ARCHITECTURE, SETTLEMENT, AND FORMATIVE DEVELOPMENTS IN THE EQUATORIAL ANDES: NEW DISCOVERIES IN THE DEPARTMENT OF TUMBES, PERU

Jerry D. Moore

The cultural transformations associated with the Formative period are pivotal for understanding the prehistory of the Americas. Over the last five decades, investigations in southwestern Ecuador have provided an early and robust set of archaeological data relating to Archaic-to-Formative transformations as exemplified by the Las Vegas, Valdivia, Machalilla, and Chorrera archaeological traditions. However, recent archaeological research in adjacent zones of the equatorial Andes indicates that the transformations in southwestern Ecuador were paralleled by coeval but distinct developments. Recent (2006–2007) excavations in the Department of Tumbes, Peru, have documented previously unknown Formative transformations, including the development of substantial domestic architecture during the Archaic (ca. 4700–4330 B.C.E.) and early Formative (ca. 3500–3100 B.C.E.), the shift from elliptical pole-and-thatch dwellings to rectangular wattle-and-daub structures at ca. 900–500 B.C.E., and the construction of public architecture and the establishment of a two-tiered settlement system by ca. 1000–800 B.C.E. These recently discovered archaeological patterns from Tumbes and additional data from southern Ecuador provide the basis for revised comparative perspectives in which southwestern Ecuador is a significant—but no longer the only—vantage point for understanding the evolution of Formative societies in the equatorial Andes.

Las transformaciones culturales asociadas con el Formativo son claves para nuestro entendimiento de la prehistoria americana. En los andes ecuatoriales, la península Santa Elena y las zonas cercanas del suroeste de Ecuador, nos han presentado un temprano y robusto conjunto de datos arqueológicos sobre las transformaciones del Arcaico al Formativo como las culturas arqueológicas de Las Vegas, Valdivia, Machalilla, y Chorrera. Sin embargo, investigaciones recientes en zonas aledañas de los Andes ecuatoriales muestran que las transformaciones que ocurrieron en el suroeste de Ecuador fueron acompañadas por desarrollos coetáneos pero distintos en el sur de Ecuador y el norte del Perú. Investigaciones recientes (2006–2007) en el Departamento de Tumbes, Perú, descubrieron datos nuevos sobre el proceso Formativo y sus antecedentes en tres sitios: El Porvenir, Santa Rosa, y Uña de Gato. Entre otros hallazgos, se incluyen los restos de una estructura del la época Arcaica de A.C. 4700–4330, una casa elíptica con tamaño 12.8 × 11 m con una fecha de A.C. 3500–3100, y una secuencia de estructuras que marca el cambio ca. A.C. 950/800 a 500 de estructuras elípticas hechas de palma y poste a estructuras rectangulares hechas de bahareque. Además, las excavaciones establecieron el desarrollo de arquitectura pública que comenzó posiblemente para A.C. 1400 pero claramente fue establecida para A.C. 1000–800, una época marcada también por un cambio fundamental en los patrones de asentamiento en cual Uña de Gato fue el centro regional y El Porvenir una aldea pequeña. En fin, los descubrimientos nuevos de Tumbes y otros datos comparativos nos presentan una visión amplia en cual la península de Santa Elena representa una importante, pero no la única, punto de vista para entender la evolución de las sociedades del Formativo enlos Andes ecuatoriales.

Marked by pivotal transformations in New World prehistory (Ford 1969; Reichel-Dolmatoff 1959; Willey and Phillips 1958), understanding the cultural patterns associated with the Formative period has been a far-reaching, varied, and significant domain of archaeological inquiry throughout the Americas. Of the many regions where Formative transformations have been investigated, southwestern Ecuador has provided an extremely early and complex archaeological record (Bischoff and Gamboa 1972, 2006; Bruhns 2003; Idrovo Urigüen 1999; Lathrap 1971; Lathrap et al. 1975; Lathrap et al. 1977; Lumbreras 2006; Marcos 1978, 1998, 2003; Marcos and Michczynski 1996; Marcos et al. 1999; Meggers 1966; Meggers et al. 1965; Raymond 1998, 2003; Raymond et al. 1980; Zeidler 2008). Over the last five decades, archaeological research has focused

Jerry D. Moore ■ Department of Anthropology, California State University Dominguez Hills, 1000 E. Victoria St., Carson, CA 90747 (jmoore@csudh.edu)

Latin American Antiquity 21(2), 2010, pp. 172–197

on the developments associated with the Valdivia, Machalilla, and Chorrera traditions (Evans and Meggars 1957; Hill 1975; Holm 1985; Meggers and Evans 1962; Meggers et al. 1965; Staller 2001a, 2001b; Zeidler 2003, 2008; Zeidler and Pearsall 1994; Zevallos and Holm 1960). Combined with excavations at earlier Archaic Las Vegas culture sites (Malpass and Stothert 1992; Stothert 1988, 2003), investigations at Valdivia sites such as Real Alto and Loma Alta (Damp 1979, 1984, 1988; Lathrap 1971; Lathrap et al. 1975; Lathrap et al. 1977; Marcos 1978, 1998, 2003; Marcos and Michczynski 1996; Marcos et al. 1999; Ubelaker 2003; Zeidler 1984, 2000, 2008) and archaeological surveys (Marcos 2003; Schwarz and Raymond 1996) have resulted in a particularly rich body from southwestern Ecuador. J. Scott Raymond has written:

> Just as the Viru valley for many years was the peephole through which Peruvian prehistory was viewed, so the Santa Elena region has been the vantage point from which the Ecuadorian Formative has been interpreted. Although there has been a concerted effort to counter the narrow regional bias of the peninsula through research in the Guayas basin [Raymond et al. 1980], in the valleys of the El Oro province ... and in the wet lowlands of Esmeraldas ..., the sequence from Santa Elena and the neighboring Valdivia and Chanduy valleys still serve as the principal framework for organizing, understanding, and explaining the Formative societies, particularly during the earliest phases [2003:35].

As Burger (2003) has cogently observed, discussions of the "Ecuadorian" Formative are, in a sense, misnamed, projecting early-nineteenth-century political divisions deep into the prehispanic past (Staller 2000). Rather than a process unique to southwestern Ecuador, an emerging body of data indicates that parallel and coeval but distinctive Formative developments occurred elsewhere in the equatorial Andes of southern Ecuador and northern Peru. Archaeological data from the southern Ecuadorian highlands (Bruhns 2003; Guffroy 2004; Idrovo Urigüen 1999; Temme 1999), the southern Oriente region (Valdez 2008; Valdez et al. 2005), and the south coast of Ecuador (Staller 1994, 2000, 2001a, 2001b) suggest the need for a broader, comparative perspective on Formative developments in the equatorial Andes (Zeidler 2008).

Contributing to this reassessment, recent (2006–2007) excavations in the Department of Tumbes, Peru, have uncovered a surprisingly rich architectural record for the Archaic and Formative periods spanning ca. 4700–300 B.C.E. The following discussion summarizes prehistoric architectural data from three sites in the Tumbes region with significant Formative deposits: El Porvenir, Uña de Gato, and Santa Rosa (Figures 1–5). Located on the edges of the floodplains of the Zarumilla and Tumbes rivers, the material records of these sites indicate diachronic changes in domestic architecture, public architecture, and settlement patterns. Although other classes of archaeological data were recovered during the excavations and have been reported elsewhere (Moore 2008; Moore et al. 2008; Pajuelo 2006, 2007, 2008; Vilchez et al. 2007), the present article focuses on significant diachronic and regional variations in Formative architecture and built environments in the equatorial Andes.

There are solid theoretical reasons for focusing on Formative architecture. The built environment is reflective and constitutive of human behavior (Moore 1996, 2005:3–5), concretely expressing key aspects of Formative transformations, such as the development of sedentism, the evolution of social complexity, and the creation of new social orders (Beck et al. 2008; Flannery 1972, 2002; Joyce 2004; Lesure 1999; Lesure and Blake 2002). For example, Raymond has suggested that even during the Archaic period in southwestern Ecuador "shelters, flimsy as they may have been, were laden with social value and played a symbolic role" and further proposes that "symbolically, then, the concept of 'house' may have distinguished the local community within a region and identified and structured relations among socio-residential units within a community" (2003:39, 52). Further, the construction of earthen mounds and other forms of "monumental" architecture may reflect reorganizations of social inequality and, in turn, become the physical referents for new social relations. Similarly, Heckenberger writes of the *monu-mentalité* of prehispanic settlements in Amazonia, noting that constructed earthworks "are particularly critical" for understanding those societies (2005:123). Finally, an energetics approach to public architec-

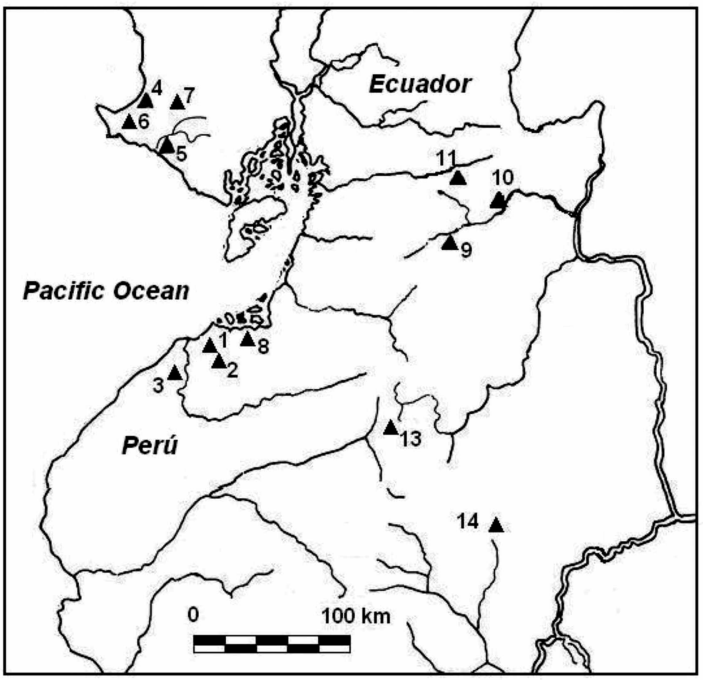

Figure 1. Sites discussed in the article. 1. Uña de Gato, 2. El Porvenir, 3. Santa Rosa, 4. Valdivia, 5. Real Alto, 6. OGSE-80, 7. Loma Alta, 8. La Emerenciana, 9. Challuabamba, 10. Pirincay, 11. Cerro Narrío, 12. La Vega, 13. Putushio, 14. Santa Ana-La Florida.

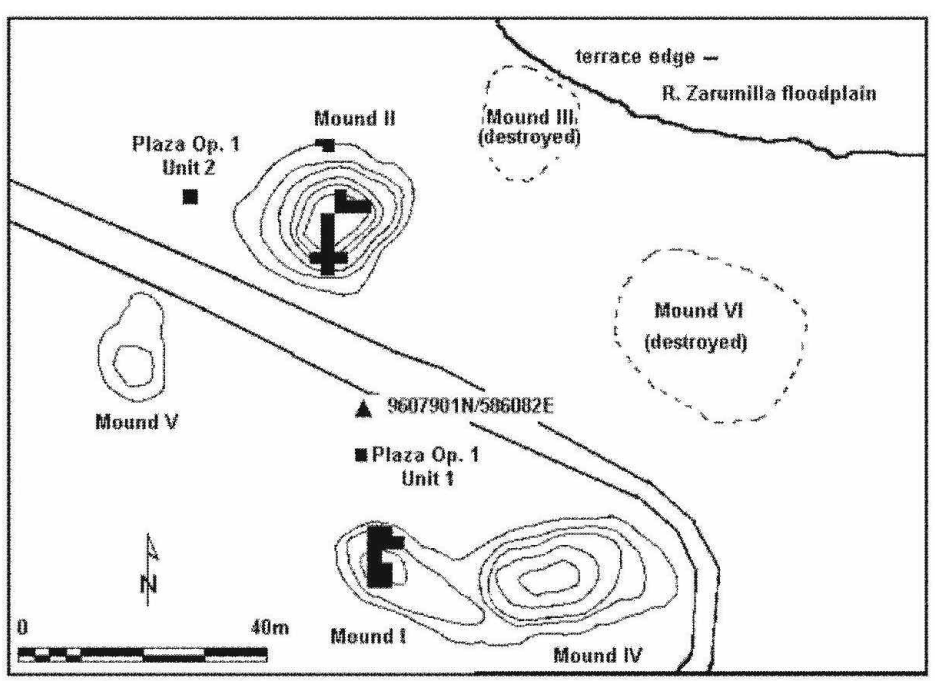

Figure 2. El Porvenir, Site Plan.

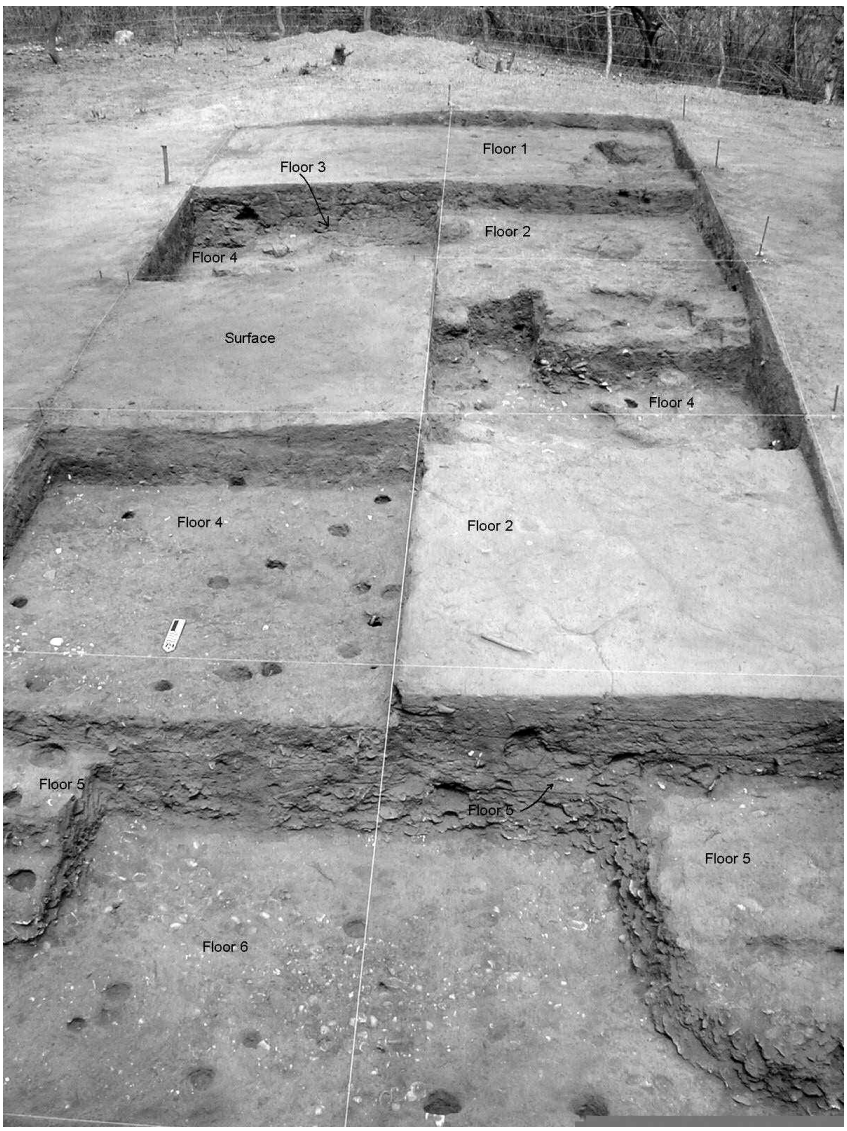

Figure 3. El Porvenir, Mound I, Superimposed Floors (view to south).

ture (Abrams 1989; Childe 1974; Moore 1996; Vega-Centeno 2007) may provide insight into the concentration of political power and the degree of sociopolitical complexity among different societies. This is well-traveled theoretical ground and suggests that a focus on architecture and settlement plans is analytically appropriate for a comparative study of the Formative period in the equatorial Andes.

After a brief summary of archaeological investigations in the Department of Tumbes, I present evidence regarding domestic architecture, public architecture, and settlement patterns for Formative Tumbes. I compare the Tumbes data against evidence from Formative sites within a 200-km radius, including the Santa Elena Peninsula, the highlands of El Oro, and the Oriente of Zamora-Chinchipe. This delineation excludes important cases farther to the north (e.g., Currie 1995; Lunniss 2008; Villaba 1988; Zeidler and Pearsall 1994) and south (Guffroy 1994; Guffroy et al. 1989; Kaulicke 1998), but some limits to the scope of this article are nec-

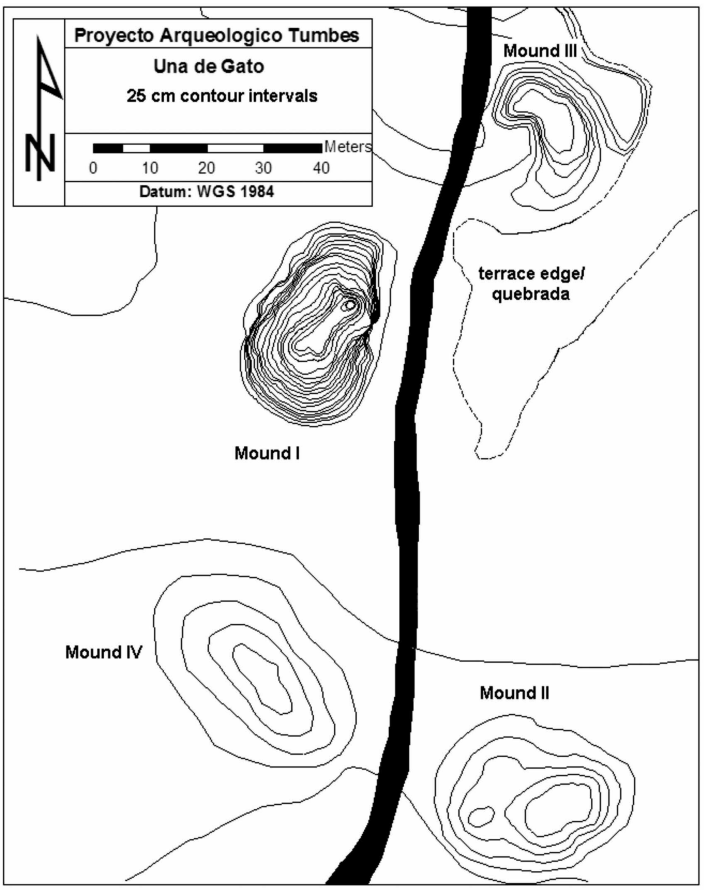

Figure 4. Uña de Gato, Site Plan.

essary. In brief, the comparative data indicate that the Formative period of the equatorial Andes was marked by distinctive, but interacting, regional traditions—thus broadening our vantage point for understanding Formative developments.

Previous Research and Archaeological Background

In general prehistoric Tumbes has been ignored, archaeologically considered a "cultural backwater" (Staller 2000). The Proyecto Arqueológico Tumbes is a multiphase research program designed to reform that perspective. In 2006 and 2007 excavations were conducted at four archaeological sites, three of which contain Formative occupations: El Porvenir, Uña de Gato, and Santa Rosa, sites recorded during a 1996 archaeological reconnaissance in the Tumbes region (Moore 2008; Moore et al. 1997). Before 1996, only 27 sites were recorded for the entire Department of Tumbes (Ishida 1960; Izumi and Terada 1961, 1966; Kauffman Doig 1987; Ravines 1973; Ravines and Matos 1983), and until 2003 the only major systematic excavations were the University of Tokyo's 1958 and 1960 investigations at the sites of Garbanzal and Pechiche, which involved only 13 days of excavation (Izumi and Terada 1966:1; Mejía Xesspe 1960:207). Seven radiocarbon dates obtained during the University of Tokyo's excavations were the only absolute dates available for the Department of Tumbes (Izumi and Terada 1966) and suggested a simple tripartite division of prehistory (modeled after Meggars's Ecuadorian framework): Formative (1800–500 B.C.E.), Regional Development (500 B.C.E.–500 C.E.), and Integration period (500–1500 C.E.; for additional discussion, see Currie 1985, 1989; Hocquenghem 1991, 1998; Hocquenghem et al. 1993; Izumi and Terada 1966; Richardson et al. 1990; cf. Moore 2008; Moore et al. 2008).

Table 1. Chronological Revisions, Department of Tumbes.

Pre-2003 Chronology*	Chronological Revisions Since 2003
Integration Period C.E 500/800 – 1532	**Integration Period**: Inca Conquest C.E.1470-1532* Chimú contact C.E.1400 – 1470
Regional Development 500 B.C.E. – C.E. 500/800	**Late Regional Development**: Late Jambelí C.E. 1200 -1500* Lambayeque contact/Middle Sicán C.E. 900 – 1100??
Formative 1800 ??? – 500 B.C.E	**Middle Regional Development** C.E. 800 – 1200 **Early Regional Development:** Middle Garbanzal 300 B.C.E.??? – C.E. 800??
* From Richardson 1990, Estrada et al 1964; Izumi and Terada 1966	**Late Formative:**Early Garbanzal—1000 – 300 B.C.E.* **Middle Formative**: 1550 – 1000 B.C.E. Pechiche 2000 – 1000 B.C.E.* Late Valdivia 2500 – 2000 B.C.E. **Early Formative**: 3500 – 1550 B.C.E.* **Archaic**: 4700 - 3500 B.C.E.*
	* Based on current calibrated C14 dates; other periods based on ceramic stylistic correlations

Consequently, a principal research goal has been revising this imprecise temporal framework (Table 1). While a detailed discussion of the proposed chronological revisions lies outside the focus of this article (see Moore 2008, for a discussion), several observations are relevant. First, the Archaic occupation of Tumbes dates to before 4700–4330 B.C.E. (Table 2). Second, the Formative period is significantly earlier than previously thought, dating to ca. 3500–3100 B.C.E. Third, the previously defined ceramic typologies for Tumbes and their chronological associations (Estrada et al. 1964; Izumi and Terada 1966) have proven to be incorrectly dated, loosely associated, and complicated by presumed connections with sequences from other regions (for discussion, see Moore 2008; Moore et al. 2008; Pajuelo 2006; Pajuelo and Moore 2005).

As noted above, Formative deposits were uncovered at three archaeological sites in the Tumbes region. The site of El Porvenir is located on a terrace on the western floodplain of the Río Zarumilla (Figure 2). The site consists of a group of six mounds surrounding an open area or possible plaza and comprising an area of 300 × 100 m (Vilchez et al. 2007). By the time of the 2006 excavations, three of the mounds had been partially or extensively destroyed by modern constructions, but Mounds I, II, and III were largely intact, with basal areas of 750–800 m^2 and maximum heights of 1.0–1.6 m. Excavations focused on Mounds I and II and proceeded in block excavations by natural and cultural layers, exposing a stratigraphic sequence in an archaeological palimpsest of superimposed floors (Figure 3). These block excavations were supplemented by two test pits in the intervening plaza area and two pits in a thick midden deposit on the north side of Mound II.

The site of Uña de Gato is located 1.2 km northwest of El Porvenir, also on the western terrace of the Rio Zarumilla (Figure 4). The core of the site covers an area of approximately 225 × 175 m, marked by the remains of four large artificial mounds built around an irregular open space. These mounds have been partially destroyed by modern construction and road building. Mound I measures 32 × 23 m at its base and has a maximum height of 5.4 m, approximately 70–80 percent of its original size. Mound II is a stepped platform mound, which in 1996 had measured 42 × 26 m (Moore et al. 1997) but by 2007 had been reduced to 33.7 × 24.3 m. Mound II is 1.6 m tall, itself a reduction from its original height. Mound III was 16 × 16 m in area and had a height of 1.25 m when recorded in 1996 (Moore et al. 1997), but subsequent destruction has left an intact area of less than 40 m^2. Mound IV measured 13 × 9 m in area and stood 1.0 m tall in 1996. Modern houses now cover Mound IV, and the 2007 excavations were conducted only at Mounds I, II, and III. In addition to the central core of Uña de Gato, a more extensive area of midden covers an area of 500–600 × 300 m along the terrace escarpment, the remains of a once-larger site reduced by erosion and human destruction.

The site of Santa Rosa is located on the western bank of the Rio Tumbes (Moore et al. 2008). The central portion of the site consists of three areas

Table 2.

BETA Sample No., Provenience, Material Type	^{14}C Yrs ± δ B.P.	δ^{13}C‰	Adjusted to Local Reservoir Effect	Cal A.D. Yrs ±2σ
Uña de Gato				
239627 Mound I, Operation 1, Unit 1, Level 2, Chared Material	2390±40	-25.9‰	n/a	BC 730-690 or BC 540-390
239628 Mound I, Profile 9, Level A, Shell	2610±50	-1.1‰	2980±70	BC 940-710
239629 Mound I, Profile 12, Level B, Charred Material	2770±40	-20.2‰	n/a	BC 1010-820
239630 Mound I, Profile 8, Level C, Charred Material	2770±50	-26.0‰	n/a	BC 1020-810
239631 Mound I, Profile 8, Level D, Charred Material	2810±50	-26.6‰	n/a	BC 1120-840
239632 Mound II, Operation 1, Unit 4, Level 10, Charred Material	2770±50	-23.8‰	n/a	BC 1020-810
239633 Mound II, Operation 2, Unit 2, Level 12, Shell	3840±40	0.3‰	3620±60	BC 1720-1430
239634 Mound II, Operation 2, Unit 2, Level 16, Charred Material	3130±40	-23.9‰	n/a	BC 1490-1360 or 1350-1310
239635 Mound III, Operation 1, Unit 1, Level 9, Shell	3060±50	-0.5‰	2840±60	BC 780-450
239636 Mound III, Operation 2, Unit 2, Level 3, Shell	3770±60	0‰	3550±70	BC 1660-1360
239637 Mound III, Operation 2, Unit 1, Level 3, Charred Material	3670±60	-24.4‰	n/a	BC 2200-1890
239638 Mound III, Operation 2, Unit 1, Level 3, Shell	3600±60	-0.5‰	3380±70	BC 1440-1110
Santa Rosa				
239639 Compound I, Operation 1, Unit 1, Level 1, Shell	5179±70	-2.3‰	4950±80	BC 3520-3090
239640 Compound I, Operation 1, Unit 2, Level 4, Charred Material	4440±60	-27.1‰	n/a	BC 3350-2910
239641 Compound I, Operation 1, Unit 13, Level 8, Shell	5010±60	-0.6‰	4790±70	BC 3330-2900
239642 Compound I, Operation 2, Unit 1, Level 13, Shell	4850±60	-2.5‰	4630±70	BC 3070-2740
239643 Compound II, Operation 1, Unit 8, Level 2, Charred Material	4560±40	-23.5‰	n/a	BC 3370-3270 or BC 3240-3110
El Porvenir				
222663 Mound 2, Unit 8, Level 3, Shell	2920±70	-1.7‰	2700±80	BC 720-290
222664 Mound 2, Unit 8, Level 3, Charred Material	2610±50	-26.4‰	n/a	BC 830-770
222665 Mound 2, Unit 8, Level 102 cm, Charred Material	2840±50	-22.2‰	n/a	BC 1130-880
222666 Mound 2, Unit 7, Level 3, Charred Material	2650±60	-22.7‰	n/a	BC 910-780
222667 Mound 2, Unit 8, Level 38 cm, Shell	2830±70	-0.9‰	2610±80	BC 530-150
222668 Mound 2, Unit 8, Level 51 cm, Shell	3090±70	-0.8‰	2870±80	BC 830-410
222669 Mound 2, Unit 8, Level 68 cm, Shell	2800±80	-0.6‰	2580±80	BC 520-80
222670 Mound 2, Unit 8, Level 96 cm, Shell	3080±70	-1.8‰	2860±70	BC 820-400
222671 Mound 2, Unit 8, Level 102 cm, Shell	6160±60	-3.4‰	5940±70	BC 4540-4290
222672 Mound 2, Unit 5, Level 6, Charred Material	3050±50	-24.3‰	n/a	BC 1420-1190
222673 Mound 2, Unit 6, Level 2, Shell	5320±60	-2.8‰	5100±70	BC 3640-3350
222674 Mound 1, Unit 3, Level 7, Charred Material	2680±50	-24.4‰	n/a	BC 920-790
222675 Mound 1, Unit 6, Level 4, Charred Material	2680±50	-23.1‰	n/a	BC 940-800
222676 Mound 1, Unit 6, Level 5, Charred Material	2660±50	-23.5‰	n/a	BC 920-790
222677 Mound 1, Unit 1, Level 7, Charred Material	2920±50	-25.0‰	n/a	BC 1280-970
222678 Mound 1, Unit 10, Level 5, Shell	3130±70	-0.4‰	2910±80	BC 890-500
222679 Mound 1, Unit 6, Level 6, Shell	3790±90	-1.6‰	3570±80	BC 1730-1310
222680 Plaza, Operation 2, Unit 1, Level 3, Shell	3960±60	-0.8‰	3740±70	BC 1900-1530
222681 Plaza, Operation 2, Unit 1, Level 4, Shell	5830±50	-2.3‰	5610±60	BC 4220-3940
222682 Mound 1, Unit 8, Level 5, Shell	3380±70	-0.2‰	3160±80	BC 1240-800
222683 Mound 1, Unit 8/5, Level 6, Shell	6260±70	-2.5‰	6040±80	BC 4700-4340
222684 Mound 2, Unit 1, Level 4, Shell	6270±90	-3.1‰	6050±100	BC 4750-4320

originally referred to as "compounds," although excavations subsequently showed that this term is misleading (Figure 5). Compound I covers an area of 38 × 44 m and at is southern end has a maximum elevation of 4.2 m above the surrounding natural surface. Compound II covers an area of 17 × 18 m and has a maximum elevation of 2.5 m. Compound III is a low mound covering 11 × 9.8 m. The

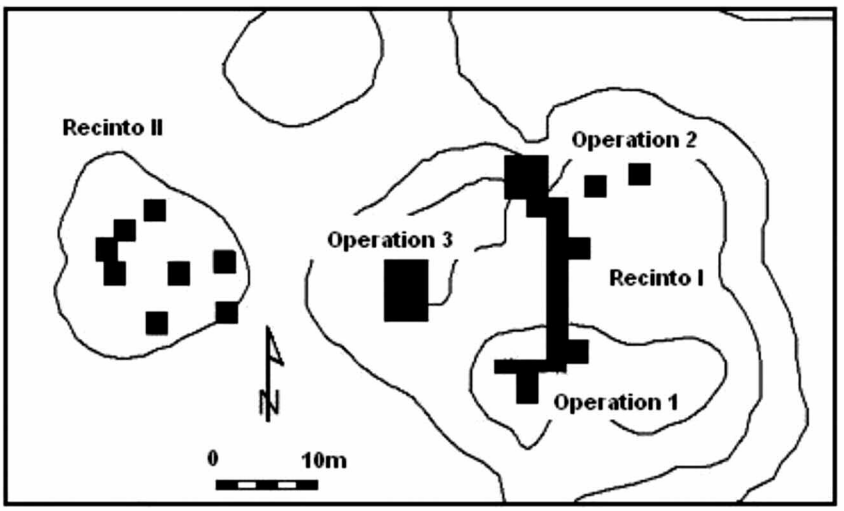

Figure 5. Uña de Gato, Site Plan.

excavation primarily focused on Compounds I and II, although two additional test pits were excavated in an area to the east where a diffuse deposit of domestic materials ("the barrio") covered an area of 200 × 200 m in 1996 (Moore et al. 1997). Unfortunately, modern agricultural developments since 1996 have all but destroyed this area, leaving a small intact deposit of 50 × 30 m. All of the architectural features from Santa Rosa discussed below come from the excavations in Compounds I and II.

Excavations at the sites of El Porvenir, Santa Rosa, and Uña de Gato documented significant shifts in domestic architecture, public architecture, and settlement patterns during the Archaic and Formative periods in the Department of Tumbes. The distinction between "domestic" and "public" architecture is not intended to be rigid. As Bowser and Patton (2004) have shown, significant political negotiations occur within domestic settings, particularly within nonhierarchical societies, and the most public of spaces may be the loci for a variety of activities (see, e.g., Low 2000). Yet, for my immediate purposes, the distinction is useful. The constructions described as "domestic architecture" are relatively modest constructions associated with evidence of domestic activities—food preparation, tool maintenance, small-scale rituals, and so on. In contrast, the buildings described as "public architecture" are significantly larger, more complex and varied constructions, exhibiting more elaborate decorative elements and lacking evidence of domestic activities. For these reasons, it makes sense to discuss and compare these constructions separately, which is then followed by a brief discussion of settlement patterns.

Archaic and Formative Domestic Architecture from Tumbes

Excavations partially uncovered the remains of eight Archaic and Formative domestic structures at El Porvenir and Santa Rosa. The earliest structures (n = 6) are the remains of relatively substantial elliptical pole-and-thatch structures, while the latest structures (n = 2) were rectangular dwellings built with wattle-and-daub walls. The following briefly describes the archaeological remains that are more fully described elsewhere (Moore et al. 2008; Vilchez et al. 2007).

Elliptical Structures

The earliest architectural feature was found at El Porvenir in Mound I and consists of a well-defined floor, a curved alignment of paired post molds, and two additional posts that indicate a circular structure estimated to be 18–20 m^2 (Moore 2007; Figure 6). Although no intramural features such as hearths were found in association, the presence of food remains suggests that this was a residential structure; no ceramics were found in association

Figure 6. El Porvenir, Mound I, Units 5 and 8, elliptical structures, paired postholes in Floor 6 (lower) and Floor 5 (upper right corner); view east.

with the floor. The structure is overlain by a thick and dense midden of oyster shell (*Ostra columbensis*) also exposed in excavations across the site of El Porvenir. A radiometric sample immediately above the floor (BETA-222683), calibrated at two sigmas, dates to 4700–4340 B.C.E.; two other assays from the same oyster midden have calibrated dates of 4540–4290 B.C.E. (BETA-222671) and 4220–3940 B.C.E. (BETA-222681). The architectural feature predates the oyster midden and thus dates to the Archaic.

The next-oldest known dwelling is an elliptical structure from Santa Rosa, Compound II, that measured 12.8 × 11 m; it was delineated by a 30- to 40-cm-wide cobblestone foundation and large postholes (25–30 cm and 45–48 cm in diameter) in the center of the structure (Figure 7). Encircling a space of 120 m^2, the structure probably was constructed similar to Shuar dwellings in which large upright posts support a thatched roof (Descola 1996; Rostain 2006; Zeidler 1984). An associated radiocarbon sample of charred material (BETA-239643) produced calibrations of 3490–3470 B.C.E., 3370–3270 B.C.E., or 3240–3110 B.C.E.; no ceramics were found in association. The elliptical structure is coeval with an ashy, deeply buried, low-density midden found across the site of Santa Rosa dated to 3330–2900 B.C.E. (BETA-239641) and 3070–2740 cal B.C.E. (BETA-239642). Further, the structure and midden are contemporary

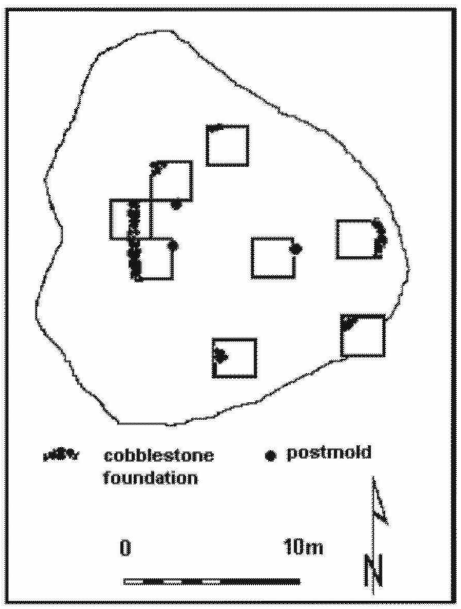

Figure 7. Santa Rosa, Compound II, elliptical structure, cobblestone foundations and postholes.

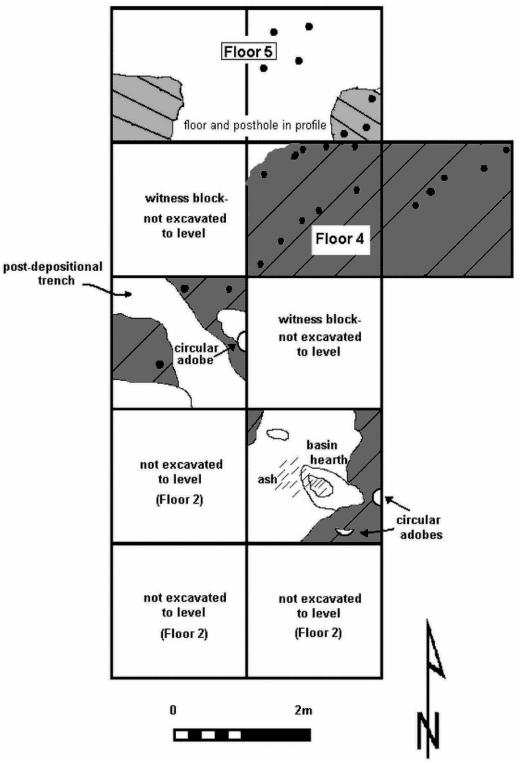

Figure 8. El Porvenir, Mound I, elliptical structures, Floors 4 and 5.

with a large (2.1-m-diameter) formal circular hearth, undisturbed since its last use, which produced a 100+ g sample of wood charcoal that dated to 3350–2910 cal B.C.E. (BETA-239640). The dates from the elliptical structure, ashy midden, and circular hearth indicate an early Formative occupation at Santa Rosa contemporary with Valdivia phases 1 and 2 (Marcos and Michczynski 1996; Marcos et al. 1999; Zeidler 2003).

The partial remains of four elliptical structures constructed between ca. 1200 and 300 B.C.E. were exposed during excavations at El Porvenir. Two of the structures were found in Mound I (Figure 8); two were found in Mound II. One of the Mound II structures was too destroyed to reconstruct its plan (see below), but the three other El Porvenir dwellings were similar constructions with paired postholes indicating curving walls and floors made from thick layers of clay. Presumably, all these structures had some form of thatched roofing. None of these structures was completely exposed, but in several cases enough of the structure was excavated to roughly estimate its minimum size. The earliest structure (Mound I, Units 5 and 8, Floor 5) dating to 1240–800 B.C.E. (BETA-222682) had been largely destroyed by subsequent constructions, but three sets of paired postholes, a larger interior posthole, and sections of intact floor indicate an elliptical structure approximately 5–6 × 3–4 m in area. Subsequently, an elliptical structure (Floor 4) was built on Mound I, its construction dating to 1100–800 B.C.E. based on bracketing radiometric samples (BETA-222682, -222674). This elliptical structure is indicated by paired postholes, a thick well-made clay floor, and a basin-shaped hearth. This structure would have measured approximately 8 × 6 m.

Two other structures were found in El Porvenir, Mound 2. One structure is indicated by a few sections of thick gray floor and a basin hearth; a ^{14}C date based on a charcoal sample from the floor dates to 910–780 B.C.E. (BETA-222666). Because of the poor preservation, it is impossible to determine the original dimensions or additional architectural details about this structure. A second, more intact elliptical structure at Mound 2 (Units 1, 3–4, 12–13) was indicated by a curving alignment of small postholes, large postholes, and a clay floor, suggesting a structure approximately 7 × 3–4 m in

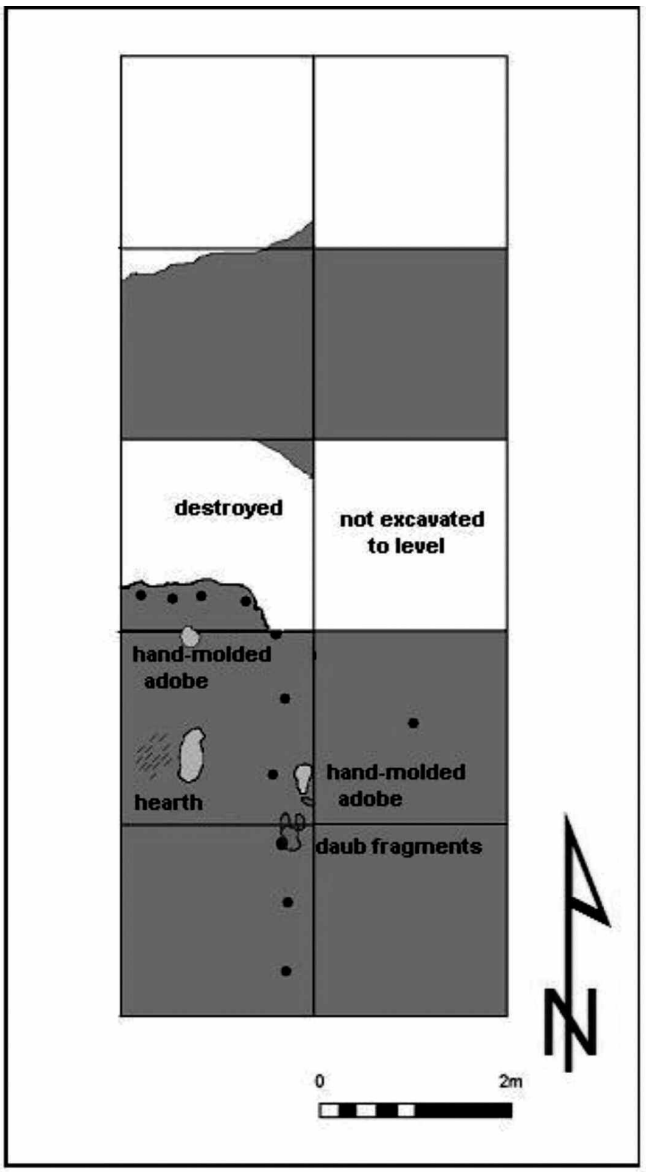

Figure 9. El Porvenir, Mound I, rectilinear structure, Floor 2.

area. Based on bracketing dates, this floor dates to ca. 800–500 B.C.E.

Rectangular Structures

The remains of two rectangular wattle-and-daub structures were uncovered from late Formative contexts at El Porvenir, one each from Mounds I and II. The Mound I house was indicated by a two perpendicular alignments of post molds anchored by a corner post mold 17 cm in diameter (Figure 9). Approximately 25 percent of the structure was exposed, suggesting a construction at least 8 × 4 m in size. A well-preserved clay floor, a simple hearth, food debris, and utilitarian ceramics indicate a domestic structure. The Mound II house is marked by a well-preserved clay floor 9.2 × 4.25 m in size (Figure 10); although no post molds were found, clay daub associated with the floor exhibits cane imprints, and one fragment is from an exterior, right-angled corner of a structure.

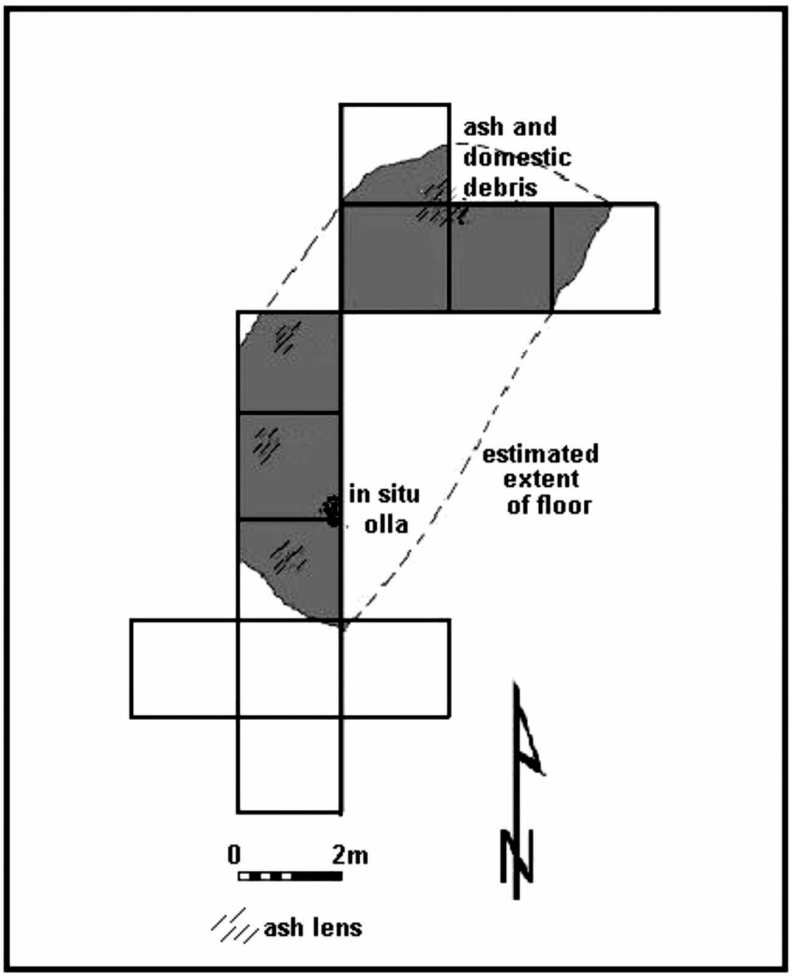

Figure 10. El Porvenir, Mound II, rectilinear structure, Floor 1.

The wattle-and-daub residences were built sometime after 950–800 B.C.E. In Mound I, a charcoal sample from below the rectangular floor (BETA-222674) dated to 920–790 B.C.E. In Mound II, a charcoal sample below the rectangular floor (BETA-222666) dated to 910–780 B.C.E. Further, excavations in a stratified midden on the northern edge of Mound II uncovered dense concentrations of daub in layers dating from 790 to 370 B.C.E. (BETA-222669). Therefore, I suggest that the shift from elliptical to rectangular structures occurred between 950–800 and 500 B.C.E. in the Department of Tumbes.

Formative Public Architecture from Tumbes

Currently, the only known Formative period public architecture in the Tumbes region is from Uña de Gato. The earliest known public architecture is a ramped mound (Mound II) built in the middle of the second millennium B.C.E. (Figure 11). In this first construction phase, I estimate that Mound II measured 20 m (north–south) × 26 m (east–west) and had a maximum height of .7–1.0 m. The mound was surfaced with a 3-cm-thick cap of gray clay that covered fill. This first phase was constructed at approximately ca. 1490–1430 B.C.E. A marine shell sample from the surface of the ramp (BETA-239633) is calibrated to 1720–1430 B.C.E. A charcoal sample from below the ramp surface (BETA-239634) calibrates at two sigmas to 1490–1360 or 1350–1310 B.C.E. Although the dates could indicate stratigraphic mixing, the intact ramp surface indicates that the stratigraphy has not

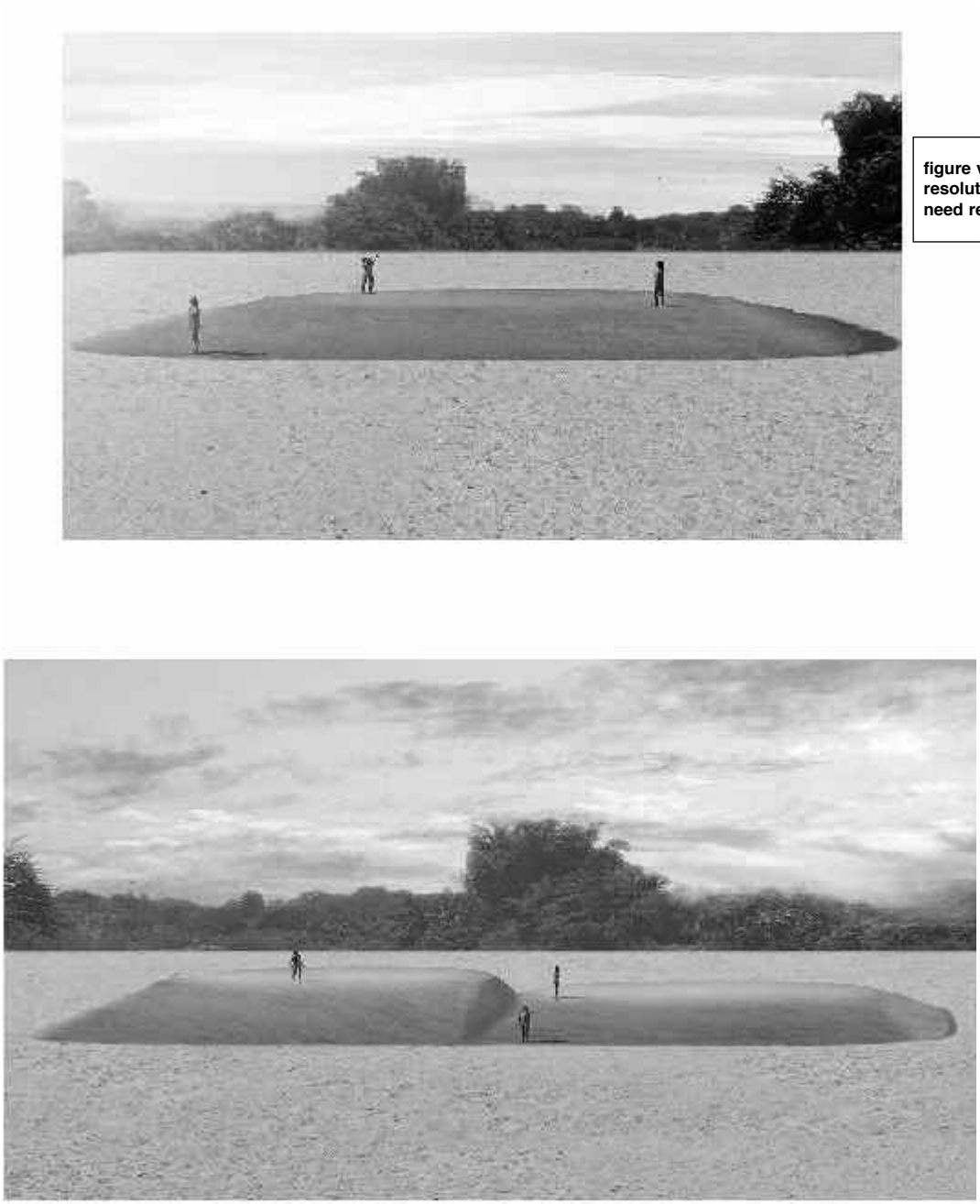

figure very low resolution need replacement

Figure 11. Uña de Gato, Mound II, Reconstructions of Building Phases: (upper) Initial Construction Phase; (lower) second construction phase showing eastern addition. Reconstructions drawn by Edward K. Hudson.

been disturbed, tentatively suggesting that the ramped mound was built sometime after 1490–1430 B.C.E.

Subsequently, Mound II was expanded to the east and raised to create a larger, taller, stepped platform mound (Figure 11). The base of the mound covered an area of 42 m (east–west) × 26 m (north–south), with a maximum height of 1.5–2 m. The eastern extension was built using a variation of a box and fill technique, involving construction

figure very low resolution need replacement

Figure 12. Uña de Gato, Mound I, Reconstructions of Building Phases: (upper) Initial Construction Phase; (middle) third construction phase showing bench-like extension; (lower) final construction phase. Reconstructions drawn by Edward K. Hudson.

of a retaining wall from courses of hand-molded, "bread loaf" adobes and then filling the space between the wall and the original eastern edge of Mound II. A radiocarbon sample from Mound II, Operation I, Unit 4, Level 10, resulted in a calibrated date of 1020–810 B.C.E. (BETA-229632).

Contemporary with the Mound II extension, construction began on Mound I, which ultimately became the largest public architecture at Uña de Gato. Currently measuring 32 × 23 m at its base and 5.4 m tall, with a volume of 1,426 m^3 (Figure 4), the modern mound represents an estimated 70–80 percent of the prehispanic construction, suggesting an original volume of 1,700–2,000 m^3.

Table 3. Uña de Gato, Mound I: Construction Phases, Volumes, and Dates

	% of volume (est.)	cal BCE (2 sigmas)	sample
Phase 1	17	n/a	
Phase 2	4	940 – 710	BETA-23929
Phase 3	23	1010 -820	BETA-23930
Phase 4	56	1120 – 840	BETA-23931

Based on stratigraphic exposures on the eastern side of Mound I, the mound was built in at least four stages over a relatively brief time during the tenth century B.C.E. (Figure 12; Table 3). Initially, Mound I was a relatively small platform mound about 1.65 m tall built from yellow-brown, hand-modeled "loaf-shaped" adobes set in a gray clay matrix. The initial mound was topped with a gray clay floor, and its sides were covered with red stucco. Subsequently, the mound was covered with a layer of fill and coated with a layer of gray clay. The third construction phase involved extending Mound I northward by building a bench-like extension and thus forming a stepped platform mound. In the fourth and final construction phase, this bench surface was filled in and the mound was raised and surfaced with a grayish brown clay.

If the construction phases in the northeastern profile characterize the entire mound, then apparently most of Mound I was constructed during the final phase 4. A very approximate estimate of construction effort can be derived using these proportions and labor estimates obtained by Erasmus (1965), who determined that a workman using traditional hand tools could excavate approximately 2.6 m^3 per day. Using the estimated volume of 1,700–2,000 m^3, then approximately 650–770 person-days were required to excavate the material incorporated into the mound. Doubling that estimate to include transport and construction indicates that approximately 1,300–1,500 person-days were required to build Mound I—a project for 20 people working two to three months.

Just east of Mound I, a distinct series of constructions were built in the extensively damaged Mound III. Sometime after 2200–1100 B.C.E. and before 780–450 B.C.E. a small mound was built from hand-modeled, semispherical adobes made from dark red clay. Subsequently, a rectangular building was constructed, cutting into the red adobe mound. Only a small portion of this construction was preserved, insufficient to estimate its original size, though it was 3.5 m on one axis. Based on a radiometric sample of marine shell (BETA-239635), the structure dates to 780–450 B.C.E. This structure was built with a lower half-wall of "bread loaf" adobes, topped by a wattle-and-daub wall and enclosing a well-plastered floor. The interior walls of this structure had been painted and decorated with a simple form of bas-relief. Daub fragments with cane impressions and traces of reddish brown stucco were found on top of the floor. One fragment displayed a rolled coil of clay pressed onto the still-wet daub; the coil formed a right angle. Notably, all the decorated daub fragments were found with the painted surfaces down and immediately on the floor; the decorated fragments had fallen from inside the structure. This is the only example of interior decoration currently known from a Formative construction in the Department of Tumbes.

Summary of Archaic and Formative Architectural and Settlement Patterns in Tumbes

First, the earliest structures at El Porvenir and Santa Rosa indicate that substantial, relatively large structures were constructed in the Tumbes region by the fifth and fourth millennia B.C.E. As discussed below, the Tumbes structures are significantly larger and more substantial than contemporary dwellings known from early Valdivia settlements (Damp 1984, 1988; Raymond 2003; Zeidler 1984). Currently, no dwellings of this antiquity have been reported from El Oro or adjacent areas of northern Peru (Guffroy 2004; Staller 1994).

Second, a basic shift from elliptical pole-and-thatch dwellings to rectangular wattle-and-daub houses occurred ca. 950/800–500 B.C.E. in the Department of Tumbes. Similar variations from circular to rectangular structures have been observed in diverse archaeological traditions, interpreted as reflecting multiple factors including the evolution of agrarian economies, an increased emphasis on interior storage, and the development of extended-family residential groups, among other factors (Flannery 1972, 2002). Based on current archaeological knowledge from Tumbes, none of these factors obviously applies. Agriculture was established at Real Alto by Valdivia phase 3 B.C.E.

in southern Ecuador (Pearsall 1978, 2002; Pearsall and Piperno 1990; Zarrillo et al. 2007; cf. Staller and Thompson 2002), and maize phytoliths are reported from the even earlier Las Vegas site (Stothert et al. 2003); there is every reason to think that maize-based agrarian societies long preceded the 950/800–500 B.C.E. shift from elliptical to rectangular dwellings (Tykot and Staller 2002). Neither is there any evidence for an increase in intramural storage; there are no known storage pits or bins associated with either elliptical or rectangular structures. And finally, there is no evidence for the development of extended-family residential groups associated with the shift from elliptical to rectangular dwellings. House sizes are broadly similar—15–48 m^2; rectangular dwellings are not larger than elliptical ones, nor are they multiroomed constructions. At this early stage of archaeological research in the Tumbes region, there is no clear explanation for this reorganization in domestic architecture, except to note that it seems associated with a change in building materials, specifically the shift from pole and thatch to hand-modeled adobes and wattle and daub. While hand-modeled adobes were incorporated into floors and hearths in elliptical pole-and-thatch structures, loaf-shaped adobes first appear in either linear walls or in mound construction. Although apsidal wattle-and-daub structures are known from other regions of the world, all wattle-and-daub structures known from the Tumbes region have rectangular plans, including the late prehispanic structure at Loma Saavedra (Moore et al. 2005) and modern constructions (Jerry D. Moore, field notes, June 2005). Thus, while it is known that dwellings changed from elliptical/apsidal to rectangular plan at ca. 950/800–500 B.C.E., it is unclear what this change implies.

Third, the creation of platform mounds began perhaps as early as ca. 1400 B.C.E. and was well established by 1000–800 B.C.E. Initially, mound construction involved the placement of unconsolidated fill that was then covered by clay floors, but as mound height increased, structural features were required to retain and support the fill. This took several forms. Hand-modeled adobe bricks were set in a mud matrix to create more stable volumes. Walls of "bread loaf" adobe bricks were used to retain mound fill. Associated with these changes is a significant increase in construction labor, with mound construction requiring the sustained effort of labor from multiple households. In contrast, building a pole-and-thatch dwelling required the residence group's labor, supplemented by short-term assistance from other men, similar to the arrangement described for the Shuar (Jívaro) in which the house owner is assisted by "one or two close male relatives" and a half-dozen men to carry the main house posts (Harner 1972:45).

Fourth, with the development of platform mounds between 1400 and 1000 B.C.E., settlement plans diverged. El Porvenir consists of a simple cluster around a central open space or plaza, while Uña de Gato has a central core marked by platform mounds and plazas surrounded by residential areas. The central core constructions at Uña de Gato were distinctive, incorporating diverse architectural forms, construction techniques (box and fill, fill and cob, adobe and wattle), and decorative elements (painted stucco, modeled reliefs). Unlike El Porvenir, which was marked by symmetries in settlement plan and architectural practices, Uña de Gato was characterized by distinctions—between a site core surrounded by a large residential zone and among the different forms of public architecture: tall mounds, stepped platform mounds, and wattle-and-daub constructions with decorated interior walls.

The creation of platform mounds suggests that a two-tiered settlement hierarchy had developed in the Tumbes region during the latter half of the second millennium B.C.E., in which Uña de Gato was the local center and El Porvenir was an affiliated hamlet, probably only one of several such communities (Moore et al. 1997). The hypothesis of the existence of a two-tiered settlement system is bolstered by Uña de Gato's and El Porvenir's differential involvement in long-distance obsidian exchange. Residents at both settlements had access to obsidian from two sources, principally from Mullumica, located 435 km to the northeast and due east of Quito, and to a lesser extent the Carboncillo source in the Saraguro region, approximately 115 km northeast of Tumbes (Ogburn 2007; Shackley and Ogburn 2008; cf. Burger et al. 1994). Although obsidian was relatively scarce at both sites, it was more commonly encountered at Uña de Gato, which possibly served as a redistributive center (Moore et al. 2008:269–271).

To summarize, archaeological data from Santa Rosa, El Porvenir, and Uña de Gato point to sig-

nificant diachronic variations in domestic architecture, public architecture, and settlement plan during the Archaic and the Formative periods. By the fifth and fourth millennia B.C.E., elliptical pole-and-thatch residences were built, an architectural pattern sustained until 950/800–500 B.C.E., when residences shifted to rectangular wattle-and-daub constructions. Platform mounds were first constructed perhaps by 1400 B.C.E. but were larger and incorporated more sophisticated construction techniques by ca. 1000–800 B.C.E. These developments also suggest the existence of a two-tiered settlement system in the Tumbes region in which Uña de Gato was a regional center. In short, the archaeological data from Tumbes contribute to a broader vision of Formative developments, especially when compared to data from adjacent regions.

Formative Trajectories in the Equatorial Andes: Comparative Perspectives

The archaeological data from Tumbes can be compared to archaeological patterns from other Formative period sites in Guayas (Damp 1979, 1984; Lathrap et al. 1975; Lathrap et al. 1977; Marcos 1978, 2003; Marcos and Michczynski 1996; Marcos et al. 1999; Raymond 2003; Stothert 1988; Zeidler 1984, 2000, 2003, 2008), El Oro (Staller 1994, 2001a, 2001b), Azuay (Grieder et al. 2002; Grieder et al. 2009; Temme 1999), Loja (Bruhns 2003; Gomis 1999; Guffroy 2004), and Zamora-Chichipe (Valdez 2008; Valdez et al. 2005). A broader comparative perspective points to marked regional variations in cultural trajectories during the Formative, variations expressed in domestic architecture, public architecture, and settlement plans.

Domestic Architecture

The earliest domestic architecture comes from the Archaic site of OGSE-80 on the Santa Elena Peninsula, where Stothert (1988:50–54) uncovered the remains of a relatively ephemeral structure less than 1.5 m in diameter, perhaps a temporary shelter (Raymond 2003:39), dating to 8018–7453 B.C.E. The sequence of Valdivia dwellings is more complete. Damp (1979, 1984, 1988) excavated a set of early Valdivia dwellings, indicated by elliptical patterns of small post molds and domestic debris. At Real Alto, the best-preserved Valdvia I dwelling, Structure 2-77, measured 4.5 × 3.2 m (14.4 m^2) as delineated by 30 postholes, 5–10 cm in diameter, that formed an elliptical wall and articulated with a center post. Sun-dried clay chunks interpreted as daub fragments were found on the floor. Damp (1979:211, 1984:578) suggests that Structure 2-77 dates to ca. 3250 B.C.E. At Loma Alta, the best-preserved dwelling was Structure 4, which dates to Valdivia I/II with an associated radiometric date of 2680 ± 160 B.C.E. (GX-7699). Structure 4 was an elliptical dwelling measuring 3.2 × 2.3 m and was built by excavating a wall trench and then placing the posts in the trench; this was indicated by a "ribbon-like feature" of organic material and some postholes (Damp 1984:579–580).

Middle Valdivia dwellings were significantly larger and more substantial than early Valdivia structures. For example, Valdivia phase 3, Structure 1, was

> a wall-trench house whose floor was a shallow saucer-shaped pit excavated about 21 centimeters into the sterile soil. The house was large and elliptical, measuring twelve by eight meters. Its walls, typical of Valdivia houses, were made of massive, closely packed, vertical logs placed in a continuous elliptical trench and covered with a thick coating of mud. Two pairs of interior posts supported a high gabled roof [Lathrap et al. 1977:8].

Zeidler (1984) documents architectural plans for 41 middle Valdivia structures, of which 15 were sufficiently complete to measure floor area and associate with specific phases in the Valdivia sequence. These data demonstrate a dramatic increase in house size between Valdivia I/II and Valdivia III and thereafter, with mean house sizes of 49.10 m^2 (Valdvia III), 51.60 m^2 (Valdivia IV/V), and 53.77 m^2 (Valdivia VI). In addition, data from eight "proto-Machalilla" structures—one of which was "rhomboidal," the only Real Alto dwelling not elliptical or circular—indicate a mean area of 70.37 m^2.

To date, no house plans have been published from Machalilla contexts, although partial excavations have encountered "two partial house floors in section during site testing in the Rio Verde drainage, indicating floor deposits between 20–30 cm thick as well as the presence of sub-floor hearths and a

sub-floor pit" (Zeidler 2008:467. No Chorrera house plans have been published.

Guffroy (2004) has published architectural data from the site of La Vega, located in the province of Loja. Structure 1 (Guffroy 2004:47–50) has an associated date of 2787 ± 94 B.P. (or 1212–797 cal B.C.E. at two sigmas) and dates to Catamayo B. The semicircular structure is 8 m long and 5 m at its greatest width and thus has a floor area of approximately 31 m^2. As reconstructed, Structure 1 had a curved foundation and sloping walls supported by a large central post, leaving the western side open. Extramural features indicated domestic activities. Some 25 m north of Structure 1 another set of architectural features (Structure 2) actually consist of two constructions: a circular foundation made of large cobbles set in mud mortar, followed by a rectangular construction marked by a double course of foundations. Neither building was complete, and the rectangular construction probably incorporated stones from the earlier construction. The circular structure is reconstructed as approximately 10 × 8 m (Guffroy 2004:50). Only a corner of the rectangular structure was preserved, but it was at least 7 × 3 m in area. A hearth inside the circular structure contained carbon dated to 2900 ± 60 B.P. (Guffroy 2004:57) or 1269–919 cal B.C.E. The circular structure at La Vega employed a building technique similar to the large elliptical structure at Santa Rosa. Another parallel is the use of whole *Spondylus* shells placed into the mud matrix of the floor (Guffroy 2004:55–57), a ritual practice associated with constructions at Santa Rosa and at El Porvenir (Moore et al. 2008:271–275).

Another late Formative structure from the southern Ecuadorian highlands is reported by Temme (1999) from Putushio in the province of Azuay. Temme (1999:134) describes a multicomponent site with three rectangular structures associated with late Formative dates. One structure (Complejo F 240/15800) is described as "a wattle and daub construction with small rectangular subdivisions" (Temme 1999:134; my translation) and dated to 2560 ± 85 B.P. (842–409 cal B.C.E.). The second construction (F-15), dating to 2360 ± 130 B.P. (798–164 cal B.C.E.), was "a simple foundation of a single course of stones" (Temme 1999:134; my translation). A third construction (F 1167) is described as an alignment of stones placed next to a paved plaza and associated with a date of 2450 ± 65 B.P. (765–678 or 674–405 cal B.C.E.); excavations in this feature recovered a fragment of daub with cane impressions on its dorsal surface and incised lines and red paint on its finished surface (Temme 1999:134–135). Unfortunately, no complete plans or dimensions for the structures are available from Putushio.

Similarly, Bruhns and colleagues have uncovered a number of well-made floors during their excavations at Pirincay. Although no dwelling has been completely exposed, a pattern of post molds forming a right-angled corner suggests a rectangular building dating to ca. 1200 B.C.E. (Bruhns 2003:149). Locally available calcium carbonate was used as floor plaster, and fragments of daub indicate that the dwelling was a wattle-and-daub construction.

Finally, Grieder and colleagues (Grieder et al. 2002; Grieder et al. 2009:18–23) have reported on their excavations at Challuabamba, located near Cuenca, which uncovered a series of wattle-and-daub domestic structures dating from ca. 2000 B.C.E. The excavations did not identify a complete structure, but early observations at the site by Uhle (1922) mentioned both apsidal and rectangular buildings, although the structures uncovered by Grieder appear rectilinear (Grieder et al. 2009:18–20). Large fragments of daub with wattle impressions indicate that walls were some 10 cm thick. At ca. 1450 B.C.E., some domestic structures incorporated cobblestone revetments that served as retaining walls along the Rio Tombebamba.

Public Architecture

As with the other classes of archaeological data, some of the best records of the development of public architecture come from Valdivia sites, particularly Real Alto and La Emerenciana. At Real Alto, the transformations in domestic architecture that occurred after Valdivia 2a/3 were paralleled by the creation of public architecture. Marcos provides a succinct summary:

> During the second period, that lasted some 600 years, between 3000 BCE and 2400 BCE, there were important changes in intrasite settlement patterns, and community development. During Valdivia Phases 2b and 3, a major change took

> place in Real Alto. The circular village gave way to a rectangular pre-urban settlement with a central plaza. It covered approximately 16 hectares. In the Plaza, four mounds topped by public buildings, looked down on the open space. The two largest mounds, Mound "A" or "Fiesta-House Mound," and Mound "B" or "Charnel House Mound," faced each other in the northern third of the open plaza. These two mounds and the space between them formed "the Ceremonial Precinct." The two smaller mounds, Mound "C" on the northeast sector of the plaza, and Mound "D" on the southwestern side, appear to have been designated for meetings and ceremonies by the "initiated few" in each one of the village halves [1998:314].

Marcos's excavations in the Fiesta Mound indicated a minimum of eight rebuilding and resurfacing "epochs" between Valdivia 2 and 7 (Marcos 1978:23, 526, 1988; Staller 1994:47; Zeidler 1984:13–15). Approximately 50 × 37 m at its base and 1.4 m tall, the Fiesta Mound contained features indicating recurrent feasting and rituals. Based on published plans, the opposite Charnel House Mound measured 125 × 40 m at its base, stood 1.8 m tall, and was topped by an elliptical 12.5-×-7-m structure (Lathrap et al. 1977:8–9; Zeidler 2008:463). This mound held the tomb of an adult female, an associated but disarticulated male skeleton, and seven secondary burials in a common grave. The major mounds at Real Alto were associated with distinctive rituals.

A well-reported example of Valdivia 7–8 public architecture is at La Emerenciana, province of El Oro, and dates to ca. 1850–1680 B.C.E. (Staller 1994:230, 2000, 2001a, 2001b; Staller and Thompson 2002; Tykot and Staller 2002). The La Emerenciana mound was built on a modified dune, capped by a hard-packed clay surface, and then had two oval daub platforms on its top; the constructed mound was 75 × 47 m and 1.5 m tall (Staller 1994:325). The edge of the mound was fronted by four steps or low terraces built with retaining walls. The La Emerenciana mound apparently began as a residential construction but then became a funerary/ritual locus at ca. 2310 cal B.C.E., as four burials were placed upright in shallow graves, covered in red pigment, and shrouded with fishing nets or textiles. Later deposits of burnt fauna and plant foods and smashed ceramics may represent post-funerary offerings or feasts (Staller 2001b). Mound construction at La Emerenciana exemplifies the development of "large Phase 8 civic-ceremonial centers with monumental public architecture of a magnitude not seen in earlier Valdivia phases" (Zeidler 2008:464). As Marcos observes, "During this period, the great changes that led to the consolidation of the Formative process were crystallized" (2003:18).

Such crystallizations are not evident in Loja during the coeval Catamayo A phase (Guffroy 2008:892). While one site (Quebrada de los Cuyes) was interpreted as a hamlet, Guffroy observes, "The majority of sites studied are of limited extents and do not appear to represent important settlements, but rather extended family residential sites or special activity sites" (2004:85–86; my translation). Similarly no public architecture was uncovered at Challuabamba, although there is evidence for a high-status burial placed in the floor of a pole-and-thatch structure (Grieder et al. 2002:171).

Given this modest pattern of public architecture in the southern Ecuadorian highlands, the early ceremonial architecture at Santa Ana–La Florida, described by Valdez and colleagues (Valdez 2008; Valdez et al. 2005), is surprisingly complex. Located in the southern Oriente province of Zamora-Chinchipe, Santa Ana–La Florida provides a robust set of Archaic and early Formative dates between 4323 and 2373 cal B.C.E. (Valdez 2008:879–880). In addition to elaborate polished stone vessels and figurines and a stirrup-spout vessel showing a shaman emerging from a *Spondylus* shell (Valdez 2008:882), the site also contains a complex of ceremonial architecture. Valdez provides a useful description:

> The architectural remains that have been uncovered display the general layout of what seems to be a local ceremonial center. At the present date, the stone foundations of several round structures that are clustered in a large double-row circle characterize the site. The circle measures 40 m in diameter and obviously divides the precinct in two distinct components: an exterior section marked by several ring-shaped structures, and an interior space where three sets of rectangular structures are symmetrically opposed in tiers. There are very few signs of domestic refuse middens throughout the explored parts of the site.

> To complete the general picture, the southeastern end of the naturally descending riverbank terrace has been artificially transformed. A complicated construction process has elevated and leveled a horizontal plane of 80 m^2. A series of concentric stone contention walls held and reinforced the riverbank fall line. In the interior of the terrace, the walls convened and formed a spiral point of origin. At the very center of this stone coil, a ceremonial hearth was found, with an offering cache placed under small stones. In the interior spaces between some of the concentric walls, burial offerings—composed of turquoise beads and polished stone bowls—were deposited. We assume that these were accompanying probable elite burials, but the bone conservation is so poor that only small fragments of a human skull were recovered [2008:872].

Settlement Plans

As with the other comparative domains, the most complete information about shifts in settlement plans comes from Real Alto. Zeidler provides a succinct summary of these changes:

> The Early Valdivia village was laid out in a horseshoe shape with small flimsy bent-pole dwellings forming a ring around a small open plaza. Each dwelling probably housed a nuclear family. At the opening of the U-shaped plaza is evidence of ritual activity, presumably of a communal nature. By Phase 3, the Real Alto village grew into an elliptical plan measuring 400m X 300m. Dwellings again form a dense ring around a long plaza, but the house structures become much larger and more permanent in their construction, indicating extended family dwellings having considerable longevity. At the center of the new configuration are two small opposing mounds each supporting a ceremonial structure. . . . By Late Valdivia times [phases 6–7] habitation area becomes reduced within the village, as small daughter settlements appear adjacent to floodplain agricultural plots and the ceremonial precinct begins to serve a wider local area [2008:463–464].

Marcos (2003) significantly amends this scenario, venturing some population estimates for different phases at Real Alto. In phases 1 and 2a (4400–3300 cal B.C.E.) the village of Real Alto village had 50–60 inhabitants living in 12–15 small dwellings, whereas in phases 2b and 3 (3000–2400 cal B.C.E.) there was a significant population of 600–1,110 residents living in 90–100 dwellings (Marcos 2003:17, cf. 14–15). This lasted until phases 4–7 (2400–1800 cal B.C.E.) "when part of the on-site population moved from a central location at Real Alto to 5 satellite *hamlets*, or 'daughter' communities, along the Río Verde and Río Real. Each of these communities consisted of five to ten houses with 40–100 inhabitants" (Marcos 2003:17–18; original emphasis). The population at Real Alto declined to an estimated 500–1,000 inhabitants living in 60–80 dwellings (Marcos 2003:18). This model views Real Alto as becoming a regional center by ca. 2400–1800 B.C.E., the major ceremonial and political locus among a small number of nearby hamlets. To summarize, the growth in Real Alto's size from phase 1/2a to phase 2b/3 was paralleled by greater formalization of the settlement plan and concomitant increase in population and size. Real Alto developed into a regional center whose resident population decreased somewhat but apparently maintained a central sociopolitical position in an emergent, two-tiered network of settlements.

As noted above, no similar evidence for changes in settlement plans is known currently from the highlands of Loja, where settlements are either dispersed homesteads or small hamlets (Guffroy 2004). As Bruhns has observed for the Ecuadorian highlands, "There are apparently no large sites or readily identifiable special purpose architecture. The historic situation of a population scattered in farmsteads or hamlets without urban centers and no architecturally differentiated ceremonial centers appears to have had a considerable time depth in the southern highlands" (2003:148). Bruhns's generalization would appear to characterize the Formative settlement at Challuabamba (Grieder et al. 2002; Grieder et al. 2009). And while it is true, as Bruhns notes, that "the apparent paucity of specialized architecture in the south does not mean a lack of specialization" at the community level (2003:152), it does suggest that Formative period regional settlement patterns differed between the coast and highland zones.

Comparisons and Hypotheses

Given the current unevenness in archaeological understanding of the Formative in the equatorial Andes, any comparative study provides the basis for hypotheses rather than firm conclusions. What is broadly apparent, however, is that the Formative developments in Guayas, El Oro, Loja, Zamora-Chichipe, and Tumbes are characterized by marked regional variations rather than a single developmental trajectory.

First, *current data indicate that there are significant interregional variations in Archaic and early Formative domestic architecture in terms of antiquity, size, and building techniques*. As noted above, the earliest structure encountered in El Porvenir, Mound I, Floor 6, is an elliptical structure of doubled posts, enclosing an area of 18–20 m^2 and dating to 4700–4300 cal B.C.E. This structure is more substantial than the Las Vegas structure reported by Stothert or the early Valdivia dwellings from Loma Alta or Real Alto. Similarly, the structure at Santa Rosa (3500–3100 B.C.E.), Compound II, is coeval with Valdivia phases 1 and 2a but at 12.8×10 m ($120\ m^2$) is similar in size to later structures at Real Alto built during Valdivia 2b–3. Only later are similar-sized structures known from the Loja region, during Catamayo B and C (ca. 1200–900 and 900–500 B.C.E.). If the increase in dwelling size at Real Alto reflected a reorganization of residence groups from individual families to multifamily units (Marcos 2003:17; Zeidler 1984:69–70), then this reorganization may have occurred in the Tumbes region one or more centuries before it occurred in Guayas or Loja.

Second, *Formative public architecture varied in scale and social function in the region*. Although public architecture is not known from the Formative in Loja, the examples from Guayas, El Oro, and Tumbes point to different ritual practices and cultural associations. At Real Alto, constructions are associated with either feastings or funerals (Lathrap et al. 1977; Marcos 2003; Raymond 2003; Zeidler 2008); similar activities are indicated at the late Valdivia mounds at La Emerenciana (Staller 1994, 2000). This transformation of public architecture into funerary architecture may be reflected by the Santa Ana–La Florida site in Zamora-Chinchipe (Valdez 2008), although this awaits more extensive excavation

In contrast, there is no evidence for funerary associations for the public architecture at Uña de Gato. The only features interpreted as offerings appear to be linked to single-event construction rituals rather than recurrent rites of commemoration (Moore et al. 2008:271–274). Again, the data sets are limited, but it seems as though public architecture is associated with distinctive sets of ritual practices in the Valdivia and Tumbes regions.

Third, *two-tiered settlement hierarchies developed by 2400–1800 B.C.E. on the Santa Elena Peninsula, at approximately 1400–1000 B.C.E. in the Tumbes region, whereas similar settlement hierarchies do not exist during the Formative period in the Ecuadorian highlands*. The evidence for the emergence of a Valdivia 4–7 two-tiered settlement hierarchy in Guayas significantly precedes similar developments in Tumbes. Yet in both regions settlement hierarchies developed during the Formative period, characterized by a relatively large regional center with public architecture (e.g., Real Alto or Uña de Gato) and smaller affiliated sites nearby (the five Valdivia hamlets on the Rio Verde and Rio Real drainages or the hamlet of El Porvenir on the Rio Zarumilla). While the regional network associated with Valdivia 4–7 appears more extensive than that in Tumbes, this could simply reflect the lack of archaeological investigations at other sites along the Zarumilla drainage. In contrast, similar settlement hierarchies apparently did not develop in the southern Ecuadorian highlands during the Formative period (Bruhns 2003; Grieder et al. 2009; Guffroy 2004).

Fourth, *the Valdivia 7–8 abandonment of Real Alto and the emergence of late Valdivia sites in Manabi and El Oro contrast with the in situ continuities in the Tumbes region*. The lengthy sequence of occupation at Real Alto ends with Valdivia 7, when the regional center is abandoned and late Valdivia settlements develop to the north in Manabi and south in El Oro. In contrast, the sites of Uña de Gato and El Porvenir continue to be occupied into the late Formative period until the fifth–fourth centuries B.C.E. Further, the construction of public architecture at Uña de Gato continued and, if anything, accelerated ca. 1000–800 cal B.C.E. during the late Formative period. Thus, the creation of public architecture and the reorganization of settlement plans appear to have been an autochthonous development in Tumbes, one that drew on

earlier local patterns, rather than one stimulated by the spread of Valdivia traditions.

Conclusion

Significant and precocious developments during the Archaic and Formative periods in the equatorial Andes were not limited to the Santa Elena Peninsula. Despite the unevenness in available archaeological data from other regions, it is clear that contemporary and independent developments occurred elsewhere in southern Ecuador and northern Peru. While apparently there were interactions between the populations in these regions, they maintained distinctive cultural practices—an inference drawn by other scholars working with different data sets. For example, Guffroy writes of the ceramic styles in Loja, "The Catamayo A phase [ceramic] material does not present any of the traits most characteristic of Valdivia culture. It is possible, however, to identify general similarities, whose significance . . . is difficult to establish" (2004:87; my translation). Similarly, Staller has observed that the ceramic data indicate "a significant diversity between regions" during late Valdivia (ca. 2100–1450 B.C.E. [2001b:241]). Such diversity was similarly present in earlier periods. A comparative analysis of domestic and public architecture and of settlement plans supports Guffroy's characterization of the Formative as marked by "notable differences that suggest the existence of subtly distinctive sociohistorical developments" (2004:99; my translation).

The Formative period in the equatorial Andes appears as a mosaic of adaptations and cultural traditions. In an analytical sense, the Formative period should be considered a period of "regional development," and not only the centuries between 500 B.C.E. and 500 C.E. as Meggers (1966) originally proposed. Rather than conceptualizing these patterns as post-Formative diversification, recent data regarding domestic architecture, public architecture, and settlement plans from El Porvenir, Santa Rosa, and Uña de Gato highlight the temporal depth of prehispanic cultural variations in the equatorial Andes.

Recent archaeological data from Formative sites in Tumbes and adjacent regions of southern Ecuador suggest a complex diversity of coeval cultural traditions, perhaps correlated with distinctive environmental zones and/or different ethnic groups, whose populations interacted but maintained distinctive sets of cultural practices. Why this pattern of Formative diversity should exist is uncertain, but the first step toward explaining variation is the recognition that it exists. While the developmental pattern associated with the Valdivia is of undisputed significance for understanding the evolution of Formative societies, it was not the only pattern, nor does it appear to be directly analogous to other, diverse and coeval patterns. Rather, recent investigations elsewhere in southern Ecuador and far northern Peru provide alternative perspectives on the evolution of Formative societies of which Valdivia is a significant, but no longer the only, vantage point.

Acknowledgments. The 2006 and 2007 archaeological excavations in Tumbes were funded by the National Science Foundation (RUI: "Architecture and Power on the Far North Coast of Peru,"0549454) and were authorized by the Instituto Nacional de Cultura (Resolución Directoral Nacional No 783/INC May, 29, 2006 and Resolución Directoral Nacional No 527/INC April 20, 2007.) I am indebted to the project co-directors—Lic. Maria Carolina Vilchez (2006) and Lic. Daniel Ivan Dávila (2007)—and to the other staff members of the Proyecto Arqueológico Tumbes—Bernardino Olaya Olaya, Eva Pajuelo, and Milagros Orbegoso—for their tremendous contributions to the project. I also wish to thank Lic. Rafael Díaz Montalvo, director of the Instituto Nacional de Cultura—Tumbes for his consistent support and goodwill. I deeply appreciate the comments made by the anonymous reviewers for Latin American Antiquity and by colleagues who read earlier versions of this article, Brenda Bowser, Janine Gasco, John Staller, and Andrew Stewart; of course, I am responsible for any errors and misinterpretations. Finally, I wish to thank the communities of El Porvenir, Santa Rosa, and Uña de Gato for their interest and support.

References Cited

Abrams, Elliot
1989 Architecture and Energy: An Evolutionary Approach. In *Archaeological Method and Theory*, edited by M. Schiffer, Vol. 1:47–87. University of Arizona Press, Tucson.

Beck, Robin A., Jr., Douglas J. Bolender, James A. Brown, and Timothy K. Earle
2008 Eventful Archaeology: The Place of Space in Structural Transformation. *Current Anthropology* 49(2):833–860.

Bischof, Henning, and Julio Viteri Gamboa
1972 Pre-Valdivia Occupations on the Southwest Coast of Ecuador. *American Antiquity* 37:548–551.
2006 Entre Vegas y Valdivia: La fase San Pedro en el suroeste del Ecuador. *Bulletin de l'Institut Français d'Études Andines* 35(3):361–376.

Bowser, Brenda, and John Q. Patton

2004 Domestic Spaces as Public Places: An Ethnoarchaeological Case Study of Houses, Gender, and Politics in the Ecuadorian Amazon. *Journal of Archaeological Method and Theory* 11:157–181.

Bruhns, Karen
2003 Social and Cultural Development in the Ecuadorian Highlands and Eastern Lowlands During the Formative. In *The Archaeology of Formative Ecuador*, edited by J. Scott Raymond and Richard Burger, pp. 125–174. Dumbarton Oaks, Washington, D.C.

Burger, Richard
2003 Conclusions: Cultures of the Ecuadorian Formative in Their Andean Context. In *The Archaeology of Formative Ecuador*, edited by J. Scott Raymond and Richard Burger, pp. 465–487. Dumbarton Oaks, Washington, D.C.

Burger, Richard, Frank Asaro, Helen Michel, Fred Stross, and Ernesto Salazar
1994 An Initial Consideration of Obsidian Procurement and Exchange in Prehispanic Ecuador. *Latin American Antiquity* 5(3):228–255.

Childe, V. Gordon
1974 [1936] The Urban Revolution. In *The Rise and Fall of Civilizations: Modern Archaeological Approaches to Ancient Cultures*, edited by C. Lamberg-Karlovsky and J. Sabloff, pp. 6–14. Cummings Publishing Co., Menlo Park.

Currie, Elisabeth
1985 La cultural Jambelí con referencia particular al conchero Guarumal. In *Memoria del Primer Simposio Europeo Sobre Antropología del Ecuador*, edited by Segundo Moreno Yanez, pp. 31–46. Ediciones Abya Yala, Quito.
1989 Cultural Relationships in Southern Ecuador 300 BC–AD 300: Excavations in the Guarumal and Punta Brava Sites. Unpublished Ph.D. diss., Institute of Archaeology, University College, London.
1995 *Prehistory of the Southern Manabí Coast, Ecuador: López Viejo*. BAR International Series 618. Oxford.

Damp, Jonathan
1979 Better Homes and Gardens: The Life and Death of the Early Valdivia Community. Unpublished Ph.D. diss., University of Calgary.
1984 Architecture of the Early Valdivia Village. *American Antiquity* 49:573–585.
1988 *La Primera Ocupación Valdivia de Real Alto: Patrones Económicos, Arquitectónicos e Ideológicos*. Escuela Politécnica de Literal, Centro de Estudios Arqueológicos y Antropológicos, Guayaquil.

Descola, Phillipe
1996 *The Spears of Twilight: Life and Death in the Amazon Jungle*. New Press, New York.

Erasmus, Charles
1965 Monument Building: Some Field Experiments. *Southwestern Journal of Anthropology* 21(4):277–301.

Estrada, Emilio, Betty Meggers, and Clifford Evans
1964 The Jambelí Culture of South Coastal Ecuador. *Proceedings of the United States National Museum* 115:483–558. Smithsonian Institution, Washington, D.C.

Evans, Clifford, and Betty Meggers
1957 Formative Period Cultures of the Guayas Basin, Coastal Ecuador. *American Antiquity* 22:235–247.

Flannery, Kent
1972 The Origins of the Village as a Settlement Type in Mesoamerica and the Near East: A Comparative Study. In *Man, Settlement, and Urbanism*, edited by P. J. Ucko, R. Tringham, and G. W. Dimbleby, pp. 23–53. Duckworth, London.
2002 The Origins of the Village Revisited: From Nuclear to Extended Households. *American Antiquity* 67(3):417–433.

Ford, James A.
1969 *A Comparison of Formative Cultures in the Americas*. Smithsonian Contributions to Anthropology, 11, Smithsonian Institution. U.S. Government Printing Office, Washington, D.C.

Fresco, Antonio
1983 La Red Vial Incaica en la Sierra Sur del Ecuador, Algunos Datos para su Estudio. *Cultura* 5(15):109–148.

Gomis, Dominique
1999 La Cerámica Formativa Tardia de la Sierra Austral del Ecuador (Cañar, Azuay y Loja): Unidad territorial y particularidades regionales. In *Formativo Sudamericano: Una Revaluación*, edited by Paulina Ledergerber-Crespo, pp. 139–159. Ediciones Abya-Yala, Quito.

Grieder, Terence, James D. Farmer, Antonio Carillo, and Bradford M. Jones
2002 Art and Prestige Among the Noble Houses of the Equatorial Andes. In *Andean Archaeology II: Art, Landscape, and Society*, edited by Helaine Silverman and William Isbell, pp. 157–177. Kluwer Academic/Plenum Publishers, New York.

Grieder, Terence, James D. Farmer, David V. Hill, Peter W. Stahl, and Douglas H. Ubelaker
2009 *Art and Archaeology of Challuabamba, Ecuador*. University of Texas Press, Austin.

Guffroy, Jean
2004 *Catamayo Precolombino: Investigaciones Arqueológicas en la provincia de Loja (Ecuador)*. Institut de Recherche pour le Développement, Orleáns.
2008 Cultural Boundaries and Crossings: Ecuador and Peru. In *Handbook of South American Archaeology*, edited by H. Silverman and W. Isbell, pp. 889–902. Springer, New York.

Guffroy, Jean (editor)
1994 *Cerro Ñañañique: Un établissement Monumental de la Période Formative, en limite de désert (Haut Piura, Peru)*. Edicciones Ostrom, Paris.

Guffroy, Jean, Peter Kaulicke, and Krysztof Makowski
1989 La Prehistoria del Departamento de Piura: Estado de los Conocimientos y Problemática. *Bulletin de l'Institut Français d'Études Andines* 22(3):701–719. Lima.

Harner, Michael
1972 *The Jívaro: People of the Sacred Waterfall*. Doubleday/Natural History Press, Garden City, New York.

Heckenberger, Michael J.
2005 *The Ecology of Power: Culture, Place and Personhood in the Southern Amazon, AD 1000–2000*. Routledge, New York.

Hill, Betsy D.
1975 A New Chronology of the Valdivia Ceramic Complex from the Coastal Zone of Guayas Province, Ecuador. *Ñawpa Pacha* 10–12:1–32.

Hocquenghem, Ann Marie
1991 Frontera entre "Areas Culturales" Nor Andinas y Centroandinas en los Valles y en la Costa del Extremo Norte Peruano. *Bulletin de l'Institut Français d'Études Andines* 20(2):309–348.
1998 Para Vencer la Muerte: Piura y Tumbes—Raices en el Bosque Seco y en la Selva Alta—Horizontes en el Pacífico y en la Amazonia. *Travaux de l'Institut Français d'Études Andines* 109.

Hocquenghem, Ann Marie, Jaime Idrovo, Peter Kaulicke, and D. Gomis
1993 Bases de Intercambio entre Sociedades Norperuanas y Surecuatorianas: Una Zona de Transición entre 1500

A.C. y 600 D.C. *Bulletin de l'Institut Français d'Études Andines* 22(2):443–466. Lima.

Holm, Olaf
1985 *Arquitectura Precolombina en el Litoral*. Museo del Banco Central del Ecuador, Guayaquil.

Idrovo Urigüen, Jaime
1999 El Formativo en la sierra Ecuatoriana. In *Formativo Sudamericano: Una Revaluación*, edited by P. Ledergerber-Crespo, pp. 114–123. Ediciones Abya-Yala, Quito.

Ishida, Eichiro
1960 *Andes: The Report of the University of Tokyo Scientific Expeditions to the Andes in 1958*. Directed by E. Ishida. Tokyo.

Izumi, Seichi, and Kasuo Terada
1961 Excavations in the Valley of Tumbes, Perú. *Journal of the Anthropological Society of Nipon (Zinruigaku Zossi)* 68:196–204.
1966 *Andes 3: Excavations at Pechiche and Garbanzal, Tumbes Valley, Perú* 109.

Joyce, Rosemary A.
2004 Unintended Consequences? Monumentality as a Novel Experience in Formative Mesoamerica. *Journal of Archaeological Method and Theory* 11(1):5–29.

Kauffman Doig, Federico
1987 Notas Arqueológicas sobre la Costa Extremo Norte. *Boletín de Lima* 9(49):53–57.

Kaulicke, Peter
1998 El Periodo Formativo de Piura. *Boletín de Arqueología PUCP* 2:19–36.

Lathrap, Donald
1971 The Tropical Forest and the Cultural Context of Chavín. In *Dumbarton Oaks Conference on Chavín*, edited by Elizabeth Benson, pp. 73–100. Dumbarton Oaks Research Libraries and Collections, Washington, D.C.

Lathrap, Donald, Donald Collier, and Helen Chandra
1975 *Ancient Ecuador: Culture, Clay and Creativity, 3000–300 BC*. Field Museum of Natural History, Chicago.

Lathrap, Donald, Jorge Marcos, and James Zeidler
1977 Real Alto: An Ancient Ceremonial Center. *Archaeology* 30:2–13.

Lesure, Richard
1999 Platform Architecture and Activity Patterns in an Early Mesoamerican Village in Chiapas, Mexico. *Journal of Field Archaeology* 26:391–406.

Lesure, Richard, and Michael Blake
2002 Interpretive Challenges in the Study of Early Complexity: Economy, Ritual, and Architecture at Paso de la Amada, Mexico. *Journal of Anthropological Archaeology* 21:1–24.

Low, Setha
2000 *On the Plaza: The Politics of Public Space and Culture*. University of Texas Press, Austin.

Lumbreras, Luis
2006 Un Formativo sin cerámica y cerámica preformativa. *Estudios Atacameños. Arqueología y Antropología Surandinas* 32:11–34.

Lunniss, Richard
2008 Where the Land and the Ocean Meet: The Engoroy Phase Ceremonial Site at Salando, Ecuador, 600–100 BC. In *Pre-Columbian Landscapes of Creation and Origin*, edited by John Staller, pp. 203–248. Springer, New York.

Malpass, Michael, and Karen Stothert
1992 Evidence for Preceramic Houses and Household Organization in Western South America. *Andean Past* 3:137–164.

Marcos, Jorge
1978 The Ceremonial Precinct at Real Alto: Organization of Time and Space in Valdivia Society. Unpublished Ph.D. diss., University of Illinois, Urbana-Champaign.
1988 *Real Alto: La Historia de un Centro Ceremonial Valdivia*. Biblioteca Ecuatoriana de Arqueología, 4 (Primera and Segunda Partes), Escuela Politécnica del Litoral—Centro de Estudios Arqueológicos y Antropológicos, Guayaquil. Corporación Editorial Nacional, Quito.
1998 A Reassessment of the Chronology of the Ecuadorian Formative. In *El Área Septrentrional Andina: Arqueología y Etnohistoria*, edited by Mercedes Guinea, pp. 295–346. Biblioteca Abya-Yala, Quito.
2003 A Reassessment of the Ecuadorian Formative. In *The Archaeology of Formative Ecuador*, edited by J. Scott Raymond and Richard Burger, pp. 7–32. Dumbarton Oaks, Washington, D.C.

Marcos, Jorge, and Adam Michczynski
1996 Good Dates and Bad Dates in Ecuador: Radiocarbon Samples and Archaeological Excavation: A Commentary on the "Valdivia Absolute Chronology." In *Proceedings of the Third Latin American Congress of the University of Varsovia, Varsovia and Biskupin-Wenecja*. Andean Archaeological Mission of the Institute of Archaeology, Warsaw University, Warsaw.

Marcos, Jorge, Aurelio Álvarez Pérez, and Giorgio Spinolo
1999 La Producción Durante el Formativo Temprano: El Desarrollo Agrícola, Artesanal y el Intercambio de Exóticos en Real Alto. In *Formativo Sudamericano: Una Revaluación*, edited by P. Ledergerber-Crespo, pp. 97–113. Ediciones Abya-Yala, Quito.

Meggers, Betty J.
1966 *Ecuador*. Praeger, New York.

Meggers, Betty J., and Clifford Evans
1962 The Machalilla Culture: An Early Formative Complex on the Ecuadorian Coast. *American Antiquity* 28(2):186–192.

Meggers, Betty J., Clifford Evans, and Emilio Estrada
1965 *Early Formative Period of Coastal Ecuador: The Valdivia and Machalilla Phases*. Smithsonian Contributions to Anthropology 1, Smithsonian Institution. U.S. Government Printing Office, Washington, D.C.

Mejía Xesspe, Toribio
1960 Algunos Nuevos elementos de la Civilización Recuay—Pasto en el extremo norte del litoral peruano. In *Antiguo Perú, Espacio y Tiempo*, edited by Juan Mejía Baca, pp. 205–217. Semana de la Arqueología Peruana, Lima.

Moore, Jerry
1996 *Architecture and Power in the Prehispanic Andes: The Archaeology of Public Buildings*. Cambridge University Press, Cambridge.
2005 *Cultural Landscapes in the Prehispanic Andes: Archaeologies of Place*. University Press of Florida, Gainesville.
2007 Early 5th Millennium B.C. Prehispanic Architecture in Far Northern Peru. *Antiquity* Project Gallery. Electronic document, https://antiquity.ac.uk/ProjGall/moore1/index.html.
2008 El Periodo Intermedio Tardío en el Departamento de Tumbes. *Revista del Museo de Antropología, Arqueología e Historia, Universidad Nacional de Trujillo, Perú* 10:155–175.

Moore, Jerry, Daniel Dávila Manrique, and Eva Pajuelo (editors)
2008 *Proyecto Arqueológico Tumbes: Excavaciones en Santa Rosa y Uña de Gato, Departamento de Tumbes, Temporada 2007*. Technical report submitted to the Insti-

tuto Nacional de Cultura, Lima.

Moore, Jerry, Bernardino Olaya Olaya, and Wilson Puell Mendoza
1997 Investigaciones del Imperio Chimú en el valle de Tumbes, Perú. *Revista del Museo de Arqueología, Antropología e Historia* 7:173–184.

Moore, Jerry, Carolina Maria Vilchez, Bernardino Olaya Olaya, Eva Pajuelo, and Andrew Bryan
2005 *Informe Técnico: 2003 Excavaciones en el sitio Loma Saavedra*. Report on file, Instituto Nacional de Cultura, Lima.

Ogburn, Dennis
2007 *Source Provenance of Obsidian Artifacts from Northern Peru*. Berkeley Archaeological Laboratory, University of California, Berkeley.

Pajuelo, Eva
2006 *Reassessing the Frontier: Implications of New Research in Tumbes, Peru*. MS on file at the University of Illinois, Urbana-Champaign.
2007 Cerámica. In *Proyecto Arqueológico Tumbes: Excavaciones en El Povenir y Loma Saavedra, Departamento de Tumbes, Temporada 2006*, edited by Carolina Vílchez, Jerry Moore, and Eva Pajuelo, pp. 181–186. Instituto Nacional de Cultura, Tumbes, Peru.
2008 Cerámica. In *Proyecto Arqueológico Tumbes: Excavaciones en Santa Rosa y Uña de Gato, Departamento de Tumbes, Temporada 2007*, edited by Jerry Moore, Daniel Dávila Manrique, and Eva Pajuelo, pp. 245–252. Instituto Nacional de Cultura, Tumbes, Peru.

Pajuelo, Eva, and Jerry Moore
2005 *Reclaiming the Frontier: Material Expressions and the Appropriation of the Past in Late Prehispanic Tumbes, Peru*. Paper presented at the Annual Meeting of the Institute for Andean Studies, Berkeley, January 7–8.

Pearsall, Deborah
1978 Phytolith Analysis of Archaeological Soils: Evidence for Maize Cultivation in Formative Ecuador. *Science* 199:177–178.
2002 Maize Is *Still* Ancient in Prehistoric Ecuador: The View from Real Alto, with Comments on Staller and Thompson. *Journal of Archaeological Science* 29:51–55.

Pearsall, Deborah, and Dolores Piperno
1990 Antiquity of Maize Cultivation in Ecuador: Summary and Reevaluation of the Evidence. *American Antiquity* 5:324–337.

Ravines, Rogger
1973 Conchales del Río Zarumilla, Perú. *Revista del Museo Nacional* 39.

Ravines, Rogger, and Ramiro Matos
1983 *Inventario de Monumentos Arqueológicos del Perú. Zona Norte. Primera Aproximación*. Instituto Nacional de Cultura, Lima.

Raymond, J. Scott
1998 Beginnings of Sedentism in the Lowlands of Northwestern South America. In *Advances in the Archaeology of the Northern Andes*, edited by A. Oyuela-Caycedo and J. S. Raymond, pp. 10–19. Institute of Archaeology Monograph Vol. 39. University of California, Los Angeles.
2003 Social Formations in the Western Lowlands of Ecuador During the Early Formative. In *The Archaeology of Formative Ecuador*, edited by J. Scott Raymond and Richard Burger, pp. 33–67. Dumbarton Oaks, Washington, D.C.

Raymond, J. Scott, Jorge G. Marcos, and Donald. W. Lathrap
1980 Evidence of Early Formative Settlement in the Guayas Basin, Ecuador. *Current Anthropology* 21(5):700–701.

Raymond, J. S., A. Oyuela-Caycedo, and P. Carmichael
1998 The Earliest Ceramic Technologies of the Northern Andes: Comparative Analysis. In *Andean Ceramics: Technology, Organization, and Approaches*, edited by I. Shimada, pp. 153–172. MASCA Research Papers in Science and Archaeology, Supplement to Vol. 15. University of Pennsylvania Museum of Anthropology and Archaeology, Philadelphia.

Reichel-Dolmatoff, Gerardo
1959 The Formative Stage: An Appraisal from the Colombian Perspective. *Actas del XXIII Congreso Internacional de Americanistas* 1:152–164. San Jose, Costa Rica.

Richardson, James, II, Mark McConaughy, Allison Heaps de Peña, and Elena Décima Zamecnik
1990 The Northern Frontier of the Kingdom of Chimor: The Piura, Chira and Tumbez Valleys. In *The Northern Dynasties: Kingship and Statecraft in Chimor*, edited by M. Moseley and A. Cordy-Collins, pp. 419–445. Dumbarton Oaks Research Library and Collection, Washington, D.C.

Rostain, Stéphan
2006 Etnoarqueología de las casas Huapula y Jíbaro. *Bulletin de l'Institut Français d'Études Andines* 35:337–346.

Schwarz, Frederick, and J. Scott Raymond
1996 Formative Settlement Patterns in the Valdivia Valley, Southwest Coastal Ecuador. *Journal of Field Archaeology* 23(2):205–224.

Shackley, M. Steven, and Dennis Ogburn
2008 *Source Provenance of Obsidian Artifacts from Northern Peru*. Berkeley Archaeological Laboratory, University of California, Berkeley.

Staller, John E.
1994 Late Valdivia Occupation in Southern Coastal El Oro Province, Ecuador: Excavations at the Early Formative Period (3500–1500 B.C.) Site of La Emerencia. Unpublished Ph.D. diss., Department of Anthropology, Southern Methodist University.
2000 Political and Prehistoric Frontiers: How History Influences Our Understanding of the Past. In *The Entangled Past: Integrating History and Archaeology, Proceedings of the 30th Annual Chacmool Archaeological Conference*, edited by M. Boyd, J. Erwin, and M. Hendrickson, pp. 242–257. Calgary.
2001a The Jelí Phase Complex at La Emerenciana, a Late Valdivia Site in Southern El Oro Province, Ecuador. *Andean Past* 6:117–174.
2001b Reassessing the Developmental and Chronological Relationships of the Formative of Coastal Ecuador. *Journal of World Prehistory* 15(2):193–256.

Staller, John, and Robert G. Thompson
2002 A Multidisciplinary Approach to Understanding the Initial Introduction of Maize into Coastal Ecuador. *Journal of Archaeological Science* 29:33–50.

Stothert, Karen
1988 *La Prehistoria Temprana de la península de Santa Elena: Cultura Las Vegas*. Miscelánea Antropológica Ecuatoriana 10. Museo del Banco Central del Ecuador, Guayaquil.
2003 Expressions of Ideology in the Formative Period of Ecuador. In *The Archaeology of Formative Ecuador*, edited by J. Scott Raymond and Richard Burger, pp. 337–421. Dumbarton Oaks, Washington, D.C.

Stothert, Karen, Dolores Piperno, and T. C. Andres
2003 Terminal Pleistocene/Early Holocene Human Adaptation in Coastal Ecuador: The Las Vegas Evidence. *Quaternary International* 109–110:23–43.

Temme, Matilde
1999 El Formativo de Putushío, sierra sur del Ecuador. In *Formativo Sudamericano: Una Revaluación*, edited by P.

Ledergerber-Crespo, pp. 124–138. Ediciones Abya-Yala, Quito.

Tykot, Robert, and John E. Staller
2002 The Importance of Early Maize Agriculture in Coastal Ecuador: New Data from La Emerenciana. *Current Anthropology* 43(4):666–677.

Ubelaker, Douglas
2003 Health Issues in the Early Formative of Ecuador: Skeletal Biology of Real Alto. In *The Archaeology of Formative Ecuador*, edited by J. Scott Raymond and Richard Burger, pp. 259–287. Dumbarton Oaks, Washington, D.C.

Uhle, Max
1922 *Influencias mayas en el Alto Ecuador*. Tipografía y Encuadernación Salesianas, Quito.

Valdez, Francisco
2008 Inter-Zonal Relationships in Ecuador. In *Handbook of South American Archaeology*, edited by H. Silverman and W. Isbell, pp. 865–888. Springer, New York.

Valdez, Francisco, Jean Guffroy, Geoffrey de Saulieu, Julio Hurtado, and Alexandra Yepes
2005 Découverte d'un site cérémoniel formatif sur le versant oriental des Andes. *Comptes-Rendus: Paléontologie humaine et préhistoire* 4(1):369–374.

Vega-Centeno Sara-Lafosse, Rafael
2007 Construction, Labor Organization, and Feasting During the Late Archaic Period in the Central Andes. *Journal of Anthropological Archaeology* 26:150–171.

Vilchez Carrasco, Carolina, Jerry D. Moore, and Eva Pajuelo (editors)
2007 *Informe Final: Proyecto Arqueológico Tumbes: Excavaciones en El Porvenir y Loma Saavedra, Departamento de Tumbes, Temporada 2006*. Technical report, Instituto Nacional de Cultura, Lima.

Villaba, Marcelo
1988 *Cotocollao: Una Aldea Formativa del Valle de Quito*. Serie Monográfica 2, Miscelánea Antropológica Ecuatoriana. Museo del Banco Central del Ecuador, Quito.

Willey, Gordon, and Phillip Phillips
1958 *Method and Theory in American Archaeology*. University of Chicago Press, Chicago.

Zarrillo, Sonia, Deborah M. Pearsall, J. Scott Raymond, Mary Ann Tisdale, and Dugane J. Quon
2007 Directly Dated Starch Residues Document Early Formative Maize (*Zea mays* L.) in Tropical Ecuador. *Proceedings of the National Academy of Sciences of the United States of America* 105(3):5006–5011.

Zeidler, James
1984 Social Space in Valdivia Society: Community Patterning and Domestic Structure at Real Alto, 3000–2000 BC. Unpublished Ph.D. diss., University of Illinois, Urbana-Champaign.
2000 Gender, Status and Community in Early Formative Valdivia Society. In *The Archaeology of Communities: A New World Perspective*, edited by Marcello Canuto and Jason Yaeger, pp. 161–181. Routledge, London.
2003 Formative Period Chronology for the Coast and Western Lowlands of Ecuador. In *The Archaeology of Formative Ecuador*, edited by J. Scott Raymond and Richard Burger, pp. 487–527. Dumbarton Oaks, Washington, D.C.
2008 The Ecuadorian Formative. In *Handbook of South American Archaeology*, edited by H. Silverman and W. Isbell, pp. 459–488. Springer, New York.

Zeidler, James, and Deborah Pearsall (editors)
1994 *Regional Archaeology in Northern Manabí, Ecuador, Vol. 1: Environment, Cultural Chronology, and Prehistoric Subsistence in the Jama River Valley*. University of Pittsburgh Memoirs in Latin American Archaeology, No. 8. Pittsburgh.

Zevallos Mendoza, Carlos, and Olaf Holm
1960 Excavaciones arqueológicas en San Pablo. *Ciencia y Naturaleza* 3(2–3):62–95.

Submitted December 5, 2008; Accepted January 31, 2009; Revised October 31, 2009.