



HAL
open science

Cultural filiations between the Virú communities, Early Intermediate Period, northern coast of Peru: Recent contributions from ceramic technology

Alicia Espinosa, Isabelle Druc, Jean-François Millaire, Gabriel Prieto,
Leonardo Arrelucea

► To cite this version:

Alicia Espinosa, Isabelle Druc, Jean-François Millaire, Gabriel Prieto, Leonardo Arrelucea. Cultural filiations between the Virú communities, Early Intermediate Period, northern coast of Peru: Recent contributions from ceramic technology. *Journal of Archaeological Science: Reports*, 2021, 40, pp.103232. 10.1016/j.jasrep.2021.103232 . hal-03916850

HAL Id: hal-03916850

<https://hal.science/hal-03916850>

Submitted on 5 Jan 2024

HAL is a multi-disciplinary open access archive for the deposit and dissemination of scientific research documents, whether they are published or not. The documents may come from teaching and research institutions in France or abroad, or from public or private research centers.

L'archive ouverte pluridisciplinaire **HAL**, est destinée au dépôt et à la diffusion de documents scientifiques de niveau recherche, publiés ou non, émanant des établissements d'enseignement et de recherche français ou étrangers, des laboratoires publics ou privés.



Distributed under a Creative Commons Attribution - NonCommercial 4.0 International License

1 **Cultural filiations between the Virú communities, Early Intermediate Period,**
2 **northern coast of Peru: recent contributions from ceramic technology**

3
4 Espinosa Alicia^{a,1}, Isabelle Druc^b, Jean-François Millaire^c, Gabriel Prieto^d, Leonardo Arrelucea^e

5 ^a Université Paris 1 – Panthéon Sorbonne, 12 Place du Panthéon, 75231, Paris, France; UMR 8096
6 (Archéologie des Amériques), 9 Rue Malher, 75004 Paris, France

7 ^b University of Wisconsin-Madison, Department of Anthropology, 5240 Social Science, Madison,
8 Wisconsin, 53706, USA; Field Museum in Chicago, 1400 S Lake Shore Dr, Chicago, 60605,
9 Illinois, USA, icdruc@wisc.edu

10 ^c The University of Western Ontario, Department of Anthropology, London, Ontario, Canada
11 N6A 5C2, jean-francois.millaire@uwo.ca

12 ^d University of Florida, Gainesville, Florida, 32611, USA, ogabriel.prietob@ufl.edu

13 ^e Universidad Nacional de Trujillo, La Libertad, Perú, Av. San Pedro s/n,
14 leoarrelucea@gmail.com

15
16 **Abstract**

17 The Virú populations are now believed to have formed a centralized polity in the Virú
18 Valley, which occasionally settled in neighboring regions, as in Pampa La Cruz in the
19 Moche Valley, and Huaca Prieta in the Chicama Valley. Their presence is essentially
20 established by their cultural marker: negative ceramic. However, little is known about the
21 relations between these populations, and in particular about the technical traditions of
22 potters, which would enable us to know if they belong to the same community of practice.
23 We propose to test the hypothesis of a movement of Virú communities into adjacent
24 valleys by a technological approach that seeks to reconstruct all the steps of the operative
25 chain. The analysis of manufacturing traces combined with the petrographic study of
26 pastes leads to the definition of a technical tradition shared and perpetuated by these
27 communities, each producing its own pottery locally.

28
29 **Keywords**

30 Ceramic technology ; Petrography ; Operative chain concept ; Technical tradition ;
31 Community of practice ; Andean Archaeology ; Virú culture.

¹ Corresponding author: alicia.espinosa@univ-paris1.fr or espinosa-alicia@hotmail.fr

1. Introduction

The Virú culture was first described by Rafael Larco Hoyle (1945), who defined it as an ethnical group independent of the Moche. The frequent discovery of ceramic wares decorated with negative design led him to consider this style as its hallmark. A few years later, after his research at the Gallinazo Group, Wendell C. Bennett (1939) proposed that the ceramic vessels decorated with modelled applications and incisions, today known as Castillo Decorated, could also be conceived as a cultural marker of the Virú culture that he called Gallinazo. These results were further supported by the Viru Valley Project, and in particular the work of William D. Strong and Clifford Evans (1952), James Ford, and Gordon Willey (1953), who have established the importance of the Gallinazo culture in the valley chronological sequence. The latter emphasized that the development of the Gallinazo culture was interrupted by the Moche who conquered the region around the 4th century, as evidenced by the presence of Moche style ceramics at Gallinazo sites (Willey, 1953: 397). Since then, the Virú, Gallinazo, or Virú-Gallinazo culture was believed to have originated in the Virú valley, and to have extended their territory throughout the northern coast during the Early Intermediate Period (200 B.C. – 600 A.D.; Fogel, 1993).

Nonetheless, until the beginning of the 20th century, this culture was mainly and solely identified by the Castillo Decorated type, that was most often found in Moche context along with Moche pottery (Chapdelaine et al., 2009; Franco et al., 2009; Ubbelohde-Doering, 1983; Uceda et al, 2009). Researchers then started to question the use of Castillo Decorated as a Virú hallmark, and the limited evidence of negative ceramics outside the Virú Valley has only accentuated doubts about the actual spatial and chronological extension of this culture (Millaire, 2009: 12). Moreover, recent excavations conducted by Bourget (2010) and Millaire (2010a, 2010b) in the Virú Valley have demonstrated the contemporaneity of the Virú and Moche during the whole Early Intermediate Period, and the absence of conquest of the region by the latter. In 2005, a roundtable held in Trujillo led to the definition of a new Virú paradigm (Millaire and Morlion, 2009). Virú is now understood as a polity contemporary to the Moche, mostly developed in the Virú valley, and whose hallmark is the Negative type, produced by highly specialized artisans linked to the elites (Donnan, 2009: 30; Millaire, 2009: 12). As for Gallinazo, it refers to the Castillo Decorated type that belong to a common domestic tradition produced by potters of the Virú and Moche communities (Donnan, 2009: 30; Makowski, 2009: 34; Millaire, 2009: 13).

66 More recently, in 2016, Jean-François Millaire and colleagues hypothesized that,
67 during the Early Intermediate Period, the inhabitants of the Virú Valley were organized
68 into a centralized polity, with outposts established in neighboring regions. It is believed
69 that these sites were occupied by members of the Virú administration, who would have
70 controlled these new territories (Fogel, 1993; Millaire et al., 2016, p. E6017).
71 Radiocarbon analyses attest to the contemporaneity of the sites, and morpho-stylistic
72 analyses of ceramics suggest the presence of a community closely connected to the Virú
73 polity, who shared the Negative style (Millaire et al., 2016, p. E6019). However, little is
74 known about the relationship between the core of the Virú polity and its outpost, and it is
75 even more challenging to understand the motivations behind this territorial expansion,
76 whether it is to access new natural or human resources or to spread their political and
77 ideological system.

78

79 In this article, we propose to document this hypothesis by adopting a new approach
80 that is ceramic technology. The so-called “culture history period” was a significant
81 contribution to the field at a time when no absolute dating techniques were available to
82 organize chronologically ceramic types found in archaeological context (Larco Hoyle,
83 1948; Strong and Evans, 1952; Willey, 1953). Recently, researchers started to approach
84 the ceramic material differently, through archaeometric analyses, going beyond mere
85 morphological and style descriptions to identify the contexts of production and the
86 networks of circulation of pots (Arrelucea, 2019; Del Solar, 2015; Koons, 2015;
87 Rohfritsch, 2010). Although previous studies have focused on sourcing clays and defining
88 petrogroups, they have not necessarily inquired about the technological dimension of
89 ceramic production, which is required to reconstruct the different steps of the operative
90 chain, and to identify communities of practice. This approach, recently applied for
91 Prehispanic ceramics in Ecuador (Lara, 2017), has never been applied to the Peruvian
92 North Coast. Our study then consists in the first description of the technical traditions of
93 Virú potters, which brings us new insights on their degree of filiation at a macro-regional
94 scale. We believe that by studying the whole range of production, which includes
95 decorated ceramics wares of the Negative and Castillo Decorated types, and undecorated
96 ceramics, we will gain a better understanding of the different techniques mastered by
97 potters. In this case, the study shows that Virú potters shared a common technical tradition
98 to shape both decorated and undecorated pottery, which were not necessarily produced
99 by different production units.

100 **2. Research and theories about the Virú polity**

101

102 During the Early Intermediate Period (200 B.C – 600 A.D), the Peruvian North Coast
103 witnessed the development of various regional entities, among them the Virú populations.
104 In the Virú Valley, between 200 B.C and at least 700 A.D, they built a significant number
105 of sites, as the Gallinazo Group which includes the Huaca Gallinazo (**Fig. 1**). This center
106 would have controlled an economically and socially integrated territory, linked to
107 mid-sized administrative and defensive centers such as Huaca Santa Clara and Castillo de
108 Tomaval, and small villages (Millaire, 2010a, p. 6187).

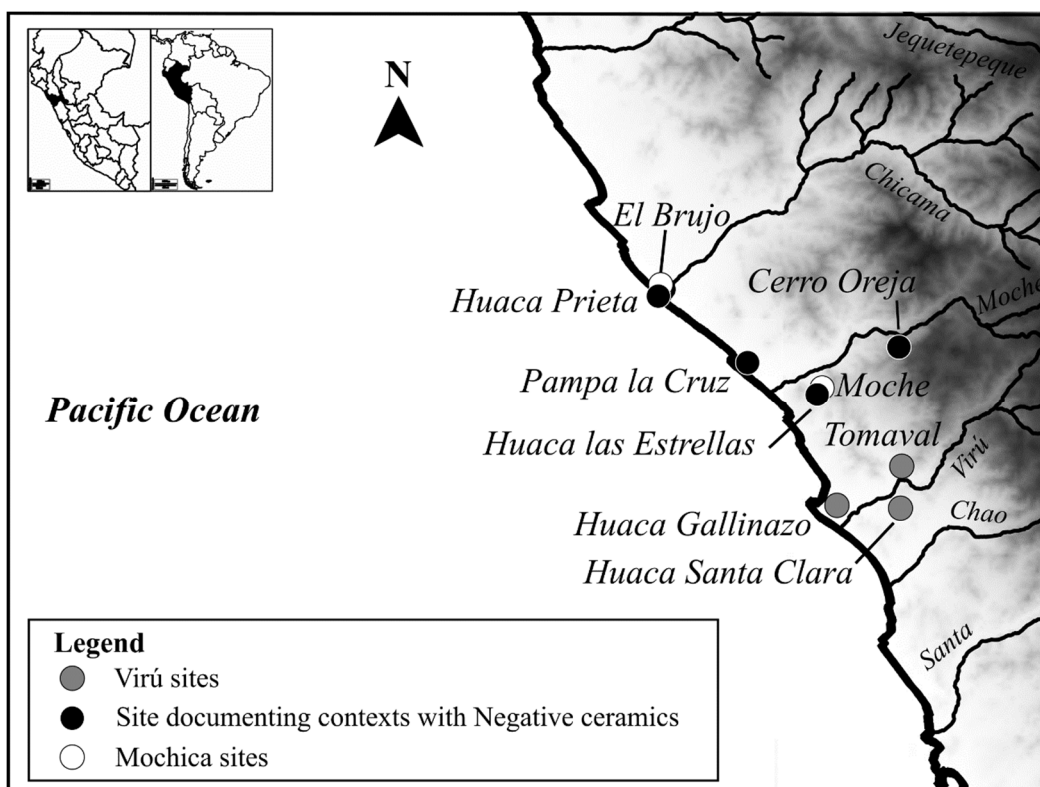


Fig. 1. Map of the study area showing the sites that are studied (Huaca Gallinazo, Huaca Santa Clara, Pampa La Cruz, Huaca Prieta) and mentioned in this work. ASTER GDEM is a product of METI and NASA.

109

110 Since the Virú Valley Project in the 1940's, evidence of Virú polity territorial
111 expansionism has been noted (Fogel, 1993). This hypothesis was further supported by the
112 discovery of Castillo Decorated ceramics from the valley of Piura in the north to the valley
113 of Casma and Huarmey in the south. However, outside the Virú Valley, few sites present
114 contexts with Negative ceramics (Millaire, 2009, p. 12; **Fig. 1**), which are considered to
115 represent the cultural hallmark of this political entity (Bennett, 1939; Ford, 1949; Larco

116 Hoyle, 1945; Strong and Evans, 1952; **Fig. 2**). The negative decoration is made by
117 applying a removable material, which protects the surface during the smoking of the
118 vessel. This material is then removed, revealing geometric designs on a black background.



Fig. 2. Examples of the Virú ceramic types from Huaca Santa Clara included in the study. a. Jar decorated with negative designs; b. Castillo Decorated: effigy vessel corresponding to the Castillo Modeled subtype; c. Castillo Decorated: cooking pots decorated with a series of geometric impressions that corresponds to the Castillo Incised subtype. d. Castillo Plain type (plainware).

119 For Millaire et al. (2016, p. E6022), the presence of negative ceramics in the
120 Moche and Chicama Valleys (**Fig. 1**) is evidencing the establishment of communities
121 politically and economically linked to the Virú polity. These sites highlight the
122 expansionist dynamics of the Virú polity, throughout the establishment of outposts in
123 strategic locations (Millaire et al. 2016, p. E6023). Since these outposts were identified
124 on the basis of negative ceramic, one is therefore entitled to wonder whether the presence
125 of negative ceramics is the result of a population movement or just of elites, of trade or
126 even of local production by potters imitating the Virú style. Traditional typological

127 studies are not adequate to characterize the technological complexity of an assemblage,
128 nor to identify the production groups and the relations between communities sharing the
129 same types. Ethnoarchaeological investigations have indeed shown that a given
130 morphological type can be produced according to different technical traditions, and that
131 different types can be produced according to the same tradition (Gallay, 2011, p. 326;
132 Roux and Courty, 2005, p. 201), which makes it impossible to say that negative ceramics
133 were produced by the same social group.

134 Based on cursory analysis of Virú ceramics uncovered in different regions, we
135 hypothesize that members of the Virú populations moved from the Virú valley to settle
136 in neighboring regions, which would include members of the elite but also potters. To test
137 this hypothesis, we use a novel approach based on the operative chain concept, which
138 identifies technical traditions by studying the diagnostic features visible on ceramic
139 vessels (Roux, 2016; Roux and Courty, 2005). In the following sections, we will describe
140 the contexts and materials, then focus on the description of the technical traditions, and
141 finally in a discussion, we will highlight the keys results that improve our understanding
142 of the cultural filiations between the Virú communities on the Peruvian North Coast.

143

144 **3. Contexts and materials**

145

146 For this study, we analyzed 9407 ceramic fragments and complete pots (minimum
147 number of individuals: 6308; **Table 1**), which includes Negative type ceramic vessels,
148 but also Castillo Decorated, Gallinazo Broad-Line-Incised, and plainwares as the Castillo
149 Plain type. These collections come from two recently excavated sites in the Virú Valley,
150 and two Virú contexts outside of this region. Huaca Gallinazo and Huaca Santa Clara are
151 two of the most important Virú settlements, occupied between 200 B.C and 700 A.D.
152 These collections are stored in the warehouses of the Ministry of Culture of Peru in
153 Trujillo (La Libertad), and were examined in 2019 following the submission of a
154 collection study project. Huaca Gallinazo is a large platform mound that comprises
155 residential and civico-ceremonial structures, located in the lower Virú Valley (Millaire,
156 2010a, p. 6187). This mound is part of the Gallinazo Group, a large agglomeration of
157 mounds and residential areas. The ceramics studied were collected by the *Proyecto*
158 *Arqueológico Virú*, directed by Millaire and his team between 2008 and 2014.

159

160

161

162

Site	Valley	Part of valley	Total	MNI	Sherds	Complete pots	Negative	Castillo Decorated	Gallinazo Broad-Line-Incised	Plainwares	Other	Slides
Huaca Gallinazo	Virú	Lower	501	177	485	16	117	79	29	221	55	11
Huaca Santa Clara	Virú	Middle	7179	4892	7150	29	702	315	60	5768	334	25
Pampa La Cruz	Moche	Lower	1197	715	1176	21	60	77	0	1060	0	33
Huaca Prieta	Chicama	Lower	530	524	294	6	35	76	0	417	2	0
Total			9407	6308	9105	72	914	547	89	7466	391	69

163

Table 1. Characteristics of the ceramic collection studied.

164

165 Huaca Santa Clara is an administrative center located in the middle Virú Valley,
166 and is characterized by a set of residential, administrative and ceremonial structures built
167 on the slopes of the *Cerro Cementerio* (Millaire, 2010b, p. 228). The collection comes
168 from the contexts investigated by the *Programa Arqueológico Huaca Santa Clara*
169 between 2002 and 2003, conducted by Millaire and his team.

170 Pampa La Cruz is located on the Huanchaco bay in the lower Moche Valley. It
171 was recently excavated by Gabriel Prieto and his team as part of the *Programa*
172 *Arqueológico Huanchaco*. The material analyzed comes from the Virú occupation levels
173 (100 to 400 A.D), which resulted in the construction of numerous residential structures
174 and plazas (Parker et al., 2018; Prieto, 2018, p. 98-220). The technological study was
175 conducted at the *Universidad Nacional de Trujillo* between 2016 and 2017.

176 The collections of Huaca Prieta are housed at the *American Museum of Natural*
177 *History* in New York, where we made the analysis in 2018. There were integrated into
178 the Department of South American Archaeology by Junius Bird following his excavations
179 at Huaca Prieta between 1946 and 1947 as part of the Virú Valley Project (Bird et al.,
180 1985). The site is an artificial mound located in the lower Chicama Valley, which belongs
181 to the El Brujo Archaeological Complex, occupied by the Mochica from the 3rd to 7th
182 centuries A.D (Millaire et al., 2016, p. E6017; Mujica et al., 2007). The Virú ceramics
183 come from test pits 1 and 3 to the north of the mound, and from test pit 4 on the northern
184 slope where several disturbed funerary contexts were identified (Bird et al., 1985, p. 29,
185 48, 271; Millaire et al., 2016, p. E6017). These contexts are dated to 111 BC to 380 A.D
186 (Millaire et al., 2016, p. E6019).

187

188 **4. Methodology: the definition of technical traditions**

189

190 We use ceramic technology as an approach to identify and compare the Virú
191 technical traditions, through the analysis of collections from secured and documented
192 contexts. This approach is rooted in the anthropology and archaeology of techniques by
193 relying on the operative chain concept (Balfet et al., 1983; Lemonnier, 1983; Leroi-
194 Gourhan, 1973). For ceramic production, this concept is defined as "*a series of operations*
195 *that transforms a raw material into a finished product*" (Cresswell, 2010 [1976], p. 26).
196 Ceramic technology offers a theoretical and methodological framework to reconstruct the
197 production process, which can be divided into six main stages: paste selection and

198 preparation, shaping, finishing, surface treatments, decoration and firing (Balfet et al.,
199 1983; Roux, 2016: 31; Shepard, 1980 [1956]: 49-94).

200 This anthropological reading of the material leads us to understand the potters'
201 choices among the set of potential techniques, which vary according to natural factors,
202 constraints linked to the properties of the materials and techniques involved, the function
203 or morphology of the manufactured vessels, the historical, economic and socio-political
204 context, or social beliefs and representations (Druc, 2009, pp. 94-95; Gosselain, 2002, p.
205 10; Roux, 2016, pp. 18-19; Skibo, 2013, pp. 39, 53). Each operative chain is conceived
206 as an inherited and transmitted way of doing things, and thus constitutes a technical
207 tradition which is the expression of a social group (Druc, 2009, pp. 94-95; Roux, 2016,
208 p. 21).

209 To define technical traditions, one needs to follow certain steps, starting with the
210 definition of technical entities and groups that are characterized by specific traditions of
211 shaping, finishing and firing. During this stage, we attempt to recognize the techniques,
212 methods, tools and gestures exercised on the material, by observing the traces visible on
213 the surfaces and cross-sections with the naked eye or using a binocular microscope. Their
214 interpretation is based upon experimental, ethnographic and ethnoarchaeological
215 reference collections that document a set of diagnostic features for each technique (Roux,
216 2016, pp. 165-253).

217 Particular attention has been given to variants, which may, for example, be linked
218 to the use of distinct tools for the same operation (Roux and Courty, 2005, p. 202). Their
219 definition is indeed critical for distinguishing social groups sharing a common technical
220 tradition on a large scale (Roux, 2016, p. 18).

221 These groups are then linked to techno-petrographic groups that define the
222 variability of the paste for each entity and technical group. A first classification was made
223 on the basis of the properties of the clay matrix (texture, color) and the inclusions
224 (abundance, distribution, color, shape, size) using a binocular on fresh cuts. We then
225 selected 69 thin sections for petrographic analysis (**Tab. 2**), carried out by Isabelle Druc,
226 to provide insights on the origin of raw materials and the context of production. The
227 definition of the petrofacies, based on the properties of the fine mass, coarse fraction and
228 pore system, was achieved by qualitative and semi-quantitative analysis of the thin
229 sections observed with a petrographic microscope (polarizing, transmitted-light

230 microscope). Semi-quantitative examination was done on a comparative basis with visual
231 charts to estimate percentage of inclusions (Matthew et al., 1991) as well as by point
232 counting, to obtain percentages of the different minerals and rock fragments (Stoltman,
233 1989). The thin sections of Huaca Gallinazo and Huaca Santa Clara are representative of
234 the different types produced, both decorated and undecorated. The thin sections from
235 Pampa La Cruz come only from Castillo Decorated, Gallinazo Broad-Line-Incised and
236 undecorated sherds, since Negative ceramics have been previously studied by Arrelucea
237 (2019) and Isabelle Druc, who compared their results to ours.

238

239 Petrogroups highlight particular choices in the modes of acquisition and
240 preparation of the pastes, but they do not necessarily reflect distinct production units.
241 General supply areas are proposed by comparison with the geologic maps issued by the
242 *Instituto Geológico, Minero y Metalúrgico* of Peru (Cossío and Jaén, 1967). The coastal
243 environment and formation are quite similar in fact from one valley to the next, with some
244 variations in amount of certain rocks. It is important to also mention the presence of the
245 coastal Batolith that runs parallel to the coast and present similar rock formations, at least
246 in the area of study. The sediments are also constantly reshaped by aeolian deposits, and
247 the heavy rains generated by the El Niño–Southern Oscillation (ENSO) phenomenon.

248

249 These groups are finally associated to techno-morpho-stylistic groups, which
250 assess the categories of forms produced according to each operative chain. This approach
251 allows to characterize the variability of the assemblage, which may be of a functional
252 order when each tradition is associated with a particular shape, or of a cultural order
253 (Roux, 2016, p. 272).

Site	N° slide	N° sherd	Sector	Context	Shape	Type	Part of vessel	Technical tradition	Petrogroup
Pampa La Cruz	1	102-13	Ambiente 4	Recint 3	Jar (small to medium size)	Castillo Decorated	Body	Hammering	1a
	2	310-5	Ambiente 4	Recinto 2	Jar (small to medium size)	Castillo Decorated	Neck	Hammering	3d
	3	313-2	Ambiente 4	Recinto 2	Jar (small to medium size)	Castillo Decorated	Neck	Hammering	2e
	4	268-3	Ambiente 3	Level 3	Jar (small to medium size)	Castillo Decorated	Neck	Hammering	1f
	5	140-1	Ambiente 3	Fill level 3	Jar (small to medium size)	Castillo Decorated	Neck	Hammering	1a
	6	247-2	Ambiente 3	Level 3	Jar (small to medium size)	Castillo Decorated	Body	Hammering	3a
	7	313-5	Ambiente 4	Fill level 2	Jar (small to medium size)	Castillo Decorated	Body	Hammering	2a
	8	243-35	Ambiente 4	Fill level 1	Jar (small to medium size)	Castillo Decorated	Body	Hammering	1b
	9	274-3	Ambiente 4	Fill level 2	Jar (small to medium size)	Castillo Decorated	Body	Hammering	3d
	10	243-35	Ambiente 4	Fill level 1	Jar (small to medium size)	Castillo Decorated	Body	Hammering	3b
	11	64-6	Ambiente 3	Surface	Undefined	Castillo Decorated	Body	Hammering	2a
	12	28-56	Ambiente 3	Surface	Jar (small to medium size)	Castillo Decorated	Neck	Hammering	1a
	13	252-12	Ambiente 4	Level 2	Jar (small to medium size)	Castillo Decorated	Body	Hammering	2a
	14	245-3	Ambiente 3	Fill level 2	Cooking pot	Castillo Decorated	Neck	Hammering	1b
	15	290-19	Ambiente 4	Fill level 2	Jar (small to medium size)	Castillo Decorated	Neck	Hammering	1a
	16	247-7	Ambiente 3	Level 3	Undefined	Castillo Decorated	Neck	Hammering	3e
	17	134	Ambiente 3	Fill level 3	Storage jar	Plainware	Neck	Hammering	1b
	18	134-4	Ambiente 3	Fill level 3	Jar (small to medium size)	Castillo Decorated	Neck	Hammering	3a
	19	401-8	Ambiente 4	Fill level 4	Cooking pot	Plainware	Neck	Hammering	3b
	20	134-14	Ambiente 3	Fill level 3	Jar (small to medium size)	Plainware	Neck	Hammering	3g
	21	67-1	Ambiente 3	Fill level 2	Cooking pot	Plainware	Neck	Hammering	1a
	22	398-9	Ambiente 4	Fill level 4	Cooking pot	Plainware	Neck	Hammering	2e
	23	398-13	Ambiente 4	Fill level 4	Cooking pot	Plainware	Neck	Hammering	1a
	24	84-2	Ambiente 3	Fill level 2	Undefined	Plainware	Body	Hammering	3f
	25	80-2	Ambiente 3	Fill level 2	Cooking pot	Plainware	Body	Hammering	1b
	26	398-11	Ambiente 4	Fill level 4	Undefined	Plainware	Body	Hammering	2f
	27	102-14	Ambiente 3	Fill level 3	Jar (small to medium size)	Plainware	Neck	Hammering	2f
	28	174-13	Ambiente 3	Fill level 3	Undefined	Plainware	Body	Hammering	3b

Pampa La Cruz	29	403-1	Ambiente 4	Fill level 4	Bowl	Plainware	Neck	Hammering	3a
	30	100-4	Ambiente 3	Level 3	Storage jar	Plainware	Neck	Hammering	3g
	31	89-7	Ambiente 3	Level 3	Jar (small to medium size)	Plainware	Neck	Hammering	2g
	32	311-12	Ambiente 4	Fill level 2a	Jar (small to medium size)	Plainware	Neck	Hammering	3g
	33	78-1	Ambiente 3	Fill level 2	Cooking pot	Plainware	Neck	Hammering	1a
Huaca Gallinazo	1	393	South Platform	A5	Bowl	Gallinazo Broad-Line-Incised (GBI)	Neck	Hammering	V-PG1
	2	390	South Platform	A5	Bowl	GBI	Neck	Hammering	V-PG1
	3	89	Sector B	CA-A1 Fill Below unit 9	Jar (small to medium size)	Castillo Decorated	Body	Hammering	V-PG2
	4	273	Sector B	CA-A1 Fill Below unit 9	Jar (small to medium size)	Castillo Decorated	Neck	Hammering	V-PG1
	5	305	Sector A	Sondage 3 Below level 4	Jar (small to medium size)	Negative	Body	Hammering	V-PG1
	6	63	Sector B	CA-A1 Surface	Jar (small to medium size)	Castillo Decorated	Neck	Hammering	V-PG1
	7	1310	Sector A	South Platform Fill Below level 1	Jar (small to medium size)	Castillo Decorated	Body	Hammering	V-PG1
	8	1198	Sector A	South Platform Fill Below level 1	Jar (small to medium size)	Plainware	Body	Hammering	V-PG2
	9	102	Sector E	Surface	Jar (small to medium size)	Plainware	Neck	Hammering	V-PG2
	11	1288	Sector A	South Platform Fill Below level 1	Storage jar	Plainware	Body	Hammering	V-PG3
	Huaca Santa Clara	1	7752	Sector 6	Below level 1	Cooking pot	Plainware	Neck	Hammering
2		6702	Sector 6	Surface	Jar (small to medium size)	Negative	Body	Hammering	V-PG3
3		6582	Sector 6	Surface	Jar (small to medium size)	Plainware	Body	Hammering	V-PG3
4		7779	Sector 6	Below level 1	Jar (small to medium size)	Plainware	Neck	Hammering	V-PG3
5		6502	Sector 6	Below level 5	Cooking pot	Plainware	Neck	Hammering	V-PG3
6		7764	Sector 6	Below level 1	Cooking pot	Plainware	Neck	Hammering	V-PG3
7		7603	Sector 6	Surface	Jar (small to medium size)	Huancaco	Body	Hammering	V-PG2
8		6559	Sector 6	Below level 5	Undefined	Negative	Body	Hammering	V-PG2

Huaca Santa Clara	9	6910	Sector 6	Below level 1	Jar (small to medium size)	Negative	Body	Hammering	V-PG2
	10	7776	Sector 6	Below level 1	Bowl	Plainware	Neck	Hammering	V-PG3
	11	7762	Sector 6	Below level 1	Bowl	Plainware	Neck	Hammering	V-PG3
	12	6875	Sector 6	Below level 4	Cooking pot	Plainware	Neck	Hammering	V-PG3
	13	6876	Sector 6	Below level 4	Bowl	GBI	Body	Hammering	V-PG2
	15	7784	Sector 6	Below level 1	Jar (small to medium size)	Sarraque Cream	Neck	Hammering	V-PG2
	16	6929	Sector 6	Below level 1	Jar (small to medium size)	Plainware	Neck	Hammering	V-PG2
	17	8330	Sector 6	Below level 6	Bouteille	Negative	Body	Hammering	V-PG2
	18	741.A	Sector 2	Fill	Jar (small to medium size)	Negative	Neck	Hammering	V-PG3
	19	741.B	Sector 2	Fill	Jar (small to medium size)	Negative	Neck	Hammering	V-PG3
	20	741.C	Sector 2	Fill	Jar (small to medium size)	Negative	Body	Hammering	V-PG2
	21	8326	Sector 6	Test pit 2 Level 1	Bowl	GBI	Neck	Hammering	V-PG2
	23	6615	Sector 6	Below level 1	Storage jar	Plainware	Neck	Hammering	V-PG2
	24	6859	Sector 6	Fill	Jar (small to medium size)	Castillo Decorated	Body	Hammering	V-PG2
	25	6533	Sector 6	Below level 5	Jar (small to medium size)	Castillo Decorated	Neck	Hammering	V-PG3
	26	6581	Sector 6	Surface	Gratter bowl	Plainware	Body	Hammering	V-PG2

Table 2. Description of the samples made for petrographic analysis.

5. Results

5.1. The Virú technical tradition from Huaca Gallinazo and Huaca Santa Clara (Virú Valley)

A clear technical homogeneity has been identified for the collections of Huaca Gallinazo and Huaca Santa Clara, since the hammering tradition respectively accounts for 90,8% (N = 434) and 96,3% (N = 6837) of the diagnostic wares (fragments or pots bearing diagnostic features; **Tab. 3**). This technical tradition coexisted with other, more rarely used traditions, such as molding and modeling, which are not presented here (**Tab. 3**; see Espinosa, 2021a). In the following description, we describe the hammering tradition in the order of group definition.

Site	Hammering		Moulding		Modelling	
	NR	%	NR	%	NR	%
Huaca Gallinazo	434	90,8	34	7,1	10	2,1
Huaca Santa Clara	6837	96,3	236	3,3	26	0,4
Pampa La Cruz	1197	100	0	0	0	0
Huaca Prieta	530	100	0	0	0	0
Total	8998	96,7	270	2,9	36	0,4

Table 3. Representativity of the technical traditions. Calculations are made on the basis of the diagnostic wares.

5.1.1 Shaping

Hammering consists in forming a hollow volume by pounding with a hammer a homogeneous clay mass against a concave support (Gosselain, 2002, pp. 90-91; Roux, 2016, pp. 87, 96). It was used to form the bases and bodies of the vessels, where we identified several features that are clearly diagnostic of the hammering technique and not paddling. We note in particular the absence of flat areas on the outer surfaces, corresponding to the traces of the beater (Roux, 2016, p. 217).

Macroscopical scale (Fig. 3)

- Regular profile from top to bottom and uniform external topography, resulting in the use of a support when hammering; irregular internal topography, marked by

279 a series of rounded depressions, which are the print of the hammer left during the
280 percussion work (Roux, 2016, p. 210; Van Doosselaere, 2005, p. 191); alternately
281 smooth, fluid and irregular microtopography, associated with numerous micro-
282 tearings and ridges, indicating a percussion work on a wet paste with a hammer
283 regularly humidified (Roux, 2016, p. 212).



Fig. 3. Diagnostic features of hammering on Negative (a.), Plain (b.), Castillo Decorated (c.) and Gallinazo Broad-Line-Incised ceramic types.

a. Regular profile from top to bottom with a thickness of 0.7 cm (Huaca Santa Clara); b. Rounded depressions left by the hammer (Huaca Santa Clara); c. Microtopography alternately smooth, fluid and irregular, associated with numerous micro-tearings and crests (Huaca Santa Clara); d. Combination of sub-parallel fissures with a vertical orientation of the coarse fraction (Huaca Gallinazo).
Photography taken with digital microscope with reflected light on a thin section.

284 Microscopical scale (cross-section; Fig. 3)

285 - Combination of sub-parallel fissures with a vertical orientation of the inclusions
286 (Roux, 2016, pp. 212-213; Van Doosselaere, 2005, pp. 191-192).

287 The necks are shaped with coils, vertically superimposed on the upper part of the
288 body. The coils are placed on the inner faces of vessels, which leads to the formation of
289 oblique internal joints. Coils are then progressively preformed by discontinuous pressure
290 with the fingers, but they are slightly stretched and compressed.

291

292 Macroscopical scale

293 - Preferential fractures at the junction between the body and the neck and shift in
294 thickness between the hammered and coiled parts (Roux, 2016, pp. 203, 210; Van
295 Doosselaere, 2005, p. 192); concentric fissures and over-thicknesses
296 corresponding to the junction between coils that were not erased by the subsequent
297 smoothing operations (Roux, 2016, p. 200).

298 - Discontinuous horizontal depressions associated with the fissures and over-
299 thicknesses, left by the fingers during the shaping of the coils by discontinuous
300 pressure (Roux, 2016, p. 214).

301 The rims are preformed by continuous pressure with the moistened palm of the
302 hand, placed on top of the rim with the fingers folded against the inner side, and exerting
303 a rotating movement.

304 - Smooth and fluid microtopography combined to a surface with partially exposed
305 protruding grains, and concentric parallel striations on the rim, suggesting the
306 rotary movement (Roux, 2016, p. 237).

307

308 **5.1.2 Finishing**

309

310 The inner and outer faces of the vessels are all smoothed by discontinuous
311 pressure with the moistened palm of the hand in a wet state, following a multidirectional
312 gesture.

313

314 Macroscopical scale

315 - Smooth and fluid microtopography, combined with partially exposed protruding
316 grains, ribbed striations organized in parallel and criss-crossed bands, reticulated
317 striations showing the use of the moistened palm of the hand, and numerous ridges
318 indicating a regular supply of water (Roux, 2016, p. 237).

319

320 **5.1.3 Surface treatments**

321
322 Some vessels were burnished, by rubbing with a pebble-hard tool the external
323 surfaces of open-forms and the internal and external surfaces of closed-forms (Roux,
324 2016, p. 240; Shepard, 1980 [1956], p. 66).

325 326 Macroscopical scale

327 - Shiny appearance; smooth and compact microtopography with embedded grains;
328 facets organized in vertical or horizontal bands (Roux, 2016, p. 240).

329 330 **5.1.4 Firing**

331
332 The atmosphere of firing is predominantly oxidizing with a short oxidation phase.
333 Although no potter's kiln has been identified at the sites, based on the color of surfaces
334 and cross-sections, we can assume that firing was carried out in an open area, and that the
335 ceramics were cooling off in the open air (Rohfritsch, 2010, p. 403).

336 337 **5.1.5 Technical variant: scraping**

338 The main variation consists in scraping with the finger the inner surface of some
339 jars at the midpoint of the body to form a hull.

340 Macroscopic scale (inner sides)

341 - Scraping grooves with rounded borders associated with nail and fingerprints on
342 the circumference of the hull, as well as threaded striations following the same
343 orientation as the grooves (Jadot, 2015, pp. 383, 390; **Fig. 5**).

344 345 **5.1.6 The techno-petrographic groups**

346
347 The petrographic analyses made on 35 thin sections from the two sites of the Virú
348 valley led to the definition of three petrogroups that are characterized by a mixed
349 lithological composition (**Fig. 4**). All appear to be local since they contain numerous
350 fragments of volcanic rocks, which is a characteristic of the Virú Valley geological
351 environment (Cossío and Jaen 1967). In this valley, the volcano-detritic Casma Formation
352 is indeed more extended (**Figure 5.a**). In comparison with the Moche valley, the Casma

353 Formation is much less widespread, resulting in a lower concentration of volcanic rocks
 354 in the slides we describe latter (**Figure 5.b**). For Huaca Gallinazo and Huaca Santa Clara,
 355 the materials are sieved or decanted clays, to which a sandy sediment has sometimes been
 356 added. The sands are also sieved or sorted, to retain only the fine, medium or coarse to
 357 very coarse fraction depending on the type of container. The presence of iron in these
 358 clays probably served as a fluxing agent, allowing the melting point of the paste to be
 359 lowered during firing. The point counting analyses shows that each slide has a slightly
 360 different composition, indicating the use of numerous sources of material, or sources
 361 whose composition varies over short distances, which illustrates the changing character
 362 of the local geology. As we previously stated, on the northern coast the composition or
 363 the sediments is indeed constantly reshaped or remodeled by aeolian and alluvial deposits,
 364 and periodically by the ENSO phenomenon. The composition of the clays and rocks
 365 mined by potters thus change over short period of time and distance.
 366

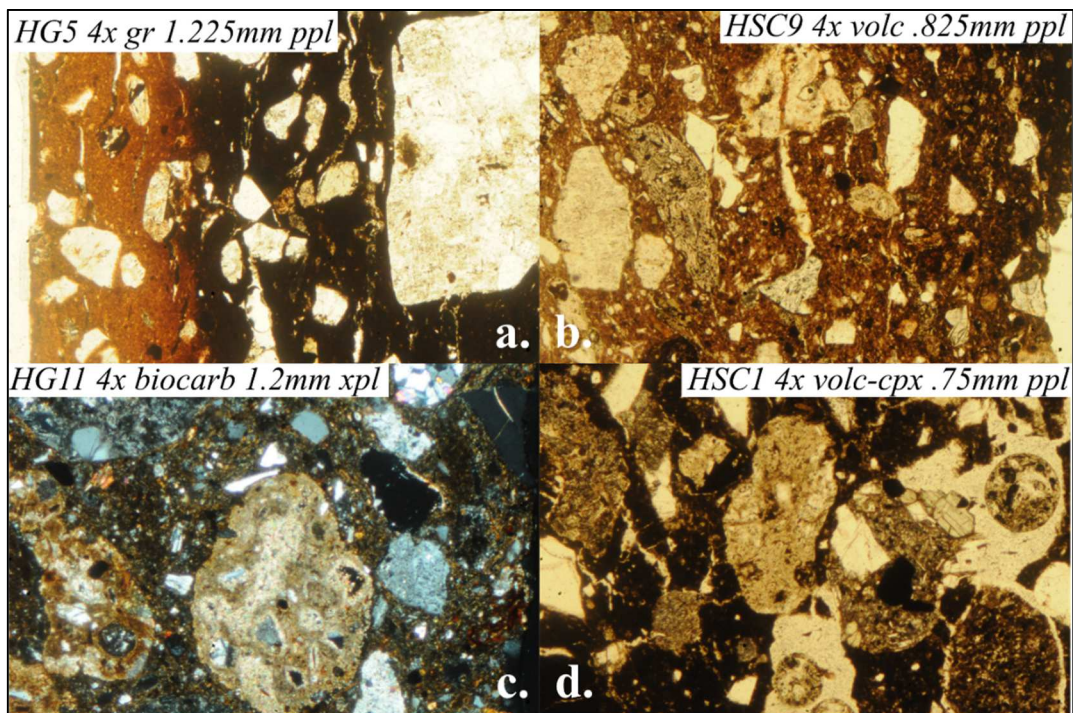


Fig. 4. Petrographic photomicrographs of the coarse fraction taken by Isabelle Druc, in transmitted light with cross nicols (xpl) or plane polarized light (ppl).
 a. Petrogroup 1 with inclusions of granodiorite (gr); b. Petrogroup 2 with inclusions of volcanic rocks (volc); c. Petrogroup 3 with biocarbonates (biocarb); d. Petrogroup 3 with inclusions of volcanic rocks (volc) and clinopyroxenes (cpx).

367

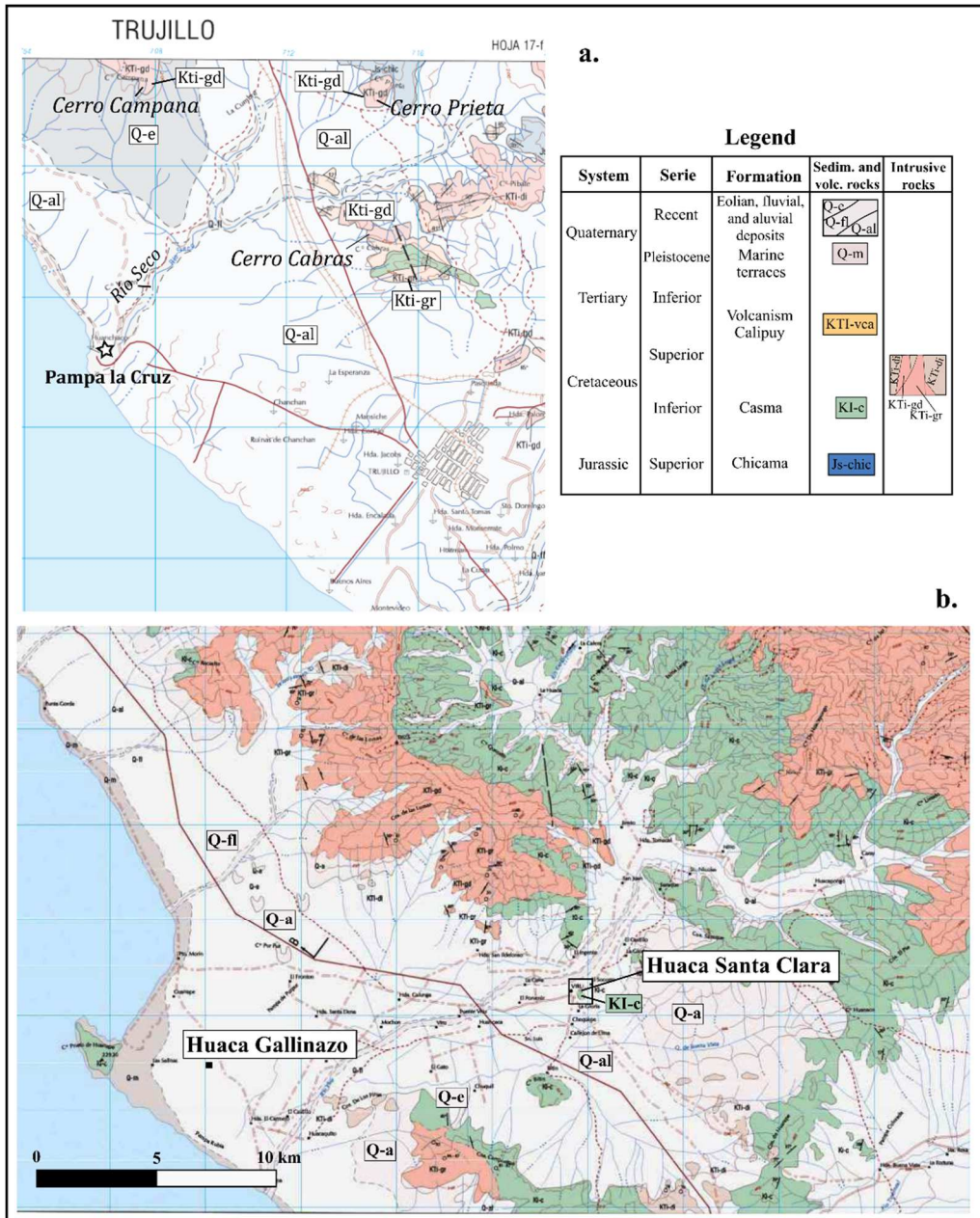


Fig.5. Geological maps of the Moche (a.) and Virú valley (b.) showing the location of sites related to potential supply areas. The maps are modified after INGEMMET, National geologic map, Lima, Peru, Hugo Jaen and Luis Vargas, 1998 digital version.

368

369

5.1.7 Techno-morpho-stylistic groups

370

371 A wide variety of forms, both decorated and undecorated, were produced by
 372 hammering, since we identified 70% (N = 6302). This includes small to large jars (from
 373 15cm to 40cm and more in height), cooking pots, bottles, as well as bowls and cups.

374

375

5.2 Virú technical traditions beyond the Virú Valley

376

377

378

379

380

381

The same technologies have been identified for Pampa La Cruz and Huaca Prieta (Tab. 3). Nonetheless, we isolated a few technological variations that reflect local adaptations of the hammering tradition. One of these variations is related to scraping tools. From the morphology of the grooves on Pampa La Cruz ceramics, we hypothesize that they used a scraper instead of their fingers (Roux, 2016, p. 214; Fig. 6).



Fig. 6. Diagnostic features of scraping on Negative and undecorated potteries
a. Carinated pots and sherds from Huaca Gallinazo (a.) and Pampa La Cruz (b.); c. to
e. Scraping with the fingers: scraping grooves with rounded borders (c.), nail and
fingerprints on the circumference of the hull (d.), threaded striations following the
same orientation as the grooves (e.); f. Scraping with a scraper: deep grooves
organized in sub-parallel bands around the hull.

382 The only tool found at Pampa La Cruz that could have been used as a scraper is a
383 sherd with rounded contours and very blunt edges. Its use could be the result of a local
384 innovation or borrowing from neighboring communities in the Moche Valley, rather than
385 an influence of the Salinar potters of Pampa La Cruz, since at the site the use of ceramic
386 scrapers has not been identified until the Virú phase (Comeca et al., 2021; Espinosa
387 2021b). The Virú occupation phase of Pampa La Cruz is contemporary with the site of
388 Moche, in particular the urban area around Huaca de la Luna, where in some contexts
389 ceramic vessels are coiled and preformed with ceramic scrapers (Espinosa, 2021b, pp.
390 322-324). Some of these tools have moreover been identified in domestic complexes of
391 the urban area (Bernier, 2005, p. 198). The hypothesis of a borrowing technology thus
392 seems likely, although traceological analyses are necessary to confirm it.

393 The petrographic analyses for Pampa La Cruz also provide significant data. The
394 petrogroups are numerous and diversified, and ceramics pastes are mostly tempered with
395 a mixed sandy sediment. These sediments are alluvial and aeolian, and characterized by
396 a high frequency of carbonate and bioclasts. Although the thin sections of Huaca
397 Gallinazo and Huaca Santa Clara are also of mixed composition, the pastes are more
398 homogeneous. These differences are explained by the location of Pampa La Cruz on the
399 coastline, where the sediments are the most mix. As hypothesized by Arrelucea (2019,
400 pp. 78-79) from the X-ray diffraction made on 20 fragments of negative decorated
401 ceramics vessels from Pampa La Cruz, compared to clay samples of the area in
402 Huanchaco, at least two sources of acquisition of raw materials would have existed: the
403 *Rio Seco* area and the *Cerro Campana* (**Fig. 5**).

404 Potters have therefore adapted their strategies to the materials present in their
405 environment, but their choices were also made according to tradition. They share the same
406 knowledge for choosing and preparing the raw materials. These materials are coluvial
407 clays tempered with a sandy sediment, sorted according to the same preferential
408 granulometry. The clays could be extracted from the hills present in each micro-region,
409 and the sands mined from the aeolian deposits around the hills. Although no evidence of
410 pottery production was identified at Pampa La Cruz and elsewhere, we can then assess
411 the local character of each site based on the mineralogical composition of the slides. In
412 the case of Pampa La Cruz, however, the strategy is different since the *Cerro Campana*
413 is located about eleven/ten kilometers from the site. Potters could therefore move over

414 this distance to find raw materials with properties similar to those they used in the Virú
415 Valley.

416 Other regional variations are noticeable, especially for the shapes of the ceramic
417 vessels which are much more diversified in the Virú Valley, with specific shapes like
418 bowls decorated with excised grooves (**Fig. 7.a**). Some shapes are also distinctive of
419 Huaca Prieta like double spouts and bridge bottles (**Fig. 7.b**). However, there seems to
420 have been a programmatic coherence in the shapes of plainwares and decoration of the
421 Castillo Decorated type present in the three valleys.



Fig. 7. Spatial variability of shapes and decorations.

a. Bowl decorated with excised grooves (Gallinazo Broad-Line-Incised type, Huaca Santa Clara); b. Double spouts and bridge bottle from Huaca Prieta, decorated with negative designs (41.2.4749, American Museum of Natural History of New York).

422

423 **6. Discussion**

424

425 Our analyses highlight a strong homogeneity of the Virú technical tradition, whose
426 stability in time and space is linked to the processes of learning and transmission of skills
427 on an individual and collective scale (Gosselain, 2002, p. 11; Roux, 2016, p. 18).
428 Hammering is a tradition specific to the Virú, that was not shared with their
429 contemporaries the Moche, who produce their decorated potteries by moulding (Donnan,
430 2004). As shown in previous papers (Espinosa, 2021a; Espinosa et al., 2019), in the
431 contexts studied at the Moche valley center Huacas de Moche, potters indeed shaped their
432 decorated wares by moulding, and their undecorated wares by coiling. There is in fact no
433 filiation between these potters, but contacts could have been maintained, as evidenced by
434 the potential borrowing of ceramic scrapers at Pampa La Cruz.

435 Hammering also has to be differentiated from paddling, a technique that
436 dominated the northern coast of Peru, and in particular in the Sechura and Lambayeque
437 regions, from the Middle Horizon to the Late Intermediate Period (Cleland and Shimada
438 1998). Hammering consist in beating the internal face of the pot with a hammer, while
439 during paddling the internal and external faces are simultaneously beaten with a paddle
440 and an anvil. Further technical studies would help define the chronological depth of the
441 hammering technique during earlier periods, and its permanence during the Middle
442 Horizon and the Late Intermediate Period. Based on a first technological study of ceramic
443 undertaken by Gianina Comeca, it appears that the potteries from the Salinar occupation
444 of Pampa La Cruz (400 B.C. – 100 A.D.) were shaped by modelling, and that hammering
445 only appears during the Virú phase (Comeca et al., 2021). Therefore, there would be no
446 filiation between these potters who belong to different communities of practice. Then, the
447 appearance of hammering along with morpho-stylistic types at Pampa La Cruz site can
448 be seen as the result of a replacement of production units, or to changes in the
449 consumption habits of local populations. Nonetheless, further evidences are needed to
450 better understand the relationship maintained by the Salinar and Virú populations at the
451 site.

452 What characterizes the Virú potting tradition is therefore the hammering
453 technique, and the succession of operations allowing the elaboration of ceramic vessels
454 of very diverse morpho-stylistic ranges. These results suggest a technical, and thus
455 historical and demographic kinship between the communities of potters from the Virú,
456 Moche and Chicama valleys, rather than an assimilation of local populations. However,
457 the identification of regional adaptations at the sites of Huaca Gallinazo, Huaca Santa
458 Clara, Pampa La Cruz and Huaca Prieta, led us to differentiate social groups sharing this
459 tradition. These variations reveal that in these regions, potters have adjusted their
460 knowledge according to local resources, as well as adapted their shapes and designs to
461 consumer demands. These results also suggest that each site produced its own ceramics,
462 or that at least the producers lived in the same micro-region as the inhabitants of the sites.
463 Contrary to what might have been expected, the ceramics, and in particular the ones
464 decorated with negative designs, are not finished products transported from the Virú
465 Valley. They are actually local productions, made by potters belonging to the same
466 potter's community. But each community followed its own trajectory, leading to potential
467 borrowings and adaptations following contacts with previous and contemporary groups,
468 as the Salinar and the Moche.

469 This technical and techno-stylistic homogeneity demonstrates that there is a
470 technical kinship between the Virú communities of the Virú, Chicama and Moche valleys.
471 From 200 BC to 300/400 A.D, at least three central areas are present, understood as "*a*
472 *geographical area in which the tradition is produced and distributed*" (Roux, 2016, p.
473 334): Pampa La Cruz, Huaca Gallinazo and Huaca Santa Clara. For Huaca Prieta, as no
474 petrographic analyses have been made, it is not possible to establish whether or not the
475 production was local. In these central areas, the populations consume potteries only
476 manufactured by potters using the Virú technical tradition and local materials (Roux,
477 2016, p. 334). In the Virú Valley, this central area lasted until the 7th century, while in
478 the Moche and Chicama valleys these occupations did not last long, as they fell under the
479 influence of the Moche, who occupied the sites or their surroundings for a long time. The
480 Virú occupation of Huaca Prieta (111 BC to 380 A.D) is in fact part contemporary with
481 the first phases of construction of the Huaca Cao Viejo, which becomes one of the most
482 important Moche civic-ceremonial center of the region (Millaire et al. 2016, p. E6021;
483 Mujica et al., 2007, p. 109). In the case of Pampa La Cruz, the Virú domestic occupation
484 (100 to 400/550 A.D) is followed by a Moche III/IV occupation around 450-550 A.D
485 (Prieto, 2018, p. 214). Although, how these contemporary populations coexisted and
486 interacted remains to be investigated in the Moche and Chicama Valleys, even if we can
487 assess that potters linked to the Virú and Moche populations were not rooted in the same
488 communities of practice (Espinosa, 2021; Espinosa et al., 2019).

489 Now, how can we understand the mechanisms underlying this technical
490 homogeneity and the distribution of Virú ceramics on the north coast? What our results
491 suggest is that the communities of Huaca Prieta and Pampa La Cruz consumed ceramic
492 vessels made by production units belonging to the same social group as the potters of the
493 Virú Valley. Nonetheless, interpreting this technical homogeneity remains complex: is it
494 the result of displacement of part of the Virú social group from the Virú Valley in order
495 to settle in the adjacent valleys, or are we facing a case of itinerant pottery production?
496 The first hypothesis seems more likely, since itinerancy is mostly documented in the
497 *Sierra*, in areas where there are no production centers, and generally responds to a
498 punctual need of the communities, and not to a continuous demand (I. Druc, personal
499 communication, May 2018; Ramón, 2013). The Virú Valley would therefore be the center
500 from which part of the Virú population, including potters, moved to settle in other
501 communities, even though it is not possible in the current state to assess if these sites are

502 outposts. These groups were probably guided by members of the Virú elite, such as the
503 individual buried in Tomb 126 at Pampa La Cruz with a double-bottle depicting a warrior
504 in arms (Millaire et al., 2016, p. E6022).

505

506 **7. Conclusion**

507

508 The present study shows that hammering is the most distinctive Virú technical
509 tradition for producing ceramic vessels, a technique that was shared and perpetuated
510 throughout the Early Intermediate Period. The variability observed, both from the point
511 of view of the common operative chain and its variants, correspond to adjustments made
512 by potters who mastered the entire technical process, and the choices to be made in order
513 to adapt to the shapes produced. However, we have noted several regional variations that
514 allow us to affirm that, although Virú potters were present outside the Virú Valley
515 between 200 B.C and 400-500 A.D, they constitute distinct production units. For
516 example, petrographic analyses show that in each region, potters have adapted to the
517 materials present in their environment, while sharing the same recipe for preparing their
518 paste. This study also demonstrates that the presence of Negative ceramics is not the result
519 of trade from the Virú Valley, nor of local imitation, but of local production made by
520 potters of Virú affiliation, as it is probably the case for the other ceramic vessels
521 (Espinosa, 2021b). However, we do not exclude that some vessels were also imported
522 from the Virú Valley. Unfortunately, it is still difficult to see whether this mobility is part
523 of the political strategies displayed by the Virú populations to extend their territory. These
524 results finally illustrate the significant contribution of the technological approach to
525 characterize the social identity of Virú potters. At the same time, they open up many
526 future perspectives in order to retrace the networks of circulation of potters and pots
527 outside the Virú Valley.

528

529 *Acknowledgements*

530 We are grateful to all the researchers that supported and advised us during this
531 investigation: Nicolas Goepfert, Véronique Darras, Valentine Roux, Belkys Gutiérrez,
532 Segundo Vásquez, Sumru Aricanli, Juan Villela and Jefrin Ascensio.

533 This study was carried out as part of Alicia Espinosa PhD sponsored and funded by the
534 University Paris 1 – Panthéon Sorbonne, the French laboratory ArchAm (UMR8096), and

535 the American Museum of Natural History of New York (Collection Study Grant
536 Program). The petrographic analysis was conducted by Isabelle Druc at the University of
537 Wisconsin-Madison. The thin sections were prepared in Peru by Sr. Mena. Fieldwork in
538 Huaca Santa Clara and Huaca Gallinazo were funded by the Social Sciences and
539 Humanities Research Council of Canada. Excavations in Huanchaco at Pampa La Cruz
540 2016 field season were funded by Programa INNOVATE-PERU, Ministerio de la
541 Producción (Contrato 354-15).

542

543 **References**

544 Arrelucea Leonardo, 2019, *Redes de Producción cerámica e interacciones sociales del*
545 *100 a.C al 400/550 d.C en Pampa La Cruz, un asentamiento Virú en el Valle de Moche,*
546 *Tesis para optar el grado de Magister en Arqueología Sudamericana con mención en*
547 *Modelización, Experimentación y Técnicas Analíticas, Universidad Nacional de Trujillo,*
548 *Escuela de Postgrado – Sección Ciencias Sociales.*

549 Balfet Hélène, Marie-France Fauvet-Berthelot and Susana Monzon, 1983, *Pour la*
550 *normalisation de la description des poteries,* Éditions du Centre National de la Recherche
551 Scientifique, Paris.

552 Bennett Wendell C., 1939, *Archaeology of the North Coast of Peru: An Account of*
553 *Exploration and Excavation in Virú and Lambayeque Valleys,* Anthropological Papers of
554 the American Museum of Natural History, Vol. 37, Pt. 1, New-York.

555 Bernier Hélène, 2005, *Étude archéologique de la production artisanale au site Huacas de*
556 *Moche, côte nord du Pérou, Thèse présentée à la Faculté des études supérieures en vue*
557 *de de l'obtention du grade de Pilosophiae Doctor (Ph.D.) en anthropologie, Université de*
558 *Montréal.*

559 Bourget Steve, 2010, "Cultural Assignations during the Early Intermediate Period", *in*
560 *Quilter Jeffrey and Luis Jaime Castillo (eds.), New Perspectives on Moche Political*
561 *Organization,* Dumbarton Oaks Research Library and Collection, Washington, D.C., pp.
562 223-251.

563 Bird Junius, John Hyslop and Milica Dimitrijevic, 1985, *The Preceramic Excavations at*
564 *the Huaca Prieta Chicama Valley, Peru,* Volume 62: Part I, Anthropological Papers of
565 the American Museum of Natural History, New York.

566 Chapdelaine Claude, Victor Pimentel and Jorge Gamboa, 2009, “Gallinazo Cultural
567 Identity in the Lower Santa Valley: Ceramics, Architecture, Burial Patterns, and
568 Sociopolitical Organization”, in Millaire Jean-François and Magali Morlion (eds.),
569 *Gallinazo, an early cultural tradition on the Peruvian north coast*, Cotsen Institute of
570 Archaeology Press, University of California, Los Angeles, pp. 181-222.

571 Cleland Kate and Izumi Shimada, 1998, “Paletaada Potters: Technology, Production
572 Sphere, and Sub-Culture in Ancient Peru”, in Shimada Izumi (ed.), *Andean Ceramics:
573 Technology, Organization, and Approaches*, MASCA Research Papers in Science and
574 Archaeology, University of Pennsylvania Museum of Archaeology and Anthropology.

575 Comeca Gianina, Gabriel Prieto, Isabelle Druc and Alicia Espinosa, 2021, “Tecnología
576 cerámica de unidades domesticas: un análisis del repertorio cerámico de las fases Salinar
577 (400 a.C. – 100 a.C.) y Virú (100 a.C. – 400/550 d.C.) del sitio Pampa La Cruz, Costa
578 Norte del Perú”, Paper presented to the VIII Congreso Nacional de Arqueología, Perú,
579 Ministry of Culture, Online, August 9th.

580 Cossío Aurelio and Hugo Jaén, 1967, *Boletín. No. 17, Geología de los Cuadrángulos de*
581 *Puemape, Chocope, Otuzco, Trujillo, Salaverry et Santa (Hojas 16-d, 16-e, 16-f, 17-e,*
582 *17-f, 18-f)*, Instituto Geológico y Minero, Lima.

583 Cresswell Robert, 2010 [1976], “Techniques et culture: les bases d’un programme de
584 travail”, in *Techniques & Culture* [Online], pp. 54-55, online June 30th, 2013,
585 <http://journals.openedition.org/tc/4979>.

586 Del Solar Nino, 2015, Contribution des sciences archéologiques à la connaissance des
587 choix techniques Mochica et Cajamarca: étude des matériaux céramiques du site San José
588 de Moro (VIIIe-Xe s. apr. J.-C.), Thèse doctorale, Archéologie et Préhistoire, Université
589 Michel de Montaigne Bordeaux III.

590 Donnan Christopher, 2004, *Moche Portraits from Ancient Peru*, University of Texas
591 Press, Austin.

592 Donnan Christopher, 2009, “The Gallinazo Illusion”, in Millaire Jean-François and
593 Magali Morlion (eds.), *Gallinazo, an early cultural tradition on the Peruvian north coast*,
594 Cotsen Institute of Archaeology Press, University of California, Los Angeles, pp. 17-32.

595 Druc Isabelle, 2009, “Tradiciones alfareras, identidad social y el concepto de etnias
596 tardías en Conchucos, Ancash, Perú”, *Bulletin de l’Institut français d’études andines*, 38
597 (1), pp. 87-106.

598 Espinosa Alicia, 2021a, “Remettre la céramique non décorée au cœur des problématiques
599 culturelles: Le cas des traditions techniques Virú-Gallinazo et Mochica”, in *Artisanat et*
600 *savoir-faire: archéologie des techniques*, Éditions de la Sorbonne, Paris, [Online], online
601 Januart 19, 2021, <http://books.openedition.org/psorbonne/78977>.

602 Espinosa Alicia, 2021b, Filiations culturelles et contacts entre les groupes sociaux de la
603 côte nord du Pérou durant la Période Intermédiaire Ancienne (200 av. – 600 apr. J.-C.).
604 Étude des traditions techniques de la production céramique Viru-Gallinazo. Thèse en vue
605 de l’obtention du grade de Docteur de l’Université Paris 1 en Archéologie, Université
606 Paris 1 Panthéon Sorbonne.

607 Espinosa Alicia, Gabriel Prieto and Walter Alva, 2019, “Tradiciones técnicas y
608 producción cerámica virú-gallinazo y mochica: nuevas miradas sobre las relaciones entre
609 dos grupos sociales del Período Intermedio Temprano en la Costa Norte del Perú”, in
610 Isabelle Druc and Jahl Dulanto (eds.), *Boletín de Arqueología PUCP*, n°26: Avances en
611 el análisis de cerámica y pigmentos en arqueología, Primera Parte, pp. 85-102.

612 Fogel Heidy, 1993, *Settlements in Time: A Study of Social and Political Development*
613 *during the Gallinazo Occupation of the North Coast of Peru*, Unpublished Ph.D.
614 dissertation, Yale University, New Haven.

615 Ford James, 1949, “Cultural Dating of Prehistoric Sites in Virú Valley, Peru, in Ford
616 James and Gordon Willey (eds.), *Surface Survey of the Virú Valley, Peru*,
617 *Anthropological Papers of the American Museum of Natural History* Vol. 44, Pt. 1, New
618 York, pp. 29-87.

619 Franco Régulo And César Gálvez, 2009, “Gallinazo-style Ceramics in Early Moche
620 Contexts at the El Brujo Complex, Chicama Valley”, in Millaire Jean-François and
621 Magali Morlion (eds.), *Gallinazo, an early cultural tradition on the Peruvian north coast*,
622 Cotsen Institute of Archaeology Press, University of California, Los Angeles, pp. 91-104.

623 Gallay Alain, 2011, *Pour une ethnoarchéologie théorique*, Errance, Paris.

624 Gosselain Olivier, 2000, “Materializing Identities: An African Perspective”, *Journal of*
625 *Archaeological Method and theory*, 7 (3), pp. 187-217.

- 626 Gosselain Olivier, 2002, *Poteries du Cameroun méridional. Styles techniques et rapports*
627 *à l'identité*, Monographie du CRA, n° 26, CNRS Éditions, Paris.
- 628 Jadot Elsa, 2015, *Productions céramiques et mobilités dans la région tarasque de Zacapu*
629 *(Michoacán, Mexique). Continuités et ruptures techniques entre 850 et 1450 apr. J.-C.,*
630 *Thèse en vue de l'obtention du grade de Docteur de l'Université Paris 1 en Archéologie,*
631 *Université Paris 1 Panthéon Sorbonne.*
- 632 Koons Michele, 2015, "Internal vs. External: An Examination of Moche Politics Through
633 Similarities and Differences in Ceramic Style", in DRUC Isabelle (ed.), *Ceramics*
634 *Analysis in the Andes*, Deep University Press, Blue Mounds, Wisconsin, pp. 57-82.
- 635 Lara Catherine, 2017, *Aportes del enfoque tecnológico a la arqueología precolombina:*
636 *Pasado y Presente de la alfarería en el valle del río Cuyes y su región (Andes sur-*
637 *orientales del Ecuador)*, Paris Monographs in American Archaeology 47, Archaeopress,
638 Oxford.
- 639 Larco Hoyle Rafael, 1945, *La cultura Virú*, Sociedad Geográfica americana, Buenos
640 Aires.
- 641 Larco Hoyle Rafael, 1948, *Cronología arqueológica del norte del Perú*, Sociedad
642 Geográfica Americana, Buenos Aires.
- 643 Lemonnier Pierre, 1983, "L'étude des systèmes techniques, une urgence en technologie
644 culturelle", *Techniques et Culture*, 1, pp. 11-34.
- 645 Leroi-Gourhan André, 1973, *Évolution et techniques. Milieu et Techniques*, Albin
646 Michel, Paris.
- 647 Makowski Krzysztof, 2009, "Virú-Moche relations: Technological Identity, Stylistic
648 Preferences, and the Ethnic Identity of Ceramic Manufacturers and Users", in Millaire
649 Jean-François and Magali Morlion (eds.), *Gallinazo, an early cultural tradition on the*
650 *Peruvian north coast*, Cotsen Institute of Archaeology Press, University of California,
651 Los Angeles, pp. 33-59.
- 652 Matthew Aj, Aj. Woods and C. Oliver, 1991, "Spots before the eyes: new comparison
653 charts for visual percentage estimation in archaeological material, in Middleton Andrew
654 and Freestone Ian (eds.), *Recent developments in ceramic petrology*, British Museum
655 Occasional Paper 81, London, pp. 211-276.

656 Millaire Jean-François, 2009, “Gallinazo and the Tradición Norcosteña”, in Millaire Jean-
657 François and Magali Morlion (eds.), *Gallinazo, an early cultural tradition on the*
658 *Peruvian north coast*, Cotsen Institute of Archaeology Press, University of California,
659 Los Angeles, pp. 1-16.

660 Millaire Jean-François, 2010a, “Primary State Formation in the Virú Valley, North Coast
661 of Peru”, *Proceedings of the National Academy of Sciences of the United States of*
662 *America*, vol. 107 (14), pp. 6186-6191.

663 Millaire Jean-François, 2010b, “Moche Political Expansionism as viewed from Virú,
664 Recent Archaeological Work in the Close Periphery of a Hegemonic City-State System”,
665 in Quilter Jeffrey and Luis Jaime Castillo (eds.), *New Perspectives on Moche Political*
666 *Organization*, Dumbarton Oaks Research Library and Collection, Washington, D.C.,
667 pp.223-251.

668 Millaire Jean François and Magali Morlion (eds.), 2009, *Gallinazo. An Early Cultural*
669 *Tradition on the Peruvian North Coast*, Cotsen Institute of Archaeology Press, University
670 of California Los Angeles, Los Angeles.

671 Millaire Jean-François, Gabriel Prieto, Flannery Surette, Elsa Redmond and Charles
672 Spencer, 2016, “Statecraft and expansionary dynamics: A Virú outpost at Huaca Prieta,
673 Chicama Valley, Peru”, *Proceedings of the National Academy of Sciences of the United*
674 *States of America*, 113(41), pp. E6016-E6025.

675 Mujica Elías, Jordán Régulo, César Gálvez, Jeffrey Quilter, Antonio Murga, Carmen
676 Gamarra, Víctor Hugo Ríos, Segundo Lozada, John Verano and Marco Aveggio, 2007,
677 *El Brujo: Huaca Cao, Centro Ceremonial Moche en el Valle de Chicama/Huaca Cao, A*
678 *Moche Ceremonial Center in the Chicama Valley*, Fundación Wiese, Lima.

679 Parker Bradley, Gabriel Prieto and Carlos Osoreo, 2018, “Methodological advances in
680 household archaeology: an application of microartifact analysis at Pampa La Cruz,
681 Huanchacho, Peru”, *Ñawpa Pacha, Journal of Andean Archaeology*, pp. 1-19.

682 Prieto Gabriel, 2018, Informe Anual Programa Arqueológico Huanchaco 2016-2017,
683 Informe final presentado a la Comisión Nacional Técnica de Arqueología del Instituto
684 Nacional de Cultura, Lima.

685 Ramón Gabriel, 2013, *Los alfareros golondrinos. Productores itinerantes en los Andes*,
686 Instituto Francés de Estudios Andinos, Sequilao, Lima.

687 Rohfritsch Agnès, 2010, “Contribución arqueométrica al estudio de las técnicas y de la
688 organización de la producción de cerámica ritual en la sociedad Mochica (150-850 d.C.,
689 costa norte del Perú)”, *Bulletin de l’Institut français d’études andines*, 39 (2), pp. 389-
690 412.

691 Roux Valentine, 2016, *Des céramiques et des hommes, décoder les assemblages*
692 *archéologiques*, Presses Universitaires de Paris Ouest, Nanterre.

693 Roux Valentine and Marie Agnès Courty, 2005, “Identifying social entities at a macro-
694 regional level: chalcolithic ceramics of south Levant as a case study”, in Bosquet
695 Dominique, Alexandre Livingstone-Smith and Rémi Martineau (eds.) *Pottery*
696 *Manufacturing Processes: Reconstruction and Interpretation*, Archaeopress, Oxford, pp.
697 210–214.

698 Shepard Anna, 1980 [1956], *Ceramics for the archaeologists*, Carnegie Institution of
699 Washington, Washington D.C.

700 Skibo James, 2013, *Understanding Pottery Function*, Springer, New-York.

701 Stoltman James, 1989, “A quantitative approach to the petrographic analysis of ceramic
702 thin sections”, *American Antiquity*, 54, 1, pp. 147-160.

703 Strong William and Clifford Evans, 1952, *Cultural Stratigraphy in the Virú Valley,*
704 *Northern Peru: The Formative and Florescent Epochs*, Columbia University Press, New
705 York.

706 Ubbelohde-Doering Heinrich, 1983, *Vorspanische Gräber von Pacatnamú, Nordperu,*
707 *Materialien zur allgemeinen und vergleichenden Archäologie*, 26, Munich.

708 Uceda Santiago, Henry Gayoso and Nadia Gamarra, 2009, “The Gallinazo at Huacas de
709 Moche: Style or Culture?”, in Millaire Jean-François and Magali Morlion (eds.),
710 *Gallinazo, an early cultural tradition on the Peruvian north coast*, Cotsen Institute of
711 Archaeology Press, University of California, Los Angeles, pp. 105-123.

712 Van Doosselaere Barbara, 2005, “Perception stylistique et technologie céramique:
713 Reconstitution et interprétation des techniques de façonnage des poteries archéologiques
714 de Koumbi Saleh (Mauritanie, IXème- XVème siècles)”, in Livingstone-Smith
715 Alexandre, Dominique Bosquet and Rémi Martineau (eds.), *Pottery Manufacturing*

- 716 *Processes: Reconstitution and Interpretation*, BAR International Series 1349,
717 Archaeopress, Oxford, pp. 179-199.
- 718 Willey Gordon, 1953, *Prehistoric Settlement Patterns in the Virú Valley, Peru*,
719 Smithsonian Institution Bureau of American Ethnology Bulletin 155, Government
720 Printing Office, Washington D.C.