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The University of Michigan, Ph.D., 1974
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THE PREHISTORIC POPULATION OF COCHITI PUEBLO AND SELECTED INTER-POPULATION BIOLOGICAL COMPARISONS

by
Rodger Heglar

A dissertation submitted in partial fulfillment
of the requirements for the degree of
Doctor of Philosophy
(Anthropology)
in The University of Michigan
1974

Doctoral Committee:

Professor Frank B. Livingstone, Chairman
Professor Stanley M. Garn
Associate Professor Ernst Goldschmidt
Professor James B. Griffin

PREFACE

In most cases, physical anthropologists are plagued with a paucity of human skeletal remains from archaeological sites fairly rich in cultural information. Despite small sample sizes--often the only human biological representation of a specific population to be recovered--the need to properly describe the skeletal series and employ comparative inter-population statistical methods is therefore essential with each additional new series. The effect of this procedure is that it increases the understanding of the overall population biology for a particular archaeological region.

The goals of this study are the description, comparison, and bio-cultural status of a past population. With the excavation of the prehistoric Cochiti sites, this investigator has had the welcome opportunity of describing a new human skeletal series, and this in turn has allowed the addition of another population sample representing the Puebloan cultural period of the north central Rio Grande River Valley.

It is hoped that the comparison of the Cochiti skeletal remains to the several other contemporary skeletal series will result in a better perspective on the prehistoric peoples in this area of the Southwest.

This study was initially made possible by Dr. Charles H. Lange, who afforded me the opportunity to analyze the humar remains from his Cochiti Dam Archeological Salvage Project, a program conducted by the

Museum of New Mexico. I wish to thank Dr. Lange not only for this opportunity, but also for allowing the use of the Cochiti data in this dissertation. Then a colleague at Southern Illinois University, Professor Lange is now at Northern Illinois University.

Thanks also go to the Department of Anthropology at Southern Illinois University for the use of its laboratory facilities and to the Computer Center at San Francisco State University.

Particular thanks for their personal encouragement go to Professors Frank B. Livingstone and Ernst Goldschmidt of The University of Michigan.

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CHAPTER I

INTRODUCTION

In the tradition and heritage of American anthropology, the Indians of the North American Southwest have undergone continued ethnographic study but only sporadic study in the area of physical anthropology. This ethnographic area includes the geographic regions of south central Utah and Colorado, the entire states of Arizona and New Mexico, and has as its southern limits the northern portions of Sonora and Chihuahua in Mexico. Therefore, it is mainly the geographic drainage area of the Colorado, Gila, Rio Grande, and Pecos Rivers.

The archaeological region includes this same arid area of the Greater Southwest. Within that area, this work will focus upon the north Rio Grande River segment of the archaeological subdivision "Anasazi," i.e., the prehistoric cultural location extending over southeastern Utah, southwestern Colorado, northeastern Arizona, and the northern half of New Mexico. The origin for this cultural subdivision is assumed to have been in the "Four Corners" area of the Southwest, the merging point of the boundaries of the above states.

Within the Anasazi subdivision, the ethnographic populations may be divided into six categories: two divisions of Pueblo peoples; three Apache; and the Navajo. The general tribal locations are shown in Fig. 1. This work is mainly concerned with biological

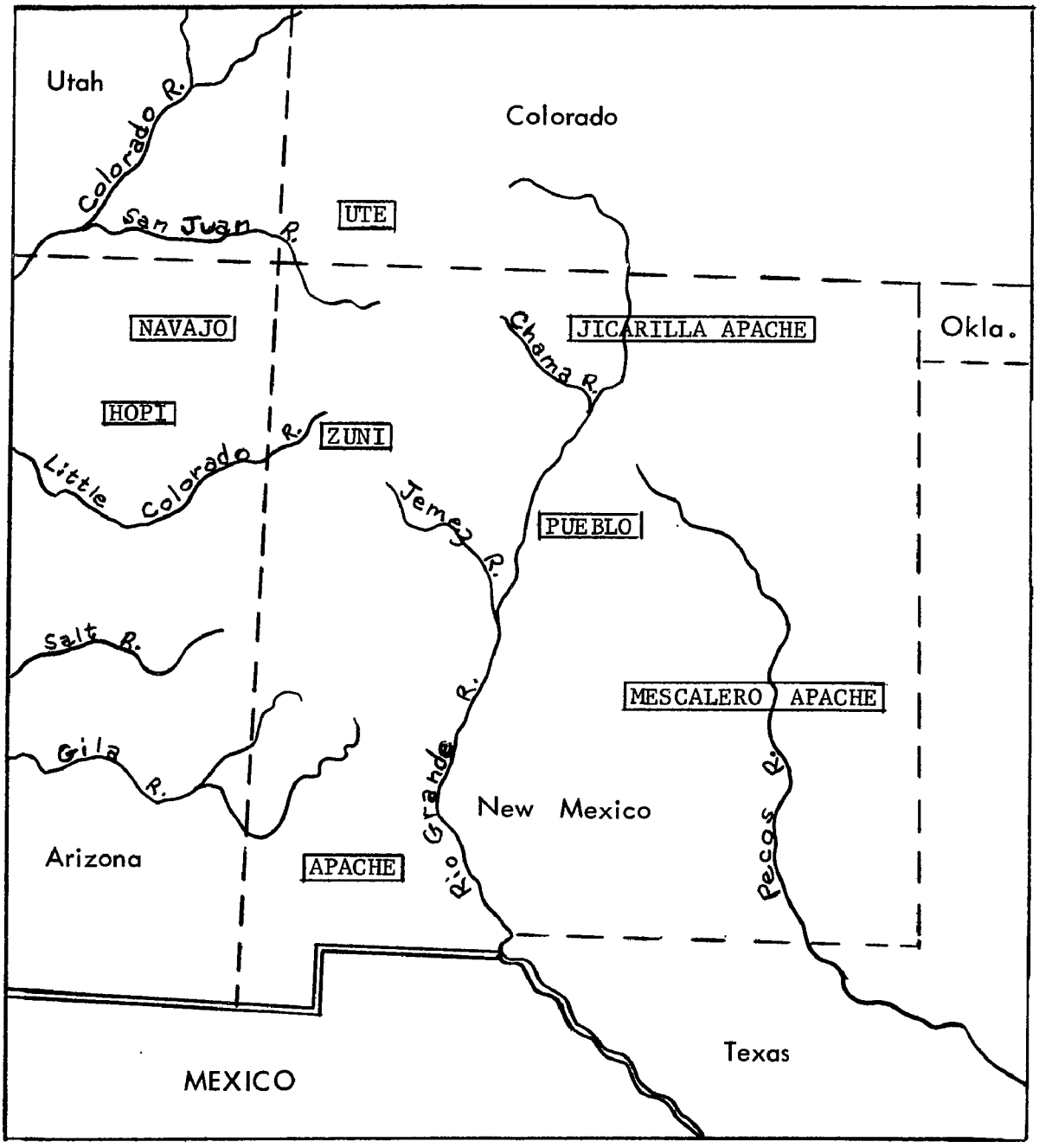

Fig. 1.--Ethnographic Populations of New Mexico

population samples from the Rio Grande's "River" or "Eastern Pueblo" peoples. Subsequent consideration is given to the "Western Pueblo-ans" of the Hopi and Zuni. The specific archaeological population of Cochiti Pueblo is 1) analyzed as to morphology and biocultural relationships in its history and 2) compared to selected populations as to time, geographic location, and biological and cultural demographic characteristics.

Therefore, the basic hypothesis in this study is that there are no statistically significant biological differences in, within, or between sample comparisons of the prehistoric Cochiti skeletal remains to other prehistoric remains coexisting in the same general time span and north central Rio Grande River locale.

Historic Interpretations in Anasazi Chronology

The temporal position of the Southwestern Anasazi chronology and its subdivisions ranges from 5000 B.C. to A.D. 1700. Prior to this beginning date, a Paleo-Indian occupation in parts of this region is roughly estimated as several thousand years earlier. A recent date for this period specific to the Rio Grande Valley will be dealt with later. The divisions within this chronology are as shown in Fig. 2 (Willey 1966: 188, Fig. 4-6).

Although this investigation is concerned mainly with population biology, a review of cultural features and changes during this time span is essential to an historic understanding of occupation in the northern Rio Grande area. Major factors are basic economy, architecture, and settlement patterns within the above chronology.

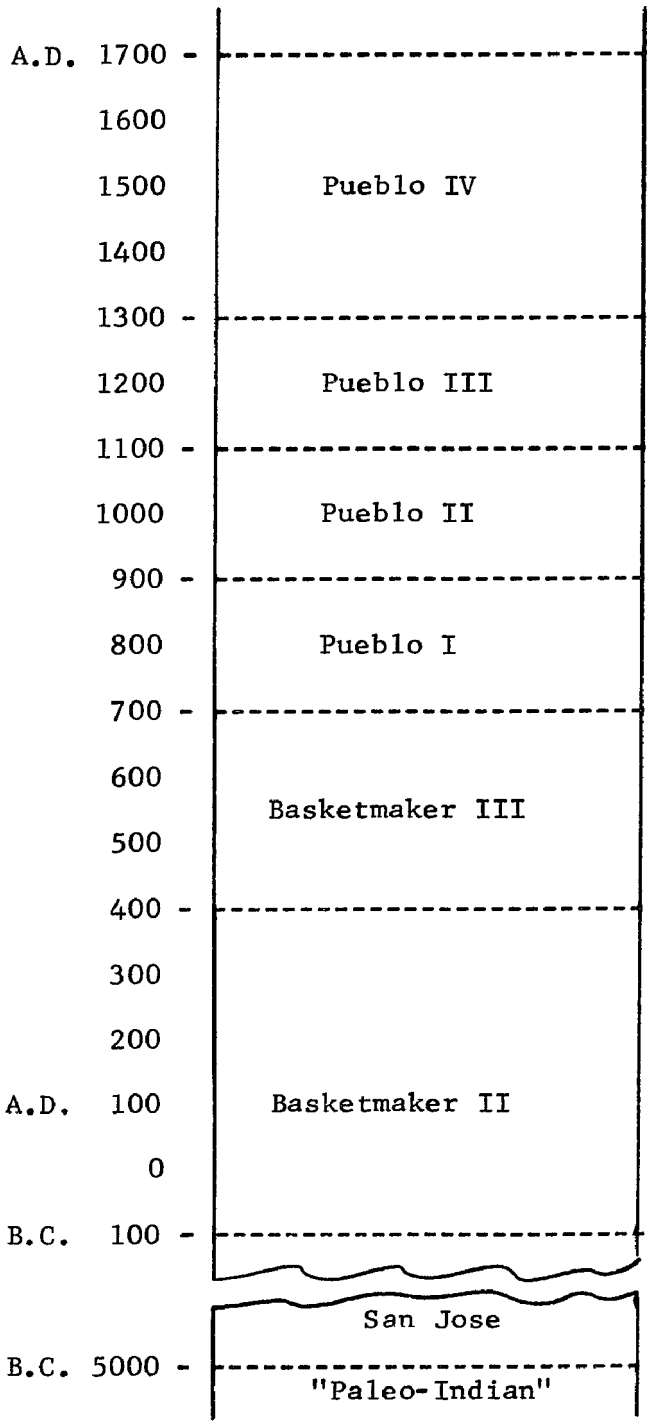

Fig. 2.--Anasazi Chronology

Albeit one can postulate a Basketmaker I in the San Jose phase prior to 100 B.C., the earliest evidence of Anasazi culture history is in Basketmaker II (Willey 1966: 187). This evidence consists of the occupation of caves and the establishment of open villages, with an economy based on agriculture, hunting, and wild plant collecting. House form consisted of semi-subterranean and circular floor plans with storage areas. A typical Basketmaker II site is at Durango, Colorado, in the northern portion of the Southwest.

Basketmaker III as exemplified by Chaco in northwestern New Mexico indicates that farming was well established in the villages; therefore, there was a higher population density. A typical village contained numerous large pit houses with storage bins between them. Kivas were constructed at the margins of the village.

From A.D. 700 to 900, the Puebloan phase of cultural development is indicated by Pueblo I; in this phase, the pit houses were grouped in clusters, with many of them built above ground; examples are sites on the Little Colorado River of eastern Arizona and in the San Juan region of Utah. Here, the construction of the rectangular pit houses was of adobe and stone; they were used for both dwelling and storage purposes and their rooms were posted. A transition from pit houses to above-ground apartment houses can be seen from Pueblo I to Pueblo II. The latter phase is characterized by a change in settlement pattern from many large villages to small scattered settlements. The dwellings were usually of coarse masonry and the kivas were not posted.

From A.D. 1100 to 1300, Pueblo III saw the full development of large apartment houses which typified a Pueblo village. Rooms

still consisted of both living and storage areas, and the pueblo itself was often constructed in a "D" shape with its curvature to the mesa behind and its flat side facing a river. The larger central kivas were only two in number, possibly denoting a dual clan or kinship use. Examples are to be found at Chaco, North San Juan, and Kayenta (Willey 1966: 202-210).

In the Pueblo IV period, there was an increased population concentration into larger towns, but these concentrations were fewer in number. In general, the northern Southwestern area appears to have been abandoned in this period, and the large pueblos retracted to the Little Colorado and to the Rio Grande River areas. The pueblo consisted of large multi-storied surface structures with a central plaza, as can be seen at Hopi and Zuni in the west and at Pecos in the east of the Anasazi area. These are the two geographic areas and the apartment-house village situations at the time of Spanish contact (Willey 1966: 211).

A further background for understanding north central New Mexico culture history can be found in the summary of pre-A.D. 500 events in the history of the Chaco Anasazi of that region. They were primarily hunters and gatherers with some agriculture. The water supply necessary for the latter pursuit depended upon random flood water, as no permanent or continual water supply existed. The settlements were far apart and geographically scattered; one can postulate that there was probably easy and frequent contact between settlements because subcultural differences were not apparent (Wendorf 1953: 18). This cultural situation was common in the Chuska Valley prior to A.D. 500.

From A.D. 500 to 1100, villages appeared close to watered plots, and there is a valid association between village size and plot size. Architecturally, a village consisted of storage and living areas plus kivas that appear to be associated with the living areas. Most of this time span contains the cultural levels Pueblo I and Pueblo II.

After A.D. 1100, larger villages appeared which were concentrations out of smaller villages. Larger houses and only several kivas typified the settlement pattern. Also, farm houses were at the margins of the apartment-house villages. It appears, then, that a large population could be supported by the economy in the Chuska Valley and Chaco Canyon areas (Wendorf 1953: 19-20).

Around A.D. 1300, the Chaco Anasazi abandoned the Chuska Valley. Stubbs has suggested that the basic reason for the Pueblo IV retraction to the Little Colorado and Rio Grande River areas was due to the environmental changes and economic stresses imposed by a 22-year drought from A.D. 1277-1299 (Stubbs and Stallings 1953: 154).

Pottery Chronology

The establishment of a chronological sequence or temporal position for archaeological sites in the Anasazi period is often based upon associated diagnostic pottery. Sherds found in room floors, pits, and refuse areas can be judged against the Southwest pottery sequence. Anasazi pottery types particular to the area of interest here, central and northern Rio Grande, are best known through the excavation of large sites ranging in time from A.D. 1300 to 1350. As was indicated above, Anasazi origin was from the northern regions of the Southwestern area as it developed from Basketmaker. The

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history of pottery-spread from the San Juan and Chaco areas into the Rio Grande has been visualized and mapped by Stubbs (Stubbs and Stallings 1953: 153, Fig. 69); here one notes geographic limits south to Springerville, Arizona, and Socorro, New Mexico, and east as far as Raton, New Mexico.

The place in time for this pottery spread can be indicated by the general usage of Black on White ware during Pueblo I and II (A.D. 700-1100). The common decoration style is classified as Chaco I and II. However, in the preceding phase of Basketmaker III, there is a noticeable lack of this characteristic pottery element, which may have been extremely rare or missing entirely in the pre-A.D. 700 period.

Specific to the Rio Grande area, there were apparently local variations in Black on White pottery toward the close of the A.D. 1000's; these variations extended from the central to the northern river valley regions. Kwahe'e was typical of Pueblo I and II ware found in association with the expected small villages of the period. Pueblo III Black on White pottery, signified as Santa Fe, was typical of the larger, later villages.

Between A.D. 1300 and 1500, there was apparently a shift in village pattern and size in this river valley. The abrupt settlement change is coincidental with the establishment of the three pottery styles as summarized below (Stubbs and Stallings 1953: 154):

Galisteo Black on White: Migration of Mesa Verde peoples into the Rio Grande range.

Jemez Black on White: Style resulting from Mesa Verde and Gallina influences on Santa Fe Black on White ware.

Rio Grande Glaze Series: Ware resulting from the concentration of population into the Rio Grande from Arizona, indicated by St. John and Springerville polychrome; also, similar concentration around Acoma and Zuni and White Mountain in Arizona. This pottery series contributed to the Zuni and Santa Ana ware of modern times.

Although pottery evidence as recent as A.D. 1300 is indicative of a Pueblo peoples in northern Rio Grande culture history, this region may well have been occupied for at least 1,000 years before that (Lambert 1954: 174). The question of origin of Puebloan culture can still be posed as to whether there was a basic Rio Grande culture, or whether this history is the result of population migration; i.e., did the people come in with the pottery, or was the pottery introduced through diffusion? Recently, Paleo-Indian sites in the central Rio Grande Valley indicate occupation of this area 7,000 to 10,000 years ago. It has been suggested then that this geographic region may have been in continual occupation for as long as 12,000 years (Judge and Dawson 1972: 1210-1211).

Physical Anthropology of the Prehistoric Populations

The history of specific studies in physical anthropology in this archaeological region occurs sporadically in the literature over the last one hundred years. In the 1870's an early interest in one aspect of population difference--cranial deformation--held the attention of archaeologists and craniometrists. By the early 1890's, archaeology in the "Four Corners" area had presented a cultural distribution in time as well as cranial differences, which resulted in the assumption of an early "Basketmaker" population and a later "Cliff Dweller" peoples with cranial deformation as a diagnostic characteristic. This assumption of cultural sequence and its inferred sequence in the biological history of the Southwest remained through the early 1900's (Reed 1963: 130). The description and labeling of skeletal series based upon the presence or absence of cranial deformation led in turn to the reasoning that this feature perhaps was representative of a difference in historic population or even race. The early Basketmaker skeletal population was typified by no deformation and was associated with the cultural matrix included in the same name. Therefore, lambdoid or occipital cranial vault flattening became as important a trait as material culture in judging historic linkages or temporal similarities when comparing the few available skeletal series (Spuhler 1954: 605).

Considering then the Puebloan population history in the context of this developing theory, Hooton had described the large sample at Pecos in 1930, followed by the descriptions of the Salt River and Basketmaker series by Hrdlička in 1937; Stewart published the White-

water material in 1940, and in 1944 Seltzer described the Old Zuni at Hawikuh. Throughout the period from 1920 to 1940, there was a recognition of Puebloan populations exhibiting cranial deformation as later than Basketmaker; there was also the theory that in the general area, Basketmaker had been replaced by a brachycranial population (Kidder 1924: 122). These notions persisted and, as can easily happen, became expectations in archaeological thinking, i.e., that long-headed peoples are earlier than round-headed peoples.

In 1946 this idea of a new biological population of brachycranial peoples in the Puebloan portion of Anasazi culture history was minimized by J. O. Brew; this feature was considered a later cultural influence upon an historically similar cranial and physical type from pre-Pueblo to Pueblo skeletal remains (Reed 1963: 130). Deformation, accidental or intentional, is usually of two types resulting from frontal pressure with a reflected flattening at lambda, or more inferiorly on the occiput; therefore, the terms fronto-lambdoidal and fronto-occipital would apply. The occurrence of cranial deformation will be described for each population sample in a later section. It is still necessary, however, to tabulate this observation as a population feature in skeletal series descriptions. It is only when a culturally-induced feature such as this becomes a stereotype in historic speculation that the association and its historic value need to be periodically reconsidered.

It should also be realized that the sheer sample size advantage of Hooton's Pecos of east central New Mexico has traditionally demanded that any remains from this area of the Southwest be compared to it in temporal occurrence and skeletal similarity. However, in the light of

other skeletal series from the same or earlier periods, the Pecos summary should not stand as a stereotype of Puebloan population biology. Time periods for samples of archaeological human remains will be considered in the next section.

Comparative morphological studies of skeletal series in the Southwest that would appear significant to the understanding of the biological history of middle and upper Rio Grande Puebloan populations have not been as specifically helpful as one might hope. The craniometric analysis of Giles contained Pecos and Puye data as regional representatives (Giles and Bleibtreu 1961). Three skeletal series--Hawikuh, Pueblo Bonito, and Puye--were statistically analyzed for genetic variation and similarity (Corruccini 1972). Comparative data from living populations is usually representative of Southwestern Indian populations to the west and southwest of the Rio Grande area (Hanna 1962). The literature does contain an anthropometric comparison between males of San Ildefonso and Cochiti (Howells 1936: 16-17).

Temporal Position of Population Samples

In the Summer of 1963, excavation began near the present modern village of Cochiti, New Mexico. The initial excavations were in sites LA 6455 and LA 6462.

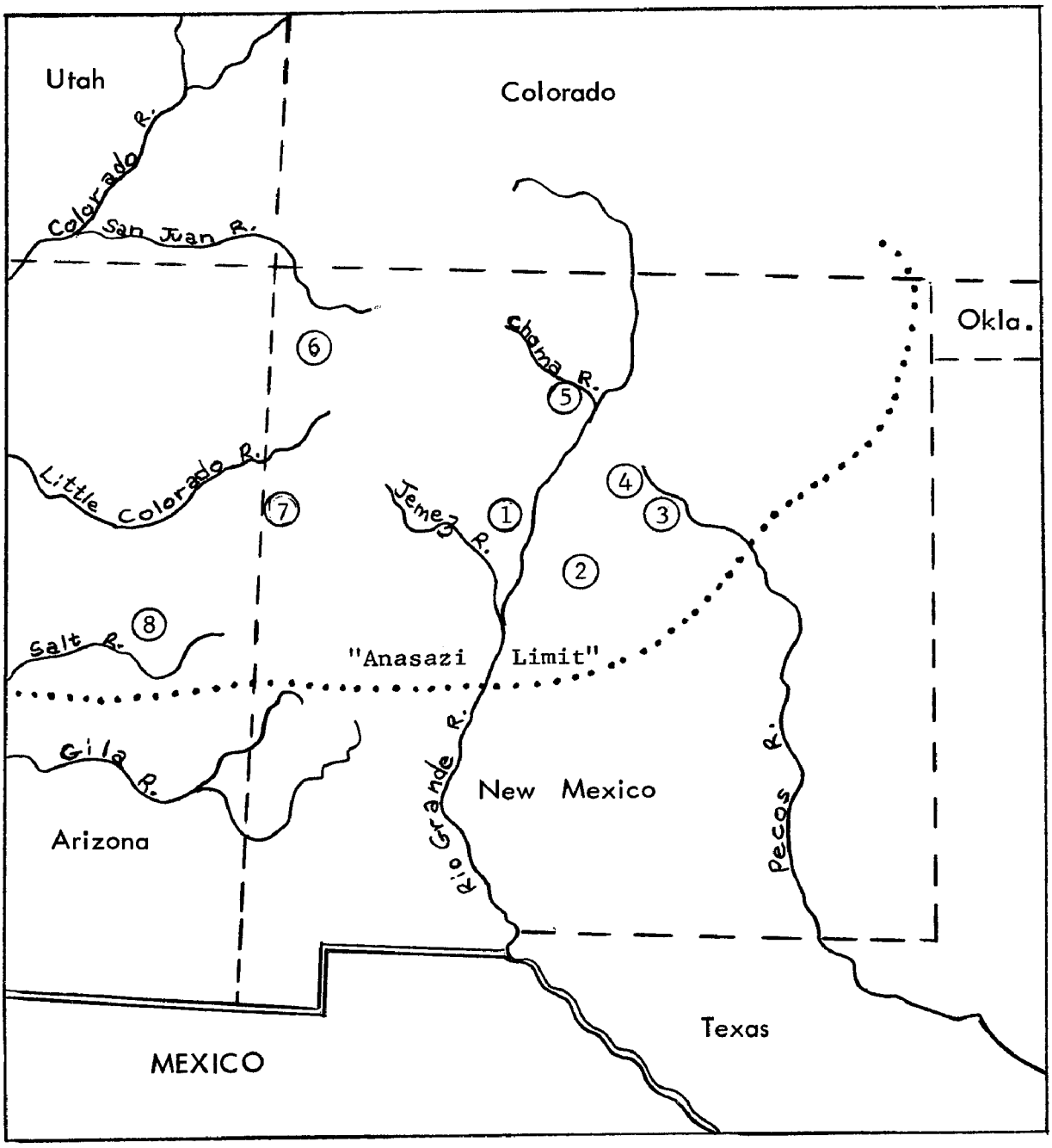
The first site dealt with, LA 6462 (Northbank Site), is one and a half miles north of Cochiti Pueblo, and the time of prehistoric occupation could have been as recent as Pueblo III. Previous surface pot sherd finds in the area include Glaze I Red on Yellow ware which would place its antiquity at the earliest around A.D. 1225 (Lange 1959: 8).

The Alfred Herrara Site, LA 6455, located on the west bank of the Rio Grande River two miles north of Cochiti Pueblo, was apparently occupied for 150 years between A.D. 1350 and 1500. This would place the occupation in the cultural phase of early-to-mid-Pueblo IV (Lange 1968: 73). This site presents a temporal stratigraphy involving three Components: Component 1, A.D. 1350-1400; and Components 2 and 3, A.D. 1400-1500. These Components are labeled "LA 6455 I," "LA 6455 II," and "LA 6455 III," respectively, in the skeletal data tables of this work.

In subsequent field seasons, another site, LA 70, was excavated. This site is on the east bank of the river, slightly north of LA 6455, and represents mostly prehistoric occupation. Although--as in the other prehistoric villages excavated--Rio Grande Glaze pottery types were the major indicators in judging its habitation dates, here there are also architectural differences. One such feature is the appearance of corner fireplaces in the living areas, which could suggest an influence from Spanish contact; thus, LA 70 appears to have been occupied from A.D. 1500 to 1550 or beyond (Lange 1972: personal communication).

This series of three sites presents an interesting sequence of Cochiti Pueblo history in terms of settlement pattern and architecture. For example, the house forms range from the early semi-subterranean pit houses of LA 6462 and LA 6455, to surface structures in the late LA 6455 occupation, to the above-mentioned contact suggestion in LA 70. It also appears that LA 70 may have been abandoned earlier than the contact period and simply re-occupied during the contact period (Lange 1972: personal communication).

The following sites and their reported human remains are relevant to the subsequent interpretation of the Cochiti Pueblo population sample: Paa-ko, Pecos, Pindi, Te'ewi, Navajo Reservoir District, Hawikuh, and Whitewater. The geographic proximity of these sites is mapped in Fig. 3.



1 Cochiti 3 Pecos 5 Te'ewi 7 Hawikuh
2 Paa-ko 4 Pindi 6 Navajo Dist. 8 Whitewater

Fig. 3.--Site Locations Containing Human Remains

Excavations at Paa-ko were undertaken from 1935 to 1937. The site is located southeast of Cochiti in a valley bounded by the San Pedro and Sandia Mountains. The human remains, also in association with pottery types, were grouped as "Pre-Columbian" (Black on White, Glaze I Red on Yellow) and "Post-Columbian" (Glaze V and VI) (Rogers 1954: 13). Apparently the site was not continually occupied; the longest time of occupation was during the first half of Pueblo IV (A.D. 1300-1500); the pueblo was then re-occupied in the 1600's (Rogers 1954: 5).

The largest pueblo, and the one most prolific skeletally, is the site at Pecos, located to the west of the headwaters of the Pecos River, i.e., east of Cochiti. Excavated from 1915 to 1924, it provides the chronology and stratigraphic pottery sequence that could indicate a time span of Pueblo III through Pueblo IV and into the historic contact period (Hooton 1930: 10).

Based upon pottery association, the human remains recovered from Pecos were categorized into four groups: Black on White with Glaze I, Glaze II and Glaze III, Glaze IV, and Glaze V with Glaze VI (Hooton 1930: 13). This places the remains roughly in Early Pueblo IV (A.D. 1300-1350) and Late Pueblo IV (A.D. 1600-1650).

The third site, northeast of Cochiti, is the pueblo at Pindi, located on the north bank of the Santa Fe River. Its pottery chronology suggests an occupation in the late A.D. 1200's, as indicated by the presence of Santa Fe Black on White. There was also a later occupation from A.D. 1300-1350, as evidenced by both Wiyo and

Galisteo Black on White (Wendorf 1953: 51). Pindi is then a Late Pueblo III and Early Pueblo IV site with its major pueblo building occurring during Pueblo III (Stubbs and Stallings 1953: 2). It was excavated in 1932 and 1933.

To the north, on the west side of the Chama River, Te'ewi Pueblo (LA 252) was excavated in 1950 and 1951 (Wendorf 1953: 36). Although this pueblo was abandoned around A.D. 1500, the Santa Fe and Wiyo Black on White pottery suggests an occupation in the A.D. 1200's and 1300's, with most of the construction occurring probably around A.D. 1350. This would place the site in Late Pueblo III and Early Pueblo IV. The skeletal remains from Te'ewi were not typical in their location in the site, in that they were recovered from a burned kiva, which, of course, is not representative of local burial practices.

Although the population samples from the above four prehistoric pueblo remains are geographically near the Cochiti Pueblo, there are three more distant samples that are included here for comparative purposes.

First, combining the skeletal remains of five sites (LA 4131, LA 4169, LA 4195, LA 4198, and LA 4242), the total series is then representative of the Navajo Reservoir District in northwestern New Mexico. These sites, excavated in the early 1960's, cover the Basketmaker II to Early Pueblo II cultural phases. The burials are from A.D. 800-900, i.e., Late Pueblo I (Eddy 1966 Part II: 471).

Second, the Hawikuh "Old Zuni" skeletal series are representative of a Pueblo population during the latter part of the Great Kiva period in Anasazi culture history. This places the remains in the

Late Pueblo IV period (A.D. 1500-1550), which may be considered to be in the "Early Spanish" period (Seltzer 1944: 5). It was excavated in 1917.

Third, the skeletal remains from the Whitewater district of eastern Arizona date from A.D. 700-1100, placing them in Pueblo I and Pueblo II (Stewart 1940: 153). The site was excavated from 1931-1933.

Fig. 4 schematically indicates the time blocks of the foregoing population samples.

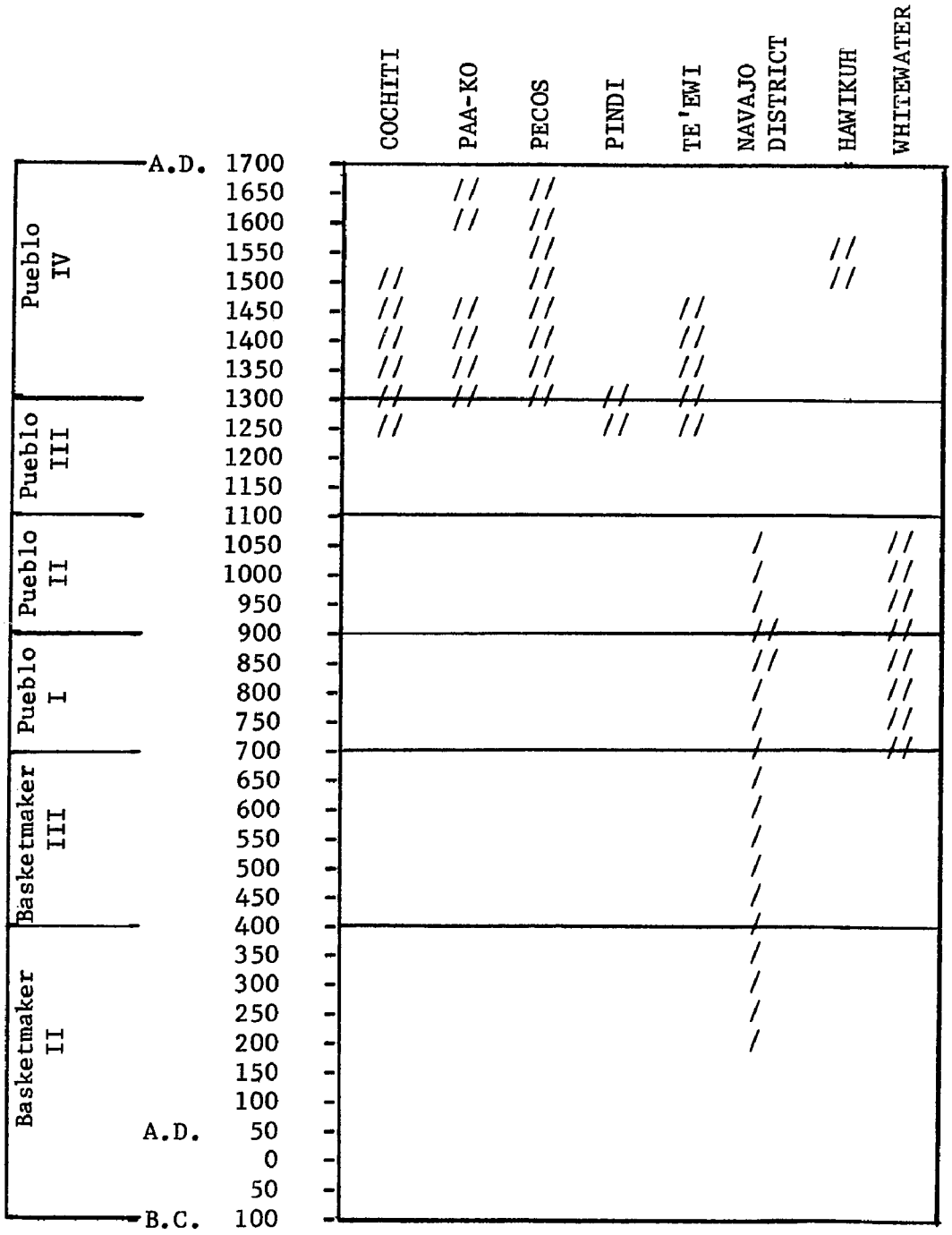


Fig. 4.--Chronology of Sites Yielding Human Remains

CHAPTER II

MATERIALS AND METHODS

Skeletal Series and Sample Sizes

At the completion of the 1965 field session at Cochiti, a total of 174 individual human burials were recovered; of these, 116 were adult, with 103 usable for osteometric data. The count of human remains for the three separate sites that make up the Cochiti prehistoric pueblo is presented in Table 1; also listed are summaries of burial count and the total number of adult remains used in the metric data of the seven skeletal series selected for comparison to the Cochiti. The reference citations are those for tables or charts which contain osteometric data. Considering how fragmentary adult burials can be, metric data is available for less than 50 per cent of the total adults identified in half of the population samples. The proportion of immature to adult remains recovered will be dealt with as a demographic feature in Chapter V.

Several other series were considered, but were found to be unsatisfactory for the comparative tables in this study. For example, the Puye series data is reported with no ranges or individual burial metrics (Reed 1953: 113, Table 5). The report of Chaco Canyon material is listed by Riley in a table which represents pooled male and female craniometric information (Riley 1954: 156, Table 1). The relatively large number of burials from Unshagi on the Upper Jemez

TABLE 1

SAMPLE SIZES OF SKELETAL REMAINS

Series:	Individuals Recovered	Total Adults	Adults in Metric Data	References:
COCHITI	174	116	103	(Total Series unpublished)
LA 70	98	60	47	Heglar 1968: 268-270
LA 6455	64	49	49	
LA 6462	12	7	7	
PAA-KO	166	74	28	Rogers 1954: 3
PECOS	1254	752	250	Hooton 1930: 17-18
PINDI	86	46	12	Stubbs and Stallings 1953: 143, 145
TE'EWI	30	16	16	Wendorf 1953: 104, 109-111
NAVAJO DISTRICT	192	57	20	Eddy 1966: 523, 543-545, 608, 614-617
HAWIKUH	60	37	37	Roberts 1932: 152-153
WHITEWATER	154	-	19	Stewart 1940: 153

River have apparently not been completely studied and reported (Reiter 1938: 76).

Estimation of Age and Sex

For the reporting of the individual age-at-death estimates within the several samples of Cochiti burials, the following ranges were used:

Infant (Birth-3 yrs.)

Child (4-8 yrs.)

Pre-adolescent (9-12 yrs.)

Adolescent (13-17 yrs.)

Sub-adult (18-20 yrs.)

Young Adult (21-35 yrs.)

Middle-age Adult (36-55 yrs.)

Old-age Adult (56 plus yrs.)

The estimates of age for adult remains depended upon the combined estimates of ectocranial and endocranial suture closures, status of dental wear, third molar eruption, arthritic change involving the scapular glenoid and clavicular fossae, scapular transluminescence and cristae prominence, and, most useful, the arthritic and age changes of the pubic symphysis (Stewart and Trotter 1954; Krogman 1962).

Immature remains were aged according to epiphyseal union and eruption of the deciduous and permanent dentition. Pre-natal remains estimates depended upon the degree of development of cranial bone and a consideration of femoral total or diaphysis length (Camps 1968: 132-133, Fig. 53, 54).

Standardized methodology in adult sex identification was employed based upon such observations as general muscularity, brow and malar size, chin shape, supramastoid ridge and mastoid process prominence, femoral angle, size and shape of pelvic brim, pubis angle, sciatic notch angle, sacrum shape and angle, and the ischium-pubis index (Krogman 1962: 112-152).

Metric Data

The measurements and indices chosen for the size and shape descriptions of individual remains are mainly those routinely used in osteometry. Unless otherwise noted, the measurements and indices listed in this section reflect selected methods from standard references (Stewart 1952; Montagu 1960; Brothwell 1963; Vallois 1965; and Olivier 1969). This investigator utilized a recording format involving a total of thirty cranio-facial measurements, twenty cranial indices, seventy-five post-cranial skeletal measurements plus stature, and thirty-two indices.

The selected cranio-facial measurements used in this work and their cephalometric points are as follows:

1. Cranial Length (CL): Glabella-Opisthocranion
2. Cranial Breadth (CB): Euryon-Euryon
3. Cranial Height (CH): Basion-Bregma
4. Auricular Height (AH): Porion-Vertex
5. Least Frontal Breadth (LFB): Post-orbital Breadth
6. Bizygomatic Breadth (BzB)
7. Basion-Nasion Line (B-N)
8. Basion-Nasospinale Line (B-Ns)
9. Basion-Prosthion Line (B-Pr)
10. Nasion-Gnathion Line (N-Gn)
11. Nasion-Prosthion Line (N-Pr)
12. Nasal Height (NH)
13. Nasal Breadth (NB)
14. Interorbital Breadth (IOB)
15. Orbital Height (OH)
16. Orbital Breadth (OB)

17. Maxillo-Alveolar Length (MAL): External Palatal
18. Maxillo-Alveolar Breadth (MAB): External Palatal
19. Bicondylar Breadth (BcB)
20. Bigonial Breadth (BgB)
21. Ramus Height (RH)
22. Ramus Breadth (RB)
23. Symphyseal Height (SH)
24. Mandibular Body Height (MH)
25. Mandibular Body Thickness (MT)
26. Mandibular Length (ML)

Cranial vault shape, facial shape, and cranio-facial proportions were recorded through the use of the following indices which are presented with their contributing measurement codes:

1. Cranial Module (CL + CB + CH/3)
2. Length-Breadth (CB/CL)
3. Length-Height (CH/CL)
4. Length-Auricular Height (AH/CL)
5. Breadth-Height (CH/CB)
6. Total Facial (N-Gn/BzB)
7. Superior Facial (N-Pr/BzB)
8. Zygomatico-Frontal (LFB/BzB)
9. Zygomatico-Bigonial (BgB/BzB)
10. Nasal (NB/NH)
11. Orbital (OH/OB)
12. Maxillo-Alveolar (MAB/MAL)
13. Mandibular (ML/BcB)
14. Ramus (RB/RH)
15. Facial Prognathism (B-Pr/B-N)
16. Alveolar Prognathism (B-Pr/B-Ns)
17. Cranio-Facial Longitudinal (B-Pr/CL)
18. Cranio-Facial Transverse (BzB/CB)

The measurements and indices for the post-cranial skeleton reported here were selected for their comparative value with similar data that has been included in other population samples. Usually, this information consists mainly of stature estimates and "maximum" and "physiological" long bone lengths. The estimation of stature for the Cochiti population was derived from the Telkkä Tables and also calculated via the Trotter and Gleser "Mongoloid" formula (Telkkä 1950; Trotter and Gleser 1958); the former estimate applies to both sexes, while the latter formula is usable only for male skeletal re-

remains. Prior to 1950, Pearson's stature formula was commonly employed.

For both intra- and inter-population long bone proportional comparisons, the following standardized intermembral indices were utilized, plus limb-length-to-stature ratios:

1. Radio-Humeral (Radius Physiological Length/ Humerus Length)
2. Tibio-Femoral (Tibia Physiological Length/ Femur Physiological Length)
3. Humeral-Femoral (Humerus Length/Femur Physiological Length)
4. Intermembral (Humerus Length + Radius Physiological Length/Femur Physiological Length + Tibia Physiological Length)
5. Upper Limb/Stature (Humerus Length + Radius Physiological Length/Stature)
6. Lower Limb/Stature (Femur Physiological Length + Tibia Physiological Length/ Stature)

Because the Cochiti population sample consisted of several burial sub-samples (LA 6462, LA 6455, and LA 70), the decision was made to summarize metric values for each in the tables presented in this work. For between-population comparative purposes and statistical analyses, the Cochiti adult human remains from LA 6455 and LA 70 were pooled as the "Cochiti Series." The few remains from the earlier LA 6462 were not considered representative of the bulk of the Cochiti sample. By the end of the 1965 field session, random burials were recovered from LA 6178 and LA 9154, but they were not considered of value here by the senior archaeologist (Lange 1972: personal communication).

It will be noted from the metric tables presented that individual burial descriptions and locations in the archaeological site are omitted. This information, with the full report of all osteometry

as well as illustrations, will be published as resource material through the Laboratory of Anthropology, University of New Mexico Museum, Santa Fe., N.M. An initial report of the human remains from the 1963 season at LA 6462 and LA 6455 was published by Lange in 1968, with a contributing chapter by Heglar, as a "Museum Report."

Anyone reasonably familiar with the format of reporting skeletal remains in specific archaeological site literature is aware of the fact that published metric values, either for individual burials or in the style of summarization, occasionally need to be adapted to one's own methods of reporting and analysis. Therefore, these adjustments, further calculations involving published data, and literature sources for the cranial and post-cranial skeletal series used in this study are noted in Table 2.

TABLE 2

SKELETAL SERIES DATA SOURCES

Skeletal Series	Data Source	Comments
Paa-ko	Rogers 1954: Tables 3-6 and 9, pp. 8-11 Table 19, p. 22	"Total Male Series" used via author's suggestion of homogeneity in his "Pre-Columbian" and "Post-Columbian" sub-series. Long bone maximum lengths recalculated where specific physiological lengths were required for stature.
Pecos	Hooton 1930: Tables III-5 to III-61, pp. 40-79, 134, 144, 152-153, 157, 158	"Total Series A" used. Cranial Module recalculated as an average from deformed and undeformed cranial tables. Stature via Pearson's formula.
Pindi	Stubbs and Stallings 1953: Table 1, p. 150	No individual burial data presented.

TABLE 2: (Continued)

Skeletal Series	Data Source	Comments
Te'ewi	Wendorf 1953: Tables I and II, p. 109 Table III, p. 111	Cranial and long bone summary calculated from individual burial raw data. Re-estimate of stature using Telkkä Tables.
Navajo District	Bennett 1966: 543-545 Reed 1966: Tables 24 and 25, pp. 614-615	"Nasion-Menton" used to estimate nasion-gnathion line. "External Palatal" is maxillo-alveolar.
Hawikuh	Seltzer 1944: Table 1, p. 6	"Palatal" is maxillo-alveolar. Stature from femoral "physiological length" is estimate of maximum length.
Whitewater	Stewart 1940: Table 5, pp. 161-162 Tables 3-8, pp. 160-165	No cranial measurements originating at basion; no vault or mandibular values. Cranio-facial indices calculated. Long bone and stature summaries from individual raw data.

In a further attempt to standardize published values for comparative statistical analysis, ranges are listed from the lowest to the highest whole number, and means are given at two decimal points.

Statistical Analysis

For both within-sample and between-sample comparisons, metric data have been reported in the accompanying tables by number, range, arithmetic mean, and standard deviation. The Appendix contains these comparative tables. Tests for significance of the difference between means utilized the t-test; due to the fact that small and numerically unequal samples are inherent in the available data for work such as this, this test seemed the most reliable choice (Boneau 1960: 61-63). The formula used was as follows (Blalock 1972: 224-225):

$$t = \frac{\bar{X}_1 - \bar{X}_2}{\sqrt{\frac{N_1 S_1^2 + N_2 S_2^2}{(N_1 + N_2) - 2}} \sqrt{\frac{N_1 + N_2}{N_1 N_2}}}$$

A listing of t-scores and their probability levels are given in the tables of Chapter V; because of small sample size, the level of significance is placed at .05.

For any comparison of proportions, the Chi-square test was used (Blalock 1972: 276):

$$X^2 = \sum \frac{(f_o - f_e)^2}{f_e}$$

The increasing use in recent years of multivariate analysis in the assessing of biological distance of human population samples can cause one to feel that he must be statistically fashionable in his research model. In a study of the present sort, some multivariate analyses may elaborate the study, but be of secondary importance. It was decided to employ a discriminate function test between the Cochiti Series and selected neighboring series. The program chosen was the UCLA BMDO7M, revised April 1972 (Dixon 1968: 214a-214t).

The variables used in this program were all male values. The population samples compared included the nearest neighbors to the Cochiti or involved segments of the Cochiti Series. The N values are low because each burial in the series needed to contain all of the selected variables. The variables selected for the discriminant function analyses were 1) measurements: Bizygomatic Breadth,

Maxillo-Alveolar Breadth, Orbital Breadth, Nasal Breadth, Nasal Height, and Superior Facial Height; 2) indices: Cranial Module, Superior Facial, Orbital, Nasal, Maxillo-Alveolar, and Facial Prognathism; and 3) long bone lengths: Humerus, Radius, Femur, Tibia, and Stature. The results of these analyses are discussed in Chapter V.

Morphological Variation and Observations

Sixteen cranial observations were routinely recorded; of these, the Cochiti non-metric data presented here include only those observations that could be useful in assessing morphological types or in demographic description including culturally-acquired influences on the population. This data consists of cranial deformation, discontinuous traits, nasal profiles, and observations relevant to sexual dimorphism.

Anomalies, pathological conditions, and indications of healed injuries are also described (Brothwell and Sandison 1967; Ralston 1967).

Some paleoserological data, restricted to the ABO system, is included in this study. Although archaeological bone blood group information is not considered useful by many workers, this investigator has recently re-evaluated the methodology; the information reported here is secure within certain limits of testing both bone and soil samples (Heglar 1972).

CHAPTER III

SUMMARY AND ANALYSIS OF COCHITI METRIC DATA

Age and Sex Distribution

The skeletal remains of 175 individuals were recorded in the laboratory. Of this number, 116 (66 per cent) were adult, i.e., 21 years or older. The distribution according to age and sex of this total series may be seen in Table 3.

Table 4 contains a listing of those individuals who comprise the data referred to here as "Cochiti Series," LA 6455 and LA 70. A table footnote specifies the crania that display deformation. The data tables used here do not show this individual identification, only the totals indicated as "Deformed."

Cranio-Facial Data and Within-Series Differences

Male and female Cochiti Series craniometric values are presented in Tables 5A and 5B respectively. This population sample can be generalized morphologically as containing cranial vaults in the undeformed individuals that are broad, rounded, and high (Cranial Index, Length-Height Index); broad-faced in total proportion with a broad and high face in maxillo-facial proportion (Total Facial Index, Superior Facial Index); orbits are narrow and high (Orbital Index); nasal aperture is medium-broad (Nasal Index); maxilla is medium (Maxillo-Alveolar Index); facial prognathism is greater in the males with only

TABLE 3

COCHITI SKELETAL REMAINS BY AGE AND SEX

Age Ranges	Males	Females	TOTALS	(%)
Infant (Birth-3 yrs.)			23	13.2
Child (4-8 yrs.)			20	11.4
Pre-adolescent (9-12 yrs.)			7	4.0
Adolescent (13-17 yrs.)			3	1.7
Sub-adult (18-20 yrs.)			6	3.4
Young Adult (21-35 yrs.)	14	20	34	19.5
Middle-aged Adult (36-55 yrs.)	44	14	58	33.1
Old-aged Adult (56 plus yrs.)	5	3	8	4.6
Adult (age not known)	2	4	6	3.4
Adult (sex not known)			10	5.7
TOTALS	65	41	175	100.0

TABLE 4

COCHITI SERIES BURIALS

	MALES		FEMALES	
	LA 6455	LA 70	LA 6455	LA 70
A. Young Adults (21-35 yrs.)				
	17-13B	200-70	14-4	72-14
	17-17	200-120	17-15C	72-26
	*23-23	231-50	*17-16	106-37
	30-19	231-90	*30-37	106-44
	*31-6	*285-24	31-57	*200-13
	*31-7	*310-3	*31-58	*200-27
	*31-47		*31-62	*238-1
	35-15A		*32-2B	287-3
	35-15B		*38-1	
	74-5		53-15	
			103-2	
B. Middle-aged Adults (36-55 yrs.)				
	*17-13A	72-33	*14-85	72-13
	17-15A	72-37	*35-12	72-49
	*17-15B	106-17	*53-6	106-15
	23-15	106-24	*53-14	*107-9
	*24-19	107-27		156-3
	24-29	114-31		231-66
	24-35	*114-35		236-1
	26-1	186-19		*237-22
	30-10	186-47		*285-17
	30-35	231-6		
	*31-11	*231-46		
	31-13	231-63		
	31-15	*237-4		
	*31-21	237-27		
	*31-22	239-17		
	*32-3A	277-13		
	*35-11	277-14		
	97-1	277-49		
	103-1	277-139		
		278-1		
		282-11		
		*303-3		
C. Old-aged Adults (56 plus yrs.)				
	*23-24	1-23	*31-18A	
	31-10	*284-1	31-71	
	*31-54			

* Deformed Crania

TABLE 5A

COCHITI MALE CRANIO-FACIAL DATA (LA 6455 + LA 70)

Cranio-Facial Measurements	No.	Range (Mm.)	Mean (Mm.)	S.D.
Cranial Length (Undeformed)	5	157-167	162.00	4.12
(Deformed)	16	143-177	155.37	8.54
Cranial Breadth (Undeformed)	5	123-145	134.00	5.75
(Deformed)	16	135-156	144.00	5.20
Cranial Height (Undeformed)	2	132-152	142.00	
(Deformed)	9	131-151	139.55	6.71
Auricular Height (Undeformed)	4	106-136	122.25	4.00
(Deformed)	9	115-138	127.33	6.63
Least Frontal Breadth	28	80-105	94.14	6.08
Bizygomatic Breadth	18	120-148	133.44	7.41
Basion-Nasion Line	14	88-104	98.07	4.24
Basion-Prosthion Line	12	87-100	96.25	4.58
Basion-Nasospinale Line	12	83-94	90.50	3.32
Nasion-Gnathion Line	26	99-132	113.96	7.42
Nasion-Prosthion Line	32	60-79	67.94	2.00
Nasal Height	34	46-60	51.35	3.16
Nasal Breadth	36	22-28	23.56	1.41
Interorbital Breadth	36	19-29	23.72	2.00
Orbital Height	35	32-40	34.69	2.24
Orbital Breadth	35	30-41	36.77	2.24
Maxillo-Alveolar Length	35	47-62	52.69	3.00
Maxillo-Alveolar Breadth	40	44-71	59.58	5.39
Bicondylar Breadth	13	122-131	119.00	5.20
Bigonial Breadth	18	73-105	92.22	7.94
Ramus Height	36	47-68	55.75	4.47
Ramus Breadth	38	30-42	35.89	2.83

TABLE 5A: (Continued)

Cranio-Facial Measurements	No.	Range (Mm.)	Mean (Mm.)	S.D.
Symphyseal Height	36	26-40	33.22	2.83
Mandibular Body Height	39	21-44	27.82	4.36
Mandibular Body Thickness	43	13-19	15.23	2.24
Mandibular Length	26	68-85	77.23	4.24

TABLE 5A: (Continued)

Cranio-Facial Indices	No.	Range	Mean	S.D.
Cranial Module	11	140-154	145.73	4.47
Length-Breadth (Undeformed)	6	74-92	84.00	6.86
(Deformed)	13	84-102	94.30	5.00
Length-Height (Undeformed)	2	81-97	89.00	
(Deformed)	9	87-99	91.22	4.00
Length-Auricular				
(Undeformed)	4	65-86	76.00	10.10
(Deformed)	9	74-91	83.55	5.83
Breadth-Height (Undeformed)	2	102-110	106.00	
(Deformed)	9	91-103	96.55	4.12
Total Facial	12	76-100	84.83	7.42
Superior Facial	14	46-59	50.93	4.12
Zygomatico-Frontal	15	65-76	70.87	3.32
Zygomatico-Bigonial	11	54-77	69.09	5.83
Nasal	34	41-57	47.24	3.61
Orbital	34	82-109	94.85	6.93
Maxillo-Alveolar	35	95-134	113.80	10.72
Mandibular	12	51-72	63.17	6.93
Ramus	31	53-75	64.26	5.66
Facial Prognathism	9	89-105	97.96	5.48
Alveolar Prognathism	10	100-111	105.90	3.46
Cranio-Facial Longitudinal				
(Undeformed)	2	58-67	62.50	
(Deformed)	7	57-65	62.29	3.61
Cranio-Facial Transverse				
(Undeformed)	3	89-97	93.67	4.12
(Deformed)	11	84-98	92.36	4.12

TABLE 5B

COCHITI FEMALE CRANIO-FACIAL DATA (LA 6455 + LA 70)

Cranio-Facial Measurements	No.	Range (Mm.)	Mean (Mm.)	S.D.
Cranial Length (Undeformed)	3	155-167	161.33	6.08
(Deformed)	10	137-163	149.60	7.87
Cranial Breadth (Undeformed)	3	135-140	136.66	2.83
(Deformed)	10	130-149	141.40	5.29
Cranial Height (Undeformed)	2	-	135.00	
(Deformed)	8	130-142	136.00	4.12
Auricular Height (Undeformed)	2	120-126	123.00	
(Deformed)	7	111-122	118.71	4.12
Least Frontal Breadth	15	85-97	94.29	4.90
Bizygomatic Breadth	10	120-137	127.30	5.20
Basion-Nasion Line	11	87-99	94.73	3.16
Basion-Prosthion Line	9	84-94	90.22	3.61
Basion-Nasospinale Line	9	80-90	86.89	3.32
Nasion-Gnathion Line	10	96-116	109.20	6.00
Nasion-Prosthion Line	13	59-78	65.08	4.90
Nasal Height	14	44-54	49.86	2.45
Nasal Breadth	17	21-28	23.53	2.24
Interorbital Breadth	18	21-26	23.11	1.45
Orbital Height	20	30-36	34.05	2.00
Orbital Breadth	21	32-40	36.10	2.00
Maxillo-Alveolar Length	19	43-56	49.58	3.16
Maxillo-Alveolar Breadth	18	47-62	57.39	4.58
Bicondylar Breadth	10	104-122	113.70	5.29
Bigonial Breadth	11	76-95	84.36	6.56
Ramus Height	22	45-67	52.73	5.00
Ramus Breadth	22	30-40	34.10	2.45

TABLE 5B: (Continued)

Cranio-Facial Measurements	No.	Range (Mm.)	Mean (Mm.)	S.D.
Symphyseal Height	19	26-35	30.84	2.24
Mandibular Body Height	16	22-30	25.33	3.00
Mandibular Body Thickness	18	11-18	14.89	1.73
Mandibular Length	18	65-88	74.17	5.83

TABLE 5B: (Continued)

Cranio-Facial Measurements	No.	Range (Mm.)	Mean (Mm.)	S.D.
Symphyseal Height	19	26-35	30.84	2.24
Mandibular Body Height	16	22-30	25.33	3.00
Mandibular Body Thickness	18	11-18	14.89	1.73
Mandibular Length	18	65-88	74.17	5.83

TABLE 5B: (Continued)

Cranio-Facial Indices	No.	Range	Mean	S.D.
Cranial Module	10	138-151	143.00	3.32
Length-Breadth (Undeformed)	3	81-94	89.33	7.28
(Deformed)	10	85-106	94.60	6.08
Length-Height (Undeformed)	2	83-87	85.00	
(Deformed)	3	84-101	91.00	5.29
Length-Auricular				
(Undeformed)	2	-	78.00	
(Deformed)	8	73-88	80.25	5.39
Breadth-Height (Undeformed)	1	-	100.00	
(Deformed)	7	92-98	95.00	2.24
Total Facial	9	74-93	82.67	6.48
Superior Facial	9	47-56	50.78	2.83
Zygomatico-Frontal	9	64-76	70.89	4.12
Zygomatico-Bigonial	4	60-71	65.25	4.80
Nasal	14	41-55	47.29	4.90
Orbital	19	83-100	94.95	5.48
Maxillo-Alveolar	18	100-126	115.60	7.56
Mandibular	10	56-75	66.20	6.48
Ramus	21	53-75	65.05	6.40
Facial Prognathism	9	90-102	91.89	4.47
Alveolar Prognathism	9	99-119	104.77	5.80
Cranio-Facial Longitudinal				
(Undeformed)	1	-	61.00	
(Deformed)	6	58-68	61.50	3.74
Cranio-Facial Transverse				
(Undeformed)	1	-	94.00	
(Deformed)	6	88-100	92.17	3.36

a slightly greater value than females in alveolar prognathism, while the general face-to-cranial vault proportions are the same in both sexes (Cranio-Facial Longitudinal Index, Cranio-Facial Transverse Index).

The chronological position of the LA 6455 burials is somewhat earlier than the LA 70; it is convenient to simply refer to these groups as "Early Cochiti" and "Late Cochiti." In this regard, the comparison of cranial measurements and indices of the Early Cochiti to the Late Cochiti--the LA 6455 I sub-series being the most representative in sample size--display some mean differences. Tables I and II of the Appendix are the source for this comparison. Mean values which are several whole numbers apart may be considered a reflection of morphological difference, as long as the sample size and standard deviation of the distribution are also taken into consideration.

The most noticeable metric differences that characterize the LA 6455 males from those of LA 70 are: broader least frontal breadth and bizygomatic breadth; longer basion-prosthion, nasion-prosthion, and nasion-gnathion; wider orbital and interorbital breadths; greater maxillo-alveolar length and breadth; greater mandibular width; and greater mandibular length and symphyseal height. The proportional differences, as indicated by the indices, are mainly reflective of facial differences: Upper Facial Length to Facial Width is greater; Least Frontal and Mandibular Breadths are broader when compared to Bizygomatic Breadth; Orbital shape is not as high or narrow; Maxilla is narrower and longer; Mandibular Ramus Width is less to Height; and there is slightly more Facial and Alveolar Prognathism.

Females in this same sub-series comparison possess: broader

bizygomatic breadth; shorter basion-prosthion, basion-nasion, nasion-prosthion, and nasion-gnathion lines; and narrower maxillo-alveolar breadth. Shape comparisons indicate broader and shorter faces; narrower least frontal and mandibular breadths when compared to bizygomatic breadth; less broadness to the mandibular ramus; and less facial--but greater alveolar--prognathism.

When putting the male mean differences to the test for significance, only three of the measurements were significant at the .05 probability level or less. The measurements were: least frontal breadth ($P = .001$); orbital breadth ($P = .02$); and symphyseal height ($P = .05$).

It is unfortunate that there are so few burials for LA 6455 II and III because in several measurements and indices shown in the comparative tables, these segments are metrically similar to values in the LA 70 series. With more individuals available, one would probably find a continuum indicating morphological difference in time over 300 years within the Cochiti Series.

Post-Cranial Data and Stature

The means for six long bone lengths are given in Table 6. The lengths are summarized as to both maximum and physiological lengths. With this data as a basis, stature estimates--Telkkä for males and females plus Trotter and Gleser for males--are summarized in Table 7. Also presented in this table are ratios for limb bone elements and limb-lengths-to-stature comparisons.

Similar within-population comparison of post-cranial data may be made by referring to Tables III, IV, and V of the Appendix. Here

TABLE 6

COCHITI SERIES LONG BONE LENGTHS

A. MALES

Long Bone Lengths		No.	Range (Cm).	Mean (Cm.)	S.D.
Humerus	(Maximum)	21	27-34	29.80	1.73
Ulna	(Maximum)	18	22-27	24.89	1.73
	(Physiological)	18	19-25	22.11	1.73
Radius	(Maximum)	29	20-27	22.97	1.73
	(Physiological)	28	19-26	21.96	1.73
Femur	(Maximum)	24	34-47	41.58	3.00
	(Physiological)	23	35-47	41.35	3.16
Tibia	(Maximum)	25	31-40	35.08	2.24
	(Physiological)	24	29-37	32.92	2.24
Fibula	(Maximum)	17	30-40	33.82	3.00

B. FEMALES

Long Bone Lengths		No.	Range (Cm.)	Mean (Cm.)	S.D.
Humerus	(Maximum)	16	27-33	28.75	1.73
Ulna	(Maximum)	12	22-25	23.58	1.41
	(Physiological)	12	19-24	21.00	1.41
Radius	(Maximum)	14	20-24	22.07	1.00
	(Physiological)	14	19-26	21.00	1.00
Femur	(Maximum)	17	37-46	40.53	2.45
	(Physiological)	17	37-46	39.65	2.45
Tibia	(Maximum)	12	30-37	33.08	2.24
	(Physiological)	12	29-35	31.08	2.24
Fibula	(Maximum)	11	29-35	32.27	1.73

TABLE 7

COCHITI SERIES STATURE AND INTERMEMBRAL INDICES

A. MALES

	No.	Range (Cm.)	Mean (Cm.)	S.D.
Stature				
Telkkä Tables	46	154-176	164.41	5.29
Trotter and Gleser	46	154-176	163.86	5.29
Intermembral Indices				
Radio-Humeral	15	70-76	73.13	2.00
Humero-Femoral	15	67-75	72.27	2.00
Tibio-Femoral	15	61-93	80.67	1.73
Intermembral	12	63-73	71.08	2.83
Upper Limb/Stature	18	29-34	31.72	1.41
Lower Limb/Stature	22	43-48	45.90	3.04

B. FEMALES

	No.	Range (Cm.)	Mean (Cm.)	S.D.
Stature				
Telkkä Tables	22	150-163	154.64	4.36
Intermembral Indices				
Radio-Humeral	11	70-75	72.64	2.24
Humero-Femoral	12	71-75	73.00	1.41
Tibio-Femoral	12	75-83	78.75	1.00
Intermembral	9	69-73	70.78	1.00
Upper Limb/Stature	11	31-33	32.72	1.00
Lower Limb/Stature	13	44-49	46.59	2.75

there are no outstanding long bone length and stature differences, other than those that reflect sexual dimorphism. The Intermembral Indices show similar mean values with the exception of the Tibio-Femoral Index; the difference here is one of a shorter knee-to-ankle length in the LA 6455 I males. This proportional difference is significant at the .01 probability level when applying the t-test.

CHAPTER IV

SUMMARY AND ANALYSIS OF COCHITI NON-METRIC DATA

Morphological Variation and Discontinuous Traits

Examples of lambdoid cranial deformation were recorded for 38 adults in the Cochiti Series of 47 judgable cranial vaults (see Table 4), showing an 81 per cent occurrence. When the counts of Table 4 are converted to percentages and the differences tested for significance, Chi-square values for age category comparisons within and between the sexes indicate significance only for the middle-aged male and female occurrences. Here, the females present a higher deformation frequency.

Although the deformation was usually symmetrical to lambda, the few occurrences of asymmetry were to the right side of this occipito-parietal region. Only one person demonstrated frontal bone change from pressure without a noticeable reciprocal posterior flattening beyond normal; this example was a middle-aged male in the LA 70 series.

There were also three occurrences of deformation in immature individuals--one infant and one child in LA 70 and one child in LA 6455.

Tables I and II of the Appendix present osteometric data for 16 deformed and 6 undeformed adult male crania and 10 deformed and 13 undeformed adult female crania.

Nasal profile, depth of the root at nasion, and nasal base configuration was observed and classified as supporting shape information to the metric description of facial features. The distribution of nose bridge shape and nasal root depth is given in Table 8. The more common concave-convex nasal profile of the males was the most noticeable characteristic upon even casual observation. Occurrences of "guttering" at the nasal aperture base also had its highest frequency among males. Of the 11 males and 8 females displaying this feature, 7 of each sex were in the LA 70 group.

Table 9 tabulates the presence of the discontinuous traits: A., wormian bones, and B., C., and D., three forms of oral hyperostoses. Also in this table, E. and F. present two congenital and developmental anomalous conditions in adult dentition. The cases of supernumerary teeth include three incisors and a first premolar. Abnormal eruption was seen in two cases of rotated central incisors and five anteriorally-impacted third molars. The frequency of both errors is highest among the females in the Cochiti Series.

The degree of dental attrition was individually recorded and was found to be not unexpectedly different in its range from that usually noted in prehistoric American Indian populations. The middle-aged individuals possessed medium to extreme degrees of dental wear on incisors and molars.

One example of the congenital anomaly atlanto-occipital fusion was seen in a middle-aged male from LA 6455.

The only post-cranial variation noted was the occasional perforated supratrochlear foramen. This feature was recorded for nine adults: two males and two females in LA 70 and two males and three

TABLE 8

NASAL VARIATIONS

A. Nasal Profile

	Concave-convex			Convex-concave
MALES	(Slight)	(Medium)	(Marked)	
LA 70	3	5	9	0
LA 6455	4	4	9	0
	7	9	18	0
FEMALES				
LA 70	1	2	1	0
LA 6455	3	2	2	3
	4	4	3	3

B. Nasal Root

MALES	(Shallow)	(Medium)	(Deep)
LA 70	9	6	1
LA 6455	12	8	0
	21	14	1
FEMALES			
LA 70	7	0	0
LA 6455	9	2	0
	16	2	0

TABLE 9

CRANIAL OBSERVATIONS AND DISCONTINUOUS TRAITS

A. Wormian Bones

	MALES	FEMALES
LA 70	1	2
LA 6455	7	4
	8	6

B. Torus Palatinus

	MALES	FEMALES
LA 70	1	0
LA 6455	4	2
	5	2

C. Maxillary Hyperostosis

	MALES	FEMALES
LA 70	0	0
LA 6455	2	0
	2	0

D. Mandibular Hyperostosis

	MALES	FEMALES
LA 70	1	0
LA 6455	4	1
	5	1

E. Supernumerary Dentition

	MALES	FEMALES
LA 70	1	0
LA 6455	0	3
	1	3

F. Abnormal Tooth Eruption

	MALES	FEMALES
LA 70	3	2
LA 6455	0	3
	3	5

females in LA 6455. Of interest here is the fact that the perforation was bilateral in one male and all of the females of the LA 6455 group. In the LA 70 occurrences, three of the four examples were right-side perforations, with one female example of left-side perforation.

Disease and Injury

The most prevalent pathology often seen in archaeological remains is dental disease, and in this the Cochiti Series was no exception. In Table 10 are the occurrences of periapical abscesses that appear as erosion and external perforation of alveolar bone around the tip of the tooth root. Another disease state is the condition of porous and resorbed alveolar bone at the gum line caused by peridontal infection and inflammation. Both of these diseases occurred in slightly higher frequency in male adults. The Series adult incidence of abscesses is 40 per cent.

Caries occurring in the tooth root area between teeth are noted as indicated in Table 10. This sub-enamel pathology occurred either between the canine and first premolar or between the second and third molars as interproximal decay usually caused by impacted food.

Tooth loss, in the condition of an edentous state for one half or more of the dental row, occurred in eight males and four females; of these twelve persons, one of each sex was a young adult and the rest were middle-aged.

A cranial vault pathology existed in a pre-adolescent from LA 70 in which the temporal and sphenoid areas were noticeably por-

ous. This individual also possessed indications of periostitis on long bones.

TABLE 10

DENTAL PATHOLOGY

A. Periapical Abscess

	MALES	FEMALES
LA 70	8	5
LA 6455	12	5
	20	10

B. Peridontal Disease

	MALES	FEMALES
LA 70	3	4
LA 6455	15	7
	18	11

C. Between-Teeth Caries

	MALES	FEMALES
LA 70	4	4
LA 6455	7	0
	11	4

In the post-cranial skeletal region, there were 35 examples of osteoarthritis in the vertebral column; the involvement in three separate regions only as a classification is presented in Table 11. This condition, like dental pathology, was not unexpected, as both spinal degeneration and vertebral body exostoses are often common in middle-aged and old-aged adults.

Less common pathologies included five male examples of chondromalacia involving the knee joint. Femoral and tibial condylar surfaces showed localized erosion, and in several cases the patellar articular surface was also affected. In one male, a femoral head displayed an isolated example of this cartilage degeneration. Gen-

eral arthritic joint marginal exostoses or "lipping" was present in extreme form in one male and appeared only around the humeral head of a female. A single example of ilio-sacral abscess was seen in an old-aged male, and an example of trochantric abscess of the right femur was seen in a young adult male.

TABLE 11

SPINAL OSTEOARTHRITIS

A. Cervical Vertebrae

	MALES	FEMALES
LA 70	1	0
LA 6455	0	2
	1	2

B. Lumbar Vertebrae "Lipping"

	MALES	FEMALES
LA 70	9	1
LA 6455	12	4
	21	5

C. Entire Spinal Column

	MALES	FEMALES
LA 70	1	1
LA 6455	2	2
	3	3

The raised scale-like appearance elicited on long bone shafts by periostial inflammation was present in a male and a female. In the latter individual, the periostitis was severe and involved most long bones.

Evidences of post-cranial trauma included a middle-aged male in the LA 70 group with a healed crushing fracture of the left wrist and compression of a thoracic vertebra. Other healed injuries in this group consisted of two thoracic vertebral and one mandibular condy-

lar fracture. In LA 6455, three individuals--two males and a female--displayed distal fractures of the forearm long bones. Another male sustained a right femoral neck fracture and another a fractured right clavicle.

Two individuals presented evidence of cranial scars as the result of blows--one to the parietal area and one to the frontal region. Another male possessed a roughly circular scar on the right frontal bone which could have been caused by trephination. These three individuals were in the LA 6455 remains. In LA 70, only one example of cranial scarring was noted, this a male with a healed perforation on the sagittal suture three centimeters superior to lambda.

Paleoserology

Over the last few years, this investigator has been involved in developing controls in support of human paleoserological information. One phase of these controls, which are concerned mainly with the specification of contamination in bone samples, has been implemented by obtaining the results described here in a selected burial series of Cochiti adults. The control simply involves the simultaneous testing of both a bone and a soil sample from the archaeological burial. Ideally, the methodology should include an individual burial cancellous bone sample and a representative soil sample (Heglar 1972). In the Cochiti study, only a portion of this control method was possible because the soil samples that were supplied for testing were collected only in the LA 70 field season at Cochiti Pueblo.

The laboratory results that are now available for the Cochiti

paleoserological series consist of 88 individual absorption inhibition tests for ABO(H) antigenicity. Of this total, 51 samples were from LA 70 and 37 were from LA 6455. No indication of ABO(H) group-specific antigenicity in bone powder occurred in 16 (31 percent) of the LA 70 samples and 7 (19 per cent) of the LA 6455 samples. The remaining 65 samples did present test results that are summarized by site location and sex in the following table.

TABLE 12

DISTRIBUTION OF BONE BLOOD-GROUP DATA

		(A)	(B)	(AB)	(O)
LA 70	Males	0	2	0	20
	Females	1	0	0	12
LA 6455	Males	1	3	0	15
	Females	1	1	0	9

This blood-group frequency information could be left as shown above, but the assumption that it truly represents blood type would not be serologically valid unless one considered both the contamination and protein degrading possibilities of the cancellous bone residual chemistry. The "soil sample control" in this case consists of 17 separate soil samples from the LA 70 site which represent several typical soils in which burials were discovered. There were only four ABO(H) antigen-specific results in the soil tests and all of these were specific for H antigenicity.

It is reasoned that if the soil demonstrates the presence of the same antigenicity as that recorded for the bone powder inhibition test, then the bone results are not valid as a "typing." The reverse--no soil specificity, but recorded specificity from the

bone sample--renders the bone test result isolated and valid.

None of the bone test results involved in Table 12 were considered influenced by soil antigenicity. Therefore, Table 12 represents the presence of possible protein identification specific to the ABO(H) system within the logic and serological methodology used to date. In the light of conclusions to be drawn from this study, it is important to note that A specificity has previously been noted in pre-Pueblo mummy muscle tissue typing (Wyman and Boyd 1937: 587; Lippold 1971: 381).

CHAPTER V

COMPARISONS BETWEEN COCHITI AND OTHER SKELETAL SERIES

Ideally, one would like to be able to present the comparative position of his osteometric series to other series in terms of detailed demographic and morphological characterizations. Often this desire can be only partially realized because consistent comparative data necessary for paleo-demographic descriptions are lacking (Angel 1969). Greater success can be had through osteometric comparisons of pooled individual information by employing "morphological distance" statistics. Here, with caution, the suggestion of even genetic distance is not without value.

Mortality and Survivorship

Table 3 in Chapter III presented the Cochiti Series in sex and age percentile distribution. Utilizing these values, a mortality curve was established based upon the age groupings used throughout this work (Lambert 1954: 165; Hooton 1930: 19, Fig. II-1). Fig. 5 plots the Cochiti, Paa-ko, and Pecos population curves. It was necessary to condense the Pecos information into larger categories than those in the original publication.

Compared to the Cochiti age proportions, the Pecos and Paa-ko mortality curves indicate primary differences. In the Pecos Series, there is a lower incidence of "Infant" and "Child" mortality, whereas in the Paa-ko Series, there is a higher incidence in these categories.

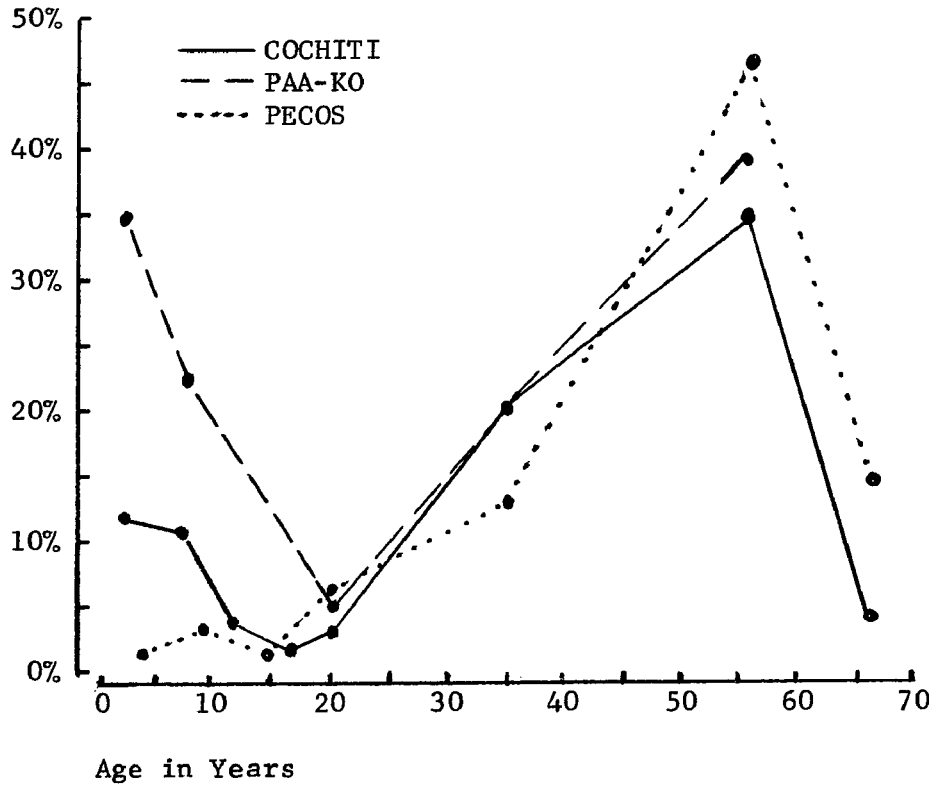


Fig. 5.--Comparative Mortality Curves

A secondary difference can be seen in the inter-population percentages occurring at the point of late middle age, i.e., 50-55 years of age. The Cochiti sample shows the lowest percentage and the Pecos the highest at this age point.

Immature mortality for these three skeletal series may be considered separately. Calculated from published burial count and age categories, infant mortality alone is strikingly high in the Paa-ko: 58 per cent as opposed to 39 per cent for the Cochiti and 14.8 per cent for the Pecos.

A geographically broader configuration can be had by simply calculating the percentage of immature to adult burials. The demographic differences shown in Table 13 include the total population samples considered in this study. By holding the Cochiti Series percentages as the "expected" values, the Chi-square test for significance is utilized, the results of which are in Table 14.

The percentage differences between Cochiti, Paa-ko, and Pecos are judged as dissimilar beyond chance, with a probability level of .001. A probability of less than .05 is also noted for the Pindi values when compared to Cochiti.

Survivorship values and curves provide another means of population description and comparison. Values are chance percentages at particular ages and can be simply calculated as adjusted age interval totals (decreasing count of individuals at an age group less the number dying by the maximum age of the group) divided by the sample or population size (McKiney 1971: 421). A survivorship curve is generated by plotting these values at specific ages against a percentile scale. Whether by considering values or curves, the result is an

TABLE 13

IMMATURE AND ADULT PERCENTAGES

	(Immature)		(Adult)	
Skeletal Series	N	Per Cent	N	Per Cent
Cochiti (Chapter III, Table 3)	59	33.7	116	66.3
Paa-ko (Rogers 1954: 165)	88	60.3	58	39.7
Pecos (Hooton 1930: 19, Fig. II-1)	88	15.0	499	85.0
Pindi (Stubbs and Stallings 1953: 143)	40	46.2	46	53.8
Navajo District (Bennett 1966: 531)	52	41.3	74	58.7
Hawikuh (Roberts 1932: 152)	24	40.0	36	60.0

estimate of reaching particular chronological ages by individuals under a specific population's environmental conditions. For comparative purposes, these estimates are based upon an assumption of population stability, i.e., constant size and bio-cultural consistency in time (Weiss 1973).

TABLE 14

TEST FOR SIGNIFICANCE IN IMMATURE AND ADULT PERCENTAGES

Cochiti Series Compared to:	(X^2)	(P Level)
Paa-ko	30.12	.001
Pindi	6.41	.02
Pecos	16.08	.001
Hawikuh	1.59	.30
Navajo District	2.18	.20

In this study, survivorship values are calculated for the Cochiti and Pecos skeletal series and given in Table 15.

TABLE 15

COCHITI AND PECOS SURVIVORSHIP VALUES

	Age Intervals in Years			
	0-10	11-20	21-35	36-55
Cochiti	.73	.63	.42	.05
Pecos	.93	.84	.70	.21

The four age intervals and their counts in Table 15 are the same basic data used in constructing Fig. 5; in the table, the Paa-ko Series is omitted due to the lack of published frequencies at specific ages within the "Adult" category.

Two demographic curves are plotted for the Cochiti and Pecos Series in Fig. 6. Here, as in the mortality curves, a higher death probability for all ages is diagrammatically indicated for the Cochiti population. The accumulated differences between the Cochiti and Pecos curves at ages 10, 20, 35, and 55 years are statistically significant at less than .001.

Disease and Trauma

The reporting of pathologies and trauma as population features depends to a great extent upon the interest and clinical resources of the investigator. For this reason, there are cases of both general and specific descriptions in the literature.

The most apparent pathology for comparative purposes is that of dental disease. But the reporting of abscess frequencies and caries presents dissimilar information. In the previous chapter, the occurrence of periapical abscesses in Cochiti adults at 40 per cent is not out of line with that usually observed in archaeological populations. In the earlier Navajo District burials, abscess frequency is noted at 31 per cent; these remains also present a frequency of caries at 62 per cent (Bennett 1966: 540). An occurrence of general dental disease of 76 per cent was recorded for Paa-ko (Rogers 1954: 25). Caries particularly were quite common in the Pecos adult tooth rows (Hooton 1930: 119).

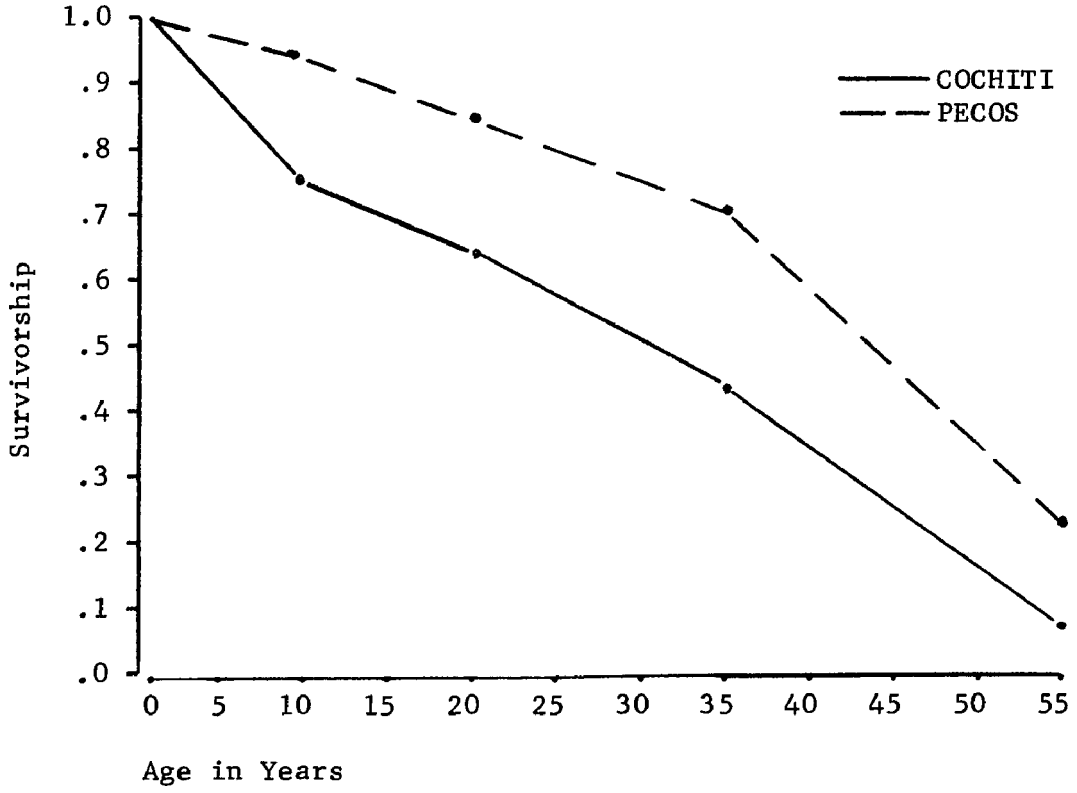


Fig. 6.--Cochiti and Pecos Survivorship Curves

Equally apparent is the post-cranial pathology resulting from arthritic changes in joint areas that result in exostoses and inflammatory conditions. These conditions are often more frequent in male skeletons. Spinal osteoarthritis, most noticeable in the lumbar vertebral region, was recorded at 70 per cent in Paa-ko remains (Rogers 1954: 23). Pecos indicates a range from 9 per cent to 13 per cent for this pathology, with the lowest percentage occurring in the earlier phases (Hooton 1930: 306). Both the Te'ewi and Navajo District adult remains display only moderate arthritic changes (Wendorf 1953: 110; Bennett 1966: 542). Burials from the Arizona Whitewater Series were judged as presenting no major pathological changes (Stewart 1940: 161). In comparison, Cochiti spinal osteoarthritis, particularly in the lumbar region, is estimated at 74 per cent from Table 11. Therefore, both in percentage of occurrence and in male frequency, the Cochiti most closely resemble the Paa-ko.

Periostitis and osteomyelitis can be readily seen in dry bone by inflammatory changes on the cortical bone surface. Periostitis of long bone shafts, as in the Cochiti, are also reported in the Pecos Series. The Pecos occurrence was greater in burials from the "historic strata." This may indicate disease sources that were not present in the pre-contact population (Hooton 1930: 308-309).

Indications of antemortum injury is usually of two sorts: long bone fractures and cranial "blow" scars. Long bone fractures in the Cochiti remains mainly involved the forearm, whereas at Pecos they were recorded for the humerus and femur. Hooton attributed these injuries to falling or jumping (Hooton 1930: 312). In

contrast, forearm or wrist fractures can indicate trauma from falls or labor-oriented accidents.

Occasional lesions on the Cochiti and Pecos adult crania are not unusual. These cranial scars are the result of healed blows of varied intensities to the vault. In the Pecos Series, the frequency of such trauma was 4.6 per cent (Hooton 1930: 314-315).

Craniometrics and Observations

An initial, non-statistical, comparative position of male Cochiti in cranio-facial size can be had by simply observing the magnitude of mean values. The summarized Cochiti Series male data in Table 5A of Chapter III are compared with similar data from other series in the Appendix Table I.

The general impression gained from the mean comparisons is that the Cochiti crania are dimensionally smaller than the Pecos crania, with the exception of basion-bregma height. They also display lower values than other cranial series in all cranio-facial widths except for the forehead area. Cochiti males are also smaller in undeformed cranial length, facial heights, nasal breadth, and symphyseal height.

Compared to neighboring population samples, the Pecos, as stated above, and Pindi dimensions are consistently larger than Cochiti. When compared to Paa-ko and Te'ewi, however, the Cochiti display greater mean values in least frontal breadth, basion-prosthion line, nasal height, and bicondylar width. These same dimensions are also greater for Cochiti than for the northerly Navajo District Series.

A consideration of mean values for the more geographically distant Hawikuh and Whitewater shows them to be generally larger than the Cochiti. The only exceptions are a greater value for undeformed cranial breadth and height of the Cochiti to Hawikuh, and a slightly greater value for orbital height and nasal height of the Cochiti to Whitewater.

Shape comparisons (see Table 5A in Chapter III and Table II of the Appendix) show cranial vault proportions of Cochiti males as differing from all other cranial series as follows:

1. Smaller vault (Cranial Module), particularly smaller than Pecos
2. Brachycephalic, with Pecos the only sample near its value
3. Greater undeformed basion-bregma height-to-length, with Pecos most similar
4. Greater undeformed basion-bregma height-to-breadth

Facial and cranio-facial proportions for Cochiti males, which are represented by larger sample sizes than those of the cranial vault, may be contrasted as below:

1. Medium-broad Total Facial proportion, as in Paa-ko and Te'ewi, with Pecos slightly broader and the geographically most distant samples the broadest
2. Wider forehead, reflected in highest value for least frontal breadth to bizygomatic breadth proportion
3. Narrow and high orbital shape, surpassed only by the Paa-ko

4. Medium-broad nasal aperture, with all other series broader
5. Medium Maxillo-Alveolar shape, with all other series shorter and broader
6. Slightly greater Facial and Alveolar Prognathism than Paa-ko, Pindi, and Pecos
7. Face more projecting when compared to cranial length
8. Cranial vault not as wide when compared to bizygomatic width

Although these compared sizes and shapes are noticeable metric differences, when evaluated in a statistical comparison-of-means test for significance, only a few stand as probable differences beyond chance. Statistically significant data, based upon the t-test and a probability level of .05, is presented in the accompanying tables.

Significance for Cochiti means in undeformed cranial measurements is more frequent between this series and the Pecos, Navajo District, and Hawikuh (see Table 16). This separation in mean values is confined to cranial length, facial height, orbital, nasal, and maxillo-alveolar differences. Pecos values show significant difference in all of the above facial areas; Paa-ko and Te'ewi are significant in nasal height difference; Paa-ko, in nasal breadth difference; and Te'ewi in maxillo-alveolar difference. The nasal area, then, appears to be the most common comparative cranial feature to demonstrate differences beyond chance.

Cranial indices, as would be expected, show significant differences mainly in face shape. Statistically significant differences particularly in the orbital, nasal, and maxillo-alveolar areas are

also given in Table 16.

TABLE 16

SIGNIFICANT DIFFERENCE IN MALE CRANIOMETRIC MEANS BETWEEN COCHITI AND OTHER SERIES

A. Cranial Measurements	SERIES	(Df)	(t-Score)	(P Level)
Cranial Length:	Pecos	49	3.50	.001
	Hawikuh	37	5.83	.001
Nasion-Prosthion Line:	Pecos	142	6.66	.001
	Hawikuh	62	9.25	.001
	Whitewater	37	3.65	.001
	Navajo Dist.	39	2.44	.02
Nasion-Gnathion Line:	Pecos	131	3.62	.001
	Hawikuh	53	2.36	.05
Orbital Breadth:	Whitewater	40	2.42	.02
	Navajo Dist.	42	2.70	.01
Interorbital Breadth:	Navajo Dist.	41	2.11	.05
Nasal Height:	Paa-ko	53	2.69	.01
	Te'ewi	39	2.22	.05
Nasal Breadth	Pecos	160	5.71	.001
	Paa-ko	54	7.14	.001
	Hawikuh	66	2.94	.01
	Whitewater	41	2.43	.02
	Navajo Dist.	43	5.76	.001

TABLE 16: (Continued)

A. Cranial Measurements	SERIES	(Df)	(t-Score)	(P Level)
Maxillo-Alveolar Length:	Pecos	135	2.15	.05
	Navajo Dist.	40	2.43	.02
Maxillo-Alveolar Breadth:	Pecos	135	8.00	.001
	Paa-ko	53	2.19	.05
	Hawikuh	65	4.76	.001
	Whitewater	44	2.78	.01
	Navajo Dist.	45	2.15	.05
Symphyseal Height:	Hawikuh	64	5.55	.001
Bigonial Breadth:	Navajo Dist.	23	2.50	.02
Mandibular Length:	Paa-ko	38	4.44	.001
B. Cranial Indices	**SERIES**	**(Df)**	**(t-Score)**	**(P Level)**
Length-Breadth:	Pecos	47	2.53	.02
	Paa-ko	25	3.88	.001
	Hawikuh	38	3.56	.001
	Navajo Dist.	7	2.39	.05
Superior Facial:	Hawikuh	42	2.80	.01
Zygomatico-Frontal:	Te'ewi	19	2.15	.05
Zygomatico-Mandibular:	Navajo Dist.	16	2.57	.02

TABLE 16: (Continued)

B. Cranial Indices	SERIES	(Df)	(t-Score)	(P Level)
Orbital	Pecos	152	2.05	.05
	Paa-ko	50	2.86	.01
	Navajo Dist.	41	3.13	.01
Nasal:	Paa-ko	52	4.35	.001
	Te'ewi	39	2.36	.02
	Hawikuh	64	3.33	.01
	Whitewater	39	2.04	.05
	Navajo Dist.	41	4.96	.001
Maxillo-Alveolar:	Pecos	130	3.24	.01
	Paa-ko	48	2.23	.05
	Hawikuh	60	2.31	.02
	Whitewater	39	6.67	.001

Although traditionally male metric description and analysis typifies a population, there are some noticeable differences between the female Cochiti Series and those of other series. Comparing the metric data in Table 5B to that of the Appendix, Cochiti females also display wider foreheads, bizygomatic dimensions, and slightly smaller face projections. Particularly, they present facial height similar to Paa-ko and Te'ewi and smaller mandibular dimensions than Pecos. This latter feature seems to separate Cochiti, Paa-ko, Pindi, and Te'ewi females from Pecos females.

The most apparent variation in the non-metric comparison of

Cochiti males to other samples is the occurrence of cranial deformation. The effect of two anterior-posterior cranial pressures is fronto-lambdoidal or fronto-occipital deformation, with the latter being less common. Table 17 lists the frequency of cranial deformation according to published adult sex distributions. The Cochiti frequencies are those given on p. 44; the 81 per cent referred to is a total observation of deformation, including crania fragmentary to the point of inaccurate sex determination. Some recalculation has been necessary to standardize the presentation of N and frequency.

Comparatively, the deformation frequencies are accurate indicators of habitual cultural behavior for a population sample only when the sample size is considerable. Therefore, Pindi, Te'ewi, and Whitewater are not as useful for inference. Cochiti, with an 81 per cent deformation occurrence as a whole, and 73 per cent for males, is not unusual. The female percentage for Cochiti is higher than males. There is a reverse trend in the Hawikuh Series where the male percentage is higher, but undeformed crania are common for both males and females.

The occurrence of wormian bones in cranial sutures are at a low frequency in the Cochiti. Similar low occurrence has been reported for the Te'ewi (Wendorf 1953: 15, Table 11-A) and Navajo District crania (Bennett 1966: 533). This is in contrast to the high percentage of wormian bone in the Pecos (Hooton 1930: 99, Table IV-14).

Nasal variations have been reported for enough samples to allow for a Cochiti comparison. The shallow-to-medium nasal root (nasion) characterizes both sexes of the Cochiti Series. The few crania from

TABLE 17

COMPARED ADULT CRANIAL DEFORMATION FREQUENCIES

MALE SERIES	Undeformed No.	Undeformed Frequency	Deformed No.	Deformed Frequency
Cochiti	6	.37	21	.73
Paa-ko	-	.00	21	1.00
Pecos	10	.06	164	.94
Pindi	-	.00	5	1.00
Te'ewi	2	.25	6	.75
Navajo District	9	.35	17	.65
Hawikuh	35	.88	15	.12
Whitewater	1	.14	6	.86

FEMALE SERIES	Undeformed No.	Undeformed Frequency	Deformed No.	Deformed Frequency
Cochiti	13	.57	10	.43
Paa-ko	-	.00	7	1.00
Pecos	3	.03	114	.97
Pindi	-	.00	6	1.00
Te'ewi	-	.00	2	1.00
Navajo District	2	.33	4	.67
Hawikuh	51	.74	18	.26
Whitewater	1	.09	10	.91

Pindi also show shallow nasal root (Stubbs and Stallings 1953: 149), as do the Paa-ko crania in which the judgment is based upon photographs (Rogers 1954: 31-43). Absent-to-slight nasion depression likewise is typical of the Pecos crania (Hooton 1930: 113, Table IV-38).

A nasal profile of "concavo-convex" shape typifies the Cochiti as well as the Pecos; in the latter, an estimate of only 10 to 20 per cent convex bridge profile exists (Hooton 1930: 112-113). Rogers also shows nasal profiles similar to Cochiti for Paa-ko (Rogers 1954: 31-43). An exception to this facial feature is a common occurrence of convex nasal profiles in both sexes in the Pindi remains (Stubbs and Stallings 1953: 149).

The observation of slight-to-medium depression of the nasal sill, i.e., "guttering," although infrequent, is present in both the Cochiti Series and the Pecos Series males. Hooton suggests that this feature is more common in later time periods (Hooton 1930: 112-113). It is of interest that it is more frequent in the later LA 70 crania of the Cochiti Series.

Other observations of variation, particularly in the mouth, are not frequent enough in the Cochiti to be significant in intra-population comparisons. Oral hyperostoses, tooth wear, and tooth count variations are within the expected ranges as often seen in American Indian population samples.

Post-Cranial Comparisons

For the between-population comparisons of post-cranial data, three sets of variables were used: long bone lengths, intermembral indices, and stature estimates. This information is given in

Appendix Tables III, IV, and V; the Cochiti Series is given in Tables 6 and 7 of Chapter III.

Arithmetic means of long bone lengths (humerus, ulna, radius, femur, and tibia) recorded for the Cochiti Series males do not show any metric differences that are outstanding; what differences in mean values there are, are not statistically significant.

Comparing means for long bone length in terms of their proportion to each other through intermembral indices does demonstrate some significant differences. Not all population samples dealt with in this study could be represented in this comparison; i.e., there is no published data for Pindi and Hawikuh. The ratio of radius to humerus does indicate a shorter forearm in both males and females of the Cochiti remains. This difference is noted particularly between Cochiti and Paa-ko, where the mean difference in radio-humeral index compared to Cochiti is significant at the P =.01 level. The only other significant difference is found in the comparative tibia-femoral index, also at the .01 level. Here, both Paa-ko and Te'ewi ratios indicate longer leg-to-thigh proportions in both sexes than those recorded for Cochiti. Longer tibial lengths are also suggested when considering the difference between Pecos and Cochiti, but this difference does not occur beyond chance.

Stature estimate means present generally taller Cochiti males than found in other male series. The closest mean value to the Cochiti value is that of the Whitewater. The shortest mean values for stature are found in the Pecos and Paa-ko Series, and their differences from Cochiti are indicated by Pecos P =.01 and Paa-ko P =.001. Female stature estimates for Te'ewi and Whitewater are greater than

for Cochiti females. In general, there is a tendency for Pueblo statures to be greater than those noted in Basketmaker remains (Newman 1962: 241-242). The Cochiti are no exception (even though in cranio-facial variety the Cochiti evidence a relatively high percentage of Basketmaker). When comparing limb lengths to statures, the indices utilized in this study present no significant differences in these proportional statements.

Morphological Distance

Through the utilization of a stepwise discriminant function analysis, morphological distance is suggested for three sets of data. The selected population samples for this form of multivariate analyses and variables chosen include (1) cranial measurements between Cochiti Series, Paa-ko, and Te'ewi; (2) cranial indices between Cochiti Series, Paa-ko, and Te'ewi; and (3) long bone lengths and stature between Early Cochiti, Late Cochiti, and Paa-ko. The variables are all male data. The individual cranial size and shape variables were selected for their independence and potential value in their discriminating capacity. The population samples chosen depended upon the desire to compare the Cochiti to closely neighboring populations and the availability of individual burial osteometric data through publications.

In the discriminant analysis involving cranial measurements, the within-group correlation matrix indicates that these variables are positively correlated, but are not highly intercorrelated, as shown in Table 18. Table 18 also indicates a similar correlation among the cranial index variables. This gives support to the independent nature of these variables.

TABLE 18

WITHIN-GROUP CORRELATION MATRICES

A. Cranial Measurements

1 - Bizygomatic Breadth
2 - Maxillo-Alveolar Breadth
3 - Orbital Breadth
4 - Nasal Breadth
5 - Nasal Height
6 - Superior Facial Height

Variable	1	2	3	4	5	6
1	1.00000					
2	0.29507	1.00000				
3	0.61730	0.24234	1.00000			
4	0.32672	0.07109	0.56382	1.00000		
5	0.43007	0.15326	0.52104	0.22780	1.00000	
6	0.23550	0.34499	0.45843	0.14844	0.62208	1.00000

B. Cranial Indices

1 - Cranial Module
2 - Superior Facial
3 - Orbital
4 - Nasal
5 - Maxillo-Alveolar
6 - Facial Prognathism

Variable	1	2	3	4	5	6
1	1.00000					
2	0.13322	1.00000				
3	0.11978	0.00076	1.00000			
4	0.53770	0.18573	0.34338	1.00000		
5	0.09291	0.51487	0.44990	0.19154	1.00000	
6	0.17119	0.27431	0.18017	0.24018	0.31050	1.00000

TABLE 18: (Continued)

C. Long Bone Lengths and Stature

1 - Humerus
2 - Radius
3 - Femur
4 - Tibia
5 - Stature

Variable	1	2	3	4	5
1	1.00000				
2	0.88901	1.00000			
3	0.89881	0.88800	1.00000		
4	0.82422	0.78207	0.78753	1.00000	
5	0.95496	0.91814	0.95331	0.81446	1.00000

As a test of the assumption that each individual in each population sample is representative of that sample, the print-out "Classification Matrix" is presented with a sample size "Order Matrix" in Table 19. A perfect classification is not shown for cranial measurements; in all three cranial series there is a degree of misclassification, and thus each series is not completely unique in its individual craniometric content. Table 19 also indicates that the Te'ewi, based on cranial indices, are misclassified by one half of its individuals represented.

The variables used to discriminate on a post-cranial skeletal level between Cochiti and Paa-ko males did not present any unexpected correlations or classifications. In Table 18, long bone lengths are highly intercorrelated with one another. Also, a high correlation between humeral and femoral length with stature is not surprising; i.e., these two bones have the highest reliability in the estimate of stature. The classification matrix in Table 19 indicates a 50 per cent overlap in the assignment of individual burials to either the

TABLE 19

ORDER AND CLASSIFICATION MATRICES

A. Cranial Measurements

	Order Matrix			Classification Matrix		
	Cochiti	Paa-ko	Te'ewi	Cochiti	Paa-ko	Te'ewi
Cochiti	10	0	0	8	2	0
Paa-ko	0	15	0	1	12	2
Te'ewi	0	0	6	0	1	5

B. Cranial Indices

	Order Matrix			Classification Matrix		
	Cochiti	Paa-ko	Te'ewi	Cochiti	Paa-ko	Te'ewi
Cochiti	7	0	0	6	0	1
Paa-ko	0	13	0	0	10	3
Te'ewi	0	0	4	0	0	4

C. Long Bone Lengths and Stature

	Order Matrix			Classification Matrix		
	Late Cochiti	Early Cochiti	Paa-ko	Late Cochiti	Early Cochiti	Paa-ko
Late Cochiti	6	0	0	3	3	0
Early Cochiti	0	7	0	3	4	0
Paa-ko	0	0	7	0	0	7

Early or Late Cochiti.

The morphological distances based upon cranial variables are shown in canonical plots in Figs. 7 and 8. The plotted mean positions shown against the two canonical variables (x and y axes) represent the central tendency of the metric variable clusters. The parameters for the three cranial measurement clusters indicate a greater overlap and likeness between Cochiti and Paa-ko than between Cochiti and Te'ewi, whereas Paa-ko demonstrates overlap into both the Cochiti and Te'ewi. Cranial indices, on the other hand, present a large cluster of variability for the Paa-ko which overlaps a smaller, tighter cluster for the Te'ewi. The Cochiti dispersal is not as graphically large as Paa-ko and does not overlap the other two clusters.

The morphological distances diagrammed in Fig. 9 expectedly support the similarity of the Cochiti sub-series samples and the dissimilarity between these two samples and the Paa-ko remains also seen in the comparison of means.

"Types" and "Race"

Another description and comparison can be had by considering any "typification" in facial morphological varieties of the Cochiti male adults. This is based upon both metric and non-metric features that can be contrasted to the range of variability judged by Hooton for the Pecos remains. The Pecos morphological descriptions consisted of seven distinct "types," plus a residual category. Hooton's naming of each type depended upon facial proportions reminiscent to anthropologists of world peoples. This labeling is best utilized within the context and understanding of archaeologists and biological

Mean Coordinates

	x	y
COCHITI	0.856	0.873
PAA-KO	0.168	-0.781
TE'EWI	-1.848	0.497

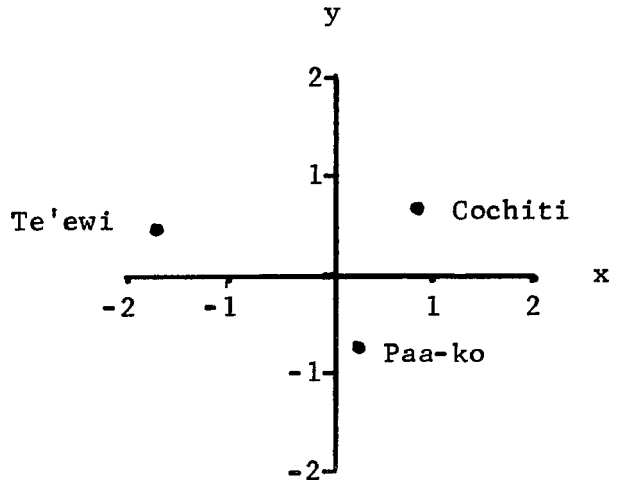


Fig. 7.--Discriminant Function Canonical Plot of Cranial Measurements

Mean Coordinates

	x	y
COCHITI	-1.636	0.260
PAA-KO	1.015	0.116
TE'EWI	-0.437	-0.832

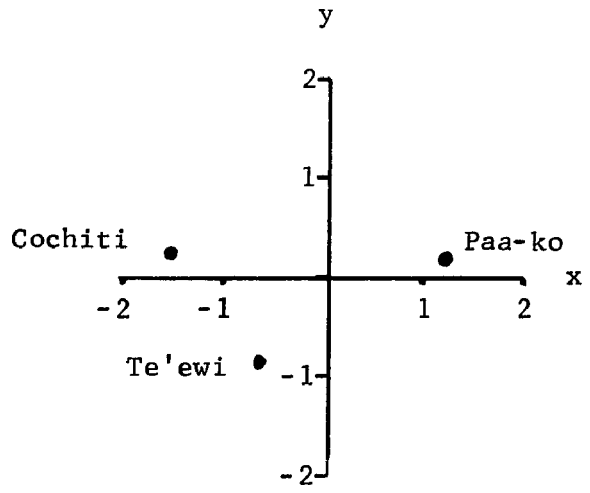


Fig. 8.--Discriminant Function Canonical Plot of Cranial Indices

Mean Coordinates

	x	y
LATE COCHITI	2.270	0.293
EARLY COCHITI	2.726	-0.235
PAA-KO	-4.672	-0.015

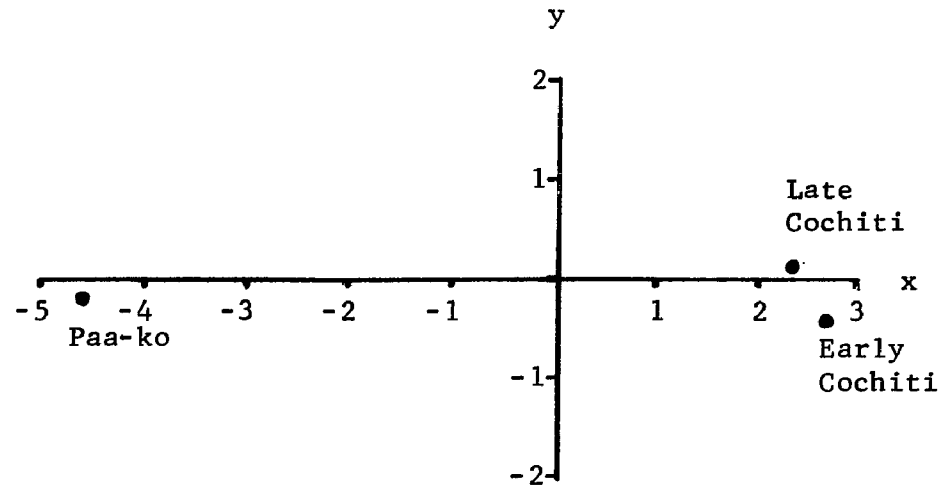


Fig. 9.--Discriminant Function Canonical Plot of Long Bone Lengths and Stature

anthropologists rather than by the public. Incorrect assumptions about the racial history of Southwestern Indians could easily be made if Hooton's categories were misunderstood. Therefore, so as not to perpetuate the labels and distract the reader from the intent here to present a range of variability, this study replaces the labels with type numbers as follows:

Morphological Type	Hooton's Terminology
No. 1	"Basketmaker"
No. 2	"Pseudo-Negroid"
No. 3	"Pseudo-Australoid"
No. 4	"Plains Indian"
No. 5	"Long Faced European"
No. 6	"Pseudo-Alpine"
No. 7	"Large Hybrid"
No. 8	"Residual"

In judgments and decisions in assigning any Cochiti male cranio-facial morphology to the above categories, Hooton's published material containing metric data, photographs, and personal comments were utilized. In addition, his metric data was supplemented by several routine cranio-facial indices used by the present investigator (Hooton 1930: 193, 196-198, 200, Tables VI-16, 25, 27, 32, 35, 41; insert 214-215, Plates VI-1-31; 185-186).

In the laboratory, the Cochiti crania were arranged first into visual, and second, osteometric groupings. The resulting categories were decided independently from the Pecos groupings, thus controlling bias based on an expectation of prehistoric Pueblo variability.

A comparison of the male facial series to those of Pecos is given in Table 20 by sample size and percentages of occurrence. The neighboring Paa-ko varieties are also included (Rogers 1954: 20,

TABLE 20

COMPARATIVE MORPHOLOGICAL TYPES

	COCHITI		PECOS		PAA-KO	
Types:	No.	Per Cent	No.	Per Cent	No.	Per Cent
No. 1	9	34.6	7	6.0	2	7.1
No. 2	2	7.7	11	9.5	5	17.9
No. 3	1	3.9	9	7.8	1	3.6
No. 4	2	7.7	19	16.4	0	-
No. 5	2	7.7	18	15.4	1	3.6
No. 6	3	11.5	14	2.1	4	14.3
No. 7	1	3.8	25	21.6	4	14.3
No. 8	6	23.1	13	11.2	11	39.2

Table 17).

From the comparison and distribution percentages in the above table, the Cochiti appears dissimilar to the Pecos Series in its low incidence of Types No. 3, 4, 5, and 7 and in its higher incidence of Types No. 1, 6, and 8. Of the latter three types, No. 1 occurs mainly in the Late Cochiti, while the greater contribution to the percentages of Types No. 6 and 8 are from the Early Cochiti. Like the Pecos, the Paa-ko Series also shows a lower incidence of Type No. 1 when compared to Cochiti, but is similar to Cochiti in its lower incidence of Types No. 4 and 5 and its higher incidence of Type No. 8.

Two tests were employed to test the significance of differences existing in Table 20. First, an analysis of variance between

Cochiti and Pecos was performed utilizing cases per type as its data. The result was statistical significance with a probability less than .05, as indicated by a large F statistic of 22.6.

The second statistic desired was Chi-square. Following the suggestion of Hooton that "Archaic" cranial morphological types (Types No. 1, 2, 3) were confined to early strata at Pecos, these percentages were pooled into one percentage contrasted to the remaining pooled percentage, i.e., Types 4 through 8 (Hooton 1930: 226). Rogers had earlier used this grouping of types in comparing the Paa-ko percentages to Pecos (Rogers 1954: 20, Table 18). Chi-square values for three comparisons (Cochiti/Pecos, Cochiti/Paa-ko, and Paa-ko/Pecos) are given in Table 21. Here, the higher proportions of "older" cranio-facial types in the Cochiti Series is beyond chance. Rogers likewise notes "older" types in the proportions of the Paa-ko Series, but this observation is not statistically significant (Rogers 1954: 21).

The sorting and summarizing of Cochiti crania, particularly into facial morphology groups, does not reflect any attempt at assigning these groups to American Indian "racial varieties." This classification at best would depend upon an evaluation of the Cochiti metric data in terms of the racial craniometrics suggested by G. K. Neumann. Here, the variety that is proposed as basic to the Southwestern Indian remains is "Ashiwid." The basic description of this variety is from the Arizona Basketmaker skeletal material, while the name is Zuni (Neumann 1952a: 220-221). The craniometric means typifying Ashiwid are: basion-prosthion line 97.1, nasion-gnathion line 116.3, nasion-prosthion line 73.1, bizygomatic breadth 132.4,

TABLE 21

CHI-SQUARE SIGNIFICANCE OF "ARCHAIC" MORPHOLOGICAL TYPE PERCENTAGES

A.	Cochiti (Observed)	Pecos (Expected)
"Archaic" Types	.46	.24
Other Types	.54	.76

$X^2 = 26.53$
Df = 1
P = < .001

B.	Cochiti (Observed)	Paa-ko (Expected)
"Archaic" Types	.46	.29
Other Types	.54	.71

$X^2 = 14.03$
Df = 1
P = < .001

C.	Paa-ko (Observed)	Pecos (Expected)
"Archaic" Types	.29	.24
Other Types	.71	.76

$X^2 = 1.37$
Df = 1
P = .30

orbital height 34.3, orbital breadth 39.1, nasal height 50.8, nasal breadth 25.4, maxillo-alveolar length 54.7, maxillo-alveolar breadth 64.7, bicondylar breadth 116.4, bigonial breadth 92.7, symphyseal height 34.6, Cranial Module 148.1, Total Facial Index 86.9, Superior Facial Index 54.8, Orbital Index 87.5, Nasal Index 50.1, and Maxillo-Alveolar Index 118.5 (Neumann 1952b: 247).

The Ashiwid craniometric summary is here compared by its mean values to the Cochiti male series of Chapter III as well as to the Pecos, Paa-ko, and Te'ewi population samples in the Appendix. This comparison was made through the simple calculation of plus-or-minus mean differences carried to one decimal point. A suggested "closeness" in mean values was had by considering only those differences less than 1.0. The comparison indicated that the Te'ewi are least similar to the Ashiwid variety, while the Pecos show the closest similarity. Cochiti and Paa-ko are in an intermediate position. It should be noted that this comparison suggests morphological positions opposite to those in Table 20, where the Pecos Series is shown to contain proportionally fewer Basketmaker crania than the Cochiti Series. Within the Cochiti Series itself, the mean values approaching the Ashiwid variety are again those crania from the Early Cochiti sub-series.

Another variety, Deneid, was also considered comparatively important because of its suggested extent from northwestern North America into the Southwest. The Cochiti Series was metrically similar to this variety in bizygomatic breadth, nasal height, and maxillo-alveolar length. Both the Cochiti and Paa-ko were together similar only in symphyseal height (Neumann 1952a: 28, and 1952b: 253-254).

CHAPTER VI

ETHNOGRAPHIC CONSIDERATIONS AND POPULATION HISTORY

The ethnographic Cochiti are an Eastern Keresan-speaking River Pueblo population who consider their homeland to be generally northwest of their present Rio Grande Valley location. The ethnohistory, linguistic affiliation, and characteristics in social organization relevant to this study will be provided in this section. It is hoped that these considerations will place the archaeological Cochiti in a cultural and historic position to other such populations. The overriding question is: did the Cochiti differ significantly from similar peoples in their bio-cultural content?

The Question of Culture Origin

A general interpretation of Anasazi chronology was presented in Chapter I, but specific regional data in pueblo ethnohistory is given here. It has been thought that Rio Grande cultures had a history and development from A.D. 1150-1300 similar to that known for the San Juan drainage area of northwestern New Mexico (Lambert 1954: 174-175).

This generality for all pueblos was not particularly satisfying due to the fact that there were several areas of difference within pueblo ethnographic data that could not be well explained. Inconsistencies in culture content existed between the Western and Eastern Pueblos. The Eastern Pueblos were viewed as having undergone some trait loss, if one concludes that both forms had a similar cultural

base in the past. One explanation was that the Western and Eastern Pueblos were dissimilar due to differential development in the two geographic localities; this explanation may also be carried to a point of assuming even different geographic areas of origin. Another alternative could be that the cultural differences were the result of population contact from outside the Rio Grande region (Underhill 1954: 650). Other suggestions have ranged from the Eastern Puebloan culture having a Plains origin, to the idea that pueblo social organization was a further development of a pre-pueblo peoples already in the Rio Grande Valley (Ford et al. 1972: 20).

With these ideas in mind, the origin of Rio Grande Puebloan society and the history of these Eastern Keresan-speaking peoples is best viewed as a marginal occurrence to a major Southwestern prehistoric cultural development. The Rio Grande area may well have been peripheral to an Anasazi distribution prior to A.D. 1100 (Dozier 1958: 21). Among the Eastern Keresans, there is a general myth that places their origin to the west. They also indicate that they had lived to the north, but this is not considered an ancestral area. A return to a western area is also prominent in their after-life concept (Dozier 1970: 143). In Cochiti mythology, there is the myth of having lived in or next to Frijoles Canyon, which is to the north and west of this pueblo (Lange 1959: 7).

There is more or less agreement that the pre-pueblo history of the Anasazi migration and distribution is one of a southern movement out of Chaco Canyon to a marginal point west of Acoma. The recent correlation of ceramic dispersal and linguistic affiliation by Ford, Schroeder, and Peckham would place the "Eastern Keres" in the Puerco

and Salado River Valleys below the Jemez Valley by A.D. 1300. There was then a migration north to the Frijoles Canyon and east to San Marco in the Galisteo area (Ford et al. 1972: 35).

The visualization of this prehistoric distribution and timing allows a more historically-secure view of Cochiti origin. Other than the Cochiti site dates given earlier, several ceramic datings precede A.D. 1300, but do not alter the possibility of occupation only within the last 700 to 800 years. These pre-14th Century evidences are first, pottery indications of occupation from A.D. 1050-1250 to the west of Cochiti in Santa Fe National Park, a region that they do not associate with historic involvement (Lange 1959: 8); second, the surface sherds mentioned on page 12; and third, the sherds from Site LA 249 across the river opposite Cochiti Pueblo, which represent a time span from A.D. 1250 to 1500 (Mera 1935: 25).

Linguistically, evidence from glottochronology further indicates the separateness of the Cochiti from populations to the north, east, and southeast. Paa-ko, for example, is basically Tanoan in language affiliation and may have been influenced by Keresan from the west by A.D. 1350 (Lambert 1954: 176). This may imply a general, early peopling of the New Mexico region southeast of the central Rio Grande. This occupation may have an antiquity of several thousand years, thus establishing the relative recency of the Eastern Keres (Dozier 1958: 21).

Social Organization and Intertribal Contacts

Any examination of ethnographic features in social organization such as rules of residence, marriage, and population contacts that

might contribute to the genetic history of an archaeological population is at best of inferential value.

An accurate judgment of the prehistoric Cochiti population size is not really possible, but it may not have fluctuated or been under the various stresses that are postulated in the history of their eastern and southeastern neighbors. There was a "southeastern shrinkage" of puebloan populations which is seen as abandonment of villages and subsequent migrations to the north. Although speculations as to the cause have ranged from drought to disease to the pressure of enemies, the latter may be the main reason for migration. Mera points out that the Mescalero Apache are found ethnographically in former pueblo territory by the end of the Glaze Period (Mera 1940: 39). The Athabascan Teya are known to have destroyed large pueblos in the Galisteo Basin. Using the Paa-ko site again as an example, this site occupation from A.D. 1350 to 1425 was apparently north of an earlier occupation area. Like many late Pueblo villages, there may have been protection in solidification, and the Paa-ko population moved northeast into Galisteo Basin (Lambert 1954: 174-176). The larger pueblos were more stable and the peripheral Cochiti seem not to show evidence of disruptive population contact from the south, as others had prior to A.D. 1450.

The history of Cochiti social organization has its origin in the community organization of early Pueblo time periods. Along with the Anasazi village pattern changes given in Chapter I, there was the general development of apartment dwelling in the Pueblo II period. The villages were unilateral kinship settlements with small living areas containing extended families (Willey 1966: 207). As villages

became larger, Wendorf proposes a trend toward urbanization as the effect of farmhouse segments economically separating social units. Enlargement of villages into apartment houses could have resulted in loss of lineage authority, and land ownership may have transferred from kin to community. In such a case, kin groups would no longer be localized, and group solidarity would shift to clan ceremonialism. At least as far as the ethnohistory of the large pueblos of northwestern New Mexico are concerned, a dual clan system could have been established, resulting in a two-kiva social organization. This organization was effective both in village ceremonial life and in political control (Wendorf 1953: 19-20).

Ceremonially, the Cochiti are quite typical Eastern Puebloan. The emphasis of the Katchina society, for example, is on curing, clowning, hunting, and warfare; in the Western Pueblos, this society is mainly functional in tribal initiation and membership.

The Cochiti also possess a kinship system different from the Western Puebloans. Lange considers the Cochiti as traditionally an exogamous and matrilocal society with a patrilineal kiva organization (Lange 1959: 367, 378). Eastern Pueblo societies may have originally had a form of matrilocal residence where the husband and wife lived in the vicinity of the wife's maternal relatives. A long-standing theory proposed by Eggan has been that pueblo residence and marriage rules originated from an Anasazi proto-culture which contained a matrilineal clan organization. The differences then noted between Western and Eastern Keresans are often considered to be the result of regional culture contact in the latter. It can be argued that there are fewer "basic features" in the social organization of the Eastern Keresan.

This theory has been recently reviewed and challenged by Fox, who presents an argument against the idea that Eastern Keresan features, particularly kinship patterns, may simply be from acculturation (Fox 1972: 72-73). His evidence is taken mainly from the Cochiti, in which he points out the possible neglect in noting a patrilocal and exogamous moiety system that once was typical of the Keres (Fox 1972: 77). His relevant analysis of Cochiti kinship and social organization offers the possibility that this pueblo possessed a dual system of patrimoieties and matriclans. He further suggests that there need not have been a proto-culture in which later acculturation occurred among the Eastern Keres, but rather that this pueblo may not have contained any original moiety system (Fox 1972: 80-85).

The above further supports the possible different nature of Cochiti. A final historic consideration is the magnitude of inter-tribal or pueblo contacts. Stubbs indicates widespread trade between pueblo populations and geographic areas such as Gallina, Mesa Verde, Little Colorado, and the Plains during the Pueblo III time period (Stubbs and Stallings 1953: 154). Trade contacts may also have been made as far away as the southern Sierra and Mexico. The Eastern Pueblos apparently had Caddoan contacts and were historically influenced by the Apache and Comanche (Underhill 1954: 649-651). The Cochiti were extensive traders: north to Taos, east into Oklahoma, south into central New Mexico, and west to Hopi (Lange 1959: 152). Kinship analysis and family name occurrences in the ethnographic population indicate some family histories originating at Pecos Pueblo as well as Hopi (Lange 1959: 407).

Prehistoric Burial Practices

The burial customs of Cochiti Pueblo are included here as another means of positioning this society in relation to other pueblos and to examine the utility of these practices in assessing social organization. Generalizations and questions concerning these practices revolve around the subjects of burial custom and its relationship to status, residence, age and sex preference, and memberships in the society. The answers have been sought in noting region or structural area of interment in the pueblo domain according to sex; burial position; compass orientation; and artifactual inclusions.

The following brief summary of Cochiti data is from two sources: the LA 6455 published information, and the LA 70 personal communication and field notes from Dr. Charles Lange. Some reorganization of LA 6455 data has been personally provided by Michael Spence.

The majority of Cochiti burials were fill interments. The sex distribution in regard to site location for the Early Cochiti (LA 6455) remains appear here as calculations based upon the tabulations by the two workers mentioned above. Percentages estimated from the published source data indicate a total adult burial count of 31 (57 per cent) in pit rooms, 21 (39 per cent) in kivas, and 2 (4 per cent) in the plaza area (Lange 1968: 90-92). A 1970 manuscript prepared by Spence presented a recalculation summary as follows:

	Pit Rooms	Kiva	Plaza
Males	18	11	4
Females	6	7	2
TOTAL	24	18	6
(Per Cent:	50.0	37.5	12.5)

Similar categorizations for the Late Cochiti (LA 70) remains, summarized by this investigator from field note designations, are:

	"Pit"	Kiva	"Primary"
Males	19	7	6
Females	6	3	9
TOTAL	25	10	15
(Per Cent:	50.0	20.0	30.0)

The only difference in proportion between these two Cochiti sub-series is the larger number of Late Cochiti females not classified in a pit room or kiva location. More concise data will be forthcoming when the total Cochiti publication is finalized.

With few exceptions, Cochiti burials are partially-to-fully flexed in position, and there is a preference for the axis of the body to be oriented on an approximate east-west line. In some cases, this alignment differed due to the positioning of the body along particular room walls. Half the burial count show head orientation to the east or west, and the next most common finding was the head to the south. With this orientation, the prone body position occurred twice as often as a side position in the Early Cochiti remains, but there is no significant indication that either the right or left side was a standardized position.

Only one reasonable example of age association with burial location was evident; this is the occurrence of four out of five "old-aged adults" (three males and two females) found in kivas; the one exception was a male.

Referring back to Chapter IV, non-metric observations are random

with no particular trend noted in regard to burial style and place. The blood group data summarized in Table 12--when individually considered by Cochiti sub-series--show a greater frequency of A and B antigenicity in the Early Cochiti. Such antigenicities were mainly among males but do not seem indicative of any cultural selection for burial style or age range.

Hill states that particular pottery elements may indicate membership in residence units and that ceremonial rooms or kivas would not be expected to contain female burials (Hill 1970: 47). In general, there is the expectation that Eastern Pueblo burial customs show preferential burial for various society members (Hill 1970: 58). Among the Cochiti, there were several female burials in kivas.

Cochiti burial practices did include either whole or fragmentary pottery. Sherds were associated with half of the Early Cochiti burials and are in a similar distribution for the Late Cochiti. However, specific identification of burial goods with a particular individual's status is not ascertainable at the time of this study, other than pottery being considered a burial "offering" (Lange 1968: 92).

Comparing the above burial features and practices with other pueblo sites, the Cochiti are similar. The particular burial locations and body positions are like those noted at Paa-ko (Lambert 1954: 164). At Pindi, a similarity likewise exists with the exceptions of a higher preference for a supine body position, no specificity in burial location, and only a 10 per cent occurrence of burials with pottery (Stubbs and Stallings 1953: 143). Pecos, on the other hand, is confusing perhaps because it has some historically late features. Here, the burials show no consistent directional

orientation, and Hooton reported their positions as quite variable. Flexed burials were common, and extended burials were recorded for the late time period. A prone position was a frequent one. Pottery inclusion was also a common occurrence (Hooton 1930: 12). Te'ewi, due to the fact that the skeletal series is that recovered from a burned kiva ("Room 6" or "Kiva I") cannot provide the desired cultural information (Wendorf 1953: 104).

Physical Diversity in Time

For many years, there has been the idea of a basic physical type present in Southwestern prehistoric skeletal populations. This impression has at its foundation Hooton's suggestion of an early Basketmaker type. He further postulated that this particular physical type would generally typify even the earliest New World peoples (Hooton 1930: 357). Further support of an early Basketmaker population or "stock" is found in Seltzer's proposal of a "Southwestern Plateau" physical type; this term is particularly applied to the Anasazi Puebloan population, with its origin assumed to be from the southeastern Utah Basketmaker (Seltzer 1944: 32). Physical characteristics of this type, in addition to the Basketmaker cranio-facial features described in the foregoing section, include a short-statured and stocky body build.

The Pueblo Basketmaker or Southwestern Plateau physical type has of necessity been a routine consideration of workers in evaluating individual prehistoric population skeletal series. This skeletal morphology in population samples appears mainly in an early stratigraphic position, which poses the question as to whether the observation of subsequent morphological changes often noted in later

strata are the result of change in situ or indications of population mixture. Both of these explanations have been utilized in judging temporal osteometric differences.

Seltzer introduced the idea of no change in the Puebloan population's Southwestern Plateau type until late prehistoric times. This would assume a homogeneity beyond the Basketmaker-Pueblo temporal boundary. Indicative of this late morphological dissimilarity from the Southwestern Plateau type is the diversity of the Pecos Pueblo IV remains. Morphological differences within the Pecos Series, and between this group and other skeletal series, have been specifically indicated by multivariate analysis (Giles 1961: 59). There would also appear to be confirmation of long-standing cranio-facial homogeneity in both the Hawikuh Zuni and the Whitewater skeletal series (Seltzer 1944: 8-10; Stewart 1940: 161).

Attempting to assign type or to understand the history of local diversity in the several Rio Grande skeletal series described in recent years produces frustration. Neither the homogeneity of the geographically-peripheral Zuni and Whitewater nor the late heterogeneity at Pecos satisfactorily aids in understanding Rio Grande skeletal history. Although there are more Rio Grande population samples to date than in the 1940's, Seltzer was aware of this regional exception and attributed its skeletal dissimilarity to possible early population contacts. He further suggested the possibility of selection in the history of the biological diversity for this western portion of the river plateau area (Seltzer 1944: 33).

A recent trend has been to more exactingly re-evaluate and report each skeletal series of the various pueblos in the light of

gene pool change mechanisms, i.e., temporal change as a result of gene flow and/or genetic drift. Reed's analysis of the Pecos skeletal material, for example, attributes the skeletal divergence from the Southwestern Plateau type (west of this pueblo) to gene flow from the Plains (Reed 1953: 118). A similar explanation is proposed for the later divergence from the Basketmaker morphology noted in the Te'ewi remains; although the Te'ewi reveal less divergence than the Pecos, Te'ewi crania are particularly more variable than those from the more northern Rio Grande area (Reed 1953: 116-117). Similarly, the skeletal variability recorded for the Puye Series was originally judged by Hrdlička as morphological heterogeneity resulting from population mixture. At Paa-ko, however, there appears to be no evidence of cranial change from mixture in later remains (Rogers 1954: 21).

Rather than late mixture, puebloan prehistoric heterogeneity may well be deeper in time in situ than once thought. This is in opposition to the Southwestern Plateau physical type hypothesis. A recent re-analysis of several puebloan skeletal series rejects the idea of gene pool similarities and focuses on the biological relationships between Puye, Pueblo Bonito, and Hawikuh skeletal remains (Corruccini 1972: 383-385).

It is of interest that prior to the puebloan population movement eastward into the Rio Grande Valley and beyond, there was already a different physical type in southeastern New Mexico. This is indicated by the remains from the Penasco Valley dated at A.D. 900. The Mescalero Apache may be a modern physical type proceeding from this early population (Neumann 1940: 16-19).

CHAPTER VII

SUMMARY AND CONCLUSIONS

The archaeological population of Cochiti Pueblo represents a north central New Mexico Rio Grande Valley peoples that are considered culturally "Eastern Pueblo" and linguistically "Eastern Keres." The occupation time span for this prehistoric population was from A.D. 1300 into the contact period of the A.D. 1500's. Their geographic origin can best be placed to the northwest of their present river valley location near the town of Cochiti; this modern village is approximately 30 miles north of Albuquerque, New Mexico.

In this study, the Cochiti data utilized was selected for its similarity in metrics and observations to that published by other workers in this portion of the Southwestern archaeological region. For comparative purposes, skeletal size and shape data from selected population samples involve remains from the archaeological excavations of Paa-ko, Pecos, Pindi, Te'ewi, Navajo Reservoir District, Hawikuh, and Whitewater. The earlier Navajo District population of northwestern New Mexico and the later Hawikuh Zuni of west central New Mexico are geographically peripheral and not contemporary to the Cochiti; the Whitewater of east central Arizona are not in the same geographic area, although they lived during the same time span. These latter three groups are included in the comparative data, however, to allow a broader perspective in considering the biocultural position of the Eastern Pueblo populations.

The working hypothesis is that the Cochiti adult human remains are not significantly different statistically in either biological or cultural content from other representative population samples of this puebloan region. The subsequent description and discussion will for the most part center around both within and between morphological differences in the skeletal groupings.

As with most descriptions of skeletal series, the Cochiti description is based mainly upon cranio-facial morphology. A general summary of the undeformed male crania as to size and shape presents a cranial vault that is broad, rounded, and high; faces that are broad and high; orbits that are narrow and high; nasal apertures that are medium in breadth; and maxillary dental arch sizes that are medium to broad in length and breadth.

Sexual differences are noted in the total Cochiti Series in that the female maxillo-alveolar shape is slightly broader than that of the males. Also, females have less full facial prognathism but do display a moderate alveolar prognathism greater than the males.

Within the Cochiti Series are two temporal divisions or sub-series: Early Cochiti (LA 6455) and Late Cochiti (LA 70). A metric comparison of males in the sub-series shows differences in size that are also reflected in proportional data. In summary, the Early Cochiti faces are larger as evidenced by wider least frontal and bizygomatic dimensions, longer face projection, higher and longer faces, orbits that are wider and not as high, narrower and longer maxillae of dental arches, and larger mandibles. Of these differences, least frontal breadth, orbital size, and mandibular symphyseal height are statistically significant at the .05 probability level.

Female crania of the same sub-series differ from the Late females in possessing shorter facial segment sizes and narrower maxillo-alveolar regions.

Perhaps the more informative metric comparisons are those between the male undeformed craniometrics of the Cochiti Series and the neighboring skeletal series. In size and shape, the Cochiti cranial vault is particularly smaller and rounder than those from Pecos or Pindi. Except for forehead least frontal width, cranial width is less than in other series.

In facial morphology, the Cochiti Series are medium to broad in cranio-facial proportions, which is also the morphology noted in the Paa-ko and Te'ewi remains. Facial and alveolar prognathism is slightly greater than Paa-ko, Pindi, and Pecos. Nasal aperture shape is narrower and higher than other series, with the exception of Paa-ko. Also, the male crania display longer and narrower maxillo-alveolar regions than found in other series. Compared to Paa-ko and Te'ewi, Cochiti measurement differences show greater face projection in the basion-prosthion line, higher noses, and wider bizygomatic breadths. In general, Cochiti male crania are smaller than Pecos and larger than those of Paa-ko and Te'ewi.

The dimensional differences between Cochiti and the more geographically distant Navajo District, Hawikuh, and Whitewater Series show the Cochiti to be generally smaller in vault size, face projection, and orbital and nasal measurements.

Some of these inter-population sample differences are also statistically significant. Significant differences between Cochiti, Pecos, Paa-ko, and Te'ewi in cranio-facial size and shape are listed

below. Compared to the remaining series, Cochiti crania are more

1. Cochiti significantly <u>smaller</u> than:

	(Measurements)	(Indices)
PECOS	Cranial Length Nasion-Prosthion Gnathion-Nasion Nasal Breadth Maxillo-Alveolar Length Maxillo-Alveolar Breadth	Maxillo-Alveolar
PAA-KO	Nasal Breadth Maxillo-Alveolar Breadth Mandibular Length	Length-Breadth Nasal Maxillo-Alveolar

2. Cochiti significantly <u>larger</u> than:

	(Measurements)	(Indices)
PECOS	None	Length-Breadth Orbital
PAA-KO	Nasal Height	Orbital
TE'EWI	Nasal Height	Zygomatico-Frontal

consistently smaller in size and shape to Hawikuh and Navajo District crania than to Whitewater (see P levels for measurements and indices listed in Table 16 of Chapter V).

Female remains also display some size differences from other cranial series. Broader least frontal and bizygomatic breadths and generally smaller faces are craniometrically noticeable. Particularly, these crania are smaller in mandible size than those found ir the Pecos Series, and their facial heights are similar to those recorded for Paa-ko females.

Cochiti Series male cranio-facial data was utilized in a discriminate function multivariate analysis with Paa-ko and Te'ewi data.

These population samples were selected both for their availability and their completeness of individual data for the craniometric variables selected. In the interpretation of resulting classification matrices, no one of the three cranial series was completely morphologically unique. The Te'ewi Series showed the largest proportion of mis-classified individuals in matrix order comparisons, and the Cochiti the smallest. The resulting statistical analysis as displayed in distribution and canonical plots shows the Cochiti and Paa-ko cranio-facial measurements to be least morphologically distant than either series from the Te'ewi. In indices, however, the Cochiti show their greatest morphological distance from the Paa-ko. On program print-offs showing variable distributions, the Paa-ko and Te'ewi form overlapping distribution clusters separating them diagrammatically from the Cochiti cluster.

The most apparent non-metric observation is that of artificial cranial deformation which includes both fronto-lambdoidal and fronto-occipital forms. The Cochiti Series is higher in its female deformation frequency than usually noted in Southwestern archaeological populations. Within the Cochiti Series, this frequency is highest in the middle-aged females.

The Cochiti crania present a low occurrence of wormian bones, as do the other series in this study when compared to Pecos; here, a high occurrence is most striking.

Other observable differences are that Cochiti nasal roots are slightly deeper, but the nasal concavo-convex profiles are similar to all other series. The occurrence of "guttering" at the nasal aperture base, although low in frequency, has a higher occurrence in

the Late Cochiti. It is of interest that only in the Paa-ko Series is there also a late occurrence of this feature. Adult tooth wear is not dissimilar in form or amount to other series and it ranges from extreme to slight from molars to anterior teeth respectively.

Post-cranial osteometrics and comparisons are limited to long bone lengths, intermembral proportions, and stature estimates. The major long bone lengths are quite similar in a between-series comparison, but the skeletal segment proportions demonstrate Cochiti differences from other series. These differences consist of shorter male and female forearms to total limb length that is statistically significant between the Cochiti and Paa-ko; also, shorter male leg length to total limb length separates the Cochiti from Paa-ko and Te'ewi. This lower limb shortness from knee to ankle is most frequent in the Early Cochiti males. In stature, Cochiti males are taller than other series males, with this difference being statistically significant when comparing Cochiti to Paa-ko and Pecos (keeping in mind that published stature for the latter series was based upon a different formula). There has been the osteometric generalization that Eastern Puebloan remains are taller than Basketmaker. The Cochiti and the other series are consistent with this observation. Female Cochiti stature is similar to that recorded for both Pecos and Paa-ko females.

Long bone lengths and stature were also involved in multivariate analysis. Here, the samples selected were the Early Cochiti, Late Cochiti, and Paa-ko. The canonical plots for this data clearly present an expected unity and overlap of Cochiti sub-series clusters as well as a separation between the Cochiti and Paa-ko data.

The occurrences of skeletal trauma and pathological conditions noted among the Cochiti did not differ from similar observations recorded for the other series. The only exception was in the frequency of spinal osteoarthritis, where both the Cochiti and Paa-ko remains presented higher frequencies than that recorded for Pecos.

This study has also included the occurrence of ABO blood group system antigenicity determined from vertebral bone samples. Serological caution must be taken in interpreting the presence of bone antigenicity, and it has been explained here in regard to controls. ABO antigen specificity for A and B occurs in the Cochiti samples. Earlier work has shown an occurrence of A specificity in Southwestern mummy tissue for the time period prior to the Pueblo phase. Antigen B has not been previously recorded.

A last characterization and comparison is in regard to morphological types and racial variety. Employing the morphological "Types" established by Hooton in describing Pecos variability, these types were given a numerical identification which can be found on page 80. In contrast to the variability seen in Paa-ko and Pecos remains, Cochiti Series contain a higher occurrence of the "Basketmaker" type, i.e., Types No. 1, 2, and 3, referred to together as the percentage of "Archaic" morphology. Similar findings of chronologically older representatives are also noted in the Paa-ko cranial material. When the pooled "Archaic" percentage is compared to the remaining percentage of morphological types and put to the test for significance, the Cochiti percentage is significantly different statistically from both Pecos and Paa-ko. Also, an analysis of variance of the eight type frequencies among the Cochiti, Pecos, and Paa-ko is significant

with a probability level less than .05. Cochiti and Paa-ko together when compared to Pecos show a lesser occurrence of Types No. 4 and 5 and a greater occurrence of Type No. 6. Also, the Cochiti specifically contain less "Plains" variety than that found in the Pecos remains.

The judgment of racial affinity can be formed by comparing Rio Grande population samples to Neumann's "Ashiwid" variety. In this regard, Pecos skeletal remains are most similar to the metric description of the Ashiwid variety, Cochiti and Paa-ko are at a comparative mid-point, and the Te'ewi are the least. In the Cochiti Series, the Ashiwid similarity exists mainly within the Early Cochiti subseries. A suggested historic influence of the Deneid variety in the Southwest has appeared in the literature, and a comparison was also made between this metric expectation and the Cochiti and Paa-ko. In this comparison, the Early Cochiti are metrically closest to this variety in only three unrelated facial measurements. Cochiti and Paa-ko together are similar to the Deneid in only one mandibular measurement. Therefore, it does not seem valid to consider either of these population samples as related historically to Deneid.

The cultural characteristics of the prehistoric Cochiti population are based upon both archaeological and ethnographic information and inferences. The general western origin in the ethnohistory of this population appears reasonable, and puebloan occupation in the Rio Grande location, as indicated by pottery occurrences, could be anywhere from A.D. 1050 to A.D. 1300. Linguistic affiliation does not suggest any other historic link but to the west, and the Eastern Keresan speakers are considered relatively recent in the north central

Rio Grande region. In the reconstruction of social organization assumed to characterize prehistoric Eastern and Western Puebloan societies, the ethnographic Cochiti are typical of the former. Their ceremonial life particularly does not differ from regional puebloan patterns. In considering skeletal interment, the prehistoric burial customs are similar to other pueblo findings, with the exception of the presence of more female kiva burials than usually noted. A summary impression is that the prehistoric population at Cochiti Pueblo was not culturally atypical.

Demographic information represented in mortality curves based upon sex and age ranges show the Cochiti differing greatly from the Paa-ko and Pecos populations only in the "Infant" category. Compared survivorship curves between Cochiti and Pecos indicate a probability of an earlier death for the Cochiti in all age ranges.

The physical anthropology of the prehistoric Cochiti population in their Pueblo III-IV time period can be summarized in nine points. First, the adult remains are not morphologically homogeneous. Second, compared metrically to the skeletal series in this study, the Cochiti are smaller cranio-facially than the nearby Pecos and more peripheral populations of the general north central New Mexico area. Third, in cranial observations the Cochiti are most similar to Paa-ko. Fourth, the Cochiti possess a slightly taller stature than that found in other population samples. Fifth, size and shape descriptive summaries for Cochiti males indicate that they were morphologically unlike the earlier and later skeletal series compared to them, i.e., Navajo District, Hawikuh, and Whitewater. Sixth, in considering morphological types established by Hooton, there is a higher percentage of

"Basketmaker" and "Archaic" cranial types than in other Eastern Pueblo archaeological populations. Seventh, racially the Cochiti and Paa-ko crania are not as morphologically similar to the Ashiwid variety as those from Pecos. This variety has been considered as basic to the Southwestern aboriginal populations. Eighth, the possible "Plains" morphological input into the Cochiti population genetics was probably not as historically influential as it had been in pueblo populations to their east and southeast. Certainly, marriage preference and trade contacts could be involved, but they are not major factors in explaining the Cochiti heterogeneity. Ninth, paleoserological data indicates the presence of both A and B antigenicity in bone samples; the former type has been previously recorded for prepueblo Southwestern mummy tissue, but the latter type is unexpected and unexplained.

In final analysis, the prehistoric Cochiti population strikes one as being biologically conservative in retaining basic Eastern Puebloan features and rather isolated as far as gene flow is concerned. The closest geographical puebloan counterpart at Paa-ko is also closest in skeletal structure. Recently, the biological history and variability of puebloan populations has been reconsidered as to local variation due to trait randomness and mating patterns rather than strong suggestions of natural selection or predominant gene flow (Corruccini 1972). The Cochiti skeletal series and culture can best be considered as another example of specific locale difference among similar circum-Rio Grande Valley prehistoric populations.

APPENDIX

The following comparative data tables provide number, range, mean, and standard deviation for the Cochiti sub-series as well as the population samples used in this work. The tables cover cranio-facial measurements and indices, long bone measurements, stature, and intermembral indices.

TABLE I: CRANIO-FACIAL MEASUREMENTS

No. 1 CRANIAL LENGTH

MALE Series:	No.	Range (Mm.)	Mean (Mm.)	S.D.
Cochiti				
70	2	163-165	164.00	
6455 II-III	2	159-167	163.00	
6455 I	1		157.00	
6462	0			
Paa-ko	0			
Pecos	46	158-198	175.74	8.46
Pindi	4		162.25	
Te'ewi	1		169.99	
Navajo District	2	180-181	180.50	
Hawikuh	34	168-188	175.76	5.48
Whitewater	1		184.00	

FEMALE Series:	No.	Range (Mm.)	Mean (Mm.)	S.D.
Cochiti				
70	1		167.00	
6455 II-III	0			
6455 I	2	155-162	158.50	
6462	0			
Paa-ko	0			
Pecos	26	152-177	163.65	5.98
Pindi	0			
Te'ewi	0			
Hawikuh	0			
Whitewater	1		176.00	

TABLE I: (Continued)

No. 1 CRANIAL LENGTH (DEFORMED)

MALE Series:	No.	Range (Mm.)	Mean (Mm.)	S.D.
Cochiti				
70	3	147-177	158.66	4.69
6455 II-III	2	150-159	154.50	
6455 I	11	143-166	154.63	7.07
6462	0			
Paa-ko	21	144-173	162.57	5.83
Pecos	95	140-187	164.28	8.46
Pindi	4		162.25	
Te'ewi	4	148-170	160.50	11.23
Navajo District	6	151-178	166.66	11.27
Hawikuh	0			
Whitewater	6	162-172	166.83	3.87

FEMALE Series:	No.	Range (Mm.)	Mean (Mm.)	S.D.
Cochiti				
70	4	150-160	153.00	7.87
6455 II-III	1		143.00	
6455 I	5	137-163	148.20	6.56
6462	0			
Paa-ko	5	146-171	160.00	
Pecos	71	144-179	159.66	8.31
Pindi	6		158.00	
Te'ewi	1		170.00	
Hawikuh	0			
Whitewater	9	156-176	161.33	3.87

TABLE I: (Continued)

No. 2 CRANIAL BREADTH

MALE Series:	No.	Range (Mm.)	Mean (Mm.)	S.D.
Cochiti				
70	2	130-134	132.00	
6455 II-III	2	123-138	130.50	
6455 I	2	145-148	143.67	
6462	0			
Paa-ko	0			
Pecos	45	122-150	137.84	6.14
Pindi	0			
Te'ewi	1		130.00	
Navajo District	3	130-135	132.33	2.65
Hawikuh	35	123-145	133.43	5.32
Whitewater	1		136.00	

FEMALE Series:	No.	Range (Mm.)	Mean (Mm.)	S.D.
Cochiti				
70	1		135.00	
6455 II-III	0			
6455 I	2	135-140	137.50	
6462	0			
Paa-ko	0			
Pecos	25	128-150	130.04	6.14
Te'ewi	0			
Hawikuh	0			
Whitewater	1		136.00	

TABLE I: (Continued)

No. 2 CRANIAL BREADTH (DEFORMED)

MALE Series:	No.	Range (Mm.)	Mean (Mm.)	S.D.
Cochiti				
70	3	138-147	143.67	5.00
6455 II-III	1		142.00	
6455 I	12	135-156	144.25	5.75
6462	1		151.00	
Paa-ko	21	130-157	142.52	8.00
Pecos	91	132-159	145.43	6.13
Pindi	3		145.00	
Te'ewi	3	135-156	143.33	11.18
Navajo District	6	131-147	138.66	7.42
Hawikuh	0			
Whitewater	6	139-148	143.33	3.16

FEMALE Series:	No.	Range (Mm.)	Mean (Mm.)	S.D.
Cochiti				
70	4	136-142	139.00	2.64
6455 II-III	1		140.00	
6455 I	5	130-149	143.60	7.81
6462	0			
Paa-ko	5	120-138	132.00	
Pecos	68	121-154	141.35	5.43
Pindi	6		139.00	
Te'ewi	1		121.00	
Hawikuh	0			
Whitewater	9	136-150	143.33	3.16

TABLE I: (Continued)

No. 3 CRANIAL HEIGHT: BASION-BREGMA

MALE Series:	No.	Range (Mm.)	Mean (Mm.)	S.D.
Cochiti				
70	1		132.00	
6455 II-III	1		152.00	
6455 I	0			
6462	0			
Paa-ko	0			
Pecos	34	121-152	137.14	6.49
Pindi	0			
Te'ewi	1		132.00	
Navajo District	3	131-137	134.33	3.16
Hawikuh	30	127-142	133.53	3.70
Whitewater	1		140.00	

FEMALE Series:	No.	Range (Mm.)	Mean (Mm.)	S.D.
Cochiti				
70	0			
6455 II-III	0			
6455 I	2		135.00	
6462	0			
Paa-ko	0			
Pecos	21	127-143	133.90	4.03
Pindi	0			
Te'ewi	0			
Hawikuh	0			
Whitewater	1		122.00	

TABLE I: (Continued)

No. 3 CRANIAL HEIGHT: BASION-BREGMA (DEFORMED)

MALE Series:	No.	Range (Mm.)	Mean (Mm.)	S.D.
Cochiti				
70	1		142.00	
6455 II-III	0			
6455 I	8	131-151	139.25	7.00
6462	1		140.00	
Paa-ko	19	116-146	136.26	6.56
Pecos	80	129-156	140.69	5.23
Pindi	4		140.69	
Te'ewi	3	140-143	141.66	1.41
Navajo District	6	128-141	134.33	5.66
Hawikuh	0			
Whitewater	4	135-136	135.50	

FEMALE Series:	No.	Range (Mm.)	Mean (Mm.)	S.D.
Cochiti				
70	3	131-135	132.33	2.64
6455 II-III	1		130.00	
6455 I	4	138-142	139.50	2.00
6462	0			
Paa-ko	4	122-138	128.00	
Pecos	55	127-148	135.24	4.00
Pindi	5		132.20	
Hawikuh	0			
Whitewater	7	128-144	135.00	3.60

TABLE I: (Continued)

No. 4 AURICULAR HEIGHT

MALE Series:	No.	Range (Mm.)	Mean (Mm.)	S.D.
Cochiti				
70	1		106.00	
6455 II-III	2	117-136	126.50	
6455 I	1		130.00	
6462	0			
Paa-ko	0			
Pecos	0			
Pindi	0			
Te'ewi	0			
Navajo District	2	116-121	118.50	
Hawikuh	0			
Whitewater	0			

FEMALE Series:	No.	Range (Mm.)	Mean (Mm.)	S.D.
Cochiti				
70	0			
6455 II-III	0			
6455 I	2	120-126	123.00	
6462	0			
Paa-ko	0			
Pecos	0			
Pindi	0			
Te'ewi	0			
Hawikuh	0			
Whitewater	0			

TABLE I: (Continued)

No. 4 AURICULAR HEIGHT (DEFORMED)

MALE Series:	No.	Range (Mm.)	Mean (Mm.)	S.D.
Cochiti				
70	1		130.00	
6455 II-III	0			
6455 I	8	115-138	127.00	7.00
6462	1		125.00	
Paa-ko	0			
Pecos	0			
Pindi	0			
Te'ewi	0			
Navajo District	5	110-123	114.20	5.30
Hawikuh	0			
Whitewater	0			

FEMALE Series:	No.	Range (Mm.)	Mean (Mm.)	S.D.
Cochiti				
70	4	111-120	116.50	3.36
6455 II-III	1		121.00	
6455 I	2		122.00	
6462	0			
Paa-ko	0			
Pecos	0			
Pindi	0			
Te'ewi	0			
Hawikuh	0			
Whitewater	0			

TABLE I: (Continued)

No. 5 LEAST FRONTAL BREADTH

MALE Series:	No.	Range (Mm.)	Mean (Mm.)	S.D.
Cochiti				
70	8	80-100	98.50	6.33
6455 II-III	3	94-98	95.66	2.24
6455 I	17	87-105	96.06	1.73
6462	1		88.00	
Paa-ko	20	81-100	92.50	3.61
Pecos	143	82-112	94.93	5.55
Pindi	5		94.20	
Te'ewi	6	85-97	90.50	4.12
Navajo District	9	87-97	92.00	2.83
Hawikuh	0			
Whitewater	7	91-97	93.71	2.00

FEMALE Series:	No.	Range (Mm.)	Mean (Mm.)	S.D.
Cochiti				
70	6	86-97	91.50	3.00
6455 II-III	1		87.00	
6455 I	8	85-93	89.89	2.45
6462	0			
Paa-ko	6	82-101	90.67	
Pecos	95	82-104	92.41	4.54
Pindi	7		90.71	
Te'ewi	2	90-92	91.00	
Hawikuh	0			
Whitewater	11	86-93	89.09	2.83

TABLE I: (Continued)

No. 6 BIZYGOMATIC BREADTH

MALE Series:	No.	Range (Mm.)	Mean (Mm.)	S.D.
Cochiti				
70	6	120-148	131.33	9.70
6455 II-III	2	130-131	130.50	
6455 I	10	123-145	135.00	6.63
6462	1		135.00	
Paa-ko	19	118-147	133.00	7.00
Pecos	102	120-161	138.56	6.17
Pindi	1		135.00	
Te'ewi	7	128-149	135.70	7.81
Navajo District	9	125-140	133.33	4.24
Hawikuh	31	125-145	134.45	4.16
Whitewater	6	126-144	136.16	2.24

FEMALE Series:	No.	Range (Mm.)	Mean (Mm.)	S.D.
Cochiti				
70	4	120-127	124.75	3.16
6455 II-III	0			
6455 I	6	121-137	129.00	5.66
6462	0			
Paa-ko	5	100-130	119.20	
Pecos	68	118-138	129.87	3.36
Pindi	2		123.00	
Te'ewi	1		124.00	
Hawikuh	0			
Whitewater	11	121-136	126.20	2.24

TABLE I: (Continued)

No. 7 BASION-NASION LINE

MALE Series:	No.	Range (Mm.)	Mean (Mm.)	S.D.
Cochiti				
70	5	91-100	97.00	3.74
6455 II-III	1		102.00	
6455 I	8	88-104	98.25	4.80
64621	1		98.00	
Paa-ko	9	73-104	95.47	7.68
Pecos	94	92-110	101.89	3.67
Pindi	4		99.00	
Te'ewi	6	95-101	97.10	2.45
Navajo District	7	96-104	98.42	3.32
Hawikuh	27	92-110	99.48	4.19
Whitewater	5	98-104	100.60	2.24

FEMALE Series:	No.	Range (Mm.)	Mean (Mm.)	S.D.
Cochiti				
70	3	95-97	96.00	1.00
6455 II-III	1		87.00	
6455 I	7	93-99	95.43	2.00
6462	0			
Paa-ko	5	73-96	88.40	
Pecos	61	89-108	97.31	4.00
Pindi	6		95.50	
Te'ewi	1		102.00	
Hawikuh	0			
Whitewater	8	91-98	94.12	2.45

TABLE I: (Continued)

No. 8 BASION-NASOSPINALE LINE

MALE Series:	No.	Range (Mm.)	Mean (Mm.)	S.D.
Cochiti				
70	4	83-94	98.25	4.80
6455 II-III	1		96.00	
6455 I	7	87-93	90.42	2.00
6462	1		84.00	
Paa-ko	0			
Pecos	0			
Pindi	0			
Te'ewi	0			
Navajo District	0			
Hawikuh	0			
Whitewater	5	84-88	85.80	1.73

FEMALE Series:	No.	Range (Mm.)	Mean (Mm.)	S.D.
Cochiti				
70	3	88-90	89.00	.60
6455 II-III	1		80.00	
6455 I	5	84-90	87.01	3.00
6462	0			
Paa-ko	0			
Pecos	0			
Pindi	0			
Te'ewi	0			
Hawikuh	0			
Whitewater	8	76-84	80.25	3.34

TABLE I: (Continued)

No. 9 BASION-PROSTHION LINE

MALE Series:	No.	Range (Mm.)	Mean (Mm.)	S.D.
Cochiti				
70	4	87-97	93.50	4.58
6455 II-III	1		106.00	
6455 I	7	93-100	96.44	2.83
6462	1		91.00	
Paa-ko	18	79-104	92.89	3.62
Pecos	90	91-106	97.80	3.59
Pindi	4		95.25	
Te'ewi	6	90-101	96.00	3.87
Navajo District	7	86-107	94.42	6.16
Hawikuh	23	86-114	98.00	5.60
Whitewater	5	95-99	97.40	1.73

FEMALE Series:	No.	Range (Mm.)	Mean (Mm.)	S.D.
Cochiti				
70	3	93-94	93.33	.50
6455 II-III	1		84.00	
6455 I	5	86-94	89.60	3.00
6462	0			
Paa-ko	5	70-98	88.20	
Pecos	61	85-107	95.05	4.75
Pindi	5		92.40	
Te'ewi	1		93.00	
Hawikuh	0			
Whitewater	7	88-95	92.42	3.00

TABLE I: (Continued)

No. 10 NASION-GNATHION LINE

MALE Series:	No.	Range (Mm.)	Mean (Mm.)	S.D.
Cochiti				
70	8	99-117	110.62	7.55
6455 II-III	3	115-116	115.33	1.00
6455 I	15	106-132	116.13	7.14
6462	1		116.00	
Paa-ko	13	109-123	114.38	3.46
Pecos	107	107-135	119.38	5.54
Pindi	3		119.67	
Te'ewi	6	108-120	115.00	3.87
Navajo District	9	99-123	116.44	7.81
Hawikuh	29	113-134	121.90	4.18
Whitewater	7	114-123	117.14	3.16

FEMALE Series:	No.	Range (Mm.)	Mean (Mm.)	S.D.
Cochiti				
70	4	109-112	110.75	4.80
6455 II-III	1		113.00	
6455 I	5	96-116	107.01	8.06
6462	0			
Paa-ko	3	90-103	98.00	
Pecos	71	100-125	113.31	5.70
Pindi	6		106.67	
Te'ewi	2	105-114	109.50	
Hawikuh	0			
Whitewater	10	109-124	114.30	1.41

TABLE I: (Continued)

No. 11 NASION-PROSTHION LINE

MALE Series:	No.	Range (Mm.)	Mean (Mm.)	S.D.
Cochiti				
70	13	60-73	66.30	4.47
6455 II-III	3	67-73	79.66	2.45
6455 I	16	63-79	78.00	4.70
6462	1		71.00	
Paa-ko	20	60-74	68.75	3.74
Pecos	112	64-84	72.85	3.95
Pindi	4		75.00	
Te'ewi	7	62-73	78.00	3.74
Navajo District	9	64-74	70.11	3.00
Hawikuh	32	66-81	73.34	3.45
Whitewater	7	69-73	71.00	1.73

FEMALE Series:	No.	Range (Mm.)	Mean (Mm.)	S.D.
Cochiti				
70	5	64-78	67.80	5.92
6455 II-III	1		59.00	
6455 I	7	60-68	64.00	2.65
6462	0			
Paa-ko	6	52-69	62.50	
Pecos	75	59-77	69.04	3.40
Pindi	6		67.17	
Te'ewi	2	63-65	64.00	
Hawikuh	0			
Whitewater	10	63-73	68.60	2.83

TABLE I: (Continued)

No. 12 NASAL HEIGHT

MALE Series:	No.	Range (Mm.)	Mean (Mm.)	S.D.
Cochiti				
70	15	47-60	51.26	3.61
6455 II-III	3	47-51	50.33	3.32
6455 I	16	46-56	51.62	2.83
6462	1		51.00	
Paa-ko	21	44-54	49.10	2.24
Pecos	125	45-57	50.96	2.74
Pindi	4		51.00	
Te'ewi	7	43-51	48.00	2.65
Navajo District	9	46-51	48.77	2.24
Hawikuh	32	46-56	50.97	2.23
Whitewater	7	47-52	50.28	2.86

FEMALE Series:	No.	Range (Mm.)	Mean (Mm.)	S.D.
Cochiti				
70	5	49-51	50.00	.22
6455 II-III	1		44.00	
6455 I	8	47-54	50.50	2.24
6462	0			
Paa-ko	6	36-51	44.33	
Pecos	86	43-53	48.20	2.24
Pindi	7		46.57	
Te'ewi	2	46-50	48.00	
Hawikuh	0			
Whitewater	11	44-53	47.63	2.45

TABLE I: (Continued)

No. 13 NASAL BREADTH

MALE Series:	No.	Range (Mm.)	Mean (Mm.)	S.D.
Cochiti				
70	15	22-26	24.33	1.41
6455 II-III	3	23-24	23.33	.50
6455 I	18	21-28	24.37	2.00
6462	1		26.00	
Paa-ko	20	23-29	25.55	1.41
Pecos	126	21-30	25.80	1.57
Pindi	4		24.75	
Te'ewi	7	22-27	24.20	1.73
Navajo District	9	23-30	26.77	2.24
Hawikuh	32	22-28	25.16	1.51
Whitewater	7	24-27	25.14	1.16

FEMALE Series:	No.	Range (Mm.)	Mean (Mm.)	S.D.
Cochiti				
70	7	21-28	23.42	2.65
6455 II-III	1		22.00	
6455 I	9	21-28	23.78	2.45
6462	0			
Paa-ko	6	22-25	24.33	
Pecos	86	21-30	25.33	1.83
Pindi	7		25.00	
Te'ewi	2	23-24	23.50	
Hawikuh	0			
Whitewater	11	22-26	23.90	1.41

TABLE I: (Continued)

No. 14 INTERORBITAL BREADTH

MALE Series:	No.	Range (Mm.)	Mean (Mm.)	S.D.
Cochiti				
70	15	20-28	23.13	2.24
6455 II-III	3	23-25	24.00	1.00
6455 I	18	19-29	24.11	2.00
6462	1		24.00	
Paa-ko	0			
Pecos	0			
Pindi	4		21.00	
Te'ewi	7	20-26	23.40	2.24
Navajo District	7	23-42	27.28	6.71
Hawikuh	0			
Whitewater	0			

FEMALE Series:	No.	Range (Mm.)	Mean (Mm.)	S.D.
Cochiti				
70	6	21-26	24.16	1.73
6455 II-III	1		23.00	
6455 I	11	21-24	22.55	1.00
6462	0			
Paa-ko	0			
Pecos	0			
Pindi	7		20.86	
Te'ewi	1		23.50	
Hawikuh	0			
Whitewater	0			

TABLE I: (Continued)

No. 15 ORBITAL HEIGHT

MALE Series:	No.	Range (Mm.)	Mean (Mm.)	S.D.
Cochiti				
70	14	32-27	34.28	1.73
6455 II-III	3	32-34	32.67	1.41
6455 I	18	32-40	33.56	2.65
6462	1		35.00	
Paa-ko	20	32-39	34.60	1.73
Pecos	117	30-38	34.90	1.60
Pindi	4		35.50	
Te'ewi	7	31-35	32.70	1.41
Navajo District	9	31-38	35.33	2.65
Hawikuh	30	32-39	35.09	1.58
Whitewater	7	30-37	34.15	2.45

FEMALE Series:	No.	Range (Mm.)	Mean (Mm.)	S.D.
Cochiti				
70	8	30-36	33.75	2.00
6455 II-III	2	32-35	33.50	
6455 I	10	30-36	34.00	2.24
6462	0			
Paa-ko	6	31-36	33.33	
Pecos	78	29-41	34.49	1.85
Pindi	7		34.14	
Te'ewi	1		34.00	
Hawikuh	0			
Whitewater	10	29-35	32.60	2.00

TABLE I: (Continued)

No. 16 ORBITAL BREADTH

MALE Series:	No.	Range (Mm.)	Mean (Mm.)	S.D.
Cochiti				
70	15	30-40	35.80	2.24
6455 II-III	3	35-38	36.33	1.73
6455 I	17	36-41	37.76	1.73
6462	1		36.00	
Paa-ko	20	36-40	38.25	1.73
Pecos	117	35-49	39.47	1.89
Pindi	3		40.00	
Te'ewi	7	34-40	36.00	2.00
Navajo District	9	37-41	39.22	1.41
Hawikuh	30	34-41	37.75	1.14
Whitewater	7	35-42	38.69	2.24

FEMALE Series:	No.	Range (Mm.)	Mean (Mm.)	S.D.
Cochiti				
70	9	33-38	36.33	1.73
6455 II-III	1		32.00	
6455 I	11	34-40	36.64	2.00
6462	0			
Paa-ko	6	34-38	36.50	
Pecos	77	34-42	38.14	1.46
Pindi	6		37.33	
Te'ewi	2		37.00	
Hawikuh	0			
Whitewater	10	34-39	36.20	1.41

TABLE I: (Continued)

No. 17 MAXILLO-ALVEOLAR LENGTH

MALE Series:	No.	Range (Mm.)	Mean (Mm.)	S.D.
Cochiti				
70	13	47-57	51.61	2.83
6455 II-III	3	50-58	53.00	4.36
6455 I	19	50-62	53.42	3.00
6462	1		50.00	
Paa-ko	16	46-55	51.50	2.45
Pecos	100	48-63	55.04	2.82
Pindi	4		54.50	
Te'ewi	6	48-58	54.00	3.61
Navajo District	7	51-60	55.85	3.16
Hawikuh	27	48-59	54.22	2.74
Whitewater	7	51-55	52.85	2.43

FEMALE Series:	No.	Range (Mm.)	Mean (Mm.)	S.D.
Cochiti				
70	8	48-54	50.62	2.00
6455 II-III	1		45.00	
6455 I	10	43-56	49.20	3.74
6462	0			
Paa-ko	5	38-55	48.20	
Pecos	66	48-61	53.97	2.72
Pindi	4		51.75	
Te'ewi	2		52.00	
Hawikuh	0			
Whitewater	10	48-56	51.90	2.24

TABLE I: (Continued)

No. 18 MAXILLO-ALVEOLAR BREADTH

MALE Series:	No.	Range (Mm.)	Mean (Mm.)	S.D.
Cochiti				
70	16	44-66	58.75	5.66
6455 II-III	3	55-66	60.67	4.58
6455 I	21	50-71	59.95	5.20
6462	1		55.00	
Paa-ko	15	57-69	62.63	3.00
Pecos	97	58-73	65.59	3.29
Pindi	3		67.33	
Te'ewi	6	61-67	63.00	3.74
Navajo District	7	57-75	64.85	5.57
Hawikuh	27	59-71	64.74	2.93
Whitewater	6	61-69	65.50	3.00

FEMALE Series:	No.	Range (Mm.)	Mean (Mm.)	S.D.
Cochiti				
70	8	51-62	58.25	4.00
6455 II-III	0			
6455 I	10	47-61	56.70	4.47
6462	0			
Paa-ko	6	56-68	61.17	
Pecos	66	55-69	62.74	2.69
Pindi	3		62.33	
Te'ewi	2	52-53	52.50	
Hawikuh	0			
Whitewater	9	58-69	63.33	3.61

TABLE I: (Continued)

No. 19 BICONDYLAR BREADTH

MALE Series:	No.	Range (Mm.)	Mean (Mm.)	S.D.
Cochiti				
70	2	113-114	113.50	
6455 II-III	2	115-123	119.00	
6455 I	9	112-131	120.23	5.20
6462	0			
Paa-ko	14	104-127	117.86	6.48
Pecos	83	109-138	122.34	6.14
Pindi	1		125.00	
Te'ewi	5	108-123	115.20	6.93
Navajo District	7	114-124	118.42	3.88
Hawikuh	0			
Whitewater	0			

FEMALE Series:	No.	Range (Mm.)	Mean (Mm.)	S.D.
Cochiti				
70	4	112-118	114.25	2.24
6455 II-III	2	104-122	113.00	
6455 I	4	108-120	113.50	5.00
6462	1		108.00	
Paa-ko	3	91-112	102.33	
Pecos	48	103-128	115.27	6.12
Pindi	2		111.50	
Te'ewi	2	90-107	98.50	
Hawikuh	0			
Whitewater	0			

TABLE I: (Continued)

No. 20 BIGONIAL BREADTH

MALE Series:	No.	Range (Mm.)	Mean (Mm.)	S.D.
Cochiti				
70	5	84-100	91.00	6.40
6455 II-III	3	91-98	94.33	3.46
6455 I	10	73-105	92.20	9.80
6462	1		87.00	
Paa-ko	14	87-116	97.79	8.00
Pecos	102	88-117	101.56	7.11
Pindi	1		102.00	
Te'ewi	0			
Navajo District	7	92-110	101.42	6.71
Hawikuh	0			
Whitewater	0			

FEMALE Series:	No.	Range (Mm.)	Mean (Mm.)	S.D.
Cochiti				
70	4	80-89	84.75	3.74
6455 II-III	2	76-95	85.50	
6455 I	5	76-95	83.60	7.21
6462	2	88-90	89.00	
Paa-ko	3	73-93	84.67	
Pecos	62	83-109	94.47	5.37
Pindi	2		91.50	
Te'ewi	2	90-107	98.50	
Hawikuh	0			
Whitewater	0			

TABLE I: (Continued)

No. 21 RAMUS HEIGHT

MALE Series:	No.	Range (Mm.)	Mean (Mm.)	S.D.
Cochiti				
70	14	47-60	55.14	3.46
6455 II-III	3	55-63	58.00	4.35
6455 I	19	47-68	55.84	5.29
6462	1		60.00	
Paa-ko	15	50-67	59.27	4.47
Pecos	116	48-78	62.83	6.01
Pindi	0			
Te'ewi	0			
Navajo District	0			
Hawikuh	0			
Whitewater	0			

FEMALE Series:	No.	Range (Mm.)	Mean (Mm.)	S.D.
Cochiti				
70	9	46-58	51.66	3.61
6455 II-III	3	45-55	50.66	5.09
6455 I	10	45-67	54.30	6.00
6462	2	50-55	52.50	
Paa-ko	4	42-53	49.75	
Pecos	79	46-65	55.02	4.06
Pindi	0			
Te'ewi	0			
Hawikuh	0			
Whitewater	0			

TABLE I: (Continued)

No. 22 RAMUS BREADTH: MINIMUM

MALE Series:	No.	Range (Mm.)	Mean (Mm.)	S.D.
Cochiti				
70	16	30-40	35.68	2.65
6455 II-III	2	35-37	36.00	.50
6455 I	20	31-42	36.05	3.16
6462	2	38-39	38.50	
Paa-ko	15	31-39	35.93	2.24
Pecos	125	30-44	36.92	2.90
Pindi	4		34.75	
Te'ewi	0			
Navajo District	5	32-37	33.80	2.24
Hawikuh	0			
Whitewater	0			

FEMALE Series:	No.	Range (Mm.)	Mean (Mm.)	S.D.
Cochiti				
70	9	32-40	34.55	2.45
6455 II-III	3	31-32	31.66	
6455 I	10	30-38	34.40	2.65
6462	2		34.00	
Paa-ko	4	30-33	31.25	
Pecos	85	29-43	35.75	2.44
Pindi	6		33.67	
Te'ewi	0			
Hawikuh	0			
Whitewater	0			

TABLE I: (Continued)

No. 23 SYMPHYSEAL HEIGHT

MALE Series:	No.	Range (Mm.)	Mean (Mm.)	S.D.
Cochiti				
70	10	26-37	31.40	3.46
6455 II-III	3		33.00	
6455 I	23	30-40	34.04	2.45
6462	2	30-35	32.50	
Paa-ko	16	27-39	32.56	3.00
Pecos	102	29-43	35.40	2.50
Pindi	3		36.00	
Te'ewi	5	31-36	33.33	2.45
Navajo District	7	27-37	34.57	3.47
Hawikuh	30	31-43	36.53	2.65
Whitewater	0			

FEMALE Series:	No.	Range (Mm.)	Mean (Mm.)	S.D.
Cochiti				
70	8	28-35	31.50	2.24
6455 II-III	2		29.00	
6455 I	9	26-33	30.68	2.24
6462	1		29.00	
Paa-ko	4	25-32	28.25	
Pecos	79	28-41	33.65	2.59
Pindi	6		30.83	
Te'ewi	2	27-28	27.50	
Hawikuh	0			
Whitewater	0			

TABLE I: (Continued)

No. 24 MANDIBULAR BODY HEIGHT

MALE Series:	No.	Range (Mm.)	Mean (Mm.)	S.D.
Cochiti				
70	13	26-44	29.84	2.45
6455 II-III	3	26-34	30.33	4.00
6455 I	23	21-37	30.17	3.32
6462	1		30.00	
Paa-ko	0			
Pecos	0			
Pindi	0			
Te'ewi	0			
Navajo District	0			
Hawikuh	0			
Whitewater	0			

FEMALE Series:	No.	Range (Mm.)	Mean (Mm.)	S.D.
Cochiti				
70	7	22-30	27.00	2.83
6455 II-III	1		25.00	
6455 I	8	24-30	27.13	2.00
6462	0			
Paa-ko	0			
Pecos	0			
Pindi	0			
Te'ewi	0			
Hawikuh	0			
Whitewater	0			

TABLE I: (Continued)

No. 25 MANDIBULAR BODY THICKNESS

MALE Series:	No.	Range (Mm.)	Mean (Mm.)	S.D.
Cochiti				
70	17	13-19	16.05	2.00
6455 II-III	3	15-16	15.33	1.00
6455 I	23	15-19	16.48	2.00
6462	2	17-19	18.00	
Paa-ko	0			
Pecos	0			
Pindi	5		14.60	
Te'ewi	0			
Navajo District	0			
Hawikuh	0			
Whitewater	0			

FEMALE Series:	No.	Range (Mm.)	Mean (Mm.)	S.D.
Cochiti				
70	8	11-18	14.62	2.24
6455 II-III	2	14-17	15.50	
6455 I	8	12-17	15.00	1.41
6462	0			
Paa-ko	0			
Pecos	0			
Pindi	4		13.25	
Te'ewi	0			
Hawikuh	0			
Whitewater	0			

TABLE I: (Continued)

No. 26 MANDIBULAR LENGTH

MALE Series:	No.	Range (Mm.)	Mean (Mm.)	S.D.
Cochiti				
70	9	72-80	75.55	2.45
6455 II-III	3	76-83	79.67	2.64
6455 I	14	68-85	77.78	5.39
6462	1		83.00	
Paa-ko	14	70-89	79.07	4.47
Pecos	0			
Pindi	0			
Te'ewi	0			
Navajo District	0			
Hawikuh	0			
Whitewater	0			

FEMALE Series:	No.	Range (Mm.)	Mean (Mm.)	S.D.
Cochiti				
70	7	65-78	72.57	4.80
6455 II-III	3	72-82	77.33	5.00
6455 I	8	65-88	74.38	7.35
6462	2	70-80	75.00	
Paa-ko	4	61-73	70.00	
Pecos	0			
Pindi	0			
Te'ewi	0			
Hawikuh	0			
Whitewater	0			

TABLE II: CRANIO-FACIAL INDICES

No. 1 CRANIAL MODULE

MALE Series:	No.	Range	Mean	S.D.
Cochiti				
70	2	142-147	145.50	
6455 II-III	1		149.00	
6455 I	8	140-153	145.62	4.83
6462	1		150.33	
Paa-ko	19	139-155	147.23	4.24
Pecos	113	136-163	149.50	4.54
Pindi	4		147.67	
Te'ewi	4	143-148	146.50	2.09
Navajo District	9	144-150	147.33	2.00
Hawikuh	30	142-153	147.60	3.12
Whitewater	5	146-153	149.26	2.20

FEMALE Series:	No.	Range	Mean	S.D.
Cochiti				
70	3	141-143	141.76	1.00
6455 II-III	1		137.67	
6455 I	6	140-151	144.66	3.53
6462	0			
Paa-ko	4	133-147	138.75	
Pecos	72	140-153	145.00	3.03
Pindi	6		143.00	
Te'ewi	1		143.67	
Hawikuh	0			
Whitewater	8	146-151	145.75	6.57

TABLE II: (Continued)

No. 2 LENGTH-BREADTH INDEX

MALE Series:	No.	Range	Mean	S.D.
Cochiti				
70	2	80-81	80.50	
6455 II-III	2	74-87	80.50	
6455 I	2	90-92	91.00	
6462	0			
Paa-ko	0			
Pecos	43	78-88	78.30	4.81
Pindi	0			
Te'ewi	1		77.00	
Navajo District	3	72-73	72.66	1.00
Hawikuh	34	68-84	75.91	4.01
Whitewater	1		73.91	

FEMALE Series:	No.	Range	Mean	S.D.
Cochiti				
70	1		81.00	
6455 II-III	0			
6455 I	2	93-94	93.50	
6462	0			
Paa-ko	0			
Pecos	25	76-96	84.32	5.96
Pindi	0			
Te'ewi	0			
Hawikuh	0			
Whitewater	1		77.30	

TABLE II: (Continued)

No. 2 LENGTH-BREADTH INDEX (DEFORMED)

MALE Series:	No.	Range	Mean	S.D.
Cochiti				
70	2	94-97	95.50	
6455 II-III	1		95.00	
6455 I	10	84-102	93.70	5.66
6462	1		94.00	
Paa-ko	21	74-96	87.96	7.07
Pecos	91	73-102	88.93	6.30
Pindi	3		90.33	
Te'ewi	2	90-105	97.50	
Navajo District	6	75-97	83.83	10.25
Hawikuh	0			
Whitewater	6	81-89	86.93	2.83

FEMALE Series:	No.	Range	Mean	S.D.
Cochiti				
70	4	85-95	91.00	
6455 II-III	1		98.00	
6455 I	5	90-106	96.80	6.48
6462	0			
Paa-ko	5	76-91	82.66	
Pecos	68	68-104	88.90	6.53
Pindi	6		88.17	
Te'ewi	1		71.17	
Hawikuh	0			
Whitewater	9	83-93	88.88	3.16

TABLE II: (Continued)

No. 3 LENGTH-HEIGHT INDEX

MALE Series:	No.	Range	Mean	S.D.
Cochiti				
70	1		81.00	
6455 II-III	1		97.00	
6455 I	0			
6462	0			
Paa-ko	0			
Pecos	34	70-89	87.11	3.95
Pindi	0			
Te'ewi	1		78.00	
Navajo District	3	71-76	74.00	2.45
Hawikuh	30	69-81	76.10	2.76
Whitewater	1		76.08	

FEMALE Series:	No.	Range	Mean	S.D.
Cochiti				
70	0			
6455 II-III	0			
6455 I	2	83-87	85.00	
6462	0			
Paa-ko	0			
Pecos	21	76-88	82.00	3.36
Pindi	0			
Te'ewi	0			
Hawikuh	0			
Whitewater	1		69.31	

TABLE II: (Continued)

No. 3 LENGTH-HEIGHT INDEX (DEFORMED)

MALE Series	No.	Range	Mean	S.D.
Cochiti				
70	1		93.00	
6455 II-III	0			
6455 I	8	87-99	91.00	3.74
6462	1		87.00	
Paa-ko	19	69-91	84.34	6.00
Pecos	80	72-101	85.78	5.10
Pindi	4		83.75	
Te'ewi	3	82-96	90.33	
Navajo District	6	74-94	81.50	7.87
Hawikuh	0			
Whitewater	4	78-83	81.00	2.45

FEMALE Series:	No.	Range	Mean	S.D.
Cochiti				
70	3	84-90	87.00	3.00
6455 II-III	1		91.00	
6455 I	4	87-101	94.00	5.56
6462	0			
Paa-ko	4	79-84	81.75	
Pecos	55	75-95	85.14	4.36
Pindi	5		84.00	
Te'ewi	1		82.35	
Hawikuh	0			
Whitewater	7	80-90	84.00	3.32

TABLE II: (Continued)

No. 4 LENGTH-AURICULAR HEIGHT INDEX

MALE Series:	No.	Range	Mean	S.D.
Cochiti				
70	1		65.00	
6455 II-III	2	70-86	78.00	
6455 I	1		83.00	
6462	0			
Paa-ko	0			
Pecos	0			
Pindi	0			
Te'ewi	0			
Navajo District	2	75-76	75.50	
Hawikuh	0			
Whitewater	0			

FEMALE Series:	No.	Range	Mean	S.D.
Cochiti				
70	0			
6455 II-III	0			
6455 I	2		78.00	
6462	0			
Paa-ko	0			
Pecos	0			
Pindi	0			
Te'ewi	0			
Hawikuh	0			
Whitewater	0			

TABLE II: (Continued)

No. 4 LENGTH-AURICULAR HEIGHT INDEX (DEFORMED)

MALE Series:	No.	Range	Mean	S.D.
Cochiti				
70	1		88.00	
6455 II-III	0			
6455 I	8	74-91	83.00	6.33
6462	1		78.00	
Paa-ko	0			
Pecos	0			
Pindi	0			
Te'ewi	0			
Navajo District	5	74-93	79.40	8.37
Hawikuh	0			
Whitewater	0			

FEMALE Series:	No.	Range	Mean	S.D.
Cochiti				
70	4	73-80	76.00	3.83
6455 II-III	1		85.00	
6455 1	3	80-88	85.33	3.60
6462	0			
Paa-ko	0			
Pecos	0			
Pindi	0			
Te'ewi	0			
Hawikuh	0			
Whitewater	0			

TABLE II: (Continued)

No. 5 BREADTH-HEIGHT INDEX

MALE Series:	No.	Range	Mean	S.D.
Cochiti				
70	1		102.00	
6455 II-III	1		110.00	
6455 I	0			
6462	0			
Paa-ko	0			
Pecos	33	89-111	93.33	4.70
Pindi	0			
Te'ewi	1		102.00	
Navajo District	2	102-105	103.50	
Hawikuh	30	93-110	100.23	4.58
Whitewater	1		102.94	

FEMALE Series:	No.	Range	Mean	S.D.
Cochiti				
70	0			
6455 II-III	0			
6455 I	1		100.00	
6462	0			
Paa-ko	0			
Pecos	21	90-104	97.67	4.16
Pindi	0			
Te'ewi	0			
Hawikuh	0			
Whitewater	1		88.27	

TABLE II: (Continued)

No. 5 BREADTH-HEIGHT INDEX (DEFORMED)

MALE Series:	No.	Range	Mean	S.D.
Cochiti				
70	1		96.00	
6455 II-III	0			
6455 I	8	91-103	96.62	
6462	1		93.00	
Paa-ko	19	85-103	95.11	4.47
Pecos	78	86-108	96.94	4.74
Pindi	3		93.33	
Te'ewi	2	91-103	97.00	
Navajo District	5	94-106	98.00	4.70
Hawikuh	0			
Whitewater	4	94-97	95.25	1.41

FEMALE Series:	No.	Range	Mean	S.D.
Cochiti				
70	3	92-98	96.00	4.46
6455 II-III	1		93.00	
6455 I	3	94-95	94.66	
6462	0			
Paa-ko	4	92-106	98.64	
Pecos	53	87-104	95.28	4.09
Pindi	5		96.60	
Te'ewi	1		115.70	
Hawikuh	0			
Whitewater	7	88-96	93.57	2.24

TABLE II: (Continued)

No. 6 TOTAL FACIAL INDEX

MALE Series:	No.	Range	Mean	S.D.
Cochiti				
70	2	82-87	84.50	
6455 II-III	3	81-94	85.67	5.65
6455 I	7	76-100	84.29	8.40
6462	1		77.00	
Paa-ko	13	74-89	84.67	3.74
Pecos	86	70-99	85.69	4.87
Pindi	1		87.00	
Te'ewi	6	77-93	85.45	5.28
Navajo District	9	74-94	87.33	4.58
Hawikuh	28	83-102	90.43	4.22
Whitewater	6	80-98	86.66	5.92

FEMALE Series:	No.	Range	Mean	S.D.
Cochiti				
70	4	78-93	86.75	6.33
6455 II-III	1		74.00	
6455 I	4	77-87	80.75	3.77
6462	0			
Paa-ko	2	83-90	86.53	
Pecos	59	76-96	86.95	4.29
Pindi	2		82.50	
Te'ewi	1		84.67	
Hawikuh	0			
Whitewater	10	84-97	89.20	3.34

TABLE II: (Continued)

No. 7 SUPERIOR FACIAL INDEX

MALE Series:	No.	Range	Mean	S.D.
Cochiti				
70	4	47-53	49.25	3.00
6455 II-III	2	53-57	55.00	
6455 I	8	46-59	50.75	4.18
6462	1		53.00	
Paa-ko	19	46-57	51.87	3.00
Pecos	90	43-59	52.09	3.28
Pindi	1		55.00	
Te'ewi	7	44-56	50.29	3.95
Navajo District	9	51-55	52.55	1.73
Hawikuh	30	48-62	54.37	2.99
Whitewater	6	48-58	52.50	3.87

FEMALE Series:	No.	Range	Mean	S.D.
Cochiti				
70	4	50-56	52.50	2.83
6455 II-III	0			
6455 I	4	47-53	49.60	2.15
6462	0			
Paa-ko	5	48-57	52.70	
Pecos	61	46-60	53.00	2.62
Pindi	2		51.00	
Te'ewi	1		50.80	
Hawikuh	0			
Whitewater	10	50-57	53.50	2.20

TABLE II: (Continued)

No. 8 ZYGOMATICO-FRONTAL INDEX

MALE Series:	No.	Range	Mean	S.D.
Cochiti				
70	4	66-71	68.25	2.24
6455 II-III	2	73-75	74.00	
6455 I	9	65-76	71.44	3.27
6462	1		65.00	
Paa-ko	18	66-78	70.61	3.31
Pecos	(Estimate)		68.51	
Pindi	(Estimate)		69.77	
Te'ewi	6	60-75	67.16	5.10
Navajo District	9	68-73	70.00	1.44
Hawikuh	0			
Whitewater	6	66-75	68.83	3.74

FEMALE Series:	No.	Range	Mean	S.D.
Cochiti				
70	4	68-76	73.25	6.08
6455 II-III	0			
6455 I	5	64-74	69.00	3.35
6462	0			
Paa-ko	6	66-88	74.83	7.81
Pecos	(Estimate)		71.15	
Pindi	(Estimate)		73.74	
Te'ewi	1		74.19	
Hawikuh	0			
Whitewater	11	66-73	69.63	2.24

TABLE II: (Continued)

No. 9 ZYGOMATICO-MANDIBULAR INDEX

MALE Series:	No.	Range	Mean	S.D.
Cochiti				
70	2		67.00	
6455 II-III	2	70-72	71.00	
6455 I	7	54-77	69.14	6.75
6462	1		64.00	
Paa-ko	14	63-83	72.92	5.10
Pecos	0			
Pindi	(Estimate)		75.55	
Te'ewi	0			
Navajo District	7	72-82	76.14	4.12
Hawikuh	0			
Whitewater	0			

FEMALE Series:	No.	Range	Mean	S.D.
Cochiti				
70	2	67-71	69.00	
6455 II-III	0			
6455 I	2	60-63	61.50	
6462	0			
Paa-ko	4	72-75	73.25	1.41
Pecos	0			
Pindi	(Estimate)		74.39	
Te'ewi	0			
Hawikuh	0			
Whitewater	0			

TABLE II: (Continued)

No. 10 NASAL INDEX

MALE Series:	No.	Range	Mean	S.D.
Cochiti				
70	15	42-55	47.66	3.74
6455 II-III	3	46-47	46.33	.50
6455 I	16	41-57	47.00	3.77
6462	1		51.00	
Paa-ko	20	44-63	51.76	3.61
Pecos	124	40-65	50.44	4.27
Pindi	4		48.50	
Te'ewi	7	45-57	50.86	4.26
Navajo District	9	46-62	54.88	4.90
Hawikuh	32	43-56	49.53	3.20
Whitewater	7	48-52	50.01	1.73

FEMALE Series:	No.	Range	Mean	S.D.
Cochiti				
70	5	43-55	47.60	5.00
6455 II-III	1		50.00	
6455 I	8	41-50	46.75	4.92
6462	0			
Paa-ko	6	47-61	55.28	
Pecos	86	42-62	52.60	4.13
Pindi	7		53.79	
Te'ewi	2	48-50	49.00	
Hawikuh	0			
Whitewater	11	45-56	50.27	3.08

TABLE II: (Continued)

No. 11 ORBITAL INDEX

MALE Series:	No.	Range	Mean	S.D.
Cochiti				
70	14	87-109	97.21	5.75
6455 II-III	3	84-97	91.00	6.00
6455 I	17	82-102	93.59	6.00
6462	1		97.00	
Paa-ko	18	82-97	98.59	3.87
Pecos	120	78-99	87.80	4.57
Pindi	3		90.33	
Te'ewi	7	81-97	90.14	5.22
Navajo District	9	80-132	106.22	15.49
Hawikuh	30	86-110	93.10	4.73
Whitewater	7	84-95	89.60	4.90

FEMALE Series:	No.	Range	Mean	S.D.
Cochiti				
70	8	83-100	95.37	6.56
6455 II-III	1		100.00	
6455 I	10	87-100	94.10	4.68
6462	0			
Paa-ko	6	86-95	91.30	
Pecos	83	76-98	89.87	4.81
Pindi	6		91.83	
Te'ewi	2	91-100	95.50	
Hawikuh	0			
Whitewater	11	83-96	90.55	3.75

TABLE II: (Continued)

No. 12 MAXILLO-ALVEOLAR INDEX

MALE Series:	No.	Range	Mean	S.D.
Cochiti				
70	13	96-134	115.76	8.76
6455 II-III	3	95-129	115.33	
6455 I	19	95-128	112.21	9.16
6462	1		110.00	
Paa-ko	15	116-125	120.78	5.66
Pecos	97	103-136	119.16	6.42
Pindi	2		123.50	
Te'ewi	5	107-122	115.40	6.15
Navajo District	7	98-126	116.42	10.40
Hawikuh	27	107-138	119.58	7.90
Whitewater	6	113-130	124.16	7.35

FEMALE Series:	No.	Range	Mean	S.D.
Cochiti				
70	8	100-126	114.87	9.17
6455 II-III	0			
6455 I	10	109-124	115.10	5.99
6462	0			
Paa-ko	5	105-147	129.90	
Pecos	65	100-132	116.32	6.28
Pindi	3		123.67	
Te'ewi	2		100.00	
Hawikuh	0			
Whitewater	9	107-132	121.44	7.73

TABLE II: (Continued)

No. 13 MANDIBULAR INDEX

MALE Series:	No.	Range	Mean	S.D.
Cochiti				
70	1		70.00	
6455 II-III	2	65-72	68.50	
6455 I	9	51-72	62.55	6.64
6462	0			
Paa-ko	14	60-73	67.21	3.87
Pecos	0			
Pindi	0			
Te'ewi	0			
Navajo District	0			
Hawikuh	0			
Whitewater	0			

FEMALE Series:	No.	Range	Mean	S.D.
Cochiti				
70	4	59-68	63.00	4.24
6455 II-III	2	74-75	74.50	
6455 I	4	56-71	65.25	5.97
6462	1		74.00	
Paa-ko	3	65-70	67.47	
Pecos	0			
Pindi	0			
Te'ewi	0			
Hawikuh	0			
Whitewater	0			

TABLE II: (Continued)

No. 14 RAMUS INDEX

MALE Series:	No.	Range	Mean	S.D.
Cochiti				
70	11	53-75	66.27	6.16
6455 II-III	2	64-67	65.50	
6455 I	18	53-72	64.50	5.33
6462	2	55-75	65.00	
Paa-ko	15	53-68	60.85	4.36
Pecos	(Estimate)		58.76	
Pindi	0			
Te'ewi	0			
Navajo District	0			
Hawikuh	0			
Whitewater	0			

FEMALE Series:	No.	Range	Mean	S.D.
Cochiti				
70	8	60-74	67.12	4.47
6455 II-III	3	57-71	63.33	6.70
6455 I	10	53-75	62.67	6.53
6462	2	62-68	65.00	
Paa-ko	4	55-71	63.23	
Pecos	(Estimate)		64.97	
Pindi	0			
Te'ewi	0			
Hawikuh	0			
Whitewater	0			

TABLE II: (Continued)

No. 15 FACIAL PROGNATHISM

MALE Series:	No.	Range	Mean	S.D.
Cochiti				
70	2	89-94	91.50	
6455 II-III	1		104.00	
6455 I	6	94-105	98.50	4.15
6462	1		93.00	
Paa-ko	17	87-108	97.47	6.00
Pecos	90	88-103	95.97	3.37
Pindi	4		96.25	
Te'ewi	6	94-104	98.83	3.48
Navajo District	7	93-105	100.00	4.00
Hawikuh	23	91-105	98.43	3.67
Whitewater	5	91-100	96.80	3.46

FEMALE Series:	No.	Range	Mean	S.D.
Cochiti				
70	3	97-98	97.66	.50
6455 II-III	1		96.00	
6455 I	5	90-102	93.60	3.88
6462	0			
Paa-ko	5	95-102	99.59	
Pecos	60	91-105	97.53	2.51
Pindi	5		96.20	
Te'ewi	1		91.17	
Hawikuh	0			
Whitewater	7	96-101	98.14	2.24

TABLE II: (Continued)

No. 16 ALVEOLAR PROGNATHISM

MALE Series:	No.	Range	Mean	S.D.
Cochiti				
70	2	100-105	102.50	
6455 II-III	1		110.00	
6455 I	7	102-111	106.29	2.81
6462	1		108.00	
Paa-ko	0			
Pecos	0			
Pindi	0			
Te'ewi	0			
Navajo District	0			
Hawikuh	0			
Whitewater	5	112-117	113.60	2.24

FEMALE Series:	No.	Range	Mean	S.D.
Cochiti				
70	3	104-105	104.33	.50
6455 II-III	1		104.00	
6455 I	5	99-119	105.20	7.30
6462	0			
Paa-ko	0			
Pecos	0			
Pindi	0			
Te'ewi	0			
Hawikuh	0			
Whitewater	7	112-117	114.43	2.00

TABLE II: (Continued)

No. 17 CRANIO-FACIAL LONGITUDINAL INDEX

MALE Series:	No.	Range	Mean	S.D.
Cochiti				
70	1		58.00	
6455 II-III	1		67.00	
6455 I	0			
6462	0			
Paa-ko	0			
Pecos	(Estimate)		55.75	
Pindi	(Estimate)		55.65	
Te'ewi	1		58.57	
Navajo District	2	58-59	58.50	
Hawikuh	0			
Whitewater	1		51.63	

FEMALE Series:	No.	Range	Mean	S.D.
Cochiti				
70	0			
6455 II-III	0			
6455 I	1		61.00	
6462	0			
Paa-ko	0			
Pecos	(Estimate)		58.09	
Pindi	0			
Te'ewi	0			
Hawikuh	0			
Whitewater	1		56.88	

TABLE II: (Continued)

No. 17 CRANIO-FACIAL LONGITUDINAL INDEX (DEFORMED)

MALE Series:	No.	Range	Mean	S.D.
Cochiti				
70	1		57.00	
6455 II-III	0			
6455 I	6	60-65	63.17	2.83
6462	1		57.00	
Paa-ko	18	47-71	57.39	4.58
Pecos	(Estimate)		59.53	
Pindi	(Estimate)		58.70	
Te'ewi	4	57-61	59.50	2.00
Navajo District	5	52-64	56.60	4.47
Hawikuh	0			
Whitewater	4	56-58	57.29	1.00

FEMALE Series:	No.	Range	Mean	S.D.
Cochiti				
70	3	58-62	60.33	2.65
6455 II-III	1		58.00	
6455 I	2	62-68	65.00	
6462	1		58.00	
Paa-ko	4	48-60	55.50	4.80
Pecos	(Estimate)		59.53	
Pindi	(Estimate)		58.48	
Te'ewi	1		54.70	
Hawikuh	0			
Whitewater	7	55-59	57.43	1.73

TABLE II: (Continued)

No. 18 CRANIO-FACIAL TRANSVERSE INDEX

MALE Series:	No.	Range	Mean	S.D.
Cochiti				
70	2	89-97	93.00	
6455 II-III	1		95.00	
6455 I	0			
6462	0			
Paa-ko	0			
Pecos	(Estimate)		100.52	
Pindi	0			
Te'ewi	1		99.23	
Navajo District	3	99-108	102.33	3.87
Hawikuh	0			
Whitewater	1		101.47	

FEMALE Series:	No.	Range	Mean	S.D.
Cochiti				
70	0			
6455 II-III	0			
6455 I	1		94.00	
6462	0			
Paa-ko	1		105.00	
Pecos	(Estimate)		99.86	
Pindi	0			
Te'ewi	0			
Hawikuh	0			
Whitewater	1		95.58	

TABLE II: (Continued)

No. 18 CRANIO-FACIAL TRANSVERSE INDEX (DEFORMED)

MALE Series:	No.	Range	Mean	S.D.
Cochiti				
70	1		90.00	
6455 II-III	1		92.00	
6455 I	9	84-98	92.89	4.47
6462	1		90.00	
Paa-ko	19	87-105	93.52	5.00
Pecos	(Estimate)		95.27	
Pindi	1		93.00	
Te'ewi	3	90-98	94.66	2.00
Navajo District	5	92-102	95.40	4.00
Hawikuh	0			
Whitewater	5	85-99	94.20	2.45

MALE Series:	No.	Range	Mean	S.D.
Cochiti				
70	3	88-93	90.67	3.16
6455 II-III	0			
6455 I	3	88-100	93.66	5.00
6462	0			
Paa-ko	5	76-101	90.60	9.49
Pecos	(Estimate)		91.87	
Pindi	2		91.50	
Te'ewi	1		102.47	
Hawikuh	0			
Whitewater	9	81-93	88.66	3.32

TABLE III: LONG BONE LENGTHS

HUMERUS LENGTH

MALE Series:	No.	Range (Cm.)	Mean (Cm.)	S.D.
Cochiti				
70	3	28-31	29.37	1.73
6455 II-III	2	28-31	29.30	
6455 I	16	27-34	29.97	2.00
6462	2	29-32	30.40	
Paa-ko	9	27-32	29.77	2.24
Pecos	134	26-36	30.83	14.70
Pindi	0			
Te'ewi	9	27-33	30.33	1.73
Hawikuh	0			
Whitewater	4	27-31	29.75	1.41

FEMALE Series:	No.	Range (Cm.)	Mean (Cm.)	S.D.
Cochiti				
70	5	27-29	27.78	1.00
6455 II-III	3	28-30	28.90	1.00
6455 I	8	27-33	29.35	2.25
6462	2		29.00	
Paa-ko	2	28-29	28.85	
Pecos	87	25-32	28.51	12.30
Pindi	0			
Te'ewi	2	20-27	23.50	
Hawikuh	0			
Whitewater	7	25-30	24.28	4.47

TABLE III: (Continued)

ULNA (MAXIMUM) LENGTH

MALE Series:	No.	Range (Cm.)	Mean (Cm.)	S.D.
Cochiti				
70	6	22-27	24.83	1.73
6455 II-III	1		24.00	
6455 I	11	22-27	25.02	2.00
6462	1		26.50	
Paa-ko	0			
Pecos	87	22-28	25.48	11.40
Pindi	0			
Te'ewi	0			
Hawikuh	0			
Whitewater	2		24.00	

FEMALE Series:	No.	Range (Cm.)	Mean (Cm.)	S.D.
Cochiti				
70	3	22-24	22.57	1.41
6455 II-III	3	22-25	24.37	1.41
6455 I	6	22-25	23.77	1.00
6462	3	23-24	23.30	1.00
Paa-ko	0			
Pecos	51	20-26	23.52	11.75
Pindi	0			
Te'ewi	0			
Hawikuh	0			
Whitewater	8	21-24	23.37	1.00

TABLE III: (Continued)

ULNA (PHYSIOLOGICAL) LENGTH

MALE Series:	No.	Range (Cm.)	Mean (Cm.)	S.D.
Cochiti				
70	6	20-25	22.33	2.00
6455 II-III	1		21.10	
6455 I	11	19-24	22.22	2.00
6462	1		24.00	
Paa-ko	0			
Pecos	0			
Pindi	0			
Te'ewi	0			
Hawikuh	0			
Whitewater	0			

FEMALE Series:	No.	Range (Cm.)	Mean (Cm.)	S.D.
Cochiti				
70	3	19-21	20.06	1.00
6455 II-III	3	21-24	21.87	1.41
6455 I	6	20-23	21.08	1.00
6462	3	20-21	20.83	1.00
Paa-ko	0			
Pecos	0			
Pindi	0			
Te'ewi	0			
Hawikuh	0			
Whitewater	0			

TABLE III: (Continued)

RADIUS (MAXIMUM) LENGTH

MALE Series:	No.	Range (Cm.)	Mean (Cm.)	S.D.
Cochiti				
70	9	21-25	22.82	1.41
6455 II-III	1		22.20	
6455 I	19	20-27	23.06	2.00
6462	2	23-25	24.15	
Paa-ko	8	21-24	22.29	1.41
Pecos	100	21-27	23.84	13.15
Pindi	0			
Te'ewi	5	21-25	23.40	1.41
Hawikuh	0			
Whitewater	2	22-25	23.50	

FEMALE Series:	No.	Range (Cm.)	Mean (Cm.)	S.D.
Cochiti				
70	5	20-22	21.14	1.00
6455 II-III	3	22-24	22.57	1.41
6455 I	6	21-24	22.51	1.00
6462	3	22-23	22.43	1.00
Paa-ko	3	21-23	22.33	1.73
Pecos	57	19-24	21.66	10.95
Pindi	0			
Te'ewi	2	20-26	23.00	
Hawikuh	0			
Whitewater	7	20-23	21.57	1.41

TABLE III: (Continued)

RADIUS (PHYSIOLOGICAL) LENGTH

MALE Series:	No.	Range (Cm.)	Mean (Cm.)	S.D.
Cochiti				
70	8	20-24	22.06	1.41
6455 II-III	1		21.00	
6455 I	19	19-26	21.98	1.73
6462	2	22-23	22.80	
Paa-ko	0			
Pecos	0			
Pindi	0			
Te'ewi	0			
Hawikuh	0			
Whitewater				

FEMALE Series:	No.	Range (Cm.)	Mean (Cm.)	S.D.
Cochiti				
70	5	19-22	20.28	1.41
6455 II-III	3	21-23	21.53	1.41
6455 I	6	20-23	21.40	1.00
6462	3	20-21	20.97	1.00
Paa-ko	0			
Pecos	0			
Pindi	0			
Te'ewi	0			
Hawikuh	0			
Whitewater	0			

TABLE III: (Continued)

FEMUR (MAXIMUM) LENGTH

MALE Series:	No.	Range (Cm.)	Mean (Cm.)	S.D.
Cochiti				
70	7	34-44	41.40	2.00
6455 II-III	2	39-43	41.00	
6455 I	15	36-47	41.73	3.46
6462	1		44.20	
Paa-ko	11	38-45	41.26	2.24
Pecos	140	36-48	42.67	19.85
Pindi	0			
Te'ewi	8	38-44	41.50	2.24
Hawikuh	0			
Whitewater	4	39-44	42.25	1.73

FEMALE Series:	No.	Range (Cm.)	Mean (Cm.)	S.D.
Cochiti				
70	3	38-41	38.87	1.73
6455 II-III	4	39-42	40.50	1.73
6455 I	10	37-46	41.22	2.83
6462	2	40-41	40.70	
Paa-ko	3	38-40	39.07	1.00
Pecos	105	35-45	39.61	17.50
Pindi	0			
Te'ewi	2	37-38	37.50	
Hawikuh	0			
Whitewater	7	37-42	40.00	1.73

TABLE III: (Continued)

FEMUR (PHYSIOLOGICAL) LENGTH

MALE Series:	No.	Range (Cm.)	Mean (Cm.)	S.D.
Cochiti				
70	7	39-43	41.07	2.00
6455 II-III	2	39-42	40.70	
6455 I	14	35-47	41.54	3.74
6462	1		44.00	
Paa-ko	0			
Pecos	142	36-47	42.32	19.25
Pindi	0			
Te'ewi	0			
Hawikuh	0			
Whitewater	4	39-43	42.00	1.41

FEMALE Series:	No.	Range (Cm.)	Mean (Cm.)	S.D.
Cochiti				
70	3	37-40	38.47	1.73
6455 II-III	4	39-42	39.78	1.41
6455 I	10	38-46	39.94	2.83
6462	2	40-41	40.35	
Paa-ko	0			
Pecos	104	35-45	39.30	17.45
Pindi	0			
Te'ewi	0			
Hawikuh	0			
Whitewater	8	37-42	39.37	1.73

TABLE III: (Continued)

TIBIA (MAXIMUM) LENGTH

MALE Series:	No.	Range (Cm.)	Mean (Cm.)	S.D.
Cochiti				
70	8	32-37	35.04	2.24
6455 II-III	2	33-36	34.35	
6455 I	15	31-40	35.18	2.83
6462	2	36-37	36.10	
Paa-ko	12	32-37	34.05	1.73
Pecos	117	31-41	35.78	18.75
Pindi	0			
Te'ewi	5	32-38	35.40	2.00
Hawikuh	0			
Whitewater	2	36-37	36.50	

FEMALE Series:	No.	Range (Cm.)	Mean (Cm.)	S.D.
Cochiti				
70	2	31-33	31.55	
6455 II-III	3	33-35	33.87	1.00
6455 I	7	30-37	33.21	2.65
6462	2	33-34	33.70	
Paa-ko	1		34.70	
Pecos	81	28-36	32.38	14.90
Pindi	0			
Te'ewi	2		32.00	
Hawikuh	0			
Whitewater	7	31-36	33.03	2.24

TABLE III: (Continued)

TIBIA (PHYSIOLOGICAL) LENGTH

MALE Series:	No.	Range (Cm.)	Mean (Cm.)	S.D.
Cochiti				
70	8	31-36	32.93	2.00
6455 II-III	2	31-34	32.00	
6455 I	14	29-37	33.00	2.65
6462	2	33-34	33.55	
Paa-ko	0			
Pecos	0			
Pindi	0			
Te'ewi	0			
Hawikuh	0			
Whitewater	2	34-35	34.50	

FEMALE Series:	No.	Range (Cm.)	Mean (Cm.)	S.D.
Cochiti				
70	2	29-31	29.55	
6455 II-III	3	30-33	31.83	1.73
6455 I	7	29-35	31.30	2.45
6462	2	31-33	32.00	
Paa-ko	0			
Pecos	0			
Pindi	0			
Te'ewi	0			
Hawikuh	0			
Whitewater	7	30-34	32.57	1.73

TABLE III: (Continued)

FIBULA LENGTH

MALE Series:	No.	Range (Cm.)	Mean (Cm.)	S.D.
Cochiti				
70	2		33.20	
6455 II-III	1		32.10	
6455 I	14	30-40	34.06	3.16
6462	1		36.30	
Paa-ko	0			
Pecos	72	31-39	35.24	18.30
Pindi	0			
Te'ewi	0			
Hawikuh	0			
Whitewater	3	33-35	34.30	1.00

FEMALE Series:	No.	Range (Cm.)	Mean (Cm.)	S.D.
Cochiti				
70	2	31-32	31.95	
6455 II-III	2	32-35	33.50	
6455 I	7	29-35	32.00	2.00
6462	0			
Paa-ko	0			
Pecos	39	29-34	31.84	12.75
Pindi	0			
Te'ewi	0			
Hawikuh	0			
Whitewater	7	30-34	32.15	1.41

TABLE IV: STATURE

COMPARATIVE STATURE

MALE Series:	No.	Range (Cm.)	Mean (Cm.)	S.D.
Cochiti				
70	18	155-173	165.00	3.61
6455 II-III	2	159-165	162.20	
6455 I	26	154-176	164.62	5.39
6462	3	164-169	166.93	3.32
Paa-ko	19	152-168	158.74	5.29
Pecos	142	152-176	161.74	4.30
Pindi	0			
Te'ewi	12	155-173	162.71	5.75
Hawikuh	0			
Whitewater	5	161-169	164.60	3.00

FEMALE Series:	No.	Range (Cm.)	Mean (Cm.)	S.D.
Cochiti				
70	7	150-155	152.50	2.82
6455 II-III	4	154-163	156.02	1.73
6455 I	11	151-163	155.57	1.73
6462	3	154-157	155.40	1.73
Paa-ko	5	148-159	151.85	4.23
Pecos	81	143-159	150.11	3.23
Pindi	0			
Te'ewi	2	150-164	157.35	
Hawikuh	0			
Whitewater	9	148-162	157.11	3.46

TABLE IV: (Continued)

COCHITI STATURE

(Trotter and Gleser Formula)

MALE Series:	No.	Range (Cm.)	Mean (Cm.)	S.D.
70	18	157-169	163.99	3.00
6455 II-III	2	159-165	162.20	
6455 I	26	153-175	163.86	6.01
6462	3	164-169	165.70	3.32

TABLE V: INTERMEMBRAL INDICES

No. 1 RADIO-HUMERAL INDEX

MALE Series:	No.	Range	Mean	S.D.
Cochiti				
70	5	71-75	73.60	1.73
6455 II-III	0			
6455 I	10	70-76	72.90	2.24
6462	1		74.00	
Paa-ko	10	72-80	76.30	2.24
Pecos	(Estimate)		77.32	
Pindi	0			
Te'ewi	5	66-76	74.20	7.25
Hawikuh	0			
Whitewater	1		73.33	

FEMALE Series:	No.	Range	Mean	S.D.
Cochiti				
70	5	69-75	70.90	3.32
6455 II-III	2	70-71	70.50	
6455 I	4	72-75	73.50	1.41
6462	2	71-72	71.50	
Paa-ko	4	75-79	76.25	2.00
Pecos	(Estimate)		75.97	
Pindi	0			
Te'ewi	2	74-77	75.50	
Hawikuh	0			
Whitewater	6	72-78	75.80	4.60

TABLE V: (Continued)

No. 2 TIBIO-FEMORAL INDEX

MALE Series:	No.	Range	Mean	S.D.
Cochiti				
70	6	78-93	82.00	3.32
6455 II-III	1		80.00	
6455 I	9	61-81	77.78	1.41
6462	1		77.00	
Paa-ko	11	82-87	83.82	2.00
Pecos	104	79-89	83.70	2.03
Pindi	0			
Te'ewi	5	83-87	85.20	2.75
Hawikuh	0			
Whitewater	2	81-85	83.00	

FEMALE Series:	No.	Range	Mean	S.D.
Cochiti				
70	3	75-81	78.60	2.00
6455 II-III	2	75-79	77.00	
6455 I	7	75-83	79.29	3.00
6462	2	77-82	80.00	
Paa-ko	3	84-88	85.66	2.24
Pecos	71	77-87	82.77	2.02
Pindi	0			
Te'ewi	2	84-86	85.50	
Hawikuh	0			
Whitewater	7	79-87	81.57	8.16

TABLE V: (Continued)

No. 3 HUMERO-FEMORAL INDEX

MALE Series:	No.	Range	Mean	S.D.
Cochiti				
70	7	72-75	72.70	1.00
6455 II-III	0			
6455 I	8	67-74	71.87	2.45
6462	1		72.00	
Paa-ko	9	70-76	73.00	1.73
Pecos	116	68-85	72.72	2.37
Pindi	0			
Te'ewi	5	71-74	73.00	1.50
Hawikuh	0			
Whitewater	4	65-74	70.75	1.63

FEMALE Series:	No.	Range	Mean	S.D.
Cochiti				
70	4	71-73	72.00	1.00
6455 II-III	2	73-75	74.00	
6455 I	6	72-75	73.50	1.41
6462	1		72.00	
Paa-ko	4	72-74	72.75	1.00
Pecos	78	68-76	72.71	2.14
Pindi	0			
Te'ewi	2	70-71	70.50	
Hawikuh	0			
Whitewater	6	68-76	71.33	9.60

TABLE V: (Continued)

No. 4 INTERMEMBRAL INDEX

MALE Series:	No.	Range	Mean	S.D.
Cochiti				
70	5	63-73	69.30	3.74
6455 II-III	0			
6455 I	7	68-73	69.85	1.41
6462	1		71.00	
Paa-ko	7	68-71	69.71	1.00
Pecos	(Estimate)		69.23	
Pindi	0			
Te'ewi	1		69.33	
Hawikuh	0			
Whitewater	1		68.42	

FEMALE Series:	No.	Range	Mean	S.D.
Cochiti				
70	3	69-71	70.00	1.00
6455 II-III	2	71-73	72.00	
6455 I	4	70-71	70.76	1.00
6462	1		69.00	
Paa-ko	3	68-70	69.00	1.00
Pecos	(Estimate)		71.52	
Pindi	0			
Te'ewi	2	67-68	67.50	
Hawikuh	0			
Whitewater	6	68-72	69.16	2.60

TABLE V: (Continued)

No. 5 UPPER LIMB/STATURE INDEX

MALE Series:	No.	Range	Mean	S.D.
Cochiti				
70	8	30-33	31.63	1.00
6455 II-III	1		30.62	
6455 I	9	29-34	31.89	1.41
6462	1		33.13	
Paa-ko	9	29-35	32.88	1.73
Pecos	(Estimate)		33.28	
Pindi	0			
Te'ewi	5	32-34	33.00	2.00
Hawikuh	0			
Whitewater	1		31.32	

FEMALE Series:	No.	Range	Mean	S.D.
Cochiti				
70	5	31-33	32.00	.50
6455 II-III	2	32-33	32.50	
6455 I	4	32-33	32.50	.81
6462	2		32.00	
Paa-ko	3	30-34	32.33	2.24
Pecos	(Estimate)		32.98	
Pindi	0			
Te'ewi	2	28-31	29.50	
Hawikuh	0			
Whitewater	6	30-34	31.66	1.41

TABLE V: (Continued)

No. 6 LOWER LIMB/STATURE INDEX

MALE Series:	No.	Range	Mean	S.D.
Cochiti				
70	9	43-47	45.18	3.00
6455 II-III	2	45-47	46.00	
6455 I	11	42-49	46.27	2.24
6462	1		47.33	
Paa-ko	11	45-49	47.09	1.00
Pecos	(Estimate)		48.42	
Pindi	0			
Te'ewi	5	45-48	46.60	1.00
Hawikuh	0			
Whitewater	2		46.00	

FEMALE Series:	No.	Range	Mean	S.D.
Cochiti				
70	3	44-46	45.39	.66
6455 II-III	3	47-48	47.33	.71
6455 I	7	45-49	47.14	2.00
6462	2	46-47	46.50	
Paa-ko	3	47-48	47.33	.71
Pecos	(Estimate)		46.83	
Pindi	0			
Te'ewi	2	42-46	44.00	
Hawikuh	0			
Whitewater	7	45-47	45.85	.83

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