# The Indigenous Stone Tool and Stone Weapons of Costa Rica



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## List of Charts and Illustrations

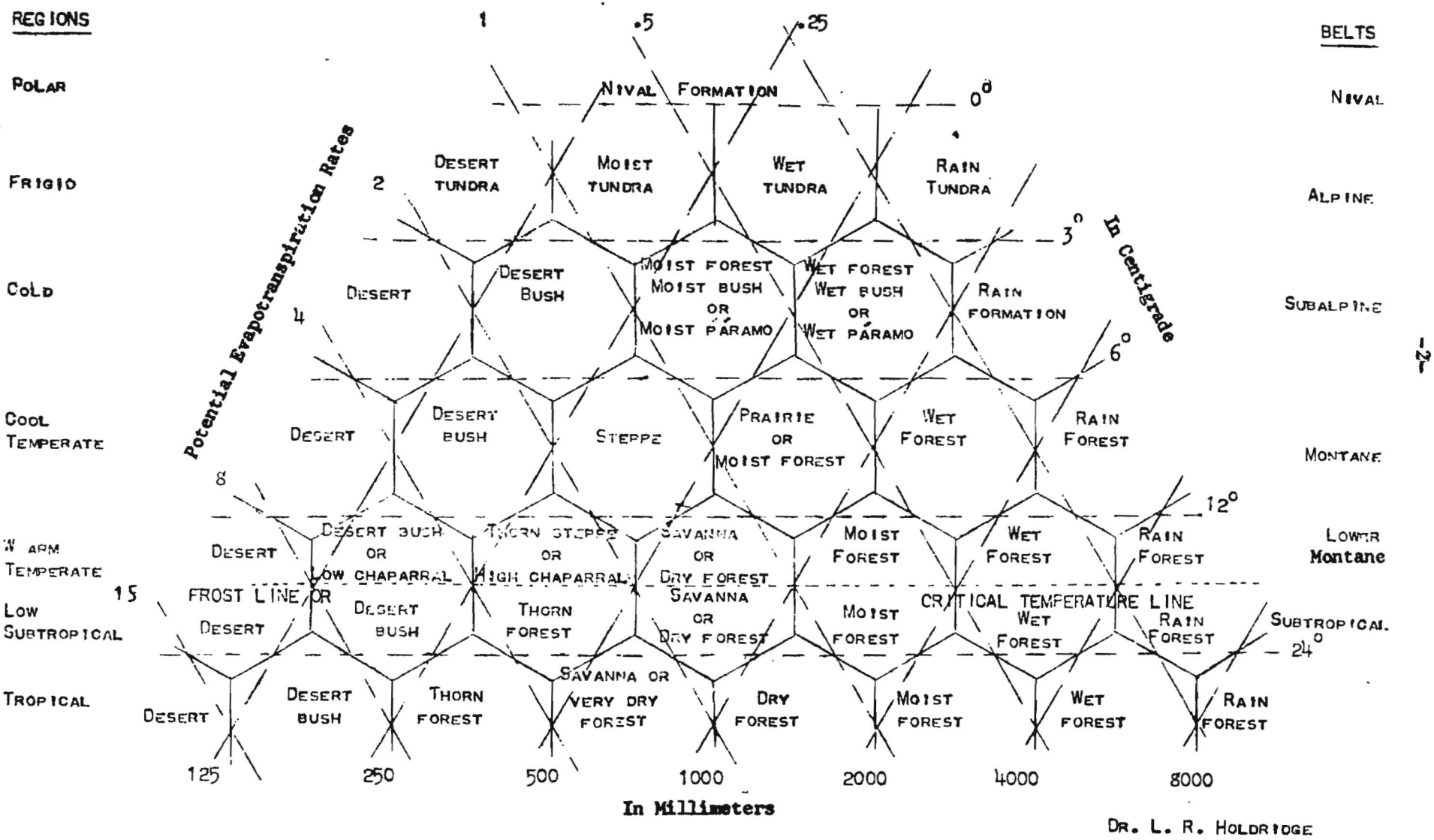
## I. Introduction

The archeological field research project undertaken during the second semester of the 1964-65 academic year in Costa Rica was predicted on three major interests. First, the construction of a comprehensive taxonomy of the aboriginal stone tools and weapons of the area was attempted. Secondly, a determination of the distribution of the various types defined in the taxonomy was accomplished on two separate levels of analysis. By plotting the type occurrence by geographical provenience, it was possible to determine to what degree the various categories of artifacts conformed to the three major cultural divisions posutlated for Costa Rica. (Lothrop, 1926, p.19). Thirdly, by re-charting the geographical data surrounding these types with reference to the "Life Zone" theory developed by Dr. Leslie Holdridge, that is, by noting the occurrence of the tools and weapons in the various ecological Life Zones projected for Costa Rica, it was possible to examine the differential influence of the ecological setting on tool and weapon variability.

The "Life-Zone" ecology systematization developed by Dr. Holdridge is a biological theory that postulates:

> a division of the earth's climate into ecologically equivalent units (there are approximately 120 such units). Each unit, representing one sector of the climatic continuum, supports a distinctive set of possible plant communities, termed plant associations, and is designated a plant formation or, alternatively, a natural life zone. Any given life zone (plant formation) will include a variety of associations depending on soils, topographic featureswhich influence drainage of surface or subsurface water, and the like, while the local pattern and character of associations are nonetheless restricted to the limits of the formation which is in turn a reflection of climate. The model which relates the criti cal climatic variables to the plant formations is represented in Figure 1. The climatic variables are (a) mean annual biotemperature; (b) mean annual precipitation; and (c) the potential evapotranspiration ratio.

Fig. 1 WORLD PLANT FORMATIONS




DR. L. R. HOLDRIDGE

> The three climatic variables are logarithmically scaled and the vegetational units thus inscribed are arithmetically scaled. ("Environmental Factors in Econ Development of the Tropics", J.A. Tosi and Robt. F. Voertman. Econ. Geography, vol. 40, no. 3, July 1964, pp. 191-193)

The specific significance of the Holdridge Model for this archeological study of the distribution and typology of pre-Columbian Costa Rican tools and weapons stemmed from the statement by J. A. Tosi and Robert Voertman that:

> Patterns of settlement and land utilization in those parts of the American tropics which have been mapped under the Holdridge system reveal that the 'settled' agriculturalists, both the Indians and the Europeans, have been fairly good practical ecologists. Given their dietary preferences and their technologies, they have generally selected good, if not always optimal sites for their specific agricultural activities. Historical settlement patterns, which may be inferred from archeological evidence as well as from the location of population concentrations and cities today bear a strong relationship to the potential evapotranspiration ratio factor as revealed by their life zone locations. (Tosi, Voertman, 1964, pp. 193-194)

While the relationship between man and the conditions of water, air, fauna, flora and soil is no doubt of primary importance in the establishment of societies, the degree to which those societies are ecologically determined, affected or limited, is difficult to assess, perhaps because, as Philip Wagner contends in The Human Uses of the Earth, "the ecological conditions of human life are in considerable degree artificial in any society in proportion to the prevailing technical level and degree of economic integration of the society". (1964, p. 22) Wagner further postulates that the relationship between the community, the environment and the "artificial" environment that mediates between them is in a delicate balance which changes as man increasingly refines his technology to make more efficient use of the natural environment or as conditions in nature change or deteriorate rendering the

existing adaptation or balance inefficient or incapable of supporting the human population. Technology, then, becomes a substantial variable in the interaction between man and the physical environment that supports him. Since the first semester of the ACM archeological program was devoted to the plotting of the known archeological sites on a map of the ecological "Life Zones" to determine possible correlations, it seemed a logical second step to attempt to formulate tool and weapon typologies and plot the distribution of the various types and styles to determine if variations existed from zone to zone that might indicate differential adaptations to different environmental circumstances.

Specimens for this study were drawn from a number of sources among which was the existing literature, the Costa Rican National Museum, collections assembled by private individuals, huaqueros (professional grave robbers) and commerciantes (dealers in pre-Columbian materials), as well as field research conducted by the ACM faculty and students.

## II. Review of the Tool and Weapon Literature for Costa Rica.

Very little scientific archeological research has been conducted in Costa Rica and the dearth of literature on the area reflects this condition. Nevertheless, this review makes no attempt at exhaustive coverage of the available material. Rather it is an attempt at outlining the relevancy of basic works on Costa Rican archeology to the problems of tool typology encountered in this paper. In all, five works have been mentioned here. Included under each is a brief discussion of their influence on this paper as well as their agreement or disagreement with some of the positions taken here.

Any treatment of Costa Rican archeology must of necessity make reference to Lothrop Pottery of Costa Rica and Nicaragua, a classic in anthropological research which, although written as early as 1926, remains the definitive work up to the present. By no means limited strictly to pottery, the book covers the entire range of archeological and historical data. Its chief relevancy for this paper stems from its illustration of several classes of tools and weapons, the translation of the Spanish Chroniclers' description of tool functions, manufacturing techniques, and agricultural technology as well as a delineation of the culture areas of pre-Columbian Costa Rica. Lothrop's ideas have substantially influenced the concluding remarks in this paper concerning possible functions of the tool and weapon types as well as the significance of their differential distribution. Further, Lothrop's cultural areas have been utilized in plotting the distribution tables found in the fourth section of this paper.

Lothrop views the territory now occupied by Nicaragua and Costa Rica as a pre-Columbian meeting ground for the general "Middle American" cultures, which extended from central Mexico to Western Nicaragua and the Nicoya Peninsula, and the "Northwestern South American" complexes of Columbia, Ecuador, Panama and Costa Rica. (1926, p. 392) The western side of Nicaragua to the Nicoya Peninsula in Costa Rica Lothrop terms the Pacific Area and notes the relative lack of South American traits in contrast to the great variety of Middle American ones. From this he proceeds to link the pottery styles and techniques found there

to recognizable periods in Mayan history. The pottery of the southern or Chiriqui area of Costa Rica, Lothrop concludes, was identical with South American assemblages; only in the Higland area of Costa Rica did a real cultural meeting occur. This meeting resulted in a cultural inter-mixing which is reflected in the eclecticism shown in the Guetar pottery and stone masonary. On the surface this study tends to bear out Lothrop's reconstruction, perhaps with the exception that the celt assemblages in the Highlands and the Pacific areas are closely related to one another and more or less distinct from their counterparts in the south.

J. Alden Mason in Costa Rican Stonework analyzes the Minor C. Keith collection, and, although Mason is chiefly concerned with statuary and stone of ornamental nature, he briefly treats chipped spearheads, doublebladed axes, mullers, pestles, mace heads, flaked points and polishing stones from several sites in Costa Rica. His descriptions of the various artifacts are excellent and he has been quoted at some length in this work and his geographical data have been incorporated into the distribution charts. The chief relevancy of this work, for this paper is his nine class celt typology. From the Las Mercedes site, he defines two types of celts which roughly correspond to what are defined below as "Standard" and "Side-edged" celt categories. The increased sample upon which this study is based, however, did not bear out Mason's statement that most of the "Side-edged" celts possess blunt butts and the majority of the "Standard" celts pointed butts. It is concluded here that the two types of butts occur with roughly the same frequency in both classes. Also his correlation of the "Side-Edged" celts with the Highland area and the "Standard" celts with the Pacific area was found to be overly simplified: both types occur with equal frequency in the two aforementioned areas.

Finally, in his treatment of the artifacts from the Buenos Aires site, Mason delineates some seven classes of celts. The increased sample used in this study has proven these classes for the most part adequate. Especially useful is his distinction between celts and chisels, which has been adopted in toto in this treatment.

Doris Stone and Carlos Balzer, the co-directors of the Costa Rican National Museum, have made a number of substantial contributions to Costa Rican ethnology and archeology. Their article with the most immediate relevancy for this paper is The Grinding Stones and Mullers of Costa Rica, 1957. Here, functional and stylistic distinctions made between various types of mullers and grinding stones are given cultural and geographical interpretations. This article has been relied on heavily in the treatment given pestles, stirrup grinder, mullers and manos below.

Professor Jorge A. Lines in his Taxonomía de la Arqueología de Costa Rica, classifies all stone artifacts into six, essentially functional, divisions: weapons, utensils, objects of cult, ornamental objects, musical instruments and petroglyphs (1954, p.) While the last three categories are beyond the scope of this paper, under "objects of cult", Professor Lines groups those Socket-Mace Heads which he considers too beautiful and exceptionally carved to have been merely utilitarian in function. The taxonomy developed below in this paper does not incorporate such a distinction on the grounds that the difference between "ceremonial" and "utilitarian" artifacts is basically a functional one, yet due to the method of excavation in Costa Rica, these Mace Heads are synchronically related and lack any cultural association that might indicate their former use. Professor Lines is able to use only the apparent differences in style and workmanship as evidence for his two categories and is forced to assume that these differences necessarily imply functional distinctiveness among the objects. Surely there is nothing to guarantee that these style changes do not indicate differences in age among the pieces; one might just as readily use criteria of style to place the Mace Heads on different levels in a conjectual chronological or evolutionary order of development. Until stratigraphic data is available for this class, as well as all the other classes dealt with in this paper, the author is content to classify the artifacts synchronically on the basis of form, material and technique of manufacture.

Much of the remaining material in Professor Lines' taxonomy, especially his classification of Costa Rican celts, has proven useful

and has been drawn upon heavily in this paper. Also, the data given by the same author in a study entitled "Una Hacha Monolitica de Rio Cuarto". has been incorporated below in the note on Monolithic Axes.

C.V. Hartman's Archeological Researches on the Pacific Coast of Costa Rica., 1907, is a report of the field work done in Las Guacas, Nicoya Peninsula around the turn of the century. The book includes only the most basic typological distinctions; the material from the excavations and collections examined by Hartman are divided into "tools and weapons" and "ornamental and ceremonial". (1907, p. 3) He further sub-divides the first category into celts, metates and manos, bark scrapers, lance points, hammerstones, and polishing stones. Only under the category of "bannerstones or club heads"(i.e. Socket Mace Heads) did he see fit to divide a main category into finer components, and this he did by employing seven stylistic features as diagnostic of class membership. They are: "human heads, mammal heads, heads of birds, birds, two-legged monsters, alligators, clubs without any zoomorphic character". (1907, p. 53). Hartman made no distinction between ceremonial or utilitarian club heads as it was his opinion that the "highly ornamental, zoomorphic features of these implements and their size, which is in many cases too small to have admitted of their use for practical purposes, bear witness to their purely symbolical and ceremonial character." (1907, p. 53). With this assumption and using the seven stylistic classes, Hartman classified and illustrated forty-eight mace heads found at Las Guacas. Using stylistic criteria as Hartman did, but with a larger specimen population (142 Socket Maces) to draw from, the taxonomy given below defines five major groupings and seventeen sub-grouping of Mace Heads. Utilizing Hartman's geographic data, photographs and descriptions, the Mace Heads and other tools mentioned in his work have been considered and included in the taxonomy and distribution tables below.

Hartman completes his section on mace heads with a description of the method of their manufacture which is worth quoting at some length.

> Most of these clubs illustrate in the most perfect manner the employment of the hollow cylindrical drill. The center perfo-

ration or shaft-hole often plainly shows a succession of circular striae at regular intervals, and in the middle there is often a deeper furrow, where the borings from each end meet... The ridge at the meeting place near the middle is plainly visible on this specimen. On many of the heads the circular vase of the core is purposely left in order to form an eye or an ear. It is possible that in the round pits, which have served as eyes, pieces of mother-of-pearl or other perishable material were inserted. Some of the central shaft-holes are plain and smooth all through, showing no furrow near the middle. In some specimens this might have been formed by drilling from only one side.

As is well known, it was with water and fine hard sand that this drilling was done. Dr. Charles Rau in his essay writes: It is very likely that the hollow drills of the aborigines of North America were pieces of that hard tough cane, Arundinaria macrosperma Michaux, which grows abundantly in the southern part of the United States. (1907, p.54)

Part III. The taxonomy of indigenous Stone Tools and Stone Weapons of Costa Rica.

Prior to this study, no comprehensive taxonomy of Costa Rican stone tools and weapons had been attempted, although, as stated above, several authors, most notably Lines (1954) and Mason (1945), have dealt with specific aspects of the problem. Below is a description of the criteria used to define membership in each of the major classes and class sub-divisions and to describe the distribution of each type by geographical provenience. In all, eleven major headings are used; sub-headings are made where sufficient variation within a class demands finer distinctions. The major tool and weapon classes are as follows:

A. Celts
B. Double-Bladed Axes
C. Single-Bladed and Monolithic Axes
D. Socket Mace Heads
E. Lance or Spear Heads
F. Flaked Points
G. Atlatl weights
H. Manos, Mullers, Pestles and Mortars, Stirup Grinders
I. Fiber or Bark Beaters
J. Polishing Stones
K. Hammerstones, assorted flakes

A. CELTS

The following is a rather free synthesis of the celt typologies developed by both Lines and Mason. The presentation of still another typology was not done simply as a academic exercise but chiefly in response to a field of data substantially larger than the one available to the previous researchers. Mason makes a nine class division of types, Lines divides celts into ten groupings, this study postulate eleven basic sub-groupings, hopefully within which the best features of the preceding systems have been retained.

The overwhelming majority of celts show evidence of having been manufactured by grinding; corresponding/nine of the eleven classes listed below assume grinding and make membership within them incumbent upon stylistic criteria. In the two remaining sub-groups,"flaked

only" and "ground and flaked", the criteria has been changed, perhaps with some sacrifice of conceptual clarity, in order to keep the taxonomy in close correspondence with empirical reality. It is the opinion of the author that celts manufactured partially or wholly by flaking present substantially different tools than those which show evidence of grinding only. In these two classes then, the fact of apparently differing techniques of manufacture is held to be more significant than stylistic similiarities which may exist between ground and flaked celts.

1. Standard Celt — celts in this class are ground; possess two sides in cross-section; lack parallel edges near the bitt; have butts either pointed or blunt but basically triangular; are overwhelmingly made of volcanic rock; may be polished or unpolished.
2. Side-Edged Celt— are ground; possess four sides in cross-section due to the presence of two parallel, flattened surfaces that run along the side of the celt beginning at the bitt and often reaching the butt; butts may be blunt or pointed but are basically triangular; are overwhelmingly made of volcanic rock; may be polished or unpolished.
3. Ridged Celt—are ground; possess four sides in cross-section but, due to the presence of a center ridge that runs from near the bitt to the butt end, the cross-section is diamond shaped; butts may be blunt or pointed but are basically triangular in shape; overwhelmingly of volcanic rock; may be polished or unpolished.
4. Six (or more) Sided Celt— are ground; possess six or more sides in cross-section and are similar in general shape to the Ridged Celts, being distinguished by a flattening of the center ridge which produces the fifth and sixth sides; butts are generally pointed; overwhelmingly of volcanic rock; polished or unpolished.
5. Flat-Butted or Axe-like— generally ground only; distinguished from the Standard by the absence of a triangular butt; may be two or four sided in cross-section and the number of sides will probably provide a means of sub-dividing the class when more specimens become available; overwhelmingly of volcanic rock; polished or unpolished.

6. Stemmed Celt--blade ground, upper half and butt ground and/or flaked, distinguished from the Standard Celt by pronounced narrowing around the butt in stem form; stem generally exhibits either wear, pecking or flaking; overwhelmingly of volcanic rock; polished or unpolished; cross-section exhibits two sides.
7. Flaked and Ground Celt--presence of flaking or chipping on one or more sides over-rides all other stylistic criteria with the exception of those flaked and ground celts that fall into Stemmed, Flat-Butted, or Chisel categories; overwhelmingly of volcanic rock; generally unpolished; butts may be pointed or blunt.
8. Flaked Celt--total absence of grinding; generally unpolished; may be fine-grained Basalt but cherts, jades, quartz, flints and quartzites are commonly worked in this manner; generally two-sided in cross-section with tendency towards a ridge; butts may be blunt or pointed.
9. Flanged Celt--are ground; basically a Standard Celt but with a bitt that extends beyond the sides of the main body of the celt to form bell-shaped projections; may possess parallel flat edges leading to the flange; butt may be pointed or blunt but basically triangular; overwhelmingly of volcanic rock; polished or unpolished.
10. White or Tiza Celt--grinding the probable technique of manufacture but the extreme softness of the Tiza material may have demanded different methods; may exhibit Standard or Side-Edged form but never Ridged or Six-or-more-sided; show great deal of wear on bitts again, probably due to the soft material; butts either pointed or blunt but basically triangular; polished or unpolished.
11. Chisels and/or Drills--are ground and/or flaked; distinguished from celts by the wider ratio of length to width; possess two four, six or more sides in cross-section; butts may be either pointed or blunt; overwhelmingly of volcanic rock; polished or unpolished.

No doubt the diversity within this artifact population is the result of functional differences which remain unknown to the modern observer. Accordingly, criteria of style, presence or shape of the tang, over-all size, and to a lesser extent, wear and weathering, have been selected for classifactory and descriptive purposes. Angeneral three-part division is made between Stemmed, Notched and Stem-less points.

Under the STEMMED category two sub-divisions are made: Straight Stemmed including those points whose tangs form 90° angles with the blade and have straight, parallel edges; and Rudimentary or Tapered containing those points which definitely possess tangs but tapered and less well-defined ones than those found on the points under the first heading.

The second of the three major categories, the NOTCHED points, is also sub-divided into two groups: those specimens which have a corner-notch and an Expanding Base, and those points which have a Rudimentary side notch but lack the expanding base.

In the final category, STEM-LESS points, a certain uniformity exists and no sub-divisions appear necessary. The ten stem-less specimens encountered in Costa Rica were "thin with sharp points, rounded bases, and sharp even edges". (Mason, 1945, p. 206).

They were of a laurel-leaf form and pointed at one end only, that is, lacked the point at each end common on blades taken in the Maya area (Kidder, Proskouriakoff.). The bulb of percussion was generally found on, or directly adjacent to, the point and the flaking work appears more carefully done with evidence of secondary chipping as well as use on the blade edges. These tang-less artifacts on the average were the largest flaked flaked point specimens encountered.

| SITE or AREA | STANDARD | SIDE EDGED spec. | SIDE EDGED rudim. | RIDGED | SIX or MORE SIDES | FLA |
|---|---|---|---|---|---|---|
| **HIGHLAND REGION** | | | | | | |
| Guayabo-Guacimo | | | | | | |
| Guayabo, general area | 2 | 2 | 1 | | | |
| La Union Sur | | | | | | |
| Quebrada de los Flores | | | | | | |
| Guacimo | 3 | | | | | |
| Rio Costa Rica | 1 | 1 | | | 1 | |
| Rio Jimenez | 2 | 1 | | | | |
| Torro Amarillo de Rococi | 1 | | | | | |
| Linea Vieja | 2 | | | | | |
| Aguas Zarcas, San Carlos | 1 | | | | | |
| Villa Quesada, San Carlos | | | | | | |
| Meseta Central | | | | | | |
| San José | 1 | | | | | |
| Finca St. Monserrat, St. | | | | | | |
| Rafael | 5 | 2 | | 1 | 1 | |
| Cartago | | 1 | | | | |
| Aguacaliente, Cartago | 16 | 2 | 2 | 1 | 14 | |
| Alto de la Palmar, Cartago | | | | 1 | | |
| Tejarcas, Cartago | 1 | | | | | |
| Tobosi de Cartago | 1 | | | | | |
| Navarrito, Cartago | 1 | | | | | |
| San Joaquin de los Flores | 1 | | | | | |
| Turrialba | 21 | 7 | 2 | 9 | 10 | |
| Torito, Turrialba | | | | | 1 | |
| Finca Las Ruinas, Turrialba | | | | | | |
| Curridabat | 2 | 1 | | | | |
| Volcan Irazu | 2 | 1 | 1 | | | |
| Faldas de Irazu | 2 | | | | | |
| Descomparados, R.Z. | | 1 | | | | |
| Santa Domingo de Heredia | 1 | | | | | |
| **PACIFIC REGION** | | | | | | |
| Nicoya | 98 | 47 | 9 | 2 | 2 | |
| Las Guacas, Nicoya | | | | | | |
| Santa Cruz, Guanacaste | 1 | | | | | |

| | | | | | | |
|---|---|---|---|---|---|---|
| [illegible] Grande Liberio | 4 | | | | | |
| Filadelfia | 2 | 1 | | | 1 | |
| San Francisco, Guanacaste (finca near Filadelfia) | 11 | 12 | 6 | | | |
| **[illegible] MISION** | | | | | | |
| **Western Pacific Side** | | | | | | |
| San Isidro del General | 1 | | | 2 | | |
| Palmar Norte | 1 | | | | | |
| Palmar Sur | 1 | | 1 | | | |
| Puerto Cortes | 3 | 3 | 2 | 5 | 11 | |
| San Vito | 48 | 12 | 4 | 41 | 62 | |
| Sabalito | | | | | | |
| Villa Neilly | | | | 1 | | |
| Buenos Aires | 1 | 1 | | | | |
| Golfito | | | | | | |
| La Florida (near Golfito) | 6 | | | 2 | | |
| Reserva Indigena | 1 | | | 1 | | |
| **Talamanca** | | | | | | |
| Talamanca | | | | | | |
| Lari, Talamanca | | | | | 1 | |
| San José de Cabacar | 1 | 1 | | 1 | 1 | |
| Cañon de Pérez Zeledón | | | | | 1 | |
| **[illegible] PROV.** | 992 | 213 | 54 | 7 | 14 | 23 |
| **TOTAL** | 1.244 | 395 | | 74 | 120 | 13 |

| STEPPED | FLAKED & GROUND | FLAKED ONLY | FLANGED | WHITE(TIZA) | CHISELS |
|---|---|---|---|---|---|
| 3 | 1 | | | | 1 |
| | | | | | 2 |
| 1 | | | | | |
| | | | | | 2 |
| 1 | | | | 1 | |
| 1 | | | | | |
| 1 | | | 1 | 1 | 1 |
| 3 | 1 | 3 | 1 | 1 | 4 |
| | 2 | | | | |
| | | | | | 1 |
| | 3 | 3 | | | |
| | | | | | 6 |
| 1 | | | | | 1 |
| 3 | 1 | 1 | | | |
| | 1 | | 1 | | |
| | | 2 | 2 | 5 | 1 |
| 1 | | | | | |

| | | | | | |
|---|---|---|---|---|---|
| 2 | 1 | | | | |
| | | | | | 3 |
| 8 | 10 | | | | 11 |
| | | | | | 2 |
| 1 | | | | | |
| | 1 | | | | |
| | 1 | | | | 1 |
| | | | | | 1 |
| 11 | 3 | 20 | 19 | 5 | 55 |
| 56 | 26 | 30 | 25 | 12 | 95 |

B. Double-Bladed Axes

Very little attention has been given the Double-Bladed Axe in the literature on Costa Rica, although almost all of the excavation reports from the highland and Pacific areas mention having encountered one or more of them in the course of a dig. Lack of written sources, coupled with a general huaquero and collector contempt for this type of tool, have militated against the assembling of an adequate sample from which to formulate a classifactory scheme. The majority of the forty-nine axes drawn upon for this study were from the collection in the National Museum of Costa Rica. The great range of diversity among the specimens in this sample indicated that it probably by no means exhausts the possible types manufactured aboriginally in Costa Rica.

Alden Mason in his study of the Keith Collection included the Double-Bladed Axe which he refers to as chipped implements:

> of a flattened dum-bell shape...with double blades and a medial construction or groove by which they were attached to a haft or handle by means of a thong or withe. They vary and grade from rude massive specimens of chipped flint or chert with irregular rude edges, through more or less regular and symmetrical examples of jasper-chalcedony, novaculite, shale or basalt with large notched edges. In length they very from 14 to 18 centimeters, and in width from 7 to 10 centimeters. The thicknesses are more variable, ranging from 7 millimeters in the case of the thin smooth shale type to 5 centimeters in the rude flint type. (Mason, 1945, p.206)

Five provisional categories have been delineated below. In order to accommodate variation from the general norm, two of the five classes are divided into "specific" and "generalized" types. Under "specific", the most highly refined and persistent manifestations of the tool idea are listed; the "generalized" heading includes the less refined variations along the theme of the specific category.

The first heading, Type 1, has a specific style type and related forms that tend to grade stylistically into Type 2 which, in turn, is related to the more specialized forms under Type 3. Note that a developmental or evolutionary sequence is not necessarily implied by this typology. Rather, it is an attempt at reconstructing the relations that existed between the various stylistic and cultural ideas manifesting themselves in various forms in what is perhaps a differential response to varying cultural and physical environmental stimuli.

Type 1 Specific

Four specimens in the Museum collection with a length range of 18 cm to 28 cm. Flat, thin stones; no "teeth" on the edges; little evidence of secondary chipping; well-formed center neck flanked by two symmetrical protrusions separated the two blades and this latter is the diagnostic feature that defines the specialized form.

Type 1 Generalized

Six specimens examined with a range of 15 1/2 cm to 24 cm. Stones generally thicker; no teeth on the edge; at least one specimen formed by grinding, others appear to combine the techniques; center neck present and well-formed but lacking the two pairs of symmetrical protrusions, otherwise the same basic shape as Type 1, Specific.

Type 2

Perhaps one of the most common Costa Rican Types; eleven specimens examined from various sources; length range from 11 cm to 21 cm; generally flat, thin stones utilized; evidence of chipping and grinding in most specimens; center neck of varying degrees of definition; possesses teeth on the edges that figures as the diagnostic trait.

Type 3

Four specimens in the Museum collection; length range from 13 to 21 cm; highly developed form that appears not unlike a butterfly as it possesses a narrow center neck with widely spread blades that exhibit teeth or filigree work on their edges. The composition of the rock type in the four specimens appears extremely similar and this plus the uniformity of the pieces makes it likely that, although found in three different geographical localities, have a common source.

Type 4 Specific

Two specimens in the Museum collection and two fragments in the ACM assemblage examined. A somewhat indefinite class of chipped axes made of thick, dense material. Length range from 15 cm to

17 cm. Briefly characterized by a small blade width to length ratio which gives the tool a compact, circular appearance.

Type 5 Specific

Six specimens in the Museum and ACM collections, one mentioned by Lothrop. Length range from 13 cm. to 22 cm Possess four to six semi-circular indentions on the blade; generally relatively thin; formed by chipping and grinding; symmetrically shaped; weight well distributed.

Type 6 Generalized

Four specimens in the Museum. Length range 13½ cm. to 28 cm; exhibits the basic general shape and large length relative to width ratio as found in the Type 6 Specific category but lacks the well-defined blades.

Type 6

Six specimens in the Museum and ACM collections. Length range from 8½ to 11½ cm.; and extremely simple tool type involving only rudimentary rounding and forming of the blades and a simple chipped notch on either side to form the center hafting groove.

Fig. 3 Geographical distribution of Double-bladed Axes

| Site or Area | Type 1 Specific | Type 1 Generalized | Type 2 | Type 3 | Type 4 | Type 5 Spec. | Type 5 Gener | Type 6 |
|---|---|---|---|---|---|---|---|---|
| Nicoya | | | | 1 | | 1 | 2 | |
| Coyolar, Orotina | | 1 | | | 1 | | | |
| Aguacaliente, Cart. | | | 3 | 2 | | | | |
| Curridabat | | 1 | | 4 | | | | |
| San José | | | | | | 1 | | |
| "Finca Las Ruinas" Turrialba | | 1 | | | | | | |
| Guapiles | | | 1 | 2 | | 2 | | |
| La Union | | | | | 2 | | | |
| Tortuguero | 1 | | 1 | | | | | |
| Guacimo, Linea Vieja | 3 | | | 1 | | | | |
| Rio Costa Rica | | | | 1 | | | | |
| Nuevo Coinito | | | 1 | | | | | |
| Marzarnillo de Puntarenas | | | | | 1 | | | |
| Palmar Norte | | | | | | | | 4 |
| Unknown | | 3 | 5 | | | | 1 | 2 |
| TOTALS (49) | 4 | 6 | 11 | 11 | 4 | 4 | 3 | 6 |

C. THE SINGLE BLADED AXE

Only five specimens from this category have been examined in the course of this study. The basic shape of the axe leads one to associate it with the celt in design and function. The Single-Bladed axe, however, is substantially larger and broader than the normal celt, the six specimens possessed a circular indention at the top which evidently served in hafting. Four of the specimens exhibited some form of decoration or secondary elaboration on the top above this hafting groove. Two of the five artifacts were of unknown provenence, the remaining four were from the Highland area.

C. THE MONOLITHIC AXE

Two specimens of this type of artifact are reported for Costa Rica: Hartman mentions the discovery of one in his 1907 Nicoya expedition and Lines treats such an axe from the Rio Cuarto in Alajuela province (1939). Generally, the two specimens are characterized by a stone handle with secondary incised decorations and a celt shaped blade projecting from the heavier fore part of the handle. This celt-shaped blade has lead to the conclusion that the monolithic axe is a copy in stone of the normal method of hafting celt blades to wooden handles.

Although rare in Costa Rica, such objects have been reported in some quantity from the Nicaraguan lake area as well as from the Antilles, Haiti and the Caribbean. (Hartman, 1907).

D. SOCKET MACE HEADS

The criticism of Lines' ceremonial-utilitarian dichotomy need not be reiterated here. Suffice it to say that the stylistic criteria adopted for Socket Mace Heads roughly conforms to Hartman's distinctions, without his assumption that all the maces are necessarily "ceremonial" in character. Outlined below are five major categories which are in turn sub-divided into seventeen minor ones. Under the main heading Bird Heads fall: Owl, Parrot, Head and Tail, and Other;

under Knobbed, Standard and Variant; Anthropomorphic, Alterego, Anthropomorphic; Zoomorphic, Alligator (head and tail), Jaguar, Bat, Two-legged Monster, and Other; Circular, Plain, Incised, and Partially Drilled Jades.

The category Bird Head covers a wide range of stylistic motifs. The "Owl" is defined by large concave depressions divided by a straight, pointed beak and topped with two knob-like projections that symbolize ears. The "Parrot" motif is similar to the Owl in that the bird head dominates more or less one-half of the mace's outer surface but the Parrot face lacks the large, concave eye depressions and possesses a smaller, hooked beak. Ear knobs may or may not be present. "Head and Tail" specimens are related to the Alligator design described below. These maces possess a protruding bird's head on one side and a conic projection or tail on the opposite side in the manner of a modern claw hammer. The general category, "Other", contains the unspecified heads of birds which range in complexity from a simple pointed beak with drill-holes for eyes to the relatively elaborate naturalistic examples whose individuality precludes their further categorization.

The first class under Zoomorphic is "Alligator" which is distinguished by a flat, projecting reptile face, often with accurate incising of the anatomic details, and a long, conic tail on the opposite side. Specimens in this class tend to possess the greatest length and their stylistic similarity to both the "Head and Tail" bird heads and to the modern claw hammer is immediately apparent. The second category, "Jaguar", is represented in this study by only two specimens yet the distributional spread of this motif in other media such as metates makes the seperate mention of these specimens worthwhile. Basically, the feline face dominates and projects from one-half of the mace in the manner of the "Owl" and "Parrot" examples. "Bat" is the prosaic common name applied to these beautifully worked specimens characterized by a protruding face with circular depressions forming the eyes and ears, a hollowed mouth made by circular drill holes and huge, fang-like teeth from which the class name has been derived. The category

"Two-legged Winged", adapted from Hartman's 1907 study, is defined by the presence of two parallel legs or wings that extend outward from the bottom of the conical socket on the mace. Both a head and an opposed, [illegible] tail is present. The tail may be either pointed or blunt on the end. Incised designs are common on this type. The grouping "Other" includes the wide range of forms which possess conventionalized normal features but defy further "speciation".

Anthropomorphic differentiates between simple "Anthropomorphic" motifs which represent conventionalized human features and "Alter-ego" which uses human features as a base, but departs from this norm into various physical distortions.

Under the category Knobbed fall the "Standard" forms which are defined by three rows of ten to fourteen projections or knobs which encircle the mace parallel to one another. Deviations from the standard type fall into the class "Variant" which includes those specimens with less than three rows, those that exhibit less than ten knobs and other variations along the knobbed theme.

Another common group, Circular, consists of "Plain" or totally undecorated, unadonned stone rings which may be polished or unpolished and vary greatly in size. "Incised" circular mace heads are equally free of adornment with the exception of one or two pairs of incised lines that encircle the drill hole at the top and bottom. "Partially Drilled Jades" are represented by six specimens in the National Museum collection and their classification with the mace heads is chiefly one of convenience. They are the size of the average mace and are circular but possess a center hole that penetrates only several centimeters. Equally unique are the two flanking drill holes which are less than half a centimeter in diameter and do not penetrate do the other side of the mace. As the other types of mace heads, the Jades could have been mounted on a handle and served as a kind of baton de commandent.

Fig. 4 Geographical Distribution of Socket Mace Heads

| Site or Area | BIRD HEADS | | | | KNOB | | Anthropomorp. | | ZOOMORPHIC | | | | CIRCULAR | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | Owl | Parrot | Bird | Other | Std. | Var. | Anthr. | Alter | Allig. | Jaguar | Bat | Other | Plain | Incis | Jade | |
| Nicoya | 12 | 10 | 6 | 3 | 3 | 1 | 4 | 2 | 9 | 1 | 1 | 6 | 17 | 8 | 4 | 5 |
| Nacascolo | | | | | 1 | | | | | | | | | | | |
| Abangares | 3 | | | | | | | | | | | | | | | |
| Ruehado Grande, Liberia | | | | | | | | | | | | | | 1 | | |
| Aguacaliente, Cartago | | | | | 1 | 1 | | | | | | | 1 | 1 | 1 | |
| San José | | | | | 1 | | | | | | | | | | | |
| Curridabat | | | | | 1 | | | | | | | | | | | |
| Moravia | | | | | 1 | | | | | | | | | | | |
| Volcan Irazú | | | | | | | | | | | | | | 1 | | |
| Guacimo | 1 | | | | | | | | | | | | | | 1 | |
| Guapiles | 1 | | | | | | | 1 | | | | | | | | |
| Rio Costa Rica | | | | | | | | | | | | | | 1 | | |
| Naranjo | | | | | 1 | | | | | | | | | | | |
| Chomes | 1 | | | | | | | | | | | | | | | |
| Línea Vieja | 1 | 1 | | 2 | 3 | | 1 | 1 | | | | | 1 | 2 | | |
| Unknown Provenience | 1 | | | | 4 | | 1 | | | 1 | | | | 1 | | 1 |
| TOTALS | 20 | 11 | 6 | 5 | 16 | 2 | 6 | 4 | 9 | 2 | 1 | 6 | 19 | 15 | 6 | 6 |

E. SPEAR OR LANCE HEADS

As in several of the above categories, the formulation of typological distinctions among stone spear or lance heads is hampered by a limited sample. Of the twenty-five specimens treated in this study, twenty-two are from the National Museum of Costa Rica, three are from the ACM assemblage. In total, only nine separate sites are represented and, of those nine, three sites in the Guapiles area account for all but six of the lance heads in the sample. Further, the similarity in rock type, style, amount of use and weathering imply that each of the three site assemblages from Guapiles were probably manufactured at the same time and buried together in the same grave or cache on each of the three sites. With these limitations in mind it was deemed futile to construct detailed sub-divisions. Instead, a definition of the uniformities which characterize the sample has been attempted on the basis of those traits which occur most frequently. Those specimens which conformed to the "norm" constitute the Standard class of lances. Deviations from the norm were noted and those artifacts which lacked elements found in the Standard lance were listed under a second heading, Deviant. Finally, one specimen from the Tortuguero site was stylistically so distinct that, while it still demanded classification under the general lance category, it was placed in a third class, Palete-shaped, as the only member. The standard definition is as follows:

1. all the specimens are stemmed.

2 all are of a fine-grained volcanic rock, generally with a white patina; no flint or chert specimens are found in this class.

3. all the specimens, with the exception of taree listed below, are flat and unworked on one side. Of the three exceptions, one of unknown provenance, one is from La Herediana, the third is from Sabanillas de Tucurrique.

4. all have been chipped or flaked to form the blade. Among the five specimens from the confluence of the Rio Sucio and the Rio General, a light grinding subsequent to manufacture seems to have been applied but the soft nature of the constituent rock may have allowed this smooth effect to have been produced through use.

Fig. 5 Geographical distribution of Lance Heads

| Area or Site | STANDARD | DEVIANT | PALATE |
|---|---|---|---|
| Guacimo | | 1 | |
| Las Mercedes | | 1 | |
| Confl. Rio Sucio & Rio General | 5 | | |
| Tortuguero, Guapiles | 5 | 4 | 1 |
| La Union & La Union Sur, Guapiles | 3 | | |
| Sabanilla de Tucurrique | | 1 | |
| La Herediana | | 1 | |
| General area: Linea Vieja, Guacimo, Guapiles | 3 | | |
| Unknown Provenience | 1 | | |
| TOTALS (25) | 16 | 8 | 1 |

5. all the specimens have a center ridge on the worked side which had been formed by flaking the blade right and left.

   a. on the Rio Sucio-Rio General group, this center ridge tends to extend from the stem to the bitt.

   b. on the Tortuguero group of ten specimens, five exhibit this ridge, five do not.

   c. two other specimens in the National Museum collection do not exhibit this center ridge; one is of unknown provenance, the other is from La Herediana.

6. all have opposed and expanding blades above the stem similar to the straight stemmed flaked points described in the following section of this paper. The one exception to this is the specimen of unknown provenance in the National Museum collection.

F. Points

When historian Gonzalez de Oviedo y Valdes wrote an account of his 1529 travels in the Nicoya area he noted that the Indians there were proficient with the bow and arrow in addition to the spear and club. (Hartman, p. 4). He did not describe the weapon in further detail, however, and to determine the nature of the arrow points utilized, we are forced to work back through the archeological record. Mason states that:

> arrowheads, as today, were made of hard wood, bone, and similar perishable substances. Fine thin regular chipped arrow and spear heads of flint, chert, and similar stones are most uncharacteristic of the Isthmian region. (Mason, 1945, p. 205)

The general paucity of flaked material in this area is further emphasized by Kidder who stated as late as 1947 that flaked blades were almost entirely confined to Meso-America and listed Hartman's discovery of several examples in the Costa Rican Highlands as the southernmost specimens found up to the time of his writing. (Kidder, 1949, p. 15).

In the entire course of ACM research in Costa Rica only thirty-seven specimens of flaked or chipped points were encountered. Most of the specimens were well-made and exhibited a sophistication, skill and

acquaintance with a diversity of styles on the part of their manufacturers that is not a little surprising in view of their rarity in Costa Rica. It is perhaps justifiable to assume that these points were obtained in trade rather than from local craftsmen. At present, however, there is too little information as to the association in the earth or mineralogical affinity to formations elsewhere to allow this statement to leave the hypothesis stage.

No doubt the diversity within this artifact population is the result of functional differences which remain unknown to the modern observer. Accordingly, criteria of style, presence or shape of the tang, over-all size, and to a lesser extent, wear and weathering, have been selected for classificatory and descriptive purposes. A general three-part division is made between Stemmed, Notched and Stem-less points.

Under the Stemmed category two sub-divisions are made: Straight and Stemmed, including those points whose tangs form 90° angles with the blade and have straight, parallel edges; and Rudimentary or Tapered, containing those points which definitely possess tangs but tapered and less well-defined ones than those found on the points under the first heading.

The second of the three major categories, the Notched points, is also sub-divided into two groups: those specimens which have a corner-notch and an Expanding Base, and those points which have a Rudimentary side notch but lack the expanding base.

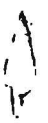
In the final category, Stem-less points, a certain uniformity exists and no sub divisions appear necessary. The ten stem-less specimens encountered in Costa Rica were "thin with sharp points, rounded bases, and sharp even edges". (Mason, 1945, p. 206). They were of a laurel-leaf form and pointed at one end only, that is, lacked the point at each end common on blades taken in the maya area (Kidder, Proskouriakoff). The bulb of percussion was generally found on, or directly adjacent to, the point, and the flaking work appears more carefully done with evidence of secondary chipping and use on the blade edges. These tang-less artifacts on the average were the largest flaked point specimens encountered.

Fig. 6 Illustrations of the five Flaked Point types of Costa Rica

STEMMED

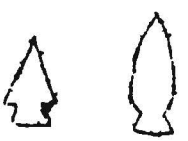
Rudimentary Stem

Straight Stem



NOTCHED

Rudimentary Side Notched



Side Notched, Expanding Base

STEM-LESS

Blade, Point at one end only.

Fig. 7 Numerical occurrence of the types of Flaked Points

| Class or Type | Number |
|---|---|
| STEMMED | |
| Rudimentary Stem | 4 |
| Straight | 17 |
| NOTCHED | |
| Rudimentary Side Notched | 3 |
| Side Notched, Expanding Base | 3 |
| STEM-LESS | |
| Blade, Point at one end only | 10 |
| TOTALS | 37 |

G. ATLATL WEIGHTS

Hartman reports the discovery of three stone atlatl pegs around 5.4 cm in length and "similar to those from northwestern South America", in the Nicoya report. (Hartman, 1907). In view of the scarcity of this type of artifact in other parts of Costa Rica, it is interesting to note Julian Steward's remark in the Handbook of South America Indians that in Central America, as in the Amazon Basin, "the bow and arrow had evidently spread at the expense of the spear and spear thrower; these weapons have a strong negative correlation". (BAE, vol. 4, p. 4).

H. MANOS, MULLERS, PESTLES AND STIRRUP GRINDERS

In their article "Grinding Stones and Mullers of Costa Rica", Doris Stone and Carlos Balser give an excellent functional and historical interpretation of the differences in form found in indigenous manos and metates. Rather than merely duplicating the extensive data concerning metates gathered by Stone, Balser, Mason and others, the author decided to omit metates from this paper altogether and concentrate on a distributional study of grinding stone or mano variation as a supplement to Stone and Balser's work. The five-category grinding stone taxonomy used in their paper has been altered to include only four categories, and limited definitions have been assigned the rahter ambiguous terms "mano" and "muller". Basically the categorization of grinding stones is as follows:

Mullers: "elongated or cylindrical stones "associated with maize grinding in Central America and Mexico".

Manos: either "short rectangular and flat bottomed" stone or shorter, loaf-shaped stone flat on one side probably developed from the former".

Stirrup Grinders: quadrilateral stone handle, not unlike the modern flat iron; may be solid or possess a four-sided center hole

Pestles: type one--mushroom or flanged grinding surface at base of a tubular stem that may or may not be decorated on the top

type two--plain cylindrical stone tube, may or may not be decorated at the top but lacks the flanged grinding surface at the base.

The functional significance of these various types will be discussed below; the geographical distibution of these types is as follows:

Stirrup Grinders: quadrilateral stone handle, not unlike the modern flat iron; may be solid or possess a four-sided center hole

Pestles: type one--mushroom or flanged grinding surface at base of a tubular stem that may or may not be decorated on the top

type two--plain cylindrical stone tube, may or may not be decorated at the top but lacks the flanged grinding surface at the base.

The functional significance of these various types will be discussed below; the geographical distribution of these types is as follows:

I. Fiber or Bark Beaters

This utilitarian tool was used according to Lothrop, to separate the fibers of certain plants in the fabrication of a "coarse, paper-like cloth". (Lothrop, 1926, p. 99). In Costa Rica and elsewhere, two basic types prevail: the monolithic or handled variety and the handle-less ovoid type which generally has a groove for hafting. Both types have either rough or striated faces.

Five further sub-divisions of the two basic types are made in this paper. The Monolithic (handled) Beaters are separated into those with striations on one face only and those with striations on two or more faces. The hafted Ovoid Beaters have three sub-categories: those with hafting groove and parallel striations on one face, those with a circular hafting groove but with a rough face and no striations, and those specimens which possess neither hafting groove or striated faces but which are nearly identical to the other Fiber Beaters in size, shape, weight and type of rock.

The nineteen Ovoid Beaters in the National Museum collection show great uniformity. All are composed of a fine-grained, dark granitic rock; all possess neatly parallel striations on one face only; all are fully encircled or nearly fully encircled by a smooth, round-bottomed hafting groove. General shape varies somewhat between oval to rectangular with rounded corners. Perhaps significantly, the majority of these Museum specimens are from the Nicoya Penninsula.

J. Polishing Stones

Smooth, glossy stones with rounded corners and polished surfaces abound in all parts of Costa Rica. These artifacts are generally composed of some variety of Quartz and often show artificial shaping, probably to facilitate griping. They apparently functioned as polishing stones for ceramic, perhaps stone, objects.

K. Hammerstones

This type of stone artifact is often indistinguishable from manos or mullers as well as natural stones and no doubt the greatest percentage of these specimens are never recognized as human products. They occur in all parts of Costa Rica and exhibit a great variety of shapes,

sizes and degrees of wear. In this study, the only criteria for membership in this class was evidence of artificial shaping, such as a squared corner. Hammerstones were probably employed in tree felling and spliting, in wood working, the manufacturing of stone objects such as statues and weapons and any of the general purposes in which the modern hammer is employed. It is highly likely that Hammerstones were used in conjunction with the Flat-Butted Celt described above. Due to the difficulty of recognition and their universal occurrence, no attempt at typology or distribution for this class has been made.

L. Assorted Chips and Fragments

The sharp cores and flakes resulting from the manufacture of flint tools were no doubt used in Costa Rica as scrapers to flay skins and for a variety of other purposes. Unfortunately, the occurrence of these items in the existing collections is at best rare and no attempt to deal with them has been made in this paper.

## IV. Conclusions Concerning the Geographical Distributions of the Stone Tool and Weapon Types in Costa Rica.

> Tools, in the widest sense, are movable material objects especially designed for the application of energy in precise and controlled ways for particular mechanical tasks. Usually their respective functions are few and specialized, and their design specific for a given task. The effect of tools is to specialize the human organism for a particular purpose by equipping it with supplementary working parts that increase the effect of its own energy or of energy available to it. (Phillip Wagner, 1960, p. 92).

The remainder of this paper will attempt to enlarge on Wagner's statement concerning the purpose of tools in the specialization of "the organism for a particular purpose," first by examining the function and geographical distribution of the various tool and weapons types, and in the final portion by discussing the material responses of the pre-Columbian Indians to the various Costa Rican ecological zones as reflected in their technology.

Any discussion of Costa Rican tool types must logically begin with stone Celts. As evidenced by the quantities dealt with in the taxonomy and distribution tables, the celt is overwhelmingly the most common tool brought to light in the course of excavation in Costa Rica. Present in Costa Rica are examples from the entire range of size possibilities beginning with the tiny three centimeter long artifacts and running to examples of nearly thirty centimeters in length. Kidder in Guatemala, has suggested the possibility of chronological significance for the abrupt size differentiation exhibited between the common medium-sized celts and the large examples. Whereas this possibility should not be ruled out for the Costa Rican assemblages, it seems less likely here where the transition from the smallest to the largest specimens appears smooth due to the presence of all sizes of celts.

Mason has already pointed out the lack of hafting grooves as a chief characteristic of the Las Mercedes and general Costa Rican celts. According to him this lack is characteristic of celt assemblages from "the entire region between Northern Mexico and Argentina". (Mason, 1945, p. 213 ) Only one grooved specimen has been reported in the

course of this study. Mason's linking of his "Type B", or what is referred to here as the Standard celt, to the Nicoya area is perhaps born out numerically in our distributional study, but the occurrence of this type in substantial proportions in all parts of Costa Rica, as well as its incidence in other parts of the world, implies that this type is in fact a standard celt shape and one that probably can not be termed a distinctively Chorotegan development. Mason also considers his "Type A" , or what is termed here Side-edged celts, to be an essentially Highland and Chiriqui type. The high incidence of Side-edged celts in the Nicoya area and their low rate of occurrence in the south does not bear out Mason's conclusions. It seems more likely that side-edging was a basic technique of manufacture practiced chiefly in the Highland and Pacific regions and was only occasionally used in the South. The possibility that the Chiriqui Side-edged celts are the result of trade between the three areas should not be ruled out but does not appear particularly likely in view of the common and utilitarian nature of these tools.

The White or "Tiza"celt, of which only eleven were encountered, appear to be chiefly a Nicoyan product. The function of this celt is something of an enigma: the softness of the constituent material of the tool would seem to preclude its use against anything but the least resistant material. Most of these Tiza artifacts show evidence of extreme wear. Chisels occur throughout Costa Rica, perhaps most commonly in the Meseta sub-region of the Highlands and on the Pacific side of the Chiriqui area and least commonly in Nicoya. Due to the universality of their occurrence, this tentative least-most distribution may be based on a sampling error. The Flat Butted celt, on the evidence of ten samples of known provenance, appears to be chiefly a Meseta Central trait which occurs in several instances in Nicoya but is absent from the south. The Flanged celt is a relatively uncommon specimen which possesses roughly the same geographical provenance as the Flat Butted variety. The belling or flanging at the bitt of these celts appears to be a non-functional stylistic modification but this is difficult to assess. The correspondence of the Flaked and Ground category chiefly to the Nicoya and Meseta regions of the Pacific and Highland areas respectively is also attested to by the distribution

chart but, due to the small number of these celts examined, the possibility of their occurrence in substantial numbers elsewhere should not be ruled out

Mason noted the absence of the Flaked Only Flint celts in the Las Mercedes and Buenos Aires sites. On the basis of a limited sample (thirty in total, ten of known provenance), the author concludes tentatively that this type was probably of Nicoyan origin; the incidence of this type on the Meseta was the result of trade for the objects themselves or diffusion of the techniques of manufacture. This explanation perhaps accounts for the absence of such artifacts in the remainder of the Highland area as well as the Chiriqui region to the south.

The most highly specialized and well-made examples of the Stemmed Celt seem to originate in the southern areas of Costa Rica. For northern Panama, Lothrop lists the discovery of a Stemmed Celt from the Cocle area similar to the one illustrated in this paper. (Lothrop, BAE vol. 4) Less highly refined versions of the Stemmed Celt occur in the Highlands, and Hartman found several in Nicoya. (Hartman, 1907, p. 36). Finally the Ridged and the Six (or more) sided Celts appear to be overwhelmingly tied to the western or Pacific side of the Chiriqui region. A significant number of this stylistic category are also found in the Meseta and scattered incidences are reported from Nicoya, Talamanca and Guapiles-Guacimo in order of declining frequency. Mason also links these two classes to the south. (Mason, 1945, p. 10).

In conclusion, the regions that have been defined by Lothrop as the Highlands, Pacific and Chiriqui cultural areas all exhibit a uniformity of celt types that is not surprising when the nature of the tool, the materials of manufacture and the size of the geographical areas are considered. In spite of these factors, however, certain regional variations are encountered. To reiterate: while the Standard celt occurs throughout Costa Rica, the source of the Side-edged variety appears to be the Pacific and Highland regions. On the other hand, the Ridged and Six (or more) sided Celt exhibit only scattered distribution outside of the western half of the Chiriqui area, with

the exception of a significant incidence of them on the Meseta. Likewise, the Stemmed celt seems to be most highly developed in the Chiriqui region.

Perhaps the most persistent uniformity to emerge from this distribution is the great amount of celt types shared between the Nicoya area and the Meseta region of the Highlands. No fewer than five subclasses (Flaked & Ground, Flaked Only, Flanged, White or "Tiza", and Flat Butted) occur chiefly or exclusively in these two areas. Two more categories, Chisels and Side-edged are found in these two regions in greater proportions than elsewhere. In view of this stylistic diversity, the assemblages of the other areas seem rather scattered or less well-defined, although occurrences of the classes are common in those areas also. The fact that these celts were hafted axes that probably functioned chiefly as agricultural tools, perhaps gives weight to the statement that the Meseta and Nicoya areas supported a greater population density and were culturally and politically dominant in pre-Columbian times. This belief, born out to some extent by the Spanish chronicles as well as the archeological record, could perhaps be best explained by the "Life-Zone" hypothesis discussed in the following section.

Double-Bladed Axe

For the most, the Double-Bladed Axe was chiefly distributed in the Highlands and Pacific areas, and it was there that it found its greatest stylistic refinement. Although specimens occur in the Chiriqui area, they appear inferior in design and workmanship. Even in the Highlands, however, the scarcity of these artifacts in relation to celts seems significant when one recalls that celts are axes also. This ratio could no doubt be explained as due to functional or temporal differences between the two classes but, at present, adequate field data for them is lacking.

The Double-Bladed Axe possesses an eminently military appearance. The broad, flat blades are generally perfectly paired and balanced and often encircled by a row of "teeth" or scalloped edges. The center hafting groove apparently allowed the head to be attached to a handle

and wielded with accuracy and force. The immediate suggestion to the observer is the battle axe of Medieval and early modern Europe and it is entirely possible that these Costa Rican artifacts were originally copied from the weapons carried by the Spanish conquerors in early post-Columbian times. However, a pre-Columbian source for the diffusion of the Double-Bladed Axe existed in the Antilles; axes identical to certain classes of artifacts found in Costa Rica have been reported in Haiti. (BAE, vol. 4, p. 501). In passing, it might be mentioned that the battle axe has been reported for ancient Peru in both the archeological record and the Spanish chronicles. (BAE, Vol. 5, p. 256).

Finally, in regard to function, another possibility aside from the apparently obvious military one presents itself. It is possible that these axes are agricultural tools which were used for such tasks as clearing fields, cultivating, even harvesting fruit.

Monolithic and Single Bladed Axes do not appear to have been of great importance in Costa Rica. As has been pointed out above, both axe types show a stylistic relationship with the stone celt and it is likely that they were originally developed from specialized forms of that tool type. The Monolithic Axe appears to have been a weapon perhaps a baton de commandent. Its presence in Costa Rica can probably be attributed to trade with either Nicaragua to the north or with Antillian traders from the Caribbean side, as groups in both of these areas manufactured such an artifact. (Lothrop, 1926, p. 100). The Single-Bladed Axe, on the other hand, appears to be an indigenous development related to the Flat-Butted Celt. Whether it was a tool or a weapon is a moot point; no doubt it could have served both functions. Assuming these Single-Bladed Axes developed in situ among the Highland peoples, their sparce occurrence could be due either to their late appearance or highly specialized nature.

Socket Mace Heads

Much about Socket Mace Heads has been said already in the review of the literature and in the section on taxonomy presented earlier in the paper. In regard to the geographical distribution of the various mace head style categories, perhaps only two significant trends emerge.

First, is the well known fact that Socket Mace heads are limited strictly to the Pacific and Highland regions and are not found in the Chiriqui area. A second, less pronounced but more surprising trend is the apparent lack of highly decorated maces in the Meseta area of the Highlands; in this study only one decorated mace was reported from that sub-region. Since both, historically and archeologically, the Meseta has held an important place in Costa Rica and since the area has produced a great diversity of styles in other types of tools and weapons, it seems likely that the apparent occurrence of knobbed and circular mace heads to the exclusion of other types is the result of sampling error. With the exception of the Meseta, the various stylistic categories of Socket Mace Heads seem to have a basically random distribution and no type seems to be fully linked to either the Highlands or the Pacific to the exclusion of the other. No doubt this condition indicates a prolonged contact between the groups living in the respective areas as well as highly developed "routes of circulation" for trading. (Wagner, 1964, p.20). Whether the mace technology had its source in one area and diffused to the other cannot be determined at present. The fact that the Pacific area produced the greatest quantities of maces in the past but now seems to be exhausted and has yielded this lead to the Guacimo-Guapiles area may indicate something of the stratigraphic depth at which these objects are found in the two regions.

In regard to the function of the Mace Heads several suggestions have been reviewed in this paper. Hartman concludes that they belong in toto to that amorphous class of "ceremonial" objects; Lines is convinced that some of them are ceremonial, others utilitarian. The suggestion that they were badges of rank or status seems plausible; the fact that a mace may serve as a baton de commandent or mark of nobility in no way precludes its use as or development from a military weapon.

The size differences exhibited by the Socket Mace Heads suggests two other possibilities. The early Spanish Chroniclers refer to young children accompanying their tribe to battle. It is possible that the small mace heads are in fact child-size copies of the larger items. (Stone) A second possibility is that these smaller, lighter mace heads tipped the handles of throwing clubs, but this latter interpretation

has no direct verification in the Chronicles.

The geographical distribution of mace heads outside of Costa Rica is specific. Alfred Metraux, in an article on weapons in the Handbook of South American Indians, states that:

> The favorite Inca club was a mace consisting of a starlike head of stone, bronze, silver, or even gold with a central perforation into which a handle (generally about three feet long) was inserted. (vol. 5, p. 225)

Metraux further mentions that many such specimens have been found on the Peruvian coast and describes a specimen from Nazca as follows:

> The shaft of hardwood, 74 cms. long, passes through the central hole of the copper head and is fastened by a piece of leather connecting the head to the shaft. Similar clubs have been found at Pachacamac, Marquez, Chiuitanta, and Trujillo. (p. 255).

Metraux goes on to state that:

> Stone or copper maces found in the Diaguita territory belong to two types: one consists of simple rings; the other has a star-shaped head. In the 17th century, some tribes of the upper Paraguay River used maces with stone heads. These Indians were probably Guarani, no Caingang. Countless stone rings, probably mace heads, have been found on archeological sites in the State of Rio Grando do Sur. (p. 255-256).

The author goes on to state that throwing clubs were not uncommon in that area but does not link them to the stone mace heads. (Metraux, p. 256).

From Honduras probably the territory that marked the northern most expansion of South American influence (Steward, BAE, vol. 4). Strong refers to an artifact assemblage that includes a number of specimens duplicated in Costa Rica. In this connection he mentions "a variety of mace heads identical with specimens from Nicoya". (Strong, BAE, vol. 4, p. 83). Finally, doughnout-shaped stone artifacts similar to mace heads are found in Guatemala but are referred to there as digging stick weights. (Dr. E. Shook, in conversation).

The problems of mace head distribution then, is a complex one. Maces are found far to the South in Peru, in the Highland and Pacific regions of Costa Rica, in Honduras and perhaps in Guatemala. No maces are reported from the Chiriqui area in southern Costa Rica, a region that geographically and culturally stands between Central and

South America and would surely have participated in land trade between the two areas. Lothrop, in fact, regards the pre-Columbian inhabitants of the Chiriqui as the bearers of South American influence and culture to Central America. (1926, p. ). Perhaps the Maces could have been introduced by tribes of the Circum-Caribbean area and then traded overland from the Highlands to Nicoya or introduced from the Caribbean in Honduras and traded to Nicoya and then to the Highland tribes. It is also conceivable that the similarities of type between Peruvian and and Central American maces are merely superficial. If this is the case, maces could be indigenous products of Central America or specifically of Costa Rica. In any event, investigation of the east coast of Nicaragua, which is presently archeologically unknown, will no doubt shed light on the source of the Socket Mace Heads.

Lance or Spear Heads

Lance heads, like the Double-Bladed Axes, possess a distribution that is limited to the Highland and Pacific regions of Costa Rica. Again, as in the case of the axes, several problems are raised by their design, frequency and general nature of these artifacts. Most of the Lance heads were apparently hafted, although there exists specimens with stems sufficiently large and well-shaped to allow the blade to be held in the hand and wielded in dagger fashion. If they were hafted, however, their size and weight would probably prevent them from being thrown like a javelin with much effect or accuracy. Most likely these stone heads tipped lances which were held by the warrior or hunter and used for thrusting, as the European pike. Metraux reports that such weapons were common throughout the New World. In any event, the limitation of the stone spear points to thrusting weapons might explain their rarity: the points for javelins and other functional types of lances could have been made from perishable materials such as wood, bone, and shell. As is the case with many Double-Bladed Axe styles, certain features of the Lances imply similarity to Spanish lances or pikes, but the possibility that these and other weapons are post-contact imitations of European styles must remain a hypothesis until detailed information concerning their in situ associations is available.

A final, alternate interpretation for the Lance heads is inspired by the broad, triangular shape on many of these rather blunt blades: the style and shape of these heads make them appear inefficient for use in the hunt and in warfare. This impression is further reinforced by the presence of a square or pallete-shaped stemmed artifact in direct association with, and of the same basic style and material, as the nine lance heads. In short, it is possible that these so-called spears, like the Double-Bladed Axes discussed above, were agricultural tools used in clearing the land, turning or cultivating the soil, boring holes for seeds, harvesting tuberous plants or in any of the varied tasks performed under a system of cultivation lacking draft animals and the plow. Doris Stone refers to what could be the modern descendant of such a tool among the Boruca of southern Costa Rica. According to Dr. Stone, the macanes are tools which:

> have possibly envolved from a digging stick, and are made with a wooden shaft or handle and a small iron flat-edged blade at one end. This is used for digging holes or even cutting roots in the field. (Doris Stone, 1949, p. 6).

Flaked Points

The rarity of flaked flint or chert points has been remarked upon by a number of authors dealing with Costa Rica. (Strong, BAE, vol. 4, p. 129; also Mason, Lothrop, Kidder). Since the presence of the bow and arrow is attested to in the Chronicles, it is the general concensus among most archeologists that the lack of Flaked Points indicates that the majority of arrowheads must have been made of bone, wood or shell in pre-Columbian times. (Mason, 1945, p. 205, see also Stone, Lothrop). Doris Stone mentions the use of the Pejibaye tree as a source of hardwood for arrow points among certain contemporary Indian groups in Costa Rica. (Stone, BAE, vol. 4, p. 7

In regard to types of Flaked Points, it might be concluded that points with tangs, especially what we have here designated Straight and Rudimentary Stems, are generally more common than tangless blades. Also, it would appear that a slightly greater frequency of points is to be found in the Chiriqui region, but this may be the result of sampling error. A safer conclusion is that Stone points, as celts, were universally known and used throughout

Costa Rica but on a very small scale in relation to points made of other materials. The paucity of Flaked Points in relation to the huge numbers of celts encountered everywhere in Costa Rica is, perhaps, significant when we consider that the opposite ratio of celts to flaked points is the rule in the United States and elsewhere. Possibly it would be rewarding to look to the ecological conditions in each area as the determinant factor in this ratio.

More scarce than points, however, are Atlatl or spear thrower weights, which gives strength to the assumption that the flaked points found here are in fact arrow heads. This assumption seems especially valid if we accept Julian Stewart's negative correlation between the bow and arrow and the Atlatl, cited in the preceding section.

A final consideration is the origin of the Flaked Points. Due to the seemingly contradictory facts of the numerical scarcity of flaked points and yet an exhibition of sophisticated techniques of manufacture and style diversity among those that are found here, the author concluded that the Costa Rican points were items gained in trade from sources external to Costa Rica. It is possible that the crudely flaked Lance Heads treated above were indigenous attempts at copying the techniques of manufacture utilized by the foreign peoples in the fabrication of flint and chert points. However, the interpretations that consider the points as artifacts from an early stage in the indigenous culture or as products of distinct peoples from an early period, are all of equal weight until detailed field work is done in Costa Rica.

Manos, Mullers, Stirup Grinders, and Pestles.

In the review of the literature given in this paper reference was made to the interpretation by Carlos Balser and Doris Stone of the function and distribution of the various types of grinding stones and mullers found in Costa Rica. Basically the two authors conceive of the diversity in grinders and grinding techniques as indicative of the presence of two distinct cultural (especially agricultural) traditions in Costa Rica. According to them, four plants, all of which were processed by mashing, formed the staple diet for the pre-contact inhabitants. These crops were tubers, cacao, maiz and the fruit of

the pejibaye palm (Guilielma gaspiates (HBK) Bailey) (Stone & Balser, 1957, p. 165). The Chorotega and Nahuatl peoples, who entered the Pacific area of Costa Rica from the north in what Steward believes to have been the last four or five centuries prior to the Spanish Conquest (BAE, vol. 4, p. 33) subsisted:

> largely on a baked maize diet which was prepared in the following manner. Crude maize was cooked with lime and ashes, washed overnight, and then ground into a pulp by placing the wet grain on the curved surface of a special stone artifact or metate and rolling over it a cylindrical shaped or elongated stone, the muller. The ground pulp was then baked over an open fire in a shallow receptacle known in Aztec as comalli, and in Spanish today as comal. This resulted in a flat bread or what is known in Central America and México as a tortilla. (Stone & Balser, 1957, p. 165).

According to the authors, a divergent tradition of agriculture and food preparation was indigenous to Costa Rica prior to the northern invasion and was held by the "peoples of southern origin who constituted the bulk of the pre-Columbian population". (Stone & Balser, 1957, p. 167). In regard to the effect of the cultural contact subsequent to the invasion, the authors state that:

> Although linguistic evidence points to their (the indigenous peoples) knowledge of maize, neither historical nor ethnological documentation suggests the use of maize bread..., until the Mexican groups penetrated their territory. Their basic diet until this event, consisted of tuberous plants, the fruit of the Pejibaye palm, and cacao. With the exception of the last, these items were often made into a ball such as the South American arepa, or into a fermented drink which, like maize products necessitated crushing in the process of preparation...Contrary to maize products, these substances cannot be soaked in water. To mash them, however, requires considerable liquid. In other words the process of preparation is fundamentally different. The need for more water during crushing does not permit the use of a borderless grinding stone. There must be a raised rim to avoid overflow. The very mullers must conform in size and shape with the containers in which the foodstuff is placed for mashing. Instead of the elongated stone associated with the preparation of maize, a flat-edged river rock, or a stone shaped as a pestle, or in the form of a stirrup was employed. The method of mashing was also governed by the form of the grinding surface. The muller was rocked, at times with one hand, and not pushed forward and pulled backward. (Stone & Balser, 1957, p. 167).

Subsequent to the invasion from the north the two cultural traditions met and mixed in Costa Rica but for the most part their agricultural traditions remained basically uncharged and distinct. This is reflected in both the Mano and Metate form, according to Stone and Balser. For the most part the distribution study in this paper of the grinding stone types revealed their predicted patterns. The elongated stones, here termed Mullers, appear to conform in the majority of cases to the Nicoya area, although some were reported from the Meseta. Manos, that is, the shorter, flat-edged, often rectangular stones associated by Balser and Stone with the rimmed metates of the southern peoples, appears most frequently in the Highlands and Chiriqui regions and is found only occasionally in Nicoya. Pestles, especially those lacking the bell- or flanged shaped grinding surface, occurred in substantial numbers in Nicoya; those with the bell-bottoms were found most frequently in the Guacimo-Guapiles area of the Highlands. This is a distinction, not taken into account by Stone and Balser, which may involve a slight revision of their hypothesis to accomodate the frequency of the "Type 2" Pestles in Nicoya and the Highlands. Further, it is the opinion of this author that the Pestle was generally not used with metates of either type. Rather, mortars of either shaped or natural stone were employed for the purpose. Such a combination of pestle and associated mortar is illustrated in this paper. No doubt such mortars were not limited to the preparation of food. In the museum collection are three fist-sized stones from various locations in the Highlands which show ground indentions on two sides and were probably used with the base-less (type 2) Pestles in the preparation of paints or herbs for magical, medicinal or ceremonial purposes. The Stirrup Grinders, which Stone and Balser link to the southern tradition, are found in great abundance in the Highlands but are almost as common in the Pacific region and have scattered incidence from both the Pacific and Caribbean sides of the Chiriqui area. A note in passing; since wood and wood products are not preserved well in the Tropics, the possibility that grinders were also made of wood in aboriginal times could not be investigated.

For the most part the distribution of the grinding stone types in Costa Rica seems to conform to the patterns predicted and described by Stone and Balser and tend to confirm their statement that:

> the grinding stones of Costa Rica reveal that this territory was a meeting ground for two very different cultural trends, one from the north with maize as a basic diet, and the other from the south with the importance given to tubers and the fruit of the Pejibaye palm.. (1957, p. 176).

Fiber or Bark Beaters.

The Fiber or Bark Beater is used to process plant fiber in the manufacture of a crude, cloth-like material. According to the Spanish Chronicles, the techniques were widely known and practiced at the time of the Conquest. Today the craft survives only in the remotest areas such as among the Talamancan tribes in southern Costa Rica where Doris Stone describes the manufacturing of crude bark cloth as follows:

> Men generally make bark cloth as it requires considerable strength...The bark of the first two trees is cut and rolled at a right angle to the grain. The outer surface is removed by beating with a stick and then with a wooden club cut with horizontal grooves, one side of which is usually slightly curved. It is soaked in water, pulled to the shape and size desired, and left in the sun to dry. Stones are placed at the corners to hold the shape. The cloth is used for blankets, hammocks (amongst the Cabecar only), to carry babies, as tumplines, belts, and loincloths, and as an article of trade with the Borucas. (Stone, 1962, p. 22).

The stone, pre-Columbian Fiber Beaters which are the concern of this study possess two basic types (see Taxonomy) both of which have a wide distribution in Central, Middle and South America. Lothrop states that the Monolithic type has been reported in Mexico in the Oaxaca and Vera Cruz regions; in Quiriqua, Guatemala and in the Cauca Valley of Columbia. (Lothrop, 1926, p. 99). According to Strong, both Ovoid and Monolithic have been found in excavations in Honduras where at present wooden monolithic beaters similar to the tools described above by Stone, are used by the modern Indian population. These two incidences of the contemporary use of wooden Fiber Beaters tends to add force to Lothrop's assertion that:

> In aboriginal times probably most of these implements were made of wood, like those which persist today among the Mexican tribes, and the form was usually that of the stony type with handle (monolithic). (Lothrop, 1926, p. 99).

Thirty-five specimens were examined in this study and within this rather inadequate sample the Monolithic Beaters with striations on one face only appear to conform rather closely to the Highland area while the Ovoid specimens occur with greater frequency in Nicoya. One exception to this statement is found in each area. It is interesting to note that the single example of a Monolithic Beater with two striated faces observed in Costa Rica was from the southern or Chiriqui area; further investigation will be necessary to determine whether this is a unique specimen or a uniform pattern for the region.

As was mentioned above, most of the Ovoid specimens from Nicoya exhibited a great deal of similarity in rock type, style, shape and apparent technique of manufacture. This may indicate that the specimens are contemporaneous or merely that a simple, functional pattern was arrived at, perhaps at an early date, and then retained without significant modification.

Fig. 8 Geographical distribution of Flaked Point types.

| Site or Area | STEMMED (tang) | NOTCHED | STEM - LESS |
|---|---|---|---|
| Aguacaliente, Cartago | 1 rudimentary<br>1 straight | | |
| Las Mercedes, Guapiles | | | 2 |
| Nicoya | 3 straight<br>1 rudimentary | 1 rudimentary | |
| Filadelfia | 3 straight<br>1 rudimentary | | 1 |
| San Francisco (outside Filadelfia) | | 1 expanding base | |
| Liberia | | 1 rudimentary | 1 |
| Guanacaste | 2 straight | | |
| Cabecera de Chenguila Reserva Indígena | | | 3 |
| Sarchi, Valverde Vega | | 1 rudimentary | |
| Sabalito | 2 straight | | |
| Purruja (near Golfito) | 1 straight | | |
| Unknown Provenience | 7 straight<br>1 rudimentary | 2 expanding base | 3 |
| TOTALS (37) | 21 | 6 | 10 |

Fig. 9 Geographical distribution of Manos, Mullers, Pestles and Stirrup Grinders

| Site or Area | MANOS | MULLERS | STIRRUP GRINDERS | PESTLES Type 1 | PESTLES Type 2 |
|---|---|---|---|---|---|
| **Highlands** | | | | | |
| Aguacaliente, Cartago | | 1 | 1 | | 1 |
| Escazú | | | 1 | | |
| Moravia | 3 | | | | |
| Volcán Irazú | 22 | 1 | 1 | | |
| Finca St. Monserrat | 2 | | | | |
| Curridabat | 12 | 1 | 1 | | |
| Turrialba | 1 | | | | |
| Guapiles, general area | 6 | 1 | 10 | 2 | 3 |
| Nuevo Cointo | | | | 1 | |
| La Unión, Río Costa Rica | 2 | | | | |
| Tortuguero | | | 2 | | |
| **Pacific** | | | | | |
| Nicoya | | 2 | 1 | | 9 |
| Las Guacas | | 2 | 6 | | 1 |
| Carrillo | | | 1 | | |
| Nacascolo | 1 | 6 | | | |
| Filadelfia & San Fran. | | 8 | | | |
| Naranjo | 1 | | 2 | | |
| **Chiriqui** | | | | | |
| Palmar N. & Sur | 3 | | | | |
| Puerto Cortés | 1 | | | | |
| Villa Neilly | 1 | | | | |
| Reserva Indígena | 1 | | 1 | | |
| San Vito | | 1 | | | |
| Agua Buena | 3 | | | | |
| Talamanca | | | 1 | | |
| Unknown | 25 | 10 | 10 | 2 | 3 |
| TOTALS | 64 | 36 | 38 | 5 | 17 |

Fig. 10 Illustrations of the five types of Grinding Stones.

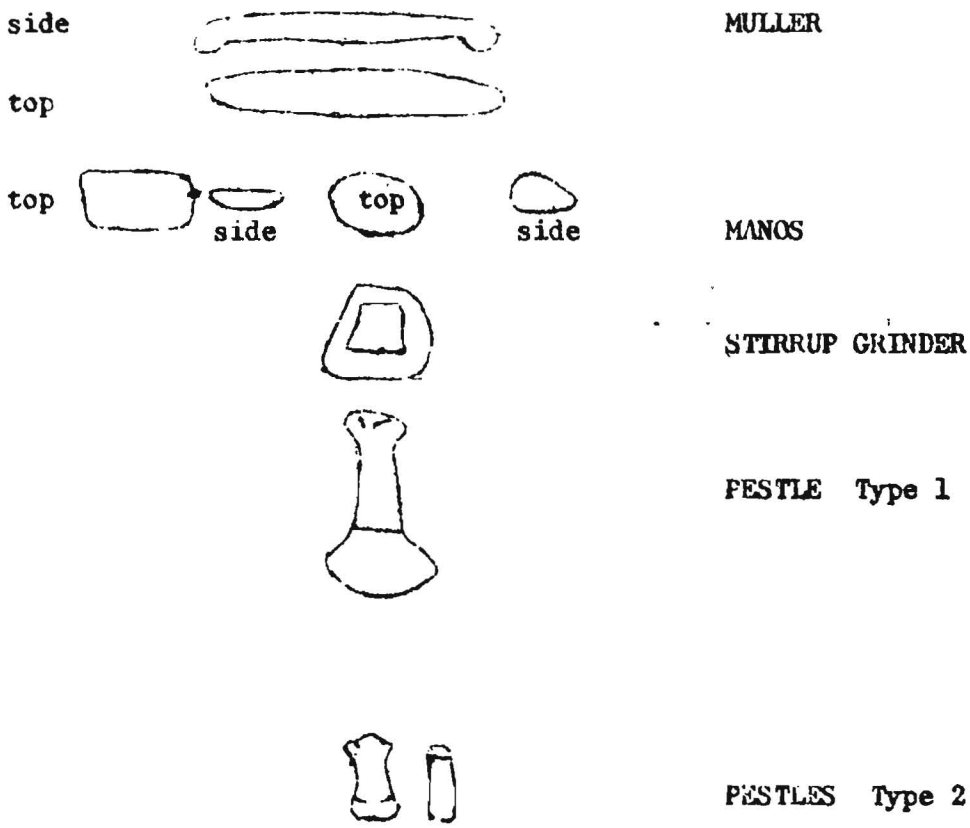


Fig. 11 Geographical Distribution of Fiber Beaters.

| Site or Area | OVOID Hafting Groove, Striations | OVOID Hafting Groove, no Striations | OVOID No Hafting Groove, no Striations | MONOLITHIC Striations on one face only | MONOLITHIC Striations on two or more faces |
|---|---|---|---|---|---|
| Nicoya | 14 | 2 | 3 | 1 | |
| Las Guacas, Guanacaste | 3 | | | | |
| San Blas Guanacaste | 1 | | | | |
| Cartago | 1 | | | | |
| Turrialba | | | | 1 | |
| San Rafael de Heredia | | | | 1 | |
| Toro Amarillo de Pococi | 1 | | | | |
| Linea Vieja | | | | 1 | |
| Quebrada Honda de Acapulco Puntarenas | | | | | 1 |
| Unknown | 3 | | 1 | 1 | 1 |
| TOTALS | 23 | 2 | 4 | 5 | 2 |

Fig. 12 Distribution of tool and weapon assemblages by Culture area.

| HIGHLANDS<br>Guacimo-Guapiles | HIGHLANDS<br>Meseta Central | NICOYA | CHIRIQUI |
|---|---|---|---|
| A. Celts Standard & Side-Edged esp. common; all other Tiza celt absent. | Celts all types found with most diversity and elaboration of styles. | Celts share diversity and style elaboration with Meseta; all types found here. | Celts 6 or more & Ridged celts originated here; some occurence of Side Edged, Standard, Chisels. |
| B. Double Bladed Axe all classes represented in this region | Double Bladed Axes All classes represented in this region | Double Bladed Axes all classes represented in this region | Double Bladed Axes only type #6 found in this region |
| C. Socket Mace Heads all classes represented in this region | Socket Mace Heads Knobbed & Circular most frequent | Socket Mace Heads all classes represented in this region | Socket Mace Heads none reported |
| E. Spears all classes represented in this region | Spears all classes represented in this region | Spears all classes represented in this region | Spears none reported |
| F. Flaked Points present in small quantities | Flaked Points present in small quantities | Flaked Points present in small quantities | Flaked Points present in small quantities |
| G. Atlatl Weights none reported | Atlatl Weights none reported | Atlatl Weights 3 reported | Atlatl Weights none reported |
| H. Grinding Stones Manos, Stirrup Grinders, Pestles common; Muller rare | Grinding Stones Manos, Stirrup Grinders, Pestles common Mullers rare | Grinding Stones Mullers, Pestles type #2 most common; Stirrup Grinders present; Manos rare. | Grinding Stones Manos, Mullers most common; Stirrup Grinders rare; |
| J. Fiber Beaters Monolithic most common; Ovoid rare | Fiber Beaters Monolithic & Ovoid | Fiber Beaters Ovoid most common; 1 Monolithic reported | Fiber Beaters 1 monolithic with 2 striated faces. |

Conclusions Concerning the Distribution by Ecological "Life Zone" of the Stone Tool and Weapon Types in Costa Rica.

Since the "Life Zone" theory of Dr. L. R. Holdridge was the organizing principle around which the ACM Central American Program was modeled it was essential that this archeological project should include a distributional study of Costa Rican stone tools and weapons according to their ecological provenance. Two diagrams are included in this section: one (Fig. 10) lists the sites mentioned in the course of this work by the "Life Zone" in which they occur; the other (Fig. 11) summarizes the numbers and classes of artifacts found in each zone without references to their respective sites. No attempt to explain the "Life Zone" theory will be offered here. For a more detailed treatment than was presented at the beginning of this paper the reader is referred to the provisional edition of Life Zone Ecology by Dr. L.R. Holdridge published by the Tropical Science Center, San José, Costa Rica, 1964. The remainder of this paper will attempt to relate the implication of this theory to archeology in general and to the specific data gathered in the course of this study.

When the biologist speaks of an animal's adaptation to an environment, he is generally referring to alterations in its physical makeup which allow it to adjust more fully to its ecological niche. Human adaptation to varying external circumstances, on the other hand, is carried on chiefly through modification and refinements of learned and shared behavior. As Phillip Wagner states:

> the human body can be changed through the use of tools from a very versatile and highly generalized mechanism into a very restricted and efficient specialized one without permanent organic change. (1964, p. 28).

Change and specialization in human society is not, then, a genetic alteration. It is through this non-genetic response to varying ecological circumstances that human society is first able to meet and adapt to their environmental conditions and is then able to change them to varying degrees. It is material culture which mediates between men and nature and in effect provides him with a new or "microenvironment". Again to quote Wagner:

> the ecological conditions of human life are in considerable degree artificial in any society in proportion to the prevailing technical level and degree of economic integration of the society. (1964, p. 22).

Through technological means, men are shielded from the direct effect of the environment and removed from the level of total dependence upon the surrounding natural ecology. Although man is able to effect changes in the environment by technical means, organic nature always remains the final source of his food supply. (Wagner, 1964, p. 106).

The tools and, to a lesser extent, the weapons which formed the basis of the pre-Columbian technologies of Costa Rica are among the material remains of the inhabitants' specialized, non-genetic responses to the varying conditions of existence presented by the different ecological Life Zones in which they lived. It was the purpose of the following distribution. (Figs. 13 & 14) to examine such possibilities as to whether artifacts from the same Life Zone, but different cultural traditions, exhibited the same characteristics, that is, whether the same Life Zone elicites the same material response from human beings of different cultural traditions in the creation of the artificial human "microenvironments".

Reading Figure 13 from right to left, Celt incidence and variation seems to be highest beginning with the Tropical Dry Forest sites through to the Premontane Moist Forest assemblages, where the incidence and variation reaches a peak, into the Premontane Wet areas where an apparent decline begins which continues for the remaining Zones. Double Bladed Axes exhibit a more hyperbolic distribution in the same first four Life Zones and begin to decline and disappear at about the same point where the Celts decline, the Premontane Wet Forest. Socket Mace Heads plot a less regular hyperbolic course; although they are not reported for the Tropical Moist Forests, they reach peak of incidence and variation in the same Premontane Moist Forest areas as do the Double Bladed Axes and Celts. Flaked Points, which were quite widely known and distributed among the various cultures in Costa Rica (see Fig. 9), were not reported in three of the eight ecological zones represented here. Lances which appeared to be a limited cultural trait, also possessed a small ecological range. The household or food preperation tools such as Manos, Mullers,

Pestles, and Stirrup Grinders had the widest range of incidence by Life Zone and were missing in only one area, the Lower Montane Rain Forests. Finally, Flaky Beaters followed a general distribution and peak of incidence similar to the Mace Heads.

Unfortunately, few conclusions concerning the relationship between the pre-Columbian technology and the ecology can be gained from the above distribution. The fact that the technology represented a highly successful adaptation is attested to by the thickness of the occupation levels and the huge number and diversity of artifacts of all types gathered in Costa Rica but the exact manner in which that technology varied to adjust itself to varying ecological conditions can not be assessed at this time. Conceivably, however, the Life Zone theory can be of great utility in assessing this relationship. Given more complete data concerning crops, diet, geographical locations, depth of settlement and general information that comes from scientific archeological research, perhaps the uniformity and variation in aboriginal technology could be plotted and correlated by Life Zones. Unfortunately, scientific archeology is lacking in Costa Rica. As is evident from Figures 12 and 13, the Life Zones were by no means equally sampled or equally represented in the assemblages examined for this report. Such sampling would require a control over the collection of data that could not be exercised under the circumstances. However, as was pointed out above, certain correlations did appear in the course of the charting and it is hoped [illegible] will examine such specific problems as Celt or [illegible] distribution to determine what the relationship was [illegible] Rica between what Wagner terms the "technical order" and the "natural order". (1964, p. 29).

Fig 14 Distribution of tool and weapon assemblages by Life Zone.

| Tropical Dry Forest | Tropical Moist Forest | Tropical Wet Forest | Premontane Moist Forest |
|---|---|---|---|
| A. Celts—Standard Side-Edged most abundant; incidence of Small Flat Butts, Ridged, 6-sided; Absent; Flaked & Tiza | Celts - Standard, Side, Ridged most abundant; incidence of 6-sided, Flaked & Ground; Asent; Flat Butt, Chisels, Flaked | Celts - Highes incidence of Flaked & Ground Stemmed, Ridged, 6-Sided of all Life Zones; Standard & Side-Edged common; Absent: Flat Butt, Tiza. | Celts Standard, Side Edged, Ridged, 6-Side; only incidence of Tiza; Absent: Flat Butt, Flaked. |
| B. Double Bladed Axes | Double Bladed Axes | Double Bladed Axes | Double Bladed Axes |
| 1 type #4 | 1 type #1<br>1 type # 4<br>4 type # 6 | 1 type # 1<br>3 type # 2<br>3 type # 3<br>2 type #4<br>2 type # 5 specific | 3 type #2<br>3 type # 3 General<br>2 type # 5 specific<br>2 type # 5 general |
| C. Socket Mace Heads | Socket Mace Heads | Socket Mace Heads | Socket Mace Heads. |
| 4 reported | none reported | 14 reported | 100 reported |
| E. Lances | Lances | Lances | Lances |
| None reported | none reported | 21 reported | none reported |
| F. Flaked Points | Flaked Points | Flaked Points | Flaked Points |
| 7 reported | none reported | 5 reported | 7 reported |
| F. Atlatl Weights | Atlatl Weights | Atlatl Weights | Atlatl Weights |
| none reported | none reported | none reported | 3 reported |
| H. Grinding Stones | Grinding Stones | Grinding Stones | Grinding Stones |
| 1 Mano<br>16 Mullers<br>1 Pestle # 2<br>6 Stirrup Grinders | 4 Manos | 10 Manos<br>2 Mullers<br>2 Pestles # 1<br>3 Pestles # 2<br>15 Stirrup Grinders | 22 Manos<br>4 Mullers<br>10 Pestles #2<br>4 Stirrup Grinders |
| I. Fibers Beaters | Fibers Beaters | Fibers Beaters | Fibers Beaters |
| 3 Ovoid<br>no Monolithic | no Monolithic | 1 Ovoid<br>1 Monolithic | 20 Ovoid<br>2 Monolithic |

Fig. 14 Distribution of tool and weapon assemblages by Life Zone, (part 2)

| PREMONTANE WET FOREST | PREMONTANE RAIN FOREST | LOWER MONTANE RAIN FOREST | MONTANE RAIN FOREST |
|---|---|---|---|
| A. Celts Standard Side-Edged esp. common; Ridged, 6-Side present; Absent: Flaked, Flat Butt, Tiza, Flanged. | Celts-few celts encountered, among those Standard, Side Edged most common. | Celts #3 specimens, one each: Standard, Ridged, 6-Sided. | Celts-four spec.: 2 Standard, Side-Edged, Flat Butt. |
| B. Double Bladed Axe | Double Bladed Axe | Double Bladed Axe | Double Bladed Axe |
| 3 type #1 specific<br>1 type #1 general<br>1 type #3 specific | none reported | none reported | none reported |
| C. Socket Mace Heads | Socket Mace Heads | Socket Mace Heads | Socket Mace Heads |
| 3 reported | none reported | none reported | none reported |
| E. Lances | Lances | Lances | Lances |
| 1 reported | none reported | none reported | none reported |
| F. Flaked Points | Flaked Points | Flaked Points | Flaked Points |
| 1 reported | 3 reported | none reported | none reported |
| G. Atlatl Weights | Atlatl Weights | Atlatl Weights | Atlatl Weights |
| none reported | none reported | none reported | none reported |
| H. Grinding Stones | Grinding Stones | Grinding Stones | Grinding Stones |
| 1 Mano<br>1 Stirrup Grinders | 4 Manos<br>3 Mullers<br>1 Stirrup Grinder | None reported | 2 Manos<br>1 Mullers<br>1 Stirrup Grinder |
| I. Fiber Beaters | Fiber Beaters | Fiber Beaters | Fiber Beaters |
| 1 Ovoid<br>1 Monolithic | none reported | none reported | none reported |

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