

# USE-WEAR PATTERNS ON BONE EXPERIMENTAL FLAKERS: A PRELIMINARY REPORT

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## INTRODUCTION

Guanaco bone blunted points found in Tierra del Fuego are known in the archeological literature as "flakers" or "retouchers." From ethnographic accounts it can be inferred that they were utilized for finishing stone tools by pressure flaking (i.e., Hyades 1885:551; Lists 1887:129; Lothrop 1928:59; Lovisato 1883:4; Nami 1985-1986). Bone tools with the same traits are present in many archeological sites. In Argentina, where bone tools are not so frequent in archeological sites (with the exception of Tierra del Fuego), the typical bone tools found are flakers.

This kind of tool presents identification problems due to the magnitude of bone modification that can occur from natural sources, especially in certain environments such as that of Tierra del Fuego (high humidity, roots, rodents and carnivorous gnawing, among other factors). In this paper, we present an experiment performed to determine the expected range of variation in tool marks left by pressure flaking on bone tools. The use-wear patterns and manufacture marks found in experimental tools are analyzed. These patterns are then matched with marks found in archeological bone tools from Tierra del Fuego. In so doing, we expect to find an analytical means of identifying those tools that can be considered flakers among other pseudo-tools with similar morphological characteristics.

## BACKGROUND

The foundations for microwear analysis, both for lithic and bone tools, are based on the work of Semenov (1981). In spite of the important studies on microwear patterns on lithic tools and on post-depositional marks on bones (see Miller 1975; Morlan 1984; Olsen and Shipman 1988; Shipman 1981; Shipman and Rose 1984; Sutcliffe 1973; and White and Hannus 1983, among others), little progress has been made on functional analyses of bone tools.

Among works dedicated to the identification of use-wear patterns on bone tools that began to develop in the 1980s (see D'Errico et al. 1984; Peltier 1986; Stordeur and Anderson-Gerfaud 1985), only Peltier and Plisson (1989) and Campana (1980 and 1989) deal with experimental studies of flakers. In both cases, they consider the use-wear patterns found in experimental flakers as part of a more general experiment dealing with different bone instruments, actions, and materials.

As was previously stated, one of the main problems related to the identification of bone tools is that due to their exposure to natural agents, they can present several natural modifications that preclude identification as an artifact. One means of solving this problem is through replicative and systematic experimental work, limited to one type of bone tool which has had a limited range of uses. Previous

studies, because of their generalized character, do not help in this task; it was necessary, then, to plan an experimental work that allowed the monitoring of certain factors which had not previously been taken into account. The preliminary results presented here are intended to achieve that goal.

## MATERIALS AND METHODS

### Analysis of Experimental Bone Flakers

As an initial approach to examining the observable marks on bone flakers, we analyzed the marks present on 11 specimens previously used by one of the authors (H. Nami) in experimental flaking. The examination of these experimental specimens did not allow many conclusions. This is due, on the one hand, to the fact that it was impossible to differentiate accurately those marks resulting from tool manufacture from those resulting from use, since the two overlap. On the other hand, Nami had utilized these instruments with different pressure techniques and on different lithic raw materials, so we did not have control over the use-wear pattern variability that this could imply. Neither did we have control over the length of use and the amount of retooling of the flaker's point, which is done periodically.

Because of the problems presented by this observational study, the need for an experimental use series implying more accurate controls arose.

### Manufacture Experiment and Pressure Flaking

We decided to manufacture flakers and use them in pressure flaking. This task was performed by one of the authors (H. Nami) who has a wide range of experience in replicating the flaking techniques used in Patagonia and Tierra del Fuego (Nami 1984, 1986, 1986-1987, 1993-1994). In order to maintain better

control over the possible variability of use-wear patterns, the following variables were kept constant:

1) Manufacture process. The bones were cut with a band saw both longitudinally and transversely in order to obtain blanks of similar morphology and size. Other than the use of the saw for this step, the techniques applied were those observed in the ethnographic record of the region. The sharp edges of the blanks were removed using the natural cutting edges of flakes by scraping (pushing away from the operator movement). This task left microwear on the flake similar to that observed by other researchers on flakes with natural edges used for working on bone (see Newcomer 1974; Odell and Odell-Veccheren 1980). For the manufacture of the blunted distal end, coarse-grained quartzite with water was used. The whole piece was smoothed by moving it laterally and longitudinally within a radius no larger than 6-7 cm.

2) Bone raw material. The flakers were made from the tibiae of a guanaco (*Lama guanicoe*) which had died a year earlier. In one case (Specimen 6, see below), the dry metapodial of a guanaco which had died approximately 10 years earlier was used.

3) Morphology. Following the morphological patterns of the archeological flakers found in Tierra del Fuego, the experimental specimens also had an elongated shape. The distal end was rounded and the natural bone epiphysis was maintained on the proximal end.

4) Retouching technique utilized. The flakers were utilized following the technique recorded by Holmes (1919) in California, a technique which has also been employed by several North American contemporary flintknappers (for example, Crabtree 1970).

5) Time of work invested in the manufacture of each flaker. The length of time invested in each flaker varied between 3 and 15 minutes depending on the

piece, but it was always within that range.

6) Raw material to be worked. All of the flakers were used for flaking lithic specimens that are part of repetitive experiments being performed by one of the authors (H. Nami) on Paleoindian flaking techniques (Nami 1993-1994, 1996). The raw material of those lithic specimens consisted of siliceous rocks of similar flaking quality obtained from Arroyo Sanico (Neuquen, Argentina) and Campo Cerda (Chubut, Argentina). Such raw material was thermally pretreated at 250° C.

After the manufacture of each flaker, the manufacture traces found on them were observed through a stereoscopic microscope (1.5X) and photographically recorded. The flakers were then used for retouching the lithic specimens previously described. Again they were observed at a 1.5 magnification and the use-wear patterns were photographed. Finally, the use-wear patterns were compared with some archeological pieces from Tierra del Fuego that supposedly had an analogous function.

## RESULTS

The manufacture marks and use-wear patterns recorded in the experimental pieces are presented in Table 1.

## DISCUSSION

The terminology applied to identify the different use-wear patterns follows that used in other papers (Campana 1989; Newcomer 1974; Peltier and Plisson 1989). In concordance with those previous works, we note identical types of manufacture and use-wear patterns. The fine striations (*sensu* Newcomer 1974) in this case can be attributed to the abrasive used to

shape the blunted distal end of the experimental pieces. The thick striations, on the other hand, can be assigned to the scraping work done to remove the sharp lateral edges. The chattermarks have, in this case, the same origin as those identified by Newcomer (1974); the difference is that Newcomer obtained them by scraping with stone tools, whereas in this case they result from the action of a saw.

The only use-wear pattern that was identified is a pitting that can be superficial or ~~de~~ depending on the length of use of each experimental piece (see Figures 1, 2 and 3). This type of trace was previously identified by Campana (1980, 1989).

Effects of a greater magnitude can only be seen in experimental specimen number 6. However, as stated previously, in this case the flaker was made on dry bone. Because of the high degree of damage that took place (which even modified the shape of the blunted edge of the piece) and the low level of resistance due to its dry state, we can say that flakers made on fresh bone are more suitable for pressure flaking.

## **Comparison with the Archeological Pieces**

Figures 4 and 5 illustrate archeological specimens from Tierra del Fuego identified as flakers. They exhibit a pitting that is similar to that found in the experimental pieces. We can also see polishing and other types of striations which cannot be identified, but which can presumably be attributed to the action of natural agents. This means that, although these tools are damaged by such agents, in many cases the pitting allows their identification as flakers.

## CONCLUSION

This work discusses the possibility of identifying in archeological specimens the use-wear patterns

Table I. Manufacture Marks and Use-Wear Patterns Recorded in Experimental Specimens.

Number of Experimental Specimen	Manufacture Marks	Use-wear Patterns
1	-Longitudinal thick striations on the shaft -Fine striations on the blunted end -Chattermarks (sensu Newcomer 1974) on the sides of the piece	pitting on the distal end
2	-Longitudinal thick striations on the shaft -Transverse fine striations on the blunted end -Chattermarks on the sides of the piece	Light pitting on the distal end
4	-Longitudinal thick striations on the shaft -Transverse fine striations on the blunted end	Pitting on the distal end, though light
5	-Longitudinal thick striations on the shaft -Transverse fine striations on the blunted end -Chattermarks on the sides of the piece	Intensive pitting on the distal end
6	-Transverse fine striations on the blunted end	Intensive pitting on the distal end, to the extent of modifying the shape of the point
g	-Longitudinal thick striations on the shaft -Transverse fine striations on the blunted end -Chattermarks on the sides of the piece	pitting on the distal end

found in experimental specimens. Some success was achieved in this endeavor. However, there are a number of archeological specimens that, due to their morphological characteristics, could be considered as flakers but which do not exhibit any type of mark, other than those produced by natural agents. In these

cases, the following possibilities may apply: 1) there are no traces comparable to those found in the experimental pieces because these specimens were not used as flakers;

2) post-depositional agents erased the traces that were once present in the tool; or

3) the retooling of the distal end of the piece erased previous use-wear patterns.

Independently of these results, it is necessary to remark that only a preliminary analysis of the data is presented here. An expansion of the experimental tool sample size, plus the creation of additional categories

of controlled variables, will allow us to achieve greater precision in our research conclusions.

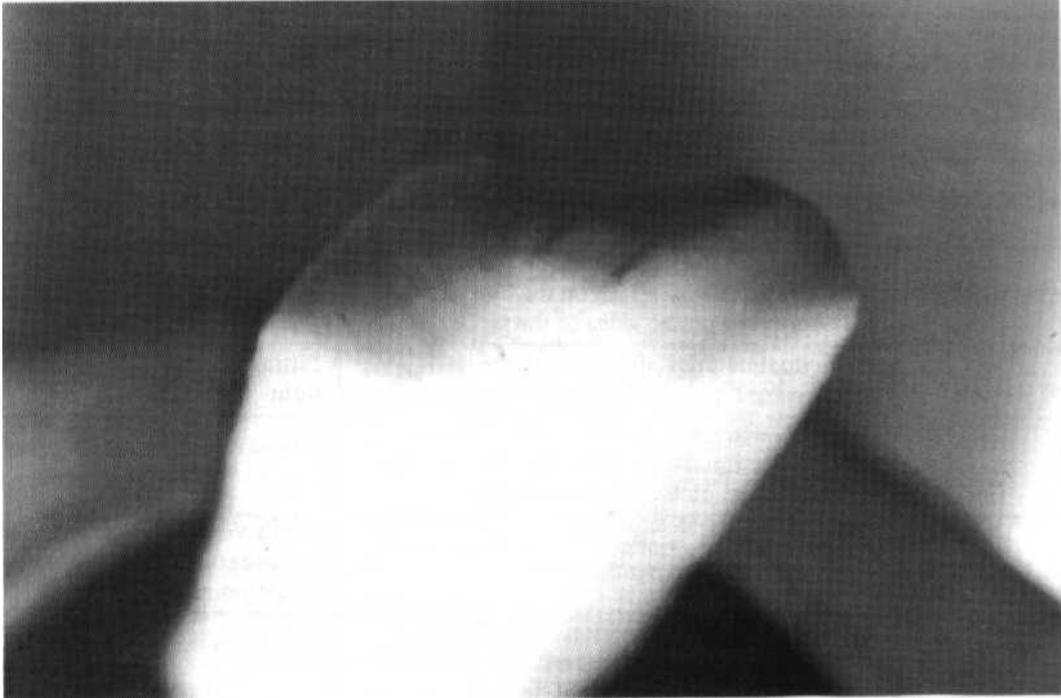


Figure 1. Experimental Specimen No. 5. Vertical view, 1.5X, before use.

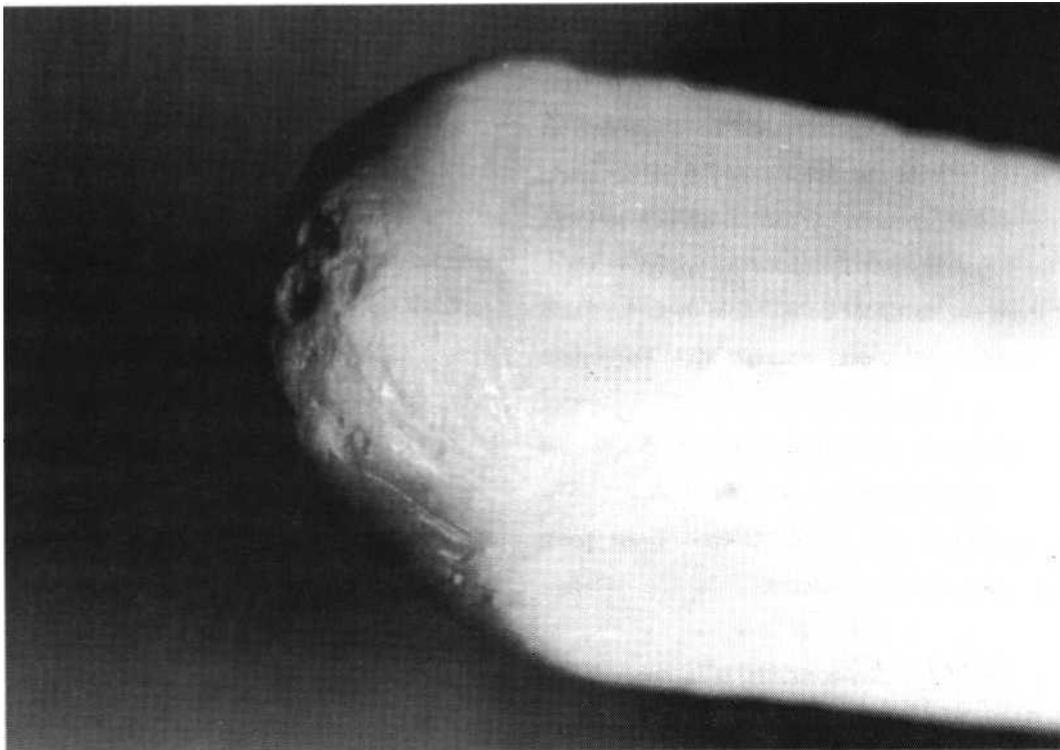


Figure 2. Experimental Specimen No. 5. Vertical view, 1.5X, after use. Notice the pitting at the working end.

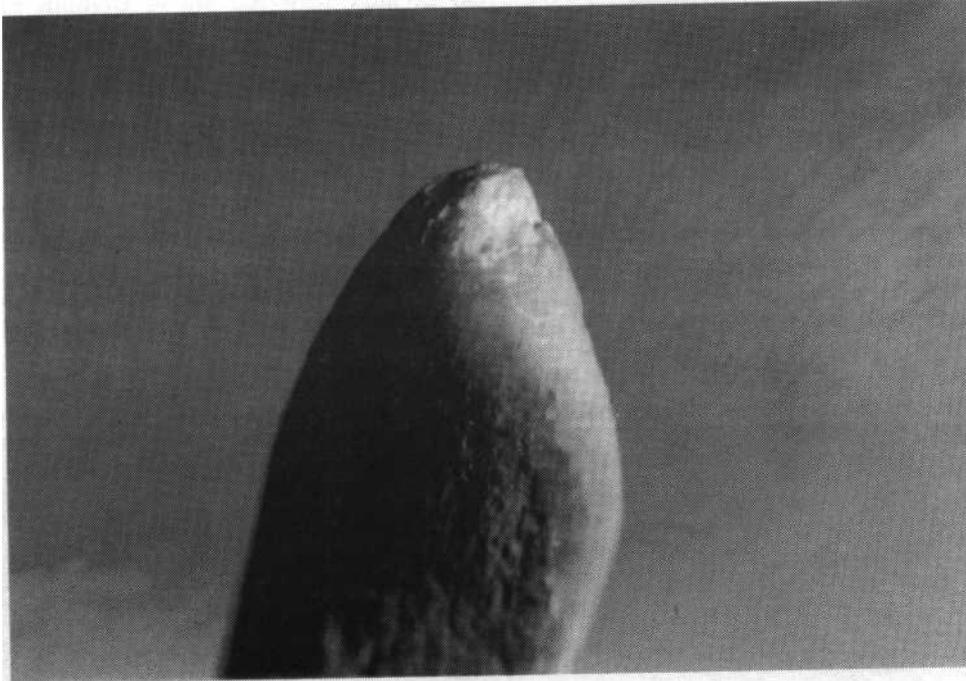


Figure 3. Experimental Specimen No. 6. Vertical view, 1.5X, after use. Notice the pitting at the working end.

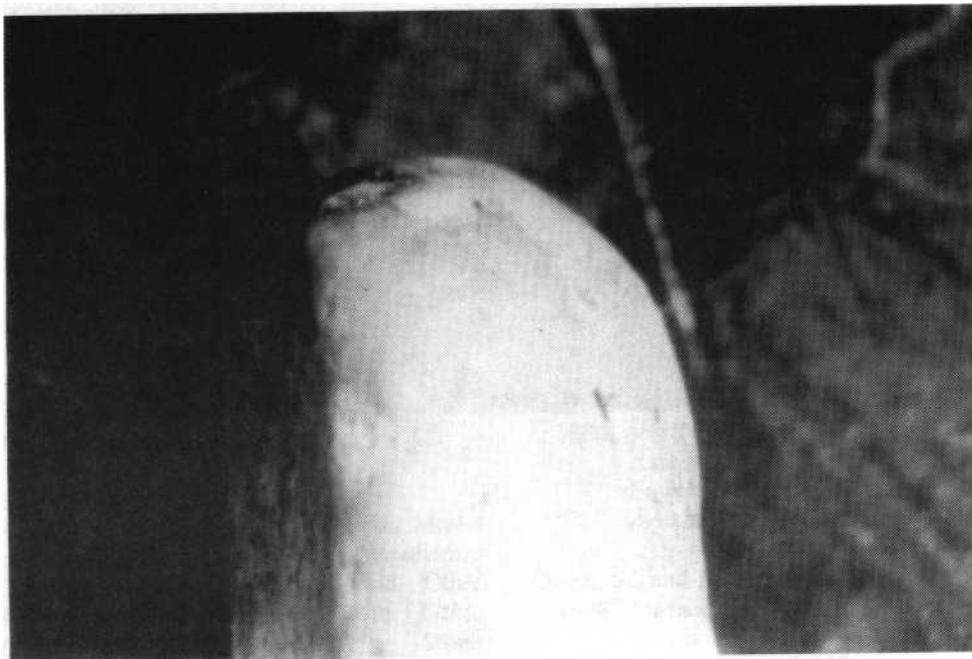


Figure 4. Archeological Specimen Tu VII 1015. Vertical view, 1.5X. Notice the pitting at the working end.



Figure 5. Archeological Specimen Tu 647. Vertical view, 1.5X. Notice the pitting at the working end.

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