# Nahal Reuel, a MPPNB site in the Negev, Israel

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Abstract: Nahal Reuel is a MPPNB site in the present day arid southern Negev, in Israel. The site contains a single occupation subdivided into various function areas (garbage, knapping, household, etc). Dated to the first half of the 8th millennium BC, this is apparently the oldest residential complex of the central-court type in Israel.

Résumé: Nahal Reuel est un site MPPNB dans la zone aride du sud du Negev, en Israel. Le site contient une seule occupation aux zones de fonctions différentes (taille de silex, activites domiciles, déchets, etc). Daté de la premiere moitiè du 8ème millénaire av. J-C, c'est probablement le plus ancien complexe résidentiel à court centrale en Israel.

Zusammenfassung: Nahal Reuel ist eine MPPNB-Fundstelle in der heute ariden Zone des südlichen Negev in Israel. Der Fundplatz enthält nur eine Belegung, unterteilt in verschiedene Funktionsareale (Silexbearbeitung, häusliche Aktivitäten, Abfälle etc.). Mit einer Datierung in die erste Hälfte des 8. Jahrtausends v. Chr. ist Nahal Reuel wahrscheinlich der älteste Wohnkomplex vom Zentralhoftypus in Israel.

## Location and Environment

The site of Nahal Reuel is in Biquat Uvda (=Uvda Valley) in the southern Negev desert ca. 35 km north of Eilat (Fig. 1). The Uvda Valley is a N-S oriented graben delimited by two sub-parallel sets of faults (Ginat and Zilberman, 1992), ca. 12 km long and maximum 5 km wide. The valley is bordered in the east by the Turonian limestone ridge which, reaching 625 m amsl, forms the western edge of the Araba Rift, and in the west by Senonian hills. The Uvda valley slopes from 500 m amsl in its southern end to 415 m in the north. Its eastern edge is some 20 m lower than the western edge, hence it is better irrigated by flood waters (Avner 1998, 169–172).

The southern Negev is presently an extreme desert environment with an average annual precipitation less than 50 mm, supporting a Saharo-Syndian vegetation. The Uvda valley, however, forms an enclave where special soil characteristics which enable exceptional water absorption are coupled by a topography allowing regular winter floods. These unique conditions are the cause for the largest concentration of prehistoric settlements known in the Negev or Sinai (Avner 1998). While early neolithic desert sites are generally considered as temporary settlements having served nomadic populations (e.g., Goring-Morris and

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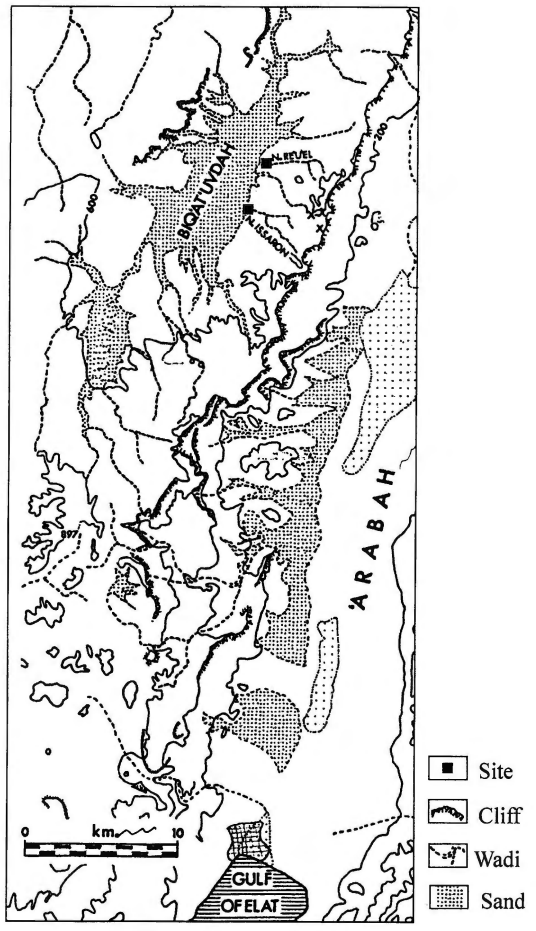


Fig. 1. Nahal Reuel site location.

Gopher 1983), Neolithic sites in the Uvda Valley, including the one presented here, may have constituted year-round settlements (Avner 1998).

Nahal Reuel is one of the wadis which enter Biqat Uvda from the east (Fig. 1). The site of Nahal Reuel is located on the northern bank of Nahal Reuel, about 5 m above the streambed, approximately 100 metres from the wadi's entrance to the Uvda Valley (UTM grid 6902/3150), where a small tributary enters Nahal Reuel from the north (Fig. 2). The site, between 435 and 433 m amsl (Fig. 3), is on a moderately steep slope and above it the hill becomes a steep limestone cliff with flint veins, which could have been exploited by the inhabitants. Excavation was initiated as a salvage project by the Israel Department of Antiquities (later the Antiquities Authority) in February 1980, followed by a second season in March 1981. The project was sponsored jointly by the Department of Antiquities, the University of Haifa and the Stekelis Museum of Prehistory in Haifa.

## Stratigraphy

Four layers were distinguished at Nahal Reuel site (Fig. 3): A. A yellow silt 10–20 cm thick, with abundant angular stone debris and scattered MPPNB artifacts (Fig. 2).

B. A gray sandy silt with architectural remains, MPPNB artifacts, organic residue and ashes, 20–50 cm thick. The layer was darkest in the southeastern part of the excavation and became gradually lighter toward the northwest. The walls rest on the top of layer C.

C. Light reddish brown silt ca. 0.4 m thick, archaeologically sterile, overlying bedrock and penetrating into fissures in the rock.

D. Bedrock.

Amidst the debris of layer A an oval structure ca. 5 m long was discernible, created by cleaning the centre and piling the cleared stones around the edges. There was nothing to suggest the age of the oval structure, which could have encircled a tent. At the feet of the slope, close to the river bed, remains of Nabatean tents are visible. Apart from these late remains, Nahal Reuel is a single occupation site of the MPPNB period.

## The Excavation

Based upon the surface finds, it is estimated that the MPPNB site had originally covered some 400 sq. m. An area 10 × 12 metres was cleared of surface debris, with finds registered by square metres. Subsequently, an area of 76 sq. m was excavated (Fig. 4) by units of 50 × 50 × 5 cm. The northwestern

quarter-square metre was designated a, the northeastern one b, the southwestern c and the southeastern quarter, d. All the excavated sediment was screened through a 3 mm mesh. The PPNB stone artifacts in layer B were covered by a thick coating of salt (not analysed, possibly gypsum). The removal of the coat took hours of soaking in fresh water. Bones were very poorly preserved at Nahal Reuel.

## The Architecture

The excavated part of the MPPNB site yielded a complex of round structures (Fig. 4) with a central space (room 4) and adjacent chambers on three sides (rooms 1, 2 and 5). An entrance discernible on the eastern edge of the excavated area (square O13) suggests that a fourth, eastern chamber had existed outside the excavated area.

The MPPNB walls are made of dry building using undressed stones of medium size. Most of the walls were carefully made, with an even thickness and a good fit between the stones (Figs. 5–8). Special care was given to the lower portion of the wall, made of closely joined vertical slabs of a quite uniform size. These were in turn capped by horizontal stones less carefully fitted, and more varied in size, than the vertical stones.

The stone debris on the surface were markedly smaller than the stones used in the MPPNB structures. Hence, it would appear that the latter hardly contributed to the surface material, suggesting in turn a rather weak erosion since MPPNB times. It follows that the MPPNB walls, preserved to a maximum height of 90 cm, may stand close to their original height. The upper part of the walls was probably made of earth or some organic material.

### The residence complex

The central space (No. 4 in Fig. 4) measures 2 × 3 metres, the largest walled space in our excavation (Fig. 5). It is surrounded on the north by the thickest wall at the site, 0.8 m (W11–W15) and 0.50 m high. From an architectrural point of view, the central space 4 very probably served as a courtyard connecting to all the other rooms. This assumption will be further confirmed by the contents of each unit, discussed below. This space will be referred hereafter as courtyard 4.

Below the yellow surface layer A, courtyard 4 was filled by some 0.5 m of grayish sand mixed with ash. The fill contained numerous artifacts, fragmented grinding stones and hammerstones. A single living floor could be distinguished in the courtyard, with the darkest concentration of ashes, in the basal 5 cm of the deposit, ca. 0.5 m above bedrock. On this floor, in sq. N13b, was a hearth 20 cm in diameter and 10 cm deep. Around the hearth was the heaviest concentration of finds encountered in courtyard 4, including two pairs of grinding stones, hammerstones and abundant artifacts.

A doorway ca. 0.4 m wide and 0.6 m long leads from the courtyard to room no. 1 in the north. There are three sill stones in this entrance, carefully chosen to fit each other (Fig. 5). A wider entrance, ca. 1.4 m, leads westward to room 2. To the south, an entrance ca. 0.4 m wide leads into room 5. Finally, an entrance 0.7 m wide is visible on the east, possibly leading to an unexcavated fourth room.

Room 1 measures 1.8 × 1.2 m, its floor cut horizontally into the slope. The surrounding wall W10 is of excellent craft, 0.7–0.8 m thick and ca. 0.9 m high inside the room (0.7 m high outside). The base of the wall is made of slabs standing upright and carefully joined. On top of the vertical slabs there are 4 rows of horizontal stones, slightly smaller in size (Figs. 5 and 6).

In room 1 the yellowish-grey silty sediment of layer B was ca. 0.5 m thick, mixed with ash and various flint artefacts. The ash was darkest in the western part of the room, becoming gradually lighter toward the east. Roughly rectangular stone slabs, ca. 30 × 20 × 5 cm, were encountered across the fill (Fig. 6).

Fig. 2. Nahal Reuel enters the Uvda Valley (far right). Excavators cleaning surface debris at the site. Remains of Nabatean tents near the car.

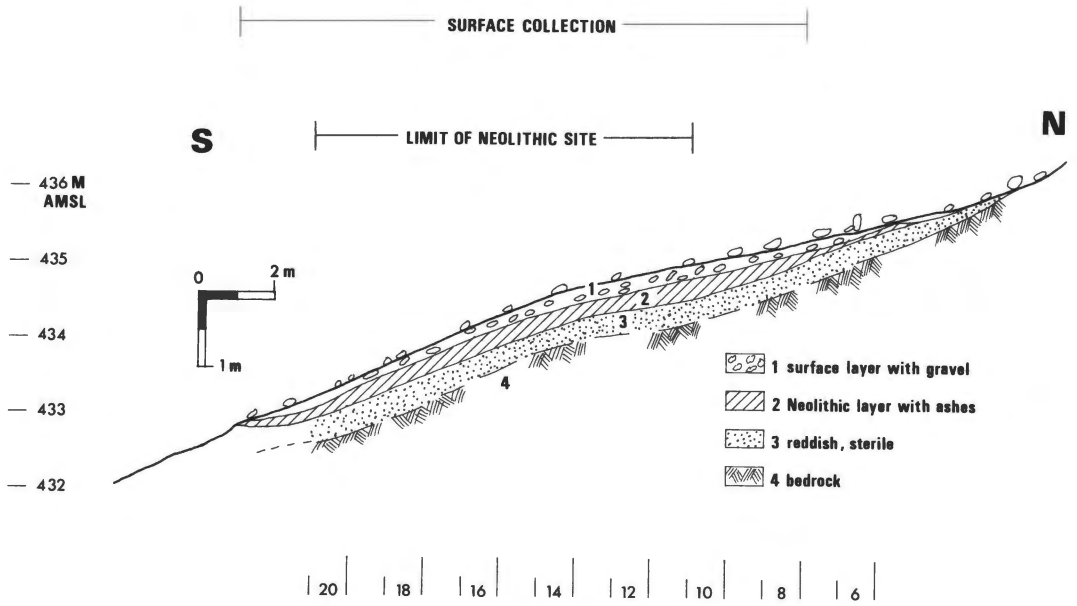


Fig. 3. Nahal Reuel Site, N–S section.

The flat slabs may have formed floors or work surfaces, no longer recognizable, which may have existed at various elevations.

Three outstanding objects distinguish room 1 from all the other units at Nahal Reuel. Firstly, in the center of the room was the longest slab encountered at the site. The slab is ca. 80 × 20 × 10 cm, pointed at one extremity and flat in the opposite extremity (Fig. 7). Undressed like all the stones in the MPPNB structures, this pointed slab does not seem to have formed part of a pavement; rather, it may have stood up as a monument of a type known in other desert sites of the same period (Avner 1993). Second, the lar-

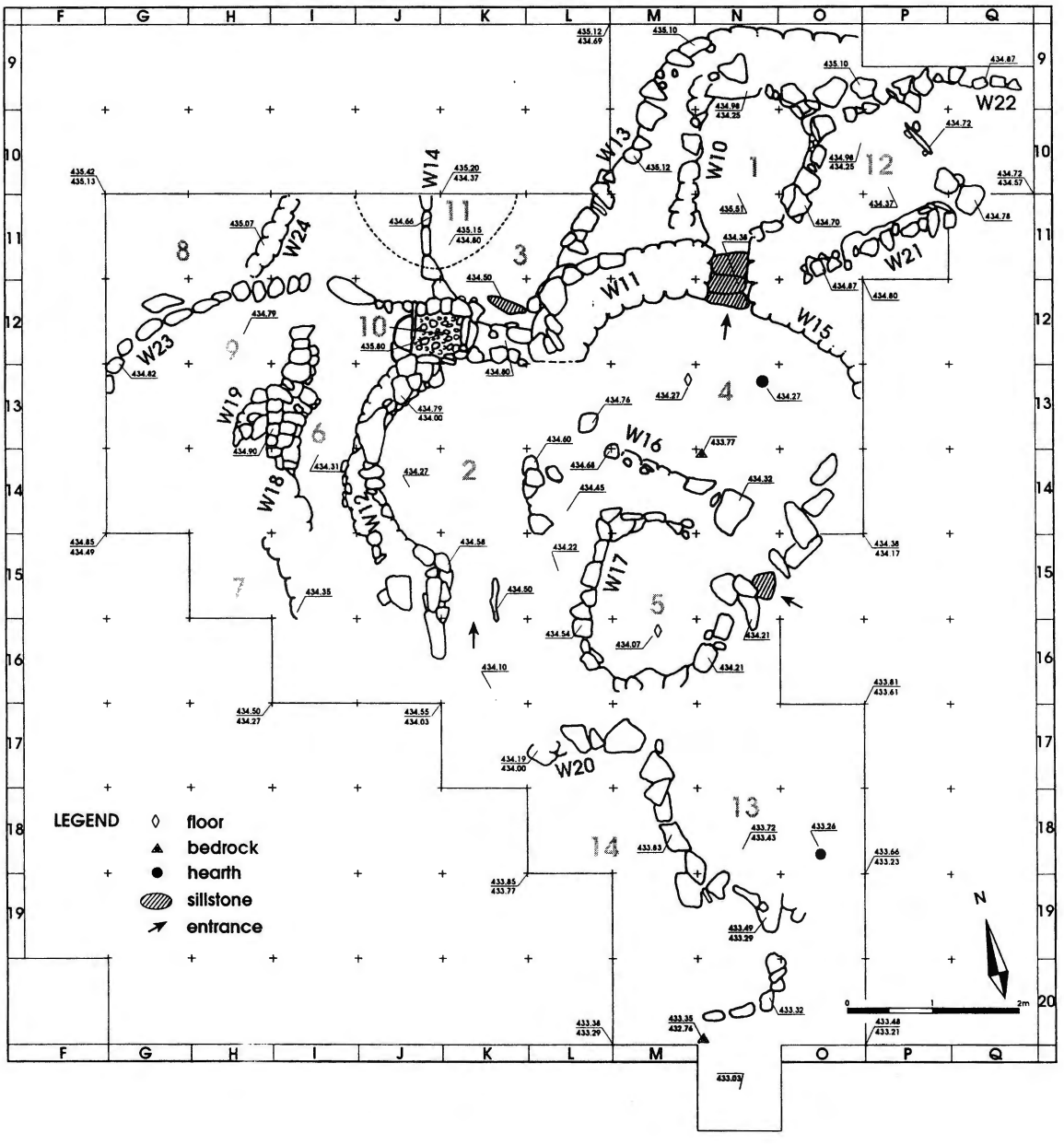


Fig. 4. Nahal Reuel Site, general plan.

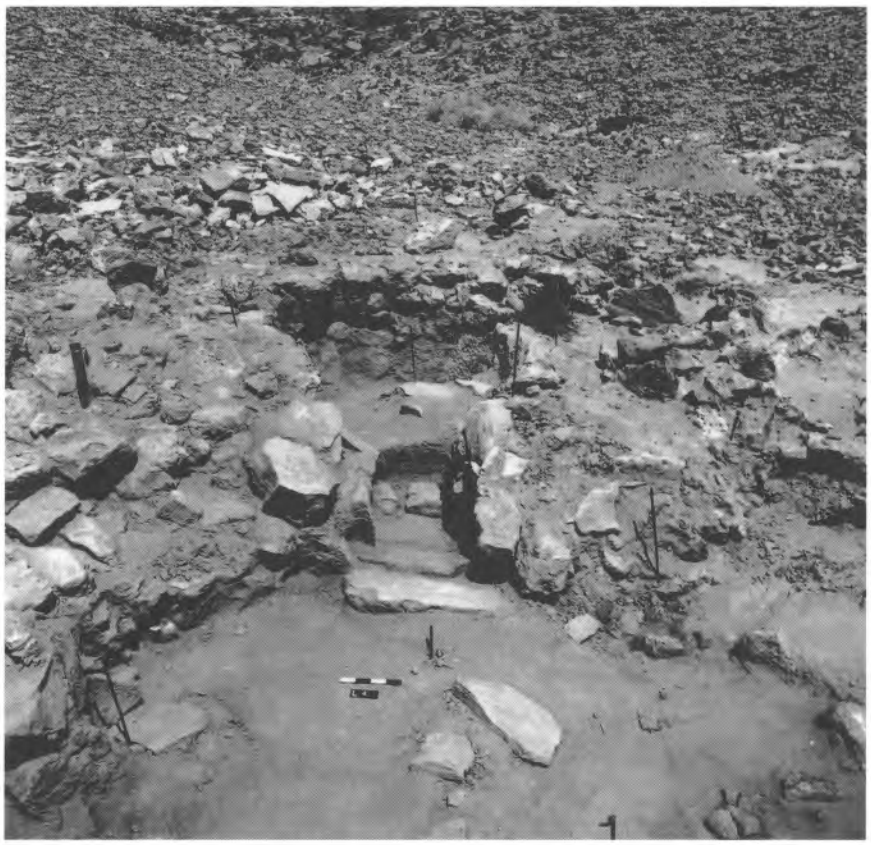

Fig. 5. Nahal Reuel site, courtyard 4 with pavement slabs, looking north to room 1 with sillstones in the entrance.

gest piece of copper at Nahal Reuel was found adjacent to the west wall of room 1, W10. Elsewhere at the site, only a few very small copper fragments were recovered. Finally, the only Mediterranean Sea shell found at the site was adjacent to the outer face of the eastern wall of Room 1. These three unique objects combine to suggest that room 1 may have had a special significance, perhaps the resident's high place.

Room 2 measures 2.5 × 2 m and is enclosed on its western side by a carefully built wall W12, 0.6 m thick and 0.8 m high. The ashy fill of layer B was ca. 0.5 m thick and contained, as in room 1, flat stone slabs at various elevations. Most finds were concentrated in the western side of the room. In addition to the eastern entrance from the courtyard, room 2 has another wide entrance on the south, 1.6 m wide. Room 2 originally had a third entrance from Locus 3 in the north, 0.4 m wide, with a sillstone. Subsequently that entrance went out of use and was apparently blocked in conjunction with the rectangular structure (silo?) of Locus 10, which was built into wall W12 (Fig. 8).

In both entrances to room 2, the eastern and southern, special devices were placed: Between courtyard 4 and room 2 there is a relatively large trapezoidal stone with its narrow side firmly stuck in the ground (Fig. 9). The wider end was flat and stood up as a table or an anvil (or altar?). In the southern entrance to room 2 a long and narrow stone slab was firmly positioned vertically in the ground, its narrow side facing up (Fig. 4). Thus, at each entrance to room 2 an anvil-like device was placed. It is further noteworthy that both devices were placed off-center, roughly at one third of their respective space.

Room 5 measures 1.8 × 1.5 m. It is enclosed on three sides by circular wall W17, some 0.5 m high, and by the straight wall W16 on the north. Room 5 has two entrances: a northern entrance, ca. 0.4 m

wide, from the courtyard and an eastern entrance from Locus 13. This entrance is ca. 0.3 m wide with a sill bordered by two vertical slabs 0.4 m high. The easternmost stone of wall W16 is a grinding stone in secondary use.

Room 5 had the same type and depth of sediments as the other units of the residence complex. A living-floor was atteined in sq. M16, at elevation 434.07 m amsl. The finds in this room – mainly flint artifacts – were quite evenly distributed.

## Non-residential features

The residential complex is surrounded by thinner, and less carefully built walls than those described above. These we consider as outside installations. The space around the residence complex is divided into the following loci (anti-clockwise; Fig. 4):

Locus 12 east of room 1, at the northeastern end of the excavated area, is delimited by the two walls W21 and W22, some 0.2 m thick and 0.5 m high. At the center of Locus 12 a stone slab was positioned vertically, its narrow edge in the ground (Fig. 10). Three pebbles placed at the extremities of the slab (Fig. 11) secured the vertical position. A large amount of knapping debris was found in locus 12 (in squares O10–O11), grouped in three concentrations about 50 cm apart, roughly at the same elevation of 434.7 m amsl. Two concentrations were adjacent to the eastern face of wall W10 (Fig. 12), the third was against the northern face of wall W21. The concentrations included numerous primary and secondary blades and flakes, core trimming elements and small waste. About 20 cores were found here but surprisingly, only one hammerstone. Locus 12 was clearly a flint knapping workshop, and hence the upright slab supported by pebbles is probably an anvil. Narrow anvils are especially useful for obtaining blade fragments of a desired length (pers. observation). The other upright narrow slab mentioned above, at the southern entrance of room 2, may also have been an anvil. The latter, however, was not associated with flint knapping, nor was it secured by pebbles. The anvil near room 2 could have served a different function, as yet unknown.

Locus 3 is west of room 1, on the northern end of the excavation. Locus 3 is enclosed between walls W24 in the west and W13 on the east. W13 is built against walls W10 and W11, perhaps (but not necessarily) at a later time. A knapping workshop was discovered in square I 11, smaller than the one described above in Locus 12. These are the only two knapping areas at Nahal Reuel.

At the center of Locus 3 there is a large pit (Locus 11) with a diameter of 2 m and 0.35 m deep (Fig. 4). The pit is irregularly lined by small stone plaques. It was filled by a dark grey sand mixed with ashes, burnt stones, lithic artifacts and a few beads of shell and stone. Ashes and burnt stones were all over the pit, but the lithics had a markedly higher concentration in the west half of the pit. It seems as if wall W14 served a barrier, dividing the pit in two halves. At present, however, the top of wall W14 lies 15 cm below the pit's base. It must be assumed, then, that wall W14 had a higher part of perishable material. By its position and measurements, wall W14 seems to be connected to the northern border of Locus 10. Locus 11 may thus be later than Locus 10, itself perhaps later than wall W12 and the main residential complex. Locus 11 may have been a trash pit.

Locus 10 is a rectangular structure 0.5 × 0.6 m, carefully paved with gravels of a uniform size. On the east and west, the pavement ends with two narrow, vertically positioned stone slabs 15 cm high. The structure may have been a silo. It could have been originally incorporated into wall W12, or it may have been a later addition. The latter possibility is strengthened by the entrance which had once connected room 2 with Locus 3, and apparently was blocked when Locus 10 was built. The blocked entrance had a sill stone (Fig. 8) and was ca. 0.5 m wide.

Fig. 6. Nahal Reuel Site, room 1 with pavement slabs, looking north to wall W10.

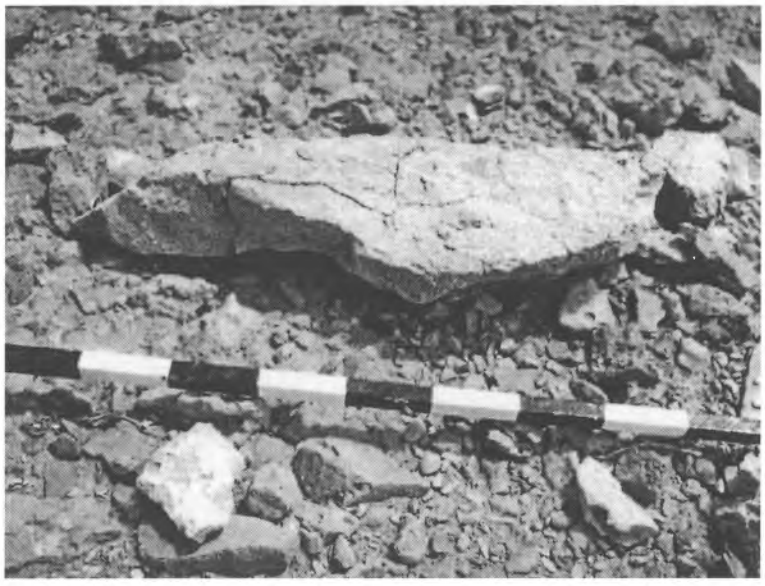

Fig. 7. Nahal Reuel, the pointed slab (stele?) from room 1.

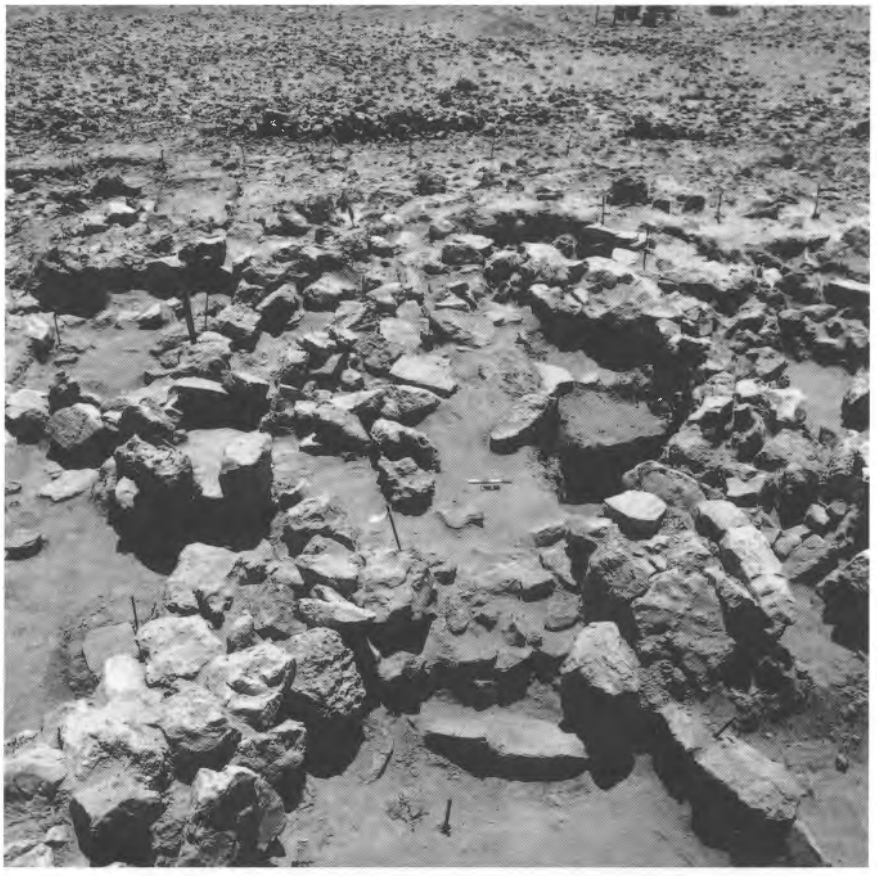

Fig. 8. Nahal Reuel Site. Locus 3 in the foreground, wall W13 on the left. Looking south into Room 2, with sillstone in the now blocked entrance and wall W12 in the far right.

The space west of the residential complex (west of wall W12) is subdivided into Loci 6–9. Walls W23 and W24 resemble in size and structure walls W21 and W22, and they too might have delimited some activity areas of unknown nature. The adjacent walls W18 and W19, with major collapses at both ends, have the same dimensions, and were built with the same care, as wall W12. Walls W18 and W19 are perhaps remnants of an older round structure, which may have preceded room 2.

South of the residential complex walls W20 and W25, on the lowest elevation in the excavated area, may also have delimited some activity areas, as the similar walls up-slope (W23, W22 and W21). Locus 13 contained the largest hearth discovered at the site, 45 cm in diameter and 8 cm deep (square O18). The E-W running wall W20 could have been a retaining wall. Locus 14 was a dump area, as will be argued below.

The architectural remains at the Nahal Reuel site reveal a residential complex surrounded by various activity areas. It appears to be the earliest example of the central-court type residence known in Israel (Avner, per. Comm.; Ronen et al. 2000). The remains may be temporally ordered as follows: walls W18 and W19 are possibly the oldest, and may have belonged to a former residential complex. The present residential complex with its annex walls come next. The rectangular silo (?) of Locus 10, walls W13 and W14 and Locus 11 are perhaps later elements at the site.

Fig. 9. Nahal Reuel Site, the trapezoidal table, or anvil, at the eastern entrance to Room 2 (square L13), looking east.

Fig. 10. Nahal Reuel Site, Locus 12 with anvil, wall W21 on left and Room 1 in bacground. Looking southwest.

Fig. 11. Nahal Reuel Site, vertical narrow anvil in Locus 12, fixed by three stones.

Fig. 12. Nahal Reuel Site, debitage in the workshop in Locus 12 (square O10d).

## Dating

Three samples were dated by 14C measurements: Pta-2848 and Pta-3137 are from the base of the large ash pit in locus 11 (Squares J/K11) and Pta-3202 is from ash on the living-floor at the base of room 2.

Table 1. 14C measurements from Nahal Reuel (Calibrated by INTCAL98, Stuiver et al. 1998)

| Sample | 14C BP | cal BC | % Area | enclosed | cal BC | ranges |
|---|---|---|---|---|---|---|
| Pta-2848 | 8670 ± 60 | 7648–7609 | 68.3 | 1 sigma | 7742–7600 | 1.000 |
| | | | 95.4 | 2 sigma | 7939–7932 | 0.012 |
| | | | | | 7919–7890 | 0.025 |
| | | | | | 7875–7857 | 0.016 |
| | | | | | 7842–7583 | 0.947 |
| Pta-3137 | 8620 ± 70 | 7599 | 68.3 | 1 sigma | 7731–7694 | 0.237 |
| | | | | | 7684–7581 | 0.763 |
| | | | 95.4 | 2 sigma | 7913–7901 | 0.008 |
| | | | | | 7872–7858 | 0.014 |
| | | | | | 7831–7535 | 0.977 |
| Pta-3202 | 8550 ± 90 | 7583 | 68.3 | 1 sigma | 7675–7663 | 0.038 |
| | | | | | 7659–7519 | 0.924 |
| | | | | | 7494–7480 | 0.039 |
| | | | 95.4 | 2 sigma | 7912–7905 | 0.004 |
| | | | | | 7868–7860 | 0.004 |
| | | | | | 7928–7449 | 0.974 |
| | | | | | 7899–7371 | 0.014 |
| | | | | | 7370–7357 | 0.004 |

Even though locus 11 and the floor of room 2 appear, on stratigraphical grounds, to belong to different phases of the occupation, the test of consistency shows the three samples to be statistically the same at 95% level, with a pooled mean age of 8627 ± 45 years BP.

The Pretoria Radiocarbon Calibration, using a different statistics, gives the following results (Talma and Vogel 1993, updated with INTCAL98):

Table 2. Pretoria Radiocarbon Calibration

| Sample | Age BP | Sample Cal date BC and 1 sigma range |
|---|---|---|
| Pta 2848 | 8670 ± 60 | 7750 (7620) 7597 |
| Pta 3137 | 8620 ± 70 | 7651 (7600) 7581 |
| Pta 3202 | 8550 ± 90 | 7606 (7581) 7542 |
| Average | 8627 ± 45 | 7622 (7602) 7590 |

The close dates would indicate a relatively short occupation around 7600 BC, the „most probable age" of the occupation (Fig. 13). A date in the first half of the 8th millennium is further supported by the finds.

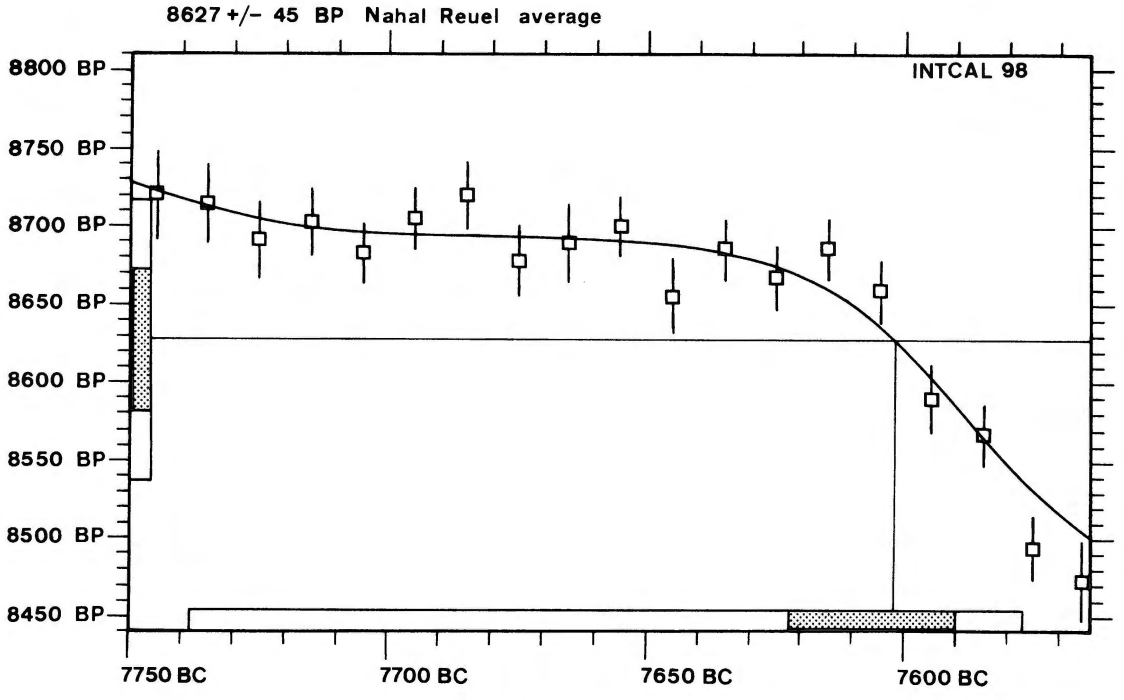


Fig. 13. Nahal Reuel, 14C calibration curve.

## Lithic industry

Nahal Reuel industry was made of high quality flint. It contains a whitish color flint, a pale brown flint and a gray flint. A small amount of dark brown, reddish and pink flints is present. The raw material could have been brought from three sources: the nearest is the Turonian flint from the very hill below which the site was established, the second is Cenomanian flint from the Araba escarpment a few hundred metres east of the site, and the third source is Senonian flint accross the Uvda Valley, at its western edge. All the cores and flaked products found at the site were studied, but only a limited sample of waste and chipping products was studied.

### Technology/Reduction

The Nahal Reuel industry is essentially blade production: some 75 % of the cores are blade cores and some 80 % of the retouched items are on blades. The waste products include only 60 % of blades against 40 % flakes. Knapping took place at the site, with at least two knapping areas in Locus 12 and locus 11, already mentioned.

## Cores

Table 3. Core Types

| Type | No. | % |
|---|---|---|
| Single platform | 18 | 9.8 |
| Naviform | 92 | 50.8 |
| two platforms | 21 | 11.6 |
| >2 platforms | 30 | 16.5 |
| Irregular cores | 20 | 11.0 |
| Total recognisable | 181 | 99.7 |
| Fragments | 54 | |
| Total | 235 | |

The large majority of cores (50 %) are naviform blade cores (Fig. 14). Some 12 % of the cores have two adjacent striking platforms and 10 % have a single platform, almost all pyramidal which, in their latest reduction phase, yielded small blades. 16 % of the cores had more than two striking platforms, most of them either globular or discoidal flake cores (Fig. 15). 11 % of the cores were of irregular shape. 54 core fragments complete the list of 235 cores found in the site (Table 3).

## Tool types

The 810 modified objects found in Nahal Reuel form a mere 6 % of the total lithic assemblage. The tools are largely dominated by arrowheads, 30 % (Table 4), which reveals the importance of hunting. This is the single representative of the „Neolithic Component" at Nahal Reuel. Of the two other components, the family of celts – axes, adzes and chisels – is entirely missing and sickle blades with a typical sheen are extremely rare, 0.4 % only. Retouched items, including racloirs, are numerous (ca. 27 %). Denticulates and notches combined (24 %) had an importance similar to the retouched items. Another important task carried out at the site was piercing, with 12 % of the tools. The „Upper Palaeolithic" tool types grattoirs, burins and truncations are present in small numbers.

Table 4. Tool Types

| Tool | No. | % |
|---|---|---|
| Arrow heads | 245 | 30.2 |
| Sickle blades | 3 | 0,4 |
| Celts | 0 | |
| Awls | 98 | 12.1 |
| Grattoirs | 16 | 2.0 |
| Racloirs | 17 | 2.1 |
| Burins | 12 | 1.5 |
| Truncations | 15 | 1.8 |
| Notches | 104 | 12.8 |
| Denticulates | 89 | 11.0 |
| Retouched blades | 117 | 14.4 |
| Retouched/used flakes | 88 | 10.9 |
| Miscellaneous | 6 | 0.7 |
| Total | 810 | 99.9 |

## Arrowheads

The 245 arrowheads found at Nahal Reuel are of three types (Figs. 16 and 17): the majority, 77, are Jericho points (53 %), followed by Byblos (44, 30 %) and Amuq points (22, 15%) (Fig. 17,10–13). Three specimens are classified as „varia". The term Jericho point was applied also in the cases when only one wing has the proper angle with the stem, smaller than 90 degrees. In the Jericho points modification generally affected only the stem and the point. The edges are almost always unretouched. About one half of the pieces were partly pressure-retouched on the dorsal and ventral faces (e.g. Fig. 17,9), the other half has a steep or semi-steep retouch. Alternating retouch is rare. Byblos points have rounded shoulders gradually narrowing to form the tang. Shoulders and tang are the only modified parts of the tool. The retouch is steep or semi-steep; pressure retouch is rare. The oval, leaf-shaped Amuq points, generally retouched on the whole circumference (Fig.17,10–13), are the most symmetrical among Nahal Reuel arrowheads. 99 specimens (40 %) are unidentifiable fragments. The three „varia" consist of two strongly twisted specimens and one very small arrowhead, probably a late intrusion.

The arrowheads of Nahal Reuel are characterised by a brief preparation, with retouch generally confined only to the tip and the tang. Pressure retouch is rare. The shape is frequently asymetrical: either the point is located off the central axis, or the wings are asymetrically positioned, or both features occur on the same piece (Fig. 16,1.2). Identical features were recently noted in arrowheads from Gurcutepe, in Southeastern Turkey (Schmidt and Beile-Bohn 1996).

## Sickle blades

The three sickle blades found at Nahal Reuel are unretouched, 3–5 cm long with sheen covering roughly one half of their width (Fig. 18,1–3). The rarity of sheen may indicate that cereal cutting was a minor task at Nahal Reuel.

## Awl

Awls form an important component in our assemblage, ca 12 %. They may be divided into four groups:

1. a short and fine point on blade (58 tools, 59 %) (Fig. 19,3.7.9.11–14);
2. a long point on blade (13 tools, 13 %) (Fig. 19,4.6);
3. a small delicate tip on large flake (12 pieces, 12 %) (Fig. 19,8)
4. a tip of any form on a thin blank (15 tools, 15 %).

The majority of the awls are of type no. 1. They are made on the distal end of long and narrow blades with modification restricted to the point alone. The point is short, some 3 mm long, and very fine. It was formed either by a gradual narrowing of the edges or by notched shoulders. The retouch is steep or semi-steep.

Type no. 2 has a longer and sturdier point than the previous type. Made on blade or a blade fragment, the length of the point is approximately half of the entire tool (Fig. 19,4). The point is made by steep retouch.

The third type has a small and delicate tip made on an angle of a relatively large, rectangular flake (Fig. 19,8). The fourth type is made on a thin and delicate blank, some 30 mm long with a rounded base. The point is relatively long, shaped on the distal end by steep retouch (Fig. 19,10).

The abundance of fine tips among Nahal Reuel awls is noteworthy, recalling the abundance of needle-like awls earlier, in some MPPNA industries (Ronen et al. 1994; Ronen and Winter 1998).

## Burins

Made on thick flakes (Fig. 20,1) or core-rejuvenation products, the majority of Nahal Reuel burins are dihedrals. Three specimens are on break and one is on a concave truncation (Fig. 20,2).

### Grattoirs

The majority (11) are simple grattoirs made on large flakes (Fig. 21,1 and 3). There is one double (Fig. 21,2), one circular and 5 steep grattoirs, the latter made on core rejuvenation flakes.

### Racloirs

Made on large flakes, the retouch frequently affects approximately half of the edge (Fig. 21,5). The racloirs are mostly of the simple straight type, with two double racloirs and a single racloir with ventral retouch (Fig. 21,4).

### Truncations

Most of the truncations are made on thin and elongated blades, sometimes with retouched edges. The dominant type is a straight truncation, with a few oblique or concave truncations.

### Notches

Almost all were made on blades, many on narrow and elongated ones (Fig. 20,4–6; nos. 3 and 7 on flakes). Most of the notches are shallow and could result from use (Fig. 20,3–5). In five cases, a symmetrical pair of notches was made close to the butt; these are perhaps unfinished arrowheads.

### Denticulates

The majority is on blades. The denticulation is frequently fine and irregular, similar to use retouch. In all but three cases the retouch is on the dorsal face (Fig. 20,8 and 9). A group of 4 items is noteworthy: carefully retouched on one or both edges, they have a pair of notches near the proximal end, in all likelihood for hafting.

### Retouched Blades

These are mostly elongated and narrow blades (Fig. 18,5.6.8.11), sometime on robust blanks (Fig. 18,7 and 10). 67 specimens (47 %) have a regular and continuous retouch on one edge with partial retouch on the opposite edge (Fig. 18.7,8 and 11). The rest of the group has an irregular or discontinuous retouch which may be flat, semi-steep or steep. Pressure retouch is rare.

### Retouched Flakes

This is a highly irregular group of tools, generally made on amorphous flakes of all sizes. All types of retouch are present except for pressure flaking. The retouch may affect the dorsal or ventral faces, and may be located anywhere on the blank.

### Miscellaneous

There is one tanged flake, two points and three Heavy Duty tools (Fig. 22,1 and 2), made on blocks or core fragments with edges violantly crashed.

### Hammerstones

36 hammerstones were unearthed at Nahal Reuel. 32 are made on rounded (Figs. 23 and 24) or elongated flint pebbles. Three were made of limestone and one, on a granit pebble. The average size of the

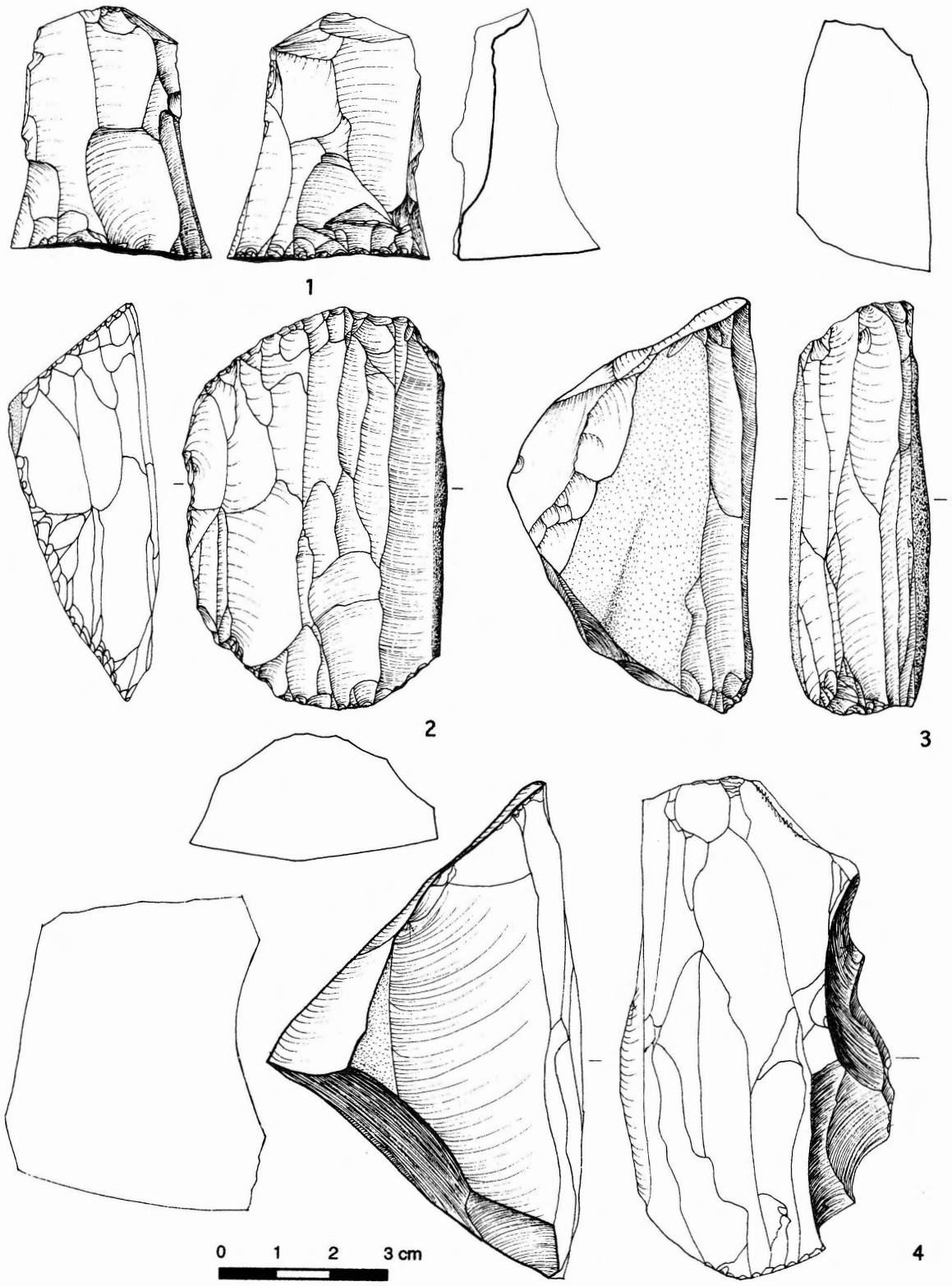


Fig. 14. Nahal Reuel Site, cores.

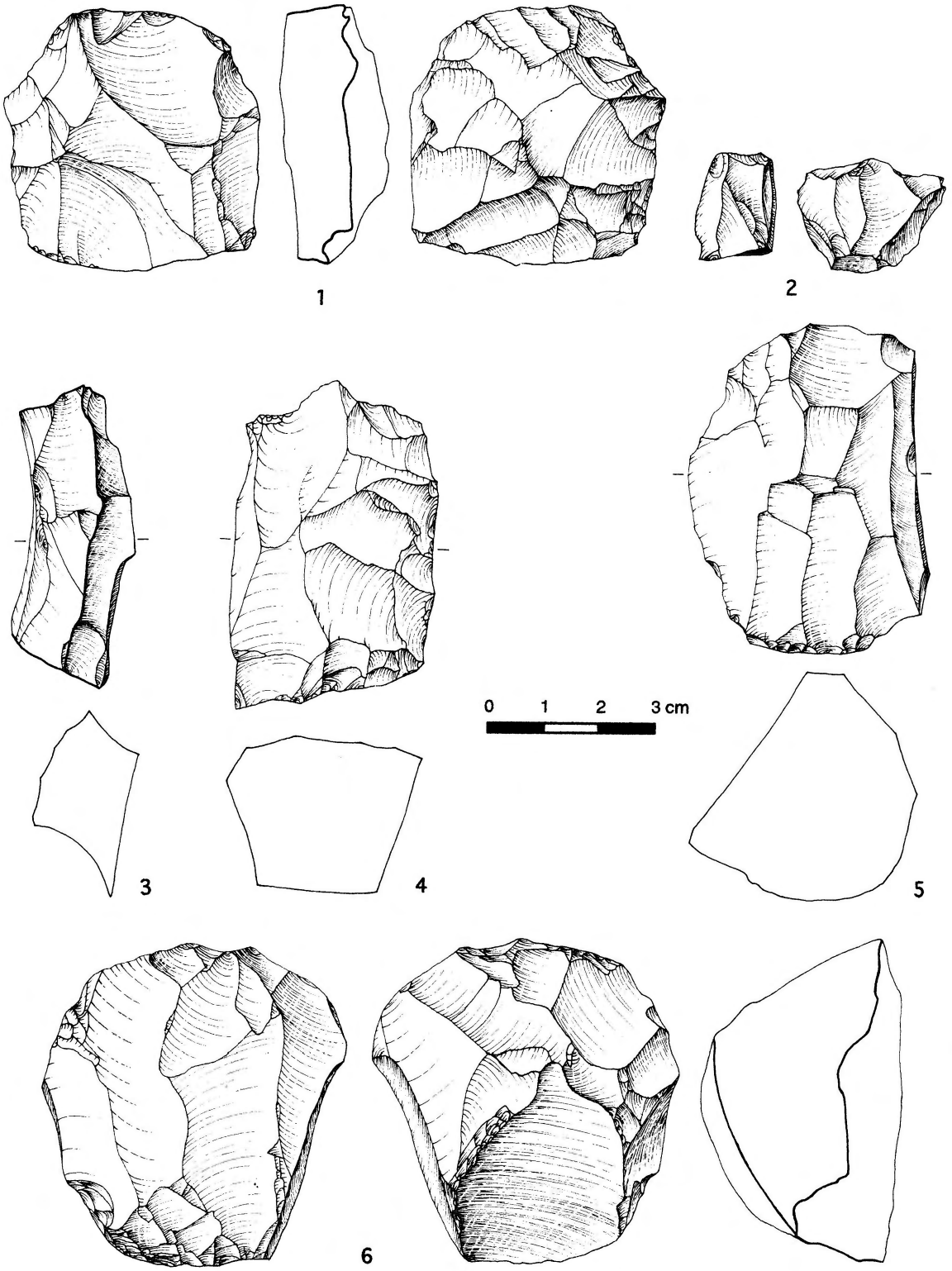


Fig. 15. Nahal Reuel Site, cores.

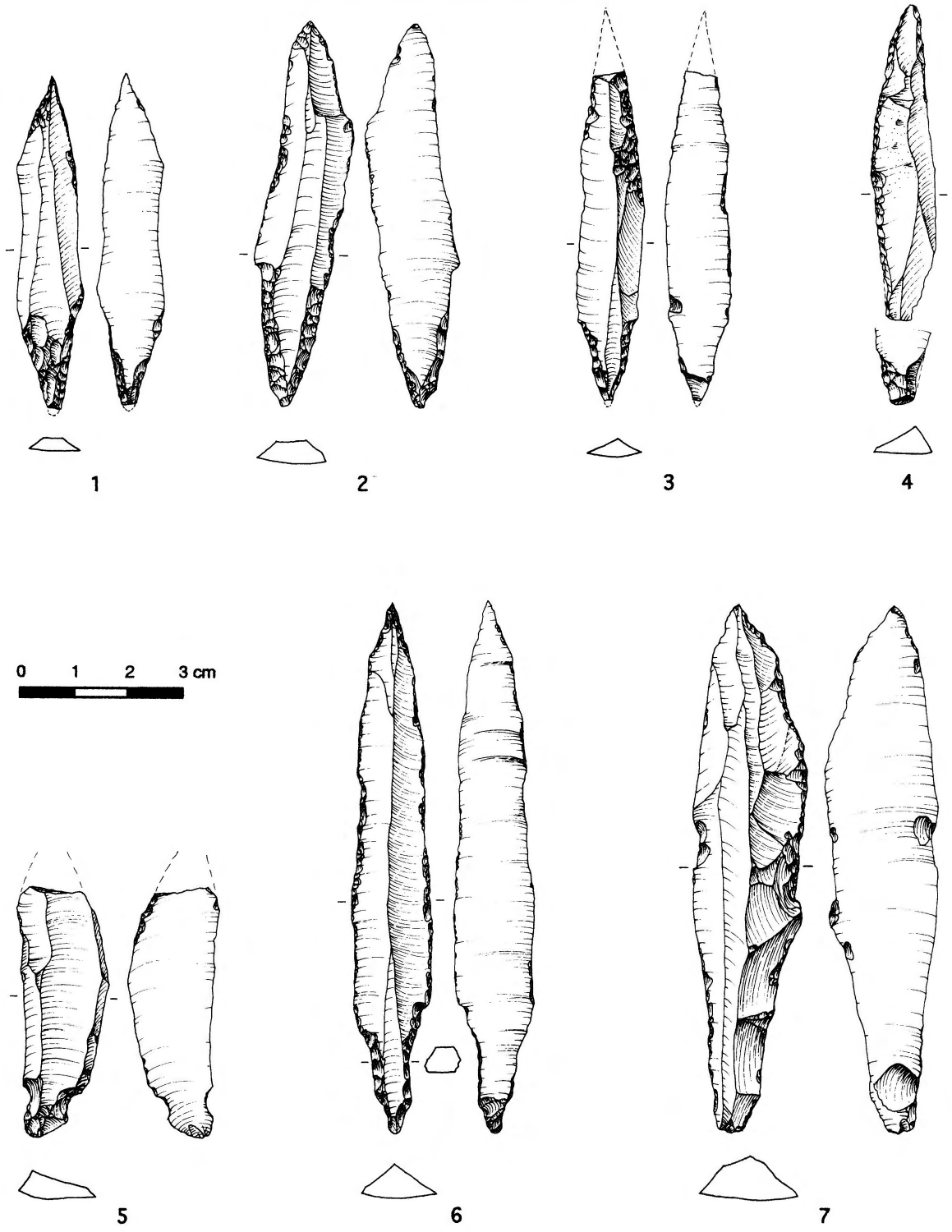


Fig. 16. Nahal Reuel Site, arrowheads.

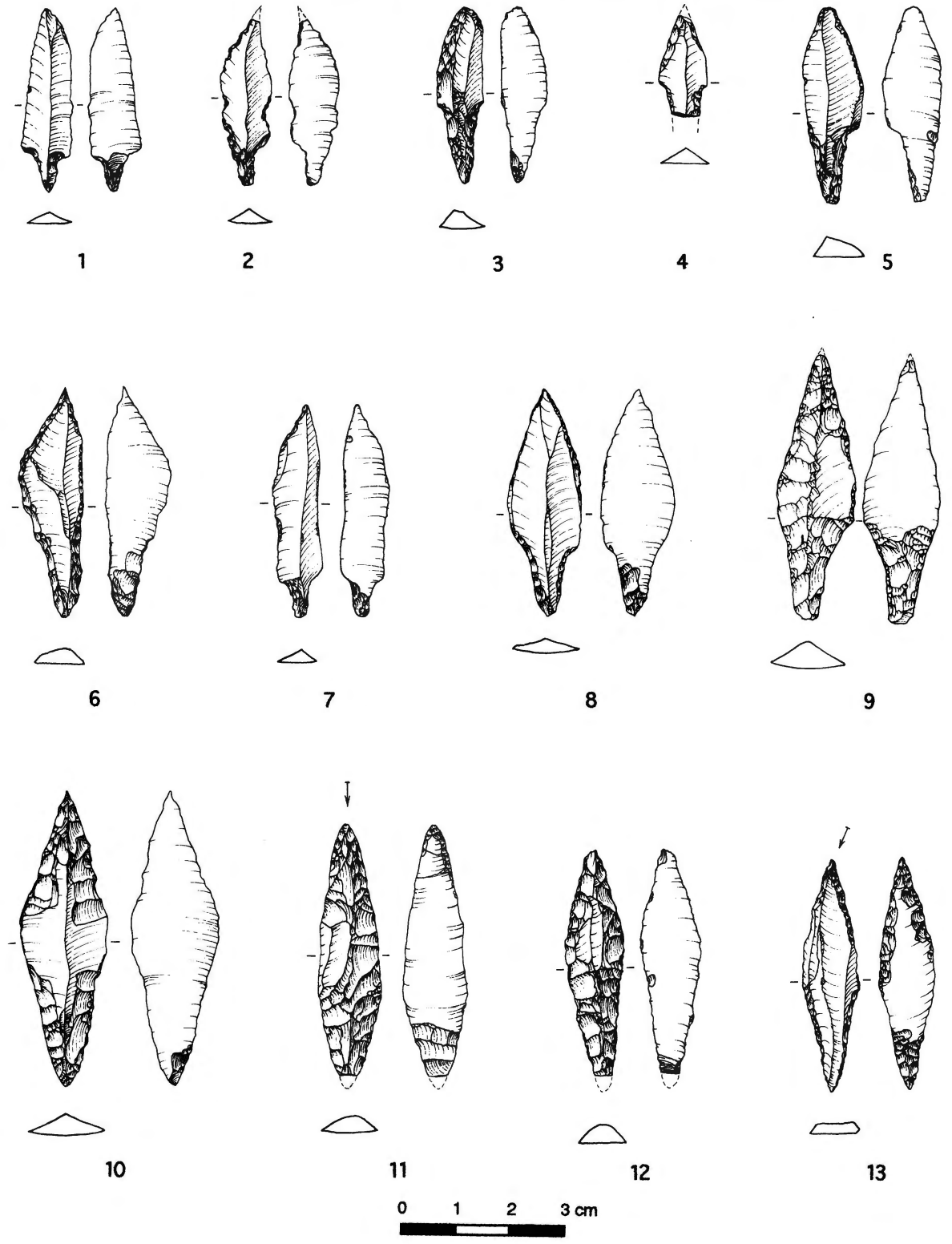


Fig. 17. Nahal Reuel Site, arrowheads.

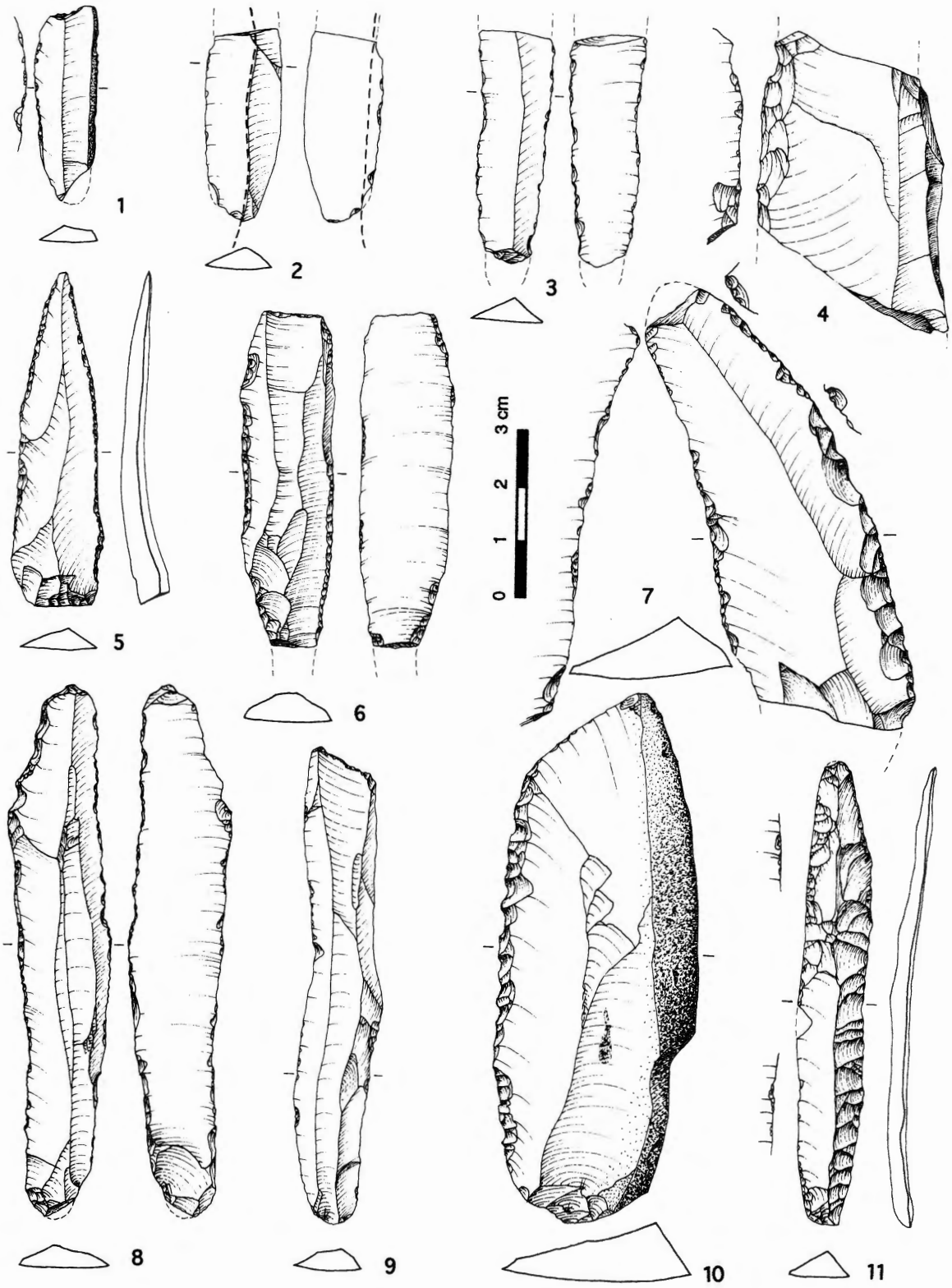


Fig. 18. Nahal Reuel Site, retouched items.

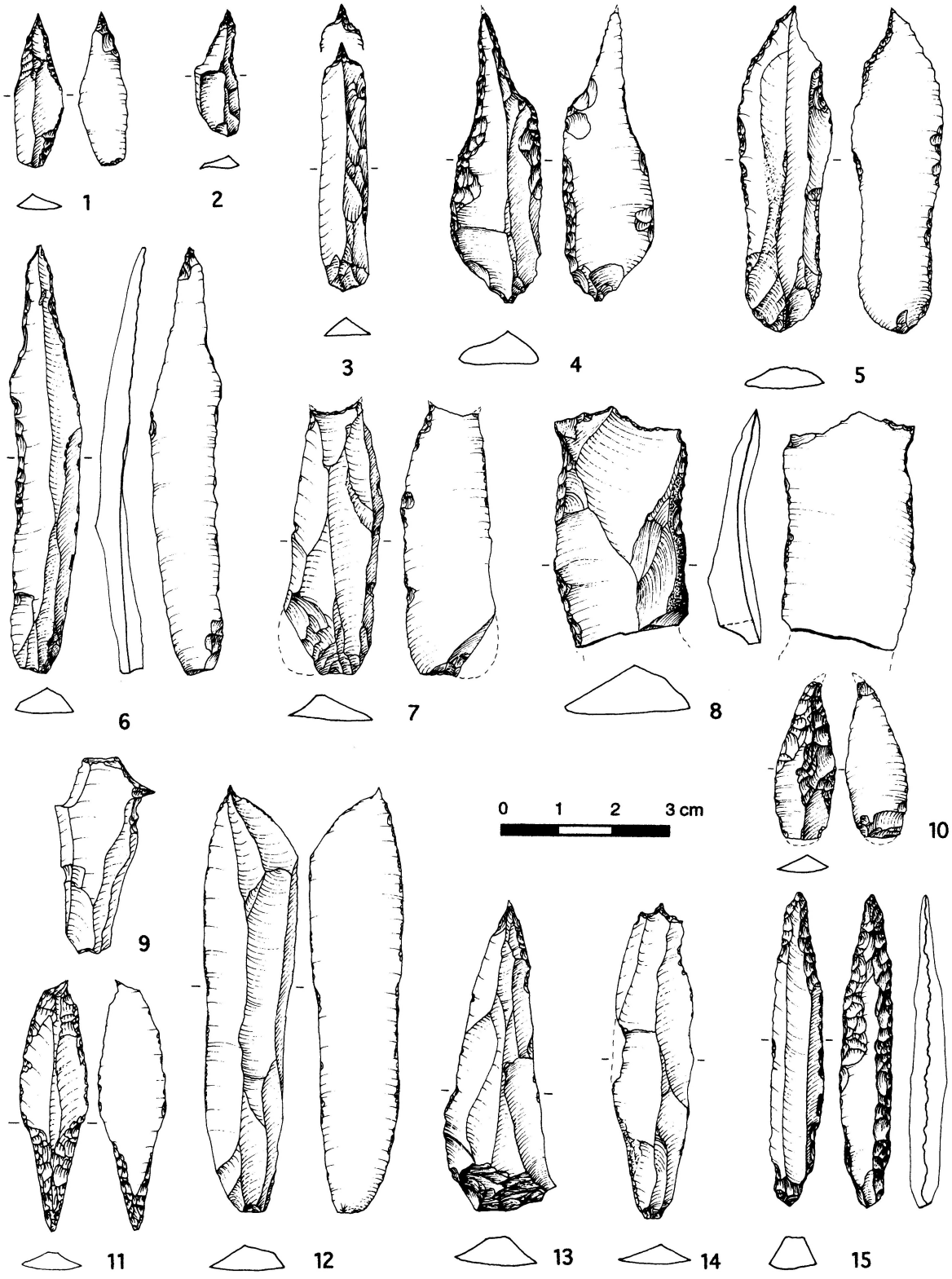


Fig. 19. Nahal Reuel Site, awls.

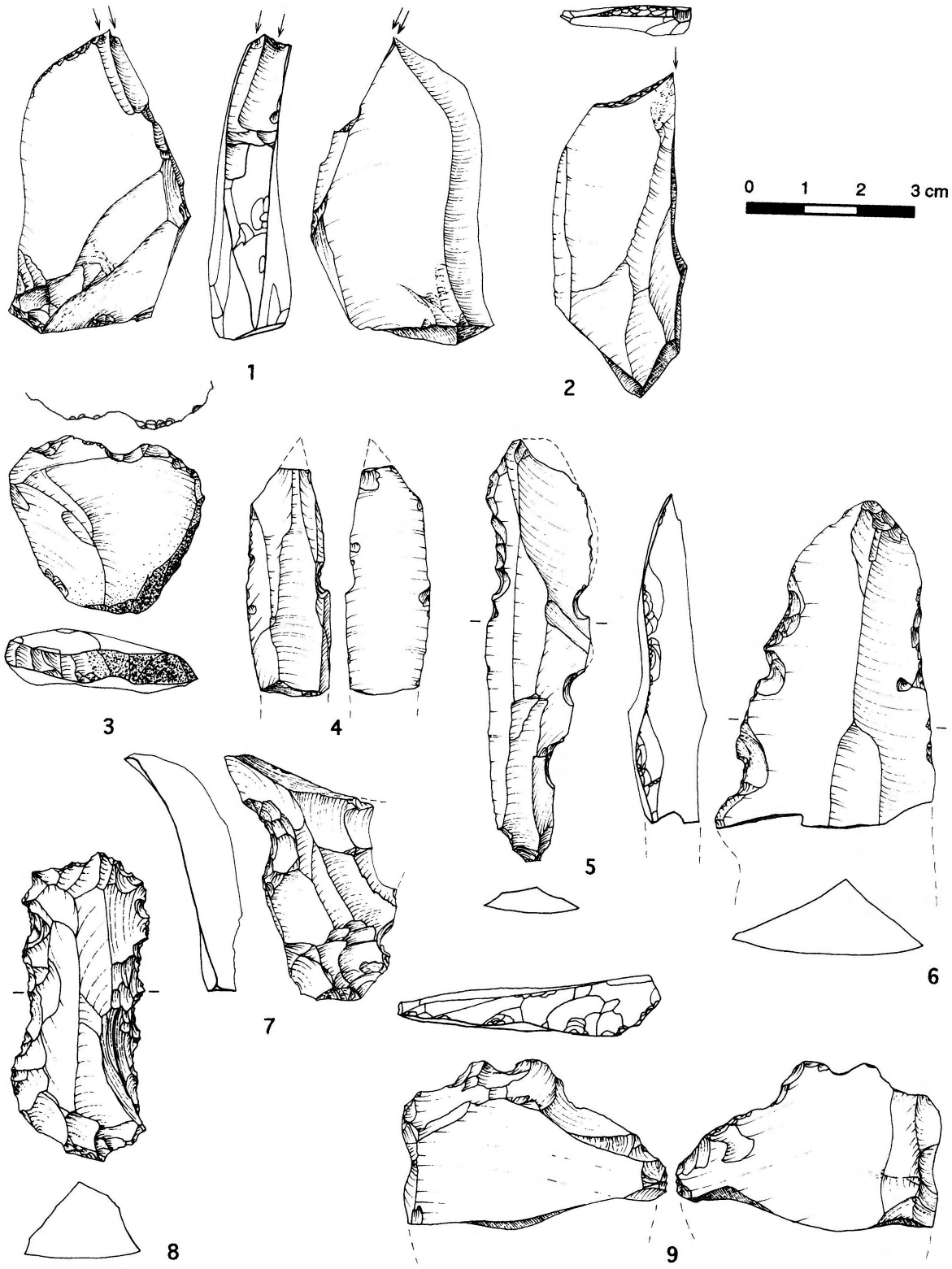


Fig. 20. Nahal Reuel Site, 1,2 burins; 3–7 notches; 8,9 denticulates.

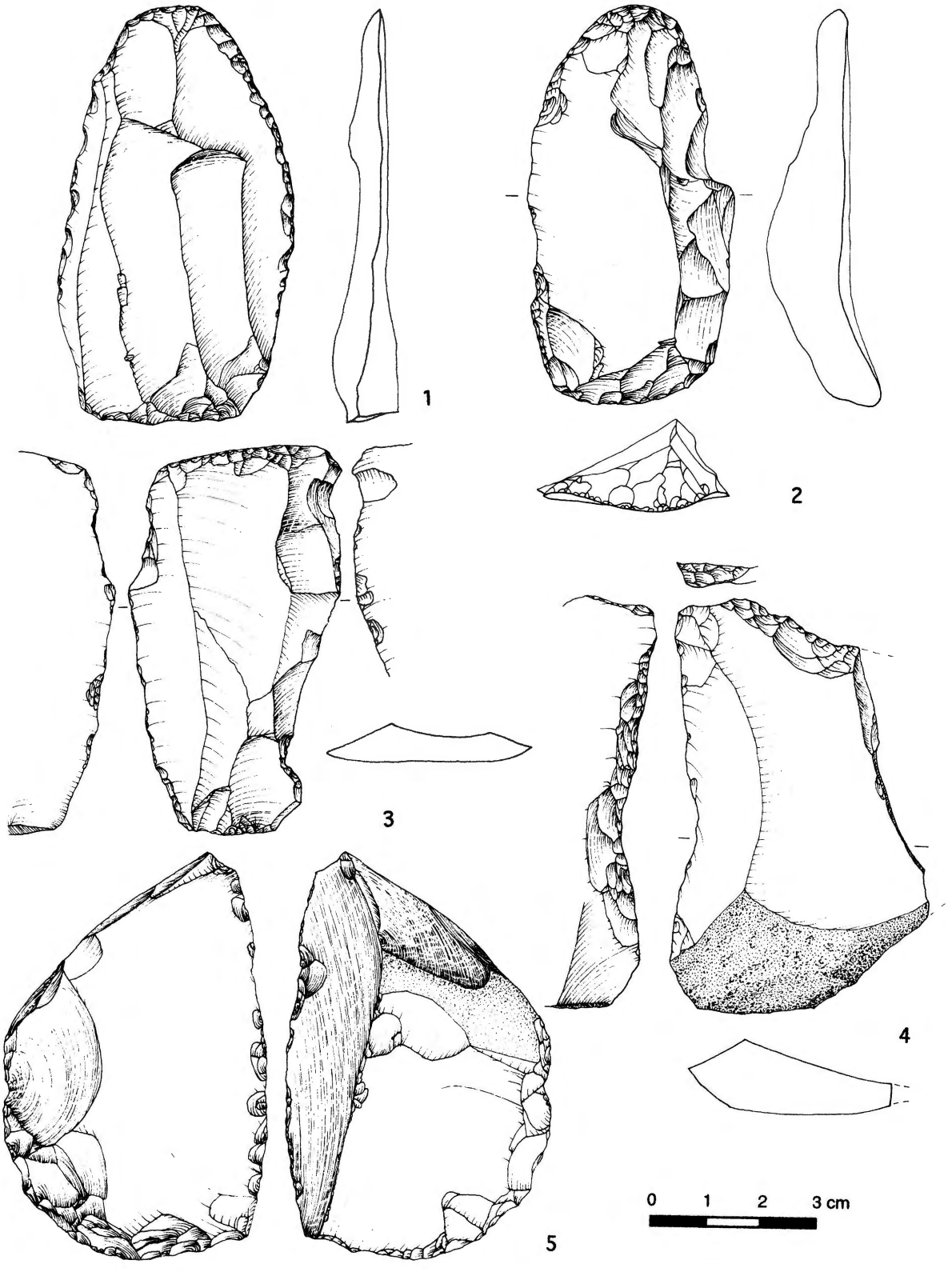


Fig. 21. Nahal Reuel Site, 1–3 grattoirs; 4,5 racloirs.

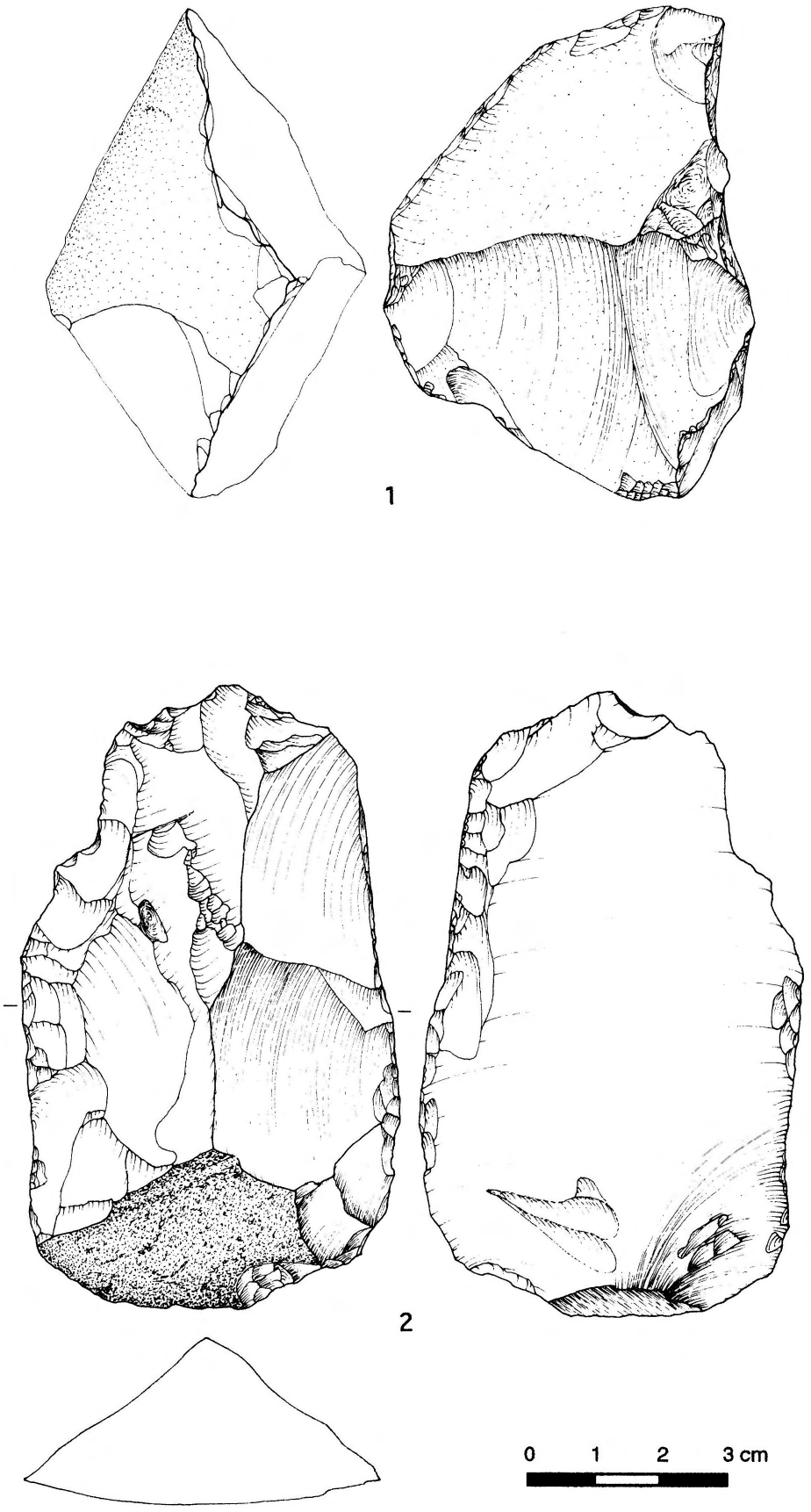


Fig. 22. Nahal Reuel Site, heavy duty.

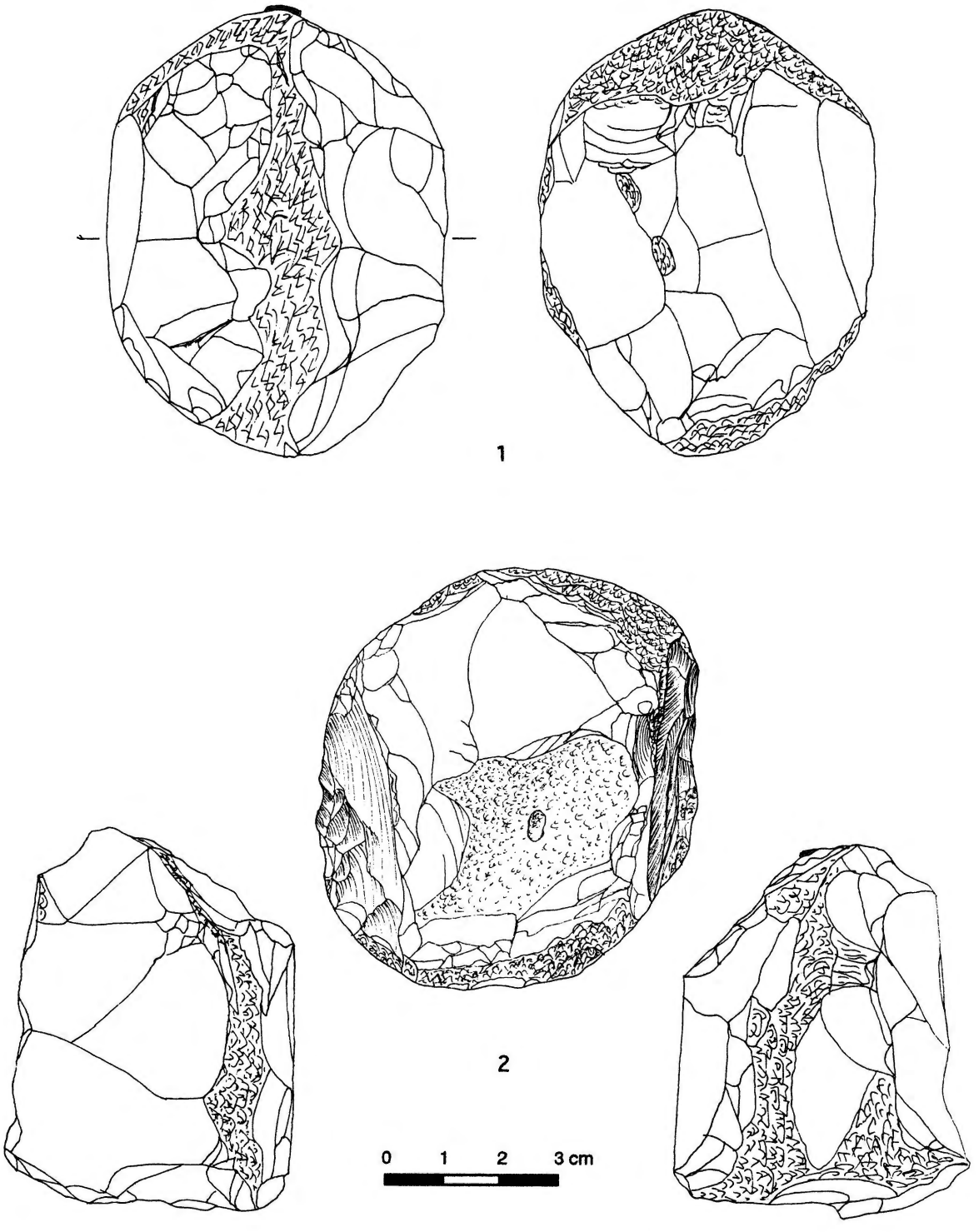


Fig. 23. Nahal Reuel Site, hammerstones.

hammerstones is 90 mm. The rounded artifacts were used on their circumference (Fig. 23) while the elongated ones were used on both ends. A single hammerstone was stained by red ochre.

### Grinding tools

Altogether, 16 grinding tools were found. The querns are shallow (Fig. 25), mostly made of local limestone and a few, of imported sandstone. The hand-stones are oval or elongated.

## Non-Lithic Finds

### Botanical Remains

Five plant remains were found in Nahal Reuel, representing 3 species (Lipshitz, pers. Comm.):

Sq. I11b, *Tamarix sp.*

Sq. J11c, *Tamarix sp.*

Sq. K11b, *Haloxylon persicum*

Sq. I11a, *Haloxylon persicum*

Sq. L14c, *Retama raetam*

The three species grow in Biqat Uvda today (Weinstein-Evron, pers. Comm.). Tamarisk indicates salty environment and presently abounds in salt playas. It is at present used both for building and fuel. *Haloxylon* is a park and desert plant, which grows especially on settled sands. *Retama* grows in sandy wadi floor and is presently used for fuel.

### Molluscs

The material consists of small to very small, rather fragmentary shells. Most of the specimens could be identified on the spot, but in some cases a comparison was necessary with material in the mollusc collection in the Hebrew University of Jerusalem.

For all the recognised taxa, except for a fossil one, references are included to a good description and/or illustration in a readily available up-to-date work.

#### Gastropoda

Family Neritidae

1. *Nerita sanguinolenta* MENKE, 1829 (Sharabati, 1984, Plt. 2, Figs. 18–18d [as *Nerita albicilla*]).

Material: Sq. O20b, one shell with a man-made hole in the last whorl left of the columellar area.

Remarks: The Bloody Nerite is commonly encountered on rocks in shallow water of the Gulf of Aqaba and elsewhere in the Red Sea. The man-made hole in the last whorl more-or-less opposite the aperture has turned this Nerite into a shell bead.

Family Cypraeidae

2. *Erosaria turdus* (LAMARCK, 1810) (Sharabati, 1984, Plt. 11, Figs. 9–9a).

Material: Sq. O18, part of posterior extremity;
Sq. O18a, labial lip;
Sq. J/K11, one shell with dorsum removed;
Provenance unknown, one shell with the dorsum removed.

Remarks: This Cowry is commonly encountered in the Red Sea and the N.W.-corner of the Indian Ocean. In removing the dorsums, the shells have been turned into so-called Cowry beads. The two fragments belong to two different specimens and both formed most probably also part of Cowry beads.


Fig. 24. Nahal Reuel Site, hammerstone and partial pavement in courtyard 4 (square N12).

Fig. 25. Nahal Reuel Site, exhausted grinding stone found upside down in the dump area in Locus 14 (square N19).

Family Naticidae

3. *Polinices tumidus* (SWAINSON, 1840) (Sharabati, 1984, Plt. 13, Figs. 1–1a).

Material: Sq. M14c, one shell with a large man-made hole in the last whorl, left of the parietal callus.

Remarks: The White Moon shell is commonly encountered in sandy habitats in shallow waters throughout the Red Sea and the Indo-Pacific. The man-made hole shows that it was a shell bead.

Family Buccinidae

4. *Engina mendicaria* (LINNAEUS, 1758) (Sharabati, 1984, Plt. 22, Fig. 5).

Material: Sq. K13, one shell with a man-made hole in the last whorl just behind the outer lip.

Remarks: This is a small littoral species commonly encountered throughout the Red Sea and the Indo-Pacific.

The man-made hole just behind the lip of the aperture indicates that it has been a shell bead.

Family Conidae

5. *Conus parvatus sharmiensis* WILS, 1986 (Sharabati, 1984, Plt. 28, Figs. 4–4a [as *Conus musicus parvatus*]).

Material: Sq. N15 (surface), one specimen.

Remarks: This dwarf Cone is a common species in the Red Sea.

Family Enidae

6. *Buliminus negevensis* HELLER, 1970 (Heller, 1970, 281, Figs. 2–3).

Material: Sq. J12c, one specimen.

Remarks: It is a local landsnail which corresponds in form and size with a specimen figured by Heller (1970, Fig. 3a) from another Negev locality, Hamachtesh Hagadol.

Bivalvia

Family Pteriidae

7. *Pinctada margaritifera* (LINNAEUS, 1758) (Oliver, 1992, 63, Plt. 9, Figs. 9a–9b).

Material: Sq. I11a, four small fragments;
Sq. K11b, one small fragment;
Sq. L13d, one small fragment;
Sq. J/K11, one fragment in the form of an oblong pendant (51.7 × 11–20 mm) lacking a hole. This fragment is in an advanced state of disintegration.

Remarks: This is the well-known „Mother-of-Pearl" shell from the Red Sea and the Indo-Pacific. The wedge shaped form of one of the fragments shows that it was intended to be used as a shell pendant.

Family Gryphaeidae

8. „Gryphaeid Oyster"

Material: Sq. N21a, one fragment.

Remarks: A local Creataceous (?) fossil.

Family Cardiidae

9. *Acanthocardia tuberculata* (LINNAEUS, 1758) (Tornaritis, 1987, 150, Figs. 229d and 230).

Material: Sq. O11, one small fragment.

Remarks: It is a common Cockle from the Mediterranean Sea.

10. *Trachycardium vertebratum* (JONAS, 1844) (Oliver, 1992, 126, Plt. 23, Figs. 4a–4b).

Material: Sq. M15c, one small fragment;
Sq. M16b, one small fragment.

Fig. 26. Nahal Reuel Site, shell ornaments.

Remarks: This Cockle species is from the Red Sea. The two fragments might have belonged to one and the same specimen.

Altogether 20 shells or shell-fragments were recovered at Nahal Reuel. They could be classified as belonging to ten different taxa. The zoogeograpgical origin of the recognised species is summarised in Table 5.

Table 5 Mollusca from Nahal Reuel

| Species | Origin | No. of specimens cq.fragments |
|---|---|---|
| *Nerita sanguinolenta* | Red Sea | 1 |
| *Erosaria turdus* | Red Sea | 4 |
| *Polinices tumidus* | Red Sea | 1 |
| *Engina mendicaria* | Red Sea | 1 |
| *Conus parvatus sharmiensis* | Red Sea | 1 |
| *Buliminus negevensis* | Biqat Uvda | 1 |
| *Pinctada margaritifera* | Red Sea | 7 |
| „Gryphaeid Oyster" | ? Biqat Uvda | 1 |
| *Acanthocardia tuberculata* | Mediterranean Sea | 1 |
| *Trachycardium vertebratum* | Red Sea | 2 |

The single landsnail Buliminus negevensis might be of recent origin. The predominance of Erythrean material (17 of 20 items, or 85 %) could be expected in view of the short distance between the site and the Red Sea, some 40 km. The presence of a single Mediterranean shell (ca. 175 km away) apparently points to weak trading links, in contrast with some later MPPNB sites in Israel which have yielded not only shells from the Mediterranean and the Red Sea, but even from the river Nile (Mienis, 1978; 1987).

A large part of the material is poorly preserved, with 75 % being small fragments. Nevertheless, we may state that the shell material has been used most probably as beads, pendants or other ornaments (Fig. 26). This impression is corroborated by the presence of five complete beads and one unfinished pendant made of shell, and two beads and one pendant made of stone (two of the latter are from Sq. J/K11 and one from Sq. I11d, Fig. 34).

### Copper

The largest mass of copper was found in room 1, sq. N10c, adjacent to the inner face of the western wall W10 (Fig.34), 0.85 m below the surface. It weighs 50.89 gramms. The original length of the mass is unknown, its cross section is apparently cylindrical with a diameter of ca. 4 cm. Both extremities have been ground roughly perpendicularly to the long axis.

The outer face of the mass is green due to a thin (less than 0.5 mm) coat of the mineral paratacamite Cu2(OH)3Cl, copper chloride hydroxide, a mineral common on weathered surfaces of copper in southern Israel and the Sinai. Below the thin green coating there is a black copper mineral, tenorite (CuO). A hole drilled to the centre of the sample revealed black tenorite throughout.

It seems improbable that the sample has been a copper ore or a nugget of native copper, because the oxidation of solid copper may affect at most a few mm below the surface, not as much as in our sample. Hence, it seems to us that the sample is a natural concretion, to be found in the Nubian sandstones on both sides of the Rift Valley. The same raw material later served in the onset of copper industry in the Chalcolithic Levant, in the 5th millennium BC, at Timna, Funon and elsewhere (Gilead et al. 1992; Rothenberg 1990).

The Nahal Reuel object may have been ground on both ends possibly to extract the black powder as a colorant. If it is true, then the object is unique since the black colorants known to us at the time were either plant ashes or manganese oxides (Soreq and Ayalon 1993).

## Spatial Distribution

It should be noted at the onset that layer B, the MPPNB habitation, was not completely excavated and the sterile reddish layer C was not atteined over the entire excavated area. Furthermore, a single living floor could be distinguished at the base of layer B, reached in a few places–in courtyard 4, room 1, room 5 and locus 12. Hence it may be concluded that all the finds in layer B, including the stone slabs found in some residential units, apperently belonged to that single floor. This would suggest post-depositional vertical movement up to 0.5 m. It remains to be seen whether lateral displacement took place as well, in which case a chaotic spatial distribution is expected. The distribution pattern of the most numerous artifact categories will be discussed first, in search of a pattern (Ronen et al. 1999).

### Cores

There is a striking division into a southern and northern zones, with a practically empty strip across squares 16–17 (Fig. 27). In the southern zone, the cores are concentrated along both sides of wall W25. Away from that wall, locus 13 is practically devoid of cores. Within the northern zone, the concentration gradually decreases from the north to the south and west. In room 1 and the knapping area locus 12, cores are abundant and distributed over the entire surface. In the other residence units the distribution is more restricted: in courtyard 4, cores are found near the northern wall and in the center. In room 2 cores occur mostly near the west wall and in the southern entrace, their absence from the northern part of room 2 is noteworthy. In room 5 the cores are clearly adjacent to both eastern and western walls. The last important

concentration of cores to be mentioned is in the western half of pit 11. The striking difference in core concentration on each side of pit 11 suggests that wall W14 was an active barrier, possibly with a top part made of organic material. In the western part of the excavated area (west of wall W12), there are but a few cores.

The spatial distribution of cores seems to reflect organized working spaces (Fig. 28). In room 1 and locus 12, cores were used or deposited all over. In rooms 2, 5 and in the courtyard, cores are more locally distributed, whereas in locus 13 they are missing altogether. This pattern may now be tested against that of other tool classes.

### Arrowheads

The spatial distribution of arrowheads is similar to that of the cores. Here too, there is a division between north and south areas with an empty strip between them. Here too, there is a scarcity of finds west of the residence, west of wall W12. A close view reveals, however, a distinctly different distribution pattern for broken and complete arrowheads. Generally speaking, complete points are mainly in the east and north (Figs. 29 and 30), while the broken ones are mainly in the west and southwest (Figs. 31 and 32). Thus, locus 7, locus 14 (along wall W25) and the western half of pit 11 contain mainly broken arrows. Mostly broken arrowheads are further concentrated in the southern and western parts of room 5, in the west side of room 2 and in the center of courtyard 4.

On the other hand, mainly complete arrowheads are found in the east side of room 2, in the north and east side of courtyard 4, the north and east sides of room 5, in locus 13 and along wall W21. There is a strong tendency for complete arrowheads to be close to walls: along the west wall of room 1, the north face of wall W21, the north wall of room 5. Complete arrowheads also align walls W23 and W24 in locus 9, the area west of the residence complex where artifacts are normally scarce. In courtyard 4, only complete arrowheads – though few – are found along walls W11 and W15 in the north, whereas numerous broken points were in the center. This fact may best be interpreted as complete arrows having stood against, or lied along, the walls.

The distinct distribution pattern of complete and broken arrowheads argues for a minimal post-depositional lateral displacement at Nahal Reuel. We suggest that the major concentration of broken arrowheads indicate garbage areas. Accordingly, the main garbage dumping areas were in locus 7 and 14, in the west-southwestern margins of the residential complex. Secondary dumping areas were in the center of courtyard 4 and in pit 11 (Fig. 32).

Surprisingly, the distribution of cores fits remarkably well the pattern just described for the broken arrowheads. This is clearly seen, for example, by the negative correlation in locus 13, an area with complete arrowheads but no cores. The cores are thus found in the garbage; it is perhaps possible to suggest that these cores were considered exhausted, whereas those found in the living quarters, amidst the complete arrowheads, were considered still workable (e.g., in room 1 and locus 12).

Awls constitute another important tool class at Nahal Reuel. Awls too exhibit the two activity zones noted above (Fig. 33), with very few specimens in the dividing zone accros squares 17–18. Of the 88 awls with known provenance, 57 % were in the northern zone, inside the residence complex and of these, 20 % (17 tools) were located in courtyard 4 alone. Ca. 15 % of the awls were in the southern zone, half of which in locus 13. In the western part of the site (west of wall W12) were found 15 % of the awls, widely dispersed.

When plotted against the arrowheads, most of the awls are associated with the complete points and only a minority is associated with broken points. In all the residence rooms except 5, the awls are found among complete points, while in room 5 they occur among broken points. In the southern activity zone, the awls are associated primarily with broken points (dumped awls?). A final remark concerning the spa-

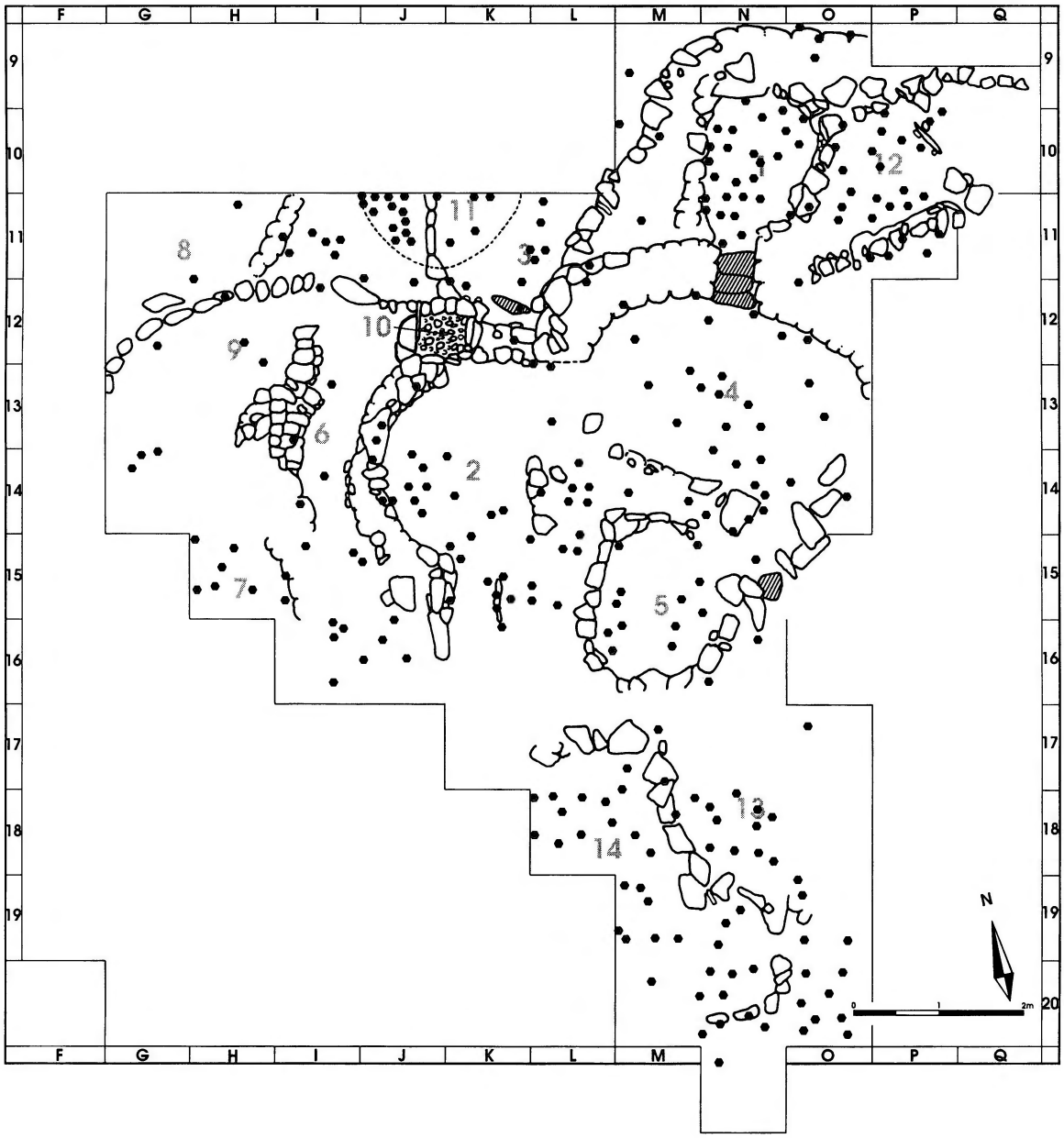


Fig. 27. Nahal Reuel Site, location of cores.

tial distribution of awls is their small number in locus 11, and their practical absence in the knapping area in locus 12.

Burins are few and distributed all over the excavated area (Fig. 33). Unlike almost all other artifact classes at Nahal Reuel, burins were not concentrated in courtyard 4, nor in any other area of the excavation.

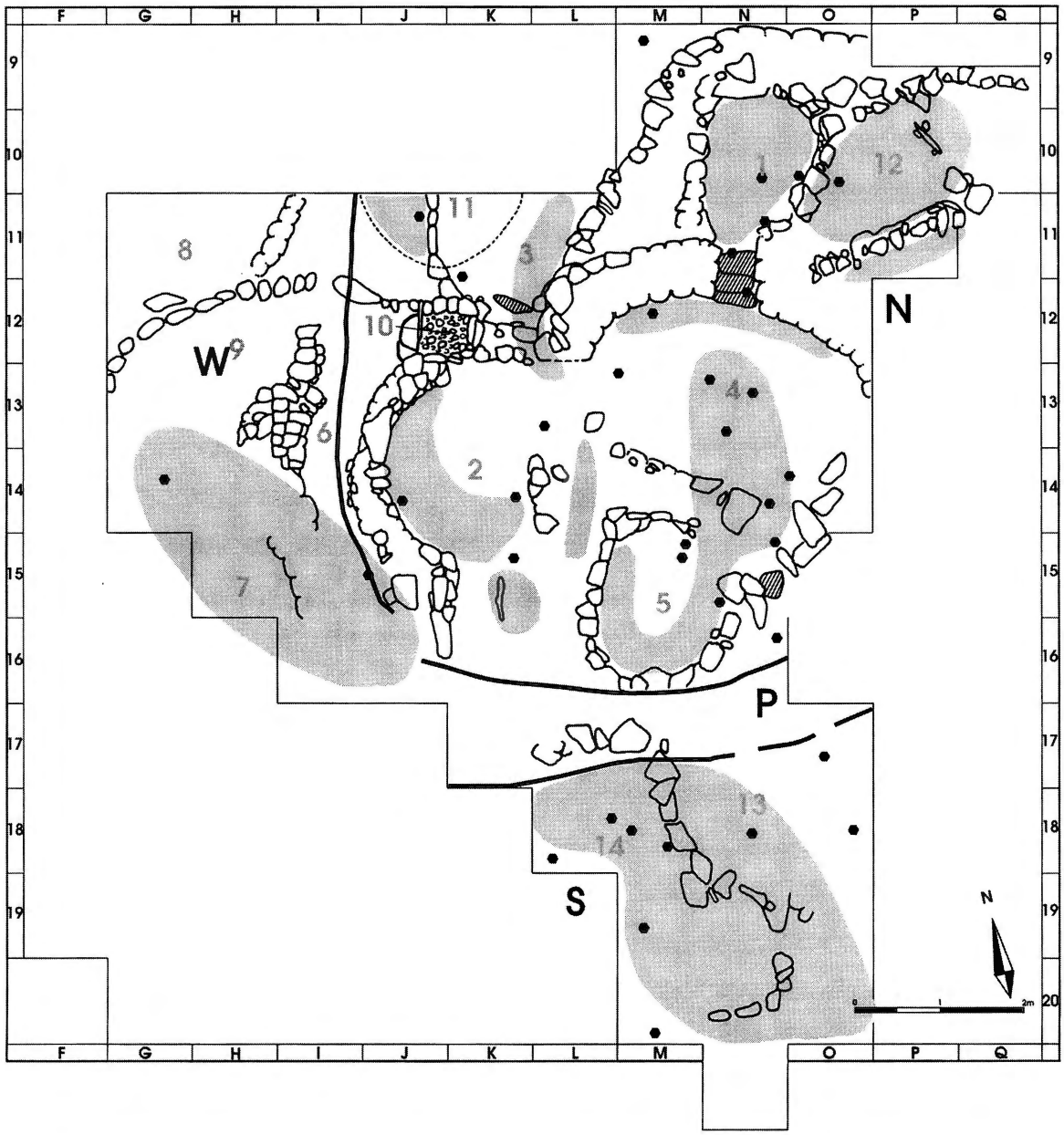


Fig. 28. Nahal Reuel Site, major concentrations of cores (shaded) and location of hammerstones (dots). N – northern zone; S – southern zone; W – western zone; P – path.

Grattoirs and Racloirs are quite rare at Nahal Reuel. Combined, they are outstanding for their relatively high number in the southern activity zone – ca. 33 %. In the residential complex there are 45 % of the grattoirs and racloirs, roughly equally distributed among the rooms. In the western zone there are 18 %.

Hammerstones are mostly located in the residential complex – some 60 % of the 36 specimens found (Fig. 28). The highest concentration is in courtyard 4, 7 pieces (20 %). In the southern zone there

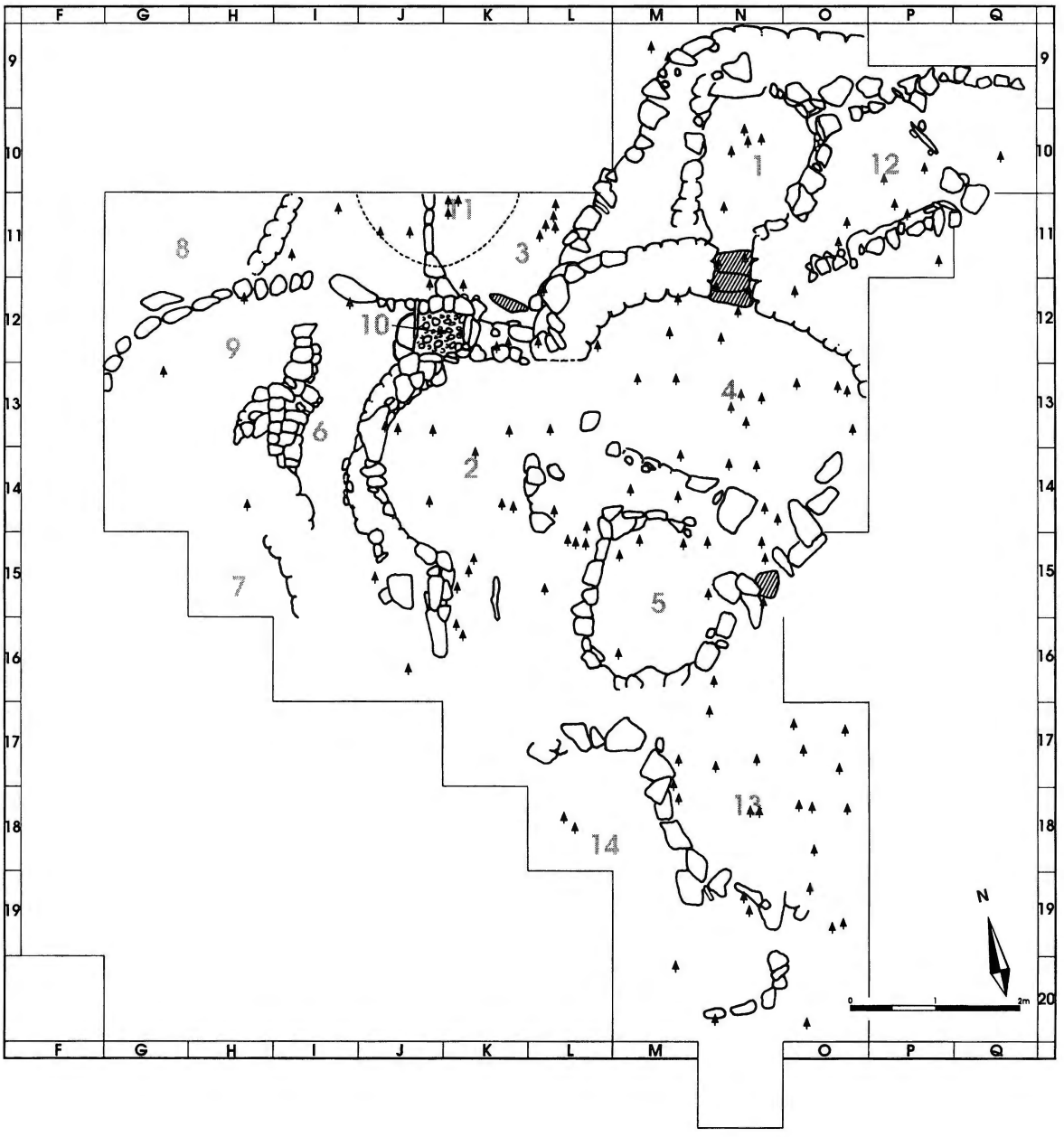


Fig. 29. Nahal Reuel Site, location of complete arrowheads.

are 9 hammerstones (25 %), twice as many in the garbage area Locus 14 (associated with broken arrowheads) as in locus 13. In the west only 2 hammerstones were found. Surprisingly, only one hammerstone was found in the knapping area in Locus 12 whereas the neighboring room 1 contained 5. Thus, the majority of hammerstones are associated with living quarters, and only a minority appear in the discard areas, possibly discarded specimens.

Grinding tools. The majority of the 16 specimens uncovered at the site were in the northern zone, and only a small minority (3 items) was found in the southern zone (Fig. 30). Considering grinding activ-

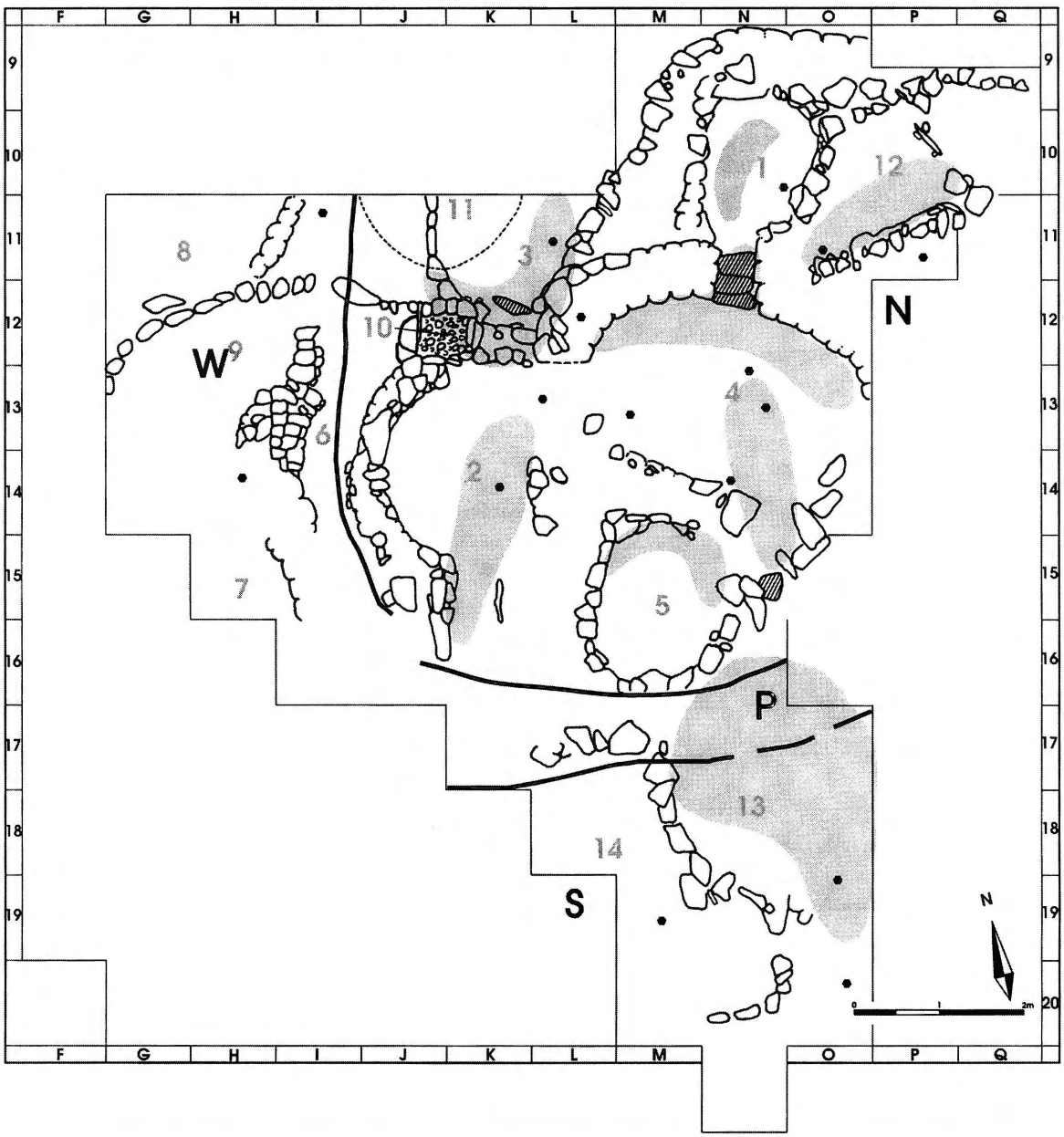


Fig. 30. Nahal Reuel Site, major concentrations of complete arrowheads (shaded) and location of grinding tools (dots). N – northern zone; S – southern zone; W – western zone; P – path.

ity, over 4 metres separate between the northern activity zone and the southern zone (from metre line 14 to 19). Additional observations concerning the spatial distribution of grinding stones are noteworthy: first, their large concentration in courtyard 4 (25 %); secondly, their very small number in the western part of the site, 2 only; and finally, 13 of the 16 grinding implements were among complete arrowheads, hence presumed in working condition while only two were associated with broken points, presumed discarded (in Locus 7 and Locus 14, Fig. 25). The position of one grinding tool, in courtyard 4, relative to arrowheads is unclear.

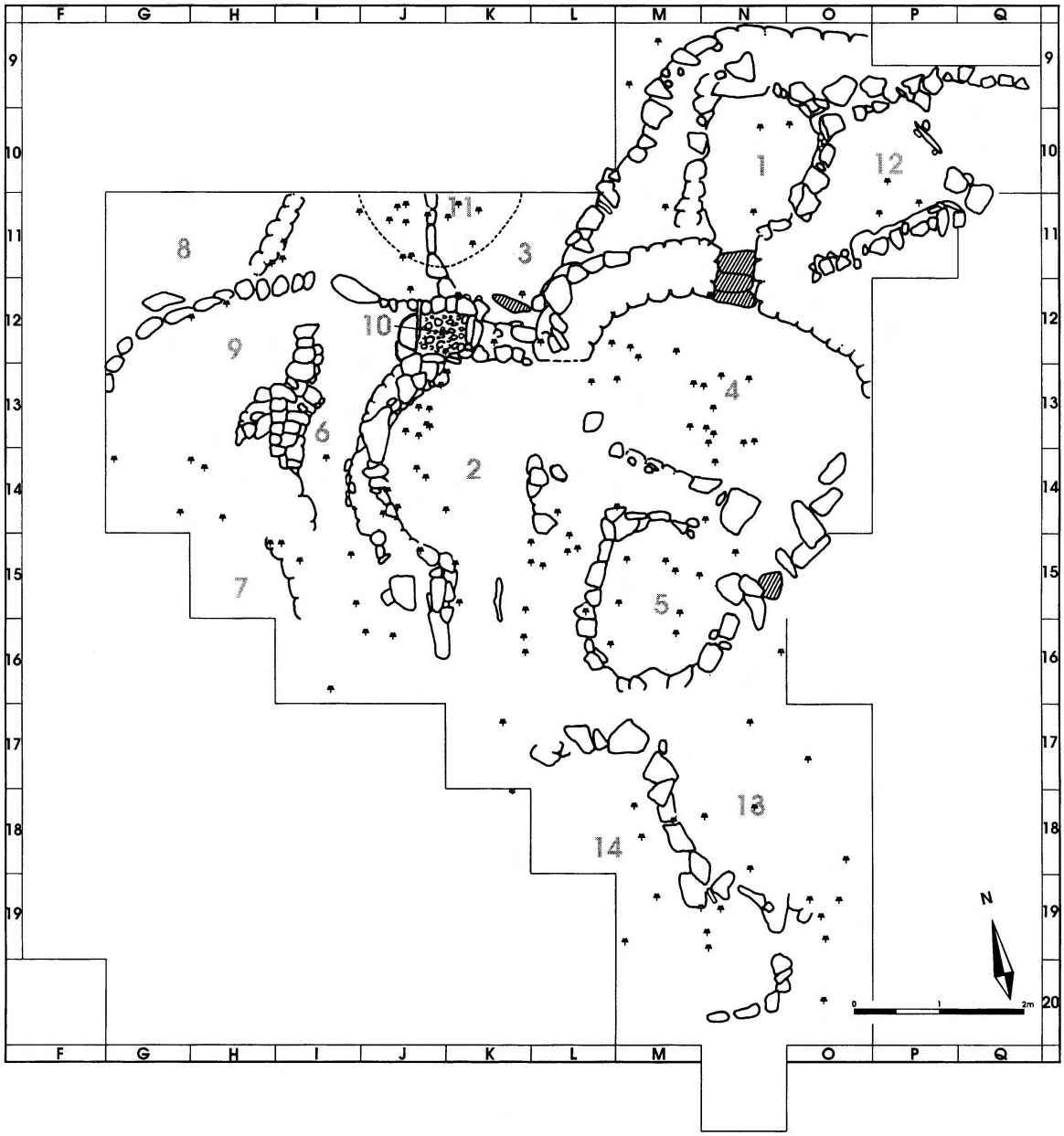


Fig. 31. Nahal Reuel Site, location of arrowhead fragments.

Shells The small number of shells recovered at Nahal Reuel show an interesting pattern of distribution (Fig. 34). Close to one half of the shells of known origin (8 of 19) were found inside the residential area, that is, in one third of the excavated area. Almost all the shells are within the residential area, the largest concentration is in and around room 5 (4 specimens). The single Mediterranean shell present at the site was found in an isolated position near room 1, as already mentioned above. It is noteworthy that only 2 shells were found in the courtyard, which was by far the main activity area at the site. Four shells were found in the southern activity zone and 4 in the ash pit in Locus 11. Thus, three major concen-

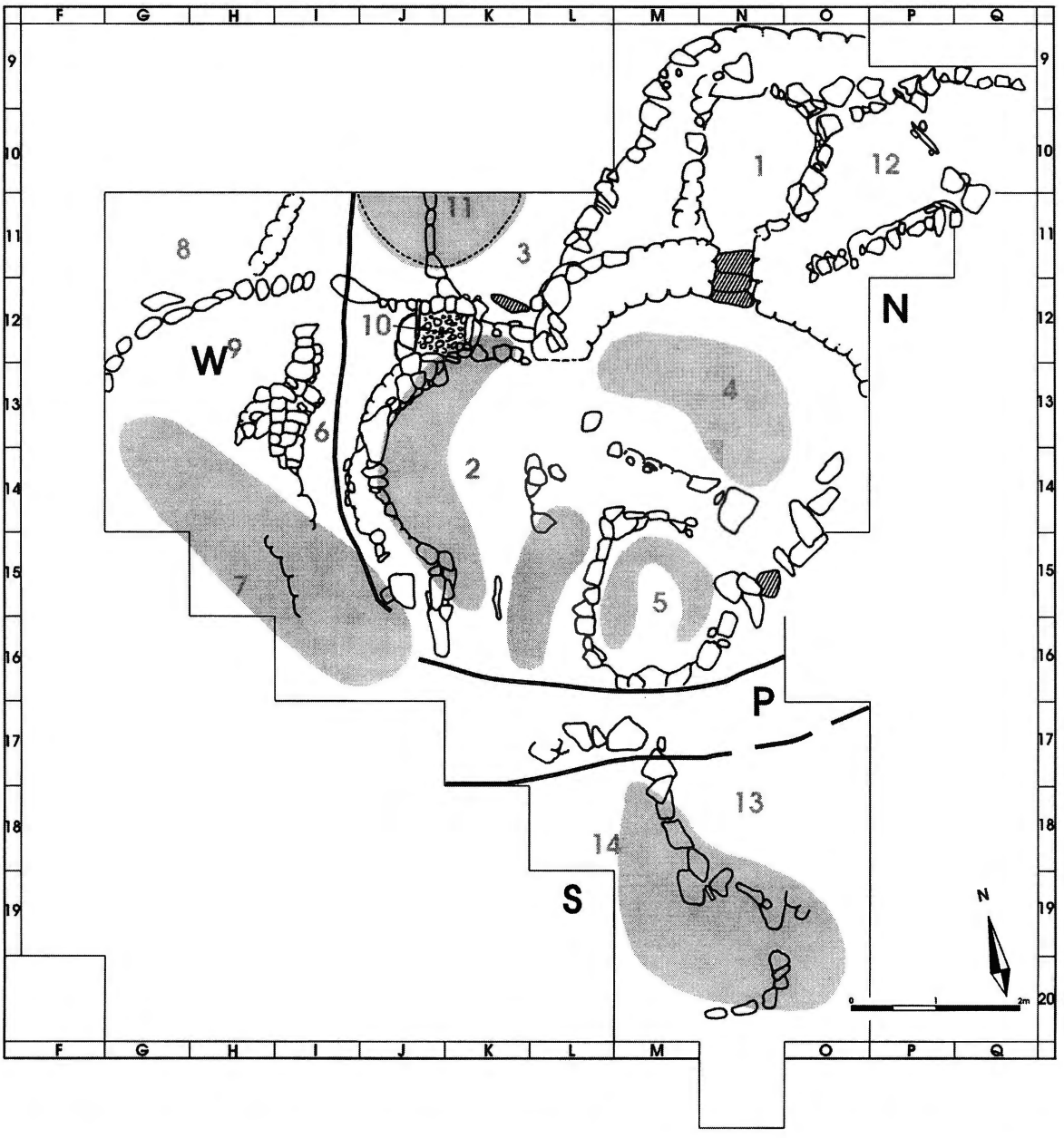


Fig. 32. Nahal Reuel Site, major concentrations of arrowhead fragments (shaded). N – northern zone; S – southern zone; W – western zone; P – path.

trations of shells are discernible at Nahal Reuel: in and around room 5, in and around the ash pit at J/K11, and in the southern area. It is also noteworthy that all three stone ornaments found at the site came from the ash pit in Locus 11, or very near to it.

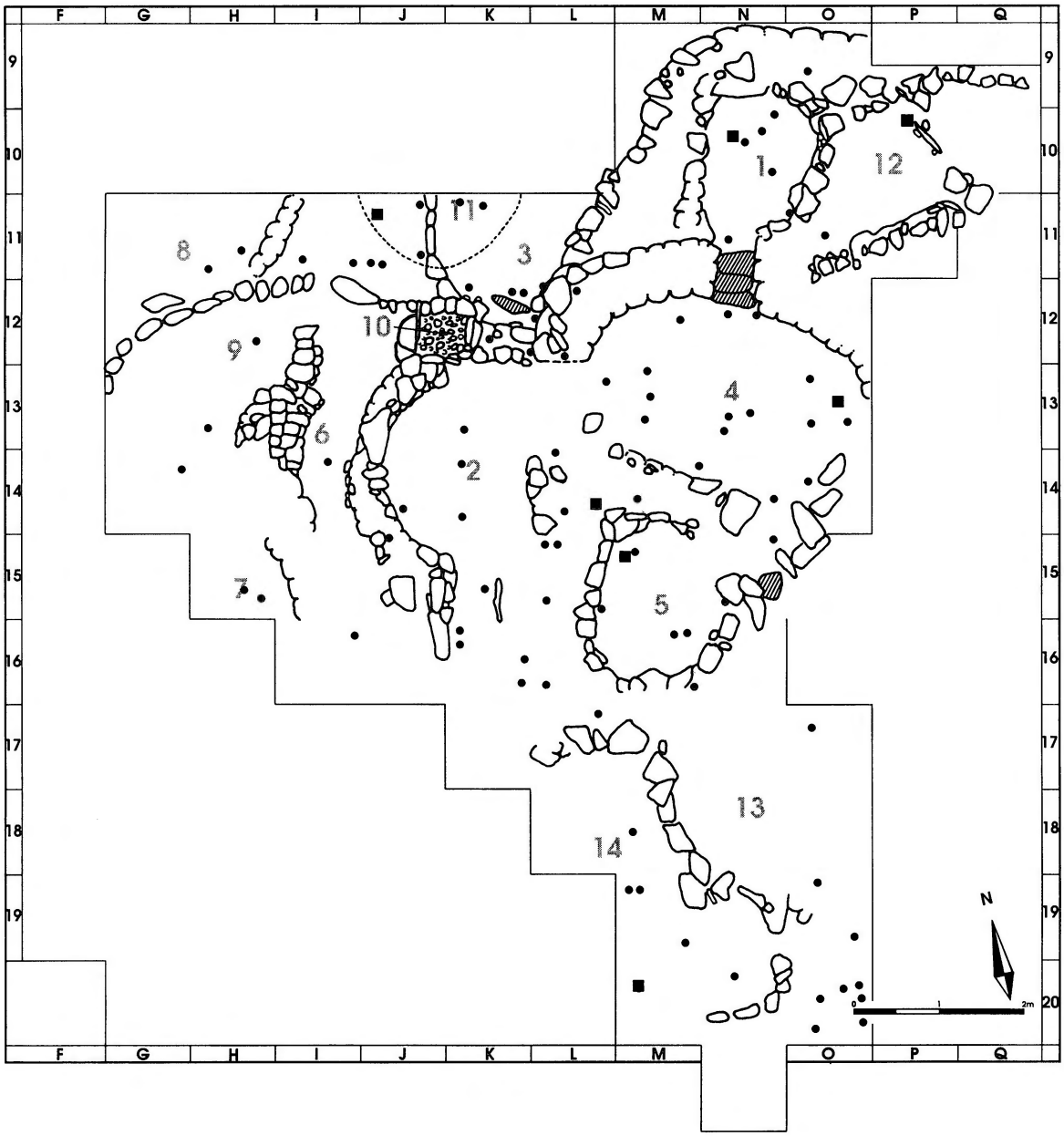


Fig. 33. Nahal Reuel Site, location of awls (dot) and burins (square).

## Summary

Nahal Reuel is a single-phase, MPPNB site from the first half of the 8th millennium BC. The lithic industry is characterized by naviform cores and by Jericho/Byblos type arrowheads, similar to Beidha (Mortensen 1970) and other contemporary south Levantine desert sites. Termed „Middle MPPNB" in the northern Levant (Cauvin et Cauvin 1993), this is the oldest MPPNB present in the southern Levant. In

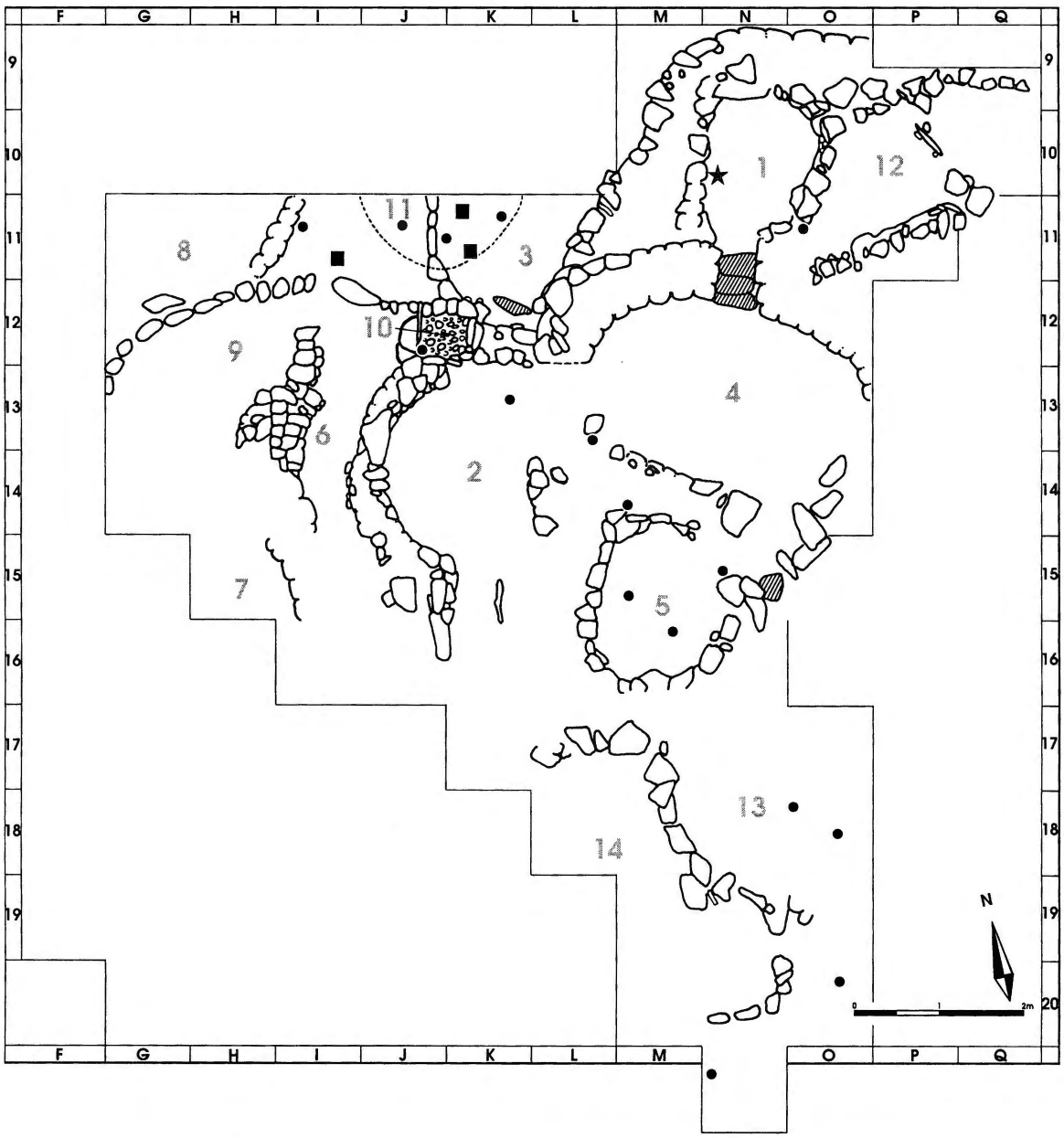


Fig. 34. Nahal Reuel Site, location of molluscs (dot), stone beads (square) and copper (star).

the second half of the 8th millenium, arrowheads were dominated by the Amuq point, as is the case in the neighboring site Nahal Issaron, just 3 km south of Nahal Reuel (Goring-Morris and Gopher 1983).

Our excavation revealed a residential complex of the central-court type, seemingly the oldest currently known in Israel (Avner 1998). The western border of the site was along the I squares of our grid, west of wall W12 where finds abruptly dwindle away. The other borders of the site lie outside the excavated area.

Two activity zones were revealed, a northern and a southern, separated by a practically sterile strip about 1.5 m wide stretching from square N17 in the east to squares K16/17 in the west. It may be postulated

that a walking trail had existed here, along the southern end of the residential complex. Activities were carried out mainly in the north and east parts of the excavation, marked by the presence of complete arrowheads, grinding stones, hammerstones and shell ornaments, beside other tool types. Garbage was discarded in the west and southwest, where mainly broken arrowheads accumulated. Food preparation and some other daily activities (e.g. piercing) were carried out mainly in the courtyard. Room 1 in the north of the residence complex perhaps served as a high place.

The subsistence heavily depended on hunting, as testified by the strong dominance of arrowheads. The types of animals hunted at Naha Reuel remain unknown, due to the poor conservation of bones at the site. It remains also unknown which vegetarian foods were processed by the relatively numerous grinding equipment.

Raw materials were procured in close-by sources (flint), in the proximity of the Red Sea (shells, sandstone and granit) and Timna (copper). Long distance ties appear rather undeveloped. It can not be excluded that due to locally adverse conditions, unknown at present, the inhabitants of Nahal Reuel at some point moved 3 km southward to the outlet of Nahal Issaron, to establish the PPNB site there (Fig. 1).

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