearson, A., 1984 A guide to the Holocene geology of North Norfolk *Bull Geol. Soc. Norfolk, 34,* 123-140.

Gale, S.J., Hoare, P.G., Hunt, C.O. and Pye, K., 1988 'The Middle and Upper Quaternary deposits at Morston, north Norfolk', U.K., *Geological Magazine* 125, 521-533.

Godwin, H., 1956. *The history of the British flora: a factual basis for phyto-geography*, 1st Ed. (Cambridge).

Godwin, H., 1984. *The history of the British flora: a factual basis for phyto-geography,* 2nd Ed. (Cambridge).

Hoare, P.G. and Gale, S.J., 1986 'Blakeney and Salthouse', in West, R.G., and Whiteman, C.A. (eds), *The Nar valley and north Norfolk,* Quarternary Research Association, Coventry, 74-94.

Hunt, C.O., 1987 'Comment: the palynology of fluvial sediments: with special reference to alluvium of historic age from the upper Axe Valley, Mendip Hills, Somerset'. *Transactions, Institute of British Geographers*, 12, 364-367.

Hunt, C.O. (in press), 'The Palynology of fluvial sediments', in Davis, O.K. (ed) *Archaeopalynology,* American Association of Stratigraphic Palynologists Contribution Series.

Jacobi, R., 1991 'The Creswellian, Creswell and Cheddar', in Barton, N., Roberts, A. and Roe, D.A. (eds) The Late Glacial in north-west Europe. *Res. Rep. C.B.A., 77*, 128-140.

Lewis, J., 1991 'A Late Glacial and early Post-glacial site at Three Ways Wharf, Uxbridge, England: interim report', in Barton, N., Roberts, A., and Roe, D.A. (eds), The Late Glacial in north-west Europe. *Res. Rep. C.B.A., 77*, 246-255.

Moir, J.Reid, 1931 'Further Discoveries of Flint Implements in the Brown Boulder Clay of North-West Norfolk'. *Proc. Prehist. Soc. E. Anglia, 6.* 306-315.

Murphy, P. and Funnell, B.M., 1980 'Preliminary Holocene stratigraphy of Brancaster Marsh', *Bull. Geol. Soc. Norfolk*, 31, 11-15.

Murray, J.W., 1971 *An Atlas of British recent Foraminifera.* (London).

Oele, E., Schuttenhelm, R.T.E. and Wiggers, A.J. (eds), 1979 The Quaternary History of the North Sea. *Symposia Universitatis Upsaliensis. Annum Quigentesimum Celebranted, 2.* Uppsala.

Rose, J., 1989 'Stadial type sections in the British Quaternary', in Rose, J., and Schluchter, C. (eds), *Quaternary type sections: imagination or reality?*, Balkema, Rotterdam, 45-67.

Wymer, J.J. and Rose, J., 1976 'A long blade industry from Sproughton and the date of the Buried Channel deposits at Sproughton', *E. Anglian Archaeol., 3,* 1-16.