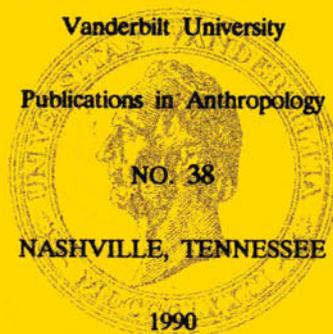


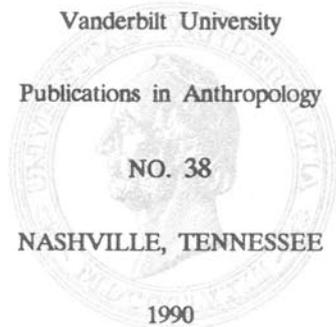
**LA CUEVA DE LA PALA CHICA: A BURIAL CAVE  
IN THE GUAYMAS REGION OF  
COASTAL SONORA, MEXICO**

**Keith A. Dixon**



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# LA CUEVA DE LA PALA CHICA: A BURIAL CAVE IN THE GUAYMAS REGION OF COASTAL SONORA, MEXICO

## 1. INTRODUCTION

La Cueva de la Pala Chica is a small cave on the coast of Sonora near Guaymas (SON:Q:4:5). It contained burials of at least six children and young adults as well as some unusual artifacts. The skeletal remains show possible evidence for tooth-knocking (incisor ablation), an unusual custom that was once claimed for the Seri but evidently has not been practiced in this century. The artifacts include a unique flat wooden object which may be a scoop or hand-shovel, a thin flat ring-shaped shell ornament with decorative drilled holes, and a bracelet of thick disc beads that were strung in a unique manner with fiber cordage.

The collection is probably late prehistoric or early historic in date. The site is in the region of the culturally extinct Guayma band of Seri and is within the range of the historic central coast Seri to the north and the Yaqui to the south. The biological and cultural comparisons favor a Seri identification. Although there is nothing to contradict that interpretation, affiliation with neighboring ethnic groups cannot be entirely ruled out.

The excavation of the collection described here was not done by people with professional training in archaeology. To understand the circumstances that gave rise to this report, please see the ACKNOWLEDGMENTS section for an explanation of the collection's origin, the report preparation, and the disposition of the specimens.

Ordinarily, such a small collection might not be thought to merit much attention, especially because the excavation was not conducted or documented with professional techniques. This case, however, is an exception for several reasons. First, what field data there are seem to be reliable. Second, hardly any perishable materials have ever been found (or at least reported) anywhere in the Sonora coastal region, which in itself is sufficient reason for attention. And third, the collection does contain several items which are virtually unique in the archaeological and ethnographic literature for Sonora and the Greater Southwest.

The basic purpose of the report is therefore a detailed description of the collection. In addition, the research problem is the obvious one in a region which has had so little scientific work: to try to relate the collection to the known prehistoric and ethnographic patterns of both the local region and wider context.

Archaeological work in the local area has been minimal. Bowen (1976) has provided an excellent interpretation of what is known from the perspective of the central coast, which was former Seri territory. In view of the attention given the Seri in the scientific literature and the popular press, surprisingly little has been done

in that region since Bowen's work. Even less is known of the prehistory of the adjacent Yaqui region, despite their dramatic role in Mexican national history and their place as subjects in important acculturation studies (e.g., Spicer 1980).

As for ethnographic work, there has been some attention to Seri material culture (e.g., McGee 1898; Kroeber 1931; Schindler n.d.); but the material culture of the early Yaqui and other coastal groups remains virtually unknown except for what has been gleaned and inferred from a few historic and ethnohistoric sources (e.g., Hrdlička 1904; Beals 1945). Trained observers reached the Yaqui, Mayo, and Pima Bajo long after their material culture had changed drastically from the native patterns.

In addition to comparisons with what is known of the archaeology and ethnology of western Sonora, the collection is also placed within the broader context by means of comparisons with the cultures of the Baja California peninsula and the Greater Southwest, *sensu lato* (i.e., southern California, northeast through Utah and Colorado, south through Arizona and New Mexico into northern México). I have not attempted to cover all the literature, but I have reviewed a large sample and feel confident of the basic patterns.

These broader comparisons have two purposes. The first is to test whether the distributions of the Pala Chica Cave artifact types might show patterns of relationship through exchange, the spread of ideas, or common tradition; at the least, the small sample does add further data for that long-standing problem, the origin and affiliations of the Seri and other western Sonoran cultures. The second purpose, particularly in the case of the wooden object, is to test the interpretations of artifact use. It can be anticipated that the cave collection and the usefulness of work done elsewhere are both too limited to allow solutions, but at the very least there is value in reviewing the present status of research. An effort is made to evaluate alternative interpretations, to explain negative as well as positive results, and to provide enough information to show the basis for judgments.

In the descriptions that follow, each artifact is identified by a sequential specimen catalog number (within the accession numbers 1292 and 1802 of the Centro Regional del Noroeste, Hermosillo). The descriptions of each type of artifact are followed first by the local Sonoran archaeological and ethnographic comparisons and then the comparisons with Baja California and the Greater Southwest. The interpretations are summarized in the CONCLUSIONS section.



## 2. THE SITE

La Cueva de la Pala Chica, or Pala Chica Cave in English usage, is named for one of the unusual artifacts in the collection, a small carved wooden scoop. The site survey designation is SON:Q:4:5.

The cave site is on the coastal plain near Bahía San Carlos, some 20 km west of Guaymas, Sonora (Fig. 1). It is near the base of an isolated hill (ca. 80 m elevation) less than 2 km from the beach.

The environment of the Sonora coast region in general and that of the Guaymas region in particular is well described by Bowen (1965:16-17 and 1976:14-21) and Bahre (1980:197-200). Briefly, the southern portion of the Sonora coastal plain near Pala Chica Cave has rocky hills which extend to the sea locally, such as Punta San Antonio and the twin peaks Las Tetas de Cabra (ca. 350 m elevation). Along the rocky coast are bays and coves with sandy beaches, which have become a major attraction for the tourist industry. Back from the beaches the coastal plain has a typical Sonoran Desert flora and fauna, with such local variations as mangrove swamps and grassy plains. The climate is arid, but both the land and the sea were rich in the kinds of food and other resources that were commonly exploited by nonagricultural peoples such as the Seri. Although agriculture is practiced by modern farmers a few miles inland, it is not clear whether conditions in the past would have been appropriate for native village agriculturalists, such as the Yaqui. At present, there is no archaeological or historical evidence of native agriculture or agricultural villages in the area.

### DISCOVERY AND EXCAVATION

In June 1962, a group of biology students from California were searching for bats in caves and crevices in the small hills around Bahía San Carlos, west of Guaymas, Sonora (Fig. 1). They noticed some human bones that were partially exposed in an upper chamber of one of the caves and removed a skull for safekeeping. When they returned to the area in March 1964, they visited the cave again. They decided that the bones were so exposed as to invite vandalism by the increasing number of tourists in the area, and for that reason they considered it to be an emergency salvage situation.

Because of these circumstances, the issue of reliability of the data must be considered. Although they were not trained in archaeology, one student did have some experience with an avocational group. Through him, much information was saved that otherwise would have been lost. The students removed the rest of the human bones and artifacts, reporting later that they worked as carefully as they could under difficult circumstances in the confined area. According to their description, they carefully removed the shallow soil over the burials with a small shovel and sifted it through a 1/8-inch mesh screen. A trowel was used to remove soil from around

the skeletal fragments; this was also screened. A brush was used to clear the bones and artifacts before they were removed. The excavation is reported to have taken about four hours.

Otherwise, no professional field techniques were used in collecting the specimens and there were no on-site field notes or drawings. However, the students were eager to reconstruct the field situation and provided as many data as they could recall.

The question of vandalism prior to the time the students made their collection is an important one. It bears on the problem of how representative the collection is of the original burial practices and the uses of caves for storage. For example, any whole pots or well-made stone tools would most likely have been removed earlier had there been previous collectors. The students said that they did not think there had been previous looting; however, it would have been difficult for them to be able to determine that. One might argue that their opinion can be supported because the human skull was readily visible once the chamber was entered; indeed, the students collected it themselves on their first visit. Had there been previous visitors, the skull would most likely have been collected together with any other attractive specimens. On the other hand, one might also argue that the collection is not complete because the one cranium is only partial and the cranial vaults of all the other skeletons are missing (APPENDIX, Table 1). There is no way of knowing whether this can be attributed to previous looting or to such a degree of fragmentation that the students missed the remaining pieces. Also, there is no way to know whether pottery vessels and stone artifacts should be expected in burial or storage cave deposits because no patterns have been established as common in the region. Although major portions of each skeleton are missing, this report is prepared on the assumption that the collection is essentially complete, except for loss by natural processes and any small artifacts and skeletal elements that the students might have left in the portion of the deposit that was not dug or screened.

#### THE BURIAL CAVE

Pala Chica Cave is in the lower portion of a rocky cliff and faces east. According to the information obtained for me by Lloyd Findley, below the cave is a talus slope with a surface of large boulders and desert scrub vegetation. The cave is in two parts (Fig. 2,a). The larger southern chamber, which can be entered at ground level, has a relatively wide opening and high roof. It extends about 4 m into the cliff. Several boulders are scattered near its opening and on its sloping floor. None of the archaeological collection came from this area.

The adjacent northern part of the cave opens as a narrow crevice which is filled with unconsolidated soil (Fig. 2,b). It rises at about a 60° slope for a distance of 4 or 5 m. At the top, the passage is reduced to a height of only about 80 cm at the entrance to a small chamber. This rear chamber contained the burials. It is about

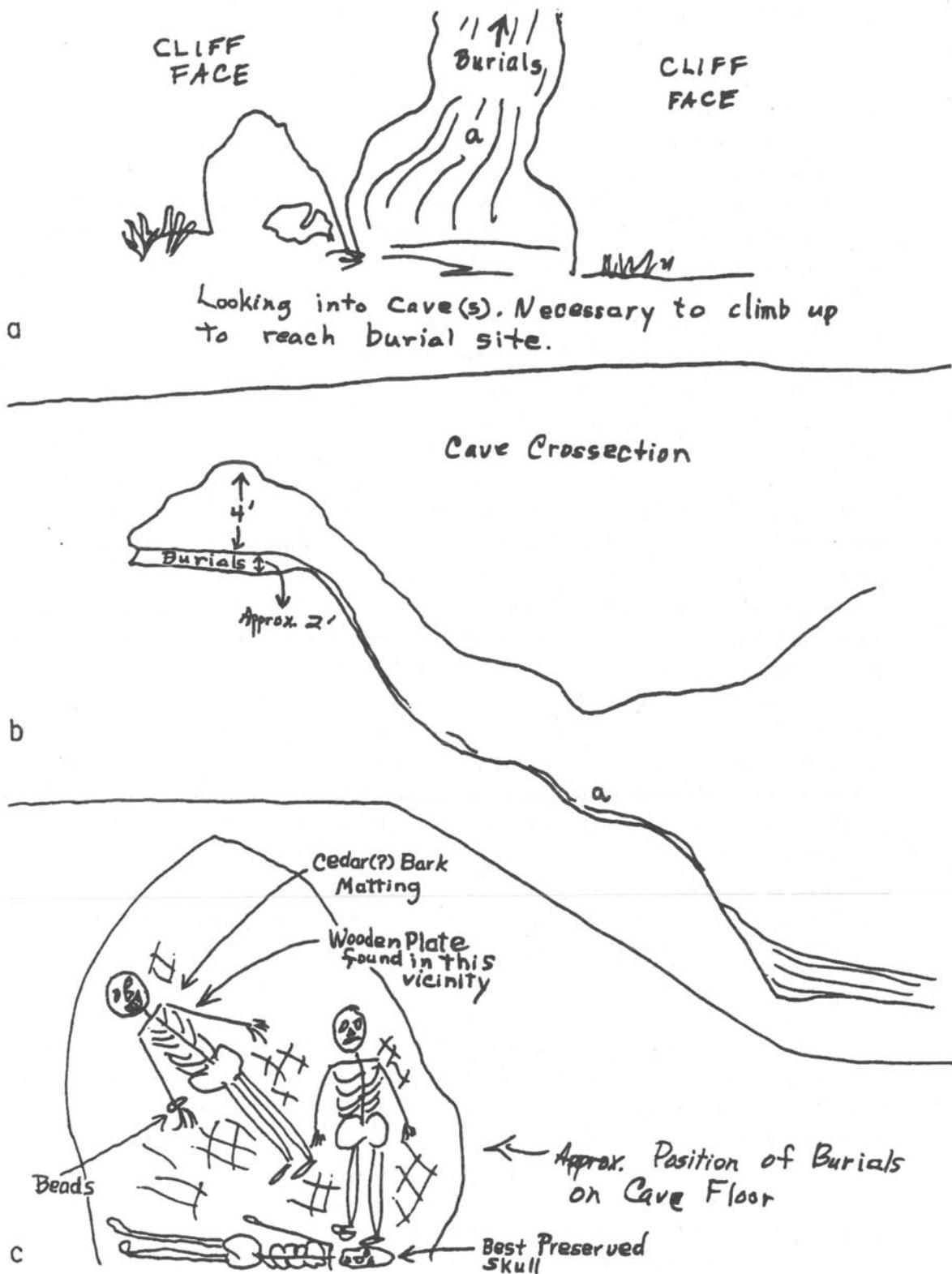


Fig. 2. Students' sketches, made from memory several weeks after the excavation: a, the position of the two cave openings in the cliff face; b, the cross-section of the burial chamber; c, the approximate placements of three of the six skeletons (exact burial positions unrecorded; cf. text explanation).

3 m long by 2 m wide by about 1.2 m high.

The students reported that "one or two" shell beads were found on the surface at ground level below the cave. They thought that the beads might have eroded from the burial chamber above, but which of the beads these might be, if in fact they are in the present collection, was not recorded.

It should be emphasized that the small cave could have been used for storage at various times. Such use of caves was common throughout the Greater Southwest and is documented for the Seri as discussed below. Therefore, in view of the lack of on-site records, it must be considered that some of the specimens from the cave may not have been associated with the burials. Others, however, were specifically described by the excavators as burial accompaniments, as noted below.

#### CAVE USE COMPARISONS

*Archaeology* Almost no information is available on prehistoric use of caves in the Sonora coast area, despite the fact that caves and rock shelters with cultural deposits are known.

In the Guaymas area one intensive survey was conducted with the specific purpose of finding the total pattern of sites in a small area with varied ecological zones (Bowen 1965 and 1976:110-115). No caves were found. However, among the sites that were located, five were rock shelters. These were at varying distances from the coast and show debris that suggests habitation. They probably were nothing more than sheltered versions of the coastal shell midden sites and the open camp sites. A fourth kind of site was the village, showing some evidence of simple masonry architecture.

In 1965, Windmiller conducted an intensive survey of easily accessible areas around Bahía San Carlos. According to his brief preliminary report (1966), he recorded 21 rock shelters with shell and ash midden and four very large open shell middens. Sherds were found only in two of the rock shelters. One of the shelters had a masonry wall at the entrance and evidence of recent habitation, but the date of the wall could not be determined; it may possibly be connected with the masonry at Bowen's inland sites.

In 1937/38, Ekholm led an exploratory survey of sites in Sonora and Sinaloa for the American Museum of Natural History. In the region near the coast from Guaymas southeast to the Yaqui River, thirteen sites are recorded (Atlas 1939:228-230, Map 25). Ten of these are shell middens with stone implements or pottery. Three "cavernas con cerámica" were found, all near Guaymas but none as far west as the Pala Chica Cave region. No further description of the caves or their surface contents has been published, and no excavations were done (Ekholm 1939:8). Vandalism and casual collecting have doubtless taken a toll of the research potential of these sites in the years since.

In 1949, Lehmer recorded a cave site near Estero Tastiota and noted that it

contained Tiburón Plain sherds (presumably early Seri). There is no further description (cf. Bowen 1976:34; Lehmer 1949). Bowen mentions a report of a pictograph cave in the mountains east of Desemboque that contained Tiburón Plain and Historic Seri sherds, as well as a few stone flakes and shells (1976:51-52).

Only one perishable specimen from a cave anywhere near the Sonora coast region has ever been reported. It is a small basketry fragment from Cueva del Tetabejo, about 50 km inland from the coast in the La Pintada region south of Hermosillo (Bowen 1973:142). The region is considered to be within the ranging area of both the Seri and the Pima, at least since the eighteenth century. Comparisons suggest that a Pima origin of the basket fragment is the more likely possibility. The only diagnostic artifact was a clay figurine similar to those from the Sonora coast, but there seems to be no reason to consider it and the basket fragment to be in meaningful association. No other data on the cave's contents have been published.

Bowen (1976:51) reports that other caves in the La Pintada region contain refuse deposits attributable to central coastal, Piman, and other peoples. Bowen (1976:66) mentions a personal communication from Walter W. Taylor who excavated one small rock shelter in 1956, but apparently the contents were minimal and the stratigraphy unclear. In sum, even at this distance from the coast no significant caves in western Sonora have been excavated or published.

*Ethnography* Ethnographic evidence for the use of caves other than for burials is limited to an occasional reference. Seri use of caves for storage was documented by Edward H. Davis in a 1929 photograph (reproduced in Felger and Moser 1985:92 and in Schindler n.d.:68). It shows three storage ollas in a small cave on Pico Johnson in the Sierra Seri, between Desemboque and Kino Bay. There is no further information on context or patterns, but storage in caves and crevices must have been common.

It is likely that the central coast Seri used certain caves in connection with the vision quest, though not as regular living areas (Bowen 1976:32). The Seri also used caves occasionally for burials, as noted below. Given the Seris' reasons for preferring camps on sand dunes (Bowen 1976:23, 51-52) and the village pattern of the Yaqui, it might be expected that both groups would have used caves for storage and burials, but for habitation or shelter only under unusual circumstances.

#### LOCAL REGIONAL SURFACE COLLECTION

No stone or pottery specimens were found within the cave. However, the students did make a casual surface collection in the surrounding region—an area 1 or 2 km along the coast away from Pala Chica Cave. No specimens are reported to have been associated with the immediate cave site surroundings.

The presence or absence as well as the relative proportions of artifact types

and materials in this collection has no significance because of the casual collecting procedures. A small part of the surface collection, including the more complete specimens, apparently was lost. However, the students photographed a group of the artifacts, which makes some minimal description possible. Fortunately, a large potsherd in the photograph is in the present collection and its size provides the scale for measuring the missing specimens in the photograph.

The students' collection is in the Centro Regional in Hermosillo with the cave materials. Accompanying it is a descriptive report which I prepared with the assistance of Jane Rosenthal, who classified the chipped stone, and Thomas Bowen, who identified the sherds.

In brief summary, the eight potsherds in the collection seem to correspond well with the two wares tentatively identified in this region by Bowen (1976:113-114). Six are coarse-tempered plain brownware, one of which is a large rim sherd from a neckless restricted-orifice jar; Bowen (personal communication) says this shape is very typical of central coast ceramics but is nearly always in Tiburón Plain instead of this coarse ware. He also suggests that the coarse ware might reflect situations where the makers of Tiburón Plain were unable to meet their usual standard for some such reason as lack of time or materials. Two sherds are Tiburón Plain, the thin fine-tempered ware.

There are 20 worked flakes and projectile points in the collection made of homogeneous black obsidian, fine-textured basalt, and chalcedony. The forms are comparable to point types that have been reported from the region (Bowen 1976:80-84, 114-115, Fig. 66). The 40 specimens of debitage are obsidian, basalt, and rhyolite. Bowen (1976:83, 114-115) mentions obsidian and basalt outcrops in the mountains north of Guaymas with evidence of quarrying and workshop activity.

Ground stone includes only one basin metate fragment in the present collection, but the student photographs show another basin metate fragment and at least two manos. These also are similar to known forms of the region (Bowen 1976:76-79, 114, Figs. 61, 62).

Little need be said of this small collection since it is not necessarily related to the cave deposits. It seems to correspond to what may be expected in this general vicinity based on earlier surveys. More systematic surface collections from this region have been published (Bowen 1965, 1976; see also Fay 1968), but much more needs to be done.

To my knowledge, there has been no systematic search for petroglyphs or pictographs on the surrounding rocks and none have been reported.

### 3. THE BURIALS

There were at least six burials in the small rear chamber of Pala Chica Cave, according to the laboratory analysis of the skeletal collection (APPENDIX). The students recognized at the time only three of the six or more individuals. Major portions of each skeleton are missing (cf. inventory, APPENDIX, Table 1). The deposit is reported to have had a nearly horizontal surface and to have been about 40 cm deep (Fig. 2,b). Some of the bones were exposed and easily visible, possibly due to rodent activity, erosion of the soil near the chamber entrance, or other disturbance.

The students' sketch (Fig. 2,c) was made several weeks after the excavation. It is included in the original form, without professional redrafting, in order to avoid a misleading appearance of scientific accuracy. Together with their verbal comments, this sketch constitutes the only evidence of context. It shows the three skeletons that the students recognized, each extended and face up. However, they informed me that this was a convenience in sketching, and they did not in fact remember the exact burial positions (although the placement of the three burials relative to each other and to the cave plan was said to be "fairly accurate").

The most exposed skeleton was placed across the chamber entrance. According to the label on the sketch, this is the one with the "best preserved skull" and it therefore is probably Individual C, a male 17-19 years old (cf. McBeath's analysis in the APPENDIX). One student informed me that this is the skull which had been removed when the cave was first discovered in 1962, and he remembered it as "rather large and adult-like." Identification is therefore probably correct.

The second skeleton is shown lying close to the chamber's north wall and parallel to it. Its feet were near the head or right shoulder of the first skeleton, and its skull was near the chamber's rear wall. The third skeleton's feet are shown near the right side of the second skeleton, and it was placed at a 45° angle between it and the first skeleton with its skull near the chamber's south wall. This latter is the skeleton with which the wooden scoop, the shell ornament, and the bead bracelet were said to be associated. These two skeletons may have been Individuals A and B of McBeath's analysis; that is, they are the two next-best-preserved, but it is not possible to sort out their placement now. Individuals A and B are both children, probably 10 to 14 years old.

The students did not keep the collection of skeletal remains separated by individual. This was partly because of their inexperience and partly because the chamber is small and the burials were crowded. It is also possible that there was mixing by successive interments or by animal activity. They did not realize that three other individuals are represented among the fragments they gathered—two young adults and one child four or five years old. There may have been a seventh individual also. It is not known how these other bones were distributed; but it is

clear that the burial pattern is more complex than the students recognized.

Concerning burial accompaniments, the students only noted that four items were considered by them to be associated with the skeleton which lay at an angle between the other two at the rear of the chamber (presumably one of the children, Individuals A or B). The wooden scoop was near the left arm. Beads were around the right wrist (the thick disc beads some of which were still strung on cordage). The circular shell ornament with decorative drilled holes was in the chest area. And finally, one student reported that something which appeared to be "cedar (?) bark matting" seemed to underlie this skeleton "and probably all other skeletons as well." There is no evidence in the collection of either fibrous bark or matting of any kind, unless small samples were embedded in the lumps of unidentified vegetal material (see catalog no. 83, below); some large portions of such material that was not collected may have been placed under burials, or else something such as compacted pack rat nest materials may have given the impression.

There are no grounds for speculating whether the scoop, the shell ornament, and the bracelet might more likely have been placed with the older youth (C) rather than with one of the children (A or B). It should also be pointed out that the fragmentary Individuals D and E were older than A, B, and C and the students did not recognize their presence when they removed the collection. If any other of the cave artifacts were closely associated with particular skeletons, the students did not make note of it. As indicated above, caves also were frequently used for storage by the Seri as well as throughout the Greater Southwest.

No evidence was reported to show whether the burials were interred at the same time or successively, or whether any might have been secondary burials.

#### COMPARISONS

*Archaeology* There is no archaeological evidence for cave burials anywhere in the Sonora coast region. So little cave analysis has been done (or reported), the lack of evidence does not argue in any way against the practice. It may well have been common in the local region.

Bowen (1976:113) reports that "at least one burial has been excavated in the Guaymas area, but no details are available." It is likely that he had heard of the burials reported here.

Some burials have been found in open sites and have been summarized by Bowen (1976:46-50, Table 6). Only one has been excavated. It is from a dune site near Punta San Antonio, at the southern boundary of the central coast culture area, not far from Pala Chica Cave. It was a young adult male placed in supine position, arms and legs fully extended, oriented with the head to the north. A necklace of more than 6,300 small shell disc beads accompanied the body. Several rocks, two manos, and a basin metate apparently had been placed on the grave. Bowen describes what is known of other burials farther north along the coast that had been

excavated or observed by amateurs. Some are multiple burials. In one case, four disarticulated skeletons are evidence of secondary burial practice. A shell bead necklace (undescribed) accompanied an infant skeleton. Felger and Moser (1985:378) mention a multiple burial that included Tiburón Plain pottery; if the radiocarbon date based on eelgrass is reliable, it may have been as much as two thousand years old.

In his summary, Bowen (1976:92) finds significance in the characteristically varied, non-standard burial practices of both the coastal archaeological evidence and the Seri ethnographic evidence. Two patterns common to both are clear: "the simplicity or total absence of nonperishable grave furnishings, and the consistent orientation of the head, which varies primarily between north and west."

The Pala Chica Cave burials might conform to the first pattern (limited offerings), but the data on context are not reliable enough to apply the second pattern (the burial orientation) although the placements in the students' sketch might conform since the cave entrance faces east (Fig. 2,c). No cave burial patterns have been established in the region for comparison. In any case, the space constraints of this small burial chamber might make *any* orientation nonsignificant compared to open-site burials.

Elsewhere in northwestern México, west of the mountains, one suspects that more cave and crevice burials have been found than the literature reflects. Nevertheless, even in suitable areas the extent of the practice may have varied from one people to another. For example, Massey and Osborne (1961:341) state: "To date, the use of small caves for the specific purpose of burial appears to be characteristic only of the extreme south of Baja California, in the Cape Region. Interments there were customarily in secondary, although primary burials, usually flexed, do occur." A survey of the more recent literature does not change that view.

*Ethnography* The use of caves as a place for burial of the dead is not reported either ethnographically or in historical documents to have been a standard practice in the coastal regions of Sonora. Suitable sites were available, however, especially in the southern portion of the coast where rocky hills with caves were common.

Much has been written about Seri burial practices, in part because of interest in the unusual custom of "tree burial" or "cactus burial" that has been reported for the Seri since 1692. Moser (1970) reviewed the documentary evidence and more recent literature and added further data. Most likely, elevated burials were resorted to when ground conditions or lack of digging implements made inhumation impractical.

Cave burials might logically constitute a functional equivalent of elevated burial for the same reasons, affording some protection without the need of a deep grave. Indeed, according to Moser (1970:213) "when occurring in a mountainous area where rocky ground prevented the digging of a grave, the corpse was often sealed in a cave or crevice." While perhaps not a frequent Seri practice in the coastal plain, cave

burials can be considered as well within the Seri pattern. Furthermore, even though there is no direct evidence for chronology, it is reasonable to suggest that the practice existed in the early Seri period and continued into the present century.

Drawing from Bowen's summary of the literature on Seri burial practices (1976:46-50), there are accounts that Seri bodies were usually placed in flexed position; that they were wrapped in a pelican-skin robe or a blanket; that personal possessions were placed with the body; that a sea turtle shell might be placed over the body; that the grave might be covered with such things as stones or brush; and so on. Some of these practices may have a time depth of two thousand years (Felger and Moser 1985:378). Bowen makes it clear that Seri practices could have been highly variable among Seri bands as well as through time.

Little is known of traditional Yaqui burial practices, though some customs may have survived. According to Beals (1945:80), if someone is killed while on a campaign or in battle, he is buried where he fell if it was near his village, but those who die in the mountains are cremated. Because the traditional Yaqui pattern may well have varied more than recent informants might know, this does not eliminate the possibility of Yaqui cave burials.

Although the Pala Chica Cave data seem to include no traits that are exclusively Seri, Yaqui, or Pima, it would also seem that there is nothing about the burials that would be inconsistent with what is known of traditional Seri burial practice. Of course, this cannot help to identify them as Seri since we do not know enough of what the native burial customs were for the other peoples who might have frequented the Pala Chica Cave area.

If the presence of artifacts is not diagnostic, then perhaps the absence of expected artifacts might provide a clue to ethnic affiliation. In the case of pottery, Bowen and Moser (1968:123) did not find any confirmation of a mortuary function for pottery by the Seri in recent times. It will take archaeological tests to reconstruct the Seri as well as the Yaqui and Pima practices regarding the placement of pottery vessels in graves.

The absence of *Olivella* shell beads, so typical of Seri necklaces in this century, is probably not meaningful. Their recent prominence seems to be due largely to commercial/tourist influence, though spire-ground or pierced olivellas are evidently part of traditional Seri culture more than the use of other shells as ornaments (Schindler n.d.:430-437).

The absence of bits of woven cotton or cotton strings might argue against the burials being Yaqui, even in the prehistoric period, since the Yaqui did grow cotton and wove cotton cloth. Knowing nothing of non-Christian Yaqui burial practices, one can do no more than speculate that if the burials were Yaqui some evidence of cotton would be expected as part of their clothing, wrappings, or possessions. Its absence might favor a Seri identification. Conversely, the presence of cotton would not necessarily eliminate the Seri. Massey and Osborne (1961:351) logically

suggested them as the trading intermediaries to account for the prehistoric cotton cloth found in the burial cave at Bahía de los Angeles, Baja California.

*Summary* Because the use of caves for burials was frequent in the Greater Southwest, it seems reasonable to speculate that cave burial was practiced at least occasionally by the Seri, Pima Bajo, and Yaqui when caves were available. While there is some ethnographic evidence for the Seri practice, the lack of ethnographic documentation for their neighbors does not rule out the practice by them as well.

#### 4. SKELETAL EVIDENCE OF CULTURAL BEHAVIOR

Aside from the evidence of artifacts and features, cultural patterns can often be inferred from evidence of customary behavior that is reflected in skeletal remains. In her analysis of this small and fragmentary subadult series (cf. APPENDIX), McBeath found no evidence of cranial deformation, significant pathology, tooth wear that would be abnormal for native populations, or other distinctive effects of cultural practices—with one intriguing exception.

McBeath describes two of the Pala Chica Cave children, Individuals A and B, as showing ante-mortem loss of maxillary central incisors. In addition, Hrdlička described the skull of a young adult female Seri that also showed long-standing ante-mortem loss of the maxillary central incisors (Hrdlička in McGee 1898:143).

This may reflect a custom that was reported for Seri women in 1894 by McGee (1898:169). He observed that Seri wives, but not the "maidens," were missing the upper central incisors. He speculated that the tooth removal might have been a marriage ritual, although his local non-Seri rancher informant gave the opinion that it was part of the Seri puberty ceremony. Kroeber (1931:26) commented that "if a regular practise, its connection with the puberty rite would be a natural inference." The absence of the trait during Kroeber's visit and its absence in McGee's maidens may have been due to a loss of the practice late in the nineteenth century. This in turn might also imply that the Pala Chica Cave burials were Seri and that they date from sometime before the last quarter of the nineteenth century. As far as I can determine, the trait has not been reported for any of the neighboring peoples. (The ethnographic evidence is more fully discussed in Dixon n.d.)

## 5. WOODEN IMPLEMENT

### Scoop or hand-shovel

1 specimen (catalog no. 1) Figs. 3-6

This specimen was found near the left arm of one of the burials, according to the excavators, and it was covered by the deposit rather than lying on the surface. This is the only basis for judging whether it was contemporary with any of the burials.

The small slab of wood was fashioned to a thin straight beveled edge at one end and a slightly differentiated handle or grip area at the other. The interpretation of it as a scoop is discussed below.

The wood was identified at the Laboratory of Tree-Ring Research, University of Arizona (Marvin Stokes, personal communication). They report that "the exact species could not be determined without removing a portion of the artifact, but examination under low power microscope revealed characteristics which place it in the Leguminosae family of plants. The consensus favored *Prosopis* sp., *Acacia* sp., or *Olynea*." These are mesquite, acacia, and ironwood. There is a simple technique to test positively for one of these—if the specimen should sink in water, it would be ironwood. However, to avoid the risk of warpage they were reluctant to perform the test. More precise identification does not seem relevant since it is sufficient for present purposes to know that it is a local wood.

The length is 27.2 cm. The width is 8.2 cm along the beveled bottom edge, and the maximum width (just above the edge) is 9.4 cm. The narrower grip area, which is the upper 8.5 cm of the specimen, is 4.1 cm wide across the top edge.

Thickness increases from the bottom edge to the top of the handle end. The bottom edge has been beveled from the back side to a thickness of only about 1 mm. The scoop is 0.5 to 0.7 cm thick over most of its length; in the handle portion it reaches a maximum thickness of 1.1 cm at the top edge.

The two side edges are thin and beveled from both the front and back. However, in the grip or handle area the two edges have been rounded, leaving barely perceptible shoulders on either side. Whether this was done intentionally or during use, the result is a comfortable grip. The top edge of the handle was carved to produce a fairly straight edge.

The lower third of the front surface is slightly concave along the short dimension. Laying a straight-edge across the two sides, the bend reaches a maximum depth of only 4 mm. In part, this may simply be the natural curve of the piece as split from the log, but it also seems to have been further shaped or worn slightly in the center toward the bottom. The same surface becomes slightly convex in the grip end. On the rear side, the lower portion is convex, and it becomes flat in the upper half.

Most of the front or concave surface is moderately polished. In contrast, the side edges are dull along their whole length. It is difficult to tell whether the dulling

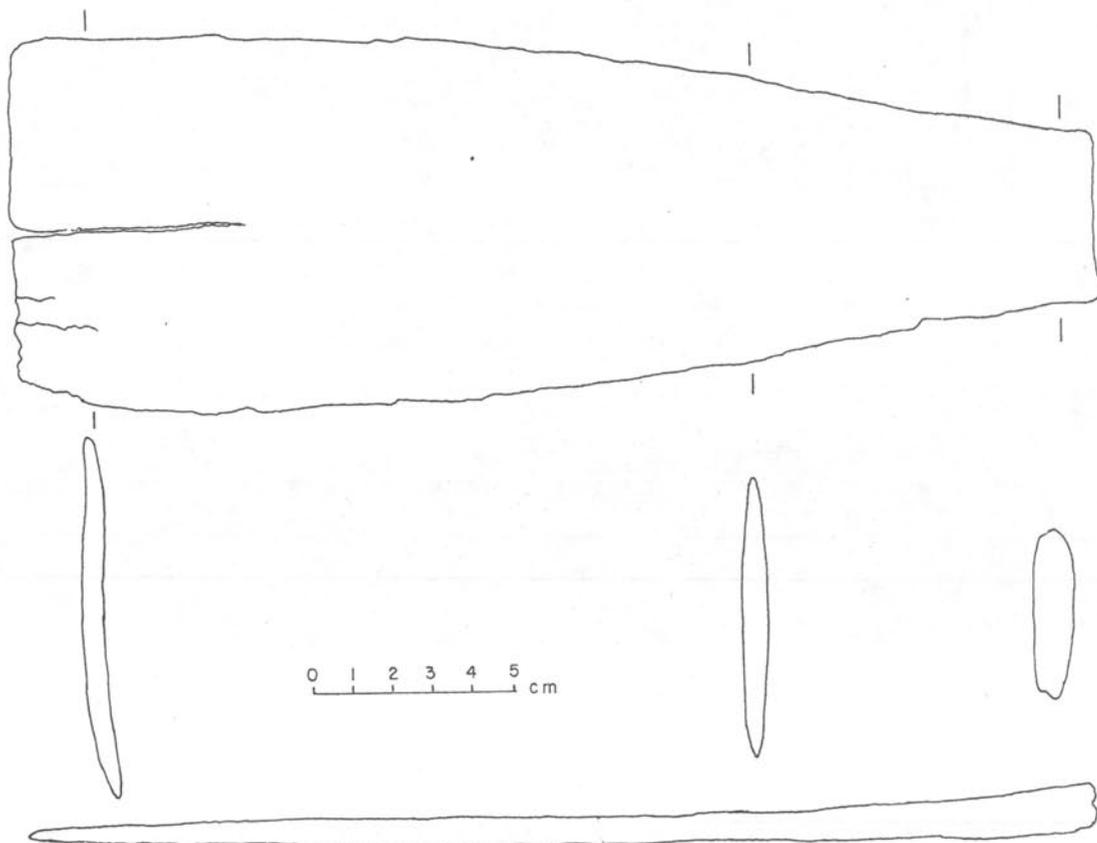


Fig. 3. Wooden scoop, plan and sections.

is the result of intentional shaping or of wear caused by handling. However, as one's hand grips the upper portion and slides up and down, the most rounded edges are precisely the areas most tightly contacted by the fingers and palm. The slightly concave lower 7 cm of the front surface is dulled as though worn. The bottom 2 cm is especially heavily abraded, and the wood is both split and splintered along the bottom edge, which implies some heavy use.

Something rough (perhaps a grainy stone or a scraper edge) made fine parallel scratches in several strokes along the whole length of the smooth front surface, but they are more prominent in the handle area. Just below the end of the handle, as well as on its cut end surface, similar strokes were made at right angles parallel to the top edge. It does not seem possible to determine whether these light scratches resulted from shaping, finishing, use, or cleaning after discovery.

The back surface of the object is very irregular. To a non-expert, it appears to have been a smooth surface originally which was later eroded in wind or water,

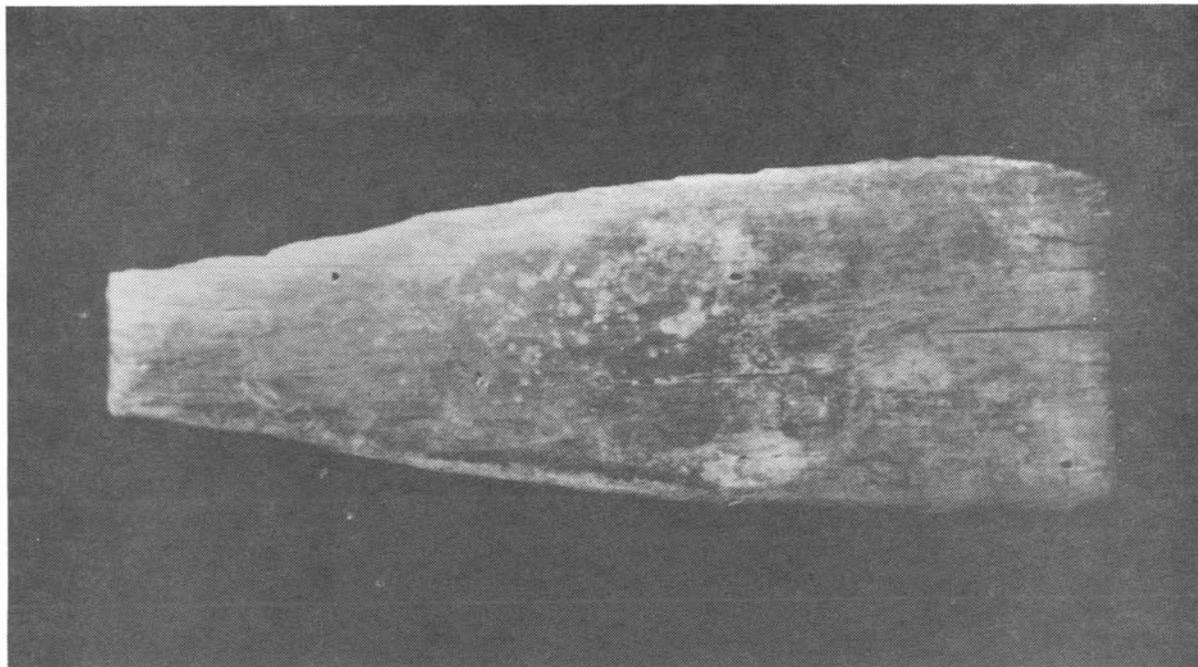


Fig. 4. Wooden scoop, front.

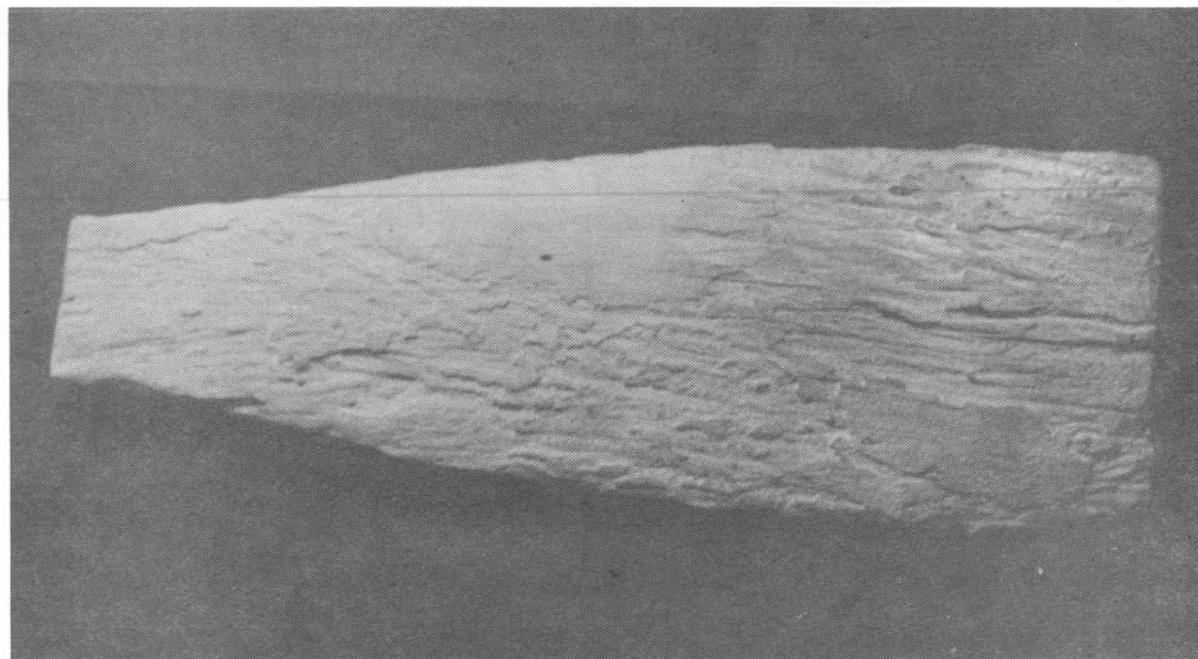


Fig. 5. Wooden scoop, back.

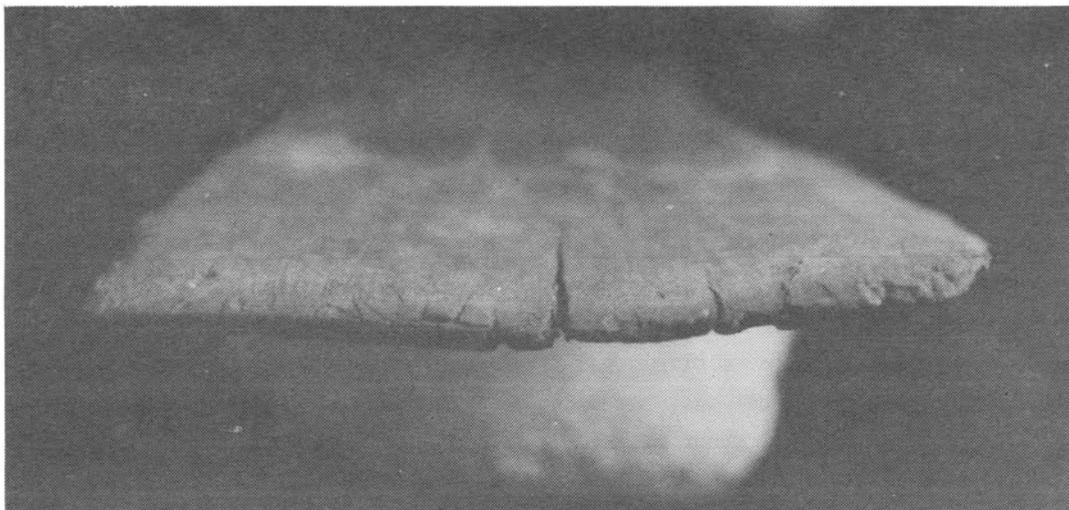


Fig. 6. Wooden scoop, detail of bottom edge.

leaving islands of the original smooth surface surrounded by eroded areas according to the grain and irregularities of the wood. It is the sculptured effect often seen in driftwood. This observation led to some speculations about the source of the original piece of wood and about its history before and after deposition.

However, the report of the Laboratory of Tree-Ring Research stressed that "there is a marked contrast between the two flat sides of the object in regard to the color of brown hues. The lighter colored side may very well indicate the presence of sapwood while the darker colored side may represent heartwood. This color demarcation was also observed on the smaller end of the scoop [end view]. The slight curvature, as seen in the blade, would suggest its manufacture from a split off of a larger log, the split being made parallel to the growth layers. To reinforce this suggestion, the surface modulation of the lighter hued side looks very much like the work of wood-boring insects, which are frequently seen in the sapwood of mesquite and ironwood. The softening of the ridges could be the result of subsequent abrasion, deliberate or otherwise" (Marvin Stokes, personal communication).

Clues to workmanship or tool use might help to determine whether the artifact was prehistoric or historic. However, evidence of the methods used for producing the basic form is unclear because the final shaping and finishing were apparently done by abrasion, which would have erased it. The top handle edge shows some facets which suggest carving, but they are not so regular as to indicate a metal knife or saw. In short, present examination reveals no evidence that metal tools were used, but their use cannot be ruled out. The general shape and finish does seem to eliminate an origin from commercial sawed lumber and supports the idea that the object was made and shaped by hand, whatever the tools used.

The only other features that were thought to be possible indications of an historic date are several small holes that resemble nail holes. Each is 1 to 2.5 mm diameter and penetrates from halfway to completely through the wood. They are not biconically drilled. Although there are no hammer-blow indentations and the wood grain does not seem to be pressure-distorted at the margins of the holes, the impression of nail holes is heightened because two are symmetrically located near the corners of the bottom edge. However, examination by the Laboratory of Tree-Ring Research showed them to be natural in origin: boring insects and wood anatomy (knots of small branch traces or buds). They observe that "the holes, as well as the surface sculpting, may suggest that the tree had been dead before being used to manufacture the object. Mesquite borers will, however, attack a living tree" (Marvin Stokes, personal communication).

There are no signs of habitual use except along the bottom edge, and there are no carved or worn features to suggest hafting. The size, shape, and wear all suggest that the specimen was used as a small shovel or scoop. Whether it was a meaningful grave offering, such as a possession of the dead person, or was merely left after it was used to prepare the grave, is a matter for conjecture.

#### COMPARISONS

One purpose of the following discussion is to compare the Pala Chica Cave specimen with previously identified specimens to test the interpretation of the object's use as based on its shape and wear characteristics. Because several different ideas about the specimen have been offered since it was discovered, a systematic review aids analysis by showing the ranges of variation in what appear to be analogous forms. A major problem in using published sources in both archaeology and ethnography is the lack of information on wear patterns and other details that would substantiate interpretations of the use of specimens. Where a use has been suggested for an archaeological specimen, the attributes that led to the interpretation are often not mentioned.

I have compared the Pala Chica Cave specimen to a wide variety of implements that were also made from slabs of wood. In the order of least likely interpretation to most likely, these include the ritual objects known as *tablas* from the Baja California peninsula, wooden pillows and other miscellany, pottery-shaping paddles, stirring or cooking paddles, balsa-raft paddles, and digging implements.

#### *Ceremonial tablas*

An interpretation of the Pala Chica Cave object has been proposed by Foster and Findley (1982). Their idea is that the object may be an example of one of the so-called *tablas*, a specific kind of ritual object which is only documented for the Baja California peninsula. The particular interest in this possibility has been that it might be evidence of some kind of close connection between the peninsular populations

and the Seri. This in turn relates to the larger problem of either Seri origins or mutual influences across the Gulf of California. Foster and Findley's interpretation can be tested by comparison with the known characteristics of the tablas.

The objects reliably identified as tablas from the northern part of the peninsula are the most homogeneous group. They are historic in date and are attributable to the Southern Diegueño and to the Kiliwa. Eight were found in caves or rock shelters which had no reported burials. Their lengths range from 59 to 117 cm and their widths from 17 to 41 cm. All eight have a narrow, sharp tang at one end which was 15 to 25 cm long. The tablas may have been carried using the tang as a handle, but the principal purpose of the tang evidently was to fix it upright in the ground (cf. Meigs 1974). The tabla's side edges are straight; the edge at the end may be either straight or else concave matching the concave end from which the tang projects. A few have nail holes near the edge where objects might have been attached. All are painted with designs in red, black, and sometimes white. No use marks or wear marks are described. (A ninth specimen, unpainted, apparently was found north of the border in San Diego County, California, but its interpretation as a tabla is ambiguous.) The tablas seem to have been associated with ceremonies to keep the dead satisfied and distant from the living, but none were reported to have been placed with burials. Most likely they were cached by shamans for retrieval and reuse when needed. (Hedges 1973; Meigs 1974)

The tablas of the central and southern portions of the peninsula are also historic or late prehistoric in date. Only two are known in collections. One is from a cave near La Purísima in the interior on the Pacific side of the mountainous central divide. The other is from a cave near the coast on the Gulf side at the southern end of Bahía Concepción at about the same latitude. There were no burials reported in either cave.

The La Purísima specimen is shaped like a long, flat stick, though particularly well finished. It is 145 cm long by only 6 to 12 cm wide and 0.5 cm thick, and it is tapered at one end. There are three large beveled crescent-shaped cuts along one side. The main feature which distinguishes it as a ritual tabla are large drilled holes. Some smaller ones may have been mending holes and others may have been means of attaching objects such as feathers, but there is one that is 5 cm diameter and is likely to have served a ritual purpose (cf. Massey 1972:28 and historical observations summarized in Williams 1975a:27, 30).

The second specimen, which is from Bahía Concepción, is also long and narrow. The length is 83 cm, the width about 14 cm, and it is nearly 1 cm thick. At one end, and possibly both, the edge is beveled bilaterally. The two long sides, which are parallel and slightly S-shaped, are unilaterally beveled. It has a painted design in yellow and white. Near one end are two drilled holes a little over 2 cm diameter and some associated grooves. It is interpreted as a tabla which may have been held as a mask. (Ritter 1974)

Eighteenth-century historical records about tablas imply that there was a wide variety (Aschmann 1967:xii, 44-45, 115-116, 128; Massey 1972:26-28). From these sources Aschmann derives a general size of about 75 by 40 cm by 2.5 cm thick. Unfortunately, the historic sources apparently do not include sufficient description of which attributes varied and what was the range of the variations.

The identification of archaeological specimens as tablas therefore becomes a problem, as in the case of the tentatively identified "bull-roarers(?)" from a burial cave near Bahía de los Angeles (Massey and Osborne 1961:344, Pl. 15,i) and from Gardner Cave (Meighan 1966:374, 389, Fig. 25). There are also some flat, lozenge-shaped wooden objects with a shark-tooth inset from burial caves of the Las Palmas culture at the tip of the peninsula (Diguët 1973:28; Massey 1966:49), but no one considers these to be related to the tablas. Pending further discoveries of identifiable cached tablas or of more detailed historic records, it is reasonable to assume that other tablas also would have special features that were nonutilitarian on the order of those that are already known.

This summary of known tabla attributes shows clearly that the Pala Chica Cave specimen is not only far smaller in size than all known tablas, but it does not have even one specific tabla attribute. In fact, it has no nonutilitarian features of any kind to suggest that it might be an unusual form of the religious objects. As for context, it was found with a burial, in contrast to what little is known of the context of all identified tablas. And none of the tablas is reported to have either the grip area or the abraded lower working edge of the Pala Chica Cave specimen.

#### *Pillows, bowls, and miscellany*

Rectangular slabs of wood used as pillows, rectangular bowls or trays, palettes, parts of furniture, and so forth, are frequently mentioned in the ethnographic and archaeological literature of northwestern México and adjacent regions. A review of available literature shows that in comparison to the Pala Chica Cave object, they lack a grip area and wear characteristics, and they are thicker, or differ strongly in size and finish, or have distinctive features which relate to their primary purpose. All such features are absent on the Pala Chica Cave object to the degree that detailed discussion is unnecessary.

#### *Pottery paddles*

The Pala Chica Cave specimen has some general resemblance to the kind of paddle that potters use to beat the exterior of clay pots against an anvil support held inside, as a finishing stage prior to drying and firing. The grip area would have been appropriate, and the abraded lower edge could have resulted from occasional use for digging into clay during preparation.

*Archaeological data* I have found no detailed descriptions of archaeological specimens that have been confirmed to be pottery paddles. One specimen that was so identified was found at the Laguna Salada in northern Baja California but may be a shovel (cf. below). Rogers (1936:8, Pl. 4,d) says that the "old form" (i.e., made prior to the use of metal tools) among the Southern Diegueño had a blade length that was twice the blade's width and sides that curved into the handle without forming right angles.

The Ventana Cave collection included four Hohokam specimens which are identified as "definitely connected with the art of pottery making" (Haury 1975:417, Pl. 35,a,b). Some were buried with an adult female. The lengths are about 24 cm including the handle. Perhaps because they were so severely damaged, the description does not indicate the basis for identification as pottery paddles rather than some other use.

Fewkes also found paddles at Casa Grande (1912:146, Pl. 77), most of which presumably are prehistoric. They vary somewhat in form. Most are long and narrow with well-differentiated handles or with grip areas. One strongly resembles the modern Pima pottery paddles and is quite different from the others. Fewkes only says that collectively they are "evidently" pottery paddles but does not support the identification.

*Ethnographic data* Use of the paddle-and-anvil finishing technique is not known for the Seri (McGee 1898:153; Kroeber 1931:17; Bowen 1976:59, 69, 72), for the neighboring Pima Bajo (Pennington 1980:312), or for the Mayo (Beals 1945:39). However, the pottery paddle interpretation must be considered because that implement was used by other neighboring groups: the Pápago (Rogers 1936:3; Fontana et al. 1962:59, 65; Hinton 1969:883; though not listed for the Sonora Pápago in Nolasco 1965:422); the Pima Alto (Russell 1908:126); the Yumans in the lower Colorado River area and in the Baja California peninsula (Rogers 1936); and by the Yaqui, surprisingly, if Spicer is correct (1969:836, though cf. a denial by a Yaqui informant cited in Drucker 1941:93, 107).

Ethnographic specimens of pottery paddles are briefly described or mentioned for some groups in the Greater Southwest, including the Paipai of the northern Baja California peninsula (Meigs 1939:36, Pl. 10,b; Smith and Michelson 1972: Figs. 9-11; the Upper Pima (Russell 1908: 101, 126, Fig. 15, Pl. 17,b; Hayden 1959:10-16, Fig. 5); the Pápago (Fontana et al. 1962: Figs. 3, 53-60, 94); the Cahuilla of southern California (Campbell 1931: Pl. 43,h); the Southern Diegueño and Kiliwa (Rogers 1936:8-9, Pls. 4,d,e, 6,b), the Cocopá (Kelly 1977:49), and the Maricopa (Spier 1933:107-109, Pl. 7,e).

This sample of ethnographic records is consistent in the ways pottery paddles differ from the Pala Chica Cave specimen. All share the characteristics of being made from heavier slabs of wood. Where details can be seen in illustrations, they

appear mostly to be 2 to 4 cm thick, and the edge at the end of the paddle seems to be as thick as the side edges. Most are shown to have short stout handles that are sharply differentiated from the blade portion by a right-angle cut on each side, which reflects the use of metal tools. Prehistoric specimens would be expected to have similar handles but set off from the blade by a curve; however, this shape cannot date specimens that are without context as prehistoric because modern forms occasionally have the curved shoulders too (Fontana et al. 1962: Figs. 56-58; cf. Rogers 1936:8, Pls. 2,f, 3,b,c, 6,b).

The range in sizes does not appear to be great. Russell (1908:101) says that the Upper Pima paddles vary according to the size of the vessel being made; one measures 27 by 11 cm. The Maricopa paddles come in three sizes, from about 20 cm long (by 8 cm) to about 25 cm long; some are curved, some flat (Spier 1933:108-109; Harwell and Kelly 1983: Figs. 5, 7, 8). The Cocopá paddles are in two sizes (Kelly 1977:49). The Diegueño paddles average about 10 by 10 cm, plus the 10 cm long handle.

The use to which the pottery paddles are put ought to cause characteristic wear patterns, but I have found only three brief remarks about the used surface and two of those may relate to the manufactured shape rather than to wear. According to Kelly (1977:49), the large Cocopá paddles had "a slightly rounded working surface." Russell (1908:101) says that the Upper Pima paddles are "hollowed to fit the convex surface of the vessel." Rogers (1936:8-9) says that in contrast to the Pima, the Southern Diegueño paddles are always flat, but that they develop an "evenly-ridged surface due to the wasting away of the softer parts of the wood grain," which in turn results in a pattern impressed onto the clay surface.

*Summary* Based on the characteristics which are described or implied in the literature, the criteria for distinguishing pottery paddles from other kinds of paddles seem clear. Perhaps the most telling is that they should show signs of heavy wear in the center from the repeated beating against the clay, regardless of such factors as the tools used to make the paddle, the variations in handle form, or whether the used surface was initially flat or concave. The Pala Chica Cave object was probably not used as a pottery paddle because it is too small, too thin, and too light, and the slightly concave and dulled lower portion certainly shows none of the wear characteristics to be expected from beating on clay.

#### *Stirring paddles*

Simple paddle-like wooden implements designed primarily for use in cooking to stir food have only rarely been described in either ethnographic or archaeological reports in the Greater Southwest and northwest México. Ladles and spoons, which are the usual names for small bowls or cups with long handles, are perhaps better known and reported because their distinctive shapes are more easily recognized. In

many instances, they are European-derived forms.

It is possible that there was a range of variation in cooking implements with sticks as the simplest form grading into those with a flattened blade or paddle at one end. But there is little published information to show what the range of variation might have been and what might be the identifying characteristics of form or wear. However, instead of a sharply beveled straight bottom edge as in the Pala Chica Cave specimen, one would reasonably expect the edge of a stirring paddle to be more rounded both in profile and in shape.

One such specimen has been reported from northern Baja California. It was found on the edge of the Laguna Salada (Williams 1975a:51). The context was not recorded, but it most likely was historic. From the illustration, it appears to be about 40 cm long including the handle, which is long, narrow, and tapers from the blade. The identification as a cooking paddle seems reasonable. The blade has a very rounded bottom edge, as would be expected if it had been used to stir in a pot.

The Seri only used a simple stick for stirring in pots (Schindler n.d.:275). More formal implements were likely to have been used in the traditional cultures of the neighboring Yaqui or Pima Bajo.

The Pala Chica Cave object seems too large to be a stirring paddle. Also, it has no features of shape or wear such as abraded corners at the lower edge that would suggest frequent use for stirring in a hard container, although it could perhaps have been put to that use occasionally.

#### *Balsa-raft paddles*

According to McGee's informant, Mashém, the Seri balsa-raft "is commonly propelled by either one or two women lying prone on the reeds and paddling either with bare hands or with large shells held in the hands." (Women also used the double-bladed paddle in the balsa.) In addition, McGee reports that "the expedition of 1895 found on Isla Tiburon four or five paddles rudely wrought from flotsam boards and barrel-staves, and partly hafted with rough sticks 3 or 4 feet long, but partly without handles and evidently designed to be grasped directly, like the shells of Mashém's descriptions" (McGee 1898:219).

McGee did not claim to have witnessed recumbent paddling himself. This leads Schindler (n.d.:283-284) to express some reservations by remarking that McGee "strays outside the realm of empiricism." However, I see no reason to doubt his report of Mashém's description.

There is no independent confirmation from other observers even though two sources do claim that the practice existed. In one case, Fortunato Hernández, a medical doctor who visited Seri country several times in 1902, apparently had few actual contacts with any Seri, who fled at his party's approach. His long descriptive report is copied and paraphrased almost entirely from McGee, including the description of using bare hands and shells as paddles. His phraseology might be

taken to imply that he himself had been told of the practice by the Seri ("Por las relaciones de los indios, sé que la balsa es impulsada. . ."), but the quality of his monograph suggests that this is likely to be merely an ambiguity or a case of literary license (Hernández 1902:54).

It is the same with the other case, Davis and Dawson (1945:199). They also mention recumbent paddling in their sketch of traditional Seri culture. Describing how the Seri hunted pelicans on a small island in Bahía Kino, they state that ". . . the balsas would be launched in the evening toward Isla Tasne, the women of the party lying prone on the cane bundles and propelling the craft by paddling with their hands or with large hatchet clam shells." There is no evidence that they actually observed the practice, and it seems evident that their description is merely an embellished paraphrase of McGee's account of the hunt (1898:190), with the gratuitous insertion of his notes on recumbent paddling.

With regard to Mashém's description of recumbent paddling with bare hands, shells, and handleless blades, Kroeber (1931:21) only says: "That such crude devices were used along shore or in bays often enough to be mentioned, is wholly in line with the conspicuous Seri indifference, slovenliness, and lack of standards." But he also adds that "the Seri are never fools in practical matters within their compass" in order to emphasize the point that such paddling by women is secondary in the Seris' "indubitable navigating skill" in open water. McGee's statements read in context seem clear on the point. One is left to speculate that recumbent paddling might well have served some practical purpose on occasion.

Unfortunately, McGee gives no further description or illustration of the handleless wooden paddles that he found on the island or of how he identified their use. One might argue that perhaps the specimens he found were *digging* implements, after all, and that he simply had Mashém's comments about hand- and shell-paddling in his mind. Or did he remember that Mashém had also listed handleless wooden paddles originally, and he simply omitted that as he wrote his text? Mashém was not on the trip to Tiburón Island and McGee last saw him a year before; the only Indians with him were Yaqui and Pápago guards (McGee 1898:14). Therefore, the interpretation of the wooden paddles may have been McGee's own, and we cannot be sure whether it was based on anything other than his memory of Mashém's description of paddling with shells. Bernard Fontana (personal communication) has informed me that there is no reference to these wooden objects in McGee's field diary. Even though McGee's published statement is based on his memory rather than his diary, the time interval was short and I can see no reason to suspect inaccuracy.

I have not found reference to any such nondescript implements in published museum collections, and it is not likely that anyone, including McGee, would have bothered with them then. None are cataloged in the McGee collections at the Smithsonian Institution (William Merrill, personal communication). However, when

Seth Schindler reviewed the Smithsonian's McGee collections in storage, he found two uncataloged wooden paddle blades with the field numbers 913 and 915 (personal communication; also cf. Schindler n.d.:323). In photographs which he kindly furnished, a five-line inked inscription on one blade can be read. The other appears to have a similar label. Both blades are rectangular, about 18 by 10 or 11 cm. The blade surface that is visible on No. 913 has an incised checkerboard design with X's in the light squares, and No. 915 just has lines forming squares. Each has straight shoulders sloping at a 45° angle to a narrow tang which Schindler and his Seri informants believe was designed to be lashed to the connecting shaft (not in the collection). They are made from commercially milled planks; a metal knife appears to have been used. These do not seem to be the handleless paddles that McGee mentions. Perhaps he just saved the fancier paddle blades that he found at the island camps.

[illegible]

915

Tiburón Isl.

Sonora Mex.

W.J. McGee.

In comparison, the blade of the Pala Chica Cave specimen (below the grip area) is similar in outline and in size; but it lacks their sharply differentiated, narrow lashing-tang. The photographs do not show the other features for comparison, such as edges, cross-section, and wear patterns. (With their geometric decoration, it is these specimens which bear a superficial resemblance to the much larger Baja California ritual tablas discussed above.)

At the opposite extreme, perhaps, a rudely made paddle was used by the Seri Chico Romero in a balsa-raft during a sea turtle hunt. "A short paddle, made from the branch of a tree, almost unworked, completed his equipment." Presumably it had a handle and was not used in a recumbent position, or Thompson would have noted it along with other Seri curiosities (1931:56).

If other coastal peoples, such as the Yaqui or those in the Baja California peninsula, had handleless paddles, I have found no reference in historical or ethnographic sources. Without examples, it is difficult to be sure of the placement and characteristics of the grip area, whether made by design or by wear. Also, some examples might show the kind of abrasion or erosion that would affect the blade of such a paddle used in the water. Although evidence of use might not show up at all on pieces of wood just grabbed for temporary service and discarded, it is conceivable that some Seri might have put a little more work into making a handleless paddle for repeated use.

In the attempt to interpret the Pala Chica Cave specimen, one can only conjecture about whether it shows what would be appropriate use characteristics as a paddle. The thinning and abrasion of the bottom edge, together with the slightly greater wear on the lower third of the front surface, does not suggest the kind of uniform erosion below the grip area that might be expected from habitual use in water or damage from hitting sand or stones in the shallows. The blade does have an appropriate shape, and the grip area itself does seem to be satisfactory for use as

a paddle (it is comfortable to hold, and with the index finger extended to brace it, it would function almost like a swim fin on the hand). But the possibility does not by itself lend any support to that interpretation. At present, primary use of the implement as a handleless balsa-raft paddle does not seem likely, though it cannot be rejected outright as a possibility.

### *Digging implements*

In the western U.S. and throughout México the primary digging tool was the stout, bluntly pointed "digging stick." More specialized shapes are found in the Southwest associated with cultivation, such as sword-like sticks with a long sharpened edge and often a short handle. These did serve for digging into the soil but only as a part of their main use, which was cutting off weeds at or below the surface, loosening the soil, and the like. What are usually called hoes, sometimes with blades made of stone, were also widespread and mostly associated with agriculture.

Tools with broader spatulate wooden blades that have been reported as digging implements are rare in both ethnographic and archaeological records. However, a few are known. Those with relatively long handles are usually called *shovels* and those with no handles or only slightly differentiated handles are sometimes called *scoops*. The two types most likely intergraded, if indeed there really were any long-handled spatulate shovels before European introductions of the form and metal tools to carve them. Wear patterns of the blades of shovels and scoops should be similar, but they are never described.

The shovels (those with the longer handles) are probably the least common. They are not described in detail in the archaeological or ethnographic literature. In Sonora, wooden shovels are reported for the Yaqui and Mayo (Hrdlička 1904:64; Holden et al. 1936:70, 78, 123; Beals 1945:7, Fig. 1,a). Shovels were also used by the Kamia of the Imperial Valley in southern California (Gifford 1931:31), and several have been found in northern Baja California that probably are historic in date (Fontaine and Prosser 1965:3, 5, Fig. 4; Williams 1975a:51; Hedges 1973:20). At Casa Grande, southern Arizona, Fewkes found some stone blades that could have been set into wooden handles; he claimed they were shovels, but his description and analysis are ambiguous at best (1912:131-132, 161-179, Fig. 39, Pls. 70, 71). Russell (1908:97, Fig. 10,b) describes Pima specimens. In most cases, if not all, the wooden shovels are probably historic. Some have blades nearly as small as the Pala Chica Cave specimen, and one might expect them to have the same kind of wear on the blade's end; they probably would differ mainly in the handle arrangement.

"Scoop" is a convenient name for small spatulate digging implements without long handles. They have either short handles or less differentiated grip areas. Such an implement would be suitable for light digging or for moving such materials as loose soil. They could be used with one hand while sitting, squatting, or kneeling; in contrast, most of the shovels would require two hands and a bending or stooping

position, or perhaps kneeling to use implements in the smaller size range.

*Sonora* I know of no archaeological specimens of scoops from Sonora. The Seri were reported to have used large shells for digging and scooping. The use of paddles from modern wooden plank boats to dig a grave was reported by Davis (1933:20). Only one other example of a Seri implement has been reported that could be termed a scoop (Schindler n.d.:296-297, Pl. 74). It was collected in 1905 and is poorly documented. At 34.4 cm long, it is about the same size as the Pala Chica Cave scoop. It was made from a section of turtle carapace, "one end of which has a bevelled edge and shows either modification or wear. Whether altered intentionally or through use in digging, this edged tool would have been well suited to its alleged function. . . ." Schindler's Seri informants agreed that the indicated use was logical but was one with which they were not familiar. As is so characteristic of the Seri, and as seems to be the case in each of these instances, they may have picked up whatever was handy on the particular occasion and modified it if necessary to accomplish a task.

*Baja California* I have found no reports of wooden scoops from the peninsula; the most similar specimens would be those from the northern part referred to above as shovels.

*Greater Southwest* Scoops are known in the prehistoric Southwest, especially in dry caves of the Anasazi, and they help to illustrate the range of variation. According to Kidder and Guernsey (in Nusbaum 1922:115-116) wooden scoops have been found in the sand or rubbish around the cists "in every Basket-maker cave that we have excavated." They are made from "thin sections from the outer parts of logs of wood; their outer surfaces are unworked and retain the natural convex form of the log." On many, but not all, the inner surfaces "have been made concave by charring and scraping" and the edges and ends "are always much worn." They also remark that the scoops vary so much in details of size and shape as not to be further classifiable. Experiments showed that the implements "are excellent tools for scraping out loose sand (as in digging a cist)." Guernsey and Kidder (1921:90-91, Pl. 38,g,h,i) also note that the scoops sometimes show evidence of multiple uses, such as palettes. Sizes range from 14 cm long by 8 cm wide to 47 by 15, the average being 18 by 10 cm, "a convenient size to use in the hand." Cosgrove (1947:145) discusses similar specimens in west Texas and southwest New Mexico. Somewhat better-shaped specimens from Tsegi Canyon, northeastern Arizona, are described by Anderson (n.d.:86, Fig. 30).

In comparison, the Pala Chica Cave specimen differs from these principally in being more deliberately shaped with a grip area, better smoothed on the front surface, less concave, and in having less-worn side edges. But it is in the same size

range and appears to be a functional equivalent.

An even more similar specimen, with a narrowed handle or grip area, was found beside a Pueblo II/III grave. The size is 32 cm long, including the handle part, by 6.5 cm wide (Guernsey 1931:107-108, Fig. 20,b). A specimen from Kanab Creek, southern Utah, also resembles the Pala Chica Cave specimen except for having an even more differentiated handle (Judd 1926: Pl. 52), but no interpretation or measurements are given.

Wooden paddle-like objects were found in some late sites in the Salt River Valley in southern Arizona. There were seventeen such implements at Los Muertos and a similar one from Los Hornos (Haury 1945:162, 182, Pl. 74, Fig. 120). The best preserved have a slanted or oblique edge at the bottom end; the edge is sharpened. Lengths range from 8 to 32 cm, widths average 8 cm, thicknesses average 2.5 cm, and the thin handles are 5 to 8 cm long by about 2.5 cm wide. Although one was actually found in a cooking pot, Haury doubts that it was a stirring paddle because the obliqueness of the bottom edge would not be maintained. Instead, he suggests that the form derives from the large digging implements from Casa Grande (Fewkes 1912:146 and 1907: Pl. 39,g), which are usually called "weaving sword hoes." The Los Muertos specimens may be small versions which preserve the shape and were used for digging and hand cultivation. (See also Lumholtz 1912:68-69; Castetter and Bell 1942:136.) In comparison, the Pala Chica Cave specimen is somewhat thinner and has a less differentiated handle. It also lacks the oblique bottom edge, which seems to be associated with cultivation. Otherwise, it is in the same size range and has the same general character; that is, it would seem useful for digging in loose soils.

A "spatulate tool" from Los Guanacos (Haury 1945:178, Fig. 115) is nearly identical in form to the Pala Chica Cave specimen, even to the slightly differentiated grip area; but it is only half its size, about 15 cm long. Haury does not describe details of form and wear patterns or interpret the use of this specimen. (Compare Lumholtz 1912:69)

Although the state of preservation may prevent it, one wonders if an examination of wear patterns would support a scoop interpretation rather than the pottery-paddle identifications for some of the prehistoric Ventana Cave and Casa Grande specimens mentioned above in the discussion of *Pottery paddles*.

*Central México* A very similar carved wooden "paddle" was found in El Riego Cave, Tehuacán Valley, Puebla, dating to about A.D. 750-1150 (MacNeish et al. 1967:158, Fig. 138). It is the same size as the Pala Chica Cave scoop, but the handle area is sharply set off from the blade. The edges are described as "ground." Also, "the lower side and end of the blade are relatively sharp, and the other edges are squared or flat." The bottom edge slopes at about 45°; judging by the photograph, it appears to be abraded more than the other edges. MacNeish only speculates that

the object could have been used in weaving or stirring, but use as a scoop would seem to be plausible.

*Summary* Except for the several references listed here, I have not found ethnographic reports of wooden scoops in the literature that I have checked. There was certainly a universal need for some means of scooping a variety of materials in a variety of circumstances. That could be accomplished with the hands or with implements as informal as a stray potsherd, a piece of gourd or basketry, or a suitable shell—as was certainly the case with the Seri. These would have been as easy to use and much easier to make compared to all but the simplest wooden scoops made of tree bark sections.

Further search might turn up other examples or functional equivalents to help in understanding the range of variation in shape and wear patterns of small digging implements. At present, the Pala Chica Cave specimen seems to be a rare kind of tool.

#### *Interpretation*

Because an object may have more than one use, the context where it was finally left may be the least important and most deceptive of clues. Even wear patterns can be deceptive if the goal is to determine the original purpose for which the object was made rather than its last employment.

The range of variation in kinds of wooden implements that have been reported in the Greater Southwest seems at present to support the interpretation of the Pala Chica Cave specimen as a *scoop*, a digging tool. This interpretation is consistent with the abrasion and splintering of the thinned bottom edge and the shaping or wear in the grip area on the specimen itself.

Using available comparative evidence, there is no reason whatever to suggest that it was a ritual object such as the tablas of Baja California, nor is it likely to have been a pottery paddle, a stirring paddle, or any of various other specialized implements that were made of small slabs of wood. Judging by the literature, it lacks all the attributes that identify these special applications.

At present, the only interpretation that seems at all plausible as an alternative to the scoop is the handleless balsa-raft paddle. But in this case the suggestion is possible because there are presently no specific attributes that could identify such an object. The suggestion only arises because of McGee's brief reference to the Seri use of unhafted pieces of wood as paddles, just as his Seri informant said shells were used, under special circumstances. The Pala Chica Cave specimen's wear pattern, however, does not seem consistent with what one might expect from primary use in the water.

The context is consistent with the specimen's form and wear characteristics that suggest use as a scoop for digging in loose soils. If the scoop was not an offering or

personal possession of the dead person, it might have been used to prepare the grave.

A wooden balsa-raft paddle left with a grave is also not beyond possibility, however. Edward H. Davis described a Seri burial that took place in the early 1930s: "His grave was dug with paddles from the *canoas* [wooden plank boat]. . . ." These must have been modern paddles rather than double-bladed balsa paddles. There is no indication that they were not immediately returned to their normal use (Davis 1933:20). Along similar lines, the Seri are said to have used shells for digging graves as well as for paddling balsas (McGee 1898:234, 289). It is entirely within the character of the Seri, if not their neighbors as well, to have made the Pala Chica Cave object for one of these purposes and then to have applied it to several others. Nevertheless, the details of shape and wear indicate primary use for digging.

Fortunately, the Spanish word *pala* is broad enough, at least in dictionary definitions, to serve nicely for both the scoop interpretation, which seems virtually certain, and for the handleless balsa-raft paddle as the only plausible alternative or additional use.

## 6. NACREOUS SHELL ORNAMENT

### Ring-shaped ornament

1 specimen (catalog no. 4) Fig. 7

The specimen was reported to have been in the chest area of the burial that was placed at an angle toward the rear of the cave, the one which was also said to have been accompanied by the wooden scoop and the shell bead bracelet. No cordage was reported to have been associated with the ornament.

The visible side of the object is nacre. The shell cannot be positively identified, but it probably is a thin *Pinctada* (?), a shell which is common locally (identified by Pat LaFolette and James McLean). It is about 5.5 cm diameter and only about 1 mm thick. The shape is a flat ring 1 cm wide around a large central hole. Eleven small holes, each 3 mm diameter, were drilled through the ring at intervals that are not quite even; on one half of the ring the holes vary from between 11 to 14 mm apart, and on the other half they are from 15 to 17 mm apart.

Although the object is now in an extremely fragile state, it is probable that it was strong when the shell was fresh despite the ornament's thinness. Viewing the study collection of *Pinctada* at the Los Angeles County Museum of Natural History, I was impressed by both the thinness and the strength of the specimens which are in a young and rapidly growing stage. These young specimens also seem to be about the right size and contour to account for the ornament.

There is no way to determine how the ornament was used. It could have been worn by stringing it into the hair on a braid or thick strand. Or else it may have been mounted on some kind of backing material. It could even have been suspended on a string by any of the small holes or else strung loosely through the large central hole. The placement of the eleven holes suggests that they most likely were ornamental rather than used for lacing, unless the lacing itself might have been intended to be decorative.

Each of the holes could have been made by punching a tiny hole and then smoothing its edges, but drilling would seem more likely in order to have avoided breakage. Although the holes are not quite evenly spaced, the circularity of the interior and exterior edges of the ring merits some admiration for the craftsmanship.

When the fragile specimen was collected it was carefully placed on a bed of cotton in a small box but was not further stabilized. As a result, it broke in numerous places, the nacreous surface flaked badly, and it has adhered firmly to the cotton. For that reason I was unable to view the other surface to determine whether it had been worked to expose the nacre. (Rather than attempt to remove the ring from the cotton, I halted complete disintegration by stabilizing it with acetone-diluted cellulose; this can be treated for improved reconstruction in the future.) The photograph, Fig. 7, was taken by the students shortly after the object was found and prior to the process of disintegration.

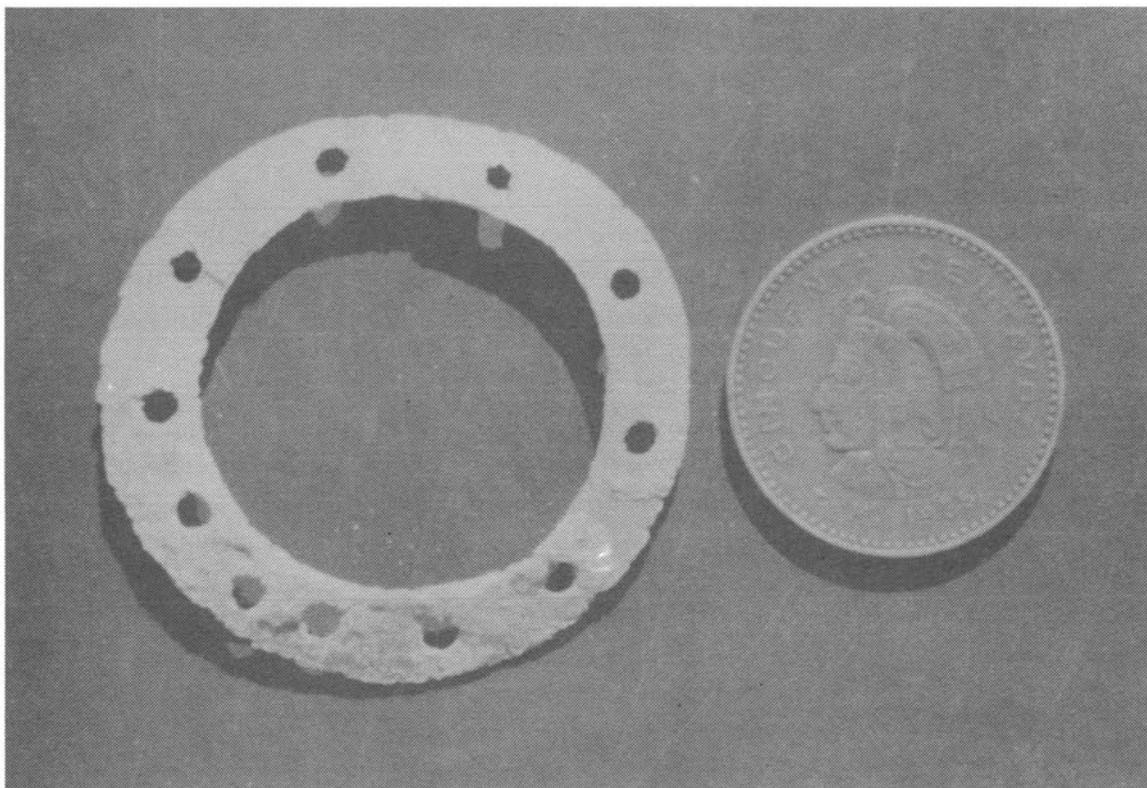


Fig. 7. Ring-shaped shell ornament shortly after excavation (the coin is 3.2 cm diameter).

#### COMPARISONS

##### *Shape and decoration combined*

The ornament's two distinctive features are the ring shape and the pattern of drilled holes. Nothing similar that combines these two features has been reported for Sonora, Baja California, or the Southwest, in either the archaeological or ethnographic literature.

However, turning to the fringes of the Greater Southwest, there is one reference to specimens with both characteristics. In his extensive survey of California shell artifacts, Gifford (1947: J3e and J3f) illustrates one abalone shell example of approximately the same size and form as the Pala Chica Cave specimen; it has eight small drilled holes at nearly equal intervals around the ring. It apparently is from the Santa Barbara coastal region of southern California. There are two other very small examples from the same region with eleven and twelve drilled holes. Because no other examples seem to have been found anywhere with both the shape and the decorative holes (as far as I can determine), the distribution of each feature might be significant when considered separately.

*Shape distribution*

I have not learned of any other examples of this shape of ornament at sites in Sonora or in the Baja California peninsula.

In the Greater Southwest, the most similar shapes that I have found in sampling the literature were probably made in coastal southern California. None have decorative drilled holes. For example, a specimen is reported at Lost City in southern Nevada as trade from the California coast (Shutler 1961:83, Pl. 75,bb). It is *Haliotis* (abalone), which has a nacreous surface similar to *Pinctada*, and the edge has incised decoration. The dimensions are also like those of the Pala Chica Cave specimen. From the photograph it appears possible that there was a drilled suspension hole near the outer edge, but this is not certain. Other published examples of the shape in Southwestern sites are all much smaller in size. For example, a similar ring-shaped ornament with one drilled suspension hole was found in Mule Creek Cave, southwestern New Mexico (Cosgrove 1947:152, Fig. 147,a). Although there was other shell traded from the California coast in the deposit, this one is identified as a fresh-water mussel shell. It is only 2.7 cm diameter. In his survey of Southwestern jewelry, Jernigan (1978:44–45, 103, passim) does not find the flat ring to be a common shape although it is fairly widespread. Apparently the ones he lists are all much smaller than the Pala Chica Cave specimen.

Other examples of the shape without the decorative holes have been found in California coastal sites. Harrington (1928:154, Pl. 25,n) lists six made of abalone from the Burton Mound in Santa Barbara. Diameters of the whole specimens are only from 1.4 to 3.5 cm, and the widths of the flat rings are 0.5 to 1.5 cm. Two have decorative incisions on the outer edge like the Nevada specimen. In his broad survey of California shell artifacts, Gifford (1947) lists a classification “artificial shell ring”; his examples seem also to be from the Santa Barbara coast and adjacent islands.

*Decoration*

*Sonora* The decoration technique—patterns of drilled holes—is not reported on any artifacts from Sonora.

*Baja California* Although none have been reported from the Baja California peninsula, one ambiguous historical note deserves some discussion because it has been referenced by others (Foster and Findley 1982, citing a secondary source, Williams 1975b:1). The original reference cited by Williams mentions the use of perforated shell pendants in 1644 at Cabo San Lucas, at the southern tip of the Baja California peninsula. Don Pedro Porter y Casanate was surveying the region for commercial exploitation of nacreous shell. He reported that the Pericú wore “around their necks mother-of-pearl shells with many holes in them” (Mathes 1970:827). Dr. W. Michael Mathes has kindly provided the original Spanish:

“trayan . . . y al cuello colgadas conchas de Nácar con Muchos agujeros. . . .” He confirms that “agujeros” can only mean perforations, not shallow punctations such as those reported in archaeological collections from that region. Mathes also indicates that “concha de Nácar” was the common usage at that time for abalone (*Haliotis*), while the current use of “concha nácar” is generic, including *Pinctada*. (Mathes, personal communication)

Abalone was traded by the natives from the Pacific shore across the peninsula, where it has been found far to the north on the Gulf side (Williams 1975b). Thus, Mathes feels certain that the shell was abalone and suggests that the holes may have been merely the natural siphon holes. An ornament made of a younger abalone, perhaps 10 to 15 cm diameter with five to eight natural siphon holes, could have served the Pericú as pendants and might well fit the quoted description. Unfortunately, there is no further confirmation of this speculation. At any rate, the main point is to show that the early historic description does not necessarily refer either to drilled holes or to *Pinctada*, and hence it cannot be considered evidence of any specific connection across the Gulf with the Pala Chica Cave people.

*Greater Southwest* I have been able to find no examples of the decoration from the Southwest. Considering the simplicity of the concept, it is surprising that Jernigan (1978) shows no examples at all in his survey of prehistoric jewelry of the Southwest. In California, however, perforations are sometimes found in decorative patterns, though drilled punctations (tiny pits) are more common (Gifford 1947).

#### *Nacreous shell*

In the Sonora coast area, few archaeological specimens have been reported that were made from nacreous shell in any form. Whether the two small “pendants” from Tastiota had nacreous surfaces is not mentioned (Holzkamper 1956:18). For the Kino Bay region, Dockstader (1961:184, 189) mentions casual collections of surface artifacts including shell ornaments, a few of which are “finely incised.” He also mentions “nacre ornaments” accompanying a figurine cache; these had been “worked, presumably to serve as body ornaments.” None are described or illustrated.

Ethnographic evidence from Sonora is also sparse and ambiguous. The use of nacreous shell ornaments by the Seri seems to have been rare in recent times. The only historic reference dates to 1692, when Father Gilg records what would seem to be a shell pendant: “At the neck hangs a beautifully polished round shell, together with all sorts of grains, fruits, beads, and other sorts of childish playthings” (DiPeso and Matson 1965:53–54). If Gilg referred to a shiny nacreous surface as “polished” (as translated), it could be evidence that the Pala Chica Cave specimen was a kind of ornament that the Seri did use.

The Seri have made no round shell pendants in the remembered past.

Necklaces with vegetal items and various forms of shell beads do survive into the modern period. (McGee 1898:171-173; Schindler n.d.:430)

*Baja California* On the Baja California peninsula opposite Seri territory, some abalone ornaments about 4 to 5 cm diameter are reported from a burial cave at Bahía de los Angeles (Massey and Osborne 1961:342-343, Pl. 13,a-c). One small decorative hole was drilled in the center of each as well as a suspension hole at the edge, but the other holes along a broken edge on one specimen appear to have been intended only for repair. Decoration is by incised lines and shallow drilled punctations (not holes).

At the southern end of the Baja California peninsula, shell ornaments are reported to have been common. Historic sources refer to their use in the hair by the Pericú. Nacreous *Pinctada* ornaments with incised and punctate decoration, serrated edges, and suspension holes have been found with burials. Massey also notes that their only counterparts are in Alta California, and he goes so far as to say "we probably are dealing with historic connection with the north—and that is probably with California coastal cultures." (Massey n.d.:31, 50, 109, 143-145, 191-192, 287, 323-325, Pls. 35, 37)

*Greater Southwest* In the Greater Southwest, the use of nacreous shell ornaments appears to be relatively uncommon (Jernigan 1978).

#### *Summary*

Other than the vague Gilg reference of 1692, there is nothing to hint whether or not the Pala Chica Cave specimen can be attributed to the Seri or to any other specific group. The known distribution of the shape, of the decorative holes, and of both characteristics combined suggests that the ornament is unique in northwestern México. But on the strength of the Gilg observation it might at least be consistent with early historic Seri patterns. Further archaeological evidence in the region is probably the only means of resolving the issue.

The Pala Chica Cave specimen is distinct from anything in the cape region of Baja California, where there was apparently much more use of nacreous shell ornaments according to present evidence.

The close similarity of the ornament's shape and technique of decoration to some California specimens may only mean that such ornaments are simple enough in concept that their occurrence anywhere would not seem surprising; what is surprising, perhaps, is their actual rarity. Without a significant number of close similarities in other aspects of the cultures, I see no implications of common heritage, exchange, or diffusion of ideas between the California coast and the Sonora coast.

## 7. THICK DISC BEADS AND BRACELET FRAGMENTS

### **Strung beads from bracelet**

2 specimens (catalog nos. 91, 92) Figs. 8-10

Two of the shell disc beads (described below) are still linked together by cordage fragments that show the stringing technique; a third bead is separate but still has fragments of the cordage attached to it that conform to the stringing pattern of the linked pair. The cordage is a 2-Z-yarn S-twist strand, tightly twisted, and is identical to the cordage fragments in group LL (Table 2). The specimens were part of a bracelet reported to have come from the right wrist of the skeleton that was placed toward the rear of the chamber (the circular shell ornament and the wooden scoop were also reported to have been with the same skeleton).

The bead stringing technique is a variation of looping, using a single element. Rather than stringing the beads loosely on a cord, each is individually held in position against its neighbors. They overlap shingle-fashion. The photographs show the effect as the bracelet was made with the string pulled tight to hold the beads close together (Figs. 8, 9) and the diagram shows the string as though loosened (Fig. 10).

The stringing pattern possibly may not be entirely complete, but what is preserved on the joined beads shows the string's movement. The string passes through Bead *A* across to Bead *B* where it forms a loop and then returns to catch a similar loop that it had formed beside Bead *A*; it then passes through Bead *B*, then along its side to catch that loop, and then would presumably move across the next bead to form a loop at its side, then back to catch the loop at Bead *B* (a small remnant is still loosely attached), down through the next bead, and so on.

Although the stringing was probably uniform over most of the bracelet's length, the single bead with cordage fragments has a variation: the string passes through the bead's hole twice, forming a loop, then passes back along the side to catch that loop and the small remnant of a previous loop. This difference from the joined beads may mean that the stringing pattern was somehow more complex than it appears to be, or else it may simply be the remnant of how the stringing was begun or ended or of how it was tied into a circle. Whatever the explanation of this difference, the basic effect of the stringing technique is to overlap the beads and tie them tightly in place.

Two experiments were tried to test both the reconstructed stringing method and the interpretation as a bracelet. First, the collection of 29 beads was laid out in a line, each bead overlapping its neighbor like the two which are still linked together; the total length was about 24 cm, which would probably be somewhat longer than the bracelet itself because I had them arranged on a flat surface. Second, the bracelet was simulated with wooden beads and a somewhat thicker cord, using the reconstructed stringing technique; the total length was about 21 cm. Both approximations are similar and are the appropriate length for a bead bracelet. It

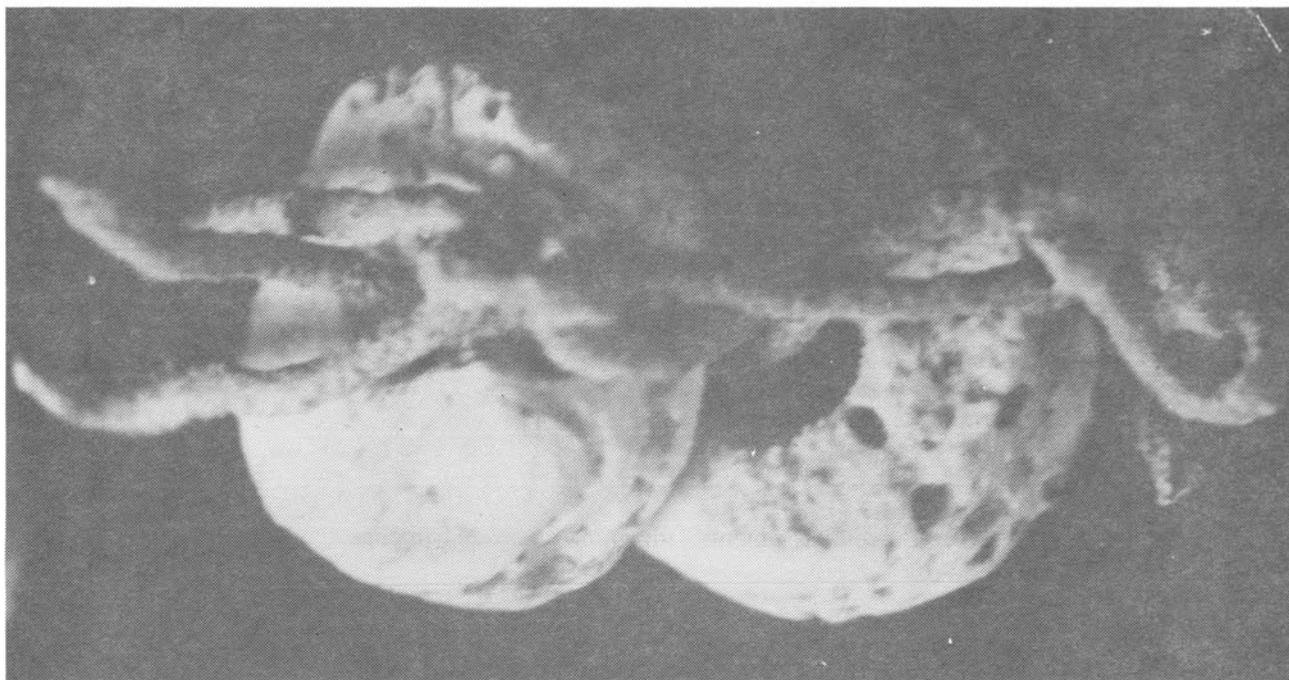


Fig. 8. Bracelet fragment: disc beads with attached cordage, top view.

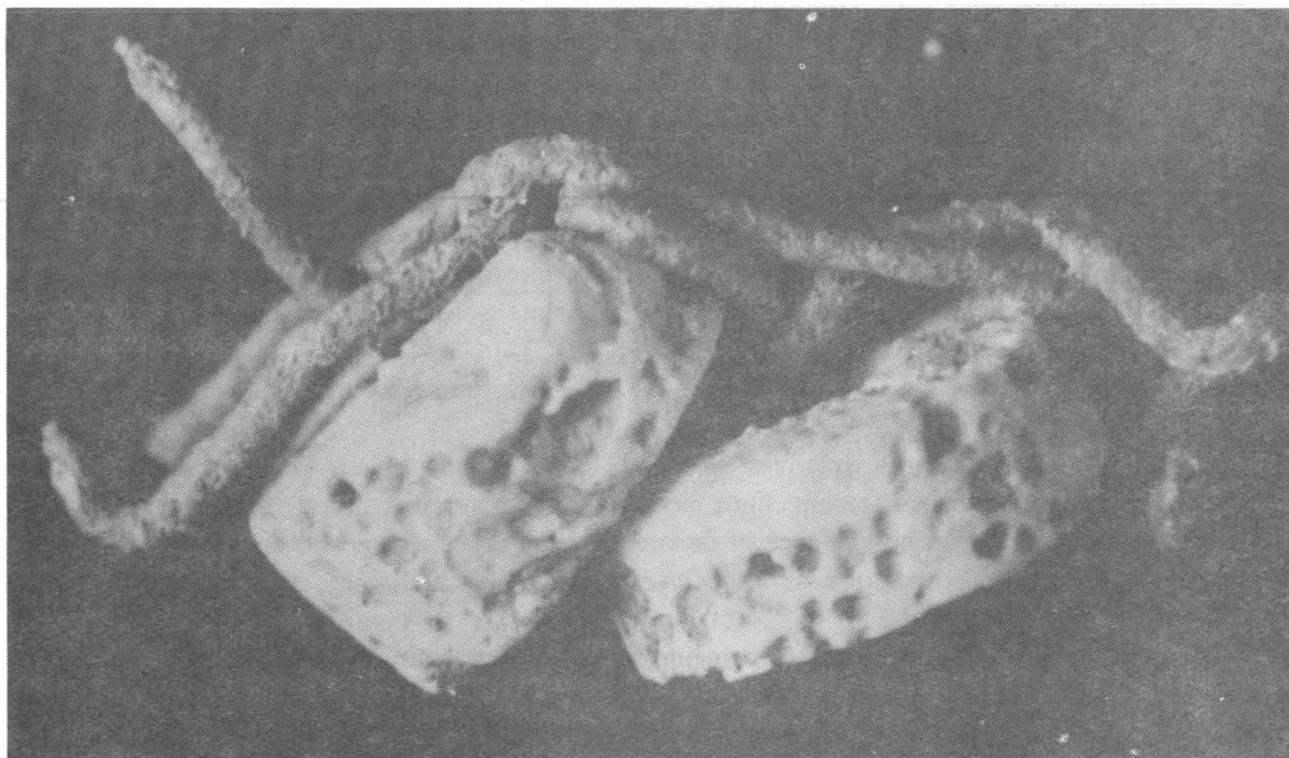


Fig. 9. Bracelet fragment: disc beads with attached cordage, side view.

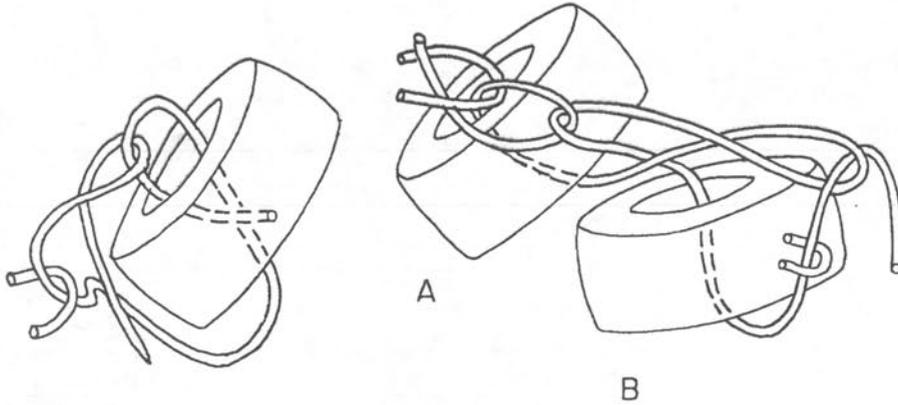


Fig. 10. Bracelet fragments: diagram of bead-stringing.

would therefore appear that the students' report is correct and that their collection of the beads is complete or nearly so.

The cordage fragments in group LL (Table 2) are the most numerous and collectively the longest of any of the kinds of cordage that could be classified. These 41 fragments total 81.5 cm. Experiments suggest that the looping technique would probably take up from three to five times more cordage than the bracelet's length, or about 70 to 100 cm total. It therefore is not only likely that all of these loose fragments in cordage group LL had made up the bracelet originally, but that the students recovered most of the bracelet cordage fragments in their brushing and screening. It could also mean that more of the bracelet might have been intact at the time of discovery and could have been preserved had the excavators had the appropriate equipment and experience. Under the circumstances, it is rare good fortune that three beads with attached cordage fragments were preserved sufficiently to allow partial reconstruction.

#### COMPARISONS

*Sonora* No archaeological examples of bead bracelets have been reported in Sonora. In his survey of recent and modern Seri material culture, Schindler (n.d.:431-432) also found no evidence of decorative bead bracelets, but he does refer to bead necklaces and other ornaments. *Olivella* shells, bleached white, seem to be the most common for necklaces in recent times. There are no data on any special bead stringing techniques, and simple stringing seems to have been standard. Felger and Moser (1985:152) mention that Seri women wore "bracelets of commercial beads."

Schindler (n.d.:431) states that decorative necklaces, worn mostly by females,

should be distinguished from “various naturefactual and artifactual fetishes strung like necklaces or incorporated as pendants among strands of decorative materials. Power objects were worn around the neck and wrist by the population as a whole. . . .” (cf. also Felger and Moser 1985:152). One could speculate that the Pala Chica Cave bracelet might represent some ritual practice that survived, perhaps with altered meanings, into recent times, but there is no reason to think that the Pala Chica Cave specimen was anything but simple adornment. I have found no published information on bracelets or bead stringing for neighboring groups.

*Baja California* In her survey of the literature on shell usage in the Baja California peninsula, Williams (1975b:2-3) gives examples of historic records of bracelets composed of beads made from seeds, wood, pearls, mother-of-pearl, and shell. All are casual reports with no details. I have not found any descriptions in archaeological or historical sources that compare with the Pala Chica Cave bracelet nor any information on stringing techniques.

*Greater Southwest* Judging by the summary of prehistoric Southwestern jewelry by Jernigan (1978), descriptive reports of any kind of bead bracelets are few everywhere. He concludes that bead bracelets were probably more common among the Anasazi than the Mogollon or Hohokam (1978:159) and that in the central Mogollon area bead bracelets were widespread and more commonly associated with children than with adults (1978:98, 159). The few ethnographic and historic sources in the Greater Southwest mention bead bracelets only casually.

The Pala Chica Cave bead-stringing technique itself is unreported in the Southwest. I have found no examples of anything similar in either archaeological or ethnographic data from the Southwest, whether for bracelets or necklaces. What little evidence there is indicates simple threading of beads along a single string. Perhaps a search of Southwestern folk art collections might turn up different techniques.

Elsewhere, the only examples of somewhat similar bead stringing techniques were found far to the north at Lovelock Cave, a hunter/gatherer site in western Nevada. The most similar specimen consisted of thin small discs from *Olivella* shell walls (about 5 mm diameter) that were strung together, each held in place to overlap the next shingle-fashion, using a looping or “crochet” stitch. The piece was a minimum of 53 cm long and was probably a necklace (Orchard 1929:23-24, Fig. 11).

Other specimens from the same site are further variations on fixing beads in place (but not overlapping). Two are *Olivella* shell beads strung with a similar looping technique; three have the *Olivella* shells tied to two base strings by the threading string; and one example has the beads enclosed in a braid (Orchard 1929:23-24, Figs. 9, 10; Carroll 1970: Fig. 1). I have not found any other reports of variations on bead stringing from sites in the Great Basin. For the historic

period, according to Jernigan (1978:21), written and photographic records show that "bracelets do not appear to be common" among the Southern Paiute and "Desert people" in general.

Throughout the Greater Southwest, there have been many analyses of well-preserved archaeological collections with perishables from dry caves—enough that it seems reasonable to conclude that stringing techniques for bracelets or necklaces that tie beads in place must in fact have been extremely rare. Their occurrence in only two hunter/gatherer sites, so widely separated as Lovelock Cave and Pala Chica Cave, is more probably a matter of chance similarity, without any significance in terms of either diffusion or shared technology from a common origin.

### **Thick shell disc beads**

29 specimens (catalog no. 90) Figs. 11, 12,c

These thick white shell beads are similar in shape and workmanship to the larger talc bead (see below). Three of the shell beads still retain fragments of the string, showing an unusual looping technique (described above). They and the loose beads are without doubt from the same bracelet, found in the context described above.

The beads are possibly thick sections from *Chama* sp., a rock scallop common in the area (identified by Pat LaFollette and James McLean). The shell is soft and porous due to the boring worms and molluscs and the fungi that affect sessile species locally (LaFollette, personal communication). Because of spalling, nicks, and other damage the bead shapes appear irregular. Measurements of diameters, however, are very regular with deviations of less than 1 mm on individual beads. Maximum diameters are between 13 and 16 mm, distributed as follows: 5 are 13 mm diameter; 17 are 14 mm; 6 are 15 mm; and 1 is 16 mm.

On some, the bead faces are irregular due to damage or to the shape of the shell. Wedge-shaped cross-sections are common, reflecting the shell contours toward the hinge area. (The looping technique of stringing the beads would nullify any effect of the wedge shape.) As on the talc bead, the edges are vertical and even, showing the same flat facets from the manufacturing process. Maximum thicknesses are also nearly uniform: 2 are 5 mm thick; 13 are 6 mm; 13 are 7 mm; and 1 is 9 mm.

The minimum hole diameter is uniformly 3.5 mm on all of the beads. The holes are biconically drilled in the beads' center or very slightly off-center. On 18 specimens the drill was held vertically on both sides, and on the remaining 11 it was held slightly slanted on one side.

The measurements and quality of workmanship suggest that these soft shell beads and the larger soft stone bead (cf. below) were all made the same way, with the same tools, by the same somewhat careless craftsman.

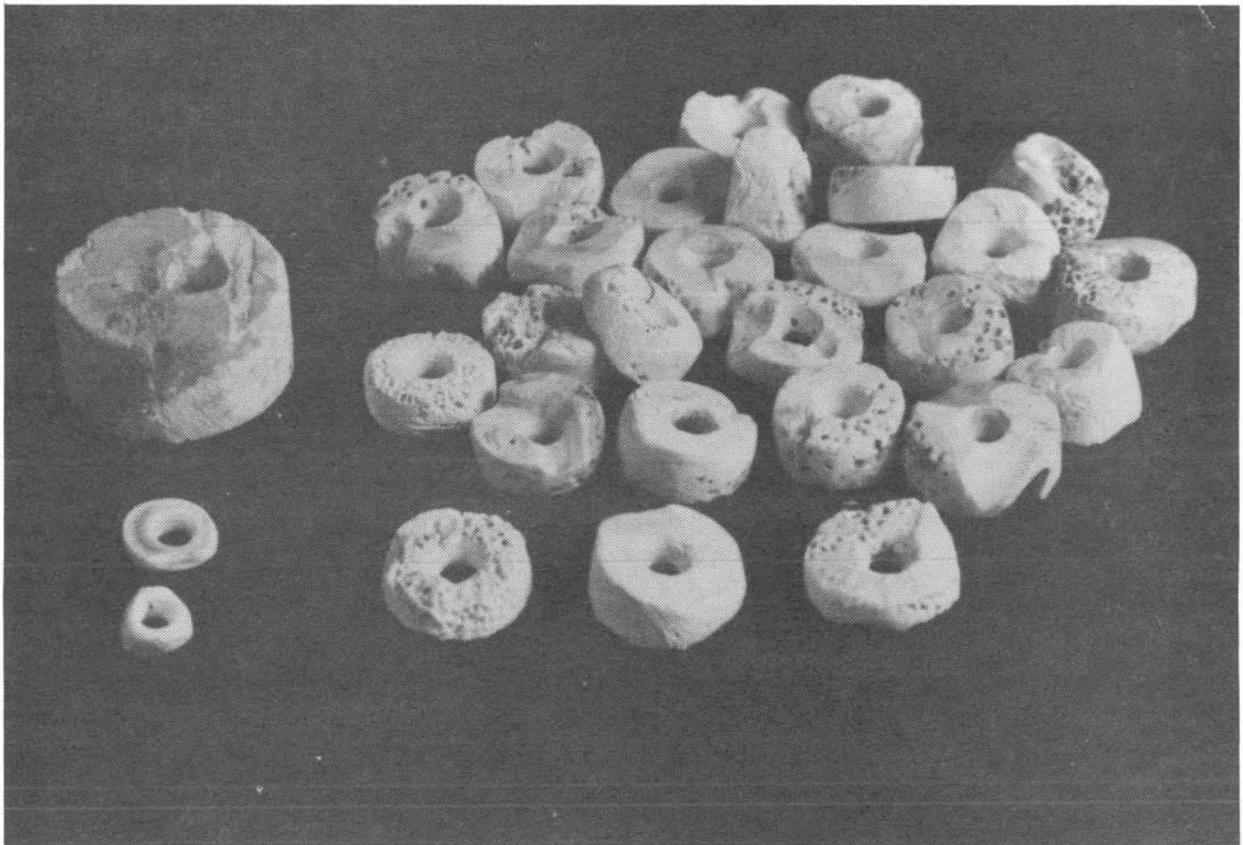


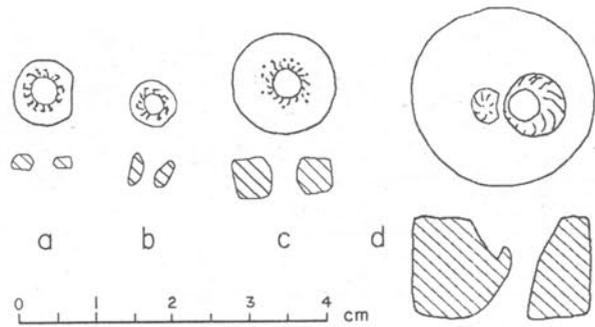
Fig. 11. Beads: *center*, thick shell beads; *left rear*, talc disc bead; *left center*, small shell disc bead; *left front*, small cylindrical shell bead.

### **Thick stone disc bead**

1 specimen (catalog no. 3) Figs. 11, 12,*d*

This thick white bead is very similar to the thick shell beads (q.v.), but it is larger and made of talc (identified by Peter Keller). The diameter is 2.4 cm, thickness is 1.3 cm. The bead is symmetrical, not varying more than 1 mm in each dimension. The sides are straight and have flat facets 7 mm wide evenly spaced around the edge; these are probably remnants of the shaping process. Despite overall symmetry, the biconically-drilled hole is asymmetrically placed. On one side, the hole starts off-center and slants toward the middle. On the other side, one hole was started off-center and was abandoned; then another hole was started off-center and was completed to the middle. The hole's diameter is 3.5 mm at the middle and 8 mm at the surface on both sides. The oddly asymmetrical hole causes the bead to hang at a 45° angle; however, if strung like the shell beads with the looping technique, this effect would be eliminated.

Fig. 12. Beads: *a*, small shell disc bead; *b*, small cylindrical shell bead; *c*, thick shell disc bead; and *d*, talc disc bead.



Because the context of the talc bead was not recorded, it is not known whether or not it was strung with the shell beads.

#### COMPARISONS

From the available literature, it appears that these thick disc beads, whether stone or shell, have not yet been found elsewhere in the Sonora coast region or in Baja California.

Some similar examples are known from the Southwest, though they seem to be infrequent. In southern Arizona, nearly identical *Chama* beads were found at the Hodges Ruin, a Hohokam site dating prior to A.D. 1300 (Officer, in Kelly 1978:113-114). Some formed three complete necklaces. Bead diameters range from 1.5 to 3.5 cm. Although other measurements are not given, use of the largest bead as a scale in the photograph permits some estimates. According to my calculations, the strung lengths of the three necklaces are about 47, 51, and 53 cm with 47, 53, and 36 beads respectively (compared to the bracelet length of 21-24 cm and 29 beads at Pala Chica Cave); these would be appropriate lengths for necklaces.

Other examples of disc beads with wedge-shaped section and large holes are reported at Los Muertos and at a Hohokam site in Tempe, though they are thinner and somewhat smaller than those from Pala Chica Cave (Haury 1945:148, Fig. 90,e; Hershkovitz 1981:69). The Pala Chica Cave beads also seem to fall within the range of the few large disc beads at Snaketown from the Santa Cruz to Sacaton phases (Gladwin et al. 1937:139-140, Fig. 54,a). Though not abundant, the occurrences noted here suggest that there was exchange from the Gulf of California and that more of the thick disc beads may be expected from Sonora coast sites.

Jernigan's broad survey of prehistoric Southwestern jewelry does not clearly distinguish between varieties of disc beads and their sizes, but he gives the impression that the thick Pala Chica Cave type is not common (1978:33, 94, 154). Although I have only spot-checked site reports, my own impression is the same.

## 8. SMALL SHELL BEADS

### **Small disc shell bead**

1 specimen (catalog no. 94) Figs. 11, 12,*a*

The shell is too modified for species identification, but possibly is *Pinctada* sp. (identified by James McLean). The maximum diameter is 9 mm, and the minimum thickness is 2 mm. The hole is 3.5 mm diameter and was drilled biconically. The context is not recorded, but this and the cylindrical bead (below) may have been the ones that the students said were found at ground level below the cave and which they thought might have eroded from the burial chamber (cf. THE SITE, BURIAL CAVE, above).

### **Small cylindrical shell bead**

1 specimen (catalog no. 93) Figs. 11, 12,*b*

The shell, which is very soft, is from a pelecypod, but it is too modified for further identification. The diameter is 7 mm, length 5 mm. The hole is 3 mm diameter and was drilled biconically. The bead wall and the hole are slightly slanted from the vertical. (See paragraph above on context.)

### COMPARISONS

*Sonora* Small cylindrical beads have not been reported in archaeological collections from the Sonora coast. However, the small disc bead probably was a common type. Bowen (1976:24, 31, 87, Fig. 72) reports a necklace of 6,300 disc beads in one burial at a site in the Punta San Antonio area, just a few kilometers west of Pala Chica Cave. These are as thin as the Pala Chica Cave specimen but smaller in diameter (5 mm). Others (undescribed) were said to have accompanied a child burial at another site far to the north near Desemboque. Bowen also mentions a few others in a private collection from the same region, which may be datable to the historic period. The most similar to the Pala Chica Cave small disc bead may be those from Tastiota, a site on the coast about 70 km to the north (Holzkamper 1956). The three disc bead types number 117, 61, and 86, and they average 8, 12, and 10–14 mm diameter respectively; unfortunately, thicknesses are not given, but they presumably are thin. Apparently, the Seri have no recollection of making disc beads. Even though they do have a word for them, they ascribe them to the mythical Giants, which may be a conventionalized way of ascribing them to their own distant ancestors (Bowen 1976:105).

*Baja California* I have not found any disc beads reported from archaeological sites in the peninsula, and they are not reported in standard ethnographic sources.

*Greater Southwest* According to Jernigan's summary (1978:33–35, 95, 156, Figs. 7, 35, 71), small shell disc beads are common and widely distributed through the Southwest, especially in Hohokam and Mogollon sites, from their earliest phases.

## 9. UNWORKED SHELL FRAGMENTS

### Unmodified shell

4 specimens (catalog nos. 87, 88, 89)

The collection includes four unmodified shell fragments. No context is recorded, but presumably they are from the burial cave. There is one marginal fragment of *Laevicardium elatum*, a giant cockle (no. 87); one fragment of *Lyropecten subnodosus*, a scallop (no. 88); and two opercula of *Turbo fluctuosus*, a gastropod (no. 89). (Identified by James McLean)

### DISCUSSION

In addition to these there were the worked shells described above: *Chama* sp., a rock oyster (the thick disc beads), *Pinctada* sp., a pearl oyster (the nacreous ring-shaped ornament), and an unidentifiable pelecypod (small cylindrical bead).

All of the shells are common locally and are easily collected (Keen 1971:79, 93, 147, 160, 352; Dushane and Poorman 1967). The unworked shell fragments could represent food remains. Although the students reported that there was no evidence of kitchen debris (midden), food could have been stored in the cave and removed numerous times, with a few pieces of shell left behind.

Curiously, *Turbo* (?) opercula were issued by a trading post in the 1920s as tokens or currency for the Seri to use (Schindler n.d.:439). I have not noted any other use for them by the Seri or surrounding peoples.

The *Laevicardium* was the most likely of the unworked specimens to have been the remnant of a shell that had been used as a container or tool. The Seri frequently employed it for this purpose. Such a shell, so useful in unmodified form, might be expected to be in common use wherever it could be gathered or traded. In fact, no group on either side of the Gulf has been reported to have used it as extensively as the Seri, who employed *Laevicardium* for face paint containers which then sometimes became grave offerings; as ladles and dishes for water and gruel; and for a number of other uses at least on a casual basis (McGee 1898:233; Schindler n.d.:284). The one fragment at Pala Chica Cave could have been brought there for some such purpose consistent with Seri custom, but that does not rule out similar uses by other groups.

In the prehistoric period, *Laevicardium* was frequently brought into the Southwest, where it may have been used commonly for the manufacture of thin disc beads (Jernigan 1978: 36, 95). In an early pre-ceramic deposit at Ventana Cave in southern Arizona, some unworked fragments of *Cardium* (= *Laevicardium*) possibly represented use as containers (Haury 1975:190). At the Hodges Ruin, a Hohokam site, seven unworked whole *Laevicardium* were associated with two house floors and others were with cremations; two worked pieces may have been used as scrapers, fleshers, or scoops (Officer, in Kelly 1978:111-112). The shell probably had multiple uses by those who could obtain it.

The distribution of *Chama* sp. is possibly more extensive than is reflected in the literature. Miller and Christensen (cited in Kelly 1978:113-114) have suggested that some modified specimens have been misidentified as the spiny oyster (*Spondylus* sp.), which is commonly listed in Southwestern site reports.

## 10. FIBER CORDAGE

The collection includes many cordage fragments as well as processed hair and fiber that may have been raw material for the manufacture of cordage.

### **Cordage fragments**

96 specimens (catalog no. 95-A through 95-LL)

Except for the remnants which are still attached to three of the shell disc beads, the cordage specimens are all loose fragments averaging about 2 cm in length with none exceeding 5 cm. There are no knots in the collection. The cord fragments holding the beads together are described separately above; the same kind is also represented among the loose fragments described below (group LL).

*Descriptive terminology* Cordage structure terminology is used as distinguished from weavers' terms (cf. standard dictionaries and encyclopedias). *Yarn* is the structural term for the initial twisting of the loose prepared fibers. *Strand* is the term for yarns twisted or plied together. The slant in the letters **S** and **Z** indicates twist direction (rather than the confusing *left* and *right*). The *number of twists* is the number of times the yarns cross per cm in a strand. *Tightness of twist*, which is used to describe strands, is affected by the number of twists per cm and the twist angle together with the size and treatment of the yarns and the characteristics of the raw materials. Tightness of twist is more impressionistic than measurable: here, *loose* means that air space can be seen between the twisted yarns; *medium* means that while there is no space between the yarns, the curve of the yarns is prominent along the strand's surface; *tight* means that the yarns are packed hard against each other and form a relatively smooth strand surface. *String*, *cord*, and *cordage* are general terms without specific structural reference.

*Classification and description* The variable morphological characteristics are used to describe the collection. The most clear-cut is direction of twist. Less useful are thickness and tightness of twist because these are continuous rather than discrete variables and can vary along the length of the same cord. The appearance of the raw material (not yet identified) is also taken into account. Using these criteria, the fragments are placed into groups. The intent is to group together the fragments which might have come either from the same cord or from very similar cords. The cordage groups are identified by upper-case letters, A through LL.

The structure of all cordage in the collection is a single strand made from two yarns. In all specimens, the twist directions of yarns and strand are opposed, which creates a tension that helps to hold the cord together firmly.

The cordage falls into two main categories based on contrasting directions of twist. In one, two S-twist yarns are twisted together to form a Z-twist strand (Table 1). In the other category, two Z-twist yarns form an S-strand (Table 2). Within each twist category the fragments are classified into groups according to whether they *appear* to have come from the same piece of cordage. The specimens were sorted using the criteria listed in the tables, including the appearance of the fibers. Some of the S-strands appear to be identical to some of the Z-strands in every attribute but twist direction. The groups A through U are Z-strands; the groups AA through LL are S-strands.

In terms of the number of groups (the *maximum* number of fragments that possibly represent different cords), 21 groups (64%) are Z-strands and 12 (36%) are S-strands. In terms of lengths, the group LL cordage fragments (the kind that was used to string the shell bead bracelet, q.v.) amount to 67% of the total length of S-strand fragments and 42% of the entire cordage fragment collection (S- and Z-strands together). Groups S (four pieces, 8 cm total), U (eleven pieces, 21 cm total), and II (ten pieces, 7 cm total) are the next in size. All the rest are the groups which are represented by only one to four short fragments.

Most published reports compare cordage in terms of strand twist instead of initial yarn twist, which often is not reported. This custom will be followed below for convenience of comparison. Whether Z-strands or S-strands can be judged to "predominate" in the Pala Chica Cave collection depends on the criteria: total length (Z=78 cm, S=119 cm), numbers of fragments (Z=34, S=62), or numbers of apparently separate cords represented by the fragments (Z=21, S=12). One of the S-strand groups, LL (used for the bead bracelet), dominates in length and in numbers of fragments; without it, Z-strands would predominate in total length and number of fragments, as well as in number of groups.

The plant fibers have not yet been identified for reasons explained in the ACKNOWLEDGMENTS. The blank column in the tables is for the reader to enter the data if supplied in the future. None of the cordage appears to me to be cotton or commercial twine. The fibers are most likely all from locally available plants, but as will be indicated below, identification of the specific types (especially the distinction between agave and mesquite) may have significance.

Why so many small fragments appear to represent so many different cords is a problem. Are some of the cord groups spurious categories or do they in fact represent different cords and strings? The problem is similar to dealing with sherds rather than whole vessels. Identification of the fiber materials would have aided in testing the nature of the differences among the specimens. Some of the factors that can affect the different *appearance* of cordage fibers taken from the same plant species are discussed by Osborne (1965), based on her experiments at Mesa Verde, Colorado. The differences relate largely to the manner of preparing fibers. Similar experiments with local plant species in desert climates have not been carried out, as

Table 1. Z-Strands

Group	Material	No. of pieces	Total length in cm	Thickness in mm	No. of twists per cm	Tightness of twist
A		1	4.0	1.5	4	loose, only partly twisted
B		1	1.5	2.0	5	medium-loose
C		1	2.0	2.0	4	medium-loose
D		1	1.0	2.0	6	medium
E		1	3.5	2.0	4	loose
F		1	1.5	1.5	6	very loose
G		1	6.0	1.5	6	loose, only partly twisted
H		1	2.0	1.5	6	loose
I		1	2.0	2.0	6	medium
J		1	4.0	1.0	5	loose
K		1	1.5	1.5	5	loose
L		1	2.0	1.0	6	medium-loose
M		1	2.5	2.0	5	medium-loose
N		1	2.0	2.0	8	medium
O		1	1.0	2.0	6	medium
P		1	2.2	2.0	4	medium
Q		1	4.5	2.0	4	medium-tight
R		1	3.8	2.0	5	medium-tight
S		4	8.0	1.5	7	tight
T		1	1.5	1.5	8	tight
U		<u>11</u>	<u>21.0</u>	2.0	5	tight
		34	77.5 cm			

Table 2. S-Strands

Group	Material	No. of pieces	Total length in cm	Thickness in mm	No. of twists per cm	Tightness of twist
AA		1	2.0	2.0	6	very loose
BB		1	2.0	1.0	10	very loose
CC		1	5.0	1.0	8	medium
DD		1	2.8	1.5	7	medium
EE		1	2.5	2.5	5	medium
FF		1	2.0	2.0	6	medium-loose
GG		1	0.6	1.5	12	medium-tight
HH		1	2.0	2.0	8	medium-tight
II		10	7.0	1.5	10	tight
JJ		1	1.5	1.2	12	tight
KK		2	10.0	1.0	8	tight
LL		<u>41</u>	<u>81.5</u>	1.5	8	tight
		62	118.9 cm			

as far as I know. Further specialized research is necessary before it will be possible to determine whether the differences among the Pala Chica Cave cordage fragments reflect variations in individual abilities, intentional processing for particular uses, differences in the plant species or in the portions of the plants used, and various other factors.

Furthermore, some cord groups may well be spurious that are comprised of single specimens of looser twist. A number of them may in fact have come from cords that were irregular when made, or they may be the tapered ends of cords. Identification of fibers and review of variability in fiber preparation would have helped in this evaluation as well. Also, small fragments are more likely to come apart, and they can be distorted in the collecting and cleaning processes and only appear to be different.

On the other hand, if so many different cords are truly represented in the

collection, there is a possible reason why each is represented by so few pieces. Most of the fragments were removed from consolidated soil lumps that contained fine gravel, fragments of vegetation, insect parts, and tiny animal bones. What the students brought in may have been the debris of rodent nests that were among the human bones. Some among the many cord fragments could represent what were in fact different cords that were accumulated by the rodents' having gnawed sections from any skeins of cordage or other artifacts that may have been nearby in the deposit.

#### COMPARISONS

At present there are only two main variables in collections of cordage fragments that can be compared using published sources, and these only to a limited degree. One is twist direction and structure, and the other is the kind of fiber that is used.

##### *Twist direction and structure*

Twist direction and cordage structure are among the simplest observations of material culture that can be made. Nevertheless, both the archaeological and the ethnographic literature are inadequate even in descriptions of large samples and in reports of natives observed making cordage. The reasons are partly due to inconsistent employment of terminology and use of non-standard, often ad hoc descriptive terms that all too frequently are left undefined. Also, cordage has not seemed to capture most anthropologists' attention even though it inevitably is one of the most vital manufactures in any society and its production results from repetitive, traditional motor habits. Many of these habits may be grounded in practicalities, while others may involve arbitrary choices that reveal unconscious learned behavior patterns that could imply cultural continuities.

As in the small Pala Chica Cave collection, 2-yarn strands seem to predominate everywhere. The basic manufacturing steps are simple. There are several variations: for example, one can quickly roll two parallel bundles of prepared fibers along the thigh to make two yarns at the same time, then combine them into a strand by rolling them together back along the thigh in reverse direction; or one can make one long yarn from a bundle of prepared fibers, then double it and roll the two halves together in the reverse direction.

However, there is the question of why there are different twist directions within cordage samples—was there individual preference? And why are regional differences found on comparison with other collections—do they imply different cultural traditions, accidents of sampling, or are there other factors?

Cordage twist direction starts with the yarns, not with the strands or other structures of which yarns are the initial components. Unfortunately, published collections too often include only a description of strand twist, not mentioning yarn

twist, despite the fact that yarn and strand are not always opposed. Instead of purely arbitrary habit, it is possible that choice of the initial fiber twist direction may be deliberate choice based on a practical consideration. It is possible that the fibers of some species have a natural twist when dried which cordage makers might view as advantageous and which might therefore govern their choice of the initial direction of twist. This aspect of the interpretation of twist direction must be left open, however, for the lack of experimental testing.

Other reasons for twist differences may have to do with local cultural traditions that are purely arbitrary, or with chance individual motor habits (such as left-handedness) to which the makers were indifferent. In dealing with prehistoric material, such interpretations of individual versus community differences depend on statistically useful samples of *consistently* described specimens. It is for the lack of these that there can be no thorough and systematic survey of the subject in the Greater Southwest based on published data. The situation has not noticeably improved since the problem was realized decades ago; it has been most recently discussed by King (1974). This limits the interpretation of any collection, but a review of the literature for comparisons does suggest that there might be some broad patterns.

*Sonora* There are no published archaeological collections, and comparative data from Seri ethnographic sources are meager. McGee did not witness Seri cordage making, but he was informed that it was thigh-rolled (1898:230; compare Davis's description of sinew cordage twisting, cited in Schindler n.d.:311). McGee does not state the direction of yarn or strand twist. The ink drawing of "an inferior example" of mesquite cordage (1898:229, Fig. 34) shows a 2-yarns Z-strand, which is probably correct rendering, but the component yarns are not so accurately drawn as to show twist direction clearly. Schindler (n.d.:317, Pl. 81) describes a "replica" specimen of mesquite cordage collected in 1971 as "'S'-plied, 'Z'-twisted two-ply and a long splice of three-ply." This probably means a 2-Z-yarns S-strand with a 3-Z-yarns (S?-)strand splice. But he does not describe or generalize on the twist directions of other specimens in the museum collections that he surveyed. Aside from these three incompletely described specimens, I know of no published descriptions of the fiber cordage made by the Seri or by any of the neighboring peoples of Sonora.

*Baja California* Most of the cordage descriptions are from sites in the central part of the peninsula. They appear to be part of the late prehistoric Comondú archaeological assemblage, which probably has continuity with the historic Cochimí. In addition, there are cordage descriptions from the southern part of the peninsula, attributed to the Las Palmas assemblage. All reports are lacking to some degree in descriptive details for purposes of comparison, such as total lengths, numbers of

fragments, fragment matching, yarn twist, and fiber identification.

One cordage collection has been described from a burial cave at Bahía de los Angeles, across the gulf from Seri territory (Massey and Osborne 1961:345). The "bulk" of the cordage fragments are 2-S-yarns Z-strand, but the amount of variation from this standard is not indicated. Further descriptive detail is not given. Massey and Osborne provide comments on unpublished collections from the peninsula which they reviewed: as in the burial cave specimen, most cordage from the central part of the peninsula was 2-yarns Z-strand.

Gardner Cave is in the mountainous center of the peninsula at about the same latitude as Pala Chica Cave. Meighan (1966:375) has briefly described "yucca or similar coarse fiber" cordage. Seven fragments are 2-yarns S-strand from 5 to 44 cm long, and 22 fragments are 2-yarns Z-strand from 2.5 to 21 cm long. The specimens shown in his Fig. 23 suggest that there might have been considerable variation, but further detail is lacking.

The largest reported sample of cordage fragments from the Baja California peninsula is a collection of over a thousand specimens from two caves in the region of Bahía Concepción (Schulz 1977). All 500 unknotted cordage fragments are 2-S-yarns Z-strand, and only 3 are 2-Z-yarns S-strand. About half the specimens are a fuzzy fiber (which she says resembles apocynum), a third are coarse grass fibers, and the rest are a coarse fiber that resembles yucca or agave. Another 511 specimens of netting are made from cordage of the same structure. Other descriptive details are not given.

An archaeological miscellany collected by Father Castaldí includes cordage specimens that were apparently from caves in both central and southern parts of the peninsula but otherwise are unprovenienced (Massey 1966). Of 36 cordage specimens, five are 2-yarns S-strand and the rest apparently are all 2-yarns Z-strand. Component yarn twists are not given, but photographs of two Z-strands show S-yarns as would be expected.

Massey analyzed cordage collections from burial caves of the Las Palmas Culture in the southern part of the Baja California peninsula (n.d.:90-92, 118-121, 289-290, 330). There was considerable variation in cordage structure, but 2-yarn strands were most common. Of these, the most frequent was 2-yarns Z-strands, which were 50% of the specimens (44 pieces); next most frequent were 2-yarns S-strands, about 25% of the collection (16 pieces). Yarn twists were probably opposite strand twist. Other details are not reported.

Massey concluded that in the central part of the peninsula Z-strands predominate but in the south, Z- and S-strands are in about the same proportion, an estimate which is probably based on numbers of fragments (Massey 1966; Massey and Osborne 1961:345). However, the distinctiveness of the Las Palmas cordage is not well supported by available descriptive detail.

*Greater Southwest* Farther to the north, especially in Anasazi and Mogollon sites, much more cordage has been found and described in published reports. Nevertheless, systematic comparisons are often made difficult when ad hoc terminology is used or when standard terms are applied in ways that cannot be interpreted with confidence. Essential observations are often omitted. With rare and brief exceptions (e.g., Castetter and Underhill 1935:61-62; Kissell 1916:229), ethnographic sources provide little clear detail either. The most recent systematic attempt to deal with the problem in the Southwest and to draw some generalizations regarding cordage is by King (1974:94). Her basic conclusions confirm previous attempted summaries; that is, in the Southwest the major contrast is between cotton and most other fibers. Normally, cotton is Z-spun and, when twisted into strands, the strands are S-twist. This may reflect the difference between spindle-spinning and hand-rolling because in contrast, the yarns made from other fibers are normally S-twisted, then Z-twisted into strands. The opposite directions in cotton and other fibers do occur throughout the Southwest but in much lesser frequency. (Cf. King 1974 for full discussion and selected references.)

#### *Material*

As noted above, the cordage and untwisted fiber materials from Pala Chica Cave have not yet been identified; however, none appear to be cotton. In general, using published reports for comparative purposes is unsatisfactory because it is often difficult to determine how carefully fiber identifications were made (for a discussion of the problem, see King 1974:78-80, 93; Osborne 1965).

*Sonora* No archaeological collections have been reported. Ethnographic evidence for Seri cordage materials is somewhat confusing even though the historic Seri did preserve more of their traditional crafts, including cordage-making, longer than did the surrounding peoples. According to McGee (1898:228-229) the Seri used fibers from mesquite roots or agave stipes for cordage, meaning that they would use either plant. His discussion implies that agave was reported by informants; the only informants mentioned in this context were non-Seri vaqueros. In contrast, mesquite root is what he reported actually to have seen and is what he collected as cordage.

Edward H. Davis visited the Seri in the early 1920s. He mentions the use of cordage for binding balsa rafts made of "the fibrous raw material from mesquite tree roots, from the yucca or the maguay [*sic*]" (Davis and Dawson 1945:197). The context of the description is the Seris' past lifeway, and the information may therefore be speculative or based on McGee. Dawson (1944:134) mentions only mesquite for cordage, and the use of yucca fiber for the head pads used in carrying.

Felger and Moser (1971:55, 59, and 1985:334-342), in a study of Seri uses of mesquite, confirm that cordage was made of that plant, and they mention several

applications of mesquite fiber cordage. In contrast, they apparently found no ethnographic evidence that agave fibers were used for cordage, although they do affirm that several species of *Agave* were endemic in Seri territory and were used for a variety of other purposes (Felger and Moser 1970:159). In his comprehensive study of museum collections of Seri artifacts, Schindler also found cordage specimens made only of mesquite (n.d.:318).

Ethnographic references to the cordage material used by neighboring groups are even more scarce and lacking in detail. Agave was used for cordage by the Pima Bajo (Pennington 1980:288, 297-299). According to Drucker's informant (1941:121, 186), mesquite bark was used for cordage by the Yaqui, who also used "mescal" (agave) or cotton (no information about yucca). If the Yaqui informant is correct, it might mean that the use of mesquite was a regional characteristic of the Sonora coast, an environmental opportunity rather than "another example of Seri divergence from the mainstream of Southwest custom," as Schindler calls it (n.d.:318). Beals also refers to the extensive forest of mesquite in Yaqui and Mayo territory, matched only in the flood plains of the lower Colorado and parts of the Salt and Gila rivers (1943:487).

*Baja California* The few archaeological references to cordage fiber identifications (cited above) are often vague and sometimes of unclear authority. Materials are often not correlated clearly with other cordage attributes, such as twist direction. There seems to be no unusual pattern that would be relevant to this study.

*Greater Southwest* There is minimal information on the California Yumans. The Mohave and Cocopá used mesquite bark, as well as willow, but denied using "mescal" (agave), yucca, and cotton for cordage (Drucker 1941:186; Gifford 1933:275). Throughout the Southwest, by far the most common cordage fibers are local species of agaves and yuccas. Cotton was also used. Mesquite root is rare. (Cf. King 1974:78-80, 93.)

### *Summary*

The evidence seems to show that the historic Seri and perhaps the Yaqui preferred mesquite for cordage rather than agave. The reason for the choice is not apparent in the literature. It might have been no more than simple convenience if, for example, mesquite fibers were easier to prepare or if a supply of cordage was customarily made during seasonal subsistence activities in the vicinity of mesquite groves (compare Dawson 1944:138, Schindler n.d.:316). On the other hand, mesquite might have been recognized to have superior qualities. It would be reasonable to expect that a preference for mesquite would have some time depth. If mesquite was sufficiently common in the area accessible to the people of Pala Chica

Cave, then one might expect the cordage material to be Seri or perhaps Yaqui if it is identified as mesquite, but slightly increase the chance that it might be Pima Bajo if it turns out to be agave. Such tortured logic is about the best one can do with so few data.

Cordage twist and structure in the small Pala Chica Cave sample shows strand twist ratios of 34 Z to 62 S in numbers of fragments, and 78 cm Z to 119 cm S in total lengths; therefore, by the usual standards of comparison S-strands (and Z-yarns) may be said to predominate. This would be contrary to the general pattern of the Greater Southwest and the central Baja California peninsula and closer to that of the Las Palmas assemblage at the southern end of the peninsula. However, if the LL group cordage (of the bracelet) is removed as representing a single artifact that unduly biases the sample, then the ratios are reversed based on 34 Z fragments to 21 S fragments, and 78 cm of Z lengths to 36 cm of S lengths. This set of ratios best matches the general pattern of the Greater Southwest and central Baja California, although the number of Z-yarns S-strands may still be unusual despite the small sample.

## 11. HUMAN HAIR

### **Hair/fiber mass** [*fiber not yet identified*]

1 specimen (catalog no. 85)

This is a single small mass with human hairs on one side and vegetal fibers on the other. It is approximately 6 cm long, 2.5 cm wide, and 1 cm thick. The fine hairs and fibers are clean and combed. Both kinds lie approximately parallel. A few of the hairs and a larger amount of the fibers (which are longer) fold back at one end of the mass, but both kinds are cut off square at the other end. Some of the fibers have been partially pulled from the mass and loosely Z-twisted into a rude yarn about 5 cm long containing both the fiber and hairs together, though the fiber predominates.

If this is a small piece from a large mass, it might represent the initial step in cordage manufacture where the worker had pressed both hairs and fibers together as a compact source so as to pull out both kinds, twisting them together with the fingers to make a yarn.

### **Bundle of human hair**

1 specimen (catalog no. 84)

This small bundle of hair is about 13 cm long, 6 cm wide, 2.5 cm thick. There is no apparent structure to the mass except that the hairs lie parallel. The bundle is cut off square at both ends and there is no evidence of scalp tissue. It therefore appears to have been raw material for some use such as the manufacture of hair cordage or as an addition to fiber cordage (compare the above specimen, no. 85).

The hair is human, dark in color, with no indication of waviness (Gretchen Sibley, personal communication).

### Comparisons

*Sonora* There are no archaeological specimens of human hair cordage reported from Sonora. McGee's Seri ethnography puts emphasis on the importance of human hair cordage as well as the mane and tail hairs of horses and other stock. However, he reports that mesquite and agave were the principal cordage materials for most applications. Human hair was used for the "finest" belts, necklaces, and other articles of "appareling." It may also have been used for some of the toy riatas and probably for other purposes where strength was important. McGee puts unusual stress on ritual associations of human hair cordage, which Schindler reasonably dismisses as speculative. (McGee 1898:10, 149-150, 171-172, 224-232; Schindler n.d.:335-347) Drucker's informant denied the use of human hair cordage by the Yaqui, though one is left to speculate on the reliability of the informant and the applicability of the denial for earlier years (1941:121, 186).

The use of small bundles of human hair like that from Pala Chica Cave is not

reported for the recent Seri. McGee says that they saved hair combings by twisting the hairs into "strands" (yarns) and winding them onto thorns or sticks in slender bobbins. When a sufficient amount had accumulated, the yarns were doubled or quadrupled to form cords (McGee 1898:227-228, Fig. 31). Schindler reports that cut hair braids used in puberty rituals were saved for later use as raw material (n.d.:339). This does not necessarily deny that the Seri may also have kept small bundles such as those reported here. For other ethnic groups, I have found no reference to such bundles either. But the problem is that human hair cordage was mostly out of fashion by the time of the little ethnographic work that was done in northwestern México, and any small bundles are not likely to have been noticed.

I have found no evidence in any archaeological or ethnographic source for the Greater Southwest that human hair was ever mixed with vegetal fibers in cordage. While one might consider this to cast some doubt on the interpretation of specimen no. 85, it is no reason to think that the coastal Sonoran people or their neighbors might frequently have done something unusual but practical. The recent Seri apparently did sometimes mix human and horse hair in cordage (Schindler n.d.:350).

*Baja California* No comparable human hair bundles have been reported from Baja California, and human hair cordage is rare.

Foster and Findley (1982) suggest that the Pala Chica Cave human hair bundles might be remnants of hanks from a shaman's cape. Because human hair capes are one of the outstanding ritual objects of the Baja California peninsula, they infer that this may be evidence of contacts or influences across the Gulf of California to the Sonora coast.

In fact, there is no support for the idea in the collection. The characteristics of Baja California human hair capes are known from historic descriptions as well as ethnographic work. Some have been found in caves where, characteristically, they were secreted. Although associated with rituals concerning the dead, they were not normally placed with burials. The little bundle of hair strands and the few hairs with the fiber bundle from Pala Chica Cave have no structural characteristics that would suggest anything similar to the numerous long hanks of hair that were used in the capes, nor was there anywhere near the amount of fiber cordage necessary to have served as the foundation of the cape as they were made in the north. Because there was no hair cordage whatever in the collection, the southern form of cape is also ruled out (compare Massey and Osborne 1961:349-350, Pl. 17,b; Aschmann 1967:114-115; Meigs 1970 and references therein).

*Greater Southwest* Archaeological specimens of small human hair bundles similar to that from Pala Chica Cave have often been reported in the Greater Southwest. The distribution could have been so general that if preservation and reporting factors were uniform it would be the absence of the trait, not the presence, which would

provoke interest (for example, religious beliefs about safe disposal of hair strands could be responsible for the absence of hair cordage in some cultures). Nevertheless, the amount of hair cordage actually found as fragments apparently was small in each archaeological site, and ethnographic reports usually cite infrequent and specialized uses of human hair cordage.

Most prehistoric examples of human hair bundles are from dry caves of the Southwest. A hank of human hair from Butler Canyon, Utah, is illustrated by Martin and Plog (1973: Pl. 44). The hairs are cut off neatly at both ends. It is very like the Pala Chica Cave specimen except that it is held together with a cord tied around the center. An example of an untied bundle of human hair was found at Long House, Mesa Verde, Colorado (Osborne 1980: Fig. 408). The bundle is 11.5 cm long by about 2 to 3 cm thick. Some bundles, both tied and untied, were found in Tsegi Canyon sites, northeastern Arizona; most are 5 to 15 cm long by 2 to 4 cm diameter (Anderson n.d.:179, Fig. 100,*k,l*). They are also reported for Basketmaker sites in the Marsh Pass area; one has an unfinished twisted string emerging from a bundle of untwisted hairs, similar to specimen no. 85, described above (Kidder and Guernsey 1919:171). These are all very similar to the Pala Chica Cave specimen, which implies a widespread, nondiagnostic practice.

## 12. MISCELLANEOUS FIBERS AND LEAVES

### **Split leaves** [*not yet identified*]

(catalog no. 81)

These leaves have been split into strips that are mostly 0.5 to 1 cm wide. The strips are laid parallel in a loose bundle about 23 cm long and 6 cm in diameter. Some leaves are folded back. Most may have been folded originally but subsequently were broken at the ends of the bundle and hence may have been longer when they were deposited. This is probably raw material, perhaps intended for lashing or for the manufacture of cordage.

### **Pieces of fiber** [*not yet identified*]

2 pieces (catalog no. 80)

One piece is about 80 cm long; most of it is in a loose coil about 5 cm in diameter. The other piece is about 28 cm long and is similarly coiled. Both are about 3 mm thick. They may originally have been the same piece. This is probably raw material intended for making or tying something.

### **Split leaf fragments** [*not yet identified*]

(catalog no. 83)

In this loose mass of split leaf fragments, which lie more or less parallel, there is no clear structure such as would suggest a purposeful bundle. None of the pieces are over 6 cm long and most are less than 0.5 cm wide. The mass is about 9 cm long by 2.5 cm diameter.

### **Fragments of vegetal material** [*not yet identified*]

(catalog no. 82)

There are 14 lumps of compacted soil and debris that contain irregular fragments of vegetal material. No effort was made to clean or sort out this material, which appears to be debris.

### **Vegetal fibers** [*not yet identified*]

2 pieces (catalog no. 86)

Two small pieces of fiber are each about 1.5 by 3 by 0.5 cm. These are probably from material prepared for the making of cordage.

## DISCUSSION

Separated lengths of vegetal fibers, often loosely coiled, are common in collections of dry materials throughout the Greater Southwest. McGee observed Seri examples of fibers stored for cordage-making. The processed fibers "are gathered in slender wisps or loosely wound coils, both of which are among the

possessions of the Seri matrons at [Rancho] Costa Rica in 1894" (1898:230).

Split leaves in coils or bundles in archaeological collections are often interpreted as cordage raw material. Among the Seri, however, such materials might have been used in a variety of tasks without any further processing. Consistent with the Seris' pragmatic custom of using what will work without unnecessary effort, they often used "pliable plant stems and green twigs" as lashing; indeed, this practice has lasted to the 1970s although native cordage-making has been lost (Schindler n.d.:135, 309, 317). When fresh and strong, split leaves and bark strips of various kinds might well have been used in the same way.

The Seri tied strips of mesquite bark into rolls for soaking in preparation of a medicine (Felger and Moser 1971:58).

According to Drucker's informants, among the Maricopa "strips of green mesquite bark, untwisted, were often used for lashings; they dried hard, like rawhide" (Drucker 1941:121, 186). Were data more complete, such practices would probably have been found to be common wherever there was a supply of mesquite.

The significance of the Pala Chica Cave specimens is still speculative pending identification of the plant parts and species, but the information on Seri practices at least makes it likely that the Pala Chica Cave specimens could represent material ready for lashing or else raw material for cordage-making or perhaps even for basketry. They may have been put in the cave for storage rather than as grave offerings.

### 13. CONCLUSIONS

The attempt to relate the Pala Chica Cave burials to currently known culture patterns is obviously hampered by the small size of the collection and by relatively sparse information about both the prehistory and the ethnography of the area.

The problem can be examined from two viewpoints: first, the location of the site relative to what is known of culture boundaries in the region, and second, the identification of possible culture diagnostics. To begin, the question of dating the collection must be considered.

#### DATING

Nothing in the cave has been dated by chronometric methods. Too much of the organic material in the collection would have been destroyed using the radiocarbon techniques that were available until recently. In the future, it may be possible to date some of the vegetal fiber or bone.

There is little chance of dating by typological comparisons using this small collection. Comparisons show that nearly all the artifactual material is either unique or else is of too general a nature to be identified as time-specific. One exception might be the thick disc beads, which may have some significance in cross-dating because they are found in dated Arizona sites. I have not attempted a thorough literature review, but the sources on Hohokam occurrences cited above suggest that the beads were traded into the Southwest at times during the span A.D. 500-1500. However, if they are a product of the Sonora coast they may have been made and exchanged along that coast both earlier and later. Otherwise, typology is useless at present for fixing any of the collection within a narrower time span. If careful craftsmanship in shell work can be compared broadly, my impression is that only the unique ring-shaped ornament was made with sufficient craftsmanship to suggest a date limited to the last thousand years.

McBeath (APPENDIX) observed that the better-preserved bone seemed to be relatively fresh, appearing oily or greasy. Some portions of the skeletons, probably lying near the surface, had severe damage due to weathering. There was no evidence in the collection of hair, scalp tissue, or ligaments from the skeleton. While these observations might be consistent with skeletal material a few decades or so old, the arid climate and factors of preservation within the cave would not rule out an age of several centuries.

The presence or absence of articles of European origin is often used as a clue to age. There were no such objects in this collection, nor is there evidence that a metal tool was used to carve the wooden scoop. The sample is not likely to have been skewed by selective vandalism prior to the present collection. Even so, the absence of European goods still might not indicate a prehistoric date if it was not customary to leave scarce or valuable trade items with the dead. Furthermore, the

isolated Seri of the Tiburón region to the north had few such items until this century, despite occasional raids and trading journeys as far as Guaymas in the 1800s (McGee 1898:115). An early twentieth century date for such burials would not be unlikely at all for Seris in that region nor for any Seris who might have ranged temporarily along the coast to the south.

Disruptions of territory in the colonial period might offer a clue to chronology. In the south, the Guayma were missionized early and were quickly absorbed into the Yaqui, the Pima, or northern Seri groups. The Guayma ended as a traditional culture in the late seventeenth or early eighteenth centuries, and the Pala Chica Cave area would likely have been abandoned by then. However, that does not necessarily date the burials to a previous time. The region in question may well have been frequented by renegades and runaways—central coast Seri, Guayma, and Yaqui of the eighteenth and nineteenth centuries. These people would have had few objects of European origin to dispose of in graves.

Another criterion for chronology might possibly be pertinent—there is some evidence of incisor tooth-removal as a Seri custom that may have been dying out by the last quarter of the nineteenth century. This could represent the minimum age of the burials if any Seri appeared in the Guaymas region before then. It will probably require further archaeological work to confirm the existence of the practice among the Seri and to determine whether the Guayma might have shared the custom when they occupied the area a century or more earlier.

Reasoning from these criteria, only a limited estimate is possible. It seems likely that the collection dates from any time within the last three or four centuries, but perhaps later is more likely than earlier.

#### ARCHAEOLOGICAL BOUNDARIES

Pala Chica Cave's location, apart from its contents, can be examined for a clue to its cultural affiliation. Prehistoric data can sometimes be used to propose "ethnic"-type boundaries when the archaeological record shows a distinctive distribution of material culture remains that are not obviously determined by environmental factors. These in turn can sometimes be related to historically-known groups. The question here is whether any such archaeological distinctions can be made that might place the cave's location within the distribution of one or another recognizable artifact complex.

The prehistory of coastal Sonora begins with the meager record of early "Clovis hunters," perhaps dating back to 10,000 B.C., and other preceramic peoples. That record is based on surface surveys, a few observations of what might be stratigraphically early nonceramic cultural deposits, and on typological comparisons with artifact types known outside of Sonora.

Bowen (1976) has done as thorough an analysis of the later archaeological patterns as the data permit. His analysis is the more valuable for first considering

the prehistoric data independently of historical ethnic distributions and only then attempting to suggest a correlation.

To summarize Bowen's work briefly, the central coast north of the Guaymas area has a pottery sequence that begins with a hard, thin "eggshell" plainware called *Tiburón Plain*. Reasoning by indirect evidence, it could have begun as early as the eighth or ninth centuries. Through a shift to the use of organic temper and a few other attribute changes, it evolved by the nineteenth century into a "crumbly, poorly fired" pottery that is called *Historic Seri*. Bowen emphasizes that there is evidence for gradual evolutionary change within and between these two "types." There seems to be no hint of one people replacing another, and therefore it is reasonable to consider the Seri as long-time occupants of the central coast. They apparently had basically the same kind of culture perhaps since the third century, judging from a single radiocarbon date on eelgrass associated with *Tiburón Plain* pottery (Bowen 1976:53-68, 91-94, and 1983:232; Felger and Moser 1985: 9, 378).

The best-known sites in the Guaymas area are a few km to the east of Pala Chica Cave in the vicinity of Guaymas city. The Guaymas archaeological pattern differs enough from the central coast that Bowen considers it to be a separate culture area with an "as yet undefined" tradition. Stone tools of the Guaymas area tend to be better made than those of the central coast. What appears to be the locally-made pottery differs from that of the central coast in that it is a brownware that is thicker, contains coarse sand temper, and ranges in surface finish from rough to polished; some has heavy organic temper. The known remains are also varied enough to suggest that more than one group may have occupied the area, and small amounts of *Tiburón Plain* pottery imply that the early Seri at least visited prior to the nineteenth century. A few simple architectural remains are still not dated but may possibly be historic Yaqui. (Bowen 1976:110-115)

Bowen found that the distribution of *Tiburón Plain* (early Seri) pottery is consistent through the central coast as far south as Punta San Antonio, but with no *Historic Seri* pottery at the southern end. In that area the thick brownware pottery and well-made stone implements of the Guaymas area begin to appear in small quantities (Bowen 1976:31-32, 68, Fig. 55). Although Bowen does not specifically suggest it, the brownware with organic temper may be the local temporal equivalent of the *Historic Seri* ware. Just east of Punta San Antonio in the San Carlos Bay region where Pala Chica Cave is located, there may be a fluid zone between the late central coast and Guaymas area cultures.

Does the archaeologically-defined boundary zone suggest an ethnic affiliation for Pala Chica Cave? As Bowen says (1976:115), it is "tempting to view the Guaymas area remains (or at least some of them) as Yaqui. At present, however, this can only be speculation, for the archaeology of the Yaqui area is almost completely unknown." One might also suggest that the Guaymas group of Seri were sufficiently distinct to have made a pottery which differed from that of their central

coast relatives, especially in the early historic period under Spanish influence. Therefore, it would seem that there are three possibilities in the *archaeological* distribution patterns for suggesting what historic ethnic groups (or their ancestors) inhabited the Pala Chica Cave area at various times: 1) a band of central coast Seri who occasionally ranged southward; 2) a distinctive southern "Guayma" Seri band; and 3) a coastal group of Yaqui. In addition, there could have been another people that did not survive into the historic record, though this would seem unlikely.

If the distribution of local archaeological complexes is ambiguous relative to the location of Pala Chica Cave, so also is the collection itself. The criteria for the archaeological complexes are basically potsherds (primarily) and stone tools (secondarily), neither of which is present in the cave collection. The students made a casual surface collection of sherds and stone artifacts from sites in the vicinity, but none of it can be connected with the cave (cf. THE SITE, above). There is not enough information about the rest of the archaeological complexes to relate any of the cave artifacts to one group more than to any of the others. Assuming that the collection dates within the last several centuries, review of the ethnohistoric evidence may help.

#### ETHNOGRAPHIC BOUNDARIES

Brief notes on the native Sonora groups date from the sixteenth century, but it is only in the seventeenth century that any details become available (e.g., Griffen 1961; Pennington 1980:10; Sauer 1934). The two peoples identified by the earliest sources in the general Pala Chica Cave region are a southern group of Seri and the Yaqui.

The Seri Indians in the central coast of Sonora speak a distinctive language usually placed in the Hokan stock. They were nonagricultural hunters and gatherers. The nature of Seri social divisions and their distributions has been a research problem made difficult by lack of appropriate data and depends in part on which historical sources are emphasized. One view, as expressed by Sauer, is that the "various tribal names of the Seri do not apparently signify anything more than geographically distinct bands" (1934:44). What information there is has been discussed most recently by Bahre (1980), Sheridan (1982), and Bowen (1983). Bahre and Sheridan suggest that precontact Seri bands differed mainly by their location and that their territories were not only "permeable" but band membership was casual. Bowen (1983:231-232) finds that prior to Spanish disruptions, the pattern was one of bands which were politically independent and that "band differences in culture and dialect, as well as in territory, were sufficient for some Europeans to recognize separate 'nations.'" The remnants of these became the much reduced "Seri" entity in the nineteenth century.

The Seri bands were surrounded on the mainland by peoples who spoke Uto-Aztec languages, had more complex social systems, were mainly agriculturalists,

were more sedentary, and tended to settle in the river valleys. These were the Pima Alto and Pápago, the Pima Bajo, and the Yaqui.

The Pima Alto and Pápago were north of the Seri. Pima Alto territory stretched inland from the Magdalena River drainage north into Arizona. The Pima Bajo were east of the Seri and south of the Pima Alto. They were a series of related inland groups ranging from the Sonora, Mátape, and middle Yaqui river drainages into the Sierra Madre Occidental mountainous areas. They are not known to have occupied any part of the coast. The Pima may have farmed the river valleys as far downstream as there was water. However, because of the Seri raids recorded in historic times, the Pima may well have avoided territory near the range of the Seri. "Between lay a hunting and gathering zone of desert in which the two groups occasionally clashed" (Sauer 1934:38-39; cf. Pennington 1980:xiii, 28-30). It is not likely that Pala Chica Cave was in territory frequented by the Pima Bajo.

South of both the Seri and the Pima Bajo, the Yaqui group of Cahita-speakers occupied the coast and inland stretches along the lower Yaqui River valley. They too were surrounded by a dangerous no man's land (Beals 1943:487). In recent historic times, the Yaqui evolved a myth that includes a concept of spiritual and sacred space; the myth is in part a reaction to acculturative situations. In this myth, they include within their sacred boundary ("Holy Dividing Line") a region that stretches northwest beyond modern Guaymas city to the twin peaks named Takalaim (Las Tetas de Cabra), which is only a short distance west of Pala Chica Cave (Spicer 1980:164-172, 309, 351). (Although Spicer did not suggest it, one wonders if this mythic geography might have been influenced by the earlier assimilation of the Guayma into the Yaqui in the process of *reducción* by the Spanish.) A far wider territory was claimed by the Yaqui apparently as a political device in the 1860s (Beals 1945:49). In the late nineteenth and twentieth centuries it was common for Yaquis to frequent Guaymas city, the principal commercial center of the region (Spicer 1980). However, none of this information suggests that in prehistoric or early historic times the Yaqui ever habitually used the territory around Guaymas or Pala Chica Cave.

The Guayma group of Seri are of particular interest to this study because they are the ones who occupied the region of modern Guaymas city, northwest to San José de Guaymas, possibly including the vicinity of Pala Chica Cave along the coast to the west. This group has long been culturally extinct, and there is little more in the early historical records than reports of their name and their linguistic affiliation. There appears to be no doubt that the Guayma spoke Seri. In 1764, Nentvig (1980:54) described the Guayma as speaking "the language of the Seris with only a slight difference. Because some have surrendered their land to the bloody fury of the Seris and others have intermingled with the Yaquis in Belem and other places, the Guaymas being so few in number do not merit being classified as a separate nation." Bahre (1980), Sheridan (1982), and Bowen (1983) have given the most

recent interpretations of the historical references and other sources.

Whether the rest of Guayma culture differed significantly from that of the other Seri groups is unknown. The historical records do show that other Seri groups warred or allied (depending on circumstances) with each other as well as with their non-Seri neighbors, but that could reflect responses to stress during the colonial period. It may have had more to do with unusual circumstances relating to specific use of territory and food resources than with cultural or even social distinctiveness between groups. In the case of the Guayma, however, one might also speculate that their trade and other contacts with the Yaqui (and perhaps the Pima Bajo) might have been more intensive because of proximity, and that they might have differed significantly from the other Seri for that reason. Because there is no pertinent historical information, the question of the cultural differences among Seri groups may be examined only by continuing archaeological analysis.

Far to the south, in Sinaloa, were the Guasave. Like the Seri, they were nonagricultural coastal peoples. So little is known about them that it is not possible to estimate their degree of resemblance to the Seri, or whether there was a cultural continuity some time prior to the advent of the Cahita agriculturalists in the Yaqui and Mayo river valleys near the coast. Indeed, so little is known of the early Yaqui and Mayo one cannot rule out at least a part-time nonagricultural maritime adaptation for part of those groups as well (cf. Beals 1943:488).

To summarize, the ethnic distribution data recorded since the sixteenth century do not provide clear boundaries nor do they allow a clear identification for the region of Pala Chica Cave. Any of these several peoples might possibly have been in the area at different times even in recent centuries. Using what locational information there is, and assuming that the date of the cave's contents was relatively recent, Pala Chica Cave was most likely within territory of a southern band of central coast Seri or perhaps a somewhat distinctive Guayma band of Seri; less likely to have been in Yaqui territory; and least likely to have been in Pima Bajo territory.

Because ethnographic and archaeological locational data are both uncertain, the trait distributions may be examined for further evidence.

#### MATERIAL CULTURE DIAGNOSTICS

The comparisons and distributions of the individual artifact categories are summarized and documented in their respective sections. Here, the focus is on the identification of the Pala Chica Cave people.

One of the purposes in attempting to compile trait distributions was to see if any of the Pala Chica Cave contents or inferred behavior could be identified as diagnostic of, or at least consistent with, any identified archaeological or ethnographic culture patterns.

Comparisons are also made with the peninsular peoples across the Gulf of California and with the groups in the Greater Southwest to review wider relationships

relative to such traditional questions as culture origins, diffusion of ideas, or trade items.

*Seri (and Guayma?)*

To summarize the evidence that would test the identification of the cave's contents as Seri, the following is a list of the comparisons and discussions for each trait category (*A* = archaeological source, *E* = ethnographic or historic source).

(1) Traits which might be considered *exclusively* Seri on the Sonora coast:

Tooth ablation, if correctly identified (*A?,E*).

Absence of cotton cordage or cloth (*E*).

Neither is a strong argument for an identification as Seri given our state of knowledge, but taken together they at least lean toward Seri.

(2) Traits that are *consistent* with what is documented for Seri culture (grasping at the slightest documented evidence):

Caves used for burials (*E*).

Caves used for storage (*A,E*).

Few nonperishable grave goods (*A,E*).

Carved wooden scoop, relying on what seems to be a turtle carapace analogue (*E*).

Ornaments made of nacreous shell (*A,E*).

*Laevicardium* shell used for tools, containers, etc. (*E*).

Mesquite cordage, *if* it is eventually so identified (*E*).

2-S-yarns Z-strand cordage (*E*).

2-Z-yarns S-strand cordage (*E?*).

Human hair cordage, if the purpose of the little hair bundle is interpreted correctly (*E*).

Coiled and bundled split leaves and stems for lashing or as raw material, if the inference is correct (*E*).

Thick and thin shell disc beads, ascribed by recent Seri to the "Giants" (*A*).

Although these traits are of such general distribution it would not be surprising to find them among the Seri or any other group in northwest México and the Greater Southwest, they at least do not contradict a Seri identification.

(3) Traits that are *not consistent* with what is documented for the recent or historic Seri:

The ring-shaped shell ornament—its shape, the decorative technique of drilled holes, and the careful craftsmanship.

Bead bracelets.

The looping method of bead stringing.  
 Mixed fiber/human hair, as raw material (?).  
 The small human hair bundle, as raw material.

The absence of the last four items from any records of the Seri might well be misleading, given that all historic and ethnographic sources are so remarkably brief and casual. Only the shell ornament seems truly out of character for Seri culture (historic and prehistoric) as we know it so far. But it must have been within the capabilities of the Seri to manufacture the ornament or to obtain it from others by exchange or raiding.

#### *Yaqui and Pima Bajo*

The lack of information on the early historic and prehistoric Yaqui and Pima Bajo cultures makes it impossible to prepare a similar listing for the neighbors of the Seri. A large part of Seri material culture survived into this century because of their isolation. In contrast, successful missionization began among the Yaqui in 1617 and the Pima Bajo in 1619, and very little of their native material culture was recorded before nearly all of it was lost to memory. None of the listed traits are reported for those groups except the possible use of mesquite for cordage by the Yaqui. However, the following *speculations* seem reasonable if one generalizes from a broad view of the agricultural or semiagricultural peoples of the Greater Southwest with which the Seri stand in contrast.

First, none of the Pala Chica Cave traits could be diagnostic of either the Yaqui or the Pima as opposed to other groups. Second, all of the traits listed under (2) as consistent with what is known of Seri culture would also very likely have been compatible with the Yaqui and Pima Bajo cultures. Third, the only traits that I would guess to be inconsistent with the native Yaqui and Pima Bajo cultures would be tooth ablation (but only because the trait is so rare anywhere else) and the absence of cotton cordage or cloth with burials in recent centuries. Clearly, this approach also is inconclusive. It resolves into the observation that the majority of traits at Pala Chica Cave are too widely distributed to be diagnostic individually, but if the sample is representative the traits taken together would probably favor a Seri identification more than what might be expected from the Yaqui or Pima.

#### WIDER RELATIONSHIPS

##### *Baja California*

Possible relationships between the Seri and the peninsular peoples directly across the Gulf of California have long been a matter of interest and speculation. In the Seri area, the distance of less than 100 km between the two coasts is broken by several islands that decrease the distance of open water to some 20 km. There are historic records of Seri travel by balsa rafts along both coasts and across the gulf.

The culture history questions have involved not only the possibility of trade or other exchange, but issues of culture origins and the diffusion of ideas.

There is a superficial resemblance in that the Seri and the peninsular groups share a nonagricultural, hunting/gathering subsistence system and other contrasts with the groups on the Sonora mainland, the Lower Colorado River tribes, and the California Yumans. The central peninsular peoples (Cochimí) and the Seri also share a remote linguistic affiliation and a degree of isolation (or at least a lack of territorial encroachment) from the other peoples. Nevertheless, the cultural differences are considerable.

For Baja California, the most systematic recent reviews of the culture history issues have been by Massey (1966) and Kowta (1984). The predominant view over the past forty years has been the "layer cake" model, in which different peoples migrated from the north into the peninsula in three main waves. The remnants of the earliest migration were found in the south, the most recent in the north. One suggestion is that the Seri originated from the second migration, some of whose people moved across the gulf to the Sonora coast, perhaps sometime after A.D. 500. An alternative suggestion also derived the Seri ultimately from the desert cultures to the north, but as a remnant of a parallel migration south through Sonora instead of via the peninsula (Bowen 1976:97).

Kowta (1984) has added an important alternative hypothesis: that the early cultures (several thousand years B.C.) of the southern part of the peninsula were more identifiable with early cultures of the Mexican mainland than with the northern deserts of California and Arizona. They could have shared Hokan-related language groups. Thus, an alternative for Seri origins would be that they remained an isolated remnant of a culture pattern related to the cultures of the peninsula's cape region and to other remnants elsewhere in México rather than to the more recent cultures of the central peninsula.

It therefore becomes important to compare Seri culture with that of the cape region (Las Palmas culture) as well as with the nonagricultural complexes in the rest of México. The bearing of these early hypothetical relationships on the recent Seri is the possibility that some aspects of their respective cultures may be survivals in common from early traditions.

Bowen's thorough review of Seri archaeology and ethnography relative to Baja California is still current (1976:95-109). As he points out, there are serious obstacles to comparing the other cultures with the Seri: for example, the Las Palmas culture of the cape region "is defined almost entirely on the basis of mortuary practices known from caves." Also, "the majority of diagnostic traits of both the Las Palmas and Comondú cultures are perishable artifacts, whereas no perishables are known from the central coast of Sonora" (1976:97). After a systematic review to evaluate what is comparable in the Las Palmas and Sonora coast burial patterns, he concludes that differences are mainly in burial position and orientation, frequency of

secondary interments, and painting bones red. There are also a considerable number of unique perishable artifact types. The only significant non-perishable burial accompaniments are the nacreous shell pendants.

Because the Comondú culture from the central part of the peninsula is just opposite Seri territory, some close similarities might be expected. As perishable diagnostic traits, Bowen discusses only square-knot netting and certain attributes of coiled basketry. Other things may be added to the significant culture inventory, such as the ritual tablas and the ritual capes made from hanks of human hair tied on a fiber cordage foundation.

The Pala Chica burial cave, limited as the collection and the field data are, holds considerable interest for being the only collection of perishables from the Sonora coast that has become known since Bowen wrote. Items both present and absent are significant.

With respect to the Las Palmas culture, only the possibility that there is a higher proportion of 2-yarns S-strand cordage than is common elsewhere might be comparable to the Pala Chica Cave collection, but the representativeness of the sample and the criteria for frequency may not be appropriate for comparison in either of the areas. Although the Las Palmas nacreous shell pendants are round, they bear no resemblance in shape, in decorative technique, or degree of craftsmanship to the one from Pala Chica Cave. The lack of detailed field records on burial position and orientation as well as the question of secondary burials does not allow comparison with the Las Palmas culture, but the definite absence of red paint on the Pala Chica Cave bones is a clear difference.

Equally, there are no specific similarities with the Comondú culture. Pala Chica Cave did not have a single piece of basketry or netting, no *Olivella* shell beads, and not a trace of any of the ritual objects from Baja California. Only the 2-yarns S- and Z-strand cordage is similar, but it is ubiquitous rather than diagnostic.

In short, nothing in the Pala Chica Cave collection suggests a connection of any kind with the cultures of the Baja California peninsula. Furthermore, some Pala Chica Cave traits such as disc beads and incisor removal are absent in the peninsula. However, given the sample size, and the fact that this is only the first collection of perishables and cave burials reported from the Sonora coast, it does not rule out the possibility that connections or common heritage of some kind may eventually be recognized (cf. Bowen's review, 1976:108-109).

#### *Greater Southwest*

Some of the specimens that most closely resemble those from Pala Chica Cave are found in the Greater Southwest, possibly because of the more intensive exploration and more favorable preservation conditions. For example, the wooden scoops that are most similar are found in several regions of the Southwest. This distribution shows that no special relationships are implied by the form, and that it is

simple enough to have occurred many times within the broad pattern of technology in the Greater Southwest and México during the past several thousand years. The same may be concluded from the distributions of the cordage structure, the human hair bundles, use of bead bracelets, and other minor traits.

The thick *Chama* shell disc beads as well as the thin disc beads are also found in the Southwest, especially in southern Arizona, which probably reflects nothing more than the well-known exchange patterns in shell. It is possible that there were people on the northern gulf coast who made beads for export, in which case they may also have been traded along the coast to the south as far as Pala Chica Cave. However, as yet there is no evidence for such a manufacturing center, and there is no reason to think that the Pala Chica Cave beads were not local products. Traded or not, these beads might eventually prove useful in broad cross-dating, as discussed above.

Artifact comparisons with the distant fringes of the Greater Southwest show some specific similarities, including the bead-stringing technique, which is similar to that found in Lovelock Cave, Nevada, and the circular shell ornament with the decorative drilled holes, examples of which are found in coastal southern California. At such long distances and with no other clear evidence of connections at this time level, there are of course no implications of exchange, common heritage, or diffusion of ideas. At this stage of knowledge, the similarities seem merely coincidental and do not imply relationships between the cultures which happened to develop them.

#### SUMMARY

In briefest summary, the contents of Pala Chica Cave include specimens that range from the unique to the ubiquitous. Comparative analyses have shown closer relationships to the Southwest than to the Baja California peninsula, which may be in part the result of sampling differences in both ethnographic and archaeological data. Most of the similarities are likely to be due to common heritage of a widespread technology (such as the cordage), coincidental solutions to the need for a tool (such as the carved wooden scoop), and possible participation in a general pattern of exchange (the thick disc beads).

From the local perspective, the attempt to relate the burial cave to an archaeological complex or to an ethnographically known group proved to be uncertain. The attempt was based on estimating the date of the burials, on examining the cave's location relative to what is known of prehistoric and historic culture boundaries, and on evaluating the possibility of culture diagnostics.

No single approach gave clear proof of an identification. In fact, the only items that suggested any specific group pointed to the Seri. These were the evidence for a custom of incisor removal and the absence of cotton cloth or cordage. At the same time, there is nothing that seriously conflicts with a Seri identification, and there is nothing that points to Yaqui or Pima (given that we know so little of the

prehistoric or early historic stages of those cultures and must speculate on what they were like). In short, as educated guesswork, the evidence leans toward the Seri (or a Guayma band of Seri).

The Pala Chica burial cave and its small collection is the first known from the Sonora coast. It is still unique and may remain so for a considerable time. For that reason, I have tried to provide as thorough a descriptive analysis as might prove useful to others in their own comparative analyses from different viewpoints.

The collection shows that there is a good potential source of data in the region that should easily justify further research in culture history and related problems. Because of rapidly increasing population, there is a clear need for conservation measures to prevent damage to whatever dry deposits may remain for analysis. One may hope that when excavations are carried out, they will be done as scientific research rather than as ad hoc data collection and that they will be done by people who are both trained and experienced in the special requirements of cave archaeology.

## APPENDIX

### DESCRIPTIVE ANALYSIS OF SKELETAL MATERIAL FROM LA CUEVA DE LA PALA CHICA, SONORA, MEXICO

Virginia McBeath and Keith A. Dixon

#### INTRODUCTION (DIXON)

In a small cave near the coast in the region of Guaymas, Sonora, the skeletal remains of at least six individuals were found buried in shallow graves. They are children and young adults. Relatively few subadult skeletons have been described in the literature, and very few skeletal analyses have ever been published for the coastal region of Sonora. It is therefore important to make a descriptive analysis of this unique collection available to others, even though the comparative analysis cannot be as thorough as we would prefer.

As explained in THE SITE and THE BURIALS sections, the skeletons were excavated by biology students with no formal training in either physical anthropology or in archaeological field techniques. They made no on-site notes or drawings, but they did try later to provide as much information as they could recall. The collection is at the Centro Regional del Noroeste, INAH-SEP, Hermosillo, Sonora, under the accession number 1292.

The skeletal materials were described by Virginia McBeath as a research project while she was a graduate student in physical anthropology at California State University, Long Beach. She completed a thorough and painstaking analysis of the skeletal material and prepared a first draft intended for publication with my report on the site and the artifacts. Regrettably, she was unable to continue her scientific career due to sudden family obligations. Because the descriptive portion of her manuscript was essentially complete in first draft form, she asked that I prepare a final draft and write the interpretive sections for publication.

Since then, I have been unable to locate her for further consultation. This report is therefore not coauthored in the usual sense. In the sections identified as hers, I have edited and rewritten for style but without, I hope, distorting or changing her data and interpretations. Where I have inserted new materials or comments in her portions, they are in parentheses and are identified with my initials.

I have had the generous assistance of Dr. Sheilagh Brooks, University of Nevada, Las Vegas, who reviewed my edited version of McBeath's manuscript with great care. She made numerous technical suggestions which I have incorporated into the text with my initials, but since she has not seen either the skeletal collection

or McBeath's unedited manuscript, I remain responsible for any errors. Most of the inserted material consists of Dr. Brooks' comments on the few of McBeath's passages which she found to be somewhat incomplete or ambiguous. These relate mainly to the aging of two of the children. Unfortunately, the skeletal collection (in Hermosillo) cannot be reexamined for these details prior to publication.

#### CONDITION OF THE MATERIAL (MCBEATH)

There is no evidence of hair, scalp tissue, or ligaments on the skeletal remains. The bones present a varied appearance. They are free from any surface mineral deposits but are in an extremely broken and fragmented condition. The greatest portion of time was spent in reconstruction. Much time was also spent in sorting because no separation of individuals had been maintained at the time of excavation.

Much of the material appears to have been at or near the surface of the deposit. Consequent weathering of the bone had produced discoloration, surface erosion, and a spalling or peeling of layers of bone. Reconstruction in many cases consisted of a process of lamination. Some of the material had apparently not been exposed because it presents the appearance of relatively fresh bone. Most of this apparently unexposed bone appears oily or greasy. In some cases there are spots of a hard black material which is either a tar-like substance or a hardened deposit of dirt and grease (it somewhat resembles bacon grease). No chemical analysis has yet been tried to determine whether the greasy coating was derived from the components of the cave deposit or from some later source.

(McBeath's description of the tar-like substance recalls a reference to "a mixture of a solidified pitch-like substance and small gravel" packed into clam shells that were found in a cluster in a rock shelter at nearby Bahía San Carlos; it was not identified [Windmiller 1967:6]. I specifically asked McBeath whether the hard greasy substance could be a product of the decay of human or animal body substances, but she believed that not to be the case. I also asked her to arrange the bones according to degree of damage, with the most weathered surfaces uppermost as a clue to the original burial positions. She spent much time on this puzzle but did not find a pattern that could be interpreted. —K.D.)

The sketch of the burials provided by the excavators unfortunately bears slight resemblance to the results yielded by analysis of the bones (cf. Fig. 2,c). The most striking feature revealed by laboratory examination is that all of the individuals are skeletally immature, as the excavators noted in one case. However, at least six rather than three individuals are identified, and the cranial vault of only one individual is present.

## DESCRIPTION (McBEATH)

The six individuals that are identified are coded as A through F. Individuals A, B, and C are represented most completely (Table 1). Assignment of skeletal elements to these three is more reliable than it is for Individuals D, E, and F.

Individuals A and B are children of about the same age (9-12 years) but of different size. (As indicated below, Brooks notes that the ages may have been 12 years or older. -K.D.)

Individual C is an adolescent or young adult, many of whose skeletal elements still had not completed epiphyseal fusion. Thus, while the size of Individual C is close to that of Individuals D and E, the incomplete fusion of C provided clues for a fairly reliable assignment of skeletal material.

Individuals D and E are young adults with fusion just completed, but with most epiphyseal lines still clearly apparent. Two mandibles are given tentative assignment to Individuals D and E. There is no certain way to match them positively to either burial, although they most probably belong to them. The skeletal elements for D and E are few, and it also seems that among these bones there is a seventh individual; they cannot be further separated by the present analysis.

Individual F, represented by very few fragments, is a child four to six years old.

A few small fragments of long-bone shafts, two skull fragments, and some vertebral processes and articulation facets are left without designation to a particular individual.

Each individual is described separately. Measurements were made where possible; however, the lamination required in the reconstruction of many of the long-bone shafts, as well as the damaged nature of many articular surfaces and borders, precluded the measurement of some bones. It was felt that a series of estimated values would be of little real significance. The metric data are presently of limited value due to the dearth of published comparative data on immature skeletal materials. The most significant information will therefore be in the description of each individual.

**Individual A**

This burial is judged to be that of a child between 10 and 12 years old. (But see comment on aging below. -K.D.) Fusion is not completed for:

The head, greater and lesser trochanters, and distal end of the left and right femur. (Brooks notes that an age estimate could be derived by measuring the diaphyses. -K.D.)

The proximal epiphyses of the left and right tibia (presumably the same was true for the distal epiphyses, but this cannot be verified because this portion of the tibia is absent).

The head of the humerus, which appears not to have been fused; the trochlea and capitulum of the right humerus are present and are unfused.

The right ulna, unfused both proximally and distally (the distal portion of the left ulna is absent).

The left radius, which appears not to have achieved fusion.

The medial and acromial facets of the clavicle.

The pelvis, no part of which is fused except the inferior ischio-pubic ramus. (Cf. comment, below.)

The superior and inferior surfaces of the first and second lumbar vertebrae, although the vertebral bodies are completely united with the arches (the spines are absent).

The manubrium, which is present but incompletely formed; it is approximately 2.5 cm diameter and about 1.3 cm thick.

The distal end of the left fourth metacarpal and the proximal end of a phalanx, both unfused.

All of the permanent dentition excluding the third maxillary and mandibular molars had erupted, and with three exceptions the missing teeth seem to have been lost post-mortem. Both central and the left lateral maxillary incisors were lost ante-mortem. The mandibular and maxillary third molars were developing but were not yet near eruption.

(Brooks notes the following comments on aging, which apply to both Individuals A and B: 1) McBeath's wording is unclear as to whether the pubic, ischial, and iliac bones are fused at the acetabulum; if they are, the age is 12-14 years. 2) McBeath does not specify whether the innominate bones had begun fusion in either Individuals A or B. 3) Eruption of  $M^2$  and  $M_2$ , plus the occlusal caries, suggests an age over 12 years. 4) The femoral length in Table 2 does not specify whether it is only of the diaphysis or whether it includes the epiphyses. "According to Sundick's tables based on Indian Knoll skeletal material, that individual would be over 18 if this were only the diaphysis; if it includes the proximal epiphysis it would be between 16 and 17; and if both epiphyses, 14 years of age." Brooks notes that McBeath's phrase "fusion is not completed" is ambiguous as to whether any fusion has actually started—individuals of 12 years or less would show no fusion of any of the epiphyses. I would suggest that since McBeath refers to epiphyses of Individual A's radius, ulna, and humerus, they may not have begun to fuse; and since she refers to fusion in Individual C, it implies that it was not present in A or B. Therefore, pending reexamination of the specimens, it seems reasonable to conclude tentatively that Individuals A and B were about 12 years old plus/minus 2 or 3 years. —K.D.)

The slightly greater size of the bones of Individual A was the immediate clue to its differentiation from Individual B. Both of these children are near the same age, but the greater size of A and the greater amount of wear on the second molars of A

indicate that A is somewhat older, by about 1 year.

No auditory exostoses are evident in the right auditory canal; the left is absent. There is no dehiscence of the floor of the right auditory canal. The olecranon fossae, left and right, show a well-developed foramen of about 1.3 cm diameter.

There is an area of possible injury or anomalous development near the epiphyseal line of the left femur. The area is on the edge of the articular surface of the lateral condyle. The lesion is on the anterior face of the femur, it is depressed about 5 mm, and it is irregular in outline as well as in relief. While there has been post-mortem damage to the articular surface near this spot, the smoothed edges and continuity of small irregularities onto the articular surface indicate that this is indeed an injury in process of healing or else is an anomaly.

An area of osteitic involvement is also apparent in the region of the maxillary incisors. Both of the central incisors and the left lateral incisor were lost some considerable time prior to death. The process of alveolar resorption for all three of these teeth is almost complete. The surface of the maxilla is raised and porous about and above the incisor area extending to the nasal aperture. The surface of this raised bone has a lattice-like appearance. The incisive foramen is enlarged and elongated. The entire anterior portion of the palate has been tilted outward and upward so that when the mandible and maxilla were in occlusion there would have been a considerable open unoccluded space in the area of the incisors. The floor of the nasal cavity is not bilaterally symmetrical, viewed from above. The superior surface of the longitudinal palatine suture is somewhat irregular. The left side of the floor of the nasal cavity is reduced in width from suture to wall. A rounded ridge of bone rises from the juncture of the transverse palatine suture and the longitudinal palatine suture, and meets with the lateral interior rim of the nasal aperture. The rim of the nasal aperture is well formed and thick. There is no evidence of a nasal spine. The surface of the palate is exceedingly rough, and the bone surface about the anterior portion of the palate is porous in appearance.

The maxillary dentition consists of the left and right  $M^1$  and  $M^2$ . The first molar is the largest; the second molar is reduced and therefore there was probably similar reduction of the third molar ( $M^3$  is not present, having fallen from the developmental cavity). The right maxillary  $M^1$  exhibits considerably greater wear than the left because it had been worn through to the dentin on all four cusps. The medial portion of the tooth is longitudinally depressed and the surface is smoothed to both sides (buccal and lingual). The left  $M^1$  shows rounding of the enamel surfaces but the relief of the cusps is still present. There is longitudinal depression with wear through to the dentin only on the posterior buccal cusp. The left and right  $M^2$  show rounding of the enamel at the high points of the cusps. Both second molars show several occlusal caries which may have resulted from food being trapped within the deeply infolded enamel on the occlusal surfaces of these two teeth. There is a

moderate deposit of calculus about the buccal surface of the left  $M^1$ . There are no Carabelli's cusps or pits or grooves.

The mandibular dentition also consists of left and right  $M_1$  and  $M_2$ . The right  $M_1$  has greater wear than the left. The right  $M_1$  is worn through to spots of dentin on all five cusps. The lingual edge is the highest point of the tooth and the buccal border is the lowest. The surface of the tooth is smoothed. The left  $M_1$  exhibits the same pattern for high and low points of the tooth, but the wear is much less. The relief of the cusps is still evident, and the wear is through to the dentin on only the two anterior cusps and on the second buccal cusp. There is a slight deposit of calculus about the buccal surface of the left  $M_1$ . The right  $M_2$  has a large occlusal cavity and several smaller pits. The wear on both the left and right  $M_2$  consists of a smoothing of the higher points of the enamel, although the cusp relief is still high; both show considerable infolding of enamel.

### Individual B

Individual B is a child 9 to 11 years of age (but see Brook's comments on aging for Individual A, above -K.D.). This individual is smaller than A but is at essentially the same stage in fusion of epiphyses. (As in the case of Individual A, this may be an underestimate; an age of about 13 or 14 years is indicated as Brooks interprets the following description. See Brooks' comments on aging, above. -K.D.) Fusion is not completed for:

The proximal and distal epiphyses of the left and right femur.

The proximal and distal epiphyses of the left humerus (the right is absent).

The epiphyses of the left radius (the right is absent).

The epiphyses of the left ulna (the right is absent).

The pelvic elements, which are unfused except possibly for the inferior ischio-pubic ramus.

The only portion of the skull that is present is a left maxillary fragment. The third molar had not yet erupted, but the first and second molars are present. All of the other permanent teeth anterior to the first molar had erupted. As in Individual A the central and lateral incisors seem to have been lost ante-mortem with resulting alveolar resorption. The first molar has moderate wear of the enamel without exposure of dentin. The tooth is depressed in a medial-longitudinal direction, with high points at the buccal and lingual borders. The cusps are not completely obliterated, with the relief of the posterior cusps being the greatest. There is a pit on the lingual wall of the anterior cusp. The second molar has virtually no wear except for some polish on the highest points. There is a small occlusal cavity on the posterior lingual cusp. There are no calculus deposits.

The anterior portion of the palate received some post-mortem damage, but it still appears that the incisors were absent ante-mortem. As in Individual A the bone surface appears porous (but to a lesser degree). The rim of the nasal aperture is

rounded, but not pathologically as in A. The nasal spine is present.

There is no perforation of the olecranon fossa, the bone being very sturdy in that area.

### **Individual C**

Individual C is a male 17 to 19 years of age. The state of bone fusion is as follows:

The head of the femur is fused, but the epiphyseal line is very evident; the greater trochanter is partially fused; the epiphysis at the distal end of the femur is not fused.

Only the distal portion of the tibia is present and it is not fused.

The fusion of the radial head is complete, but the distal epiphysis is unfused.

The pelvis shows only a partial fusion of the iliac crest; fusion at the acetabulum is almost complete; fusion of the ischial tuberosity is partial; and fusion of the pubis is incomplete.

The coracoid process of the scapula is almost completely fused.

The sacrum is damaged, but fusion appears to be near completion with the transverse lines being highly visible.

Fusion of the manubrium is incomplete.

Fusion of the bodies of the vertebrae is incomplete as is fusion of the tips of the spines and of the rib facets on the transverse processes.

The skull is so fragmentary that its repair required a series of laminations as well as fitting pieces together. The parietals seem to be thickened. There is dehiscence of the floor of the right auditory canal (the left side is absent). There are no auditory exostoses on the right side. The mastoid processes are well developed, and the digastric grooves are deep and well defined. Suture convolution is moderate with no accessory ossicles other than a very large Inca bone.

No condition of disease or injury is noted.

### **Individual D**

Individual D is a female (?) 19 to 21 years old. The state of bone fusion is as follows:

The epiphyseal lines of the femur are clearly demarcated above the distal epiphyses and slightly less apparent about the head and greater trochanter.

The distal epiphysis of the fibula has a moderately visible epiphyseal line.

Fusion is completed for \_\_\_ facet of the clavicle. (McBeath left the designation blank in her draft. Brooks notes that the medial facet does not complete fusion until between 26 and 28 years, while the lateral epiphysis fuses in early adolescence. —K.D.)

The pelvis shows completed fusion of the iliac crest with the epiphyseal line still visible; the line is also visible along the bony bridge between the ischium and the pubis. (Brooks notes that fusion of the iliac crest is now known to be complete by age 18-24 in both sexes. -K.D.)

Fusion of the bones of the hand and the foot is complete.

There is no observable evidence of disease in this fragmentary skeleton.

A fragment of the distal end of the left humerus shows that there is no perforation of the olecranon fossa.

### **Individual E**

Individual E is about 19 to 21 years old. It is not possible to make any determination of the sex. The following data on fusion indicate that this individual is about the same age as Individual D or perhaps a little older:

The epiphyseal lines of the femur are slightly visible at the distal and proximal epiphyses.

The fibula has a visible epiphyseal line at the distal end.

A fragment of the distal end of the left humerus indicates perforation of the olecranon fossa. The single phalanx assigned to this individual is so weathered that little can be said about it beyond basic identification.

### **Individual F**

Individual F consists of the remains of a child 4 to 6 years old, represented by the shaft and proximal end of the right humerus and a mandible fragment. The head of the humerus is unfused. A fragment of the left horizontal ramus of the mandible is present and has a newly erupted and unworn M<sub>1</sub> molar. The area of the still-developing second premolar can be seen beneath the dM<sub>2</sub> (second deciduous molar).

### **Mandibles 1 and 2**

Two mandibles, designated Mandibles 1 and 2, are also in the collection. It is felt that they belong to either Individual D or E, both estimated to be 19-21 years old. However, it is not possible to assign the mandibles to either with any degree of confidence. Therefore, the mandibles are described but not assigned.

Mandible 1 is less robust than Mandible 2. All of the teeth are absent but were lost post-mortem. There is congenital absence of the left and right third molars. The permanent dentition is completely erupted.

Mandible 2 is only a fragment of the right side. All permanent dentition appears to have erupted but was lost post-mortem except for the third molar.

### **Unassigned Maxilla**

A fragmentary portion of a right maxilla is also unassigned. This fragment extends from the incisors through the second premolar. All teeth appear to have been lost post-mortem with one possible exception. The area of the central and lateral incisors was destroyed post-mortem. While there is the possibility that the incisors may have been lost ante-mortem, the barely visible ends of the root cavities indicate that such is probably not the case; there does not appear to have been any resorption. The root of the second premolar has penetrated the floor of the sinus cavity. The aperture is round with smoothed edges.

### **Other Unassigned Fragments**

The remaining osseous material includes a few rib fragments. These cannot be assigned to any individual. The fragments were examined for anomalies and pathologies but none are apparent. There are also a few fragments of the shafts of long bones and of vertebral arches, which also cannot be assigned. They appear to be normal. Finally, there are two forming molar crowns and a fragmented unworn maxillary incisor. These teeth cannot be assigned to any individual.

## COMPARISONS (DIXON)

At the time she prepared her manuscript, McBeath had only begun a comparative analysis of the descriptive data. She used some of the published skeletal descriptions for the Seri. She also discussed some comparisons from prehistoric Alta California skeletal series as well as living populations of Alta California, the southwestern U.S., and northwestern México. Some of her references are graduate student manuscript sources that are not now available. Since she wrote, further published and unpublished materials have become available.

I have not asked a physical anthropologist to bring the comparisons up to date because the Pala Chica Cave skeletons are few in number, are fragmentary, and are mostly immature. For this paper, which is primarily a descriptive analysis, present purposes are served sufficiently to summarize some of McBeath's conclusions as she originally prepared them in draft form, with the expectation that it is the descriptive data which will be of most use to others.

For purposes of comparison, the metric data are meager for the Pala Chica Cave series (Table 2), partly because of the fragmentary condition of many bones and partly because of the circumstances of collection. However, McBeath was able to comment that an interesting aspect of this material is the manner in which some of the data agree with observations made about the Seri, who have inhabited the area north of Guaymas since some unknown time prior to European contact in the 1540s.

First, she pointed out that the stature estimates for this group show relatively

tall stature. The reports of McGee (1898:136-137) and others indicate that tallness is a Seri characteristic and has been noted since earliest contact. (However, compare Kroeber 1931:36, 53, who suggests that the impression of great stature is influenced by the Seris' relative slenderness.)

Second, two of the Pala Chica Cave children, Individuals A and B, show ante-mortem loss of maxillary central incisors, which may reflect a custom that has been reported for Seri women. In addition, Hrdlička described the skull of a young adult female Seri that also showed long-standing ante-mortem loss of the maxillary central incisors (Hrdlička, in McGee 1898:143). According to McGee's observations of Seris in 1894 (1898:169), the central incisors were removed, possibly at the time of either puberty or of marriage. This practice is rare in the Americas and, as far as I know, has not been reported for the surrounding peoples of Sonora or Baja California (cf. Dixon n.d.).

McBeath's third indication that the Pala Chica Cave skeletons may have been Seri is very general. This is simply Hrdlička's observation that the Seri skeletal material conforms to aspects of the broad California-Southwestern pattern to which the Pala Chica Cave specimens also conform. One example is agenesis of the third molar. While this trait seems to be of rather common occurrence among many American Indians, its presence both in the small Pala Chica Cave sample and in the limited sample observed by Hrdlička may indicate a strong tendency for the occurrence of the trait that is shared in both groups. Another example is the greater linearity of build among the Seri that was noted by both McGee (1898:138) and Kroeber (1931:36, 53). The Pala Chica Cave skeletons show strong muscular development but it is not as great as that found in the skeletal material that McBeath had worked with from Stockton, central California; this also may reflect the Seri linearity of build. The single child's cnemic index that could be determined is similar to that reported by Hrdlička (in McGee 1898:146). I note that the tibia measurements of Individual A in Table 2 give an index of 68 and the index for the Hrdlička female is 64.8; both are therefore in the mesocnemic range of 63.0 to 69.9. The perforation of the olecranon fossae of Individuals A and E also fits within the expected range and is another factor noted by Hrdlička (in McGee 1898:146) on the female Seri skeleton that he described.

Finally, McBeath notes that few pathologies are evident in the Pala Chica Cave material. There is either an injury or a developmental problem in the knee of Individual A. The apparent osteitis associated with the absent incisors of the same individual might indicate some systemic disorder. The perforation of the sinus cavity by the root of the second premolar in an unassigned maxilla is a condition found rather frequently in Southwestern and California materials. She concluded that "there is no overt clue to the cause or causes of the deaths in this group of young individuals."

## SUMMARY (DIXON)

This series consists of (at least) six skeletally subadult individuals ranging in age from about 5 years to just over 20. The sex of two of the older individuals can be identified: Individual C is a male and D is a female. Individuals A and B, both children of around 12 years, may be females *provided that* ante-mortem loss of the maxillary incisors can be used as a criterion based on Seri custom.

No chronometric dating technique has been applied, but the general condition of the bones and the absence of any artifacts or materials of European origin suggests that they are either late prehistoric or early historic, although a date even as recent as the beginning of this century cannot be excluded. No evidence is apparent for either the causes or the sequence of the deaths.

As for affiliation, there are certain clues that lead to a likely interpretation, including the stature of the older individuals, the possible culturally-patterned loss of upper incisors, the degree of muscular development, some specific physical variations, and the geographic location. Considered individually, none are significant. But taken together, these suggest (without proving) that the Pala Chica Cave skeletons represent burials of the Seri or of a closely related group. No observable data suggest otherwise.

TABLE 1. INVENTORY

		Individual:					
		A	B	C	D	E	F
Clavicle	left	x			x		
	right						
Scapula	left						
	right			x			
Sternum		x		x			
Humerus	left	x			x	x	
	right	x	x				x
Radius	left	x	x	x			
	right			x			
Ulna	left	x	x			x	
	right	x	x				
Sacrum				x			
Ilia	left	x		x	x		
	right	x					
Pubis	left			x	x		
	right	x					
Ischium	left	x	x	x	x		
	right	x	x				
Femur	left	x	x	x	x		
	right	x	x			x	
Tibia	left	x		x			
	right	x		x			
Fibula	left				x	x	
	right						
Patella	left			x			
	right						
Vertebrae	cervical						
	thoracic			2			
	lumbar	2					
Metatarsals					1		
Phalanges					1		
Metacarpals		1					
Phalanges		1			1	1	
Calcaneus	left			x			
	right						
Talus	left	x		x			
	right	x					
Navicular	left			x			
	right						
Scaphoid	left				x		
	right						
Mandible		x					x
Maxilla		x	x				
Parietal	left			x			
	right			x			
Occipital				x			
Temporal	left			x			
	right	x		x			

TABLE 2. MEASUREMENTS

	Individual:					Hrdlička's	
	A	B	C	D	E	F	Seri fem.
Palate							
Endomolare-endomolare	3.4						3.55
Orale-staphylon	4.1						4.60
Orale-palatine suture	2.9						
Mandible							
Max. mandibular length							9.55
Min. ramus breadth							
Gnathion-infradentale							
Femur							
Length (bicondylar)	40.6		47.8	47.1	48.6		43.60
Width of condyles	7.0			7.6			
Max. diameter femoral head	4.0	3.8	4.4	4.6	4.6		
Subtrochanteral min. diameter	2.0	1.7	2.5	2.1	2.5		
Subtrochanteral max. diameter	2.5	2.7	3.1	3.2	3.0		
Max. midshaft diameter	2.2	1.9	3.0		3.1		
Min. midshaft diameter	2.0	1.8	2.1		2.5		
Tibia							
Length							35.60
Max. diam. nutrient foramen	2.5						2.50
Min. diam. nutrient foramen	1.7						1.62
Humerus							
Length							31.30
Max. midshaft diameter	1.6						
Min. midshaft diameter	1.2						
Max. diam. head of humerus							
Pelvis							
Total height innominate			20.5	22.0			19.40
Max. width ilia	11.9		15.0	16.4			13.70
Ischial length	6.7	6.3	8.0	7.9			
Pubic length	5.4		7.3	9.1			
Diameter acetabulum			5.0	5.0			
Sciatic notch length			4.5	4.4			
Sciatic notch height			2.5	3.1			
Dentition							
Maxillary M <sup>2</sup> , left							
Buccal-lingual	11.0	12.0					
Mesio-distal	10.0	10.0					
Maxillary M <sup>2</sup> , right							
Buccal-lingual	11.0						
Mesio-distal	10.0						
Maxillary M <sup>1</sup> , left							
Buccal-lingual	13.0	12.0					
Mesio-distal	13.0	11.0					
Maxillary M <sup>1</sup> , right							
Buccal-lingual	12.0						
Mesio-distal	13.0						

(TABLE 2, continued)

	A	B	C	D	E	Hrdlička's F	Seri fem.
Mandibular M <sub>2</sub> , left							
Buccal-lingual	10.0						
Mesio-distal	11.0						
Mandibular M <sub>2</sub> , right							
Buccal-lingual	11.0						
Mesio-distal	11.0						
Mandibular M <sub>1</sub> , left							
Buccal-lingual	11.0					11.0	
Mesio-distal	12.0					12.0	
Mandibular M <sub>1</sub> , right							
Buccal-lingual	11.0						
Mesio-distal	12.0						
Stature*	159.6		175.3	173.8	177.1		166.3

\* Computed using Trotter's Mongoloid Male Formula; the Hrdlička female was reassessed with the same formula.

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Although they asked not to have their names listed, special acknowledgment is due the biology students who excavated the cave in 1964 and later requested that the collection be placed in the proper institution in México. In addition, they cooperated generously in describing the field circumstances and their procedures, and by supplying the illustrations in Figs. 2 and 7. Their intentions were good, and only later did they realize that they had excavated and removed the collection illegally.

At the time of excavation the students did not know the appropriate local authorities to notify and brought the collection to California. Later they contacted me, and I referred them to the Centro Regional del Noroeste (INAH-SEP) in Hermosillo, which had been established in 1973. The students asked me to facilitate conveyance of the collection to the Centro Regional. That office then requested in 1977 that I prepare a report for publication using the information that the students had supplied. At my suggestion, approval was also given for an analysis of the skeletal remains by a graduate student in physical anthropology at California State University, Long Beach. There have been numerous delays in completing the report, but in the time during its preparation the collection was available for study in Long Beach and then in Hermosillo. The entire collection and the complete documentation is at the Centro Regional del Noroeste in Hermosillo, under the accession numbers 1292 and 1802.

I have not had an opportunity to visit the site myself. However, Lloyd T. Findley (Instituto Tecnológico y de Estudios Superiores de Monterrey—Campus Guaymas) kindly visited for me in 1975 and 1982. He provided an exact locational map (not published here in order to avoid vandalism), a photograph, and a description of the cave. Otherwise, the students' information and the collection itself are the basis for this study.

Many other people have also given their time and energy toward the preparation of this report. I wish to express my appreciation to Arqlga. Beatriz Braniff, formerly with the Centro Regional del Noroeste (INAH-SEP) in Hermosillo, for requesting that I prepare the present report and for her many courtesies during the long period of completing the manuscript. Arqlga. Elisa Villalpando C. of the same office kindly provided information on the site survey and acquisition numbers as well as information on the Guaymas area.

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Long Beach) completed the laboratory analysis and prepared a first draft of the descriptive skeletal analysis; she asked me to prepare the manuscript for publication. In this latter connection, I owe special thanks to Dr. Sheilagh Brooks (University of Nevada, Las Vegas) for her review of the draft manuscript and her helpful comments as described in the APPENDIX.

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A botanist volunteered to identify the vegetal fibers and then deliver the specimens to Hermosillo. However, he later changed his mind and without making other arrangements delivered the unopened containers to México, where they still await botanical review. Because I have since been unsuccessful in finding another means of having the identifications done, that information must be left for the future.

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Finally, I wish to thank Mr. David Crammer for producing the photographs in Figs. 4, 5, 6, 8, 9, and 11. The Fig. 1 map, which I have modified slightly to enter Pala Chica Cave, is from Thomas Bowen's *Seri Prehistory* courtesy of the author and by permission of the University of Arizona Press, copyright 1976.

NOTE: For consistency, I have followed the usage of Mexican publications in using diacritical marks on ethnic and place names within México, e.g., Pápago (not Papago); Cahita (not Cáhita); and México (but New Mexico).

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## REFERENCES

- Anderson, Keith M.  
n.d. Tsegi Phase Technology. Doctoral dissertation, University of Washington, Seattle [1969].
- Aschmann, Homer  
1967 *The Central Desert of Baja California: Demography and Ecology* (reprint edition). Manessier Publishing Company, Riverside [first published in *Ibero-Americana* 42, University of California Press, 1959].
- Atlas  
1939 *Atlas arqueológico de la República Mexicana*. Publicación 41, formado por el Instituto Nacional de Antropología e Historia, Instituto Panamericano de Geografía e Historia, México.
- Bahre, Conrad J.  
1980 Historic Seri Residence, Range, and Sociopolitical Structure. *The Kiva* 45(3):197-209, Tucson.
- Beals, Ralph L.  
1943 The Population of Northwest Mexico. *American Anthropologist* 45:486-489.  
1945 The Contemporary Culture of the Cáhita Indians. Bulletin 142, Bureau of American Ethnology, Smithsonian Institution, Washington.
- Bowen, Thomas  
1965 A Survey of Archaeological Sites Near Guaymas, Sonora. *The Kiva* 31(1):14-36, Tucson.  
1973 Seri Basketry: A Comparative View. *The Kiva* 38(3/4):141-172, Tucson.  
1976 Seri Prehistory, the Archaeology of the Central Coast of Sonora, Mexico. Anthropological Papers 27, University of Arizona, Tucson.  
1983 Seri. Handbook of North American Indians, Vol. 10, Southwest:230-249, Smithsonian Institution, Washington.
- Bowen, Thomas, and Edward Moser  
1968 Seri Pottery. *The Kiva* 33(3):89-132, Tucson.
- Campbell, Elizabeth W. Crozer  
1931 An Archeological Survey of the Twenty Nine Palms Region. Papers 7, Southwest Museum, Highland Park, Los Angeles.
- Carroll, John  
1970 Notes on Bead Stringing at Lovelock Cave, Nevada. Contributions 7, Archaeological Research Facility, University of California, Berkeley.
- Castetter, Edward F., and W.H. Bell  
1942 Pima and Papago Indian Agriculture. *Inter-Americana Studies I*, University of New Mexico Press, Albuquerque.

Castetter, Edward F., and R.M. Underhill

- 1935 The Ethnobiology of the Papago Indians. *Ethnobiological Studies in the American Southwest* 2, Bulletin 275 (Biological Series 4[3]), University of New Mexico, Albuquerque.

Cosgrove, C.B.

- 1947 Caves of the Upper Gila and Hueco Areas in New Mexico and Texas. *Papers of the Peabody Museum of American Archaeology and Ethnology* 24(2), Harvard University, Cambridge.

Davis, Edward H.

- 1933 Juan Tomás, War Chief of the Seris. *Touring Topics* 25(6):20-21,33, Los Angeles.

Davis, Edward H., and E. Yale Dawson

- 1945 The Savage Seris of Sonora [Parts I, II]. *The Scientific Monthly* 60:193-202, 261-268.

Dawson, E. Yale

- 1944 Some Ethnobotanical Notes on the Seri Indians. *Desert Plant Life* 16(9):133-138.

Diguet, Leon

- 1973 Ancient Native Burials of Southern Baja California (trans. by Jutta Banks). *Pacific Coast Archaeological Society Quarterly* 9(1):27-30, Costa Mesa [originally published in *Journal de la Société des Américanistes de Paris*, 1905].

DiPeso, Charles C., and Daniel S. Matson

- 1965 The Seri Indians in 1692 as Described as Adamo Gilg, S.J. *Arizona and the West* 7(1):33-56.

Dixon, Keith A.

- n.d. Incisor Tooth Removal Among the Seri Indians of Sonora, México: The Ethnographic and Skeletal Evidence. Manuscript [1989].

Dockstader, Frederick J.

- 1961 A Figurine Cache from Kino Bay, Sonora. In, *Essays in Pre-Columbian Art and Archaeology*, ed. by Samuel K. Lothrop:182-191, Harvard University Press, Cambridge.

Drucker, Philip

- 1941 Culture Element Distributions XVII: Yuman-Piman. *Anthropological Records* 6(3), University of California Press, Berkeley.

Dushane, Helen, and Roy Poorman

- 1967 A Checklist of Mollusks for Guaymas, Sonora, Mexico. *The Veliger* 9 (4):413-441.

Ekholm, Gordon F.

- 1939 Results of an Archaeological Survey of Sonora and Northern Sinaloa. *Revista Mexicana de Estudios Antropológicos* 3:7-10, Sociedad Mexicana de Antropología.

Fay, George E.

- 1968 A Preliminary Archaeological Survey of Guaymas, Sonora, Mexico, Part I: Ensenada to Boco-chibampo to San José de Guaymas (cont'd.). *Katunob Occasional Publications in Mesoamerican Anthropology* 3, Museum of Anthropology, Colorado State College, Greeley.

Felger, Richard, and Mary B. Moser

- 1970 Seri Use of Agave (Century Plant). *The Kiva* 35(4):159-167, Tucson.  
1971 Seri Use of Mesquite, *Prosopis glandulosa* var *torreyana*. *The Kiva* 37(1):53-60, Tucson.  
1985 People of the Desert and Sea, Ethnobotany of the Seri Indians. University of Arizona Press, Tucson.

Fewkes, J.W.

- 1907 Excavations at Casa Grande, Arizona, in 1906-07. *Smithsonian Miscellaneous Collections* 50(4:3):289-329, Smithsonian Institution, Washington.  
1912 Casa Grande, Arizona. *Annual Report* 28:25-179, Bureau of American Ethnology, Smithsonian Institution, Washington.

Fontaine, Joseph, and Allen Prosser

- 1965 A Preliminary Report on the Aboriginal Sites of the Sierra de Juarez. *Pacific Coast Archaeological Society Quarterly* 1(1):1-7, Costa Mesa.

Fontana, Bernard L., W.J. Robinson, C.W. Cormack, and E.E. Leavitt, Jr.

- 1962 Papago Indian Pottery. *The American Ethnological Society*. University of Washington Press, Seattle.

Foster, John W., and Lloyd T. Findley

- 1982 Seri-Baja California Connection: New Light on Trans-Gulf Contact. Program and Abstracts, Great Basin Anthropological Conference, Eighteenth Biennial Meeting, 30 September-2 October, Reno.

Gifford, E.W.

- 1931 The Kamia of Imperial Valley. *Bulletin* 97, Bureau of American Ethnology, Smithsonian Institution, Washington.  
1933 The Cocopa. *Publications in American Archaeology and Ethnology* 31(5), University of California, Berkeley.  
1947 Californian Shell Artifacts. *Anthropological Records* 9(1), University of California Press, Berkeley.

Gladwin, Harold S., et al.

- 1937 Excavations at Snaketown, Material Culture. *Medallion Papers* 25, Gila Pueblo, Globe.

Griffen, William B.

- 1961 Seventeenth Century Seri. *The Kiva* 27(2):12-21, Tucson.

Guernsey, S.J.

- 1931 Explorations in Northeastern Arizona, Report on the Archaeological Fieldwork of 1920-1923. Papers of the Peabody Museum of American Archaeology and Ethnology 12(1), Harvard University, Cambridge.

Guernsey, Samuel J., and A.V. Kidder

- 1921 Basket-Maker Caves of Northeastern Arizona, Report on Explorations, 1916-17. Papers of the Peabody Museum of American Archaeology and Ethnology 8(2), Harvard University, Cambridge.

Harrington, John P.

- 1928 Exploration of the Burton Mound at Santa Barbara, California. Annual Report 44:23-168, Bureau of American Ethnology, Smithsonian Institution, Washington.

Harwell, Henry O., and Marsha C.S. Kelly

- 1983 Maricopa. Handbook of North American Indians, Vol. 10, Southwest:71-85, Smithsonian Institution, Washington.

Haury, Emil W.

- 1945 The Excavation of Los Muertos and Neighboring Ruins in the Salt River Valley, Southern Arizona. Papers of the Peabody Museum of American Archaeology and Ethnology 24(1), Harvard University, Cambridge.
- 1975 The Stratigraphy and Archaeology of Ventana Cave, second printing. University of Arizona Press, Tucson [1950].

Hayden, Julian D.

- 1959 Notes on Pima Pottery Making. The Kiva 24(3):10-16, Tucson.

Hedges, Ken

- 1973 Painted Tablas from Northern Baja California. Pacific Coast Archaeological Society Quarterly 9(1):5-20, Costa Mesa.

Hernández, Fortunato

- 1902 Las razas indígenas de Sonora y la guerra del Yaqui. Talleres de la casa editorial "J. de Elizalde," México.

Herskovitz, Robert M.

- 1981 Arizona U:9:46, a Dual Component Hohokam Site in Tempe, Arizona. The Kiva 47(1/2):1-90, Tucson.

Hinton, T.B.

- 1969 Remnant Tribes of Sonora: Opata, Pima, Papago, Seri. In, Ethnology, Part Two, ed. by Evon Z. Vogt, Handbook of Middle American Indians 8:879-888, University of Texas Press, Austin.

Holden, W.C., et al.

- 1936 Studies of the Yaqui Indians of Sonora, Mexico. Texas Technological College Bulletin 12(1), Scientific Series 2, Texas Technological College, Lubbock.

Holzkamper, Frank M.

- 1956 Artifacts from Estero Tastiota, Sonora, Mexico. *The Kiva* 21(3/4):12-19, Tucson.

Hrdlička, Aleš

- 1904 Notes on the Indians of Sonora, Mexico. *American Anthropologist* 6(1):51-89.  
1906 Notes on the Pima of Arizona. *American Anthropologist* 8(1):39-46.

Jernigan, E. Wesley

- 1978 *Jewelry of the Prehistoric Southwest*. School of American Research, Santa Fe, and University of New Mexico Press, Albuquerque.

Judd, Neil M.

- 1926 *Archeological Observations North of the Rio Colorado*. Bulletin 82, Bureau of American Ethnology, Washington.

Keen, A. Myra

- 1971 *Sea Shells of Tropical West America*, 2nd ed. Stanford University Press, Stanford.

Kelly, Isabel T.

- 1978 *The Hodges Ruin, a Hohokam Community in the Tucson Basin*. Anthropological Papers 30, University of Arizona, Tucson.

Kelly, William H.

- 1977 *Cocopa Ethnography*. Anthropological Papers 29, University of Arizona, Tucson.

Kidder, A.V., and S.J. Guernsey

- 1919 *Archeological Explorations in Northeastern Arizona*. Bulletin 65, Bureau of American Ethnology, Smithsonian Institution, Washington.

King, Mary Elizabeth

- 1974 *Textiles and Basketry*. In, *Casas Grandes, a Fallen Trading Center of the Gran Chichimeca*, by Charles C. DiPeso, John B. Rinaldo, and Gloria J. Fenner, Vol. 8:76-120, Amerind Foundation Papers 9, Dragoon.

Kissell, Mary L.

- 1916 *Basketry of the Papago and Pima*. Anthropological Papers 17(4):115-264, American Museum of Natural History, New York.

Kowta, Makoto

- 1984 *The "Layer Cake" Model of Baja California Prehistory Revised: An Hypothesis*. Pacific Coast Archaeological Society Quarterly 20(1):1-16, Costa Mesa.

Kroeber, A.L.

- 1931 *The Seri*. Papers 6, Southwest Museum, Highland Park, Los Angeles.

Lehmer, Donald J.

- 1949 *Archaeological Survey of Sonora, Mexico*. Bulletin 20(12):4-5, Chicago Natural History Museum, Chicago.

Lumholtz, Carl

- 1912 *New Trails in Mexico*. T. Fisher Unwin, London.

- MacNeish, Richard S., et al.  
1967 *The Prehistory of the Tehuacan Valley, Volume Two: Nonceramic Artifacts.* University of Texas Press, Austin.
- Martin, Paul S., and Fred Plog  
1973 *The Archaeology of Arizona, A Study of the Southwest Region.* Doubleday/Natural History Press, Garden City.
- Massey, Lee Gooding  
1972 *Tabla and Atlatl: Two Unusual Wooden Artifacts from Baja California.* Pacific Coast Archaeological Society Quarterly 8(1):25-34, Costa Mesa.
- Massey, William C.  
n.d. *Culture History in the Cape Region of Baja California.* Doctoral dissertation, University of California, Berkeley [1955].  
1966 *The Castaldí Collection from Central and Southern Baja California.* Contributions 2, Archaeological Research Facility, Department of Anthropology, University of California, Berkeley.
- Massey, William C., and Carolyn M. Osborne  
1961 *A Burial Cave in Baja California: The Palmer Collection, 1887.* Anthropological Records 16(8), University of California Press, Berkeley.
- Mathes, W. Michael, ed.  
1970 *Californiana II: Documentos para la historia de la explotación comercial de California, 1611-1679,* 2 vols. Ediciones José Porrúa Turanzas, Madrid.
- McGee, W.J.  
1898 *The Seri Indians.* Annual Report 17, Pt. 1, Bureau of American Ethnology, Smithsonian Institution, Washington.
- Meighan, Clement W.  
1966 *Prehistoric Rock Paintings in Baja California.* American Antiquity 31(3):372-392.
- Meigs, Peveril, 3rd  
1939 *The Kiliwa Indians of Lower California.* Ibero-Americana 15, University of California Press, Berkeley.  
1970 *Capes of Human Hair from Baja California and Outside.* Pacific Coast Archaeological Society Quarterly 6(1):21-28, Costa Mesa.  
1974 *Meigs on Tablas.* Pacific Coast Archaeological Society Quarterly 10(1):37-38, Costa Mesa.
- Moser, Mary Beck  
1970 *Seri Elevated Burials.* The Kiva 35(4):211-214, Tucson.
- Nentvig, Juan, S.J., trans. by A. F. Pradeau and R. R. Rasmussen  
1980 *Rudo Ensayo, a Description of Sonora and Arizona in 1764.* University of Arizona Press, Tucson.

Nolasco A., Margarita

- 1965 Los pápagos, habitantes del desierto. *Anales* 17(1964):375-448, Instituto Nacional de Antropología e Historia, México.

Nusbaum, Jesse L.

- 1922 A Basket-Maker Cave in Kane County, Utah. *Indian Notes and Monographs*, Museum of the American Indian, Heye Foundation, New York.

Orchard, William C.

- 1929 Beads and Beadwork of the American Indians, a Study Based on Specimens in the Museum of the American Indian, Heye Foundation. *Contributions* 11, Museum of the American Indian, Heye Foundation, New York.

Osborne, Carolyn M.

- 1965 The Preparation of Yucca Fiber: An Experimental Study. *In*, *Contributions of the Wetherill Mesa Archeological Project*, assembled by Douglas Osborne, *Memoirs* 19:45-50, Society for American Archaeology.
- 1980 Objects of Perishable Materials. *In*, Long House, Mesa Verde National Park, Colorado, by George S. Cattanach, Jr., et al.: Chapter 7. *Publications in Archeology* 7H, Wetherill Mesa Studies, National Park Service, Washington.

Pennington, Campbell W.

- 1980 The Pima Bajo of Central Sonora, Mexico, Vol I: The Material Culture. University of Utah Press, Salt Lake City.

Ritter, Eric W.

- 1974 A Magico-Religious Wooden Tablet from Bahia Concepcion, Baja California Sur. *Pacific Coast Archaeological Society Quarterly* 10(1):29-36, Costa Mesa.

Rogers, Malcolm J.

- 1936 Yuman Pottery Making. *San Diego Museum Papers* 2, San Diego.

Russell, Frank

- 1908 The Pima Indians. *Annual Report* 26:3-389, Bureau of American Ethnology, Smithsonian Institution, Washington.

Sauer, Carl

- 1934 The Distribution of Aboriginal Tribes and Languages in Northwestern Mexico. *Ibero-Americana* 5, University of California Press, Berkeley.

Schindler, Seth

- n.d. The Material Culture and Technoeconomic System of the Seri Indians: An Experimental Reconstruction. Doctoral dissertation, Southern Illinois University at Carbondale [1981].

Schulz, Jeanette K.

- 1977 Prehistoric Textile Remains from Bahía Coyote, Baja California Sur. *Pacific Coast Archaeological Society Quarterly* 13(1):28-34, Costa Mesa.

Sheridan, Thomas E.

1982 Seri Bands in Cross-Cultural Perspective. *The Kiva* 47(4):185-212, Tucson.

Shutler, Richard, Jr.

1961 Lost City, Pueblo Grande de Nevada. *Anthropological Papers* 5, Nevada State Museum, Carson City.

Smith, Helen, and Ralph C. Michelson

1972 The Making of Paddle and Anvil Pottery at Santa Catarina, Baja California, Mexico. *Pacific Coast Archaeological Society Quarterly* 8(1):2-9, Costa Mesa.

Spicer, Edward H.

1969 The Yaqui and Mayo. *In*, *Ethnology*, Part Two, ed. by Evon Z. Vogt, *Handbook of Middle American Indians* 8:830-845, University of Texas Press, Austin.

1980 *The Yaquis, a Cultural History*. University of Arizona Press, Tucson.

Spier, Leslie

1933 *Yuman Tribes of the Gila River*. University of Chicago Press, Chicago.

Thompson, D. Roberto

1931 Sons of the Stone Age, The Seri—Modern Mexico's Most Savage Indians (as told to H.H. Dunn). *Travel* 56(6):43-44, 54-56.

Williams, Anita Alvarez de

1975a *Primeros pobladores de la Baja California: introducción a la antropología de la península*. Gobierno del Estado, Mexicali.

1975b Sea Shell Usage in Baja California. *Pacific Coast Archaeological Society Quarterly* 11(1):1-22, Costa Mesa.

Windmiller, Ric

1967 An Archeological Reconnaissance of Bahia de San Carlos, Sonora, Mexico, a Preliminary Report. *Sacramento Anthropological Society Newsletter* 1(3):4-7, Sacramento.