

*Southern Lowland Maya
Archaeology and Human
Skeletal Remains: Interpretations
from Caracol (Belize), Santa
Rita Corozal (Belize), and
Tayasal (Guatemala)*

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One class of data that is crucial to archaeological interpretations of prehistoric populations, their health, status, and demographic patterns, is that derived from human burials. These are recovered in what, at first glance, appear to be sizeable quantities in most excavations at most Maya sites (Chase 1994; Saul and Saul 1991; Tourtellot 1990a; Welsh 1988). Yet, how much do we know about the actual remains of the ancient Maya and how can excavated samples be used to define ancient populations?

The sites of Caracol, Santa Rita Corozal, and Tayasal are all Maya sites in the southern lowlands. Each of these sites, however, is located within a distinctive geographic area and maintains a different history of human occupation. Investigations at each site have added important information to our views of the ancient Maya and, when taken together, provide greater insight into both a broader interpretation of the nature of ancient Maya populations and the methodological and the-

oretical difficulties involved in making intersite comparisons.¹

*Caracol, Santa Rita Corozal,
and Tayasal: Temporal and
Skeletal Samples*

Caracol, the largest of the three sites, is located in the Vaca Plateau of Belize in the foothills of the Maya Mountains at an elevation of over 500 m. Long-term large-scale excavation was started at Caracol in 1985 and has taken place every year since then (Chase and Chase 1987; D. Chase and A. Chase 1994). The earliest

¹The author acknowledges the problems in comparing health among archaeological populations as identified by Wood et al. (1992). This discussion, however, will place greater emphasis on an equally important phenomenon: determination of sampling problems through correlation of osteological remains with other archaeological information.

settlement at the site epicenter dates to approximately 300 B.C. and occupation continued until about A.D. 1100. However, the primary occupation of Caracol was during the Classic period, or from A.D. 250 to 900, with a population peak occurring at approximately 650. Population estimates based on housemound counts indicate that minimally 115,000, and more probably almost 150,000, people lived at the site in 650 (A. Chase and D. Chase 1994a). The total burial sample recovered thus far at Caracol consists of 183 recorded interments (171 with data retrieved by means of excavation) representing more than 300 individuals.² More than 80 of Caracol's investigated interments are located in formally constructed tombs.

Half a country away to the north in Belize is Santa Rita Corozal. Encompassed by, and largely buried under, modern Corozal Town and its suburbs, this site is located directly on Chetumal Bay between the New River and the Río Hondo. Santa Rita has a very long and continuous history of occupation beginning at about 1200 B.C. Its peak settlement, however, dates to the Late Postclassic period (A.D. 1200–1530) when population is estimated to have reached between approximately 7000 and 11,000 people (D. Chase 1990). The Corozal Postclassic Project (Chase 1982; Chase and Chase 1988) excavated 134 interments, including two formal tombs, at Santa Rita Corozal from 1980 through 1985. Some 164 individ-

uals are represented in these burials. At the turn of the present century, Thomas Gann (1900, 1911, 1914, 1918) recovered an additional 26 burials representing 28 individuals at Santa Rita Corozal (Chase 1982).

Tayasal is located in the heart of the Maya lowlands on the tip of a peninsula that juts into Lake Petén Itzá in the northern part of modern-day Guatemala. Tayasal and its surrounding region were occupied continuously from the Middle Preclassic through the Classic and Postclassic periods. Excavation and reconnaissance were undertaken by the University of Pennsylvania in 1971 and 1979 (A. Chase 1983, 1985, 1990). This work recovered 51 burials representing 56 individuals. This total also includes two tombs. Eight additional burials representing eight individuals were excavated at the site early in this century by Carl Guthe (1921, 1922).

Population History: Settlement and Burial Samples

It is common for reconstructions of prehistoric population to be based on excavation data, exclusive of skeletal or burial remains (cf. Ashmore 1981; Culbert and Rice 1990). Generally speaking, population estimates in the Maya area are based on counts of numbers of structures at any one site, with consideration being given to the possibility that not all structures are visible based upon surface remains and to the likelihood that early occupation has not been adequately sampled at multiphase sites. The structure counts, usually derived from reconnaissance and survey, are further modified to account for nonresidential buildings and for limited use-spans for individual constructions. Excavation data are then utilized to estimate the total number of structures in use at any given time. The resultant figures are then multiplied by a standard number of individuals believed to have lived in any single Maya house-

²The burial totals reflected in this paper and in Table 2.3 are current through the 1994 season at Caracol, Belize. Additional data gathered as a result of the 1995 and 1996 field seasons do not change the conclusions presented here or significantly alter any percentages relative to Caracol burial practices. As of the end of the 1996 field season some 213 formal interments, representing almost 400 individuals, are known from the site; 31 of these interments were disturbed by looters; 7 empty tombs, presumably once used for burial, are not included in this burial total. Additionally, a burial dating to approximately 600 B.C. is now known from the outlying Caracol core settlement.

Table 2.1 Santa Rita Corozal: Relative Population Based on Burials and Settlement
(Approximately 5 km²)

Time Period	Percent Based on Structures	Percent Based on Burials	Total Population Based on Structures	n*	Percent of Population Seen in Burials
Early Preclassic 1200–900 B.C.	2.19	4.82	150	4	.0044
Middle Preclassic 900–300 B.C.	2.19	3.02	150	5	.0028
Late Preclassic 300 B.C.–A.D. 200	15.77	24.44	1079	34	.0032
Protoclassic A.D. 200–300	26.28	14.38	1798	4	.0011
Early Classic A.D. 300–550	21.02	20.13	1438	14	.0019
Late Classic A.D. 550–900	35.65	29.76	2438	29	.0017
Terminal Classic/Early Postclassic A.D. 900–1200	30.66	7.19	2097	6	.0005
Early Facet Late Postclassic A.D. 1200–1300	26.28	17.97	1798	5	.0014
Late Facet Late Postclassic A.D. 1300–1530	100.00	100.00	6840	64	.0020

*n = number of skeletal individuals.

hold (usually 5 or 5.6 people) to arrive at the total projected population for various time periods and an overall population trajectory. While there are problems with this method of population reconstruction, its general use and application in the Maya area provide a relatively standard method for comparing excavated sites.

Although not typically employed, a comparison of relative population derived from skeletal individuals, as opposed to structural dating, may be instructive in identifying places where skeletal sampling is inadequate or where problems exist in population estimates that have been made using nonskeletal data. Burial samples recovered from the sites of Caracol, Santa Rita Corozal, and Tayasal compare favorably in size with those collected at other lowland Maya sites (see Welsh 1988). Any consideration of the total length of time that given

sites were occupied, however, reveals the fact that only an extremely small percentage of the total population alive at any one time is represented in a given skeletal population. Numbers of interments recovered archaeologically, though, may correlate proportionately with relative numbers of excavated structures per time period. Alternatively, they may not, thus indicating a greater possibility of sampling error.

At Santa Rita Corozal (Table 2.1) when the burials per time period are adjusted to indicate maximum individual lifespans (likely overestimated at 50 years), the representative population, as recovered in skeletal remains, is extremely small. For late facet Late Postclassic Santa Rita, the time period for which we have the largest skeletal sample as well as ethnohistoric information that can be correlated with this estimated population peak, only .002% of

Table 2.2 Tayasal-Paxcamán Zone: Relative Population Based on Burials and Settlement (Approximately 90 km²)

Time Period	Percent Based on Structures	Percent Based on Burials	Total Population Based on Structures	n ^a	Percent of Population Seen in Burials
Middle Preclassic 750–250 B.C.	4	.00	878	0	.000000
Late Preclassic 250 B.C.–A.D. 250	56	2.50	12,293	1	.000008
Early Early Classic A.D. 250–400	71	41.67	15,585	5	.000032
Late Early Classic A.D. 400–550	85	83.33	18,658	10	.000179
Early Late Classic A.D. 550–700	95	50.00	20,853	6	.000096
Late Late Classic A.D. 700–950	100	100.00	21,951	20	.000182
Early Postclassic A.D. 950–1200	37	45.00	8122	9	.000222
Middle Postclassic A.D. 1200–1450	76	35.00	16,683	7	.000084
Late Postclassic A.D. 1450–1700	16	5.00	3512	1	.000057

^an = number of skeletal individuals.

any contemporaneous population was recovered archaeologically. For Classic period Tayasal (Table 2.2) the figures are even more dismal, with only .000182% of the coeval population that existed at that area's population peak being recovered. For Caracol (Table 2.3) even though the burial sample of individuals dated to the Late Classic is over ten times that of the Tayasal region (275 vs. 26), only .000591% of the estimated population has been recovered relative to the site's population peak. Thus, our skeletal samples are extremely small, in spite of all the excavation that has been undertaken. The major implication of these figures is that interpretations made from such archaeological samples with regard to health, age of death, and population characterization may suffer from significant sampling errors even if the percentages of relative population derived from both structural counts and skeletal individuals is equivalent.

A second problem in characterizing skeletal populations derived archaeologically becomes evident when one looks at population trajectories over time. Comparisons between population numbers derived from settlement research and numbers of recovered individuals for specific temporal periods reveal severe points of disjunction at some sites. In particular, differences tend to be magnified with regard to the Protoclassic (A.D. 100–300) and Terminal Classic (A.D. 800–1000) periods at many sites (cf. Culbert and Rice 1990). Estimated populations based on settlement, as opposed to numbers of recovered burials, hint at differential burial practices that standard archaeological sampling is not finding. This gulf between the estimated population based on settlement research and the number of burials that may be correlated with this settlement is particularly strong for the Terminal Classic era at both Santa Rita

Table 2.3 Caracol: Relative Population Based on Burials and Settlement
(Approximately 177 km²)

Time Period	Percent Based on Structures	Percent Based on Burials	Total Population Based on Structures	n ^a	Percent of Population Seen in Burials
Late Preclassic 300 B.C.–A.D. 250	1.49	1.47	1714	3	.000583
Early Early Classic A.D. 250–400	8.27	2.94	9513	5	.000210
Late Early Classic A.D. 400–530	17.50	14.71	20,131	27	.000497
Early Late Classic A.D. 530–650	100.00	100.00	115,032	162	.000591
Late Late Classic A.D. 650–780	87.51	63.24	100,665	113	.000427
Terminal Classic ^b A.D. 780–1080	9.64	1.47	11,089	7	.000090

^an = number of skeletal individuals.

^bLow frequency may partially reflect an inability to separate Late and Terminal Classic material in the core of Caracol.

Corozal and Caracol. Assuming that the settlement data are being correctly interpreted, it can be suggested that burial patterning at these two sites for this time period differed substantially from previous Classic period patterns. This would suggest skewing not only of our burial populations but also of our understanding of the changes and processes that occurred during this crucial time of transition.

Caracol

Investigations at Caracol have focused on the Classic period (A.D. 250–1080). Ten seasons of excavation have led to the recovery of a relatively large osteological collection. However, because of the substantial population that inhabited the site, there is still a question of the representative nature of the skeletal sample (Table 2.3). The relative populations at Caracol derived from structures and burials indicate closest correspondence during the late Early Classic (A.D. 400–530) and the subsequent early Late Classic period (A.D. 530–650), even though the largest skeletal samples derive from

the early Late Classic and the late Late Classic periods. While the number of individuals identified in burials during both phases of the Late Classic (162 and 113) may seem large compared with the number of individuals identified for any phase at Santa Rita Corozal or Tayasal, they are extremely small relative to the larger projected population for Caracol. In addition, it would appear that there is underrepresentation of osteological remains for the majority of phases at Caracol. The percentage of estimated population seen in burials varies from a low of .00009% in the Terminal Classic (A.D. 780–1080) to a high of nearly .0006% during the Late Preclassic (300 B.C.–A.D. 250) and early Late Classic periods (A.D. 530–650).

Santa Rita Corozal

Investigations at Santa Rita Corozal were conducted with the intent of producing information on the Maya Postclassic period (Chase and Chase 1988). The site was selected for excavation because of its known Postclassic occupation, but earlier remains were excavated when

encountered. Identification of Santa Rita Corozal population history has been undertaken based both on structural and burial information (Table 2.1). Methodologies for these analyses are provided in D. Chase (1990). Even though only securely dated burials and occupation were utilized in these analyses, the two databases provide nearly equivalent information for only two periods of occupation at the site: the Early Classic period (A.D. 300–550) and the late facet of the Late Postclassic (A.D. 1300–1530). Burial populations were found to exceed percentages of structurally projected populations during the Early Preclassic (1200–900 B.C.), Middle Preclassic (900–300 B.C.), and Late Preclassic periods (300 B.C.–A.D. 200), but structure-based population percentages exceeded those in the burial sample during the Protoclassic (A.D. 200–300), Late Classic (A.D. 550–900), Terminal Classic/Early Postclassic (A.D. 900–1200), and early facet Late Postclassic (A.D. 1200–1300) periods. Thus, one can question the reliability of the excavated skeletal sample in comparison to the evidence for occupation of structures during at least four time periods totaling 900 years. Similarly, one can question the structural sample in contrast to the osteological sample during three time periods totaling 1400 years. However, as indicated above, even in those horizons where the relative proportion of osteological samples exceeds or correlates with other archaeological information, the total number of individuals identified represents such a small portion of the total population (from less than .0005% of the Terminal Classic/Early Postclassic estimated population to between .001 and .005% of all other estimated populations) that it is unclear how representative these samples really are relative to the population at large.

Tayasal-Paxcamán

Excavations in the Tayasal-Paxcamán Zone were undertaken in an effort to identify Late

Postclassic occupation in the area. However, investigations produced evidence for settlement predominantly on earlier horizons. The basic methodology for undertaking an analysis of population in the Tayasal area is explained by A. Chase (1990). His comparison of relative populations based on burials and settlement has been amplified in Table 2.2. These calculations indicate nearly equivalent structure- and burial-based populations during three periods in Tayasal's history: the late Early Classic (A.D. 400–550), the late Late Classic (A.D. 700–950), and the Early Postclassic (A.D. 950–1200) periods. During all other periods of occupation (totaling 1800 years) the percentage of relative population derived from structure counts was found to exceed the percentage of relative population based on skeletal information substantially. The estimated population of the approximately 90 km² area of the Tayasal-Paxcamán Zone was approximately 22,000 in the late Late Classic period (A.D. 700–950). The relative percentage of coeval population seen in the skeletal sample ranges from 0 to approximately .0002%. The smaller percentage of population seen in burials at Tayasal as opposed to Santa Rita Corozal or Caracol may be related to the number of seasons of work (only one excavation season at Tayasal compared with four at Santa Rita Corozal and more than ten at Caracol) as well as to an excavation strategy that focused both on areal clearing of latest structures and "vacant terrain" tests. Thus, in comparison to the other two sites, it is even more unclear how representative the Tayasal sample is relative to the population at large.

Location and Typology of Interments

The location of interments at any Maya site is related both to ancient cultural practices and to contemporary archaeological excavation strategies. At Caracol, the majority of interments have been encountered in residential architectural compounds or "*plazuela* groups." While interments are present in varying contexts

within these groups, the prominent burial location in a Caracol *plazuela* group is in relation to the eastern building. Approximately 65% of Caracol's residential groups are easily recognizable as having an eastern focus (where the eastern building is the focal point in a given group). Even when not recognizably focal, the eastern building was still often used as a shrine or mausoleum at Caracol (A. Chase and D. Chase 1994b). Such eastern constructions generally contain burials in one or more tombs along with subsequently placed interments in crypts, cists, or simple fill. The pattern of eastern interment is fairly clear-cut archaeologically. Most Caracol tombs have entryways permitting multiple use of the same chamber and most of these tombs contain the remains of more than one person. In contrast to other sites practicing sequential multiple-individual interments in tombs (where all bodies remain in the chamber) such as at Guaytán (Smith and Kidder 1943) and at Lubaantun (Hammond et al. 1975), Caracol provides a different and diverse interment picture with regard to its tombs. Some interments were primary with individuals buried immediately in tombs. Other individuals were clearly secondary burials within tombs. Still other individuals were removed from tombs after a period of time and interred elsewhere (D. Chase and A. Chase 1996). Eventually, however, the tomb was given its final use and formally sealed. This final use often consisted of the interment of a primary individual accompanied by other bundled secondary remains. Following tomb closure, crypt or cist interments were then placed tangentially to the lower eastern building step and subsequent burials were then intruded into the stairway itself. While tombs and burials have been noted in other (noneastern) locations (including the north and south buildings in Caracol's residential groups), they do not occur in the same frequency as in an eastern construction. Given the large population projected for Caracol and the archaeologically known residential burial patterns, it

can also be posited that the Classic inhabitants maintained other burial areas that have not yet been located.

The location of more than 120 tombs is known for Caracol, and archaeological information has been recorded for more than 90 of these. All date to the Classic period (and most to the Late Classic period). More collapsed tombs are located whenever settlement pattern research is carried out at the site. In fact, based on the data from tombs, and particularly in their distribution at Caracol, any social dichotomy seen in Maya burial practices in the central lowlands becomes diminished by the Late Classic period, when not only did a greater percentage of the population have final resting places inside tombs, but there was also more distributional equivalency in burial goods and patterns as compared to earlier times (Chase 1992).

Many interments at Caracol, whether in tombs or simple burials, contained the remains of more than one individual. As mentioned previously, not all interments were primary. Archaeological evidence exists for secondary burials of single individuals in tombs and in simple graves as well as evidence of multiple primary interments combined with secondary interments in similarly varied circumstances. The interment of multiple individuals (some of whom may be partially or wholly articulated) is not unknown in the Maya world, but the quantity of multiple-individual burials that have been recovered at Caracol (ca. 39% of the total Late Classic sample; Chase 1994) is striking in comparison to the paucity of these kinds of interments at other lowland sites. For instance, at Tikal only 1.4% of the Late Classic burial sample contains multiple bodies. The prevalence of multiple-individual interments at Caracol is part of a complex of features that can be suggested as correlating with the creation of a strong cultural identity at Caracol during the Late Classic period following a period of successful wars against Tikal and Naranjo (A. Chase and D. Chase 1996). The emphasis on this

practice at the site may also conceivably correlate with the need to inter an ever-increasing Late Classic population within a limited space.

At Santa Rita Corozal, interments are encountered in both residential and nonresidential structural locations. Perhaps because of its greater time depth, temporal variation in burial patterns is more evident at Santa Rita Corozal than it is at Caracol. During the Preclassic period, most of the skeletal population was buried in simple primary context in extended or flexed position below houses or house platforms. Most burial offerings included a single ceramic vessel, although some included shell or other artifacts. By the Early Classic period, a dichotomy in burial practices is noticeable at Santa Rita Corozal. Two tombs were found in nonresidential architecture in Structure 7. These are elaborate interments of single individuals (one male and one female) containing a variety of exotic ceramic, jadeite, lithic, and shell artifacts. Elsewhere at Santa Rita Corozal during the Early Classic period, interments were located below houses and consisted primarily of flexed individuals in cists or simple burials that were generally accompanied by no more than a single ceramic vessel that had been "killed" and placed over the head. Similar to Caracol, however, by the Late Classic period any dichotomy in burial practices lessened. During the Postclassic period, while there was variation in burial practices, tombs were no longer used. Elaborate interments during this later time were marked by stone altars and were located in association with multiple-room residential structures and smaller shrines. Individuals in these interments included both males and females, but were usually buried in an upright flexed position. These presumed high-status burials were accompanied by pottery or by jewelry made of shell, jadeite, or metal. Other Postclassic interments consisted of simple graves cut into or behind existing buildings. Multiple interments, both primary and secondary, are much more common in the Postclassic

at Santa Rita Corozal (42 burials with 69 individuals) than during the earlier Classic period (41 burials with 42 individuals). There is no evidence at Santa Rita Corozal for the eastern burial focus found at Caracol.

At Tayasal, the burial sequence starts with a single elaborate Late Preclassic burial that was found in vacant terrain excavations. It was accompanied by eccentric obsidians and a jadeite and shell mosaic ornament. The Tayasal burials datable to the Early Classic exhibit the same dichotomy noticed at Caracol and Santa Rita Corozal. The single tomb noted for this period contained 14 vessels and a host of smaller items, whereas most other coeval burials had only one or two vessels. The Late Classic interments at Tayasal are almost formulaic: an extended supine body accompanied by one to four vessels, one of which is often "killed" and inverted beneath the head of the individual as if to serve as a pillow. The single Late Classic tomb, dating to the beginning of the period, is a slight elaboration on this general theme with seven ceramic vessels and five jadeite beads. No multiple burials are known from Late Classic Tayasal ($n = 26$); however, two multiple burials, each containing two individuals, are known from both the Early Classic ($n = 13$) and the Postclassic ($n = 12$) periods.

Relative Aging, Sexing, and Health Status of Skeletal Populations

The skeletal samples from each of these sites are somewhat fragmentary. Even *in situ* preservation of remains was generally poor. Thus, in-field identification of age and sex often has taken precedence over post-field analyses. Nevertheless, there have been rare cases when post-field assessments have altered in-field interpretations. The author viewed all of the available skeletal material from each of these sites, but not always with the same intensity. The author was not present for the 1971 Tayasal excavations and thus could only review the stored skeletal remains in Guatemala in conjunction

with other post-field analyses undertaken during the summer of 1977. A large number of the Santa Rita Corozal burials were excavated by the author and all were viewed in-field and briefly in the Corozal laboratory, but many have not been fully reviewed post-field. A similar situation exists for Caracol. Analysis of the Santa Rita Corozal and Caracol materials is still ongoing and, in fact, the Caracol sample is being increased on a yearly basis. Thus, certain of the following comments may be modified in the future.

In all cases, as many factors as possible were included in the analysis. Age-at-death in each sample population is most accurate for subadults in which dental eruption patterns could almost always be used in conjunction with other less reliable factors (such as long-bone length). Age-at-death of adults has generally been based on less reliable, degenerative changes, especially wear in teeth. However, a complete internal scaling of wear following Miles (1963) has yet to be completed. Age-at-death for adults was likely underestimated, rather than overestimated. Some individuals in each of the sample populations are particularly difficult to analyze because of substantial antemortem tooth loss that interfered with assessment of dental wear.

Sexing of skeletal remains also has been undertaken using as many means as possible, but has been hampered by preservation. Sex assessments were made only on adults and only when there was reasonably good evidence, preferably from analysis of features on the pelvis and skull. Other identifications (individual stature, pathological lesions, etc.) were dependent upon preservation and thus were made on an individual case-by-case basis as samples would allow.

The age-at-death of individuals in the skeletal population at Caracol ranges from infants less than one year of age to adults approximately 50 years of age or older. The majority of adults in this skeletal sample, however, likely lived to somewhere between 25 and 35 years of age. This skeletal information compares with

historic information from Caracol hieroglyphic texts that record the death of one of Caracol's known rulers, Kan II, at the age of 71 in A.D. 680. Potential problems and discrepancies for other Maya sites (specifically Palenque) have been previously noted between skeletal age and hieroglyphically recorded age (Marcus 1992; Ruz 1977). As Kan II's burial has not been found, we cannot assess the validity of the site's textual statements *vis-a-vis* skeletal analysis. However, few, if any, individuals at Caracol can be assigned an age of "71." It must be cautioned again, though, that the extant analysis has avoided any over-aging of osteological remains at Caracol.

Even though the samples are extremely small relative to the once extant total populations, the percentages of archaeologically recovered burials at various ages of death may be instructive in viewing the populations of these sites. For instance, in comparing the two inland sites of Caracol (cf. Chase 1994) and Tayasal (cf. Chase 1983) for individuals identified as to age-of-death, 14.79% of the sample at Caracol was composed of infant skeletons, while only 5.36% of the sample at Tayasal was composed of infants. At Tayasal, 23.21% of the sample was composed of skeletons of individuals over 35 years of age, while at Caracol only 11.24% of the sample was composed of such individuals. It is tempting to ascribe such demographic differences to variations in population density and urban environment (cf. Storey 1992b for Teotihuacán). Alternatively, these differences may simply relate to differential sampling at the two sites.

The actual cause of death is rarely evident in the skeletal remains from Caracol. Health problems evident in the skeletal remains rather indicate that a given individual survived a particular health problem. Identifiable health problems include dental problems such as enamel hypoplasia, calculus, caries, tooth loss, and alveolar resorption, as well as other less common maladies such as fused vertebrae, porotic hy-

perostosis, and arthritis. The most common affliction is enamel hypoplasia, existing in approximately 16% of the burial sample. Moderate to severe calculus is thus far noted in only seven individuals, or 2.1% of the Caracol sample. Porotic hyperostosis, found to be present in relatively high proportions in some Maya populations (cf. Saul 1972a for Altar de Sacrificios), has been identified in only seven individuals at Caracol, equally distributed among adults and subadults. Interestingly, however, the identified cases of porotic hyperostosis cluster within specific household groups. The known cases come from only three locations at the site.

The Santa Rita Corozal individuals show less evidence of ailments than those from either Caracol or Tayasal. Porotic hyperostosis occurs in only three cases and there is only a single recorded case of dental calculus. In comparison, the Tayasal population exhibits no porotic hyperostosis and only a single case of noticeable hypoplasia. Some 13.56% of the adult burials at Tayasal had no caries or calculus in the teeth ($n = 8$). However, two cases of possible rickets are recorded for Tayasal and 18.64% of the population ($n = 11$) shows mild to severe calculus build-up, indicative of other potential dietary problems. Evans (1973), in his study of calculus and caries in the Tayasal sample, suggested the presence of a dietary imbalance (specifically a high-carbohydrate, low-protein diet) throughout much of the site's history. How much of a potential role the environment played in the health picture cannot be determined at this time. From this rather limited sample, it is unclear whether the seaside Santa Rita population was healthier than either the lakeside Tayasal or the upland Caracol populations.

Dental Modification (Filing and Inlays)

Dental modification is extremely variable across the three sites. No cases of either inlays or filing have been noted for Santa Rita Corozal. At Tayasal inlays occur in three Late Classic burials

while filing occurs in four burials (one Preclassic, two Late Classic, one Early Postclassic). One Postclassic burial additionally exhibits a single supernumerary tooth. Caracol is seemingly anomalous for most Classic era lowland sites in that 34.34% of the burial sample exhibits filing or inlays of jadeite, hematite, and shell, making dental modification relatively common in the skeletal sample of the site. Of the Caracol interments, 11.66% have inlays only, 14.11% have filed teeth only, and 8.57% include teeth that exhibit both inlays and filing. Fully 20% of the excavated interments at Caracol (33 burials in 26 groups) contain individuals with inlaid teeth. This may be compared with 2.6% of the total interments from Tikal ($n = 6$). The interments that have individuals with inlaid teeth include those located in tombs in the epicenter that presumably represent royalty, as well as many individuals buried in simple graves in the farming areas of Caracol. Thus, the simple presence of filing or inlays has no direct correlation with status (a similar situation is also true for Copán; Whittington 1989). However, the Caracol data also indicate that certain inlay and filing patterns (such as mandibular inlays of jadeite in the incisors and canines bounded by hematite-inlaid premolars) may be indicative of a particular status.

Population History: Further Problems in Intrasite and Intersite Comparison

The osteological sample at each of the three sites or zones considered here was generated using roughly comparable methodologies. Areal clearing, axial trenching, and test excavations were undertaken at each site. In all three sites interments have been encountered in a variety of locations, including placement in residential and nonresidential constructions, as well as in plazas. Individuals have also been placed in a diverse range of interment conditions, from inclusion in trash dumps to formal placement in

elaborately constructed tombs. However, the intensity of investigation has varied at each site. Caracol has been the locus of ten years of research, but had a larger overall population. Santa Rita Corozal was a smaller site with four seasons of excavation. Maximal Tayasal populations were larger than Santa Rita Corozal but smaller than Caracol, but digging took place during only a single season. As noted, the temporal foci of investigation also varied among the sites as did the frequencies of differing excavation types and the emphasis on structural as opposed to nonstructural investigations. All of these things have a bearing on the osteological sample that is generated and should be considered in any attempt at making absolute correlations of skeletal remains among these sites.

Analysis of Smaller Household Compounds

Granted that synthetic interpretations relating to skeletal populations at most Maya sites are problematic because of scale, the legitimate question can be raised as to whether sampling problems can be better controlled in smaller, more intensively excavated contexts. A brief answer to this obviously complex question is "yes and no."

Perhaps the best known skeletal samples that have been used to characterize a large population are those derived from the Tlajinga 33 apartment complex at Teotihuacán (Storey 1985, 1992b). Storey (1992b:50,70) notes that this "compound is but one of 2000" and that it was occupied for "a period of 450–500 years." Millon (1976) estimated that each Teotihuacán compound housed populations of up to 100 people. Thus, over the span of its history Tlajinga 33 presumably housed some 900 people. Storey (1992b:130) notes that "the Tlajinga 33 compound residents recovered from skeletal remains numbered 206." Of this number, there were 42 primary burial contexts with 49 individuals, 16 secondary interments with 19 in-

dividuals, and 22 "refuse interments" representing 42 individuals. The remainder of the sample derived from secondary fill (and midden) contexts. This combined sample appears to present a representative cross-section of a prehistoric population (Storey 1992b). Thus, Storey sees her skeletal sample as adequately reflecting age and sex distributions. It would also apparently represent some 22.89% of the compound residents, an extremely high total for most Mesoamerican contexts. However, disagreement exists over how representative even this skeletal sample is. While Storey (1992b:70) argues that the Tlajinga 33 sample "will reflect demographic characteristics of the majority of the inhabitants of the city," Sempowski (1992:30) explicitly disagrees, noting that "most burial data from Teotihuacán relate to persons of intermediate status, whose remains were interred in their house and happen to have been well preserved."

Samples from most lowland Maya house compounds or plaza groups are not as representative as those from Tlajinga 33. This is particularly evident in the published data from Tikal. Haviland has presented data from a series of housemound excavations at Tikal, from which the representativeness of a given house compound's skeletal population can be extrapolated. For Group 2G-1 (Haviland 1988), it can be estimated that some 106 people occupied it over its history. Twelve burials of adult males are known from this group. Thus, although 11.32% of the presumed burial population from Group 2G-1 was recovered, the sample is nevertheless skewed, including only males that are all associated with a single building in the group. For Group 7F-1 (Haviland 1981), it can be estimated that some 245 people occupied this compound over its history. Fifteen burials were recovered from excavations in the structures and associated plaza of this group. Thus, some 6% of the total population is represented in this burial sample. For Groups 4F-1 and 4F-2

(Haviland et al. 1985), it can be estimated that some 910 people occupied these locales over a long occupation history. Even though 31 burials (spanning all segments of a potential population) were recovered, this sample represents only 3.41% of the overall population that once lived here. Similar low figures, hovering around 10% of a total group's population, can be obtained from calculations based on the more intensively excavated groups at Caracol. In summary, then, the representativeness of the skeletal samples from even the most detailed excavations in Maya *plazuela* groups of the south-central lowlands must be questioned from an analytic standpoint in regard to both the residential group and the population at large.

Discussion

Comparisons of the skeletal populations from Caracol, Santa Rita Corozal, and Tayasal suggest very different population histories but reveal some interesting similarities. Epicentral Caracol was occupied relatively late (ca. 300 B.C.) compared to both Tayasal (600 B.C.) and Santa Rita (1200 B.C.). However, Caracol reached a much larger peak population during the Late Classic period than either of the other two sites. Santa Rita Corozal is the only site of the three to have its primary population peak occur in the Late Postclassic period. The skeletal populations at all three sites suffered similar health problems. However, the sampled osteological remains of the people from Caracol show more evidence of maladies, a higher percentage of infant skeletons, and a lower percentage of skeletons of individuals older than 35. Differences seen among these populations may be related to a variety of factors such as environment (lacustrine and coastal as opposed to inland), the more urban nature of the densely populated Caracol, or to sampling. Some answers may possibly be garnered from future re-

search, such as the dietary analyses being conducted on the Santa Rita and Caracol samples by Henry Schwarcz and Christine White.

Viewing skeletal and burial information among sites can be misleading if the proper controls of context and scale are not maintained. For example, a comparison of Early Classic interments at Santa Rita Corozal and Caracol might tend to overemphasize the significance of Santa Rita Corozal based on the wealth of exotic items found in that site's tombs (cf. Chase 1992), items of far more beauty and rarity than are presently known from Caracol's many chambers. Santa Rita Corozal was clearly a less important site politically than Caracol during this time. The prominence of its burials likely reflects Santa Rita's closer proximity to trade routes and increased efforts of peripheral rulers to emphasize their status in death.

Coeval differences in cultural practices relating to interments among the sites are also worthy of attention. Early Classic interments at each of the three sites exhibit bimodal distributions. All three sites have elaborate Early Classic tombs sharing broadly similar artifacts. However, a basic similarity in the pattern of placing single ceramic vessels near the heads of individuals in Early Classic and Late Classic primary interments at both Tayasal and Santa Rita Corozal is not reflected in the burials of Caracol. The greater frequency of tombs and inlaid teeth in the Late Classic period at Caracol, as opposed to either Santa Rita Corozal or Tayasal, may reflect the site's prosperity at this time, but also may be indicative of other internal cultural factors (such as the intentional establishment of a distinctive Caracol identity).

Burials have been used to assist in making status distinctions at each site. However, this is never a simple matter. At Caracol, there does seem to be one key factor in status assessments: the amount of tomb volume per individual. The greater tomb volumes (ca. 7 m³ of space per individual) appear to correlate with other

factors, such as painted hieroglyphic texts, that suggest royal status. At Santa Rita Corozal and Tayasal other factors, such as the architecture and artifact contents of the surrounding building, when combined with interment type and contents, have helped to yield better status assessments. Comparative study of interments can also be used to assess relationships among sites within a region. The distributional study of tomb volume in the wider area surrounding Caracol reinforces the existence of a hierarchy of sites subordinate to Caracol (Chase 1992).

When viewing the occupation history of these three sites, it is useful to compare population reconstructions gained from settlement data with the actual skeletal population recovered. Discrepancies between population percentages, as expressed in settlement and skeletal samples, may be suggestive of sampling problems in the recovery of the skeletal population. Such comparisons may also help to demonstrate the severity of cultural changes associated with specific transitions that are evident in the archaeological record.

In summary, not only does contextual analysis of skeletal remains from the lowland Maya sites of Caracol, Santa Rita Corozal, and Tayasal add significantly to the interpretations at each site, but the combined comparisons suggest more about the variability in ancient Maya populations than each of these analyses would indicate in isolation. However, discussion and comparison of skeletal materials within and between sites is not without its difficulties. A number of authors have questioned the overall comparability of data from divergent reports, the ability to view health among different archaeological populations, and whether paleoepidemiology can be attempted using archaeological data (Ortner and Aufderheide 1991; Wood et al. 1992). There are not only differ-

ences in methodology and reporting with regard to skeletal analysis, but there are also problems in the basic sampling of skeletal remains. Differing archaeological research strategies may yield distinctive or skewed skeletal samples, as may past cultural practices. Furthermore, comparison of population percentages based on dated structural occupation as opposed to dated osteological materials reveals even greater potential sampling problems whether one is viewing residential groups, sites, or wider regions. Comparisons within and between sites can only be expected to be meaningful if the parameters involved in defining any set of archaeological data have been carefully explored in an attempt to determine the reliability and comparability of individual sample populations.

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