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Excavations at the Harappan Flint Quarry 862 on the Rohri Hills (Sindh, Pakistan)

Abstract

The paper presents the results of the last three seasons of fieldwork of the "Joint Rohri Hills Project" in the flint quarry Site 862 located along the western fringes of the Rohri Hills, in Upper Sindh (Pakistan).

The Hills are a calcareous plateau rich in flint nodules, which have been exploited since Palaeolithic times, representing one of the most important flint sources of the Indus Valley. During the Harappan Civilisation period, flint was exploited in a very intensive way, with the opening of several quarrying areas along the western fringes of the Rohri Hills. At that time flint was still an important raw material which was mainly employed, in particular, for the production of regular blades, exported and utilised for different handicrafts in the urban centres of the Indus Valley.

Quarry 862 produced evidence of a quarrying episode dating to the Mature Harappan period. This paper illustrates in particular the patterns of the flint nodules extraction and the quarrying techniques which have been reconstructed from the fieldwork evidence.

***Keywords**: Indus Valley, Harappan Civilisation, Upper Sindh, Flint quarries.*

Introduction

Site 862 is a flint quarry located along the central-western fringes of the Rohri Hills in Sindh (Pakistan) (Fig. 1). The hills are a very dry limestone plateau which is part of the Brahui formation (Blandford 1880), attributed to the Middle Eocene/Early Oligocene period. Pale brown and variegated good quality flint occurs as nodules in seams, at various depths of the limestone formation. The first report of the presence of flint artefacts on the hills was given by Blandford (1880, 20) who wrote that "*Large quantities of flint cores have been found near Sukkur and Rohri, and there is a good collection in the Geological Museum, Calcutta*". At present this evidence has unfortunately been totally destroyed by modern limestone quarrying and by the expansion of human settlements around both the towns of Rohri and Sukkur (Biagi 1997).

Surveys carried out during the last eight years by the members of the Joint Rohri Hills Project (Biagi & Pessina 1994; Biagi *et al*. 1995) have revealed an impressive number of flint exploitation areas, still untouched and well preserved along the central and south-western fringes of the Hills.

The importance of the Rohri Hills as a source for flint since early prehistoric times is due to the fact that good quality siliceous rocks suitable for debitage are absent over quite a large area in the Indus Valley (Lahiri 1992, 21) with the exception of the Kirthar limestone hills around Kotri in southern Sindh (Blandford 1880, 142) were site Milestone 101 was exploited in Palaeolithic times (Allchin *et al*. 1978, 295). This led to an extremely wide utilisation of the Rohri Hills flint as major raw material source, especially during the Harappan period, for the production of very specialised stone tools, such as long and regular flint blades and micro-borers from bladelets (Kenoyer & Vidale 1992); the latter were used for the manufacture of semiprecious stone beads by the craftsmen of the urban centres (Kenoyer 1986).

Site 862 is located 3.5 km south of the Shrine of Shadee Shaheed (Fig. 1) where the hills are capped by a hard, highly fissured, yellowish limestone layer rich in flint nodules. As described by Biagi *et al.* (1997, 30), the site is part of an impressive, wide ring-shaped group of features, some 120 m in diameter, related to a Harappan flint quarrying activity area (Fig. 2). From the surface, Site 862 was

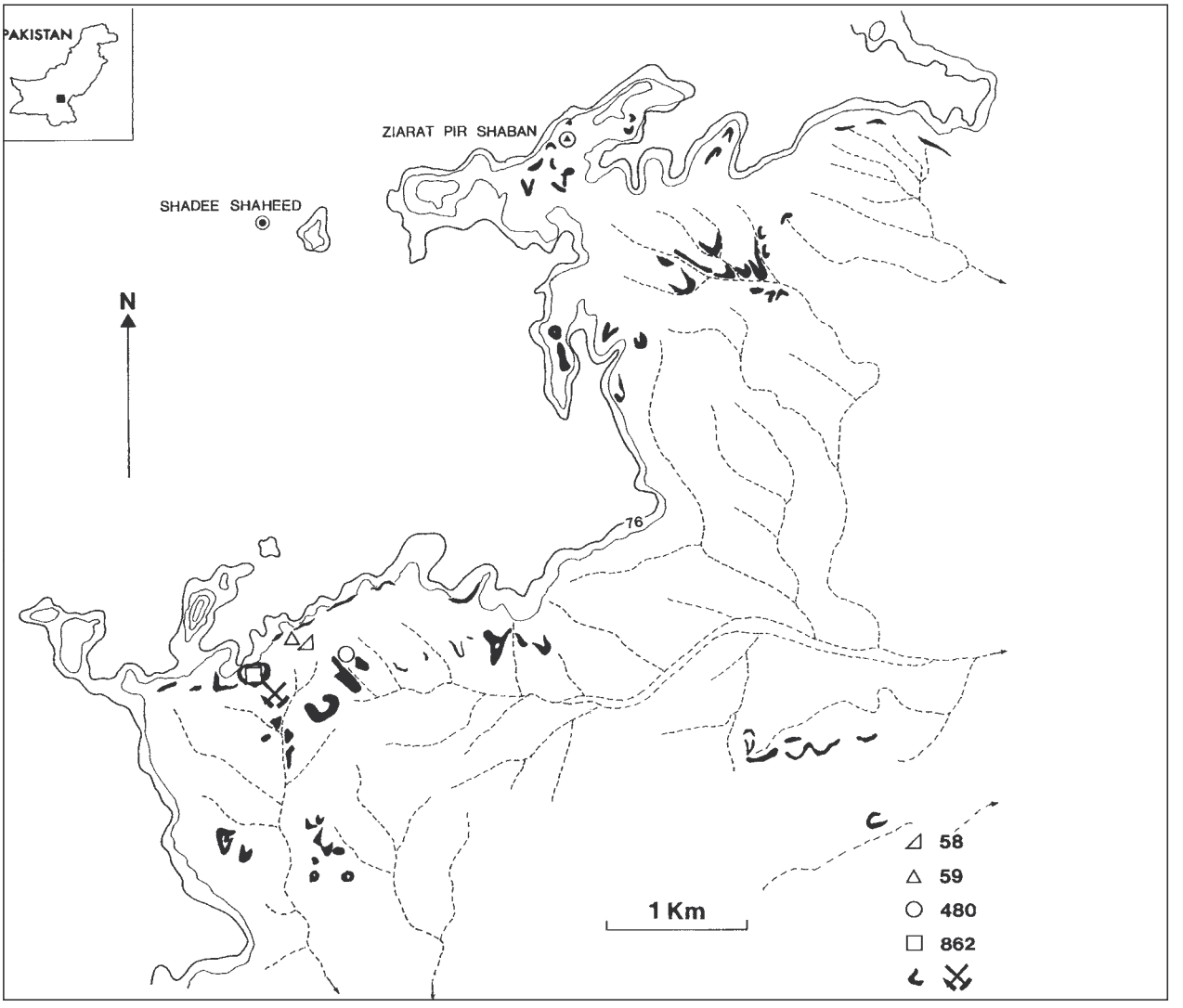


Fig. 1: Distribution map of the Harappan flint quarries of the Shadee Shaheed Hills, with the indication of the excavated Sites 58, 59, 480, and 862 (drawing by E. Starnini).

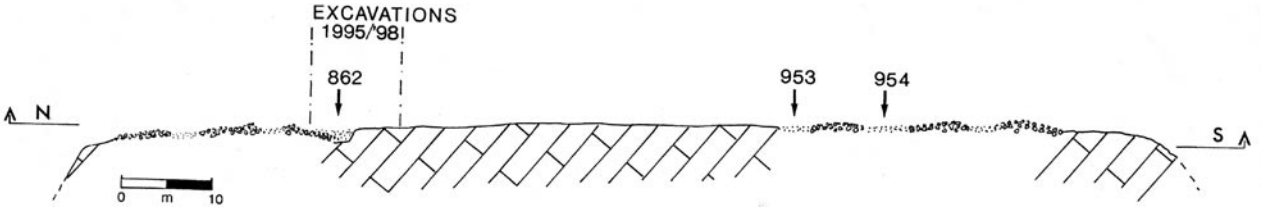


Fig. 2: North-south profile of the terraces on which Site 862 is located (after Negrino *et al*. 1996, 101).

characterised by a large spot of sand corresponding to the quarrying area, partly surrounded by heaps of limestone blocks and by two separate flint workshops (Workshops 1 and 3) resulting from two distinct chipping floors (Fig. 3).

The site was partly excavated since 1995 (Biagi 1995; Negrino *et al*. 1996; Biagi *et al*. 1997) in the framework of the Joint Rohri Hills Project, a research programme whose aim is the study of flint exploitation and quarrying, carried out by the University of Venice (I) and the Shah Abdul Latif University, Khairpur (Sindh-PK).

The 1995 investigations began with the excavation of one debitage area (Workshop 1) connected with the flint quarry (Negrino *et al*. 1996), related to the production of narrow bladelets from bullet cores. A test trench was then opened in the quarry area in order to understand the quarrying techniques employed by the Harappan workers. During this season it was possible to attribute the quarry to the Mature Harappan period thanks to the recovery of two charcoal pieces of *Zizyphus cf. nummularia*, one of which was dated to 3870±70 BP (GrA-3235) (Biagi 1995). The two following seasons (1997 and 1998) were devoted to

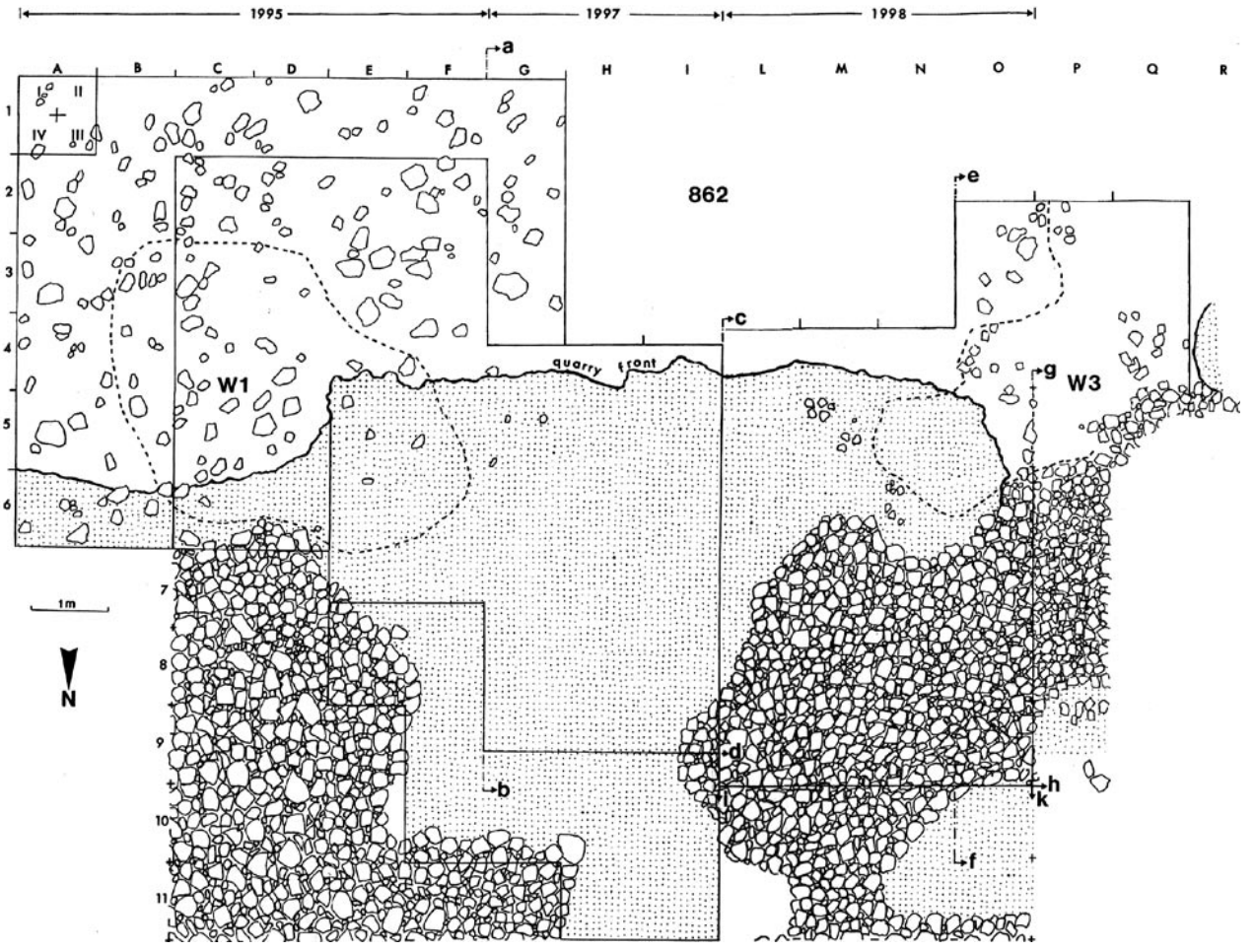


Fig. 3: Surface plan of Site 862 with the indication of the excavated areas and of Workshops 1 and 3 (drawing by E. Starnini).

the excavation of the quarry-pit and to the understanding of the way flint was exploited.

Quarry exploitation system

The mining methods adopted at Quarry-Site 862 and in general at all the flint mining features recorded on the Rohri Hills during the surveys of the last eight years, can be described as quarrying (Lech 1997, 614), resembling the pattern of the site of Aachen "Lousberg" in Germany (Weiner & Weisgerber 1980). In fact no evidence of underground shaft exploitation with galleries or deep shafts has been so far discovered, even though some features, occasionally encountered on the Hills, characterised by small, well-defined sand spots, might eventually correspond to clusters of single pits.

However, this is not the case for Site 862, where the excavations have partly exposed a more or less continuous, open quarrying space (Fig. 4). The excavation was carried out in correspondence of the quarry front, clearly recognisable from the surface by the fact that Aeolian sand had filled up the empty trenches left open by the Harappan miners (Fig. 5). The presence of sand spots permits one to recognise quite easily every artificial pit or depression on the terraces, especially with the aid of aerial photographs (Maifreni 1995). Furthermore, in the undisturbed areas, the extractive, empty features are always surrounded by the result of the quarrying activity, *i.e.* by heaps of limestone rubble. These latter features are clearly visible from a certain distance even from the alluvial plain of the Indus, waving the flat profile of the mesas.

The excavation of the quarry revealed the composition of the fill. After the removal of the sandy layer, a stony level was encountered, composed of a mixture of reddish, sandy-clayey soil and limestone rubble. Enlarging the ditch it was decided to remove part of the heaps of limestone boulders which constituted the backfilling of the quarry. This was done to understand whether such heaps hid an old quarry front or the quarry bottom. It was possible to observe that, while in some cases the stone heaps covered part of the unquarried, natural terrace, in others they were lying just at the bottom of the trench (Fig. 6). Nevertheless, it is still to be clarified whether these untouched areas represent "islands" of the natural, limestone terrace left unquarried or are part of a continuous quarry front whose complete edge is still to be defined.

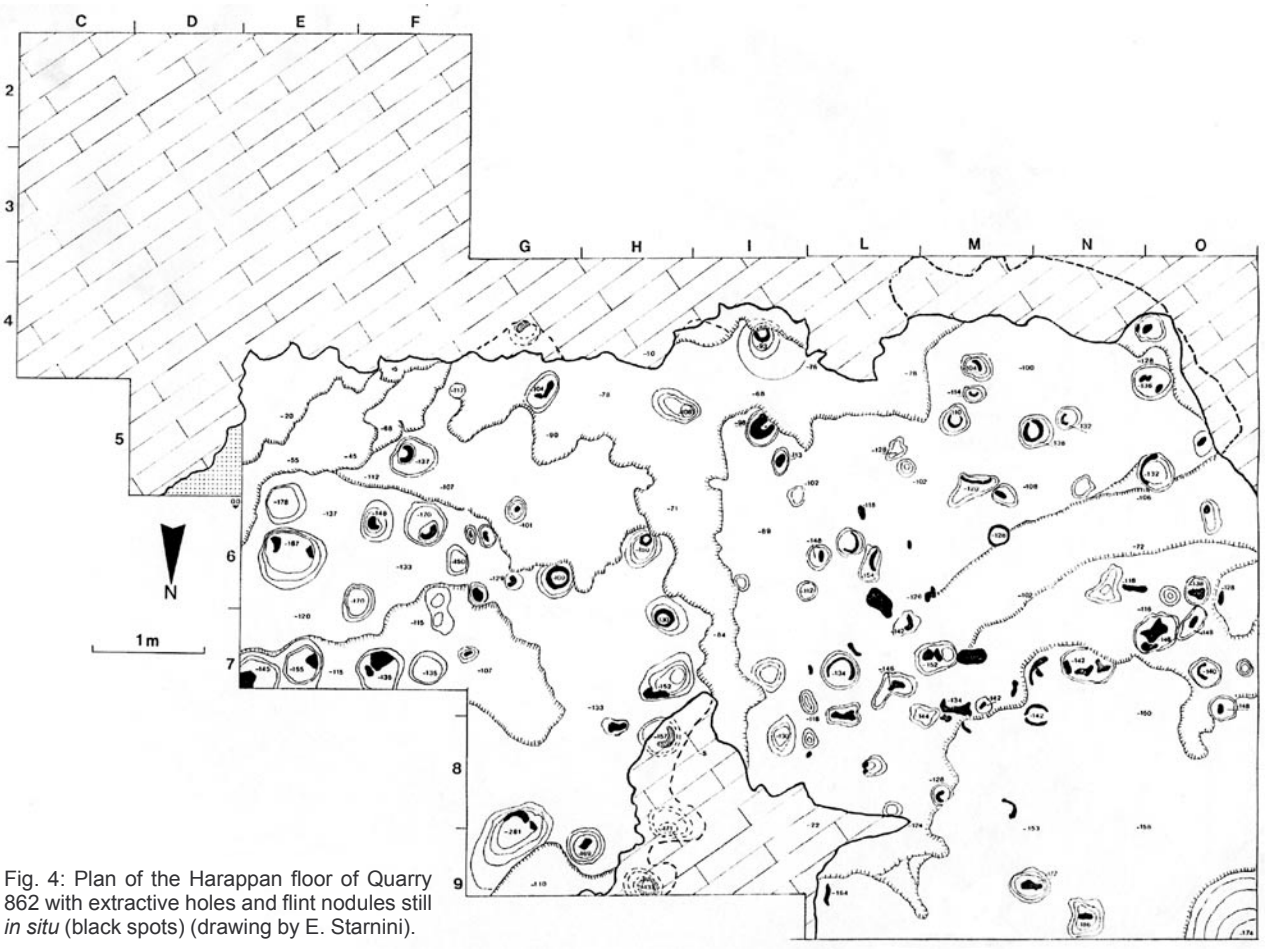
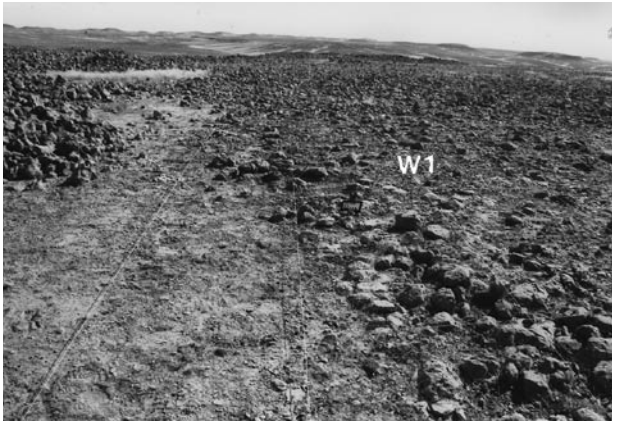


Fig. 4: Plan of the Harappan floor of Quarry 862 with extractive holes and flint nodules still *in situ* (black spots) (drawing by E. Starnini).

As suggested by the presence of many fragments and crushed flint debris in the holes where the flint nodules were found still *in situ*, their extraction had to involve their breaking out of the limestone bedrock. This pounding work was probably conducted with the aid of hammers or maces. So far, the fill of the quarry has not yielded any stone tool that might have been employed for this purpose. We know that antler tools, simple unhafted pebbles used as hammerstones, stone maces and flint picks were largely utilised for breaking the bedrock and extracting the raw material in the mining sites of Europe (Lech 1981, 43; Desloges 1986; Weiner 1997). Thus, chips and fragments of hammerstones are commonly found during the excavation of flint mining sites.

Fig. 5: Surface of Site 862 before excavation with the sand spot on the left, the quarry limit in the centre and the location of Workshop 1 (W1) (photograph by P. Biagi).



Despite the fact that quite a large area of quarry 862 has been carefully excavated during the last three seasons (Fig. 3), only a few, small hammerstones of flint pebbles have been recovered. They were probably employed in the flintknapping performed inside the quarrying area, related to the decorticating and preparation of the pre-cores (Negrino *et al*. 1996, Fig. 21.3), as the high number of refitting flakes found in the fill should testify (Negrino *et al*. 1996, Fig. 18.2 and 3).

Thus, the absence of both proper, complete stone tools and flakes accidentally blown from them, led us to hypothesise the use of metal implements, as alternatives to the stone ones, for breaking the bedrock and extracting the flint nodules. In fact, up to now, we have never observed any evidence for wedge-holes, fire-settings or gad traces.

The natural characteristics of the local limestone formation, very fissured and weathered, facilitate its breakage with the use of a simple metal bar, acting as a lever, as the present Baloochi workers easily do quarrying the limestone for industrial purposes (Fig. 7). A similar pattern of

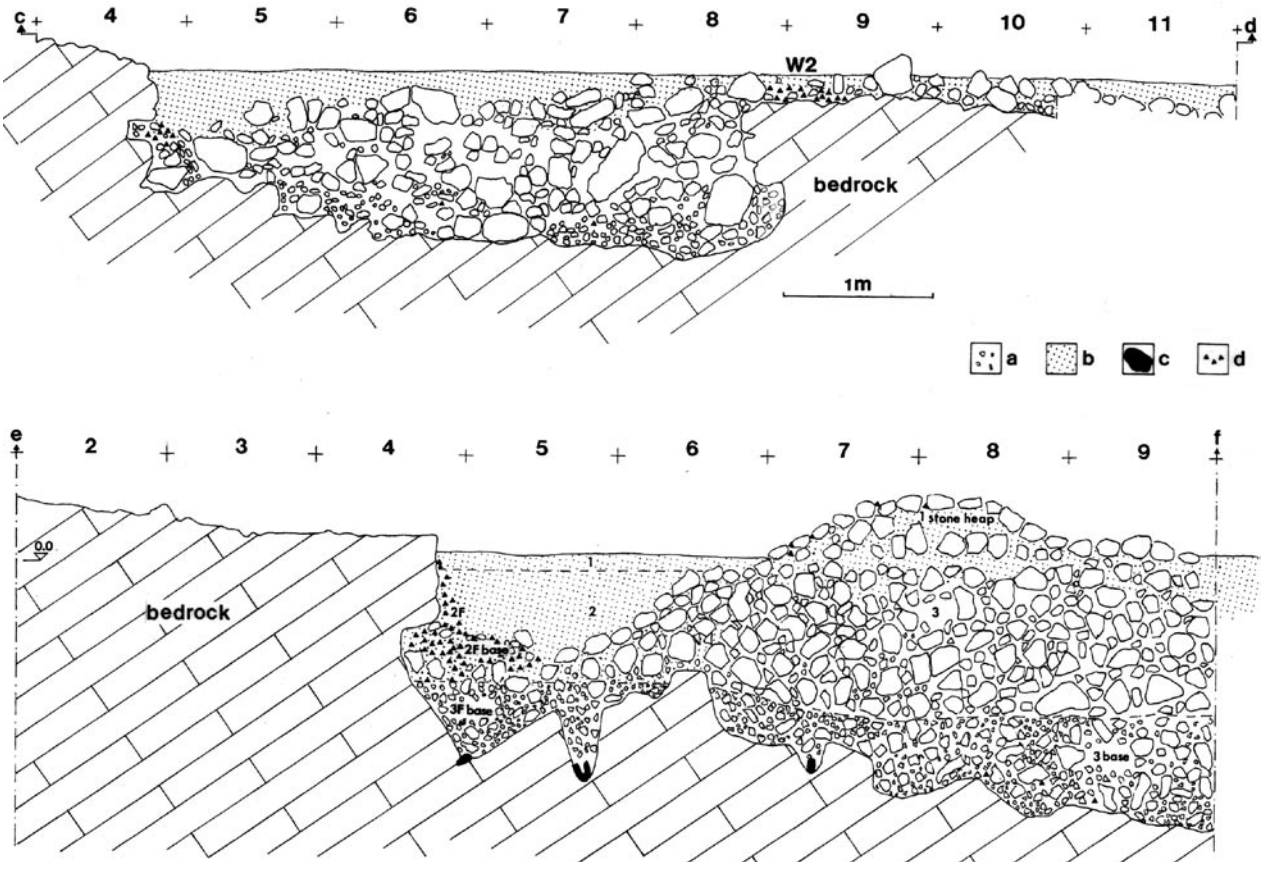


Fig. 6: Sections through the deposits of Quarry 862: a reddish, sandy-clayey soil; b Aeolian sand; c flint nodules; d chipped flint artefacts (drawing by E. Starnini).

stone quarrying has been reconstructed for a rock outcrop for polished axes (Pétrequin & Jeunesse 1995, 113). On the other hand, the metallurgy of the Bronze Age Harappan Civilization was developed enough to favour the manufacture of proper tools for such an activity (Wheeler 1968, 74). However, some kind of hammers, possibly metal maces, were also employed in addition to other possible tools, as suggested by the presence of a certain amount of limestone flakes bearing clear traces of having been struck by hard hammering (Fig. 8). At present we cannot exclude the utilisation of quarrying implements made of organic material such as wood, bone or antler which have not been preserved or not so far recovered.

The extraction produced flint nodules, which seem to have been immediately utilised and processed in the ateliers scattered around the quarrying areas. Many flint nodules have been found still *in situ* inside the quarry floor. They are always irregular and of small size, which might be the reason why they were left. The larger ones are always hollowed, but if properly split, they could provide enough raw material even for the preparation of large cores (Fig. 9).

The preparation of the pre-core rough-outs was most probably performed inside the quarry trench, or along its edge, as the many decorticating flakes, discarded pre-forms and typical crested blade-like-flakes found inside the ditch fill should indicate.

Fig. 7: Baloochi worker removing limestone blocks with a lever in the neighbourhoods of Site 862 (photograph by E. Starnini).

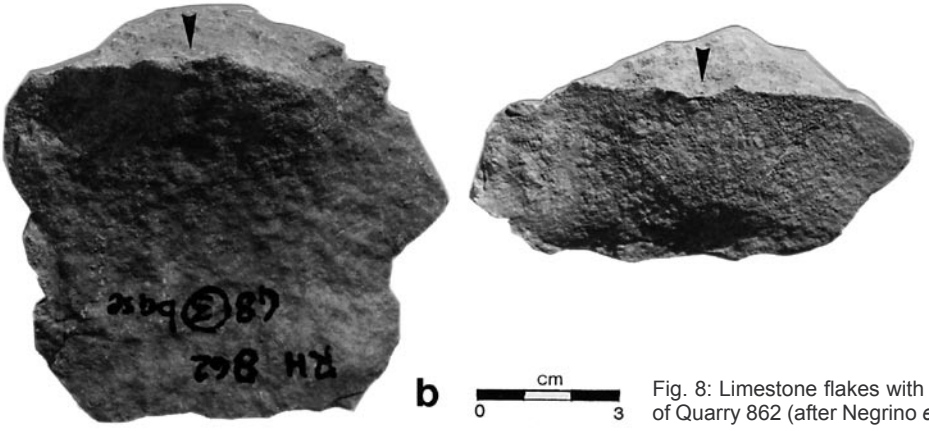


Fig. 8: Limestone flakes with concoidal fracture from the deposit of Quarry 862 (after Negrino *et al*. 1996, Fig. 11).

The evidence to date available indicates that the flint nodules were extracted from the limestone deposits of the terrace thanks to open ditches or pit-systems, with an average extraction depth of some 1.5 m (Fig. 6 and 10). The extraction trenches exhibit more or less vertical walls, sometimes with niches at their bottom. The quarry floor, exposed by the excavations, shows an irregular outline with steps and bulges, giving the impression of different episodes of exploitation (Fig. 4 and 9A).

Considerations

The excavations carried out at Quarry 862 have furnished a few preliminary findings which are of great importance for our better understanding of the exploitation of the flint resources of the Rohri Hills in Mature Harappan times:

1) the first AMS radiocarbon date of a flint mining-pit in the region;

2) the models of exploitation of the flint seams which, according to the more recent results, seem to have been conducted in a rather random way most probably thanks to the excavation of pits or trenches, even though traces of superficial quarrying are clearly visible along the edge of the terrace in form of long, U-shaped incisions that cover the whole perimeter of the hill where Site 862 is located. This evidence might indicate that the exploitation of the seams started from the quarry edge, following the buried stratum of flint nodules towards the interior of the terrace. Nevertheless, in the light of the new discoveries made in 1998, this interpretation has to be demonstrated through further excavations towards the western limit of the mesa;

3) the collection of information regarding the model of utilisation of the flint resources especially as regards the operative chain followed for the production of parallel-sided blades and bladelets, whose fundamental stages have already been illustrated by Negrino *et al*. (1996, 100) and Briois *et al.* (2006, Fig. 3);

4) further consideration on the areas where the preliminary exploitation of the flint nodules took place, thanks to the recovery of masses of flint flakes inside the quarry-pit, of almond-shaped pre-cores in the sediment itself as well as of three workshops around the edges of the quarry-pit;

5) more data on the models of extraction of the flint nodules from the limestone floor reached by the Harappan workers, even though no instrument related to the extractive processes has so far been discovered.

Fig. 9: a Floor of Quarry 862 at the end of the 1998 season of excavations; b holed flint nodule *in situ* in the quarry floor (photographs by P. Biagi).

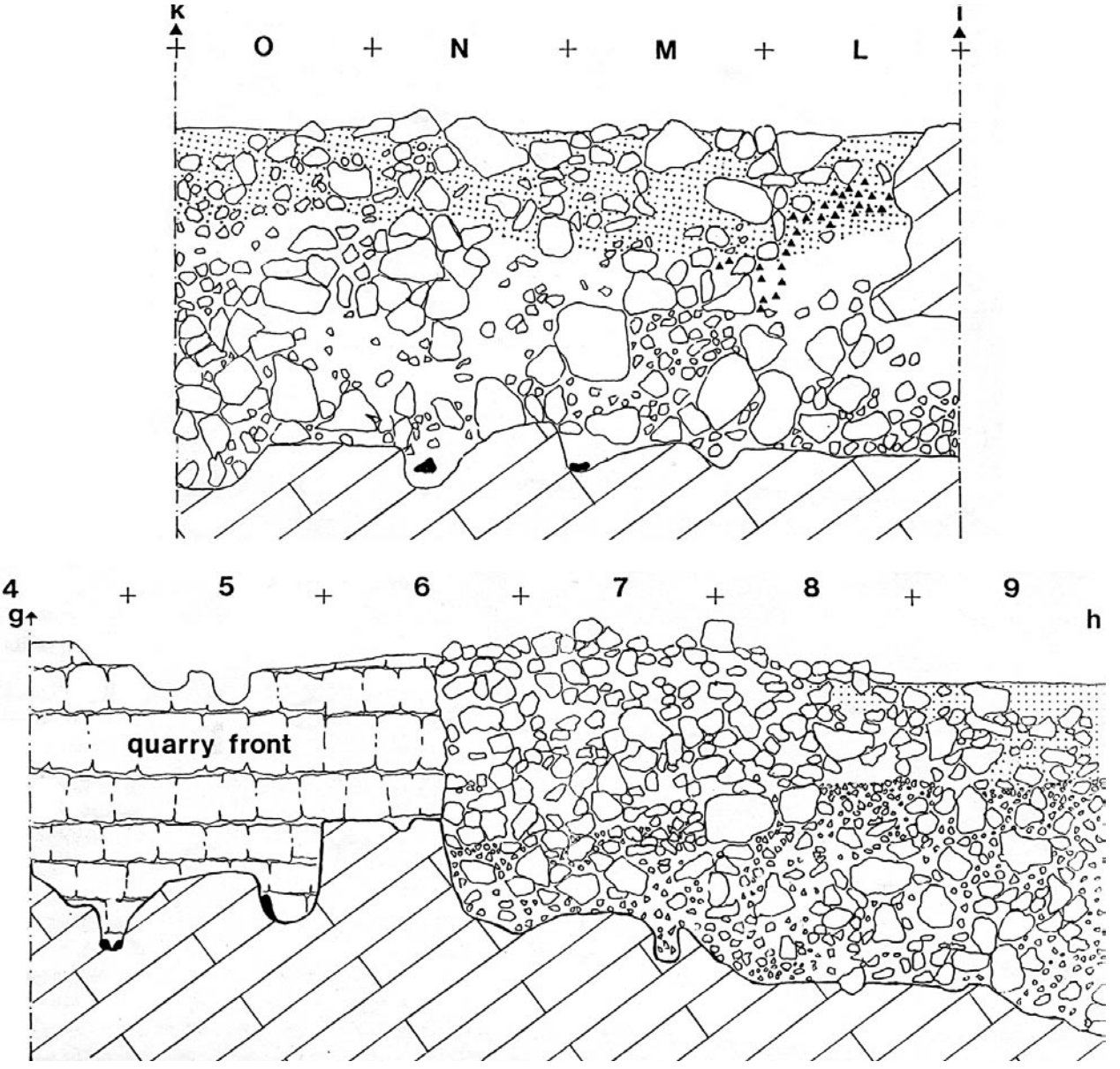


Fig. 10: Sections through the deposits of Quarry 862 (drawings by P. Biagi and E. Starnini).

It has already been remarked in several works that the Rohri Hills acted as major flint sources (not only) in Harappan times (Allchin 1979; Negrino *et al*. 1996; Allchin, R. & Allchin, B. 1997; Kenoyer 1998) and that flint artefacts from the hills were exported throughout a wide territory covered by the (Mature) Harappan Civilisation. In fact, one of the characteristics of the Rohri Hills extraction sites is the mass-production of blades and bladelets which might improve our better understanding of one factor never enough pointed out in the past, that is the trade and exchange patterns of this material which took place, on microregional and macroregional scales, during the flourishing and development of the Harappan Civilisation.

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