Shkârat Msaied

A MPPNB bidirectional blade workshop

and its socio-economic implications

Introduction

The site of Shkârat Msaied is located 13 km north of Petra / Wadi Musa (**Fig. 1**). The small site (ca. 0.1 ha) has been investigated since 1999 by a team of the University of Copenhagen in co-operation with the Jordanian Department of Antiquities.

Twelve seasons of excavation exposed app. 600 m² of early Neolithic architecture which comprises six phases of occupation (**Fig. 2**). Phases I to III span the first half of the MPPNB (ca. 8250 to 7950 BCE), Phase IV is dated to the Late Neolithic and Phase V represents the Nabataean / Roman Period.

The MPPNB site of Shkârat Msaied is characterized by circular buildings which cluster around courts or open spaces. Due to shortage of water sources, blocked entrances and comprehensive tool inventories the MPPNB village is assumed to be seasonally occupied (Jensen et al. 2005; Kinzel 2013; Purschwitz 2016)

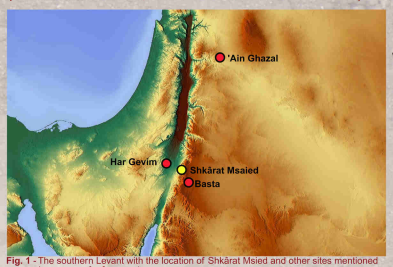

Fig. 1 - The southern Levant with the location of Shkârat Msied and other sites mentioned (www.maps-for-free.com)

Locus 90307

The pit Loc. 90307 was found 2010 in an open space (area VI, **Fig. 2-3**) adjacent to a small wall. The flat pit is app. 30 cm in diameter and was compactly filled by 3739 chipped lithic artefacts – all waste products of bidirectional core reduction. No other artefacts were associated.

Although the exact stratigraphic position is not clear, the pit appears to be dug as the wall was still in use. The small wall is stratigraphically later than Unit g (Phase I). According to Kinzel (2013) Unit g was in use until Phase III. The waste disposal most likely took place either in Phase II or Phase III (Kinzel pers. comm.).

Fig. 3 - Loc. 90307 in situ (Photo: A. Abu-Laban)

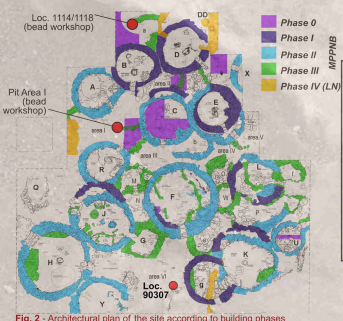

Fig. 2 - Architectural plan of the site according to building phases (after Kinzel 2013: Taf. 2.22)

Tab. 1 - Debitage Classes

	Locus 90307	
	n	%
Chunks	1	<0.1
Debris	290	7.8
Cores		
Core Trimming Elements	302	8.1
Burin Spalls		
Chips	1650	44.1
Flakelets	710	19.0
Flakes	80	2.1
Non-bidir. Blades	86[1]	2.3
Bidirectional Blades	213[1]	5.7
Undetermined Blades	407[1]	10.9
Total Tools	3739 1	100 <0.1

[1] Classification according to dorsal scar pattern. Technologically all blades of Loc. 90307 are struck by bidirectional blade core technology.

Primary Product Data

The artefacts Loc. 90307 are characterized by a high proportion of chips, flakelets and microdebris (altogether more than 70%, **Tab. 1**), which is considered as major indicator for primary production activities (e.g. Schiffer 1987; Quintero 2010). The second most categories are blades (18.9%), followed by CTE (8.1%), while cores, tools and tool production waste are missing.

The CTE are exclusively composed by CTE of bidirectional core preparation and reduction (**Tab. 2**). The relatively low number of Primary Elements and Biface Thinning Flakes may indicates, that initial core shaping took place off-site.

The core opening and core reduction is well attested by Platform Trimming Flakes (PTF), Initial Platform Spalls (IPS) and Initial Blades II. Initial Blades I (Primary Crest Blades) are only represented by four small terminal fragments.

Tab. 2 - Tabulation of Core Trimming Elements (CTE)

	Loc. 90307	
	n	%
Primary Elements total	47	15.6
Biface Thinning Flakes	14	4.6
Non-bidir. CTE total	0	0.0
Bidir. CTE total	241	79.8
- Initial Bl. I (bifacially crest.)	3	1.0
- Initial Bl. I (unifacial ridge)	1	0.3
- Initial Bl. I (natural ridge)		
- other/ unspec. Initial Bl. I		
- Initial Bl. II (bifacially crested)	9	3.0
- Initial Bl. II (unifacial ridge)		
- Initial Bl. II (natural ridge)		
- other/ unspec. Initial Bl. II		
- other/ unspec. Initial Bl. I/II		
- Non-initial Bl. I	1	0.3
- Non-initial Bl. II	4	1.3
- Non-initial Bl. I/II	2	0.7
- IPS (bifacially crested)	1	0.3
- IPS (facetted)	14	4.6
- IPS (unprepared/natural)	2	0.7
- other/unspec. IPS	4	1.3
- CPS (bifacially crested)		
- CPS (facetted)	4	1.3
- CPS (unprepared/'ski spall')	8	2.7
- other/unspec. CPS	3	1.0
- bidir. core tablet (plain/'ski')	5	1.7
- bidir. core tablet (facetted)	1	0.3
- other bidir. core tablet	2	0.7
- undet. platf. spall/core tablet	2	0.7
- platform trimming fl.	156	51.7
- bidir. clean-up bl.	11	3.6
- bidir. plunging bl.		
- epsilon bl./fl.	8	2.6
- other/undet. bidir. CTE		
Undet. CTE		
Total	302	100

fl. - flake; bl. -blade; IPS - Initial Platform Spall; CPS - Consecutive Platform Spall

Raw Material Procurement

The raw material consists of 99.7% of FRMG 2, which is quite rare in evidence among other find collections at Shkârat Msaied (around 3% at Unit U and Unit K). The natural surfaces are characterized by primary lime cortex of lenticular nodules.

The source area of nodular FRMG 2 is unclear. Although tabular FRMG 2 is known form Jabal Jiththa (ca. 7 km east of Basta), the use of Jiththa-Flint is not in evidence at Shkârat Msaied. I expect possible source areas of nodular FRMG 2 in the Eocene limestones of the Negev, where flint quarries have been discovered at Har Gevim (Gopher / Barkai 2011; walking distance to Shkârat Msaied ca. 14 h).

Refitting Studies & Consecutive Platform Spalls (CPS)

The refitting studies focused on refitting platform spalls (**Fig. 5**, **d1-d17**) and platform trimming flakes (**d18-d23**) in order to understand the specific reduction procedure and to approach the Minimum number of cores (MCN, cf. below).

17 Aggregates of ISP have been refitted. They revealed a number of Pseudo-IPS, which are called here Consecutive Platform Spalls (CPS). In the chaîne opèratoire CPS follows IPS but precede the blade reduction. At Shkârat Msaied CPS appear to be a strategy to adjust the reduction angle of the established platform. They appear to be plain ('ski-spalls', e.g. **d1-d2**) if minor corrections occurred or facetted (e.g. **d4-d5**) if larger corrections were considered necessary. Twelve CPS are in evidence, which could be refitted to seven aggregates. Sometimes two or three CPS were consecutively detached (e.g. **d1**).

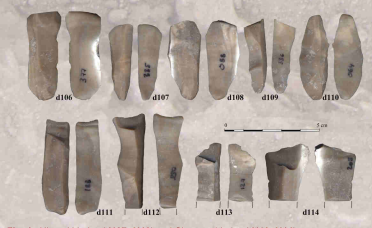

Fig. 4 - Hinged blades (**d107-d110**) and Clean-up blades (**d111-d114**)

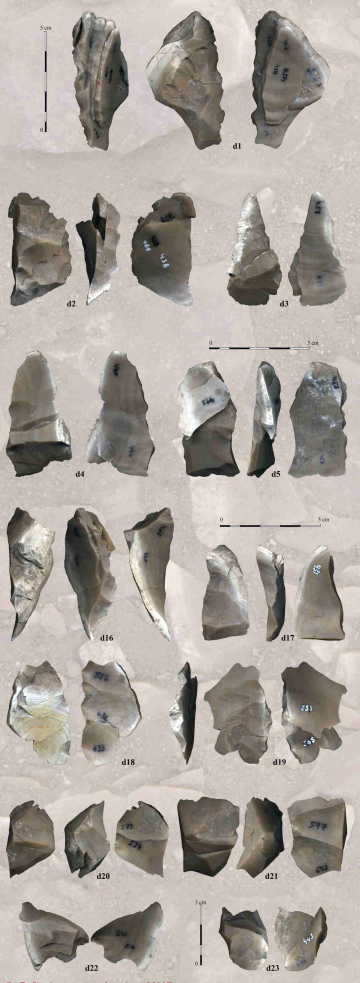

Fig. 5 - Refitted aggregates from Loc. 90307.
d1-d3, **d16-d17**: Aggregates of Initial Platform Spalls (IPS)
d4-d5: Aggregates of Consecutive Platform Spalls (CPS)
d17-d23: Aggregates of Platfrom Trimming Flakes (PTF)

Minimum Core Number (MCN) & Estimation on Blade Productivity

The estimation on blade productivity is based on the assumption, that all bidirectional cores involved in Loc. 90307 have been reduced completely. Additionally, it is considered, that the waste was disposed almost completely in the pit and that the MCN represent the number of core reductions.

Since no cores have been found the MCN has to be estimated by indirect evidence. Indirect conclusions can be drawn on the number of Initial Blades I or II, which usually should equate the number of cores. Another way is to count the number of IPS, which usually should double the core number.

Initial Blades I are missing with exception of four small fragments. The number of Initial Blades II is nine and well corresponds with the MCN estimated by the platform spalls. 20 aggregates with IPS are present plus two additional aggregates with CPS which could not further refitted. Therefore a MCN of ten or eleven bidirectional core reduction sequences can be concluded.

The average productivity of bidirectional blade cores of 'Ain Ghazal is estimated by Quintero via replication studies (Quintero 2010) about 20-25 target blades per core. Barzilai (2010) calculated the average productivity by a formula considering lengths of Initial blades I and IPS as well as the heights of exhausted bidirectional cores. He concludes an average productivity of about 14 to 19 target blades per core for the sites MPPNB Beidha and Shkârat Msaied.

Considering Barzilai's average numbers, the blade productivity of Loc. 90307 can be estimated between 140 and 209 target blades. If the missing Initial Blades I are considered as target blades as well, the blade productivity increase up to 150 to 220 blades.

Socio-economic implications

Who produced these blades and for whom? The answers of these questions may tell a lot about the socio-economic settings of this bidirectional workshop dump.

The extraordinary homogeneity in core preparation and core reduction suggest that very few, probably just one person was involved. The non-association of other garbage (e.g. bones) or sedimentation in the pit fill suggest a very short period of deposition, probably as a single event. As Quintero (2010: 97) states, the preparation and complete reduction of a bidirectional blade core can be managed within a very short time, e.g. less than 40 minutes and the reduction of 10 to 11 blade cores could be handled within one day.

The number of knapping errors (i.e. hinges, overshoots, **Fig. 5**) hints to a skilled person. The hinge-rate is 7.7% with slightly to medium developed hinges only, while overshoots are absent. The presence of minor knapping errors and the evidence of some CPS to correct the platform angle may hint to de-skilments due to discontinuous or seasonal practicing of bidirectional blade technology.

Although we lack empirical data on blade consumption pattern, Quintero assumes that the yearly demand of an average PPNB household can be satisfied by the reduction of one or two bidirectional blade cores (Quintero 2010: 97). These numbers well match the calculated yearly blade consumption of 27 blades per household for Early Neolithic farmers at Laurenzberg 7 / Rhineland (LBK ceramic tradition, Zimmermann 1995: 82).

Considering these numbers the Shkârat Msaied workshop is likely to have been operated beyond the self-supply and the surplus may have provided blanks for non-associated households (3 to 11 households if the estimation on consumption holds true). The workshop productivity is low and may not exceed the community demand. The mode of production is best characterized as individual specialisation on a household and there is no evidence of other on-site operating specialized workshops for bidirectional blade production at Shkârat Msaied. Nevertheless, there is good evidence of (individual) household specialisation for other products, such as green-stone processing (beads, pigments, cf. Pit Area I or Locus 1114/1118) or the concentration of bird bones (particularly of wings) at Unit B (Jensen 2008).

In contrast bidirectional blade workshops dumps of the LPPNB Period such as known from 'Ain Ghazal (Quintero 2010) or Basta (cf. Barzilai 2010) comprise hundreds of reduction sequences per workshop, which testify the production of thousands to tens of thousands blades. At Basta, several workshops concentrate in specific quarters and are assumed to produce for regional consumption.

Bibliography

BARZILAI, O.
2010 *Social Complexity in the Southern Levantine PPNB as reflected through Lithic Studies: the Bidirectional Blade* Industries. BAR International Series 2180. Oxford: Archaeopress.

GOPHER, A. / BARKAI, R.
2011 A new Neolithic quarry complex at Har Gevim, Israel: An Introduction. In: M. CAPOTE / S. CONSUEGRA / P. DÍAZ-DEL-RÍO / X. TERRADAS (eds), *Proceedings of the 2nd International Conference of the UISPP Commission on Flint Mining in Pre- and Protohistoric Times (Madrid, 14-17 October 2009)*. BAR International Series 2260: 275-282. Oxford: Archaeopress.

JENSEN, C.H.
2008 Workshops and Activity areas in the PPNB Period: The Excavation at Shkarat Msaied. In: H. Kühne / R.M. Czichon / F.J. Kreppner (eds), *Proceedings of the 4th International Congress of the Archaeology of the Ancient Near East. 29 March - 3 April 2004, Freie Universität*: 331-344. Wiesbaden: Harassowitz.

JENSEN, C.H. / HERMANSEN, B.D. / BILLE, M.P. / KINZEL, M. / HALD, M.M. / BANGSGAARD, P. / LYNNERUP, N. / THUESEN, I.
2005 Preliminary Report on the Excavation at Shakarat al-Musay'id, 1999-2004. *Annual of the Department of Antiquities of Jordan* 49: 115-134.

KINZEL, M.
2013 *Am Beginn des Hausbaus. Studien zur PPNB-Architektur von Shkarat Msaied und Ba'ja in der Petra-Region, Südjordanien*. Studies in Near Eastern Production, Subsistence, and Environment 17. Berlin: ex oriente.

PURSCHWITZ, C.
2016 *The Lithic Economy of Flint during the Early Neolithic of the Greater Petra Region. Geological Availability, Procurement, Production, and Modes of Distribution of Flint from the Early to Late PPNB-Period*. Ph.D.-Thesis, Freie Universität Berlin. (in german)

QUINTERO, L.
2010 *Evolution in Lithic Economies in the Levantine Neolithic. Development and Demise of Naviform Core Technology as seen from 'Ain Ghazal*. Berlin: ex oriente.

SCHIFFER, M.B.
1987 *Formation Processes of the Archaeological Record*. Albuquerque: University of New Mexico Press.

ZIMMERMANN, A.
1995 *Aussaustauschsysteme von Silexartefakten in der Bandkeramik Mitteleuropas*. Universitätsforschungen zur prähistorischen Archäologie 26. Bonn: Dr Rudolf Habelt GmbH.

Contact:
Christoph Purschwitz
Freie Universität Berlin
Institute of Near Eastern Archaeology

purschw@zedat.fu-berlin.de

In cooperation with:

Department of Antiquities

Freie Universität Berlin

Funded by:

CARLSBERG FOUNDATION

DET DANSKE INSTITUT I DAMASKUS

Elsa-Neumann-Stiftung des Landes Berlin

shkaratmsaied.tors.ku.dk