Long-term Cultural Continuity in the Central Region of Panama: An Examination of the Preceramic and Early Ceramic Socioeconomic Foundations in the Rio Parita Valley, Panama

Mikael J. Haller

St. Francis Xavier University, Department of Anthropology, Antigonish, NS, Canada
mhaller@stfx.ca

Abstract: Many of the characteristics of Panamanian societies described by the Spanish during the conquest, had been established much earlier. In the Central Region of Panama, social change was usually not a radical departure from dominant socioeconomic patterns but was incorporated into existing strategies. In this paper, I examine change and continuity through the archaeological record in the Parita River Valley focusing on the early occupational sequence (9200-100 BC). More specifically, I examine how general patterns, such as regional exchange, techno-ecological adaptation of the subsistence economy, and increasing social identity and differentiation were established in the Preceramic and Early Ceramic Periods and endured, albeit transformed, into the Late Ceramic Period. The continuity of these trends supports the long cultural development in the Central Region of Panama without the need of explaining social change as the result of migration.
Keywords: Archaeology; preceramic; subsistence; Parita River Valley; Panama.

Continuidad cultural en la Región Central de Panamá: Un examen de las bases socioeconómicas de los periodos Precerámico y Cerámico Temprano en el valle del río Parita, Panamá
Resumen: Muchas de las características de las sociedades panameñas descritas por los españoles durante la Conquista, fueron establecidas muchos años antes. Los cambios sociales que se producían en la región central de Panamá no eran, por lo general, cambios radicales en los patrones socioeconómicos, sino que

Cuadernos de Antropología
Julio-Diciembre 2019, 29(2), 1-19
DOI: 10.15517/cat.v29i2.36760
Recibido: 15-02-2018 / Aceptado: 25-06-2018

Revista del Laboratorio de Etnología María Eugenia Bozzoli Vargas
Centro de Investigaciones Antropológicas, Escuela de Antropología, Universidad de Costa Rica
ISSN 2215-356X

se incorporaban a estrategias preexistentes. En este artículo, examino estos cambios y la continuidad cultural a través del registro arqueológico en el valle del río Parita, centrándome en la secuencia ocupacional temprana (9200-100 a.C.). Más concretamente, me enfoco en cómo patrones generales, tales como el intercambio regional, la adaptación tecno-ecológica de la economía de subsistencia y el aumento de la identidad y la diferenciación social, se establecieron en los periodos Precerámico y Cerámico Temprano y cómo se mantuvieron, aunque transformados, en el Periodo Cerámico Tardío. La continuidad de estas tendencias es compatible con el extenso desarrollo cultural en la Región Central de Panamá sin la necesidad de explicar los cambios sociales como resultado de la migración.
Palabras claves: arqueología; precerámico; subsistencia; valle del río Parita; Panamá.

Introduction[1]

Many of the characteristics of the Panamanian societies described by the Spanish during the Conquest had been established many years before. Social change in the Central Region of Panama was not, in general, a radical departure from dominant socioeconomic patterns, but was incorporated into pre-existing strategies. Dr. Richard G. Cooke developed and championed this line of thought and throughout his career (e.g., Cooke, 1984a, 1984b, 1995, 1998, 2005, 2016; Cooke and Ranere, 1992a, 1992b; Cooke, Ranere, Pearson, and Dickau, 2013; Cooke and Sánchez, 1997; Cooke, Sánchez, and Udagawa, 2000; Cooke et al., 2016; Ranere and Cooke, 1991, 1995, 1996, 2003; Sánchez and Cooke, 2000), he demonstrated that social change in Panama could be explained by modifications within a long history of in situ sociocultural continuity and without having to resort to unsubstantial claims based on diffusion or migration (e.g., Helms, 1979).

Following these ideas of Richard G. Cooke, here, I examine social change and the cultural continuity through the archaeological record in the Parita River Valley focusing on the Early Occupational Sequence (9200-100 BC; Haller, 2008; Sánchez, 2007). More specifically, I focus on general patterns, such as regional exchange, the techno-ecological adaptation of the subsistence economy, and the changing nature of social identity and differentiation, which were established in the Preceramic and Early Ceramic periods and endured, although transformed, into the Late Ceramic Period (Haller, 2013, 2017). The continuity of these trends within the long developmental sequence in the Central Region of Panama is sufficient to explain cultural change without the need to resort to ideas of migration or long-distance diffusion (Cooke, 2011).

Using a systematic regional survey, we investigated more than 100 km^2 of the Parita River Valley performing 1237 surface collections and identifying 378 archaeology sites (see Haller [2008] for a detailed

1 This article is based on the paper presented in the Symposium "After a Millennial Cultural Legacy: Richard Cooke's Contributions to the Isthmo-Colombian Area Archaeology" (*Tras una herencia cultural milenaria: contribuciones de Richard Cooke a la arqueología del Área Istmo-colombiana*), organized by Luis A. Sánchez and Yajaira Núñez-Cortés at the XI Central American Anthropology Network Congress (*XI Congreso de la Red Centroamericana de Antropología*), celebrated from February 27 to March 3, 2017 in San Jose, Costa Rica.

description of methodology and findings). Despite that the Early Occupancy Sequence includes roughly 9,000 years of human settlement within the Parita River Valley survey, few of the recovered artifacts could be assigned to this time frame. That being said, it is important to discuss the patterns of settlement and subsistence in this time frame as it lays the foundation for further cultural developments (Haller, 2013, 2017). The Early Occupation Sequence is divided roughly into two equal parts-not an arbitrary division, but one that reflects changes in artifact technology closely linked to evolving subsistence strategies. The first part of this sequence includes the Early Hunter-Gatherers (Paleoindian) and Early Preceramic periods (9,200-5,000 BC), characterized by the presence of bifacial thinning as a lithic reduction technique and the addition of several cultivated plants to the subsistence base of wild resources (Cooke, 2005; Piperno and Pearsall, 1998; Ranere and Cooke, 1995, 1996, 2003). The presence of grinding tools and the emergence of ceramic technology suggest, respectively, an increase in dependence on the processing of tree roots and fruits (Dickau, 2010; Ranere and Cooke, 1996), and a growing sedentary lifestyle (Cooke, 1995; Iizuka, Cooke, Frame, and Vandiver, 2014; Ranere and Cooke, 1996; Willey and McGimsey, 1954) during the second part of the Early Occupation Sequence, from the Late Preceramic to the Early / Middle Ceramic B (5,000-100 BC; Haller, 2008; Sánchez, 2007).

Early Hunter-Gatherers (Paleoindian) / Early Preceramic Period (9,200-5,000 BC)

Research into the earliest human occupation in the Americas has produced much controversy. While some scholars support that the Early Hunter-Gatherer (Paleoindian) period, associated with the "Clovis" technological horizon, represents the first human groups (Anderson and Gillam, 2000; Fiedel, 1999; Sauer, 1944; Steele, Adams, and Sluckin, 1998; Webb and Rindos, 1997), others (Adovasio et al., 1978; Adovasio, Pedler, Donahue, and Stuckenrath, 1999; Bourgeon, Burke, and Higham, 2017; Dillehay, 1989, 1997, 2000; Wade, 2017) accept the presence of settlements prior to 10,500 BC. Despite claims that early human groups migrating between the Americas would have had to pass through the isthmus, there is little evidence of a pre-Clovis occupation in Panama (Cooke, 1998; Cooke et al., 2013; Pearson, 2002; Ranere and Cooke, 2003; Ranere, 1992). When evidence of human settlements is found, the earliest archaeological sites occur in a wide range of ecological configurations (e.g., tropical rainforest, savanna / thorn scrub). Ranere and Cooke (1991, 1996) suggest that, since it is easier to exploit animal resources than plant resources, when one moves to a new biomass, the first inhabitants most likely depended mainly on hunting. Despite this debate, an mtDNA study of modern Panamanians (Perego et al., 2012) and strong technological similarities between lithic assemblages in Panama and North American archaeology sites suggests that Clovis peoples settled the isthmus rapidly after human populations entered the Americas (Cooke et al., 2013). Several research projects in Panama provide important information to better understand how these early inhabitants adapted to this new environment and established subsistence strategies that would influence later socioeconomic patterns.

During the Proyecto Santa Maria survey, investigators directed by Richard Cooke and Anthony Ranere (see Ranere, this volume) recovered occupations from the Paleoindian and Early Preceramic periods in five cave sites and rock shelters (Aguadulce, Corona, Los Santanas, Carabali, and Cueva de los Vampiros) producing a long sequence of stratified dates for most of the Early Occupancy Sequence up to the end of La Mula ceramic style's use (300 AD) in the Late Occupation Sequence (Cooke and Ranere, 1992a, 1992b; Pearson and Cooke, 2002; Ranere and Cooke, 1996). The majority of the 20 open-air archaeological sites identified by the Proyecto Santa María for this period, coming from non-stratified deposits, were quite small (< 0.1 ha), and were often located in areas above the alluvium of secondary streams (Piperno and Pearsall, 1998:212; Ranere and Cooke, 1996:58). Piperno and Pearsall (1998) propose that at three of these sites of Central Panama (Carabalí, Vampiros and Aguadulce), horticulture was carried out, at least on a smaller scale, consisting of bottle gourd (*Lagenaria siceraria*), arrowroot (*Maranta arundinacea*), leren (*Calathea allouia*), and squash (possibly *Cucurbita moschata*) prior to 5,000 BC. The location of these sites, the presence of some grinding tools and phytoliths of domesticated plants, and evidence of the cutting and burning of forests support such a proposal (Cooke, 2005; Piperno and Pearsall, 1998; Piperno, Andres and Stothert, 2000, Piperno and Holst, 1998; Piperno, Ranere, Holst, and Hansell, 2000). The abundance of charred remains of parts of wild trees, including the palm fruits (*Attalea*, *Elaeis*, *Acromia*), nance (*Byrsonima*), and zapote (*Zapotaceae*) recovered from these sites (Cooke, 2005; Cooke and Ranere, 1992a) indicates that cultigens formed only a small proportion of the subsistence base (Dickau, 2010; Piperno and Pearsall, 1998) and that the adoption of agriculture in Panama was a slow process that started well before sedentism.

Lithic artifacts, similar to the Clovis tradition in North America, were recovered from open-pit quarry sites and workshops throughout the drainage area of the Parita River (Cooke and Ranere, 1992a; Pearson, 2002, 2003; Ranere and Cooke, 1991, 1996, 2003) (Figure 1). Lithics of the Early Preceramic Period such as at the site of La Mula-Central, however, were broad-stemmed, unfluted, and tanged points that reflect a tradition of bifacial reduction that is very different from that of the Early Hunter-Gatherer (Paleoindian) Period (Cooke and Ranere, 1992a; Ranere, 1992). Despite this technological and stylistic variation between the Paleoindian and Early Preceramic Periods, none of these differences could be identified in the bifacial artifacts from the Parita River Valley survey. Since the bifacial lithic reduction strategy was not used in the Central Region of Panama after 5,000 BC, however, the lithics produced with this technology could be assigned to the first part of the Early Occupation Sequence that includes the Early Hunter-Gatherer (Paleoindian) and Early Preceramic periods (Haller, 2008). Some of the wedge-shaped tools, whose edges were bifacially prepared but found much later at a shell workshop at Cerro Juan Diaz, is the only exception to this general rule (Mayo, 2004).

Even though the early sites of La Mula-West and La Mula-Central are located within the boundaries of the Parita River Valley survey, surface collections in these areas did not recover lithics from the Early Hunter-Gatherer (Paleoindian) or Early Preceramic periods. Nevertheless, we identified nine previously

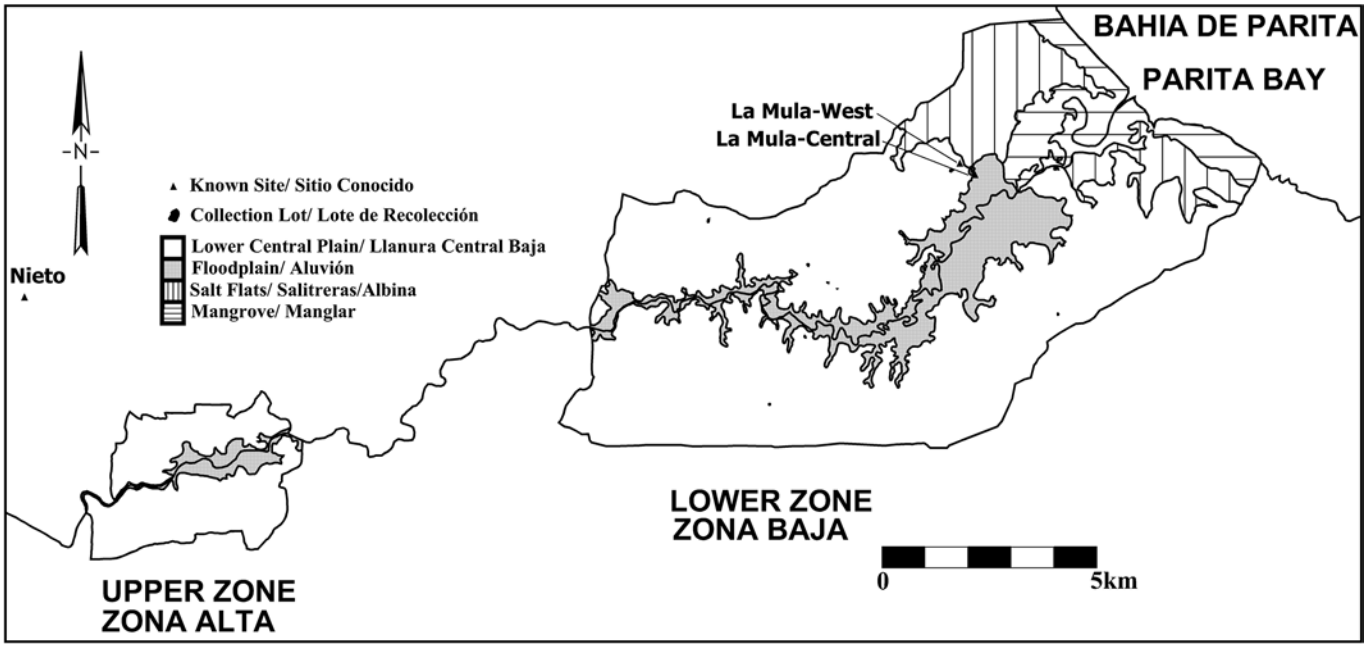

Figure 1: Paleoindian/Early Preceramic settlement.

unknown Early Hunter-Gatherer (Paleoindian) / Early Preceramic sites (Figure 1) based on the presence of bifacial fragments, end scrapers with lateral spurs, and more commonly bifacial thinning flakes (Haller, 2008). These artifacts have technological and stylistic features similar to other lithics of the Early Hunter-Gatherer (Paleoindian) / Early Preceramic periods found at sites in other parts of Panama, such as Lake Madden, Lake Yeguada, Monte Oscuro, La Mula-West, La Mula-Central, and Nieto (Bird and Cooke, 1977, 1978; Cooke, 1998; Pearson, 2002, 2003; Pearson and Cooke, 2002; Piperno and Jones, 2003; Ranere and Cooke, 1991, 1996, 2003).

From the Parita River Valley survey, all surface collections assigned to the first part of the Early Occupation Sequence corresponding to open-air sites (Figure 1), are located in the Lower Survey Zone, normally in the Low Central Plains on low hills less than 1 km from a current water source (the Parita River or secondary streams) and had an approximate average size of .5 ha. Despite intensive surveying, no rock shelters or cave sites were identified in the Parita River Valley as it was the case in adjacent river valleys. Identified occupation was located at elevations varying between 10 and 40 m above the current sea level, which would correspond to between 110 and 140 meters above sea level during the Glacial Maximum (Pearson, 2003). Inferences based on the sea level curve proposed by Golik (1968) for the Parita Bay suggest that sites such as the ones identified during the PARP survey would have been at a considerable distance, perhaps 50 km, from the coast (Ranere and Cooke, 2003).

In summary, based on previous research carried out in the Parita River Valley and its neighboring drainages, the Early Hunter-Gatherer (Paleoindian) / Early Preceramic Period was characterized by the presence of human groups occupying a wide variety of ecological zones with a subsistence base focused on a variety of resources. The subsistence economy of this period, essentially, was a mixture of hunting, gathering of wild fruits, and the cultivation of some plants (e.g., arrowroot, leren, squash, and bottle gourd) (Cooke, 2005; Dickau, 2010; Dickau, Ranere, and Cooke, 2007; Piperno and Jones, 2003). This was complemented by the processing of domesticated (or pre-domesticated) crops, whose production was favored by the direct modification of the environment through the felling and burning of forests (Cooke et al., 1996; Piperno and Pearsall, 1998). Although no rock shelters or cave sites were identified, settlement patterns from the Parita River Valley survey are characterized by small open-air sites similar to those found during the Proyecto Santa Maria, although slightly larger in area (Cooke and Ranere, 1992a; Piperno and Pearsall, 1998; Ranere and Cooke, 1996; Weiland, 1984). There is no direct evidence to suggest the existence of small-scale horticulture, but information from the nearby sites of Aguadulce Rock shelter and Cueva de los Vampiros, suggests that the early cultivation of plants could have been practiced in the Parita River Valley as well (Dickau, 2010; Dickau et al., 2007; Piperno et al., 2000; Piperno and Holst, 1998; Piperno et al., 2000).

The Late Preceramic Period to Early Ceramic B (5,000-200 BC)

It is during the Late Preceramic Period (5,000-2,900 BC) when significant changes in the subsistence base, artifact technology, and settlement patterns occur throughout the Pacific area of the Central Region (Dickau et al., 2007). Although it was a gradual process, cultivation becomes an important subsistence strategy, which was initially carried out near the household, and then, approximately around 5,000 BC, larger fields were prepared for slash and burn cultivation of several domesticated plants (Piperno and Pearsall, 1998). A primitive species of maize, bottle gourd, and a species of squash arrive in central Panama about 5,000 BC, followed by a sweet form of manioc about a thousand years later (Cooke, 2005; Piperno and Pearsall, 1998: 286-287; Perry et al., 2007; Piperno, Clary, Cooke, Ranere, and Weiland, 1985; Piperno, Bush and Colinvaux, 1991).

Edge-ground cobbles and boulder milling stones, which have been identified as plant processing tools, together with the presence of starch grains on these tools (Piperno and Holst, 1998), support an increasing dependence on cultivated resources (Ranere and Cooke, 1996). It should also be noted that the increase in the number of grinding implements may suggest an increase in the population, and not an increasing dependence on cultigens (Haller, 2008). Additionally, an analysis of a groundstone tool from the Aguadulce Rock Shelter revealed starch residues from maize, domesticated yam, and chili pepper (Piperno et al., 2000). The strong association of maize and chili pepper starch remains at early sites throughout the Americas have led Perry et al. (2007) to argue that together they represent an ancient Neotropical plant food complex.

Bifacial thinning techniques are no longer practiced and are "replaced by core reduction in which flakes are almost haphazardly struck from irregular cores" (Ranere and Cooke, 1996). It is not clear why this change occurs, but the abundance of white-tailed deer at Cerro Mangote suggests that a change in hunting orientation occurred, which would have required a different tool technology using nets, wooden spears and clubs, and setting fire to grasslands to drive / hunt this species (Andagoya, 1994; Cooke, 2005; Cooke and Ranere, 1989; Oviedo y Valdés, 1853). Similarly, at Pedro Gonzalez Island, the increased hunting of a dwarf deer at this time resulted in its extinction by the beginning of the Ceramic Period (Martínez et al., 2015) and was part of a multi-faceted subsistence strategy that exploited dolphins and marine turtles, farming, marine shore collecting, marine coastal fishing, and hunting in island forests and secondary vegetation (Cooke et al., 2016; Martín et al., 2016). These patterns at Pedro Gonzalez support the idea that horticulture, ceramics, metallurgy and other socio-technological changes were incorporated into efficient existing subsistence strategies in Ancient Panama rather than occurring as radical change (Cooke, 2011).

Settlement patterns of the Santa Maria River Valley reveal that these horticulturists were not sedentary people but adapted the location of their settlements to rain patterns, the suitability of specific topographies for planting, and the availability of uncultivated resources (Cooke, 2005; Weiland, 1984). Although Late Preceramic sites were larger than the previous period, they were still small (< 1 ha) and normally located in elevated areas overlooking streams. As well, there was a fifteen-fold increase in the number of sites on the landscape implying higher yields of domesticated crops contributed to population growth (Piperno and Pearsall, 1998; Weiland, 1984). Despite intensively surveying the lower reaches of La Villa River Valley, Isaza (2013) did not find any Paleoindian or Preceramic sites; however, she did find one site with pottery that appears to correspond to the Monagrillo complex.

From the available settlement information, it has been suggested that coastal sites, such as Cerro Mangote, were occupied during the dry season and then inhabitants would relocate to inland sites during the rainy season and focused on cultivation (Norr, 1991, 1995; Piperno and Pearsall, 1998). Cooke (2005), however, states that current data cannot distinguish between the scenarios, where [1] the same social groups would practice a transhumance settlement round, or [2] the inland / coastal sites were occupied by different groups. Nevertheless, the diversity of fauna assemblages throughout the Central Region documents the transport of shellfish and fish inland and along trans-cordilleran routes (Carvajal, Cooke, and Jiménez, 2008; Cooke, 2005; Cooke and Jiménez, 2008; Cooke and Ranere, 1992a, 1999; Ranere and Hansell, 1978) which suggests that resources from different ecological zones were exchanged.

Pottery appears in the Parita River Valley during the Early Ceramic A Period with the manufacture of Monagrillo pottery used for consuming liquids and food (Cooke, 1995; Cooke and Ranere, 1992a; Willey and McGimsey, 1954). The function of Monagrillo pottery is based on the limited forms of bowls and restricted collarless vessels with no appliqué (e.g., handles, feet) (Cooke, 1995). The simple vessel shapes

most likely reflect copying of existing organic containers (i.e., gourds) that would suggest the adoption of ceramic technology as a continuation of local traditions. Originally thought as low-fired crudware, Iizuka et al. (2014) have demonstrated that Monagrillo pottery was not crudely made as it was manufactured using a very uniform firing temperature (800-950° C). Additionally, Monagrillo vessels were decorated using bands and daubs of red paint and, later in the tradition, increased use of incised, impressed and modelled motifs (Cooke, 1995; Cooke and Sánchez, 2004; Iizuka et al., 2014).

The Monagrillo period (3520-1300 cal BC; Iizuka et al., 2014) is associated with the Monagrillo type-site near the mangrove-estuarine delta of the Parita River (Figure 2), which was occupied between 2800 and 1200 cal BC, and has been identified at Cueva de Los Ladrones associated with slightly earlier dates (Cooke, 1984a, 1995) and at the Cocle del Norte area in the Caribbean foothills (Griggs, 2005). Based on stratigraphic evidence at Corona, Carabali, Aguadulce, and Ladrones, Monagrillo Period sites in the Central Region of Panama are often found in the same locations previously used during the Late Preceramic Period (Cooke and Ranere, 1992a; Ranere and Cooke, 1996). Sites near the coast, however, are larger and more numerous and are characterized by an increase in land clearing and frequency of edge-ground cobbles and millstone bases (Cooke and Ranere, 1992a; Piperno et al., 1991; Piperno and Pearsall, 1998). For example, Monagrillo period occupation at La Mula-Sarigua site measures 1.3 ha (Hansell, 1988:199), the Monagrillo site (He-5) measures 1.4 ha (Willey and McGimsey, 1954), and the Zapotal site, in the Santa Maria River Valley, measures 3.1 ha in area (Cooke and Ranere, 1992a).

Grinding stones from Monagrillo and La Mula-Sarigua were analyzed for traces of starch grains, and Piperno and Holst (1998) identified remains of maize, manioc, and palm. As in the previous period, the faunal record documents the inland and trans-cordilleran transport of coastal resources, except instead of shellfish, now and continuing into the Early Ceramic B Period, the focus is on small estuarine fish (Carvajal et al., 2008; Cooke, 1995, 2005; Cooke and Jiménez, 2008; Cooke and Ranere, 1992a, 1992b, 1999; López-Angarita, Roberts, Tilley, Hawkins, and Cooke, 2016; Ranere and Hansell, 1978). Hansell's (1979) analyses suggest that the Monagrillo site (He-5) was occupied during the dry season (non-farming season) to obtain fish and shellfish, and the occupants spent the rest of the year elsewhere.

Although this early pottery was produced over an area of 5,600 km^2 of Central Panama, analyses by Iizuka et al. (2014) reveal that it does not appear that Monagrillo pottery manufactured at the mouth of the Parita River (He-5) was exchanged or transported very far; it is uncertain whether this was the case for other areas of Monagrillo pottery production (Iizuka et al., 2014). This potential lack of pottery exchange, coupled with the use of similar vessel shapes as organic containers and residential continuity from the Preceramic period, suggests that when ceramic technology was adopted / invented by local groups, it served to enhance existing socioeconomic activities rather than resulting in a radical transformation.

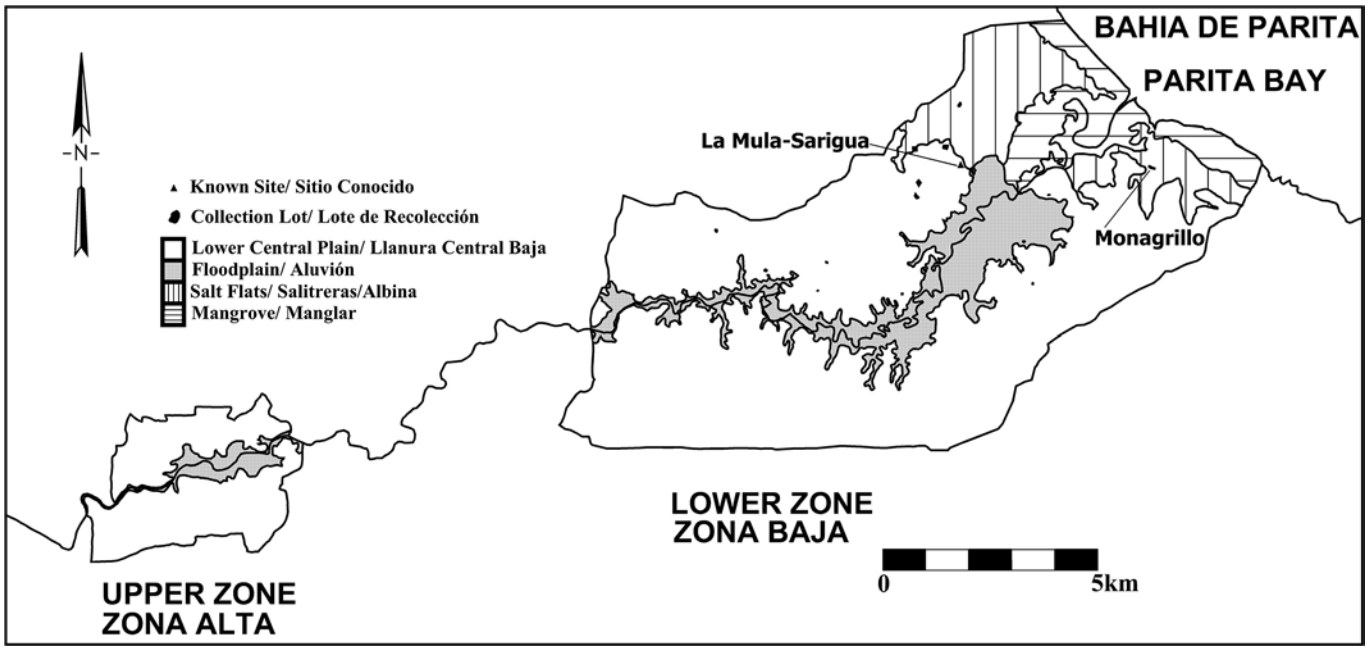

Figure 2: Late Preceramic to Early Ceramic B settlement (5,000-200 B.C.).

This trend towards increasing dependence on coastal resources and farming of the alluvium may have been the result of severe destruction of upland forests (Cooke and Ranere, 1992a:273, Piperno and Pearsall, 1998). Cooke and Ranere (1992a) and Piperno and Pearsall (1998) have advanced the hypothesis that the increase number and size of coastal sites was related to the gradual decline in fertility of hill-slope soils, which, based on the vegetation history of La Yeguada basin in the Pacific foothills (and Monte Oscuro [Piperno and Jones, 2003]), would have been so intense around 5,000 BC that the long-fallow cycle would have made swidden agriculture extremely difficult. Once again, it is not clear whether this reflects a growing dependence on coastal resources or whether it reflects the growing population along the coast of Parita Bay (Cooke, 2005). Cooke and Ranere (1992a) note that overall during the Monagrillo Period "site hierarchies and occupational specialization are more apparent" than in the Late Preceramic Period, suggesting that "some segments of the regional population were becoming larger, less self-sufficient, and more sedentary." All of which may have been the result of the increased demand for land and dependence on cultigens, and the reduction of opportunities for emigration (Cooke and Ranere, 1992a).

During the third millennium BC (Early Ceramic B Period), the population continued to shift from the foothills to the coast, concluding with the establishment of large permanent settlements, such as La Mula-

Sarigua and Sitio Sierra (Dickau et al., 2007; Ranere and Cooke, 1996). Gradually, a few cultigens that responded quite well to human manipulation began to dominate food production. The agricultural system became specialized in a few selected crops (maize, manioc, a type of yam, and chili peppers) cultivated in the alluvium of the major rivers of the Lower Coastal Plain (Dickau, 2005; Perry et al., 2007; Piperno and Holst, 1998; Piperno and Pearsall, 1998). Over time, edge-ground cobbles and milling stones were replaced with manos and breadboard metates, a polished stone-axe technology emerges (most likely as an effective way to clear the riverine forest), and the pottery is of better quality made in a variety of vessel shapes (Cooke and Ranere, 1992a, 1992b; Piperno and Pearsall, 1998).

The increase of levels of firing, decoration, and standardization of late third-millennium pottery suggests that ceramics had become a new medium for symbolic expression (Cooke and Ranere, 1992a). The disappearance of edge-ground cobbles by the Middle Ceramic C (La Mula ceramic complex) has led Cooke and Ranere (1992a) to believe that the processing of certain cultivated plants (arrowroot and a variety of yuca [*M. esculenta*]) had ended in favour of more productive crops (i.e., maize). Likewise, Piperno and Pearsall (1998) conclude that slash-and-burn agriculture, which lasted approximately 5,000 years, had eventually led to the over-exploitation of the environment and coupled with an increase in population, created a need to move into the more productive alluvium.

Beginning in the third millennium BC, the exchange of goods intensifies among the inhabitants of different ecological zones culminating during the Middle Ceramic C (La Mula ceramic complex [100 BC to 300 AD]; Haller, 2008) with the regional exchange of utilitarian (small estuarine fish, breadboard metates, polished stone axes, and pottery) and prestige goods (shell, gold, and stone ornaments) (Cooke, 2005; Cooke and Ranere, 1992a; Cooke and Sánchez, 1997; Cooke et al., 2000; Cooke, Isaza, Griggs, Desjardins, and Sánchez, 2003; Hansell, 1987, 1988). The recovery of similar styled pottery in the Atlantic watershed beginning with the Early Ceramic A period identified by Griggs, Sánchez, Cooke, Díaz, and Carvajal (2003), has led Cooke et al. (2003) to suggest that this homogeneity in style "derived from continual exchange of people and information across the mountains" (see also Cooke and Ranere, 1992a; Ranere and Cooke, 1996). Whether his exchange was regulated through the control of resources or through kinship lines, or if it represented a periodic extraction by certain individuals, however, it is not known, but it appears to be laying the foundation for later interactions (Haller, in press).

Diagnostic artifacts recovered during the Parita River Valley survey can be placed within the larger 5,000-100 BC period, but only few could be identified to the shorter temporal divisions within it (Haller, 2008). As little material was recovered for the second part of the Early Occupational Sequence, all artifacts were grouped together and were taken to represent the entire period, including the edge-ground cobble and milling base complex, and early ceramics. Although the edge-ground cobble and milling base complex appeared in the Early Preceramic, it was not until 5,000-100 BC that it reached its zenith (Piperno and Pearsall, 1998; Ranere and Cooke, 1996). This ground stone complex, therefore, has been assigned to the period of 5,000-100 BC instead of the earlier one. In support of this separation, no ground stone from this

complex was recovered in the same surface collections as Early Hunter-Gatherer (Paleoindian) or Early Preceramic material.

From the Parita River Valley survey, there were a total of 12 ha of occupation from the 5,000-100 BC period. Figure 2 illustrates that the occupation was not evenly dispersed throughout much of the survey zone as no sites were found in the Upper Survey Zone or in the Lower Central Plain south of the Parita River in the Lower Survey Zone. The majority identified sites are located just above the floodplain, on small hills or elevated areas. The location of the sites near the floodplain and the presence of edge-ground cobbles and milling stones could suggest an increased dependence on cultigens, but the lack of temporal control for this period makes it very difficult to discuss whether the settlement patterns represent something similar to those found by the Proyecto Santa Maria (Cooke and Ranere, 1984, 1992a; Weiland, 1984). There is an increase in the number of sites occupied during the latter part of the Early Occupation Sequence, but, for both parts, sites are located in roughly the same locations. Hansell's (1988:199-201) research at La Mula-Sarigua provides the best settlement information for the transition from the Early to Late Occupation Sequence. She determined that La Mula-Sarigua gradually grew from the Monagrillo Period (1.3 ha) to the first millennium B.C. (8.4 ha). It was during the Middle Ceramic C (La Mula ceramic complex), however, that population increased dramatically with La Mula-Sarigua becoming a large village (58 ha by her estimate), representing a seven-fold increase in occupation based on site size (Hansell, 1988).

In general, during the period 5,000-100 BC, settlements in the Central Region grew in size and number and were concentrated near the coast. The mixed subsistence economy continued from the previous period with the introduction of and increasing dependence on specific cultigens (i.e., maize, yuca, and palm), which was supplemented through the exchange of goods between inhabitants of different ecological zones (Cooke, 2005). It is not clear if there was a gradual migration from inland sites to the coast due to decreasing soil fertility during the 5,000-100 BC period, or if this reflects the ability of coastal areas to maintain higher population levels (Cooke, 2005). In any case, the trend of larger sites located near the coast and in the fertile valleys participating in the macro-regional exchange of goods and resources continues and intensifies during the Late Occupation Sequence (Cooke and Ranere, 1992a).

Conclusions

Although the Paleoindian, Preceramic, and Early Ceramic socioeconomic patterns are not as evident as later periods in the Parita River Valley, the survey results support the existence of a long cultural tradition in the Central Region of Panama. It is important to view the adoption of domestic plants as an extension of the previous subsistence strategies, rather than as a watershed moment in social development (see Dickau et al., 2007). Likewise, the extensive exchange that appeared during the Middle Ceramic E (Cubita ceramic complex) could be considered an elaboration of the previous trends of inland and trans-cordilleran and trade (see Sánchez and Cooke, 2000). With existing genetic evidence (Cooke, 2016; Cooke et al., 2013; Perego

et al., 2012), this continuity in subsistence strategies and socio-economic exchange supports a connection between social groups over a long temporal depth. Obviously, early hunters and gatherers and chiefly societies with ascribed status are quite different when viewed side by side and, of course, social change is important when investigating Ancient Panama; but, as well, it is important to identify trends that connect social groups and recognize their important role in socioeconomic development in Ancient Panama (Cooke, 2011).

Acknowledgments

These investigations were funded by the U.S.A.'s National Science Foundation (NSF) (#0139005; #0612859), the Social Sciences and Humanities Research Council of Canada (SSHRC) (#752-2005-0531, #410-2007-1633, #756-2010-0298; a SSHRC small-institution grant administered by StFX), Center for Latin American Studies and the University Center of International Studies both of the University of Pittsburgh. I would like to thank Lic. Carlos Fitzgerald, Dr. Tomas Mendizábal, Lic. Domingo Varela, Lic. Linette Montenegro and Architect Jaime J. Zarate (INAC) for granting permissions to undertake this project. I would also like to thank Georges Pearson for his assistance in the identification of lithic remains from the Parita River Valley Survey. I would like to express my deepest gratitude to Dr. Robert D. Drennan and Dr. Richard G. Cooke who helped me in these investigations; and to the organizers of this symposium, Luis Sánchez and Yajaira Nunez.

References Cited

Adovasio, J. M., Gunn, J. D., Donahue, J., Stuckenrath, R., Guilday, J., and Lord, K. (1978). Meadowcroft Rockshelter. In A. L. Bryan (ed.), *Early Man from a Circum-Pacific Perspective. Occasional Papers No. 1* (pp. 140-180). Edmonton, Alberta: Department of Anthropology, University of Alberta.

Adovasio, J. M., Pedler, D., Donahue, J., and Stuckenrath, R. (1999). No Vestige of a Beginning nor Prospect for an End: Two Decades of Debate on Meadowcroft Rockshelter. In R. Bonnichsen and K. L. Turnmire (eds), *Ice Age People of North America: Environments, Origins, and Adaptations* (pp. 416-431). Corvallis: Center for the Study of the First Americans, Oregon State University.

Andagoya, P. de. (1994). Relación de los sucesos de Pedrarias Dávila en las provincias de Tierra Firme ó Castilla del Oro, y de lo ocurrido en el descubrimiento de la mar del sur y costas del Perú y Nicaragua. In C. F. Jopling (ed.), *Indios y negros en Panamá en los siglos XVI y XVII: selecciones de los documentos del Archivo General de Indias* (pp. 28-35). South Woodstock, Vermont: Centro de Investigaciones Regionales de Mesoamérica, Antigua, Guatemala; Plumstock Mesoamerican Studies.

Anderson D. G., and Gillam, J. C. (2000). Paleoindian Colonization of the Americas: Implications from an Examination of Physiography, Demography, and Artifact Distribution. *American Antiquity*, 65, 43-66.

Bird, J., and Cooke, R. G. (1977). Los artefactos más antiguos de Panamá. *Revista Nacional de Cultura*, 6, 7-31.

Bird, J., and Cooke, R. G. (1978). The Occurrence in Panama of Two Types of PaleoIndian Projectile Points. In A. L. Bryan (ed.), *Early Man in America from a Circum-Pacific Perspective. Occasional Papers No. 1* (pp. 263-272). Edmonton, Alberta: Department of Anthropology, University of Alberta.

Bourgeon, L., Burke, A., and Higham, T. (2017). Earliest Human Presence in North America Dated to the Last Glacial Maximum: New Radiocarbon Dates from Bluefish Caves, Canada. *PLoS ONE*, 12(1), e0169486. doi: 10.1371/journal.pone.0169486

Carvajal, D., Cooke, R. G., and Jiménez, M. (2008). Taphonomy at two contiguous coastal rockshelters in Panama: preliminary observations focusing on fishing and curing fish. *Quaternary International*, 180, 90-106.

Cooke, R. G. (1984a). Archaeological Research in Central and Eastern Panama: A Review of Some Problems. In F. W. Lange and D. Z. Stone (eds), *The Archaeology of Lower Central America* (pp. 263-302). Albuquerque: University of New Mexico Press.

Cooke, R. G. (1984b). Book Review of Ancient Panama by Mary Helms. *Ethnohistory*, 31(2):115-116.

Cooke, R. G. (1995). Monagrillo, Panama's First Pottery: Summary of Research with New Interpretations. In J. W. Hoopes and W. Barnett (eds), *The Emergence of Pottery: Technology and Innovation in Ancient Societies* (pp. 169-184). Washington, D.C.: Smithsonian Institution Press.

Cooke, R. G. (1998). Human Settlement of Central America and Northernmost South America (14,000-8,000 BP). *Quaternary International*, 49/50, 177-190.

Cooke, R. G. (2005). Prehistory of Native Americans on the Central American Land Bridge: Colonization, Dispersal and Divergence. *Journal of Archaeological Research*, 13, 128-187.

Cooke, R. G. (2011). The Gilcrease Collection and the Gran Coclé. In Gilcrease Museum (ed.), *To Capture the Sun* (pp. 115-160). Tulsa: University of Oklahoma Press.

Cooke, R. G. (2016). Recientes avances metodológicos y sustantivos hacen necesarios nuevos esquemas de desarrollo socio-cultural en el istmo indígena. Paper presented at the *Congreso de Antropología e Historia de Panamá 2016*, Ciudad de Saber, Panamá.

Cooke, R. G., Isaza, I., Griggs, J., Desjardins, B., and Sánchez, L. A. (2003). Who Crafted, Exchanged and Displayed Gold in Pre-Columbian Panama? In J. Quilter and J. W. Hoopes (eds), *Gold and Power in Ancient Costa Rica, Panama, and Colombia* (pp. 91-158). Washington D.C.: Dumbarton Oaks.

Cooke, R. G., and Jiménez, M. (2008). Pre-Columbian use of fish in the Santa Maria Biogeographical Province, Panama. *Quaternary International*, 185, 46-58.

Cooke, R. G., Norr, L. C., and Piperno, D. R. (1996). Native Americans and the Panamanian Landscape: Harmony and Discord between Data Sets Appropriate for Environmental History. In E. J. Reitz, L. A. Newsom, and S. J. Scudder (eds), *Case Studies in Environmental Archaeology* (pp. 103-126). New York: Plenum Press.

Cooke, R. G., and Ranere, A. J. (1984). The "Proyecto Santa María": A Multi-Disciplinary Analysis of Prehistoric Adaptations to a Tropical Watershed in Panama. In F. W. Lange (ed.), *Recent Developments in Isthmian Archaeology. BAR International Series 212* (pp. 3-30). Oxford: BAR.

Cooke, R. G., and Ranere, A. J. (1989). Hunting in Pre-Columbian Panama: A Diachronic Perspective. In J. Clutton-Brock (ed.), *The Walking Larder: Patterns of Domestication, Pastoralism, and Predation* (pp. 295-315). London: Unwin Hyman.

Cooke, R. G., and Ranere, A. J. (1992a). The Origin of Wealth and Hierarchy in the Central Region of Panama (12,000-2,000 BP), with Observations on its Relevance to the History and Phylogeny of Chibchan-speaking Polities in Panama and Elsewhere. In F. W. Lange (ed.), *Wealth and Hierarchy in the Intermediate Area* (pp. 243-316). Washington D. C.: Dumbarton Oaks.

Cooke, R. G., and Ranere, A. J. (1992b). Prehistoric Human Adaptations to the Seasonally Dry Forests of Panama. *World Archaeology*, 24(1), 114-133.

Cooke, R. G., and Ranere, A. J. (1999). Precolumbian Fishing on the Pacific Coast of Panama. In M. Blake (ed.), *Pacific Latin America in Prehistory: The Evolution of Archaic and Formative Cultures* (pp. 103-121). Pullman, WA: Washington State University Press.

Cooke, R. G., Ranere, A. J., Pearson, G. and Dickau, R. (2013). Radiocarbon Chronology of Early Human Settlement on the Isthmus of Panama (13,000-7000 BP) with Comments on Cultural Affinities, Environments, Subsistence, and Technological Change. *Quaternary International*, 301, 3-22.

Cooke, R. G., and Sánchez, L. A. (1997). Coetaneidad de metalurgia, artesanías de concha y cerámica pintada en Cerro Juan Díaz, Panamá. *Boletín del Museo del Oro*, 42, 57-85.

Cooke, R. G., and Sánchez, L. A. (2004). Panamá Prehispánico. In A. Castillero (ed.), *Historia general de Panamá* (pp. 3-46, vol. 1, Pt. 2). Panama City: Comité Nacional del Centenario de la República de Panamá.

Cooke, R. G., Sánchez, L. A., and Udagawa, K. (2000). An Update Based on Recent Excavations and New Radiocarbon Dates for Associated Pottery Styles. In C. McEwan (ed.), *PreColumbian Gold* (pp.154-176). Chicago: Fitzroy Dearborn.

Cooke, R. G., Wake, T. A., Martínez-Polanco, M. F., Jiménez-Acosta, M., Bustamante, F., Holst, I. ... Redwood, S. (2016). Exploitation of dolphins (Cetacea: Delphinidae) at a 6000 yr old Preceramic site in the Pearl Island Archipelago, Panama. *Journal of Archaeological Science*, 6, 733-756.

Dickau, R. (2005). *Resource Use, Crop Dispersals, and the Transition to Agriculture in Prehistoric Panama: Evidence from Starch Grains and Macroremains* (Unpublished doctoral dissertation). Temple University, Philadelphia, EEUU.

Dickau, R. (2010). Microbotanical and Macrobotanical Evidence of Plant Use and the Transition to Agriculture in Panama. In A. M. VanDerwarker and T. M. Peres (eds), *Integrating Zooarchaeology and Paleoethnobotany: A Consideration of Issues, Methods, and Cases* (pp. 99-134). New York: Springer.

Dickau, R., Ranere, A. J. and Cooke R. G. (2007). Starch Grain Evidence for the Preceramic Dispersals of Maize and Root Crops into Tropical Dry and Humid Forests of Panama. *PNAS*, 104(9), 3651-3656.

Dillehay, T. D. (1989). *Monte Verde: A Late Pleistocene Settlement in Chile: Paleoenvironment and Site Context (Vol. I)*. Smithsonian Institution Press, Washington, D.C.

Dillehay, T. D. (1997). *Monte Verde: A Late Pleistocene Settlement in Chile: The Archaeological Context (Vol. II)*. Washington, D.C.: Smithsonian Institution Press.

Dillehay, T. D. (2000). *The Settlement of the Americas: A New Prehistory*. New York: Basic Books.

Fiedel, D. (1999). Older Than We Thought: Implications of Corrected Dates for Paleoindians. *American Antiquity*, 64, 95-115.

Golik, A. (1968). History of Holocene Transgression in the Gulf of Panama. *Journal of Geology*, 76(5), 497-507.

Griggs, J. (2005). *The Archaeology of Central Caribbean Panama* (Unpublished doctoral dissertation). University of Texas, Austin, EEUU.

Griggs, J., Sánchez, L. A., Cooke, R. G., Díaz, C. P., and Carvajal, D. R. (2003). *Recopilación de Datos Ambientales y Culturales en la Región Occidental de la Cuenca del Canal de Panamá. Tarea 6: Inventario de Sitios de Recursos Culturales y Evaluación del Potencial de Sitios Adicionales. Volumen 2: Informe de la Fase I e Informe Final*. Panamá: The Louis Berger Group, Smithsonian Tropical Research Institute, Universidad de Panamá and La Autoridad del Canal de Panamá. Unpublished manuscrit.

Haller, M. J. (2008). *Asiento Viejo and the Development of the Río Parita Chiefdom, Panama. Memoirs in Latin American Archaeology No. 19*. Pittsburgh: University of Pittsburgh.

Haller, M. J. (2013). Interdependencia Socioeconómica y el Desarrollo de las Sociedades Cacicales en el valle del río Parita, Región Central de Panamá. *Canto Rodado*, 8, 59-74.

Haller, M. J. (2017). Creación y expresión de la identidad social: utilización del espacio sagrado y residencial en el valle del río Parita, Panamá. *Canto Rodado*, 12:39-60.

Haller, M. J. (In press). Una perspectiva de múltiples escalas sobre el desarrollo de las sociedades complejas durante la fase Cubitá en el valle del río Parita, Panamá. In J. G. Martín and T. Mendizábal (eds), *Mucho más que un puente terrestre: avances de la arqueología en Panamá*. Panama: Ediciones Uninorte y Smithsonian Tropical Research Institute.

Hansell, P. (1979). *Shell Analysis: A Case Study from Panama* (Unpublished master's thesis). Temple University, Philadelphia, EEUU.

Hansell, P. (1987). The Formative in Central Pacific Panama: La Mula-Sarigua. In R. D. Drennan and C. A. Uribe (eds), *Chiefdoms in the Americas* (pp. 119-139). Lanham, MD: University Press of America.

Hansell, P. (1988). *The Rise and Fall of an Early Formative Community: La Mula-Sarigua, Central Pacific Panama* (Unpublished doctoral dissertation). Temple University, Philadelphia, EEUU.

Helms, Mary W. (1979). *Ancient Panama: Chiefs in Search of Power*. University of Texas Press, Austin.

Iizuka, F., Cooke, R. G., Frame, L., and Vandiver, P. (2014). Inferring provenance, manufacturing technique, and firing temperatures of the Monagrillo ware (3520-1300 cal BC), Panama's first pottery. In M. Martinón-Torres (ed.), *Craft and Science: International Perspectives on Archaeological Ceramics* (pp. 19-29). Doha: Bloomsbury Qatar Foundation.

Isaza, I. (2013). Desarrollo diacrónico de dos asentamientos precolombinos en los dominios sureños del Cacicazgo de Parita en el Gran Coclé, Panamá. In Scott D. Palumbo, A. M. Boada Rivas, W. A. Locascio, and A. C. J. Menzies (eds), *Multiscalar Approaches to Studying Social Organization and Change in the Isthmo-Colombian Area* (pp. 15-37). Pittsburgh: University of Pittsburgh Center for Comparative Archaeology, Editorial Universidad de Costa Rica, and Universidad de los Andes.

López-Angarita, J., Roberts, C. M., Tilley, A., Hawkins, J. P., and Cooke, R. G. (2016). Mangroves and people: Lessons from a history of use and abuse in four Latin American countries. *Forest Ecology and Management*, 368, 151-162.

Martín, J. G., Cooke, R. G., Bustamante, F., Holst, I., Lara, A., and Redwood, S. (2016). Ocupaciones prehispánicas en isla Pedro González de las Perlas, Panamá: aproximación a una cronología con comentarios sobre las conexiones externas. *Latin American Antiquity*, 27(3), 378-396.

Martínez, M. F., Jiménez, M., Buckley, M., and Cooke, R. G. (2015). Impactos humanos tempranos en fauna insular: El case de los venados enanos de Pedro González (Archipiélago de las Perlas, Panamá). *Archaeobios*, 9(1), 202-214.

Mayo, J. A. (2004). *La Industria Prehispánica de Conchas Marinas en "Gran Coclé", Panamá* (Unpublished doctoral dissertation). Universidad Complutense de Madrid, Madrid, España.

Norr, L. C. (1991). *Nutritional Consequences of Prehistoric Subsistence Strategies in Lower Central America* (Unpublished doctoral dissertation). University of Illinois, Urbana, EEUU.

Norr, L. C. (1995). Interpreting Dietary Maize from Bone Stable Isotopes in the American Tropics: The State of the Art. In P. W. Stahl (ed.), *Archaeology in the Lowland American Tropics: Current Analytical Methods and Recent Applications* (pp. 198-223). Cambridge: Cambridge University Press.

Oviedo y Valdés, G. F. De. (1853). *Historia natural y general de Las Indias (vol. 3)*. Madrid: La Real Academia de la Historia.

Pearson, G. A. (2002). *Pan-Continental Paleoindian Expansions and Interactions as Viewed from the Earliest Lithic Industries of Lower Central America* (Unpublished doctoral dissertation). University of Kansas, Lawrence, United States.

Pearson, G. A. (2003). First Report on a Newly Discovered Paleoindian Quarry site on the Isthmus of Panama. *Latin American Antiquity*, 14(3), 311-322.

Pearson, G. A., and Cooke, R. G. (2002). The Role of the Panamanian Land Bridge During the Initial Colonization of the Americas. *Antiquity*, 76, 931-932.

Perego, U. A., Lancioni, H., Tribaldos, M., Angerhofer, N., Ekins, J. E., Olivieri, A. ... Achilli, A. (2012). Decrypting the mitochondrial gene pool of modern Panamanians. *PLoS One*, 7(6), e38337. doi: 10.1371/journal.pone.0038337

Perry, L., Dickau, R., Zarrillo, S., Holst, I., Pearsall, D. M., Piperno ... Zeidler, J. A. (2007). Starch Fossils and the Domestication and Dispersal of Chili Peppers (*Capsicum* spp. L.) in the Americas. *Science*, 315(5814), 986-988.

Piperno, D. R., Andres, T. C., and Stothert, K. E. (2000). Phytoliths in Cucurbita and other Neotropical Cucurbitacea and their Occurrence in Early Archaeological Sites from the Lowland American Tropics. *Journal of Archaeological Science*, 27, 193-208.

Piperno, D. R., Bush, M. B., and Colinvaux, P. A. (1991). Paleoecological Perspectives on Human Adaptation in Central Panama, I: The Pleistocene. *Geoarchaeology*, 6, 201-226.

Piperno, D. R., Clary, K. H., Cooke, R. G., Ranere, A. J., and Weiland, D. (1985). Preceramic Maize in Central Panama: Phytolith and Pollen Evidence. *American Anthropologist*, 87(4), 871-878.

Piperno, D. R., and Holst, I. (1998). The Presence of Starch Grains on Prehistoric Stone Tools from the Humid Neotropics: Indications of Early Tuber Use and Agriculture in Panama. *Journal of Archaeological Science*, 25, 765-776.

Piperno, D. R., and Jones, J. G. (2003). Paleoecological and Archaeological Implications of a Late Pleistocene/Early Holocene Record of Vegetation and Climate from the Pacific Coastal Plain of Panama. *Quaternary Research*, 59, 79-87.

Piperno, D. R., and Pearsall, D. (1998). *Origins of Agriculture in the Lowland Neotropics*. New York: Academic Press.

Piperno, D., Ranere, A. J., Holst, I., and Hansell, P. K. (2000). Starch Grains Reveal Early Root Crop Horticulture in the Panamanian Tropical Forest. *Nature*, 407, 894-897.

Ranere, A. J. (1992). Implements of Change in the Holocene Environments of Panama. In O. R. Ortiz-Troncoso and T. van der Hammen (eds), *Archaeology and Environment in Latin America* (pp. 25-44). Amsterdam: Instituut voor Pre- en Protohistorische Archeologie Albert Egges van Giffen, Universiteit van Amsterdam.

Ranere, A. J., and Cooke, R. G. (1991). Paleoindian Occupation in the Central American tropics. In R. Bonnichsen and K. L. Turnmire (eds), *Clovis: Origins and Adaptations* (pp. 237-253). Corvallis: Center for the Study of the First Americans, Oregon State University.

Ranere, A. J., and Cooke, R. G. (1995). Evidencias de Ocupación Humana en Panamá a Postrimerías del Pleistoceno y a Comienzos del Holoceno. In I. Cavelier and S. Mora (eds), *Ambito y Ocupaciones Tempranas de la América Tropical* (pp. 5-26). Bogotá: Fundación Erigaie, ICAN.

Ranere, A. J., and Cooke, R. G. (1996). Stone Tools and Cultural Boundaries in Prehistoric Panama: An Initial Assessment. In F. W. Lange (ed.), *Paths to Central American Prehistory* (pp. 49-77). Niwot CO: University Press of Colorado.

Ranere, A. J., and Cooke, R. G. (2003). Late Glacial and Early Holocene Occupation of Central American Tropical Forests. In J. Mercader (ed.), *Under the Canopy: The Archaeology of Tropical Rain Forests* (pp. 219-248). New Brunswick, NJ: Rutgers University Press.

Ranere, A. J., and Hansell, P. (1978). Early Subsistence Patterns along the Pacific Coast of Central Panama. In B. J. Stark and B. Voorhies (ed.), *Prehistoric Coastal Adaptations: The Economy and Ecology of Maritime Middle America* (pp. 43-59). New York: Academic Press.

Sánchez, L. A. (2007). Reporte tipológico y cronológico de los componentes cerámicos de Cerro Cebollal (LP-134), La Pintada, provincia de Coclé. *Revista Española de Antropología Americana*, 37(1), 159-178

Sánchez, L. A., and Cooke, R. G. (2000). Cubitá: a New Stylistic Link in the Ceramic Tradition of Gran Coclé, Panamá. *Precolombart*, 3, 5-20.

Sauer, C. O. (1944). A Geographic Sketch of Early Man in America. *Geographical Review*, 34, 529-573.

Steele, J. F., Adams, J., and Sluckin, T. (1998). Modeling Paleoindian Dispersals. *World Archaeology*, 30, 286-305.

Wade, L. (2017). Most archaeologists think the first Americans arrived by boat. Now, they're beginning to prove it. *Science Magazine*. doi:10.1126/science.aan7213. Retrieved from http://www.sciencemag.org/news/2017/08/most-archaeologists-think-first-americans-arrived-boat-now-they-re-beginning-prove-it

Webb, R. E., and Rindos, D. J. (1997). The Mode and Tempo of the Initial Human Colonisation of Empty Landmasses: Sahul and the Americas Compared. In C. M. Barton and G. A. Clark (eds), *Rediscovering Darwin: Evolutionary Theory and Archaeological Explanation. Archaeological Papers of the American Anthropological Association, No. 7* (pp. 233-250). Arlington, VA: American Anthropological Association.

Weiland, D. (1984). Prehistoric Settlement Patterns in the Santa María Drainage of Central Panama: A Preliminary Analysis. In F. W. Lange (ed.), *Recent Developments in Isthmian Archaeology: Advances in the Prehistory of Lower Central America. BAR International Series 212* (pp. 31-53). Oxford: BAR.

Willey, G. R., and McGimsey, C. R. (1954). *The Monagrillo Culture of Panama. Papers of the Peabody Museum of Archaeology and Ethnology, Harvard University Paper, 49(2)*. Cambridge, Massachusetts: Peabody Museum.