LITHIC ARTIFACTS, PROYECTO PREHISTORICO ARENAL, 2002-03

Payson Sheets
Department of Anthropology
University of Colorado, Boulder

RESUMEN

La investigación de dos cementerios ubicados en los alrededores de Tilarán,Guanacaste, revelaron muchas similitudes entre las colecciones líticas de ambos sitios. Se encontraron lascas desprendidas por percusión, cuyos filos fueron utilizados para cortar. También se hallaron algunas piedras para moler con desgaste leve, probablemente producido por la preparación de comida. Las colecciones difieren en algunos objetos especiales como hachas miniatura y una laja con incisiones. El fuerte huaquerismo en uno de los cementerios causó el desprendimiento de fragmentos de las lajas. Estas lascas, en promedio, son más anchas que largas y presentan una variabilidad evidente y marcada. Los artefactos líticos de ambos sitios se interpretan como evidencia de actividades asociadas al ritual funerario y a los festines posteriores al entierro de los difuntos durante el Período Bagaces.

ABSTRACT

Excavations in two cemeteries near Tilaran, Guanacaste, revealed many similarities in stone tools including each having a few percussion flakes for various cutting tasks and a few lightly used grinding stones probably for food preparation. The cemeteries differed in a few special items such as a miniature axes and an incised laja. The extensive looting of one cemetery resulted in inadvertent flaking of laja edges, the flakes from which characteristically were wider than they were long, with large standard deviations which quantitatively express variation. The stone tools are consistent with people at both cemeteries participating in the Periodo Bagaces socio-religious phenomenon of burial ritual and post-interment feasting.

Payson Sheets *payson.sheets@colorado.edu*

The lithic artifacts of the Proyecto Prehistorico Arenal are here presented in two sections. The first focuses on the lithic artifacts of the Castrillo site near Tilaran, and deals with the problem of a heavily looted cemetery and the resulting inadvertent flaking of lajas. The second focuses on the lithics recovered from unlooted areas of the Poma cemetery.

ANALYSIS OF CHIPPED STONE ARTIFACTS FROM THE CASTRILLO SITE, G-724 CT, GUANACASTE, COSTA RICA

The excavations at the Castrillo Site, G-724Ct, Guanacaste, Costa Rica, undertaken in June of 2003 as a part of the Proyecto Prehistorico Arenal, are described above in the article by Errin Weller. As with so many cemeteries in Costa Rica, the Castrillo site was heavily looted, and we found almost no artifacts or tomb construction in or near their locations where they were placed in ancient times. Because we later excavated an almost entirely intact cemetery in the 2003 season, the Poma site, it was decided to analyze their lithic artifacts separately, focusing on percussion flakes, and then compare them, to explore the effects of looting on this class of artifacts. We also wished to explore the possibility that funerary belief and practice might have been related to the "Periodo Bagaces" cultural/religious phenomenon noted by Guerrero, Solis and Herrera (1988) and by Guerrero, Solis, and Vázquez (1994) that dates from AD 300 to 800, and extended from Cañas to Liberia. The percussion flakes are presented in Table 1 and Figures 1 and 2, and the other chipped stone and ground stone artifacts are described individually below.

PERCUSSION FLAKES

The Castrillo cemetery was built up primarily of river rocks, with the actual tombs apparently made of laja. The extensive looting in historic and recent times resulted in the large river rocks being tossed around with the flat thin laja slabs, apparently generating some flaking of the river rocks and a lot of flaking of the laja. Because the river rocks are composed of a coarse grained dacite and the laja a fine grained dacite from the Tovar source, the two can be easily distinguished by material. Also, the Tovar laja generally forms a yellowish-orange weathering rind which also helps to distinguish it. Table 1 presents the percussion flaked artifacts encountered, with their length (always measured along the direction of fracture), width, thickness, material, type (primary has cortex over the entire dorsal surface, secondary has some flake scars with the cortex, and tertiary has all flake scars and no cortex), material, and then judgments as to whether the flake probably was deliberate, and if it probably came from a laja. All percussion flakes in photographs are oriented with the point of force at the top (Fig. 1).

It is significant that the mean width of the Castrillo site percussion flakes, 4.8 cm, is greater than the mean length, 4.5 cm. I think this is a result of two factors, the morphology of laja, and the randomness of inadvertent flaking. The surface morphology of laja, of course, is quite flat thin slabs, thus providing only rare to nonexistent convex ridges to elongate the fracture surface. In other words, the relatively featureless flat surface of the laja, when getting impacted, tended to spread the fracture surface instead of elongating it, resulting in flakes that were wider than they were long. The other factor is the randomness of flaking that is an unintended consequence of looting cemeteries. Such flakes, and the scars on the laja slabs left from that flaking, exhibit no patterning, in contrast to deliberate flaking to shape slabs or make useful artifacts. The fact that the standard deviation of the flake widths (1.7 cm) is greater than the standard deviation of lengths (1.4 cm) is additional indication of inadvertent random percussion flaking. Although the ventral surfaces of these inadvertent flakes resemble the "large bifacial trimming flakes" and "small bifacial trimming flakes" from previous Arenal project research (Sheets, 1994: 220-223), the dorsal surfaces are different.

These inadvertent flakes do not show the careful shaping and thinning on their dorsal surfaces that the trimming flakes exhibit.

THERMALLY FRACTURED COOKING STONES

Only a few thermally fractured cooking stones were found at the Castrillo site (Fig. 1i), indicating that occasional cooking was done at this cemetery using this technology, but it was done not nearly as commonly here when compared to the later Silencio cemetery up on the divide (Bradley, 1994; Sheets, 1994). Out of the approximately 40 identified at the site, three were collected and measured. Each was oxidized to orange-red on the outside, and the fracture derived from thermal stress rather than a percussion blow. They average 9 cm in length, 5 cm in width, and 3 cm in thickness. Their original diameters of the intact cooking stones are estimated to range from 15 to 25 cm. Materials included fine to coarse grained andesite and a medium to fine grained basalt.

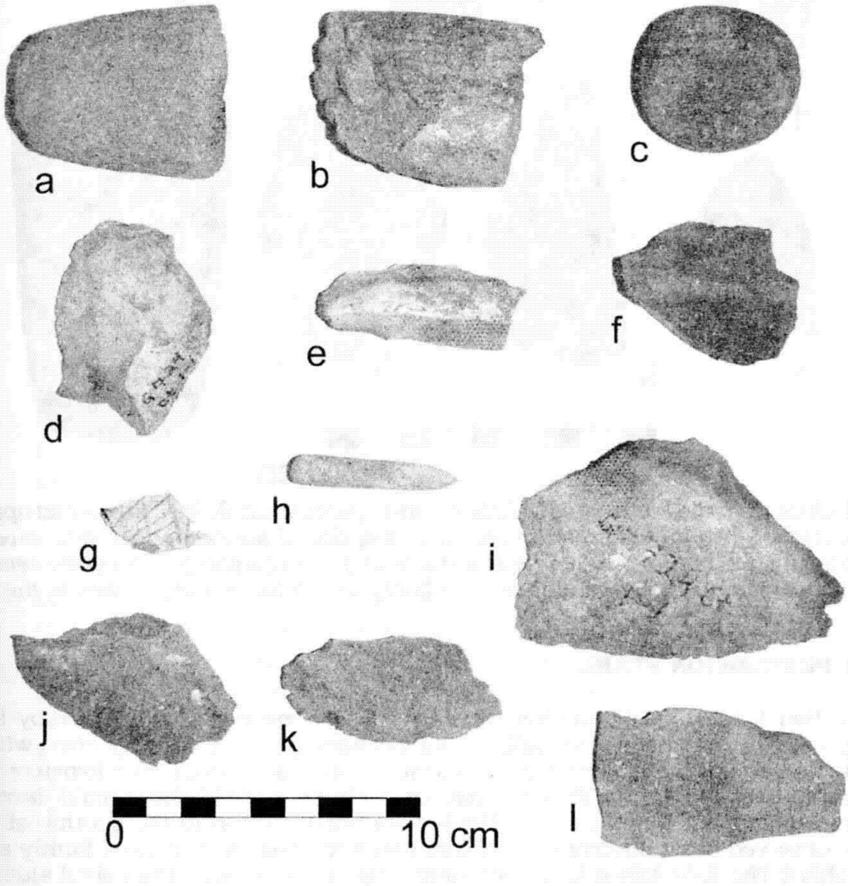

Fig. 1** Lithic artifacts from the Castrillo site (G-724Ct):* ***(a-b) *mano fragments, probably broken intentionally;* ***(c)*** *grinding stone;* ***(d)*** *chert flake;* ***(e)*** *scraper fragment;* ***(f)*** *laja percussion flake, probably inadvertent;* ***(g)*** *incised laja fragment, the soft weathering rind was incised with a stone flake;* ***(h)*** *miniature axe, edge view, with bit end at right;* ***(i)*** *thermally fractured cooking stone with oxidized outer surface; and* ***(j-l)*** *inadvertent percussion flakes from edges of laja stones.*

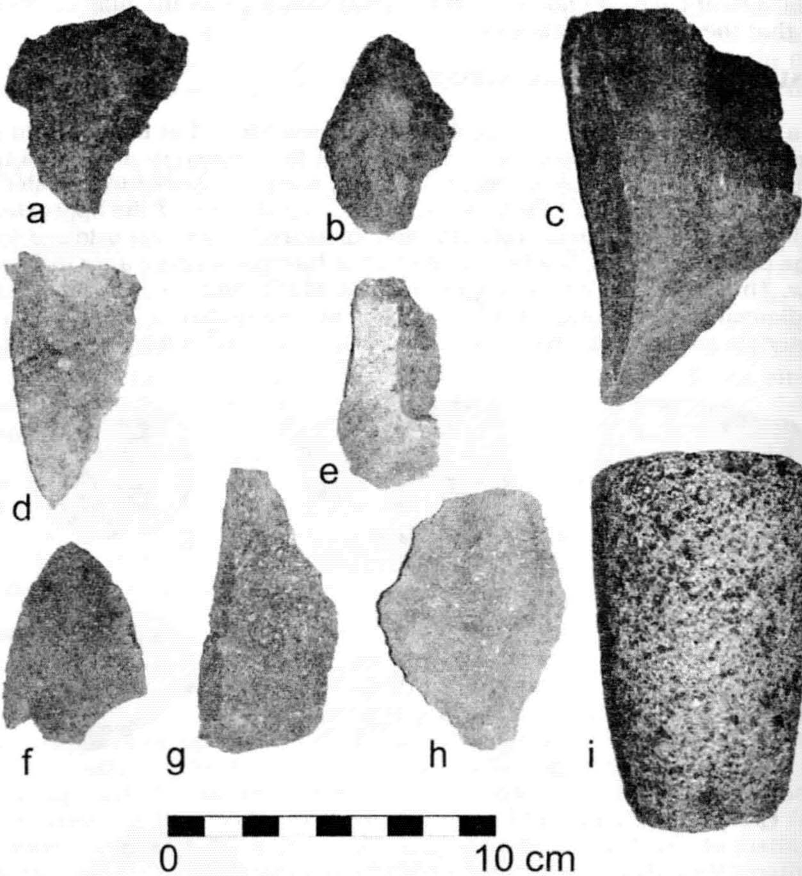

***Fig. 2** Lithics from the Poma site (G-725Pm): **(a-h)** percussion flakes, **(a)** and **(c)** apparently were deliberate, judging from the regularities of dorsal scars, and **(h)** may have been deliberate; the others apparently were inadvertent, from smashing rocks in the cemetery; **(i)** mano, this was used minimally, and probably was intentionally broken in the cemetery.*

CHERT PERCUSSION FLAKE

Operation 1, Lot 1 yielded a chert percussion flake measuring 6.3 by 4.6 by 1.4 cm (see Fig. 1d). The material is a visually striking banded purple and beige chert with tiny glassy inclusions. It might derive from limestone outcrops about 30 kilometers to the northeast of Castrillo, in the Venado area. Or, perhaps more likely, it could have come from limestone outcrops in the Palo Verde area about 30 km to the southwest of the site. We observed chert outcropping in that limestone that was at least faintly similar to this chert. The flake has a long softhammer lip, 1.5 cm long. The dorsal side has 4 scars and a little cortex (weathered, not stream cobble cortex). There was no use wear detected, but in such a disturbed site only the most well-formed traces of use could survive. This flake perhaps was wastage in the manufacture of a large biface, and thus is equivalent to the "large bifacial trimming flakes" of earlier research in the area (Sheets, 1994).

Table 1
*Inventory flaked stone artifacts Castrillo site (G-724Ct)**

op. & lot	lenght (cm)	width (cm)	thickness (cm)	material	flaking type	deliberate?	laja cortex?	comments
1 1	5,2	3	0,6	f.g. dacite	Tertiary	probably	no	soft hammer lip 9 long. 2 partial fractures
1 1	6,2	3,6	3	f.g. dacite	Secondary	prob. Not	no	laja flake
1 1	4,6	7,6	1,2	f.g. dacite	Secondary	prob. Not	no	laja flake
1 1	4,6	7,8	0,7	f.g. dacite	Secondary	prob. Not	no	laja flake
1 1	4,4	6,7	1,7	f.g. dacite	Primary	prob. Not	no	laja flake
1 1	4,9	6,1	0,6	f.g. dacite	Secondary	prob. Not	yes	laja flake
1 1	6,2	3,1	0,9	f.g. dacite	Tertiary	prob. Not	no	laja flake
1 1	3,6	5	0,9	f.g. dacite	Primary	prob. Not	yes	laja flake
1 1	4	3,6	0,6	f.g. dacite	Secondary	prob. Not	no	laja flake
1 1	3,3	5,3	0,8	f.g. dacite	Secondary	prob. Not	no	laja flake
1 1	3,3	6	0,8	f.g. dacite	Secondary	prob. Not	yes	laja flake
1 1	5,4	5,7	1,1	f.g. dacite	Tertiary	prob. Not	yes	laja flake
1 1	5,9	6,9	0,9	f.g. dacite	Secondary	prob. Not	yes	laja flake
1 1	3,3	5,8	1,5	f.g. dacite	Secondary	prob. Not	no	laja flake
1 1	5,8	3,8	1,8	f.g. dacite	Primary	prob. Not	yes	laja flake
1 1	5,4	4,6	0,5	f.g. dacite	Tertiary	prob. Not	no	laja flake
1 1	6,5	2,2	1,6	f.g. dacite	Secondary	perhaps	yes	laja flake with very straight edges
1 1	6,7	3,1	0,9	f.g. dacite	Secondary	prob. Not	no	laja flake
1 1	5,4	3,5	0,8	f.g. dacite	Secondary	prob. Not	yes	laja flake
1 1	6,1	2,8	0,8	f.g. dacite	Tertiary	perhaps	no	laja flake
1 1	3,6	4,3	0,8	f.g. dacite	Tertiary	perhaps	no	laja flake
1 1	3,4	4,9	1	f.g. dacite	Secondary	prob. Not	yes	laja flake
1 1	3,4	4,5	0,8	f.g. dacite	Secondary	prob. Not	yes	laja flake
1 1	4,1	3,4	0,9	f.g. dacite	Secondary	prob. Not	yes	laja flake
1 1	4,4	9,3	1,3	f.g. dacite	Primary	prob. Not	yes	laja flake
1 2	7	4,8	1,8	f.g. dacite	Secondary	prob. Not	no	laja flake
1 2	5,8	4,2	1,9	f.g. dacite	Secondary	prob. Not	yes	laja flake
1 2	6,1	3	1,4	f.g. dacite	Secondary	prob. Not	yes	laja flake
1 2	4,1	4,5	1,4	f.g. dacite	Tertiary	prob. Not	yes	laja flake
1 2	3,3	4	0,8	f.g. dacite	Secondary	prob. Not	yes	laja flake
1 2	3	5,1	0,7	f.g. dacite	Tertiary	prob. Not	yes	laja flake
1 2	3,1	3	1,1	f.g. dacite	Tertiary	prob. Not	yes	laja flake
1 2	2,8	3,7	0,8	f.g. dacite	Secondary	prob. Not	yes	laja flake
1 2	1,8	3	0,3	f.g. dacite	Tertiary	prob. Not	yes	laja flake
2 2	3,5	5,1	1,5	f.g. dacite	Secondary	prob. Not	yes	laja flake
2 2	3	5,5	1,1	f.g. dacite	Secondary	prob. Not	no	laja flake with stream cobble cortex
1 1	3	6,3	1,1	f.g. dacite	Primary	prob. Not	no	laja flake
1 1	6,5	4	2	f.g. dacite	Secondary	prob. Not	yes	laja flake

Table 1
*Inventory flaked stone artifacts Castrillo site (G-724Ct)**

op. & lot	lenght (cm)	width (cm)	thickness (cm)	material	flaking type	deliberate?	laja cortex?	comments
1 1	5,2	3	0,6	f.g. dacite	Tertiary	probably	no	soft hammer lip 9 long. 2 partial fractures
1 1	6,2	3,6	3	f.g. dacite	Secondary	prob. Not	no	laja flake
1 1	4,6	7,6	1,2	f.g. dacite	Secondary	prob. Not	no	laja flake
1 1	4,6	7,8	0,7	f.g. dacite	Secondary	prob. Not	no	laja flake
1 1	4,4	6,7	1,7	f.g. dacite	Primary	prob. Not	no	laja flake
1 1	4,9	6,1	0,6	f.g. dacite	Secondary	prob. Not	yes	laja flake
1 1	6,2	3,1	0,9	f.g. dacite	Tertiary	prob. Not	no	laja flake
1 1	3,6	5	0,9	f.g. dacite	Primary	prob. Not	yes	laja flake
1 1	4	3,6	0,6	f.g. dacite	Secondary	prob. Not	no	laja flake
1 1	3,3	5,3	0,8	f.g. dacite	Secondary	prob. Not	no	laja flake
1 1	3,3	6	0,8	f.g. dacite	Secondary	prob. Not	yes	laja flake
1 1	5,4	5,7	1,1	f.g. dacite	Tertiary	prob. Not	yes	laja flake
1 1	5,9	6,9	0,9	f.g. dacite	Secondary	prob. Not	yes	laja flake
1 1	3,3	5,8	1,5	f.g. dacite	Secondary	prob. Not	no	laja flake
1 1	5,8	3,8	1,8	f.g. dacite	Primary	prob. Not	yes	laja flake
1 1	5,4	4,6	0,5	f.g. dacite	Tertiary	prob. Not	no	laja flake
1 1	6,5	2,2	1,6	f.g. dacite	Secondary	perhaps	yes	laja flake with very straight edges
1 1	6,7	3,1	0,9	f.g. dacite	Secondary	prob. Not	no	laja flake
1 1	5,4	3,5	0,8	f.g. dacite	Secondary	prob. Not	yes	laja flake
1 1	6,1	2,8	0,8	f.g. dacite	Tertiary	perhaps	no	laja flake
1 1	3,6	4,3	0,8	f.g. dacite	Tertiary	perhaps	no	laja flake
1 1	3,4	4,9	1	f.g. dacite	Secondary	prob. Not	yes	laja flake
1 1	3,4	4,5	0,8	f.g. dacite	Secondary	prob. Not	yes	laja flake
1 1	4,1	3,4	0,9	f.g. dacite	Secondary	prob. Not	yes	laja flake
1 1	4,4	9,3	1,3	f.g. dacite	Primary	prob. Not	yes	laja flake
1 2	7	4,8	1,8	f.g. dacite	Secondary	prob. Not	no	laja flake
1 2	5,8	4,2	1,9	f.g. dacite	Secondary	prob. Not	yes	laja flake
1 2	6,1	3	1,4	f.g. dacite	Secondary	prob. Not	yes	laja flake
1 2	4,1	4,5	1,4	f.g. dacite	Tertiary	prob. Not	yes	laja flake
1 2	3,3	4	0,8	f.g. dacite	Secondary	prob. Not	yes	laja flake
1 2	3	5,1	0,7	f.g. dacite	Tertiary	prob. Not	yes	laja flake
1 2	3,1	3	1,1	f.g. dacite	Tertiary	prob. Not	yes	laja flake
1 2	2,8	3,7	0,8	f.g. dacite	Secondary	prob. Not	yes	laja flake
1 2	1,8	3	0,3	f.g. dacite	Tertiary	prob. Not	yes	laja flake
2 2	3,5	5,1	1,5	f.g. dacite	Secondary	prob. Not	yes	laja flake
2 2	3	5,5	1,1	f.g. dacite	Secondary	prob. Not	no	laja flake with stream cobble cortex
1 1	3	6,3	1,1	f.g. dacite	Primary	prob. Not	no	laja flake
1 1	6,5	4	2	f.g. dacite	Secondary	prob. Not	yes	laja flake

Table 1 *(cont's)*

op. & lot	lenght (cm)	width (cm)	thickness (cm)	material	flaking type	deliberate?	laja cortex?	comments
1 1	5,2	4,5	0,5	f.g. dacite	Secondary	prob. Not	yes	laja flake
1 1	4,5	6,5	0,6	f.g. dacite	Secondary	prob. Not	yes	laja flake
1 1	5,9	5,2	0,3	f.g. dacite	Secondary	prob. Not	yes	laja flake
1 1	6	4	1,1	f.g. dacite	Tertiary	prob. Not	yes	laja flake
1 1	3,6	5,6	1,2	f.g. dacite	Primary	prob. Not	no	laja flake
1 1	5	5,6	0,9	f.g. dacite	Primary	prob. Not	no	laja flake
1 1	2,5	4,6	1,1	lg gr dac.	Primary	prob. Not	no	broken river rock
1 1	3	6,1	1,6	lg gr dac.	Primary	prob. Not	no	broken river rock
1 1	3,4	3,6	0,4	f.g. dacite	Tertiary	prob. Not	yes	laja flake
1 1	2,5	8,6	1,4	f.g. dacite	Tertiary	prob. Not	no	laja flake
1 1	3,3	2,9	0,4	f.g. dacite	Secondary	prob. Not	yes	laja flake
1 1	6,3	2,6	1,4	f.g. dacite	Secondary	prob. Not	no	laja flake
2 3	3,1	6,6	0,8	f.g. dacite	Primary	prob. Not	yes	laja flake
2 4	5,5	7,5	1,7	f.g. dacite	Secondary	prob. Not	yes	laja flake
2 4	5,6	3	1,1	f.g. dacite	Tertiary	prob. Not	no	prob laja flake, but dorsal flaking, step fractures
2 4	5,1	8,2	1,4	f.g. dacite	Tertiary	prob. Not	no	laja flake
2 4	3,6	7	0,9	f.g. dacite	Secondary	prob. Not	no	laja flake
2 4	4,2	4,5	1,2	f.g. dacite	Tertiary	prob. Not	no	laja flake
2 6	8,2	5,9	1,2	f.g. dacite	Secondary	prob. Not	yes	laja flake
2 6	4,6	3,4	1,4	f.g. dacite	Secondary	prob. Not	yes	laja flake
2 6	4,8	2,4	1,6	f.g. dacite	Tertiary	prob. Not	no	laja flake
3 1	3,7	5,5	0,7	f.g. dacite	Secondary	prob. Not	yes	laja flake
3 1	4	2,3	0,5	f.g. dacite	Tertiary	prob. Not	no	laja flake
mean	4,5246	4,8344	1,0786885					
std. dev,	1,3519	1,6723	0,4848913					

QUARTZITE CORE

Operation 2, Lot 4 included a small core of quartzite that had produced at least 7 flakes. Its height was 3.4 cm, and it was 4.5 cm wide. It was unidirectional except for one large fracture that was initiated at the distal end. It is likely that the quartzite was selected for making flakes because of their durability in use, compared to flakes of most other materials. This core is quite similar to flake cores found in previous research seasons of the project (Sheets, 1994: 236-38)

SCRAPER FRAGMENT

Lot 4 of Operation 2 also yielded a distal segment of a fine grained chert scraper (see Fig. 1e). The ventral surface is a single smooth flake scar. The working end was fashioned by steep percussion retouching by well-placed impacts detaching flakes 0.5 to 1.5 cm long. Later attempts at retouching were less successful, as 8 impacts resulted in a series of 8 step fractures and 2 hinge fractures, making further resharpening much more difficult. Five final attempts at resharpening were unsuccessful, as they only resulted in ring cracks on and into the ventral surface 1-3 mm from the dulled working edge, but the force was insufficient to carry the fracture under the step and hinge fractures (Fig. 3). The scraper was smashed and discarded. The smashing blow is what resulted in this small fragment. It would be interesting to know why someone would take the trouble of detaching this large percussion flake, instead of simply discarding the entire scraper following the failed attempts at resharpening. Why scrapers were so rare in the Arenal-Tilaran area is unknown. Aguilar (1984: 74) may have recovered a scraper from Unit 10, an early horizon probably dating to the Tronadora phase from the Tajo site near Arenal Volcano. It was unifacially retouched, but rather irregularly retouched. In contrast, Kennedy (1978) found abundant scrapers at the Monte Cristo site, Reventazon drainage east of San Jose, dating to AD 850-1400.

INCISED LAJA

Lot 2 of Operation 1 yielded a small fragment of an incised laja (see Fig. 1g). It is a percussion flake, probably inadvertent, of a laja with a design incised into the yellowish weathering rind with a hard tool, presumably a flake of laja or chert. The end of the incising tool rounded out at 0.5 mm. The flake is of fine grained dacite. Six approximately parallel lines made by single incisions terminate in a roughly perpendicular broader and deeper line made by double incisions. The design is common on incised zoned bichrome pottery.

A large incised laja was found in the Silencio cemetery with an interlacing mat design, and five other incised stones were found in other cemeteries in the research area Chenault 1994:273). One was on a huge rock weighing about a ton at the laja repository (G-151) on the way to the Silencio cemetery. The other three were relatively small, but none was as small as this piece from the Castrillo cemetery. Although the sample is small, the fact that we have found more villages than cemeteries, and all incised lajas came from cemeteries (or repositories for cemeteries) indicates that laja incising had funerary significance.

GROUND STONE ARTIFACTS FROM CASTRILLO

MINIATURE AXE

Lot 2 of Operation 1 contained a miniature axe made from a naturally tablet-shaped river stone (see Fig. 1h). The stone seems to be a dense fine grained andesite. The only

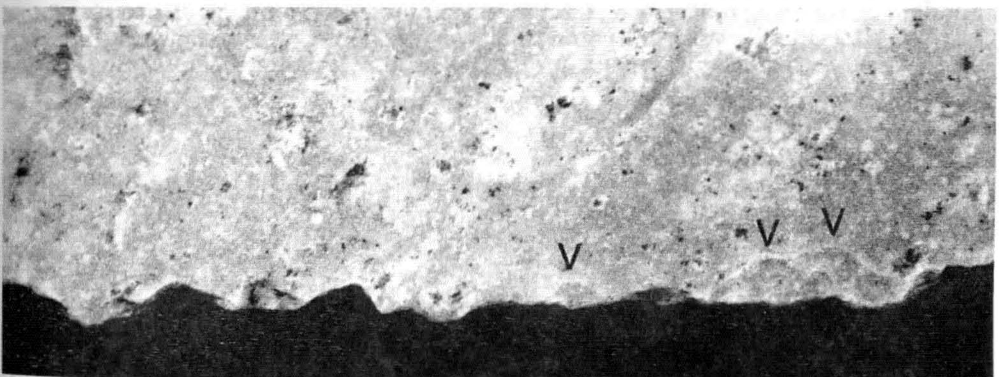

***Fig. 3** Closeup view of scraper working edge from Castrillo cemetery (G-724 Ct, opera - tion 2, lot 5), (see Fig. 1e) actual length of edge shown here 1.7 cm. Each "V" points to a ring crack from a failed attempt to resharpen the edge.*

working of the stone is at the bit end, where it was ground to a biconvex working edge. It was shaped for only 1.2 cm of its length. And the length of sharp cutting edge is only 1.2 cm. It measures 4.8 by 1.8 by 0.9 cm. It is so small that it is unclear what small items could be modified by its use, perhaps only very small wooden items. Or it is possible that it functioned in a symbolic fashion. Some small nicks in the bit end could be use wear, or could be post-abandonment edge damage, or both. Many other celts were found during previous years of research in the area (Chenault, 1994: 270-71), but none were as tiny as this celt. Axes were rare in the Reventazon drainage (Kennedy, 1978) but what was found was considerably larger than this tiny specimen.

MANO

Lot 1 of Operation 1 yielded a mano, used for grinding, that measures 6.1 cm in length and 4.6 cm in diameter (see Fig. 1a). It must have been an expedient mano, perhaps used because a pre-made mano (and metate) was not available. It was used primarily on one side, and that side maintains a slight concavity along its length, of 1 mm, very rare among manos. It probably was used on a slightly convex surface of the metate, also very likely an expedient item. The mano originally was a leg of a metate. It is possible that a metate was deliberately broken as a part of post-interment funerary ritual, and at some later date someone needed to do some grinding. But they were not prepared with a regular mano and metate, so they used the leg as a substitute. The material is a slightly vesicular andesite.

MANO

The same lot of Operation 1 yielded a well-made mano of dense dacite that measured 6.7 cm in length (incomplete), and averages 4.6 cm in diameter (see Fig. 1b). It was harshly fractured, probably intentionally. It was pecked to roughen it during use. One side was used more heavily than the other, resulting in a somewhat oval cross section. Many manos were found in earlier research seasons in the project area (Chenault, 1994: 265-69); they consistently were well formed into finished manos like this example, but contrasting with the above-described expedient mano.

GRINDING STONE

A naturally rounded river rock, of medium grained andesite, was used for enough grinding or polishing to give it a slight facet on one side, from Operation 2, lot 6 (Fig. 1c). What it could have been used on in a cemetery context is unknown. It measures 5 cm in average diameter. Chenault (1994: 269) reports grinding stones similar to these two, from various phases of sites in the project area.

GRINDING STONE

Lot 4 of Operation 2 encountered an oval shaped grinding stone with a minimal diameter of 3.7 cm and a maximum diameter of 4.8 cm. It was of a medium grained dacite. It had only one weakly developed grinding facet.

SUMMARY

The chipped stone and ground stone artifacts from the Castrillo site were rather limited in number and variety, once the apparently inadvertent flakes from looters impacting lajas are removed from the collection. Apparently cemetery visitors occasionally needed to do some cooking and used heated stones to warm liquids. And they sometimes needed to do some grinding, likely of food to be consumed in feasting events. Only occasionally would they need a sharp flake for cutting substances, and apparently for incising a laja. It would be important to understand why laja incising was important for funerary situations but not habitational. Scrapers were occasionally used at the cemetery, likely for sharpening digging sticks and other tasks. Not surprisingly the scrapers were resharpened at the cemetery. Sometimes that resharpening was successful, but at other times it was not.

LITHIC ARTIFACTS FROM THE POMA SITE (G-725) GUANACASTE, COSTA RICA

The Poma and Castrillo cemeteries both date to about the same time, approximately 1500 years ago, and both were built largely of subrounded river rock, and they were about the same size and in the same environment. They differ in two significant ways, in that lajas were used in inner tomb construction at Castrillo, and in the fact that the areas we excavated at Poma were not looted. Therefore, the lithic artifacts from each site are described and compared in these two articles, and observations are made as to the effects of looting on stone, especially laja.

ESTIMATING TOTAL WEIGHT OF ROCKS IN TOMB CONSTRUCTION

One of our workers, Mario Ugalde Nuñez, is skilled in estimating weights in the field, and as we were excavating Feature 2 he provided rough estimates of rock weights. Each tomb was built of approximately six layers (courses) of larger rocks forming a circle, with smaller rocks filling the inside. He estimates the average weight of the outside rocks at 15 to 20 kilos each, and each layer or course contains an average of 23 rocks. Hence the total weight of the outside rings of rocks is estimated to range from 2070 to 2700 kilos. Smaller rocks filled in the inside of the tomb, with roughly the same number of smaller rocks per layer. Mario estimates the average weight of each of these smaller rocks at 5 to 10 kilos. Thus, the smaller rocks would weigh between 690 and 1380 kilos. The entire tomb, combining outer and inner rocks, would thus involve hauling between 2760 and 4140 kilos of rock. The largest rocks were impressive in size, requiring a maximum effort from three or four hearty males to lift them out of the excavations. Getting these largest rocks from the river to the cemetery clearly demanded the need for cooperative effort by at least a few people. Presumably the family of the bereaved would use extended family connections and perhaps other reciprocal obligations, and perhaps feasting, to assemble a working group of blood and fictive kin as well as others fulfilling reciprocal obligations. Most of the rock was hauled from a river, probably the Rio Quebrada Grande which is the closest and largest river within a few kilometer radius of the cemetery. The closest portion of the river is 430 meters to the south in straight-line distance. The rocks needed to be hauled uphill about 80 meters in elevation, so considerable work went into building each tomb. A small fraction of the rocks in the Poma cemetery were obtained from the weathered Aguacate formation, based on the finding of the yellowish weathering rind on their outsides, a layer that is removed from rocks in the river by abrasion and rock movement. I estimate less than a tenth of the rocks at Poma were from the Aguacate formation. Just where they came from is not clear but the fact that one of the confirmed paths, 170 m to the eastnortheast of the cemetery, eroded down to rocks of the Aguacate formation indicates that one source would be very close and uphill. Other sources of rock from the Aguacate formation probably were also available at the spring 120 m northeast of the cemetery and along its drainage. But only rarely were the nearer Aguacate rocks used. The cultural preference was construction with river rocks, in spite of the fact that they required four or five times the effort to get them to the cemetery. As impractical as this might sound, for people willing to make such efforts in cemetery tomb construction, there might have been an advantage in using the river as the principal rock source.

The rocks that outcrop in the Aguacate formation are often weathered almost or entirely to clay and thus would not be useable. The rocks that still are solid in the Aguacate formation are not concentrated within the formation, and are highly irregular in size and shape. Because quite a bit of size and shape sorting was done during construction, people may have realized early in cemetery construction that similar rocks could be found more readily in the river.

One question we posed before excavating at the Poma site is: was cemetery construction, or sections of the cemetery, built all at once showing some-to-considerable prior planning and possibly centralized authority? Or were individual tombs built one at a time, and thus the cemetery grew by accretion with no evidence of centralized authority? Cemetery construction divulged by our excavations apparently was done in individual tomb segments. The total amount of effort per tomb is impressive, but it is not beyond the abilities of a household, particularly an extended household. And the possibility exists that funerary construction as well as post-interment feasting may have involved other invitees.

CHIPPED STONE FROM THE POMA SITE

Many flakes of stone were encountered at the Poma site, but it was clear that most of them resulted from natural processes of weathering and exfoliation of the rocks used in construction. They numbered in the hundreds, and they often had reasonably sharp edges that could have been used as ad hoc (expedient) cutting tools, even though they were not the result of deliberate manufacture. They consistently lacked the attributes of fracture, such as platforms, bulbar swellings, radial fissures, and so forth. Rather, the stresses resulting in fracture came from a large surface of internal weathering. These were examined in the field and discarded there. The flakes that might have been deliberately manufactured were collected and cleaned in our laboratory and examined The inventory of flaked stone artifacts from Poma site is presented in Table 2. Most also turned out to have been either from weathering exfoliation or from smashing rocks together as the cemetery was being constructed. Only two flakes were judged to be deliberate (see Figs. 2 a and c), and two others may have been deliberate (see Fig. 2h), as evidenced by the presence of attributes of percussion fracture mentioned above, and the existence of numerous flake scars on their dorsal surfaces.

The overall average length of flakes of all types from Poma is 5.5 cm (standard deviation of 1.6 cm), which is significantly longer than flakes at Castrillo. The main reason for the relative shortness of Castrillo flakes is that most of them were from flaking laja. Most laja flakes were removed from an end that was flat on both sides, so after the impact that generated the flake, what ended up as the dorsal surface had no ridge to elongate the fracture surface. The result was a relatively short flake. In contrast, the subrounded river rocks often had mild to prominent ridges that generated longer fracture planes. The overall width of Poma flakes is 3.9 cm, not surprising given how they were generated.

Some of the flaking of rocks at the Poma cemetery evidently resulted from their being smashed into place, a practice noted at the contemporaneous Bolivar site (Hoopes & Chenault, 1994) on the south shore of Lake Arenal. It is conceivable that someone wanting a reasonably sharp edge to do some cutting, who did not have a ready-made stone tool, could use an inadvertent flake for that purpose. All flakes, no how inadvertent or deliberate they were judged, were examined for any use wear. None was observed. This is not very surprising in a cemetery collection of this nature. Only a relatively harsh use for a significant amount of time would result in use wear that could be detected in this collection.

Table 2
*Inventory flaked stone artifacts Poma site (G-725Pm)**

op & lot	lenght (cm)	width (cm)	thickness (cm)	material	flaking Type	deliberate?	cortex	comments
1 3	3,8	3,6	1,3	f.g. dacite	Tertiary	prob. Not	Aguacate fm.	sheared from blow
1 3	4,7	2,2	0,5	f.g. dacite	Primary	prob. Not	stream cobble	smashed rock
1 3	4,9	3,4	1,4	f.g. dacite	Secondary	prob. Not	Aguacate fm.	smashed rock
2 3	3,1	2,2	1,4	f.g. dacite	Secondary	prob. Not	Aguacate fm.	smashed rock
2 4	4,6	6,2	1	f.g. dacite	Secondary	prob. Not	stream cobble	cortex on platf.
3 1	5,6	4,4	0,9	f.g. dacite	Secondary	prob. Not	stream cobble	cortex on platf.
3 1	5,4	3,5	0,9	f.g. dacite	Tertiary	yes	none	6 dorsal fl scars, sharp edge
3 2	9	5,9	3,3	f.g. dacite	Secondary	yes	tiny Aguacate fm.	4 dorsal fl scars, sheared
3 3	6,6	3,6	0,6	f.g. dacite	Tertiary	unknown	none	2 dorsal fl scars, Platf. Crushed.
3 4	5,5	2,6	0,6	f.g. dacite	Secondary	prob. Not	Aguacate fm.	smashed rock
3 5	4	5,5	0,9	f.g. dacite	Secondary	prob. Not	stream cobble	smashed rock
3 5	7,7	3,5	1,1	med. g. dac.	Secondary	prob. Not	stream cobble	smashed rock
3 5	7	4,9	1,3	f.g. dacite	Secondary	unknown	stream cobble	may be intentional
mean	5,531	3,962	1,169231					
stad. dev.	1.6	1,279	0,680932					

*After this article was written, I received the petrographic and geochemical analyses of Briana Agar and Charles Stern. It turns out that most of the rock types that I had identified as dacite in my analyses, would be more properly identified as andesite.

Certainly the two collections have their differences. The Castrillo percussion flakes are largely from flaking lajas, and the flakes are wider than they are long, on average. Most of the flaking of laja has occurred during the past two centuries of looting of that cemetery. The Poma flakes are largely from forcefully smashing subrounded river rocks and occasional rocks from the Aguacate formation, into the grave features, and all flakes were produced in ancient times. As many of the inadvertent flakes at Poma were removed from rocks that had some ridges, they tended to be longer than they were wide, on average. The overwhelming material is fine grained dacite at Castrillo because all laja are of that material, from the nearby Tovar source. At the Poma site fine-grained dacite occurs in small percentages in river rock as well as in the Aguacate formation. The very rough grained dacite that predominates in the rock used in cemetery construction at Castrillo and at Poma does percussion flake under harsh smashing conditions, but the irregular and rough flakes were readily field-identified as clearly not the result of deliberate stone tool manufacture, and were not collected.

GROUND STONE ARTIFACT

A mano was found in Operation 3, Lot 5, inside of the burial mound at Poma (see Fig. 2i). It was broken; this fragment measures 9.6 cm in length. Its original length would have been about 12 cm. The average diameter is 5.1 cm. It is very slightly ovoid in cross section, largely from use. It was used only on one side, and not very much. It was made by pecking and smoothing of a slightly vesicular andesite. It is possible that it was used only in the cemetery, and broken there for interment. Thus it is quite different from the well-formed manos generally found in the project area from earlier seasons of research (Chenault, 1994).

CONCLUSIONS

It does appear that the Castrillo and Poma cemeteries were a part of the "Periodo Bagaces" socio-religious phenomenon that extended from Cañas to Liberia in the middle of the first millennium AD (Guerrero, Solis & Herrera, 1988; Guerrero, Solis & Vázquez, 1994). While lithic artifacts were not a central feature of that phenomenon, they did clearly support people participating in it. People did manufacture some informal percussion flakes for a variety of cutting tasks. The quartzite core from Castrillo and the chert flake were brought in from considerable distances, on the order of 30 km. Both cemeteries had moderate frequencies of thermally fractured cooking stones. While not doing intra-cemetery cooking with the intensity of the Silencio cemetery (Bradley, 1994), they still were doing quite a lot of cooking, presumably for feasting events. The burned residue of food in sherds of some vessels at both sites is further evidence of on-site cooking, as it is difficult to conceive of people bringing food to a cemetery that had been burned to a carbonaceous crisp elsewhere. The finding of expedient manos at both cemeteries probably is another indication of food preparation, likely grinding of maize and/or other seeds or nuts.

Both the incised laja fragment and the miniature axe found at the Castrillo cemetery may well have had symbolic-religious functions. The axe may have related to vegetation and people's role in modifying it for human use, but that is speculation that is difficult to investigate or test. The incised laja is another case of what seems to be a consistent pattern in the Arenal-Tilaran area of association with cemeteries or stone repositories near cemeteries.

In neither case was evidence found of societal complexity. Egalitarian villages may well have been the sources of the dead bodies for burials as well as the pottery, stone tools, and survivors who buried and revered the dead. Individual households or extended families could have done grave construction in both cemeteries. Or construction could have occurred on a cooperative basis or by fulfilling obligations established by reciprocity.

The chipped stone artifacts show a general resemblance to those excavated to the north, from the Ayala site (Valerio & Salgado 2000). These artifacts do not exhibit the technical sophistication, elaboration, and manufacturing complexity found by Acuña (2000) in the Turrialba area.

LITERATURE CITED

ACUÑA, V. 2000 Cronología y tecnología lítica en el Valle de Turrialba, Costa Rica. *Vínculos* 25 (1-2):41-76.

AGUILAR, C. 1984. Introducción a la arqueología de la región del Volcán Arenal. *Anales de la Academia de Geografía e Historia de Costa Rica (1979-1982): 55-87.* Imprenta Nacional, San José.

BRADLEY, J. 1994. The Silencio site: An Early to Middle Polychrome period cemetery in the Arenal Region. In Sheets, P. & B. McKee (eds.) *Archaeology, Volcanism, and Remote Sensing in the Arenal Region, Costa Rica*, pp. 106-121. University of Texas Press, Austin.

CHENAULT, M. 1994. Precolumbian ground, polished, and incised stone artifacts from the Cordillera de Tilaran. In Sheets, P. & B. McKee (eds.) *Archaeology, Volcanism, and Remote Sensing in the Arenal Region, Costa Rica*, pp. 255-277. University of Texas Press, Austin.

GUERRERO, J.V., F. SOLIS DEL VECCHIO, & A. HERRERA. 1988. Zona arqueológica Cañas-Liberia: planteamiento de un problema de investigación. *Vínculos* 14: 67-76.

GUERRERO, J.V., F. SOLÍS DEL VECCHIO & R. VÁZQUEZ 1994. El Período Bagaces (300-800d.C.) en la cronología arqueológica del noroeste de Costa Rica. *Vínculos* 18-19 (1-2): 91-110.

KENNEDY, W. 1978. A middle period lithic tool assemblage from the Atlantic Watershed region, Costa Rica. *Vínculos* 4 (1): 43-56.

SHEETS, P. 1994. Chipped stone artifacts from the Cordillera de Tilaran. In Sheets, P. & B. McKee (eds.) *Archaeology, Volcanism, and Remote Sensing in the Arenal Region, Costa Rica*, pp. 211-254. University of Texas Press, Austin.

VALERIO, W. & S. SALGADO. 2000 Análisis de ias industrias líticas del sitio Ayala, región de Granada, Pacífico de Nicaragua (300-1550 d.C.). *Vínculos* 25 (1-2):77-95.