WĀDĪ ABŪ ṬULAYḤA: A PRELIMINARY REPORT ON THE SUMMER 2008 FINAL FIELD SEASON OF THE JAFR BASIN PREHISTORIC PROJECT, PHASE 2

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Introduction

The primary purpose of the Jafr Basin Prehistoric Project is to trace the process of pastoral nomadization in the area on the basis of specific archaeological evidence and, in so doing, shed new light on far-reaching socio-economic reorganization in the later prehistory of the southern Levant. For this purpose, we have continuously investigated a dozen archaeological sites since 1997, focusing on the four millennia spanning from the Pre-Pottery Neolithic B (PPNB) to the beginning of the Early Bronze Age (EBA).

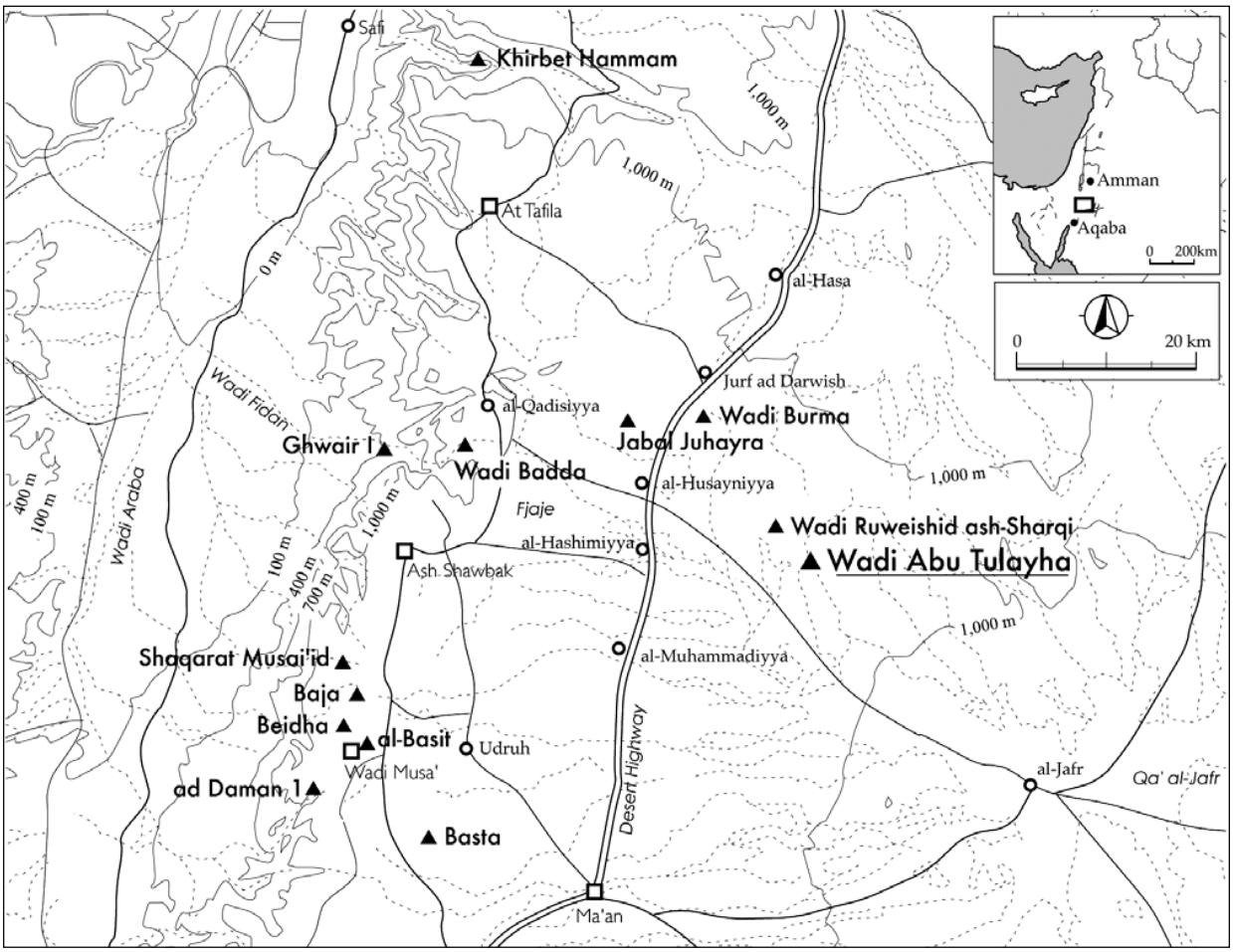
The site of Wādī Abū Ṭulayḥa, or JF-0155 in our site registration code, has undergone continuous excavation since the first field season in the spring of 2005. The previous five investigation seasons revealed some sixty semi-subterranean masonry structures at an elongated settlement *ca*. 100m in total length (Fujii 2006a, 2007a, 2008a), in addition to a series of water catchment facilities along a tributary wadi flowing across the southern edge of the site (Fujii 2007b, 2007c). Available evidence suggests that they were combined to form a Middle-Late PPNB agro-pastoral outpost probably derived from contemporary farming communities to the west, and that it was based on a risk-diversifying, mixed economy consisting of hunting mainly of gazelles, short-range transhumance bringing along a limited number of domestic sheep and goats, and small-scale basin-irrigated agriculture within the flooded area of a large stone-built barrage (Barrage 1).

The sixth and final field season took place between August 2 and September 18 2008, focusing on the following three major issues: (1) the date and material culture of the initial occupational phases of the outpost, (2) the identification of pens for livestock whose existence was suggested through our faunal analysis and (3) the function, date, and archaeological implications of a cistern-like feature that first came to light in the previous season. Although no clear evidence for animal pens was confirmed, the investigations have shown that the outpost began with a tripartite structural complex dated to the Middle PPNB, and that the unique feature was used as a cistern to supply drinking water to the neighboring outpost. This report briefly outlines the investigation results of the sixth and final field season at the site of Wādī Abū Ṭulayḥa.

The Site and Research History

The site of Wādī Abū Ṭulayḥa, situated in the north-western part of the Jafr Basin, was first discovered during our 2001-2002 winter season survey (Fujii 2002b; Fujii and Abe 2008) (**Fig. 1**). Topographically, it occupies flat terrain on the north bank of the tributary wadi that flows eastwards across the southern edge of the site to merge into the main stream of Wādī Abū Ṭulayḥa. Lying in the middle of a flint pavement desert (al-Ḥamād in Arabic) with an average annual precipitation of less than 50-100mm, the site is currently completely isolated from farming communities to the west. This is not to say, however, that it occupied a similar setting in the Neolithic period. The occurrence of various wild animal bones and the existence of water catchment facilities both suggest that the Jafr Basin received a certain amount of rainfall during the Neolithic.

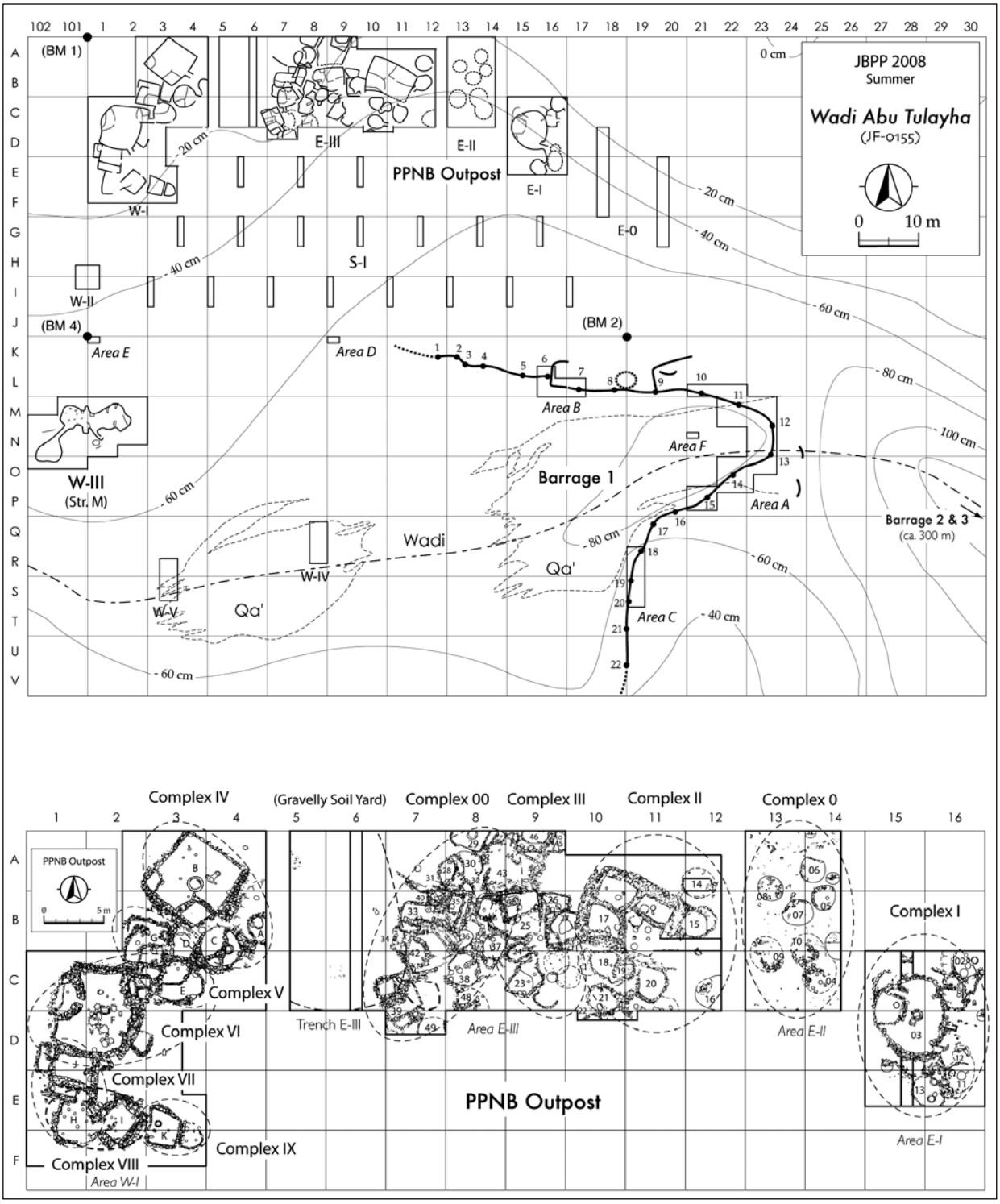
To date, five seasons of investigation have been carried out. A general area survey and limited soundings, both conducted in the first field season in the spring of 2005 (Fujii 2006a), showed that the site covered an area of ca. 1.5ha and consisted of the following three major com-



1. Wādī Abū Ṭulayḥa and PPNB sites around the Jafr Basin.

ponents: (1) a small settlement occupying the north-western corner, (2) a pair of EBA burial cairns overlying the settlement and (3) an elongated, V-shaped freestanding wall built across the tributary wadi (**Fig. 2**). The second field season in the summer of the same year fully excavated the western half of the settlement (Fujii op. cit.). Evidence suggested that it served as a Middle-Late PPNB agro-pastoral outpost, probably derived from the contemporary farming society to the west. The third season conducted in the spring of 2006 was focused on the V-shaped freestanding wall, which turned out to be a basin-irrigation facility (Barrage 1) used by the neighboring Middle-Late PPNB outpost (Fujii 2007b, 2007c). The season also investigated two smaller barrages or wadi barriers newly found in the lower course of the same wadi. The fourth season in the summer of the same year returned to the main body of the outpost and excavated its eastern half extensively (Fujii 2007a). The fifth season in the summer of 2007 was devoted to excavation in the eastern half of the outpost and revealed Complex 00, probably the first residential quarter of the site (Fujii 2008a). The season also located a cistern-like feature (Structure M) at Area W-III.

The sixth and final field season, our main concern, was focused on the three major issues described above, that is to say, the continued excavation of Complex 00, the identification of animal pens, and further scrutiny of the cistern-like feature. In addition, a few supplementary operations were conducted for a more comprehensive understanding of the site. The area and volume of soil excavated this season totaled *ca.* 200 square meters and *ca.* 100 cubic meters respectively. Excavated soil from fill layers was not routinely sieved; a total of *ca.* 500 liters of hearth contents and floor deposits was wet sieved.



2. Wādī Abū Ṭulayḥa: site plan (above) and the outpost (below).

Continued Excavation in Area E-III (Complex 00)

The last field season revealed a total of 19 semi-subterranean masonry structures in the western half of Area E-III; two of them (Units 39 and 42) were not fully excavated owing to time constraints (**Figs. 3 to 5**). This season started with the continued excavation of these two

3. Complex 00: general view (looking N).

4. Complex 00: general view (looking NE).

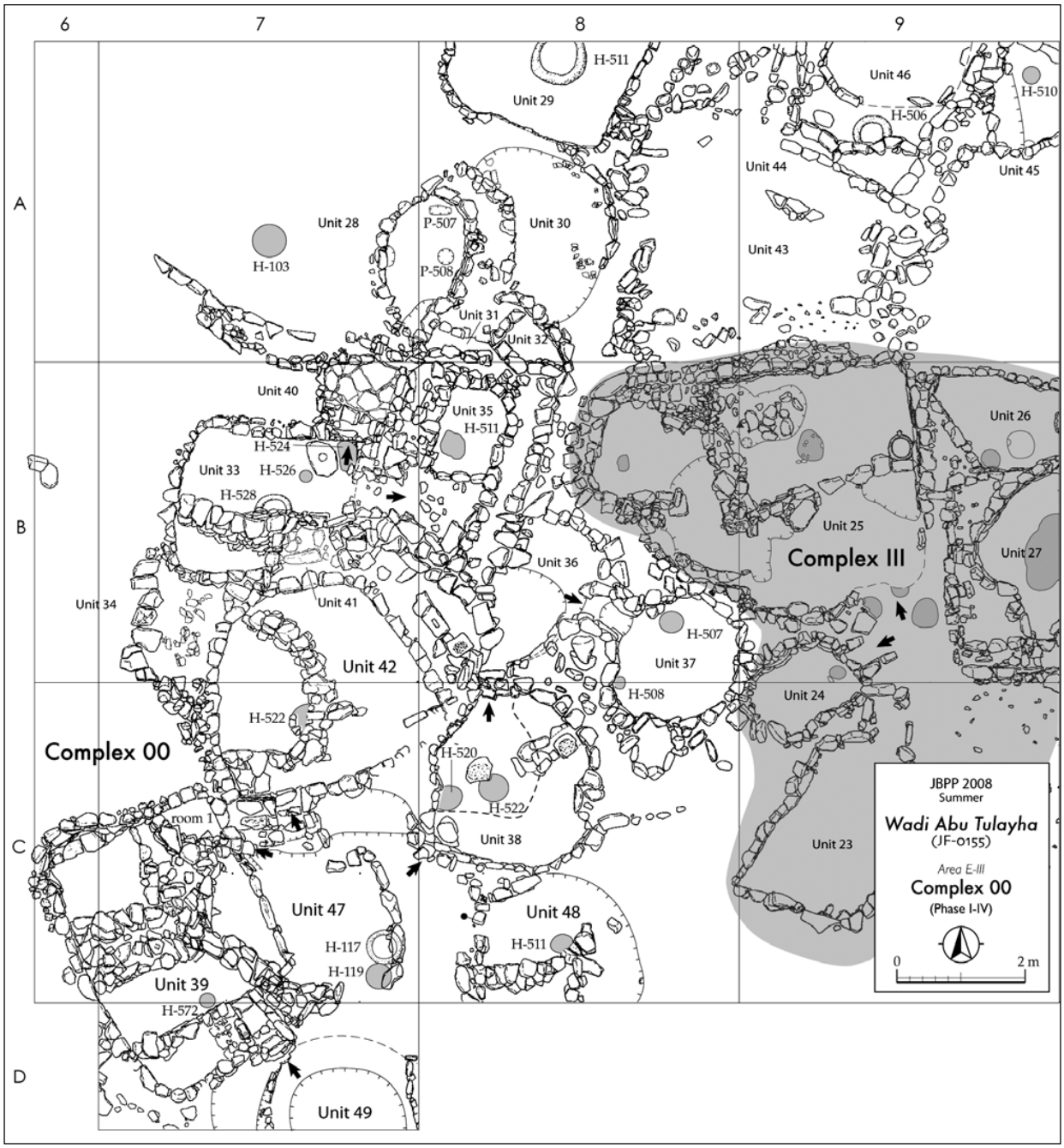
units. In the course of this operation, three new features (Units 47, 48 and 49) were also identified and excavated. Thus, the structural remains investigated in this season totaled five (six if a forecourt-like space between Units 48 and 49 is also counted). In combination with a few abutting units, they constitute the southern half of Complex 00. Stratigraphical evidence suggests that they fall into the following three phases (**Fig. 6**).

Phase I

Phase I consisted of three small architectural components centred on the southern corner of Complex 00: Unit 48, Unit 49 and a forecourt-like space between the two. Interestingly, all of them were situated within a large semi-quadrangular pit *ca*. 7m across and *ca*. 0.7m deep. This semi-tripartite complex represents the initial phase of the occupational sequence of the outpost.

Unit 49

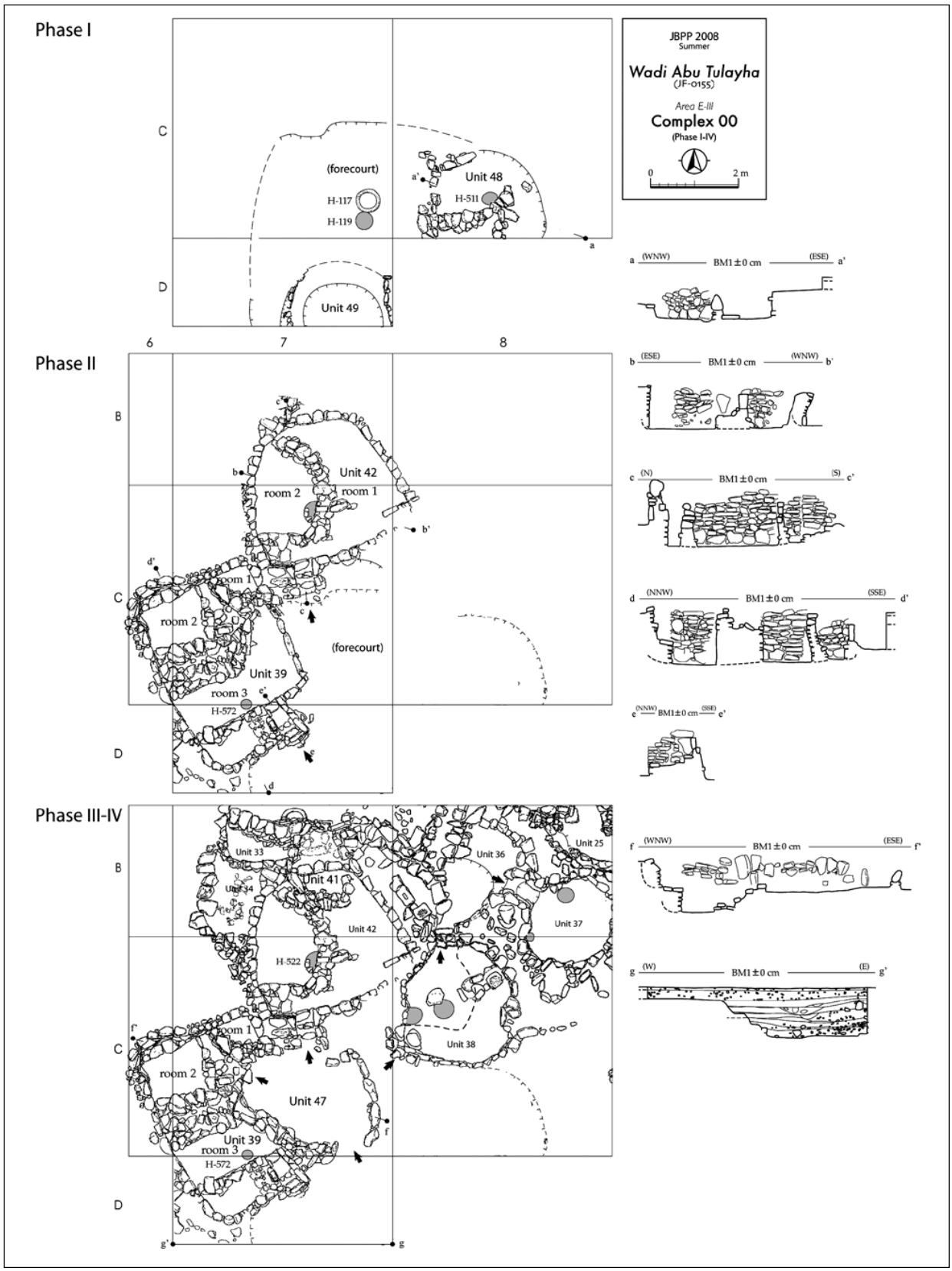
Unit 49 was discovered in Square D7, at the south-western corner of Area E-III (**Fig. 7**). It was a round, semi-subterranean structure nested in the large pit, measuring *ca*. 2m in diameter and *ca*. 0.9m in total depth (or *ca*. 0.2m below



5. Complex 00: general plan.

the base of the pit). Unfortunately, it was barely preserved at its foundation course owing to the poor standard of construction. No remarkable features were found on its original floor, but the existence of a few hearths on ashy fill layers suggested that it was repeatedly reused as a semi-open kitchen or as a dumping pit for surrounding, later structures.

This unit, though poor in material culture, provides a key with which to trace a techno-typological development of the outpost's structures. Noticeable are a stepped, less steep foundation pit, and rubble and clay fill compacted behind masonry walls, both of which contrast with subsequent features characterized by nearly perpendicular pit sides and pebble fill (Fujii 2006a, 2007a). Presumably, those who were involved in the construction of Phase I features



6. Complex 00: reconstruction of the occupational sequence.

7. Unit 49: general view (looking SW).

had yet to become fully familiar with the construction of semi-subterranean masonry walls. In this context, it is understandable that the masonry walls were founded not on the floor but on a lower step of the foundation pit (it is important to note that the same technique was used in Structure M referred to below). The same is true of the combined use of smaller slabs and larger upright cobbles as foundation stones. Such technological inconsistency highlights the immature nature of this unit.

Unit 48

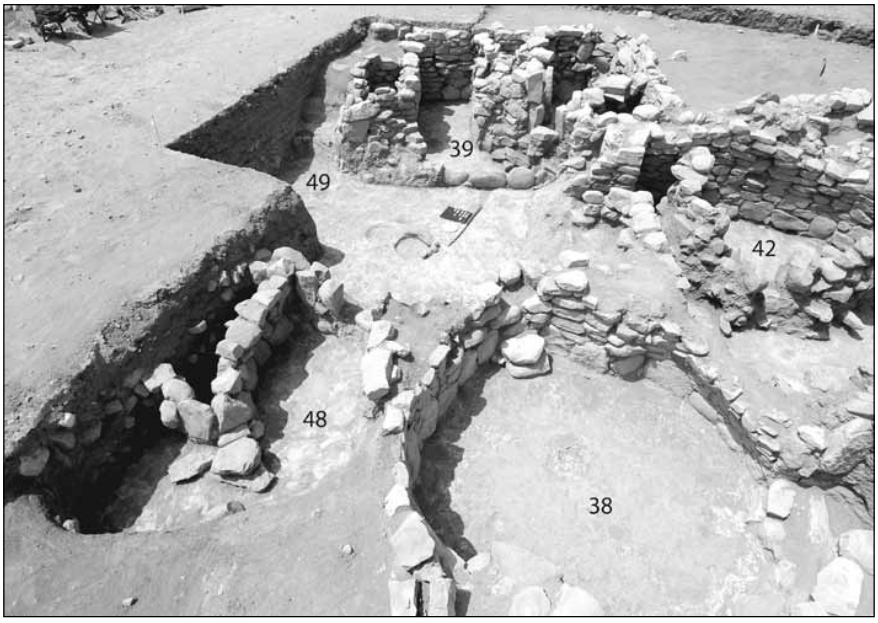
This round structure, *ca*. 2.5m in diameter and *ca*. 0.7m deep, occupied the north-eastern corner of the large pit (**Fig. 8**). It had much in common with Unit 49 in terms of technology. Nevertheless, it was different in typology, being equipped with a partition wall bent at a right angle in the southern half, and a narrow entrance flanked with a pair of upright stones at the western corner. A small hearth (H-511) was found beside the partition. This unit yielded a stone figurine (see **Fig. 20: 1, Fig. 21**) and two unique clay objects from a middle fill layer (see **Fig. 20: 7-8**).

Forecourt

A *ca*. 3m by *ca*. 4m empty space occupied the north-western quarter of the large pit (**Fig. 9**). It was cut by Unit 39 (belonging to Phase II-III) at its western edge, and was partly disturbed by Unit 42 (Phase II-III) at its northern periphery. A clay-lined hearth *ca*. 0.6m in diameter (H-117) and a simple hearth (H-119) *ca*. 0.4m in diameter were found roughly in the middle of the floor. Their existence, coupled with ashy deposits around them, suggests that this space served as a communal forecourt for the abutting two units nested in the same pit.

Phase II

Phase II included Units 39 and 42 as two major components (**Figs. 3 to 5**). Both features partly cut the large pit containing the three Phase I features, and were in turn partly disturbed by Unit 47 of Phase III. In addition, the forecourt of Phase I continued to be used in combination with these two new units. In this sense, the



8. Unit 48 and its surrounding features: general view (looking WSW).

9. Forecourt between Unit 48 and 49: general view (looking N).

Phase II features can be defined as a later version of the semi-tripartite complex of Phase I.

Unit 39

Unit 39 was located at the south-western corner of Complex 00. Continued excavation this season showed that it was a rectangular, semi-subterranean structure *ca*. 3-3.5m across and up to *ca*. 1.2m deep, and that it was equipped with a narrow stepped entrance at both the north-eastern and south-eastern corners. This unit underwent repeated reconstruction, which allowed us to divide its occupational history into the following three sub-phases.

Sub-phase 1 is represented by four masonry retaining walls and the stepped entrance opening to the south. It follows that Unit 39 was originally a single-room structure. The walls were constructed with relatively small yet standardized limestone slabs, preserved up to a height of a dozen courses. Overall, the masonry technique was superior, forming a marked contrast with other features that were reconstructed or newly added in subsequent sub-phases. Of interest is the southernmost wall, which partly collapsed and was converted to a support in order to protect a newly added wall from strong lateral soil pressure. A similar technique was observed in Unit 03 of Complex I (Fujii 2007a). Seeing that the new wall also stood on the original floor, the chronological gap between the two is thought to have been small. A small hearth (H-572) was found beside the southern wall.

Sub-phase 2 witnessed the collapse and reconstruction of a wall segment at the north-western corner (**Fig. 10**). This episode is evidenced by a remarkable difference in masonry technique in both vertical and horizontal directions. While the upper two-thirds of the wall were irregular in construction, the lower third still retained its original condition. Interestingly, the lower part was fully covered with clay mortar *ca*. 7-8cm thick and the upper part was crudely reconstructed, overhanging it (**Fig. 11**). The contrast in the horizontal direction, on the other hand, means that while the western two-thirds of the wall underwent the patchwork reconstruction described above, the eastern third still remained intact. This probably means that a curvilinear partition wall (*loc*. 507. bwl),

10. Unit 39: Room 1 and 2 (looking NW).

11. Unit 39: northern wall of Room 2 (looking NW).

12. Unit 42: general view (looking E).

newly added to the interface between the two wall segments, also doubled as a buttress. It was founded on an upper floor *ca*. 20cm higher than the original one, clearly indicating that this episode post-dated Sub-phase 1. The same is more or less true of another partition wall (*loc*. 506. wll) attached to the middle of the western wall. A pair of clay-lined hearths (H-562 and H-564) was found beside the southern wall of Room 2.

Sub-phase 3 saw an episode in which another stepped entrance was newly opened at the north-eastern corner. Given that it leads down from the original floor of neighboring Unit 47 (Phase III), the northern half of Unit 39 may have been remodeled as a rear room or storage bin for Unit 47. If this is the case, it follows that Sub-phase 3 of Unit 39 is equivalent to Phase III of the general occupational sequence of Complex 00. A few heaths were found beside the southern and eastern walls of Room 2.

<u>*Unit 42*</u>

The continuation of last season's excavations showed that Unit 42 was a relatively large trapezoidal structure with a floor area of *ca*. 3m by *ca*. 3m, and a floor depth of *ca*. 0.9-1m (**Fig. 12**). It partly cut the large pit of Phase I and, in turn, had its southern and south-eastern corners partly disturbed by Unit 47 (Phase III) and Unit 38 (Phase IV) respectively. Both observations, coupled with overall technological affinities to the abutting Unit 39, enable us to assign it to Phase II.

This structure also underwent reconstruction, falling into the following two sub-phases. Sub-phase 1 was represented by the original floor and a series of masonry retaining walls founded on it. There is little doubt that, like the abutting Unit 39, this unit was originally a single-room structure. A narrow stepped entrance flanked with a pair of side walls was at the south-western corner. In addition, a small hearth (H-522) was found roughly in the center of the floor, underneath a later partition wall (see below). Sub-phase 2 contained upper floors and a semi-circular partition wall (*loc*. 510. wll) attached to the western wall and probably doubling as a buttress. It is conceivable that Sub-phase 2 of Unit 39 was equivalent to neighboring Unit 47 and therefore falls within Phase III of the general occupational sequence of Complex 00, along with Sub-phase 3 of Unit 38.

<u>*Forecourt*</u>

In light of the orientation of the two entrances belonging to this phase, there is little doubt that the north-western quarter of the large pit, though in a half-buried condition, continued to be used as a communal forecourt for the neighboring two units. It therefore follows that, as in the case of Phase I, Phase II was characterized by a tripartite complex consisting of an open forecourt and two roofed features. What differentiates the two in technological terms is that the Phase II features were much larger and constructed separately in an individual pit, rather than being nested within the same pit. Typologically, the shift to a rectangular or trapezoidal plan is noticeable. Such techno-typological innovations suggest that the Phase II structures were constructed against a background of some bitter experiences in Phase I.

Phase III

Phase III consisted of the three components:

Unit 47, newly built as a semi-roofed communal forecourt or anterior chamber, and Units 39 and 42, both reused as its rear rooms. It is important to note that the tripartite layout is common to the three phases representing the initial stage of the outpost.

Unit 47

Unit 47 was a small, semi-subterranean structure *ca*. 3m by *ca*. 2m in floor area, the construction of which partly disturbed the two abutting units of Phase II. Unlike surrounding features, it was shallow at *ca*. 0.3m depth and surrounded with a single course of upright slabs (**Fig. 13**). It is also noteworthy that it overlay the forecourts of preceding Phases I and II. Both observations strongly suggest that it served as a semi-roofed anterior chamber for the abutting two units. An upright limestone slab, probably a remnant of an entrance, was found *in situ* at the southern corner.

The occupational sequence of this unit falls into the following two sub-phases. Sub-phase 1 consists of the original floor and the eastern wall founded on it. As noted above, this sub-phase witnessed the opening of a passage leading down to Room 1 of Unit 39. In this context, it is understandable that the entrance of Unit 42, another pre-existing feature, was incorporated into the northern wall of Unit 47. Two hearths (H-117 and H-119) and several concentrations of fire-cracked limestone pebbles were found on the original floor, indicating that this unit was used as a communal kitchen for the abutting two units. Sub-phase 2, on the other hand, is characterized by the reconstruction of the south-western wall on an upper floor *ca*. 0.3cm higher than the original floor. A few heaths and stone concentrations still existed in this sub-phase, indicating that the unit continued to be used for domestic affairs.

Phase IV

Although beyond the scope of the sixth field season under discussion here, a few comments should be made about Phase IV, reviewing the results of last season's excavations. This phase includes at least two units: Unit 38 which cut the south-eastern corner of Unit 42 (**Figs. 3 to 5**), and Unit 41 which was built over the top of the northern edge of the same Unit 42 (**Fig. 14**). Both of these can be defined as Phase IV features in the sense that they forced Unit 42 (Phases II-III) into a state of dysfunction. It therefore follows that Unit 36 and 37, both connected to Unit 38 through a narrow passage, also fall within Phase IV. In light of its general layout and contents, it appears that Unit 38 served as a roofed communal anterior chamber for the two rear rooms. Thus Phase IV is characterized by the appearance of a full-fledged tripartite complex. On the other hand, Unit 41 disturbed the south-eastern corner of Unit 33 as well as the northern edge of Unit 42. This probably means that the tripartite

13. Unit 47: general view (looking N).

14. Unit 41: general view (looking N).

complex consisting of Units 33, 35 and 40 belongs to Phase III. This seems likely, seeing that Unit 33 has much in common with Unit 39 and 42 in terms of both technology and typology.

Considered in this light, it seems reasonable to conclude that Complex 00 gradually developed from the nested-in-one-pit, semi-tripartite complex of Phase I, through the independently-constructed semi-tripartite complex of Phase II and the proto-tripartite complex of Phase III, into the full-fledged tripartite complex of Phase IV. A series of C-14 dates suggest a date of the end of the Middle PPNB for the features of Phases III and IV (see **Table. 1**). Thus, the features of Phases I and II may date back to the middle part of the Middle PPNB. Results of the radiometric dating now in progress are eagerly awaited.

Supplementary Operation 1: Trench E-III

The last field season revealed an area of gravelly soil at the western edge of Area E-III. On the basis of its location and contents, it was tentatively identified as a dumping site for excavated soil from neighboring semi-subterranean structures, especially those of Complex IV (Fujii 2008a). In order to test this hypothesis, we set up a 1m by 15m trench (Trench E-III) running north-south across the area in order to examine the stratigraphy (**Fig. 2**). It turned out that the gravelly soil was stratigraphically sandwiched between Layer 2 (on which the EBA burial cairn was constructed) and Layer 4 (into which the PPNB semi-subterranean structures were dug) (see **Fig. 26**). Close scrutiny also showed that pebble components of the gravely soil have much in common with those of the underlying stony layers, especially Layers 5 and 6. Both observations confirmed our initial perspectives.

The Finds

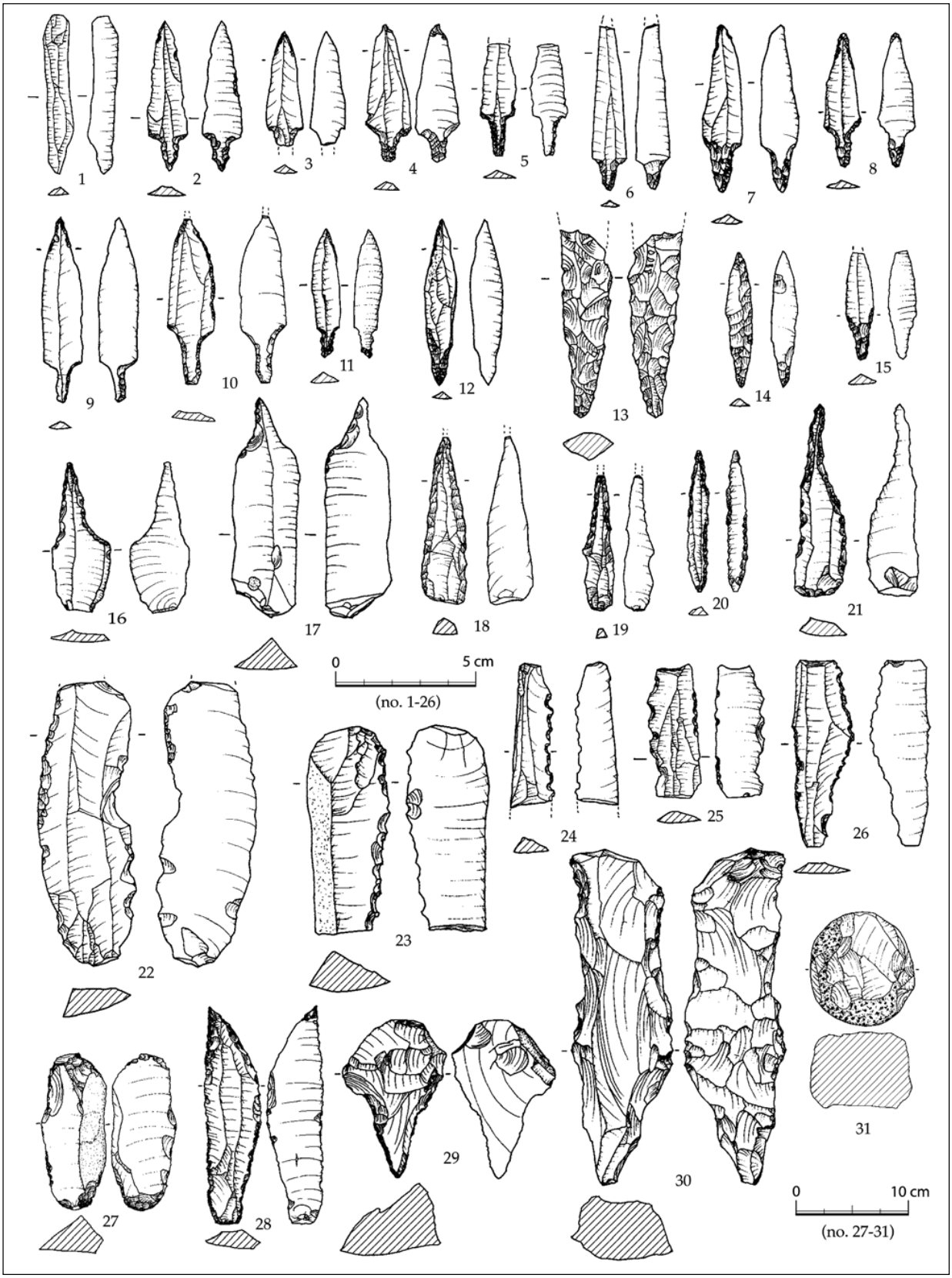
The Phase I-III features of Complex 00 produced various artifacts, mainly stone, including chipped flint artifacts, grinding implements, stone vessels, gaming boards, diagonally truncated stone bars, palettes, stone weights, pillar bases, and other miscellaneous objects. The finds also included small clay objects, bone tools, and adornments. In addition, faunal and botanical remains also occurred in some contexts. As detailed analyses of these finds are now in progress, we will give just a brief overview of each category.

Chipped Stone Artifacts

The chipped stone assemblage included a large number of cores and debitage, most of which were produced by the naviform core-reduction technique (**Fig. 15: 1**). Their presence, coupled with that of hammerstones made of cortical flint pebbles (**Fig. 15: 31**), clearly indicates that the flint production took place within the outpost. Of interest is a blade cache found *in situ* on an upper floor of Unit 47 (*loc*. C7-107. art), which contained a total of 26 blade blanks including three crested blades (**Fig. 16**). The tool kit, on the other hand, was dominated by projectile points (**Fig. 15: 2-15**) and drills / perforators (**Fig. 15: 16-21**), followed by less frequent artifact classes such as notches/denticulates (**Fig. 15: 22-24**), serrated blades (**Fig. 15: 26**), retouched blades (**Fig. 15: 25**), end- or side-scrapers (**Fig. 15: 27**), and a large pointed tool (**Fig. 15: 28**). The projectile points included a certain number of Jericho points (**Fig. 15: 2-6**), as well as Byblos (**Fig. 15: 7-11**) and Amuq (**Fig. 15: 12**) points. In addition, heavy digging tools also occurred in small quantities (**Fig. 15: 29-30**). They were probably used for digging the deep foundation pits of the semi-subterranean structures.

Grinding Implements

Grinding implements from the Phase I-III features were relatively infrequent, consisting of several flat querns (**Fig. 17: 1-3**) and a dozen round to oval grinding slabs (**Fig. 17: 4-9**). Neither oblong nor rectangular grinding slabs were recovered. The querns were made exclusively of limestone and flint, whereas the grinding slabs



15. Finds from Complex 00: chipped flint artifacts.

16. Finds from Complex 00: blade cache from an upper floor of Unit 47.

were made of a variety of materials, including basalt, granite, tuff, scoria and sandstone, as well as limestone and flint.

Stone Vessels

Three stone vessels were found in Units 39 and 42. One of them was a medium-sized shallow bowl made of limestone (**Fig. 17: 12**) and the other two were unusual bowlets made of a cortical flint slab with a natural depression or pitted hole on their upper surface (**Fig. 17: 10-11**). One of the two bowlets was a half-finished or failure product, suggesting on-site production of these unique artifacts. Similar examples have been reported from Basṭa (Nissen *et al.* 1991; Gebel 1999), al-Ḥimmah (Makarewicz and Goodale 2004) and ‘Ayn Jammām (Rollefson 2005). In view of their unique form and limited distribution, flint bowlets may help to define the Middle-Late PPNB cultural entity in southern Jordan.

Gaming Boards

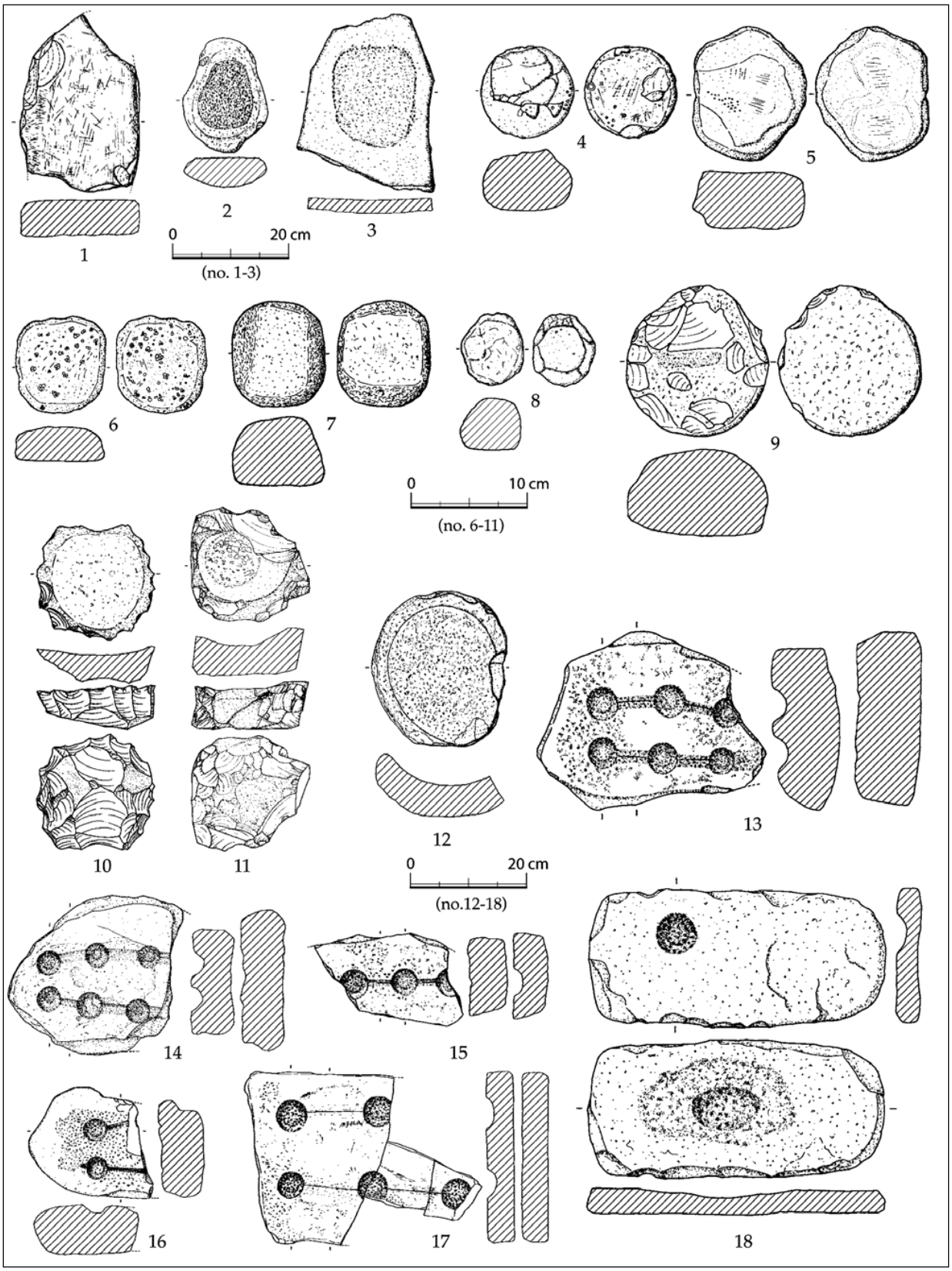
Five gaming boards were found, again from Units 39 and 42 (**Fig. 17: 13-17, Fig. 18**). In total, the site has yielded a total of twenty-five gaming boards, including nineteen examples found in previous seasons. All of them were made of limestone and had relatively large, well-defined, semi-spherical depressions and a pair of shallow grooves connecting them in a lateral direction. The number of preserved depressions varied from two to six, but the existence of interrupted grooves suggested that they were at least four to eight. The collection also included a half-finished product that reused the reverse side of an exhausted quern (**Fig. 17: 18**).

Diagonally Truncated Stone Bars

Diagonally truncated stone bars are unique to the site; nine examples occurred this season. They were made of hard, fine-textured limestone and were abruptly truncated, usually at both ends (**Fig. 19: 1**). The exceptions to this were a few examples with a relatively pointed end, which were truncated only at the other end (**Fig. 19: 2-3**). Interestingly, they were standardized to a length of *ca.* 20-25cm and a weight of *ca.* 3-4kg. In light of their weight and remarkable edge damage, they were probably used for digging through or, more precisely, pecking off the limestone layers during excavation of the semi-subterranean structures. Noticeable is the fact that this season’s nine examples all came from a relatively small area of excavation. This is probably because ‘deep floor’-type features were concentrated there.

Palettes

This season yielded three small palettes made of limestone or flint, two of which were found in the fill layers of Unit 42 (**Fig. 19: 4-6**). They were irregular in form, being roughly trimmed at their peripheral edges only. It is reasonable to assume, therefore, that their production and use were *ad hoc* in nature. It is probably for this reason that traces of red pigments were usually limited to a small part of their working surface.



17. Finds from Complex 00: groundstone artifacts.

18. Finds from Complex 00: game board from Unit 42 (Reg. no. WAT-8243).

Grooved Stone Weights

Grooved stone weights are important in that they help to date the nearby barrage system (Fujii 2007b, 2007c, 2009). Three specimens were found, again from Units 39 and 42 (**Fig. 19: 7-9**). They were made of limestone and had with a shallow groove on both surfaces and/or a pair of small notches at both lateral edges. Traces of friction, probably from rope, were recognized in these areas. Importantly, these weights were standardized to a length of *ca*. 25-30cm and a weight of *ca*. 5-6kg. There is little doubt that they were used for tying something (possibly roof material) down in combination with rope.

Pillar Bases

Two large pillar bases made of limestone were recovered from upper fill layers of Units 42 and 47 (**Fig. 19: 10-11**). Both of these were *ca*. 45cm long and *ca*. 10cm thick, and had a semi-spherical depression *ca*. 8-10cm in diameter and *ca*. 3cm deep roughly in the centre of their flat upper surface.

Other Stone Products

Miscellaneous stone artifacts included half a mace head made of limestone (**Fig. 20: 2**), four small whetstones made of reddish sandstone (**Fig. 20: 3-4**), three amorphous scoria pebbles possibly used for scrubbing grime off the skin (**Fig. 20: 5**), and a few cuphole-like slabs made of limestone (**Fig. 20: 6**). Of further interest is an anthropomorphic figurine from a middle fill layer (*loc*. 48-516.sfl) in Unit 48 (**Fig. 20: 1, Fig. 21**). This small figurine was made of buff-colored, finely-textured limestone, and was 7.5cm high, 4.1cm wide and 1.6cm thick. It was complete except for the distal end of the left arm. Typologically, it can be defined as a torso typical of Neolithic anthropomorphic figurines from the southern Levant. A series of identifying traits -- a relatively small trapezoidal face, a narrow forehead, large eyeholes, an elongated nose, a long and robust neck, squared shoulders, short arms and a slender body -- were noted. The absence of represented mouth and ears also attracted our attention. The gender of the figurine is uncertain, but the absence of breasts suggests that it may be male or gender-free. This figurine is original in many respects and no parallel examples have so far been reported from contemporary sites in southern Jordan.

Clay Objects

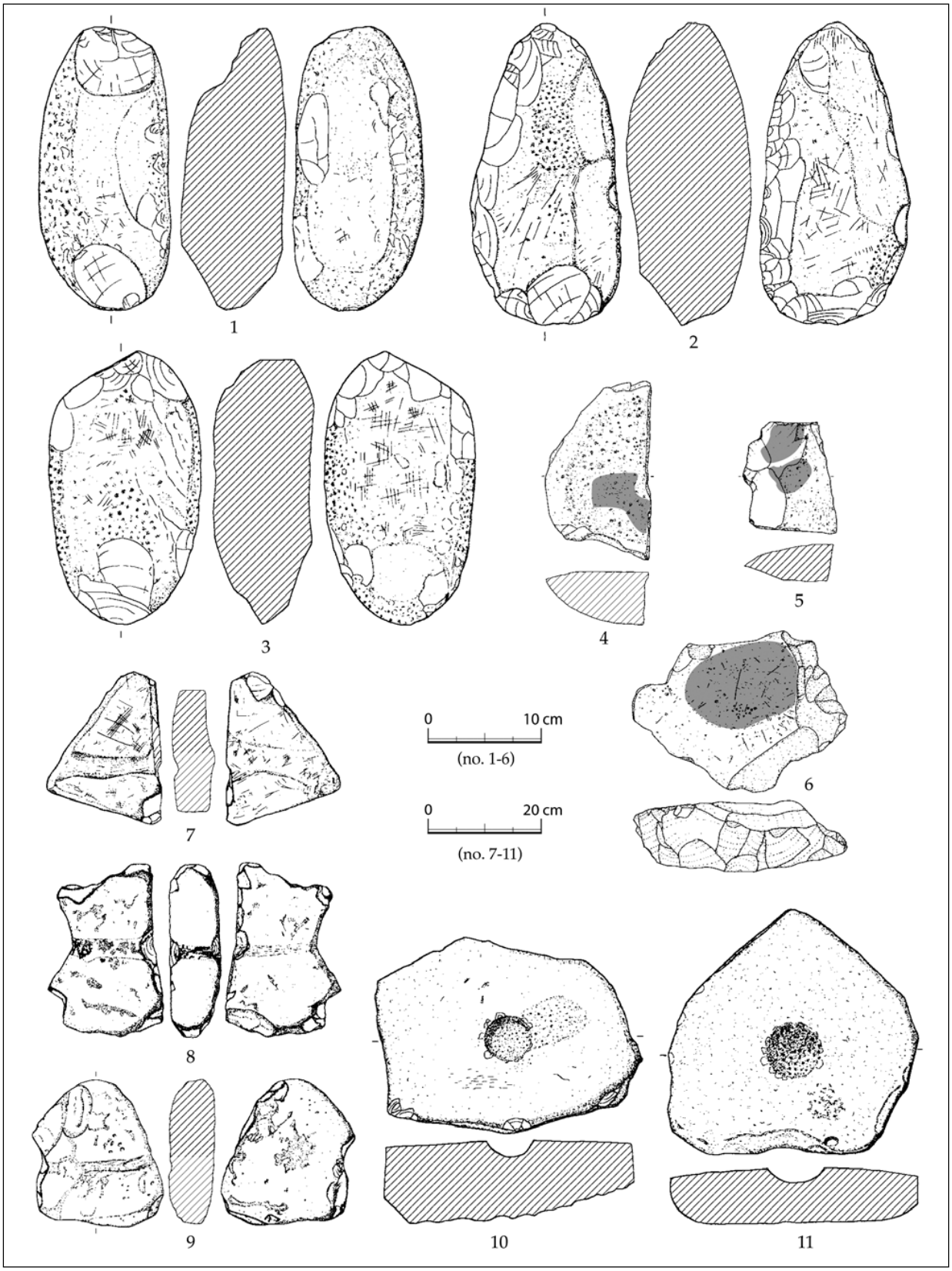
A total of twenty-seven unbaked, grit-tempered clay objects were found from various loci in Complex 00 (**Fig. 20: 7-27**). All of them were very small in size, measuring *ca*. 2-4cm in length or diameter. Typologically, they fell into stick (**Fig. 20: 7-24**) and ball (**Fig. 20: 25-27**) categories; neither representational nor geometric specimens were included. Of interest are two sticks coiled with clay strings (**Fig. 20: 7-8**), both of which occurred from the middle fill layers of Unit 48 (*loc*. 48-512. sfl and 48-516. sfl), in association with the anthropomorphic figurine referred to above.

Bone Tools

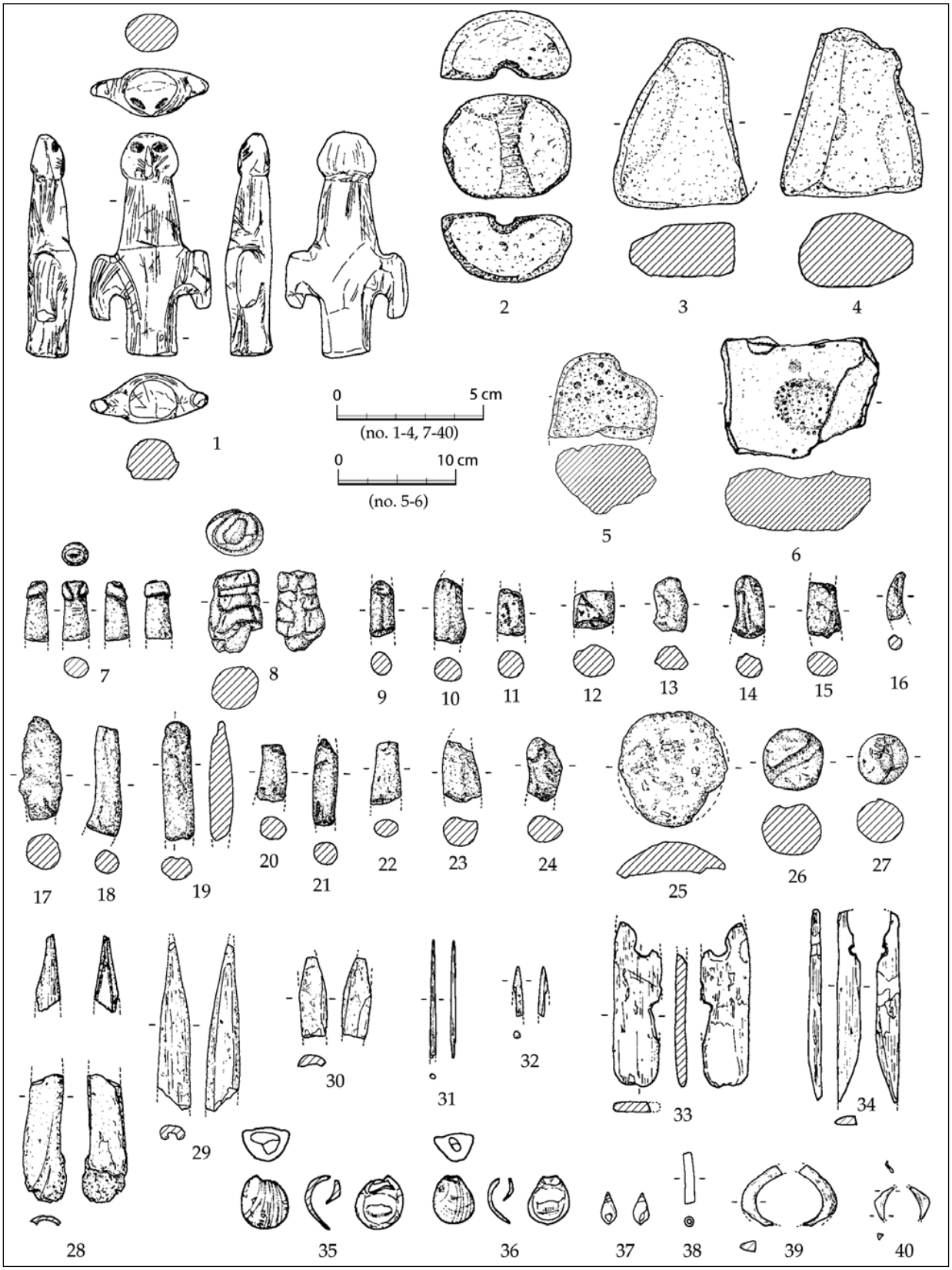
Only seven bone tools were found this season. They contained three awls (**Fig. 20: 28-30**), two needles (**Fig. 20: 31-32**) and two spatulas (**Fig. 20: 33-34**). A small hole was recognized at the butt end of the spatulas. As previously noted (Fujii 2008a), the worked bone assemblage is modest at the site.

Adornments

The production of adornments also appears to have been infrequent at the outpost and this season yielded several specimens only. They included three snail shell beads (**Fig. 20: 35-37**), a tube-type pendant made of snail shell or bone (**Fig. 20: 38**), and other miscellaneous objects made of unidentified material (**Fig. 20: 39-40**). The excavation also produced an unmodified



19. Finds from Complex 00: groundstone artifacts.



20. Finds from Complex 00: miscellaneous artifacts.

21. Finds from Complex 00: anthropogenic figurine from Unit 48 (Reg. no. WAT-8251).

quartz-like pebble *ca*. 4cm in diameter and two calcite fragments *ca*. 3cm long, both of which may have been imported as raw material for adornments.

Pigments

Red pigments were recovered throughout Complex 00. They occurred either in laminate form or in the form of a solid fragment *ca*. 1-3cm long, the latter probably representing the state in which they were originally brought to the outpost. There is little doubt that the traces of red pigment remaining on the palettes derived from them. Our preliminary examination identified these pigments as sedimentary rock containing iron oxide and carbonate minerals (Hoshino 2008). They were probably imported from the mountain range to the west where similar rocks are exposed.

Petroglyphs

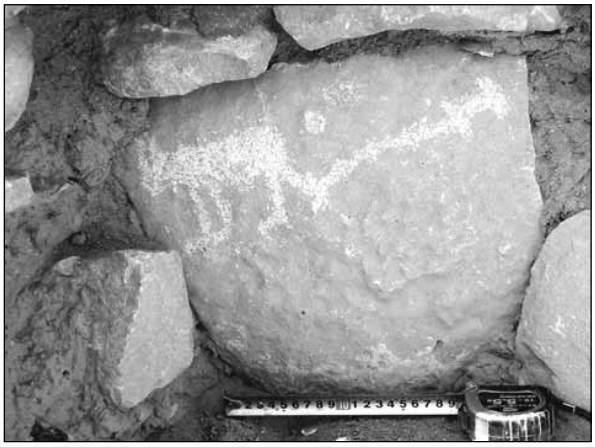
In addition to the two examples found last season (Fujii 2008a, 2008b), five additional petroglyphs were identified this season. Complex 00 yielded only one these; the other four were discovered by the rain-swept walls of previously excavated structures. All of these were incorporated into masonry walls as foundation stones or doorjambs, and were buried in thick PPNB fill deposits containing distinctive artifacts such as naviform cores and blades. Thus, they can confidently be dated to the same horizon as the outpost, namely, the Middle - Late PPNB. Technologically, they were produced by means of shallow pecking; no line drawing was recognized. Iconographies fall into animal designs and geometric patterns. Petroglyph 47 (found in the western wall of Unit 47 of Complex 00) depicted three quadrupeds running in a line. Petroglyphs F1 and F2 (from the western wall of Structure F of Complex VI) represented a gazelle-like quadruped and an ostrich-like biped respectively. In contrast, Petroglyph 13 (from Unit 13 of Complex I) consisted of a mesh design. What interested us most was Petroglyph 01 (from Unit 01 of Complex I), which represented a caged, cheetah- or caracal-like feline tethered to a stake (**Fig. 22**). These unique finds will be described in more detail elsewhere (Fujii in prep.).

Faunal and Botanical Remains

A certain quantity of faunal and botanical remains were recovered, but since analysis is still in progress nothing specific can be said. All we can say is that the faunal remains are dominated by gazelle bones (Dr Hitomi Hongo, pers. comm.) and that the botanical remains include wheat and barley grains (Dr Hiroo Nasu, pers. comm.).

The Excavation in Area S-I

Area S-I is a collective term for a total of eighteen 1m x 5m test trenches that were opened this season in the narrow space between the main area of the outpost and Barrage 1 (**Figs. 2 and 23**). Work in this area was aimed at locating animal pens associated with the outpost. In light of the general orientation of individual structures, as well as the prevailing north-westerly



22. Petroglyph from Unit 01 of Complex I (Reg. no. WAT-8903).

23. Area S-I: general view (looking SE).

winds in this area, animal pens -- if they existed – might well have occupied the area covered by the trenches. Taking both the expected diameter of the pens and the need for digging efficiency into consideration, the trenches were arranged in three rows, at 5 m intervals north - south and 10m intervals east - west.

Structural Remains

Unfortunately, no clear evidence for stone-built pens was forthcoming, despite the careful arrangement of the test trenches. Features found on the upper surface of Layer 4, or the construction surface of the neighboring PPNB outpost, were limited to a short stone alignment (loc. 105 at Trench E-8), ashy deposits (loc. 102 at Trench E-6 and G-4), a small hearth (loc. 103 at Trench G-8), and an amorphous depression (loc. 102 at Trench I-7). These results allows for various interpretations. One possibility is that if pens existed, they were constructed exclusively of perishable material such as thorny bushes and, for this reason, left no trace in the archaeological record. This interpretation seems less than convincing, however, first because suitable stones are abundant in the adjacent wadi bed to this day and, second, because stone was the predominant constructional material at the neighboring outpost. It is most unlikely that animal pens would have been the only structures not to utilize them at all. This would have been especially true if animal pens were situated in Area S-I, which is even closer to the wadi bed than the outpost itself. Thus, a more plausible explanation is that suggested for the contemporary site of ʻAyn Abū Nukhayla (Henry *et al*. 2003; Albert and Henry 2004), i.e. some of the semi-subterranean structures doubled as (or were converted to) small pens and, therefore, no specific animal pens were ever constructed. Since the first option is questionable, and since domestic sheep and goats are known to have existed at the outpost, albeit in small numbers, (Hongo 2008), this latter interpretation seems the more likely. Whatever the case, our work has testified to the absence of full-scale stone-built pens at the outpost. This fact probably means that any herds brought out to the outpost from a parent settlement to the west would have been limited in scale. This assumption is consistent with the fact that domestic sheep and goat bones account for merely ca 1 % of the faunal assemblage (Hongo op.cit.). Thus, it may well have been the case that transhumance played only an auxiliary role at the outpost.

The Finds

Considering the total area and volume of deposit excavated (90 square meters and ca. 20 cubic meters respectively), the finds from Area S-I were unexpectedly scarce, comprising only a few animal bones and a total of 718 chipped stone artifacts. Thus, the density of finds is calculated at just ca. 35 specimens per cubic meter, and these were concentrated in several trenches nearer to the outpost. Among them is Trench

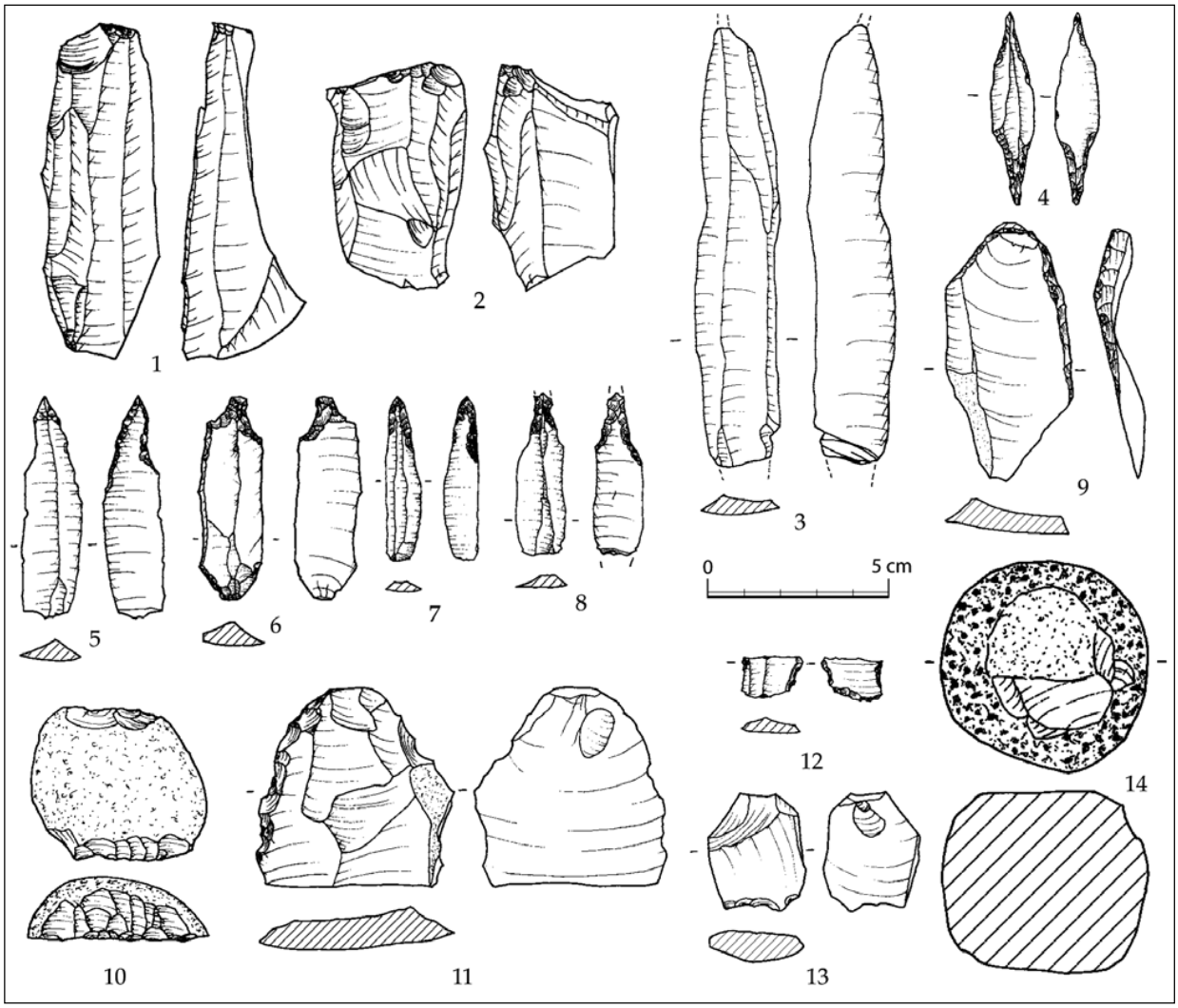
G-4, which produced two naviform cores (**Fig. 24: 1-2**), a single-platform core, several dozen unmodified blades and flakes (**Fig. 24: 3**), a few Byblos and Amuq points (**Fig. 24: 4**), drills (**Fig. 24: 5-8**), retouched blades and flakes (**Fig. 24: 9, 12-13**), end- and side-scrapers (**Fig. 24: 10-11**), and a few hammerstones (**Fig. 24: 14**). In light of their density and well-balanced contents, the assemblage is interpreted as part of the outdoor flint production activities that were probably associated with the neighboring Complex IX.

Continued Excavations in Area W-III (Structure M)

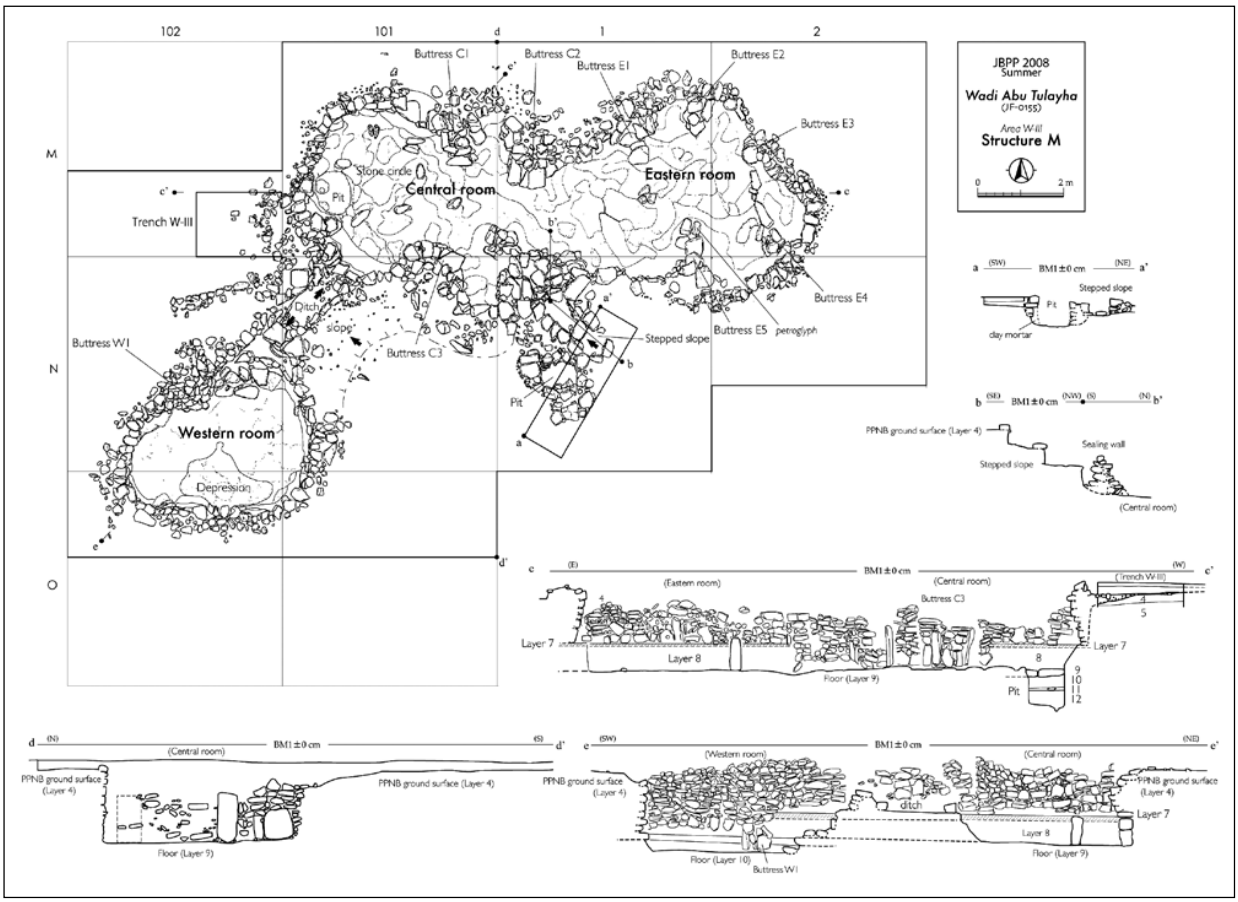
Last season's excavations in Area W-III revealed a large semi-subterranean composite structure (Structure M) which was tentatively identified, on the basis of indirect evidence referred to below, as a cistern for supplying drinking water to the neighboring outpost (Fujii 2008a, 2009). In order to further scrutinize the nature of this unique feature, we continued our intensive investigation of the western and central rooms, which were not fully excavated last season owing to time constraints (**Figs. 25-30**).

The Central Room

It turned out that the central room was analogous to the eastern room in many aspects (**Figs. 31, 32**). First, as was the case in the eastern room, the foundation pit of the central room dug through a total of five layers, including limestone bedrock, thereby attaining a depth of *ca.* 1.7 - 1.8m below the ancient ground surface



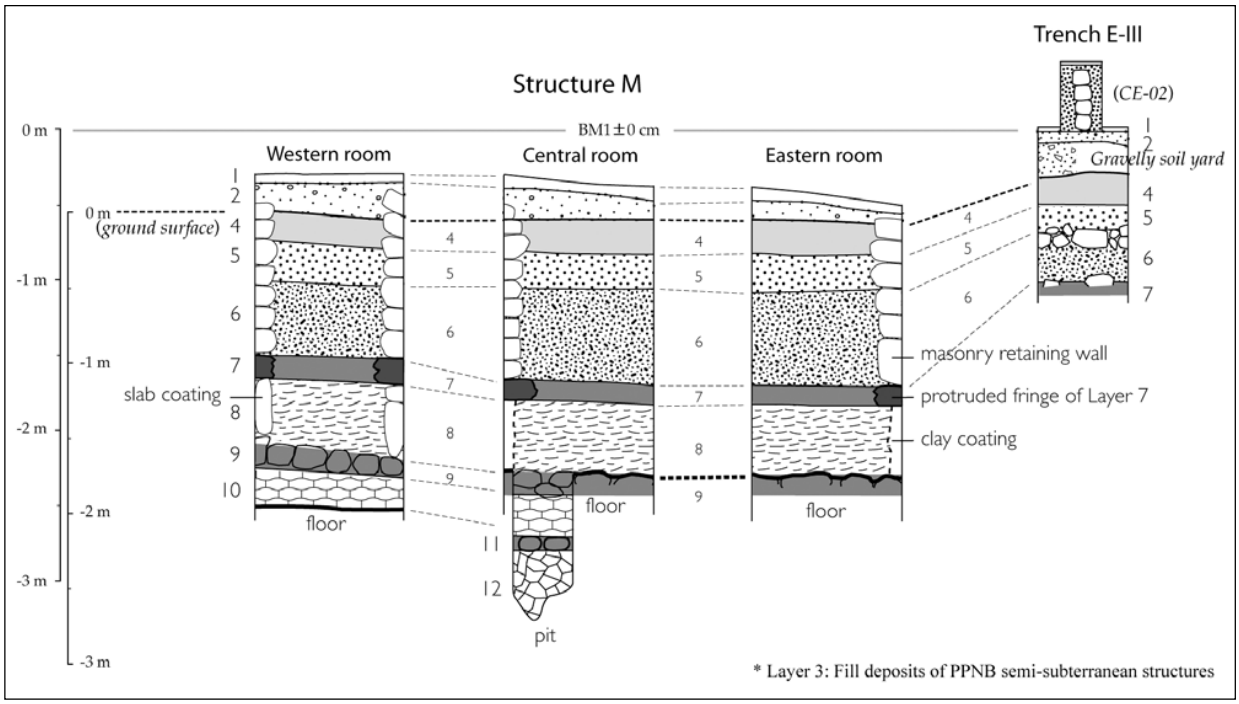
24. Finds from Area S-I.



25. Structure M: general plan and sections/elevations.

(**Fig. 26**). Second, the hard limestone surface reached in the base of the pit (top of Layer 9) was used as an uneven (owing to massive flint nodule inclusions) yet impermeable floor. Third, the masonry retaining walls defining the room were constructed on protruding 'steps' of the upper hard limestone layer (Layer 7) which had been dug through during construction, thereby covering the upper, permeable layers whilst leaving the lower, impermeable layers exposed. Fourth, a robust buttress wall (Buttress C1) was constructed against the northern wall to cope with a serious lean and its eventual collapse owing to strong lateral soil pressure (**Fig. 33**). It is evident that there was technological consistency between the two rooms sharing a continuous stretch of floor.

It is, however, most unlikely that both rooms were constructed as a single structure at the same time, since the central room shows a few technological innovations. First, two semi-circular buttress walls (Buttress C2 and C3) were systematically incorporated into the peripheral walls from the beginning (**Fig. 33**). In contrast, Buttress C1 (referred to above) was attached at a later stage. These walls must have enhanced the structural durability of the room to a significant extent. As a matter of fact, the central room escaped from critical wall collapse and consequently reinforcement work was limited to the construction of Buttress C1. In contrast, no less than five buttress walls were constructed against the peripheral walls of the eastern room, at *ca.* 2m intervals. Second, a clay coating *ca.* 7 - 10cm thick was applied to the western corner of Buttress C2 (**Fig. 34**). This coating was probably intended to enhance the less than complete impermeability of the exposed limestone bedrock layers. No clear evidence for such a coating was confirmed elsewhere, but this may have been due to the difficulty in distinguishing clay layers from cemented fluvial deposits. A similar 'render' may well have been applied throughout the structure, including the eastern room exca-

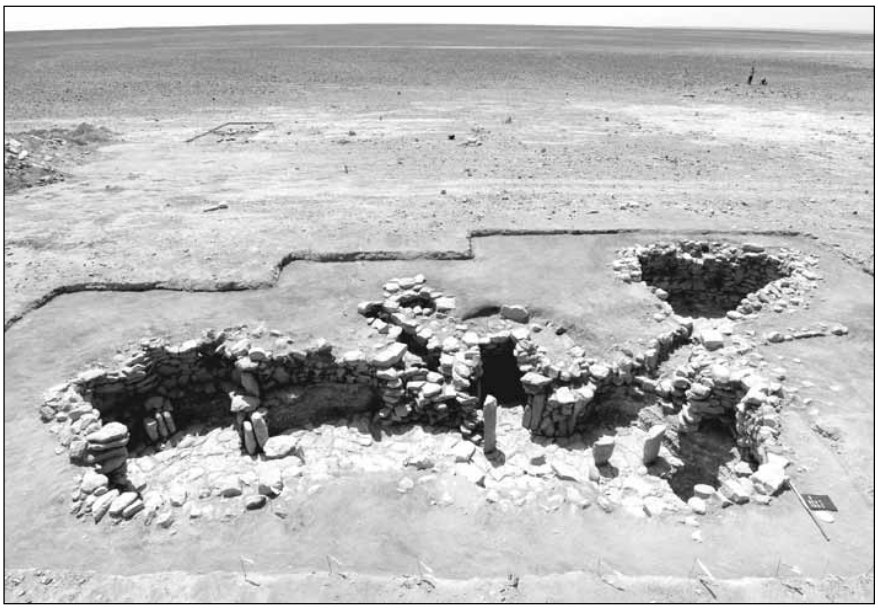


26. Structure M: stratigraphical columns.

27. Structure M: general view (looking N).

vated last season. In addition, the masonry was of higher quality in the central room, especially in the western wall. It appears that these technological innovations were introduced against a backdrop of some trying experiences in the eastern room.

Typological innovations included the appearance of various small features, other than the buttress walls. Among them is a large cylindrical pit found beside the western wall (**Fig. 35**). This pit, measuring *ca.* 1m in diameter and *ca.* 0.8m in depth, not only dug through the hard floor (Layer 9), but also three underlying layers of limestone bedrock (Layers 10 to 12). Interestingly, it slanted slightly toward the western edge, where a small hole *ca.* 0.2m deep was dug. Such a careful device strongly suggests that the cylindrical pit was used for a sludge tank or



28. Structure M: general view (looking S).

29. Structure M: general view (looking W).

sump. A heavy-duty digging tool was found *in situ* in the nested hole (**Fig. 44: 19**).

What also interested us was a circle of upright limestone boulders found in the western half of the central room (**Figs. 31 and 32**). This stone circle, *ca.* 0.5 - 0.8m high and *ca.* 2m in diameter, crossed the eastern edge of the cylindrical pit. It consisted of eight upright boulders, but four of them were paired up to form two composite features (the stone circle thus comprises six standing features). The function of this unique feature is still unknown. Seeing that no boulders had a notch at their top end and that a similar, albeit much smaller, stone circle was found in an identical position within a middle fill layer (**Fig. 36**), it may have had a ritual significance rather than a practical use such as floor supports (Kuijt and Finlayson 2001; Rollefson 2008). An upright boulder found in Unit 03, a key structure of Complex I (Fujii 2007a), also argues for a ritual interpretation, but a final conclusion must await further scrutiny.

Other remarkable features included an elongated stepped slope and a small masonry pit,

30. Structure M: general view (looking NE).

31. Structure M: central room (looking N).

32. Structure M: central room (looking S).

33. Structure M: Buttress C1 (left) and C2 (right) of the central room (looking N).

34. Structure M: clay-coating between Buttress C1 and C2 (looking N).

35. Structure M: nested pit of the central room (looking W).

36. Structure M: stone circle on an upper fill layer of the central room (looking W).

both of which were found along the southern wall (**Fig. 37**). The stepped slope, *ca*. 3m long and *ca*. 0.5m wide, looks like an entrance leading down to the central room. This interpretation seems questionable, however, first because it descends a depth of *ca*. 1.8m in only three ir-

37. Structure M: small features along the southern wall of the central room (looking W).

regular steps, and second because it was covered with *ca*. 5 - 10cm thick clay mortar. Thus, its use as some sort of input channel seems more likely. The masonry pit beside it, measuring *ca*. 0.8m in diameter and *ca*. 0.7m in depth, was also coated with thick clay mortar. The function of this small feature is also uncertain, but it is intriguing to hypothesize that it was used as a waterhole for livestock kept in the neighboring outpost. It seems to make sense in view of public hygiene that a watering place for livestock would have been separated from the main body of the cistern-like feature.

The Western Room

Unlike the other two rooms, the western room was roughly oval in plan (**Fig. 38**) and much smaller in floor area (*ca*. 4m by *ca*. 3m). Nevertheless, it was *ca*. 0.2 - 0.3m deeper, at *ca*. 1.9 - 2m depth. This is because it dug through Layer 9 (used for the floor in the other two rooms) and part of Layer 10, to say nothing of the overlying five layers.

The western room showed further technological improvement. To begin with, it introduced the curvilinear general plan, which was probably intended to more successfully absorb strong lateral soil pressure. This, coupled with the use of more standardized construction materials and superior masonry, must have lowered the risk of leaning walls and collapse. As a matter of fact, the western room underwent no obvious reconstruction, with the sole exception of the addition of a small buttress wall (Buttress W1). Second, the floor depth was increased to a certain extent, although this might have been a last resort to

38. Structure M: western room (looking N).

offset the reduction in floor area rather than a positive policy to increase the reservoir capacity per unit area. Third, the laminar limestone layer (Layer 8) sandwiched between the two hard limestone layers was covered with clay-mortared limestone slabs arranged in an upright position (**Figs. 26, 39**). This device makes no sense in terms of the structural reinforcement of the wall, because the masonry walls stood on solid 'steps' of the upper hard limestone layer (Layer 7) and therefore needed no support. This device probably aimed to supplement the less than completely waterproof properties of the laminar limestone layer. It is partly for this reason that the limestone slabs were attached with their flat surfaces oriented outwards.

Small features associated with the western room were limited to the compact buttress wall

39. Structure M: the eastern and southern walls of the western room (looking N).

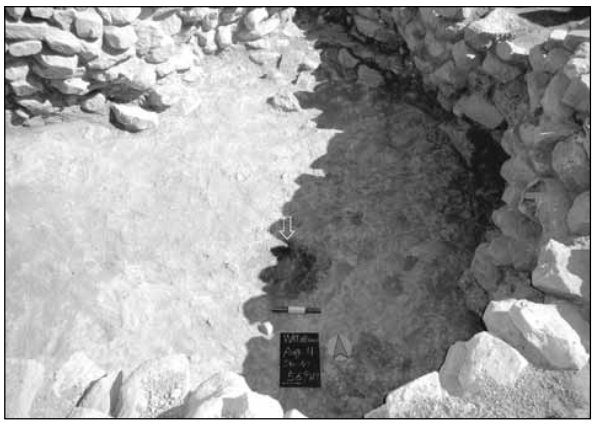
referred to above, a narrow ditch (**Fig. 40**) and a stepped entrance below it (**Fig. 41**). The ditch measured *ca*. 2.5m long, *ca*. 0.5m wide and *ca*. 0.5m deep, and connected the western and central rooms. Interestingly, it was fringed and paved with clay-mortared limestone slabs. It is also noticeable that it was sandwiched between an artificially erased gentle slope to the south (towards the wadi) and a stone pile on the opposite side. Both observations clearly indicate that it was used as a water channel for the two rooms. It therefore follows that the stepped entrance utilizing exposed limestone bedrock layers functioned as an inlet leading from the channel. Incidentally, a few small features were found in middle fill layers (**Figs. 42 and 43**), which will be referred to below in connection with the reuse history of Structure M.

Supplementary Operation 2: Trench W-III

In addition to the main excavations described above, a 2m by 1m trench was opened beside the western wall of the central room to examine the stratigraphy behind the masonry retaining wall. It turned out that the stratigraphy around Structure M is more or less consistent with that of Trench E-III in Area E-III, except that Layer 6 was not capped with angular limestone pebbles. The results from this trench are incorporated into the upper part of the three stratigraphic columns (**Fig. 26**).

40. Structure M: ditch between the central and western rooms (looking NW).

41. Structure M: northeastern part of the western room (looking N).



42. Structure M: hearth on an upper fill layer of the western room (looking N).

43. Structure M: quern found in situ on an upper fill layer of the western room (looking N).

Supplementary Operation 3: Areas W-IV and W-V

In the hope of finding another cistern-like feature, we conducted a limited sounding in two areas where promising stone alignments were confirmed (**Fig. 2**). However, they proved to be a wall segment of two ground level rectangular structures. In addition, finds from Area W-IV were limited to two modern iron artifacts and 78 undiagnostic flint artifacts (2 cores, 9 blades and 67 flakes), probably washed in by the upper stream of the wadi. Finds from Area W-V were even poorer, containing only 6 nondescript flint artifacts (2 blades and 4 flakes). Although no stratigraphic comparison was available owing to the location of the two structures in the middle of fluvial deposits, it is indisputable they are different in both date and function from Structure M. The same probably applies to the other less substantial stone alignments dotted around them. Thus, we may tentatively conclude that Structure M was the only feature likely to have been used as a cistern. In this context, it may reasonably be assumed to have undergone repeated extension and reconstruction.

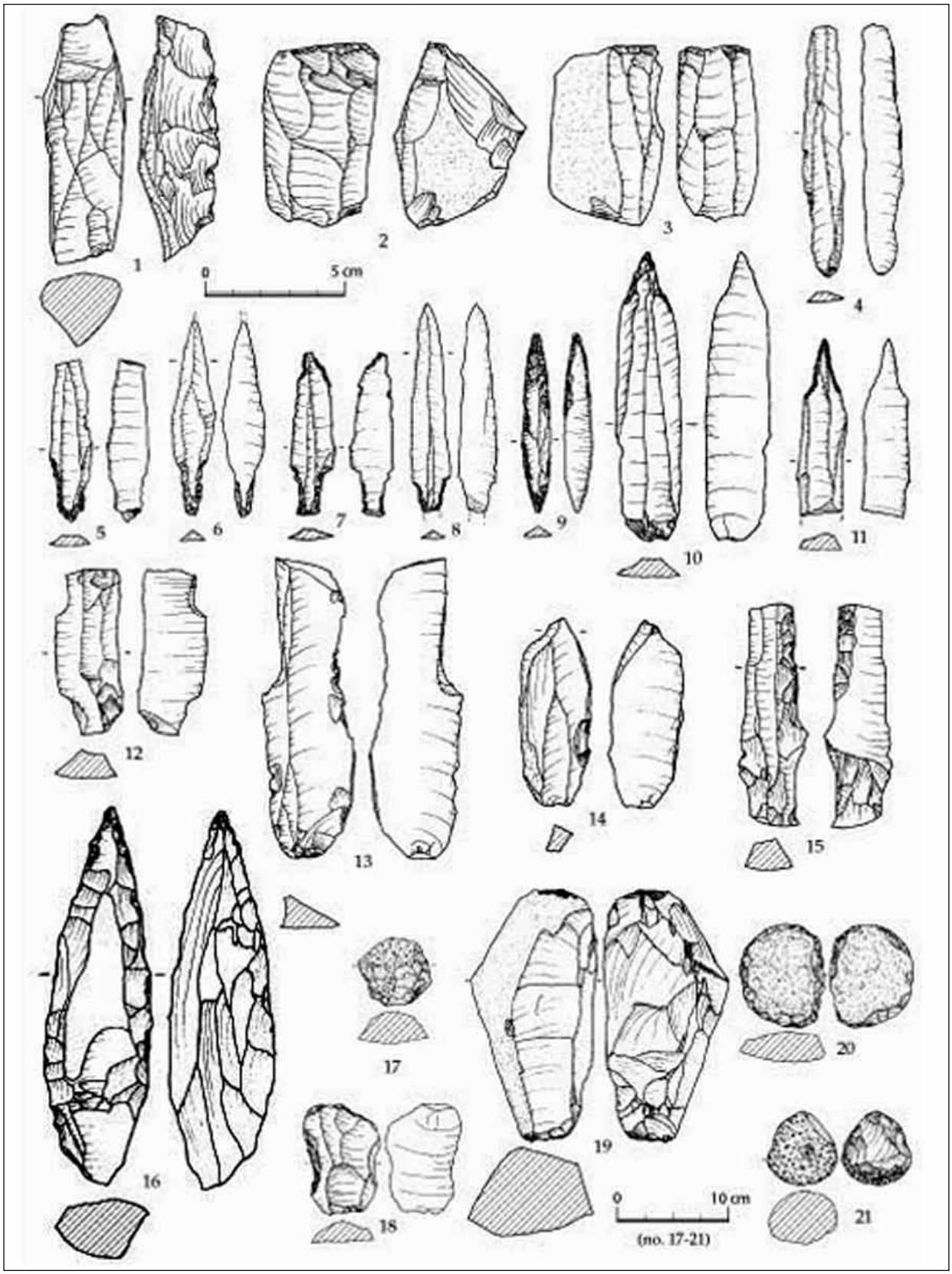
The Finds

The central and western rooms of Structure M yielded a certain number of chipped stone artifacts, although some of them may have been washed in by floodwater. Overall, the assemblage was based on the naviform core and blade technique, an indicator of the PPNB lithic industry (**Fig. 44: 1-4**). This trend is consistent from the floor deposit up to the topmost layer of fill, suggesting a PPNB date for the structure. The tool kit included various types of projectile points (**Fig. 44: 5-9**), drills (**Fig. 44: 10-11**), burins (**Fig. 44: 12-14**), retouched blades (**Fig. 44: 15**), a bifacial spearhead (**Fig. 44: 16**), end- and side-scrapers (**Fig. 44: 17-18**), and a few heavy-duty digging tools (**Fig. 44: 19**). In addition, hammerstones and retouchers occurred in small quantities (**Fig. 44: 20-21**). The projectile points included Byblos (**Fig. 44: 6**) and Amuq (**Fig. 44: 9**) type specimens, but no clear evidence for Jericho points was forthcoming this season. Overall, there was no major difference between the flint assemblage of Structure M and that of the outpost, except that Jericho points were less clearly evidenced in the former. This makes sense, however, given that the structure seems to have been reused as a temporary shelter within the time range of the PPNB (see below).

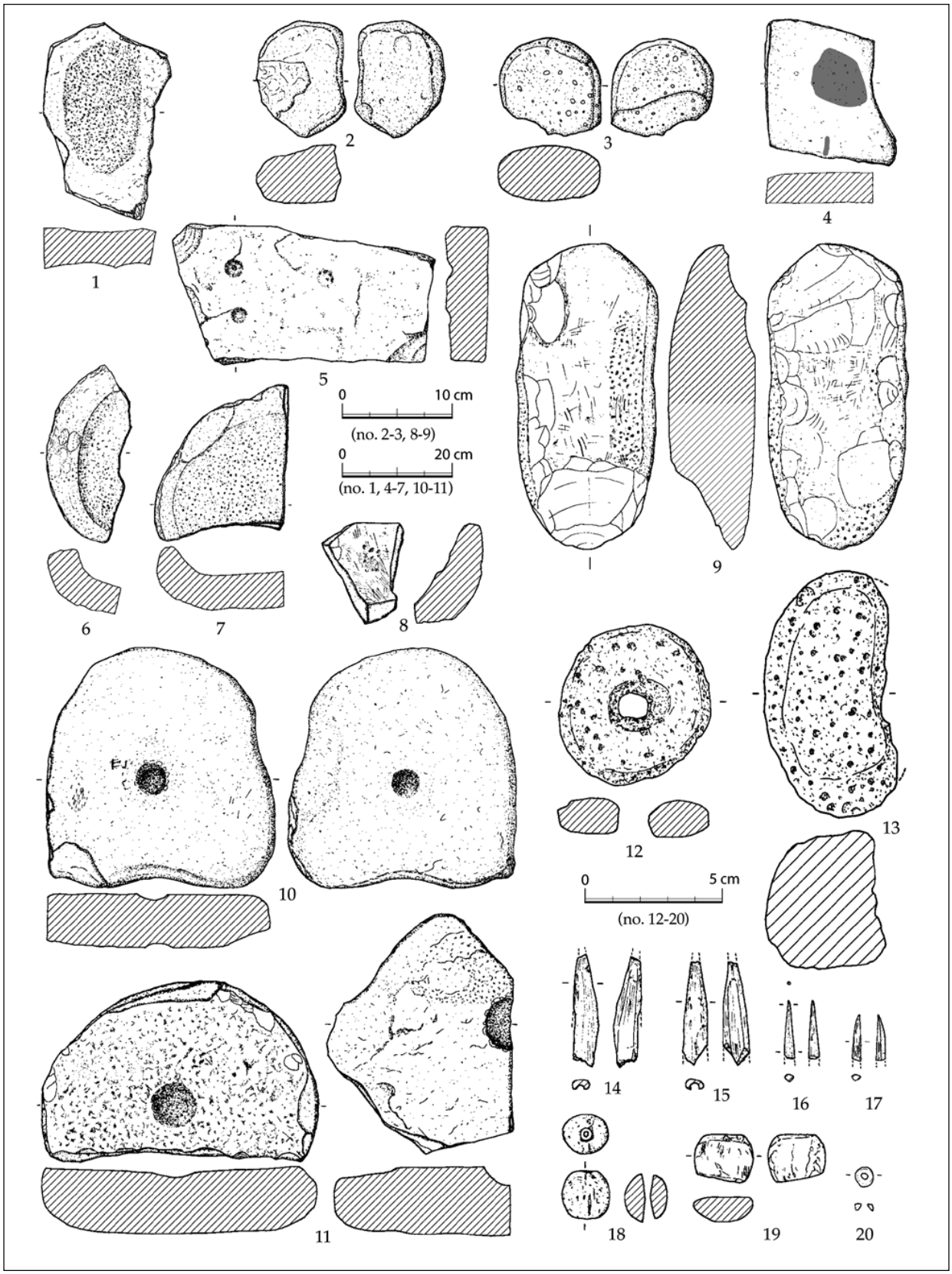
Other finds included several grinding tools made of limestone or flint (**Fig. 45: 1-3**), a cosmetic palette (**Fig. 45: 4**), a half-finished gaming board (**Fig. 45: 5**), a few stone vessel fragments (**Fig. 45: 6-8**), three diagonally truncated stone bars (**Fig. 45: 9**), two large pillar bases (**Fig. 45: 10-11**), a perforated disc made of scoria (**Fig. 45: 12**), two scoria pebbles (**Fig. 45: 13**), four worked bones (**Fig. 45: 14-17**), and three adornments made of malachite or snail shell (**Fig. 45: 18-20**). It is interesting to note that stone weights, whetstones and clay objects, to say nothing of anthropomorphic figurines, did not occur at Structure M. Also of significance is the fact that many of the finds, especially those found *in situ*, were concentrated in the middle and upper fill layers. The half-finished gaming board, for example, was found sticking into an upper fill layer as a component of the small stone circle (**Fig. 35**). The scarcity of finds in both floor deposits and the lower fill layers is a most singular phenomenon for ordinary structures, emphasizing the unique nature of Structure M. The only exception to this observation concerns the chipped stone artifacts, which occurred throughout the layers. In addition, the three diagonally truncated stone bars were focused on a lower fill layer of the central room (*loc*. M-572). This is understandable, however, since they were probably used for digging through the limestone bedrock layers.)

Date and Function of Structure M

We will briefly discuss these two major issues in light of results of the last two field seasons. Regarding dating, three C-14 determinations are now available (**Table 1**). All of them fall within a period ranging from the end of the 10th to the second half of the 9th millennium BC. (uncalibrated), suggesting a date of the Middle - Late PPNB. The consistency of PPNB flint artifacts throughout the layers also supports this dating. There is no doubt that Structure M dates to the same chronological horizon as the neighboring outpost. It is however questionable whether such a large-scale composite structure would have been constructed at one time. Noticeable in this regard are the remarkable techno-typologi-



44. Finds from Structure M: chipped flint artifacts.



45. Finds from Structure M: miscellaneous artifacts.

cal differences between the three rooms. While the eastern room had an irregular general plan, the central and western rooms were a roughly rectangular or oval. As a consequence, the number of buttress walls drops markedly from five in the east to, essentially, zero in the west. In contrast, the depths of floors and quality of the masonry walls both increase from east to west. This strongly suggests that the construction of Structure M began with the eastern room, followed by the central and western rooms. It is interesting to note that westward development is a general trend in the neighboring outpost.

The function of Structure M is also now clear, on the basis of the various lines of evidence available. First, it is located between the outpost and the barrage, and therefore doesn't disturb either of them. Second, it is situated *ca*. 100m upstream of the barrage, an ideal position for a cistern. If it were downstream of the barrage, it couldn't collect and store runoff water from the side wadi. If it were situated further upstream, it wouldn't work properly in combination with the barrage. Such careful choice of location is essential for any water catchment facility. Another line of evidence comes from its depth of up to *ca*. 2m, which is twice as deep as the deepest structures in the neighboring outpost. This is all the more noteworthy, because such this depth was achieved by digging through more than lm of thick layers of limestone bedrock. We should also note that the upper surface of the massive limestone layer thus reached was used as an impermeable floor, and that the masonry retaining walls only covered the upper, permeable layers, leaving the lower, impermeable layers exposed. No less important is the fact that a thick clay coating covered even the lower, impermeable parts of the structure. All of these factors – along with the total absence of hearths and ashy deposits on the original floor, the relative scarcity of finds in the floor deposits and the lower fill layers, and the presence of a few suggestive features, such as the nested sludge tank, the input channel and the water channel -- indicate that Structure M was most likely used as a cistern. When full of water up to the top level of the impermeable limestone bedrock layers, the pondage is estimated at *ca*. 40 - 50 cubic meters, a sufficient volume for a few months' stay for a small group of transhumants.

Summary and Discussion

The sixth and final field season has clarified our overall understanding of the site. In conclusion, we will briefly review the results of all six seasons, focusing on several general aspects. It should however be emphasized that the following is a tentative summary and subject to minor modifications in future publications.

Settlement Date

The series of C-14 dates from the outpost are concentrated within a relatively short time period ranging from 8,700 to 8,400 BC (uncalibrated) (**Table 1**). It follows that the overall occupational history of the outpost falls within a few centuries spanning the end of the Middle PPNB and the beginning of the Late PPNB. It should be noted, however, that radiometric dating of the Phase I / II features of Complex 00, now in progress, may push back the start of the sequence to some extent. Thus, the chronological gap between the outpost and the cistern could, to a certain extent, be filled.

Archaeological evidence also supports this dating. To begin with, the tripartite or honeycomb layout characteristic of Complex 00 is common to Middle PPNB settlements in southern Jordan such as al-Bayḍa Layer 6 (Kirkbride 1966, 1968; Bryd 2005), Shaqarat al-Musay'īd (Hermansen and Jensen 2003; Hermansen *et al*. 2006; Jensen 2004; Jensen *et al*. 2005) and 'Ayn Abū Nukhayla (Kirkbride 1978; Henry *et al*. op. cit.; Albert and Henry op. cit.). On the other hand, Structure B, a key feature of Complex IV, has much in common with a large square structure in al-Bayḍa Layer 2 that is probably dated to the first half of the Late PPNB. Further support for this dating comes from the typological sequence of projectile points. While Complex 00 yielded a certain number of Jericho points as well as Byblos and Amuq points, subsequent assemblages are dominated by a combination of the latter two types (Nagaya, in prep.). Although such a unilinear sequence is now questioned at 'Ayn Abū Nukhayla, our data seem more or less consistent with the traditional perspective (Gopher 1994). In addition, the occurrence of diagnostic finds such as flint bowlets and gaming boards also corroborates our view. There is no doubt that the outpost can be dated to the Middle - Late PPNB.

Table 1: A list of C-14 dates from Wādī Abū Ṭulayḥa 2005-2007.

No.	Area	Complex	Structure	Locus	Remarks	BP±1 σ	cal. BC	d13C	Lob. no. (NUTA2-)
Outpost									
1	E-III	00	Unit 29	29-512. hfl	hearth on floor	8674±36	7709 - 7695 (13.2%) 7683 - 7603 (86.8%)	-11.8	13114
2	E-III	00	Unit 31	31-510. sfl	floor deposit	8533±36	7589 - 7567 (71.8%) 7563 - 7550 (28.2%)	-23.0	13537
7	E-III	00	Unit 32	32-510. sfl	floor deposit	8458±42	7573 - 7517 (100%)	-23.6	13188
8	E-III	00	Unit 33	33-525. hfl	hearth on floor	8367±41	7516 - 7450 (66.2%) 7408 - 7367 (33.8%)	-12.5	13189
9	E-III	00	Unit 33	33-527. hfl	hearth on floor	8462±42	7573- -7519 (100%)	-13.5	13190
10	E-III	00	Unit 33	33-529. hfl	hearth on floor	8425±35	7539 - 7486 (100%)	-20.2	13387
11	E-III	00	Unit 35	35-510. sfl	floor deposit	8407±42	7539 - 7459 (100%)	-13.5	13191
12	E-III	00	Unit 35	35-512. hfl	hearth on floor	8656±43	7706 - 7697 (7.7%) 7682 - 7597(92.3%)	-18.6	13194
13	E-III	00	Unit 38	38-507. hfl	hearth on fill layer	8295±41	7458 - 7309 (100%)	-11.9	13195
14	E-III	00	Unit 38	38-519. sfl	floor deposit	8609±42	7649 - 7582 (100%)	-13.0	13196
15	E-III	00	Unit 38	38-521. hfl	hearth on floor	8531±43	7589 - 7549 (100%)	-14.6	13197
16	E-III	00	Unit 38	38-523. hfl	hearth on floor	8499±42	7580 - 7538 (100%)	-27.1	13198
17	W-I	IX	Str. K	E3-105	lower fill layer	8409±41	7539 - 7464 (100%)	-10.9	11406
18	W-I	IX	Str. K	E3-113	floor deposit	8464±51	7578 - 7514 (100%)	-18.5	11408
19	W-I	IX	Str. K	E3-113	floor deposit	8443±51	7569 - 7557 (13.2%) 7555 - 7491 (86.8%)	-26.0	11409
Cistern									
20	W-III	-	Str. M	M-513. sfl	eastern room middle fill layer	8365±35	7513 - 7451 (66.9%) 7407 - 7370 (33.1%)	-12.9	13111
21	W-III	-	Str. M	M-517. sfl	eastern room middle fill layer	8355±39	7496 - 7447 (46.6%) 7433 - 7425 (6.1%) 7412 - 7358 (47.2%)	-25.0	13112
22	W-III	-	Str. M	M-559. sfl	eastern room floor deposit	9144±41	8424 - 8404 (15.7%) 8392 - 8375 (11.6%) 8349 - 8287 (72.6%)	-15.4	13113

Settlement Size and Form

The extensive excavation has enabled us to estimate the size of the outpost at *ca*. 0.1 - 0.15ha (*ca*. 100m in total length by *ca*. 10 - 15m in average width). This estimate should be reasonably accurate, as Areas E-0, W-II and S-I clearly limit three sides of the elongated outpost. The only uncertainty concerns a possible further extension to the north but, in view of the general layout, any resulting increase in area is likely to be insignificant. Thus, it is concluded that the Middle - Late PPNB outpost of Wādī Abū Ṭulayḥa is much smaller in size than coeval sedentary settlements to the west, and roughly equivalent to desert sites such as 'Ayn Abū Nukhayla (*ca*. 0.12 ha; Henry *et al*. op. cit.) and Wādī Jīlāl 26 (*ca*. 0.1ha; estimated from Garrard *et al*. 1994: Fig. 3). It is interesting to note that while the farming communities vary in settlement size to a considerable degree, the desert outposts / settlements seem to converge on a range of 0.1 - 0.2ha.

Also noteworthy is the arc-shaped settlement plan facing south or south-east. Jilat 26 again provides a comparable example (Garrard *et al*. op. cit.). Such an unusual settlement plan may be a natural consequence of the prevailing north-westerly winds endemic to the Transjordanian plateau. It should be noted, however, that Complex 00 has a honeycomb layout common to Middle PPNB settlements in southern Jordan. Taking this into account, it may be more correct to say that the arc-shaped settlement plan is characteristic of the post-Complex 00 outpost. Whatever the case, both settlement forms are unique to PPNB desert sites in the southern Levant and may help to define them.

Settlement Seasonality

To begin with, the harsh environmental conditions of the Jafr Basin, especially the total absence of perennial water sources, casts doubt on the year-round use of the outpost. Even if average annual rainfall during the Middle - Late PPNB period was much higher than at present (< 50 - 100mm), it is highly questionable that the basin would have permitted a sedentary way of life. As a matter of fact, no fully-fledged Neolithic settlements have been confirmed in the basin (Fujii and Abe 2008). The custom of sealing entrances and the frequency of grinding tools left upside down on floors are both consistent with seasonal use of the outpost (Fujii 2006a). Of particular interest in this regard is the predominance of juvenile gazelle bones in the excavated faunal assemblage (Hongo op. cit.) and the frequency of cereal grains among the botanical remains (Nasu *et al*. 2008). Both of these observations are suggestive of seasonal occupation from spring to early summer, a likely assumption in view of the availability of water in this arid landscape.

So, for how long was the outpost used each season? This is a difficult question to approach, but a range of indirect evidence -- for example, the large pondage of the cistern and the existence of elaborate structures such as Structure B -- points to a relatively long stay. The occurrence of a few dozen gaming boards, including a few half-finished examples, is also understandable in this context. Thus, we hypothesize that the outpost was used for a few months from spring to early summer.

Subsistence Strategies and Site Function

Available evidence suggests that the outpost had a mixed economy, based mainly on hunting of gazelle and hare, short-range transhumance involving a limited number of domestic sheep and goats, and small-scale basin-irrigated agriculture within the flooded area of Barrage 1 (Fujii 2007b, 2007c, 2009; Hongo op. cit.; Nasu *et al*. op. cit.). It therefore follows that the site served as a seasonal agro-pastoral outpost, probably derived from contemporary farming communities to the west.

To begin with, evidence for hunting comes from the predominance of wild taxa in the faunal assemblage and the frequency of hunting and butchering implements in the tool kit. There is no doubt that hunting played an important role at the remote outpost. Second, evidence for agriculture includes the occurrence of cereal grains and pulses (including domestic forms) on the one hand, and the presence of reaping and grinding tools on the other. It should be noted, however, that the basin-irrigated field produced by Barrage 1 would not have covered more than a few hectares. This probably means that basin-irrigated agriculture was a subsidiary activity. Third, evidence for transhumance consists of the fact that domestic sheep and goats were present at the seasonal outpost. However, in view of the fact that they seem to account for just *ca*. 1 % of the excavated fauna assemblage (Hongo op. cit.), it is reasonable to assume that herds brought to the outpost was limited in size. This assumption is consistent with the absence of specific animal pens at the outpost.

Given that both basin-irrigated agriculture and transhumance were subsidiary economic activities, it is possible that the outpost was established as a remote hunting station rather than a narrowly-defined agro-pastoral outpost. That is not to say, however, that the outpost itself was necessarily sustained by hunting, since hunted game may not have been consumed there, especially if it was not very far from its parent settlement. Suggestive in this regard is the fact that excavated faunal remains were unexpectedly scarce considering the frequency of hunting / butchering tools. This discrepancy, though undoubtedly partly due to poor bone preservation, could mean that the outpost was originally established to supply meat to the parent settlement. Our tentative assessment is that the outpost was intended as a hunting base but was, in terms of on-site subsistence, sustained by small-scale transhumance and basin-irrigated agriculture.

Water Exploitation Strategy

Our previous investigations revealed three barrages along the tributary wadi. To date, they are among the earliest anthropogenic water catchment facilities known in the entire Near East, let alone Jordan. The barrages fall into two types: a large V-shaped barrage occupying flat, permeable terrain beside the outpost (Barrage 1), and two small but robust dams built in a slightly

dissected stony valley in the lower course of the wadi (Barrages 2 and 3). A line of collateral evidence suggests that Barrage 1 was used for basin-irrigated agriculture to sustain a seasonal, yet relatively long-lasting stay at the neighboring outpost (Fujii 2007b, 2007c). Barrages 2 and 3, on the other hand, probably supplied supplementary drinking water for livestock.

The fifth and sixth field seasons have shown that the outpost was equipped with a large composite cistern in addition to the barrage system. The finding of the large cistern settled the problem of why the outpost was situated as much as ca. 300 m from the two small dams (Barrages 2 and 3). It is now evident that the cistern, rather than the dams, supplied drinking water to the outpost. Presumably, it was the systematic water exploitation strategy based on at least three barrages and one cistern that first enabled the early transhumant population to maintain a fixed outpost in the Ḥamād. This, in turn, probably means that during the PPNB the Jafr Basin received sufficient precipitation to make the construction of such large-scale water catchment facilities worthwhile.

Settlement Formation Processes

Since we have repeatedly discussed this issue elsewhere (Fujii 2006a, 2006b, 2007a, 2008a), we will here restrict ourselves to presenting a few minor revisions based on our most recent results.

The first revision concerns the date at which the outpost was established. Our previous report suggested that part of the outpost may date back to the Middle PPNB (Fujii 2008a). This assumption has now been clearly validated by the series of C-14 dates (**Table 1**). It is evident that the outpost lasted for a few centuries spanning the end of the Middle PPNB to the beginning of the Late PPNB. We should note, however, that the earlier limit is based on several C-14 dates from Phase III / IV features of Complex 00. C-14 dates from Phase I / II features may push it back further. Noticeable in this regard is the construction date of the cistern, which we suggest may date back to the very beginning of the Middle PPNB or even the end of the Early PPNB. The outpost may also date back to this same period, although it is equally conceivable that there was some chronological gap between the two.

Second, the transition from Complex 00 to Complex 0/I has become more reasonably understood, since the dataset from ʻAyn Abū Nukhayla suggests that a temporary climatic deterioration intervened during the latter half of the PPNB (Henry *et al*. op. cit.). The occupational shift at Wādī Abū Ṭulayḥa may also be understood in the same context. Presumably, the outpost was largely abandoned for a short time due to a temporary reduction in rainfall, and then made a fresh start at Complex I -- perhaps with a cluster of several huts (Complex 0) in the intervening period (Fujii 2008a). Complex I consisted of a large core structure (Unit 03) and several subsidiary features, illustrating the techno-typological transition from the tripartite layout of Complex 00 to the dichotomous arrangement characterizing subsequent complexes.

The correlation between Complex I and Barrage 1 has also become clearer. Our previous investigations suggested that the occupational shift from Complex 00 to Complex I may have been related to the construction of Barrage 1 (Fujii op.cit.). The last season added another line of collateral evidence for this assumption. A protruding reinforcing wall incorporated into the converging point of Barrage 1 (and the other two barrages) is common to Unit 38 (belonging to Phase IV of Complex 00) and the central room of the cistern (probably representing the second phase of this feature). Given the rough contemporaneity of these three features, it follows that the barrage was also constructed somewhat after the initial establishment of the outpost, perhaps at the very end of the Middle PPNB or the very beginning of the Late PPNB. Of significance is the brief time lag between the establishment of the outpost and that of the barrage, which implies that the barrage was subsequently added in an attempt to stabilize and increase the productivity of opportunistic agriculture taking advantage of seasonal ponding on an existing mud playa (Henry *et al*. 2003). The westward enlargement of the cistern may also be understood as a measure to cope with the climatic deterioration.

Correlation Between the Half-Buried Cistern and Pastoral Nomadization

The sixth field season shed unexpected light on a possible correlation between the function-

al conversion of the cistern and the process of pastoral nomadization in the Jafr Basin. The former episode is evidenced by the existence of several heaths (**Fig. 42**), a few querns found *in situ* (**Fig. 43**), and a small stone circle (**Fig. 35**). Interestingly, all of them were concentrated in the middle fill layers. This means that the 2m deep cistern was converted to a 1m deep temporary shelter after it was buried up to the top level of the impermeable layers and, for this reason, was no longer able to fulfill its original function. A series of C-14 dates indicates that this episode took place in the middle of the Late PPNB, immediately after the westward development of the neighboring outpost finally ended with Complex IX (**Table 1**).

Of significance are those who left their mark on the middle fill layers of the cistern. They may be defined as the first group of pastoral nomads in the basin, in the sense that they could no longer maintain a fixed outpost (probably as a result of the environmental crisis and consequent failure of the water catchment system) and, instead, camped by the disused, half-buried cistern. It is important to note that this episode was followed by the appearance of two unique cemeteries at Ḥarrat al-Juhayra (Fujii 2005b) and Qā' Abū Ṭulayḥa (Fujii 2000, 2001, 2002b, 2002c, 2006b). Our investigations have confirmed that both sites directly inherited the unique burial practice (i.e. façade-side cairn burial), as well as the distinctive settlement form and formation process (Fujii 2002c, 2006b), of the outpost. Thus, the transition from the Middle - Late PPNB fixed outpost of Wādī Abū Ṭulayḥa to the Late Neolithic cemetery of Qā' Abū Ṭulayḥa, with the functional conversion of the cistern in the intervening period, is considered to reflect the initial process of pastoral nomadization in the Jafr Basin.

Concluding Remarks

The second phase of the Jafr Basin Prehistoric Project finally ended with the sixth field season at Wādī Abū Ṭulayḥa. We are now able to reconstruct the transition from initial transhumance to early pastoral nomadism on the basis of specific archaeological evidence. Our present perspective is that the multi-faceted Middle - Late PPNB transhumance evidenced at Wādī Abū Ṭulayḥa paved the way for the fully-fledged pastoral nomadism suggested by the two unique funerary sites in the same area. Presumably, the climatic deterioration at the end of the PPNB caused a serious reduction in both cistern pondage and productivity of the basin-irrigated cereal field, which in turn led to the abandonment of the fixed outpost and a consequent process of pastoral nomadization. The next step is to test this working hypothesis in a broader context. The third phase of our project is scheduled to start in the near future.

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