ARCHAEOLOGICAL EXCAVATIONS AT LATE PPNB BA'JA A PRELIMINARY REPORT ON THE 1997 SEASON

by

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Introduction

The excavations were carried out by the German Protestant Institute of Archaeology in Amman (DEI) in collaboration with *ex oriente* e.V., a research association at the *Seminar für Vorderasiatische Altertumskunde* of the *Freie Universität Berlin* (Germany) and the *Deutsches Archäologisches Institut, Orient-Abteilung* (Prof. Dr Ricardo Eichmann) in Berlin (Germany). Funding came from the *Evangelische Kirche in Deutschland* (EKD), the *Deutsche Forschungsgemeinschaft*, Bonn (DFG), *the Deutsches Archäologisches Institut, Orient-Abteilung*, Berlin (DAI) and *ex oriente*, Berlin. The Department of Antiquities in Amman (DAJ) substantially supported the project by covering work force needs. Logistic help was also provided by the *Conservation and Restoration Center in Petra* (Dr Helge Fischer). This campaign was co-directed by the authors.

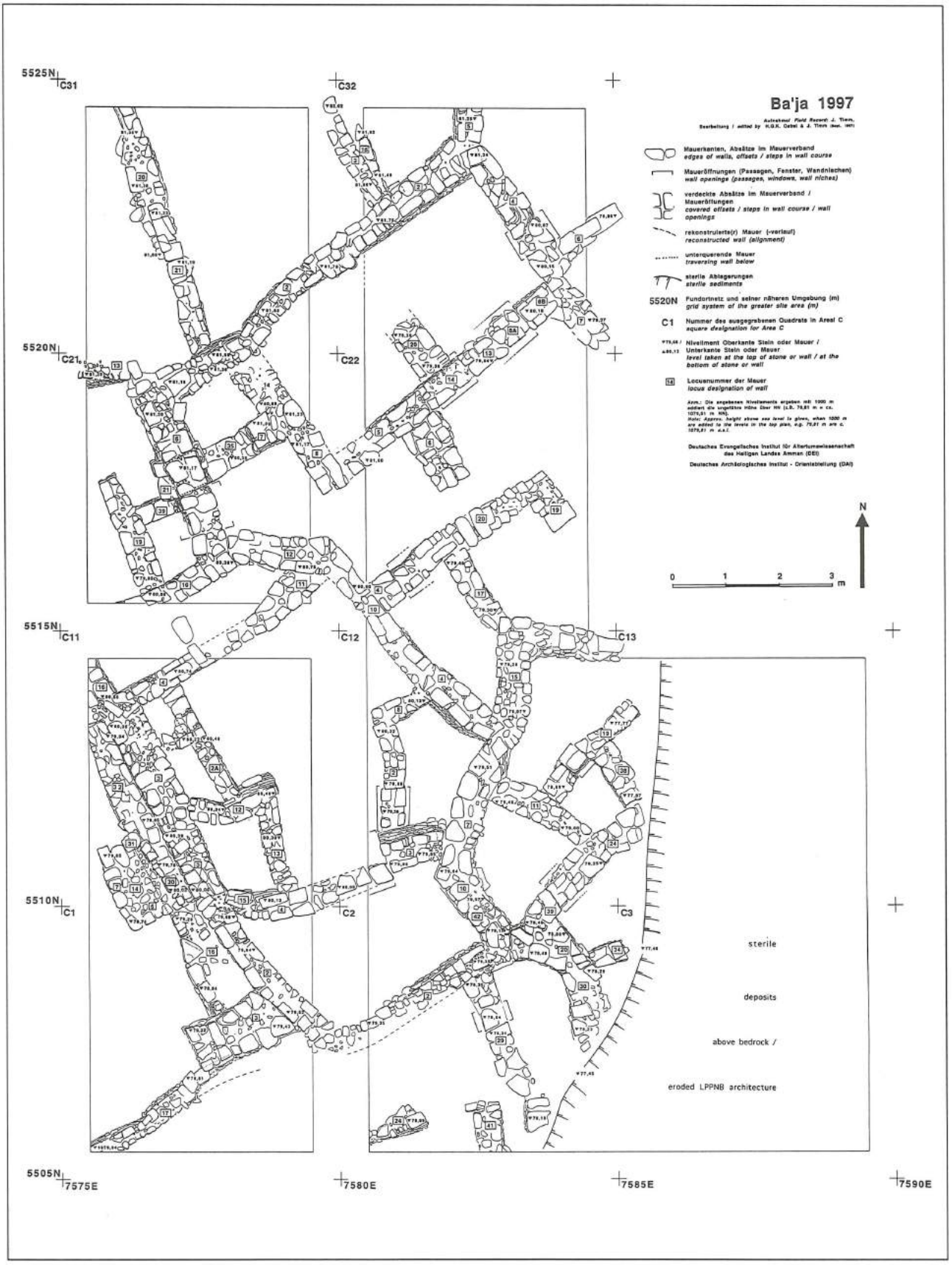
The excavations lasted from June 16th until July 20th, 1997. The first week of work concentrated on basic topographical reconaissance conducted by a team of surveyors. As well as starting with mapping the site topography, it included the layout of a grid system from which ten squares, measuring 5 x 5 m, in Area C were selected for excavation. The excavation area extended over part of a spur and the adjacent steep western slope of the main Neolithic occupation Area C (Fig. 1). Here, work concentrated on the exposure of the architectural remains down to the first floor of the upper occupation. Squares C1 - C2, C11 - C12, C21 - C22 and C 31-32 yielded well-preserved structures immediately below the surface (Figs. 2-5). To our surprise, Squares C3 and C13 (Fig. 1), situated in the central steep slope of Area C, did not contain any architecture. Instead, they revealed the sterile sandy layers of a Pleistocene intramontane basin fill, sharply separated from the lowermost occupational layers.

Further on, two test units were excavated in order to follow specific goals: test unit 1 (TU1) is a step-trench situated at the edge of the cliff that forms the northern wall of the Sīq Ba'ja. The aim was to investigate the sterile layers and their contact zone with the Neolithic occupation.

Test unit 2 (TU2) was situated in the wadi bordering the site to the north, in which ashy garbage deposits were found. These deposits yielded huge quantities of animal bones and chipped lithics, which were sampled in order to obtain a large collection of these find classes.

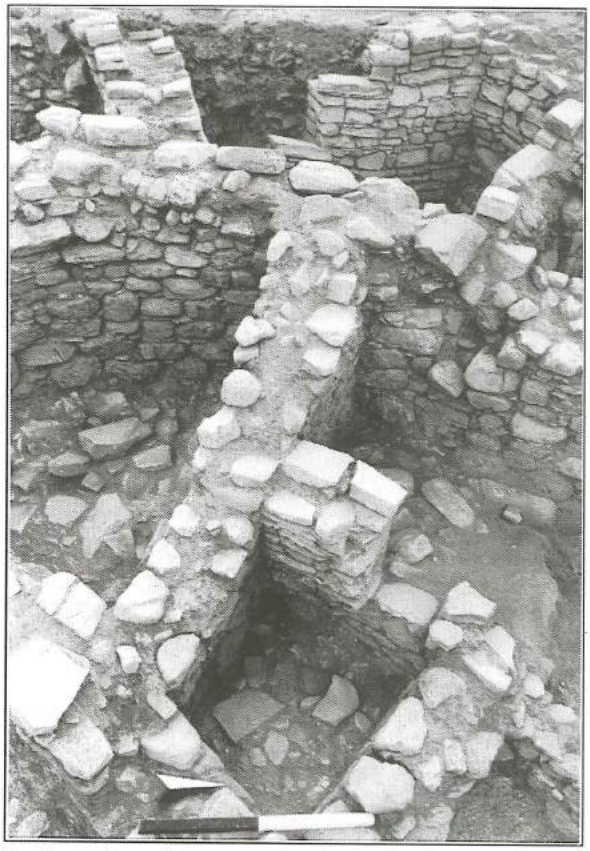
Apart from the excavation a site survey was carried out, plotting all surface archaeological features. This included the recording of the different categories of walls as well as grinding slabs and *manos* preserved to at least half of their original size.

Also, a survey in the vicinity of Ba'ja was conducted up to approximately 1 km radial distance. The aim of the survey was to detect possible outliers of the Neolithic occupation. According to preliminary results of this survey it seems that there was no further Neolithic occupation in the near vicinity of Ba'ja. The many small basins, partially, filled with sediments in the direct surrounding of Ba'ja did not show any surface or buried traces of settlement. However, remains of later - possibly Iron Age



1. Architecture of main building phase excavated in Squares C1-3, C11-13, C21-22 and C31-32 (top plan by J. Timm).

2. Excavated architecture in area C, view from north (photo: S. Fengler/N. Höffgen).



3. Remains of excavated rooms/courtyards of the main building phase in Square C12 (photo: S. Fengler/N. Höffgen).

and Nabataean - settlement activities could be detected and documented an several spots. Furthermore a number of possibly Nabataean terraces have been found north and northwest of the Early Neolithic site of Ba'ja.

It seems possible that numerous sediment traps may have been used by the Neolithic settlers of Ba'ja for cultivating and/or herd-

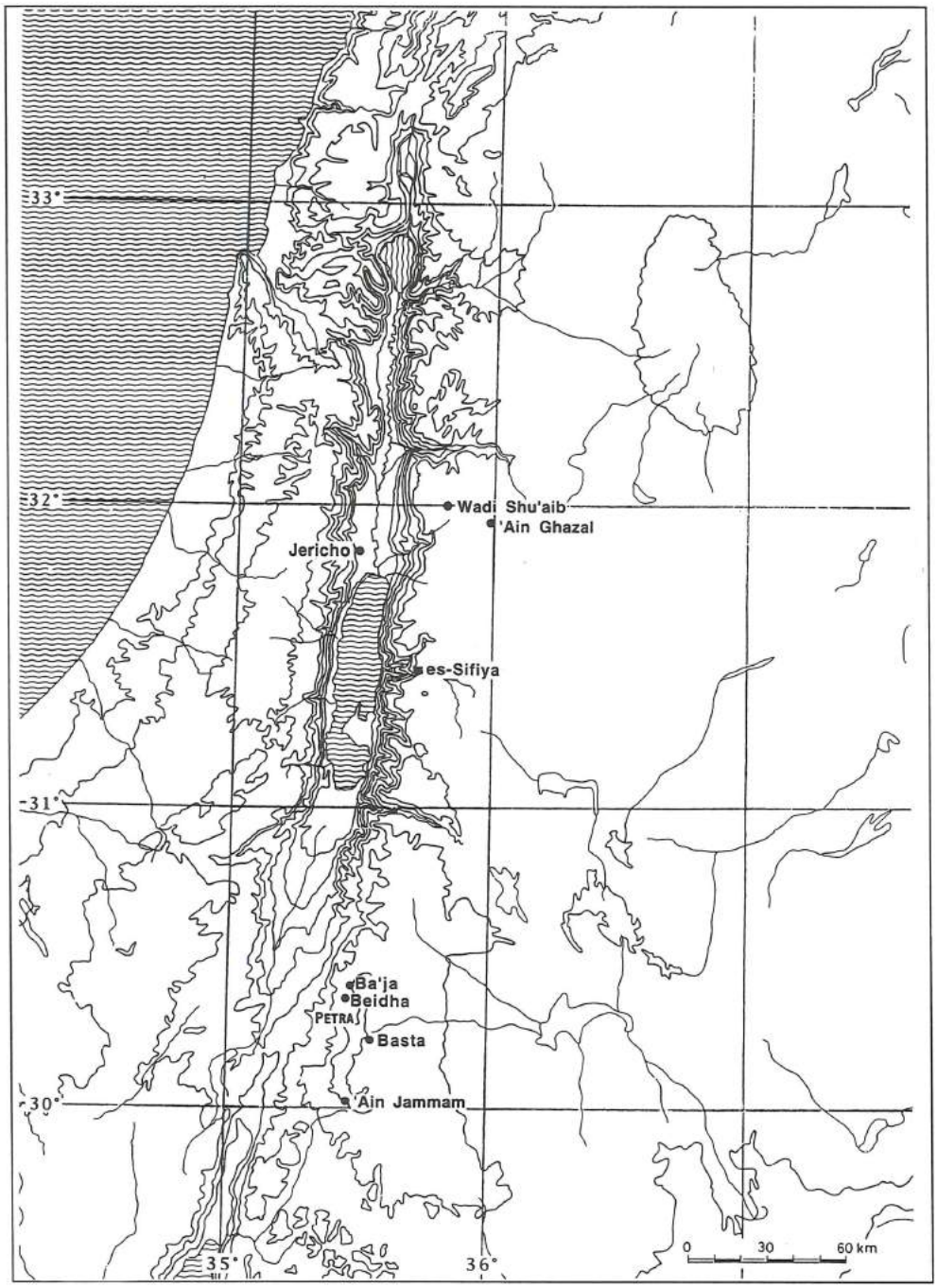
4. The compound/terrace wall which was found in Squares C1 and C11. This wall was stabilized by two succeeding reinforcements (photo: S. Fengler/ N. Höffgen).

5. The blocked passage in Square C12 (photo: S. Fengler/N. Höffgen).

ing purposes. However, proper evidence for this hypothesis is still lacking. No traces of springs which may have supplied the Neolithic villagers of Ba'ja with fresh water have been located in the near vicinity of the settlement, so the water supply system is still unknown (Müller-Neuhof 1997).

Site Setting

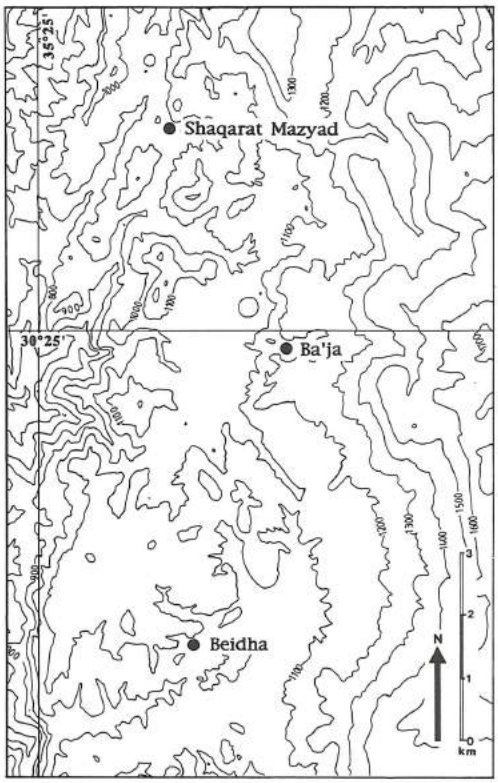
Ba'ja is located at 35° 27' 45" E / 30° 24' 55", ca. 1060-1095 m asl, some 11 km straight distance north of Wādī Mūsā / Petra in the lands of the al-'Amārīn tribe (Figs. 6 and 7). The MPPNB-LPPNB/C site of Bayḍā (Kirkbride 1966; 1967; 1968) is situated only ca. 6 km to the south (Fig. 7: a and b). The mean annual precipitation in this region reaches approximately 200 mm. Some local Beduin refer to the immediate site area as "al-Mehmad". The site rests on



6. Topographical map showing PPNB sites in Jordan.

topographically very differentiated intramontane steep slopes and is bordered by the Sīq Ba'ja to the south and nearly vertical rock formations to the north (Fig. 8). Today the site can only be reached through the Sīq Ba'ja, which is blocked at certain spots by huge fallen rocks and often bears a dense vegetation of oleander, juniper, pistachio and especially the thorny stone oaks. The fallen sandstone blocks created barriers of up to 5 m height (Fig. 9), behind which gravel accumulations raise the as-Sīq's bottom level. The as-Sīq itself has vertical walls of up to 70 m high, and is as narrow as 1.5 m.

The site was discovered in the late summer of 1983 by mountaineering members of Manfred Lindner's team from the *Naturhistorische Gesellschaft Nürnberg* (Germany) (Lindner 1996: 264, 267-270). They presented chipped lithics to H. G. Gebel (Lindner 1996: 268, fig. 21) and among

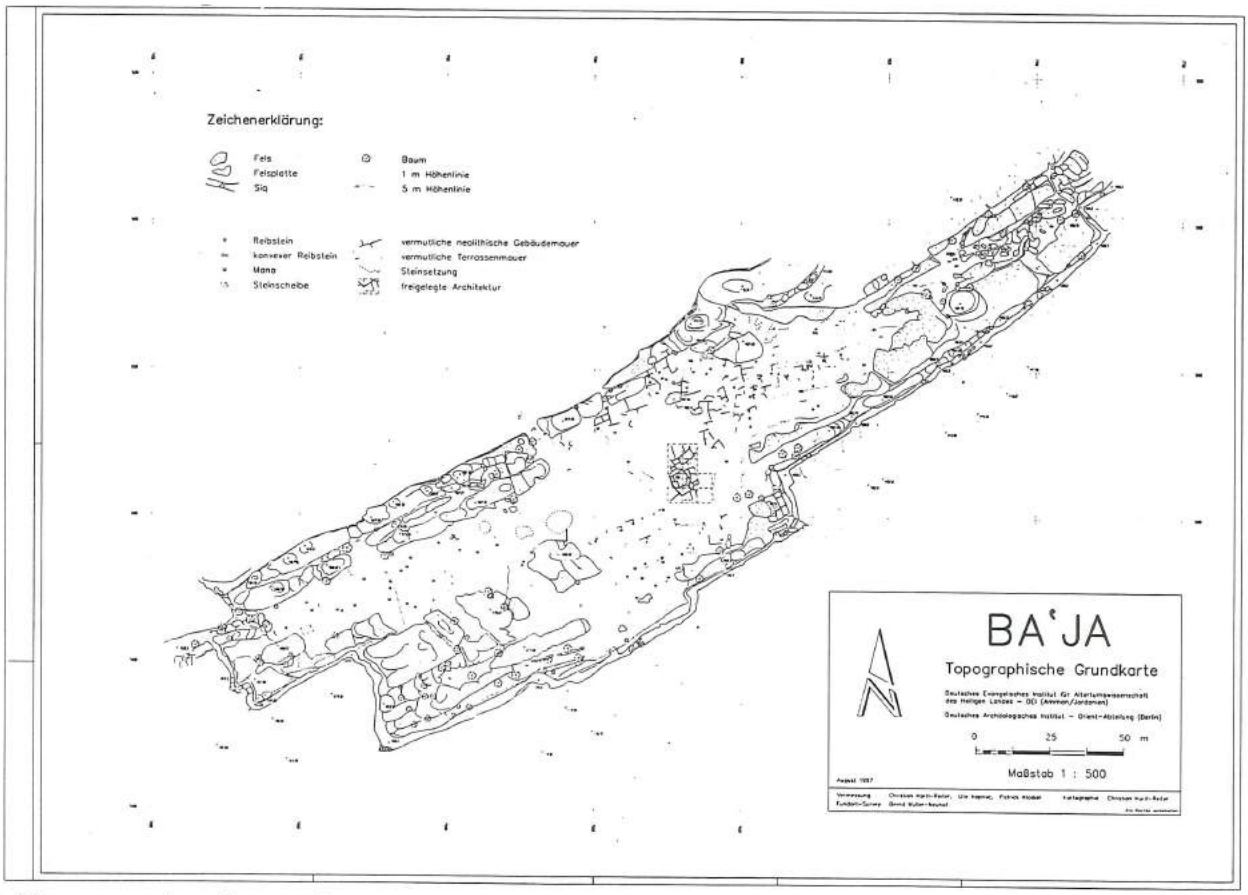


7a. Geographic setting of Ba'ja in the Greater Petra area.

these finds some diagnostic LPPNB material could be detected. After visting the site in autumn 1984, three soundings were made that year (Gebel and Starck 1985; Gebel 1988). These investigations aimed to retrieve palaeobiological samples from appropriate deposits, while the visible architectural structures were commented on but left untouched.

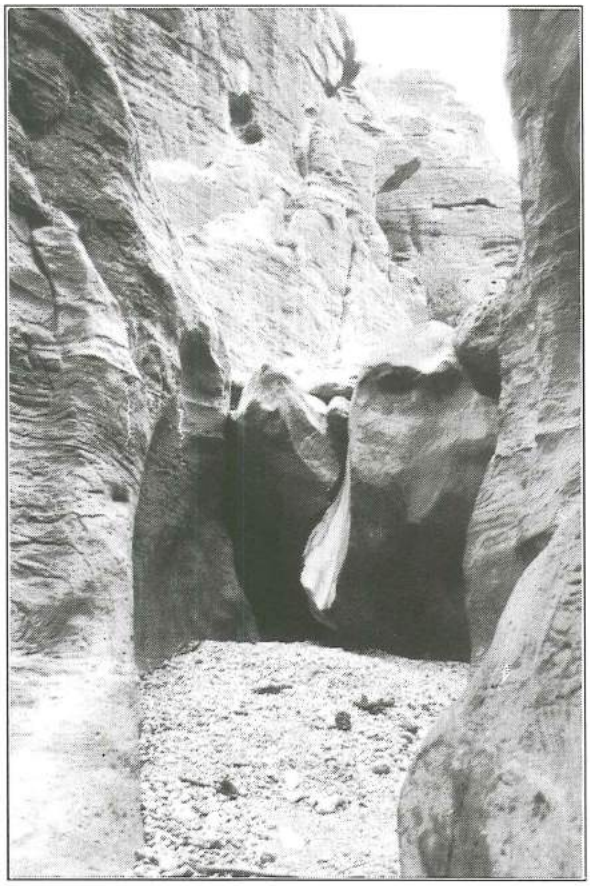
Site Extent and Preservation

According to the topographical survey and surface distribution of the LPPNB artefacts, the site extends over the complete intramontane surface enclosed by the Siq Ba'ja and the northern rock formations (Fig. 10). Its SW - NE oriented longitudinal axis is some 290 m long, its width varies from ca. 20 m at the western and eastern accesses to about 90 m in the central parts. The area was occupied in the later seventh mil-



7b. Site topography with area of excavation (topographical plan by C. Hartl-Reiter).

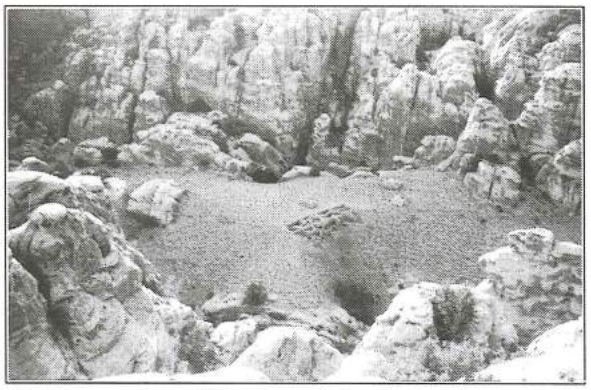
8. View from the east towards the location of LPPNB Ba'ja, before the excavation (photo: H.-D. Bienert).



9. One of the huge rock blockanges in the as-Sīq of Ba'ja (photo: H.-D. Bienert).

lennium bc and is roughly estimated to have covered some 11,500 sq.m. This would be ca. 5,000 sq.m larger than the preserved part of the site of Bayḍā, mentioned above (Gebel and Bienert 1997b: 15).

From both surface and the excavation evi-



10. The setting of Ba'ja and the excavation area in the midst of mountains, view from south-east (photo: S. Fengler/N. Höffgen).

dence it is obvious that we are dealing with well-preserved and dense terraced housing, probably comparable to that of some present-day villages in areas with similar settings (e. g. Ḍānā, aṭ-Ṭayyiba, Basṭa, etc.). The site survey, carried out by Bernd Müller-Neuhof, revealed that the densest concentration of near-surface LPPNB walls occurs on the highest parts of the site (areas D and upper parts of area C), while no such evidence comes from the as-Sīq bordering lower areas A and F. LPPNB grinding slabs and *manos* cover all parts of the site in varying densities. Their reuse by later visitors of the area cannot be excluded. In parts of the site, most likely due to field clearance activities of the post-PPNB until (or only in) Nabataean times, the stones from eroded LPPNB walls were thrown down the slopes. In other areas, the densly concentrated eroded wall stones created a natural pavement protecting the cultural sediments underneath. The later, most probably Nabataean, use of the site (judging from the pottery finds) exhibits activities related to the building of stone piles, field terrace walls, wall alignments, surface levelling, etc. (Müller-Neuhof, unpub. M.A. thesis).

It appears necessary to reconsider earlier assumptions on intensive spatial use within the bounderies formed by the bordering as-Sīq and rock formations: While TU1 and a step trench at the eastern preserved fringe in Square C3 indicate that at least in the lower

third to half of the sloping area C, the architecture and cultural layers are not preserved or did not exist, the sterile layers in TU1 and the aforementioned C3 trench clearly prove that the site here was founded on Pleistocene water-laid fills of a formerly closed intramontane basin, similar to the *playa*-like sedimentary environments exposed at the eastern edge of the plain of the Wādī al-Jabu. The question of domestic structures in the lower parts of this main occupation area (area C) remains the subject of discussion with several possible explanations. It seems that between the western and eastern retaining/compound walls of C1 - C11 and C2 - C12 stratified architecture exists, while to the east only single-phased rooms were built. This would imply that in this extreme sloping setting, building activities were restricted by impacts which were possibly caused by the danger of seasonal floods. This could explain the total absence of settlement activities, including architectural remains, in the easternmost part of Squares C3 and C13, as well as the sharp erosional cut through both the sterile layers and rooms dug into these layers in Squares C2 and C12. However, two other explanations remain. First, colluvial processes caused the removal of the lower architecture. Second, there may not have existed architecture in the steep lower parts.

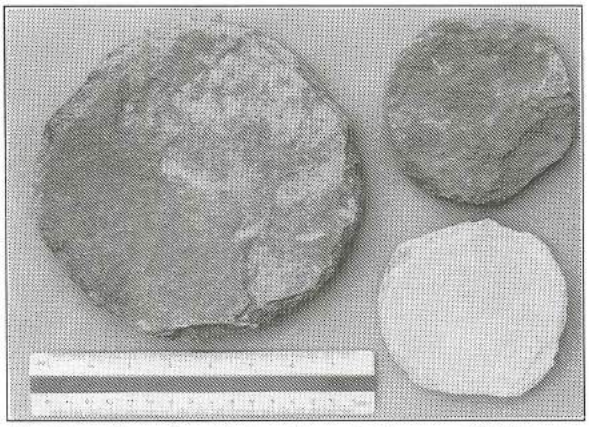
Architectural Remains and Stratigraphical Evidence

Apart from the situation in Squares C3 and C13, well-preserved and mostly dense double-faced recti-and sometimes curvilinear walls occur in all other excavated squares, forming rectangular or polygonal rooms (see Figs. 1-5). Although the ground-plan matches the known LPPNB architecture (Bienert in press; Mahasneh 1996, 1997; Najjar 1992, 1994; Nissen *et al.* 1987, 1991; Rollefson 1984; Rollefson *et al.* 1992; Waheeb 1996) characterized by very small rooms, there is clear evidence for large rooms and/or courtyards in the northern squares of the excavated area.

The walls resemble the building techniques of the other known LPPNB sites (e. g. Basṭa, aṣ-Ṣifiyya, 'Ayn Jammām): double-faced walls (see Fig. 3) made of local tabular sandstone slabs were erected and the individual courses were stabilized by smaller "wedging" stones (see Fig. 5). The faces of most slabs were roughly dressed. Although the wall faces were built with great care, they lack headers and thus stability. This is clearly visible in Squares C1 and C2, where the southern walls are barely preserved on one face. There is also evidence for less well-built, cobble-faced walls, which were perhaps built due to funtional changes and/or increasing the heights of walls.

As of yet, functional units cannot be isolated within the excavated layout (see Fig. 1). Communication between rooms is attested by wall openings and some of these were found blocked, indicating functional changes of the layout. Pre-planning or an intended ground-plan is expected to have existed, but must have been subject to topographical adaption and influence. It is clear from the site survey that the directions of walls did not necessarily follow contour lines. Most probably long-used, major walls served as compound and terrace/retaining walls for the terraced architecture (see Fig. 4). Apart from the cobble and lime plaster paved floors (Fig. 11) dug directly into the sterile soil (Squares C2 and C3), no evidence of initial foundation techniques has yet been identified at Ba'ja.

The long wall running from NNW to SSE in Squares C1 and C11 (see Figs. 1 and 4) was obviously too weak as it was stabilized by two succeeding reinforcements. First, a second wall was built adjacent to the western base of the long wall. Afterwards both of those walls had to be further stabilized by two buttresses, partly built over the first reinforcement wall.

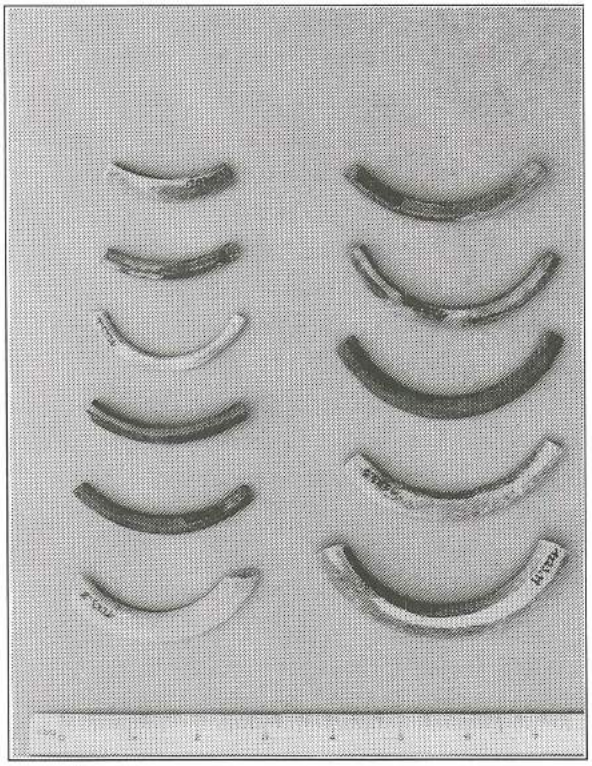


11. Remains of a plaster floor in Square C2 (photo: S. Fengler/N. Höffgen).

Within the architecture, three major activity zones could be indentified: In the eastern fringe of the exacavated area almost all rooms bore remains of ovens associated with ashy layers, often rich in animal bones. In the space largely covered by the northeastern part of Square C11, food processing activities had taken place, as evidenced by large numbers of grinding slabs and *manos*. This activity may also indicate that this area was not roofed but functioned as a courtyard. One grinding slab was found in its original position, set into a circular stone alignment. In the same area and the nearby vicinity, a high concentration of stone discs was found together with partially formed products, indicating a manufacturing area for sandstone rings (Figs. 12 and 13).

Figure. 1 illustrates walls related only to the main building phase of the settlement in

12. Flaked sandstone discs of different sizes used for the production of bracelets (photo: S. Fengler/N. Höffgen).

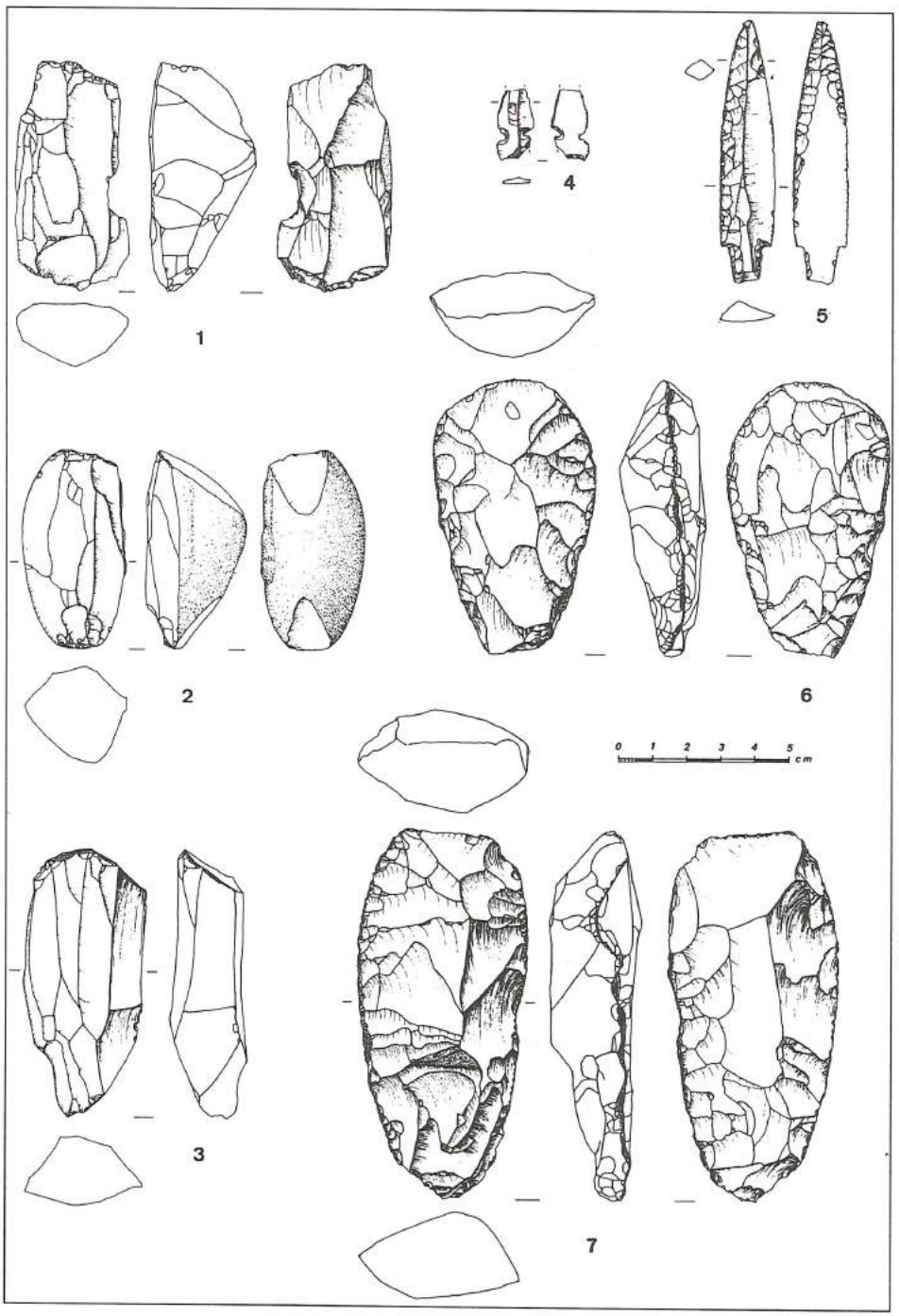


13. Examples of sandstone bracelets (photo: S. Fengler/N. Höffgen).

area C. Wall alterations and blockages indicate locally restricted changes, most probably representing subphases. An interesting succession of subphases came from the western room in C21. Here, a lower lying wall with an opening was blocked before its height was increased by a superimposed wall, leaving a step between both faces. This step might have supported a second floor, representing evidence of two-storeyed building units. This assumption is further supported by the fact that the top of the western partition wall and the top of a buttress interlinking with the above-mentioned two-phased wall are on the same level as the wall step, which supports wooden beams. Small and very fragile remains of red painted wall plaster were retrieved from the wall of the western room in C21.

Ground and Chipped Stone Industries

Both the ground stone and the chipped lithic industries are well represented and reflect the spectra of types known from other late PPNB sites (Fig. 14). However, some



14. LPPNB chipped lithic artefacts: 1-3 bidirectional (pse-udo-naviform) cores, 4-5 arrowheads atypical for the industry (Khiam Point, tanged arrowhead), 6 celt, 7 adze (pre-1997 surface finds, by H. G. K. Gebel).

peculiar aspect can already be mentioned. Although the stone vessels and abundant grinding tools are attested as classes, the variety of sub-classes – by means of types– seems to be less developed, when compared with other sites such as Baṣṭa and 'Ayn Jammām.

The primary production of the flint industry does not contain the typical naviform cores and their preparation waste, although rare bi-directional cores (Fig. 14:1-3) do resemble this specific reduction technique. Characteristic of these cores is that they have been reduced to the utmost; the average length of debitage blades being considerably smaller than those of Baṣṭa. An explanation for that must be sought in the fact that tabular flint was rarely used at Ba'ja, and that mostly wadi pebbles of greyish flint were exploited. Behind that fact, a pre-

dominantly household-level based production must be expected.

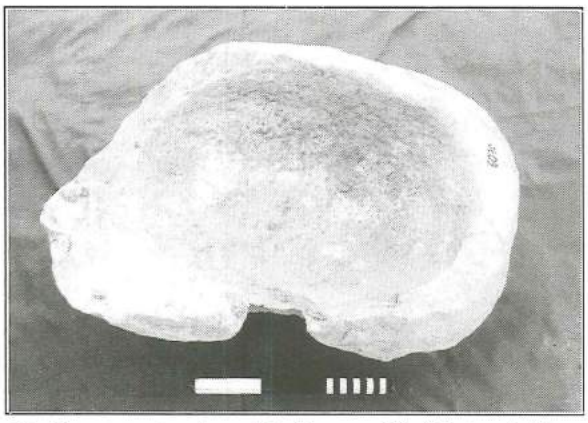
In the excavated areas, and from the surface we have no evidence yet for specialized workshops on an industrial scale for either primary or secondary production. TU 2 clearly yields the material of such a workshop, exhibiting both primary production (few cores only), as well as (denticulated) arrowhead and borer manufacture. The tool kit seems somewhat restricted to arrowheads (Fig. 14:4-5), celts (Fig. 14:6) borers, adzes (Fig. 14:7), hammerstones; retouched or ad hoc implements do not seem to be abundant.

Also the grinding tools and stone vessel fragments resemble the classes characteristic for the LPPNB (Wright 1992). A huge mortar (Fig. 15) was found in Square C1 west of the long compound wall running from NNW to SSE.

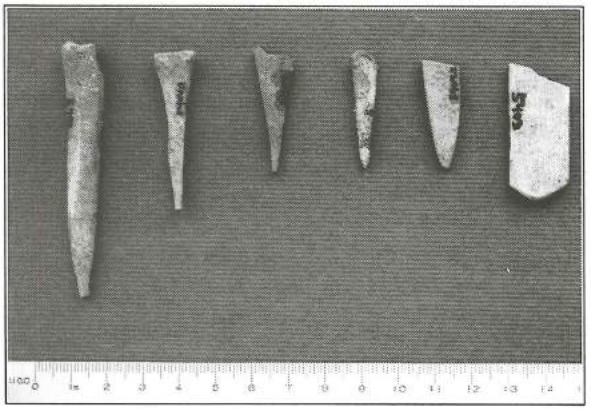
The flint and ground stone industries of Ba'ja reflect the tool kits of a self-relying regional centre rather than that of a centre involved in large-scale surplus production and exchange, which allows a distinction to be made between a "manufacture" and "industrial" mode of lithic production.

Bone Industry

The worked bone industry is almost exclusively represented by tools and tool fragments belonging to the classes of piercers and spatulae (Fig. 16). One piece is an in-



15. Huge mortar found in Square C1 (photo: S. Fengler and N. Höffgen).

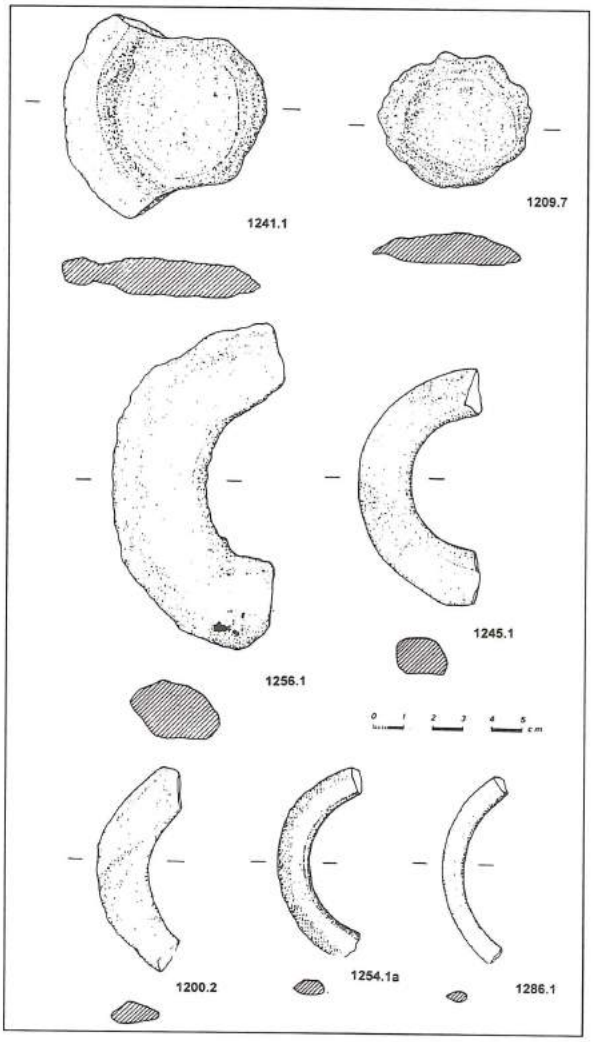


16. Examples of bone implements from LPPNB Ba'ja (photo: S. Fengler/N. Höffgen).

cised tubular bone blank from which bone beads were cut off. The bones used for the production of tools belong to cattle (Fig. 16:5403), sheep/goat (Fig. 16:5404.1-2) and small - not identifiable ruminants (Fig. 16:5402 and 14:5404.2) (von den Driesch, pers. comm.). A detailed study of the animal bones as well as the bone tools is under way.

Sandstone Ring Manufacture

The site was obviously a centre for the production of sandstone rings, probably on an industrial scale (cf. also Starck 1988). Certainly the amount of finished products seems to far exceed the local demands of a site like Ba'ja. Based on the archaeological context. Several areas within the village seem to have been reserved for the production of these rings Pointing to this interpretation are the abundant tabular raw materials of the Cambrian sandstone which is available locally. Sandstone rings are known from other PPNB sites, such as Bas a (Nissen *et al.* 1987: 114, fig. 17.1-4; Starck 1988) and aṣ-Ṣifiyya (Mahasneh 1996: 140, fig. 9.10; 1997: fig. 8). In Ba'ja all of the production stages could be found and documented for the first time (Fig. 17). They are represented by the semi-, unfinished and broken elements of the "chaîne opératoire" and are attested as follows: After selection of the tabular material the sandstone was flaked bifacially into a disk



17. The different production stages (from top left to bottom right) of the sandstone bracelets as documented in Ba'ja (drawing: S. Shraydeh).

shape, varying in diameter from 4 to 16 cm (average: 8-9 cm). From this disc an inner disc was removed (Fig. 17:1209.7). Work traces (Fig. 17:1241.1) indicate a concentric graving and possibly a low-pressure chiselling process from both sides until a raw ring was produced (Fig. 17:1256.1). While the inner discs may have been transformed into other artefact types (perforated and surface-smoothed stone discs of 4-5 cm in diameter) (Fig. 18:0406.4 and 1231.3), the raw torus for the intended sandstone ring was ground in various stages (Fig. 17:1245.1; 1200.2 and 1254.1a) until final grinding brought it the finished shapes (Starck 1988) (Figs. 13 and 17:1286.1). Back staining of the rings is an often observed procedure. Bicolour decoration can result from the later removal of the stain by grinding it from interior or obverse surfaces.

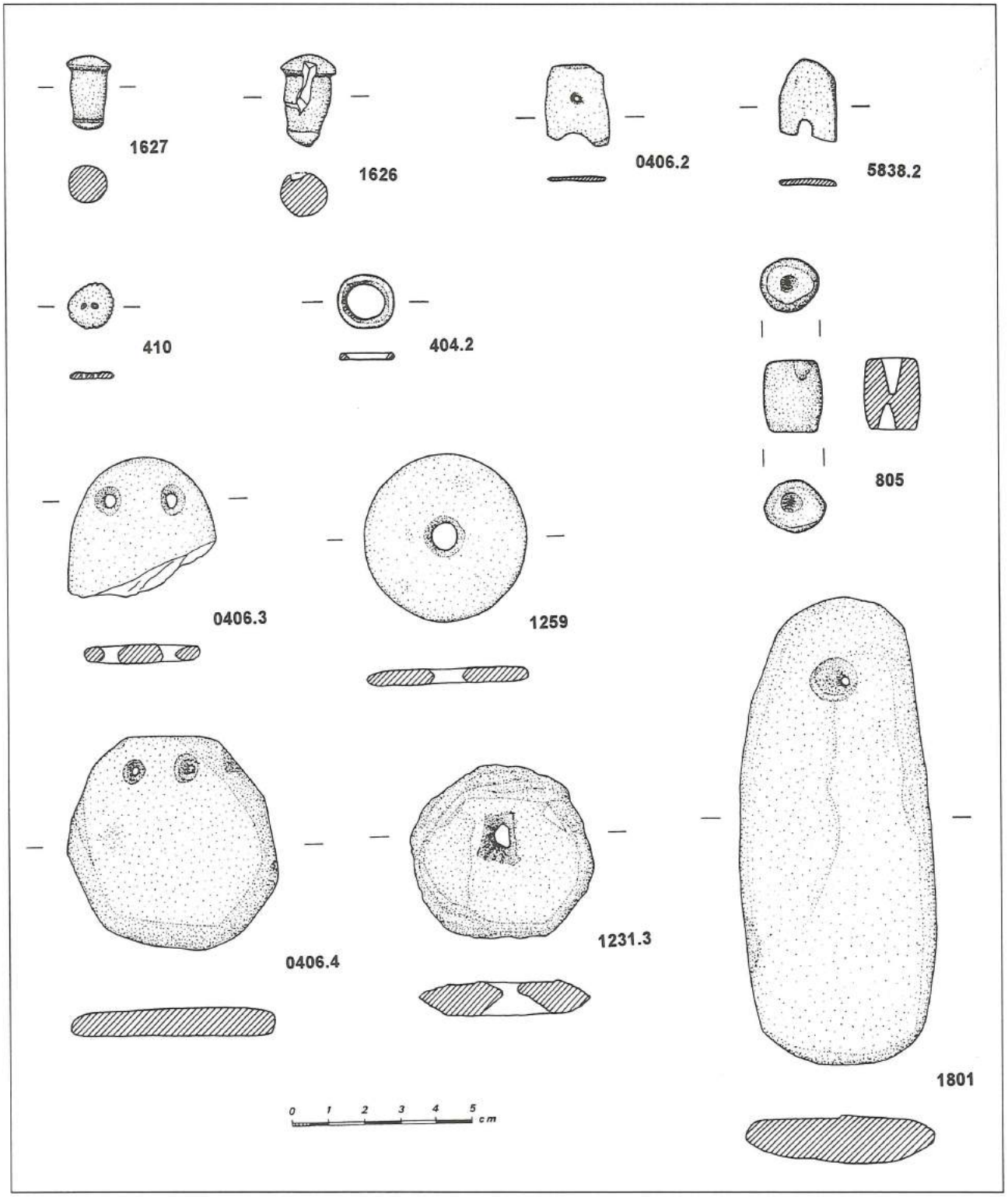
Other Prestige Goods

Evidence of other prestige goods is rather rare at Ba'ja. Apart from the sandstone rings only a few items have been found that are worth discussing. As mentioned above, some of the inner discs which were by-products of the sandstone ring production were transformed into other objects, such as sandstone pendants (Fig. 18:0406.4 and 1231.3). However, stone pendants were also produced separately. They are of an elongated shape (Fig. 18:1801 and 0406.3) or round with a concentric hole (Fig. 18:1259). Marine molluscs - most probably coming from the Red Sea and/or the Mediterranean were transformed into pendants, too.

Some other objects are made of mother-of-pearl. The function of two fragments is not identifiable (Fig. 18:0406.2 and 5838.2), although they may have been parts of pendants. One object is of button shape (Fig. 18:410). A number of rings and ring fragments are also made of mother-of-pearl. One complete ring seems too small to have been used as a finger ring, unless applied to babies or children. The inner diameter of this object is just 1 cm (Fig. 18:404.2).

Beads, which are still very rare at Ba'ja, are either made of stone or marine molluscs. One bead was found unfinished (Fig. 18:805) with the drilling not fully executed.

The function of two almost identical objects (Fig. 18:1626 and 1627) is not yet clear. They have been made - as it seems after a first superficial examination - of a soft limestone. Objects of simliar and exactly the same shape have been found at LPPNB Baṣṭa (Nissen *et al.* 1987: Fig. 17.5; Nissen *et al.* 1991: fig. 6.6-7). Hermansen interprets these objects at Baṣṭa as "tokens" or "counters" (Nissen *et al.* 1991: 29).



18. Selection of small finds from Ba'ja (drawing: S. Shraydeh).

Subsistence Evidence

A first on-site scanning of the bone sample from TU2 by Cornelia Becker (*Freie Universität Berlin*, Germany) revealed the following species: wild and domestic goat, domestic sheep?, aurochs (*Bos primigenius*), *Equus africanus*?, a small and a large type of gazella, wild boar, hare, hedgehog, hyrax and small carnivore (fox?).

A first analysis of the botanical remains

has been undertaken by Reinder Neef (*Deutsches Archäologisches Institut - Eurasien Abteilung*) who also joined the excavation and collected some of the samples. Preliminary results indicate that botanical remains at Ba'ja were only preserved in a carbonized form, the main category being charcoal. Most of the charcoal belonged to a juniper species, most probably the Phoenician juniper (*Juniperus phoenicia*), which is still the main component of the woody vegetation in the surroundigs of Ba'ja. All the excavated wood identifiable as construction wood belonged to juniper. The rest of the charcoal belonged to pistachio, most probably *Pistacia atlantica* or *Pistacia khinjuk*. Nowadays both pistachio species are also still common in the Ba'ja region.

Remains of fruits which could be collected belonged to wild pistachio, hawthron (*Crataegus azarolus/aronia*) and fig (*Ficus sp.*). Remains of cultivated plants were rarely found, suggesting that crop plant cultivation was less important in LPPNB Ba'ja. Only a few remains of the processing of emmer wheat (*Triticum dicoccum*), the so-called glume bases and spikelet forks, were retrieved (Neef, pers. comm.)

Human Remains

So far, no human burials have been encountered in the excavated squares; although a few human remains were found among the animal bones and flint artefacts concentrated in the ashy deposits of TU2. This evidence is quite striking since it occurs in a very homogeneous deposit related to habitation clearance, such as removal of chipping debris, food remains and ashes.

Due to the fact that the floor level was not reached in most rooms during the excavation campaign, the possibility still remains that human burials might have been placed under the floors of rooms, a habit very common in the PPNB (Bienert in press; 1995; Rollefson 1983; 1986). Neither the site, nor the vicinity survey revealed any traces of burials.

Conclusions

The results of the 1997 campaign can be summarized as follows:

1) The occupational level of the architecture and the associated material culture are of Late Pre-Pottery Neolithic date (second half of the seventh Mill. bc); occupational layers within the room fills are most likely related to the same culture, representing the use of the ruins after sedentary habitation came to an end or after a shift from the (excavated) area.
2) The type of architecture resembles in all respects exactly what has been found in Baṣṭa (Nissen *et al.* 1987; 1991), 'Ayn Jammām (Waheeb 1996), Ghwair 1 (Najjar 1992; 1994) and aṣ-Ṣifiyya (Mahasneh 1996; 1997). The architecture represents a multi-roomed rectangular association of roofed rooms and open spaces. Connections between the rooms existed through passages built into the groundplan via wall-openings and via possibly roof-tops. Architectural subphases existed and altered the groundplan within the framework of three major compund/terrace walls. Whenever topography required it, the groundplan of the smaller rooms became curvilinear or polygonal. Room sizes may vary from 1.5 - 15 sqm. Subphases can be well distinguished by additions onto existing wall tops, as well as additions to the ground plan. Reinforcement measures by buttresses and secondary walls to stabilize the terrace and room walls are well attested.
3) Unexpected was the fact that the lower third of the south side had eroded away, may be due to a much higher level of wadi floods in the post occupational period. Further investigations of this aspect of the site preservation is necessary, as well as an evaluation of whether or not the lower part and the steep part towards

the edge of the as-Sīq had ever been built upon.

4) Contact zones of the cultural layers with the sterile substrate are attested and show that the area on which the site rests was once a closed intramonatne basin filled with water-laid sandy sediments (playas). At one spot it was obvious that the rooms were dug into these sterile layers. Lime plaster floors were placed on this sterile foundation, with a cobble surface between.
5) For the chipped lithic industry, it is striking that the site seems not to have had specialized naviform workshops. This element known from other LPPNB central settlements is missing, but a nonnaviform bidirectional blade technology exists as shown by cores with detachments from all around the (round) platform.
6) The ornament industry is poor in comparison to other contemporary sites, although the site was a fabrication centre for sandstone rings, probably on an scale which did serve the whole region: all stages of manufacturing of these goods is attested and we can expect that it played a major role for the wealth of the settlement (trade).
7) No burials were encountered so far despite the occurence of human bones within the cultural debris.
8) Subsistence relied on emmer wheat, wild pistachio and the exploitation of juniper and pistachio wood as well as a diet of animal protein which made use of the following species: wild goat, domestic sheep/goat, gazelle, wild boar, aurochs (*Bos primigenius*), African wild ass, hare, hedgehog, equid (*Equus africanus?*), hyrax, and various birds.

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