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9 The earliest occupation of Europe: Continental Northwestern Europe

The palaeolithic record of continental northwestern Europe is characterized by sites in a loess- and fluvial deposits context, usually preserved in the form of loess-covered river terraces. As a result relative chronologies can be established over rather large distances, allowing to infer that the earliest occupation of this region dates back to about 600 Kyr BP. This is especially well established in the Somme valley. Work in the Cagny area has placed the Acheulean occupations there in a large variety of ecological settings.

1. Introduction

The geographical area concerned (Fig. 1) is characterised by the presence of fluvial deposits, often preserved in the form of terrace sequences, and by Middle and Late Pleistocene loessic deposits, that locally reach considerable thicknesses. Traces of former marine beaches are rather common in the Massif Armoricain, but rare in the northern part of the Channel. Karstic infillings are virtually limited to the Meuse basin. The area reviewed here is one of those European regions where Palaeolithic archaeologists have been conducting fieldwork from the very beginning of prehistoric archaeology onwards (e.g. in the Somme and Haine valleys and in the Liège region). In this paper we will give a short regional presentation of the evidence of the earliest occupation of this area, probably one of the most heavily researched regions of Europe.

2. The Meuse basin

2.1. La Belle-Roche (Sprimont)

The only site in the Meuse area that predates OIS 8 is La Belle-Roche at Sprimont, a karstic cave situated about 20 km south of Liège (Belgium) on the right bank of the Amblève river. Partially destroyed by quarrying activities, the site has been under excavation from 1980 onwards (Cordy *et al.* 1992). The finds come from a horizontal karst gallery, whose infilling consists of a basic gravel unit overlain by a series of mudstone layers containing the finds, and sealed by a calcite layer. U-series dating of the calcite covering the fossiliferous deposits yielded an age in excess of 350,000 years.

The faunal assemblage recovered from the mudstone layers contains about 50 species, among which *Canis mosbachensis, Ursus deningeri, Xenocyon lycaonides, Panthera leo fossilis, Panthera gombaszoegensis, Equus mosbachensis, Dicerorhinus etruscus* and *Hemitragus bonali* are present. The assemblage has been dated to OIS 13 age, i.e. at around 500 Kyr BP. The lithic industry consists of flint objects – severely weathered and in all probability in secondary position – recovered from the upper part of the fossiliferous deposits. The small assemblage contains pebbles with a few scars ("pebble-industry") and some flakes. Because of its physical condition this series is difficult to submit to a detailed analysis and some workers have even cast doubts on the artificial character of the flint objects (Roebroeks and Stapert 1986).

3. The Haine valley

Four river terraces (Fig. 2), separated from each other by a chalk talus 10 m high, were recognised in the Haine valley (Haesaerts 1984). The oldest two (Pa d'la l'iau and Petit Spiennes) are interpreted as dating from the end of the Cromerian complex. They have been attributed to the Middle Pleistocene on the basis of correlations to the Schelde (Escaut) basin and in view of the soils present in the loessic sediments covering the two youngest terraces.

Investigations carried out by P. Haesaerts in the Somme valley have led to a correlation scheme for the fluvial deposits of the Somme and Haine basins (Haesaerts and Dupuis 1986): the Petit-Spiennes terrace can be equated with the terrace of Cagny-l'Epinette, whereas the Pa d'la l'iau would correspond with the terrace of Cagny-la Garenne. In the Haine valley only the two oldest terraces, Pa d'la l'iau and Petit-Spiennes, have yielded Acheulean industries.

3.1. Pa d'la l'iau (OIS 12)

A small cutting in the top of the Pa d'la l'iau plateau, where the gravels surface, yielded a few artefacts, some handaxes and two scrapers (Cahen 1984).

3.2. Petit-Spiennes (OIS 10)

The Petit-Spiennes formation consists of a sequence of fluvial gravels and sands, upwards changing into greyish

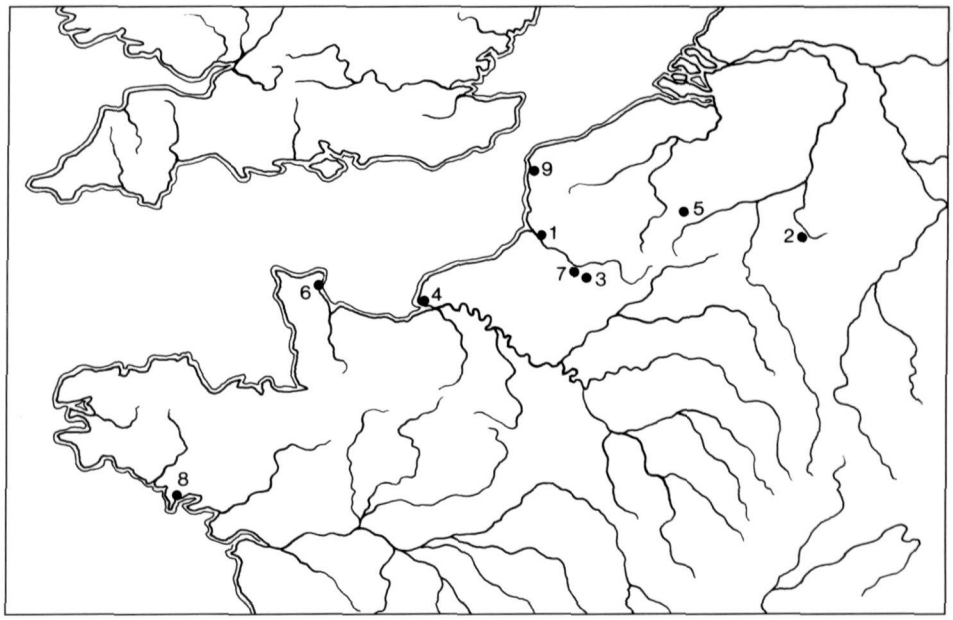

Fig. 1. Location of sites mentioned in the text:
1. Abbeville;
2. La Belle Roche (Sprimont);
3. Cagny;
4. Le Havre;
5. Pa d'la liau/Petit Spiennes;
6. Port-Pignot (Fermanville);
7. Saint-Acheul;
8. Saint-Colomban.

sands. Most artefacts recovered from this terrace are from surface collections, while some were uncovered in an excavation trench. Most of them are handaxes, of various forms: amygdaloids, ovates and *lancéolés*. Tools on flakes are relatively few in number. The Levallois technique is represented by cores and flakes (Cahen 1984).

4. The Somme Basin

4.1. Chronostratigraphical and palaeoenvironmental context of the sites

The detailed knowledge of the geometry of the Somme valley's terrace system allows us to position palaeolithic sites within a series of nine terraces, regularly spaced between 5 to 6 and 50 m above the bed-rock of the actual river valley (Antoine 1990; 1993; Antoine and Tuffreau 1993; Haesaerts and Dupuis 1986).

Studies of the climatical and processual significance of the various fluvial sequences have shown that each terrace body, represented by a succession of gravels and fine-grained fluvial deposits, forms the morphological-sedimentary output of a glacial-interglacial cycle. In general, primary context sites are preserved within the fine-grained calcareous fluvial sediments, within the 'external' parts of the terraces, i.e. close to the chalk talus. These sites belong to the end phase of the fluvial cycle, in a mainly interglacial context (Fig. 5). In some cases, however, Acheulean occupations from the beginning of a climatic cycle have been documented, in a still temperate context from the beginning of a glacial phase (Figs 3 and 4).

A first chronostratigraphic interpretation is based on the comparison of climatic cycles deduced from the study of the terrace system (river terraces and its cover of loess and palaeosols) with the oxygen isotope stratigraphy, palaeomagnetic data (Biquant 1974; Laurent 1993) and more recently, ESR and U-series dates (Laurent 1993).

In this interpretation, the terrace 'Formations' I to VII date to the Middle Pleistocene Bruhnes normal epoch, while only the present valley's gravels are attributed to the Weichselian pleniglacial.

The oldest inferred traces of human occupation documented in the Somme valley are the few 'artefacts' uncovered in the river deposits from the terrace of Grâce at Montières, dating from before the Brunhes-Matuyama boundary (Bourdier *et al.* 1974a). However, the artificial character of the few flakes published is not uncontested, as the best piece is a point obtained by retouching a natural flake. Before the Middle Pleistocene there is no solid trace of human presence in this region, with the first industries belonging to the Acheulean.

4.2. The sites of Abbeville

4.2.1. Abbeville: Carpentier quarry (Formation VII, OIS 16/15)

The Carpentier quarry at Abbeville is located on the right bank of the Somme, at its confluence with the Scardon, a small tributary of the Somme. This site is well-known for the abundant palaeontological remains uncovered from the *marne blanche* (Boule, in Commont 1910; Pontier 1928). The stratigraphy of the site, well-known since the beginning

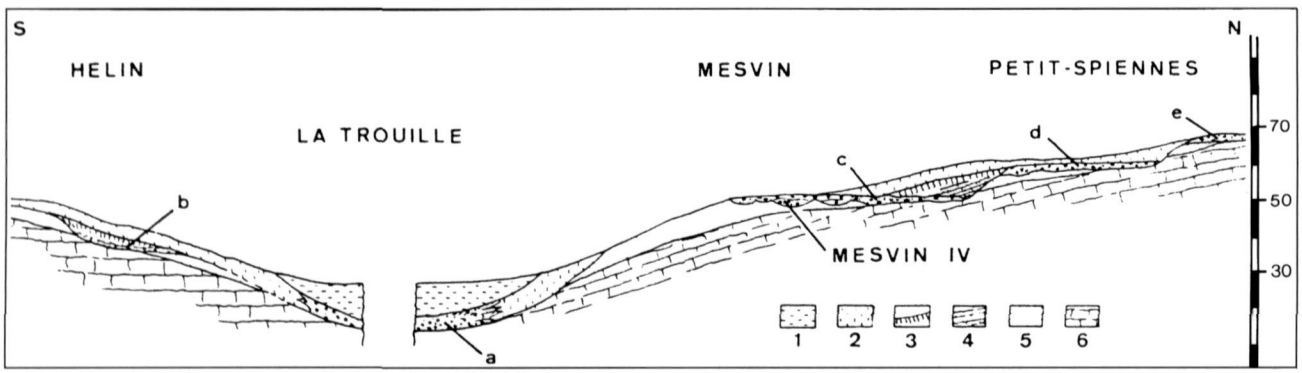

Fig. 2. Composite section through the alluvial formations in the Spiennes area (after Haesaerts and Dupuis, 1986).
a. Bottom valley gravels; b. Lower gravels of Carrière Hélin; c. Mesvin terrace aggradation; d. Petit-Spiennes terrace aggradation; e. Pa d'la l'iau terrace aggradation.
1. Current fluvial deposits; 2. Weichselian loess; 3. Harmignies palaesoil (Eemian); 4. Saalian loess; 5. Tertiary sands (Landenian); 6. Chalk.

of this century (Commont 1906; 1910) has been integrated in various syntheses on the terraces and the palaeolithic industries of the Somme basin (Agache *et al.* 1963; Bourdier 1969a; Bourdier 1974; Bourdier *et al.* 1974a and 1974b; Tuffreau 1981; 1987).

Recently, precise measurements have situated the base of the terrace body at 40 m above the bed-rock of the present river valley. The fluvial sequence of the Carpentier quarry corresponds to the downstream extension of the seventh formation of the Somme system (Formation de Renancourt, Antoine 1990). Parallel to these studies palaeomagnetic analyses showed that the fluvial sequence belongs to the Brunhes normal epoch (Laurent 1993).

The presently visible section shows a thin fluvial sequence, from the external part of the terrace body, close to the chalk talus, covered by a thin layer of sandy-loamy deposits. The boundary between these two units is marked by an erosional level, associated with large pockets.

The fluvial sequence consists of two main units: the lower unit consists of a chalky gravel, very badly sorted in its lower parts, where it contains big blocks of chalk and flints, unrolled in a sandy-calcareous matrix. This unit contains lenses of calcareous loams that display a roughly horizontal stratification.

The upper fluvial unit corresponds to the *sables marneux verdâtres* and the *marne blanche* of V. Commont, that yielded the remains of large mammals. It consists of a succession of lenses of sandy loams and sands with calcareous oncoliths, and displays a stratification indicative of a fluvial environment of medium energy. The abundant oncoliths that characterise this deposit where formed in this environment. These ovaloid, centimetre-sized carbonated elements are the result of seasonal activities of Rodophycées and Cyanophysées (Adolphe 1974), algae indicative of clear water, in a stable hydrographic setting, and pointing to temperate climatic conditions.

In general the pollen assemblages from the oncolith-deposits indicate a mosaic landscape, with forests and steppes, corresponding to a temperate continental climate (Munaut 1988 and pers. comm.). From a climatic point of view the type of sediments and the pollen indicate a clearly temperate context, an assessment confirmed by the abundant presence of oncoliths comparable to those observable in the Holocene deposits in the present-day valley.

The fauna from the Carpentier quarry contains the following species, according to Boule (*in* Commont 1910):

Lower unit: *Equus* aff. *stenonis*, *Rhinoceros* (= *Dicerorhinus*) and *Hippopotamus*.

Upper unit: *Hyaena* cf. *crocuta, Homotherium latidens, Mammuthus meridionalis, M. trogontherii, M. primigenius* with archaic characteristics, *Elephas (Palaeoloxodon) antiquus, Equus stenonis, E. stenonis robustus* and maybe *E. hydruntinus, Dicerorhinus etruscus, D. mercki, D. leptorhinus, Elasmotherium, Sus scrofa, Hippopotamus, Cervus solilacus, C. (Dama) somonensis, C. elaphus, C. belgrandi, C. canadensis, Capreolus capreolus, Bos priscus*, and *B. elatus* or *etruscus*. A radius of a large cervid and an upper M3 of *Sus* cf. *strozzi* were found in 1989. Although it is impossible to specify the exact provenance of the large mammal remains described at the beginning of this century, the composition of the fauna ascribed to the upper unit is coherent with the type of environment mentioned above; the presence of hippopotamus in the lower unit, the gravels, seems to indicate a mixture, however.

The chronostratigraphic interpretation of the *Formation de la Carrière Carpentier* within the Somme system (OIS 16 to 15) is in agreement with the position of the Abbeville

fauna in the large mammal biozonation (zone III of Cordy 1982), with palaeomagnetic evidence and with the ESR dates (600 ± 90 Kyr BP).

At the end of the last century G. d'Ault du Mesnil collected large numbers of handaxes (now at the Musée des Antiquités nationales and the Institut de Paléontologie Humaine), thought to be contemporaneous with the *Mammuthus meridionalis* fauna. According to H. Breuil and H. Kelley (1954), 'Abbevillian' handaxes, with negatives of short and thick flakes and cortex preserved at their base and edges were found. Numerous ovate handaxes and *limandes* were described by V. Commont (1910), who could not find artefacts associated with the fauna in the *marne blanche*. Breuil's work in the adjacent Léon quarry yielded only one *limande*, from above the *marne blanche*.

4.2.2. Abbeville: Stade and Champ de Mars (Formation VI, OIS 14 to 13)

The sites of the Stade and the Champ de Mars are situated in the same geomorphological context as that of the Carpentier quarry. However, the relative altitude of the base of the gravels (at about +33 m) suggests a correlation to the immediately following fluvial formation, the *Formation de Fréville (VI)*. In the absence of recent observations it is impossible to give a precise description of the stratigraphical and palaeoenvironmental context of the very numerous handaxes (Fig. 3) discovered in the gravels. Most of them are ovates and limandes, though some have been classified as 'Abbevillian' by Breuil (collection of the Musée des Antiquités Nationales); Tuffreau 1987; 1992). It is therefore possible that some of the 'Abbevillian' bifaces are much more recent and that each *a posteriori* classification of artefacts without a precise stratigraphical context only yields artificial series of on the one hand rough 'Abbevillian'-type handaxes and Acheulean ones on the other. For that reason one should for once and for all abolish the term 'Abbevillian', be it in the classical "cultural" sense or, to avoid every possible confusion, in the typological sense, as still used in the typology of F. Bordes (1961).

4.3. Sites of the Saint-Acheul/Cagny region

Fluvial terraces are particularly well-developed at Saint-Acheul, a suburb of Amiens, situated on the left bank of the Somme, at its confluence with the Avre river. The terraces belong to the Fréville formation (VI) and to the *Formation de la Garenne* (V). This last one is visible a few kilometres upstream, at Cagny-la Garenne and at Cagny-Cimetière, in the valley of the Avre, where younger river deposits are also preserved (*Formation de l'Epinette, IV*).

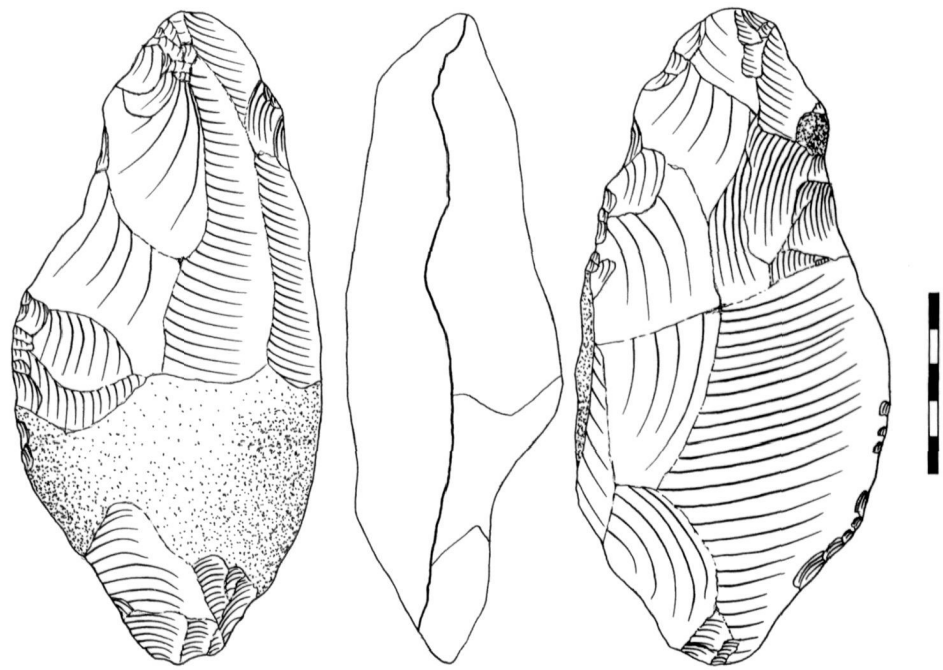

Fig. 3. Abbeville, Champ de Mars. Handaxe. Scale in cm.

4.3.1. *Saint-Acheul, rue Marcelin Berthelot (Formation VI, OIS 14 to 13)*

The sequence of the 'rue Marcelin Berthelot' at Saint-Acheul has been studied in detail in 1981 by A. Tuffreau and J.P. Fagnart during a salvage excavation. The fluvial deposits are rather thin here (about 3 m thick) and to a large extent weathered as result of their position in a more central part of the former river valley, where covering loessic layers are usually very thin. Their relative altitude allows a correlation with the Fréville formation (VI).

The numerous Acheulean artefacts collected from the gravels and the fluvial sands are usually patinated and rolled. There are various forms of handaxes (amygaloids, *limandes*) and flakes with irregular retouches. A Levallois core *à éclat préférentiel* is also present. These finds recall the artefacts mentioned by V. Commont, from de Fréville quarry (Saint-Acheul), which occupies a less 'internal' position in the same terrace body. In view of the bad conditions of preservation one cannot exclude an admixture with more recent artefacts. The importance of the site lies in its confirmation of Commont's earlier observation of the numerous presence of Acheulean artefacts within the Fréville formation (Commont 1908; 1909).

4.3.2. *Saint-Acheul, rue de Cagny (Formation V, OIS 12 to 11)*

The site of the 'rue de Cagny' at Saint-Acheul is well-known because of the excavation undertaken by V. Commont (1908) during building activities in 1906. The stratigraphical sequence contains gravels and fine-grained river deposits – sands and loams – overlain by a rather thin layer of loamy deposits, the famous *sables roux*.

The gravels yielded amygdaloid handaxes with a cortical base and a few tools on flakes: scrapers, end-scrapers, notches and denticulates. The lower part of the fine-grained fluvial deposits consists of white sands. These contained a series of 220 handaxes, amydaloids and limandes, as well as tools on flakes of various types. The *sables roux* deposits, without any doubt dating from the later part of the Middle Pleistocene, (OIS 8?) yielded 300 handaxes, most (271) of them limandes, with numerous twisted edges. Just like the other series from this site the tools on flake are of various forms, and no Levallois products are present.

4.4. The Cagny sites

The sites of Gagny, 'La Garenne', 'Cimetière' and 'l'Epinette' are situated on the left bank of the Avre river, a few kilometres from its confluence with the Somme. The three sites are very close to each other, with a maximum distance of 1 km. The three sites belong to two distinct fluvial formations (Fig. 4): the *Formation de la Garenne* (terrace V, OIS 12 to 11, with an ESR age at Garenne of 400 ± 101 Kyr BP) for the first two sites and the *Formation de l'Epinette* (terrace IV, OIS 10 to 9, ESR date of 296 ± 53 Kyr BP; Laurent 1993) for the last one.

A combined study of these three sites has resulted in a model of their climatical and sedimentological evolution, in which the Acheulean occupational phases have been integrated (Antoine and Tuffreau 1993).

4.4.1. *Cagny-La Garenne (Formation V, OIS 12 to 11)*

The site Cagny-La Garenne was exploited as a quarry from 1916 to 1959, when it was classified as a *Monument historique*, a few years before it was bought by the French state (1963). The site is famous for the innumerable Acheulean artefacts recovered from the Avre deposits, overlain by a thick series of loessic sediments.

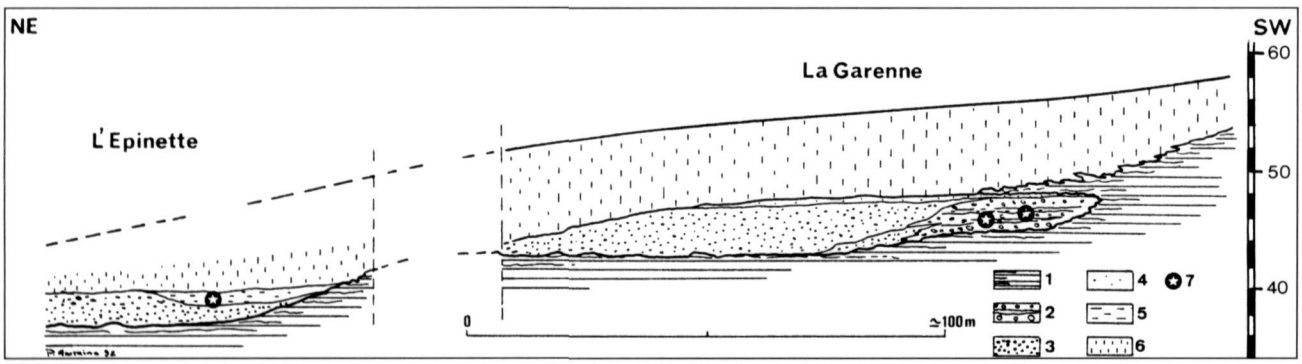

Fig. 4. General structure and relationship between Garenne and Epinette formations in the Cagny area (after Antoine and Tuffreau, 1993). 1. Chalk bedrock; 2. Slope deposit sequence with interstratified fluvial silts in the Garenne Formation; 3. Periglacial fluvial gravels of Garenne and Epinette formations; 4. Fluvial sands (Garenne Formation); 5. Fluvial calcareous silts (Epinette Formation); 6. Slope deposit sequence overlying alluvial formations (loess, slope deposits and palaeosoils); 7. Undisturbed palaeolithic settlements.

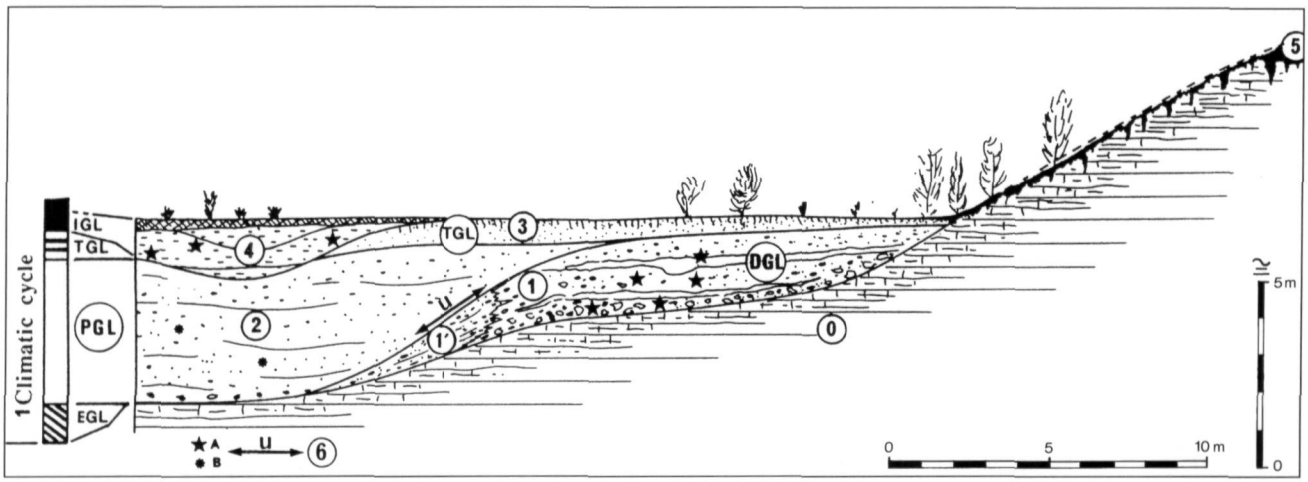

Fig. 5. Idealized section through the alluvial sequence of the Middle terrace complex in the Cagny area (after Antoine and Tuffreau, 1993). 0. Chalky bedrock; 1. Sequence of chalky slope deposits with interstratified beds of calcareous fluvial silts. The basal part of these deposits laterally pass through typically calcareous fluvial gravels (1') (1 & 1': Early glacial sedimentation); 2. Major phase of coarse sedimentation in a braided river and a periglacial environment (Fullglacial sedimentation); 3/4. Stabilisation of the floodplain: calcareous fine fluvial silts with immature soils of humid grassland (Interglacial); 5. Brown leached soil (interglacial in slope environment); 6. Unconformity between units (1-1') and (2). A. Undisturbed Palaeolithic settlements; B. Reworked Palaeolithic artefacts.

The site's stratigraphy is known through the observations of F. Bourdier (1969a), the detailed studies by P. Haesaerts (Haesaerts and Dupuis 1986) and by the data collected in 1986-1987 during an excavation in the external part of the Garenne terrace, at the foot of the large classical section (Tuffreau 1989). In 1993 new excavations started to the north of the main section, towards the Cimetière site (excavations by the universities of Lille and of Pennsylvania).

The sequence of the external part of the Garenne terrace, excavated in 1986 and 1987, is dominated by slope dynamics, with occasionally interspersed fluvial sediments. The proximity of the river course is documented throughout the sequence by overbank deposits and by a lateral shift to a typical fluvial deposit at the base of the sequence (Fig. 5, units 1 and 1').

Recent studies have shown this sequence to be older than the 'classical' river terrace described by earlier workers. This classical terrace consists of pleniglacial fluvial deposits, and a gravelly flood plain intersected by braided channels (Fig. 5, unit 3).

The first results of pollen analyses of the Cagny-la Garenne sequence (Munaut 1993) indicate for the lower part of the excavation section (Fig. 5, unit 1) a succession of continental temperate phases, corresponding to a forested-steppic landscape relatively rich in temperate taxa. After a colder period the higher levels show a change towards a boreal forest landscape, ending with a subarctic environment with *Betula*. Pollen from sand lenses in the unit 2 gravels indicate an open steppic environment, with a vegetation dominated by herbs (non-arboreal pollen 66.7 %).

This pollen-based model of the evolution of vegetation and climate confirms and details the model of climatic evolution initially proposed on the basis of stratigraphical and sedimentological observations (Antoine 1990): early glacial for the unit with the Acheulean artefacts and the large mammal fossils (*Equus caballus mosbachensis, Megaceros* sp., *Cervus elaphus* and large bovids; Moigne 1993), pleniglacial for the major coarse grained part – with reworked artefacts – of the terrace body and late glacial for the green sands covering the flood plain (Fig. 5, unit 3). The upper part of this unit displays a river valley-type pseudogley from a temperate context (Van Vliet-Lanöe, in Tuffreau 1989).

Studies of the geometry of the deposits clearly show that the first sites were on a sub-horizontal bank about 10 m wide, situated between the chalk talus along the southern bank of the river and the river itself (Fig. 5). The artefacts from the various archaeological levels (Fig. 6) are mostly products of a flint workshop exploiting the raw material present in the adjacent chalk cliff: numerous cores and handaxes, many of them discarded roughouts in various stages of production (Lamotte 1991). The presence of a very small number of Levallois cores and of Levallois flakes – often hardly distinguishable from flakes produced while making handaxes – is striking.

Various pieces show the existence of linkages between methods of handaxe production and methods of Levallois

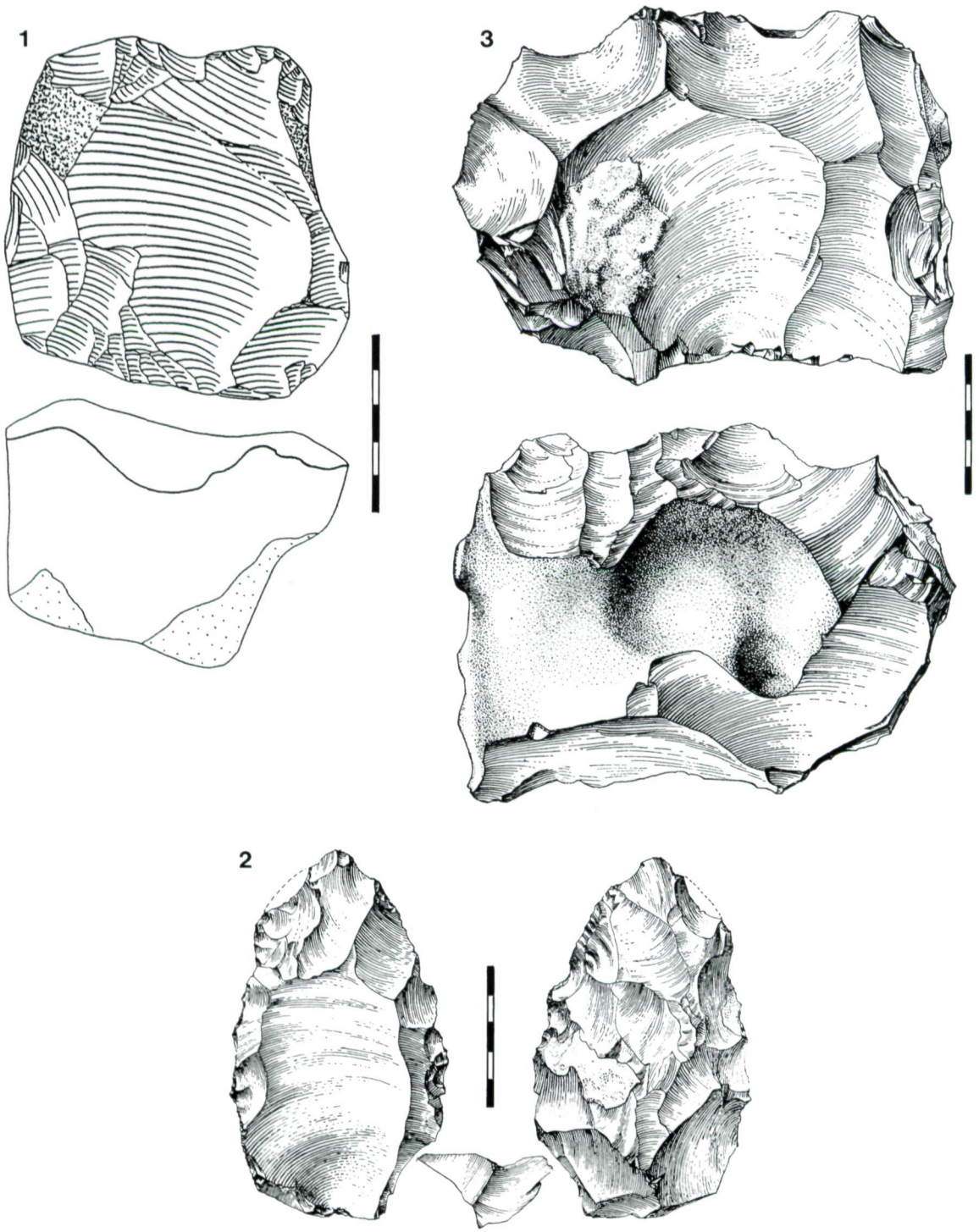

Fig. 6. Cagny-la Garenne. Industry of the fluvial deposits.
1 and 3: Levallois cores. 2: Handaxe with a negative of a removal similar to a Levallois flake. Scale in cm.

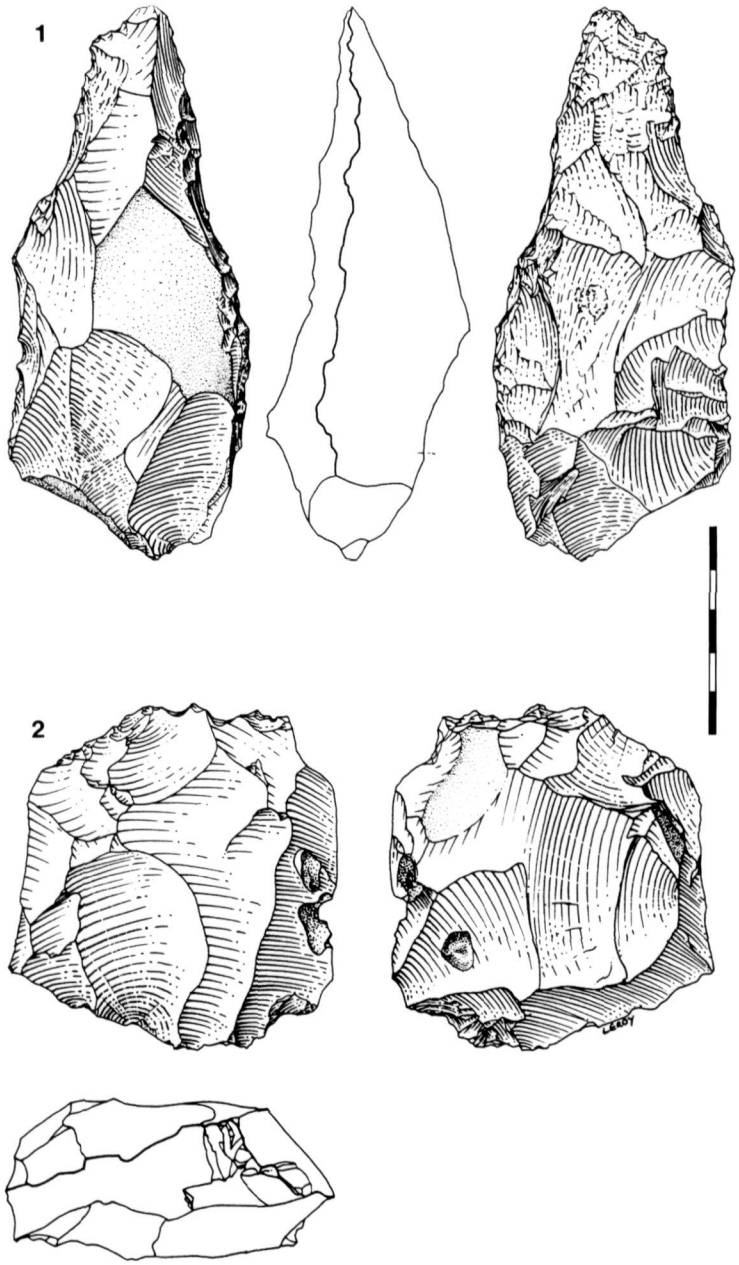

Fig. 7. Cagny-l'Epinette. Industry of the fluvial deposits.
1. Handaxe; 2. Levallois core.
Scale in cm.

debitage. Some handaxes broken during flaking have yielded a large *éclat préférentiel*. Other handaxes, finished as shown by the presence of secondary retouch on the cutting edges, display proximally a striking platform that served for producing a large flake on the other side.

In some cases the large flake has been struck perpendicularly to the axis of the handaxe. Such examples are known both from the recent excavations as well as from old collections (Breuil and Kelley 1954). The morphology of handaxes is in a way comparable to that of Levallois cores, with two intersecting surfaces of lateral and distal convexity, one serving for the preparation of the striking platform, the other for the flaking of the *éclat préférentiel*. In view of this one could consider handaxes, discarded during production or as finished objects, as Levallois cores. The above-mentioned products obtained from them are

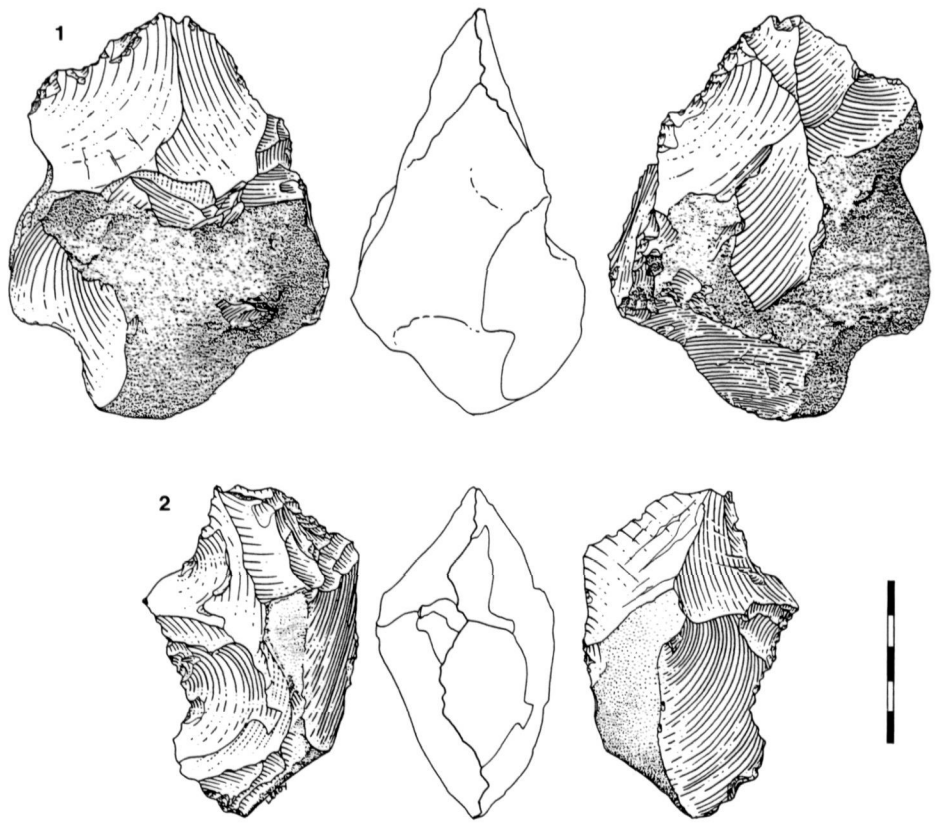

Fig. 8. Cagny-l'Epinette. Industry of the fluvial deposits. Scale in cm.

Levallois flakes. At Cagny-la Garenne there is a clear conceptual link between the production of handaxes and the presence of Levallois flaking methods.

4.4.2. Cagny-Cimetière (Formation V, OIS 12 to 11)

The stratigraphy of the Cimetière quarry at Cagny was studied by F. Bourdier (Bourdier *et al.* 1974b) and afterwards the site was the object of excavations by A. Tuffreau (Tuffreau 1980a and 1980b; 1987; Tuffreau *et al.* 1982). Additional observations were made in 1993 during a rescue excavation at the cemetery of Cagny, adjacent to the now abandoned quarry.

The levels concerned are in the same morphological position as those from Cagny-la Garenne (relative altitude +28 m), at a distance of 200 m. The Cimetière sequence, however, was formed in a less external part of the flood plain, where the oldest sedimentary units are absent (Fig. 4).

The deposition of fine-grained fluvial sediments begins with a layer of stratified sands, deposited in channels eroding the upper part of the gravels. These sands yielded a few artefacts and contain abundant tree pollen (arboreal pollen 80 %, cf. Munaut 1974; 1988) indicating a temperate continental climate, contrasting with the conditions during formation of the gravels.

The fine-grained sedimentation continues with a large scale horizontal deposition of sands and stratified loams, subsequently affected by the formation of calcite concretions. Pollen analysis discerned three palynozones: two steppic phases separated by a more forested episode, the *interstade de Cagny* (Munaut 1974; 1988), an interpretation confirmed by the study of the small mammals (Chaline 1974).

The Acheulean sites of Cagny-Cimetière are therefore contemporaneous with several phases of silting up of the floodplain, that accompanied the establishment of temperate conditions and of a forest steppe under a continental temperate climate. Occupation continued during the interglacial and the phase of the climate deterioration marking the beginning of the next cycle.

The geometry and the stratigraphy of the units of the Garenne terrace allow us to position the industries of the fine-grained fluvial deposits of the Cimetière site – though

situated in the same terrace as those of Garenne – at the end of the fluvial cycle, separated from the Garenne finds by a pleniglacial phase (the beginning of OIS 12 at Garenne, early OIS 11 at Cimetière).

The lithic industry is rather poor, comprising elongated handaxes associated with tools on flakes, mainly notches and denticulates. There are no indications to relate the lithic assemblage to the faunal remains recovered from the same deposits.

4.4.3. Cagny-l'Epinette (Formation IV, OIS 10 and 9)

The interpretation of the Epinette sequence is based on multidisciplinary studies of the numerous sections generated during the excavations by A. Tuffreau, from 1980 onwards (Tuffreau *et al.* 1982; Tuffreau *et al.* 1986; Antoine and Tuffreau 1993. Since 1991 the site is excavated jointly by a team of the University of Lille and the University of Pennsylvania). This sequence is the stratotype of the Epinette formation (IV), with a relative altitude of 21 m above the river's maximum incision, i.e. 6 m lower than that of the *Formation de la Garenne* (Fig. 4).

At Cagny-l'Epinette the fluvial deposition starts with pleniglacial gravels. The top of these formed the surface during the main Acheulean occupation documented in the northern part of the excavation. Next a series of badly sorted calcareous fluvial loams was deposited. The first of these (I2) is a fine-grained calcareous loam deposited in a shallow depression in the top of the gravels. This level, probably reflecting a channel in which settling took place, could as yet only be documented over a few square metres.

The fine-grained fluvial sedimentation continues with the deposition of a calcareous loam (I1) on the external part of the terrace – loam with common rolled flints and chalk particles. In the last phase of the fluvial sedimentation a unit of homogeneous loam was deposited, again within a channel cutting through the lower levels.

The upper part of this sequence was then subjected to soil formation. The resulting loamy-humic brown-black palaeosol testifies to soil formation in a humid environment, corresponding to a stabilisation of the flood plain. Pollen analysis of the upper part of these deposits indicates an open forest of a boreal type (average of arboreal pollen: 68.4 %) and a temperate continental climatic setting. These results are in agreement with the results of the micromammal studies, which identified species characteristic of a cool-temperate climate, indicating interstadial or tardiglacial conditions (studies by J.M. Cordy and T. van Kolfschoten). The hypothesis of an interglacial pedogenesis at this level is corroborated by the abundant presence of calcite concretions in the upper part of the fine-grained deposits and by the cementation of the gravel layer J. In fact, this 'humid environment' pedogenesis is roughly contemporaneous with the development of a brownish-red soil visible on the chalk slope, at that time the bank of the river valley (Fig. 5, unit 5).

These data indicate that the formation of the fine-grained deposits at Cagny-l'Epinette took place at the end of the climatic cycle, in an early-interglacial context, an interpretation recently confirmed by the results of the latest pollen studies. The Acheulean occupations of Cagny-l'Epinette therefore took place at the margins of the flood plain from the beginning of the climatic amelioration onwards.

In the fluvial loams the following species are present: *Elephas (P.) antiquus*, *Equus mosbachensis*, *Equus hydruntinus*, *Equus* sp., *Dama dama*, *Cervus elaphus* and *Bos primigenius*. Only two carnivore-remains were found yet: a fox mandible and a hyena humerus. The levels H, I and I1 differ in their faunal compositions. In H horse is well represented whereas levels I and I1 are dominated by bovids. Fragments of deer antler are common in I and I1. The presence of shed antlers and the age of the young bovids seems to indicate an occupation at the end of autumn or winter for level I1. Some bones show cut-marks.

The first human occupation took place on the top of the gravels, whereas other traces appear in the sequence of fine-grained fluvial deposits. In the fine-grained loams a clear spatial organization of finds could be discerned, with a concentration of nodules, that, judging from their morphology, might have been introduced by humans, and zones with various categories of bones (vertebrae, fragments of limb bones and antlers).

The layers covering the fluvial sequence correspond to the lower part of the covering layers at La Garenne. The industry (Figs 7-8) contains handaxes and tools on flakes, some of which were made on natural flakes, indicating a rather opportunistic attitude towards raw materials, in stark contrast to what was observed at Cagny-la Garenne (Tuffreau *et al.* 1995).

5. The littoral sites of the Channel and the Atlantic Ocean

5.1. Wimereux, La Pointe-aux-Oies

The site (Wimereux, Pas-de-Calais) is at 5 km north of Boulogne-sur-Mer, between the cliffs of la Pointe-aux-Oies and the estuary of the Slack, in a littoral cliff of Pas-de-Calais.

Above Portlandien deposits, with an upper part corresponding to an old abrasion surface, the cliff displays a sequence of gravels and brownish loams of marine origin, that have been correlated to the fluvial-marine sequence

Fig. 9. Saint-Colomban (Carnac, Morbihan). Flake-tools (after Monnier 1985)
1. Flake; 2. Pseudo-Levallois point; 3 and 4. Side-scrapers; 5. Notch; 6. Denticulate; 7. Transversal side-scraper; 8. Composite flake-tool (notch and denticulate); 9. Single convex side-scraper; 10. Déjeté scraper; 11. Denticulate; 12. Bill-hook; 13. Single side-scraper; 14 to 16. Denticulates; 17. Single side-scraper; 18. Borer; 19 to 24. Denticulates and notches; 25 and 26. Single side-scrapers; 27 to 29. Denticulates and notches; 30. Scrapers; 31. Denticulate; 32. Side-scraper; 33. Naturally backed knife; 34. Denticulate; 35. Convex transverse side-scraper. Scale in cm.

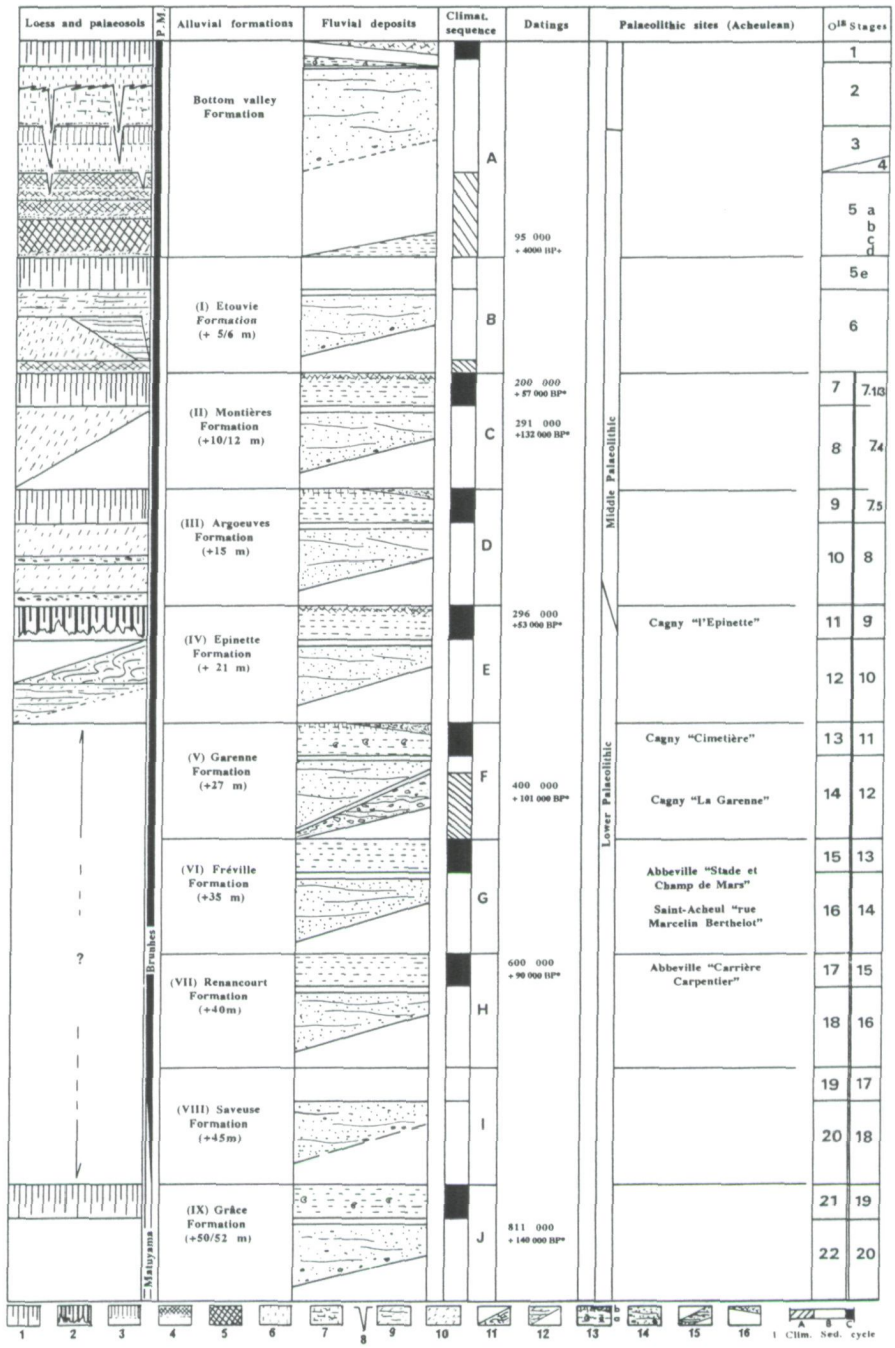

Fig. 10. Localisation of the palaeolithic sites in the sedimentary sequence of the Somme Basin, with a hypothetical correlation to the oxygen isotope stratigraphy. 1. Bt horizon of brown leached soil; 2. Bt horizon of red clayey soil; 3. Intrapleniglacial boreal leached soil; 4. Early glacial humic soil; 5. Early glacial grey forested humic soil; 6. Calcareous loess; 7. Calcareous bedded loess; 8. Ice wedges and frost cracks; 9. Sandy calcareous loess; 10. Sandy loess; 11. Rubble chalk; 12. Sandy slope colluviums; 13. Early glacial slope deposits sequence with inter-stratified calcareous silts; 14. Coarse fluvial gravels; 15. Fluvial calcareous silts; 16. Peat (modern flood plain); PS1-SR-Sol de Rocourt (Eemian). PS2, PS3, PS4-pre-Eemian palaeosols. *ESR dates on fluvial quarz. +U/Th-dates on bones. Climatic cycle: A. Interglacial; B. Early Glacial; C. Full glacial.

with *Mammuthus meridionalis* and *Hippopotamus major* of Wissant (Bourdier 1969b). The sequence furthermore consists of ancient fluvial deposits (gravels and sands) of the Slack, covered by stratified sands and the Holocene dunes. Laterally the Pleistocene deposits are overlain by a loess cover with a palaeosol of interglacial character (Sommé and Tuffreau 1976 and *in prep.*). More studies are needed – especially palaeomagnetic ones – to specify the age of the marine deposits that bear witness to the opening of the Pas-de-Calais (Strait of Dover) from the Middle Pleistocene onwards (Colbeaux *et al.* 1980). They probably date from somewhere in the Cromer complex (OIS 13 to 21).

The lithic industry, unrolled, but with an intensive brown to yellow colour patina, was collected from the lower gravel

layer (the marine deposit) that is exposed during high and strong tides on the present beach. Some more abraded artefacts have likewise surfaced from the fluvial gravels.

The assemblage mainly consists of flint nodules with a cutting edge obtained by successive or alternating bifacial flaking. A few rare handaxes with large flake-scars ('proto-bifaces') are also present. Because of the way the assemblage has been collected flakes are not numerous (Tuffreau 1971).

5.2. The sites of Normandy

The beaches of Le Havre (Seine-Maritime) have yielded many artefacts from the end of the last century onwards, for example series with many handaxes (amygdaloids and lanceolate forms) from the '*Station Romain*'. Others are characterised by the abundance of thick flakes with a wide flaking angle, that have been related to the 'Clactonian'. They also possess some handaxe roughouts, showing that in fact we are dealing with Acheulean flint knapping sites (Ohel and Lechevalier 1979; Watté 1987). Their context of discovery – the beaches – makes it difficult to establish the age of these series.

The Port-Pignot site (Fermanville, Manche) yielded a lithic industry situated on top of old marine deposits of the Cotentin peninsula, covered by Saalian slope deposits (head). In view of the regional context the old beach could be of Holsteinian or intra-Saalian age. The lithic industry, classifiable as evolved Acheulean, contains some Levallois products and a few amygdaloid handaxes. Some structures have been described from this site, amongst which four stone-lined hearths are the easiest recognizable ones (Michel 1982).

5.3. Saint-Colomban

The site is situated at la Pointe de Saint-Colomban, at Carnac (Morbihan), on the southern coast of Brittany, and has been excavated from 1981 onwards (Monnier and Le Cloirec 1985; Monnier and Molines 1993). The stratigraphic sequence, visible in a cliff, consists of sands from an old marine beach covered by a head. This old beach should be older than the last interglacial, as confirmed by ESR dates (OIS 11 or 13) obtained at the Pleuvines site. The lithic assemblage (Fig. 9) from the marine sequence consists of tools on flakes (mainly notches and denticulates) and of pebble-tools, mostly choppers. "Colombanien" has been suggested as a term to indicate the specific character of this type of assemblage. An assemblage comparable to the one from Saint-Colomban has been recovered in an identical stratigraphical context at the site of Menez-Drégan 1 (Hallegouet *et al.* 1992).

6. Conclusions

There is no trace of human occupation in northwestern France and Belgium older than OIS 15. The oldest industry comes from the Carrière Carpentier at (Fig. 10). Abbeville, and it is an Acheulean one. All lithic assemblages from or older than OIS 9 can be attributed to the Acheulean, which shows a large typological variability in the composition of handaxe forms. At Cagny-la Garenne the appearance of the Levallois debitage is situated in a context of handaxe production, indicating a conceptual link between the flaking of handaxes and the emergence of the Levallois flaking methods. The presence of sites specifically aimed at collecting meat (Cagny-l'Epinette) or lithic raw materials (Cagny-la Garenne) is also a point to emphasise. These observations show that the presence of the Acheulean is probably not the result of a local evolution, but rather an intrusive phenomenon with a large variability, that stresses the artificial character of the classical break between the Lower and the Middle Palaeolithic.

The existence of original "Colombanien" assemblages in Brittany poses the question of their individuality in the context of the Acheulean. Are we dealing with assemblages resulting from specialised activities within the Acheulean or do they reflect different traditions? The answer to this question is to a large extent dependent on the development of research in Brittany, where the Acheulean *sensu stricto* is hardly represented.

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