L'Homme de Néandertal, vol. 2, L'ENVIRONNEMENT, Liège, 1988, pp. 21 à 44

LARGE PALEOLITHIC MAMMALS OF LATIUM (CENTRAL ITALY): PALAEOECOLOGICAL AND BIOSTRATIGRAPHIC IMPLICATIONS *

by

Lucia CALOI **, Maria Rita PALOMBO **

RESUME

L'examen des faunes de mammifères du Pléistocène moyen et supérieur du Latium a été effectué dans le but de fournir un encadrement paléoécologique et paléoenvironnemental, d'évaluer l'étendue de l'influence humaine et ses variations dans le temps, de fixer les différents complexes fauniques selon une suite chronologique la plus précise possible. Les données relatives au commencement du Paléolithique inférieur sont assez pauvres et, par conséquent, il est difficile d'établir une corrélation entre les faunes et les industries. Les industries les plus archaïques du Latium viennent des gisements du Pléistocène moyen inférieur, période pendant laquelle dans le Latium il y avait des associations caractérisées par de nouvelles espèces d'origine orientale avec très peu de carnivores archaïques. Les faunes associées aux industries acheuléennes sont mieux documentées. Deux complexes fauniques peuvent être reconnus: dans l'un les associations sont caractérisées par la présence des espèces du Pléistocène moyen et de quelques éléments nouveaux, dans l'autre les faunes ont un caractère évolué, mais il n'y a pas encore le daim moderne. Dans les associations un peu plus récentes du Pléistocène moyen supérieur final, le daim est, par contre, très abondant. Ces faunes sont associées aux industries moustériennes rissiennes. Les faunes associées aux industries acheuléennes sont caractérisées par une relative abondance d'éléphants antiques et de bovidés; dans les faunes du complexe plus récent, au contraire, les cervidés semblent être un peu plus abondants. Les complexes fauniques sans industrie, mais d'âge comparable, confirment les indications fournies sur la situation du paléoenvironnement et du paléoclimat, bien que l'abondance relative des espèces puisse être différente. Les faunes qui devaient accompagner l'homme de Néandertal semblent être caractérisées, pour la plupart, par une moindre abondance de gros mammifères. Il est évident que la chasse était orientée vers les animaux de taille moyenne, qui sont les plus fréquents dans les différents gisements. Au cours de la dernière période glaciaire, les pachydermes sont très rares ou absents, bien que la chasse semble être orientée vers la plupart des animaux qui caractérisaient un certain contexte de l'environnement, du moment que les différentes oscillations climatiques produisent quelques variations dans la composition des faunes. Au passage du Paléolithique moyen au Paléolithique supérieur, il n'y a pas de très sensibles variations dans les associations fauniques et la chasse semble être toujours orientée vers les mammifères de taille moyenne.

* M.R. Palombo has analysed the Lower Paleolithic faunas, L. Caloi the Middle and Upper ones.

** Dipartimento di Scienze della Terra, Università "La Sapienza", Roma, Italie.

SUMMARY

A comparative analysis is conducted between Latium mammalofaunas associated with Palaeolithic industries and those from contemporary deposits without evidence of human activity. The analysis should supply a palaeoecological and palaeoenvironmental framework for each cultural phase, in an attempt to evaluating human influence and its possible variations over time and/or in relation to geographical position. Besides, the comparative analysis of faunas is conducted in order to fit the various deposits within a chronological sequence, taking into account the evolutionary level of species from various faunistic complexes, changes of associations and sequence of species upon changes of climatic and environmental conditions, also in relation to evolution in lithic industry typology.

Mots-Clés : Mammalia, Pléistocène, Latium, Paléoenvironnement, Biostratigraphie.
Key-Words : Mammalia, Pleistocene, Latium, Palaeoenvironments, Biostratigraphy.

LOWER PALEOLITHIC

The earliest evidence of the human presence in Latium is documented in the Liri and Sacco valleys. In particular, in the Anagni basin, uni- and bifacial choppers of various typology, associated with few remains of *Pachycrocuta brevirostris* (Aymard), have been found in the higher levels of the travertine and calcareous mud complex (SEGRE, 1982a; SEGRE, 1982b). Chronologically, this complex was deposited before the beginning of the activity of the Alban Hills volcanic complex, generally estimated at about 700,000 yr.. B.P., and anyhow not more recent than 500,000 yr.. B.P. (BIDDITTU and SEGRE, 1982; BIDDITTU and SEGRE, 1984; BERNARDI *et alii,* 1982). The cultural facies of these archaic industries is present also in the basins of Arce and Fontana Liri (BIDDITTU, 1972), as well as in the basin of Pofi-Ceprano where, at Castro de' Volsci (BIDDITTU, 1974), the most highly evolved phase of this cultural period seems to be documented, as shown both by industry typology and by the presence of volcanic products in the levels from which the tools are supposed to derive. Unfortunately, both in the case of Arce and Fontana Liri, and of Castro de' Volsci, the lithic tools have been collected mostly from the surface, and no faunistic remains are known. This fact makes it difficult to fit the remains within the chronostratigraphic setting and does not allow to reconstruct the palaeoenvironment of these first inhabitants of Latium. The tools found at Valchetta Cartoni (Rome) (BLANC, 1935-37), at the base of a tuffite deposited before the emission of "tufo rosso a scorie nere" from the Sabatini Mountains, the chopping tool found on Via Cortina d'Ampezzo (Rome), together with few animal remains (*Sus* sp., Bovidae; DURANTE, 1973) and the chopper and flake industry from Montauto (Viterbo; COCCHI, CECCANTI and FIORINI, 1980) belong to the same facies. Therefore, the cultural facies of the archaic industries appeared in the early lower Middle Pleistocene and developed during most of this period.

The data relative to the mammalian faunas belonging to the early lower Middle Pleistocene of Latium are not very abundant; they refer almost exclusively to the local fauna from Ponte Galeria (CALOI *et alii,* 1986; CALOI and PALOMBO, in press a). These remains mostly come from the current bedding gravels of the Ponte Galeria Formation, which are related to the expansion of the Tiber palaeodelta (CONATO *et alii,* 1980); they come also from the river gravel deposits related to the above-mentioned gravels in the hinterland ("Maremmano" Auct.) (CALOI and PALOMBO, in press a; MALATESTA and ZARLENGA, 1986). Sporadicity of the findings and relative scarcity of the remains do not allow to consider the faunistic picture as complete. In any case, it may be noticed that, on the basis of the forms recognized until now, the association appears renewed; a large number of immigrants from Asia is found among the large mammals, and the archaic faunas of

Villafranchian tradition are almost absent. Among the Proboscidea both the elephants of the "palaeoloxodontine" line *Elephas (Palaeoloxodon) antiquus* Falconer and Cautley, and those of the subgenus *Mammuthus* line, *Mammuthus (Mammuthus) armeniacus* (Falconer), more related to open environments, appear with faunas still little evolved, while the representatives of the subgenus *Archidiskodon* have disappeared. Among bovids, both *Bos primigenius* Bojanus and *Bison* are present. The megacerines *Megaceros verticornis* (Dawkins), *Megaceros savini* (Dawkins) and *Megaceros solilhacus* (Robert) are the most common species, so that cervids, among which one finds Cervus *elaphus acoronatus* Beninde and small-sized fallow-deer forms, are the most represented group. Hippos are present with both the Pleistocene forms of continental Europe. A primitive form of *Dicerorhinus hemitoechus* Falconer is reported as present, while, for the time being, equids (*Equus* cfr. *altidens* and *Equus caballus* Linnaeus) and carnivores are generally little known. In this connection, it is important to observe that archaic forms such as *Pachycrocuta perrieri* Croizet and Jobert are still present, together with others forms of modern type such as *Meles meles* Linnaeus (CALOI and PALOMBO, in press b) in more advanced phases of the lower Middle Pleistocene, in a period perhaps related to the Mindel glaciation of the Alpine chronology. In terms of overall characters and evolutionary degree of the various forms, the local fauna of Ponte Galeria may be referred to the third phase of late-post-Villafranchian faunistic renewal (DE GIULI *et alii*, 1983; CALOI and PALOMBO, in press a). Palaeoecological indications justify reference of this faunistic complex to a mild phase (stage 21? of the oceanic isotopic scale; SHACKLETON and OPDYKE, 1976) (? Günz cataglacial and/or Günz-Mindel interglacial *p.p.* according to the Alpine chronology; CALOI and PALOMBO, in press a). Such conclusion is supported by the presence of an association rich in fresh-water and terrestrial molluscs of a mild character in the clayey levels locally interbedded in the gravels (CONATO *et alii*, 1980; MALATESTA and ZARLENGA, in press). As is well known (CONATO *et alii*, 1980), evidence of dry and cold climatic conditions (stage 22) is found at the formation base, while the top, that ends with the first volcanic products of the Alban Hills complex [706,000 ± 70,000 yr.. B.P. according to EVERDEN and CURTIS, 1965; 680,000 ± 70,000, according to GASPARINI and ADAMS, 1969; and anyhow earlier than 530,000 yr.. B.P. (BERNARDI *et alii*, 1982)], is affected by an important erosive phase (Flaminian; AMBROSETTI *et alii*, 1972). This phenomenon was probably caused, beside local tectonic factors, also by negative glacioeustatic oscillations of the sea level, oscillations which may be related to a cold phase (stages ?20-16, ?Mindel anaglacial and/or Mindel *p.p.* of the Alpine chronology; CALOI and PALOMBO, in press a). On the basis of the species recognized until now and their relative frequencies, a rather varied landscape may be envisaged for the part of the Campagna Romana considered here. The woods prevailed, with clearings and water surfaces at the border of flat areas either steppe-like or grassland. Close to the coast, lagoons and pools were already rather common. The climate changed from being cooler and drier than the present one to mild with tendency to mist. In the zone SE of Rome, the area corresponding to the Sacco and Liri valleys was likely to be occupied by a series of lakes among the mountains in the process of filling up and becoming swampy; this phenomenon was also related to the piling up the first pyroclastic products by the Vulcano Laziale and by the Ernici. Those basins will be later affected by widespread erosion. So the palaeoenvironmental conditions were not substantially different from those in the western sector of Latium; the woods were mainly composed of conifers (Vallemagna flora, Anagni basin; BIDDITTU, SEGRE and SEGRE NALDINI, 1984); the mammalian fauna consisted roughly of the same forms. Nevertheless it is not possible to specify which were present in inland Latium during the basal Middle Pleistocene, and this because of the lack of levels with associated fauna and industry; similarly, it is not possible to clarify whether the human presence extended already towards the coast. The situation is different in the case of the layers at Fontana Ranuccio (Anagni basin; BIDDITTU *et alii*, 1979), where an abundant fauna associated with the oldest evidence of Acheulean lithic industry in Latium was found. In the mammalofauna, modern characters are more evident: equids (*Equus*

caballus ssp.) are already of clear caballine character; *Elephas antiquus* is represented by fairly typical morphotypes (PALOMBO, 1986); the modern deer with crown and new forms such as *Ursus arctos* Linnaeus (AZZAROLI, 1983), *Cuon* cfr. *alpinus* Pallas and *Cervus (Dama) clactonianus* Falconer (CASSOLI and SEGRE NALDINI, 1984) appear, beside species already known from the basal Middle Pleistocene (megacerines of the *M. verticornis* group, *Bos primigenius, Bison, Sus scrofa* Linnaeus, *Hippopotamus*). Elephants, bovids and cervids are the most common forms; the bone industry (BIDDITTU and SEGRE, 1982b) is to be related to these species. So it appears evident that the human groups from Anagni hunted prevalently the elephants and aurochs herds, forms which must have been particularly common in the hunting territory. The fauna of the anthropic horizon at Fontana Ranuccio (to which also the association from Cava Pompi (Pofi) (BIDDITTU and SEGRE, 1982a; BIDDITTU, SEGRE and SEGRE NALDINI, 1984) is to be related) suggests on the whole a mild, not dry climate (presence of *Hippopotamus* and *Macaca*) and a landscape with not too extended woods with water surfaces and rivers. The avifauna includes in part water forms typical of a mild climate (BIDDITTU *et alii,* 1979). The presence of *Castor fiber* Linnaeus and *Cuon* cfr. *alpinus* is not entirely consistent with this picture, even if these forms are present also under not harsh climatic conditions. On the basis of the dating of the anthropic level (458,000 ± 5,700 yr.. B.P.; BIDDITTU *et alii,* 1979), the association of Fontana Ranuccio should be related to a period of cold climate (stage 12); nevertheless, the contemporary presence of the hippo, the fallow-deer and *Macaca*, the kind of avifauna, the presence of woods of hot Mediterranean character in the gray "cinerite" of the underlying level (estimated age about 487,000 yr.. B.P.; BIDDITTU *et alii,* 1979) favour the hypothesis of a relation with mild climatic phases (stages 11 or 13; CALOI and PALOMBO, in press a).

The faunistic and palaeoenvironmental situation in north-western Latium is not very well known. The level with fauna and industry of Fontana Ranuccio might be tentatively related (MALATESTA and ZARLENGA, in press) to those belonging to the sedimentary cycle of the San Cosimato Formation (CONATO *et alii,* 1980); from a chronological point of view, the latter levels may be ascribed to the time of the emission of the "tufi stratificati varicolori" of Sacrofano (estimated age about 500,000 yr.. B.P.; MALATESTA and ZARLENGA, in press), of the ignimbritic lavaflow of "tufi rossi a scorie nere" from the Sabatini (dated at about 430,000 yr.. B.P.; EVERDEN and CURTIS, 1965) and of the "tufo lionato" belonging to "tufi inferiori albani" (dated about 360,000 yr.. B.P.; BERNARDI *et alii,* 1982; BIDDITTU *et alii,* 1979). The fauna is little known (*Ursus* sp., beaver, rhino of the genus *Dicerorhinus,* cervids, bovids); paleontological findings in the lower and middle levels indicated a typically lacustrine, continental environment; the presence of *Emys orbicularis* in the brackish upper level suggests rather mild climatic conditions. It is to be noticed that the stratigraphic data apparently suggest a relation among the levels of the S.Cosimato formation and those of the urban area from which the few remains of the lithic industry of Valchetta Cartoni (MALATESTA and ZARLENGA, in press) derive; anyway, the characters of the latter are more archaic than those of the lithic industry from Fontana Ranuccio. The layers of the S. Cosimato cycle might have been deposited in a temperate phase, characterized by more or less marked negative oscillations (stage 13?), perhaps preceding the deposition of levels with fauna at Fontana Ranuccio (cfr. CALOI and PALOMBO, in press a). It is also difficult to establish the relations among the levels of the S. Cosimato formation and those already referred to the Pariolian (AMBROSETTI *et alii,* 1972). In these levels many vertebrate remains were found, among which *Elephas antiquus* with characters on the whole little evolved with respect to the morphotypes present at Fontana Ranuccio (PALOMBO, 1986). The data available so far suggest a reference – at beast for some of them – to a time preceding the deposition of the S. Cosimato formation levels (stage 15?; CALOI and PALOMBO, in press a). On the other hand, the faunas and the industries from the levels, deposited between the two Flaminian and Nomentanan erosive phases, are little known in the whole Latium area; the two phases

are commonly related to the Mindel and Riss I of the Alpine glaciations. In fact, all of the industries and the faunas better represented appear later than the erosive Nomentanan phase, and are conventionally related to the various periods of the Riss glaciation of the Alpine chronology. In the western Latium area, the mammalian faunas of this period come mostly from the levels of the Aurelian formation (MALATESTA, 1978; CONATO *et alii,* 1980) or from levels which may be related to it; in many cases they are found together with lithic industries of the upper Acheulean. The industries are considered by PIPERNO (1984) as representative of a particular facies, defined as "Torre in Pietra", from the name of the most well-known deposit. On the whole, the mammalian associations show evolved characters, which evidence the progressive development of a fauna of modern type. In general the characteristic elements are caballine equids of large size, comparable to the morphotypes of *Equus caballus piveteaui* David and Prat, large size *Bos primigenius, Cervus (Dama) clactonianus* and one deer perhaps related to a local form (*Cervus elaphus rianensis* Leonardi and Petronio; LEONARDI and PETRONIO, 1974); *Elephas antiquus* is present with relatively evolved forms and slightly polymorphous populations. Mammalian faunas of the various deposits with industries related to the Torre in Pietra cultural facies show differential elements and composition variations, even if with a basic uniformity; it is difficult to judge which of the discrepant elements are due simply to chance, to slight time difference, to local climatic and/or microclimatic factors, or else to human action. In the area W of Rome, at Torre in Pietra (lower levels, CALOI and PALOMBO, 1978; PIPERNO and BIDDITTU, 1978), a fauna-industry association appears as accidental; at Cava Rinaldi (Via Portuense, Rome; AMBROSETTI, 1965) and at Castel di Guido, km. 19 on the Via Aurelia (CAPASSO BARBATO and PETRONIO, 1983), tools are found. At Castel di Guido, km. 20 on the Via Aurelia (PITTI and RADMILLI, 1984 and preceding papers) the industry and part of the fauna come from a settlement. A fauna-industry association at Malagrotta is less certain (CALOI and PALOMBO, 1980; CASSOLI *et alii*, 1982). At Malagrotta, as well as at Castel di Guido, the two dominant species are the elephant and the auroch; the horse is rare; cervids are scarce, the wild board and the rhino are sporadic. It is interesting to point out that these forms, even if present at Castel di Guido, km. 20, are absent in the area where human presence is proved. Therefore it seems that, in western Latium and in this period, human groups preferentially hunted the auroch and the elephant. This fact is partially confirmed by the recent discovery in this area of a rich paleosol, where the elephant and the auroch are clearly the most abundant forms (ANZIDEI, personal communication). The presence of the horse in the area inhabited by men at Castel di Guido, together with the lack of cervid remains of medium-small size, suggests that the horse was preferred, perhaps because it was more abundant. If these data are compared to those related to the fauna from the lower Torre in Pietra levels, it may be observed that in these layers roughly the same species already mentioned with regard to Malagrotta and/or Castel di Guido are found (even if carnivores appear on the whole more common and *Megaceros giganteus* Blumembach appears). On the contrary, the most common species are equids. This occurrence shows that there is no strong difference between faunistic associations produced by chance and associations affected by human action from the standpoint of the constituent species; human influence may bias the relative frequency (obviously accidental associations are generally richer in species, especially in carnivores and small mammals). An exception may be represented by the fauna, more or less of the same period as the previously mentioned ones, from the lacustrine basin of Riano (Rome; CALOI, PALOMBO and PETRONIO, 1980a). With regard to large mammals, the association is oligo-specific and is composed of only four species which, anyway, are present with a large amount of remains: *Elephas antiquus, Cervus elaphus rianensis, Cervus clactonianus* and *Dicerorhinus* sp. (cfr. *hemitoechus*). On the contrary, the small number of species present in the levels of the Aurelian formation at Vitinia (Rome; CALOI *et alii,* 1983) is to be attributed to the scarcity of fossil remains. A similar conclusion may apply in part to the mammalian fauna of Cava Rinaldi, Ponte Galeria (Rome; AMBROSETTI, 1965); here, anyway, deers, elephants, aurochs, beside one bear and one beaver, have been found.The

analysis of the relative composition of the mammalian faunas belonging to the Aurelian formation examined up to now suggests to relate them, on the whole, to a latest phase of stage 10 and to the temperate and long lasting stage 9. The fauna from Torre in Pietra suggests on the whole mild climatic conditions with tendency to cold: presence of *Anas platyrhynchos* Linnaeus, *Anas acuta* Linnaeus, *Aytya nyroca* (Güldenstädt) (CASSOLI, 1978) in the avifauna, relative abundance of the horse and lack of the deer and the hippo in the mammalofauna. Also for the deposit of Riano, indications of mild climate with tendency to cooling are available (CALOI and PALOMBO, in press a). The data pertinent to Malagrotta and Castel di Guido would suggest, on the whole, temperate conditions. Slight variations in the environment were likely to be present as a consequence of the different geographic position of the various basins. In the innermost area (Riano), the landscape was dominated by deciduous woods and lacustrine basins with clear and relatively deep waters; towards the coast, the landscape was characterized by the presence of coastal lagoons, marshy areas, and more or less stagnant basins. The climatic improvement favoured the diffusion of woods composed mainly of oceanic forests of mild type, always intermixed with large clearings; so, the grasslands were reduced in size, while they had characterized the paleoenvironment at Torre in Pietra. The following climatic deterioration, related to the first signs of stage 8, will give rise to an opposite situation: diffusion of grasslands, reduction of the land covered by woods, in which conifers prevailed, especially in the innermost and/or highest areas. In southern Latium, industries related to the Acheulean technique are often found in the middle Sacco Valley. These industries make a relatively homogeneous whole ("facies at Pontecorvo"; PIPERNO, 1984) which, however, differs (because of some peculiarities) from the Acheulean facies with roughly the same age in Western Latium. According to some authors (PIPERNO, 1984), this fact may be due to a regional differentiation in late-Acheulean populations of Latium. According to some authors (BIDDITTU and SEGRE, 1982), we are facing a real time difference, even if not very important; so these industries should be attributed to phases later than that relative to the facies of Torre in Piertra and related industries. In this case, it is difficult to define the chronologic relations between the deposits containing the Pontecorvo facies and those which, in western Latium, are characterized by the presence of the Rissian Mousterian. The chronostratigraphic definition of the Pontecorvo facies industries is not always easy; besides, at the moment, it is not possible to clarify the relations (if any) between the series of the Liri basin and those pertinent to the sedimentary cycles identified in the Campagna Romana. In the middle Sacco Valley, the stratigraphic situation is noticeably complicated by lateral variations of the facies and authors do not agree on their interpretations (cfr. DEVOTO, 1965; SEGRE and BIDDITTU, 1981; SEGRE, BIDDITTU and PIPERNO, 1982; SEGRE, 1984a; SEGRE, 1984b; CALOI and PALOMBO, in press a). The horizons with Acheulean industries and faunas are in general located in levels of the fluvial-lacustrine complex which forms the higher part of the series chronologically related to the upper Middle Pleistocene. The fauna from the various deposits – Pontecorvo (BIDDITTU and CASSOLI, 1968), Aquino (BIDDITTU and CASSOLI, 1968; FLORES, 1895), Lademagne (SEGRE, 1984b), Pignataro Interamna (DE LORENZO and D'ERASMO, 1932; D'ERASMO, 1949; D'ERASMO, 1950; D'ERASMO and MONCHARMONT ZEI, 1955), Pulviano (DE LORENZO and D'ERASMO, 1927), etc. – is rather uniform and the most common species are *Elephas antiquus*, the rhino (*Dicerorhinus* sp.), the horse, the deer and the auroch. The mammalian fauna by itself is not very significant for a reconstruction of the paleoenvironment, also because of the lack of data on the actual frequency of the various species. In any case it may be noticed that the levels with industry and fauna should be located between two periods of mild-cold climate, as witnessed by the malacofauna in the travertines of Aquino, and by the ostracods and molluscs of the final paleolacustrine phase (DEVOTO, 1965; SEGRE, 1984 a, b); SETTEPASSI and VERDEL, 1965). Furthermore, in the two sites of Ceprano-Colle Avarone (BIDDITTU and SEGRE, 1982a; BIDDITTU and SEGRE, 1984b) and of Pontecorvo (BIDDITTU and CASSOLI, 1968; BIDDITTU and SEGRE, 1982a), birds are present which indicate harsh climatic conditions (*Stercorarius*

longicaudus Vieillot and *Anser brachyrhynchos* Baillon at Ceprano, *Anser erythropus* Linnaeus at Pontecorvo); these conditions are confirmed by the presence of *Cuon* in the former deposit. Therefore it would be justified to relate this faunistic complex to a relatively cold-temperate phase, which might be referred to the cooler oscillation of the warm-temperate stage 9 (given the more evolved technological level of the facies of Pontecorvo with respect to Torre in Pietra one). This hypothesis apparently contradicts the presence of the hippo in the fauna of Pignataro Interamna, but it is difficult to establish how the slight differences between the associations in the various deposits are affected by factors such as slight time differences or different geographic position. The data at our disposal at present are not sufficient to clarify chronostratigraphy of southern Latium deposits, or to establish a clear relation with those in the coastal areas. In fact, in western Latium, a new cultural tendency shows up, recognizable in the Rissian Mousterian industry, at a time that may be related to an advanced phase of stage 9. The transition from the Lower Paleolithic industries to those belonging to the Middle Paleolithic *sensu lato* might be placed within this period.

MIDDLE PALEOLITHIC

During the upper Middle Pleistocene of Latium, layers are found which are characterized by industries, based mainly on flakes of Mousterian typology, without bifacials. These lithic complexes, defined "Protopontinian" by TASCHINI (1967), are typically represented in the remains from the fluvial and lacustrine deposits of Sedia del Diavolo and Monte delle Gioie. A mammalofauna was found together with these industries, just slightly reworked; its features are rather similar each others and is characterized by the prevalence of the modern fallow-deer over the deer and by the presence of the elephant, the hippo, the auroch, *D. hemitoechus*, the horse and *E. hydruntinus*. The faunal complex, even if not very rich in species, suggests on the whole a mild climate, with a landscape in which woods alternated with more or less wide clearings and rivers. Anyway the filling of the fluvial-lacustrine basin of Sedia del Diavolo and Monte delle Gioie appears to have happened in a period in which the climate changed from mild to cold conditions. In fact, both these deposits show evidence of a certain climatic worsening just after the deposition of the layers with industry: presence of travertine levels with only deer and horse at Sedia del Diavolo, and avifauna of boreal type (*Cygnus bewickii* Yarrell, *Cignus olor* Gmelin, *Branta leucopsis* Bechstein; BLANC, 1955) at Monte delle Gioie. These levels may be tentatively related to the latest phase of stage 9 and to earlier signs of the climatic worsening of stage 8. According to SEGRE (1984a), the lithic industries from Monte delle Gioie are to be related with the ana-Riss III of the Alpine chronology, whereas those of Sedia del Diavolo may be referred to the Riss II-III interstadial. Nevertheless similarity of faunas and industries suggests that the chronologic gap between the two associations is not recognizable from a biostratigraphic point of view. Finally, it is interesting to stress the abundance of the remains of *Cervus (Dama) dama* Linnaeus at Sedia del Diavolo; the fallow-deer seems to spread now for the first time in Italy, which is second only to *Bos primigenius*, while *Elephas antiquus* is less represented. The frequency of the fallow-deer would almost suggest the association to belong to an interglacial phase rather than to an interstadial one, but this hypothesis is not corroborated by the stratigraphical context. It is therefore reasonable to envisage a preferential human hunting of the auroch and the fallow-deer; in this way, the characteristic feature of the association, that is the dominance of the fallow-deer, would result in some way from human action. Remains ascribed to *"Elephas primigenius"* and a lithic industry similar to that of Monte delle Gioie come from Borgo Montello and, more precisely, from the fluvial-torrential complex layers (in which the cold species *Unio sinuatus* is present, related to the Riss III of Monte delle Gioie; SEGRE, 1984a). Therefore, the appearance of relatively evolved forms of mammoth must have occurred in advanced phases of the next-to-the last glaciation.Besides, it is important to

notice that the dominant form in the fauna from Casal de' Pazzi (ANZIDEI, 1984, but still under study) is again *Elephas antiquus*, while the fallow-deer is little represented. This fauna derives from a level of fluvial gravels which lies over the eroded surface of the "tufo litoide" and, therefore, may be related with the fluvial – lacustrine upper level of the Sedia del Diavolo outcrop, as shown also by the typology of the lithic industry (ANZIDEI *et alii,* 1984; PIPERNO, 1984; SEGRE, 1984a). In any case, it is difficult at the present time to decide whether this faunistic association may be considered as representative of the real composition of the local fauna, or whether human selection has altered it. In the latter case, one would have to assume that human groups, close in time, made different choices while moving in neighbouring areas. Only the acquisition of new data and the finding of paleosols with human presence will help to clarify the problem. Also the chronostratigaphic setting of the Fara Sabina faunistic association (ANGELELLI, 1983) is fairly uncertain; nevertheless, the presence of the fallow-deer and *Equus hydruntinus*, like at Sedia del Diavolo, justifies its reference to the same time interval. During the interglacial period related with to stage 7 (CALOI and PALOMBO, in press), evidence of a lithic industry without bifacials continues. This industry shows instruments technically and typologically similar, if not identical, to those of the Mousterian which characterizes the first part of the last glacial period, and which may be compared, in particular, with the Pontinian industry (PIPERNO and BIDDITTU, 1978; PIPERNO, 1984). This type of industry is characteristic of the upper limnic-brackish series ("d level" at Torre in Pietra, Rome; MALATESTA, 1978). Remains of amphibians, reptiles and mammals (CALOI and PALOMBO, 1978) have been collected together with industry (PIPERNO and BIDDITTU, 1978); on the whole, they show a clear hot-temperate and moist character, as evidenced by the almost complete desappearance of the horse and the simultaneous appearance of abundant fallow-deers and marshturtles, as well as of the hippo, *Macaca sylvana* Linnaeus, the frog and the toad (CALOI and PALOMBO, 1978). The avifauna composition is not against the climatic interpretation obtained from amphibians, reptiles and mammals. In fact, even if most birds nest in northern or eastern-central Europe, all of them migrate in the winter months toward the Mediterranean regions, where they spend a large part of the year. Only one species, *Nucifraga cariocatactes* Linnaeus, which lives in high mountains, is not found at present in the Italian avifauna. Moreover, species strictly related to cold climates are missing and 69 % of the specimens live in temperate Mediterranean climates.

The vertebrate association, much more varied and abundant than that collected from the lower limnic-brackish series, testifies a diversified environment, dominated by vast extents of mixed forest trees with thick underbush, alternated with more or less wide clearings. The area was characterized also by many rivers, which become swampy, especially towards the mouth, as shown also by many species of water birds. This faunistic association should represent, with good approximation, a sample of the fauna living at that time in territories next to those inhabited by men; in fact, emplacement and preservation conditions exclude direct human influence. Hot climatic conditions are shown by the fresh-water molluscs and by the mammals, banal and fallow-deer dominated. They derive from levels of the Vitinian formation (CONATO *et alii,* 1980), which turns out to be heteropic with respect to the Tyrrhenian ingression (= *Strombus* beachs 200,000 years B.P.) and partially overlapping them; the formation, therefore, is only slightly later than the deposition of the upper limnic-brackish series of Torre in Pietra (CALOI and PALOMBO, in press a). The avifauna, in which water species clearly prevail, indicates the presence of fresh water basins, originated by local obstructions at some distance from the coast, rather than coastal lagoons (CALOI *et alii,* 1983). The fauna from Cerveteri (Capasso Barbato; PALMARELLI and PETRONIO, 1983) roughly shows the same characteristics: clear prevalence of the auroch and the fallow-deer. A relation of human origin may be supposed also for this deposit. Anyway, in this case, human presence is not documented. The correlation of the fauna of Cerveteri with those of Torre in Pietra and Vitinia is supported by the stratigraphic evidence of Monte Cucco, near Cerveteri, where a gray tuff with

mammalian remains, dated 170,000 ± 30,000 yr. B.P. (BONADONNA and BIGAZZI, 1970), outcrops. There are not evidence of mammalian faunas related with temperate-hot phase of substage 5e (*Strombus* beachs dated about 125,000 years B.P.) (CALOI and PALOMBO, in press a).[1] The faunas from Saccopastore (Roma) (BLANC, 1948; BREUIL and BLANC, 1936; SEGRE, 1983 with bibliography; PIPERNO and SEGRE, 1984) may be related to a subsequent temperate phase. The few lithic remains do not allow a precise typological placement within the last interglacial industries. On the whole, paleontological data from land molluscs, birds and mammals collected in the level between the two human-skull (Saccopastore I, a woman, and Saccopastore II, a man) and from upper and lower adjacent levels suggest temperate climatic conditions with some tendency to coolness; afterwards mixed-oak woods appear (TONGIORGI, 1939; FOLLIERI, 1983), which are found at present at an altitude of 800 m a.s.l. Therefore, this climatic period may be correlated with part of stage 5 (5c up to 5a or, more probably, 5a up to Würm I), and in many cases it appears to take place before the appearance of the adverse climatic conditions of the stage 4. The long phase from the Lower Palaeolithic to the Pontinian Mousterian would require a time interval of at least 100,000 yr., according to the relation proposed here with the stages of the oceanic isotopic scale. In this interval, various climatic phases alternate, faunas become altered, but not appreciably, except, perhaps, for the appearance of the modern species of the fallow-deer, for the spreading of *Mammuthus cosarichus* Dubrovo and for the higher evolutionary level reached by the horse, the rhinoceros and *Elephas antiquus*. Also the lithic industries, even taking into account some technical and typological innovations and modifications, do not appear as substantially different. The most common and best known facies of Middle Palaeolithic of Latium is surely the Pontinian one; it appears as the continuation and development of the trend started at the end of upper Middle Pleistocene. The range of this facies includes coastal Latium, between Palidoro, Gaeta and the Pontinian Plain; in this area, most sites are found, showing an intense and continuous human presence. It is to be borne in mind that the coastal plain was at that time much wider than today, since the shoreline was then at least at the level of the present isobath – 100 (SEGRE, 1949). The Mousterian aspects in inland Latium appear more varied and complex even if not well known as yet. For example, the Mousterian of Levallois technique appears in the paleolacustrine basin of Sora, near Valle Radice (BIDDITTU, CASSOLI and MALPIERI, 1967; SEGRE, BIDDITTU and CASSOLI, 1984), and at Carnello (SEGRE, BIDDITTU and CASSOLI, 1984), and may be also in the Middle Liri valley (Cassino: COSTA, 1864; FLORES, 1895; MOCHI, 1912; SEGRE, BIDDITTU and CASSOLI, 1984). Further North, one finds human presence in Latium beyond 1000 m of height, on the Monte Gennaro Plateau, behind Tivoli, where an industry with Levallois component has been found (BIDDITTU and DE ANGELIS, 1980; PIPERNO, 1984). Differentiations and novelties may be observed also within the territory where the Pontinian facies propagated, likely in relation to chronological factors. Clear examples are the site of the Barbara cave (ZAMPETTI and MUSSI, 1983; ZAMPETTI and MUSSI, in press b) and the open one of S. Andrea, near Sabaudia (MUSSI, 1977-82), where the Levallois technique is present and the retouch of Quina is absent. As is well known, the cultural development of the Neanderthal man took place during a climatic deterioration, that may be placed at the beginning of the Würm [Würm I according to CALOI and PALOMBO (in press a), = Würm I *p.p.* and

---

[1] It is to be kept in mind that in the text the division of the Upper Pleistocene is the one indicated by present Authors (CALOI and PALOMBO, in press a). Namely, the last interglacial is related to the whole stage 5 of the oceanic isotopic scale (between 128,000 and 75,000 yr. B.P.), the last glacial (Würm according to the Alpine glaciations, between 75,000 and 13,000 yr. B.P.) is subdivided in three stadials. Würm I should roughly correspond to stage 4, characterized by a harsh climate, Würm II to the relatively mild and moist oscillations in the central part of stage 3, Würm III to stage 2, again particularly severe.

Würm II *p.p.* according to French chronology].[2] In any case, the chrono-stratigraphic placement of the deposits, especially of the innermost ones still under study, is not yet clear. Some stratigraphic data may be obtained from the classical sequence of Mussolini Channel (BLANC, 1937; BLANC and SEGRE, 1953; BLANC, DE VRIES and FOLLIERI, 1957; PALOMBO, in press; TASCHINI, 1970; TASCHINI, 1972) and from recent drillholes in the Pontina Plain (MALATESTA, in press; PALOMBO, in press), as well as from the cave deposits of M. Circeo [among others, Guattari cave, Capre cave, Fossellone cave, Breuil cave and Barbara cave (CALOI and PALOMBO, in press c)] and from the coastal deposits between Sperlonga and Gaeta, in particular the Moscerini cave (VITAGLIANO, 1984) and the S. Agostino cave (TOZZI, 1970). Faunistic remains, sometimes rather abundant, have been found in many deposits with Mousterian industry. It is possible to identify a faunistic sequence during the first part of the last glacial period, on the basis of the characteristics of the vertebrate association and with the support of stratigraphic and palaeobotanic data and of the related industry. At first, the climate is still relatively temperate and moist, related to the end of substage 5a and to the beginning of the Würm I (CALOI and PALOMBO, in press a); the fauna is similar to that of the preceding interglacial period and *Elephas antiquus*, the hippo and the rhino of the genus *Dicerorhinus* are still found. Afterwards, the hippo disappears with the increasing cold and the steinbock appears. During the subsequent harsher phase, related to the Würm I coldest oscillations [according to CALOI and PALOMBO (in press a) = Würm II *p.p.* according to French chronology], *Equus hydruntinus* spreads and the woolly rhino, *Coelodonta antiquitatis* Blumembach (PALMARELLI and PALOMBO, 1983), probably arrives in Latium in this period. The climatic worsening is evidenced, perhaps in an immediately following period, also by the presence of *Marmota marmota* Linnaeus and *Cricetus cricetus* Linnaeus (S. Agostino cave; TOZZI, 1970), in a fauna dominated by cervids. A similar association is present also in the nearby Moscerini cave (G-A layers; VITAGLIANO, 1984) and Barbara cave (CALOI and PALOMBO in press c), in a subsequent period that may be correlated with the Würm I-II interstadial, if not already referable to the Würm II stadial according to industry typology (ZAMPETTI and MUSSI, in press b). The sequence outlined refers in particular to the plain regions and to the coastal caves. Some "cold species" seem to appear earlier in mountain sites of the hinterland, where the mitigating effect of the sea is less felt; for example, the steinbock and the marmot are found at Valle Radice already in the "ana-Würm I" (SEGRE, BIDDITTU and CASSOLI, 1984), in a fauna with plenty of rhinos, rich in herbivores (wild boar, deer, roe-deer, auroch) and in carnivore species, among which *Ursus spelaeus* Rosenmüller is very abundant [3]. Additionally it is interesting to point out in the avifauna the presence of *Cygnus cygnus* Linnaeus, in a fauna also referred to the "ana-Würm" including the hippo, *Elephas* and the rhino (SEGRE NALDINI, 1984), found in the cave close to Sezze Romano, on the slopes of the Lepini Mountains. Also *Cygnus cygnus* and *Cygnus bewickii* are found in the site of Carnello (Sora)[4], in a fauna including

[2] The proposed correlation between climatic oscillations and the stage of the isotopic oceanic scale appears tentative; it is also to be taken into account that the meaning of definitions such as glacial and interglacial, stadial and interstadial, phase and probable subphase is not yet settled (cfr. also BONIFAY, 1980; DUCHADEAU-KERVAZO and KERVAZO, 1983).

[3] The "cold character" given to Valle Radice by the steinbock and especially by the marmot might suggest a relation with a harsher climatic phase, but the presence of these two species may be due to geographic factors, as confirmed by the avifauna with mountain habitat.

[4] The presence of the two swan species at Carnello might indicate a more severe climate than that generally assumed for the beginning of Würm I (cfr. CALOI and PALOMBO, in press a). The lack of the hippo, even in the presence of a lacustrine basin, and the presence of *Elephas antiquus* (taking into account the faunistic succesion identified in the plain regions) might correlate that deposit with a not very advanced phase of the Würm I, given the geographic position of the Deposit itself.

Elephas antiquus, the rhino, the horse, *Equus hydruntinus* and carnivores.The landscape, especially during the end of substage 5a and the beginning of the Würm, probably was still rather varied. The mountain slopes featured beech and conifer forests, in which many cervids and the lynx lived. In the plains, mixed beech and oak woods prevailed, even if alternated with cool steppe (BLANC, 1956; BONATTI, 1963; FRANK, 1969; FOLLIERI and COCCOLINI, 1982). Large marshy areas were likely to be still present, especially along the coast and in the plains, but also close to the mountains, as it may be inferred from the presence of the hippo and Anatidae at Sezze Romano (SEGRE NALDINI, 1984). In the hinterland of Southern Latium, around Sora, there still was a lacustrine basin, as demonstrated by the recovery of the beaver, various Anatidae, the toad and the marsh-turtle. With the climatic worsening corresponding to the Würm I more rigorous conditions, the hornbeam appears and the birch becomes the dominant form. Aridity causes the cold steppe-like area to expand greatly into the plains; in such areas the mammoth, the wolley rhino and *Equus hydruntinus* throve. Also the conifer forests on the mountain slopes of the first phase are replaced by areas more or less bare. Nevertheless, wood areas (more or less wide) and residual Mediterranean bush could still be found, especially along the coasts and the valleys; in these areas herds of deers, roe-deers and wild boars lived. The steinbock prevailed in the most inaccessible zones. The fauna from Northern Latium is almost unknown. Some palaeobotanic data are known (FRANK, 1969) which confirm the hypothesis of Southern Latium, even if conifers appear more common. On the whole and considering the species represented, the fauna found in the sites which exhibit human presence at the end of the penultimate interglacial period and/or the beginning of the Würm coincides with the faunas in which human presence is not documented. Therefore, it looks like that man went on hunting big pachyderms, even if only sporadically. Anyway, the preferred preys were medium size animals, mainly cervids (deer and fallow-deer in particular). In any case there is no analytic study of the faunas which specifies the percentage of each species in the various associations. A more substantial change in the habits of the Middle Palaeolithic hunters seems to be documented during the Würm I-II interstadial and/or the Würm II (cfr. CALOI and PALOMBO, in press a): the mammoth and the wolley rhino, even if present in the territory, are never found in the sites with industries, where, on the contrary, a rhino of the genus *Dicerorhinus* is reported. In this period, the preferred and more common preys are cervids, followed by bovids; some wild boars and horses are captured sporadically. Anyway it appears as if different groups of Neanderthal men would prefer a well defined prey, even if chronologically close and living on the same territory. For example, in the Circeo, the inhabitants of the Guattari cave appear to prefer the deer (PIPERNO, 1976-77), at least judging from the mammalian remains from the level where the human skull was found; the inhabitants of Fossellone prefer the auroch (BLANC and SEGRE, 1953). Further South and likely in a late period in the S. Agostino cave, near Gaeta (TOZZI, 1970), the fauna associated with industry is dominated by cervids. This tendency may be noticed also in the subsequent phases of the nearby Moscerini cave (VITAGLIANO, 1984) and in the Barbara cave (CALOI and PALOMBO, in press c). In this site, a prearranged choice for hunting young and female deer and fallow-deer individuals was noticed; these species are easier to catch, while steinbocks and horses, perhaps accidentally hunted, are represented by adult and old individuals. Finally, in this site, an extreme fragmentary character of animal remains is to be noticed. This fact suggests the use of crushing techniques to extract both the marrow and the fat (CALOI and PALOMBO, in press c). This crushing habit will show up again during the Upper Palaeolithic, in this site and in others. A peculiar faunistic complex is that from Valle Radice (BIDDITTU, CASSOLI and MALPIERI, 1967; SEGRE, BIDDITTU and Cassoli, 1984); here, the dominance of *Ursus spelaeus* seems to indicate a place of specialized hunting in order to get hold of the fur, even if some doubts are raised by the state of the remains, mainly whole bones.

UPPER PALAEOLITHIC

Upper Palaeolithic industries develop during the late Würm [Würm II-III interstadial and Würm III according to CALOI and PALOMBO (in press a) = Würm III and Würm IV in French literature]; in Latium they are more widely documented in the later phases relative to the Epigravettian. The faunistic findings of some importance during the "Pleniglacial" and "Tardiglacial" are known mostly through sites with human presence. The climatic oscillations in this period are rather difficult to follow in the Tyrrhenian side of the peninsula, and also in Latium; in fact, the cold climatic acmes were always felt with more intensity on the Adriatic side (SALA, 1983a). Also in this period Latium must have maintained some woods, even if with variations in extension. After the disappearance of the large sized mammals, the dominant animals were deers, roe-deers and wild boars; the faunistic sequences are poorly defined and are based on slight variations in the composition of the association, in particular, the frequency of the roe-deer, a forest animal sensitive to temperature variations, of the steinbock, an indicator of more or less harsh climatic conditions and of barren environments, and *Equus hydruntinus* which preferred wide open spaces. Therefore, the biostratigraphic and climatic sequence are only indicated by the presence of very rich associations (SALA, 1983a), that in Latium are still little represented and limited basically to the sites of Palidoro and of the Polesini cave. The environmental differences between the two sites make correlation between the various associations even more difficult. In addition to the aforesaid herbivores, mention should be made of the auroch, sometimes relatively abundant, of the horse and of the fallow-deer, sporadically present, buth throughout the Upper Palaeolithic. The chamois seems to mainly characterize the "Tardiglacial" (Polesini cave, Riparo Salvini; cfr. MASINI, 1983). The large carnivores slowly disappear (*Crocuta crocuta* is likely to last longer) and small carnivores and the hare become more and more common. The Aurignacian, generally dated in Italy at about 32,000-30,000 yr. B.P. (GIOIA, 1978-79; GIOIA, in press), is known basically from the sites of M. Circeo (Fossellone cave: layer 21 and level 2 in cavity B, BLANC, 1938; BLANC and SEGRE, 1953; Breuil cave: TASCHINI, 1970; Presepe cave: BLANC, 1938; Barbara cave: ZAMPETTI and MUSSI, in press b; ZAMPETTI and MUSSI, 1983; CALOI and PALOMBO, in press c) and in the Pontina Plain (Le Grottacce: BLANC, 1937; BORZATTI VON LÖWENSTERN, 1971; ZAMPETTI and MUSSI, 1983). As a result it appears confined to southern Latium with a use of the territory and of the caves similar to the Mousterian one (TASCHINI, 1970; ZAMPETTI and MUSSI, 1983). An abundant fauna, unfortunately lacking detailed studies, is that associated with the industry in the Fossellone cave (BLANC and SEGRE, 1953). Abundant remains suggest intense human presence. The prevalence of the deer and *Equus hydruntinus* and the presence of aurochs, horses, steinbocks, fallow-deers, wild boars and roe-deers give evidence of a forest environment and of extensive grassy ground in the coastal plain, which may be referred in a generic way to a relatively mild climatic period, corresponding to the Würm II-III interstadial (CALOI and PALOMBO, in press a). In particular, the crushed bones of the Barbara cave display continuation and perhaps increase in the use of bones to get marrow and fat, a practice already noted in the Mousterian levels.The Gravettian appears in the Western Italian side in the first half of the Würm III (CALOI and PALOMBO, in press a) (= first half of stage 2) (= between an advanced stage of the Würm III and the beginning of the Würm III-IV interstadial of Laugerie, according to PALMA DI CESNOLA and BIETTI, 1983). In Latium, this culture is little known and is limited to the tools from the lower levels of the Riparo Blanc (CARDINI and TASCHINI, 1961) and from a surface site of Castel Malnome (TASCHINI, 1960-61). The fauna is known only through the few remains from the Riparo Blanc related to *Bos, Equus* and *Cervus*. At this time, Latium was probably dominated by a phase of steppe with Gramineae and *Artemisia* (BONATTI, 1963; FRANK, 1969). The Epigravettian is more widespread and well known; besides, many old and new sites are under study or revision. This culture develops from the second half of the Würm III (CALOI and PALOMBO, in press a; = Würm IV according to French chronology) to the

beginning of the post-glacial. Faunas associated with industry of the early Epigravettian (Cavernette Falische – Riparo del Sambuco: BLANC, 1933; BARRA INCARDONA, 1968; PALMA DI CESNOLA, 1984; Ponte Sfondato: BULGARELLI and TAGLIACOZZO, 1984; Tor Vergata: CAZZELLA and MOSCOLONI, 1984; the assignment of the industry from this site to the early Epigravettian rather than to the later one is still to be clarified) are poorly known and banal and consists of auroch, horse, *Equus hydruntinus* and deer remains. Equids are abundant at Tor Vergata; the presence of remains of very small dimensions at Ponte Sfondato is interesting, since it suggests a use of the bones similar to that observed in the Aurignacian and Mousterian levels at the Barbara cave. A rather rich faunistic association was found in a small cave at Palidoro, together with tools of the evolved Epigravettian (BIETTI, MARTINI and TOZZI, 1983; CASSOLI, 1976-77). The bone remains are mainly crushed by human action and show signs of slaughtering. The frequency variation of some species, on the background of a fauna in which the deer prevails and the auroch and *Equus hydruntinus* are abundant, allow to identify a more wooded environment with mild climate in lower levels (8-4): upwards the environment appears more open and perhaps cooler. The data that may be obtained from the absolute C-14 dating of the various levels (ALESSIO *et alii*, 1976-77) are in partial disagreement with those from the analysis of sedimentology (PALMIERI, 1976-77); so it is not possible at the moment to assign deposition of the fossiliferous levels either to the Prebölling or to the Angles-sur-Anglin or, anyway, to a homogeneous or non-homogeneous phase. A site is also known – Polesini cave (Tivoli, Rome) (BIETTI, MARTINI and TOZZI, 1983; RADMILLI, 1974) – for the late Epigravettian; a rich faunistic association was found in it, the analysis of which (SALA, 1983a) shows the sequence of climatic oscillations and environmental changes from the end of the Bölling to the Drias III and so to the end of the Tardiglacial. The dominant form is that of the deer, present in all the levels, with 70 % on average. Chamois, steinbock, roe-deer and wild boar spread more during the mild periods with higher abundance of forests; the auroch is always poorly represented. An absolute dating exists also for levels 8-1 and gives an age of 10,000 ± 80 yr. B.P. (BELLUOMINI, 1980). Among the small carnivores, present in large abundance, *Gulo gulo* Linnaeus is to be mentioned; if confirmed, his presence here would give the latest and most southerly findings of this species. Finally, let us mention the clear prevalence of the deer (80 %) also at Riparo Salvini, near Terracina (BIETTI, 1984), the persistence of Equidae, the presence of the fallow-deer and *Crocuta crocuta* at Cisterna (SEGRE, 1957) and the presence of some carnivore species (wild cat, lynx, fox and badger) in the Iolanda cave (ZEI, 1953), suggesting the local existence of some woods. In any case, the palaeoenvironment in Latium during the upper Pleniglacial and Tardiglacial cannot yet be described completely. Some Palaeobotanic data (BONATTI, 1963; FRANK, 1969) suggest that cool and dry steppes rich in Gramineae and *Artemisia* expanded during the harshest climatic phases (Upper Pleniglacial and Drias I); mixed oak groves and *Corylus* woods prevailed in relatively mild, moist phases, especially during the Alleröd. At the end of the Tardiglacial, temperature diminishes slightly and aridity increases, but not enough to prevent the growth of *Alnus* and *Ostrya* and a limited diffusion of mixed-oak groves. The human economy in the Upper Palaeolithic was based on one form: the deer. Anyway one always finds the auroch and Equidae in the diet, even plentifully; less abundantly, wild boar, chamois, steinbock, roe-deer and hare. So the phenomenon already noticed in the first phases of the Mousterian culture increases in importance: hunting is aimed mainly at large herds of cervids and Equidae. Both the deer and *Equus hydruntinus* are in fact very abundant in sites at the coastal plains (cfr. the caves at Fossellone and Palidoro) as well as on the mountain slopes (cfr. Polesini cave and Cisterna). The abundant fox remains at the Polesini cave may suggest its use as fur animal. During this time interval, the modifications in the environment due to human activity increased in importance; this fact is a consequence also of the changes in overall economical activities, more noticeable than the changes in industry. In this respect, the diffusion of *Plantago lanceolata* is of interest: it has been put in relation with human activity, perhaps starting from the Bölling (FRANK, 1969).

CONCLUSIONS

The appearance of the archaic industry in Latium is almost coeval with the renewal of the fauna which, starting from the late-post Villafranchian faunas with archaic elements, gives origin to the lower Middle Pleistocene faunas; in the latter, new immigrant forms prevail and species of Villafranchian origin are very rare. The mammal associations from the current bedding gravel of the Ponte Galeria Formation (CALOI and PALOMBO, in press a) is the most typical example. The most frequent forms are herbivores and, inside this group, the fauna appears noticeably varied, much more than in the contemporary Isernia deposit (SALA, 1983b). Here, in any case, the selection operated by man is evident, through preferential hunting of medium or large sized mammals: *Bison schoetensacki* Freudenberg, *Elephas antiquus* and *Dicerorhinus hemitoechus*. The paleontologic data as a whole allow to suggest for Latium an environment characterized by climatic conditions varying from cold-temperate to mild, and by diversified biotopes. For example, woods which during the initial phase, cooler than the present one, were mainly made up by conifers and oaks with archaic elements (FOLLIERI, 1979); meadows with some steppe-like characteristics; plenty of both running and stagnant waters. In any case, available data do not allow any hypothesis on the hunting habits of the early inhabitants of Latium. Also the appearance of the Acheulean industries in the Anagni basin (Fontana Ranuccio: BIDDITTU *et alii*, 1979; Cava Pompi: BIDDITTU, SEGRE and SEGRE NALDINI, 1984) coincides with a faunal renewal, although of less relevance than the previous one. In fact the mammals show enhanced modern characteristics, evident in the evolutionary stage reached by forms belonging to lines already appeared in the early lower Middle Pleistocene and also in the disappearance of the last Villafranchian species and in the appearance of new species among cervids and carnivores. The favorite preys of these human groups are still herbivores of large and medium size, especially elephants and bovids (*Bos primigenius* Bojanus). The tendency to hunt mainly *Elephas antiquus* and *Bos primigenius* appears still present also in the time interval during which the Upper Acheulean industries are found. Such a preference may be justified by the abundance of these forms during the activity of the human groups, as well as by the relative facility of hunting these animals. In fact, they form large herds, slow in their movings, especially when compared with the horse herds which, on the basis of available data (see Torre in Pietra, lower layers; CALOI and PALOMBO, 1978), were the most frequent species in open regions. The mammalian faunas associated with the industries of the Upper Acheulean and related ones, derive in Western Latium mostly from the levels corresponding to the transgressive cycle of the Aurelian Formation (MALATESTA, 1978; CONATO *et alii*, 1980; CALOI and PALOMBO, in press a). These associations are told from the preceding ones mainly on the basis of the higher evolutionary level of the various species, of the disappearance of the Megacerini of the *Megaceros verticornis* Dawkins group, replaced by a primitive form of the *Megaceros giganteus* Blumenbach group. These associations may be distinguished from the slightly later ones found with Rissian Mousterian industries in the upper Middle Pleistocene, mainly by of the absence of the modern fallow-deer [*Cervus (Dama) dama* Linnaeus; Sedia del Diavolo, CALOI, PALOMBO and PETRONIO, 1980b]. The industries of Mousterian typology appear in a moment in which the climatic conditions are still mild, but there are indications of an approaching cooling of the climate, such as the appearance of cold elements in the levels which, at Monte delle Gioie and Sedia del Diavolo (Rome), follow the upper gravels containing industry and fauna in the stratigraphic sequence. In this epoch, *Elephas antiquus* and *Bos primigenius* must have been relatively abundant (Casal de' Pazzi, Rome; ANZIDEI *et alii*, 1984), but the human groups who lived in the low Tiber palaeovalley and in the nearby basins must have hunted also herbivores of lesser size; this fact may be related to the spreading of modern fallow-deers in the region.In the early phases of the Upper Pleistocene, the temperate-hot characters of mammalian faunas are emphasized. Among herbivores, the species are not far from the modern ones, as for morphology and evolutionary stage, with the exception of large-sized forms. Also small carnivores are

evolutionary stage, with the exception of large-sized forms. Also small carnivores are essentially of modern type, while, among the larger ones, some species are found (cave lion, leopard, cave bear and hyena) which, with the exception of the brown bear, will progressively disappear during the last period of the Upper Pleistocene. Besides, the higher frequency of lagomorphs is to be noticed. The mammalian associations, especially those in Western Latium, come mostly from the Vitinian Formation or from related levels, and from the thirds series of terraces of the low Aniene valley. The various faunistic complexes give a fair documentation as far as palaeoenvironmental reconstruction is concerned, but do not allow hypotheses on hunting preferences and modes of human groups, since faunistic associations due exclusively to or dominated by human activity are not known. The advent of cold climatic conditions, recognizable from palynologic, malacologic and sedimentary data, is observed with difficulty on the basis of data on large mammalian associations alone, which are not very different from those of the preceding interglacial period. Nevertheless, the change in the environment and the induced progressive reduction in the suitable biotopes for the survival of *Elephas antiquus*, hippos and rhinos of genus *Dicerorhinus* may have reinforced the tendency to hunt mainly medium or small-medium sized animals. At the beginning of the Würm, the cultural dichotomy among coastal populations and interland ones, closer to the Abruzzi populations from a cultural point of view, seems to increase; such a dichotomy may have been present already at the end of the upper Middle Pleistocene. It is not possible to say whether this dichotomy exists also in the hunting habits, since the particular environmental conditions in the Valle Radice (SEGRE, BIDDITTU and CASSOLI, 1984) cannot be generalized. It is to be stressed that the animal remains found in the two sites of Carnello (SEGRE, BIDDITTU and CASSOLI, 1984) and Valle Radice appear as due to natural factors and therefore reflect the environment, but do not give clear information on human activity. The progressive change in the environment and the beginning of the colder Würm I oscillations is noticed in the faunas from the Latium coastal caves (Circeo, Sperlonga, Gaeta) owing to a progressive disappearance of the hippo, *Elephas antiquus* and the rhino of the genus *Dicerorhinus*, and to the appearance first of the steinbock (*Capra ibex* Linnaeus), which lives together with *Elephas antiquus* and the rhino, and secondly of *Equus hydruntinus, Marmota marmota* Linnaeus and *Cricetus cricetus*, while these associations lack *Mammuthus (Mammuthus) primigenius* Blumembach and *Coelodonta antiquitatis* Blumembach. Therefore, Neanderthalians hunted not only large mammals but preferred more and more animals of lesser size (young deers and steinbocks). The preferential choice of preys was likely related with hunting habits which required transportation to sites where parts already butchered were consumed. Furthermore, it is to be noticed that in an advanced Würm phase (Würm I-II or Würm II, cfr. CALOI and PALOMBO, in press a), indications are found at the Barbara cave (CALOI and PALOMBO, in press c) of an intensive utilization of the bones of hunted animals, from which not only the marrow, but also the fat, were obtained. This practice apparently becomes even more common in the same site, in the Aurignacian levels, with the appearance of modern man. The passage to the more advanced Würm phase does not involve notable changes in the fauna at the beginning, even if small carnivores become more numerous and the hare spreads increasingly. In this time interval, it is very difficult to follow the sequence of associations, mainly composed of cervids, bovids and equids. Such a study may be done only on rich faunas and mainly on the basis of the oscillations in the relative frequency of roe-deer, steinbock and *Equus hydruntinus*. Anyway, during the "Upper Pleniglacial" and the "Tardiglacial", the deer is the most frequent, accounting for 40 % – 70 % of the forms. Also *Equus hydruntinus* and *Bos primigenius* may be very abundant, according to the geographic site position and to climatic period. Finally it is interesting to observe that the passage from one culture to the other, appearance of different human types, changes in the environment and faunistic situation are mutually related in different ways during the Palaeolithic of Latium. The appearance of the first human groups, the post-Villafranchian faunistic renewal, the progressive improvement in climatic conditions are almost concurrent events in the early lower Palaeolithic. Also the appearance of Acheulean industries is more

or less coeval with a certain faunistic renewal, which is anyway more evident with the coming of the upper Acheulean and is not remarkably influenced by changes in climatic conditions. The appearance of the industries of Mousterian typology in Western Latium seems related only with the spreading of the modern fallow-deer. On the contrary, the appearance of the Neanderthal man seems related more with climatic variations, even if not strong, that with noticeable changes in the faunistic situation. The disappearance of pachiderms connected with mild conditions and the spreading of "cold forms" in Latium occurs when Neanderthalian groups already lived in regions both in the hinterland and on the coast. The appearance of the modern man is connected with the introduction of new typologies in the lithic industries, but the change in the environment appears as slow and gradual (Würm II-III interstadial?; CALOI and PALOMBO, in press a). Also the variations in hunting habits are not strictly related with the appearance of new human groups. The preferential hunting of bovids and elephants continues throughout most of the Lower Palaeolithic, but also smaller sized species begin to be preyed upon systematically and substantially since the beginning of industries of Mousterian typology; these species will be the preferred preys during the whole Middle and Upper Palaeolithic. During this time interval, sites at the entrance of valleys at the foot of mountains become more common; in fact, such a geographic position is more favorable to the exploitation of cervids and equid herds during their seasonal migrations.

BIBLIOGRAPHY REFERENCES

ALESSIO M., BELLA F., CALDERONI G., CORTESI C. and IMPROTA S., 1976-77. Carbon-14 Dating of Bone Collagen from Upper Paleolithic Palidoro Deposit. *Quaternaria*, 19.

AMBROSETTI P., 1965. Segnalazione di una fauna con *Elephas antiquus* rinvenuta nella zona di Ponte Galeria (Roma). *Boll. Soc. Geol. It.*, 84 (1), 15-23.

AMBROSETTI P., AZZAROLI A., BONADONNA F.P. and FOLLIERI M., 1972. A scheme of Pleistocene chronology for the Tyrrhenian side of Central Italy. *Boll. Soc. Geol. It.*, 91, 169-184.

ANGELELLI F., 1983. Cenni preliminari sulla fauna quaternaria di Fara Sabina (Roma) conservata nel Museo del Servizio Geologico d'Italia. *Boll. Serv. Geol. It.*, 102 (1981), 3-11.

ANZIDEI A.P., BIETTI A., CASSOLI P., RUFFO M. and SEGRE A.G., 1984. Risultati preliminari dello scavo in un deposito pleistocenico in località Rebibbia-Casal de' Pazzi (Roma). *Atti XXIV Riun. Scient. I.I.P.P.*, Firenze, 1982, 132-139.

AZZAROLI A., 1983. Quaternary mammals and the "End-Villafranchian" dispersal event – a turning point in the history of Eurasia. *Palaeogeogr. Paleoclim. Palaeoecol.*, 44, 117-139.

BARRA INCARDONA A., 1968. Le nuove ricerche nelle cavernette e nei ripari dell'Agro Falisco. *Atti Soc. Tosc. Sc. Nat.*, Mem., s.A. 76, 101-124.

BELLUOMINI G., 1980. Datazioni dirette di ossa fossili umane provenienti da siti archeologici dell'Italia centro-meridionale effettuate con il metodo della racemizzazione dell'acido aspartico. *Geogr. fis. dinam. quat.*, 3 (2), 25-35.

BERNARDI A., DE RITA D., FUNICIELLO R., INNOCENTI F. and VILLA I., 1982. Chronology and structural evolution of Alban hills volcanic complex, Latium, Italy. *Guidebook for the field exc. to Alban hills. C.N.R., Workshop on explosive volcanism, Roma, May 1982.*

BIDDITTU I., 1972. Pleistocene e industrie litiche pre-acheuleane ad Arce e Fontana Liri (Frosinone). *Quaternaria*, 16, 35-52.

BIDDITTU I., 1974. Giacimenti pre-acheuleani di Castro dei Volsci (Frosinone). *Mem. Ist. It. Paleont. Umana*, 2, 50-60.

BIDDITTU I., 1984. Il Paleolitico inferiore del Lazio, industrie arcaiche. *Atti XXIV Riun. Scient. I.I.P.P.*, Firenze, 1983, 31-38.

BIDDITTU I. and CASSOLI P.F., 1968. Una stazione del Paleolitico inferiore a Pontecorvo in provincia di Frosinone. *Quaternaria*, 10, 167-197.

BIDDITTU I., CASSOLI P.F. and MALPIERI L., 1967. Stazione musteriana in Valle Radice presso Sora (Frosinone). *Quaternaria*, 9, 321-348.

BIDDITTU I., CASSOLI P.F., RADICATI DI BROZOLO F., SEGRE A.G., SEGRE NALDINI E. and VILLA I., 1979. Anagni a K-Ar dated lower and middle pleistocene site, Central Italy: preliminary report. *Quaternaria*, 21, 53-71.

BIDDITTU I. and DE ANGELIS G., 1980. Testimonianze del Paleolitico medio e superiore nel gruppo del Monte Gennaro. *Monti Lucretili, un parco naturale nel Lazio*. Ed CAI.

BIDDITTU I. and SEGRE A.G., 1982a. Pleistocene medio-inferiore con industria arcaica su ciottolo nel bacino di Anagni, Lazio. *Atti XXIII Riun. Scient. I.I.P.P.*, Firenze, 1980, 567-576.

BIDDITTU I. and SEGRE A.G., 1982b. Utilizzazione dell' osso nel Paleolitico inferiore italiano. *Atti XXIII Riun. Scient. I.I.P.P.*, Firenze, 1980, 89-105.

BIDDITTU I. and SEGRE A.G., 1984a. Industria su scheggia e bifacciali: nuovi reperti del Paleolitico inferiore ad Anagni-Fontana Ranuccio, Frosinone. *Atti XXIV Riun. Scient. I.I.P.P.*, Firenze, 1982, 105-112.

BIDDITTU I. and SEGRE A.G., 1984b. Ceprano. Lazio. *In:* A.A.V.V., *I primi abitanti d'Europa*, Roma, marzo-luglio 1984, 165-167.

BIDDITTU I., SEGRE A.G. and SEGRE NALDINI E., 1984. Cava Pompi – Lazio. *In:* A.A.V.V., I *primi abitanti d'Europa*, Roma, marzo-luglio 1984, 134-135.

BIETTI A., 1984. Primi risultati dello scavo nel giacimento Epigravettiano finale di Riparo Salvini (Terracina, Latina). *Atti XXIV Riun. Scient. I.I.P.P.*, Firenze, 1982, 195-205.

BIETTI A., MARTINI F. and TOZZI C., 1983. L'Epigravettien évolué et final de la zone moyenne et basse tyrrhénienne. *Riv. Sc. Preist.*, 38 (1-2), 319-349.

BLANC G.A., 1933. Resti di Equidi pleistocenici di una cavernetta di Corchiano. *Rivista di Antropologia*, 30, 3-14.

BLANC A.C., 1935. Stratigrafia del Canale Mussolini nell' Agro Pontino. *Proc. Verb. Soc. Toscana Sc. Nat.*, 44 (2), 52-56.

BLANC A.C., 1935-37. Scheggia di tecnica clactoniana rinvenuta in situ nel Quaternario della Valchetta-Cartoni, Roma. *Riv. Antrop.*, 31, 253-261.

BLANC A.C., 1937. Nuovi giacimenti paleolitici del Lazio e della Toscana. *Studi Etruschi*, 11, 273-304.

BLANC A.C., 1938. Una serie di nuovi giacimenti pleistocenici e paleolitici in grotte litoranee del Monte Circeo. *Rend. Accad. Naz. Lincei*, 28, 200-209.

BLANC A.C., 1948. Notizie sui ritrovamenti e sul giacimento di Saccopastore e sulla sua posizione nel Pleistocene Laziale. *Palaeontogr. It.*, 42 (1942-46), 3-23.

BLANC A.C., 1955. Ricerche sul Quaternario Laziale. III. Avifauna artica, crioturbazioni e testimonianze di soliflussi nel Pleistocene medio-superiore di Roma e di Torre in Pietra. Il periodo glaciale Nomentano, nel quadro della serie di glaciazioni riconosciute nel Lazio. *Quaternaria*, 2, 187-200.

BLANC A.C., 1956. Sur le Pléistocène de la région de Rome. Stratigraphie – Paléoécologie – Archéologie préhistorique. *Actes IV Congr. Int. Quat.*, Rome-Pise, Août-Septembre 1953, 1097-1111.

BLANC A.C., VRIES DE H. and FOLLIERI M., 1957. A first C^{14} Date for the Würm Chronology on the Italian Coast. *Quaternaria*, 4, 88-93.

BLANC A.C. and SEGRE A.G., 1953. Excursion au Mont Circé. *IV Congr. Int. INQUA*, Roma-Pisa, 112 pp.

BONATTI E., 1963. Stratigrafia pollinica dei sedimenti postglaciali di Baccano, lago craterico del Lazio. *Atti Soc. Tosc. Sc. nat.*, Proc. Verb. e Mem., ser. A, 70(1), 40-48.

BONADONNA F.P. and BIGAZZI G., 1969. Studi sul Pleistocene del Lazio. VII – Età di un livello tufaceo del bacino diatomitico di Riano stabilita con il metodo delle tracce di fissione. *Boll. Soc. Geol. It.*, 89, 463-473.

BONADONNA F.P. and BIGAZZI G., 1970. Studi sul Pleistocene del Lazio. VIII – Datazioni di tufi intertirreniani della zona di Cerveteri (Roma) mediante il metodo delle tracce di fissione. *Boll. Soc. Geol. It.*, 89, 463-473.

BONIFAY M.-F., 1980. Relations entre les données isotopiques océaniques et l'histoire des grandes faunes européennes plio-pléistocènes. *Quaternary Research*, 14, 251-262.

BORGHETTI G., SBRANA A. and SOLLEVANTI F., 1981. Vulcano-tettonica dell'area dei M. Cimini e rapporti cronologici tra vulcanismo cimino e vicano. *Soc. Geol. It., seduta scientifica "Vulcanismo e tettonica"*, 18-19 giugno 1981, Gargano (*non vidimus*).

BORZATTI VON LÖWENSTERN E., 1971. Provincia di Latina. *Riv. Sc. Preist., Notiziario, Paleolitico, Lazio*, 26 (2), 456-457.

BULGARELLI G.M. and TAGLIACOZZO A., 1984. Il Paleolitico superiore di Ponte Sfondato (Montopoli Sabina). *Atti XXIV Riun. Scient. I.I.P.P.*, Firenze, 1982, 175-182.

CALOI L., CUGGIANI M.C., PALMARELLI A. and PALOMBO M.R., 1983. La fauna a vertebrati del Pleistocene medio e superiore di Vitinia (Roma). *Boll. Serv. Geol. It.*, 102 (1981), 41-76.

CALOI L., GLIOZZI E., KOTSAKIS T., MALATESTA A. and PALOMBO M.R., 1986. Osservazioni sulla paleobiogeografia dei mammiferi del Pleistocene italiano. *Hystrix* 1 (1), 7-23.

CALOI L. and PALOMBO M.R., 1978. Anfibi, rettili e mammiferi di Torre del Pagliaccetto (Torre in Pietra, Roma). *Quaternaria*, 20, 315-428.

CALOI L. and PALOMBO M.R., 1980. Resti di mammiferi del Pleistocene medio di Malagrotta (Roma). *Boll. Serv. Geol. It.*, 100 (1979), 141-188.

CALOI L. and PALOMBO M.R., 1986. Le mammalofaune plio-pleistoceniche dell'area laziale: problemi biostratigrafici ed implicazioni paleoclimatiche. *Prestampe Atti 73° Congr. Soc. Géol. It.*, Roma,

30/9-4/10 1986, 27-30.

CALOI L. and PALOMBO M.R., in press a. Le mammalofaune plio-pleistoceniche dell'area laziale: problemi biostratigrafici ed implicazioni paleoclimatiche. *Mem. Soc. Geol. It.*

CALOI L. and PALOMBO M.R., in press b. Resti di mammiferi in livelli del Pleistocene medio inferiore affioranti al km 2 del G.R.A. (Roma). *Boll. Serv. Geol. It.*, 104 (1983-84).

CALOI L. and PALOMBO M.R., in press c. Prime osservazioni sulla mammalofauna di grotta Barbara (Monte Circeo): implicazioni paleoclimatiche e paleoambientali. *Convegno "La valle Pontina nell'antichità"*, Cori, 1985.

CALOI L., PALOMBO M.R. and PETRONIO C., 1980a. Le principali mammalofaune del Pleistocene della Campagna Romana. *Quad. Paleont. Stratig. Evol.*, 1, 73-79.

CALOI L., PALOMBO M.R. and PETRONIO C., 1980b. La fauna quaternaria di Sedia del Diavolo (Roma). *Quaternaria*, 22,177-209.

CAPASSO BARBATO L., PALMARELLI A. and PETRONIO C., 1983. La mammalofauna pleistocenica di Cerverteri (Roma). *Boll. Serv. Geol. It.*, 102 (1981), 77-94.

CAPASSO BARBATO L. and PETRONIO C., 1983. La mammalofauna pleistocenica di Castel di Guido (Roma). *Boll. Serv. Geol. It.*, 102 (1981), 95-108.

CARDINI L. and TASCHINI M., 1961. Campagna di scavo al Riparo Blanc in località "Cava di Alabastro" al Monte Circeo. *Quaternaria*, 5, 353-354.

CASSOLI P.F., 1976-77. Upper Paleolithic Fauna at Palidoro (Rome): 1955 Excavation. *Quaternaria*, 19, 187-196.

CASSOLI P.F., 1978. L'avifauna pre-würmiana di Torre in Pietra. *Quaternaria*, 22, 429-440.

CASSOLI P.F., DE GIULI C., RADMILLI A.M. and SEGRE A.G., 1982. Giacimento del Paleolitico inferiore a Malagrotta (Roma). *Atti XXIII Riun.Scient.I.I.P.P.*, Firenze, 1980, 531-549.

CAZZELLA A. and MOSCOLONI M., 1984. Tracce di insediamento del Paleolitico superiore a Tor Vergata (Roma). *Atti XXIV Riun.Scient.I.I.P.P.*, Firenze, 1982, 165-174.

CASSOLI P.F. and SEGRE NALDINI E., 1984. Nuovo contributo alla conoscenza delle faune villafranchiane e del Pleistocene medio del bacino di Anagni (Frosinone). *Atti XXIV Riun.Scient.I.I.P.P.*, Firenze, 1982, 115-118.

COCCHI D., CECCANTI M. and FIORINI F., 1980. Segnalazione di Manufatti di tipo pre-acheuleano nel Vulcente. *Quaternaria*, 22, 95-120.

CONATO V., ESU D., MALATESTA A. and ZARLENGA F., 1980. New data on the Pleistocene of Rome. *Quaternaria*, 22, 131-176.

COSTA O.G., 1864. Relazione intorno agli ossami fossili di Cassino e della Melfa. *Rend.R.Accad.Sc.Fis.Mat.Napoli*, 3 (5), 155-161.

DE GIULI C., FICCARELLI G., MAZZA P. and TORRE D., 1983. Confronto tra successioni marine e continentali del Pliocene e Pleistocene inferiore in Italia e nell'area mediterranea. *Boll. Soc.Paleont.It.*, 22 (3), 323-328.

DE LORENZO G. and D'ERASMO G., 1927. L'*Elephas antiquus* nell'Italia meridionale. *Atti R.Accad.Sc.Fis.Mat.Napoli*, s.2, 17 (11), 1-105.

DE LORENZO G. and D'ERASMO G., 1932. L'Uomo paleolitico e l'*Elephas antiquus* nella valle del Liri. *Rend.R.Accad.Sc.Fis.Mat.Napoli*, s.2, 19 (5), 1-107.

D'ERASMO G., 1949. Nuovi rinvenimenti di pachidermi nella Valle del Liri. *Rend. R.Accad.Sc.Fis.Mat.Napoli*, s.4, 16, 160-168.

D'ERASMO G., 1950. Sopra un teschio di *Bos primigenius Bojanus* recentemente rinvenuto a Pignataro Interamna. *Rend.R.Accad.Sc.Fis.Mat.Napoli*, s.4, 17, 259-262.

D'ERASMO G. and MONCHARMONT ZEI M., 1955. Il cranio giovanile di *Elephas antiquus italicus* di Pignataro Interamna nella Valle del Liri. *Atti Accad.Sc.Fis.Mat.*, s.3, 3 (6), 1-32.

DE RITA D., FUNICIELLO R., ROSSI U. and SPOSATO A., 1983. Structure and evolution of the Sacrofano-Baccano caldera, Sabatini volcanic complex, Rome. *J. Vulcanology and Geothermal Res.*, 17, 219-236.

DEVOTO G., 1965. Lacustrine Pleistocene in the Lower Liri Valley, Southern Latium. *Geologica Rom.*, 4, 291-368.

DUCHADEAU-KERVAZO C. and KERVAZO B., 1983. Confrontation de plusieurs types de courbes climatiques et corrélations avec quelques dépôts du Quaternaire récent. *Bull. Ass. Fr. Et. Quat.*, 1983 (1), 25-38.

DURANTE S., 1973. Segnalazione di un giacimento pleistocenico con Leptobos a Roma. *Quaternaria*, 17, 413-416.

EVERDEN J.F. and CURTIS G.H., 1965. Potassium-Argon Dating of Late Cenozoic Rocks in East Africa and Italy. *Current Anthrop.*, 6 (4), 343-385.

FLORES E., 1895. Catalogo dei Mammiferi fossili dell'Italia centrale. *Atti Accad. Pont. Napoli*, 25 (18), 3-38.

FOLLIERI M., 1979. Late Pleistocene evolution near Rome. *Pollen et Spores*, 21, 135-148.

FOLLIERI M., 1983. Il contributo della paleobotanica alla ricostruzione dell'ambiente dell' uomo di Saccopastore. *In:* A.A.V.V., *L'uomo di Saccopastore e il suo ambiente*, Roma, 16 dicembre 1982 - 3 gennaio 1983, 19-23.

FOLLIERI M. and COCCOLINI G.B.L., 1982. Evoluzione della vegetazione, del clima e biostratigrafia palinologica di un lago del Pleistocene superiore in località Valle Nocchia (Magliano Romano). Contr. conclusivi Carta Neotett. d'It., 513, 7 pp.

FRANK A.H.E., 1969. Pollen stratigraphy of the Lake of Vico (central Italy). *Paleogeogr. Palaeoclim.Palaeoecol.*, 6, 67-85.

GASPARINI P. and ADAMS J.A.S., 1969. K/Ar dating of Italian Plio-Pleistocene volcanic rocks. *Earth Plan.Sc.Lett.*, 6, 225-230.

GIOIA P., 1978-79. *L'Aurignaziano in Italia*. Tesi Laurea in Paletnologia. Ist. Paletn., Roma (inedita).

GIOIA P., in press. Problems related to the origins of Italian Upper Palaeolithic: Uluzzian and Aurignacian. *Actes Coll. Int. "L'Homme de Neandertal"*, 4-7 décembre 1986, Liège.

LEONARDI G. and PETRONIO C., 1974. I cervi pleistocenici del bacino diatomitico di Riano (Roma). *Atti Accad. Naz. Lincei,* Mem., s.8, 109-208.

MALATESTA A., 1978. La serie di Torre in Pietra nel quadro del Pleistocene romano. *Quaternaria*, 20, 537-577.

MALATESTA A., in press. *Geologia delle pianure costiere*. Relazione finale "Progetto Laghi Costieri", Amm. Prov. Latina Ed.

MALATESTA A. and ZARLENGA F., 1986. Evoluzione paleogeografico-strutturale pliopleistocenica del basso bacino romano a Nord e a Sud del F. Tevere. *Prestampe Atti 73° Congr.Soc.Geol.Ite.*, Roma, 30/9-4/10 1986, 47-50.

MALATESTA A. and ZARLENGA F., in press. Cicli trasgressivi medio-pleistocenici sulle coste liguri e tirreniche. *Geologica Rom.*, 24.

MASINI F., 1983. Würmian and Holocene Chamois of Italy. *In:* S. LOVANI, *The biology and management of mountain ungulates*. Croom Helm, 31-44.

MOCHI A., 1912. La succession des industries Paléolithiques et changements de la faune du Pléistocène en Italie. *Arch. Anthrop. Etnol.*, 45 (3-4), Firenze, 328-337.

MUSSI M., 1977-82. Musteriano a denticolati su ciottolo in località S. Andrea di Sabaudia. *Origini*, 11, 45-70.

PALMA DI CESNOLA A., 1984. Il Paleolitico superiore nel Lazio. *Atti XXIV Riun. Scient.I.I.P.P.*, Firenze, 1982, 55-78.

PALMA DI CESNOLA A. and BIETTI A., 1983. Le Gravettien et l'Epigravettien ancien en Italie. *Riv.Sc. Preist.*, 38 (1-2), 181-228.

PALMARELLI A. and PALOMBO M.R., 1983. Un cranio di *Coelodonta antiquitatis* Blumenbach (Rhinocerotidae) del Pleistocene superiore del Monte Circeo (Lazio meridionale). *Boll. Serv. Geol. It.*, 102 (1981), 281-312.

PALMIERI A.M., 1976-77. Sedimentological Study of the Upper Paleolithic Site at Palidoro (Rome, Italy). *Quaternaria*, 19, Roma.

PALOMBO M.R., 1986. Observations sur *Elephas antiquus* Falconer et Cautley du Pléistocène moyen d'Italie: essai d'évaluation des caractères dentaires. *Geologica Rom.*, 23 (1984).

PALOMBO M.R., in press. *Osservazioni suole mammalofaune pleistoceniche della Pianura Pontina.* Relazione Finale "Progetto Laghi Costieri", Amm. Prov. Latina Ed.

PATERNE M., LABEYRIE J., DUPLESSY J.C. and GUICHARD F., 1984. V*ariations climatiques en mer Tyrrhénienne depuis 140.000 ans.* Prép. C.F.R., C.N.R.S., 99190.

PIPERNO M., 1976-77. Analyse du sol moustérien de la Grotte Guattari au Mont Circé. *Quaternaria*, 19, 71-92.

PIPERNO M., 1984. L'Acheuleano e il Musteriano nel Lazio. *Atti XXIV Riun.Scient.I.I.P.P.*, Firenze, 1982, 39-54.

PIPERNO M. and BIDDITTU I., 1978. Studio tipologico ed interpretazione dell'industria acheuleana e

pre-musteriana dei livelli (m e d) di Torre in Pietra. *Quaternaria*, 20, 441-536.

PIPERNO M. and SEGRE A.G., 1984. Saccopastore, Lazio. *In:* A.A.V.V., *I primi abitanti d'Europa*, Roma, marzo-luglio 1984, 207-209.

PITTI C. and RADMILLI A.M., 1984. Castel di Guido, Lazio. *In:* A.A.V.V., *I primi abitanti d'Europa*, Roma, marzo-luglio 1984, 176-179.

RADMILLI A.M., 1974. Gli scavi nella Grotta Polesini a Ponte Lucano di Tivoli e la più antica arte nel Lazio. *Origines*, 117 pp.

SALA B., 1983a. Variation climatique et séquences chronologiques sur la base des variations des associations fauniques à grands mammifères. *Riv.Sc.Preist.*, 38, 161-180.

SALA B., 1983b. La fauna del giacimento di Isernia La Pineta (nota preliminare). *In:* A.A.V.V., *Isernia La Pineta, un accampamento più antico di 700.000 anni*. Calderini, 71-76.

SEGRE A.G., 1949. Tracce di morfologia subaerea sul fondo marino litoraneo del Lazio meridionale. *Historia naturalis*, 3 (1), 24-26.

SEGRE A.G., 1957. Contributo allo studio del Quaternario dell' Agro Pontino: il travertino di Cisterna di Latina. Giacimenti del Paleolitico superiore e del Bronzo. *Quaternaria*, 4, 191-194.

SEGRE A.G., 1982a. Elementi archeologico-preistorici per la definizione del Pleistocene medio in Italia: A) Il più antico Paleolitico d'Italia. *Geogr. Fis.Dinam.Quat.*, 5, 247-248.

SEGRE A.G., 1982b. Elementi archeologico-preistorici per la definizione del Pleistocene medio in Italia: B) Nuovi dati sulla stratigrafia pleistocenica del bacino di Anagni (Frosinone). *Geogr. Fis.Dinam.Quater.*, 5, 248-249.

SEGRE A.G., 1983. Posizione e stratigrafia di Saccopastore. *In:* A.A.V.V., *L'uomo di Saccopastore e il suo ambiente*, Roma 16 dicembre 1982 - 3 gennaio 1983, 11-13.

SEGRE A.G., 1984a. Considerazioni sulla cronostratigrafia del Pleistocene laziale. *Atti XXIV Riun.Scient.I.I.P.P.*, Firenze, 1982, 23-30.

SEGRE A.G., 1984b. Lademagne, Lazio. *In:* A.A.V.V., *I primi abitanti d'Europa*, Roma, marzo-luglio 1984, 167-168.

SEGRE A.G. and BIDDITTU I., 1981. Paleolitico inferiore: le più antiche tracce dell'attività umana nella valle del Sacco. *Quad. Centro Studi Archeol. Etrusco-Ital.*, 5, 26-34.

SEGRE A.G., BIDDITTU I. and CASSOLI P.F., 1984. Il bacino paleolacustre di Sora (Frosinone) e i suoi giacimenti musteriani. *Atti XXIV Riun.Scient.I.I.P.P.*, Firenze, 1982, 149-154.

SEGRE A.G., BIDDITTU I. and PIPERNO M., 1982. Il Paleolitico inferiore nel Lazio, nella Basilicata e in Sicilia. *Atti XXIII Riun.Scient.I.I.P.P.*, Firenze, 1980, 177-206.

SEGRE NALDINI E., 1984. Il Musteriano di grotta della Cava, Sezze Romano (Latina). *Atti XXIV Riun.Scient.I.I.P.P.*, Firenze, 1982, 141-148.

SETTEPASSI F. and VERDEL V., 1965. Continental Quaternary Mollusca of Lower Liri Valley (Southern Latium). *Geologica Rom.*, 4, 369-451.

SHACKLETON N.J. and OPDYKE N.D., 1976. Oxygen isotope and paleomagnetic stratigraphy of Pacific

core V28-239 Late Pliocene to Latest Pleistocene. *In:* CLINE R.M. and HEYS J.D. (Eds.), *Investigations of Late Quaternary Paleo-oceanography and Paleoclimatology*. Géol. Amer. Mem., 145, 449-464.

TASCHINI M., 1960-61. Industrie paleolitiche a Castel Malnome (Roma). *Bull.Paletnol.It.*, 69-70, 207-211.

TASCHINI M., 1967. Il "Protopontiniano" rissiano di Sedia del Diavolo e di Monte delle Gioie (Roma). *Quaternaria*, 9, 301-319.

TASCHINI M., 1970. La grotta Breuil al Monte Circeo. Per una impostazione dello studio del pontiniano. *Origini*, 4, 45-78.

TASCHINI M., 1972. Sur le Paléolithique de la Plaine Pontine (Latium). *Quaternaria*, 16, 203-223.

TASCHINI M., 1979. L'industrie lithique de Grotta Guattari au Mont Circé (Latium): définition culturelle, typologique et chronologique du pontinien. *Quaternaria*, 21, 179-247.

TONGIORGI E., 1939. La flora fossile di Saccopastore, suo significato nella storia della vegetazione nella regione laziale. *Riv. Antropol.*, 32, 237-242.

TOZZI C., 1970. La Grotta di S. Agostino (Gaeta). *Riv. Sc.preist.*, 25, 3-87.

WOILLARD G. and MOOK W.G., 1982. Carbon-14 Dates at Grande Pile: Correlation of land and Sea Chronologies. *Science*, 215 (4529), 159-161.

VITAGLIANO S., 1984. Nota sul Pontiniano della Grotta dei Moscerini, Gaeta (Latina). *Atti XXIV Riun.Scient.I.I.P.P.*, Firenze, 1982, 155-164.

ZAMPETTI D. and MUSSI M., 1983. Structures d'habitat et utilisation du territoire au Paléolithique supérieur dans le Latium (Italie centrale): état de la question. *In:* BERKE H., HAHN J. and KIND C.-J., *Structures d'habitat du Paléolithique supérieur d'Europe*. Verlag Arch.Ven., Inst.Urgeschichte Univ.Tübingen, 69-77.

ZAMPETTI D. and MUSSI M., in press a. La presenza umana nella pianura Pontina durante il Paleolitico medio e superiore. *Convegno "La valle Pontina nell'antichità"*, Cori, 1985.

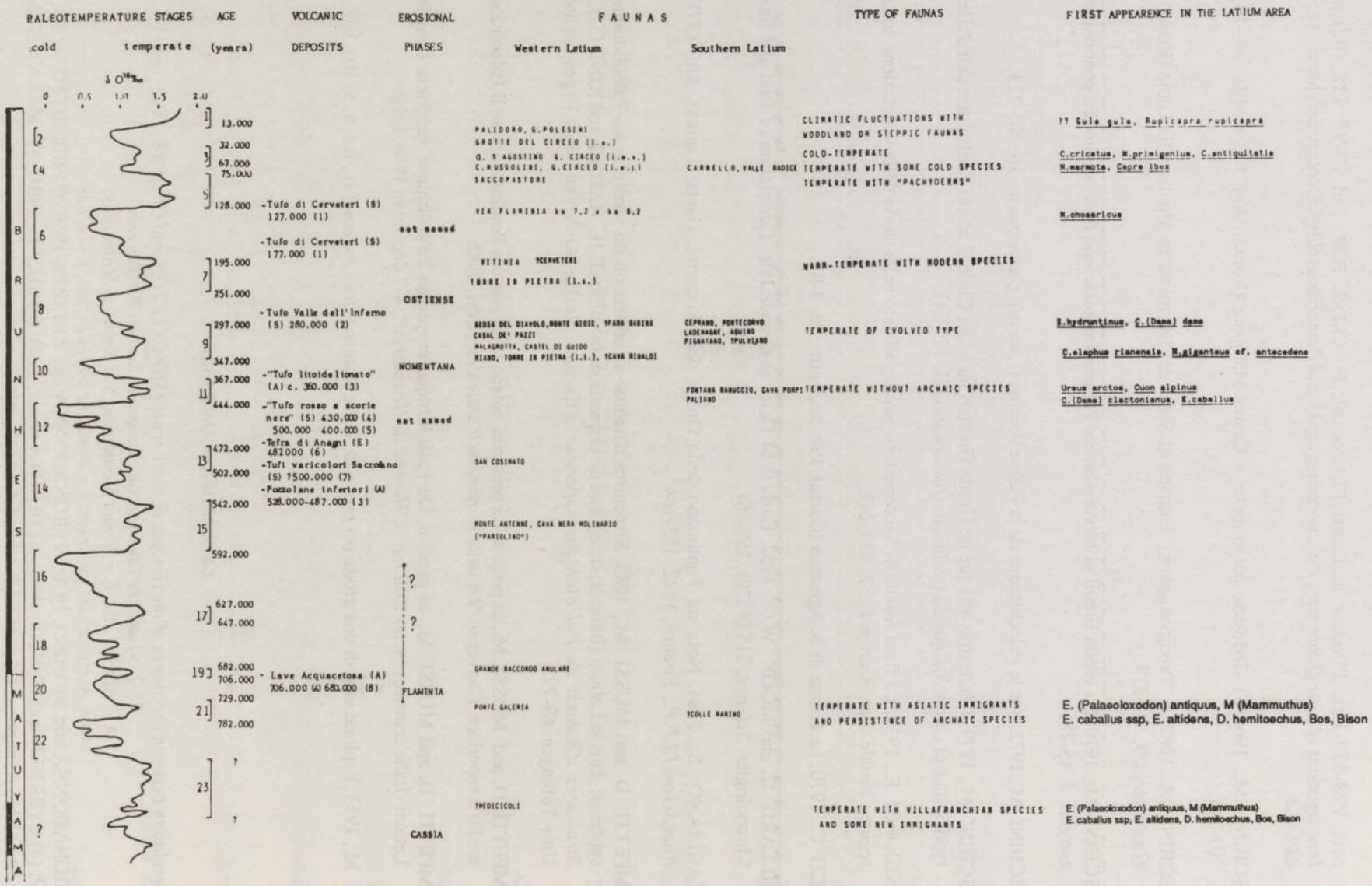
ZAMPETTI D. and MUSSI M., in press b. Du Paléolithique moyen au Paléolithique supérieur dans le Latium (Italie centrale). *Actes Coll.Int. "L'Homme de Neandertal"*, 4-7 décembre 1986, Liège.

ZEI M., 1953. Esplorazione di una grotta nei pressi di Sezze Romano. *Bull.Paletnol.It.*, n.s. 8, 5, 102-107.

EXPLANATION OF TABLE

Correlation between the stages of the isotopic oceanic scale (SHACKLETON and OPDYKE, 1976, core V 28-239) and the faunistic successions in Latium Pleistocene.
A = Alban Hills; E = Ernici Mountains; S = Sabatini Mountains;
a = Aurignacian; i = lower; l = levels; m = Mousterian; s = upper

(1) BONADONNA and BIGAZZI, 1970; (2) BONADONNA and BIGAZZI, 1969; (3) BIDDITTU *et alii*, 1979; (4) EVERDEN and CURTIS, 1965; (5) DE RITA *et alii*, 1983; (6) SEGRE, 1984a; (7) MALATESTA and ZARLENGA, in press; (8) GASPARINI and ADAMS, 1969.


PALEOTEMPERATURE STAGES
cold
temperate
AGE (years)
VOLCANIC DEPOSITS
EROSIONAL PHASES
FAUNAS
Western Latium
Southern Latium
TYPE OF FAUNAS
FIRST APPEARENCE IN THE LATIUM AREA
δ O18‰
0
0.5
1.0
1.5
2.0
BRUNHES
MATUYAMA
13.000
32.000
67.000
75.000
128.000
195.000
251.000
297.000
347.000
367.000
444.000
472.000
502.000
542.000
592.000
627.000
647.000
682.000
706.000
729.000
782.000
-Tufo di Cerveteri (S) 127.000 (1)
-Tufo di Cerveteri (S) 177.000 (1)
-Tufo Valle dell'Inferno (S) 280.000 (2)
-"Tufo litoide lionato" (A) c. 360.000 (3)
-"Tufo rosso a scorie nere" (S) 430.000 (4) 500.000 400.000 (5)
-Tefra di Anagni (E) 482000 (6)
-Tufi varicolori Sacrofano (S) 7500.000 (7)
-Pozzolane inferiori (A) 528.000-487.000 (3)
- Lave Acquacetosa (A) 706.000 (A) 681.000 (8)
not named
OSTIENSE
NOMENTANA
not named
FLAMINIA
CASSIA
PALIDORO, G.POLESINI
GROTTE DEL CIRCEO (I.s.)
G. S AGOSTINO G. CIRCEO (I.s.s.)
C.MUSSOLINI, G.CIRCEO (I.s.i.)
SACCOPASTORE
VIA FLAMINIA ka 7,2 e ka 8,2
VITINIA TCERVETERI
TORRE IN PIETRA (I.s.)
BEDSA DEL DIAVOLO,MONTE GIOIE, TFARA SABINA
CASAL DE' PAZZI
MALAGROTTA, CASTEL DI GUIDO
RIANO, TORRE IN PIETRA (I.i.), TCAVA RIBALDI
SAN COSIMATO
MONTE ANTENNE, CAVA BERA MOLINARIO ("PARIOLINO")
GRANDE RACCORDO ANULARE
PONTE GALERIA
TMEDICICOLI
CARNELLO, VALLE RADICE
CEPRANO, PONTECORVO
LADERAGGE, AQUINO
PIGNATARO, TPULVIANO
FONTANA RANUCCIO, CAVA PONPI
PALIANO
TCOLLE MARINO
CLIMATIC FLUCTUATIONS WITH WOODLAND OR STEPPIC FAUNAS
COLD-TEMPERATE
TEMPERATE WITH SOME COLD SPECIES
TEMPERATE WITH "PACHYDERMS"
WARM-TEMPERATE WITH MODERN SPECIES
TEMPERATE OF EVOLVED TYPE
TEMPERATE WITHOUT ARCHAIC SPECIES
TEMPERATE WITH ASIATIC IMMIGRANTS AND PERSISTENCE OF ARCHAIC SPECIES
TEMPERATE WITH VILLAFRANCHIAN SPECIES AND SOME NEW IMMIGRANTS
?? Gulo gulo, Rupicapra rupicapra
C.cricetus, M.primigenius, C.antiquitatis
M.marmota, Capra ibex
M.ohosaricus
E.hydruntinus, C.(Dama) dama
C.elaphus pianensis, M.giganteus cf. antecedens
Ursus arctos, Cuon alpinus
C.(Dama) clactonianus, E.caballus
E. (Palaeoloxodon) antiquus, M (Mammuthus)
E. caballus ssp, E. altidens, D. hemitoechus, Bos, Bison
E. (Palaeoloxodon) antiquus, M (Mammuthus)
E. caballus ssp, E. altidens, D. hemitoechus, Bos, Bison