

# ARTICLE 11: GROUND AND POLISHED STONE FROM THE CUENCA DE ARENAL

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## ABSTRACT

*Ground and polished stone artifacts collected during the 1984 field season of the Proyecto Prehistórico Arenal are described. Diachronic and synchronic differences in the ground and polished stone collection are presented, based on stratigraphy and ceramic analysis. Statements are made concerning prehistoric activities at sites from which ground and polished stone artifacts were collected.*

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## INTRODUCTION

During the 1984 field season of the Proyecto Prehistórico Arenal, a total of 74 groundstone and polished stone artifacts were recovered from 13 sites and four isolated find locations. These ground and polished stone artifacts represent a time span from Period IV to Period VI of the S.A.R. time scale (Lange and Stone 1984). Because the Cuenca de Arenal is situated between two archaeological subregions, the Greater Nicoya (Lange 1984b) and the Central Highlands—Atlantic Watershed (Snarskis 1984), the ground and polished stone may exhibit a mixture of influences.

In this article the ground and polished stone artifacts from the Cuenca de Arenal are described. These artifacts are also examined for traits from the above mentioned subregions in an attempt to determine which of the two areas exerted the most influence over the styles of the Cordillera subregion, as defined by Sheets (Article 1). An attempt is also made to help define a temporal sequence based on diachronic differences in ground and polished stone as shown for the Cuenca de Arenal. This will be based on the stratigraphic record as presented in Article 3. Four incised *laja* are also briefly described.

## METHODOLOGY AND TERMINOLOGY

Two basic divisions — groundstone and polished stone — have been made based on assumed final artifact production technique. Groundstone items are those that were shaped by pecking and then grinding. Rough percussion flaking of the lithic material may have also been part of the production sequence. Polished stone items are those produced by pecking and/or flaking and pecking, followed by grinding and polishing. Within these two major categories, the artifacts are further divided into sub-categories based on morphology and use. For example, if an item looks like a metate, as metates have traditionally been defined, it is so categorized; and use-wear observed on the item may further

substantiate its placement in a given category. If, however, an item looks like one type of object, but exhibits use wear that suggests a different morphology and use, the indicated function is used as the primary criterion. An example of this from the Arenal Project collection is one artifact that looks like a metate leg but which exhibits use wear indicating it was used as a mano. While this item may in fact have been a broken metate leg reused as a mano, it is classified as a mano based on its latest function.

Several terms and elements of description used in this article need some explanation. When discussing legged metates, it is helpful to establish some orientation. Therefore, since all whole, legged metates collected by this project are tripod, the end with the single leg will be referred to as the front of the metate. This is intended to reflect the prehistoric view of these metates, because when carved animal heads occur on tripod metates they are located, facing outward, at the end with the single leg.

Two characteristics of the groundstone items, the degree of grinding involved in production, and the degree to which the raw material of an item is vesicular, are discussed somewhat subjectively. The degree of production grinding is divided into three levels: 1) fine, 2) moderate, and 3) rough. The size of vesicles is broken into the following: 1) small: less than 2 mm in diameter; 2) medium or moderate: 2 mm to 3 mm in diameter; and 3) large: greater than 3 mm in diameter. The degree of grinding during production is indicative of the amount of work involved in producing an item. A distinction is made between production-grinding and use-grinding. Polished stone items are, by definition, finely ground and polished. The degree to which the raw material is vesicular suggests some differences in item use. Stone with large vesicles would probably not be used in making decorated, ceremonial metates; but rather, would more probably be used for plain, daily use metates. Decoration on finer grained material is more easily discernible than on heavily vesicular material. As used here, "plain" refers to undecorated, but does not imply "non-legged."

Metric data — length, width and thickness/height — were collected for each whole item and fragment (Table 1). All dimensions are to the nearest tenth of a centimeter. The weight of each item was recorded in grams.

Because analysis of ground and polished stone was performed under field laboratory conditions, use-wear analysis was limited to observation with a 10X to 70X stereo-microscope, or in the case of large items such as whole metates, with a 10X hand lens. Direct slant lighting was used in all cases. Terms used in use-wear analysis in this article follow those presented by Hummer (1983). As in Hummer's study, no distinction between "polish" from abrasion and "polish" as an additive material will be attempted. The amount of use apparent for each item will be presented on a subjective scale of 1) light, 2) moderate, and 3) heavy.

## GROUNDSTONE

Sixty groundstone artifacts were recovered from the Cuenca de Arenal. According to Melson (personal communication 1984), most of the groundstone was produced from a raw material of plagioclase-phyric basaltic andesite. The groundstone artifacts occur in the following typological categories: metates, manos, polishing stones, sculpture, and unspecified items.

**Table 1. Metric Data for Ground and Polished Stone from the Cuenca de Arenal**

Morphology	Length	Width	Thickness	Weight	Height
<b>METATES</b>					
Rectangular tripod	42.3 cm	30.2 cm	8.5 cm	11,575 g	18.2 cm
Oval legged	29.5 cm	20.7 cm	7 cm	6250 g	9 cm
Rectangular decorated	33.5 cm	22.5 cm	3.5 cm	7450 g	13.5 cm
Ovoid tripod	50.5 cm	29.8 cm	3.4 cm	12,300 g	17 cm
Legged and decorated fragments	18 cm	13.8 cm	6.9 cm	2897 g	
Plain fragments	9.4 cm	7.3 cm	4.4 cm	628 g	
<b>MANOS</b>					
Bar	8.9 cm	5.1 cm	3.8 cm	261 g	
Ovoid	12.7 cm	8 cm	4.5 cm	771 g	
Loaf	8.2 cm	7.5 cm	5.2 cm	657 g	
Oval	9.5 cm	7.15 cm	4.3 cm	440 g	
<b>CELTS</b>					
Flaring bit fragments	5.9 cm	5.2 cm	3.3 cm	145 g	
Rounded bit	12.5 cm	4.6 cm	3.1 cm	300 g	
Rounded bit fragments	6.6 cm	4.8 cm	3 cm	146 g	
Small celts	3.9 cm	2.9 cm	1.2 cm	32 g	
Celts fragments	6.3 cm	3.9 cm	2.6 cm	103 g	
<b>CHISEL</b>	2.9 cm	2 cm	1.8 cm	15 g	
<b>SCULPTURE</b>	38 cm	23 cm	22 cm		

Note: Data are the means of major morphological categories.

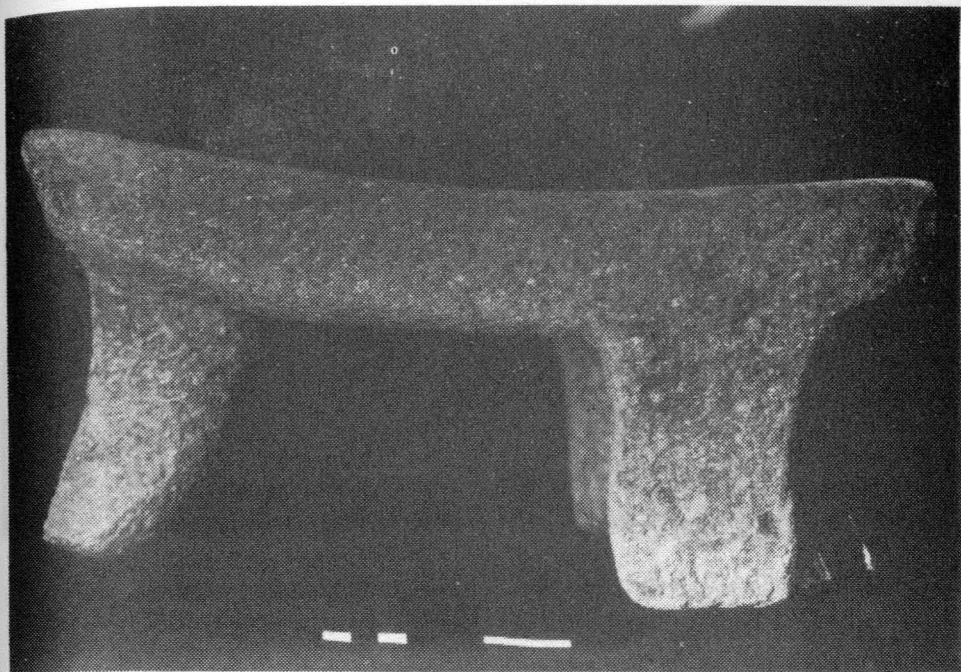
*Rectangular, tripod metates:* two whole specimens and three fragments. This type of metate is blocky and massive, with angular edges (Fig. 1). The body of the metate is thick (5 cm to 7 cm). The legs are thick and wide, and are D-shaped or trapezoidal in cross-section. The outside of the back legs is not inset, that is, they are flush with the side of the body of the metate. These metates are made of non-vesicular stone and are undecorated. They were pecked to shape and then only roughly ground, leaving an uneven surface over the entire metate. There is very little use-grinding on any of the specimens in this category.

*Oval, tripod metates:* one whole specimen and two fragments. Metates in this category are small with three short, inset, knob legs (Fig. 2). These metates are "turtle backed", having smooth, rounded undersides. They are undecorated, and they are ground to a medium smoothness. The whole specimen was made from a lithic material that is moderately vesicular. One of the fragments is non-vesicular while the other has small vesicles. The whole item shows moderate use-wear with parallel striations occurring along the long axis of the grinding surface. The two fragments have grinding surfaces which exhibit only light use:

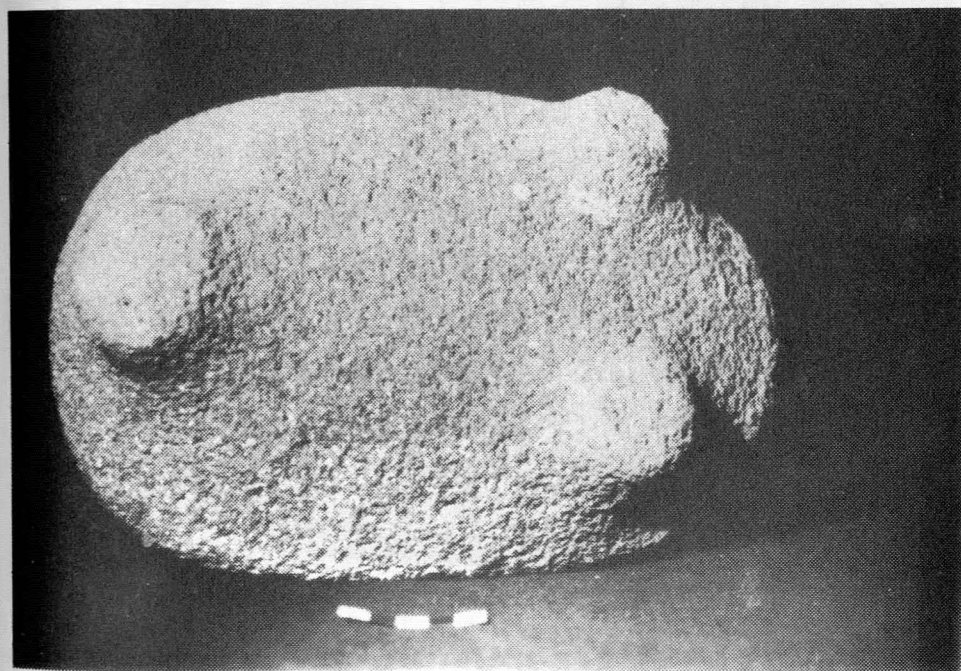
*Ovoid tripod metate:* one specimen. This metate is large but not as blocky as the above-mentioned rectangular metates. The front leg is D-shaped in cross-section and the back legs are roughly oval in cross-section; they are inset from the edge of the metate. All of the edges are rounded and the specimen is undecorated. The raw material of the metate is vesicular with large pores. The metate shows heavy use-grinding with truncation of grains and polish. The bottom of the legs are ground smooth, apparently through back-and-forth movement of the metate during use. This would indicate that the metate was placed on some sort of hard surface during use. This would probably have been a wooden surface or a hard-packed floor. A stone slab is unlikely as no stone with the distinctive use-wear one would expect from this kind of use has ever been reported, and none was found by project personnel. Striations are evident both on the grinding surface of the metate and on the bottom of the legs. The striations on both of these areas indicate back-and-forth grinding. None of the metate fragments found during project research could be definitely placed into the ovoid tripod metate category.

*Rectangular, decorated metate:* one specimen. This metate is deeply bowed in the middle of its grinding surface (Figs. 3, 4 and 5). Its three legs are trapezoidal in cross-section; the back legs are not inset. The sides of the metate, the outside of the back legs and both sides of the front leg are decorated with a geometric pattern. Bands of similar decoration occur at each end of the grinding surface, but have been partly obliterated by use-grinding. These decorative elements appear to have been made by pecking the surface of the metate with a stone tool. Another geometric pattern is located on the underside of the metate. The lines that form this decoration were incised or ground into the stone. This metate is of non-vesicular stone. It has seen heavy use-grinding in spite of its appearance as a probable ceremonial, non-daily use item. The bottoms of the legs on this item are also smoothed from movement of the metate during grinding.

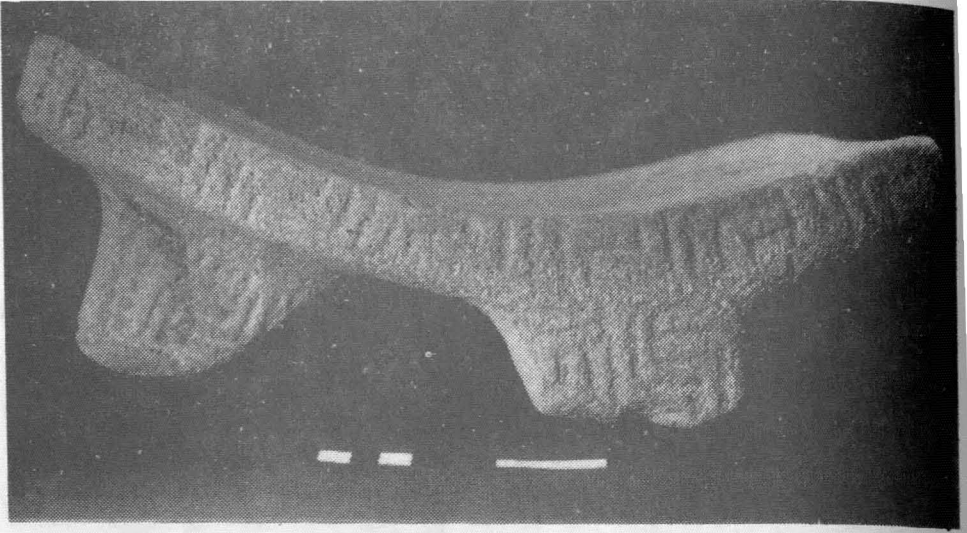
*Ovoid, non-legged metate:* one whole specimen. Except for the absence of legs, this item is similar to the small, whole oval metate mentioned above. This undecorated metate is made of a moderately vesicular stone, is somewhat rounded on the underside, and has a flat grinding surface. Truncation of grains from use-grinding is present, as are parallel use striations.



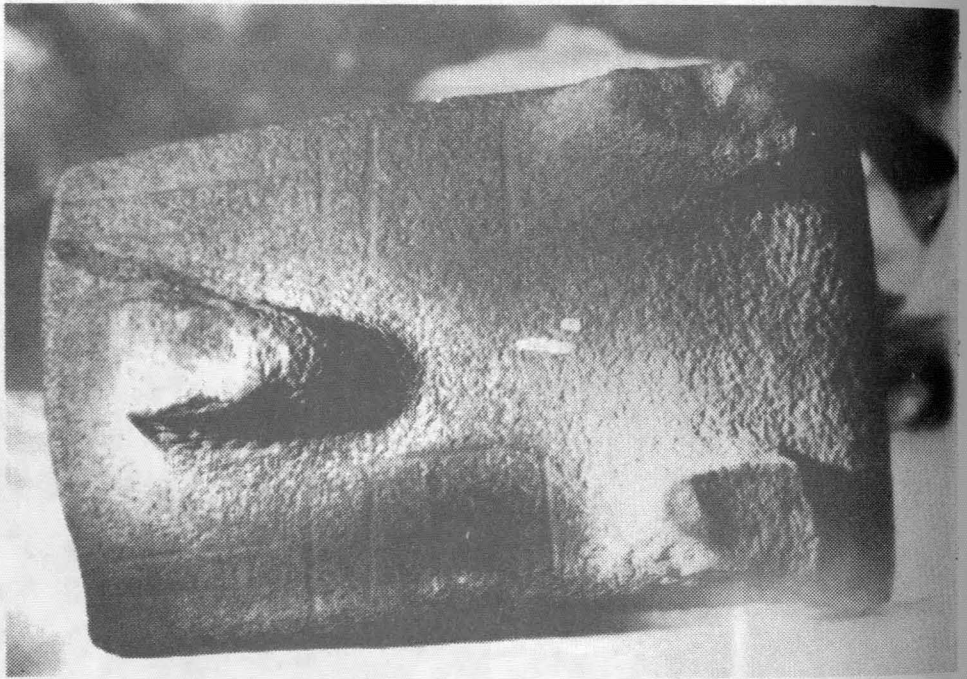
*Figure 1. Rectangular tripod metate. Provenience: G-150C8/1.*



*Figure 2. Oval tripod metate. Provenience: G-150C4/1.*



*Figure 3. Rectangular decorated metate. This metate formed part of the tomb wall of a burial at the Silencio site. Provenience: G-150D3.*



*Figure 4. Rectangular decorated metate. This is the underside of the same metate illustrated in Figures 3 and 5. Note that the underside is also decorated with a geometric pattern.*

*Basin metates:* two almost complete specimens. These metates were made from large pieces of volcanic stone, and are minimally shaped. This type of metate underwent a different type of use—grinding than of the traditional metate — meaning those used with a back-and-forth grinding motion, such as that used for processing maize. These items appear to have been ground with a handstone in a circular motion forming a basin, instead of a flat or troughed grinding surface. No use striations are visible to confirm this, evidently because both metates were surface finds and are badly weathered. Battering occurs in the lower portion of both basined areas (Fig. 6), indicating some sort of crushing or pounding action.

*Unshaped, boulder metate:* one whole specimen. This item is a large unshaped stone of non-vesicular material. It has a grinding surface, but exhibits no striations.

### Metate Fragments

Twenty-six metate fragments, which were not complete enough to allow determination of their respective metate types, were recovered by Arenal project personnel during excavation and site survey. Of the twenty-six, two fragments are decorated and five were definitely from legged metates.

*Decorated.* One of the decorated metate fragments appears to have been from a rectangular metate — probably legged, although there is no evidence of legs. The thin, tabu-

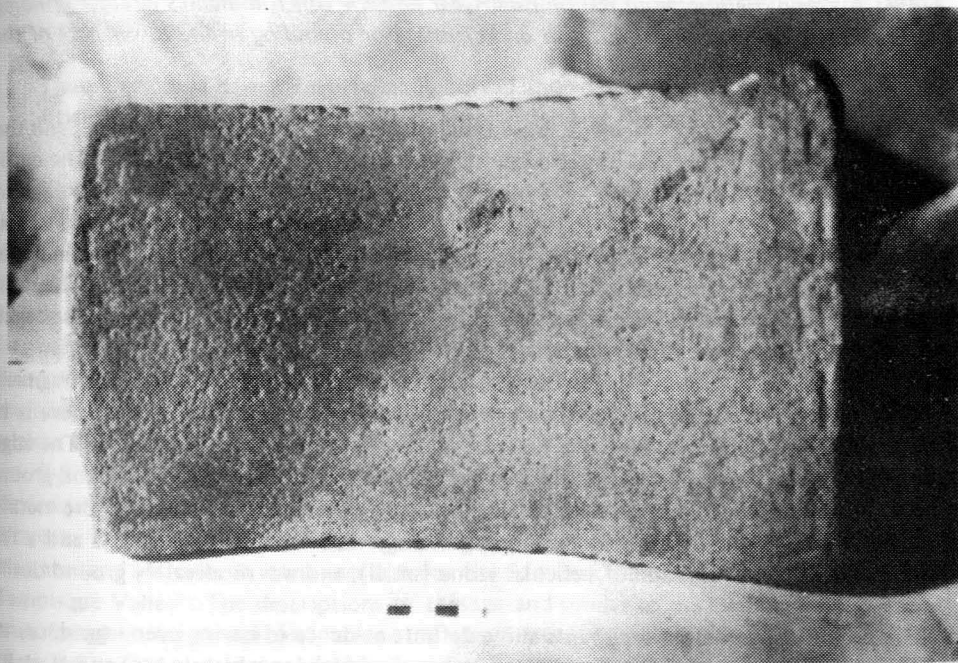
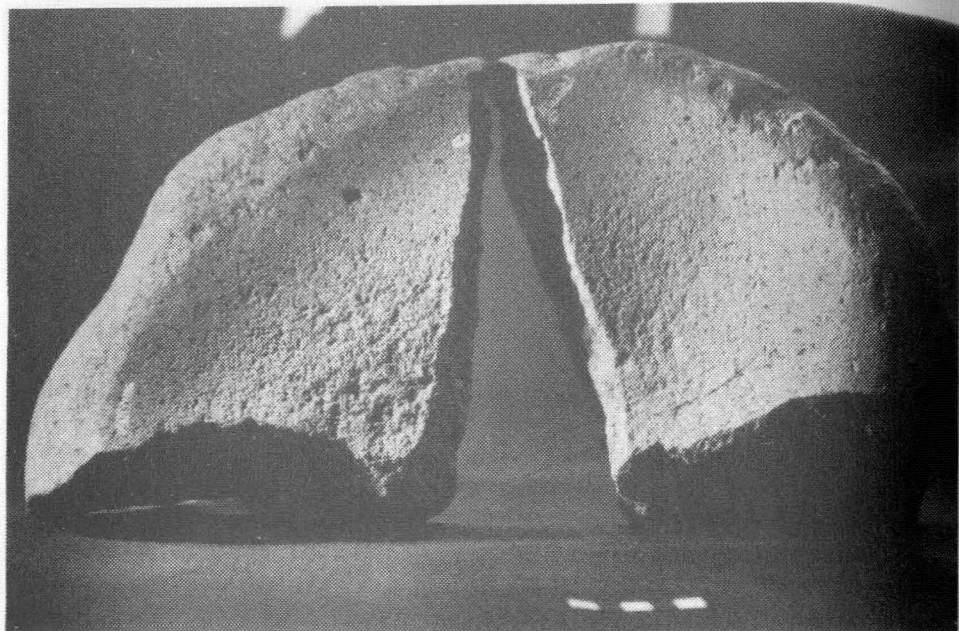


Figure 5. Rectangular decorated metate. This shows the grinding surface of the metate illustrated in Figures 3 and 4. Note the bands of decoration at each end, which have been partially ground away through use.



*Figure 6. Basin metate. Note the unusual wear pattern which indicates circular grinding with a handstone forming the basin and crushing or pounding in the lower part of the basined area. Provenience: G-168A1.*

lar nature of the metate fragment, which includes part of the grinding surface, and the apparent presence of decoration, strongly suggest that the metate was legged. The decoration consists of the remainder of a broken projection extending out from the edge of the metate body. It is possible that this projection was part of some type of carved animal head at the front of the metate. The fragment is made out of vesicular lithic material (small to medium), and exhibits only light use-wear, with parallel striations. The striations also suggest that the projection is at the front of the metate. The item was shaped and well-smoothed during production.

Another decorated fragment is from a circular or oval metate. From the fragment, it appears that the body of the metate was very thick (more than 8.5 cm). There is no evidence of legs, but it is probable that the metate had some type of supports. The edge, which is 6.5 cm thick, is decorated with a geometric design which was pecked and ground into the stone. Some additional decorative lines are evident below the edge of the metate. The item appears to have been used for grinding, with truncation of grains and a few striations visible. It is made of vesicular stone (small), and was moderately ground during production.

*Legged.* Five metate fragments show definite evidence of having been legged, or, are themselves metate legs. One fragment has a cylindrical leg which is broken off at the bottom. Another fragment appears to be of a cylindrical leg from a metate, although it could be an end of a long cylindrical mano, or a case of re-use. This item has two roughly pecked grooves around it — probably decorative rather than functional. Both items are of vesicular stone (small), and are moderately smoothed.



Another metate fragment appears to be from the right rear corner of a metate (when viewed from the front). The metate appears to have been undecorated, but of fine workmanship. The body of the metate is thin and the leg is thin with a "flying buttress" attachment. Use-wear is present, but no striations are evident. The bottom of the leg is ground smooth, apparently from movement of the metate during use.

Two other metate fragments evidently were legged. No legs remain, but raised areas where legs were formerly attached are present. Both metate fragments are of vesicular stone (large), are moderately to roughly finished, and were ground during use. One was heavily used and has very truncated grains and a polished grinding surface. No use striations are visible.

*Unspecified metate fragments.* Of the 19 remaining metate fragments only two retain enough of the edge of the original metate to suggest its original shape. One fragment is from the corner of a rectangular metate. The corner seems to flare upward from the grinding surface. The other fragment appears to be from an oval or ovoid metate. All of the rest of the metate fragments are too small and indistinguishable to be placed into any typology. They are made of vesicular stone, with small to large vesicles. All of the 19 unspecified metate fragments exhibit some use in the form of truncation of grains and varying degrees of polish. Only six have use striations, all of which are parallel and unidirectional.

In summary, the metates from the Proyecto Prehistórico Arenal consist of both plain and decorated tripod metates, and non-legged plain metates. According to Graham (1981), there are regional differences in the special purpose metates — those with mortuary contexts.

Those in Nicoya have a longitudinally curved and rimless plate, while in the Atlantic Watershed the plate is horizontally flat and rimmed (Graham 1981:113).

Thus, it appears that in overall design most of the metates in the project collection are of the Nicoya style. The small, oval metate type (Fig. 2), however, is ubiquitous in Costa Rica, being found throughout the Atlantic Watershed (Snarskis 1978), and in the Diquis subregion (Drolet, personal communication 1984). Baudez (1967: Plate 53) illustrates what appears to be a similar metate from the Nicoya area. The decorated fragment from the oval or circular metate conceivably could be from one of the circular "ceremonial" metates found in the Atlantic Watershed subregion. Still, it appears that the Nicoya style exerted more influence over the manufacture of metates in the Cordillera than did the styles of the other two subregions.

Cylindrical legged metates appear in northern Costa Rica during the Late Period IV (Snarskis 1981a), which correlates with the Arenal Phase (500 B.C. — A.D. 500) of the Proyecto Prehistórico Arenal sequence (Article 9). Baudez (1967) describes metate legs that are semi-circular in cross-section for the San Bosco and Palo Blanco Phases in the Tempisque Valley. The descriptions of these sound similar to the D-shaped, legged metates found during this project, associated with Silencio Phase (A.D. 600–1000) ceramics (Article 9). This placement would be compatible with Baudez phases.

Decorated metates, with geometric designs on their rims very similar to the geometric design on the one whole decorated metate (Figs. 3, 4 and 5) from the Cuenca de Arenal, are illustrated by Graham (1981: Pl. 49 and 50) and Snarskis (1981b: Catalogue numbers 73 and 74). These metates are from the Guanacaste — Nicoya Zone and date to

the Late Period IV — Period V (c.A.D.300 — 700). This would suggest that the decorated metate might date to the **Silencio Phase** of the Cordillera. It is fact, associated with Silencio Phase ceramics. The above-mentioned, illustrated metates from the Guana-caste — Nicoya zone have legs — though more elaborate — that are similar to the finely carved legs from the Cordillera.

The limited use-wear analysis performed for the metates and metate fragments from the Cuenca de Arenal indicates that most of the use was in a back-and-forth grinding motion, possibly for processing maize. A different processing method of circular grinding and battering is evident with the two basin metates (Fig. 6).

This author agrees with Snarskis' (1981a) interpretation of the legged metates as "grinding tables" and not seats for high-status personages. While the metates may at times have been used as ceremonial seats, the heavy amount of use evident on most of the specimens from the Cuenca de Arenal indicates that their primary function was grinding. Even though the two rectangular legged metates in the collection do not show extensive use, they were used enough to negate their function as only being seats.

### **Manos (12)**

*Bar mano:* three fragments. This type of mano varies from oval to almost cylindrical in cross-section. The three specimens are fragmentary, so average length cannot be determined. However, they were probably elongated and meant for use with two hands. The ends were pecked flat and, to a lesser extent, so were the edges. One item is made of vesicular stone (medium) and the other two are of non-vesicular stone. Two of the mano fragments were used on both sides. Only one of the three has use striations, which — surprisingly — are diagonal to the long axis, rather than perpendicular as would be expected.

*Ovoid mano:* one whole, two fragments. This type of mano is ovoid in plan view and oval in cross-section. The ends of the manos were pecked flat and ground moderately smooth. These manos are used on two surfaces. Striations are evident on one fragment, but not the other. The whole mano has striations perpendicular to the long axis on both sides. The whole mano and one of the fragments are made of vesicular stone (medium) and the other fragment is non-vesicular.

*Rectangular mano:* one fragment. This mano is rectangular in plan view and rectangular and slightly biconvex in cross-section. The item is made of a non-vesicular, volcanic stone and appears to be extensively weathered. It seems to be well shaped, but little sign of use-wear and no striations are evident.

*Loaf-Shaped mano:* four fragments. This type of mano is termed "loaf-shaped" due to the plano-convex cross-sections; plan views vary from ovoid to irregular. Three of the items are made of non-vesicular stone, while the fourth is vesicular (small). Two of the mano fragments have two use surfaces; the other two have only one use surface. One of the four appears to be an unshaped natural cobble, and has striations running in different directions, possibly indicating that a circular grinding motion was employed in its use.

One of the fragments is the item mentioned earlier as possibly being a metate leg reused as a mano. The intact end of this fragment is beveled at an angle and ground smooth in a manner similar to some of the metate legs in the project collection. A metate leg reused as a handstone is reported by Einhaus (1980). The item has two use surfaces,

one of which appears to have been in the process of being repecked.

*Oval mano*: two fragments. This type of mano is oval in plan and cross-section. Both fragments were shaped, but not extensively. One item is made of non-vesicular stone, and the other has small vesicles; the latter is badly weathered and crumbles easily. It has one use surface with no striations. The other fragment has two use surfaces, but also shows no striations. The intact end of this mano fragment is battered. This type of grinding/battering tool could have been used with the basin metates discussed in this article.

Manos are not dealt with extensively in the literature on Costa Rican archaeology – at least not the literature known to this author. Manos present a special problem for typologies and chronologies in that they do not vary in morphology as greatly as do other artifacts such as metates and ceramics, not only temporally but also spatially. For example, manos similar in plan and cross-section to many of the manos found in the Cuenca de Arenal are reported from Mayan sites in El Salvador (Hummer 1983; Sheets 1978), from Nicaragua (Healy 1980) and from sites in Panama (Einhaus 1980; Linares and Ranere 1980). Because they have use striations running perpendicular to their long axis, the majority of manos appear to have been used with metates in the processing of maize.

### Miscellaneous

Seven groundstone pieces do not fall into the categories of metates or manos. One of these items is a small oval stone, plano-convex in cross-section. The item has one grinding surface that was lightly used, and battering on one end. According to Snarskis (personal communication 1984), this type of artifact has been found associated with pigment. It may have been used to crush and grind paint pigments. Another item is a discoidal grinding stone with two grinding surfaces, whose edges appear to have been shaped. It is too small in diameter and too thin to be a mano.

A large pecked and ground stone piece was found on the present ground surface at the large cemetery site (G-150). This item appears to be a fragment from a sculpture of some kind. It consists of a large cylindrical (20 cm long and 20 cm in diameter) section with a broken, irregular section at one end. It is probably the "tenoned" lower portion of a sculpture. Tenon based heads are found in the Atlantic Watershed (Graham 1981). A small piece of shaped stone with three pecked grooves was also found at the cemetery. This piece may be a fragment of a decorated metate, but it is too small to allow any certainty.

Three unclassified items are included in the collection. One is rectangular in plan view and bi-convex in cross-section. It is shaped, but has no ground surfaces. It may have been meant to be a mano, but was never used. One edge is shaped at an angle. Two other unspecified pieces of vesicular stone were recovered during the field season. One is shaped and may be a very small fragment from a metate leg. The other does not appear to be shaped or ground.

### POLISHED STONE

The 14 polished stone artifacts consist of 13 celts and celt fragments, and one chisel fragment. According to Melson (personal communication 1984), many of the polished stone items are made from a raw material of slightly hydrothermally altered, plagioclase-phyric andesite, a dense, non-vesicular material.

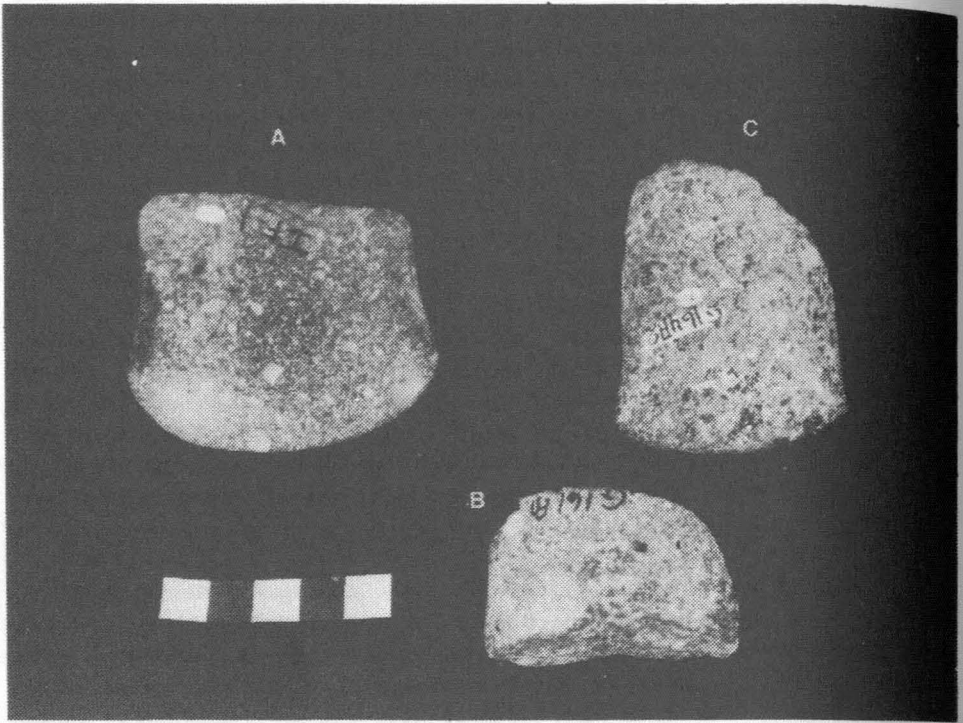


Figure 7. Flaring bit celts. Proveniences: A, IF-1. B, G-161A1. C, G-164A2.

## Celts

Einhaus discusses the distinctions among axes, celts and adzes.

Tools hafted with the bit parallel to the handle are commonly called axes when they are grooved, and celts when they are ungrooved. Tools whose bits form an acute angle with the haft are adzes. Axes and celts that are used for chopping tend to be symmetrical in cross-section, while tools that are used in adzing of planing tend to be asymmetrical (Einhaus 1980: 448).

She goes on to state that the direction of use marks on the bit can help to distinguish adzes from axes and celts. Adze wear will appear as grooves on the convex side of the bit. Striations will follow the long axis of the tool. Conversely, axes and celts will have diagonal striations on both bit surfaces (Einhaus 1980). Polished celts are traditionally considered to have been used for wood cutting (Ranere 1980). However, Bernstein (1980) suggests functions other than just wood chopping for celts from Guanacaste.

*Flaring bit celts:* three fragments. This type of celt has a bit with flaring edges (Fig. 7). No poll ends were found for any of the fragments of this celt type. Two of the three items have evidence of small flakes having been removed during use. No striations are visible. Production and/or sharpening striations are visible as parallel lines running the length of the bit, perpendicular to the long axis of the tool. These striations occur only at the bit end of the celt.

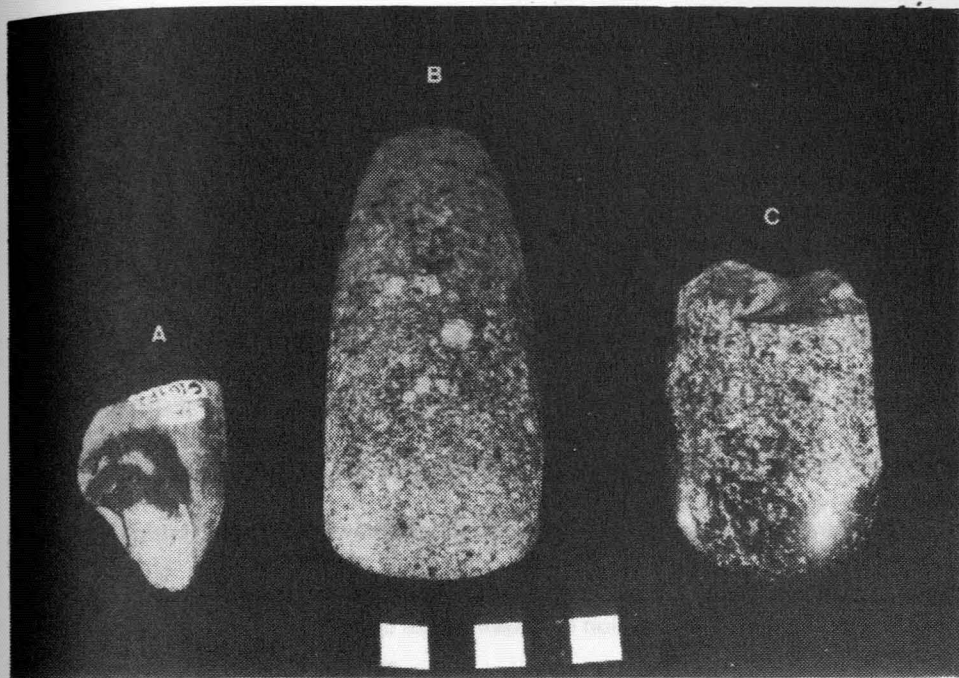


Figure 8. Rounded bit celts. Proveniences: A, G-169F2. B, G-174A1. C, IF-17.

*Rounded bit celt:* one whole specimen and four fragments. This type of celt has a bit with rounded edges (Fig. 8). Four of the items show signs of use. Only two have striations — these are diagonal. A third celt fragment is heavily battered over most of its blade. The whole item is battered on the poll end.

*Small celts:* two whole specimens. Due to their small size, these two celts are separated from the other types, though they have rounded bits. One item is trapezoidal in plan, the other triangular. The trapezoidal celt may have been broken and reshaped. The bit is unsharpened and unpolished. The triangular celt shows use damage at both ends. This item is made of siltstone.

*Celt fragments:* three fragments from the poll end of celts were recovered. Two of the polls are pointed, the other is wider and flattened. All three show use battering.

#### Chisel

One small ground chisel fragment is part of the polished stone from the Cuenca de Arenal. The bit end appears to have been heavily used. Chisels are not as wide as celts, but, like celts, are also biconvex in cross-section (Einhaus 1980).

## GROUND AND POLISHED STONE CHRONOLOGY

### Ground and Polished Stone with Stratigraphic Context

Only slightly more than 20 percent of the ground and polished stone artifacts from the Cuenca de Arenal were found through stratigraphic excavation. The remainder of artifacts were found on the surface at various sites in the area (Table 2). Valid statements concerning chronological changes in ground and polished stone artifacts are difficult to make due to the small number of items recovered during excavations. Table 3 provides a listing of numbers of an artifact type by strata, and Figure 9 graphically displays a grouping of the morphological types by strata.

One apparent pattern is that metates are present in nearly equal numbers throughout most of the stratigraphic sequence. Manos occur both pre-Unit 40 (representing a large tephra deposit) and post-Unit 40. They are not, however, as evenly distributed as metates. This could easily be explained as a sampling bias. Manos are notably absent from our collection from the large cemetery site G-150, although the landowner has reported finding manos at the site.

There are no chronological differences evident between the distribution of metates and metate fragments with stratigraphic context. Examples of the rectangular tripod metate occur both pre- and post-Unit 40. There are not enough specimens of other metate types to give any indication of chronological change.

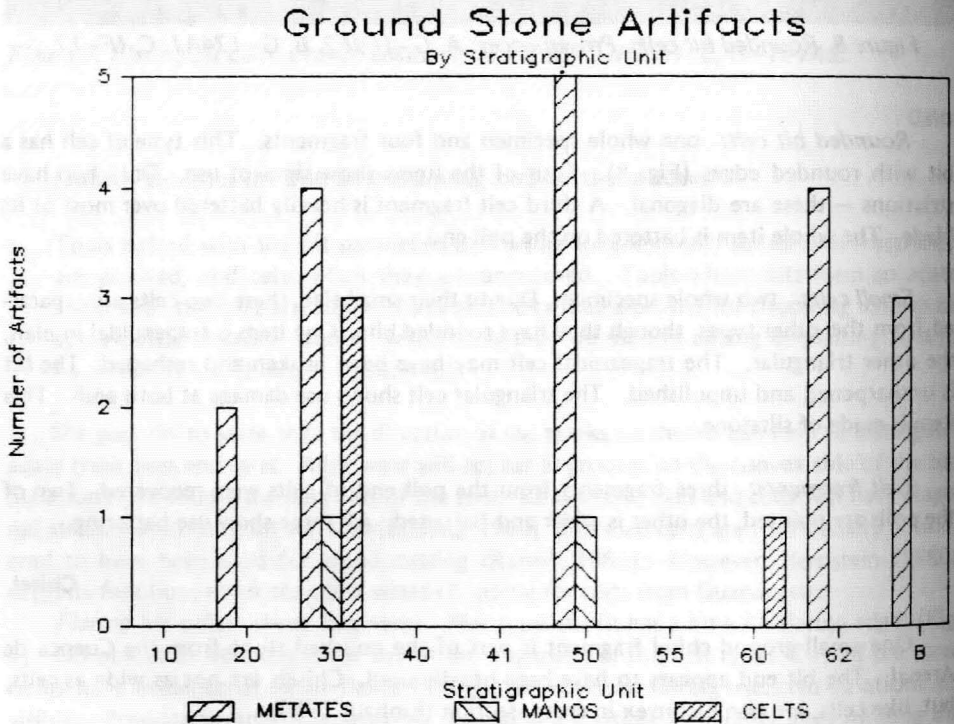


Figure 9. Graph of groundstone artifacts by stratigraphic unit.

**Table 2. Groundstone By Site**

**G-150**

*Metates:* 5 whole: C-9/1, C-4/1, D-3, C-8/1, B-12  
 12 fragments: 2 from A, 1 from C-1, 4 from C-2, 1 from C-3, 2 from E-1, 1 from I-1, 1 from I-2  
*Manos:* 1 fragment: I-2  
*Dicoidal grinding stone:* 1 whole: C-1  
*Sculpture:* 1 frag: A-1  
*Misc:* 1 frag of unidentifiable decorated stone: C-2  
 1 frag of unidentifiable ground stone: C-2

Total ground stone from G-150: 22

**G-154**

*Metates:* 1 frag: 1-2  
*Celts:* 1 frag: A-3

Total 2

**G-156**

*Metates:* 1 whole: A-1  
 1 frag. A-1  
*Celts:* 1 frag: A-1/1

Total 3

**G-161**

*Metates:* 4 frags: A-1  
*Manos:* 1 frag: A-1, 1 frag: B-4  
*Celts:* 1 frag: A-1

Total: 7

**G-163**

*Manos:* 2 frags: A-1  
*Celts:* 1 frag: A-1

Total: 3

**G-164**

*Metates:* 5 frags: A-1  
*Manos:* 1 frag: A-2  
*Celts:* 2 frags: A-2

Total: 8

**G-165**

*Metates:* 1 frag: A-1  
*Mano:* 1 frag: A-1

Total: 2

**G-166**

*Mano:* 1 whole: A-1

Total: 1

**G-168**

*Metates:* 2 frags: A-1

Total: 2

**G-169**

*Metates:* 1 frag: B-3  
*Manos:* 1 frag: F-2  
*Celts:* 1 whole: D-2  
 1 frag: F-2

*Chisel:* 1 frag: D-2  
*Unspecified:* 1 frag: C-2

Total: 6

**G-174**

*Celts:* 1 whole: A-1  
1 frag: A-1

Total: 2

**G-176**

*Mano:* 1 frag: A-1

Total: 1

**IF-17**

*Celt:* 1 frag  
*Unspecified:* 1 whole  
Total: 2

**S-2**

*Unspecified:* 1 whole  
Total: 1

**G-175**

*Metates:* 1 whole: A-1  
5 frags: A-1

*Celts:* 1 frag: A-2

*Mano:* 3 frags: A-1

Total: 10

**IF-1**

*Celts:* 1 frag.

Total: 1

**IF-20**

*Metate:* 1 frag

Total: 1

Total ground stone: 74

**Table 3. Ground and Polished Stone with Stratigraphic Context**

Unit	10	20	30	40	41	50	55	60	62	B
Morphology										
Rectangular, tripod metate									1	1
Oval, tripod metate										1
Ovoid, tripod metate										1
Rectangular, decorated metate									1	
Decorated metate fragment			2							
Legged metate fragment		1				2				
Metate fragments		1	2			3			2	
Ovoid mano fragment			1							
Bar mano fragment						1				
Rounded bit celt			1					1		
Trapezoidal celt			1							
Celt fragment			1							
Chisel fragment			1							
Total	0	2	9	0	0	6	0	1	4	3



Conversely, celts are mainly confined to the more recent strata. The one celt from Unit 60 is the very small whole item described above. There is evidence, however, for polished celt use and resharpening (Article 10) from strata deposited before Unit 40. Therefore, the lack of celts and celt fragments in the earlier strata is apparently due to the small sample size. All of the celts with intact bits from the recent strata are of the rounded bit variety.

### Ground and Polished Stone as Correlated with Ceramics

Information from ceramic analysis (Article 9) helps to differentiate the ground and polished stone artifacts temporally. In this section the ground and polished stone types are discussed in conjunction with the ceramic assemblages with which they were found in association.

All of the rectangular tripod metates, and fragments of that type, are found with Silencio Phase (A.D. 600 — 1000) ceramics. The ovoid tripod and rectangular decorated metates are also associated with Silencio ceramics. All of the examples of these metates are from site G-150 (Article 6), the Silencio Phase type site. Oval tripod metates are also associated with Silencio Phase ceramics, except for one example which comes from a site with Arenal Phase (500 B.C. — A.D. 500) ceramics as the main component, though Silencio Phase ceramics also occur at the site.

The one ovoid non-legged metate was found with Arenal Phase ceramics, as were the unshaped boulder metate and one of the basin metates. The other basin metate is associated with both Arenal and Silencio Phase components.

The decorated metate fragments were found with Silencio Phase ceramics. Cylindrical legged metate fragments occur at Arenal Phase sites. The fragment of a rectangular metate with upturned corners was found with Arenal Phase ceramics.

Bar manos are mainly found with Arenal Phase ceramics, however, one small fragment comes from a Silencio Phase site. Ovoid manos occur with Arenal and Silencio Phase components. The one rectangular mano fragment was found with Arenal ceramics. Loaf-shaped manos are found with ceramics from the Tronadora Phase (300 B.C.) to the Tilarán Phase (A. D. 1000 — 1500). Oval manos are associated with Tronadora and Arenal ceramics.

Flaring bit celts are found with Arenal Phase ceramics. Rounded bit celts appear to be more recent, being associated with Silencio Phase materials. One pointed poll celt is from a Silencio Phase context, while the other is from a Tronadora Phase site. The remaining celt fragment is associated with Arenal ceramics. The single chisel fragment was found with Silencio Phase materials.

To summarize, too few metates and manos were found during controlled excavation to allow chronological placement of types based on stratigraphic context alone. With the addition of information from ceramic analysis however, some patterns are evident. It seems that non-legged and cylindrical leg metates are early in the phase sequence, occurring in the Arenal Phase. The decorated, legged metates from the Cuenca de Arenal are later, being associated with Silencio Phase ceramic artifacts. The plain, legged metates, excepting those with cylindrical legs, are also from Silencio Phase context.

No chronological differences in manos are apparent. The only pattern evident from correlation with ceramic data is that most of the manos seem to date to the Arenal Phase.

The stratigraphic context for celts suggests that rounded bit celts occur late in the

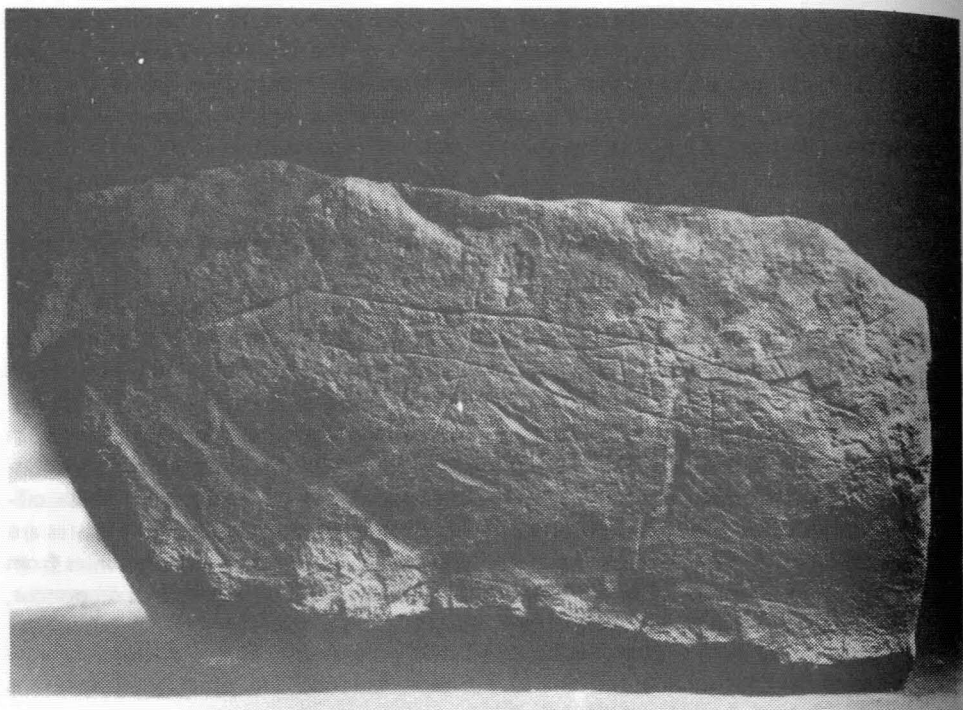


Figure 10. Incised laja from site G-151, Neblina.

sequence. This is supported by the information from ceramic analysis which places rounded bit celts in the Silencio Phase and flaring bit celts in the Tronadora and Arenal Phases.

#### INCISED STONE

Four large stones with incised lines were found during the 1984 field season of the Proyecto Prehistórico Arenal (Fig. 10). None of these stones was found *in situ* by controlled excavation. The antiquity of each incision is therefore suspect. The stones are laja, one quite large, and are heavily weathered. The incised lines in most cases do not extend deeper than the weathered outer portion of the stone. The largest, most elaborately incised stone was found in a large huaquero pit at site G-151. The end of the stone appeared to extend slightly into the undisturbed stratigraphy in the side of the pit. The three smaller stones were recovered from G-150. Because a possible prehistoric temporal placement for the incised stones cannot be discounted they are included here.

#### CONCLUSIONS

The ground and polished stone from the Cuenca de Arenal was not found during controlled excavation in numbers large enough to enable construction of a chronology based on stratigraphic context alone. With the addition of information from ceramic

analysis, some chronological change in ground and polished stone can be defined. Additional archaeological excavation in the Cordillera is needed for recovery of data on the temporality of ground and polished stone artifacts in the area.

While there may be a few pieces from the Cuenca de Arenal that exhibit Atlantic Watershed traits, the evidence from ground and polished stone alone indicates that, during Precolumbian times, the Cuenca de Arenal was culturally closer to the Greater Nicoya subregion.

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