A USE-WEAR ANALYSIS OF TOALIAN GLOSSED STONE ARTEFACTS FROM SOUTH SULAWESI, INDONESIA

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ABSTRACT

This paper attempts to bring together the data and results of the use-wear analysis of 127 glossed flakes excavated from the rockshelter of Leang Burung 1 in South Sulawesi, Indonesia. This research was conducted as part of my honours dissertation submitted to the Center for Archaeology at the University of Western Australia in 1997. Glossed flakes are a particular phenomenon from a number of sites in Island South East Asia, including sites in the Philippines and East Timor. Many functions have been postulated for these implements by several researchers. In this study, I put forward the contention that these artefacts were used to cut soft, living plant materials, in particular, grasses and even cereals such as rice. The results presented in this paper may shed some light on Hunter-Gatherer/ Austronesian Farmer relations in South Sulawesi after the middle Holocene.

THE TOALE AND THE TOALEAN

As part of the first phase of archaeological research in South Sulawesi the Swiss naturalists, Fritz and Paul Sarasin, excavated four rockshelters in 1902 and 1903 in the remote Lamoncong area, and reported their findings in 1905. During their time in South Sulawesi, the Sarasins came into contact with rain-forest dwellers whom at least occasionally inhabited rockshelters of the hinterland Lamoncong region. The Sarasins then extended the name Toalian (which means forest peoples) to refer to the stone tools that they had excavated in some rockshelters, even though the To-ale' had no knowledge of the manufacture of stone tools (Bulbeck in press; Mulvaney and Soejono 1970a: 27).

There are no living hunter-gatherers in South Sulawesi (or in any other part of mainland Sulawesi) and apart from the scant observations of the To-ale' by the Sarasins, claims for ethnographic records concerning the nature of Toalian society are non-existent (Bulbeck in press). Researchers such as Pelras (1996:37) suggested that the To'ale were simply exiled modern Bugis ostracised by Bone rulers for some unknown indiscretion or breach of customary law.

It is also interesting to note, however, that oral tradition in South Sulawesi does refer to the existence of a "different" group of people, the original inhabitants of South Sulawesi "whose physical appearance was different from that of present-day Indonesians" (Pelras 1996:37). In oral traditions, the people of South Sulawesi call them the To-Marege, a name also given to Australian Aboriginal people by the South Sulawesi navigators whom visited Australia's north in search of trepang (Pelras 1996:37).

The Toalean, in archaeological terms, refers now to a stone tool complex, which manifested around 6000 years ago in South Sulawesi. It was mainly focussed on the manufacture of microliths, including what are commonly known as backed blades and geometric forms. A distinctive type of hollow based, serrated point, known as the Maros point, was also manufactured after 6000 years ago and continued to be after the appearance of pottery in rockshelter deposits (Bellwood 1997:196).

PREVIOUS STUDIES ON TOALIAN SUBSISTENCE PATTERNS

Previous studies on Toalian subsistence is confined, firstly, to a general overview of economic activities, proposed by Heekeren. Heekeren painted a broad picture of Toalian economic activities, based predominantly on the abundant faunal remains from 19 different rockshelters. He concluded that the Toalian peoples utilised resources such as molluscs, big and small game and edible wild plants (Heekeren 1957:95).

Valerie Chapman, in her 1981 Masters study of Toalian artefacts from Leang Burung 1 and other Toalian rockshelters, utilised a typological paradigm to infer certain activities such as hunting (points) and tool maintenance and wood working (scrapers) (Chapman 1981, 1986:81).

Chapman, as I did, also recognised the relative abundance of small flakes all made of fine grained chalcedony which have a distinctive sheen on their edges and are commonly therefore called glossed flakes (Chapman 1981; 1986:81).

Examining them cursorily at a relatively low magnification of 80x, she found that gloss was either restricted to the margins of the edge, or alternatively, extended from the edge into the interior of the artefact. Her brief analysis suggested that the flakes were used to process soft, yielding and thin stalked plants (Chapman 1981;1986). Whilst I agree with Chapman's observations at the initial level, I also wanted to explore these patterns further by using high-powered microscopy as well as a more objective form of attribute recording to observe how such patterns are manifested through space and time.

THE SITE

LEANG BURUNG 1

Leang Burung 1 (Figure 1) is a relatively large rockshelter located in the Tonasa limestone towers approximately 10 km directly east of the town of Maros (Glover 1979:304). It was excavated, along with other rockshelters, under the auspices of the Australian – Indonesian Archaeological Expedition in 1969 (Mulvaney and Soejono 1970a; 1970b).

Three trenches, designated A, B and C were excavated at Leang Burung 1. Whilst Trenches A and B were dug primarily to recover stratified cultural materials, Trench C was excavated in order to test the stratigraphic relationships between A and B. (Chapman 1981). Therefore, this trench and any materials that may have originated from it, were not examined as part of my study.

Trench A consists of eight squares excavated inside the rockshelter to a greatest depth of nearly four metres. A total of 23 spits, dug in 6 cm levels, were excavated in Trench A. A radiocarbon date of 2820±210 (ANU-391) years BP was obtained on charcoal at the bottom of spit 16 in Trench A. This date essentially marks the beginning of ceramic usage inside the shelter with the deposit above spit 16 replete with ceramics. It is likely that occupation within the rockshelter began around 3500 BP as represented by Spits 17-23, which are aceramic (Chapman 1981).

A total of 7762 artefacts were excavated from Trench A and of these, 341 pieces were analysed for use-wear. The majority of these artefacts were types and therefore were selected for analysis. They include so-called "scrapers", blades, points, geometric microliths, backed points and the distinctive Maros points. It was decided however, that the 100 glossed flakes that were also identified, would be the most useful in addressing questions concerning soft plant processing as they showed definite signs of use-wear in the form of gloss on their edges. It is important to note that microscopic analysis of any of the other artefact types failed to detect any obvious signs of use wear, except for edge-fracturing which could not confidently be assigned to use as all of the artefacts had been bagged together after excavation.

Trench B

Trench B was also a part of my investigation. Trench B was excavated just outside the overhang of the Leang Burung 1 rockshelter. The impetus for its excavation was to investigate the mound of shelly material, which appeared to be *in situ* outside the shelter (Chapman 1981:30).

A total of five squares, also dug in 6 cm spits, were excavated to a depth exceeding 150 cm. Several important features mark the excavation of Trench B. These included an area of disturbance in squares 1-3, which appeared to be the infilling of recent potholes and a recent goat burial on Square 5. David Bulbeck also recovered fragments of human bone, probably derived from a primary burial. A radiocarbon date of 4610±220 (ANU-6175) from this unburnt bone was returned and seems to be a later cultural feature, with a date of 4480±480 (ANU-1624) obtained on charcoal marking the minimum date of the beginning of site occupation (Pasqua and Bulbeck in press).

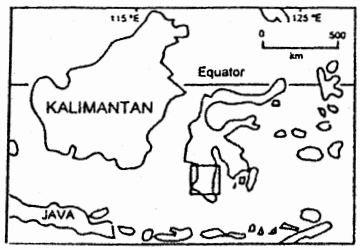
A total of 2846 artefacts were excavated from Trench B, of which I analysed 50 for signs of use-wear. Significantly, glossed flakes, of which there were 27, make up over 50% of artefact types analysed. Therefore, as with the Trench A artefacts, it was an opportune context in which to explore changes in plant processing over time.

METHODOLOGY AND OBSERVED USE-WEAR PATTERNING

In order to explore any differences in plant processing at the rockshelter, I utilised criteria set by Grace (1989; Levi-Sala 1996; see also Vaughan 1985) as they seemed the most useful in determining these basic differences. These criteria include polish invasiveness, polish development, polish distribution, and the absence or presence of striations. These attributes have the potential to identify any differences in plant processing.

Polish invasiveness was gauged as being absent, restricted to the edge or more than half the diameter of the microscope's lens at x200 magnification. This attribute has potential to indicate the relative hardness or softness of a particular material. An artefact with high polish invasiveness may indicate its use against a soft material, due to the deep penetration of the artefact into the material.

Polish development also has the potential to identify the hardness or softness of a particular material. However, it is also a potential indicator of the intensity or longevity of artefact use. For example, an artefact showing an "all over polish development" suggests that it was used intensively



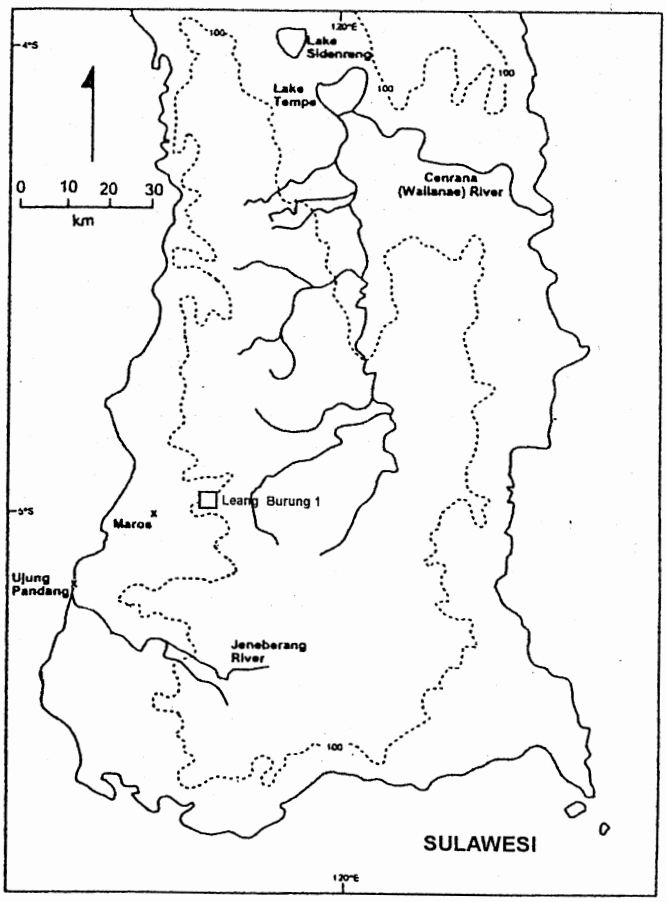


Figure 1: Map of South Sulawesi showing Leang Burung 1.

or over a long period of time to produce a pattern whereby the polish has become linked or smoothed. Striations, which are commonly long furrows gouged into the surface of a utilised artefact, can determine the motion of the tool as it was used against a material.

Polish distribution, an observation that simply determines the location of gloss/polish on the artefact's edge, also has the potential to delineate an artefact's mode of movement, i.e., sawing, cutting, scraping or whittling. For example, a stone tool exhibiting a polish distribution located on both the dorsal and ventral side of the edge suggests its use as a cutting tool (Grace 1989:99).

Using a high-powered microscope, which ranged in power from 200x to 800x, I was able to distinguish two main types of use wear patterning on the glossed flakes from both Trench A and Trench B. I postulate that these patterns are the result of the cutting and whittling and/or scraping of both soft and harder plant materials.

Type One

Glossed flakes that exhibited an equal distribution and development of polish on both the ventral and dorsal sides of the artefact with a high polish invasiveness into its interior on both sides were deemed to be cutting implements.

Type Two

Alternatively, those glossed flakes that displayed higher polish invasiveness and a more developed polish on one side of the artefact, usually the dorsal side, were thought to be scraping and/or whittling implements.

Other differences that I observed I believe point to differences in the relative hardness or softness of the plant material being processed. For example, those glossed flakes showing low polish invasiveness and/or polish development, combined with other criteria such as angled, perpendicular or parallel striations and high edge angles, suggested that they were used against a harder plant material.

RESULTS

Microscopic analysis of the glossed artefacts from both Trench A and Trench B suggested that changes in plant processing over time took place both within the rockshelter as represented by Trench A, and outside the shelter (Trench B).

Trench A

Utilising those attributes described earlier, the following pattern within the rockshelter was recognised. Pooling all the 100 glossed flakes from Trench A together revealed that the majority of glossed flakes were used for cutting soft plant materials with only a small number used for other activities such as whittling or scraping (Table 1).

Secondly, after it was observed that there seemed to be a large concentration of glossed flakes in the upper seven spits of Trench A, they were divided into two analytical units, designated Unit 1 (spits 1-7) and Unit 2 (spits 7-23) and contain 83 and 17 glossed flakes respectively. The pattern described for all the Trench A glossed flakes, that is, the predominant cutting of soft plant materials, was recognised as being confined to the Unit 1 glossed flakes

with the Unit 2 glossed flakes showing use-wear characteristics such as low polish invasiveness, heavier rounding and higher edge angles that point to the processing of a harder plant material. Therefore, Unit 2 represents the processing of a harder plant material than Unit 1. Also, and much more importantly, a class of thin glossed flakes with lower edge angles and shorter working lengths was found to be a distinctive set of artefacts found in Unit 1, which was deposited after 2800 years ago.

Microscopic analysis of this class of glossed flakes found that they were mainly used to cut soft, probably thin stalked plants as they show a well developed and an equal and high polish invasiveness on both faces. It is also noted that no macro-edge fracturing is present, suggesting only a soft plant material was being processed. A small number of these flakes were used to scrape and whittle soft plants.

In summary, within Unit 1, a number of thin glossed flakes were shown to be mainly cutters of soft, thin stalked plant materials (Table 1). Therefore, it seems that the cutting of soft plant material is a trend confined to the later Holocene as represented by the upper levels of Trench A (Unit 1) which were deposited some time after 2800 years ago.

Trench B

Although the Trench B sample was small (n=27), some of the more salient tendencies to emerge from this analysis were a complex of low polish invasiveness, heavy macro and micro rounding and more striations. These attributes combined suggest, that similar to Unit 2, a harder plant material was being processed earlier in time at the Leang Burung 1 rockshelter.

DISCUSSION

The changes in soft plant processing that have been identified over the duration of the rockshelter's occupation have, I believe, important implications for the identification of any sort of interaction with Austronesian farmers over the last 2000-2500 years in South Sulawesi.

Firstly, as indicated by the relative abundance of glossed flakes in Leang Burung 1, Trench A, after 2500 years ago, a definite focus on the processing and mainly cutting of some sort of soft plant material was taking place. It may be that the arrival of Austronesian farmers on the coastal plain offered a new set of resources that enabled Toalian hunter-gatherers to overcome certain hardships brought on by resource depletion or scarcity. The increase in soft plant processing could conceivably be the reflection of such a response. Interaction with Austronesian farmers may have also directly influenced the Toalians to cultivate their own rice fields or procure forest products, as trading networks and communication between the two groups were established.

Such trading networks are evident in modern day hunter-gatherer groups such as the Agta negritos of Northern Luzon in the Philippines whom trade regularly with Itawi farmers, a tradition which Headland and Reid (1989:45) contend began in the Philippines some time after 3000 BC. In contemporary times, only a few groups of Agta people follow a traditional hunting/gathering lifestyle. Even these Agta groups "have added activities because of contact" with Itawi farmers, e.g. the Agta plant small crops of rice and/or sweetcorn in order to supplement their subsistence based diet, or to trade with Itawi farmers for tobacco or other goods.(Griffin and Solheim

Table 1: Classificatory Table of Functional Classes for Glossed Flakes, Leang Burung 1, Trench A (N=100).

Functional Class	Motion of activity	Criteria	Proportion (%)
Cutting soft plant materials	Longitudinal	Equally high polish invasiveness on both faces; equally well developed polish on both faces	63
Whittling plant materials with dorsal side as leading edge	Transverse	Higher polish invasiveness on dorsal side; more well developed polish on dorsal side	19
Whittling plant materials with ventral side as leading edge	Transverse	Polish more invasive and better developed on ventral side	6
Cutting harder plant materials	Longitudinal	Less invasiveness polish equally distributed on both sides; less developed polish equally distributed on both sides	5
Not able to classify	Unknown		7

1990:154; Barbosa 1985:14; see also Griffin and Estokio-Griffin 1978 and Peterson 1978.)

Secondly such trading patterns may be related to the new class of thin glossed flakes that were deposited after 2800 years ago in trench A. They possibly represent a precursor to the metal finger knife which is still in use in South Sulawesi rice paddies today. These flakes are small, thin, have short working edges and are sharp. These features, combined with a low edge angle, would have made them ideal tools with which to cut thin stalked, soft plants such as rice or other such grasses or cereals. The highly developed gloss apparent on their edges, on both sides of the artefacts, show that they were used against a highly siliceous plant. Rice plants and other grasses contain high amounts of silica in the form of phytoliths which, when combined with water from the surrounding environment, serve as protagonists in the creation of gloss as they abrade and deform the surface of the artefact edge (Levi-Sala 1996:68; Fullagar 1991; Blackman 1971).

In support of this contention, Peterson (1974:33) has suggested that similar glossed flakes from the Dimolit site in Northeastern Luzon are indicative of the importance of grain reaping in the period between 3170 and 5340 BP. Similarly, Chapman (1981:77) states the possibility of glossed flakes from the Dimilot site showing use wear patterns resembling those found on "the small metal blades which are commonly used for rice harvesting throughout the Philippines, Indonesia and Malaysia". There is therefore, no reason not to assume that some of the glossed flakes at Leang Burung 1, Trench A, perhaps represented by the new class of tools mentioned earlier, were used as Toalian finger knives.

Ian Glover has suggested, however, that glossed flakes are the result of use on highly siliceous plants such as palms and bamboo. He postulates that the prescence of glossed flakes in various sites in East Timor are representative of the manufacture of basket goods and woven mats, a tradition he believes has its roots "well back into the Pleistocene" (Glover 1986:209).

There is no reason to suspect that at least some of the glossed flakes that I analysed were used to manufacture baskets and the like. This would be in keeping with my contention that a more varied plant-processing base became available upon the arrival of Austronesian peoples.

CONCLUSION

In the course of my study, I believe that I have outlined important chronological changes marking different phases of siliceous plant processing during the occupation of the Leang Burung 1 rockshelter.

Firstly, the trend of cutting and scraping a harder siliceous plant material was one confined mainly to the mid-Holocene as represented by Trench B and the lower levels of Trench A (Unit 2). Concomitantly, proportionally lower numbers of glossed flakes in the mid-Holocene support the postulate that a more limited range of plant materials were being processed.

Secondly, it follows that the perceived increase in glossed flake use after 2500 years ago is perhaps related to the impact of Austronesian farmers on the Sulawesi landscape at this time. The appearance of pottery in these upper Trench A levels is also a tantalizing glimpse of Austronesian impact.

My data showed that the Leang Burung 1 inhabitants, after around 2500 years ago, seemed to be processing a wider variety of plant materials with a real focus on the cutting of a soft, thin stalked siliceous plant. Whether this is a phenomenon related to a direct trade of plant resources with Austronesians, or an adoption of farming techniques by hunter-gatherers lies in the realm of speculation.

I also believe that I have showed the technique of use-wear analysis of stone tools to be a useful one in the right circumstances. In this instance, I had the opportunity to analyse quite a large number of glossed flakes from one site. It must be remembered, however, that stone tools are just part of the unsynthesised economic picture at Leang Burung 1 and any further research into this problem should focus on other aspects of the archaeological record such as a detailed pollen and faunal/floral analysis. In this way, such data could be married in order to produce a clearer picture of Toalian hunter-gatherer cultures.

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