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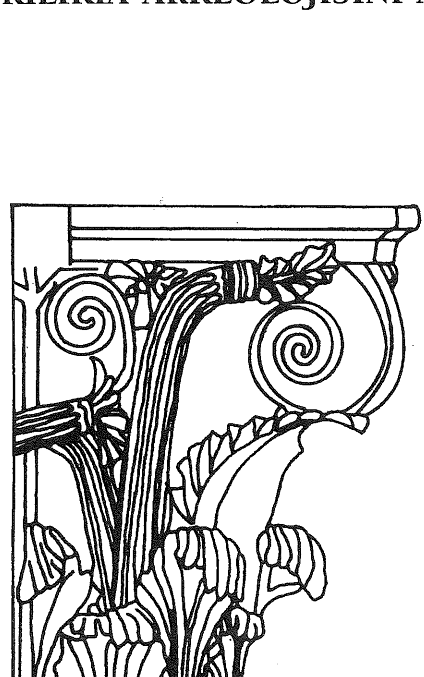

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Serra DURUGÖNÜL
Murat DURUKAN

Correspondance addresses for sending articles to following volumes of Olba:
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Mersin Üniversitesi
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Arkeoloji Bölümü
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e-mail: Kilikia@usa.net

Tel: 0.90 324 361 00 01 (10 hat) / 162
Fax: 0.90 324 361 00 46

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İÇİNDEKİLER

A REVIEW OF THE LATE QUATERNARY HISTORY OF ANATOLIA
(Lev. 76-80)

KAPUR, S[1]., ATALAY, İ[2]., ERNST, F[3]., AKÇA, E[1].,
YETİŞ, C[4].,İŞLER, F[4]., ÖCAL, A. D[5]., ÜZEL, İ[6]., ŞAFAK, Ü[4].

ABSTRACT

Climatic changes of the Quaternary period affected the distribution of plant communities, soil forming processes, karstification, human settlements etc. During the last glacial period the higher parts of the Anatolian mountains were covered by glaciers. Euro-Siberian plants most probably migrated from the northern parts of Anatolia to the Mediterranean region. The present level of the Anatolian lakes was higher. Karstification was induced with red soil formation and some Mediterranean plants shifted to the northern parts the Anatolia. Especially to the coastal belt of the Black Sea region during the interglacial. In addition to these phenomena, towards the end of the last glacial –12.000 to 10.000yr BP-, the Paleolithic man lived in the rocky shelters and/or karstic caves in the Mediterranean region and the hilly parts of southeastern Anatolia. Thus, agricultural settlements were established on the fertile crescent and the receded coastal belt of paleolakes during the period 10.000 to 7.000yr BP.

An attempt is made in this review paper to explain the paleoenvironmental conditions of Anatolia during the period between the last glacial and the early Holocene bringing geomorphological, paleopedological, geological and paleobotanical, archaezoological and archaeological evidences with a holistic interdisciplinary approach.

ANATOLIA TODAY

The Anatolian peninsula has rugged mountains and a high topography with a mean elevation of over 1100m above sea level. Orogenic belts extend both in the north and southern parts with summits over 3000m. These Alpine orogenic belts were deeply cut by the rivers creating great altitudinal differences between the valleys and high parts of the mountains. The elevation difference is more than 2000m between the Çoruh river valley, cutting the northern Anatolian and Kaçkar mountains. The horst-graben system extending in the east-west direction is dominant in the western part of Anatolia. The relative altitude of the isolated

[1] Prof.Dr. S. KAPUR, E. AKÇA, Univ. of Çukurova, Department of Archaeometry, Adana/ TURKEY

[2] Prof.Dr. İ. ATALAY, 9 Eylül Univ, Faculty of Education Department of Geography, Buca, İzmir/ TURKEY

[3] Dr. F. ERNST, Univ. of Çukurova, Research Center of Environment, Adana/ TURKEY

[4] Prof.Dr. C. YETİŞ, Prof.Dr. F. İŞLER, Prof.Dr. Ü. ŞAFAK, Univ. of Çukurova, Department of Geology, Adana/ TURKEY

[5] Öğr.Gör. A.D. ÖCAL, Univ. of Mersin, Department of Archaeology, Mersin/ TURKEY

[6] Prof. Dr. İ. Uzel, Univ. of Çukurova, Fakulty of Dentistry, Adana/ TURKEY

Quaternary volcanic cones rising on the plateau surfaces such as Erciyes, Süphan and Ararat varies from 3000 to 4000m. On the other hand, there are tectonic corridors crossing the orogenic belts.

Paleozoic rocks are found in the Menderes massif west of Anatolia, Bitlis massif east of the Taurids and northwestern part of Anatolia and Thrace. The geological structure of the northern Anatolian mountains are made of Mesozoic flysch and volcano-sedimentary rocks deposited in the Tethys ocean. Granitic masses occur in the eastern part of the Black Sea mountains. The middle and western parts of the karstic Taurids are composed of Mesozoic and Tertiary limestones. Volcanic and volcano-sedimentary formations are widespread in eastern Anatolia. Neogene lake deposits of alternating layers of clay, clayey limestones and marl are common within the tectonic basins and/or corridors of the inner and western parts.

Three main climatic types prevail in Anatolia. The northern part is under the effects of the oceanic climate. The mean annual precipitation is over 1000mm increasing to 2000mm on the slopes facing north in the eastern Black Sea mountains. The rainy season covers most of the year. The different kinds of deciduous forest formations composed of *Fagus orientalis, Tilia rubra, Tilia tomentosa, Alnus glutinosa sub-sp. barbata, Acer campestre, Fraxinus ornus, Castanea sativa, Carppinus betulus* and *Carppinus orientalis* are widespread on the coastal belt of the Black Sea rising up to 1000m. A cold and humid climate is dominant on the high parts of the mountains. Coniferous forests including *Picea orientalis, Pinus sylvestris* and *Abies nordmanniana* are dominant.

The Mediterranean climate influences the western and southern parts of Anatolia with a mean annual precipitation more than the other countries of the Mediterranean region. Evergreen xerophytes are widespread at places where *Pinus brutia* forests were completely destroyed (remaining only as climax communities) and succeeded by maquis communities ie. the secondary vegetation of Anatolia. The oro-Mediterranean region and/or upper part of the mountainous areas are covered by the coniferous forests composed of *Cedrus libani, Pinus nigra* and *Abies cilicica*. A dry continental climate prevails in central Anatolia, with most of the precipitation falling during the winter and spring. Hot and dry summers are dominant in southeastern Anatolia causing a high water deficiency. The lower parts of the inner regions are covered by steppic vegetation, whereas higher parts of the area are suitable for the growth of oak (*Quercus species*) forests.

Geographic location, topographic properties, exposition and altitudinal differences along with continentality bring about the different natural environmental conditions. Topographical conditions are responsible for differences in the climate and vegetation types of the same geographical region. Climatic conditions are different in the deeply cut valleys and the tectonic corridors extending to the inner parts of the Black Sea, along with the mountainous areas and the coastal belt of the Black Sea region.

The natural environment and/or landscapes of Anatolia were changed or shifted by the climatic changes of the Pleistocene and Early Holocene. The distribution of natural vegetation, soil forming processes, agents forming the topography along with the activities and the settlements of the inhabitants of Anatolia were probably affected to a great extent by these climatic variations. Thus, the Anatolian peninsula witnessed the climatic changes in terms of different properties of landscape cultures.

The Quaternary (Fig. 1) in terms of geology is a period of two million years, which comprises landmark events, partly influenced by the human impact, such as the development of and changes in mudflows, calcretes, the karst, soils, lakes and vegetation. However, the man to environment relations brings this time span down to 15.000yr BP which is the period from the last glacial to the present ie. the warming up period of the earth. In fact this period specifically began from the Neolithic and continuos to the present (the last 8.500 to 5.500 years). This means that at man's advent the physical environment was suitable for his biological necessities along his mental development and should be dealt with numerous concepts of social and earth sciences. A good example for this is the study undertaken in the famous ceramic center –the İznik region south of the Marmara Sea, west Anatolia-, on the settlement criteria of the Ilıpınar tumulus, west of Orhangazi dating back to 7.800yr BP, which mainly depend on tectonic phenomena (Kayan, 1993).

Mudflows-Calcretes and Soil Formation

Mudflows occur most frequently in environments that provide an abundant source of incoherent fine grained rock debris and soil materials, steep slopes, large but intermittent sources of water and sparse vegetation. In presently arid and semi-arid regions mudflows usually accompany periods of intense widespread rainfall or local cloud bursts. Whereas, mudflows of the Pleistocene pluvials were most probably more vigorous, developing to calcretes underlying soils of varying leaching and erosion levels (Kapur et al., 1990). These are the residual Red Mediterranean soils (Terra Rossa) which include Entisols, Inceptisols, Mollisols and Alfisols of the Keys to Soil Taxonomy (Soil Survey Staff-USDA, 1998), later eroded at different magnitudes.

Karstification

Karstification may have intensified during the interglacial or interglacials due to melting of the glaciers. The cold water of the glaciers most probably dissolved limestones enhancing canyon formation together with the ground water drainage systems in the Taurids during the glacial period. The lapiés formed following these processes are destroyed by past and present freezing and thawing. The terra rossa developing in/on the karstic landscape of the Miocene and older marine limestones, are transported in vertical and/or oblique directions (cracks) along the lapiés due to widening by dissolution of $CaCO_3$ (Atalay, 1997) deposited as argillans on mineral and/or structural unit surfaces.

According to earlier assumptions terra rossas were considered merely to be residual soils-paleosols formed by the weathering of the insoluble residue of limestones with ages varying from the Cretaceous to the Miocene (Montarlot, 1944; Hızalan, 1953; Yaalon, 1959; Smolikova, 1963; Ravikovitch, 1967; Rousset, 1967; Lamouroux and Segalen, 1969; Bronger, 1976; Zeidenberg et al. 1982; Bronger et al. (1983) and Cangir et al. 1984). However, studies conducted by Yaalon and Ganor (1973, 1975 and 1979), Verheye et al. (1973), Mermut et al. (1976), Alaily (1977), Macleod (1980), Jackson et al. (1981), Kapur et al. (1993), Kubilay et al. (1997), Yaalon (1997) and Kapur et al. (1998) advocate enrichment of terra rossa by addition of aeolian material from North Africa-the Sahara- and the Arabian Peninsula which is still going on today, with a striking episode of $50g/m^2$ dust fall to Adana in 16 March, 1998, since some 5.000.000 years when the Sahara became desert as stated by Yaalon (1997). Danin and Gerson (1983) protagonists of the aeolian enrichment calculated that it would take 200.000 years for a terra rossa soil of the thickness of those near Jerusalem to accumulate by the dissolution and the weathering of 20m of limestone. Cangir et al. (1979) also state that calcic horizons of Central Anatolia formed from leaching of carbonate rich materials transported by periodical aeolian action. This theory seems to have merit primarily because the amounts of the acid insoluble residues of the west, south and southesatern Anatolian marine limestones of the Miocene alike limestones elsewhere (Nihlen and Solyom, 1986; Nihlen, 1990, Pye, 1992), are very low and vary from 0.01 to 3% by weight (Özbek et al. 1976; Karaman and Kapur, 1993) and the fact that aeolian additions have been taking place in Anatolia and the Levant in the last 150.000 years (Yaalon, 1997) (Fig. 1). Studies conducted by Ganor and Mamane (1982), Ganor (1990), Dayan (1986), Dayan et al. (1990) and Ganor et al. (1992), following the pioneering works of Singer (1967), Dan and Yaalon (1968), Yaalon and Lomas (1970) and Jackson et al. (1971, 1972) on the clay mineral contents of the aeolian materials of the eastern Mediterranean have also sought to explain the addition of red-reddish brown to yellowish brown clay, silt and very fine sand size materials from the Sahara and dispute the insoluble residue theory for the development of terra rossas.

Vegetation and Lakes

During the period of c.18.000-15.000yr BP the sea level was lowered 90-95 m from it's present level (Kraft et al., 1980). Thus, most part of the continental shelf of Marmara and the Aegean sea were converted into land. The existence of submerged river channels, deltaic and continental deposits clearly reflect the lowering of the sea level.

During the Last interglacial, the closed basins of Anatolia were occupied by lakes. The largest one is Lake Konya. The depth of the lake was estimated to be 15 to 30 m and the length 90-100 km (Erol, 1978, 1979; Roberts et al., 1979). The present levels of the lakes which occupy the closed basins were raised. The differences between the present and the Last interglacial levels are 70-72 m in Lake Van (Degens and Kurtman, 1976), 114-115 m in Lake Tuz, 35 m in Acıgöl (Erinç, 1967), 140-145 m in Lake Burdur (Cohen and Erol, 1969), 35 m in Lake Akşehir and 42 m in Lake Eber (Atalay, 1975).

According to Roberts et al. (1979), the last major phase of high lake levels in the Konya basin occurred between 23.000 and 17.000yr BP. The lake probably existed before this period, but was at a lower level. On the other hand, after 17.000yr BP, during the late glacial stage, the basin seems to have been largely dry.

The period dating back to at least 15.000yr BP is the phase of the receding of paleolakes. During the Last interglacial the levels of the lakes that occupied closed basins were raised about 10 m to 100 m from the present levels, and at the end of the Last glacial the sea level was lowered 95 to 100m compared to their present level, due to the prevailing cold and dry climatic conditions. Moreover, the mountainous areas that are higher than 2200 m in western Anatolia and 2500 m in eastern Anatolia were occupied by glaciers and snow fields.

At the beginning of the Early Holocene (11.000-12.000yr BP) there was a rise in temperature, causing the lakes of the closed basins of Anatolia to recede. A minor readvance, in isolated secondary depressions may have been caused by glacial melt water and by over flows from a higher lake system in the Beyşehir-Suğla basin.

The vegetation cover, according to pollen cores obtained from marsh and lake sediments, points to the climatic changes and past environmental conditions. During the Würmian period, most parts of the Near East, including Anatolia was mostly covered by steppe and desert type vegetation due to the cold and arid climate. A pollen diagram prepared for Lake Zeribar (van Zeist and Bottema, 1988; 1991), Western Iran, reflects predominantly open vegetation, viz. steppe or desert-steppe in which Artemisia, Chenopodiaceace and Umbelliferae were dominant. Scattered tree stands occurred in the Zeribar area in the period from 40.000yr BP to about 35.000yr BP.

The Ghab pollen evidence obtained from sediment cores in the Ghab valley (northern Syria), covered a period from 50.000 to 11.000yr BP, showing considerable changes in terms of vegetation cover. In the Late Pleistocene, the vegetation pattern of northwest Syria underwent marked changes. During these periods dominant forests were replaced by steppe vegetation. Between 11.000 and

10.000yr BP this forest vegetation must have expanded rapidly in northwestern Syria. The increase in trees was accounted for not only by oak, but various other taxa became important constituents of the forest cover. The pollen evidence suggests that the forest vegetation reached its greatest expansion in the Early Holocene, in the period of 10.000 to 8.000yr BP (van Zeist and Bottema, 1988; 1991).

According to some data given above, the climatic changes in the period from 50.000 to 14.000yr BP, coincide with the Pleniglacial of European Würm-glacial chronology, revealing much lower temperatures than today. During this period it was not only colder, but the pollen evidence suggests that it must also have been drier than the present.

In the period 23.000 to 16.000yr BP, the temperature dropped to a minimum. The reduced temperatures most probably caused an abrupt drop of the upper forest line. Although the number of pollen diagrams for this time period is quite low compared to the following periods their evidence suggests that dryness, at least as much as low temperature, must have been a limiting factor for tree growth. Dry steppe vegetation with *Artemisia* and *Chenopodiaceae* were of much greater extent than at present. The mountainous areas that are higher than 2200 m in western Anatolia and 2500 m in eastern Anatolia were occupied by glaciers and snow fields. Assuming occurrence of a subalpine vegetation zone extending over an elevation range of about 1000 m, points to one presence of a limited area left for tree growth in South Anatolia (Fig. 2). Thus in the central and eastern parts of Anatolia, the steppe and desert-steppe became the dominant natural vegetation, but the coastal belt of Anatolia and especially the lower south-facing slopes of the Taurus Mountains were probably covered by forest vegetation. Pine forests, composed of scotch pine (*Pinus sylvestris*) and some oriental spruce (*Picea orientalis*) must have shifted down the coastal belt of the Black Sea. Some Euro-Siberian plants on the other hand, expanded on the upper section of the mountainous regions at some sheltered places of the subalpine zone, in the central and the eastern parts of Anatolia (Atalay, 1983, 1989a, 1992b). For Example, Betula was shifted as far as the lower subalpine zone of the Anatolian mountains. The present day Betula species and/or communities are found on the higher parts of Mount Ararat, Munzur and Nemrut and the eastern sections of the Black Sea or Northern Anatolian Mountains (Atalay, 1983; 1991 and 1992a). Mediterranean elements could only survive at some well-sheltered locations along the Aegean and Mediterranean coast not representable on the map at this scale.

The areas covering the lower parts of southeastern Anatolia and the fertile crescent of Mesopotamia have had a more humid and hotter climate than other parts of Anatolia. In addition to this, today, trees and/or oak forests, are widespread in the higher parts of Syria, Lebanon and Palestine. This indicates that a comparatively significant tree growth must have occurred in western Syria, Lebanon and Palestine from 18.000 to 16.000yr BP (van Zeist et al.,1978; Bottema, 1987; van Zeist and Bottema, 1988; 1991).

Temperatures increased markedly in the Late glacial, in the period from 14.000 to 10.000yr BP, which coincides with the Late glacial of the Würm-glacial chronology. During the period from 12.000 to 11.000yr BP, summer temperatures were only 2-3º C lower than at present.

The Late glacial increase in temperature brought about a higher rate of evaporation. In most Near Eastern areas, the increase in evaporation was not compensated by an increase in precipitation. As a result, it became drier as is also suggested by the pollen evidence from the Ghab and Söğüt, with maximum herbaceous pollen values in the Late glacial section. At the Zeribar in western Iran, the arid conditions of the Pleniglacial continued in the Late glacial. On the other hand, the Huleh pollen record in northern Israel points to an expansion of forest in Late glacial times, implying an increase in humidity.

Tree growth occurred largely in the mountainous areas of Anatolia. A pollen diagram prepared for a sediment core from Lake Van in southeastern Turkey points to steppes with scattered oak (Quercus) and birch (Betula) in the area. The deciduous forests must have expanded in the period 12.000 to 11.000yr BP on the coastal lowland and the rear section of the Black Sea, whereas a steppe with tree stands must have occurred in the northwestern parts of Anatolia. The pollen data of Lake Söğüt, located in the tectonic-karstic depression of the lake region of southwestern Anatolia and Akgöl (southern section of Central Anatolia), point to the expansion of open woodlands with Pinus and Quercus (van Zeist et al., 1978).

The period between 11.000 and 10.000yr BP, coincides with the Late Dryas. Forest vegetation must have expanded rapidly in northwestern Syria due to the increase in humidity. But the pollen records suggest steppe and desert-steppe vegetation in and around the Konya basin. The herb pollen belonging to 13.000 and 11.000yr BP, points to arid climatic conditions during the greater part of the Late glacial. The Konya basin and the surrounding areas were almost completely devoid of trees due to dryness at this period.

It can be stated that cold and dry climatic conditions prevailed during the glacial periods and that a hot and somewhat humid climate was dominant during the interglacials with pollens indicating (obtained from İzmit Bay-W. Anatolia) the presence of Pinus, Quercus, and Abies species.

Pollen diagrams obtained from several parts of the Anatolian peninsula revealed slight changes in paleoclimatic-paleoenvironmental conditions in the period between 10.000 yr. BP and present. Lake Söğüt's pollen diagram suggests an alternating expansion of steppe and forest vegetation in intramontane depressions, at an elevation of ca. 1400 m in the Western Taurus. Radiocarbon-dated levels revealed gradual increases of tree pollen percentages from 9.180yr BP onwards. The large proportions of oak and juniper in the forest vegetation and relatively high herb pollen values suggest that the past climate was drier than the present and about 3.000 years ago the pine became the dominant tree.

A pollen diagram of Lake Tuz (İnceoğlu and Pehlivan, 1987) makes the presence of scattered Pinus and Quercus trees in the Central Anatolian steppe most likely after 6.000yr BP. The climate was less dry and hot in zones A and B corresponding to the period between 6.000yr BP and 3.000yr BP than at present. This can be concluded from the high proportion of arboral pollen (up to 50%) in the diagram with Quercus being the most important taxon about 4.000yr BP (Fig. 3). This means that during this period Central Anatolia consisted at least of open woodland even at its driest parts. Research results on Neolithic sites support the idea that the fauna represented depended heavily on forest vegetation (French et al. 1972, Perkins 1969).

According to the Lake Abant (1300 m northwestern Turkey) pollen diagram, located in the coniferous forest zone, the Late glacial high herbaceous pollen percentages consist primarily of *Artemisia* and other *Compositae. Pinus, Juniperus, Betula* and *Cedrus* are also represented. Towards the final phase of the Late glacial (10.430yr BP), forests composed of *Betula, Abies, Carpinus* and *Quercus* expanded, whereas the steppe vegetation did not disappear. In the Early Holocene, the climatic conditions of the Abant area were favorable for forest vegetation (van Zeist and Bottema 1988, 1991). Besides, the presence of Olea pollen, indicates slightly higher temperatures than today. A pollen study carried out at Ağaçbağ (Sürmene) at an elevation of 1887m, in the southern section of Trabzon, and in the Eastern Black Sea Mountain range, reveals the climatic changes from 9.000yr BP to the present (Aytuğ et al., 1975). In the period from 9.000 to 7.000yr BP *Picea orientalis* and *Pinus sylvestris* were dominant, suggesting a cold and wet climate (Fig. 3). *Castanea sativa* dominated between 7.000-4.000yr BP, whereas the other leading tree species were *Pinus sylvestris, Abies nordmanniana, Ulmus sp.,* and *Fagus orientalis*, all characterizing a subhumid-cold climate. This period was replaced by a humid-cool climate represented by dominant *Castanea sativa.* In the last period ranging between 2.000yr BP and the present, the temperature decreased again, and under the cold and humid climatic conditions *Picea orientalis* and *Pinus sylvestris* dominated the Ağaçbaşı (N. Anatolia) area. These climatic changes determined the plant species and the structure of the forests. Especially deciduous and coniferous tree compositions reveal the existence of frequent climatic changes during the Holocene period. Namely, the remnants of *Pinus sylvestris* communities which, are seen on the coastal belt of the Black Sea, clearly shows the cold and humid climate which had prevailed during the Early Holocene and the Last glacial. On the other hand, the Mediterranean species such as *Arbutus andrachne, A. unedo, Olea europea, Pistacia terebinthus, Phillyrea latifolia, Mrytus communis, Pinus brutia* and *Cedrus libani* (Niksar area, in the backward section of the Middle Black Sea region) are found on the Black Sea coast in deeply incised valleys and on the slopes facing south, pointing to a past prevailing climate resembling the present Mediterranean (Atalay,1983; 1987a,b; 1991; 1992a and 1992b).

The radiocarbon dating of about 8.000yr BP may suggest that, already in the Early Holocene, the present day climatic conditions had been established. The expansion of the pine may have taken place later than 8000yr BP, due to increasing humidity. Because of these facts it seemed reasonable to reconstruct the vegetation maps in Figures 2 and 3 referring to the map of the potential natural vegetation from Akman and Ketenoğlu (1986). Yet, regarding the retarded readvance of woodlands into the Central Anatolian steppe as visible in the comparable pollen diagrams of Lake Söğüt, Karamık and Pınarbaşı (van Zeist and Woldring, 1978) revealing a probable forest boundary development taking place 2.000 years later.

For the end of the last glacial a clear relation exists between the distribution of different plant formation types and that of human settlements. The cave and the open site settlements mostly appeared in Lebanon, Syria and rarely on the undulating parts of southeastern Anatolia. Man preferred to settle within the zone where forests and woodlands met the open steppes. The forests hosted a wide range of game and provided wood for construction and heating. And it were some plants of at the steppe vegetation that enabled man to settle down permanently: the predecessors of *Triticum aestivum*.

The Human Impact and the Early Holocene

According to Esin's studies on Anatolia and Southern Europe (1979, 1981) the Early Holocene in respect to the human impact is classified as 1) the gathering stage (10.500yr BP) and 2) the transitional production periods in terms of pollen and archaeological data. The most important transitional events of this period are the establishment of the settlement sites, cultivation of cereals and legumes, and domestication.

The first cave settlements of Anatolia were generally centered in the western Taurids, especially in the western parts of the Antalya gulf and coastal belt of the Mediterranean. The artifacts obtained from Beldibi, Öküzini, Belbaşı, caves indicate the existence of a food gathering stage and an intensified food-collecting era. This period covers at least an era of 11.000 to 10.000yr BP. The bones of bos, equus, wild goat and deer were found in the caves and their near vicinity (Esin, 1981). After the cave settlements and/or the food gathering stage the first villages or agricultural settlements were established on the fertile crescent encircling the foot edge of the southeastern Taurids (Mellaart, 1965; 1975; 1978; Çambel and Braidwood, 1980). The best example may be given from Çayönü, southeast Anatolia in the period from 9.800 to 7.600yr BP, according to ^{14}C. Sheep (*Ovis orientalis anatolica*), goat (*Capra aegagrus*), cow (*Bos primigenisus*) and boar

(*Sus scrofa*) were domesticated (Çambel and Braidwood, 1980) and emmer, barley, pea, lentil, vetch and einkorn were cultivated. Almond, acorn and pistachio were gathered from the wild, while dwellers used tools made of copper.

In Central Anatolia, the first and most prominent village settlements were established on the areas that coincide with the receded glacial and post glacial lake bottoms and their shores. Neolithic Hacılar was located near Lake Burdur, Suberde near Lake Suğla, Erbaba on the coastal belt of Lake Beyşehir, Alacahöyük and Can Hasan were settled near the bottom lands of the old Konya-Ereğli lake. As a general rule these areas were/are suitable both for the establishment of settlements and farming activities (Mellaart, 1975; 1978).

Hacılar: The earliest aceramic agricultural settlement (8740+180 to 7380+250yr BP) is located 25 km west of Burdur (SW. Anatolia). Dry farming was practised with concentration on two row hulled barley and some emmer wheat and lentil along with wild eincorn and naked barley. The animal bones indicate the existence of sheep/goat cattle and red deer.

Suberde: This is a second aceramic site, covering an acre of land in the 9th millenium (8316+300 to 7947+88yr BP) on a rocky knoll beside Lake Suğla in the north section of the Taurids. A series of radiocarbon dates show that the site was settled in the second half of the 7th millenium, a little later than aceramic Hacılar. Dogs were also butchered on this site.

Can Hasan III: This settlement is found 13km northeast of Karaman (S. Anatolia) and it was settled immediately after the recession of Lake Konya. According to ^{14}C, the Can Hasan settlement survived between 6872+78 and 6710+76yr BP. Some species of eincorn wheat (*Triticum boeticum spp. aeogilopodies* and *Triticum thaoudar*) and emmer wheat (*Tr. dicoccum*), bread-wheat (*Tr. aestivum, Tr. aestivo-compactum*), durum wheat (*Tr. durum*), rye (*Secale cereale cp. ssp. segetale*), barley (*Hordeum distichum* and *H. vulagre var. rudum*), lentil (*Lens cf. culnaris*), vetch *(vicia ervilia V. cf. sativa*) were cultivated. Wild grape (*Vitis sylvestris*), Prunus and Crataegus also occurred in the area.

The animal bones showed that no species dominated numerically, but cattle (*Bos*) was the important meat animal, followed by sheep/goat (*Ovia/Carpa*), onager (*Equus hemionus*) and pig (*Sus scrofa*) were fairly common, red and roe deer (*Cervus elaphous*) were also present besides hare (*Lepus*) and two species of canids. It has not yet been established whether any of these animals were domesticated, but it would not be surprising to find them so, at this period.

The Aşıklı, aceramic Hacılar, Suberde and Can Hasan (III) sites had already fully agricultural communities in the 7th millenium, in spite of the wild morphology of the animal remains excavated, whereas the fully, Neolithic cultures most probably reached Crete and Greece (Knossos, Franchthi etc) by the end of the 7th millenium B.C.

Çatal Höyük: Çatal Höyük (980m) is the largest known Neolithic site in the Near East (Southern-Central Anatolia). The economy of Çatal Höyük was based on simple irrigated agriculture and cattle breeding, trade and industry. A preliminary study of crops shows that domestic emmer, eincorn, bread-wheat and six-row naked barley were grown. The latter two cereals being hybrids had developed as important food crops. Moreover vegetable fats were obtained from the seeds of crucifers, acorns, pistachios and almonds. Other fruits included crab-apple juniper berries, hackberry and capers.

Wild sheep occurred widely whereas goats, not an inhabitant of the alluvial plain, were rare. Domestic cattle provided the people of Çatal Höyük with more than 90 % of their meat, as well as transport. The domestication of cattle is reflected in the bull games. In addition to these, onager, half-ass, boar, red, roe and fallow deer, bear, wolf and feline-lion or leopard were hunted, some for their skins, others no doubt to provide a change from beef. There are bones of mice and shrews, pests rather than food, fresh-water fish, birds and eggshells.

Compared to other cultures, Çatal Höyük's specialities were wheat rather than barley, cattle rather than sheep and goat (Northern Mesopotamia) or goat (Zagros and the Levant). Conservative estimates suggest that in its heyday Çatal Höyük may have comprised a thousand houses, with a population of 5.000–6.000. This culture had survived between 8.200–7.400yr BP according to ^{14}C (Mellaart, 1975).

The Anatolian people lived in rocky shelters and hunted wild animals especially in Antalya-Beldibi, Belbaşı, Öküzini, Karain, Çarkini and the coastal belt of Mediterranean – the karstic lands – in the era covering the end of the Last glacial phase and the beginning of the Holocene (13.000–11.000yr BP). However, the first agricultural settlements (Neolithic) were on the somewhat higher areas encircling the fertile crescent, such as the Çayönü, Biriş cemeteries and Söğüt fields, found on the Southern and Southeastern parts of the Taurids. According to Çambel and Braidwood (1980), the ^{14}C results of the first aceramic village settlements of Çayönü were of 9.200–8.700yr BP. Volcanic areas of Late Neolithic (Tepecik) and Early Chalcolithic (Tülintepe) located at east of Elazığ (E. Anatolia) reveal ages of 7.000– 5.000 yr. BP and 6.000–3.000yr BP respectively by obsidian hydration and ^{14}C (Göksu et al. 1981; Esin, 1981; Dereli, 1983; Yeğingil, 1983). The thermoluminescence (TL) ages of the ceramic shards obtained from the four tumuli discovered in the Late Neolithic–Early Bronze age İkiztepe site (Early Hittite) in Samsun-Bafra (N. Anatolia) are from 7.000 to 3.000yr BP (Alkim, 1981). Clay coatings (illuviated and deposited clay size minerals in sediment/soils), which are indicators of Pleistocene paleoclimatic fluctuations, were determined in a 7.000yr BP old shard of the İkiztepe site contradicting the assumptions on the uniformity of the Holocene climate. Other agricultural settlements belonging to the Neolithic were established on the emerged land and/or lake bottoms and near the lakes after the receding of the previous, which had formed during the last glacial, and Neolithic Süberde was near Lake Suğla, Erbaba on the east coast of lake Beyşehir and Hacılar west of Burdur. Can Hasan and Çatal Höyük were located on the southern edge of old Lake Konya. The fruits of the early civilisation were grown in these areas ie. the bottoms and the marginal lands of the old lakes can be considered to be the cradle of the Anatolian civilisation. Most of the wild animals such as sheep, goat, cattle were domesticated and the wild species of cereals and grains were cultivated in these settlements. The existence of wild sheep, goat, cattle, pig, deer, ibex etc. indicates the dominance of steppe-forest on the plain surfaces and on the edge of the mountains. The influence of suitable geomorphology ie. the suitable landscape for agriculture and settlement is undeniable on prehistoric and historic societies, namely in İkiztepe-Samsun, Çanakkale-Troy, Küçükmenderes-Ephesus, Büyükmenderes-Miletus, the Orontes delta Seleukeia Pieria, the Euphrates valley near Malatya-Değirmentepe, İmikuşağı and Şemsiyetepe near Adıyaman-Samsat and Çayönü-S. E. Anatolia. All these sites are still the most highly inhabited areas of modern Turkey, built on fertile alluvial and soils developed on basalts (Göksu and Kapur, 1982) located in the Aegean and northern parts of the fertile crescent ie Southeastern Anatolia. The contrast in geomorphological stability between the two adjacent sites of Çayönü and Değirmentepe makes the former more interesting to study for Quaternary landscape-settlement relationships (which have been stable since the Pleistocene), the unstable Quaternary events of the Euphrates seem to be a drawback for Değirmentepe. Similarly the beginning of the ancient industry depended mainly on the existence of raw material source sites and their exploitability. These were the main ceramic centers of Mesopotamia and Çatal Höyük.

The present climate began to dominate Anatolia and adjacent areas with the Mediterranean influence after about 8.000yr BP. The upper limit of somewhat a uniform climate was determined to prevail around 5.500yr BP by van Zeist et al. (1968) for Southeast Anatolia and 2.100yr BP for the Near East (Butzer, 1972). During the period 4.000–5.000yr BP, the climate of Central Anatolia was somewhat moister with a greater expansion of steppe forest than that of today. Unfortunately natural vegetation of steppe forests of Central Anatolia has been gradually decreased by the interference of human activity. Thus, the antropogenous steppe is widespread in semiarid Central, East and Southeastern Anatolia. Slight changes in the climate have probably occurred from ca. 1.450 to 1.850 AD as the Little Ice Age with higher rainfall in the former and weak glacier surges in the latter (Montgomery, 1992). The most recent climate change in the Near East according to Butzer (1972) was probably the gradual decrease of winter temperatures after 650 AD and the decrease of rainfall by 1 to 15% since 1900 AD. Besançon (1978) mentions the effect of the pluvials/glacials on the formation of the Holocene terraces of the Orontes river in Western Syria documenting recent climatic changes in the Near East with abundant archaeological evidence. Courty (1998) stated the occurrence of a third millenium catastrophe for Syria which was identified as an abrupt climate change dated at 2.200 BC most probably synchronous to a volcanic event which most probably has initiated the collapse of Akkadian Empire.

A multidisciplinary study of the Last Glacial – Early Holocene (ca. 7.000–3.000yr BP) fluviatile deposits –conglomerates (Pre-wurmian terraces) of the Nizip Basin (S. Anatolia)- documents the discovery of Paleolithic hand tools made of flint pertaining to the Acheulian and Upper Acheulian (Fig. 4 and 5). The source of flint present on the older river terraces of the Euphrates was determined to be of both geological and pedological origin. The red coatings on some of the flint implements was attributed to the presence of hydromorphic soil at the time of their development. Hydromorphic soils are presently extinct in the area pointing to a probable wetter climate of the Pleistocene with higher precipitation (pluvials) than today (Sanlaville, 1979; Minzoni-Déroche, 1987).

LIST OF FIGURES

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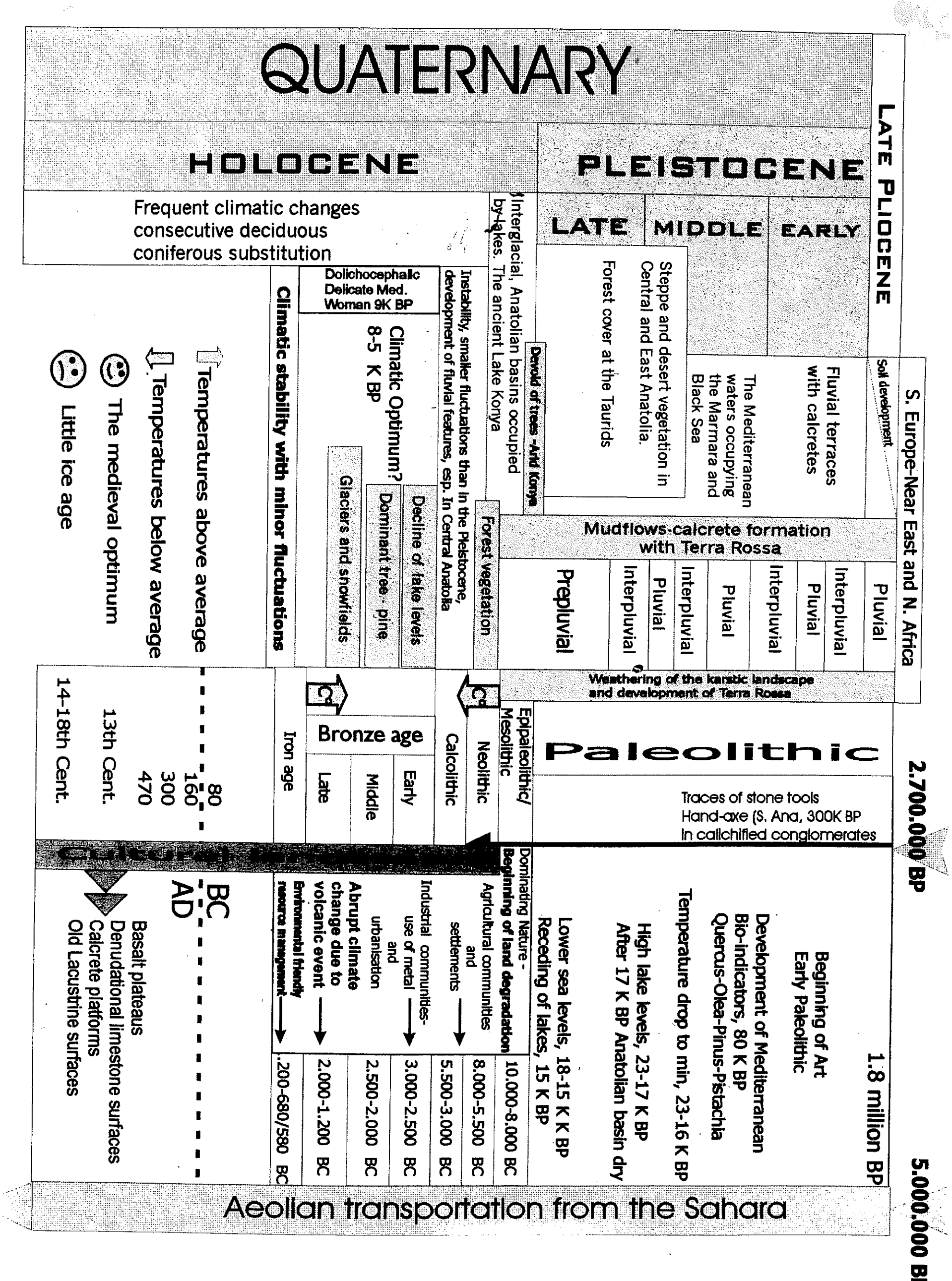
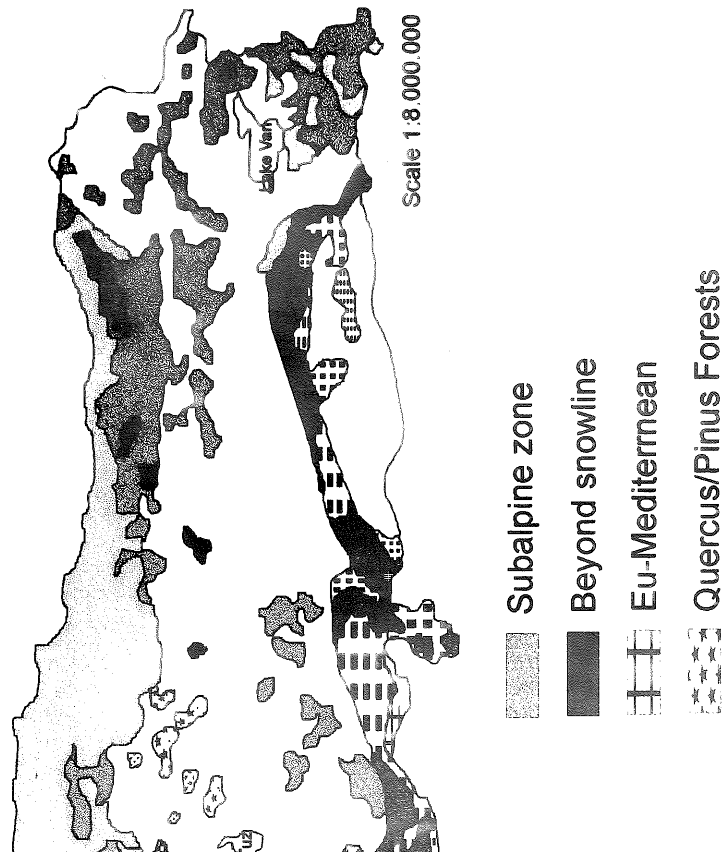

QUATERNARY
HOLOCENE
PLEISTOCENE
LATE PLIOCENE
LATE
MIDDLE
EARLY
Frequent climatic changes consecutive deciduous coniferous substitution
Interglacial, Anatolian basins occupied by lakes. The ancient Lake Konya
Steppe and desert vegetation in Central and East Anatolia.
Forest cover at the Taurids
The Mediterranean waters occupying the Marmara and Black Sea
Fluvial terraces with calcretes
Soil development
S. Europe-Near East and N. Africa
Dolichocephalic Delicate Med. Woman 9K BP
Climatic Optimum? 8-5 K BP
Instability, smaller fluctuations than in the Pleistocene, development of fluvial features, esp. In Central Anatolia
Devoid of trees -Arid Konya
Forest vegetation
Decline of lake levels
Dominant tree - pine
Glaciers and snowfields
Climatic stability with minor fluctuations
Temperatures above average
Temperatures below average
The medieval optimum
Little ice age
Mudflows-calcrete formation with Terra Rossa
Prepluvial
Interpluvial
Pluvial
Interpluvial
Pluvial
Interpluvial
Pluvial
Interpluvial
Pluvial
Weathering of the karstic landscape and development of Terra Rossa
Epipaleolithic/ Mesolithic
Neolithic
Calcolithic
Bronze age
Early
Middle
Late
Iron age
80
160
300
470
13th Cent.
14-18th Cent.
Paleolithic
Traces of stone tools
Hand-axe (S. Ana, 300K BP
In callchifled conglomerates
2.700.000 BP
Cultural sequence
BC
AD
Dominating Nature -
Beginning of land degradation
Agricultural communities and settlements
Industrial communities- use of metal and urbanisation
Abrupt climate change due to volcanic event
Environmental friendly resource management
10.000-8.000 BC
8.000-5.500 BC
5.500-3.000 BC
3.000-2.500 BC
2.500-2.000 BC
2.000-1.200 BC
1.200-680/580 BC
Lower sea levels, 18-15 K BP
Receding of lakes, 15 K BP
High lake levels, 23-17 K BP
After 17 K BP Anatolian basin dry
Temperature drop to min, 23-16 K BP
Development of Mediterranean Bio-indicators, 80 K BP
Quercus-Olea-Pinus-Pistachia
Beginning of Art
Early Paleolithic
1.8 million BP
Basalt plateaus
Denudational limestone surfaces
Calcrete platforms
Old Lacustrine surfaces
Aeolian transportation from the Sahara
5.000.000 BP

Fig. 1

Lev 77



Scale 1:8.000.000
Lake Van
Lake Tuz
Subalpine zone
Beyond snowline
Eu-Mediternean
Quercus/Pinus Forests
Quercus/Ostrya-Forests
Pinus/Cedruis/Abies F.
Pinus/Picea Forests
Steppe/Semi Desert

Fig. 2

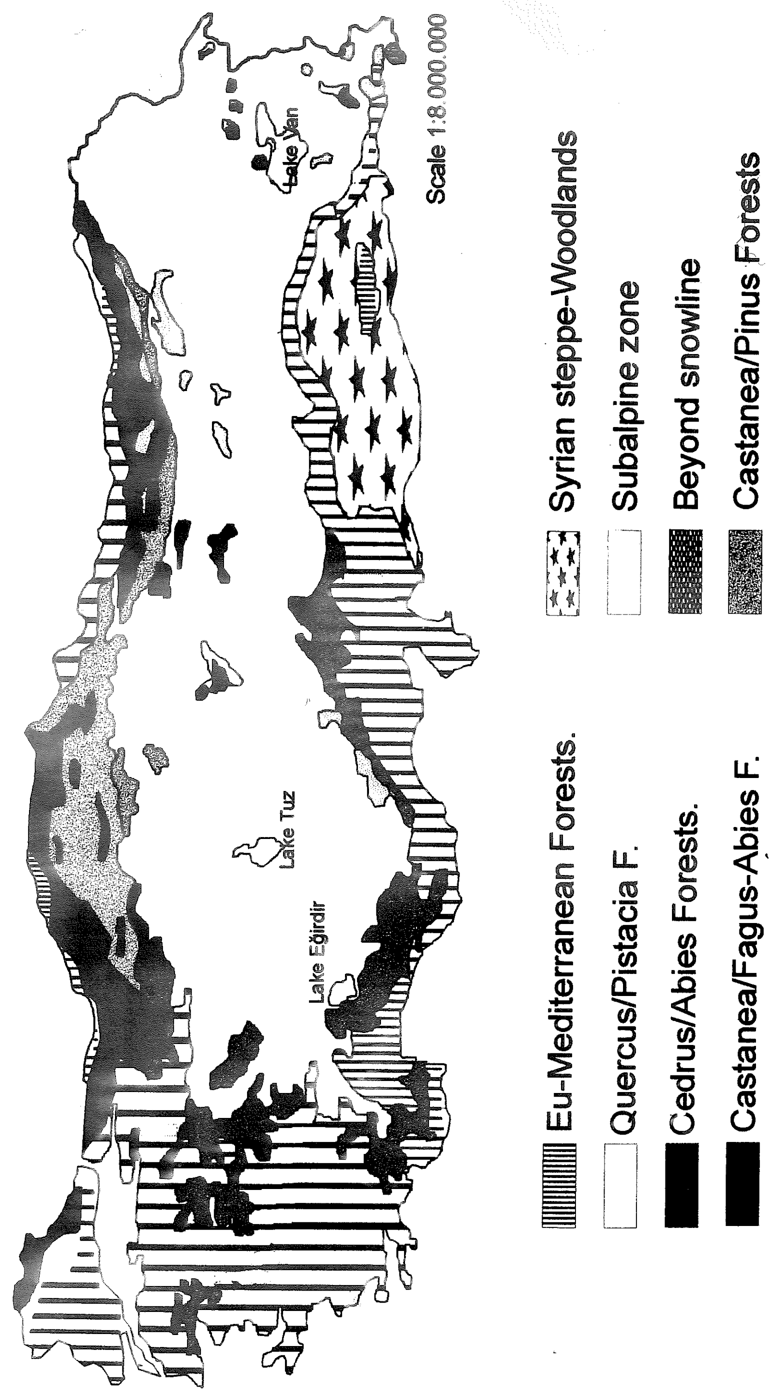
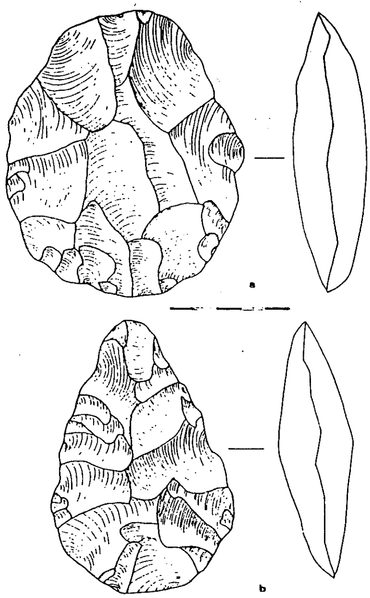
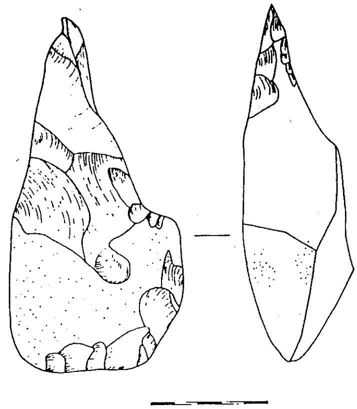

Lake Van
Lake Tuz
Lake Eğirdir
Scale 1:8.000.000
Eu-Mediterranean Forests.
Quercus/Pistacia F.
Cedrus/Abies Forests.
Castanea/Fagus-Abies F.
Syrian steppe-Woodlands
Subalpine zone
Beyond snowline
Castanea/Pinus Forests

Fig. 3

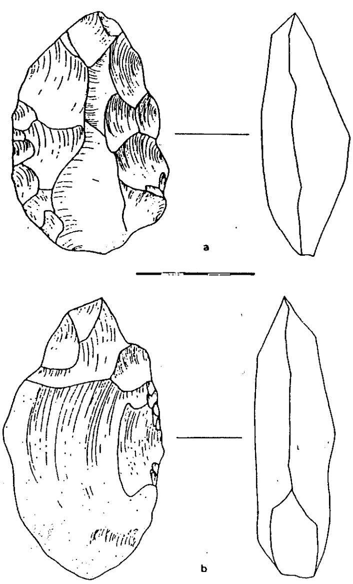
Lev 79



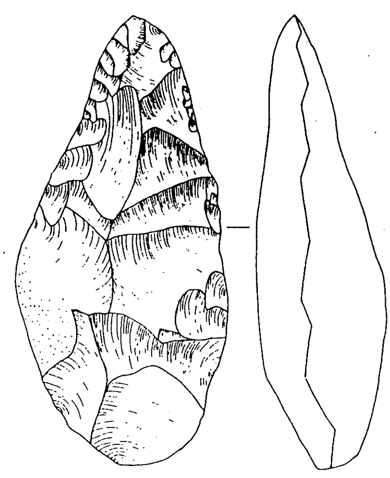
a) Oval biface, red/yellow, patinated, point 3A
b) Cordiform biface, red/yellow, patinated, point 52



Triedric pickaxe, white, patineted, point 35

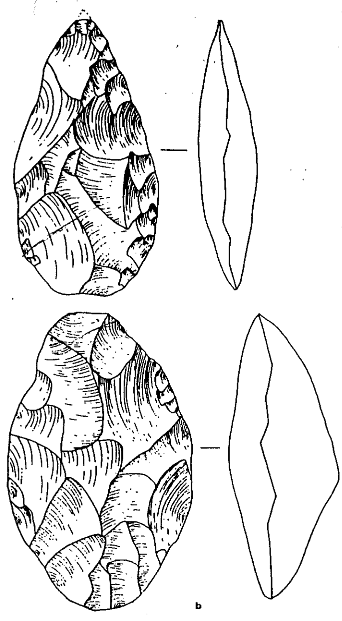


a) Lengthened biface, white, patinated, point 29
b) Ridged biface, white, patinated, point 33

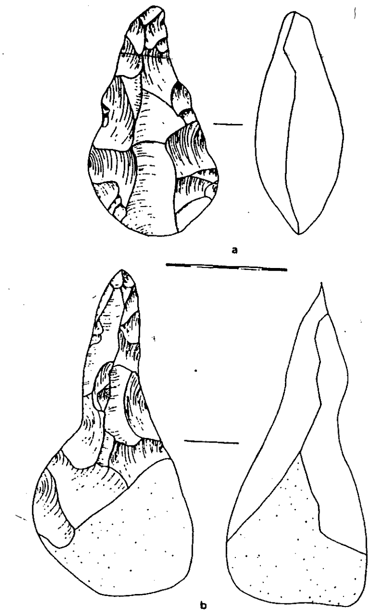


Lanceolated biface, dark brown, patinated, point 38

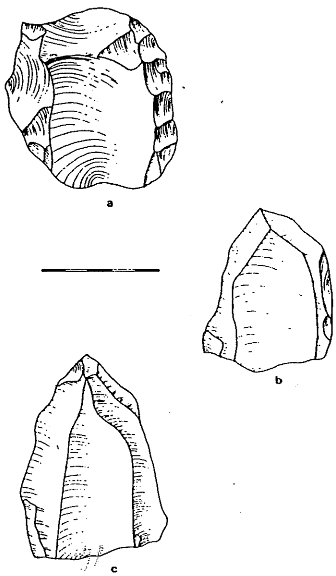
Fig. 4



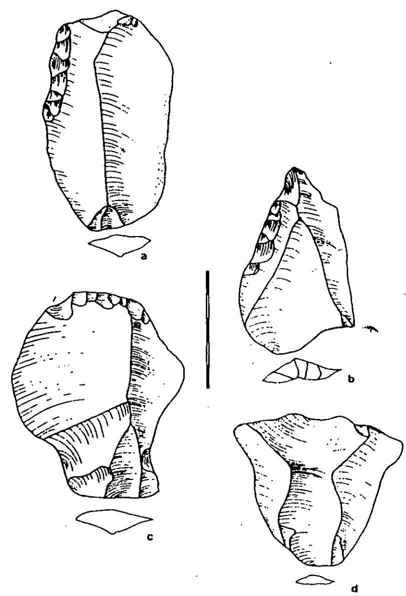
a) Cordiform biface, light brown, patinated, point 19A
b) Lengthened oval biface, dark brown, patinated, point 21



a) Amyodaloidal biface, dark brown, patinated, point 21
b) Triedric pickaxe, dark brown, patinated, point 48



a) Levallois nucleus, red/yellow, patinated, point 1
b) Levallois nucleus, white, patinated, point 34
c) Levallois nucleus, white, patinated, point 34



a) Splinter, red/yellow, patinated, point 1
b) Splinter, red/yellow, patinated, point 3A
c) Splinter, white, patinated, point 44
d) Splinter, white, patinated, point 35

Fig. 5