

## The Epi-Palaeolithic site Hefziba, Central Coastal Plain of Israel\*

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with Pl. VI-VII

### The site and excavation

The site of Hefziba is located west of Hadera, on a hill 37.8 m. above sea level which is the highest point in the area. It is 1,300 m. from the present shoreline and 700 m. south of Nahal Hadera (Fig. 1). The hill is covered by sand which protected the site and left it unknown until recently. A pipe laid to



Fig. 1. Hefziba near Hadera, location map. Nos. 4-8: provenience of samples from Caesarea sands (Bakler below).

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drain the overflow from a water tower that was constructed on the hilltop in the early 50's caused the erosion of a small gully, on both sides of which numerous implements and bones cropped out and were sighted by R. Gophna in 1968. The remains were embedded in a red sandy loam which locally turned dark brown or black. A brief survey and surface collection (Gophna et al. 1973) showed that the site belonged to the Epi-Palaeolithic complex. On the surface of the loam and under the sand cover, two deep basalt mortars were found.

The importance of the site became immediately apparent: first, by its outstanding richness; second, by the preservation of bones, which is a rare phenomenon on the coastal plain of Israel; and third, by the presence of deep basalt mortars. These grinding implements were for a long time thought to occur from the Natufian onward. A few years ago, the first pre-Natufian deep mortar was found at Ein-Gev, an Epi-Palaeolithic site near the Lake of Galilee (Stekelis et al. 1966), since dated to 13,750 BC (G. N. 5576). Hefziba will apparently be the second case, if the relation between the basalt tools and the Epi-Palaeolithic industry is confirmed.

Excavation started in 1972 on both sides of the gully (Fig. 2). It was soon confirmed that the basalt implements, in fact, belonged with the Epi-Palaeolithic industry, since pestles and fragmented mortars were found in the archaeological bed. In 1973 a six-week season was held at Hefziba, during which the

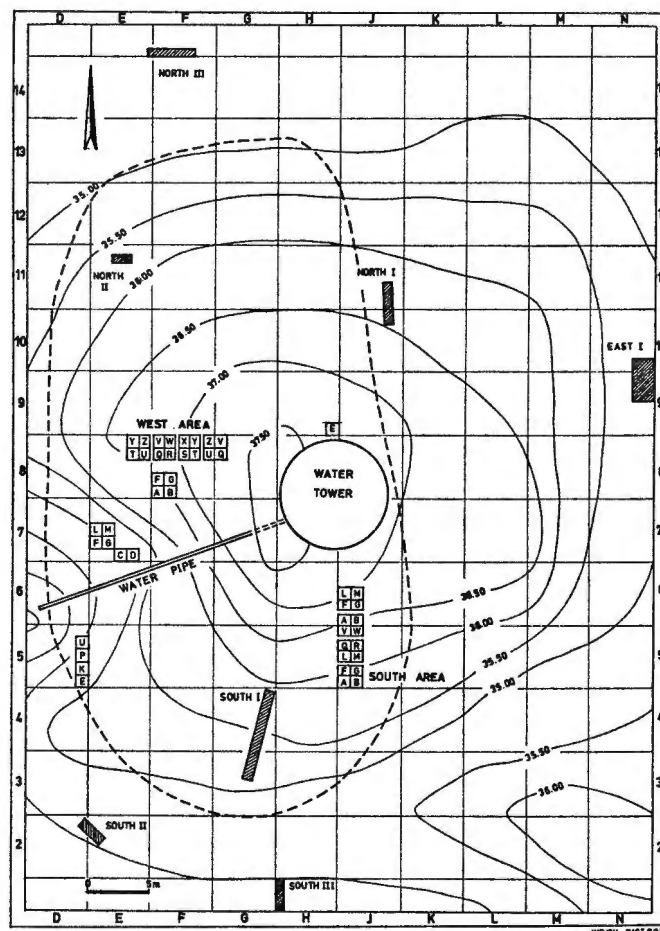


Fig. 2. Hefziba near Hadera. Plan of site, test trenches, excavated areas and approximate limit of occupied area.

area of habitation was determined by trenches dug mechanically. Two excavation areas were opened,  $8 \times 2$  m. each, on the South and West slopes (Pl. VI, 1). Every second meter a bench 0.5 m. wide was left for cross-sections (Pl. VI, 2). The whole of the southern area was excavated down to the bottom of the archeological occupation by the end of the 1973 season, but in the west area another two-week excavation in 1974 was required to complete the removal of the habitation layer in  $4 \text{ m}^2$ . Thus, stratigraphy and industry in the west can be compared with those of the south area.

#### Method of excavation

The basic grid is  $5 \times 5$  m. squares, each designated by a letter and a number. Each square meter within these  $5 \times 5$  m. squares was given a letter consecutively from the south-west corner to the north-east one skipping the letter I to avoid mistaking it for the number 1. Each square meter was further subdivided into four  $50 \times 50$  cm. areas, the south-western quadrant designated 1 and the north-eastern 4. Elevations were measured by a level from a point located on the water tower at 39 m. a. s. l.

All the excavated soil was sieved under running water thanks to a water pipe installed to the hill especially for this purpose by the municipality of Hadera. The sieving device we constructed consists of three superimposed screens with openings of 1.0, 0.4 and 0.2 cm. respectively from top to bottom.

In the first season (1972) each item found during the excavation was noted in the usual, three-dimensional system. The dirt was then sieved from each  $50 \times 50$  cm. area in spits 5 cm. thick. The amount of micro-liths retrieved by sieving was very large, many of them smaller than 1.0 cm. This method resulted in a series split into a part that was located to the centimeter and another, substantial part, located to the quadrant and 5-cm. spit only. Hence, in the following seasons all the finds were recorded solely by their quadrant and spit. Elevations were taken for each square meter after the removal of each spit.

Altogether,  $47 \text{ m}^2$  were excavated, excluding the mechanically dug trenches. The archaeological layers were completely removed in  $23 \text{ m}^2$  only. A rough estimation indicates the density of finds – flint and bone – to be over 4000 per cubic meter of deposit.

#### Stratigraphy and Occupation Area

Four major geological units exist at Hefziba. These are, from top to bottom (Fig. 3, Pls. VI, 3; VII):

A. Holocene sand dunes. On the west and north slopes the sand is between 0.30–0.70 m. thick. On the south slope and the hill crest it reached 1.0 m. On the east slope the sand cover grew considerably thicker, and trenches dug 2.0 m. below surface failed to reveal its base.

B. A dark brown to black sandy clay, 0.5–1.2 m. thick, strewn with occupational debris of the Epi-Palaeolithic. Outside of the occupation area Layer B became reddish. This layer could be detected in the south, west and north but not in the east slope, where it either does not exist or is buried under a thick sand cover. As it stands, the dark occupation zone covers ca.  $1300 \text{ m}^2$  and the maximum area of implement distribution in Layer B is ca.  $2000 \text{ m}^2$  (Fig. 2). The upper limit of Layer B is very sharp. Its base is a gradual transition to Layer C.

C. A yellow-reddish sand 1.0–1.5 m. thick.

D. A red sandy loam (Hamra). This layer was only detected in Trench South I for a depth of 2.0 m.

The major part of the hill of Hefziba is thus built of unconsolidated sand, an unusual feature on the coastal plain of Israel where hills are normally built primarily of sandstone. The major geological units described above could be further subdivided during the excavation, as follows (Fig. 3):

A1. Upper loose sand, thickness 0.40 m. No archaeological finds.

A2. Grey sandy soil (Regosol), maximum thickness 0.50 m., with abundant snails. Lower limit irregular. No finds.

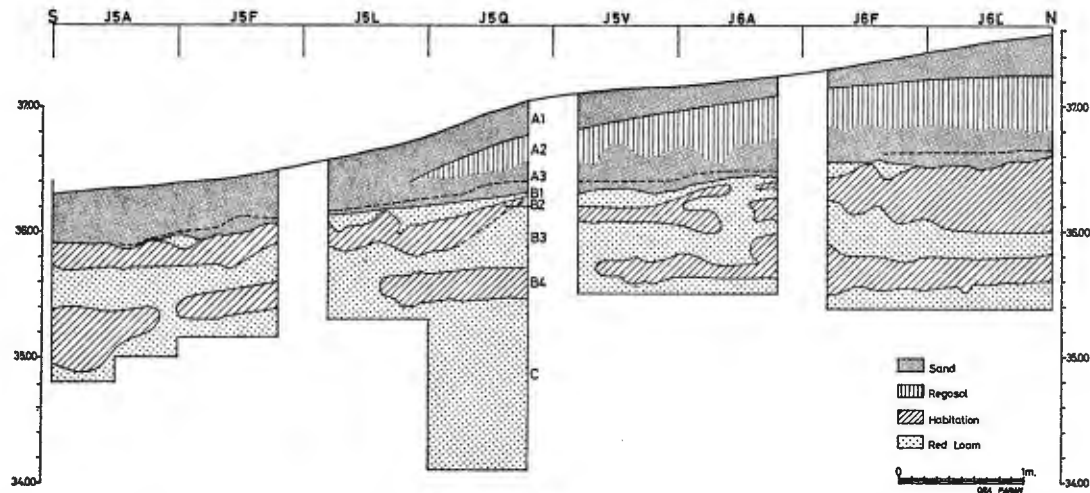


Fig. 3. Hefziba near Hadera. South Area, section of west face. The dashed line in Layer A3 is a deflated surface with Neolithic implements.

- A3. Lower loose sand, 0.40 m. maximum thickness. At the base there is a continuous concentration of artifacts which appear to be an old deflation surface. Several Neolithic arrowheads are here mingled with Epi-Palaeolithic implements probably derived from the underlying layer which is locally B1 or B2. There is no fauna in Layer A3.
- B1. A reddish-brown, compact sand, 0.10–0.20 m. thick, discontinuous. It is clearly and evenly separated from the overlying white loose sand. The lower limit is irregular. Epi-Palaeolithic tools and fauna.
- B2. Dark sandy clay, grey to black, 0.50 m. maximum thickness. Practically continuous, Layer B2 is extremely rich in Epi-Palaeolithic tools and fauna.
- B3. Reddish sand, compact, 0.30 m. thick. Cultural remains less numerous than either in B2 or B4.
- B4. A dark grey or black sandy clay, but less dark and thinner, 0.20–0.30 m., than B2. Epi-Palaeolithic remains.
- C. Loose, pale reddish sand with some clay, 1–1.5 m. thick. Abundant small carbonate concretions. Relatively few Epi-Palaeolithic artifacts and bones, with adhering concretions. The finds quickly diminish with depth and practically disappear at the base of Layer C. They seem to be intrusive from Layer B.
- D1. Red sand, loose, with almost no clay, 0.80 m. thick. Archaeologically sterile.
- D2. Red sandy clay, 0.70 m. thick.
- D3. Red sand, less clay. Only 0.30 m. were visible to the base of Trench South I, at 31.80 m. a.s.l. Layer D3 probably lies on top of the sandstone that outcrops at 29.30 m. a.s.l., some 100 m. south of Trench South I.

#### Dating and Interpretation of the Section

Samples of charred bone and what seemed to be burnt soil from Layer B at Hefziba were submitted for C14 measurement. It turned out however, that there was no charcoal in the soil samples. The contamination in the coastal plain sandy environment appears to be quite considerable, as seen from the wide range of dates obtained and from their being, on the whole, far too low except perhaps for the date of 11,900 BP.

The section of Hefziba described above can be interpreted as four cycles of sand accumulation and stabilisation, followed in three cases by weathering and soil formation. The date of the lowest unit (Layer D) is unknown. The following unit, Layer C and its soil, Layer B, date to the end-Pleistocene, probably between 20,000–12,000 BP. An important weathering took place during that period, as evidenced by the dark colour and the thickness of the soil (Layer B) and the carbonate leached into Layer C. Dense

human occupation took place twice during the formation of this soil, in B4 and B2. The horizon of B3 may either represent a lighter occupation or a period of non-occupation, in which case the finds in it would have derived from Layer B2.

Table 1: C14 dates for Layer B at Hefziba

Sample No.	Laboratory No.	Material	Date BP
HF 1	Hv 4971	Humic black soil	3635 ± 225
HF 1	Hv 4976		4060 ± 130
HF 6	Hv 5854		5090 ± 285
HF 5	Hv 4975	Charred bone	5930 ± 380
HF 8	Gx 3215	Carbonaceous black soil	6350 ± 300
HF 4	Hv 4974	Charred bone	7560 ± 145
HF 2	Hv 4972	Humic black soil	7720 ± 455
HF 9	Gx 3216	Charred bone	11,900 ± 500

Subsequently, new sand dunes moving from the west covered the site of Hefziba (Layer A3 and its soil A2). The beginning of their penetration seems to coincide with sparse Neolithic remains, which date this phase to the 8th or 7th millenium. The Neolithic finds mingle with Epi-Palaeolithic remains strewn on the (deflated?) surface of Layer B1. The soil formation this time (A2) was a minor one, and the decalcification slight enough to enable snail preservation.

Finally, the latest sand penetrated into Hefziba (Layer A1). There is at present no hint as to the dates of A2 and A1 other than their being post-Neolithic. Hopefully, the snails in A2 can be C14 dated.

### The Finds

#### The Fauna

Bones are numerous and quite well preserved at Hefziba – a rare phenomenon on the coastal plain of Israel. The preservation is only in the Epi-Palaeolithic occupation (Layers B and C) and none in the Neolithic (Layer A).

Only a limited sample of bones was studied by Mrs. D. Hacker (1974) namely those of the 1972 season. The data shows that the animals hunted were, in descending quantity: *Gazella*, *Bos*, *Capra*, *Dama* or *Cervus*, and *Sus*. The presence of *Ovis* or *Capra* and of *Dama* or deer at Hefziba indicates a range of hunting that stretched at least 10 km. to the east, to the more heavily forested hilly area.

Fishing is attested to by a few remains of fish bone, still undefined. Fishing probably took place in the nearby Hadera River since the Mediterranean shore at that time was some 8–10 km. west of the site.

#### Basalt Tools

The basalt tools were spread in space and depth without noticeable concentrations. The finds consist of pestles and fragments of deep mortars, with at least two kinds of basalt used: a porous and a compact one. The mortars are between 20 and 25 cm. high, with rim diameters ranging between 12 and 26 cm.

(Fig. 9: 1-3). The largest fragment found had a base diameter of 16 cm. and weighed ca. 18 kg. when complete (Fig. 9: 1).

The pestles are of two major types: rectangular with rounded corners (Fig. 9: 4,5) and round or oval shaped with flat section (Fig. 9: 6,7). One peculiar specimen, made of hard limestone, has a protuberance on its surface (Fig. 9: 6).

It is worth noting that not one complete mortar was found. The most complete one has a hole in its base (Gophna et al. 1973, Fig. 1), which is the apparent reason for its having been discarded. It would seem that these hard-to-make implements were carried away by the departing group. There is no indication that the basalt was worked at the site.

The pestles found at Hefziba do not seem to fit the deep mortars, which perhaps had wooden pestles. On the other hand, not one flat bowl or plaque of basalt or any other stone was found that would fit the pestles. Hence, the precise manipulation of the grinding tools at Hefziba remains unclear. These tools, together with those found at Ein-Gev, are the oldest known at present.

### Other Finds

Two human teeth were found at Hefziba in the South Area, 4 m. from each other. These are the first prehistoric human remains to be discovered on the Israeli coastal plain, and they adjoin the only other Epi-Palaeolithic human remains known in Israel, from Ein-Gev in the Jordan Vally (Stekelis et al. 1966). One tooth is from Layer B2, the other from the junction of B2 and B3 (see P. Smith below).

Ochre was quite abundant in Hefziba, of red or yellow color. A large pink oyster shell (*Spondylus gaederopus* [L])<sup>5</sup> was found, which perhaps constitutes the only element of decoration at this site. It came from the top of Layer B, and may have belonged either to the Epi-Palaeolithic or the Neolithic occupations.

In the Epi-Palaeolithic layers, a few bone implements were found, all fragmented. There are some points and some larger polished pieces.

The lack of any architectural remains in this well-preserved site is significant. One small, curved line of sandstone fragments, ca. 1.0 m. long, was found at the base of Layer A3 and apparently belongs to the Neolithic.

In the Epi-Palaeolithic Layer B, only two pieces of sandstone or beachrock were found, and not one piece of limestone except the mentioned pestle. Apparently, constructions of organic material must have been used by the Epi-Palaeolithic people at Hefziba. Two small pits were indeed distinguished in the upper part of Layer B which were perhaps postholes: they are about 25 cm. deep, with diameters of 14 and 20 cm. respectively. Both were filled with the dark deposit of Layer B, hence they must have preceeded the sand accumulation of Layer A.

### The Lithic Industry

It will be some time before the study of the rich lithic material recovered at Hefziba is completed. Here, the complete analysis of tools from 4 m<sup>2</sup> in the south area will be reported. Altogether, these 4 m<sup>2</sup> yielded 2929 tools, 433 cores and a very large number of unretouched pieces.

The Epi-Palaeolithic industry was divided into four units: The uppermost comprises geological Layers B1 and the dark occupation horizon B2, the industries of which could not be separated. The second unit is the reddish sandy Layer B3, and the third is the lower dark horizon B4. The lowest unit comprises the artifacts found in the yellow-red sand of Layer C.

<sup>5</sup> Identified by A. Horowitz.

Typologically, the industry is the same in all four units and, although not yet thoroughly checked, there do not seem to be any technological differences either. Therefore, a general description will be given first, followed by the variations – all quantitative – among the units.

The industry is made up almost totally from microliths, grattoirs and burins. Other tool types account for no more than 5 % of the entire series.

**Grattoirs.** More than 3/4 of the grattoirs are made on flakes (Fig. 4). The large majority is of the simple type. Only 13 % of the grattoirs are on retouched blanks and about 6 % are double (Nos. 8–10). A few oval-edged (No. 4) and circular grattoirs complete the collection. A variant of the simple grattoir which is made on the side of the flake is noteworthy (10 %, No. 7).

No typical keeled grattoir was found at Hefziba. Keeled or Rabot-type pieces constitute the bulk of cores at this site, so that pieces transitional between cores and carinated grattoirs were included with the cores.

**Burins.** Dihedral burins (Fig. 5: 1, 2, 6) are less numerous than those on truncation. Most of them are angle dihedrals and some are canted. Burins on a natural surface are also present (Fig. 5: 3, 4, 5). The dihedrals do not have any special characteristics, and are essentially the same as in previous periods. The burins on truncation, on the other hand, are unlike the Upper Palaeolithic types. They are small (15–20 mm. in length), frequently thick and of a sub-quadrangular shape (Figs. 5: 10; 6: 1, 2). The truncation is usually very steep and may be oblique (Fig. 5: 8), concave (Figs. 5: 9; 6: 1–3) or straight (Fig. 5: 10). Burins on edge-retouch are also common. The burins on truncation often have the burin blow on the ventral surface (Fig. 5: 9, 10 top), and sometimes it is a very fine and thin one (Fig. 6: 1). This small subquadrangular burin is a typical Epi-Palaeolithic tool.

**Other tool types.** The group of multiple tools is small (only 18 pieces). The choice of combinations is of interest: all four awls in this category are combined with burins, two with Bd and two with Bt (Fig. 6: 6, 7). Of the 11 grattoir-burins, seven are Bd (Fig. 6: 4, 5) in spite of the great predominance of Bt in the collection. Also in marked contrast to the numerous burins on truncation, truncated items are extremely rare at Hefziba – only eight pieces. Notches and denticulates together number 25. Retouched items are slightly better represented, with 74 pieces, forming 2.5 % of the series. Most of these are flakes or blades with direct retouch (Fig. 6: 8, 9), and some have alternate or inverse retouch.

Knives or any other backed pieces are altogether absent from the Hefziba industry, including backed blades. Thus, not only sickle blades with sheen, but even any morphologically similar type without sheen does not exist alongside the basalt mortars and pestles at Hefziba. Awls are remarkable both for their scarcity and way of manufacture: altogether, only five were found of which four, as already noted, are all combined with burins to form multiple tools.

**Microliths.** The microliths form about 3/4 of all tools (Fig. 7). The complete non-geometric tools are dominated by pointed backed bladelets (Nos. 3, 6) and backed and truncated bladelets (Nos. 7, 8). The first type tends to have very fine and light retouch, the second heavier and steeper retouch. There is also a relatively large number of arc-backed bladelets with fine retouch (Nos. 4, 5). The large majority of the non-geometrics are fragments, with fine retouch more frequent than heavy.

The geometric microliths are characterised primarily by long, narrow and thin trapezes and rectangles (80 % of all geometrics, Fig. 7: 9–10). Lunates count for about 10 % of the geometrics (Fig. 7: 19, 20) and there are very few triangles (1.5 %). A few hammerstones complete the sample of the lithic industry studied till now.

Two technical affinities are to be stressed in this brief discussion. Helwan retouch does not appear at all, and there are only 8 microburins in the entire series. If these are not accidental, it means that even though the microburin technique was known, it was not utilised.

**Cores.** As could be expected in a microlithic industry, most of the cores would have yielded blade-

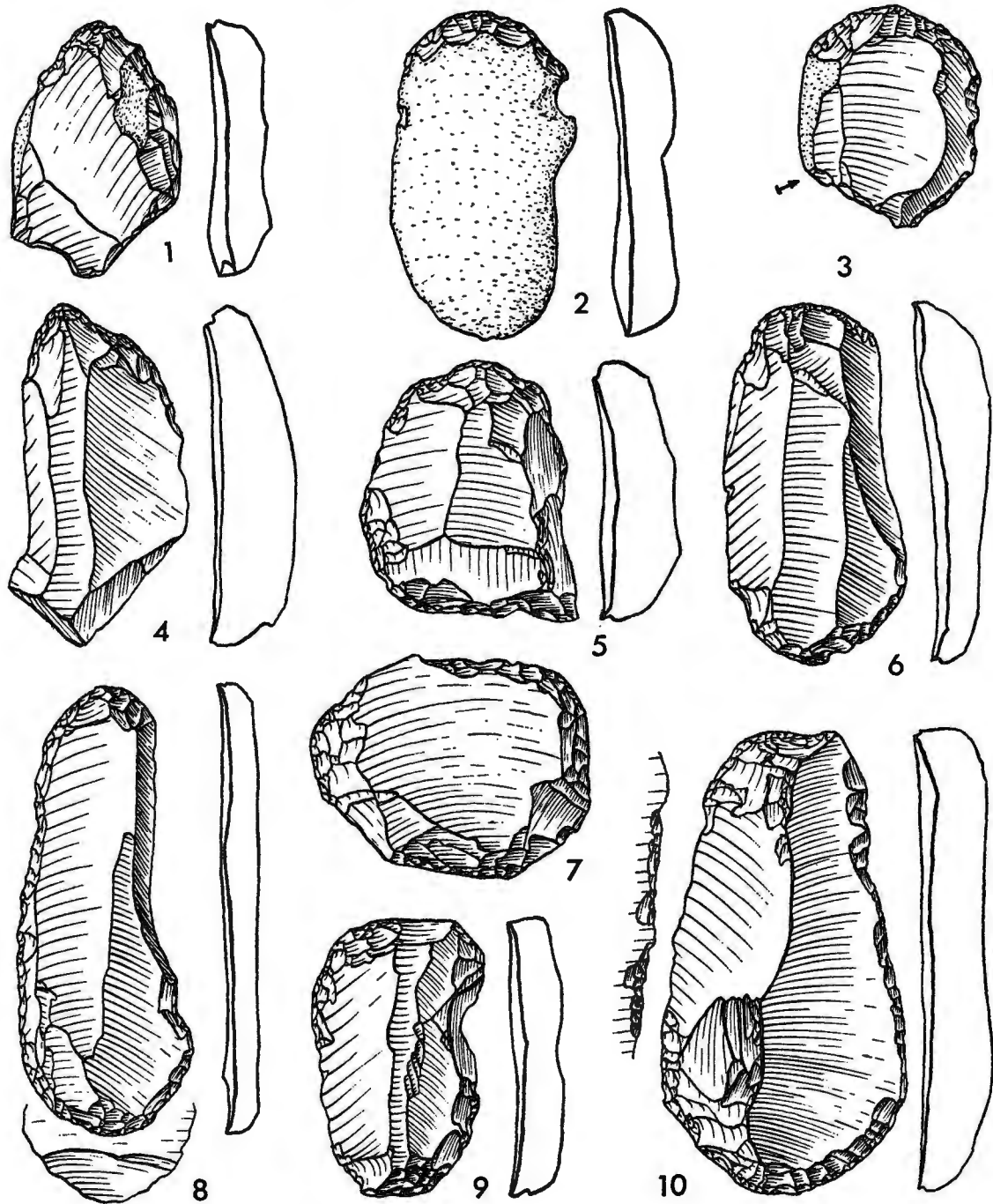


Fig. 4. Hefziba near Hadera, grattoirs. 1:1.



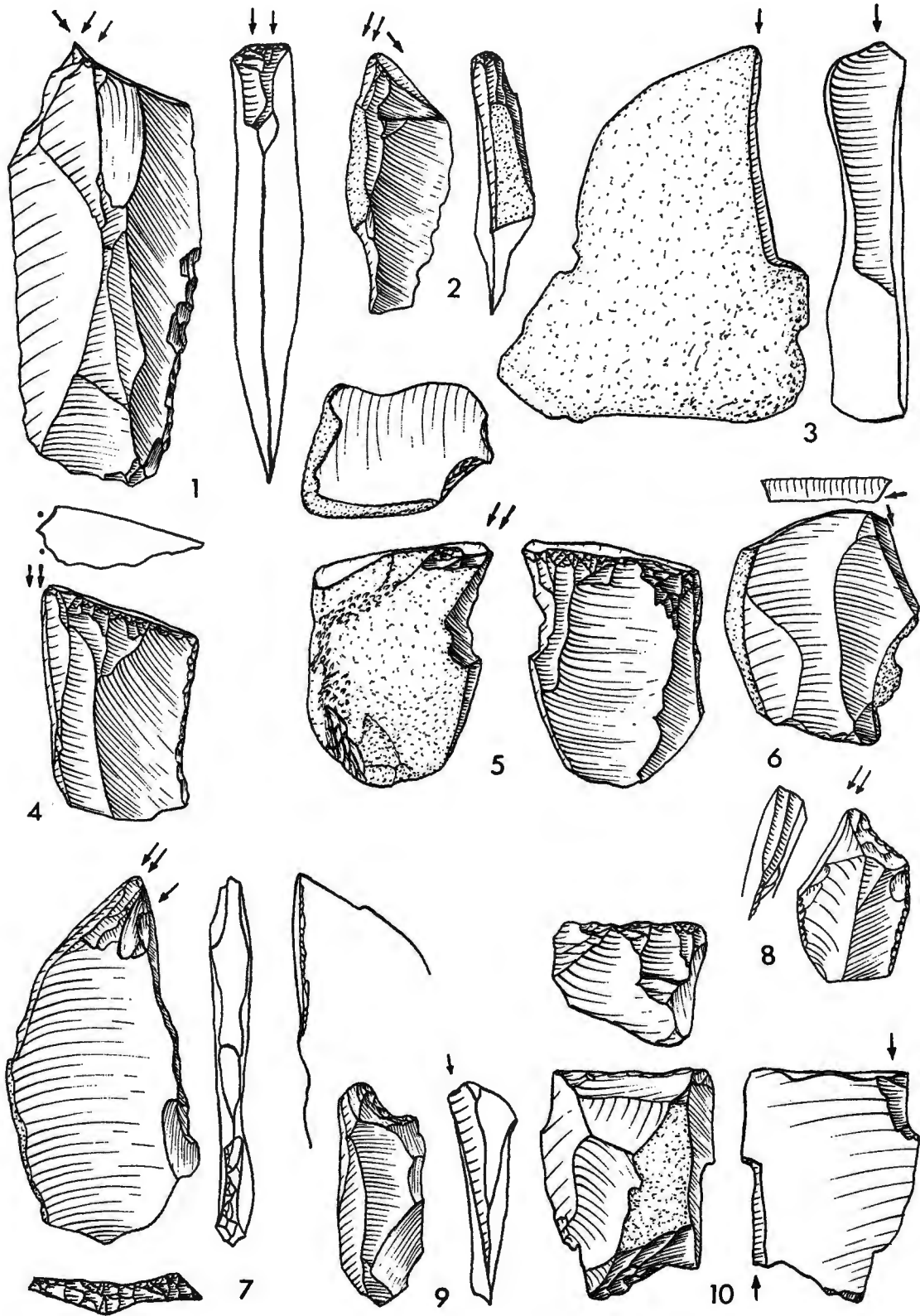


Fig. 5. Hefziba near Hadera, burins. 1:1.

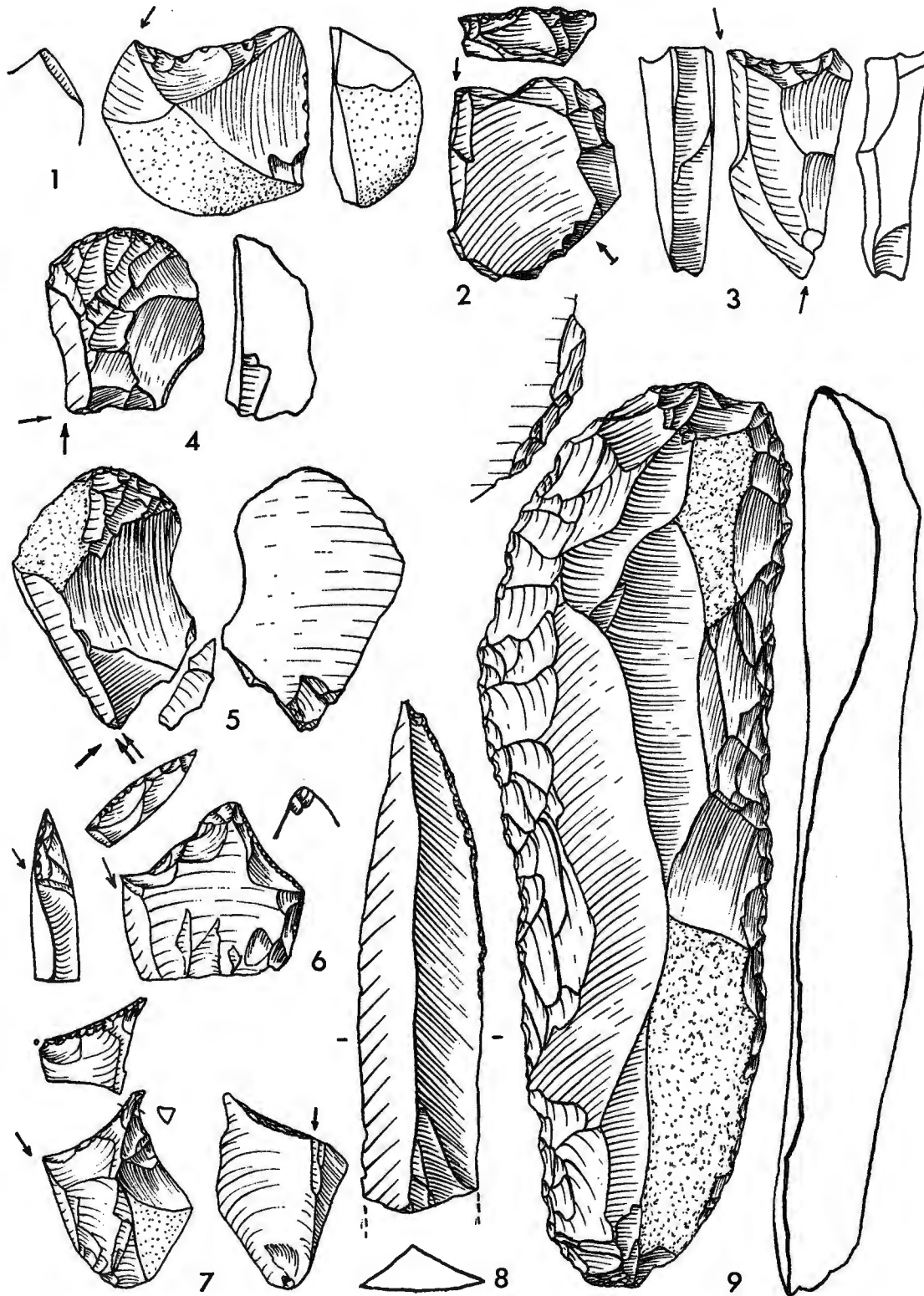


Fig. 6. Hefziba near Hadera. 1-3: burins; 4-7: multiple tools; 8, 9: retouched blades. 1:1.

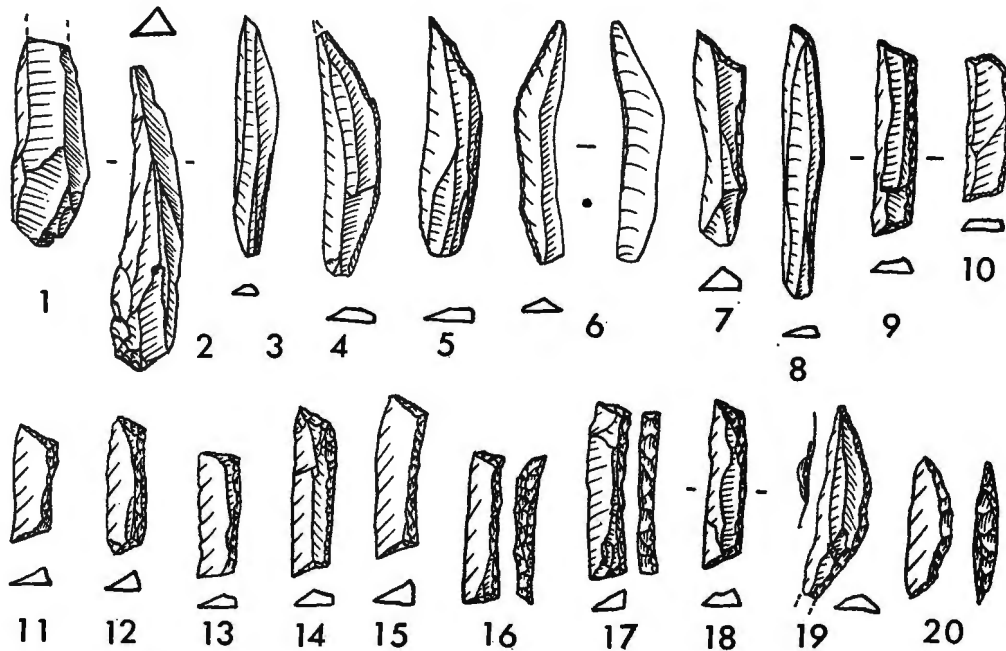


Fig. 7. Hefziba near Hadera, bladelets. 1, 2: unretouched; 3-8: non-geometric; 9-20: geometric. 1:1.

lets. Indeed, the majority of the 433 cores in the 4 m<sup>2</sup> studied here are carinated, with a single striking platform (Fig. 8). Flake cores seem to be underrepresented, although several bladelet cores have also had one or two flakes removed. However, this does not account for the large number of flake tools and debitage found. Also, the raw material found at the site (all manuport) tends to be small, with no considerable reduction in size between nodules and discarded cores. The majority of the cores still retain much of the cortex, so it does not seem likely that flakes could have been removed prior to the removal of bladelets. It is possible that flake debitage was done at a raw material source outside the site, or – less likely in our opinion – in some unexcavated area of the site.

#### Temporal Variations

No variations of tool forms were noticed among the four Epi-Palaeolithic strata. However, important quantitative differences do exist (Table 2, and Fig. 10). The lower two units (Layers C and B4) have a lower frequency of microliths (67% and 57%) than the two upper units (84% and 78%). Interestingly, the few microburins that were found come only from the upper pair of units, and particularly from the uppermost (7 of the 8 found). Similarly, the three triangles also come from the upper pair of units. All other types of microliths, including lunates, are found in all four units.

The frequency of grattoirs increases steadily from the lower to the upper unit, and the frequency of burins decreases in the same order. The ratio of burins to grattoirs, from the lower to upper unit, is 11:1, 9.5:1, 2:1 and 0.86:1.

The great variation in the frequency of burins is mostly due to those on truncation. In all four units Bt outnumbers Bd, but far more so in the lower pair. The ratio of Bt to Bd per unit is, from bottom to top: 2.8:1, 5.7:1, 3.8:1 and 1.4:1. Layer B3 forms, in a way, a transition between B4 and B2-1: the general aspect of B3 is like that of the upper unit (Fig. 10), but at the same time B3 shares with the lower pair of units the high frequency of Bt as opposed to Bd and the higher frequency of burins than of grattoirs.

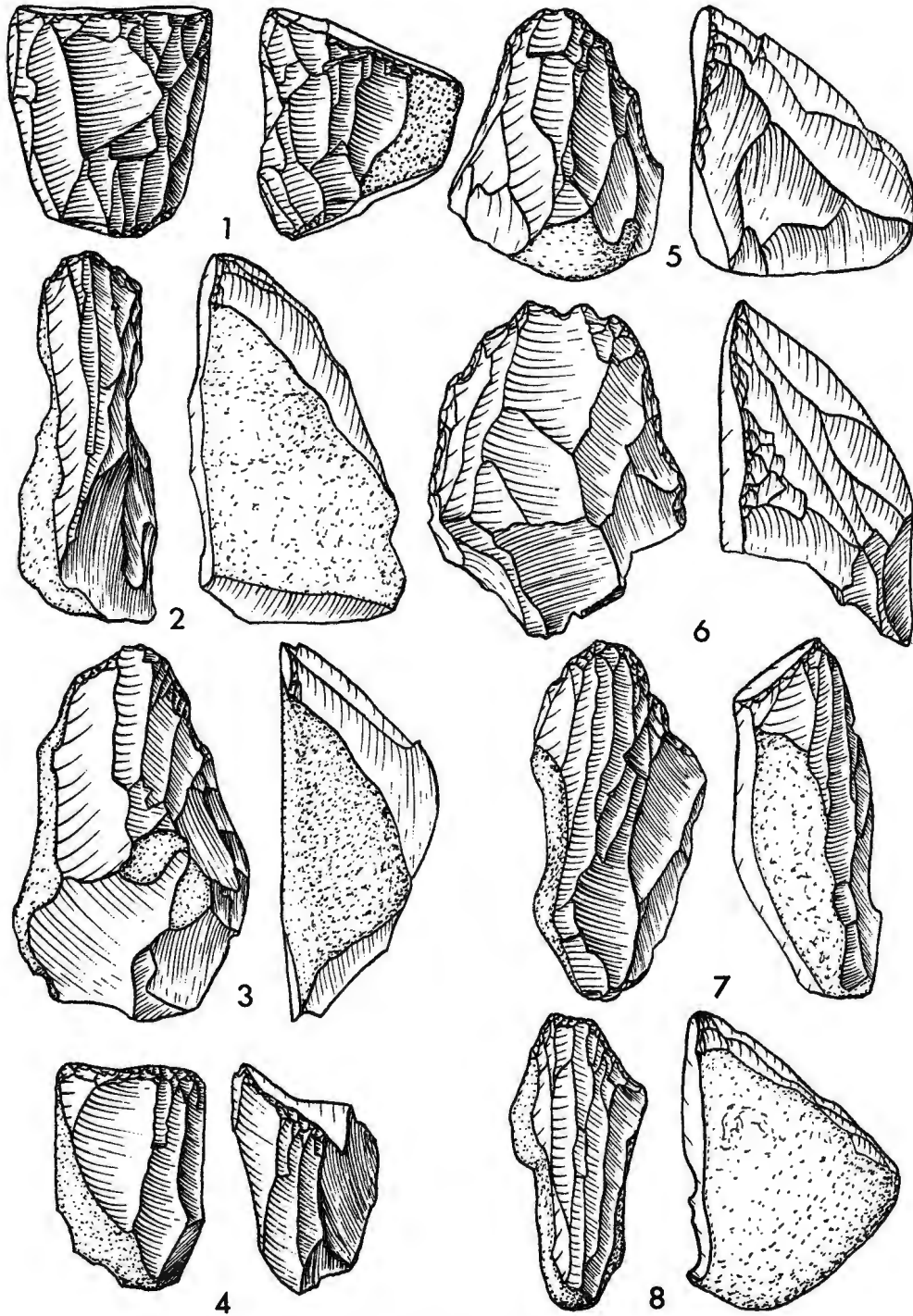


Fig. 8. Hefziba near Hadera, cores. 1:1.

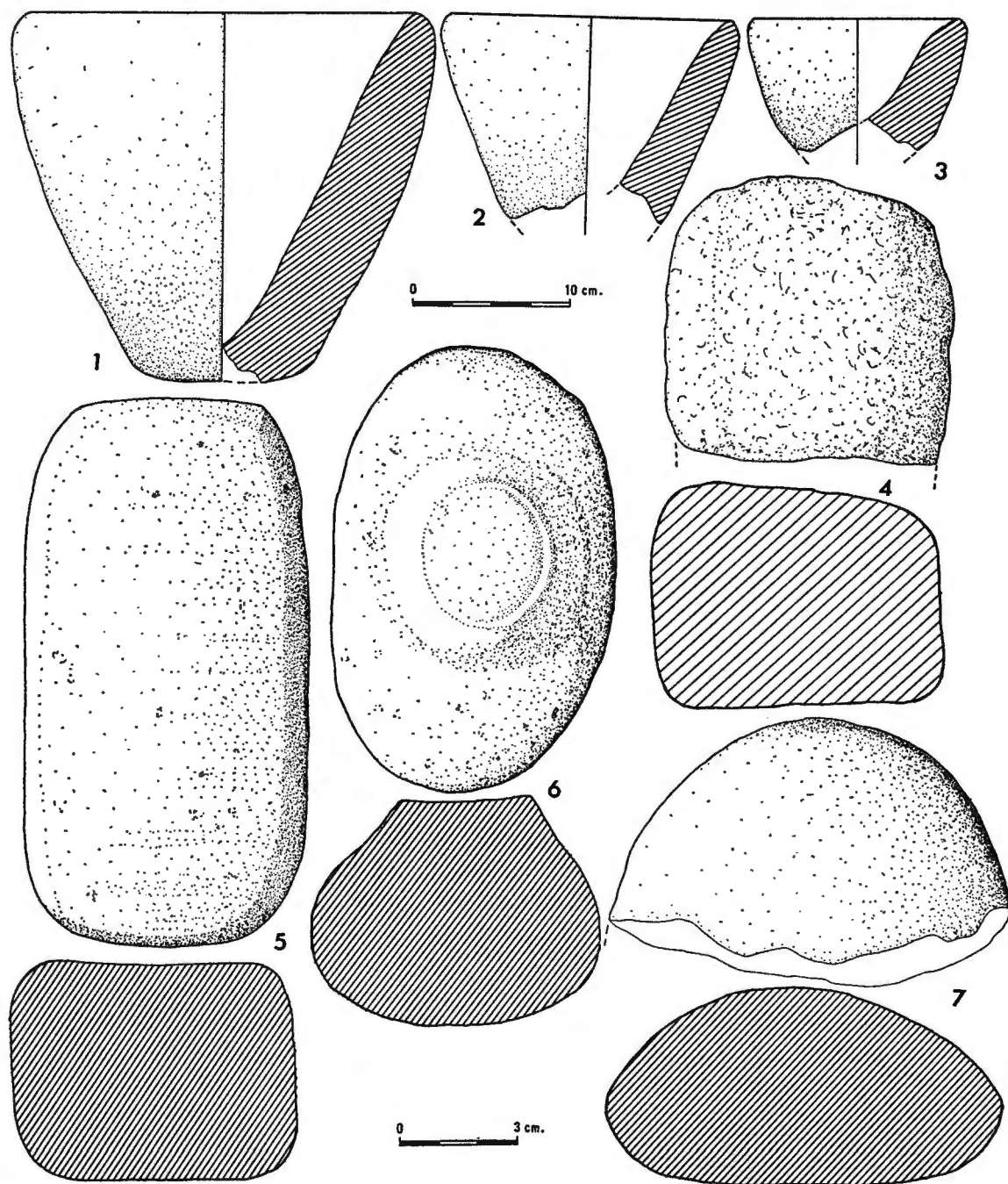


Fig. 9. Hefziba near Hadera, basalt grinding tools. 1-3: mortars; 4-7: pestles (No. 6 is of limestone).

The sandy character of Layers B3 and C at Hefziba has already been mentioned. Since numerous observations on the coastal plain of Israel show that sandy areas were not normally occupied, the validity of these industrial units may be questioned and the possibility of their being derived from above and/or below should be born in mind. Units B2-1 and B4, on the other hand, certainly are two distinct and undisturbed occupation layers.

The quantitative variations described above may denote either temporal evolution or a change of activity areas affecting the 4 m<sup>2</sup> studied. This will be clarified with the further examination of lithic material from Hefziba.

Table 2: Tool categories and their relative frequencies for each stratigraphic unit

TYPE	LAYER							
	B2-1		B3		B4		C	
	N	%	N	%	N	%	N	%
A. End Scrapers	152	8.96	24	4.26	20	3.42	2	2.29
B1. Dihedral Burins	55	3.24	10	1.77	28	4.79	6	6.89
B2. Burins on truncation	76	4.48	38	6.75	162	27.74	16	18.39
C. Awls	1	0.05	—	—	—	—	—	—
D. Knives and backed pieces	—	—	—	—	—	—	—	—
E. Truncated Items	4	0.23	2	0.35	2	0.34	—	—
F. Notches and Denticulates	16	0.94	1	0.17	8	1.36	—	—
G. Multiple Tools	8	0.47	4	0.71	6	1.02	—	—
H. Retouched Items	40	2.35	9	1.59	22	3.76	3	3.44
I. Special Tools	5	0.29	2	0.35	1	0.17	2	2.29
J. Nongeometric Microliths	1195	70.50	442	78.50	315	53.93	46	52.87
K. Geometric Microliths	136	8.02	30	5.32	20	3.42	12	13.79
L. Microburins	7	0.41	1	0.17	—	—	—	—
M. Miscellaneous	—	—	—	—	—	—	—	—
Total Tools	1695		563		584		87	
Cores	316		46		57		14	

### Discussion

Unfortunately, it is impossible to draw quantitative comparisons between Hefziba and any of the Epi-Palaeolithic sites hitherto published from the coastal plain of Israel, since the wet sieving of all the earth removed gave a much higher retrieval of microliths at Hefziba. The following traits clearly relate Hefziba to the non-geometric phase of the Kebaran culture:

**Typologically:** the abundance of microliths, the low ratio of geometrics, the dominance of burins over grattoirs, the dominance of Bt over Bd, and the importance of the sub-quadrangular Bt.

**Technically:** the high ratio of tools on flakes, and the absence of microburin technique and Helwan retouch.

In the light of the above mentioned characteristics, the shift from the local Upper Palaeolithic (Levantine

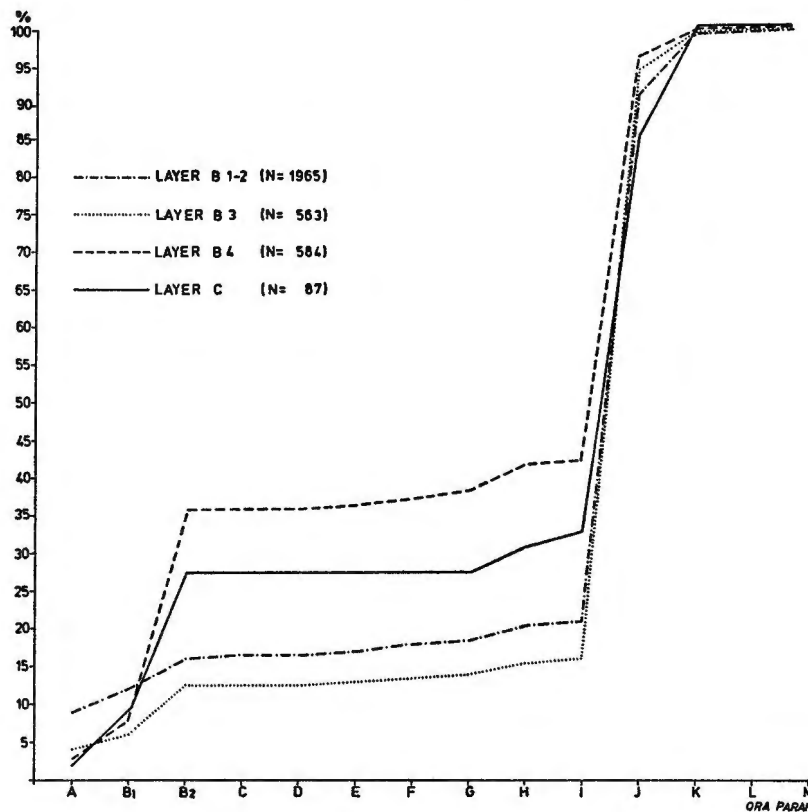


Fig. 10. Hefziba near Hadera. Cumulative graphs of lithic series.

Aurignacian) to the Epi-Palaeolithic may be described, in addition to the obvious microliths, by the following significant features:

- 1) Many of the Upper Palaeolithic tool types are only scarcely represented in the Epi-Palaeolithic. In other words, the EP industry is composed almost entirely by grattoirs, burins and microliths.
- 2) Burins on truncation become more important in the EP than in the preceding Aurignacian, frequently to the point of domination over grattoirs. The sub-quadrangular Bt is typical among EP tools.
- 3) Blades are far less favoured for tool manufacture than in the preceding UP.

The shift in the traits listed above was by no means sudden, unlike the misleading impression given by the old excavations. Recent examination of the material shows, on the contrary, that the trends appear from late Aurignacian on (Ronen, in press): the use of blades for tool manufacture drops in the late Aurignacian of El-Wad D<sub>2</sub>-D<sub>1</sub>, as compared with the earlier Aurignacian, and further decreases in the Atlitian of El-Wad C. The peculiar aspect of this Atlitian which was well noticed by Garrod – namely, grattoirs and burins together forming two thirds of the industry – is precisely an Epi-Palaeolithic characteristic. In our view, microliths must have been quite numerous in the Atlitian of El-Wad C, but were thought to be intrusive from the overlying Natufian. Also, the typical Epi-Palaeolithic sub-quadrangular Bt makes its first noticeable appearance in the Atlitian<sup>6</sup>. On the other hand, Bt in the Atlitian are few compared to Bd, which is still in the Aurignacian tradition.

<sup>6</sup> According to these observations, we now think that Stekelis had correctly assigned the lowest layer at Nahal Oren Terrace to the Atlitian (Stekelis and Yizraeli, 1963).



A gradual transition between the Aurignacian and the Epi-Palaeolithic is also reported from Ksar Akil (Copeland, in press), but the precise traits of this transition are still not published. It will be interesting to see whether the transition in Lebanon follows a pattern similar to the one seen in Israel, which may be summarized as follows:

	Blade Blanks	Composition of Industry	Burins on Truncation	Microliths
Kebaran	Scarce	Grattoirs, burins and microliths dominate	Numerous, sub-quadrangular type characteristic	Abundant
Atlitian	Less frequently used	Grattoirs and burins dominate	Not numerous. Sub-quadrangular type appears	Well represented (N. Oren Terrace)
Aurignacian	Numerous in early stage, drop in frequency in later stage	Wide range of tool types represented	Not numerous	Very few

### Conclusions

During the Epi-Palaeolithic, the hill of Hefziba was repeatedly and heavily inhabited at least twice, perhaps three times, during a period of soil formation which is the latest red sandy loam that developed on the coastal plain of Israel. The Kebaran occupation covered some 1300 m<sup>2</sup> and did not make use of stone structures. It apparently came to an end by a new sand penetration. At least two millenia later, a poor Neolithic occupation marked the end of the history of settlements at Hefziba. The repeated Kebaran occupations seem to belong to the same group of people, since tool types, and apparently technology also, are the same throughout.

The oldest known appearance of deep grinding tools denotes, in our view, that beside hunting and fishing, gathering in the Kebaran had acquired a more important role in the economy than hitherto. This took place before cutting or harvesting tools in the form of sickle blades were invented.

### Petrography of Hefziba sands (N. Bakler)

The sand of Layers A1, A3 and B1 at Hefziba were analyzed for grain size of 1/2 Phi intervals between 1.000 and 0.062 mm., and for calcium carbonate content. The three Hefziba samples are compared (Table 3) with five samples of sands from the nearby Ceasarea area (Fig. 1): 4) present beach sand; 5) active shore dune sand; 6) red sandy loam (Hamra); 7) stable dune sand; 8) inland active dune sand (Bakler et al. 1972).

### Grain size

Samples A1 and A3 of Hefziba are similar to each other, with more than 90 % of the grains concentrated between 0.250 and 0.125 mm. Layer A3 is somewhat more enriched with fines smaller than



0.062 mm. Sample B 1 differs from Layer A in its considerably higher amount (6%) of the fraction smaller than 0.062 mm. (silt and clay). In this respect, Layer B 1 at Hefziba resembles the group of red sandy loams (Hamra) of the coastal Plain, although the latter are still richer in fines (sample 6; also Shachnai et al. 1974).

Hefziba samples A 1 and A 3 clearly resemble the other wind-blown sands. All of these show a concentration of grains in the narrow range of fractions between 0.250 and 0.177 mm., and all are practically devoid of fines below 0.062 mm. except Hefziba A 3, where the 2.5 % of fines are due to leaching from the A 2 soil horizon.

Table 3: Grain size analysis of sands from Hefziba and Ceasarea.

Sample	+	+	+	+	+	+	+	+	+	-	Total
	1.000	0.710	0.500	0.350	0.250	0.177	0.125	0.088	0.062	0.062	
1. Hefziba Layer A 1	0.63	0.27	0.38	0.85	4.89	55.00	35.04	1.78	0.17	0.99	100.00
2. Hefziba Layer A 3	0.25	0.08	0.06	0.38	3.76	49.67	39.21	3.78	0.25	2.56	100.00
3. Hefziba Layer B 1	0.42	0.08	0.13	0.47	3.40	44.16	38.64	5.45	0.42	6.70	99.87
4. Ceasarea Beach Sand NB/101/70	1.94	0.98	2.80	8.71	17.29	49.20	17.20	0.61	-	0.89	99.62
5. Ceasarea Shore Dune NB/97/70	0.01	0.03	0.03	0.89	5.99	65.73	24.97	0.87	-	0.87	99.39
6. Ceasarea Red Loam NB/70/70	0.03	0.02	0.04	0.21	1.99	49.35	28.89	5.27	0.62	13.54	99.96
7. Ceasarea Stable Dune NB/81/70	0.09	0.12	0.26	1.31	4.96	68.71	21.74	1.41	0.15	0.94	99.69
8. Ceasarea Active Dune NB/75/70	0.17	0.24	0.60	1.99	4.13	59.26	30.20	1.80	0.10	0.12	98.61

### Calcium carbonate

The calcium carbonate content in the sands of the area varies widely. Two sources of carbonate are present: 1) complete or fragmented land snails in the coarse fractions, and 2) wind-blown dusty material and reprecipitated silty particles.

The first type of carbonate is found mainly in the well defined grey soils like Layer A 2 at Hefziba, which can be identified all over the coastal plain of Israel (Shachnai et al. 1974). This grey horizon always underlies the latest sand accumulation, and the only later carbonate concentration in the form of snails is on the present surface of the sand.

	CaCO <sub>3</sub> %
Hefziba A 1	4.6
Hefziba A 3	7.6
Hefziba B 1	2.2
Ceasarea dunes (Rim 1951)	13.0
Ceasarea dunes (Shiloni and Bogoch, 1971)	10-15

Layer A 1 at Hefziba is poor in carbonate content which increases slightly in A 3 as a result of leaching from the overlying soil A 2. But even with this enrichment, the values of Hefziba are lower than those reported from the nearby area. The low carbonate content (2.2 %) in Layer B 1 at Hefziba is in accordance with the known data on the red loams of the Israeli coast (Dan et al. 1969).

### Summary

1) The sandy layers A 1 and A 3 at Hefziba are part of the wide-spread wind-blown sand which penetrates locally inland along the coast of Israel.

2) Well established field evidence suggests that the latest sand complex – which is the major part of sand dunes in Israel – dates from post-Roman times. Layer A 1 at Hefziba is attributed to this phase. From the Hefziba evidence it seems that the lower sand complex (A 3) is not older than the eighth millennium B. C.

3) Layer B 1 at Hefziba can be attributed to the group of well-known Hamra soils (red loams) on three grounds: (a) its considerable silt and clay content; (b) the decalcification, and (c) the dune-like distribution of its sand fraction (Fig. 11).

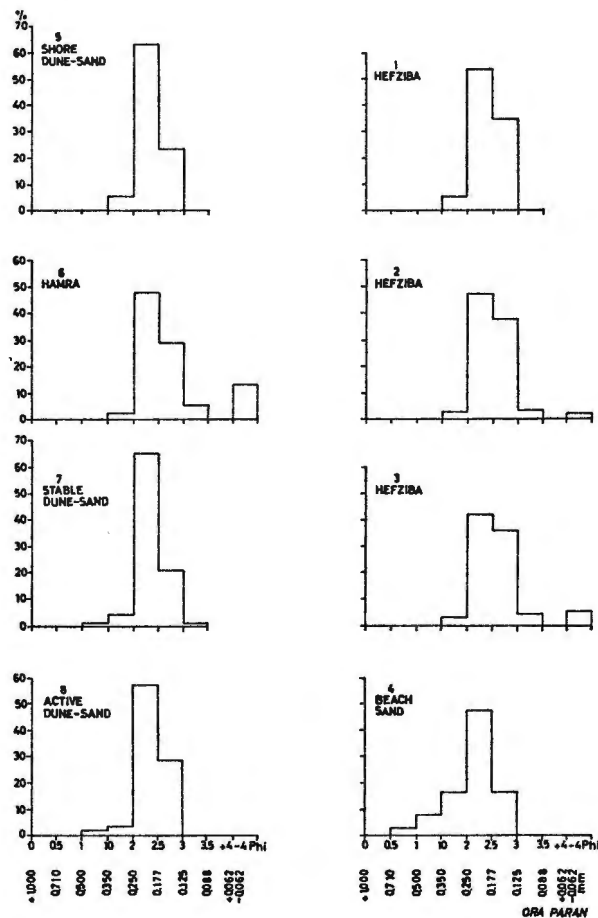


Fig. 11. Hefziba near Hadera. Grain size analysis of sand from Hefziba and the area of Caesarea.

### The human teeth from Hefziba (*P. Smith*)

The two human teeth recovered from the Kebaran level at Hefziba were found some four meters apart. They differ greatly in degree of attrition so that they must have belonged to two individuals of very different age.

The more complete specimen, J5G 4-7<sup>7</sup> consists of the almost unworn crown of a lower second permanent molar. Cusp pattern is + 4. and an anterior fovea is present. The buccal and lingual surfaces are smooth with no pits or grooves, and no trace of a cingulum. Tooth measurements are: length (MD) 11.5 mms; breadth (BL) 10.5 mms; crown height (CH) 6.5 mms. Enamel faceting is present on all cusps, demonstrating even wear of the occlusal surface. The presence of a slight mesial contact facet, and absence of distal facet, indicates that the third molar had not erupted. This, together with the minimal attrition present is suggestive of an age of 13-15 years at death.

The second tooth, J6L 1-9, is a very worn fragment of a maxillary molar tooth. All morphological detail has been lost. The one remaining root is short and rounded, so that the tooth was either a second or third maxillary molar from an elderly individual.

The only known specimen from Israel contemporary with Hefziba, that of Ein Gev I (Arensberg and Bar Yosef, in press) has very worn teeth from which all morphological detail has been lost. For the rest of the Upper Palaeolithic, the skeletal record is very sparse - there is one burial from Nahal Ein Gev I (Bar Yosef 1973), and a few fragments from the Aurignacian levels at El Wad and Kebara (McCown and Keith 1939, pp. 375-8). The succeeding Natufian culture has, by contrast, yielded a large number of human skeletal remains (Bar Yosef, Arensberg and Smith, 1971).

In so far as the material from Hefziba and the other Upper Palaeolithic sites listed permits of analysis, it appears that the Upper Palaeolithic inhabitants of Israel closely resembled their Natufian succedants. This differs from the situation in Europe where Upper Palaeolithic populations show marked temporal change, but once again, the small size of the sample known from Israel may be responsible for this apparent homogeneity.

Preliminary Investigation of phosphorus in Hefziba (*A. Amiel*)

A few samples from Hefziba were analysed for their phosphorus content, to test its value as a measure for the intensity of occupation. The samples were digested with a mixture of nitric and perchloric acids and the phosphorus was determined colorimetrically according to the ascorbic acid method, proposed by Watanaby and Olsen (1965).

The test was carried out on the complete stratigraphical sequence in two localities: one in square J6A in the South Area, the other in the central part of Trench South I.

Layer	Phosphorus Concentration (ppm)	
	Square J6A	Trench South I
A 2		Traces
A 3	Traces	2
B 1	590	} 645
B 2	1360	
B 3	Traces	
B 4	830	
C Upper	Traces	Traces
C Lower	Not excavated	194
D 1	" "	Traces
D 2	" "	Traces
D 3	" "	Traces
Bone from Layer B	6360	

<sup>7</sup> Square J5G, 4th quadrant, 7th spit.

The results correlate well with the visible stratigraphical units: the heaviest concentration of phosphorus is found in Layer B2, which is indeed the richest and the darkest layer in the site. Surprisingly, the phosphorus content in Layer B3 is close to zero, even though tools and bone fragments were found here. The phosphorus value seems to confirm that the sandy Layer B3 represents a period of non-occupation, in which case the finds in it are intrusive from the overlying B2.

In Trench South I only one occupation layer was distinguished (Layer B), with no subdivisions. The lower content of phosphorus in Layer B here than in Square J6A probably reflects the proximity of the limit of occupied area. On the other hand, the significance of the slight phosphorus concentration in the lower part of Layer C in the trench is not clear, since no occupation layer was distinguished here. This horizon was only attained in Trench South I, by the back-hoe, but in none of the excavated areas. Hence, the matter should await further excavations.

In view of the promising results hitherto obtained, a more intensive work is now being done on the phosphorus content at Hefziba.

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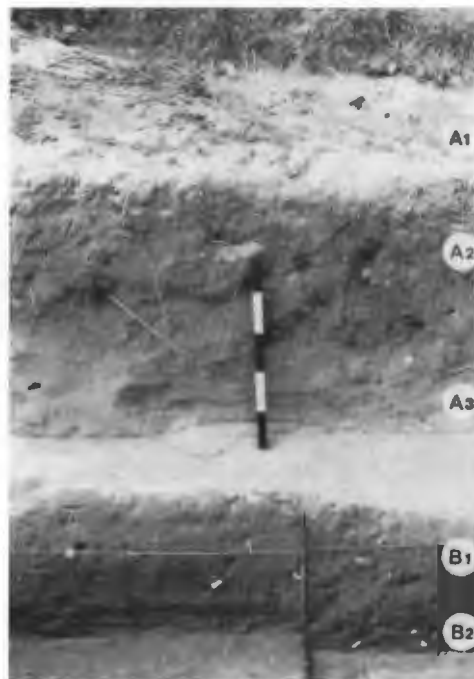
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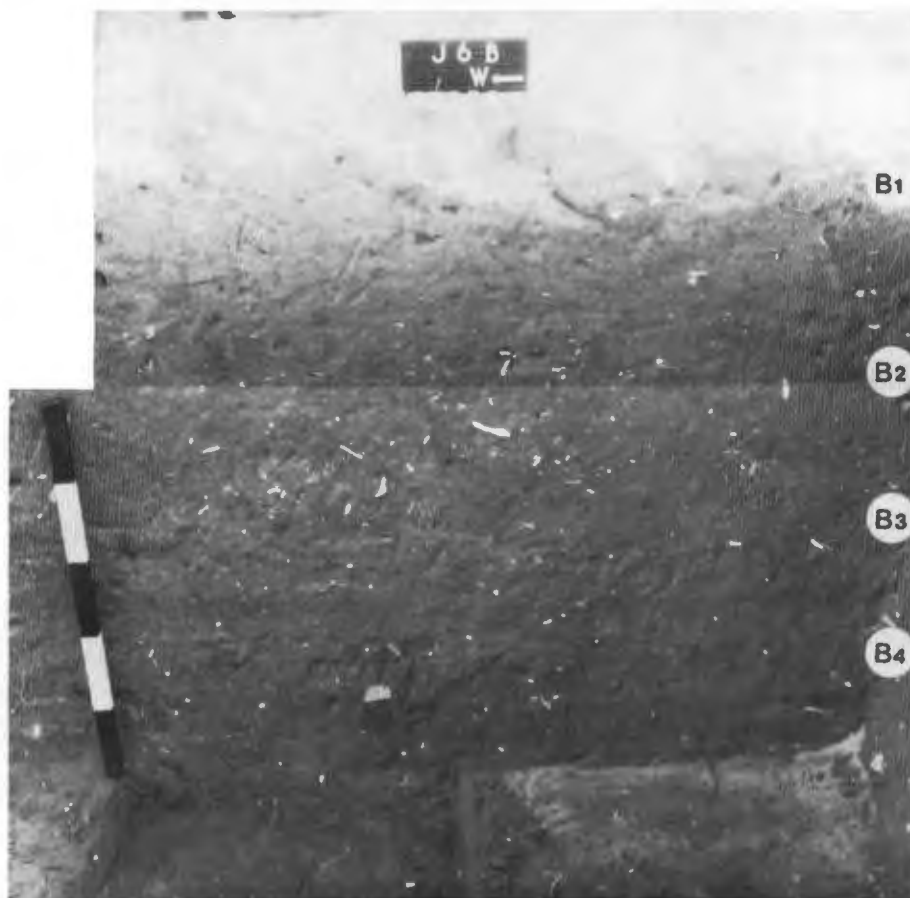
1. Aerial view of the site of Hefziba, looking to SW. A part of the West Area is filled.



2. Hefziba, South Area looking south. Implements and bones are visible in the dark occupation layer.



3. Hefziba, stratigraphy of Layer A and top of B.



Hefziba, stratigraphy of Layer B.