The early Paleolithic sites of the Rohri Hills (Sind, Pakistan) and their environmental significance

Paolo Biagi and Mauro Cremaschi

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Introduction

The Palaeolithic of Pakistan has been investigated in increasing detail in recent years, following the pioneering work by De Terra and Paterson (1939). In many areas, however, it is difficult to find undisturbed stratified sites, and so a full representation of the Palaeolithic must depend on extracting the maximum information from the available indicators. This paper demonstrates the use of palaeopedological features of soils and scanning electron microscope studies of artefact patinas for acquiring environmental information.

The first Palaeolithic sites of the Rohri Hills in Sind Province were discovered by Allchin (1976) in 1975. The Rohri Hills are a limestone plateau, deeply dissected by the erosion, some 40 km long and 16 km wide (Figure 1). They are surrounded by the alluvial plain of the River Indus except for their eastern side where they are lapped by the Nara Canal, an old bed of the Indus itself (Holmes 1968; Wilhelmy 1966), which separates them from the Thar Desert. Nowadays the region is a steppe desert conventionally described as an arid subtropical lowland whose rainfalls are included between 90 and 125 mm per year. The minimum temperature, in January, is 7°C and the maximum, in June, 46°C (Ahmad 1951; Soil Survey Project 1971).

Geological framework

The hills, whose uprising from the plain is caused by the neotectonic movement of the Khairpur buried anticline (Hunting Survey Corporation 1960), mainly consist of stratified limestone rocks gently dipping to the south east. They are part of the Brahui formation (Blanford 1877; Hunting Survey Corporation 1960), attributed to the Middle Eocene/Early Oligocene period.

The more complete geological sequence was observed at Unnar along the western side of the hills in the neighbourhood of the tomb of Hoban Shah (Figure 2). Here the stratigraphy shows a lower layer, some 20m thick, composed of nodular biomicrite rich in nummulites, and an upper one consisting of massive nodular limestones, poorly bedded, with chert nodules. The top of the terraces is covered with limestone blocks and chert

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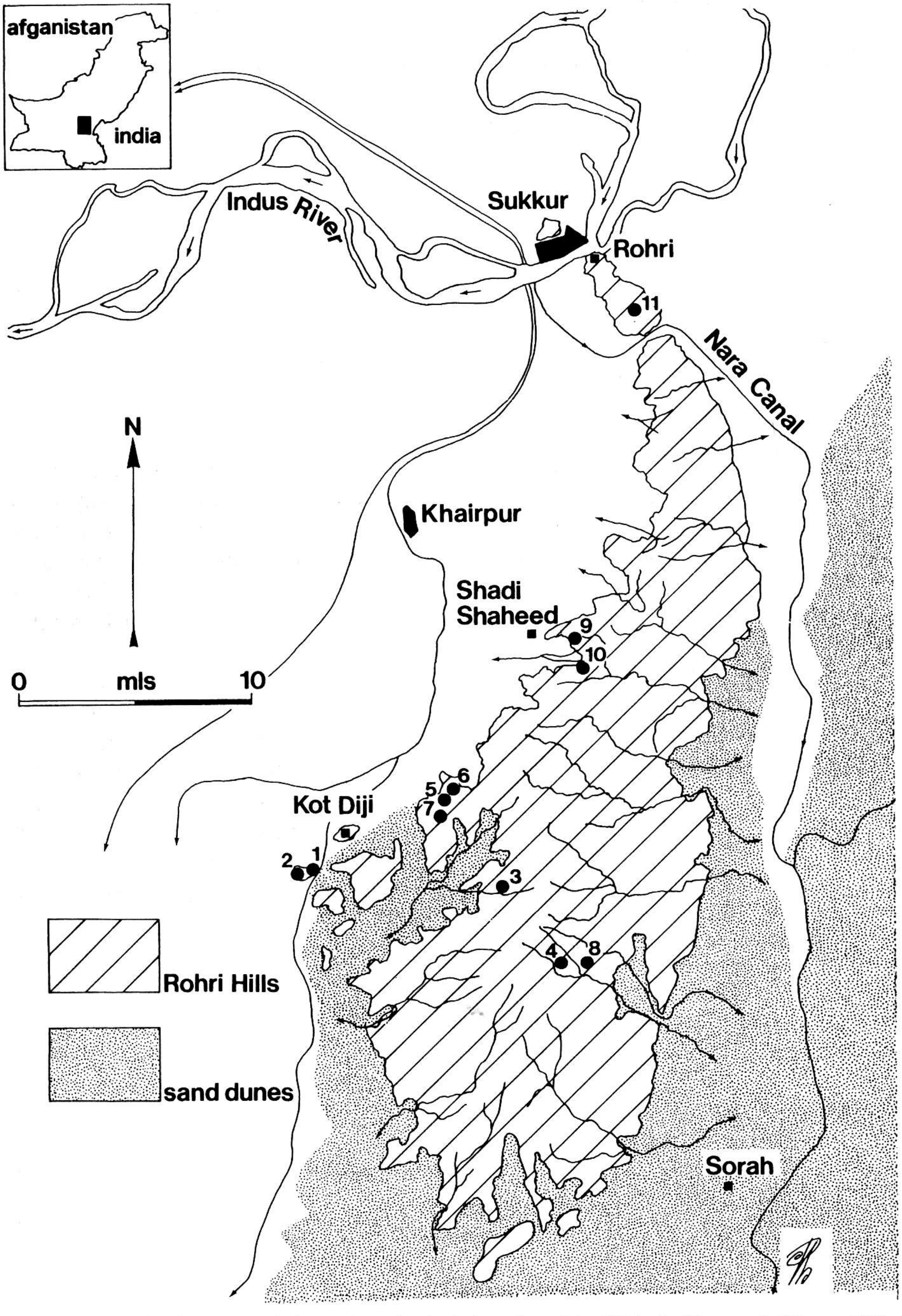

Figure 1 Distribution map of the archaeological sites found in 1986. 1: Unnar; 2: Unnar Hill; 3: Bridge Site; 4: Tanki Rahab Shair; 5: Shiraz; 6: Red Hill; 7: Bunglow Kot; 8: Rahib Sharik and Mutton Jugoth; 9: Shadi Shaheed; 10: Hilly Site; 11: Shelter Site and Buddhist Cave near Aror.

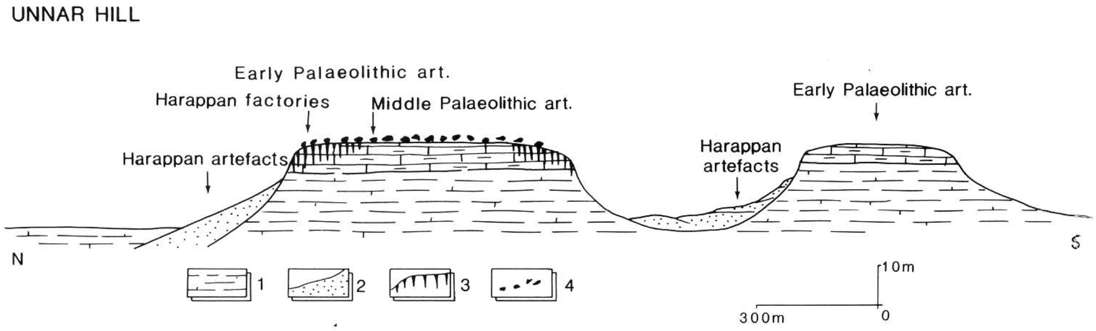

Figure 2 Geological section of the sites around Unnar. 1: Limestone; 2: sand dune; 3: red soil; 4: chert nodules.

nodules strongly weathered which lie on the bedrock. Pockets of reddish soil contained in fissures of the bedrock were observed along the eastern side of the hills (De Terra and Paterson 1939). For a better understanding of the origin of the reddish soil, one of the profiles described at Shan Sakar Ganj (Figure 3), near Aror, has been studied in detail (Figure 4). It produced the following results:

cm 0–15: alignment of angular limestone and chert blocks together with flint artefacts; sharp linear boundary to:
B2 cm 15–95: red brown-red (5YR4/4-5YR5/4) clayey sand, fine subangular blocky, poorly developed; weak; many interpedial voids; dry; small gypsum crystals; cherty stones common to abundant; abrupt wavy boundary to:
R: nodular limestones with cherty nodules.

Identical profiles were also observed near Kot Diji along the south western side of the upland where they are covered with a thin layer of sand. The micropedological analysis

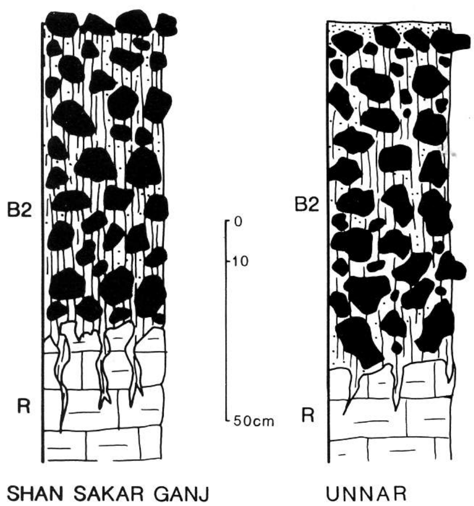

Figure 3 Soil profiles of Shan Sakar Ganj and Unnar.

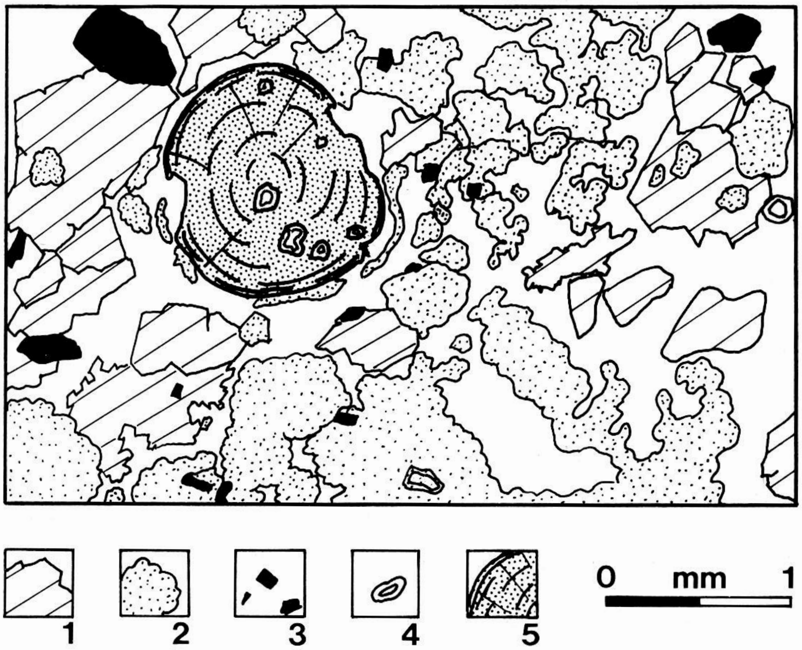

Figure 4 Micromorphological aspect of the B2 horizon of the Aror profile. 1: Gypsum crystallaries; 2: calcite including grains and red clayey material; 3: red clayey pedorelicts; 4: large quartz grains; 5: Fe-Mn nodules.

of a sample taken from horizon B2 indicates that this soil is composed of quartz grains of eolic origin, calcite concretions and gypsum crystals including rubified clay pedorelicts and Fe-Mn nodules. The micromorphological study demonstrates that these profiles mainly belong to arid soils developed in the actual morphoclimatic system even though they had a complex evolution. In fact they show palaeopedological features which derive from more humid pedological phases. Further information about the palaeopedological history of the hills is given by the deposits of the wadis flowing close to Shiraz. Figure 5 illustrates the location and distribution of artefacts at the site named Red Hill, where the rubified clay and chert deposit yielded Early Palaeolithic tools. These deposits originated

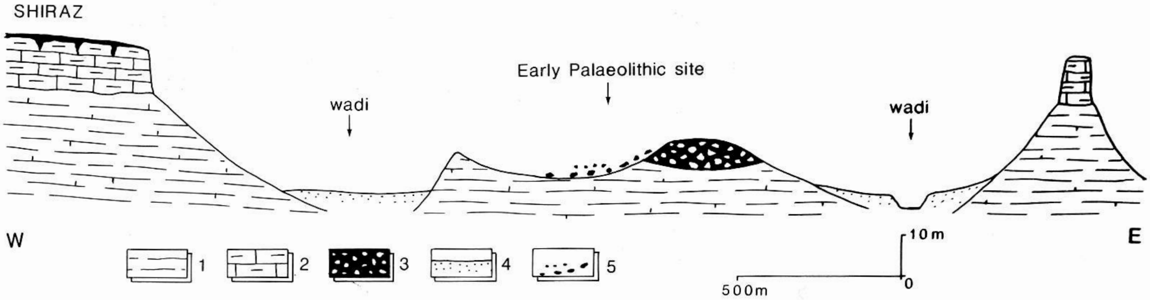

Figure 5 Geological section of the site named Red Hill. 1: Biomicrite; 2: limestone with chert nodules; 3: transported red soil with chert nodules; 4: wadi alluvial deposits; 5: chert nodules.

from the erosion of the clayey soil previously developed at the top of the upland. At Aror the presence of small karstic caves also indicates a period of rainy/humid climate. These long, subhorizontal tunnels, brought to light by the erosion of the slopes of the hills, are filled with an allocthonous red soil identical to that found at the Palaeolithic site named Red Hill (Figure 1.6).

All these data document a pedological phase of rainy and humid climate. The occurrence of chert blocks on top of the mesas is connected with the development of the above mentioned soil. In a later stage most of the soil was washed down to the valley bottom leaving up on the mesas the chert blocks which constituted its skeleton. The presence of high quantities of natural chert attracted the prehistoric communities of various ages which exploited the raw material on a large scale (Allchin and Allchin 1982; Allchin *et al.* 1978).

The surviving artefacts represent industries of different periods. Laboratory analyses have demonstrated that clear relationships exist between age/type/physical aspect/distribution of the flint artefacts and the environmental changes which occurred in the region. The Early Palaeolithic tools, which are scattered only at the top of the terraces, have a thick red patina, surfaces deeply modified by thermoclastic detachments, and eolisation exactly identical to that of the unworked chert blocks. The Early/Middle and Upper Palaeolithic artefacts, in contrast, exhibit plainly visible polished surfaces as well as clear traces of eolisation. They are concentrated both on the terraces and along the slopes of the hills. They are also often distributed on lower-lying terraces formed by erosion (Figure 6).

Finally, the III millennium BC Harappan assemblages (Allchin 1979; Biagi and

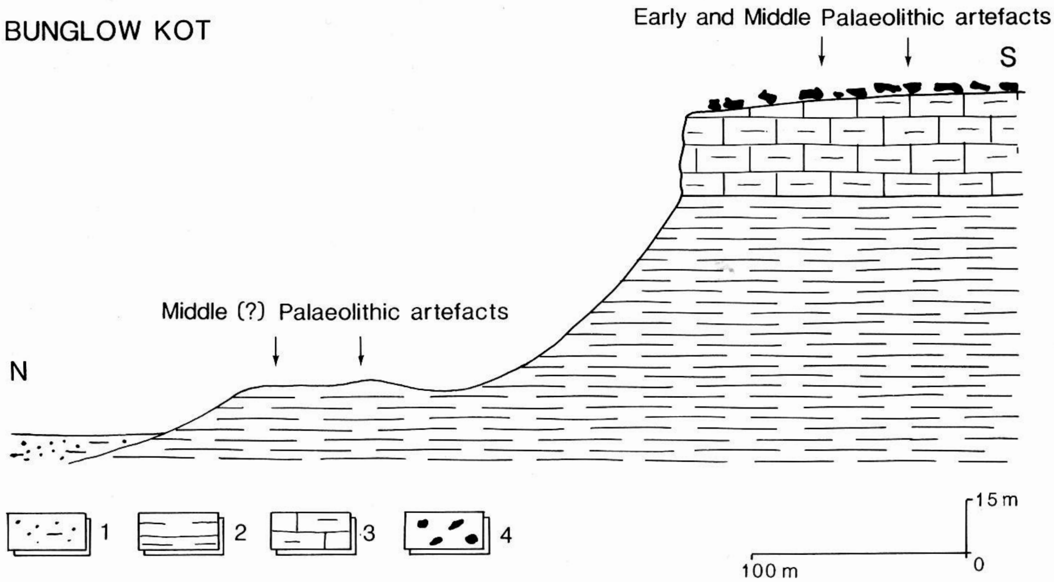

Figure 6 Geological section of the site Bunglow Kot. 1: Wadi alluvial deposits; 2: biomicrite; 3: limestones with chert blocks; 4: chert nodules.

Cremaschi n.d.) have polished surfaces due to the strong eolisation. They have been collected at the top of the mesas, distributed within well preserved stone walled circular structures. They have also been discovered in the valley bottoms, incorporated into the *talus* as well as into the sand dunes of the eastern side of the region.

Laboratory analyses

Differences in the patinas are easily recognisable especially in the case of the Early Palaeolithic tools which are very different from those visible on the artefacts of more recent age. In order to understand the processes which led to the origin of the patinas and to underline their environmental significance, a number of samples was analysed by Scanning Electron Microscope (Plate 1).

Sample 1: unretouched fresh flint. Has an almost homogeneous texture and colour. Microscopically it looks opaque, light brownish grey in colour (10YR6/2) with whitish spots. It has a microgranular texture with intergranular voids caused by the occurrence of foraminifera shells and/or silicate crystals (Plate 1.1).

Sample 2: Harappan flint: of brown colour (10YR5/3) with bright surface dotted by eolisation. Microscopically has more or less the same characteristics of the unretouched fresh flint (Plate 1.2).

Sample 3: Palaeolithic flint: is of brown colour (10YR5/3) with polished surfaces. Dotted areas caused by the eolisation are clearly visible. Under the microscope its surfaces look polished.Dotted areas are very concentrated and give the surface a very rough appearance (Plate 1.3).

Sample 4: Early Palaeolithic flint: has a very rubified patina (2.5YR4/4). Part of the surface is covered with a very polished patina of Fe-Mn (Plate 1.4). The section of one of the tools revealed that the patina is a few tenths of millimetre thick and is separated from the fresh flint by a thin halo of light brown colour. Microscopically the surface of this sample is very polished, with numerous impact breakages and clear thermoclastic detachments, while the section shows several voids coated by iron hydroxides down to a depth of some 600 microns (Plate 1.5).

Sample 5: chert nodules: have some strongly rubified areas and some others of blackish colour caused by the presence of an iron manganese coat. Associated thermoclastic detachments have sometimes given shape to very rough surfaces. Under the SEM, both the surfaces and the sections show the same characteristics already described for the Early Palaeolithic artefacts (Plate 1.6).

Thus it is clear that the natural chert nodules and the Early Palaeolithic tools underwent a process of quartz solution, followed by an enrichment in iron hydroxides and later by thermoclastic detachments as well as eolic abrasion. The first of these phenomena is typical of an equatorial pedogenetic environment. They allow us to connect the Early Palaeolithic assemblages with the development of the palaeosol which affected the surface of the plateau. These processes have not been observed in the case of the assemblages of more recent age. This implies that at least since the beginning of the Middle Palaeolithic an arid environment was already established in the region of the Rohri Hills.

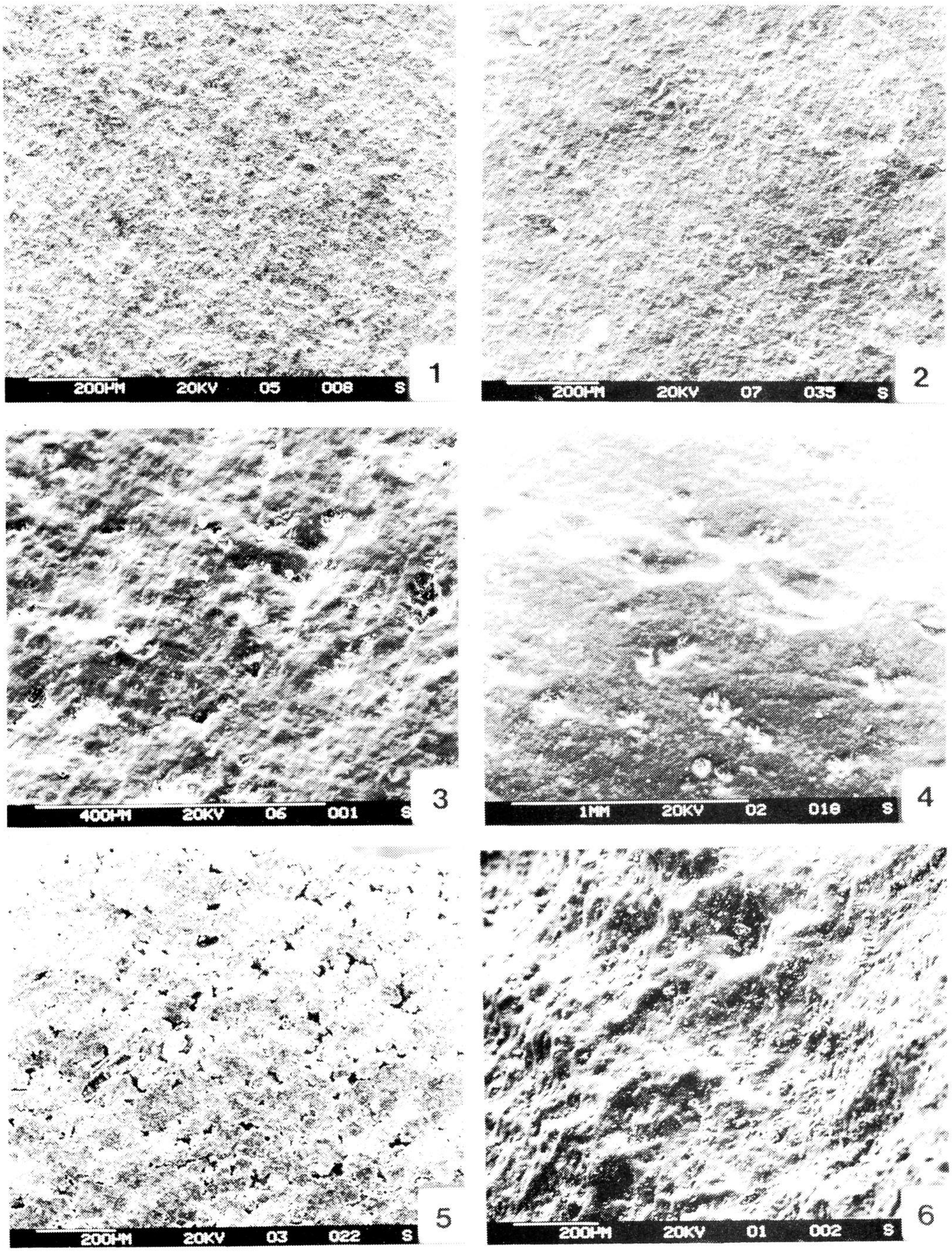

Plate 1 SEM photographs. 1: Surface of fresh flint; 2: surface of Harappan core; 3: surface of Middle/Late Palaeolithic tool; 4: surface of Early Palaeolithic tool; 5: section of the patina of Early Palaeolithic artefact; 6: surface of unworked chert nodule.

The Palaeolithic sites

Seven of the sites discovered so far have produced Early Palaeolithic assemblages, and seven have yielded Early/Middle Palaeolithic artefacts.

Unnar (Figure 1.1): Is a low hill situated along the south western adge of the Rohri Hills. The top of the plateau is covered with Early Palaeolithic and Early/Middle and Late Palaeolithic tools (Figure 2). Typical Harappan chipping floors are also abundant. The Early Palaeolithic instruments include one fragment of handaxe with smooth surfaces, sinuous profile, broken at one edge (Figure 7.2) and a few typical unretouched flakes with simple 'Clactonian' platforms. The Early/Middle Palaeolithic tools are represented by two handaxes with wavy sharp profiles (Figure 7.1) as well as side scrapers on thick flake (Figure 8.9), one scraper with bifacial, bilateral, simple retouch (Figure 8.4) and one denticulated scraper on large flake. The Levallois flaking technique is also present in the tool inventory.

Hill 300 metres east of Unnar (Figure 1.2): Has the same morphological structure of the preceding site. The top of the mesa is particularly rich in Early Palaeolithic artefacts

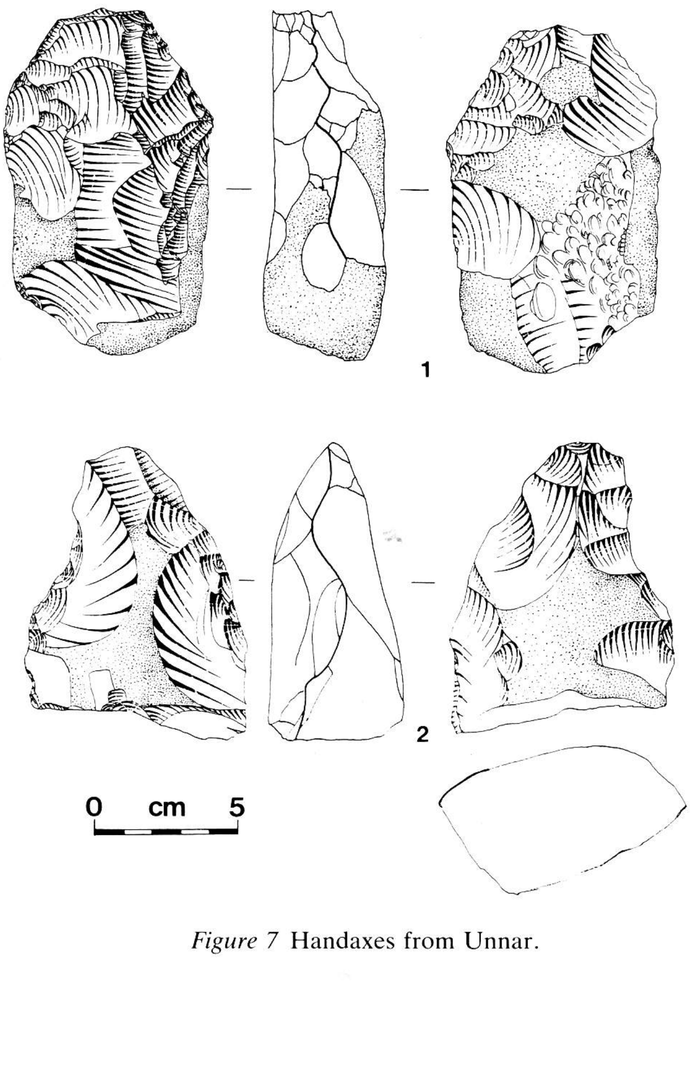

Figure 7 Handaxes from Unnar.

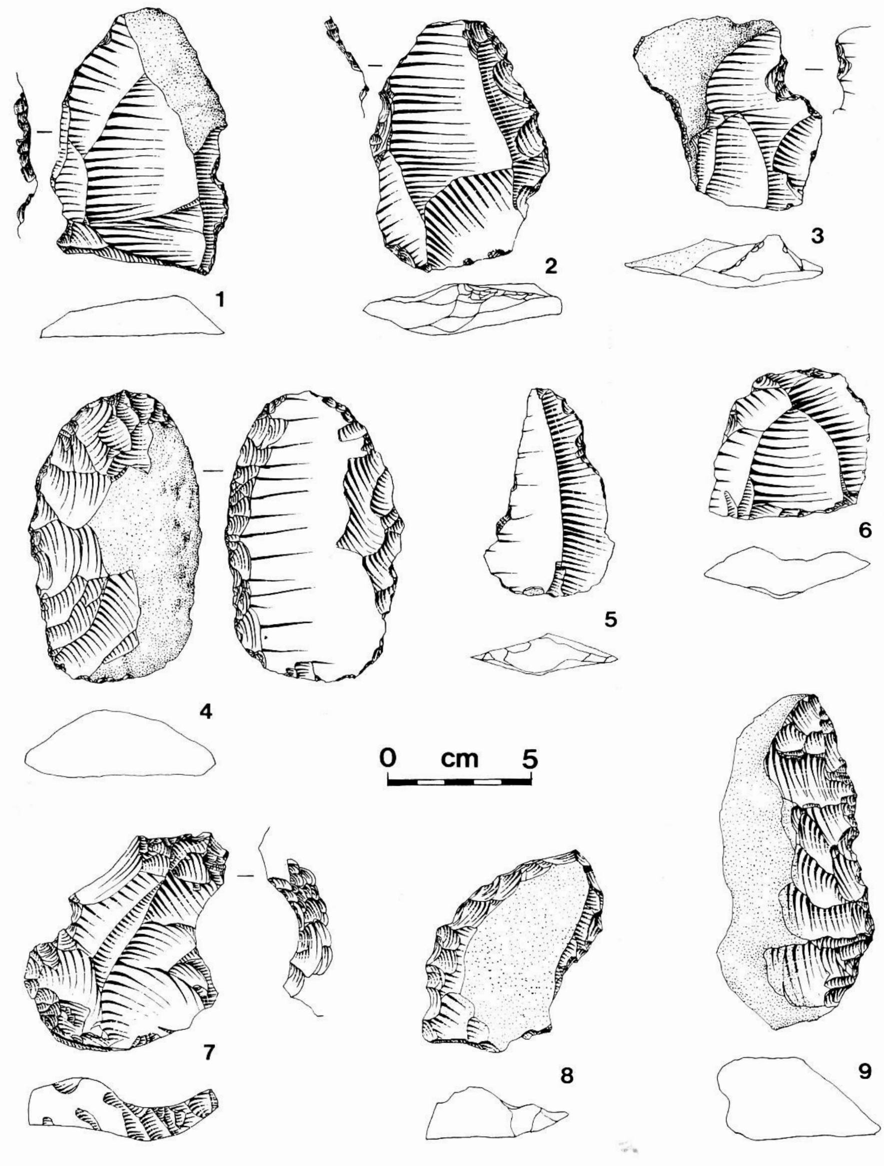

Figure 8 1, 2, 6: flint artefacts from Unnar Hill; 3, 5: Bridge Site, 4, 9: Unnar; 7: Red Hill; 8: Mutton Jugoth.

among which are side and transverse scrapers on 'Clactonian' flakes with flat unretouched platforms. Side scrapers on *Protolevallois* flakes also occur (Figure 8.2). The Early/Middle assemblage is represented by unretouched Levallois flakes (Figure 8.1; 6). One broken handaxe with sharp profile was also collected as well as a thick flake with bilateral, bipolar, backed retouch.

Red Hill (Figure 1.6): The site is located just to the North of the hill of Shiraz. The Early Palaeolithic artefacts were recovered along the hanging valley at the foot of the red soil deposits previously containing the tools (Figure 5). This site yielded a few implements attributed to the Early Palaeolithic including one discoidal core and one large inverse notch on a flake (Figure 8.7).

Tanki (Figure 1.4): On the road to Sorah, close to the eastern edge of the upland. The Early Palaeolithic material only includes unretouched flakes collected from the top of the mesa.

Rahib Sharik and Mutton Jugoth (Figure 1.8): Also these sites are on the road to Sorah close to the eastern edge of the Hills. Only a few instruments were found isolated, scattered on the bedrock. One typical convex side scraper on a flake with simple platform comes from Mutton Jugoth (Figure 8.8) as well as one bifacially retouched handaxe with smooth surfaces and sinuous profile; while one marginal side scraper with simple retouch, on a flake with simple platform, comes from Rahib Sharik. All these instruments are attributable to the Early Palaeolithic both on their typological basis and on the physical state of the artefacts.

Bridge Site (Figure 1.3): On the road to Sorah, at the western edge of the plateau. The Early/Middle assemblage comes from the foot of the hills surrounding a valley some 300 metres wide. Side scrapers both on flake and blade (Figure 8.5) as well as denticulated scrapers are common to this assemblage which also produced circular scrapers and cores.

Bunglow Kot (Figure 1.7): Is located a few kilometres south east of Shiraz, on the road to Sorah, on the eastern side of the valley. The Early Palaeolithic flakes come from the top of the terrace while the Early/Middle Palaeolithic tools were collected at the foot of the hill as shown in Figure 6. The site only produced unretouched artefacts.

Considerations

The presence of a true Early Palaeolithic Acheulian industry had never been recorded from the Rohri Hills before. The major site to have produced an assemblage of this culture, including handaxes and side scrapers on Clactonian flake, is that of Milestone 101 in Lower Sind near Hyderabad (Allchin *et al.* 1978). Our knowledge of the first Palaeolithic cultures in this country is far from clear (Sankalia 1976). Nevertheless the recent discovery of material *in situ* in Punjab (Dennell *et al.* 1985) has cast more light on the first human occupation of that region. Even though all the artefacts found on the Rohri Hills come from surface collections, two distinct assemblages are easily recognisable on the basis of their state of preservation. The earliest Acheulian phase is represented by handaxes, simple ('Clactonian') and *Protolevallois* flakes, sometimes shaped into side scrapers and notched tools. The presence on these artefacts of a dark brown patina invites us to relate them to a period of equatorial, warm and humid climate. A more recent assemblage, including slightly lanceolate handaxes with wavy sharp profile, which might be associated with Levallois flakes and side/transverse scrapers, seems to be referrable to an Early/Middle Palaeolithic technocomplex. The study of the patinas of the artefacts and of the geomorphological and palaeopedological contexts associated with the industries allows the reconstruction of some traits of the environmental history of Sind (Table 1). As mentioned before the region had already been settled during the Early Palaeolithic Acheulian Complex. The subsequent degradation of the soil which covered the Hills caused the dispersion of the Palaeolithic

Table 1

Age	*Landscape development*	*Climate*	*Arch. Culture*
Early/Middle Pleistocene	Weathering of the top of the plateau	Humid and warm	Acheulian
	Dissection of the plateau	Humid	(?)
Upper Pleistocene	Sand dunes	Arid	Acheulian (?) Middle/Late Pal.
Holocene	Fluvial sedimentation	More humid	
	Wind erosion on the top of the plateau	Arid	Harappan Culture

artefacts and the complete destruction of any possibly existing man-made structures. The sequence of the geomorphological events and the typology of the flint industries indicate that this phenomenon happened during the Early/Middle Pleistocene. At present it is not possible to correlate the flint assemblages from the Rohri Hills with those from Punjab (Mohapatra 1976; Sen 1976). The Quaternary deposits of this region, which originated from glacial and periglacial Pleistocene morphosystems, have left no visible traces in Sind and have largely been controlled by the neotectonics of the Himalayan chain (Raynolds 1980). Their dating (Paterson and Drummond 1962; Joshi *et al.* 1974) has often been based on a chronostratigraphy referred to that of the Alps (De Terra and Paterson 1939). Recent researches in Punjab have brought to light a few Early Palaeolithic sites with *in situ* industries, contained into gravel deposits, dated to 0.4/0.7 million years (Rendell and Dennell 1985; 1987). Even though a distinction between Acheulian and Soan cultures is hardly tenable (Coles and Higgs 1975), it is more reasonable to attribute the Rohri Hills Early Palaeolithic industry to the Acheulian on the basis of the presence of a relative high proportion of handaxes and simple unretouched and retouched flakes. It is more difficult to ascertain whether the handaxes with wavy sharp profiles are contemporary with the Levallois technique artefacts, as the presence of identical patinas on both these tools might suggest, or whether they represent a Later Early Palaeolithic phase and a pure Middle Palaeolithic one characterised by the Levallois flaking technique.

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30.vi.1987 *Paolo Biagi, Department of Historical, Archaeological and Oriental Sciences University of Venice, Italy*

Mauro Cremaschi, CNR, Centre for the Study of the Stratigraphy and Petrography of the Central Alps Department of Earth Sciences University of Milan, Italy

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Abstract

Biagi, Paolo and Cremaschi, Mauro

The Early Palaeolithic sites of the Rohri Hills (Sind, Pakistan) and their environmental significance

The preliminary investigations carried out on the Rohri Hills in January 1986 led to the discovery of several Palaeolithic sites, seven of which are to be attributed to the Early Palaeolithic Acheulian tradition. The laboratory analysis of the physical state of the artefacts as well as the study of the soils still preserved in some areas of the Hills allowed the Authors to formulate a preliminary assessment of the environmental changes which occurred in the area between the Early/Middle Pleistocene and the Harappan Culture which flourished in the Indus Valley during the III millennium BC.