

# The Pampa de las Salinas archaeological complex: the rise of social complexity in the Chao Valley of Northern Peru

by Ana Cecilia Mauricio

**Keywords:** Andes, Preceramic, monumentality, radiocarbon chronology, geoarchaeology

**Palabras clave:** Andes, Precerámico, monumentalidad, cronología radiocarbónica, geoarqueología

## Introduction

The Late Preceramic Period (5800–3600 cal. BP), also known as the Late Archaic, the Cotton Preceramic, or Early Formative Period<sup>1</sup> was a time of rapid and extraordinary social achievements that made Peru one of the cradles of civilization in the world.<sup>2</sup> Population growth, the spread of cultivated products, the intensification of long-distance interactions, and the first manifestations of more complex social organizations appeared during this period.<sup>3</sup> Research on the Late Preceramic Period has shifted from chronological and subsistence economy studies to the more recently debated hypothesis about the origin of the first monumental settlements and the social organization that characterized these Late Preceramic peoples.<sup>4</sup> One of the most remarkable characteristics of the Late Preceramic Period is the development of monumental architecture for non-domestic/ceremonial purposes, which is recognized as the most ubiquitous manifestation of complex societies worldwide.<sup>5</sup> In 1940s, the first Preceramic coastal sites were discovered and excavated in the Supe, Virú, and Chicama valleys.<sup>6</sup> Much later, the outstanding discovery of Caral and several other sites on the part of the northern Peruvian coast called Norte Chico demonstrated that the first florescence of monumental sites began to be built around 5000 BP. in the Norte Chico, in which the most numerous and im-

pressive manifestations of early monumentality are concentrated.<sup>7</sup> Moreover, most of the theoretical corpus that focuses on the emergence of social complexity in Peru is based on the findings and data from the central and north-central coast of Peru.<sup>8</sup> Many of these studies have focused on the study of the “earliest” monumental sites and the economic and sociopolitical organization that was the basis of their development.

Current models propose that these complex Late Preceramic societies developed upon an economy that combined maritime and agricultural production under a stratified social regime centered in the Supe Valley.<sup>9</sup> Another model proposed that these early developments occurred in different valleys of the north-central coast almost simultaneously, without a single center of origin.<sup>10</sup> More recently, new archaeological excavations on the north and north-central coast are showing that monumental sites have had complex formation processes, with different site locations, economic and social bases, and even architectural layouts.<sup>11</sup> It is therefore important to consider this diversity when building theoretical models about the rise of social complexity. Within this context, the results of recent excavations at the Preceramic Archaeological Complex of Pampa de las Salinas are crucial. Pampa de las Salinas is currently a hyperarid

1 Moseley 1992; Quilter 1991a; Sandweiss 2014.

2 Service 1975.

3 Burger 1992; Fung 1988; Moseley 1985; Quilter 1991.

4 Haas – Creamer 2004; Haas – Creamer 2006; Lanning 1963; Lanning 1967; Moseley 1975; Moseley 1992; Patterson – Moseley 1968; Quilter 1991a; Shady et al. 2001; Shady et al. 2003.

5 Trigger 1990.

6 Willey – Corbett 1954; Feldman 1980; Moseley 1982.

7 Shady et al. 2001; Haas – Creamer 2004.

8 Benfer 1990; Fung 1988; Haas – Creamer 2006; Lanning 1967; Moseley 1975; Quilter 1991a; Shady et al. 2001; Shady et al. 2003.

9 Shady et al. 2003; Shady 2004.

10 Haas – Creamer 2004; Haas – Creamer 2006.

11 Vega Centeno 2006; I. Alva 2008; Dillehay et al. 2012.

and hypersaline environment characterized by the invasion of migrating barchanoid dunes and a lack of vegetation. A particular characteristic of this environment is the presence of a paleo-embayment that contains a salt flat. Despite the aridity and apparent isolation of this area, Pampa de las Salinas seems to have been a very different environment earlier in the Holocene, based on the evidence of an ancient and long human occupation dating to the Preceramic Period. More than 20 archaeological sites have been reported in the Pampa Las Salinas alone, all of these settlements appear to be Preceramic in age, although there are short-term traces of ceramic-age

human occupation. Among the preceramic sites, Salinas de Chao is perhaps the best-known site, and is widely cited in the archaeological literature as the first example of Preceramic monumentality in the valley, even though there is a debate about its chronological position.<sup>12</sup> The site Los Morteros was first identified by Cárdenas as a "stabilized dune" whose top was used as cemetery by Preceramic peoples around cal 5000 BP.<sup>13</sup> However, geo-radar explorations of the mound in 2006 and 2010 showed evidence of architecture of considerable dimensions covered by thick layers of eolian sand that would pre-date the remains reported by Cárdenas.<sup>14</sup>

## The local setting

### The Chao Valley

The Chao Valley is a small and narrow river valley located in the La Libertad region along the northern Peruvian coast. Geographically, this valley lies between the Virú Valley to the north and the Santa Valley to the south. Chao belongs politically to La Libertad Region, Province of Virú, and District of Chao (Fig. 1). The main economic activity in this valley today is agriculture, which has focused on the exportation of crops such as asparagus, avocados, sugar cane, grapes, and other fruits in the last fifteen years. Most of these industrial agricultural lands are located in the lower and middle valley, and use water provided by the CHAVIMOCHIC Irrigation Project. The growth of agro-industrial activities in La Libertad Region has made Chao a focus of migration, especially for people from highland or upper valley localities. Chao Valley weather is temperate year-round with an average temperature of 20 °C in areas close to the ocean and between 17 to 13 °C in the upper valley. The Chao River originates at the foothills of Cerro Ururupa, at an elevation of 4050 m asl, and is formed by the convergence of the Chorobal (north) and Huamanzaña (south) rivers. It is part of the Pacific hydrologic basin, and is fed primarily by seasonal precipitation in the upper basin.<sup>15</sup> The Chao River is a dryland river located on the northern coastal desert of Peru. In this valley precipitation is almost absent and surface flow originates from rainfall in the upper Huamanzaña basin above 3000 m asl during the rainy season. Based on current flow measurements,

the Chao River can be characterized as intermittent, flowing only from January to April with a mean annual flow of 1.43 m<sup>3</sup>/s (among the lowest of the Peruvian coast). The Chao River basin has an area of approximately 1558 km<sup>2</sup>, 44 % of which is characterized as the humid basin (i.e., the area that receives most of the precipitation). The ONERN report of 1973 indicates that at that time, irrigation took place during the highland rainy season, while during the rest of the year farmers used ground water. However, before the CHAVIMOCHIC project started (1998), the Chao River was reported as having a water deficit, limiting the agricultural development of this valley. To date, there are more than 600 wells in the lower Chao Valley, half of which are functioning. The water table in the lower valley is located at depths less than 3 m, and in areas close to the coast, it is located at less than 1.5 m from the surface.

### Pampa de las Salinas

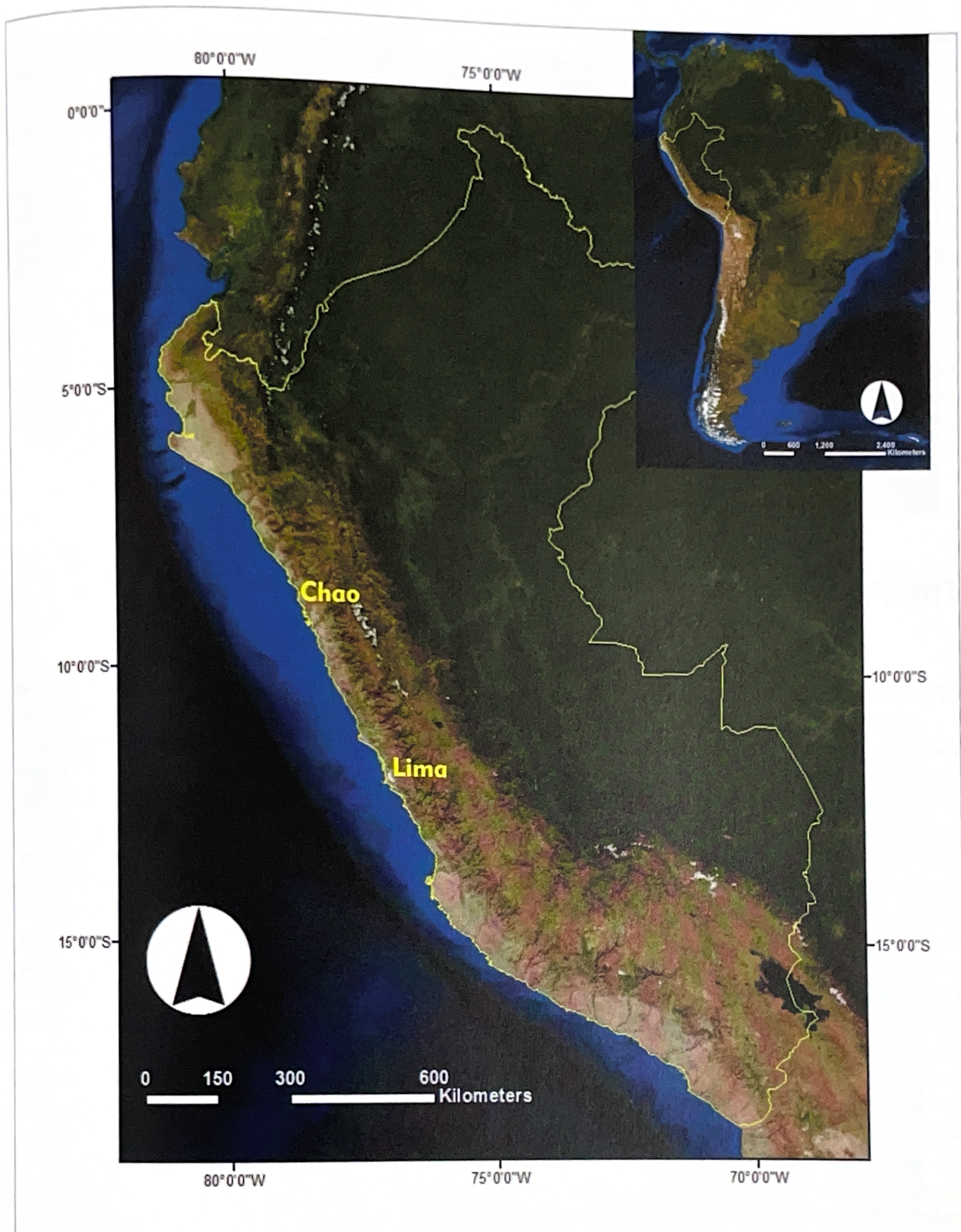
Pampa de las Salinas is located in the lower Chao Valley. The Pampa is bounded by the river mouth to the north, the Cerros Coscomba and Cerros Salinas to the south, the Cerros Jaime to the east, and the Pacific Ocean to the west. Pampa de las Salinas has an area of approximately 25 km. The ~10 m high scarp of a paleo-shoreline divides Pampa de las Salinas into two main geomorphological areas: 1) a gently sloping pampa above the ancient shoreline, and 2) a dry pa-

12 Pozorski – Pozorski 1990; Quilter 1991b.

13 Cárdenas 1995; Cárdenas 1999.

14 Sandweiss et al. 2010.

15 ONERN 1973.



1 Location of the Chao Valley in the Peruvian territory (map: PRAET).

leo-embayment of lower elevation that extends to the coast (Fig. 2). The upland portion of the pampa is a uniformly sloping area, approximately 6 km wide, flanked by Andean foothills to the east. The geomorphology of the pampa is characterized by the presence of Late Pleistocene to post Mid-Holocene alluvial channels and alluvial fan deposits

that appear to decrease in age towards the paleo-shoreline. Dense eolian-sand deposits occupy the northwest and southwest ends of the paleo-shoreline, forming large dunes and less dense sand sheet covers, often filling incised alluvial channels (Fig. 2). The saline content of the pampa sediments is high, and almost no vegetation grows naturally in

this area. Currently, a large number of chicken farms are located on the pampa and appear as rectangular white blocks in satellite imagery. The pampa is crossed by an extensive network of dirt roads that lead to the farms and the local beach. The dry embayment of Pampa de las Salinas is the area between the ocean and a 3 m high log-spiral shoreline. The paleo-embayment has an area of approximately 20 km. The width of the paleo-embayment from the scarp to the ocean is about 4 km in the central part of the paleo-shoreline. The maximum elevation of this area in the east is approximately 10 m asl and decreases towards the ocean. The entire area of the ancient embayment is crossed by extensive dune fields that are formed by wind-blown sand. The alignment of the dunes is from southwest to northeast and follows the trend of the coastal winds (Fig. 2). These dunes are up several meters in height, and migrate northwards due to the

very strong coastal winds that sweep the area during the day. The largest dunes are located in the northeast and northwest portions of the paleo-embayment. Very large dune fields occupy the entire northwestern section of the paleo-embayment. The northeastern section contains a vegetated area that is visible from the pampa. This area is a remnant of a secondary dry forest of *Acacia macracantha* (*huarango*) and *Arundo donax* plants (*carrizo*). The sediments of the paleo-embayment are highly saline with a pH between 7.9 and 8.4.<sup>16</sup> Surface salt crusts are visible over large areas. Even though most of Pampa de las Salinas is owned by a large industrial farming company, the dry embayment is currently not subject to any economic activity. The area with the highest accumulation of salt is a salina, located to the south-central embayment. This salina was exploited for salt production by the Peruvian government until late 1970.

## The Pampa de las Salinas archaeological complex

### Previous research

The first archaeological investigations at Pampa de las Salinas were carried out by Cárdenas and her team in 1976–77. They recorded more than 20 archaeological sites, the majority of which were described as pre-pottery sites (Fig. 3). This project reported dwellings, mounds, temples, geoglyphs, one road, and a series of wind-breaks.<sup>17</sup> Archaeological excavations were performed at seven of these sites: Salinas de Chao (Site 10), Los Morteros (Site 7), Piedras Negras A (Site 137), Piedras Negras B (Site 138), El Muerto (Site 141), Conchal Viejo (Site 4), and Los Pescadores (Site 6). These sites were excavated through test pits (except for Salinas de Chao) and produced a total of 21 radiocarbon dates that are between 7165 and 3077 cal. BP.<sup>18</sup> Another site excavated by this project is El Muerto. This site was identified by a human skeleton partially exposed in a profile cut by an alluvial channel. Three units were excavated here, one of which uncovered the human body. The excavations found midden deposits with 27 species of marine shells, botanical remains, and lithic artifacts (probably net sinkers).<sup>19</sup> Two radiocarbon dates place this site as the second oldest site in the area (6529–5602 cal. BP). At Los Morteros, Cárdenas and her crew excavated twelve 2 x 2 m test pits. Ten

of these pits were located on the upper mound and two on the eastern slope.<sup>20</sup> In these excavations, Cárdenas reported the remains of domestic refuse composed of mortars, pestles, stone net sinkers, hooks, fish bones, marine shells, fragments of reed mats, pieces of gourds, etc. Seven Preceramic human burials were also reported at Los Morteros, which were wrapped in cotton and reed bundles. Based on these findings and the characteristics of the uncovered stratigraphy, Cárdenas interpreted Los Morteros as a stabilized dune with two occupations. The older occupation corresponds to the use of the site by Preceramic people who did not use cotton and who exploited local resources. The later occupation corresponds to the Cotton Preceramic Period, when the site was used as a cemetery. Cárdenas ran two radiocarbon dates for Los Morteros that yielded calibrated dates between 5576–4894 cal. BP. Cárdenas did not recognize other occupations and interpreted these dates as the oldest and youngest for this site.<sup>21</sup> In the 1980s, Sandweiss et al.<sup>22</sup> explored Pampa de las Salinas as part of a study of the relationships between physical and climatic changes (specifically coastal uplift and marine currents) and ancient populations. In Chao, Sandweiss et al. analyzed the characteristics of surface marine shell remains at Salinas de Chao, Los Morteros, Los Pescadores, and Piedras Ne-

16 ONERN 1973.

17 Cárdenas 1976; Cárdenas 1977–78; Cárdenas 1999.

18 Cárdenas 1976; Cárdenas 1999.

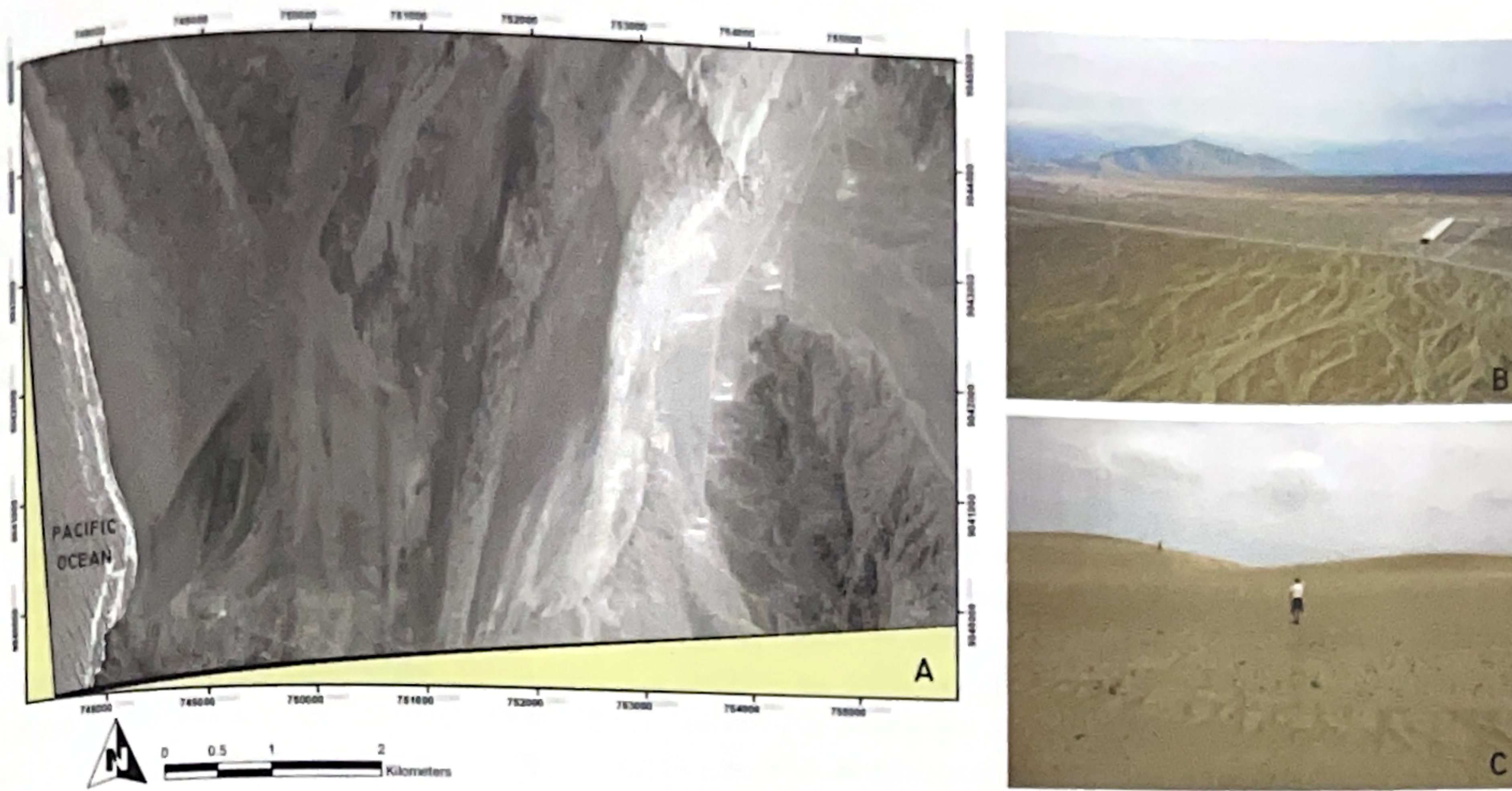
19 Cárdenas 1999; Cárdenas – Vivar 2002.

20 Cárdenas 1999, 151.

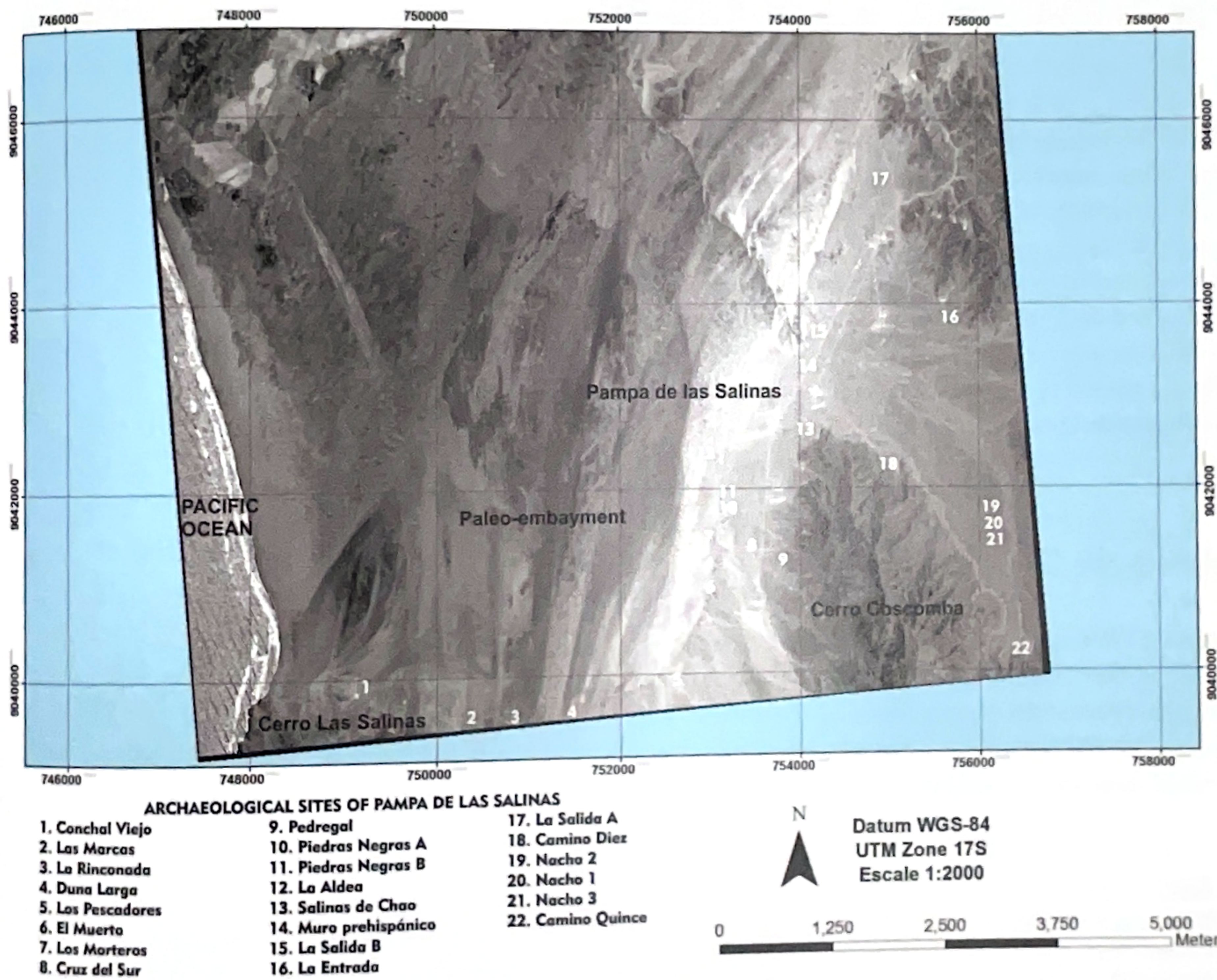
21 Cárdenas 1999.

22 Sandweiss 1983.

THE PAMPA DE LAS SALINAS ARCHAEOLOGICAL COMPLEX



2 The natural setting of Pampa de las Salinas. A: satellite photo of Pampa de las Salinas showing the dry embayment and the pampa area. B: view from east to west of the alluvial deposits that characterized the pampa area. C: dune fields inside the dry embayment (photos and composition: PRAET).



3 Location of the main archaeological sites that compose the complex of Pampa de las Salinas (photo and composition: PRAET).

gras. They obtained dates for Los Morteros (4784–4152 cal. BP) and Los Pescadores (3045–2425 cal. BP), four of them based on marine shells and one on charcoal.<sup>23</sup> The authors hypothesized that tectonic uplift stranded the Chao bay, altering the landscape and the availability of local marine resources.<sup>24</sup> Later, Perrier et al.<sup>25</sup> explored Pampa de las Salinas in order to establish a chronology for the infilling of the ancient embayment based on some ideas proposed by Wells<sup>26</sup> for the old embayment of the Santa Valley.<sup>27</sup> Perrier et al. present a series of radiocarbon dates from archaeological and geological contexts, the majority of which were obtained from surface deposits.<sup>28</sup> These authors propose that the infilling of the Chao embayment would have occurred between 5000 and 3000 cal. BP. In 2006 and 2010 a crew from the University of Maine conducted geo-radar explorations at Los Morteros to test whether Cárdenas' idea of a natural mound was viable, and whether this feature contained architecture underneath the current sand cover. This research found evidence for some sort of artificial constructions in dif-

ferent sectors of the mound. They concluded that there was evidence that Los Morteros was not a natural feature but a human construction.<sup>29</sup> In 2012, Los Morteros-Pampa de las Salinas Archaeological Project initiated geoarchaeological studies at Pampa de las Salinas, as part of my doctoral research. This project has been ongoing in this area for over 10 years and it has become the Programa de Investigación Arqueológica Ecodinámicas Tempranas de los Valles de Chao y Santa (PRAET). In the beginning, the focus of this study was the site of Los Morteros and the environmental reconstruction of the area. Several other sites have been excavated with different degrees of extension. This research also includes geoarchaeological explorations of the major geomorphological components of the area. The objective of the study at Pampa de las Salinas is to understand the Pre-ceramic occupation of this area, the rise of monumentality and social complexity, and the role that climate and the local environment played on these social transformations.

## The Archaeological Compound

Most of the archaeological sites and features of Pampa de las Salinas were recorded by the Project "*Obtención de una Cronología del Uso de los Recursos Marinos en el Antiguo Perú*", led by archaeologist Mercedes Cárdenas,<sup>30</sup> this work has been reported in several published and unpublished documents. In this description of the sites, as well as for our excavations, I use the same names given by this project to all of the archaeological sites reported at Pampa de las Salinas.

### Salinas de Chao

Salinas de Chao is perhaps the best-known archaeological site of the Chao Valley in the literature about the Preceramic Period, first reported by Cárdenas and colleagues. This site is located on the western slopes of the Cerros Coscomba, on the northeast side of Pampa de

las Salinas (Fig. 3). Salinas de Chao encompasses an area of around 80,000 m and is composed of a series of platforms located on the lower slopes of this formation. Two sunken circular plazas and large square structures are visible on the ground surface and face the structures on the slopes (Fig. 4).<sup>31</sup> Immediately to the north of this site, there is a stone wall that trends from the northwest edge of Cerros Coscomba to the southeast edge of Cerros Jaime. This wall seems to have served to enclose the main area of Pampa de las Salinas (i.e., the central and southern zones) where the majority of the archaeological sites are located. Salinas de Chao was found by Carlos Milla and first excavated by Walter Alva.<sup>32</sup> Excavations in Salinas de Chao were more extensive and provided considerable data about the architectural components and faunal and botanical remains.<sup>33</sup> Six uncalibrated radiocarbon dates obtained by this project ran from 3300±150 BP to 3570±60 BP (Tab. 1). Two more dates were processed later by the In-

23 Sandweiss 1983.

24 Sandweiss et al. 1983, 295.

25 Perrier 1994.

26 Wells 1988.

27 Perrier et al. 1994.

28 Perrier et al. 1994.

29 Sandweiss et al. 2010.

30 W. Alva 1986; Cárdenas 1976; Cárdenas 1999.

31 W. Alva 1986.

32 W. Alva 1986.

33 W. Alva 1986; Cárdenas 1999.

## THE PAMPA DE LAS SALINAS ARCHAEOLOGICAL COMPLEX

RADIOCARBON DATES FROM THE PAMPA DE LAS SALINAS ARCHAEOLOGICAL COMPLEX								
Site	Sample code	<sup>14</sup> C Age	Uncertainty	2σ cal yrs BP	Mean	Lab. Code	Project Code	Material
Conchal Viejo	Conchal Viejo_PRAET_01	2143	46	2300-1931	2082	AA104441	CV-A2-C4-OG02	Charcoal
Conchal Viejo	Conchal Viejo_PUCP_28	5270	120	6287-5734	6015	PUCP-28	PUCP-28	Not specified
Conchal Viejo	Conchal Viejo_PUCP_31	5080	70	5922-5603	5783	PUCP-31	PUCP-31	Not specified
El Muerto	El Muerto_PUCP_19	5590	80	6552-6191	6354	PUCP-19	PUCP-19	Human bone
El Muerto	El Muerto_PUCP_38	5190	150	6273-5599	5921	PUCP-38	PUCP-38	Charcoal
MEMEJO 2	Memejo 02_PRAET_01	2490	30	2705-2360	2537	Beta - 467144	MM2-CT1-OG5	Charcoal
MEMEJO 2	Memejo 02_PRAET_02	3020	30	2766-2462	2628	Beta - 467147	MM2-CT1-OG05-2	Shell
Los Morteros	Morteros_PRAET_01	4629	63	5477-4990	5275	AA104438	A1-S1-C1-OG17	Burnt seed
Los Morteros	Morteros_PRAET_02	4686	33	5475-5304	5396	D-AMS 033203	T3-C2-OG78-R19	Charcoal
Los Morteros	Morteros_PRAET_03	4548	31	5312-4990	5164	D-AMS 033202	A5-C4-MU12	Reed mat
Los Morteros	Morteros_PRAET_04	4583	54	5446-4977	5192	D-AMS 033197	A2-S3-C5-T201-OG04	Reed mat
Los Morteros	Morteros_PRAET_05	4935	45	5746-5482	5640	D-AMS 033204	A2-S3-T201-OH01	Tooth (enamel)
Los Morteros	Morteros_PRAET_06	4445	43	5280-4857	5028	D-AMS 033205	A2-S3-T202-OH01	Tooth (enamel)
Los Morteros	Morteros_PRAET_07	4592	33	5439-5048	5201	D-AMS 033199	A2-S3-C5-T202-TX04	Charred textile
Los Morteros	Morteros_PRAET_08	4539	33	5309-4982	5159	D-AMS 033198	A2-S3-C5-T202-TX02	Charred textile
Los Morteros	Morteros_PRAET_09	4409	32	5213-4846	4951	D-AMS 033201	A2-S3-C7-T203-OG01	Gourd
Los Morteros	Morteros_PRAET_10	4808	45	5594-5327	5495	D-AMS 033200	A2-S3-C7-T203-OG001	Reed mat
Los Morteros	Morteros_PRAET_11	5037	33	5895-5603	5743	D-AMS 033206	A2-S3-T203-OH01	Tooth (enamel)
Los Morteros	Morteros_PRAET_12	4641	53	5474-5051	5311	AA104439	A2-S3-3-C8-OG34	Cane fragment
Los Morteros	Morteros_PRAET_13	4880	30	5654-5476	5557	Beta - 467140	A6-CT1-C10-MU89	Charcoal
Los Morteros	Morteros_PRAET_14	4680	30	5469-5308	5394	Beta - 467141	A6-CT1-C11-MU90	Charcoal
Los Morteros	Morteros_PRAET_15	4700	30	5547-5310	5400	Beta - 467142	A6-CT1-C14-MU92	Charcoal
Los Morteros	Morteros_PRAET_16	4660	30	5470-5289	5380	Beta - 467143	A6-CT1-C15-MU93	Charcoal
Los Morteros	Morteros_PRAET_17	4916	48	5736-5477	5617	AA104440	T2-S4-C6-R4-OG13	Charcoal
Los Morteros	Morteros_PUCP_26	4656	60	5573-5051	5336	PUCP-26	PUCP-26	Charcoal
Los Morteros	Morteros_PUCP_27	4560	60	5444-4889	5166	PUCP-27	PUCP-27	Charcoal
Los Pescadores	Pescadores_PRAET_01	3744	44	4231-3897	4051	AA104442	LP-A1-C2-OG01	Seeds
Piedras Negras A	Piedras Negras A_PUCP_36	6100	90	7165-6675	6935	PUCP-36	PUCP-36	Not specified
Piedras Negras B	Piedras Negras B_PUCP_01	3850	80	4423-3933	4211	PUCP-01	PUCP-01	Rope
Piedras Negras B	Piedras Negras B_PUCP_03	4190	100	4959-4413	4670	PUCP-03	PUCP-03	Plant tissue
Piedras Negras B	Piedras Negras B_PUCP_04	3850	180	3376-2933	3658	PUCP-04	PUCP-04	Shell
Piedras Negras B	Piedras Negras B_PUCP_05	3970	160	4146-3186	3804	PUCP-05	PUCP-05	Shell
Piedras Negras B	Piedras Negras B_PUCP_35	4490	100	5438-4843	5100	PUCP-35	PUCP-35	Plant tissue
Piedras Negras A	Piedras Negras_PRAET_01	3690	30	4091-3851	3984	Beta - 467145	PN-CT1-C5-OG12	Charcoal
Piedras Negras B	Piedras Negras_PRAET_02	3690	30	4091-3851	3984	Beta - 467146	PN-CT2-C4-OG11	Seeds
Salinas de Chao	SdCh_PRAET_01	3611	28	3980-3725	3874	AA114904	A1-Amb2-C5-Og17	Seeds

RADIOCARBON DATES FROM THE PAMPA DE LAS SALINAS ARCHAEOLOGICAL COMPLEX								
Site	Sample code	<sup>14</sup> C Age	Uncertainty	2σ cal yrs BP	Mean	Lab. Code	Project Code	Material
Salinas de Chao	SdCh_PRAET_02	3575	28	3958–3699	3816	AA114905	A1-Amb2-C7-R1-Og21	Seeds
Salinas de Chao	SdCh_PRAET_03	3583	28	3966–3702	3828	AA114906	A1-Amb2-C8-Og25	Seeds
Salinas de Chao	SdCh_PRAET_04	3686	28	4089–3850	3978	AA114907	A1-Amb2-C10-R5-Og36	Seeds
Salinas de Chao	SdCh_PRAET_05	3595	28	3974–3720	3848	AA114908	A2-Amb2-C3-R6-Og33	Plant tissue
Salinas de Chao	SdCh_PRAET_06	3660	27	4081–3837	3942	AA114909	A2-Amb2-C8-Og43	Charcoal
Salinas de Chao	SdCh_PRAET_07	3458	27	3825–3573	3682	AA114910	T1-Amb1-C2-R4-Og41	Charcoal
Salinas de Chao	SdCh_PRAET_08	3797	28	4241–3986	4123	AA114911	T1-Amb1-C7-R1-Og43	Charcoal
Salinas de Chao	SdCh_PUCP_02	3300	150	3891–3078	3502	PUCP-02	PUCP-02	Cotton
Salinas de Chao	SdCh_PUCP_07	3310	60	3683–3370	3500	PUCP-07	PUCP-07	Charcoal
Salinas de Chao	SdCh_PUCP_08	3490	80	3958–3487	3717	PUCP-08	PUCP-08	Charcoal
Salinas de Chao	SdCh_PUCP_20	3550	60	3976–3634	3792	PUCP-20	PUCP-20	Charcoal
Salinas de Chao	SdCh_PUCP_21	3460	70	4245–3375	3161	PUCP-21	PUCP-21	Shell
Salinas de Chao	SdCh_PUCP_22	3570	60	4060–3639	3817	PUCP-22	PUCP-22	Charcoal
Salinas de Chao	SdCh_VRI_01	3600	90	4146–3593	3863	VRI-01	VRI-01	Charcoal
Salinas de Chao	SdCh_VRI_02	3200	90	3587–3080	3365	VRI-02	VRI-02	Unburnt wood

Table 1 Calibration of the 51 radiocarbon dates from Pampa de las Salinas. This list only considers dates obtained by archaeological excavations. Dates were calibrated using Oxcal 4.4.2/ ShCal20 atmospheric and Marine.20.

stitut für Radiumforschung und Kernphysik der Österreichischen Akademie der Wissenschaften<sup>34</sup> yielding uncalibrated radiocarbon dates of 3200±90 BP and 3600±90 BP (Tab. 1).

## La Aldea

La Aldea was also recorded by Cárdenas and her team.<sup>35</sup> It is located on the north end of the paleo-shoreline, north of the Piedras Negras and Los Morteros sites. La Aldea is apparently composed of one square structure of approximately 30 x 30 m with internal divisions. Alluvial quebradas have eroded the north and south side of the pampa leaving this structure/site isolated (Fig. 3).

## Piedras Negras A and B

Piedras Negras was originally reported by Cárdenas and her team<sup>36</sup> and is divided into A and B. However, given the current state of the site, it was not possible to recognize this division. Cárdenas (1999) also recognized that these sites could have been parts of just one site. Piedras Negras is also located along the north section of the paleo-shoreline, south of La Aldea and north of Los Morteros (Fig. 3). The approximate extension of the site is 200 m (N-S) by 100 m (E-W), based on the distribution of the structures. The architecture of the site consisted of square stone structures of different dimensions. Walls are composed of angular boulders larger than 20 cm. Alva (1986) mentioned that Deza identified round corners in the structures of this site, however our surface

34 W. Alva 1986; Felber 1984.

35 Cárdenas 1976; Cárdenas 1999.

36 Cárdenas 1999.



4 Aerial photograph of Salinas de Chao (photo: PRAET).

reconnaissance did not identify such features. To the east of the square structures are a series of semi-circular stone windbreaks, some of which were placed over the square rooms, indicating that windbreaks belong to a later occupation of the site when the original structures were no longer in use. At the site of Piedras Negras A, Cárdenas and her team excavated two test pits with a maximum depth of 1.4 m, recovering organic remains that were interpreted as part of two occupations: one with no cotton and the other with cotton remains. Piedras Negras A yielded the oldest date for Pampa de las Salinas (7165–6678 cal. BP). The excavations by Cárdenas and her team<sup>37</sup> found Preceramic tombs at this site and reported two Preceramic occupations, one without cotton and another with cotton remains.

## Los Pescadores

This site is located along the south-central section of the paleo-shoreline, south of Los Morteros (Fig. 3). This site was also reported and excavated through test pits by Cárdenas and colleagues.<sup>38</sup> The main architecture at this site is composed of both small and large square stone structures laid in an apparently “U”-shaped pattern open to the south. However, the western side of this architectural complex is poorly preserved due to a wide runoff channel that crosses the site from southeast to north (Fig. 5). The eastern side is composed of a large square room or patio with smaller rooms on the southwest corner. The north side of this patio is covered by eolian sand. The architecture on the north side is composed of a big square room with smaller units attached to the east and west sides. There are remains of possible square rooms on the west side, but this part is also covered by eolian sand. The layout of these structures leaves a large open space in the center, part of which seems to have been occupied later by windbreaks.

<sup>37</sup> Cárdenas 1999.

<sup>38</sup> Cárdenas 1976; Cárdenas 1999.



5 Aerial photograph of the site Los Pescadores (photo: PRAET).

The square architecture seems to have been the original structures of the site, which was later partially occupied by a series of stone wind breaks, the majority of which were placed to the west of the square structures, although some windbreaks were placed to the south and inside the older structures. Excavations were carried out in one of the small square structures on the east side of Los Pescadores to recover datable materials.

## Duna Larga

Reported originally by Cárdenas and colleagues,<sup>39</sup> this site is located on the south end of the paleo-shoreline, south of Los Pescadores (Fig. 3). Duna Larga is composed of windbreaks spread over the east side of a large dune that covers a slope of Cerros Salinas. Our explorations of the zone recovered a piece of a colonial period bowl close to the large dune.

39 Cárdenas 1976; Cárdenas 1999.

## La Rinconada

This site is located on the western side of the large dune at the south end of the pampa (Fig. 3). La Rinconada was first reported by Cárdenas et al.<sup>40</sup> It is composed of a single square stone structure with internal square spaces. It is possible that this site and Duna Larga were part of a single larger site, since both are partially covered by the large dune.

## Conchal Viejo

Conchal Viejo is located on the southwestern end of Pampa de las Salinas on the lower slope of Cerros Jaime (Fig. 3). The area of this site is approximately 100 x 100 m. It is composed almost exclusively of *Mesodesma* middens with some remains of architecture on the west side that could correspond to stone platforms likely used to process these clams. In Conchal Viejo, Cárdenas and her crew excavated

40 Cárdenas 1976; Cárdenas 1999.

two test pits, recognizing this site as a pre-cotton shell midden site. Two radiocarbon dates from this site based on marine shells provided uncalibrated radiocarbon dates of  $5270 \pm 120$  RC14 BP and  $5080 \pm 70$  RC14 BP.<sup>41</sup>

## The geoglyph areas

Previous research also reported the presence of particular archaeological features that they called geoglyphs.<sup>42</sup> The present team identified the presence of two areas of geoglyphs. These archaeological features are composed of low-height circular piles of stones (Fig. 6D, 6E) enclosed by stone walls forming large square rooms of more than 50 m per side (Fig. 6A, 6B). These large rooms have internal rooms as well as doorways (Fig. 6C). One of the geoglyphs reported by Cárdenas, called Cruz del Sur, is located a few meters to the east of Los Morteros. The second one, Las Marcas, is located on the south end of the paleo-shoreline, between the sites of Las Marcas and Conchal Viejo. Our explorations in 2013, however, have identified the presence of three more geoglyph zones with similar characteristics in the pampa area. One is located to the north of Los Morteros and to the west of Salinas de Chao. The other two are located between Los Morteros and Los Pescadores, close to the paleo-shoreline.

None of these zones with geoglyphs have been excavated. Our explorations did not identify any remains on the surface of these areas besides pieces of marine shells. Cruz del Sur and the most northern geoglyph are currently affected by the transit of vehicles and the structures of chicken farms. No similar features have been reported in other sections of this valley, nor have similarly constructed geoglyphs been found at other archaeological sites on the coast, to the knowledge of the author.

## Windbreaks

These archaeological features can be found forming groups over all the pampa area. However, the central and south sections of the pampa have more numerous groups of windbreaks. The windbreaks are semi-circular walls made of angular stones with the open area facing the north (against the wind pattern of the area).<sup>43</sup> The location of some of these structures over part of the architecture of some sites such as Piedras Negras and Los Pescadores indicates that they represent a late phase of occupation of Pampa de las Salinas.

## The Los Morteros-Pampa de las Salinas archaeological project

This work started as part of my doctoral research in 2012, the main objectives of which were to understand the nature of the mound of Los Morteros within the cultural Preceramic context of the Pampa de las Salinas complex, and within the prehistoric natural context of the local landscape. For this purpose, a first field season was carried out from September 2012 to January 2013, which included archaeological excavations, geoarchaeological explorations, and archaeological and geological survey. Further field work continued at intervals through July 2014. Excavations continued in 2016, 2017, and 2019. Archaeological excavations mainly focused on the mound of Los Morteros, but our research included more restricted excavations at several neighboring sites in or-

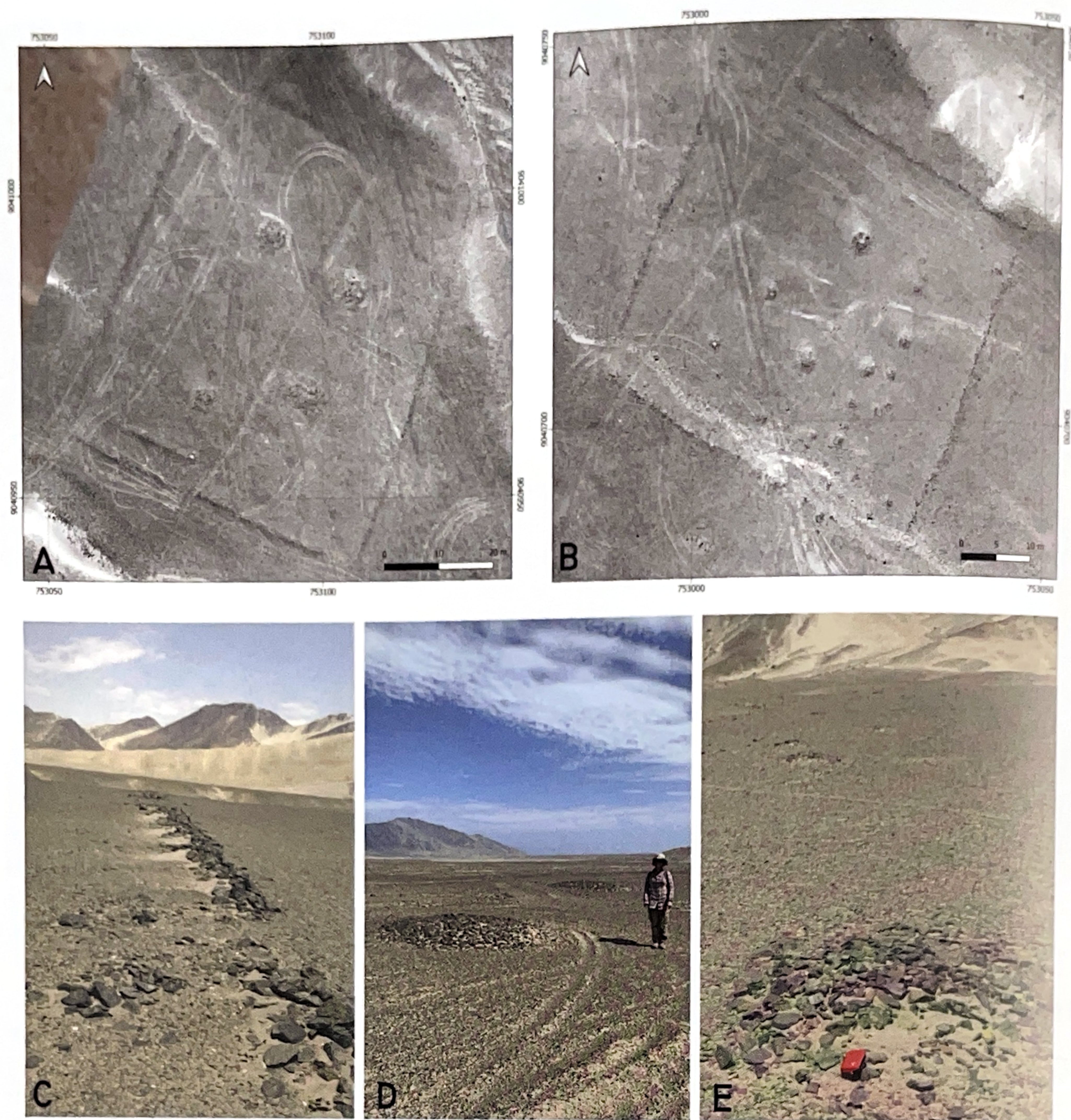
der to build a reliable chronology of the archaeological complex. These excavations included the sites of Piedras Negras, Los Pescadores, Conchal Viejo, MEMEJO 1 and 2 (these are two out of three cultural *Mesodesma* middens, discovered in our explorations of the dry embayment in 2013), and Salinas de Chao. In addition, we have recorded several sites, including all the geoglyphs areas through mapping and aerial photography. Finally, the environmental studies of this research include geoarchaeological and geological explorations of the entire area of Pampa de las Salinas and the Chao River mouth. These studies included stratigraphic analysis of the dry embayment through test pits.<sup>44</sup>

<sup>41</sup> Cárdenas 1976; Cárdenas 1978; Cárdenas 1999.

<sup>42</sup> Cárdenas 1976; Cárdenas 1999.

<sup>43</sup> Cárdenas 1999, 21 fig. 20.

<sup>44</sup> Mauricio 2015.



6 Examples of two geoglyphs areas of Pampa de las Salinas. A: Geoglyph 3; B: Geoglyph 4; C: access to the Geoglyph 5 (Las Marcas); D: circular piles of rocks of Geoglyph 2 (Cruz del Sur); E: detail of circular marks at Las Marcas (photos and composition: PRAET).

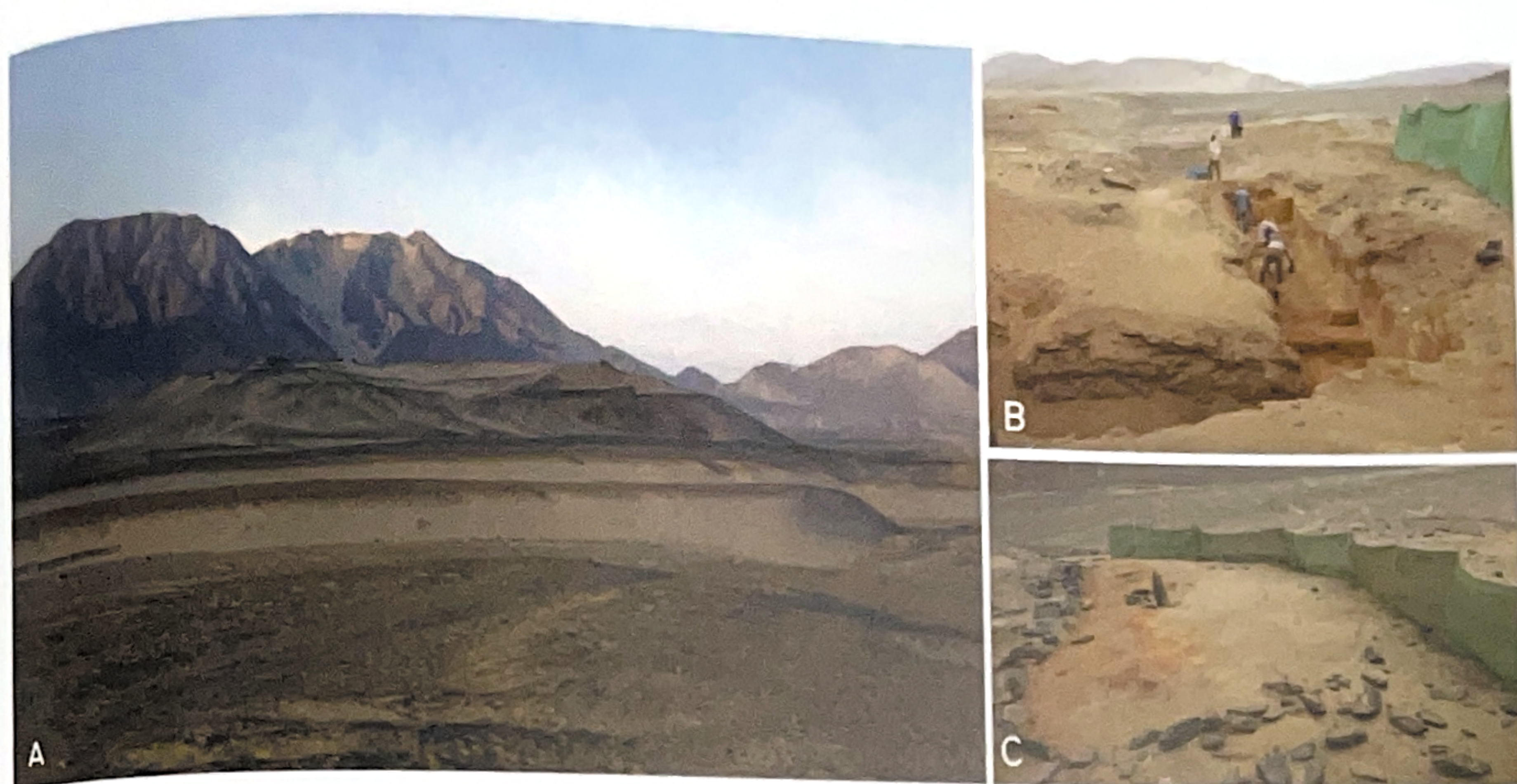
In this section I present the main results from excavations at the two main sites of Pampa de las Salinas: Los Morteros and Salinas de Chao.

## Los Morteros

Los Morteros is a mound-shaped site of large dimensions (200 x 225 m and 15 m in height), which is entirely covered by several meters of wind-blown sand. This site

is located on the central part of the pampa, on the edge of the paleo-shoreline, approximately 7 km from the Chao River and 4 km from the ocean (Fig. 3). Excavations at this site began in 2012 and continued until 2017. Our excavations at Los Morteros proved that this site was formed by complex episodes of occupation that have been grouped into two components.<sup>45</sup> Component I consists of the deepest and earliest cultural deposits, these are as yet undated, but are stratigraphically underneath, and hence older than, the first dated phase. Component II has three dated phases. The first dated occupation,

45 Mauricio 2014; Mauricio 2018.



7 Los Morteros archaeological site. A: view from north to south of the mound; B: monumental adobe architecture (Phase II-2), found on the northwest side of the mound; C: monumental stone architecture recorded on top of the mound (Phase II-3) (Photos and composition: PRAET).

Phase II-1, is a superposition of several archaeological and stratigraphic units having a high density of organic remains, clay surfaces, post holes, and stone hearths, dating to 5700–5400 cal. BP (Tab. 1). Phase II-2 corresponds to architecture with monumental characteristics composed of at least two rooms made of adobe bricks. The best-preserved room is rectangular in shape, approximately 10 m long and 7 m wide, it has foundations of medium-sized (30 x 20 cm) rocks mortared with clay. Topping this stone foundation are walls made of rows of rectangular mud bricks cemented with reddish clay mortar. Some walls of this room remained preserved up to 2 m, were covered with clay plaster, and associated with thick clay floors (Fig. 7). We have not found organic materials to date this architecture directly. However, we dated three child burials that were part of a large votive offering placed on the floor of the adobe architecture interpreted as part of a symbolic closing ceremony. Eight calibrated dates returned from the burials have a median of ca. 5100 cal. BP (Tab. 1). Phase II-3 corresponds to stone architecture built immediately over the adobe-phase structures. This architectural phase has rectangular rooms approximately 8 m long and 6 m wide, with distinctive rounded corners, stone platforms, and large standing stones (locally called *huancas*) placed in the center of some of these rooms (Fig. 7). This final phase has yielded dates between 5500–5000 cal. BP (Tab. 1).

## Salinas de Chao

In 2019 we began new excavations at Salinas de Chao with the objective of obtaining reliable materials with which to build a comparative chronology of the site based on stratigraphic excavations at different sectors. Previous investigation at Salinas de Chao yielded radiocarbon dates between 4000–3000 cal. BP, which placed the site mostly at the Initial Period. Pozorski and Pozorski<sup>46</sup> used the term “aceramic” for sites such as Salinas de Chao, El Paraiso, and Alto Salaverry, because of their lack of ceramics and their available radiocarbon dates within the Initial Period. Quilter<sup>47</sup> proposed to use Terminal Preceramic to designate this period and called attention to the need of larger excavations at massive sites like these, in order to have a better assessment of their chronology. Until 2019, radiocarbon dates obtained through excavations at several sites of Pampa de las Salinas had indicated a 1000 cal.-years gap between Los Morteros and Salinas de Chao, i.e., the two sites in this complex with ceremonial-monumental architecture. In July 2019, we carried out stratigraphic excavations in three different sectors of the site: north, south and northwest. Units were placed in areas with architecture visible on the surface. These excavations recorded several moments of site construction and remodeling. Based on the architecture recorded and eight new radiocarbon dates, we have identified two phases of occupa-

<sup>46</sup> Pozorski – Pozorski 1990.

<sup>47</sup> Quilter 1991b.



8 Location of the 2019 excavation units at the site of Salinas de Chao (photo: PRAET).

tion that are related to three moments of construction. The first occupation phase is associated with the original Preceramic construction of the site. Two moments of Preceramic construction have been identified at two excavation units; the oldest moment corresponds to monumental architecture of large dimensions recorded in Trench 1 located in the south sector of the site, at a depth of ~1.5 m from the surface. This architecture was built on artificial platforms constructed on the west slope of the Cerros Coscomba. This architecture yielded dates of 4200–3900 cal. BP. We identified more cultural layers underneath this architecture, yet to be excavated. The second Preceramic construction moment has been identified in Trench 1, Unit 1, and Unit 2. Unit 1 was located on the northwestern side, on the plain area. Unit 2 was located at the northern end of the site, at the base of the

slope of the Cerros Coscomba (Fig. 8). Excavations in these units recorded monumental architecture made of stone, clay mortar and clay floors, all carefully constructed. In Trench 1, this moment corresponds to new stone architecture built over the massive room previously described (Fig. 9). This preceramic moment of construction is related to dates between 3900–3700 cal. BP.

The second phase of occupation is related to a reuse of the site by ceramic people. This ceramic occupation used materials from the collapsed Preceramic walls and built superficial structures, many of which followed the orientation of the Preceramic spaces (Fig. 9). In several sectors, architecture visible on the surface corresponds to this late ceramic use which did not use clay mortar and did not build massive spaces. This phase is also related to incised ceramics and *Donax obesulus* shells.



9 Archaeological contexts recorded by PRAET in 2019 at the site of Salinas de Chao. A to C: Preceramic monumental architecture composed of stone and plaster walls and clay floors, recorded at Unit 2. D: monumental architecture recorded in Trench 1 (photos and composition: PRAET).

This phase seems to have been short and it is not associated with architectural remodeling. Our interpretations

about the occupation of Salinas de Chao generally concurs with the phases identified by W. Alva.<sup>48</sup>

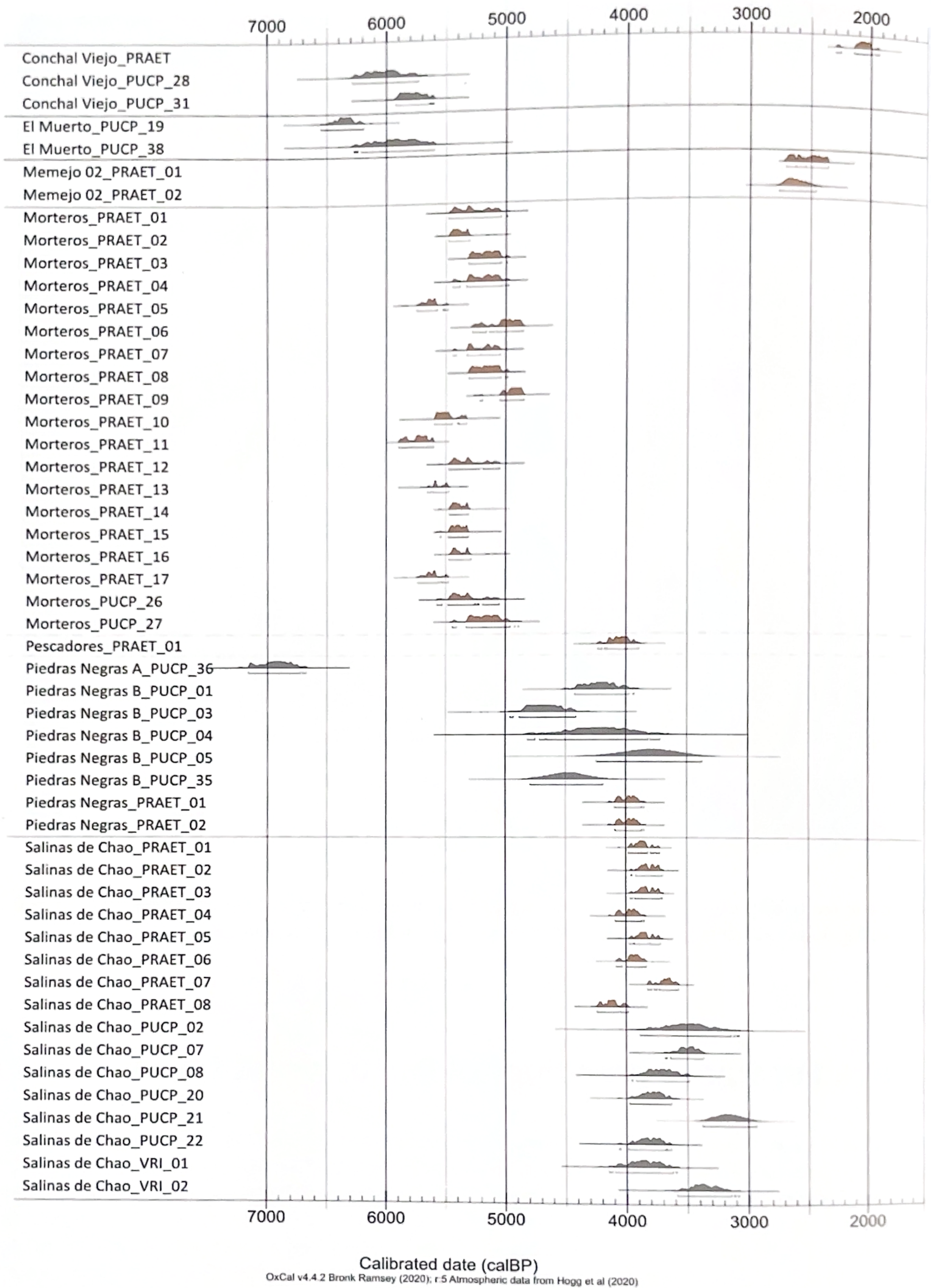
## The radiocarbon chronology of Pampa de las Salinas

Previous research at Pampa de las Salinas produced 27 radiocarbon dates for seven sites: Los Morteros, Salinas de Chao, El Muerto, Los Pescadores, Piedras Negras A, Piedras Negras B, and Conchal Viejo.<sup>49</sup> These dates are based on a variety of organic materials such as marine shells, charcoal, fibers, seeds, and human bones, collected from the surface, as well as from excavated deposits at these archaeological sites. Since 2012, our project has

carried out excavations at the site of Los Morteros, Salinas de Chao, Los Pescadores, Conchal Viejo, Piedras Negras A and B, and MEMEJO 1 and 2. These excavations have yielded 31 new dates, the majority of which are based on short-lived organic materials such as seed or cords. Just in case, the shell midden MEMEJO 2, a marine shell was dated to compare results with a charcoal sample found at a hearth in the same site.

<sup>48</sup> W. Alva 1986.

<sup>49</sup> Cárdenas 1999.



10 Graph showing the 2σ calibration plot of radiocarbon dates from eight archaeological sites in Pampa de las Salinas (elaborated by Nadia Gamarra).

The  $2\sigma$  calibration of the 58 available radiocarbon dates from eight archaeological sites of Pampa de las Salinas strongly indicates a constant occupation of the area from at least 6000 to 3000 cal. yrs. BP, which corresponds almost exclusively to the Preceramic Period (Middle and Late) (Fig. 10). The oldest of these dates comes from the site Piedras Negras A, which is a site located ca. 200 meters north of Los Morteros. Cárdenas describes this site as a small "aided" (small village) with stone architecture of about 200 m by 150 m. Another site with Middle Preceramic dates is El Muerto, whose dates come from a bone from human burial and charcoal from what it was called a domestic refuse.<sup>50</sup>

Conchal Viejo also had Middle Preceramic dates obtained by Cárdenas,<sup>51</sup> based on marine shells. My research in 2013 obtained a new date for Conchal Viejo (2143±46 RC yrs. BP), based on charcoal recovered from level 4 in unit 2. The  $2\sigma$  calibration of this new date (2300–1931 cal. BP) is significantly younger than Cárdenas' dates and falls in the Early Horizon. In fact, this date is one of the youngest dates so far obtained for an archaeological site at Pampa de las Salinas (Fig. 10). The wide difference between these two groups of dates from Conchal Viejo makes it difficult to assign a period of occupation to this site. The oldest date from the material recovered by the author could correspond to a much later use of the site, which is supported by surface finds of ceramic sherds at the site and on the slopes facing the ocean. Five out of the eight dated archaeological sites yielded dates corresponding to the Late Preceramic Period: Los Morteros, Piedras Negras A and B, Los Pescadores, and Salinas de Chao (Fig. 10). The oldest dates for the Late Preceramic period at Pampa de las Salinas correspond to seventeen new radiocarbon dates obtained by our research program from archaeological excavations at Los Morteros.<sup>52</sup> As mentioned above, the human occupation of Los Morteros has been grouped into two components. Component II has been divided into Phases 1 through 3 based on seventeen radiocarbon dates; these dates extend from 5700–5000 cal. BP. Component I correspond to several meters of cultural deposits identified underneath Component II, yet to

be dated. The available dates show a continued occupation of the site and its constant transformation. The presence of Component I suggests that the occupation of Los Morteros could have started in the Middle Preceramic.

Piedras Negras B is another site with Late Preceramic dates. There are five dates obtained by Cárdenas<sup>53</sup> from a human burial and from two other excavation units. The dates are based on organic materials such as *junco* and *totorra* from Tomb 2 (Tumba 2) and shells from Units A and B (Pozo A and Pozo B).<sup>54</sup> We obtained two new dates from Piedras Negras A and B that yield means of 4000 cal. BP (Fig. 10). Our excavations at Los Pescadores also yielded a calibrated date of 4000 BP. On the other, the  $2\sigma$  calibration of dates obtained from previous excavations at Salinas de Chao placed this site between 3900–3000 cal. BP. That is, from the end of the Late Preceramic Period through the Terminal Preceramic<sup>55</sup> and the Initial Period. Excavations by our research program obtained eight new radiocarbon dates from three different sectors of the site. These new dates come from stratigraphic excavations that recorded architectural contexts from different construction phases but excavations did not reach sterile levels. Our dates have recorded a progressive growing of the site and a continued occupation from at least 4200 to 3500 cal. BP.

The youngest dates come from *Mesodesma* shell middens located in the northwest section of the dry embayment. Our geoarchaeological explorations in 2013 found three shell middens in this part of the embayment that were not reported by previous research. Two dates come from a stone hearth containing *Mesodesma donacium* shells and charcoal at the MEMEJO 2 shell midden. Fig. 10 shows a consistent and continuous occupation of Pampa de las Salinas from 6000 cal. BP to 3000 cal. BP. The few dates older than 6000 BP seem to indicate that the initial occupation of the area started around 7000 BP. Dates from the *conchales* do not correspond with the use of any site of the pampa and seem to correspond with a final, perhaps sporadic occupation of Pampa de las Salinas, related to the exploitation of some resources such as salt and marine mollusks, after the abandonment of the sites.

50 Cárdenas 1978–79; 1999.

51 Cárdenas 1999.

52 Three radiocarbon dates obtained by Sandweiss et al. (1983) from surface deposits of marine shells. These dates are younger than the majority of other dates from the site that were recovered through archaeological excavations. Four dates were obtained by Perrier et al. (1994) from surface materials at Los Morteros, two of them yielded much older dates than the one recovered by my project from a ~2.7 m deposit in Trench 2. In this chronological as-

essment of Los Morteros, I use dates from samples recorded in archaeological excavations. As dates obtained from surface deposits could represent short use of the site after its abandonment, until we find primary contexts of these late use of the site, I prefer not use these dates.

53 Cárdenas 1999.

54 Cárdenas 1999, 158 tab. 1.

55 Quilter 1991a.

## The ceremonial complex of Pampa de las Salinas

Based on the radiocarbon dates presented above, there is evidence of a continued occupation of Pampa de las Salinas from around 6500 to 3000 cal. BP. However, in order to assess this occupation within the environmental and landscape context, I divide this chronology according to the type of context and radiocarbon dates. Occupation of Pampa de las Salinas from 6500 to 6000 cal. BP come from dates reported by previous research in the sites of El Muerto and Conchal Viejo. This occupation is not associated with major architecture or dense deposits. Therefore, it can represent a seasonal use of the area.

From 6000 cal. BP to 5000 cal. BP, human presence in Pampa de las Salinas seems to be focused at Los Morteros, with nineteen radiocarbon dates from stratigraphic excavations at different sectors proving a continuous occupation of the site. Undated deposits, found stratigraphically underneath the oldest radiocarbon-yielding contexts, could provide an older still origin of the mound. Los Morteros shows an initial site formation by a small population. It is likely that this occupation was first seasonal and changed to a permanent use of the site. The change from minor architecture such as clay floors and stone hearths to adobe, and later stone ceremonial architecture seem to indicate this transition and a long and continuous occupation and transformation of the site. During most of the Late Preceramic Period (and likely before), Los Morteros seems to have been the center of the social activities in Pampa de las Salinas, concentrating the ceremonial spaces and apparently the economic resources.

Between 4500 and 4000 cal. BP, new and larger sites with monumental characteristics were built in Pampa de las Salinas, these sites were Piedras Negras A and B, Salinas de Chao, and Los Pescadores. No domestic structures have been identified by our excavations at any of these sites. Piedras Negras A was initially reported by Cárdenas and her team (1999) as a domestic occupation; however, our excavations in 2017 found stone structures of monumental dimensions, not corresponding to domestic spaces. W. Alva<sup>56</sup> suggested domestic occupations for the structures on the plain area of Salinas de Chao. Stone hearths recorded by our research in 2019 could support this assumption but more data is needed (Fig. 9). During this period, Pampa de las Salinas reached its growth (and popularity) peak and would have become a ceremonial complex where the construction of communal spaces was favored. I propose that the geoglyph's

ceremonial areas correspond to this period, however, excavations and radiocarbon dates of these areas are necessary to confirm this idea.

It is likely that a series of environmental and landscape changes transpired between 6000 cal. BP and 4000 cal. BP. The beginning of this period coincided in time with the onset of El Niño.<sup>57</sup> These changes in the climate regime enriched the Peruvian ocean. More frequent El Niño events could have provided more fresh water to the Chao River, enriched the alluvial floodplain, and produced higher water table levels that could have been the source of freshwater for the local people. The rich ocean, riverine, and wetland environments made Pampa de las Salinas a very attractive and favorable area for permanent settlements and population growth. Coastal progradation by large amounts of sediments supplied by eolian, marine, or fluvial mechanisms (or, likely a combination of all three), seems to have started around the beginning of this period. It is likely that the formation of wetlands and mud-rich lagoons in nearby areas would have accompanied this process. The local wetland and riverine areas complemented the marine resources with fruits, tubers, legumes, sedges, and cotton (either by gathering or cultivation). The reported presence of *puquios* (artificial sunken areas or wells that exploit the water table to create springs) in the lower Virú and Chao valleys since the 1940s<sup>58</sup> could help to explain what were the sources of fresh water for these populations. However, it is a matter for future research to identify the presence of local ancient wells or springs.

With the available data, all Preceramic settlements seem to have been abandoned by 3000 cal. BP (Fig. 10). I have proposed elsewhere<sup>59</sup> that this would be the period when the population also exploited the local salina that was progressively exposed as the ocean receded to its current position. The stone mortars found on the surface (and possibly in some tombs) of Los Morteros have been related to the important economic activity of salt processing.<sup>60</sup> The progressive aridification and salinization of Pampa de las Salinas could have reached a critical point around the proposed time, which was coupled with the proposed southward displacement of an important local economic resource (*Mesodesma* clams) around 2800 cal. BP as a result of an increase in the frequency of major El Niño events.<sup>61</sup> The radiocarbon dates from MEMEJO 2 *Mesodesma* shell midden, located in-

56 W. Alva 1986.

57 Sandweiss et al. 2020.

58 ONERN 1973; Willey 1953.

59 Mauricio 2015.

60 Cárdenas 1999.

61 Sandweiss et al. 2001; Sandweiss 2020.

side the paleo-embayment, indicate that by 2700–2400 cal. BP that part of the embayment was already stable and at some distance apart from the ocean. Our radiocarbon date from Conchal Viejo fits better with this *Mesodesma* exploitation and represents the last dated human presence in Pampa de las Salinas.

The abandonment of Pampa de las Salinas could also have been coupled with social transformations in the valley, perhaps associated with the rise of new civic-ceremonial centers in other parts of the valley. Initial Period and Early Horizon sites such as Tizal on the right side of the lower valley or Cerro Cabra in the middle valley<sup>62</sup> could

## Conclusion

New comprehensive research carried out at Pampa de las Salinas has produced valuable information that advances our understanding of the Late Preceramic Period and the development of monumentality in the northern Peruvian coast. Before 2012, Salinas de Chao was only site with known monumental-communal characteristics in the Chao Valley, but its chronology led to the interpretation that it was a late example of monumentality that developed at the end of the Late Preceramic and the beginning of the Initial Period, as consequence of cultural diffusion. In 2012, our research program initiated an integrated study of the area, including a re-evaluation of the radiocarbon chronology and environmental approaches. Our results led us to consider Pampa de las Salinas as a long-term Preceramic ceremonial complex. The human occupation of this area seems to have begun before 6500 cal. BP, with a permanent occupation probably starting at 5700 cal. BP at Los Morteros. Los Morteros is an Early Late Preceramic site that contains examples of early small-scale monumental architecture built between 5300–5000 cal. BP. This architecture seems to be related to the performance of activities and ceremonies that gathered small groups of people, perhaps at a family level. During most of the Late Preceramic Period (and likely before), Los Morteros seems to have been the center of the social activities in Pampa de las Salinas, concentrating the ceremonial spaces and apparently the economic resources. Los Morteros has evidence suggestive of emerging leaders who performed ceremonies and probably coordinated communal activities. Nevertheless, there

have replaced Pampa de las Salina as regional centers for the Chao Valley (or even sites in the Santa or Vim valleys). However, the lack of archaeological investigations in most areas of this valley does not allow a more in-depth discussion for now. It is important to stress the fact that the available data indicate that Pampa de las Salinas did not have significant human occupation after the Preceramic Period. The explorations of the sites of Pampa de las Salinas by my research and by Cárdenas and colleagues in the late 1970s indicate that the sites in this area were all preceramic, though some of them had a short-term ceramic period "reuse", particularly Salinas de Chao.

is no evidence for differential individual access to resources among the population of Pampa de las Salinas.

Around 4500 cal. BP, Pampa de las Salinas began to experience a critical period of growth with the construction of several sites with monumental dimensions, favoring the presence of large public/communal spaces. This would be the period when the construction in Salinas de Chao, Piedras Negras, Los Pescadores (and likely the geoglyph ceremonial areas) started. This growing period continued the creation of a cultural landscape that started with the construction of the mound of Los Morteros. Between 4500–3500 cal. BP, Pampa de las Salinas was an important ceremonial center in the Chao Valley and based on the available information, it was a major center for this part of the north coast. By 3000 cal. BP the occupation of Pampa de las Salinas declined significantly and by 2700 cal. BP activities in this area seem to have been reduced to the exploitation of particular economic resources.

The preceramic occupation of Pampa de las Salinas seems to have been closely related to local and regional climatic and environmental trends, particularly with the El Niño regime. Our study at Pampa de las Salinas shows that it is not possible to understand the human history of this area without including the study of the local environment. Finally, the results of this study indicate that understanding the social developments of the Late Preceramic Period in the Central Andes, requires paying closer attention to local and regional histories that exhibit high variability, in addition to assessing homogeneous trends across the broader region.

<sup>62</sup> Cárdenas 1998.

## Abstract

Pampa de las Salinas is an isolated area located 9 km southwest of the Chao district, north coast of Peru. In 1976, pioneering work led by Dr. Mercedes Cárdenas discovered more than 20 archaeological sites, including Las Salinas de Chao. In 2012, we started a research program at Pampa de las Salinas, applying a comprehensive geoarchaeological and environmental approach. This research includes excavations at several archaeological

sites, extensive ground and aerial survey and mapping, as well as a series of analyses including more than 50 radiocarbon dates. Based on this data, we propose that Pampa de las Salinas was a ceremonial complex that flourished during the Late Preceramic period. The history of Pampa de las Salinas contributes to understanding the social and environmental context of the rise of monumentality on the Peruvian coast.

## Bibliography

- I. Alva 2008** I. Alva, Los complejos de Cerro Ventarrón y Collud-Zarpan: del Precerámico al Formativo en el valle de Lambayeque, *Boletín de Arqueología PUCP* 12, 2008, 97–117.
- W. Alva 1986** W. Alva, Las Salinas de Chao. Asentamiento temprano en el norte del Perú, *Materialien zur Allgemeinen und Vergleichenden Archäologie* 34 (München 1986).
- Benfer 1990** R. Benfer, Proyecto de excavaciones en Paloma, valle de Chilca, Perú, *Boletín de Arqueología PUCP* 3, 1990, 213–237.
- Burger 1992** R. L. Burger, *Chavin and the origins of Andean civilization* (New York 1990).
- Carcelén – Angulo 1999** J. Carcelén – A. Angulo, Catastro de los sitios arqueológicos del área de influencia del canal de irrigación Chavimochic: Valle viejo de Chao, *Patrimonio arqueológico zona norte* 5 (Trujillo 1999).
- Cárdenas 1976** M. Cárdenas, Informe preliminar del trabajo de campo en el valle de Chao, Informe presentado al Instituto Nacional de Cultura (Lima 1976).
- Cárdenas 1977–78** M. Cárdenas, Obtención de una cronología del uso de recursos marinos en el antiguo Perú, *Boletín del Seminario de Arqueología* 19–20, 1977–78, 3–26.
- Cárdenas 1978** M. Cárdenas, Columna cronológica del valle de Chao. Informe general de trabajos, Instituto Riva Agüero, unpublished report submitted to the Instituto Nacional de Cultura-La Libertad (Lima 1978).
- Cárdenas 1995** M. Cárdenas, El sitio precerámico de Los Morteros, pampa de Salinas de Chao, *Boletín de Lima* 100, 1995, 45–56.
- Cárdenas 1998** M. Cárdenas, Material diagnóstico del periodo formativo en los valles de Chao y Santa, costa norte del Perú, *Boletín de Arqueología PUCP* 2, 1998, 61–88.
- Cárdenas 1999** M. Cárdenas, El Periodo Precerámico en el valle de Chao, *Boletín de Arqueología PUCP* 3, 1999, 141–169.
- Cárdenas – Vivar 2002** M. Cárdenas – Vivar, Restos humanos de la ocupación precerámica en Pampa de Salinas de Chao, *Boletín de Lima* 24 (129), 2002, 43–62.
- Dillehay et al. 2012** T. Dillehay – D. Bonavia – S. Goodbred – M. Pino – V. Vásquez – T. Rosales – W. Conklin – J. Splitstoser – D. Piperno – J. Iriarte – A. Grobman – G. Levi-Lazzaris – D. Moriera – M. López – T. Tung – A. Titelbaum – J. Verano – J. Adovasio – L. Scott – P. Bearez – E. Dufour – O. Tombret – M. Ramírez – R. Beavins – L. DeSantis – I. Rey – P. Mink – G. Maggard – T. Franco, Chronology, mound-building and environment at Huaca Prieta, coastal Peru, from 13700 to 400 years ago, *Antiquity* 86, 2012, 48–70.
- Felber 1984** H. Felber, *Vienna Radium Institute Radiocarbon Dates* 14, *Radiocarbon* 26 (3), 1984, 441–448.
- Feldman 1980** R. Feldman, *Aspero, Peru: Architecture, subsistence economy and other artifacts of a Preceramic Maritime Chiefdom*. Ph.D. diss. University of Harvard (Cambridge 1980).
- Fung 1988** R. Fung, The Late Preceramic and Initial Period, in: R. Keatinge (ed.), *Peruvian prehistory: An overview of pre-Inca and Inca society* (Cambridge 1988) 67–96.
- Garrido 1953** E. Garrido, La zona arqueológica de Trujillo, Chimor, *Boletín del Museo de Arqueología de la Universidad Nacional de Trujillo* 1 (1), 1953, 3–21.
- Haas – Creamer 2004** J. Haas – W. Creamer, Cultural transformations in the Central Andean Late Archaic, in: H. Silverman (ed.), *Andean Archaeology* (Malden 2004) 35–50.

- Haas – Creamer 2006** J. Haas – W. Creamer, The crucible of Andean civilization. The Peruvian coast from 3000 to 1800 BC, *Current Anthropology* 47 (5), 745–775.
- Kent et al. 2003** J. Kent – T. Rosales – V. Vásquez, Informe final (temporada 2002): Manejo ecosustentable y desarrollo cultural del Complejo Arqueológico Santa Rita “B.” Informe final presentado al Instituto Nacional de Cultura-La Libertad (Trujillo 2003).
- Kent et al. 2005** J. Kent – T. Rosales – V. Vásquez – C. Gaither, Informe final (temporada 2004): Manejo ecosustentable y desarrollo cultural del Complejo Arqueológico Santa Rita “B.” Informe final presentado al Instituto Nacional de Cultura-La Libertad (Trujillo 2005).
- Kent et al. 2009** J. Kent – T. Rosales – V. Vásquez Sánchez – R. Busch – C. Gaither, Gallinazo and Moche at Santa Rita B: Middle Chao Valley, Northern Coastal Perú, in: J. F. Millaire – M. Morlion (eds.), *Gallinazo: An Early Cultural Tradition on the North Coast of Peru* (Los Angeles 2009).
- Lanning 1963** E. P. Lanning, A pre-agricultural occupation on the central coast of Peru, *American Antiquity* 28, 1963, 360–371.
- Lanning 1967** E. P. Lanning, *Peru before the Incas* (New Jersey 1967).
- Mauricio 2014** A. Mauricio, *Los Morteros: Exploraciones Geoarqueológicas y Paleoambientales de un Montículo Temprano, Valley de Chao (Los Morteros: Geoarchaeological and Paleoenvironmental Explorations of an Early Mound, Chao Valley, Peru)*, *Bulletin de l’Institut Français d’études Andines* 43 (1), 2014, 141–169.
- Mauricio 2015** A. Mauricio, *Los Morteros: Early Monumentality and Environmental Change in the Lower Chao Valley, Northern Peruvian Coast*, Ph.D. diss. University of Maine (Orono 2015).
- Mauricio 2018** A. Mauricio, El sitio Los Morteros y el complejo arqueológico de Pampa de las Salinas, in: I. Ghezzi – L. E. Salcedo (eds.), *La cooperación francesa en Latinoamérica. Avances recientes en datación y arqueometría en los Andes* 45 (La Paz 2018) 101–118.
- Moore 1996** J. Moore, *Architecture and power in the ancient Andes. The archaeology of public buildings*, *New Studies in Archaeology* (Cambridge 1996).
- Moseley 1975** M. E. Moseley, *The maritime foundations of Andean civilization* (Menlo Park 1975).
- Moseley 1982** M. E. Moseley, Introduction: human exploitation and organization on the north Andean coast, in: M. Moseley – K. Day (eds.), *Chan Chan: Andean desert city* (Albuquerque 1982) 1–24.
- Moseley 1985** M. E. Moseley, The exploration and explanation of early monumental architecture in the Andes, in: C. B. Donnan (ed.), *Early ceremonial architecture in the Andes*, *Dumbarton Oaks Pre-Columbian Symposia and Colloquia* (Washington D.C. 1985) 29–58.
- Moseley 1992** M. E. Moseley, *The Incas and their ancestors: the archaeology of Peru* (London 1992).
- ONERN 1973** ONERN, *Inventario, evaluación y uso racional de los recursos naturales de la costa: cuencas de los ríos Virú y Chao 1. 2*, Oficina Nacional de Evaluación de Recursos Naturales (Lima 1973).
- Patterson – Moseley 1968** T. C. Patterson – M. E. Moseley, Late preceramic and early ceramic cultures on the central coast of Peru, *Ñawpa Pacha* 6, 1968, 115–133.
- Perrier et al. 1994** C. Perrier – C. Hillaire-Marcel – L. Ortlieb, Paléogéographie Littorale et enregistrement isotopique (13C, 18O) d’événements de types El Niño par les mollusques Holocènes et récents du nord-ouest péruvien, *Geographie Physique et Quaternaire* 48, 1994, 23–38.
- Pozorski – Pozorski 1990** S. Pozorski – T. Pozorski, Re-examining the critical Pre-ceramic/ Ceramic Period transition: New data from coastal Peru, *American Anthropologist* 92, 1990, 481–491.
- Pozorski – Pozorski 2008** S. Pozorski – T. Pozorski, Early cultural complexity on the coast of Peru, in: H. Silverman – W. Isbell (eds.), *Handbook of South American Archaeology* (New York 2008) 607–631.
- Quilter 1991a** J. Quilter, Late Pre-ceramic Peru, *Journal of World Prehistory* 5 (4), 1991, 387–438.
- Quilter 1991b** J. Quilter, Problems with the Late Pre-ceramic of Peru, *American Anthropologist*, New Series 93 (2), 1991, 450–454.
- Rosales et al. 2006** T. Rosales – J. Kent – V. Vásquez – J. Bethard, Informe Final, Temporada 2006, Manejo Ecosustentable y Desarrollo Cultural del Complejo Arqueológico Santa Rita “B.” Informe final presentado al Instituto Nacional de Cultura-La Libertad (Trujillo 2006).
- Sandweiss 2010** D. H. Sandweiss – A. Kelley – D. Belknap – J. Kelley – K. Rademaker – D. Reid, GRP Identification of an early monument at Los Morteros in the Peruvian coastal desert, *Quaternary Research* 73 (3), 2010, 349–448.
- Sandweiss 2014** D. H. Sandweiss, Early coastal South America, in: C. Renfrew – P. Bahn (eds.), *The Cambridge prehistory* (Cambridge 2014) 1058–1074.
- Sandweiss 2020** D. H. Sandweiss – C. F. T. Andrus – A. R. Kelley – K. A. Maasch – E. J. Reitz – P. B. Roscoe, Archaeological Climate Proxies and the Complexities of Reconstructing Holocene El Niño in Coastal Peru, *Proceedings of the National Academy of Sciences* 117, 2020, 8271–8279.

- Sandweiss et al. 1983** D. H. Sandweiss – H. B. Rollins – J. B. Richardson III, Landscape alteration and prehistoric human occupation on the North Coast of Peru, *Annals of Carnegie Museum* 52, 1983, 277–298.
- Sandweiss et al. 2001** D. H. Sandweiss – K. A. Maasch – R. L. Burger – J. B. Richardson III – H. B. Rollins – A. Clement, Variation in Holocene El Niño frequencies: Climate records and cultural consequences in ancient Peru, *Geology* 29 (7), 2001, 603–606.
- Service 1975** E. Service, *Primitive social organization: An evolutionary perspective* (New York 1975).
- Shady 2004** R. Shady, Caral. *The City of the Sacred Fire/Caral. La ciudad del Fuego Sagrado* (Lima 2004).
- Shady – Leyva 2003** R. Shady – C. Leyva, *La ciudad sagrada de Caral-Supe: los orígenes de la civilización andina y la formación del Estado prístino en el antiguo Perú* (Lima 2003).
- Shady et al. 2001** R. Shady – J. Haas – W. Creamer, Dating Caral, a pre-ceramic site in the Supe Valley on the central coast of Peru, *Science* 292, 2001, 723–726.
- Trigger 1990** B. Trigger, Maintaining economic equality in opposition to complexity: an Iroquoian case Study, in: S. Upham (ed.), *The evolution of political systems: Sociopolitics in small-scale sedentary societies* (Cambridge 1990) 119–145.
- Vega Centeno 2006** R. Vega Centeno, *Ritual and architecture in a context of emergent complexity: A perspective from Cerro Lampay, a Late Archaic site in the central Andes*, Ph.D. diss. University of Arizona (Tucson 2006).
- Vogel 2012** M. Vogel, *Frontier life in ancient Peru: the archaeology of Cerro La Cruz* (Gainesville 2012).
- Willey 1953** G. Willey, *Prehistoric settlement patterns in the Viru Valley, Peru* (Washington 1953).
- Willey – Corbett 1954** G. Willey – J. Corbett, *Early Ancon and Early Supe Culture*. *Columbia University Studies in Archaeology and Ethnology* 3 (New York 1954).
- Wells 1988** L. E. Wells, *Holocene Fluvial and Shoreline History as a Function of Human and Geologic Factors in Arid Northern Peru*. Ph.D. dissertation, Stanford University (Palo Alto, CA. 1988).

**Address of the author**

Ana Cecilia Mauricio  
Departamento de Humanidades, oficina 113  
Pontificia Universidad Católica del Perú  
San Miguel, Lima, Perú  
Email: cecilia.mauricio@pucp.edu.pe