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Projectile points and early human presence in terminal Pleistocene Middle America

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PROJECTILE POINTS AND EARLY HUMAN PRESENCE IN TERMINAL PLEISTOCENE MIDDLE AMERICA

by

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PROJECTILE POINTS AND EARLY HUMAN PRESENCE IN TERMINAL PLEISTOCENE MIDDLE AMERICA

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ABSTRACT

The antiquity of human presence in the Americas has been a topic of intense debate in archaeology since the inception of the discipline as a scientific study. A century of multidisciplinary investigations have failed to achieve consensus on indentifying the earliest humans to inhabit the Western Hemisphere, their origins, routes, and the antiquity of their initial dispersals. Hundreds of Late Pleistocene human occupations have been documented in both North and South America. This is not the case for Middle America where only a handful of early sites have provided diagnostic artifacts in datable context. In the absence of a clear understanding of what happened in this intermediate region, the early archaeological records of North and South America will be difficult to reconcile. This is problematic because the geographic location and the relatively narrow expanse makes Middle America a natural funnel of early human movement.

This dissertation contributes to advancing understanding of early human occupation in Middle America in three ways: (1) it provides a synthesis of the known archaeological sites of Terminal Pleistocene/early Holocene age; (2) it evaluates lithic analysis of the most pervasive Middle American lithic technologies, Clovis-like and Fell-like points, as to assess their relationship to North and South America; and (3) it focuses on a single case of possible Late Pleistocene human interactions with extinct Central American megafauna through the examination of the paleontological site of Chivacabé (Ttzi'kab'b'e) located in the western highlands of Guatemala.

The data collected for this dissertation reveals that (1) the majority of Late Pleistocene artifacts from Middle America are surface finds, and only a handful of sites have been archaeologically excavated and/or have produced radiometric dates; (2) North American Clovis-like and South American Fell-like projectile points represent the majority of the Paleoamerican record in this area; and (3) clear evidence of human and extinct Late Pleistocene megafauna interaction is still a matter of debate and merits future research.

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List of Abbreviations

14C yr BP	Radiocarbon Years Before Present
BP	Before Present
c.	*circa* (approximately)
Cal yr BP	Calendar Years Before Present
CL	Clovis-like point
FL	Fell-like point
FPP	Fishtail Projectile Point (Same as Fell points)
KYA	Thousands of Years Ago
LGM	Last Glacial Maximum
masl	Meters above Sea Level
RCYBP	Radiocarbon Years Before Present

Chapter 1

1. Introduction

The antiquity of human presence in the Americas has been a topic of intense debate in archaeology since the inception of the discipline as a scientific study. A century of multidisciplinary investigations have failed to achieve consensus on indentifying the earliest humans to inhabit the Western Hemisphere, their points of origin, timing, and the routes taken during these initial dispersals. While different points of entry to the Americas have been suggested (Dixon 2013; Robledo 1954; Stanford and Bradley 2012), most models start with the presumption of northeast Asia as the ancestral home for all Paleoamerican lithic technologies and peoples. Early models envisioned a terrestrial migration of Siberian big-game hunters (Clovis points c. 13,200-12,800 BP) that crossed Beringia, and moved south through a west-Canadian "ice-free corridor." From that point on, the model suggests, humans followed a general north-to-south and west-to-east direction until they reached Tierra del Fuego (Fell projectile points c. 13,600-8,700 BP)[1], culminating in a continent-wide human saturation of unglaciated territories in less than four centuries (Fiedel 1999; Meltzer 2009).

Despite the extensive geographical distribution of Clovis and Fell projectile points, the evidence now suggests that fluted points were not used by the first humans

[1] Clovis has been refined through ^{14}C dating to c. 13,200-12,800 BP (Waters and Stafford 2007); while the less precisely dated Fell point present a temporal range of c. 13,600-8,700 BP (Borrero et al. 1998; Pearson 2004; Politis 1991). Fell projectile points are also referred to in the literature as Fishtail Projectile Points (FTPP or FPP), however, this dissertation will use Fell throughout for consistency. Fell projectile points get their name from the Fell Caves near the Magellan Strait in southern Chile, where they were first discovered by Junius Bird in the 1930s. See Chapter 3 for a more in depth discussion of Clovis and Fell Projectile points.

that set foot south of the ice sheets (Dillehay 2000; Dillehay et al. 2015; Gilbert et al. 2008; Halligan et al. 2016; Jennings and Waters 2014; Joyce 2013; Waters et al. 2011). The existence of an older non-fluted technology is now more widely accepted and alternative migration models have been formulated to demonstrate how South America could have been colonized before the initial Clovis expansion (Fladmark 1979, 1983; Mandryk 2001). Chief among these is a coastal migration along the Pacific which may have brought people to South America more rapidly by avoiding the interior regions (Des Lauriers 2006; Dillehay 1999; Dixon 1999, 2013; Fix 2002; Gruhn 1988, 1994). Early maritime economies are well documented on the Pacific side of the Americas and may represent descendants of ancient communities that occupied these shores before the Holocene marine transgression (Chauchat 1992; DeFrance et al. 2001; Des Lauriers 2006; Dixon 2013; Fedje and Christensen 1999; Goebel, Waters, and O'Rourke 2008; Llagostera 1979; Rick, Erlandson, and Vellanoweth 2001; Sandweiss et al. 1989, 1998; Stothert 1985, 1988). However, archaeologists have not been unanimous, and debates continue over interpretation of data from purported older than Clovis and Fell sites (Fiedel 1999, 2014a; Lynch 2001; Morrow et al. 2012)

At the same time, the historical, biological, and technological relationships between North and South American early lithic industries and the humans who manufactured them remain unclear. Radiocarbon dates from North American Clovis sites and the oldest lithic assemblages south of Panama appear contemporaneous and have proven inconclusive toward establishing a clear chronological pattern (Jackson et al. 2007; Steele and Politis 2009; Suárez 2014, 2015, 2016; Waters and Stafford 2007;

Waters, Amorosi, and Stafford 2015). The lack of agreement and information has caused the Paleoamerican records of both continents to remain isolated from each other.

While no single model can account for the diversity of the Paleoamerican archaeological record, hundreds of late Pleistocene human occupations have been documented in North and South America (Dillehay 2000; Meltzer 2009). Unfortunately, this is not the case for Middle America[2] where only a handful of early sites have provided diagnostic artifacts in datable context, making this data deficiency to be rarely considered in models of early human mobility. This situation has prevented archaeologists from understanding how early North and South American populations relate to each other and has made it almost impossible to formulate hemisphere-wide models of human mobility based on archaeological evidence.

In the absence of a firm grasp of what happened in this intermediate region, the early archaeological records of North and South America will be difficult to reconcile. This is problematic because the geographic location and the relatively narrow expanse makes Middle America a natural funnel of early human movement. At the same time, it is in Middle America, besides southern Florida, that Paleoamericans might have first encountered the Neotropics, and yet research targeting the Paleoamerican horizon has been intermittent and virtually nonexistent since the 1970s (Gruhn et al. 1977; Hayden

[2] In this dissertation, Middle America refers the region that extends from the Isthmus of Tehuantepec (roughly south of the Tropic of Cancer) in Mexico to the Darien Zone of southern Panama, which can include portions of northern South America. Paleoamerican and Paleo Middle America is older than the end of the Younger Dryas c. 11,600 yr BP.

1980; Perrot-Minnot 2013)[3]. The adaptive repercussions that may have ensued following their entry into tropical environments are still unknown yet they are crucial for understanding the role and origins of late Pleistocene cultures in northern South America (Gruhn et al. 1977; Pearson 2017).

Therefore, an important goal for Paleoamerican archaeologists today is to formulate Pan-American colonization models that integrate both North and South American archaeology into a single narrative. In an effort to fill in some of this information void, this dissertation presents a comprehensive, although not exhaustive, report on Terminal Pleistocene/early Holocene instances of human activity in the Middle American Isthmus and adjacent insular Caribbean regions.

This dissertation will address the understudied Paleoamerican time period for this region, a pivot point between North American Clovis, South American Fell points, and other lithic types. It synthesizes and builds on available literature, as well as new data obtained through a brief visit in 2017 to the paleontological site of Chivacabé, in the western highlands of Guatemala, in order to more effectively address the larger questions concerning the peopling of Middle America.

The research presented here follows a three-article format (Chapters). It employs as a point of departure the available corpus of terminal Pleistocene/Early Holocene Middle American data in order to expand the details of the documented instances of the

[3] Besides the difficulties presented by some areas of Middle America, such as the environment and detectability (e.g., tropical lowlands have low visibility), the Paleoamerican record for Middle America is limited due to a lack of research focusing on that time period in the area. Most archaeological research tends to focus on the great urban Mesoamerican civilizations of the last three millennia.

earliest human activity in the region. The specific aims and objectives of the three Sections are: (Chapter 2) to generate a comprehensive corpus of Paleo-Middle American data, and a descriptive synthesis of the various sites and lithic technologies; (Chapter 3) to examine the morphological and technological variations of the two most pervasive Paleoamerican lithic technologies in the Middle America: Clovis-like lanceolate fluted points and Fell-like South American stemmed points. Based on preliminary morphological and technological observations of these two lithic forms, I argue for independent origins for both of these traditions and bi-directional movement between South and North America, which may have existed along the now submerged late Pleistocene Pacific and circum-Gulf/Caribbean coasts; and (Chapter 4) elaborates on and assembles the research focusing on the very few existent studies on late Pleistocene megafauna in the region, as well as utilize the site of Chivacabé (Huehuetenango, Guatemala) as a descriptive study for potential evidence on paleontological remains with possible cultural modifications. Collectively, these chapters aim to provide a more holistic understanding of early human presence in Middle America and thereby bridge existing literature and debates for the two larger and better studied areas (North and South America).

Chapter 2

2. Terminal Pleistocene/early Holocene archaeological record of Middle America and the Caribbean

According to Bray (1978, 1980), the earliest discovery of a fluted point in Middle America was reported by Fray Francisco Ximenez who lived in Guatemala in 1722. However, Ximenez's description has been interpreted in different ways (Rovner 1980), and without an available drawing of the object in question, it remains a subjective matter with many equally valid explanations. The first unequivocal Middle American Clovis-like point was discovered on the Pacific Coast of Costa Rica and purchased by archaeologist C. V. Hartman in 1903 (Swauger and Mayer-Oakes 1952). The point was not recognized as particularly significant at the time and its exact provenience is unknown, but it has been suggested that the point was discovered at Las Huacas, near Nicoya (Bird and Cooke 1978, 263). Since then, diagnostic early Paleoamerican points have been recovered in all Middle Americans countries except Nicaragua and the Caribbean Islands. Figure 1 presents the geographic distribution of sites where Paleoamerican projectile points have been reported.

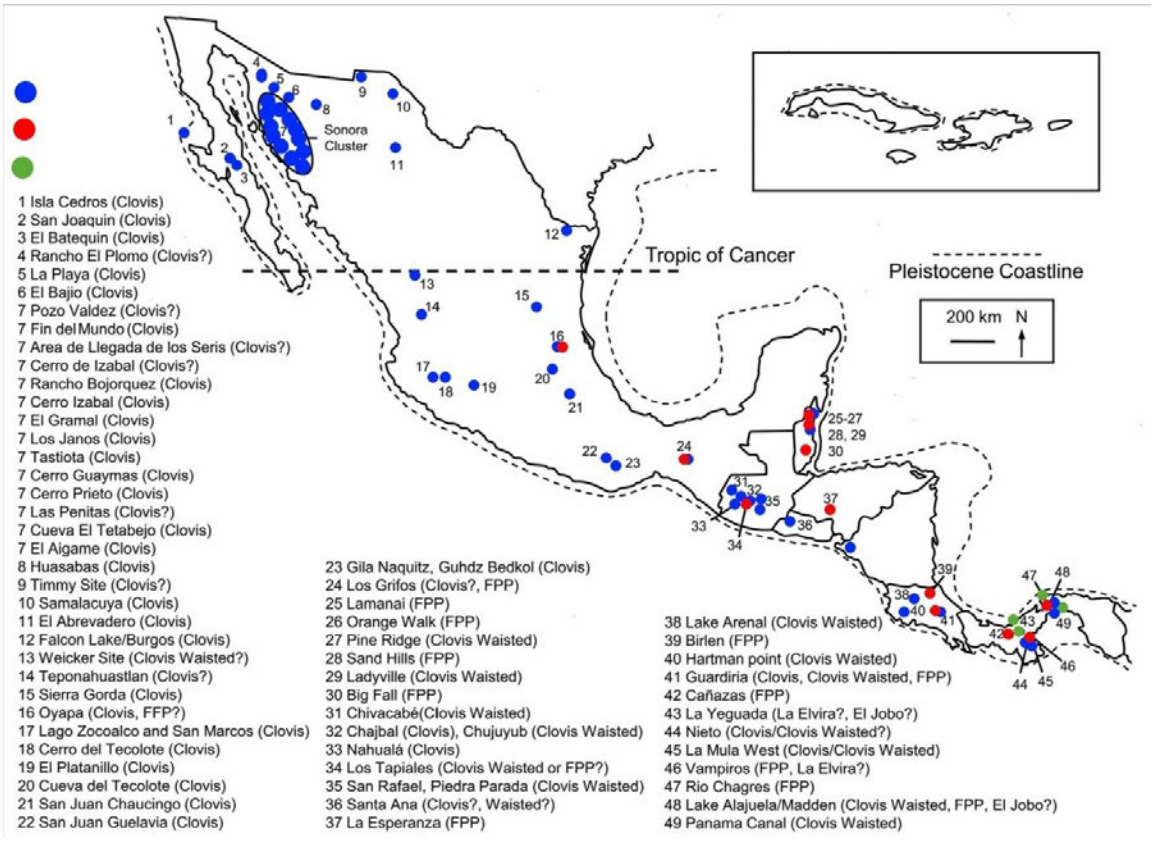


Figure 1. Map of Middle America showing archaeological sites containing diagnostic early Paleoamerican points. Blue: Clovis-like points; Red: Fell-like points (FPP); Green: El Jobo, Elvira points. Adapted and modified from Pearson 2004.

2.1. Geographic distribution of Paleoamerican projectile points in Middle America

2.1.1. Clovis-like points

Starting in Mexico, we notice a large concentration of lanceolate fluted points on the eastern side of the Gulf of California (Sonora Cluster). Some of these are clearly associated with classic Clovis (Sánchez 2015; Sánchez and Carpenter 2015; Sánchez et al. 2014) and represent a southern extension of its province. In Central America proper, in Belize, two Clovis-like points were collected at the Ladyville site (Hester 1979; Hester

et al. 1982; Hester, Kelly, and Ligabue 1981; Hester, Shafer, and Kelly 1980a; MacNeish et al. 1980) and a third at the Pine Ridge locality (Lohse et al. 2006; Valdez and Aylesworth 2005). Further south, a complete fluted point made of obsidian was discovered in 1956 near San Rafael, Guatemala (Coe 1960). Years later, the base of an additional fluted point was discovered at Los Tapiales (Gruhn and Bryan 1977), as well as a complete specimen from the Chajbal localities in the Quiché Basin (Brown 1980). Other sporadic finds were recorded at the Chivacabé, Chujuyub, Nahualá, Las Verapaces, and Piedra Parada sites (Perrot Minnot 2013, 2014) (Fig. 2). Two obsidian fluted bases with lateral grinding were also discovered near Santa Ana, El Salvador. Unfortunately these points belonged to a collector who did not disclose their context or exact location (Sheets 2000:44). Clovis-like points have not been reported in Honduras or Nicaragua, and one must jump from El Salvador to Costa Rica to find the next examples. Since the discovery of the Hartman point in 1903, a minimum of 19 finished points and fluted preforms have been discovered at the Guardiria site located in the Turrialba Valley of central Costa Rica (Acuña 2000; Snarskis 1979; ValerioLobo 2004). A nearly-complete specimen was also discovered on the shore of Lake Arenal during the Proyecto Prehistorico Arenal (Sheets and McKee 1994). In Panama, two Clovis-like points were discovered along the Canal Zone (Balboa and Lake Alajuela), with an additional 17 fluted fragments and numerous broken bifacial pieces from the La Mula-West site (Fig. 3) (Cooke 1998; Cooke and Ranere 1992b; Ranere 2000; Ranere and Cooke 1995, 1996, 2002). Finally, a broken preform (Fig. 3), a base, and a possible channel flake made from

translucent quartz were discovered at the Nieto quarry-workshop located on the Azuero Peninsula (Pearson 2002, 2003).

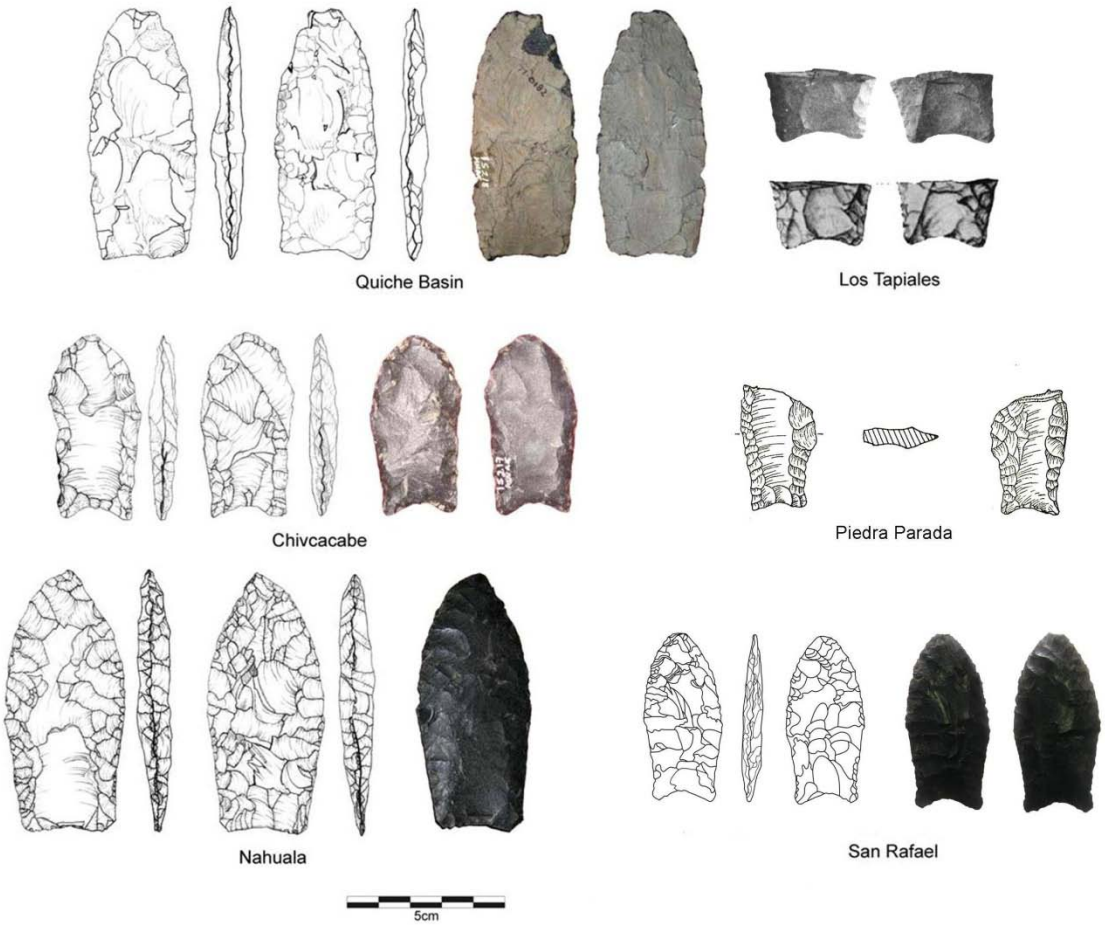


Figure 2: Reported fluted Clovis-like projectile points from Guatemala. Modified from Lohse and Paiz (2010).

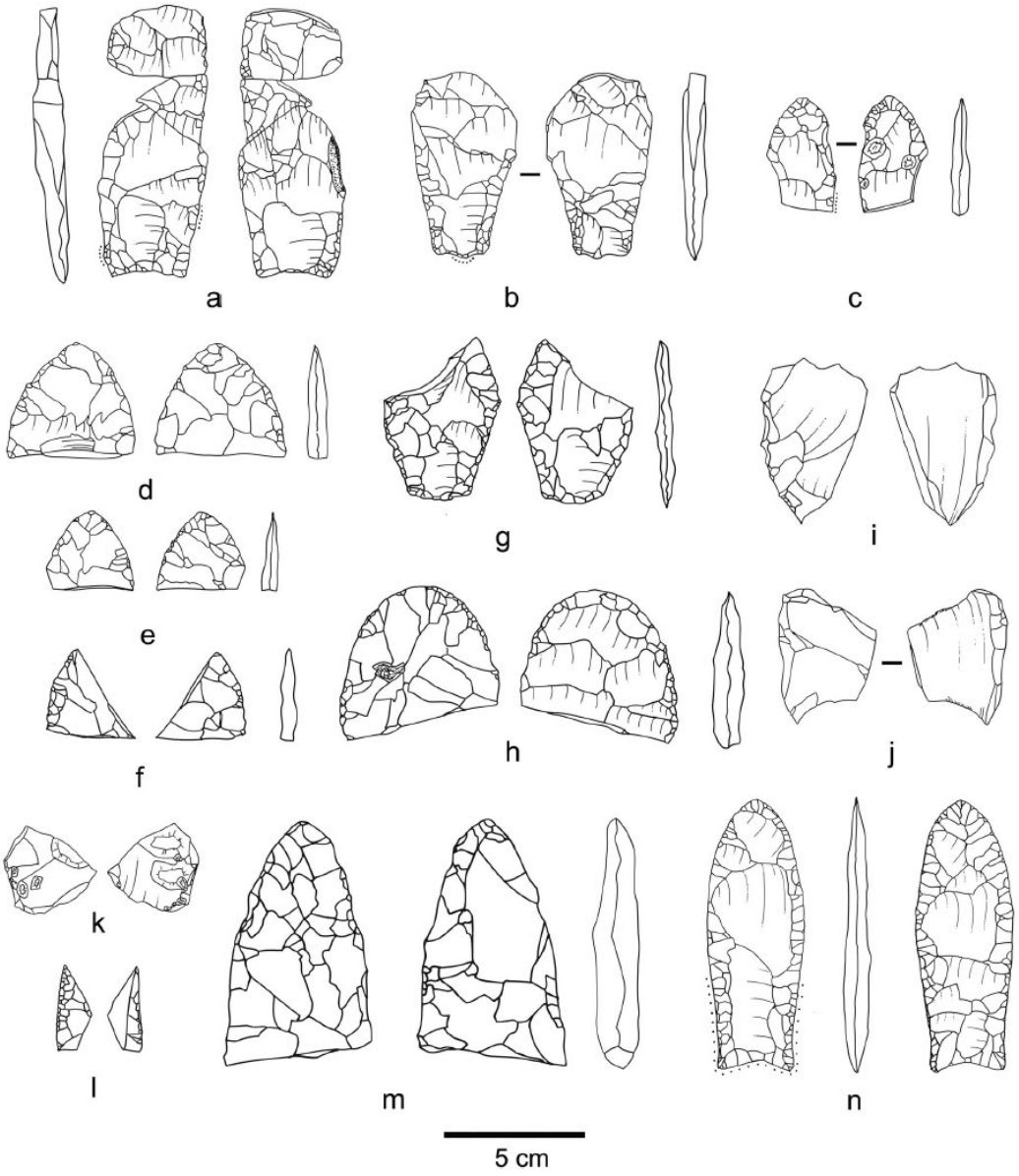


Figure 4 Fluted points and related stone artifacts from Panama and Florida. La Mula-West: projectile points (a–c); Vampiros Cave: projectile points (d–g), biface fragment (h), overshooting flakes (i–l); Nieto Quarry: projectile point preform (m); Ross County Point (n) from Sloth Hole, Florida (Hemmings 1999a, b).

Figure 3: Fluted points and related stone artifacts from Panama and Florida. La Mula-West: projectile points (a-c); Vampiros Cave: projectile points (d-g), biface fragment (h), overshooting flakes (i-l); Nieto Quarry: projectile point perform (m); Ross County projectile point (n) from Sloth Hole, Florida (Hemmings 1999). Adapted from Pearson 2004 and Ranere 2006.

2.1.2. Fell-like points (Fishtail projectile points, FPP)

At least 20 Fell-like points have been discovered in Middle America. As with Clovis-like points, the majority were recovered from undatable open air sites. The northernmost examples were discovered at Los Grifos in Ocozocoautla, Chiapas (García-Bárcena 1979; Santamaria 1981) and possibly at Oyapa (Cassiano and Vázquez 1990; Cassiano and Alvarez Palma 2007) in Mexico. Four others were reported from Belize (Lohse et al. 2006; MacNeish et al. 1980; Pearson and Bostrom 1998), with an additional two fluted stemmed points from La Esperanza in Honduras (Bullen and Plowden 1963). A total of three complete and fragmented Fell points were recovered at Guardiria (Snarskis 1979; Valerio-Lobo 2004) as well as an isolated find at the Birlen site (León 2006) in Costa Rica. In Panama, a total of six Fell points were discovered along the exposed shoreline of small islands in Lake Alajuela (Bird and Cooke 1977, 1978; Ranere and Cooke 1991; Sander 1959, 1964). Other examples from the isthmus were discovered in Cañazas (Ranere and Cooke 2002), Vampiros Cave (Fig. 3) (Pearson 2002), and the Chagres River (Cooke et al. 2013).

2.1.3. Other Paleoamerican projectile points

Only a handful of Folsom and perhaps as many as 58 late Paleoamerican projectiles points been discovered south of the Rio Grande (Pearson 2002, table 6). Most of these are Plainview points from northern and central Mexico (Epstein 1961, 1969; MacNeish, Nelken-Terner, and Johnson 1967; Sánchez 2015; Sánchez and Carpenter 2015), with one example from Belize (MacNeish et al. 1980). Two possible Clovis points of the Cody type have also been reported from the Mexican Basin (Aveleyra 1956, 1964),

demonstrating that bison ranges and the groups that relied on them for subsistence may not have been restricted to North America. More equivocal are 27 Agate Basin specimens reported from the Tehuacan Valley by MacNeish, Nelken Terner, and Johnson (1967, 62). Stemp, Awe, and Helmke (2016) recently reported a wide stemmed point from Ladyville, Belize.

Other early point types usually associated with South American groups have also been found in Middle America. Among these are two possible El Jobo points recently reported from Panama. The first consists of an apparent base fragment recovered on the surface of a quarry/workshop during a survey at Lake La Yeguada (Pearson 2000, 2002), while the other is a small mid-section found on the surface near Lake Alajuela by Junius Bird (Cooke et al. 2013; Ranere and Cooke 2002). It is important to highlight that these points are incomplete and their affiliation with El Jobo assemblages from Venezuela must remain tentative. A stemmed point with a flute like basal thinning scar was also discovered at Lake La Yeguada in 1999 (Pearson 2000, 2002). This point was fashioned on a jasper flake and recalls broad stemmed examples from El Inga in Ecuador (Bell 1965; Mayer-Oakes 1986b) and La Elvira in Colombia (Gnecco and Illera 1989; Illera and Gnecco 1986). Another pentagonal example resembling those from La Elvira and Quebrada Santa Julia in Chile (Jackson et al. 2007; Méndez, Jackson, and Seguel 2007) was discovered in 2004 during the excavations at Vampiros Cave. The point was manufactured on purple jasper and is fluted on both sides. Although its tip is missing, it displays an expanding base that contracts at an angle toward the middle. The discovery of possible El Jobo and La Elvira points in Panama would extend the geographic

distributions of these types and also suggest widespread contacts, mobility and/or technological transfer amongst existing populations between Panama and northern South America during the terminal Pleistocene.

2.1.4. "Paleo-Indian" projectile points in the Caribbean Islands

Although the term "Paleo-Indian" has been used on several occasions to describe the earliest insular populations (Cruxent and Rouse 1969; Kowzlowski 1974, 1980), late Pleistocene diagnostic projectile points have yet to be discovered on the islands (Bullen 1976; Fitzpatrick 2015). Thus far, the oldest human occupations in Cuba belong to the Seboruco-Mordán complex and date to approximately 6,400 cal yr BP (Ulloa Hung and Valcárcel Rojas 2014). The Casimiroid complex of Hispaniola is thought to be about 6,000 cal yr BP (Callaghan 2003; Cruxent and Rouse 1969; Perrot-Minnot 2015; Rouse and Allaire 1976).

One of the models put forth to explain the colonization of the Caribbean Islands traces the origins of the earliest migrants to the El Jobo and El Inga industries of Venezuela and Ecuador (Kowzlowski 1974, 1980; Raggi Ageo 1973; Veloz Maggiolo and Martin 1981; Veloz Maggiolo and Vega 1982). For instance, Veloz Maggiolo and Martin (1981; also Veloz Maggiolo and Vega 1982) have argued that the macroblades and keeled scrapers characterizing the Mordanoid complex resemble unifacial tools found in El Jobo assemblages. Based on these similarities, the authors suggest that the first humans that navigated to the islands were descendants of early Venezuelan Paleoamericans. Interestingly, this idea might get some support by models based on

present-day sea currents that indicate that it is easier to colonize the Greater Antilles from Venezuela than Middle America (Callaghan 2003). However, it would be interesting to examine the flow of these currents during the LGM and Terminal Pleistocene due to continental shelf exposure and the greater size of the Caribbean islands.

2.2. Technological and typological characteristics of Middle American Paleoamerican lithic industries

The earliest lithic assemblages of Middle America can be described as flake core industries. Paleoamerican tools and projectile points were manufactured on flakes and blade-like flakes. Blanks were struck from primary and secondary source lithic materials sometimes following a distinct rotating core reduction technique that removed the distal ends of cores to create new striking platforms (Pearson 1998, 2004). Such discarded core bases were found at Guardiria, Nieto, and Vampiros Cave (Pearson 2002; Ranere 2006).

Fluted lanceolate Clovis-like points were produced by multi-stage, bifacial reduction of large flake blanks to achieve desired shape and thinness. At La Mula-West and Nieto, Clovis-like points were manufactured on large and relatively thick flake blanks. Early stage reduction consisted of: (1) flattening the ventral side of blanks by removing their bulb of force and striking platform; and (2) removing high ridges on dorsal surfaces by detaching a series of thinning flakes around the periphery of the piece (Pearson 2004, Ranere 2006). Consequently, before true bifacial flaking began, a number of early stage preforms appeared like unifacial tools with plano-convex cross sections. Lateral thinning flakes were often detached after isolating and grinding platforms on the margins of these preforms. These flakes were struck with great force and at an angle that

would cause them to travel across the preform's entire face (*outré passé*). This strategy effectively flattened the pieces and often produced overshooting flakes. Generally speaking, the low number of dorsal scars and the presence of square or flat edges on the distal ends of overshot flakes (e.g., Guardiria, La Yeguada, La Mula-West, and Vampiros Cave) indicate that this technique was commonly used in the initial stages of reduction (Fig.??). End thinning and the removal of flute-like flakes were also carried out to eliminate occasional high central ridges on preforms throughout the reduction process. Projectile points had bi-convex or lenticular cross-sections, and flaking patterns were mostly horizontal with occasional diagonal retouch (Pearson 1998, 2004, 2017; Ranere 2006). A noteworthy aspect of the La Mula-West assemblage is that despite the fact that the majority of its bifacial artifacts are incomplete, almost none display remnant surfaces of the original flake blanks.

Fell points, on the other hand, began as large, flat flakes (Bird and Cooke 1978; Morrow and Morrow 1999; Ranere and Cooke 1991) that were bifacially thinned by removing a series of expanding flakes from opposite margins. These flakes overlapped at the points' mid-line often leaving their central surfaces thinner than their edges. Unlike their lanceolate counterparts, however, overshooting flake scars have yet to be observed on any specimen. Final shaping was accomplished using bimarginal percussion and pressure (Pearson and Bostrom 1998; Ranere and Cooke 1991). On occasion, sufficiently flat and thin flake blanks required only a minimum of bimarginal retouch to obtain a finished tool. Such points exhibit large intact portions of the original flake blank's ventral surface which appear as pseudo flutes (Bird 1969). Over all, blades on Fell points are

wider, thinner, display flattened cross sections, and have larger tip angles than lanceolate points. Shoulders are generally round above concave and ground bases (Bird and Cooke 1978; MacNeish et al. 1980; Pearson and Bostrom 1998). In addition to projectiles points, other similarities as well as key differences have been observed between Middle and North Paleoamerican tool kits. For example, there is a noticeable absence of large prismatic blades in Middle American lithic assemblages.

At the same time, macroblades and large polyhedral blade cores, often found at classic Clovis sites, are almost non-existent south of Mexico. Although Gruhn and Bryan (1977) illustrate two triangular blades discovered at Los Tapiales, these examples are small (Gruhn and Bryan 1977), and no Clovis-like blade cores or blade manufacturing by-products were found during the excavations. Brown (1980) also noted an absence of blade tools among the artifacts collected at other Guatemalan localities in the Quiché Basin. The lithic assemblage from Guardiria contained many blade-like flakes and ridge spalls, but true prismatic macroblades and manufacturing by-products, such as exhausted cores and rejuvenation tablets, were not present (Pearson 2002). Blades from La Mula-West and Nieto (Fig.??) are also smaller than North American examples, but the brittle nature of the lithic raw materials found at these localities could explain their diminutive size. With the exception of a single broken specimen from Lake Alajuela (Pearson 2002), true macroblade production has yet to be identified in Middle American fluted point sites. Nevertheless, it is possible that this gap is more apparent than real considering that large blade and conical cores were discovered on the surface of the El Cayude Clovis-like site in Venezuela (Szabadics Roka 1997).

Other types of tools found with fluted point assemblages in Panama and Costa Rica include spurred end scrapers, various types of gravers, keeled scrapers, and large scraper planes fashioned on blade-like flakes. Some of these scraping tools were manufactured on large triangular or trapezoidal blade-like flakes and shaped by bifacial or trihedral reduction. Observations of the working surfaces reveal that great efforts were made to flatten the ventral side of these large scraping tools. Irregularities, such as the bulb of force and excessive curvature, were corrected by striking the blank's edges at very low angle to detach large flakes that would terminate in hinge or step fractures. This tactic ensured that the retouch itself did not plunge and compound the initial problem and is comparable to core platform rejuvenation removals (Pearson 2002, 2004).

With the exception of projectile points and certain scrapers, there appears to be an absence of formalized lithic tool types in Middle America. Most tools were fashioned on ill-defined flakes with no real standardization in shape or form. Perhaps settlement patterns based on a more generalized economy as well as the quality and quantity of seasonal resources and lithic raw materials may have precluded the need to cache and curate formalized tool kits as is the case on some North American sites.

2.3. Chronology

Very few radiocarbon dates from secure deposits and reliable association have come from Middle America. A Classic Clovis kill or scavenging site and associated camp at El Fin del Mundo in Sonora Mexico, provided an approximate age of 13,390 cal yr BP for this occupation (Sánchez et al. 2014). At the Los Grifos Cave, an unfluted lanceolate

point and two Fell points were discovered in a stratigraphic unit bracketed between 9,460 and 8,930 14C yr BP (Acosta Ochoa 2010, 2011; Santamaria 1981). Additional lithic artifacts associated with a separate radiocarbon date of 9,540 14C yr BP and an obsidian hydration date of 9,330 BP were also discovered below these points. Unfortunately, several problems with the integrity of the cave's deposits have made it difficult to assess these results.

At Los Tapiales in Guatemala, a total of 10 radiocarbon dates were secured from charcoal samples recovered from hearth features as well as from scattered fragments lying on possible living floors (Gruhn and Bryan 1977). However, the investigators rejected these dates as being too young due to possible contamination. Based on the oldest dates and on stratigraphic comparisons with the nearby-dated deposits from Piedra del Coyote, Gruhn and Bryan suggest Los Tapiales was occupied approximately 10,700 14C yr BP (Gruhn and Bryan 1977, 245). Attempts to date the cultural material at the Guardiria site in Costa Rica were carried out using river terraces as relative horizontal time markers. Interestingly, the Clovis-like material lay on the highest terrace while the complete Fell-like lithic was discovered on the lowermost suggesting that it might be younger (Castillo et al. 1987; Ranere and Cooke 1991). Although fluted points from the La Mula-West site in Panama have not been dated, it is worth noting that several years prior to their discovery Crusoe and Felton (1974) located an 11,350 ± 250 (FSU-300) 14C yr BP hearth in the same area. Additional early radiocarbon dates have come from rockshelters discovered during a survey of the Santa Maria watershed in the mid-1980s (Cooke and Ranere 1984, 1992a; Lange 1984). One of these, the Corona rockshelter,

contained evidence of a bifacial industry dated at 10,440 ± 650 14C yr BP (Beta-19105) (Cooke and Ranere 1992b, Cooke et al. 2013; Valerio-Lobo 1985). At the Aguadulce Rockshelter, dates of 10,725 ± 80 (NZA10930) and 10,529 ± 184 (NZA-9622) 14C yr BP were obtained on phytoliths from a level containing a bifacial industry (Piperno et al. 2000). Lastly, excavations at the Vampiros Cave unearthed a fluted point occupation dating between 11,050 and 10,300 14C yr BP (Cooke et al. 2013; Pearson 2002) (see Table 1).

Country	Site	Lab No.	^{14}C Date	Material	Remarks	Reference
Mexico	Los Grifos	1-10762	9,540 ± 150	Charcoal?	Under fluted points and FTPPs	Santamaria 1981
Mexico	Los Grifos	1-10761	9,460 ± 150	Charcoal?	Under fluted points and FTPPs	Santamaria 1981
Mexico	Los Grifos	—	*9,330	Obsidian	Under fluted points and FTPPs	Santamaria 1981
Mexico	Los Grifos	I-10760	8,930 ± 150	Charcoal?	Above fluted points and FTPPs	Santamaria 1981
Guatemala	Los Tapiales	GaK-4885	4,730 ± 100	Hearth charcoal	Rejected	Gruhn and Bryan 1977
Guatemala	Los Tapiales	GaK-4886	4,790 ± 100	Charcoal		Gruhn and Bryan 1977
Guatemala	Los Tapiales	GaK-4887	7,150 ± 130	Hearth charcoal	Rejected	Gruhn and Bryan 1977
Guatemala	Los Tapiales	GaK-2769	7,550 ± 150	Charcoal		Gruhn and Bryan 1977
Guatemala	Los Tapiales	GaK-4888	7,820 ± 140	Hearth charcoal	Rejected	Gruhn and Bryan 1977
Guatemala	Los Tapiales	Birm-703	7,960 ± 160	Charcoal		Gruhn and Bryan 1977
Guatemala	Los Tapiales	Tx-1630	8,810 ± 110	Charcoal		Gruhn and Bryan 1977
Guatemala	Los Tapiales	GaK-4890	9,860 ± 185	Charcoal		Gruhn and Bryan 1977
Guatemala	Los Tapiales	Tx-1631	10,710 ± 170	Charcoal	Accepted age of site	Gruhn and Bryan 1977
Guatemala	Los Tapiales	GaK-4889	11,170 ± 200	Charcoal		Gruhn and Bryan 1977
Guatemala	Piedra del Coyote	Tx-1633	5,320 ± 90	Charcoal	No diagnostics	Gruhn and Bryan 1977
Guatemala	Piedra del Coyote	Tx-1635	9,430 ± 120	Charcoal	No diagnostics	Gruhn and Bryan 1977
Guatemala	Piedra del Coyote	Tx-1634	10,020 ± 260	Charcoal	No diagnostics	Gruhn and Bryan 1977
Guatemala	Piedra del Coyote	Tx-1632	10,650 ± 1,350	Charcoal	No diagnostics	Gruhn and Bryan 1977
Panama	La Yeguada	Multiple assays	11,050	Charcoal	Average age for early forest clearing by humans	Piperno et al. 1991
Panama	Corona Rockshelter	Beta-19105	10,440 ± 650	Charcoal	No diagnostics	Cooke and Ranere 1992b:120
Panama	Alvina de Parita	FSU-300	11,350 ± 250	Hearth charcoal		Crusoe and Felton 1974
Panama	Aguadulce Rockshelter	NZA-9622	10,529 ± 184	Phytoliths		Piperno et al. 2000
Panama	Aguadulce Rockshelter	NZA-10930	10,725 ± 80	Phytoliths		Piperno et al. 2000
Panama	Cueva Los Vampiros	Beta-5101	8,560 ± 650	Charcoal	No diagnostics	Cooke and Ranere 1984

*n = 23 uncalibrated radiometric dates (Mexico 3; Guatemala 14; Panama 6);*1 obsidian hydration dating (Mexico 1)*

Table 1: Radiocarbon Dates (uncalibrated) from Middle American fluted point sites.

2.4. Paleo-Middle American Human Remains

Although rare, the osteological remains of Paleoamerican age in the Yucatán Peninsula offer the best direct evidence for terminal Pleistocene human presence in this region (see Table 2). In Chiapas, Mexico, a molar from Los Grifos associated with a stratum dated to c. 11,500 BP is the only human remains dating to this period (Pompa and

Serrano 2001). In 2000, an underwater-cave archaeological project identified human bones inside three submerged caves near the coast of Quintana Roo, Mexico (González et al. 2006; González et al. 2005). These skeletons, apparently deposited in the caves along with charcoal from fire pits, indicate human occupation of the caverns prior to the rise in sea level towards the end of the Pleistocene. The Las Palmas cave skeleton is c. 10,100 BP, and the remains from the Naharon cave is c. 13,600 BP, making the latter one of the few potential older than Clovis human remains in the Americas (González et al. 2006; González et al. 2005). More recently, Chatters et al. (2014) report from the Hoyo Negro site a near complete human skeleton with an intact cranium and preserved ancient mtDNA (Haplogroup D1) dated to c. 13,000-12,000 BP.

Cave	Sample	Material	14C Date	Calibrated age (1 sigma)	Calibrated age (2 sigma)	Reference
Naharon	UCR-4000	Human bone	11,670 ± 60	13,610– 13,430	13,700- 13,370	Gonzalez et al. 2008
Las Palmas	UGA-6828	Human bone	8,050 ± 130	9,130– 8,710	9,400– 8,550	Gonzalez et al. 2008
	INAH-2123	Charcoal	8,941 ± 39	10,200– 9,940	10,210– 9910	Gonzalez et al. 2008
	INAH-2119	Charcoal	7,740 ± 39	8,560– 8,450	8,600– 8,430	Gonzalez et al. 2008
Aktun Ha	Beta-1666199	Charcoal	9,180 ± 60	10,410– 10,250	10,500– 10,230	Gonzalez et al. 2008
	INAH-2009	Charcoal	9,318 ± 37	10,580– 10,440	10,660– 10,400	Gonzalez et al. 2008
	INAH-2011	Charcoal	9,139 ± 23	10,285– 10,235	10,390– 10,230	Gonzalez et al. 2008
	UGA-6637	Charcoal	9,524 ± 84	11,080– 10,690	11,150– 10,550	Gonzalez et al. 2008
Hoyo Negro	UCIAMS-119438	Human tooth	10,976 ± 20	--	12,910- 11,750	Chatters et al. 2014

Table 2: Radiocarbon ages obtained by analyses of samples from submerged caves on the Yucatan peninsula (Quintana Roo).

Archaeological testimonies, such as "kill sites"[4] and art or ritual attributable to the Paleoamerican period, attested in North and South America, have not been identified in

[4] A possible exception could be the 14 Columbian mammoths (*Mammuthus colombi*) unearthed 6 feet below ground in Tultepec, Mexico in December 2015 dated to c. 15-12 kya. There has been no formal publication of the find to date.

Middle America. An exception could be a petroglyph carved on a boulder from Baja Vera Paz, central Guatemalan highlands, that may portray a schematic depiction of a proboscidean (Ericastilla, personal communication 2017; Sharer and Sedat 1987:247-248, Plate 13.3a and b, 13.4) (see Figure 4). If the petroglyph portrays an extinct proboscidean and if it is of corresponding antiquity, it would be only the second example of Paleoamerican art depicting Pleistocene megafauna. The example in existence is a fossil bone with an incised figure of a mammoth from Vero Beach, Florida dated to c. 13,000 BP (Purdy et al. 2011).

Figure 4: Petroglyph from Baja Vera Paz region, central Guatemala highlands presumably portraying a schematic depiction of an extinct proboscidian (Photograph by Julio Avila, courtesy of Sergio Ericastilla Godoy and Otto García).

2.5. Summary and interpretations

Irrespective of the antiquity of human presence in the Americas, an archaeological context that predates Clovis or Fell points in Middle America has yet to be confirmed, with the only possible exception of the Chiquihuite Cave site and its very intriguing lithic typology dated to c. 33,000-26,000 BP (Ardelean et al. 2020). Researchers have argued for a human occupation of Middle America by at least 20-30 kya, including many sites in the Basin of Mexico (Lorenzo and Mirambell 1986), Loltún Cave, Yucatán (Arroyo-Cabrales and Álvarez 2003), and El Bosque, Nicaragua (Page 1978). However, their validity is questioned due to uncertainties in stratigraphic integrity and ambiguous artifacts (Meltzer 2004; Stanford 1982). Similar problems are found at sites of the Valsequillo reservoir, south of Puebla, where Irwin-Williams (1967) recovered a scraper associated with a shell dated to c. 20,000 BP. The hypothesis of an older than Clovis occupation in La Isla (Costa Rica) was based on the patina on lithic material apparently from a volcanic deposit of c. 17,000 years ago, but the association is problematic (Chávez Montoya 2016).

As such, the materials reported in this chapter have clustered primarily around a time bracket of c. 13,000-6,000 BP, which its oldest dates fall within Paleoamerican age materials. This work in progress and preliminary research suggests two things: (1) evidence of Paleo-Middle American activity is scarce and fragmentary, with less than 35 sites reported (using "site" in a very broad sense; Figure 1); and (2) only a handful have

been archaeologically excavated, producing only 14 absolute dates of Paleoamerican age (Table 2).

This is in part due to the lack of Paleolithic archaeology in the region. Yet, some sites (Turrialba, Costa Rica; Nieto, Panama; and possibly, BAAR 26, Belize) have allowed for the identification of camps of variable sizes, workshops, and quarries (Pearson 2004; Perrot-Minot 2013). The Turrialba site (~10 hectares) constitutes the most extensive Paleoamerican settlement known in Central America. Paleoamerican vestiges are located in varied geographic zones: along the present Pacific and the Caribbean Sea coasts, the base of mountains, and mountain ranges of up to an altitude of 3,300masl, as in the cases of Los Tapiales and La Piedra del Coyote, Highland Guatemala. However, about half of the "sites" have been discoveries of isolated objects without archaeological context. As a consequence more data is needed and it is difficult to undertake general assessments on Paleoamerican demography in the region.

Characteristics of the Clovis toolkit have been recognized in roughly 15 sites, mainly as projectile points, but also in the form of scrapers (some with lateral spurs), gravers, and burins. The toolkits associated with fluted points at sites like Los Tapiales, Guatemala (although this could be a fluted Fell point (see Figure 2), and Los Grifos, Chiapas, indicate that their subsistence was dependent upon hunting, with specialized tools for defleshing game and preparing skins (Perrot-Minnot 2013). At Los Grifos, the faunal remains associated with the Clovis occupation are derived from medium-sized game like white-tail deer (*Odocoileus* sp.), peccary (*Tayassu* sp.), and Pleistocene horse (*Equus* sp.) (Acosta Ochoa 2010). Fell points have also been found in a similar number

of Middle American sites. Interestingly, both traditions were observed in the deposits of Los Grifos (Chiapas), Ladyville 1 (Belize), Turrialba (Costa Rica) and Los Vampiros (Panama) (Pearson 2004). It is tempting to explain this "co-habitation" as the meeting of different groups, but additional fieldwork is necessary to corroborate this proposal (Perrot-Minnot 2012).

Two point fragments collected in Panama (near La Yeguada and Alajuela lakes) appear to be of South American El Jobo type (Pearson 2004). El Jobo points have been primarily reported in Venezuela, and the assemblage could be older than Clovis and Fell traditions, although its antiquity remains uncertain (Pearson 2004; Pearson and Ream 2005). A projectile point from the pre-Clovis site of Monte Verde, Chile (c. 18,500-14,600 BP), is intriguing, as it might also be of El Jobo type (Pearson 2004; Dillehay 2000). There are Lerma points in Chiapas and possibly one that I documented in the summer of 2017 (Museo Popol Vuh, Guatemala, see Figure 4 below). Plainview points are also found in Belize and Yucatan (Acosta Ochoa 2010; Zeitlin 1984), and both of these point types are present in the North American Paleoamerican record. Apart from projectile points, in Turrialba (Costa Rica), Nieto and La Mula West (Panama), it is also possible to examine in some detail the *chaîne opératoire* (operational sequence, see Chapter 2) of bifacial point reduction (Pearson 2004). At the same time, in Los Grifos (Chiapas), Santa Marta (Chiapas), Cueva del Gigante (Honduras) and Los Vampiros (Panama), remains of plants and animals used in human subsistence can be associated with cultural levels (Acosta Ochoa 2010; Pearson and Cooke 2007; Scheffler et al. 2012).

El Gigante rock shelter in western Honduras (c. 9,000 BP; Esperanza Phase) present a type of points that have bifurcated stems, and each has a distinctive thinning flake removed by hard percussion from the base. These facets may have acted in the same way as flutes for facilitating the hafting of these points to a foreshaft. However, they appear to have been removed as one of the final acts in the production of these points rather than during the process of manufacture as common of truly fluted points. These points are not of the lanceolate or fishtail fluted point varieties. Although an isolated find without archaeological control, I was able to identify one of these points in the summer of 2017 in the collections of the Museo Popol Vuh, Guatemala (see Fig. 5)

Figure 5: Top row: two views of a potential Esperanza projectile found in the Museo Popol Vuh, Guatemala in 2017. Middle row: Two projectile points from from El Gigante Rockshelter Honduras, dated to c. 9,000 BP (Scheffler et al. 2012). Bottom: A potential Lerma point found in the Museo Popol Vuh, Guatemala in 2017

Moreover, it is also worth noting that Paleoamerican sites in the Guatemalan Quiché Area: Los Tapiales, Chajbal, and Chujuyub, are centrally located near major potentially navigable river systems: Usumacinta and Motagua that drain towards the Gulf of Mexico and the Atlantic, respectively; and Samalá and Nahualate that flow into the Pacific. This could suggest maritime-adapted groups using coastal and riverine routes into the mainland. The discovery of numerous coastal sites older than Clovis in North

and South America (Dillehay et al. 2015; Jenkins et al. 2012; Lahaye et al. 2013; Wah et al. 2014), and of human remains with dates slightly prior to the appearance of fluted points in submerged caves in Yucatan may suggests that the coastal areas were probably settled prior to the Clovis and Fell horizons.

Concerning the Paleoamerican site distribution in Middle America, aside from Panama (where both oceans are in relative proximity), there is only a single site on the Pacific coast in Costa Rica (Pearson 2004). Moreover, paleoenvironmental studies carried out on the Pacific coast of Guatemala showed no occupation before the Archaic period [nothing older than c. 6,000 BP] (Neff et al., 2003). On the other hand, four sites have been reported on the Central American Caribbean coast (Yucatan and Belize), and from Yucatan to Panama, no less than 20 sites have easy access to the Caribbean Sea, due to the distance, topography and riverine routes. While the Middle Paleoamerican cultural links between Central America and Florida are vague, the early period interactions are much clearer. Ross County Clovis variants, primarily found in the Ohio River valley, Tennessee River Basin, and the Great Lakes region, represent an unambiguous morphological and technological link between North and Middle America. These points have been found in the Florida panhandle (Hemmings 1999a; Tyler 2008), Texas (Long 1977), and other southeastern U.S. states (Perino 1971), which strengthens the idea of a circum-Gulf and Caribbean connection. This could imply an area of maritime/coastal cultural interaction along a now submerged terminal Pleistocene circum-Gulf/Caribbean coasts, between Florida and the delta area of the Mississippi with northern South America, perhaps with now submerged areas of insular Caribbean, and might suggest that

initial entries into Middle America were primarily achieved from the Atlantic littoral zone.

Chapter 3

3. Clovis-like and Fell-like Projectile Points in Middle America

Archaeologists have historically traced a putative expansion of early migrants across the Americas through the recovery of two projectile point types: bifacial fluted points in North America (Clovis points), and South American stemmed "Fish-Tail" projectile points (Fell points) (Meltzer 2010). The Clovis typology was first recognized in New Mexico, but these projectiles are found across the continental U.S. and as far south as Venezuela (Pearson and Ream 2005). Fell points, initially found in Fell's Cave located in the southernmost region of Chile, have been found as far north as Nacogdoches County, Texas (Collins and Ayala 2015). Clovis has been refined through ^{14}C dating to c. 13,200-12,800 BP (Waters and Stafford 2007); while the less precisely dated Fell point present a temporal range of c. 13,600-8,700 BP (Borrero et al. 1998; Pearson 2004; Politis 1991). A third lithic technology is the Western Stemmed tradition from western U.S. that is as early, if not older than Clovis and Fell (Jenkins et al. 2012).

An intriguing aspect of the Paleo-Middle American legacy is the coexistence of two great Paleomerican lithic traditions of the Americas: South American Fell points (occasionally fluted) and North American lanceolate bifaces (rarely unfluted) (Pearson 2004; Perrot-Minnot 2012; Morrow and Morrow 1999). This chapter presents an overview of the hypotheses over the presence of these two virtually contemporaneous traditions in Middle America. Two objectives can be achieved. First, the two lithic traditions serve as a case study to determine their techno-cultural relationship, if one gave

rise to the other or if they are of independent origin. Second, if of independent origin, then a tentative probe into respective potential ancestral lithic assemblages in the New World and/or Old World can be explored (e.g. Western Stemmed, Solutrean, etc.).

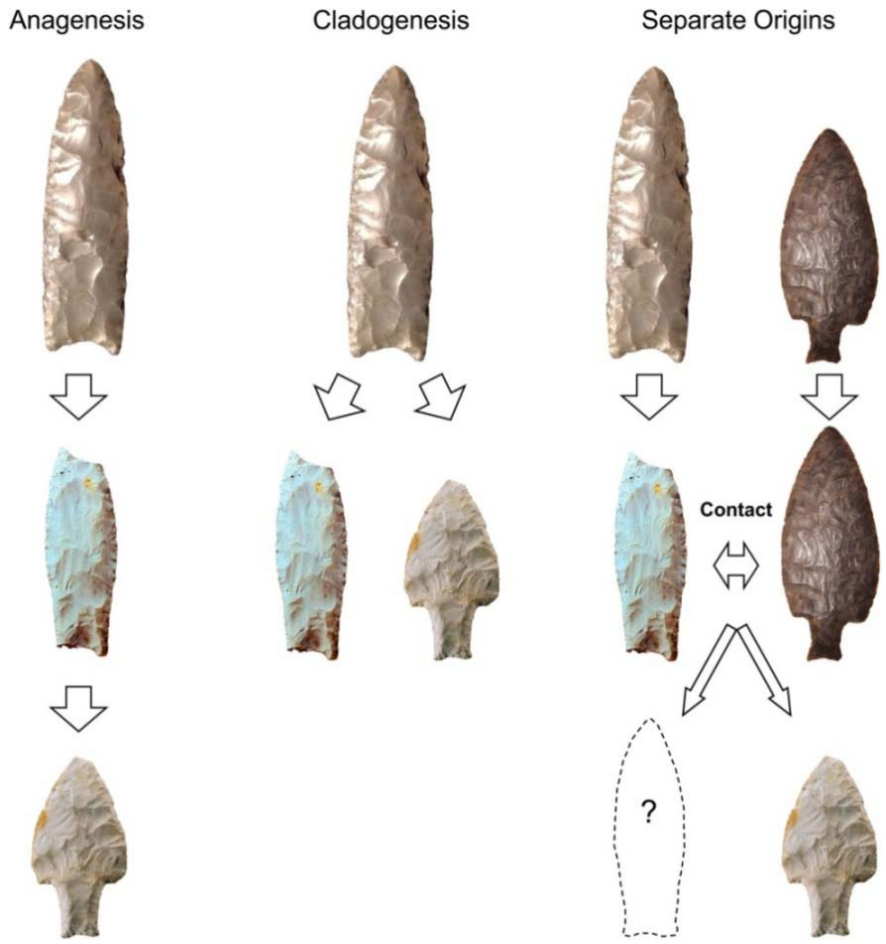


Figure 6: Diagrams demonstrating three current models used to explain the fluting technique in Middle and South America (projectiles depicted from Hester, Kelly, and Ligabue (1981, 1982); Loponte, Okumura, and Carbonera (2016); Pearson and Bostrom (1998)).

3.1. Current Models (Anagenesis, Cladogenesis, and Independent Origin)

Three different hypotheses (Fig. 6) are used to explain the origins of fluted Fell points and their relationship with Clovis (Bryan 1973; Morrow and Morrow 1999; Politis 1991; Ranere 2000; Snarskis 1979). Each carries its own set of assumptions and predictions, but all conclude that fluting was a Clovis innovation. It is interesting to note, however, that while Clovis points were typically made from large bifacial blanks (Bradley et al. 2010), Fell points were often made from flake blanks not much thicker than the finished points (Bird 1969). Given these differences in shape, technology and manufacture, some researchers assert the independence of the Fell lithics and see no strong connection to fluted bifacial points. In light of these divergent schools of production, the rarely discussed Restrepo points may be significant. Restrepo points from northern South America (primarily Colombia) are fluted bifacial projectiles displaying large flake scars (overshot flakes), bi-convex cross-sections, and stemmed bases (Ardila Calderon 1991). Hence, are these stemmed Clovis points, or are these fluted Fell points with bifacial transverse shots? Overall, despite their stemmed bases, Restrepo points seem to have more techno-morphological similarities with lanceolate projectiles than the Fell complex.

3.1.1. Model 1: Anagenesis (formation without branching from evolutionary line of descent)

This model holds that Fell points were the end product of a single evolutionary lineage, starting with parallel-sided Clovis points, changing to waisted forms, and ending with Fell points and other fluted stemmed types (Morrow and Morrow 1999; Ranere 2000; Snarskis 1979). If so, Fell points can never be as old as the oldest Clovis points. Under this scenario, point assemblages will display a continuum of techno-morphological traits spread over time, and similarities between Clovis and Fell points will decrease through time and space; the farther south Fell points are found, the less they will resemble Clovis, assuming no return migrations.

3.1.2. Model 2: Cladogenesis (formation of a new type through evolutionary divergence from ancestral form)

In the second model, Fell are the result of a single or multiple cultural divergence(s) that split Clovis into a new Fell or stemmed industry and one or more contemporaneous Clovis-like industries (Bryan 1973; Morrow and Morrow 1999; Politis 1991; Ranere 2000; Snarskis 1979). The chronological prediction of this model is the same as the first: Fell points can never be as old as the basal Clovis. Less geographic overlap between these projectile points is expected, if we assume that morphological and technological differences are reflections of distinct environmental pressures, or local raw-material quality and availability. Greater divergence is also expected with time and distance, but unlike anagenesis, transitional projectile forms may be short-lived and limited due to more rapid selection and/or extinction.

3.1.3. Model 3: Independent Origins

In the independent origin model, South American bifacial stemmed points (including Fell) were products of one or more independent invention(s) associated with a single or multiple non-Clovis migration(s). These first South Americans later came into contact with Clovis-related groups, presumably in Middle America, from whom they borrowed the fluting technique (Gruhn and Bryan 1977). Although this encounter and its techno-morphological ramifications are speculative, it may have led to an exchange of ideas and the application of the fluting technique to Fell points. This is the only model that allows, but does not require Fell to be as old (or older) than Clovis. Geographical predictions are difficult to assess, but some degree of overlap is expected because contact is required by this model. Technological similarities between Clovis and Fell points would also decrease farther south, closer to the Fell's center of origin. Unlike the other models, a separate origin for Fell points predicts that younger examples will share the most technological traits with Clovis (e.g., fluted versus unfluted bases; overshot flakes).

Because the predictions and the expected archaeological signatures for these three models are not mutually exclusive and because data are still deficient (particularly in Middle America), no model can be rejected at present. This situation is compounded due a now submerged late Pleistocene Pacific and circum-Gulf/Caribbean coasts of Middle America, which most probably funneled and intertwined migrating waves multi-directionally.

3.2. Seeking Models and a Paleo-Middle American Paradigm

Having examined the earliest assemblages from Middle America in the previous chapter, we can now attempt to link both northern and southern regions with a unifying model of human and cultural mobility as well as potential technological diffusion through pre-existing populations. Although our collections of Middle American artifacts constitute a small sample, several important observations can be made. A two part approach is adopted to make sense of the variability encountered. First, I compare the North and Middle American records. Based on these observations, a second assessment is carried out, this time examining the Middle and South American connections. It is important to remember that the current paucity of data does not permit the analytical process to venture beyond simple pattern recognition; nevertheless, the ideas put forth below merit exploration and should guide future research.

3.2.1. North and Middle American interactions

Early assemblages from Middle America have been classified as either Fell or Clovis like industries with the latter used as a catchall category for many non-stemmed forms. Archaeologists have also split "Clovis-like" points into "parallel-sided" and "waisted" sub-types (Bray 1978; García-Bárcena 1979; Ranere and Cooke 1991; Snarskis 1979). Of these, the parallel-sided specimens are thought to be the oldest since they most closely resemble Clovis points found west of the Mississippi in Texas and Mexico (Ferring 2001; Sánchez et al. 2014). The projectiles recovered at these sites define the classic Clovis type and share a combination of the following characteristics (Bradley

1982, 1993; Bradley, Collins, and Hemmings 2010; Collins 1990; Howard 1990; Miller, Holliday, and Bright 2013; Morrow 1996, 2015):

(a) Straight or slightly concave base;

(b) Convergent tip;

(c) Fluted by direct percussion on a beveled base or isolated nipple;

(d) Absence of eared projections;

(e) Presence of overshooting scars on preforms and/or finished points;

(f) Lateral removal of distal flute scar.

In general, later Clovis-related points are identified by the occurrence or greater percentages of some of the following attributes (Miller, Holliday, and Bright 2013; Morrow 1996; Morrow and Morrow 1999; Storck 1983, 1991; Tankersley 1994):

(a) Deeper basal concavities;

(b) Folsom-like fluting (on well-defined nipples) and pressure used in the final preform shaping;

(c) Waisted sides (concave proximal margins);

(d) Greater occurrence of pseudo-fluting (flake blanks);

(e) Basal ears;

(f) Thinner blades.

The geographic distributions of classic Clovis and “waisted” variants in Middle and South America are presented in Fig. 7. Both point types overlap north of the Equator

and there is no discernable pattern of segregation based on this sample. Moreover, without additional radiocarbon dates we cannot establish if:

(1) Waisted types evolved locally from parallel-sided points after classic Clovis groups had settled Middle America;

(2) Waisted types evolved from classic Clovis points as they were moving through Middle America;

(3) Each point type represents separate Clovis-related migrations into Middle America.

(4) Or, does the possibility exists that *waisted types are older than the "classic" Clovis*? (see Figure 8 for a Clovis distribution in North America).

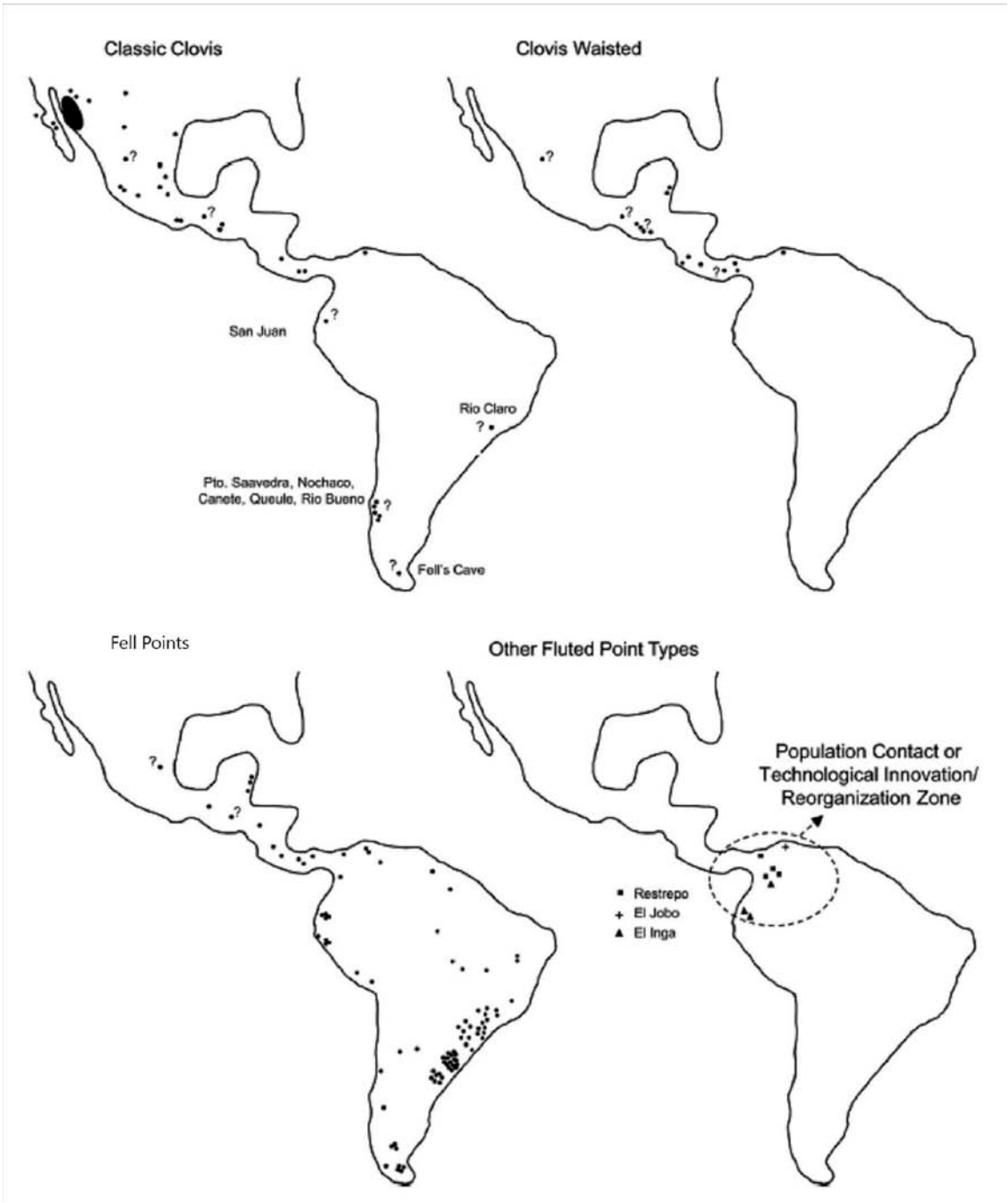


Figure 7: Geographic distributions of lanceolate and stemmed fluted points in Middle and South America. Modified and adapted after Pearson 2004.

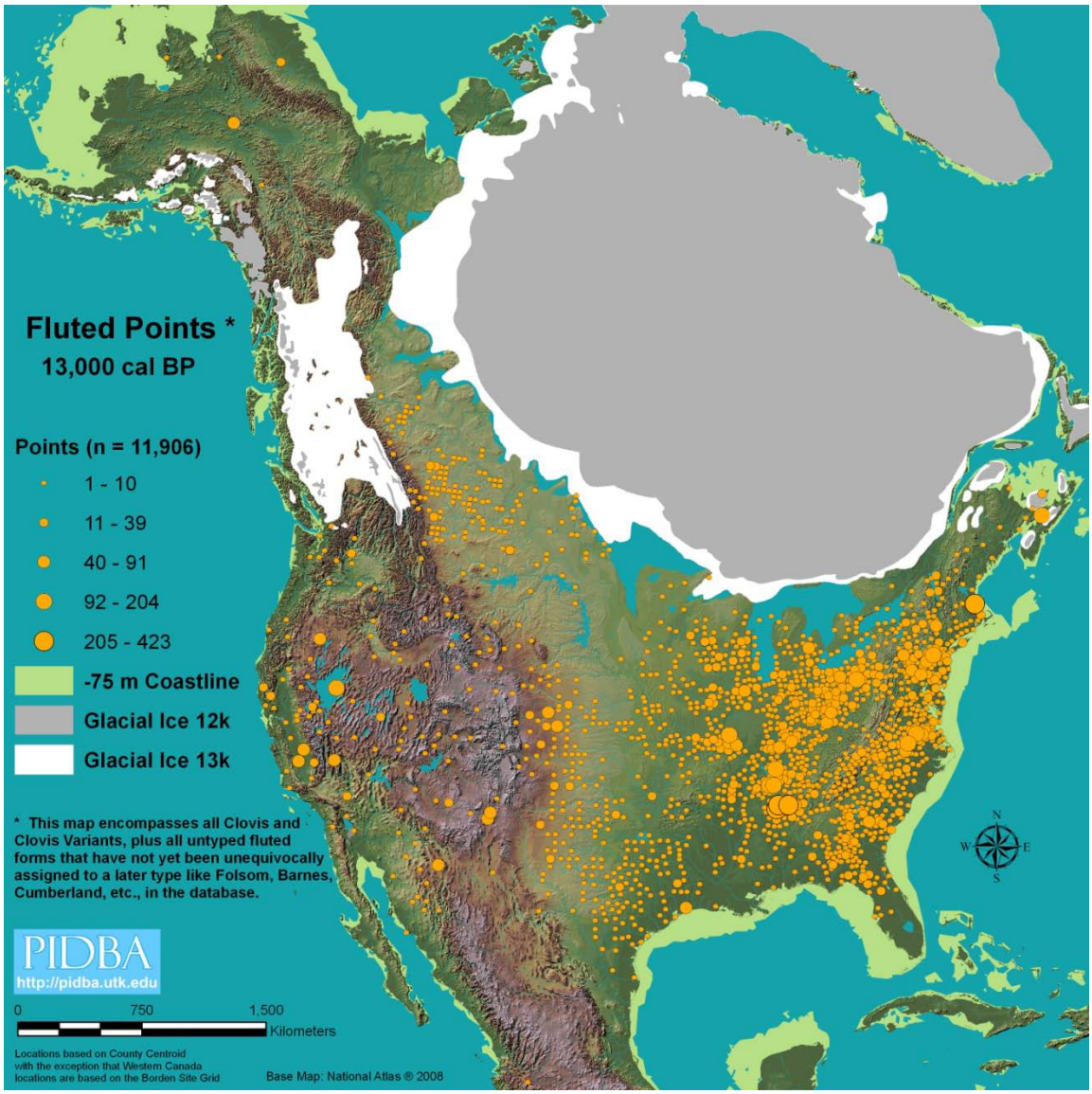


Figure 8: Map showing distribution of Clovis points and sites in North America. Notice the vast frequency of Clovis material east of the Mississippi, with the Delmarva Peninsula showing the highest concentration of Clovis lithics. Courtesy of PIDBA https://pidba.utk.edu/maps.htm.

As remarked above, the differences between both types are not always straightforward when assemblages contain mainly preforms and fragments. Specimens depicted on Figure 3(a-b) from La Mula-West are especially problematic because one appears to fit the classic Clovis outline while the other does not. We are thus presented

with several choices. Either the La Mula-West collection (1) is a mixed assemblage, (2) is a single waisted point assemblage (i.e., Figure 4(a) would have eventually been waisted) or (3) was left behind by groups that manufactured and used both types. Point morphology aside, the technological aspects of the La Mula-West bifaces leave little doubt as to their connection with Clovis. As well, the discovery of a remarkable assemblage of lanceolate fluted points and preforms at the El Cayude and Siraba localities in Venezuela demonstrates that a Clovis-related technology crossed the Isthmus at least as far as northern South America (Ardila Calderon 1991; Ardila Calderon and Politis 1989; Jaimes 1999; Nami 2016; Pearson and Ream 2005; Szabadics Roka 1997) (Fig. ??).

Several archaeologists have also hinted at possible early and/or middle Paleoamerican contacts or movements around the Gulf of Mexico and the Caribbean (Faught 2006; Nami 2016; Pearson 2002; Pearson and Bostrom 1998). This idea is based largely on the discovery of similar point styles across this region and on comparable late Pleistocene fauna around the Gulf Coastal Plain (Webb 1992). The early lithic assemblages of Florida have been especially important in supporting this connection. At least four early and middle Paleoamerican point types have been identified and described from this peninsula (Bullen 1975; Dumbar 2012; Dunbar and Hemmings 2004; Goodyear et al. 1983; Prufer and Baby 1963; Thulman 2007, 2012). A brief description is presented below (Pearson 2004, 2008):

Early Paleoamerican Period of Florida (11,500-11,000 14C yr BP/13,340-12,945 BP)

(I) Clovis: fluted lanceolate with straight to slightly excurvate sides; slightly concave base; ground basal edges; no ears.

(II) Ross County/Clovis Waisted: fluted lanceolate; waisted basal margins; flat and excurvate blade with large transverse flaking scars (sometimes overshooting) surrounded by fine bi-marginal pressure retouch on margins; slightly concave and ground base.

Middle Paleoamerican Period of Florida (11,000-10,500 14C yr BP / 12,945-12,465 BP):

(I) Suwannee: unfluted lanceolate; usually parallel-sided (occasionally slightly waisted) with projecting basal ears; transverse thinning on ground and slightly concave base; broad, expanding lateral thinning removals; flat cross-section.

(II) Simpson: occasionally fluted lanceolate; waisted basal margins; can have a very wide and thin blade ("bull tongue"); concave and ground base; occasional small basal ears; blades are sometimes thinned by overlapping, horizontal transverse flaking and do not show overshooting thinning scars.

While the Middle Paleoamerican cultural links between Middle America and Florida are vague, the early period of interactions are much clearer. As mentioned in the previous chapter, Ross County variants, primarily found in the Ohio and Mississippi

River valleys, Tennessee River Basin, and the Great Lakes region, represent an unambiguous morphological and technological link between North and Middle America. These points have been found in the Florida panhandle (Hemmings 1999a; Tyler 2008), Texas (Long 1977), and other southeastern U.S. states (Perino 1971), which strengthens the idea of a circum-Gulf and Caribbean connection. Figure 3(n) presents an archetypal example of a Clovis waisted point recovered at the Sloth Hole site in Florida (Hemmings 1999a). This point clearly displays the large lateral removals and overshooting scars as well as the fine bi-marginal pressure retouch used to shape it. Similar points have been found in Belize (Hester et al. 1982, Hester, Shafer, and Kelly 1980a, 1980b), Guatemala (Coe 1960), and Costa Rica (Sheets and McKee 1994); Snarskis 1979). To this list, I am tempted to add the bifacial fragment found at the Tequendama rockshelter in Colombia (Correal Urrego and van der Hammen 1977, 84, 97), which seems to bear typical Clovis waisted flaking scars (see Cooke (1998). This pattern is visible on many of the La Mula-West preforms and especially on the distal fragment on Figure 3(c). Additional evidence supporting a circum-Gulf and Caribbean connection comes from large flake cores discovered at the Fossil Hole quarry site in Florida (Hemmings 1999b) that exhibit the same particular reduction techniques as the ones recorded in Costa Rica and Panama (Pearson 2002).

The possible existence of a cultural network around the Caribbean and Gulf of Mexico does not, however, explain its genesis or its significance. We still ignore if Clovis waisted points originated in Middle America and then spread to Florida (and further north) or vice versa. In the absence of radiocarbon dates, I can make certain assumptions

in an attempt to offer possible simple scenario. If we accept that southwestern Clovis points represent the oldest common ancestors, then it follows that Clovis waisted are indeed younger variants (although point distribution on Figure 8 above would suggest otherwise). It is, however, still impossible to determine how much time may have separated both types or if they overlapped chronologically. The evidence seems to suggest that the first fluted point users to enter lower Central America (i.e., Guatemala, Nicaragua, Costa Rica and Panama) carried Clovis waisted types. In fact, the majority of "classic Clovis" examples cited in this chapter that were discovered south of Mexico are unfinished preforms often found alongside waisted types. Instead of looking for a North American origin, Clovis waisted points may have appeared first in Middle America and subsequently dispersed northeast and south along the exposed shelves. If that is the case, then how old Clovis really is (e.g. Aubrey, Texas site possibly dating to c. 17k yr BP; see Waters and Stafford (2007) Supp. Material)? The late Dennis J. Stanford from the Smithsonian Institute had similar questions regarding the real antiquity of Clovis (pers. comm. SAA Conference, Washington D.C. April, 2018).

3.2.2. Middle and South American interactions

Several fluted and non-fluted lanceolate points have been reported from Ecuador (Carluci 1963; Mayer-Oakes and Cameron 1971) and Fell's Cave, but they do not appear to be directly related to classic Clovis (Nami 1998, 2010). Based on what has been published, the Nochaco specimens from Chile (Dillehay 2000; Gruhn and Bryan 1977; Jackson 1995; Seguel and Campana Von 1975) do display several similarities with

Clovis. Gomphothere bones were apparently associated with some of these points, and Dillehay (2000, 159, 304) reported a date of 10,400 ± 90 14C yr BP / c. 12,500 BP on charcoal found next to a buried example at the Rio Bueno site. Nochaco points have been restricted to a small region in central Chile and have not been described in great technological detail. Nami, who has studied these points, does not think they are directly related to Clovis (Nami 2020). Another interesting fluted lanceolate perform was discovered in Uruguay and recalls similar North American specimens (Suárez 2016). For now, suffice it to say that fluted lanceolate points have never been discovered above or below any of the buried and well-dated Fell points' occupations from the Southern Cone.

Because there are so few radiocarbon dates in Middle America and some South American results could be problematic (Fiedel 2014b), it remains difficult to determine if a pattern exists across this vast region. Nonetheless, a look at technological and stylistic attributes might show revealing trends. Fell points from both continents show occasional remnants of their flake blanks, but pseudo-fluted examples have only been discovered in South America, although the broken flutted base from Los Tapiales, Guatemala might reveal to be a stemmed point, rather lanceolate instead (see Figure 2). The occurrence of fluting on Fell points also shows a significant north to south decrease. According to Morrow and Morrow (1999) this phenomenon represents "the decline of fluted point technology through South America rather than its development there." Their study provides a useful discussion on the stylistic differences between lanceolate and stemmed fluted points from a latitudinal perspective. They propose that parallel-sided Clovis points underwent a progressive narrowing of their hafting area as Clovis related groups

expanded south (GarcíaBárcena 1979; Lynch 1983; Ranere and Cooke 1991; Snarskis 1979). The authors suggest that morphological changes between lanceolate fluted points and Fell points were the result of a gradual stylistic drift (Morrow and Morrow 1999, 227). In my opinion, the differences between lanceolate fluted points and Fell points (especially some of the broader examples) are simply too great for a direct link unless transitional forms are interposed between them. An alternative explanation would be that some of these stemmed bifaces served different purposes (e.g., knives) (Pearson 2008).

Lastly, we can add to the mix human mobility and migrations. The narrow Isthmus of Panama not only funneled populations into a very small very treacherous area as in the present, but the Colombian coast on either side formed a major northeast-southwest crossroads which surely separated groups and accelerated cultural differentiation (Aceituno et al. 2013; Dillehay 1999; Pearson 2002; Rothhammer and Dillehay 2009; Schmidt Dias and Bueno 2013). As a result, the traditional expanding "bow waves" model (Martin 1973; Mosimann and Martin 1975) breaks down at the doorstep of South America and vice-versa and must be re-evaluated in light of these geographic variables. Regardless of an interior, an Atlantic, or a Pacific coastal route, the constriction of the Panamanian "Land Bridge" would have focused the point of entry into South America within a narrow area, mimicking a maritime landing. Consequently, geographical and chronological data, associated with the expansion of the first Middle and South Americans, may not be obviously patterned across the continent.

Chapter 4

4. Terminal Pleistocene Giants and Paleoamericans in Highland Guatemala

This chapter reports on the terminal Pleistocene paleontological site of Chivacabé (Ttzi'kab'b'e), Huehuetenango, Guatemala, which I visited in 2017 and where I conducted short pedestrian surveys in the surrounding area to locate similar geological profiles in search for potential sites and future excavations. Before discussing the site, and to contextualize it in the larger framework of Paleoamerican activity within Middle America, I will first proceed to describe the Middle American landscape during the Terminal Pleistocene. I will also provide a brief summary on some of the most prominent reported extinct Late Pleistocene megafauna of the region, with a focus in Guatemala, and a few suggestive indications of possible human interactions with these vanished animals.

4.1. The Middle American Landscape during the Late Glacial

There have now been a sufficient number of paleoecological studies in Middle America and neighboring regions to approximate a description of the climate and vegetation for the area during the LGM to the Terminal Pleistocene, or c. 26,500-11,600 BP (for example, Bartlett and Barghoorn 1973; Bush and Colinvaux 1990; Leyden 1984, 1985; Piperno et al. 1991; Piperno and Jones 2003). The data have been summarized by Dolores Piperno and Deborah Pearsall (1998), who note that temperatures for the Late Pleistocene were on the order of 5 to 7 degrees Celsius cooler than at present, and annual

rainfall was 25-50 percent lower than today. If the vegetation map of Middle America is adjusted to account for these differences in rainfall and temperature, where do Paleoamerican sites and isolated projectile points fall? The Belize localities (Hester et al. 1981; MacNeish and Nelken-Terner 1983) are all found in what would have been some sort of thorn woodland, low scrub, or wooded savanna vegetation. A similar landscape would have been present in the lowlands of central-Pacific Panama (for example, at La Mula West [Ranere 2000], Vampire Cave [Pearson and Cooke 2003], and the Nieto quarry [Pearson 2003]) and northwestern Costa Rica (an isolated fluted point findspot [Swauger and Mayer-Oakes 1952]). The Late Pleistocene phytolith record from the coastal plain Monte Oscuro sediment core documents the open nature of the vegetation in central-Pacific Panama (Piperno and Jones 2003). Closed-canopy lowland forests (although drier than those found today) would have blanketed the Chagres River watershed near the present-day Panama Canal (for example, at the Madden Lake/Lago Alajuela localities [Bird and Cooke 1978]) and the foothills of central-Pacific Panama (for example, at Cerro Corona and La Yeguada [Ranere and Cooke 1991, 1996]). An 11,300 year old pollen/phytolith sequence from the Chagres basin (Bartlett and Barghoorn 1973; Piperno 1985) and a 14,000 year old pollen/phytolith sequence from La Laguna de la Yeguada (Piperno et al. 1991) confirm this characterization of the vegetation in these two regions of Panama. Closed-canopy montane forests are reconstructed for the lower montane Costa Rican localities of Turrialba (Snarskis 1979) and Arenal (Sheets 1994), as well as San Rafael (Coe 1960), the Quiché Basin and to the west at Chivacabé (Brown 1980; Hayden 1980; Lohse and Paiz 2010) in the Guatemalan

highlands. Alpine meadows are reconstructed for the landscape higher than 3,300masl in Guatemala, where Los Tapiales and La Piedra del Coyote sites are situated (Gruhn et al. 1977).

During the LGM, it appears that the modern summer precipitation regime in the Yucatan had collapsed (Metcalfe et al. 2000) and a similar change in the climate regime appears to have occurred throughout Middle America. Leyden (1984) and Leyden et al. (1993) documented that the Middle American lowlands were cooler and more arid during Marine Isotope Stage 3 (c. 36-26.5 ka) and continued to cool with increasing aridity during Stage 2 (c. 26.5-11.6 ka), with the lowest lake levels at this time and the presence of savanna and juniper scrub habitat. Based on their work in Panama, Piperno and Jones (2003) indicated that during the Late Pleistocene Middle America was more arid and generally cooler than today and savanna grasslands expanded at the expense of tropical forested habitats, which became restricted to higher elevations. This may have provided the ideal situation for the southward expansion of mammoths into Middle America based on our understanding of the distribution of mammoths in North America and their association with grassland environments (Meltzer 2009).

As discussed in the previous chapters, although few Paleoamerican localities have been identified, they are found in a diversity of environments and geographic regions: in both Caribbean and Pacific coastal lowlands, in highlands on both sides of the continental divide, in relatively open thorn scrub/savanna vegetation, in both lowland and montane dosed-canopy forests, and in alpine meadows. This includes most of the range of environmental and geographic settings present in Middle America during the Terminal

Pleistocene. As it is known for North and South American archaeological and paleontological settings (Dillehay2000; Meltzer 2009), these environments were prime ecosystems for both extinct megafauna and Paleoamerican hunters.

4.2. Late Pleistocene Megafauna in Middle America

Even though Middle America is of prominent importance to the overall understanding of changing faunal communities in the Western Hemisphere, the region has received little attention compared with high latitude regions in the Americas (Lucas, 2008a; Morgan, 2008; Lucas and Alvarado, 2016). This is due to a scarcity of high resolution biostratigraphic data and limited conceptual understanding of the continental record of sediments, but the absence of solid data is also a result of unstable political circumstances in the area and difficulties of scientific access (Morgan 2008).

Although not scientific and purely speculative, perhaps the first identification of skeletal fossil remains of large animals that no longer exist in the area comes from the mythology of the pre-Columbian inhabitants of Middle America. It is possible that very early on in the Early Preclassic or Formative periods, if not during Archaic times, as the Holocene reshaped the landscape, some early Mesoamerican individuals might have encountered very large bones of extinct beasts. And just like the ancient Greeks as they encountered bones of extinct proboscideans that led them to imagine giant Cyclopes by rearranging the fossilized elephant bones into humanoid forms (see Mayor 2001), the Mesoamerican mind could have come to similar conclusions. An immediate example is in the pages of the *Popol Vuh* or "Book of Counsel", a 16th century manuscript that

recounts the origin myth of millennia before of the Maya K'iche' people from Guatemala. It mentions three colossal creatures, two described as two reptilian and skeletal brothers, Zipakná and Kabrakan, who are responsible for earthquakes, and the explosion of mountains (i.e., volcanoes). They are led by their father, Vukub-Kakix, an enormous bird dragon-like skeletal creature, perhaps the same Principal Bird Deity of the Preclassic and Classic Maya (600BCE - 900CE), and together they slaughtered humans, and were also responsible for shaking the skies and creating total chaos. The myth seals the fate of these monsters, when they are defeated by K'iche' heroes, and are buried under mountains of rocks and earth. The legend tells that sometimes one can still unearth their remains (Recinos 1995: 55-58; Gutiérrez 1996:28; Tedlock 1996).

More recently, the first credible reference of fossils in Middle America comes from Guatemala in a chronicle written by D. Francisco Antonio de Fuentes and Guzman in 1690, in which the authors mention huge vertebrate bones at Chiquimula, attributed at that time to "biblical giants." In 1722, Fray Francisco Ximenes recorded the presence of fossil impressions on stones from Sacapulas, Quiche, which he attributed to the effect of ice. The first scientific paper on a Pleistocene fossil from Guatemala described *Serridentinus guatemalensis* from Chinautla (Osborn 1923). Today, this fossil is referred to *Cuvieronius hyodon*, the same proboscidian species found at the site of Chivacabé to be discussed later.

4.2.1. Extinct Megafauna in Middle America

While mammoths are widely distributed in North America from Canada through the United States (Agenbroad, 2005) and into Mexico (Arroyo-Cabrales et al. 2003) their record in Middle America is minimal with only a few scattered records in five of the seven countries. In Mexico mammoths have been studied in more detail (Arroyo Cabrales et al. 2010; Perez-Crespo et al. 2012; Gutierrez-Bedolla et al. 2016) but much less is known about them in the rest of the Middle American countries.

The presence of *Mammuthus* in Middle America was first reported by Leidy (1886) as part of a small Pleistocene fauna from Nicaragua and the genus has subsequently been found in Guatemala, El Salvador, Honduras, and Costa Rica (Laurito and Aguilar, 2007; Lucas and Alvarado, 2010). The recovery of additional mammoth remains in Guatemala provides a stronger geographic link between Mexico and these more southern records and improves our understanding of the southernmost portion of the genus' distribution (Arroyo-Cabrales et al., 2007; Lucas and Alvarado, 2010; Mead et al., 2012).

The taxonomic assignment to species of specimens of *Mammuthus* has varied in the past and often reflected the changing opinions on the valid species of North American *Mammuthus* based on both morphological or molecular criteria (Lister and Sher 2015; Enk et al. 2016). Based strictly on tooth morphology, records of *Mammuthus* from Middle America can be referred to *M. columbi*, although some earlier records were referred to the species *M. imperator* (Gutierrez, 1963) and Lucas and Alvarado (2010) recognize a record of *M. meridionalis* from El Salvador. Based on the limited available stratigraphic and chronologic information available for most specimens it seems most

likely that most of the *Mammuthus* records in Middle America can be considered to be Late Pleistocene in age.

The known records tell us that the distribution of mammoths in Middle America tend to be concentrated on the Pacific side of the isthmus and suggests the former presence of a savanna corridor that formed during an interval of decreased precipitation Mead et al. 2012; McDonald and Dávila 2017). However, the distribution of open savanna in the regions may not have been continuous but rather consisted of isolated patches within a more forested environment, hence the presence of forest browsers such as *Cuvieronius* and the sloth, *Eremotherium* in some of the faunas that include *Mammuthus*. This may simply reflect the vegetational response to drier Pleistocene climates in the Pacific watershed lowlands with an annual precipitation of 2000mm and less, and forests that were more prone to fragmentation (Piperno and Jones, 2003). Unfortunately, there are no radiocarbon dates for any of the *Mammuthus* from Middle America which prevents placing them within a more precise chronological context. Proboscideans known to have inhabited Middle America from southern Mexico through to South America during the Pleistocene include elephants (*Mammuthus*, Elephantidae), gomphotheres (*Cuvieronius, Haplomastodon* [including *Stegomastodon*] Gomphotheriidae), and mastodonts (*Mammut*, Mammutidae), as well as other extinct megafauna such as xenarthrans (*Eremotherium, Glyptotherium*), *Equus sp.*, and cervids, etc. (Mead et al. 2012; McDonald and Dávila 2017).

Arroyo-Cabrales et al. (2003) in their review of records of mammoth in Mexico listed three records of mammoths in Chiapas, the state that borders the department of

Peten in northern Guatemala. There are no records for the Yucatan Peninsula (states of Tabasco, Campeche, Yucatan and Quintana Roo) and the current absence of mammoth in Belize may either reflect the absence of open savanna habitat in this area during the Pleistocene, or merely the lack of sufficient field work in this and adjacent regions in Mexico that border the Caribbean. In addition to the three records of mammoth in Chiapas there are two and six records in the northern adjacent states of Veracruz and Oaxaca respectively (Arroyo-Cabrales et al. 2003). While it might be expected that the population densities of mammoths would decrease southward (Fig. ??) reflecting more limited availability of suitable open country habitat and more closed forest, any patterns that can be observed based on the current state of knowledge more likely reflect that lack of extensive collecting in these regions rather than any indication of the relative abundance of mammoths in Middle America (McDonald and Dávila 2017).

Given the lack of any comprehensive summaries of the Pleistocene faunas for most of the countries in Middle America detailed comparisons are not possible but the few examples are illustrative of the differences in relative abundance of mammoths compared to the other proboscideans in Middle America. Laurito (1988) listed 15 records of gomphotheres in Costa Rica, compared to the single mammoth record. Cisneros (2005) in a comparison of 11 Middle American faunas listed eight with gomphothere and two with mammoth. This pattern is the same in Guatemala, gomphotheres are known from at least 11 locations: Estanzuela, Chivacabe, San Rafelito, Mixco, Malacancito, Chinautla, Tívoli, Ciudad Real, El Rosario-Ipala, Jutiapa, and Río La Pasion compared to the four locality records of mammoth, although both genera are found in Estanzuela and

Chinautla (Arroyo-Cabrales et al., 2007). Based on our understanding of the differences in habitat preference of gomphotheres and mammoths the difference in their relative abundance in Middle America is suggestive of a greater extent of forest compared to open country.

Arroyo-Cabrales et al. (2003) noted that in Mexico much of the distribution of *Mammuthus* follows a pattern close to that of other Nearctic taxa. In Middle America the pattern is less clear as there are few faunas that include Nearctic taxa along with mammoth. Most finds of mammoth consist of isolated specimens and are not part of a larger faunal assemblage. The few available records of faunal assemblages that include mammoth in Middle America tend to include mostly representatives of taxa originating in South America and the only other taxa of North American origin are *Cuvieronius* and *Equus*. As a grazer *Equus* is often associated with *Mammuthus* in many North American faunas, but *Cuvieronius* is generally considered to be a forest browser and rarely found in the same fauna as *Mammuthus* (Lucas et al. 1999; Lucas and Alvarado 2010).

Among the taxa of South American origin associated with *Mammuthus* is *Mixotoxodon*. Based on the extreme hypsodonty of its dentition it might be inferred that *Mixotoxodon* like *Mammuthus* was an inhabitant of open savanna (Dávila et al. 2019). The two taxa co-occur at Orillas del Humuya, Honduras as well as at Estanzuela, Guatemala and possibly at Río La Pasion, Guatemala, although the association is less certain. Stable isotope studies of *Mixotoxodon* from Orillas del Humuya indicate that the

dominant local habitat was C3 forests but that some C4[5] grasslands may have been present and at El Hatillo, Panama, which does not include mammoth in the fauna, it inhabited a canopied forest habitat (MacFadden, 2005).

Finally, the striking absence of large carnivores in the Middle American faunal assemblages is puzzling. To date, this record is confined to the Pleistocene bear *Tremarctos* from Belize, the saber-tooth cat *Smilodon*, from El Salvador (Morgan, 2008), and two *Canis* teeth from the Peten area in northern Guatemala (Dávila et al. 2019). The complete absence of small-sized faunal elements (e.g. small mammals, birds, amphibians, and reptiles, etc.), on the other hand, may be attributed to collection bias and preferred collection of large bones (Webb and Perrigo 1984), which are easily identified in the field by laymen.

4.2.2. Guatemala

The Pleistocene fossil assemblage of Guatemala consists of large herbivores in which proboscideans (*Cuvieronius*) and xenarthrans (*Eremotherium*, *Glyptotherium*) are the dominant elements, while co-occurring *Equus* and *Mixotoxodon* are significantly less

[5] "The perennial grasses can be classified as either C3 or C4 plants. These terms refer to the different pathways that plants use to capture carbon dioxide during photosynthesis. All species have the more primitive C3 pathway, but the additional C4 pathway evolved in species in the wet and dry tropics. The first product of carbon fixation in C3 plants involves a 3-carbon molecule, whilst C4 plants initially produce a 4-carbon molecule that then enters the C3 cycle…

These differences are important because the two pathways are also associated with different growth requirements. C3 plants are adapted to cool season establishment and growth in either wet or dry environments. On the other hand, C4 plants are more adapted to warm or hot seasonal conditions under moist or dry environments. A feature of C3 grasses is their greater tolerance of frost compared to C4 grasses. C3 species also tend to generate less bulk than C4 species."
(https://www.dpi.nsw.gov.au/agriculture/pastures-and-rangelands/native-pastures/what-are-c3-and-c4-native-grass).

frequent, and *Holmesina*, *Palaeolama*, *Tapirus*, *Neocherus*, *Mammuthus* and other ground sloth taxa (*Paramylodon; Megalonyx*) are rare. From the systematic point of view, the Guatemala megafaunal assemblage is thus approximately consistent with other associations documented along the Mesoamerican Corridor (e.g. Honduras, El Salvador, Nicaragua, Costa Rica, Panama) and northern South America (Venezuela, Colombia) (Stirton and Gealey, 1949; Webb and Perrigo, 1985, 2018; Lucas et al., 1997; Cisneros, 2005; Lucas, 2008a, 2014), which also include predominantly *Cuvieronius*, *Eremotherium*, *Glyptotherium* and *Mammuthus*.

The area around Estanzuela is perhaps the richest in Pleistocene vertebrates for Guatemala in terms of the number of specimens of Pleistocene fauna known from a restricted location within the country. However, despite the large number of specimens the species richness is low and limited to megafauna. Along with the mammoth, *Cuvieronius hyodon*, *Eremotherium laurillardi*, *Glyptotherium* cf. *G. floridanus*, *Neochoerus* sp., *Mixotoxodon larensis* and *Equus* sp. are known from the area (Dávila et al. 2019). All of these taxa are known to be of Pleistocene age. While exact locality information is not available, there are four specimens of *Mammuthus* known from the general vicinity of Estanzuela, making it the largest concentration of mammoth from a general area in Central America proper (Mead et al. 2012; McDonald and Dávila 2017).

Except for the records from Estanzuela, Teculutan and Río La Pasion in Guatemala, which are located closer to the Caribbean side of the isthmus, the distribution of mammoths in Middle America is primarily restricted to the Pacific side (Fig. ??) and may indicate where the major portions of savannah habitat in Middle America existed

during the Pleistocene. This distribution may reflect differences in seasonal rainfall on each side of the mountains extending through the center of the isthmus that separates the lowlands along the Atlantic and Pacific coasts, a pattern that exists today. Today Middle America is embedded in an easterly trade wind flow for most of the year with dry months on the Pacific slopes coinciding with stronger low-level easterly flow, while wetter months are associated with weaker winds (Peña and Douglas 2002). During the Pleistocene the long-term existence of similar patterns may have contributed to the spread of the more arid grassland habitat preferred by mammoths. Direct evidence for this is provided by the phytolith record from Monte Oscuro, a crater lake located 10masl on the Pacific coastal plain of Panama. During the Late Pleistocene the lake bed was dry and savanna-like vegetation expanded at the expense of tropical deciduous forest reflecting a significant reduction in precipitation that would have resulted in the observed changes in vegetation (Piperno and Jones, 2003). Piperno and Jones (2003) noted that there was a persistence of forests during the late Pleistocene, but that the few known glacial-age paleovegetational sequences below 1,000masl in tropical America have no modern analog. While most records of mammoth in Middle America are at lower elevations well below 1,000masl it should be noted that the presence of mammoth at Chinautla, Guatemala at 1,232masl may indicate some flexibility in habitat use or simply the patchiness of the forest habitat that did exist. That these forests have no modern analog (Piperno and Jones, 2003) may also be a critical factor that requires further investigation.

While Monte Oscuro is south of the current known distribution of mammoth in Middle America it does indicate that potential mammoth habitat extended farther south.

Other pollen studies from lakes in Mexico and Guatemala show that vegetational shifts from forests (C3- dominated) to grasslands (C4-dominated) eco systems in the lowland Neotropics are unlikely to occur without a significant reduction in precipitation (Huang et al. 2001). Given that mammoths in Middle America were at the extreme southern margin of their distribution, their extirpation from the region was probably the result of increased rainfall, the resulting expansion of tropical rainforest into lower elevations, and the loss of suitable habitat.

4.3 Evidence of Human Interaction with Extinct Megafauna in Middle America

As discussed in the previous chapters, archaeological evidence of human interaction with extinct megafauna or the presence of "kill sites," and art or ritual from the Paleoamerican period, attested in North and South America, is lacking in the Middle American isthmus. However, albeit no official publication of the site yet exists, a possible exception to this lacuna could be the 14 Columbian mammoths (*Mammuthus colombi*) unearthed 6 feet below ground in Tultepec, Mexico in December 2015 dated to c. 15-12 kya. The popular reports provide us with glimpses of what could be human built mammoth traps, but we must wait for the formal study for confirmation (see https://www.bbc.com/news/world-latin-america-50330717). A potential example of art comes in the form of a petroglyph carved on a boulder located in Baja Vera Paz, in the central Guatemalan highlands, that may portray a schematic depiction of a proboscidean (Ericastilla, personal communication 2017) (see Figure 3). Sharer and Sedat (1987:247-248, Plate 13.3a and b, 13.4), who personally examined the carving in the late 80s,

argued that the petroglyph represents the profile of the elephantine-looking long-lipped Maya deity known as the Principal Bird Deity. However, if the petroglyph in fact portrays an extinct proboscidean and dates to at least the Terminal Pleistocene, it would be only the second example of Paleoamerican art depicting extinct proboscideans[6]. The other example is from Vero Beach, Florida and portrays a mammoth carved on a fossil bone dated to c. 13,000 BP (Purdy et al. 2011). A third interesting example is what has been described as "a ground sloth pelvis fragment" found by Barnum Brown in 1951-52 in the Pasión River area, in southern Petén, Guatemala that shows a series of V-shaped cut-marks (see Fig. 10). Below is the story of this bone:

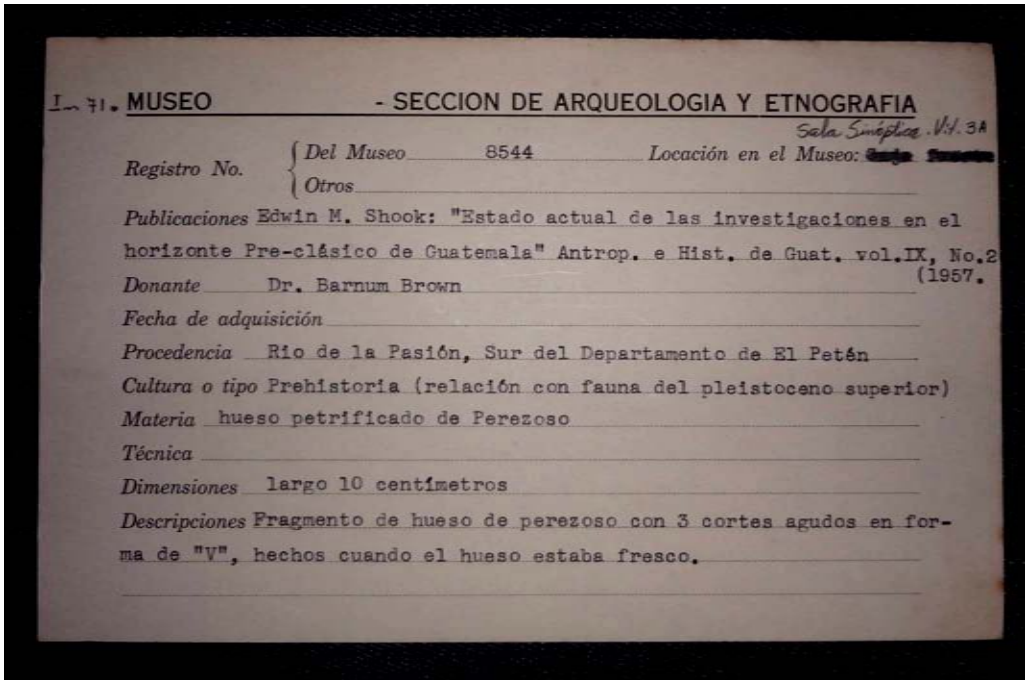
> "From 1947 to 1952, Brown returned south of the border, this time to the jungles of Guatemala. Initially, his work was funded by a trio of American promoters who had secured "the Strapper-Osborne concession in the region around El Peten." Eventually, this concession was acquired by Sohio. Among Brown's major tasks was a 130-flight aerial survey that covered 44,000 square miles and documented the entire country of Guatemala. This overhead view was supplemented by a ground-based reconnaissance by jeep and horse to explore all the country's roads and trails, and by boat to cover all the river systems in the northern part of the country around El Peten, from mouth to source and back again. In 1951 and 1952, Brown also turned his attention to finding fossils in the region. These forays, funded in part by Sohio and in part by himself, were difficult and not especially successful. *Primarily Pleistocene fossils were recovered, including a "boxcar" of fragments from mastodons and giant ground sloths and one fairly complete skeleton. One sloth pelvis exhibited three "knife cuts," which Brown suspected might have been made by humans. "If these cuts prove to have been made by man, as I and many associates contend," he observed, "it places man back thousands of years contemporaneous with the giant land sloths on the American continent."'* (Dingus & Norell (2010; Ch.16)

[6] In 1959, Juan Armenta Camacho discovered a mastodon pelvis at Valsequillo, Mexico engraved with multiple Ice Age animals, including a mammoth (Scott, 1999). The object has since disappeared (Meltzer, 2009:106). See Hardaker (2007) for an in depth description of the artifact and the controversy surrounding dating issues of sites in the area where it was found.

In 2017 while in Guatemala City I attempted to find the bone in the basements of the *Museo Nacional de Arqueología y Etnología*, and although the museum has many specimens in storage, we could not relocate this particular bone. I did find the museum's catalog entry from when the bone was donated in 1957 and the description places the bone in the "pleistoceno superior" or Late Pleistocene (see Fig. 9). Interestingly the museum entry for this bone also includes the following:

> "Fragmento de hueso de perezoso con tres cortes agudos en forma de "V", hecho cuando el hueso estaba fresco."
>
> Sloth bone fragment with three deep "V"-shaped cutmarks, made when the bone was green.

The implication here is that if the cutmarks were made when the bone was green, then whatever or whoever is responsible for the incisions must have been contemporaneous with the animal. So it is imperative to get a hold of such bone, attempt to date it and determine if the cutmarks are of anthropogenic origin. The only visual that I could find of this bone, is a photograph of a cast in the collections of the American Museum of Natural History, New York (Fig. 10).



I-71. MUSEO - SECCION DE ARQUEOLOGIA Y ETNOGRAFIA

Sala Simples Vit. 3A

Registro No. { *Del Museo* 8544 *Locación en el Museo:* [redacted]
{ *Otros*

Publicaciones Edwin M. Shook: "Estado actual de las investigaciones en el horizonte Pre-clásico de Guatemala" Antrop. e Hist. de Guat. vol.IX, No.2 (1957.

Donante Dr. Barnum Brown

Fecha de adquisición

Procedencia Rio de la Pasión, Sur del Departamento de El Petén

Cultura o tipo Prehistoria (relación con fauna del pleistoceno superior)

Materia hueso petrificado de Perezoso

Técnica

Dimensiones largo 10 centímetros

Descripciones Fragmento de hueso de perezoso con 3 cortes agudos en forma de "V", hechos cuando el hueso estaba fresco.

Figure 9: Photograph of Barnum Brown's sloth bone with cut marks registry at the *Museo Nacional de Arqueología y Etnología*, Guatemala City. Photograph by the author. Courtesy of the Museo Nacional de Arqueología y Etnología, Guatemala City.

AMERICAN MUSEUM OF NATURAL HISTORY
Division of Anthropology

CAST FOSSIL BONE, POSSIBLY CUT
MEXICAN & CENTRAL AMERICAN ARCHAEOLOGICAL COLLECTION

Catalog No: 30.2/ 9708
Locale: GUATEMALA, KAMINALJUYU
Country: GUATEMALA
Acquisition Year: 1952 [TRANSFER]
Donor: DEPARTMENT OF GEOLOGY AND PALEONTOLOGY

Collector: BROWN, BARNUM
Keywords: CAST FOSSIL BONE

Figure 10: Cast of fossil bone found by Barnum Brown in the Pasión River, Peten, Guatemala in 1951-52, that shows a number of V-shaped cut marks. Courtesy of the American Museum of Natural History, New York.

4.4 The Chivacabé (Ttzi'kab'b'e) Site, Huehuetenango, Western Highlands in Guatemala

The actual name of the site is *Ttzi'kab'b'e* in Maya, probably meaning "Earth Road of the Dog," but the Latinized Chivacabé is commonly used for easier pronunciation. The site is located on a deep alluvial terrace of a small stream that drains into the Rio Selegua and the Huehuetenango Basin (Fig. 11). Relatively steep valley sidewalls are present to the northwest, and the terrace slopes gradually down-slope to the east. Ericastilla (1992, 1996, 2008) and others considered the site to be a place where Paleoamericans exploited now-extinct megafauna. An on-site museum presents findings from earlier projects, including obsidian artifacts, and the bone bed remains open for viewing (~3-4 m below the surface; Fig, 11).

This site was discovered in 1976 when the landowner, Octavio Alvarado Villatoro dug a well. At approximately three meters there was a layer of extinct Pleistocene fauna. From 1977-1978, Herb Alexander and Brian Hayden of Simon Fraser University opened a horizontal block and noted the presence of what they identified as mastodon, horse, glyptodont, peccary, and deer, noting the presence of multiple individuals in some cases. Based on impressions that the setting was almost entirely colluvial slope wash, and the infrequency of artifacts, Hayden concluded that it was a poor candidate for Paleoamerican occupation (Hayden 1980:702). However, this early work did recover a glyptodont scapula that shows a puncture hole possibly caused by human action. After the excavations finished, the fluted point mentioned earlier was found by a Villatoro family member but with no archaeological context (Figure 2; Hayden 1980).

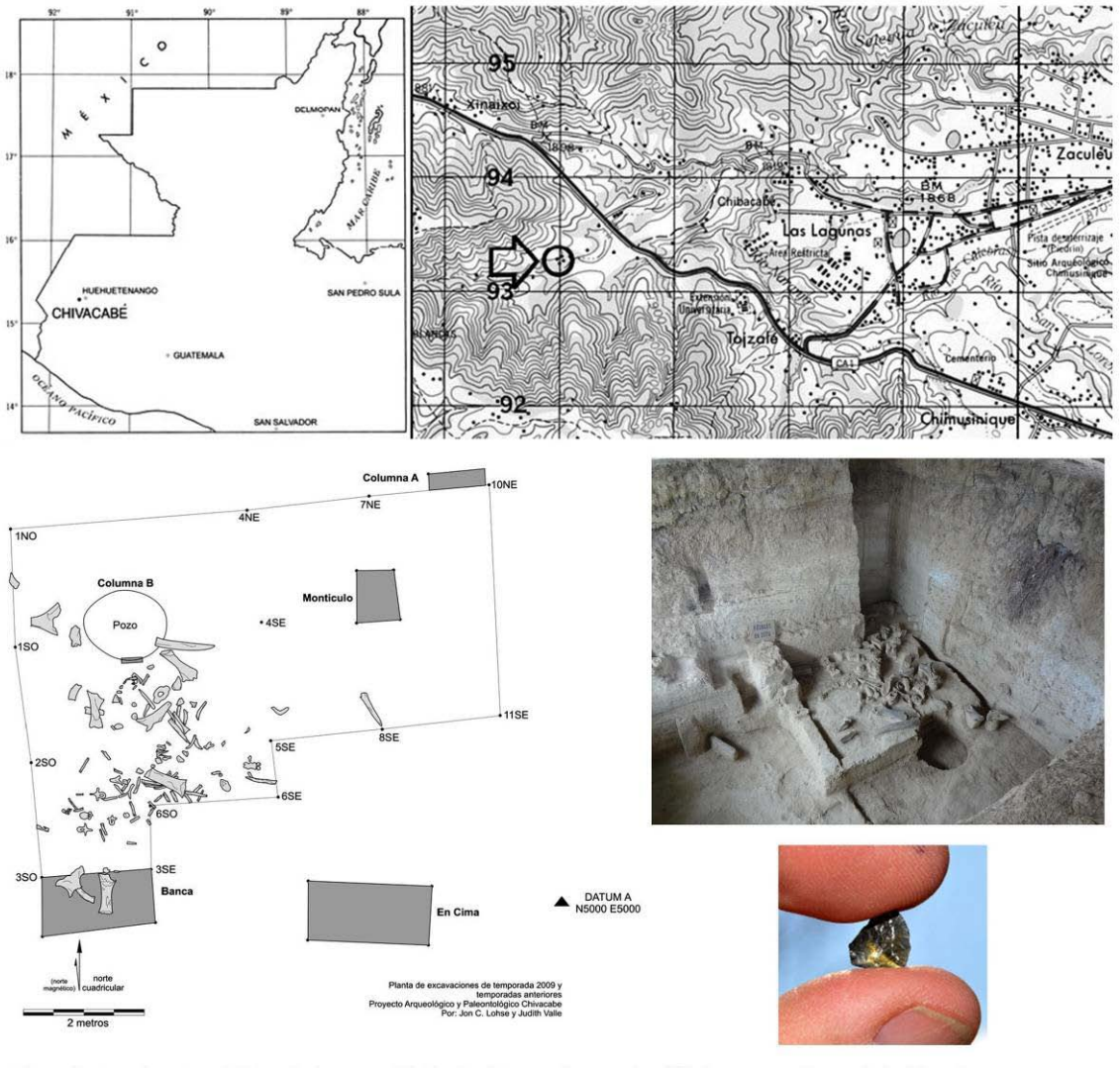


Figure 11: Top: Location of Chivacabé in western Highlands of Guatemala, near city of Huehuetenango. Bottom Left: Map of open block showing 2009 excavations by Lohse et al. 2010 in grey. "Pozo" is hand-dug well in which the faunal remains were first found by Octavio Villatoro in 1976. Bottom Right Top: Open block with faunal remains in situ, available for viewing to the public. Bottom Right Below: A very small flake of green Pachuca obsidian from Central Mexico found at the site, although not from known context.

In 1991, Guatemalan paleontologist Sergio Ericastilla and his team re-visited the site. Contrary to Hayden and Cox (1978), Ericastilla (1992, 1996, 2008) argued for human occupation at the site, and lists a number of lithic pieces that seem culturally manufactured. He also cited additional paleontological evidence for human agency

including horizontal cut marks on deer antlers, modified proboscidean molars of different ages, and a longitudinally fractured proboscidean rib that does not appear to have been broken under natural conditions.

The site was last examined by a multidisciplinary team led by Dr. Jon Lohse (Texas State University, San Marcos) in 2009 (Lohse and Paiz 2010), but their research could not corroborate, nor refute Paleoamerican presence at the site. However, their geomorphological assessment of the site, and ^{14}C and stratigraphic data, determined that a volcanic event occurred after 15,700-15,100 BP. This date was derived from a paleosol beneath the tephra containing the bone bed at the site. A subsequent date of 13,210-12,920 BP, taken from a paleosol that overlies the reworked tephra deposit corresponds well with the bone bed and the Clovis period [c. 13,200-12,800] (Lohse and Paiz 2010; Waters and Stafford 2007). This is highly significant because: (1) it provides future researchers with a specific Paleoamerican chrono-stratigraphic marker to target; and (2) it indicates that Clovis-era deposits may be expected to occur on developed landforms not just at the site itself, but in at least some settings in the mountainous western Highlands, if not in other volcanic landscapes as well. The site area was also mapped, including a topographic map of the alluvial terrace.

In 2017, I briefly visited the site with paleontologist Sergio Ericastilla-Godoy, and assisted by the site owner Mr. Octavio Alvarado Villatoro. This work consisted of walking across the landscape near the site in order to understand the local surface processes and examine all significant vertical exposures that provided a view of the subsurface deposits. Most of the reconnaissance was restricted to the Villatoro property,

and primarily examined the slopes north of the site, as well as the incised stream valley that flows from west to east immediately south of the block excavation. The stream valley was walked for approximately 1 km (0.6 miles) east and west of the site. The southern valley slopes were not examined and are assumed to be similar to the northern slope.

Several critical observations relevant to understanding the site were immediately apparent from this informal survey: 1) the bedrock surrounding the alluvial valley is gneiss; 2) the majority of the deposits in the valley beneath the surface where the site is situated consist of red gravelly to clayey, poorly sorted alluvium derived from the erosion of the red gneissic slope soils; 3) the deposits within the block excavation that encase the bone beds are composed of two different materials: fine-grained sandy sediment that resembles volcanic tephra and gravels derived from the gneissic bedrock; and 4) a reworked tephra was found within a cutbank within the deeply incised stream valley immediately southwest of the site. These observations formed the core of the field interpretation of the site deposits and will be used for future research at the site.

4.4.1. Late Pleistocene Megafauna and Lithics at Chivacabé

The Chivacabé megafauna is represented only by large mammals dating to between 15,700 and 12,920 BP and was preserved immediately prior to the waning phase of the cooler and drier glacial climate regime. The specimens reported include: at least one individual of a glyptodont (*Glyptotherium* sp.) represented by osteoderms and various postcranial long bones; three individuals (one juvenile and likely two adults) of a

gomphothere (*Cuvieronius* cf. C. *hyodon*) represented by tusk fragments, numerous teeth, vertebrae, and limb elements; one individual of a horse (*Equus* sp.) represented by teeth and numerous postcranial elements; and two individuals of a deer (*Odocoileus* cf. *O. virginianus*) represented by two right, naturally-shed antlers. An additional specimen that originally was thought to represent a deer antler is identified by Mead et al. (2012) as a hyoid bone pertaining to *Cuvieronius*. Mead et al (2012) observes that no vertebrate remains could be assigned to *Tayassu* or *Eremotherium* as stated by Hayden and Cox (1978) and Ericastilla-Godoy (1996). No faunal specimens exhibit apparent human modification, hunting, or butchering marks as suggested by previous investigators (Hayden and Cox 1978; Ericastilla-Godoy 1996). Mead et al. (2012) conclude that all aberrations observed on the bones and teeth can be explained by physical taphonomic processes.

Another interesting aspect of this site are lithics found within the paleontological pit. In the late 1970s non-blade obsidian artifacts, including a lanceolate fluted point (Figure 2), were found at the site but without archaeological control (Hayden 1980). Interestingly, one of the obsidian items is a very small piece of green obsidian that appears visually to be from the Sierra de Las Navajas or Pachuca source in Central Mexico (Lohse and Paiz 2010) (Fig 11). Although not from a known context, the possibility that early Paleoamerican occupants at the site had access to Central Mexican obsidian is potentially significant in terms of exchange relations or foraging ranges.

4.4.2. Research at the Chivacabe Site: Specific Aims and Objectives

In order to reconcile these contrasting assessments for Chivacabe, my future research at the site is being planned in consultation with the Departamento de Monumentos Prehispánicos y Coloniales del Instituto de Antropología e Historia de la Dirección de Patrimonio Cultural y Natural/Instituto de Antropologia e Historia de Guatemala (IDAEH), and with the Villatoro family, to be carried out in the Spring/Summer (alternatively Fall, depending on road and weather conditions) of 2023 and 2024. The preliminary objectives of this work will involve: (1) a number of new excavations within the open pit targeting the chrono-stratigraphic marker [~13,187-12,935 BP] established in 2008 (Lohse and Paiz 2010); (2) to carry out a test excavation (2x2m and 3m in depth) approximately 3m west of the open pit, where the Villatoro family informs me that the fluted point was found; and (3) to examine, inventory, and improve the preservation condition of the exposed and on-site museum faunal and lithic remains. To date, unlike North and South America, there are no demonstrable human-megafaunal associations anywhere in Middle America (but see Sanchez et al. 2014). Therefore, the eventual goal of this research is to establish definitive traces of human agenciy associated with the megafaunal deposits at the site, which as mentioned before, includes multiple fragments of *Cuvieronius*, a New World genus of extinct gomphothere.

Chapter 5

5. Conclusion

Due to its geographical location, its relatively narrow expanse and a natural land bridge between North and South America, Middle America is poised to contribute significantly to the question of the first inhabitants of the Western Hemisphere. The

Paleoamerican record for Middle America is limited due to a lack of research focusing on that time period in the area. Most archaeological research tends to focus on the great urban Mesoamerican civilizations of the last three millennia. The fragmented Paleoamerican archaeological record in Middle America is mainly composed of individual finds with no archaeological context, and the chronological assignment of such finds is mainly based on lithic morphology. Only a handful of sites such as Los Tapiales, Guatemala, Los Grifos, Mexico, and to some extent some sites in Costa Rica and Panama. Despite this, it is evident that Middle America posses lithic traditions that place the region at a crossroads between North and South America due to the presence of North American Clovis-like and South American Fell-like projectile points, amongst other lithic types.

Clovis and Fell projectile points make the general bulk of paleoamerican archaeological record in Middle America, and due to a lack of solid chronometric data it is difficult to assess which technology made it to the region first. On the question of the Clovis-like projectile points from Middle America, it is interesting to note that the Middle American samples present identical technological attributes to North American Clovis known as "Ross County" Clovis variant. While the Middle Paleoamerican cultural links between Middle America and Florida are vague, the early period of interactions are much clearer. Ross County Clovis variants, primarily found in the Ohio River valley, Tennessee River Basin, and the Great Lakes region, represent an unambiguous morphological and technological link between North and Middle America. These points have been found in the Florida panhandle and other southeastern U.S. states, which

strengthens the idea of a circum-Gulf and Caribbean connection. This could imply an area of maritime/coastal cultural interaction along a now submerged terminal Pleistocene circum-Gulf/Caribbean coasts, between Florida and the delta area of the Mississippi with northern South America, perhaps with now submerged areas of insular Caribbean, and might suggest that initial entries into Middle America were primarily achieved from the Atlantic littoral zone.

The Pleistocene fossil assemblage of Middle America consists of large herbivores in which proboscideans (*Cuvieronius*) and xenarthrans (*Eremotherium, Glyptotherium*) are the dominant elements, while co-occurring *Equus* and *Mixotoxodon* are significantly less frequent, and *Holmesina, Palaeolama, Tapirus, Neocherus, Mammuthus* and other ground sloth taxa (*Paramylodon; Megalonyx*) are rare. From the systematic point of view, the Middle American megafaunal assemblage is approximately consistent with other associations documented along the Mesoamerican Corridor (e.g. Honduras, El Salvador, Nicaragua, Costa Rica, Panama) and northern South America (Venezuela, Colombia), which also include predominantly *Cuvieronius, Eremotherium, Glyptotherium* and *Mammuthus*.

Terminal Pleistocene evidence of human and extinct megafauna interaction in Middle America is not evidently clear. We might have a few suggestive instances where the case can be made for anthropogenic activity and extinct megafauna such as at the site of Chivacabé (Ttzi'kab'b'e) in the Western Highlands of Guatemala, where a bone bed of Terminal Pleistocene (dated to c. 15.5-12.9 kya) megafauna is present (*Glyptotherium* sp., *Cuvieronius* cf. *C. hyodon, Equus* sp., *Odocoileus* cf. *O. virginianus,* etc.) along with

lithic debitage and a “waisted” fluted Ross County type projectile point, although their association is unclear, and the matter needs further research.

Middle America is a promising area in which to gather data and test North-South Paleoamerican colonization models. The Isthmus not only constricted the passage between the continents, it also contains both Clovis-like and Fell-like projectile points Given the Darien Zone of Middle America was either the last stop before entering South America or the first one upon leaving, its buried past will surely provide key evidence capable of joining the archaeological records of both continents.

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