Avi Gopher & Ran Barkai

Flint Extraction Sites and Workshops in Prehistoric Galilee, Israel

Abstract

Our survey project was aimed to investigate lithic procurement and exploitation strategies of prehistoric communities in the central Dishon valley, Northern Israel. Many archaeological sites are known from there, representing a long sequence of human activity starting from the Lower Palaeolithic. In the course of our survey we have located two major types of flint extraction and exploitation localities.

Intensive activities related to flint extraction and exploitation are indicated at the central Dishon valley in the Upper Pleistocene and Holocene. These activities are most probably related to sites of these periods known in the close vicinity of the raw material sources.

Keywords: *Upper Pleistocene, Holocene, Palaeolithic, Neolithic, Dishon valley, Mount Pua, Israel, surface quarrying, seam quarries.*

Introduction

Our Galilee survey project aimed at investigating the lithic procurement and exploitation strategies of prehistoric communities in the central Dishon valley, northern Israel (Fig. 1).
The study area lies on both flanks of the central part of the Nahal Dishon Valley in a mountainous area some 500-800 m a.s.l. This is a Mediterranean region rich in resources and has attracted human communities through the ages.

We hoped that as it was rich in flint sources, this landscape would provide a good case study for prehistoric flint economies throughout the ages in a restricted, well defined, area rich in prehistoric sites.

Work was been conducted on behalf of the Institute of Archaeology, Tel Aviv University in 1998-1999.

Environmental setting

The Nahal Dishon valley is a geologically “young” system created in association with the Jordan Rift Valley to its east. Its specific morphology and route towards the Hula Valley (part of the Rift valley) were described by Yair (1962). The Dishon cuts into a series of Late Cretaceous and Early Tertiary formations (Yair 1962; Ronen *et al.* 1974). Our study concentrates on two parts of this region (Fig. 1):

1. The central Dishon valley cut into the Early-Middle Eocene Timrat formation which is made of limestone with flint horizons. The specific area in which flint was extracted belongs to a special element of the Timrat formation highly visible near the spring of Ain Jarjur (Hebrew – Ein Gargir). Flint veins comprising flat and rounded nodules occur here in limestone, chalk and marls stratified in thin plates.
2. The Pua mountain to the south of the Dishon channel.

The area and the immediate vicinity is rich in archaeological sites representing a long sequence of human activity spanning the Lower Palaeolithic and up to the present.

The extraction sites

In the course of our survey we located two major types of flint extraction and exploitation localities which can be summarised as follows:

1. Quarries in the Nahal Dishon which we believe should be dated to the Neolithic period (Barkei & Gopher 2001).

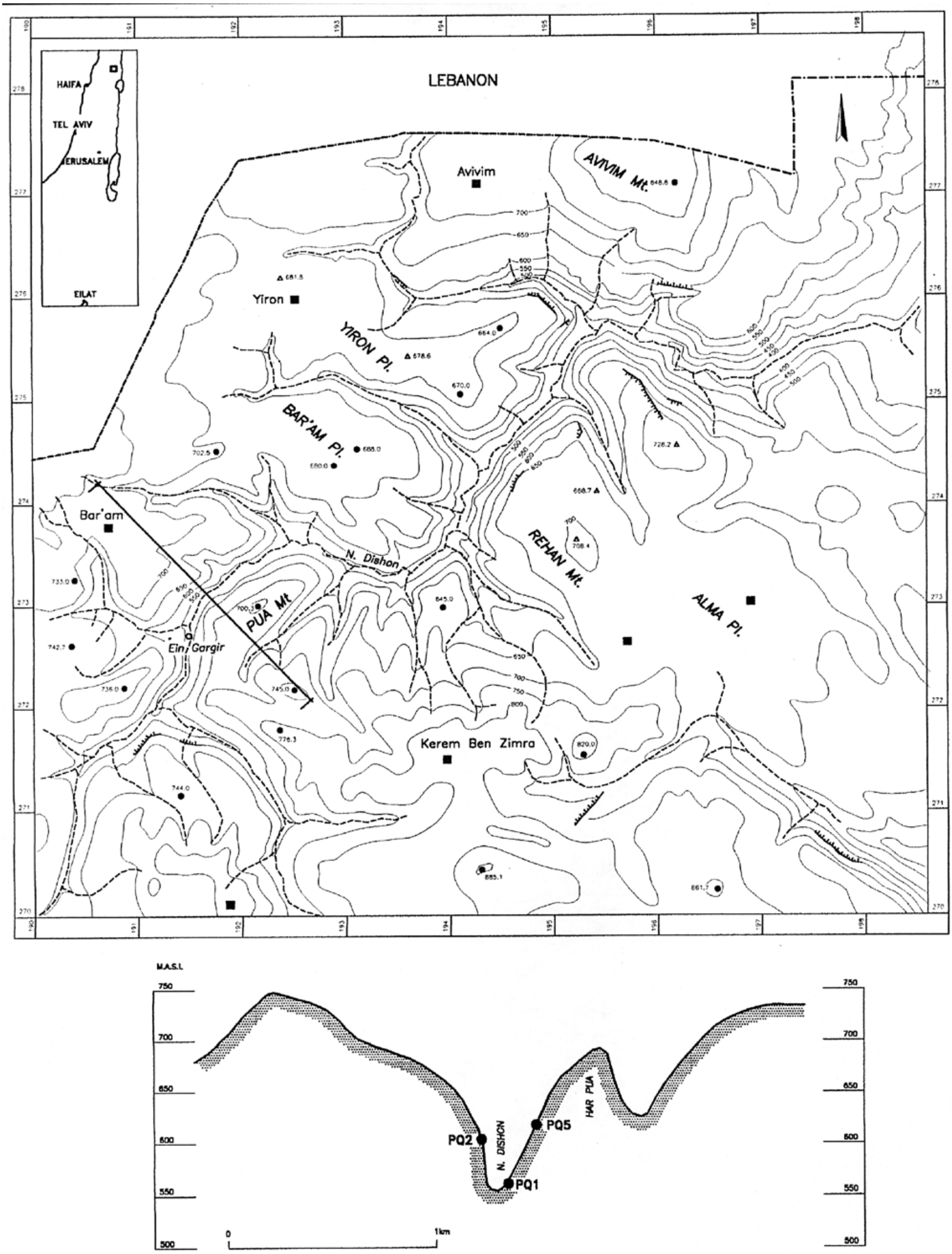


Fig. 1: Map of study area and section of the Dishon valley.

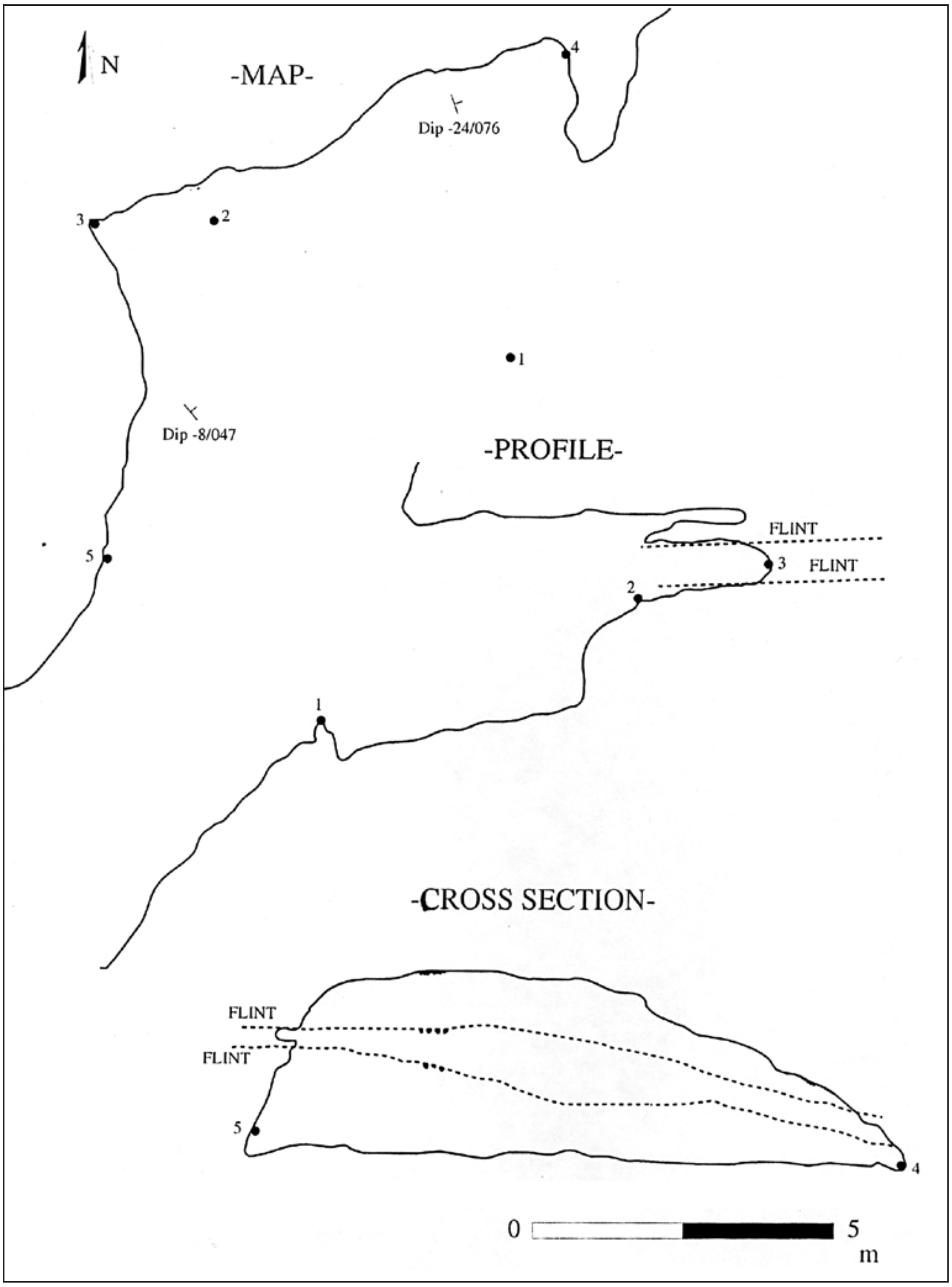


Fig. 2: Plan and sections of seam quarry “PQ2”.

2. Surface quarrying on the summit of the Pua mountain which we believe dates to the late Lower Palaeolithic period (Barkei & Gopher 2001).

Quarries in the Nahal Dishon channel

This is a series of more then ten rock shelters and karstic cavities containing exposed flint veins close to the Nahal Dishon channel. The extraction sites are spread over the slopes on both flanks of the Dishon valley at three different elevations, the lowest of which is *c*. 15 m above the present channel (Fig. 1 lower).

Two main types of extraction sites/quarries identified in this group:

1. Seam quarries – horizontal natural “rockshelter” like features in the rocky cliffs (Fig. 2). Mining activities included the detachment of limestone plates to expose flint veins and the extraction of flint nodules of various sizes (Fig. 3). It can be clearly seen that the removal of thin limestone blocks, up to 15-20 cm thick from above and below the flint vein assisted the exposure and tracing of the usually horizontal or somewhat inclined flint veins. These seam mines would run along the cliffside and flint vein sometimes for tens of metres, usually not penetrating more than one or two metres into the cliff.

Fig. 3: An example of a flint vein at "PQ2".

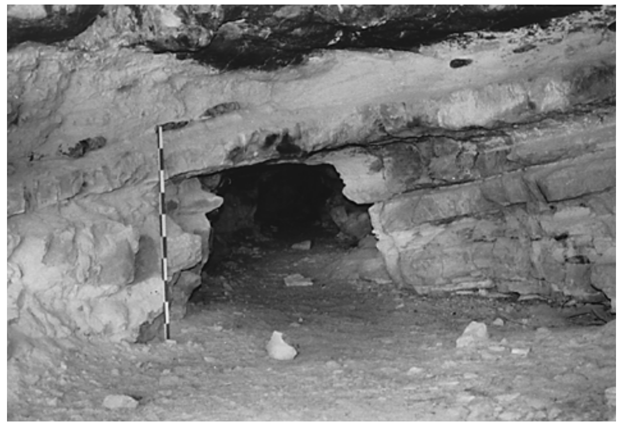
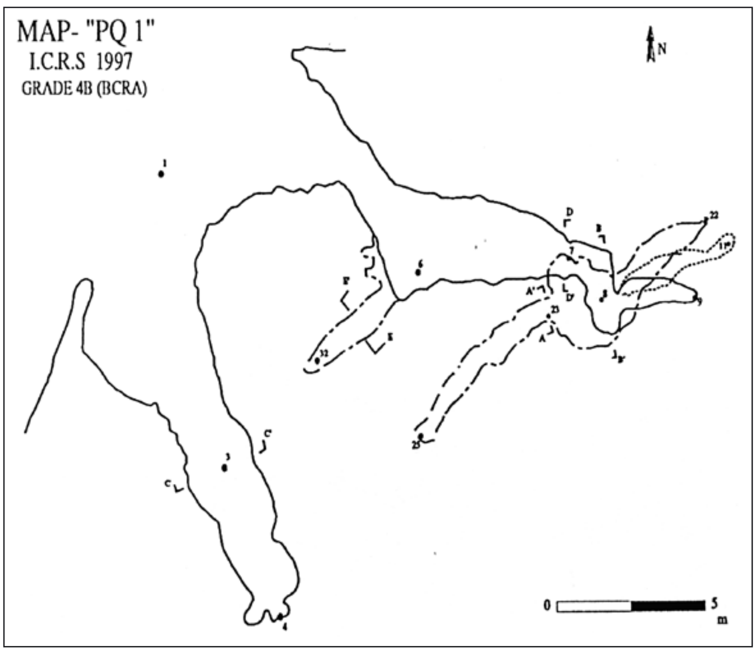
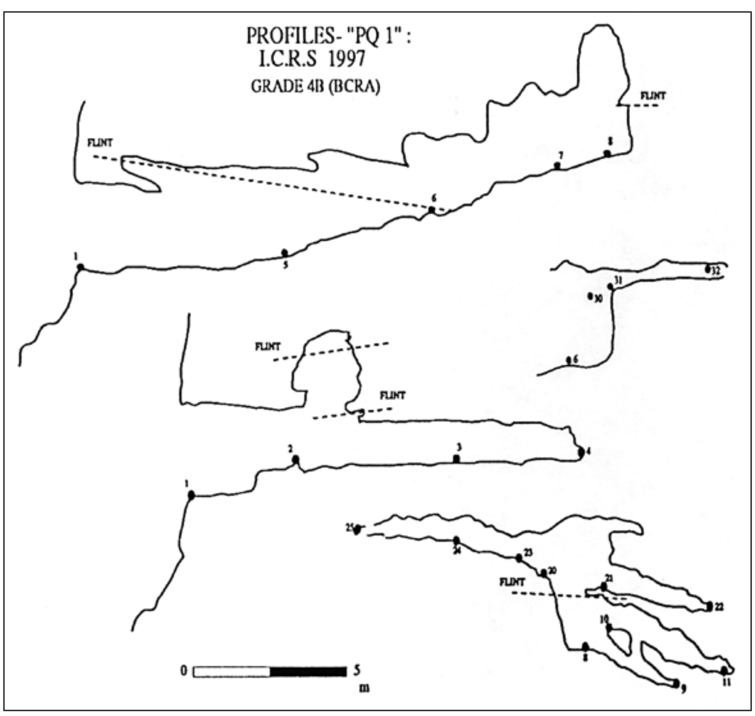


Fig. 4a: View of western gallery and exploited flint vein at "PQ" 1.





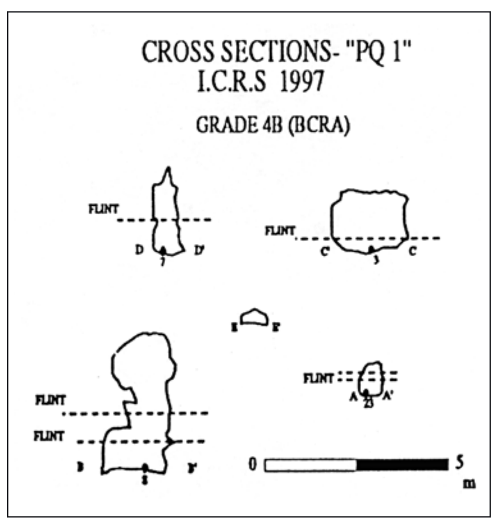


Fig. 4b: Plan and sections of deep mine "PQ1".

2. Deep (cave-like) horizontal quarries – actually, extended seam mines, with one, or several penetrating narrow galleries (Fig. 4). These cave-like tunnels could sometimes reach a depth of 10-15 m of visible flint veins. Here too, evidence of the characteristic chipping away around the flint vein is common.

Both kinds of extraction sites take advantage of natural phreatic activity that created dissolved spaces, and exposed fresh flint veins. Karstic activity can be recognised in these spaces in the form of characteristic rounded smoothed surfaces visible mostly on the ceiling and walls of the deep cave-like mines. We interpreted the angular breakage-marks in the limestone plates above and below the nodules in the flint vein area as signs of human extraction activity (Fig. 5). The angular breakage pattern in the limestone is associated with the distribution of high quality flat flint nodules, and not with veins of low quality which have small, cracked or weathered flint. Low quality flint usually has smooth neighbouring limestone surfaces.

Also, in the exploited veins, cavities of "winkled out" missing nodules, or broken nodules indicate possible extraction activity (Fig. 5c).

The mining techniques are as yet unknown, however, we suggest that people took advantage of the limestone's structure, utilising joints and weak structural lines to detach the thin limestone plates. They could use flint, stone, wood or antler implements. Future excavations of areas adjoining the quarries would perhaps reveal mining equipment and debitage.

In summary, the following points can be made which best describe the phenomena and in our opinion indicate that quarrying activities have taken place:

1. Natural karstic systems were used.
2. There is a high variability in the quality of the flint veins and a high correlation of high quality flint and signs of man's use.
3. Extraction zones show angular breakage, missing nodules and possibly tested nodules.
4. In the close vicinity of these extraction sites some Epipalaeolithic (roughly 20,000-10,000 uncalibrated ^{14}C years ago), Neolithic (10,000-6,000 years ago) and Chalcolithic (6,000-5,300 years ago) sites were located during our survey as well as Bronze Age and later sites.
5. A preliminary reconstruction of the cut of the Nahal Dishon indicates that these flint extraction sites, being so close to the present drainage channel, could have been exploited only from the very end of the Pleistocene - early Holocene and onwards, most probably not much earlier than the Epipalaeolithic and the Neolithic periods.
6. Flint, similar to that extracted from these mines is found in sites in the area. This is most conspicuous in the Neolithic sites.

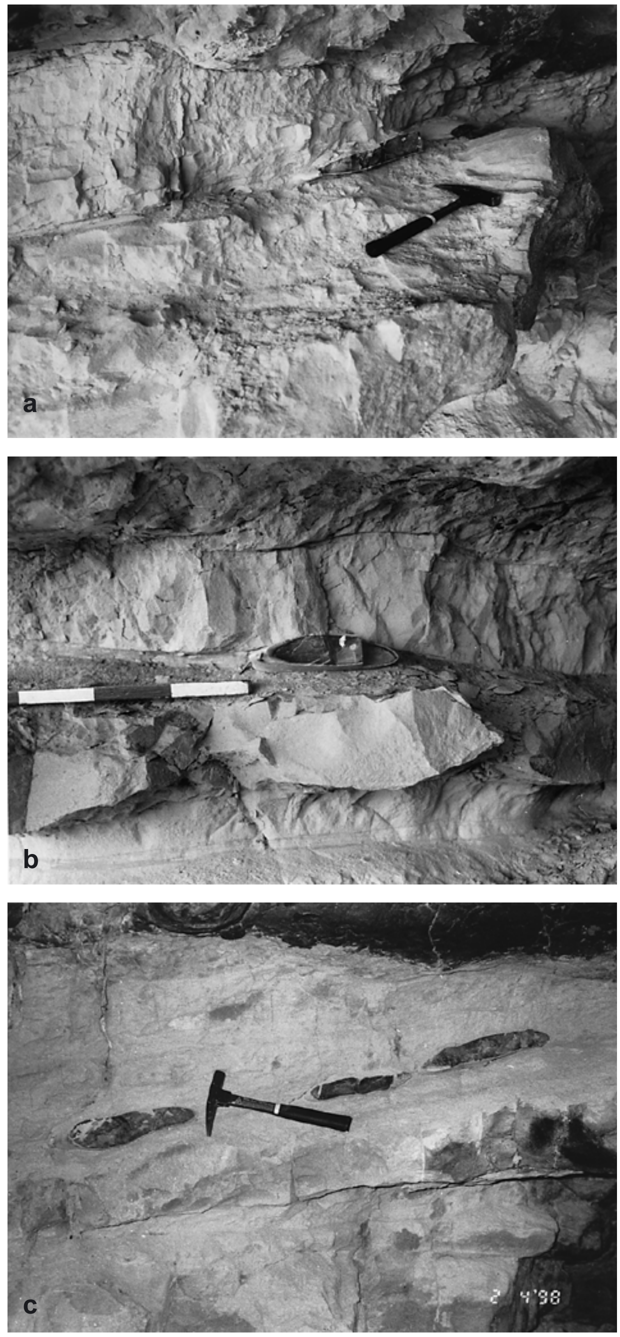


Fig. 5: Three examples of angular breakage above and below flint nodules at deep seam quarry "PQ1". Note the winkled out nodule in c.

Surface quarrying and workshops at Mount Pua

Mount Pua is *c*. 700 m a.s.l. – some 150 m above the present drainage channel of Nahal Dishon (Fig. 1). On its generally flat and narrow summit a concentration of flint extraction sites and workshops was found in the form of large heaps of extraction waste material and worked flint. This exploitation site is spread over *c*. 700-800 m along the

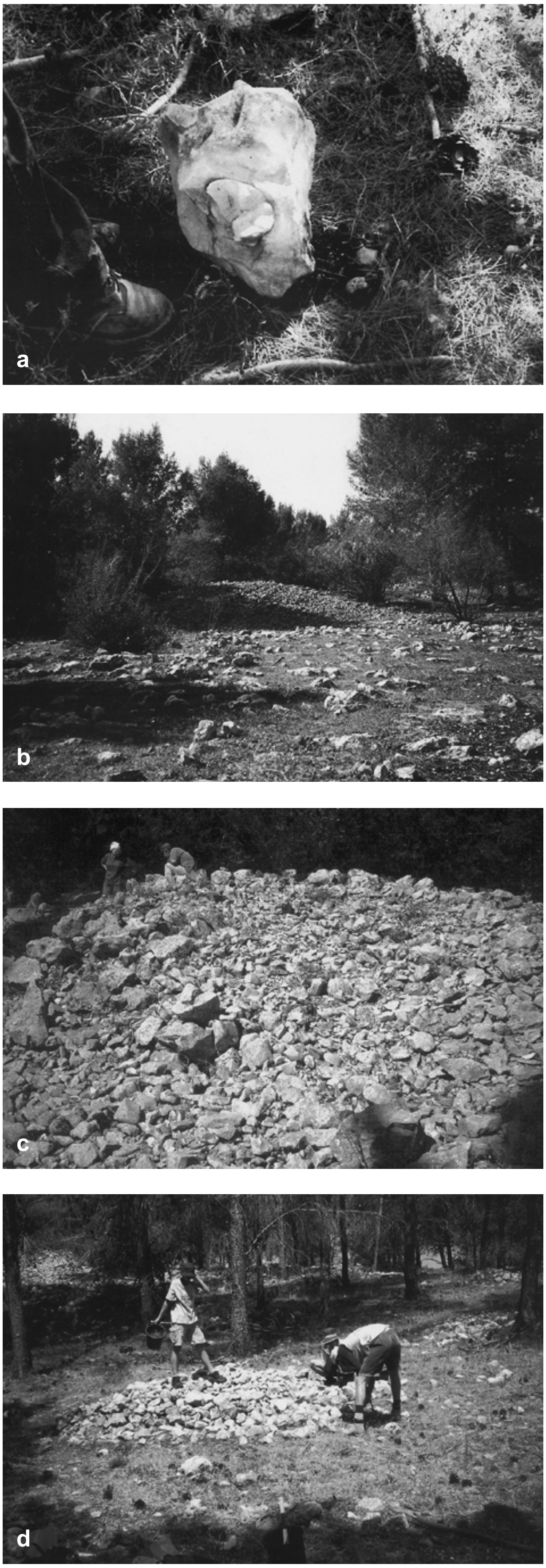


Fig. 6: a Flint nodule in a "free" lime stone boulder; b general view of large heaps at Mt. Pua; c closer view of large heap, note the light coloured flint; d view on a small sized heap.

mountain's summit and varies in width from 100-200 m. We have no information for the slopes of Mount Pua. These are very steep slopes covered by a recently planted deciduous forest and only very little could be seen.

The terrain at the summit is rocky and shows an abundance of flint nodules still "trapped" within the limestone boulders (karrens) (Fig. 6a). The flint outcrops in a variety of sizes, mostly in rounded nodules and is light brown/beige in colour. Its quality is medium but it is generally homogenous. Flint could be "freed out" from the rock by natural agencies (erosion, weathering) or taken out by man.

It seems that flint nodules were extracted from the exposed rocky ground, in a manner known as surface quarrying (breaking the limestone and taking out the flint nodules), and worked at the spot into cores and roughouts. The heaps created by this activity consist mostly of limestone "waste" broken while extracting the nodules and flint waste. The heaps vary in size (diameter ranges from 0.5 m to *c*. 20 m) and height (ranging from a few cm to 3-4 m; Fig. 6b, c) and are generally associated with rocky cliff-like outcrop lines that cross the summit.

The flint industry described here is known from preliminary observations during our survey and from two assemblages collected systematically from two different heaps – one from a part of a large heap ("PW 3") and a second a total collection of a small heap ("PW 100"; Fig. 6d). A small test pit in the large heap revealed a depth of limestone broken boulders (almost one metre) and flint as well as some sediments at the lower part of the heap. These sediments close to the base of the heap bear *in situ* lithics down to bedrock and in two cases it seems that 'cashing' was being practised. The two cashes consisted of concentrations of 10-15 items in small piles including complete flakes, cores and a handaxe.

The most distinctive items found in these workshops are Levallois cores (Fig. 7), handaxe roughouts (Fig. 8), choppers, chopping tools and other heavy-duty tools (Fig. 9, 2). The Levallois cores show a variety of trajectories and products. The bifacial tools are mostly roughouts of hand-axes (including rejects) and choppers/chopping tools. Other elements in the industry include a variety of cores and flakes some of which are retouched (Fig. 9, 1). The quantity of debitage items is immense.

Based on the above preliminary observations, we suggest that these flint assemblages, representing this extensive complex of flint extraction and reduction is best dated to a late part of the Lower Palaeolithic period (Barkai & Gopher 2001; Barkai *et al.* 2002). It is premature, and this is not the proper place to attempt a detailed comparative study of this industry – this will be dealt with in a separate publication.

Another attempt to date the site independently by measuring cosmogenic isotope content is underway now (in collaboration with A. Matmon of the Geology department,

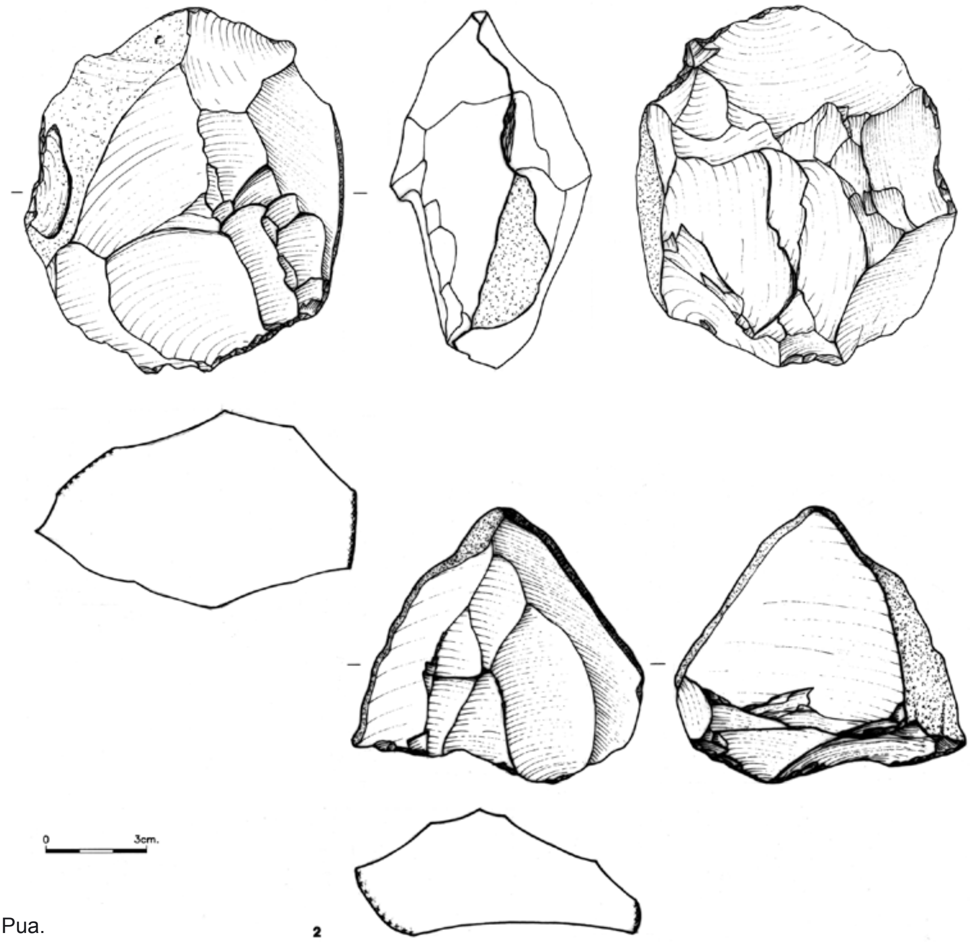


Fig. 7: Levallois cores from Mt. Pua.

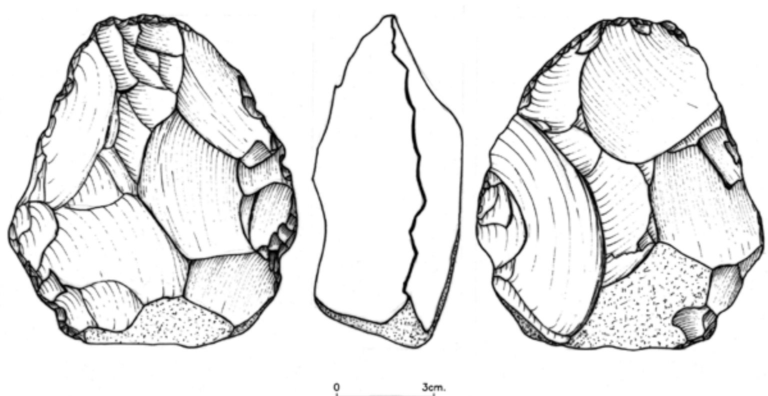


Fig. 8: A handaxe roughout from Mt. Pua.

Hebrew University, Jerusalem) and may provide more chronological evidence.

We should comment that throughout our survey on Mt. Pua a few adze-like items have been found which may be assigned a Late Neolithic or a Chalcolithic date. These are single items from an immense lithic assemblage and may indicate a possible, very limited, use of this flint source in late prehistory.

To summarise:

1. This large enterprise was based on locating a good flint source.
2. Surface quarrying is the best explanation for the observed phenomena. Use was probably repetitive since the scale is very large. Cashing also indicates repetition (Barkai *et al.* 2002).
3. The date suggested is in the later part of the Lower Palaeolithic as far as it is possible to judge. We are aware of the difficulties in dating Neolithic mines and workshops as Palaeolithic, for example in England where the debate continued for a long time (Barber *et al.* 1999, 8-10 and references).
4. Lower Palaeolithic sites are known in the vicinity (*e.g.* Ohel 1990) but it is not clear where the extracted flint was distributed.

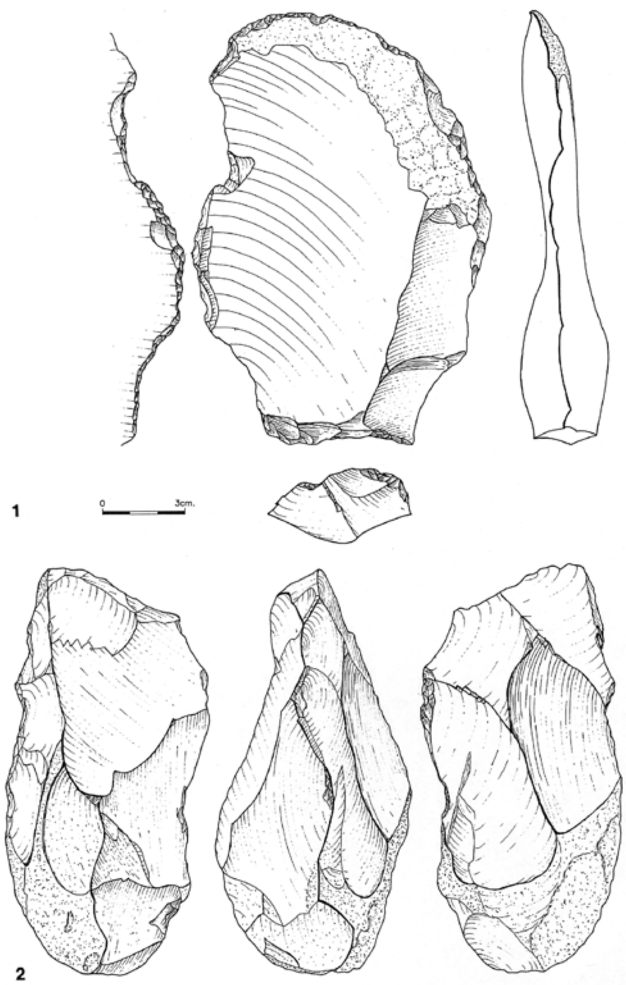


Fig. 9: Flint items from cashes excavated in the large heap ("PW3").

Two excavated samples of knapped flint, one from a large stone pile (PW3) and one from a small pile (PW100) have been analysed during 1999-2000. The study indicates mainly Lower-Middle Palaeolithic finds (including Levallois Technique) as well as a very small component of Neolithic-Chalcolithic material (roughouts of bifacial tools). In the case of PW100 the sample is of ***c***. 10,000 flint items of which maybe five 5 can be considered late in origin. We thus do not exclude the possibility that there is some Neolithic-Chalcolithic presence on-site, however, the massive accumulation of the piles is most probably Lower-Middle Palaeolithic in date while the Neolithic-Chalcolithic seems to be minor.

Summary

The Dishon valley project is in its infancy, however intensive activities related to flint extraction and exploitation are indicated in the central Dishon valley for the Upper Pleistocene and in the Holocene. These activities include two major types of quarrying – surface quarrying in Palaeolithic times and seam quarries most probably dating to the Neolithic period and later. The scale of the mining phenomena is immense in both periods and is based on a very specific occurrence of flint sources in the environment. The intensive procurement of flint in both periods is most probably related to a settlement system in the area which needs to be studied. It is still unclear whether some of the sites near the extraction sites relate to the mining and this will also have to be investigated in the future.

The potential for studying a long sequence of flint extraction in a well-defined region is clear.

Acknowledgements

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