What the Shell? The Zooarchaeology of Cerro San Isidro, Peru

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WHAT THE SHELL? THE ZOOARCHAEOLOGY OF CERRO SAN ISIDRO, PERU

A Thesis

Submitted to the Graduate Faculty of the Louisiana State University and Agricultural and Mechanical College in partial fulfillment of the requirements for the degree of Master of Arts

in

The Department of Geography and Anthropology

by

Monica Fenton
B.A., University of Pennsylvania, 2015
December 2021
For Xena and Alistair
ACKNOWLEDGEMENTS

This research was funded in part by the Robert C. West/R.J. Russell Graduate Student Field Research Award from the Department of Geography and Anthropology at Louisiana State University. The Proyecto de Investigación Arqueológica Cerro San Isidro 2019 was directed by David Chicoine and Jeisen Navarro, and financially supported by a National Science Foundation grant (1853905) awarded to Chicoine. Field activities and excavations were carried out with permission of the Peruvian Ministerio de Cultura under the Resolución Directoral 232–2019/DGPA/VMPCIC.MC. Vertebrate remains were taxonomically identified and quantified at the Arqueobios laboratory facilities in Trujillo, Peru under supervision of Victor Vásquez and Teresa Rosales.

Thanks to my thesis advisor Dr. David Chicoine and committee members Drs. Mary J. Brody and Rebecca Saunders for their patience and advice. Many thanks to Mom for supporting and believing in me, even when I wouldn’t do the same for myself. And of course, thank you to Xena and Alistair for keeping me sane by being your sweet goofy selves.
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ABSTRACT

Zooarchaeologists have documented the importance of marine resources in the ancient Andes, and the first field season at Cerro San Isidro (Ancash, Peru) proves no different. The multi-component hilltop archaeological complex lies in the agriculturally rich Moro Pocket of the middle Nepeña Valley, at least an eight-hour walk from the ocean on the north-central coast. Between June and August 2019, members of the Proyecto de Investigación Arqueológica Cerro San Isidro carried out the first scientific excavations at this important ancient human settlement. Block excavations focused on a hypothesized elite compound, documenting intermittent occupations from the Late Formative (c. 600 BCE) through the Late Intermediate Period (c. 1400 CE).

This thesis reports on the zooarchaeological assemblages recovered during those excavations. Taxonomic analyses indicate that most identifiable vertebrate bones are camelids. Cutmarks and burning demonstrate that the animals provided food in addition to transportation. While both aquatic and terrestrial animals were uncovered, four marine bivalve species (rock-perching mussels *Perumytilus purpuratus* and *Semimytilus algosus*, and sand-dwelling clams *Donax obesulus* and *Mesodesma donacium*) dominate an assemblage that is taxonomically rich but not even. Relative frequencies of mollusk taxa and corresponding habitats resemble those of Late and Final Formative lower valley sites Huambacho, Caylán, and Samanco, suggesting that Cerro San Isidro residents sourced seafood from the same environments and enjoyed trade ties with neighboring groups in the coastal zone. While better chronological control is needed to understand how site residents' tastes may have changed over time, this thesis brings preliminary insight into ancient foodways in a previously understudied mid-altitude region of western Peru.
CHAPTER 1. INTRODUCTION

This thesis explores foodways in ancient Peru by taxonomically analyzing zooarchaeological remains at the multi-component complex of Cerro San Isidro (c. 600 BCE–1450 CE) located in the Nepeña Valley of the north-central coast of Peru. The site is hypothesized to be a major prehispanic center with significant political and demographic weight. Situated in the middle of the Moro Pocket, an enclave of flat arable land in the western foothills of the Andes, Cerro San Isidro is visible from most surrounding ridgetops, mountain peaks and ceremonial locales. While previous surface surveys pointed to the enduring importance and long occupational sequence (Ikehara 2015; Proulx 1968), archaeologists had yet to scientifically excavate deposits or document stratigraphy and material assemblages. This situation changed in June 2019 when members of the Proyecto de Investigación Arqueológica Cerro San Isidro, spearheaded by David Chicoine and Jeisen Navarro (2020), began a long-term research program at this important site. I participated in the 2019 field season and here report and synthesize the zooarchaeological results.

The geographic location of Cerro San Isidro (c. 500 masl) in the foothills of a coastal river valley makes it a good candidate to study coast-highland interactions and test models of ecological complementarity (Murra 1985). The Moro region is located about eight hours’ walk from the Pacific Ocean and 24 hours by foot from the Callejón de Huaylás to the east (a major intermountain valley). While today’s Morinos, including food producers and consumers, network closely with neighboring coastal urban centers such as Chimbote and Lima and enjoy access to global markets, little is known about prehispanic subsistence strategies and the relative importance of different ecological niches and foodstuffs. My thesis explores this key research problem through analyzing invertebrate and vertebrate faunal remains recovered in archaeological deposits at Cerro San Isidro. The 2019 excavations sampled 191 m² spread over
seven block excavations (5x5 m each) and eight test units (1x2 m each) and yielded 11.42 kg of vertebrate skeletal remains and 7.76 kg of shells from mollusks and other invertebrates (Chicoine and Navarro 2020). Taxonomic analyses, using photographic archives and reference collections housed in the Arqueobios laboratory in Trujillo, Peru (Vásquez and Rosales 2019), enumerate 1547 NISP of vertebrates and 3384 NISP of mollusks. Pottery styles confirm that CSI was occupied between the Late Formative, perhaps as early as 600 BCE, and the Late Intermediate Period, perhaps as late as 1400 CE (Chicoine and Navarro 2020:12–13). However, radiocarbon measurements will be necessary to confirm this.

The remainder of this thesis anchors the zooarchaeological research chronologically, geographically, and culturally historically. I detail field activities, summarize major excavation results, and describe the assemblage and analytical methods. Based on taxonomic analyses, I discuss the implications of the Cerro San Isidro faunal remains and compare the datasets with coeval assemblages from neighboring coastal and highland regions (Figure 1). Results suggest the enduring importance of seafood in local diets, combined with a dominance of camelids used for both eating and transportation. The invertebrate assemblage is taxonomically rich but not even, as 83% of the NISP belong to the five most common species—*Perumytilus purpuratus, Donax obesulus, Semimytilus algosus, Mesodesma donacium*, and *Scutalus* sp.—among 24 different taxa that were present. Shells from rocky marine habitats predominate and sand-dwellers are also well-represented, suggesting that Cerro San Isidro’s coastal seafood suppliers exploited these environments most intensely.
Geographic Context

Cerro San Isidro (CSI) rises about 100 m above the vineyards and avocado orchards populating the Moro Pocket, the widest stretch of the middle Nepeña Valley on Peru’s north-central coast. The relatively short and slender coastal valley measures 74 km long from terminus to source, 6 km across in the Moro Pocket, and 8 km across at its widest. Only 300 m northwest of CSI flows the Río Nepeña, formed of three tributaries originating in the Cordillera Negra, a total drainage area of 1,900 km$^2$. The northernmost Jimbe branch converges with the central Salitre 5 km upstream from CSI to form the Río Nepeña proper, which joins the southernmost Río Loco (Vinchamarca) branch 4 km downstream from CSI. This means that the archaeological site on the large hill is strategically located within the floodplain of rich agricultural soils formed by the
rivers coming together (ONERN 1972:33; Proulx 1968:2). Additionally, the ancient inhabitants would have lived next to one natural spring, and within about a kilometer of two others (Ikehara 2015:144; 159).

Divisions such as ‘lower,’ ‘middle,’ and ‘upper’ valley are inherently artificial, but usually map onto natural changes in topography. When archaeologist Donald Proulx conducted the first systematic survey of Nepeña in the 1960s and 1970s, he designated land from the shoreline to the Moche site Pañamarca as the lower valley, with the middle section continuing upstream from that site until the valley floor constricts to its narrowest around Kiske (300 masl), just below the Moro Pocket. Proulx’s upper valley includes Moro, the lower 8 km of the Río Salitre, and the Río Jimbe from the top of the pocket to where its tributaries meet north of the modern town of Jimbe (1200 masl) (Proulx 1985:21–22). In the 2010s, Hugo Ikehara revised this system to fit the way similar valleys like Nasca and Santa have been subdivided. Now, the lower valley consists of Proulx’s lower and middle sections, the middle valley is essentially Proulx’s upper valley, and the upper valley is the part of the Cordillera Negra up to about 4500 masl, which feeds the Río Nepeña’s tributaries (Ikehara 2015:22–23).

Most of the river’s 74.7 million m³ annual volume flows during the highland rainy season in February and March. The raw quantity seems large in isolation, but it represents only 43.3% of the annual volume of the Río Casma one valley south, and a mere 1.6% of that of the Río Santa one valley north. The latter huge discrepancy is because over half of the Río Santa’s approximately 350 km course forms the Callejon de Huaylas, a fertile intermontane valley between the western Cordillera Negra and eastern Cordillera Blanca that catches most runoff that otherwise would have drained into the Río Nepeña’s tributaries and dry quebradas. Despite the difference in hydrological input, the Nepeña’s shallow riverbed means that almost all of its water
is harnessable for irrigation agriculture, compared to only 7% of that of the deeper Santa
(ONERN 1972:33–36; Proulx 1968:2–3). The spot where the Río Nepeña discharges into the
Pacific Ocean shifts during major floods linked to El Niño Southern Oscillation (ENSO)
episodes. Severe ENSO flooding in 1998 moved the river outlet from the town of Samanco on
the Bahía de Samanco to the town of Los Chimús on the Bahía de Tortugas, about 8 km south
(Chicoine and Rojas 2013:341). A 1925 flood washed so much sediment downstream that it
destroyed old Samanco and silted up the mouth of the river, necessitating the town be rebuilt on
the new shoreline over 400 m away (Proulx 1968:1). CSI is about 35 km inland from the
coastline as the crow flies—a 42 km (8–10 hour) walk along the natural path of the river.

A prominent concept in Andean studies is the eight natural regions or ecozones of Peru,
characterized by altitude, climate, and indigenous land use practices. Cerro San Isidro is located
at the lowest elevations of the maritime yunga zone, which encompasses the middle and upper
sections of coastal river valleys from 500 to 2300 masl. Its climate is similar to the chala zone of
the lower valleys, river mouths, and Pacific littoral below 500 masl. Both yunga and chala are
arid environments created by the rain shadow of the Andes to the east combined with the cold
Peru (Humboldt) Current to the west. Expanses of rocky desert are carved up by river valley
oases descending from the sierra to the sea. During austral winter, a dense fog called garúa
forms at night and can persist all day near the ocean, while in Moro it typically burns off by
noon. The garúa sustains xerophytic plants in mist oases called lomas, the sort of vegetation that
populates otherwise sparse slopes like San Isidro or the hillsides surrounding Moro. Despite the
reduced fog, the middle valley yunga is nonetheless wetter with greater precipitation and poorer
organic preservation compared to the lower valley chala (Lau 2011:22–23; Proulx 1968:2–3;
Sandweiss and Richardson 2008:95–96).
Cerro San Isidro Archaeological Complex

The site under discussion is actually an archaeological complex consisting of Cerro San Isidro (PV31–51) and Puente Piedra (PV31–50), dubbed the Cerro San Isidro Archaeological Complex (Figure 2) after the larger of the two. Self-confessed “splitter” archaeologist Donald Proulx initially recorded the sub-sites separately during his 1967 Nepeña Valley survey, but upon observing a long east-west wall connecting the two sectors, realized they had been contiguous before recent fruit tree farming disturbed low-lying areas. The survey predates the catastrophic 1970 Ancash earthquake that leveled modern buildings, damaged archaeological sites, and killed an estimated 70,000 people (Proulx 1968:19–21, 93–94, 1993:231–232). Consequently, the surface architecture and landscape features we see today differ from early descriptions in archaeological literature.

Figure 2. Satellite map of Cerro San Isidro Archaeological Complex. Used with permission. Source: Chicoine and Navarro 2020
Proulx classifies both sectors as stone mounds with habitation and ceremonial components, but he could not securely date the archaeological complex despite finding Middle Horizon and Late Intermediate Period ceramics. To the west, he observed Puente Piedra (PV31–50), a megalithic worked fieldstone structure(s) atop a small natural hill, most walls in ruin save some eastern sections facing Cerro San Isidro. Officially designated PV31–51, CSI consists of four or five terraces built into a large natural hill, topped by several sizable multi-room architecture groups constructed of fieldstone and mud mortar (Proulx 1968:19–21, 93–94).

Hugo Ikehara’s 2012-2013 survey of the Moro Pocket in the middle Nepeña Valley (2015) is the next archaeological project to document Cerro San Isidro. Unlike Proulx, Ikehara did not conduct a site-based regional survey; instead, he collected surface artifacts at regular intervals throughout all 87.8 km² of the basin (minus 4.1 km² of dense modern towns). His underlying assumption was that all prehispanic households produced trash at more-or-less the same rate, in proportion to number of residents and occupation duration. Using density and distribution of artifacts as a proxy for population ameliorates many biases of traditional surveys, which first identify visible sites. Non-site methodology accounts for low-density rural occupations, vacant areas, and destroyed sites whose only trace is surface refuse (2015:40–42).

Ikehara’s geospatial analysis indicates that roughly a quarter of people in the Late Formative Period (800–450 BCE) Moro lived at or around Cerro San Isidro, the largest settlement. When the area’s population surged during the Final Formative (450–150 BCE), CSI stood out among a dozen demographic centers as the most densely nucleated, concentrating almost all households at one hilltop site and vacating low-lying lands surrounding. After 150 BCE, the Moro Pocket population figures returned roughly to Late Formative numbers, but
settlement distributions had changed dramatically. Demographic centers shifted to the eastern end of the survey zone and CSI did not regain its former importance (2015:225, 231).

As another part of the Moro survey, Ikehara maps surface constructions and identifies 23 monumental structures, which he interprets as ceremonial centers occupied between 800 BCE and 500 CE. Both Puente Piedra and San Isidro are documented with defensive walls and restricted mound-top access, but only Puente Piedra is covered in megalithic constructions—an iconic Final Formative style. A section of Ikehara’s dissertation compares the ceremonial sites through proxemics, a method of measuring architectural dimensions in order to quantify the shape, layout, capacity, privacy, or other qualities of a structure (Ikehara 2015:40–42, 190–196).

In regards to chronology, two major schemes are used to subdivide history and time in the ancient Central Andes. Edward Lanning (1967) codified one system using the ceramic sequence John Rowe (1962) developed for the south coast of Peru; an alternative system was later developed by Luis Lumbreras (1974) and recently refined by Peter Kaulicke (1994, 2009, 2010). Koichiro Shibata has assembled a partial sequence for the lower Nepeña Valley from excavations at Huaca Partida and Cerro Blanco de Nepeña (2011), while Ikehara divides the prehispanic middle valley into five periods in his dissertation research (2015). I have chosen to use Kaulicke’s updated Andean master sequence in this thesis in order to match the systems used by most other 21st century research about the valley. The following chart (Table 1) compares systems of classifying time.
Table 1. Comparative chronologies used in the Nepeña Valley

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<td>Preceramic (?–1800 BCE)</td>
<td>Archaic Period (?–1800 BCE)</td>
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<tr>
<td>Initial Period (1800–900 BCE)</td>
<td>Early Formative (1800–1200 BCE)</td>
<td>Huambocayan (1500–1100 BCE)</td>
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<tr>
<td></td>
<td>Middle Formative (1200–800 BCE)</td>
<td>Cerro Blanco (1100–800 BCE)</td>
<td></td>
</tr>
<tr>
<td>Early Horizon (900–200 BCE)</td>
<td>Late Formative (800–450 BCE)</td>
<td>Nepeña (800–450 BCE)</td>
<td>Period I (800–450 BCE)</td>
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<td></td>
<td>Final Formative (450–150 BCE)</td>
<td>Samanco (450–150 BCE)</td>
<td>Period II (450–150 BCE)</td>
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<tr>
<td>Early Intermediate Period (200 BCE–600 CE)</td>
<td>Epi-Formative (150 BCE–200 CE)</td>
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<td>Period III (150 BCE–500 CE)</td>
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<td></td>
<td>Early Intermediate Period (200–600 CE)</td>
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<tr>
<td>Middle Horizon (600–1000 CE)</td>
<td>Middle Horizon (600–1000 CE)</td>
<td></td>
<td>Period IV (500–1000 CE)</td>
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<tr>
<td>Late Intermediate Period (1000–1470 CE)</td>
<td>Late Intermediate Period (1000–1470 CE)</td>
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<td>Period V (1000–1500+ CE)</td>
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<tr>
<td>Late Horizon (1470–1535 CE)</td>
<td>Late Horizon (1470–1535 CE)</td>
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Ikehara describes Cerro San Isidro as a hilltop complex consisting of a monumental core of plazas and platforms surrounded by a village with a non-orthogonal layout, which lacks the perimeter walls that enclose other sites he surveyed. Access to public spaces is moderately restricted, with visitors needing to cross two or three thresholds (walls, dry moats, or pronounced elevation changes) to enter the innermost plaza. The largest plaza is 1631 m$^2$, for which Ikehara and colleagues estimate a capacity ratio between 10 m$^2$ per person and 3.7 m$^2$ per person (Helmer et al. 2018:12), meaning this space could host 163 to 440 participants. All other plazas combined total only 163 m$^2$, a capacity of 16 to 44 individuals. (Ikehara 2015:170–171, 180–181, 190–196, 212). The surface ceremonial architecture seems to include one space for a few-hundred-person elite ‘in-crowd,’ while only a few dozen powerful individuals could access the smaller structures. Additionally, Cerro San Isidro is more vertically oriented than three quarters of the other ceremonial sites Ikehara analyzed. He posits that a vertical layout correlates with smaller plazas, more exclusionary spaces, and greater social inequality—although it also may be related to the site’s steep natural terrain (Ikehara 2015:172–178).

**Proyecto de Investigación Arqueológica Cerro San Isidro**

The Cerro San Isidro Archaeological Project is testing Ikehara’s hypothesis that people occupied the archaeological complex in varying capacities from at least the Late Formative (800 BCE) until Chimú times (1400 CE) (Chicoine and Navarro 2020:7, 12–13; Ikehara 2015:59–60). The inaugural 2019 season spent nine weeks excavating seven 5x5 m units in Compound 3, approximately halfway up the hill, as well as eight 2x1 m test pits on the terraces. The core team includes co-directors David Chicoine and Jeisen Navarro, Peruvian archaeologists Carlos Ciriaco and José Ríos, and U.S. graduate students Christopher Nicosia, Audrey DeLuca, and myself.
We documented each stratum with photography, photogrammetry, and both profile and plan-view drawings. Visiting archaeologist Jacob Bongers mapped the partially excavated Compound 3 with a drone and created a three-dimensional digital model in Agisoft Metashape (Figure 3). Our team also used a handheld GPS unit to document the large ground stones littering the site. In the lab, we washed, bagged, labeled, and cataloged artifacts in an Excel database. I classified invertebrate shells to species or genus level, and my fellow graduate students analyzed the human remains. Commissioned by the project, lab technicians at Trujillo-based archaeological consulting firm Arqueobios (El Centro de Investigaciones Arqueobiológicas y Paleoecológicas Andinas) identified taxa and cultural modifications of non-human vertebrate ecofacts (Vásquez and Rosales 2019).
Excavations at Cerro San Isidro are part of a US-UK-Peru joint study of how divine lordships came to power in the early first millennium CE Ancash region. The ideology holds that hereditary rulers are supported by—or are actual incarnations of—the gods and the forces of the cosmos. Deeply entrenched in later Andean societies (e.g., Inka and Chimú), divine lordships first became highly visible in the Early Intermediate Period (200–600 CE). They probably grew from the diverse novel political forms that had sprung up centuries earlier on the north coast and highlands, in the power vacuum formed after the Cupisnique-Chavin Religious Complex collapsed (Ikehara 2016, 2021). George Lau of the University of East Anglia is collecting highland data from the Pashash site (near modern Cabana, far northern Callejón de Huaylas) to
compare with coastal data from Cerro San Isidro, Huambacho, Caylán, Samanco, and other recently excavated sites in the Nepeña Valley. The CSI and Pashash field sites, 85 km apart, were occupied throughout the entire period under study and existed on the periphery of Moche and Recuay spheres of influence. The project hopes to analyze changes in leadership, ritual practices, and economic systems with a fine-grained resolution that surveys cannot capture (Ikehara 2015:59–60; Proulx 1982:85–89).
CHAPTER 2. BACKGROUND

Nepeña Valley’s Significance to Peruvian Archaeology

For the divine lordships project on post-Chavín societal transformation, a site in the Nepeña Valley is a fitting choice to investigate, because our research can build upon nearly a century of previous fieldwork. During professional Peruvian archaeology’s rapid growth in the 1930s and 40s, Nepeña was key to the era’s defining debate: the origins of Chavín styles and ideology. Julio C. Tello excavated the lower valley platform mounds Cerro Blanco and Punkurí in 1933 and 1934, uncovering temples decorated with painted friezes of anthropomorphic and feline supernatural beings. Having dug at Chavin de Huántar, the Chavín phenomenon type site, and become an expert on the subject, Tello interpreted Cerro Blanco and Punkurí as colonies built on ‘virgin soil’ by Chavin-affiliated migrants bringing art, religion, and culture from the highlands. His colleague Rafael Larco argued the polar opposite—that Chavín’s ‘feline cult’ originated from the earlier north coast Cupisnique tradition represented at Cerro Blanco and Punkurí (and first identified and published by Larco himself) (Daggett 1987a:119–121; Munro 2018:60–61; Shibata 2011:113–115; Willey 1951).

Beyond professional aspirations that may have influenced each man to inflate the importance of the archaeological culture he codified, the scholars’ dueling hypotheses also reflect the power dynamics of the era they lived in. For example, archaeology in the early 20th century the was dominated by ultra-diffusionist narratives of ‘civilization’ arriving in the Andes from Mesoamerica rather than developing in situ. By contending that Peru was home to one of the world’s few independently arisen hearths of civilization, Tello contributed to a sense of national pride and identity, symbolically asserting independence from northern neighbors (Burger 2009:1–4; Daggett 1987a:119–121). Additionally, within the country, political,
economic, and social power was (and still is) concentrated on the Hispanicized coast, with the more rural and culturally indigenous highland and tropical forest regions stigmatized as backwards. Tello came from a Quechua-speaking family in mountainous Huarochirí, fought systemic oppression like racism and classism, earned a world-class education in medicine and archaeology, and eventually became the first indigenous archaeologist in the Americas. Larco occupied a dramatically different place in Peru’s social order. Ivy League educated in agricultural engineering, he inherited not only his father’s sugar cane plantation in the north coast Chicama Valley, but also his fascination with the estate’s prehispanic ruins and artifacts. Knowing these biographical contexts, one can understand how Larco may have been inclined to interpret the past in a coastal-centric way, while Tello emphasized innovation and influence emanating from the sierra, giving respect and recognition to indigenous highlanders (Burger 2009:1–4; Daggett 1987a:119–121; Willey 1951). The scholarly debate itself became an example of complex coast-sierra relationships that continually evolve and renegotiate themselves—even into the present day.

Tello’s interpretation of the Formative Period prevailed until the 1980s, instituting a trend of archaeologists portraying the Nepeña Valley as acted upon by external forces, rather than shaped through local agency (Ikehara 2015:13). In the Early Formative, as per Daggett, Casma Valley polities siphoned Nepeña residents’ labor into building monumental centers (Daggett 1987b). Proulx’s image of the Early Intermediate Period saw Nepeña sharply divided between outside powers; the Moche maintained their southern frontier in the lower valley, Recuay-affiliated communities occupied the middle and upper valleys, and fortifications at the valley neck reflected territorial tension between the parties (Proulx 1982). Archaeological research at the turn of the millennium shifted to exploring how Nepeña’s local variation and home-grown
developments figured into regional trends; the Formative Period and highland-coast relationships remain perennial themes (Chicoine 2006, 2011a; Chicoine et al. 2017; Chicoine and Ikehara 2014; Helmer 2015; Ikehara 2008, 2015; Shibata 2011). Projects in coastal Ancash offer unique points-of-view because the Cupisnique-Chavín Religious Complex (CCRC, formerly ‘Chavín cult’) persisted there for several centuries after collapsing on the rest of the coast, and therefore overlapped and interacted with the emerging north coast Salinar phenomenon that rose to fill Chavín’s cultural and ideological vacuum (Ikehara 2008:30–31, 372–374). The PIACSI team hopes that our fieldwork at Cerro San Isidro—and the divine lordships project underlying it—will address Nepeña residents’ agency in developing new political, social, economic, and cosmological ideas and exchanging said ideas with groups in other valleys or regions.

Local and Regional Trends Predating Cerro San Isidro

People only began living at Cerro San Isidro in the first millennium BCE, even though the Nepeña Valley has been occupied since at least the Late Archaic (3000–1800 BCE). On the north-central coast in this period, social complexity emerged and large-scale public architecture of pyramid mounds and sunken circular plazas became common. Starting c. 3100 BCE, the Norte Chico region, equidistant between Nepeña and Lima, boasted the densest concentration of monumental centers in the Andes (Haas and Creamer 2006:745–746; Shady 2006:30–34). The Casma Valley’s Sechín Complex that would flourish in the Early and Middle Formative began with a similar mound-and-sunken plaza gathering space as early as 3500 BCE (Pozorski and Pozorski 2018:367). Archaeologists hypothesize that these maritime-based societies would exchange ocean resources (e.g., mollusks, fish, salt) harvested at seaside sites for the raw materials used to make fishing equipment (e.g., cotton for nets and bags, gourds for floaters) grown by inland settlements (Munro 2018:36–40; Proulx 1973:8–11).
By the end of the Archaic Period, long-distance trade routes linked coastal communities to highland Ancash, where Kotosh-Mito ceremonial traditions predominated. Here, small groups of people—perhaps extended families—would practice their religion in private enclosed mini-temples equipped with a ventilated central hearth and wall niches to receive offerings. When these temples completed their useful lifespan, adherents ritually ‘entombed’ and sealed them (Contreras 2010:13–15). Kotosh-Mito probably adopted aspects of other belief systems, like by incorporating mound-plaza arrangements into some highland sites. Coastal communities, especially in the Casma Valley, also adopted ventilated hearth structures alongside native traditions, an early example of coast-highland cultural exchange (Munro 2018:42–46).

Purely Archaic sites can prove difficult to find due to the lack of ceramic surface scatters, which is why few have been identified in the Nepeña Valley (Moseley 1975a:691). Along the shoreline between Nepeña and Casma, early surveys documented the Archaic shell mound seasonal fishing stations Tortuga and Huaynuná; Huaynuná contains both highland and coastal style ritual structures. Also noted was PV31–208, called Las Salinas or Los Chimús (‘Los Chinos’ in some publications), situated between two rows of hills slightly inland from the modern fishing village Los Chimús, near Rio Nepeña’s current outlet as of 1998. Archaeologists who have examined Los Chimús/Las Salinas determined it is a likely habitation site brimming with seafood scraps and other domestic refuse; surface architecture has been interpreted as guinea pig corrals or as a Kotosh-Mito ventilated hearth chamber (Chamussy and Goepfert 2019:14; Engel 1957; Munro 2018:41–42; Pozorski and Pozorski 1990; Proulx 1973:8–11).

In the upper valley Cosma Basin near the Rio Nepeña’s headwaters, the eponymous Cosma Complex held Kotosh-Mito rituals in its two mound-top temples beginning after 3000 BCE. The coastal-style pyramids grew sequentially as worshippers entombed and built on top of
successive private ritual chambers, continuing to practice their religion at one of the mounds until at least the Early Formative. Fish bones, crab claws, and *Spondylus* shell found at this site (2500 m above sea level) reflect its proximity to a major trade route between coastal Ancash and the Callejón de Huaylas. Cosma’s peculiarities illustrate the diverse ways Andean communities added local flavor to the Kotosh-Mito tradition, similar to the variety of manifestations of the Chavín phenomenon (Bischof 2009:13; Chamussy and Goepfert 2019:14; Munro 2018:373–378).

Although the following Early Formative (1800–1200 BCE) saw ceramic technology introduced, sites from this period are less identifiable than later ones because surface survey collection methods privilege decorated “diagnostic sherds” and discount most early pottery, which is often coarse and plain. If people reoccupied the site, their artifact assemblages further obscure these oldest but mostly inconspicuous components. Proulx attests to one single-component site of this era, PV31–105, a shell mound and possible fishing hamlet on the sandy central beach of Nepeña’s shoreline (Ikehara 2015:27–30; Moseley 1975a:691; Munro 2018:46–47; Proulx 1968:138, 1973:12). Additionally, ceramics did not become instantly ubiquitous across Peru at the end of the Archaic, as Early Formative sites like Punkurí in the lower valley are considered ‘aceramic.’ Punkurí lacks pottery, but other diagnostic artifacts and architecture date its adobe platform and polychrome reliefs to 1800–1500 BCE, based on similarities to sites in neighboring valleys like Santa’s San Juanito and Casma’s Sechín Alto (Chapdelaine and Gagné 2015:35–37; Samaniego 2012:25).

North and central coast communities coalesced into complex political entities that mobilized labor pools, built monumental architecture, and developed infrastructure for irrigation agriculture to unprecedented degrees. Survey and ceramic data suggest that Early Formative
Nepeña fell under sway of a Casma Valley-based complex chiefdom dubbed the Sechín Alto polity (Pozorski and Pozorski 2005:143–144), contributing labor to huge communal projects that included the largest mounds in the Andes predating Huacas de Moche. The connection is evidenced by Casma Valley-style sherds in the earliest stratum of Cerro Blanco de Nepeña, which predate any monumental construction at the site and correspond to the Huambocayan phase (1500–1100 BCE) of the lower valley ceramic sequence. A stone lintel carved in Sechín Alto style also appears at the middle valley site Kushipampa, built into a Final Formative structure like an antique on display (Ikehara 2015:27–30; Munro 2018:42, 46–51; Shibata 2011:116–117).

The spectrum of beliefs and practices called the ‘Cupisnique-Chavín Religious Complex’ (CCRC) appeared on the coast in the Middle Formative (1200–800 BCE), introducing a “multi-regional network of elite solidarity” (Ikehara 2015:29) in which authority was based in shamanistic power (2016:76). Since the early 20th century, simplistic Chavín Horizon-as-Andean-mother culture narratives have been revised in favor of more nuanced interpretations that explore local diversity. The existence of a uniform Chavín culture or religion emanating from a single geographical location is not borne out in decades of accumulated archaeological data; the CCRC drew influences and antecedents from throughout the Andes. Stylistically, ceramics and public art feature felines and other predators, hallucinogens and shamanic transformations, anthropomorphic beings, and plants and animals from far-flung locations, especially the tropical forest. The iconography appeared first in central coast (Manchay) and north coast (Cupisnique) art long before monumental construction at the ‘type site’ Chavín de Huántar began around 1100 BCE. The U-shaped temple complex is considered a classic Chavin architectural form, but it originated on the central coast around 2300 BCE, persisting there
through the Early Formative Manchay phase while spreading to other regions of Peru. U-temples are hypothesized to symbolize balance of opposing forces, as they consist of a central mound flanked by two perpendicular mounds. Frequently oriented with open arms facing upstream to a nearby river and the cordillera beyond, the U-temples may also reflect how people increasingly depended on irrigation agriculture and needed to appease the mountain deities who controlled the water sources (Burger 2008:694–695; Burger and Salazar 2008:83–86; Ikehara 2015:27–30; Munro 2018:38, 52–56, 59).

Above-ground temples at the pilgrimage site Chavín de Huántar have a central coast U-layout, while the oldest subterranean galleries resemble Kotosh-Mito ventilated chambers, adapted with an elaborately carved stela in place of a central hearth. Worshippers also may have built the temples over an Archaic Kotosh-Mito structure; the two religions coexisted for centuries, evidenced by a Kotosh-Mito temple close to Chavín that was still active into the Middle or Late Formative. Atop these deep roots in highland spirituality, the site’s 900 BCE renovation-expansion incorporated architectural elements of north and central coast ceremonial centers. The site’s design gravitated to a more coastal style over time, even though the CCRC’s popularity on the coast would plummet a mere 50 years into Chavín de Huántar’s peak as a ritual center (800–500 BCE) (Burger 2008:694–695; Burger and Salazar 2008:83–86; Munro 2018:32–33, 49, 56–59). Strong coast-highland ties and abundant cultural exchange developed immediately before Cerro San Isidro’s heyday as a demographic and ceremonial center, strategically located in the transitional yunga ecozone between the coastal desert and fertile mountain valleys.

The notable ceremonial centers of lower Nepeña’s local Cerro Blanco phase (1100–800 BCE) are Huaca Partida and Cerro Blanco de Nepeña. Both are platforms built of conical or
rectangular adobe bricks, construction material emblematic of coastal architecture in this period, and decorated with colorful friezes depicting CCRC supernatural entities. While Huaca Partida and the earlier Punkurí are stepped pyramids in the north coast style, Cerro Blanco takes after the central coast tradition of three mounds arranged in a U shape. Both designs create unequal degrees of access to sacred spaces, articulating status difference through elevation difference. The mere 2 km distance between Huaca Partida and Cerro Blanco means the centers likely served the same community and may have had a complementary relationship to each other. Caretakers generally kept the sites clean, except for feast remains deposited on a platform at Cerro Blanco which include ceramics in the north coast Cupisnique style. Artifact assemblages suggest that Nepeña residents regularly exchanged goods and ideas with coastal neighbors to their north and south, but had minimal contact with the highlands (Ikehara 2015:27–30; Munro 2018:49–50, 62–65; Samaniego 2012:17, 20, 25; Shibata 2011:117, 121, 2017:16–18).

Late Formative: Coastal Crisis and Cupisnique-Chavín Collapse

Across the Andes, the Late Formative Period (800–450 BCE) saw massive changes in ideology and in the political landscape. Chavín de Huántar peaked as an interregional ritual center. Violence between communities increased, as did household inequalities within them (Ikehara 2016:75–78). The Middle Formative’s relatively non-coercive inter-group relationships—based on supernatural power and elite solidarity—broke down throughout much of the coast between 800 and 750 BCE. Monumental centers were abandoned during this crisis and massive sociopolitical upheaval (Burger 1992:184–187; Onuki 1993:89–92). The north coast dramatically depopulated as people migrated up-valley to adjacent highlands, where ceremonial sites continued to flourish and expand for several more centuries. These pre-existing centers were renovated with coastal architectural features, despite the religion being abandoned on the coast.
itself. Archaeologist Richard Burger (1992:189) hypothesizes that the coastal contingent of the Chavín interaction sphere disintegrated due to a legitimization crisis. If ambitious leaders had tried to institutionalize unequal power relationships by controlling sacred knowledge, accumulating political influence, or ascribing hereditary status, then some CCRC adherents may have lost faith in the establishment. Elites may have lost claim to authority, because these leaders would have been violating the religion’s established ideals of semi-egalitarian communities (Burger 1992:189; Ikehara 2015:12, 30–31; Munro 2018:32–33; Shibata 2011:121–125). A more recent example of a legitimization crisis and ensuing religious, social, and political turmoil is the Protestant Reformation.

The Late Formative is confusingly called the ‘Nepeña phase’ (800–450 BCE) in the lower Nepeña Valley ceramic sequence. At this time, some inhabitants resisted the anti-CCRC trend by remodeling and expanding Huaca Partida and Cerro Blanco with megalithic walls and other highland-style features—like corbel vaults and ventilation ducts—while preserving the sites’ original layouts. Additionally, ceramics with ‘classic’ Chavín designs appear, as does the valley’s first evidence of maize, which would become the most important crop to Andean ritual life. Open buckets for brewing manioc beer (masato), prevalent in the Middle Formative, disappear from the assemblage, replaced by enclosed neckless ollas for fermenting chicha corn beer, a key element of ceremonies and gatherings from this period onwards. Relatively separate from where people were actually living and having few permanent residents, the ceremonial sites provided large open spaces where a dispersed population could congregate, feast, and commune with supernatural forces. The communities participated in the Chavín interaction sphere, albeit briefly, by shifting the focus of long-distance trade in exotic goods from the defunct north coast.

At the same time, a parallel competing sociopolitical configuration that consciously rejected previous ideology was emerging in the lower valley at sites like Caylán, Huambacho, Samanco, and Sute Bajo; the same pattern played out in the lower Casma Valley after the Sechín Alto polity declined. The very concept of supra-local mass gatherings fell out of favor—instead, ceremonial spaces became part of large urban residential compounds, probably associated with extended kin groups that formed the basic units of a heterarchical segmentary social organization. The polity features a three-tier settlement hierarchy with Caylán as the major population center, although whether it wielded enough power over the others to qualify as a capital city is uncertain. To control water resources and maximize cultivable land, the sites are built strategically on valley margins next to primary irrigation canals (Chicoine 2006; Chicoine et al. 2020:12, 18; Chicoine and Ikehara 2014; Cotrina et al. 2003; Helmer 2015; Ikehara 2015:13–14, 30–32; Ikehara and Chicoine 2011; Munro 2018:63–68, 75).

The incipient urbanism of this Late Formative lower valley polity manifests to a lesser degree in the contemporaneous middle valley Moro Pocket, where over a quarter of people lived in the largest town, Cerro San Isidro (CSI) (Ikehara 2015:99, 112). Ikehara (2016:74–75) calculates that about 87% of Moro’s estimated population of 1240–1870 individuals resided in the ‘district’ or ‘supra-local community’ surrounding the site. CSI’s district comprises the entire site, the approximately seven villages (household clusters) within a 1.5–2 km radius, and the isolated homes between these settlements. Although Cerro San Isidro is geographically the center of this supra-local community, the district’s demographics are relatively decentralized because more than twice as many people lived in the villages than at CSI itself. The other district
Ikehara (2015:99) documented in Moro is a small town to the west near the valley neck, home to 8% of all survey zone residents. The remaining 5% of Moro’s population occupied scattered farmsteads in the low-density rural area outside the two districts. The survey found that in the Late Formative, settlement locations did not correlate with irrigation canal intake points, which suggests that hydrological infrastructure was not yet the basis of political, economic, and social power that it would become in later periods (Ikehara 2015:99, 112, 162, 209, 225).

In this era, a single U-shaped temple dubbed ‘Nuevo Moro 4’ served the entire Moro Pocket, boasting a plaza large enough to host the whole population plus guests from throughout the region (Ikehara 2016:77). The site had few to no permanent inhabitants because its purpose was purely ritual, providing face-to-face interaction and bonding for a relatively dispersed community. Located about 2 km upstream from Cerro San Isidro, the ceremonial center opens northeast towards the Rio Nepeña’s headwaters, like classic central coast U-temples. Similarly to lower valley counterparts Cerro Blanco and Huaca Partida, the community participated in CCRC long-distance exchange networks. The wealthiest families—who mostly lived in populous areas like CSI and its peripheral villages (on average closer to the temple than non-elites)—possessed a disproportionate number of exotic artifacts. High-status households gained social influence by redistributing these valuable trade goods, resulting in commoners with rich neighbors being more likely to own imported pottery than other ordinary citizens (Ikehara 2015:73–74, 76–77, 112, 136, 168, 197, 226–227).

Local ceramic production was independent of elite control, but nonetheless forged economic interdependence among the people of Moro. Based on a lower density of clay-working tools documented in CSI’s hinterlands, Ikehara calculates that not enough craftspeople worked there to make enough vessels for the entire district. The western village’s semi-specialized
crafting community filled the gap, producing almost as much as the CSI metro area despite having only one-tenth of the people (Ikehara 2015:73–74, 76–77, 112, 136, 168, 197, 226–227). According to the sum of Ikehara’s survey evidence, Late Formative Moro Pocket residents integrated their society through voluntarily attending mass gatherings and laboring on public projects, which has been true for many north and central coast cultures since the Archaic. The particular time and place of Cerro San Isidro’s earliest centuries is characterized by elites using the Cupisnique-Chavín Religious Complex to aggrandize themselves, but this non-coercive power was limited, impermanent, and dependent on followers cooperating (2016:77).

**Final Formative: Factions and Fortifications**

By the beginning of the Final Formative (450–150 BCE), the Cupisnique-Chavín Religious Complex had disintegrated in the highlands and on the coast. The iconography disappeared from material culture and ceremonial centers were either abandoned, converted into distinctly non-CCRC ritual spaces, or repurposed for residential or burial use. Without this local and interregional cohesion, communities’ social and political trajectories evolved in wildly different directions. Leaders lost external sources of authority and had to rely on internal strategies like enacting rituals or building factions of supporters. Endemic warfare created opportunities for accruing power, as threats of violence forced people to cooperate for collective survival. For example, the Casma Valley fortress complex and solar observatory, Chankillo, combined needs of post-Chavín ceremonial life with a robust defense system against post-Chavín political chaos (Ghezzi 2006:67–69). The Virú Valley depopulated and migrants streamed into Moche and Nepeña. Mound-building ceased in Moche and Santa, while residents of the Nepeña, Casma, and Jequetepeque Valleys adapted new forms of monumental architecture to better suit the present sociopolitical situation (Ikehara 2015:12, 32–34, 2016:70–71, 76–77; Munro 2018:69–70).
The north coast Salinar phenomenon was many things: a time period, an archaeological culture, a ceramic stylistic successor to Cupisnique, a suite of broad societal changes following Chavin’s collapse, and a network of related political entities filling a power vacuum. Trends included political balkanization, defensive settlement designs, increased violence in iconography and skeletal remains, smaller scale monumental architecture, and localized exchange networks replacing long-distance ones (Brennan 1982; Larco 1944; Mujica 1984). People of the north coast laid foundations for future complex societies of the Early Intermediate Period (e.g., Gallinazo, Recuay, and Moche) through trends like militarism, urbanization, demographic centralization, and increasing elite control of ritual spaces, crafts, trade, and agricultural surplus (Ikehara 2015:12, 32–34, 2016:70–71; Ikehara and Chicoine 2011:158–160). The rising importance of maize—chicha especially—to social capital and political power incentivized expanding irrigation agriculture (Chicoine 2011a:432–434; Chicoine et al 2020a:17–19).

During the lower Nepeña Valley’s Samanco Phase (450–150 BCE), people had abandoned Cerro Blanco and Huaca Partida as ceremonial sites, reusing them for less sacred purposes. Organic and ceramic refuse accumulated along the temples’ stone walls, but long-distance trade goods like obsidian and exotic vessels disappeared from the assemblage. Decorated pottery decreased drastically in diversity and relative quantity, resembling the plain wares people were using at Caylán and affiliated sites, which implies that these opposing factions descended from the same source community in the recent past (Ikehara 2015:14–15; Munro 2018:66–67; Shibata 2011:125). At these sites, fine ceramics have been found resembling diverse styles including Cupisnique (Figure 4), Chavín (Figure 5), and Salinar (Figure 6) (Chicoine 2006; Chicoine et al. 2020:12, 18; Chicoine and Ikehara 2014; Cotrina et al. 2003; Helmer 2015; Ikehara 2015:13–14, 30–32; Ikehara and Chicoine 2011; Munro 2018:63–68, 75).
Figure 4. Ceramics from Huambacho with Cupisnique-like textile impressions. Used with permission. *Source:* David Chicoine

Figure 5. Ceramics from Caylán with Chavín-like stamped circle-and-dot design. Used with permission. *Source:* David Chicoine
According to archaeological surveys, the proto-urban Caylán polity encompassed over 90 km$^2$ of the lower valley coastal plain (Chicoine and Whitten 2019:87), and was home to an estimated 8,000 to 15,000 people. From residential center Caylán, covering over 100 hectares
(ha), to industrial town Samanco (40 ha) and elite ritual centers Huambacho (12 ha) and Sute Bajo (5 ha), builders adhered to the same strict architectural canons (Helmer and Chicoine 2015a:37). The basic social and spatial units are high-walled compounds where large kin groups would live for centuries, repeatedly renovating the structures and interring the dead below living areas. Hierarchical social inequality was minimal, as far as the simple grave goods indicate; people instead used architecture to distinguish more-or-less equal heterarchical factions (i.e., houses or clans) (Chicoine and Ikehara 2014:349; Chicoine and Whitten 2019:87, 90–94; Helmer and Chicoine 2015a:34, 39–45).

Residents of the middle and upper Nepeña Valley built communities much differently than their Caylán polity neighbors. In the upper valley, most habitation sites are scattered along ridgetops and include small platform mounds and defensive features (Daggett 1984:306; Munro 2018:70). Additionally, the Cosma Complex experienced a revival after little to no activity in the Early and Middle Formative; the tallest mound was converted into an open feasting space associated with secondary burials of infants and young children. By the high ceramic diversity, many groups considered the site a place of supernatural significance worthy of relocating remains of ‘special’ individuals, perhaps because of its Archaic age. People harkening back to a tradition perceived as more ancient than Chavín may relate to the CCRC’s highland decline around 500 BCE (Munro 2018:331–334, 373–375).

Settlement patterns, demographics, and religious practices dramatically shifted in the Moro Pocket as well. The population surged to approximately 8,500 to 12,700 as people migrated in from the highlands or neighboring valleys, aggregating into a dozen ‘supra-local communities’ (i.e., districts) of several hundred residents each, located where elites had lived in the Late Formative. Within a district, elite households tended to form a ‘leaders’ village’ separate
from the main town (Ikehara 2015:112, 2016:76); leaders also clustered near irrigation canal intake points, suggesting that control of water resources was key to political power (2015:162). Despite the political fragmentation of this period, the districts cooperated to construct complex defensive infrastructure. Most communities occupied hillsides, ridgetops, or other difficult-to-attack places, surrounded by walls and moats. Over three dozen fortresses and lookout points protected Moro, providing an early warning system as well as refuge for residents during an attack. The threat likely came from outside the valley, as high walls block off quebradas leading north to Santa and Lacramarca. Spatial analysis shows that commoners and elites had equal access to protection from these various defensive constructions (Ikehara 2016:77–81).

Non-violent contact with outside groups diminished and long-distance trade networks and exotic goods disappeared along with the Cupisnique-Chavín Religious Complex. Nuevo Moro 4 was abandoned; no longer did everyone congregate at a single ceremonial center. In the Late-Final Formative transition, several districts tried building their own temples for large audiences, but these attempts were either abandoned partway through or expediently finished differently from the original plans (Ikehara 2021). Each supra-local community ended up with at least one small ceremonial center—only enough space to host district residents, not outsiders. These structures are more architecturally diverse than the failed projects, suggesting that the Final Formative was a phrase of religious experimentation following centuries of widespread CCRC orthodoxy (Ikehara 2015:197–200, 2016:76–77).

**Epi-Formative and Early Intermediate Period: New Gods, New Masters**

The era from 150 BCE until Moche influence arrived in Nepeña around 500 CE saw the north coast’s fragmented political landscape coalesce into integrated large-scale polities, which mobilized subjects’ labor on an unprecedented scale to build agricultural infrastructure and
monumental mounds. The region’s first centralized state-like entity to span multiple valleys grew out of the Gallinazo culture and emanated from the Gallinazo Group city in the Virú Valley, eventually incorporating the Moche and Santa Valleys as well. Proulx’s Nepeña surveys did not document Gallinazo components on any site, but understandings of what Gallinazo was, and what it could look like, were less nuanced in the 1960s and 70s than they are now. Contemporary archaeologists like Ikehara and Chicoine observe that the lower valley Tres Marias mounds (Proulx classification PV31–71/73) may represent a local version of Gallinazo, based on physical location between post-Chavín site Caylán and Moche site Pañamarca, and its resemblance to Gallinazo construction in other valleys. The presence of Recuay ceramics and absence of Moche ones date the site to the appropriate time period (Ikehara 2015:35–37, 224; Munro 2018:76; Proulx 1985:104–106). Additionally, Chicoine has identified two Gallinazo-style intrusive burials at Huambacho, radiocarbon dated to between 50 and 340 CE (Chicoine 2011b:533).

The number of Moro Pocket residents crashed back to Late Formative levels: 1200 to 1800 people. Perhaps Final Formative violence had driven them away; a concurrent population boom in Virú and Santa—especially at the Gallinazo Group—suggests where the missing people migrated (Ikehara 2015:236). Those who remained concentrated themselves at the eastern end of Ikehara’s survey zone in two districts, each centered around a fortified town: Huancarpón to the north on a hilltop beside the Río Nepeña, and to the south overlooking the Río Loco, a larger and more populous ridgetop site complex surrounding the Chacuas Cucho 1 ceremonial center. Both are strategically positioned to control irrigation canal intake points and were disproportionately home to leadership households. Social inequality manifests most saliently in how elites had readier access to the towns’ defenses than commoners did. Most Moro potters manufactured their wares at these sites as well, especially in the Chacuas Cucho town where over half of the local
ceramics were produced. In this era, new long-distance exchange networks reintroduced exotic pottery to Nepeña; exotics usually ended up in possession of leaders in the two fortified towns, with some also given to commoners living closest to these elites. So much highland Recuay fineware appears at Huancarpón’s residences and cemetery that some archaeologists interpret the site as an actual Recuay settlement. Huancarpón dominated ritual life in the Moro Pocket, evidenced by a ceremonial center plaza large enough to accommodate participants from outside the district, compared to the Chacuas Cucho plaza designed for a limited local audience. All other Final Formative ceremonial centers were abandoned (Ikehara 2015:113, 137–138, 217–218, 236–239).

In the Final Formative, Cerro San Isidro had been the demographic center of one of a dozen districts of varying size, population, wealth, and political strategy. Its importance further diminished in the Early Intermediate Period, when it became one of three minor satellite districts to the two major ones discussed above. CSI remained the demographic center, but fewer elite families lived there compared to the two main towns, and no evidence indicates that residents continued to use the ceremonial center. Fifteen percent of the survey zone’s exotic ceramics were found in CSI’s district, most at the site itself (Figure 7)—a meager proportion compared to the Huancarpón and Chacuas Cucho districts, but nonetheless greater than the remainder of the Moro Pocket combined. Notably, Ikehara’s survey found no trace of ceramic production anywhere in the CSI district, the only such case in any period he documented (Ikehara 2015:106, 111–112, 126, 130–134, 202).
Moche and Later: Under the Sway of States

Circa 500 CE, the Southern Moche State’s frontier expanded into the Nepeña Valley after having incorporated the neighboring Santa Valley some two centuries earlier. This was apparently a gradual process; there is no evidence of warfare (Chapdelaine 2010). Although Moche influence manifests in material culture as far south as the Huarmey Valley, the lower Nepeña site Pañamarca is the southernmost known administrative and ceremonial center (Chicoine 2011b:529–529; Ikehara 2015:36–37; Munro 2018:76–78; Trever 2017). The number of culturally or ethnically Moche people living in the valley is unknown, as archaeologists have not identified any definitive habitation sites. Based on evidence from the Santa Valley, Proulx hypothesizes that colonists mostly built settlements on the valley floor, which have since been destroyed by over a millennium of flooding and farming. Alternatively, Moche presence and control over Nepeña may have been marginal enough that the only actual Moche people there were administrators, priests, and their retinues based at Pañamarca. Nearly all 37 sites Proulx
documented are cemeteries around Pañamarca in the upper half of the lower valley, probably because the Moche arrived in this area via ancient roads leading north through the Pampa of San José. The mere eight middle valley sites with Moche pottery had small amounts that were likely trade goods rather than remains of a substantial Moche presence in the area (Chicoine 2011b:529, 543–544; Proulx 1982:83–84, 90).

In the middle and upper Nepeña Valley, Recuay influence had arrived several centuries earlier. Unlike the more centralized Southern Moche, the Recuay culture consisted of a fragmentary confederacy or group of rival polities based in the Callejón de Huaylas highland region (Lau 2011). Their distinctive kaolin fine ware became a prestige good from the north coast to the eastern slopes of the Andes, far beyond the territories they directly controlled. In Nepeña, Recuay material culture was absent from the lower valley which the Moche ruled, but Proulx surveyed over three dozen multi-component sites with Recuay pottery in the middle and upper valley sections. While Recuay-style tombs high in the upper valley were probably constructed by actual members of that culture, their contemporaries living in the Moro Pocket were likely Recuay-influenced locals. Moro seems to have been a buffer zone between Moche colonists and Recuay groups at the end of the Early Intermediate Period. Downstream from Cerro San Isidro, six Moche sites are clustered at the narrow valley neck—a strategic location critical to defending against an incursion from the middle valley or staging attacks against the folks upstream. However, archaeologists have found little trace of actual military campaigns or conquest in this period. The Moche seem to have had designs upon the middle valley, but their neighbors were well entrenched enough that territorial expansion was not worth the trouble. Overall, the material culture and site locations suggest a territorial standoff and uneasy coexistence (Ikehara 2015:36–37, 137–138; Lau 2011:44–46, 55–56; Munro 2018:77–79; Proulx 1982:87–91).
Drawing a clear picture of the Nepeña Valley during the Middle Horizon (600–1000 CE) and later is difficult because those eras have not been studied much outside of Proulx’s survey work, even though almost half the sites he lists have Middle Horizon components (Proulx 1973:50). Cerro San Isidro has the Moro Pocket’s densest concentration of ceramics from the 500–1000 CE timespan Ikehara labels “Period IV,” but the significance of this is unclear because his dissertation only analyzes data from Periods I, II, and III (Ikehara 2015:60). In the Andes overall, the most powerful political and cultural entities of the time were Wari and Tiwanaku, expansionist states originating in the highlands. Archaeologists previously counted Nepeña in the Wari sphere of influence, as the nearby middle and upper Casma Valley boast a substantial amount of Wari material culture; the adjacent Callejon de Huaylas was a major trade route peppered with Wari settlements amongst allied local elites, who were probably Recuay descendants. However, few to no Wari traces appear in Nepeña (Isbell 2008:733, 753–754; Munro 2018:79–80).

The Southern Moche state’s decline (700–800 CE) coincided with the rise of another, the Casma polity headquartered in the valley of the same name with a capital city at El Purgatorio. Moche presence at Pañamarca ended around 800–850 CE, leaving a power vacuum. After the Casma state (Figure 8) annexed Nepeña in the late Middle Horizon, the population increased to a prehispanic peak. Transitional ceramic wares with both Moche and Casma style decorations, as well as a post-Moche structure at Pañamarca, imply that locals maintained a continuous cultural identity despite an influx of newcomers (Ikehara 2015:58–59; Munro 2018:80–82; Proulx 1973:54; Vogel 2018:173–175).
In the Early Intermediate Period through early Middle Horizon, northern Peru suffered multiple catastrophic El Niño Southern Oscillation (ENSO) floods from excessive rainfall. Such calamities may have hastened political collapse by eroding Southern Moche leaders’ authority as divine mediators between humans and (super)natural forces. The Casma state flourished during the subsequent Medieval Climate Anomaly (800–1250 CE), a global disturbance that curtailed rainfall in El Niño years. The Rio Nepeña carries comparatively low volumes of water even in years with normal precipitation levels, so such chronic drought could have imperiled the valley’s irrigation agriculture-based food supply. Vulnerable Nepeña communities may have accepted Casma rule because the state’s surplus redistribution system offered them food security (Vogel 2018:169). This period’s environmental instability is evidenced by an alluvial flood layer at Caylán associated with an intrusive Casma burial (Chicoine and Ikehara 2014:347).
Casma was not the only state to dominate Nepeña during the Late Intermediate Period (1000–1470 CE); the Chimú Empire conquered the valley between 1350 and 1400 CE. Headquartered at the vast city of Chan Chan in the Moche Valley, the polity consolidated itself around 900 CE and first subsumed the northern Sicán state in about 1300 CE, before turning on its southern neighbor (Vogel 2018:170–171). People of Nepeña ultimately failed to resist the advance, despite building defensive walls near Caylán to block the easiest access point to the lower valley from the north (Chicoine and Ikehara 2014:349). To rule the Santa, Nepeña, and Casma Valleys, the Chimú converted local lords into their vassals, sharing power and maximizing efficiency by installing themselves at the apex of preexisting hierarchies. Chimú material culture in Nepeña (Figure 9) only appears at sites that already have Casma ceramics; hybrid Casma-Chimú wares demonstrate continuity despite conquest. Residents also continued the Casma-era tradition of reusing older sites like Caylán as cemeteries (Chicoine and Ikehara 2014:349; Munro 2018:82–83). Archaeologists are studying this transitional period in more detail with recent excavations at Pan de Azúcar de Nepeña, a lower valley fortified hilltop site with both Casma and Chimú components (Navarro and Hurtubise 2018:6–9).
This new political order did not last long because the Inka Empire subjugated the Chimú around 1470 CE, beginning the Late Horizon (1470–1534 CE). Three clearly Inka sites in Nepeña are located at the highest reaches of the upper valley, bordering on the Callejón de Huaylas (Munro 2018:84–88). Much of the minimal Inka material at lower altitudes comes from a Chimú-Inka intrusive elite tomb Helmer uncovered at Samanco, continuing the pattern of reusing Formative sites for burials. Despite the Chimú-Inka label, the tomb occupants likely were neither culturally Chimú nor Inka, but were rather from a lineage of local leaders charged with ruling the valley on behalf of both empires. Grave goods include Inka aríbalo-style storage jars and Chimú blackware stirrup-spout bottles, distinctive prestige objects associated with the most powerful entities to recently hold sway over the Nepeña Valley (Carter and Helmer 2015:46–49).
Summary

Understanding the culture-history of the Nepeña Valley and surrounding regions is essential for the PIACSI team to interpret Cerro San Isidro excavation data in appropriate context. The theme of coastal, inland, and highland groups interacting and exchanging goods and ideas underlies my zooarchaeologically focused study, as well as research questions about divine lordship and political innovation that the broader project aims to address.

The Andes are unusual as an ancient cultural area because here, monumental architecture and incipient social complexity predate ceramics, domesticated agriculture, and fully sedentary lifeways—probably enabled by the uniquely rich marine resources of coastal Peru during the Late Archaic (3000–1800 BCE) (Haas and Creamer 2006:745–746; Shady 2006:30–34). The ‘cotton-for-fish hypothesis’ proposes an economy in which fisherfolk would exchange fish and shellfish for the raw materials of fishing equipment: cotton and gourds gathered or cultivated by communities further inland (Beresford-Jones et al. 2018; Munro 2018:36–40; Proulx 1973:8–11). By the end of the Archaic around 1800 BCE, long-distance trade routes had formed and connected the coast and highlands. Ceremonial spaces, the earliest monumental constructions, reflect close cultural contact and possible religious syncretism; the regions borrow each other’s architectural canons, with highland temples incorporating elements of north and central coast temples, and vice versa (Chamussy and Goepfert 2019:14; Engel 1957; Munro 2018:41–42; Pozorski and Pozorski 1990; Proulx 1973:8–11).

Ceramic use gradually spread during the Early Formative (1800–1200 BCE), a time when the first political entities emerged on the north and central coast (Chapdelaine and Gagné 2015:35–37; Ikehara 2015:27–30; Moseley 1975a:691; Munro 2018:46–47; Proulx 1968:138, 1973:12). One such chiefdom incorporated Nepeña into its sphere of influence and used
residents’ labor for large public works projects like irrigation infrastructure and ceremonial
centers (Ikehara 2015:27–30; Munro 2018:42, 46–51; Pozorski and Pozorski 2005:143–144;
Shibata 2011:116–117). By the Middle Formative (1200–800 BCE), Nepeña was participating in
the Cupisnique-Chavín Religious Complex, a belief system and associated artifact style adopted
throughout the Andes, held together by elite exchange networks and pilgrimages that brought
exotic goods to the valley. Distinctive CCRC iconography integrates plants and animals from the
coast, sierra, and tropical forest, and architectural canons continue the Late Archaic trend of
melding coastal and highland influences (Burger 2008:694–695; Burger and Salazar 2008:83–86;

Cerro San Isidro’s closest CCRC temple (Nuevo Moro 4) is spacious enough for a crowd
larger than Moro’s estimated Late Formative (800–450 BCE) population—one-fourth of whom
lived at CSI, the largest town (Ikehara 2016:75–78). Despite enduring in Ancash until the Final
Formative (450–150 BCE), the Chavín system started collapsing centuries earlier on the north
coast around 800 BCE, which spurred people to mass-migrate into adjacent highlands. Nepeña
strengthened relationships with the Callejón de Huaylás to compensate for lost trade, but a
growing contingent in the lower valley (what would become the Caylán polity) were abandoning
Chavín style, ideology, networks, and power structures completely (Chicoine 2011a:436;
Munro 2018:63–66; Shibata 2011:122–124). By 450 BCE, the CCRC and its coast-highland
connections were defunct everywhere. Violence and social inequality, already on the rise since
the Late Formative, took off. The Caylán polity prevailed in the lower valley. As displaced
people from nearby valleys sought refuge in Nepeña, Moro’s population multiplied by 4.5 to ten
times and fragmented into a dozen self-contained communities who only cooperated to defend
themselves from outside threats. Cerro San Isidro is the most densely nucleated among them; almost all households are clustered on the large hill, likely for safety purposes (Ikehara 2015:12, 32–34, 2016:70–71, 76–77; Munro 2018:69–70).

The transitional Epi-Formative (150 BCE–200 CE) saw the quantity of people living in Moro fall back to Late Formative levels. Numbers in the north coast Gallinazo culture heartland, one of the earliest probable states in the Andes, spiked around the same time (Ikehara 2015:236). Continuing into the Early Intermediate Period (200–600 CE), a decentralized and diverse post-Chavin landscape coalesced into complex entities with institutionalized social inequality and hierarchy, whose ruling classes controlled public projects, commoners’ labor, resource distribution, and even religion. Lower Nepeña Valley residents adopted some Gallinazo material culture after the Caylán polity faded from prominence, but evidence of state control is lacking (Chicoine 2011b:533; Ikehara 2015:35–37, 224; Munro 2018:76; Proulx 1985:104–106). With trade routes to the Callejón de Huayllás reestablished, people in the middle valley imported fine ceramics from Recuay chiefdoms in highland Ancash. In turn, even small towns and villages in the mountains imported marine resources like shells and salt (Lau 2011:60–61). However, fear of violence persisted, so Moro’s population shifted east and condensed into two fortified hilltop towns perched near key irrigation canal intake points—a new basis of power for leaders. Huancarpón, the settlement at the confluence of the Jimbe and Salitre tributaries, may have been a gateway controlling access to the sierra through these branches. At both major sites, elite households’ disproportionate access to defensive structures and exotic ceramics demonstrates how social inequality had worsened (Ikehara 2015:113, 137–138, 217–218, 236–239; Lau 2011:45–46). Cerro San Isidro’s importance shrank as it became one of three outlying satellite communities where few elites lived (Ikehara 2015:106, 111–112, 126, 130–134, 202).
Around 500 CE, Moche colonists upended the balance of power in Nepeña by establishing an administrative-ceremonial center in the lower valley. Evidence of military conquest is absent, but an adversarial relationship nonetheless developed between Moche newcomers Recuay-affiliated Moro residents. The valley neck became a standoff point and impeded the flow of people, goods, and ideas; archaeologists have found no Recuay material culture in the lower valley, and Moche fineware at some middle valley sites is probably from trade, not from Moche people living there. (Ikehara 2015:36–37, 60, 137–138; Lau 2011:44–46, 55–56; Munro 2018:77–79; Proulx 1982:87–91). Moche influence in Nepeña probably waned when the Southern Moche State declined in the eighth century CE (Munro 2018:80–82; Vogel 2018:173–175).

Archaeologists have found no trace of the Wari Empire in the valley, despite the Callejón de Huaylás being a major artery of imperial trade (Isbell 2008:733, 753–754; Munro 2018:79–80). Ikehara’s survey documents that Cerro San Isidro has the densest concentration of ceramics dating from 500 to 1000 CE, all styles and cultural affiliations combined (Ikehara 2015:60). Near the end of the Middle Horizon (600–1000 CE), the coastal Casma state expanded north into Nepeña and coincided with the valley’s largest prehispanic population increase. Residents’ relationships to external powers flipped yet again between 1350 and 1400 CE in the Late Intermediate Period (1000–1470 CE) when the north coast Chimú Empire conquered the Casma State, Nepeña included. Ceramics with transitional designs between Moche and Casma styles, and Casma and Chimú styles, imply that communities maintained a continuous cultural identity and gradually incorporated outside influences (Ikehara 2015:58–59; Munro 2018:80–82, 84–88; Proulx 1973:54; Vogel 2018:171–175). The Chimú regime was cut short when the Inka Empire (Tawantinsuyu) subsumed all their territory and ruled the valley through the Late Horizon

One way we can understand Cerro San Isidro’s cultural history is how influence and interaction flowed between coastal Ancash and neighboring regions—most prominently the north coast and adjacent Ancash highlands—and how dynamics changed throughout the centuries. From the Late Archaic through Middle Formative, robust exchange networks enabled people of these three regions to adopt and transform one another’s cultural ideas, such as: prestige goods, ceremonial architecture, iconography, ideologies of leadership, and concepts of the cosmos. The apex of this network, the Cupisnique-Chavín Religious Complex, disintegrated during the Late Formative and coincided with mass population displacement, inter-regional relationship breakdown, political fragmentation, and increased violence. These trends continued for centuries; not until the first millennium CE did coastal Ancash stabilize and reconnect with other regions. Then, Nepeña split between opposing regional polities—north coast in the lower valley, highlands in the middle and upper valley—until those outside influences declined in the late Middle Horizon. Two successive states—first from coastal Ancash, next from the north coast—expanded into Nepeña, bringing access to coastal exchange networks. The final prehispanic conquest incorporated the valley into a transportation, trade, and communication system that extended all over the Andes.
CHAPTER 3. ZOOARCHAEOLOGICAL STUDY

In prehispanic times—and still today, to a degree—people, goods, and ideas flow through Ancash by certain geographical conduits: dry quebradas or desert roads that connect coastal river valleys (north-south) (Ikehara 2016:77–81), river valleys that connect coast and highland Callejón de Huaylás (east-west), intermontane drainages that run between the Cordilleras Negra and Blanca (north-south), and high-altitude quebradas that traverse the Cordillera Blanca to the eastern side of the Andes (east-west) (Lau 2011:28–31). PIACSI is part of a project exploring how the political and religious ideology of divine lordship spread through these networks across Ancash and beyond. Cerro San Isidro lies near an access route to the Santa Valley, as well as junctures on the coast-highland axis. Middle valleys are natural gateways, so those who control this territory can become gatekeepers to upper valley routes into the sierra, and to the lower valley and ocean through the narrow valley neck (Lau 2011:44–46). Rising from the middle of the Moro Pocket floodplain, CSI offers a panoramic view of the surrounding foothills and key routes into and out of the area.

Through the dimension of animal remains, I analyze Cerro San Isidro’s ties to the Pacific and lower valley, and its place in the surrounding yunga ecozone, a transitional environment between the coastal desert and mountains proper.

Zooarchaeology’s Value to Cerro San Isidro

Research on marine resources in the ancient Andes has traditionally explored how fishing-centric subsistence strategies and associated technology could have paved the way for social complexity and monumental architecture to develop in the Archaic and Early to Middle Formative, predating fully sedentary living and irrigation agriculture. Archaeologists have embraced, debated, and continually reassessed evidence for this hypothesis outlined in Moseley’s *The Maritime*
Foundations of Andean Civilization (MFAC) since its publication in 1975 (e.g., Beresford-Jones et al. 2018), but the marine theme dates as far back as Max Uhle in the early 1900s (Chicoine and Rojas 2013:337; Moseley 1975b; Prieto and Sandweiss 2019:2). The middle-range foundation of MFAC is enhanced by models from ethnohistoric analogy, based on Colonial Period networks of complementary, interdependent, and specialized fishing and farming communities (Prieto and Sandweiss 2019:6–7, 25–26; Ramírez 2019:418; VanValkenburgh et al. 2019). Ethnographic studies of modern Peruvians who make their living from the sea with traditional techniques also help bridge the interpretive gap (Sandweiss 1979:10–11).

Twenty-first century scholarship on the topic branches out from origins-of-civilization to address the economic, political, social, or spiritual role of ocean products in any number of prehispanic societies. The Nepeña Valley has been especially fruitful for understanding the Formative Period (e.g., Chicoine and Rojas 2013, 2012; Chicoine et al. 2019; Helmer 2019). My study benefits from this well-established and ongoing research tradition. From a logistical standpoint, a few valley residents who have worked on excavations for a decade or longer are now highly trained non-traditional archaeologists who have shared valuable expertise. Additionally, projects at Huambacho, Caylán, Samanco, and Cerro San Isidro all use similar field and lab methods, maximizing the potential of comparing data across sites. The principal investigators have designed successive research questions to answer issues raised by previous projects.

How can animal remains from Cerro San Isidro help answer questions about the Nepeña Valley’s past? By defining the patterns I would expect from different political, economic, and social conditions and processes, I can then evaluate how my results compare (i.e., hypothesis testing). For example, whether taxa found at the site prefer habitats of sand, rock, or mud
substrate, in littoral or sublittoral zones, correlates with the harvesting community’s location and access to technology. In the littoral zone, alternatingly underwater or exposed to air depending on tides, one can hunt seabirds and marine mammals from shore, catch fish in mesh nets, and gather mollusks with bare hands or simple tools like rakes; deeper waters of the sublittoral can only be exploited using fishing lines or boats. Sandy beaches are easier and safer collecting spots than rocky cliffs, which due to slip-and-fall danger are usually reserved for skilled collectors with specialized tools (Chicoine et al. 2020:190–191, 196).

Beyond being evidence of human subsistence strategies, some marine species are also indexes of paleoclimate conditions. Climate disturbances alter not only water temperature, but also salinity, dissolved oxygen, nutrient content, and tidal patterns. For example, a period of severe El Niño Southern Oscillation (ENSO) events would cause highly temperature-sensitive cold-water bivalves (e.g., *Choromytilus chorus* or *Mesodesma donacium*) to vanish from a faunal assemblage, coinciding with an appearance of warm-water species typically foreign to the Peruvian Province of the Pacific (Chicoine and Rojas 2013:340–341).

**Data Collection Methods**

To maximize the value of comparing faunal assemblages from Cerro San Isidro and the three lower valley sites of Huambacho, Caylán, and Samanco, I analyze and present my data similarly to these earlier projects. Chicoine and Rojas (2012, 2013) and Helmer (2015) in turn pattern their methods after those Roselló and colleagues (2001) employ for marine resources at the Huacas de Moche residential urban zone (ZUM). Authors of the ZUM prototype study count mollusk taxa by minimum number of individuals (MNI), where what constitutes an ‘individual’ varies by type of shell. In bivalve species, MNI is determined by quantity of left or right hinges, whichever is greater; for gastropods, each complete apex (spiral top of shell) or peristoma (edge of shell
opening) counts as one individual. MNI of chitons, whose bodies are protected by eight
interlocking valves, is “the largest number of plates, whether central, cephalic or anal, from the
same position.” Crustacean shells were so fragmentary that the authors could not estimate MNI,
instead quantifying them by number of individual specimens (NISP) (Roselló et al. 2001:75).

Chicoine and Rojas (2012:286, 2013:345) simplified these methods to describe
malacological data from Huambacho and Caylán. They quantify bivalves the same way as
Roselló et al, but only count the number of complete apices towards the gastropod MNI, to avoid
double counting an apex and peristoma from the same fragmentary individual. The chiton MNI
is equal to the frequency of cephalic or anal plates, whichever is more; in a context without any
distal chiton valves, “several plates from the same central position [are] identified and counted”
(Chicoine and Rojas 2013:345). For crustaceans (usually crabs) and echinoderms (usually sea
urchins), the authors attempt to find analogous claw and exoskeleton fragments, but they also
acknowledge how this imprecise method creates an unreliable MNI. Helmer (2014:116, 2015:66)
reports that at Samanco, each complete or almost complete gastropod was counted towards the
MNI, but he does not mention how the zooarchaeological specialist determined the MNI of
chitons, crustaceans, or echinoderms. The same scientist, Peruvian archaeologist Carol Rojas,
analyzed mollusk material from all three lower Nepeña Valley sites.

Almost all contexts at Cerro San Isidro were vertically and horizontally mixed secondary
deposits lacking the chronological control needed for MNI to be an effective measure of
taxonomic abundance. MNI would be more appropriate—for example—for analyzing remains
from a dense midden with distinct strata corresponding to discrete feasting episodes. Given the
lack of discrete deposits, PIACSI project director Chicoine recommended I quantify the 2019
field season shell remains by NISP instead of MNI in order to use limited time efficiently, since
we were excavating greater amounts of artifacts than expected. I did not separately weigh each mollusk taxon for similar labor-conserving reasons; moreover, weights also do not reflect actual relative abundance or dietary importance of species with dramatically different shell size and thickness, such as the massive *Concholepas concholepas* versus light thin-walled *Semimytilus algosus*.

Vertebrate bones we uncovered at Cerro San Isidro were analyzed not by me, but by professionals at Arqueobios, a commercial archaeological science lab in Trujillo, Peru, supervised by Víctor Vásquez and Teresa Rosales. The same company (although unlikely the same individuals) also processed material Chicoine excavated at Huambacho and Caylán, but not Helmer’s remains from Samanco (Chicoine et al 2020b:197; Helmer 2014:116). Taxonomic identifications are based on the lab’s extensive comparative collection of mammal, bird, fish, reptile, and amphibian skeletons, supplemented by reference texts. The site zooarchaeology report describes taphonomic processes and cultural modifications as well (Vásquez and Rosales 2019:1). A complete zooarchaeological data set is yet to be realized, however. Bones of small fish like sardines (*Sardinops sagax*), prominent in lower valley sites (Chicoine et al 2020b:198; Helmer 2020:178), are rarely recovered by 3 mm mesh screens and are instead found by floating and fine-screening soil samples. We had preliminarily floated and sifted two samples during the 2019 season, and upon finding few ecofacts, planned to process the remainder in 2020 but were unable to do so due to COVID-19.

**Stratigraphic and Architectural Results**

In light of unforeseen logistical difficulties, the PIACSI team did not undertake a systematic surface survey of Cerro San Isidro and Puente Piedra, so we have an unclear picture of what parts of the site were occupied, when, and how intensively. In the future, radiocarbon dates likely
will help resolve the chronological quagmire of Compound 3’s stratigraphy, which is complicated by features like a massive looter’s pit. What we do know is that Compound 3 was a popular place for ruling elites to live for over 2,000 years, mostly because of its strategic location in a natural depression on the hill, protected from wind while offering a good vantage point facing the lower valley and the confluence of Ríos Nepeña and Loco. We have identified at least three occupational phases, ranging from the Formative through Late Intermediate Period (Chicoine and Navarro 2020:43).

The latest phase is a surface-level orthogonal structure. Its double-faced walls built of mostly uncut fieldstone—plus some reused grindstones—are unplastered and bonded by mud mortar (Chicoine and Navarro 2020:32–34). Most associated ceramics are Casma style, with a minor presence of Chimú and Recuay; pottery and construction techniques date this layer to the Casma and Chimú eras of the LIP (2020:39, 46–49). The compound consists of two discrete structures: the ‘main compound’ contained by thick perimeter walls, and a kitchen and outbuilding cluster of four small rooms adjacent to the enclosure’s northwest corner (Figure 10). The latter probably had a domestic function, evidenced by household refuse, cuy coprolites, cooking hearths, and a food storage chamber (2020:32).
The main compound provides multiple large open areas like patios and a grand benched plaza for civic or religious events, with some courtyards partially roofed, judging by remnants of wooden support posts (Chicoine and Navarro 2020:34, 40). Inhabitants likely prepared food in these spaces too, as evidenced by big grindstones next to hearths in one patio, as well as a storage room boasting two huge Casma-style vessels best suited for holding liquids like chicha maize beer (2020:37, 39). Residents renovated Compound 3 at least twice by rebuilding the plaza bench after heavy rains and flooding, enlarging the plaza by demolishing old walls, sealing the
aforementioned storage room under earthen fill, and interring a small dog as part of a ritual for decommissioning old architecture. Fine ceramics found throughout the compound and its outbuilding indicate that this was an elite residence (2020:32, 37, 39, 47, 49).

The surface structures are not the first Late Intermediate Period construction in this spot; below the cooking patio are remnants of an adobe building, intentionally dismantled to make space for this final phase (Figure 11). Walls of rectangular adobe bricks, mud-plastered and double-faced with dirt and adobe fragments filling the center, are associated with a well-preserved mud floor upon which fine Casma serving dishes are broken in situ. The bricks vary in dimensions and manufacturing techniques—some 'cane-marked’ from reed molds, others smooth-sided from clapboard molds—implying that brickmakers were not all using the same standardized methods (Chicoine and Navarro 2020:40, 43).
The deepest excavation units reached Cerro San Isidro’s earliest construction phase. Located directly on the natural soil of a stepped terrace, the structure includes a fine clay floor and curved walls built of cut stone and mud mortar. The small cell-like rooms, artifacts found within, and a nearby hearth suggest a domestic purpose. Architectural and ceramic styles date this layer to the Formative Period. We uncovered three superimposed floors that point to multiple renovation episodes and a long occupation duration; residents ritually decommissioned
the structure by burying, at the base of the deepest wall, offerings of cuy bones, a large neckless olla, and a textile embellished with tiny shell beads (Chicoine and Navarro 2020:37, 42–43, 45–46). Inhabitants also laid the dead to rest close to the structure, as evidenced by the partially disturbed internment of a young woman with a Formative-style grater bowl beneath the benched plaza associated with the LIP compound (2020:49).

Other data also points to intensive food processing at the site. In addition to the excavations, we used handheld GPS to map grindstones over approximately one-fourth of Cerro San Isidro’s 9.5-hectare surface, and had planned to document PV31–50 (Puente Piedra, 1.5 ha) and the rest of PV31–51 in 2020. Despite the incomplete data set, we already counted almost 600 lithics, which represent intensive food processing in a very limited area compared to the lower valley site Caylán, whose mere 237 grindstones are spread across 50 ha (Chicoine et al 2020a:16).

**Vertebrate Results**

Mammals account for over 96% of the vertebrate assemblage (n=1547), and camelids alone constitute over 62% of the total NISP, dwarfing fish (2.1%), birds (1.4%), and reptiles (0.1%) (Figure 12, Table 2) (Vásquez and Rosales 2019:15). Osteometric data from nine camelid first phalanges reveal a mixed herd, about evenly split between four large camelids (llamas) and five small camelids (alpacas). Along with mollusks, camelids provided the leading form of animal protein for Cerro San Isidro residents (Vásquez and Rosales 2019:16, 26–27). The presence of dung indicates the livestock lived on-site and were not imported for food as jerky, already processed and preserved (Vásquez and Rosales 2019:59). Camelid bones are also most likely by far to exhibit cooking-related human modification like cutmarks, burning, calcination, or
percussion breakage, as well as rodent-gnawing marks that often appear on food scraps (Vásquez and Rosales 2019:17–20).

Table 2. Vertebrate taxa NISP and frequency, Cerro San Isidro 2019

<table>
<thead>
<tr>
<th>Class</th>
<th>Taxon</th>
<th>Common name</th>
<th>NISP</th>
<th>%</th>
</tr>
</thead>
<tbody>
<tr>
<td>Mammal</td>
<td><em>Lama</em> sp.</td>
<td>Andean camelid</td>
<td>962</td>
<td>62.18%</td>
</tr>
<tr>
<td></td>
<td><em>Canis lupus familiaris</em></td>
<td>Domestic dog</td>
<td>257</td>
<td>16.61%</td>
</tr>
<tr>
<td>Mammal n/i</td>
<td>Unidentified mammal</td>
<td></td>
<td>149</td>
<td>9.63%</td>
</tr>
<tr>
<td></td>
<td><em>Cavia porcellus</em></td>
<td>Cuy (guinea pig)</td>
<td>51</td>
<td>3.30%</td>
</tr>
<tr>
<td></td>
<td><em>Odocoileus virginianus</em></td>
<td>White-tailed deer</td>
<td>39</td>
<td>2.52%</td>
</tr>
<tr>
<td></td>
<td><em>Muridae</em> n/i</td>
<td>Mouse, rat, or gerbil</td>
<td>18</td>
<td>1.16%</td>
</tr>
<tr>
<td></td>
<td><em>Lagidium peruanum</em></td>
<td>Northern viscacha</td>
<td>12</td>
<td>0.78%</td>
</tr>
<tr>
<td></td>
<td><em>Cervidae</em> n/i</td>
<td>Deer</td>
<td>1</td>
<td>0.06%</td>
</tr>
<tr>
<td></td>
<td><em>Felidae</em> n/i</td>
<td>Cat</td>
<td>1</td>
<td>0.06%</td>
</tr>
<tr>
<td></td>
<td><em>Puma concolor</em></td>
<td>Puma (cougar)</td>
<td>1</td>
<td>0.06%</td>
</tr>
<tr>
<td>Bird</td>
<td><em>Bird</em> n/i</td>
<td>Unidentified bird</td>
<td>10</td>
<td>0.65%</td>
</tr>
<tr>
<td></td>
<td><em>Passeriforme</em> n/i</td>
<td>Songbird</td>
<td>3</td>
<td>0.19%</td>
</tr>
<tr>
<td></td>
<td><em>Zenaida</em> sp.</td>
<td>Zenaida dove</td>
<td>3</td>
<td>0.19%</td>
</tr>
<tr>
<td></td>
<td><em>Nothoprocta</em> sp.</td>
<td>Tinamou</td>
<td>2</td>
<td>0.13%</td>
</tr>
<tr>
<td></td>
<td><em>Anas</em> sp.</td>
<td>Dabbling duck</td>
<td>1</td>
<td>0.06%</td>
</tr>
<tr>
<td></td>
<td><em>Bubo</em> sp.</td>
<td>Horned owl</td>
<td>1</td>
<td>0.06%</td>
</tr>
<tr>
<td></td>
<td><em>Cyanocorax</em> sp.</td>
<td>New World jay</td>
<td>1</td>
<td>0.06%</td>
</tr>
<tr>
<td></td>
<td><em>Falco sparverius</em></td>
<td>American kestrel</td>
<td>1</td>
<td>0.06%</td>
</tr>
</tbody>
</table>

Figure 12. Cerro San Isidro Vertebrate NISP by taxonomic class
Llamas and alpacas were not the only domesticated animals on the menu at CSI. Despite a tiny size that makes them less likely to be preserved or recovered, cuy (guinea pig, *Cavia porcellus*) bones constitute 3.3% of the assemblage. The substantial quantity of cuy coprolites in the Late Intermediate Period kitchen-pantry outbuilding of Compound 3 shows residents likely raised guinea pigs there, similarly to where families raise cuy in rural Peru today (Vásquez and Rosales 2019:32). We also recovered mostly fragmentary remains of at least 19 dogs (*Canis familiaris*), including three puppies, one bearing butcher marks on the humerus (Vásquez and Rosales 2019:24), which implies that inhabitants consumed this species.

Wild animals appear in the assemblage as well. White-tailed deer (*Odocoileus virginianus*) are the most popular game by far, and people also opportunistically hunted vizcachas (chinchilla-like rodents, *Lagidium peruanum*) and various small-to-medium-size bird species whose habitat ranges include CSI’s immediate surroundings. No marine bird bones appear. Owls, kestrels, and pumas—apex predators that are spiritually significant in Andean culture—have a trace presence. Murids (mice, rats, and gerbils), one of the few vertebrate taxa
representing over 1% of the NISP, were likely scavengers feasting on CSI residents’ trash and stored food (Vásquez and Rosales 2019:25–26).

Additionally, animal bones have been repurposed into tools and ornaments (Table 3). Craftspeople fashioned a spatula and other implements of unclear function from dense and durable artiodactyl (deer and camelid) metapodials and tibiae. The light and delicate shaft of a bird ulna, trabecular bone scraped out of the medullary cavity, was converted into a tube bead. A hole drilled through a requiem shark’s vertebral centrum transformed the element into a pendant, probably worn suspended on a cord (Vásquez and Rosales 2019:21–23).

Table 3. Vertebrate bone taphonomy and modification, NISP frequency, Cerro San Isidro 2019

<table>
<thead>
<tr>
<th>Taxa</th>
<th>Cutmarks</th>
<th>Burn/calcine</th>
<th>Percussion</th>
<th>Gnaw/bite</th>
<th>Tool</th>
<th>Ornament</th>
</tr>
</thead>
<tbody>
<tr>
<td><em>Lama</em> sp.</td>
<td>28</td>
<td>75</td>
<td>3</td>
<td>4</td>
<td>9</td>
<td></td>
</tr>
<tr>
<td>Mammal n/i</td>
<td></td>
<td>10</td>
<td></td>
<td></td>
<td></td>
<td>1</td>
</tr>
<tr>
<td><em>Canis lupus familiaris</em></td>
<td>1</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>1</td>
</tr>
<tr>
<td><em>Odocoileus virginianus</em></td>
<td>1</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>1</td>
</tr>
<tr>
<td><em>Sarda chiliensis</em></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td><em>Carcharhinus</em> sp.</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>1</td>
</tr>
<tr>
<td>Bird n/i</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>1</td>
</tr>
<tr>
<td>Total</td>
<td>29</td>
<td>87</td>
<td>3</td>
<td>5</td>
<td>11</td>
<td>2</td>
</tr>
</tbody>
</table>

Invertebrate Results

The Cerro San Isidro invertebrate assemblage is taxonomically rich but not even, in terms of these measures of taxonomic abundance which zooarchaeologists have adapted from ecology. Richness is the number of different taxa in an assemblage, and evenness is how equally frequencies are distributed between taxa (DeAngelis and Lyman 2018:557–558; Lepofsky and Lertzman 2005:176). While 24 different taxa are represented at CSI (Table 4, Figure 13, Figure 14, Figure 15), 83.1% belong to the five most common species: small rock-perching mussels *Perumitylus purpuratus* (33.2%) (Figure 16) and *Semimytilus algosus* (14.2%) (Figure 17), sand-dwelling intertidal clams *Donax obesus* (22.1%) (Figure 18) and *Mesodesma donacium* (9.5%)
(Figure 19), and edible land snails of the genus *Scutalus* (4.1%) (Figure 20). Freshwater shellfish are completely absent.

Table 4. Mollusk and other invertebrate taxa NISP and frequency, Cerro San Isidro 2019

<table>
<thead>
<tr>
<th>Class</th>
<th>Taxon</th>
<th>Family</th>
<th>NISP</th>
<th>%</th>
</tr>
</thead>
<tbody>
<tr>
<td>Pelecypoda</td>
<td><em>Perumytilus purpuratus</em></td>
<td>Mytilidae</td>
<td>1124</td>
<td>33.22%</td>
</tr>
<tr>
<td></td>
<td><em>Donax obesus</em></td>
<td>Donacidae</td>
<td>748</td>
<td>22.10%</td>
</tr>
<tr>
<td></td>
<td><em>Semimytilus algosus</em></td>
<td>Mytilidae</td>
<td>481</td>
<td>14.21%</td>
</tr>
<tr>
<td></td>
<td><em>Mesodesma donacium</em></td>
<td>Mesodesmatidae</td>
<td>320</td>
<td>9.46%</td>
</tr>
<tr>
<td></td>
<td><em>Atrina maura</em></td>
<td>Pinnidae</td>
<td>91</td>
<td>2.69%</td>
</tr>
<tr>
<td></td>
<td><em>Argopecten sp.</em></td>
<td>Pectinidae</td>
<td>57</td>
<td>1.68%</td>
</tr>
<tr>
<td></td>
<td><em>Choromytilus choroides</em></td>
<td>Mytilidae</td>
<td>43</td>
<td>1.27%</td>
</tr>
<tr>
<td></td>
<td><em>Trachycardium procera</em></td>
<td>Cardiidae</td>
<td>14</td>
<td>0.41%</td>
</tr>
<tr>
<td>Gastropoda</td>
<td><em>Chione sp.</em></td>
<td>Rubiaceae</td>
<td>8</td>
<td>0.24%</td>
</tr>
<tr>
<td></td>
<td><em>Semele sp.</em></td>
<td>Semelidae</td>
<td>3</td>
<td>0.09%</td>
</tr>
<tr>
<td></td>
<td><em>Scutalus sp.</em></td>
<td>Bulimulidae</td>
<td>140</td>
<td>4.14%</td>
</tr>
<tr>
<td></td>
<td><em>Crepidula lessonii</em></td>
<td>Trichoniscoidae</td>
<td>99</td>
<td>2.93%</td>
</tr>
<tr>
<td></td>
<td><em>Thais chocolata</em></td>
<td>Thaididae</td>
<td>74</td>
<td>2.19%</td>
</tr>
<tr>
<td></td>
<td><em>Concholepas concholepas</em></td>
<td>Muricidae</td>
<td>40</td>
<td>1.18%</td>
</tr>
<tr>
<td></td>
<td><em>Tegula atra</em></td>
<td>Trochidae</td>
<td>20</td>
<td>0.59%</td>
</tr>
<tr>
<td></td>
<td><em>Prunum curtum</em></td>
<td>Marginellidae</td>
<td>17</td>
<td>0.50%</td>
</tr>
<tr>
<td></td>
<td><em>Fissurella sp.</em></td>
<td>Fissurellidae</td>
<td>5</td>
<td>0.15%</td>
</tr>
<tr>
<td></td>
<td><em>Thais haemastoma</em></td>
<td>Thaididae</td>
<td>2</td>
<td>0.06%</td>
</tr>
<tr>
<td></td>
<td><em>Olivella columellaris</em></td>
<td>Olividae</td>
<td>1</td>
<td>0.03%</td>
</tr>
<tr>
<td></td>
<td><em>Scurria sp.</em></td>
<td>Acmaeidae</td>
<td>1</td>
<td>0.03%</td>
</tr>
<tr>
<td></td>
<td><em>Thais sp. (other)</em></td>
<td>Thaididae</td>
<td>1</td>
<td>0.03%</td>
</tr>
<tr>
<td>Polyplacophora</td>
<td><em>Chiton sp.</em></td>
<td>Chitonidae</td>
<td>38</td>
<td>1.12%</td>
</tr>
<tr>
<td>Other</td>
<td>Unknown</td>
<td></td>
<td>30</td>
<td>0.89%</td>
</tr>
<tr>
<td>Crustacea</td>
<td>Crustacean</td>
<td></td>
<td>26</td>
<td>0.77%</td>
</tr>
<tr>
<td>Echinodermata</td>
<td>Sea urchin</td>
<td>Strongylocentrotidae</td>
<td>1</td>
<td>0.03%</td>
</tr>
<tr>
<td></td>
<td>Total</td>
<td></td>
<td>3384</td>
<td>100%</td>
</tr>
</tbody>
</table>
Figure 13. Cerro San Isidro site overall invertebrate taxa frequency NISP
Figure 14. Cerro San Isidro terrace test pit invertebrate taxa frequency NISP

Figure 15. Cerro San Isidro Compound 3 invertebrate taxa frequency NISP
Figure 16. *Perumytilus purpuratus* specimen. Used with permission under Creative Commons license. *Source:* World Register of Marine Species (marinespecies.org)
Figure 17. *Semimytilus algosus* specimen. Used with permission under Creative Commons license. *Source:* World Register of Marine Species (marinespecies.org)
Figure 18. *Donax obesulus* specimen. Used with permission under Creative Commons license. 
*Source*: World Register of Marine Species (marinespecies.org)
Figure 19. *Mesodesma donacium* specimen. Used with permission under Creative Commons license. *Source:* World Register of Marine Species (marinespecies.org)

Figure 20. *Scutalus proteus* specimen. This is the most common land snail taxon I encountered in my analysis. Used with permission under Creative Commons license. *Source:* Naturalis Biodiversity Center (naturalis.nl)
Overall, 56.4% of invertebrates were harvested from rocky substrates, 37.1% from sandy areas, and 0.7% from mangroves or other muddy habitats (Table 5). Most can be gathered from the easily accessed intertidal zone (mesolittoral), with only three species (*Crepidula lessonii* slipper limpets, *Argopecten* sp. scallops, and *Trachycardium procerum* slender cockles) restricted to the deeper infralittoral and only reachable by divers or watercraft (Helmer 2014:117–118). Mollusks that require cold temperatures of the normal Peru Current—and which are negatively impacted by a warmer ocean in El Niño years—account for 60.4% of invertebrate NISP at the site. Taxa that tolerate a broad range of temperatures make up 31.1%. Merely 3.5% of the assemblage are obligate warm-water species native to the Panama Current of Ecuador and far northern Peru, which only colonize coastal Nepeña during severe ENSO events (Chicoine and Rojas 2013:340–341). The “temperature indifferent” category is probably inflated because genus taxon *Argopecten* sp. encompasses both the cold-dwelling *Argopecten pupuratus* and the warm-water *Argopecten circularis*; I grouped the species together because they are difficult to distinguish, especially when fragmentary. While the animals themselves need temperature-specific habitats, I label them “temperature indifferent” because an *Argopecten* sp. counted in this assemblage is not a useful indicator of water temperature.

Table 5. Mollusk and other invertebrate taxa NISP and biotopic preferences, Cerro San Isidro 2019. Taxa-habitat data based on Chicoine and Rojas 2013, Chicoine and Rojas 2012, and Helmer 2014

<table>
<thead>
<tr>
<th>Taxon</th>
<th>NISP</th>
<th>% Supralittoral</th>
<th>% Mesolittoral</th>
<th>% Infra-littoral</th>
<th>Substrate</th>
<th>Water temperature</th>
</tr>
</thead>
<tbody>
<tr>
<td><em>Perumytilus purpuratus</em></td>
<td>1124</td>
<td>33.22%</td>
<td>•</td>
<td>•</td>
<td>R</td>
<td>C</td>
</tr>
<tr>
<td><em>Donax obesulus</em></td>
<td>748</td>
<td>22.10%</td>
<td>•</td>
<td>•</td>
<td>S</td>
<td>I</td>
</tr>
<tr>
<td><em>Semimytilus algosus</em></td>
<td>481</td>
<td>14.21%</td>
<td>•</td>
<td>R</td>
<td>C</td>
<td></td>
</tr>
</tbody>
</table>

(table cont’d.)
<table>
<thead>
<tr>
<th>Taxon</th>
<th>NISP</th>
<th>%</th>
<th>Supra-littoral</th>
<th>Meso-littoral</th>
<th>Infra-littoral</th>
<th>Substrate</th>
<th>Water temperature</th>
</tr>
</thead>
<tbody>
<tr>
<td><em>Mesodesma donacium</em></td>
<td>320</td>
<td>9.46%</td>
<td>•</td>
<td>•</td>
<td></td>
<td>S</td>
<td>C</td>
</tr>
<tr>
<td><em>Scutalus sp.</em></td>
<td>140</td>
<td>4.14%</td>
<td></td>
<td></td>
<td></td>
<td>L</td>
<td>—</td>
</tr>
<tr>
<td><em>Crepidula lessonii</em></td>
<td>99</td>
<td>2.93%</td>
<td>•</td>
<td>•</td>
<td></td>
<td>R</td>
<td>W</td>
</tr>
<tr>
<td><em>Atrina maura</em></td>
<td>91</td>
<td>2.69%</td>
<td>•</td>
<td>•</td>
<td></td>
<td>S</td>
<td>I</td>
</tr>
<tr>
<td><em>Thais chocolata</em></td>
<td>74</td>
<td>2.19%</td>
<td>•</td>
<td>•</td>
<td></td>
<td>R</td>
<td>C</td>
</tr>
<tr>
<td><em>Argopecten sp.</em></td>
<td>57</td>
<td>1.68%</td>
<td>•</td>
<td></td>
<td></td>
<td>S</td>
<td>I</td>
</tr>
<tr>
<td><em>Choromytilus chorus</em></td>
<td>43</td>
<td>1.27%</td>
<td>•</td>
<td>•</td>
<td></td>
<td>R</td>
<td>C</td>
</tr>
<tr>
<td><em>Concholepas concholepas</em></td>
<td>40</td>
<td>1.18%</td>
<td>•</td>
<td>•</td>
<td></td>
<td>R</td>
<td>I</td>
</tr>
<tr>
<td><em>Chiton sp.</em></td>
<td>38</td>
<td>1.12%</td>
<td></td>
<td></td>
<td></td>
<td>R</td>
<td>I</td>
</tr>
<tr>
<td>Unknown</td>
<td>30</td>
<td>0.89%</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Crustacean</td>
<td>26</td>
<td>0.77%</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>I</td>
</tr>
<tr>
<td><em>Tegula atra</em></td>
<td>20</td>
<td>0.59%</td>
<td>•</td>
<td>•</td>
<td></td>
<td>S</td>
<td>I</td>
</tr>
<tr>
<td><em>Prunum curtum</em></td>
<td>17</td>
<td>0.50%</td>
<td>•</td>
<td></td>
<td></td>
<td>S</td>
<td>W</td>
</tr>
<tr>
<td><em>Trachycardium procerum</em></td>
<td>14</td>
<td>0.41%</td>
<td>•</td>
<td></td>
<td></td>
<td>M</td>
<td>I</td>
</tr>
<tr>
<td><em>Chione sp.</em></td>
<td>8</td>
<td>0.24%</td>
<td>•</td>
<td>•</td>
<td></td>
<td>M</td>
<td>I</td>
</tr>
<tr>
<td><em>Fissurella sp.</em></td>
<td>5</td>
<td>0.15%</td>
<td>•</td>
<td></td>
<td></td>
<td>R</td>
<td>I</td>
</tr>
<tr>
<td><em>Semele sp.</em></td>
<td>3</td>
<td>0.09%</td>
<td>•</td>
<td>•</td>
<td></td>
<td>S</td>
<td>I</td>
</tr>
<tr>
<td><em>Thais haemastoma</em></td>
<td>2</td>
<td>0.06%</td>
<td>•</td>
<td>•</td>
<td></td>
<td>R</td>
<td>I</td>
</tr>
<tr>
<td><em>Olivella columellaris</em></td>
<td>1</td>
<td>0.03%</td>
<td>•</td>
<td></td>
<td></td>
<td>S</td>
<td>W</td>
</tr>
<tr>
<td><em>Scurria sp.</em></td>
<td>1</td>
<td>0.03%</td>
<td>•</td>
<td></td>
<td></td>
<td>R</td>
<td>C</td>
</tr>
<tr>
<td>Sea urchin</td>
<td>1</td>
<td>0.03%</td>
<td>•</td>
<td>•</td>
<td>•</td>
<td>R</td>
<td>I</td>
</tr>
<tr>
<td><em>Thais sp.</em> (other)</td>
<td>1</td>
<td>0.03%</td>
<td>•</td>
<td>•</td>
<td>•</td>
<td>R</td>
<td>I</td>
</tr>
<tr>
<td>Total</td>
<td>3384</td>
<td>100%</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>
Thin-shelled species like *S. algosus* and other mussels are probably underrepresented in the data set compared to clams like *D. obesulus*, whose thick shells preserve better (Chicoine et al 2020b:194). Taxa with a higher meat yield per individual—*M. donacium*, *Thais chocolata* (2.2%), *Concholepas concholepas* (1.2%), *Atrina maura* (2.7%), or *Argopecten* sp. (1.7%)—likely contributed more to CSI residents’ diets than their low percentages of the NISP would suggest (Helmer 2014:117–118). Some *T. chocolata* specimens are broken open as if struck with a rock to access the meat, implying people ate these sea snails raw, as cooking should release the animal from its shell (Chicoine and Rojas 2013:348).

To summarize, our 2019 excavations at Cerro San Isidro documented three superimposed residential enclosures, two dating to the Late Intermediate Period and one to the Late Formative. Generations of builders repeatedly repurposed earlier trash as construction fill, so most strata were chronologically mixed and included ceramics dating from 600 BCE through 1400 CE. Therefore, analyzing the zooarchaeological data for how human-animal relationships changed over time would not be feasible. I instead will compare the prominence of different vertebrate and invertebrate taxa at CSI to data from Huambacho, Caylán, and Samanco, the three lower Nepeña Valley sites I modeled my methodology upon.
CHAPTER 4. DISCUSSION AND CONCLUSION

Cerro San Isidro (CSI) residents ate a variety of animal protein from terrestrial, marine, vertebrate, invertebrate, domesticated, and wild sources. Although they were agriculturalists and not hunter-gatherers, they collected land snails and sometimes hunted deer, viscacha, and wild fowl from nearby middle valley habitats to supplement their main sources of meat. Domesticated mammals like camelids, dogs, and cuy are the most common land animals and vertebrates we found. Concentrations of cuy and camelid feces and cooking-related modifications on dog and camelid bones suggest that the animals were living on-site, and that becoming food was a frequent fate. However, this does not preclude other jobs, like cuy consuming leftover vegetable scraps, dogs guarding livestock and other resources, or camelids providing wool or serving as beasts of burden.

Camelid caravans likely transported marine resources over 40 km inland to CSI. Neither the tiny-yet-abundant staple fish like sardines, nor the greater meat-yield taxa like bonitos, sharks, and rays, are prominent in the assemblage. Recovery bias partially accounts for this, because some fish bones were too small for our 3 mm screens to capture, and cartilaginous skeletons do not preserve well. Evidence suggests CSI residents’ coastal trading partners focused on harvesting shellfish from both rocky and sandy nearshore environments—probably from the stretch of shoreline easiest for them to access. The assemblage’s ratio of rock-perching to sand-dwelling to mud-burrowing mollusks may reflect proportions of each habitat in the preferred shellfishing area. Alternatively, the over two millennia of food waste accumulated in mixed secondary fill contexts may be an amalgamation of many different source locations that supplied CSI with marine resources over the years. The site’s chronologically mixed complex stratigraphy also obscures discrete events and narrow timespans, such as individual feasts or ENSO episodes.
(a 2–11 year cycle). Almost all taxa in the assemblage are native to coastal Nepeña under normal climate conditions (i.e., not during an ENSO event), with a small minority exclusive to warm tropical waters.

Here, I compare my zooarchaeological results with—and build upon—preceding research at lower Nepeña Valley sites Huambacho (Chicoine and Rojas 2012), Caylán (Chicoine and Rojas 2013), and Samanco (Helmer 2014). Cerro San Isidro’s extensive occupation history and resulting mixed-up deposits make my zooarchaeological data less chronologically precise than data from these three sites, which were inhabited only in the first millennium BCE. I cannot know for certain if the remains I analyze are contemporaneous with the Caylán polity, but through comparison I can nevertheless make broad inferences about how residents in the middle versus lower valley interacted with their environments, cooked and ate food, raised animals, exchanged goods locally and over vast distances, and responded to ancient climate anomalies.

**Overview of Lower Valley Comparative Sites**

Caylán was not only the main habitation center in the lower Nepeña Valley during the Late and Final Formative, but it is also the largest archaeological site in all Nepeña. Nestled against hills on a flat *pampa* at the valley margin, it includes a 50 ha dense urban core of at least 40 stone residential compounds directly abutting one another, surrounded by another 50 ha of low-status households whose perishable structures did not preserve, leaving only scattered domestic debris. Inhabitants did not build their compounds rigidly aligned with each other or with the site’s main roads, as if separate autonomous groups—rather than a central authority—constructed each one. The city’s core is preferentially protected by parapets, part of a public defense system including a hilltop fortress, ridgetop walls, lookout stations for early warnings, and blocked-off northern valley access points. The Moro Pocket boasts similar and contemporaneous defensive structures,
suggesting the people of Cerro San Isidro and Caylán both feared violence advancing from the Santa Valley (Chicoine and Ikehara 2014:339–342; Chicoine and Whitten 2019:89–90, 95–96; Helmer and Chicoine 2015a:40; Ikehara 2016:77–81).

Downstream and less than 2 km from the modern shoreline, the satellite town of Samanco (40 ha) is less than half the total size of Caylán. Its six compound groups are spread out across uneven terrain and are less densely packed together than their city counterparts, with more spacious—yet less elaborately decorated—interiors. Archaeological evidence suggests most people at Samanco were commoners, likely members of multiple autonomous kin-based exchange networks that redistributed resources across the lower valley (Chicoine and Rojas 2013:355; Helmer and Chicoine 2015a:40–41, 2015b:640). Similar systems may have supplied Cerro San Isidro as well, although this hypothesis requires more investigation in subsequent field seasons.

While Samanco was a bustling economic hub of quotidian subsistence activity, elites at the much smaller (12 ha) nearby ritual center Huambacho channeled food surpluses into competitive feasts to accrue social and political power in a specialized feasting facility. Elaborately decorated sunken benched plazas paired with raised platforms are venues for large inclusive events at which elites literally elevated themselves above commoners gathered below, showing off status while fueling cycles of reciprocity and redistribution. Exclusive sub-groups also feasted in colonnaded patios of various sizes that emphasize togetherness and equality among participants, not differences in rank (Chicoine 2011a:437–440, 449–451). Compared to other Nepeña (800–450 BCE) and Samanco (450–150 BCE) phase settlements, Huambacho’s compounds feature more patios for gathering and fewer back rooms for living, sleeping, and storage. Not many people resided at the site full-time, aside from a small group of caretakers
who kept floors fastidiously clean of primary refuse (Helmer and Chicoine 2015a:40). The site is notable in Late and Final Formative Nepeña for “urban-style architecture…associated with non-urban functions” (2015a:41).

Episodic feasting linked to renovation events generated most of Huambacho’s comparatively minimal trash, which laborer-guests repurposed as platform construction fill (Chicoine 2011a:439). This contrasts with deep and expansive middens on the outskirts of Caylán and Samanco, accumulated garbage from centuries of daily life (Chicoine and Whitten 2019:94; Helmer 2020:171). Deposition patterns at Cerro San Isidro are completely different because the site was inhabited for several times longer than the lower valley sites. CSI residents in the Middle Horizon and Late Intermediate Period mined dirt and trash from Formative and Early Intermediate Period middens and constructions to build their own compounds, so most material we excavated was divorced from its primary context.

**Subsistence Strategies: Lower Valley vs. Cerro San Isidro**

Macrobotanical and zooarchaeological evidence from Caylán’s residential core demonstrates that people consumed crops, wild plants, domestic animals, and seafood, but generally did not produce or harvest the resources themselves. A possible exception are wild birds, opportunistically hunted from close-by habitats like the Caylán Lagoon, marshlands, and woodland scrub (Chicoine et al 2020b:211–212), similarly to how people at Cerro San Isidro captured birds common to their immediate middle valley surroundings. Based on Caylán’s population of at least 3,000 and its proximity to two primary irrigation canals, inhabitants probably ate plants grown in a catchment area encompassing at least half of lower valley bottom farmland (Chicoine et al 2020a:15).
Most animal protein in the diet derives from shellfish and marine vertebrate fish (especially *Sardinops sagax*) supplied by the self-sustaining satellite community of Samanco, in contrast to CSI where camelids are the most common vertebrates and sardines are barely present. Ground maize—in the form of flour or fermented chicha—is the foremost carbohydrate source in Caylán’s diverse floral assemblage, which also features legumes (e.g., common beans, Lima beans, pacay, peanuts) necessary to replenish soil nitrogen depleted by intensifying maize agriculture. We hope that upon returning to CSI post-pandemic, examining macrobotanical remains recovered by floatation will furnish more plant-related data to compare with Caylán and its neighbors (Chicoine et al. 2016:158–160; Chicoine et al 2020a:10–19; Chicoine and Whitten 2019:96).

The seaside town of Samanco specialized in fishing, but also grew the richest variety of fruits and vegetables among all sites in the polity and supplemented the diet with island-dwelling seabirds. Fisherfolk mass-harvested mollusks and small nearshore fish species, ate some, and traded the surplus to inland communities like Caylán. Camelids housed in a monumental-scale corral probably carried marine products from the ocean to the town, and then to other settlements in the local exchange network (Chicoine et al 2020a:12–13; Helmer 2020:166, 178; Helmer and Chicoine 2015b:640). Like at Cerro San Isidro, concretions of compacted camelid dung demonstrate that a herd lived on-site.

Huambacho’s visitors ate a lower diversity of plants than at regular residences elsewhere in the lower valley, implying that feast food was distinct from everyday meals (Chicoine et al 2020a:13). Unlike at Cerro San Isidro where camelids and mollusks were both major protein sources, at Huambacho a lack of roasting hearths, cutting tools, or chopped and burned camelid bones—combined with presence of cooking pots, deep serving bowls, gourd containers, and
copious discarded shells—suggests mollusk-based soups and stews were the most popular dishes (Ikehara and Chicoine 2011:448).

**Mollusk Assemblages: Lower Valley vs. Cerro San Isidro**

Comparing lower valley mollusk assemblages quantified by MNI (minimum number of individuals) with my assemblage quantified by NISP (number of individual specimens) is not ideal. However, no NISP data is available for Caylán, while the excavators of Huambacho and Samanco reported each site’s total mollusk NISP but not that of each taxon. My NISP-only data are what I could collect in the limited time available and should be adequate for discussing the rough proportion of each assemblage represented by a given species.

Invertebrate assemblages at the three lower valley sites are richer and less even than Cerro San Isidro’s, even though all four sites have the same top three most abundant species: *Perumitylus purpuratus, Semimytilus algosus* and *Donax obesulus* (albeit in different orders). Only 22 genus-level-identifiable taxa are present at CSI, compared to 55 at Huambacho (Figure 21) (Chicoine and Rojas 2012:286–287), 60 at Caylán (Figure 22) (Chicoine and Rojas 2013:345–347), and 41 at Samanco (Figure 23) (Helmer 2014:422). While the top three species account for 69.5% of CSI’s NISP, the category encompasses 80.2% of Huambacho’s MNI (Chicoine and Rojas 2012:286), 90.3% of Caylán’s (Chicoine and Rojas 2013:346–347), and 88.3% of Samanco’s (Helmer 2014:422). Differences between CSI and the other sites may be partially an artifact of small sample size, as I am working with a mollusk NISP of 3357; meanwhile, Huambacho’s MNI is 11,274 and NISP nearly 20,000 (Chicoine and Rojas 2012:286), Caylán’s MNI is 103,443 (Chicoine and Rojas 2013:345), and Samanco’s MNI is over 70,000 with an NISP upwards of 250,000 (Helmer 2014:116–117). A larger
zooarchaeological assemblage gives each taxon present at a site more chances to turn up in the excavated material (Lepofsky and Lertzman 2005:176).

Figure 21. Huambacho mollusk taxa MNI frequency

Figure 22. Caylán mollusk taxa MNI frequency
Figure 23. Samanco mollusk taxa MNI frequency

Being only 8 km from the Pacific littoral, Huambacho residents had much readier access to saltwater shellfish than Cerro San Isidro folks living in the middle valley. Camelids represent the plurality of the assemblage, but the absence of butchering tools and minimal bone fracturing implies that they were pack animals rather than food. Even when accounting for animal size differences, the vertebrate NISP of 1,300 pales in comparison to quantity of mollusk shells.

Fishing equipment is absent despite the prominence of marine resources, suggesting the site was not a primary food producer but rather strictly a consumer. Rocky habitats are most represented (77.8%) while sandy ones are minor (18.7%) (Figure 24), which matches the terrain of the closest shoreline—the southern stretch of Nepeña coast and northern Bahía de Tortugas—dominated by rocky cliffs interspersed with small beaches (Chicoine and Rojas 2012:285–288).

Of the lower valley sites, Huambacho’s mollusk habitat pattern most closely matches that of Cerro San Isidro, where 56.4% of shells come from rocky environments and 37.2% from sandy ones. Muddy, mangrove, and terrestrial biotopes are more represented at Huambacho than
Caylán or Samanco but fall short of CSI’s habitat breakdown of 0.7% mud-or-mangrove and 4.1% terrestrial.

At Caylán and Samanco, prominent mollusk species and their substrate preferences reflect how the city and satellite town were economically interdependent. *Donax* is the most popular shellfish at Caylán by far, comprising 61.6% of the assemblage on its own, but it accounts for only 11.1% of Samanco’s MNI. Rock-perching mussels *Perumitylus* and *Semimytilus* follow an inverse pattern; combined, they represent 28.7% of Caylán mollusks compared to 77.2% at Samanco. Overall, habitats represented at Caylán are 34.9% rock and 64.3% sand, versus 79.9% rock and 19.0% sand at Samanco (Chicoine and Rojas 2013:287–288; Helmer 2014:117–118, 422). Both sites’ project directors hypothesize these shells were harvested from the Bahía de Samanco, an unusually calm water body ringed by long sandy beaches and sheltered from the open ocean by rocky cliff peninsulas. Fisherfolk from Samanco disproportionately exported the hardy and easily collected *Donax* clams up-valley to Caylán and kept the mussels and meatiest species for themselves. Consequently, Samanco ended up with

Helmer (2014:119–120) suspects the above-mentioned dynamic is an incipient version of a seashore-inland marine resource exchange system that supplied the Moche urban capital’s residential sectors in the Early Intermediate Period. According to Roselló and colleagues (2001:75–76), *Donax* represents over 94% of mollusks and 81% of all marine taxa including mollusks, crustaceans, fish, birds, and mammals. Chicoine and Rojas observe that such networks may be “generalized, kin-based, specialized, and/or centralized” (2013:339), so a state or complex chiefdom like the Moche was probably more centralized in this regard than our Late and Final Formative Caylán polity or whatever political entity Cerro San Isidro belonged to. Based on Caylán and Huambacho’s data, the authors contend that shellfish distribution was decentralized, autonomous, and likely kin-based; independent collectors exploited species and environments based on availability and proximity to consumption sites, and could be specialized or unspecialized depending on the difficulty and danger of what and where they were harvesting (Chicoine and Rojas 2012:288–289, 2013:355). In light of new data suggesting Samanco residents selected which mollusk taxa to keep for themselves and which to send up-valley to Caylán, Helmer (2014:119–120) proposes that the lower Nepeña Valley exchange system was more centralized than previously thought.

Marine invertebrates ended up 44 km inland at Cerro San Isidro because camelid caravans, or another means of transport, carried them from one Nepeña Valley ecozone to another. Land snails, on the other hand, inhabit fog-fed oases (*lomas*) and middle and upper valley hillsides such as Cerro San Isidro and its immediate vicinity, which includes several
natural springs that could have supported additional habitat. This made *Scutalus* sp. easily available to residents in a way that sea mollusks were not, explaining why the genus composes a six times greater proportion of CSI’s NISP than Huambacho’s MNI—and why *Scutalus* sp. represents a miniscule 0.3% and 0.1% of Caylán and Samanco’s MNIs, respectively (Chicoine and Rojas 2012:287, 2013:346–347; Helmer 2014:428). Snails are even more common in the wetter *quechua* biome above 2300 masl, where they are the most frequent mollusk found at the Cosma Complex, mostly in Late and Final Formative ritual feasting contexts (Munro 2018:308–309). While coastal people usually poach shellfish in soups or stews, terrestrial snails in the everyday diet need special processing with maize in order to remove hallucinogenic alkaloids the creatures absorb from San Pedro cactus (Bourget 1990:47–48; Chicoine 2011a:448). On other occasions, people may deliberately eat untreated land snails in order to feel these psychoactive effects.

Not all mollusks were intended as food, as many minor taxa could have been bycatch from bulk harvesting. Ethnography documents how coastal Peruvians gather *Donax* and *Mesodesma* by wading into knee- or waist-deep water, about half a meter at low tide; they sweep their hands or a rake through the top few centimeters of sand, capturing clams as waves drag the sediment back to sea. Collectors cannot see the ocean bottom clearly in these turbid shallows, so they indiscriminately scoop up small sea snails, crustaceans, and other less culinarily appealing creatures in addition to target taxa (Chicoine et al. 2020:196; Chicoine and Rojas 2013:347–348; Roselló et al. 2001:77; Sandweiss 1979:15–16). For example, a common tagalong to *Donax* hauls is *Tegula atra*, a sand-dwelling gastropod that averages 2 cm in diameter and provides minimal meat. Helmer (2014:117) hypothesizes that resourceful Samanco fisherfolk repurposed bycatch like this for bait. *T. atra* is most prominent at Samanco (3.5%), the polity’s major fishing
center, but residents culled most of them from the massive shipments of *Donax* inland to Caylán, where the species reduces to 1.3% of the assemblage. The snails are nearly absent at Huambacho, a feasting facility that sourced seafood from a different coastal community, which exploited mostly rocky habitats (Chicoine and Rojas 2012:287).

At all four sites, most marine mollusks are either strict cold-water species adversely impacted by ocean warming periods, or temperature-indifferent species that tolerate these fluctuations (Figure 25). Very few shells exclusive to warm waters appear in the Nepeña Valley, but the 3.5% share of Cerro San Isidro’s NISP is over five times the warm-water proportion of Huambacho’s assemblage (0.7%), fifteen times Samanco’s (0.2%), and eighty-six times Caylán’s (<0.1%). Without the 99 *Crepidula lessonii* slipper limpet specimens, CSI’s mollusk temperature preferences would resemble those of Huambacho. Several factors could explain why this tropical gastropod—incidental at Huambacho and absent from Caylán and Samanco—has such a robust presence at our site. These are not known to be ornamental or ritually significant shells, so trade across hundreds of kilometers seems unlikely.

![Figure 25. Mollusk water temperature habitat preferences, Cerro San Isidro and lower valley site comparison](image-url)
A series of severe El Niño-Southern Oscillation (ENSO) events in the Late Intermediate Period could have led to *C. lessonii* becoming locally abundant, as the zooarchaeological signature of ENSO disturbance is “presence of species alien to an area or sharp increase/decrease of local populations,” (Roselló et al. 2001:82). These patterns do not appear at Formative Period lower valley sites, where almost all taxa are typical of the Peruvian Province, but that does not preclude climate changes later in CSI’s occupation history after the other sites were abandoned (Chicoine and Rojas 2012:289, 2013:341; Helmer 2014:181). *Choromytilus chorus* and *Mesodesma donacium* are especially sensitive to warming seas; populations take up to a decade to recover afterwards (Chicoine and Rojas 2013:341). However, these species are much more abundant at CSI than at the others, and no warm-water mollusk besides *C. lessonii* appears at our site in substantial numbers, suggesting extreme ENSO events are not to blame. Another explanation is that my taxonomic identifications or reference photographs are incorrect, and the 99 shells I counted are not in fact *C. lessonii*, but rather a similar-looking local species.

**Worked Shells and Personal Adornment: Lower Valley vs. Cerro San Isidro**

At Cerro San Isidro, Huambacho, Caylán, and Samanco, certain shells were frequently fashioned into decorative objects like beads and pendants. By raw numbers, most such trinkets at Cerro San Isidro belong to the dedicatory offering (necklace or embellished textile) buried at the base of a Formative Period wall; however, the 610 circular and cylindrical beads are so heavily modified that their taxa are undeterminable. Chicoine and Rojas (2013:345–348) conclude that at Huambacho and Caylán, based on substantial overlap between incidental taxa (less than 1% of the assemblage) and cultural modification, economically marginal species caught inadvertently were opportunistically worked into ornaments.
To a degree, the same may be true at Cerro San Isidro. We uncovered perforated shells—one each—of common species *Donax obesulus* and *Scutalus* sp., plus a unique small gastropod possibly of genus *Cerithidea*, but the most popular ornamental taxon is *Prunum curtum*; 22 of 27 loose perforated shells at our site are these tiny warmwater sea snails. Normally rare in the cold Peruvian Province of the eastern Pacific, *P. curtum* will make incursions southward from the tropics when an ENSO event raises the water temperature. Marine biologists have documented isolated permanent colonies established disjointly along Peru’s coast, including near modern Chimbote just north of the Nepeña Valley (Helmer 2014:118; Ramírez et al. 2003:230). The additional 17 unmodified *P. curtum* specimens we uncovered imply that residents were manufacturing ornaments on-site, probably with ready access to the raw materials.

The species appears at the three lower valley sites too, most significantly at Samanco where 103 *P. curtum* beads represent over 70% of all worked shells. Helmer hypothesizes they were valued not only for their natural polish, but also for looking like miniature versions of *Titanostrombus galeatus*. *Pututu* trumpets made of these Eastern Pacific giant conches are a fixture of Cupisnique-Chavín rituals and iconography, and *P. curtum* adornments may have been personal reminders of spirituality (Helmer 2014:118, 150). Interestingly, that would make the conch trumpet one of the few Chavín religious elements to endure in Nepeña after the CCRC collapsed. At Huambacho and Caylán, the little shells are more marginal. The former site had fewer *P. curtum* beads than Cerro San Isidro (only 15), despite having a much larger mollusk assemblage overall (Chicoine and Rojas 2012:288). Caylán’s MNI of 26 *P. curtum* shells—both worked and unworked—is even smaller compared to a total MNI of 103,473 mollusks (Chicoine and Rojas 2013:353). Another interesting difference is that Cerro San Isidro *P. curtum* beads were only modified through perforation, usually near the apex, whereas some from lower valley
sites had the tops and bottoms cut off, creating a tube through which to thread fiber (Chicoine and Rojas 2013:353; Helmer 2014:118).

*Spondylus princeps* was one of the most important shells in prehispanic Andean ritual life. Native to the warm tropical waters of Ecuador and far northern Peru, the prized material could only be acquired through long-distance trade networks. Only three *Spondylus* beads have appeared at Cerro San Isidro thus far, compared to over 100 specimens found at Huambacho. However, most Huambacho *Spondylus* hails from disturbed and surface-level contexts, likely looted burials of Moche and later peoples who reused the site as a cemetery (Chicoine and Rojas 2012:288). Evidence for Formative *Spondylus* use is clearer at Caylán. Four pre-form blanks and 16 beads in an antechamber adjacent to a compound’s largest plaza demonstrate that residents were manufacturing beads near the main communal ceremonial space (Chicoine and Rojas 2013:348–349). Helmer hypothesizes that Samanqueños made ornaments from local *Argopecten* sp. shells as similarly-colored substitutes for exotic *Spondylus*, as he found 10 preform blanks of the former species compared to merely two beads of the latter (Helmer 2014:118).

Related to themes of decoration and symbolic meaning, we uncovered two *Argopecten* sp. scallop shells holding brilliant red pigment, possibly vermillion (the poisonous mineral cinnabar, or mercuric sulfide). Samanco and Caylán yielded several such artifacts, although these used *Mesodesma* shells exclusively (Helmer 2014:119). At Caylán, excavators found the red-stained clamshells in offering caches associated with renovations at the site’s largest mound, hinting at a ceremonial purpose beyond being a pigment in paint (Chicoine and Rojas 2013:350–351).
Conclusion

Over the course of nine weeks from June to August 2019, the Proyecto de Investigación Arqueológica Cerro San Isidro team excavated seven five-by-five-meter units in Compound 3, a walled enclosure on a terrace about halfway up the southern side of a large hill, in addition to eight one-by-two-meter test pits nearby. The 2019 field season is one element of a collaboration between Drs. George Lau and David Chicoine, who are examining how the concept of divine lordship developed, spread, and became institutionalized in the first millennium CE Ancash Region. The project directors hypothesize that early versions were among the diverse new political and religious ideas that arose during the Final Formative (local Period II, 450–150 BCE) in the wake of the Chavín system collapsing. To investigate the research question, our team was especially interested in finding contexts from this key time period, as well as the preceding Late Formative (local Period I, 800–450 BCE) when Cerro San Isidro was the largest and most important town in Moro, and the subsequent Epi-Formative and Early Intermediate Period (local Period III, 150 BCE–500 CE) when Moro interacted closely with Recuay groups ruled by hereditary divine lords (Ikehara 2015, 2016).

While Formative ceramics were mixed into many strata, most of the deposits we excavated had been formed in the Late Intermediate Period (local Period V, after 1000 CE); we also found little Recuay material and no contexts dating to the early first millennium CE. With the Compound 3 excavations not producing enough data for the pertinent time periods, the project directors’ pre-pandemic 2020 plans had been to systematically survey and dig test pits in both site sectors—Puente Piedra (PV31–50) and Cerro San Isidro (PV31–51)—in order to better understand the complex’s occupation history. This would have complemented earlier coarse-grained surveys covering the entire Nepeña Valley or a significant sub-section.
Although the 2019 season marked the first scientific excavations carried out at Cerro San Isidro, surveys by Donald Proulx in 1967 and Hugo Ikehara in 2009–2010 have established that it was occupied from the Late Formative to Late Intermediate Period. Our fieldwork has confirmed that people lived at the site from about 600 BCE to 1400 CE. Ikehara’s surface artifact density survey of the entire Moro Pocket—over 90 km²—identified CSI as a key player in the area’s early history, worthy of further research. The site was the largest and most prominent in Late Formative Period Moro (800–450 BCE), and closely associated with the ceremonial center a few kilometers upstream, Nuevo Moro 4, which participated in the Cupisnique-Chavín Religious Complex. When the population surged and violent conflict increased during the Final Formative (450–150 BCE), CSI stood out among a dozen demographic centers as the most densely nucleated, concentrating almost all households at one hilltop location and vacating low-lying lands surrounding. From the Epi-Formative (150 BCE–200 CE) through the beginning of the Early Intermediate Period, the Moro Pocket population returned to similar numbers as before 450 BCE—the bust after the boom. In the aftermath of massive demographic reshuffling in the Final Formative, two fortified towns near the eastern (upstream) edge of Moro emerged as the most populous and politically powerful entities in the survey zone; Cerro San Isidro became a small outlying satellite town to these two (Ikehara 2015, 2021).

Proulx (1982) observed that in the Early Intermediate Period—even before Moche colonists arrived in lower valley around 500 CE—middle and upper valley residents like those at our site forged connections with highland Recuay groups. Sometime after Moche influence disappeared from Nepeña (around 800 CE), the Casma state expanded north into the valley and ushered in another population boom. The Moro area fell within vast swaths of Casma territory that the Chimú Empire conquered between 1350 and 1400 CE, before the Chimú in turn fell to
the Inka circa 1470, ending the Late Intermediate Period. The Inkas had no direct presence in the valley, and the Late Horizon looked the same—in terms of material culture—as the preceding era (Munro 2018:80–87; Vogel 2018:173–176). The later in Cerro San Isidro’s occupation history we go, the less published research we have on what was happening at the site specifically and in the Nepeña Valley in general.

Most of the architecture we uncovered hails from these lesser known later periods. The team documented three superimposed structures in Compound 3. Newest is the surface compound, built of uncut fieldstone and full of Casma and Chimú style pottery that date it to the Late Intermediate Period. Its purpose as an elite living space is implied by fine ceramics, food and beverage storage areas, grindstones, kitchen hearths, household refuse, and guinea pig and camelid coprolite clusters. Residents interred a small dog as an offering when they renovated or abandoned the compound. Directly beneath these walls is the remnant of an adobe building, partially dismantled—presumably to make way for the final phase. Fine Casma-style ceramics broken in situ, possibly part of a decommissioning ritual, date the adobe layer to an earlier part of the Late Intermediate Period. Finally, the earliest human occupation is linked to the deepest structure, consisting of Formative-style cut stone walls associated with a fine clay floor. Buried at the base of one wall is an offering marking a renovation or abandonment event. This consisted of guinea pig bones and an ornament embellished with over six-hundred circular beads carved from shells.

For unknown reasons, Cerro San Isidro residents took an approximately millennium-long hiatus from living in this specific spot in the Early Intermediate Period and Middle Horizon. However, Ikehara’s survey documented dense concentrations of these eras’ ceramics at the site in general, meaning people were living elsewhere on or around the hill (Ikehara 2015:59–60).
While Compound 3’s architectural phases are distinct, the stratigraphy overall is chronologically convoluted since it consists of mostly secondary contexts. Earlier refuse was reused as construction fill—sometimes centuries later, and possibly multiple times. Therefore, I cannot analyze how residents’ animal consumption habits changed over time.

All non-human vertebrate remains were sent to Arqueobios, an archaeological consulting firm in Trujillo, Peru, where technicians identified taxa, quantified them by ‘number of individual specimens’ (NISP), and documented cultural modifications. The resulting report reveals an extremely uneven assemblage—96% mammal, and 62% camelid alone—dwarfing all fish (2%), birds (less than 2%), and reptiles (a mere fraction of 1%). According to osteometric analysis of camelid first phalanges, Cerro San Isidro residents kept a mixed herd of about half llamas and half alpacas. Camelids also account for almost all bones with cooking-related modifications like cutmarks, burning, calcination, or percussion breakage, as well as rodent-gnawing marks that often appear on food scraps. Most terrestrial animal protein in people’s diets came from llamas and alpacas, but these were not the only domesticated animals on the menu.

Over 3% of the NISP is cuy (guinea pig). Piles of droppings in the kitchen and pantry section of Compound 3’s final phase hint that people were raising them for meat, much like families in rural Peru do today. Murids (mice, rats, and gerbils) were likely scavengers feasting on CSI residents’ trash and stored food. Wild animals also appear in the assemblage, white-tailed deer being the most popular game. Residents opportunistically hunted vizcachas (chinchilla-like rodents) and various small-to-medium-size bird species that inhabit the site’s immediate surroundings (no marine birds included). Apex predators that are spiritually significant in Andean culture (owls, kestrels, and pumas) have a trace presence. Craftspeople also repurposed
bones into tools and ornaments; for example, camelid and deer lower leg bones were modified to be spatulas, and bird wings and shark vertebrae were fashioned into beads and pendants.

Despite Cerro San Isidro being a half to a full day’s journey inland from the Pacific Ocean, marine mollusks are nearly ubiquitous here. With a photographic reference collection and close instruction from the project directors, I was able to identify over 98% of invertebrates to at least genus level. Since our excavations yielded tons more artifacts than expected, I quantified shells by NISP instead of MNI (minimum number of individuals) for expediency. The assemblage is taxonomically rich but not even. Bivalve mollusks account for more than 85% of NISP, followed by gastropods at 12%. Chitons barely make up 1%, and even that is probably over-representative because each individual’s body consists of eight discrete pieces—compared to two for bivalves and one for gastropods. While 24 different taxa are represented at CSI, half of them constitute less than 1% of the assemblage each. Over 83% of the NISP belong to the five most common species: small rock-perching mussels *Perumitylus purpuratus* and *Semimytilus algosus*, sand-dwelling intertidal clams *Donax obesulus* (small but incredibly abundant) and *Mesodesma donacium* (meatier but environmentally sensitive), in addition to land snails of the genus *Scutalus*. Notably, freshwater shellfish are completely absent despite proximity to the river.

I modeled my approach to these data after earlier studies of marine resources at lower Nepeña Valley sites, namely David Chicoine and Carol Rojas’s work at Huambacho and Caylán, and Matthew Helmer’s dissertation on Samanco. All three sites were integral to the Caylán polity, an economic-political-ritual entity that prevailed in the lower valley in the Late and Final Formative (800–150 BCE) during and after the prolonged Cupisnique-Chavín decline. Research at these sites explores how habitats of organisms that people collect and consume can inform
archaeologists about technology use, divisions of labor, social networks, economic systems, and political structures. Additionally, an unexpected presence or conspicuous absence of certain species can index climate variations—especially extreme El Niño–Southern Oscillation events.

Comparing lower valley assemblages quantified by MNI with my assemblage quantified by NISP is not ideal, but these are the data I have to work with. Mollusk habitat substrates represented at CSI most resemble those of Huambacho: a majority rock-perching, a still substantial proportion sand-dwelling, and a marginal presence of terrestrial and mangrove-based organisms compared to their near total absence at Samanco and Caylán. Chicoine and Rojas hypothesize that people feasting at Huambacho sourced shellfish from the closest coastal community, which was probably on the northern Bahía de Tortugas where rocky cliffs predominate. However, proximity is not the only factor. Samanco’s surroundings are overwhelmingly sandy, but habitats in the mollusk assemblage are 80% rock and only 19% sand; Caylán shows an inverse pattern with 35% rock and 64% sand. That is because food-producing seaside satellite town Samanco and consumption-heavy inland city Caylán were economically interdependent. Fisherfolk disproportionately exported hardy and easily-to-collect sand-burrowing *Donax* clams up-valley to Caylán, keeping *Perumitylus* and *Semimytilus* rock mussels and meaty species like *Mesodesma* for themselves. Therefore, the mollusk biotopes at Cerro San Isidro probably reflect culinary tastes of residents or the harvesting community, as well as different taxa’s suitability for transport by camelid caravan. Land snails, on the other hand, are more common to middle and upper valley hillsides like Cerro San Isidro than drier lower valley environments, which explains their abundance here.

Not all mollusks at the site were used only for food, as some have been fashioned into ornaments like beads and pendants. Our excavations also uncovered two *Argopecten* scallop
shells holding brilliant red pigment, possibly cinnabar. We found just three beads of *Spondylus*, the pink-orange shell important to indigenous spirituality throughout the Andes. Native to the warm tropical waters of Ecuador and far northern Peru, the prized material is normally only acquirable through long-distance trade networks. The major ornamental taxon at CSI is tiny sea snail *Prunum curtum*, also a warm-water species that can intrude into coastal Nepeña in El Niño years. Marine biologists have even documented isolated permanent colonies of *P. curtum* in cold waters of the Peruvian province, including near modern Chimbote just north of Nepeña. Twenty-two out of 27 perforated shells are *P. curtum*, not counting 17 un-worked specimens, which suggests that CSI residents manufactured pendants and beads on-site with ready access to these raw materials.

In conclusion, there is still much work to be done at Cerro San Isidro to understand how residents interacted with vertebrate and invertebrate animals, both terrestrial and marine. For a clearer picture of what people were doing at this site across the millennia, our team needs to survey in detail surface artifacts and architecture of both sectors and dig test pits beyond the southern terraces we explored in 2019. The insights I can glean from animal remains accumulated over such a vast timespan are limited. Only since mid-2021 have the radiocarbon dates been available to project directors, so they have not yet analyzed that data in context. I hope that in the future, comparing CSI zooarchaeology data to the three Caylán polity sites will reveal valley-wide exchange networks, kin ties, political rivalries, culinary differences, or other interesting insights.
### APPENDIX. DATA FROM CHARTS

Table A. 1. Cerro San Isidro Compound 3 and test pit invertebrate taxa NISP frequency comparison

<table>
<thead>
<tr>
<th>Taxa</th>
<th>Compound 3</th>
<th>Test pits</th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>NISP</td>
<td>%</td>
<td>NISP</td>
</tr>
<tr>
<td><em>Perumytilus purpuratus</em></td>
<td>728</td>
<td>30.08%</td>
<td>396</td>
</tr>
<tr>
<td><em>Donax obesus</em></td>
<td>607</td>
<td>25.08%</td>
<td>141</td>
</tr>
<tr>
<td><em>Semimytilus algosus</em></td>
<td>339</td>
<td>14.01%</td>
<td>142</td>
</tr>
<tr>
<td><em>Mesodesma donacium</em></td>
<td>211</td>
<td>8.72%</td>
<td>109</td>
</tr>
<tr>
<td>Land snail</td>
<td>94</td>
<td>3.88%</td>
<td>46</td>
</tr>
<tr>
<td><em>Atrina maura</em></td>
<td>70</td>
<td>2.89%</td>
<td>21</td>
</tr>
<tr>
<td><em>Crepidula lessonii</em></td>
<td>65</td>
<td>2.69%</td>
<td>34</td>
</tr>
<tr>
<td><em>Thais chocolata</em></td>
<td>61</td>
<td>2.52%</td>
<td>13</td>
</tr>
<tr>
<td><em>Argopecten</em> sp.</td>
<td>44</td>
<td>1.82%</td>
<td>13</td>
</tr>
<tr>
<td><em>Choromytilus chorus</em></td>
<td>37</td>
<td>1.53%</td>
<td>6</td>
</tr>
<tr>
<td><em>Concholepas concholepas</em></td>
<td>35</td>
<td>1.45%</td>
<td>5</td>
</tr>
<tr>
<td>Crustacean</td>
<td>24</td>
<td>0.99%</td>
<td>2</td>
</tr>
<tr>
<td><em>Chiton</em> sp.</td>
<td>24</td>
<td>0.99%</td>
<td>14</td>
</tr>
<tr>
<td>Unidentified</td>
<td>22</td>
<td>0.91%</td>
<td>8</td>
</tr>
<tr>
<td><em>Prunum curtum</em></td>
<td>15</td>
<td>0.62%</td>
<td>2</td>
</tr>
<tr>
<td><em>Tegula atra</em></td>
<td>14</td>
<td>0.58%</td>
<td>6</td>
</tr>
<tr>
<td><em>Trachycardium procerum</em></td>
<td>13</td>
<td>0.54%</td>
<td>1</td>
</tr>
<tr>
<td><em>Chione</em> sp.</td>
<td>8</td>
<td>0.33%</td>
<td>0</td>
</tr>
<tr>
<td><em>Fissurella</em> sp.</td>
<td>5</td>
<td>0.21%</td>
<td>0</td>
</tr>
<tr>
<td><em>Scurria parasitica</em></td>
<td>1</td>
<td>0.04%</td>
<td>0</td>
</tr>
<tr>
<td><em>Semele</em> sp.</td>
<td>1</td>
<td>0.04%</td>
<td>2</td>
</tr>
<tr>
<td><em>Thais haemastoma</em></td>
<td>1</td>
<td>0.04%</td>
<td>1</td>
</tr>
<tr>
<td><em>Thais</em> sp. (other)</td>
<td>1</td>
<td>0.04%</td>
<td>0</td>
</tr>
<tr>
<td><em>Olivella collumellaris</em></td>
<td>0</td>
<td>0.00%</td>
<td>1</td>
</tr>
<tr>
<td>Sea urchin</td>
<td>0</td>
<td>0.00%</td>
<td>1</td>
</tr>
<tr>
<td>Total</td>
<td>2420</td>
<td>100.00%</td>
<td>964</td>
</tr>
</tbody>
</table>
Table A. 2. Mollusk habitat preferences, lower valley sites

<table>
<thead>
<tr>
<th>Water temperature</th>
<th>Huambacho</th>
<th></th>
<th>Caylán</th>
<th></th>
<th>Samanco</th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>MNI</td>
<td>%</td>
<td>MNI</td>
<td>%</td>
<td>MNI</td>
<td>%</td>
</tr>
<tr>
<td>Warm</td>
<td>74</td>
<td>0.66%</td>
<td>46</td>
<td>0.04%</td>
<td>165</td>
<td>0.23%</td>
</tr>
<tr>
<td>Cold</td>
<td>7817</td>
<td>69.34%</td>
<td>31796</td>
<td>30.73%</td>
<td>57963</td>
<td>81.71%</td>
</tr>
<tr>
<td>Indifferent</td>
<td>3193</td>
<td>28.32%</td>
<td>71251</td>
<td>68.86%</td>
<td>12705</td>
<td>17.91%</td>
</tr>
<tr>
<td>n/a</td>
<td>189</td>
<td>1.68%</td>
<td>380</td>
<td>0.37%</td>
<td>102</td>
<td>0.14%</td>
</tr>
<tr>
<td>Total</td>
<td>11273</td>
<td>100.00%</td>
<td>103473</td>
<td>100.00%</td>
<td>70935</td>
<td>100.00%</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Substrate</th>
<th>Huambacho</th>
<th></th>
<th>Caylán</th>
<th></th>
<th>Samanco</th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>MNI</td>
<td>%</td>
<td>MNI</td>
<td>%</td>
<td>MNI</td>
<td>%</td>
</tr>
<tr>
<td>Sand</td>
<td>2112</td>
<td>18.74%</td>
<td>66522</td>
<td>64.29%</td>
<td>13454</td>
<td>18.97%</td>
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<tr>
<td>Rock</td>
<td>8765</td>
<td>77.75%</td>
<td>36155</td>
<td>34.94%</td>
<td>56705</td>
<td>79.94%</td>
</tr>
<tr>
<td>Mud/mangrove</td>
<td>34</td>
<td>0.30%</td>
<td>32</td>
<td>0.03%</td>
<td>51</td>
<td>0.07%</td>
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<tr>
<td>Land</td>
<td>134</td>
<td>1.19%</td>
<td>289</td>
<td>0.28%</td>
<td>102</td>
<td>0.14%</td>
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<tr>
<td>Multiple or unknown</td>
<td>228</td>
<td>2.02%</td>
<td>475</td>
<td>0.46%</td>
<td>623</td>
<td>0.88%</td>
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<tr>
<td>Total</td>
<td>11273</td>
<td>100.00%</td>
<td>103473</td>
<td>100.00%</td>
<td>70935</td>
<td>100.00%</td>
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</table>
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