An Acheulean site of the last Interglacial at Boccabianca (Cupra Marittima, Marche)

INTRODUCTION (M.S.).

The territory of Cupra Marittima, like many other areas of the Ager Cuprensis, has been the object of surface surveys for over twenty years by the local Archeoclub, in collaboration with the Laboratorio di Ecologia del Quaternario – Istituto di Antropologia, University of Florence (Via- nello, 1987). The paleolithic sites brought to light during these investigations (Aa.Vv, 1996) are concentrated mainly along the road between the River Aso and the Menocchia Stream, in the municipalities of Massignano and Campofilone and, to a lesser extent, in the southernmost area bordered by the Tesino River, in the municipalities of Grottamare and Cupra Marittima. The results of these studies, while affording a preliminary overview of the human population of the Ascolan territory in the Lower and Middle Paleolithic, do not provide a systematic scenario due to the sporadic nature of the finds. The limited number of materials...
collected, their dispersion and degree of preservation do not allow highly detailed cultural and chronological attribution to be proposed. In other cases, however, the lithic artifacts — as many as several hundreds and scattered in relatively restricted areas — seem to constitute fairly homogeneous complexes from a cultural point of view (La Rosa, 1986; La Rosa, Vianello, 1985; La Rosa et al., 1986; Vianello, Liguori, 1986; Vianello et al., 1988). The Paleolithic site of Boccabianca, the object of the present paper, was already known and located in 1992 (Mora, Vianello, 1992). The majority of the finds, collected by the junior high school pupil Paolo Marconi, were given to the Soprintendenza Archeologica per le Marche by the local Archeoclub in May 1994. The particular importance of the site, as indicated above all by the presence of numerous bifaces, led the Soprintendenza to plan a systematic research program which culminated in two excavations in 1998 and 1999.

Unfortunately, since the presence of lithic artifacts was notified to the Soprintendenza only after the house situated adjacent to the explored area had been built, it remains highly probable that the excavation made for its construction has led to the destruction of a considerable part of the deposit, as can be seen from the degree of preservation of the artifacts themselves.

**Geomorphological Setting (M.C.).**

The Boccabianca site is located near the mouth of the Menocchia Stream, on the hydrographic left at the top of an alluvial terrace (ca. 50 m a.s.l.), less than 1 km from the coast (Fig. 1). The terrace is cut by a small valley, WNW-ESE oriented, crossed by the Mignini Stream.

The Menocchia Stream flows in a ca. SW-NE direction; it rises in the hills of the Peri-Adriatic Basin close to the town of Montalto and reaches the Adriatic Sea to the north of Cupra Marittima (Fig. 2). The thalweg cuts across pelitic, pelitic-arenaceous, arenaceous and conglo-

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1 The fieldwork was carried out from 05.05 to 05.06.1998 and from 15.05 to 24.06 1999 and was performed by staff of the CORA Ricerche Archeologiche S.n.c., coordinated by M. Bassetti (A. Bacha, A. Budini, M. Biennà, C. Cariitti, F. Cavulli, P.I. D’Aleo, A. Giuffrida, L. Mattioli, S. Padovan, L. Rossini), in close collaboration with the technician Lionello Fabi of the Soprintendenza Archeologica per le Marche. Faunal remains have been restored by P. Rinaldini of the CORA Ricerche Archeologiche S.n.c. Geomorphological research and study of the lithic industry were carried out with M.U.R.S.T. contribution, in the ambit respectively of ex60% Project (M.Colorti) and National Project “Origini ed evoluzione del popolamento umano in Italia: paleobiologia, comportamento e strategie di sussistenza” (M.Penesani).

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meratic sediments deposited in a marine and coastal environment between the Middle and the Lower-Middle Pleistocene. The sediments located at the top of the sequence generated wide, coarse grained fan deltas, which in many parts of the coastal area are easily recognizable due to their evident clinostatification (Rainone et al., 1981; Massari et al., 1986). Fluvial conglomerates, composed also of coarse elements, overlie these deposits, which have been attributed to the Sicilian (Sequence Qm; Centamore, Micarelli, 1991). A lacustrine silty clay layer containing Pulmonate shell is intercalated within these coarse sediments (sequence Qc). These sediments have been attributed to the “Crotonian” (Centamore, Micarelli, 1991), but the chronological setting of this term is nowadays uncertain. In the type area of Croton the extended “Crotonian” terraced unit has been correlated to stage 7 (Cosenzino et al., 1989) as well as to stage 9 (Palmentola et al., 1990) of the deep sea cores. In the study area it corresponds to alluvial deposits of the 1st order (Colorti et al., 1991), deposited when the Menocchia reached the limestone ridge of the Sibillini Mts. In fact, along the present-day valley, there are no outcrops of limestones similar to the ones constituting the fan delta and the alluvial deposits. This fan delta, similar to the other coeval deposits found along the Marche coasts, was subsequently dissected by the rivers which, together with the coastal ero-
Fig. 2. Geomorphological map of the lower part of the Menocchia Valley. Key: 1. lagoon and beach deposits (Holocene); 2. coarse-grained alluvial sediments (Holocene); 3. colluvial sediments (Holocene); 4. coarse-grained alluvial sediments (Upper Pleistocene); 5a. fine-grained alluvial sediments (Late Middle Pleistocene); 6. beach, dune, and alluvial sediments (Upper Pleistocene); 7. coarse-grained alluvial sediments (Middle-Lower Pleistocene); 8. clays (Middle-Lower Pleistocene); 9. river scarps; 10. river scarps, h > 10 m; 11. abandoned meander channel; 12. alluvial fan (Holocene); 13. Boccianera archaeological site.
sion, generated a wide terrace all along the coast. The top of this litho-
and morpho-stratigraphic unit is weathered by a relict fersiallitic soil
characterized by strong rubefaction similar to the ones observed also in
other fluvial terraces from the same age (Chiesa et al., 1990; Coltorti,
1995). This terrace was most probably deposited during stage 9, be-
cause only two other units can be attributed to the late Middle Pleistoc-
cene (stage 6) and the Upper Pleistocene (stages 4, 3, and 2). In the
past Lipparini (1939) and Villa (1942), following other Italian authors,
attributed to eustatic reasons the terracing of the alluvial sediments
and considered the deposition coeval with the interglacial periods. More
recently, it has been demonstrated that the deposition of the alluvial
terraces was constituted mainly by coarse sediments occurring during
the cold phases of the Pleistocene (Chiesa et al., 1990; Calderoni et al.,
1991; Coltorti, 1995). The coarse sediments, responsible for the ag-
gradation of the valley bottom, were deposited by braided streams dur-
ing the cold stadial periods when the slopes were devoid of vegetation
and at the highest elevations glacial and periglacial morphogenesis do-
minated (Coltorti, Dramis, 1995). During the interstadials the rivers
were characterized by relatively stable anastomosed channels (Caldero-
ni et al., 1991). Only during the interglacials were meanders established
while the sea level was rising. Further inland these meanders were re-
sponsible for river downcutting.

More recently, although some authors still utilize the old subdivi-
sion in 4 orders of the river terraces, detailed research on the Late Glacial
and Holocene have demonstrated a more complex reality (Coltorti, 1991;
1995; Massi et al., 1997). At the end of the Last Glaciation, most proba-
bly already during the Allerød/Bolling climatic amelioration (Daansgaard
et al., 1993), the rivers assumed a meandering pattern, at intervals sli-
ghtly incised inside the previously deposited sediments. During the pro-
gressive downcutting i.e. along the Musone River a number of terraces
have been described and grouped in 5 different phases of pattern and
channel evolution (Coltorti, 1991). On top of the older Holocene terras-
ces, in various Marchean rivers, silts and clayey deposits similar to those
of Boccabianca have been recognized (Cilla et al., 1996; Massi et al.,
1997). These deposits constitute the filling of meandering channels.
However, these deposits have been studied only in the more internal
parts of the valleys because the coastal areas generally underwent heavy
sedimentation during the Late Holocene. Probably meander sequences
are present also in older alluvial units, but they have never been descri-
based; Boccabianca constitutes the first description of these sediments clo-
se to the coastline.

Along the Menocchia River, on top of the alluvial unit attributed to
the Late Middle Pleistocene, a fersiallitic paleosol is present similar to
the one observed also on the older unit. This soil, throughout the entire Peri-Adriatic area, has been attributed to the last Interglacial. In fact, this partially truncated pedostratigraphic unit outcrops in the Paleolithic sites of Erbarella and Ponte di Crispiero (Bisi et al., 1982; Coltorti et al., 1980).

The upper part of the Boccabianca terrace is characterized by fine sediments (Figs 2, 3). Medium and coarse gravels are present at over 8 m

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**Fig. 3.** – a: cross section of the lower part of the Menocchia Valley. The archaeological site of Boccabianca is on the left side of the valley on top of a terrace which represent a meander filling which cut the late Middle Pleistocene alluvial deposits (key as for Fig. 2). b: Cross section of Sector 2 located north of the site. S.l (sample 1) contains the mollusc fauna described by D.E. and M.M. in this paper. The sample come from the border of a wide channel.
beneath the surface. Coarse cross bedded gravels have been recognised in a more internal part of the valley (less than 1 km from Boccabianca) on top of a terrace located at ca. 80 m a.s.l. The upper surface of the terrace decreases progressively in elevation and no escarpments have been observed, suggesting that they belong to the same morphostratigraphic units. These evidences allow us to establish that in the coastal area, following a phase of coarse sedimentation, a fine grained unit was deposited. Most probably an erosional surface (channel) is present between these two units, although it has not been observed in outcrop.

The fine sediments inside the thalweg and the fluvial facies are similar to the Holocene sequences, suggesting that the contemporaneous slopes were both covered by a dense forest during a period corresponding to the last Interglacial.

The Upper Pleistocene alluvial sediments in this part of the valley seem to have undergone a similar sequence of events. The terrace is characterised by coarse alluvial sediments whose top in the middle part of the valley was surveyed at about 40 m of altitude. Along the middle part of the valley it is strongly dissected, while close to the coastline in the upper part of this unit, located ca. m 20-25 a.s.l. there are many abandoned channels filled with silty and sandy sediments. Close to Boccabianca there is a sequence of fine sediments belonging to this unit, but the lack of stratigraphic sections prevents a more detailed description.

**Stratigraphy of the site (M.C.).**

The stratigraphy was obtained by investigations on the sediments brought to light by ploughing and detected by a borehole located few metres north of the excavated area.

Layer 1: 0,0-0,30 m, plough horizon.
Layer 2: 0,30-3,50 m, sandy silts and silty sands (10YR 6/3 pale brown) with abundant carbonate small size nodules which at places generate a thick network (10YR7/3 very pale brown); all the archeological finds were recovered in this unit.
Layer 3: m 3,50-3,80, dark silts due to the presence of millimetric Fe-Mn nodules;
Layer 4, m 3,80-4,60, sandy silts;
Layer 5, m 4,60-8,80, silty sands and fine sands;
Layer 6, m 8,80-9,50, lower limit not reached, medium size subrounded and subangular gravels.

These layers were sampled also for palynological analyses, but they gave negative results.
Fig. 4. — Cross Section of Sector 1. The two sections are joined along the B-B' contact. In this section a series of trough cross bedded sands are present. Rare fine grained gravels are locally present at the bottom of the small channels. From this section an handaxe belonging to the lithic assemblage II has been collected and it is indicated in section. A small flake, indicated with a black rectangle, come from a channel in a lower position.
During the 1999 fieldwork the excavation of a trench 2 m wide, 3 m deep and 15 m long (Fig. 4) exposed the structures of layers 1 and 2. In its upper part (0-90 cm) a succession of oblique alternations of plough slices composed by sediments similar to those of unit 2 is visible (Fig. 7). Unit 2 is representative of wide and very flat channels filled up with fine sediments which generated a trough cross bedded stratification (St structures of Miall, 1985; 1992; 1996). The channel width varies from 1 to 3 m, with a visible maximum depth of 30-50 cm. Carbonate nodules are abundant and locally more concentrated; medium size common silt-sized are also present. In the western, deeper part of the section these sediments overlie horizontally laminated and very flat trough cross bedded sands and silts deposited inside a larger channel. Minor channels with an asymmetric cross section suggest a lateral migration. At the base of the main channel (Ch of Miall) discontinuous fine gravel lenses are also present.

To the west of Case Marconi, another shorter trench (Sector 2, Fig. 3b) revealed the presence of a channel which could represent the lateral termination of that observed in section I, or a similar one. The infilling is made up of well sorted medium and coarse sands, containing the shells which will be described in a following chapter (Sample 1). Also in this section millimeter thick veins and carbonate nodules are abundant. The textural changes are due to lateral facies variations inside a similar sedimentary environment, which was an alluvial plain crossed by one or more meanders. The sequence likely represents progressively abandoned meanders affected by several alternances of cut and fill, probably linked to pluriseasonal events.

THE EXCAVATION (M.B., M.S.).

Methods and modalities of the fieldwork

The first phase of the research consisted in a detailed survey of the topography and morphology of the site surroundings, cleaning the exposed sections, and investigating sample squares by both mechanical and manual digging. Research was subsequently backed up by systematic stratigraphic excavation of the most interesting areas, indicated as excavation sectors (Fig. 5). A surveying system with total station theodolite was set up, in order to relate the samples, finds and excavation grid to the same topographical reference. The axes of the reference grid were orientated, according to the classical cartesian system, with two orthogonal S-N axes or ordinate (SN) axes and
Fig. 5. – Map of the investigated area showing position of sectors, sections and private building (elab. P.T.).

W-E or abscissae (WE). In the sectors the grid was laid out on the ground: each 1-metre sided square was in turn subdivided into four 50-cm sided quadrants, marked with Roman numerals from I to IV, starting from the lower left corner of the square and proceeding clockwise. The next step was to record, with precise coordinates, all the lithic and faunal finds and pebbles, marking the direction of the axis of some faunal finds, for a total of 469 recorded finds (R.R.). For sieving, the IVth qua-

\[2\] For the surveying operations, referring to the absolute a.s.l. altitude, the geographical reference used was the Carta Tecnica Regionale, Marche Region, municipality of Cupra Marittima, section 31515, Sheet 01, scale 1: 2,000.
drant of each square of sectors 1 and 4 was systematically sampled. Altogether a total of 120 sediment samples were taken, including the samples destined for palynological and mollusc analysis. The stratigraphic units defined are to be intended as excavation units, and do not assume pedological significance\(^3\) (field description is reported on appendix).

**The excavation samples and sectors**

In 1988 a total of 8 samples were performed (A, B, C, D, D1, D2, D3, E); in the 1999 fieldwork was intensified in the northern sector, with the digging of trench F, in correspondence with sample C of 1998. On the basis of the data obtained during the 1998 fieldwork, in fact, the area above this was considered the probable source area of the material, in view of the better conservation of the stratigraphy in this sector and the general inclination of the erosional surface (unit 4) at the base of the sedimentary body containing the archeological materials (unit 3).

**Sectors 1 and 4**

In 1998 the stratigraphic excavation of sector 1 was performed, within the cleared area indicated as sample D. This area was selected on the basis of the finding of some flint chips in unit 5 and unit 2a during the operations of rejuvenation of the N-S section (section 6), at the eastern edge of the excavation for building.

As a whole, the correlation of the sample stratigraphies and excavation sectors revealed an alluvial deposit (unit 6) (cf. M. Coltorti, layer 2) truncated by an erosional wavy surface and inclined southeastward (unit 4). The upper stratigraphic succession hence develops with discordance above the lightly older deposits. Local depressions of the erosional boundary are filled by lens-shaped deposits of fine and medium-grained sand of a maximum thickness of around 120 cm, containing remains of land snails and the majority of archeological material found (Fig. 6). This unit, named unit 3, has been distinguished in an upper portion, 3a, and a lower one, 3b, and covers the sectors 1 and 4, while a similar deposit (unit 12) has been sectioned for a width of 7.5 metres in sample F (cfr. section 3). The deposit is stratified in lenses which overlie one another with erosional contact, whose deposit tends to drape over the lower di-

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\(^3\) The field description of the stratigraphic series of each sector is reported in the appendix, and will follow the pedological and sedimentological criteria on the basis of the guidelines set out by G. Sanesi (a cura di), 1977, Guida alla descrizione del suolo, CNR; FAO, Soil Map of the World. Revised Legend, Rome 1988; Ricci Lucchi, 1980, Sedimentologia, Bologna. The colours are codified and determined in the moist state according to the Munsell Soil Color Chart.
Fig. 6. – Sector 1 and lower boundary of unit 3, viewed from SE. In foreground, the biface found in one of the depressions.
scontinuity (unit 4). Of particularly interest is unit 5, confined to an extension of 4.5 sq. m. Only partly spared from the above mentioned erosional event (unit 4) and the excavation for building, it probably represents a rest of paleosurface, as evidenced by the presence of two adjoined diaphysary fragments and lithic fragments, some large. This is followed by a clayey component deposit, its stratification inclined westwards, evolved into a vertisol, unit 2, subdivided into unit 2top and unit 2a in the lower part. Lastly there is unit 1, made up of two overlapping plough horizons (cfr. M.Coltorti layer 1).

Sector 2

A 22 sq. m. excavation sector was made in order to investigate the stratigraphy of sample N, where the stratigraphic series was best preserved. Given the scarcity of findings, the result of excavation here can be considered negative. The stratigraphic series investigated is to be correlated to units 2 (unit 10) and 2a (unit 11, 13) of sectors 1-4 (Fig. 7).

Fig. 7. – Sector 2, unit 13, viewed from NNE.
Sector 3

Excavation was performed in order to find the paleosurface or unit containing the single bifacial of the II lithic assemblage. A surface of 85 sq. m. was cleared, while manual digging was concentrated on a surface of 25 sq. m., at the level of the biface. Apart from this specimen, not many artifacts were found. The investigated series can be correlated to the stratigraphic series of sector 1-4 or, from top to bottom, to unit 2 (unit 14), unit 2a (unit 15, 16, 17, 18, 19) and unit 3 (unit 12).


The archaeological units of Boccabianca and the underlying sandy sediments provided abundant remains of continental mollusc fauna (Sample 1 and unit 3, sectors 3 and 4). In the samples examined various taxa of land and freshwater mollusks were recorded, to which the quantitative method proposed by Lozek (1964) and Puisségur (1976) was applied. This method was adapted for the Quaternary continental mollusc assemblages of central-western Europe and then utilized by various authors (including one of the writers, D.E.) for detailed paleoenvironmental and paleoclimatic reconstructions of Pleistocene and Holocene continental successions. The species were grouped in ten ecological groups, expressed numerically and characterized by abbreviations linked to the particular environmental connotation for each taxon. The number of specimens of each species is expressed in its percentage of the total number of individuals of the association belonging to a single stratigraphic unit. Each ecological group is thus expressed in terms of the percentage of individuals of the species belonging to it. In the characterization of these groups, particular emphasis is laid on the link between the mollusc fauna elements and vegetational formations. In this way, it is possible to reconstruct the environmental and climatic features instaurated during the phase of deposition of the analyzed sediment.

Malacological analysis of the sandy level (sample 1, section II) underlying the archaeological units

The sediment underlying the archaeological units that provided mollusc fauna remains, mainly consists of slightly altered fine sands; it provided 10 different species of terrestrial gastropods for a total of 144 individuals per unit of sample.

The association is made up of two species of land Prosobranchia, Pomatias elegans (2Wm; 18.06%) and Platyla similis (1W; 1.39%) and eight species of land Pulmonates: Carychium tridentatum (8H; 31.94%);
Sphyradium doliolum (1W; 4.17%); Granaria sp. (4S; 0.69%); Acanthinaula aculeata (1W; 2.78%); Punctum pygmaeum (7M; 27.78%); Discus rotundatus (2Wm; 4.16%); Limax sp. (7M; 2.78%); Chocodina sp. (1W; 6.25%).

In the assemblage there is a well-represented overall total (36.8%) of species generally living in a wooded habitat, such as P. similis, S. doliolum and A. aculeata, closely linked to the temperate-warm, humid environment (1W), and species which - though possessing a fair possibility of adapting to other environments, like P. elegans and D. rotundatus - are frequently found in mesophile open wooded environments (2Wm). A high percentage of individuals (30.56%) also belong to species presenting considerable possibilities of adapting to mesophile environments, e.g. P. pygmaeum and Limax sp. which, however, prefer moderately humid places with abundant vegetation and deciduous woods; 31.94% consists of a single species (C. tridentatum) which prefers humidity and is found in both wooded and open environments. Lastly, 0.69% is represented by a single, fragmented specimen of a genus which lives exclusively in open, well-exposed environments (Granaria sp.) (Lozek, 1964; Kerney, Cameron, 1979).

The association is hence representative of wooded environments of medium humidity, not too thickly wooded, with partially open areas. The presence of C. tridentatum, a markedly hygrophilous element, in elevated percentage (around 32%) indicates the existence of moist grassland or a stream. It should be noted, moreover, that strictly aquatic species are completely absent in this assemblage, while those of open environment represent only 0.69%. All the species found are still living in the Marche region today and widespread throughout the rest of Italy (Bodon et al., 1995a, b).

The climatic conditions revealed by the mollusc fauna were very probably warm-temperate and medium-humid; in fact, almost all the species present in this part of the succession are characteristic of the warm, humid climatic phases of the Quaternary (Lozek, 1964), so that the association can be referred to an interglacial phase.

The mollusc fauna of unit 3 and related (sectors 1 and 4)

Several samples were collected from the units including the lithic assemblage (unit 3 and related, sectors 1 and 4), which appears to be affected by weathering, so a recognition at genus level resulted problematic for some shells. The relatively scarce mollusc fauna is mostly badly broken and in a very poor state of preservation. Recognition of the species or genera of gastropods and bivalves, 18 in all, was effected mainly by the apex and apertures or internal moulds, used also as reference for
determining the minimum number of individuals present. In relation to
the abundance of fragments found, it is clear that the amount of indi-
viduals contained in the sediment must have originally been much higher.
It should also be borne in mind that the remains of species characterized
by very thin or very small shells, for example those of Carychiun, may
have been completely leached.

The mollusc fauna found is represented by one species of land Pro-
sobranchia: Pomatias elegans (2 Wm; with 76 individuals), fourteen spe-
cies of land Pulmonates: Cochlicopa lubrica (7M; 1 ind.), Sphyradium
doliolum (1W; 1 ind.), Pupilla cf. muscorum (5O; 1 ind.), Vallonia pul-
chella (5O; 4 ind.), Chondrula tridens (4S; 1 ind.), Punctum pygmaeum
(7M; 1 ind.), Discus rotundatus (2Wm; 2 ind.), Limax sp. (7M; 7 ind.),
Cochlodina cf. laminata (1W; 12 ind.), Poietri dilatata (7M; 1 ind.),
Cernuella sp. (4S; 1 ind.), Hygromia cinctella (2Wm; 1 ind.), Helicodonta
obovata (1W; 1 ind.), Cepaea sp. (2Wm; 1 ind.); one species of aquatic
Prosobranchia: Bithynia tentaculata (10SF; 2 operculum); one species of
aquatic Pulmonates: Lymnaea peregra (10SF; 1 ind.) and one species of
Bivalve: Pisidium amnicum (10F; 9 ind.). Rare valves of Ostracods are
also present in the sediments.

The extremely high number of tiny fragments of shells belonging to
various species were not used for counting; consequently, the particular
strength of the apaxes of some species and the possibility that others are
more abundant in sediment lenses which are less permeable and thus
more resistant to leaching make any attempt at formulating a percent
counting unreliable. However, by applying the proposed ecological cha-
racterization to each species, some indications of a paleoenvironmental
nature can nevertheless be obtained.

Approximately one third of the species, represented overall by nu-
merous individuals, are linked to a wooded environment; some of these
are typical of temperate-warm and humid forest environment (1W), while
the others - though possessing a certain degree of adaptability also to
other environments - are often found in medium-humid, open wooded
mesophile environment (2 Wm). Little less than a third of the species fit
well with medium-humid environments, generally wooded (7M). Less
represented are the species which prefer open, sunny spaces (4S), or tho-
se favouring open environments while showing a certain degree of adap-
tability to various humidity conditions (5O) (Kerney, Cameron, 1979).
Also present in the association, with a fair number of individuals, are
three aquatic species normally living in watercourses or shallow streams
(10F and 10SF); the finding of the opercula alone of Bithynia, without
the shell, makes one think of selective transportation by watercourses.

The mollusc species found associated with the lithic industry make
it possible to confirm the existence of a temperate climate coeval with
the depositing of sediments. All the species are still living in the Marche region and throughout the rest of Italy (Bedulli et al., 1995; Bodon et al., 1995a, b). The surrounding environment was characterized by more or less sparse woods, but with a greater presence of open spaces with respect to that in existence during the deposition of the underlying sands, as demonstrated by the finding of as many as four species associated with open, grassy spaces, constituting about 27% of the land species found here. The presence of at least three aquatic species belonging to a fluvial context, of ostracod remains not present in the previous association, and the frequent fragmentation of shells, makes it likely that the sediments were deposited by the action of a watercourse during an interglacial climatic phase.

TAPHONOMICAL ASPECTS OF UNIT 3 (M.B., P.B., C.L., M.P., P.R.).

The finds recovered in unit 3 and on the boundary with the underlying unit, already from an early stage in the excavations, had a spatial distribution clearly connected with the geometry of the sedimentary body and, in particular, with the morphology of the erosional boundary. This is represented on figure 8 as an undulating surface, sloping eastward on

![Figure 8](image-url)
average by 4-5°, whose maximum and minimum quotes are respectively 48.40 and 47.50 m a.s.l. The main morphological feature of this erosional surface consists of a curved step whose orientation varies from NS in the northern part of sector 1, coinciding with the isohypse 48.05 m a.s.l., to NW-SE in the southern part between sectors 1 and 4, gradually decreasing to 47.70 m a.s.l. To the east of this contour there is a wide area with irregular surface characterized by the presence of at least two smaller depressions, sub-circular with cone-shaped profile, whose maximum diameters range from 100 to 120 cm (sector 1), and an elliptical one with maximum diameter of about 200 cm (sector 4). The depth varies from 15 to 30 cm, and the walls denote a variously oriented flaring. The depressions are separated by blandly tabular surfaces or by very rounded ridges.

The areal distribution of the finds (flint artifacts and faunal remains) and of the pebbles records the minimum frequencies on the upper step, with 1.55 pieces/sq m, while higher values (6.14 pieces/sq m) are found downhill from it, where the materials tend to be concentrated in correspondence with the mentioned depressions and to become more scarce in the areas bordering these (Figs. 9, 10). Considering the diverse nature of the materials, it is possible to recognize some differences in their distribution. The faunal remains, which are practically absent in the W area, evidence a progressively greater presence towards E and SE, ranging from 2.71 pieces/sq m in the central and eastern portion of sector 1, to a frequency of 8.95 pieces/sq m in sector 4, where they tend to be more concentrated in correspondence of the only depression completely centred by excavation. The same degree of concentration is however noted also around the depressions of sector 1. On the other hand, the relationship between depressions and concentration of heavy elements is more systematic in the case of pebbles, which are practically absent in the investigated areas. A partial concordance is nonetheless observed between the distribution of fauna described above and that of lithic artifacts, the latter distinguished between unretouched flaking products and retouched tools. On the whole, the artifacts seem to be arranged in such a way as to delineate a circular area centred around sector 1, indiscriminately occupying the step to the W and the lower terraces. Southeastwards, however, in sector 4, the artifacts become more frequent, occupying positions close to those of the faunal remains and reaching a greater concentration in correspondence of the central depression. Also in this case there are no observable differences in distribution between unretouched and retouched artifacts. Finally, the only biface of the unit was found within one of the central depressions; likewise, two of the three cores occupied positions inside the depression of sector 1.

Certain peculiar aspects concerning the size and degree of preservation of the surfaces were observed in the bones and lithic artifacts. As
regards the bones, the majority consisted of fragments with an average length of few cm, showing traces of drifting and Fe-Mn pigmentation, and partly covered in thick carbonatic concretions. In unit 3, 43% of finds are between 2 and 3 cm long, whereas only 12% are 5 to 7 cm long, the greatest length class in this unit. On the unit 3a bed and near the lower boundary (u. 3b/6) of unit 3b the largest elements were found, the biggest being an epistropheous belonging to *Bos primigenius* (maximum length 18.5 cm).

![Diagram](image)

**Fig. 9.** - Unit 3: spatial distribution of lithic artifacts (bifaces, cores, retouched implements and separate flaking products), faunal remains and pebbles >100gr weight (isohyphses equidistance 5 cm; elab. P.T.).
The lithic artifacts too reveal a granulometric gap owing to the relative scarcity of smaller elements, which usually constitute the microshatter of a lithic workshop, to the advantage of the larger sizes. Of these, 65 (34.7%) out of a total of 98 show a pronounced patination of the surface which completely conceals the original features of the lithotype; the latter, in turn, is represented by a light grey porous variety (5Y7/1) originating at the expense of a calcarenite (type 1), a compact, light olive-grey porous variety (5Y6/2) which originated at the expense of a micritic limestone (type 2), and a very dark red porous variety (2.5YR2.5/2), originating from a micritic marly limestone (type 3); both limestones belong to the Mesozoic formations of the Umbria-Marche Appennine. As regards the patinae, the yellowish-red and reddish-yellow types predominate (5YR5/8; 5YR6/6), formed on types 2 and 3 and on type 1 respectively, while the association between various patinae (pale olive 5Y6/3, reddish-yellow 5YR6/8, besides the dominant one) offers a wide range of varieties, including overlappings of various shape and extension, or else divided areas, sometimes due to the irregularities encountered in the original lithotype (cortex, rim with variable degree of substitution, etc.). The red patina uniformly impregnates the surfaces of the artifacts and presents the maximum thickness (ca. 1 mm) in type 1, decreasing progressively from type 2 to 3.
Also the functional analysis of the lithic industries can provide useful data for a description and interpretation of the weathering undergone by the artifact surfaces (Levi-Sala, 1993; Plisson/Mauger, 1988; Röttlander, 1975a, 1975b; Stapert, 1976; Texier, 1981). Observation by stereomicroscope (magnification range 10X-63X) and metallographic microscope (magn. range 150X-600X) of 49 finds in flint and one in quartzite made it possible to express some considerations on the weathering. There are 18 artifacts presenting an alteration of mechanical type, i.e. microflaking attributable to “flint on flint” type rubbing that may have occurred during deposition, or to mechanisms of sediment compression or trampling. In certain cases, flared margins were observed. Two artifacts were covered with a white patina, a modification of the flint structure caused by chemico-physical processes which manifests itself as an altered refraction of light and causes a whitish stain, like a coating, covering practically the entire artifact. A patina giving a glossy appearance (soil sheen and glossy patina) was observed on 29 artifacts, recognizable by the homogeneous luminosity it creates on the surface. This modification can be ascribed either to mechanical abrasion, producing a glossy soil sheen, or to chemical processes which cause a glossy patina. It should be stressed that several artifacts recovered at Boccabianca show clear traces of different types of weathering: the glossy appearance, in particular, is often associated with mechanical weathering. Since in certain cases more than one type is present on a single artifact, the quantitative values of table 1 are to be taken as an absolute value for each category out of the total of analyzed material. Lastly, on the majority of artifacts subjected to analysis, bright spots (Levi-Sala, 1988, p.241) were found to be present; this suggests mechanical modification caused by rubbing of the artifacts with abrasive sediments and/or against other artifacts and lithic geofacts, in the presence of water.

As already noted, several evidence concur in outlining the set of postdepositional mechanisms responsible for both the modification of the finds and the present-day spatial arrangement of the coarse elements found in unit 3. The evident rounding of the bone finds, but particularly the gaps encountered in their granulometry, as in the case of the lithics, are to be ascribed to the action of water at low speed, responsible for washing away the more transportable materials. This effect, which has been evidenced also on an experimental basis (Schick, 1987; Petraglia,

<table>
<thead>
<tr>
<th>Tab. 1. — Types of weathering on the surface of flint artifacts.</th>
</tr>
</thead>
<tbody>
<tr>
<td>mechanical alteration</td>
</tr>
<tr>
<td>white patina</td>
</tr>
<tr>
<td>glossy appearance</td>
</tr>
<tr>
<td>coloured patina</td>
</tr>
</tbody>
</table>
Nash, 1987), is part of a set of mechanisms connected with a single, overall fluvial taphonomic process of elements originally contained in one or more units which, partially in agreement with the model of Hanson (1980), were affected by the flow of water, suffering an impoverishment of the more transportable elements. Actually, the spatial configuration shown by the different classes of materials, and especially the concordance with the morphology of the lower erosional boundary of the unit, suggest -- in agreement with the account of Schick (1987) -- that also the larger elements were transported and concentrated in discrete spatial areas; in the case of Boccabianca, these coincide with the depressions, which were evidently sites of greater turbulence. Apart from a few elements affected by pseudoretouching, on the whole the sharpness of the unretouched and retouched edges of the lithic implements indicate in any case transport of a short distance.

As regards the coloured patinas, their origin is to be attributed to the same processes of hydromorphism that determined the pedogenetic figures observed on the field. Impregnation -- however much it is differentiated in relation to the granulometry of the flint lithotype -- would imply a previous corrosion of the surfaces, more efficacious in alkaline environment, which would determine the development of a porosity suited to subsequently receiving various chemical compounds and elements (Cremaschi, Peretto, 1976; Biagi, Cremaschi, 1988).

A further modification of the surfaces and presumably of the spatial configuration originating in this manner is linked to the subsequent pedogenetic phase, pertaining to the evolution of a vertisol (unit 2 and related), the mechanisms of which would have produced the brilliant spotting observed on certain elements. In this context, it seems significant to note that various lithic industries with bright spots analyzed by two of the present authors (C.L., P.R.) are associated with archeological contexts characterized by erosion of the fine matrix of the deposit which determined small-scale shifting and "rubbing" of the components of the residual matrix, which appears "compacted" into a smaller volume than that of the original deposit.

MACROMAMMAL REMAINS (P.B.)

Out of a total of 172 bone finds examined, the majority consist of fragments. The elements with largest dimensions are present in the unit 3a bed and in unit 3b/6: the biggest of these is an axis of *Bos primigenius* (max. height 18.5 cm). The determined elements are few, almost all larger than average, broken, and partly covered with thick carbonatic concretions. Their determination was possible thanks to preliminary restoration work (demolition of concretions, consolidation and assembly of the parts).
As the result of the poor state of preservation of the bone material, it is difficult to identify any traces of butchering or intentional breakage of the diaphyses. Only one find, a proximal fragment of the 3rd metatarsal of a horse, displays a percussion notch on the ventral side.

**The determined species**

The determinable bones are ascribed to 4 taxa of large mammals: *Elephas* sp., *Equus caballus*, *Bos primigenius* and *Cervus elaphus* (Tab. 2). In a few cases specific determination remains uncertain, on account of fragmentation and the bad bone preservation.

**Tab. 2.** Determinable faunal remains.

<table>
<thead>
<tr>
<th>unit</th>
<th>species</th>
<th>anatomy</th>
</tr>
</thead>
<tbody>
<tr>
<td>3a bed</td>
<td><em>Equus caballus</em></td>
<td>fragment of left metacarpal 4°</td>
</tr>
<tr>
<td>3a bed</td>
<td><em>Equus caballus</em></td>
<td>proximal fragment of left metatarsal 3°</td>
</tr>
<tr>
<td>3a bed</td>
<td><em>Bos/Bison</em></td>
<td>fragment of tooth</td>
</tr>
<tr>
<td>3a bed</td>
<td><em>Elephas</em> sp.</td>
<td>fragment of tusk</td>
</tr>
<tr>
<td>3a bed</td>
<td><em>Elephas</em> sp.</td>
<td>fragment of tusk</td>
</tr>
<tr>
<td>3a bed</td>
<td><em>Elephas</em> sp.</td>
<td>fragment of tusk</td>
</tr>
<tr>
<td>3a bed</td>
<td><em>Cervus elaphus</em></td>
<td>third phalanx</td>
</tr>
<tr>
<td>3a bed</td>
<td><em>Equus caballus</em></td>
<td>left metapodial – middle distal fragment</td>
</tr>
<tr>
<td>3a bed</td>
<td><em>Bos/Bison</em></td>
<td>distal fragment of metapodial</td>
</tr>
<tr>
<td>3b bed</td>
<td><em>Bos/Bison</em></td>
<td>fragment of premaxilla</td>
</tr>
<tr>
<td>3/6 bed</td>
<td>cf. <em>Cervus</em></td>
<td>right scapula</td>
</tr>
<tr>
<td>3b/6 bound.</td>
<td><em>Bos primigenius</em></td>
<td>axis</td>
</tr>
<tr>
<td>3b/6 bound.</td>
<td><em>Bos/Bison</em></td>
<td>fragment of left scapula</td>
</tr>
<tr>
<td>3b bed</td>
<td><em>Cervus elaphus</em></td>
<td>metatarsal - fragment of diaphysis</td>
</tr>
<tr>
<td>3 bed</td>
<td>cf. <em>Cervus</em></td>
<td>fragment of molar</td>
</tr>
<tr>
<td>3 bed</td>
<td>cf. <em>Cervus</em></td>
<td>2°/3° right incisor</td>
</tr>
<tr>
<td>3 bed</td>
<td><em>Cervus elaphus</em></td>
<td>metacarpal - distal fragment</td>
</tr>
</tbody>
</table>

*Elephas* sp.

Three fragments of Proboscidea tusk were found in the stratigraphic unit 3a bed, probably belonging to the same animal. The two largest fragments (79 x 170 mm and 84 x 45 mm) clearly reveal smoothing on one side, and exfoliation and missing pieces on the other. The three fragments were found in a small depression, 50 – 70 cm from one another.

*Equus caballus*

Three finds are attributed to the horse, all metapodial limb seg-
ments. A proximal fragment of a 4th left metacarpal was found in unit 3a, its articular part eroded and the diaphysis chipped, together with a proximal fragment of a 3rd left metatarsal, split transversally to the articular surface and showing a percussion notch on the ventral side. The only measurement it was possible to make of this find was the diameter of the articular facet with the cuboid (meas. 8, Eisenmann et al., 1988): 17.1.

The third horse element, a middle distal metapodial fragment, was found in the “3a bed” stratigraphic unit. Its dorsal side presents smoothening and cupels, while the absence of some parts of compact bone on the ventral side make it possible to distinguish the moulded filling concretion of the medullary cavity. This feature leads to the hypothesis that the bone was broken subsequent to its internal concretion. The measurements of this metapodial are: maximum distal articular width (meas. 11 Eisenmann) 55.0; minimum thickness of lateral condyle (meas. 13 Eisenmann et al., 1988) 29.1.

These measurements are little short of those of two similar horse remains recovered in the levels of the Last Interpleniclacial and Upper Pleniglacial of the Paglicci Cave in the Gargano (Boscato, 1994).

Bos primigenius

The finds consisted of aurochs axis, broken and markedly concretionary. The left transverse process is missing from the find. Abrasions and missing parts are evident at various points of the vertebra, especially the odontoid process, the upper part of the spinous process, and the cotilooid cavity. Determination was effected on the morphology of the articular cranial surface, which shows the lateral expansions typical of this species (Stampfli, 1963). The measurements, according to the scheme of A. von den Driesch (1976), are: BFct (137.0), BPacd (93.7), SBV (89.5), LCDe (149.0). The specific determination within the two genera Bos/Bison was not possible in the case of four other finds, on account of their fragmented nature. These consisted of: a fragment of scapula about 15 cm long; a small fragment of tooth; a middle distal fragment of metapodial, with part of diaphysis badly broken and a portion of hemicondyle missing; and a left incisive bone with palatine process missing.

Cervus elaphus

Three skeletal elements of the deer were determined: a distal fragment of metacarpu; a fragment of metatarsal diaphysis; a whole third anterior phalanx with some abrasions, but on the whole in a good degree of preservation. The measurements of the third phalanx, according to the scheme of von den Driesch, are: DLS 52.4, Ld 49.9, MBS 16.4.

The three elements of uncertain attribution are two tooth fragments and a piece of scapula.
The small number of determined bone elements do not allow any faunistic comparisons or reliable palaeoeconomic observations to be made. Moreover, from a compositional analysis of the association with ungulates it is only possible to effect a valid environmental reconstruction if a statistically reliable amount of finds is available.

The coexistence of taxa connected with different habitats is a frequent feature in the macromammal fauna of Italian prehistoric deposits. The articulated morphology of the territory frequented by Paleolithic populations often provided an alternation of open and wooded areas, whose respective extensions and faunal distributions were influenced by the various climatic phases. The frequency variations in species along the stratigraphic series of the sites often make it possible to define climatic-environmental modifications.

In the site of Cupra Marittima the presence of the deer, linked to forest environments, was noted, accompanied by two species typical of open grassland – wooded grassland settings, i.e. the horse and aurochs. The Proboscidea found, probably *Elephas antiquus*, is frequent in Mediterranean Europe in temperate faunal associations of the Middle Pleistocene up to the initial phases of the Last Glacial, and is linked to both open areas and broad-leaved forests. Generally speaking, the small faunal group does not afford particular chronological indications, though it can be attributed to an interglacial or interstadal temperate phase.

**Lithic industry (M.P., M.S.).**

The lithic industry of Boccabianca groups three assemblages: the first one is composed of the artifacts recovered during digging out for private building or collected at surface and handed over by Paolo Marcocni to the Soprintendenza Archeologica per le Marche, while the second and third ones\(^4\) include the finds of the 1998-99 excavations. The second assemblage is small and groups artifacts of units 1bed, 2atop, 2a, 11, 14, 15, 17, 17a; the third one, those from units 3, 3A, 3Abed, 3Allcut, 3b, 3bIIcut, 3btop, 3bed, 12, 3/5, 5, 3/6, 6, 5top, 6bed. Except for one quartzite flake, flint was the sole exploited rock: the three above described varieties\(^5\) were supplied as pebbles or rounded blocks in correspondence with the main thalwegs.

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*\(^4\) For every assemblage pieces with module not lower than 40 mm have been counted.  
*\(^5\) Extension and intensity of patinae do not facilitate a more detailed determination, hence the Authors do not guarantee the reliability of such a classification.*
Lithic assemblage I

Previously reported by A. Mora and F. Vianello (1992), the bulk of artifacts collected from surface on the Boccabianca terrace has been increased with many bifaces and a few tools on flake found in digging out for private building. In their note, the authors describe 75 artifacts among which 3 bifaces and, in attributing the entire collection to the late Acheulean of Levallois technology, mention the unusual size of two of these bifaces. In reexamining the whole collection, we remark the dubiousness of this cultural attribution owing to the absence of Levallois blanks; on the contrary, it has been possible to verify that most of the finds fit well the pedo-sedimentary and archaeological contexts of the investigated site. Other artifacts, certainly more recent and with a different degree of preservation, have not been taken into account.

Bifaces are generally entire but, almost systematically, bear abraded or fragmented edges; all are partially covered by carbonatic concretions. Obtained from flint nodules, pebbles, sub-rounded blocks or platy cobbles of medium textured light-gray flint (type 1), these artifacts are generally triangular or micoquian type, sometimes cordiforme, while a sole specimen probably unfinished, is sub-rectangular. Their size varies from 85 to 198 mm length, 55 to 98 mm breadth, 43 to 65 mm thickness, with average values of 138 mm, 80 mm, 45 mm respectively.

The micoquian types (Fig. 11) have convex and natural base coincident with the thickest part of the tool, or oblique base drawn by a fracture plane. Manufacture is bilateral and usually approximative, sometimes with one edge more finished; the edge profile is concave or straight, while the section of the distal portion varies: semi-lozenge, asymmetric biconvex, plane-convex; the section at the proximal portion is plane-convex.

Triangular bifaces have a thick and natural base, from almost straight to convex, sinuous in only one case, sometimes thinned on one face (Fig. 12); generally, manufacture is bilateral and rough; at times, one edge is more finished with a simple scaled invasive retouch, mesial or distal; the profile is from straight to sinuous, the transverse section is plane-convex or biconvex in the distal portion, plane convex and at times asymmetric, biconvex or lozenge-like in the proximal one. One specimen was discarded during its manufacture.

The sub-rectangular biface has natural convex shaped base and greatest thickness in the mesial part. On the distal portion a simple scaled unifacial retouch is visible; the opposite face shows an attempt at thinning; profiles range from broken to straight; the distal transverse section is plane-convex, while the proximal one is squared.

In the rest of the assemblage we note two cores, three retouched
tools and several flakes. One core obtained on pebble bears a natural straight striking platform and a flaking face with three wide unidirectional scars; the angle depicted by these two surfaces measures around 70°. The second core, again on pebble and avoid of a prepared platform, has one flaking face showing two wide scars left by inclined bidirectional flakes. Among the chipping products the following types can be distinguished: thick and partially cortical flakes with asymmetric triangular section due to the presence of a manufactured back; uncortical flakes

Fig. 11. — Micoquian biface found at the surface of the terrace (2/3 nat. size; drawn by G. Pignocchi).
with inclined and flat butt, at times fitted with a manufactured back. Both these types of blanks have been used to shape denticulates and lateral or transverse scrapers; retouch is simple scaled, mostly total.

Lithic assemblage II

This assemblage comprises 15 artifacts: one biface and 14 flakes (Tab 3). The biface is of cordiforme type with natural base and has been manufactured on both faces (Fig. 13); the sides are biconvex with straight profile; the section is biconvex in the distal portion, and biconvex with maximum thickness in the proximal part; the right side bears mesial and distal simple scaled retouch, stepped at intervals; the left side has distal simple inverse retouch; l=158 mm, b=83 mm, t=44 mm.

Fig. 12. – Triangular biface found at the surface of the terrace (2/3 nat. size; drawn by G. Pignocchi).
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Fig. 12. – Triangular biface found at the surface of the terrace (2/3 nat. size; drawn by G. Pignocchi).
The flakes form a heterogeneous group which comprises cortical blanks and/or blanks provided with natural back opposed to a thin edge, Kombewa-type blanks, various by-products and undeterminable pieces. Among by-products, we note the presence of some flakes with natural or manufactured back. Butts are flat, natural flat, inclined.

Three specimens are retouched: one simple scraper on cortical flake, one undifferentiated flake with inverse retouch and one undeterminable fragment.

Lithic assemblage III

This assemblage groups one biface and few blanks derived from bifacial manufacture and from core flaking. The biface has triangular sha-

Fig. 13. – The biface found in unit 11 (2/3 nat. size, drawn by G. Almerigogna).
pe with slightly oblique natural base, corresponding to the greatest thickness (Fig. 14); it exhibits bifacial and bilateral manufacture, more approximative on the lower face where a portion of cortex is visible; straight edges on plan and profile, proximal and distal biconvex section; simple scaled retouch, direct on the right edge, inverse on the left one; \( l=164\text{mm}, b=130\text{mm}, t=59\text{mm} \).

The flaking products are 97 altogether (Tab. 3), 92 blanks, 4 cores and one platy cobble lightly manufactured. Among the blanks there are: cortical blanks, blanks with triangular section and natural or manufactured back, predetermined types, Kombewa-type flakes and various by-products. Among the undeterminable pieces we observed one deeply fissured raw cobble and one blank profoundly transformed by retouch.

Fig. 14. – Biface from unit 3 (2/3 nat. size, drawn by G. Pignocchi).
Tab. 3. – Composition per morpho-technical categories of lithic assemblages II and III. Specifications: B, cortex extension from 100% to ≥10%; C, cortical/manufactured back; F, striking platform preparation flake, undifferentiated fl., repairing fl., flaking accident (hinged and plunged fl., slice, etc.); G, blank profoundly transformed by retouch, fragment, shatter, resharping of retouched edge. Notes: * one with back; ** two with back.

<table>
<thead>
<tr>
<th>morpho-technical categories</th>
<th>II</th>
<th>III</th>
</tr>
</thead>
<tbody>
<tr>
<td>A – raw or lightly manufactured cobble</td>
<td></td>
<td>1</td>
</tr>
<tr>
<td>B – cortical flake</td>
<td>2*</td>
<td>12**</td>
</tr>
<tr>
<td>C – flake with back</td>
<td>1</td>
<td>9</td>
</tr>
<tr>
<td>D – end-product</td>
<td></td>
<td>8</td>
</tr>
<tr>
<td>E – Kombewa-type flake and similar goods</td>
<td>2</td>
<td>2*</td>
</tr>
<tr>
<td>F – by-product</td>
<td>4*</td>
<td>20**</td>
</tr>
<tr>
<td>G – undetermined</td>
<td>5</td>
<td>41</td>
</tr>
<tr>
<td>H – core and core/flake</td>
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<td></td>
</tr>
<tr>
<td>biface</td>
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<td>1</td>
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<tr>
<td>biface manufacture by-product</td>
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</tr>
<tr>
<td>total</td>
<td>15</td>
<td>101</td>
</tr>
</tbody>
</table>

Technological features

Lithic production was essentially organized through three reduction sequences: the first two processed blocks, nodules and variously sized pebbles, while the third one exploited large cortical flake-cores detached by large cobbles. Percussion technique was direct with hard hammer.

During the initial phase, the first sequence did not involve detachments aimed at pre-shaping the raw pebble: by removal of thick cortical flakes, a dihedron of 70°-75° between the natural flat prepared striking platform (Tab. 4) and the flaking surface was delinea-

Tab. 4. – Distribution of butt types among the morphotechnical categories in lithic assemblage III (C-cortical; Fn-natural flat; F-flat; F2-flat with two horizontal scars, D-dihedre, FF-faceted, P-punctiform).

<table>
<thead>
<tr>
<th>Cat.</th>
<th>C</th>
<th>Fn</th>
<th>F</th>
<th>F2</th>
<th>D</th>
<th>FF</th>
<th>P</th>
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</tr>
</thead>
<tbody>
<tr>
<td>B</td>
<td>7</td>
<td>1</td>
<td></td>
<td></td>
<td></td>
<td></td>
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<td>8</td>
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<tr>
<td>C</td>
<td>1</td>
<td>3</td>
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<td></td>
<td></td>
<td></td>
<td>5</td>
</tr>
<tr>
<td>D</td>
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<td>2</td>
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<td>2</td>
<td>3</td>
<td>3</td>
<td></td>
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</tr>
<tr>
<td>G</td>
<td>2</td>
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<td>4</td>
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<td>8</td>
<td>2</td>
<td>6</td>
<td>58</td>
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</table>
Recurrent production of flakes or short series of unidirectional flakes did not involve a compelling control of lateral convexities, because the detachment of flakes with thick back opposed to a thin edge drew an axial salience which facilitated the removal of a relatively flat flake with two thin opposed lateral edges. Generally, the single production series foresaw the detachment of three, maximum four predetermined/attempted flakes, two lateral, the rest axial.

The second reduction sequence involved an alternated exploitation between the core surfaces that in their turn assumed interchangeable roles (flaking surface and striking platform), but preserving the same angle. This operative scheme constituted the principal way of the production, within which the core assumed morpho-technical features closer to the discoid technology: extension of the dihedron, relatively accentuated core convexities, obliquely directed (with wide angle convergence) detachments of each single series. While lateral convexities were shaped through removal of edge-core flakes, it was possible to exploit the distal convexity by means of two shrewdnesses: A) using roughly axial saliences, depicted by the crossing of two or more unidirectional convergent scars and choosing an inner position of the impact point on the striking platform; B) inclined scars directed obliquely and against the direction of the predetermined detachment; C) exploiting inclined cortical surfaces (only in the initial phases of exploitation). Concerning choice of impact point, this usually falls within the striking platform or on the lateral convex zones of the scars left by the detachments occurring on the lower core face (Tab. 4). Removables were organized according to a centripetal recurrent modality, avoiding any apparent solution of continuity.

Therefore, flaking seems to be addressed to obtaining two main categories of blank:

- strong flakes, equipped with sometimes very thick cortical back opposed to a thin edge; the transverse section is triangular, the longitudinal profile of the thin edge is generally straight, the butt is thick, cortical or naturally flat.

- less strong flakes than above, with quadrangular or rectangular contour, occasionally triangular; transverse section is triangular symmetric, trapezoidal or polygonal, with longitudinal profile curved or sinuous; butt is thick and of different types.

The third reduction sequence is represented by two flake-cores (Fig. 15)

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6 Apart from the absence of significant cores in this lithic assemblage, some specimens of the first assemblage allow us to verify these morpho-technical criteria observed on the flaking products.
Fig. 15. — Lithic assemblage III: pebble with prepared striking platform (1), flake-core (2, 3) (1/2 nat. size, drawn by G. Almerigogna).
and flaking products: it involved exploitation of the ventral face of large cortical flakes obtained by processing the largest blocks or pebbles. Gestures were simple and limited to the removal of two-three Kombewa-type flakes, avoiding any preliminary shaping of the striking platform. The detachment, which occurred according to a sloped direction with respect to the secant plane between the two flake-core faces, allowed to obtain short strong blanks with thick butt and biconvex transverse sections; the longitudinal profile is straight and regularly extended to the whole perimeter.

Retouched tools

Among 93 flaking products of the III lithic assemblage, 30 (32.6%) were retouched (Tab. 5). The most appreciated blanks to be shaped were cortical flakes and, indifferently, the predetermined blanks described above, while the by-products were less processed; Kombewa-type flakes and similar goods are unretouched, presumably owing to the morphological features of their shaped and highly functional edges.

Tools are distributed among the main typological categories as follows: 4 flakes with marginal retouch, 16 scrapers, 7 among notches and denticulates, 3 undetermined. In their turn, scrapers comprise lateral types with direct, inverse or bifacial retouch, and bilateral or lateral-transverse types (Figs. 16, 17).

**Side scrapers:** obtained from cortical (sometimes strong and thick) flakes and from strong asymmetric flakes equipped with a back opposed to the retouched side, sometimes broken and recycled, these tools exhibit straight or broken edge and usually total simple marginal retouch, stepped only in a single piece. One specimen shows cortical back affected by abrasion or approximative retouches along the whole side.

**Bilateral scrapers:** apart from a single small piece obtained from an undeterminable blank profoundly transformed by retouch, these tools were shaped on cortical or predetermined blanks; sides are straight or

<table>
<thead>
<tr>
<th>type</th>
<th>B</th>
<th>C</th>
<th>D</th>
<th>F</th>
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<td>8</td>
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</tbody>
</table>
of large flakes, sidescraper, etc., and were scribed or flaked. Flakes and core fragments were among the blank material and were used in various ways. Figure 16 shows the distribution of the tools according to typology and function. The numbers indicate the total number of each type of tool.

Table: Distribution of Tools

<table>
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<tr>
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<td>Sidescraper</td>
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<td>Core</td>
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<td>Sidescraper</td>
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<tr>
<td>Core</td>
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</tr>
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<td>Flakes</td>
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<tr>
<td>Total</td>
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</tr>
</tbody>
</table>

Fig. 16.—Lithic assemblage III: side scrapers (3, 4), lateral-transverse scr. (1), bilateral scr. (2), scr. with bifacial retouch (5). Implements 1, 2 and 4 show macro use-wear. Key: 1-macro use-wear; 2-smoothing of the edge (2/3 nat. size, drawn by G. Almerigogna).
lightly convex and bear simple scaled retouch, not very invasive, partial or total and systematically dishomogenous on the two sides.

Lateral-transverse retouch: one single artifact on flake with manufactured back, short and hinged; it bears direct simple total retouch on the transverse side and partial bifacial retouch on the right side; retouch is always scarcely invasive.

Fig. 17. – Lithic assemblage III: side scrapers (2, 4-6), bilateral scr. (3), lateral-transverse scr. (1), transverse scr. (7), retouched flake (8). Implements 1, 5 and 7 show macro use-wear (2/3 nat. size, drawn by G. Almerigogna).
Scrapers with inverse retouch: the relatively high frequency of these tools justifies this separate treatment. Commonly obtained from complete or fragmented (and in this case recycled) asymmetric blanks with back, or indifferently from other types of blanks, these artifacts usually exhibit a single manufactured side, straight in almost all cases, concave in only one piece; another scraper has right side with mixed retouch; retouch is generally approximative, rarely very invasive, sometimes partial.

Bifacial scrapers: one single piece obtained on asymmetric flake with natural thick back; the retouch is simple lamellar, invasive and bifacial, and covers the distal portion, while the thicker proximal one was thinned by removing the bulb.

Notches: three pieces, each with marked differences (Fig. 8). The first one, on a thick cortical scale, bears one clactonian notch; the second one is on predetermined flake and has one retouched notch on the distal part of the left side; the third notch falls on a fragmented flake with a crest.

Denticulates: the four denticulates share a certain affinity in the morpho-technical features of the blanks used for their manufacture, namely thick cortical flakes sometimes with natural back (Fig. 10). We note two pieces with two profound clactonian notches on the side opposite the back (the first piece) or opposed to a thick edge (the second one); both show bulb thinning.

Undetermined: these are fragmentary artifacts, sometimes recycled, and one predetermined triangular flake whose edges are damaged by pseudoretouches.

Apart from the undetermined pieces, the two groups of tools, namely scrapers and marginally retouched flakes, notches and denticulates (fragmentary and recycled pieces considered), show differences in all the typometrical parameters (Tab. 6). Although both the groups share similar ranges in length values, notches and denticulates exhibit more limited ranges in width and thickness as well as overall greater dimensions especially for the thickness, the average of which is double that of scrapers and marginally retouched flakes.

| Tab. 6. – Lithic assemblage III. Typermertical data (in mm) for scrapers (nn. 9-28 Bordes’ list plus marginally retouched flakes (mr) and notches + denticulates. |
|---------------------------------|----------------|----------------|
| length                         | 9-28+mr         | 42+43          |
| (tot. 20)                      |                  | (tot. 5)       |
| average                        | 42,2            | 58,0           |
| min-max                         | 20-76           | 32-48          |
| breadth                        | 35,9            | 40,2           |
| average                        | 20-63           | 32-50          |
| min-max                         | 4-26            | 17-30          |
| thickness                      | 12,1            | 24,0           |
| average                        | 4-26            | 17-30          |
| min-max                         | 4-26            | 17-30          |

Functional analysis of the lithic industries can provide extremely detailed information regarding the employment of stone artifacts made by prehistoric humans (Anderson-Geraud, 1981; Gassin, 1996; van Gijn, 1990; Keeley, 1980; Moss, 1983; Odell, 1975; Shea, 1991; Tringham et alii, 1974). The quality and detail of the information obtained are directly connected with the degree of preservation of the lithic implements to be submitted to analysis. It is obvious that a lithic assemblage which has undergone sin- and post-depositional weathering, as indeed subsequent to its recovery, shall preserve intact a greater number of use-wear traces than one that has instead been damaged by various agents.

The low degree of preservation of the Boccabianca lithic industry has not permitted the detection, by metallographic microscope, of any polishes, striations, micro-edge rounding or micro-abrasions to make it possible to give a detailed interpretation of the materials processed and actions performed.

The functional study was carried out by analyzing macrotraces (edge-removals, macro-edge rounding, macro-abrasions) with a stereomicroscope (Shea, 1991; Longo, 1994; Lemorini, 2000; Broglio et alii, 1998). Diagnostic traces were detected on 11 (22%) of the 50 artifacts studied.

Results

On the 11 artifacts (8 scrapers, 1 notch, 1 fragmented piece of the III assemblage, and 1 scraper found in a reworked deposit) presenting macrotraces of use, 12 utilized areas were revealed (Figs. 16-18). These areas coincide with the portions of edge on which the macrotraces had developed.

Table 7 summarizes the data relative to the actions performed and the processed materials. As regards the former, a detailed evaluation was obtained; in the latter case, determination was less specific, owing to the fact that analysis of macro-use wear can afford only general indications as to the consistency of the worked material. There are three categories that can be distinguished: low resistant (animal tissues, vegetable fibres); resistant (soft wood, damp or dry skin, soft stone); highly resistant (bone,

<table>
<thead>
<tr>
<th></th>
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</tr>
<tr>
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<td>8</td>
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<td>2</td>
<td>12</td>
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</tbody>
</table>

Tab. 7. – Type of action performed and processed materials.
Owen, hard stone, compact wood, tooth, shell). In addition to these, we also used intermediate categories for cases when interpretation of the material in question was of uncertain attribution.

Briefly, the results indicate an employment of the tools for a limited range of actions and of materials. This functional specificity is due, at least in part, to the destruction caused by the patinas which greatly limit visibility of the macro-use wear to those most resistant to the postdepositional weathering. It is not possible to make any interpretation which go beyond those that can be inferred from a single artifact, on account of both the small number of specimens, and the lack of certainty due to its depositional context.

![Figure 18](image_url)

**Fig. 18.** Lithic assemblage III: denticulates (1, 3), notches (2, 4, 5). Implements 1, 5 and 7 show macro use-wear (2/3 nat. size, drawn by G. Almerigogna)
CONSIDERATIONS

The Boccabianca site presents a set of affinities of a taphonomic nature with numerous open-air sites of the Lower Paleolithic in Europe, the Near East and the African continent (for further bibliographic details see Nash and Petraglia, 1987), affected by hydrological disturbances at various scale. Nevertheless, the redeposition of archeological elements occurring over only short distances does not weak the chronological and palaeoenvironmental attribution of the site sustained by the geomorphological context, macromammal and malacological assemblages, as well as by the techno-typological features of the lithic assemblages.

The finds are contained within silty-sandy sediments which constitute the filling of a wide channel, the dynamics of which consist of small channels formation followed by depositions causing concave crossed-over stratification, likely as the result of seasonal events. It is more difficult to quantify the period of time represented by these sediments, but generally such sequences fit well events very close together (tens and/or hundreds of years). During the last termination (stage 2/1), the creation of a meandering system in the Marche area takes place parallel with the climatic amelioration, and is never recorded during stages 2 and 3 (Calderoni et al., 1991), suggesting a collocation of the deposits in question in stage 5, probably substage 5e, warmer and longer-lasting than the subsequent ones. The absence at the top of the Boccabianca terrace of fersiallitic soils, observed both upstream and on the older terraced units, suggests that deposition within the channel could be contemporaneous with pedogenesis in the more stable areas. Besides, this channel cuts the terraced gravelly deposits weathered by these soils, which throughout the Marche area have been ascribed to the final phase of the Middle Pleistocene (stage 6). At lower altitudes, furthermore, a coarse alluvial unit is present, probably deposited during the last cold phase. The sediments containing the lithic industry and paleontological finds of Boccabianca are therefore subsequent to stage 6 and previous to stage 4; however, it is not possible to establish which moment of stage 5 they belong to.

Lithic assemblage III, though providing new elements of evaluation for the Lower-Middle Paleolithic of the region, comes up against some difficulties in comparison with other industries, due both to the small number of these, and to the lack of appropriate technological analyses. From a morpho-technical point of view, the flaking products denote similarities in flaking angle and in the butt morphology with the blanks of the retouched tools (in this case considered together with corticales and uncorticales) of layer I of the Monte Conero site (Peretto,
nomic
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list-
logical
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A similar convergence from a typological and perhaps technological point of view seems to be evident in the industry of layers 20, 24, 30, 33, 40, 42 of the Valle Giumentina open-air site (Demangeot, Radmilli, 1966), where the fersiallitic soil affects the topmost part of the sequence, and hence should indicate its attribution to the final part of the Penultimate Glaciation (Coltorti, studies in progress). In the description of the industry, A.M. Radmilli (1965; Demangeot, Radmilli, 1966) reports the dominant features of the butts of the strong and sometimes asymmetrical triangular-section blanks which were mainly destined to the shaping of scrapers by scaled flaked retouching or of notches. Layer 37 also contains one biface which, according to the author, justified its attribution to the Late Acheulean (Radmilli, 1982).

Still more problematic is the comparison with the deposit of Le Svolte di Popoli, where the sequence containing the industries with bifaces is truncated (Demangeot, Radmilli, 1966; Radmilli, 1965; 1982). Layer 20 is particularly interesting, as it has provided pachyderm bones and lithic artifacts in primary and secondary setting, subdivided in four groups; two of these contain bifaces which are morphologically similar to those of Boccabianca.

From a technological point of view once again, assemblage III of Boccabianca instead differs markedly from the Levallois industries without bifaces of the Ager Cupreensis (AA.VV., 1996) and from those found on old terrace units of the II order of the Esino and Potenza rivers. At Erbarella the industry attributed to the Last Interglacial lay in the IIA$_2$ horizon of the fersiallitic soil mentioned above (Bisi et al., 1982). On the stable fluvial terrace of Erbarella it is likely that pedogenesis evolved during throughout stage 5, just stopped during the stadial phases (5d and 5b) and began again during the interstadial phases (5a and 5c), as also recognized in the oldest paleosols of the Po Basin by M.Cremaschi (1987). Moreover, we remark the absence of such a detailed subdivision of the stage 5 when the chronological attribution of the Erbarella site was propo-
sed. At Ponte di Crispiero the industry lays on a discordance which truncates the Interglacial soil (Coltorti et al., 1982; Chiesa et al., 1990), covered in turn by at least three paleosols characterized by an ever less marked leaching and by the progressive input of aeolian sediments. These paleosols may be attributed to substages 5c and 5a, while the truncation on which the artifacts lie – indicative of an important erosion following a degradation of the forest vegetation and the consequent slope instability – should correspond to stage 5d. A similar phenomenon, but less pronounced, appears to characterize stage 5b. If this subdivision is correct, the archaeological evidence of Ponte di Crispiero may belong to the beginning of the stage 5c. The loess burying the sequence is in fact older than 48 ky (Chiesa et al., 1990), and probably corresponds to isotopic stage 4, in analogy with the aeolian sedimentation on the Apennine Po border, as indicated by the dates of the Ghiardo site (Cremaschi, in press; Martini et al., in press).

The layer G of the Monte Conero site yielded a Levallois lithic assemblage (with a Levallois core interpreted as biface) which fits well with the industries of Ponte di Crispiero, Colonia Montani, Erbarella, La Quercia and Monte Gentile. At La Quercia, among the implements recovered at the surface of an old alluvial terrace, Vianello et al. (1988) describe one biface. At Monte Conero layer G is strongly leached but not so rubeified like layer I: it was placed in the glacial period at the end of the Middle Pleistocene age by C. Peretto (1990), basing its assumption essentially on the affinities shared with several sites in the Po Basin. In the opinion of one of us (M.C., study in progress) the paleosol of layer I shows strong similarities with those of the Last Interglacial, while layer G is more comparable with the sediments and the weathering degree observed at Ponte di Crispiero, Colonia Montani and in previously cited deposits (cfr. Ghiardo site).

Analogously with the flaking products, also the comparison between Boccabianca and the industries with bifaces seems to provide merely partial perspectives of evaluation. Emphasizing the fact that the biface of unit 3 was shaped on coarse textured flint, it has been noted that the bifaces found in layer I of Monte Conero (Bartolomei et al., 1966) were produced on a similar raw material but commonly affected by fissures and discontinuities which interfered a more elaborate manufacture. The finds of Monte Conero are generally subtriangular in shape; the base is constituted by cortex or fractures, sometimes truncated; they are usually thick to very thick, with rectilinear and sometimes undulating profile. In the cases where these tools are lesser thick more curated, they were made on better flint.

Lithic assemblage II of Boccabianca differs from this situation; indeed, in spite of the low number of finds, the high degree of elabora-
tion of the only biface - on type 1 flint - cannot be overlooked.

Leaving aside the precariousness of the archaeological record of the Boccabianca site, and the ascertainment that this type of condition is frequently shared by other open-air sites, the evidence emerging from the systematic investigations and discussed in this paper highlight how necessary it is, for the purposes of an evaluation on human behaviour, to have at one's disposal precise chronological references also for those industries which were previously settled in the last Interglacial in s.l., and whose existence concurs in defining, alongside Boccabianca itself, a variety of methods and technical objectives in the lithic production system. Finally, it has to be noted that Boccabianca represents one of the rare Italian evidence which can provide a useful contribution in depicting the upper chronological boundary of the Lower-Middle paleolithic technocomplexes with bifaces.

APPENDIX

FIELD UNIT DESCRIPTION (M.B.)

SECTORS 1 AND 4.

From top to bottom:

- Unit 1, made up of two plough horizons; the present-day 50 cm thick horizon, and that (90 cm deep from surface) originated by the plant of the vineyard during the 40's. The latter shows on the E-W sections lens shaped bodies, sloped with a 45° angle, constituted by the underlying sediment partially affected by the plowing. Lower linear boundary to:

- Unit 2, clayey soil, homogeneous, with marked vertic features; at the bottom an increase in granules and small flint flakes was observed. The unit has been divided in a uppermost portion (Unit 2top) and a basal one (Unit 2a):

- Unit 2top, CL, 2,5Y 5/4, lightly moist, moderately adhesive and plastic, no stones, moderately developed prismatic structure with large and very large large peds with weakly developed medium angular polyhedral subordinate structure; moderately reactive to HCl; common and very small carbonate nodules; few Fe-Mn nodules; continuous slickensides; scarce and thin voids; few and thin roots; few and isolated Fe-Mn cutans; few and dusty carbonate cutans. Lower erosional and abrupt boundary, subhorizontal, evidenced by silica surrounded granules and often by small flint flakes, to:

- Unit 2a, CL, 2,5Y 5/4, lightly moist, moderately adhesive and plastic, centimetric surrounded granules and angular blocks of silicatic rocks frequent in the upper part, moderately developed prismatic structure with large and very large large peds and subordinate weakly developed medium angular polyhedral structure; no reactive to HCl; small carbonate nodules; continuous and very evident slickensides. Lower abrupt and linear boundary to:
- Unit 3, formed by cuneiform lenses thickening eastward, with lower erosional boundary dipping E and SE. Quartzitic sand predominates in the texture. In the sample 4 two units have been distinguished: an upper one, 3a, and a lower one, 3b.
- Unit 3a is constituted of selected medium and fine sand, often organized in lenticular bodies not extended, some E-W directed, with a concave erosional lower boundary that affects in variable measure the underlying stratigraphy. Within them and usually grouped near the bottom, artifacts of various sizes have been recovered. 5Y 6/3-6/4 (sand); lens FLC, 2,5Y 5/3, with frequent isolated iron patches; 7,5YR 5/8, lightly moist, very small and rare subrounded and subangular silica granules, moderately developed subangular to angular medium and fine polyhedral structure; no reactive to HCl; frequent, thin and very thin voids; few Fe-Mn thin nodules; few and isolated Fe-Mn cutans, mostly upwards; organic cutans in the channels 10YR 4/3. Few millimetric pedo-relicts included in the sandy lenses are visible. Tiny (1-2 mm diameter) land-snail remains. Lower linear boundary to:
- Unit 3b, FS, 2,5Y 5/3, lightly moist, no stones, weakly developed large and very large prismatic structure, moderately developed angular and medium polyhedral structure; no reactive to HCl; frequent, thin and very thin tubular subhorizontal and vesicular voids; frequent subvertical carbonate concretions; common Fe-Mn cutans on the ped; few carbonate cutans; few organic cutans 7,5 YR 4/3. Lower linear or wavy boundary to:
- Unit 4, erosional surface cutting units 6 and 5, also affecting unit 6. Generally dipping E-SE, wavy, with isolated marked depressions, bounded by decimetric stepped slopes.
- Unit 5, very limited unit lying in the western side of the sector 1 (sect. 6) and dug up for the private building. Probably it represents the rest of a subhorizontal palaeosurface, successively truncated by unit 4. Concave-convex lens, FS, 2,5Y 5/4, lightly moist, no stones, strongly developed angular medium and fine polyhedral structure; no reactive to HCl; scarce thin voids; frequent carbonate concretions; common Fe-Mn cutans on the ped; slickensides; subspherical small (4-5 mm diameter) fecal pellets. Lower linear abrupt boundary to:
- Unit 6, this deposit has not been detected during the open excavation. It is constituted by a mixing of very large pedo-relicts, spread carbonate nodules, irregular lenses of variably textured sediment. The whole profile is affected by hydromorphic features, Fe-MN nodules and cutans. The base is characterized by bioturbation and carbonatic subvertical concretions.

SECTOR 2.

- Unit 10, CL, 2,5Y 5/3-5/4, lightly moist, moderately adhesive and plastic, rare tiny subangular flint fragments, moderately developed prismatic structure with large and very large peds and weakly developed medium angular polyhedral subordinate structure; moderately reactive to HCl; common small and very small carbonate nodules; scarce small Fe-Mn nodules; continuous slickensides; scarce and thin voids; few and thin roots; few and isolated Fe-Mn cutans; scarce and very small 2,5Y 5/6 patches. Lower weakly wavy gradual boundary to:
AN ACHEULEAN SITE OF THE LAST INTERGLACIAL AT BOCCHIANCA ...

SECTOR 3.

- Unit 11, CL, 2,5Y 4/3, lightly moist, moderately adhesive and plastic, no stones, moderately developed prismatic structure with large and very large pedes and weakly developed medium angular polyhedral subordinant structure; moderately reactive to HCl; abundant very small carbonate nodules; scarce small Fe-Mn nodules; continuous slickensides; scarce and thin voids; few and thin roots; scarce and isolated very small Fe-Mn cutans. Lower weakly wavy gradual boundary to:

- Unit 13, LC, 2,5Y 4/3, massive, lightly moist, moderately adhesive and plastic, very small and scarce subrounded granules and subangular flint blocks, moderately developed medium polyhedral structure; reactive to HCl; scarce Fe-Mn very small nodules. The base of this unit has been met only in sq. 252N/406E.

- Unit 14 sandy lens, carbonatic, underneath the plough horizon (unit 1). Lower strongly wavy abrupt boundary to:

- Unit 16, CL, 2,5Y 5/3, lightly moist, moderately adhesive and plastic, rare very small subangular flint fragments, moderately developed prismatic structure with large and very large pedes and weakly developed medium angular polyhedral subordinant structure; moderately reactive to HCl; scarce small Fe-Mn nodules; continuous slickensides; scarce and thin voids; few and thin roots; few and isolated very small Fe-Mn cutans. This unit comprises a basal level without concretions and an upper level with very abundant sferical carbonate nodules. Lower linear gradual boundary to:

- Unit 18, LC, 2,5Y 5/2, lightly moist, moderately adhesive and plastic, moderately developed prismatic structure with large and very large pedes and weakly developed medium angular polyhedral subordinant structure; moderately reactive to HCl; very abundant sferulitic carbonate nodules, scarce small Fe-Mn nodules; continuous slickensides; scarce and thin voids; few and thin roots; few and isolated very small Fe-Mn cutans. Lower lightly wavy gradual boundary to:

- Unit 17, LC, 2,5Y 4/3, lightly moist, moderately adhesive and plastic, moderately developed prismatic structure with large and very large pedes and weakly developed medium angular polyhedral subordinant structure; moderately reactive to HCl; common sferulitic carbonate nodules, scarce small Fe-Mn nodules; continuous slickensides; scarce and thin voids; few and thin roots; few and isolated very small Fe-Mn cutans. Lower lightly wavy gradual boundary to:

- Unit 15, CL, 2,5Y 4/3, lightly moist, moderately adhesive and plastic, rare tiny subangular flint fragments, moderately developed prismatic structure with large and very large pedes and weakly developed medium angular polyhedral subordinant structure; moderately reactive to HCl; common sferulitic carbonate nodules, scarce small Fe-Mn nodules; continuous slickensides; scarce and thin voids; few and thin roots; few and isolated very small Fe-Mn cutans. Lower lightly wavy gradual boundary to:

- Unit 19, CL, 2,5Y 4/3, lightly moist, moderately adhesive and plastic, moderately developed prismatic structure with large and very large pedes and weakly developed medium angular polyhedral subordinant structure; moderately reactive to HCl; common sferulitic carbonate nodules, scarce small Fe-Mn nodu-
les; continuous slickensides; scarce and thin voids; few and thin roots; few and isolated very small Fe-Mn cutans. Lower lightly wavy gradual boundary to:

- Unit 12, FS-FL, 2,5Y 4/3, lightly moist, no stones, moderately developed subangular poliedric structure with subordinate well developed prismatic structure; moderately reactive to HCl; common sferulitic carbonatic nodules, common tiny Fe-Mn cutans on the pedis; Fe-Mn nodules from frequent to abundant downwards; common to frequent Fe-Mn cutans, 7,5YR 5/6-5/7, downwards the profile.

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SUMMARY. — AN ACHÉULEAN SITE OF THE LAST INTERGLACIAL AT BOCCABIANCA (CUPRA MARITTIMA, MARCHE). — Settled on an alluvial terrace of the Menocchia Stream less than one km from the present-day coast, the Boccabianca site was investigated in the course of two excavations in 1998-99. These made it possible to recover lithic artifacts and faunal remains from a series made up of sandy-loamy units with scarce pebbles. The facies of these deposits and the finding upward sequence characterizing the stratigraphy of the terrace, suggest depositional dynamics in relatively calm waters which contrasts with the sedimentary dynamics reconstructed for the depositional phases correlated to the glacial periods. The attribution to the last Interglacial is supported by the position of Boccabianca in the terraced system of the Menocchia Torrent. The paleoenvironmental context is confirmed by the malacological and mammiferous associations (Elephas sp., Equus caballus, Bos primigenius and Cervus elaphus). Especially the former, is representative of mid-humid, more or less sparse wooded environments in temperate-warm and mid-humid climatic conditions. The lithic and faunal remains in unit 3 show a distribution pattern clearly connected to the geometry of this sedimentary body and to the morphology of the lower erosional boundary which suggest a hydrological redeposition from an originig stratigraphic context not detected by surveying.

The lithic industry is divided in three assemblages: a first one made up of reworked implements, and a second and third ones, the latter being larger, collecting the finds of units 2 and 3 and related. The second assemblage includes one subcordiform biface, manufactured with simple retouch, scaled at intervals, and a few flakes, sometimes retouched. The third assemblage groups one triangular biface and many flaking products, whose morpho-technological features suggest the production was addressed in creating fairly thick, strong blanks, sometimes found with a cortical back opposite a thin edge. About a third of these flaking products was used to obtain various retouched tools, among which prevalently lateral, bilateral and latero-transverse scrapers, also with scaled flaked retouch and several notches and denticulates, these latter presenting the greatest overall dimensions. A preliminary functional analysis of a lithic sample indicates a utilization of the retouched tools for a limited range of actions and materials worked, showing however the marked reduction of the use-wear interpretative power produced by postdepositional alterations. In spite of the small number of finds, the lithic assemblage II seems to differ from this situation, like highlighted by the higher degree of manufacture of the sole biface found.

The site of Boccabianca encounters some difficulties in a comparative study, due to the lack of recent technological analyses in other sites. The flaking products and retouched tools appear to denote some affinities with those of layer I of Monte Conero and the series of Valle Giumentina, while the bifaces are apparently more comparable with those of layer 20 of Le Svolte di Popoli than with those of Monte Conero, whose morphological features seem to be due to the poor quality of the local lithic materials. Nevertheless, Boccabianca represents one of the rare Italian evidence for improving knowledge about the human population during the Eemian.

RÉSUMÉ. — UN SITE ACHÉULÉEN DU DERNIER INTERGLACIAIRE À BOCCABIANCA (CUPRA MARITTIMA, MARCHE). — Situé sur une terrasse alluviale du torrent Menocchia, à moins d’un kilomètre de la côte actuelle, le site de Boccabianca a été étudié lors de deux campagnes de fouilles en 1998-99. Elles ont permis de repérer des outils lithiques et de la faune dans un ensemble stratigraphique composé d’une unité limoneuse-sableuse avec quelques galets. Le faciès de ces dépôts et la fining upward sequence qui caractérisait la stratigraphie de la terrasse, suggèrent une dynamique dépôsionnelle dans des eaux relativement tranquilles qui contrastent avec les dynamiques sédimentaires reconstruites pour les phases dépôsionnelles corréllées aux périodes glaciaires. L’attribution au dernier Interglaciaire est indiquée par la position de Boccabianca dans le système de terrasse du torrent Menocchia. Les associations malaco-logiques et à macromammifères (Elephas sp., Equus caballus, Bos primigenius et Cervus elaphus) donnent un cadre paléoenvironnemental cohérent et organique; en particulier la première, étant représentative d’un milieu boisé moyen-humide plus ou moins éclairci dans des conditions climatiques tempérées-chaudes et moyennes-humides particulières.

Le matériel lithique et osseux retrouvé dans l’unité inférieure, présente une distribution spatiale visiblement connectée à la géométrie du corps sédimentaire et à la limite inférieure érosive qui suggèrent une redéposition hydrique à partir
d’un contexte stratigraphique originel non intercepté pendant les prospections.

L’industrie lithique se compose d’un premier ensemble formé de matériel remanié, un second ensemble puis un troisième, ce dernier étant plus consistant, constitué respectivement de pièces de l’unité 3 et coréliées. Le second ensemble comprend un biface subcordiforme élaboré avec une retouche simple écaillée en partie scalariforme et quelques éclats hétérogènes parfois retouchés. Le troisième ensemble comprend un biface triangulaire et un groupe consistant de pièces sur éclat dont les caractéristiques morphotechniques suggèrent, comme objectif de la production, des supports relativement épais et robustes, dotés parfois d’un dos cortical opposé à un bord fonctionnel. Environ un tiers des produits de débitage fut utilisé pour la confection de divers outils retouchés parmi lesquels dominent des racloirs latéraux, bilatéraux et latéro-transversaux avec également des retouches écaillées scalariformes et plusieurs pièces à cran et denticulés. Ces derniers offrent les plus grandes dimensions complexes. Une analyse préliminaire des macro-traces d’utilisation sur un échantillon des produits pour la pluspart retouchés souligne un nombre limité d’actions et de matériaux travaillés, démontrant toutefois une forte réduction de l’enregistrement tracéologique produit par des altérations post-dépositionnelles. Par contre, le II ensemble lithique s’écarte de ce cadre, qui, malgré la rareté des pièces, a mis en évidence un degré élevé d’élaboration d’un unique biface.

Le site de Boccabianca rencontre quelques difficultés par rapport aux autres gisements, aussi bien par la rareté de l’industrie que par le manque d’analyses technologiques récentes. Les produits de débitage et les outils retouchés semblent dénoter quelques affinités avec ceux de la couche I de Monte Conero et du gisement de Valle Giumentina, alors que les bifaces ressemblent plus comparables à ceux de la couche 20 de Le Svolte di Popoli qu’à ceux de Monte Conero, leurs caractéristiques morphologiques semblant être imputables à la faible qualité des matières premières locales. En revanche, Boccabianca représente une rare évidence pour améliorer les connaissances sur le peuplement humain pendant l’Interglaciaire Eemien.

RIASSUNTO. — Un sito acheuleano dell’ultimo interglaciale a Boccabianca (Cupra Marittima, Marche). — Il sito di Boccabianca, ubicato su un terrazzo alluvionale del Torrente Menocchia a meno di un chilometro dalla costa attuale, è stato indagato mediante due campagne di scavo nel 1998-99 che hanno consentito di reperire manufatti litici e resti faunistici da un insieme stratigrafico composto di unità limoso-sabbiose con scarsi ciotoli. La facies di tali depositi e la fining upward sequence che caratterizza la stratigrafia del terazzamento suggeriscono una dinamica deposizionale in acque relativamente tranquille che contrasta con le dinamiche sedimentarie ricostruite per le fasi deposizionali correlate ai periodi glaciali. L’attribuzione all’ultimo Interglaziale viene indicata dalla posizione di Boccabianca nel sistema terrazzato del Torrente Menocchia. Le associazioni malacologiche e a macroinvertebrati (Elephas sp.,Equus caballus,Bos primigenius e Cervus elaphus) forniscono un quadro paleoambientale organico e coerente: in particolare la prima, rappresentativa di ambienti boscosi medio-umidi più o meno radi in condizioni climatiche temperate-calde e medio-umide.

I reperti litici e ossei rinvenuti nell’unità 3 e sull’interfaccia con l’unità sottostante mostrano una distribuzione spaziale paleamente connessa alla geometria del corpo sedimentario e alla morfologia del limite inferiore erosivo che suggerisce la loro rideposizione idrica a partire da un originario contesto stratigrafico, peraltro non intercettato dalle prospezioni.

L’industria litica si divide in un primo insieme formato da materiali rimaneggiati, in un secondo e in un terzo, quest’ultimo più consistente, formati rispettivamente dai reperti delle unità 2 e 3 e correlati. Il secondo insieme comprende un bifacciale subcordiforme, elaborato con ritocco semplice scagliato a tratti scalariforme e alcune schegge talora ritoccate. Il terzo insieme comprende un bifacciale triangolare e un consistente gruppo di manufatti su scheggia le cui caratteristiche morfotechniche suggeriscono come l’obiettivo della produzione fossero supporti relativamente spessi e robusti, dotati talora di un dorso corticale opposto a un margine sottile. Un terzo circa dei prodotti della scheggiatura è stato trasformato in vari strumenti ritoccati tra cui prevalgono raschiatoi laterali, bilaterali e latero-transversali anche a ritocco scalaire scalariforme e diversi incavi e denticolati. Questi ultimi presentano le maggiori dimensioni complessive. Un’analisi preliminare delle macro-trace d’uso su un campione di reperti prevalentemente ritoccati, indica un uso degli strumenti ritoccati per un limitato range di azioni e di materiali lavorati, dimostrando tuttavia la forte riduzione della registrazione tracceologica prodotta dalle alterazioni postdeposizionali. Da questo quadro si discosta invece
il II insieme litico che, malgrado la scarsità di reperti, evidenzia un elevato grado di elaborazione tecnica per l'unico bifacciale rinvenuto.

Il sito di Boccabianca incontra alcune difficoltà nel confronto con altri giacimenti, sia per la scarsità dell'industria che per la mancanza di analisi tecnologiche recenti. I prodotti della scheggiatura e con essi gli strumenti ritoccati, sembrano denotare qualche affinità con quelli dello strato I del Monte Conero e del giacimento di Valle Giumentina, mentre i bifacciali risultano apparentemente più confrontabili con quelli dello strato 20 di Le Svolte di Popoli che con quelli del Monte Conero, le cui caratteristiche morfologiche sembrano imputabili alla scarsa qualità dei materiali litici locali. Boccabianca rappresenta una delle rare evidenze italiane che consentono di approfondire le conoscenze sul popolamento umano della penisola durante l'Eemiano.