

# Statecraft and expansionary dynamics: A Virú outpost at Huaca Prieta, Chicama Valley, Peru

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**Interpolity interaction and regional control were central features of all early state societies, taking the form of trade—embedded in political processes to varying degrees—or interregional conquest strategies meant to expand the polity’s control or influence over neighboring territories. Cross-cultural analyses of early statecraft suggest that territorial expansion was an integral part of the process of primary state formation, closely associated with the delegation of authority to subordinate administrators and the construction of core outposts of the state in foreign territories. We report here on a potential case of a core outpost, associated with the early Virú state, at the site of Huaca Prieta in the Chicama Valley, located 75 km north of the Virú state heartland on the north coast of Peru. This site is discussed in the context of other possible Virú outposts in the Moche Valley, Pampa La Cruz, and Huaca Las Estrellas, and as part of a broader reflection on expansionary dynamics and statecraft.**

archaic states | territorial expansion | core outposts

Research carried out over the past decades suggests that territorial expansion and consolidation often played a key role in the crystallization of early states (1–18). Drawing from historical case studies from Madagascar, Wright noted that statecraft generally takes place in contexts of conflict and expansionary dynamics in landscapes that often featured closely spaced and competing centers and that this process is usually marked by many successes and failures before enduring states emerge (18). Viewed as a process rather than as an evolutionary breakthrough, research into statecraft has contributed to the anthropological study of early civilization by documenting the varied historically contingent trajectories ancient polities followed as they developed more complex systems of political organization.

In his work on the expansionary dynamics of primary state formations, Algaze (1) stressed the important role played by core outposts in early statecraft. Such outposts were founded at crucial nodes along trade routes, near resources concentrations, or amid strategically located native polities in control of existing corridors of communication and trade and functioned as centers attracting information, services, population, and resources from the surrounding regions. Reviewing archaeological evidence from different regions around the world, Algaze found that outposts often represented the culmination of earlier patterns of interregional exchange that had by then intensified and become formalized, that, for their own political ends, local elites were often initially amenable to granting such access to foreign powers, and that transportation constraints “meant that the most efficient way to channel regular exchanges between such contrastive polities was precisely by means of isolated core outposts embedded within distant peripheries” (ref. 1, pp. 319–320).

To Algaze, core outposts were therefore important “instruments of expansion” founded on the asymmetrical relation early states attempted to maintain over peripheral societies, and whose faith was invariably tied to local and regional historical processes. In some cases, after the collapse of the core state, outposts were simply abandoned whereas, in others, the core outposts were only the prelude to a more intensive colonization. In other circumstances still, the abandonment of outposts was directly related to

the rise of a local polity that started “asserting control of regional exchange networks previously held by the intruding core groups” (ref. 1, p. 324).

Redmond and Spencer’s work (5, 6, 10–12) has helped document various key aspects of the expansionary dynamics of early states, including annexation strategies, administration practice, and issues related to the cooption of indigenous leaders, delegation of authority, and responses to varying conditions of local competition or resistance (see also ref. 7). In a cross-cultural comparison of expansionary dynamics in primary state formations, Spencer (10) highlighted the correspondence in time between the appearance of state institutions and the expansion of the state’s control to regions lying in its close periphery. As polities grew through effective resource mobilization, they often reached a critical threshold at which point they could enlarge their political–economic catchment area through territorial expansion (see also refs. 3 and 8). The effective management of the newly annexed territories often fostered the delegation of partial authority to subordinate administrators stationed at distant outposts who maintained control and managed the extraction and transfer of resources back to the state core (6, 10). Rather than being associated with “imperial” phases of later state development, it seems that outposts were therefore often part and parcel of the initial processes of statecraft and were marked by cycles of growth and decline, successes and failures (3).

The Virú polity offers an interesting case study on the expansionary dynamics of an early state from the Andean region. Virú is one of several polities that developed along the north coast of Peru during the Early Intermediate Period (EIP) (~200 BC to AD 800), besides the later and better known Moche. The organization of the Virú polity was characterized by a four-tiered settlement system and is consistent with that of an archaic state (19–22). At the top of the settlement hierarchy was the political capital of the Gallinazo Group, a large and densely populated agglomeration featuring imposing civic architecture presumably used for large

## Significance

**Cross-cultural analyses of early statecraft suggest that territorial expansion was an integral part of the process of primary state formation, closely associated with the delegation of authority to subordinate administrators and the construction of core outposts of the state in foreign territories. Understood as instruments of territorial expansion that were closely tied to historical processes, such outposts offer important viewpoints on the evolutionary trajectories of specific early states and also on the nature and extent of the foreign policy of archaic states in general.**

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public gatherings (23, 24). The settlement hierarchy also featured midsized centers involved in the management of resources and defense against competing neighboring polities, as well as smaller villages and hamlets (20–22).

Evidence suggests that the Virú state sought to expand its territory northward to the Moche and Chicama valleys around the turn of the first century AD, an active period of statecraft in the Virú Valley. This idea was first hypothesized by Fogel (25), who contended that Virú leaders had eventually conquered neighboring lands and created the first multivalley state in the region. Tangible evidence of Virú expansionary dynamics first came from Billman's (26) study of Moche Valley settlement patterns, which indicated that the first centuries AD were times of profound geopolitical change in this region marked by the consolidation of settlements into two politically independent clusters: one focused on Cerro Oreja at the valley neck and the other around Pampa La Cruz, close to the seashore (Fig. 1). According to Billman (19), the Cerro Oreja polity possibly coalesced to resist invasion from the highlands or midvalley *chaupiyungas*.

In this paper, we argue that the other settlement cluster (focused on Pampa La Cruz) became entangled in the expansionary dynamics of the Virú polity along the Pacific shoreline and may have functioned as a core outpost of the Virú state for part of its history. Excavations carried out 70 y ago by Junius B. Bird at Huaca Prieta provide additional concrete evidence of the territorial expansion of the Virú polity further north, into the Chicama Valley. In what follows, we review the evidence available from Huaca Prieta and interpret the occupation as evidence of Virú expansionary dynamics north of its core territory.

### Huaca Prieta: A Virú Outpost in the Chicama Valley

In 1946 and 1947, Bird conducted archaeological excavations at Huaca Prieta, a raised mound located on a terrace near the Pacific seashore in Chicama (Figs. 1 and 2)—formed by the accumulation of material deposited over millennia of occupation (27–31)—that is currently part of the El Brujo archaeological complex. As part of the multidisciplinary Virú Valley Project, Bird had set out to document the earliest evidence of sedentary life in the region during the Preceramic period and selected Huaca Prieta as a field

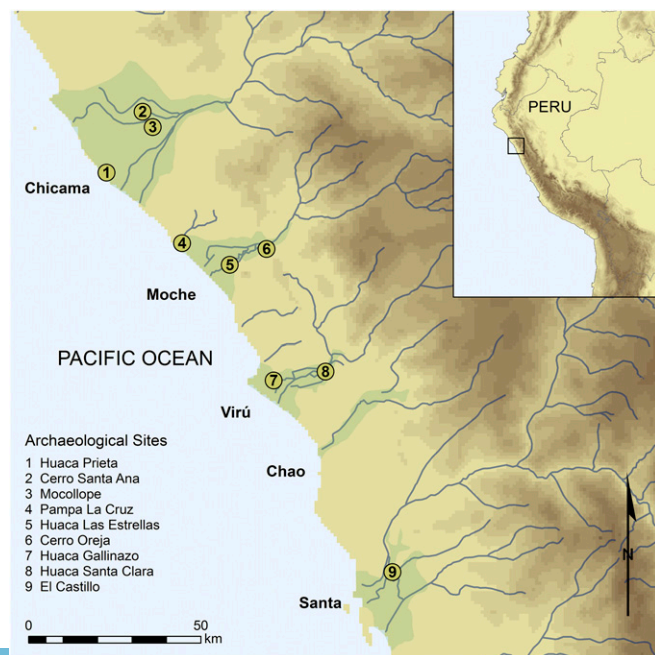


Fig. 1. Map of the north coast of Peru.

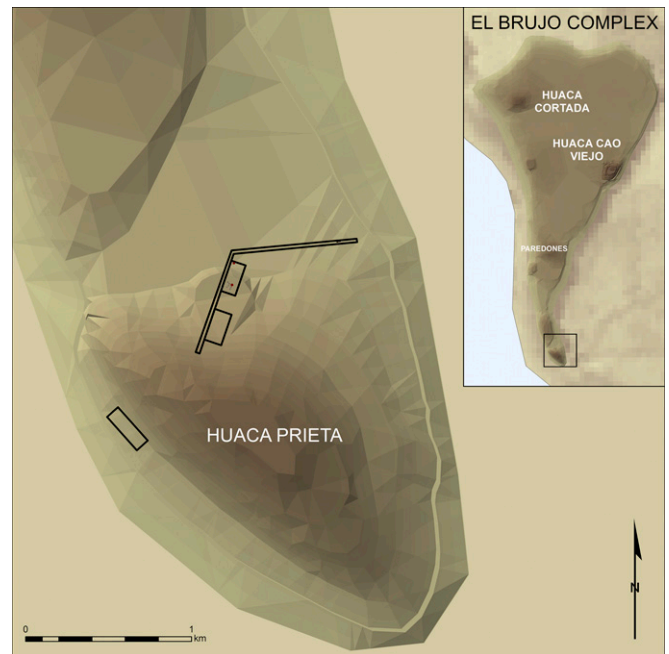


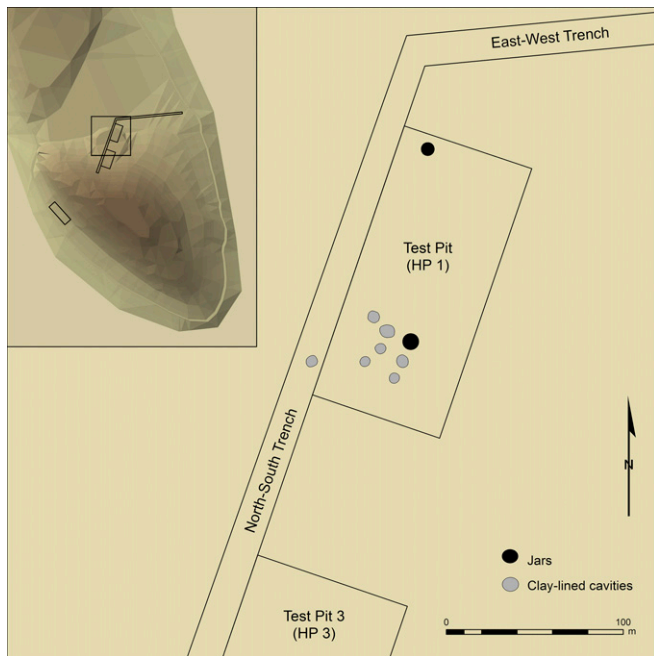
Fig. 2. Map of Huaca Prieta and the El Brujo Complex [after Bird and Hyslop (Reproduced with permission from ref. 31)].

site because of the excellent preservation of the remains (31, 32). He excavated trenches, test pits, and several house features on and immediately outside the mound (Figs. 2 and 3). The dimensions of excavation units are as follows (in meters): east–west trench,  $43 \times 0.8$ ; north–south trench,  $\sim 30 \times 0.8$ ; test pit 1,  $8 \times 3$ ; test pit 3,  $11 \times 4$ . The east–west trench and associated test pit 1 (HP 1) were meant to train workers, but these contexts nevertheless produced important evidence on the terminal occupation of the site during the EIP. Additional evidence came from excavation of the north–south trench and from test pit 3 (HP 3).

Stratigraphic information from these contexts (Figs. 4 and 5) revealed the presence of a layer of consolidated cobbles, beach gravel, and mud silt, possibly left by a large tidal wave that hit the site during the late Initial Period or Early Horizon (1200–200 BC) (31, 33). The tidal wave damaged exposed structures and buried the lower slopes of the mound under a sterile deposit up to 1 m thick (34). The site continued to be used during the EIP, as evidenced by the presence of Virú-style negative-painted pottery in all subsequent deposits on the northern flank of Huaca Prieta and in other excavation units, including on the Paredones mound located north of Huaca Prieta (29).

The EIP remains were found within a relatively small excavation area ( $\sim 1,200 \text{ m}^2$ ), but the original occupation was presumably larger. No architecture was identified, except for stone walls in the east–west and north–south trenches (31). In test pit 1 (Figs. 3 and 5), Bird excavated a number of layers (A–E) through a continuous EIP occupation deposit (30). In this area, the team uncovered seven salt-hardened clay-lined cavities, as well as two large ceramic jars (figures 13 and 14 of ref. 31). The clay-lined cavities (Fig. 6) had 5-cm-thick walls and were on average 55 cm wide; some were up to 1 m deep. Each cavity offered a capacity of  $\sim 238 \text{ L}$  and a total of  $\sim 1.66 \text{ m}^3$  of storage space for the seven cavities identified. These cavities were likely used for the storage of dried goods, possibly crops. They were eventually filled with trash, including textile fragments, sherds, gourd fragments, cordage, stone tools, and maize cobs. The first jar was a large globular vessel with neck (70 cm in diameter at its widest point), its mouth capped with small sticks and a piece of matting. The bottom of a second jar was





**Fig. 3.** Map of EIP occupation at Huaca Prieta [after Bird and Hyslop (Reproduced with permission from ref. 31)].

uncovered a few meters away. Jars of this type (*tinajas*) are typically used for the fermenting and storage of *chicha* (maize beer).

Most materials recovered at Huaca Prieta came from Preceramic levels, but all deposits were screened and the team also collected ecofacts and artifacts from the late occupation levels, some of which were shipped to the American Museum of Natural History (AMNH) for further analysis.

**Ceramics.** Initial analyses of the Huaca Prieta ceramics by Bird indicated that the site was once home to a community that used negative-painted pottery, characteristic of the fine ceramics produced in the emergent Virú state, some 75 km to the south (Fig. 7). The Virú polity is defined by this distinctive type of black resist-painted ceramics, initially designated as “Virú” ceramics by Larco Hoyle (35–37) and later as “Gallinazo Negative” pottery by the Virú Valley Project (22, 38–41). It is characterized by a number of vessel forms, including stirrup spout bottles, often modeled to depict animals, people, or architecture. The vessels’ surfaces are systematically burnished, fired in an oxidizing atmosphere, and decorated with resist- or negative-painted designs.

Recently, some Andeanists have endeavored to decouple Gallinazo Negative (herein called Virú Negative) from the various domestic wares with which it has been amalgamated under the label “Gallinazo” over the years, including the well-known Castillo-style face-neck jars (42). Unlike negative pottery, this type of unburnished utilitarian ware was produced in every valley of the Peruvian north coast and throughout the EIP and into later periods (21, 43, 44).

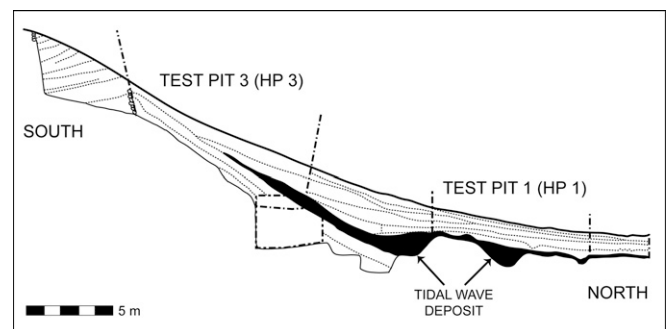
Millaire analyzed 382 sherds from test pit 1. All sherds were initially classified into the Virú Valley Project typology (Table S1) based on technological aspects, including paste color and composition, firing techniques, and vessel thickness, as well as decoration. Sherds were subsequently classified in broader types (Table S2) following Downey’s (20) reassessment of Ford’s (40) original work. Downey’s work was based on Ford’s manuscript notes, archived at the AMNH (.F673, Papers of James Ford, Division of Anthropology). Here, we consider the entire collection to be part of a single occupation because of the absence of floors or clear break in the stratigraphy.

Results support the original assessment that the site was occupied by a community that produced or used Virú Negative pottery. Although one white-on-red painted sherd (Huancaco) was identified, all 37 other decorated fragments came from Virú Negative vessels, accounting for an unusually high percentage of all ceramic artifacts analyzed (9.7%). All fragments come from relatively small fine ware containers. The motifs include wavy lines, vertical lines, and double horizontal lines, as well as patterns of circles and dots. The conspicuous presence of Virú Negative pottery at Huaca Prieta stands out compared with ceramic collections from core settlements in the Virú Valley. Of all sherds analyzed for the Virú capital city of the Gallinazo Group (Huaca Gallinazo), 15.9% were decorated with negative-painted designs whereas only 5.7% of all ceramic fragments from the midsized Virú administrative center of Huaca Santa Clara were of this type.

Utilitarian ceramics from the Huaca Prieta collection fall neatly into the Virú Valley Project typology (Table S1) and in Downey’s (20) broader types (Table S2). Most fragments were classified as Castillo ware ( $n = 327$ , 85.6%), a well-fired oxidized ceramic with an orange-red to brownish-red paste made into a variety of forms of jars, bowls, and bottles. Castillo ware was the hallmark of the EIP domestic ceramic tradition on the north coast of Peru. In Virú, Downey (20) classified assemblages with similarly high percentages of Castillo ware to the Middle Virú period (200 BC to AD 600), a time marked by the crystallization and expansion of the Virú polity.

The Castillo fragments from Huaca Prieta came from storage, cooking, and serving containers, either undecorated (Valle Plain, Castillo Plain) or adorned with modeled, appliquéd, gouged, incised, or punctated designs (Castillo Modeled and Incised); others were partly covered with a thin white wash (Sarraque Cream). Vessels represented included large storage jars (such as the ones found in situ by Bird), cooking jars with smudged surfaces and carbonized residue (the surface of two sherds was partly vitrified due to overheating), a small open cup, and a miniature vessel. Decorative elements included modeled ribs along the vessel shoulder and neck, pierced handles at the neck, a bird head appliquéd fragment, and modeled arm-shaped handle. Finally, 17 sherds were classified as Gloria (Gloria Polished) and Late Plainwares (Queneto Polished), two types of pottery produced during the Middle Virú period. The collection also includes a large spindle whorl (*tortero*) made out of a modified Castillo sherd. On the north coast of Peru, this type of oversized whorl was traditionally used for plying cotton yarns together when making fishing cordage (45, 46).

The most salient characteristic of this utilitarian ceramic collection is how closely it resembles pottery assemblages from the EIP in the Virú Valley in terms of types represented and relative frequencies. The same applies to the Virú Negative ceramic sherds from Huaca Prieta, which are morphologically and stylistically



**Fig. 4.** Stratigraphic cut of the north–south trench and test pits 1 and 3 [after Bird and Hyslop (Reproduced with permission from of ref. 31)].

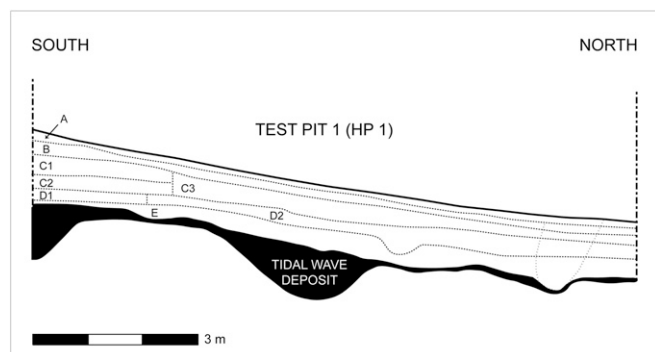


Fig. 5. Stratigraphic cut of test pit 1 [after Bird and Hyslop (Reproduced with permission from ref. 31)].

indistinguishable from the fine pottery that was produced and used by Virú leaders at the political core of this emerging state. Larco Hoyle coined this pottery “Virú de Chicama,” arguing that it was not a product of import, but was directly derived from a local ceramic tradition (36). Whether Virú-style pottery was produced locally or imported is a question that would eventually need to be tested through trace element analysis. The evidence presented here nevertheless points to a community that was closely connected with the Virú polity, some 75 km to the south.

The presence of a spindle whorl traditionally used in the making of fishing cordage and the nature of the ceramic containers recovered (large jars, cooking pots, and serving bowls) hint at a community that was engaged in food gathering, preparation, storage, and consumption. As such, if Huaca Prieta was closely connected to the Virú state core, those who lived in the contexts excavated by Bird were likely engaged in attending to the needs of local representatives of this distant power.

**Maize Cobs.** Plant materials recovered from Huaca Prieta have provided bioarchaeologists with an exceptional record of early domestication in the Andean region of South America (28, 47). Species identified in the EIP levels included peanuts (*Arachis hypogaea*), pacay (*Inga feuillei*) and algarroba (*Acacia sp.*) pods, avocados (*Persea americana*), and maize (*Zea mays*) (31). Some maize cobs were shipped to the AMNH (although part of the collection is now at Harvard University and at the Missouri Botanical Garden), where they were subjected to botanical analyses (30, 48–50). Test pit 1 produced an unusually high number of cobs ( $n = 571$ ) whose kernels had systematically been removed (30). This evidence, together with the presence of storage cavities and large jars in test pit 1, led Spencer (10) to argue that this area of the site was a facility used for the production of *chicha*.

Alcohol consumption was central to how past societies forged and maintained social relations (51), and Andeanists have long recognized the special role of *chicha* consumption and production in the political economy of early Andean states (52–58). *Chicha* making has been documented ethnographically and archaeologically on the north coast of Peru (59–62), pointing to three broad contexts of production: large-scale *chicha* making within permanent facilities, small-scale household production, and production for feasts by attached households (61). Although state-sponsored *chicha* brewing facilities have been documented at several Prehispanic sites, according to Hayashida (61) household production is difficult to identify in the archaeological record because of the few tangible traces it leaves behind and the fact that *chicha* is usually made in kitchens where food is prepared.

That being said, several lines of evidence from test pit 1 suggest that *chicha* brewing took place in this sector, including the large quantity of maize cobs recovered and the storage cavities and large jars uncovered in situ. The maize cobs from Huaca Prieta were

undoubtedly discarded once kernels had been removed and either stored in dry containers (e.g., clay-lined cavities) or cooked to produce beer. As part of this process, maize kernels first need to be malted (germinated and then dried) and milled into a meal that can be stored or immediately boiled in a cooking jar over a hearth. When ready, the *chicha* is sieved and poured into large jars, where it is left to ferment. The fermenting jar mouths are usually capped with a piece of cloth or matting similar to the one from the large jar found in test pit 1. Based on evidence available, however, it is impossible to assess the amount of *chicha* that could have been produced or to speculate on whom it was brewed for (household, higher-status residents of the site, or feasting parties).

Spencer subjected six maize cobs from different layers in test pit 1 to radiocarbon analysis (Table S3), dating the occupation to between 2,000 and 1,770 y B.P. (cal 111 BC to AD 380). All dates reported here are calibrated at the  $2\sigma$  age range ( $\geq 95\%$ ) using OxCal 4.2 and the IntCal13 calibration curve (63). The earliest and the latest dates both come from layer C2, a section of layer C associated with the trash-filled clay-lined storage cavities. It is therefore likely that the earliest sample dates the construction of these storage cavities whereas the latest dates the filling of those spaces upon the site’s abandonment. The radiocarbon dates suggest that this facility was in use for a long time, perhaps throughout the first two centuries of the current era.

The dates from Huaca Prieta fall within the heyday of the Virú polity development, as indicated by a series of radiocarbon dates obtained from core sites in the Virú Valley (64). Excavations in residential and civic-ceremonial sectors at Huaca Gallinazo documented the founding of the city before the first century BC and its evolution until the site was abandoned, possibly as late as the seventh century AD. Similar results were obtained from Huaca Santa Clara, a midsize administrative center higher up in the valley.

The first centuries AD witnessed an unprecedented demographic boom in the Virú Valley, possibly related to the demise of Cerro Arena (Moche Valley), until then the main urban center in the region (22, 26). By that time, the Gallinazo Group was by far the largest agglomeration of the valley (~40 ha), boasting a densely occupied urban landscape dominated by the impressive platform mound of Huaca Gallinazo, which featured a stage-like platform fronted by a wide plaza for public gatherings (23, 24). This period was a time when Virú polity leaders were clearly experimenting with state development (20, 64) and were likely also engaging in expansionary dynamics, including the establishment of outposts in neighboring lands (10).



Fig. 6. Workman standing in test pit 1 at Huaca Prieta (AMNH, Junius Bird Archive). Image courtesy of the Division of Anthropology, AMNH.





**Fig. 7.** Virú Negative double spout and bridge vessel uncovered close to test pit 1 at Huaca Prieta (AMNH Cat. No. 41.2/6567). Image courtesy of the Division of Anthropology, AMNH.

**Textiles.** Surette analyzed 228 textile fragments from test pit 1. These textile fragments were subsequently examined as part of a broader study of north coast textiles from the EIP that considered the materials, techniques, and motifs used by north coast weavers (65). The EIP textile collection from test pit 1 at Huaca Prieta comprises fabric fragments that feature a limited number of structural techniques (Table S4). Most (92.1%) were plain weaves, but a few tapestries, twills, and warp-face fabrics were also identified. The most common form of decoration was warp stripes (Fig. 8), with one example of plaid in cream and blue.

The vast majority of warps (256; 98.5%) and wefts (250; 98.4%) analyzed were made of cotton fibers whereas only a handful of fabrics were made with camelid wool (Table S5). With regard to spin direction, most of the warps (237; 91.2%) and wefts (235; 92.5%) consisted of S-spun yarns (counterclockwise twist), used as singles or plied S/2Z or (S/2Z)2S. The Z-spun yarns (clockwise twist) were often combined with S-spun yarns in the same textile. The two examples of yarn made up of cotton and maguey fibers were spun S/2Z. About half of the fabrics (121; 48.8%) were woven with paired warps and wefts whereas 107 (43.1%) were woven with single warps and wefts (Table S6). The remainder consisted of paired warps (12; 4.8%), paired wefts (6; 2.4%), a 2/2 twill weave, and a textile with two warps to every three wefts. Most yarns were made from undyed cotton and woolen yarns in the shades of cream and light brown, but some textiles were made with yarns dyed in blue, red, yellow, orange, gold, or dark brown (Table S7).

The main characteristics of these textiles lie in the primary reliance on cotton, near absence of wool, and emphasis on plain weave. What little decoration was identified consisted solely of simple warp or weft stripes, usually in blue on a cream ground, and three fragments of supplemental weft work. However, knowledge of more complex weaves is hinted at by the fragments of tapestry.

These traits somehow contrast with the material excavated from the contemporaneous Virú sites of Huaca Gallinazo and Huaca Santa Clara that boasted intricately woven cloths, often enriched by brightly dyed woolen yarns (65, 66). The near absence of woolen fabrics at Huaca Prieta is indeed striking when we consider that 18% of all textiles from the Virú Valley featured at last some camelid wool (65). One possible explanation for the near absence of wool at Huaca Prieta is that the site was peripheral to the Virú state's coast-highland exchange network and thus lacked direct access to the woolen yarns that were readily available to weavers in core settlements.

In a recent study (67), carbon and nitrogen isotopic compositions of woolen fabrics from the Virú Valley were used to reconstruct the diet and habitat of the camelids (llamas and alpacas) from which they were produced. Results revealed that the finest garments worn by members of the Virú elite were crafted in local styles with yarns imported from high-altitude grasslands. This study points to the importance of woolen yarns as a key commodity that was regularly traded down the valley as part of the Virú long-distance exchange system, but also as a prestige good that would have been useful for supporting a narrative of connectedness with distant powers or lands (68–70). The scarcity of wool at Huaca Prieta may therefore simply be due to the settlement's marginal position within the Virú state economy.

**Human Remains.** The burials of one adult (burial 910) and one child (burial 911) were found during the excavations of the EIP levels in test pit 3 (31). No contextual information on these burials is available. The remains were also too fragmentary for aging and sexing, but the adult's skull (burial 910) showed evidence of auditory exostoses, a pattern observed on a third of the skeletons from different periods at Huaca Prieta. Tattersall (71) interpreted these abnormal bone growths in the ear canals as evidence of prolonged contact with cold water, the result of either diving for bivalves in the deep waters off the shoreline or of a life spent net fishing in heavy surf (see also refs. 72–74). The presence of this condition in an EIP burial minimally suggests that some of the residents of Huaca Prieta spent a substantial amount of their time exploiting marine resources.



**Fig. 8.** EIP textile from Huaca Prieta decorated with warp stripes (12.5 × 11.5 cm) (AMNH Cat. No. 41.2/2773). Image courtesy of the Division of Anthropology, AMNH.

**Virú Footprint in Chicama.** The evidence on the EIP occupation of Huaca Prieta points to the presence, in the Chicama Valley, of a settlement whose residents were economically and/or politically aligned with the Virú state, some 75 km to the south. This connection is indicated by the prevalence of Virú Negative fine ware at the site and by the absolute dating of the occupation to a time of important state development in Virú. Other lines of evidence indicate that those who resided at Huaca Prieta relied to some extent on marine resources and that maize beer was being prepared and consumed. More work will need to be done at the site to evaluate the size of the settlement and the nature of the occupation. That being said, the very presence of a Virú-aligned community so far from the state's core suggests that Huaca Prieta functioned as a form of outpost, likely founded in Chicama as part of the Virú's expansionary dynamics.

The abandonment of Huaca Prieta happened at a time when two large platform mounds were built on the El Brujo Complex terrace: Huaca Cortada and Huaca Cao Viejo (Fig. 2). Work by Franco and Gálvez at Cao Viejo (75–78) helped document a ceremonial complex fronted by a large ceremonial plaza, built through several construction phases between the third and eighth centuries AD (79). The building of these monumental structures, the architectural layout of Huaca Cao Viejo, and the fact that by then the local population had embraced Moche artistic canons (in its architecture and in portable objects, including ceramics) all point to a major political realignment of the local community toward the emerging Moche world. Although a few Moche-style ceramic sherds were uncovered in the uppermost levels at Huaca Prieta, there is no compelling evidence that the site was still being occupied at that time. Similarly, although fragments of Virú Negative pottery were uncovered at El Brujo (75), none were found in secure context, suggesting that the construction of Huaca Cao started after Moche-style ceramics had replaced Virú Negative as main corporate ceramic ware in the area.

Survey work and archaeological excavations elsewhere in Chicama only hint at the presence of Virú Negative pottery beyond Huaca Prieta (36, 75, 77, 80). But besides published information on three negative-painted vessels associated with burials at the site of Cerro Santa Ana (35, 36) in the center of the lower valley floor (Fig. 1), no other contextual evidence has yet been reported in the literature.

### Possible Virú Outposts in the Moche Valley

Other settlements with Virú Negative pottery were identified in the Moche Valley through survey and excavation work. According to Billman (19), the pre-Moche occupation of the valley was marked by the crystallization of two settlement clusters, each focused on a relatively large agglomeration: Cerro Oreja and Pampa La Cruz.

**Cerro Oreja.** Cerro Oreja is located at the Moche River valley neck (Fig. 1), where a canyon descending from mountainous terrain emerges onto the coast. It consists of an extensive settlement—spread over 2 km of relatively steep terrain—that features numerous habitation terraces and large stone wall architectural compounds, as well as an adobe platform perched on the hillside. According to Billman, Cerro Oreja's hold on the entire middle valley region was possibly part of a strategy to resist invaders from the highlands or midvalley *chaupiyungas* (19).

Excavations carried out by Peru's Instituto Nacional de Cultura in 1995 (81) exposed an area of ~550 square meters at the site, uncovering 811 "Gallinazo-period" (read "pre-Moche") burials. Results from these excavations have not yet been properly published, but recent bioarchaeological studies provide important information on the burial contexts (82–85). The EIP occupation of Cerro Oreja spanned three phases based on stratigraphic information, body treatment, and inclusion of fine wares (81). During the earliest phase, people were buried in excavated pits

whereas the following phase was marked by the construction of aboveground funerary structures. These structures were eventually covered by domestic architecture, with burials excavated through the houses' floors. Burials were associated with Castillo incised or modeled pottery and at least some featured negative-painted designs (81, 86). Until further analysis of the ceramic collections is carried out, however, it would be premature to comment on the nature and intensity of the Virú presence in this part of the valley.

**Pampa La Cruz.** Virú Negative pottery was abundant at the other site cluster core: Pampa La Cruz (Fig. 1), which is a large settlement (~5 ha) located near the seashore in the present-day municipality of Huanchaco, 28 km south of Huaca Prieta and 50 km north of Huaca Gallinazo. Pampa La Cruz was initially investigated by Iriarte (87), Donnan and Mackey (88), and Barr and coworkers (89, 90), who described it as a large fishing village occupied from the Late Early Horizon (Salinar) to the Late Intermediate (Chimú) period.

The settlement is located on a terrace (~15 m above sea level) and features residential architecture and two rectangular platforms (35 × 45 m and 49 × 34 m) made of adobe and stones (standing ~2.5 m above the terrace level). Today, the site has largely been engulfed by urban development, but Prieto and Campaña (91) recently excavated numerous test pits in streets and other public spaces to document the nature of the EIP occupation. Nine samples of organic material from Late Early Horizon and EIP levels produced valid <sup>14</sup>C results (Table S8) and dated the occupation to between 2,240 and 1,730 y B.P. (cal 390 BC to AD 386).

Results from recent excavations reveal that Pampa La Cruz was initially occupied by fishing folks who used Salinar-style pottery—characteristic of Late Early Horizon and which dates back to between ~400–100 BC (92)—and built one of the mounds (Montículo II). Houses featured stone walls, the most common vernacular building material throughout the occupation history of Pampa La Cruz. The settlement size increased substantially during the subsequent period (early EIP), which featured a compact agglomeration with houses, open spaces or plazas, burial grounds, and refuse deposits, associated with Virú Negative pottery (93). A second platform was built during this phase (Montículo I). The following period (late EIP) was characterized by the ubiquitous presence of Moche IV-style vessels at the site, the expansion of the settlement toward the lower section of the marine terrace, and the gradual abandonment of the original Virú settlement core. This transition from Virú to Moche was marked by violent events, including the destruction of stone walls and the desecration of funerary structures.

Before the Moche occupation of the site, Pampa La Cruz was a prosperous fishing community that relied on medium to small size drums (*Paralonchurus peruanus*, *Sciaena deliciosa*) and rocky and sandy shellfish, such as the surf clam (*Donax sp.*) and dye shells (*Stramonita hemastoma*). Auditory exostosis was identified on adult male skulls, suggesting that these individuals either dived frequently or spent a substantial part of their life net fishing. Among the artifacts uncovered in test pits and burials were several copper fishing hooks of different sizes, as well as fishing weights and mesh spacers, giving credence to the hypothesis that the inhabitants of the site relied heavily on marine resources. Other tools were uncovered, including a number of ball-shaped spindle whorls and a larger ceramic *tortero*, similar to the one from Huaca Prieta, and presumably used for plying yarns into lines or ropes.

Camelid remains were ubiquitous in almost all excavated deposits, something that contrasts with earlier Late Early Horizon occupation levels at Pampa La Cruz and at the nearby fishing village of Gramalote (94). The introduction in this region of camelids as food and as beasts of burden therefore seems to correlate with the Virú incursion in the region during the EIP. A similar situation existed with maize remains, which were abundant in EIP middens at Pampa La Cruz but were absent in the earlier levels and at Gramalote. Several concentrations of fragmented



jars typically used in the production of *chicha* were also uncovered at the site, suggesting that the EIP fishermen of Pampa La Cruz had ready access to maize (whether locally grown or imported). These shifts in diet may have negatively affected the overall health of local fishing communities. Indeed, preliminary analysis of human remains from Pampa La Cruz suggests that EIP residents were shorter than their predecessors at Gramalote, something that may be related to the shift from a regime rich in marine proteins (and well-balanced with carbohydrates) to one that relied on a narrower range of marine resources and on camelid meat and maize (93, 94).

Evidence also points to the existence of clear social differentiation at Pampa La Cruz. For example, Prieto and Campaña uncovered the grave of a prominent member of the community (*Jefe Pescador*) closely associated with exploiting sea resources. The deceased was buried with a number of artifacts of wood, metal, and shell, including a series of finely carved nacre adornments, copper tweezers, a metal nose ornament (covered with fragments of yellow and red textile), and a gilded copper plaque. Near the chest of the deceased, a large hook (12 cm long) wrapped in textile was also found—an object akin to the tools currently used by fishermen to catch octopus along the coast. The grave, which also contained the remains of a younger individual, also featured several fishing implements, as well as a high-quality ceramic dipper and a Virú Negative globular vessel (91). This burial contrasts with other graves excavated in the vicinity, none of which featured the same quantity and quality of offerings.

The negative-painted pottery (with straight lines, wavy lines, circles and dots, and triangles with dots) uncovered at Pampa La Cruz is typical of the fine ceramics that were produced and consumed at coeval Virú settlements documented by Bennett (38), Strong and Evans (41), and Millaire (21) in the Virú Valley. Some vessels uncovered at Pampa La Cruz were of exceptional quality and featured warriors holding quadrangular shields, animals, and fanged beings. The widespread presence of Virú Negative pottery sherds at the site points to relatively open access to these fine ceramic vessels and suggests the existence of solid connections between the political core of the Virú state, where these objects were presumably produced (there is as yet no evidence of ceramic production at the site), and Pampa La Cruz.

**Huaca Las Estrellas.** Virú Negative pottery was conspicuous at another settlement in the lower Moche Valley: Huaca Las Estrellas. Work carried out at the site of Huacas de Moche by Uceda and his team over the past 25 y has helped document the flourishing of the largest Moche settlement in the region, between the second and eighth centuries AD. Excavations in deep stratified deposits revealed an uninterrupted sequence of occupation by people who used Castillo Incised and Modeled utilitarian pottery, as well as fancy Moche-style ceramics (95), but negative-painted pottery is scarce and probably limited to the earliest occupation levels.

However, Virú Negative pottery was found at Huaca Las Estrellas: a small platform (46 × 36 m) located only 1 km south of the plain where that city eventually flourished. Excavations at the site under the supervision of Gayoso and Angulo (96) revealed an occupation by a group of people likely connected with Pampa La Cruz (15 km due west) and Huaca Gallinazo (35 km to the south) that predates the florescence of Huacas de Moche. Huaca Las Estrellas was a stepped platform with patios and rooms with well-plastered walls that had seen several phases of construction. At least some walls were also decorated with sculpted friezes (originally painted) similar to decorated walls uncovered at Huaca Gallinazo and Tomaval in Virú (figure 9 of ref. 38). Unfortunately, no absolute date is currently available for this site.

Ceramic fragments uncovered at Huaca Las Estrellas suggest that the site was built, occupied, and abandoned before the construction of the Moche *huacas*. Excavations in secure contexts produced Virú Negative ceramic fragments (and a few unclassified

painted sherds), pointing to the community's affiliation with the Virú world (96) (see also refs. 25 and 26).

### Virú Expansionary Dynamics

Very few negative pottery fragments have been found north of Chicama and south of Virú. None were found at the sites of Pacatnamú, Dos Cabezas, or Mazanca in the Jequetepeque Valley, and this ceramic type was also absent at Pampa Grande in Lambayeque (43, 44, 62). One exception is the upper Piura Valley, where Kaulicke (97, 98) reports negative-painted pottery in contexts also associated with Vicús material culture.

South of Virú, survey work and excavations in the Chao and Santa Valleys (99, 100) failed to produce evidence of sites with negative-painted pottery although some sherds were found on sites in the region (37), including twenty fragments at El Castillo in Santa (101). Larco Hoyle (37) interpreted the presence of negative-painted pottery in this region as the local manifestation of a “negative” stylistic current in the northern highlands during the EIP that connected societies from the highland (Recuay) and the coast (Santa and Virú) through networks of long-distance trade (see also refs. 38, 41, 95, and 102).

If we agree that Virú Negative pottery was a corporate style made for and used by Virú state leaders, the conspicuous presence of this aesthetically charged pottery on settlements along the coastline suggests that those were outposts, implanted by the Virú state as part of expansionary dynamics, similar to those documented by Algaze (1) and Spencer (10) in other parts of the world. As prestige goods, these objects were probably used by local leaders and subordinate administrators as markers of political alignment with the Virú world.

Evidence presented above also suggests that the Virú state's expansionary dynamics in the Moche and Chicama valleys was focused on the lower section of the flood plains (Fig. 9). Indeed, besides reports of negative pottery on settlements located in the middle Moche and Chicama valley areas, the ceramic records in these regions speak of communities that remained politically and economically independent throughout the EIP although further work at Cerro Santa Ana and Cerro Oreja would help clarify this issue. More settlements aligned to (or directly controlled by) the Virú polity likely existed within and beyond the incursion zone featured in Fig. 9. We would also expect to find villages and hamlets that were part of the Virú trade and communication network, as well as cemeteries and burials with Virú Negative pottery. The unregulated growth of the Municipality of Trujillo and adjoining district over the past century has greatly reduced the chance of finding pristine settlements in this area, but the coastline between Pampa La Cruz and Huaca Prieta is still relatively untouched and offers potential for identifying other settlements that would have been part of the Virú world system.

Drawing from the work of Santley (103, 104) on core outposts in Central Mexico, Algaze (1) noted that this type of settlement usually falls into three categories: Some were way stations founded along trade routes; others were established in the periphery or within native settlements; and still others were built near resources being exploited. The evidence currently available does not permit us to classify Virú outposts into any of these categories. However, it is worth noting that, to control the area in which these settlements were founded, Virú leaders would have had to rely on the partial delegation of authority to subordinate administrators (8–12, 16), ideally stationed in outposts evenly spread out in the territory. In this context, it is worth stressing that Huaca Las Estrellas and Pampa La Cruz are located a full day trip by foot north of the Virú capital city of Huaca Gallinazo whereas Huaca Prieta is located an extra half-day trip further north (~6-h walk). Those outposts may therefore have been founded in strategic locations to facilitate the movement of people and goods along the coastline, while also serving as way stations for travelers and llama caravans.

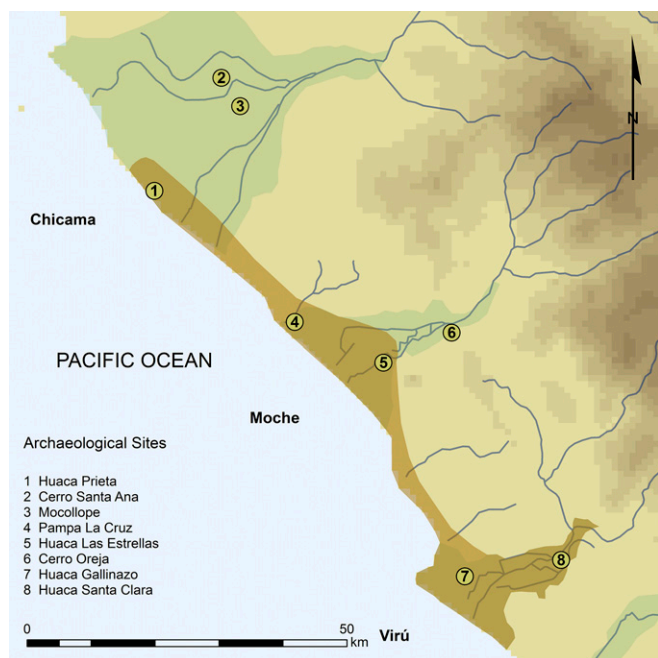


Fig. 9. Map of the north coast of Peru with tentative Virú incursion zone.

The data gathered here point to another aspect of early statecraft closely related to territorial expansion: territorial consolidation. According to Downey (20), the transition from the Early Virú (Puerto Moorin) and Middle Virú (Gallinazo) periods was a time of profound change in the Virú Valley, associated with the consolidation of two independent polities into the nascent Virú state. The first polity was centered around the Huacapongo Valley, immediately beyond the valley neck, whereas the other was centered on the lower valley, south of the Virú River. During this time of change, the population doubled and the region saw a sharp increase in the number of settlements and total area occupied. By then, a new capital was established at Huaca Gallinazo (Gallinazo Group), and soon thereafter Virú leaders started to expand beyond their core area, establishing outposts in the Moche and Chicama valleys. In the Moche Valley, this territorial expansion was eventually curbed when local leaders managed to consolidate what had been until then a politically fragmented territory and soon developed expansionary dynamics of their own.

Indeed, during pre-Moche times the Moche Valley was likely under the authority of two independent polities: one centered at Cerro Oreja in the middle valley and the other on Pampa La Cruz near the seashore. According to Billman (19, 26), these two clusters were eventually united under the authority of Moche state leaders, based at the newly founded capital city at Huacas de Moche, presumably marking the end of the Virú authority in the lower valley. Interestingly, as Billman points out, once control of the valley was achieved, Moche state leaders themselves turned their gaze outward and started their own territorial expansion campaigns south and north, integrating adjacent valleys into their own political and economic system (19), through direct and indirect control of foreign lands (see also ref. 105). In this context, the sites of Huaca de la Cruz in Virú (41) and El Castillo in Santa (101) could be interpreted as early core outposts established by the Moche state in foreign territories although the faith of these settlements was obviously tied to broader historical processes, beyond the scope of this paper.

These oscillations between episodes of territorial consolidation and territorial expansion in Virú and Moche fit well with Wright's (18) observation that statecraft often takes place in the contexts of expansionary dynamics marked by many successes and many fail-

ures. The evidence presented above also echoes Marcus's (3) insightful study of the dynamic cycles of growth and decline in Mesoamerican states. Reviewing evidence from this region, she noted the existence of cultural regularities associated with the cyclical growth and decline of early states in contexts of competing prestate societies, and the associated dynamics of cyclical annexation and loss of outlying provinces. As she summarizes it: "early in each state's history, a major investment was made in annexing outlying provinces through conquest or political and economic alliance. Many states appear to have reached their maximum areal extent early, then slowly contracted as outer provinces became powerful enough to break away" and establish their independence (ref. 3, p. 392). But, as Marcus also pointed out, even as frontiers were shrinking, it was not uncommon for the capital cities of the core states to continue to grow, a process she describes as a "shift from heavy investment in distant areas to heavy investment in one's own backyard" (ref. 3, p. 392). In this context, the end of Virú's hold over the lower Moche and Chicama valleys may well have marked the beginning of a time of political consolidation in the Virú Valley.

Understood as instruments of territorial expansion that were closely tied to historical processes (1) (see also ref. 106), core outposts offer unique viewpoints on the nature and extent of the foreign policy of archaic states, but also on the case-specific trajectories early states followed after core polities lost political and economic command over an enclave. In the case of Pampa La Cruz, the realignment from Virú to Moche was apparently associated with an expansion of the settlement and the substitution of Virú Negative pottery with Moche ceramics as the prestige artifacts of choice in funerary contexts. A different picture emerges from Huaca Las Estrellas, where the abandonment of this site was likely related to the founding of Huacas de Moche as the capital of a new regional power, only a few hundred meters to the north. In Chicama, Huaca Prieta seems to have suffered a similar fate and was likely abandoned at a time when two imposing Moche platform mounds started to be built close-by. Whether colonists traveled back to their homeland or were integrated into the emerging El Brujo Moche community is something that future research at Huaca Prieta and on other Virú outposts may eventually help to resolve.

## Materials and Methods

The radiocarbon samples came from maize cobs, cotton fabric and cordage, wood from a tool handle, and small charcoal fragments and do not include architectural components, which could have come from trees harvested long before the activities being dated by the smaller samples (a problem known as the "old wood effect"). For Huaca Prieta, we used only maize cobs because the large deposit of cobs (with kernels removed) is one probable manifestation of *chicha* brewing (see ref. 61) and thus the radiocarbon results likely date the brewing facility. All dates were calibrated at the  $2\sigma$  age range ( $\geq 95\%$ ) using OxCal 4.2 and the IntCal13 calibration curve (63).

Analyses of the Huaca Prieta ceramics were carried out at the AMNH using the Virú Valley Project classification system (40). Several attributes were recorded, including paste color and composition, firing technique, vessel thickness, and decoration. Sherds were subsequently classified in broader types following Downey's (20) reassessment of the Virú Valley ceramic sequence.

Huaca Prieta textiles from the AMNH were studied using an analytical grid derived from Surette's (65) study of ancient Peruvian coastal textiles. Several attributes were recorded, using a thread counter magnifier, including structural technique, spin direction, fiber types, warp and weft densities, yarn colors, and decorative motifs.

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1. Algaze G (1993) Expansory dynamics of some early pristine states. *Am Anthropol* 95(2):304–333.
2. Flannery KV (1998) The ground plans of archaic states. *Archaic States*, eds Feinman GM, Marcus J (School of American Research Press, Santa Fe, NM), pp 15–57.
3. Marcus J (1992) Dynamic cycles of Mesoamerican states: Political fluctuations in Mesoamerica. *National Geographic Research & Exploration* 8(4):392–411.
4. Marcus J, Flannery KV (1996) *Zapotec Civilization: How Urban Society Evolved in Mexico's Oaxaca Valley* (Thames and Hudson, London).
5. Redmond EM, Spencer CS (2006) From raiding to conquest: Warfare strategies and early state development in Oaxaca, Mexico. *The Archaeology of Warfare: Prehistories of Raiding and Conquest*, eds Allen MW, Arkush EN (Univ Press of Florida, Gainesville, FL), pp 336–393.
6. Redmond EM, Spencer CS (2012) Chiefdoms at the threshold: The competitive origins of the primary state. *J Anthropol Archaeol* 31(1):22–37.
7. Sherman RJ, Balkansky AK, Spencer CS, Nicholls BD (2010) Expansory dynamics of the nascent Monte Albán state. *J Anthropol Archaeol* 29(3):278–301.
8. Spencer CS (1998) A mathematical model of primary state formation. *Cult Dyn* 10(1): 5–20.
9. Spencer CS (2009) Testing the morphogenesis model of primary state formation: The Zapotec case. *Macroevolution in Human Prehistory*, eds Prentiss AM, Kuijt I, Chatters JC (Springer, New York), pp 133–155.
10. Spencer CS (2010) Territorial expansion and primary state formation. *Proc Natl Acad Sci USA* 107(16):7119–7126.
11. Spencer CS, Redmond EM (2003) Militarism, resistance, and early state development in Oaxaca, Mexico. *Social Evolution & History* 2(1):25–70.
12. Spencer CS, Redmond EM (2006) *Resistance Strategies and Early State Formation in Oaxaca, Mexico: Intermediate Elites in Pre-Columbian States and Empires*, eds Elson CM, Covey RA (Univ of Arizona Press, Tucson, AZ), pp 21–43.
13. Stanish C (2001) The origin of state societies in South America. *Annu Rev Anthropol* 30:41–64.
14. Trigger BG (2003) *Understanding Early Civilizations: A Comparative Study* (Cambridge Univ Press, New York).
15. Webster D (1975) Warfare and the evolution of the state: A reconsideration. *Am Antiq* 40(4):464–470.
16. Wright HT (1977) Recent research on the origin of the state. *Annu Rev Anthropol* 6:379–397.
17. Wright HT (1998) Uruk states in southwestern Iran. *Archaic States*, eds Feinman GM, Marcus J (School of American Research, Santa Fe, NM), pp 173–197.
18. Wright HT (2006) Early state dynamics as political experiment. *J Anthropol Res* 62(3): 305–319.
19. Billman BR (2002) Irrigation and the origins of the southern Moche state on the north coast of Peru. *Lat Am Antiq* 13(4):371–400.
20. Downey JT (2015) Statecraft in the Virú Valley, Peru, in the First Millennium AD. PhD dissertation (The University of Western Ontario, London, ON, Canada).
21. Millaire J-F (2009) Gallinazo and the tradición norcosteña. *Gallinazo: An Early Cultural Tradition on the Peruvian North Coast*, eds Millaire J-F, Morlion M (CIOA, Los Angeles), pp 1–16.
22. Willey GR (1953) *Prehistoric Settlement Patterns in the Virú Valley, Peru* (Smithsonian Institution, Washington, DC).
23. Millaire J-F, Eastaugh E (2011) Ancient urban morphology in the Virú Valley, Peru: Remote sensing work at the Gallinazo Group (100 BC-AD 700). *J Field Archaeol* 36(4): 289–297.
24. Millaire J-F, Eastaugh E (2014) Geophysical survey on the coast of Peru: The early prehispanic city of Gallinazo Group in the Virú Valley. *Lat Am Antiq* 25(3):239–255.
25. Fogel H (1993) Settlements in time: A study of social and political development during the Gallinazo occupation of the north coast of Peru. PhD dissertation (Yale University, New Haven, CT).
26. Billman BR (1996) The evolution of prehistoric political organizations in the Moche Valley. PhD dissertation (University of California, Santa Barbara).
27. Dillehay TD, et al. (2012) Chronology, mound-building and environment at Huaca Prieta, coastal Peru, from 13,700 to 4000 years ago. *Antiq* 86(331):48–70.
28. Dillehay TD, et al. (2012) A late Pleistocene human presence at Huaca Prieta, Peru, and early Pacific Coastal adaptations. *Quat Res* 77(3):418–423.
29. Grobman A, et al. (2012) Pre-ceramic maize from Paredones and Huaca Prieta, Peru. *Proc Natl Acad Sci USA* 109(5):1755–1759.
30. Bird RMck, Bird JB (1980) Gallinazo maize from the Chicama Valley, Peru. *Am Antiq* 45(2):325–332.
31. Bird JB, Hyslop J (1985) The pre-ceramic excavation at the Huaca Prieta Chicama Valley, Peru. *Anthropological Papers of the American Museum of Natural History* 62(1):1–294.
32. Cohen J (1980) *Peruvian Weaving: A Continuous Warp for 5000 Years* (University of California Extension Center for Media and Independent Learning, Berkeley, CA).
33. Nesbitt J (2012) Excavations at Caballo Muerto: An Investigation into the Origins of the Cupisnique Culture. PhD dissertation (Yale University, New Haven, CT).
34. Bird RMck (1987) A postulated tsunami and its effects on cultural development in the Peruvian Early Horizon. *Am Antiq* 52(2):285–303.
35. Larco Hoyle R (1945) *La Cultura Virú* (Sociedad Geográfica Americana, Buenos Aires).
36. Larco Hoyle R (1948) *Cronología Arqueológica del Norte del Perú* (Sociedad Geográfica Americana, Buenos Aires).
37. Larco Hoyle R (1962) *La Cultura Santa* (Litografía Valverde, Lima, Peru).
38. Bennett WC (1950) The Gallinazo Group, *Viru Valley, Peru* (Yale Univ Press, New Haven, CT).
39. Collier D (1955) Cultural chronology and change as reflected in the ceramics of the Virú Valley, Peru. *Fieldiana Anthropol* 43(1):1–226.
40. Ford JA (1949) Surface survey of the Virú Valley, Peru. 2. Cultural dating of pre-historic sites in Virú Valley, Peru. *Anthropological Papers of the American Museum of Natural History* 43(1):31–78.
41. Strong WD, Evans C (1952) *Cultural Stratigraphy in the Virú Valley, Northern Peru: The Formative and Florescent Epochs* (Columbia Univ Press, New York).
42. Millaire J-F, Morlion M (2009) *Gallinazo: An Early Cultural Tradition on the Peruvian North Coast* (CIOA, Los Angeles).
43. Donnan CB (2009) The Gallinazo illusion. *Gallinazo: An Early Cultural Tradition on the Peruvian North Coast*, eds Millaire J-F, Morlion M (CIOA, Los Angeles), pp 17–33.
44. Shimada I, Maguñá A (1994) Nueva visión sobre la cultura Gallinazo y su relación con la cultura Moche. *Moche: Propuestas y Perspectivas*, eds Uceda S, Mujica E (Universidad Nacional de La Libertad, Trujillo, Peru), pp 31–58.
45. Millaire J-F (1997) La technologie de la filature manuelle sur le site Moche de la côte nord du Pérou précolombien. MSc thesis (University of Montreal, Montreal).
46. Vreeland JM (1986) Cotton spinning and processing on the Peruvian North Coast. *The Junius B. Bird Conference on Andean Textiles: April 7th and 8th, 1984*, ed Rowe AP (Textile Museum, Washington, DC), pp 363–383.
47. Pearsall DM (2008) Plant domestication and the shift to agriculture in the Andes. *Handbook of South American Archaeology*, eds Silverman H, Isbell W (Springer, New York), pp 105–120.
48. Bird RMck (1978) Archaeological maize from Peru. *Maize Genet Coop News Lett* 52: 90–92.
49. Mangelsdorf PC, Cámara-Hernández J (1967) Prehistoric maize from Huaca Prieta, Peru. *Maize Genet Coop News Lett* 41:48.
50. Nickerson NH (1953) Variation in cob morphology among certain archaeological and ethnological races of maize. *Ann Mo Bot Gard* 40(2):79–111.
51. Dietler M (2006) Alcohol: Anthropological/archaeological perspectives. *Annu Rev Anthropol* 35:229–249.
52. Jennings J (2004) La chichera y el patrón: Chicha and the energetics of feasting in the prehistoric Andes. *Archaeol Pap Am Anthropol Assoc* 14(1):241–259.
53. Jennings J, Bowser BJ (2009) *Drink, Power, and Society in the Andes* (Univ Press of Florida, Gainesville, FL).
54. Marcus J (2009) A world tour of breweries. *Andean Civilization: A Tribute to Michael E. Moseley*, eds Marcus J, Williams PR (CIOA, Los Angeles), pp 303–324.
55. Moore JD (1989) Pre-hispanic beer in coastal Peru: Technology and social context of prehistoric production. *Am Anthropol* 91(3):682–695.
56. Morris C (1979) Maize beer in the economics, politics, and religion of the Inca Empire. *Fermented Food Beverages in Nutrition*, eds Gastineau CF, Darby WJ, Turner TB (Academic, New York), pp 21–34.
57. Moseley ME, et al. (2005) Burning down the brewery: Establishing and evacuating an ancient imperial colony at Cerro Baul, Peru. *Proc Natl Acad Sci USA* 102(48): 17264–17271.
58. Prieto G (2011) Chicha production during the Chimú period at San José de Moro, Jequetepeque Valley, north coast of Peru. *From State to Empire in the Prehistoric Jequetepeque Valley, Peru*, eds Zori CM, Johnson I (Archaeo, Oxford), pp 105–128.
59. Chappelaine C (2001) The growing power of a Moche urban class. *Moche Art and Archaeology in Ancient Peru*, ed Pillsbury J (National Gallery of Art, Washington, DC), pp 68–87.
60. Gillin J (1947) *Moche: A Peruvian Coastal Community* (Smithsonian Institution, Washington, DC).
61. Hayashida FM (2008) Ancient beer and modern brewers: Ethnoarchaeological observations of chicha production in two regions of the North Coast of Peru. *J Anthropol Archaeol* 27(2):161–174.
62. Shimada I (1994) *Pampa Grande and the Mochica Culture* (Univ of Texas Press, Austin, TX).
63. Reimer PJ, et al. (2013) IntCal13 and Marine13 radiocarbon age calibration curves 0–50,000 years cal BP. *Radiocarbon* 55(4):1869–1887.
64. Millaire J-F (2010) Primary state formation in the Virú Valley, north coast of Peru. *Proc Natl Acad Sci USA* 107(14):6186–6191.
65. Surette FK (2015) Virú and Moche Textiles on the North Coast of Peru during the Early Intermediate Period: Material Culture, Domestic Traditions and Elite Fashions. PhD Dissertation (The University of Western Ontario, London, ON, Canada).
66. Millaire J-F (2009) Woven identities in the Virú Valley. *Gallinazo: An Early Cultural Tradition on the Peruvian North Coast*, eds Millaire J-F, Morlion M (CIOA, Los Angeles, CA), pp 149–165.
67. Szapak P, et al. (2015) Origins of Prehispanic camelid wool textiles from the north and central coasts of Peru traced by carbon and nitrogen isotopic analyses. *Curr Anthropol* 56(3):449–459.
68. DeMarrais E, Castillo LJ, Earle T (1996) Ideology, materialization, and power strategies. *Curr Anthropol* 37(1):15–31.
69. Helms MW (1993) *Craft and the Kingly Ideal: Art, Trade, and Power* (Univ of Texas Press, Austin, TX).
70. Vaughn K (2006) Craft production, exchange, and political power in the pre-Incaic Andes. *J Archaeol Res* 14(4):313–344.
71. Tattersall I (1985) The human skeletons from Huaca Prieta, with a note on exostoses of the external auditory meatus: The Pre-ceramic excavation at the Huaca Prieta Chicama Valley, Peru. *Anthropological Papers of the American Museum of Natural History* 62(1):60–64.
72. Kennedy GE (1986) The relationship between auditory exostoses and cold water: A latitudinal analysis. *Am J Phys Anthropol* 71(4):401–415.
73. Kroon DF, Lawson ML, Derkay CS, Hoffmann K, McCook J (2002) Surfer's ear: External auditory exostoses are more prevalent in cold water surfers. *Otolaryngol Head Neck Surg* 126(5):499–504.

74. Okumura MMM, Boyadjian CHC, Eggers S (2007) Auditory exostoses as an aquatic activity marker: A comparison of coastal and inland skeletal remains from tropical and subtropical regions of Brazil. *Am J Phys Anthropol* 132(4):558–567.
75. Franco R, Gálvez C (2009) Gallinazo-style ceramics in Early Moche contexts at the El Brujo Complex, Chicama Valley. *Gallinazo: An Early Cultural Tradition on the Peruvian North Coast*, eds Millaire J-F, Morlion M (CIOA, Los Angeles), pp 91–104.
76. Franco R, Gálvez C, Vásquez S (2003) Modelos, función y cronología de la Huaca Cao Viejo, complejo El Brujo. *Moche: Hacia el Final del Milenio II*, eds Uceda S, Mujica E (Pontificia Univ Católica del Perú, Lima, Peru), pp 125–177.
77. Gálvez C, Briceño J (2001) The Moche in the Chicama Valley. *Moche Art and Archaeology in Ancient Peru*, ed Pillsbury J (National Gallery of Art, Washington, DC), pp 140–157.
78. Mujica E (2007) *El Brujo: Huaca Cao, Centro Ceremonial Moche en el Valle de Chicama* (Fundación Wiese, Lima, Peru).
79. Koons ML, Alex BA (2014) Revised Moche chronology based on Bayesian models of reliable radiocarbon dates. *Radiocarbon* 56(3):1039–1055.
80. Attarian CJ (2009) Urbanism and social change during the Gallinazo and Moche periods in the Chicama Valley. *Gallinazo: An Early Cultural Tradition on the Peruvian North Coast*, eds Millaire J-F, Morlion M (CIOA, Los Angeles), pp 77–90.
81. Carcelen J (1995) *Rescate Arqueológico Flanco Norte y Arenales al Oeste de Cerro Oreja* (Dirección Regional de Cultura-La Libertad, Trujillo, Peru).
82. Gagnon CM (2006) Daily life and the development of the state in the Moche Valley of North Coastal Peru: A bioarchaeological analysis. PhD dissertation (University of North Carolina, Chapel Hill, NC).
83. Gagnon CM, Wiesen C (2013) Using general estimating equations to analyze oral health in the Moche Valley of Peru. *Int J Osteoarchaeol* 23(5):557–572.
84. Gagnon CM, Billman B, Carcelen J, Reinhard KJ (2013) Tracking shifts in coca use in the Moche Valley: Analysis of oral health indicators and dental calculus microfossils. *Nawpa Pacha* 33(2):193–213.
85. Yoshida B (2004) Status and health amid changing social conditions: Bioarchaeology of a prehispanic Moche Valley population. PhD Dissertation (University of California, Santa Barbara).
86. Lambert PM, et al. (2012) Bone chemistry at Cerro Oreja: A stable isotope perspective on the development of a regional economy in the Moche Valley, Peru during the Early Intermediate Period. *Lat Am Antiq* 23(2):144–166.
87. Iriarte F (1965) *Los Trabajos de Rescate Arqueológico en el Sitio La Poza de Huanchaco* (Patronato de Cultura de Trujillo, Trujillo, Peru).
88. Donnan CB, Mackey CJ (1978) *Ancient Burial Patterns of the Moche Valley, Peru* (Univ of Texas Press, Austin, TX).
89. Barr G (1991) *Secuencia Estratigráfica y Cultural de Pampas La Cruz-Huanchaco, Valle de Moche* (Facultad de Ciencias Sociales, Escuela de Arqueol, Univ Naci de Trujillo, Trujillo, Peru).
90. Barr G, Lecca C, Silva E, Vásquez J (1986) *Investigaciones Arqueológicas en el Montículo I de Pampa La Cruz Huanchaco, Valle de Moche: Un Estudio Preliminar* (Facultad de Ciencias Sociales, Escuela de Arqueol, Univ Naci de Trujillo, Trujillo, Peru).
91. Prieto G, Campaña V (2013) *Proyecto de Evaluación Arqueológica con Excavaciones Las Lomas de Huanchaco* (Municipalidad Distrital de Huanchaco, Huanchaco, Peru).
92. Ikehara H (2007) Festines del período Formativo Medio y Tardío en Cerro Blanco en Nepeña. BA thesis (Pontificia Univ Católica del Perú, Lima, Peru).
93. Prieto G (2015) Gramalote: Domestic life, economy and ritual practices of a pre-hispanic maritime community. PhD Dissertation (Yale University, New Haven, CT).
94. Pezo-Lanfranco L, Eggers S (2013) Modo de vida y expectativas de salud en poblaciones del periodo Formativo de la costa norte del Peru: Evidencias bio-antropológicas del sitio Puemape. *Lat Am Antiq* 24(2):191–216.
95. Uceda S, Gayoso H, Gamarra N (2009) The Gallinazo at Huacas de Moche: Style or culture? *Gallinazo: An Early Cultural Tradition on the Peruvian North Coast*, eds Millaire J-F, Morlion M (CIOA, Los Angeles), pp 105–124.
96. Gayoso HL, Angulo MI (2013) Huaca las Estrellas: Un centro ceremonial y administrativo gallinazo en la campiña de Moche. *Proyecto Arqueológico Huaca de la Luna-Informe Técnico 2012*, eds Uceda S, Morales R (Univ Naci de Trujillo, Trujillo, Peru), pp 527–573.
97. Kaulicke P (1992) Moche, Vicús Moche y el Mochica Temprano. *Bull de l'Inst Fran d'Études And* 21(3):853–903.
98. Kaulicke P (2009) Concluding remarks. *Gallinazo: An Early Cultural Tradition on the Peruvian North Coast*, eds Millaire J-F, Morlion M (CIOA, Los Angeles), pp 233–242.
99. Kent JD, Rosales T, Vásquez V, Busch RA, Gaither CM (2009) Gallinazo and Moche at the Santa Rita “B” archaeological complex, Middle Chao Valley. *Gallinazo: An Early Cultural Tradition on the Peruvian North Coast*, eds Millaire J-F, Morlion M (CIOA, Los Angeles), pp 167–179.
100. Wilson DJ (1988) *Prehispanic Settlement Patterns in the Lower Santa Valley, Peru: A Regional Perspective on the Origins and Development of Complex North Coast Society* (Smithsonian Institution, Washington, DC).
101. Chapdelaine C, Pimentel V, Gamboa J (2009) Gallinazo cultural identity in the lower Santa Valley: Ceramic, architecture, burial patterns, and socio-political organization. *Gallinazo: An Early Cultural Tradition on the Peruvian North Coast*, eds Millaire J-F, Morlion M (CIOA, Los Angeles), pp 181–206.
102. Kroeber A (1944) *Peruvian Archaeology in 1942* (Viking Fund, New York).
103. Santley RS (1983) Obsidian trade and Teotihuacan influence in Mesoamerica. *Highland-Lowland Interaction in Mesoamerica: Interdisciplinary Approaches*, ed Miller AG (Harvard Univ Press, Cambridge, MA), pp 69–124.
104. Santley RS (1989) Obsidian working, long-distance exchange, and the Teotihuacan presence on the south Gulf Coast. *Mesoamerica after the Decline of Teotihuacan, A.D. 700-900*, eds Diehl RA, Berlo JC (Dumbarton Oaks, Washington, DC), pp 131–152.
105. Millaire J-F (2010) Moche political expansionism as viewed from Virú: Recent archaeological work in the close periphery of a hegemonic city-state system. *New Perspectives on Moche Political Organization*, eds Quilter J, Castillo LJ (Dumbarton Oaks, Washington, DC), pp 221–249.
106. Stanish C, et al. (2010) Tiwanaku trade patterns in southern Peru. *J Anthropol Res* 29(4):524–532.