Migration, resettlement, and transition in the aftermath of the Maya collapse: a case study of a terminal classic Maya community in Northern Belize

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MIGRATION, RESETTLEMENT, AND TRANSITION IN THE AFTERMATH OF THE MAYA COLLAPSE: A CASE STUDY OF A TERMINAL CLASSIC MAYA COMMUNITY IN NORTHERN BELIZE

By

Josalyn M. Ferguson

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ABSTRACT

While there is consensus that the processes of decline and abandonment at many sites associated with the Terminal Classic Maya “collapse” (A.D. 750-1050) included the movement of peoples across the Maya lowlands, there has been little focused archaeological research on the resettlement and regeneration of these migrant groups. The movement of peoples across the Maya landscape was partially encouraged by a declining and ever increasingly taxed environment, as well as a revolution in exchange systems, with a notable increase in entrepreneurialism across the Maya subarea. This more integrated economic system focused on a wider range of commodities that served to link polities and regions on a more inclusive scale. As a result, many regions experienced marked population growths with the expansion of existing settlements, the resettlement of previously abandoned sites, and the establishment of new communities. While in recent years some scholars have begun to investigate Maya immigrants using biological and chemical scientific methods, the archaeological investigation of the resettlement of a migrant or immigrant community in wake of the Maya “collapse” has remained somewhat elusive.

The Progresso Lagoon region of northern Belize is one area that witnessed substantial population growths during the Terminal Classic period. Seeking to flee their own deteriorating existences, migrants came to the region to take advantage of the changing sociopolitical and economic milieu of the period, the regions previously “rural” location between the former dominant polities of the central Maya Lowlands and the expanding polities of the northern Yucatán and capitalize on the area’s access to water routes and abundant natural resources. The Strath Bogue site provided a unique opportunity to examine the interwoven processes of collapse, migration and resettlement.
Through the examination and discussion of multiple intersecting lines of data, including ethnographic, epigraphic, material culture analyses, this research has demonstrated the identification, resettlement and regeneration of a migrant Maya community in the aftermath of the Maya collapse. These data were ultimately examined in light of three proposed models of community regeneration in Results of this research have confirmed that this community was able to mitigate the disorder of the “collapse” and negotiate a new existence for themselves in northern Belize, while attempting to maintain connections to their former life and integrating themselves within the growing Progresso Lagoon community and northern Belize region populous.
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CHAPTER 1: THE TERMINAL CLASSIC PERIOD, POPULATION MOVEMENTS AND NORTHERN BELIZE

THE PROBLEM: MIGRATION AND RESETTLEMENT IN THE AFTERMATH OF THE LOWLAND MAYA LOWLAND “COLLAPSE”.

This dissertation project seeks to address a longstanding question that has yet to be adequately investigated: Where did all the people go after the Maya collapse? The goal of this project is to evaluate and understand patterns of migration, resettlement, and socio-cultural regeneration in the aftermath of the southern lowland Maya “collapse”, and to understand the stimuli for, and the processes and manifestations of, resettlement and revitalization of a post-“collapse” Maya community. The specific historical, temporal and geographic context within which the Strath Bogue community was able to resettle and rejuvenate in the wake of the southern Maya lowland “collapse” have broader implications for understanding the patterns of demographic, political and economic change between the Classic and Postclassic Periods across the Maya lowlands.

Models examining cultural regeneration in the aftermath of societal decline have not been adequately formulated and evaluated in studies of the Classic Maya collapse. Based on a generalized typology developed by Bennet Bronson (2006), I have devised three models of post-collapse societal regeneration that will be tested at Strath Bogue.

Hypothesis 1: Fission Regeneration:

The balkanization of large Classic Period polities coincided with the partial abandonment or complete desertion of once prominent centers. Regeneration by fragmenting groups in such instances involves the expansion of existing rural centers or the reestablishment of a community at a new location (Cowgill 1988; Culbert 1988a:87-88; Marcus 1992a). Such types of regeneration
are built on resilience and the retention of pre-collapse institutions and phenomena. A shift in authority away from traditional administrative structures occurs, but the overall regional structure is maintained (Bronson 2006:138, 140; Schwartz and Nichols 2006:7-9).

Archaeological Correlates: The artifact assemblage would mimic that of earlier sites within the region. Artifacts, mortuary and ritual patterns, and subsistence strategies would indicate continuity in styles. Evidence of enculturated practices would be detected in techno-stylistic traits of artifacts. Artifacts would mimic pre-existing spheres, reflecting the retention of previous ideologies and institutions. Isotopic analyses of human remains, and dietary analyses, would indicate continuity with earlier periods.

Hypothesis 2: Stimulus Regeneration:

In the Stimulus Regeneration model, Strath Bogue was settled by a local Maya group that was realigning and converging with a foreign political and economic authority. Strath Bogue and the Progresso Lagoon region may have been of economic interest to the Chichén Itzá or Puuc polities of northern Yucatán as a resource extraction zone and gateway between coastal trade routes and riverine thoroughfares penetrating inland areas. Many evolving ideological, economic and political traditions and institutions would represent a melding of traditional and external influences. Participation in a northern Yucatán-influenced economic sphere would also be indicated by a high degree of economic craft specialization and involvement in long-distance trade.

Archaeological Correlates: Expected archaeological correlates would include a ceramic assemblage consisting of types from Chichén Itzá’s Sotuta sphere and/or the Puuc regions Cehpech sphere, local reproductions and/or hybridized versions of foreign goods, and locally produced items. A borrowing of “foreign” technologies and styles in local clay resources would also be detected. Commodity production would indicate a mercantile-focus and integration into
interregional trade networks (Zedeño 1998:470) associated with the expansion of Chichén Itzá or the Puuc polities. Isotopic dietary analyses will indicate differing dietary patterns.

**Hypothesis 3: Restoration via long-distance migration:**

Many current theories on the cause of the Maya collapse are centered around environmental change and its negative impact on the economic, social and political institutions within Classic Maya society (Dahlin 2002; Folan, et al. 1983; Shaw 2003). Environmental and economic factors are noted as being both prominent push and pull factors for long distance migration and regeneration (Bronson 2006:11; Fix 1999:205). The natural resources and favorable environmental conditions in the Progresso Lagoon region, particularly the presence of permanent water sources, were likely important factors in in-migration by refugees fleeing political breakdown elsewhere in the Maya lowlands.

*Archaeological Correlates:* Archaeological correlates include material culture, mortuary patterns, and subsistence strategies distinct from Progresso Lagoon region and northern Belize sites, with strong ties to the Petén or the Puuc region. Dietary analyses would indicate a “Petén,” “Chichén” or “Puuc” sphere subsistence pattern. Technical, modal, and stylistic traits of Strath Bogue ceramics would differ from those from other sites in the Progresso Lagoon region and Aventura, and show correlations with Petén, Puuc or inland southern lowland spheres. Poorly executed specimens would indicate unfamiliarity with local clays. The combination of these analyses will provide clear evidence of the presence of non-local groups at Strath Bogue.

**The Terminal Classic Period, Collapse of the Southern Maya Lowlands, and Population Movements.**

The Terminal Classic period (A.D. 750-1050) has customarily been characterized as a period of cultural decay and societal decline (Culbert 1988a:74), having been framed in the context
of the collapse of the southern Maya lowlands (see Figure 1.1 for map of regional divisions). Characteristics of the Classic Maya collapse include the dissolution of centralized authority; fragmentation or decentralization of traditional sociopolitical and economic structures; the cessation of elaborate tomb burials and the erection of stela; and the abandonment and mass movement of peoples from many urban centers (Chase and Chase 2006; Culbert 1974; 1988a:87-88; Masson 2000:276; Tainter 1988a:166-178; Thompson 1966; Willey and Shimkin 1973). Without denying these events having occurred in the southern lowlands, not all of the Maya experienced the same degree of pronounced sociopolitical and economic disintegration, fragmentation and site abandonment (Andrews, et al. 2003; Pendergast 1986:248; Rice 1986:281).

Many regions and urban centers north of the southern lowlands continued to thrive or were newly settled during this period. Northern Yucatán was one region in particular which flourished during the Terminal Classic period, as observed in the growth of many prominent centers (see Figure 1. 2) (Andrews and Andrews 1980; Andrews V and Sabloff 1986; Bey, et al. 1997; Gonzalez de la Mata and Andrews 1998:457; Kepecs, et al. 1994; Willey 1986a:192).

That is not to say that communities outside the southern lowlands did not experience a constellation of change during this time, as many communities were either directly or indirectly affected by the sociopolitical and economic transformations occurring in the southern lowlands (Andrews, et al. 2003; Pendergast 1986:248; Rice 1986:281). It is evident however, that many Maya communities, like those in the Yucatán, were able to manage an effective means of crisis management and negotiate a suitable response, and thereby forge a new less erratic trajectory for themselves. And they generally did so while being able to maintain degrees of cultural continuity with their previous reality. It would seem that the decision to migrate was one of these effective
responses employed by the Maya during the Terminal Classic period (Lowe 1985:38; Marcus 1976).

Figure 1.1: Map of the Maya area, indicating regional divisions. (http://www.latinamericanstudies.org/maya/maya-map2.gif) (See Permission Appendix III).
One of the most significant transitions of the Terminal Classic period was a progressive decentralization of hierarchical systems (Lowe 1985:38; Marcus 1976) and a revolution in exchange systems. There was a notable increase in mercantilism and entrepreneurialism across the Maya Area, particularly in the Maya lowlands (Andrews, et al. 2003; Rathje and Sabloff 1975; Sabloff and Rathje 1975a, b), with a shift from a trade system founded on luxury items to a more integrated system focused on a wide range of commodities linking polities and regions across Mesoamerica (D. Freidel 1986:425; Smith and Berdan 2003; Webb 1973).

Coinciding with this economic revolution was the growth of many prominent centers across the northern Maya lowlands, most notably in the Puuc region (Andrews and Andrews 1980; 1986; Bey, et al. 1997; Gonzalez de la Mata and Andrews 1998:457; Kepecs, et al. 1994), and including the emergence of Chichén Itzá as a macro-regional political and economic authority, whose territorial and political expansion and power was fueled in part by these economic changes (Andrews, et al. 2003; Gonzalez de la Mata and Andrews 1998:464; Kepecs, et al. 1994: 142, 148; Schmidt 1998; Wren and Schmidt 1991:222-223). The importance and prominence of trade and exchange to the northern Yucatecán polities played an integral role in the institution and maintenance of its evolving sociopolitical organization and macro-regional influence and/or “control” (Kepecs, et al. 1994:142).
Figure 1.2: Map of Maya area indicating locations of sites with Terminal Classic period occupation and, or significance (See Permission Appendix III).

Chichén Itzá and the Puuc region’s territorial expansions are seen as a move towards decentralization, and another example of negotiating and adjusting to the changing *milieu* of the
Terminal Classic period. Concurrent with this decentralization was the establishment of “chains of secondary centers” at fairly regular intervals across the landscape (Kepecs, et al. 1994:148). It is my contention that in concert with the decline of the southern lowland polities, these institutional Terminal Classic period changes (decentralization, changes to the trade economy and the growth and expansion of Chichén Itzá), also contributed to the abandonment and mass movement of peoples in the wake of the “collapse.” As these changes took hold across the Maya subarea, communities were enticed to and relocate to new and various locations, establish “chains” of communities and contributing to and being a component of the evolving organization. Migration is recognized as a strategy implemented by peoples and communities in order to negotiate social, political, economic and environmental challenges, and improve on their exigent circumstances (Fix 1999).

The migration of individuals and communities throughout time and across great distances is recognized as a historical fact throughout human history. Migrations are a prominent theme within many Mesoamerican historical narratives and in prehistoric imagery (Christensen 1997b). Archaeologists studying the early cultures of Mesoamerica and the Maya regularly discuss the likelihood of movements of peoples during Precolumbian times. Academics recognize population movements as a contributing factor to, and or a resultant factor of the sociopolitical and economic transitions associated with the Terminal Classic period and decline of the southern lowland polities. The mere depopulation of the southern lowlands, and the coinciding rise of populations to the north and northeast, support this supposition (Boot 1995, 1997; Chase 1990; Demarest 2004; Fry 1989:105; Hammond 1973; Houston, et al. 2001; Masson and Mock 2004; Rice, et al. 2004; Schele 1995; Schele and Grube 1995; Sidrys 1983).
The decision to migrate is made by individual actors or groups within a given institution, rather than by a larger governing institution (Clark and Herr 2003), and thus migration is never carried out by an entire culture. This decision is based on various conditions, but most prominently on the existence and interplay of “push” and “pull” factors. Push factors are perceived to be the negative conditions associated with the homeland, while pull factors are seen as the positive and anticipated conditions of the destination site (Anthony 1990:899; 1997:22). Migration decisions take into account access to, and reliability of, incoming information from the migration route and destination site, consideration of the costs of a population movement, and the strength of the existing social structure in harboring the ability to organize, promote and manage the migration process (Andrews 1997:22, 26; Oliver-Smith and Hansen 1982:2).

Factors traditionally noted as “pushes” for migration include increasing competition or warfare, over population, environmental degradation, depletion of resources, environmental disasters, an imbalance in sociopolitical and economic positioning, social upheaval, religious persecution, as well as the desire to obtain mates or a new way of life (Ben-Sira 1997:xii; Fix 1999:47, 205). Interestingly, many of the factors considered to be an impetus for migration are the same causal factors conceived of by collapsed theorists, and argued to have been operational preceding and during the Terminal Classic period (Adams 1973a; Adams and Smith 1977; Adams 1988; Andrews, et al. 2003; Blanton, et al. 1996; Culbert 1988a, b; Dunham 1990; Erasmus 1968; D. Freidel 1986; Lowe 1985; Sabloff and Willey 1967; Santley, et al. 1986; Sharer 1977; Webster 2002; Willey and Shimkin 1973; Yoffee 1988; Yoffee and Cowgill 1988). The most convincing support for a mass movement of peoples having taken place is the depopulation of a given site, or region (Clark 2001:6), paired with an increase in the population of another region.
**TERMINAL CLASSIC NORTHERN BELIZE, POPULATION MOVEMENTS AND STRATH BOGUE.**

Northeastern Belize is one of the regions that did not experience the abandonment traditionally associated with the “collapse” of the central and southern lowland polities (Ferguson 2003; Masson and Mock 2004). Many settlements in northern Belize, including: Aventura (Sidrys 1983:399); San Estevan (Levi 1993; 1996:Fig.6.4d; 2002:Fig. 3d, 126; 2003); Pulltrouser Swamp (Fry 1989, 1990a; Shafer 1983); and Sarteneja (Boxt 1993) to name a few, witnessed increases in construction episodes and population growths during the Terminal Classic period, while others were newly settled, or like Strath Bogue, resettled after centuries of abandonment (Ferguson 2002a, 2003, 2004, 2005, 2006; Masson and Mock 2004; Sidrys 1983:399; Walker 1990; 2004; West 2002). Many scholars have argued that the northern Belize region was partially populated, and the region further settled, by factions of migrating groups during the Terminal Classic period. (Demarest 2004; Ferguson 2002b, 2003, 2004, 2006; Hammond 1982b:360; Masson and Mock 2004; Sidrys 1983:399; Walker 1990; D. S. Walker 2004; West 2002).

In a recent re-reading of the native chronicles, paired with ongoing hieroglyphic analysis and interpretation, Schele, Grube and Boot (1996:16) have argued that migrations north and northeast to Yucatán were likely motivated by rampant warfare, and sociopolitical and economic disintegration (Boot 1997:6). The years between A.D. 670-711 A.D. are known from inscriptions to have been fraught with war and are thought by Schele et al. to have created refugees (1996:16). Evidently, their response was to migrate northward (Boot 1995:333. 335; 1997:1).

Indigenous texts, most pointedly the books of *Chil’am Bal’am* (Roys 1933; Schele 1995), discuss migrations of people traveling over great distances, and settling in various places along the way. These migrations were characterized by the Maya as the “Great Descent” or *Noh Emal*, and the “Little Descent” or *Ts’e Emal* (Boot 1997:7-8; Schele and Mathews 1998:363). These migrants
are perceived to have been Itzá from the Central Petén core area. The Itzá migrations are suggested in the chronicles to have taken place over an eighty-year period, during katun 6 Ahau, or 8 Ahau (Ringle, et al. 1998:184), between A.D. 650-750 and between A.D. 750-950 (Boot 1997:maps 1 & 2).

Figure 1. 3: A) Map of the Little Descent (A.D. 650-750); B) Map of the Great Descent (A.D. 750-950) (maps were created by author, based upon work of Barrera Vasquez and Morley (1949; Schele and Mathews 1998) and Boot (1997)).

Evidence from the Chronicles suggests that the migration of the Great Descent involved a large movement of peoples towards the west, and north, while the Little Descent involved fewer people with the advance having progressed towards the north and the east (see Figure 1. 3). Both episodes evidentially resulted in the mass movement of peoples out of the Petén core area and contributed to the increasing occupation of the northern lowlands. Some have argued that these movements eventually resulted in the founding and settling of the great site of Chichén Itzá around

There remains some debate as to the route or routes by which the migrations took place. Barrera Vasquez and Morely (1949) have argued for the Great Descent originated in Chiapas and the Usumacinta drainage, moving up the western Coast of the Yucatán Peninsula to Uxmal and Dzibilchaltun before arriving at Chichén Itzá. They argue that the Little descent originated in the central Petén and went through northern Belize, moving up the eastern Yucatán coast via Cobá and terminating at Chichén Itzá. Schele and Matthews (1998:363) are in agreement with these suggestions, in light of “new” data from Classic period inscriptions involving the identification of the use of the *Itzá Ahaw* and *Kan Ek’* title or name on vessels and murals associated with both the Petén and Chichén Itzá regions (Figure 1.3). Boot (1997:12) has noted that a third migration may also have occurred which did not head directly to Chichén Itzá, but which first went to a place called *Siyan Kan Bak’halal*. *Siyan Kan Bak’halal* was significantly located within the Chetumal province, which encompasses northern Belize (Chase 1986:Fig.10.1; Roys 1957:Map 1).

Demographic data noted by Demarest (2004:117) for the Petén suggest a dramatic depopulation of the Petexbatún, and likely most of the Pasion regions between A.D. 760 and 830, with populations suggested to have reduced to “less than 10 percent of earlier levels.” Such drastic population declines coincide and support the mass migrations of the Great and Little Descents. Demarest credits the rampant warfare of the eighth century for such declines and suggests that these declines cannot be the result of related mortality rates. He credits population movements as
the cause of these declines, spurred by the need to look beyond the Petén for secure settlement areas that were not be impacted by the ensuing turmoil (Demarest 2004:118).

Figure 1.4: Map of Maya Provinces Encountered by Spaniards & of Perceived Boundaries of Tz'ul Winikob Territory (map created by the author based on the work of Clendinnen (1987), Jones (1989, 1998) and Roys (1962)).

The Chil’am Bal’am of Chumayel I, Tizimin and Mani note that the migrants who established Siyan Ka’an Bak’halal reigned for 60 years before eventually completing their migration to Chichén Itzá (Boot 1997:8). Further ethnohistoric support of the Chil’am Bal’am migration data can be found in Yucatecán terminology from the Colonial-Spanish Period. Evidently, inhabitants of Chichén Itzá, referred to themselves as Tz’ul Winikob. Significantly, residents of northern Belize living along the New River lived in a region known by the same name. Tz’ul or dzul in Yucatec
means “foreign” and was also used to refer to a group of people believed to be Itzá living in Colonial Chactemal or Chetumal province, and/or under the influence of the Itzá (see Figure 1.4) (Andrews 1990:262; Jones 1989:41-44; 1998:3, 427; Roys 1962:40-41).

It appears that the sociopolitical and economic milieu associated with the decline and abandonment of many southern Lowland Classic Period sites, and the concurrent expansion and prosperity of the Yucatecán polities of the northern Maya lowlands, had far reaching effects. Paired with the decentralization of political power, the change in the trade economy, the territorial expansion of Chichén Itzá, the decline of the southern lowland polities and prosperity of the Yucatecán polities, acted as an impetus for mass population movements and the resettlement of communities to the north, including to northern Belize (Boot 1997; A. F. Chase 1985; Chase 1982b; 1985; Chase and Chase 1988; Culbert 1988a:88; Erasmus 1965; Fry 1990a; Masson 2000:268-269; Pendergast 1986; Rice 2004a; Schele, et al. 1996; D. S. Walker 2004), and the Strath Bogue site (Ferguson 2002b, 2003, 2004, 2006).

The area in which the Strath Bogue community is situated may have been of interest to the Terminal Classic period migrating population for several reasons. Strath Bogue is located approximately 2.5 km east of the New River, 1.5 km west of Progresso Lagoon and the Freshwater Creek drainage, and less than 20 kilometers from Chetumal Bay and the Caribbean Sea (see Figure 1.5). The New River is a freshwater river that extends inland to the south and flows by the site of Lamanai. While the New River itself does not run directly into the southern lowlands, it is not far from the Belize River and its many tributaries. The Belize River is a prominent gateway into the southern Maya lowlands. Strath Bogue’s geographical positioning between these two river systems is fundamental to the migration hypothesis. These New River is one of three of Belize’s
largest rivers, and one of the few easily accessible and passable gateways to and from the Caribbean Sea, and inland. It is very probable the New River was a pre-existing communication and travel route and thus played a role in the decision to migrate using this river, and to settle in its immediate vicinity. The existence of a pre-existing communication route is one of the requisite factors for population movements, according to migration theorists (Anthony 1990:895-895, 902; 1997:24, 26). The New River riverine system is hypothesized as having become one of the keys to the developing trade network that was dominated by the powerful Chichén Itzá state and continued into the Postclassic and Colonial eras (Gonzalez de la Mata and Andrews 1998:464). Given recent scientific evidence espousing to the fact that many regions in the Maya lowlands were contending with dramatic regional environmental change(s), most notably drought, the Progresso Lagoon region’s abundant water sources would have been advantageous and attractive to populations seeking to relocate. The brackish waters of Progresso Lagoon and the fresh water of the New River also would provide diverse and varying aquatic and terrestrial resources.

Strath Bogue is located on fertile agricultural land, in an area known to have been involved in the production and trade of cacao, cotton and honey (Chase 1986; Gonzalez de la Mata and Andrews 1998:Fig. 458). Given the likelihood that the production and distribution of agricultural products during the Terminal Classic period would have been heavily impacted by the decline and abandonment of many southern lowland sites, paired with the transition of the trade economy to surplus goods and more utilitarian commodities (such as agricultural products), the Strath Bogue site and region may have been of interest to a migrant population on an economic production level. Especially in consideration of the site’s location relative to the New River and the Freshwater Creek drainage system. Several chultuns have been identified across the site.
Figure 1.5: Map of Northern Belize and vicinity marking sites with Terminal Classic period occupation (See Permission Appendix III).
One of the functions chultuns are argued to have held is as storage facilities for water and surplus food products (Dahlin and Litzinger 1986; Griffith, et al. 2000; Puleston 1971). The site and regions agricultural production potential, paired with the developing trade network system may have been one of the economic opportunities that made the Strath Bogue region attractive to a migrant community, and may have thus been one of the migratory “pulls” contributing to the decision to move and resettle there.

Northern Belize has been characterized as a region with abundant lithic resources, including high quality chert and a courser grained chalcedony, and chalcedony-and-quartz blends (Hester, et al. 1991; Mitchum 1991; Thompson 1991). The chert bearing zone (CBZ) of Belize is one of the most recognized outcrops in perhaps all of the Maya area (see Figure 1. 6). The CBZ is thought to cover an area larger than 544 square kilometers (Hester and Shafer 1984:159; Wright, et al. 1959). Regional surveys conducted under the auspices of the Colha Project found that the quality of the cherts in terms of their homogeneity and thus flaking quality varied across the region, with the finest quality of fine-grained cherts concentrated in a restricted area of approximately 181 square kilometers, with chalcedonies predominating outside the chert-nodule zone proper (Hester and Shafer 1984:159; Kelly 1980, 1982). While an actual outcrop has yet to be identified in the vicinity of Progresso lagoon, scholars have long hypothesized that one must exist as scattered large nodules or boulders of lesser grades of red, brown and grey coarse-grained cherts, chalcedonies and chalcedony-quartz blends have been identified here (Andersen 1976; Hazelden 1973:77; Hester, et al. 1991; Mitchum 1991; Oland 1998; Sidrys 1983:278; Thompson 1991), as well as at Strath Bogue itself (Ferguson 2002a, b, 2003, 2004, 2006).
Chert and chalcedony are perhaps one of the most technologically important raw materials to the Precolombian Maya of northern Belize (Hester and Shafer 1984:159). Given the decline of the previously dominant, and recognizable superior chert production center of Colha in the Terminal Classic period (Hester and Shafer 1984, 1994) Strath Bogue’s relative location approximately 35 kilometers away from Colha may have been advantageous. Having an easily exploitable chert and chalcedony resource at and immediate to the site would have been an
attractive feature to an incoming community, both at a domestic and potential export level, in terms of economic production and distribution of lithic goods.

Summary

In the following pages a substantial theoretical and contextual foundation will be laid from which an examination and understanding of one of the long eluded to, but rarely investigated effects of the southern Maya collapse will be presented. Migration as a response to societal collapse has long been understood as one of the factors contributing to, and also resulting from societal declines or “collapses” over time and across societies. Nonetheless, with the exception of scientific biological and chemical analyses of a select group of migrant peoples themselves, a contextual and archaeological examination of the resettlement and regeneration of a migrant Maya community has been a topic long in need of detailed attention. The specific historical, temporal and geographic context within which the Strath Bogue community established itself in Northern Belize’s Progresso Lagoon region provides a unique opportunity to archaeologically examine and comprehend the stimuli to move, the decision-making processes involved in the resolution to migrate, as well as where to migrate, and how a community reestablishes and regenerates itself. All of which will lead to a better understanding of who the people of the Strath Bogue community were.
CHAPTER 2. COLLAPSE THEORIES AND APPROACHES.

NATURE OF COLLAPSE

What is Collapse? How is it defined?

The term “collapse” is one that is hotly contended within anthropological and archaeological inquiry. Despite decades of attention, and studies on the “collapse” of various cultures, scholars have yet to devise a decidedly satisfactory conceptualization or definition of “collapse”. Conceptualizations and definitions of cultural collapse have ranged along a broad spectrum of characterizations, as have the treatments of collapse, and the investigation into the cause(s) of societal collapse.

Collapse has come to signify two types of phenomena. One characterization of “collapse” implies the complete disintegration or death of a civilization, while the other conceives of “collapse” as the “decline”, fragmentation, or “devolution” of a given society. These differing conceptualizations of collapse have in many cases resulted in the inappropriate and misrepresentation of societal transformation (Lekson 1999:36-37). Many of the cultures and civilizations characterized as having collapsed should perhaps more appropriately have been characterized as having “declined”, “transformed”, or politically fragmented. Thus, scholars have come to recognize variations in the degree of collapse, and question the actuality of societal “collapse”, as very few civilizations throughout history have been proven to actually have ended (Cowgill 1988:256; Durant and Durant 1968:90-94; Yoffee 1988:15-16). Cowgill (1988:256) has hence argued, the use of the term “collapse” should be reserved to only describe “the end of a great cultural tradition,” and to avoid using “collapse” and decline analogously. Scholars need to distinguish between “collapse” and fragmentation when discussing the death of a civilization versus the disintegration of a state into smaller autonomous units.

It is agreed, that “collapse” is the culmination of a specific set of historical, political, economic, social, demographic, technological and, or environmental factors (Eisenstadt 1981:242; Liverani 1987:69), and what might have been the “cause” for one society’s collapse, was not necessarily the root cause of other
societal “collapses”. Some early proponents of societal “collapse” argued that “collapse” was a recurrent throughout human history, and affected every category of society (Tainter 1988a:191-193). Collapse was once argued to have been a rapid, all encompassing, and regionally experienced event (Flannery 1972). However, more recent assessments of ancient societal “collapse” contend that collapse was not a rapid event, and that was rarely cataclysmic to the entire civilizational system. Societal “collapse” did not necessarily affect all societal institutions equally and was more often than not institutionally specific. Because one component of a given society experienced “collapsed” or declined, did not mean that every sector experienced the same degree of “collapse,” or that the whole civilization died (Adams 1988:21; Durant and Durant 1968:90-94; Eisenstadt 1988:238; Knapp 1990:205; Yoffee 1988:18; 2005:135). Thus, according to Eisenstadt (1988:242), when examining collapse investigations should concentrate on analyzing what aspect(s) of the society “collapsed,” and how the various societal sectors, or organizations were essentially reformulated or reorganized and how the boundaries between the different societal sectors were reconstituted. Key to understanding a given society’s decline is arriving at a comprehension of what facets of a society were predisposed to vulnerability, and thus prone to collapse (Knapp 1990:199).

Recent trends towards viewing what might have previously been classified as societal collapse as a form of cultural transformation or change, stem in part from the investigation of societies in the aftermath of “collapse.” Investigations on the regeneration of, or post-collapse societies have been the focus of continual research since the mid-1970s (Brumfiel and Fox 1994; Chase and Chase 1985; Chase and Rice 1985; Chase 1981; Chase and Chase 1988, 2006; Masson 1997, 1999b, 2000; Masson, et al. 2006; Price 1977; Rice 1986; Rice, et al. 2004; Sabloff and Andrews V 1986b; Schwartz and Nichols 2006; Yoffee 1979). The assertion by many prominent scholars that societies seldom fall or are terminated, paired with the fact that rarely has a civilization experienced such radical upheaval that there was a complete absence of any antecedent structural, ideational, political, economic or social continuities (Cowgill 1988:256; Eisenstadt 1981:242; Yoffee 1988:15-16; 1995; 2006: 222), has added credence to the reconceptualization of the characterization of societal collapse. Many scholars now conceive “collapse” as a transitional
What range of variation in the kinds of social transformations is typically labeled collapse?

One of the challenges faced by collapse theorists and archaeologists alike is the fact that “collapse” is a complex diachronic phenomenon rather than a solitary or synchronic event. Moreover, it is experienced rather than enacted. The range of archaeological evidence for such a phenomenon is further hampered by the fact that periods of “collapse” are marked by general declines in activities, populations and the movements of peoples (Renfrew and Poston 1979:481-482), and thus material correlates of such a phenomenon are not as tangible as they might be for a behavioral event. While most archaeologically documented events are observed through positive evidence, “collapse” tends to be identified via negative data; through a scarcity or complete dearth of otherwise previously documented materials. Thus, to a degree, collapse is a quantitative phenomenon, as decreases in various activities, including manufactured goods and monument production, economic transactions, ceremonial and construction events are all affected. A couple of studies have investigated the Maya collapse using the cessation of monument construction and associative dating as markers of this phenomenon (Bove 1981; Hamblin and Pitcher 1980), and in such scholarly instances, collapse is a quantitative phenomenon. However, from an anthropological view, and likely for the peoples experiencing a world of change in their lives, I would hasten to suggest that it was also a qualitative phenomenon.

As noted earlier, most scholars now agree that societal collapse is rarely, if ever, an absolute event that results in the complete annihilation of a given civilization. The current appraisal of societal collapse must then refer to the collapse of some aspect of that civilization. There is an array of differing opinions as to what then actually collapses. Rathje (1973) envisioned collapse to be less of a demographic crisis, and like Tainter (1988a:4) defined “collapse” as a political process, while Yoffee (1988:13) initially defined
collapse as an essentially economic process. Other evaluations conceive ancient societal collapse as having been a systems failure, due largely to the interconnectedness and thus fragility of the system (Culbert 1974:116; 1977:526; Flannery 1972; Hosler, et al. 1977:564; Renfrew 1978, 1984; Sharer 1977:548). Others envision societal collapse as a failure of the governing body or centralized administrative organization (Durant and Durant 1968:94). Some have similarly contended that collapse occurs due to an inability of a society to effectively respond or introduce cultural adaptations to impending crises, and satisfactorily moderate and rectify the crises, and thereby maintain order (Dahlin 2002; de Menocal 2001; Diamond 2000:396; 2005; Dunham 1990: 593). Tainter (1988a:4) further sees “collapse” as resulting from the rapid and significant loss of the established socio-cultural complexity due to economic crises related to the perceived exorbitant cost of complexity.

In his analysis of systems collapse, Colin Renfrew (1984:367-368) has compiled a general outline of the characteristics through which societal collapse is envisioned. He has arranged them into four main categories, which he then further dissects. They are as follows (with some slight modification on my part):

1) Disintegration of the centralized administration – marked by the decentralization of sociopolitical and economic system, abandonment of palaces and public buildings, and storage units, loss of secular and religious literacy, as well as the dissolution of military services or actual military, alliances and treaties (Liverani 1987:70);

2) Disappearance or removal of the elite class – marked by the cessation of elaborate burial practices, abandonment of palaces and elite residential structures and reuse by squatters, cessation of conspicuous consumption;

3) Dissolution of centralized economy – termination of comprehensive redistribution or market system, established currency no longer utilized (if applicable), long-distance trade is reduced, and previously established trade routes dwindle, reduction in internal exchange, craft-specialists and specialized or intensive agriculture production;
4) Settlement and demographic decline - abandonment of communities and a shift to smaller, rural, and more dispersed settlements, a marked preference for specific geographical locations (i.e., defensible locations, or those associated with water sources), manifest decline in population numbers and density, either as a result of mass population movements, substantial deaths, or a failure/inability to effectively reproduce (Gill 2000:372).

The archaeological evidence is more obscure as the range of data available in such instances are viewed as being less adequate because of the associative declines in activities, populations, and the movements of peoples (Renfrew and Poston 1979:481-482). While most archaeologically documented events are done so through positive evidence; i.e., the presence of signature or tangible artifacts, collapse has tended to be identified via negative data; through a scarcity or complete dearth of otherwise previously documented materials. Traditionally, the most decisive indicator of collapse has been the partial or complete abandonment of prominent urban centers, marked and most significantly, population decline. Other collapse scenarios have been identified through the decentralization or fragmentation of political units into smaller, less centralized and more dispersed entities. Concurrent with these changes is the failure of the governing political apparatus, ideology, and economic system (Schwartz 2006:5-6).

**Pivotal Collapse Publications**

The two main works dedicated to collapse are *The Collapse of Complex Societies* by Tainter (1988a) and the edited volume *The Collapse of Ancient States and Civilizations* (Yoffee and Cowgill 1988), both of which were published in 1988 and remain perhaps the most respected publications dedicated to the topic of societal collapse. The Yoffee and Cowgill volume was intended to bring together a number of cases and approaches to societal collapse as presented and discussed by a range of scholars and identify and examine the potential factors thought to have culminated in the breakdown of societal complexity among ancient states and civilizations. The editors then wished to devise a standard by which these factors and instances of ancient collapse could be investigated and compared throughout ancient history. Using case studies of the Roman, Maya and Chacoan “collapses,” Tainter’s goal was to present an explanatory model
of sociopolitical collapse. Tainter’s “Law of Diminishing Returns” model is heavily formulated on an economic perspective. He argues that collapse becomes increasingly likely when the cost of societal complexity outweighs its benefits, and the marginal returns are unable to proportionately satisfy the economic needs of the society, without new innovations or energy resources (Tainter 1988a:111).

The most recent treatment of societal collapse has been Diamond’s 2005 book *Collapse, How Societies Choose to Fail or Succeed* (2005). In his book, Diamond assesses the collapse of many ancient societies, including the Easter and the Polynesian Islands, the Anasazi of the southwest United States, the Vikings in Iceland and Greenland, and the Classic period Maya. Diamond essentially conceives ancient societal collapse to have been the result of anthropogenic environmental causes, and an inability of the society to adapt to their changing environment. The most recent (2006) collapse related publication is an edited volume that is not centered on the causes and process(es) of societal collapse, but instead contemplates the mechanisms and consequences of collapse and the associative cultural transitions and regeneration of communities and cultures subsequent to societal collapse. As noted by Yoffee, *After Collapse: The Regeneration of Complex Societies* (Schwartz and Nichols 2006) reflects the changing and current scholarly perspective on collapse. Collapse is regarded less as a failure of complex social systems, and is seen more as a kind of, or as Yoffee notes: “a species of social change that must be investigated in its appropriate larger temporal and spatial sequences” (2006:223).

The edited volume *The Classic Maya Collapse* (Culbert 1973a) was devised out of the 1970 advanced seminar on the subject in Santa Fe, New Mexico, and sponsored by the School of American Research (Culbert 1973d:xiv; Rice, et al. 2004:4). The goal of the seminar was to discuss and evaluate the then recent archaeological investigations, data, and various hypotheses on the causes of the Classic Maya collapse. The seminar and volume were/are somewhat biased as they focused on the Maya lowlands, As Rice et al. (2004:4) have since noted, the interpretations presented in the volume were numerous and often contradictory. The end result was an amalgamation of the hypotheses presented into a “multi-causal” model for the collapse (Culbert 1988a:76; Rice, et al. 2004:3-4). More pointedly, the volume signified the initial
paradigm shift away from the perception of a uniform collapse. Concurrently, emerging interest and investigations into the Postclassic period (Andrews and Castellanos 1986; Webb, 1964 #668; Andrews and Sabloff 1986; Ball 1974, 1978, 1986; Chase 1982b; Eaton 1978; Eaton and Ball 1978; Fox 1981, 1987; Graham 1985; A. G. Miller 1986; Rice 1986; Willey 1973b, 1986b), challenged the presumed uniformity of the Classic Maya collapse, and together eluded to a very different chain of events for the end of the Classic period. The result has been a reassessment and characterization of this period in Maya history as one of cultural transition, rather than societal termination.

There have been three publications dedicated to the Maya collapse, two of which, *The Dynamics of Apocalypse: A Systems Simulation of the Classic Maya Collapse* by John W.G. Lowe (1985) and Richardson B. Gill’s (2000) *The Great Maya Droughts: Water, Life and Death*, were the published versions of Ph.D. dissertations. Lowe’s book uses systems analysis and computer simulation to investigate the Maya collapse, using archaeologically derived data such as epigraphic data and inscription dates, ceramic sequences, settlement survey, while Gill’s book examines the Maya collapse from the perspective of environmental change, specifically drought, having been the initial causal factor that lead to a chain of additional stresses and eventually their demise. Both of these books are in my opinion flawed. Lowe’s systems simulation is dated, and I find his simulation to be convoluted and the fact it is agency-less, problematic and flawed. Gill’s book is poorly written and researched, heavily biased, lacks agency, and asserts that humans are unable to mediate and adjust to conflict, tension and change. The third book, *The Fall of the Ancient Maya: Solving the Mystery of the Maya Collapse* by David L. Webster (2002), was intended to solve the mystery of the Maya “collapse” by identifying what, how and why the Maya collapsed (Webster 2002:47). However, despite the fact that Webster identifies three interrelated causal factors (destabilization of societal due to warfare/competition; rejection of Classic period ideology and overextension of agricultural and other resources), this book is really only successful in rehashing previously presented hypotheses, models and perspectives of the Maya collapse.
Another publication deserving recognition within the framework of this overview is *The Terminal Classic in the Maya Lowlands: Collapse, Transition, and Transformation* (Demarest, et al. 2004b). The focus of this book is in part a reaction to the changing perspectives on the nature and degree of collapse, as well the need for, and continuing interest in the study of the Maya in the aftermath of the “collapse”. The contributions to this volume are varied in their assessments of the Terminal Classic period, but all must contend with issue(s) of the “collapse” pertinent for the specific region or site on which they write.

**THE CLASSIC PERIOD MAYA COLLAPSE**

What kinds of social transformations epitomize the Maya Collapse and how is it identified archaeologically?

Mayanists are no more in agreement in formulating an explanation for the Classic Maya collapse, or in assessing how it is epitomized than are other scholars and theorists interested in the collapse. Initially the Maya collapse was comprehended as having been absolute across the entire Maya subarea, and marked by a decline in complexity, with many of the societal institutions having disintegrated (Masson 2000:275). Later, the collapse was seen as having essentially been an elite phenomenon, affecting the elite-commoner hierarchy and the ceremonial, artistic and ideological institutions thought to have been solely in the realm of the privileged members of society (Adams 1973a; Rice 1986; 1987a:83; Rice, et al. 2004:3; Webster 2002:46; Webster, et al. 2000:197). More recently however, the Maya collapse is generally regarded as having been a largely political phenomenon, marked by the dissolution of the centralized authority, and the fragmentation or decentralization of the traditional sociopolitical and economic structure (Culbert 1988a:87-88; Dunham 1990:563-564; Freidel 1983:377; Lowe 1985:38; Masson 2000:276; Mathews and Willey 1991; Schele and Miller 1986). Moreover, the time frame in which the collapse occurred, the rate at which it occurred, and the degree of depopulation is also recognized to have varied across the Maya subarea (Rice, et al. 2004:8). Thus, some contend that the categorical identification of a “Maya Collapse” is incorrect, as it was not absolute, but alternatively, differentially experienced across the entire Maya Subarea (Cowgill 1988:266; Rice 1986; 1987a:83; Rice, et al. 2004:6). Different regions and sites experienced a
constellation of degrees of societal change and decline. As such, Mayanists hold differing opinions as to the nature of collapse. What might be deemed significant or is reflected in the culture history of one region or site, does not necessarily mean it was relevant or experienced in other areas or sites. Thus, explanations of and, or for the Maya “collapse” are thus various, and often overlap (Aimers 2007:331) Nonetheless, for the purposes of this review, and having noted these differing viewpoints, I will present a generalized summary of the nature of the Classic Maya collapse.

Traditionally, the Late Classic Period (ca. 600-800 in the southern lowlands, and 800-1100 in the northern lowlands) was characterized as a period of “florescence” in Maya culture history, as it is said that the Maya culture climaxed during this time (Morley 1946; Sabloff and Andrews V 1986a:5; Thompson 1970; Willey and Shimkin 1987:20-23). During this period, the Maya obtained their greatest degree of societal innovations, including expansive city-centers with elaborate architectural constructions and geographical expansion, intensive agricultural practices, their highest populations with multiple polities, sophisticated ceremonial and monument traditions, complex calendrical and writing systems, as well as an intricate arts and crafts tradition (Sabloff and Andrews V 1986a:5). Some contend that embedded within this period of “florescence” were also the stresses and difficulties that eventually culminated with the collapse (Dunham 1990:528; Lowe 1985:38; Thompson 1966:82-84).

Culbert (1973b:17) notes that the first evidence of an impending “cultural decay” was a striking wane in the frequency of monument carving and erection is noted to have begun around A.D. 790-810 (Dunham 1990: 563, 565; Rice 1986:281; Webster 2002:46; Willey 1986b:19). By A.D. 890, public or monumental construction efforts (Graham 1987:75) were declining, in some cases abruptly. An apparent rupture in Classic period writing and calendrical systems evidently coincided with the cessation of monument erection (Culbert 1973b:17: Adams, 1973 #549:22).

Ceramic evidence from the Late and Terminal Classic period indicates that the ruling Maya sought to decrease productive and distributive control over economic goods with mounting political instability, rather than tighten their grip, as an expanding diversification or localization of ceramic styles is evident

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The result was near cessation of the Maya’s complex polychrome ceramic industry (Adams 1973a:22; Culbert 1973b:17). Ceramic objects are also noted as having declined in quality and ostentation during this period (Pendergast 1986:248; Rice 1987a:84; Sabloff and Willey 1967:314). Coinciding with the change in Maya ceramic traditions is the sudden introduction of fine paste wares in the central and Puuc regions. These data have often been used to indicate the introduction of non-Maya, Mexican peoples at some sites, specifically Seibal, Becan and Altar de Sacrificios (Adams 1973b; Ball 1977b; Sabloff and Willey 1967) and that these peoples were somehow involved in instigating the collapse (Cowgill 1964; Sabloff and Willey 1967:312-313; Willey 1987:3).

It has also been argued that disillusionment with the established ideology and ruling elite occurred, whereby the kings were no longer being exalted as divine and thus their authority was challenged, and eventually culminated in their loss of power. Consequently, a number of elite activities, including ossuary complexes, multifaceted funerary rites and elaborate ceremonial rituals also ceased (Adams 1973a:22 Dunham, 1990 #20:563, 565; Rice, et al. 2004:9).

Another hypothesis argues that the carrying capacity of the land was so taxed by an ever expanding population, that it was unable to regenerate and resulted in inadequate subsistence yields, nutritional balance, severe health impacts, and demographic instability (Culbert 1988a; Mathews and Willey 1991; Meggers 1954; Paine and Freter 1996; Reina 1967; Rue 1987; Santley 1990:329; Santley, et al. 1986:149; Shaw 2003; Webster, et al. 1992; Willey 1986a; Willey and Shimkin 1973; Wiseman 1985). The stresses on the environment, health and demography likely impacted the daily functioning of society, causing further stress to the societal system, and perhaps caused the decentralization or fragmentation of the larger system in attempt to mediate the compounding stresses. Others have argued that while such stresses may have climaxed by the Late Classic-Terminal Classic period, fault lies in the excessive burdens demanded by the elite classes, and the failure and disintegration of the administrative power and their overtaxing of the social system and inability to mediate mounting stresses, including the potential of peasant rebellion, and maintain

Particularly relevant to the Pasion-Usumacinta Regions of the Maya subarea, has been the supposition that elite-rivalry, inter-site competition and warfare reached intense heights around A.D. 760, as indicated by fortification and defensive works, and the apparent destruction of sites. Eventually the competition and warfare in these areas culminated in drastic population reductions, and abandonment (Demarest 2004; Demarest and Fahsen 2003; Demarest, et al. 2004a:550-551; O’Mansky and Dunning 2004; Tourtellot 1988:432-436; Tourtellot and González 2004).

Chronology and Progression of the Maya Collapse

A pattern of collapse based on the cessation of the erection of dated monuments has indicated a southwest to northeast spread of decline over the course of the late eighth to tenth century (Bove 1981; Lowe 1985:15, 39), and has been further supported through many recent investigations focusing on the Terminal Classic Maya (Demarest, et al. 2004a:550; 2004b). Early assessments of the duration of the collapse postulated that it was a quick process, and that it encompassed all of the Maya subarea (Rice, et al. 2004:8). Support for the rapidity of the collapse in part came from the identification of swift changes in the material culture and culture histories of “key” Classic period sites on the western edge of the Maya subarea (Demarest, et al. 2004a:550; Willey 1973a, 1990). Recent reassessment of the material culture associated with Seibal, one of the sites from which the quickness of the collapse was assessed, has modified the quickness estimation for the collapse (Tourtellot and González 2004). Opinions as to the duration of the collapse vary, from a rapid 50 to 60 years (Sabloff and Willey 1967:329), to its having been drawn out over a longer period of time, perhaps 100 to 200 years (Adams 1973a:22; Braswell, et al. 2004; Culbert 1988a:74).

While some have argued that the collapse began with the major centers and began a slow progression of affecting secondary centers and rural communities (Culbert 1988a:74; Webster and Gonlin
Lowe (1985:205) has argued that the collapse initially began in the periphery. Others maintain that rural populations were less drastically affected by the changing processes coinciding with the collapse (Sidrys 1983; Thompson 1966). While many sites and regions, particularly those associated with the coasts, riverine waterways, lagoons and lakes to the north of the central Petén area, experienced some degree of sociopolitical, economic and ideological change, the drastic population declines, and abandonment experienced to the south were not commonplace. Conversely, many of these sites experienced population increases, and did not experience drastic decline (Adams, et al. 2004; Fry 1983, 1989; Hammond 1973; Masson 1997, 1999b, 2000; Masson and Mock 2004; Pendergast 1986; Sidrys 1983; Willey, et al. 1965).

Continuing research over the last 30 years has discovered that an all-encompassing explanation of the cause of the Maya collapse may not be appropriate, as indications are that marked variability in the culture histories of individual sites and regions occurred. Scholars now discuss regionally and in some cases site specific sequences of events and pose similarly regional hypotheses of collapse (Demarest, et al. 2004a:549-562; Rice, et al. 2004:8). Nonetheless, regardless of the specifics of the causes and sequences of the collapse experienced within the different sites and regions, settlement data has indicated that between A.D. 750 and 1050 many centers experienced dramatic culture change, depopulation, and the mass desertion or abandonment of many once prominent centers and associated peripheral communities (Culbert 1973b:17; Demarest 2004; Rice and Rice 1990; Rice, et al. 2004:9; Santley, et al. 1986:125; Turner II 1990; Willey 1986b:19). The question remains however, what happened to these people, did they die or migrate elsewhere?

EXPLANATORY FRAMEWORKS OF COLLAPSE

In order to examine societal “collapse” from a viable and comparative perspective, scholars have introduced various explanatory and conceptual models, and have utilized different analytical perspectives and methods. Many of these treatments have been forged with the intent of deciphering stimuli or root causes of the societal “collapse” of a given civilization, or in identifying a general theory of civilizational
“collapse” that can be ascribed to all cases of societal “-collapse.” Unfortunately, rather than these models helping to solidify a definition and understanding of the process(es) of “collapse”, they have resulted in the creation of a plethora of classifications and characterizations of collapse, each based upon the theoretical orientation of their associative model. Moreover, the requisite characteristics used to demonstrate collapse also vary according to the individual model. The models put forth are either particularistic or multifaceted. Some hypotheses focus on a specific causal factor, such as invasion, drought, or revolt; while others incorporate several interrelated factors, for instance, population pressures and environmental degradation, the over extension of the elite, limited subsistence capacities, culminating in commoner revolt (see below). In their testing of their hypotheses, some scholars have utilized specific analytical models and, or theoretical approaches, such as mathematical and computer simulations, Trend-surface analysis, catastrophe and systems theory (see below for more elaborate discussions of these and other models and approaches).

There have been various frameworks by which scholars have attempted to classify the different causal factors of the Maya collapse. While most seem to have relatively the same components, different scholars have modified their classification schemes more or less by their analytical, testable and explanatory capabilities (Adams 1973a; Cowgill 1964; Liverani 1987:69; Morley 1946; Sabloff 1973b:36; Sabloff and Willey 1967; Thompson 1954; Willey 1964; Willey and Shimkin 1973). In all, the different frameworks seem to be variations of a theme - that being the internal versus external classification framework. Since the mid-1970s, external causes of collapse have been favored. Within Maya studies, this has in part been in response to previous treatments of collapse that are criticized for having been temporally- and Maya-centric, for little consideration was given to diachronic history, neighboring cultures and regions, or the potential of a Mesoamerican wide tradition (Sabloff 1973b:37).

Recent scientific advances in pollen studies, isotopic analyses and neutron activation have been particularly responsible for having amplified external causal speculations, especially in the realm of environmental issues (see below). However, causal studies of collapse are not the only avenue of inquiry concerning societal collapse. Investigators have also been concerned with establishing, defining, and
refining periods and chronologies of collapse (Hester 1985b:3; Rands 1973), identifying and differentiating the causes from the effects of collapse (Liverani 1987:69), and investigating societies in the aftermath of collapse (Bower 1988; Bronson 2006; Schwartz and Nichols 2006; Yoffee 1979). Some scholars have introduced new methods for modeling and investigating aspects of collapse, including computer simulations (Hosler, et al. 1977) and mathematical models simulations (Hamblin and Pitcher 1980; Lowe 1982, 1985). Many collapse theorists investigate the dichotomy of the rise and fall of civilizations simultaneously, as they maintain that in order to understand the complexities of collapse, scholars must recognize the framework within which the civilization emerged, since the factors that contributed to the rise of complexity may in fact be the same as those that contributed to the so-called collapse of the society (Culbert 1988a:77; Kaufman 1988:226-227; Tainter 1988a:111; Yoffee and Cowgill 1988).

Traditional classificatory theories of the causes of the Maya collapse include: A) Ecological factors - such as soil exhaustion, erosion, grass invasion, water loss; B) Catastrophic events - such as earthquakes and hurricanes; C) Evolutionary processes – volatile nature of the balance between humans and their environment, and the limited agricultural potential of a tropical environment preordaining the Maya collapse; D) Paleopathological causes – poor health and disease; E) Demographic failure – inability to sustain population; F) Social Structure – a multifaceted, internal breakdown of society involving social decay, economic revolt and external Mexican influences; and Invasion – intrusion by Mexicanized peoples, possibly Toltecs (Adams 1973a:23; Cowgill 1964; Morley 1946; Thompson 1954; Willey 1964). Some of these traditional causal explanations were renewed and expanded upon during the Santa Fe conference, with the aid of what was then new data from a select group of sites within the central Maya lowlands (Rands 1973:44; Rice, et al. 2004:4). Building on previous theories and the new data, the Santa Fe Seminar was intent on addressing the “problem” of the Classic Maya collapse, and devise a single explanatory explanation as to its cause (Culbert 1973d:x). While the participants were unsuccessful in identifying a solitary causal factor, a generalized classificatory framework was devised that separated an array of causal factors along two main theoretical lines: those causes which were the result of internal factor; and those
which were the result of *external* causal factors (Sabloff 1973b:36; Willey and Shimkin 1987:3). Sabloff (1973b) was put to the task of formulating a classificatory scheme, based on testable criterion, and was presented as follows:

A. Internal Causal Factors
   1. Natural
      a. Soil potential
      b. Demographic Change
      c. Earthquakes
      d. Hurricanes
      e. Climatic Change
      f. Disease
      g. Insect pests
   2. Sociopolitical
      a. Peasant revolt
      b. Intersite warfare

B. External Causal Factors
   1. Economic
   2. Sociopolitical
      a. Invasion without resettlement
      b. Invasion with resettlement

Previous to the Santa Fe seminar, the majority of causal theories while not identified directly as such were internal and processual in nature (Sabloff and Willey 1967:315). During the 1970’s, external explanations for the collapse began to take precedence, partially as a result of data emerging from sites like Seibal and Altar de Sacrificios. Sabloff (1973b:37) also questioned whether or not the reformulated external causal focus for the collapse was a reaction to the tendency of scholars to focus on the Classic period Maya independently of the Mayas diachronic history, or without consideration of neighboring regions, cultures, or the potential of a Mesoamerican wide culture. While the external and internal explanatory framework for the Maya collapse remains in use to some degree today, the factors and their related criteria/criterion continue to change with continuing research. Many of the hypothesized criteria are the same as those employed in other causal explanations, as elements germane to one theory are often applicable to another. Furthermore, some would argue that some of the current environmental explanations should be regarded more as external, rather than internal factors.
Somewhat in compensation for not being able to formulate the explanatory model for the Maya Collapse, Willey and Shimkin (1973, 1987) conducted a synthesis of the various perspectives, and themselves formulated a hypothetical multi-causal explanation for the collapse. While not all scholars agree on the specifics of this multi-causal explanation, most scholars concur that it is unlikely that a solitary factor was ultimately responsible for the Classic Maya collapse (Webster, et al. 2000:197). Societal collapse is a very complex phenomenon, with many integrative and interactive aspects. Distinguishing which elements were causal versus which were effects, and which factors were most pivotal may very well never fully come to fruition. Moreover, what might be considered a pertinent casual factor in one collapse scenario may not be in another. Each culture has its own specific set of cultural, geographical, historical and environmental circumstances that present a specific set of circumstances, advantages and challenges, and even obstacles. How that culture mitigates its relative set of circumstances is ultimately what is key to its longevity, or conversely, “collapse”.

CAUSAL MODELS OF COLLAPSE

I. Environmentally Based Models

Under the umbrella of environmentally based models are several multi-faceted, interrelated hypotheses related to the natural environment, and, or human ecology, and how naturally occurring, or human induced changes in the environment are hypothesized as having contributed to, or caused societal collapse. While neither externally-based environmental causal models or internally-based ecological models are newly conceived they have received renewed attention in recent years, partially due to scientific achievements in data collection as well as in identifying, measuring and tracing the degree(s) of environmental change as well as the degree of human impact on the environment. For example, the analysis of oxygen and carbon isotopes, pollen counts and sequences, diatom, as well as rates of evaporation, changes in mollusk populations, lake sedimentation and erosion, have all been used as indicators of environmental or climate oscillation (Brenner, et al. 2001; Curtis, et al. 1998; Curtis, et al. 1996; Dahlin 1983; Deevey, et al. 1979; Hodell, et al. 2001; Hodell, et al. 1995; Leyden, et al. 1996; Rice 1996;
Whitmore, et al. 1996). Such studies have also indicated that previous pan-generalizations about the environment of the Maya subarea were flawed, and have invoked the need to recognize the degree of environmental diversity across the region and examine the question of environmental change and the Maya collapse at a local level (Pyburn 1996; Shaw 2003).

A. Natural/Environmental Explanations

i) Climatic change - Changes in Precipitation and Drought

The theory that climatic change was a catalyst for or contributor to, the collapse of ancient societies is not a new one. The popularity of the climatic change hypothesis is not surprising given the fact that traditionally, if not erroneously, many scholars have viewed both collapse and climate as regional phenomena. Purveyors of environmental or climatic change explanations of civilizational collapse argue that changes in the climate of a given region were so rapid, extreme and protracted over time, that societies were unable to forge innovative or adaptive means by which to mitigate such events, and thus abandonment and collapse ensued (Weiss 2001:609; Weiss, et al. 1993:995).

The environmental model dictates that the environment-culture relationship was somewhat precarious, in that a given culture was vulnerable to climate change, most specifically in annual rainfall. The theories that link drought or paleoclimate change and the Maya collapse hypothesize that while the development or evolution of Classic Maya society coincided with periods of favorable climate, or wet conditions, that even during these more favorable periods the land was being heavily exploited, making it susceptible to increases in aridity, and society vulnerable to dramatic changes in rainfall (Haug, et al. 2003; Hodell, et al. 2001; Hodell, et al. 1995). Because climate is an impartial and yet an elementary variable affecting societies, changes in climate, particular radical ones, would greatly impact a people’s existence, perhaps affecting the entire social structure. Disruptions to, or dislocations in a society’s political, ideological and social organization, and the economy, especially in trade relations, have been argued for (Paulsen 1976:121). Decreases in precipitation, and full-blown drought would have most severely impacted
the agriculture and subsistence bases, and limited drinking water, especially in those areas without access to other water sources. Limited or restricted access to water, can also directly affect dietary quality and quantity (Lowe 1985; Plog and Hantman 1990:452), hygiene and overall health. Such impacts would be identifiable archaeologically via changes in the material signatures of an array of sociocultural behaviors; subsistence; the size, volume and location of settlements; and in artifact assemblages (Paulsen 1976:121).

Drastic changes in precipitation generating drought (Ahlstrom, et al. 1995; Gill 2000; Kolata 1993; Sabloff and Rathje 1995; Shrimpton 1987), changes in wind (Weiss, et al. 1993) solar activity (Hodell, et al. 2001; Kerr 2001:1293), and/or climatic cooling, or conversely warming, are noted as the main triggers of climatic change. Changes in precipitation and most explicitly drought have taken the forefront of not only climatic change theories, but also of causal explanations for the Maya collapse, and have become commonplace within many ancient societal collapse discussions. Climatic change as a motivator of depopulation and the ultimate cause of the collapse of a civilization has been cited in the explanations of the collapse of many ancient societies, including: the 12th century A.D. collapse of the Anasazi and Pueblo neighbors in the southwest United States (Ahlstrom, et al. 1995; Euler, et al. 1979); some Andean civilizations (Binford, et al. 1997; Paulsen 1976), the Akkadian empire and surrounding regions of southern Mesopotamia (Weiss 2001; Weiss, et al. 1993); the extensive depopulation of 14th century northern Europe (Utterstorm 1955), and the Maya collapse (Folan, et al. 1983; Gill 2000).

The drought hypothesis has been greatly substantiated by modern scientific advances, specifically in terms of the analysis of sediment core samples taken from Lagoons, cenotes, bajos, etc., as well as of tree ring and speleothem growth data (Aimers and Hodell 2011:45). Critics of the climatic change hypothesis have argued against it due to its deterministic nature (See below). Recent purveyors of the climate change hypothesis are quick to renounce suggestions that they are advocating an environmental deterministic theory, arguing instead that both collapse and climate need to be considered not as a catalyst for collapse, but as a factor that exacerbated already stressed conditions (Shaw 2003:160; Turner II 2010:575). Discussions of collapse are intertwined with ecological models of collapse.
Meteorological, paleoclimatic and ethnohistoric data from the Holocene have indicated that
droughts were fairly regular, however, an extensive drought is noted as having between A.D. 750-850, the
period that just so happens to correspond to the last carved monument dates at a number of prominent sites
in the southern Maya lowlands, which are argued by some to essentially record the abandonment and
collapse of these sites (Gill 2000). This drought has been identified as having been the worst drought in
7000 years (Gill 1994, 2000; Kerr 2001:1293). It has been suggested by some that changes in solar activity
every 206-208 years may have played a causal role in the regularity of cyclical drought patterns (Hodell, et

The drought explanation for societal collapse came to the forefront of climatic hypotheses in the
1990s (Robichaux 2002:341), although studies on the subject had been initiated earlier (Covich and Stuiver
1973; Dahlin 1983; Euler, et al. 1979; Folan, et al. 1983; Gunn 1985; Gunn and Adams 1981; Thompson,
et al. 1985; Wright 1968). Recent paleoecological studies by a number of scholars investigating indicators
of climate change, drought and their potential role in the collapse of ancient civilizations have most
prominently focused on the analysis of oxygen isotopes in shells and gypsum from sediment core samples
1996). The use of paleoliminological studies has been particularly championed by those investigating the
1993; Thompson, et al. 1985), most specifically the “collapse” or “disintegration” of the Tiwanaku
civilization in the Lake Titicaca and altiplano region of Bolivia and Peru around A.D. 1100. Researchers
have paired paleoliminological evidence in the form of cores taken from Lake Titicaca and the Quelccaya
ice cap, with archaeological and chronological data and water budget modeling in their assessment of the
impact and effects of drought on the raised-field agricultural system. They use these data to argue that the
collapse of the intensive, hydrological-based agricultural system on which Tiwanaku’s food production was based, caused the collapse of the entire state, from its urban core to its rural periphery.

Using lake cores and stable Oxygen Isotopic analysis, and radiocarbon dating, investigators were able to “map” ecological changes, specifically variations or shifts in moisture and lake levels, and in sedimentation over more than 2500 years (1260 B.C. – A.D. 1600) (Binford, et al. 1997:240-241). They note that periods of known culture change coincided with notable changes in moisture and water in the Lake Titicaca region, including both the inception of intensive agriculture, and its collapse. Further, between A.D. 600 -1100 climate conditions were favorable and allowed for the intensification and expansion of agriculture. However, a drastic precipitation deficit beginning around A.D. 1150 caused a 300 year drought, as is evidenced in 12-17 meter drops in lake levels and the reduction of some lake areas, including some lake areas to turn essentially into saline swamp (Binford, et al. 1997:240-241). It is hypothesized by Binford et al. (1997:245) as well as Stanish (1994:329) that the extreme aridity and lack of available water caused the hydrology dependent raised-field agricultural system to become ineffectual, causing the failure of agricultural production system on which both rural and urban populations had become reliant, and resulting in the abandonment of the raised fields (Binford, et al. 1997:242-243; Kolata and Ortloff 1996:196). Hungry populations consequently abandoned urban centers and are thought to have migrated to areas previously unoccupied during Tiwanaku times, and resulting in the eventual collapse of the Tiwanaku State (Binford, et al. 1997:242-243; Kolata and Ortloff 1996:196). Post-collapse communities come to consist of small dispersed settlements whose agriculture production system no longer includes raised-fields (Albarracin-Jordan 1992 cited in, Binford, et al. 1997:246; Kolata 1996; Kolata 1993).

Recent studies by Brenner (2001), Hodell (2001), Leyden (1996), and Whitmore (1996) have suggested that around the time of the Maya Collapse, some portions of the Maya area were experiencing increasingly more arid or dryer conditions. Data supporting such hypotheses have been collected from cenotes and lakes, and include oxygen isotopic analysis, pollen and diatom analyses, and other unspecified environmental indicates conducted by a host of paleoecologists and archaeologists (Bradbury, et al. 1990;

Many scholars take issue with the environmental model, questioning the ability to accurately define climatic events and changes chronologically in the paleoenvironment, and the apparent lack of recognition of climatic and cultural regional diversity and variability across the Maya subarea (Aimers and Hodell 2011;
Furthermore, critics of environmental models for cultural change and collapse argue that such approaches are environmentally deterministic and assume that cultural systems are adaptive, with the ability to adjust to any and all challenges. Further they contend that ecological models are flawed in that they focus on “homeostatic” behavioral systems with no concern for human agency (Brumfiel 1992:559). Others contend that the ecological model is entrenched in a larger Evolutionary model (Brumfiel 1992; Rushforth and Upham 1999). Clark Erickson (1999) contends that attempts to understand societal collapse using environmental models are “neo-environmentally deterministic”, and the result of “simplistic reductionist thinking”. In focusing on behavioral systems as the unit of analysis rather than agents, ecosystem theorists view cultural change as the result of external rather than internal factors, and as such are accused of denying agents a role in determining their own experiences and destinies (Brumfiel 1992:551-552, 559). Erickson (1999) argues that such models view humans as passive and inadaptable to climatic change beyond a presumed level or threshold. He alternatively argues that humans are active and dynamic agents who have proven throughout history to have been able to monitor, mitigate, respond and adapt to environmental changes, even to the point of transforming their environments to deal with such occurrences. He contends that many Andean studies have overlooked or ignored evidence to the contrary, that even during the larger drought, there were periods of excessive rain (Monheim 1963 cited in, Erickson 1999). Erickson also questions what, and how, “neo-environmental deterministic” scholars (Binford, et al. 1997; Kolata 1993; Kolata and Ortloff 1996) classify “normal” in terms of environmental characteristics, thresholds and climatic changes.

Using ethnohistoric and ethnographic data and analogies, Erickson argues that throughout history other seemingly devastating droughts occurred in the Andean region, but they did not result in systemic agricultural or societal collapse or permanent migration. He maintains that Andean peoples have been able to successfully mitigate drought, by reducing agricultural risk; by developing strategies to help alleviate drought such as the diversification of agro-pastoral agricultural production, maintenance of surplus production and freeze-dry storage (Browman 1987, Morlon 1992 cited in Erickson, 1999 #653). Further,
Erickson suggests that historical evidence indicates that raised-field agriculture was more resilient than other scholars have argued, and that the raised-field’s associated canals were able to be manipulated enough so to capture excess water for periods of need. Moreover, while Erickson acknowledges significant drops in water levels, he asserts that while such drops may have negatively impacted hydrology-based agriculture systems, such drops also resulted in the exposure of previously submerged and sediment rich lake bed soils which would be prime for field agriculture. He suggests that with a one meter drop in lake levels, approximately 20,000 hectares of previously unavailable land would be newly available (Erickson 1999).

The cultures that experienced climatic change and collapse, including the Maya were and are environmentally diverse, and like collapse itself climate change and drought were experienced differently in various parts of the world by peoples of varying cultural orientations. Scholars examining pollen evidence from various lakes within the Maya lowlands, including Lakes Peténxil and Eckixil, have suggested that drying episodes over the last 2000 years were not uniformly experienced throughout the Maya subarea, as only minor precipitation changes or no changes at all were tracked (Turner II 1978; Wiseman 1978).

Moreover, not all polities, cities or regions that faced the same degree of drought, collapse(d) (Erickson 1999). Many scholars suggest that the interplay of a region’s environmental circumstances paired with historical or cultural factors and the subsequent response of the culture to such crises, are key to the success or failure of the culture. In other words, the environmental factors made collapse possible, but it was not the ultimate causal factor for collapse (Dahlin 2002:327; Diamond 2000, 2005; Robichaux 2002; Shaw 2003). In fact, with few exceptions (Gill 2000), the environmental literature does not contend that climatic change or drought were the cause of societal collapse, only that it may have caused a crack in the foundation of a given society or exacerbated an already stressful situation.

The fact that polities across the Maya area differentially experienced degrees of abandonment, restructuring and even collapse, while those in the northern Lowlands continued to flourish supports the supposition that simply identifying drought as the sole cause of an all-embracing “Maya collapse” is rather

ii) Catastrophism

Some scholars have attempted to link natural disasters or catastrophic events such as earthquakes, hurricanes, plagues, tornadoes, tsunamis, volcanic eruptions, or severe El Niño events to the collapse of ancient or Prehistoric societies (Bawden and Reycraft 2000; Gill 2000; Hayden and Ryder 1991; Mackie 1961; Moseley 1983, 1999; Moseley and Richardson 1992; Renfrew 1979; Sheets 1980; Van Buren 2001; Williams 1997). Proponents of catastrophism theories who study the Collapse of the Precolumbian Maya argue that a catastrophe or series of natural catastrophic events may have drastically impacted the Classic period Maya way of life, culminating in the Mayas inability to maintain, or rehabilitate natural, political and social resources which were relied upon to sustain Maya society, resulting in the destruction of the society (Adams 1973a; Mackie 1961; Sabloff 1973b; Sanders 1973; Shimkin 1973).

In an early attempt to understand the collapse of Classic Maya society at Benque Viejo, British Honduras (now s Xunantunich in Belize), Mackie (1961) presented data from two excavated structures whose collapse was hypothesized to have been the result of an earthquake event, sometime between A.D. 890-900. He further hypothesizes that this earthquake event may have affected the sites of Uaxactún, and San Jose (Mackie 1961:221-222). Mackie found several rooms in a palace and a residence had collapsed, and contained evidence indicating it was occupied at the time of the collapse. He also identified piles of presumably cleared debris within the central plaza area that under normal circumstances would not have been removed. Mackie further notes that similar collapse debris at Zaculeu, Guatemala was identified by Woodbury and Trik (1954 in,Mackie 1961) as that associated with earthquake activity. Mackie also presents geological data that indicate several fault lines run in close proximity to the site and acknowledges that the area is considered to be geologically unstable (Mackie 1961:219). This hypothesis has never been accepted. Lowe (Lowe 1985:51) has remarked that the limestone foundation of the Maya Lowlands is relatively
unsusceptible to earthquakes, whereas the Guatemalan highlands, where Zaculeu is located, are more prone to earthquakes.

While there has been little discussion or evidence for hurricanes as a catalyst for societal collapse, their undeniable capability of destruction and their prevalence in the Atlantic Ocean and Caribbean Sea have warranted some postulation as to whether hurricanes could have played a role in the Maya collapse. However, as noted by Adams (1973a: 27), both hurricanes and earthquakes are irregular in occurrence, and their effects are limited to a small area. Historically, no society is recorded to have collapsed as a result of either hurricane or earthquake events. Moreover, the pattern of post-collapse population movements towards the coastal regions of the Maya subarea, does not support this premise (Lowe 1985:45).

El Salvador, particularly the Zápotitlan Valley has been subject to regular volcanic activity, including the eruptions of Boquerón, Playón and Loma Caldera, that throughout history resulted in the abandonment of communities and cities within the Zápotitlan Valley (McKee and Sheets 2003:72). The most catastrophic eruption was that of Ilopango before A.D. 470 (Dull, et al. 2001) which covered “tens of thousands of square kilometers” (McKee and Sheets 2003:63) in size, and as far as 100 km from the Volcano (Sheets 1983). Cities and entire regions were forced to flee their homelands for more than 100 years and causing the irreversible disruption of the Valley’s agricultural and economic system, interregional interaction with the Guatemalan Highlands, and resulting in a marked change in material culture (McKee and Sheets 2003:74; Sharer 1974). Prior to Ilopango’s eruption, the area now encompassed by modern day El Salvador was densely occupied and included several cities that were equally populous, and which exhibited great cultural complexity (Sharer 1974). Although not officially noted as such, the Ilopango eruption essentially resulted in a demographic, and apparently a cultural collapse within this region. Gill (2000:376-379) has noted several historical cases in which a volcanic event resulted in a drastic impact to the weather that subsequently lead to subsistence and famine crises. He argues that the sulfuric acid released into the stratosphere by the eruptions is unable to absorb and reflect radiation expelled from the earth, resulting in a cooling of the troposphere. He further contends that the cooling affect often coincides with
drought episodes, with 64 percent of the volcanic eruptions recorded between 1440 and 1840 in tropical Mesoamerica having had an 3month of longer associative drought within two years of eruption (Gill 2000:376-379). While Gill admits that there is no direct or convincing evidence of volcanic action having been responsible for the Classic Maya collapse, he does note that two volcanoes (El Chichón in Chiapas, and Popocatépetl near Mexico City) are thought to have erupted at the beginning of the ninth century, and thus raise interesting implications for this scenario. He also notes that the period coinciding with the Terminal Classic period was marked by an elevated number of eruptions worldwide, and was subsequently followed by an apparent cooling period, which has further implications for the collapse of the northern lowland sites (Gill 2000:378-379).

Volcanic eruptions were experienced by many peoples of Mesoamerica throughout prehistory, and most did not result in societal collapse, rather they resulted in periodic abandonment, as was indicated above for the Zapatitan Valley, and has been noted for Tetimpa (Plunket and Urnuela 2003), Zohapilco (or Tlapacoya) (Niederberger 1976 in,Santley 2003:179), as well as various communities in the Tuxtla Mountains (Santley 2003). While Gill’s volcanic claim poses possible implications for a catastrophic impetus for the Classic period collapse, his argument is based entirely on conjecture and speculation, and has no associative evidence.

The sudden collapse and abandonment of large “Classic” Lillooet villages in modern day Canada between 1000-1200 years B.P., are argued to have coincided with a massive landslide as a result of a rock avalanche than dammed the Fraser River (Hayden and Ryder 1991). The rock avalanche blocked the river, causing massive flooding, disruption of the salmon runs and thus the subsistence and economic trade economy of the Classic Lillooet communities. Despite the fact that the “Classic” Lillooet villagers were hunters-and-gatherers, they maintained an economic trade system that was centrally administered and argued to have been as structured as residential corporate groups (Hayden and Ryder 1991:53). After their collapse, some of the Classic Lillooet communities experienced brief reoccupations, but the communities never regained the same level of complexity again. A recent reexamination of the Lillooet data has
contended that similar cultural transformations were occurring in other areas along the Fraser River and elsewhere along the Pacific Northwest Coast, that were not subject to the rock avalanches hypothesized for the Lillooet area, and thus, it has would appear that the decline was a regional phenomenon (Kuijt 2001:700).

With the aid of models developed out of hazards and disaster theory, and in collaboration with geologists, hydrologists and climatologists, many scholars, particularly Andeanists studying the Moche and Chiribaya societies, have examined the role of severe El Niño events and their related climatic and environmental effects with the rise and collapse of societies (Fagan 1999; Moore 1991; Moseley 1983; Moseley and Richardson 1992; Oliver-Smith 1996; Reycraft 1998; Williams 1997). Brian Fagan (1999) has even suggested that the effects of severe El Niño events were responsible for the collapse of the Moche state, as well as the Classic period Maya and Egypt’s Old Kingdom. While many of these studies have come to employ sophisticated methods for tracing and identifying environmental impacts and changes, and the nature and timing of a given disaster, there has been little advancement in understanding the role and impact of El Niño events on societies (Van Buren 2001:141). Van Buren (2001:142) has suggested that as a consequence of the collaboration with other disciplines, the cultural investigations have become secondary to the environmental ones. Although most scholars would individually refrained from specifically blaming collapse on an El Niño event, suggesting factors like degrees of vulnerability or the human failure to adjust to changing conditions (Moseley 1983:779, 794; 1990) as being suspect, the cumulative result has been the painting of environmental or geological deterministic scenarios.

Ken Dark (1996) has examined the impacts of ecological disaster or catastrophes and the question of such events having resulted in state or interstate collapse. Dark argues against what he calls a “neo-realist” concept of environmental security (or insecurity as the case may be) and uses historical and paleoecological data from around the world to illustrate a lack of collaborative evidence to support the environmental catastrophe hypothesis for collapse.
Such events as the 1628 B.C. Thera volcanic eruption, the 1159 B.C. Hekla eruption and the A.D. 536 eruption of an unnamed volcano that is thought to have led to the “Justinianic Plague” of the A.D. 540’s and evidently affected the entire Byzantine empire and spread to China are examined by Dark (Dark 1996:175). He also comments on a meteorite sighting in the Mediterranean during the Roman period (A.D. 442-3) that was reportedly followed by snow for six months and then severe drought in Jerusalem (Dark 1996:173-174); comet sightings in A.D. 891 which was followed by cold winters in A.D. 893-4; and a drought in the Middle East during the same decade (Dark 1996:173-174). Further, Dark includes discussions regarding contemporary concerns and issues for modern ecological disaster and societal collapse (Dark 1996:169-172). He concludes that while cataclysmic events may have resulted in ecological crisis and environmental change that subsequently caused a decline in agriculture and other resources; plagues; demographic crises, that may have impacted various social, political and economic subsystems; historically environmental disaster has not been the cause of societal or inter-societal collapse (Dark 1996:167, 175). Thus, conversely, such cataclysmic events are unlikely to result in modern day political crisis, state or interstate collapse, as they did not result in societal collapse in antiquity. According to Dark, only Easter Island and similarly small “micro-states” whose small size and limited resources may have “hypothetically” made them more vulnerable to collapse as a result of natural disaster. However, most would argue that the Easter Island Scenario cannot qualify as a natural disaster, as the failure of the agricultural system and population exodus was due to deforestation and soil exhaustion, not a natural disaster (Dark 1996:169).

Tainter (1988a) argues that the harsh conditions resulting from natural catastrophes would not drastically impact complex civilizations to the degree to cause collapse. He perceives complex societies as essentially being by nature intended to contend and manage harsh conditions such as natural disasters, and thus unlikely to be the cause of societal collapse. Several key factors help characterize the human response to a natural disaster: the severity of, and longevity of a catastrophic event; the degree and permanence of the effects of the event; the relative proximity to the source of the natural disaster; the scale of social
complexity (Santley 2003:164), and the degree of vulnerability of the society, and their ability to anticipate, manage and recuperate from the event (Blaikie, et al. 1994:9; Manzanilla 2003:92 Moseley, 1990 #1164; Moore 1991; Van Buren 2001:131; Williams 1997).

It would appear that regardless of the level of complexity, in the wake of an environmental disaster, entire communities, even societies were able to temporarily, and even permanently abandon an area, emigrating to neighboring areas, perhaps becoming integrated into existing communities, but regardless they were able to maintain their culture and level of complexity. But abandonment does not necessarily signal collapse, and in severe cases, abandonment is the most drastic effect of catastrophic events. It would appear that in cases where catastrophism is considered as a causal agent in collapse, it is more likely to have been a secondary cause, resulting in additional hardship or exacerbating existing ones of an already challenged or declining society (Dark 1996; Dunham 1990:580, 583; Oliver-Smith 1996; Tainter 1988a). In regard to the Maya, both Adams (1973a:26-27) and Lowe (1985) are opposed to the catastrophism model, contending that the evidence, or lack thereof, does not sustain such hypotheses. Critiques of catastrophe-based theories of collapse argue that they are environmentally deterministic (Kuijt 2001:692).

iii) Crop Disease

A somewhat obscure model for the Maya collapse was formulated in the late 1970’s that hypothesized that a primary factor in the collapse may have been an epidemic crop disease and or pests that lead to persistent maize crop failures (Brewbaker 1979:101, 113; Bronson 1978:297; Willey and Shimkin 1973). Building on the common perception that the Maya were reliant on a single crop for their dietary intake, that being maize, Bronson (1978:297) speculated that should an uncontrollable blight or pest become rampant in a given region, it may have rendered that area otherwise uninhabitable.

A professor of horticulture and genetics championed this hypothesis, arguing that an epidemic crop disease called the Maize Mosaic Virus (MMV) and that is transmitted via an insect, lead to persistent maize crop failures and may have ultimately been responsible for the collapse of the Petén Maya (Brewbaker
The Maize Mosaic Virus (MMV) is claimed to have been initially blown from the Caribbean to the mainland, and then transmitted by a plant-hopper insect called *Peregrinus maidis*. This disease is prevalent in wet/humid or irrigated areas with intensive and yearround maize crop cultivation (Brewbaker 1979:101, 112-113). Dryer areas with less intense and prolonged dry seasons would not have been as readily affected, and thus the Maya are argued to have migrated to these areas when crop failure was rampant (Brewbaker 1979:101). The insect responsible for the transmission of MMV particularly flourishes on maize or teosinte plants. Moreover, the races of maize and teosinte plants argued to have been grown by the Precolumbian Maya do not, unlike other Caribbean and South American varieties, have a resistance gene to the Maize Mosaic Virus, and were thus highly susceptible to it (Brewbaker 1979: 113). Brewbaker argues that the resulting dwarfism of the maize and teosinte may have been seen by the Maya as a “cruel omen of maize gods,” and caused the collapse and abandonment of maize production altogether (Brewbaker 1979:116). Unfortunately, Brewbaker does not provide any tangible evidence for the role of MMV and its effects on maize cultivation and its role in the collapse of the Maya. Brewbaker’s evidence is completely based on conjecture of ethnographic and biological studies of existing races of maize, and a very basic understanding of the collapse literature at the time of the articles writing. Willey and Shimkin (1973) also made note of the possibility insects and plant diseases may have put added stresses on maize crops, but they do not suggest that they were a primary causal factor in the collapse of the Classic period Maya. This hypothesis was never really considered seriously.

In consideration of the collapse of the Moundville polity, Schoeninger et al. (2000) have noted that in the late 1500s, the genetic diversity of maize diminished, it became less abundant and had more meager returns. They further contend that the decrease in maize strains and diminished productivity made it more susceptible to disease and crop failures. Coinciding with these changes was an increase in human pathologies that suggest the people of Moundville were experiencing dramatic nutritional stress. In an attempt to contend with these issues, the people of the Black Warrior Valley surrounding Moundville expanded their subsistence base to include wild crops. It is hypothesized that they were unable to maintain...
a nutritional balance, and this paired with increases in endemic and epidemic diseases, as well as a
disruption to the trade economy, resulted in the destabilization of the political system. The authors thus
suggest that collapse of the Black Warrior Valley and the Moundville polity was due to internal biological
factors related to a decline in the maize subsistence base (Schoeninger, et al. 2000:75). Unfortunately,
tangible data in support of such a contention was not adequately presented but is said to be forthcoming.

**B. Anthropogenic Models**

Environmental degradation or anthropogenic environmental change occurs when human
intervention or manipulation of the environment is so extreme that it interferes with the natural existence
and maintenance of a given ecosystem. The factors leading to environmental degradation are complex and
are generally linked and accumulative. Models involving Anthropogenic environmental change tend to be
inexplicitly linked to demographic increases, subsistence stress, the carrying capacity of the land, and/or
the “limitedness” of a given environment (Meggers 1954; Paine and Freter 1996; Reuveny and Decker
2000; Willey and Shimkin 1973; Wiseman 1985). Scientific advances in the analyses of archaeological,
phytolith, palynological & Pedological data predominantly obtained from ice and lagoon-bed cores, have
indicated fluctuations in regional vegetation and substantiated claims of anthropogenic change (Bradbury,

i) **Traditional Ecological Model**

Early Ecological Models of societal collapse were comprehensive in scope, however they tended
to focus on agricultural failure as a result of environmental degradation as the key component of collapse.
In such models it is argued that as states evolved, territorial expansion and increasing population pressures
put excess demands on the already taxed traditional agricultural system(s), which were unable to meet the
subsistence needs of the population (Adams 1983; Culbert 1988a; Sanders 1977). Some have argued that
the natural tropical environment was also to blame, as it had limited agricultural potential. Societal changes,
and the presumed limitedness of the environment necessitated the expansion, and intensification of traditional agricultural practices (Culbert 1988a:100; Tainter 1988a, b, 1995).

According to Culbert (1988a:91), the support capacity of traditional milpa farming with long fallow periods had reached its feasible sustainability limits by the onset of the Early Classic period. The expansion of agricultural practices began in the Early Classic period and involved increases in the amount of land cultivated through traditional swidden agriculture, as well as the intensification and expansion of ditched and raised field agriculture, terracing of hillsides, use of irrigation, and the reclamation of bajos.

Some have argued that while the intensification of agricultural practices was initially successful, the population climaxed in the Late Classic period to point of it exceeding the carrying capacity of the land (Adams 1983; Culbert 1988a:99; Paine and Freter 1996; Willey and Shimkin 1973). Coinciding with these new and expanding practices was the reduction of forest in favor of crop land, the use of otherwise inferior crop lands, and in some cases, a reliance on one staple crop (i.e., maize). While there were initial successes, they are argued to have been short-term, the Maya were quickly confronted with decreases in soil fertility, shorter fallow periods and declines in crop yields (Cooke 1931; Culbert 1988a; Jacob 1995; Jacob and Hallmark 1996; Paine and Freter 1996; Sanders 1962, 1963, 1973:362; Santley, et al. 1986; Tinker, et al. 1996; Willey and Shimkin 1973:474-475; Wiseman 1985).

It is further argued that there were significant detrimental long-term effects, as the escalating cultivation and concurrent deforestation had severe ecological impacts and repercussions, including the exposure, leaching, and erosion of once fertile soils, the sedimentation of bajos, wetlands, rivers and lakes, water-logging and salinization of fields, decreased evapotranspiration and reduced precipitation and an increased sensitivity to variations in rainfall, flooding episodes, environmental disasters and short-term climate change, plant diseases, grass invasions and locusts (Brewbaker 1979; Culbert 1988a:97-101; Deevey, et al. 1979; Hansen, et al. 2002; Harrison 1977; Sanders 1973; Shaw 2003; Tinker, et al. 1996). Proponents of this model thus contend that the Maya collapse was elicited by a failure of the agricultural system, initially in the inability of the Maya to sustain the subsistence needs of a growing population, and
then exacerbated by the detrimental environmental effects of the expansion and intensification of their agricultural practices (Harrison 1977; Healy, et al. 1983).

Some scholars have suggested that the intensification of agriculture was able to maintain high productivity yields and was successful, and thus the perceived instability and un-sustainability of the Maya’s subsistence practices, and the role of subsistence failure in the collapse is improbable (Freidel and Scarborough 1982:153; Jones 1979; Lowe 1985:84). Others have suggested that it is improbable that the Maya collapse stemmed from issues with agriculture or subsistence practices, as this was the greatest area of cultural diversification and is one of the few remaining cultural adaptations to still exist today (Pyburn 1996:247).

**ii) Deforestation, Erosion and Sedimentation**

Although this model is linked to population stresses, and the overextension of the land due to subsistence demands, proponents of this theory for collapse do not see the failure of the agricultural system to have been the decisive cause of societal collapse, but instead view the environmental degradation to have been the ultimate cause. The effects of deforestation as a result of massive agroforestry clearing can include surface soil erosion, sedimentation of water sources and the depositional burial of renewable fertile soils (Beach, et al. 2006; Brenner, et al. 1990; Deevey, et al. 1979; Lentz and Hockaday 2009; Mueller, et al. 2010; Paine and Freter 1996; Turner II 2010). Deforestation is generally the result of anthropogenic or human action(s). There are cases in which naturally occurring fires or volcanic eruptions may have resulted in the absence of forests, and have resulted in erosion or leaching of soils, however, no such incidents have been cited as causative factors in the collapse literature. Conversely, deforestation as a result of human intervention and the clearing of forests for agricultural practices has been a topic of much discussion (Binford, et al. 1987; Curtis, et al. 1996; Rice 1996; Shaw 2003). Should secondary issues such as warfare, socio-economic or political decline, class conflict or revolt, or additional external environmental stresses such as natural catastrophe, drought or conversely extreme moisture coincide with these deprived
conditions, the effects could be insurmountable (Hansen, et al. 2002:288; Ricketson and Ricketson 1937:11).

One of the few authentic cases of societal collapse is deforestation as a result of population growth and the limitedness of its Island environment, is that of Easter Island (Bahn and Flenley 1992; Dark 1996:169; Reuveny and Decker 2000). Archaeological, palynological and faunal evidence have corroborated the extremity of ecological degradation as triggered by deforestation (Diamond 2000:394; Flenley 1979; Flenley and King 1984; Steadman, et al. 1994). Initially the clearing of the forest was for agricultural purposes, but as the society progressed, wood was also need for firewood, canoes and a means to aid in the movement of statues. The deforestation was so extreme on Easter Island that virtually every indigenous species of tree became extinct (Diamond 2000:395). The total ecology of the island was thus impacted, for with the loss of the trees soil exhaustion occurred, and both land and sea birds disappeared. The inability to construct canoes resulted in the exhaustion of nearby fish supplies. Both the birds and fish were integral to the subsistence of the islanders (Brander and Taylor 1998; Steadman, et al. 1994). The remote location of Easter Island (their nearest neighbors were 2000 miles away) complicated and exacerbated the situation as the Easter Island inhabitants were unable to diversify their subsistence strategy by tapping into neighboring environments or trade networks. With all sources of protein depleted, starvation ensured and was followed by cannibalism, which lead to warfare and demographic collapse (Diamond 2000:395).

In the case of the Maya, deforestation is argued by some to have been one of the contributing factors to the environmental degradation hypothesis. Similar to the Easter Island scenario, proponents of this theory argue that due to increasing population and subsistence stresses, and mounting demands for wood for fuel and building materials, increasing tracts of land were cleared. Confirmation of the degree of deforestation in the Southern Maya Lowlands by the Late Classic period has been obtained through pollen and sedimentology studies of cores from the Petén, which indicated an increase in maize, grass and weed pollens in conjunction with increases in burned organic materials (Binford, et al. 1987; Curtis, et al. 1998; Deevey, 1990)
et al. 1979; Rice 1996; Rice and Rice 1984). Coinciding decreases in tree pollens were also indicated, and evidence of their return does not occur until after the collapse (Leyden, et al. 1994; Vaughan, et al. 1985; Wiseman 1985). More recent data have indicated that the forest did not truly return until the 1700’s (Rice and Rice 1984).

Recent investigations in the Mirador Basin, Guatemala have found that extensive deforestation in the Late Formative period led to the sedimentation of the wetland marshes, and burial of secondary or renewable soils from around the wetlands which were being garnered and transported to terraced fields in attempt to counteract erosion processes associated with the deforestation (Hansen, 2002 #791). It has been hypothesized that the clearing of forested areas was partly the result of the excess fuel required to create lime plaster or stucco (Hansen 2000; Hansen 1995; Hansen, et al. 2002:290; Schreiner 2001, 2002).

iii) Deforestation, Evapotranspiration and Rainfall

Leslie Shaw (2003) recently presented a new, and very compelling perspective on regional anthropogenic climatic change as spurred by deforestation, and its role in the Maya collapse. Shaw pairs human causation and deforestation with a “feedback” effect - deforestation associated with land clearing for swidden agriculture caused decreased evapotranspiration and reduced precipitation resulting in localized arid or regional drying trends (Shaw 2003:161-164). Shaw’s hypothesis is based on comparative data from recent studies of the effects of modern deforestation in Nigeria, Costa Rica and the Amazon (Ghuman and Lal 1987a, b; Laurance 1998; Shukla, et al. 1990; Walker, et al. 1995), which have found that the removal of forest cover and an increase in crops, grasses and or bare soil lead to a warmer and drier local climate. Researchers found that the average daily temperature in cleared areas was nearly double what had been recorded for undisturbed areas over an extended sixty day period. In these cases, cleared land caused a near cessation of wind speed, a drop in humidity levels, increased temperatures and thus rapid evaporation of any moisture that existed (Ghuman and Lal 1987a, b; Laurance 1998; Shukla, et al. 1990; Walker, et al. 1995).
Decrease evapotranspiration can result in diminished rainfall in some systems when there are excessive pressures on the land due to population and/or land usage pressures. The impact of deforestation and decreases in rainfall and evapotranspiration are in part dependent on local conditions and whether rainfall is highly reliant on evapotranspiration (as is generally the case with interior systems) or whether rainfall is not as reliant on evapotranspiration due to water vapors being dispersed from oceanic systems (such as with coastal or island systems) (Shaw 2003:161-164). P. Bernard Tinker (1996) is noted as having examined deforestation and evapotranspiration in regard to slash and burn or swidden agricultural practices, as practiced by the Precolumbian and Modern Maya. The removal of forest, and the clearing and maintenance of non-forest vegetation or bare land over large land tracts can raise temperatures and decrease evapotranspiration, and potentially result in diminished rainfall in some systems when there are excessive pressures on the land due to population and/or land usage pressures.

In the case of the Precolumbian Maya, Shaw suggests that deforestation as a result of swidden agriculture and its subsequent effects on evapotranspiration may have resulted in anthropogenic climatic change, particularly in the southern Maya lowlands as compared to the northern and coastal Maya lowlands (Shaw 2003:162). She notes that in the northern lowlands, rainfall is less dependent on evapotranspiration due to seasonal patterns of rainfall and what is known as the “double sea breeze effect.” Additionally, the indigenous scrub-vegetation of the northern lowlands is less susceptible to moisture loss. The southern Maya lowlands, however, lack the coastal water vapor dispersal and conversely relies on evapotranspiration to produce adequate rainfall. Moreover, due to the relative closeness and accessibility of the water table in the north, and the fact that agricultural practices there focus on water conservation as opposed to seasonal water surplus as in the south, the northern lowlands may have only been minimally affected by total moisture loss, since it was less reliant on rainfall through evapotranspiration. Thus, in comparison to the southern lowlands, the north suffered disproportionately fewer effects from such anthropogenic climate change (Shaw 2003:162-163).
Grass invasion of agricultural lands was initially proposed by Morley (1946:71-72) to have been the primary cause of the failure of the agricultural system. He argued that forested land was converted into man-made grasslands due to the repetitive cutting and burning of forest for swidden agriculture, and that the Maya were no longer able to cultivate such fields. This in turn caused the collapse of the economic system and gave rise to social, religious and political disturbances, which ultimately culminated in societal collapse. Willey and Shimkin (1973:362) agree that grasses and weeds had the potential to add stresses on maize crops, but they did not concur that grass invasion was a primary causal factor in the collapse of the Classic period Maya.

Other scholars have noted that grass invasion could not have been a prominent factor, as milpás in the Petén tend to regress to shrubby vegetation (Lundell 1937 in Brewbaker 1979:108). The problematic grasses associated with maize agriculture and present today in the Petén are noted by Brewbaker (1979:108) to not have been known in Precolumbian times in the area, and thus he has suggested that grass invasions would not have been a prominent problem and could have only been a contributing factor to the Maya collapse when coupled with other more dramatic factors such as warfare.

**Critiques of Environmentally Based Models**

Both Leyden et al. (1996:30) and Diamond (2000:392), have raised the issue of being able to identify whether or not the climate change being held responsible for a societal collapse is the result of naturally occurring phenomena (external cause), or whether it is the result of human manipulation (anthropogenic change - internal cause). They note that in some cases the effects of human manipulation of the environment and natural environmental change can mimic each other, thus discerning whether natural or anthropogenic environmental changes are the cause of societal collapse may be difficult to discern.

Support for early ecological models was proposed to be evidenced in heightened disease burdens, detrimental changes in diet and nutrition, as a perceived consequence of overpopulation, unsustainable agricultural practices, environmental limitations and the decline and degradation of the environment
(Culbert 1988a; Hammond 1982a:140; Haviland 1967:319; Santley 1990:329; Santley, et al. 1986; Saul 1973:318-319; Schele and Freidel 1990:489; Sharer 1994:344; Webster, et al. 1992; Willey and Shimkin 1973). Some scholars utilized osteological data from the Maya area to support early illustrations of ecological models of the Maya collapse (Haviland 1967:319; Santley 1990; Santley, et al. 1986; Saul 1973:318-319). Proponents of these models relied heavily on assumptions about disease burdens, diet and nutrition, and they made broad geographical generalizations in their assessments, asserting that the perceived ecological and health stresses were experienced throughout the Maya Lowlands. However, in a review of early osteological data and ecologically based discussions of the Maya collapse, paired with more recent isotopic data, Wright & White (1996) found that the existing paleopathological, dietary and health related data obtained directly from bioarchaeological analysis of human remains did not corroborate the claims made in support of the early ecological models. Wright and White were unable to substantiate any diachronic patterning of health or nutritional deterioration over time, and have noted that in general, bioanthropologists are currently unable to make indisputable nutritional assessments from skeletal materials. Moreover, they note that it is difficult to assess acute health changes in skeletal data, as sudden shifts in health are less easily detectable, if at all. Moreover, some diseases do not leave osteological evidence (Wright and White 1996:154, 177-180). They were, however, able to detect changes in subsistence patterns (Wright and White 1996:171-174, 180) Wright and White also found that the degree of deteriorating health and level of disease of the Terminal Classic Maya was not comparatively greater than that of other societies (Wright 1997b, c; Wright and White 1996:Table I, II, 183). Further, in addressing the imagined broad geographical evaluation of health in the Terminal Classic period across the Maya Lowlands, the paleopathological, dietary and nutritional data was assessed in light environmental data and examined for associative patterns. In their testing, Wright and White detected regional and site-specific trends in nutrition and dietary health relative to different environmental niches and were unable to substantiate the contention that the Late Classic Maya were subject to a pan-regional and, or culture wide health crisis (Wright and White 1996:174-177, 179, 186).
Structuring their investigation on an earlier North American study correlating maize production and the diet of archaeological deer samples by Cormie & Schwarcz (1994), Emery, Wright and Schwarz (2000) address the hypothesis that the Classic period Maya’s intensifying agricultural practices were unsustainable and contributing to anthropogenic environmental change. Through the study of deer bone collagen and stable carbon isotopes, Emery et al. were able to diachronically document impacts/changes to, and or the solidity of the environment through relative changes in ratios of C3 and C4 plants as seen through the diet of the deer. Relative changes in the consumption of C4 plants (i.e., maize) over C3 plants (i.e., leafy, nonagricultural plants) is understood to be indicative of changes in staple crops and land-use patterns, including expanding crops and clearing of the forests, and the resulting availability or expansion of these types of plants (Emery, et al. 2000:537-538). Emery et al.’s investigation essentially was able to extrapolate these data and extend our knowledge of human diet and agricultural practices, through isotopic analysis of deer bone from the Petexbatún region of the Maya Lowlands and the composition of deer diets (Emery, et al. 2000:537). Their analysis found that while the deer’s diet had both C3 and C4 plant types present, the C4 plants (i.e., maize) were seen as statistically insignificant in terms of their relative dietary contribution over time, and across the Petexbatún landscape (Emery, et al. 2000:537-545). Emery et al. thus concluded that there was no evidence to support the hypothesis that Maya agricultural practices were detrimentally impacting the forest in favor of expanding maize agricultural fields. Conversely, they note that the evidence indicates that there was no evidence to suggest that there was a decrease in relative field to forest ratios over time, and that the data indicate relative stability in forest to maize crop ratios across the Petexbatún landscape and over time (Emery, et al. 2000: 545-546).

Lowe (1985:48-49) is in opposition to the environmental degradation hypothesis. He suggests that if the Maya had impacted the environment so drastically as to cause the collapse, the so-called Maya “Core area” would have been impacted the most dramatically due to the environment and number of sites in the region, and would have collapsed first. Alternatively, he notes that Copan, located within an alluvial river
valley and more likely to have thus been able to sustain its food resource demands collapsed first (Lowe 1985:187-190).

II) Sociopolitical Turmoil and Conflict Models

The political history of many Maya cities has in recent years come to light with the discovery and decipherment of Maya inscriptions. Many of these inscriptions recount the feats of local rulers, and interpolity and intersite or intraregional conflict (Demarest 1992; Fash 1994; Marcus 1995). These hieroglyphic data, paired with excavations have indicated that some sites, and regions experienced ongoing tensions and clashes with neighbors (Demarest and Houston 1989, 1990; Demarest, et al. 1992; Demarest, Inomata, et al. 1991).

A. Invasion

The invasion hypothesis, wherein an intrusion of non-Classic peoples within the Central Petén region during the 9th century A.D. was said to have occurred, was most staunchly advocated in the 1960s and early 1970s (Adams 1971, 1973b; Sabloff 1971, 1973a; Sabloff and Willey 1967). Although he does not outright condemn them for the Maya collapse, Thompson (1966) was the first to proposed there had been a 9th century invasion of non-Maya peoples into the Petén. Thompson argued that a group of peoples from the Tabasco region he identified as Putun or Chontol, invaded the central Maya peoples, and conquered such sites of Altar de Sacrificios and Seibal. He noted the introduction of foreign or Mexican “exotic religious developments,” but rather than argue for invasion, he argues they were introduced through diffusion (Thompson 1966:100-109).

The Invasion hypothesis was further “supported” by intrusive ceramic and iconographic evidence within the Usumacinta-Pasión river drainages, most specifically the identification of intrusive fine paste ceramics, and “foreign” architectural and artistic influences thought to have derived from the northern Yucatán and Gulf coast regions (Adams 1971, 1973b; Graham 1973; Pollock 1936; Proskouriakoff 1950; Smith 1958). This theory was championed by Sabloff and Willey (Sabloff and Willey 1967), who
hypothesized that a group of Mexican, or Mexicanized peoples, inva

A.D. 810, a west and north intrusion via the Usumacinta and Pasión river systems, settling at Seibal and from which the rest of the Petén was equally invaded. Additional ceramic and architectural evidence from Altar de Sacrificios, (Adams 1964; Willey and Smith 1963), Yaxchilan (Proskouriakoff 1964:196-199; Proskouriakoff and Thompson 1947) and Palenque and its surrounding area (Rands 1967) was indicated to support the invasion by “non-Classici” Maya peoples. As to whom the invaders were, Sabloff and Willey proposed that they may have been displaced Central Mexicans who had initially settled in the Gulf Coast region as a result of unrest in Central Mexico, specifically noting concurrent upheavals at Tula (Sabloff 1973a; Sabloff and Willey 1967:320, 326). Evidently, at the 1970 collapse seminar, the majority of scholars were of the opinion that invasion was the cause of the Maya collapse (Culbert 1988a:79); however, by the time the collapse volume was published, Willey and his coauthor Demitri B. Shimkin (Willey and Shimkin 1973) had refocused their assessment of the collapse to their famous multi-causal theory, sociopolitical disintegration theory (Culbert 1988a:79).

Many others have similarly hypothesized that an external invasion occurred and had a role in the Maya collapse. Similar to Sabloff and Willey, Vogt (1964) argued that the invaders were from Central Mexico. Cowgill on the other hand argued (1964:155) that the invasions may have been by Mexicanized Maya from Chichén Itzá and that the incursions occurred over several years, rather than in one event. He argued that the depopulation of central Petén may in part have been a response to the invasions, but also may have been forced resettlement imposed by Chichén Itzá and its Mexicanized military, similar in essence to the Inca militaristically enforced resettling of its subjects. Adams (Adams 1971, 1973a, b; 1966) stylistically linked the non-classic Maya fine paste ceramics seen across the Usumacinta-Pasión region to those from Panuco, and suggested that the invasion was carried out through several incursions. Also using architectural, ceramic and iconographic connections, others hypothesized a similar Gulf Coast origin for the intruders, specifically the Petun/Chontal peoples, who were thought to have been expanding their
territories around A.D. 800 (Adams 1983; Adams and Smith 1977; Sabloff and Willey 1967). Coe (1966) on the other hand did not opposed the idea of an invasion, recognizing the possibility of an invasion, but contended that the invasion would only have been successful after the collapse had begun.

Following Erasmus (1965:265) Sabloff and Willey saw Maya society operating as theocratic Chiefdoms, who were vulnerable to more powerful “state societies” (Sabloff and Willey 1967:318). The invasion is argued to have destabilized the Classic period socio-economic and political system, causing systemic crisis that lead to collapse within approximately 100 years of the initial offensive (Sabloff and Willey 1967:312, 314). It has also been hypothesized that the invaders may have been successful partly because of their superior weaponry (dart and atlatl), they had different rules of war, and they may have had an established knowledge of the Maya area because of earlier merchant or militaristic visits by peoples from Teotihuacan. The invasion hypothesis represents one of the first externally focused theories for the collapse, as traditionally scholars had concentrated on internally focused theories (Sabloff and Willey 1967:315).

As to where the Maya and their invaders went, scholars offered few conclusions. Sabloff and Willey suggested that they may have been killed outright, or starved to death as a result of the disruption and chaos of intrusion. Alternatively, the inability of the intruders to sustain themselves and their subjects in a new and different environment, and without a formidable understanding of Maya agricultural practices may have led to their demise and abandonment. They also noted that the Maya and their conquerors may have migrated towards the Yucatán, where they were more successfully integrated into society (Sabloff and Willey 1967:327-328).

Sabloff and Willey acknowledged that there is little occupational evidence to support this hypothesis, and that intrusion or warfare would not have been the root cause of collapse, but that it may be revealed through an understanding of the chains of events and the manner of their links (1967:319). Lowe (1985:66-67) insisted that the invasion hypothesis was lacking more than occupational data, suggesting such an event would have had clear indications of violence, most prominently the weapons, and the
destruction of sites. Culbert (1988a:79) was opposed to the invasion hypothesis, arguing that Maya society declines too quickly and too early for the invasion to have been the key factor in the collapse. Further, he notes that this hypothesis is not reflected throughout the Maya lowlands, and that the evidence used to support the invasion hypothesis is completely absent at most sites and in many areas.

Using dated monuments and a form of mathematic regression analysis called Trend Surface Analysis to statistically measure or “map” trends and variations in the data, Frederick Bove (1981) tested the invasion hypothesis and found that it did not support this hypothesis. Similarly, John Lowe (Lowe 1985) conducted a mathematical systems simulation of the collapse to test the patterning of site collapse across the lowlands and like Bove also found a southwest to northeast progression of site collapse that contradicts the invasion hypothesis.

Ironically, the same data that was used to support this hypothesis is now indicating a differing timeline and orientation. The iconographic styles known as “Facies A,” and “Facies B” associated with Seibal and once thought to represent “foreign,” “Mexican” or “Putun” peoples (Graham 1973, 1990), are now acknowledged as being Classic Maya (Schele and Mathews 1998:179-184; Stuart 1993; Tourtellot and González 2004:64-71). It has been suggested that these styles may reflect a conscious attempt by the Seibal rulers to legitimate their leadership by affiliating themselves with distant Maya peoples (Demarest 2004:117), and may even represent the spread of pan-Maya stylistic traditions (Chase and Chase 1985; Demarest 2004:117; Ringle, et al. 1998).

Initial corroboration of the invasion hypothesis with burial data was found in differentiating mortuary practices, which were thought to indicate invaders from inhabitants, however when these data were considered alongside burial vessel seriation, acculturation instead of invasion was indicated (Tourtellot 1990:139-140). Similarly, architectural with structural designs previously unknown to Seibal until the Terminal Classic and previously suggested to represent a foreign installation, have since been recognized as constructions not uncommon to Late Classic Maya elsewhere in the Maya area (Pollock 1965; Tourtellot and González 2004:71)
Chemical characterization studies have found that the fine paste ceramics once thought to have been foreign imports associated with a “Mexican” or “Putun” invasion at Piedras Negras, Siebal and Altar de Sacrificios differ from one another, and are earlier than once thought (Demarest 2004:113; Foias 1992:272-276; Rands 1973). Ceramics from the Pasión Region have been chemically determined to have been manufactured within this region (Foias 2004; Foias and Bishop 1997), although scholars recognize that the style and technology may reflect a Lower Usumacinta region influence where there is a long history of fine paste ceramic objects (Bishop 1994; Foias and Bishop 1997). Moreover, Rands (1973) and Demarest (2004:113) believe that the Piedras Negras materials date to an earlier time period. Demarest asserts that their transmission coincides with the height of long-distance trade in the region during the Eighth century or Late Classic period (Tepeu 2 phase A.D. 760-830), when other fine paste ceramics are noted as having been imported from the area around Palenque (Foias 1996; Foias and Bishop 1997).

B. Militarism and Warfare

The theory that increased militarism or warfare had a role in the Classic period collapse has received a great deal of popular attention, especially since the 1980s and the archaeological investigation of the Petexbatun region of Guatemala by Arthur Demarest and colleagues (Demarest 1993, 1994, 1996c, 1997, 2004; Demarest, et al. 1997; Demarest, et al. 2004b; Inomata 1997, 2003; O'Mansky and Dunning 2004; Palka 1995; Tourtellot and González 2004). However, the scale of militarism and warfare evident in the Petexbatún region is somewhat of an anomaly. And while warfare seems to have had a most definite role, if not the cause of the “collapse” in many of the cities within this region, most scholars who support a militarism/warfare hypothesis do so with the understanding that it was not the sole cause of the collapse (Cowgill 1979:51, 61; Lowe 1985:70). This is in part due to the fact that the causes and motives of warfare itself are poorly understood.

Reasons postulated by scholars as to why warfare was enacted, and what was to gain, include: attempts to acquire resources in light of escalating population densities and subsistence stress (Culbert 1988a; Sharer 1994); retribution for “predatory tribute demands” (Demarest 1996b, 1997; 2004:102);
attempts to gain political authority and regional supremacy (Andrews and Robles Castellanos 1985; Chase and Chase 1998; Cowgill 1979; Demarest 1997; Martin and Grube 1995; Rands 1973:359); and, legitimization of political authority (Hassig 1992; Schele and Freidel 1990). Some have hypothesized that the demographic crisis seen in the Late Classic period paired with mounting elite rivalry and hostility resulted in full blown acts of warfare that become so systemic that it caused the demise of the Classic period Maya (Hamblin and Pitcher 1980; Webster 1976, 1977).

Proponents of the warfare hypothesis differ to some degree on the particulars of its role and its associative factors. Early views contended that the Classic period Maya’s warfare appetite was militaristically challenged (Willey and Shimkin 1973:479), while others speculated on the potential for military. Most agree that during the span of the Classic period warfare increased in regularity, beginning perhaps as early as the sixth century (Chase and Chase 1989, 1998; Chase, et al. 1991; Chase and Chase 2002; 2004:20; Culbert 1988a; Demarest and Fahsen 2003; Schele and Miller 1986:209-210; Webster 1977, 1993, 2000), becoming increasingly widespread over the course of the Classic period and endemic by the Terminal Classic period (Adams and Smith 1977; Cowgill 1979:51; Lowe 1985; Rice, et al. 2004:8; Sabloff and Willey 1967). Based upon the presence of fortifications at Becan David Webster is noted as having postulated that the Maya had an institutionalized military by the Late Classic period (endnote in, Willey and Shimkin 1973:500).

Some early scholars disagreed with the warfare hypothesis, arguing that militaristic imagery does not increase over the course of the Classic period (Rands 1952), nor does the archaeological data support the premise that the Maya were reliant on a standing army (Willey and Shimkin 1973:480). Lowe (1985:69) has also suggested that there is little in the way of evidence for catastrophic warfare of the type to induce societal collapse, including battle fields, mass graves, increases in weaponry. However, advances in hieroglyphic decipherment, the discovery of more monuments and continuing investigations into the collapse have altered this early view point, and the degree of militarism practiced by the Maya has definitely come to light. The Maya are no longer seen as a non-violent civilization (Webster 2000). A great deal of

Cowgill (1979:61) has argued against external invasion and overpopulation/subsistence stress theories for the collapse, and yet, his warfare hypothesis has a degree of both elements in it. He argues that the intensification of warfare in the Late Classic was spurred in response to Teotihuacán and Monté Alban’s dwindling influence in the area and the resultant upsurge in competition between settlements. The ensuing increases in militarism and competitive strategy are further argued by Cowgill to have likely stimulated increases in population and the intensification of subsistence practices, possibly to a detrimental scale. Moreover, the demands of a state regularly engaged in warfare likely drew its warriors from those engaged in other professions, including subsistence farmers, thus interrupting or devastating agricultural cycles and resulting in food shortages.

Additional evidence for warfare has been documented in the construction of wall and palisade fortifications at residual centers and refuges throughout the Petexbatun region (Demarest, et al. 1997; Inomata 1995, 1997; O'Mansky and Dunning 2004; Palka 1995, 1997). Defensive works or fortifications, some hastily constructed, have also been identified at Terminal Classic occupied sites outside of the Petexbatun, at Becan (Webster 1976); Chunchucmil (Dahlin 2000), Zacpetén (Rice, et al. 1998), Yaxuná (Suhler, et al. 2004:471-2, 483), and have obvious implications for warfare. Changes in weaponry use, such as the use of the atlatl as seen in Maya art (Hassig 1992:178), and a preponderance of weaponry production, such as stemmed blades at production locales such as Colha, are also seen as evidence of dramatic warfare intensification (Barret and Scherer 2005:104-105; M. A. Masson 2001b:42)
Evidence of increased violence associated with warfare has been identified in Maya art and architecture, and in paleopathological studies. Increases in human sacrifice thought to be associated with acts of warfare and conquest have also been documented in the presence of “skull platforms” at such sites as Copán and Chichén Itzá, and other less elaborate, and unrecognized structures likely occur at other sites (Chase and Chase 2004:20-21). As for Lowe’s (1985:69) commentary on their being no mass graves or battle fields to evidence warfare, the identification of the “skull pit” at Colha would exemplify a form of mass grave (Massey 1989, 1994; Shirley B. Mock 1994a:222; Steele, et al. 1980). The skull-pit contained 20 adults and 10 children, who are believed to have been the elite members of the Colha polity. Many of the skulls exhibited cut marks associated with their decapitation and flaying. It is hypothesized that these individuals were sacrificed as a result of internal rebellion, warfare and, or an overthrow of the ruling elite, as the site was razed and abandoned around the time of the internment. The subsequent reoccupation of the site was by individuals whose material culture and behavioral traditions differ drastically from those previously there (Hester 1985a:16; Shirley B. Mock 1994a:222; Valdez and Adams 1982). Previously reported data and speculated “collapse” hypotheses for the site were recently (re)evaluated by Barret and Scherer (2005). The authors revealed new skeletal evidence for an additional 25 individuals whose deaths were simultaneous and thought to have been the result of battle or a related execution or sacrifice episode. They have argued that the skull-pits, the plethora of stemmed blades (the perceived warfare weapon of choice) and the newly crowded settlement plan support the conclusion that warfare was an antecedent to the site’s abandonment and “collapse” (Barret and Scherer 2005:114). Similar situations have been reported at Yaxuná, where 11 individuals believed to have been executed in connection with an act of warfare and interred in the North Acropolis (Suhler and Freidel 1998:34).

As for Lowe’s battlefield critique, I would argue that the environment that the Maya lived in does not allow for the easy identification or preservation of such an otherwise obscure event, and that it would seem that perhaps Lowe had a particular type of warfare (battlefield) in mind that does not seem apparent in the case of the Maya.
C. Class Conflict - Internal Revolution/Revolt - Overextension of Elite

Sir Eric Thompson was the first to suggest that class conflict or commoner revolt was the cause of the Maya collapse (1931, 1954; :305). In the 1950’s, when archaeology in the Maya area was still somewhat in its infancy, revolt was seen as one of the more plausible causes for the collapse (Rice, et al. 2004:3). As Maya archaeological inquiry expanded, evidence of internal conflicts and revolts gave added support to the class conflict hypothesis, as disparities between the elite and commoners and the demands being forced upon the commoners became more apparent (Erasmus 1968; Hamblin and Pitcher 1980; Sabloff and Willey 1967:317; Thompson 1966:82-84). Many other earlier scholars attempted to follow up on Thompson’s hypothesis (Erasmus 1965; Kaplan 1963; Kidder 1950; Morley and Brainerd 1956; Sharer 1977 Hamblin, 1980 #537), however most of those who have supported the revolt hypothesis in theory, did so with insubstantial or no sustaining data (Lowe 1982:643; 1985:71).

Thompson’s (1954, 1966 #180:82-84; 1970) theory argued that the Maya collapse was a product of the overpopulation and overextension of the elite class. In attempt to legitimize and exemplify their positions and authority, they made excessive demands on the Maya commoner class, and engaged in conspicuous ideological acts and displays, essentially widening the gap between the classes. In response to the excessive land, labor and tribute burdens and subsequent stresses placed upon them, the decreasing access to goods and products, and in recognition of their increasing subordinate position, the commoners are suggested to have risen up in revolt. Thompson further adds that the Maya collapse culminated out of similar such revolts and overthrowing of the ruling elites and collapses elsewhere within Classic period Mesoamerica.

Some scholars have argued that the increases of burden by the elite onto the commoner classes was in recognition of the growing instabilities and stresses elsewhere within the Maya socio-economic political system, and the perceived need by the Maya elite or ruling classes to reassert their power and control. The elites’ attempts to sustain their positions of control through symbolic gestures of their power likely required the channeling of labor and other resources to meet these ends. These acts are argued to have taken people
and energy away from other necessities such as food and good production. Their actions appear to have had a cyclical effect, as the extraordinary demands and increasing displays and additional stresses on the peasants resulted in the mounting agitation, to which the elites responded with additional demands and displays (Dunham 1990; Hamblin and Pitcher 1980; Hosler, et al. 1977; Sharer 1977). Peter Dunham (1990:590) has argued that increases in stelae erection, and their erection of peripheral Maya communities during the Late-Terminal Classic period was an attempt by the ruling classes to maintain and justify the authority of an individual or group, and control over the people, land and resources. Willey (1986a) and Mathews & Willey (1991) have argued that increases in population, and a disproportionate increase in the elite population with these increases with merchants gaining elevated elite status in during the Late Classic, paired with their excessive demands resulted in class conflicts and eventual collapse.

Hamblin and Pritcher’s (1980) treatment of peasant revolt and the Maya collapse is one of the few models attempted using data, as problematic as it is. Using what they argue to be qualitative and quantitative data (more like assumed data) from monuments, the authors present a mathematical model of class conflict. Hamblin and Pritcher use the destruction of elites and rulers in iconographic imagery (qualitative data) and dating evidence from a handful of sites. In my opinion, there are several problems with both the quantitative and qualitative aspects of this model. First, the qualitative data, noted as the destruction of elite faces in iconographic imagery as the result of rebellion action; and the proposition that the non-elite peoples represented in imagery generally understood to be battle related scenes, were potential revolt leaders - are highly speculative and not testable. Second, the quantitative data they use is incomplete, incorrect and based on an assumption. Several sites in their database are indicated more than once, using different names, and one site, Cerro de las Mesas is a non-Maya site. Lowe also notes a problem with Chichén Itzá’s reported date (Lowe 1982:643). Further, the basis of Hamblin and Pritcher’s model rests on dates taken from monuments that they interpret to be indications of site occupancy intervals. These data do not necessarily reflect the findings of other archaeological data, or the fact that many sites continued to be occupied without erecting carved stelae, or any stelae at all, and thus these sites are not represented (Hamblin and Pitcher
1980:262). Thirdly, the perception that the cessation, or the “waxing and waning” of monument erection at a given site indicates an attempted rebellion (Hamblin and Pitcher 1980:254), is a remarkable assumption, given that at this date no supplemental evidence for such a speculation exists, nor can it be tested. And finally, I fail to see how chronological data gleaned from a monument and transformed into a mathematical equation can be used to indicate a complex behavior such as rebellion. Lowe (Lowe 1982:644) raises two other important points: does the failure or collapse of the stela cult reflect rebellion and thus collapse, and should the northern lowland sites be included within this treatment of what is more specifically a lowland collapse?

Based on Wallace’s (1956, 1970) Revitalization theory, and using Tikal as his reference point, Sharer (1977:547) contends that the ultimate cause of the Classic period collapse was a failed attempt by the non-elite members of society to instigate a revitalization movement, or essentially a revolt. This movement was forged out of a series of proceeding hardships and stresses, including increasing demands of elites and their associative burdens on the commoners, a break in belief systems between the elites and commoners, and increasing nutrition and health problems. In an attempt to displace any rising insurrections, the elites attempted to consolidate their power and prestige, by reinforcing social and ideological structures, and increasing ceremonial activities. However, hardships are argued to have continued, and when the gods did not intervene, the peoples revolted. Sharer claims that revolts were not new to the Maya, as an earlier successful revitalization movement was instigated in the Early Classic, however by the elites.

In his attempt to ascertain the potential cause of the sudden demise and abandonment of “Classic” Benque Viejo (Xunantunich), Mackie (Mackie 1961:221-222) speculated that an already disintegrating authority may have been further challenged should such an earthquake event be understood by the masses to be divine intervention. In such a case, the elites may no longer have been able to command authority, and the disillusioned of the masses might have spread to the periphery, eventually culminating in social upheaval in wake of the earthquake. In support for this scenario, Mackie suggests that the fact the city was
not rebuilt after the hypothesize earthquake event, indicates the subjected populous refused to rebuild the city.

Evidence from the native chronicles (Roys 1933:177) as well as Landa’s ethnohistoric accounts (Tozzer 1941:177-178) has been used by Andrews (1990: 262) to illustrate that historically the Maya engaged in rebellions or revolts as a reaction to political crises and class conflict, as oral traditions are recorded as having been the case in the collapse of Chichén Itzá. In one scenario espoused by Landa, there was an uprising against the Itzá rulers when a return to partisan rulership was invoked in the absence of one of the rulers. During the revolt the implicated rulers were killed, and in the turmoil that ensued society declined, and the land was abandoned (Andrews 1990:262; Tozzer 1941:177-178). The books of *Chil’am Bal’am* recount a different scenario, that of the Cocom ruler of Mayapán and his role in the conquering of Chichén Itzá. It is recorded that Mayapán’s ruler interfered in the marriage of the ruler of Izamal, by inciting the passions of the Chichén ruler with a flower and causing him to kidnap the Izamal king’s bride. Izamal, already upset with Chichén’s demands for sacrificial victims, rose up in revolt with the assistance of other subjugated Yucatecán cities, and allies of Izamal, against Chichén Itzá. As a result of Chichén having been conquered, Mayapán was able to be the new dominating force within Yucatán (Andrews 1990: 262; Roys 1933:177).

Willey (1956) has disputed the class conflict or revolt model for collapse, suggesting that it accounts for the disappearance of the elite members of society, but it does not effectively account for the disappearance of the commoners as well. Further, he adds that in considering historical cases of class conflict, there have been no circumstances where a class revolt resulted in vast regional depopulation. Culbert (1973c:99) also opposes the social upheaval argument, suggesting that the enormity of population loss associated with the collapse was so dramatic that causes relating to social malfunctions cannot effectively address the larger issue of societal collapse.
Lowe (Lowe 1982; 1985:71-72, 106) suggests that while rebellion may cause a degeneration or momentary social decline, it does not result in massive demographic collapse and regional abandonment without recovery. Moreover, he contends that there is a lack of tangible data to support the class rebellion or revolt model, including evidence of violence.

I would argue that should rebellion be effective enough to cause societal degeneration or retardation, it may result in mass migration, and thus widespread depopulation. The concurrence of the social upheaval and the removal of a governing authority and their associative infrastructure, paired with demographic decline as a result of population movement, could indeed cause great disruption to the larger societal system, resulting in its ultimate collapse. Further, population movements are a form of upheaval, as the people were essentially “voting” or rebelling with their feet. Unfortunately, the fact remains that material evidence for class conflict and revolt is currently lacking.

**III) Culture-Historical Causal Explanations:**

**A. Population Pressure**

Population pressure has been noted by many scholars as an impetus for societal or cultural development and change, as well as an impetus for agricultural development, expansion and intensification, but also as one of the key agents in societal collapse (Culbert 1977; Fash 1994:188). Proponents for the role of population pressure or overpopulation in the collapse of the Classic period Maya have argued that increases in population, and population density dramatically climaxed in the Late Classic period, especially with the expansion of large city centers, putting mounting stress on different organizational and resource components of society.

Overpopulation greatly impacts the environment, and correspondingly, the carrying capacity of the land. Subsistence demands increase with increases in population, resulting in the expansion and intensification of agriculture (see ecological models above). Slash and burn agriculture, believed to be the dominant form of agriculture practiced by the Precolumbian Maya, requires large tracts of land which are

Sabloff and Willey (1967:316) concede that the environment of the Petén and the Maya lowlands were not necessarily optimal for agriculture, but note it was good enough for the rise and maintenance of Maya civilization. They argued that the precarious balance that the Maya were attempting to maintain between the environment and the ever-increasing population may have been seriously compromised if not destroyed in light of an historical event such as invasion.

Evidence for stress caused by overpopulation has been argued to be found in the skeletal remains from Tikal, Barton Ramie, Seibal, Altar de Sacrificios, Lubaantun, and Chichén Itzá, where malnutrition is indicated by a decrease in stature during the Late Classic (A.D. 550-900) at Tikal and Barton Ramie (Haviland 1967:319; Willey, et al. 1965:538), and by the presence of anemia, and linear dental enamel hypoplasia at Altar de Sacrificios and Seibal (Saul 1973:318-319). Saul (1972; 1973:311-321) also noted other diet or nutritional related pathologies including; spongy or porotic hyperostosis crania, pellagra (unbalanced diet) and vitamin “C” deficiencies (scurvy). These pathologies have been correlated with a decline in nutrition due to an inability to sustain the required agricultural yields of a growing population (Montagu, 1951:436-437, in Haviland 1967:319). Disruptions in childhood growth were also indicated by overall stature and poor dental development in children (hypoplasia). Hypoplasia has been observed at Altar.
de Sacrificios (Saul 1972), Copán (Storey 1992; Whittington 1991), Lamanai (White 1986), and within the Pasion region (Wright 1994) among other sites. However, there was no detectable diachronic increase in these growth disruptions, nor was there any secure indication that population pressures further impacted childhood development (Wright and White 1996:164, 166). Additional evidence for malnutrition and the related effects of overpopulation on subsistence is likely unobservable due to the inability to assess health pathologies not present in archaeological bone (Saul 1973:309). New data on these diseases and in examining the frequencies and relative diachronic and comparative data from a global perspective, there is little evidence to support the supposition that nutritional diseases could have been the key causal agent to the Maya collapse (Wright and White 1996).

B. Paleodemography, Health and Disease

Despite the fact that the Maya collapse had obvious demographic causes and or repercussions, relatively little attention has been afforded to the role of declining health and demography among the Precolumbian Maya. Early proponents of ecological models, have however, resourcefully, and yet perhaps erroneously, blended discussions of the limitations of the ecology of the lowlands and environmental degradation, with speculations of overpopulation, the unsustainability of Maya agricultural practices, and the effects of these factors on paleodiet, nutritional stress and disease (Adams 1973a; Culbert 1988a; Hammond 1982a:140; Haviland 1967:319; Santley 1990:329; Santley, et al. 1986; Saul 1973:318-319; Schele and Freidel 1990:489; Sharer 1994:344; Webster, et al. 1992; Willey and Shimkin 1973; Wright and White 1996:147-149). However, in these discussions, health related issues are treated more as secondary agents, rather than a causal impetus for collapse.

Herbert Spinden (1928) was the first to really consider diseases, on an epidemic scale, as an impetus for the Maya collapse. However, this proposition was purely conjecture, as no skeletal analysis or data was incorporated into his work. Since Spinden’s initial speculations, the role of infectious disease has received very little attention. In an early attempt to make light of its cursory treatment, Shimkin (1973:279-284) discusses many debilitating diseases, including most prominently Chagas’ disease, as well as chronic
yellow fever, parasitic infections, and the pathogens that cause severe and chronic diarrhea. Unfortunately, his sources were either ethnographic and, or ethnohistorical and focus on diseases which are not detectable in archaeological bone. Both syphilis and yaws are detectable archaeologically as they cause a thickening or inflammation of bone, and have regular occurrence patterns (Saul 1973:321), and have been identified within Maya skeletal samples. Infectious disease can be detected in bone through the identification of treponemal infections, as it was at Altar de Sacrificios and Seibal (Saul 1972, 1973), and in the identification of periostitis. However, periostitis is associated with several infections, and is not able to be associated with specific infections (Wright and White 1996:167). Periostitis have been identified in human remains from Copán (Whittington 1989, 1991), and in the Pasión region (Saul 1972; Wright 1994).

Hooton (1940), was the earliest scholar to have speculated on the role of nutritional stress and disease and its role in the Maya collapse, after having conducted osteological examination of the human remains from the Cenoté of Sacrifice at Chichén Itzá. A number of years later, Haviland (1967) and Saul (1973) again raised the issue of nutritional pathology and the collapse with their ground-breaking osteological examinations of the human remains from several prominent Maya sites.

Both Haviland (1967) and Saul (1972, 1973) are considered pioneers in the examination of health and related stresses, however, both scholars focused primarily on nutritional pathology and its larger implications for general health stress and the collapse. Saul’s (1972) early osteological study of the skeletal material from Altar de Sacrificios, however, found a decrease in the mean age of death in the Late Classic period, raising speculations as to the potential of elevated mortality rates around the time of the collapse (Santley, et al. 1986; Willey and Shimkin 1973). Nonetheless, Wright and White have since observed that these data are statistically insignificant and note that recent scholarly opinion argues that reconstructing mortality rates from mean ages of death from cemetery data is problematic due to sampling issues related to preservation, among other reconstruction issues (Wright and Schwarcz 1996:156). Some scholars have speculated on a reduction in fertility rates in the Classic period, and its role in demographic decline, specifically at the site of Copan (Whittington 1991), however, a reexamination of the data found that it was
impossible to reliably reconstruct fertility or mortality solely from osteological analyses (Paine, 1992 in, Wright and White 1996:156-157).

Modern Maya ethnographic demographic information has also been extrapolated to infer prehistoric death and birth rates, and possible issues with demographic health around the time of the Maya collapse. An unbalanced sex ratio, with a shortage of reproductive females, has been indicated in modern Maya populations, and is suggested to possibly indicate a long-standing trend that may have impacted the prehistoric population as well. This unbalanced ratio may have in part been the result of what the authors called “passive female infanticide,” whereby female infants were killed due to food shortages. The long-term effects of such a practice may have been depopulation (Cowgill and Hutchinson 1963). Most scholars have not even given this theory consideration, as projecting a modern trend back over 1000 years is highly problematic, especially when as noted above, there is no supporting osteological data derived from prehistoric samples to support such a premise.

Saul (1972, 1973) was hesitant to draw any direct conclusions as to the role of declining health and demography and the collapse. While epidemics and pandemics involving the diseases discussed would have had devastating demographic effects, whether or not they could have led to societal collapse is difficult to assess, especially for those diseases which leave no bioarchaeological evidence. While Santley et al. (1986) asserted that the end of the Late Classic period witnessed marked increases in infectious disease, due to the presumed loss of non-human hosts when the habitats of animal hosts were destroyed with the expansion of agricultural lands. However, the skeletal data from the Pasión region (Wright 1994), as well as Copán (Whittington 1989), do not support this assertion.

The role of declining health and high mortality rates has received more attention in discussions of the decline of contact period societies, such as Moundville in Alabama, where new diseases are known to have been introduced by Europeans (Schoeninger, et al. 2000). Unfortunately, those diseases commonly known to have been introduced by the Europeans, such as measles, smallpox and influenza, result in quick deaths, and thus are not present long enough to leave signatures to be detected archaeological on the bone.
However, population densities and sizes, as well as continuities in mortuary patterns do not support a large-scale population loss to a catastrophic degree, suggesting that while such diseases may have been endemic enough to have caused disruptions in trade and mortality rates, they are perceived to have been contributing factors, rather than the sole cause of collapse.

The demise of Classical civilization and the Roman Empire, as well as the Han Empire has been partially blamed on epidemic disease that spread throughout these empires via long-distance trade networks within the Mediterranean basin and the orient (McNeill 1976). The historical record indicates that several epidemics affected the early Roman Empire and early modern Europe in A.D. 165 and another in A.D. 251 (Dark 1996:176; McNeill 1976:119). These epidemics depopulated rural areas whose population formed the backbone of the economic and labor sectors of society. Evidently the government saw the need to increase their defense force as a response, which only put more pressure on the depleting resource base. Whether barbarian incursions or upheaval, or both ensued, the governing parties were unable to recover, and collapse occurred (McNeill 1976).

Critics of the disease-based model of collapse contend that due to constraints with our current inability to identify specific diseases in human bone through scientific means, we are unable to adequately test this hypothesis (Wright and White 1996:167). Moreover, there is a lack of additional supporting archaeological data that might uphold this hypothesis. Additional types of data that would help support this hypothesis include: imagery of infected masses, mass graves, such as those found on Cozumel dating to the 1500s when disease is said to have depopulated the Yucatán (Lowe 1985:53-54); or most exceptionally, a codex that discusses an epidemic. Unfortunately, the existing native chronicles tell the opposite story, indicating that before the arrival of the Spanish, there was no illness or rampant disease (Lowe 1985:54; Roys 1967:83). Apparently, this avenue of inquiry into the Maya collapse is so problematic in terms of being able to be substantiated, that until more advances in the technological analyses of human remains are made, this avenue of inquiry among the Maya will likely remain a matter of inference.
C. Ideological Factors

For some scholars, and indeed for many cultures, ideology is seen as having an significant role in sustaining the larger fabric of society. Some have argued that it dictates or constrains the behaviors of its constituents.

The ideological based theory was formulated on a perception of Classic Maya society as not really being a state-level society, but something more comparable to religious Chiefdoms, whose authority was essentially seated in the pervasiveness of its ideology (Lowe 1985; Thompson 1966; Webb 1964, 1973). Proponents of this premise saw Maya social organization as being very fragile, and in a precarious position should popular support decline due to stress, hardships or some sort of crises that could, and may have ultimate resulted in their collapse. Lowe (Lowe 1985:59) points out two main flaws with this premise. Firstly, this hypothesis does not leave explanation for drastic population loss, and secondly, Mayanists generally agree that Maya society functioned as a state-level society, or as a series of city-states, and that it was borne and operated on substantially more than its ideology.

IV) Systemic Approaches/Models of Collapse

A. Feedback Loop Models

All of the following models converge on a one main issue.: they all find fault in the existence of a feedback loop within the societal organism, the role of which is to assist in stabilizing the social system, but instead serves to create instabilities, either through the interconnectedness of its subsystems (Culbert 1977; Flannery 1972; Renfrew 1978) or by the pervasiveness of an ideological system pedestaled on prophecy (Adams 1977; Puleston 1979).

i) Feedback Loop

Hosler, Sabloff and Runge’s approach to systems analysis (1977) was to design a mathematical simulation model of Willey and Shimkin’s (1973) general or multi-causal model. Two types of simulations were conducted; a “causal loop diagram” and a mathematical model, however, only a subset of the factors
outlined by Willey and Shimkin were tested by the authors. Their analysis graphed a predicted course of such variables as: population size, food production output, required food per capita, desire degree of prestige building activity, and proportion of nonagricultural commoners (Hosler, et al. 1977:564). Hosler et al. concluded that a possible cause of the Maya collapse was the cyclical effects on the system, otherwise referred to as a feedback loop. They argued that an increase construction and ceremonialism, paired with overpopulation, an increase in the number of laborers no longer producing food and instead involved in prestige building activities, lead to decreased food production and the inability to meet the required food per capita. However, Hosler et al. note that their mathematical model is conditional, as such parameters as time frames and output per laborer, and the ability of the elite to respond to crises and their ability to reverse or recover from the decline could have produced different results. However, they believe that these factors could have weakened the system to such a degree as to create a vulnerability within it that could lead to collapse (Hosler, et al. 1977:579-580).

As noted above, Shaw’s treatment of anthropogenic environmental degradation is another feedback-loop hypothesis. The deforestation of the land in order to satisfy the growing subsistence and resources needs of the Maya is so extreme, that it has detrimental effects on local temperatures and rainfall, causing localized environmental changes that in turn further impact environment and thus the agricultural and thus subsistence system of the Classic period Maya (2003).

Lowe (1985:100) has identified an egregious error in this work, in the fact that the authors never identified what constituted the system they were modeling. Lowe noted that Hosler et al.’s work implies that the system is the entire Southern Maya Lowlands, which is problematic in that the parameters/data utilized in the model were gleaned from specific sites (micro level) and extrapolated to be representative of the larger Southern Lowlands (macro level).

Personally, I find the concept of mathematically modeling human behavior difficult to accept and somewhat offensive for a couple of reasons. Firstly, it seems to ignore one of the key premises within the discipline of anthropology, that of human agency. I do not believe that a balanced representation of the
relationships between the social actors and their institutions can be forged out of a mathematical formula that is based on predictions of a select group or number of parameters and then extrapolated to be representative of an entire cultural region. Secondly, “collapse” is a process, and mathematical formulas by their nature are unable to treat such processes as anything other than static events. Human beings are not simply automatons whom are subject to repetitive actions that can be mathematically predicted and modeled.

ii) Ideological Feedback Loop

One theory that suggests ideological factors had a role in the Maya collapse, is that concerned with the Maya’s cyclical perception of time (256-year cycles, 13 Katuns of approximately 20 year intervals) (Puleston 1979) and their belief in preconceived or predetermined events, and the potential for there to have been a prophecy of collapse (Adams 1977; Puleston 1979:70). Adams has noted that a number of centers experienced 250-year periods of stability, and even growth, which were followed by shorter periods of decline were observed. Support for this premise, was drawn from Adams’ (Adams 1977) contention that 250 years prior to the beginning of the collapse (which Adams calculates to have begun around ca. A.D. 790), the Maya hiatus occurred (ca. A.D. 534). Some consider the hiatus to be a mini-collapse or a precursor to collapse, as they share some similarities, such as a near termination of monumental erections, a cessation in architectural constructions, and a decline in trade and wealth (Willey 1974:419). And 250 years prior to the hiatus was the eruption of Ilopango which resulted in the complete depopulation and collapse of the Zapotitan Valley (Puleston 1979). Interestingly (or perhaps more conveniently for this model), the date A.D. 790, which Adams suggests is the beginning of the collapse, also marks the period when the most sites are erecting monuments. There are a couple of problems with this theory. Firstly, it is based on a somewhat abstract date from which to trace all other pertinent dates are based. The A.D. 790 date is not necessarily the agreed consensus, and while this is just a theory, without the few supportive date related occurrences, it would never amount to more than just a theory. Secondly, the evidence for this model is
predominantly conjecture, and highly lacking in substance. Thirdly, this collapse theory essentially sees the Maya as a people who were unable to forge their own existences outside of the confines of their ideology.

B. The “Overshoot” Model

The overshoot model maintains that the same progressive trends that lead to the development of Classic Maya society were responsible for its downfall (Culbert 1977:526). Maya society was seen as having progressed beyond the carrying capacity of the land or overshooting the available resources and environmental limitations. The explosive societal growth of the Classic period is argued to have reached a maximum threshold, at which point the Maya’s overexploitation strained the sociopolitical and economic system so drastically that they were unable to maintain any semblance of stability, making the system vulnerable to other internal and external forces and culminating in their spiraling towards decline (Culbert 1974:116; Sharer 1977:548). Culbert (1974, 1988a) specifically puts blame on the Maya’s farming practices, their organizational aptitude, and their ability or inability (as the case may be), to effectively utilize their labor force and redistribute goods.

V) Evolutionary/NeoEvolutionary Approaches

Some investigations into societal “collapse” grew out of evolutionary studies of the rise of civilizations (Tainter 1988b; Toynbee 1933-1954; Yoffee 1988:1). Some have argued that the same processes involved in the rise of complexity and the state were at play, or interconnected in the fall of some states (Adams 1988:21; Culbert 1988a:77; Erasmus 1968; Kaufman 1988:226-227; Tainter 1988a; Yoffee 1988, 2005). Following evolutionary analogy, the “life-cycle” of a civilization was compared to that of a living organism, and thus “collapse” was seen as an expected or preconceived stage in the evolution of a society (Adams 1988:21). Complexity, then, was viewed as an adaptive mechanism of sociopolitical evolution, and thus collapse ensued when there was a substantial decline in the level complexity, or “health” of the civilization (Tainter 1988a:4). Collapse was a regression in a society’s level of complexity to a previously experienced stage of complexity (Culbert 1988a:251-255; Yoffee 1988:5-11).
Critics of the evolutionary perspective argue that civilizations are not organisms, and that complex social systems are inherently maladaptive, as they are comprised of a variety of components, each of which are interconnected. As such when change occurs in one component, it sends a chain-like reaction to the others, and because of the multitude of regulators within the system, communications and transitions are not necessarily smoothly received or enacted. Thus, within an especially specialized (complex) system, the multiplicity of its components and interconnectedness of the system, paired with a, or several, stressors, may lead to the progressive weakening of the system. Should these stressors impact the system strongly enough, communication between the components may be hindered, and recovery may unattainable (Rappaport 1977:67; Yoffee 1988:5).

A. Hyperintegration or Hypercoherence

Flannery (1972) formulated a theory for the collapse based on a feedback loop fed through the interconnectedness of the larger systemic societal organization, and the embedded vulnerability of that system. The premise behind the hyperintegration model is that the extreme interconnectedness of all of the various societal subsystems makes the larger social system unstable, and when a change occurs in one subsystem, it affects all the others as well. Flannery (1972:420-421) extends this premise to encompass the hierarchical “hexagonal lattice” relationships or interconnected of sites, as was forged through marriage and military alliances. Thus, when one the extreme level, when one site in the hierarchy experienced difficulties, it had a fast-moving ripple effect, effecting the other cities, thus when one city within the hexagon collapsed, it may have even rippled all the way to the collapse of the others within the hexagon. Thus, collapse was seen as a catastrophic and rapid event. However, more recent treatments of instances of societal “collapse” suggest that “collapse” was seldom rapid nor entirely catastrophic (Yoffee 2005).

B. Dynamic Model

Drawing on a neo-evolutionary perspective, some have asserted that civilizations are prone to cyclical patterns of growth and decline, or centralization and decentralization, over the course of their histories, but in a non-linear trajectory (Adams and Smith 1981; Adams 1981; Demarest 1996a; Iannone
One such perspective championed by Joyce Marcus (1992a, 1993, 1998) is the “Dynamic Model.” Marcus argues that large centralized, urban states and, or polities experience periods where they are able to exude far reaching authority over peripheral communities, which are followed by periods of segmentation and balkanization when the peripheral communities are able to detach or decentralize from the centralized authority, and eventually regenerate their own political identity under a new authority of local elites.

C. Catastrophe Theory

Catastrophe theory as it is applied to the case of societal collapse stems from the application of mathematical principles to the study of social systems and sudden change (Woodcock and Davis 1978; Yoffee 1988:9). Within archaeology, catastrophe theory is used to illustrate how a slow and measured change in a significant area of the system can lead to unexpected and abrupt changes in the entire state system (i.e., collapse). It focuses on internal or systemic variables rather than on external factors (Renfrew 1978:212; 1979; Yoffee 1988:9).

One of the leading proponents of catastrophe theory in archaeology is Colin Renfrew (1978, 1979, 1984). Key to Renfew’s theory is the characterization of the Maya social system as a highly centralized, state-level society (Culbert 1988a:77; Lowe 1985:85), and two variables, “Investment in Charismatic Authority” – the promotion of a central authority to ensure allegiance and “Net Rural Marginality,” – as the marginalization of the rural population escalates, and on whom the balance of the economic system relies, output diminishes (Renfrew 1978:213). These variables are then graphed on a cusp catastrophe projection and other systemic elements are considered or ignored in relation to the main variables. This graph essentially indicates an “evolutionary” sequence towards equilibrium when the variables show a steady rise, until they abruptly decline, until a new equilibrium is established (Renfrew 1978:213:212; 1984:375-379, Fig. 2).
One of the problems with catastrophe theory is that it assumes that drastic change is sudden, which as Yoffee (1988:10) has noted is not the case with the Maya collapse, as it is acknowledged to have culminated over a period of more than 100 years. Another criticism is that catastrophe theory relies on too few and contentious variables (Culbert 1988a:77; Lowe 1985:87).

V) Economic Reorganization

A. Core Area-Buffer Zone

Discussions of the rise of Maya civilization are often paired with considerations of the collapse of Classic period Maya and propositions as to its causes. For some, such as William Rathje (1973), the same economic factors that gave rise to the Maya’s complex sociopolitical system were in effect responsible for its demise. In his Core-Buffer model, Rathje contends that the Petén Core Area’s environment was lacking in natural resources, and that as a means of overcoming this disadvantage in the Early Classic Maya fostered a trade partnership with Teotihuacan. Access to additional resources via Teotihuacán allowed them then to established economic ties with peripheral communities in the “Buffer Zone”, the area surrounding the core area which had other necessary resources and goods. Rathje maintains that this symbiotic relationship between the core and the Buffer Zone was a necessary adaptation to their disadvantaged environment and resource base. The core maintained the trade relationship for critical food resources and materials with the periphery, in exchange for luxury goods, religious direction, and protection. Over time however, the Buffer Zone communities became capable of producing their own status goods and developed their own sociopolitical based, becoming increasingly independent form the Core Area, until they were able to effectively replace Core Area’s commodities and ideology with their own. The resources exchanged from the periphery to the Core Area were critical to sustaining the cities, and the dissipation of trade and exchange gravely impacted them. Without being able to maintain a proportional return for their investments, the Core Area and its integrated subsystems became unsustainable. Depopulation (i.e. migration) and eventually collapse occurred (Rathje 1973:442-443). Rathje suggests that because the sociopolitical organization that arose in the Buffer Zone did so under different circumstances than that of the Core Area, so to where the
reasons for its collapse. Impacted by the loss of the trade and exchange relationship with the Core Area, competition among the remaining peripheral communities was heightened. With the absence of Core Area traded goods, “middleman trade centers” became obsolete (Rathje 1973). Many of the Buffer Zone centers, to which many no doubt migrated, were overpopulated and functioning beyond their carrying capacity. Eventually the Buffer Zone also collapsed (Rathje 1973:449-451).

Some have questioned the suggestion that the Petén Core Area was environmentally and hence resource challenged, the degree to which the Core Area was reliant on highland resources (Lowe 1985:96; Sharer 1977:538), and the likelihood that other more easily obtainable materials (i.e. chert) may have been easily substituted for the more exotic items (i.e., obsidian) (Sanders 1973:354).

Culbert (1977, 1988a) has also stated that the Maya collapse was largely an internal, systemic problem. He asserts that the interwoven nature of the Maya social structure and its constant growth and modification produced vulnerabilities within it, and that Maya society never attained a state of equilibrium. Culbert attributes the success of the city-centers to a positive feedback chain between the centers (the core) and a “regional area” or the periphery (Culbert 1977; :77). With increased competition, tensions between regional-states, issues with resources and subsistence, the core-periphery dichotomy had the potential to aggravate the situation. Thus, in its fabrication, the core-periphery relationship had the potential to be the destructive force when the region or periphery was no longer able to produce enough or support the larger system (Culbert 1988a:77).

B. Destabilization of Trade and Exchange

Mimicking or coinciding with Rathje’s (1973) core-buffer zone model and expanding on Sabloff and Willey’s (1967) invasion hypothesis, Webb (1973) has argued that a new interaction sphere emerged in the Terminal Classic/Epiclassic period, that resulted in the reorientation and destabilization of the existing economy and sociopolitical system. Webb (1973) hypothesizes that the infusion and expansion of Tabasco-Campeche merchants, drastically affected the existing economic and political organization of the
Maya lowlands, and upset the traditional core-periphery relationship within the Petén polities, and throughout the larger Maya lowlands. He contends that the Petén Maya had effectively just “evolved” beyond chiefdoms into city-states, yet they maintained a theocratic system of governing, largely based upon the allocation and redistribution of trade goods (Webb 1973:389). The infiltration of foreign merchants into the existing trade and exchange economy within the Maya lowlands, resulted in a reorientation of its focus to the coastal and riverine regions, as well as a shift in the objects being traded from prestige items, to more utilitarian and secular luxury goods. The Petén city-states were unable to command a role in the developing trade system as the evolving and secularized coastal trade networks came to dominate lowland Maya economy. Moreover, due to issues with accessibility, transportation and the relative expense of the transportation of goods to its comparatively remote location, the once dominant Petén core area effectively became marginalized. (Webb 1973:390, 403; 1975; Willey 1986a). The traditional “balance” or “indentured” relationship between the core and periphery, and the elite rulers and commoners, would also have been greatly challenged and disrupted (Webb 1973; 1975; Willey 1986a). Webb (1973:402) further hypothesizes that through this process and over time, the theocratic ruling elite of the Petén would have been unable to maintain their social cohesion and ability to effectively govern, and thus would have been ineffectual at meeting the challenges of the new and evolving economic system, or in being able to marshal resources or defenses in light of social revolts or warfare. Collapse was inevitable.

Lowe (1985:90) has argued that evidence for an overpowering intrusion of a dominant foreign merchant class, and the development of an expansive trade network at a time when many state societies are experiencing crises is problematic, let alone one powerful enough to essentially cause the collapse of the Petén core area, is very limited. He further disagrees with Webb’s characterization of the Petén Maya city-states as having been theocratic chiefdoms, whose control was based upon charismatic leadership and their ability to maintain cohesion through belief and prestige redistribution (Lowe 1985:92). Moreover, Lowe contends that should the collapse be attributable to the intrusion of a foreign merchant class, the monument evidence for the collapse would indicate a North-South progression of collapse, logically following their
expansion, however monument cessation moves from the South to North in the opposite direction (Lowe 1985:91). Further, he asks for evidence for the city-state in Tabasco from which the foreigners came from, or that how the presence of a perceived enemy could have led to intercity warfare (Lowe 1985:92-93).

Of course, the Petun/Chontal invasion hypothesis on which Webb’s argument is largely founded is no longer in vogue, and his characterization of the Maya as slightly more than chiefdoms is also not agreed upon. Notwithstanding, while Webb’s contribution to our understanding of the development and foundation of Postclassic secular Maya trade economy is formidable, his treatment of the collapse as a product of the destabilization of trade and exchange is not convincing. While I agree with many of Lowe’s criticisms of Webb’s hypothesis, for me the most forthright question is why would a class of merchants, whose goal was to expand their economic network, want to cause such disruption to cause the collapse of their consumers?

VI) Political Segmentation. Destabilization and Disintegration

The decentralization or segmentation of political authority that is argued by some to be a factor in the collapse of Classic Maya society, actually precedes the collapse, and is seen as having paved the way towards the Collapse. The fragmentation of socio-economic, political power during the latter part of the Late Classic or so-called Florescence, has been argued by some to be an attempt to maintain the already stressed and dissolving Classic period system. The initial decentralization sought to support the remaining centralized command (Marcus 1976:187-190); however, what ensued was the dissolution of power and the further weakening of Maya society (Freidel 1983; Mathews and Willey 1991; Schele and Miller 1986). By the Terminal Classic period, most Classic polities had become decentralized (Marcus 1992b, 1993; 2003:103). The dissolution of the centralized authority impacted all sectors of society, and thus fragmentation moved from a tool of preservation to one of destruction, as it essentially came to dismantle the system (Dunham 1990:569). Lowe (1985) has argued that this decentralization may in part reflect migrations, even refugees escaping the collapsing cities in the core areas, and similarly to Marcus (1976) questions whether the segmentation of society may have been the result of out-migration from the central
core areas to the once peripheral countryside. This period of decentralization has thus been coined by some as the “incipient collapse” (Dunham 1990:565-570; Lowe 1985:38).

The decentralization of political authority was marked by an increase in emblem glyphs, reflecting the number of new polities, and an increase in monument erection, not just in the larger centers, but in peripheral secondary and tertiary sites, which had previously not wielded the authority or ability to erect dynastic monuments (Freidel 1983; Mathews and Willey 1991; Schele and Miller 1986). The same monuments and inscriptions whose expanded erection in the Late Classic period marks the beginnings and extension of political decentralization, are not only prominent indicators of Late Classic period political decentralization, their cessation around A.D. 890-900 marks the period, trajectory and expanse of the Maya collapse (Adams and Jones 1981).

In his reconstruction of polities within the Usumacinta region, (Mathews 1985) was able to identify the growth and expansion of polity numbers represented by emblem glyphs, particularly during the “Late Classic (A.D. 593-790). By the Terminal Classic period, over a 90-year period, the number of polities went from nine to one, with the last 40 years experiencing the most dramatic drop. The Pasión region also experienced a decline in the number of polities, from four to two (Mathews and Willey 1991). San Jose Magote is similarly noted by Adams and Jones (1981) as having had 22 or 23 polities at its height, but after A.D. 889 the number of representative emblem glyphs dropped to none.

Proponents of models that invoke discussion of political decentralization do so with the understand that political fragmentation or transformation may have been an instrument of collapse, but was not the cause of the Maya collapse (Marcus 1976; Mathews 1985, 1991; Mathews and Willey 1991).

VII) Multicausal Interpretations

Cowgill (1964) was probably first to recognize that the Maya collapse was differentially experienced across the lowlands and suggested that it was very unlikely that a single factor was ultimately responsible for the downfall of the Classic period Maya. The participants of the 1970 School of American
Research seminar on the Maya Collapse also evidently agreed that several causal factors resulted in the Maya collapse (Adams 1969; Culbert 1988a:75; Sabloff 1971, 1973b; Willey and Shimkin 1971, 1973). Building on this understanding, and Karl W. Deutsch’s (1969:28-30) general model of sociopolitical collapse, Willey & Shimkin (1971, 1973, 1987) were the first to propose a broad-spectrum model of collapse for the Classic Maya. They hypothesize that while the Maya’s sociopolitical organization was successful, and that its success contributed to its ultimate demise. Despite Willey and Shimkin’s model being multifaceted, it has a main or somewhat particularistic theme. Coinciding with the intensification of the sociopolitical order, it is argued that the system became increasingly stringent and unable to recognize and adequately mediate or successfully respond to the associative internal and external stresses, pressures and competition of such an order. Thus, they were vulnerable to a general system failure (Willey and Shimkin 1973: 490). Willey and Shimkin (1973:490-492) outline several contributing and plausible scenarios that together are contended to have transpired, as well as several elemental factors that together contributed to the collapse, including: over population, pressure on natural resources; subsistence and consequently health problems; increases in internal and external competition and conflicts; the overextension and conspicuous consumption of the elite at the expense of the commoner class, and an expanding fissure between the elite and commoners; decreased labor capacity and productivity; as well as, foreign economic and military intervention. However, Willey and Shimkin argue that the fundamental contributing factors were the coincidence of several unfortunate circumstances culminating at once, the inability of the management (ruling elite) to mitigate them effectively, and, or the incapability of the sociopolitical order to recuperate (Willey and Shimkin 1973:491).

A comprehensive or multi-causal model for societal collapse has also been proposed for the Eleventh century Anasazi case, whose societal collapse is predicated on many of the same issues argued for the Maya scenario. It is argued that as Anasazi society’s complexity and population increased, it became increasingly reliant on its periphery for support. Growing population numbers and densities put excessive pressures on the land and resource base. An already fragile environment became over utilized. Deforestation
became widespread for construction and fuel requirements. Unable to foresee the long-term consequences of their environmental degradation, construction episodes continued (Betancourt, et al. 1986; Diamond 2000:398-403). Unable to farm land destroyed by their own anthropogenic changes, starvation and strife resulted. Due to the extremity of the environmental change in the region, and massive drought as indicated through tree rings (Diamond 2000:402). So extreme were the conditions, and so desperate were the people that people are thought to have resorted to cannibalism. Warfare became commonplace (Diamond 2000:402; Haas and Creamer 1993)

The general or multi-causal theory of collapse to satisfies most people to some extent, as it is essentially the melting pot of theories, and thus most scholars no matter their perspective, can agree to some degree with the model. The question sparked by this model then is which factor or factors are most prominent, and which of these factors leave the most tangible material markers of this comprehensive and complicated process?

The problem with the multi-causal model is that there is no way to precisely tract the connections between the various “causal” elements, or determine which factors were primary or secondary factors, or to what degree a factor was a causal “primary” factor, versus a reactionary or secondary factor. It is difficult to assess such things, and may be impossible to test accurately (Dunham 1990:592). Nonetheless, many Scholars tend to believe that multi-causal models are the most viable or correct theory (Culbert 1977:509; Dunham 1990:593).

DISCUSSION

Recent discussions of societal collapse have included dialogues concerning collapse terminology and the actuality of civilizational collapse (Cowgill 1988; Eisenstadt 1981; Rice, et al. 2004; Yoffee 1988, 1995). As noted earlier, two types of phenomena have been categorized under the umbrella of societal collapse – the death of a civilization or the decline of a civilization. Recent trends towards viewing what might have previously been classified as societal collapse, as a form of cultural transformation or change,
Societal collapses are now alternatively conceptualized as transitional phases, in which the degree of complexity, stability and overall size of a given civilization is indeed impacted and altered (Yoffee 2006:222), but during which a restructuring or regeneration of the society’s sociopolitical, ideological and economic institutions ensues (Adams 1988; Chase and Chase 2004:16; Cowgill 1988; Erasmus 1968; Tainter 1988a; Yoffee 1988:15). I believe this distinction to be an important one, particularly in the case of the Maya collapse where popular consensus had implied that the Maya disappeared after the collapse. Cowgill’s characterization of collapse as the end of “a great tradition” truly is apropos in consideration of the Maya collapse, where the complexities achieved by Classic Maya society are greatly impacted and decline, but where a residual or resilient portion of society underwent a significant degree of transformation in the aftermath of the “collapse” and did not disappear.

Unfortunately, some have misinterpreted this more progressive view of societal collapse and have implied that its proponents are arguing that the Maya collapse did not occur (Marcus 2003:104). This situation baffles me. Archaeologists need to do more than provide “lip-service” to the recognition that societies are not static entities. Collapse is a form of cultural change. Culbert (1988b:77) would argue that all societies are in a continual state of flux, changing continually and therefore never reaching a state of equilibrium. When discussing cultural change, including instances of collapse, we are dealing with cultural
dynamics, with the word dynamics being key. Dynamic refers to an ever changing, active or vibrant force, it does not imply a static state, as the word collapse does.

The problem in the past has been that collapse has been viewed as an absolute and terminal state (death), when in fact there are a range of mechanisms and processes that cause and characterize societal collapse, as are its manifestations. By recognizing collapse as a form of culture change, we should be able to recognize and accept its gradations, rather than deny it as having happened.

One of the other issues plaguing treatments of collapse has been the view that when a society collapsed, it was uniformly experienced across the civilization. This has in part stemmed from the non-specificity of what exactly was collapsing, and the use of site- or region-specific evidence in the corroboration of pan-regional and pan-societal hypotheses of civilizational collapse (Eisenstadt 1981:238; Rice, et al. 2004:10). Collapse is never a quick process and is not equally experienced across all sects of society (Adams 1988:21; Yoffee 1988:18). Like Tainter, (1988a:4), I believe that collapse is a political process. In the case of the Maya, the civilization did not collapse; rather, it's political system did – its centralized body whose institutions facilitated all transmissions and exchanges, maintained status quo and mitigated and maintained relations of production and inter-societal conflict, and established and/or legitimated ideological expression (Yoffee 1988:13).

As should be clear from the bulk of this chapter, most causal explanations or models offered for societal collapses are indirectly or directly connected to other causal factors. Nonetheless, nearly every causal factor proposed for collapse entails some degree of political dissension or deficiency (Dunham 1990: 593). Part of the role of a governing political system is to recognize changing conditions and manage the society’s ability to adapt or respond to these changes. Of course, the extent of change, and its duration affect the civilizations ability to adapt (Binford, et al. 1997). Whatever the suggested cause of societal collapse, it seems apt to suggest that ultimately the failure of a given society’s managerial abilities, and capability to identify and mitigate an effective response to an impending or transpiring crisis, is key to understanding societal collapse (Dahlin 2002; de Menocal 2001; Diamond 2000:396; 2005; Lowe 1985:111).
Using the dichotomy of the continuance of the northern Yucatán Maya polities and the collapse of the southern lowland Maya polities for a descriptive example, Dahlin (2002:332-334) outlines the different types, and stages of adaptive responses possibly implemented by individuals and societies in attempt to mitigate the effects of an environmental disaster. While his discussion is framed in terms of an environmental disaster, the processes and responses discussed are not necessarily specific to such circumstances. Dahlin notes three main types of responses: 1) Discounting the effects, refute their impact (which of course is not a form of mitigation but denial); 2) Accepting damage losses (a passive response, and does not institute any form of crisis management); and 3) Preventing and, or protecting against an event by modifying the degree of the crisis through attempts at reducing damage before and during the crisis. The prevention and protection response can include three forms, they are: a) Ideological response – the performance of rainmaking ceremonies, offering of sacrifices, divination, etc. b) Technological response – the creation and implementation of early warning systems though observation of climate, plant and animal behaviors, by forecasting environmental events through astronomy and record keeping; intensification of labor, production and storage technologies; c) Sharing the burden of loss – this is most effective through the expansion of interaction networks, thereby permitting access to more diverse and possibly unaffected zones, either though trade (symbiotic relationship), or through tribute or military means (parasitic relationship).

Drought conditions associated with the Terminal Classic period are argued by some to have been experienced across most if not all of the Maya subarea (Binford, et al. 1997; Brenner, et al. 2001; Brenner, et al. 2000; Curtis, et al. 1996; Dahlin 1983; Folan, et al. 1983; Gill 2000; Group 2003; Hodell, et al. 2000; Hodell, et al. 2001; Hodell, et al. 1995:391; Robichaux 2002:341). Polities across the southern Maya lowlands experienced differential degrees of collapse, while the northern lowlands continued to flourish. While technological efforts to divert or mitigate effects of the Terminal Classic drought were assumedly undertaken, tell-tale signs of such efforts, such as raised fields, irrigation ditches or agricultural terraces, are not evident in the archaeological record of the northern lowlands (Beach 1998; Dunning 1992).
argued that the pervasive drier conditions of the northern lowlands, and the porosity of the karst topography of the peninsula preconditioned the northern inhabitants to more effectively manage drought conditions (Dahlin 2002:331; Shaw 2003:162-163). Dahlin (2002:335-336) has argued that the multépal form of government existed at Chichén Itzá in the Terminal Classic, in which there were several offices or a second level of government that had the organizational means to create a system of formal crisis management that effectively enabled them to adopt strategies to mitigate prolonged drought conditions. The key to any systems stability and security, especially in consideration of drought survival, is subsistence diversity. The primary protective strategy instituted by Chichén Itzá’s governing body was to extend their interaction networks into diverse resource and thus subsistence zones along the coast and inland through such symbiotic and parasitic means, as trade, tribute and warfare.

Particularly poignant to the discussion of the role of cultural response and its effects on collapse, is the paradox between the collapse of Easter Island and the similarly severe cases of environmental degradation and demographic decline on other Polynesian islands, but whose societies did not collapse (Diamond 2000:396). The difference? Cultural response. The residents of Mangaia, Mangareva, Rapa, and the low Marquesan islands, parts of New Caledonia, and parts of Fiji recognized the pending disaster and saw that they had options. They thus began to monitor and change their practices, including abandoning swidden agriculture for more intensive practices, relying on fixed garden plots (Rolett 1998) and, or implemented intensive forms of agriculture such as irrigation (Kirch 1984).

Just as the collapse was not uniformly experienced across the Maya area, I do not believe that any one cause is responsible for the collapse. It should be apparent from this chapter that a variety of crises were differentially experienced within the Maya area during the ninth and tenth centuries, many of which (i.e., warfare, drought) were specific to certain regions. However, just as I have isolated cultural response (or lack thereof) as having been a crucial factor in determining the trajectory of a crisis, and its ultimately culmination in societal collapse, I do believe that that a very real aspect of the Maya collapse must have involved some environmental circumstance. I concur with many scholars that the simple identification of
drought as the sole cause of the Maya collapse is too simplistic (Pendergast 1986:248; Rice 1986:281; Willey 1986a:192; Andrews, et al. 2003). Such assertions do not give enough credence to human agency, and the ability of people and cultures to manage challenges and mitigate their own destinies. Nonetheless, the progression of the “collapse” from the inland southern lowland sites lacking permanent water sources, out-paired with the persistent and in some cases, expansion of sites in areas with water, or of sites that were constantly managing water challenges such as was the case in the northern lowlands, is clearly significant.

Ultimately, scholars must move away from attempting to weed out a solitary cause for societal collapse and understand what types of processes and phenomena are associated with the collapse, from its inception through to its aftermath. Like Diamond (2000:392-393) I question whether we should be attempting to identify “a” causal factor of societal collapse, that perhaps we should be more apt to survey the entirety of historical, ecological, social, economic and sociopolitical factors potentially having preceded or co-occurring with collapse and consider whether these factors may have exacerbated or paved the way for “the” appointed causal factor.
CHAPTER 3. ARCHAEOLOGICAL APPROACHES TO MIGRATION

Until relatively recently, archaeological approaches to social identity and migration have been considered problematic and even outdated paradigms (Andrews 1990:21; Clark 2001:1; Snow 1995:72). When migration was invoked, it tended to be used as an explanation for culture change (Cameron 1995:104), rather than being a subject of archaeological inquiry in and of itself (Andrews 1990:897; Hammel and Howell 1987; Kelly 1983). A poorly developed and infused theoretical foundation, a deficient methodology plagued by unscientific and casual management of data (Trigger 1968:26-47) largely reliant on symbolic, and, or subjective indicators (Burmeister 2000) resulted in the rejection of early migration archetypes. Nonetheless, the recognition of site abandonment, the continuous identification of discontinuities in material culture distributions, alongside the fact that migrations are an acknowledged historical fact within human history, have demanded that archaeologists reconsider and regenerate the migration paradigm, and investigate this process and phenomenon beyond it merely being an explanation of culture change (Adams 1978; Andrews 1997:21; Burmeister 2000; Cordell 1995; Haury 1958; Lekson 1996; Stark, et al. 1995; Whiteley 1988).

Current approaches to population movements recognize that migration is a dynamic and complex process whose actors nevertheless conduct themselves in habitual or systematic fashions. These customary behaviors are governed by generalized principles or structures that produce recognizable patterns within the archaeological record (Andrews 1990:908-909; Beekman and Christensen 2003:154). The identification of key variables affecting and structuring the migration process and correlating the associative behaviors with artifacts and activities are key components of recent archaeological approaches to migration (Andrews 1990:909; Anthony 1992:174; Fix 1999:12). Archaeological investigations involving the identification of migrant groups are charged
with more than the identification of intrusive populations’, but also with the difficult challenge of determining a place of origin. Through the comprehensive analysis of settlement and domestic spatial patterns’, biological and behavioral analyses’, in conjunction with artifactual analyses and the demonstration of associative antecedent cultural properties or signature elements’, archaeologists may successfully trace a migrant group back to its homeland (Clark 2001:6).

Accordingly, a growing recognition of the benefits of techno-stylistic analytical methods to artifact analyses (Allen 2005; Clark 2001; Lyons 2003; Stark, et al. 1995:216), paired with archaeological efforts to isolate markers of group identity through artifact production patterns, have gained increasing ground within archaeological migration studies. Moreover, scientific techniques including the chemical sourcing of ceramics through such methods as Instrumental Neutron Activation Analysis (INAA) (Lyons 2003) and Inductively-coupled-plasma mass-spectrometry (ICP-MS) (Cecil 2004) have proven beneficial in the reconstruction of population movements. Additionally, the analyses of oxygen and strontium isotope ratios in human remains (δD, δ13O, 87Sr/86Sr) have been instrumental in identifying the homelands of migrant peoples (D. T. Price, et al. 1994; Price, et al. 2000; Price, et al. 2006; White, et al. 1998; Wright 2005). Stable isotopic analyses of δ13C and δ15N signatures in bone collagen provide a method to detect geographically distinct paleodiet and subsistence spheres (Gerry 1997; Wright and Schwarcz 1996:174), that may also be beneficial in tracking population movements.

This Chapter discusses contemporary methodological approaches to isolating and demonstrating the presence of a migrant group in the archaeological record.
HISTORICAL BACKGROUND

Early migration research within the field of archaeology progressed out of formative cultural historical anthropological approaches, and the development of comparative anthropological studies that regarded migration an instrument of explanation for cultural change (Adams 1978:483-484; Lyons 2003:4). Many proponents of early migrationist theory were further influenced by early diffusionist theorists (Ratzel 1899). Early anthropological approaches to migration often employed diffusion as an attempt to explain discontinuities in material culture and historical sequences. Following suit, early migrationist approaches focused on establishing group identity, making direct equations between distinct artifact types and or traits, and associative cultures or peoples. Accordingly, the identification of the dispersal of traits and artifact types across landscapes and culture areas came to be seen as evidence of the movement and relocation of autonomous units of distinct cultural, social and, or ethnic populations (Andrews 1990; Childe 1925, 1929, 1950, 1958; Clark 2001:2; Duff 2002; Graebner 1911; Kluckhohn 1936; Lyons 2003; Trigger 1989; Willey 1968). The emergence of civilizations came to be seen as the result of either emic diffusion or stimulus diffusion, with the identification of broadly dispersed cultural materials regarded as evidence of either down the line interaction and trade (stimulus diffusion) or the complete movement of peoples and traditions across the landscape (Levy and Holl 2002:83; Trigger 1980). Culture change was thus equated with cultural evolution, with waning treatment given to in situ development, or consideration for individual cultural achievements (Levy and Holl 2002:84).

With the shift in theoretical paradigms associated with the New Archaeology and Processualism in the 1960s, concerns for what constituted ethnic identity, and the assumption that ethnic groups could be classified as distinct, were raised and contested (Moerman 1965). By
extension, traditional “migrationist” approaches also were challenged. Critics expressed concerns for equating artifacts with ethnic or cultural units, and peoples (Snow 1995:72; Trigger 1968:26-47), arguing that they manifested a disconnect between material culture, population and cultural dynamics, as well as demography and language (Friedlaender, et al. 2002:454). They also maintained that migrationist approaches were theoretically and methodologically inadequately developed (Burmeister 2000:539; Champion 1990:215). They argued that migrationist theory lacked an appreciation for inter-societal dynamics and development and was constrained by an analytical disjunction between artifact assemblages, and their associative peoples (Adams 1978; Andrews 1990; Binford 1965; Burmeister 2000:540; Champion 1990:215; Myhre and Myhre 1972:48; Trigger 1968). Of further concern was the associative implication that migrant groups moved and resettled without significant changes to their social composition (Burmeister 2000:540; Cordell 1995:206). This negative view of migration studies was exacerbated by the extreme application of diffusionist explanations of inter-continental cultural similarities and influences through extreme long-distance diasporas, (Fell 1989; Friedlaender, et al. 2002:454).

Many archaeological investigations involving population movements were regarded as having involved a single event, and large-scale exoduses (Andrews 1990; Lyons 2003:5; Oliver-Smith and Hansen 1982:1), whereby significant sized population movements and resettlements were more readily detected as distinct or foreign from existing populations (Clark 2001:2). Migration came to be seen as a “catch-all” answer to queries into cultural patterning and culture change (Chapman and Dolukhanov 1992:1), perceived too often be employed by those whose ability to implement more challenging models, or whose grasp of theory was lacking.

The perspective that the dispersal of ideas, artistic styles, beliefs and population movements were compulsory to social evolution (Childe 1925, 1950; Friedlaender, et al.
2002:454) caused migrationist theories to be perceived as diffusionistic and evolutionary in perspective. Critics found further fault with early population movement studies in that they employed too broad and vague a definition of migration to adequately encompass the variety of types, strategies and processes of movements, let alone their cause(s) or structure(s). Migration studies were further criticized for essentially exhibiting a disconnect between such variables, the migrants and their behaviors (Andrews 1990:897; 1997; Anthony 1992; Chapman and Dolukhanov 1992:1; Cordell 1995). Early studies concerned with population movements thus focused on the identification of migrants themselves, and on the probable causes for diasporas. With many such studies relying on little physical evidence and a great deal of conjecture investigations of prehistoric migration fell out of favor.

Renewed interest in the study of population movements in the mid-1980s was owed in part to a growing interest in complex societies, and an emerging commitment to regional and inter-regional studies. In the 1990s, archaeologists began to integrate world systems theory to their approach of examining culture change and population movements (Andrews 1990:897; Schortman and Urban 1987; Shennan 1986, 1987; Trigger 1984; Upham 1982). Nowhere since has migration theory been more championed than in the southwest United States (Andrews 1990; Cameron 1995; Clark 2001:1; Clark and Herr 2003; Duff 2002; Lyons 2003; Rouse 1986).

The return of migration theory and studies to archaeological inquiry was not simply the result of an opportunistic change in theory and inquiry, but also the result of attempts to utilize a more holistic approach to understanding complex human behaviors, including population movements. Investigators studying migration are concerned with a multiplicity of variables related to the causes, structure, processes and effects of migration, through “multiple intersecting lines of data,” (Beekman and Christensen 2003:113; Chapman and Dolukhanov 1992; Rouse 1986). As a
result, migration in and of itself has become a topic of theoretical and investigatory interest (Beekman and Christensen 2003:111; Burmeister 2000:539). New migrationist studies have moved away from limited traditional cultural-historical approaches; realigning to employ a range of theoretical, methodological and analytical perspectives borrowed from human geography, sociology, linguistics and demographic studies. The goals of current migrationist studies have expanded to include a broader understanding of the behavioral ecology of migration and migrants (Andrews 1990:897; Fix 1999). Additionally, a growing recognition for the efficacy and significance of identity and ethnicity studies, and their intrinsic role in migrant detection has had a profound impact on how investigators regard migration and immigrants. Advances in correlating behaviors to artifacts and activity areas, and in scientific compositional and provenance procedures (Fix 1999:205) have also had a substantial supportive role in the growing acceptance of “new migrationist” studies.

METHODOLOGICAL APPROACHES TO SOCIAL IDENTITY AND MIGRANT POPULATIONS

Artifact Production and Behavior Analysis

Settlement and Domestic Pattern Analysis

Although migration obviously involves the reestablishment of a community’s settlement, migration studies are less apt to discuss this aspect of archaeological data. This is perhaps due to the difficulty in reconstructing such patterns for many cultures, however, abrupt changes in, or newly established, technological, stylistic and organizational patterns in architectural constructions and settlement patterns may be reflective of those inherent to their homeland.

There have been few studies involving, let alone focusing on this aspect of migration. Most treatments of architecture and settlement are theoretical suggestions of how to identify intrusive or new populations through the identification of discontinuities in architecture, the location of activity areas and settlement arrangements (Clark 2001:10, 13). Nonetheless, migrants have been detected in the archaeological record through the identification of previously unidentified architectural features at a given site, including new forms or styles of construction, new construction methods or materials (Beekman 1995; Chase 1982a; Clark 2001:41; Haury 1958; Stark, et al. 1995:222, 232), the reorganization of architectural and household components or conceptions of space (Collett 1987; Haury 1958; Lindsay 1987; Stark, et al. 1995:222, 232), room numbers, room or building sizes, organizational layout, as well as the measurement of roofed versus unroofed space (Clark 2001:41; Ezzo and Price 2002; Stark, et al. 1995:225). Others have identified the superimposition of new structures on top of traditional architectural forms (Beekman 1995; Ferguson 2004, 2006; Stark, et al. 1995:214; Walker 1990; D. S. Walker 2004), or the reoccupation or drastic change in use of structures, most pointedly the residential usage of standing religious structures (Lekson 1984:267-269; Lekson and Cameron 1995:190; Vivian 1990:383;
Wilcox 1993:88ff) as evidence of the presence of immigrants. The rapid establishment of new sites, or expansion of existing settlements, particularly during time periods understood to be fraught with turmoil are also seen as evidence for migration (Adams, et al. 2004; Fry 1983, 1989; Masson and Mock 2004; Sidrys 1983), as is the presence of “islands” within existing settlement patterns that are marked by variable patterns in construction techniques and housing forms, as well as the organization and location of activity areas (Laporte, et al. 2005; Stark, et al. 1995:218).

Artifact Style

Style has often been regarded as a culturally sensitive variable, perceived to relay information from function, to class, to cultural identity (Wobst 1977:317). As defined for traditional archaeological purposes by Sackett (1982:63, 113-115) style is a distinctive and explicit way of doing something, which is bound by time, place and peoples. Stylistic attributes of any form of material culture can communicate unspoken messages which signal group identity, integration, ownership and social differentiation, that are argued to guide interactions among individuals and groups (Hodder 1990:45; Wiessner 1990:107; Wobst 1977:327). In instances of marked competition, conflict, and a desire to mark territories or boundaries, or when people wish to stress their differences, they often communicate such things through decorative or formal styles of their material culture (Brenner, et al. 2001:192).

The development of ceramic classification schemes allowed for the establishment of regional ceramic traditions (Fry 1989; Gifford 1960; Shepard 1965; Sterner 1989). These ceramic traditions were by extension associated with particular culture groups (Shennan 1989). Thus, style has played a role in traditional migration studies (Rouse 1986). Some have argued that depending on the degree of social interaction between groups, stylistic expressions can and are often borrowed
across boundaries and between groups, and thus can blur the designations of group identity (Plog 1980; 1983:126).

While decorative styles were once seen as clear identity markers archaeologists have varied perceptions on the role of style and its validity in transmitting cultural/ethnic information, or in assisting in the defining of relationships, networks or boundaries (Hegmon 1992:518; Wobst 1977:320). As we will see in the following archeometric trait section, style is now considered but one trait amongst many that is utilized in one of the more progressive forms of identity determination and ceramic analysis. Current thought is that style should not be utilized as the sole means of group identification.

In attempt to identify consistencies in architectural spatial organization, a methodology for detecting changes in architectural construction and form was developed by Hillier and Hanson (1984). A “built environment” abstract approach to architectural planning, Hillier and Hanson’s method utilizes gamma maps to illustrate spatial relationships of rooms, their position, and circulation patterns through access and constraint points. These are then factored into larger circulation patterns within architectural complexes or larger living compounds, including unroofed areas, auxiliary and external spaces. These maps depict degrees of symmetry, irregularity and depth to circulation patterns, and relationships between components. (Clark 2001:42-46). Clark (2001:46) utilized this methodology in his research in the southwest United States and established reoccurring continuities in elemental features of compound patterns. While applicable in the case of the Salado and Tonto Basin peoples, this method may not be as successful in cases where architectural constructions are limited by the lack of complexity, or in the ability of determining the full range of usage of a compound without doing extensive archaeological excavations.
Archaeometric Ceramic Trait Analysis

Traditional studies investigating identity and population movements relied heavily on ceramic analysis, but were limited to the use typological and stylistic ceramic analyses (Adams 1964; Andrews and Robles Castellanos 1985; Ball 1974; Ball and Taschek 1989; Conkey and Hastorf 1990; Dunnell 1978; Fox 1980; Kowalski 1989; McVicker 1985; Plog 1980, 1983; Rouse 1986; Wobst 1977). More recently, archaeologist focusing on population movements have begun to implement methods and theories derived from ethnographic studies concerned with ceramic production and circulation patterns, and their relationship to ethnicity and group identity (Allen 2005; Clark and Herr 2003; Lyons 2003; Pauketat 2003).

In the production of ceramic vessels, a distinct set of formal, stylistic, technological, mechanical and compositional actions are consciously and unconsciously executed by ceramicists during each stage of the manufacturing process (i.e., chaîne opératoire, see (Creswell 1983; Dobres 2000; Sellett 1993)). Ethnographic studies have shown that each action or combination(s) of choices enacted stem from a foundation of environmental, technological and cultural knowledge (Day 2004; Howie 2007; Mahias 1993; van der Leeuw 1991, 1993) that is passed down through the generations. Each potting community may thus exhibit a distinct set of technological, formal and stylistic traits that indirectly signal group identity (Binford 1965; Braun 1995; Burmeister 2000:541; Clark 2001:10-13; Deal 1998; Sackett 1990). These enculturated traits are not intentional, overt visual markers of group identity, but are the inadvertent, mundane and less visible characteristics and objects of everyday life. Highly visible stylistic traits tend to be emulated and widely distributed and are thus problematic measurements of group identity and migration. Objects and traits of low visibility, such those associated with routine practices and utilitarian objects have greater potential for displaying group identity because they experience less
scrutiny and are not intended to do so (Binford 1965; Braun 1995; Burmeister 2000:541; Clark 2001:10-13). Techno-stylistic traits, such as those demonstrated in rim, lip, neck and wall dimensions, as well as paste recipes, are prime examples of enculturated traits, whose specific variations and combinations are acknowledged as markers of group identity (Allen 2005; Braun 1995; Clark 2001:10-13; Dietler and Herbich 1998; Lyons 2003). Ethnographic studies have found that enculturated traits are often temporally and spatially resilient (Arnold 1987; Arnold and Nieves 1992; Gosselain 1998; Mahias 1993; Reina and Hill II 1978:231; Rice and Rice 1984:252; Stark 1999:40; van der Leeuw 1991), indicating that potting communities retain their own cultural, formal, technological and stylistic methods of ceramic craftsmanship over time, and across the landscape.

Archaeological classification schemes dictate that artifacts and their attributes hold inherent significance and meaning to the producer, consumer, and the archaeologist. During the production process, formal, stylistic, technological and mechanical choices are consciously and unconsciously made in order to satisfy the intended function, morphology and style of the object. The choices made at each stage of the manufacturing process results in a distinct set of signatures, or attributes (Binford 1965; Braun 1995; Burmeister 2000:541; Clark 2001:10-13). Many of these choices are dictated by cultural traditions and represent enculturated traits that indirectly signal group identity (Arnold, et al. 1999; Clark 2001:10-13; Deal 1998; Dietler and Herbich 1998; Hodder 1982; Reina and Hill II 1978; Sackett 1990; Stark 1999; Wobst 1999). Objects or traits that reflect enculturation are those that are not intended to be visual markers of group identity, and thus are the more mundane traits and objects. Technological and stylistically-mechanical traits (techno-stylistic traits) such as ceramic rim, lip and wall dimensions, are assumed to have little intention and potential for displaying group identity because they experience less scrutiny and self-
reflection and are less likely to be imitated or emulated (Binford 1965; Braun 1995; Burmeister 2000:541; Clark 2001:10-13). These are the traits that are argued to be more readily lead to the identification of migrants.

Recent archaeological approaches to identity and migration have indicated a growing concern for attribute or metric trait analyses, particularly those reflecting technostyle (Allen 2005; Clark 2001; Dietler and Herbich 1998; Lyons 2003; Zedeño 1998). Ethnoarchaeological studies have shown that such traits are inherently more resilient, and thus less likely to change (Gosselain 1992:582-583; Reina and Hill II 1978:231; Rice and Rice 1984:252; Sackett 1985; Stark 1999:40). It is hypothesized that migrants would continue to manufacture ceramics following their enculturated traditions, and thus a comparative analysis of ceramics focusing on techno-stylistic traits has shown to be advantageous in the decipherment of foreign or migrant peoples.

*Compositional Studies*

While typological and stylistic analyses they have been instrumental to studies of migration, particularly in the southwest United States, the chemical characterization of ceramics is adding a new dimension to these studies and is playing an increasingly pivotal role in reconstructing population movements (Clark 2001; Futrell 1998; Lyons 2003). The chemical characterization of archaeological ceramics has added a scientific element to traditional approaches to ceramic production and circulation and their relationships to ethnicity, group identity and migration. Compositional studies have provided meaningful supplemental, objective data to the investigation of identity and population movements by chemically identifying compositionally similar ceramics, source zones, and associations between ceramic groups and communities, and permitting the identification of immigrant communities, the reconstruction of homeland locations, as well as the courses, processes and effects of migration and


Compositional analyses of ceramic specimens detect the origin or production location of an artifact by identifying the presence and/or absence of different chemical elements in the fabric of a given specimen. Homogeneous compositional groups are identified by their elemental compositions as being representative of geographically restricted “source zones” depending on the geological makeup of the area origin. By comparing known and unknown compositional groups to known source zones, provenience of the artifact can be determined (Arnold, et al. 1999:68; Bishop, et al. 1982).

Ceramics produced within a geographically distinct “source zone” produce relatively compositionally homogenous groups of ceramics. Following the principles of enculturation (Clark 2001) and the provenance postulate (Braswell, et al. 2004; Weigand, et al. 1977), compositional and statistical patterns in the chemical attributes of the ceramics can thus distinguish one production community from another (Arnold, et al. 1999:68, 81-82; Reents-Budet, et al. 2000:101). By comparing the chemical compositional profiles of prehistoric ceramics from unknown sources with those from reference groups of known or presumed provenance, or through
chemically similar experimental and/or contemporary clay deposits (Neff 1989, 2001; Neff and Bishop 1988), it is possible to discriminate clay source zones based on their trace element constituents (Bishop, et al. 1982; Braswell, et al. 2004).

Instrumental Neutron Activation Analysis (INAA)

Instrumental Neutron Activation Analysis (INAA) is one of the most sensitive and accurate sourcing methodologies. This technique focuses on detecting chemical similarities and differences in the mineralogical composition of a ceramic, essentially tracing and differentiating its source through the ceramics macro-, micro- and trace elements and variations in clay and paste recipes (Arnold, et al. 2000; Bishop 1980; Bishop, et al. 1990; Bishop, et al. 1982; Braswell, et al. 2004; Glascock 1992). INAA has the ability to identify between seventy-five and ninety-two natural elements (Arnold 1987:397; Bishop, et al. 1982:292), and measure more than thirty elements simultaneously (Howie 2007), with an accuracy of results calculating to be +/-5% or as low as +/-1% (Arnold 1987:397).

INAA has been credited as being able to potentially discriminate pottery provenance from multiple loci within a single source zone otherwise considered to be geologically homogeneous, and difficult to otherwise microscopically discriminate (Arnold, et al. 1991; Arnold, et al. 1999; Bishop, et al. 1982). Given that INAA requires a small sample size (less than 200mg), involves very little sample preparation, is minimally destructive (Arnold 1987:397; Little, et al. 2004:103), and produces data that are comparable cross-institutionally (Arnold, et al. 2000; Bishop 2003; Bishop, et al. 1982; Braswell, et al. 2004), INAA is seen as the most comprehensive chemical characterization technique, particularly within the Maya area (Beaudry-Corbett 2003; Beaudry 1991; Bishop, et al. 1990; Glascock 1992; Howie 2007:111; Neff and Bishop 1988).
INAA has been utilized to reconstruct ceramic production and economic patterns or demonstrate contact (i.e., trade) (Bishop 1975; Reents-Budet, et al. 2000), test hypotheses of ceramic production and compositional sources using ethno-archaeological data (Arnold, et al. 1999; Arnold, et al. 2000; Arnold, et al. 1978), model the distributional patterns of specific ceramic types (Bishop 2003; Little, et al. 2004; Neff and Bishop 1988; Reents-Budet and Bishop 2003), and identify source production areas of ceramics from specific sites (Andersen 1976; Bishop 1987, 2006). With the exception of research being conducted by Dr. Leslie Cecil, INAA has not been utilized as a tool in the correlation of ceramic artifacts with the identification of migrant groups in the Maya area.

One issue plaguing the investigation of migrants using INAA is the probability of coming across one of the few vessels that actually made the journey with the immigrants, since it is unlikely migrants travelling over great distances would transport large numbers of vessels. This they argue, paired with the assumed abundance of vessels made locally after resettlement, would statistically make the identification of these few transported vessels difficult (Rosenswig, 2008, personal communication). This is a valid concern and is why INAA must be paired with other types of ceramic analysis. As has been discussed, many formal, technological, and stylistic traits are enculturated, and thus are spatially and temporally resilient. With the creation and use of archaeological ceramic types in which techno-Stylistic traits play a role, archaeologists have a stronger likelihood of visually identifying variations in a given ceramic that could represent a transported traditionally made vessel, versus a locally made version of the same traditionally produced vessel, but with local raw materials. After preliminary sorting and identifications INAA can play a potentially invaluable roll, as the chemical characterization of the different versions of the same type may result in the identification and source area of the transported vessels.
Inductively-coupled-plasma mass-spectrometry (ICP-MS)


Inductively-coupled-plasma mass-spectrometry is a highly sensitive analytical technique used to identify the chemical composition of a sample by chemically fragmenting or ionized charged particles using inductively coupled argon plasma, so that the ions can be separated and detected, allowing the different constituent elements to be identified, and a profile of the ceramic to be produced (Kennet, et al. 2002:444-445). ICP-MS is able to detect most elements in the periodic table, and at a relatively lower detection level, unlike INAA which is unable to detect many elements (Kennet, et al. 2002:444, 451; Little, et al. 2004:108). Although ICP-MS can accommodate larger samples than INAA, of physically up to 5x5x5 cm in size (Peacock, et al. 2007:320), it is advantageous in that it does not require large samples, making it less destructive. Unfortunately, however, ceramic specimens must be pulverized and digested with acid or atomized with a newer technique using lasers, in order to be analyses. If specimens submitted for ICP-MS are dissolved, the results are comparable with those produced with INAA (Kennet, et al. 2002:445). The laser ablation process (LA-ICP-MS) is less destructive, however, it has a more
limited range of detection, and unlike INAA, is less agreeable to bulk analysis is not feasible (Cecil and Neff 2006; Crock and Lichte 1982; Kennet, et al. 2002:444; Peacock, et al. 2007).

Unfortunately, some archaeologists have had problematic results when acid is used to treat the sample. In the separation of some elements, rare-earth elements are used to make distinctions, and unfortunately these rare-earth elements are susceptible to the insoluble calcium fluoride molecules that are left after acid evaporation, making them difficult to detect (Arnold, et al. 1999; Blackman and Vidale 1989; Kennet, et al. 2002:445). There is a procedure to inhibit the creation of the insoluble fluorides, however it involves the use of perchloric acid which is highly explosive and dangerous (Kennet, et al. 2002:445).

Bioanthropological Analyses

Isotopic Analyses

While isotopic analyses have only been applied in archaeological investigations in the last thirty years (Vogel and van der Merwe 1977), they have truly only gained full attention in the last fifteen or so years. Having originated in environmental and geological studies (Faure 1986), isotopic analyses have proven valuable to archaeological investigations, providing scientific data to questions of prehistoric environments, human ecology, diet, sedentism, and mobility (Budd, et al. 2004:127; Ericson 1985).

Isotopes are elements, whose nuclei vary in the number of neutrons. Each element varies in the number of isotopes, which affects the degree of energy used in chemical reactions and thus ratios of isotopes in different materials. Stable isotopes include carbon ($^{12}\text{C}$,$^{13}\text{C}$), oxygen ($^{16}\text{O}$, $^{17}\text{O}$, $^{18}\text{O}$) and nitrogen ($^{14}\text{N}$, $^{15}\text{N}$). Carbon 14 isotopes are not stable, and decay over time (Tykot 2004).
The principle behind isotopic analyses is that various environments contain different elements, each of which contains particular isotopes, whose ratios vary according to locality (Budd, et al. 2004:127; Faure 1986). Stable isotopes are ingested into the human body through the consumption of food, water and soils, and are absorbed into teeth and bone during the formation of skeletal tissues (White, et al. 1998:643). Bone collagen (the organic aspect of bone composed of amino acids) is predominately produced through proteins in diet, whereas bone apatite (the mineral aspect of bone, comprised of calcium hydroxyphosphate-carbonate) is the result of one’s entire diet (Ambrose 1993; Tieszen and Fagre 1993). Permanent teeth are formed around the age of 12, and the enamel effectively seals or mineralizes a geological signature of the individual’s habitat up until that point (2004:128; Budd, et al. 2000; Price, et al. 2000; Wright 1999; 2005:555-556). Conversely, human bone undergoes a regular (7-10 year) restoration cycle, and thus strontium and oxygen isotopes recovered from bone collagen is indicative of the geographical location of the individual during the last years of an individual’s life (Luz, et al. 1984; White, et al. 1998:645; Wright 2005:556).

The analysis of oxygen isotopes ($\delta^{18}$O), strontium isotope ratios ($^{87}$Sr/$^{86}$Sr) and ratios of stable carbon and nitrogen elemental concentrations in archaeological skeletal material ($\delta^{13}$C and $\delta^{15}$N), have recently proven successful in the identification of the geographical origins of individuals from archaeological contexts, or more pointedly prehistoric immigrants (2004; Al-Shorman 2003; Bentley 2006; Budd, et al. 2001; Hodell, et al. 2004; Price, et al. 2000; White, et al. 1998; Wright 2005).

While isotopic analyses are increasingly being conducted in concert with the investigation of population movements, it should be noted that the success of such studies are reliant on the group in question having migrated from one environmental zone to another, since the key elements
in the osteological remains are reflective of the chemical signatures specific or varying within and between environmental zones.

**Carbon and Nitrogen Isotopic Analyses (ratios of δ\(^{13}\)C, δ\(^{12}\)C, δ\(^{14}\)N and δ\(^{15}\)N)**

Carbon and nitrogen isotopic signatures detected in human remains are a reflection of the foods consumed, and thus allow the reconstruction of paleodiet and nutrition. The isotopic composition of plant tissues varies according to the plants photosynthetic path and are identifiable through light or heavy ratios of carbon (δ\(^{13}\)C and δ\(^{12}\)C) and to a lesser degree nitrogen (δ\(^{15}\)N). These signatures are passed on to the consumer and are detectable in bone collagen and tooth enamel. The carbon signatures embedded in tooth enamel differ from those detected in bone collagen and reflect the consumption of different types of foods (Wright and Schwarcz 1996). Carbon signatures in bone collagen indicate the intake of proteins, while those detected in tooth enamel reflect the ingestion of non-protein foods, such as grasses and shrubs (Al-Shorman 2003:1693; Ambrose 1993). Recent investigations have found that in fact all aspects of one’s diet, including proteins, carbohydrates and lipids, contribute to carbon in bone apatite (Tracy, et al. 2004). Given that different geographical environments have varying indigenous plants and animals, and thus differing carbon and nitrogen isotopic signatures, isotopic data from archaeological bones can relay information about one’s mobility across a landscape, and over time since teeth and bone isotopic signatures may reflect different residential areas during the course of one’s life.

The isotopic composition of plant tissues vary according to their photosynthetic path, are identifiable through light or heavy ratios of carbon (δ\(^{13}\)C) and nitrogen (δ\(^{15}\)N) and are detectable in bone collagen. Most edible plants tend to use either C3 (beans, squash, roots, fruit) or C4 (maize, amaranth, epazote) pathways. Animals who eat these plants and are consumed by humans also
contribute to the carbon signatures detected in bone. Nitrogen isotopes are positive indicators of trophic position and are reflective of diets enriched with the consumption of fish (Wright and Schwarcz 1996:171-172).

Geographical isotopic patterns are indicated by distinctions in elemental dietary signatures of different regions, specifically $\delta^{13}$C and $\delta^{15}$N weights, and are indicative of the differential consumption of maize and meat (Wright and Schwarcz 1996:174). Accordingly, such isotopic data is indicative of the individual’s ecological position relative to the available terrestrial, freshwater, or marine resources. If variations with other isotopic data or between isotopic signatures in individual’s teeth differ from their bone, mobility may be indicated.

**Oxygen Isotopes ($\delta^{18}$O)**

Oxygen Isotopes ($\delta^{18}$O) are relative to geographical elevation, climate, water temperature and distance from the sea, and differ from other isotopes in they are *not* linked to the geology, but are reflective of climate and weather, or in other words, to geography (Budd, et al. 2004:129; White, et al. 1998:645; Yurtsever and Gat 1981). While popular discussions of climate refer to it as being pan-regional in scope, in truth climates are to varying degrees localized, diverging according to the degrees of environmental or geographical diversity across a given region (Shaw 2003). Consequently, the oxygen isotope ratios detected in human tissues would signal an individual’s local environment, and thus place of residence.

Oxygen isotope ratios in skeletal remains, indicate the intake of oxygen, which is controlled by drinking water (Budd, et al. 2004:128; Longinelli 1984). Since teeth forms at very specific life stages, specifically during childhood, and since both precipitation and drinking water vary in customary ways geographically, oxygen isotope values identified in dentition are reflective of the place of residence at the time those tissues were formed, during childhood (2004:128; Budd, et al.
When compared with oxygen isotopes extracted from the same individuals’ bones, which would be indicative of their place of residence in the last seven to ten years, investigators should be able ascertain whether that individuals place of residence was the same in adult hood as it was in childhood.

Unlike strontium isotopes, oxygen isotopes in humans and other mammals are altered by biological processes but are able to be controlled for through a calibration process that relates the oxygen isotope ratios of drinking water to the skeletal oxygen isotope ratios (Budd, et al. 2004:128; Levinson, et al. 1987; Longinelli 1984; Wright 2005:555-556).

Budd (2004:129) has argued that oxygen isotope analyses are more advantageous to migration studies than other forms of isotope analysis, specifically strontium isotopes, because oxygen isotopes are more readily quantified due to the fact that the isotopic signatures of water are fundamentally tied to such geographical factors as latitude, altitude, distance from sea and temperature, which when mapped across the landscape produce wide variations in the isotopic composition of water (2003; Budd, et al. 2004:129; Darling, et al. 2003). Conversely, Bentley (2006:135) has argued that strontium is one of the most effective methods available for tracking migration, citing its extensive use in the study of animal mobility (Blum, et al. 2000; Hodell, et al. 2004:585; Hoppe, et al. 1999; Koch, et al. 1992).

**Strontium Isotopes \(^{87}\text{Sr}/^{86}\text{Sr}\)**

Strontium is “a divalent alkaline-earth element [that] has similar chemical properties [as tooth enamel] and can substitute for calcium in enamel” (Price, et al. 2008:167). There are four stable isotopes in strontium, $^{84}\text{Sr}$, $^{86}\text{Sr}$, $^{88}\text{Sr}$, and $^{87}\text{Sr}$. While $^{84}\text{Sr}$, $^{86}\text{Sr}$, and $^{88}\text{Sr}$ occur in comparatively ample amounts and are unalterable, beta decay from another naturally occurring chemical element/isotope Rubidium ($^{87}\text{Rb}$) can produce $^{87}\text{Sr}$. Rubidium has a long half-life (49 billion years), dental enamel that has $^{87}\text{Sr}/^{86}\text{Sr}$ in it does not change over the span of one’s life, or in the scope of human history (Neumann and Huster 1974; Price, et al. 2008:168).

As mentioned earlier, human bone undergoes regular restoration, and different skeletal elements, or bones have differing durational periods of restoration. Dental enamel is predominantly comprised of the mineral hydroxylapatite or hydroxyl-calcium phosphate (Price, et al. 2008:167). Hydroxylapatite also occurs in bones. The rates of bone restoration differ “according to the ratio of active osteoclasts (which precipitate hydroxylapatite) and osteoblasts (which dissolve hydroxylapatite)”]. Thus, bones with dense cortex, like femurs, have a restoration period which lasts decades, whereas trabecular bones like ribs have shorter regeneration periods of just a few years (Bentley 2006:162; Bentley, et al. 2002:Figure 7; Hoogewerff, et al. 2001). This is significant in the case of migration studies as the $^{87}\text{Sr}/^{86}\text{Sr}$ ratios in an individual’s bones thus has the potential of relaying more of the individual’s history over an even more refined time span (Bentley 2006:162; Schweissing and Grupe 2003:Fig. 2). This was best demonstrated in the case of the Iceman, where the varying $^{87}\text{Sr}/^{86}\text{Sr}$ ratios from a femur compared to a rib bone indicated the Iceman traveled between two areas in the Alps (Hoogewerff, et al. 2001; Müller, et al. 2003).
Unlike oxygen isotopes, strontium isotopes are directly related to a given area’s geology, and the age of the underlying geological topography. Strontium isotopes are essentially “geochemical signatures” of a given landscape. The isotopic ratios of the different types of rocks present in a geological landscape are incorporated into the local plants and mirror the geology of the area. The plants are then consumed by humans and animals, which are also consumed by humans, and these elemental signatures transferred or incorporated into the enamel and bones of the individual through their diet. Thus, since different localities vary in geology, they can be detected in archaeological skeletal remains, and serve to “source” an individual to an area (Beard and Johnson 2000; Bentley 2006:136; Blum, et al. 2000; Budd, et al. 2004:129; Graustein 1989; Price, et al. 2008; Price, et al. 2000).

While some landscapes have very varied geology and thus allow relatively constrained analyses that make it relatively straightforward to associate individuals with particular areas, the fact that the underlying geology of many regions is relatively uniform in age and composition across large landscapes, makes “sourcing” an individual to a particular locality somewhat problematic. (Budd, et al. 2004:129). The problems with regions in which the topography is more uniform stem from an unclear comprehension of the nature of the isotopic composition of the geology and that which is composed of in the soil, water, plants and air, and end up entering the human body (Blum, et al. 2000; Budd, et al. 2004:129). This can pose a significant obstacle to mobility studies. Thus, areas which exhibit less uniform geological topography allow for more precise assessments of migration patterns. In attempt to rectify such obstacles, scholars have turned to the analysis of isotopes in local modern or prehistoric animal tissues to set as a marker of regional levels of isotope exposure and ingestion (Bentley, et al. 2002; Budd, et al. 2004:131). Additionally, spatial analyses and mapping of regional variations of 87Sr/86Sr ratios as detected in
rocks, soils and groundwater across given landscapes are also being conducted (Bentley, et al. 2002; Ezzo, et al. 1997; Hodell, et al. 2004).

Characterization of the localized strontium isotope signature for a given region has been found to best be assessed by analyzing the signatures of small animals, preferable archaeological bone, from the same localized environment (particularly their teeth), which are seen as predictors of local values in mammals (Bentley 2006:155; Bentley, et al. 2002; Hoppe, et al. 1999). Some investigators have used skeletal remains of modern animals; however these may be problematic due to modern contaminations associated with the consumption of non-indigenous foods, or foods with exotic Sr, fertilizers or other pollutants (Bentley 2006:158). Others have tested localized plants, groundwater (Beard and Johnson 2000). Bones which have been interred in the ground may not be the best sources of local strontium signatures, as the burial process can contaminate them (see below) (Grupe, et al. 1997; D. T. Price, et al. 1994).

Problematic to isotopic studies is the fact that often archaeological bone, particularly porous bone (Nelson, et al. 1986; Robinson, et al. 2003), is the fact that human bones can be subject to diagenesis. Diagenesis occurs when the burial environment modifies the original elemental, and, or compositional state of the bones. This can happen when naturally occurring strontium in the soils, or groundwater seep in and infiltrate, and or replace the strontium ingested and absorbed in the bone by the subject, and thus changing the original strontium signatures, and essentially contaminating them (Bentley 2006:166; Collins and Riley 2000; Hoppe, et al. 2003; Lee-Thorp 2002; Nielsen-Marsh and Hedges 2000; Price 1989; Price, et al. 1992). While teeth are also subject to diagenesis through burial processes, tooth enamel is more resilient because of its denser, more rigid composition, and thus less subject to contamination (Bentley 2006:167-169; Budd, et al. 2000; Hoppe, et al. 2003; Lee-Thorp and Sponheimer 2003). Digenetic strontium can evidently

It should be pointed out though that just because variations in strontium are detected in an individual, it does not automatically mean that a person’s residence changed, as it could indicate that a person traveled frequently, and ate different foods with different isotopic signatures (Bentley 2006:170). As with the other methods for detecting migration, it thus stands to reason that a multi-disciplinary approach to migration would afford the most accurate of results.

*Genetic (DNA) Analysis*

The study of ancient DNA is a relatively new area of research within archaeology, having only been introduced to archaeology in the last twenty years (Berigsen 2003:92; Jones 2003:629), and with research focusing on human DNA having only gained true attention in just over the last ten years (Arriaza 1995; Hauswirth, et al. 1994; Jones 2003). While the application of genealogical methods and models, in concert with linguistic and archaeological investigations, have provided insights into population structures and histories, including population changes and movements over time and space among many ancient cultures (Berigsen 2003; Blum, et al. 2000; Cann 2001; Gibbons 2001; Harpending 1994; Redd and Stoneking 1999), research involving population genetics, archaeology, and issues of migration remain somewhat underutilized.

Ancient DNA was first successfully extracted from a 1000 B.C. Egyptian mummy in 1985 by Pääbo (1985; Berigsen 2003:93; Hagelberg and Glegg 1991:45). Investigations focusing on population movements have since continued and expanded in scope. The areas or topics receiving the most attention, and perhaps where DNA studies have been most successfully implemented, involve the peopling of the Polynesian islands, Oceania, and East Asia (Bellwood and Sanchez-
Mazas 2005; Blum, et al. 2000; Friedlaender, et al. 2002; Gibbons 2001) the movement of modern humans out of Africa (Gugliotta 2008); the populating of Australia (Redd and Stoneking 1999), and the crossing of the Bering Strait into the Americas (Harpending 1994).

The techniques utilized in tracking the genetic aspects of population movements were not initially developed for the study of population dynamics but were originally developed for the analysis of molecular systematics (Cann 2001:1742). Population genetic studies have involved various types of analyses, beginning with sequence comparisons of blood groups, serum proteins and enzymes (Cann 2001:1743); including the analysis of “maternally inherited DNA from mitochondria – the energy-producing organelles outside the nucleus of the cell” (Gibbons 2001:1736); and Y-chromosome studies used to trace paternal ancestry by comparing the frequency and diversity of DNA sequences and markers (Gibbons 2001:1736).

Deoxyribonucleic acid or DNA is a nucleic acid that is “the master molecule of a cell” (Berigsen 2003:92). DNA molecules contain the genetic and structural make-up of living organisms. There are between 60,000 and 100,000 genes within a nuclear DNA cell (Berigsen 2003:93). Each nucleus cell holds thousands of mitochondrial DNA (mtDNA). Most archaeologically based genetic investigations utilize mtDNA cells, which have discrete structures from the nucleus of DNA cells and are inherited from the subject’s maternal side. Since mtDNA have only 37 genes within them, they are easier to study (Berigsen 2003:93). Archaeogenetic studies have begun to include the investigation of paternal DNA lines through Y microsatellite studies, which when combined with the maternal Y studies have the potential to make great strides in the study of ancient kinship, and of course provide promising results for migration studies (Lell, et al. 1997; Underhill, et al. 1996).
With advances in DNA cloning, and the development of amplification methods, specifically the polymerase chain reaction (PCR) tool which permits the infinite replication of DNA fragments (Berigsen 2003:93; Pääbo 1989), specimens containing minimal retrievable, or degraded DNA cells are possible from most ancient samples (Berigsen 2003:93; Hagelberg and Glegg 1991:45, 48). DNA can be extracted from soft tissues, including brain, but also from bones and teeth (Hagelberg and Glegg 1991:45). DNA extracted from bone tends to be less degraded than that obtained from soft tissues (Hagelberg and Glegg 1991:49). The polymerase chain reaction tool copies a section of the mtDNA sequence, which is then compared to known samples from a mtDNA population database (Berigsen 2003:93).

Unfortunately, DNA analysis, and its application in ancient migration studies is considered controversial (Berigsen 2003; Cann 2001; Friedlaender, et al. 2002; Gilbert, et al. 2005). Skepticism of DNA studies ranges from methodological or scientific concerns with authenticity, contamination and reliability of samples; to the degradation or destruction of ancient samples and their molecules over time and in the analysis process (Berigsen 2003; Cann 2001:1743; Gilbert, et al. 2005:541, 542; Hofreiter, et al. 2001:354; Nicholls 2003:Box 1; Pääbo, et al. 2004). Other criticisms center on the applicability of the data to larger interpretative concepts, as well as biases in data collection and interpretations, to the usefulness of the resultant data and, or correctness of the ensuing interpretations (Cann 2001:1743; Gilbert, et al. 2005:543). Some scholars have raised concerns over the use of DNA with studies involving ethnicity, claiming ethnicity to be a social, and politically charged, construct utilized by observers to maintain boundaries, and thus the inclusion of DNA data may be used to serve unintended purposes, or perhaps even be misused (Berigsen 2003:94; Mirza and Dungworth 1995).
In response to some of these criticisms, prominent proponents of DNA studies have published a series of criteria to be met in order to maintain quality and reliability and prohibit contamination. These criteria were created to serve as guidelines (Cooper and Poinar 2000; Gilbert, et al. 2005; Lindahl 1993; Nicholls 2003; Pääbo 1989).

**Non-metric, Discrete, or Epigenetic Morphological Traits**

The use of biological morphological traits to determine population diversity, or conversely, uniformity across time and space is not new to anthropological study, or migration studies (Darwin 1871; Huxley 1959). While early bio-morphological studies concentrated on the measurement of *metric* traits, such as skull shape, facial features, stature and body form, those examining geographical and temporal variations found these types of data arbitrary and unhelpful (Cann 2001:1743). At first extrapolated from field and laboratory zoological studies involving rodents and non-human primates, and later expanded to human subject, studies indicated that skeletal variations are determined by genetic, or hereditary composition (Blom, et al. 1998:240; Cheverud and Buikstra 1978, 1981, 1982; Grüneberg 1963; Hauser and DeStefano 1989; Saunders and Popovich 1978; Szathmary and Ossenberg 1978:679). Scholars investigating population diversity have been increasingly returning to bio-morphological studies (1998; Blom, et al. 1998; Christensen 1997a; Corruccini 1974; Ossenberg 1976).

More recent morphological studies involve the examination and recording of the absence or presence of non-metric, discrete or epigenetic morphological traits in crania and dentition (1974; 1998; Berry and Berry 1967; Christensen 1997a, 1998; Corruccini 1972; Finnegan 1978; Ossenberg 1992; Szathmary and Ossenberg 1978; Turner, et al. 1991). Given that migration is defined by the movement of peoples, some suggest that biological evidence should provide the
most direct evidence through which peoples can be linked (Beekman and Christensen 2003:127; Blom, et al. 1998:240).

Discrete morphological traits include such attributes as the presence or absence of accessory cranial bones in sutures; canals, spurs, bridges, and grooves in the skull; the presence or absence of foramina and sulci, as well as their number and location; and dental patterns, including cusp numbers of molars, root numbers, shoveling, winging, among other traits (Beekman and Christensen 2003:128; Blom, et al. 1998:245, Table 2; Christensen 1998:Table 3; Finnegan 1978; Szathmary and Ossenberg 1978:679, Table 5; Turner, et al. 1991). Postcranial morphological taxonomical studies are not commonly undertaken, as postcranial data are considered less reliable, as they are evidently more commonly subject to environmental influence (Beekman and Christensen 2003:128).

While there may be upwards of fifty-five observable non-metric traits, most studies are unable to “score” this many trait due to preservation problems, or the traits also have correlations with sex and environmental considerations (Beekman and Christensen 2003:131; Blom, et al. 1998:245, 246; Christensen 1998:268). Thus, studies are more likely to “score” between 20 and 35 cranial traits (Beekman and Christensen 2003:131, Table 2; Blom, et al. 1998:Table 2; Christensen 1998; Szathmary and Ossenberg 1978). While independently these traits are not likely to be significant, when these attributes are recorded across archaeological populations, their absence or presence frequencies presented as percentage indices and subjected to cluster analysis, permit distinctions to be made between populations (Beekman and Christensen 2003:128, 131; Finnegan 1978; Szathmary and Ossenberg 1978:679; Turner, et al. 1991).

Resultant data from discrete trait data have not always proven to be analogous with either metric data (Howells 1976; Szathmary and Ossenberg 1978), or genealogical data (Szathmary and
This in part may be more of a product of the populations selected, whether they are regionally and temporally comparable, and whether the traits chosen for analysis were these most statistically significant for the studies (Ossenberg 1976:707).

As research involving questions of ethnicity and identity have increasingly come into vogue, scholars have underlined the fact that groups maintain boundaries and associations through rules of interaction. These rules may be social defined by such things as marriage or taboo conventions or geographical locations, distances, obstacles or isolations. Ultimately, these social boundaries and interactions impact biological reproduction and the spreading of genealogical codes. It thus follows that genealogical codes are controlled by the maintenance of these boundary and interaction rules and should be reflected in a population’s biology (Blom, et al. 1998:244; MacBeth 1993).

In the articles reviewed for this paper that dealt with discrete traits and hypotheses relating to population movements, every investigation correlated linguistic, archaeological and, or other biological approaches in their studies, as a means of substantiating the data with additional data from other avenues or research. Most also suggested that further studies were required (Beekman and Christensen 2003; Cavalli-Sforza 1997; Christensen 1997a; Ossenberg 1976, 1992; Sokal 1991; Szathmary and Ossenberg 1978).

It seems logical that the most authentic and accurate results would result from studies which are able to include a large population sample size. In his own studies, Christensen (1998; Beekman and Christensen 2003) examined 486 individuals in one study, and only 16 in another, and even the earlier study of 486 specimens was considered a small population sample, as was Blom et al’s (1998:Table 1) study which utilized 586 individuals. A wider range of attributes does
not necessarily mean that the data will be more precise however, as the data may be lost in the variety of traits recorded.

**DISCUSSION**

With the application of increasingly scientific techniques, and the re-conceptualization of migration as a process rather than an un-patterned event (Beekman and Christensen 2003:154), migration studies have undergone great leaps of change. Migration research is no longer viewed as simply a means to explain culture change, or a stage of social evolution. Nor is it stigmatized by inferential data (Rouse 1958) diffusionist theory (Childe 1925, 1950; Friedlaender, et al. 2002:454), or the perception that it is inadequate methodologically or theoretically. While the new migrationist approach still promotes methodology, it does so with a heightened concern for demonstrability, scientific corroboration and human agency. Key to this shift was a realignment of migration methods away from simply identifying migrants through the identification of culturally emblematic artifacts (Shennan 1989), after all, artifacts do not migrate, people do (Andrews 1990, 1997). Researchers saw the need to elucidate data that would establish evidence of the causes, processes and effects of migration, and conditions favoring migration existed (Clark 2001:6; Reid 1997:631; Rouse 1958:64).

Perhaps the most influential factor in the renewal of migration studies has been the diligence afforded to more holistic or multi-disciplinary approaches (Beekman and Christensen 2003). As has been seen repeatedly in this paper, no one methodology truly can, or should stand on its own. Biological studies are paired with archaeological and linguistic studies; chemical studies are paired with archaeological data. The need to look beyond our own discipline for sources of scientific inquiry has been well demonstrated (Andrews 1990:898; Beekman and Christensen 2003:154; Fix 1999:6). Thus, the investigation of population movements can no longer be accused

Despite the scientific and conceptual advances made in migration studies, demonstrating migration remains a difficult task, and there is certainly a continuing need for improvement. This is partially due to the difficulties archaeologists experience in determining culture contact and interaction through trade and exchange, from true cases of population movements. While chemical characterization studies are assisting in the detection of trade goods versus traditional objects manufactured by migrants, in areas with rather homogenous geographical or topographical environments, this is still proving to be problematic. In instances where artifacts are made directly from raw materials which do not undergo any human alteration (i.e., lithic objects), whether the item is a trade good or brought with a migrant is still directly indeterminable without supplementary data, such as the examination of production techniques, use-wear, and provenience analyses. In the case of testing materials which are subject to decay or poor preservation, such as human and animal bone, wood, cloth, chemical and characterization studies may be hindered or inaccessible due to the degree of poor preservation. Moreover, the cost of some testing strategies that have the potential to address the movements of peoples, can also hinder the ability to use these methods to answer questions about Maya mobility. The discipline would benefit from the development of additional and affordable techniques for assessing poorly preserved specimens. It would also benefit from the development of a method for quantifying architectural, spatial and settlement data with the premise of examining identity through the built environment in a similar fashion to how identity is examined through the more mundane aspects of ceramics. Such an application could assist in identifying the presence of migrants through another “line of evidence.”
Nonetheless, conceptual problems still remain. Material culture still forms the basis on which migration studies are based. What remains problematic within migration studies is the conception of what comprises or defines a given “population”. The question of emic identity still remains. Culture groups are formed through a vigorous process of aggregation, ascription, delineation and social construction (Barth 1969; Blom, et al. 1998:244; Chapman 1993; Holl 1993:42; Levy and Holl 2002:85). Do the peoples we identify archaeologically as belonging to the same group actually share linguistic, social and biological connections? Archaeological investigations must be able to methodically transcend our etically prescribed archaeological boundaries, and examine the data independently, as well as through multi-intersecting lines of evidence (Bellwood and Sanchez-Mazas 2005:481).
CHAPTER 4: EXCAVATIONS AT STRATH BOGUE

SHORE RECONNAISSANCE AND IDENTIFICATION OF THE STRATH BOGUE SITE

Archaeological research at the Strath Bogue site was conducted under the auspices of the Belize Postclassic Project, the direction of Dr. Marilyn Masson, and in conjunction with the University at Albany’s archaeological field school. In keeping with the main objectives of the Belize Postclassic Project of documenting and reconstructing community patterns and processes of culture change, project members continually performed reconnaissance surveys around Progresso Lagoon, in hope of identifying Terminal Classic, Postclassic and Colonial occupation.

Reconnaissance initially involved driving along dirt roads adjacent to the shore of Progresso Lagoon, through various agricultural fields, and extended approximately 1 ½ to 2-kilometers inland looking for mounded architecture. In areas with high densities of visible architectural features, surface inspection and artifact collection supplemented cursory “truck” surveys. These surveys were aimed at identifying areas of occupation and providing chronological associations of archaeological features through temporally recognized artifact classes. Reconnaissance activities west of Progresso Lagoon in 2000 resulted in the identification of a Terminal Classic period site which now bears the name Strath Bogue after the area in which it is located (see Figure 4.1).

Limited investigation of the Strath Bogue site was initiated during the 2001 summer field season, with the bulk of field investigations taking place during the summer of 2002. Due to the Belize’s requirements of having an associated Ph.D. present in country for analyses, two additional analysis seasons were undertaken in 2005 and 2008, with the oversight of Dr. Robert Rosenswig and in association with the University at Albany’s archaeological field school.
Figure 4.1: Google earth snap-shot of Progresso Lagoon Region, marking location of Strath Bogue and Caye Coco.

The site of Strath Bogue is located approximately 1.5 kilometers west of the western shore of Progresso Lagoon, roughly 2.5 kilometers east of the New River (Ferguson 2002a:34), and less than 20 kilometers from Chetumal Bay and the Caribbean sea (see Figure 4.2). The land on which the site is located is today primarily utilized for sugar cane and corn crops, although sections of the site are located within the boundaries of a modern papaya and banana plantation. The true size and boundaries of the site were unable to be determined, as permission to access some properties was denied by some landowners, most pointedly the owners of the papaya plantation.

The land on which Strath Bogue is located is owned by several individuals. However, the area of the site on which this dissertation research concentrated is on land primarily held by four different landowners: Srs. Pat, Sr. Carlos, Sr. Cowo (Junior), and Sr. Cowo (Senior). Where applicable, plazas and isolated groups of structures were designated alphabetically.
Figure 4.2: Map of Northeastern Belize indicating location of sites with Terminal Classic occupation (See Permission Appendix III).
Structure numbers associated with *plazuelas* (plazas) or platforms were also designated alphabetically according to associated plaza and numbered numerically as encountered during reconnaissance. (i.e., Group A, Structure 2A).

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A number of solitary mounded structures, plazuela groups and substantial raised platforms surmounted by superstructures of various sizes are located across the site (see Figure 4.3). While Strath Bogue is not dominated by a central acropolis complex typical of a large center, an approximately 2.5-meter-high raised platform (Group A) is present at and around which most of the sites architectural constructions are concentrated. Group A has two pyramidal-type superstructures (Str.’s A1 and A2), an approximately 18m long range-type structure (Str. A4), and a smaller eastern, and possible shrine structure (Structure A3) (see Figure 4.4). Unfortunately, all four structures, especially the eastern structure, had been heavily looted prior to investigation.

According to local informants, the land on which Strath Bogue is located was used roughly 35-40 years ago as a ranch. Over the past 25 years the land has been subject to cropping and thus plowing. A number of large mounds were destroyed in the last 10-15 years in the construction of the east-west running cane road that runs through the site, and a number of superstructures were razed from the Group I platform. Locals say they were larger than those remaining at the site. No
one is sure how many structures were actually destroyed. A structure of unknown size was apparently situated over a chultun on Sr. Salazar’s land (Chultun #5). Informants suggested that the transportation branch of the government was responsible for the bulldozing of these structures. Evidently the fill from these structures was used for fill in the construction of the road.

**RECONNAISSANCE AND SURFACE COLLECTION AT STRATH BOGUE**

Reconnaissance and surface collection at Strath Bogue was periodically conducted throughout the two field seasons, with a more systematic surface collection program being implemented in 2002. Reconnoitering was performed in order to identify previously unidentified activity areas, mounded platforms and structures, and other culturally significant features such as possible stelae, reservoirs and quarries, and chultuns, and attempt to determine the boundaries of the site. The surface collection program was aimed at assessing function(s), and providing temporal associations of structures, activity areas and regions of the site.

Sugar cane is typically planted in rows, and generally was no higher than 1m at the outset of our investigations. The rows of cane actually facilitated the reconnoitering of the site, as the rows allowed us to transverse the site in a systematic fashion by exacting the direction and spacing of the transects. Mounds higher than 50cm were relatively easy to identify, especially those whose dense construction fill prevented the growth of cane on them. Wild vegetation or weeds of a different color grow on these mounds, making them easy to identify, even when changes in topography are not clearly observable at a distance. Surface structures or architectural constructions lower than 50cm were identified only when encountered in cases were tracts of land had been cleared, or during reconnaissance. Artifact scatters or activity areas were, however, more difficult to identify because of the vegetation and the tilling or plowing of the ground. Rows between the sugar cane provided “alleys” void of vegetation, which aided in visibility and the
identification of artifact concentrations. Nonetheless, surface scatters of artifacts were hindered somewhat by the natural littermat and charred debris associated with cane burning.

Figure 4.3: Map of Surveyed Portions Strath Bogue.
Figure 4.4: Close up of main area of Strath Bogue, and where investigations were concentrated.
Figure 4.5: Map of Strath Bogue indicating location of surface collections.
Significant artifact concentrations revealed during 2002 reconnaissance efforts were marked at their centers, and systematically surface collected. A 3 meter “dog-leash” collection area was set to radiate out from the center of the concentration and all the artifacts within the 3-meter radius were collected. Each concentration was numbered, as was each collection (i.e., Conc.1-1). Due to the relatively small size of the artifact concentrations, none of the concentrations identified at Strath Bogue warranted more than one collection. The relative density of each concentration was assessed according to the density of artifacts within the 3-meter radius, not according to the size of the artifact concentration. Each concentration was rated according to light, moderate or dense scales. A total of 57 collections were made in 2002 (see Figure 4.5). Of those 57 collections, 17 were light, 18 were moderate and 22 were densely scattered with artifactual materials. Thirty-nine of the collections were located on mounded structures, while 18 were associated with off-mound artifact concentrations. It should be noted that not all of the artifact concentrations identified at the site could be sampled/collected due to time and labor constraints.

Artifacts recovered from the collections included lithic tools such as bifaces, unifaces, projectile points, and scrapers, lithic cores and flakes of all stages of production, ceramic sherds, modified and unmodified shell, faunal bone, obsidian blades, and objects classified as special finds, such as manos, conch shell objects, spindle whorls, etc. Every surface collection contained ceramic sherds, and with the exception of two collections all contained lithic flakes.

Due to the nature of surface collections, the artifacts recovered were more often than not damaged through exposure to the elements and modern agricultural practices. Many artifacts were charred or scarred from fire and plowing, were leached of surface treatments, crumbled on collection, or exhibited postdepositional patina growth. Thus, the artifacts recovered through surface collection unfortunately proved to be less informative than expected. Nonetheless, their
detection did permit the identification of activity areas and middens that might not have otherwise been exposed and facilitated the placement of several test units whose excavation provided better preserved cultural materials.

**EXCAVATION STRATEGY**

Excavation units consisted of a series of vertical and horizontal units, were excavated by stratigraphic and/or arbitrary levels, using trowels, geological picks and shovels, and were screened through 1/4-inch screens. All subops were excavated by arbitrary and stratigraphic levels. Subop initially began with the excavation of 10cm arbitrary levels, and where cultural and natural levels could be determined, these were further divided into 10cm levels (where applicable). Arbitrary levels were altered to 20cm levels when more expansive and, or larger matrices such as construction fill were encountered. Some subops were not excavated to bedrock due to a paucity of artifacts or cultural materials, or according to the rationale behind the excavation, while others were expanded horizontally to further reveal cultural deposits. Lot numbers were assigned to arbitrary levels, significant stratigraphic and horizontal exposures, and features. In situ mapping and photographing were also conducted. Detailed notes, level records, wall profiles, top plans and lot and artifact logs were kept. Artifacts were collected by subop, stratigraphic level and lot, and sorted according to material, artifact type, and special find classification in the field. Provenience was documented horizontally and vertically by subop datums.

Since the primary foci of the 2001 field season was to securely define the temporal associations of the site, and to gather artifact samples attesting to the different activities the people of Strath Bogue were engaged in, the majority of subops were placed in locations expected to reveal middens. Thus, several 1x2 meter subops were placed off-mound in locations deemed likely to contain associated midden/discard materials. Additional 1x2m subops were located in areas
where surface artifact scatters suggested potential locations of middens. Two 2x2m subops were placed on architectural constructions, one in the Pat Group on Structure 5 (Subop 5), and the other in the Carlos Group on the edge of a platform or terrace associated with Structure 14 (Subop 6). All units were placed on a north-south axis, unless it was more appropriate to follow exposed architectural or artifactual features, or where the least impact to the cane crop would be. Some subops were expanded to more adequately expose and understand architectural features, or in the case of the Structure 5 excavations, to full expose Burial features. Additionally, further and ongoing reconnaissance coincided with the initial mapping of the site.

The second and more elaborate phase of archaeological investigations at Strath Bogue took place during the summer of 2002. The 2002 research continued with our program of reconnaissance, excavation and mapping. Excavations were expanded to include the investigation of a complement of the architectural constructions and cultural features at Strath Bogue, including two structures within the site’s main platform group (Structures A1 and A4); a low residential structure, (Structure 30c); and a possible ritual-oriented structure, (Structure 39). Investigation of Structure 5 continued in order to remove a burial left in situ from 2001, and to gain a better understanding of the structures design, construction, function and temporal affiliation. Two chultuns (Chultuns #3 and #5), were entered and mapped and Chultun #3 was excavated. Test excavations of two areas associated with possible monuments were conducted in attempt to confirm or refute such propositions. The subops placed to test the validity of there being potential monuments were initiated as 1x2 meter units.

Structural excavations began with the excavation of 2x2m subops, with the structure’s terminal phase of occupation initially only being excavated. Once the terminal phase of occupation had been exposed, additional excavation units were added when deemed advantageous. Expansion
units were set to follow the architecture exposed in the initial excavations. Structures 30c, 39 and A4 were excavated in a semi-horizontal fashion. Vertical excavations were performed in only a few of these sub-operations, so to provide diachronic and structural data essential to reconstructing occupation and temporal sequencing.

Additionally, a program of stratified, random-sampling subsurface testing was implemented to supplement the surface collection of artifact concentrations in attempt to further isolate and probe on and off mound deposits that might have been related to middens, workshops, or other activity areas. A total of 7 test units were excavated. Collections were separated into the three relative density categories (dense, moderate and light), and two collections from each category were randomly chosen to be excavated. Seven test units were excavated, representing a 12% sampling strategy. All stratified, random-sample test excavations were 1x1m units and were excavated to bedrock or sterile levels in 10cm arbitrary levels, except where cultural levels warranted additional level changes.

**EXCAVATIONS**

**Subop 1**

Subop 1 was a 1x2m unit, placed on a northeast-southwest orientation, off of the southwest side of Pat Group Plaza A’s raised platform. The unit was placed so that the short axis ran parallel to the platform, and the subop slightly incorporated the edge of the platform (see Figure 4.6). This orientation was chosen in an attempt to maximize the potential dispersal area of midden scatter away from the edge of the platform.

The subop was surrounded by sugar cane and tiger grass, and thus root disturbance, especially from the sugar cane, had impacted surface deposits. A number of large limestone rocks
were lying on the surface. Both levels were disturbed through plow activity and roots from the cane and tiger grass. Rock debris was heaviest in the northeast half of the subop, and likely was representative of structural collapse from the adjacent platform. Level 3 had marl inclusions in its matrix that made excavation more laborious. Artifacts recovered were minimal, consisting mostly of lithic debris, and small non-diagnostic ceramic sherds. Two obsidian blade fragments were recovered. Due to the lack of midden debris, and the paucity of artifacts recovered from this subop, this excavation was terminated at the average depth of 50cm below surface.

Subop 2a

Subop 2a was located off of the rear of Structure 2a, to the northwest of the structure (see Figure 4.6). The purpose of this 1x2m unit was to test for midden debris. The unit was placed on a north-south orientation and situated so that the short axis of the unit was closest to the structure. Undulating bedrock was encountered between 25.5 and 43cm below surface. The matrix removed consisted of humus mixed with limestone rocks that appears to have been either structural collapse or back dirt from the very large looter’s pit (LP2) in Structure 2A. Minimal numbers of ceramic sherds and lithic flakes were recovered from this subop, as was an obsidian blade from Lot 9. This excavation failed to locate a midden deposit.

Subops 3a and 3b

Subop 3a was a 1x2m unit situated to the east of Structure 3, at the base of Group A’s platform, just off the back of Structure A3 (see Figure 4.6). The subop was placed along a north-south axis and was intended to test for a midden deposit. The area had been heavily plowed, as was evident in the disturbed nature of the topsoil and the presence of plow furrows. After clearing away the humus and collapse debris, a concentration of large rocks appeared in the southwest corner of the subop. As excavations proceeded, the rock concentration in the southwest
corner of the subop expanded, and a row of additional rocks branched off of it towards the east at its northern extreme. The northern portion of the subop was less compact than that in the south.

A dark circular stain in the soil was unearthed at the northeast corner of the subop. The stain was isolated and excavated separately. The circular stain measured approximately 18x18 centimeters and was 14 centimeters deep. As the removal of the stain progressed, ash was encountered. The shape and size of the stain are consistent with that of a post, and the charcoal may have been the result of the post having been burned. Added support for the identification of this feature as a posthole was the recovery of a piece of daub from inside the stain’s hole. No artifacts were retrieved from the stain.

Figure 4.6: Group A indicating location of Subops 1, 2a, 3a and 3b.
Excavations continued around the construction in the southwest corner and additional rocks were exposed. A limestone rock wall protruded from the northern extreme of the construction. The soil to the south of the wall suggested a possible tamped earth surface. This surface was flush with the top of the limestone rock wall.

Another concentration of rocks was unearthed in the northeastern quad of the subop, at a depth of 20.5cm below surface. The rocks had a veneer-like quality to them and extended into the eastern wall of the subop. Remnants of a plaster floor (Floor 1) abutted the construction in the southwest corner of the unit and continued north and east for about 40cm, into the middle of the subop, where it was no longer detected. Interestingly, the floor ceased to exist where the cobble surface, exposed and running into the eastern wall of the subop, was located. An expansion unit was initiated in order to gain more insight into this construction feature.

Subop 3b was a 2x1m unit, placed directly to the east of Subop 3a. Limestone rocks and a large chert cobbles forming a circular formation were encountered surrounding the area previously noted as being a very compact soil, and completely outlining the north-south running veneer-type stone “alignment” first identified in Subop 3a (Figure 4.7). The veneer stone “alignment” was comprised of limestone rocks and measured approximately 0.30x1 meters. Only a few small lithic flakes were recovered from within the veneer alignment.

Artifacts recovered from the excavation of the circular construction were minimal; however more artifacts were recovered from the eastern side of the circular structure, particularly lithic flakes. The wall of the circular tamped earth platform was constructed of medium to large limestone rocks (15-30cm), many of which exhibited evidence of burning. Very few artifacts were recovered from the wall construction itself. A very thin layer of soil was sitting above bedrock beneath the area of the circular structure.
Figure 4.7: Top plan of Subop 3a & 3b circular platform and veneer stone alignment.

While no midden materials were recovered from these subops, a rounded tamped earth construction with a veneer stone walkway to it was encountered. It would appear that this construction may have had a wattle and daub superstructure built above it, as was evidenced by the post hole and associated daub. Sadly, the artifact complement of this structure does not lend itself to discerning the function of the round platform construction.

Subop 4

Subop 4 was located off-mound, roughly equidistant from Structures 5 and 6 (see Figure 4.8). This subop was a 1x2m unit, intended to test the area for possible midden deposits. Subop 4 was placed in this area to investigate a significant surface scattering of artifacts in this location.
Excavation of Subop 4 revealed an apparent construction feature in the southern half of the unit, only 10-15 centimeters below surface. The matrix to the north and abutting the construction was comprised of a fine-grained dark brown soil with numerous limestone inclusions and pebbles. Two small clusters of ceramics were unearthed at depths of approximately 13cm below surface. The presence of the ceramic clusters and the high density of limestone inclusions at the same level were suggestive of a disturbed/decomposing plaster surface with only the corresponding ballast and soil fill remaining. This floor surface would likely have been the terminal plaza floor (Floor 3).

The construction feature in the southern half of the subop was fashioned from an aggregate fill of limestone cobbles, rocks and marl. Many of the rocks in the fill showed signs of burning, as did the limestone inclusions in the gray-brown loamy soil above the fill. It is likely that the surface of the construction had been plastered in antiquity. Remnants of a second-floor surface from the area to the north of/in front of the platform in the form of a densely packed rock surface at approximately 23cm below surface (Floor 2). This rocky surface below the ballast fill of Floor 3 was so well packed that at first, we mistook it for decomposing bedrock. This surface abutted the base of the platform and was thus associated. It is likely that the construction and Floor 2 were representative of an earlier edge or the raising of the plaza platform on which Structures 5 and 6 sat, and was filled in upon expanding the plaza at a later date. Many artifacts were recovered from the fill above the plaza platform, including diagnostic ceramic sherds with characteristic Terminal Classic rims, a conically drilled pottery sherd, and two lithic tools.

Artifacts recovered from within the platform included ceramic sherds, lithic flakes, marine shell, a mano fragment, and a utilized flake, as well as a shell bead, a fragment of an obsidian
blade, and a burnt faunal bone. Artifacts recovered from below the adjacent floor (Floor 2) included ceramics, lithic flakes, a fragment of an obsidian blade, and a faunal bone.

**Figure 4.8: Map indicating Subops 4 and 5a in the vicinity of Structure 5.**

Removal of the construction and associated floor revealed a light, orange-brown, low to moderately packed sandy loam with limestone flecking. Artifact densities decreased drastically in this matrix. A marl floor surface (Floor 1) was encountered below this across the entire subop area. An associated aggregate fill with 10-20cm sized limestone rocks was encountered below this floor. This fill continued down to an approximate depth of 60cm below surface. As is typical with construction fill, a modest amount of ceramic and lithic artifacts was recovered.

A reddish-brown fine-grained matrix that became more clay like as excavations progressed was encountered below the fill. Limestone cobbles were dispersed throughout the level, as were a number of gray limestone pieces likely indicating burning. The number of artifacts collected decreased. A change in matrix color and an increased presence of burnt limestone and charcoal flecking coincided with increased depth, as did a decrease in artifact density. A black, charcoal stain against the western wall of the subop was identified.
The charcoal feature was encountered at a depth of approximately 71cm below surface. This feature was comprised of burnt charcoal and carbon in a deep-red clayey-loam matrix. Only five ceramic sherds and one lithic artifact were retrieved from this feature. This feature is evidently a fire pit or hearth of some sort. The pit measured approximately 40x30cm at its largest extremes and reached a maximum depth of 13 centimeters (see Figure 4.9). The soil immediately adjacent to the fire pit was a very bright orange-red clayey soil, with burnt limestone all around the area. The deep orange-red matrix is indicative of the oxidization of the soil as a result of a burning episode. This feature was sitting on bedrock (see Figure 4.10 for a full profile of this unit). The area surrounding the fire pit was comprised of a loosely packed, dry, sandy matrix with very few artifacts dispersed throughout. Eight ceramic sherds, one patinated possibly archaic lithic tool, and one flake was recovered this matrix. Bedrock was reached across the entire unit.
Subop 5a was located off-mound, to the north of Structure 5. The purpose of this 1x2 meter unit was to test for midden debris. The unit was placed on a north-south orientation and situated so that its short axis was closest to the structure (Figure 4.8).

While bedrock was encountered in some areas of the subop relatively quickly, and despite the humus having been greatly impacted by plowing, the artifact density was fairly high right from the beginning. Burned limestone and some charcoal flakes were encountered in Level 2. Initially it was uncertain whether this burning was from recent slash and burn practices, or whether it was associated with Prehispanic activities. However, the presence of an undisturbed hole in the bedrock complete with carbon in the matrix suggested a Prehispanic association (Figure 4.11). Artifact
densities increased with depth. The density of artifacts, paired with the burning activity was consistent with that of a midden deposit, and thus this classification has been assigned.

**Figure 4.11: North profile of Subop 5a.**

**Subop 6**

Subop 6 was a 2x2 meter unit, placed on the southeastern area of a platform associated with looted Structure 14. Structure 14 is located approximately 80m north of Group A (see Figure 4.12). The subop was placed here as a large concentration of ceramic sherds, many of which had Terminal Classic traits (black slip, thick bolster rims), were visible on the surface. Evidence of plowing was also visible here, and thus the ceramics may be from the fill of the platform. A north-south running alignment of rocks was visible at surface level. The purpose of this unit was to test for midden deposits while exposing another form of architecture.
The rocks associated with the north-south running alignment were exposed and confirmed to be a wall that bisected the unit. A concentration of ceramic sherds was initially detected on the surface was found to be substantially larger immediately below the topsoil. A plaster floor (Floor 3) was located at a depth of 21 centimeters below surface, in the northeast quadrant of the unit. The floor did not lie flush with the top of the structural wall encountered at surface level. The same plaster floor in the southeastern quad or the unit was not encountered; however, evidence from the profile indicates that the floor had been cut through at this level. Interestingly, there was a higher density of artifacts above the area of the preserved plaster than the area cut through in the southeast quad, above where the floor should have been. Despite having been cut through, no intrusive
deposits were encountered within the construction fill in the southeastern quad of the unit (see Figure 4.13).

Figure 4.13: Top plan of Subop 6, Floor 3 and architectural walls.

The northwestern quadrant of the subop was littered with limestone pebbles and rocks typical of ballast fill. While no plaster was detected above the ballast, the soil was grayish in color and had a high density of limestone inclusions. This floor was at the same level as that of in the northeast quad of the subop, and thus deemed to be a continuation of the same floor (Floor 3).
A north-south oriented cut stone was unearthed in this area amongst the ballast fill and was fully exposed in the removal of the aggregate fill. This cut stone was part of a low east west running stone wall that was faced, or cut, on the north side. This new wall bisected the north and southern portions of the unit, west of the north-south oriented wall. Additionally, the aggregate fill north of the east-west running wall was found to be sitting on a very well-preserved plaster surface (Floor 2). This plaster surface was raised where it met with a step at the base of the wall, which was also exposed in the excavation of aggregate fill. This raise, or lip, in the plaster at the step indicates that the plaster once went up and over the step, and likely over the wall. This single-coursed wall was sitting on Floor 2 More ceramics were unearthed from the area above the plaster floor than in its southern counterpart, suggesting perhaps that the fill in the south was actually part of a separate construction episode.

Interestingly, Floor 2 extended into the unit to approximately the same area as that of Floor 3. Floor 2 abutted the east-west running wall in the northwest quadrant. Another north-south running rock alignment was encountered in the western wall of the subop and was found to be sitting on Floor 2. Floor 2 was a thick plaster, below which was an associated mixture of marl/plaster and limestone pebble ballast fill. A layer of moderately packed, fine grained silty loam with burnt pieces of limestone sat above another very well-preserved plaster floor (Floor 1) that extended across the entire subop, and on which the central north-south running wall had been erected (see Figure 4.14). Very few artifacts were retrieved from this matrix. Due to time constraints, excavations were terminated.

**Subop 7**

Subop 7 was a 1x2 meter unit placed adjacent to Structure 9 in attempt to locate midden deposits in an area with a relatively high density of surface artifacts (Figure 4.12). While some
lithic and ceramic artifacts were recovered from the unit’s silty-clay loam matrix, artifact densities and content were not indicative of a midden. The last 40 centimeters of excavations were void of cultural materials. Bedrock was reached at an average depth 91.2cm below surface.

**Figure 4.14: Subop 6 north wall profile.**

**Subop 8**

Subop 8 was a 1x2 meter unit initiated along an east-west orientation and positioned to expose an apparent north-south running linear rock alignment partially visible at the surface. An absence of protruding rocks and cobbles in the eastern section of the subop suggested that the rocks represented a cultural construction, likely the eastern extreme of the platform associated with Structure 14 (Figure 4.12). This was confirmed upon clearing of the heavily artifact laden humus layer, which included moderate to large sized ceramic sherds, lithic flakes and cores, and an obsidian blade fragment. The rocks used in this construction were both limestone and chert cobbles. No plaster surface was detected on the platform (see Figure 4.15).
A concentration of large ceramic sherds was encountered on the platform. Small ceramic clusters of ceramics were also noted as having appeared in the fill along the edge of the platforms wall and were likely deposited there through the sweeping of the platform’s surface in antiquity.

![Platform diagram](image)

**Figure 4.15: Top plan of Subop 8 platform.**

The platform’s construction fill was comprised of a clayey matrix, with numerous limestone rocks, but mainly chert cobbles, some of which appeared to have been tested for quality before being used as construction fill. Large quantities of diagnostic ceramic sherds and lithic debris, including many cores, and a mano fragment were recovered from within the platform’s construction fill. There was a notable disparity in the density of artifacts retrieved from the platform than from the matrix in front of, or outside the platform, with the platform containing significantly higher amounts.
The matrix in front of the platform consisted of a clayish, fine-grained matrix with a high number of limestone inclusions, including burnt limestone pebbles. A dense charcoal and ash lens deposit outside of the platform in the northwest corner of the subop was encountered. Artifact sizes and quantities recovered from this area became smaller with depth. Due to time constraints excavations were terminated before reaching bedrock. Subop 8 was excavated to an average depth of 65cm below surface (Figure 4.16).

Figure 4.16: Subop 8 north wall profile.

Subop 9

Subop 9 was a 1x2 meter unit located north of Structure 9 (Figure 4.12). The goal of this excavation was to locate a midden deposit. Obvious tractor furrows on the surface indicated disturbance. Associated matrices were consistent throughout, and comprised of a compact, medium grained, brown clayey-loam. Soil color became lighter as the excavation of this unit became deeper, and limestone inclusions also increased with depth. Fewer and fewer artifacts were encountered with increasing depth. Above bedrock, loose limestone cobbles, and cleaving pieces of bedrock were encountered. While a thin 3-centimeter matrix above bedrock was mainly void of
artifacts, a patinated archaic lithic tool was recovered. No midden deposits were encountered in this subop.

**STRATIFIED RANDOM-SAMPLING TEST EXCAVATIONS OF SURFACE COLLECTIONS**

**Collection 12-1, Subop 24**

Subop 24 was a test unit of collection 12-1, located off of the northwest corner of Structure 37 (see Figure 4.17). Collection 12-1 was designated as having a relatively light artifact density that contained a greater concentration of ceramics than lithics. An animal burrow was located at the center of the concentration and was likely responsible for having brought the artifacts to the surface. The concentration measured 1.24mx1.82m in size. Unfortunately, the highest density of artifacts came from the humus layer, with the artifact density decreasing as excavations proceeded. A matrix reminiscent of a ballast-type fill was encountered at an approximate 34.5cm depth below surface. The unit was excavated to bedrock, at a depth of approximately 41.6cm below surface. No artifacts were recovered from below the fill, while lithics and ceramics were recovered from the fill and humus layer. It is likely that the ballast type fill was associated with Structure 37’s patio area that was evidently set directly above bedrock.

**Collection 34-1, Subop 25**

Subop 25 was a test unit of collection 34-1, located approximately 4m west of a possibly residential structure in the northeastern extreme of the site (Figure 4.18). The concentration was designated as having a moderate artifact density and was predominately marked on the surface by lithic artifacts, with some ceramics also recovered. This unit involved the excavation of only the disturbed humus layer as bedrock was reached very quickly in some areas of the unit. The unit was terminated at an average of 18.6-centimeter depth below surface. The artifact complement was
comprised of lithic flakes and ceramics. It is likely that the artifacts associated with the surface scatter of collection 34-1 were associated with the nearby structure and may have been re-deposited at a distance through plowing activities.

Figure 4.17: Map of southern section of main area of site, indicating location of Subops 24, 29 and 30.

Collection 20-1, Subop 26

Collection 20-1 was located on the eastern side of Group B. Group B is a raised platform group, likely an elite residential group (see Figure 4.19). Collection 20-1 was characterized as a dense artifact concentration typically indicative of a midden deposit. The majority of artifacts recovered from Collection 20-1 included ceramics, lithic tools and flakes, and obsidian. Artifacts continued in high densities through to approximately 50 centimeters below surface, where artifacts began to decrease in number. The matrix associated with levels 2-5 maintained a general
consistency of a granular, rich organic soil with limestone inclusions ranging from pebbles to stones 3-8cm in size but changing in color. The soil below the midden became a dark-brown clay loam, with less limestone inclusions and rocks. The few artifacts associated with this matrix were very small, and likely the result of leaching from higher levels (see Figure 4.20 for unit profile).

Figure 4.18: Map of locations of Subops 25 & 32.
The bulk of this deposit was most definitely a midden based upon the quantity and types of artifacts (including ceramics, lithic flakes and lithic tools, obsidian blade fragments, and a net weight), and given its location off of the side of this residential plazuela group.

Figure 4.19: Map of locations of Subops 26 and 27.

Concentration 24-1, Subop 27

Collection 24-1 was a dense artifact concentration, measuring 6.7 x 10.2 meters in size. The collection was situated on Structure 47, a low-lying platform in an area marked by several likely domestic low-lying mounds (see Figure 4.19). The mound had been impacted by plowing, and thus limestone and chert cobbles, likely used in the structure’s construction, were exposed at surface level. The artifacts were predominantly ceramics, but also included lithic flakes, and tools, including blade and biface fragments. Subop 27 was excavated by five 10cm arbitrary levels. This
test unit was excavated to bedrock. The matrices below the humic layer were similar to those in other test units. At approximately 45 centimeters below surface there was an increase in stone size, from a ballast and aggregate core type fill, to one of a medium sized core fill that sat directly on top of bedrock. Artifacts collected from Subop 27 were incorporated into the construction fill of the platform and was evidently exposed through plowing activities. Excavations revealed that Structure 47 was constructed in one phase of construction.

Figure 4.20: Subop 26 north profile.

Collection 7-1, Subop 29

Collection 7-1 was located on Structure 34, a low-lying mound located in the vicinity of many such mounds that were likely domestic in nature (see Figure 4.17). Collection 7-1 was
characterized as having a relatively light artifact density, predominantly consisting of lithic
reduction flakes as well as some tools and ceramic sherds. The 3-meter collection radius extended
from the center of the structure towards the eastern exterior of the structure.

This subop was excavated in 6 arbitrary levels. Large rocks like those from the platform’s
construction fill were encountered on the surface and within the excavations of Subop 29. The
matrices between levels remained consistent, becoming progressively more clayey as excavations
proceeded. While artifacts were recovered from Subop 29 all the way to bedrock, Level 4
contained more artifacts than the other levels, and also produced two pieces of obsidian. Level 5
also produced an obsidian blade fragment. Considering the size of the test unit, the relative
distribution of obsidian at the site, and the size of the platform, the quantity of obsidian here is
surprising. Bedrock was reached at an average depth of 56.4 cm dbs. Level 6 was a restricted to
an 18-centimeter-deep small depression (42 x 39 centimeters) in the bedrock along the north end
of the unit. The matrix associated with this lot was consistent with those in the proceeding levels,
however only 2 ceramic sherds were recovered from this area.

Collection 43-1, Subop 30

Subop 30 was a test unit of collection 43-1, a densely scattered artifact concentration
located on a low-lying rudimentary patio (see Figure 4.17). It is likely that the artifacts associated
with collection 43-1 were part of the patios fill, and present on the surface due to plowing
disturbance. Artifacts recovered in the collection included lithic flakes and ceramics, and a mano
fragment.

Six 10-centimeter arbitrary levels were excavated in Subop 30, with the final two levels
being excavated according to natural/cultural changes. The matrices associated with Subop 30
were comprised of a dark tan-brown silty clay-loam with significant gravel content (approximately
As excavations progressed an increase in the clay content coincided with a decrease in gravel content. Large rock slabs were encountered in Level 3 along the northwest and north east corner of the unit. Artifact quantities were relatively low, however in Level 4 excavators noticed an increase in the frequency of lithic artifacts. In Level 5 the artifact density again increased, with the ratio of ceramics to lithics becoming equal. Excavators also encountered burnt limestone, but not in a significant amount. Level 6 witnessed a noticeably moister matrix coinciding with a decrease in gravel content to between 3-10%. Evidence of burning became more pronounced, as charcoal and burned artifacts were recovered. The size of ceramics recovered also increased, while the number of lithic artifacts decreasing. Obsidian blade fragments were also recovered from Level 6. Matrices drastically changed in color and consistency, becoming increasingly moister and eventually transitioning into a clumping yellow clay. Artifact levels dropped dramatically and were absent in the final level excavated. The excavations were terminated prior to reaching bedrock because of the sterility of the last level, and the heavy clay nature of the matrix, which made screening virtually impossible.

**Collection 70-1, Subop 32**

Subop 32 was a test unit of collection 70-1, a moderately distributed artifact concentration at the northern extreme of the site (see Figure 4.12). The area of the concentration and test unit was marked by lots of limestone pebbles, cobbles and rocks. Excavators recovered a fair number of lithic flakes and two ceramic sherds from the excavation of the humus layer; however, bedrock was reached within 2-11 centimeters.
INTENSIVE ARCHITECTURAL AND CULTURAL FEATURE EXCAVATIONS

Structures representing an array of Strath Bogue’s architectural compliment were tested at Strath Bogue, including two structures within the site’s main platform group (Structures A1 and A4); a low residential structure, (Structure 30c); an approximately 2.5-meter-high possible residential or shrine structure (Structure 5); and a possible ritual-oriented structure (Structure 39). Structures were initially tested through the excavation of 2x2m subops, with only the structure’s terminal phase of occupation predominantly being excavated. Once the terminal phase of occupation had been exposed, additional excavation units were added when deemed advantageous. Expansion units were set to follow the architecture exposed in the initial suboperation. Vertical excavations were performed in only a few units, so to provide the diachronic data essential to reconstructing occupation and temporal sequencing. Additional cultural features investigated at Strath Bogue included the testing of two potential stela (PS) monuments, and the entering and mapping of two chultuns (Chultuns #3 and #5). The potential stela test units were initiated as 1x2 meter units. Chultun 3 was also tested.

Structure 30c

In the process of conducting site reconnaissance and surface collections of an area newly cleared of sugar cane, we encountered a number of previously undetected structures, including a linear structure reminiscent of household structures encountered by Dr. Laura Levi at the nearby site of San Estevan, classified as Paired Platform groups. These structures are noted as having no well-defined plaza area, and are further subdivided into abutted or offset paired platforms (Levi 1993; 1996:Fig 6.4d; 2002:3d). The version at Strath Bogue is the abutted type and is characterized by an approximate half a meter-high long base platform, on which three smaller structures were situated (see Figure 4.21). Three surface collections were made, one for each the three
superstructures associated with Structures 30 (Collections 1-1, 2-1, 3-1). The artifacts collected were consistent with those associated with residential structures, including lithic flakes and tools, and ceramic sherds. Based on its likeness to the San Estevan household structures, the un-obsured visibility of the ground surrounding the structure, the relative preservation of structure, as well as the associated artifacts of Collection 3-1, we decided to test Structure 30c, the most eastern of the three superstructures.

Figure 4.21: Map of location of Structure 30c and Subops 10-10e.

An initial 2x2 meter unit (Subop 10) was placed in the area of the perceived southeast corner of the structure. Evidence of some structural collapse was encountered in the presence of strewn limestone rocks. Excavations followed an alignment of limestone blocks that were partially visible at surface level in the southern quadrant of the unit. Debris constituting disturbed and in
situ construction fill was primarily located north of the alignment, in the area of the structure’s interior. A metate fragment, 3 obsidian blade fragments and a large number of lithic and ceramics artifacts were recovered. Excavators noted a slight increase in ceramics and lithics recovered from the area adjacent to the rock alignment, in an area which would constitute the outside of the structure.

Partially embedded rocks were scattered across the structure. Rocks that were clearly disturbed were removed to fully expose the embedded rocks associated with the in situ architecture. The southeast corner of the structure was revealed as were a number of flat cut stones on the surface of the structure, associated with a flagstone flooring surface. Many of these stones were set in east-west running alignments across the structure. Unfortunately, due to the nature of the exposure and slump of the area, it was unclear whether the corner was angular or rounded. Excavation of the area to the south or in front of Structure 30c revealed a potential tamped earth surface running perpendicular to the southern structural wall was encountered. The tamped surface was marked by white limestone flecking and tapered in some areas where it met with a more natural or possibly prehistoric ground surface.

Excavations did not continue beyond the exposure of the terminal phase of occupation/construction in Subop 10, and to expand our excavations to the west (Subop 10a, a 2x2 meter subop), and eventually to the north (Subops 10d, 10b were 1x3 meter units, and Subop 10c was a 2x3 meter unit) and east (Subop 10e, a 1x2.5 meter unit) (see Figure 4.21). The goal of these expansion units was to permit the horizontal exposure of the structure and to glean a fuller picture of the structure’s size, architectural arrangement and artifactual compliment, and to hopefully encounter an associative activity area and, or midden deposits.
In fully exposing the terminal architecture, we came to further recognize a pattern in the construction. Several “rows” of flagstone were placed across the structure, apparently to provide a more concrete living surface. In the shifting of the ground over the last 1000 years, and with the impact of agricultural plowing, it appeared as though some of the rows were in fact actually demarcating low bench areas. In attempt to clarify the possibility of an actual furnishing, it was decided to penetrate the structure where the feature in question was in Subop 10b.

Excavation of the architectural component of Subop 10b included the northern structural wall and its architectural mass. Collapse debris was removed as were two short north-south running alignments of semi-flat stones, under which additional flat stones were exposed. Very few artifacts were recovered from the excavations associated with the architectural of Subop 10b. The excavation of the area associated with the exterior of the structure in the northern section of Subop 10b, permitted the definition of the northern structure wall, while also exposing a variation in the treatment of the structure’s exterior, in comparison to that exposed to the south. Interestingly, the area to the north of the structure was composed of an apparent fill of densely packed gravel and fist size rocks mixed with a brown fine grained silty organic soil. Very few artifacts were recovered from this area; fewer than from the area excavated in Subop 10 to the south, and outside the structure. It appears as though this fill was laid by the Maya to level the area. It likely was plastered over in antiquity, but due to its relative closeness to the surface, and the ravages of time, the plaster was no longer detectable. Support for this area having been plastered came from the relative proximity of Structure 30c to Group A, the apparent site center.

The northern wall of Structure 30c was defined in both Subops 10b and 10c, however it remained unclear whether the structure was rounded or angular at its ends. Since we did not catch the western end or corners of the structure, and the western end was evidently more grossly impacted by
modern agricultural practices, we decided to place a final unit, Subop 10e, on the eastern end of the structure. This unit was offset from the others, as we used the architecture exposed in both Subops 10 and 10d as used as a guide as where to place it. With the excavation of Subop 10e, we decided to conduct a full vertical excavation of the area encompassed by the unit, so to obtain clear chronological, compositional and artifactual data associated with Structure 30c, and the activities and practices conducted in association with and adjacent to it (see Figure 4.22 and Figure 4.23).

![Photo of Structure 30c excavations.](image)

**Figure 4.22: Photo of Structure 30c excavations.**

Subop 10e was placed so to encompass the eastern end of the structure. This area of the structure was more heavily impacted, as there were more displaced rocks protruding through the surface level. Unlike in Subop 10, no tamped earth floor surface was exposed to the south of the
southern structural wall. Bedrock was reached in this area after approximately 45 centimeters. Artifacts retrieved from this area outside the structure dissipated with depth (see Figure 4.24).

Figure 4.23: Top plan of Structure 30c excavations (Subops 10, 10a-e).

Rocks used in the construction of the bulk of the platform included rocks ranging from 10cm to 40cm in size, and smaller cobbles for fill. A substantial number of artifacts were recovered from the construction fill, including a piece of greenstone. The larger rocks used to define and give strength to the structure were generally only one course high and were found to be sitting on a tan colored, fine grained moist clay-like matrix. Matrices became increasingly clay-like and moist as excavations progressed, and the closer bedrock came. While screening became increasingly
difficult as we approached bedrock, we found significantly more ceramics as we approached, and directly above bedrock.

![Profile of western wall of Subop 10e.](image)

**Figure 4.24: Profile of western wall of Subop 10e.**

Due to poor preservation and the impact of modern plowing practices, we were unable to securely ascertain whether the eastern wall of this low structure, and thus Structure 30c was round or angular. We were able to determine through the dissection of the construction of Structure 30c that it was erected in one phase of construction in the Terminal Classic period, and was a residential structure comprised of both limestone rocks and chert cobbles. The artifactual compliment of this structure confirmed that this was a residential structure.

**Structure 39**

Structure 39 was identified during reconnaissance and surface collection. A moderate concentration of artifacts was identified and collected from the structure as Concentration 14-1. Concentration 14-1 was comprised of ceramics and lithic debitage, but also included a biface, and 3 cores. Of primary significance however, was the apparent direct association of a fallen Stela
(Stela #1) to the west of the structure. The monument measures 1.53x0.94x0.36 meters and shows no evidence of carving and thus may have been a painted stela, or an unfinished carved monument. The Stela does show evidence of having been shaped at its blunt end and along one of its sides. The surface that was facing up was badly weathered and appeared to have had pieces removed at some time in antiquity (see Figure 4.25). The surface on the underside was relatively flat, and possibly smoothed. It’s “hacha” or axe like shape is evidently typical of other Terminal Classic and Postclassic period stelae (Joel Palka, personal communication, 25 July, 2002. Similar plain monuments have been identified at other northern Belize sites, such as that found in Group E at Aventura (Sidrys 1983:Fg 7), Group B at Sarteneja (Sidrys 1983:Fg 116b), and Stela 1 at Cuello (Sidrys 1983:23). Upon recognition of the presence of one stela at Strath Bogue, we began to pay more attention to other large stone slabs that could also be fragments of monuments. Once one stela has been identified at a site, the likelihood of additional stelae being present at a site increases (Joel Palka, personal communication, 25 July, 2002). The measurements of Strath Bogue Stela #1 are very similar to those recorded for the Sarteneja monument (1.74x1.22x0.25-0.31 meters) (see, Sidrys 1983:171). The presence of similar monuments at other northern Belize sites, and their like measurements lends support to the supposition that Strath Bogue Stela #1 is in fact a stela. The presumed base, where the monument tapers, appeared to be broken, and was not evident in the area in which the stela lay. Three additional large stone slabs were identified, two of which had test units placed in their vicinity.
The decision to investigate Structure 39 was primarily based on the presence of Stela #1 in direct association with Structure 39. The association of the low-lying structure and monument begged the question of whether or not Structure 39 was a shrine. Shrines are often noted to be in association with stela, and often are part of the stela-altar-shrine ritual triad. Often the monuments associated with such triads are beside and even on the structure, or platform. The research design called for the testing of both ritual and residential structures. If it was not a shrine, it likely would have been a residential structure, and thus, regardless of the outcome, we would be satisfying our research objectives. Additional objectives for this particular excavation endeavor was to determine if the basal end of the stela could be identified on the platform, and further, to investigate whether or not an altar was also present on Structure 39’s platform.
Investigations of Structure 39 commenced with the excavation of a 2x2 meter unit (Subop 11). The placement of this subop was based on the presence of a large stone that we speculated might be the basal end of the stela. As the architecture began to be exposed, the decision whether or not to expand investigations, and if so, in what direction was made. Three additional 2x1 meter extension units (Subops 11a, 11b, and 11c) and a 1x1 meter unit (11d) were later instigated. Subop 11a was set on the south side of Subop 11, and Subop 11b was extended north of Subop 11. Subop
11c was extended south of Subop 11a. The 1x1 meter test unit, Subop 11d was extended east off of the southeastern corner of Subop 11 (not indicated in Figure 4.26). The extension subops, with the exception of the test unit, were excavated to the terminal phase of construction/occupation, horizontally exposing the architecture and thereby providing an opportunity to truly comprehend the structure’s size and construction (see Figure 4.26).

Limestone cobbles ranging from 5 to 40cm in size were present throughout the subops. All large rocks were exposed and were removed only if it was determined that they were no longer in situ. Artifacts were generally low in density across all subops in the humus layer, however a collection of possible censer fragments was recovered from this layer.

The northern wall of Structure 39 was defined in Subop 11b, with the northern half of the subop representing an area to the exterior of the structure. This wall ran in an angular fashion from the northwest to the southeast and continued into Subop 11. In order to determine if a corner of the structure was just to the east of Subop 11, Subop 11d was instigated. Excavations determined that the structure’s northern wall extended further to the east, and thus excavations were terminated in Subop 11d after one level of excavation. Subop 11b was also terminated upon exposure of the terminal phase of construction/occupation. The large rock in the center of Subop 11 that was speculated to have been the base of the Stela was determined not to have been large enough to have been the base, nor was it embedded deep enough into the fill of the platform to have been representative of the basal end of a stela.

A semi-circular alignment of large limestone rocks was identified in Subop 11a and later found to extend into a full circle in Subop 11c (see Figure 4.27). We speculated that this circular feature may represent an altar construction within Structure 39’s platform. The southern portion of the semi-circular feature, in Subop 11c, was more disturbed than that in Subop 11a. Of note was
the paucity of artifacts being recovered from Structure 39, and specifically the apparent lack of ceramic olla sherds (utilitarian ware).

Figure 4.27: Top plan of Structure 39, Subops 11, 11a-c.
The decision to penetrate Structure 39 in the area of the circular feature in Subops 11a and 11c was made in order to gain diachronic data on the construction of the platform, and to isolate any cached objects that may have been interred here, and that might give credence to the feature having been an altar. The feature measured approximately 1.51x1.27 meters at its extremes. The feature was found to be set next to a southwest to northeast running rock alignment that may have been a retaining wall for the structure. Penetration of the circular feature revealed that the structure had been erected in one phase of construction, as it was sitting on bedrock. Bedrock was reached at an average depth of 23 centimeters below surface inside the circular feature, and 20.4 centimeters below surface outside the feature.

No cache of objects was associated with the circular feature. The designation of the circular feature as an altar remains inconclusive. Nonetheless, I do tend to lean towards this supposition. The general paucity of artifacts retrieved from Structure 39 lends support to the supposition that the structure was a ritual platform, as ritual structures are known to generally contain less midden materials in their construction fill than seen in residential structures. Moreover, the fact that the ceramics retrieved did not include ollas, a generally recognized utilitarian vessel type, lends further support to the hypothesis. Further, the mere presence of Stela #1 in direct association with Structure 39, and the potential of an altar embedded into the structure also substantiate the hypothesis. Like Structure 30c, Structure 39 appears to have been hastily constructed, as construction materials consisted of unmodified limestone rocks and chert cobbles.

**Structure A1**

Due to the size of the platform and its associated structures, as well as the relative dispersal of structures radiating around Group A, Group A is argued to have been the site’s proverbial center.
Structure A1 is Group A’s western pyramidal structure and is the largest structure at Strath Bogue (see Figure 4.4).

Looter’s Pit 1

In an attempt to gain an understanding of the construction sequence of Group A, the eastern wall of a giant looter’s pit in Structure A1 (the western structure) was cleaned up and profiled prior to any controlled excavations of the structure (see Figure 4.28). During profiling artifacts were collected from secure contexts in the profile wall, and elevations were recorded. Judging from the profile of the looter’s pit, Structure A1 was erected on the raised platform in one phase of construction.

Subops 12-16

A series of five consecutive west-east running suboperations (Subops 12-16 from summit to plaza) were arranged down the eastern side of Structure A1 facing the plaza (see Figure 4.29). Due to the destruction caused by the looter’s pit, the subops were placed to the south of the structures perceived center, so to avoid the trench, and to help maintain the structure’s integrity. Excavations were initiated here to determine the architectural construction of the structure, and in hopes of recovering associative cultural materials that would aid us in understanding the nature and function of the structure, Group A and the site. Due to the already disturbed and questionable stability of Structure A1, we did not intend to excavate Structure A1 beyond the terminal phase of construction, but hoped to reveal the nature of its stairway, any structural terraces and the platform.
Figure 4.28: Profile of north wall of Looter's pit in Structure A1.
Figure 4.29: Map of Group A, indicating locations of Subops on Structure's A1 and A4.

Exposure of the terminal phase of construction involved the removal of and a great deal of chert and limestone rocks, from fist sized to boulder size, representing a combination of looter’s backdirt and structural collapse. Many of the stairs were no longer *in situ*, however the stairway’s backing masonry was present in subops (see Figure 4.30).

Subop 16, located at the base of the structure, was excavated deeper in order to gain insight into the platform construction itself, and to see if any cached objects had been placed along the structure’s central axis at the base of its stairway. While a greater degree of collapse debris was encountered at the base of the stairway, a section of preserved plaster floor associated with the plaza was unearthed. Unfortunately, the floor deteriorated some closer to the base of Structure A1.
The identification of the basal course of Structure A1 is extremely tentative due to the degree of collapse debris and the poor preservation of the stairway.

Figure 4.30: North Profile of Structure A1 stairway, as revealed in Subops 12-16.

Of particular note is the fact that the construction materials used in the construction fill of Structure A1 and in the facings of this seemingly grand structure, were both limestone and chert cobbles. This is of significance as Classic and Postclassic architecture is typically constructed of cut or faced limestone slabs. This suggests that the Strath Bogue Maya were in a hurry when they erected Group A, as they evidently did not take or have the time, or labor resources to manufacture blocks from limestone, but otherwise utilized “collectable” alternative resources available around the site, namely, chert and chalcedony nodules. This hypothesis is in part further supported when paired with the data from the Structure A1’s looter trench, which indicated that the structure was raised in one phase of construction.

I believe that Structure A1 was a terraced structure, with a slight outset stair running down the center of the structure. Judging from the protruding architecture, I would hypothesis that Structure A1 had approximately four to five terraces, with each terrace having roughly four to five steps. Although the summit of the structure was impacted greatly by the looters pit, and we were
unable to effectively test it, I suspect that no masonry superstructure was erected on Structure A1 based on the surface evidence. However, as we found on Structure A4, such evidence is not always forthcoming at the surface level.

**Structure A4 (Subops 21, 22, 28, 31, 33 and 34)**

Structure A4 is a large, rectangular range structure located on the southern edge of Group A’s platform. The structure is approximately 2 meters high, 20 meters long and 15 meters wide (see Figure 4.29). The research objectives called for the gathering of data on the variability of architecture and associated artifact assemblages, on extraction and production activities, as well as the degree of social differentiation within the Strath Bogue community, the testing of Structure A4, a possible elite residence or community oriented, administrative structure was warranted.

A series of 2x2 meter subops were placed down the north, plaza-oriented side of Structure A4, just west of the structure’s center. The units were offset because of the presence of large plow furrows across the western and central areas of the structure. Investigation of Structure A4 commenced with the excavation of three subops, with Subop 20 placed towards the presumed top of the mound, and Subops 21 and 22 running down the mound’s northern face. Additional extension units of varying sizes were later initiated as the architecture became exposed. Subop 28 was a 2x2 meter eastern extension of Subop 21, while Subops 31 and 33 were north and south 2x1 meter extensions of Subop 28 (respectively). Subop 34, a 2x3 meter unit, was placed west and adjacent to Subop 21, extending towards the south, or up the structure 3 meters.

Excavations revealed an exceptionally well preserved raised structure on which a masonry superstructure with a clearly marked entryway into an interior room was situated (see Figure 4.31; Figure 4.32 and Figure 4.33). In the interior room, remnant plaster floor was encountered. Vertical excavations in the interior room of the masonry structure were initiated in
order to obtain data on the chronology and construction sequence of Structure A4. Below the interior room’s plaster floor was the requisite ballast fill was an obvious mixture of eroded limestone plaster and soil. An aggregate fill associated with the floor construction also occurred beneath the masonry wall a series of large limestone slabs were encountered that jutted into the unit. These slabs were likely part of the interior support of the structure. Below the aggregate fill, a layer of soft marl fill was encountered, at the bottom of which flakes of charcoal, burned pieces

Figure 4.31: Top plan of Structure A4 architectural as exposed in Subops 20-22, 28, 31, 33 and 34.

of chert and bits of burned limestone were detected. Unfortunately, the excavation area had tapered to such a small area because of the extruding limestone fill and restricted size of the lot,
and thus excavations were unable to proceed further. Excavations went to a maximum depth of 86 centimeters below surface.

Remnant plaza floor comprised of varying densities of marl was revealed along the base of the fully exposed wall. Despite having cleared a substantial section of the plaza area in front of Structure A4’s platform structure, it remains unclear how the Maya gained entry onto Structure A4’s platform. Sections of the plaza floor in front of the platform wall were cut through in antiquity. There was a dense accumulation of marl/plaster in this area, which was likely related to the floor having been cut through. If the Maya had interred something in this area, the resulting destruction and patching of the floor would call for large quantities of marl, compared to the plastered area in the rest of the subop, where the marl was more thinly laid. Below the plaza floor excavators encountered the usual ballast fill followed by rubble fill of 5 to 25-centimeter sized cobbles.

Figure 4.32: Photograph of Structure A4 architecture.
Figure 4.33: Profile of Structure A4 north or plaza facing platform wall.

Investigation of Structure A4 revealed that the structure was comprised of an approximately 1-meter high masonry structure made of limestone rocks. The stones were cut and faced on the exposed surfaces. The structure was surmounted by a superstructure, as indicated by the low masonry walls at its summit. The walls of the superstructure were block-like and set back approximately 50cm from the platform edge. An entranceway into an apparent room was identified in Subop 20 (see Figure 4.32). The floor of the room had been plastered, although only remnants of the plaster remained. The size of the room was unable to be determined with the extent of excavations undertaken. The artifacts retrieved from Structure A4 dated to the Terminal Classic period, but interestingly were different in form than those excavated from Structure 30c the nearby residential structure that also was horizontally exposed.

Structure 5

The initial excavation of Structure 5 began as a 2x2m unit (Subop 5) at the structure’s summit. The goal of this excavation was to obtain representative chronological and constructional data from a representative sample of Strath Bogue's structures and determine its use. Despite the fact that Structure 5 is approximately 2m high, plowing of the structure was evident through the presence of deep plow furrows up and over the structure. Artifacts on the surface of the structure
were visible in dense quantities, and included obsidian blade fragments, a variety of lithic debris, and ceramic sherds, including many with traits typical of Terminal Classic utilitarian wares. As excavations progressed, a number of burials were encountered, and a number of expansion units had to be initiated (Subops 5b-g) (see Figure 4.34). A total of four burials ended up being recovered from the core fill of Structure 5 (in different units). Burial’s PR10-01, PR10-02, and PR10-03 were encountered in 2001, however Burial PR10-02 was not able to be removed until 2002. Both Burial PR10-02 and PR10-04 were removed in 2002. Subop 5d was the only unit that was excavated to a maximum depth. Please see Chapter 6 for a discussion of the skeletal data.

Figure 4.34: Map of Structure 5 indicating locations of Subops 5, 5b-j.
The full diachronic excavation of Structure 5 itself was not effectively completed until 2002 with the excavation of Subop 5d. The full vertical excavation of Subop 5d also aided in gaining an understanding of the construction methods and episodes employed in Structure 5’s erection. Excavation of this structure also included the testing of the rear of the structure in an attempt to determine the architectural configuration of this obviously important and possibly round structure. Round structures are typical of Terminal Classic period ancestral shrines, and were apparently in use in northern Belize, as has been noted at Caye Coco (Digrius and Masson 2001) and Santa Rita (Chase and Chase 1982).

**Subops 5, 5b and 5c**

Removal of the humus layer revealed two sections of a poorly preserved plaster floor (Floor 2), and its associated ballast fill were encountered around 29 centimeters below surface. A few ceramic and lithic artifacts were recovered from the floor surface and collected separately. The ballast fill below the plaster was comprised of a tightly packed blend of limestone and chert cobbles, and a grayish-brown soil. An abundance of artifacts, particularly ceramic sherds and lithic flakes and cores were collected from within the ballast fill.

Below the ballast fill, a loose, dry, fill comprised of small and medium sized cobbles and rocks, surrounded by a moderately packed grayish-brown was encountered. This type of fill is typical of core fill associated with such constructions in this area. The loose nature of the matrix was due to the fact that the builders used larger rocks and less soil at this stage of the construction process, which created pockets or holes in the core fill. The artifact density increased substantially as excavations proceeded, and large sized sherds were common. Chert flakes and cores as well as a metate fragment were encountered within the core fill. The size of the rocks used in the core fill
increased to 20-30cm, and air pockets also between the rocks became more numerous, making it difficult to maintain the provenience of artifacts as they were found.

Due to the extension of the burials beyond the area of the established excavation unit, two extension units were initiated in an attempt to fully expose them. Subop 5b was a 2x0.5m unit placed parallel to the southern axis of the unit to expose Burial 1. Based on the measurements of Burial PR10-01, and our perceived understanding of its orientation, Subop 5c was established as a 1.5x0.5m unit and placed adjacent to the southeastern edge of Subop 5. Unfortunately, we misjudged the angle at which Burial PR10-02 was interred and did not expose the burial. Due to time constraints Burial PR10-02 was left in situ until we returned in 2002 to fully expose it. A third Burial (Burial PR10-03) was encountered mid-unit, also within the core fill.

**Burial PR10-01**

Burial PR10-01 first began to be exposed in the southeast corner of Subop 5 at a depth of approximately 67 centimeters below surface, in the aggregate/core fill. The initial bones included teeth, mandible fragments, and a possible clavicle. Upon exposure of a humerus, ulna and radius running in a southwest direction, a certain degree of articulation was evident, and an additional subop (Subop 5b) was initiated to fully expose the burial.

The skeletal remains were damp, and generally in poor condition. The body had been placed in an extended, supine position, along a 42 degree or northeast-southwest axis, with the head towards the northeast. The individual's hands were placed over the pelvis. As there was an absence of a clearly defined crypt or line of demarcation for the burial, it was difficult to define the boundary of the burial area, especially with many bones missing due to taphonomic processes. Some limestone rocks were placed haphazardly around the skeleton, and between the legs of the
individual, but it was by no means a formalized grave. The area in which the skeletal remains were
confined measured approximately 1.58x0.44 meters (see Figure 4.35).

Figure 4.35: Top plan of Burial PR10-01.

(The maximum depth at which bones were encountered was 74.4 centimeters below surface. While no grave goods were recovered in association with Burial PR10-01, a notable number of lithic flakes and cores were found in the area close to the burial and in association with the interred individual. No foot bones were recovered from Burial PR10-01.)
Burial PR10-03

After the complete removal of Burial PR10-01 we continued excavation of the core fill, and shortly thereafter a third Burial (Burial PR10-03) was encountered. Additionally, two ceramic concentrations (Cache 1 and Cache 2) associated with Burial PR10-03, were unearthed below the human remains.

Skeletal remains were first encountered at a depth of 85.5cm below surface, within the core fill. While no formal demarcation of the grave was evident, there were a few larger rocks around the area of the skeletal remains and lay in a slight depression within the fill. The individual was interred in an extended, supine position, on a 30-degree angle or northeast-southwest axis, with the head to the northeast, as indicated by the position of a tibia and fibula (see Figure 4.36). A capstone in the area of the cranium was recognized. The bones were in very poor condition, with many completely absent. However, the individual does appear to have been articulated at the time of interment, as indicated by the position of the torso and arm bones. The dimensions of the burial area were approximately 0.915 x 0.165 meters. The maximum depth at which human remains were unearthed was 105.5 centimeters below surface, although this bone was quite a bit deeper than most others recovered.

While artifacts immediate to the interment were sparse, two clusters of ceramic sherds (Cache 1, and Cache 2) were located beneath the area of the burial, as was a shell ink dish, similar to those seen used by scribes on polychrome vessels. Cache 1 had 45 ceramic sherds, and one lithic flake while Cache 2 included 99 ceramic sherds, 12 lithic flakes, and some charcoal (Figure 4.36). Support for the association of the “caches” and the dish with the internment comes from the depth measurements. The lowest bone was encountered at a depth of 105.5cm below surface, while the shell dish was found at 100cm below surface, Cache 1 at 105.5 centimeters below surface, and
Cache 2 at 100.5 centimeters below surface. It should be noted however, that the aforementioned bone was located deeper than all others recovered from Burial 3 (most osteological remains were encountered between 85.5 and 96 centimeters below surface).

Figure 4.36: Top plan of Burial PR10-03, & Cache 1 and 2.

Burial PR10-02

Burial PR10-02 was first encountered in the southeast corner wall of Subop 5, when a rock (later identified as part of the internment’s burial crypt) fell from the eastern subop wall, into Subop 5 (see Figure 4.37). The fallen rock revealed fragments of a cranium and a broken, but complete vessel. Upon recognition of the vessel, we decided to expand the subop to completely expose Burial PR10-03. We placed the 1.5x0.5 meter unit perpendicular to the southeast corner of Subop
5. Unfortunately, we had not yet encountered Burial 3, and were unaware of the developing pattern of burial orientation (extended supine position, on a northeast to southwest axis, and head to the northeast), and we misjudged the orientation of Burial PR10-02. Upon excavation of two cultural layers and encountering cut stones and rocks that seemed to define the burial crypt around the cranial area, we realized that the burial ran on a north-south, or more likely northeast-southwest orientation, and we thus entirely missed the burial. We did collect the exposed cranium fragment and the vessel and left the burial in situ to be fully exposed the following field season.

Figure 4.37: East profile of Subop 5 and 5b, beginning of Burial PR10-02.

**Subop 5d, 5e, 5f, 5g**

**Burials PR10-02**

Continued investigations of Structure 5 in 2002 commenced with the excavation of a 2x2m unit (Subop 5d) placed east of 2001’s Subop 5 and south of Subop 5c. Subop 5d partially
incorporated Subop 5c from 2001 in Subop 5d’s northwest corner, in an area measuring approximately 1.18x0.18 meters. Excavations proceeded with the removal of ballast and aggregate fill however no plaster was detected in this unit. Artifacts were moderately dispersed and increased in density with depth. Artifacts retrieved from this fill included a chert wedge or adze, lithic flakes and ceramic sherds. A higher concentration of rocks in the fill in the eastern portion of the subop was recognized, while the western portion had fewer and more dispersed rocks. At an approximate depth of 50cm below the surface, bone fragments were encountered, essentially “floating” in the fill matrix. The fill in the western half of the unit was evidently removed with the internment of the individual in Burial PR10-02.

Unfortunately, the remains were in very poor state of preservation, and many deteriorated before the excavator’s eyes upon being unearthed. Some of the bones were removed from the western wall of the subop. The individual had been placed in a semi-flexed position, with the head towards the north. Cut stones defining the head area were identified during the 2001 season, and it was suspected that this individual may have been interred in a crypt, however, with the exception of the cranium area, there was little evidence of a formal crypt construction (see Figure 4.38). Very few artifacts were found to be associated with Burial PR10-02.

Burial PR10-02 was placed on a combination aggregate and core fill comprised of large boulders ranging between 20-40 centimeters in size. The boulders were tightly packed and dispersed with a smaller aggregate fill (granular soil with limestone rock inclusions). Gaping holes in the fill continually developed throughout this core fill. While numerous artifacts including a mix of Terminal Classic and Early Classic ceramic sherds were recovered from the core fill, artifacts frequently slipped into these holes, as skeletal remains continued to be encountered below the area of the exhumed Burial PR10-02.
More bones and teeth were unearthed on the opposite side of Subop 5d in the southwestern quadrant in the core fill, indicating the presence of another burial. Inopportune Burial PR10-04 was predominantly located outside of Subop 5d, and thus an extension unit was established to the south of Subop 5d. Unfortunately, one extension unit became three (Subops 5e, f and g), as we misjudged the orientation of the Burial. Subop 5e was a 2x2m unit, Subop 5f was a 2x1m unit to
the west of Subop 5e, and 5g was a 1x0.5m unit to the north of Subop 5f (see Figure 4.34). Upon exposure and removal of Burial PR10-04, the excavation of these extension units was terminated.

Like the others encountered in Structure 5, Burial PR10-04 was in a similarly poor state of preservation. Many of the remains including the skull had been crushed with the weight of the structure. The extent of the burial measured approximately 1.66x0.68 centimeters and was oriented on a roughly east-southeast to west-northwest orientation. Based on the layout of the bones the individual in PR10-04 was placed in an extended position, with the head towards the east-southeast, an orientation more similar to that of Burials PR10-01 and PR10-03 than PR10-02 (see Figure 4.39). The burial was not defined by a crypt, pit or any other means, but instead had simply been interred within the fill of the structure. Nonetheless, the soil surrounding the individual was distinct from that elsewhere in the subops, as it was a comprised of a light brown, fine grained soil with a high gravel content.

![Figure 4.39: Top plan of Burial PR10-04.](image)

The loosely packed soil found around PR10-04 was laid on the same core fill noted in other Structure 5 subops. The porous nature of the underlying fill was likely responsible for the
differential preservation of the bones, as well as the disarticulation of the remains. Roots also played havoc with the remains, many bones having roots growing right through them. Additionally, a rodent burrow had at some point penetrated the area of the burial. Lithic and ceramic artifacts were also recovered from the area of the internment, as was modified shell.

**Vertical Excavation of Subop 5d and Structure 5-sub**

Upon removal of Burial PR10-04 our attention concentrated on the vertical excavation of Subop 5d. The core fill continued below Burial PR10-04 but was more compact, and very solid in structure. A beautifully preserved 10-centimeter thick plaster floor (Floor 1) was encountered below the core fill that contained several artifacts including an obsidian blade. The coloration of the plaster was more yellowish-brown than typically encountered, so much so that at first some of the excavators wondered if it might not be bedrock. Below the plaster layer was a predominantly brown matrix, with limestone inclusions typical of ballast type fill. This level contained a high density of artifacts, including obsidian, shell and a special find, but mostly ceramic sherds, as well as charcoal and charcoal flecking. The ballast/soil fill was laid over a very flat surface of tightly laid, very uniform soft stones. This thick cobble or veneer surface spread across most the unit and abutted four 20 to 30-centimeter shaped limestone rocks exposed in a roughly northwest-southeast alignment along the north wall of the subop. This alignment was a wall belonging to an earlier structure (Structure 5-sub) located below more than 1 meter of Structure 5’s construction fill. Structure 5-sub’s wall was three courses high and erected on a different orientation than Structure 5. The materials and techniques used in the construction of Structure 5-sub were also different than any other building seen at Strath Bogue. The 20-30cm rocks used in this construction were of a very soft limestone, and were more rounded than cut (see Figure 4.40 and Figure 4.41).
Figure 4.40: Top plan of Subop 5d, illustrating Structure 5-sub and associated cobble veneer surface.

Figure 4.41: Photo of Subop 5d exposing Structure 5-sub and associated cobble veneer surface.
Excavation of the cobble veneer surface found that this surface had a high proportion of marl mixed with it, which acted almost as cement between and underneath the rocks. Many of the rocks showed evidence of having been burned, as recognized in the blue-gray tinge to some of the rocks. Below the cobble surface was a marl and soil fill, with few limestone pebbles (3-5cm) and rocks (5-10cm) (see Figure 4.40). A high degree of charcoal and charcoal flecking was also present. The ceramics recovered from this deposit and included red slipped bowls, as well as bichrome and polychrome flanged dishes that quite obviously dated to the Early Classic period. Some of the ceramics exhibited evidence of burning, or had charcoal congealed to them. Unfortunately, excavations had to be terminated due to time constraints, and thus bedrock was never reached (see Figure 4.42 for full profile of Subop 5d). However, given the topography of the immediate area, and our understanding of where bedrock should be from other excavation units, bedrock would not have been much deeper.

We were able to determine that Structure 5 had two phases of construction, with the last phase of construction appearing to be simply a raising of the existing platform. Both phases dated to the Terminal Classic period. An earlier construction, Structure 5-sub, was also identified. This construction was oriented differently from the later construction and made of different construction materials and techniques than that of the later structure. The ceramics associated with Structure 5-sub were clearly Early Classic in nature.
Subops 5h, 5i and 5j

The presence of four burials within Structure 5 begs the question whether or not Structure 5 was an ancestral shrine, or simply an elite residence. If Structure 5 should be round, it would lend credence to the supposition that it was an ancestral shrine, similar to that encased within Structure 1 at Caye Coco (Digrius and Masson 2001). In attempt to ascertain whether Structure 5 was a rounded or square structure, Subop 5h was initiated in the vicinity of what we presumed would be the northeastern corner of the structure. Subop 5h was a 2x2m unit. Two additional
extension subops, Subops 5i (2x2m) and 5j (2x1m) were initiated after perplexing architectural features were unearthed in Subop 5h (see Figure 4.34).

Excavation of the humus and collapse debris exposed what appeared to be the corner of the structure in the western half of the Subop 5h. It was immediately apparent that the artifacts retrieved from this area were more numerous and diverse than seen anywhere else in our 2002 excavations. Artifacts included lithics and ceramics, but also included lithic tools, ground stone and obsidian.

Excavations exposed several cut stones corresponding to an “L” shaped corner and structural wall of Structure t’s platform. A dense midden in the area encompassed by the “L” shaped wall was also revealed. The midden contained faunal remains, four bags of ceramics, 2 bags of lithics, fragments of lithic tools including many bifaces, choppers and round chert discoidals, obsidian, stemmed blade fragments and ground stone objects. The midden was restricted essentially to the area defined by the “L” shaped wall, an area roughly measuring 1x.0.70 meters and approximately 25-centimeters thick. The matrix associated with the midden was comprised mostly of soil, but also included limestone cobbles and rocks. The midden was found to have been sitting on a plaster surface, likely an outer patio area, exterior to the structure.

In attempt to expand our understanding of the “L” shaped wall, and thus the configuration of the structure, and in an attempt to define the limits of the midden, expansion Subops 5i and 5j were initiated. Subop 5i was a 2x2 meter unit placed to the east and offset towards the south of Subop 5h. The offset nature of this unit allowed us to follow the southeastern extension of the “L” shaped wall. Subop 5j (2x1m) was set north of Subop 5h, so to follow the northeastern extension of the “L” shaped wall, and to determine the extent of the midden deposit (Figure 4.43). Excavation of Subop 5h did not proceed further than the exposure of the plaster surface.
Subop 5i commenced with the excavation of the humus and collapse and the exposure of the “L” shaped platform wall’s southeastern extension. Exposure of the southeastern-running platform wall revealed a corner and another southwest running wall. Another alignment of rocks running parallel to the southeastern extension was also revealed (see Figure 4.43).

The outer or most eastern wall, composed of 20-25cm rocks which appeared to be on a curve and faced towards the west were enclosing a separate platform, as indicated by the presence of aggregate fill in the area to the east, or behind this outer wall. The inner wall, comprised of rocks “dressed” towards the east and measuring approximately 10-15 centimeters in size, runs parallel to the larger wall, and meets with the southeastern running alignment of the “L” shaped wall. It is hypothesized that this wall is Structure 5’s exterior platform wall. Unfortunately, the corner where the two walls effectively meet is not well preserved and appears to have been impacted by modern plow activities.

The midden exposed in Subop 5h was also present in both Subops 5i and 5j. However, unlike Subops 5h and 5j, the midden in 5i was found to be sitting on a cobble surface similar to that encountered at the base of Subop 5d, in front of the Early Classic period construction (Structure 5-sub).

It does not appear that Structure 5 was round, and yet it was quite obviously a structure of some consequence. By following the “L” shaped wall to the north and to the east we were able to determine that despite Structure 5 not having been a large structure, it appears to have been a terraced structure. The identification of the three corners in Subops 5h, 5i and 5j helped to determine this. All of the walls exposed through our excavations were more or less aligned in the same orientation. The large boulders seen at the north end of Subop 5i appear to align with those extending out from the corner of the outset stair in Subop 5j. The area thus enclosed by the
alignment and the “L” shaped wall essentially formed the lower terrace of Structure 5. The alignment at the extreme north end of Subop 5j is not as clear, however, the corner of the outset stair is present. The alignment may represent an additional terrace wall however, without further excavations this remains inconclusive.

Figure 4.43: Top plan of Subops 5h, 5i and 5j illustrating Structure 5's outer platform wall and location of midden.

**Potential Stela Test Excavations**

Test investigations of two areas associated with two potential stela monuments were undertaken so to confirm or refute this designation. The possible monuments, tentatively assigned
Potential Stela (PS) #2 and #3, were not carved, were irregular in shape and size, and unlike Stela #1 showed no clear evidence of human manipulation. However, while they are irregular in size and shape, they are large enough to represent fragments of “killed” or destroyed monuments. The tentative identification of these slabs as potential monuments was made based on their relative size, the lack of similar rocks elsewhere at the site, and their relative positioning at the site. Moreover, the confidence with which Stela #1 was designated an uncarved monument lends support to the prospect of there being additional such monuments at the site. We know that writing was a practice engaged by the Strath Bogue Maya, as evidence beyond the presence of monuments has been found, in the presence of a bark beater found on Group A’s platform in close proximity to the location of Possible Stela #2, and the recovery of a conch shell ink pot from Burial PR10-03 (Ferguson 2002a:41).

Possible Stela #3, Subop 23

Subop 23 was a 2x1 meter unit placed in the area located beneath Possible Stela #3 (hereafter referred to as PS#3). PS#3 was badly weathered with no obvious indications of carving or modification (see Figure 4.44). The limestone slab measured 1.15 x 0.90 x 0.30 meters in size and is thus similar to Stela #1 and the Sarteneja stela in size (Sidrys 1983:Fig 116b). The decision to place a unit here was based upon the knowledge that monuments often have objects cached beneath them, and thus the unearthing of such a cache would help determine the legitimacy of labeling the stone slab a possible stela and would provide a temporal associated for its erection. Prior to placing the subop, PS#3 was turned over to see if the stone had been carved, and to facilitate the placement of the subop. Upon turning of the stone, an alignment of stones was revealed below the stela. The subop was thus placed so to encompass this alignment. The rock
alignment was located in the western third of the unit and ran roughly north south. This rock alignment continued southwards outside of the subop for approximately an additional 2.5-3 meters.

![Figure 4.44: Photo of potential Stela #3.](image)

There was a definite distinction between the rock content in the area located east of the rock alignment and that to the west. Almost fifty percent of the matrix associated with the area east of the alignment was comprised of limestone rubble fill, ranging in size from 5 to 20 centimeters. Many of the rocks were burned, likely through modern agricultural practices. The
area of the subop located to the west of the alignment was comprised of humus and was virtually void of limestone rock. Given the variation in matrices on either side of the rock alignment, it was unclear whether the alignment was a wall to a platform or a patio that extended towards the east.

A 22x21 centimeter concentration of ceramic sherds was encountered along the western “face,” and encompassing a portion of, the rock alignment. Nineteen substantially sized ceramic sherds (on average 4cm) were recovered from this area. An obsidian blade was also recovered from within the ceramic concentration. The concentration ranged between 2 and 12 centimeters in depth. The concentration was found to be sitting on a dark brown, densely packed soil mixed with gravel and rocks ranging from 4-7cm in size. As excavations proceeded, the compactness of rocks increased. The density of artifacts recovered from this area was lower than that associated with the apparent platform, and consisted mainly of ceramics, although some lithic objects were recovered as well.

The fill exposed and excavated east of the alignment is consistent with that of a purposeful construction, especially when consideration is given to the fact that no such fill existed to the west, or effectively outside, of the walled area. It is likely that this wall is associated with Structure 37, a low-lying residential type structure to the southeast of Subop 23. Artifacts continued to be recovered in substantial quantities from the area east of the north-south running rock alignment and included mostly ceramics and some lithic flakes. Whether this rock alignment was part of a platform wall, or part of a patio area associated with Structure 37 is unclear. However, given that the wall continued southward for a considerable distance, it is likely that this rock alignment was part of Structure 37’s platform wall. Excavations were terminated as there was no evidence of the base of the possible stela. The data retrieved from this test excavation was unable to refute or support the supposition that PS#3 was part of a stela.
Possible Stela #2, Subops 18 and 18a

Subop 18 and later extension Subop 18a were placed approximately 5 meters northeast of Structure A1. Possible Stela #2 (hereafter referred to as PS#2) was identified during the 2001 season, when a bark beater was collected in its vicinity. The stone limestone slab exhibited no obvious evidence of having been shaped, however, if the monument had been ritually “killed”, characteristic marks indicating it had been formed would not necessarily be evident. It was hypothesized that, at best, it would have been a fragment of such a monument. PS#2 measured approximately 0.74x0.70x0.20 meters in size, and as such is thinner than the other possible stela at the site (see Figure 4.45). The fact that such a large slab of limestone had been purposely situated on top of Group A’s large platform supported the fact that it had some cultural significance and was not simply the product of cleaving bedrock processes. Group A’s platform is approximately 2.5 high at the northwest corner on which PS#2 was located. This paired with the fact that no such large slabs were evidently used in the construction of any of the architecture at the site, and that a similar such slab (Possible Stela #4) was found south of the southeast corner of Structure A1, approximately equidistant from Structure A1 as PS#2, lends support to the potential of these slabs being fragmentary, and potentially paired, monuments.

Subop 18 was a 1x2 meter unit, placed so to encompass the stone slab. We intended to only excavate to a maximum depth of 50 centimeters below surface, with the expectation that support for the monumental assignment of the slab in the form of a dedicatory cache, or the stela’s base, would be evident within that depth. Excavation of Subop 18 initially commenced without the removal of the subject stone slab. It was immediately evident that PS#2 was sitting on a number of smaller rocks in the western half of the unit. Excavations revealed an alignment of rocks in a seemingly non-linear, rounded fashion beneath the stone slab. Below the humus the matrix was
comprised of a ballast fill likely associated with the terminal phase of Group A’s platform construction. The suspect rock was removed in order to facilitate the excavations. The removal of the stone slab allowed us to define the rounded alignment of rocks more clearly. Exposure of the circular feature involved the removal of a melding of ballast and aggregate fill from around the feature. A number of large rocks and chert boulders that were evidently not part of the aggregate fill were exposed, as was a large, flat rock. This large flat limestone rock also appeared to be round, and was running into the north wall of the unit. In order to investigate the large round boulder, an extension unit (Subop 18a) was initiated.

Figure 4.45: Photo of potential Stela #2.

Subop 18a was a 2x1m extension unit, situated to the north of Subop 18, and thus the two subops together comprised a 2x2m unit. Removal of the ballast/aggregate fill allowed the round
boulder to be clearly defined. Additional rock alignments, seemingly part of some sort of construction covered by the terminal aggregate and ballast fill of Group A’s plaza floor were also exposed in the excavation of Subop 18a. The removal of the aggregate fill revealed a series of walls. Two of the walls were more formal masonry constructions that ran roughly north south. These walls were comprised of large rounded and or cut limestone boulders. The largest wall, exposed in the eastern section of the subops, was comprised of boulders measuring between 40 and 60cm in size. A second, parallel wall was evident in the center of the subops. This wall was comprised of cut stones that were faced towards the east and set on a curve, implying that the structure they encompassed was situated to the west and was potentially circular. Two courses of this wall were identified. The remains of a stucco surface on the eastern face of the wall, and between the courses, was also identified. A third, less formal east-running wall, comprised of some cut and rugged rocks (10-20cm in size), was exposed in the western portion of the Subops 18 and 18a at the 1-meter mark. This wall intersected with the cut/stucco wall in the center of the subops. A fourth alignment was evident in the northeast corner of Subop 18a, and was comprised of only a few, much smaller (10-15cm) cut stones (see Figure 4.46).
Figure 4.46: Top plan of walls revealed beneath PS#2.

In attempt to expose evidence intended to support the hypothesis that the stone slab an earlier construction was unearthed that at some point had been incorporated into and lay below the plaza floor during Group A’s final phase of occupation. This earlier construction had at least two phases of construction, as is evident by the parallel walls running north-south through the unit. The most eastern wall was evidently the latest, or most recent phase, as it would have engulfed the earlier north-south and east-west running walls. Thus, the central stucco wall would have been the earlier phase. It is likely that the east-west running wall identified within the area delineated by the stucco wall was a retaining wall for this early structure, a hypothesis that is supported by the fact that this wall intersects with the stucco wall and does not extend beyond it. Interestingly,
relatively few ceramics were recovered from all levels of excavation in Subops 18 and 18a. However, it is of note that in Subop 18, there was a distinct association of lithic artifacts recovered from the terminal phase of construction and occupation, as more lithics were recovered from this level than in any other level in the unit (N=91).

CHULTUNS

Eight chultuns have been located at Strath Bogue (see Figure 4.3). It was decided to investigate and test the chultuns in order to obtain information on the use of these associative cultural features at the site. Unfortunately, only two chultuns were able to be entered because of the labor involved in preparing the chultun for entry, and the concern for the safety of those entering. Both chultuns were “smoked”, so as to rid them of snakes, bats and rats. Profile and plan mapping of the two chultuns was conducted with the aid of base lines strung across the orifice and the interiors of the chultuns. Measurements were taken every 20cm along the baseline to the walls, ceiling and floors of both chultuns.

Chultun 3

Chultun 3 is located on property owned by Juan Rivera, at the juncture of the two main cane roads located to the south of the main part of the site. The chultun was carved out of the limestone bedrock in a standard boot-shape. The orifice measured approximately 67x50 centimeters in diameter (Figure 4.47), and while the orifice would have been capped in antiquity, a cap was not found in or around the chultun. The interior is small, measuring approximately 318x206 centimeters at its extremes, and reached an optimal depth of approximately 260cm below surface. No artifacts were found on the surface inside the chultun, and it was apparent that a lot of the matrix in the chultun had fallen in from above. We began excavating the chultun as Subop 19,
using the confines of the chultun itself to demarcate the dimensions of the excavation “unit.” Modern debris, most specifically wire fencing, was found throughout the associative matrix, down to the base of the chultun. A few ceramic sherds were recovered, but these were not diagnostic. A local informant later informed us that a large structure had once stood in the vicinity of the chultun and may in fact have been erected over top of Chultun 3.

Figure 4.47: Photo of Chultun 3 orifice.

Chultun 5

Chultun 5 was located on the Salazar Property, toward the western edge of the site. The chultun was located approximately 20 meters northeast of the intersection of the east-west running cane road that divides the site, and a tertiary cane road running into Sen. Salazar’s cane fields. Like Chultun 3, Chultun 5 is a standard boot-shape, with an orifice measuring approximately 75cm in diameter (see Figure 4.48). The orifice was located at the approximate center of the chultun while the chamber or “boot” ran towards the south. No cap to the chultun was encountered inside or
around the chultun. The chamber measures approximately 3.20x2.30 meters in size. Chultun 5 differs from Chultun 3 in that the ceiling of Chultun 5 is dome shaped. It was decided that it was best not to excavate this chultun for health reasons. We also learned from the landowner that a large mound had stood over the chultun until about 20 years ago, but that it had been bulldozed when the cane road was built. Sen. Salazar also noted that the chultun had been entered and disturbed at, and since that time.

Figure 4.48: Profile of Chultun 5.

**DISCUSSION**

Excavations at Strath Bogue have shed a great deal of light on the site’s resident community. A complete complement of the architectural constructions at Strath Bogue was tested over the course of two years of archaeological investigation. Structures representing an array of variability in households were excavated, as were two structures with ritual significance. Excavations also revealed that there was some degree of social and, or economic variability in constructions across the site, as well as in the artifact assemblages of different structures. The
majority of constructions at Strath Bogue were erected in one of two phases of construction during the transitioning Terminal Classic period. While an earlier Early Classic period less expansive occupation at the site was detected through the excavations of Structure 5 and the identification of Structure 5-sub, ceramic data indicates a clear disjunction between the two time periods, as does the orientation of architecture and construction methodologies employed.

One of the most significant discoveries at Strath Bogue was the recognition that nearly all architectural constructions were not only built in one or two phases of construction but were unmistakably erected in a “hurried fashion.” Structures were built using a mixture of amorphous limestone and chert cobbles rather than dressed or finished limestone blocks in their constructions, with virtually no mortar having been detected during excavations. Such construction methodologies were not restricted to just household constructions either, as even Structure A1 a community-oriented temple structure, was also comprised of such materials. These construction practices speak to the urgency of the community’s resettlement at Strath Bogue. Social distinctions were also indicated in variability of constructions, in the materials used, but also through their associated artifact assemblages.

Debra Walker (1990:462) has identified a reoccupation of the site of Cerros in the Terminal Classic Sihnal phase (A.D. 850-1150) by a group of people she has labeled “colonizers”. This occupation was marked by the “hurried renovation of ruined Preclassic mounds atop which flagstone floors were laid.” Walker postulated that the insurgence of Terminal Classic populations within northern Belize in the Terminal Classic period were likely the result of population displacements associated with Classic period declines and upheavals. She further argues that these
peoples likely originated in the Petén and sought refuge and a new social order in northern Belize by forging an alliance with polities from the northern lowlands, or the site of Chichén Itzá itself.

Continuites with Classic period traditions are recognizable at Strath Bogue in the presence of at least one Stela at the site. Although Stela #1 does not appear to have been carved, and would likely have been painted, the recovery of both a bark beater and an ink dish attest to the fact that some residents at the site were literate. Despite the fact that the cessation of stela erection and writing systems have in the past both been considered markers for the collapse, residents of the Terminal Classic period Strath Bogue community was continuing in both these traditions. There are also continuities in the treatment of the dead, as the Strath Bogue community continued to inter their dead in family-oriented structures, in extended burials crypts, unlike in the Postclassic period, where residents of nearby Caye Coco interred their dead in pits dug into the bedrock (Goldman 2001; O'Hare 2001).

Artifacts recovered from our excavations support the site having been resettled in the Terminal Classic period. The fact that construction across the site was, with the exception of the Structure 5-sub, erected during the Terminal Classic period is telling. The hasty way in which structures were built, and the use of undressed or unmodified limestone and, or chert nodules as construction materials in most structures, including those seemingly used for ritual and by the more elite individuals, points to the inhabitants of Strath Bogue having arrived en mass and having a need to quickly establish themselves on the landscape. As will be shown in the artifact analysis chapters to follow, the residents of Strath Bogue took advantage of the available local resources, adapting to the local clays and making good use of the immediate lithic source.
CHAPTER 5: ZOOARCHAEOLOGICAL ANALYSES

FAUNAL AND MOLLUSK REMAINS

This chapter reports on the results of the zooarchaeological and stable isotopic analyses of Strath Bogue’s faunal assemblage and compares and contrasts them with that reported from other Maya sites. While analysis of the sites faunal remains provides insights into consumption and dietary patterns of the site’s inhabitants, they also shed light on available regional resources, and add “food for thought” to the question of the site’s inhabitants having been migrants. While isotopic analyses have been becoming steadily more prominent in faunal analyses, there has been limited investigation involving Terminal Classic period sites. Moreover, beyond the analysis of dog and deer, isotopic analyses of other animal species have been practically nonexistent. Thus, the Strath Bogue isotopic analyses provide some innovative and important comparable data and analyses. The data presented in this chapter provide interesting chronological, environmental, social, economic and biological evidence in support of the supposition that Strath Bogue was settled in the Terminal Classic period by a group of migrant peoples.

Methodology

All fauna and mollusk fragments recovered at Strath Bogue were identified to the lowest possible taxon by Sean Higgins, with the aid of skeletal reference manuals, archaeological comparative samples in the field, and with a comparative collection. Quantification of the number of specimens (NISPs) and minimum number of individuals (MNI) followed standard zooarchaeological procedures. Each specimen was washed and inspected for modifications, features and pathologies prior to sorting them into zoological classes as per their physical,
characteristics. All specimens, fragmentary or complete were counted individually for NISPs. Calculations of MNIs were based on the presence of complete specimens (mollusks), elements present and represented sides, as well as animal’s age, for each relative cultural unit and across the site. Due to the extremely small and limited size of the Strath Bogue faunal assemblage, contextual comparisons are not merited. The faunal and mollusk remains recovered from Strath Bogue are representative of the microenvironments surrounding the site. I do not suppose that the absence of many other species indigenous to area and typical of Maya diets is a reflection of their having been over hunted or not utilized by the Strath Bogue Maya.

**The Zooarchaeological Assemblage**

Based on their mere location, we understand that the Strath Bogue community would have had access to an array of environments locally, and that would have thus made available an array of marine, riverine, aerial and terrestrial animal resources. However, as is often the case with bone materials from the tropics and was the case with the human remains from the site, a very small amount of faunal remains were recovered from Strath Bogue. Those that were recovered were generally fragmentary and often in a poor state of preservation. Nonetheless, all of the faunal remains at Strath Bogue were minimally able to be identified to the class level, with a relatively high ratio of bones being identifiable to the level of species (43.8%). Soil acidity and moisture retention in the tropic environment of the southern Maya lowlands are recognized as contributing to the degradation of faunal bone over time (Emery 1986; 1990:61). A similarly small Terminal Classic faunal assemblage was encountered from at Caye Coco, despite the fact that the site has a particularly rich midden deposit, albeit it primarily dates to the Postclassic period (Masson 2002a:342).
The mollusk assemblage from Strath Bogue is surprisingly sparse; this may be in part due to the relative prominence of *Pomacea* at the site, a type of mollusk whose shell does not easily withstand the pressures of time. The faunal assemblage from Strath Bogue is by no means large enough to propose any definitive conclusions or offer any treatments as to the state of the Progresso Lagoon region environment in the Terminal Classic period or make any sweeping conclusions as to dietary preferences and patterns, or pressures on local animal resources. The limited nature of the Strath Bogue deposit types paired with taphonomic, depositional and density differences can skew data (Emery 1990:30; Styles 1985). Nonetheless, the remains and analysis conducted offer some minimalistic insights into the community’s local resources. Isotopic analyses performed on a small selection of the faunal remains offer additional facets of information the faunal analysis.

*Faunal*

A total of 32 faunal bones were recovered from different contexts at Strath Bogue. The majority of faunal remains from Strath Bogue were recovered from architectural fill and midden contexts. Perhaps one of the most striking things about Strath Bogue’s small faunal assemblage is that despite its relatively small size, a respectable range of animals is represented across the assemblage (see, Figure 5.1 and Table 5.1), including *Odocoileus virginianus* (white-tailed deer), dog (*Canis familiaris*), turkey (*Meleagris ocellata*), Testudines (turtle), Osteichthyes (bony fish) and unidentified mammals. It should be noted that three *rodentia* (rodent) specimens were collected from Burial PR10-03, however their presence is thought to likely be the result of bioturbation, given their superior state of preservation and relatively small size. An additional 890 *Dasypus novemcinctus* or armadillo bones (773 of which were scutes) were also recovered from Chultun 3 but were determined to be modern.
Mammalian remains dominate the Strath Bogue sample. Specimens identified as, or suspected to be *Odocoileus virginianus* represent the most common species of animal within the entire Strath Bogue faunal assemblage, with a secure minimum number of individuals (MNI) being 3, however the remains of a “large mammal” are suspected to be a white-tailed deer, thereby bringing the MNI number to 4 (see Table 5.1). This is not an uncommon occurrence at other inland sites. Pulltrouser Swamp/Kaxob’s Terminal Classic period faunal assemblage was also dominated by mammals, with *Odocoileus virginianus* representing the largest percentage of the assemblage (Masson 2004:Table 7.1). Emydidae and unidentified mammals represent the next most numerous (see Figure 5.2) taxa at Strath Bogue. While the faunal remains recovered from across the site are very minimal in number, they represent animals typically encountered at sites throughout the Maya region, and are recognized as characteristic of both dietary and ritualistic events (K. F. Emery 2004:84; Masson 2004; White, et al. 2004).

Only one bone, an antler tip of a *Odocoileus virginianus* (white-tailed deer) showed evidence of having been fashioned into what appears to have been a small punch or boring tool. This object was recovered from a unit that contained very little in the way of artifacts, and otherwise produced relatively little data. Otherwise none of the faunal bone exhibited evidence of defleshing, cooking, or modification.
Figure 5.1: Photograph of sample of faunal remains recovered from Strath Bogue.

Table 5.1: Minimum Number of Individuals of Faunal Species from across Strath Bogue.

<table>
<thead>
<tr>
<th>Scientific Name</th>
<th>Common Name</th>
<th>MNI for Site</th>
</tr>
</thead>
<tbody>
<tr>
<td><em>Meleagris ocellata</em></td>
<td>Turkey</td>
<td>1</td>
</tr>
<tr>
<td><em>Canis Familiaris</em></td>
<td>Dog</td>
<td>1</td>
</tr>
<tr>
<td><em>Odocoileus Virginianus</em></td>
<td>White-tailed Deer</td>
<td>3</td>
</tr>
<tr>
<td>Emydidae</td>
<td>Turtle</td>
<td>3</td>
</tr>
<tr>
<td>Mammalia</td>
<td>Mammal</td>
<td>3</td>
</tr>
<tr>
<td>Mammalia (likely <em>Odocoileus Virginianus</em>)</td>
<td>Large Mammal</td>
<td>1</td>
</tr>
<tr>
<td>Mammalia</td>
<td>Small Mammal</td>
<td>1</td>
</tr>
<tr>
<td>Perciformes</td>
<td>Fish</td>
<td>1</td>
</tr>
<tr>
<td>Structure #</td>
<td>Deposit Type</td>
<td>Class</td>
</tr>
<tr>
<td>------------</td>
<td>--------------</td>
<td>-------------</td>
</tr>
<tr>
<td>Off Str. 5 (Unit 5a)</td>
<td>Midden</td>
<td>Mammalia</td>
</tr>
<tr>
<td>Off Str. 5 (Unit 5a)</td>
<td>Midden</td>
<td>Sauropsida</td>
</tr>
<tr>
<td>Off Mound (Unit 4)</td>
<td>Pliform/ Patio Floor (Redposited Midden)</td>
<td>Aves</td>
</tr>
<tr>
<td>Off Mound (Unit 4)</td>
<td>Pliform/ Patio Floor (Redposited Midden)</td>
<td>Aves</td>
</tr>
<tr>
<td>Off Mound (Unit 4)</td>
<td>Pliform/ Patio Floor (Redposited Midden)</td>
<td>Mammalia</td>
</tr>
<tr>
<td>N of Str. 9 (Unit 9)</td>
<td>Compact Medium Grained Brown Clayey-Loam</td>
<td>Mammalia</td>
</tr>
<tr>
<td>Pit/str East of Str. 14 (Unit 8)</td>
<td>Construction Fill, East of Wall</td>
<td>Sauropsida</td>
</tr>
<tr>
<td>Str. 14 (Unit 6)</td>
<td>Architectural Wall</td>
<td>Mammalia</td>
</tr>
<tr>
<td>Str. 5 (Unit 5d)</td>
<td>Aggregate Fill, Below Floor 1</td>
<td>Actinopterygi</td>
</tr>
<tr>
<td>Str. 5-Sub</td>
<td>Cobble Floor surface associated with Str 5-sub</td>
<td>Mammalia</td>
</tr>
<tr>
<td>Structure #</td>
<td>Deposit Type</td>
<td>Class</td>
</tr>
<tr>
<td>------------</td>
<td>--------------</td>
<td>-----------</td>
</tr>
<tr>
<td>OHNE Corner of Str. 5 (Unit 2a)</td>
<td>Midden</td>
<td>Mammalia</td>
</tr>
<tr>
<td>OHNE Corner of Str. 5 (Unit 2a)</td>
<td>Midden</td>
<td>Mammalia</td>
</tr>
<tr>
<td>OHNE Corner of Str. 5 (Unit 2a)</td>
<td>Midden</td>
<td>Mammalia</td>
</tr>
<tr>
<td>OHNE Corner of Str. 5 (Unit 2a)</td>
<td>Midden</td>
<td>Mammalia</td>
</tr>
<tr>
<td>OHNE Corner of Str. 5 (Unit 2a)</td>
<td>Midden</td>
<td>Mammalia</td>
</tr>
<tr>
<td>OHNE Corner of Str. 5 (Unit 2a)</td>
<td>Midden</td>
<td>Sauropsida</td>
</tr>
</tbody>
</table>

Table 5.2 (cont.): Table of total counts and range of faunal remains from Strath Bogue.
A medial section of a radius of an unidentified small mammal was the only faunal bone recovered from an Early Classic context at Strath Bogue. The rest of Strath Bogue’s faunal assemblage was securely associated with Terminal Classic contexts. Sixty-eight percent of the Terminal Classic faunal was recovered from midden deposits associated with Structure 5. Twenty-one percent of the remains were recovered from various types of construction episodes, including masonry walls, patio and plaster floors and architectural fill. Preservation of faunal remains at Strath Bogue is clearly lacking given the mere dearth of animal bones recovered during archaeological investigation. While it makes sense that the majority of animal bones would be recovered from midden like contexts, it also appears that there is a higher quality of preservation.
evident in midden deposits. **Error! Reference source not found.** illustrates the distribution of faunal remains at Strath Bogue according to specific context types.

![Distribution of Faunal Remains by Context](image)

**Figure 5. 3: Distribution of Faunal Remains from Strath Bogue by Archaeological Context (NISP).**

**Mollusks**

A total of 89 unmodified mollusks thought to likely represent food items, and an additional 22 Mollusk shells classified as “special finds,” were recovered from a variety of contexts at Strath Bogue. The majority of shells were identified either as *Pomacea flagellata*, a local freshwater species, or as shells belonging to the Genus *Strombus*, a marine species (see Table 5. 3). Special find shell objects are shells that show evidence of modification or which are clearly long-distance
imports (i.e., *Spondylidae*, from Pacific Ocean; *Oliva* from the Gulf of Mexico) and thus are unique and special in their being non-indigenous and objects of long-distance trade. Forms of modification include cut marks and drilling holes, or the manufacturing of specific objects from this form of raw material.

**Table 5.3: Mollusk specimens and quantities from Strath Bogue.**

<table>
<thead>
<tr>
<th>Class</th>
<th>Order</th>
<th>Family</th>
<th>Genus</th>
<th>Species</th>
<th>Common Name</th>
<th>Quantity</th>
<th>MNI For Entire Site</th>
</tr>
</thead>
<tbody>
<tr>
<td>Gastropoda</td>
<td>Architaenioglossa</td>
<td>Ampullariinae</td>
<td>Pomacea</td>
<td>flagellata</td>
<td>Apple Snail</td>
<td>86</td>
<td>38</td>
</tr>
<tr>
<td>Bivalvia</td>
<td>Unionoida</td>
<td>Unionidae</td>
<td>Nephronaias</td>
<td></td>
<td>Freshwater clam</td>
<td>2</td>
<td>1</td>
</tr>
<tr>
<td>Gastropoda</td>
<td>Neogastropoda</td>
<td>Olividae</td>
<td>Oliva</td>
<td></td>
<td>Olive</td>
<td>1</td>
<td>1</td>
</tr>
<tr>
<td>Gastropoda</td>
<td>Neogastropoda</td>
<td>Strombidae</td>
<td>Strombus</td>
<td></td>
<td>Conch</td>
<td>19</td>
<td>18</td>
</tr>
<tr>
<td>Gastropoda</td>
<td>Neogastropoda</td>
<td>Strombidae</td>
<td>Strombus</td>
<td>gigas</td>
<td>Conch</td>
<td>1</td>
<td>1</td>
</tr>
<tr>
<td>Bivalvia</td>
<td>Ostreoida</td>
<td>Spondylidae</td>
<td>Spondylidae</td>
<td></td>
<td>Spondylus/ Spiny Oyster</td>
<td>1</td>
<td>1</td>
</tr>
<tr>
<td>Gastropoda</td>
<td>Unknown</td>
<td></td>
<td></td>
<td></td>
<td>UID</td>
<td>1</td>
<td>1</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>Total</td>
<td>111</td>
<td>61</td>
</tr>
</tbody>
</table>

Shell objects were recovered randomly from architectural fill deposits, plaster floors, domestic middens and were purposefully deposited in burials. The majority of mollusks were recovered from either midden or architectural fill deposits (see Figure 5. 4). Some mollusk were also recovered from the initial excavation levels of humus and plow disturbance or humus and collapse matrices. With the exception of Burial PR10-01 which contained no shell objects within it, each burial had at least one Pomacea shell interred within the individual. Burials PR10-03 and PR10-04 additionally had “special find” artifacts rendered from shell included in them. Burial PR10-03 had the *Strombus gigas* ink dish (see Chapter 6) and PR10-04 had an informal biconically drilled bead rendered from a *Strombus* shell (see Figure 5. 5).
While shells recovered from archaeological contexts may have dietary or functional significance in terms of their being a raw material, shells also have symbolic significance. Shells, especially conch or *Strombus* shells are understood to be emblematic of the underworld and the realm of the dead, in addition to being aquatic symbols (Andrews IV 1969:48-53; Moholy-Nagy 1985:155; Thompson 1939:49, 133-134). Iconographically, bivalves and *Oliva* shells, sometimes in association with the image of a hand, are recognized as symbolizing completion and the number zero (Thompson 1939, 186). Thus, the inclusion of shells or shell objects in burials likely had symbolic significance.

![Figure 5. 4: Distribution of mollusk Types according to context.](image-url)
Stombus shells, including Strombus gigas are large “conch” gastropods that are typically encountered in shallow, sandy environments along the Caribbean coast from Belize into the Gulf of Mexico. They have occasionally also been encountered in the brackish waters of Progresso Lagoon. Strombus has been a recognized food item since Precolumbian times. Their dense and comparatively solid structure have allowed these shells to be commonly used as a raw material in the manufacturing of a variety of objects, from ornaments to tools, to musical instruments (Andrews IV 1969; Covich 2000:132; Dreiss 1994; Eaton 1978; Moholy-Nagy 1963, 1985).

All of the “special find” artifacts manufactured from Mollusk were fashioned from Strombus, but given their degree of modification or small size, were not securely able to be identified to the level of species. The ink shell dish was the only special find that was able to be identified to that level and was identified as Strombus gigas (see Figure 6.17). The majority of Strombus artifacts were simply fragments of the shells body whorl or sections of the columella that exhibited obvious cut marks but were evidentially either unfinished objects or debris from the manufacturing process.

Other shell objects at Strath Bogue fashioned from Strombus shell include informal “seed” beads, adornos, spindle whorls and a shell pigment holder (see Figure 5.5 and discussion in Chapter 6). The one Olivella shell recovered at Strath Bogue was excavated from the aggregate fill associated with the earliest Floor (Floor 1) and Terminal Classic construction of Structure 5, that was erected over top of the differently oriented Early Classic structure (Str. 5-sub) at this location. Typically, Olivella shells exhibit modifications in the form of cut faces or perforations for suspension and are commonly referred to as tinklers. The Strath Bogue specimen was unmodified.
Figure 5.5: Strombus shell artifacts recovered from Strath Bogue: a) Seed Bead from Burial PR10-04; b) Bead associated with base of Str. A1; c) Spindle Whorl from Architectural fill; d) Adorno; e) Pigment holder from Midden; f) Inlay from Humus/disturbed level.

The majority of shells recovered at Strath Bogue were complete or fragmentary *Pomacea flagellata* commonly known as Apple snails (see Table 5.2 and Table 5.3). *Pomacea* are commonplace in the Maya area, and within the archaeological record. Ordinarily recognized as a riverine snail, *Pomacea* are also found in swamps, watering holes, arroyos and lakes (Moholy-Nagy 1978:66). These species of snail are able to maintain prolific populations and are noted as the most abundant freshwater species in the area today (Covich 2000:124). Of particular note is the fact that these snails readily adapt to seasonal changes in water temperature and levels and can endure complete absences of water and deoxygenated states by tunneling deep into the remaining mud (Covich 2000:125).
Pomacea snails are argued to have been a part of the Precolombian Maya diet (Andrews IV 1969; Feldman 1978; Moholy-Nagy 1978) and occur archaeologically at many sites across the Maya area in every time period (Pohl 1985a:109), particularly those within, or close to riverine environments. Pomacea were evidentially not just food items but likely held symbolic significance as well, as their shells were also occasionally included in ceremonial or ritual activities (Moholy-Nagy 1978; Powis 2004:125). While Pomacea shells were recovered from Burial contexts at Strath Bogue, none of the shells or fragments exhibited evidence that they had been modified. The thin nature of the shell itself likely negated any such usage.

Pohl (1985a:109) has noted a recognizable difference in the occurrence of freshwater mollusks at some Maya sites over time, that suggests an apparent shift in the use of freshwater mollusks from subsistence to ritual and ornamental purposes in the Classic period. It is unclear what the impetus for this shift is however. The decrease in Pomacea usage does not seem to be due to a lack of these snails as a result of environmental impacts, as excavations at wetlands sites such as San Antonio Río Hondo and in northern Belize indicate they remain prolific in these environments throughout history (Pohl 1985a:109). It is interesting to note however that evidently Pomacea recovered from Formative period contexts when they are found in abundance, are smaller in size compared to those recovered from later period deposits. It would appear that the influx in snail size in deposits over time coincides with the change in snail usage, as Pohl cites Miksicek (1980) as noting (Pohl 1985a:109) the larger the snail, the less appetizing it is. Unfortunately, it is unclear what is classified as “large” versus “small” Pomacea, and thus it is difficult to ascertain where comparatively the Strath Bogue specimens would fall.
At the site of Tikal, Guatemala, Moholy-Nagy (1978:67-69) noted a marked increase in the distribution of *Pomacea* in indiscriminate deposits dating to the Terminal Classic period at the site, in comparison to a clear decrease in the deposition of other material culture objects, such as bifaces during the same period. This occurrence is suggestive of a greater relative importance being placed on this shell during this period than in previous periods. While *Pomacea* shells were recovered from special deposits at Tikal including two Burials dating to the Terminal Classic period, their relatively low distribution in specialized deposits during this period compared to their presence in such deposits dating to the Early Classic period, suggests that they held little prescribed significance in the Terminal Classic period. It is thus likely that the increase and suggested importance of *Pomacea* was more as a dietary supplement as opposed to these shells holding ritual or ceremonial significance. Moholy-Nagy (1978:72) suggests that the increase in the use of Pomacea in the Terminal Classic is likely directly linked to changes in population. During the preceding time periods archaeological deposits revealed a decrease in *Pomacea* usage over time that coincides with surges in population at Tikal. She notes by the Terminal Classic period the Tikal populace may have decreased by 90% from its ultimate population levels, and thus pressure on the Pomacea would have been alleviated and thus likely account for the increases in their numbers and usage.

*Pomacea* snails are still eaten today in the Maya area, typically in a soup or stew. The snail can easily be removed from the shell without damaging the shell. While recognized ethnographically and archaeologically as a food source, their low caloric value (approximately 70 snails=367.5 calories and only 73.5 grams of protein) suggests that they were not a stable food, but a supplemental protein source (Moholy-Nagy 1978:71). However, should a population be
surviving on a marginal diet, particularly one based largely on plants, the low caloric and protein value of the Pomacea snail would have been relatively important (Cook 1946:52). Moreover, the ability of *Pomacea flagelleta* to sustain high population levels and withstand dry conditions may have allowed this snail to play an important supplementary dietary role should other sources of meat be unobtainable or during periods of environmental crisis (Powis 2004:138).

**ISOTOPIC DATA**

Different food items, (meat and plants) as well as soils and water have discrete isotopic signatures. These isotopic signatures are passed on to the consumer (whether animal or human) and are manifested as heavy or light ratios of carbon (\(^{13}\text{C}/^{12}\text{C}\)) and nitrogen (\(^{15}\text{N}/^{14}\text{N}\)). Stable isotopes (carbon (\(\delta^{13}\text{C}\)) and nitrogen (\(\delta^{15}\text{N}\))) are ingested into the body through the consumption of food, water and soils, and are metabolically controlled and absorbed into teeth, tissues and bone (Price, et al. 1985:429; Vanderwarker 2006:182-183; White, et al. 1998:643; Wright and Schwarcz 1996). Thus, the stable isotopes detected in bone collagen and tooth enamel are reflective of the animal or human’s diet (Price, et al. 1985:429; Vanderwarker 2006:182-183; Wright and Schwarcz 1996). Stable carbon isotope (\(\delta^{13}\text{C}\)) samples are generally expressed as negative values as most biological specimens have less \(^{13}\text{C}\) compared to \(^{12}\text{C}\) as defined by international standards (Peedee belemnite (PDB)). Conversely, stable nitrogen isotope samples are expressed as positive \(\delta^{15}\text{N}\) values as biological specimens tend to have higher \(^{15}\text{N}/^{14}\text{N}\) ratios than atmospheric international standards (AIR) (Schoeninger 1985; Schoeninger and Moore 1992:254).

The isotopic composition of plant tissues varies according to the plants photosynthetic path (for terrestrial plants) and chemosynthetic path (for marine plants). Most edible terrestrial plants tend to use either \(\text{C}_3\) (beans, squash, roots/tubers, fruit), \(\text{C}_4\) (maize, amaranth, epazote) or
Crasseulean Acid Metabolism (CAM) pathways (mostly succulents) (Ambrose 1993; DeNiro 1987:184; Schwarcz and Schoeninger 1991; Vanderwarker 2006:184; Wright and White 1996:171). C_3 plants produce very negative δ^{13}C values, ranging between -22‰ to -35‰, but averaging around -26.5‰, while C_4 plants δ^{13}C values range between -9‰ to -19‰, and averaging around -12.5‰, and thus there is little overlap between C_3 and C_4 plants (Ambrose and Norr 1993; DeNiro 1987:184; Freiwald 2011:252; Gerry and Krueger 1997:197; Norr 1995:200; Schoeninger and Moore 1992:255-256; Schwarcz 2000; Vanderwarker 2006:184; Wright and White 1996:171). CAM plants have separate C_3 and C_4 cycles during the day and night, and thus have δ^{13}C values that can encompass the range of C_3 and C_4 plants (DeNiro 1987:184; Freiwald 2011:252; Norr 1995:200; Vanderwarker 2006:184; Wright and White 1996:171), but tend to most similar to C_4 plants. Nonetheless, C_4 plants other than maize are limited in tropical environments, and since maize was the dominant C_4 plant consumed by the Maya, it is safe to argue that δ^{13}C values are reflective of maize consumption (White 1997:184). Marine plants and terrestrial plants also differ in their carbon isotopic signatures because of the variations in atmospheric carbon dioxide compared to oceanic carbon dioxide, and thus can be have distinct values (Chisholm, et al. 1982:1131; Schoeninger and Moore 1992:255; Vanderwarker 2006:184).

The plants themselves not only have their own δ^{13}C and δ^{15}N values, but they also contribute to those of the organism which feed upon them, and consequently contribute to the stable isotopes values absorbed into the bone apatite and collagen of the animals as well (see Figure 5. 6) (Ambrose 1987:94; Vanderwarker 2006:184; White and Schwarcz 1989:461; Wright and White 1996:171-172). Stable isotopic studies focusing on bone chemistry tend to emphasize bone collagen, as the constitution of the carbon isotopes are consistently sustained through time in the
Bone collagen (the organic aspect of bone composed of amino acids) is predominately produced through proteins in diet, whereas bone apatite (the mineral aspect of bone, comprised of calcium hydroxyphosphate/carbonate) is the product of one’s entire diet (Ambrose 1993; Tieszen and Fagre 1993).

**Figure 5. 6: δ15N and δ13C values for plant and animal resources (after Norr 1984 in, Vanderwarker 2006:Figures 6.2 & 6.3) (d= δ).**

Investigators using isotopic analyses must take into consideration the “trophic-level” of the specimen being analyzed. The trophic-level of an organism refers to its place on the food chain. The food chain is a sequence of organisms that consume organisms from the preceding level and are in turn consumed by an organism from a subsequent level (see Table 5.4). Thus, an organism’s dietary content affects both the δ13C and δ15N values absorbed in an organism’s bone collagen.
Table 5.4: Categorization of trophic levels.

<table>
<thead>
<tr>
<th>Trophic Level</th>
<th>Consumer Category</th>
</tr>
</thead>
<tbody>
<tr>
<td>1 Primary Producers</td>
<td>Plants, algae</td>
</tr>
<tr>
<td>2 Primary Consumers</td>
<td>Herbivores</td>
</tr>
<tr>
<td>3 Secondary Consumers</td>
<td>Carnivores that eat primary consumers</td>
</tr>
<tr>
<td>4 Tertiary Consumers</td>
<td>Carnivores that eat other carnivores</td>
</tr>
<tr>
<td>5 Decomposers</td>
<td>Fungi that eat dead matter</td>
</tr>
</tbody>
</table>

Isotopic nitrogen ratios convey information on the proteins of plants and animals ingested by the organism and absorbed into its bone collagen. As such, \( \delta^{15}N \) values can be used to determine trophic position and diet reconstruction (White 1997:184; Wright and White 1996:171-172). The nitrogen isotopic levels of terrestrial species range between -3 and 10‰. Terrestrial herbivores average around 5 or 6‰, while terrestrial carnivores tend to average around 8 or 9‰ (see Figure 5.6 Error! Reference source not found. for the full range of both carbon and nitrogen isotopic values for plant and animal resources) (Gerry and Krueger 1997:199).

Some marine plants and animals can yield \( \delta^{13}C \) values that can be difficult to differentiate from terrestrial C\(_4\) plants (Schoeninger and Moore 1992: 256; Vanderwarker 2006:184). Similarly, nitrogen isotopes of different plants are very similar, with legumes being one of the few more easily identified isotopically, as they register lower than most other plants (near 2-5‰) (Wright and White 1996:172). Fortunately, terrestrial and marine protein contributions to diet can be differentiated through nitrogen isotopes, as their \( \delta^{15}N \) values differ significantly (DeNiro 1987:184; Price, et al. 1985:431; Schoeninger and Moore 1992:256; Vanderwarker 2006:184). This is in part due to the fact that terrestrial, riverine and marine systems have different sources of nitrogen, with marine \( \delta^{15}N \) values being significantly more enriched or positive. Both freshwater
and marine fish in the Maya area are noted as having more enriched $\delta^{15}N$ values than terrestrial animals, with freshwater species having even higher values than marine reef fish. While some terrestrial herbivores have nitrogen isotope values that overlap with shellfish, snails, and reef fish and some C3 plants, freshwater fish are intermediate to terrestrial animals and marine species, with nitrogen isotopic values typically measuring between 12-20‰ (Gerry and Krueger 1997:199; Schoeninger and Moore 1992:256; Vanderwarker 2006:185, Figure 6.3; White, Pohl, et al. 2001:96; Wright and White 1996:172). This fact is of particular relevance when involving beings (be they animal or human) who eat both maize and marine organisms, especially when testing relies on the use of bone collagen (Chisholm, et al. 1982:1132; Vanderwarker 2006:184). Of related significance is the fact that snails and freshwater fish in the Maya region resemble C3 plants, while Caribbean shellfish and marine fish are $^{13}C$ enriched and thus have $\delta^{13}C$ values similar to maize (Tykot, et al. 1996; Wright and White 1996:95), and hence the need to examine nitrogen isotopes.

The effects of trophic-level ingestion are diet and chemical specific but can result in an enriching of both nitrogen and carbon in bone collagen. While carbon levels in collagen are affected (enriched) through secondary ingestion and relative trophic position of the animal consumed by approximately 1‰, nitrogen levels are more recognizably affected by trophic-level ingestion, by as much as approximately 3-5‰ (Gerry and Krueger 1997:199; Schoeninger and Moore 1992:258; Vanderwarker 2006:185-186). Rates of nitrogen enrichment are not constant, as they vary by dietary mixture and degree of macronutrients. Nitrogen isotopes are positive indicators of trophic position and are good indicators of diets enriched with the consumption of proteins and diets reliant on marine subsistence chains (White 1997:184; Wright and White
Carbon isotope analyses using bone collagen samples has thus found that diets based on the ingestion of C\textsubscript{3} plants, have δ\textsuperscript{13}C enriched values averaging around -21.5‰, whereas those based on C\textsubscript{4} plants had δ\textsuperscript{13}C enriched values of around -7.5‰.

Stable carbon and nitrogen isotope analyses of faunal and human skeletal specimens from Strath Bogue were initiated in attempt to construct an understanding of the isotopic variability in locally available foods, and to provide insights into local subsistence economy and dietary patterns. Data gleaned from these analyses can then be extrapolated to provide insights into the larger community’s subsistence dependencies.

**Methodology and Sampling**

Stable isotope analyses of a representative sample of the range of animal species archaeologically present at Strath Bogue were submitted for testing, as was a modern faunal specimen to be used as a local marker. Unfortunately, due to financial constraints, stable isotopic analysis for this study was limited to the testing of bone collagen. All isotope analyses were conducted by the University of Oregon’s Archaeometry Facility and funded through a University at Albany Graduate Student Organization research grant.

Skeletal specimens were prepared for isotopic testing using cleaning, collagen and isotope extraction protocols established at the Archaeometry facility (Culleton 2012) and based upon testing practices instituted by Stafford et al. (Stafford, et al. 1988). Sediments were removed from the surfaces of the specimens and 200-400mg of each sample was placed in scintillation vials and sonicated in 4mL 1:1 acetone:methanol solution for 15 minutes to remove adhesives, and then rinsed with DI H\textsubscript{2}O. Decalcification of each bone sample occurred over a 3-5-day period by adding
5ml 0.5N HCl to each sample vial and subjecting it to a temperature of 4°C. Following
decalcification, the bone is subjected to a DI H2O solution to achieve neutrality, and then soaked
for a 24-hour period in 0.1% KOH at 4°C. After neutrality is achieved, water percent pseudomorph
is documented as per Stafford et al. (1988:Table 1) and the sample is lyophilized. The resulting
percent collagen yield is then determined by weight (Culleton 2012).

The extracted collagen is then gelatinized in 1mL 0.02N HCl at 110°C for approximately
5 to 30 minutes. The resulting gelatin sample is pipetted by a filtered syringe and propelled into a
culture tube. The filtered emulsion is lyophilized, and the percent gelatinization and yield are
determined by weight. The sample gelatin is then hydrolyzed for 22 hours in 1.5 mL 6N HCl at
110°C. ENVI-Chrom SPE (Solid Phase Extraction) columns are prepared in methanol washes and
rinsed in 10ml DI H2O. The SPE Column is then equilibrated through a filter with 50mL 6N HCl,
and the superfluous wash is disposed of. A SPE column pipetted with 1-5mL collagen Hydrolyzate
as HCl is driven along with 10ml 6N HCl through a syringe into a 20mm culture tube. The
hydrolyzate (1-5mL) is then dried. UHP N2 gas is heated at 50°C and passed over the sample for
approximately 12 hours, turning it into a viscous syrup (Culleton 2012). A Fisons NA1500NC
elemental analyzer/Finnigan Delta Plus isotope ratio mass spectrometer is then utilized to analyze
the resulting stable isotope samples (~0.7 mg) with an accuracy of <0.1‰ for δ13C and δ15N
(Culleton 2012).

Given the low quantities and preservation of the specimens recovered during excavations
at Strath Bogue, there was little to no choice in the elements chosen for testing. Faunal specimens
were chosen by their having been representative of the range of animals present in the
archaeological record at the site and or were the best preserved and thus most likely to produce
data. This sampling methodology should not bias the results as the collagen in different skeletal elements does not produce different isotopic signatures, and allows a more complete picture of the available resources.

The majority of faunal remains tested from Strath Bogue were excavated from archaeological deposits associated with Structure 5, a Terminal Classic period house mound (see Figure 5.7). Three specimens (deer, dog and turtle) were excavated from an off-mound midden to the northeast of the structure, while the boney fish specimen was recovered from a sealed interior floor deposit (Floor 1) within Structure 5. The turkey bone was retrieved from a sealed plaza/patio plaster surface north of Group A, and east of Structure 5. Given that the majority of faunal specimens were associated with Structure 5, there is some obvious bias in the data, since these findings are predominantly reflective of this household. Nonetheless, given the small size of the faunal assemblage encountered at Strath Bogue, and the fact that the majority of faunal remains came from deposits associated with this structure, despite having tested extensively for midden deposits across the site, the bias is reflective of the archaeological record, and not of the excavation sampling strategy.

The paucity of animal bones recovered from Late and Terminal Classic components of sites in the Maya area, and particularly in the Freshwater Creek and New River basins in Belize has been discussed elsewhere (Masson 1999a:98-99; 2004:97-98; White 1988, 1997). Masson (1999a:99) has argued that taphonomic processes or preservation issues are not to blame for the low numbers of Late and Terminal Classic faunal remains in northern Belize, as both Formative and Postclassic period remains have been well documented in good condition (Masson 2004; Shaw and Mangan 1994).
Figure 5. 7: Map of the location of Str. 5, Str. 5 midden and Subop 4, from which specimens submitted for stable isotopic analysis were recovered.

Faunal Stable Isotope Results

One modern armadillo (*Dasypus novemcinctus*) sample and five archaeologically derived faunal specimens were submitted for testing. The archaeological specimens submitted for testing included White-Tailed Deer (*Odocoileus virginianus*), dog (*Canis familiaris*), boney fish (Perciformes), turtle (Emydidae) and Ocellated Turkey (*Meleagris ocellata*). The modern sample was submitted so to provide a measurement of local values from the area. Sample quality was assessed based on the amount of collagen produced from sample processing, and in terms of ratios of Carbon/Nitrogen. All five of the faunal samples submitted for testing yielded satisfactory results, as presented in (see Table 5. 5).
Although this sample of the Strath Bogue faunal assemblage is too small to make sweeping generalizations about the dietary significance or availability of animal resources in the area, they provide a starting point from which to assess existing food resources and their contributions to the Strath Bogue diet, as well as regional ecological conditions. These data also relate an interesting picture of the relationship between these animals and that of the inhabitants of Strath Bogue (see below).

Table 5.5: Stable isotope data for tested animal specimens from Strath Bogue.

<table>
<thead>
<tr>
<th>Sample ID</th>
<th>Element</th>
<th>Δδ¹³C (%)</th>
<th>C Amount (ug)</th>
<th>Δδ¹⁵N (%)</th>
<th>N Amount (ug)</th>
<th>Amount (mg)</th>
<th>C/N Ratio</th>
<th>% C</th>
<th>% N</th>
</tr>
</thead>
<tbody>
<tr>
<td>PR10-4-3-23</td>
<td>Turkey Long Bone</td>
<td>-12.80</td>
<td>188.10</td>
<td>10.12</td>
<td>62.03</td>
<td>0.95</td>
<td>3.54</td>
<td>19.80</td>
<td>6.53</td>
</tr>
<tr>
<td>PR10-5h-3-249</td>
<td>White Tailed Deer Phalanx</td>
<td>-19.61</td>
<td>226.66</td>
<td>6.69</td>
<td>76.62</td>
<td>0.93</td>
<td>3.45</td>
<td>24.37</td>
<td>8.24</td>
</tr>
<tr>
<td>PR10-5h-3-249</td>
<td>Dog Radius</td>
<td>-19.92</td>
<td>242.61</td>
<td>5.94</td>
<td>82.82</td>
<td>1.20</td>
<td>3.42</td>
<td>20.22</td>
<td>6.90</td>
</tr>
<tr>
<td>PR10-5d-8-213</td>
<td>Fish Dorsal Spine</td>
<td>-17.39</td>
<td>146.23</td>
<td>10.03</td>
<td>47.43</td>
<td>0.84</td>
<td>3.60</td>
<td>17.41</td>
<td>5.65</td>
</tr>
<tr>
<td>PR10-5j-3-269</td>
<td>Turtle Shell</td>
<td>-21.89</td>
<td>233.30</td>
<td>5.68</td>
<td>80.27</td>
<td>1.13</td>
<td>3.39</td>
<td>20.65</td>
<td>7.10</td>
</tr>
<tr>
<td>Modern Armadillo sample</td>
<td>Armadillo Long Bone</td>
<td>-16.27</td>
<td>210.04</td>
<td>9.46</td>
<td>71.88</td>
<td>1.20</td>
<td>3.41</td>
<td>17.50</td>
<td>5.99</td>
</tr>
</tbody>
</table>

Emydidae (Turtle)

Reptiles, including snakes, lizards, crocodiles, and most especially turtles are found in prehistoric Maya fauna assemblages. While occurring in varying percentages at different sites and across different time periods, all reptiles but most commonly turtles, are believed to have been a dependable and staple protein resource (K. F. Emery 2004:84; Hamblin 1984: Table 9.4, 9.5;
Masson 1999a:113; 2004:97, 105, 122; Wake 2004:220). In an examination of lowland Maya Postclassic faunal assemblages from Colha, Laguna de On, Cozumel and from the Petén, Masson (1999a:115) observed that turtles formed one, if not the most common dietary staple. At K’axob/Pulltrouser Swamp, turtles appear in the archaeological record for all time periods but are argued by Masson to likely have been a secondary resource (Masson 2004:119). Masson found turtle to be at its peak in the Protoclassic period at K’axob/Pulltrouser, forming 38.89 percent of the assemblage but decreasing to 20 percent in the Late Classic-Terminal Classic periods (Masson 2004:Table 7.1, 107).

At the site of Caracol in the Maya Mountains, researchers have found that turtle usage increases over time, but decreases as the site goes through abandonment in the Terminal Classic period. Teeter (2004:184) has argued that turtles and humans have somewhat of a symbiotic relationship, as increases in human populations over time can result in increased food sources for the turtles and thus in turtle populations, thereby providing a perpetual food source for site inhabitants. Such an occurrence may account for turtles being a staple food source at most Maya sites, and why their percentages decrease at some Terminal Classic period sites.

While the identification of the turtle to the level of genus or species could not be made based on the skeletal remains, the carbon and nitrogen isotopic data indicates that this turtle was an herbivore (see Table 5.6) and was either a terrestrial or freshwater species, not a marine species. Its δ13C value indicates that it was a primary consumer (Level 2), one trophic level above a primary producer, with a diet of C3 plants. A review of the available faunal literature has found that investigators have not typically examined turtle remains isotopically. With the exception of one Postclassic and one historic period specimens from Lamanai, no other isotopic analyses on turtles
appears to have been undertaken, and thus inter-site comparisons are limited (White and Schwarcz 1989: Table 4). The specimens from Lamanai were also not identified to the level of species, but their isotopic values are nonetheless in line with the Strath Bogue samples, indicating that they too were not marine species, and thus riverine or terrestrial turtles (see Table 5. 6). Moreover, these data further suggest that there was some level of continuity in the New River environment between the Terminal Classic through to the Historic period, as both Lamanai and Strath Bogue are proximate to the New River, Lamanai more so than Strath Bogue.

Table 5. 6: Stable isotopic values and C/N ratios for Emydidae (turtle) from Strath Bogue and Lamanai.

<table>
<thead>
<tr>
<th>Sample ID</th>
<th>Element</th>
<th>δ13C‰</th>
<th>δ15N‰</th>
<th>C/N Ratio</th>
</tr>
</thead>
<tbody>
<tr>
<td>Strath Bogue</td>
<td>Turtle</td>
<td>-21.89</td>
<td>5.68</td>
<td>3.39</td>
</tr>
<tr>
<td>(T. Classic)</td>
<td>Shell</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Lamanai (Postclassic)</td>
<td>Turtle</td>
<td>-21.4</td>
<td>4.1</td>
<td>N/A</td>
</tr>
<tr>
<td>Shell</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Lamanai (Historic)</td>
<td>Turtle</td>
<td>-22.2</td>
<td>5.3</td>
<td>N/A</td>
</tr>
<tr>
<td>Shell</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

As noted above, turtles are considered to have been a dietary staple among many prehistoric Maya sites. When we consider the recorded nutritional composition of non-specific species of turtle (order Testudines) (see Table 5. 7) and compare it to other known and available food resources per 100g portions, turtles are a relatively good source of macronutrients. In fact, following the Food and Drug Administrations suggested Daily Reference Values for people four years or older, consuming a diet of 2000 calories per day, turtles are comparatively good sources of the daily recommended nutrients.
Table 5. 7: Nutritional composition of select food resources per 100-g portions (after (Administration 2011; Powis 2004: Table 8.2)).

<table>
<thead>
<tr>
<th>Taxa/Common Name</th>
<th>Kilocalories</th>
<th>Protein (g)</th>
<th>Fat (g)</th>
<th>Carbohydrates (g)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Emydidae (Turtle, roasted)</td>
<td>89</td>
<td>19.8</td>
<td>0.5</td>
<td>0</td>
</tr>
<tr>
<td>Odocileus sp. (Deer, raw)</td>
<td>126</td>
<td>21</td>
<td>4</td>
<td>0</td>
</tr>
<tr>
<td>Sylvilagus sp. (Rabbit, raw)</td>
<td>73</td>
<td>21</td>
<td>5</td>
<td>0</td>
</tr>
<tr>
<td>Ictalurus sp. (Freshwater Catfish, raw)</td>
<td>103</td>
<td>17.6</td>
<td>3.1</td>
<td>0</td>
</tr>
<tr>
<td>Pachuchilus indiorum (Freshwater snail, raw)</td>
<td>84</td>
<td>6.3</td>
<td>1.2</td>
<td>12</td>
</tr>
<tr>
<td>Helix pomacea (Land snail, raw)</td>
<td>75</td>
<td>15</td>
<td>0.8</td>
<td>2</td>
</tr>
<tr>
<td>FDA’s Daily Reference Values (DRV)</td>
<td>2000</td>
<td>50</td>
<td>65</td>
<td>300</td>
</tr>
</tbody>
</table>

Canis familiaris (Dog)

*Canis familiaris* (dog) specimens are consistently noted within the faunal assemblages at most sites in the Maya lowlands, and across all time periods (Gerry and Krueger 1997:200; Götz 2008:164:166; Pohl 1990:159; White, Pendergast, et al. 2001; White, et al. 2004:155; White and Schwarcz 1989; Wing 1981:25). While most regularly associated with middens deposits, not all of the dog remains recovered from middens are necessarily related to consumption practices. As domesticates, dogs have a unique relationship with humans, and their presence at Maya sites may not simply be the result of subsistence practices. Dogs have themselves had such roles within human societies as companions, guardians and hunting assistants (Gerry and Krueger 1997:200). Moreover, dogs are noted as having occasionally been associated with ritual activities (White, et al. 2004:155; White and Schwarcz 1989). Thus, their presence in middens may have been related to consumption practices, ritual activities, or their remains may simply have been discarded along with other refuse upon the dog’s death (Götz 2008:164:166).
Table 5. 8 compiled below presents published isotopic data for dog specimens from several Maya sites, including Strath Bogue, from various environmental regions and across several time periods for comparative purposes. Unfortunately, investigations involving the isotopic testing of dog specimens have been limited, with no studies having reported on the inclusion of dogs from the Terminal Classic period. The dog specimen from Strath Bogue was recovered from an off-mound midden deposit and is the only dog specimen recovered at the site.

Dogs by nature are omnivores, and thus are generally perceived to be at the same trophic level as humans (Level 3 or 4). Because of their unique and close relationship with humans, dogs tend to have relatively positive carbon isotope values, as can be seen in Table 5. 8, since the potential of them having been fed scraps, scavenge garbage, and hunt creatures that lived in human manipulated environments (milpas), is high (Gerry and Krueger 1997:201; White and Schwarcz 1989). There also seems to be a correlation between high $\delta^{13}\text{C}$ and high $\delta^{15}\text{N}$ values, which is again attributed to their close relationship with humans (White, Pohl, et al. 2001:96, 99; White, et al. 2004:155), and the likelihood of these dog specimens having been being managed or domesticated to some degree.

As demonstrated in Table 5. 8, there is a great deal of variability in both the carbon and nitrogen isotopic values for dogs. Dogs with $\delta^{13}\text{C}$ values less positive than -10‰ indicate some consumption of $\text{C}_4$ plants/products, while those closer to the -22‰ end of the spectrum largely had $\text{C}_3$ dominate diets (White, Pohl, et al. 2001:99; White, et al. 2004:156). These dogs were likely scavenging or being fed leftovers or were hunting and consuming creatures that inhabit maize fields and were themselves consumers of maize (Schwarcz 2000; White, et al. 2004:156). Conversely, dogs with $\delta^{13}\text{C}$ values more positive than -10‰ (less than -10‰) are argued to have
been purposefully fed C₄ rich diets (maize) since they were young, and their movements were likely restricted or they were confined altogether, thereby preventing the consumption of C₃ foods (see Figure 5. 9). Dogs with δ¹³C values closer to -6‰ being fed pure C₄ (maize) diets (White, Pohl, et al. 2001:100; White and Schwarcz 1989:461). Such animals may have been reared and so fed for ritual purposes (White, Pohl, et al. 2001:92, 100; White, et al. 2004:156), as has been illustrated at Preclassic Colha where dogs recovered from ritual oriented deposits have isotopically distinct values from those retrieved from middens (White, Pendergast, et al. 2001:92). Or alternatively they may have been fed significant amounts of maize in order to fatten them up for human consumption, as has been recorded historical in Mesoamerica (Wing 1976 in, White, 1989 #1881:461).

As detailed in Table 5. 8 and Figure 5. 9, dogs with the least positive δ¹³C values come from sites dating to the earliest time periods (Preclassic, Late Preclassic), compared to those of the Classic period where maize consumption increases as is indicated in increases in dog δ¹³C values. These values begin to decrease again in the Late Classic, indicating a relative change to a comparatively lower consumption of maize/maize products. As comparable data on Terminal Classic period dogs is not available, the Strath Bogue specimen is the only evidenced specimen for this timer period. Thus, the fact that maize consumption in dogs appears to drastically decrease in the Terminal Classic period, it should be noted that it would be inappropriate to make such hypotheses without additional comparative data.
Table 5.8: Summary statistics of stable isotopic values and C/N Ratios for Canis (Dog) from sites in the Maya lowlands from different Time Periods.

<table>
<thead>
<tr>
<th>Archaeological Sites</th>
<th>Mean $\delta^{13}$C‰</th>
<th>Mean $\delta^{15}$N‰</th>
<th>C/N Ratio</th>
<th>Source</th>
</tr>
</thead>
<tbody>
<tr>
<td>Cuello (PCL)</td>
<td>-15.60</td>
<td>7.50</td>
<td>N/A</td>
<td>Tykot et al. 1996;  van der Merwe et al. 2000; White et al. 2004: Table 9.3</td>
</tr>
<tr>
<td>Tikal (LPCL)</td>
<td>-14.50*</td>
<td>12.00</td>
<td>3.20</td>
<td>White et al. 2004: Table 9.2</td>
</tr>
<tr>
<td>Lagartero (LC)</td>
<td>-13.00</td>
<td>7.2</td>
<td>3.3</td>
<td>White et al. 2004: Table 9.3</td>
</tr>
<tr>
<td>Lagartero (LC – Wild?)</td>
<td>-21.9</td>
<td>4.3</td>
<td>3.3</td>
<td>White et al. 2004: Table 9.2</td>
</tr>
<tr>
<td>Colha (LPCL)</td>
<td>-12.80</td>
<td>8.40</td>
<td>N/A</td>
<td>White et al. 2001: Table 2</td>
</tr>
<tr>
<td><strong>Strath Bogue (TC)</strong></td>
<td><strong>-19.92</strong>*</td>
<td><strong>5.94</strong></td>
<td><strong>3.42</strong></td>
<td><strong>Present Study</strong></td>
</tr>
<tr>
<td>Copan (LC)</td>
<td>-9.7</td>
<td>9.1</td>
<td>3.3</td>
<td>White et al. 2004: Table 9.2</td>
</tr>
<tr>
<td>Pasio (ANC)</td>
<td>-9.10</td>
<td>6.28</td>
<td>N/A</td>
<td>Wright 2006</td>
</tr>
<tr>
<td>Altun Ha (ANC)</td>
<td>-8.40</td>
<td>8.20</td>
<td>N/A</td>
<td>Gerry 1993 in Freidwald 2011: Table 6.4</td>
</tr>
<tr>
<td>Lamanai (HIST)</td>
<td>-10.7</td>
<td>8.9</td>
<td>N/A</td>
<td>White 1989: Table 4</td>
</tr>
<tr>
<td>Pacbitún (CL)</td>
<td>-8.20</td>
<td>7.3</td>
<td>N/A</td>
<td>White et al 1993; White et al. 2004: Table 9.3</td>
</tr>
</tbody>
</table>

*NOTE: The Tikal and Strath Bogue specimens are not mean statistics, but individual specimens.

ANC = Ancient (likely Classic period)  
LPCL = Late Preclassic Period  
PCL = Preclassic Period  
CL = Classic Period  
LC = Late Classic Period  
TC = Terminal Classic

As should be quite evident, the Terminal Classic period Strath Bogue dog’s isotopic values are markedly different than those reported for all other time periods and Maya sites (see Table 5.8 and Figure 5.8). Registering a $\delta^{13}$C value of -19.92‰, and a $\delta^{15}$N value of 5.94‰, indications are that this particular dog was neither a primary consumer of C4 plants or plant products, nor was it extremely carnivorous, unlike the dogs charted from other Maya sites and time periods. In fact, both its $\delta^{13}$C and $\delta^{15}$N values are more similar to those of deer than of these other dog specimens or humans (see Figure 5.10). White et al. (2004:156, Table 9.2) have reported on one of the dogs from Lagartero having had similarly extreme $\delta^{13}$C and $\delta^{15}$N values of -21.9‰ and 4.3‰ respectively, indicating that this dogs diet had limited C4 plant
consumption, if any, and it ate even less meat than the Strath Bogue specimen. This dog has been separated from the mean of the rest of the Lagartero dog specimens and has been individually charted in the scatter chart illustrated in Figure 5. 8 and Figure 5. 10 for comparative purposes.

Figure 5. 8: Scatterplot illustrating δ13C‰ and δ15N‰ data for Canis (Dog) from different lowland Maya sites.

Figure 5. 9: Graph of carbon isotope values in dog specimens over time.
Figure 5. 10: Scatterplot illustrating the uniqueness of the Strath Bogue dog specimen’s isotopic values in comparison to dogs from sites around the Maya lowlands; deer and human specimens from Strath Bogue, and human from Progresso Lagoon, for comparison.

It appears that both the Strath Bogue and aberrant Lagartero dog had diets with minimal if any consumption of maize. This fact paired with their low δ^{15}N values suggests these dogs were predominantly C_{3} consumers, and what little C_{4} plant ingestion they may have had was the result of scavenging or secondary ingestion through the few animals these dogs consumed. This further leads to the hypothesis that both dogs may have been either feral/wild, or alternatively were domesticated but had been purposely feed a C_{3} rich diet of such plants as squash and, or manioc (White, et al. 2004:156). Since domesticated dogs, unlike any other animal, tend to have isotopic signatures most similar to those of humans (White, Pohl, et al. 2001:91), I would argue that the
Strath Bogue dog was not a domesticated animal, as its isotopic values are unlike those of the Strath Bogue or Progresso Lagoon shore individuals (see Figure 5. 11).

![Figure 5. 11: Scatterplot illustrating δ13C and δ15N isotopic data for all animal and human specimens tested in this study.](image)

Since as previously noted the dog specimen isotopically tested from Strath Bogue was the only evidence of dog at the site, hypotheses as to the role of dogs at Strath Bogue must remain theoretical. Moreover, given the lack of comparable data on dogs from the Terminal Classic period, it is unclear if the prominence and, or significance of dogs was altered in the Terminal Classic period. Nonetheless, given the Strath Bogue specimen’s unique isotopic values, and the lack of evidence for one of the normally most prolific animals at Maya sites, paired with the fact that we know the area had been unoccupied since the Early Classic period, leads to some interesting
speculations. Given the dogs predominantly C\textsubscript{3} rich diet, I am comfortable hypothesizing that this particular dog was potentially either feral, or wild; or alternatively was a “managed” or semi-domesticated dog that made the journey with this migrant community. If we consider how dogs could have been a valuable commodity during a migration, and after reaching their destination, the potential of the dogs having made the journey stands to reason. Dogs are motivated by food and attach themselves to their human counterparts with the expectation or motivation of food. Dogs with δ\textsuperscript{13}C values like that of the Strath Bogue dog are not without having some C\textsubscript{4} plants or plant products in their system, and thus this dog may have been minimally fed, or they themselves scavenged scraps. As has been speculated for the Lagartero dog, the Strath Bogue dog alternatively may have been feed C\textsubscript{3} rich foods like squash or manioc instead of maize.

Dogs are foragers and could also easily have fended for themselves along the route, thereby also explaining their C\textsubscript{3} rich diet. The ability of the dog to fend for itself would have been a benefit to their human counterparts, as they would not be a costly investment during the trip, especially since they also transport themselves. Furthermore, dogs have the added benefit of being protectors and hunting companions, and they could also have provided an additional food source along route should foodstuffs or hunting become challenging during the journey. Moreover, these same advantages could be further capitalized on once the community was resettled at their destination location. Of course, these are high speculative notions, which can only be properly tested with further excavations and isotopic analyses.

As is apparent from their presence in archaeological contexts, as well as their inclusion in such ethnohistoric myth-histories as the \textit{Popol Vuh} (Tedlock 1992), dogs were not only a contributor to Maya diet, they also had ritual or ceremonial significance. In the Popol Vuh, the
Lords of the Underworld or Death are tricked by the Hero Twins into requesting that they be sacrificed and brought back to life as had been demonstrated with the killing and resurrection of a dog. While the dog was brought back the life, the Lords were not, and thus humans were able to come to live on earth. Thus, dogs are believed to have been instrumental in humans finding a place on earth to life, and the resurrection of a dog by the Hero Twins symbolizes regeneration (Tedlock 1992:152; White, Pohl, et al. 2001:101, 103). As such, the inclusion of dogs on a journey to a new homeland may have held symbolic significance as well.

“When they sacrificed the dog 
he then came back to life. 
And that dog was really happy 
when he came back to life. 
Back and forth he wagged his tail 
when he came back to life.”

- from the *Popol Vuh* (Tedlock 1992:152)

**White-tailed Deer (Odocoileus virginianus)**

Within the Maya area, White-tailed deer (*Odocoileus virginianus*) are recognized herbivores, but are also importantly known as opportunistic foragers or “edge browsers,” as they commonly frequent and scavenge around agricultural crops, particularly maize crops (Cormie and Schwarcz 1994; K. F. Emery 2004:91; Emery, et al. 2000:539; White, et al. 2004:150). Faunal experts in the Maya area have used isotopic analyses of deer bone to test for biotic patterning and the availability of maize (*C₄* plant) relative to *C₃* producing leafy browse plants as indicators of the extent of intensive agriculture or monocropping taking place across the landscape, and the resulting impacts to the environment. The greater the proportion of maize supplementing the deer’s natural leafy primarily *C₃* plant diet, the greater the degree of corn intensification occurring.
in the region (Cormie and Schwarcz 1994; K. F. Emery 2004:91; Emery and Thornton 2008:133; Emery, et al. 2000:539). These same data may also indicate the purposeful feeding of deer (and other animals), which in turn can suggest some degree of animal management or control, or perhaps even animal husbandry/semi-domestication (Carr 1996; Emery, et al. 2000:539). There has been no direct evidence for the complete domestication of deer prehistorically among the Maya, although it has been argued for based on ethnographic and ethnohistoric evidence (Emery, et al. 2000:539-540). Nonetheless, it is more likely that in some cases the Precolumbian Maya were engaging in some degree of animal management, and that in such instances maize likely played a significant role. Recent stable isotopic analyses have been used to shed some light on the subject.

Cormie & Schwarcz’s (1994) isotopic analyses of deer remains from North America found that in areas where maize was a major crop, δ^{13}C values were as high as -17.8‰. In comparison, deer whose diet was based entirely on \( \text{C}_3 \) plants registered δ^{13}C values as low as -23.3‰. When these values were corrected to take into account variations in pre-industrial atmospheric conditions for comparative purposes, these values would have prehistoric equivalencies of -16.3‰ and -21.8‰ respectfully (Emery, et al. 2000:540). In their analysis of modern-day deer, Cormie & Schwarcz (1994) found that corn-fed North American deer had isotopic values around -13.3‰, and they hypothesized that a deer fed entirely on a \( \text{C}_4 \) diet would produce δ^{13}C values measuring around -7.5‰. Emery et al. (2000:542) suggest that an entirely \( \text{C}_4 \) diet would produce δ^{13}C values around -9.6‰, while and entirely \( \text{C}_3 \) based diet would produce δ^{13}C values around -26.0‰. Where deer have reportedly been observed consuming maize, modern deer are reported to have δ^{13}C values measuring between -24.3‰ and -23.0‰ in the Maya Lowlands (White, Pohl, et al. 2001:99;
White, et al. 2004:150) while deer in the Orange Walk District of Belize reportedly have $\delta^{13}C$ values of -20.8+/-% (Emery, et al. 2000:545; Tykot, et al. 1996). While it is unclear whether the Orange Walk value was corrected for pre-industrial atmospheric conditions (an adjustment of approximately 1.5% (Freiwald 2011:252; van der Merwe and Medina 1991; White, et al. 2004:150), White et al. (2004:150) do note that the variations between the archaeological and modern $\delta^{13}C$ values are approximately 2.0% less than the modern ones, and that these variations are likely due to the pre- and postindustrial atmospheric CO$_2$ changes, rather than drastic changes in deer maize consumption.

Nonetheless, CO$_2$ can also be affected naturally by the density of the tropical forest canopy and thus can affect $\delta^{13}C$ values in herbivores, including deer. CO$_2$ is naturally recycled within the vicinity of the tropical forest floor, which results in a reduction of $\delta^{13}C$ in plants, and thus by extension in the animals that consume them (Emery, et al. 2000:540; van der Merwe 1989; van der Merwe and Medina 1991). This “canopy effect” could thus also indicate relative proportions of high tropical forest versus agricultural or open lands based on variations in deer bone $\delta^{13}C$ values. Increases in $\delta^{13}C$ over time are believed to potential indicate either increases in maize consumption by the deer, presumably because maize was becoming more available; and/or a reduction in tropical forests presumably as a result of the expansion of agricultural fields(Emery, et al. 2000:540).

Unfortunately, the reported isotopic data of deer specimens from around the Maya area is somewhat incomplete, as investigators have been inconsistent in how they have reported their data, by not always providing $\delta^{15}N$ values or by presenting time frames that are nonspecific (i.e., “ancient,” or “Classic period”). Nonetheless, while an examination of the isotopic values of deer
from sites around the Maya region indicates some variability, they relate a fairly consistent
distribution of carbon isotope values (White, Pohl, et al. 2001:102). Table 5. 9 below represents a
compilation of data assembled from several studies reporting on the isotopic values of white-tailed
dereer in the Maya area. The values presented in this table are generally mean values for the sites
indicated, although some sites reflect individual specimens.

Table 5. 9: Summary statistics of δ13C and δ15N values for deer specimens from sites in the
Maya lowlands from different time periods.

<table>
<thead>
<tr>
<th>Archaeological Sites</th>
<th>Time Period</th>
<th>Mean δ13C%</th>
<th>Mean δ15N%</th>
<th>C/N Ratio</th>
<th>Source</th>
</tr>
</thead>
<tbody>
<tr>
<td>Holmul</td>
<td>ANC</td>
<td>-21.30</td>
<td>6.8</td>
<td>N/A</td>
<td>Gerry 1993 in Freidwald 2011: Table 6.4</td>
</tr>
<tr>
<td>Xunantunich</td>
<td>ANC</td>
<td>-20.20</td>
<td>5.3</td>
<td>N/A</td>
<td>Freidwald et al. in Freidwald 2011: Table 6.4</td>
</tr>
<tr>
<td>Altun Ha</td>
<td>ANC</td>
<td>-21.60</td>
<td>3.7</td>
<td>N/A</td>
<td>Gerry 1993 in Freidwald 2011: Table 6.4</td>
</tr>
<tr>
<td>Pacbitún</td>
<td>CL</td>
<td>-19.20</td>
<td>8.70</td>
<td>N/A</td>
<td>White et al. 1993:Table 4</td>
</tr>
<tr>
<td>Tikal</td>
<td>LC</td>
<td>-20.90</td>
<td>5.0</td>
<td>3.4</td>
<td>White et al. 2004: Table 9.1</td>
</tr>
<tr>
<td>Copan</td>
<td>LC</td>
<td>-20.00</td>
<td>4.9</td>
<td>3.3</td>
<td>White et al. 2004: Table 9.1</td>
</tr>
<tr>
<td>Lagartero</td>
<td>LC</td>
<td>-18.20</td>
<td>5.4</td>
<td>3.3</td>
<td>White et al. 2004: Table 9.1</td>
</tr>
<tr>
<td>Dos Pilas</td>
<td>LC-TC</td>
<td>-20.47</td>
<td>N/A</td>
<td>2.8-3.8</td>
<td>Emery &amp; Thornton 2008: Table 2</td>
</tr>
<tr>
<td>Colha</td>
<td>LPCL</td>
<td>-21.20</td>
<td>5.0</td>
<td>N/A</td>
<td>White et al. 2001:Table 3</td>
</tr>
<tr>
<td>Punta de Chimino</td>
<td>TC</td>
<td>-20.80</td>
<td>N/A</td>
<td>3.0-3.5</td>
<td>Emery et al. 2000:Table 3; Emery &amp; Thornton 2008: Table 2</td>
</tr>
<tr>
<td>Petexbatun</td>
<td>TC</td>
<td>-20.60</td>
<td>N/A</td>
<td>N/A</td>
<td>Emery 2004: Table 6.3; Emery et al. 2000:Table 3</td>
</tr>
<tr>
<td>Tikal</td>
<td>TC</td>
<td>-20.50</td>
<td>5.8</td>
<td>3.3</td>
<td>White et al. 2004: Table 9.1</td>
</tr>
<tr>
<td>Strath Bogue</td>
<td>TC</td>
<td>-19.61</td>
<td>6.69</td>
<td>3.45</td>
<td>Present Study</td>
</tr>
</tbody>
</table>

ANC = Ancient
LPCL = Late Preclassic Period
PCL = Preclassic Period
CL = Classic Period
LC = Late Classic Period
TC = Terminal Classic

It is important to keep in mind that while inter- and intra-site variability’s in δ13C values in
dereer could simply indicate preferential diets of individual deer, on an inter-site level they could
also indicate variations in availability of \( C_3 \) and \( C_4 \) plants, or the opportunistic methods of feeding deer are known for. Wide ranges in values, whether inter- or intra-site, could alternatively indicate evidence of purposeful feeding (animal management) or even domestication. The data presented in Table 5. 9 indicates that while these deer were primarily \( C_3 \) plant consumers, they were also minimally consuming to varying degrees some \( C_4 \) (maize) plants, and were by no means reliant on the plant or being fed corn, and thus were wild, undomesticated deer (Gerry and Krueger 1997; Tykot, et al. 1996; White, Pohl, et al. 2001:102; White and Schwarcz 1989).

![Graph of carbon isotope values (δ\( ^{13} \text{C} \)) for deer from Terminal Classic period occupations/sites in the Maya region.](image)

**Figure 5. 12:** Graph of carbon isotope values (δ\( ^{13} \text{C} \)) for deer from Terminal Classic period occupations/sites in the Maya region.

Like most of the deer recorded in Table 5. 9, the Strath Bogue deer was primarily a consumer of \( C_3 \) plants. Nonetheless, its \( δ^{13} \text{C} \) value of -19.61‰ also indicates that it was also a consumer of \( C_4 \) plants, presumably maize plants. While its presumed maize consumption was
limited, with the exception of the Classic Period Pacbitún and Late Classic Lagartero specimens, the Strath Bogue deer was evidently consuming more maize than deer from most other sites recorded in Table 5. 9. Perhaps more relevantly, the Strath Bogue deer was eating more C₄ plants than the other specimens from Terminal Classic period occupations (see Figure 5. 12). I believe this to be significant as it suggests that maize was more plentiful in the Progresso Lagoon region than it was in the Petén.

The more positive δ¹³C values of the Strath Bogue, Pacbitún and Lagartero specimens do not suggest these animals were purposefully fed corn, nor do they support full domestication, but they are values similar to those suggested by some scholars to suggest the potential of semi-domestication (or animal management) (Dillion 1988; Gerry and Krueger 1997:200-201). Alternatively, these values may be more indicative of crop foraging and invasion (Gerry and Krueger 1997:200-201), a more plausible and likely scenario given the more recent and additional isotopic results.

White et al (White, et al. 2004:150-151) report that at Lagartero (Guatemala) there were two archaeological specimens that registered abnormally high for C₄ plant consumption. One animal had a very high bone collagen δ¹³C value of -7.3‰, suggesting that this animal had been purposefully and exclusively fed a maize diet probably since its infancy. They further postulate that this animal was so fed for ritual consumption. The second specimen also had a positive δ¹³C value of -12.7‰, and is suggested to either have been purposefully fed, but for not as long a duration, or alternatively may have had been an extreme opportunistic browser, regularly consuming maize. Deer are noted as having been purposefully fed maize or fattened on maize for ceremonial purposes (Pohl and Feldman 1982 in (Wright and Schwarcz 1996:460)). Regardless, it
is not believed that either case is indicative of full domestication; at most they represent evidence of semi-domestication and are considered anomalies. Analyses of isotopic data from several Maya sites has resulted in most scholars arguing that most deer would have been hunted as opposed to domesticated or semi-domesticated (Emery, et al. 2000:546; White, et al. 2004:152).

What is puzzling however is the fact that the nitrogen isotopic values of the deer with more positive $\delta^{13}C$ values do not uniformly conform to the expected results for herbivores. Most C$_3$ reliant white-tailed deer, as recorded in Table 5.9, have $\delta^{15}N$ values around 4‰ to 5‰ (Gerry and Krueger 1997: Table 15.1; White, Pohl, et al. 2001:102). The deer from Strath Bogue and Pacbitún have relatively high $\delta^{15}N$ values, which when paired with their more positive $\delta^{13}C$ values may indicate that these deer were more reliant on C$_4$ plants due to a decreasing availability or variety of C$_3$ plants, perhaps as a result of a proliferation of agricultural maize crops (White, Pohl, et al. 2001:102).

It is interesting to note that despite the fact that the Pacbitún data is only identified as belonging to the “Classic period,” the site’s “zenith” is noted to have taken place during the Late and Terminal Classic periods, when intensive agriculture became expansive, and coincided with a heightened population (White, et al. 1993:350). The expansion and intensification of agriculture at Pacbitún is well documented in the presence of its notable terraces, and clearly would have impacted and reduced the availability and variety of C$_3$ plants around the site. While there is no evidence of intensive forms of agriculture around Strath Bogue like at Pacbitún or Pulltrouser Swamp, the land surrounding the site may very well have been dominated by agricultural production and may have similarly impacted the variety and availability of C$_3$ plants, thereby impacting the diet of localized deer. As will be discussed, the proliferation of lithic bifaces at the
site suggests that the Strath Bogue community was indeed heavily involved in agricultural production. What remains unclear is why there is a lack in uniformity in the sites with more positive $\delta^{13}$C values also having more positive $\delta^{15}$N values, and what is responsible for the heightened $\delta^{15}$N values in an herbivore. While legumes are a recognized protein rich plant, their consumption would produce $\delta^{15}$N values closer to 0‰, and thus does not explain these results. Moreover, there are some deer recorded in Table 5. 9 that have less positive $\delta^{13}$C values and high $\delta^{15}$N values, and vice a versa.

The data from sites and regions for which there is diachronic isotopic data have allowed some scholars to suggest that certain regions, such as the Petexbatún, appear to have relative environmental stability over time. This does not negate the fact that maize was most definitely a significant crop to the Petexbatún Maya, but it does not appear that the intensity or expansion of maize agriculture came to dominate the landscape so much so to affect the eating habits or presence of deer. Moreover, these same data also counter suggestions that the Petexbatún Maya overexploited the land and significantly impacted their local environment (Emery and Thornton 2008; Emery, et al. 2000:546).

Archaeobotanical analysis of a three-meter sediment core taken from nearby Progresso Lagoon around the Island and site of Caye Coco was undertaken by the Belize Postclassic Project in 2000. While investigators were focused on the Postclassic period, they make some interesting observations. They note that the major taxa present in the sample include pollens belong to the Graminae family (grasses), Chechem sp., Tabebuia sp., and a fair amount of charcoal. Also present was zea maize pollen, and diatoms (phytoplankton) (Digrius and Jones 2001:178). These data indicate that during the Postclassic period the vegetation around the lagoon was a swampy forest,
and that the low frequency of mangrove pollen and the prevalence of diatoms in the core sample suggest that the Lagoon had lower levels of salinity than today but was not without salt. Moreover, they further suggest that this Postclassic environment is representative of a reforestation event, after the area had been subject to large-scale clearing for agricultural purposes during the Terminal Classic period (Digrius and Jones 2001:178).

Since there are no comparable earlier or later time periods at Strath Bogue, we are unable to assess changes in the diet of the local deer or offer postulations or conclusions as to alterations in the availability of maize, or whether or not there had been modifications in the local environment over time.

Despite the fact that small and medium mammals, as well as turtle decrease in frequency at Pulltrouser Swamp/K’axob during the Terminal Classic period, large mammals, predominantly deer, increase drastically in frequency at this site (Masson 2004:119, Fig. 7.9). *O. virginianus* also dominated the mammalian faunal assemblages of Late and Terminal Classic occupations at Chichén Itzá and Dzibilchatltún (Götz 2008:165, 167). Some scholars have suggested that increases in deer populations may have coincided with increases in human populations; the perception being that population increases would have demanded the expansion of agricultural fields, and thus more secondary forests, and more opportunistic and secondary forest dwellers like the white-tailed deer (Carr 1996:258; Götz 2008:164:167).

**Turkey (Meleagris)**

Turkeys can be seen as a multi-faceted resource. While providing sustenance and objects for sacrifices and rituals, turkeys were also sources of feathers, bones and fat - materials that could
be used in the production of ornamental (headdresses, fans and ornaments), functional (implements and musical instruments), and medicinal items (Emery 1990:53, 96; Hamblin 1984:95; Henderson and Joyce 2004:234; Pohl and Feldman 1982; Pollock and Ray 1957; Thornton, et al. 2012:1; Tozzer and Allen 1910). Turkey (*Meleagris sp.*) bones have been identified at a number of sites in contexts ranging from middens to burials at Maya sites. They have been illustrated on ceramic vessels and in the codices, and their likeness has been modeled into vessels (Hageman 2004:Figure 6; Pollock and Ray 1957; Sullivan 2002:Figure 7.12; Tozzer and Allen 1910).

Two species of turkey have been identified prehistorically in the Maya area, *Meleagris gallopavo* (common or Mexican turkey) and *Meleagris ocelleta* (ocellated turkey). Regional and temporal variations in the presence and, or use of turkey have been recognized (Pohl 1985a:109). While there traditionally has been a general consensus that *M. gallopavo* was domesticated and brought into the Maya area in the Postclassic period from somewhere in northern Mexico (Götz 2008:166; Hamblin 1984:82; Leopold 1959:275; Shaw and Mangan 1994:74; Thornton and Emery 2017), there is some disagreement as to the full range of *M. ocellata* within Mesoamerica, and whether or not it was indigenous to the Maya area.

The separation of *M. ocellata* from *M. gallopavo* species based on the skeletal remains can be difficult, especially when preservation is poor (Thornton, et al. 2012:5), causing some zooarchaeologists to simply identify specimens to the genus level of *Meleagris sp* (Norbert Stanchley, personal communication, 2013; Götz, 2008 #1861:165; Masson, 2008 #1898:173). Thornton et al.’s (2012) initiation of the use of DNA analysis to identify species may be the most reliable way of separating the two species. While the paucity of *Meleagris sp.* identification at most Maya sites in northern Belize dating to the Terminal Classic and earlier may be a reflection
of taphonomic processes, the general lack and even absence of *Meleagris sp.* in archaeological contexts dating prior to the Early Postclassic period in northern Belize is interesting. The turkey specimens recovered from archaeological investigations at Strath Bogue have been identified as *Meleagris ocellata* based on their morphological traits and date to the Terminal Classic period.

*Meleagris ocellata* is a terrain-oriented bird that makes use of a range of ecological zones depending on the season, including low to tall forest, dry brush or savannahs and open or cleared areas (Carr and Fradkin 2008:147; Emery 1990:53; Gonzalez, et al. 1998:508; Hamblin 1984:82). Such environments are typical of northern Belize and the Progresso Lagoon region. *M. ocellata* is considered an omnivore, as their diet consists predominantly of a wide range of plants including leaves, grasses, seeds, fruits and flowers, palm nuts and breadnut seeds (Steadman, et al. 1979:35; Sugihara and Heston 1981:396), but is supplemented, particularly in the winter with insects, including ants, moths and beetles (Sugihara and Heston 1981:396). Thus, ocellated turkeys are a slight trophic level above herbivores. Turkeys, like deer, are also recognized as having opportunistic tendencies, occasionally taking advantage of ripening crops in milpa fields (Carr and Fradkin 2008:147, 149). Their attraction to crops, particularly corn, made them easy prey due to their inept flying abilities, and they are thus considered an additional benefit or cultivated field resource (Emery 1990:82-83, 89).

*Meleagris ocelleta* has never been fully domesticated due to difficulties the offspring have surviving in captivity, as well as *M. ocellata*’s accomplished flight abilities (Götz 2008:166; Hamblin 1984:93, 96; Leopold 1959; White, et al. 2004:141). Nonetheless, the ocellated turkey does appear have been tamed to a degree or was likely “managed” prehistorically (Hamblin 1984:93, 96; Thornton, et al. 2012:1; Turner II 1985:203). *M. ocellata* is a fairly large bird,
weighing between 3-5 kg, or on average 4.2 kg or 9.26 pounds (Kampichler, et al. 2010:1; León and Montiel 2008:Table 1, 253). Maya hunters continue to hunt ocellated turkeys today in many Maya communities, with the majority of turkey’s being taken during the dry season in March and April. In a study of traditional wildlife hunting within the Maya community of Los Peténes in Campeche, Mexico, investigators found that ocellated turkeys make up approximately 5% of the wild meat procured (León and Montiel 2008:Table 1, 253).

Hamblin (1984:82) has noted the presence of *M. ocellata* throughout the Yucatán Peninsula. It is unclear whether this supposition is based on the current range of *M. ocellata* or data specific to Postclassic and Historic period archaeological data. Thorton et al (2012:1) have suggested that ocellated turkeys are indigenous to the Maya area and occur throughout northern Belize and the Yucatán Peninsula, from the Formative period onward. They do not, however indicate which Formative period sites they are referring to, or where they are located. Alternatively, Shaw and Mangan (1994:74) have stated that *M. ocellata* is not indigenous to northern Belize but is native to the Petén and regions to the south (Davis 1972 in (Shaw and Mangan 1994:74)). They further contend that *M. ocelleta* was not introduced to Northern Belize until the Early Postclassic period (A.D. 900-1000), thus suggesting that neither species of turkey existed in northern Belize prior to the Early Postclassic period. Paynter (1955:320) has also suggested that *M. ocellata* is not indigenous to the Yucatán Peninsula; however other than noting it is a tropical, temperate region bird, he is unable to suggest where they may have originated from, or when they arrived on the Peninsula. Moreover, it should be noted that recent DNA research at the northern Petén site of El Mirador by Thorton et al (Thornton, et al. 2012) has indicated that *Meleagris gallopavo* was evidently present at this site as early as the Formative period, and into
the Classic period, but it is unclear if it was managed or domesticated there (Sharpe, et al. 2018; Thornton and Emery 2017).

A review of the available published data discussing the faunal assemblages of sites in northern Belize confirms that turkey remains are generally absent in deposits dating earlier than the Early Postclassic period at K’axob, Pulltrouser Swamp, Laguna de On, Northern River Lagoon (Masson 2004) and Colha (Masson 2004; Shaw and Mangan 1994). The exceptions seem to be at the sites of Cerros and Cuello, where *M. ocellata* was evidently recovered from Formative Period deposits (Carr and Fradkin 2008; Carr 1985:Table 8.1), although in very limited numbers. It should be noted however, that Masson (2004), who is cited as a source for comparative data for Colha and K’axob does not indicate the specific identification of turkey at either of these sites in the formative period, nor does Leslie Shaw in her analysis of faunal remains from Colha (1999). Carr’s identification of bones belonging to *Meleagrididae* date to the Early phase of the Formative period at Cerros but are absent in the preceding transitional or succeeding Late phase Formative period deposits (Carr 1985:Figure 8.1).

At Tikal in the Petén, a *M. ocellata* bone specimen was recovered from an Early Classic period burial and is thought to represent a food offering (Moholy-Nagy 2004). Evidence from sites in Northern Honduras indicate that turkey is not recorded in the archaeological record until the Terminal Classic-Early Postclassic period, and even then, are restricted to a select number of sites, being present at only Santa Rita and Las Flores Bolsa (Henderson and Joyce 2004:226). At Caracol in the Maya Mountains, turkey is restricted to *M. ocellata*, and is the dominant bird species recovered from floor deposits (Teeter 2004:184).
At the northern Yucatán coastal sites of Xcambó and Champotón, turkey (*Meleagris*), dominate the avian assemblage, especially in Postclassic occupations at Champotón where the domesticated turkey (*Meleagris gallopavo*) is said to be encountered for the first time in the northern lowlands and represents more than 80% of the NISP and MNI counts for the site (Götz 2008:164-165, 166). Similarly, turkey bones dominate the bird assemblages from the majority of sites on Cozumel Island (45.7 percent of bird remains), with most remains thought to be representative of food items (Hamblin 1984:91). Hamlin also suggests that the Cozumel sites represent the first communities in the Maya lowlands to contain *M. gallopavo* (Hamblin 1984:96). Hamblin however does not break down his analysis into specific time periods and notes that the majority of bird bones in the Cozumel wide assemblage date to the Postclassic through Historic periods, with only 4 bird bones, or 2 MNI dating to the Terminal Classic period (Hamblin 1984:99, Figure 6.9). At the Postclassic site of Mayapán, Masson and Lope (2008:173) (*Meleagris* sp.) found that turkey was the second largest primary animal consumed at the site, with turkey bones representing 12.9% of the identified bones within the assemblage.

The Late Postclassic and Colonial period faunal assemblage recovered from Lamanai also had pronounced frequencies of turkey remains. Lamanai is a large site with an extensive culture history that dates from the Formative period through modern times and is located on a Lagoon along the New River in northern Belize. Strath Bogue is located just off this same river, approximately 40 kilometers north of Lamanai. Galliformes, large land birds that in the Maya area include pheasants, curassows and turkeys, represent the second largest frequency of animal recovered at the site, second only to fish, with turkeys specifically representing 16.4% of the minimum number of individuals (MNI). This percentage is extremely high, and is noted by Emery
as being distinct as no other lowland Maya or Mesoamerican site has recorded such a high frequency of turkeys at it. This level is even more heightened during Colonial times, when turkeys represent 18.91% of the MNI at the site. While the proliferation of turkey at Lamanai in the Postclassic and Colonial periods is noteworthy, it is equally if not more noteworthy that very few bird remains occur at the site prior to the Late Postclassic period (Emery 1990:72), and turkeys do not appear at all until the Late Postclassic period (Emery 1990:92).

It has been suggested that the influx of turkey in Postclassic faunal assemblages may relate to their having been demanded for sacrifices, particularly at such sites as Mayapán, Cozumel (Pohl and Feldman 1982), and perhaps now Lamanai where their presence is particularly marked during this time. Moreover, the archaeological data seem to confirm the initial or heightened presence of turkey in northern Belize also does not occur until the Postclassic period. The presence of *M. ocelleta* at Strath Bogue, a Terminal Classic period site, is therefore striking. Recognizing of course, that the evidence for turkey at Strath Bogue is itself extremely limited (NISP=3, MNI=1), these remains do appear to be the only physical evidence of turkey in the area between the Formative and Terminal Classic periods. I find the identification of turkey in the Formative period at Colha suspect, as there does not seem to be a consensus on their presence among the zooarchaeologists who examined the specimens. I am more inclined to accept the presence of turkey within Formative period occupations at Cerros given the site's location and involvement within early trade networks, however I wonder whether such birds represent an actual regular presence at the site, or rather were considered luxury and, or trade items at this point in time, given their restricted nature in the area and at the site, and the fact that they are not noted at the site afterwards. Additional isotopic analyses of turkey bones are needed to fully come to understand
the complex relationship between the Maya and turkey, and to more accurately distinguish trade of live animals from managed-animals to fully domesticated ones (Sharpe, et al. 2018).

Adding to the uniqueness of the Strath Bogue specimen is information provided through isotopic analysis. The stable carbon isotopic data indicates that the Strath Bogue turkey’s diet was primarily comprised of maize, registering a $\delta^{13}C$ value of -12.80‰, a very positive value. In fact, if we consider the range of isotopic values $C_4$ plants produce, between approximately -24 and -8 $\delta^{13}C$ (see Figure 5.6), with the highest numbers representing the largest consumption of maize, it is evident that turkeys were eating more maize than any other animal at Strath Bogue, and almost as much as the humans (see Figure 5.11).

**DISCUSSION**

The exploitation of animals as a food source, and in some cases ritual objects at sites in northern Belize seems to mimic that witnessed at some sites in the Yucatán, with a shift away from large mammals towards the use of small mammals and turtles over time, particularly with the onset of the Classic period (Carr 1996; Hamblin 1984; Masson 1999a, 2004; Wing and Steadman 1980:329-331). This phenomenon has been suggested by some to be related to increases in population pressures, the expansion and intensification of agricultural, and a concurrent reduction in hunting grounds and animal availability (Márquez 1991:370).

A recent reexamination of the Dzibilchaltún and Chichén Itzá fauna assemblages has found, however, this was not in fact the case, as both white-tailed deer and peccaries continue to be dominant, with smaller mammals being secondary. Others (Carr 1996:258; in,Götz 2008:167; Velázquez, et al. 1988:41-48) have argued that large mammals may have even increased in the
Late and Terminal Classic periods, with the expansion of agricultural fields and resulting change in forest cover subsequently encouraging an increase in the presence of edge browsers such as the white-tailed deer. Caracol (Teeter 2004:190) also continues to display consistent ceremonial and subsistence usage of large mammals over time, despite increases in population sites and the intensification of agricultural practices. Unfortunately, at Strath Bogue we do not have the benefit of a chronological sequence, or an expansive enough faunal assemblage to definitively test if this was the case here.

Nonetheless, comparisons with the faunal data from other sites around suggests that the dietary resources of the Strath Bogue inhabitants are generally not unlike those of other Terminal Classic sites, but appear more limited in scope, as other prominent animals such as armadillo, peccary, iguana, etc., are absent from the assemblage. While granted the lack of diversity in faunal remains at the site may in part be due to preservation issues, it is more likely that the degree of diversity seen at earlier and other Terminal Classic sites in the Maya area was just not the case at Strath Bogue. I feel secure in this suggestion when we consider the faunal assemblage itself; that of other nearby and distant Terminal Classic period sites; the isotopic data and its implications; as well as our understanding of the ecology of the region during the Terminal Classic period.

Given how large deer are, and how many more bones there are in this animal in comparison to turkey, turtle, and dog; if deer had been a prominent food resource at the site, it stands to reason that there would have been more deer bone present, and at more loci across the site. Instead, it would appear instead that the focus was on small mammals, turtles, and perhaps freshwater snails (Pomacea).
Animal resource diversity is suggested by some scholars as being reactionary to issues with agricultural production, whether caused by drought, deforestation, soil erosion, or land capacity pressures (Gerry and Krueger 1997:106; White 1997). Given the fact that both the animal, and as we will see, the Human Isotope data indicates corn was a prominent food item amongst the inhabitants of Strath Bogue. Moreover, as indicated earlier, pollen data from Progresso Lagoon suggests that the area had been cleared on a large scale for agriculture purposes during the Terminal Classic period (Digrius and Jones 2001:178), and thus the community may not have demanded the animal diversity seen at other Terminal Classic period sites.

Having examined the results of faunal studies present from a number of sites across the Maya area, Kitty Emery (2004) has noted a substantial increase in bird remains starting in the Terminal Classic period. Despite the bones of birds often being considered more fragile than most animal remains, Emery has identified an increase in the presence of birds to mammals starting in the Terminal Classic period, and increasing into the Postclassic period (K. Emery 2004:47-48, Figure 10). Possible reasons given for this increase include the beginning of the use of turkeys in rituals, and, or the coinciding introduction of domesticated turkeys at this time (see discussion above). Perhaps along with the domesticated (or managed) dog, domesticated (or managed) turkeys could have been a means to establishing a constant and secure meat/protein supply (K. Emery 2004:48) at a time when access to food resources was being impacted by such issues as social unrest, upheaval, environmental crises and population movements, or all of these factors.

The apparent mass migration of peoples across the landscape in the Terminal Classic Period in response to such crises has been discussed and documented across the Maya area. With such population movements comes the transfer of new technologies and ideas, as well as goods.
New animal-use patterns, including the use and management of *M. ocellata*, and eventually *M. gallopavo*, may in part have been the result of such transmission processes coinciding with the movement of peoples, or perhaps the maintenance of social practices amongst the migrant group itself. Food and food practices are considered signifiers of cultural, or social identity (Emery 1999:78; Kalcik 1984). The continuation of such practices as hunting and food preparation are seen as habitual expressions of everyday life that are founded in specific ideologies and mores of a culture, and thus help serve as identity markers (Clark 2001:12-13; Snead 2003). Thus, the choice of consuming particular animals, and the means by which they are hunted, processed, prepared and cooked, and the tools used to complete these tasks, are active yet perhaps unintentional, means of maintaining group cohesion/identity, particularly in response to a changing social or physical landscape. In the case of Postclassic-Colonial Lamanai, the introduction and influx of turkey coincided with the introduction of a new lithic technology that has suggested a new means of hunting using a bow-and-arrow (K. Emery 2004:48; Pendergast 1990). It would stand to reason that the preparation and cooking of certain foodstuffs may similarly have required specific tools or vessels that would also be group identity markers.

The movement of peoples across the Maya area has been discussed at length, particularly in response to the Maya “collapse,” however, discussions of the items carried with these migrating populations have not readily been addressed. While this is of course in part due to the difficulty, and unlikelihood of identifying the handful of such items in the archaeological record, however, we can postulate on the likelihood of certain items making the journey with them. It stands to reason that domesticated or managed animals, such as the dog and turkey, would have been “items” with value to have *en routé* but also at the destination location. Domesticated or managed dogs
who had been used to being fed would have easily followed a reliable food source, especially if there was a scarcity of food within the homeland. Fully domesticated dogs could very well have served as pack animals, although I acknowledge there is no historic or artistic evidence of their use as such. Nonetheless, their role as “look-outs” may also have been beneficial while travelling and camping, as well as at their new destination. Moreover, their ability to help flush out prey during a hunt could also have been of use both while traveling and at their destination location, particularly in unfamiliar territories. Furthermore, if food was scare en routé, the dogs could themselves have been used as foodstuffs.

Similarly, while more cumbersome, turkeys might have been an animal that was an animal from the homeland that was brought along on a trip to their new settlement. If a group was unsure of the resources available to them at the destination site, bringing along an animal that could be eaten in transit, but also serve as a food, ritual and material resource at the destination location may have made it an object worthy of transport. These hypotheses are of course highly speculative, but I believe they are worth contemplation and discussion.

Finally, the more positive deer, and turkey $\delta^{13}C$ values for the Strath Bogue specimens suggests that maize was a staple crop that was easily accessible to the inhabitants of the Progresso Lagoon region. While they do not indicate that either animal was domesticated, the more positive values for the $M. ocellata$, and it’s unique and temporally early presence at this Terminal Classic period site are significant.
CHAPTER 6: STRATH BOGUE STRUCTURE 5 BURIALS, PROBLEMATIC DEPOSIT AND PROGRESSO SHORE BURIAL

This chapter reports on the results of the archaeological and osteological analyses of the human remains recovered at Strath Bogue and compares and contrasts them with that reported from other Maya sites. Analysis of burial practices and the osteological remains provides interesting social, chronological, biological information about the Strath Bogue inhabitants.

**HUMAN REMAINS**

The purposeful internments of the skeletal remains of four individuals were recovered from one structure at Strath Bogue (Burials PR10-01, PR10-02, PR10-03 and PR10-04). All individuals were interred in the supine position, in simple pits within the loose rubble and aggregate fill of Structure 5, a structure located near the site’s main plazuela group (see Figure 6.1). Additionally, a small collection of human remains was recovered from a midden/problematic deposit of the northeast corner of Structure 5 (see Figure 6.2) While considered a residential structure, Structure 5 was larger in height and breadth than many house structures at the site. Given its proximity to the site’s main group, Structure 5 was believed at the outset to have been associated with a family of some consequence, who evidentially participated in ancestor veneration, as indicated by the placement and continued inclusion of several individuals within the household unit. The placement of burials within residential structures is common place at Classic period sites around the Maya area, and is often associated with or ensued by house modifications or renovations (Becker 1992:187; Gillespie 2001:91, 95; Haviland, et al. 1985:152; McAnany, et al. 1999:141; McAnany 1995, 1998; Welsh 1988:7).
Figure 6.1: Map of location of Structure 5 from which 4 burials were excavated.
Figure 6.2: Map of placement of units associated with Str 5. with human remains.

Burials

The skeletal remains associated with all four primary internment events were fragmentary, incomplete and generally poorly preserved, making age, sex, health and disease assessments difficult to evaluate. Assessments of sex and age at the time of death were morphologically established by osteologist Margaret Briggs, based on dentition, epiphyseal fusion and cranial sutural fusion (where discernible) according to disciplinary standards (Briggs 2002a:153; 2003:152; Buikstra and Ubelaker 1994; White 2000). Due to an absence of discernible dimorphic skeletal markers, sexes were established by conducting Discriminant Function Analysis on only
those bones whose preservation permitted such measurements (Briggs 2003:152). Molar wear, calculus buildup and cranial suture fusion traits were also taken into consideration in assessing age (Briggs 2002a:153).

Burial PR10-01

Burial PR10-01 was excavated from Subops 5 and 5b at a depth of approximately 67cm below surface. The initial bones encountered included teeth, mandible fragments, and a clavicle. Articulation became apparent upon exposure of a humerus, ulna and radius running in a southwest direction. The skeleton had been placed in an extended, supine position, along a 42 degree or northeast-southwest axis, with the head towards the northeast. The individual's hands were placed over the pelvis. As there was an absence of a clearly defined crypt or line of demarcation for the burial, it was difficult to define the boundary of the burial area, especially with many bones missing due to taphonomic processes. Some limestone rocks were placed haphazardly around the skeleton and between the legs of the individual, but by no means this a formalized grave. The area in which the skeletal remains were confined measured approximately 158 x 44 cm, with a maximum skeletal depth of 74.4cm below surface (see Figure 6.3 and Figure 6.4). While no grave goods were recovered in association with Burial PR10-01, a notable number of lithic flakes and cores were found in the area immediate to the burial and a handful of lithic flakes and ceramic sherds were found in association with the interred individual. As a result of recent disturbance and a rodent burrow, no foot bones were recovered from Burial PR10-01 (Ferguson 2002a:41).
The individual associated with Burial PR10-01 was the best preserved of the four individuals recovered, and has been identified as a young adult female, between 20 and 35 years of age at her death. Determination of this individual’s sex was based on observable cranial traits and humeral and femoral measurements, as other sexually dimorphic indicators were unobservable due to their absence as a result of preservation or bone remodeling due to disease. Observed female cranial traits include sections of a thin and relatively sharp supraorbital margin, a relatively smooth, nearly absent supraorbital ridge, and a negligible nuchal crest. While neither the

**Figure 6.3: Top plan of Burial PR10-01.**
perauricular surfaces of the pelvis nor the pubic symphyses were preserved, one of this individual’s sciatic notches was recovered from excavations and was observed to have been marginally narrower than those observed in the Laguna de On and Caye Coco female populations (Briggs 2002a:153). Further, discriminant function analysis of this individual’s femoral measurements indicated that this individual fell within the 96-100% probability range for female; however, her comparatively large ulna measurements indicated only a 55% female probability. When compared to statistics for the male population, it was found that they appeared as low male outliers, and thus based on all the available data her sex was designated as female (Briggs 2002a:153; 2003:153).

![Image](image.png)

Figure 6.4: Photo of Burial PR10-01.

Her skeletal remains, particularly the right fibula and both tibia, indicated the presence of a severe treponemal infection, and bone regeneration consistent with the osteomyelitic disease
known as yaws (Briggs 2002a:153, 154). Both tibiae were characteristically bowed in what is referred to as “sabre shin” appearance typical of yaws. Of particular note is the fact that while such treponemal infections are not uncommon from other Maya burials, they are not typical for Laguna de On or Caye Coco, with each population only having one representative case in each, and both of which date to the Postclassic period (Briggs 2002a:154).

The female individual associated with Burial PR10-01 was likely a person of status, as indicated by her dental and cranial modification. Despite the fragmentary nature of the skull, 60% of it could be reconstructed and tabular erect cranial modification was detected in the presence of a lambda depression, the flattening of the frontal and occipital bones, slight protuberance of the parietal bones, and the presence of extrasutural bones in the lambdoid suture (Briggs 2002a:154; Dembo and Imbelloni 1938; Romero Molina 1970). Furthermore, the left maxillary first and second incisors (LI1 and LI2) and right maxillary first incisory (RI1) were filed and inlaid with a dark brown pyrite like material (Figure 6.5).

Figure 6.5: Photo of G-13 dental modification pattern from individual associated with Burial PR10-01.
An individual exhibiting teeth with both modification and inlay in the same teeth is not uncommon among Late Classic and Terminal Classic period (A.D. 700-1000) Maya elite. However, while dental filing continued into the Postclassic period (A.D. 1000-1500), inlaid teeth generally disappear during the Postclassic period (Romero Molina 1970). This is significant when one considers that none of the skeletal remains of the seventy-three individuals from the nearby Postclassic period sites of Caye Coco and Laguna de On exhibit thus dual “G-13” dental modification pattern, or inlaid teeth at all (Briggs 2002b:154). Even within the population from the much larger and prominent site of Santa Rita to the northwest of Strath Bogue, no such patterns of inlay or filing, or both were encountered during any of the site’s occupational history (Chase 1997:24). It has been noted that during the Late and Terminal Classic period combinations of both filing and inlay dental modifications, like the “G-13” pattern were commonplace (Havill, et al. 1997:90). The “G-13” dental modification pattern is not noted as occurring in the southeastern Petén or at Uaxactún for any time period (López Olivares 1997).

While 22 lithic debitage flakes, 139 ceramic sherds, 1 parallel sided biface of Colha chert, and a fragment of a metate were recovered from Burial PR10-01, there is no indication that the sherds represented an entire vessel or an intentional caching of objects. The artifacts recovered from Burial PR10-01 may simply have been part of the general fill used to bury the individual. Considering this individual exhibited skeletal and dental modifications typically associated with individuals of status, it is surprising that no obvious grave goods were recovered from this burial.

The ceramics associated with Burial PR10-01 predominately date to the Terminal Classic period, with 3 Early Classic sherds (Aguila Orange) occurring as an anomaly (see Table 6.1). It is probable that these Aguila Orange sherds, representing only 2% of the sample, were
unintentionally swept up along with the Terminal Classic sherds and dumped along with structural/burial fill deposits. Interestingly, 6 sherds representing 5% of the sample represent slate wares deriving from the Cehpech ceramic sphere of northern Yucatán that also dates to the Terminal Classic period. Figure 6.6 illustrates the percentage of ceramics from the different ceramic spheres represented in Burial PR10-01, and also includes those that were unable to be identified and the Early Classic ceramics. It should be noted that the 7 sherds from the Tepeu III ceramic sphere were all the same type and may derive from the same vessel, and the majority of ceramics recovered from this burial (84%) were either undiagnostic or eroded and unable to be securely identified by type. Nonetheless, the majority of unidentified sherds were striated body sherds from ollas, which were arguably either Burgos/Progresso, Blue/Freshwater Creek, Chambel or Dumbcane Striated, all of which are Rancho sphere ceramics dating to the Terminal Classic period.

Table 6.1: Table of ceramic types found in association with Burial PR10-01.

<table>
<thead>
<tr>
<th>Ceramic Type</th>
<th>Quantity</th>
</tr>
</thead>
<tbody>
<tr>
<td>Achote Black: Variety Unspecified (Salmon paste)</td>
<td>1</td>
</tr>
<tr>
<td>Aguila Orange: Dos Hermanos Variety</td>
<td>3</td>
</tr>
<tr>
<td>Burgos/Progresso Striated: Variety Unspecified</td>
<td>3</td>
</tr>
<tr>
<td>Chumayel Red-on-slate: Chumayel Variety</td>
<td>2</td>
</tr>
<tr>
<td>Coco Red: Variety Unspecified</td>
<td>2</td>
</tr>
<tr>
<td>Muna Slate: Variety Unspecified</td>
<td>1</td>
</tr>
<tr>
<td>Ticul Group</td>
<td>1</td>
</tr>
<tr>
<td>Ticul Thin Slate: Ticul Variety</td>
<td>1</td>
</tr>
<tr>
<td>Tinaja Red: Variety Unspecified</td>
<td>7</td>
</tr>
<tr>
<td>UID Eroded/Unslipped</td>
<td>24</td>
</tr>
<tr>
<td>UID Red slipped</td>
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</tr>
<tr>
<td>UID Slate</td>
<td>1</td>
</tr>
<tr>
<td>UID Striated</td>
<td>85</td>
</tr>
<tr>
<td><strong>Total</strong></td>
<td><strong>139</strong></td>
</tr>
</tbody>
</table>
Burial PR10-02

Burial PR10-02 was centrally located within Structure 5, approximately 50cm below surface level within rock and aggregate architectural fill. While initially recognized through the presence of “floating” fragments of human bone evidentially redistributed throughout the fill to the east of Burial PR10-01, in the southeast corner of the Subop 5. While this scattering of skeletal remains was the result of taphonomic processes, the presence of an intentional interment was confirmed through the identification of an anomaly in the conventional structural fill, and the presence of a simple crypt. The crypt was defined by deliberately placed rocks around the cranial area, one of which fell out of the southeast wall of Subop 5 in 2001, revealing additional cranial fragments and a black slipped vessel which has been identified as Achote Black: Provisional Variety (see Figure 6.7 and Figure 6.9). While an attempt to fully expose this burial with an
extension unit (Unit 5c) was initiated in 2001, estimation of the burial’s directionality was incorrect, and we were forced to leave the burial in situ until the following field season (Ferguson 2002a:40; 2003:61).

In 2002 a 2x2m unit east of Subop 5 and partially encompassing extension Unit 5c was initiated specifically for the purpose of retrieving Burial PR10-02, and to gain greater insight into the construction of Structure 5. Excavations of Subop 5d revealed a large semi-dressed 4cm thick limestone slab measuring 29cm x 12cm placed over the individual’s upper torso. The individual’s left humerus and right radius were subsequently arranged over this stone, while the right humerus lay below it. This placement of the rock and the individual’s arms around it indicates that the body was fully articulated at the time of interment. Three limestone rocks were arranged around the area of the cranium, cursorily demarking the limits of the Burial around the skull. Unlike the other burials from this structure, the individual in Burial PR10-02 was placed in a semi-flexed position, with their knees bent and drawn up to the right, in a 90-degree angle with the upper torso. It was also interred with the individuals head facing up, and oriented to the north, while the extent of the burial crypt was oriented in a north-south direction (approximately 200x100cm area), perpendicular to the other burials in the structure (see Figure 6.8). All the other burials from Structure 5 were all extended burials, with the heads placed towards the east and oriented in a northeast-to-southwest direction (PR10-01 and PR10-03) or a southeast to northwest position (PR10-04) (Briggs 2003:153; Ferguson 2003:61).

Unfortunately, the skeletal remains associated with Burial PR10-02 were very poorly preserved and fragmentary. The skull had been crushed and was incomplete, making reconstruction difficult and determination of whether this individual’s cranium was modified
impossible. Determination of the sex of the individual was made after the partial reconstruction of the right femur, right ulna, left humerus and left clavicle, and determined to be a probable female.

Figure 6.7: Initial identification of Burial PR10-02, and Achote Black: Provisional Variety vessel in 2001.

As was the case for the individual in Burial PR10-01, the female sex designation of this individual was hindered by the nature of the skeletal remains, particularly the incomplete skull and a larger than average ulna measurement. The initial discriminant function analysis suggested a
female probability range for femoral measurements of 96 to 100% range; however, ulna measurements indicated only a 22% probability of female. Given the discrepancy of the ulna probability rate, a retest was conducted and found the remains to be closer to the center of the female-to-male spectrum, and at best a low male outlier, thus lending higher probability to this individual being female (Briggs 2002b:40-41; 2003:152-154).

Figure 6.8: Top plan of Burial PR10-02.
Age determination was likewise hindered by the complete absence, or deteriorated and fragmentary nature, of the skeletal remains. Specific age assessments could not be made outside of this individual having been an adult (Briggs 2003:152). Hindering the age assessment was the fact that teeth were found in two separate locations within Burial PR10-02, one in the area of the skull, and the other in the crook of the knees in what appears to have been a caching event, along with lithic flakes and ceramic sherds. The collection of teeth included deciduous (n=5) and permanent teeth (n=16), and 3 unerupted permanent molars. Given the mix of adult and juvenile dentition associated with this burial, these teeth could represent the dentition of one individual, or that of two distinct individuals (Briggs 2003:153).

Burial PR10-02 also included one of the most significant burial goods encountered at Strath Bogue. As mentioned earlier, a fragmented black slipped vessel was located inverted and in association the skull. Since the vessel, along with fragments of the cranium were removed in 2001 prior to the full exposure of the burial in 2002. The vessel is local version of Achote Black which had striking formal similarities to Infierno Black, and thus was designated Achote Black: Provisional Variety. The bowl had been ritually “killed” through the drilling of a hole at the center of its base (Ferguson 2002a:41; 2003:61) (see Figure 6.9).

The placement of a vessel over the face of an interred individual is commonplace amongst Classic period burials (Welsh 1988:216) and has been noted from burials dating to the Classic and Terminal Classic periods from Santa Rita (Chase and Chase 1988). A total of 58 ceramic sherds and one vessel were also recovered from Burial PR10-02. Like in Burial PR10-01 the ceramic assemblage from PR10-02 included sherds from the local Terminal Classic Rancho ceramic sphere, as well as the Cehpech and Tepeu III spheres (see Figure 6.10). One ceramic sherd securely
dating to the Early Classic period and two likely Early Classic (UID Orange slip) sherds were anomalies, 36 sherds were unidentifiable, 21 of which (or 36% of the assemblage) were striated olla body sherds and likely either Chambel, Burgos/Progresso, Blue/Freshwater Creek or Dumbcane Striated (see Table 6.2). Additionally, 21 lithic flakes, 2 proximal ends of obsidian blades, and one complete informal biface were also recovered.

Figure 6.9: Reconstructed Achote Black: Provisional Variety vessel recovered from above the skull of the individual in Burial PR10-02.
Figure 6.10: Percentage of ceramics from Burial PR10-02 by associated ceramic sphere.

Table 6.2: Table of ceramic types found in association with Burial PR10-02.

<table>
<thead>
<tr>
<th>Type Variety</th>
<th>Quantity</th>
</tr>
</thead>
<tbody>
<tr>
<td>Achote Black: Variety Unspecified (Salmon paste)</td>
<td>1</td>
</tr>
<tr>
<td>Achote Black: Provisional Variety</td>
<td>1 vessel</td>
</tr>
<tr>
<td>Burgos/Progresso Striated: Variety Unspecified</td>
<td>1</td>
</tr>
<tr>
<td>Cambio Unslipped: Variety Unspecified</td>
<td>1</td>
</tr>
<tr>
<td>Sharp Red: Variety Unspecified</td>
<td>1</td>
</tr>
<tr>
<td>Chumayel Red-on-slate: Chumayel Variety</td>
<td>6</td>
</tr>
<tr>
<td>Coco Red: Variety Unspecified</td>
<td>3</td>
</tr>
<tr>
<td>Dos Arroyos Orange Polychrome: Variety Unspecified</td>
<td>1</td>
</tr>
<tr>
<td>Kik Red: Kik Variety</td>
<td>2</td>
</tr>
<tr>
<td>Palmar Orange Polychrome: Variety Unspecified</td>
<td>5</td>
</tr>
<tr>
<td>Ticul Group</td>
<td>1</td>
</tr>
<tr>
<td>UID Black slipped</td>
<td>4</td>
</tr>
<tr>
<td>UID Orange Slipped</td>
<td>2</td>
</tr>
<tr>
<td>UID Red slipped</td>
<td>4</td>
</tr>
<tr>
<td>UID Striated</td>
<td>21</td>
</tr>
<tr>
<td>UID Unslipped</td>
<td>5</td>
</tr>
<tr>
<td><strong>Total</strong></td>
<td><strong>59</strong></td>
</tr>
</tbody>
</table>
Burial PR10-03

Burial PR10-03 was encountered roughly 10cm below Burial PR10-01. While no formal demarcation of the interment existed, a slight depression within the fill, and the presence of a few large rocks around the area of the skeletal remains indicated a prepared location for the body. A capstone in the area of the cranium was recognized. The dimensions of the burial were approximately 91.5cmx165cm, with bones being distributed in the area between a depth predominantly between 85.5cm and 96cm below the surface, while some loose bones were found as deep as 105.5cm below the surface. While the skeletal remains were the most poorly preserved of all the Strath Bogue burials, based on the positioning of the tibia and fibula, it does appear that the individual was articulated at the time of burial, and was interred in an extended, supine position on a 30-degree angle or northeast-southwest axis, with the head to the northeast (Ferguson 2002a:41).

Due to the extreme fragmentary, incomplete and poorly preserved nature of the skeletal remains associated with Burial PR10-03, age and sex determinations could not be securely assigned. Reconstruction of the right femur facilitated measurements which suggested a diameter and circumference robustness typical of the male range of populations at Caye Coco and Laguna de On, however subtrochanteric diameters coincided more with gracile, indeterminate female spectrum in comparison. Osteologist Margaret Briggs assigned a “possibly male” sex to the individual. Despite the fact that only one tooth was recovered, it was a permanent molar with moderate wear, indicating the individual interred in Burial PR10-03 was an adult. The skeletal remains did not indicate any signs of pathology (Briggs 2002b:154)
Artifacts recovered from Burial PR10-03 included those scattered randomly amongst the human remains and within the area defined by rocks as the simple crypt, as well as those recovered from two clusters or concentrations of artifacts (Cache 1 and Cache 2) located in the aggregate/core fill encompassing the burial (see Figure 6.11). Cache 1 was located at a depth between 105.5 and 114.5cm depth below surface, and Cache 2 was between 105.5 and 108.6cm depth below surface. Artifacts recovered randomly from around the Burial crypt included 60 ceramic sherds, 2 *Pomacea* shell fragments; 26 lithic flakes and one complete hammerstone. Three rodentia bones were recovered from the area of the individual’s feet, but likely represent evidence of bioturbation (rodent burrowing). Cache 1 contained 14 ceramic sherds, and 2 lithic flakes; while Cache 2 included 78 ceramic sherds, 11 lithic flakes, a medial section of a miscellaneous biface and some charcoal.

A total of 152 ceramic sherds were recovered for the entire Burial area of PR10-03, ten of which (or 7%) were identified as being Early Classic. Unfortunately, many ceramics types were unable to be identified due to their eroded nature, small size, or more often than not, an absence of diagnostic attributes. Nonetheless, it was evident that the sherds were not representative of a reconstructible vessel, and that an array of forms, decorative surface treatments and type varieties were represented (see Figure 6.12 through Figure 6.15, and Table 6.3). Many sherds were classified as either unslipped or eroded/unslipped. Some olla sherds were easily identified as simply unslipped, while other formal specimens were less securely identified one way or another. Additionally, due to the limited size of many of the rims, or lack of diagnostic attributes, form designations on many specimens were indeterminate (see Figure 6.13 and Figure 6.14). Slate wares interestingly are more numerous than either red or black slipped specimens (see Figure 6.13).
Figure 6.11: Top plan of Burial PR10-03 and Caches 1 & 2.
Figure 6.12: Vessel forms represented in Burial PR10-03 (excluding Early Classic specimens).

Figure 6.13: Percentage of ceramic specimens according to surface treatments from Burial PR10-03, including associated Caches 1 & 2 (excluding Early Classic specimens).
The majority of sherds overwhelmingly represented unidentifiable striated ollas or jars and were likely one of the major striated types typical of the Progresso complex (Burgos/Progresso Striated, Blue Creek/Freshwater Creek Striated, Chambel Striated or Dumbcane Striated). While the preponderance of unidentifiable ceramic sherds affected our understanding of the ratio of specimens relative to the appropriate ceramic sphere, the Burial PR10-03 ceramic assemblage, including its associated caches were able to be securely date to the Terminal Classic period, with

Figure 6.14: Types of vessel forms within Burial PR10-03 ceramic assemblage, including associated Caches 1 & 2 indicating types of surface treatment for each vessel form (excludes Early Classic specimens).
specimens being representative of spheres typical of the Yucatán, Southern Lowlands and northern Belize regions (see Figure 6.15).

![Pie chart showing ceramic sphere affiliation]

**Figure 6.15: Percentage of ceramic specimens from Burial PR10-3, including Caches 1 & 2 according to ceramic sphere affiliation (excluding Early Classic specimens).**

Of the identifiable ceramics recovered from Burial PR10-03, including the ceramics from the two caches directly associated with it, the majority are types that date to the Terminal Classic period (Table 6.3). If we consider the likelihood that the majority if not all of the unidentified striated types are very likely representative of the dominant regional Terminal Classic striated types, paired with our assertion that the caches and the burial ceramics also date to the Terminal classic, it follows that their inclusion in the burial was not simply the result of the re-depositing of random midden materials, but that these sherds were purposefully interred with the individual in the Terminal Classic period.
Table 6.3: Table of ceramic types found in association with Burial PR10-03.

<table>
<thead>
<tr>
<th>Ceramic Type: variety</th>
<th>Quantity</th>
</tr>
</thead>
<tbody>
<tr>
<td>Achote Black: Provisional Variety</td>
<td>3</td>
</tr>
<tr>
<td>Achote Black: Variety Unspecified (Salmon paste)</td>
<td>1</td>
</tr>
<tr>
<td>Aguila Orange: Variety Unspecified</td>
<td>6</td>
</tr>
<tr>
<td>Cambio Unslipped: Variety Unspecified</td>
<td>1</td>
</tr>
<tr>
<td>Coco Red: Variety Unspecified</td>
<td>2</td>
</tr>
<tr>
<td>Dzitas Slate: Variety Unspecified</td>
<td>1</td>
</tr>
<tr>
<td>Encanto Striated: Variety Unspecified</td>
<td>2</td>
</tr>
<tr>
<td>Encanto Striated: Yokat Variety</td>
<td>2</td>
</tr>
<tr>
<td>Fat Polychrome: Variety Unspecified</td>
<td>1</td>
</tr>
<tr>
<td>Infierno Black: Bolocantal Variety</td>
<td>2</td>
</tr>
<tr>
<td>Muna Slate: Metzabok Variety</td>
<td>1</td>
</tr>
<tr>
<td>Palmar Orange Polychrome: Variety Unspecified</td>
<td>5</td>
</tr>
<tr>
<td>Burgos/Progresso Striated: Variety Unspecified</td>
<td>1</td>
</tr>
<tr>
<td>Saxche Orange Polychrome: Saxche Unspecified</td>
<td>1</td>
</tr>
<tr>
<td>Ticul Thin Slate: Ticul Variety</td>
<td>8</td>
</tr>
<tr>
<td>Tinaja Red: Variety Unspecified</td>
<td>4</td>
</tr>
<tr>
<td>Triunfo Striated: Variety Unspecified</td>
<td>3</td>
</tr>
<tr>
<td>UID Cream slip</td>
<td>1</td>
</tr>
<tr>
<td>UID Eroded/Unslipped</td>
<td>20</td>
</tr>
<tr>
<td>UID Orange Slipped</td>
<td>1</td>
</tr>
<tr>
<td>UID Polychrome</td>
<td>2</td>
</tr>
<tr>
<td>UID Red slipped</td>
<td>4</td>
</tr>
<tr>
<td>UID Red-on-orange</td>
<td>1</td>
</tr>
<tr>
<td>UID Slate</td>
<td>1</td>
</tr>
<tr>
<td>UID Striated</td>
<td>78</td>
</tr>
<tr>
<td><strong>Total</strong></td>
<td><strong>152</strong></td>
</tr>
</tbody>
</table>

When the two assemblages associated with the entire Burial PR10-03 “complex” that contain the most similar quantities of ceramics are compared (the burial crypt N=60 and Cache 2 N=78) the overall distribution of ceramics according to affiliated ceramic sphere mimic each other. The only significant differences are the presence of a Sotuta affiliated ceramic in Cache 2 (N=1), and a higher number of Early Classic sherds being present in the burial crypt area than in the cache (see Figure 6.16).
A) Burial PR10-03 crypt

B) Cache #2

Figure 6.16: Graphs indicating the distribution of ceramic sherds by affiliated ceramic sphere for A) Burial PR10-03 crypt and B) Cache #2.

Additional artifacts of significance from Burial PR10-03 include a shell ink dish associated with the Burial crypt was encountered approximately 100cm below surface. The ink dish (Figure 6.17) was formed from a section of a *Strombus costatus* shell, similar to those used by scribes and depicted on polychrome vessels, such as on Kerr vase K717, “Scribal Workshop,” and Kerr vessel K2744 (see Figure 6.18 and Figure 6.19), and similar to such rare vessels as those excavated from
burials at Copán and Tikal (Fash 1991:106-111; Reents-Budet 1994:Figures 2.2, 2.6, 2.15, 2.16).

*Strombus costatus* is a large gastropod species that is predominantly found along the shallow waters of the Gulf Coast, as opposed to the east coast of the Yucatán Peninsula (Andrews IV 1969; Vokes and Vokes 1983). I have also personally observed these species, though rarely, living in the brackish waters of Progresso Lagoon. The ink dish was intentionally placed on the stones outlining the burial crypt and appears to be the only true personal item associated with this burial, begging the question whether this individual was a scribe.

Figure 6.17: Ink dish formed from a *Strombus costatus* shell from Burial PR10-03.
Many polychrome pictographic vessels illustrate scribes in the act of painting and writing, and depict aspects of their scribal tool kit, most prominently halved shells which served as paint containers, similar to the one in Burial PR10-03. More elaborate versions of these shell vessels can be seen in Reents-Budet’s *Painting the Maya Universe: Royal Ceramics of the Classic Period* (1994: Figures 2.8, 2.9, 2.10).

![Figure 6.18: Rollout photograph of polychrome vessel (Kerr 717) with shell ink dish and stylus indicated (Kerr 2013) (reproduced with Justin Kerr’s permission, see Appendix IV).](image)

Shells were evidently the preferred raw material for these vessels into the Postclassic period, their smooth surfaces being more resistant to wear and pigment stains than wood or ceramic and allowed the mixing of the paints without worry of it absorbing liquids (Reents-Budet 1994:37-38). Such ink dishes were excavated from Structure M8-10, a scribal household at Aguateca in Guatemala (Inomata 1997:345; 1998:437); from the tomb of Hasaw Ka’an K’awil in Temple I at Tikal and the burial of an elite individual at Holmul (Coe and Kerr 1997:150, Fig. 118 & 119; Reents-Budet 1994:36, 68, Figs. 2.10, 2.9).
Figure 6.19: Detail of rollout photograph of polychrome vessel (Kerr 2744) illustrating Hunahpú (?) with shell ink dish and a possible paper-polisher indicated (Kerr 2013) (reproduced with Justin Kerr’s permission, see Appendix IV).

Adding to the argument that the individual associated with Burial PR10-03 was a scribe, is the presence of several lithic tools that we have previously referred to as chert “discoidals,” but which have been labeled elsewhere as chert “palettes” (Aoyama 2011:49, Figure 4.3). Palettes are thought to have been used in the formulation of pigments and were identified in a similar household structure labeled “the House of Mirrors” in the center of Aguateca (Aoyama 2011:49). The Strath Bogue discoi
dals like the Aguateca palettes, are ovoid to round in shape, and fashioned from a large predominantly unifacial flake. The dorsal side of the palette is slightly convex and finitely flaked; while the ventral side exhibits an either relatively flat or marginally concave surface. We have also identified denticulate version of palettes at Strath Bogue, in which the edges are not smoothen, but instead have notches chipped into them. The quality of chert and the execution of the tool can vary, with some specimens, even the formal ones, exhibiting cortex. The Strath Bogue
assemblage includes specimens that are classified as either formal; informal (presumably expedient versions or perhaps palette preforms, although some do show usage); or denticulate specimens (see Figure 6.20).

![Image of assemblage specimens]

**Figure 6.20**: Sample of palettes from Strath Bogue. a) Drawing of formal palette #L-190; b) Denticulate palettes; c) Formal palettes (#L-190 lower left); c) Informal palettes.

I have examined the available lithic data from Northern Belize, including at the chert production site of Colha, and elsewhere in the Maya area, and have only ever seen reference to
this tool type in association with Late Classic elite structures (including the elite residences, the palace, and the royal temple (Str. L8-6), at Aguateca. Researcher Aoyama (2011:49) does not make reference to their known presence at other sites, but he does note that they are completely absent from commoner household structures throughout the region. Structure 5 at Strath Bogue, in which Burial PR10-03 is located, is similarly considered an elite household and is associated with the site’s epicenter. Structure 5 also had a number of palettes recovered from deposits associated with this structure. In fact, an informal denticulate palette made from chalcedony was found in the fill immediately above Burial PR10-03 (artifact # L-194) (see Figure 6.20b, right).

**Figure 6.21: Distribution of palettes at Strath Bogue by archaeological context.**

A total of 20 palettes were recovered at Strath Bogue. Like at Aguateca, all were recovered from elite or ritual contexts. As can be seen in Figure 6.21, the majority of palettes were recovered from the elite residence in which Burial PR10-03 was interred (Structure 5). The other palettes
were recovered from the elite residence associated with the main plaza group (Str. A4), the most formal residential structure at the site. Of particular interest is the fact that the remaining palettes were found in association with uncarved, and thus presumably painted stelae. All three forms of palettes were retrieved from Structures 5 and A4. The majority of palettes from Structure 5 were those classified as Formal, while the majority of those recovered from Structure A4 were Informal.

![Diagram](image)

**Figure 6.22: Strath Bogue palettes.** a) Percentage of different palette forms; b) Percentage of palettes fashioned from different raw materials.

There were an equal number of formal and informal palettes excavated at Strath Bogue, with the Denticulate palettes being the less common, with both Formal and informal forms being recovered (see Figure 6.22a). The majority of palettes (N=16) were flaked from local raw materials, including chalcedony, chert and a chert/quartzite blend, with the majority (65%) being fashioned from Chalcedony (Figure 6.22b). The remaining four palettes were made from the much more homogenous and superior quality and “nonlocal” Colha chert. Interestingly, three of the specimens made from Colha chert had actually been recycled from previously used unifacial macroblades. The question remains whether the Colha specimens were pieces scavenged and
subsequently recycled, or whether these were objects brought along on the trip to Strath Bogue as macroblades and recycled after their arrival at their new location.

Adding to the potential of the individual interred in Burial PR10-03 having been a scribe, and/or Structure 5 having been a scribe’s household, was the recovery of a possible pigment applicator (an implement that resembles a stylus); and a pigment holder (see Figure 6.23a), both of which were excavated from a midden associated with the structure. Both the pigment applicator and the holder were made from *Strombus* shell, the applicator being fashioned out of a shell’s columella, and the holder being formed by carving a depression into a section of body whorl, and thereby making a scoop-like object. Pigment applicators are inflexible implements that are commonly illustrated in the hands of scribes in scenes that also depict ink containers (see Figure 6.18) (Reents-Budet 1994:38, 41). Similar objects were encountered in a more formal scribal burial chamber at the site of Minanhá in the Maya Mountains, in west-central Belize (Schwake 2010:22, Figure 6) and in “the House of the Scribe” (Str. M8-10) at Aguateca (Inomata 1997:345, Fig.12; Inomata and Stiver 1998:437).

The individual in Burial PR10-04 also had what has been identified as a paper-polisher interred with them (see Figure 6.23b below). This object was fabricated out of a round stone which had two depressions ground into opposing surfaces. Paper polishers are hypothesized by Coe and Kerr to have been round or egg shaped and used to prepare and smooth the limestone/stucco coating on bark paper before writing, similar to that carried out by ancient Islamic calligraphers (Coe and Kerr 1997:152). While none of these objects are depicted in actual use by scribes on vessels, there are a number of images that illustrate such objects in association with scribes, paper and other recognized objects from their toolkits (see Figures 120-122 in (Coe and Kerr 1997:152-
In the scenes in which perceived paper-polishers are depicted, they are ball-shaped, and some are illustrated with a round dot on them, likely representing a depression for grasping the object, as seen in Figure 6.19, and like the one recovered from Burial PR10-04. This funerary object further adds to the hypothesis that Structure 5 was a scribal household. Such items are not readily encountered together in archaeological contexts. And while they are not necessarily in direct association with one-another, they essentially represent aspects of a scribal tool kit (see Figure 6.23) (Schwake 2010:22) and were all recovered from Structure 5. Accordingly, their presence and direct association with Structure 5 support the supposition that Structure 5 was a scribal household, and that two of the individuals interred within the structure were likely scribes themselves.

Although not found in direct association with Structure 5, two other scribal artifacts were recovered at Strath Bogue. A barker beater made of limestone (Figure 6.23c) was also recovered in a surface collection in the vicinity of Possible Stela #2 next to the temple on the main plaza (Str. A1, Group A); and a ground limestone pigment mortar (Figure 6.23d) that resembles a mini-metate, was retrieved from a fill level during the cleaning of a looter’s pit profile within the same temple. Eight stone mortars used for pigment preparation, like the Strath Bogue example, have been identified in Str. M8-10 at Aguateca, and are considered integral utensils within the scribal tool kit (Inomata 1997:Fig. 11; 2001:326; Inomata and Triadan 2000:58). Such mortars are quite a bit smaller than grinding stones used for food preparation and are much more abundant in the archaeological record than the pigment mortars. The Aguateca mortars were made out of a variety of raw materials, including limestone, sandstone, chert and igneous rocks (Inomata 2001:327).
Figure 6.23: Scribal paraphernalia, components of a Scribal toolkit: a) Shell pigment holder (Str. 5 midden); b) Groundstone paper polisher (Burial PR10-04); c) Limestone bark beater (Group A plaza); d) Limestone pigment mortar (Temple, Str. A1) (paper polisher illustration by Meg Sodano).
While the rendering of images of scribes in Classic period art are not uncommon, the identification of scribes and their tool kits in the archaeological record is rare. Scholars have thus had to largely rely on embedded iconographic details for clues about scribes, their tools and the different media for clues about these individuals, their office and tools. Fortuitously, such images have identified the various media in which scribes work, including with wood, ceramics and codices, as well as the appropriate tools for each medium in which they work (see Figure 6.18 and (Reents-Budet 1994:Fig. 216)). Yet despite the plethora of images depicting scribes or scribal gods, there is surprisingly little known about their toolkits. And somewhat oddly, there are no known depictions of Maya scribes carving monuments, and thus no images of the utensils utilized in carving practices (Coe and Kerr 1997:145). Coe and Kerr (Coe and Kerr 1997:146-147) note that the predominant tool utilized by scribes illustrated on vessels is the “brush pen,” of which there are several different thicknesses and permutations. Based on the imagery and their comparative analysis of Chinese and Japanese writing implements, Coe and Kerr suggest that Maya brush pens were constructed by binding hair and inserting or gluing the bounded hair inside a handle. Others may have been tied to the outside of the handle at its end. Unfortunately, they do not speculate on what the handles were made of, as no intact brush pens have been found in the archaeological record. Similar scribal tools have been identified through historic documents and epigraphic data as “quill pens” specifically utilized for writing. Images from pictoral vessels also support the use of quill pens, and in fact the “stick bundles” associated with scribal headdresses or tied to their foreheads, may in fact represent collections of these quill pens (Coe and Kerr 1997:148).
Of course, scribes had to possess tools appropriate to the media in which they worked, and thus different tools would be required for wood, ceramics, paper, stucco and carving. Wood and clay objects would require carving implements and engraving tools, likely constructed of hafted obsidian blades (Coe and Kerr 1997:146). Manipulators of shell and bone, and perhaps jade and other small stone objects would likely have used similar tools, and perhaps utilized objects of chert, such as chert knives, adzes and drills and other more expedient flake tools (Coe and Kerr 1997:146). It is because these objects can be used for a variety of other possible functions that they are not readily identified as potential instruments of a scribal toolkit.

As discussed by Inomata and Triadan, the intrinsic value of scribal implements and their small size meant these objects were rarely abandoned, but instead could be effortlessly, and evidently were, transported with their possessors elsewhere. Moreover, the nature of their craft is such that it does not produce a great deal of wasters or debitage, and thus activity areas are not readily identified (Inomata and Triadan 2000:58-59). The implements themselves are made of a variety of perishable and non-perishable materials. Perishable tools, such as brushes, are not preserved in many contexts, while others, like lithic objects used in carving activities, or pestles may not be readily identified as utensils associated with a scribal tool kit, but are instead mistaken for those associated with other activities (Inomata 2001:330; Inomata and Triadan 2000:58-59).

Similarly, Coe has noted that scribal deities illustrated in the Madrid Codex are seen making idol heads with a variety of different tools, including bone awls, hafted axes, ink bowls with feather or brush pens (Coe 1977:330, 332, Fig. 1 & 2). Based on experiments by colleagues involved in recording the Tancah and Tulum murals, Coe has suggested that Maya “feather pens”
were made from turkey feathers, using the feather as opposed to the quill end to create the long lines without any fading of the line (Coe 1977:336).

At Aguateca, artisans associated with carving and sculpting were hypothesized to be associated with Structure M7-35 based on the presence of polished axes, while those associated with monument carving were identified as residents of Structure M8-8 based on the larger number of polished axes and debitage. The presence of mortars and pigment grinders in Structures M8-4 and M8-10 suggested that the scribes associated with the structures focused on art involving illustration with paints. Interestingly, different types of stone mortars were associated with each of the two structures, suggesting that different types of pigments and thus media were associated with each of these structures (Inomata and Triadan 2000:63).

As noted before, it seems that most of the data pertaining to scribes and their tool kits come from illustrations on polychrome vessels, as very few scribe burials or scribal households have been identified. Structures M8-10 and M8-4 at Aguateca have been identified as scribal households based on the presence of such objects as small mortars, ink pots of shell, mortar and pestles, polished stone axes, as well as a carved human skull with a scribal glyph title engraved into it (Inomata 1997:345; 2001:326, 328; Inomata and Stiver 1998:437; Inomata and Triadan 2000:62; Inomata, et al. 2002:324). Another elite scribal household (Str. M8-8) has also been identified at Aguateca based on the presence of chert palettes, polished axes, and groundstone mortars and pestles alone (Aoyama 2011:49; Inomata 2001:327, Fig. 5). The rapid abandonment of Aguateca presented a unique glimpse of these scribal households, as the apparent immediate demand for the departure of its residents resulted in the relinquishing of objects not normally left behind.
Group 9N-82, also known as the “House of the Bacabs,” and the “Scribes compound” at Copán has similarly been identified as a building dedicated to, and residence of elite scribes. Figures recognized as scribes are set within the front façade of the structure holding shell ink dishes (Fash 1989); Fash, 1991 #550:120; Schele, 1990 #1413:85; Reents-Budet, 1994 #1266:43; Coe, 1997 #1931:100}. Earlier versions of these busts were also encountered in the fill of the structure along with a shell ink dish. The internment of a scribe (Burial VIII-6) was excavated in the northeast corner of this same structure and has a pectoral that identifies him as the son of another scribe at the site (Fash 1991:120).

Interestingly, there is some disagreement as to whether scribes were solely male. The iconographic record on vessels and monuments predominantly shows only men in the act of writing or illustrating (Inomata 2001:325; Inomata, et al. 2002:324). Some researchers have noted the association of the scribal title ah k’u hun with the names of a selection of women on monuments and vessels, the implication thus being that women could be scribes (Coe and Kerr 1997:99). However, these women are typically depicted as onlookers or participants in a courtly event, and while a few may have been adorned in scribe-like headdresses, they are not engaged in typical scribal performances. Moreover, the scribal titles ah k’u hun means “he of the holy books,” and similarly the other scribal title ah ts’ib means “he of the writing” (Coe and Kerr 1997:99), with “ah” specifically meaning “he of…,” thus further suggesting the position of scribe was gender specific. Additionally, epigraphic evidence from the pectoral mentioned above in Copán Burial VIII-6, and on a hieroglyphic bench associated with Structure 9N-82 also indicates that scribal positions were inherited from father to son (Fash 1991:120, 162; Schele and Freidel 1990:85), a tradition that evidently continued into historic times (Roys 1983). Given their fundamental value,
and near absence within the archaeological record, including in burials, it stands to reason that scribal implements, like the position, may also have been inherited or passed on upon the retirement or death of a preceding scribe. Such a practice would also help explain why so few scribal implements are found in burials.

**Burial PR10-04**

The individual in PR10-04 was placed in a supine, east-southeast to west-northwest extended position, with the head towards the east-southeast as was indicated by the layout of the skeletal remains. Similarly, to the other burials, the skeletal remains were fragmentary and in a poor state of preservation, with many of the existing bones, including the skull, seemingly having been crushed over time. While the burial was not defined by any sort of distinct pit, crypt or by any sort of masonry means, a partially modified limestone rock was intentionally placed east of the individual’s head, in a fashion reminiscent of the three uncut stones used to define the cranial area in Burial PR10-02. The area in which the individual was laid was prepared through the intentional deposition of loosely packed light brown, fine grained dirt with high gravel content, very distinct from the surrounding haphazard and holey core fill. The recognized limits of the burial area measured approximately 166 x 68 cm (see Figure 6.24).
Figure 6.24: Top plan of Burial PR10-04.

The skeletons fragmentary and poorly preserved state made assessments of the individual’s sex difficult. The incomplete and damaged cranium made it impossible to determine whether or not the cranium had been culturally modified. Where preservation and reconstruction allowed, measurements of bones used in sex determination were taken. Discriminant function analysis of the left clavicle, right humerus, left femur and left fibula suggested that the individual interred in Burial PR10-04 was probably male (Briggs 2003:154).

The presence of twenty-seven teeth, including “two deciduous teeth, and four unerupted M3s, or “wisdom teeth” with incomplete root formation” (Briggs 2003:154) in a concentrated area along with the skull, maxilla and mandible fragments, indicated that the individual was an adolescent aged 12 to 20 years at the time of their death. The permanent molars and premolars showed moderate wear patterns. While two carries and minimal calculus development were identified, there was no indication of dental modification. Osteological analyses did not identify
or detect any other pathologies or indications of trauma in these skeletal remains (Briggs 2003:154).

**Table 6.4: Table of ceramic types found in association with Burial PR10-04.**

<table>
<thead>
<tr>
<th>Type Variety</th>
<th>Quantity</th>
</tr>
</thead>
<tbody>
<tr>
<td>Achote Black: Variety Unspecified (Buff paste)</td>
<td>1</td>
</tr>
<tr>
<td>Aguila Orange: Variety Unspecified</td>
<td>1</td>
</tr>
<tr>
<td>Cambio Unslipped: Variety Unspecified</td>
<td>1</td>
</tr>
<tr>
<td>Chambel Striated: Chambel Variety</td>
<td>1</td>
</tr>
<tr>
<td>Chilar Fluted: Variety Unspecified</td>
<td>1</td>
</tr>
<tr>
<td>Coco Red: Variety Unspecified</td>
<td>6</td>
</tr>
<tr>
<td>Kik Red: Kik Variety</td>
<td>1</td>
</tr>
<tr>
<td>Langostino Red: Langostino Variety</td>
<td>1</td>
</tr>
<tr>
<td>Nitan Composite: Nitan Variety</td>
<td>1</td>
</tr>
<tr>
<td>Strath Bogue Unslipped: Variety Unspecified</td>
<td>3</td>
</tr>
<tr>
<td>Ticul Thin Slate: Ticul Variety</td>
<td>3</td>
</tr>
<tr>
<td>Tinaja Red: Nanzal Variety</td>
<td>5</td>
</tr>
<tr>
<td>UID Brown slip</td>
<td>2</td>
</tr>
<tr>
<td>UID Eroded/Unslipped</td>
<td>15</td>
</tr>
<tr>
<td>UID Eroded/Unslipped Early Classic</td>
<td>1</td>
</tr>
<tr>
<td>UID Polychrome</td>
<td>1</td>
</tr>
<tr>
<td>UID Red slipped</td>
<td>1</td>
</tr>
<tr>
<td>UID Striated, Brush</td>
<td>27</td>
</tr>
<tr>
<td>UID Striated, Herringbone</td>
<td>3</td>
</tr>
<tr>
<td><strong>Total</strong></td>
<td><strong>75</strong></td>
</tr>
</tbody>
</table>

A total of 75 ceramic sherds (see Table 6.4), 22 lithic debitage flakes, a battered chalcedony nodule, and a peculiar bi-conically drilled limestone rock were recovered from the area of the internment (see Figure 6.25). An informal shell bead fashioned from a small piece of *Stombidae* (Strombus) (see Figure 5. 5), four *Pomacea* shell fragments, and as discussed above, a paper polisher was also found in association with this burial (see Figure 6.23b).
As has been typical with all the burials, most of the ceramic sherds were unable to be securely typed due to their lack of diagnostic attributes, size and or preservation issues. Nonetheless, of those that were able to be identified to type, the majority were determined to be specific to the local northern Belize Rancho and Tepeu III ceramic spheres (See Figure 6.26). The majority of unidentifiable sherds were striated olla body sherds that are presumed to have been from prominent vessel types of the Rancho ceramic sphere, such as Burgos/Progresso, Blue/Freshwater Creek, Chambel or Dumbcane Striated.

Figure 6.25: Bi-conically drilled limestone rock from Burial PR10-04.
Figure 6.26: Distribution of ceramics from Burial PR10-04 by affiliated ceramic sphere.

Figure 6.27: Distribution of ceramics from Burial PR10-04 by vessel form and associated ceramic sphere.
There are some notable correlations between vessel forms and surface treatments however. Bowls and Basins are primarily Red slipped, and as expected, Ollas are either striated or unslipped (see Figure 6.28). As mentioned before, the majority of sherds from all of the burials, including Burial PR10-04 are striated olla body sherds which were unable to be securely classified to a specific ceramic type, however, they most likely are associated with one of the main Terminal classic Olla types seen at Strath Bogue, being Chambel, Blue/Freshwater Creek, Burgos/Progresso and Dumbcane Striated. They also may have belonged to other Late/Terminal Classic striated types seen in other ceramic spheres, including Encanto and Piste Striated, although these types are far less frequent. Despite the fact that some specimens of Early Classic Triunfo Striated have been identified at Strath Bogue, they are similarly rare, and thus it is likely that most if not all striated types date to the Terminal Classic period. Granted the form data is skewed due to the inability to determine a large number of the specimen’s forms, there still do not appear to be any specific correlations between formal types and ceramic spheres (see Figure 6.27).

As was seen elsewhere (Ferguson 2001:105), the fill typically associated with burial features at Strath Bogue is construction fill that was excavated from the core of the structure by the Maya for the initial preparation of the burial pit and subsequently used to cover the remains upon the individual’s interment. Secondary or re-deposited midden deposits can also be included with the filling of the internment area and resealing the structure. The inclusion of the few Early Classic period ceramic sherds in the burials is attributed to this process.
Figure 6.28: Distribution of vessel forms by surface treatment for specimens from Burial PR10-04.

**PROBLEMATIC DEPOSIT - HUMAN REMAINS FROM MIDDEN CONTEXT**

Completely out of any defined burial context, a small collection of human remains was recovered from a midden located off the northeastern corner of Structure 5 (Figure 6.2 and Figure 6.29). This midden deposit was securely dated to the Terminal Classic period based on its associated ceramics. Two temporal bone fragments and another unidentifiable cranial fragment were recovered from two separate units towards the bottom of the midden deposit. Due to the small number of bones recovered, and their lack of discriminate traits, sex and age determinations were unable to be made.
Human remains are not infrequently encountered within midden deposits. In such instances individuals were typically interred in middens with deep accumulations into which an individual could be easily laid to rest. Such deposits however were often the subject of removal and dispersal, either intentionally being dug up at a later date and re-deposited elsewhere as secondary burials, or in the reuse of midden accumulations as architectural fill elsewhere within a given community or across a site (Haviland, et al. 1985:14; Tiesler 2007:15). It is possible that an intentional burial had been placed in the midden and was later removed and re-deposited elsewhere by the Maya, however there was no evidence of this midden having been disturbed after it was placed in this location.

The sheer number of ceramics associated with this deposit indicate that it was a midden, as well as the breadth of artifacts recovered from it. In addition to a large number of ceramic sherds, two ceramic spindle whorls, a ceramic net weight and a fragment of a ceramic disc were recovered from this deposit. A number of obsidian blade fragments were recovered (medial=11, proximal=12, distal=2), as was a complete core and an incomplete core, but not one complete obsidian blade was found. The *Strombus* shell pigment holder discussed earlier (see Figure 6.23e), a *Strombus* shell adorno and a cut piece of *Strombus* were also recovered, along with 24 *Pomacea* shell fragments. The midden also contained a number of lithic flakes and tools, including the chert palettes discussed above (Figure 6.20), a range of biface tools, unifacial scrapers, cores, a macroblade, a stemmed blade and 2 cores. This midden also contained the highest concentration of faunal remains, including 24 *Pomacea* shell fragments, a number of bones from white tailed deer (*Odocoileus virginianus*), dog (*Canis familiaris*), turtle (*Emydidae*), and unidentifiable large Mammalia.
A total of 2,752 ceramics sherds recovered came from Structure 5, comprising 18% of the total number of analyzed sherds from Strath Bogue. Due to the high volume of ceramics recovered, a full array of ceramic types was identified (Table 6.5). As with all contexts at Strath Bogue, there were a number of undiagnostic sherds that could not be identified to type, the majority of which were body sherds from striated vessels, which likely belonged to the Burgos/Progresso, Blue/Freshwater Creek, Dumbcane, or Chambel Striated Rancho sphere ceramic types. The diagnostic ceramic types are overwhelmingly associated with the Rancho ceramic sphere, with Tepeu II-III ceramic types also being well represented. Surprisingly, there are nearly the same numbers of Cehpech and Sotuta sphere related ceramics present, and both are in relatively few numbers.
Figure 6.29: Top plan of units encompassing northeast corner of Structure 5 and associated problematic deposit/midden.
Table 6.5: Ceramic types from problematic deposit/midden associated with Structure 5.

<table>
<thead>
<tr>
<th>Type: variety</th>
<th>Quantity</th>
</tr>
</thead>
<tbody>
<tr>
<td>Achote Black: Provisional Variety</td>
<td>32</td>
</tr>
<tr>
<td>Achote Black: Variety Unspecified (Buff paste)</td>
<td>21</td>
</tr>
<tr>
<td>Achote Black: Variety Unspecified (Pink paste)</td>
<td>20</td>
</tr>
<tr>
<td>Achote Black: Variety Unspecified (Salmon paste)</td>
<td>86</td>
</tr>
<tr>
<td>Aguila Orange: Dos Hermanos Variety</td>
<td>2</td>
</tr>
<tr>
<td>Aguila Orange: Variety Unspecified</td>
<td>4</td>
</tr>
<tr>
<td>Blonde Unslipped: Variety Unspecified</td>
<td>7</td>
</tr>
<tr>
<td>Freshwater/Blue Creek Striated: Variety Unspecified</td>
<td>5</td>
</tr>
<tr>
<td>Burgos/Progresso Striated: Variety Unspecified</td>
<td>17</td>
</tr>
<tr>
<td>Buyuk Striated: Buyuk Variety</td>
<td>24</td>
</tr>
<tr>
<td>Campbells Red: Campbells Variety</td>
<td>104</td>
</tr>
<tr>
<td>Sharp Red: Variety Unspecified</td>
<td>21</td>
</tr>
<tr>
<td>Chambel Striated: Chambel Variety</td>
<td>22</td>
</tr>
<tr>
<td>Coco Red: Variety Unspecified</td>
<td>65</td>
</tr>
<tr>
<td>Daylight Orange: Darknight Variety</td>
<td>2</td>
</tr>
<tr>
<td>Dos Arroyos Orange Polychrome: Variety Unspecified</td>
<td>1</td>
</tr>
<tr>
<td>Dumbcane Striated: Variety Unspecified</td>
<td>23</td>
</tr>
<tr>
<td>Encanto Striated: Progress Variety</td>
<td>8</td>
</tr>
<tr>
<td>Encanto Striated: Variety Unspecified</td>
<td>3</td>
</tr>
<tr>
<td>Encanto Striated: Yokat Variety</td>
<td>1</td>
</tr>
<tr>
<td>Fat Polychrome: Variety Unspecified</td>
<td>1</td>
</tr>
<tr>
<td>Jaguarandi Brown: Jaguarundi Variety</td>
<td>2</td>
</tr>
<tr>
<td>Kik Group</td>
<td>78</td>
</tr>
<tr>
<td>Kik Red: Kik Variety</td>
<td>222</td>
</tr>
<tr>
<td>Meditation Black: Meditation Variety</td>
<td>1</td>
</tr>
<tr>
<td>Muna Group</td>
<td>1</td>
</tr>
<tr>
<td>Muna Slate: Metzabok Variety</td>
<td>2</td>
</tr>
<tr>
<td>Muna Slate: Variety Unspecified</td>
<td>7</td>
</tr>
<tr>
<td>Ohel Polychrome</td>
<td>2</td>
</tr>
<tr>
<td>Ohel Red: Ohel Variety</td>
<td>30</td>
</tr>
<tr>
<td>Palmar Orange Polychrome: Variety Unspecified</td>
<td>8</td>
</tr>
<tr>
<td>Piste Striated: Variety Unspecified</td>
<td>10</td>
</tr>
<tr>
<td>Red Neck Mother Striated: Red Neck Variety</td>
<td>11</td>
</tr>
<tr>
<td>Sakatan Unslipped: Sakatan Variety</td>
<td>1</td>
</tr>
<tr>
<td>Savinal Cream: Savinal Variety</td>
<td>16</td>
</tr>
<tr>
<td>Saxche Orange Polychrome: Saxche Unspecified</td>
<td>25</td>
</tr>
<tr>
<td>Sisal Unslipped: Variety Unspecified</td>
<td>1</td>
</tr>
<tr>
<td>Strath Bogue Unslipped: Variety Unspecified</td>
<td>68</td>
</tr>
<tr>
<td>Ticul Thin Slate: Ticul Variety</td>
<td>5</td>
</tr>
<tr>
<td>Tsabak Unslipped: Tsabak Variety</td>
<td>11</td>
</tr>
<tr>
<td>Zakpah Orange-Red: Variety Unspecified</td>
<td>5</td>
</tr>
<tr>
<td>UID Black slipped</td>
<td>9</td>
</tr>
<tr>
<td>UID Eroded/Unslipped</td>
<td>805</td>
</tr>
<tr>
<td>UID Incised</td>
<td>1</td>
</tr>
<tr>
<td>UID Orange Slipped</td>
<td>24</td>
</tr>
<tr>
<td>UID Polychrome</td>
<td>1</td>
</tr>
<tr>
<td>UID Red slipped</td>
<td>17</td>
</tr>
<tr>
<td>UID Red-on-cream</td>
<td>1</td>
</tr>
<tr>
<td>UID Slate</td>
<td>2</td>
</tr>
<tr>
<td>UID Striated</td>
<td>737</td>
</tr>
</tbody>
</table>

Total 2572
Table 6.6: Table of represented ceramic spheres in Structure 5 midden.

<table>
<thead>
<tr>
<th>Ceramic Sphere</th>
<th>Quantity</th>
<th>Percentage of Deposit</th>
</tr>
</thead>
<tbody>
<tr>
<td>Rancho</td>
<td>716</td>
<td>27.57%</td>
</tr>
<tr>
<td>Tepeu II-III</td>
<td>207</td>
<td>7.97%</td>
</tr>
<tr>
<td>Early Facet Kanan</td>
<td>16</td>
<td>0.62%</td>
</tr>
<tr>
<td>Cehpech</td>
<td>15</td>
<td>0.58%</td>
</tr>
<tr>
<td>Sotuta</td>
<td>11</td>
<td>0.42%</td>
</tr>
<tr>
<td>Tepeu III</td>
<td>2</td>
<td>0.08%</td>
</tr>
<tr>
<td>Rancho-Early Kanan</td>
<td>1</td>
<td>0.04%</td>
</tr>
<tr>
<td>Tzakol</td>
<td>7</td>
<td>0.27%</td>
</tr>
<tr>
<td>Unknown</td>
<td>1597</td>
<td>61.49%</td>
</tr>
<tr>
<td><strong>Total</strong></td>
<td><strong>2572</strong></td>
<td><strong>99.0%</strong></td>
</tr>
</tbody>
</table>

**PROGRESSO SHORE BURIAL**

Data pertaining to a Terminal Classic period burial associated with a household structure located along the western shore of the Progresso Lagoon, and approximately 1.5 kilometers from Strath Bogue was included in this study in order to obtain a more comprehensive understanding of the Terminal Classic period in the area for comparative purposes (Figure 6.30). Structure 3 was one of four structures associated with the Chuk Group, a grouping of solitary structures all within close proximity to one another. Structure 3 was located approximately 200 meters from the Progresso Lagoon and was a relatively small household structure located on a natural ridge, which had been artificially modified to create a platform or small patio area (Ferguson 2001:99). Unlike at Strath Bogue, Postclassic and Colonial period artifactual debris was found scattered on the surface off of the ridge.

Contrasting with the Strath Bogue burials, the Progresso Lagoon burial was not interred within the structure itself, but was located at the base of the structure, in a restricted (50cmx60cm) and haphazardly defined cavity below the floor and within the fill of the modified ridge/patio.
(Figure 6.31). The majority of bones and teeth were fragmentary, poorly preserved, and appeared to be “floating” within the fill. The small size of the internment area, paired with their dispersed nature of the bones suggested the bones may not have been articulated when interred, and thus this internment may have been a secondary burial (Ferguson 2001:100).

Figure 6.30: Map of Progresso Lagoon Region, showing location of Strath Bogue and Progresso Shore and Caye Coco.
Analysis of the bones while fragmentary was able to ascertain that this individual was an adult, between the ages of 21 and 25 years of age. Discriminant analysis of the bones found that the gracile appearance of three partial long bone diaphyses suggests that this individual was a female. Due to the eroded and fragmentary nature of the skull, we were unable to determine if the cranium had been modified or not. A total of 12 teeth were recovered, and no significant calculus or caries were observed, however the teeth were also in poor condition (M. Lullen Briggs, personal communication, 2013).

While the burial did not contain any notable burial “goods” or offerings, 184 ceramic sherds were associated with the burial, 77 of which were directly associated with the human
remains (three arbitrary levels). Unfortunately, due to poor preservation and a number of sherds having been burned, a large percentage of this assemblage was unable to be typed. However, as with the Strath Bogue deposits, the majority of these unidentifiable specimens were body sherds of striated ollas, and likely pertain to such Rancho sphere ceramic types as Burgos/Progresso, Blue/Freshwater Creek, Dumbcane or Chambel Striated. Two sherds, one Preclassic sherd and one Early Classic were also recovered from this context. Table 6.7 lists the different ceramic types and quantities recovered from the deposits associated with the Progresso shore burial.

Table 6.7: Table of ceramic types found in association with Progresso Shore burial pit.

<table>
<thead>
<tr>
<th>Type Variety</th>
<th>Quantity</th>
</tr>
</thead>
<tbody>
<tr>
<td>Achote Black: Provisional Variety</td>
<td>1</td>
</tr>
<tr>
<td>Achote Black: Variety Unspecified (Buff paste)</td>
<td>2</td>
</tr>
<tr>
<td>Achote Black: Variety Unspecified (Salmon paste)</td>
<td>8</td>
</tr>
<tr>
<td>Campbells Red: Campbells Variety</td>
<td>3</td>
</tr>
<tr>
<td>Sharp Red: Variety Unspecified</td>
<td>3</td>
</tr>
<tr>
<td>Chambel Striated: Chambel Variety</td>
<td>5</td>
</tr>
<tr>
<td>Coco Red: Variety Unspecified</td>
<td>19</td>
</tr>
<tr>
<td>Daylight Orange: Darknight Variety</td>
<td>1</td>
</tr>
<tr>
<td>Fat Polychrome: Variety Unspecified</td>
<td>1</td>
</tr>
<tr>
<td>Kik Red: Kik Variety</td>
<td>2</td>
</tr>
<tr>
<td>Muna Slate: Variety Unspecified</td>
<td>1</td>
</tr>
<tr>
<td>Ohel Red: Ohel Variety</td>
<td>1</td>
</tr>
<tr>
<td>Palmar Orange Polychrome: Variety Unspecified</td>
<td>3</td>
</tr>
<tr>
<td>Saxche Orange Polychrome: Saxche Unspecified</td>
<td>1</td>
</tr>
<tr>
<td>Sierra Red: Variety Unspecified</td>
<td>1</td>
</tr>
<tr>
<td>Strath Bogue Unslipped: Variety Unspecified</td>
<td>2</td>
</tr>
<tr>
<td>Ticul Thin Slate: Ticul Variety</td>
<td>1</td>
</tr>
<tr>
<td>Tsabak Unslipped: Tsabak Variety</td>
<td>1</td>
</tr>
<tr>
<td>UID Applique</td>
<td>1</td>
</tr>
<tr>
<td>UID Eroded/Unslipped</td>
<td>62</td>
</tr>
<tr>
<td>UID Red slipped</td>
<td>17</td>
</tr>
<tr>
<td>UID Striated</td>
<td>47</td>
</tr>
<tr>
<td>Vista Alegre Striated: Variety Unspecified</td>
<td>1</td>
</tr>
<tr>
<td><strong>Total</strong></td>
<td><strong>184</strong></td>
</tr>
</tbody>
</table>
The number of ceramics associated with the Progresso shore burial is larger than that associated with the majority of burials at Strath Bogue, and yet was confined to a smaller space. The identifiable ceramics are very prominently Terminal Classic in date, with essentially the same ceramic spheres represented here as were at Strath Bogue, including two early anomalies. However, when we examine the ceramic types and represented spheres of the burial assemblage as presented in Table 6.7 and Table 6.8, some significant differences are recognized.

A much smaller percentage of Cehpech sphere ceramics are represented here than amongst the Strath Bogue burials, with a prominent majority of identifiable ceramic sherds belonging to the local Rancho ceramic sphere. While a significantly higher percentage of this burial’s overall assemblage belongs to the Rancho sphere than was seen with the Strath Bogue burials, indicating a preponderance of locally produced ceramics, the ceramics also indicate that the Progresso household was still participating to some degree in the larger regional exchange network.

### Table 6.8: Table of the percentage of ceramic types from the representative ceramic spheres.

<table>
<thead>
<tr>
<th>Ceramic Sphere</th>
<th>Quantity</th>
<th>Percent of Burial Deposit</th>
</tr>
</thead>
<tbody>
<tr>
<td>Unknown</td>
<td>127</td>
<td>69%</td>
</tr>
<tr>
<td>Rancho</td>
<td>36</td>
<td>20%</td>
</tr>
<tr>
<td>Tepeu II-III</td>
<td>13</td>
<td>7%</td>
</tr>
<tr>
<td>Cehpech</td>
<td>3</td>
<td>2%</td>
</tr>
<tr>
<td>Tepeu III</td>
<td>1</td>
<td>1%</td>
</tr>
<tr>
<td>Rancho-Early Facet Kanan</td>
<td>1</td>
<td>1%</td>
</tr>
<tr>
<td>Early Facet Kanan</td>
<td>1</td>
<td>1%</td>
</tr>
<tr>
<td>Early Classic</td>
<td>1</td>
<td>1%</td>
</tr>
<tr>
<td>Preclassic</td>
<td>1</td>
<td>1%</td>
</tr>
<tr>
<td><strong>TOTAL</strong></td>
<td><strong>184</strong></td>
<td><strong>100%</strong></td>
</tr>
</tbody>
</table>

One of the prominent ceramic types within the Progresso ceramic complex is Coco Red (Figure 6.32). Coco Red is the most prominent diagnostic type within the Progresso shore burial, 319
representing 10% of the burial ceramic assemblage. This type is common amongst Terminal Classic occupations along the Progresso Lagoon shore, on the island of Caye Coco, as well as at Strath Bogue. However, there are some variations between the specimens at Strath Bogue compared to those communities located at the Lagoon. Coco Red is distinct within the Progresso complex due to its blackened, improperly fired or partially reduced cores, sand temper, and often pitted, cracked or eroding rough, buff colored surfaces, and predominantly bowl form ([Masson 2002b:127, Fig. 7.1], see Chapter 8).

![Figure 6.32: Photo of Coco Red: Variety Unspecified.](image)

Coco Red or similar types have not been reported elsewhere at northern Belize sites, although a contemporary similarly eroding type at Cerros called Sakatan Unslipped was identified.
by Walker (Walker 1990:77-78, Fig. 2.5c). Coco Red was assigned to the later Early Postclassic Zakpah ceramic group by Masson based on its buff exterior and sandy paste. Initially Masson had combined ceramics that resembled another Early Postclassic type, Tsabak Unslipped (Walker 1990:91) with the Coco Red sherds, but after further analysis I have separated those that were perceived precursors of Tsabak in form and paste/temper from the Coco Red type, creating a new type called Strath Bogue Unslipped (see Chapter 8).

There are some important local variations between the Coco Red and Strath Bogue Unslipped sherds from Strath Bogue compared to those from the Progresso shore and Caye Coco. Those recovered from Strath Bogue are more crumbly than eroded, often to the point of falling apart in one’s hand as a result of their very poorly reduced firing atmosphere. They are also thicker than those from Progresso shore and Caye Coco, with the black core taking up a larger portion of the paste than those from around the lagoon. While those recovered from Caye Coco and the shore still exhibit evidence of having been incompletely or improperly fired, the dark core is thinner and sometimes red instead of black, and they tend to have smoother eroded exteriors rather than crumbly like at Strath Bogue. Overall those centered at the lagoon are generally executed better than those at Strath Bogue, with their paste being harder, crumbling only when under pressure. Additionally, the Coco Red specimens associated with the shore community and Caye Coco tend to be thinner than those at Strath Bogue, in some cases very thin, with the red slip adhering more effectively to the lagoon specimens.

These variations are significant for a couple of reasons. While some might argue that these differences could signify two different production centers, based on the variation in their execution, I do not believe this to be the case. We know that the majority of Terminal Classic
ceramics from Strath Bogue as well as the Progresso shore household were of established types, whose quality and broad northern Belize representation indicate they were made by established ceramicists and thus production centers. Both the Coco Red and Strath Bogue unslipped types however are poorly executed, the paste recipe and required firing process not having yet been properly formulated. I believe the reasoning behind this is that the people making these new types were new to the area and were perhaps attempting to replicate ceramics from their homeland, or make new forms but with local, unfamiliar raw materials, and thus they were in the process of working out the right recipe and relative firing temperatures and timing. This not only accounts for these poorly devised ceramics, but also explains the differences between the Strath Bogue and Lagoon specimens, as I further believe they represent different evolutionary stages essentially in their production, with their initial production being amongst the Strath Bogue community, and their later, better executed forms being found along the Progresso shore and on Caye Coco. This argument is further substantiated when we consider the relationship and perhaps “evolution” of these types into the Early Postclassic Zakpah Orange-red and Tsabak Unslipped types, at which time the producers seem to have arrived at an adequate recipe and firing process. The premise that the Strath Bogue community was an earlier “colony” to the area than the Progresso shore households is further substantiated by the results of carbon and nitrogen isotopic analyses, as will be shown in the following chapter.

Additionally, while few in number, the inclusion of a Fat Polychrome sherd, a late Terminal Classic/Early Postclassic ceramic type, as well as an Early Postclassic Tsabak Unslipped, also supports the likelihood that this burial dates towards the end of the Terminal Classic period.


DISCUSSION

Four purposeful internments were encountered within the construction fill of Structure 5 at Strath Bogue, a household structure with multiple construction episodes, all dating to the Terminal Classic period. The human remains were unfortunately fragmentary and in a poor state of preservation. In the absence of formal crypts, all four individuals were essentially placed in informal, simple pits delineated by varying levels of stone-line demarcation. All four burials were in the supine, extended position with the exception of burial PR10-02 which was in a semi-flexed position. Burials PR10-01 and PR10-03 ran northeast to southwest, with the head to the northeast. Burial PR10-02 was placed north to south, with the head to the north, while burial PR10-04 was placed east to west, with the heat to the east. The individuals interred in Burials PR10-01 and PR10-02 were buried at relatively the same depths, and adjacent to one another. Burial PR10-03 was located approximately 10cm below PR10-01 and was thus interred earlier. Burial PR10-04 was the deepest interment and was located just above the earliest Terminal Classic floor episode. Burial PR10-02 appears to have been placed in a semi-flexed position, north of east-to-west running, deeper and thus presumably older Burial PR10-04 in order to avoid disturbing it (Briggs 2003:153). It thus stands to reason that Burial PR10-04 was the first interment to be placed within Structure 5.

Age determinations could not be made on the probably female interred in burial PR10-02 nor with the male interred in burial PR10-03. Burial PR10-01 contained a woman between the ages of 20-30, while PR10-04 contained a male adolescent/young adult between 12-20 years of age. The individual in PR10-01 was the only individual to display dental modification in several upper teeth in the form of inlays as well as filing. This female also displayed evidence of
osteomyelitis and bone regeneration, and treponemal infection in her long bones. Other than calculus and minimal caries in the teeth, the other three individuals displayed no evidence of pathologies (Briggs 2002a, 2003).

The presence of a shell ink dish in Burial PR10-03, an object directly and most regularly associated with scribes suggests that the individual interred in in this crypt was potentially a scribe himself. The presence of a second individual with another scribal related utensil, the paper polisher, in Burial PR10-04 is particularly noteworthy. Furthermore, the existence of other scribal accoutrements recovered from within Structure 5 and its associated midden, lends credence to the likelihood that not only were both of these individuals scribes, but that Structure 5 was a scribal household. As noted above, scribal instruments had intrinsic value, and thus they were rarely abandoned. Their small size meant they were easily transported and personalized (Inomata and Triadan 2000:58-59), thus the inclusion of these items within burials is significant and is understood to relate to these individuals’ office.

While the poor preservation of the human remains made sexing of the individuals in PR10-03 and PR10-04 difficult, both of the possible scribes from Structure 5 have been identified as male (Briggs 2002a, 2003). Epigraphic and historical evidence suggests that the scribal office was one held by men (Coe and Kerr 1997:99), and was a hereditary position passed on from father to son (Fash 1991:120, 162; Roys 1983; Schele and Freidel 1990:85). Given their interment in the same structure, it is likely that the individuals in Burials PR10-03 and PR10-04 were related; perhaps even father and son whose scribal office was inherited.
It is hypothesized that those who held a scribal office were granted a considerable amount of distinction from the rest of society, and that these individuals may very well have influenced or played roles in power struggles within political realms (Inomata, et al. 2002:324). Migration theorists have noted that successful population movements involve the ability of a prominent member of the community, often a lineage elder or founder, or member of an apex family who is able to attract additional kin folk, advocates or clients with them to their destination location (Anthony 1997:23; Fox 1987, 1989). Such individuals would have had to exude a certain amount of prominence, charisma, organization and undoubtedly power, in order to attract followers. Scribes are suggested to have been members of elite Maya society, perhaps even holding positions of nobility (Coe and Kerr 1997:97). Thus, having the ability to attract an individual with the prestige and aristocracy of a scribe; an individual who was responsible for documenting and maintaining histories, calendric cycles, helped control knowledge, and had a direct connection to the gods, would have given political power and prestige to the principal member of a migrant group (Inomata 2001:321, 324 332). Thus, the association of a member of the scribal elite, and the ability to persuade such an important member of society to migrate alongside your group would no doubt have been significant to those who may follow.

Unfortunately, the ceramic assemblage associated with the burial deposits, as well the problematic deposit/midden in which loose human remains were recovered, suffered the same preservation issues seen across the site. An overwhelming number of ceramic specimens were unable to be identified or did not possess the traits necessary to determine modal forms, slip or decorative features or their type: variety affiliations. Regardless, a number of relevant observations can be made.
Given that a large majority of specimens were body sherds of striated ollas and recognizing the prominence of Rancho sphere ollas within the Progresso complex, it is safe to say the majority of these likely belong to the Blue/Freshwater Creek, Burgos/Progresso, Dumbcan or Chambel Striated ceramic groups. Thus, the true number and percentage of sherds associated with the Rancho sphere is much larger than that documented based on diagnostic specimens.

Based on the diagnostic ceramics associated with the burials, we can firmly say that the all of the intended interments date to the Terminal Classic period. Moreover, the ceramics indicate a prominent involvement with the local Rancho ceramic sphere, but also show the participation in regional exchange/trade networks through the presence of ceramics associated with the Tepeu, Cehpech and Sotuta ceramic spheres.

The inclusion of data and discussion concerning the burial from the Progresso shore household was provided in order to compare and contrast Terminal Classic burial data, and to provide a more comprehensive understanding of Terminal Classic period occupations in the Progresso Lagoon region. Contrasting to the burials encountered at Strath Bogue, the Progresso shore burial appears to have been a secondary pit burial placed exterior to the household. Despite the fact that the secondary nature of the burial added to the fragmentary nature of the human remains, it was able to be determined that the individual was a female between the ages of 21 and 25. No pathologies were observed, and no burial goods were interred with this individual.

The analysis of the ceramics associated with the Progresso shore burial pit provided some interesting points of discussion. Comparison of two Progresso complex ceramic types, Coco Red and Strath Bogue unslipped recovered from both Strath Bogue and the Progresso shore locations
resulted in some interesting observations. Both Coco Red and Strath Bogue Unslipped have been recognized as earlier forms of Early Postclassic types, Zakpah Orange-Red and Tsabak Unslipped respectfully. Both Coco Red and Strath Bogue Unslipped are generally poorly executed, their firing having been incomplete and resulting in black cores, and their paste having poor plasticity causing the surfaces of sherds to crack and even crumble. I have argued that these ceramic types are poorly executed due to the fact that the people fabricating them were new to the area, and unfamiliar with the local clays and tempers. Thus, they were essentially still devising the appropriate recipes and firing procedures to be effective for the new raw materials. Interestingly, it was discovered that those associated with the shore community were predominantly better fabricated than those found at Strath Bogue. While they still were not well executed, the firing process was completed in a more reduced atmosphere, resulting in thinner black bands in the core of the ceramics, and some having red cores. Their surfaces were more prominently cracked than crumbly and the sherds themselves were thinner than those at Strath Bogue. It was thus argued that variations in the execution of these ceramic types suggest the Strath Bogue peoples were the earlier colonizers of the area, with their fabrication of the Coco Red and Strath Bogue Unslipped vessels being at the introductory stages of production and development. On the other hand, the Progresso shore household was a later arrival to the region, which benefited to a degree from the Strath Bogue communities experience with the local raw materials, and their ceramics were better executed.
CHAPTER 7: STRATH BOGUE AND PROGRESSO SHORE HUMAN REMAINS ISOTOPIC RESULTS

This chapter reports on the results of the stable isotopic analyses of the human remains recovered at Strath Bogue and an individual associated with a solitary house mound in the linearly dispersed Progresso shore community and compares and contrasts the results with that reported from other Maya sites. While nitrogen and carbon isotopic analyses are typically intended to shed light on consumption and dietary health patterns, they can also provide additional information on regional diets and even movements of peoples across the landscape. While isotopic analyses have been becoming steadily more prominent in human osteological and faunal analyses, its full potential has yet to be realized by many scholars.

ISOTOPIC DATA

Stable carbon and nitrogen isotope analyses of human skeletal specimens from Strath Bogue were initiated in attempt to construct an understanding of the isotopic variability in locally available foods, and to provide insights into local subsistence economy and dietary patterns and subsistence dependencies. It was also hoped that these data would permit the examination of potential differences in dietary patterns/choices of individuals based on sex and age. Furthermore, data resulting from these analyses would allow temporal, chronological and intra- and inter-regional comparisons to be made.

Due to financial constraints, stable isotopic analysis for this study was limited to the testing of bone collagen, and to the identification of carbon and nitrogen isotopes. Strontium isotope studies are typically conducted in cases questioning the presence of a migrant individual or
community, and have been successful in identifying migrants throughout prehistory (Beard and Johnson 2000; Bentley 2006; Bentley, et al. 2002; Budd, et al. 2004; Ericson 1985; Freiwald 2011; Grupe, et al. 1997; Hoogewerff, et al. 2001; D. T. Price, et al. 1994; Price, et al. 2008; Price and Gestsdóttir 2005; Schweissing and Grupe 2003; Wright 2005). The cost of strontium isotopic analysis is considerably more than that of carbon and nitrogen isotopic analysis, and so we waited to see how successful the carbon and nitrogen analysis was before an attempt at strontium analyses was initiated. Unfortunately, the poor preservation of the Strath Bogue bones affected the success of the isotopic analyses, and thus strontium analyses were not undertaken.

Methodology and Sampling

The methodology and processing of human remain specimens were the same as those undertaken with the stable isotope analysis of the animal specimens. Please see Chapter 5 for a detailed discussion of these methods and procedures, and a synthesis of how stable isotopic analysis works and what the results can provide. As with the faunal specimens, all isotope analyses were conducted by the University of Oregon’s Archaeometry Facility and funded through a University at Albany Graduate Student Organization research grant.

Skeletal samples of human remains were selected from each individual encountered at Strath Bogue and submitted for stable isotope testing. A fifth individual from a nearby Terminal Classic household structure close to the shore of Progresso Lagoon (Chuk Group, see (Ferguson 2001)) was also tested for comparative interest. Skeletal specimens were chosen on the basis of preservation and the absence of pathologies present in the bone.
The human remains isotopically tested from Strath Bogue were excavated from archaeological deposits associated with Structure 5, a Terminal Classic Period Maya residential structure (see Figure 6.1). Given that all of the human remains encountered at Strath Bogue were associated with Structure 5, it is recognized that any data produced through these analyses are reflective of a single household at the site, and thus are not necessarily indicative of the entire Strath Bogue community. It should also be stated that the absence of burials elsewhere at the site is reflective of the archaeological record, and not a bias in the investigation methodology. Nonetheless, given the variations in burials, differences in ages and sex, and their varying stratigraphic locations within the structure, it was thought that the resulting data would be able to provide a sufficient demographic sample of the site’s residents.

Given the low numbers of representative individuals at Strath Bogue, and the low number of bones preserved in each burial and the general poor preservation of the human remains, there was great concern as to whether the remains would be appropriate for isotopic analyses. Long-bones are typically the chosen elements used in isotopic testing of bone, and thus a tibia, a humerus and femurs were utilized.

Stable carbon and nitrogen isotopic analysis was limited to the testing of bone collagen, and thus neither bone apatite nor teeth were tested. Collagen in human bone is generated and restored over approximately 30 years. Thus, isotope values in human bone are representative of the consumption patterns up to the last 30 years of the individual’s life. Thirty years is an extended period of time in the life of an individual, during which their diet may be affected by various situations which cannot be adjusted for, for example: seasonality or effects of long-term disparities in consumption patterns (i.e., drought), and thus isotopic results represent averages over time.
Typically, stable carbon and nitrogen isotopic analyses of human bone are used to trace food consumption on an individual level and assist in determining an individual’s reliance on terrestrial versus marine resources and different types of plant foods (Vanderwarker 2006:182). However, identification of regional variations in subsistence practices around the Maya area has also allowed researchers to use these same data to identify the presence of foreigners at a given site when an individual or group of people’s carbon and nitrogen isotopic signatures vary from those typical of a site or region (J. Z. Metcalfe, et al. 2009:32; Parker 2011:53; Wright 2007:6).

**Isotopic Analyses Results**

Comparative isotopic ratios in human remains can provide interesting insights into the dynamic nature of Maya diet, and can be used to ascertain social, biological and geographical patterning in subsistence practices amongst variable populations. By comparing variations in the $\delta^{13}C$ and $\delta^{15}N$ ratios of different individuals at a given site, and the averages of distinct populations, and the standard deviations from group means, insights into levels of resource diversity, food preferences, and regional variations can be assessed (Gerry 1997:60; Gerry and Krueger 1997:205-206; Tykot 2002:13).

As can be seen in Table 7.1, three of the samples from Strath Bogue produced results that were problematic. Collagen could not be recovered from Burial PR10-02 because the poor preservation exhibited in the bones from this individual prevented the retrieval of a stable sample. Sample sizes retrieved from Burials PR10-03 and PR10-04 were very small, thus producing carbon
to nitrogen ratios that were not considered acceptable, as the values for these individuals are way outside the normal parameters. An acceptable range of C/N ratios is between 2.9 and 3.6 (DeNiro 1987; Wright 2006). If a combined C3 and C4 human plant consumption diet averages around -14.5‰, and an extremely enriched C3 plant diet has δ¹³C values averaging around -21.5‰, then the -24.36‰ and -25.52‰ values for Burials PR10-02 and Burials PR10-04 respectively are definitely problematic. Similarly, the δ¹⁵N values in these burials are also nowhere near the normal values for humans, and are in fact off the charts (for comparison, see values plotted for Terminal Classic individuals from sites across the Maya area in Table 7.2 and Figure 7.1). Thus, these results will not be utilized in any of the discussions to follow, and therefore the usable isotopic data from this study is limited to that retrieved from Strath Bogue Burial PR10-01 and the Progresso Shore burial.

Table 7.1: Stable carbon and nitrogen isotopic data for Terminal Classic period human remains in this study from Strath Bogue and Progresso Lagoon.

<table>
<thead>
<tr>
<th>Sample ID</th>
<th>Element</th>
<th>δ¹³C%</th>
<th>δ¹⁵N%</th>
<th>C/N Ratio</th>
<th>Comments</th>
</tr>
</thead>
<tbody>
<tr>
<td>SB Burial PR10-01</td>
<td>Human Right Femur</td>
<td>-11.90</td>
<td>8.33</td>
<td>3.59</td>
<td></td>
</tr>
<tr>
<td>Progresso Lagoon Individual</td>
<td>Human Tibia</td>
<td>-11.35</td>
<td>7.17</td>
<td>3.43</td>
<td></td>
</tr>
<tr>
<td>SB Burial PR10-03</td>
<td>Human Right Femur</td>
<td>-25.52</td>
<td>32.21</td>
<td>8.37</td>
<td>This sample is too small, C:N ratio is way outside acceptable values. THIS DATA SHOULD NOT BE USED TO RECONSTRUCT DIET.</td>
</tr>
<tr>
<td>SB Burial PR10-04</td>
<td>Human Left Humerus</td>
<td>-24.36</td>
<td>58.41</td>
<td>13.64</td>
<td>This sample is too small, C:N ratio is way outside acceptable values. THIS DATA SHOULD NOT BE USED TO RECONSTRUCT DIET.</td>
</tr>
<tr>
<td>SB Burial PR10-02</td>
<td>Human Femur</td>
<td>nd</td>
<td>nd</td>
<td>nd</td>
<td>This sample repeatedly disintegrated during demineralization and no sample could be recovered.</td>
</tr>
</tbody>
</table>

As with the faunal analyses, carbon (δ¹³C) and nitrogen (δ¹⁵N) isotope values for the human remains were assessed and compared to the known values of human remains from other sites in the Maya area, as
well as with plants and animal resources typically present and eaten in the Maya area (see Figure 5.6 in previous chapter). Comparisons with plant and animal isotopic values help researchers assess the dietary intake and reliance of these foods by the individual tested. It should be noted that some marine plants and animals can yield δ\textsuperscript{13}C values that can be difficult to differentiate from terrestrial C\textsubscript{4} plants (Schoeninger and Moore 1992:256; Vanderwarker 2006:184), for example fish from the Caribbean have similar δ\textsubscript{13}C values as maize (Tykot and Young 1996; Wright and White 1996:171). Similarly, the nitrogen isotopes of different plants are very similar, with legumes being one of the few more easily identified isotopically, as they register lower than most other plants (near 2-5‰) (Wright and White 1996:172). Fortunately, in some cases terrestrial and marine protein contributions to diet can be differentiated through nitrogen isotopes, as their δ\textsuperscript{15}N values can differ significantly (Coyston, et al. 1999:Fig. 12.1; DeNiro 1987:184; Price, et al. 1985:431; Schoeninger and Moore 1992:256; Vanderwarker 2006:184). This is in part due to the fact that terrestrial, riverine and marine systems have different sources of nitrogen.

Both freshwater and marine fish in the Maya area are noted as having more enriched δ\textsuperscript{15}N values than terrestrial animals. While some terrestrial herbivores have nitrogen isotope values that overlap with shellfish, snails, and reef fish and some C\textsubscript{3} plants, freshwater fish are intermediate to terrestrial animals and marine species, with nitrogen isotopic values typically measuring between 12-20‰ (Gerry and Krueger 1997:199; Schoeninger and Moore 1992:256; Vanderwarker 2006:185, Figure 6.3; White, Pohl, et al. 2001:96; Wright and White 1996:172). This fact is of particular relevance when involving peoples who eat both maize and marine organisms, especially when testing relies on the use of bone collagen (Chisholm, et al. 1982:1132; Vanderwarker 2006:184), and hence nitrogen and carbon isotopes must be examined simultaneously. Given the close proximity of Strath Bogue to the freshwater New River and brackish Progresso Lagoon, as well its relative location to the Caribbean (approximately 20km), consideration of these factors must be made.
Carbon isotope analyses using bone collagen samples in animals has found that diets based on the ingestion of C3 plants, have δ\(^{13}\)C enriched values averaging around -21.5‰, whereas those based entirely on C\(_4\) plants had δ\(^{13}\)C enriched values of around -7.5‰. When a human diet is comprised of both C3 and C\(_4\) plants, the enriched δ\(^{13}\)C values will span these two extremes, but average around -14.5‰ (Gerry and Krueger 1997:197; van der Merwe 1982 cited in Vanderwarker 2006:Fig. 6.1) as meat consumption also affects the carbon isotopic values as well. The consumption of maize fed deer and reef fish will result in more enriched δ\(^{13}\)C values of the consumer, while the consumption of C3 plant animals, such as some wild game, riverine fish, and snails will deplete their δ\(^{13}\)C values (Coyston, et al. 1999:224). The availability and ultimately the consumption of a diverse variety of foodstuffs can also been indicated through the examination of the carbon and nitrogen ratios and their standard deviations. The larger the deviation the greater the diversity (Gerry and Krueger 1997:197:205).

### Placing the Strath Bogue Results into Regional and Comparative Context

Recent investigations of the Precolumbian Maya diet have revealed significant regional variations in isotopic ratios. Investigators have identified “Belizean” and “Petén” isotopic composition patterns of ratios of δ\(^{13}\)C and δ\(^{15}\)N weights that are indicative of the differential consumption of maize and proteins (meat and, or legumes typically) (Gerry 1997:60; Gerry and Krueger 1997:197, 206; Wright and White 1996:174). Similarly, and as expected, isotopic values of individuals inhabiting coastal sites have positive δ\(^{13}\)C and δ\(^{15}\)N values. Significantly, researchers have indicated that δ\(^{13}\)C and δ\(^{15}\)N isotopic data from northern Belize indicates consumption patterns of maize were significantly lower than those characteristic of the Petén or of the Copán regions (Gerry 1993; Gerry and Krueger 1997:197, 206; Wright 2006:113), and that these communities benefited from the availability of a more diverse resources and thus diet, likely
afforded to them in part through their access to aquatic resources (Gerry and Krueger 1997:205; Wright 2006:137).

I have compiled the published stable isotope human data from Terminal Classic period sites within the Maya area, and presented them in Table 7.2, and Figure 7.1. Some of the above noted patterns are readily seen. We can clearly see the “Belizean” isotope patterns with the northern Belize sites of Lamanai, Altun Ha and Chau Hiix, their values noticeably indicating that inhabitants tested from these sites were eating significantly less C4 plants, presumably maize, and C4 enriched animals than those from the Petén region, whose pattern is also clearly evident. Gerry & Krueger have noted that the overall average δ¹³C values for their larger study of Classic period Maya diets were around -10.2 ± 1.3‰, which indicates a heavy ingestion of C₄ plants (Gerry and Krueger 1997:202). Tykot (2002:8) has indicated that a diet measuring a δ¹³C rate of -12.6‰ indicates a diet in which roughly fifty percent of the carbon in the bone collagen is from the consumption of C₄ dominate foods, while one with a more positive δ¹³C rate of -10.2‰ indicates that approximately seventy percent of the carbon in the bone collagen came from C4 enrich foods. Gerry and Krueger have similarly estimated the majority of Classic period diets to have been comprised of approximately 55% maize, while others have found variations between 40% to 75% of their diet based on time periods, age, sex, status and location to affect dietary maize intake (White, et al. 1993; White and Schwarcz 1989). Diets in which the primary source of protein was meat typically produce more negative δ¹³C than that seen in the overall rates for the Maya, but this would also be reflected in positive δ¹⁵N values (Gerry and Krueger 1997).
Figure 7.1: Scatter plot graph illustrating distribution of Terminal Classic human stable nitrogen and carbon isotopic values. ** The Yaxúna data is for a Late Classic/Terminal Classic Individual and not a time period mean.

In terms of nitrogen isotopes, Gerry & Krueger indicated that in their study the overall nitrogen isotope values for the Classic period Maya averaged around 8.7 +/- 1‰, a value that is not representative of seafood consumption, as they would be more positive than this (Gerry and Krueger 1997:202-203). Overall these nitrogen values are typical of populations which rely on terrestrial animals for their protein sources. While there are inter- and intra-site variabilities, diets are differentially identified through the main protein sources based on their δ¹⁵N signatures. A diet rich in legumes will generally range between 4-7‰, while one that includes terrestrial animals
measure between 6-10‰, while one rich in riverine or marine fish, particularly those from more temperate zones will register values between 10-20‰ (Ambrose 1991; Freiwald 2011:257; Lambert 1997; Tykot 2002:4).

If we examine the Strath Bogue and Progresso shore individuals relative to the human isotopic data from other Terminal Classic period sites as presented in Table 7.2 and Figure 7.1, along with the general information discussed above and the published details and arguments made by researchers, some interesting observations can be made not only about the subsistence practices of these individuals, but also of how they differ from those of the region and what these differences mean.

Table 7.2: Table of Late and Terminal Classic period stable carbon and nitrogen isotopic values in individuals from sites across the Maya area.

<table>
<thead>
<tr>
<th>( \delta^{13}C )%</th>
<th>( \delta^{15}N )%</th>
<th>Site</th>
<th>Source</th>
</tr>
</thead>
<tbody>
<tr>
<td>-14.8</td>
<td>10.0</td>
<td>Lamanai</td>
<td>(White, et al. 1993; White and Schwarcz 1989)</td>
</tr>
<tr>
<td>-12.3</td>
<td>10.2</td>
<td>Altun Ha</td>
<td>(White, Pendergast, et al. 2001)</td>
</tr>
<tr>
<td>-11.9</td>
<td>8.3</td>
<td>Strath Bogue*</td>
<td>Current study</td>
</tr>
<tr>
<td>-11.8</td>
<td>6.6</td>
<td>Yaxuná**</td>
<td>(Mansell, et al. 2006)</td>
</tr>
<tr>
<td>-11.4</td>
<td>7.2</td>
<td>Progresso Lagoon*</td>
<td>Current study</td>
</tr>
<tr>
<td>-11.3</td>
<td>8.3</td>
<td>Xunantunich</td>
<td>(Freiwald 2011; Gerry 1993; Piehl 2006)</td>
</tr>
<tr>
<td>-11.0</td>
<td>9.2</td>
<td>Baking Pot</td>
<td>(Gerry 1993; Gerry and Krueger 1997)</td>
</tr>
<tr>
<td>-10.8</td>
<td>9.6</td>
<td>Caracol</td>
<td>(Tykot 2002; Table I)</td>
</tr>
<tr>
<td>-10.6</td>
<td>9.2</td>
<td>Cahal Pech</td>
<td>(Freiwald 2011; Gerry 1993; Piehl 2006)</td>
</tr>
<tr>
<td>-10.5</td>
<td>10.2</td>
<td>Dos Pilas</td>
<td>(Wright 1994)</td>
</tr>
<tr>
<td>-10.3</td>
<td>9.4</td>
<td>Uaxactún</td>
<td>(Gerry 1993; Gerry and Krueger 1997)</td>
</tr>
<tr>
<td>-10.1</td>
<td>9.3</td>
<td>Pacbitun</td>
<td>(White, et al. 1993)</td>
</tr>
<tr>
<td>-10.1</td>
<td>8.8</td>
<td>Caledonia</td>
<td>(Rand, et al. 2013)</td>
</tr>
<tr>
<td>-10.0</td>
<td>7.6</td>
<td>Copán</td>
<td>(Gerry 1993; Gerry and Krueger 1997)</td>
</tr>
<tr>
<td>-9.6</td>
<td>9.3</td>
<td>Seibal</td>
<td>(Gerry and Krueger 1997; Wright 1994)</td>
</tr>
<tr>
<td>-9.2</td>
<td>8.9</td>
<td>Piedras Negras</td>
<td>(Scherer 2007)</td>
</tr>
<tr>
<td>-9.0</td>
<td>9.1</td>
<td>Holmul</td>
<td>(Gerry 1993; Gerry and Krueger 1997)</td>
</tr>
<tr>
<td>-8.9</td>
<td>8.8</td>
<td>Altar de Sacrificios</td>
<td>(Gerry 1993; Gerry and Krueger 1997)</td>
</tr>
<tr>
<td>-8.3</td>
<td>11.4</td>
<td>San Juan/Chac Balam</td>
<td>(Parker 2011)</td>
</tr>
</tbody>
</table>

*All values represent means for the Terminal Classic period at each site, with the exception of these sites.  
*** The Yaxuná data is for a Late Classic/Terminal Classic Individual and not a time period mean.
Based on their relative geographical location, one would suspect that both the Strath Bogue and the Progresso shore individuals would follow the northern “Belize” pattern of a less maize dominant diet. As was the case with the other northern Belize sites, their isotope values do indicate a significant difference in their consumption of C4 plants (presumably maize) and, or C4 enriched animals compared to the Petén and the non-riverine sites of western Belize, in that they are lighter and thus are consuming less maize and C4 enriched foods. Interestingly, however their $\delta^{13}C$ values are also a bit of a departure from the other northern Belize sites. Lamanai’s values are unique altogether, so it is not surprising that the Strath Bogue and Progresso individuals differ from it, but they also differ from the other northern Belize sites, in that they are slightly more positive than their northern Belize counterparts. The Strath Bogue individual’s $\delta^{13}C$ values vary from the Chau Hiix and Altun Ha site means by .4‰, and from the chemically closest central western Belize site of Xunantunich’s mean by -.6‰, thus suggesting that the Strath Bogue individual was presumably consuming more C4/C4 enriched products than the other northern Belize inhabitants, but less than the Xunantunich and other western Belize site means (Freiwald 2011; Gerry 1993; J. Z. Metcalfe, et al. 2009:Table 4; Piehl 2006; White, Pendergast, et al. 2001:Table 3).

What is of additional interest is the fact that the carbon isotope values for the Strath Bogue and Progresso individuals also vary from each other, despite their close proximity to one another. In fact, they differ on practically the same scale as the Strath Bogue individual does from the northern Belize and western Belize site means. The Progresso Lagoon individual’s $\delta^{13}C$ value is .5‰ more positive than the Strath Bogue individual, and thus exhibits a greater departure from the northern Belize pattern by .9‰, and a higher consumption of C4 and C4 enriched products.
The Strath Bogue individual’s carbon isotope value is most similar to that of the Yaxuná individual, with the Strath Bogue individual registering a slightly more negative rate by -0.1‰. Conversely, the Progresso Lagoon individual exhibits a value that is most similar to the Xunantunich mean value, registering a value that differs from that site by a mere -0.1‰. These finds are of particular interest considering that both Cehpech and Tepeu sphere ceramic types, ceramics associated with the Yucatán and Petén respectively, were also found in association with both of these individuals.

Following the previously mentioned calculations of percentages of carbon in bone collagen attributable to the consumption of C4 dominate foods, a $\delta^{13}C$ value of -12.6‰ indicates that fifty percent of the carbon comes from C4 consumption, while a value of -10.2‰ indicates an approximately seventy percent rate (Tykot 2002:8). Thus, the Strath Bogue individual’s $\delta^{13}C$ value of -11.9‰ would mean that approximately sixty percent of the carbon in their bone collagen came from C4 and C4 enriched foods, while the Progresso shore individual’s value of -11.4‰ suggests a slightly more positive C4 intake of approximately sixty-seven percent.

What is of additional note, and particular interest here is the fact that the archaeobotanical analysis of a core sample taken from Progresso Lagoon indicated to researchers that the landscape adjacent to the Lagoon had been cleared on a large scale in the Terminal Classic period probably for agricultural purposes, given the identification of a “fair amount of charcoal” and the presence of *zea mays* pollen (Digrius and Jones 2001:178). In view of the fact that maize has arguably been one of the most widely and important cultivated crops throughout Maya history (Lentz 1999:4), paired with the apparently large-scale clearing of the terrain and the presence of *zea mays* pollen
in the core sample, it is highly probably that maize was one of the crops otherwise grown by inhabitants of the Progresso Lagoon region in the Terminal Classic period.

Nonetheless, the carbon isotopes values for the Strath Bogue and Progresso Lagoon individuals are at the least positive end of the spectrum, indicating that compared to data from most other Terminal Classic sites, these individuals were consuming less C4 plants and C4 enriched products, despite evidence to suggest maize cultivation was occurring in the immediate vicinity (see Figure 7.2). And yet, for some reason the Progresso Lagoon and Strath Bogue individuals evidently had greater access to and were consuming more C4 products than their northern Belize neighbors.

As noted by White (1997:173) changes in consumption levels of C4 plants, presumably maize, can be the impetus for or result of shifts in other food items and often have effects on the general nutrition of the consumers, including the potential of malnutrition if proper dietary needs are not being met. Such shifts may be, or are hypothesized to be connected to environmental, social or political changes or upheavals. Migration is a type of upheaval that could very well have detrimental effects on one’s diet, as access to regular meals, let alone a well-balanced diet could very likely be difficult for a mobile group. Such a shift away from maize has been suggested for Pacbitun in the Terminal Classic, where despite attempts to intensify agricultural production to meet population demands, the Maya were unable to support the growing population (White, et al. 1993:370).

Unfortunately, in the case of the Strath Bogue and Progresso individuals we do not have earlier or later skeletal data from these sites to make comparisons with about shifts or changes in
health and diet. While the Strath Bogue individual did suffer from osteomyelitis and treponemal
infection associated with yaws, these are not afflictions related to one’s diet (Margaret L. Briggs,
personal communication, 2013). Disappointingly the Progresso shore individual’s remains were
in such a poor state of preservation that other than identifying the individual as a female between
21-35 years old, without significant calculus or caries (Margaret L. Briggs, personal
communication, 2013), we were unable to ascertain any other health data that may have added to
our understanding of these individuals’ dietary and health status. Analysis of the skeletal remains
of the other individuals at Strath Bogue found no evidence for dietary insufficiencies, only
evidence of caries and calculus which were at insignificant levels. The carbon and nitrogen isotope
data and osteological analyses of both the Strath Bogue and Progresso shore individuals indicated
that neither were suffering from malnutrition and appear to have been consuming a relatively well-
rounded diet.

Isotopic data from nearby Chau Hiix and Lamanai indicate periodic shifts in the
consumption of C4 and C4 enriched animal foods seems to have begun in the Terminal Classic
period in northern Belize (J. Z. Metcalfe, et al. 2009:Table 4; White 1997:173). In the case of both
sites, we know that these temporal dietary changes were not the result of the collapse of these sites,
but instead are argued to have been the result of adaptations to regional socioeconomic changes
related to a process of withdrawing cultural and economic ties from the Petén and establishing
This is very significant in the case of the Strath Bogue and Progresso shore communities, as both
of these sites appear to have been engaged in a similar affiliation shift away from the Petén to
polities in Yucatán.
Shifts in diets can also have advantageous effects, in that a more diverse diet is generally considered healthier. Lentz’s work (1999:5) has noted that a diet that included maize and beans had a collaborating effect in that together they provided the appropriate essential amino acids required for balanced nutrition. When maize was processed with limewater calcium levels are elevated. Beans themselves can play a major role in sustaining proper human nutrition as they are high in proteins and can even be grown in soils that may be deficient for other food crops. Since maize is not a high protein plant (Mansell, et al. 2006:180) the Maya supplemented their protein from other sources, often beans and squash (Kaplan 1973; Lentz 1999:5).

![Figure 7.2: Line graph of human stable carbon isotope data from different Terminal Classic period sites, ranked from most positive to least positive $\delta^{13}C$ values.](image)

In order to fully grasp the Strath Bogue human isotope values, it is necessary to consider them in concert with those of the animal species that tend to have the closest domestic relationships with them, the dog and deer. As was discussed in the previous chapter, the dog specimen recovered from Strath Bogue was also not a prominent consumer of C4 plants or C4 enriched food products,
with values uniquely lacking in $\delta^{13}C$ and strikingly different from well over the majority of dogs from other sites (see Figure 5.8). As companion animals and scavengers, it is odd that the Strath Bogue specimen’s isotope values are not more positive. In fact, this dog’s values registered more in line with that of a feral dog, than one that was living in association with or on the fringe of a human population. And yet we know that maize was grown in the region and that this dog was living in association with, if not immediate to the Strath Bogue community. Nonetheless, it would appear that this specimen’s lower values mirror those of its human companions.

**Table 7.3: Table of mean $\delta^{13}C\%$ values for deer tested from all time periods at sites across the Maya area. Note: Strath Bogue value is representative of one specimen.**

<table>
<thead>
<tr>
<th>Archaeological Sites</th>
<th>Time Period</th>
<th>Mean $\delta^{13}C%$</th>
<th>Source</th>
</tr>
</thead>
<tbody>
<tr>
<td>Altun Ha</td>
<td>ANC</td>
<td>-21.60</td>
<td>(Gerry 1993) in (Freiwald 2011: Table 6.4)</td>
</tr>
<tr>
<td>Holmul</td>
<td>ANC</td>
<td>-21.30</td>
<td>(Gerry 1993) in (Freiwald 2011: Table 6.4)</td>
</tr>
<tr>
<td>Colha</td>
<td>LPCL</td>
<td>-21.20</td>
<td>(White, Pohl, et al. 2001: Table 3)</td>
</tr>
<tr>
<td>Tikal</td>
<td>LC</td>
<td>-20.90</td>
<td>(White, et al. 2004: Table 9.1)</td>
</tr>
<tr>
<td>Punta de Chimeno</td>
<td>TC</td>
<td>-20.80</td>
<td>(Emery and Thornton 2008: Table 2; Emery, et al. 2000 Table 3)</td>
</tr>
<tr>
<td>Petexbatun</td>
<td>TC</td>
<td>-20.60</td>
<td>(Emery and Thornton 2008: Table 2; Emery, et al. 2000 Table 3)</td>
</tr>
<tr>
<td>Tikal</td>
<td>TC</td>
<td>-20.50</td>
<td>(White, et al. 2004: Table 9.1)</td>
</tr>
<tr>
<td>Dos Pilas</td>
<td>LC-TC</td>
<td>-20.47</td>
<td>(Emery and Thornton 2008: Table 2)</td>
</tr>
<tr>
<td>Xunantunich</td>
<td>ANC</td>
<td>-20.20</td>
<td>Freidwald et al. in (Freiwald 2011: Table 6.4)</td>
</tr>
<tr>
<td>Copán</td>
<td>LC</td>
<td>-20.00</td>
<td>(White, et al. 2004: Table 9.1)</td>
</tr>
<tr>
<td><strong>Strath Bogue</strong></td>
<td>TC</td>
<td>-19.61</td>
<td>Present Study</td>
</tr>
<tr>
<td>Lagartero</td>
<td>LC</td>
<td>-18.20</td>
<td>(White, et al. 2004: Table 9.1)</td>
</tr>
</tbody>
</table>

ANC = Ancient    CL = Classic Period
LPCL = Late Preclassic    LC = Late Classic Period
PCL = Preclassic Period    TC = Terminal Classic
What is particularly puzzling, however, is the fact that the Strath Bogue white-tailed deer (*O. virginianus*) specimen’s δ¹³C value of -19.61‰ is more positive than all other published deer means from Terminal Classic period sites. Moreover, it was one of the top three most positive tested for all time periods, registering more positive than the mean calculated for all time periods (Σ= -20.35‰), with 77% of the sites registering δ¹³C values less positive (Table 7.3).

The average carbon isotopic mean values for deer from sites in Belize range between -20.2‰ and -21.6‰, and in the central lowlands where human maize consumption is significantly higher, white tailed deer δ¹³C mean values range from -20.6‰ to -21.3‰ (Freiwald 2011:Table 6.4, 255). These values are striking in light of the fact that the Strath Bogue deer carbon isotope values indicate that it was eating substantially more corn than those elsewhere in Belize or in the Central Lowlands, and yet these two Progresso Lagoon region humans were eating less maize than their human counterparts in these regions.

As these data are generally reflective of site mean values, it should be noted that there were a few select deer specimens at some sites that registered more positive values, including some that were significantly more positive; however, in some cases these deer were clearly being fed maize, possibly for symbolic or ritualistic purposes. Nonetheless, the Strath Bogue deer specimen was generally consuming a comparatively larger quantity of C4 plants/products, again supporting the supposition that maize must have been growing within the Progresso Lagoon region, if not within the immediate vicinity of the sites themselves. It would appear however judging from the human δ¹³C values for the Strath Bogue and Progresso shore individuals that given that their values were at the least positive end of the C4 plant consumption spectrum of Terminal Classic period sites,
they themselves for whatever reasons were just not as heavy consumers of maize as their neighbors.

Despite the fact that deer are classified as edge browsers and thus opportunistic consumers of maize, and dogs as members of the domestic households were also often consumers of maize and maize products, we know that despite its comparatively more positive $\delta^{13}C$ value, the Strath Bogue deer and particularly the dog were not significant consumers of maize (see Chapter 5, and Figure 7.3). Thus, the consumption of the dog, and even the deer would not likely have contributed significantly to the Strath Bogue individual’s carbon isotope signature. The one animal species tested in this study that could have contributed to the carbon isotope values in the Strath Bogue individual was the turkey, as its C4 consumption evidently mirrors that of the humans in this study (see Figure 7.3). Nonetheless, we must remember that this value was relative to only one Turkey specimen, and we cannot be sure if this was the norm for all turkeys at the site, or if this specific turkey was subject to special feeding practices, perhaps for ritualistic or symbolic purposes. Of course, carbon isotopes are just half of the tested isotopic equation and should be examined in concert with nitrogen isotope data. Nitrogen isotopes are telling of protein intake and will be examined in more depth shortly.

In contemplating faunal and human isotope data, the question that begs to be asked is why do the human and dog values suggest a seemingly more restricted access, availability and/or consumption of maize products compared to the turkey and deer, and to their Terminal Classic and northern Belize counterparts when the phytolith and deer data suggest maize is definitely present? And conversely, why do they ostensibly have greater access/consumption to these items than their immediate neighbors? A few possible scenarios as to why this may be can be argued for:
Figure 7.3: Scatterplot illustrating $\delta^{13}C$ and $\delta^{15}N$ isotopic data for all animal and human specimens tested in this study.

1) Personal taste/choice. Perhaps unlike their Terminal Classic counterparts these individuals were not particularly fond of C4 plants and products, and thus were not heavy consumers of maize, and yet either enjoyed it enough, or reliant enough on it that they consumed more than those typical of other northern Belize communities. Given the extremely limited sample size this hypothesis cannot be properly tested as there is not a large enough representative sample from either site to which these biological and mortuary data can be compared to, and the feasibility of this scenario to be tested by. Differences in carbon isotope values in individuals from Copán and Pacbitun were argued to not have been due to variations in taste or food symbolism but were instead attributed to differing environments and thus food resources (White, et al. 1993:369). Moreover, I question whether personal taste or choice is something that can truly be ascertained,
given that the individuals are not able to speak for themselves and relate such information. Nonetheless, it is worth noting as a factor that may have affected the consumption of C4 plants and products and resulted in these individuals’ \( \delta^{13}C \) values.

2) Social Status. Chemical and osteological analysis have revealed that social status, whether defined by economic position, gender, age or social standing/position, can play a role in an individual’s diet in that access to prized or constrained food items are differentially experienced (Cohen 1989; Hayden 1990; White, et al. 1993:361). Following this premise, individuals who have been identified as having had an elite status should have had access to more valued food items, and their more selective diet may be detected in through isotopic analyses, as it was at Pacbitun where variations in the diet between men and women and sexes was suggested (White, et al. 1993:362-365).

Determination of elite status involves consideration of an assortment of variables, such as mortuary practices, grave goods and burial construction; skeletal or dental modification; domestic architecture; and where available, epigraphic documentation. Correlations between status and diet among the Maya has been inferred by some scholars using faunal remains (Masson 1999a; Pohl 1985b), botanical remains (Lentz 1999; Lentz and Hockaday 2009) and human remains, including chemical and structural analyses (Gerry 1993, 1997; Haviland 1967; Storey 1999; White, et al. 1993; White, Pendergast, et al. 2001; Wright 2006). Using an assessment of burial type, quality and type of grave goods and distance from site core, researchers at Pacbitun found that across time, including in the Terminal Classic period, the individuals from burials of those understood to have had a more privileged existence exhibited more positive \( \delta^{13}C \) signatures, indicating that higher

Neither the domestic architecture associated with the Strath Bogue or Progresso individual’s graves, nor the grave goods or the graves themselves were definitively suggestive of an elite status, although the burials goods from Structure 5 at Strath Bogue were comparatively more numerous and rich, and the structure itself was larger than that of the Progresso household. Both structures were of similar configuration. All of the burials were excavated from simple crypts, partially demarcated by pits and, or haphazard and incomplete stone alignments. The Strath Bogue burials were excavated from the interior of Structure 5, while the Shore individual’s simple crypt had been placed outside of the structure, at its base. While dental and cranial modification was present on one individual from Strath Bogue, the remainder of skeletons excavated exhibited no modifications. There were significantly larger domestic compounds at Strath Bogue, suggesting that Structure 5, a solitary structure, and those interred within were not likely ruling elites, and yet they were likely of a higher status than those whose smaller solitary house mounds can be seen across the site. In comparison, the household with which the Shore individual was associated was likely of a lower status than those associated with Structure 5 given the fact that the burial was less well defined, had less elaborate and numerous grave goods, and the burial was placed outside of a smaller residential structure instead of within one with clear ancestral significance.

As eluded to earlier, collagen based isotopic results from a study of skeletal remains from Pacbitún (White, et al. 1993) where consideration of socioeconomic status based on grave type and goods, as well as location from site core found that social status, as well as sex and age groups affected the consumption of C4 foods ($\delta^{13}C$). These findings subsequently suggested to the
investigators that maize was a valued food item at Pacbitún as elites evidently had less restricted access and thus consumed more of it than their non-elite counterparts. Protein consumption ($\delta^{15}N$) was slightly heavier in males, but only to statistically insignificant degree (White, et al. 1993:361). Isotopic studies on skeletons from Copán had similar results, where women’s carbon isotopic values were considerably less positive than those of men, however nitrogen values or protein consumption was even less enriched and thus restricted than it was at Pacbitún or Lamanai (White, et al. 1993:361; Whittington 1989). Another isotopic study concerned with assessing status differences based upon a multi-tiered site type assessment of urban versus nonurban sites and stable isotopes at Copán found statistically significant variations in mean carbon and nitrogen isotope weights between men and women, but not in the means between site-types (Reed 1992; Reed 1999-192; White, et al. 1993:365).

Interestingly, isotopic data from Lamanai did not find significant statistical variations in $\delta^{13}C$ values based on social status or age and sex (White, et al. 1993:360). There does however seem to be a very slight variation between men and women in terms of their protein intake however, with the exception of one Early Classic royal male that had elevated $\delta^{15}N$ values that were presumed to have been reflective of his differential access to marine foods (White, et al. 1993:365, 366).

A subsequent examination of skeletal data from Pacbitún and Lamanai that considered the previous study of $\delta^{13}C$ composition from bone collagen additionally tested bone carbonate found somewhat differing results. The $\delta^{13}C$ carbonate results indicated that regardless of one’s socioeconomic status, or sex and age, diets were relatively uniform, and did not statistically vary
significantly across the population spectrum at either Lamanai nor Pacbitún (Coyston, et al. 1999:236-239).

In his analysis of isotopic values from around the Maya area, Gerry (1997:62) found that while there were some dietary distinctions between apparent social classes, these differences were more likely to have been in terms of quality rather than quantity. He argues that the elite likely had privilege over certain types of symbolic meat, but not enough to have resulted in great nutritional disparities between the classes. These data are also supported by the distribution of faunal remains of animals of ritual significance, such as jaguars (Gerry 1997:62; Pohl 1985b, 1994).

Due to the small sample size of burial data from Strath Bogue and the Shore community, comparative inter- and intra-site temporal and burial data are problematic, in that we do not have an effective population profile. Furthermore, researchers presenting isotopic data are not always forthcoming in their descriptions of burials or discussions of status, and thus comparative considerations are problematic for this reason as well. We do know however that traditionally skeletal data has disproportionately come from large centers with elite burials, than from rural communities with more common peoples (Danforth 1999:113). Recognizing this and that we don’t necessarily know the status of the individuals at other sites for which we have isotopic data, if we compare the Strath Bogue and Progresso shore isotopic data to that of their northern Belize neighbors, we can see that the Progresso Region individuals have more positive $\delta^{13}C$ values, indicating that maize and maize products were more readily accessible and consumed by the Strath Bogue and shore. If we follow the premise that increased access is relative to status, their values seem to be more indicative of elite status. However, when we consider the full gamut of status indicators of the Strath Bogue and Progresso shore individuals as noted above, these individuals’
burials did not exhibit the criteria typically associated with elites. Moreover, these noted criteria indicate that the Progresso individual was evidently of lower status than those encountered at Strath Bogue, and yet their $\delta^{13}C$ value was more positive than that of the Strath Bogue and other northern Belize tested individuals.

In considering questions of status in concert with the recorded carbon isotope values from the central Maya lowlands (Freiwald 2011; Gerry 1993, 1997; Gerry and Krueger 1997; White, et al. 1993:368; Wright and White 1996:174), the Progresso region individuals have less heavy values, indicating that they consumed less maize, maize products and, or maize-consuming animals. Thus, are we to assume that the Progresso Region individuals’ access to these items was more restricted due to their lower status? Or can some other factor account for these regional variations? Even with the limited dataset, I do not believe that status is a viable reason for the inter- and intra-regional variations in $\delta^{13}C$ signatures discussed here. Given our understanding of these individuals “status” and the conclusions made by Gerry (Gerry 1997) and the fact that studies considering status and differential food consumption seem to find little statistically or isotopically significant variation between elites and non-elites (Coyston, et al. 1999; Reed 1992; Reed 1999; White, et al. 1993), it seems unlikely that the isotopic values of the Progresso region individuals are indicative of those of individuals from a lower class.

3) Change in availability of agricultural goods/consumption patterns due to ecological or cultural “hardships” (Healy, et al. 1983; Paine and Freter 1996; Pyburn 1996; Santley, et al. 1986; Tainter 1988b; Willey and Shimkin 1987; Wiseman 1978). Social upheaval, political strife, population increases or changes in environmental conditions (such as drought or flooding) can separately and jointly impact the cultivation and distribution of crops/food items, and thereby
result in changes in a given populations subsistence base or diet (Tykot 2004:440), perhaps even to the point of dietary stress (White 1988; Wright and White 1996). Such situations and or conditions have often been discussed in tandem with dialogues concerning the causes and effects of the Maya “collapse” (See Chapter 2).

This argument is prefaced on the supposition that the majority of food items are believed to have been obtained by the Maya not through trade, but were procured locally (Wright and White 1996:176). When local procurement practices are impacted by social, political or environmental situations or conditions, the availability of, and access to these food items, including staples, becomes more restricted, thereby impacting consumption levels and diminishing the populations’ subsistence base. These lower consumption levels will be reflected in less positive $\delta^{13}C$ signatures in the skeletal material of the consumers. Moreover, when faced with reduced access to a food item, particularly one which had been such a prevalent source of protein throughout Maya history, other food items such as beans, squash, manioc, nuts, cactus, kelp, meats, etc., may by necessity take precedence in a community’s diet. Such dietary changes or nutritional impacts can be detected in the structure and chemical properties of the skeletal remains (Lentz 1991; Storey 1999; White 1988, 1997; White, et al. 1993; White, Pohl, et al. 2001; Wright and White 1996). In order for these changes to truly be reflected in the skeletal material, such “hardship” consumption patterns would have to be identified over long periods of time in order to make impacts to the chemical composition of one’s bones (White 1988). As we know that the regeneration of bone collagen occurs over an approximately 20 to 30 year period (Ambrose 1987; Chisholm, et al. 1982:1131; Price, et al. 1985; Schoeninger and Moore 1992; Vanderwarker 2006:183), and thus such hardships are generally seen through temporal and intersite comparisons.
Isotopic analyses of skeletal specimens from Pacbitún (White, et al. 1993:366; Wright and White 1996:178), Lamanai (White, et al. 1993:368), La Milpa and the Programme for Belize sites in northwestern Belize (Tykot 2004:440), have revealed a marked decrease in the consumption of C4 plant foods in the Terminal Classic period, compared to isotopic data from earlier periods. This is striking in that Pacbitún’s community evidently experienced a dramatic increase in its dependency on maize during the Late Classic period. And yet, settlement figures and the intensification and expansion of agricultural practices at the end of the Late Classic and in the Terminal Classic periods indicate this dependency was paired with a substantial population increase. It appears that despite their attempts to manage the community’s growing population and reliance on maize and its byproducts, the Terminal Classic Pacbitun population was unable to meet the growing demands on this staple crop. According to White et al. (White, et al. 1993:366), isotopic data from the Terminal Classic period show a decrease in their consumption of maize and maize-based foods by approximately 10%, from 72 to 77% of their diet in earlier periods, to 68% in the Terminal Classic period. Similarly, isotopic data show similar drifts away from a reliance on maize and maize products at Altar de Sacrificios and Dos Pilas (Wright 1997b; Wright and White 1996:178-179).

Both environmental and social hardships have been documented by archaeologists in various regions of the Maya subarea leading up to and during the Terminal Classic period and have been hypothesized as potential reasons for the Maya “collapse.” Based on their isotopic analyses, Wright and White (Wright and White 1996:179) have noted that throughout the prehistory of a number of sites across the Maya area, the diets of the inhabitants were affected by major historic events. What is peculiar is that like the collapse, these dietary changes do not necessarily seem to
be reactive to ensuing stresses, nor are they equivocally experienced across the Maya subarea (Wright and White 1996:179). Allowing that the skeletal data do not indicate under- or malnutrition, and the consumption of C3 plants - both wild and cultivated, does not diminish at this time, it is unlikely that a cataclysmic natural environmental event, nor agricultural degradation are the cause of the change in maize consumption in the Terminal Classic period (Wright and White 1996:180).

Given that the decline in maize consumption appears to be more situational and or locally experienced, as attested to by the isotopic data, Wright and White (Wright and White 1996:180) contend that these dietary changes are more indicative of a changing subsistence strategy fostered by the ensuing sociopolitical instabilities and ideological changes of the times. These instabilities are argued to culminate in the alteration of the ideological significance of maize, and of the ruling elite’s management of, and/or demands on agricultural production. At Lamanai, where isotopic values indicate a reduction in maize consumption during the Terminal Classic period but where monumental construction efforts suggest the maintenance of some semblance or level of political authority, White (1986; Wright and White 1996:180) has argued that maize production and tribute payments by farmers were probably hindered, as the farmers could not meet both the construction labor and agricultural taxation demands. As a means of moderating these demands, a shift in the subsistence economy was seemingly affected; thereby relieving the farmers of their agricultural obligations and thus less maize was produced and consumed.

However, Lamanai is a highly unusual site, and perhaps unlike any other Maya site as it has never truly been completely abandoned, and thus its historic path is unlike most others. Moreover, it has a history of evidently being less reliant on C4 plants, presumably maize, than all
other Maya sites for all time periods. This is probably in part to do with the fact that it seems to have had a greater breadth of resources available to it locally. Nonetheless, in the Terminal Classic period an apparent change in subsistence practices is evident through changes in protein consumption (apparently fish), and thus affecting nitrogen isotopes and as well as carbon isotopes. These changes coincide with apparent sociopolitical and or cultural changes at the time that also result in increases in trade networks and resultantly in a greater diversity of resources (Coyston, et al. 1999:221, 231-232).

It is a commonly held hypothesis that the Terminal Classic period in general was witness to an apparent decentralization or fragmentation of authority (Carmack 1981; Fox 1987; Iannone 2002; Marcus 1992a, 1993; Rice 2004b). It makes sense in light of the apparent sociopolitical fragmentation being experienced by many polities that there was a subsequent relaxation of elite taxation burdens on the populace elsewhere as well, presumably in the form of demands for maize. Such change in levies would have had far reaching effects on the availability of maize, and thus the subsistence practices as less maize and maize products would be available. Moreover, freed from excessive state exacted quotas, farmers may have been free to cultivate a wider range of plants for consumption, thereby changing the subsistence economy and the community’s diet. Therefore, decreases in the consumption of maize may not necessarily be indicative of agricultural or environmental failure, but may instead be reflective of, or responses to, other sociopolitical and or ideological factors.

4) Migration. The reasons communities decide to migrate are discussed at length in Chapter 3. It has been argued that historically communities faced with environmental challenges or disasters and, or sociopolitical and ideological conflicts and hardships attempt to mitigate such
ordeal through migration, thereby escaping the sufferings of the homeland and relocate elsewhere in attempt to begin anew (Anthony 1990, 1997; Beekman and Christensen 2003; Burmeister 2000; Cameron and Tomka 1993; Clark 1994; Duff 1998; Ferguson 2004, 2006; Inomata 2004; Lange 2003; D. S. Walker 2004).

As has been discussed in concert with the Maya “collapse, and as has been evidenced in many areas, and at numerous sites across the Maya subarea, many Maya communities in the Terminal Classic period were in fact experiencing sociopolitical, economic and, or environmental and agricultural “hardships.” In more recent years, some Mayanists have begun to examine the reality of migration occurring in concert with such issues, perhaps as a means of escape, or alternatively, as a calculated decision by which some polity members were able to successfully mitigate such circumstances and thereby forge a new life under better conditions. Inomata (2004:175) has argued that migration was a method particularly implemented by non-elites as a means to adjust to or resist sociopolitical and economic changes, as well as oppression.

Comparative analyses by various scholars have found that overall, Classic to Postclassic period Maya diets were maize reliant, with notable regional variations in subsistence practices being identified (Freiwald 2011; Gerry 1997; Gerry and Krueger 1997; Rand, et al. 2013; Tykot 2002, 2004; Wright 2007; Wright and White 1996, 2004 #1764). The identification of regional Maya subsistence patterns was accomplished through the employment of carbon and nitrogen isotope analyses on bone collagen, and in some cases bone and or teeth apatite of skeletal remains from sites around the Maya area (Gerry and Krueger 1997; Tykot 2002; Wright and White 1996). By examining isotopic of carbon and nitrogen values and determining how they relate to the intake and balance of proteins, carbohydrates and fats as consumed through the consumption of meats, C3 plants (i.e., legumes) and C4 plants (i.e., maize), variations in dietary behavior were able to be identified (Gerry and Krueger 1997:206). Theoretically a community’s subsistence practices are defined by a catchment zone. A community’s catchment zone is typically bound by the natural environment and its available resources but is also influenced by sociopolitical and economic factors that may also influence subsistence and consumption patterns, all of which affect agricultural and subsistence patterns that end up being regionally distinguishable. Accordingly, an individual’s skeletal remains that produce δ\textsuperscript{13}C and, or δ\textsuperscript{15}N values that deviated from those typical of a given site or region would indicate that they were not originally from the region and were thus a migrant.

The diet of peoples in transit would have fluctuated across the landscape and according to the different environmental zones they traversed, not only by what was locally available, but also by what sorts of and how regular their access to different food items would have been en route. As a mobile community, would they have had access to foodstuffs that were agricultural and sedentary
based such as maize? And if so, how regular was it? Were migrants able to obtain such goods through trade? Did their migration involve several stops along the way and thus allow for kitchen garden types of production? How long did the expedition take; as the longer the trip the more likely their diet and by extension, their isotopes would be affected. Given that one’s bone collagen is subject to the regular natural regeneration of bone over several years, depending on how long the journey took and how soon they passed away after reaching their homeland, a migrant’s isotope values could be indicative of their homeland diet; a mixture of their homeland and their less stable migrant diet; of their migrant diet and their destination diet; or an amalgamation of all three scenarios.

Among the analyzed Postclassic highland population at Iximché in Guatemala, there were several individuals whose collagen and tooth enamel isotopic results indicated an extreme reliance on maize compared to populations from the preceding time period in the region, or from contemporaneous Postclassic Lamanai Maya (David Reed and Stephen Whittington cited in (Tykot 2004:440-441)). These individuals were evidently beheaded and have heavily weighted δ13C values. It was hypothesized that these individuals are likely to have been captive warriors/elites whose homeland was located in a different environmental zone than Iximché, and thus their diet included more or differential access to foods such as maize, which was evidently prominent in their elite diet.

Similarly, an individual from the Postclassic period site of Mayapán whose carbon isotope value was weighted less than the rest of those tested (δ13C=-13.93‰ compared to -9‰ to -11‰ for the rest of the population), and whose nitrogen isotope value was also low (δ15N=5.63‰ compared to 7.5‰ to 11‰), was proposed by Wright (2007:6) to have potentially been from a
different region where the rainfall regime and consequently whose maize consumption was evidently lower than the rest of the population. Mayapán is recognized as having had a multiethnic population (Wright 2007:3) and thus this hypothesis stands to reason. Similar arguments of foreignness have been made for individuals from Chau Hiix (J. Z. Metcalfe, et al. 2009:32), San Juan (Parker 2011:53) and Altun Ha (White, Pendergast, et al. 2001:389), as well as for three sacrificial victims from the Preclassic period at Cuello (Tykot, et al. 1996:359) based on their stable carbon and nitrogen isotopic values and how they vary from the standard values at these sites.

It may be argued that both the Progresso shore and Strath Bogue individuals’ carbon isotopic values fall within an acceptable range for most of the northern Belize and even the Belize Valley values; however, their nitrogen isotopic values are dietarily distinct from those of their northern Belize neighbors (see Figure 7.4). When their nitrogen and carbon isotope values are examined in concert with those reported from other sites, and evaluated in concert with the available dietary, faunal, environmental and resource data, it is conceivable that their signatures are indicative of the diet of peoples from a different ecological zone with different resources, and different dietary practices than are typical of northern Belize. Alternatively, their values may be indicative of peoples whose biological system is in the process of essentially adapting to their new setting and resources after having recently migrated, and their bone collagen has not yet fully regenerated to reflect their new setting and possible dietary changes.
Figure 7.4: Line graph of human stable nitrogen isotope data from Terminal Classic period sites, ranked from most positive to least positive $\delta^{15}$N values.

The available mean Terminal Classic period isotopic data for individual sites was presented earlier in Table 7.2. Using the site data presented in Table 7.2, averages for the different geographical regions were calculated and are presented in Table 7.4. Note that Strath Bogue, Progresso Shore and Lamanai were not calculated into the mean for Northern Belize as the Lamanai value is a Maya area anomaly, and the Progresso region values were isolated, so they could be clearly seen relative to the others, and because they too appear to be anomalies. The data are presented in Table 7.4 are offered in graph form in Figure 7.5, so to best demonstrate the geographic distribution of mean regional Terminal Classic period $\delta^{13}$C and $\delta^{15}$N values. Yaxuná, Strath Bogue and Progresso shore are not means per se, as these values are representative of individuals.
Table 7.4: Average Terminal Classic Period Carbon and Nitrogen Isotopic Data According to Geographical Region. NOTE: Strath Bogue, Progresso Shore and Lamanai were not factored into the Northern Belize mean due to Lamanai’s extreme values, and so to illustrate the Progresso Region individuals’ values relative to the others.

<table>
<thead>
<tr>
<th>Geographic Region</th>
<th>δ¹³C‰</th>
<th>δ¹⁵N‰</th>
</tr>
</thead>
<tbody>
<tr>
<td>Coastal</td>
<td>-8.3</td>
<td>11.4</td>
</tr>
<tr>
<td>Northern Belize</td>
<td>-12.3</td>
<td>10.7</td>
</tr>
<tr>
<td>Lamanai</td>
<td>-14.8</td>
<td>10.0</td>
</tr>
<tr>
<td>Petén</td>
<td>-9.6</td>
<td>9.3</td>
</tr>
<tr>
<td>Belize Valley/ Western Belize</td>
<td>-10.7</td>
<td>9.1</td>
</tr>
<tr>
<td>Strath Bogue</td>
<td>-11.9</td>
<td>8.3</td>
</tr>
<tr>
<td>Copán</td>
<td>-10.0</td>
<td>7.6</td>
</tr>
<tr>
<td>Progresso</td>
<td>-11.4</td>
<td>7.2</td>
</tr>
<tr>
<td>Yaxuná</td>
<td>-11.8</td>
<td>6.6</td>
</tr>
</tbody>
</table>

Figure 7.5: Interregional isotopic distinctions in bone collagen during the Terminal Classic period.

Meat consumption, whether terrestrial animals or aquatic animals, not only affects the consumer’s collagen δ¹⁵N values, which it most significantly impacts, it also affects the consumer’s δ¹³C values (Coyston, et al. 1999:224). In their review of carbon isotopes in individuals from around the Maya region, Wright and White (Wright and White 1996:174) found
that individuals from sites located inland had more enriched $\delta^{13}$C values than those from sites situated near to riverine environments. Riverine sites tended to have lower carbon isotope values as a result of the consumption of fish, and due to the fact that these environments also have a broader range of C3 plants and other riverine fauna (Wright and White 1996:186). Despite these overall findings, Tykot (2002:8) has argued that among the Petén sites there was no statistically significant difference in $\delta^{13}$C values regardless of whether a site was located inland or on a river, and thus fish did not seem to have played an important role in the diet of the Petén Maya.

The consumption of tropical reef fish (from Belize’s barrier reef for example) and animals that were fed or were feeding on maize, result in more positive or enriched $\delta^{13}$C values, as are diets that are reliant on the consumption of maize and maize products. Conversely, the consumption of terrestrial animals that were consumers of predominantly C3 plants (i.e., wild game), or of riverine fish and snails (i.e., *Pomacea*, Jute (*Pachychilus*)) result in the depletion of $\delta^{13}$C in the consumer (Coyston, et al. 1999:237, 224; van der Merwe, et al. 2002; White, Pendergast, et al. 2001:Fig. 2). Temperate marine fish, mammals and reef shellfish can be somewhat less decipherable contributors of $^{13}$C compared to other aquatic resources, as their $\delta^{13}$C values lie between freshwater and tropic reef fish, and are within the range of terrestrial animals and C4 plants (Coyston, et al. 1999:Fig. 12.1; White, Pendergast, et al. 2001:Fig. 2), while reef fish are the most more positive contributor of $^{13}$C of all the meat items (White, Pendergast, et al. 2001:Fig. 2).

Nitrogen isotope values are representative of protein foods, typically terrestrial and aquatic animals and fish as well as C3 plants such as beans, squash, nut and tubers and C3 consumers, including deer and reptiles (Parker 2011:47). Whether an animal is carnivorous or not also affects how enriched the $\delta^{15}$N values of the consumer will be, with carnivorous animals (i.e., dogs)
contributing more positive $^{15}$N compared to herbivores (Schoeninger and DeNiro 1984). Riverine, marine and reef-based fish and mammals have varying isotopic signatures relative to their aquatic location (Coyston, et al. 1999:12.1; van der Merwe, et al. 1994 in, Coyston, 1999 #1982:224; van der Merwe, et al. 2002; Vanderwarker 2006:Fig. 6.3; White, Pendergast, et al. 2001:381, Fig. 2; Wright 1994).

The effects of fish and shellfish on $\delta^{13}$C and $\delta^{15}$N values are particularly important to note in this study given the immediate availability of riverine and estuarine resources to both the Strath Bogue and the Progresso shore communities, and their reasonably easy access to marine resources. The aquatic source of these resources also affects the amount $^{15}$N in the consumer’s bone collagen. Reef fish, and river snails, particularly apple snail or *Pomacea* (*Pomacea flagellata*) and Jute (*Pachychilus*) snails, have comparatively depleted $\delta^{15}$N values, while temperate marine mammals and fish values are the most enriched. Freshwater fish have more positive $\delta^{15}$N values than tropical reef fish, but less than temperate marine fish (Coyston, et al. 1999:Fig 12.1; Schoeninger 1985; van der Merwe, et al. 2002; Vanderwarker 2006; White, Pendergast, et al. 2001:Fig. 2; Wright 1997b:Fig. 14.1). Estuarine and anadromous fish (fish that spend time in both marine and freshwater bodies of water depending on their lifecycle stage), would also contribute to the human nitrogen isotopes to varying degrees (Coyston, et al. 1999:232; Schoeninger and DeNiro 1984:630), however unfortunately this group of fish have not yet been tested in Belize. Terrestrial animals have a broader range of values that have some cross over with other protein sources, including plants (Coyston, et al. 1999:Fig. 12.1, 224; Lege 2001, in, Macek, 2009 #1989:1687).

While small in size, the assemblage of animal bones recovered in excavations at Strath Bogue (see Chapter 5) are typical of those associated with Precolumbian Maya diets (K. Emery
2004; Götz 2008; Masson 2004; Teeter 2004; Teeter and Chase 2004). The most numerous faunal specimens recovered at Strath Bogue were the shells of freshwater *Pomacea flagellata*. *Pomacea* are easily harvested, especially in the dry season when they tend to mass together as their water sources wither, whether they be rivers, cenotes, swamps or *aguadas* (Lege 2001, in, Macek, 2009 #1989:1688). Their shells are found in various contexts dating to the full range of time periods at many Maya sites (Andrews IV 1969:58; Moholy-Nagy 1978:71; Sidrys 1983:345; White and Schwarcz 1989:466), and are a recognized Precolumbian Maya food item (Moholy-Nagy 1978:71; White and Schwarcz 1989:466) although one ethnographer has noted that modern Lacondon Maya choose not to eat *Pomacea* as they believe the snail makes people sick (Nations 1979: 569).

*Pomacea* snails are herbivores that consume the tissues of freshwater plants (Lege 2001, in, Macek, 2009 #1989:1687). In a recent study of modern day *Pomacea flagellata* in Belize, the δ¹³C value of *Pomacea* averaged around -28.8‰ and δ¹⁵N value of 4.9‰ (Lege 2001, in, Macek, 2009 #1989:1690), indicating it is clearly a C3 plant consumer and within the same range as Jute (Coyston, et al. 1999:224, Fig 12.1; White, Pendergast, et al. 2001:Fig. 2). The consumption of these snails would thus not be prominent contributors to carbon or nitrogen values in their human consumers and would in fact result in depleted values (Coyston, et al. 1999:224). An isotopic and elemental study involving Preclassic period human remains from Lamanai confirmed that *Pomacea* was not a substantial contributor of ¹³C, nor were they a significant source of protein (White and Schwarcz 1989:466-467). Like the Jute was to the western Belize or Petén communities (Coyston, et al. 1999:Fig. 12.1, 224; Healy, et al. 1990; Wright 1997b:Fig. 14.1, 188), *Pomacea* likely would not have satisfied the dietary protein requirements on their own, and thus at best would likely have been of secondary importance (Coyston, et al. 1999:224) at Strath Bogue.
Formative period inhabitants of Cuello, in northern Belize are argued to have been conspicuous consumers of *Pomacea*, so much so that the snails are suggested to have been a prominent contributor of their dietary protein in the absence of beans at the site (Hammond and Miksicek 1981:268).

Unfortunately, only one fish bone was encountered archaeologically at Strath Bogue. While we were unable to identify it to the level of species, it was isotopically tested and it’s δ¹³C value of -17.39‰ and δ¹⁵N value of 10.03‰ securely identifies it within the range of temperate marine fish (Coyston, et al. 1999:Fig. 12.1; White, Pendergast, et al. 2001:Fig. 2). While some marine or anadromous fishes are known to make periodic forays into and have the ability to adapt to estuarine and freshwater environments (Coyston, et al. 1999:232) typical of Progresso Lagoon and the New River, the isotope values indicate that this fish was a primary inhabitant of the Caribbean Sea.

Despite the fact that we have little faunal evidence to the effect, given the relative location of these communities to the New River and Progresso Lagoon it would be a reasonable hypothesis that local estuarine and riverine fish and shellfish played an important role in both of these populations’ regular subsistence regime. The riverine sites in the Belize Valley while not evidently reliant on their aquatic resources, their isotopic values do indicate they made use of them (Freiwald 2011; Gerry 1993; Gerry and Krueger 1997; Piehl 2006).

Only one fish bone was recovered during investigations at Strath Bogue. Fish bones are easily consumed by scavengers after discard, and the small and fragile nature of fish bones likely made them more susceptible to the already poor bone preservation experienced at Strath Bogue.
A collection of ceramic netsinkers or net weights used for fishing (see Figure 7.6) were retrieved from excavations. Nonetheless, the fact that only fourteen were retrieved is surprising, and again implies that fishing was not a prominent activity amongst this community residents, a supposition further substantiated by the isotopic data.

Figure 7.6: Ceramic netsinkers or net weights from Strath Bogue.

Because of their lower nitrogen values, paired with their more negative carbon isotope values, we know the Strath Bogue and Progresso Lagoon individuals were not prominent consumers of marine, estuarine or riverine resources, such as that seen in the marine based diets of Late/Terminal Classic individuals from coastal San Juan/Chac Balam (Parker 2011). Had they
been prominent consumers of aquatic resources, either from Progresso Lagoon or the New River, their nitrogen isotope values would have been significantly higher.

Understanding that freshwater fish have $\delta^{13}C$ values approximately 5‰ lighter than terrestrial herbivores, human consumers of riverine fish/shellfish can thus have lighter $\delta^{13}C$ values even if they consume the same amount of maize as terrestrial herbivore consumers (Wright and White 1996:176). While this could arguably account for the slightly lighter carbon isotope values the Strath Bogue and Progresso Shore peoples, it should follow that their $\delta^{15}N$ values would be enriched, which they clearly are not. Peoples who have diets of freshwater or marine fish and mammals typically have enriched nitrogen isotope values in the range of 10-20‰ (Freiwald 2011:257; Tykot 2002:4), and comparatively enriched $\delta^{13}C$ values (Coyston, et al. 1999:224).

According to Wright and White (Wright and White 1996:176), sites that are located closer to the coast, or riverine and lacustrine environments tend to have greater access to a diversity of C3 enriched resources, and of course aquatic foods, and correspondingly populations from these locations tend to have less positive $\delta^{13}C$ values indicating less of a reliance on C4 resources. Sites whose subsistence practices included riverine or lacustrine resources in the Maya area, such as those in northern Belize, and Dos Pilas in the Petén, have comparatively enriched nitrogen isotopic values, although they are at the cusp, or low end of this range, as well as depleted carbon isotope signatures, as is to be expected (Coyston, et al. 1999:231-232; Gerry 1997:60; Gerry and Krueger 1997:204; Wright and White 1996:174). Populations whose dietary practices are fish dominant have significantly higher nitrogen isotope values than those noted anywhere for the Maya area. Bahamian fisher-agriculturalists have $\delta^{15}N$ values ranging between 9.8 to 12.0‰ (Schoeninger, et al. 1983; White and Schwarcz 1989:466), while Prehistoric freshwater Ontario fish consuming
peoples reported have nitrogen isotopic values of approximately 12.4‰ +/- .4‰ (White and Schwarcz 1989:467). Clearly the Strath Bogue individual’s nitrogen isotope value of 8.33‰ and the Progresso shore individual’s value of 7.17‰ are not enriched and are not indicative of peoples whose diet is dependent on aquatic resources.

The majority of populations at Maya sites demonstrate diets which were maize dominant and were reliant on terrestrial animals as their source of protein. These diets typically also included the consumption of C3 terrestrial plants. However, individual as well as regional variations of the degrees of the consumption of the different components exist. Terrestrial animal-based diets have δ¹⁵N values ranging between 7.7-10‰ (Tykot 2002:4; White and Schwarcz 1989:466), with Precolumbian Mesoamerican agriculturalists having an identified mean δ¹⁵N value of 9.0‰ (Schoeninger, et al. 1983:1382). As a region, the Belize Valley/Western Belize area’s mean carbon (δ¹³C=-10.7‰) and nitrogen isotopic (δ¹⁵N=9.1‰) indicate that these sites protein source was primarily terrestrial animals and plants (Coyston, et al. 1999:231-232; Gerry 1997:59-60; Gerry and Krueger 1997:204; Tykot 2002:4; Wright and White 1996:174). The Belize Valley sites, especially those located on the Macal River (Cahal Pech and Baking Pot) had communities whose diets included the consumption of some fish, their nitrogen isotope values were not enriched enough to have classified them as riverine dependent (Freiwald 2011; Gerry 1997:59; Gerry and Krueger 1997:204; Wright and White 1996: 186). The Belize Valley/western Belize region carbon isotope values also exhibit a fairly heavy reliance on maize, with approximately 60-70% of the carbon deposited in their bone collagen coming from C4 plants (after (Gerry and Krueger 1997:202; Tykot 2002:4)). Although their riverine resources would have included a larger breadth of C3 plants and animals, including fish and snails that could account for their δ¹³C values, the
combination of the carbon and nitrogen values support the terrestrial plant and game subsistence practices.

Likewise, the Petén communities were similarly receiving their proteins primarily from terrestrial game and C3 plants ($\delta^{15}N=9.3\%_o$), however their comparatively more enriched $\delta^{13}C$ values ($\delta^{13}C=-9.6\%_o$) indicate they were more reliant on maize (see Figure 7.1 and Table 7.2), with perhaps as much as 80% of the carbon in the bone collagen coming from C4 plants (after (Gerry and Krueger 1997:202; Tykot 2002:4)). While the Petén’s mean nitrogen value is essentially the same as that of the Belize Valley/western Belize group’s mean, their carbon isotopic values vary by 1.1\%. While seemingly a small variation, it reflects a significant difference in the importance of maize among the Petén people’s diet (Gerry 1997:60; Gerry and Krueger 1997:202; Tykot 2002:8; Wright and White 1996:186). In their regional study, Gerry and Krueger (Gerry and Krueger 1997:203) argue that the range of $\delta^{15}N$ values across the Maya sites tested is due to the variable consumption of C3 plant proteins, such as beans in relation to those obtained through meat consumption. They continue by noting that the Petén populations, like those of the Copán region, evidently would also have received some of their proteins from their maize dominant diet in lieu of a variability of alternative resources (Gerry and Krueger 1997:204).

The coastal region’s enriched carbon ($\delta^{13}C=-8.3\%_o$) and nitrogen ($\delta^{15}N =11.4\%_o$) isotopic values are typical of subsistence practices that focused on marine resources (Gerry 1997; Gerry and Krueger 1997; Tykot, et al. 1996; Wright and White 1996:171). While the San Juan and Chac Balam carbon isotope values are the most enriched Terminal Classic isotopic values of all the noted regions, they are actually less enriched than coastal Postclassic-Historic Marco Gonzalez or San Pedro (Parker 2011:54; Williams, et al. 2009:Table 4). It is suspected that San Juan and Chac
Balam peoples were also consuming both C3 and C4 plants, as well as terrestrial animals which would account for their comparatively more depleted values than their later counterparts (Parker 2011:49-50). Parker has noted that there are two elite male individuals from San Juan whose stature and comparatively depleted isotopes, along with their burial association with a round, seemingly Yucatecán structure at the site may suggest that these individuals were immigrants from the mainland, whose values represent a combination of their once terrestrial dominant diet and their more recent, or final marine focused existence (Parker 2011:53-54).

Marine web dominant diets are not the norm among Maya populations. There are however, some sites whose populations are argued to also have enjoyed access to marine and estuarine resources, along with riverine resources and terrestrial plants and game. For instance, carbon and nitrogen data from the northern Belize sites of Lamanai, Altun Ha and Chau Hiix indicate that a prominent portion of the dietary protein of these populations was derived from reef and marine resources despite the fact they are not immediate to the Belizean coast, as well as riverine resources (Coyston, et al. 1999:222, 232, 240; Gerry and Krueger 1997:204; J. Z. Metcalfe, et al. 2009; White 1988; White, Pendergast, et al. 2001:381; White and Schwarcz 1989). As has been noted, the northern Belize sites, with the exception of those from this study, have the most depleted carbon isotope values of all the sites discussed, as well as the, if not close to the most enriched nitrogen isotope values, with Chau Hiix even being slightly more enriched than the coast (see Table 7.2 and Table 7.4). Despite the fact that their $\delta^{15}N$ is above the 10.0‰ cusp of the marine or riverine dominant diet, together with their depleted $\delta^{13}C$ values indicate that these communities diet was a mix of C3 and C4 plants and terrestrial animals, as well as river and marine resources (Coyston, et al. 1999:230; Gerry 1997:60; Gerry and Krueger 1997:204; J. Z. Metcalfe, et al. 2009; White,

Interestingly, researchers at the northern Belize sites all recognized a general pattern of decreased C4 plant consumption among the non-elite beginning in the Early/Late Classic periods that climaxes during the Terminal Classic. They argue that it seems that C4 plants are being substituted with C3 plants. It has been hypothesized that a possible reason for the change in maize consumption was a disruption in access to maize either as a result of impacts to local agricultural crops or to importation of maize to the region (White, Pendergast, et al. 2001:388). Another hypothesis is that maize in the Terminal Classic period may have been a value imbued status food item, and thus access was hierarchically determined according to elite power strategies. Support for this argument was seen in intrasite variations in individuals’ δ^{13}C values according to status (J. Z. Metcalfe, et al. 2009:31; White, Pendergast, et al. 2001:389, 390).

Since we don’t have the benefit of diachronic isotopic data from Strath Bogue, we could extrapolate that such changes were potentially responsible for the depleted isotopic values of the Progresso region individuals, except that researchers at these sites found that despite these dietary changes there was little impact to these populations protein intake, and their health was evidently not compromised (J. Z. Metcalfe, et al. 2009:Table 5; White, Pendergast, et al. 2001:388; White and Schwarcz 1989:466, 468). While carbon isotope values clearly change over time in these northern Belize communities, nitrogen isotopes remain consistent, indicating a move away from a C4 plants to C3 plants (J. Z. Metcalfe, et al. 2009; White and Schwarcz 1989:468; Wright and White 1996:185). Moreover, this change in maize consumption does not indicate agricultural or
cultural failure, as other crops, likely C3 plants, are clearly still being cultivated and Chau Hiix and particularly Lamanai continue to thrive well beyond the Terminal Classic period (J. Z. Metcalfe, et al. 2009; Wright and White 1996).

Peoples whose diet contains very little meat proteins and are instead reliant on C3 plants such as legumes, squash, tubers and nuts for their protein intake, have $\delta^{15}$N values ranging between 4-7‰ (Ambrose 1991; Freiwald 2011:257; Lambert 1997). The little meat consumed could also have been that of C4 plant consumers, and thus their consumption could have subsequently contributed to the human carbon isotopic signatures, however given the generally low or depleted carbon isotopic values of most test deer from across the Maya area, it appears that deer were not significant contributors to human carbon isotopes (White, et al. 2004:Table 9.3, 152). Such depleted nitrogen isotope values paired with positive carbon isotope values underline the importance of maize as a staple crop amongst these communities, and that even maize was relied on to partially contribute what limited proteins it possesses to substantiate the diet (Mansell, et al. 2006:181).

The Copán regional Terminal Classic period mean and Yaxuná’s Terminal Classic period mean $\delta^{15}$N values (N=7.6‰ and 6.6‰ respectively) and enriched $\delta^{13}$C values (N=-10.0‰ and 11.8‰ respectively) are indicative of such vegetable weighted diets, indicating a dependence on maize and beans, and a lack of proteins derived from animal consumption (Gerry 1993; 1997:60; Gerry and Krueger 1997:204; Mansell, et al. 2006:181; Tykot 2002:10). If meat had been the primary source of protein, the nitrogen isotope values would have been more positive, and the carbon isotope values would have been more negative (Gerry and Krueger 1997:202). Freshwater snails such as Pomacea would result in depleted nitrogen and carbon isotopes but would not have
provided sufficient dietary protein on their own (Macek, et al. 2009:1690). Thus, other C3 protein sources such as legumes, squash, tubers, etc., must have played a prominent role in the subsistence practices of these Maya communities.

Copán’s values have been argued to be particularly illustrative of a plant-based diet, and how prehistoric diets can be shaped by regional environmental constraints, and subsequent lack of resource diversity (Gerry 1997:60, 63; Gerry and Krueger 1997:204; Reed 1999:191; Tykot 2002:8; Wright and White 1996:186). Copán’s inhabitants were heavily reliant on maize (Gerry 1997; Gerry and Krueger 1997:205; Reed 1999:187; White, Pendergast, et al. 2001:381; Whittington 1999:159-160; Whittington and Reed 1997: 167), consuming approximately up to 30% more maize and maize products than the inhabitants of Lamanai (White, et al. 1993:369). High incidences of dental caries are of particular note amongst peoples who are horticulturists, and prominent consumers of carbohydrates, such as maize and tubers. At Copán, caries frequencies and tooth loss are tied to the community’s horticultural, maize dominant diet (Whittington 1999:160, 164).

It has also been suggested that settlement density may have affected stable isotope values, in that expansion of a community’s population would have infringed on the natural balance of available plants and wild animals in favor of cultivated crops, and thus less game would have been available for consumption (Gerry 1997:64-65). Faunal remains are not numerous at Copán, however isotopic testing of deer and other remains has shown that animals from the Copán region consumed similar amounts of C4 plants as elsewhere in the Maya area, with Late Classic period deer having a mean δ¹³C value of -20.0‰ (Reed 1999:187, 191; Tykot 2002:10). While there are a few deer which have more positive δ¹³C values these values are more suggestive of periodic or
opportunistic milpa grazing (Tykot 2002:10; White, et al. 2004:Table 9.3, 152). Despite the fact that the Copán regional sites are within close proximity to a river, it is also clear that freshwater fish did not factor prominently into the Copán area diet as nitrogen isotopic values would have been much more positive.

Yaxuná’s northern lowland environment is more arid than that of the Petén, to the point of it potentially being critical during the dry season (White and Schwarcz 1989:187), and is characterized by low scrub bush rather than lush tropical forest. While it received more rainfall than the coastal plain 20 kilometers away (Mansell, et al. 2006:174), the northern lowlands’ lack of rainfall meant that sites had to be reliant on cenotes, aguadas and chultuns for water. The Yaxuná community was dependent on three centralized cenotes for its water (Suhler, et al. 2004:452). The site was directly connected to the center of Cobá and the east coast by a sacbe and was 20 kilometers from the major Maya center of Chichén Itzá (Mansell, et al. 2006:174-175). The one identified Terminal Classic individual whose collagen was preserved enough to have produced stable isotope data had the lowest δ^{15}N value of all the reported sites consulted in this study (N=7.17‰) (see Figure 7.4), and a relatively positive δ^{13}C value (C=−11.8‰) (Mansell, et al. 2006:Table 13.1). Stable isotope data from bone collagen has suggested to researchers that the Yaxuná inhabitants had a diet that was reliant on maize and maize products, although much less so than the Petén region sites, and was supplemented by C3 plants, such as beans and legumes, and some wild animals (Mansell, et al. 2006:177, 180-181).

As two out of the three components of the “Mesoamerican triad,” researchers have traditionally focused on squash, and most prominently beans as having been the dominant cultivated C3 plant consumed by the Precolumbian Maya (Lentz 1999:5, 10; Tykot 2002:2, 6, 10).
Beans, as well as root crops, are underrepresented in the archaeological record due in part to their traditional preparation that involves the soaking and boiling, as thus they rarely have the opportunity to become carbonized and thereby preserved (Hammond and Miksicek 1981:265; Sheets, et al. 2012:274). Moreover, the soft fleshy consistency of beans and lack of inedible extraneous parts make such products as beans and root crops prone to quick decomposition without carbonization, unlike maize and squash which have better opportunities for preservation (Hammond and Miksicek 1981:265; Lentz 1999:5). Nonetheless, it is widely accepted, as well as historically and ethnographically recognized that beans have been a major component of traditional Maya subsistence practices. This is in part due to the fact that beans, unlike tubers, are regularly represented in Maya art and in such “mythhistories” and chronicles as the Popol Vuh (Tedlock 1992) and the Chalam Balam of Chumayel (Roys 1933). Archaeobotanical evidence of beans has been found at Copán (Reed 1999:185) and the site of Cerén in El Salvador, where a mixture of common beans (Phaseolus vulgaris L.) and sieve beans (Phaseolus lunatus L.), along with wild beans were identified in nearly full ceramic vessels and in storage containers (Lentz 1999:5; Sheets 1979:40).

Other C3 plants such as tubers are often noted and recognized as having been eaten by the Maya historically (Bronson 1966:256; Gates 1978:38-39), however, the dietary significance of such tubers as manioc (Manihot esculenta) (also known as yuca and, or cassava) and sweet potato (Ipomoea batatas) have remained elusive since minimal archaeological evidence for them exists (Bronson 1966; Hammond and Miksicek 1981:265; Lentz 1999:14; Pohl, et al. 1996). As is the case with beans, the dearth of evidence of tuber consumption is predominantly due to preservation issues, and the fact that tubers generally lack seeds as they are vegetatively planted (Cock
Manioc pollen is also a rarity in and of itself, as the plant does not require pollination for plant propagation (Jones 1994:208; Sheets, et al. 2012:277). Additionally, manioc begins to rot within two to three days of harvesting (Dixon 2011:55; Sheets and Dixon 2011:4, 5; Sheets, et al. 2012:272-273) and as mentioned earlier given their tender physical properties and improbability of being carbonized, unearthing direct evidence is particularly challenging (Bronson 1966:256; Hammond and Miksicek 1981:265; Lentz 1999:11; Sheets and Dixon 2011:2, 3).

In 1959, scientists with the British Honduras Land Use Survey proposed that the Precolumbian Maya of northern Belize (then British Honduras) may have been more reliant on root crops as opposed to maize, however they made such a suggestion without archaeological evidence (Wright, et al. 1959:112). In 1966 Bronson (1966) presented a very compelling argument for tubers having been of importance to the prehistoric Maya diet, but while he noted very plausible circumstantial evidence, he also noted that the lack of hard evidence for its use and role. Admittedly hampered by the lack of hard evidence, I believe researchers have been remiss in their lack of attention paid to the potential importance of such crops as manioc, especially in light of recent discussions concerning increasing aridity and drought in the Terminal Classic period.

Manioc is considered an “anxiety crop,” as it is less susceptible to periods of extended aridity, requiring less rainfall and less fertile soils than the plants of the triad do (Sheets and Dixon 2011:2, 4). Leon has stated that of all the Mesoamerican cultigens, manioc is the most drought-resistant (Leon 1968, in Sheets, 2011 #2004:4), and can even withstand more acidic soils than maize, beans or squash to the point of being more productive even than maize (Cock 1982, in Sheets, 2011 #2004:4, 5). The plant itself is a very productive perennial; capable of harvest yields
of 5-10 tons per hectare, and the plant itself is edible beyond the tubers, as the leaves are also edible (Sheets and Dixon 2011:4). Both the tuber and the leaves are rich in carbohydrates, with the tubers being 85% carbohydrates. They are good sources of iron, phosphorous and vitamin B, and depending on the study manioc plants can provide between six and 15 times more calories than maize (Bronson 1966:269; J. H. Walker 2004, in Sheets, 2011 #2004:4). Granted, the protein content of tubers is limited (1-2 grams of protein for 100 grams total weight), and are in fact inferior to maize in this respect (8 grams of protein to 100 grams total weight) (Bronson 1966:268), in an arid environment or drought crisis, tubers with all of their nutritional properties and high yields and ability to produce despite the conditions, may have been one of the most important crops available (Bronson 1966; Sheets, et al. 2011:8). The potential uses of manioc are also numerous. It can be eaten raw or cooked, it can be dried. Manioc can also be processed - ground into a powder, like flour, called almidón, or mashed and fermented in jars into a beer-like concoction. The juice of manioc is sticky and could have been used as an epoxy, as was hypothesized at Cerén in some constructions (Sheets, et al. 2011:4; Sheets, et al. 2012:273).

Cores in Cob Swamp along the Hondo River (Pohl, et al. 1996:362), an aguada near Sierra de Agua in northwestern Belize (Kunen 2001:56) and Cobweb Swamp near the site of Colha (Crane 1996:271; Jones 1994:208) in northern Belize are argued to have contained manioc pollen grains, which are quite early in date (3400 B.C. and 2400 B.C. respectively). These grains co-occur with maize pollens and strongly suggest cultivation; although there is the possibility they may have been managed wild ancestors of domesticated manioc (Pohl, et al. 1996:363). Miksicek et al. have reported the identification of Late Preclassic carbonized manioc stems from Cuello (Miksicek, et al. 1991:180). The most significant and hard evidence of manioc cultivation by the Maya has
come from the site of Cerén in El Salvador, where tephra deposits from the A.D. 630 eruption of Loma Caldera helped preserve evidence of manioc cultivation. Phytoliths in sediments, starch grains from artifact scrapings, carbonized macroremains of plants from middens, and casts of manioc plants associated with planting beds and monocrop field plots, together support the argument for the intensive cultivation of manioc as an important staple crop (Dixon 2011:41, 54; Sheets, et al. 2011:8; Sheets, et al. 2012:273, 276-277).

Adding to the perception that manioc was an important crop within Precolumbian Maya diet was the provisional identification of manioc starch granules imbedded in the calculus of human teeth at the site of Kichpanha in northern Belize over the course of the sites history (Protoclassic to Terminal Classic period) (Magennis 1999:144). Thus, I would argue that despite their otherwise ostensive absence at many sites, it is highly likely that manioc, like beans, played an important role in the subsistence of the Precolumbian lowland Maya. As argued by Sheets et al. (Sheets, et al. 2012:278), it stands to reason that manioc was a staple crop among other Maya communities besides Cerén, particularly in areas that are in fact more suitable for its cultivation (lower rainfall rates), but which were not as uniquely and fortunate enough to have had its significance preserved by a volcanic eruption. It is clear that the inhabitants of Copán (the closet isotopically tested site to Cerén) and Yaxuná were consuming a predominantly plant-based diet, which is argued to have included such C3 plants as beans and squash, but also likely included tubers such as manioc. Given the prominence of plant foods to these communities’ subsistence base, much of which we have little hard evidence for, I believe that despite its elusiveness manioc was very likely prominent in these peoples’ diet, perhaps so much so to have been a staple crop like it evidently was at Cerén.

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I have intentionally presented a discussion here on the relevant data and possible significance of manioc as a significant C3 food here as I believe this crop would have been of particular importance to the peoples of Yaxuná given the recognized dryness of the northern Maya lowlands, but also in light of recent dialogues arguing drought around the time of the Terminal Classic period to have been a possible explanation for the Maya “collapse” (Carmean, et al. 2004; Curtis, et al. 1996; Gill 2000; Hodell, et al. 2001; Hodell, et al. 1995; Sabloff and Rathje 1995; Yaeger and Hodell 2008). It is important to point out that despite the northern Maya lowlands’ longstanding and characteristic dryness’, caused in part by limited access to groundwater and variable if not often deficient rainfall rates (Ringle and Bey 2002:505; Yaeger and Hodell 2008:211), many sites in the northern lowlands, like Yaxuná, Chichén Itzá and those of the Puuc region experienced architectural, population and political growths during the Terminal Classic period, and in some cases persisted for 100-200 years longer than those associated with the southern and central lowland collapse (Carmean, et al. 2004; Kepecs, et al. 1994; Ringle, et al. 2004; Yaeger and Hodell 2008). For centuries the communities of the northern lowlands were able to forge a balanced existence in spite of their arid environmental challenges, and the cultivation of manioc as a staple crop may have been one adaptation that allowed them to succeed. Having the knowledge of how to mitigate dry conditions would have been advantageous in the face of drought like conditions, particularly in areas not experienced in the management of such hardships. The comprehension and experience of how to manage such a hardship could have provided a solid foundation from which the expansion of the northern communities across the landscape was facilitated. Especially in light of the onset of hypothesized drought conditions occurring elsewhere in the Maya lowlands during the Terminal Classic period.
The Copán and Yaxuná stable carbon and nitrogen isotopic values signal a plant-based diet, with the primary source of protein being C3 plants (Gerry and Krueger 1997:204; Mansell, et al. 2006:177), is particularly significant for comparative purposes in examining the Strath Bogue and Progresso shore isotopic data. While their carbon isotope values are more depleted, they are not remarkably dissimilar to those tested elsewhere in northern Belize. The Strath Bogue and Progresso shore individuals’ nitrogen isotopic values however diverge significantly from those recorded for the region. As seen in Figure 7.4, their nitrogen isotope values are of particular interest, as not only are they regionally divergent, they are also amongst the least enriched values within the Maya area, particular that of the Progresso shore individual. It is for this reason that I chose to not only discuss the subsistence practices of the other Maya communities, but also presented information concerning C3 plants, including a discussion about beans and in particular manioc.

Despite the very immediate and easily accessible aquatic resources, and that unlike more densely populated sites or regions, the dispersed settlement pattern would likely have had minimal impact on local wild game (see for instance (Gerry 1997:64-65)), the Strath Bogue and Progresso shore peoples were not obtaining the bulk of proteins from either the New River or the Progresso Lagoon, nor were they notable consumers of terrestrial animal resources. Their stable carbon and nitrogen isotopic values indicate that, like the people of people of Copán and Yaxuná, the Strath Bogue and Progresso shore individuals shared similar plant prominent diets, and most significantly, their regionally divergent subsistence practices help identify them as recent immigrants to the Progresso Lagoon region. Moreover, it is my contention that their stable carbon and nitrogen isotopic signatures, in concert with the other archaeological, ethnohistoric and
ceramic data presented lend cautious support to the hypothesis that the Strath Bogue and Progresso shore individuals migrated to the region from the northern Maya lowlands.

The Strath Bogue individual’s $\delta^{15}N$ value of 8.3‰ is the more positive of the two tested individuals in this study, and in fact technically falls within the low-end of the range of a terrestrial plant and some terrestrial animal consumers (after (Tykot 2002:4)). However, like the similar yet more positive $\delta^{15}N$ value for Terminal Classic Seibal (N=8.9‰,) the Strath Bogue individuals’ nitrogen isotopic value is low enough to suggest the regular consumption of C3 plants (Wright 1997b:191). The Progresso shore individual’s $\delta^{15}N$ value of 7.17‰ is the second lowest of the reported Terminal Classic values for the Maya area, even lower than that for Copán which has been effectively discussed in print as “the” Maya example of a plant based subsistence strategy (see Figure 7.4) (Gerry 1997:60; Parker 2011:54; Reed 1999:191; Whittington 1999:159-160; Whittington and Reed 1997: 167). While most Maya diets are acknowledged to have been heavily reliant on maize and maize products, the Copán and Yaxuná, and by extension the Progresso shore individuals’ diets are not only predominantly vegetarian diets, by seemingly more weighted towards a C3 diet than the other tested sites (Gerry and Krueger 1997:204; Mansell, et al. 2006:177).

**DISCUSSION**

There are three things that are particularly significant about the Strath Bogue and Progresso shore nitrogen isotope values: 1) They are both significantly less enriched than the mean nitrogen isotopes values of its northern Belize neighboring sites; 2) despite these sites fortunate proximity to both a freshwater river AND a brackish lagoon (particularly the Progresso shore location) and thus to a great diversity of available resources, neither of these individuals were prominent or
regular consumers of fish or other aquatic animals; and 3) the nitrogen isotopic values of the Strath Bogue and Progresso Lagoon individuals are also remarkably dissimilar from each other.

If, as has been noted by some researchers, one’s subsistence practices are shaped by their environment (Gerry 1993, 1997; Gerry and Krueger 1997; Wright and White 1996), it should follow that the Strath Bogue and Progresso individuals would be regular if not prominent consumers of fish and other aquatic animals. In comparing the Strath Bogue and Progresso shore scenarios and data to that of the other tested northern Belize sites, two things are immediately apparent. Firstly, Chau Hiix, Altun Ha and Lamanai are all sites located on or within the immediate vicinity of aquatic environments. Second, all three of these sites have mean nitrogen isotopic values which while not heavily weighted (Table 7.5), indicate a regular consumption of aquatic resources. As has been discussed, the type and diversity of resources available to prehistoric communities is bound to a degree by their immediate and natural environments, and thus as was the case with these communities, they took advantage of those resources within the immediate vicinity. It is thus striking that the Progresso region individuals did not partake of the immediate aquatic resources.

Table 7.5: Table of stable carbon and nitrogen isotopic values for sites tested in northern Belize.

<table>
<thead>
<tr>
<th>SITE</th>
<th>δ¹³C‰</th>
<th>δ¹⁵N‰</th>
</tr>
</thead>
<tbody>
<tr>
<td>Chau Hiix</td>
<td>-12.3</td>
<td>11.2</td>
</tr>
<tr>
<td>Altun Ha</td>
<td>-12.3</td>
<td>10.2</td>
</tr>
<tr>
<td>Lamanai</td>
<td>-14.8</td>
<td>10.0</td>
</tr>
<tr>
<td>Strath Bogue</td>
<td>-11.9</td>
<td>8.3</td>
</tr>
<tr>
<td>Progresso Shore</td>
<td>-11.4</td>
<td>7.2</td>
</tr>
</tbody>
</table>
Additionally, given that settlement in the Progresso Lagoon region can generally be described as dispersed, with sporadic settlement nucleations, it is unlikely that the terrestrial animal populations would have been so drastically impacted so to negatively affect the diets of the regions inhabitants, as has suggested to have occurred elsewhere in the Maya area (Wright and White 1996:185). In fact, Chau Hiix’s success and ability to prevent the overexploitation of local animal resources has been partially accredited to the site’s small size and its rich and varied resources (J. Z. Metcalfe, et al. 2009:31). Moreover, while an admittedly small assemblage of faunal remains was recovered from Strath Bogue excavations, the full range of local animals typically consumed by the Maya was present. Moreover, all three of the other northern Belize tested sites note that while carbon isotope values and thus maize consumption decreased in the Terminal Classic period, the nitrogen isotope values of their inhabitants remained stable over time, with the exception of Chau Hiix whose values became more enriched. It thus seems that northern Belize’s protein resources, at the least those associated with aquatic environments, were evidently not drastically impacted or overexploited (White and Schwarcz 1989:468; Wright and White 1996:186).

Unlike many of the other sites from which isotopic data are available, comparative chronological data for preceding or succeeding time periods at Strath Bogue and the Progresso shore household do not exist. We are thus unable to identify variations, or changes in isotopic data that might indicate (in)stabilities or shifts in subsistence behaviors that might otherwise help explain the low nitrogen values of these individuals. Such data it typically helpful in ascertaining stresses or developments that may have been experienced by these communities that affected people’s dietary behaviors, as was ascertained at other Terminal Classic period sites during this period of transition (Freiwald 2011; J. Z. Metcalfe, et al. 2009; White 1988, 1997; White, et al.
the fact that we do not have diachronic information for Strath Bogue or the Progresso shore household does not stem from a lack of archaeological investigations but is instead because these two sites were established during the Terminal Classic period. The fact that there are no immediate proceeding or succeeding periods of occupation at either of these locations underlines the reality that these people were new to the area, and thus were either maintaining the subsistence practices of their native homeland, which very likely did not include aquatic resources, or they had not yet fully embraced the new resources available to them. Alternatively, and as I believe to have been the case more so with the Strath Bogue individual, after having established themselves in the region before the Progresso shore household, the Strath Bogue individuals likely began to introduce the local resources into their diet but continued to maintain some of their traditional dietary practices. The potential of their having been relatively newly established in the area but having been settled longer than the Progresso shore individual would account for differential nitrogen isotopic values, given that it takes many years for bone collagen to fully regenerate (Ambrose 1987; Chisholm, et al. 1982:1131; Price, et al. 1985; Schoeninger and Moore 1992; Vanderwarker 2006:189). This would further explain why the Strath Bogue and Progress shore values also deviate from those of the northern Belize region.

Aquatic environments are known not just for their varying animal resources, but also for having a greater diversity of C3 resources, including plants, but also such C3 consuming animals as freshwater snails, turtles and iguanas. Thus, it is possible that the ingesting of these items, particularly freshwater snails like *Pomacea* which have stable isotopic values as C3 plants that are also within the range of tubers and legumes, may have contributed to these individuals’ isotopic
values (Coyston, et al. 1999:Fig. 12.1; Tykot 2004:Fig. 2; Wright 1997b:Fig. 14.1). As discussed earlier, *Pomacea* snails, whose shells were the most recovered faunal item at Strath Bogue, could have been a secondary source of protein, which would account for the low and C3 dominant $\delta^{15}N$ values, but would also account for the low $\delta^{13}C$ values as they also result in the depleted carbon isotopes (Coyston, et al. 1999:224; Healy, et al. 1990; Lege, 2001 #1990 in, Macek, et al. 2009:1690). As it is my contention that the Strath Bogue and Progresso shore individuals were recent immigrants to their area, with the Strath Bogue individual having been settled longer than the shore individual, this would help explain why the Strath Bogue individuals’ $\delta^{13}C$ value was more depleted and the $\delta^{15}N$ value was more positive than the Progresso Shore individual’s values were. As they became more accustomed or acclimatized to the northern Belize resources, their constitutions and thus isotopes were slowly changing and becoming more like those of their neighbors.

As has already been stated, Maya diets have traditionally been C4 plant dominant, with some communities relying more than others on maize. During the Terminal Classic period a reduction in the consumption of maize and maize products occurred in northern Belize. This reduction is not argued to have been related to poor environmental conditions, the overexploitation of the land, and, or cultural or agricultural failure, nor did it negatively impact people’s diets or result in health crises. Had such a change been environmental or agricultural in nature, C3 crops, plants and terrestrial animals would also have likewise been negatively affected, which in turn would have drastically impact subsistence practices and be indicated in the depletion of both carbon and nitrogen isotopes in humans. Instead, this movement away from the consumption of maize was concomitant with a distinct move towards the regular consumption of C3 plants and
products, as has been indicated by the nitrogen isotopes at Chau Hiix, Lamanai, and Altun Ha (J. Z. Metcalfe, et al. 2009:30-31; White 1997:179; White, Pendergast, et al. 2001; White and Schwarcz 1989:468; Wright and White 1996:180, 186). Additionally, recent core studies from the New River Lagoon where Lamanai is located have indicated limited signs of drought during the Late-Terminal Classic (S. Metcalfe, et al. 2009:639), despite there being evidence to the contrary in other parts of the Maya area (Curtis, et al. 1998; Curtis, et al. 1996; Hodell, et al. 2001; Hodell, et al. 1995). Furthermore, the New River and nearby Honey Camp Lagoon instead show signs of enrichment (S. Metcalfe, et al. 2009:640). The decrease in maize consumption and switch to C3 plants at these sites is seemingly a cultural or sociopolitical choice, rather than a consequence of drought. The more positive carbon isotope values of the Strath Bogue and Progresso shore individuals does not negate this point, as I believe that like their nitrogen isotope values, their more positive carbon isotope values are related to their having been recent immigrants to the area where maize was more prominently consumed food. This would also explain why the Strath Bogue individual’s carbon isotope value is more depleted than the Progresso, as once again, they appear to have been settled longer in the area than the Progresso shore individual, and thus their constitutions have begun to become accustomed to their new subsistence regime.

The recovery of grinding implements such as metates and manos at Strath Bogue, were by no means were numerous (manos n=11; metates n=10), they do signal the processing of plants. Due to funding constraints, we were unfortunately unable to conduct residue analyses on these specimens to see what types of foodstuffs were being processed, however, we know that metates have been used in the processing of both maize (Sidrys 1983:294) and manioc (Sheets, et al. 2012:277). At Cerén, manos and metates from households were thought to have been used in the
grinding of manioc after it is sun-dried into *almidón*, a flour-like powder that is able to store for extended periods of time so long as it is kept dry (Sheets, et al. 2012:273). In his early investigation of sites around northern Belize, Sidrys (1983:294) found that the majority of metates and manos recovered from sites across the region dated primarily to the Terminal Classic period, the period in which there is appears to have been a regional increase in the consumption of C3 plant foods, perhaps manioc.

These region wide subsistence changes are also paired with the understanding that the Terminal Classic period in northern Belize is NOT marked by cultural or environmental decline, but instead by construction episodes and architectural elaborations, population increases, site expansion, and the growth of trade networks. Co-occurring with these changes in northern Belize is an apparent shift away from previous affinities with Petén polities in favor of regional independence and, or connections with Yucatecán polities (Andrews, et al. 2003; Ball 1977a; Chase 1982a, b; Chase and Chase 1982; Demarest, et al. 2004a; Fry 1983:204; 1989; Kepecs, et al. 1994; Kosakowsky and Pring 2001; Masson and Mock 2004:367; J. Z. Metcalfe, et al. 2009:31; Pendergast 1986; Sidrys 1983; Sullivan 2002; Walker 1990; D. S. Walker 2004; White 1997:179; Wright and White 1996:177; Yaeger and Hodell 2008:229). These shifts underline a Maya area trend at the time, wherein there was a sociopolitical and economic repositioning of allegiances away from the south-central Maya lowlands in concert with the decline of many of these same communities. At the same time polities in the northern Maya lowlands were bourgeoning, particularly in the Puuc region and with the expansion of the Chichén Itzá polity during what had been labeled the “Florescent” period in the north (Carmean, et al. 2004; Cobos Palma 2004; Dunning 1992; Ringle and Bey 2002; Wren and Schmidt 1991; Yaeger and Hodell 2008). These
changes also occurred with the expansion and importance of trading networks during this period of transition, that were in part supported by water transportation down the coast and along waterways or “canoe highways,” like the New River and Freshwater Creek drainage systems (Andrews, et al. 2003; Kepecs, et al. 1994:143; Masson and Mock 2004:367; McKillop 1996; McKillop and Healey 1989; Pendergast 1986; Robles and Andrews 1986:78; Williams, et al. 2009:39; Wright and White 1996:177; Yaeger and Hodell 2008:229) and giving rise to communities along their trajectories.

These new northern affinities are perhaps most prominently seen in the growing presence or influence of both Cehpech and Sotuta ceramic wares from the north as well (Chase and Chase 1987; Chase 1982a; Fry 1983:204; 1989; Kosakowsky and Pring 2001; Masson 2002b; Masson and Mock 2004; Masson and Rosenswig 2005a; Robles and Andrews 1986:78; Walker 1990; D. S. Walker 2004), as well as Yucatecán architectural features, including round structures, at some sites (Chase and Chase 1982; Digrius and Masson 2001; Kosakowsky and Pring 2001). The stable isotope analyses conducted on the Strath Bogue and Progresso shore individuals has added another element by which connections to the northern Maya lowlands can be confirmed, and additionally these data have also helped established that these individuals were migrants, likely from the northern lowlands themselves. It would appear that these communities sought to take advantage of the changing sociopolitical and economic climate of the Terminal Classic period and migrated to the Progresso Lagoon region. A region whose natural resources and location along “transcontinental” waterways was advantageous to the developing entrepreneurism and later championed by the Maya during the Postclassic period (Andrews, et al. 2003; Masson and Mock 2004; McKillop 1996; Sabloff and Rathje 1975b). Since the area’s waterways were not severely
affected by changes in aridity, their ability to farm was not significantly hampered, and evidently was an important component to their subsistence practices. The richness and or ability to sustain agricultural endeavors may have been one of the draws of the area and may have been one of the opportunities capitalized on as part of the developing economic networks.

We also know from the stable isotope analyses from other sites in northern Belize that during the Terminal Classic period there was a seemingly region-wide increase in the consumption of C3 plants at sites with long occupation histories. This increase has not been tied to environmental or sociopolitical crises. Rather, it also coincides with increases in community populations, settlement densities, architectural elaborations and construction episodes, all of which not indicators of a peoples in crisis but are instead considered affirmations of success. Co-occurring with these adjustments was an influx in the presence and influence of northern Yucatán ceramics across northern Belize and Quintana Roo. It is thus logical to suggest that this increase in the consumption of C3 plants, presumably a particular crop or a particular dish is also related to these seemingly northern Yucatán influences.

The extreme deviation of the Strath Bogue and Progresso shore individuals’ nitrogen isotopes from those tested elsewhere in northern Belize and yet who lived in similar environments with similar resources, underlines the foreignness of the Strath Bogue and Progresso shore individuals. Neither of these peoples were prominent consumers of fish, or terrestrial animals, and while their carbon isotope values indicate they were eating more maize than their neighbors, they were not nearly as prominent consumers of maize or meat as those from northern Belize or the Petén regions. The lack of faunal remains from Strath Bogue, despite the identification of an otherwise rich midden associated with Structure 5 may in fact be a reflection of their vegetable focused subsistence practices; after all, without regular meat consumption few bones are to be had.
The stable isotope values of the Progresso shore individual indicate they were consuming a diet primarily vegetarian diet, and like the Yaxuná individual, and the Copán communities, they were obtaining the majority of their proteins from C3 plants, such as beans, and very possibly tubers like manioc. While the Strath Bogue individual’s stable nitrogen values were more positive than the Progresso individual, they still differ remarkably from the other northern Belize values. I have thus argued that both the Strath Bogue and Progresso shore individuals were migrants to the Progresso Lagoon region. It would appear that given their depleted nitrogen isotopes, the Progresso shore individual was a more recent migrant to the region who died a relatively short time after their arrival and thus their diet had not yet incorporated the full gamut of available local resources. On the other hand, the Strath Bogue individual’s isotope data has revealed that this individual had begun to incorporate local foods into their diet, while still maintaining some degree of their C3 prominent culinary practices associated with their homeland. These data further suggest that this individual likely had been settled in the area for a longer period of time given enough time had passed for their bone collagen and isotopes to be altered. As I previously argued, this individual may have been an important figure in the resettling, founding of this community.

Following the observations of others (Andrews, et al. 2003; Kepecs, et al. 1994; Masson and Mock 2004:367; McKillop 1996; Sabloff 1977; Sabloff and Rathje 1975a), it is my contention that these influences were linked to an expanding Caribbean and riverine trade networks, but were not simply the result of mere contact with peoples and goods from the north, but these impacts included the actual relocation of peoples who sought to take advantage of the declining polities to the south, and the changing sociopolitical climate and burgeoning economic developments of the north. People thus began to move more about the Maya landscape presumably in pursuit of better lives. Whether such moves were individualistically pursued or sponsored by a regulatory party or polity is pure speculation at this point and outside the scope of this study. “Foreigners” as identified by stable carbon and nitrogen isotopes have been similarly, yet tentatively, identified amongst Terminal Classic occupations at Chau Hiix (J. Z. Metcalfe, et
al. 2009:32), Altun Ha (White, Pendergast, et al. 2001:383, 389) and San Juan (Parker 2011:53), although conclusions as to where they may have come from were not offered.

As was the case with the Terminal Classic individual at Yaxuná, but also with others from different time periods at this site, as well as at the earlier Northern Yucatán site of Chunucmilk (Mansell, et al. 2006:Table 13.1), peoples’ diets in the north appear to have been C3 dominant. Given the arid environment of the northern Maya lowlands and what we know about C3 crops, particularly manioc as a viable crop in such conditions and in drought situations, it is logical that these peoples’ diets would include such food items. Should northern Yucatán inhabitants have decided to move across the landscape, their traditional dietary and culinary practices would come with them. If as has been discussed some portions of the Maya area were experiencing episodes of drought or increasing aridity (Brenner, et al. 2001; Curtis, et al. 1996; Dahlin, et al. 1991; Hodell, et al. 2000; Turner II 2010; Yaeger and Hodell 2008), peoples who were experienced with such conditions and able to forage viable existences despite such challenges may have had valuable knowledge to pass on to other communities that would have helped assimilate into new areas, even those which were minimally affected by such environmental impacts.

As attested to by their stable isotope values, the Strath Bogue and Progresso shore communities did not simply relocate from larger sites down the road as a result of population increases. Nor were they transplants from another elsewhere in northern Belize as a result of political fractioning, as their isotopes in both cases would have mimicked those from northern Belize region. I also am not of the opinion that these people were refugees fleeing from the Petén region as a result of the ensuing decline of the south-central polities. Had they been, their carbon and nitrogen isotopes would have been significantly more positive, as has been recorded for that region. I firmly believe given the stable carbon isotope results, as well as the other data discussed in this study, that the Progresso Shore and Strath Bogue individuals were members of communities that migrated from the northern Maya lowlands to the Progresso Lagoon region in attempt to take advantage of the numerous natural resources and the transitioning sociopolitical and
economic climate. Where exactly they came from is unknown at this point, and worthy of more additional study, including the use of strontium isotopic analyses which have been very successful in identifying more precisely the homeland of various individuals (Freiwald 2011; Hoogewerff, et al. 2001; Müller, et al. 2003; D. T. Price, et al. 1994; Price, et al. 2008; Price and Gestsdóttir 2005; Wright 2005, 2007).

SUMMARY

Stable carbon and nitrogen isotope analyses were performed on the human remains of four individuals from Strath Bogue, and one individual from the Progresso shore community for contrasting and comparative purposes, and to provide a larger context from which to understand Terminal Classic occupations in the Progresso Lagoon region. These were the Terminal Classic burials recovered from these locations. Unfortunately, the bone collagen in three of the individuals from Strath Bogue was deemed unstable, and thus unable to produce results.

The stable carbon and nitrogen isotope analyses of the Strath Bogue and Progresso shore individual found that their dietary practices differed substantially from those studied at other northern Belize sites, all of which lived in similar aquatic environments. Despite being located a short distance from both a riverine and estuarine environment, the Strath Bogue individual’s isotopic results indicated they were not prominent consumers of aquatic resources, as their nitrogen isotopes would be significantly more enriched. Additionally, this individual was a prominent consumer of C4, presumably maize and maize products, consuming slightly more maize than the norm for northern Belize, and yet they consumed less than those in the Petén. This is somewhat peculiar when the deer specimen tested from Strath Bogue was found to have eaten more maize than most deer around the Maya subarea, but not enough to have been purposefully fed maize, suggesting maize was readily available, agricultural crop in the area. It is suggested that while this
individual did consume some terrestrial meat products, they were a prominent consumer of such C3 plants as beans, squash and tubers such as manioc.

The Progresso shore individual’s isotopic analyses were particularly interesting, as their carbon and nitrogen values indicated that they too were not consumers of aquatic resources. This is particularly surprising given their relative location within 300 feet of the Progresso Lagoon. In fact, their extremely low nitrogen isotopes indicate that this individual’s subsistence practices centered on vegetables, with minimal consumption of meat products. At other sites in the Maya area where diets produced similar isotopic results, scholars have argued for a diet prominently focused on maize, beans and other C3 plants. The discovery of manioc agricultural crops at the site of Cerén in El Salvador has prompted discussions on the likelihood that despite little botanical evidence, manioc likely played a prominent role in Maya subsistence practices, especially in areas and during times where aridity or drought was a factor.

It appears that these individuals had either not yet conformed to the consumption of aquatic resources, or as I believe to be the case with the Strath Bogue individual, had begun to take advantage of the resources in their new environment, but had either not fully embraced them, or their bone collagen was just beginning to regenerate after the change in dietary practices. The extremely depleted nitrogen isotopic value of the Progresso shore individual is argued to indicate that this individual was a very recent migrant to the area, having died relatively soon after their arrival, as their nitrogen isotopes given very little indication that they were consuming any aquatic resources at all.
The stable carbon and nitrogen isotopic results from the Strath Bogue and Progresso shore individuals are particularly stunning given their immediate access to both the lagoon and the New River, and the wide variety and apparent abundance of resources available within the local environment. It has been established that bone collagen is regenerated approximately every 20-30 years (Ambrose 1987; Chisholm, et al. 1982:32; Price, et al. 1985; Schoeninger and Moore 1992; Vanderwarker 2006:189). Thus, given the extreme departure of these individual’s isotopes from the norm in northern Belize, and their clearly non-aquatic and non-meat focused diet, I have argued that the results indicate they were relatively new arrivals to the area, having migrated from an area, and community whose subsistence practices were vegetarian based. The isotopic data support my contention that these individuals were not part of a local political fractioning group or part of a population expansion of a nearby community, as their isotopes would be reminiscent of those from elsewhere in northern Belize. While I am unable to pinpoint an exact location of their origin, the similarity in isotopes to those in northern Yucatán, paired with the presence of ceramics from the Sotuta, but particularly the Cehpech ceramic spheres is compelling. Moreover, in light of the recognized expanding Yucatecán trade networks and influences during this period and coinciding shift away from earlier associations with the Petén, it is believed that the Strath Bogue and Progresso shore inhabitants likely migrated to the Progresso Lagoon region from the northern Maya lowlands.

Additional support of this hypothesis was broached in the previous chapter and the discussion of two new ceramic types within the Progresso complex. Coco Red and Strath Bogue Unslipped are argued to be ceramics produced by peoples new to the area. Their relative unfamiliarity with the local raw materials impacted the formulation of these ceramics, generally
resulting in cracked and crumbly surfaces, and dark, poorly fired cores. Structural and quality variations in these ceramics were seen between those found at Strath Bogue compared to those recovered at the Progresso shore and Caye Coco communities. I have suggested that these variations indicated the Strath Bogue peoples were the earlier producers of this type, and thus their unfamiliarity with the local resources is more evident in the more pronounced structural issues and improper firing techniques. The specimens from the Progresso Lagoon centered locations are also poorly executed, however their structural integrity is much better, their surfaces are much smoother and less crumbly, they were clearly fired in a more reduced environment than those at Strath Bogue, and they are thinner. I have suggested these improvements are likely due to the fact that the later arriving Progresso shore peoples were benefiting from the original producers having been established in the area longer by the time the Progresso shore peoples arrived, and thus had the benefit of their slightly more seasoned familiarity with the resources. These ceramic data together with the isotopic results offer additional support not only to the migration hypothesis, but that the Strath Bogue peoples were earlier colonizers of the area than those at the Progresso shore, Chuk group.

In considering the stable isotope data for the Strath Bogue and Progresso Lagoon individuals, it must be stated that these data of course truly only reflective of these solitary individuals, and not of entire populations at these sites. However, given the extreme departure of their isotopic values from northern Belize norms, the fact that these particular locations did not have Late Classic period occupations at this time and that northern Belize witnessed extreme population increases in the Terminal Classic period, it is feasible to consider these individuals
representative of their communities, until such time that additional subjects and testing are allowed.
CHAPTER 8: STRATH BOGUE MATERIAL CULTURE

CERAMICS

As material expressions of past human behaviors, ceramic artifacts such as spindle whorls, figurines, net weights, and most especially vessels and their broken counterparts (sherds) play an important role in the archaeologists’ understanding of a given culture and its social, economic and political practices. Their nature as a plastic and additive art means ceramic objects are easily manipulated by influences and changing practices, and thus readily reflect daily and cultural practices, and how these may have changed overtime (Rice 1984:234). The alteration of a ceramic object through the addition or subtraction of various elements or attributes, from minute changes in tempering to larger formal or decorative alterations, or the culmination of these attributes, allows the ceramicist to move beyond a basic functional understanding of a given object, and in the case of ceramic vessels, view them as more than mere containers.

The majority of ceramic objects recovered from excavations at Strath Bogue were pottery sherds. Only one vessel was encountered at the site from a burial (see Chapter 6), which was fragmentary and had to be reconstructed with a minimal number of missing pieces. A total of twenty-six non-vessel ceramic objects were encountered at the site and were categorized as “ceramic special finds” due to their uniqueness at the site (see Table 8. 1). Given the extent of excavations at Strath Bogue and the ubiquity of such objects from all temporal occupations at other Maya sites, this small number is surprising. Moreover, there was a notable absence of clearly identifiable ceramic figurines and, or whistles at Strath Bogue, although two objects may have been fragments of figurines.
Table 8.1: Table of Ceramic Special finds and Associated Contexts.

<table>
<thead>
<tr>
<th>Artifact type</th>
<th>Str. 5</th>
<th>Str. 14</th>
<th>Str. 15</th>
<th>Str. 17</th>
<th>Str. 53</th>
<th>Str. 14, off mnd</th>
<th>Str. 5, off mnd</th>
<th>Str. A1</th>
<th>Str. A4</th>
<th>Str. B1, off mnd</th>
<th>Off Mnd btwn Str.’s 5 &amp; 6</th>
<th>Total</th>
</tr>
</thead>
<tbody>
<tr>
<td>Applied Element</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
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<td></td>
<td></td>
</tr>
<tr>
<td>Anthropomorphic Nose</td>
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<td></td>
<td></td>
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<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>1</td>
</tr>
<tr>
<td>Sphere/Pellet</td>
<td>1</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>1</td>
</tr>
<tr>
<td>Bead/Roller Stamp?</td>
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<td></td>
<td></td>
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<td></td>
<td></td>
<td>1</td>
<td></td>
<td></td>
<td></td>
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<td>Disc</td>
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<td></td>
<td></td>
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<td></td>
<td>1</td>
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<tr>
<td>Notched Sherds (Fishing weights)</td>
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<td>1</td>
<td>1</td>
<td></td>
<td>6</td>
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<td></td>
<td>2</td>
<td>1</td>
<td></td>
<td></td>
<td>14</td>
</tr>
<tr>
<td>Spindle Whorl</td>
<td>3</td>
<td>1</td>
<td>1</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>5</td>
</tr>
<tr>
<td>UID, Indeterminate object (figurine?)</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
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<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>1</td>
</tr>
<tr>
<td>UID, Zoomorph (Figurine or small vessel foot?)</td>
<td>1</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>1</td>
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<tr>
<td>Total</td>
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<td>1</td>
<td>1</td>
<td>1</td>
<td>1</td>
<td>1</td>
<td>6</td>
<td>1</td>
<td>2</td>
<td></td>
<td>25</td>
</tr>
</tbody>
</table>

Spindle Whorls

As components of Mesoamerican textile makers weaving and spinning tool kits, spindle whorls are typically the most commonly recognized and encountered textile production tool (C. Halperin 2008:115). While not typically an abundant artifact type at Maya sites, spindle whorls are however not uncharacteristic, and are most often encountered in association with Maya households (Beaudry-Corbett and McCafferty 2001; Carpenter, et al. 2012; C. Halperin 2008). Spindle whorls are weights used in conjunction with spindles (often bone or wood (Beaudry-Corbett and McCafferty 2001:60)) in the process of hand-spinning fiber into thread (McCafferty and Mccafferty 2000:42). The presence of spindle whorls alone, without the presence of other components of the cloth producer’s toolkit are not however evidence of textile production alone, as the spinning of thread is commonplace in households without textile production (Carpenter, et
al. 2012:392). The whorls diameter, weight, height, form and hole diameter are functional attributes argued to be related to the type fiber being processed and the intended type and, or quality of thread being produced, and have been used by various researchers in the assessment/creation of spindle whorl types. Classification schemes for spindle whorls range in scope and resulting number of types anywhere from two to ten types (Beaudry-Corbett and McCafferty 2001; Chase, et al. 2008; C. Halperin 2008:115, Table 1; Kamp, et al. 2006; McCafferty and Mccafferty 2000:43, 46).

Spindle whorls are the most direct artifact related to thread, and their features relate to the type of fiber, and affect the quality and twist of the thread, and relate to the method of spinning (McCafferty and Mccafferty 2000:43), as different fibers use different weights and spinning techniques, either support spinning or drop spinning (Carpenter, et al. 2012:386-387).

Spindle whorls are regularly recovered during excavations at Maya sites, and are typically manufactured out of ceramic, stone - particularly limestone in the Maya lowlands (Beaudry-Corbett and McCafferty 2001; Chase, et al. 2008; C. Halperin 2008; Hendon 1997; Kamp, et al. 2006; Moholy-Nagy 2007; Smith 1973; Willey, et al. 1965), but also have been made out of wood (Ferguson, et al. 2003), shell (Chase, et al. 2008:Table 1; Dreiss 1994:Fig. 3c, e, f), and coyol palm endocarp (described as “the inner layer of the pericarp where there are two or more layers of different textures or consistencies (Beaudry-Corbett and McCafferty 2001:60). Several types of fibers are noted to have been used ethnohistorically and ethnographically, and others are hypothesized to have been used based on what is known to have been available in the area and through imagery. Some of those fibers include cotton, silk cotton, maguey, yucca/palm, nettles, hemp, cattails, hibiscus, moss, hair/fur, as well as feathers (Beaudry-Corbett and McCafferty
The spindle whorls from Strath Bogue were all ceramic. Although researchers have created an array of types based on the above noted attributes, there are generally two main types of ceramic spindle whorls, 1) modeled whorls and 2) perforated disc whorls. Modeled whorls were specifically made for their intended purpose from their inception, whereas perforated disc whorls are recycled and formed from pottery sherds (Carpenter, et al. 2012:389). It should be noted that Chase and Chase (Chase, et al. 2008:127, 128) do not believe that perforated ceramic discs are spindle whorls, arguing instead that contextual data from Caracol suggests that they are ear spool backings. Given that the majority of archaeologists now understand these artifacts to be spindle whorls, although they are sometimes referred to as weights, and ethnographic and ethnohistoric evidence supports such arguments, I believe the Chases are incorrect in their assessment. The Chases are not however the only archaeologists who did not classify these objects as spindle whorls, as they are often simply described as “discs” (Chase 1982b:492; Dreiss 1994:185; Shirley B. Mock 1994b:Fig. 4, 329), or perforated discs. Other possible usages for perforated discs have been offered, including as beehive stoppers (Hammond 1991) and jar lids (Sheets 1978), although these seem to be in reference to larger discs.

In the Maya area, stone was the most common material from which spindle whorls were manufactured up until Late Classic period, with ceramic spindle whorls becoming more prominent in the Terminal Classic period, and continuing into the Postclassic period (Chase, et al. 2008:128; Masson 2000: 165; McGregor 1994:246; Willey, et al. 1965, 1972). This is contrary to central Mexico, where baked-clay spindle whorls were common place. It has been suggested that the
changes in spindle whorl form and material may signal changes in cloth production (Chase, et al. 2008:128). Stone whorls illustrated in publications seem to be fairly standardized in form, as do ceramic modeled whors (Chase, et al. 2008:Fig. 2, 3; Kamp, et al. 2006:Fig. 4, 5), although their size, weight, and decorations when present, are more varied. Modeled whorls are generally lighter than disc whors and exhibit a more standardized range of size and weights and are thus thought to have been better for lighter or finer fibers (Carpenter, et al. 2012:389-390).

A total of five spindle whorls, belonging to both the modeled and perforated disc generalize whorl types were recovered at Strath Bogue. Only one modeled spindle whorl was encountered at Strath Bogue and was excavated from within an interior wall of a superstructure on a plaster floor of a platform (Structure 14). The modeled spindle whorl (Figure 8.1) is bead-shaped and had light remnants of a reddish slip as well as a pre-slip decorative design etched into its surface. At Caracol, the majority of ceramic spindle whors (78%) were recovered from Terminal Classic floor contexts (elite/palaces) (Chase, et al. 2008:Table 1). A similar but more elaborately decorated modeled spindle whorl was described from Nohmul (Chase 1982b:492), as well as at the Northern River Lagoon Site (Shirley B. Mock 1994b:Fig. 54), Cerros (Garber 1989:Fig. 34), and at Sarteneja (Boxt 1993:Fig.5.28), Altar de Sacrificios in Terminal Classic period contexts (Willey, et al. 1972).

At nearby Laguna de On and at Caye Coco, ceramic spindle whorls were recovered from Postclassic contexts (Masson 2000:166; M. A. Masson 2001a:Illus.), however the form of these spindle whorls are different than the tapered, or bead shaped whorl more typical of the Terminal Classic and found at Strath Bogue. Masson has argued that the stylistic similarity of Postclassic ceramic spindle whorls from Laguna de On with those from Veracruz is reflective of economic ties the area had with Mexico (Masson 2000:166). These forms of spindle whorls are also
reminiscent of those made from stone more commonly seen at Maya sites up until, and into the Late Classic period (see (Chase, et al. 2008:Fig. 2; Kamp, et al. 2006:Fig. 4 & 5)).

Figure 8. 1: Modeled ceramic spindle whorl from Str. 14.

The remaining four spindle whorls were Type 2 whorls (perforated discs whorls), two of which were broken in half (Figure 8.2). Each of the disc whorls were formed through the recycling of pottery sherds. The sherds are presumably cut, ground, and, or flaked into rounded discs and centrally drilled with a hole of varying sizes (Buttles 1994: 286-287; Garber 1989:73). Each of the Strath Bogue whorls was recycled from a relatively flat sherd. Each whorl was from a different pottery type, with differing paste and tempers, three exhibiting remnant red slip on one surface (Figure 8.2 b-d).

The one complete specimen (Figure 8.2b) had a much wider hole than the others. As noted above, the differing sized whorls and their holes affect and reflect the different types of thread being spun, with the larger holes being more indicative of the processing of a larger fiber and resulting in a less fine thread. The Strath Bogue specimen has a whorl diameter of 28mm, and a
perforation diameter of 10mm. Similarly, sized disc whorls with wide diameter holes have been argued by McCafferty and McCafferty (McCafferty and Mccafferty 2000:47) to have potentially been used in the spinning of feathers in Central Mexico. Such a suggestion is in part based on ethnohistoric documents to the effect that note that the feathers of aquatic birds were particularly easily accessible in local swamps around Cholula (McCafferty and Mccafferty 2000:47; Sahagún 1950-1982 [1559-1585]:10:92, 9:89-90). Their Type D (1-3) disc whorls range in size between 30 and 53mm, with perforated holes measuring between 7-11mm. The Strath Bogue specimen is most similar to McCafferty and McCafferty’s Type D1 in size (McCafferty and Mccafferty 2000:Table 6). Perhaps this was what this particular spindle whorl was used for.

![Ceramic disc spindle whorls from Strath Bogue.](image)

Figure 8.2: Ceramic disc spindle whorls from Strath Bogue.

Three of the perforated disc whorls were recovered from excavations associated with Structure 5, two from the sheet midden off the northeast corner of the structure (Figure 8.2b, d),
while the fourth was collected from the surface of Structure 15 (Figure 8.2c). At the time of excavation and analysis, these objects were not recognized as spindle whorls, and unfortunately their measurements were incompletely recorded, however the dimensions of the whole specimens and their construction follow the normal range of perforated disc whorls seen elsewhere. Perforated disc spindle whorls have been recorded at numerous sites, including Cerros (Garber 1989:83), Sarteneja (Boxt 1993:Fig. 5.28), Northern River Lagoon Site (Buttles 1994:386-387; Shirley B. Mock 1994b:Fig. 4, 329); La Milpa (Phillips 2014: Fig. 3), as well as at Nohmul (Chase 1982b:492) where one was referred to simply as a drilled sherd disc.

Table 8.2: Provenience and measurements of ceramic perforated disc spindle whorls from Strath Bogue.

<table>
<thead>
<tr>
<th>Str.</th>
<th>Context</th>
<th>Condition</th>
<th>Decoration</th>
<th>Perforation</th>
<th>Diameter (mm)</th>
<th>Thickness (mm)</th>
</tr>
</thead>
<tbody>
<tr>
<td>5</td>
<td>Midden</td>
<td>Whole</td>
<td>Red slip exterior</td>
<td>Biconically Drilled</td>
<td>28</td>
<td>4.4</td>
</tr>
<tr>
<td>5</td>
<td>Midden</td>
<td>Fragment</td>
<td>Red slip exterior</td>
<td>Biconically Drilled</td>
<td>-</td>
<td>-</td>
</tr>
<tr>
<td>5</td>
<td>Off Mound, collapse/humus</td>
<td>Fragment</td>
<td>Unslipped</td>
<td>Undetermined</td>
<td>-</td>
<td>-</td>
</tr>
<tr>
<td>15</td>
<td>Surface</td>
<td>Damaged</td>
<td>Red slip exterior</td>
<td>Conically Drilled</td>
<td>26</td>
<td>4.1</td>
</tr>
</tbody>
</table>

Discs

Ceramic discs also manufactured from pottery sherds, and while not usually numerous in quantities, they are regularly encountered at Maya sites in different contexts and temporal periods. These objects are made from recycled ceramic sherds, and are typically formed through grinding, flaking and, or cutting broken pottery pieces into circular shapes. They have been recovered in a range of sizes, and their function(s) have been debated. Discs whose diameter is larger than 65mm
are considered large following Willey’s designations (Willey, et al. 1972). It is possible, and very likely that they may have had several purposes over the course of their use-life. Some of the suggestions as to their uses include: gaming pieces (Shirley B. Mock 1994b:Fig. 4, 329), tokens; preforms for perforated disc spindle whorls (Buttles 1994:289), and lids for narrow mouthed ollas (Willey, et al. 1965), a usage which was confirmed at Cerros where they were found in situ in several cached vessels (Garber 1989:75). Discs have been recovered from a variety of contexts and temporal periods at sites around the Maya including such northern Belize sites as Nohmul (Chase 1982b:492), Northern River Lagoon Site (Buttles 1994:287-288; Shirley B. Mock 1994b:Fig. 54), Colha (McGregor 1994:245-246), and Cerros (Garber 1989). At Santa Rita a small number of large discs (10-12cm in size) were identified as “pot lids” following their identification as such at Mayapán by Proskouriakoff (1962) (Chase 1982b:517-518). Interestingly, no ceramic discs were recorded from Sarteneja, although limestone discs were (Boxt 1993:Fig. 5.31).

Figure 8.3: Ceramic disc from Strath Bogue.

The one ceramic disc recovered from Strath Bogue was manufactured from a recycled olla sherd and exhibits the blackening effect of it having presumably been a cooking vessel (Figure
The disc’s diameter is approximately 28mm, and is approximately 5mm thick, putting it in the category of small discs under Willey’s classification. The edges are damaged, but it is uncertain if this is wear related to its usage or post depositional damage. The Strath Bogue specimen was recovered from the collapse, humus level (10cm arbitrary Level 2) of Structure 5.

Interestingly, ceramic discs at Cerros most frequently ranged in size between 50 and 100mm, although they were also recovered as small as 10mm and as large as 150mm (Garber 1989:Fig. 25). At Colha discs tended to range between 27 and 43mm (McGregor 1994:245). Interestingly Cerros had a total of 600 discs dating to each time period and from a range of contexts, but only one perforated disc, suggesting that at least at Cerros they were not disc spindle whorl preforms (Garber 1989).

Ceramic Sphere or Pellet

There have been several theories put forth as to the function of baked clay or ceramic spheres. These balls are typically between 1 and 2cm in diameter and are either hand molded or modeled into form. Some appear to be more formal than others, exhibiting varying degrees of symmetry. They are found in various contexts at numerous sites. One ceramic sphere was recovered at Strath Bogue from the midden deposit associated with the northeast corner of Structure 5. The Strath Bogue specimen measures 1.14x1.2x.093cm in size and was unslipped. Other forms of spheres or pellets have indentations or notches at one end that were cut into the clay prior to firing. These modified pellets may have been a form of net weight (McGregor 1994:249).
Typically, these spheres are hypothesized to have been the ball inside the rattle foot of a Late Postclassic period vessels (Buttles 1994:290; Garber 1989:90; McGregor 1994:248), however, seeing as how there are no such vessels, or Late Postclassic period ceramics at Strath Bogue, I would argue that this is not the case for the Strath Bogue specimen. Other possible functions attributed to such spheres include game pieces for patolli, marbles, or blow-gun projectiles or pellets for hunting small animals, particularly aquatic birds (McCafferty and McCafferty 2000:47; Sahagún 1950-1982 [1559-1585]:8:30). Although this hypothesis was put forth in reference to such items recovered from sites in Cholula, given the lack of Late Postclassic period occupation at Strath Bogue, it seems appropriate to consider such a hypothesis. The idea that such objects were blow-gun projectiles or “fowl balls” is particularly thought-provoking given the relative location of the site to aquatic areas and the suggestion that perforated disc spindle whorls with large perforated holes may have been used for the spinning of feathers (McCafferty and McCafferty 2000:47; Sahagún 1950-1982 [1559-1585]:10:92, 9:89-90).

Similar specimens have been recorded from Northern River Lagoon site (Buttles 1994:290) and Colha (McGregor 1994:248), although they are considered rattle balls from vessel feet at these sites; as well as at Sarteneja, where no perceived function was presented (Boxt 1993:Fig. 5.28). They were not recorded at either Santa Rita (Chase 1982b) or Cerros (Garber 1989).

**Notched Sherds (Fishing Weights)**

Of the ceramic special find artifacts, notched sherds were the most numerous type of ceramic special find at Strath Bogue. Notched sherds are ubiquitous at sites located on or near aquatic environments across the Maya lowlands. They are made out of recycled pottery sherds that
typically have parallel “V” or sometimes “U” shaped notches incised or carved into either their ends (end-notched sherds) or their short, lateral sides (side-notched sherds) (Boxt 1993:220; Buttles 1994:285; Eaton 1976:234; Garber 1988:35; 1989:77). Occasionally notched sherds have been recorded with only one, or more than two notches, but these are rare (Garber 1989:77) Their size, weight and form vary, from oval to rectangular to asymmetrical, and they can be flat, concave, convex or rounded. The sherds themselves are generally informally cut, pecked and, or ground into the desired form from an array of ceramic types, and vessel parts (Garber 1989:81). Notched sherds are also commonly referred to as “mariposas,” the Spanish word for butterfly based on their resemblance to butterflies (Boxt 1993:220; Garber 1988:35; 1989:77).

The general consensus is that these objects were fishing weights (Eaton 1976:238; Garber 1988:35; 1989:77), with their size and weight variations being hypothesized to be relative to either the depth, the aquatic environment being fished; the type of fiber used for the line or net; or the type of fishing being practiced, with some being specific to use with nets while others may have been more appropriate for line-fishing (Boxt 1993:225; Buttles 1994:285-286; Eaton 1976:238, 239, 241; Garber 1988:38; 1989:77, 81). Eaton (1976:241) however has suggested that some notched sherds could have been used interchangeably on lines or with nets. These hypotheses have been partially supported by the variation in notched sherd weights relative to site location, with coastal sites having heavier weights than those inland, and more often than not stone weights rather than notched sherds (Buttles 1994:286; Eaton 1976:241) and from ethnohistoric and ethnographic studies/observations (Garber 1988; 1989:77). Garber reports that at Cerros end-notched sherds are regularly encountered in groups suggesting their grouping was related to their having been attached to now decomposed nets (Garber 1988:38; 1989:83). Of the 333 notched sherds recovered from
all contexts and time periods at Cerros, Garber (1989:77) noted that the vast majority were of the end-notched and presumably net-related variety, with only 56 having been side-notched, and of the possibly line-fishing type.

Other hypotheses as to their use have included weft and warp weights used in textile production, and door hangings (Garber 1988:35; 1989:77). Mariposas or fishing weights have also been found to have been molded out of clay and then fired after the notches had already been carved, although these appear to be rare (Garber 1988:36; 1989:87), while others have been noted to be made out of stone (Buttles 1994:292; Eaton 1976:238; Garber 1988:35; 1989:77).

Notched sherds have been encountered in all time periods, and at too many sites to mention all here. Nonetheless, they have been recovered at such northern Belize sites as Sarteneja (Boxt 1993; Sidrys 1983), Cerros (Garber 1988, 1989), Northern River Lagoon site (Buttles 1994; Shirley B. Mock 1994b), Colha (McGregor 1994), Caye Coco (Delu, et al. 2002:Appendix 3.8), Santa Rita (Chase 1982b:521), Nohmul (Chase 1982b:493), as well as Aventura, Chan Chan, Patchachacan (Sidrys 1983:381) and at “Decadent period” coastal sites in Quintana Roo (Eaton 1976:236; Sanders 1960: 261).

A total of fourteen notched sherds were recovered from varying contexts at Strath Bogue (Table 8.3). Two specimens were formed out of rim sherds, one from a handle, and the rest were body sherds and generally flat, and of varying paste and temper. The majority of notched-sherds across the Maya area appear to have been made out of body sherds, with rim sherds being much less frequently encountered (Eaton 1976:234). I have not come across any others reportedly having been made from a vessel handle. There does not appear to have been any sort of standardized form
or shape other than a coincidently butterfly appearance, and the notches themselves are predominantly worn. Due to the worn nature of the notches, it is difficult to tell if the notches themselves were “V” or “U” shaped. Two notched-sherds had remnant slip, and one rim sherd form was highly eroded but because the vessel form and type could be identified as Campbells. Red, hence we know it had been red slipped at one time. The sherds were not formally rendered, and there does not seem to have been a particular vessel type. Other than their general resemblance to butterflies, their shapes are fairly irregular.

The vast majority of notched sherds at Strath Bogue were end-notched, with three being conclusively, and one inconclusively, side-notched. End-notched sherds are thought to have functioned as net weights, which explains why they are often found in groups, while the typically less frequently encountered side-notched sherds are thought to have been line-weights (Eaton 1976:238; Garber 1988:38 Garber, 1989 #2065:83). Four end-notched sherds were found in close proximity to one another within the collapse of Structure A1 and may represent such a grouping. Otherwise the notched sherds do not exhibit any significant patterns, being predominantly solitary finds, and in varying contexts. Nonetheless, notched-sherds were found at varying locations across the site, suggesting despite their relative infrequency at the site, fishing was being practiced by several members of the community, however, perhaps in somewhat of a relaxed or restricted fashion. Given that no large or notched-stones were found, it can be surmised that the fishing being engaged in by the Strath Bogue community was limited to the nearby New River and Progresso Lagoon, and not the deeper choppier waters of the Caribbean Sea.
Table 8.3: Provenience, description and measurements of notched-sherds from Strath Bogue.

<table>
<thead>
<tr>
<th>Str</th>
<th>Unit</th>
<th>Level</th>
<th>Context</th>
<th>Condition</th>
<th>Shape</th>
<th>Size (cm)</th>
<th>Notching</th>
<th>Surface Treatment</th>
<th>Vessel Portion</th>
</tr>
</thead>
<tbody>
<tr>
<td>5</td>
<td>5</td>
<td>1</td>
<td>Humus/Collapse</td>
<td>Whole</td>
<td>Flat</td>
<td>N/R</td>
<td>End-notched</td>
<td>Unslipped</td>
<td>Body Sherd</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>Humus/Collapse</td>
<td>Whole</td>
<td>Round</td>
<td>5.53x3.5x1.51</td>
<td>End-notched</td>
<td>Eroded</td>
<td>Rim sherd</td>
</tr>
<tr>
<td>A1</td>
<td>12</td>
<td>1</td>
<td>Humus/Collapse</td>
<td>Whole</td>
<td>Flat</td>
<td>2.1x1.7x.35</td>
<td>End-notched</td>
<td>Unslipped</td>
<td>Body Sherd</td>
</tr>
<tr>
<td>A1</td>
<td>12</td>
<td>2</td>
<td>Humus/Collapse</td>
<td>Whole</td>
<td>Flat</td>
<td>2.64x2.32x.55</td>
<td>End-notched</td>
<td>Unslipped</td>
<td>Body Sherd</td>
</tr>
<tr>
<td>A1</td>
<td>12</td>
<td>2</td>
<td>Humus/Collapse</td>
<td>Whole</td>
<td>Flat</td>
<td>2.9x2.9x.44</td>
<td>End-notched</td>
<td>Unslipped</td>
<td>Body Sherd</td>
</tr>
<tr>
<td>A1</td>
<td>16</td>
<td>3</td>
<td>Plaza Flr/Collapse</td>
<td>Incomplete</td>
<td>Flat</td>
<td>-</td>
<td>End-notched</td>
<td>Unslipped</td>
<td>Body Sherd</td>
</tr>
<tr>
<td>5</td>
<td>5f</td>
<td>2</td>
<td>Humus/Collapse</td>
<td>Whole</td>
<td>Flat</td>
<td>1.89x1.5x.8</td>
<td>End-notched</td>
<td>Unslipped</td>
<td>Body Sherd</td>
</tr>
<tr>
<td>5, off mnd</td>
<td>5j</td>
<td>2</td>
<td>Midden</td>
<td>Incomplete</td>
<td>Flat</td>
<td>-</td>
<td>End-notched</td>
<td>Unslipped</td>
<td>Body Sherd</td>
</tr>
<tr>
<td>53</td>
<td>Surf. Coll. 63-1</td>
<td>surface</td>
<td>Surface</td>
<td>Whole</td>
<td>Convex</td>
<td>2.98x2.61.44</td>
<td>End-notched</td>
<td>Unslipped</td>
<td>Handle</td>
</tr>
<tr>
<td>B1, off mnd</td>
<td>26</td>
<td>2</td>
<td>Midden</td>
<td>Whole</td>
<td>Flat</td>
<td>2.9x1.5x.94</td>
<td>Side-notched</td>
<td>Red Slipped</td>
<td>Body Sherd</td>
</tr>
<tr>
<td>B1, off mnd</td>
<td>26</td>
<td>6</td>
<td>Midden (base)</td>
<td>Whole</td>
<td>Flat</td>
<td>2.1x1.51x.73</td>
<td>Side-notched</td>
<td>Unslipped</td>
<td>Rim sherd</td>
</tr>
<tr>
<td>17</td>
<td>Surf. Coll. 46b-1</td>
<td>surface</td>
<td>Surface</td>
<td>Whole</td>
<td>Flat</td>
<td>2.3x1.61x.63</td>
<td>Side-notched</td>
<td>Unslipped</td>
<td>Body Sherd</td>
</tr>
<tr>
<td>A1</td>
<td>16</td>
<td>3</td>
<td>Plaza Flr/Collapse</td>
<td>Incomplete</td>
<td>Flat</td>
<td>-</td>
<td>Side-notched</td>
<td>Red Slipped</td>
<td>Body Sherd</td>
</tr>
</tbody>
</table>

The dearth of notched sherds at Strath Bogue is somewhat surprising, given the sites relative location to the New River and Progresso Lagoon, and their perceived fishing related purpose. As indicated earlier, other sites located near aquatic environments in northern Belize, such as Cerros, Sarteneja, New River Lagoon and even Colha reportedly had much larger numbers.
of notched sherds and were clearly engaged in fishing. However, when we consider the human stable nitrogen isotopic data from Strath Bogue, the lack of fish in these people’s diet is further substantiated, and begs the question why were these people not taking advantage of such a rich natural resource in their own backyard? I believe it had to do with the fact that their homeland was in a non-aquatic environment, and their traditional subsistence practices did not include fish, and they had not yet adjusted their subsistence practices to include these new, aquatic resources.

**Bead or Roller-Stamp**

A section of a cylindrical object that had a deeply etched linear or geometric pattern carved into its surface (Figure 8.4) was recovered from the humus level of an off-mound excavation unit associated with Structure 14. Due to the fragmentary nature of the specimen it is difficult to ascertain whether this object was a cylindrical roller-stamp or a bead. The object was modeled into shape, and its design was carved into its surface when the clay was still wet. There is no evidence that the item had been slipped, and should it have been a roller-stamp, it likely would not have been.

![Figure 8.4](image)

**Figure 8.4:** Fragment of a possible cylindrical ceramic roller-stamp or bead recovered from the humus level of an off-mound unit associated with Structure 14.
A flat stamp dating to the Postclassic or Protohistoric was encountered during excavation of the Avila household complex on the shore of Progresso Lagoon, very close to Caye Coco (M. A. Masson 2001a:Illus.), however unlike the abstract linear pattern of the Strath Bogue specimen, the Avila specimen appears to be of a hand or paw. Brainard (1958:Fig. 91g-n) illustrates a series of ceramic stamps from Chichén Itzá and vicinity that display geometric elements similar to that of the Strath Bogue specimen, however all these elements appear to be decorative and secondary to the more central zoomorphic figures. In his brief discussion of the objects, Brainard (1958:298) suggests that the objects were imports to the Yucatán in “Early Mexican times,” very likely from Veracruz, while others have suggested a northern Yucatán provenance (Adams 1971; Helmke, et al. 1998; Sabloff 1973a, 1975). Others have suggested that it was the stamp technology itself that was imported in the Late-Terminal Classic period and signal the beginnings of the mass production and standardizations of ceramic vessel forms and decorative motifs commonly associated with the Terminal Classic period (Harrison-Buck and McAnany 2007:129).

Such stamps are argued to have been used in the transferring of standardized decorative bands or iconography on Terminal Classic vessels, most prominently associated with Pabellon Modeled-Carved and Belize Molded-Carved vessels, where it is thought such stamps were pressed on to the surfaces of the wet clay leaving impressions that were used as guides for the artist to render more deeply by carving and incising the design left pressed on the vessel (Graham, et al. 1980:164; Harrison-Buck, et al. 2008:129; Helmke, et al. 1998:98). If the specimen from Strath Bogue was a roller-stamp, its use likely would have been restricted to decorative bands on vessels. Nonetheless, it should be noted that no Pabellon or Belize Modeled-Carved sherds were encountered within the Strath Bogue assemblage, no was there evidence of other pottery types
with carved designs or iconography. Perhaps should this specimen have been a roller-stamp, perhaps it was used in the creation of repetitive and standardized designs on other surfaces, such as paper or perhaps on skin.

Stamps have been found in the Sibun River Valley (Harrison-Buck, et al. 2008:129), and in a Terminal Classic ritual termination deposits at Blue Creek (Guderjan and Hanratty 2007:160). A roller stamp is noted as having been encountered in an elite courtyard midden at Dos Hombres, however no description or illustration of the object was provided (Sullivan, et al. 2007:140).

While not an abundant class of artifact, beads are not uncommon at Maya sites. Nonetheless, those recovered from non-mortuary, household contexts do not tend to be elaborate like the specimen recovered at Strath Bogue. Instead, they tend to be small (1-3cm), plain, undecorated clay balls, with a centrally located or slightly off perforation pressed through the object when it was informally molded. It appears that on occasion researchers may have identified these clay ball beads as a form of net weight elsewhere. Examples of these clay ball beads have been described by Chase from Late Postclassic contexts at Santa Rita (Chase 1982b:522) and Colha (McGregor 1994:252); as well as at Altar de Sacrificos (Willey, et al. 1972). An examination of the available reports for sites in northern Belize has found that similar specimens to the Strath Bogue stamp/bead have not been reported in northern Belize.

Unidentifiable Ceramic Objects

Three objects, one a crudely executed zoomorphic figure, a modeled anthropomorphic nose and an unidentifiable modeled ceramic object may very well be figurine fragments, however, their incomplete or fragmentary nature make such conclusions difficult. Figurines and ocarinas occur
in Formative period to Colonial contexts at sites across the Maya area, but are particularly common during the Classic period. Both ocarinas and figurines are known to depict a variety of characters, including animals, spirit-animals, gods and humans, with some figurines seemingly conjoining different categories. Anthropomorphic figurines depict both men and women, and illustrate different roles, social statuses, and people performing different tasks and engaged in different scenarios (C. T. Halperin 2008:148). Such figurines have been instrumental in understanding cultural ornamentation and dress, how different tasks and rituals were performed, who they are performed by, age and sex differentiations, as well as relationships between people and deities/animal spirits (C. T. Halperin 2008:149).

The zoomorphic figure is the head of an animal, possibly a turtle, bird or dog, and is most likely to have been part of a figurine. The object is small in size (2.99x1.89cm), and is a solid, clearly hand-modeled form. There is no evidence of it having been slipped and is fairly coarsely tempered with calcite (Figure 8.5). While initially it was speculated to have possibly been a miniature vessel foot, there is no wear on the snout of the animal to suggest such usage, and its small size make such identification unlikely. Moreover, its solid nature negates the possibility that the specimen is part of an ocarina or whistle. It is more likely that this object is the head of a zoomorphic figurine, similar to those illustrated from the Puuc region by Brainerd (1958:Fig. 55i-k). Similar small zoomorphic heads were recovered by Sidrys at Patchchacan and Chan Chen, although he also speculates that they may have been “adornos” associated with effigy censers dating to the Postclassic (1983:Figs. 38 & 60, pg. 56).
The second unidentifiable ceramic object was recovered from a unit off the northeast side of Structure 5 in the humus/collapse level. Unfortunately, its fragmentary nature gives no definitive answer as to what it was, what its form may have been, nor who or what it may have been depicting. Its crude execution adds to the difficulty in identifying this object. The specimen did not exhibit slipping, although it may have been eroded as a result of post-depositional processes. The most likely hypothesis is that it may have be a section of the body of a hollow figurine or a whistle. Should it have been a figurine fragment, it and the possible zoomorphic head would have been the only such objects recovered from Strath Bogue, and no whistles were otherwise identified at the site.

Modeled or “Mayapán Style” effigy censers or incensarios are very diagnostic and have been identified from Postclassic period contexts around the Maya area (Aimers 2009:249). Such vessels are commonplace throughout northern Yucatán, Quintana Roo, and have additionally been recovered at sites in northern Belize (Aimers 2009:249; Brainerd 1958:Fig. 98-102; Chase 1982b:537-538; 1984:Fig. 4; Eppich 2000:184; M. Masson 2001:352; Milbrath and Peraza Lope 2013; Pring 1976:47-48; Robles Castellanos 1980:Fig. 51; Sidrys 1983:238; Smith 1971:135-136, 416.
The style is believed to have originated from the site of Mayapán itself, where they have been classified as Hoal Modeled in the Hocaba phase (A.D. 1200-1300) and Chen Mul Modeled in the Tases phase (A.D. 1300-1450). Some ceramicists have named “Mayapán style” or influenced effigy censers differing names at sites elsewhere in the Maya area as is the case for Santa Rita Corozal in northern Belize, where Diane Chase refers to them as Kol Modeled: Kol Variety.

Features or accouterments of some *incensarios* suggest the representation of specific deities; however, not all censers exhibit features that are identifiable as specific gods (M. Masson 2001:353; Milbrath and Peraza Lope 2013; Sidrys 1983:245-257). Fragments of “Mayapán Style” effigy censers have been found at nearby Santa Rita Corozal (Chase 1981, 1982b), Aventura, Patchchacan, Chan Chen (Sidrys 1983:238-265), Cerros (Walker 1990:Fig. 5.7 & 5.11c), as well as at such sites as Honey Camp, Nohmul, Colha and Benque Viejo among others (Gann 1918:114). When encountered at these sites, these vessels were typically found in deposits heavily laden with effigy censer fragments.

Late and Terminal Classic modeled effigy censers have also been identified at sites across the Maya area, however these earlier versions are generally more rare, and despite having seemingly similar themes to earlier and later effigy censers, they vary regionally in their execution (Shirley B. Mock 1994b:Fig. 39 & 40; Sagebiel 2014:127, Fig. 9; Walker 1990:362-363, Fig. 5.3). Moreover, while they can be classified as anthropomorphic, they are more abstract in their iconography than the Postclassic censers (Chase 1992:133; Sullivan, et al. 2007:139). There are also forms of late Late-Terminal Classic period effigy censers that are rendered by the application of appliqued facial features and iconographic accouterments to the side of bowls and cylindrical

The unslipped anthropomorphic nose found atop of Structure A4 is clearly an appliqued feature of an anthropomorphic character. Given its applique nature and relatively large size (approximately 2.5 wide by 4cm long), it is highly unlikely that it is from a figurine. Moreover, since the nose feature is an appliqued element, it is also unlikely to have been part of a Postclassic period “Mayapán style” effigy censer as the faces of such censers tended to be molded in the round. Additionally, no other fragments or distinct elements characteristic of Postclassic effigy censers were recovered anywhere at Strath Bogue, and the only Postclassic period ceramics encountered at the site were Terminal Classic-Early Postclassic transitional types. Thus, the anthropomorphic nose is arguably an appliqued segment of a form of anthropomorphic censer that was a predecessor of Postclassic forms, whereby the effigy is represented by the application of decorative facial features individually appliqued to the surface of an otherwise bowl-shaped vessel (Sagebiel 2014:127). (Sagebiel 2014:Fig. 9c; Walker 1990:Fig. 5.3)

**Pottery**

**Pottery Analysis**

Pottery analysis is an important and integral part of many archaeological endeavors. Since Maya ceramic artifacts are relatively indestructible, are fairly resilient to taphonomic processes, and in some areas, are the most numerous of artifacts present, the benefits of pottery analysis are abundant (French 1984:52). While ceramics have been instrumental in the reconstruction of the culture histories of many peoples and sites, ceramic analyses have also customarily been conducted
to establish local and regional distributional patterns, as well as evidence for object, activity and site function and status (Orton, et al. 1993:9, 23; Shepard 1985:102). One of the original and primary functions of traditional ceramic pottery analyses has been the establishment of local and regional chronologies and associating cultural developments or changes with temporal periods (Gifford 1960:341; Kidder 1931; Orton, et al. 1993:9, 11, 23). To this end, ceramic typologies were developed.

While pottery analysis has advanced beyond cultural chronologies, traditional typological methodologies developed to aid such analyses remain at the forefront of ceramic analysis. The classification of a given “type” of ceramic vessel according to its morphological, functional, technological, and/or stylistic characteristics creates an organizational and analytical tool by which to historically, temporally and meaningfully reconstruct past human behaviors and cultural practices (Braun 1983:107; Krieger 1944:271-272). In turn, patterns in variabilities of attributes, vessel forms, decoration and functions, contexts in which they are used, as well as the resources available and technological processes engaged in can also be sources of information on cultural behaviors (Rice 1989:110). These approaches and some of the premises behind them are not without regular scrutiny and controversial debate (Aimers 2013; Aimers and Graham 2013; Bill 2013; Chilton 1999; Clarke 1968:187-191; Culbert and Rands 2007; Dunnell 1971, 1986; Hill and Evans 1972:232; Rice 2013; Rouse 1970; Sabloff and Smith 1969, 1972; Smith 1979; Whallon 1971).

The typological classification of pottery is a required and unquestionably helpful analytical agent within archaeology. The ceramic traditions of a given culture reflect not only the resources available, but also embody data pertaining to cultural knowledge, traditions and identity, in
addition to information that allows archaeologists to decipher the chronological, economic, political and social standing of the immediate context, a given group, the larger community or site. The analytical method most often utilized by ceramists and archaeologists, particularly those who work in the Maya area, is that of the type-variety system. The type-variety system is partially dependent on technological and chemical indices of paste and temper, and yet it contains a significant degree of subjectivity, and etic principles of categorization.

As noted earlier by Krieger (1944:271-272), in order for historical and behavioral reconstructions to be meaningful and accurate, there must be a systematic, organizational methodology that will relate distinct patterns of behavior, and that will allow for the reconstruction of cultural developments and relationships. Traditionally, typological schematics have relied on morphological/formal or functional classifications. Such schemes have been utilized in the identification of regional and cultural patterns, object production and the development of temporal and formal sequences (Hill and Evans 1972: 9, 11, 23). Accepting the basic principles of human behavior, archaeologists perceive that regularities are inherent in the construction of any given object, and that these morphological, technological, functional and stylistic regularities are in fact documentation of behavioral regularities. Hence, it is further presupposed that analyses founded in classification schemes will permit an understanding of relevant social, economic, and political human behaviors (Gifford 1960:342; Hill and Evans 1972:234).

The empirical premise behind archaeological classification schemes is that not only do the artifacts themselves hold inherent significance and meaning, but so can the attributes of a given artifact (Hill and Evans 1972:233). Following the scientific method, an artifact classification scheme is essentially a taxonomic system that recognizes varying degrees of sameness among the
various attributes of an artifact. A classification scheme essentially orders the artifacts into classes according to consistent patterns in attributes. Each class of artifact will thus exhibit a uniform and non-random set of attributes or traits, or cluster of attributes, that allows the class to be consistently distinguished from others based on the recognition of comparable or conversely, dissimilar variables, such as style, morphology, technology and/or specific formal attributes (Gifford 1960:341; Hill and Evans 1972:232-35; Krieger 1944:275, 277, 283; Rouse 1960:313; Shepard 1965:335; Spaulding 1953, 1954). Through the conceptualization and identification of such patterns or types, and their distributions, archaeologists can arrive at historical reconstructions of the processes surrounding a given artifact and its use life (Krieger 1944:283).

It is important to recognize and continually consider when utilizing classification schemes, that the creation of classes or types is not the goal ceramic analysis, nor are they entities in and of themselves. They are mere tools or procedures designed to permit the temporal, technological, spatial and social understanding of a particular assemblage (Rice 1987c:275; Rouse 1960:313). This is not to say that the prehistoric ceramicist did not have an intended outcome from his/her labor. Many scholars have argued that all artisans no matter what the medium conform to “mental templates” that imbue not only the artist’s personal style, but also culturally significant processes and behaviors (Rondeau 1996:230). As discussed, archaeologists conceive of a vessel as holding inherent “signatures” of processes or meanings within its different attributes (Hill and Evans 1972:234; Rouse 1960:317), and thus warrant the reconstruction of past human behaviors and processes through their analysis (Krieger 1944:283, 286). As a result, classification schemes have traditionally been highly technical, and have only recently started to be concerned with understanding the more complex, and perhaps more distant human behaviors.
As a variable of classification, style has often been regarded as a culturally sensitive variable, as the style of an artifact is seen more as cultural expression, rather than a functional characteristic (Wobst 1977:317). However, styles are able to follow systematic systems of manufacture that can be mathematically identified (through byproduct analysis or through characteristic analysis), and they are subject to change, and as such, stylistic analyses are not entirely subjectively based (Wobst 1977:317). The more expressive, varied and specialized an artifact becomes, the more useful it is within a classificatory scheme. The greater the stylistic detail of an artifact, the less restricted it is by cultural conventions, and material and technological restrictions. As such, it is more unstable and apt to change (Shepard 1965:224-225). Conversely, artifacts that express consistency and repetitiveness in attributes should likewise indicate standardizations in technologies, procedures, ideology and usages, and depending on scale and technology perhaps even mass production. Different types of variables may be instituted into the classificatory scheme that may not be immediate to the artifact, but which are more readily recognizable at the level of assemblage analysis (Plog 1983:126). Additionally, researchers should be aware of potential markers of innovation or transition as indicators of change, in the manufacturing process, decorative display, and, or performance.

Changes in pottery can be qualitative and quantitative expressed and measured, and may involve the substitution, subtraction or integration of technological, decorative and formal variables (Rice 1987c:460). These changes can themselves be reflective of political and, or social changes, as the production and distribution of such objects as vessels may be controlled by the powers-to-be (Sinopoli 1991:159), whether at the state, polity or household level. Technological attributes are particularly resistant to change because they are devoid of symbolism or meaning,
unlike decorative attributes which may display inherent or overt symbolism; as technological attributes correlate to the science of the vessel’s composition and performance (Rice 1987c:464). Because of their functional usage and lack of overt symbolic display, the habitual or traditional ways of producing and using utilitarian vessels are more likely to be retained, and thus their formal, technological and performance variables are more resistant to change (Rice 1987c:460, 464). The examination of the spatial distributions, as well as similarities and discontinuities in attributes within pottery types and across ceramic assemblages and even regions, can lead to the identification of different production philosophies, centers or perhaps even of individual ceramicists, as well as innovations, culture change and polity or locational affiliations.

Despite its critiques (Adams 2008; Culbert and Rands 2007), Type: Variety analysis has been the most widely utilized form of pottery analysis amongst Mayanists, for over fifty years now (Adams 1964; Gifford 1960; Rice 2013:11; Smith, et al. 1960). For the purposes of this dissertation, a type: variety ceramic analysis was performed, so to identify the representative pottery types present, confirm the temporal position of the site, identify commonalities and divergences with local and regional pottery traditions, determine potential ceramic sphere affiliations and thereby identify possible intra- and inter-regional influences and connections. The identification of variations from local pottery traditions, ceramic sphere affiliations and potential connections with other regions, and new pottery types are of particular interest when examining migration, as they may help assist in determining from whence these peoples may have come.
Pottery Analysis in Northeastern Belize

The earliest approach to a comprehensive ceramic analysis conducted in northeastern Belize was that associated with the British Museum and Cambridge University’s 1973-1976 Corozal Project directed by Norman Hammond (1973, 1975a). Having access to an extensive regional ceramic assemblage, ceramicist Duncan Pring (1976) developed the first temporal pottery sequence and established the names of what he labeled “Ceramic Complexes” for the northeastern Belize region. These “complexes” were however, actually ceramic spheres as defined by Willey et al (Willey, et al. 1967:306-307), since they were related to the examination of common ceramic types at more than two sites, and were intended to be reflective of, and applied across the region, and not to just one site, as is apropos with a ceramic complex. Unfortunately, however, only a very cursory examination of the region’s Late and Terminal Classic period pottery was carried out, with the Terminal Classic period “Rancho” sphere (previously incorrectly labeled a complex) being virtually ignored due to a lack of “evidence,” due in part to poor stratigraphic data, as well as a lack of good (read recognized) horizon markers (Pring 1976:44). Thus, Pring never defined the sphere’s common types as is required in the establishment of a ceramic sphere, or complex or that mater, instead he only performed a cursory discussion of some of the pottery types recognized at other Terminal Classic period Maya sites. Nonetheless, he did note that different sites in northern Belize seem to have affinities with different ceramic spheres, for example, the Terminal Classic at El Pozito was seen as having connections with San Jose V, while the ceramics associated with other areas had ties with the Yucatán in the form of heavy slate ware bowls (basins), while others appeared more connected or included ceramics associated with the Tepeu 3 ceramic sphere (Pring 1976:44,45).
As part of Raymond V. Sidrys (1983) 1970s regional survey of northernmost Belize, Joseph Ball conducted a cursory site-by-site analyses of approximately 10% the ceramics collected during the survey. Due to the restricted nature of his analysis, Ball did not feel it appropriate to construct local or regional sequences, and instead offered a “partial, preliminary sketch of prehistoric pottery distributions in northernmost Belize” (Ball 1974:204), as well limited observations and discussions on temporal affiliations and perceived trends. Detailed pottery type descriptions typical of ceramic type: variety analyses were thus absent in his dialogue, although he did provide some general observations of several established and new types. Ball did however make a point of saying that based on his own observations, and as confirmed through discussions with other researchers in the area at the time, there is a lack of ceramic homogeneity across the area, with sites in relatively close proximity to one another, noting as a particularly example that Terminal Classic occupations at Aventura and Nohmul have little resemblance to one another (Ball 1983:203).

Adding to the ceramic analysis associated with Sidrys’s regional survey, Sidrys and Krowne (Sidrys and Krowne 1983) also report on a distinct vessel from the region that they date to between A.D. 750-1150, with its most dominant usage being during the 10th century, or the Terminal Classic period. The double-mouthed striated jar (known as the Aventura Double-mouth Jar or Buyuk Striated), occurs in fairly regular numbers at most sites around northern Belize, with its highest densities centering on the site of Aventura, leading them to suggest that the vessel was primarily produced there. They further note that given its relative prominence, and seemingly everyday usage around northern Belize, the double-mouth jar may be considered a horizon marker for the Terminal Classic in northern Belize (Sidrys and Krowne 1983:221), similar to Fine Orange
and Gray Wares or Pabellon Model-carved vessels elsewhere in the Maya Area (Graham 1987). Fragments of double-mouthed jars have also been identified at sites in the Yucatán, including Uxmal, Dzibilnocac and Santa Rosa Xtampak (Brainerd 1949:233), as well as in and around Calderitas (Sanders 1960:207-208, 255-256), and Chacchoben in Quintana Roo (Fry 1972:490). In his analysis of *The Archaeological Ceramics of Yucatán*, Brainerd described the double-mouthed jar as an “imported and rare pottery” (1958:292-293, Fig. 89u, x).

Extrapolating from Ball’s preliminary analyses, Sidrys’s makes a point of underlining Terminal Classic Yucatecán-northern Belize contacts. Connections with the Puuc region were documented in the occurrence of Puuc Slate wares at Aventura, Patchchacan, and Santa Rita, and the reverse connection of the double-mouth jars at sites in the Puuc region, including Dzibilnocac, Santa Rosa Xtampak and Uxmal (Sidrys 1983:384).

Diane Chase’s (1982b) dissertation focused on the Classic to Postclassic Transition in northern Belize, as illustrated in part through the ceramics from the sites of Nohmul and Santa Rita. Nohmul is located west of the New River, and approximately 15 to 20 kilometers away from Strath Bogue, and Santa Rita is farther north by approximately 5 to 10 kilometers. Chase’s work corrected Pring’s improper classification of the Rancho complex to that of the Rancho sphere and was the first comprehensive type: variety-based examination of Terminal Classic ceramics from north eastern Belize. It seems however that Chase’s analysis followed the early type: variety practice of establishing a new set of type names for each site complex (Willey, et al. 1967:290-291), as her analysis largely created and defined new ceramic types for Nohmul, while also outlining a few already established types known from other complexes and spheres. Unfortunately, illustrations of the pottery types were lacking, with only a few very being illustrated. Chase created
the Terminal Classic Ikilik ceramic complex for Nohmul and she was able to isolate some of the common types of the previously ill-conceived and defined Rancho sphere (Chase 1981, 1982a). A later analysis and unpublished manuscript by Kosakowsky and Pring (Kosakowsky and Pring 2001) however reexamined the Nohmul ceramics and instituted a new ceramic complex name for the Terminal Classic/Postclassic period (the Tecep ceramic complex). Moreover, following the terminological rules of the type: variety classification system (Gifford 1976), they resorted to the use of the earlier established type names from previous analyses when applicable (Kosakowsky and Pring 2001:12). Nonetheless, they did not indicate which types relate to which, or who established the earlier types and where. They do however concur with Chase’s suggestion that the Terminal Classic period has indications of Yucatecán influences in Nohmul’s pottery, including local reproductions of Yucatecán types. They further note that while population and architectural expansions during the Terminal Classic period coincide with these Yucatecán ceramic influences at Nohmul, they were unable to determine if the ceramics indicate a migrant component to the site (Kosakowsky and Pring 2001:11).

For his dissertation, Fred Valdez, Jr. (Valdez 1987) conducted a comprehensive type: variety analysis of the ceramics of the site of Colha, presenting brief examinations of previously established types, and more complete descriptions and illustrations of newly established types and varieties at Colha. Ceramic complexes for each time period at Colha were previously established by Valdez and Adams (Adams and Valdez 1980; Valdez and Adams 1982), with the Masson complex being designated and defined for the Late-Terminal Classic period, which was dated between A.D. 680-850 (Valdez 1987:190).
Robert Fry has a long-established reputation with the analysis of Maya ceramics. Fry has published several articles concerning the ceramics of southern Quintana Roo and northern Belize and their distribution patterns and served as the ceramicist for archaeological projects at both Chau Hiix and Pulltrouser Swamp (1972, 1983, 1987, 1989, 1990a, 2013). As the Pulltrouser Swamp ceramicist, Fry identified, or newly established ceramic types and thereby created ceramic complexes for each occupational time period represented (1990b). Regrettably his ceramic typology was unknown to us at the time of our analysis, as it is not published, and his typology manuscript remains in limited distribution. Additionally, the type descriptions presented in Fry’s manuscript are narrowly defined and incomplete, and void of illustrations, making it difficult to correlate types.

Debra Walker’s ceramic based dissertation (Walker 1990) focused on the Terminal Classic through Late Postclassic periods at the site of Cerros located on the Chetumal Bay. The Terminal Classic period Sihnal Phase (ceramic complex) was dated to between A.D. 850-1150 (Walker 1990:Fig. 1.2). Walker’s research served to expand on Chase’s initial examination of the Terminal Classic period in northern Belize and included ceramic identifications and descriptions of new ceramic types for the region. In addition, Walker found that after Cerros’ abandonment in the Late Formative/Early Classic period, many of the site’s ruined structures were reoccupied in the Terminal Classic period. Moreover, the ceramics also suggested a connection between the new Cerros population and northern Yucatán.

Based on ceramics from the Terminal Classic period occupation on the island site of Caye Coco, located in Progresso Lagoon and occupations in and around the Lagoon, Marilyn Masson (2002b) conducted a comprehensive inventory and type: variety ceramic analysis covering several
seasons worth of investigations. Employing the typologies previously created by Diane Chase and Debra Walker, the majority of Terminal Classic pottery identified in Masson’s analysis had already been established, although she also created and described a few types previously not identified or detailed in print according to standard type: variety classification traditions (Gifford 1960, 1976; Sabloff 1975). Masson also established the Progresso ceramic complex for the Progresso Lagoon region. Two ceramic types independently identified by Masson as Progresso Striated and Freshwater Creek Striated had been previously defined by Fry (1990b) as Burgos Striated and Blue Creek Striated respectively (Debra Walker, personal communication, 2001, Laura Kosakowsky, personal communication, 2008 (Aimers, 2012 #2037:59)). These two previously identified type designations were presented in Fry’s previously discussed unpublished manuscript.

**STRATH BOGUE POTTERY ANALYSIS**

The following is by all means not a complete or comprehensive analysis of the Strath Bogue pottery assemblage. Rather, it should be understood as a presentation of the pottery analysis performed, some of the subsequent results, and a discussion of select pottery types that are relevant and meaningful to our understanding of the Strath Bogue site, its Terminal Classic period occupation, and the hypothesis that the site was settled by a community of migrants, transitioning to their new life in the Progresso Lagoon region in the aftermath of the Maya Collapse. Future publications will include a more comprehensive and prescribed typological pottery report, and an expanded presentation and analysis of the technological, chronological and formal data.

Correlations with previously defined ceramic complexes within northeastern Belize as presented in the descriptions and associated illustrations reported in the literature cited above formed the foundation of the ceramic analyses undertaken in this investigation. Both Walker’s and
Chase’s ceramic analyses and type: variety descriptions served as pinnacle sources or references for the Strath Bogue ceramic analysis. Additionally, monograph’s by Sabloff (1975), Gifford (1976), Ball (1977a) and Forsyth (1983, 1989) were also regularly consulted, and helped fill in the gaps where appropriate. Analyses were additionally assisted through the ability to make comparisons with the Caye Coco Terminal Classic ceramic type collection created by Marilyn Masson. During the period in which the ceramic analysis for this study was occurring, I also had the opportunity to work on a project in the Champotón region of Campeche and contribute to the then on-going ceramic analysis. Slate wares are of course common place during the Terminal Classic period on the Yucatán Peninsula, and thus my time on this project helped in the identification of slate wares at Strath Bogue. Ceramicists Laura Kosakowsky, Debra Walker and Jim Aimers also provided invaluable information, guidance and feedback during the analysis and writing stages of this dissertation.

A ceramic complex is an organizational and theoretical concept that relates to the total collection of ceramic types recognized as having temporal and geographical significance (Forsyth 1983:9; Sabloff 1975:5; Walker 1990:56; Willey, et al. 1967:304), and has commonly come to refer to the ceramic collection of a particular occupational period at a given site. Given the Strath Bogue material is clearly identified with the Terminal Classic Progresso ceramic complex at Caye Coco and the Progresso Shore community, the Progresso ceramic complex is being extended to include the Strath Bogue ceramic assemblage.

A ceramic sphere is established when the majority of the most common types in two or more ceramic complexes are recognized as co-occurring in two or more complexes from a contemporary chronological period. Ceramic spheres are helpful in comparing ceramic production
and consumption patterns between different sites and identifying similarities and differences between complexes. Spheres are also important in identifying trade, exchange, and communication networks, but they also have cultural and historical affinities and developments between sites and regions (Forsyth 1983:9; Sabloff 1975:5; Walker 1990:56; Willey, et al. 1967:291, 306-307). Comparative analyses of spheres are important in assessing possible relations, but also the possibility of being contemporaneous and possessing some affinities but being markedly dissimilar as well. Of course, caution should be exercised when comparing only one facet of archaeological inquiry and drawing conclusions as to cultural and historical connections. Nonetheless, spheres can be helpful in making inferences as to affinities between peoples, sites and regions associated with the same or similar ceramic spheres. The Progresso ceramic complex’s cross correlation with the Terminal Classic Sihnal complex at Cerros (Walker 1990), and Ikilik complex at Nohmul (Chase 1982a, b), as well as its apparent affinities with the Pulltrouser Swamp region’s Rancho complex as discussed by Fry (2009, personal communication (1983, 1989)), confirm its temporal assessment, and similarly support its inclusion within the regional framework of the Rancho Ceramic sphere. Several pottery types identified within the Strath Bogue ceramic assemblage sample are noted as belonging to other ceramic spheres, even though they are clearly present and common within the Rancho sphere. This was done following the standard practice whereby pottery types are associated with the complex and sphere in which they were first identified, regardless of the pervasiveness of their presence. Such pottery types as Cambio Unslipped, and most significantly Achote Black are ceramic types that are present in more than one ceramic sphere and are present in the Rancho sphere.
Traditional type: variety-mode analysis was the primary form of ceramic analysis employed on the Strath Bogue ceramic assemblage. Type designations were assessed following Smith, Willey and Gifford’s (Smith, et al. 1960) parameters, focusing on the clustering of certain attributes that are shown to be consistent and have spatial significance, including mode, surface treatment, decoration and paste (Gifford 1960; Sullivan and Sagabiel 2003; Wheat, et al. 1958; Willey, et al. 1967). Where possible, specimens were compared and correlated to type: variety/mode designations previously identified by other ceramicists, as presented in published and unpublished articles, dissertations and monographs. Many specimens were unable to be identified due to poor preservation. A small percentage of identifiable specimens did not receive the same scrutiny or treatment as they were determined to predate the Strath Bogue Community.

The type: variety ceramic names utilized in the analysis of the Strath Bogue assemblage largely derived from comparisons and correlations to known types previously established through the ceramic analysis of assemblages associated with neighboring sites and regions, and elsewhere when appropriate. New ceramic type names were only created when repetitive specimens with like attributes were unable to be correlated to any known types described or illustrated in the known literature.

Type: variety designations typically emphasize surface treatments such as slips, washes and designs play a primary role in type assessments. Due to severe preservation issues, predominantly eroded surfaces, other attributes such as form, paste color, inclusion type and density, as well as evidence of firing atmosphere, played more prominent roles in type identifications at Strath Bogue. Moreover, typological classifications were reliant on those sherds with clear diagnostic attributes, predominantly rim sherds. Thus, preservation issues, small sherd
size, and an absence of diagnostic attributes, meant that a very large portion of the ceramic sample
was unable to be identified. As a result, body sherds are underrepresented in the typological
analysis.

**Sampling Procedures & Constraints**

The Strath Bogue data set used for this research stems primarily from stratified deposits
excavated by arbitrary and cultural levels. A collection of architectural and cultural features from
varying on and off mound contexts across the site were part of the sampling strategy. Some non-
stratified surface collections were intended to be included in this analysis, however due to the
extremely eroded and poor state of preservation of surface collected specimens, only those surface
collections that were selected by stratified random sampling to be tested (excavated) were
analyzed.

An estimated 30,000-40,000 pottery sherds were excavated and collected during
investigations at Strath Bogue. Sherd preservation was a severe complication to the pottery
analysis due in part to poor vessel composition and construction, and post-depositional processes.
As part of the Strath Bogue sampling strategy, many pottery sherds were recovered from surface
collections. These surface collections helped with the identification of activity areas, where
excavations may be warranted and were used as the basis for the random sampling testing strategy.
It came to be decided however, that it would be detrimental to the analysis to examine the pottery
from surface collections due to poor preservation and sherd size.

Additionally, not all of the ceramics from units associated with the excavation of Structures
5, A1, A4 or 30c were analyzed due to time constraints, and in order to gain a more inclusive
sample from across the site. We thus restricted the analysis of these structures to those units that we felt would yield the most in-depth, well preserved thus diagnostic and representative stratigraphic data.

Unfortunately, no intact vessels were excavated during excavations, and only one reconstructible Achote Black: Provisional Variety dish associated with Burial PR10-02 was encountered during the Strath Bogue excavations (see Figure 8. 6) Thus, the characterization of the Progresso complex at Strath Bogue was limited to the use of diagnostic rim sherds and where possible, body sherds.

While the testing strategy employed at Strath Bogue within the two, 4 to 6-week field school sessions was somewhat limited in scope, we were able to conduct surface collections and excavations across a large portion of the accessible site, sampling a range of activity areas and structures. And in spite of our attempts to appropriately test and document the site through our archaeological efforts, a relatively small number of pottery sherds were recovered from Strath Bogue. The relatively small ceramic assemblage from Strath Bogue, as well as the overall poor preservation of the pottery sherds as a result of them not necessarily being buried or deeply buried upon discard, speaks to the limited time frame in which this community was established and occupied, as well as their lack of affluence and standing as newcomers within the larger Progresso Lagoon region.
Figure 8. 6: Reconstructed vessel from Strath Bogue, Achote Black: Provisional Variety.

A total of 14,534 sherds were subject to type: variety analysis for the purposes of this study. From this sample, 337 specimens (2.3% of the sample) were identified as Formative, Early Classic or Late Classic pottery types. Most of these minimally and sparsely distributed early ceramic types were predominantly found mixed within construction fill episodes that were determined to otherwise date to the Terminal Classic period. While indicating there had been some degree of earlier, clearly sporadic occupation in the area, only one in situ abandoned structure dating to the Early Classic period was identified at Strath Bogue (see Chapter 5, Structure 5-sub).

Most diagnostic sherds from the Strath Bogue assemblage were confirmed through type: variety analysis to date to the Terminal Classic period. The small percentage of sherds found to pre-date the Terminal Classic period dictates that it is likely that an equally small percentage of
the unidentifiable sherds within the Strath Bogue assemblage may also date to earlier time periods. Similarly, there is a small number of sherds within the Strath Bogue assemblage that date to the Early Postclassic period (see Figure 8.4). Based on the low frequencies of such temporal outliers, the percentage of undiagnostic sherds that date to these time periods is likely to be negligible. Moreover, the relatively large number of types and specimens that are attributable to Terminal Classic period striated vessels, again underlines the likelihood that the majority of striated specimens from Strath Bogue likely date to the Terminal Classic period, and thereby reinforces the contention that a low percentage of undiagnostic ceramic specimens date to these earlier time periods. These otherwise random ceramic specimens will not be outlined or discussed herein.

An overwhelming 10,280 sherds, or 70.1% of the sample were unable to be identified to type, predominantly due to extreme sherd weathering, an absence of undiagnostic attributes, and, or small size. On occasion sherds could be identified as associated with a specific time period by formal attribute (i.e. basal flange and Early Classic Period), or surface treatment (i.e., slate wares) but were unable to be identified to specific ceramic type; while others could only be identified to the level of Ceramic Group based on paste and slip attributes (i.e., Kik Group). The extreme number of specimens unable to be identified to ceramic type through the type: variety analysis resulted in only 29.26% of the analyzed assemblage being able to be identified to ceramic type/group and, or time period.
Table 8.4: Percentage of Strath Bogue Ceramic Assemblage According to Representative Time Periods.

<table>
<thead>
<tr>
<th>Time Period</th>
<th>Percentage of Identifiable Sherds According to Time Period (N=4,253 sherds)</th>
<th>Percentage of Analyzed Assemblage (N=14,534 sherds)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Early Postclassic Period</td>
<td>2.1%</td>
<td>0.605%</td>
</tr>
<tr>
<td>Transitional Terminal-Early Postclassic Period</td>
<td>0.1%</td>
<td>0.028%</td>
</tr>
<tr>
<td>Terminal Classic Period</td>
<td>66.2%</td>
<td>19.382%</td>
</tr>
<tr>
<td>Transitional Late-Terminal Classic Period</td>
<td>23.7%</td>
<td>6.929%</td>
</tr>
<tr>
<td>Late Classic Period</td>
<td>0.1%</td>
<td>0.034%</td>
</tr>
<tr>
<td>Early Classic Period</td>
<td>4.4%</td>
<td>1.287%</td>
</tr>
<tr>
<td>Formative Period</td>
<td>3.4%</td>
<td>0.998%</td>
</tr>
<tr>
<td><strong>Grand Total</strong></td>
<td><strong>100.0%</strong></td>
<td><strong>29.262%</strong></td>
</tr>
</tbody>
</table>

The majority of ceramic specimens that were unable to be identified through type: variety analysis were body sherds from utilitarian vessels, predominantly striated ollas (jars). Whereas rims and profiles of striated vessels may be diagnostic, their body sherds are not as distinct. A total of 3,777 undiagnostic striated specimens alone were encountered within the sample, representing 36.7% of the unidentifiable sherds, or 27% of the entire analyzed data set.

Interestingly, vessel features such as handles, spouts and most significantly feet or supports are underrepresented within the Strath Bogue assemblage. Only 4 handles and 6 feet were identified. The near absence of these aspects of vessels is unfortunate since they can possess, or themselves are attributes that are considered diagnostic in the identification of temporal, regional and cultural patterns. The underrepresentation or complete absence of such elements as slab, nubbin, oven and tau-shaped feet or pedestal supports/bases (Chase and Chase 2013; Chase 1982b;
Graham 1987:78; Sabloff 1975) is of particular note, since such features are characteristic of Terminal Classic period vessels elsewhere in the Maya lowlands. While many rim sherd specimens could not be typologically classified, generalized vessel forms of most rims were able to be determined. Other specimens could be narrowed down to either/or formal identifications.

The recording of techno-stylistic attributes of rim sherds was conducted in anticipation that these data could aid in the identification of commonalities and differences within and between types. By extension, it was hoped that such data may be able to shed light on pottery production, perhaps elucidating whether production occurred at the household level, community level, and perhaps even contributing answers to the question of local vs foreign pottery specimens. Unfortunately, because the Strath Bogue Terminal Classic assemblage ended up having relatively few diagnostic rim sherds identifiable to type: variety, these data ended up being of limited use, but were still helpful in different aspects of the pottery analysis.

Data on slip, paste, temper, firing, as well as rim lip and wall contour types and measurements of wall thickness and orifice diameter were also recorded as part of a supplemental techno-stylist analysis of rim sherd specimens. Rim diameters were calculated based on metric diameter charts and were only able to be measured when 5% or more of the rim was established as present. An analysis guide of rim/lip and side wall designations, temper type, paste and slip color and slip location, vessel surface texture, and oxidization characterization, was established and followed during the analysis process.

Fine paste and ash tempered wares are generally common amongst Terminal Classic period sites in central Belize, the Petén (Graham 1987:78; Jones 1986:54-55; Rice and Forsyth 2004:38;
West 2002:172) and amongst sites within the Sotuta ceramic sphere in northeastern Yucatán (Cobos Palma 2004:521). While Fine Orange and Fine Gray vessels are absent from the Strath Bogue ceramic assemblage, imitation fine paste wares, such as ash tempered wares, occur in low frequencies. Only 1% of the sherds examined during the techno-Stylistic analysis were ash tempered (see Table 8.7). Basal break bowls (which were classified as “dishes” under the Strath Bogue analysis system), basins and thickened bolster rims, have been noted elsewhere as marking connections or influences with the northern Yucatán region (Harrison-Buck and McAnany 2007:85-86).

At Barton Ramie in western Belize, Willey (1973b:98, 104) noted a correlation between the end of fine polychrome painting and the introduction of ash tempered ceramics in the Terminal Classic period, and a corresponding upswing in calcite tempered wares. He postulated that this was linked to a decline in the Petén polities during this period, where ash tempered wares are argued to have originated. The lack of such wares, and other Petén centric ceramic types at Strath Bogue suggests that connections to the Petén at Strath Bogue were minimal at best.

An array of ceramic fabrics were identified at Strath Bogue, including within individual type: varieties in some cases (i.e., Achote Black; Campbells Red). Pastes hardness, firing and oxidation levels, as well colors were variable. Paste colors ranged from creams to pinks, and from beige to red. This variability in ceramic fabric also aligns with the larger Terminal Classic period trend towards ceramic diversity. While the vast majority of pastes were primarily tempered with calcite, the size, density and type of calcite, as well as secondary and tertiary tempers, varied. The variation in tempers and pastes aligns with the larger Terminal Classic period trend towards diversity. Sand temper represents the next most common temper identified in the Strath Bogue
sherds, with fine, medium and coarse sand being the dominant temper type in 16% of the analyzed assemblage (see Table 8.7).

Amongst the ceramics associated with the Progresso ceramic complex at Strath Bogue, 78.2% of the sherds subject to techno-Stylistic had calcite as the primary temper type (see Figure 8.7 for a more specified breakdown of tempers utilized in Strath Bogue assemblage ceramics). As noted by Jones (1986:16-17, 31) in her petrographic analysis of ceramics from the nearby site of Cuello and Nohmul, pottery was found to principally be tempered with calcite temper. She further argued that calcite was the primary temper utilized within northern Belize (Jones 1986: 31). This is in contrast to petrographic analyses at the sites of Colha and Kichpanha (Iceland and Goldberg 1999) where a shift towards the use of quartzite temper occurs sometime after the Late Preclassic period, and becomes the dominant temper utilized at both sites by the Late-Terminal Classic period (Iceland and Goldberg 1999:964).

Interestingly, Valdez (1987:249) has noted that ceramics belonging to the Tinaja Ceramic Group dominate the Late-Terminal Classic Masson complex at Colha, and unlike other Terminal Classic period ceramic types, calcite was the chosen temper type for this Terminal Classic marker (Iceland and Goldberg 1999:963-964). Of note is that Kichpanha and Cuello are on the southern "border" of the northern Belize region, and as per the dominant ceramic types seen at these sites, were evidently within the production, consumption or influential sphere(s) of the Petén. As Iceland notes (Iceland and Goldberg 1999:965), perhaps these contradictions indicate the existence of competing regional political spheres of influence that are being expressed ceramically.
Table 8.5: Temper types identified during techno-stylistic pottery analysis.

<table>
<thead>
<tr>
<th>Temper Type</th>
<th>Percentage</th>
</tr>
</thead>
<tbody>
<tr>
<td>Quartz</td>
<td>0.1%</td>
</tr>
<tr>
<td>Sand, Coarse</td>
<td>0.3%</td>
</tr>
<tr>
<td>Unknown</td>
<td>0.5%</td>
</tr>
<tr>
<td>Grog</td>
<td>0.5%</td>
</tr>
<tr>
<td>Sand, Fine</td>
<td>0.8%</td>
</tr>
<tr>
<td>Ash</td>
<td>1.0%</td>
</tr>
<tr>
<td>Calcite, Translucent</td>
<td>3.1%</td>
</tr>
<tr>
<td>Limestone</td>
<td>3.5%</td>
</tr>
<tr>
<td>Calcite, Angular</td>
<td>10.7%</td>
</tr>
<tr>
<td>Sand, Medium</td>
<td>15.1%</td>
</tr>
<tr>
<td>Calcite, Blue</td>
<td>15.4%</td>
</tr>
<tr>
<td>Calcite, Rounded</td>
<td>22.6%</td>
</tr>
<tr>
<td>Calcite, Opaque</td>
<td>26.4%</td>
</tr>
<tr>
<td>TOTAL</td>
<td>100.0%</td>
</tr>
</tbody>
</table>

**Vessel Class/Forms**

Following Jeremy Sabloff’s (1975:22-27) primary vessel classification scheme, vessel shapes or class designations were determined by assessing general vessel shape, rim and lip type, and wall or side contours. The vessel classes utilized in this study do not themselves hold emic cultural or historic significance among the Pre-Columbian, Colonial or modern-day Maya. In this study they are tools to help describe, categorize, analyze and compare specimens, and assist in discussions of chronology and issues of analytical, comparative and interpretive significance.

Basic vessel classes include plates, bowls, dishes, vases, and jars (ollas), and the addition of basins due to their prominence within the Strath Bogue assemblage and Progresso complex. Additional classes were recorded as appropriate. Many vessel forms were however unable to be determined due to sherd size, indistinct rim and wall contours and perhaps inexperience of analyst.
Even though the vessel form of some specimens may have been unclear, many of the less distinct specimens were at least able to be assigned to an either/or classificatory (i.e., Dish/Bowl). Once again, preservation issues and small sherd sizes hindered the identification of vessel forms for many sherds, resulting in 31 percent of the sherds in the assemblage having indeterminate forms, or insecure forms, resulting in such designations as Basin/Olla, Plate/Dish, etc. (see Figure 8.7).

**Table 8. 6: Vessel side/wall contour designations utilized with type: variety and technostylistic pottery analysis.**

<table>
<thead>
<tr>
<th>Vessel Side/Wall Type</th>
<th>Abbreviation</th>
<th>Vessel Side/Wall Type</th>
<th>Abbreviation</th>
</tr>
</thead>
<tbody>
<tr>
<td>Insloping - Straight</td>
<td>IS</td>
<td>Necked Jar - Vertical</td>
<td>JV</td>
</tr>
<tr>
<td>Insloping - Convex</td>
<td>ICV</td>
<td>Necked Jar - Outsloping</td>
<td>JOS</td>
</tr>
<tr>
<td>Insloping - Concave</td>
<td>ICX</td>
<td>Necked Jar - Outflaring</td>
<td>JOF</td>
</tr>
<tr>
<td>Insloping - Carinated</td>
<td>IB</td>
<td>Necked Jar - Outflaring, no break at Neck</td>
<td>JOB</td>
</tr>
<tr>
<td>Vertical - Straight</td>
<td>VS</td>
<td>Necked Jar - Outsloping Convex Neck</td>
<td>JCX</td>
</tr>
<tr>
<td>Vertical - Convex</td>
<td>VCX</td>
<td>Necked Jar - Outsloping, Channeled Neck</td>
<td>JCN</td>
</tr>
<tr>
<td>Vertical - Concave</td>
<td>VCV</td>
<td>Necked Jar - Composite Neck</td>
<td>NCP</td>
</tr>
<tr>
<td>Outsloping - Straight</td>
<td>CS</td>
<td>Orientation Indeterminate - Straight</td>
<td>OIS</td>
</tr>
<tr>
<td>Outsloping - Convex</td>
<td>OCX</td>
<td>Orientation Indeterminate - Convex</td>
<td>OICX</td>
</tr>
<tr>
<td>Outflaring</td>
<td>OF</td>
<td>Orientation Indeterminate - Concave</td>
<td>OICN</td>
</tr>
<tr>
<td>Extreme Outflaring or Flat</td>
<td>EO</td>
<td>Incurved with Outsloped Neck</td>
<td>IBON</td>
</tr>
<tr>
<td>Necked Jar - Insloping</td>
<td>JI</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>
Vessels were further categorized according to whether they were considered utilitarian, serving, or specialty wares by virtue of their formal class, surface treatment, and uniqueness within the Strath Bogue assemblage and Progresso ceramic complex. While traditionally ceramicists consider vases and plates serving vessels based on form, the low representation of these forms at Strath Bogue indicates they likely had more distinctive purposes here. Only seven plates and thirteen vases were clearly identified within the Strath Bogue ceramic assemblage. Whether the uses of these otherwise unique-to-Strath Bogue vessels represent functional variations of more utilitarian vessels, or different types of foods being prepared and/or served, or they embodied symbolically different meaning(s) is unknown. Regardless, their sparseness suggests a potential variation in use and, or significance at Strath Bogue, and thus I do not feel comfortable assigning them the characteristic serving vessel category.

Vessel side contours were assessed by examining the profile of the sherd and were assigned a descriptive “type” based on the sherds characteristic of side wall attributes (see Table 8. 6: Vessel side/wall contour designations utilized with type: variety and techno-Stylistic pottery analysis.). Side wall assessments were instrumental during the type: variety analysis and in determining vessel class or form. Similarly, a rim and lip guide for analytical purposes was also employed and expanded upon as needed (see Table 8. 7). Again, these designations were utilized during type: variety analysis, vessel form and determining temporal associations of the pottery sherds. Since both guides were developed and utilized during the analysis of all the pottery from Strath Bogue, the vessel side wall and rim/lip guides were applicable to all of Strath Bogue’s pottery sherds, regardless of pottery type or chronological positioning.
Table 8.7: Rim and Lip designations utilized with type: variety and techno-stylistic pottery analysis.

<table>
<thead>
<tr>
<th>Rim Lip Type</th>
<th>Abbreviation</th>
<th>Rim Lip Type</th>
<th>Abbreviation</th>
</tr>
</thead>
<tbody>
<tr>
<td>Direct, rounded</td>
<td>DR</td>
<td>Interior flat, exterior beveled, thickened</td>
<td>IFR</td>
</tr>
<tr>
<td>Direct, tapered, interior</td>
<td>DRI</td>
<td>Interior &amp; exterior beveled, triangular</td>
<td>IEBT</td>
</tr>
<tr>
<td>Direct, tapered, symmetrical</td>
<td>DRS</td>
<td>Exterior, hooked</td>
<td>EH</td>
</tr>
<tr>
<td>Direct, tapered, exterior</td>
<td>DTE</td>
<td>Interior beveled, exterior thickened</td>
<td>IBET</td>
</tr>
<tr>
<td>Direct, beveled, interior</td>
<td>DBI</td>
<td>Interior, ledge</td>
<td>IL</td>
</tr>
<tr>
<td>Direct, beveled, flat</td>
<td>DBF</td>
<td>Everted, curled</td>
<td>ECR</td>
</tr>
<tr>
<td>Direct, beveled, exterior</td>
<td>DBE</td>
<td>Triangular (arrowhead)</td>
<td>TR</td>
</tr>
<tr>
<td>Everted, curved</td>
<td>EC</td>
<td>Exterior, bolster, triangular</td>
<td>EBT</td>
</tr>
<tr>
<td>Everted, flat</td>
<td>EF</td>
<td>Interior beveled, exterior tapered</td>
<td>IBT</td>
</tr>
<tr>
<td>Everted, bolstered</td>
<td>EB</td>
<td>Thickened, symmetrical, rounded</td>
<td>TSR</td>
</tr>
<tr>
<td>Inverted, curved</td>
<td>IC</td>
<td>Thickened, symmetrical, tapered</td>
<td>TST</td>
</tr>
<tr>
<td>Inverted, flat</td>
<td>IF</td>
<td>Thickened, symmetrical, beveled</td>
<td>TSB</td>
</tr>
<tr>
<td>Inverted, bolstered</td>
<td>IB</td>
<td>Thickened, exterior, rounded</td>
<td>TIR</td>
</tr>
<tr>
<td>Thickened, interior, rounded</td>
<td>TIR</td>
<td>Thickened, exterior, tapered</td>
<td>TET</td>
</tr>
<tr>
<td>Thickened, interior, tapered</td>
<td>TIP</td>
<td>Thickened, exterior, beveled</td>
<td>TEB</td>
</tr>
<tr>
<td>Thickened, interior, beveled</td>
<td>TIB</td>
<td>Thickened, exterior</td>
<td>TE</td>
</tr>
<tr>
<td>Folded, exterior, flat</td>
<td>FEF</td>
<td>Exterior, beaded</td>
<td>EBD</td>
</tr>
<tr>
<td>Folded, exterior, rounded</td>
<td>FER</td>
<td>Interior, beaded</td>
<td>IBD</td>
</tr>
<tr>
<td>Everted, triangular</td>
<td>ET</td>
<td>Interior beveled, interior beaded</td>
<td>IBB</td>
</tr>
<tr>
<td>Everted, tapered</td>
<td>EVT</td>
<td>Interior beveled, exterior rounded</td>
<td>IBR</td>
</tr>
<tr>
<td>Rounded, triangular, bolster</td>
<td>RTB</td>
<td>Interior rounded, exterior beveled</td>
<td>IRB</td>
</tr>
<tr>
<td>Direct, tapered, exterior concavity</td>
<td>DEC</td>
<td>Everted, interior tapered</td>
<td>EIT</td>
</tr>
</tbody>
</table>

Some of the typical Terminal Classic period ceramic markers noted elsewhere in the Maya lowlands, including in northern Belize are either absent or occur in very low numbers at Strath
Bogue. For instance, pedestal bases (Graham 1987:78; Sabloff 1975), Fine Orange and Fine Grey Wares (Adams 1971:104-106, 132-134; Rice and Forsyth 2004:38; Sabloff 1973a:110; 1975:32, 174-228; Valdez 1987:249-51), ritual appliqued censers and model-carved vessels (Graham 1985:227, Graham, 1987 #681:79; Sabloff 1975:195-198) are absent at Strath Bogue. Vessels with these attributes or types of vessels, along with polychrome decorated vessels, are typically considered sumptuous goods, or as embodying symbolic meaning, and tend to be recovered from elite or ritual contexts like burials and offerings (Reents-Budet 1994). Basal break bowls (dishes) are the only “serving-type” vessel identified at Strath Bogue. They primarily occur in the Achote Black ceramic group and are restricted in number. Given the predominance of basal break bowls/dishes at other Terminal Classic period sites in northern Belize and in the Yucatán, and their limited numbers at Strath Bogue, I must acknowledge the fact that there is a possibility that due to the limited number and generally small size of rim sherds within the Strath Bogue assemblage, there is chance that this aspect of the vessel is just not being preserved or easily recognized during analysis.

The majority of identifiable vessels from Strath Bogue are utilitarian in nature. Utilitarian vessels are those vessels typically associated with domestic contexts and are argued to have largely been storage or cooking containers, or vessels used for every day, mundane purposes. These vessels are typically coarse pasted jars or ollas, unslipped or monochrome dishes or bowls, and large bolster-rimmed basins. Utilitarian vessels display limited if any decorative features. While many of the jar forms have striations on their exteriors these marks are perceived to have been largely functional rather than decorative attributes. Basins may be slipped, but this decorative attribute tends to be limited to portions of the exterior rim and, or interior rim only. The coarseness of these vessels,
most especially the striations on jars, are thought to have been employed so to assist in the gripping of the vessels when wet, and, or to help regulate heat while cooking (Lucero 2001:48).

![Vessel Form Percentages](image)

**Figure 8.7: Strath Bogue’s Terminal Classic-Transitional Early Postclassic Period Progresso Complex Vessel Forms.**

Changes to traditional utilitarian wares generally tend to occur less often or readily compared to more sumptuous or decorative pottery wares, as partially dictated by the technical properties and formal attributes required of utilitarian ceramics given their functional uses (Rice 1984:252). The introduction and adaptation of new forms, attributes and styles of utilitarian wares within the local Progresso ceramic complex is significant when discussing the movement of peoples into the area during the Terminal Classic period.

Comals are the rarest vessel class within the Terminal Classic period Strath Bogue assemblage, with only 0.1% or two vessels being represented amongst the sherds recovered from
the site. Comals are relatively large, flat and comparatively thick plate-like “vessels,” used as cooking surfaces, and typically assigned to the utilitarian vessel type. The near absence of comals in Terminal Classic ceramic assemblages is seen elsewhere at such lowland Maya sites as Saktunja (Mock 2005a:123), Uaxactún (Smith 1955), Lubaantun (Hammond 1975b), Altar de Sacrificios (Adams 1971), among others. It appears that this form becomes more common towards the end of the Terminal Classic-beginning of the Early Postclassic period and is likely related to the introduction of a new food or food preparation technology (Mock 2005a:123). Both comals recovered from Strath Bogue were unslipped and were of the same type (Cambio Unslipped: Variety Unspecified) and came from the upper levels of excavation off of Structure B1 and Structure 5.

Plates, which are of course similar in form to comals, are also rare at Strath Bogue, representing only 0.2 percent of the vessel forms identified during our analyses. All plate specimens from Strath Bogue were slipped. The infrequency of these relatively flat vessel forms may relate to a lack of technological experience and prowess in making such vessels. With the exception of two specimens, the majority of Strath Bogue plates were from units associated with Structure 5 (the Scribal household), while another was associated with Structure A4, the largest range structure associated with the main plaza. Except for one Zakpah Orange-Red specimen, typically an Early Postclassic type, the majority of plate specimens at Strath Bogue belong to the Terminal Classic period Achote Group (Achote Black: Variety Unspecified and Provisional Variety, and Daylight Orange: Darknight Variety). Grater bowls or dishes which are vessels with deep striations or ridges incised into the base of the vessel so to provide a grating surface on which to mash or grind food or pigments, are completely absent from the Strath Bogue assemblage,
although a Terminal Classic Coco Red grater bowl was identified at the Erlington Group, one of the Progresso Lagoon shore communities.

Tecomates are another vessel type that is uncommon within the Strath Bogue ceramic assemblage. Tecomates identified at Strath Bogue were globular in shape, and resemble gourds with restricted, round orifices at their apex. They do not possess any sort of neck or rim per se. This vessel form was a more predominate in the Formative period, although they do occur through all time periods. Only eight Tecomates (0.2% of the assemblage) were identified at Strath Bogue, which while a low number is only slightly lower than the mere 13 Vases recovered at the site (see Error! Reference source not found. and Table 8. 10). Interestingly while 5 or 62.5% of the Strath Bogue tecomates were slipped, the ceramic types to which they were identified all varied.

Of the identified vessel forms at Strath Bogue, bowls were the most prolific vessel type, with 24% of the Progress Complex being represented by bowls. As indicated earlier, this excludes those classified elsewhere as basal-break bowls, but which we classified as dishes during the Strath Bogue analysis. Interestingly, bowls were found to principally be associated with 4 ceramic groups (see Table 8. 9), with Coco Red: Variety Unspecified (Zakpah Group) having the highest percentage of bowls within the Progresso complex (see below for a larger discussion of this Pottery Type). With the exception of the Strath Bogue Unslipped (Tsabak Group), all bowls exhibited some form of slipped surface, predominantly red (50.8%) and black (24.7%), although many exhibited only partial or eroded slips. Perhaps not unsurprising, bowls also exhibited the largest array of surface treatments than any other vessel form (see Table 8. 8 and Table 8. 9).
Four hundred and thirty-nine specimens representing bowls were examined as part of the techno-stylistic analysis. Unfortunately, 101 of those were unable to be identified to type through type: variety analysis. Based on diameter measurement charts, rim sherds which were determined to represent 5% or smaller of the orifice circumference were unable to have their diameters ascertained. Thus, the diameters of 27% of the Strath Bogue bowls were unmeasurable.

<table>
<thead>
<tr>
<th>Ceramic Group/Type</th>
<th>Percentage</th>
</tr>
</thead>
<tbody>
<tr>
<td>Zakpah (Coco Red)</td>
<td>26.3%</td>
</tr>
<tr>
<td>Achote Black Group</td>
<td>22.7%</td>
</tr>
<tr>
<td>Kik Red Group</td>
<td>15.5%</td>
</tr>
<tr>
<td>Tsabak Group (Strath Bogue Unslipped)</td>
<td>8.8%</td>
</tr>
<tr>
<td>Ohel Group (Ohel Red)</td>
<td>4.7%</td>
</tr>
<tr>
<td>Remaining Pottery Types</td>
<td>21.9%</td>
</tr>
</tbody>
</table>

Basins comprised 9.3% of the identified vessel forms within the Strath Bogue ceramic assemblage (see Figure 8.7 and Table 8.9). Basins were distinguished from bowls based on their orifice size, rim type, wall contour, depth of vessel and overall size. One hundred and twenty-seven rim sherds from basins were examined during analysis, with 9.3% of the techno-stylistic assemblage being classified as Basins. Basin orifices ranged in size between 17 and 50 centimeters in diameter, with most having diameters measuring between 28 and 38 centimeters.

The appearance and increasing numbers of basins in ceramic assemblages at sites across northern Belize (Chase 1982a, b; Fry 1972, 1983, 1989, 1990b, 2000, 2013; Shirley B. Mock 1994b; Mock 2005a, b) and elsewhere in the northern Maya lowlands (Ball 1977a, 2014; Ball and Taschek 2013; Vallo 2005) is one of the significance Terminal Classic period changes noted at
many sites. As a ceramic form, shallow basins with large bolstered rims are not generally seen at sites whose assemblages mimic or are analogous to those in, or with connections to, the Petén and Belize Valley regions. Instead, such basins tend to be affiliated with, or show influences or interactions with sites from northern Yucatán (Brainerd 1958:47; Forsyth 1983:101, Fig. 26m-w; Harrison-Buck and McAnany 2007:85-86). Many basin forms in fact emulate those associated with Cehpech sphere ceramics, including Puuc Red, Cream and Slate wares (Brainerd 1958:196-197; Forsyth 1983; Smith 1971; Williams-Beck 2005:Fig.9).

Since there is an absence of complete jars from the Progresso Lagoon region to which comparisons can be made, and the Strath Bogue assemblage type: variety analysis was reliant largely on rim and sometimes neck sherds. However, because ollas have such large bodies, the assemblage was dominated by a plethora of body sherds. Our analysis of jars did not include assessments of their larger vessel purpose or function, although if present on a given sherd, fire clouding, or blackened interior and exterior surfaces were recorded as part of the techno-stylistic analysis. Jars in the Terminal Classic period, and as witnessed in the Strath Bogue assemblage, tend to see a thickening, rolling, padding or bolstering of rims, with short low necks, which is in contrast to many other Terminal Classic period sites where necks tend to be tall and out-flaring, with everted and more tapered rims (Masson and Mock 2004:379). Ollas were largely striated (60.4% of ollas) or red slipped on their exteriors (22%), with 4% of the sherds representing ollas being both striated and red slipped. Surprisingly, only 12.1% of the ollas in the assemblage were unslipped (see Table 8.10). Within the jar category of vessel form identified at Strath Bogue were sherds associated with the Buyuk Striated or Aventura Double-mouthed jar. This particular form
is a Terminal Classic period marker, whose production is argued to have centered around the site of Aventura in northern Belize.

**Surface Treatments**

The Strath Bogue ceramic assemblage is dominated by Red and Black slipped vessels, with an overwhelming 50.5% of the assemblage being red slipped, and 14% being black slipped (see Figure 8.8 and Table 8.9 for a breakdown of the different surface treatments seen on Terminal Classic and transitionary-Early Postclassic ceramics from Strath Bogue). Vessels were slipped on the exterior and, or interior, while others were slipped only on the rims or partially down the vessel wall. Slipped vessels at Strath Bogue are largely bowls, and dishes. Many of the slips, particularly the black slips, are modelled or crazed due to weathering and erosion, or have dendritic rootlet stains or marks. Some of the black slips are glossier than others and appear to be attempts at mimicking slate wares. In some instances, completed eroded black slips were able to be detected by a black “stain” left on the sherd, which is understood to indicate the former presence of the slip.

Red slips tended to be more flakey than black slips, and do not adhere as well to their pastes. On several occasions red slipping was only identified by the tiniest remnant of slip. In fact, in the case of the Coco Red specimens, the presence of slip was often inferred simply by recognizing this ceramic type by its other distinct attributes. While orange-red, cream, and brown slips do occur within the Strath Bogue assemblage, they are not well represented, and those that were able to be identified to type: variety are so few in number that they were not classified as part of the Progresso complex at Strath Bogue.
Table 8. 9: Correlation of ceramic vessel forms with surface treatments within the Progresso complex at Strath Bogue.

<table>
<thead>
<tr>
<th>Surface Treatment</th>
<th>Basin</th>
<th>Basin/Bowl</th>
<th>Bowl</th>
<th>Comal</th>
<th>Dish</th>
<th>Dish/Bowl</th>
<th>Double-mouthed Jar</th>
<th>Indeterminate</th>
<th>Olla</th>
<th>Olla/Dish</th>
<th>Plate</th>
<th>Plate/Dish</th>
<th>Teconate</th>
<th>Vase</th>
<th>Vase/Dish</th>
<th>Total</th>
<th>% of Assemblage</th>
</tr>
</thead>
<tbody>
<tr>
<td>Bichrome</td>
<td>5</td>
<td>4</td>
<td>1</td>
<td></td>
<td>13</td>
<td>1</td>
<td></td>
<td>3</td>
<td></td>
<td></td>
<td>26</td>
<td>1</td>
<td>4</td>
<td></td>
<td></td>
<td>39</td>
<td>0.7%</td>
</tr>
<tr>
<td>Black Slipped</td>
<td>252</td>
<td>78</td>
<td>76</td>
<td></td>
<td>137</td>
<td>1</td>
<td></td>
<td>3</td>
<td>16</td>
<td>5</td>
<td>5</td>
<td>16</td>
<td>548</td>
<td>14.0%</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Black Slipped &amp; Fluted</td>
<td>2</td>
<td>2</td>
<td></td>
<td></td>
<td>2</td>
<td>1</td>
<td></td>
<td>5</td>
<td></td>
<td></td>
<td>1</td>
<td>5</td>
<td>1</td>
<td>0.1%</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Black Slipped &amp; Incised</td>
<td>5</td>
<td>2</td>
<td></td>
<td></td>
<td>2</td>
<td></td>
<td></td>
<td>2</td>
<td></td>
<td></td>
<td>9</td>
<td>0.2%</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Brown Slipped</td>
<td>4</td>
<td>4</td>
<td></td>
<td></td>
<td>4</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>8</td>
<td>0.2%</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Cream Slipped</td>
<td>1</td>
<td>3</td>
<td></td>
<td></td>
<td>13</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>17</td>
<td>0.4%</td>
<td></td>
<td></td>
<td></td>
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</tr>
<tr>
<td>Inflation Fine Paste</td>
<td>1</td>
<td>1</td>
<td></td>
<td></td>
<td>4</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>6</td>
<td>0.2%</td>
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<td></td>
<td></td>
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<tr>
<td>Impressed</td>
<td>1</td>
<td>2</td>
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<td></td>
<td>3</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>3</td>
<td>0.1%</td>
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<td></td>
<td></td>
</tr>
<tr>
<td>Incised</td>
<td>1</td>
<td>2</td>
<td></td>
<td></td>
<td>3</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>3</td>
<td>0.1%</td>
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<td></td>
<td></td>
</tr>
<tr>
<td>Incised slate ware</td>
<td>1</td>
<td>1</td>
<td></td>
<td></td>
<td>1</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>1</td>
<td>0.0%</td>
<td></td>
<td></td>
<td></td>
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</tr>
<tr>
<td>Orange Slipped</td>
<td>1</td>
<td>3</td>
<td></td>
<td></td>
<td>6</td>
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<td></td>
<td>1</td>
<td>1</td>
<td>1</td>
<td>13</td>
<td>0.3%</td>
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<td></td>
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<tr>
<td>Polychrome</td>
<td>5</td>
<td>5</td>
<td>10</td>
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<td></td>
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</tr>
<tr>
<td>Red Slipped</td>
<td>316</td>
<td>18</td>
<td>477</td>
<td>148</td>
<td>178</td>
<td>682</td>
<td></td>
<td>149</td>
<td>5</td>
<td>4</td>
<td>1982</td>
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<td></td>
<td></td>
<td></td>
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<td></td>
</tr>
<tr>
<td>Red Slipped &amp; Striated</td>
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<td>27</td>
<td></td>
<td></td>
<td>1</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>2</td>
<td>29</td>
<td>0.7%</td>
<td></td>
<td></td>
<td></td>
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</tr>
<tr>
<td>Slate ware</td>
<td>20</td>
<td>2</td>
<td>18</td>
<td>3</td>
<td>7</td>
<td>119</td>
<td></td>
<td>7</td>
<td></td>
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<td></td>
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<tr>
<td>Striated</td>
<td>3</td>
<td>1</td>
<td>5</td>
<td>15</td>
<td>56</td>
<td>3</td>
<td>899</td>
<td>5</td>
<td></td>
<td></td>
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<td></td>
<td></td>
</tr>
<tr>
<td>Unslipped</td>
<td>15</td>
<td>132</td>
<td>2</td>
<td>11</td>
<td>21</td>
<td>193</td>
<td></td>
<td>82</td>
<td>4</td>
<td></td>
<td>453</td>
<td>11.8%</td>
<td></td>
<td></td>
<td></td>
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</tr>
<tr>
<td>Grand Total</td>
<td>362</td>
<td>21</td>
<td>5</td>
<td>939</td>
<td>2</td>
<td>259</td>
<td>317</td>
<td>56</td>
<td>1215</td>
<td>677</td>
<td>16</td>
<td>1</td>
<td>8</td>
<td>13</td>
<td>18</td>
<td>3919</td>
<td>100.0%</td>
</tr>
<tr>
<td>% of Assemblage</td>
<td>9.3%</td>
<td>0.5%</td>
<td>0.1%</td>
<td>24.0%</td>
<td>0.1%</td>
<td>6.6%</td>
<td>8.1%</td>
<td>1.4%</td>
<td>31.0%</td>
<td>17.3%</td>
<td>0.4%</td>
<td>0.2%</td>
<td>0.0%</td>
<td>0.2%</td>
<td>0.3%</td>
<td>0.5%</td>
<td>1.0%</td>
</tr>
</tbody>
</table>
Unlike other Terminal Classic sites, cream wares and fine orange and grey paste wares are practically absent from the Strath Bogue assemblage, and plumbate wares are completely absent. Plumbate wares are considered a Terminal Classic period marker at many Maya sites in the Petén and northern lowlands. Only .03% of the ceramics from Strath Bogue were designated as fine paste or imitation fine paste wares. In fact, most of fine paste wares at Strath Bogue appear to be attempts at replicating or imitating these distinctive wares. Unfortunately, only a handful of these wares had remnant slip, thus making specific type designations impossible to identify. Fine Orange and Plumbate wares are considered important components of the Chichén Itzá Sotuta ceramic complex (Cobos Palma 2004:521), although both originate in the lower Usumacinta and western Guatemala highland regions respectively (Bishop 1994; Cobos Palma 2004; Neff and Bishop 1988) and have been used to identify an overlapping foreign component at Chichén Itzá that begins in the Terminal Classic period (Suhler, et al. 2004:454).

Cream (or pale brown) slipped wares represent only 0.4% of the Strath Bogue assemblage. Interestingly, all but one of the cream wares were identified as local Savinal Cream: Savinal Variety defined by Diane Chase (1982a:502, 506; 1982b). Chase noted that some vessels duplicated forms from northern Yucatán, and she classified this type as being under the umbrella of Peto Cream Ware associated with Yucatán (Smith 1971:170-205). The remaining cream ware at Strath Bogue was only able to be identified as being a Peto Cream Ware, and not to a specific type. Unfortunately, 76.5% of the cream ware vessel forms were unable to be determined.

Bichrome slipped (also referred to as dichrome by some ceramicists) vessels represent only 0.7% of the Strath Bogue assemblage and were limited to only 3 bichrome types. Unfortunately, the forms of the majority of bichrome specimens were unable to determined, but of those
identified, a variety of forms were represented. The majority of bichrome vessels belong to the Daylight Orange: Darknight Variety. Originally identified by Gifford at Barton Ramie within the New Town or Postclassic period complex (Gifford 1976:300-302), Daylight Orange has since been corrected as belonging to the Spanish Lookout complex and is accepted as a Terminal Classic marker (Graham 1987; LeCount 1996; Shirley B. Mock 1994b; Mock 2005a). Vessels belonging to the Daylight Orange have also been classified elsewhere as ritual vessels (Aimers 2002; Mock 2005a:124; Valdez 1987; Walker 1990).

The Daylight Orange specimens at Strath Bogue are largely reddish-orange and black slips applied in regular interspersed “blotches” or as Gifford (1976:301, Fig.199; Willey, et al. 1965:390, Fig. 247, 254a-c) describes, as “intentionally blackened firecloud-like decorative…pattern”. The randomness of the design poses issues with ceramic analysis, given that these vessels share similar fabric and slip characteristics with Achote Black and Kik Red wares. Depending on the sherd, if only one slip color is present, there is a chance that such specimens may be incorrectly identified as either of those monochrome types, instead of their true bichrome ceramic type. One single Amberhead Black on Orange: Amberhead Variety sherd also of the Darknight ceramic group, but with purposeful, yet messily rendered black lines drawn on the surface was also identified (Gifford 1976:304, Fig. 200d-f; Willey, et al. 1965: Fig.247, 251e). The waxiness of the slips is suggestive of a slate ware, and perhaps this ceramic type was an attempt at replicating a true slate ware. Interestingly, the rest of the bichrome specimens from Strath Bogue were slate wares, identified as Chumayel red-on-slate: Chumayel Variety, a Puuc Slate ware, belonging to the Cehpech ceramic sphere (Smith 1971) and principally associated with the
northwest Yucatán. Debra Walker also identified this ceramic type within the Cerro Maya ceramic assemblage in 1995 (Walker, personal communication, April 2019).

Striated vessels are also relatively numerous, representing 13.4% of the assemblage, and are predominantly represented by jars or ollas; however, some dishes, specifically those identified as Vista Alegre types, were also striated. With the exception of the more distinctly executed Buyuk Striated/Aventura Striated and some Vista Alegre specimens, there is as of yet no known correlation of striation execution type (i.e., depth, breadth, design or location) with type: variety designations or temporal associations. Recognition of such correlations are of course hampered by the absence of intact striated vessels across the region. Depending on the vessel, striations can be lightly executed, some looking more like brush marks, while others are deeply rendered. Striations thickness or breadth and exactness of execution varies as well. Striations were drawn vertically, horizontally, and were crosshatched on vessel bodies, and were largely restricted to below the rim or neck of the vessels.

Unslipped vessels also represent a comparatively large percentage of the Strath Bogue assemblage. It should be noted however, that specimens within this category of surface treatment could be sherds in which the slips were eroded, or where there was an absence of slip or striations on that particular specimen, but elsewhere on the vessel it may have had a different surface treatment.

Polychrome vessels, which are traditionally characterized as specialty serving vessels and, or prestige and status goods, are typically distinct to burials and offering contexts prior to the Terminal Classic period (Reents-Budet 1994). In the Terminal Classic period at sites across the
Maya area, a significant decrease in the production and consumption of polychrome vessels compared to the preceding time periods occurs. Moreover, those that continue to be produced are less complex in their execution and decorative motifs and styles (Ball 1993; Forsyth 2005:7, 10, 14; LeCount 2005:99; Smith 1955; Vallo 2005:168).

![Surface Treatments](image)

**Figure 8.** Vessel surface treatments of Terminal Classic/Early Postclassic period Strath Bogue ceramics.

At Strath Bogue, polychrome designs are limited in their stylistic execution and numbers, largely being restricted to alternating bands of black, red and orange slips, rather than attempts at codex style scenes or elaborate images and designs. Additionally, the polychrome sherds recovered from Strath Bogue came from an array of contexts, not only in the fill of such ceremonial structures like the stela structure (Structure 39) and the main temple (Structure A1), or within 2 of the 4

456
burials within Structure 5 (Burials 2 & 3), but also including several domestic platforms, patios, middens and within random off mound excavations, suggesting a change not only in the ideology surrounding these vessels, but perhaps a change in the need to symbolize one’s status, identity and/or sociopolitical ties and power through such imbued markers. Instead, the Strath Bogue polychromes seem to indicate a more level playing field, and as some have argued, a “devaluation” of polychrome vessels themselves (Ball 1993:263; Forsyth 2005; LeCount 2005:99; Shirley B. Mock 1994a; 2005a:128; Valdez 1987).

Although not recovered in large quantities, the identification of slate wares, along with other northern Yucatecán derived forms and wares, are significant identifications at Strath Bogue, particularly in light of the migration hypothesis. Slate wares have a very distinct, soapy surface, and are recognized as deriving from northern Yucatán (Brainerd 1958; Forsyth 1983; Smith 1971). As was communicated to me by Maya Ceramicist Donald Forsyth’s (2008, personal communication), slate wares should not be identified as such unless the slate finish is present. Accordingly, only those specimens with preserved slate surfaces were designated as such within the Strath Bogue assemblage. I suspect that many of the unslipped and unidentified sherds from Strath Bogue are in fact local attempts at replicating slate wares, whose eroded surfaces unfortunately negated them from being properly identified. While most of the slate wares at Strath Bogue are local reproductions, others may be imports given their more precise execution and apparent expertise by which their slate slips were able to be preserved (Kosakowsky and Sagebiel 1999; Sagabiel 2005a, b; Sagebiel 2014).

Slate wares at Strath Bogue came in an array of vessel forms, including basins, bowls, dishes, ollas, and vases, with 66% of the slate ware specimens not being able to be identified to
the level of type: variety. While slate wares were recovered from all four burial contexts, they were also recovered from non-ceremonial domestic contexts, such as middens and house platforms (see Table 8.8).

**The Progresso Ceramic Complex**

As regions across the Maya area, including northern Belize, began to take advantage of the changing Terminal Classic period socio-political landscape and break free from the control of larger centers and strive for some level of independence, shifts in ceramic stylistic expressions and diversity, changes to utilitarian vessels and regionally produced ceramic styles occurs (Ball 1993:244; Ball and Taschek 2013:146; Graham 1987; Hantman and Plog 1982:252; Howie 2007:3-4; Howie, et al. 2016:166; Rice 1987a:79-80, 83; Sullivan 2002:212; 2003:34, 35 Masson, 2004 #1038:374). Such changes concur with the socio-political and economic decentralization of many sites across the Maya subarea that comes to characterize this period. Perhaps by choice, or perhaps as a result of a forced breakdown of politico-economic organization and integration characterizing this period, trade and exchange networks during this time, communities seem to become more independent and self-reliant on local resources (Ball 1993:256; Graham 1985:228; Sullivan 2002:215). Amongst many Terminal Classic Maya communities within the Yucatán peninsula, more mundane and restricted ranges of decorative treatments begin to take the place of polychrome status and specialty wares. While appearing to suggest trends towards ceramic homogeneity, these changes also coincide with the introduction of new vessel forms and a diversity of localized ceramic fabrics Fry, 1980 #622; Rice, 1982 #1293; Rice, 1987 #1303:83; Connor, 1983 #366; Graham, 1985 #680:228; Ball, 1993 #109; Foias, 1997 #583; Sullivan, 2002 #1571; Sullivan, 2003 #1975; Masson, 2005 #1039; Howie, 2007 #818:3).
In southern Quintana Roo and northern Belize, this shift towards ceramic regionalization includes the adoption of more simplified surface treatments and decorative techniques, including more poorly executed slips, as well as the adoption of slate wares, changes in vessel morphology, including some new vessel forms and an increase in the variety of ceramic fabrics (Aimers 2007; Chase and Chase 1987:61; Howie 2007:3-4; Masson 2000:43-57; Masson and Mock 2004:374; Rice and Forsyth 2004:28, 33; Valdez 1987). The initial introduction of new vessel forms and surface treatments appear to stem from non-local or foreign origins, efforts to replicate non-local pottery features at local levels are evident, with some being more successfully adapted than others (Ball 2014; Ball and Taschek 2013; Chase 1982a:77; Chase and Chase 1982; Howie 2007:3-4; Masson and Mock 2004:374). Imperfections in replications, as well as intentional modifications to signal specific potters or group affiliations will occur as community’s experiment and imitate forms (Rice 1984:266). As has been demonstrated by Howie (Howie 2007; 2005) and Bartlett et al.’s chemical compositional analyses (Bartlett, et al. 2000), despite having a uniform limestone geologic foundation, northern Belize contains significant variations amongst its soil and rock formations. In fact, Howie has even demonstrated varying clay deposits within one vertical meter (Howie 2007:10). Thus, notable variations in fabrics of ceramics and forms, particularly as seen with the Achote Black and Kik Red groups, suggests that while communities are participating in a regional ceramic system, they are producing and consuming wares from multiple clay sources and are comfortable taking some liberties with forms.

Analysis of the Strath Bogue ceramic assemblage has demonstrated the community’s participation in the local regional production and consumption in the Rancho ceramic sphere, as discussed by such scholars as Pring (1976, 1977), Kosakowski and Pring (Kosakowsky and Pring
The Strath Bogue assemblage exhibits a predominance of utilitarian wares and styles, an observable variation in the composition of ceramic fabrics (paste and temper), a lack of sumptuous or polychrome vessels in favor of simplified surface treatments (largely monochrome reds and black slips) and vessel forms, the production of a hand full of new pottery forms and ceramic types, and the reproduction of ceramic types associated with, and participation in, more distant ceramic spheres. The lack of prestige vessels and predominance of utilitarian vessels at Strath Bogue is amplified when one considers that it is not just in terms of the near absence of “luxury” polychrome and burial vessels, but also by the lack of elaborate serving vessels, and vessel offerings within burials. At Strath Bogue, the one reconstructible ceramic vessel recovered from a burial context was not an elaborate serving vessel or a polychrome dish, but an otherwise unremarkable Achote Black: Provisional Variety dish. While the deliberate deposition of this vessel type in a burial may be taken by some to signal a higher social value for this artifact or vessel type (Knapp and Cherry 1994:146, West, 2002 #1691:150), the fact that it was a more mundane vessel seen in various contexts across the site suggests that not only was this vessel not a marker of social status, the contextual ceramic data for Achote Black vessels suggests an overall lack of social stratification across the site. Alternatively, perhaps this vessel was the best they had at the time.

The Progresso complex is dominated by low-luster, often flakey red slips, and shades of black (brown-black, red-black) slipped bowls, plain and striated low and narrow necked and narrow-mouthed olla’s or jars and wide orifice basins. While there are some orange slipped vessels, these are not all that numerous in the Progresso complex, unlike at other Terminal Classic
sites (Graham 1987:79) Interestingly, plain narrow-orifice jars, basins and bowls, slate wares and low-luster, flakey glossy slipped wares have been noted as having traditional roots and contemporaneous affiliations with northern Yucatán (Ball 1974; Chase 1982a:77; Chase and Chase 1982:61); or as is my more specific contention, the Cehpech ceramic sphere of the northwest Puuc region of the Yucatán (Ball 1974, 2014; Ball and Taschek 2013:146).

There seems to be a correlation between the decline in the significance and use of polychrome ceramics, and the introduction of slate wares (and other northern derived ceramic forms) in northern Belize and elsewhere in across the Maya subarea (Ball 1974, 2014; Ball and Taschek 2013; Chase and Chase 1987; Chase 1982a, b; Chase and Chase 1982; Forsyth 2005:14; Fry 1972:489; 1989:104; Sidrys 1983; Williams-Beck 2005). This decline significantly coincides with the collapse of many of the Petén polities and their socio-political and economic spheres of power and influence, and an apparent participation in the rising influential sphere of northern Yucatán polities during the Terminal Classic period. However, Yucatecán ceramic influences were not limited to the finer slate wares replacing polychromes; northern influences are more widely seen in ceramic forms, vessel attributes, decorative treatments and pastes (Forsyth 2005:15-17).

Ceramic Typology and the Progresso Complex at Strath Bogue

The Progresso complex at Strath Bogue (see Appendix 1 and Table 8.10) is an extension of the initial ceramic complex identified at Caye Coco by Marilyn Masson (2002b) during her original assessment of Terminal Classic ceramics from the Progresso Lagoon region. Masson’s analysis was aided by the input of several scholars with experience in northern Belize and the Yucatán; correlations with regional site typologies and was substantiated by the ability to correlate their placement within the Terminal Classic period with the contextual excavation of an in situ
stratigraphic midden at Caye Coco. AMS dates for this midden indicated a 750-1000 A.D time frame for the Terminal Classic period in the Progresso Lagoon region (Masson and Mock 2004:392; Masson and Rosenswig 2005b:359), which corresponds to the dates similarly outlined by Hammond et al. (1988:12) for Nohmul and Fry (Fry 1989:104) for the Pulltrouser Swamp region in northern Belize.

As was noted by Masson (2002b), there are distinct similarities between the Progresso complex and that of the Ikilik complex at Santa Rita and Nohmul (Chase 1982a, b; Kosakowsky and Pring 2001), and Cerros’ Sihnal complex (Walker 1990). Further development of the Progresso complex has found that unlike those two complexes, the Progresso ceramic complex also includes ceramic types that are central to the ceramic complexes of other neighboring sites, including Pulltrouser Swamp and its satellite communities (Fry 1983, 1989), as well as sites in southern Quintana Roo (Ball 1977a, 2014; Ball and Taschek 2013; Fry 1972, 1987) and Becan in southern Campeche (Ball 1977a, 2014; Ball and Taschek 2013) and to a lesser degree, northwestern Belize and the Petén (Aimers 2012; Kosakowsky and Sagebiel 1999; Sagabiel 2005a, b; Sagebiel 2014). Perhaps two of the most wide spread and distinct Terminal Classic period ceramic markers, Achote Black and Tinaja Red, are characteristically considered Tepeu-2/3 horizon markers and thus when present at a given site are habitually suggested to reflect Petén connections and influences. However, both types are significant components of the Progresso ceramic complex, as they are within Becan’s Xcocom ceramic complex (Ball 2014:429) Additionally, as has been discussed earlier, ceramic types from northern Yucatán as well as imitations of those types or ceramic forms, have also been identified within the Strath Bogue
assemblage, some which occur frequently enough to be considered part of the Progresso ceramic complex.

A variety of new ceramic types and forms are reported at sites across northern Belize during the Terminal Classic period. Similarly, we have identified a handful of new forms, as well as ceramic types either being produced at, or at the very least were “consumed” by the Strath Bogue community. These newly identified types have been provisionally classified during this research. The ceramic analysis performed for this dissertation while aided by the kind advice of numerous individuals, was reliant on my own limited ceramic experience and knowledge in Belize, the Yucatán and Campeche, but was predominantly based on referencing types reported and described in various monographs, papers and dissertations. I take full responsibility for any and all errors in my identifications. Because these newly designated types are provisional, and I am not officially a ceramicist, I did not necessarily feel comfortable assigning type to ceramic groups or determining ceramic wares for these new/provisional types. The full type: variety descriptions of the Progresso ceramic assemblage at Strath Bogue can be seen in Appendix I, while Table 8.10 records the ceramic types that were determined to be the primary components of the Progresso complex at Strath Bogue.

The following discussion is limited to those pottery types that are at the core of the Progresso ceramic complex at Strath Bogue, as well as some of those that are particularly relevant to the immigration hypothesis. A more detailed and developed ceramic type: variety classification of the Terminal Classic Progresso complex at Strath Bogue is forthcoming and is intended to be made available on the Institute of Mesoamerican Studies (IMS) website at the University at Albany (SUNY) in the future.
Table 8.10: Progresso Terminal Classic ceramic complex pottery types at Strath Bogue (see Appendix I for Progresso complex ceramic type descriptions).

<table>
<thead>
<tr>
<th>Progresso Complex</th>
<th>Quantities</th>
<th>% of Identified Types</th>
</tr>
</thead>
<tbody>
<tr>
<td>Kik Red: Kik Variety</td>
<td>645</td>
<td>16.5</td>
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<tr>
<td>Achote Black Group</td>
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<td>Coco Red: Variety Unspecified</td>
<td>342</td>
<td>8.7</td>
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<td>Campbells Red: Campbells Variety</td>
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<td>Strath Bogue Unslipped: Variety Unspecified</td>
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<td>5.1</td>
</tr>
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<td>Tinaja Red: Variety Unspecified</td>
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<td>4.0</td>
</tr>
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<td>Ohel Red: Ohel Variety</td>
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<td>Chambel Striated: Chambel Variety</td>
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</tr>
<tr>
<td>Sharp Red: Variety Unspecified</td>
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<td>Emal Red: Variety Unspecified</td>
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<td>Dumbcane Striated: Variety Unspecified</td>
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<td>Ticul Thin Slate: Ticul Variety</td>
<td>69</td>
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<tr>
<td>Palino Unslipped: Variety Unspecified</td>
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</tr>
<tr>
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<td>1.4</td>
</tr>
<tr>
<td>Cambio Unslipped: Variety Unspecified</td>
<td>49</td>
<td>1.3</td>
</tr>
<tr>
<td>Palmar Orange Polychrome: Variety Unspecified</td>
<td>49</td>
<td>1.3</td>
</tr>
<tr>
<td>Tres Mujeres Mottled: Variety Unspecified</td>
<td>49</td>
<td>1.3</td>
</tr>
</tbody>
</table>

The Strath Bogue ceramic assemblage is dominated by red slipped vessels, most specifically those of the Kik Group. The Kik ceramic group was defined by Diane Chase in her ceramic analyses of ceramics from the northern Belize sites of Nohmul and Santa Rita Corozal (1982a, b). Three pottery types within the Kik Ceramic Group occur at Strath Bogue: 1) Kik Red: Kik Variety; 2) Campbells Red: Campbells Variety; and 3) Fat Polychrome: Variety Unspecified (provisionally assigned to this group my Mock (Shirley B. Mock 1994b:306). A number of pottery sherds could not be identified to their specific type: variety, but based on paste and slip, could
minimally be assigned to the Kik group (2.3%, see Table 8.10). Altogether, ceramics associated with the Kik ceramic group equaled 26.9% of the Progresso ceramic complex at Strath Bogue.

Kik Red vessels were the dominant ceramic type identified within the Progresso complex at Strath Bogue, representing 16.5% of the assemblage (see Table 8.10). Vessel forms include outsloping and insloping bowls and dishes, and vertical and insloping necked jars (see Figure 8.9). Vessels were slipped red on their interior or exteriors, or both. It is Marilyn Masson and my contention, along with Joe Ball’s based on his analysis of the Becan ceramic assemblage (Chase 1982b:496), that Kik Red is a local and Terminal Classic period variant of Tinaja Red Group (Masson and Mock 2004). Chase argues that “it does not appear to be equivalent with the Petén Tinaja Red,” (my italics) as per Sabloff’s Seibal ceramic analysis (1975). She does not, however, address the potential for Kik being a local variant of this type or note that Tinaja Red has Late Classic precursors and a geographical distribution beyond the Petén, including at Cozumel in Quintana Roo (Connor 1983:160), Becan (Ball 1977a:23; 2014:432) and Calakmul (Domínguez Carrasco 2004:143, Fig. 41) in Campeche, Colha of north-central Belize (Valdez 1987, 1994; Valdez and Adams 1982) and Saktunja and Northern River Lagoon on the northern Belizean coast (Masson and Mock 2004; Shirley B. Mock 1994b; Mock 2005a, b). It thus seems odd that this type was not present at Santa Rita or Nohmul (Chase 1982a, 1984; Kosakowsky and Pring 2001).

Chase however classifies Kik Red as a Puuc or Chichén Red Ware, whereas Tinaja Red is typically classified as a Petén Gloss ware (Smith and Gifford 1966:163). Interestingly, Ball (1977a:135) associates Tinaja Red with northern ceramic types, and new forms of Achote and Ticul Slate wares. Given that the Terminal Classic period has been characterized by many not only a period of transition, but also of regionalization, with ceramic affiliations or influences seemingly
switching from a more previously Petén focused realm of influence, towards one in which Yucatecán forms and types are being introduced and imitated, it stands to reason that Kik Red is a localized expression of this melding of traditions.

During analysis, I separated out those sherds that more succinctly fit to the traditional modal and paste descriptions of Tinaja Red from those of Kik Red, with this premise in mind. As defined by Chase (1982a, b) and seen in the Strath Bogue assemblage, paste colors within the Kik Group are quite variable, but largely range from yellowish-brown to yellowish-red, to red and very pale brown to light brown.

![Figure 8. 9: Kik Red: Kik Variety vessel profiles.](image)

Campbells Red: Campbells Variety vessels are easily identified based on their basin form, bolstered rim and large size (see Figure 8. 10) and represent the fourth most identified type, or 8% of the Progresso complex assemblage at Strath Bogue (see Table 8. 10). While the slips amongst the Strath Bogue assemblage specimens were rarely preserved, when present they were seen on the lip and exterior of the vessel. Some sherds exhibited fireclouding on their exteriors. Campbells
Red sherds were quite variable in paste color and were predominantly calcite tempered with a gritty surface. Some specimens however had no visible temper and had a chalky texture indicative of ash tempering. Campbells Red basins are deep containers and are ubiquitous across the site. While Chase (1982a:75-76) likens these basin forms to those seen in the Central Petén, Campbells Red basins appear deeper and larger than the Petén forms, and in my opinion are more reminiscent of the basin forms associated with the Cehpech ceramic sphere, including those associated with the northwestern Yucatán derived Muna Slate (Brainerd 1958:196-197).

Figure 8. 10: Campbells Red: Campbells Variety vessel profiles.
Essentially a polychrome version of Campbells Red, Fat Polychrome: Variety Unspecified vessels are large, thick walled basins with bolstered or thickened lips, that exhibit interiorly and exteriorly dark reddish-brown and orange slipped with seemingly random rudimentary black slipped designs. This type is not pervasive in northern Belize and was first identified by Mock at sites on the northern coast of Belize (Masson and Mock 2004:387, Fig. 17.7d & e; 1994b:306-307, Fig. 51; 2005a:128, Fig. 7; 2005b:429). It appears that the distribution of this type is limited to sites on or linked to the “canoe highways” of the Belizean coast, and immediate to the northern river and lagoon systems, such as Saktunja, Northern River Lagoon, Salt Creek Site, Santa Rita (Masson and Mock 2004:387; Mock 2005a:128), and Strath Bogue. Identified by Mock as a late-Terminal Classic/Early Postclassic period ware produced in the northern Belize region based on its Kik Group paste, she acknowledges that this type has obviously been influenced by the slate wares forms from the north.

Specimens classified at Strath Bogue as Tinaja Red were identified as such based on Forsyth’s (Forsyth 1989) classification of the type at El Mirador, Petén. Tinaja sherds represent 4% of the Progresso Ceramic Complex at Strath Bogue (see Table 8.10). Tinaja sherds had darker salmon or reddish-brown pastes, had fine, well sorted calcite tempering and were stronger than Kik Red sherds. Slips were predominantly eroding but were darker red than the Kik reddish-orange slips. Tinaja Red Vessel forms at Strath Bogue are largely outsloping bowls and outflaring ollas, although some dishes and a vase were also identified. Our hypothesis of Kik being a local variant of Tinaja will perhaps benefit from future excavations and will have to be put to the test through future petrographic analyses. Ball contends that the Tinaja and Nanzal varieties at Becan date no earlier than the beginning of the ninth century (Ball 2014:433).
Figure 8.11: Fat Polychrome: Variety Unspecified vessel profiles.

Achote Black and Tinaja Red ceramics are recognized as Terminal Classic period (Tepeu III) horizon markers (Ball 2014:433; Boxt 1993:141; Fry 1983:200, 209), and are one of the most pervasive ceramic types across a large portion of the Maya subarea during this period, including at Calakmul (Domínguez Carrasco 2004), across southern Quintana Roo (Ball 1977a, 1983, 2014; Fry 1972, 1987), at sites in northeastern Petén (Adams 1971:25; 1999:211; Culbert 1993:12; Fialko and Foiás 2005:63; Forsyth 1989:119; Rice 1987b:74; Sabloff 1975:181; Smith and Gifford 1966:154) and across northern Belize (Ball 1983:121; Boxt 1993:141; Chase and Chase 1987:61 Fry, 1983 #623:201; Chase 1982a, 1984; Fry 1989; Masson 2002b:383; Masson and Mock 2004:129; Shirley B. Mock 1994b; Mock 2005b:124; Valdez 1987; Walker 1990:68).

The Achote ceramic group has several type: varieties within it, which at Strath Bogue included: Achote Black: Variety Unspecified, Achote Black: Provisional Variety, Tres Mujeres Mottled: Variety Unspecified, Cubeta Incised: Variety Unspecified and Torro Gouge-Incised: Variety Unspecified (Appendix 1, Table 8. 10). The majority of sherds belonged to the Achote Black: Variety Unspecified and Provisional Variety, and Tres Mujeres Mottled types, with the more decorative incised, gouge-incised and fluted types being very limited in numbers (see Appendix 1).
While Achote Black was first identified by Smith and Gifford at Uaxactún (Smith 1955:185; Smith and Gifford 1966:154), and has thus been defined as being part of the larger Tepeu III ceramic sphere, the ubiquity of this type across such a vast area of the Maya subarea, and within so many ceramic complexes and spheres makes its assignment to any one sphere problematic. This is particularly true when we consider the supposition of more than one ceramicist that the source of Achote Black is not in the Petén region, but instead is argued to have likely originated in northern Belize (Shirley B. Mock 1994b; Valdez 1987). Ceramicists at other northern Belize sites have noted more than one Achote Black paste in their assemblages and have suggested this indicates the presence of more than one production center (Fry 1983:196; 1989:105; Masson
and Mock 2004:383); however, most do not really expand on this other than to suggest at least one northern Belize production center (Shirley B. Mock 1994b; Valdez 1987). Fry (1989:105) does note the existence of yellow (what we called buff) and pink pastes that together with subtle shape variations suggests at least two production sources; however, he suggests that the Achote Black group may also have been imported “since this type is almost identical throughout much of northern Belize”.

Masson and Mock (Masson and Mock 2004:383) have argued that at coastal Belizean sites the more yellow (or as I note, buff) and sandy paste Achote Black sherds are transitional. They further note Ball’s suggestion of a potential relationship between Achote Black and Tinaja Red and other northern ceramic types (Ball 1977a:138), and go to further suggest a production relationship with the bichrome Daylight Orange type, based in part on similarities in their slips, but due to shared decorative modes, and manufacturing techniques. If this is the case, some of the sherds classified as Achote or Tinaja may in fact be pieces of the bichrome Daylight Orange types. Ball (1977a:135; 2014:433) and Debra Walker (personal communication, April 21, 2019) from her recent ceramic analysis at Yaxnohcah, argue that the Achote Group may have a northern lowland derivation, suggesting that it originated in the Río Bec (southern Quintana Roo) region, spreading outwards from there, including into the Petén during the beginning of the Terminal Classic period. Petrographic pottery analysis will help us address this and help clarify the question of production centers in the future. Interestingly, in their petrographic analysis of Terminal Classic period ceramics at Lamanai, Howie et al. (Howie, et al. 2016:182, 184) found that while all other stylistically equivalent pottery types had locally derived pastes and were thus produced by local
potters, those associated with the Achote Ceramic Group, were not produced locally. This supports the supposition that Achote Black ceramics were likely produced at regional center(s).

During the initial ceramic analysis, I was initially unsure how to classify a number of black slipped sherds that were mostly tempered with opaque calcite and had the black slip and modal forms suggestive of an Achote group affiliation, but whose paste-cores tended to be red to reddish-brown. These sherds were initially and tentatively lumped into the generalized Achote group “undetermined” category. However, during the techno-stylistic analysis we realized that many of these reddish paste outsloping vessels also shared a distinct wall form that commonly included a medial to basal-ridge similar to the Tepeu II Infierno Black ceramic type (see Figure 8.13 and Figure 8.14). It was decided that these sherds should have their own variety. Our decision to create this variety was substantiated when found out that at the northwestern Belize site of La Milpa, Sagabiel (2005b:Fig. 3.3) had previously identified a Terminal Classic period type Achote Black: Infierno Black Variety, using the same paste and wall attributes as we had at Strath Bogue. Sagabiel’s variety confirmed the need to similarly separate this variety out from the other Achote Blacks; however, following the traditional type: variety naming provisions we chose to label it as a provisional variety.

Achote Black: Variety Unspecified vessels at Strath Bogue were largely outsloping and outflaring bowls and dishes, with some vessels having more direct walls than others (see Figure 8.13, Figure 8.14 and Figure 8.15). Achote group sherds are calcite tempered, but their pastes are considered fine or smooth and they are largely well fired. Unique to this ceramic group, four visually distinct paste colors were recognized amongst the Strath Bogue assemblage: salmon, buff, and pink, and reddish-brown. The use of “salmon” as color designation of Achote paste was
adopted to visually separate it during analysis from the pink and buff pastes. Salmon pastes ranged from 7.5YR 6/3 light brown to 7.5 YR 6/6, reddish yellow, and 5YR 5/4 reddish brown to 5YR 5/6 reddish yellow; pink pastes included 5YR 7/4 pink and 5YR 6/4 light reddish brown; while buff pastes ranged between 10YR 7/4 very pale brown, to 10YR 6/4 light yellowish brown, to 7.5YR 6/4 light brown. The red pastes of the Achote Black: Provisional variety ranged between 2.5YR 4/6 to 5/6.

Table 8. 11: Percentages of Achote Black group paste colors, as observed in rim sherds subject to the techno-stylistic analysis.

<table>
<thead>
<tr>
<th>Paste Color</th>
<th>Percentage</th>
</tr>
</thead>
<tbody>
<tr>
<td>Salmon</td>
<td>52%</td>
</tr>
<tr>
<td>Buff</td>
<td>25%</td>
</tr>
<tr>
<td>Red</td>
<td>14%</td>
</tr>
<tr>
<td>Pink</td>
<td>11%</td>
</tr>
</tbody>
</table>

As noted above, Achote Black: Provisional Variety sherds were primarily fabricated from red pastes, while Tres Mujeres Mottled sherds fell under the pink pastes shared by some of the Achote Black: Variety Unspecified specimens (Table 8. 11). While we cannot adequately assess the true validity of suggesting the different paste colors correlate with different production locations without petrographic analyses, we were particularly cognizant of which the three pastes of the Achote Black: Variety Unspecified sherds had during our analysis in hopes of exposing additional information about the type, variations in vessel attributes and perhaps production location commonalities. Our analysis revealed that the majority of Achote Black sherds from Strath Bogue were manufactured from the salmon paste variety, followed by the buff paste, with the pink pasted Variety Unspecified and Tres Mujeres types together forming the third most
common of the paste types. The Provisional Variety was the least numerous of the Achote Black types (see Figure 8.16).

It is my opinion that the visually distinct pastes represented amongst the Strath Bogue Achote Black ceramics alone supports the theory that there is more than one production center for this type. I therefore do not think it is truly appropriate to lump all Achote Black ceramics into the Tepeu Sphere, given their prominence within the Progresso complex and the larger Rancho sphere. It would perhaps have been more appropriate not to have classified them under the Tepeu sphere, and follow Diane Chase’s (1982b:506) lead in assigning it to the Rancho sphere. However, for consistency sake, I have assigned Achote Black to the Tepeu sphere but must note the incongruity of doing so here.

Figure 8.13: Vessel forms of Achote Black group types.
While occurring in higher frequencies than the decorative Achote Black varieties, Tres Mujeres Mottle: Variety Unspecified is considered uncommon at Strath Bogue. Tres Mujeres was established as a type in the Three Rivers Region of northwestern Belize (Kosakowsky and Lohse 2003:11; Sagabiel 2005b:433-439). Like the other Achote Black Group vessels at Strath Bogue, Tres Mujeres sherds were predominantly outsloping and outflaring bowls and dishes (see Figure 8.14 u, z & aa); however, they have a highly mottled black and reddish-brown, crazed exterior slip. When the black slip is eroded, the underlying paste surface also has a mottled stain. Their pastes are finely tempered with well sorted calcite, and like the other Achote types, can be pink to light reddish brown.

Some of the newly identified types were discussed in earlier chapters, and as noted appear to be attempts to replicate ceramics using established recipes from elsewhere but with local and otherwise unfamiliar raw materials, and thus they are very poorly made. This is a scenario that is particularly relevant and supportive of the hypothesis that the inhabitants of Strath Bogue were new arrivals to the area and had not yet figured out how to make their traditional vessels with local clays or were not integrated enough into the northern Belize economy to afford or be able to purchase higher quality clays. Despite their poor production, Coco Red and Strath Bogue Unslipped represent a strong component of the Progresso ceramic complex. Although the small bowl form of Coco Red is contemporary with Sakatan Unslipped, a similar type from Cerros (Walker 1990:77-78, Fig. 2.5c), they differ in execution, surface treatment and paste. Unfortunately, we have not been able to readily identify what might be considered a prototype for Coco Red or Strath Bogue Unslipped from ceramic complexes outside of the area that would help us link the producers of these new types to a specific area.
Figure 8. 14: Achote Black group ceramic profiles.
Figure 8. 15: Correlation of Achote Black: Variety Unspecified vessel forms with side wall types within the Strath Bogue Progresso complex.
Most of the bowls at Strath Bogue were identified as Coco Red: Variety Unspecified; a pottery type newly characterized in the Progresso Lagoon region by the Belize Postclassic Project, and discussed in earlier chapters. These vessels are generally small, with predominantly slightly outsloping or vertical sides. Other Coco Red forms include dishes, olla’s and one basin and one tecomate (see Table 8. 12 and Figure 8. 17).

Figure 8. 16: Achote Black: Provisional Variety vessel profiles.
In general, Coco Red vessels are poorly executed, their firing having been performed in poorly reduced environments, resulting in thick black cores, and cracked and even crumbly surfaces. Most sherds had no remaining slip due to the tendency of both the slip and the sherds surface to flake off, and the fact that the primary temper type of 70% of Coco Red sherds was sand, resulting in the sherds having a sandy or gritty texture, making it hard for slip to adhere to the rough surfaces. Because of their poor execution and thus preservation, most sherds were very small in size, making it sometimes difficult to ascertain vessel form or class, and rim/wall profiles. Of those specimens that could have their rim diameters determined, the majority (52%) of Coco Red specimens had orifices between 10 and 17 centimeters in size, making them rather small vessels. Their proliferation and small size suggest that these vessels were likely for personal, every day usage. It is my contention that their poor execution speaks to their makers having been new to the area, and were attempting to replicate ceramics from their homeland, with clays, tempers, and perhaps more saline water than they were familiar with, and thus they were in the process of working out the right paste recipe and relative firing temperatures and timing.

Strath Bogue Unslipped: Variety Unspecified is a pottery type established during this dissertation research. Very similar to Coco Red specimens from Strath Bogue, Strath Bogue
Unslipped sherds and are very poorly fired, with black cores being prominent, if they were not entirely reduced. The sherds crack and the surfaces almost cleave from their inner pastes like shale at times. What appears to be fire-clouding on their exterior of some vessels is more likely the result of their poor firing than cooking. Vessel surfaces are coarse and gritty because of their sand tempering, which would make slipping impossible to adhere to. Vessel forms include incurring bowls and outsloping dishes, some with rolled or folded lips (see Figure 8. 18).

As discussed earlier, it appears that the producer(s) of Coco Red and Strath Bogue Unslipped eventually begin to figure out the correct recipe with the local clays, as later occupations along the shore of Progresso Lagoon and on Caye Coco have better formed and fired examples of these types. Coco Red and Strath Bogue Unslipped are also hypothesized to eventually develop into temporally later Zakpah Red and Tsabak Unslipped respectfully, ostensibly after they have figured out the correct pottery recipe for these forms and with the local raw materials (Walker, personal communication, 2002; (Masson and Mock 2004). These Early Postclassic to Late Postclassic types are noted by Masson and Mock (Masson and Mock 2004:397) as actually beginning earlier in the Progresso Lagoon region than elsewhere in northern Belize.

One of the new, provisional types established with this research was primarily created based on its identifiable and very common frequency rather than by its vessel shape or its rim, lip or wall attributes (see Table 8. 10). Sharp Red: Variety Unspecified sherds have a distinct porous, chalky, yellowish-orange paste, that is tempered with what appears to be either crushed limestone or ash, and includes some blue and angular calcite, and magnetic nodules, that often show through the surface. While most sherds have eroded surfaces, others have a thin-matte dark reddish-brown slip. While this type was established based almost entirely on indeterminate body sherds, these
few forms that could be identified included thin outsloping dishes and ollas, and at least one outsloping bowl. While clearly not a fine paste ware, it appears that Sharp Red vessels were a local emulation or attempt to produce fine wares typical of the time period. Unfortunately, no profiles were able to be drawn.

Another very common and provisional pottery type established as a result of the Strath Bogue pottery analysis, is that of Emal Red: Variety Unspecified (see Table 8. 10 and Figure 8. 19). Like Sharp Red, Emal Red was primarily established based upon its distinct fabric. The paste is a somewhat chalky or powdery pink to buff color, and on eroded sherds the surface may be soft or somewhat gritty depending on the temper size and density. Sherds are generally tempered with a high density (40-50%) of very-fine to fine sized opaque calcite or crushed limestone temper. Temper is well sorted. The high density of very fine temper can give a speckled look to the sherds.

Sherd cores may be oxidized throughout, while others show darker light brown to brown cores, or thin dark lines in the center. Most sherds appear to be unslipped, however some were found to have an eroding dark red to reddish-orange slip that does not adhere well to its surfaces. The slip is a non-lustrous finish, and it appears that the pink appearance of the eroded sherds may be reflective of the eroded slip staining of the surface paste. Surfaces are smoothed. While sherds associated with this type were largely indeterminate forms, those that were quite variable, but included thin walled insloping bowls, outsloping and outflaring dishes and ollas (see Figure 8. 17). It appears that these vessels were also attempts at replicating fine paste wares, but with calcite tempering.
Figure 8. 17: Coco Red: Variety Unspecified pottery photo and profiles from Strath Bogue Progresso complex.
Figure 8. 18: Strath Bogue Unslipped: Variety Unspecified pottery profiles from Strath Bogue Progresso complex.

Another common new provisional type established with this research was Palino Unslipped: Variety Unspecified. Once again, the establishment of this type was based on the specimens appearing to imitate or replicate a fine buff paste, but without the ash tempering. Pastes are thin and finely tempered with dense, very-fine to fine crushed limestone or milky calcite. In very eroded specimens, the temper may show through the surface appearing speckled in some cases. Textures can be soft or somewhat coarse, perhaps gritty. Cores are oxidized throughout. Sherds are clinky. Paste colors range from light brown to brown and surfaces are unslipped and generally smooth and soft. These vessels are rounded, out-sloping-convex bowls with direct, or
direct symmetrically tapered lips and direct walled bowls and, or dishes, with direct symmetrically
tapered lips or direct, interior tapered lips.

Figure 8. 19: Emaíl Red: Variety Unspecified pottery profiles from Strath Bogue Progresso complex.

The presence of the new types seen at Strath Bogue also corresponds to a rapid decrease in
the presence of polychromes and apparent corresponding introduction of Puuc slate wares across
northern Belize region. While some specimens were able to be more positively identified as slate
related wares, other previously identified northern Belize types and some of the newly identified
types at Strath Bogue also appear to be formal replications of types reminiscent of Yucatecán or
Cehpech Sphere wares, particularly those associated with Muna Slate vessels (Ball 2014:433; Ball
and Taschek 2013:156; Fry 1989:104). This formal emulation is particularly evident at Strath
Bogue with Campbells Red large basins, which appear to be intentionally imitating Muna Slate
basin forms. Diane Chase’s local Metzabok Slate (1982a:75; 1982b:505-506) was classified based
on two reconstructed tripod-dishes, and was similarly identified at Cerros (Walker 1990:67-68).
Chase’s form was not evident at Strath Bogue, however a basin form with a characteristic exterior
bolstered triangular incurved lip (see Figure 8. 20) fashioned out of a paste similar to that of
Metzabok Slate and slipped with the waxy-slate slip was present. We initially classified this type
in our techno-stylistic analyses as Muna Slate: Metzabok Variety. Following Donald Forsyth’s
instructions noted earlier. However, because we could not definitively tell local from foreign produced vessels (as was similarly experience at Cerros by Walker (1990:586), we ended up classifying them all as Muna Group Slate wares (see Figure 8. 18) based on their formal attributes. Other specimens which were clearly emulating slate wares but were unable to be assigned to a type or group were simply classified as “slate wares” (see Figure 8. 21). Ticul Thin Slate wares were very rare at Strath Bogue (4 specimens) and were only represented by body sherds. Petrographic analysis is still forthcoming, and thus we are currently unable to affirm if these slate wares are truly Yucatecán types or are simply comparatively well-made locally emulated reproductions.

The introduction and growing presence of more shallow basins and utilitarian monochrome bowls in northern Belize during the Terminal Classic period has been argued to indicate a move away from northeastern Petén influences, and/or production centers, and a stylistic merging with or intended emulation of Slate Ware vessels from the north (Fry 1989:104), as was also recognized at the site of Becan in Quintana Roo (Ball 1977a, 2014; Ball and Taschek 2013). This emulation or local production of slate wares has also been seen in several other sub-regions and sites within northern Belize, including at Aventura (Ball 1983; Sidrys 1983), Caye Coco and the Progresso Lagoon Shore (Masson 2002b; Masson and Mock 2004; Masson and Rosenswig 2005a), the northern Belize Coast (Masson and Mock 2004; Shirley B. Mock 1994b; Mock 2005a, b), Colha (Shirley Boteler Mock 1994), Nohmul (Chase 1982a, b; Chase and Chase 1982; Kosakowsky and Pring 2001) Santa Rita (Chase 1982a, b), the Three Rivers Region (Kosakowsky and Lohse 2003; Kosakowsky and Sagebiel 1999; Sagabiel 2005a, b; Sagebiel 2014) and Pulltrouser Swamp area (Fry 1983, 1987, 1989, 2000, 2013).
A total of 4,284 striated sherds were recovered from Strath Bogue, representing approximately 30% of the pottery sample examined during these analyses. Striated sherds were recovered from every context at the site. Unfortunately, only 509 of these sherds, predominantly rim sherds, could be identified to type. This is due to the fact that the majority of these unidentifiable sherds were predominantly body sherds, which typically do not possess diagnostic traits. Should the Strath Bogue assemblage have had whole striated vessels, they may have assisted in ascertaining whether or not different vessels had particular styles of striations that in turn may have help in the identification of their associative types from mere body sherds.
A significant number of striated sherds were unable to be identified to specific types due to their being nondescript striated or unslipped neck sherds; nonetheless, we are confident in saying that the majority of striated sherds identified at Strath Bogue belong to ollas (see Table 8.13) and to those typical of the Terminal Classic period and of the Rancho sphere at sites in northern Belize. Support for this supposition is taken from the paucity of sherds at Strath Bogue from earlier time...
periods, and due to the fact that there are no striated ollas identified amongst Late Postclassic occupations in northern Belize (Walker 1990:75).

Table 8. 13: Striated vessel forms at Strath Bogue.

<table>
<thead>
<tr>
<th>Vessel Form</th>
<th>Quantity</th>
<th>Percentage of Striated Sherds</th>
</tr>
</thead>
<tbody>
<tr>
<td>Olla (Jar)</td>
<td>3705</td>
<td>86.5%</td>
</tr>
<tr>
<td>Indeterminate</td>
<td>402</td>
<td>9.4%</td>
</tr>
<tr>
<td>Olla or Dish</td>
<td>121</td>
<td>2.8%</td>
</tr>
<tr>
<td>Double-mouthed Jar</td>
<td>56</td>
<td>1.3%</td>
</tr>
<tr>
<td>Total</td>
<td>4284</td>
<td>100%</td>
</tr>
</tbody>
</table>

Of those that could be identified, the majority of striated vessels within the Progresso complex at Strath Bogue were identified as Chambel Striated: Chambel Variety, Burgos (or Progresso) Striated: Variety Unspecified, Dumbcane Striated: Variety Unspecified and Buyuk Striated: Buyuk Variety (see Table 8. 10). Other striated types at Strath Bogue included Encanto Striated, Piste Striated, Blue Creek (or Freshwater Creek) Striated and Vista Alegre Striated (see Appendix I). Restricted mouthed and short necked jars are clearly the form of choice during the Terminal Classic within the Progresso Lagoon region.

Chambel Striated: Variety Unspecified is a prominent Rancho sphere jar type, first identified by Chase (1982b:510, Fig. 3-6c) from Santa Rita and Nohmul, and also found to occur at Cerros (Chase and Chase 1988:13; Walker 1990:73-75, Fig. 2.5a-b). Chambel Striated ollas at Strath Bogue have high, outsloping and unstriated necks with everted or rolled lips. Striations start at the shoulder (see Figure 8. 22). Pastes are light yellowish-brown to brown, to yellowish-brown to reddish-yellow with either calcite or sand tempering. Vessels vary in size, however are generally
smaller in size with thinner vessel walls and orifices ranging in diameter from 11 to 41 cm, but most being between 20 and 25 cm in diameter. Mayapán ceramicist Willberth Cruz has suggested that Chambel Striated olla are formally similar to Chum Unslipped and Yokot Striated from northwestern Yucatán (see Smith 1971: Fig. 2), however their pastes differ.

Another very common striated type at Strath Bogue, is Dumbcane Striated (see Table 8.10 and Figure 8.23). While noted and illustrated in reports as a significant Terminal Classic period type at sites within the Pulltrouser Swamp area (Fry 1983; 1989:105, Fig. 6), Nohmul (Kosakowsky and Pring 2001: Table 11), Ka’kabish (Aimers 2012:56) and noted as occurring regularly at Albion Island (Pohl n.d. Fry 1989) and into Chetumal Bay at Ichpaatún (Sanders 1960), Dumbcane Striated has yet to be defined according to standard reporting procedures, as per Sabloff (1975). Dumbcane Striated as a distinctively large olla with a wide orifice, high neck with a medial ridge on the unstriated vessel neck. While occurring in different sizes, its storage capacity is generally larger than those of earlier jars (Fry 1989:105).

Masson (2002b:130, Fig. 7.6; Masson and Mock 2004:397; Masson and Rosenswig 2005a) had previously included Dumbcane Striated under Piste Striated following Smith’s Mayapán ceramic analysis (1971:20, Fig. 11). Dumbcane’s higher neck is a departure from the local prominent striated olla forms within the Progresso complex and also including unslipped and slipped ollas. Dumbcane Striated appears to be a local emulation of Piste Striated (Fry 1983:199-200, 208), however the more outflaring necks, lower neck ridge, thicker, brown paste, densely large calcite tempered walls of the Dumbcane Striated separate them from the true Piste Striated form.
Figure 8. 22: Chambel Striated: Chambel Variety profiles from Strath Bogue Progresso complex.
Figure 8. 23: Dumbcane Striated pottery sherd profile and photo from Strath Bogue Progresso complex.

A number of sherds from Strath Bogue were identified as Piste Striated based on their formal attributes and general paste characteristics. The Piste Striated sherds at Strath Bogue were
all of ollas, with reddish brown calcite tempered pastes, whose tempering was so dense that their surfaces appear speckled. Piste Striated rims have distinctive ridges on the necks like Dumbcane, however the ridges tend to be more associated more with the lip than the vessel neck or wall (see Figure 8. 24).

As indicated earlier, two types of large ollas described by Masson (2002b:131-132, Fig.7.8, 7.9) as new types (Progresso Striated and Freshwater Creek Striated) had previously been identified as Burgos Striated and Blue Creek Striated respectively (Debra Walker, personal communication, 2001; (Kosakowsky, personal communication, 2000, 2008 (Aimers 2012:59; Kosakowsky and Pring 2001), but at the time were not readily reported in the published literature. Because both Blue Creek Striated and Burgos Striated names presented within gray literature, and were known amongst some northern Belize ceramicists, I used Fry’s designations for the primary names of these types.

While Burgos/Progresso Striated and Blue Creek/Freshwater Striated sherds comprised significant components of the ceramic assemblage at Caye Coco, Blue Creek/Freshwater Striated vessels are considered rare at Strath Bogue. According to Laura Kosakowsky (personal communication, 2000), Blue Creek/Freshwater Creek Striated vessels are more numerous early in the Terminal Classic period compared to Burgos/Progresso Striated, with the frequency of Dumbcane Striated vessels subsequently increasing over Burgos/Progresso Striated vessels over time. This seems to indicate a temporal and perhaps cultural variation between the Caye Coco and Strath Bogue Progresso Ceramic Complexes. If this is the case, it supports the theory that the Strath Bogue community settlers arrived in the Progresso Lagoon region as local ceramic styles had
already been well established and were available for consumption. Perhaps the Strath Bogue community were the latest of the migrants to arrive in this area.

Figure 8.24: Piste Striated pottery profiles from Strath Bogue Progresso complex.

Interestingly, Blue Creek/Freshwater Creek Striated or Burgos/Progresso Striated types do not appear to have occur at Nohmul or Santa Rita Corozal (Chase 1982a, b), Cerros (Walker 1990) the Pulltrouser Swamp region (Fry 1983, 1989, 1990b, 2000) or Becan (Ball 1977a, 2014; Ball and Taschek 2013), or at least they are not readily reported. They have been reported at different sites within the Three Rivers Region of northwestern Belize. Burgos Striated vessels have a distinct rolled bolster rim jar, that is almost more cauldron like that Olla due to its very short to almost absent neck. Shallow horizontal striations begin immediately below the bolstered lip, are closely spaced and numerous (see Figure 8.25). The paste of these vessels is reminiscent of Piste Striated, but while exhibiting dense calcite tempering, fabrics do not have the same speckled look.
Buyuk Striated vessels are unique and easily identifiable double-mouthed jars, that are a recognized Terminal Classic marker in north-central and northeastern Belize, and also occur in more sparse numbers in southern Quintana Roo and Campeche (Brainerd 1958:292-293, Fig. 89u, x Chase, 1982 #296:75; Chase 1982b:510; Fry 1972:490; 1989:105; Masson 2002b; Masson and Mock 2004:390; Sanders 1960:207-208; Sidrys and Krowne 1983:221; Walker 1990:73). This ceramic type has also been referred to as Calderitas Fine Paste Striated (Fry 1972:490; Sanders 1960:207-208), Aventura Striated: Striated Variety (Ball 1983:206) and the Aventura Double Mouth Jar (DMJ) (Sidrys 1983:399; Sidrys and Krowne 1983) by other ceramicists. These vessels are globular, and uniquely have two low and opposing, restricted orifices at their apex. They are striated with deep, wide incisions carved into the finely calcite tempered paste, which can vary in color substantially (see Figure 8. 26).

Given the high number of representative vessels and sherds at the site of Aventura in northern Belize, it has been hypothesized that Aventura is the likely production center of these vessels (Sidrys 1983:399; Sidrys and Krowne 1983:222). Sidrys and Krowne (1983:234) suggested that the DMJ likely had to purposes, to draw water from wells and to transport water over short distances. They also noted that their primary geographical distribution seemed to be at sites within close proximity to the coast of Chetumal Bay, and the upper river systems of the New River and Rio Hondo. The Belize Postclassic Project can also confirm their identification at sites along the Freshwater Creek drainage and Progresso Lagoon.
Figure 8. 25: Burgos Striated pottery profiles from Strath Bogue Progresso complex.
One of the Striated types identified within the Strath Bogue assemblage that represents contact or influences with the Yucatán was that of Vista Alegre: Variety Unspecified, as identified at Coba (Robles Castellanos 1980:Fig. 36f-h, 37). Vista Alegre is unlike most other striated types seen within the assemblage and has not been readily identified at other sites in northern Belize. Vista Alegre sherds typically possess deep and sometimes wider striation than the other striated vessels.
The type is more reminiscent and initially easily mistaken for Buyuk Striated double mouthed ollas vessels. It was not until Vista Alegre rim sherds were identified that this identification was securely made. Formally Vista Alegre vessels at Strath Bogue include outsloping dishes and bowls and some outflaring ollas (see Figure 8.27).

![Figure 8.27: Vista Alegre: Variety Unspecified pottery profiles from Strath Bogue Progresso complex.]

Ceramic Spheres

With the identification of type: variety designations, ceramic spheres could also be defined. An understanding of the ceramic spheres represented in the ceramic assemblage at Strath Bogue is of note in consideration of the migration hypothesis, as it has the potential to indicate influences and contacts of peoples from different regions; the movement of goods, and perhaps of peoples. A
summary of the quantity and percentage of ceramic spheres represented within the Strath Bogue ceramic assemblage can be seen in Table 8. 14.

As one might expect, of the spheres represented, the local Rancho sphere dominates the assemblage, with 17.40% of the entire analyzed assemblage, or when we remove the unidentifiable specimens from the calculation, 59.45% of the identifiable assemblage. The Tepeu II-III spheres are the next most represented sphere in the Progresso complex, followed by the Cehpech sphere. It should be noted however, that a very large number of the Tepeu II-III specimens belong to the Achote ceramic group. As discussed earlier, the Achote ceramic group has traditionally been associated with the Tepeu sphere and the central lowlands, and thus it was put in the Tepeu sphere here. However, as discussed above, Achote Black is a prolific ceramic type within the local Rancho sphere and at Strath Bogue (N=498 specimens), and in fact has been identified at a range of sites from around the Maya area, from Calakmul (Domínguez Carrasco 2004), to El Mirador (Forsyth 1989:93-98), Uaxactún (Smith and Gifford 1966), Seibal (Sabloff 1975:), from Pulltrouser Swamp (Fry 2000:200) to Becan (Ball 1977b, 2014; Ball and Taschek 2013) to the Belizean Coast (Masson and Mock 2004; Shirley B. Mock 1994b; Mock 2005a, b) to northwestern Belize (Sagebiel 2005a, b; Sagebiel 2014). Given that a number of scholars are also now suggesting that the Achote group of ceramics were produced either in northern Belize or southern Quintana Roo (Ball 2014; Ball and Taschek 2013; Mock 2005a, b; Valdez 1987), it appears that perhaps the Rancho sphere would be more appropriate placement for the Achote group. If we take this into account, 71.2% of the ceramics identified are associated with the Rancho sphere, and only 12.3% is associated with the Terminal Classic period Tepeu II-III/III Sphere (see Table 8. 14). Hopefully the continued
petrographic analysis of researchers in northern Belize and elsewhere will shed light on the location of their production centers, and the appropriate sphere affiliation for Achote ceramics.

Table 8. 14: Table of Ceramic Spheres as represented through the identification of known ceramic types from all contexts at Strath Bogue.

<table>
<thead>
<tr>
<th>Ceramic Sphere</th>
<th>Quantity</th>
<th>% of Entire Analyzed Assemblage</th>
<th>% Relative to Identified Spheres</th>
</tr>
</thead>
<tbody>
<tr>
<td>Unknown</td>
<td>10280</td>
<td>70.7%</td>
<td>-----</td>
</tr>
<tr>
<td>Rancho</td>
<td><em>2529/3027</em></td>
<td><em>17.4/20.8%</em></td>
<td><em>59.5/71.2%</em></td>
</tr>
<tr>
<td>Tepeu II-III/III</td>
<td><em>1022/524</em></td>
<td><em>7.0/3.6%</em></td>
<td><em>24/12.3%</em></td>
</tr>
<tr>
<td>Cehpech</td>
<td>229</td>
<td>1.6%</td>
<td>5.4%</td>
</tr>
<tr>
<td>Tzakol</td>
<td>189</td>
<td>1.3%</td>
<td>4.4%</td>
</tr>
<tr>
<td>Chicanel</td>
<td>130</td>
<td>0.89%</td>
<td>3.1%</td>
</tr>
<tr>
<td>Rancho-Early Facet Kanan</td>
<td>55</td>
<td>0.38%</td>
<td>1.3%</td>
</tr>
<tr>
<td>Sotuta</td>
<td>46</td>
<td>0.32%</td>
<td>1.1%</td>
</tr>
<tr>
<td>Early Facet Rita</td>
<td>24</td>
<td>0.17%</td>
<td>0.56%</td>
</tr>
<tr>
<td>Mamom</td>
<td>15</td>
<td>0.10%</td>
<td>0.35%</td>
</tr>
<tr>
<td>Early Facet Kanan</td>
<td>9</td>
<td>0.06%</td>
<td>0.21%</td>
</tr>
<tr>
<td>Tepeu I-II</td>
<td>5</td>
<td>0.03%</td>
<td>0.12%</td>
</tr>
<tr>
<td>Undetermined (Late Classic)</td>
<td>1</td>
<td>0.01%</td>
<td>0.02%</td>
</tr>
<tr>
<td><strong>Total</strong></td>
<td><strong>14534</strong></td>
<td><strong>100.00%</strong></td>
<td><strong>100.00%</strong></td>
</tr>
</tbody>
</table>

*A very large number of the Tepeu II-III specimens (N=498) belong to the Achote group, which while traditionally a Tepeu sphere type, is also one of the most prolific types within the Rancho sphere, and Progresso complex, and so quantities of Tepeu II-III/III and Rancho ceramics are somewhat skewed.

Table 8. 14 also illustrates that ceramics associated with the Sotuta Sphere of northeastern Yucatán are very limited in number at Strath Bogue, as are ceramics associated with Late Classic, Postclassic and Preclassic spheres.

If we examine the perceived range of socio-economic classes present at Strath Bogue according to a representative sample of three different perceived residential structures (high-end elite or upper class (Str. A4), low-level elite or middle class (Str. 5), and commoner (Str.30c)), one
might expect to see variations in the frequency of pottery associated with “foreign” spheres between the households. Moreover, if one was to consider Cehpech sphere pottery more “extravagant” than locally produced pottery due to its foreign origin or influence, and the perceived replacement of polychrome wares in favor of northwestern Yucatán derived Cehpech slate wares, it would stand to reason that the elite residential structure would have a higher frequency of Cehpech sphere wares than the other structures. We see however that this is not the case (see Table 8.15).

Table 8.15: Comparison of ceramic spheres represented from deposits associated with high-end elite (Str. A4), low level elite, and commoner (Str. 30c) households.

<table>
<thead>
<tr>
<th>Ceramic Sphere</th>
<th>Str. 5</th>
<th>% of Str.</th>
<th>Str. 30c</th>
<th>% of Str.</th>
<th>Str. A4</th>
<th>% of Str.</th>
<th>Total</th>
</tr>
</thead>
<tbody>
<tr>
<td>Cehpech</td>
<td>97</td>
<td>6.32%</td>
<td>5</td>
<td>5.15%</td>
<td>4</td>
<td>2.07%</td>
<td>106</td>
</tr>
<tr>
<td>Early Facet Kanan</td>
<td>5</td>
<td>0.33%</td>
<td>0</td>
<td>0.00%</td>
<td>1</td>
<td>0.52%</td>
<td>6</td>
</tr>
<tr>
<td>Rancho</td>
<td>925</td>
<td>60.22%</td>
<td>68</td>
<td>70.10%</td>
<td>138</td>
<td>71.50%</td>
<td>1131</td>
</tr>
<tr>
<td>Rancho-Early Facet Kanan</td>
<td>13</td>
<td>0.85%</td>
<td>2</td>
<td>2.06%</td>
<td>3</td>
<td>1.55%</td>
<td>18</td>
</tr>
<tr>
<td>Sotuta</td>
<td>13</td>
<td>0.85%</td>
<td>1</td>
<td>1.03%</td>
<td>4</td>
<td>2.07%</td>
<td>18</td>
</tr>
<tr>
<td>Tepeu III</td>
<td>7</td>
<td>0.46%</td>
<td>0</td>
<td>0.00%</td>
<td>1</td>
<td>0.52%</td>
<td>8</td>
</tr>
<tr>
<td>Tepeu I-II</td>
<td>0</td>
<td>0.00%</td>
<td>2</td>
<td>2.06%</td>
<td>0</td>
<td>0.00%</td>
<td>2</td>
</tr>
<tr>
<td>Tepeu II-III</td>
<td>476</td>
<td>30.99%</td>
<td>19</td>
<td>19.59%</td>
<td>42</td>
<td>21.76%</td>
<td>537</td>
</tr>
<tr>
<td><strong>Total</strong></td>
<td><strong>1536</strong></td>
<td><strong>100.00%</strong></td>
<td><strong>97</strong></td>
<td><strong>100.00%</strong></td>
<td><strong>193</strong></td>
<td><strong>100.00%</strong></td>
<td><strong>1826</strong></td>
</tr>
</tbody>
</table>

Interestingly, the lowest frequency of Cehpech sphere sherds is from the structure understood by its location, size and quality of construction, to be associated with the highest social class at Strath Bogue. Additionally, the frequency of Cehpech sphere ceramics from the middle and commoner structures vary by only 1.17%. While Sotuta sphere ceramics occur at low frequencies within all three classes of structures, Structure A4 has over double the frequency of the other structures. It should be noted that the residential classification of Structure A4 is not
obvious or confirmed. This structure is a range structure on the south side of the main plaza and may have had another function outside of or separate from a residential structure.

**DISCUSSION**

Unlike the Petén region, the Late-Classic transition into the Terminal Classic period in northern Belize is marked by its lack of homogenous ceramic patterns, in favor of marked ceramic diversity and regionalism (Ball 1977a; Chase 1982a; Forsyth 2005:10; Fry 1989; Graham 1987:78; Rice 1987a:83; Rice and Forsyth 2004:33; 2005a, b; 2014). While this in part may be seen as a response to the collapse of political rulership and the resulting breakdown of trade networks, it is argued that northern Belize sites expressed a greater regionalism than even in earlier time periods (Chase and Chase 1987:67) freeing up more localized production and distribution of goods as regions were no longer subject to a larger authority.

The Late Classic - Terminal Classic transition has been considered one marked by ceramic regionalism and diversification (Ball 1977a; Fry 1980, 1983, 1987, 1989, 1990a, 2013; Gifford 1976). With regions increasingly becoming their own economic units (Fry 1989:103), ceramic production and distribution appears to become centered around local villages and community specialization, rather than being obtained through centralized market-exchanges (Fry 1980:16; Masson and Mock 2004:399; Rice 1981:226; 1987a:83). The result was a greater heterogeneity in ceramic complexes, while still maintaining a degree of intercommunication and integration with a larger interaction sphere (Forsyth 2005:10). Over the course of the Classic period, as ceramic production became increasingly decentralized and community oriented, potters at sites in northern Belize and southern Yucatán are noted as moving away from their Classic period affinities with the Petén region. This gradual shift away from the Petén, while not absolute, does coincide with
potters clearly becoming increasingly influenced and inspired by contacts with Cehpech ceramic sphere communities of northern Yucatán, as seen in the waning of traditional Petén glossy wares, deep basins and restricted orifice jars and luxury polychrome serving and funerary wares, towards the Slate wares and vessel forms, monochrome and scored or carved surface treatments (Fry 1989:101; Kosakowsky and Pring 2001).

This observation is particularly prominent in northern Belize where not only do we see the distribution of a number of new ceramic types and the proliferation of a handful of centrally shared ceramic types; but also the local production of vessels whose style, fabric and form mimic those that would otherwise be considered foreign, but whose pastes clearly deviate from the originals, and were not executed quite as masterfully as the prototypes (Sidrys 1983:391). In fact, a general decrease in production quality and decorative expressions has been recognized in the pottery (Fry 1989:104). The array of paste groups between and in some cases within ceramic groups (i.e., Achote) suggest that there were several producers or perhaps production centers (Masson and Mock 2004:374, 397), and evidently some sort of localized inter-community or regional exchange network (Fry 1989:108).

With the ceramic regionalism and diversification that came with the socio-political and economic decentralization of the Terminal Classic period, potters were free to experiment and develop new pottery types and forms, as well as emulate pottery associated with other communities and areas, specifically that from northern Yucatán. The development of this localized, yet regional interaction and production sphere significantly, and not coincidently, coincides with an influx in population at many sites and areas within northern Belize (Fry 1983:104; Masson and Mock 2004:400; Sagabiel 2005b; Sagebiel 2014; Sidrys 1983:12, 24; Walker 1990; D. S. Walker 2004),
including within the Progresso Lagoon region and at Strath Bogue. The experimentation with pottery types, development of new pottery types, the clear influence and replication of foreign vessel forms and types, the diversification of types and pottery fabrics in local clays, and a recognizable decrease in the quality of ceramic production and poor production is of particular interest to the migration hypothesis.

Following the northern Belize Terminal Classic period pattern, the ceramic assemblage at Strath Bogue is marked by a diversity of ceramic type: varieties and forms (Graham 1987; Howie 2005; 2016:166). While some of the type: varieties identified may have roots in or overlap with Late Classic period types and have been considered more pan-regional (i.e., Achote Black, Tinaja Red, Palmar Orange-Polychrome and Encanto Striated), the components of Strath Bogue’s ceramic assemblage include locally established Terminal Classic types and a handful of newly classified pottery types that demonstrate attempts at emulating forms, fabrics and pottery types associated with other regions.

The Terminal Classic Progresso complex at Strath Bogue was principally dominated by every-day-use, red and black monochrome vessels and utilitarian jars. Bowls and dishes were not as elaborate or decorative as those typical of the Late Classic period or of other Terminal Classic period sites. While bichromes and polychromes did occur, their presence was very limited. Similarly, other ceramic types with decorative features were also scarce if not absent at Strath Bogue. This very noticeable lack of more elaborate decorative features included a lack of elaborate surface treatments (applique, polychrome, carving, filleting, etc.), vessel attributes (“oven” feet, supports, handles), and vessel forms (plates, vases, censers). Most other Terminal Classic period occupations contain and are even in part identified as such based on the presence of these more
elaborate features and pottery types. For instance, sherds indicative of the highly decorative Terminal Classic period molded-carved pottery tradition (i.e., Ahk’utu’, Pabellion and Sahcaba Molded-Carved (Graham 1987:79; Ting and Helmke 2013:43)) was completely absent from the Strath Bogue assemblage. And while ceramics from the Achote Black group were one of the most prolific monochrome types at Strath Bogue, the more decorative Chilar Fluted, Torro Gouge-Incised and Cubeta Incised types were very limited in numbers. It appears that potters moved away from the more creative designs and instead focused on reorganizing their pottery priorities, experimenting with new forms, slips and types and realigning their intercommunity ties to communities or connections to the north (Graham 1985:228; 1987:79; Rice and Rice 1982:67).

While geographically dispersed, there are stylistic similarities in ceramics at Terminal Classic period occupations and sites within the Rancho sphere and across the northern Belize region, suggesting that while ceramic diversity was the norm, communication and information was being freely shared between communities as they interacted amongst one another (Howie, et al. 2016:165). Further, it appears that this interaction was not indicative of an incursion or insurgence, but one that was encouraged and supported by the canoe highway. This is particularly significant if we consider the Terminal Classic period as otherwise being characterized as tumultuous and wrought with conflict. Instead northern Belize displays not only an apparent circulation of values, ideas and information, but also an apparent sharing of stylistic ceramic inventories (Graham 1987; Howie, et al. 2016:166). Water transport was becoming increasingly important in the spread of ideas and information, (Fry 1989) especially in northeastern Terminal Classic Belize where not only did it likely play a role in ceramic distribution patterns, but also in the movement of peoples looking to populate new areas and settle new lands.
As has been discussed, the replication of several Cehpech derived pottery forms and wares is evident in the vessel forms, styles and pastes of several of the new ceramic types at Strath Bogue and other sites in northern Belize. Variabilities in the simulated pottery types and forms are natural and to be expected. A potter’s experience replicating new forms and types, or who is new to, uncomfortable with, or limited by the locally available raw material options; or has had limited exposure to the intended pottery type or form; or who is altogether new to the changing pottery production sphere, are all factors that will result in imperfections and intentional modifications (Rice 1984:266-267). Many pottery specimens within the Strath Bogue assemblage display such imperfections: in firing (i.e., Coco Red, Strath Bogue Unslipped); in variabilities in the production of established pottery types (i.e., Tinaja Red/Kik Red, Achote Black), and in the attempted replication of foreign types (i.e., Muna/Metzabok Slate, Fine Wares, Piste Striated). For instance, slips on local wares intended on imitating fine-orange or fine-gray wares, as well as on slate wares, were consistently unable to adhere to their pastes, and were more gritty than true fine-paste wares, likely due to their presumed pottery recipes and/or local raw material options. While the Campbells Red basins appear to have intended on rivaling the Muna Group slate basins, their red slips do not seem to mimic those of the true slates. In fact, many of the basins associated with the Muna Group display what are revered to as trickle-effects in their slips, and virtually none of those at Strath Bogue displayed this form of surface treatment. Whether this is an intended modification, the result of the potter’s inexperience or lack of skill or exposure to the original ware, or due to the local raw material options is unknown.

The mirroring of Muna Group basins and other slate ware forms and attributes is seen in several of the pottery types discussed in this chapter and is particularly evident in the frequency
and wide circulation of Campbells Red sherds in various contexts across Strath Bogue and northeastern Belize. While basins are not a new form amongst many Maya communities previous to this era, they were limited in numbers and were formally not as big or shallow. Falko (2005:64) has suggested that perhaps the sudden influx of large capacity basins and jars are indicative of the preparation of large communal meals, suggestive of the inclusion of several families. Some might argue this to be evidence of ritual or ceremonial communal meals. However, given their ubiquity at Strath Bogue from nearly every context sampled, but primarily associated with residential structures, perhaps their presence has more to do with the bond this community would have had and developed during the entire migration, settlement and transition process.

There is no a comparative Late Classic period occupation with which to compare the Strath Bogue Terminal Classic assemblage; however, a few new types differ from the larger Rancho sphere, and even some differ from the Progresso complex on Caye Coco and among the Progresso Lagoon Shore community. All of these new types are ones which were either poorly made and seem to indicate the introduction of new ceramic producers, or peoples who are working with unfamiliar and local raw materials (clays, tempers), or were intending to replicate to the best of their abilities and with what materials were available a likeness to slate and fine-paste wares. As discussed by Fry (1989:104) a noticeable decline in the quality of ceramic produced in the Terminal Classic period in northern Belize. While this may be likened to the expansion of localized, community-oriented ceramic production and the introduction of new potters on the landscape, this could also be reflective of the fact that new pottery producers to Strath Bogue and the site were in fact migrants who were unfamiliar and limited by local raw material options.
Evidence that the local pottery producers were refining their skills over time is seen in the Coco Red and Strath Bogue Unslipped sherds from the Progresso shore and Caye Coco communities, where these ceramic types while still not well executed, they exhibit improvements in the sherds being better fired and their pastes being more stable, and in their eventual transition to their Postclassic period counterparts, Zakpah Red and Tsabak Unslipped respectfully.

**Cehpech and Puuc Region Expansion**

Economic and presumably political ties to northern Yucatecán polities is said to have begun as early as A.D. 700, as Puuc sites such as Oxinintok, Sayil and Uxmal began to expand their territories (Braswell, et al. 2004:190; Forsyth 2005:17; Suhler, et al. 2004:453, 454). While these movements were in part military campaigns that involved the absorption or conquest of sites to the east, including Yaxuná, Coba and Tancah (Suhler, et al. 2004:454), their presence or influence was detected to the south of the northern Puuc region, at sites such as Calakmul (Braswell, et al. 2004:182), Becan (Ball 1977a, 2014; Ball and Taschek 2013), Ichpaatún (Fry 1972, 2013) and into northern Belize. Their presence or influence is detected through the presence of ceramics associated with the Cehpech sphere, including Puuc and slate wares, as well as changes in architectural styles at several northern Belize sites (Braswell, et al. 2004:190; A. F. Chase 1985; Chase and Chase 1982; Fry 1983, 1989, 1990b, 2000, 2013; Masson and Mock 2004:390; Shirley B. Mock 1994b; Mock 2005a, b; Shirley Boteler Mock 1994; Sagabiel 2005b; Sagebiel 2014; Sidrys 1983; Suhler, et al. 2004:454; Vallo 2005:170).

It has been hypothesized that the initial influence, if not the presence of peoples associated with the northern polities, was precipitated and later coincided with a transition in interaction
spheres, as a result of increasing conflicts in the southern Maya lowlands. As the once politically and economically dominant polities of the southern lowlands began to collapse, people were forced to flee, and as was discussed in earlier chapters, migrated towards the north, resulting in expanding populations and dispersed settlements being established along their route, and into Yucatán, including into the Puuc region. As a result, the lowlands began to diminish in influence while the northern Lowlands, specifically the Puuc region, headed towards a “florescence” (Demarest, et al. 2004b:559) and a growing sphere of influence (Braswell, et al. 2004:190; Forsyth 2005:10; Suhler, et al. 2004:454-455). It is this growing range of influence that is initially seen in the spread of the Cehpech sphere ceramics across the Yucatán and into northern Belize, where Puuc and slate wares begin to be seen amongst Terminal Classic communities in favor of polychrome vessels and attempts to replicate them locally are seen (Braswell, et al. 2004:182; Domínguez Carrasco 2004).
CHAPTER 9: STRATH BOGUE AND THE MIGRATION HYPOTHESIS

Through the examination of “multiple intersecting lines of data” (Beekman and Christensen 2003:113), including the analysis of data retrieved through the archaeological investigation of the Terminal Classic period Strath Bogue site of northern Belize, this dissertation sought to address the question of where people went in the aftermath of the lowland Maya “collapse.” To address this question, this research moved away from minimally identifying material signatures of migration, but to also engage in a theoretical, ethnohistorical and archaeological discussion of the stimuli for, and patterns of, collapse and migration in light of the sociopolitical, temporal and geographical context in which the Strath Bogue community of the Progresso Lagoon region of northern Belize was settled. The results of two seasons of archaeological investigation at Strath Bogue were then presented and analyzed with the expectation of determining the mechanism for post-collapse community regeneration and settlement.

Three models of post-collapse societal regeneration and their hypothesized archaeological correlates were presented for testing: 1) Hypothesis 1 – Fission Regeneration, whereby fragmenting yet resilient communities expand the population of existing rural centers or reestablish themselves at a new location, with little change to their traditional, pre-collapse structure; 2) Stimulus Regeneration – where by a local Maya group realigns and converges with a foreign authority, and settles in a new location; 3) Restoration via long-distance migration – wherein the natural resources and favorable economic and sociopolitical conditions of northern Belize hinterlands are attractive to immigrants or refugees fleeing from collapsing centers elsewhere. While the archaeological correlates theorized to coincide with each of these hypotheses were not conclusive or absolute, archaeological data support migrants having settled and regenerated their
community at Strath Bogue as a result of a combination of stimulus regeneration and restoration via long-distance migration.

**FACTORS SUPPORTING TERMINAL CLASSIC MIGRATION**

In the proceeding chapters, a comprehensive discussion of factors precipitating and contributing to the movement of peoples across a landscape was presented. Population movements can be elicited by an array of circumstances and stressors, many of which are understood to have been experienced by many Maya communities in the aftermath of the Terminal Classic period “collapse.” An in-depth examination of the events resulting from the Maya “collapse” as well as the processes involved in a community’s decision to migrate were presented. This included an assessment of the sociopolitical, economic and environmental dynamics potentially “pushing” communities to emigrate, and the inspiration and conditions existing at, or “pulling” them to a given location. The application of the “multiple intersecting lines of data” approach, including regional environmental, historical and archaeological data from the Progresso Lagoon region and the analysis of the archaeological data from the Terminal Classic period Strath Bogue site in light of these factors followed. The subsequent discussion serves to summarize and corroborate the migration hypothesis.

Mayanists have come to recognize that the Maya “collapse” was not uniformly experienced across the Maya subarea, with different regions experiencing different kinds and degrees of decline, and the time frames in which it may have occurred also varying. Some sites and regions were fraught with warfare, environmental degradation and, or economic, religious and political decline, while others were completely abandoned (Aimers 2007; Cowgill 1964; Culbert 1988a; Dahlin 1995, 2002; Demarest, et al. 2004a; K. F. Emery 2004; Ferguson 2004; D. A. Freidel 1986;

And yet those in the northern lowlands, including the hill country of the Puuc region, flourished and grew in population, power and settlements (Schele and Freidel 1990:346; Willey 1986a:192). Whether it might be considered a cause or an effect of societal decline and collapse, migration was a clear mechanism contributing to the abandonment and depopulation of the Maya lowlands. It was also an adaptive strategy implemented by communities under stress and in turmoil, used as an instrument to facilitate change by providing an opportunity to escape the hardships of a declining society and start anew. Through migration, people and communities were able to mitigate the instabilities of their location, time and society, and experiment with and generate strategies to pursue a new existence elsewhere.

Archaeological evidence has shown that northern Belize did not experience the same degree of socio-cultural and political upheaval, and site abandonment that has inauspiciously come to characterize the Terminal Classic period (Ferguson 2002b, 2004, 2006; Fry 1983; 1990a:295; Masson and Mock 2004:372, 401; Sidrys 1983). To the contrary, many sites and areas in northern Belize have been shown to have experienced a resurgence of sorts through population growth as evidence through expansion of settlements and increases in construction episodes (Fry 1983, 1989, 2013; M. A. Masson 2001a; Masson and Mock 2004:370-372; Sidrys 1983:399; West 2002), while other sites, like Strath Bogue were newly resettled (Ferguson 2001, 2002a, 2003; Sidrys 1983). The concurrent sociopolitical, economic and environmental stresses associated with the decline of many southern lowland polities; and the expansion and prosperity of the Yucatecán polities in the northern Maya lowlands, would have had far reaching “push” and “pull” effects, that together were
impetuses for enticing migration. Paired with northern Belize’s evident stability on the hinterlands of the major Classic period Maya centers, the easy accessibility and resource rich environment would have made Strath Bogue a prime location to relocate.

Three notable migrations of people out of the Petén were chronicled in indigenous historic texts (Boot 1997:7-8; Ringle, et al. 1998:184; Schele and Mathews 1998:363). According to the Chil’am Bal’am (Roys 1933), the “Great Descent,” or Noh Emal occurred during the Terminal Classic period (between A.D. 750-950), while the “Little Descent” or Ts’e Emal occurred between A.D. 650-750. Both of these migrations are argued to have contributed to the increase in populations in the northern lowlands, including the expansion and settlement of sites in more stable areas along its route, such as in northern Belize (Boot 1997:7-8; Schele and Mathews 1998:363).

According to the Chil’am Bal’am of Chumayel I, Tizimin and Mani (Boot 1997:8) a third migrant caravan also headed north towards Chichén Itzá, but before arriving at their destination at Chichén Itzá, settled briefly at a placed referred to as Siyan Ka’an Bak’halal in an what was known historically as Chetumal province. Chetumal province incorporated northeastern Belize within it. The migrants who established Siyan Ka’an Bak’halal evidently stayed for a relatively brief period of time, approximately 60 years (Boot 1997:8) – what we might today consider a generation or two, given the period in time. While the length of the period of settlement at Siyan Ka’an Bak’halal cannot be confirmed, it is of course significant, as we have argued that Strath Bogue was not occupied for a relatively brief period of time, having been settled and abandoned within the Terminal Classic period. Further, during colonial times residents living along the New River in northern Belize were identified as living in a region identified as Tz’ul Winikob. Tz’ul or dzul, means “foreign” in Yucatec Maya. This designation was also used to refer to people believed to
have been Itzá living in Colonial Chactemal or Chetumal province (Andrews 1990:262; Jones 1989:41-44; 1998:3, 427; Roys 1962:40-41). This linguistic data suggests that entire settlements were being identified as separate from the local inhabitants - identifying them essentially as “others.” Further, such terminology suggests that migrants were not just individual families emigrating and mixing with the existing communities; rather, large groups were migrating, potentially en masse and settling in new communities, such as Strath Bogue, which arguably could be considered on the New River, as it is only 2.5 kilometers away from it. It should be said that the accounts of these migrations in the books of Chil’am Bal’am were written centuries after their actual occurrence, and thus they do not offer a solid chronology of their time frame. Moreover, given the time lapse between their occurrence and recording, the direction, timing and size of the movements should be understood as being qualified deductions by educated scholars.

Strath Bogue is located within a region diverse in natural resources, that included access to chert and chalcedony, clay for pottery, aquatic and terrestrial game, fertile land and access to an assortment of different water sources. As our scientific understanding of the role environmental change played in exacerbating, if not instigating culture change during this time period increases, the importance of the Progresso Lagoon region’s environment in attracting emigrants is increasingly compelling. Many subregions and sites within the Maya lowlands were having to adjust their diets and lifeways to a new dryer existence. While many sites like those in northern Yucatán and the Puuc region constantly had to contend with, and even flourished in arid and minor drought conditions, the increasingly dry conditions had negative consequences on the Maya’s existence. Even inhabitants of these northern arid areas, who were somewhat preconditioned to effectively manage a successful existence in dry environments (Dahlin 2002:331; Shaw 2003:162-163) were meeting the full challenge of an increasingly dry climate. One of the ways they had
previously navigated such an increasingly challenging and dry environment was to become less reliant on more drought susceptible C4 plants, such as maize (which traditionally formed the bulk of Maya people’s diet), and instead supplement large portions of their diet with more sustainable drought-resistant C3 plants, such as squash, beans and manioc. Such diets have been demonstrated isotopically in the skeletal remains of individuals from the site of Yaxuná (Mansell, et al. 2006:177). Another way to mitigate deep water table and dry conditions was to construct chultuns within the bedrock to store water for domestic use (Dunning 1992; Yaeger and Hodell 2008). However, once the extreme drought conditions associated with the Terminal Classic period arrived, even those who had become well versed in managing dry environments were challenged.

Strath Bogue’s location in close proximity to the Caribbean Sea, Progresso Lagoon, the Freshwater Creek drainage system and the New River, would have thus been particularly attractive to an emigrant community. Not only do these water systems have their own variable ecosystems and thus food and material resources, they also permitted easy contact with other communities and regions. The New River at this time is understood to have been developing into a “canoe highway,” essentially functioning as a gateway to the Caribbean and the Yucatán coast, as well as to Belize’s inland and points beyond. The ease with which peoples and goods could be transported short and long distances were evidently being realized and must have been of particular interest to people moving across the landscape. In addition, it would have been of interest to the expanding dominant mercantile polities of northern Yucatán who were seeking to exploit new resources, as well as influence or absorb other sites and regions.

Migration theorists have stipulated that the existence of a pre-existing communication route and or prior connections to the lands in which a community intended to move are requisite factors
to population movements. As has been indicated, the rivers essentially on either side of Strath Bogue were considered communication routes. Based on the presence of an Early Classic period structure below Structure 5, we know there had been a limited earlier occupation at the site. According to Willey (1974:424), the Maya were known to have been pioneering new territories during the Early Classic period “little collapse” or hiatus. Perhaps this earlier occupation served as the community’s prior connection to the land, and if so may have meant that the later Terminal Classic period inhabitants may have had ancestral ties to the land that would have strengthened the argument for migrating and settling at this particular location.

**Archaeological Evidence for Migrants at Strath Bogue**

Despite the clear population explosion associated with the Classic-Terminal Classic period transition and the Maya “collapse,” scholars in northern Belize have found it difficult to identify archaeologically the migration and resettlement of Maya emigrants or “refugees” satisfactorily. While it seems logical to suggest several migrations took place; some may argue that the actual evidence of a true migration has been unclear in the existing data (Kosakowsky and Pring 2001). This is in part due to the difficulty in isolating migrants in the archaeological record, particularly in separating them from mere trade interactions or not examining the full context of “foreign” traits (Adams 1973b:156-158; Tourtellot and González 2004:62). In the case of Terminal Classic period migrants, it is also due to the fact that archaeologists are still in the infancy of our understanding of the material culture of this time period in northeastern Belize. Combining the “multiple intersecting lines of data” approach with the data retrieved through the archaeological investigation of Strath Bogue, a site that is virtually void of a preceding Late Classic or succeeding Postclassic
period occupation, we had the opportunity to investigate the movement, settlement and the regeneration of a community within a larger context.

As was encountered by Debra Walker (1990:462-463) amongst Cerros’ Terminal Classic period occupations, the Strath Bogue settlers choose to occupy a location that had been previously occupied and abandoned centuries before. Putting aside the possibility that the migrant settlers may have had ancestral connections to the previous occupiers and thus a connection to the land, the recognizable presence of earlier inhabitants may have been seen as a positive sign in terms of the potential of the land and region. The extant ruined structures would have been of benefit the newcomers who were in a hurry to settle, by either providing raw materials from which new structures could be constructed, or by allowing the mere renovation of ruined platforms, thereby saving them time and resources. Our excavations revealed that most of the structures at Strath Bogue were constructed very hurriedly in one phase of construction and typically were constructed of undressed or uncut stones, and scavenged chert boulders. Also similar to those seen at Cerros (Walker 1990), many constructions were simply low, crudely constructed rubble platforms or “chich” mounds. Such practices across a wide area and several structures speak to the urgency of their settlement. Strath Bogue’s “nucleated-dispersed” settlement pattern, in which domestic architecture or groupings of plazuelas are scattered across an otherwise rural landscape with large tracts of open areas in between them for cultivation mimics that seen in the Puuc region, and as exemplified at the site of Sayil (Carmean, et al. 2004:339-440; Dunning 1992; Dunning, et al. 2002).

Successful population movements are noted as involving a prominent member of a community, who had the ability to attract others. They often have some knowledge or connection
with the destination site and had the ability to negotiate safe a passage and transition to the
the excavation of two individuals interred with paraphernalia associated with a scribal tool kit is a
very unique occurrence at such a relatively small, rural site like Strath Bogue. Scribes were
prominent members of Maya society, who were people of influence and prestige. The inclusion of
someone of such standing, who was responsible for documenting and maintaining community
records, histories, religious information, and calendric cycles, and assisted in the control of
knowledge, and had a connection to the gods (Inomata 2001:321, 324 332), would have given
strength to the decision to migrate and helped persuade others to join as well.

Analyses of the Strath Bogue ceramic assemblage indicated the inhabitants were
participants in the regional Rancho pottery sphere, as demonstrated by the presence of such types
such as Kik Red, Chambel Unslipped, Campbells Red, Burgos/Progresso Striated, Dumbcane
Striated, Ohel Red and Achote Black. However, they also indicated that the Strath Bogue
community had connections to northern Yucatán, as demonstrated through the presence and
emulation of pottery forms and types associated with the Cehpech sphere, such as Muna Slate,
Ticul Slate, Piste Striated, Vista Alegre; as well as Muna group-like forms and attributes, such as
basins, short or low-necked everted jars, bolstered, and triangular slate-like rims (Fry 2013; Vallo
2005:170). Although hampered by poor preservation, and without petrographic analyses we cannot
be certain about accurate ratios of true types to emulated types within the assemblage, it appears that the majority of these Puuc-like and representative sherds are examples of local reproductions over the northern Cehpech sphere Yucatán originals.

A handful of new types within the Progresso Complex at Strath Bogue were identified and are thought to have been attempted reproductions of the distinct fine-paste wares associated with northern Yucatán. Despite the fact that due to preservation issues the specific pottery types or forms they were attempting to replicate with the production of such new types as Emal Red, Sharp Red and Palino Unslipped, the intended emulation of these distinct Cehpech sphere Yucatán pastes (Rice and Forsyth 2004:45), but with local raw materials is clear. The same can be said for those reproduced slate-like “types” that while produced more effectively than the Coco Red and Strath Bogue types, were still utilizing “physically disparate materials and firing techniques” (Ball and Taschek 2013:156). Similar circumstances have been very well documented as Becan in southern Quintana Roo, where Ball and Tascek have similarly identified the resettlement of a migrant Cehpech-sphere group from the Puuc region (Ball and Taschek 2013).

Perhaps the strongest ceramic data in support of the migration hypothesis can be seen through the identification of two other new ceramic types within the Progresso Complex. Coco Red was first identified within the Progresso Complex at Caye Coco by Masson (Masson 2002b; Masson and Mock 2004; Masson and Rosenswig 2005b), and Strath Bogue Unslipped was newly identified at its name sake. Both Coco Red and Strath Bogue Unslipped were poorly constructed and fired vessels, exhibiting gritty, cracking and cleaving surfaces with thick black cores, indicating they were fired in poorly reduced environments. I have argued that both of these pottery types were produced by potters who were attempting to replicate a traditional pottery type from
their homeland, but with local and otherwise unfamiliar raw materials. As the potters were still working out the correct “pottery recipe,” firing temperatures and timing relative to the local materials, the results were less than satisfactory. The majority of Coco Red vessel forms at Strath Bogue were bowls, and I speculate these forms were attempted replications of small, early-Puuc style bowls.

Interestingly, when comparing the Strath Bogue specimens of Coco Red and Strath Bogue Unslipped to their counterparts from Caye Coco, it became apparent that while they were still inadequately executed, the Caye Coco vessels were better fabricated. The surfaces were less prominently cracked and crumbly, the sherds were thinner, and they had been fired more completely as demonstrated by either their red cores or the thinness of the black core within its paste. It is thought that Coco Red and Strath Bogue unslipped represent an early stage in the evolution of a the later Postclassic period Zakpah Red and Tsabak Unslipped respectfully (Debra Walker, personal communication, 2001; (Masson and Rosenswig 2005b)). As such, the variation in the Strath Bogue specimens and Caye Coco specimens, and continuity with the Postclassic period types indicates that the manufacturers of this pottery eventually came to master the production pottery in local raw materials.

While some may question why the manufacturers of the other replicated or emulated types did not have issues with the local clays in the same way that the producers of Coco Red and Strath Bogue Unslipped did, one must be reminded that during this period, pottery production, like the political-economy, was becoming more decentralized. It is also likely that new emigrants may not have had the resources to purchase or access to purchase from existing networks. The result was an increase in rural satellite communities founded on local population growth and immigration and
housing their own potters. Correspondingly, the reorganization of ceramic production, consumption and distribution spheres resulted in an increase in ceramic diversity and the acceptance and promotion of connections to other regions through emulation (Sullivan and Sagabiel 2003:33-34). This in part accounts for the general decline in ceramic production commented on by many Mayanists during the Terminal Classic period. It stands to reason that certain types were produced by different potters. These points, paired with the fact that we cannot be certain of the timing of the arrival of different migrant groups, or of their mastering of their craft, provides some possible understanding to the variable quality of their production.

The ceramic assemblage at Strath Bogue ultimately can be seen as an example of a blending of cultural traditions, reflective of the stylistic and variable food ways of people associated with Cehpech ceramics and those of local northern Belize Rancho sphere. The identification of new types not only shows local attempts at reproducing or emulating forms from the north, but also the involvement of the community in local consumption spheres, and the development or evolution of local ceramic production, new cultural traditions and increasing ceramic regionalization (Masson and Mock 2004; Mock 2005a:123).

Of all the data collected through our archaeological excavations, the most intriguing and supportive of the migration hypothesis were those resulting from the stable carbon and nitrogen isotope analyses of the bone collagen in the human remains. Acknowledging that the extremely low sample size of four individuals from Strath Bogue, and one from the Progresso Shore community is sufficiently representative of these communities as a whole, when the results are paired with the other intersecting lines of data, they are still able to add another chapter to the story.
Since we know that bone collagen restores itself over an approximately 30-year period, and both the Strath Bogue and Progresso Shore individuals were at most 25-35 years of age, the carbon and nitrogen isotopic results had broader implications than merely providing an understanding of these individuals’ dietary consumption patterns for the last 30 years of their lives. When compared to regional isotopic data from Terminal Classic period sites in northern Belize, they were found to be positive indicators that both of these individuals were migrants.

The results of the nitrogen isotopic data indicated that neither the Strath Bogue or Progresso Lagoon individual were significant consumers of fish or other aquatic resources. This was very surprising given their proximity to water and the diversity of resources that would have been immediately available to them in such environments – including fish, fowl, mollusks, turtles, lizards, crocodiles, as well as aquatic plants. Furthermore, this was in contrast to the results of individuals tested from other northern Belize sites in similar environments, whose enriched nitrogen values indicated that aquatic based resources figured prominently in their diets. The Strath Bogue and Progresso shore individuals’ nitrogen levels indicated they were principally consumers of vegetable-based diets, with most of their protein being obtained from C3 rich plants such as beans, tubers and squash, and were not significant meat eaters – again contrasting with their northern Belize neighbors.

The Strath Bogue and Progresso Shore individuals again diverged from their northern Belize neighbors in terms of the stable carbon isotope values, which indicated that they were more prominent consumers of C4 based food items (presumably maize, maize products and animals that consumed maize). And yet they still ate less maize than people from the Petén. Interestingly, the Strath Bogue and Progresso individuals also differed from each other in respect to the carbon
isotopes, with the Progresso individual having a more enriched C4 or maize diet, with 60% of the Strath Bogue individuals diet coming from C4 sources, compared to 67% of the Progresso Lagoon individuals’ diet. Given the rate of collagen restoration, the age of the individuals, and the variation of their diets from their northern Belize counterparts, these data clearly indicated they were migrants. When these results were compared to those of individuals tested from other Terminal Classic period sites, it was found that Strath Bogue was most comparable to that of an individual from the Cehpech sphere site of Yaxuná; while the Progresso individual was most closely aligned with an individual from Xunantunich in western Belize. The decrease in C4 plant, or maize consumption is seen at many sites within the Maya lowlands during the Terminal Classic period, particularly those that had previously been under the influence of the Petén polities (J. Z. Metcalfe, et al. 2009:30-31; White 1997:179). This shift away from Petén influences not only coincides with a change in maize consumption, but also with a larger shift in cultural affinities or influences towards those associated with the Yucatán polities.

Unfortunately, the skeletal remains of the two scribes identified from the Structure 5 burials were unable to produce satisfactory stable carbon and nitrogen isotopic results. Nonetheless, the fact that the individuals buried in such residential structures are traditionally understood to have been kin and given Strath Bogue’s relatively short period of occupation - and thus the period of time likely to have transpired between their having settled at Strath Bogue and their deaths - I would argue that both of the scribes were also likely migrants. If this was the case, it would of course speak to the argument that long-distance migrations generally require a person of strong community standing or prominence to be successful.
The prominence of C3 plants in the Strath Bogue and Progresso Shore individuals’ diet is of further interest as it has the potential to identify where they came from. An in-depth discussion of C3 plants and their importance to people who were from arid environments or were navigating through long term drought conditions was provided. It was argued that C3 plants, such as manioc, squash and tubers, were likely the preferred cultigens of communities faced with constant and potentially increasingly dry conditions, such as those argued to have had contributed to the Terminal Classic period “collapse,” and experienced by communities in the northern Yucatán.

**Northern Yucatán Roots?**

The Terminal Classic period is argued to be marked by population movements and shifts in settlements, as has been documented in northern Belize by the apparent increases in populations at many sites, and evidenced by increases in residential construction, and the establishment of new sites like Strath Bogue (Culbert 1988a; Demarest 2004; Demarest, et al. 2004a; Ferguson 2004, 2005, 2006; Sidrys 1983; D. S. Walker 2004). These population increases and the founding of new settlements in areas previously considered hinterlands to the dominant Petén region, correspond to the sociopolitical and economic changes being experience across the larger Maya subarea, and the in the wake of the “collapse.” However, the true degree and direction of migrations in the aftermath of the Terminal Maya “collapse” is difficult to determine. The indigenous chronicles and ethnohistoric accounts seem to support the premise that people were fleeing warfare and the decline of the central lowland polities in the Petén, as does the shift in ceramic affiliations across the lowlands. However, evidence from northern Belize, including from Strath Bogue, suggests that the migrants may not only have been arriving from the Petén, but also from the north.
The Terminal Classic period in the Yucatán peninsula is manifested by the domination of Cehpech-using peoples. During the corresponding “Puuc Florescence” and with the growing pressures of conflict and an overgrowing and overreaching population on an environment that always had difficulties sustaining itself, Puuc polities began to expand their regional political and economic control and realms of influence (Carmean, et al. 2004:442; Robles and Andrews 1986:82; Schele and Freidel 1990:346). With this expansion and population dispersal beyond the Puuc realm, the distribution of slate wares as a prominent part of ceramic assemblages across the Yucatán peninsula and into Belize is seen (Ball 1977a, 2014; Ball and Taschek 2013:151; Chase and Chase 1987; Chase 1982a, b; Chase and Chase 1982; Forsyth 2005:15-17; Fry 1972; 1983:104; 1987, 1989, 1990b, 2000, 2013; Shirley B. Mock 1994a, b; Mock 2005a, b; Shirley Boteler Mock 1994; Sidrys 1983:24).

The question then becomes was the clear spread of Cehpech sphere ceramic traditions the result of “incursions” (Ball 2014:441; Ball and Taschek 2013:151) or “intrusions” of refugees from the northwest Yucatán as argued by Ball, or invasions of northern Yucatecán polities, as argued by the Chases at Nohmul (Chase and Chase 1982) and Mock at Colha (Shirley B. Mock 1994a; Shirley Boteler Mock 1994) and seen across other sites in the Yucatán, including Yaxuná and Coba (Suhler, et al. 2004). Or could the presence of Cehpech sphere using peoples in northern Belize and at Strath Bogue reflect the expansion of communities moving towards a larger shared economic and ideological interaction sphere (Masson and Mock 2004:390-391) and desire for alliance building (Carmean, et al. 2004:441).

Although the initial expansion of interaction spheres across the western Yucatán polities at the height of their “florescence” may have been more sociopolitical and economic in nature, the
pressures of a growing population and a congruently taxed and declining environment would have also been an impetus for the need to relocate (Demarest, et al. 2004a:568). It has been argued that the increasingly arid conditions experienced by the Puuc polities resulted in the depopulation of many centers as access to water became more challenging (Carmean, et al. 2004:441; Curtis, et al. 1996; Dahlin 2002; Dunning 1992; Gill 1994; Hodell, et al. 1995). Climatic change in and around the Maya subarea has come to the forefront of discussions on Maya collapse and the movement of peoples across the landscape. Recent investigations into droughts using speleothems from a cave in the village of Tecoh in northwestern Yucatán, approximately 50km northeast of Uxmal, have indicated that the area was fraught with drought issues between A.D. 800 and 940, with at least eight droughts having occurred during that time frame (Lucero, et al. 2015:1150; Medina-Elizalde, et al. 2010:260-261). Braswell et al (2004:190) have noted that the change in interaction spheres at Calakmul coincided with environmental changes in the region, marked by cooler temperatures and less rainfall.

The comparatively large number of chultuns among the Strath Bogue community may be considered additional evidence of a connection with the northwest Yucatán. Because the water table within the Puuc region was deeper than elsewhere in the Yucatán, and there is a dearth of streams and rivers there, the Puuc region Maya became prolific manufacturers and users of chultuns for the storage of water (Carmean, et al. 2004:438; Dunning 1992). Despite the fact that water would have been more accessible at Strath Bogue, this community still felt the need to construct and utilize such facilities. Perhaps this concern with chultuns is a hold-over from this community’s earlier existence, and the constant fear of having no or little access to water.
The strategic location of Strath Bogue in between two prominent and water sources and their differing ecologies and thus access to diverse food items would have been very attractive to newcomers. The fact that the site sites on very fertile land, currently being used for papaya and sugar cane fields, as well as an outcrop of chert and chalcedony also add to the functionality and attractiveness of this location.

**Community Settlement and Regeneration at Strath Bogue – the Application of Proposed Models**

The site of Strath Bogue posed a unique opportunity to present a case study of the settlement and regeneration of a migrant group in the aftermath of the Terminal Classic period Maya “collapse.” The impetus for those population movements, and the direction and timing of the migrations remain somewhat elusive. It is possible that the site was settled over time by more than one migration, and perhaps by a network of peoples connected to one-another but from different locations. Through the examination of “multiple intersecting lines of data” this research has shown that the Strath Bogue community had definitive ties to northern Yucatán, as demonstrated by the ceramic assemblage at Strath Bogue and the results of the human stable carbon isotopic data. The ethnohistoric and linguistic data clearly show a classification of peoples living along the New River and in northern Belize as foreign.

The archaeological correlates from the Strath Bogue data appear to indicate that no singular proposed regeneration hypothesis was at play at Strath Bogue; and that instead a combination of hypotheses was represented: restoration via long-distance migration and stimulus regeneration. The natural resources, favorable conditions and likely earlier connections to the Progresso Lagoon region appear to have been important factors in the immigration of people to this area. Dietary
analyses indicate a clear departure from those typical of northern Belize and indicate a people who were reliant on the consumption of drought resistant plants. The clear connections to the Cehpech ceramic sphere with the presence and replication of traditional forms and types attests to this. The hybridization of local ceramics with foreign ones has also been demonstrated, as has the difficulties of blending foreign “technologies” or methodologies with local resources.

While this research was unable to specify the origin of the Strath Bogue community, it is my opinion that it does support the argument that the site was settled by migrants associated with northern Yucatán, who were seeking to settle and regenerate in the aftermath of the Maya “collapse.”
APPENDICES:
APPENDIX I: COMPLETE STRATH BOGUE CERAMIC TYPES ACCORDING TO SPHERE AND FREQUENCY.

*1-10=Very Rare; 11-30=Rare; 31-50=Uncommon; 51-80=Common; 81-150=Very Common; 150=Abundant

<table>
<thead>
<tr>
<th>Ceramic Type: variety</th>
<th>Quantity</th>
<th>% of Complex</th>
<th>Sphere</th>
<th>Frequency *</th>
<th>Surface Treatment</th>
</tr>
</thead>
<tbody>
<tr>
<td>Kik Red: Kik Variety</td>
<td>645</td>
<td>16.46</td>
<td>Rancho</td>
<td>Abundant</td>
<td>Red Slipped</td>
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<tr>
<td>Achote Black Group (Variety Unspecified, Provisional Variety &amp; Unidentified Varieties)</td>
<td>498</td>
<td>12.71</td>
<td>Tepeu II-III</td>
<td>Abundant</td>
<td>Black Slipped</td>
</tr>
<tr>
<td>Coco Red: Variety Unspecified</td>
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<td>8.73</td>
<td>Rancho</td>
<td>Abundant</td>
<td>Red Slipped</td>
</tr>
<tr>
<td>Campbells Red: Campbells Variety</td>
<td>313</td>
<td>7.99</td>
<td>Rancho</td>
<td>Abundant</td>
<td>Red Slipped</td>
</tr>
<tr>
<td>Strath Bogue Unslipped: Variety Unspecified</td>
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<td>5.08</td>
<td>Rancho</td>
<td>Abundant</td>
<td>Unslipped</td>
</tr>
<tr>
<td>Tinanja Red: Variety Unspecified</td>
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<td>4.03</td>
<td>Tepeu II-III</td>
<td>Abundant</td>
<td>Red Slipped</td>
</tr>
<tr>
<td>Ohel Red: Ohel Variety</td>
<td>149</td>
<td>3.80</td>
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<td>Very Common</td>
<td>Red Slipped</td>
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<tr>
<td>Chambel Striated: Chambel Variety</td>
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<td>3.14</td>
<td>Rancho</td>
<td>Very Common</td>
<td>Striated</td>
</tr>
<tr>
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<td>3.09</td>
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<td>Cehpech</td>
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<td>Slate</td>
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<td>Dumbcane Striated: Variety Unspecified</td>
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1-10=Very Rare; 11-30=Rare; 31-50=Uncommon; 51-80=Common; 81-150=Very Common; 150=Abundant

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<td>1-10=Very Rare; 11-30=Rare; 31-50=Uncommon; 51-80=Common; 81-150=Very Common; 150=Abundant</td>
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APPENDIX II: SAMPLE DISTRIBUTION OF TERMINAL CLASSIC THROUGH EARLY POSTCLASSIC CERAMIC TYPES BY CONTEXT.

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<th>Str. 47</th>
<th>Str. 14’s Platform</th>
<th>Str. 30c</th>
<th>Str. A1</th>
<th>Str. A4</th>
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<th>Str. 5 Mid.</th>
<th>off mnd, btwn Str.’s 5 &amp; 6</th>
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APPENDIX III: PERMISSION FOR USE OF MAPS IN FIGURES 1.1, 1.2, 1.5 & 4.2

Walter R. T. Witschey, Ph.D.
Research Professor of Anthropology and Geography
Cook-Cole College of Arts and Sciences • Longwood University
Director Emeritus, Science Museum of Virginia
Past President, Virginia Academy of Science

May 14, 2019

Ms. Josalyn Ferguson
20 Ver Planck St.
Albany, NY 12206

Dear Josalyn,

Per your request I am happy to grant permission for you to use three maps prepared by Dr. Clifford T. Brown and me as part of our project The Electronic Atlas of Ancient Maya Sites for inclusion in your dissertation.

In particular, this permission applies to:

- Map of the Maya area (May 14, 2019)
- Map of Northern Belize and vicinity (February 17, 2012)
- Map of the northern 2/3 of the Maya area, with sites of terminal classic significance (February 16, 2012)

With warmest congratulations on completing your Ph.D. program!

Sincerely,

Walter R. T. Witschey

From: MAYAVASE@aol.com [MAYAVASE@aol.com]
Sent: Friday, April 26, 2013 11:14 AM
To: Ferguson, Josalyn M
Subject: Re: permission to reproduce image - © K717 & K2744

Dear Jocelyn,

We now have separated our web site from Famsi's (they still may link to it) but we are now https://protect2.fireeye.com/url?k=79bc393b-25849f86-79bec00e-000babd9fa3f-f5b1a0c84ce3ed17&u=http://www.mayavase.com/ so that any materials must now come from us. K717 is on this web-site and you are welcome to download it to use in your dissertation at no charge. If you need to have it as a hi-res file, then there is a charge of $75.00 for the file.

MAYAVASE.COM


CLICK ON THE ABOVE BANNERS TO ENTER EITHER DATABASE. Information for the use of photographs in the Mayavase Database or A Precolumbian Portfolio - please contact Justin at justinkerr@mayavase.com.

I hope that answers your question about using K717, or K2744, or any other K number you need for your dissertation. K2744 interestingly has the figure holding the shell paint-pot which even has the three dots above it, that we see on the famous shell paint pot, K6580 (see Precolumbian Portfolio). It takes some time as there are quite a few, but browse through the word "shell" and you will see a number of paint palettes.

That's a fascinating premise, the idea of a scribal toolkit, including a "paper polisher".

Good luck,
Barbara

In a message dated 4/25/2013 2:53:41 P.M. Eastern Daylight Time, jferguson@albany.edu writes:

Dear Mrs. Kerr,

Approximately a year ago now I requested, and happily received permission to reproduce Kerr image K717 for the purposes of my dissertation. In my final writing and wrapping-up of my dissertation I have discovered that I have a scribal household. One of the ways I am arguing this is through the presence of aspects of a Maya "scribal toolkit," including what I believe to be a paper-polisher, as described by Coe and Kerr in "The Art of the Maya Scribe." There is a snip-it of a Kerr roll-out (Kerr vessel K2744) in Figure 122 in which one such item is argued to be present. I have largely identified this artifact as such based on their description and this image, and was wondering if it would please be possible to receive permission to use this image for the purposes of my dissertation. The object I have recovered from a Burial is a rounded rock with two opposing "dimples" or depressions pecked and smoothed into it. Other Scribal objects found in association with this household include a shell ink dish, a shell ink holder, a shell stylus, and 9 chert palettes. As of yet I have not been able to confirm whether any other such objects have been identified archaeologically.
I have searched the FAMSI Kerr database, and have noticed that it is not there. If it would be ok to use this image, I would be very grateful. If you are able to grant me permission, I was wondering how I would respectfully be able to obtain a copy of the image, since it is not available through the FAMSI website. Of course I understand that should permission be granted for it's use it would be limited to the use the image only for the purpose of presenting my dissertation data and not for any monetary purposes.

Thank you kindly for your time and consideration.

Sincerely,
Josalyn

Josalyn Ferguson
Ph.D. Candidate
Department of Anthropology
University at Albany
1400 Washington Ave.
Albany, NY 12222

From: MAYAVASE@aol.com [MAYAVASE@aol.com]
Sent: Friday, March 16, 2012 10:40 PM
To: Ferguson, Josalyn M
Subject: Re: permission to reproduce image - © K717

Dear Josalyn,

You have our permission to use K717 in your dissertation, without charge. Feel free to download it from the web-site.

Good luck with your dissertation,
Regards,
Barbara

In a message dated 3/16/2012 5:11:09 P.M. Eastern Daylight Time, jferguson@albany.edu writes:

Dear Mr & Mrs. Kerr,

Good afternoon! I am writing you today to respectfully request permission to reproduce one of the roll-out images listed within the FAMSI Kerr database. My name is Josalyn Ferguson and I am currently in the final stretches of completing my dissertation on a Terminal Classic Maya site in northern Belize. I excavated a burial from a site called Strath Bogue, in the Progresso Lagoon region that I believe to be a "collapse" refugee resettlement community, that included a shell ink dish very similar to that illustrated on Kerr K717 "Scribal Workshop." I was wondering if I might be able to include an image of the vessel in my dissertation, and at a presentation I am giving in April at the Maya at the Lago conference in North Carolina. Of course I would make all of the proper references to the copyrighted vessel, the database, Mr. Kerr and your having granted permission, should you be kind enough to grant it to me.

I thank you in advance for your time and consideration of this request. Sincerely,

Josalyn Ferguson

Josalyn Ferguson
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