

The Natufian-Early Neolithic site Hatula, near Latrun, Israel

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Abstract: The site of Hatula is on the western flanks of the Judean hills, 20 km west of Jerusalem. It was occupied in the Late Natufian and Khiamian (Early Neolithic) periods, 11 – 9,000 years ago. With an area of ca. 3,000 m², 1.5 m. thick cultural remains and a semi-subterranean hut or house, the site seems to have been inhabited by semi-sedentary groups. There is indirect evidence for domestic dog. Gazelle hunting seems to have been the principal activity, and gazelle provided 95 % of the meat. Other animal resources were also exploited, including fish from the Mediterranean, but added little to the diet. The fish had to be transported some 40 km, which apparently implies conservation through drying. Sea-shell ornaments further testify to connections with, or expeditions to, the Mediterranean shores. Vegetal remains could not be recovered.

Flint had to be brought to the site from some distance, and was consequently intensively reduced. The Khiamian seems as an adaptation of the Late Natufian tool-kit through the introduction of El-Khiam points and more intensive use of awls, while the small role played by sickle blades remained unchanged. The new adaptation occurred without traceable environmental changes, nor change in man/animal relations.

The site of Hatula is located on the western edge of the Shephela hills, the piedmont region of Judea, at an altitude of 215 m. above sea level (E 34 ° 59' 15'', N 31 ° 49' 32''; Israel coordinates E 14850, N 13680). It is found on the south bank of Nahal (stream) Nahshon (Figs. 1, 2, 4) which, slightly west of the site, flows into the relatively large Ayalon valley. The stream continues north-west as the Ayalon river, and shortly after it is joined by Nahal Natuf (source name for the Natufian). Further to the north-west the river joins the Mediterranean-bound Yarkon river. The site owes its name to the historical ruins Hurvat Hatula, located slightly to the east 369 m a.s.l.

The prehistoric site was discovered by Father Claude of the Trappist Monastery of Latrun. We are very grateful to him for allowing us to study his collection, which indicated the presence of Natufian and Early Neolithic (El-Khiam points). Isolated human remains were also found, and hinted at the presence of inhumations in the site. Hatula fills the geographical gap that had appeared, in the End-Pleistocene/Holocene boundary, between the cave of Shukba (Garrod 1928), some 20 km to the north, and the Judean Desert sites (Neuville 1951). Father Claude has also assisted us in the field, and we have benefitted from his thorough knowledge of the area.

Near Hatula Nahal Nahshon flows in the contact between Senonian, in the north, and Eocene in the south. The rich permanent source in the river at this point may have been one of the reasons for the location of the site; the hard Eocene rocks adjacent to the site have abundant cup marks, and this suitable rock may have been another factor in the location of the site. At present, the annual precipitation is around 500 mm, available only in the cold season between November and April. The vegetation is of the Mediterranean type.

The investigation to be reported here took place between 1980-82, under the auspices of the University of Haifa and the French Research Center in Jerusalem. The investigations included survey, sampled surface collections, and excavations.

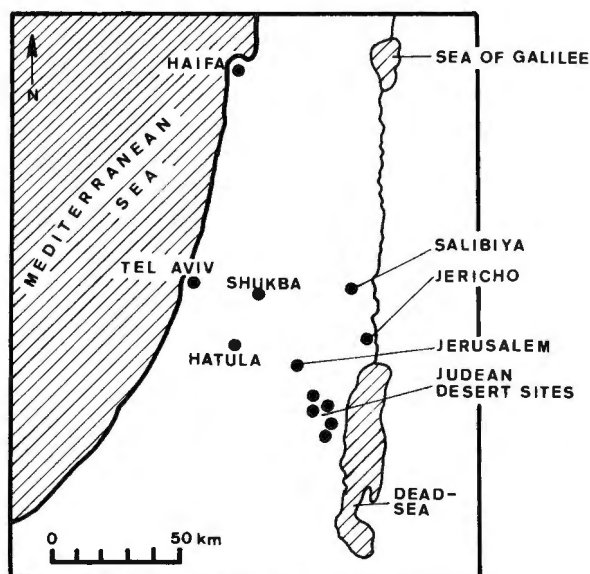


Fig. 1. Orientation map.

Survey and surface sampling

The survey and surface collection consisted of the following: A. Cleaning and mapping the numerous cup-marks in the rocks near the site; B. An electrical Resistivity Profiling, and C. Sampled collection of surface material.

A. The cup marks. The rocky slope which forms the southern edge of the site has abundant cup marks. An area of 800 m² was cleaned, revealing one of the richest concentrations of cup marks that we know. The relation between the cup marks and our site is established by several identical cup marks, found in the archaeological layers, cut into large blocks of limestone. Cup marks were previously known from the vicinity of Natufian and Early Neolithic sites.

There are two types of cup marks near Hatula. One consists of rather large depressions, 20–30 cm in diameter and ca. 20 cm deep, with an oval section, narrowing toward the bottom. These features occur in isolation. The second type is smaller, with a diameter between 7–15 cm and 6–8 cm deep, with a rounded, bowl-shape section. These always occur in groups, up to 30 on the same rock slab. Normally no pattern can be noticed in the distribution of cup marks, except for a single case where an isolated group of 7 cup marks are arranged in: one-two-one-three (Fig. 5). This group is on the rock ledge closest to the habitation area revealed in our Excavation A (Fig. 3). The seven cup marks are surrounded by 5 or 6 very shallow depressions, 20 cm in diameter. The peculiar order of cup marks, the number seven involved and the proximity to the dwelling may suggest, hypothetically, a game board.

B. Electrical Resistivity Measurements were carried out in April 1981 in a South-North strip of 8 × 150 metres. They revealed that bedrock was high in the south (subsequently confirmed in our excavation area A) but too deep to be detected in the north, toward the water course. The measurements did not show any stone concentrations to a depth of ca. 2 m.

C. Surface Sampling. The surface material was sampled to determine the extent of the site and the distribution of artifacts. Samples were obtained by scraping the top 5 cm of an area (1 m.sq. or 2 m.sq.) and sieving for contents with a 2 × 2 mm. mesh. We have made two S-N sampling strips and one E-W strip (Fig. 3).

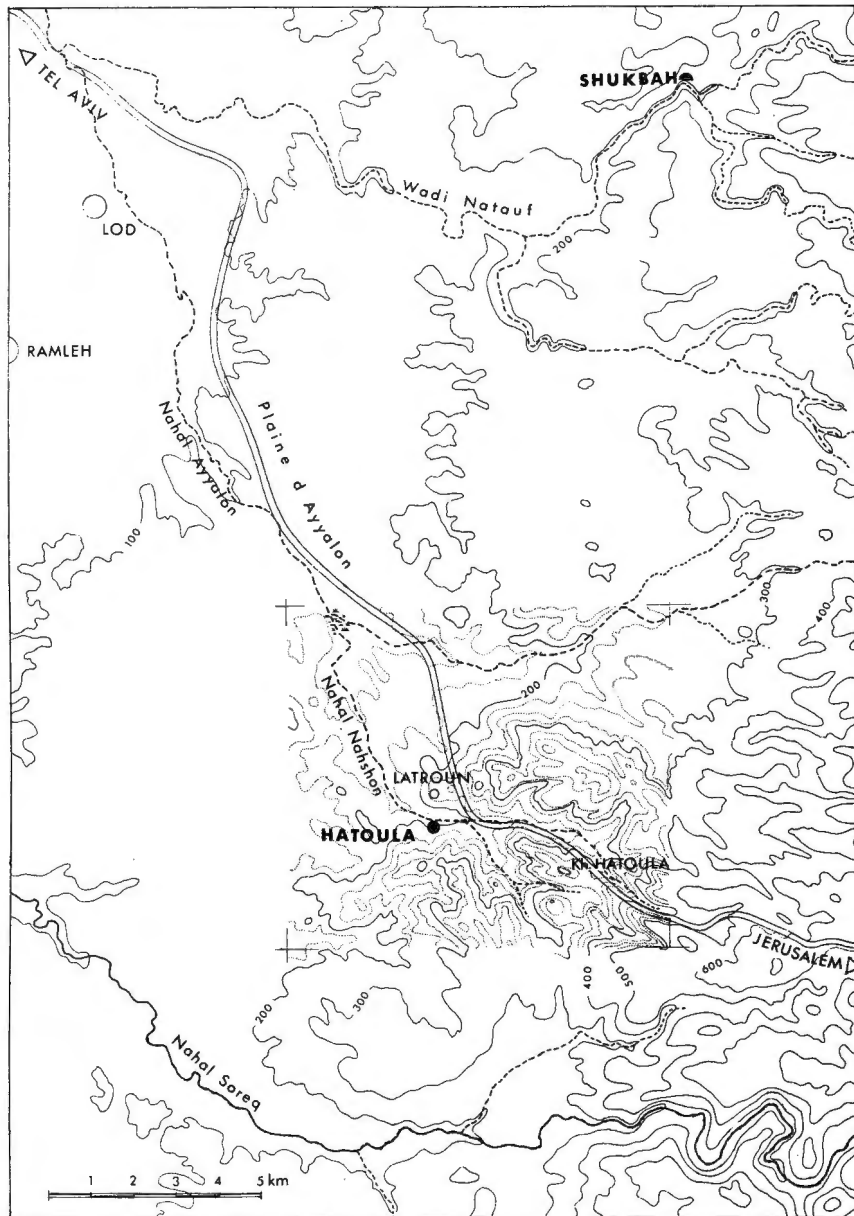


Fig. 2. The situation of Hatula.

The S-N strips. These covered the distance of ca. 180 m between the site and the river. The slope is gradual (Fig. 3), and we assumed that a gradual decrease of material will occur as one goes farther from the site. The first strip was on the 45 metre line, with 1 × 1 metre squares collected at intervals of 10 m. Instead of the expected gradual decrease, the finds gradually increased to a maximum density 50–60 m from the site, then gradually decreased northward toward the river (Fig. 6). The distribution by weight showed the same pattern.

Excavation Area B was opened, therefore, at the maximum density of finds revealed by the sampling strip described above. Area B proved to be sterile, except for the surface finds. In order to check again, another S-N sampling strip was collected along the 80 metre line, with 1 × 1 metre squares sampled

every 15 m. There was again a gradual increase to two peaks in the mid-slope (Fig. 7), then decrease and a practical disappearance. Hence, we may conclude that the site at the top of the slope was, most likely, the source of the surface material. The irregular distribution pattern over an otherwise regular slope suggests, in our opinion, that an obstacle had prevented the artifacts from sliding. The obstacle, app. 60 m. North of the site, may have been a fence built by the inhabitants or a natural thicket of reed on the river bank, or a marsh. In the latter case, reed would have grown at a distance of some 100 m. up slope from the present thicket (9–10 m higher).

The E-W strip. This strip, 370 m long, was sampled by areas 2×1 at intervals of 20 metres, altogether 19 samples (S 1 the western, S 19 the eastern). The finds were located mainly on the western slope, to a lesser degree on the eastern slope, and with a minimum on the hilltop (Fig. 8). The distribution by weight shows the same situation, with an even more pronounced concentration on the west slope. But here, a clear separation appears between retouched items and waste, a phenomenon which did not exist in the N-S strips and for which we have no explanation.

It should be noted that the lithics found in the surface samples have the same tool types as in the excavation: microliths, borers, grattoirs, burins, denticulates cores, rare El-Khiam points and sickle blades. Cores were excluded from the weighed samples.

The excavation

Two areas of excavation were opened, one adjacent to the rock exposure in the south (Area A, 25 m²), the other at mid-slope (Area B, 16 m²), where the densest concentration of surface material has turned up. Three additional test pits, 1 m² each, were dug to reveal the stratigraphy of the site (points C, D, E in Fig. 3). In point D the cultural deposits reached a thickness of 1.25 m below surface, without attaining the bedrock.

The northern area (B) turned out to be archaeologically sterile. Artefacts were found only in the surface layer, and in all likelihood were washed down from a higher point on the slope. In the southern excavation area (A) *in-situ* Khiamian remains overlay Natufian deposits. In the following pages, the results obtained in the south excavation area (A) will be described.

Stratigraphy (Figs. 9, 10)

Layer 1: Granular brown surface soil with small calcareous concretions, 20–30 cm thick. Khiamian finds, Natufian intrusions (?) and small pottery fragments.

Layer 2: Fine grain, gray layer with ashes. Contains abundant gravel and Khiamian artefacts. The layer fills a circular cavity ca. 4 m in diameter, 30 cm max. thickness and tapers out in the edges.

Layer 3: Yellow, powder-like deposit with rounded gravel, and yellow-orange concretions. Fills a depression 3,70 × 3,30 m with thickness varying from 10 to 30 cm. At the base, a hard crust resembles a 'plastered floor'. Khiamian artefacts.

Layer 4: A compact, dark brown sediment with abundant Natufian lithics and faunal debris (Fig. 14). Thickness 30 cm in the south, growing to 60 cm down slope to the north. The lower limit is not clear. Where layers 2 and 3 did not exist, outside of the Khiamian depression, layer 1 was in contact with 4.

That part of layer 4 into which the oval depression was dug was termed 4 Upper; below the depression is 4 Lower.

Layer 5: Reddish, granular soil which lies directly on bedrock. Reached only in 6 m², it contains a few Natufian artefacts in its upper part. The lower part is sterile.

Bedrock is slightly decomposed and split in large blocks, partly rounded. The irregularities are filled by layer 5.

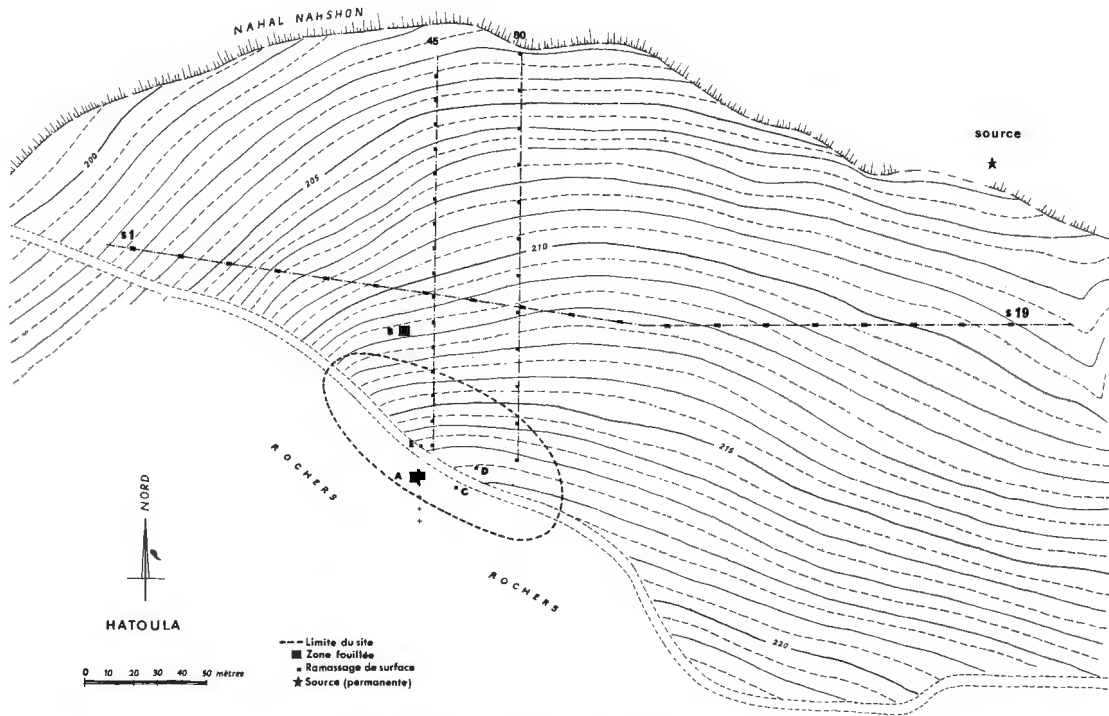


Fig. 3. General plan of the site of Hatula.

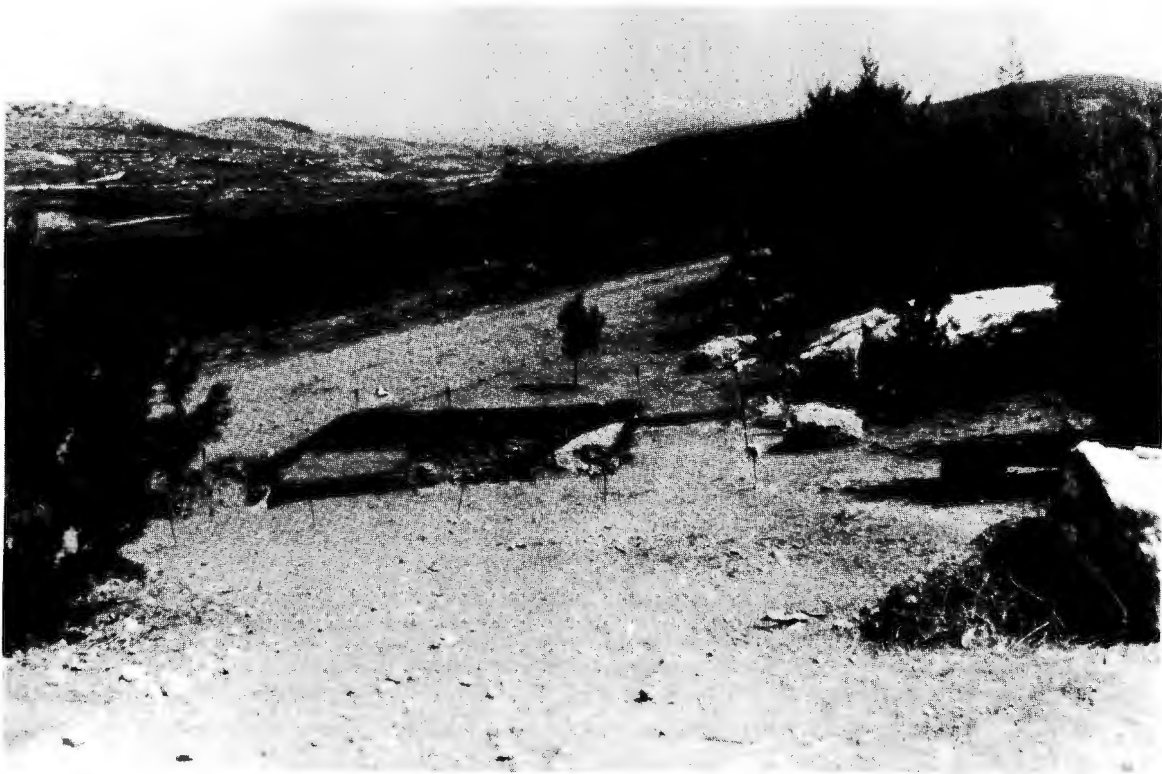


Fig. 4. General view of excavation area A, looking east.



Fig. 5. A group of seven cup-marks, perhaps a game board.

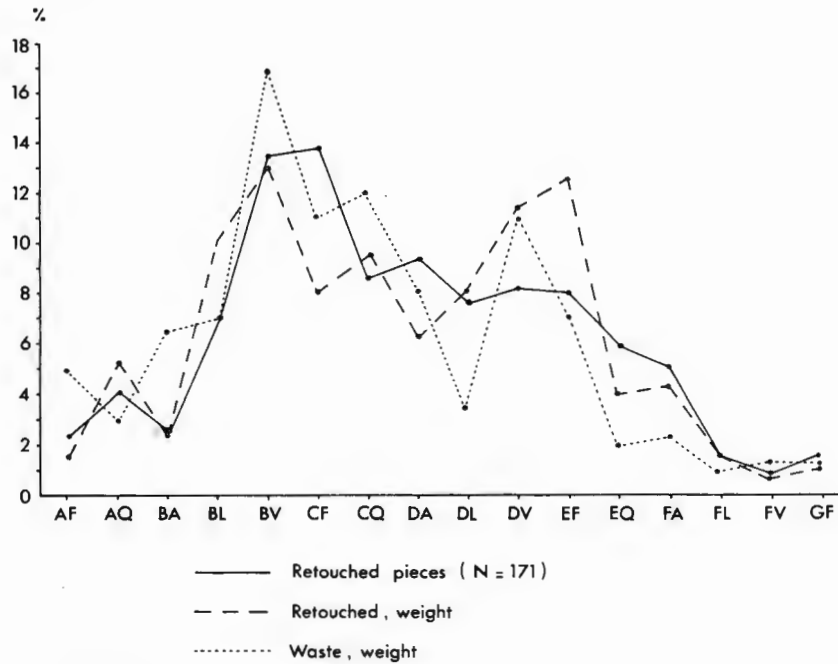


Fig. 6. The distribution of surface finds along the 45 metre sampling strip.

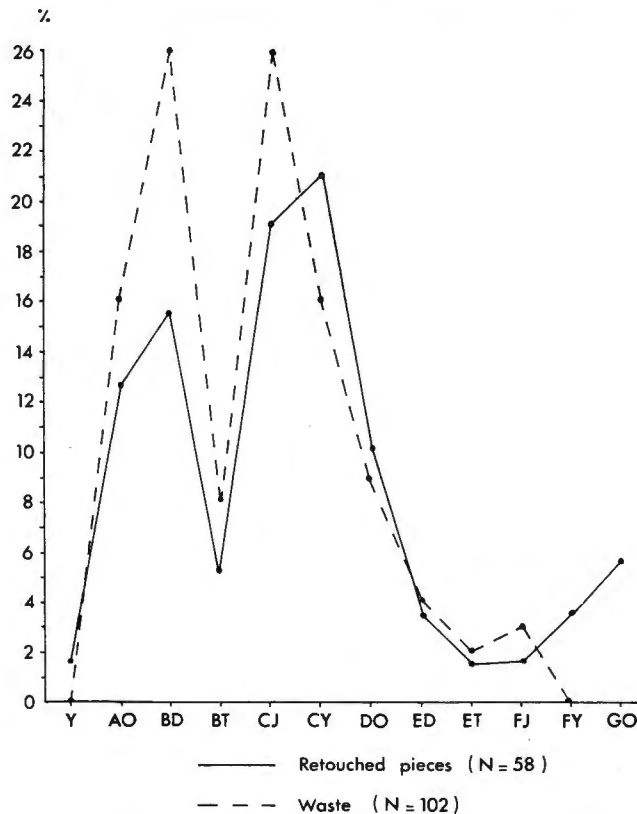


Fig. 7. Distribution of surface finds along the 80 metre sampling strip.

Archaeology

Natufian

The Burial. The Natufian layers 4 and 5 did not yield any structure. An adolescent ca. 12 years old, probably female (Arensburg 1985) was buried in square S 40 (H 01, Fig. 11). The skeleton lay on the right side, in a flexed position, head eastward and face oriented to the east. The grave did not contain any accompanying object, except for a few flint artefacts most probably unrelated to the burial. The skeleton was right below the Khiamian depression, and had been partly damaged by it.

A few additional human remains were found, isolated, in the Natufian deposits: skull and mandible fragments, teeth and long bones.

The Lithic Assemblage. The flint used by the Natufian people was of a very good quality, fine grained and homogeneous. Only a limited use was done of the breccoid, poor-quality Senonian flint found in near-by gravel layers and widely used in the Lower Palaeolithic. The Eocene flint used by the Natufian and Khiamian alike was brought to the site, but the precise place of origin is unknown. That raw material had to be carried to the site is evidenced by the absence of flint nodules, cores went frequently through an extreme reduction, and the lithics are in general of small size.

The Natufian layers 4 and 5 yielded a total of 30 000 items in 5 m³, hence a density of 6 000 pieces per 1 m³.

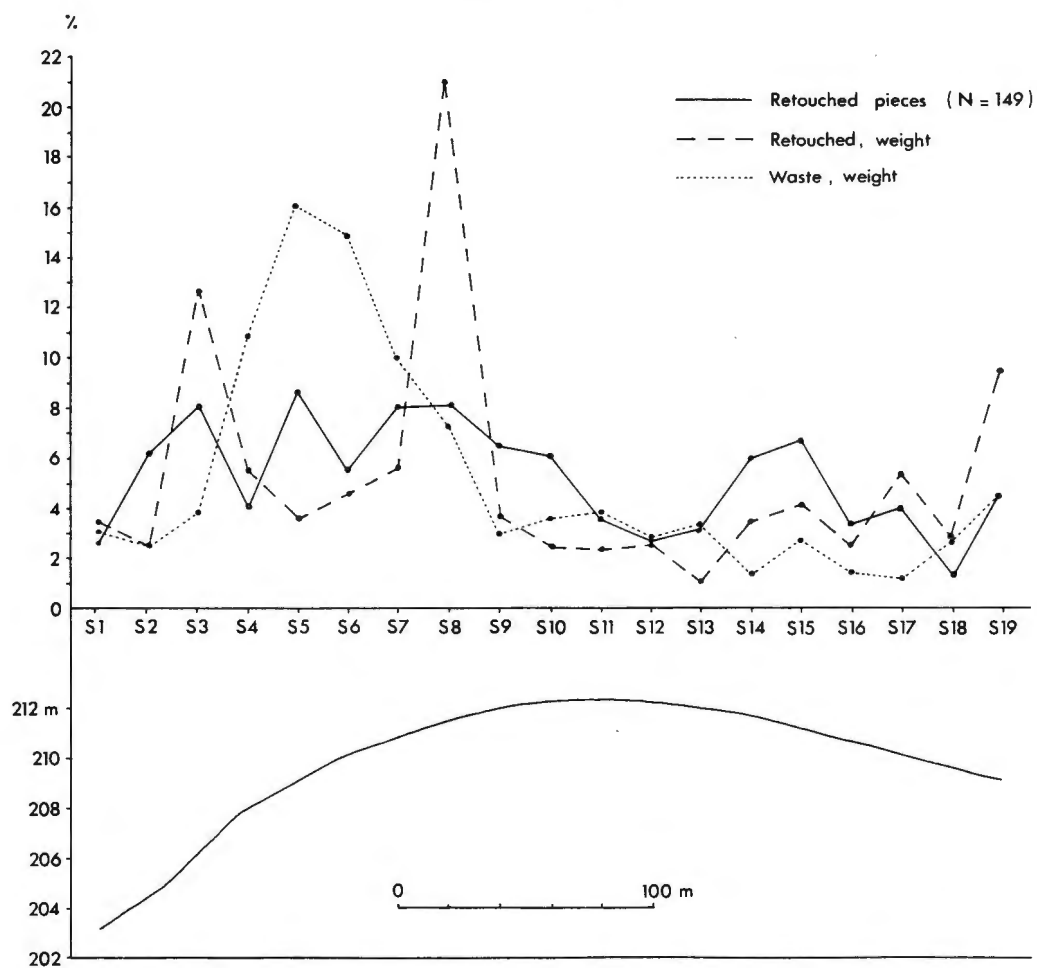


Fig. 8. Distribution of surface finds along the E - W sampling strip, S. 1 - S. 19.

Table 1

Principal Components of the Natufian Industry (%)

	Layer 5	Layer 4 lower	Layer 4 upper	Total
	N = 2125	N = 7978	N = 18,417	N = 28,520
Cores	1,27	1,76	1,61	1,63
Blades/bladelets	26,87	24,29	24,31	24,49
Flakes	59,90	63,91	68,02	66,26
Burin spalls	0,84	0,56	0,42	0,49
Microburins	—	0,02	0,02	0,02
Waste	11,10	9,45	5,59	7,08

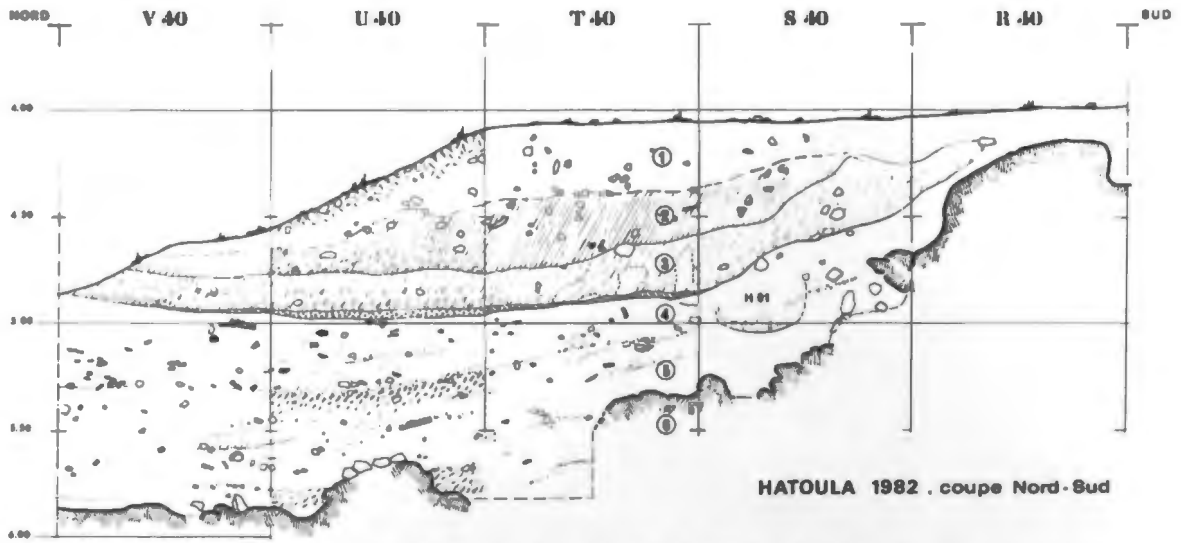


Fig. 9. Stratigraphy of Excavation Area A at Hatula. H 01 - location of burial.



Fig. 10. View of the Khamian depression (light colored layers 3 and 2) dug into the dark Natufian sediment. Looking East.



Fig. 11. H 01 *in situ*. Scale points to North.

Cores. The 466 cores found in the Natufian layers are generally of small dimensions, most of them bladelet-cores (Fig. 12; 1, 2). Frequently the core has the appearance of having been broken; actually, the nodule had indeed been split in halves or quarters, and the split surfaces served as striking platforms. When split in 'quarters', cores with two striking platforms resulted with an angle of 90° – 100° between the surfaces (Fig. 13; 1). This preparation may have been at the origin of the naviform cores of the PPNB.

Blanks. Flakes constitute the major product of knapping. Most of the blades and bladelets are found broken (65 – 72 %).

Tools. There are 1483 tools in the Natufian of Hatula. Half of them are geometric microliths, and the majority of these are the lunates (Table 2). Grattoirs (Fig. 12; 3, 4) are frequently denticulated, made on

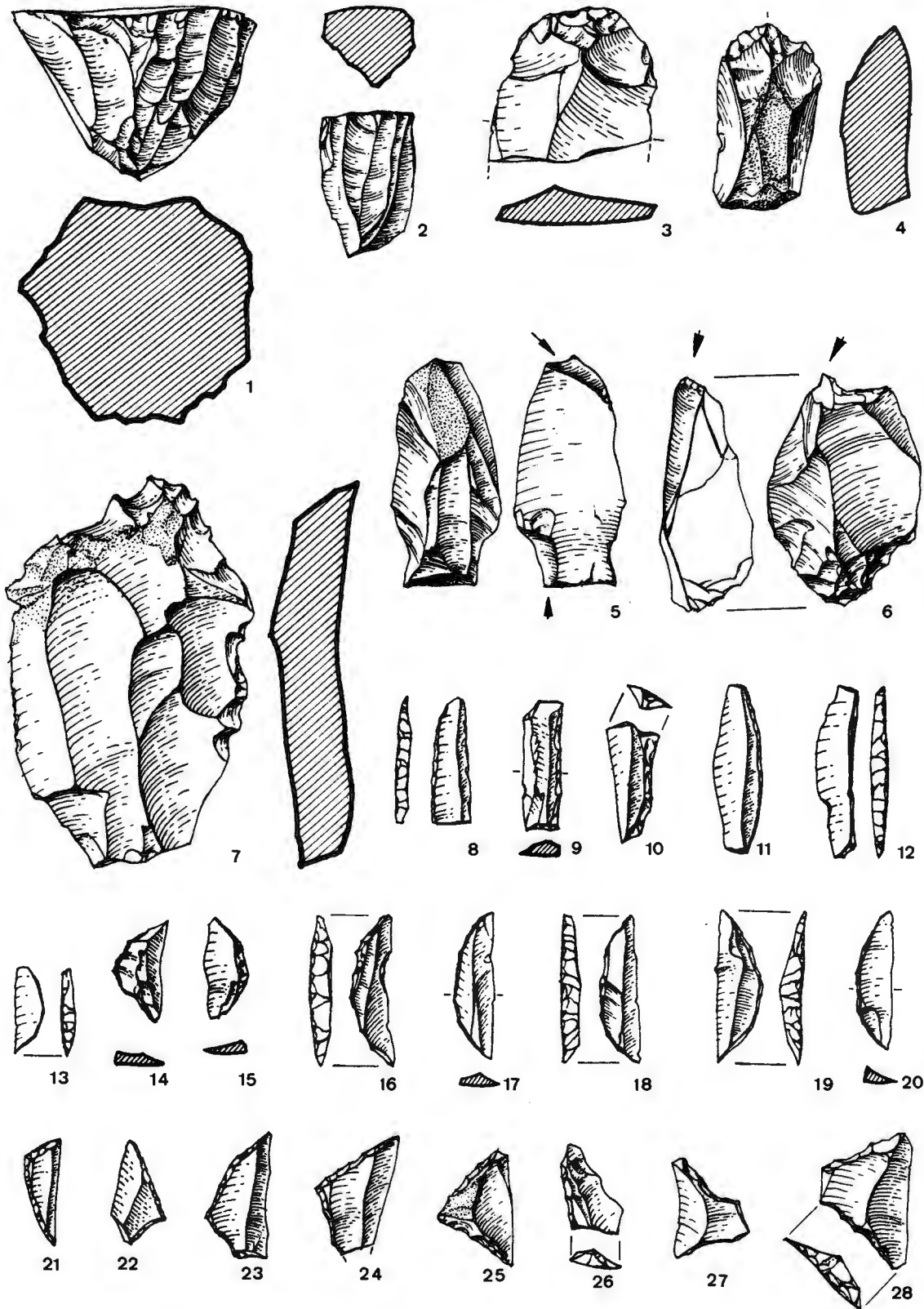


Fig. 12. Natufian flint implements. 1, 2: Cores; 3, 4: Grattoirs; 5, 6: Burins; 7: Denticulate; 8-28: Microliths. 1:1.

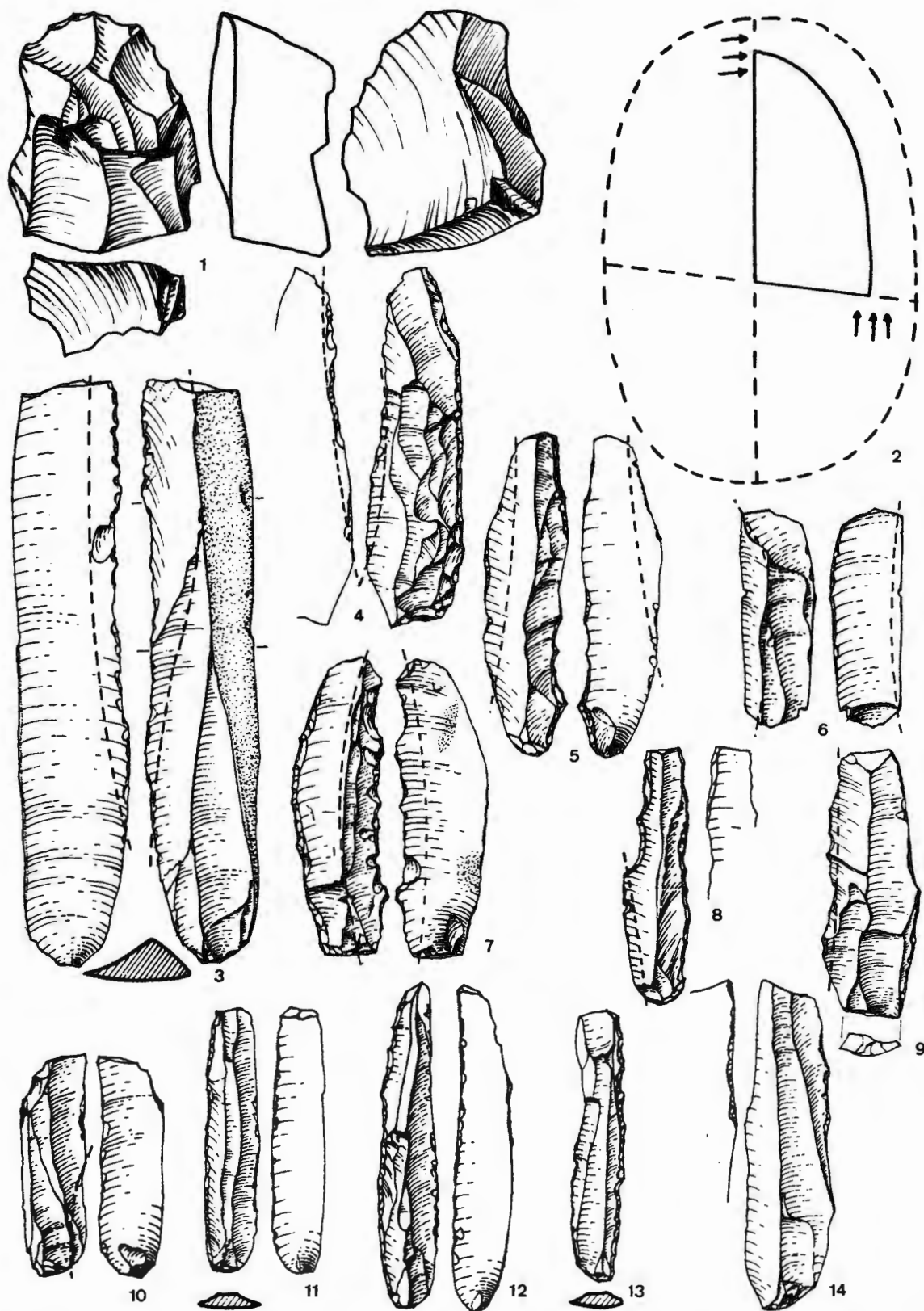


Fig. 13. 1: 'Broken' core; 2: Splitting of nodule and pattern of core reduction; 3 - 10: Sickles blades with gloss; 11 - 14: Retouched/backed blades. All Natufian except 3, Khiamian. 1:1.



Fig. 14. Natufian finds *in situ*, Layer 4.

flakes rather than blades (7:1). Burins, on the other hand, are made in equal proportions on flakes and blades. Borers constitute one of the most numerous and characteristic tool type; it will be described below, in the Khiamian assemblage.

Sickle blades are rare in our series: less than 1 % of the tools have sickle gloss (Fig. 13; 4 – 10). The cutting edge is non denticulated, except from use. If the backed blades without gloss are added (Fig. 13; 11 – 14), we still have less than 1.5% of the assemblage.

Retouched blades and flakes (ca. 2:1) are the most important group after the microliths. The non-geometric microliths include mainly backed bladelets, with a few truncated ones and micropoints (Fig. 12; 8 – 11). The geometric microliths are mainly composed of lunates, with a small addition of

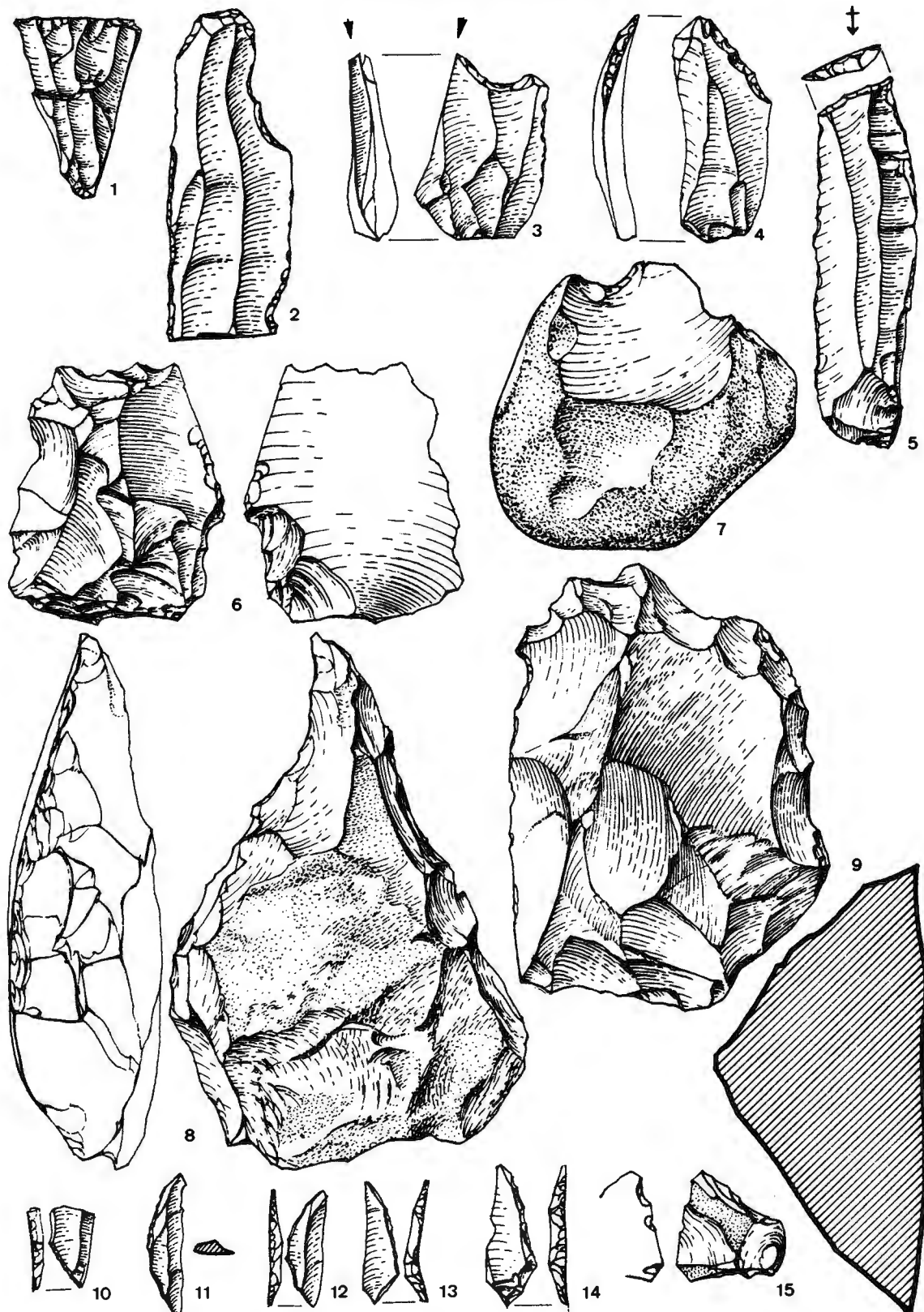


Fig. 15. Khamian flint implements. 1: Core; 2: Grattoir; 3: Burin; 4, 5: Truncations; 6, 9: Denticulates; 7: Core-Chopper; 8: Pick; 10-15: Microliths. 1:1.

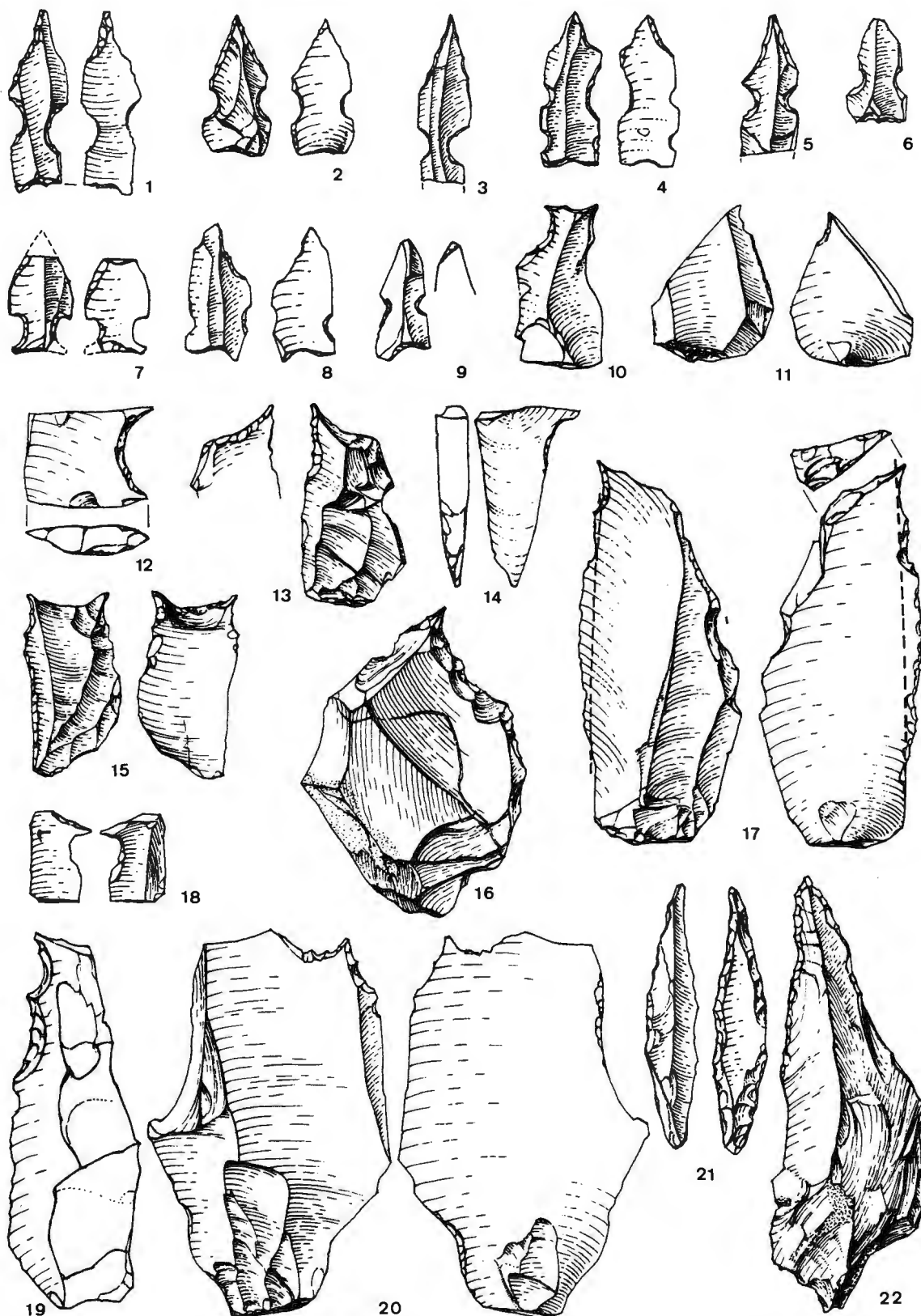


Fig. 16. 1-9: El-Khiam points; 10-20: Needle borers; 21, 22: Drills. Khiamian: 1-10, 15-17, 19, 20. Natufian: 11-14, 18, 21, 22: 1:1.

triangles and trapezes (Fig. 12; 12 – 28). The bone industry includes a sickle fragment with a groove 2.5 mm deep (Fig. 18; 2), fragments of polished awls, and a pierced needle (Fig. 18; 3). A few personal adornments were found: one limestone bead, 5 perforated sea shells and 25 dentalium fragments.

Table 2

The Natufian Assemblage

	Layer 5		Layer 4 lower		Layer 4 upper		Total	
	No.	%	No.	%	No.	%	No.	%
Grattoirs	4	4,78	23	4,04	16	1,92	43	2,89
Burins	2	2,38	8	1,40	15	1,80	25	1,68
Awls	—	—	11	1,93	46	5,54	57	3,84
Backed blades	—	—	9	1,58	1	0,12	10	0,67
Truncations	—	—	22	3,86	33	3,97	55	3,70
Notches and Denticulates	—	—	18	3,16	14	1,68	32	2,15
Composite tools	—	—	—	—	2	0,24	2	0,13
Sickle blades	3	3,57	8	1,40	3	0,36	14	0,94
Retouched blades	19	22,61	45	7,90	103	12,40	167	11,26
Retouched flakes	3	3,57	21	3,69	53	6,38	77	5,19
Utilised blades	4	4,76	16	2,81	8	0,96	28	1,88
Utilised flakes	—	—	16	2,81	18	2,16	34	2,29
Backed bladelets	7	8,33	70	12,30	133	16,02	210	14,16
Geometric microliths	42	50,00	302	53,07	385	46,38	729	49,15
Total	84	99,98	569	99,95	830	99,93	1 483	99,91

Summary of the Natufian

The assemblage recovered in layers 5 and 4 at Hatula is a Late Natufian, as may be judged by the absence of bifacial-oblique retouch (Helwan) and the short lunates (Bar-Yosef and Valla 1979). The Hatula industry adds original traits to the already diversified Natufian complex (Valla 1984): it has the highest ratio of microliths among all Natufian sites, the highest ratio of geometrics and of awls. Burins, on the contrary, are scarce at Hatula, compared with other Natufian sites. Large stone mortars and pestles are absent altogether, which would argue against a permanent settlement. The fact that until now no structures were found adds to the impression of temporariness. However, the Natufian burial, the large number of rock-cut cup marks and the abundant cultural remains indicate that it was more than an ephemeral halt. Thus, it is most likely to consider Hatula a semi-sedentary Natufian site. An analysis of the seasonality of gazelle's kill (Davis 1985) suggests more than one season, but not a year round pattern.

Khiamian

The Structure. The Khiamian deposits were preserved as a fill of a slightly oval shallow depression, ca. 10 m², which was dug into the underlying Natufian deposits (Figs. 9, 10). At the base of the structure a hardened floor was locally preserved. The structure was destroyed by fire, which had cracked many pieces of flint. The lowest fill of the depression, the yellow layer 3, contained hard, irregular yellow-orange concretions baked by fire; these may be the residue of the mud walls or ceiling of the structure. The gray layer 2 was deposited after the destruction of the structure. This deposit contained abundant gravel, many of which were cracked, bone remains, and Khiamian lithics and bone tools (Fig. 19). In the southern part of the area covered by layer 2 (i. e., the oval depression) a particularly dense concentration of gravel has occurred with numerous bones, notably gazelle vertebrates in connection. Two large bovine vertebrates were also found in connection. The ashy fill of layer 2 seems to have been the refuse from a near-by kitchen dumped into the abandoned dwelling.

The Lithic Assemblage. The flint used by the Khiamian inhabitants of Hatula was the same as in the Natufian period. The density of Khiamian lithics is approximately half of that of the Natufian: 13,800 Khiamian items were found in 4.5 m², some 3,000 per 1 m³.

Table 3

Principal Components of the Khiamian Industry (%)

	Layer 3	Layer 2	Total
	N = 5680	N = 7422	N = 13,102
Cores	1,32	1,23	1,27
Blades/bladelets	26,83	21,75	23,95
Flakes	47,86	73,44	62,35
Burin spalls	0,26	0,37	0,32
Microburins	—	—	—
Waste	23,71	3,17	12,08

Cores. 157 cores were found in the Khiamian, 86 of them have 'broken' striking platforms. The cores of the Khiamian are like those of the Natufian by their size and mode of reduction (Fig. 15,1).

Blanks. Flakes constitute, once again, the most numerous blanks. The largest part of the blades and bladelets found in the Khiamian are fragments (70 - 77%), like in the Natufian.

Tools. There are in the Khiamian of Hatula the same types of tools as in the Natufian, with a new introduction: the El-Khiam point. In addition, the relative frequencies of certain types differ from those of the Natufian (Table 4).

Grattoirs and burins are of the same types as before, with preference for the same types of blanks (Fig. 15; 2 - 3). But in the Khiamian the burins are more numerous than the grattoirs, while in the Natufian grattoirs twice outnumbered the burins. Borers constitute the most important tool in the Khiamian assemblage, after the microliths. The borers include a few types: a long point (Fig. 16; 22), a short, robust 'bec', and a very long drill (Fig.; 16; 21). The most numerous, however, and the most

typical of the Khiamian at Hatula is a short and thin borer, with almost needle-like point (Fig. 16; 10 – 18). These borers were present also in the Natufian at this site, but in smaller number.

Table 4

The Khiamian Assemblage

	Layer 3		Layer 2		Total	
	No.	%	No.	%	No.	%
Grattoirs	8	2,08	7	2,17	15	2,12
Burins	12	3,13	6	1,86	18	2,55
Awls	56	14,62	67	20,80	123	17,44
Backed blades	1	0,26	—	—	1	0,14
Truncations	7	1,82	12	3,72	19	2,69
Notches and Denticulates	9	2,34	10	3,10	19	2,69
Composite tools	—	—	—	—	—	—
Sickle blades	6	1,56	4	1,24	10	1,41
Retouched blades	41	10,70	36	11,18	77	10,92
Retouched flakes	31	8,09	25	7,76	56	7,94
Utilised blades	18	4,69	3	0,93	21	2,97
Utilised flakes	7	1,82	1	0,31	8	1,13
Backed bladelets	39	10,18	23	7,14	62	8,79
Geometric microliths	135	35,84	119	36,95	254	36,02
Arrowheads	13	3,40	9	2,79	22	3,12
Total	383	99,93	322	99,95	705	99,93

The needle-borers were manufactured in three ways: A. At the meeting of two delicate notches (Fig. 16; 20); B. At the meeting of a delicate notch and a distal truncation (Fig. 16; 17), and C. At the meeting of a delicate notch and a distal break (Fig. 16; 12, 14). It seems to us that the distal break – as well as a proximal break which sometimes occurs – was snapped on purpose, to give the blank a desired length. For it is clear that, were any of the edges broken by use, the point would certainly have been broken first.

Table 5

Mean Size of 'Hatula Needle-Borer' (in mm) (N = 50)

	Length	Width	Thickness
Blank	36	20	4,5
Point	5	3	2,0 *

* measured at mid-length.

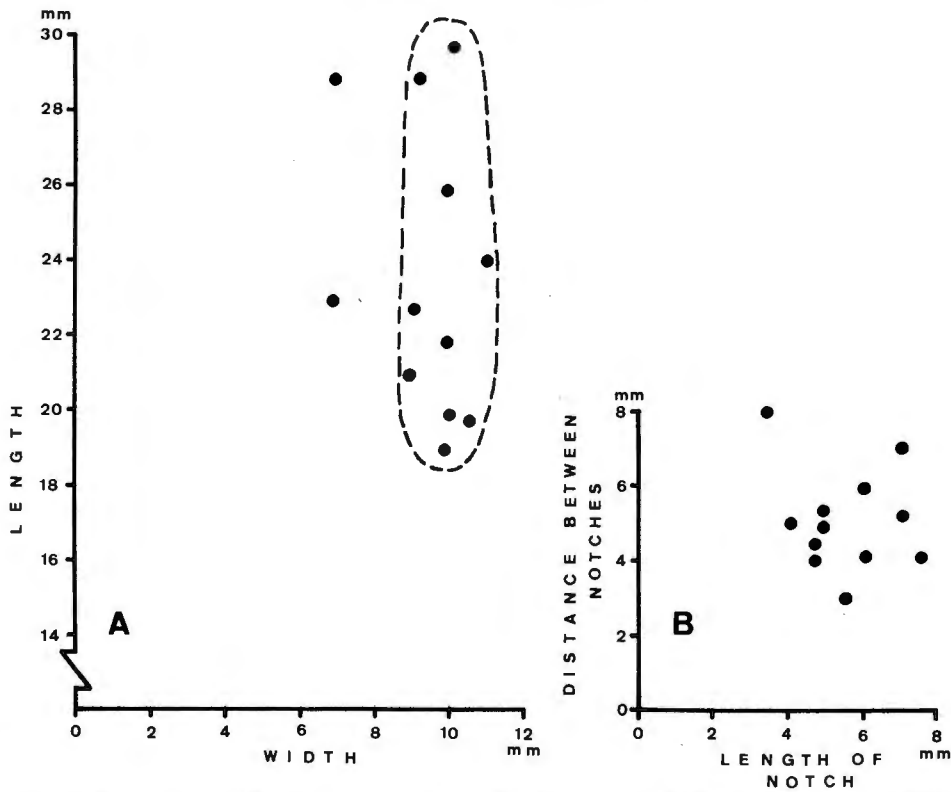


Fig. 17. Scattergrams of El-Khiam points. A: Size of the complete tool. B: Size of notches and space between notches.

Sickle blades (Fig. 13; 3) and retouched blades and flakes are, in the Khiamian, of the same types and have about the same frequencies as in the Natufian. The microliths, on the other hand, decrease in the Khiamian, as compared with the Natufian, but the same types persist, notably the lunates (Fig. 15; 10 - 15).

El-Khiam points, which appear now for the first time, form 3 % of the tools (Fig. 16; 1 - 9). They are made on small thin blades, with a pair of relatively large notches separating the point from the stem. Rarely there are three, or four notches. The notches are typically placed at the lower third of the tool,

Table 6

Some Metrical Attributes of El-Khiam Points (in mm) (N = 12)

	Mean	Range
Length of tool	23,8	19 - 30
Max. width of tool	9,7	7 - 12
Max. width of stem	9,0	6 - 12
Length of left notch	5,6	4 - 7,5
Length of right notch	5,3	3 - 8
Distance (width) between notches	5,2	3 - 8

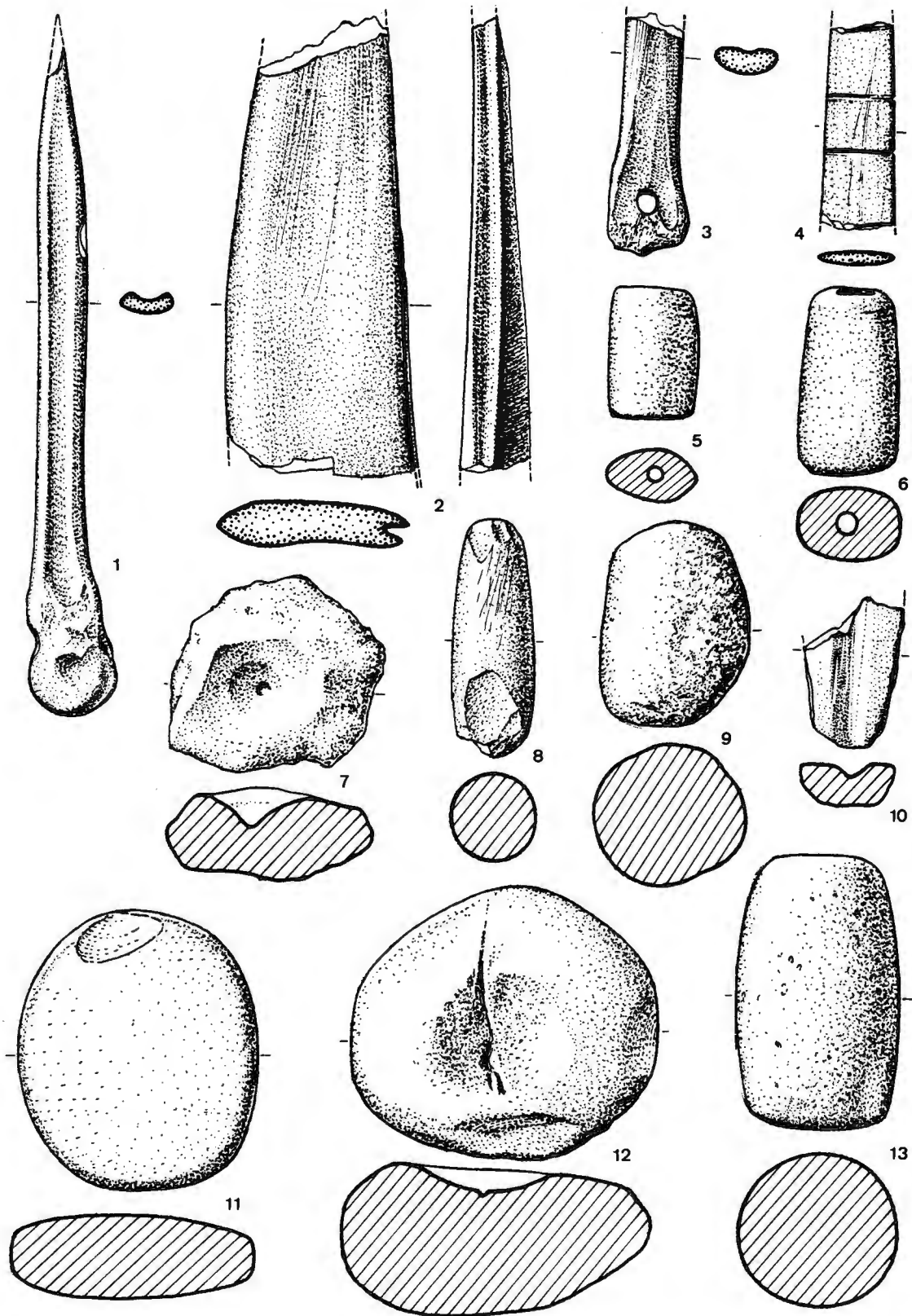


Fig. 18. Bone and stone artefacts. 1-3: Awls; 2: Sickle; 4: Grooved bone; 5, 6: Limestone beads; 7, 12: Cup Marks; 8, 9, 11, 13: Pestles; 10: Grooved stone. Khiamian: 1, 4-13; Natufian: 2, 3. 1-6, 1:1; 7-13, 2:5.



Fig. 19. Khiamian finds *in situ*, Layer 2.

sometimes near the center. The point is made by direct or inverse, normally semi-steep retouch. The stem has a truncated butt, frequently concave.

The El-Khiam points frequently are asymmetrical, and the form of the individual point appears to have been quite freely determined. A closer examination, however, reveals that some standards were rigorously kept. In the sample studied by us, the blanks were selected to be 10 mm wide, with a very small variation (Fig. 17). The size of the notches was controlled, and consequently, the space left between the notches – the narrowest part of the point – was also determined, as the following measurements indicate.

The bone tools found in the Khiamian consist mainly of awls, similar to the Natufian ones (Fig. 18; 1 – 4). Stone objects are more numerous than in the Natufian, with pestles and cup-marks; they are not heavier, though, than in the preceding layers (Fig. 18; 7 – 13). Ornaments include five limestone beads with a longitudinal perforation (Fig. 18; 5, 6), a few dentalium and other perforated sea-shell.

Summary of the Khiamian

The assemblages of layers 3 and 2 closely resemble each other. They include the same tool types, and were made in the same technique, as the underlying Natufian. The Khiamian is characterized by the

introduction of the El-Khiam point, a growing importance of awls and a decreasing importance of microliths. At the site of Hatula, the Khiamian may be defined as 'a Late Natufian with El-Khiam points and needle-borers'.

There is as yet little material to compare with the Khiamian of Hatula. Salibiya IX (Bar-Yosef 1980) and Netiv Hagdud (Bar-Yosef, pers. comm.) have more abundant El-Khiam points and celts, and far fewer microliths, than Hatula. Are the microliths in the Khiamian of Hatula intrusive? This may perhaps be the case of layer 3, where building material was brought into the depression, which may have contained microliths; but a mixture in layer 2 seems unlikely, with its content of kitchen waste. On the basis of the limited area excavated to date, it seems to us that the microliths do belong to the Khiamian, an initial phase of which may be represented at Hatula.

Table 7

The Emergence of Khiamian Characteristics (%)

	Layer				
	5	4 Lower	4 Upper	3	2
El-Khiam points	—	—	—	3,4	2,7
Borers	—	1,9	5,5	14,6	20,8
Backed Bladelets	8,3	12,6	16,0	10,1	7,1
Geometric Microliths	50,0	53,0	46,3	35,8	36,9

The Khiamian faunal remains include the same animal species as the Natufian. It seems that the same climatic conditions have existed and that the animal resources have been similarly exploited in both periods of habitation at Hatula (Davis 1985).

Faunal remains

The mammals and reptiles from Hatula were studied by S. J. M. Davis (1985). *Gazella gazella* dominates the assemblages, with 97% in the Natufian and 95% in the Khiamian (Table 8). The age and sex determination of the sample conform to a random culling of gazelle, which is neither seasonal nor year-round, but an intermediate pattern. The dominance of gazelle and the complete absence of deer would indicate a small, or even non-existent tree cover. On the other hand, the presence of European Hedgehog, Polecat and Badger argue against a pronounced aridity, according to Davis.

A few small bones, notably gazelle phalanges and astragali, found in the Natufian and Khiamian, show a peculiar kind of corrosion, unseen in pre-Natufian faunal assemblages. These corroded bones are interpreted by Davis as having been partly digested by dogs. Hence, the domestication of the dog may be inferred for Hatula, in accordance with evidence from other Natufian sites (Davis and Valla 1978).

Remains of three families of Mediterranean fish were found in the Natufian and Khiamian of Hatula (Lernau 1985): Serranidae, Sparidae (*Sparus aurata*) and Mugilidae. The presence of vertebral centers and head bones probably indicate that the fish were brought to the site with their head and fins. Considering a distance of some 40 km to a lower sea shore than today, the fish were possibly transported in a dried state.

With the study of the avifauna still awaited (Pichon, in preparation), the information at hand suggests a minimal difference between the Natufian and Khiamian faunal assemblages. Similar environmental conditions, and similar man/animal relations, can thus be inferred.

Table 8

List of Species (Davis 1985)

n = number of registered identifiable bones.

I = minimum number of individuals.

Species	Level	Natufian				Khiamian			
		5		4		3		2	
		n	I	n	I	n	I	n	I
Crab claws		—		2		1		—	
Fish vertebrae		—		5		3		15	
Reptile mandibles		—		6		2		2	
Hedgehog (<i>Erinaceus</i>) mandibles		—		1		—		—	
Vole (<i>Microtus</i>) mandibles		—		1		1		1	
Burrowing mole rat (<i>Spalax</i>) mandibles		—		17		4		9	
Hare (<i>Lepus</i>) mandibles		—		4		3		4	
Marbled polecat (<i>Vormela</i>) mandibles		—		1		1		—	
Badger (<i>Meles meles</i>) mandibles		—		2		—		—	
Cat (<i>Felis cf silvestris</i>) mandibles		—		1		—		1	
Fox (<i>Vulpes vulpes</i>) mandibles		1		5		2		3	
Gazelle (<i>Gazella gazella</i>) bones etc.		245	10	2 043	77	120	8	136	7
? Hartebeest (<i>Alcelaphus</i>) bones etc.		—	—	16	1	?2	?2	—	
? Sheep (<i>Ovis</i>) bones etc.		1	1	7	1	2	1	—	
Aurochs (<i>Bos primigenius</i>) bones etc.		—		17	2	1	1	4	1
Boar (<i>Sus scrofa</i>) bones etc.		—		14	1	1	1	1	1

Conclusions

The open air site of Hatula, near Latrun, contains the remains of two archaeological phases, Late Natufian and Early Neolithic, or Khiamian (11 000 – 9 000 years ago). Today the site is about 15 m above the bed of Nahal Nahshon, but the pattern of tool distribution on the surface may indicate that at the time of occupation, the river (or marsh) was some 10 m higher than the present stream bed.

Gazelle constituted the main food of these people (95%, Davis 1985), with small additions, including Mediterranean fish. The nature and quantity of vegetal food is unknown. However, sickle blades played a small part in both Natufian and Khiamian economies.

The Natufian and Khiamian lithic assemblages closely resemble as tool types and technology are concerned. Flakes and blades somewhat decrease in size in the later phase (Table 9); have flint resources become harder to get? A change of techniques of subsistence occurred in the Khiamian, indicated by the introduction of El-Khiam points and the increase of the use of borers. The impact of this change on the archaeological record could not be traced at the present state of research.

Table 9

Mean size of Hatula Artefacts (mm.)

	Natufian	Khiamian
Cores	N = 94	N = 54
Length	32,2	32,4
Width	27,0	26,2
Thickness	20,3	21,0
Flakes	N = 54	N = 59
Length	29,3	25,7
Width	20,5	17,4
Thickness	5,8	4,2
Blades	N = 70	N = 19
Length	30,1	27,1
Width	10,9	9,7
Thickness	3,4	3,0
Lunates	N = 285	N = 52
Length	18,3	18,4
Width	5,3	5,8
Thickness	2,3	2,2

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