Chapter 8

DISCUSSION

Copán

For members of the Coner period Copán society (A.D. 600–1250), social status, as inferred from site type, appears to have had remarkably little influence on diet. Surprisingly, grouping by sex provided dietary patterns in all site types, with female adults showing a slightly less C₄–based diet than male adults. Although statistically significant differences were observed between some subgroups of the Copán data, those differences were typically small, between 0.4‰ and 0.8‰ for carbon and between 0.2‰ and 0.7‰ for nitrogen. Those are small separations between subgroups. Following the methods discussed on page 73, such differences in carbon isotopic values represent a 2–5% difference in diet.

The Copán Coner phase inhabitants based their diet on terrestrial plant sources with maize as the dominant staple. This was noted previously by Reed (1991, 1992a, 1992b, 1994, 1995) and independently by Gerry (1993, 1997) and Gerry and Krueger (1997). Deer and other meat sources were likely to have been only occasional food items since the isotopic results show little input from C₃–plants or sources depleted in $^{13}$C relative to maize. Adult diet probably ranged between 62% and 78% maize based on the methods discussed on page 73.
Figure 8.1: Comparison of all Copán isotopic results from this study and Gerry’s study (1993). The two sets of isotopic values correspond reasonably well, although this study is more tightly clustered.
This estimated range for adult diet brackets the 70% maize and 30% beans diet considered to be an optimal protein mix by the FAO (see discussion on page 62). However, such a diet is considered poor in quality for children. Since the Coner Copán Maya were apparently consuming a diet near this optimal mix, the nutritional risk to children as observed in instances of anemia related skeletal indicators could be dietary based. Therefore, the maize proportion of the diet concords well with paleopathological observations in the Copán case.

The conclusions inferred from botanical (Lentz 1991) and faunal (Pohl 1994) remains concord poorly with the isotopic evidence. Too little faunal evidence exists to predict more than a minor contribution of meat to the diets of the Copán Late Classic human population. For all social levels, deer have been reported as the most common faunal remain and dogs as the second most frequent (Pohl 1994). The 41 deer analyzed by myself and Gerry (1993) were $C_3$–browsers. If deer were a major food source as inferred from the faunal assemblage by Pohl (1994) then humans should show a stronger $C_3$–signature than observed through isotopic analysis. It is important to note that the one jaguar, a carnivorous creature, has more positive carbon and nitrogen isotopic values than the humans (Figure 8.1). Based on its bone collagen isotopic composition, the jaguar diet consisted of $C_4$–eating prey. The isotopic compositions of the humans are more negative relative to the jaguar indicating their herbivorous and meat poor diet. Deer have a central $\delta^{15}N$ value of 4‰ (Table 7.3) indicative of a leguminous diet and nearly equivalent to modern North American white–tailed deer which are $C_3$–eaters (Cormie and Schwarcz 1994). The quantities of plants and fauna at elite sites more likely represent longer occupations and ritual activities than evidence of dietary differences. Inferences from the

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1. Legumes have $\delta^{15}N$ values near 1‰ and the diet–to–bone fractionation for nitrogen is approximately 3‰ (Cormie and Schwarcz 1994, DeNiro 1987).
isotopic evidence leads to the conclusion of equivalent diets across social strata and reliance on maize with little faunal supplement.

Copán samples are considerably different from other Mesoamerican samples (Figures 8.2, 8.3, and 8.5). Differences are particularly significant for nitrogen. Copán samples show a greater $^{15}$N–depletion than all other sites, an observation supported independently by the Copán isotopic results of Gerry (1993, 1997). One inference, based on an assumption that the isotopic composition of bone collagen is largely derived from the protein portion of diet, is that the Copán diet was more vegetarian and less meat based than diets at other locations.

Bone collagen preservation for 32 human specimens was judged too poor for isotopic analysis. Juvenile bone specimens had the highest rate of poor preservation 11/27 (41%) of the individuals with known age–at–death. Rib specimens from juvenile skeletons, particularly young ones, tend to be thinner and less sturdy than bone specimens from adult skeletons. The fragile characteristic of juvenile osseous remains probably contributed to their poor preservation and made them readily damaged in the burial environment. Additionally, samples from the Gordon subphase (600–900 B.C.) were poorly preserved. The friable nature and poor preservation of the earliest bone samples were probably due to the length of burial time. Because of the low likelihood of extracting well–preserved bone collagen further preparations were halted on juvenile and Gordon subphase samples.

Differences by age

Age related differences can be seen in Figures 7.6, 7.7, 7.8, and 7.9 and numeric differences are listed in Tables 7.4, 7.5, 7.6, and 7.7. Dietary variability at Copán was explored for six broad age categories (Table 4.5) typically used in paleopathological research. Those categories include children (infant and juvenile), young, middle, and old
adults. Lifecycle or culturally regulated age–related differences in dietary patterns should be apparent among the age–at–death divisions.

**Adult versus children.** Two children show a diet far removed on the nitrogen scale (Figures 7.2 and 7.6) from all other older individuals. One is identified as an infant and the other as a young juvenile (Figure 7.6). All other juveniles and adolescents lie within the dietary realm spanned by all adults (Figure 7.6. The infant (0–1 years old) and young juvenile (2–3 years old) show $^{15}$N–enriched collagen relative to older individuals, which is likely related to the isotopic shift observed between nursing children and their mothers.

**Young, Middle, and Old Adults.** There exist negligible differences by age for male adults in either the carbon or nitrogen isotopic measurements (Figure 7.9, Tables 7.4 and 7.5). Regardless of age category, male adults have central carbon and nitrogen isotopic values of $-8.9‰$ and $7.5‰$, respectively, according to their biweight estimates (Table 7.4). Middle and old aged female adults typically show a $0.6‰$ more negative carbon isotopic values than young aged female adults (Table 7.6). This translates into a $\text{C}_4$% difference of approximately $4\%$. The mean differences between young and old female adults and young and middle females is $0.6‰$ for carbon and $-0.1‰$ for nitrogen (Table 7.6), which in bivariate analysis yield statistically equal samples at a 0.05 level. A two sample $t$–test on the carbon average differences also results in no statistically significant difference (young vs. middle: $t = 1.631, p = 0.1391$, young vs. old: $t = 1.837, p = 0.1133$).

Although none of the possible age related dietary differences were statistically significant within each sex, there remains the possibility that a diet of less maize is represented by the average carbon isotopic differences between young and older female adults. The underrepresentation of young individuals indicates a need for further analysis with a larger sample.
**Differences by sex**

Statistically significant differences were observed between male and female adults, regardless of age (Figure 7.9, Tables 7.4, 7.5, and 7.7), social status (Figures 7.10, 7.11, and 7.15, Tables 7.8, 7.10, 7.11, 7.17, and 7.18), or locale (Figure 7.13, Tables 7.14 and 7.16). Male adults typically show more positive carbon isotopic and nearly equivalent nitrogen values relative to female adults (Table 7.5).

The largest difference (0.7‰) translates into roughly 4% more $C_4$-based foods for male than female adults. As reviewed on page 69, dental caries frequency for low status individuals was significantly higher for females than males (Whittington 1989, 1998). The isotopic evidence supports a scenario in which females ate maize more frequently, but in smaller amounts than males as inferred from dental caries rates by Whittington (1989, 1998). However, the isotopic results contradict the alternative inference in which dental caries pertain to the quantity of carbohydrates eaten.

The isotopic difference between male and female adults also demonstrates the need to consider the influence of sex-based dietary differences when examining other socially or temporally relevant divisions. Relplot shapes, for male groupings, are often more oblong than for female-based groupings. Relplot shapes, along with outliers in many plots, indicate that some categorical variability may be better represented by the female samples than by the male samples (Figures 7.9, 7.10, 7.12, 7.13, and 7.14).

**Difference by locale (urban versus nonurban)**

Male adults from urban or nonurban locales show nearly equivalent carbon and nitrogen isotopic distributions (Figure 7.14, Tables 7.14 and 7.16). Female adults from urban or nonurban locales also show similar isotopic distributions regardless of locale (Figure 7.14,
Tables 7.14 and 7.16). In contrast, male and female adults show statistically significant differences within each locale. Thus, Coner phase diets appear to be the same for each sex regardless of locale, while the different dietary patterns between male and female adults remains.

**Difference by social status**

Ethnographies of complex societies contain descriptions of persons of high rank consuming different foods or more food than commoners. The findings of this study partially support that observation for the Coner phase Copán Maya. From the stable carbon and nitrogen isotopic analyses in this study, it can be inferred that members of all ranks ate the same basic diet with some differences depending partially on how social status was assigned to an individual. It is possible that individuals of higher status had access to a greater variety of foods on an infrequent basis and in quantities too small to be detected with stable isotopic analysis of bone collagen. It is also possible that different diets were reserved for royal individuals living in the Main Group. Testing for a diet difference between Copán royalty and everyone else is impossible in this study, because few skeletal remains of rulers have been recovered and my sample was drawn from subroyal elites and commoners.

It makes little difference whether sample measurements for individuals from Type III sites are categorized as commoners or elites (Figure 7.15 and Table 7.17). Preferably, Type III associated individuals should be categorized with Type IV individuals as elite since most Type III sites have sculpture, vault stones, and dressed stone construction like Type IV sites and unlike lower ranked sites (Table 2.2). When individuals are grouped as commoner (Types I and II) and elite (Types III and IV), then statistically significant differences are observed between commoner and elite male adults, but not for female adults (Table 7.18).
Additionally, when adults were grouped according to the grave type in which they were interred, the differences between the sexes, previously noted, remains and low versus middle status female adults show a statistically significant difference. The status difference between low and middle ranking female adults is approximately 0.5‰ for carbon and –0.2‰ for nitrogen (Table 7.12). The diet of female adults buried in pit graves was generally higher in C₄-based foods than that of female adults in interred in other types of graves (Figure 7.12 and Table 7.8). Male adults appear the same regardless of the grave type in which they were buried. However, when site type is the status identifier high status male adults show a 0.3‰ more positive carbon and 0.3‰ more negative nitrogen isotopic composition than low status male adults (Figure 7.16 and Table 7.12).

Regardless of social standing and the range of potential food choices, maize was either the preferred food, or the only one which was reliable and regularly available to the Coner Copán Maya. The differences among social status divisions within each sex are smaller than the difference observed between male and female adults, indicating that dietary restrictions or behavior were more important in Copán society primarily in terms of sex and secondarily according to social standing. It could also reflect a social structure in which female adults had fewer status positions than male adults, and the male positions included status–related dietary behaviors. Because of the presence of outliers and oblong relplot shapes, it is likely that the dietary variability of male adults is inadequately captured by the existing sample.

**Comparison with Other Mesoamerican Isotopic Data Sets**

This study is the largest single stable isotopic analysis of diet for a Mesoamerican polity (Table 4.8). Regional variability has been suggested as the largest factor in isotopic
differences for the Classic Maya (Gerry 1993, 1997, Gerry and Krueger 1997). Regional variations would obscure age– and sex–related differences that may have existed within sites when samples are pooled based on location. Gerry’s and other studies lack enough age or sex determinations for a fair examination of differences within sites. Site–to–site variability for Mesoamerican societies (Figure 8.2 and Figure 8.3), dating between A.D. 600–1000¹, clearly shows similar carbon isotopic values for all groups. Relative to other coexisting groups Copán shows more negative nitrogen values (Figure 8.5). The most direct interpretation for the isotopic results is that the Copán diet contained less meat and more legumes or C₃–based plants than other Lowland Maya diets. The interregional variability in floral and faunal stable isotopic composition largely explains sitewise differences, but more extensive and representative isotopic measurements of food sources across ancient Mesoamerica are needed before we fully understand the regional patterns.

Careless consideration of statistical issues for several studies has yielded unreliable conclusions regarding intrasocial and intersocial health and diet differences of the ancient Maya. I contend that it is a conceptual mistake and a flawed statistical assumption to collapse along the archaeologically distinct and highly relevant categories of time, space, or social status when sample sizes are small for the purpose of making larger samples on which to perform statistical testing. Small samples contain little information regarding the unknown underlying pattern which they are expected to represent. Pooling samples from subdivisions only makes sense when it can be demonstrated that the sampling is representative and similar in each division. Thus, grouping results for hypothesis testing requires large samples. The collapsing of category divisions to gain larger sample sizes falsely implies that the small samples are representative or that the divisions are unimportant. Sample pooling may lead to statistical significance which would otherwise fail to exist. Reanalysis of published data once better options have become available (e.g.,

¹ Each source used different time period definitions, so samples matching the dating of the Coner phase for Copán were chosen.
robust and computer intensive techniques suited to the analysis of small data sets) provides a common statistical foundation and more comparative results than obtained by relying on published conclusions.
Figure 8.2: Comparison of isotopic results for Mesoamerican studies of human adult specimens dating between A.D. 600–1000. Carbon and nitrogen isotopic values from the time period of this paleodietary study of Copán (R) are compared against published data for several Maya sites (Gerry 1993 (G), Wright 1994 (W), White and Schwarcz 1989, White, Healy, and Schwarcz 1993) and the Zapotec site of Monte Alban (Blitz 1995).
Figure 8.3: Univariate comparisons of location and scale isotopic results for Mesoamerican studies of human adult specimens dating between A.D. 600–1000. Biweight location and scale estimates for samples of size 5 or more for carbon and nitrogen isotopic values from the time period of this paleodietary study of Copán (R) are compared against and scale estimates for samples of size 5 or more for carbon and nitrogen isotopic values from the time period of this paleodietary study of Copán (G) are compared against samples from other Maya sites (Gerry 1993 (G), Wright 1994 (W), White and Schwarcz 1999 (W), White and Schwarcz 1997 (W), White and Schwarcz 1999 (W), White and Schwarcz 1999 (W), White and Schwarcz 1999 (W)).

Altar de Sacrificios (W)
Altar de Sacrificios (G)
Itzán Seibal (G)
Seibal (W)
Aguateca
Dos Pilas
Baking Pot
Barton Ramie
Central Zone
Izban
Agriculta
Zapotec (G)
Zapotec (W)
Altar de Sacrificios (G)
Altar de Sacrificios (W)
Copán (G)
Copán (R)
Southwestern Zone
Pasion Zone
Belize Zone
Lamanai
Hohmul
Holmul
Lamanai
Altar de Sacrificios
Copán (R)
Monte Alban
Zapotec
Palenque

Figure 8.3: Univariate comparisons of location and scale isotopic results for Mesoamerican studies of human adult specimens dating between A.D. 600–1000. Biweight location and scale estimates for samples of size 5 or more for carbon and nitrogen isotopic values from the time period of this paleodietary study of Copán (R) are compared against samples from other Maya sites (Gerry 1993 (G), Wright 1994 (W), White and Schwarcz 1999 (W), White and Schwarcz 1997 (W), White and Schwarcz 1999 (W), White and Schwarcz 1999 (W), White and Schwarcz 1999 (W), White and Schwarcz 1999 (W)).

Altar de Sacrificios (W)
Altar de Sacrificios (G)
Itzán Seibal (G)
Seibal (W)
Aguateca
Dos Pilas
Baking Pot
Barton Ramie
Central Zone
Izban
Agriculta
Zapotec (G)
Zapotec (W)
Altar de Sacrificios (G)
Altar de Sacrificios (W)
Copán (G)
Copán (R)
Southwestern Zone
Pasion Zone
Belize Zone
Lamanai
Hohmul
Holmul
Lamanai
Altar de Sacrificios
Copán (R)
Monte Alban
Zapotec
Palenque

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Altar de Sacrificios (W)
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Zapotec (W)
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Coner phase are compared against this study of Copán (R) Maya.

Figure 8.4: Bivariate comparison of location and scale isotopic results for Mesoamerican studies of human adult specimens dating between A.D. 600–1000. Biweight location and midvariance bars for samples of size 5 or more for stable carbon and nitrogen isotopic measurements from other Mesoamerican sites (Blitz 1995; Gerry 1993; White and Schwartz 1993; White, Healy, and Schwartz 1993) approximately contemporary with the Copán (R) Maya period are presented for comparison. The stable carbon and nitrogen isotope values are in ‰ vs. PDB and AIR, respectively.
Figure 8.5: Comparison of Copán isotopic values with other Maya sites.

Displayed are the isotopic results for adult human specimens from × Copán (Gerry 1993), ○ Copán (this study), and + other sites\(^a\) regardless of time period.

\(^a\) Aguateca (Wright 1994), Altar de Sacrificios (Gerry 1997, Wright 1994), Baking Pot (Gerry 1993), Barton Ramie (Gerry 1993), Dos Pilas (Wright 1994), Holmul (Gerry 1993), Itzán (Wright 1994), Iximché (Whittington and Reed 1994), Lamanai (White and Schwarz 1989), Pacbitun (White, Healy, and Schwarz 1993), Seibal (Gerry 1997, Wright 1994), Uaxactun (Gerry 1993).
Dietary model for the Copán Maya

By adjusting bone collagen isotopic composition measurements to account for the fractionation between diet and collagen ($\delta^{13}C_{DC} \approx 5\%e$ and $\delta^{15}N_{DC} \approx 3\%e$), it is possible to estimate the isotopic composition of the diet. In Figure 8.6, estimated diets are shown as 99% replot confidence bounds with bivariate biweight centers as calculated from bone collagen isotopic measurements for the Copán human adults from this study, deer from this study and Gerry (1993), dogs from Gerry (1993), and peccaries from Gerry (1993). A box encompassing the approximate region of the isotopic composition of maize, based on two standard deviations around the mean, illustrates this $C_4$–based food source. Dashed lines between from the upper and lower limits of the maize box to the region of $C_3$–based faunal diets provide an estimated region for the isotopic composition of plants in the Copán Valley during Classic times.

From Figure 8.6, deer and peccary at Copán show essentially the same $C_3$–based diet. Their estimated diets correspond to their expected habitats and eating habits (see page 49). The dietary region for dogs indicates that their diet consisted almost exclusively of maize (Figure 8.6). Humans lie very close to the region for pure vegetarian diets, but the nitrogen isotopic composition of their diet is enriched over that of dog, deer, and peccary. This model indicates the consumption of some $^{15}N$–enriched foods, possibly meat. However, in comparison with other contemporary Maya the enrichment is considerably less than elsewhere (Figure 8.2, 8.3, 8.4, and 8.5), indicating that meat was a relatively unimportant part of the diet. The humans also show a more restricted range, as shown by the size of the confidence region, than the $C_3$–plant eating fauna, indicating a relatively unvaried maize–based diet.
The proposal of a maize–rich diet with little meat supplementation provides support for population pressure and density based models of the Copán Maya collapse. Estimated population at Copán places it among the densest settled and most populous of Maya polities (Culbert and Rice 1990). Large and dense populations would have been instrumental in reducing resource variety and increasing reliance on staples, which would have proved detrimental to these people.
Figure 8.6: Estimated Copán dietary regime. Relplot 99% confidence regions and biweight centers for human, deer, peccary, and dog diets show the probable range of C3-based, C4-based, and mixed diets for Cerren phase Copán.
Implications for Subsistence Studies

Reconstructions and models of ancient Maya subsistence systems generally rely on evidence for human modification of the landscape and material remains of agrotechnologies. From a stable isotopic reconstruction of diet, several food procurement strategies can be eliminated as having a central role for the Copán Maya.

Available faunal choices for regular feeding of a population of about 25,000 people include deer and peccary, both of which were C₃–plant eaters. Since there is little evidence for animal domestication, for the hunting of more than a few animals to provide a rare meat supply, or for a more than a minimal C₃ signature in the human bone collagen, it can be concluded that neither deer nor peccary were common dietary items. Although dogs show strong isotopic evidence of C₄–plant consumption, their typical position in the food web as scavengers and the few numbers of skeletal remains lends support to their rarity as meat in the human diet. It is possible that consumption of small amounts of meat was of sociopolitical importance and as prestige foods they might have been consumed in ritual situations. Another possibility is that deer caught at a distance were briefly kept and fed in house compounds, then used for periodic feasts rather than more regular consumption.

Despite the wide range of foods (see discussions on pages 50 and 54) potentially available the isotopic evidence indicates that the Copán Maya ate mostly maize. Few other plants were consumed relative to maize. Macrobotanical research at Copán has furnished evidence for the C₄–plant maize and the C₃–plants bean, squash, nance, wild grape, chayote, bottle gourd, palm, ciruela, avocado, zapote, hackberry, and frijolillo (see Table 4.3 and page 50). Undoubtedly, palm trees and other tree crops provided supplemental sources to a maize staple diet, but beyond the few botanical remains there is little evidence for tree fruits being consumed more frequently.
Root and tree crops are $C_3$-based plants. Since there is little evidence for $C_3$-based sources from the stable isotopic results and no evidence from macrobotanical studies for root cultivars, such as yam, manioc, *malanga*, sweet potato, or tree cultivars, such as *ramón*, or cacao, it seems unlikely that either trees or roots were grown or collected to provide more than supplemental foods. This inference would eliminate the likelihood that the Copán Maya based their food procurement on an artificial rain forest, arboriculture, or a root cropping system in which maize was anything less than the principal staple.

The isotopic evidence for a $C_4$-based human diet lends support for subsistence models favoring maize as a staple. The $C_3$-signature for hunted fauna indicates that they were killed away from fields of maize. It could denote a need for distant hunting and sparse populations of desired fauna during the Classic period.

Furthermore, the deer dietary pattern has implications for environmental and subsistence reconstructions. Once deer populations are decimated in an area, they recolonize slowly, even when threats have been removed (Carr 1996: 259). Thus the amount of deer and their feeding habits could indicate the extent of deforestation and the expansiveness of cultivated land.

Additionally, population size estimates that are based on a maize subsistence economy, can be bounded by estimates of maize consumption made from isotopic results. For instance, Wingard (1992, 1996) assumed a diet of 60% maize and 120 kg per person per annum for his demographic calculations. The portion of the adult Coner phase Copán Maya diet which was composed of maize was probably slightly higher than the percentage Wingard chose for modeling purposes. How much difference a 70% maize diet would make in similar demographic estimates would require recalculation, but would provide a better estimate of Copán Late Classic population size.
Future Research Directions

Once more complete age and sex results become available, many more isotopic analyses could be performed. Patterns presented here could be explored in greater detail. Many more skeletal samples are available for analysis and would provide an opportunity to better examine internal variation at the sites of 9N–8, 9M–22, and 10L–1 (see Table 7.2). Correlations of disease with isotopic values should be considered because of its possible confounding effect, but the paleopathological analyses of Storey remain unfinished.

A larger array of fauna should be analyzed to better establish an isotopic baseline for the area. In addition, macrobotanical remains should be analyzed for isotopic composition to add detail regarding the Copán Coner phase ecosystem. As shown by Cormie and Schwarcz (1994) and Gerry (1997) regional variation will be considerably greater than local variation in the isotopic composition of food sources. Isotopic compositional knowledge for each Maya polity would assist in furthering interregional comparison of dietary variation for ancient Mesoamerica. Very small archaeologically derived isotopic databases exist for the tropics and must be expanded before strong conclusions may be drawn concerning ancient dietary patterns.

Too few samples of rural and lower status individuals are available for Copán and are nearly nonexistent from other Mesoamerican sites. Additionally, samples from royal burials at Copán, which better represent the top social tier than the Type IV individuals, are needed. There are weak indications of dietary patterning by social status which could be strengthened with larger, more representative samples.

Bone samples which failed to produce well–preserved collagen might yield well–preserved collagen though the application of a collagenase preparation. Although more expensive than acid–base wash methods, collagen extraction with collagenase has been shown by DeNiro and Weiner (1988a) to work with poorly preserved samples. Both skeletal
remains of children and early Gordon subphase remains might yield suitable collagen. Either would enhance our understanding of the youngest segment of Coner phase Copán society or extend the sample to time periods prior to A.D. 650.

Other bone fractions could be analyzed. Through a stable carbon and nitrogen isotopic amino acid analysis of bone collagen an expected improvement in dietary knowledge would come from isotopic differences between essential and nonessential amino acids. It might be possible to better determine food sources, particularly when coupled with a more comprehensive study of the faunal and floral remains. To best take advantage of an isotopic study at the amino acid level a model relating the expected isotopic difference among the essential and nonessential ones for C₄–rich and –poor diets. In particular, examining the carbon isotopic ratios of methionine and lysine, which are limiting amino acids in maize–based diets, would more strictly estimate the proportion of maize involved in collagen formation. In turn, this might provide a distinction for whether maize–based diets were unbalanced and protein–poor among the ancient Maya. From a bioapatite analysis a more complete picture of diet might be painted. Since collagen and bioapatite bone fractions represent different metabolic sources, protein and whole diet respectively, an examination of bioapatite would provide better estimates of which food sources contributed to the carbon isotopic composition of bone. From the work of Gerry (1993), Coyston (1995), and Wright and Schwarcz (1996), Maya bone bioapatite could provide additional dietary evidence, when diagenesis is carefully controlled, but sometimes generates results at odds with those derived from bone collagen isotopic studies.
Conclusions

This study has been a successful experiment in determining whether intrasocial differences in diet can be measured with stable isotope bone chemistry. Within ancient Copán society (A.D. 600–1250) there were statistically significant differences in diet as determined from measurement of bone collagen stable isotopic composition between male and female adults, regardless of age, social status, or locale. Additionally, statistically significant differences in diet were detected between commoner and elite male adults, but not between commoner and elite female adults. Therefore, it is concluded that social behavior as reflected in diet was strongly affected by sex, but only weakly influenced by social position. This implies, along with previously published paleopathological evidence, that markers of social status are divorced from differences in diet and nutrition in societies like Copán.

The isotopic differences represent only a few percent (maximally 5%) difference in maize consumption. The isotopic–based reconstruction of the Late Classic Copán Maya diet at Copán reflects their circumstances of few animal foods and a high proportion of maize in their diets.