Territorial Expansion in the Virú State: Updating Old Settlement Patterns to Explore New Ideas

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Version Date: January 14, 2018

Highlights:

- The territorial-expansion model is examined in context of the development of the Virú state (ca. 200 BC) in the Virú Valley of Peru
- The Virú state is shown to have incorporated two earlier Puerto Morin Period (ca. 400 – 200 BC) polities during a process of large-scale settlement growth
- Settlement hierarchies are reconstructed for both Puerto Morin and Virú settlement
- This article provides support for the territorial expansion model

Abstract

The territorial-expansion model, recently proposed as a general model to explain the development of first-generation states, is tested in the Virú Valley of Peru. The Virú state developed around 200 BC and is the earliest known state on the north coast of Peru. The settlement patterns and settlement hierarchies of the Virú Period (ca. 200 BC – 600 AD) are compared with those of the earlier Puerto Morin Period (ca. 400 – 200 BC) to investigate processes of territorial expansion. Two independent polities and several outlying communities occupied the valley during the Puerto Morin Period whereas settlement during the Virú Period was extensive, populations surged, and large swaths of the valley were settled for the first time.

Evidence is presented to show that the Virú state incorporated the earlier Puerto Morin polities and that a three-tiered settlement hierarchy existed at this time. Drawing from cross-cultural evidence and recent studies on Virú expansionary dynamics, I propose a hypothesis that the Virú state expanded rapidly throughout the valley early in its developmental history and pursued a policy of territorial consolidation later in its history. Ultimately, the Virú case supports the territorial-expansion model of early state development.

Keywords: Early states; territorial expansion model; settlement patterns; settlement hierarchies; Peru; north coast; Early Intermediate Period, Puerto Morin; Virú

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Declarations of interest: none

Introduction

Essential to statecraft among incipient and early states is that political power becomes centralized, a process that typically involves the coalescence of autonomous communities into a single polity (Algaze 1993; Flannery 1998, 1999; Marcus 1992, 1998; Marcus and Flannery 1996; Spencer 1990, 1998, 2009, 2010; Redmond and Spencer 2012; Wright 1977, 1986, 2006). A centralized and internally-specialized leadership has the power to delegate authority through a bureaucracy while being relatively certain that orders will be carried out without insubordination and without upsetting the hierarchy (Spencer 2010; Wright 1977). In Spencer's (2010) view, the presence of a bureaucracy allows states to expand their territorial borders far wider and more quickly than would be possible under forms of political governance that have a centralized but not internally-specialized sociopolitical system, such as exists in chiefdoms.

Spencer (2010) used cross-cultural examples to develop the territorial-expansion model, which argues that the expansion into and consolidation of new territories is entangled with the development of a centralized authority (see also Millaire et al. 2016). Along similar lines, Marcus (1992, 1998; Flannery and Marcus 1996) showed that regions where early states developed often underwent dynamic cycling. This is where investments in land and economic resources allowed for major population growth and led to polities run by strong leaders, only to break down as distant territories sought self-governance when participation in the central polity became less attractive. In time, a strong political authority would emerge once more and pull distant territories into a centralized polity, restarting this cycle. Furthermore, Flannery (1999) showed that statecraft is a process, one that is carried out by powerful agents who use specific economic, ecological, and ideological means—always including some aspect of warfare—to come to power and to craft a state out within a context of competition.

Of key importance to the present paper is that states always delegate power in a hierarchy with four levels of leadership (Flannery 1999). Each level has a presence on the landscape of the state in the form of size differences between capital cities, secondary centers, villages, and hamlets, with power structures moving up the chain from village elders to the ruling state elite. Chiefdoms, in contrast, will have either a two- or three-tiered hierarchy, and are limited in the amount of territory they can effectively control (Spencer 1998; 2010). The power dynamics that

brought this landscape into being can be productively studied through settlement hierarchies. The settlement hierarchy approach was first used by Wright and Johnson (1975; see also Wright 1977) to rank settlements by size in southern Iran and it has since been widely applied (Billman 1999, 2002; Spencer 1998, 2009, 2010; Spencer and Redmond 2004; Underhill et al. 2008). Indeed, Flannery (1998) considered settlement hierarchies to be one of the most important traits that archaeologists can use in the study of early states and they form a key part of Spencer's (2010) territorial-expansion model. Wright and Johnson (1975: 270) cautioned that a hierarchy in site size alone is not sufficient evidence of administrative control of one site over another. Instead, there must be additional evidence that commanding sites were located in such a way to control trade and movement, and as such Wright and Johnson (1975) outline a specific pattern of both settlement hierarchy *and* site location. To this I will add that additional evidence of the importance of certain locations—such as the presence of civic structures or community space at a site—can serve as additional supporting evidence for administrative control.

The settlement hierarchy approach provides a compelling and easily analyzed model, but it is based on several core assumptions about both the nature of leadership structures and how settlements form and grow. Various geographic, economic, political, and cultural variables may factor into site placement strategies and can affect the life history of individual settlements and of entire regions (Davies et al. 2014; Duffy 2015; Verhagen et al. 2015). Drawing from ethnohistoric and archaeological evidence, Duffy (2015) has recently argued that it is incorrect to assume that a hierarchical pattern in site size automatically demonstrates a hierarchical political relationship. Instead, Duffy (2015) demonstrates several cases of size hierarchies that occurred due to subsistence resource aggregation, seasonal occupations, and communities that split in two. Along similar lines, Davies et al. (2014) developed a model to demonstrate how social and environmental variables influence site size, location, and importance in the Middle Bronze Age and Iron Age of Syria, showing that political relationships are only one factor in the development of settlement size hierarchies. The specific settlement patterns and geographical organization of a polity depend on long-term trajectories in its growth and development (Peterson and Drennan 2012) and the same polity, or culturally related ones, can follow different organizational strategies at different times (Dillehay 2014a). Additionally, not all states pursue territorial expansion; there are varying degrees of power and control within any polity, authority may be contested by various state and non-state actors, and it is overly-simplistic to assume that all early

states resemble a pattern of a single powerful capital holding sway evenly across a bounded territory (Campbell 2009; Chabot-Hanowell and Smith 2013; Claessen and Hagesteijn 2012; Dillehay 2014a, 2014b; Falconer and Redman 2009; Feinman 1998; Glatz 2009; Honeychurch 2014; Kristiansen 2010; Osborne 2013; Renfrew 1986; Richards-Rissetto and Landau 2014; Routledge 2014; M.L. Smith 2005, 2007; Van Valkenburgh and Osborne 2013; Yoffee 2013). In response to such criticisms, Spencer (2014) emphasizes that the territorial-expansion model, as he developed it, refers only to primary or first-generation states.

The dynamics of territorial expansion can be seen at play in the Virú Valley (Figure 1) during the Puerto Morin and Virú Periods (ca. 400 – 200 BC and 200 BC to 600 AD, respectively)¹. Willey (1953: 396) considered the valley to have been organized as a state during the Virú Period (the Gallinazo Period, in his terminology). More recently, Millaire (2009a, 2010a; Millaire and Eastaugh 2011, 2014; Millaire et al. 2016) has confirmed Willey's conclusion by demonstrating that the powerful Virú state developed an urban core at the Gallinazo Group (Figure 2) with outposts of the administrative elite located throughout the valley at settlements such as Huaca Santa Clara, and with evidence of expansionary dynamics in the Moche and Chicama valleys to the north. The Virú state also embarked on a program of infrastructure-building with major investments in irrigation networks, public space, and a formalized military apparatus (Downey 2014; Millaire 2008). While Millaire has investigated the role that major settlements played in the Virú state, the original Virú Valley settlement patterns have never been comprehensively revisited or updated from the perspective of the territorial-expansion model.

The goal of this paper is to test whether processes of territorial expansion were at play in the nascent Virú state. This is achieved by comparing settlement patterns between the Puerto Morin and Virú periods to determine the extent of territorial expansion in the latter and to explore whether authority became centralized as the Virú state grew in power during the Virú Period. Satellite imagery and the ArcGIS suite of software are used to map and summarize Puerto Morin and Virú settlement patterns. Settlement hierarchies, a key analytical tool offered by Spencer (2010) and others as a universal way to examine the type and degree of political

¹I have previously (Downey 2014) suggested that the Puerto Morin, Virú, and Huancaco periods are all part of the same cultural tradition and should be regarded as Early, Middle, and Late Virú. I maintain distinct period names in this paper for clarity and to ensure consistency within the literature.

centralization in territorial-expansionist polities, are also examined for each period. Ultimately I find that settlement was far more extensive and centralized during the Virú Period and a three-tiered settlement hierarchy came into place at this time. These findings are consistent with the development of a strong, centralized political authority and are indicative that the Virú polity was organized as a state.

Background

The north coast of Peru has long been recognized as a core area of primary state development but considerable debate remains over the nature of the region's earliest states. Most attention has been paid to the Moche (ca. 100 – 800 AD). For decades, the Moche were seen as an expansive territorial state that violently conquered coastal valleys to the north and south of their core area (Bawden, 1996; Billman 1996; Larco 1945; Moseley 2001; Quilter 2002; Willey 1953: 397; Wilson 1988). As research programs continue in various parts of the Moche region, a more nuanced picture is emerging. Instead of an expansive territorial state, the Moche are now understood to consist of several politically autonomous groups with shared iconography that likely indicates a cultural sense of “Moche-ness” across various politically- and ethnically-independent valleys (Bourget 2010; Castillo and Donnan 1994; Castillo and Quilter 2010; Donnan 2009, 2011; Millaire 2010b; Quilter and Koons 2012; Shimada 2010).

The idea of an expansive Moche territorial state stems in part from conclusions made by the Virú Valley Project (Bennett 1950; Collier 1955; Ford 1949; Strong 1947; Strong and Evans 1952; Willey 1953: 397). The Virú Valley Project (VVP) was a multi-institutional project that sought to describe the entire occupational history of a single valley of the Peruvian north coast, choosing Virú because it is relatively small with continuous occupation from the Preceramic Period through to the present-day. The apparently sudden appearance of Moche-like ceramics during the Huancaco Period (600 – 750 AD), especially at sites such as Huaca Santa Clara (V-67), indicated to Willey and his colleagues that an expanding Moche kingdom violently overthrew the ruling Virú elite and then established the site of Huancaco as a regional capital. However, research within the last 20 years has overturned these conclusions. Bourget (2004, 2010) excavated at Huancaco and found that rather than being a provincial capital of an expanding Moche polity, it instead served as the capital of a Virú polity that continued to hold sway over parts of the valley even as Moche became an increasingly popular entity in the region.

Millaire (2004, 2009b; 2010b) excavated at Huaca Santa Clara and found that this strategically-located town served as an administrative center for a powerful Virú polity with no evidence of the violent military incursion described by Willey (1953: 397). Millaire's (2010a; Millaire and Eastaugh 2011) subsequent work at the Gallinazo Group, long considered the capital of the Virú state (Willey 1953: 396-397) has further demonstrated that the Virú period was marked by a strong polity that controlled much if not all of the Virú Valley. According to Millaire, the Virú leadership moved to Huancaco around 450 AD and the polity remained unified in its new capital.

At present, it is thought that the Virú Valley and its important tributary, Huacapongo, were organized as a series of small, independent polities during the Puerto Morin Period, and later became integrated into a valley-wide polity during the Virú Period (Topic 1982; West 1971; Willey 1953: 396-397). It is clear from Willey's (1953: 391) work that a major shift in settlement patterns occurred between these periods (Figure 3)². Puerto Morin settlement was densely-concentrated in the Huacapongo branch of the valley with sparser settlement throughout the lower valley. Willey considered the Huacapongo Valley to have been almost entirely abandoned at the end of this period as settlement shifted away from the steep hills bordering the middle valley and onto the floor of the lower Virú Valley nearer to the Pacific Ocean. According to Willey, population levels slowly recovered throughout the Virú Period in the Huacapongo region but the valley system underwent a major reorganization. The Gallinazo Group, a large cluster of mounds located near the coast, was founded as a capital city of the Virú state. Massive irrigation networks protected by six large fortified civic-ceremonial centers—known as *castillos*—reclaimed large tracts of desert and the valley saw its highest Prehispanic population levels (Willey 1953: 393).

This narrative is convincing but it is based on old data and especially on the results of a seriation (Ford 1949) that is difficult to accept at face value in light of newer typological and chronological evidence on the north coast (Donnan 2009; Millaire 2009a; Millaire and Morloin 2009). Cultural chronologies throughout the north coast of Peru are continuing to be improved, but it is now clear that cultural expressions in the region are more diverse and fractured than has traditionally been recognized and absolute dates for cultural phenomena are still uncertain

² Willey (1953) subdivided the Puerto Morin Period into an early and a late phase and subdivided the Virú Period into an early, middle, and late phase. These subdivisions are not currently recognized (Millaire 2009a) and are not used in this paper.

(Bourget 2010, Castillo and Quilter 2010; Donnan 2009, 2011; Downey and Millaire 2015; Koons 2015; Koons and Alex 2014; Makowski 2009; Millaire 2009a; Quilter and Koons 2012). A program of radiometric dating and an updated seriation of the Virú Valley's ceramic assemblages has refined site chronologies (Downey 2014; Downey and Millaire 2015; Millaire and Morloin 2009); these updated chronologies form the basis for the settlement patterns mapped and analyzed in this paper. It is shown that while Willey's (1953) overall conclusions remain valid, many of the specific settlement patterns he mapped contain errors. Updating these settlement patterns brings the process of statecraft in the valley more in-line with the territorial expansion model being tested in this paper.

Virú Valley geography

The Virú River is typical of north coast river valleys. The Peruvian coastal plain consists of a narrow strip of arid land between the Andean mountains to the east and the Pacific Ocean to the west. This desert plain is cut by several river valleys that have been irrigated since antiquity and that have always housed the majority of coastal populations. The Virú River rises in the Carabamba Plain at an elevation of approximately 3000 masl and flows in a wide arc through a narrow channel to the valley neck. Here the river meets the Huacapongo River, a major tributary, and continues to flow in a southwest direction for approximately 18 km from the valley neck to the coast. The Virú Valley Project study area consisted of the lower and middle portions of Virú along with the smaller Huacapongo Valley (Ford and Willey 1949; Willey 1953: 13-14); I maintain the same study area and refer to this as the Virú Valley system.

The Virú Valley system can be subdivided into three broad zones: (1) Huacapongo and Middle Virú; (2) Lower Virú; and (3) the littoral. The first zone describes the Virú Valley neck, the area upstream from the neck, and the entirety of the Huacapongo Valley. This zone is characterized by narrow valley floors surrounded by steep, rocky hills with sparse cactus vegetation. These hills are cut by numerous dry *quebradas*, narrow ravines leading to boulder-strewn alluvial fans that result from the periodic deluges received during El Niño events. The second zone, Lower Virú, is the largest. Lower Virú is a roughly cone-shaped plain of arable land extending downstream from the valley neck.³ For my purposes, Lower Virú consists of the area that was irrigated and arable when Willey (1953) conducted his survey of the valley in the

³ Lower Virú is approximately 2.5 km wide at the valley neck and 15 km wide at or near the coast.

1940s. Lower Virú is a wide, flat plain dotted with sand dunes of varying heights. The Compositan Hills, a spur of the Andean foothills, extends along the southern margin to the coast and several isolated rocky outcrops are found on the south side of the valley, the tallest being Cerro Bitín at approximately 250 m above the valley floor. Finally, the littoral zone consists of beaches and back-beach areas that are characterized by *salitre*, a type of soil that cannot be farmed without considerable effort. This zone continues to be sparsely used today.

Materials and Methods

Data Acquisition

This study presents updated settlement patterns for the Virú Valley during the Puerto Morin and Virú periods based satellite remote sensing and informed by field surveys. The 315 sites identified and described by Willey (1953) serve as the source of data. Together, these sites account for approximately one-quarter of all sites that were visible on aerial images of the valley (Ford and Willey 1949: 20).⁴ The bulk of these sites were identified by Ford and Willey from aerial photographs, and the pair subsequently surveyed and collected ceramics from some 270 sites. Ford (1949) used seriation to date these ceramic collections. The remaining sites were excavated and dated by other project members (Bennett 1939, 1950; Collier 1955; Strong and Evans 1952) and did not have surface collections. Willey (1953) subsequently summarized the results of both the survey and excavations in a single volume. Several survey projects were undertaken in the 1970s and 1980s and some new sites were identified (Ericson et al. 1989; Parsons 1968; Parsons and Psuty 1975; Topic, 1982; Topic and Topic 1978; Topic and Topic 1982; West 1971, 1979, 1981; West and Whitaker 1979), but it is difficult to correlate these with the original Virú Valley survey due to differences in dating methodologies and they are not included in this study. Recent excavation projects have focused on major settlements, and the present study is informed by these (Bourget 2004, 2010; Millaire 2004, 2009a, 2009b, 2010a, 2010b; Millaire and Eastaugh 2011, 2014; Zoubek 1997). Survey to identify, map, and date unidentified sites was beyond the scope of this project.

⁴ Following Ford and Willey's (1949:20) estimate, approximately 900 additional sites are thought to occur in the valley. Few of these sites have been investigated by subsequent studies. It is likely most of the ~900 undocumented sites are small residential settlements.

All Puerto Morin and Virú sites were relocated on satellite photos either on the Google Earth or ArcGIS software platforms and were mapped in ArcGIS. Sites that were occupied during either or both of these time periods were identified through an updated chronological sequence for the Virú Valley described in Downey (2014; see also Downey and Millaire 2015), keeping in mind that surface collections in Virú can only reliably date occupations if time periods are fairly broad (Downey 2017). Satellite remote sensing has become a major focus of archaeology in recent decades (Myers 2010; Parcak 2009) and has recent precedent in Virú and elsewhere in coastal Peru (Contreras 2010; Vega et al. 2011). Freely-available satellite photos were used because of budgetary constraints; archaeological sites and landscape features are clearly visible in these images. Site locations were determined by carefully correlating satellite images with the original valley-wide site map (Ford and Willey 1949: fig. 2)⁵ and with descriptions and maps for individual sites (Willey 1953).

Once each site was relocated one or more polygons⁶ were drawn over the visible extent of the site in a GIS to record the size of each site. I found that in many cases Willey only described or mapped the core area of a settlement and apparently ignored adjacent occupational sectors, and he sometimes described two separate architectural compounds as being different sites despite their close spatial and temporal proximity. I therefore aimed to map the true extent of any given site where this differed from Willey, and in ten cases I merged nearby sectors into a single site.⁷ The majority of sites could be relocated with high accuracy but a small number could not be relocated or have been destroyed since the 1940s. These sites were recorded in the GIS based on Willey's maps and site descriptions, making sure to record the site location and size as faithfully as possible. This sample is non-random and is very likely biased towards larger

⁵ Jean-François Millaire provided coordinates for each site to me, initially for the purposes of navigation while conducting survey. Millaire obtained these coordinates by georeferencing Ford and Willey's valley map (personal communication, May 2009). Spatial accuracy was improved as sites were located and mapped using satellite photos in a GIS.

⁶ Sites with non-contiguous areas (e.g. built across several terraces on a hillside with unoccupied land between sectors) were drawn as separate polygons so as to not artificially inflate their size.

⁷ The Gallinazo Group forms a special case here; although Bennett (1939, 1950) considered the entire Gallinazo Group to be essentially one site I felt that only the central major civic-ceremonial and residential mounds should be merged together since the majority of smaller residential mounds and one civic-ceremonial mound (V-279) lie at some distance from the central mounds.

sites and sites with monumental architecture; that said, these limitations are common to many regional archaeological projects and are difficult to work around.

Fieldwork was carried out between September – December 2010. Fifty-eight sites were visited and investigated through pedestrian survey. The purpose of these surveys was to confirm and update the architectural and functional site types that Willey (1953: 7) described and to allow me to become familiar with the Virú Valley from the ground. No artifacts were collected or removed from any site. I also participated in excavations at the Gallinazo Group site, identified as the capital city of the Virú polity (Millaire 2009a; Millaire and Eastaugh 2011). This on-the-ground research informs the current project although specific data from it did not contribute to the study except to verify and update original site descriptions.

Five functional attributes were used to classify each site: (1) residential; (2) midden; (3) civic (i.e. anything from a small community plaza or *huaca* to a large civic-ceremonial centre; (4) defensive (i.e. having formal or informal fortifications); and (5) funerary. Willey's (1953) individual site descriptions and Ford's field notes⁸ served as the primary sources of information for determining site functions but I also drew conclusions based on my own field observations and from insights gleaned from surveying satellite imagery. Any single site could have more than one attribute; for instance, a residential site that contained a civic-ceremonial structure (e.g. a *huaca* or pyramid mound) was classified as both residential and civic, whereas a strictly residential site was classified as residential only. Middens are fairly common in the lower Virú Valley but are rare in Huacapongo and middle Virú. In addition to being refuse dumps, middens were likely the location of economic or subsistence activities (e.g. processing fish and shellfish) with few or no permanent residents. Sites were only classified as funerary if they had evidence of Puerto Morin or Virú burials since intrusive from later time periods are very common throughout the valley. A number of sub-types can be identified and these are useful for more in-depth analyses (see Downey 2014) but are not used here.

Analytical methods

Mapping in GIS established two key pieces of data for each site: its size and its location within the valley. To test the precepts of the territorial expansion model I applied two simple

⁸ .F673, Papers of James Ford, Division of Anthropology, American Museum of Natural History.

measurements to each period: (1) convex hull polygons to estimate the amount of territory occupied during each period; and (2) histograms to test the settlement hierarchy model. Due to the geography of the valley, convex hull polygons greatly overestimate the size of each territory because they include large tracts of land that fall outside the valley margins as defined by Willey (1953: 13-17, 361) and were uninhabited in Prehispanic times. The area of each polygon that falls within the valley margins was calculated to provide a more reasonable estimate how much land was occupied during either period; this data is presented as a range. Histograms are a straightforward way to display the distribution of data within a dataset. Histograms can be calculated either with or without data standardization; Wright and Johnson (1975) used unstandardized site size in hectares whereas Spencer and Redmond (2003, 2004) displayed standardized histograms of the natural logarithm of size for each site. Data does not need to be standardized in order to compare periods. I produced histograms using both unstandardized and standardized (using natural logarithms) settlement size data. I also estimated total population size during each period. There are various methods to estimate demographics in the archaeological record and all come with a considerable degree of uncertainty (Chamberlain 2006; Drennan et al. 2015; Hassan 1981). Population estimates based on settlement size rely on assumptions of population density, family arrangements, and the lifecycle of buildings, among other factors, and as such are typically published as a range. Moreover, regional estimates can be problematic because an urban centre may be arranged very differently from a village. Wilson (1988: 78) derived population estimates for his extensive survey in the Santa Valley 65 km south of Virú in a similar cultural and geographic context. Wilson counted the number of housing units visible at various sites to develop population estimates per hectare, assuming five persons per housing unit. Wilson's index described four categories of site density: (1) low (15 p/ha); (2) low-to-moderate (50 p/ha); (3) moderate (100 p/ha); and (4) high (250 p/ha). In Virú, Millaire and Eastaugh (2011: 295-296) developed population estimates for the Gallinazo Group as part of a multi-year excavation and mapping project. Millaire and Eastaugh estimated a population of 10,000-14,400 at the 40 ha site, or between 250-360 people per hectare. This estimate sets a precedent for the Virú Period and is used in this study. The same estimate is also used for the Puerto Morin Period because Willey (1953:345-348) felt that house size and arrangement was similar for both periods. I also include Wilson's (1988: 78) moderate index although I discard his low and low-to-moderate indexes. Thus the index used here is 100-360 people per hectare and the total size of

each residential site is also presented. Population estimates are only made for sites that have an identified residential component. It must be emphasized that this is a very rough estimate that needs to be refined through further research.⁹

Updated Virú Valley Settlement Patterns

This research yields productive results that highlight the expansionary dynamics of an emerging Virú state. There are clear and marked differences between the Puerto Morin and Virú settlement patterns that indicate that rapid growth occurred, and yet these speak to an overall continuity between the periods. I do not mean to imply that there was a sudden or rapid shift in valley populations; data limitations—and especially the limitations of the relative dating methods used—mean that I am only able to treat each period as a snapshot. While the amount of growth that took place during the long Virú Period surely did not happen overnight, nevertheless I suggest that the valley witnessed a fairly rapid expansion in both population and the amount of land under irrigation after the founding of the Gallinazo Group city, which is radiocarbon dated to around 200 BC (Millaire 2010b). The settlement patterns of the Puerto Morin and Virú periods are presented separately below.

Puerto Morin Settlement Patterns

Puerto Morin sites are distributed throughout most parts of the Virú Valley system but they are not distributed evenly (Figure 4a). Instead, Puerto Morin sites are clustered into two major regions, one centered in the Huacapongo Valley and the Virú Valley neck,¹⁰ and the other centered in the southern part of the middle and lower Virú Valley—I call these the Huacapongo and Lower Virú South clusters (Figure 5a). In addition to these two major clusters there is one small cluster of three sites located near the coast on the north margin of the valley at the present-day village of Puerto Morin as well as four outlying sites on the north margin of the lower valley. The mean geographic centre of Puerto Morin settlement is located in the middle valley. Sites in

⁹ Except in limited cases, it is not possible to determine whether individual sites grew, shrunk, or stayed the same size between the two periods. Future research focused on refining site chronologies will also improve the accuracy of demographic estimates.

¹⁰ Note that although there appears to be two separate clusters in the Huacapongo Valley this is likely due to sampling biases. Willey (1953) recorded few sites along the southern margin of the Huacapongo Valley although many structures are visible on satellite imagery.

the Huacapongo cluster are located primarily on the rocky quebrada floors and on terraced hillsides lining the Huacapongo and Virú valleys. The Lower Virú South cluster primarily consists of mounds built on the valley floor but some sites were built either on the summit or at the base of the steep-sided Compositan Hills located on the south margin of the valley. The Puerto Morin cluster was likely a small, isolated fishing village and not part of the main valley system. The three sites of that cluster are large middens, residential sites, and cemeteries, including V-66, the Puerto Morin type-site excavated by Strong and Evans (1952).

The total area of all Puerto Morin sites is 77.3 ha and the mean site size was 1.19 ha (Table 1). The Huacapongo cluster accounts for almost half of all occupied space during this period, with a total sum site area of 38 ha. The Lower Virú South cluster is somewhat smaller at 27.6 ha of total site area. Of the 65 Puerto Morin sites, the majority were either residential sites or middens (47 and 8, respectively). There were no middens in the Huacapongo cluster and 33 of its 40 sites were residential (a combined total of 36.32 ha of residential site). The Lower Virú South cluster had 14 residential sites (20.82 ha) and 3 middens (4.41 ha). Bolstered by the three large middens of the Puerto Morin cluster and the other outlying sites there was a total of 57.14 ha of residential space and 15.94 ha of midden space. Fully one-third of all sites, 23, had community space or a civic-ceremonial function associated with them and 7 were fortified; in some cases these community buildings and fortified sites were standalone structures but in most cases they were part of a residential site. However, although relatively few sites contain formal fortified structures, Puerto Morin settlements were typically located in defensible hillsides or were built close enough to fortified sites that residents could flee to refuge if they faced attack and this period appears to be marked by skirmishes or warfare (Downey 2014, 2016; Willey 1953: 358-359). Based on the demographic estimates discussed above of 100-360 people per hectare, I estimate that the total population during was 5700-20,500 people;¹¹ while this is a wide range it serves as a point of comparison.

Total occupational area was estimated using the convex hull method discussed above, producing a range of 48 – 84 km² of occupied land during the Puerto Morin Period (Figure 4a and Table 2); the true area occupied is likely closer to the low end of this range. Large areas of the valley were unoccupied during this period while the clusters were relatively limited in extent. The Lower Virú South cluster was less densely-populated than Huacapongo and included a large

¹¹ Only settlements with residential space are included in these estimates. See method discussion above.

amount of land between sites, with a total of 33-54 km² of occupied land compared to 15-28 km² in the Huacapongo cluster. It is unclear how much of this land was irrigated and farmed at this time. The Huacapongo cluster, on the other hand, was constrained by the steep, barren foothills that line the Huacapongo and middle Virú valleys, limiting the amount of arable land. Sites were more densely-concentrated in this cluster and were primarily built on the hills and boulder-strewn quebradas lining the valleys, presumably for defensive reasons and to free up land that could be farmed. While populations were higher in the Huacapongo cluster, the Lower Virú South cluster occupied a larger territory overall.

Settlement hierarchies for the Puerto Morin Period show a continuous and one-tailed distribution (Figure 6a). There is a large number of small sites tapering off to a small number of large sites with no true tiers.¹² This pattern is to be expected if there are no sites with unfettered control, but settlement hierarchies are more telling when the Lower Virú South and Huacapongo clusters are compared. The Lower Virú South histogram shows a continuous one-tailed distribution (Figure 6b). The largest two sites, Taitacantin (V-235) and V-64A—a large residential site and a midden-cemetery, respectively—show no evidence of a community function or of administrative control. Although these sites are centrally-located within the cluster, they do not appear to have been settled for the purposes of controlling trade or movement, contrary to what would be expected if administrative control was centralized. The next largest two sites, the Compositan Group (V-83, V-85, V-86, V-87) and V-127, are large residential sites each with a small civic-ceremonial mound or plaza that is located within each site's residential sectors, suggesting they primarily served local residents only. Moreover, neither of these sites are central to the Lower Virú South polity but rather are tucked into the quebradas and hill spurs of the Compositan Range and there is no clear evidence they controlled any other site. Based on the available settlement pattern and hierarchy evidence I suggest that the Lower Virú South cluster was in effect a decentralized polity that consisted of autonomous communities that were friendly to each other and that worked closely together, but were not ruled by any single political authority. Evidence from fortified and civic-ceremonial structures supports this view (Downey 2014, 2016)

¹² Note that most of the largest sites are midden-cemeteries or residential settlements with no evidence of fortified or civic-ceremonial space, and these are unlikely candidates for an administrative capital. The exception to this is the site of V-167/V-177, discussed below. The largest Puerto Morin site is V-212, a terraced hillside residential site with a fortified retreat on the hill's summit.

The Huacapongo settlement hierarchy has two tiers (Figure 6c). The top tier has three sites: (1) V-21; (2) V-176/V-177; and (3) V-212. Each of these is considerably larger than any other site in the cluster. While both V-21 and V-212 are large residential sites, neither has any evidence of civic-ceremonial or community space and these are unlikely candidates for administrative control of their neighbors. V-176/V-177 (figure 7), on the other hand, is a large residential site built on a hillside with defensive or fortified terraces, and it contains a small plaza with a platform and niched walls. This is one of very few plazas at any Puerto Morin site—and is the only one I am aware of that contains niched walls—and it is larger than most contemporary civic-ceremonial spaces that I observed. V-176/V-177 is located midway along the Huacapongo Valley and as such could serve as a central location, although the same can be said for other many other settlements in the region. This site provides tantalizing evidence of a significant place that could have been a regional administrative center and would be an ideal site for future study into the nature of political authority in the Puerto Morin Period.

The Puerto Morin Period was marked by two main clusters—Huacapongo and Lower Virú South—one small fishing community at the village of Puerto Morin, and four isolated sites. Large parts of the valley were unoccupied during this period and valley populations were relatively low. There is no evidence that any single community or polity had hegemonic control over the entire Virú Valley system but each of the two major clusters do demonstrate some degree of political authority within them and both should be considered independent polities. The Lower Virú South polity did not have a strong centralized authority and no clearly dominant sites, but the close proximity of all sites within the polity suggest some sense of community identity and cohesion. The Huacapongo polity shows better evidence of an emerging centralized political authority with a possible capital at V-176/V-177. These interpretations partly reflect West (1971); West considered the Huacapongo region to have been the location of a unified polity during the Early Virú Period but thought that the communities of lower Virú were all entirely autonomous. I consider the lower Virú communities to have been semi-autonomous, but otherwise agree with West's conclusions. In this sense, the Huacapongo cluster could be considered a chiefdom while the Lower Virú South cluster consisted of villages with local, but not powerful, hierarchy structures.

Virú Period Settlement Patterns

Settlement is dispersed throughout the valley during the Virú Period (Figures 4b and 5b). New areas were settled for the first time and settlement spread along the Lower Virú River, expanding far from the foothills that held the majority of Puerto Morin settlement. Large population centres were founded throughout the lower valley, including the Gallinazo Group which was built on a series of sand dunes north of the Virú River (Millaire and Eastaugh 2014). Settlement remained extensive along the southern margin of the lower valley, in the narrow valley neck, and throughout the Huacapongo Valley.¹³ Although there are no clusters during this period, there are two major concentrations of sites: one at the Gallinazo Group on the western edge of the valley and another at the confluence of the Huacapongo and Virú rivers on the northeastern edge. Settlements are distributed evenly between these two concentrations. The mean geographic centre of Virú settlement was located closer to the coast than it was in the Puerto Morin Period, reflective of a major population shift towards the coast, although the middle valley continued to be densely occupied.

There was a total of 155.2 ha of occupied space in the Virú Period and the average site size was 1.24 ha in extent. In total there were 125 sites; 83 had residential occupations for a total of 118.63 ha of residential space (Table 1). Eighteen sites (29.26 ha) were middens, 43 (60.64 ha) had evidence of a civic function, and 12 (37.60 ha) were fortified. Using the demographic indexes described above, the Virú population can be estimated at between 11,800-42,700 inhabitants (Table 1). Millaire and Eastaugh (2011: 296) approximated that the Gallinazo Group alone, the largest Virú site, had a population of between 10,000-14,400 inhabitants, and it is therefore reasonable to suggest that the true valley population lies somewhere around 30,000 – 35,000 inhabitants. Using the convex hull polygon method, I estimate that between 130-271 km² of land was in use in the valley during the Middle Virú Period, with the true occupied extent likely lying closer to the lower end of that range (Figure 6d, Table 1). Nearly the entire valley system was occupied during this period and Willey (1953: 397) considered the valley to have witnessed its greatest Prehispanic population at this time.

¹³ Willey (1953: 392) considered the Huacapongo Valley to have been almost entirely abandoned around the beginning of the Virú Period and gradually repopulated through the period. While some sites were abandoned, updated dating methods show an overall continuity between period (Downey 2014).

A three-tiered settlement hierarchy developed in the Middle Virú Period (4 g. h).¹⁴ The Gallinazo Group is by far the largest settlement during this period and there is good evidence that it served as a capital city for the Virú polity (Bennett 1939, 1950; Fogel 1993; Millaire 2010a; Millaire and Eastaugh 2011, 2014). Its place as the largest site in a three-tiered settlement hierarchy also strongly suggests the city's role as capital. The second size tier in the settlement hierarchy consisted of 10 sites. Seven of these¹⁵ were residential settlements (some fortified) or were midden-cemeteries and it is unlikely that any of these sites had administrative control over their neighbours. The remaining three sites in this tier include Huaca de la Vela (V-279), which is essentially an outlying mound of the Gallinazo Group, and two Castillo Fortification Complexes, Tomaval (V-51) and Sarraque (V-74). In total there are six *castillos*, which were fortified civic-ceremonial centres and towns, all located in the Virú Valley neck, that were built as part of the Virú administrative apparatus (Downey 2014, 2016; Millaire 2008; Strong and Evans 1952; Willey 1953: 157). One *castillo*, Huaca Santa Clara (V-67), is known to have served as a major administrative outpost of the Virú polity (Millaire 2004; 2009b; 2010b). Despite its known administrative function, Huaca Santa Clara falls into the lowest tier of the settlement hierarchy. In addition to Tomaval, Sarraque, and Huaca Santa Clara, Castillo San Juan, Castillo Napo, and Virú Viejo make up the remaining *castillos*, which line the valley neck and command strategic importance over the valley. The *castillos* demonstrate one of the limitations of the settlement hierarchy approach since they are all known to have been important infrastructure built by the Virú polity, but most are of a modest size.

The Virú Period witnessed the incorporation of most of the valley system into a single large polity. The current findings contrast somewhat with Willey's (1953: 105, 391-392) interpretation that there were major disruptions that caused people to move from the Huacapongo and Upper Virú Valley towards the coast or that settlers came from beyond Virú. Still, Willey considered this period to have witnessed the largest Prehispanic population within Virú and the current evidence is consistent with this conclusion. New areas of the valley were settled for the first time, there were massive increases in the amount of land potentially under cultivation, and

¹⁴ Millaire and Eastaugh (2011: 295) estimated the entire Gallinazo Group to measure ~40 ha spread over dozens of separate mounds. For the purposes of my analysis I mapped each mound as an independent site, following Willey (1953), but merged the core mounds of the group. The core area of the site, used for this analysis, is 17.54 ha. While this accounts for some 40% of the site's entire size it is still far larger than any other site in the valley.

¹⁵ V-21, V-64A, V-162, V-194, V-212, V-235, and V-283

populations grew considerably over this long period. The rate of growth is substantial and migration likely does account for some of the population growth, but there is a much greater degree of continuity between the Puerto Morin and Virú populations than has been previously recognized. There is clear evidence that political authority was centralized during the Virú Period with the development of a major urban centre at the Gallinazo Group, several smaller administrative centres, and a large number of villages and small farming communities.

Discussion and Conclusions

Mapping Puerto Morin and Virú settlement patterns separately yields dramatic results. It is clear that the Virú Period occupation of the valley was far more extensive than was Puerto Morin. More sites were settled, populations were much larger, and there was a substantial increase in the overall amount of land that was potentially in use for agricultural or economic activities. While there were two main clusters of sites in the Puerto Morin Period, settlement spread throughout most parts of the valley system during the Virú Period and no discrete site clusters are evident. Some Puerto Morin sites were abandoned in the Virú Period but many were continuously occupied and many new sites were settled. The average size of settlement did not change between the two periods, but the number of sites increased sharply and the total area of occupied space doubled.¹⁶ Sixty-five Puerto Morin sites occupied a total of 77.27 ha whereas 124 sites and a total of 155.18 ha of space were occupied in the Virú Period. The total amount of residential space occupied also doubled, from 57.14 ha to 118.63 ha. Using the population estimate ranges described above this equates to a population growth from between 5700 – 20,500 in the Puerto Morin Period to 11,800 – 42,700 in the Virú Period. The mean geographic centre of the valley's population is located near the valley neck for both periods—being somewhat closer to the coast during the Virú Period—indicating that Huacapongo and the valley neck were significant sources of population during both periods even while large swaths of the lower valley were settled for the first time in the Virú Period. That said, this population shift signalled a major change in the way that land was used. The total area of land occupied during the Puerto Morin Period is estimated at 48-84 km², increasing dramatically to 130-271 km² in Virú. This increase of 170-229% far outpaces the 100% increase in total area of all sites and 108% increase in estimated population

¹⁶ Puerto Morin sites averaged 1.19 ha in size and Virú sites averaged 1.24 ha. This difference is not statistically significant (Kolmogorov-Smirnov [KS] test, $D=0.0892$, $p=0.87$).

size between the two periods. Not only were more people living in Virú during the later period, they were also occupying and using more of the valley's land and potentially producing larger agricultural yields.

The proliferation of settlement into unoccupied parts of the valley offers tantalizing evidence that statecraft was at play in the Virú Valley as political authority was centralized into a single polity. Puerto Morin settlement was somewhat fragmented, with two large clusters and some outlying communities. One cluster, Lower Virú South, was territorially extensive but with relatively low populations; I suggest that it is a decentralized chiefdom, with villages or hamlets that were largely autonomous but that worked together for projects of mutual interest, such as defense and irrigation (Downey 2014, 2016). The other major cluster, which I have named Huacapongo, was more populous and densely-occupied than Lower Virú South. This cluster has a two-tiered settlement hierarchy and I suggest that it was a weakly-centralized chiefdom. Multiple lines of evidence suggest that the Puerto Morin Period was a time of violence and strife (Downey 2014, 2016; J. Topic and T. Topic 1978; T. Topic and J. Topic 1982, 2009; Willey 1953: 392), and settlement was located close to the hills that offered protection to the valley's residents. Water availability also must have been a major concern, and settlement may have been located in areas of greater water abundance, or in areas that were easier to irrigate. Few sites from this period have been excavated or intensively surveyed anywhere in the north coast region and further research is necessary to explore how political authority was enacted in these communities.

Most of the Virú Valley system became incorporated into a single polity with centralized political authority during the Virú Period. This polity grew out of the two earlier clusters by ingesting the earlier settlements and expanding into previously unoccupied parts of the valley. A clear three-tiered settlement hierarchy developed at this time with the Gallinazo Group, capital city of the Virú polity, being far larger than any other contemporary settlement. Moreover, there is evidence of a strong administrative presence in the strategically-important valley neck in the form of six *castillos*, large fortified civic-ceremonial centres and towns that brought political authority to a part of the valley system that bordered the mountains to the east (Downey 2014, 2016; Millaire 2004, 2008, 2009b, 2010a, 2010b). The Virú Period also saw a substantial investment in infrastructure including large civic-ceremonial centres, formalized military structures, and an expansive irrigation network (Downey 2014).

How does the growth of the Virú polity fit with the territorial expansion model examined throughout this paper? There are two key elements of this model: (1) a nascent state expands considerably as it incorporates distant regions into a single political unit; and (2) a four-tiered settlement hierarchy develops (Spencer 2010). The first trait is undoubtedly true in the Middle Virú case: while the distances are relatively modest, the period witnessed the incorporation of two distinct polities into a single one and large tracts of the valley were settled, with a new-build capital city located near the coast. In other words, there was massive territorial expansion. However, the second trait is not met: the Middle Virú polity had a three-tiered settlement hierarchy, not four. How can we reconcile these differences?

There is strong evidence that the Virú polity practiced expansionary dynamics by sponsoring or setting up outposts at important sites in the Moche and Chicama valleys to the north of Virú, including at Huaca Prieta some 75 km north of the Gallinazo Group (Millaire et al. 2016). It is thus clear that the Virú polity not only practiced territorial expansion within the borders of the Virú Valley, but also far beyond. Could these sites represent the missing fourth tier of a Virú state? This is difficult to test since Huaca Prieta and the two possible Virú outposts in the Moche Valley—Pampa La Cruz and Huaca Las Estrellas—are essentially Virú sectors or compounds located within or near to larger Moche sites. Indeed, they could potentially be considered embassies, seeking to favourably influence local leaders to ease trade relationships. The political realities of such settlements are complex and do not fall easily within the settlement hierarchy criteria of the territorial expansion model. The Virú capital likely did not have control of these large Moche settlements and the size of the Virú compound at such sites would not correlate to how much control or influence the Virú state had in the local area. However, this is a shortcoming of the settlement hierarchy approach, not of the territorial-expansion model. It is important to recognize that settlement hierarchies are *archaeological evidence* that can inform our understanding of political dynamics. The territorial expansion model, as proposed by Spencer (2010), is a generalized *anthropological model* that seeks to explain how an emergent political authority comes to power. We are ultimately interested in whether a nascent Virú state practiced territorial expansion and the answer is a resounding “yes.”

While the present study clarifies the picture of what the Virú polity looked like within the Virú Valley, it also opens up many avenues for future research. Chronological questions are paramount. North coast chronologies and cultural sequences are largely based on ceramic

seriation and radiocarbon dates are only recently being widely collected (Koons and Alex 2014). Indeed, we have recently (Downey and Millaire 2015) worked to reconcile ceramic sequences with radiocarbon dates in Virú. Moreover, I have argued (Downey 2014; Downey and Millaire 2015) that there are actually two separate and intertwined ceramic sequences within Virú, one corporate and one domestic. The corporate ware sequence developed along much smaller timescales than did the domestic ware sequence, meaning it can be used to date sites with greater precision, but corporate ware sherds associated with Puerto Morin and Virú sites are extremely rare outside of major civic-ceremonial centres within the Virú Valley, making it difficult to date the timing and tempo of territorial expansion in anything but general terms.

However, cross-cultural comparisons offer clues to how the Virú state may have expanded and I would like to propose a hypothesis regarding early Virú statecraft. Millaire et al. draw from Marcus' (1992) ideas about the dynamic cycling of state authority and from Wright's (2006) view that states develop through multiple failures and successes to suggest that the outposts of the Virú state were founded early in its territorial expansion phase, and that Virú pulled back from these northern outposts as Moche influence began to dominate the region. Millaire et al. suggest that Virú likely turned its focus inward after its initial expansionary phase, focusing on consolidating its power within its core region.

Based on this reasoning, I suggest that the initial expansion and consolidation of the Virú Valley occurred before these northern outposts were established. I suggest this because the initial consolidation of the Huacapongo and Lower Virú South polities was not merely a merger of two communities but was itself a major investment in territorial expansion that included the establishment of the Gallinazo Group in a previously unoccupied part of the valley at a very early date (approximately 200 BC; Millaire 2010b). This could have been an initial attempt by the nascent Virú state to establish itself near the economically-productive coast. After this initial success, the growing state then established outposts farther north and enjoyed initial success there, too, but were ultimately forced to focus on its core region after Moche began to grow. The establishment of the Gallinazo Group would have itself been a major investment in state infrastructure as there is no fresh water in the area and major irrigation canals were required to bring both water both for drinking and agricultural purposes. Other investments made by the Virú state, such as the construction or expansion of the *castillos* in the valley neck and of various

civic-ceremonial centres (*huacas*) throughout the valley, may have been part of a later strategy of core consolidation, but territorial expansion came first.

Conclusions

This paper has explored Puerto Morin (ca. 400 – 200 BC) and Virú (ca. 200 BC – 600 AD) settlement patterns in the Virú Valley from the perspective of Spencer's (2010) territorial-expansion model to document and describe the development of centralized political authority. Using GIS analyses, site maps drawn from satellite images, and an updated cultural sequence for Virú, this paper also stands as an innovative example of the ways that old sources of data on coastal Peru can be updated according to current knowledge of the region's culture history, and presents settlement patterns that will be of use to future studies. Previous research (Millaire 2010a; Spencer 2010) has identified Virú as the location of a primary state, thought to develop during the Virú Period. This polity grew out of two Puerto Morin polities by ingesting the earlier settlements and by expanding into previously unoccupied parts of the valley. In so doing, the Virú polity more than doubled the amount of land under their direct control and reoriented the polity towards the Pacific Ocean. In addition to expanding into a previously unoccupied and under-utilized part of the valley, the Virú polity may have shifted its focus towards the sea as part of an expansionary policy that saw it establish coastal outposts in valleys to the north (Millaire et al. 2016). While the Virú settlement hierarchy shows a three-tiered pattern, contrary to what is expected of a state form of political governance (Spencer 2010), there is strong evidence that territorial expansion and statecraft was at play at this time. In addition to its territorial expansion, the Virú polity developed an urban centre, built administrative outposts that oversaw large parts of the valley, and sponsored a large-scale program of infrastructure-building that expanded public civic-ceremonial, defensive, and economic structures throughout the valley (Downey 2014, 2016; Millaire 2009a, 2009b, 2010a, 2010b; Millaire and Eastaugh 2011, 2014).

It is therefore reasonable to suggest that the Virú polity was made into a state with a strong and centralized form of political authority, but a form of settlement hierarchy that does not follow the four-tiered model of states undergoing territorial-expansion. This is because some large administrative settlements, such as Huaca Santa Clara, are considerably smaller than other sites that were primarily residential. Nevertheless, there is clear evidence that territorial-expansion was a major focus of the emergent Virú polity.

Settlement patterns offer tantalizing evidence that processes of statecraft were at play in Virú but they are limited in what they can tell us about these processes. These patterns provide a top-down view of what changes took place between the Puerto Morin and Virú Periods but do not address how these changes were brought about. Surely generations of agents worked to build their power and authority, ultimately crafting the Virú state, and surely there was both support and resistance from the wider populace. We can only infer past behaviour from the archaeological evidence at hand, of course, but we can always obtain a clearer picture through more intensive research. The story presented here can be seen as a hypothesis to be tested. Site dating within Virú—both absolute and relative—is not well-refined and more excavation and survey is required to better date and to ground-truth the settlement patterns presented here. With better site dating we can begin to develop a more nuanced and accurate picture of how Virú state history played out and what their relationship with their neighbours to the north, south, and east looked like. As a final note, it is important to always keep in mind that the landscape is not a mere backdrop upon which the state develops but instead forms a core part of the fabric of the state, in what Adam T. Smith (2003) calls the political landscape.

Acknowledgements

I would like to thank Jean-François Millaire for his advice and guidance throughout this project and for his comments on an earlier draft of this paper. I would also like to thank Theresa Topic, Lisa Hodgetts, Chris Ellis, and Micha Pazner for their guidance through this project and for their comments on an earlier version of this paper. Estuardo La Torre provided considerable assistance during my fieldwork. James Keron provided advice on the statistics used in this paper. I would also like to thank Stacey Guy who helped with editing the paper. This research was conducted while I was a doctoral candidate at The University of Western Ontario and portions of this article were written while I was under the support of the Ontario Graduate Scholarship and the Western Graduate Research Scholarship.

Funding Statement:

Funding for fieldwork was provided via a Social Sciences and Humanities Research Council of Canada (SSHRC) grant awarded to Dr. Jean-François Millaire at The University of Western Ontario. Dr. Millaire released funds that allowed me to travel to Peru and to hire a research assistant (Estuardo La Torre).

Data Access Statement:

Data used in this publication is available in the keyhole markup language (KML) format, native to Google Earth software. A .kmz file containing all data is openly available at:
<https://ir.lib.uwo.ca/etd/2687/>

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Tables

Table 1. Total area in hectares of each site type by period and by Early Virú cluster (funerary sites not included). Note that, any one site can have more than one type attributed to it.

Period	Total		Civic		Residential		Midden		Fortified	
	ha	n	ha	n	ha	n	ha	n	ha	n
Early Virú (Lower South cluster)	27.57	19	12.34	4	20.82	14	4.41	3	5.15	3
Early Virú (Huacapongo cluster)	38.00	40	15.87	18	36.32	33	0.00	0	10.49	4
Early Virú (total)	77.27	65	28.39	23	57.14	47	15.94	8	15.64	7
Middle Virú	155.18	125	60.64	43	118.63	83	29.26	18	37.60	12

Table 2. Estimated area of occupation for each period and for each Early Virú cluster based on Convex-Hull polygons, and on the area of each polygon clipped to the area that lies within the limits of the valley margins.

	Convex-Hull Area		Clipped Convex-Hull	
	ha	km ²	ha	km ²
Early Virú (Lower South cluster)	5403.53	54.06	3294.56	32.95
Early Virú (Huacapongo cluster)	2828.54	28.29	1509.77	15.10
Early Virú (total)	8247.97	82.48	4804.31	48.04
Middle Virú	27150.08	271.50	13016.87	130.17

Figure Captions

Figure 1 – The Virú Valley and the Huacapongo Valley, an important tributary, showing sites mentioned in the article.

Figure 2 – Huaca Gallinazo (V-59), the principle mound of the Gallinazo Group, as seen from another part of the site.

Figure 3 – Virú Valley settlement patterns shown by Willey (1953) for (a) the Early Puerto Morin, (b) Late Puerto Morin, (c) Early Gallinazo (Virú), (d) Middle Gallinazo (Virú), and (e) Late Gallinazo (Virú) periods.

Figure 4 – (a) Puerto Morin Period (ca. 400 – 200 BC) settlement patterns classified by site size; and (b) Virú Period (ca. 200 BC – 600 AD) settlement patterns classified by site size.

Figure 5 – Convex hull polygons for the (a) Puerto Morin Period and (b) Virú Period. Note the Puerto Morin settlement clusters.

Figure 6 – Settlement hierarchies for (a) the overall Puerto Morin Period; (b) the Lower Virú South cluster (Puerto Morin Period); (c) the Huacapongo cluster (Puerto Morin Period); and (d) the Virú Period.

Figure 7 – View across the core area and plaza of the V-176/V-177 site with the Huacapongo Valley in the background.

0 5 10 Km

Sites Mentioned in Text:

1. V-66 (Puerto Morin)	11. V-231 (Castillo Virú Viejo)
2. V-283	12. V-194
3. V-59 (Huaca Gallinazo)	13. V-16 (Castillo San Juan)
4. V-279 (Huaca de la Vela)	14. V-51 (Castillo de Tomaval)
5. Gallinazo Group	15. V-21
6. V-127	16. V-74 (Castillo de Sarraque)
7. Comositán Group	17. V-68 (Castillo Napo)
8. V-162 (Huaca de la Cruz)	18. V-176/V-177
9. V-67 (Huaca Santa Clara)	19. V-212
10. V-64-A	

○ Archaeological site
Virú Valley study area