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**The Western ar-Rub<sup>c</sup> al-Khālī "Neolithic":  
New Data from the Ramlat Sab'atayn  
(Yemen Arab Republic)**

with contributions of: L. COSTANTINI for Plant remains; F.G. FEDELE  
for Animal remains; F. GRAVINA and C. SMRIGLIO for Malacology \*

For some time now we have grown accustomed to hearing reports about the recovery of lithic tools on the western side of the great Arabic desert: the Rub<sup>c</sup> al-Khālī. A large inventory of these objects is now available, but we have scant information about the places in which they have been found. This is partly due to the authors of those recoveries, usually not archaeologists, but other sorts of workers who, while carrying out their activities — mainly oil prospecting — came across prehistorical sites by chance. The collection of the material on the ground surface thus did not follow exact rules, but rather the tastes of the discoverers, who probably used to choose the most striking objects.

These places have been referred to a period called "Neolithic" (in inverted commas because of doubts and perplexities about its cultural and economic meaning). For the sake of simplicity, if by the word "Neolithic" we mean those post-Palaeolithic peoples, foregoing the Metal Age, who used to produce at least some of their foodstuffs, these places of the Rub<sup>c</sup> al-Khālī cannot be placed, at least for now, in the Arabian Peninsula Neolithic period. There is no faunistic, botanical, etc. evidence to solve the doubts on their cultural insertion. The word "Neolithic" has probably been ascribed after comparing their industry with that of other places: the presence of tools that in other places of the world are considered typical of a Neolithic period, has been taken as diagnostic. The objects considered

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important to this effect are the so-called bifacials and, mainly the arrowheads which so far seem to be the most typical elements of the lithic production of the Rub<sup>c</sup> al-Khālī.

Thanks to the results of recent archaeological, geomorphological and hydrological studies, we know that at least some of these places were situated near ancient lakes, belonging to a Holocene period. This would have allowed an environmental situation unlike the present one and characterized by the presence of flora and fauna very different from the ones belonging to arid and desert zones. Such a situation would be linked to a chronological period roughly between 9000 and 6000 B.P. (*A.N. Garrard*, 18; *H. McClure*, 22–23).

This could raise the likely problem of a certain temporal, and perhaps also cultural, diversity of the recoveries in West Rub<sup>c</sup> al-Khālī. As we go on with the analysis, we realize that the information about this subject is very approximate and sometimes incorrect. Chronological and cultural “levellings” have often been made, probably for convenience of study. Speaking about these sites, we had to content ourselves with the incomplete and scanty data and information available. Paradoxically, we know the exact location of some places – also with their geographic coordinates – but we know nothing else about them, except for the arrowheads.

A C14 dating made in 1960 puts one of them in  $5090 \pm 200$  B.P. (*H. Field*, 15).

Further, more precise information has come from C. Edens’ work (*C. Edens*, 9–10); he attempted a synthesis giving an hypothesis of systematic work of the lithic industry, that is a typology. Even if we are still far from a sufficient understanding of these places, this is a step towards gaining a knowledge of them.

All these considerations have driven us towards the edges of the Yemenite desert in search of new places<sup>1</sup> (*F. Di Mario*, 8), hoping that new recoveries could give data leading to a more comprehensive vision of these peoples who no doubt gave their contribution to the cultural developing of Arabian Peninsula.

Some members of the General Organization for Antiquities and Libraries of the Yemen Republic had come into possession of some flint, quartz and obsidian arrowheads. These objects, collected in an imprecisely identified area along the *wādī* Ḥarīb stream, in a zone not far from the Safir oil-refinery, about 70 km East–North–East of Marib, seemed to be

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<sup>1</sup> This new research has been carried out as part of the activities of the Italian Archaeological Mission of IsMEO in the Yemen Arab Republic, directed by Prof. Alessandro de Maigret (Project of Archaeological Cooperation between Italy and Yemen Arab Republic).

included in the horizon of the *Rub<sup>c</sup> al-Khālī*. We thus decided to head for this area to make a short reconnaissance<sup>2</sup>. These arrowheads have been marked with a generical *Y.86.HAR* and for convenience and homogeneity of study they will be described together with the other specimens from the site of *Y.86.HARii*. Reference is made to the typology of the arrowheads later displayed and to figs. 9 and 10.

We proceeded south-eastwards from the oil-refinery, in the direction of *wādī Ḥarīb*, following the track towards the village of *Al-Haḡlah al-Hamrā*, in the zone of the *Rub<sup>c</sup> al-Khālī* called *Ramlat Sab<sup>c</sup>atayan* and characterized by low sand dunes. The bottom of some small valleys among the dunes clearly differed from the general landscape because of its dark-grey colour, which contrasted strongly with the yellow-reddish colour typical of the sand. The patches of colour represent deflation pavements, that is all that remains of the paleosoils after the erosion due to aeolian agents. The action of the wind continues and these areas are periodically uncovered and recovered with a fairly thick layer of sand. These areas were in certain cases associated with remains of thin-layered silt deposits, typical of still waters. These indicate the presence, in ancient times, of one or more lake basins of which, for the moment, we know nothing except that they existed. In some of these small areas we collected sporadic traces of human frequentation (sites *I* and *II*). On arriving at the stream of the *wādī*, we went along its left edge, where we found site *III* and those denoted as *Y.86.HARi* and *Y.86.HARii*, which are bigger and rich in archaeological materials.

### *Y.86.I.*

A patch of dark-grey colour situated in the middle of a small valley among the dunes at about 16 km from the oil-refinery and characterized, on one edge, by the remains of silt deposits. In this area we recovered a residue of flint, a few "mineralized" bone fragments, a good deal of ostrich egg shells, terrestrials gasteropods (*Anciculidae* gen. sp.).

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<sup>2</sup> The team that has taken part in this first activity in the desert comprised, besides the author of this article, also Prof. Alessandro de Maigret, Dr. Sabina Antonini, and a member of the General Organization for Antiquities and Libraries of Yemen Arab Republic, to whom I express my warmest thanks. Moreover, I would like to thank Dr. Grazia M. Bulgarelli, Dr. Roberto Ciarla, Prof. Maurizio Tosi, Dr. Annalisa Zaratini, whose advice has been of great help in the analyses of the archaeological material.

*Y.86.II.*

Situated at about 2.7 km from the former place and characterized by the presence of a patch of dark colour associated with a large pack of deposits (plate I). We have recovered a flint flake with a flat butt (39 mm long; 31 mm broad; 3 mm thick).

*Y.86.III.*

Situated at about 2 km from place *II*, near the intersection between the track and the *wādī* Ḥarīb, and characterized by the familiar dark colouring of the ground. We have recovered a flint flake with a flat butt and plane-convex section (39 mm long; 33 mm broad; 10 mm thick).

*Y.86.HARi.*

This site is at about 22.2 km from the oil refinery, on a river terrace on the left bank of the *wādī* Ḥarīb, opposite the water pump of the Al Haġlah al-Hamrā village. On the ground, characterized by an intense dark colour, we have collected "marsh" gasteropods (*Melania tuberculata*), a fragment of *Cypraea*<sup>3</sup> and some archaeological materials (fig. 1). These are represented by a relatively small lithic industry, mainly composed by flint objects, followed by quartz, granite, basalt and obsidian ones (fig. 2).

Most of the recovered industry is represented by the *débitage* objects (fig. 3). These are constituted by flakes, residues and cores, the latter shapeless and small. The flakes are generally fragmentary and have been detached by hard percussion. The various activities were probably carried out *in situ*. The recovered flint is of two types: chert nodules and banded flint, and can be found on the river bed of the next *wādī* as for the quartz and the other stones except for obsidian. Little can be said about it, except that it is present in small quantities.

*Tools.*

1. *End scrapers*: three specimens made of flint obtained from quite thin flakes.

One is a thumb-nail end scraper (25 mm long; 22 mm broad; 4 mm thick); the second one is an end scraper on flake whose dorsal surface

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<sup>3</sup> The examination of the shells was made by Dr. Flavia Gravina and Mr. Carlo Smriglio. More detailed data come from the description of the malacological finds coming from *Y.86.HARii*.

|             |                        | n° | %     |
|-------------|------------------------|----|-------|
| Chert/Flint | Cortical flakes        | 3  | 4.9   |
|             | Flakes                 | 18 | 29.5  |
|             | Residues               | 3  | 4.9   |
|             | Cores                  | 1  | 1.6   |
| Quartz      | Flakes                 | 16 | 26.3  |
|             | Residues               | 4  | 6.6   |
|             | Cores                  | 1  | 1.6   |
|             | Obsidian Flakes        | 2  | 3.3   |
|             | Flakes of other stones | 4  | 6.6   |
| Tools       | End-scrapers           | 3  | 4.9   |
|             | Drills                 | 3  | 4.9   |
|             | Retouched flakes       | 3  | 4.9   |
|             | Total                  | 61 | 100.0 |

Fig. 1. Lithic industry from Y.86.HARi.

|             | n° | %     |
|-------------|----|-------|
| Chert/Flint | 32 | 52.4  |
| Quartz      | 23 | 37.7  |
| Obsidian    | 2  | 3.3   |
| Others      | 4  | 6.6   |
| Total       | 61 | 100.0 |

Fig. 2. Raw material frequencies.

|                 | n° | %     |
|-----------------|----|-------|
| <i>Débitage</i> | 52 | 85.3  |
| Tools           | 9  | 14.7  |
| Total           | 61 | 100.0 |

Fig. 3. Ratio between *débitage* and tools.

has cortex traces (26 mm long; 17 mm broad; 4 mm thick); the third, of an elongated triangular shape, is characterized by rectilinear front with carelessly executed direct, continuous retouches.

2. *Drills*: three tools made of flint. The working point of two of them, both on flake (32 and 24 mm long; 26 and 17 mm broad; 9 and 11 mm

thick), is bordered by a retouched notch. The third one (21 mm long; 21 mm broad; 12 mm thick) is star-shaped.

3. *Retouched flakes*: three objects, one made of flint and two made of quartz, characterized by retouches on only one edge; these retouches are direct or inverse, continuous, marginal, and quite carelessly executed.

#### *Y.86.HARii.*

This place, the largest recovered in the area of recoinnassance so far, is situated at about 1.5 km from the Y.86.HARi upstream from the *wādī*. It appears as a great ovoid patch, slightly elevated in comparison with the surrounding ground, rich in archaeological and faunal materials. It has not been possible to mark the boundaries of the site exactly; in fact particularly in the northern and southern zones, the boundaries do not seem to correspond to the end of the material scatter. On the other hand, the short time at our disposal and the sandy covering that characterizes the whole region made it difficult to survey its true extension exactly. We are perhaps dealing with a large dispersion area of archaeological finds which have been partly discovered by the sand. The action of the wind could have uncovered only the slightly higher portions of ground giving to the zone its ovoid structure. Therefore, they could represent variously sized portions of the areas of settlement made by the wind. These areas are perhaps the result of the periodical return of one or more human groups who re-inhabited this zone in several occasions.

The examined area, constituted by the above-named dark-grey ovoidal patch, measures 58 m north-southwards, and 41 m east-westwards. In the northern part we could see a concentration of charcoal on the surface of the ground. Therefore, we decided to build a transect 6 m long and 1 m broad, running north-south and divided into 24 squares with sides 50 cm long, and with the charcoal materials approximately in the centre of it. In this way, trying to state a balance between the scanty time at our disposal and the importance of the discovery, we set out to analyze a small portion of the site in detail, closely relating the zone with the charcoal to part of the surrounding area. We excavated square no 10, containing the charcoals, recovering both the organic materials and the underlying soil. We had found a hearth with a diameter of 50 cm. This small trial excavation, together with another one carried out in the southern part, revealed the complete lack of archaeological deposits (*H. McClure*, 23). In fact, the wind has eroded the site completely and only a thin layer of the ancient soil, about 2 cm thick, has remained, on which all the archaeological material rests.

Therefore, we started two different activities to collect the finds: the former, called "general collection" which took in the whole area of the site, was carried out by collecting unsystematically (fig. 4), although trying not to damage the material concentrations that seemed to be worthy of greater care. The rationale behind this was to get an idea of what was present on the ground, leaving what seemed to be more interesting to a later, more careful collection. In fact, mainly in the most southern zones of the patch and just outside it, you can found little concentrations of materials with a diameter of about 1 m, constituted by flint flakes, residues and cores (perhaps chipping areas?), by ostrich egg-shells, by bones (perhaps butchering areas?). Only a more careful work will perhaps allow us to connect up the various small activity areas with the single objects, trying to put them in a more exact archaeological framework.

| Flint/Chert  |                        |        |                    |                    | Obsid. |          | Quartz |                    | Basalt | Tools      |           |             |               |                |               |               |                  |        |                          |                  |     |
|--------------|------------------------|--------|--------------------|--------------------|--------|----------|--------|--------------------|--------|------------|-----------|-------------|---------------|----------------|---------------|---------------|------------------|--------|--------------------------|------------------|-----|
| First flakes | Partially cort. flakes | Flakes | Resharpning Flakes | Residues and cores | Flakes | Residues | Flakes | Residues and cores | Flakes | Arrowheads | Bifacials | Drill-heads | End-scrappers | Side-scrappers | Backed knives | Stemmed tools | Trihedral drills | Drills | Notched and denticulates | Retouched flakes | Axe |
| 17           | 20                     | 67     | 4                  | 41                 | 15     | 6        | 8      | 9                  | 1      | 30*        | 39        | 23          | 6             | 6              | 2             | 1             | 1                | 7      | 11°                      | 10+              | 1   |

Fig. 4. Y.86.HARii: the lithic industry from the general collection.

\* 4 of obsidian

° 1 of quartz

+ 1 of obsidian

Inside the transect, instead, we carried out the collection square by square, collecting all the soil and then sifting. In this way we were sure we could recover even the smallest objects and ensure that the sampling was as complete as possible (fig. 5).

The description of the archaeological find starts from the lithic industry, which appears to be highly patinated through prolonged exposure to the atmospheric agents. It has been divided in two big groups, *débitage* and tools, which will be described successively.

|           |     | Flint/Chert |          | Quartz |          | Obsidian |          | Flakes of other stones | Arrowheads | Fragmentary arrowheads | Bifacials | Drill-heads | Drills | Denticulates | Retouched flakes | Grindstones, anvils | Other objects | Fragments of green stone | Shell beads | Worked sea shells | Shell beads | Total |
|-----------|-----|-------------|----------|--------|----------|----------|----------|------------------------|------------|------------------------|-----------|-------------|--------|--------------|------------------|---------------------|---------------|--------------------------|-------------|-------------------|-------------|-------|
|           |     | Flakes      | Residues | Flakes | Residues | Flakes   | Residues |                        |            |                        |           |             |        |              |                  |                     |               |                          |             |                   |             |       |
| Square 1  | 151 | 1           | 14       |        | 2        | 1        |          |                        | 1          | 2                      |           | 1           |        |              |                  |                     |               |                          |             | 1                 | 1           | 174   |
| Square 2  | 172 | 1           | 12       |        | 4        |          |          |                        |            |                        |           | 1           |        |              |                  |                     |               |                          |             | 1                 | 2           | 193   |
| Square 3  | 161 | 2           | 5        | 1      | 4        |          |          |                        |            |                        |           |             |        |              |                  |                     | 1             |                          |             |                   |             | 174   |
| Square 4  | 103 | 4           | 12       |        | 2        |          |          |                        |            | 1                      |           |             |        | 1            | 1                |                     |               | 1                        |             | 1                 | 2           | 128   |
| Square 5  | 150 | 4           | 16       | 2      | 6        |          |          |                        |            | 2                      |           | 1           |        |              |                  |                     |               |                          |             |                   |             | 181   |
| Square 6  | 106 |             | 12       |        | 8        | 1        | 1*       |                        |            |                        |           | 1           |        |              |                  |                     |               | 1                        |             |                   | 1           | 131   |
| Square 7  | 177 |             | 14       |        | 15       |          |          |                        |            |                        |           | 1           |        |              |                  |                     |               |                          | 1           |                   | 1           | 209   |
| Square 8  | 75  |             | 14       |        | 4        |          | 1+       |                        |            |                        |           |             |        |              |                  | 2                   |               |                          |             |                   |             | 96    |
| Square 9  | 184 | 1           | 16       | 1      | 8        |          | 2°       |                        |            |                        |           | 1           |        |              |                  |                     |               | 2                        |             | 1                 |             | 216   |
| Square 10 | 183 | 2           | 16       |        | 7        | 1        |          | 1                      |            |                        |           |             | 2      |              |                  |                     |               |                          |             |                   | 1           | 213   |
| Square 11 | 226 | 1           | 15       | 2      | 7        |          |          | 1                      |            |                        |           | 1           |        |              |                  |                     |               |                          |             |                   | 1           | 254   |
| Square 12 | 196 |             | 6        |        | 6        |          |          |                        |            |                        |           |             |        |              |                  |                     |               |                          |             |                   |             | 208   |
| Square 13 | 203 | 1           | 27       | 4      | 10       |          |          |                        |            | 1                      |           | 1           | 1      |              |                  |                     |               |                          |             | 1                 |             | 249   |
| Square 14 | 201 |             | 13       | 3      | 5        |          |          |                        |            |                        |           |             |        |              |                  |                     |               |                          |             |                   |             | 222   |
| Square 15 | 169 |             | 29       | 6      | 6        |          |          | 1 □                    | 2 ◇        |                        |           | 1           |        |              | 1                |                     |               | 1                        |             |                   | 2           | 218   |
| Square 16 | 135 |             | 17       | 3      | 7        |          |          | 1                      |            |                        |           | 2           |        |              |                  |                     |               |                          |             | 1                 |             | 166   |
| Square 17 | 202 | 1           | 23       | 8      | 11       |          |          |                        |            |                        |           |             |        |              |                  |                     | 1             |                          |             | 2                 | 1           | 249   |
| Square 18 | 195 | 1           | 23       | 2      | 17       |          |          | 1                      |            |                        |           | 1           |        |              | 1                |                     |               | 1                        |             | 1                 | 1           | 244   |
| Square 19 | 200 |             | 28       | 1      | 5        | 1        |          |                        |            |                        |           | 2           |        |              |                  |                     |               |                          |             | 2                 |             | 239   |
| Square 20 | 192 |             | 20       | 2      | 15       |          |          | 1                      | 1          | 2                      | 1         |             |        |              |                  |                     |               |                          |             | 2                 |             | 236   |
| Square 21 | 196 | 3           | 35       | 2      | 15       |          |          | 1                      |            |                        |           | 2           |        |              |                  |                     |               | 1                        |             |                   | 1           | 256   |
| Square 22 | 188 |             | 13       | 1      | 11       |          |          | 1                      | 1          | 1                      |           |             |        |              | 1                |                     |               |                          |             | 1                 | 1           | 219   |
| Square 23 | 190 | 4           | 20       | 1      | 9        |          |          |                        |            |                        |           | 1           |        |              |                  |                     |               |                          |             |                   | 1           | 226   |
| Square 24 | 157 | 1           | 20       | 2      | 8        |          |          |                        |            | 1                      |           |             |        |              |                  |                     | 1             | 1                        |             |                   | 1           | 192   |
| Total     |     | 4112        | 27       | 420    | 41       | 192      | 4        | 4                      | 9          | 11                     | 3         | 18          | 3      | 1            | 4                | 2                   | 2             | 9                        | 1           | 13                | 17          | 4893  |

Fig. 5. Y.86.HARii: material collected in the transect (\* basalt; + limestone; ° rhyolite; □ obsidian; ◇ 1 of obsidian and 1 of flint; the remaining lithic tools are made of flint).



## A. LITHIC INDUSTRY

a. *Débitage*.1. *Flakes*.

At Y.86.HARii different raw materials have been utilized for chipping works. The most commonly used stone was flint, followed by obsidian, quartz and basalt (fig. 6a).

The various working activities aimed at producing flakes mainly by hard percussion. From the analysis of the length-breadth ratio of the blanks coming from the general collection, we can notice that the narrow flakes

|             | %     |
|-------------|-------|
| Flint/Chert | 95.9  |
| Obsidian    | 8.0   |
| Quartz      | 5.5   |
| Basalt      | 0.6   |
|             | 100.0 |

Fig. 6a. Raw material frequencies.

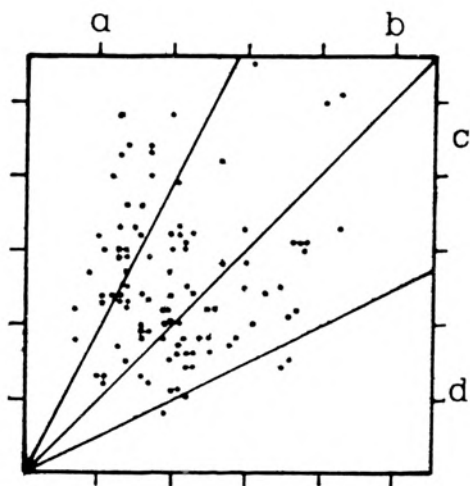


Fig. 6b. Graphic representation of the flakes lengthening index: the axis of the ordinates corresponds to the length of the blanks, the one of the abscissae to their breadth (a: lamellar flakes; b: narrow flakes; c: large flakes; d: very large flakes).

|                     | %     |
|---------------------|-------|
| a Lamellar flakes   | 26.4  |
| b Narrow flakes     | 36.8  |
| c Large flakes      | 32.1  |
| d Very large flakes | 4.7   |
|                     | 100.0 |

Fig. 6c. Ratio identified between a) lamellar flakes, b) narrow flakes, c) large flakes, d) very large flakes.

represent the majority of the chipping products (fig. 6b). The large and very large flakes are less numerous (fig. 6c). In the lithic production there is also a certain quantity of peculiar long blanks (lamellar flakes), 25 made of flint and 3 of quartz, that should be considered blades because of their dimensions. The asymmetry of these objects and the absence – except for two crested blades – of core preparing techniques, lead us to suppose that they were accidental by-products of the chipping processes, that is their length–breadth–thickness relationship wasn't on purpose, but unintentional. These blanks, probably together with the crested blades, all of them detached by hard percussion, represent – at least partly – flakes due to the start of core working and shaping out. The largest of them are a first flake and 5 partially cortical flakes. All the others are smaller. The butts are flat in 21 cases, in 1 punctiform and in 1 cortical. Most of them have triangular sections (fifteen), followed by the trapezoidal ones (ten) and flat-convex one (one).

Coming back to the flakes of “normal dimensions”, the flint ones consist of 98 flakes, 16 of which first flakes, 15 partially cortical, and 67 others, 24 of which are fragmentary; the obsidian flakes comprise 4 whole ones and 11 fragmentary ones; the quartz ones 3 whole and 5 fragmentary. Many of these are asymmetrical, the so called “shaping flakes”.

The flakes coming from the sifting carried out in the squares of the transect are mostly small: in fact, the majority (80% of the total) are between 5 and 10 mm in length (fig. 7a). While the smallest ones are chips, many others are shaping flakes, generally asymmetrical, the length of which tends to be comparable to their breadth.

The analysis of the butts of the various blanks has revealed the existence of four different types: flat, cortical, dihedral and punctiform (fig. 7b). Many of the flat ones bear clear traces of the abrasion of the striking platform.

The analysis of the dorsal faces of the blanks, that is the calculation of the ribs and of the negatives due to former removals, has given some information about the cores. Most of these had one direction of detachment only, even if some of them had two opposite striking platforms. The percussion was mainly hard. The section of the flakes is both triangular and flat-convex, and in this second case their dorsal face is characterized by a single big negative of removal. We have also recovered 4 resharpening flint flakes.

The presence of first flakes, of shaping and resharpening ones, as well as – of course – the residues, suggests that the various working activities of the raw materials were carried out *in situ*.

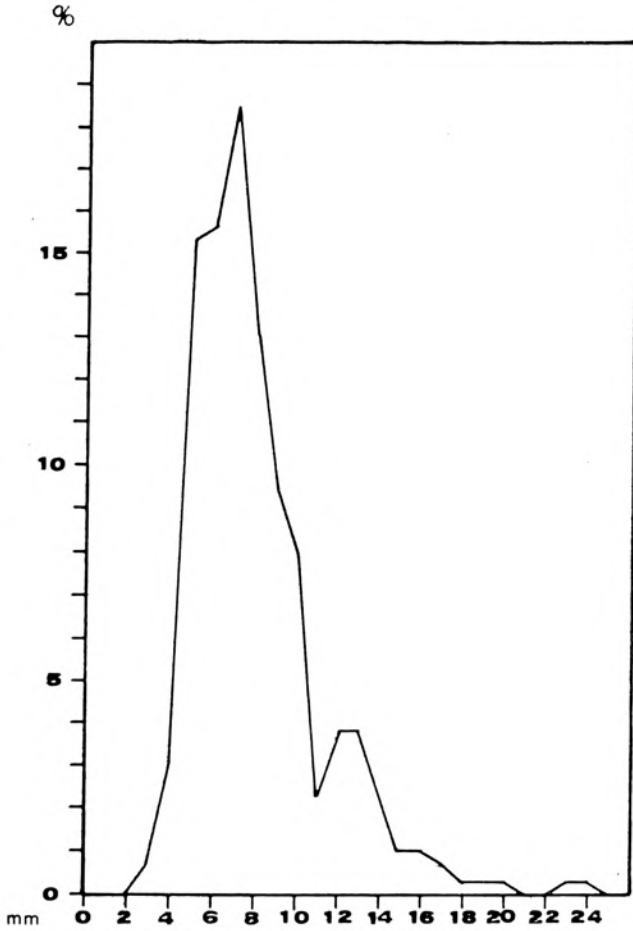


Fig. 7a. Blanks coming from the transect. The axis of the abscissae corresponds to their length (in *millimetres*) while that of the ordinates corresponds to their number (expressed in percentage).

|                  | %     |
|------------------|-------|
| Flat butts       | 84.0  |
| Cortical butts   | 12.0  |
| Dihedral butts   | 2.7   |
| Punctiform butts | 1.3   |
|                  | 100.0 |

Fig. 7b. Different types of butts.

## 2. Residues and cores.

We have recovered 56 objects (41 of which made of flint, 9 of quartz and 6 of obsidian<sup>4</sup> (*V. Francaviglia, 17*), all shapeless and small. This is due to the intense exploitation to which the cores were subjected. The flint, that used to be probably collected in the river-bed of the *wādī Ḥarīb*, appears to consist of two different types: nodular chert and banded flint. The quartz, generally of good quality presumably came from the same source.

### b. Tools.

In the tool analysis consideration has been given to the typology suggested by Edens (*C. Edens, 9–10*); for the arrowheads, instead, we have followed the work by Hugot (*H.J. Hugot, 21*). As mentioned above, the arrowheads belonging to Y.86.HAR will be described together with those from Y.86.HARii.

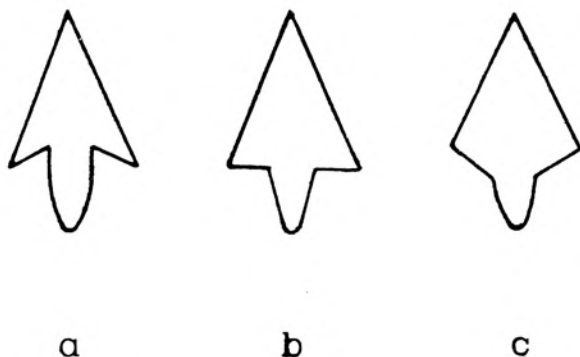


Fig. 8. a: arrowhead with acute-angled barbs; b: arrowhead with right-angled barbs; c: arrowhead with obtuse-angled barbs (by H.J. Hugot, fig. 12).

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<sup>4</sup> Dr. Vincenzo Francaviglia has carried out some analyses of obsidian samples coming from Y.86.HARii. The results though still preliminary, have shown that the specimens examined are identical and probably have the same origin, that is, they are located in the zone of Ġabal Isbīl and Ġabal al Isī. Moreover, they are similar to the obsidian from the Yemen highland and, more exactly, from the neolithic site of Ġabal Qutran (*A. Zarattini, 28*) and *wādī at-Thayylah* (*F. Fede, 11–12*) and from the numerous Bronze Age settlements (*A. de Maigret, 6; F.Di Mario, 7*).

### 1. Arrowheads.

All the arrowheads are characterized by pressure-made low angle retouches. According to their shape, they have been divided into four classes (triangular, sub-triangular, rhomboidal, trapezoidal), all of which have been further subdivided into types because of their high variability. For the establishment of each single type we have considered as discriminating elements, besides the different morphologies of the objects, attributes like the barbs, that appear in three different forms (acute, right, obtuse-angled) (fig. 8), the stems, etc.

#### 1.1. Triangular arrowheads.

1.1.1. Triangular arrowheads without stem with rectilinear or slightly curved edges. The manufacture is bifacial. One of the two flint specimens comes from Y.86.HAR (25 mm long; 17 mm broad; 3 mm thick), and the other one from Y.86.HARii – (22 mm long; 21 mm broad; 3 mm thick) (fig. 9).

1.1.2. Stemmed arrowheads with rectilinear edges and right-angled barbs. The manufacture is bifacial on the stem and monofacial or bifacial on the rest of the body. The stem is tapered and the end is rounded or pointed. Five flint specimens come from Y.86.HAR and three from Y.86.HARii (squares 10, 18, 20) (21–25 mm long; 10–13 mm broad; 3–4 mm thick) (fig. 9).

1.1.3. Stemmed arrowheads with curved edges. The barbs are right-angled and the stem is tapered and tends to have a pointed end. The end of the arrowheads is slightly asymmetrical with respect to the axis of the objects. The manufacture is bifacial on the stem and bifacial or monofacial on the rest of the body. Three specimens come from Y.86.HARii (1 of obsidian from square 15; 1 of flint from square 16; 1 of obsidian from the general collection) (18–22 mm long; 9–10 mm broad; 3 mm thick) (fig. 9).

1.1.4. Stemmed arrowheads with denticulate right edges. The manufacture is bifacial, the barbs are right-angled and the stem is tapered and rounded at the end. Two flint specimens come from Y.86.HARii, one of which from the general collection and the other, fragmentary, from square 11 (32 mm long; 17 mm broad; 5 mm thick) (fig. 9).

1.1.5. Stemmed arrowheads with rectilinear edges and acute-angled barbs. The body is elongated and the manufacture is bifacial. One flint specimen comes from Y.86.HARii – general collection – (31 mm long; 20 mm broad; 4 mm thick) (fig. 9).

1.1.6. Stemmed arrowheads with highly curved edges. The barbs are acute-angled and the stem is quadrangular shaped. The manufacture is

| Types                                                                                         | Y. 86. HAR | Y. 86. HAR i<br>general<br>collection | transect             |
|-----------------------------------------------------------------------------------------------|------------|---------------------------------------|----------------------|
| <br>1.1.1.   | 1          | 1                                     |                      |
| <br>1.1.2.   | 5          |                                       | 3 (sqs. 10, 18, 20). |
| <br>1.1.3.   |            | 1                                     | 2 (sqs. 15, 16).     |
| <br>1.1.4.  |            | 1                                     | 1 (sq. 11).          |
| <br>1.1.5. |            | 1                                     |                      |
| <br>1.1.6. | 1          | 1                                     |                      |

| Types                                                                                         | Y. 86. HAR | Y. 86. HAR i<br>general<br>collection | transect  |
|-----------------------------------------------------------------------------------------------|------------|---------------------------------------|-----------|
| <br>1.2.1.   | 2          |                                       |           |
| <br>1.2.2.   | 1          | 1                                     |           |
| <br>1.2.3.   |            |                                       | 1 (sq. 1) |
| <br>1.2.4.  |            | 2                                     |           |
| <br>1.2.5. | 2          |                                       |           |
| <br>1.2.6. | 1          | 3                                     |           |

0 1 2 3

Fig. 9

bifacial on the stem and monofacial or bifacial on the rest of the body. Two specimens, a flint one from Y.86.HAR, and a fragmentary obsidian one from Y.86.HARii – general collection – (23 mm long; 22 mm broad; 4 mm thick) (fig. 9).

## 1.2. Sub-triangular arrowheads.

1.2.1. Stemmed arrowheads with rectilinear edges. The pointed stem is enhanced by one or two opposite notches. The manufacture is monofacial or only partially bifacial. Two flint specimens come from Y.86.HAR (30 and 22 mm long; 13 and 8 mm broad; 4 and 3 mm thick) (fig. 9).

1.2.2. Stemmed arrowheads with slightly sinuous edges and acute-angled barbs. The manufacture is bifacial. Two flint specimens, one of which from Y.86.HAR and the other one from Y.86.HARii – general collection – (27 and 24 mm long; 15 and 13 mm broad; 3 mm thick) (fig. 9).

1.2.3. Stemmed arrowheads with concave edges and very protuberant acute-angled barbs. The manufacture is monofacial and the stem is tapered and pointed at the end. One flint specimen comes from Y.86.HARii, square 1 (28 mm long; 19 mm broad; 3 mm thick) (fig. 9).

1.2.4. Stemmed arrowheads with curved edges and obtuse-angled barbs. The stem is tapered and tends to have a pointed end. The manufacture is bifacial. Two flint specimens come from Y.86.HARii – general collection – (28 and 24 mm long; 10 mm broad; 5 mm thick) (fig. 9).

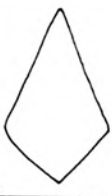
1.2.5. Shouldered arrowheads. Two specimens come from Y.86.HAR (29 and 21 mm long; 9 and 7 mm broad; 6 and 3 mm thick). The manufacture is bifacial (fig. 9).

1.2.6. Stemmed arrowheads with rectilinear or slightly curved edges. The barbs are not very pronounced and tend to be obtuse-angled. The stem, which exceeds half of the length of the whole object, is tapered and has a rounded end. The manufacture is bifacial. Four flint specimens one of which from Y.86.HAR and three from Y.86.HARii – general collection – (40–32 mm long; 12–9 mm broad; 5–4 mm thick). The manufacture is bifacial (fig. 10).

1.2.8. Stemmed arrowheads with curved and – in some cases – denticulate edges. The stem is tapered and tends to have a pointed end. The body is less elongated than in the preceding group. Ten flint specimens three of which from Y.86.HAR (one of these from square 22 and six from the general collection) (38–19 mm long; 13–9 mm broad; 5–3 mm thick). The manufacture is bifacial on the stem and both bifacial and monofacial on the rest of the body (fig. 10).

1.2.9. Stemmed arrowheads with curved and slightly sinuous edges, obtuse-angled barbs and elongated body. The stem is quadrangular and

| Types                                                                                          | Y.86.HAR | Y.86.HAR <i>ii</i>    |            |
|------------------------------------------------------------------------------------------------|----------|-----------------------|------------|
|                                                                                                |          | general<br>collection | transect   |
| 1.2.7.<br>    | 2        | 4                     |            |
| 1.2.8.<br>    | 3        | 6                     | 1(sq. 22). |
| 1.2.9.<br>    |          | 1                     |            |
| 1.2.10.<br> |          | 1                     |            |
| 1.3.1.<br>  |          | 2                     |            |

| Types                                                                                        | Y.86.HAR | Y.86.HAR <i>ii</i>    |            |
|----------------------------------------------------------------------------------------------|----------|-----------------------|------------|
|                                                                                              |          | general<br>collection | transect   |
| 1.3.2.<br>  | 2        | 1                     | 1(sq. 21). |
| 1.3.3.<br>  | 2        |                       |            |
| 1.3.4.<br>  |          | 1                     |            |
| 1.4.1.<br> |          | 1                     |            |

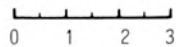


Fig. 10



the manufacture is bifacial. One flint specimen comes from Y.86.HARii – general collection – (37 mm long; 10 mm broad; 4 mm thick) (fig. 10).

1.2.10. Large stemmed arrowheads. The edges are curved and the barbs are right-angled. The body is elongated and the stem is tapered and tends to have a pointed end. One flint specimen comes from Y.86.HARii – general collection – (50 mm long; 18 mm broad; 4 mm thick). The manufacture is bifacial (fig. 10).

### 1.3. Rhomboidal arrowheads.

1.3.1. Stemmed arrowheads with curved edges and elongated body. The stem is barely separate from the rest of the body. The objects tend to be rhomboidal-shaped. Two flint specimens come from Y.86.HARii – general collection – (42 and 39 mm long; 12 mm broad; 5 and 4 mm thick). The manufacture is bifacial (fig. 10).

1.3.2. Stemmed arrowheads with right or slightly concave edges and with obtuse-angled barbs located approximately in the centre of the objects. The stem is about half the length of the whole arrowhead. The manufacture is bifacial on the stem and both monofacial and bifacial on the body. Four flint specimens two of which come from Y.86.HAR and two from Y.86.HARii (one of which from the general collection and one from square 21) (31–25 mm long; 14–11 mm broad; 5–4 mm thick). The manufacture is bifacial (fig. 10).

1.3.3. Rhomboidal-shaped arrowheads with obtuse-angled barbs and rounded stems. The edges are rectilinear, the manufacture is bifacial. Two flint specimens come from Y.86.HAR one of which is fragmentary (32 mm long; 15 mm broad; 5 mm thick) (fig. 10).

1.3.4. Rhomboidal-shaped arrowheads without stem with rectilinear edges. The manufacture is bifacial. One flint specimen comes from Y.86.HARii – general collection – (20 mm long; 20 mm broad; 3 mm thick) (fig. 10).

### 1.4. Trapezoidal arrowheads.

1.4.1. Trapezoidal-shaped arrowheads with rectilinear edges, obtuse-angled barbs and very large stem. The manufacture is bifacial. One flint specimen comes from Y.86.HARii – general collection – (33 mm long; 19 mm broad; 6 mm thick) (fig. 10).

In the site of Y.86.HARii we have collected also thirteen fragmentary arrowheads (ten made of flint and three of obsidian), two of which from square 1, one from square 4, two from square 5, one from square 13, two (one of which of obsidian) from square 15, one from square 20, one from square 22, one from square 24, two from the general collection: it

has not been possible to attribute any of these to one of the above-named types.

From squares 9 and 19 come two flint flakes with monofacial manufactured stem, which could represent an intermediate stage in the manufacture of the arrowheads.

## 2. *Bifacials.*

2.1. Narrow foliates: thirteen flint objects four of which whole and nine fragmentary; two of these come from square 20, one from square 22, and the rest from the general collection. Except for seven specimens, which can only generically be said to belong to this class, the other ones can be divided into two groups.

2.1.1. Objects with pointed ends: three whole specimens of careful manufacture (43, 42, 38 mm long; 7, 16, 11 mm broad; 4, 6, 4, mm thick) and probably two fragmentary ones. They have covering bifacial retouches made by pressure. The section is lenticular and quite thin. The points tend to be sharp (fig. 11).

2.1.2. Objects with a pointed end and a convex one; one specimen of careful manufacture (36 mm long; 14 mm broad; 6 mm thick). The covering retouches have been made by pressure. The section is lenticular and the point is sharp (fig. 11).

2.2. Broad foliates: class constituted by two flint specimens (47 mm long; 25 and 22 mm broad; 9 and 6 mm thick), coming from the general collection, with both the ends rounded and the broadest part in the centre of the objects. They have been worked with hard and soft percussion (fig. 11).

2.3. Lanceolates: only one flint object comes from the general collection (90 mm long; 32 mm broad; 8 mm thick); its distal end has a quite sharp point, while the other one is convex. The maximum breadth is situated in the proximal part, at about a third of the length of the object. The manufacture is made by soft percussion and – near the point – by pressure. The edges are curved (fig. 11).

2.4. Quadrangular-shaped objects: two flint specimens come from the general collection (27 and 25 mm long; 16 and 17 mm broad; 9 and 7 mm thick); they are carefully manufactured and of comparable size. The first one is quadrangular, has a lenticular section and is characterized by hard and soft percussion. One of the two side-edges is quite extensively rounded while the other one is sharp (fig. 12).

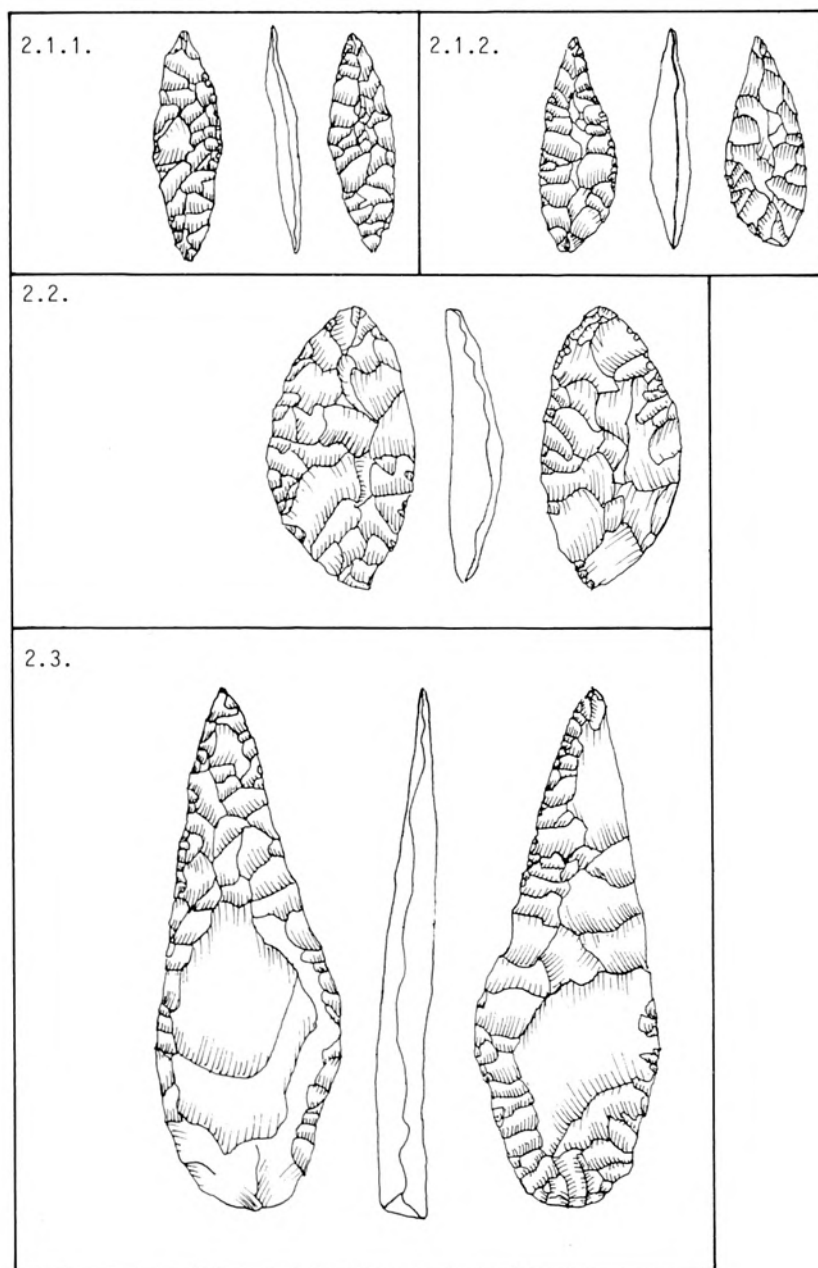


Fig. 11. Types of bifacials present in the lithic industry of Y.86.HARii.

the handled one, has alternate retouches along the side-edges at a more abrupt angle than in the rest of the body (plate II).

3.2. "Toothpick"-shaped drill-heads with a central thickening: three flint specimens (41, 37, 27 mm long; 8, 8, 4 mm broad; 6, 5, 4 mm thick), two of which come from the general collection and a smaller one from square 18. In these objects the working end is separate from the handled part by a thickening of the body. This part, lenticular in section, has bifacial retouches made by soft percussion. Instead, the ends, of quadrangular section, are characterized by backed edges due to abrupt retouches made on an anvil. In the drills examined the working end is longer than the opposite one and in two cases it is also thinner. The difference between the wear of the working end (consisting of "abrasion" and very small scars) and the one of the handled part (bigger chips generally directed according to the axis of the tool) is quite evident (plate II).

3.3. "Toothpick"-shaped drill-heads: thirty-five flint specimens mostly fragmentary, with a quadrangular section. The original dimension of these objects must have been: length 36-16 mm; breadth and thickness 5-2. Their side-edges are characterized by retouches made on an anvil. The breadth and the thickness tend to lessen as you go from the end with the handle towards the originally pointed working end. It appears to have considerable usage abrasions.

The opposite end is characterized by a different kind of wear, consisting mainly of scars of small flakes, mostly directed according to the axis of the object and probably due to the attrition between the tool and the handle (plate II).

Among the thirty-five objects collected - only nine of which are whole-eleven come respectively from squares 1, 2, 5, 6, 7, 9, 13, 15, 20, 21, 23, two from square 16 and two from square 19, while the remaining twenty from the general collection.

Moreover, we have recovered a flint object which could be a drill-head belonging to a still incomplete manufacturing stage. This fragmentary tool comes from square 21. It is "toothpick"-shaped, has a quadrangular section and irregular edges.

#### 4. *End scrapers.*

Class comprising six flint tools from the general collection, subdivided into six different types.

4.1. Thumb-nail end scraper with lateral retouches on a mesial-distal fragment of flake (29 mm long; 21 mm broad; 8 mm thick). The right

side-edge has bifacial retouches (continuous, marginal, semi-abrupt on the dorsal surface and low-angle on the ventral one), made by hard percussion. The front, situated on the transverse distal edge, the thickest of the blank, is characterized by direct, long, accurate retouches (fig. 13 no. 1).

4.2. End scraper on retouched flake (35 mm long; 22 mm broad; 8 mm thick). The blank is sub-triangular-shaped. The butt has been removed by direct, semi-abrupt long retouches. The left edge has direct, continuous, marginal retouches along its entire length. Similar retouches characterize the proximal part of the right-hand edge (fig. 13 no. 2).

4.3. End scraper on elongated flake with lateral notch and backed edge (28 mm long; 16 mm broad; 5 mm thick). The left edge has direct, continuous, and has been backed by, abrupt retouches. The notch (5 mm wide) is on the proximal part of the right-hand. The front, asymmetrical with respect to the axis of the tool and partly fractured, is located on the transverse distal edge of the blank.

4.4. End scraper on lamellar flake. The blank consists of a mesial-distal fragment of flake (50 mm long; 24 mm broad; 5 mm thick).

4.5. Circular end scraper on mesial-distal fragment of flake. The proximal part of the blank, opposite the front, has direct truncation (25 mm long; 23 mm broad; 4 mm thick).

4.6. End scraper-bec on chipping residue (45 mm long; 17 mm broad; 10 mm thick).

## 5. *Side scrapers.*

5.1. Converging side scrapers: type comprising two specimens from the general collection, of roughly the same shape and size, very accurately manufactured. One of them is entire while the other one is fragmentary (47 and 34 mm long; 28 and 26 mm broad; 9 mm thick). In both specimens the dorsal surface keeps part of the original cortex. The side-edges have direct, continuous, semi-abrupt, partly stepped retouches, very accurately manufactured and made by soft percussion (fig. 13 no. 3).

5.2. Tortoise shell shaped side scrapers: three ogival specimens and a quadrangular one, made of flint, of very accurate monofacial manufacture and with a plane-convex section, from the general collection (fig. 13 no. 4). They are characterized by the complete modification of the dorsal surface while the ventral one has remained intact. The retouches have been made by both hard and soft percussion. Two of the three ogival specimens are of roughly the same size (about 38 mm long; about 16 mm broad;

about 9 mm thick), while the third one is bigger (50 mm long; 23 mm broad; 11 mm thick). The fourth object (31 mm long; 22 mm broad; 7 mm thick) differs from the others because of its quadrangular shape.

6. *Knives with natural back*: two flint tools from the general collection. The first has been obtained from a small plate, intentionally fractured at one end to reduce its length. One of the two long side-edges

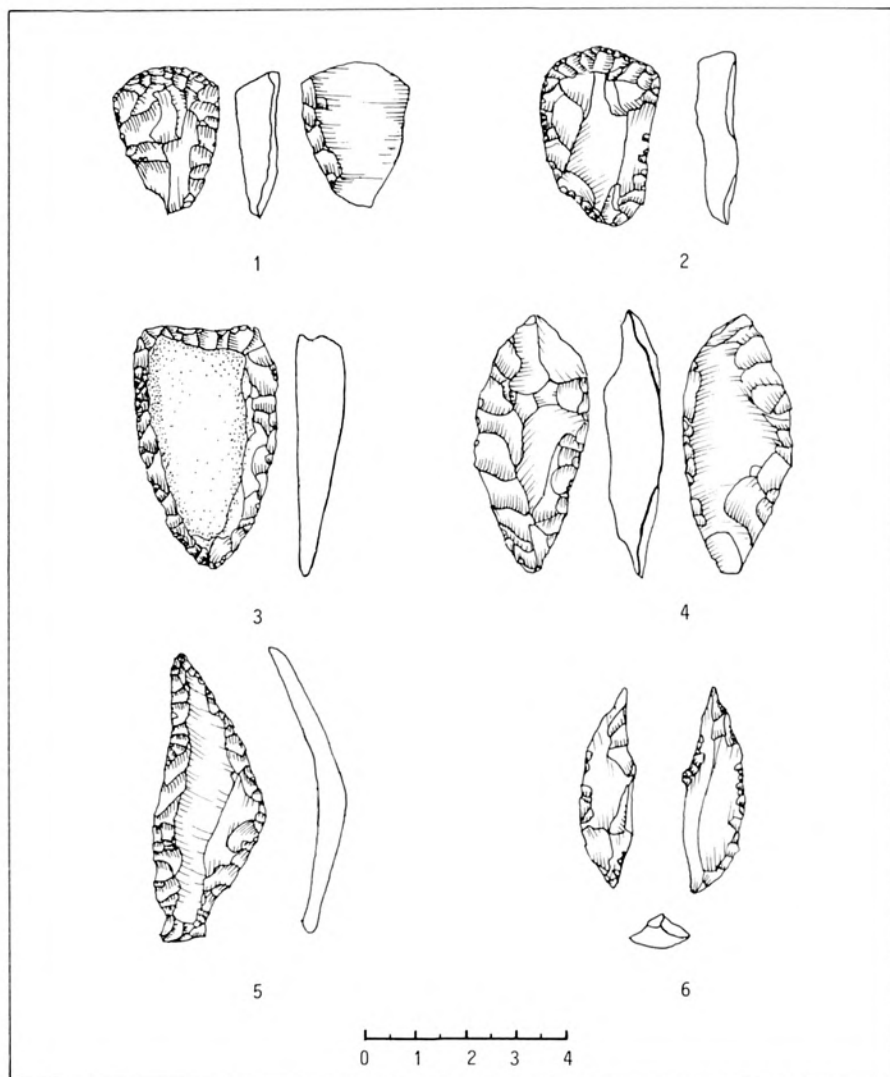


Fig. 13: 1) Thumb-nail end scraper; 2) End scraper on flake; 3) Converging side scraper; 4) Side scraper; 5) Stemmed tool; 6) Drill.

has a natural back, while the opposite one is characterized by long, continuous, parallel retouches, accurately made, that are bifacial in the neighbourhood of the fracture (80 mm long; 24 mm broad; 9 mm thick) (fig. 14 no. 2).

The second tool has been obtained from a fragmentary flint flake (48 mm long; 21 mm broad; 6 mm thick). One side-edge is characterized by an intentional fracture (the back), while the opposite one has large bifacial retouches obtained by hard percussion.

7. *Stemmed tools*: a single specimen, a lamellar flint flake (fig. 13 no. 5) from the general collection (57 mm long; 23 mm broad; 5 mm thick); its sinuous left edge has direct, semi-abrupt, lamellar, parallel retouches made by soft percussion. The right-hand edge, strongly curved, has similar retouches on the mesial-distal part. The blank, pointed at the distal end, is characterized – on the proximal part – by a quadrangular-shaped stem, differentiated from the rest of the body by two opposite, direct, retouched notches. Of this tool, which was probably handled, were used the side-edges, accurately manufactured.

8. *Trihedral drills*: only one fragmentary tool of this type (30 mm long;  $\times 6 \times 7$  mm) from the general collection; of triangular section, it is characterized by an edge backed by retouches made on an anvil, while the other two edges, which form an acute angle, have long retouches. These have been made using the backed edge as striking platform.

9. *Drills*: class comprising ten flint specimens. Seven of them (fig. 13 no. 6) (one of which from square 13 and six from the general collection) have the working end, strong and with a triangular section, characterized – on the side-edge – by very small, abrupt retouches that have thinned it. These tools have been obtained from different-sized elongated flakes or residues (50–25 mm long; 18–3 mm broad; 10–3 mm thick). Among the remaining tools two, from square 10, are of small dimensions (15 and 14 mm long; 22 and 18 mm broad; 5 and 4 mm thick). The working end, of triangular section, is bordered by two direct notches.

The working end of tenth tool – from the general collection – (35 mm long; 22 mm broad; 5 mm thick), of lenticular section, is characterized by bifacial retouches accurately made by pressure, while the remaining part of the blank is only partially and briefly retouched. This object, which bears traces of exposure to heat, is fractured both on the end of the drill and on the opposite part of the blank (fig. 14 no. 1).

10. *Notches and denticulates*: class comprising 12 specimens, eleven of which are made of flint and one of quartz. This group consists mainly

of the notches (ten objects, all of them from the general collection), from 6 to 9 mm wide, obtained from blanks mostly of small size.

There are two denticulates (25 and 16 mm long; 18 and 20 mm broad; 8 and 7 mm thick), the first of which from the general collection and the second from square 4. The blank of the first object, made of flint, has – on the mesial–proximal part of the left side–edge – two inverse

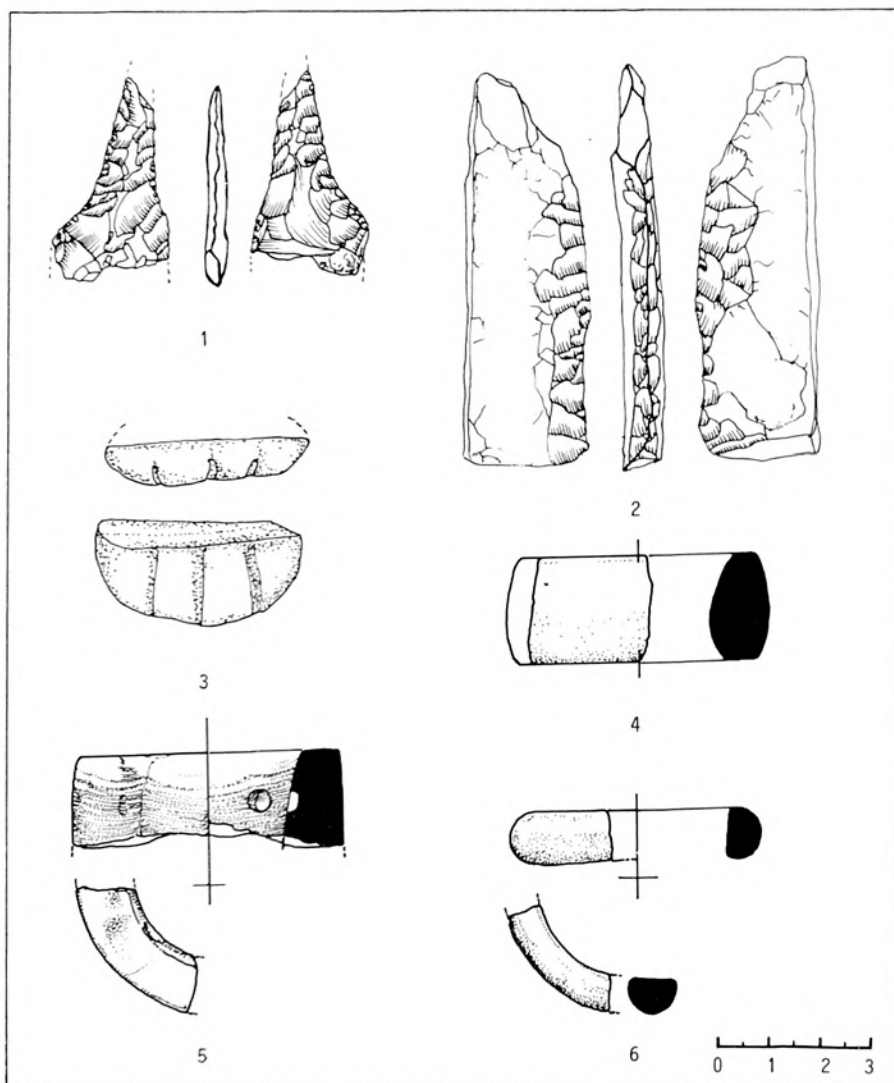


Fig. 14: 1) Drill; 2) Knife; 3) Steatite object; 4) Quartzite object; 5) Alabaster bowl; 6) Quartzite object; (nos. 4, 5, 6, were drawn by E. Gatti).



adjacent notches, each 7 mm wide, and low-angle, inverse, continuous retouches on the distal zone.

The second tool has inverse denticulate retouches on the transverse distal edge, which is convex, on the left; it has inverse low-angle, lamellar retouches on the right.

11. *Retouched flakes*: class differentiated into two types using the dimensions and the different types of retouches as discriminant principles.

11.1. Thirteen flint flakes and an obsidian one, fragmentary and small in size, characterized – on one or more edges – by various types of retouches, relatively accurate, mostly marginal and short, but also semi-long and parallel or scaled. Nine of them from the general collection, one from square 4, one from square 15, one from square 18, one from square 22.

11.2. Mesial-distal fragment of lamellar flake from the general collection (53 mm long; 14 mm broad; 6 mm thick), of trapezoidal section, whose parallel edges, partly backed, have direct, semi-abrupt, continuous, long retouches. The ones on the left side have been made by soft percussion, while the ones on the right side, with a denticulate profile, have been obtained by hard percussion. The transverse distal edge has direct, lamellar, sub-parallel retouches, made by pressure, which have thinned the blank at that point. The proximal end is characterized by a fracture probably due to torsion.

*Polished axe*: ogival shaped, metamorphic stone tool from the general collection (114 mm long; 49 mm broad; 28 mm thick). The part of the cutting edge is perfectly polished while the rest of the body is characterized by a less accurate manufacture and by the scars due to the strokes by which it was shaped. About half way along it, the thickness of the tool narrows probably to form a sort of "slide" for the handle (fig. 15 no. 2).

#### B. GRINDING-STONES, HAMMER-STONES AND ANVILS.

1. *Upper grinding-stone* made of sandstone from the general collection: the greater diameter measures about 108 mm and the thickness 21 mm in the centre and 14 mm on the edges. Flat discoidal-shaped, it has a plane face and a slightly convex one. The side-edges are characterized by the negatives of chippings made when shaping it out. On the plane face, the used one, striations can be seen to run from the edges towards the centre of the tool (fig. 15 no. 3).

2. *Upper grinding-stone* made of granite from the general collection; "semi-dome" shaped, it has a plane-convex section. It was shaped by

chipping, traces of which are still visible on the edges. The greater diameter measures about 110 mm. The object is 40 mm thick at the centre, and 29 mm and 27 mm on the edges (fig. 15 no. 4).

3. *Small lower grinding-stone* made of sandstone from the general collection; flat discoidal-shaped. The greater diameter is about 154 mm; rather thin, the object is 23 mm thick in the centre and 15 and 18 mm

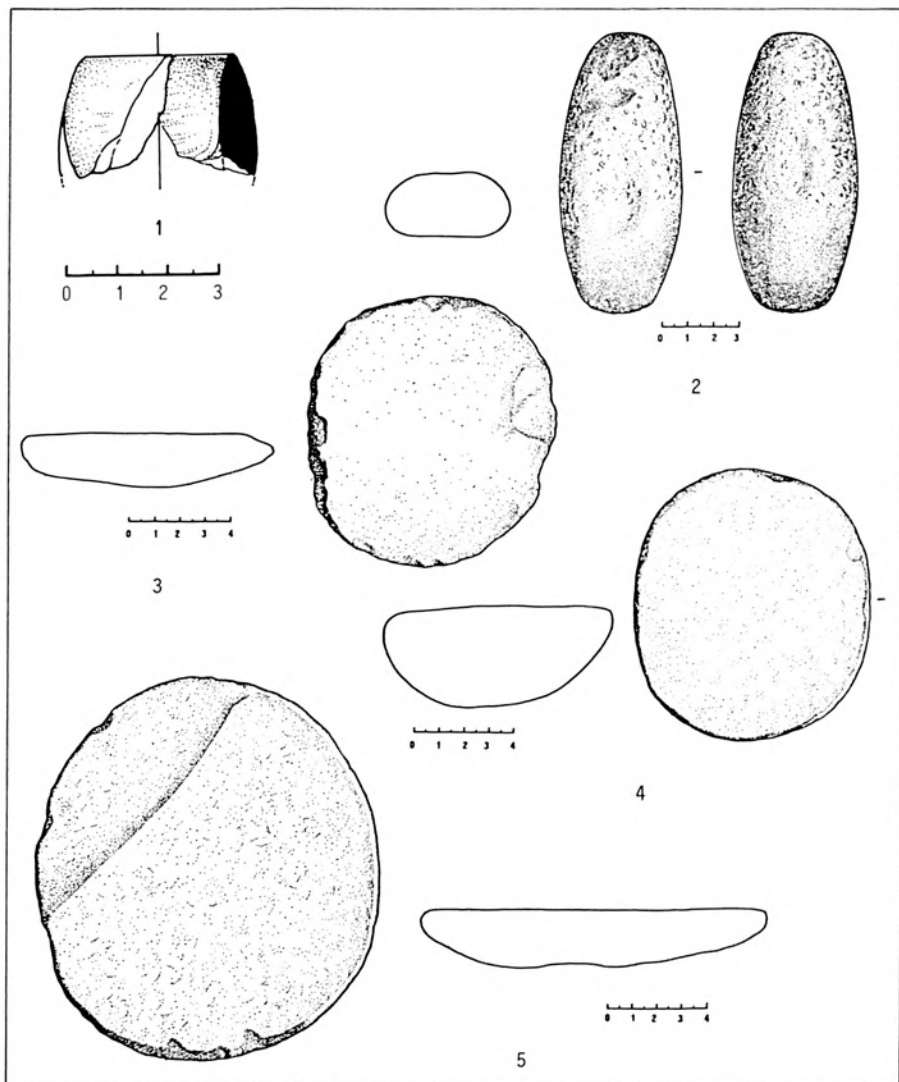


Fig. 15: 1) Rhyolite object; 2) Axe; 3) Upper grinding-stone; 4) Upper grinding stone; 5) Lower grinding-stone; (no. 1 was drawn by E. Gatti; nos. 2-5 were drawn by P. Smith).

on the edges. Of plane-convex section, it bears traces of the chipping used to shape it out on the edges (fig. 15 no. 5).

4. *Lower grinding-stone* made of pink granite quadrangular-shaped, of biconcave section, from the western part of square 8. Both faces have been used, although one is worn more than the other. The side-edges are characterized by scars due to the strokes used to shape it out. This object is 205 mm long and 130 mm broad; it is 61 mm thick in the centre, and 78 and 70 mm on the edges (fig. 16).

5. *Hammer-stone*: quadrangular-shaped flint pebble ( $64 \times 59 \times 49$  mm), on which are evident numerous scars due to percussion; all of them are patinated. It comes from the general collection.

6. Long-shaped sandstone object, of quadrangular section, from square 8. One of the ends of the stone is characterized by numerous small scars which, besides modifying the section from quadrangular into circular, have created a sort of "narrowing" along the whole circumference. Probably this stone was used as an anvil during the various chipping operations.

#### C. OTHER OBJECTS.

1. Micaceous schistose stone, roughly rectangular-shaped, from square 24 ( $43 \times 26 \times 14$  mm) with a median rectilinear engraving, parallel to the short edges.

2. Fragmentary steatite object from the general collection ( $40 \times 19 \times 8$  mm), with a polished face and three parallel rectilinear engravings (fig. 14 no. 3).

3. Fragmentary granite pebble from square 17 ( $25 \times 20 \times 14$  mm), triangular-shaped, with traces of polishing on one face. On the fracture it is possible to see the concavities of two holes which, from the face opposite the polished one, reached one third of the thickness of the object. We can suppose that this small pebble was used as stone drill cap in the manufacturing processes in which the drills, whose flint heads we have recovered, were used.

4. A fragment of alabaster bowl from the general collection, with flat rim and a diameter of about 50 mm. The inside surface has a hole, 4.5 mm in diameter and 2 mm deep, corresponding to another one, barely

outlined, on the outside face. These holes can be interpreted as evidence of the reutilization of this object as a drill cap (fig. 14 no. 5).

5. *Mace heads and/or beads (?)*.

5.1. Fragmentary quartzite object from the general collection, round, polished, with a biconvex hole in the centre. The upper and lower edges are flat. It is 21 mm high (fig. 14 no. 4).

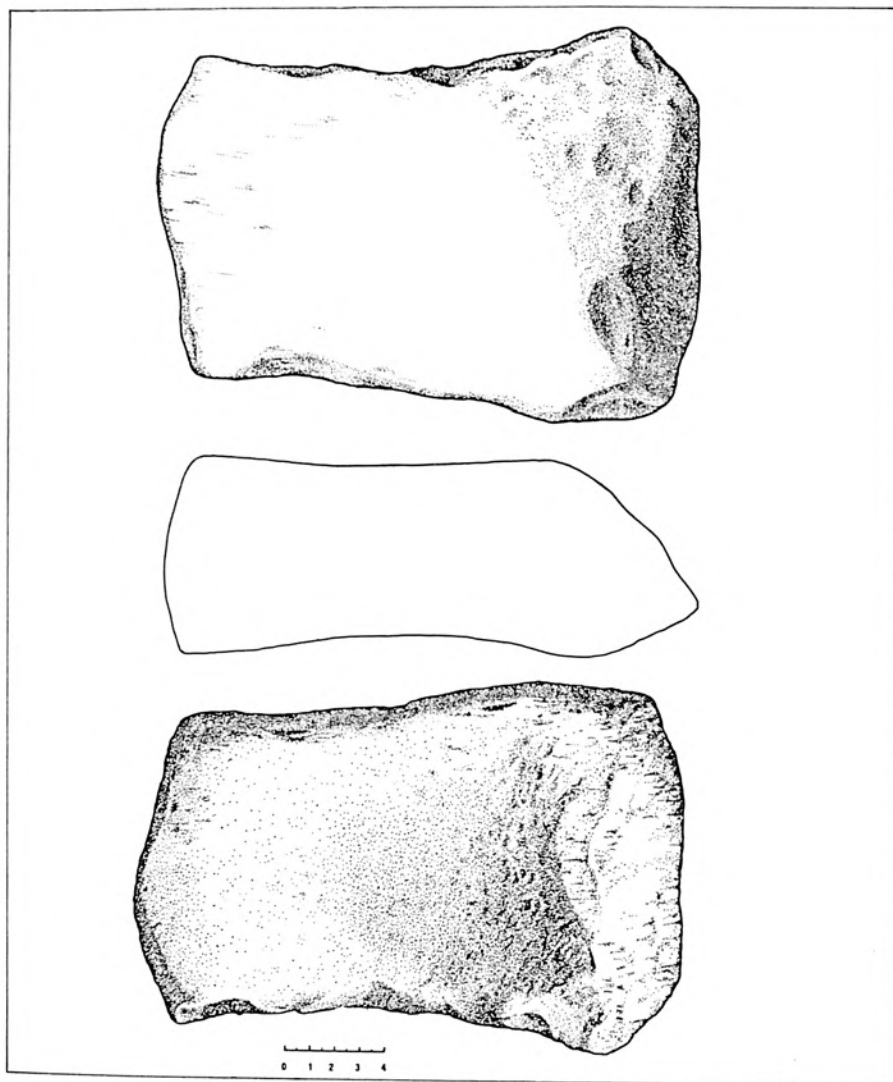


Fig. 16: Granite lower grinding-stone (P. Smith).

5.2. Fragmentary quartzite object from the general collection, polished, with a hole in the centre. It is 11 mm high (fig. 14 no. 6).

5.3. Fragmentary object, round, from the general collection; polished, made of rhyolite, with a biconvex hole in the centre and thinned rim (fig. 15 no. 1).

6. *Beads*: among the general collection we have recovered four fragmentary beads made of feldspathic green stone (a variety of amazonite). Two of these objects – which broke while being perforated – are very small and it is impossible to reconstruct their shape, while the other ones are cylindrical with a flat top and rounded body. The best preserved specimen is 18 mm high and its greater diameter measures 16 mm.

Moreover, we have collected other fragments of the same material (eighteen in all, nine of which from squares 3, 4, 6, 15, 18, 21, 24, two fragments from square 9 and the remaining ones from the general collection) which attests to some of the phases of the manufacturing, of which the one above described represents an advanced stage. The reconstruction of the various moments of the manufacturing has been made on the base of studies carried out on similar objects recovered in other areas (*Bulgarelli and Tosi*, 2; *Piperno and Tosi*, 25):

a) raw material. Consisting of the so-called "raw material", with no apparent traces of manufacturing. Various objects, only one of any size (20 × 25 × 9 mm). The others are rather small and could be the remains of the first and more approximate works of whittling down and reducing the size of the stone blocks.

b) blocks of raw material already made smaller. We cannot yet say anything more about this second stage.

c) material at an advanced manufacturing stage. The objects have already been shaped and polished. But this last work has only been roughed out and will be completed only in phase "e", the final one.

d) perforation works, probably a bipolar one. Delicate moment of the manufacturing process in which, for different reasons (too much pressure given by the drill, faults of the raw material, and so on) the bead was liable to break.

e) final moment of the manufacturing devoted to the accurate touching up of the beads. No specimens recovered.

The material collected on this expedition is scanty and allows only hypothetical reconstruction of the manufacturing processes: we can describe them with a few broad lines. We hope that future collection of objects will permit a more exact identification of the various phases of manufacturing. To these objects, of course, we have to relate the drill-heads, the

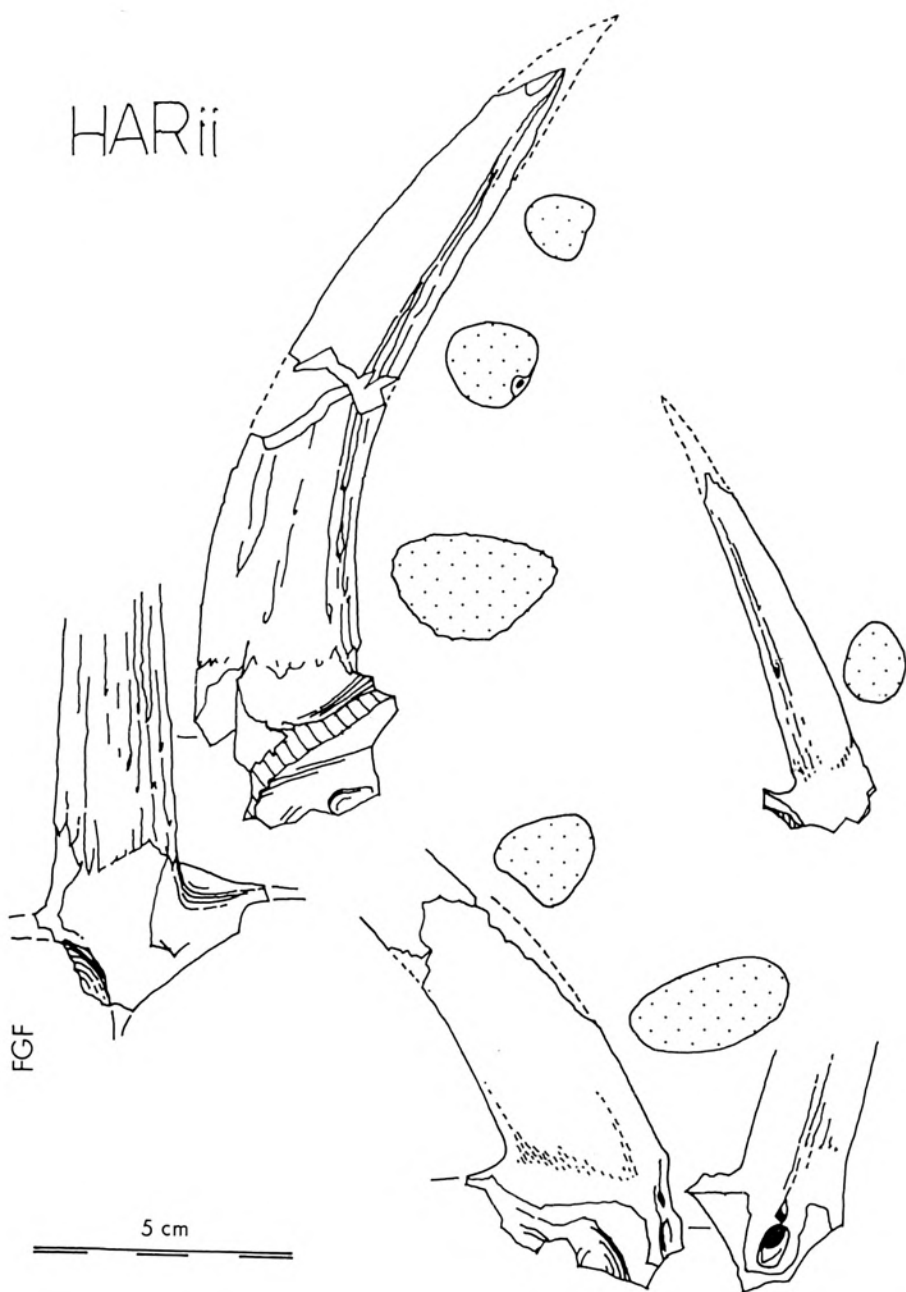


Fig. 17. Y.86.HARii. *Gazella* sp.: reconstructed horncores. (F.G. Fedele, Naples).

stone drill caps (?), and perhaps some of the grinding-stones recovered, which can be assumed to have been used in the processes to polish the beads.

A fragmentary shell bead comes from square 7.

7. A small bronze object from square 9 (a pendant?).

8. We have collected numerous fragments of ostrich egg-shells with no apparent traces of working.

#### D. PLANT REMAINS (L. Costantini).

The analyses have been carried out both on the soil collected during the excavation of the hearth and on the charcoal.

a) The sample of ground taken from the area of the hearth has given back:

- 1) 6 shell of terrestrial gasteropods (Family *Anciculidae* gen. sp.).
- 2) 6 bony micro-mammals remains.
- 3) 18 achenes of *Lithospermum*.
- 4) 40 fragments of *Boraginacea* achenes.
- 5) 4 fragments of indeterminable graminaceous plants (non carbonized, probably modern).

b) Charcoal coming from the hearth: the examined fragments can be referred to four different types of wood, two of which belong to *Ziziphus* and *Acacia*, while it was impossible to get a precise determination of the other ones.

#### E. ANIMAL REMAINS (F.G. Fedele).

The small sample of animal remains associated with *HARii*, a "Rub<sup>c</sup> al-Khālī Neolithic" site in the semi-arid fringe of North Yemen (*F. Di Mario, this report*), is the first collection to be reported from this region of southwestern Arabia. Its faunal composition and cultural association are of the utmost interest as they begin to provide a glimpse of mid-Holocene manifestations in a virtually unknown area of the Middle East, with an obvious bearing on the relationships between man and animals. What follows is a summary report of the analysis carried out in April-May 1987 at the institute of Anthropology of Naples University (Prehistory and Human Paleoecology Laboratory), where the collection will be housed through the kind permission of the General Organization for the Antiquities and Libraries of the Yemen Arab Republic, Ṣan'ā'.

### Analysis

The sample comprises 180 pieces, most of them abraded and fragmentary, of which 73 have been identified to the size-family (e.g. *Gazela*-sized) and 107 to the species. Naming the species may have been withheld, for the moment, but it will be possible after additional comparative work is completed.

Most of the animals are represented by a sufficient percentage of post-cranial bones, in broadly regular anatomical proportions, to suggest slaughter on site or nearby. Butchering marks from percussion are apparent, followed by roasting on simple, ground-lit fires. Charred pieces in shades

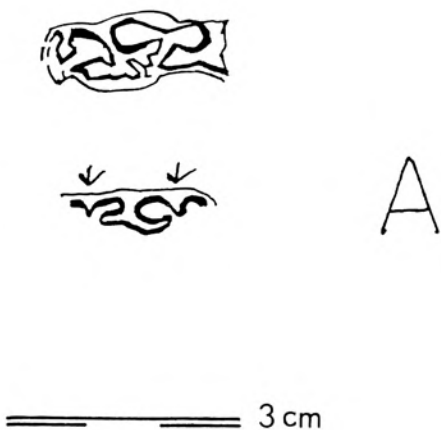
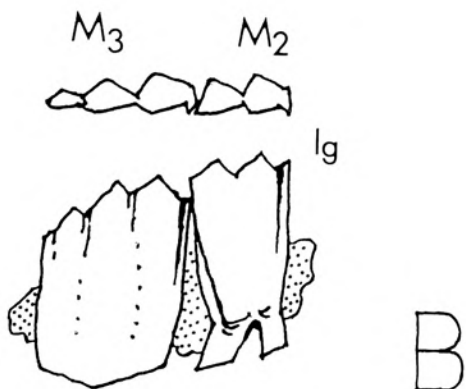


Fig. 18. Y.86.HARii. A, *Equus* sp., preserved portions of lower molars. B, *Gazella* sp., mandible fragment with  $M_2 - M_3$ . (F.G. Fedele, Naples).





of black and grey point to low-temperature burning. All the bones and teeth have a sonorous quality. According to optical thin-section analysis this is due, it seems, to the loss of collagen in not dry conditions and the subsequent recrystallization of calcium salts<sup>5</sup>. Equid teeth have dramatically suffered from cracking and splitting.

Site evidence suggests that the fauna may be treated as a synchronous assemblage. The fauna consists of wild species, with equids and gazelles being the most numerous animals. The presence of domesticated species appears to be highly unlikely; this possibility would only concern ovicaprines, but was ruled out in spite of the poor preservation of the material.

Equid remains point to a single *Equus* species, dentally an ass rather than an onager. Two incomplete jugal teeth available for occlusal examination (1 molar, 1 M<sub>1r</sub> or P<sub>4r</sub>) tend to display an "asinine", V-shaped double knot<sup>6</sup>. Measurements taken on five astragali<sup>7</sup> and two distal ends of metapodials are insufficient for specific diagnosis. Statistics based on the proportions of the limb bones to each other cannot be applied to our current database. Animals of both sexes or at least two age-groups seem to be represented.

The abundant gazelle remains can probably be attributed to males and females of one species, taking into account some degree of horncore variation as normal in antilopines. Juveniles are very common. Traces of burning are frequent. Several horncores have been reconstructed from the heavily comminuted finds, indicating a minimum number of three adults (fig. 1); plate III).

Parts of frontal bones are preserved. As detailed comparative work is still in progress, specific diagnosis must be awaited, but it seems likely that either *Gazella gazella* or *G. dorcas* are represented. measurements taken on astragali (n = 6), first phalanges (n = 4), and the distal end of humerus (n = 3), point to a fairly small-sized species, which might be taken as an indication cf. *G. dorcas*<sup>8</sup>.

Caprines can be recognized from a single astragalus with a maximum length of 45 mm, morphologically *Capra* (a wild male?). A fragment of

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<sup>5</sup> Cf. R. Burleigh, *Chronology of some early domestic equids in Egypt and Western Asia*, in "Equids in the ancient world", eds. R.H. Meadow and H.-P. Uerpmann (see note 6 below), p. 233.

<sup>6</sup> For the study of equids the contributions in "Equids in the ancient world", eds. R.H. Meadow and H.-P. Uerpmann, Wiesbaden, Dr. L. Reichert Verlag, 1986, have been taken into account.

<sup>7</sup> An astragalus found a hundred metres south of the main site is included.

<sup>8</sup> The discovery of a new gazelle species in North Yemen, on the basis of old museum collections and ten living individuals in a Qatar zoo, has been reported in the press (July, 1987, The species has been named *Gazella bilkis*).

burnt humerus, affected by thermal shrinkage, fits well with wild *Capra* according to both Boessneck's criteria and size.

### Discussion

The Arabian Peninsula is an extremely interesting region for faunal distribution because it lies at the borderline of two zoogeographical regions, the Ethiopian and the Palaearctic<sup>9</sup>. Any information from the southern part of the peninsula may play a major role in pinpointing shifts and exchanges of animal species across the dividing lands. Yemen, which spans several ecozones from the Red Sea coast to the high-altitude uplands and down to the desert, may have an outstanding zoogeographic importance in this context.

The preliminary collection from *HARii* is the first contribution from the desert margins of North Yemen. Its value is zoogeographical and cultural. It shows that formally Neolithic groups similar to those of the Rub' al-Khālī desert relied on hunting in what must have been a greener semidesert than today. They hunted equids (asses?) and gazelles, whose ecological requirements imply a slightly different environment. It is interesting to note that hunting is very poorly represented among the Neolithic communities of the plateau<sup>10</sup>.

The concentration on gazelles may reflect a broad pattern of wild game exploitation which is now well known along the northern border of the Arabian Peninsula, all along the former steppe belt from lower Jordan to the Euphrates<sup>11</sup>. Apart from preoccupations with chronology and cultural affiliation, it seems possible that the groups responsible for *HARii* and similar sites had a broad-spectrum economy and practised hunting only as a part of their overall cycle. Hunting may have been a specialized activity of a segment of the population in specific ecosystems at specific times of the year.

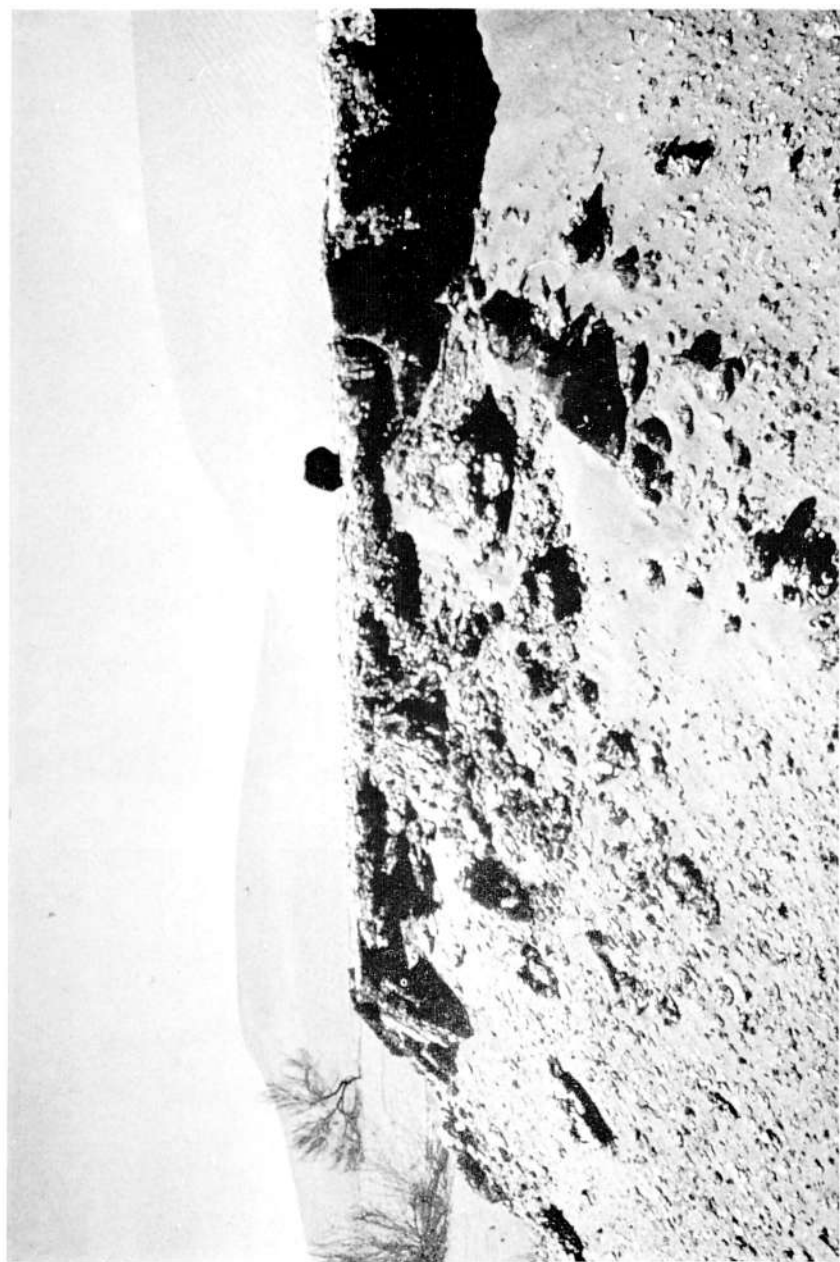
From a zoological point of view, pending further fieldwork and the resolution of taxonomic uncertainties, *HARii* already provides what may

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<sup>9</sup> Cf. J. Clutton-Brock, *Domesticated animals from early times*, London, Heinemann and British Museum (Natural History), 1981, p. 8; H.-P. Uerpmann, *Halafian equid remains from Shams ed-Din Tannira in northern Syria*, in "Equids in the ancient world" (see note 6), p. 259-60.

<sup>10</sup> F.G. Fedele, *North Yemen: the Neolithic*, in "Aus dem Reich von Saba, 3000 Jahre Kunst und Kultur des Glücklichen Arabien. Eine Ausstellung etc.", ed. W. Daum, Innsbruck, Pinguin-Verlag, 1987 (in press); F.G. Fedele, interim reports on file, 1984-1986.

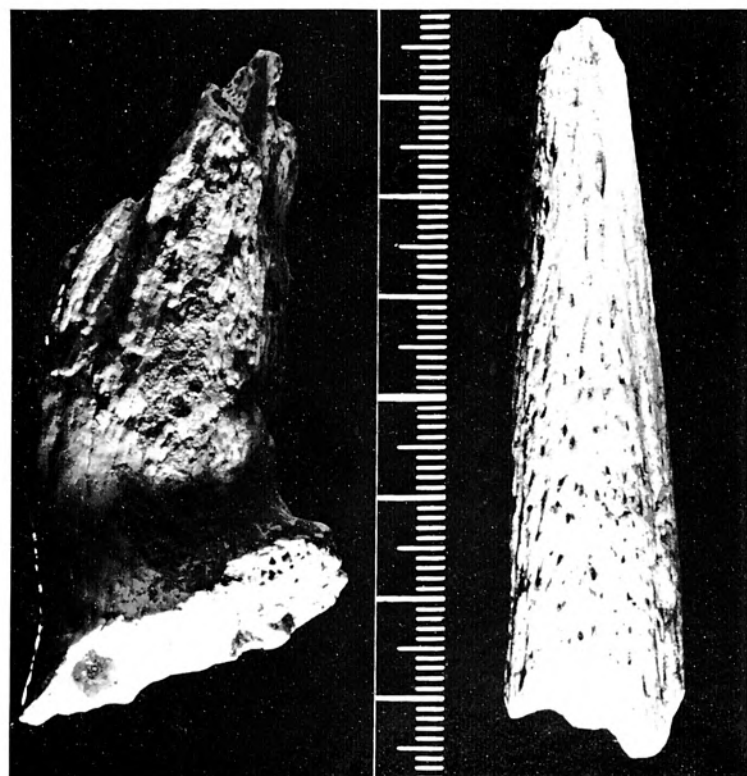
<sup>11</sup> Cf. A.J. Legge and P.A. Rowley-Conwy, *Gazelle killing in Stone Age Syria*, "Scientific American", July 1987, p. 76-83.



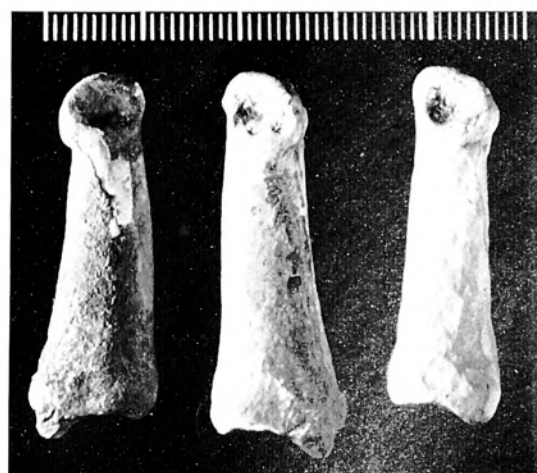
Silt deposits



Drill-heads from Y.86.HARii.



A



B

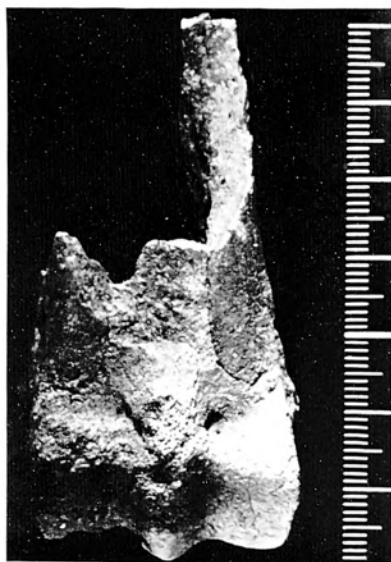


C

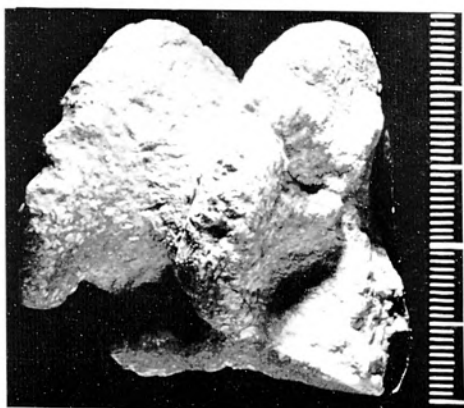
Y.86.HARII. *Gazella* sp.: A, horncore; B, first phalanges; C, astragalus.  
Main divisions of scale are cms. (Phot. C. Anastasia, Naples).



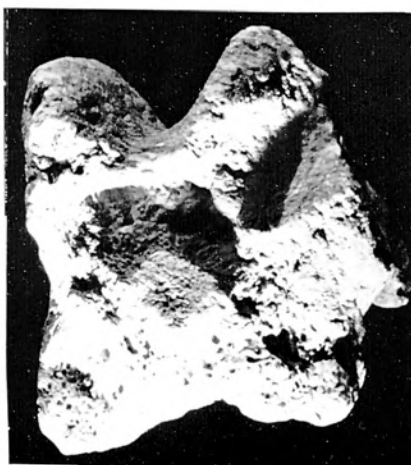
A



B



C



D

Y.86.HARii. *Equus* sp.: A, distal end of tibia; B, distal end of metapodial;  
C,D, heavily abraded astragali. (Phot. C. Anastasia, Naples).

be the best sample of equids and gazelles from a prehistoric context in southern Arabia. J. Zarins<sup>12</sup> has recently summarized the previous reports from the interior of the Arabian Peninsula. Equids are currently the subject of extensive debates on matters of taxonomy, distribution, and human manipulation. North Yemen is beginning to reveal her presumable wealth of cases of man-equid interaction. *HARii*, for the moment, emphasizes a paleoecological and paleoeconomic episode of the desert margins whose origins, continuity, and implications, are problems for the future.

#### F. MALACOLOGICAL ANALYSES (F. Gravina and C. Smriglio).

The examination of the shells has revealed the existence of marine, terrestrial (Family *Anciculidae* gen. sp.) and "marsh" (*Melania tuberculata*) specimens. The terrestrial ones are spread all over the site and have been recovered in each square. The "marsh" specimens (collected in squares 4, 6, 9, 11, 13, 16, 17) probably indicate the presence, in ancient times, of still-water basins.

##### 1. Sea shells from the transect.

Square 1: *Engina mendicaria* (Linnaeus).

Square 2: *Policenes* cf. *tumidus* (Swainson) with an artificial hole.  
Two fragments of sea shells not identified.

Square 4: *Morula anaxeres* (Kiener), sectioned. *Ostrea* sp., fragment.  
*Planaxis sulcatus* (Born).

Square 6: *Cypraea* sp., fragment.

Square 7: *Conus* cf. *coronatus* (Gmelin).

Square 9: *Policenes* cf. *tumidus* (Swainson), with an artificial hole.

Square 10: *Marginella* sp.

Square 11: *Cypraea* sp., fragment.

Square 13: *Morula anaxeres* (Kiener), sectioned.

Square 15: *Ostrea* sp., fragment. A fragment of non identifiable shell.

Square 16: *Planaxis sulcatus* (Born), sectioned. *Policenes* cf. *tumidus* (Swainson), fragment. *Marginella* sp., with an artificial hole.

Square 17: *Policenes* cf. *tumidus* (Swainson), with an artificial hole.

Square 18: *Planaxis sulcatus* (Born), sectioned. *Cypraea macandrewi* (Sowersy), fragment.

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<sup>12</sup> J. Zarins, *Equids associated with human burials in third millennium B.C. Mesopotamia: two complementary facets*, in "Equids in the ancient world" (see note 6), p. 177-8, with references; C.P. Groves, *The taxonomy, distribution, and adaptations of recent equids*, *ibidem*, p. 45.

- Square 19: *Policenes* cf. *tumidus* (Swainson), two specimens with an artificial hole.
- Square 20: *Ancilla* sp., with an artificial hole. *Policenes* cf. *tumidus* (Swainson), fragment with an artificial hole.
- Square 21: *Cypraea* sp., Fragment.
- Square 22: *Planaxis sulcatus* (Born), sectioned. Fragment of non identifiable shell.
- Square 23: Fragment of non identifiable shell.
- Square 24: *Ostrea* sp., fragment.

2. Sea shells from the general collection.

*Planaxis sulcatus* (Born), two sectioned specimens.

*Cypraea* cf. *moneta* (Linnaeus), a sectioned specimen and a fragmentary one.

*Policenes* cf. *tumidus* (Swainson), with an artificial hole.

*Ostrea* sp., two fragmentary specimens one of which with an artificial hole.

#### G. CONCLUSIONS

The most evident result of this first research is represented by the now acquired certainty of the presence of prehistorical sites in the Yemenite desert: however, we still know very little about the populations to which the traces we have found refer. The most significant discovery of those made during the 1986 expedition is Y.86.HARii. The archaeological materials are varied and attest to the development of a wide range of activities: many problems have to be faced, the solution of which is still not in sight. It remains to be established whether there were one or more occupations related to a single period or to several different stages. It has not been possible to relate the archaeological material to a single cultural period. However, at least part of the lithic industry collected in the site seems to belong to the Western ar-Rub<sup>c</sup> al-Khālī "Neolithic".

The hearth charcoals have been dated to 880 + 70 B.P. and 30 + 60 B.P.<sup>13</sup>: these unequivocally attest the frequentations of the site at different periods of time. So the plant remains and the small bronze object – presumably – belong to this "historical age". It is now very difficult to understand whether the rest of the archaeological material is homogeneous both culturally and chronologically. It is uncertain whether the lithic industry is the result of only one cultural production and the association

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<sup>13</sup> The two datings have been carried out (lab. ref. T-7166, T-7167) by the Radiological Dating Laboratory. The Norwegian Institute of Technology, N-7030 Trondheim NTH, Norway.



with the faunal finds cannot be taken for granted, even if bones belonging to *Gazella* sp. and *Equus* sp. have already been recovered together with arrowheads and other archaeological materials in sites attributed to the Western ar-Rub' al Khālī "Neolithic"<sup>14</sup>. However, Y.86.HARii was inhabited by human groups who used to be engaged in hunting activities.

In the site there is also evidence of other activities, including the manufacture of beads made of stone and shell. It has been possible to reconstruct — even if in a still hypothetical and summary way — the manufacturing process from the raw material to the finished products. It will be very interesting to take our analyses further. The recovery of worked sea shells not only attests to the existence of other ornamental objects, but gives us an incontrovertible proof of the existence of contacts with the coastal areas. Other relations were established with the Yemenite plateau, where the obsidian came from.

The recovery of marsh shells should furthermore confirm the existence, in the Ramlat Sab' atayn, of environmental conditions which were certainly different than the present ones, and which probably lasted from 9000 to 6000 B.P.

The recoveries made in the Yemen Arab Republic have added new elements to the framework of the Rub' al-Khālī prehistorical settlements, but they have not yet contributed to settle the numerous existing problems.

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<sup>14</sup> Bone of *Gazella* sp. and *Equus* sp. have been recovered in the sites of Jiledah and al-Mutabthah (C. Edens, 9), both belongin to ar-Rub' al-Khālī "Neolithic". Other remains of *Equus* (apparently similar to the Asiatic wild ass) come from collections made near the beds of ancient lakes identified in the Rub' al-Khālī (H. McClure, 23).

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