Use-wear Analysis of Later Stone Age Artifacts from Mogapelwa, Botswana

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Introduction

In 2005 excavations were conducted at the site of Mogapelwa located on a sand ridge in the Kalahari Desert within 1 km of ancient shoreline features of Lake Ngami (Figure 1). The site is situated about 6 km southwest of Toteng 1 where the earliest dated domestic livestock in the Kalahari was found (Robbins et al. 2008).

Mogapelwa is primarily a Later Stone Age site that spans much of the Holocene. Historic deposits, most likely dating to the 19th century, are also evident just below the present ground surface. A detailed report about this site, not including the use-wear information, has recently been published (Robbins et al. 2009). Before presenting the use-wear analysis we will briefly describe the excavations and findings.

Seven 1m squares were excavated exposing approximately 2 meters of artifact bearing sandy deposits overlying a base of hard calcrete. Overall, there were four sediment units. Eight OSL and four radiocarbon dates (two of which are AMS) indicate the following age brackets for the sediment units starting from the surface (see details in Robbins et al. 2009: 16-17) sediment unit 4= modern to 2 ka, sediment unit 3= 2 - 3.5 ka, sediment unit 2= 5.2 - 9.4 ka, sediment unit (calcrete) 1= “bioturbated/deposited some time after 16-15ka” (Robbins et al. 2009: 17).

The main Later Stone Age occupation levels, containing the densest concentrations of artifacts and bone fragments, were uncovered between 95 and 130 cm. These deposits date to between approximately 6.4-3.3 ka. During most of this period (6.4-3.3 ka) Lake Ngami was a large body of water in contrast to its recent historic record of periods of very low water and episodes of total drying out (Shaw 1985).

The stone artifacts from Mogapelwa are mainly microlithic including such tools as segments or crescents, distally backed points, small scrapers, and backed drills (Figure 2). About 91% of the lithic material is debitage. Raw materials include a variety of different colored chert/chalcedony, silcrete, and quartz/quartzite. Together, chert/chalcedony and silcrete make up about 84% of the raw material.

Bone points similar to bone arrow points or link shafts used recently by Kalahari San (Silberbauer 1981; Wiessner 1983) were found in sediment units 4, 3 and 2 indicating long term use of an ethnographically known type of arrow point at Lake Ngami.

There were also unique clusters of large (7.0 mm mean diameter) red ocher stained ostrich egg-shell beads that were still firmly stuck together in groups of two or three beads. These bead clusters and numerous single beads that were identical to the beads in the clusters were concentrated in a single square (Sq. 4) between 110 and 135 cm. We believe that these beads were all part of the same bead string (see discussion in Robbins et al. 2009). An AMS dated bead from the concentration of beads (Sq. 4, 115-120, Sediment Unit 2) was dated to 4,568 +/- 43 BP (2 Sigma calibration BC 3380-3090 or BC 3500-3450, 5.3 ka, University of Arizona AA 65811). Other smaller ostrich egg shell beads were also found in the deposits and there were occasional finds of undecorated potsherds. The potsherds mainly occurred in levels above 60 cm in the upper part of Sediment Unit 3 and within Sediment Unit 4.

Approximately 6,000 bone fragments were recovered. Most of the mammal bones were too frag-
mented to be identified to species. Those that could be identified were from a wild fauna including springhare, steenbok, grey duiker, impala, zebra, warthog, and other animals all of which occurred in the Lake Ngami area in historic times. Bones of cichlids and various catfish such as *Clarius* were common finds. Fish otoliths (earstones) recovered from the deposits most likely belong to the cichlid fish genus *Oreochromis*.

**Use-wear Analysis**

An exploratory use-wear study was conducted on a sample of 16 stone artifacts to understand how these tools were used at the site (Figures 2 and 3). These artifacts were selected in the field from sediment units 4, 3 and 2 and were carefully wrapped before being transported, in order to protect the edges. Following the classification and description of these tools in the lab, they were studied for traces of use, specifically edge damage, scars, striations and micro-polishes, under an incident light microscope (an Olympus BH microscope with a magnification of 50-400X). The method of use-wear analysis used for this research was based upon a technique developed progressively by Semenov (1964), Tringham et al. (1974) and Keeley (1980).

Before examination, the tools were cleaned in an ultrasonic cleaning tank containing an ammonia-free detergent solution. They were successively washed using clean water. This helped to remove the small particles of sand, silt, and clay adhering to the implements’ surfaces (Kashyap 2006). Apart from initial cleaning, alcohol was used during the examination to remove finger-grease from the clay supporting the microliths. After cleaning, preliminary scans of 50-100X were performed with the incident light microscope to initially divide the assemblage into.
‘used’ and ‘unused’ tool categories. Although higher magnifications of up to 400X were employed to examine the micro-polishes, all of the edge damage, striations, and scar types were identified at 200X magnification. The photomicrographs were also taken at 200X.

Findings

Table 1 presents the results of the use-wear analysis. While the number of artifacts is too small to reach any broad conclusions, the results do show that traces of use are frequently present on the working edges (10 of 16 specimens). Evidence of use was most common on the chert artifacts (eight of ten chert artifacts vs. two of six silcrete artifacts).

Use-wear was evident on tools found in all three of the main artifact bearing sediment units (sediment units 4, 3 and 2). The depths for the specimens with use-wear in the sample ranged from 5-10cm below the surface to 130-135cm. This information on the overall depth of the artifacts, when combined with the OSL and radiocarbon ages from the Sediment Units (Robbins et al. 2009), suggests that stone tools that preserve microscopic traces of use are likely to span at least a 6,000 year period.

The inferred use of tools based on microscopic examination is generally consistent with our expectations based on typology as well as the general assumptions held about the use of similar tools at other sites. For example, one of the segments (Table 1, #1) revealed impact damage from use as a projectile; a finding that is consistent with their likely use as armatures in arrows. Since bone arrow points were also found in the excavation, the impact damage on the segment suggests that arrows armed with microliths as well as arrows using bone points were in use. In addition, the double backed drill (Table 1, #11) had wear consistent with use on a hard substance, which supports the inference that such implements were actually used as drills. Most likely at Mogapelwa drills were used in the production of holes through ostrich eggshell beads. Finally, the convex end scraper (Table 1, #15) characterized by ‘scraper retouch’ was used on hide and was recovered in deposits rich in mammal bones.

Conclusions

Use-wear analysis has the potential to provide an important new window into the past in the Kalahari. Our work at Mogapelwa as well as other studies from two of the Tsodilo Hills rock shelters, located in northwestern Botswana, suggests that researchers may expect to find significant numbers of tools with evidence of use-wear. Furthermore, it is now apparent traces of use on stone tools can cover a very long range of time in the Kalahari extending through much of the Holocene and into the Pleistocene. At the Tsodilo Depression Shelter, nine of 19 chert artifacts contained evidence of use (Donahue and Robbins 1989). These artifacts spanned the period between approximately 1300-12,000 years ago while at White
Paintings Shelter 15 of 78 artifacts from five of the major occupation units revealed microscopic evidence of use (Donahue et al. 2002-2004). The time span of the artifacts indicated that the use of this site extended from as recent as a few hundred years ago to at least 50 ka in the Middle Stone Age from which there is evidence of work on bone, wood and hide, as well as impact damage on the tips of spear points.

The work at Mogapelwa has added to the available information about how specific kinds of stone tools were being used in the Kalahari at an open site over a substantial period of time during the Holocene. We suggest that further work with larger samples of tools from the different sediment units might be informative about stability and change in tool use during a critical period of the Holocene, and within an area where there has been considerable debate (Sadr 1985) about the initial impact of domestic livestock on the technology and subsistence of hunter-gatherers.

Acknowledgements

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Table 1: Use-wear artifacts from Mogapelwa.

<table>
<thead>
<tr>
<th>Artifact</th>
<th>R.M.</th>
<th>Sq/depth cm.</th>
<th>Use-Wear Characteristics</th>
<th>Interpretation</th>
</tr>
</thead>
<tbody>
<tr>
<td>1. Segment/point</td>
<td>Chert</td>
<td>7, 5-10</td>
<td>Tip broken from impact, half-moon shaped impact fractures, linear polish running parallel to direction of impact.</td>
<td>Projectile</td>
</tr>
<tr>
<td>2. End scraper on bladelet</td>
<td>Chert</td>
<td>7,15-20</td>
<td>Moderate edge scarring with scalar scars. Polish is smooth and bright with greasy luster only on isolated spots.</td>
<td>Meat with bone/fish polish</td>
</tr>
<tr>
<td>3. Double backed Microlith/point</td>
<td>Chert</td>
<td>2, 25-30</td>
<td>Tip broken from impact, very prominent fracture scars, half-moon in shape, no linear polish evident.</td>
<td></td>
</tr>
<tr>
<td>5. Segment with pointed tip</td>
<td>Silcrete</td>
<td>4, 80-85</td>
<td>Use-wear absent.</td>
<td></td>
</tr>
<tr>
<td>6. End scraper on flake</td>
<td>Chert</td>
<td>2, 80-85</td>
<td>Edge scarring is prominent.</td>
<td>Scaling fish or butchering meat</td>
</tr>
<tr>
<td>7. “Utilized” blade with broken tip</td>
<td>Silcrete</td>
<td>4, 95-100</td>
<td>Scalar half-moon scars, isolated spots with rough and greasy polish, used on hard material.</td>
<td>Probably butchering</td>
</tr>
<tr>
<td>8. Segment</td>
<td>Chert</td>
<td>4, 95-100</td>
<td>Use-wear absent.</td>
<td></td>
</tr>
<tr>
<td>9. Double backed drill</td>
<td>Silcrete</td>
<td>5, 95-100</td>
<td>Use-wear absent.</td>
<td></td>
</tr>
<tr>
<td>10. Unretouched Bladlet, broken on end</td>
<td>Silcrete</td>
<td>5, 105-110</td>
<td>Use-wear absent.</td>
<td></td>
</tr>
<tr>
<td>11. Double backed drill</td>
<td>Chert</td>
<td>4, 105-110</td>
<td>Heavy use on hard material, longitudinal striaations on both edges, circular striaation pattern on tip.</td>
<td>Drill</td>
</tr>
<tr>
<td>12. Small scraper/adze</td>
<td>Chert</td>
<td>2, 120-125</td>
<td>Tip broken on both sides, macro-scars prominent but no polish.</td>
<td></td>
</tr>
<tr>
<td>13. Segment</td>
<td>Chert</td>
<td>2, 120-125</td>
<td>Patinated, probably used but can’t determine.</td>
<td></td>
</tr>
<tr>
<td>15. Convex end scraper</td>
<td>Chert</td>
<td>2, 130-135</td>
<td>Thin line of polish.</td>
<td>Work on hide</td>
</tr>
</tbody>
</table>

Key to shading of Sediment Units in Table 1
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