Introduction

The site of Shkärat Misaed is located 13 km north of Petra / Wadi Musa (Fig. 1). The aerial view (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 a 600 m² of Neolithic architecture which comprises six phases of occupation (Fig. 2). Phases I to III span the first half of the MPPNB (ca. 8520 to 7950 BCE). Phase IV is dated to the Late Neolithic and Phase V represents the Nabatean / Roman Period. The MPPNB site of Shkärat Misaed is characterized by circular buildings which cluster around courts or open spaces. Due to shortage of water sources, blocked entrances and comprehensive tool misplacement the settlement area is assumed to be seasonally occupied (Jensen et al. 2005; Kinzel 2013; Purtscheller 2016).

Raw Material Procurement

The raw material consists of 99.7% of FRMG 2, which is quite rare in evidence among other finds collections at Shkärat Misaed (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 from Jabal Uthriha (ca. 7 km east of Basta), the use of Uthriha-Fint is not in evidence at Shkärat Misaed. I expect possible sources 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 Shkärat Misaed ca. 14 km).

Refitting Studies & Consecutive Platform Spalls (CPS)

The refitting studies are based on refitting platform spalls (Fig. 5, d51-d71) and platform trimming flakes (d41-d22) 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 chain operating CPS follows IPS but precedes the blade reduction. At Shkärat Misaed CPS appear to be a strategy to adjust the reduction angle of the established platform. They appear to be plan (58%), e.g. d43, d52, d57, 1.2% if minor corrections occurred; or faceted (e.g. d54-d55) if larger corrections were considered necessary. Twelve CPS are in evidence, which could be refitted to seven aggregates. Sometimes two of three CPS were consecutively detached (e.g. d11).

Locus 90307

The pit Loc. 90307 was found 2010 in an open space (area VI, Fig. 3-4) adjacent to a small wadi. The flat pit is 30 cm in diameter and was completely filled by 3736 chopped 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 wadi was still in use. The small wadi 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.).

Primary Product Data

The artefacts Loc. 90307 are characterized by a high proportion of chips, flakes and microdebit (altogether more than 70%, Tab. 1), which is considered as major indicator of the primary production activities (e.g. Schiffer 1987; Quinette 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 Blade Trimming Flakes may indicate that initial core shaping took place off-site.

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

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 already 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 which usually should equal 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 Am Ghazal is estimated by Quinette via refitting studies (Quinette 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 Shkärat Misaed.

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 increases up to 150 to 230 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 in the production. The absence of other garbage (e.g. bones, charcoal, etc.) within the pit fill suggest a very short period of deposition, probably as a single event. As Quinette (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 have been finished within one day.

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

Although we lack empirical data on blade consumption pattern, Quinette assumes that the yearly demand of an average PPNB household can be satisfied by the reduction of one to two bidirectional blade cores (Quinette 2010: 97). These numbers well match the calculated yearly blade consumption of 27 blades per household for Early Neolithic farmers at Laurenburz 7 / Rheinland (LLBK ceramic tradition, Zimmermann 1996: 82).

Considering these numbers the Shkärat Misaed 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 specialisations for bidirectional blade production at Shkärat Misaed. Nevertheless, there is good evidence of (individual) household specialisation for other products, such as green-stone processing (beads, pendants, cf. P. Aria I or Loc. 114-1141) or the concentration of bird bones (particularly of wings) at Unit B (Jensen 2008).

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