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Assessing Fishtail points distribution in the southern Cone

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ABSTRACT

This paper discusses possible causes affecting the distribution of Fishtail points in the southern Cone. This distribution is discontinuous, with large territories without diagnostic remains and areas where sites and points are concentrated. Also, most of the sites with this type of points exhibit few specimens, with remarkable exceptions in Uruguay, the Argentinian Pampa and Patagonia and southern Chile.

We present thoughts arising from long term research in the central east Tandilia ranges, in the Argentinian pampas with information relevant to this discussion. We call the attention to the importance past social practices have in conforming current point distribution together with the history of research and site visibility. This issue is then considered in the broader regional scale. It is concluded that the discontinuous distribution observed is due to factors inherent to both the original occupations and to current research.

1. Introduction

Projectile point distribution has been widely used in North America Paleoindian archaeology to interpret mobility and land use strategies, settlement patterns, peopling models and pathways; and the origin and spreading of fluted projectile point technologies (for example, Anderson and Faught, 1998; Prasciunas, 2011; Daniel and Goodyear, 2015; Miller, 2016). Fluted projectile point concentrations are interpreted as "staging areas" of population growth, and fluting technology origin or as intense occupation areas (Anderson and Faught, 1998; Daniel and Goodyear, 2015); and also as "easy to find" and resource rich places of periodic group aggregation, or places of high point discard rates linked to raw material availability (Miller, 2016). Gaps and discontinuities are interpreted as regional boundaries (Daniel and Goodyear, 2015), a discontinuous distribution of human groups at the end of the Pleistocene; and as evidence of a "leap frog" model for the American peopling (see Anderson and Faught, 1998; Buchanan, 2003; Prasciunas, 2011). Most of these studies assess the potential biases influencing our knowledge of projectile point distribution (Anderson and Faught, 1998; Anderson and Gillam, 2000; Shott, 2002; Prasciunas, 2011; Loebel, 2012; Daniel and Goodyear, 2015).

In South America models of point distribution are infrequent (Bird, 1969; Borrero, 1983; Mayer Oakes, 1986; Politis, 1991; Suárez, 2015) and large data bases are not yet available and need to be built.

Currently, in the Southern Cone Fishtail points (FTP) show a discontinuous distribution with large territories without FTPs or other diagnostic remains (discoidal stones and small ground spheres) and other areas with concentrated FTPs or isolated findings (Fig. 1). This pattern is also recognized at smaller scales, where some places show a particular trait: they concentrate FTPs, discoidal stones and ground spheres (Flegenheimer et al., 2013a; Miotti and Terranova, 2015). There is a growing agreement suggesting FTPs are similar throughout the continent and that the people who made and used them were somehow related, and shared technological and stylistic concepts and social meanings (Bird, 1969; Politis, 1991; Bayón and Flegenheimer, 2003; Flegenheimer et al., 2003, 2013a; Politis et al., 2004a; Miotti and Terranova, 2015; Suárez, 2017).

In this paper we assess potential causes influencing our current knowledge concerning FTP distribution in the Southern Cone. We will consider scientific and taphonomic biases, (see for example Prates et al., 2013; Martínez et al., 2015 for biases on chronological trends); and we will also reflect on past social practices as another possible factor influencing FTP distribution. We will focus our discussion on the information gathered in the last thirty years working in the central-east Tandilia Ranges (Pampean Region, Argentina), with inter-connected sites occupied by people with FTP, in order to reflect about the larger scale FTP distribution.

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Fig. 1. Map of Southern Cone showing sites with fishtail projectile points: 1- Tres Arroyos; 2- Laguna Iturbe; 3- Pali Aike; 4- Magallania; 5- Fell; 6- Cueva del Medio; 7- Los Toldos 2; 8- Cerro Vanguardia; 9- Piedra Museo; 10- Los Toldos 3; 11- Cerro galera, Aysen; 12- Pampa Coichel; 13-Tapera Isidoro; 14- LDA5; 15-El Abra; 16-Amigo Oeste; 17-Arroyo Corral; 18-Piedra del Águila; 19-Temuco; 20- Tapera Moreira; 21-Bajo del Carmel; 22-Río Sauce Chico; 23- Monte Hermoso; 24- Ibarra; 25-San Cayetano; 26- Los Ángeles; 27- El Picadero; 28-Paso Otero 5; 29-La Querencia; 30- Arroyo Carolina; 31- Bellamar 3; 32- La Ballenera; 33- Miramar; 34- Amalia sitio 2; 35-Alero Los Pinos; 36-Cerro El Sombrero Cima y Abrigo 1; 37- Cerro La China 1 y 2; 38-Arroyo Giménez; 39-Lobos; 40- Plaza Don Torcuato; 41- Urupez; 42- Cerro Los Burros; 43- Arroyo Vejigas; 44- Paraje Tapia; 45- Laguna Blanca; 46-Cañada La Pinta; 47- Arroyo Cacique; 48- Lago de Rincón de Bonete; 49- Paso de la Cruz; 50- Laguna Negra; 51- Valizas; 52- Santa Teresa; 53- Solís Grande; 54- Arroyo Boicuá; 55-Río Negro Medio; 56- Paso Ramírez; 57- Paso Talavera; 58- Paso del Puerto; 59- Los Molles; 60- Tacuarembó; 61- Río Tacuarembó; 62- Laguna Las Veras; 63- Laguna Mirim; 64-Laguna Merín; 65- Cañada de Acegua; 66- Arroyo Cacique Grande; 67- Boca del Tala; 68- Los Espinillos; 69- Femenías; 70- Collares Rincón de Bonete; 71- Arroyo Molle Quiteros; 72-El Puente; 73- Arroyo Carpintería; 74- Minas de Callorda; 75- Baigorria; 76- Arroyo Tres Árboles; 77- Paso Blanco 4; 78- Federación; 79- Laguna Canosa; 80- Pay Paso; 81- Arroyo Juan Santos; 82- Santa Eloisa; 83- Los Pinos; 84- Salto Grande; 85- RS I 69; 86- Santa Lucía Monte Caseros; 87- Paso La Catumbera; 88- Paso Taborda; 89- Paso Centurión; 90-Montenegro; 91- RS C 43; 92- Rio Grande do Sul; 93- Orleans 1; 94- Orleans 2; 95- Jaguaruna; 96- Río Iraní; 97- Itapiranga; 98- Jusante; 99- PR FI 124; 100- Apiai; 101- Río Claro 1; 102- Río Claro 2; 103- Río Claro 3; 104- Río Claro 4; 105- Río Claro 5; 106- Abrigo do Santa do Riacho; 107- Estancia La Suiza 1; 108- Villa del Dique Río Tercero; 109- Lago San Roque; 110- Characato; 111- La Crucesita; 112- Ranquil Norte; 113- Santa Inés; 114- TaguaTagua 2; 115- Valiente; 116- El Tigre; 117- El Bolsón; 118- Cobres; 119- Antofalla; 120- Salar de Punta Negra; 121- Laguna Taxara; 122- Arenera Ferrando; 123- Arroyo Pintos; 124- Real de San Carlos Colonia; 125- Playa San Antonio de Polanco

2. Spatial framework

The pampas are best known for their rolling plains covered with eolian sediments, mostly loess or sandy deposits whose surface largely exceeds the study area (Zárate, 1997, 2015). Today these comprise a rich agricultural and grazing land, and the densest populated region in the country. But, in a more detailed scale, necessary to assess site formation processes and visibility, this general setting exhibits a heterogeneous environment: the plains are traversed by several rivers and two low mountain ranges, Tandilia and Ventania; and are flanked by the Atlantic coast towards the east; towards the north the Paraná River exhibits an important delta; the geomorphological limits with neighboring regions are transitional. All these features create a variety of

microenvironments with different taphonomic histories and archaeological visibility.

In this opportunity our database will be limited to the Humid Pampa sub-region. According to climatic, geomorphological and phytogeographic characteristics, it includes different areas, representing archaeological spatial units (Berón and Politis, 1997; Martínez et al., 2015) (Fig. 2) with differences in their archaeological record and research history.

The Delta area is located in the northeast of the region. It includes the coastal plains and the deltaic area of the Paraná River (Martínez et al., 2015). The first archaeological reports of the Delta date back to late 19th century, but methodical excavation and record started in the 1970′s and 1980′s (Ceruti and González, 2007; Loponte and Acosta, 2011; Politis et al., 2011a). Increasing research programs over the last two decades resulted in detailed archaeological information with a great number of excavated archaeological sites and more radiocarbon dates (Bonomo and Barboza, 2014). Currently, this area is sometimes included in the Northeast Region of Argentina, neighboring the Pampean Region.

The North is comprised by slightly undulating plains traversed by numerous water courses (Martínez et al., 2015). Its eastern limit is the Río de la Plata that separates the area from Uruguay. Archaeological research has a short history of systematically excavated sites and there is a gap of information in the area (Politis and Madrid, 2001). However, specific locations mainly next to the river coast, have been studied since 1990's (e.g. Paleo and Pérez Meroni, 1995; Sempé, 1995).

The Salado Depression is defined by grassland plains crossed by the Salado River and splattered with lagoons and ponds. The earliest archaeological records of this area are based on typological studies and date to the late 19th and early 20th century (Ceruti and González, 2007). It was not until 1980′s that continuous and systematic studies started in the area (Aldazabal, 1991; González, 2005; Escosteguy, 2011).

Westward of the Salado Depression, the West area is dry and characterized by an undulating landscape and temporary water bodies (Martínez et al., 2015). Only isolated sites and findings are reported in the West area, mainly close to water sources.

As mentioned above, the Pampean plains are interrupted by two range systems which conforms two more areas: Tandilia and Ventania. Tandilia, extends northwest-southeastward for more than 350 km and ends in the Atlantic Ocean (Nágera, 1940), it is a discontinuous and low range with butte hills as an outstanding feature in the sections where quartzitic rocks outcrop. Numerous water courses that drain the surrounding plains towards the Atlantic originate in these hills. Archaeological information was first published during the early 20th century (Tapia, 1937; Menghín and Bórmida, 1950) and was revised and discussed in the next decades. Long term archaeological research programs in Tandilia began in the 1980′s (Flegenheimer, 2004; Mazzanti, 2013) and multiplied during the last two decades including different hilly micro-regions (Mazzanti et al., 2013; Barros et al., 2015; Flegenheimer et al., 2015a).

The southern range system corresponds to the Ventania area. It is an arch-shaped series of hills which extends for more than 180 km in a northwest-southeastward direction. Many temporary and permanent water courses that drain the adjacent plains originate in these ranges (Oliva et al., 2010; Martínez et al., 2015). The first archaeological explorations in the Ventania caves date back to the late 19th century. Some studies were developed in the 1960′s and 1970′s, but systematic and continuous archaeological research started after 1985 (Oliva et al., 2010).

Tandilia, Ventania and the Atlantic Ocean limit the Interserrana area; a well-drained gently undulated plain with numerous water courses and lagoons. Its history of research, as that of other areas, exhibits discontinuous studies since the late 19th century; but it was not until the 1980′s decade that archaeological research began in earnest (Politis and Madrid, 2001). Since then, the number of excavated sites and researchers working in the area grew significantly.

The South area covers the plains southward of Ventania and up to the Colorado River basin; which is the southern regional boundary (Politis and Barros, 2006; Martínez et al., 2015). Research in the plains has a longer, discontinuous history (Bayón et al., 2010). In the lower basin of the Colorado River, systematic organization of archaeological research is very recent and excavations began in the

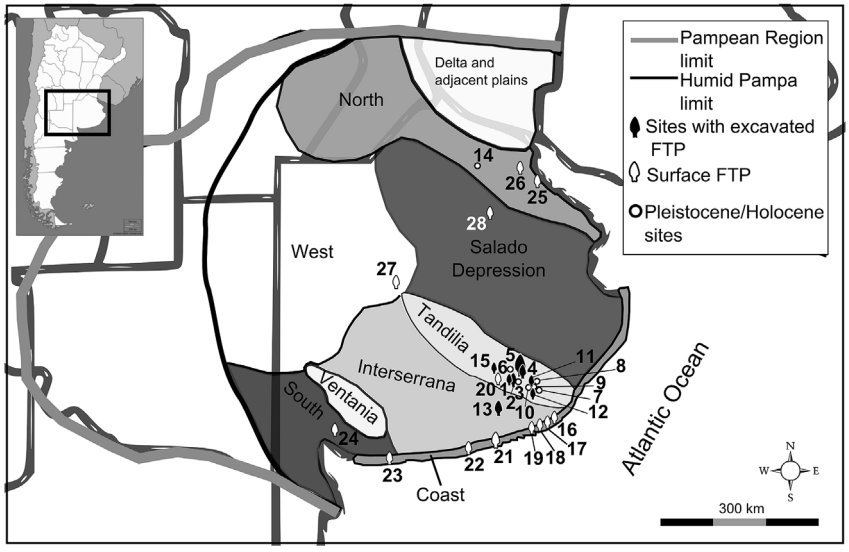

Fig. 2. Fishtail point and Late Pleistocene sites distribution in Humid Pampas (map modified from original by Berón and Politis, 1997). Ref. 1: Cerro La China 1, 2: Cerro La China 2, 3: Cerro La China 3; 4: Cerro El Sombrero Abrigo 1; 5: Cerro El Sombrero Cima; 6: Cueva Zoro; 7: Cueva Tixi; 8: Cueva La Brava; 9: Cueva Burucuyá; 10: Cueva El Abra; 11: Abrigo Los Pinos; 12: Amalia sitio 2; 13: Paso Otero 5; 14: Arroyo de Frías; 15: El Picadero; 16: Miramar; 17: Arroyo Ballenera; 18: Arroyo Carolina; 19: Bellamar 3; 20: La Querencia; 21: Los Ángeles; 22: San Cayetano; 23: Monte Hermoso; 24: Río Sauce Chico; 25: Arroyo Giménez; 26: Plaza Don Torcuato; 27: Ibarra; 28: Lobos.

early 2000's (Martínez, 2008–2009).

Finally, for the purpose of this paper we decided to include the Atlantic Coast, from Samborombón bay in the north to Puerto Belgrano, as another area although it is not defined as such in the conventional subdivision of the Pampean region. This coast is low, sandy and occasionally disrupted by cliffs (Bayón and Politis, 2014). The archaeological record of the coastline was studied since late 19th century and was the scenario for much discussion about the early antiquity of human occupation; but systematic explorations started in the 1990's decade (Bayón and Politis, 1997; Bonomo, 2006).

3. Materials and methods

For data analyses we used published information coming from excavated sites and well dated contexts. As shown in Fig. 1, most of the FTPS are surface findings. Several contexts with excavated FTPs, as RS C 43 (Brasil), Valiente (Chile), Santa Inés (Chile), and Tapera Moreira (Argentina), do not have associated radiocarbon dates (Berón, 2004; Jackson et al., 2004; Méndez et al., 2010; Loponte et al., 2016). Other contexts have problematic dates: Pali Aike (Chile), Los Toldos Cueva 3 (Argentina), PR F1 124 (Brasil), and Abrigo do Santa do Riacho (Brasil) (Bird, 1988; Prates et al., 2013; Loponte et al., 2015). For the purpose of this paper we use a FTP chronological range from 12,800 to 12,100 cal BP considering the sites with excavated points associated with radiocarbon dates (Table 1) and the recent proposals of Waters et al. (2015) and Suárez (2017).

We will discuss information organized in three different issues: archaeological visibility, research intensity and past social practices. Archaeological visibility for the different areas is described in order to evaluate relevant traits that could affect early site distribution. To assess research intensity we recorded published papers describing excavated and dated sites for each area, assigned to human occupations during either Late Pleistocene, Early Holocene, Middle Holocene or Late Holocene (prior to European conquest). Finally, past social practices are discussed by analyzing the great intersite variability recorded in the region in general, with detailed information from the central-east Tandilia ranges.

In the micro-region under study the hills are characterized by flat summits covered by quartzite outcrops and loess deposits with grass and shrub vegetation; rockshelters are scattered along the upper part of the hillsides. Five sites within the FTP chronological range have been described for Late Pleistocene hunter-gatherers (Flegenheimer et al., 2015a). Cerro El Sombrero Cima (CSC) is an open air site that occupies 25,000 m^2 of the highest hilltop (427 masl) in this portion of Tandilia (Flegenheimer et al., 2015a). Cerro El Sombrero Abrigo 1 (A1) is a nearby small rockshelter on the western slope of the same range (Mazzia and Flegenheimer, 2012). Two open air sites, Cerro La China 2 and 3 (LCH2, LCH3), and another in a rockshelter, Cerro La China 1 (LCH1), are placed on the southern side of a very low hill (228 masl) (Flegenheimer et al., 2015a). More than 15 km separate these last three sites from those at Cerro El Sombrero (Mazzia, 2010–2011).

4. Archaeological visibility and site formation processes

Archaeological visibility and its relation to the record of early sites is an important concern for researchers working in the area (for example, Barrientos, 1991; Flegenheimer and Zárate, 1993; Prates et al., 2013; Martínez et al., 2015). The dominating feature in the region is the loessic plain but, at a scale of detail, a variety of environments must be considered when discussing visibility and site formation processes.

The following is a brief description of some relevant traits affecting site distribution. Although loess deposits represent low-energy sedimentary environments and tend to preserve archaeological material, several factors affect their visibility and integrity. Natural grass vegetation is dense in the humid Pampas, but is restricted to small areas since crops or pastures cover most deposits. Sites are mostly visible when the land is barren after harvest and mainly after rainfall. Site discovery depends mostly on casual circumstances, sometimes farm workers identify surface sites; and deeply buried early sites usually are detected when they correspond to the lower section of a multicomponent site under investigation.

Sedimentation has been active during the Pleistocene and in some areas during most of the Early Holocene, producing an accretion soil surface. Pedogenesis and its correlated processes (i.e. bioturbation, horizon formation, translocation) have been the major agent affecting loess site formation processes in the region (Flegenheimer and Zárate, 1993; Zárate, 2015). Several soils are identified in the North, Interserrana and Tandilia areas (Kemp et al., 2006; Zárate, 2015). According to microenvironmental conditions, early sites can be found in A, B or C soil horizons of current soils, as well as in buried soils. In many cases they exhibit poor stratigraphic control, either because stratigraphic unconformities are difficult to observe, making discrete occupational levels hard to identify in multicomponent sites, or because occupations are included in "shallow sites" (Zárate et al., 2000–2002). Stable or low accumulating environments in theory would favor the formation of palimpsests, though these have not been reported and may be difficult to identify if artifacts are not diagnostic. In addition, few living floors or other archaeological features, useful as tools to identify discrete occupations, have been described.

The sedimentation timing for the regional occupation span exhibits variations in the diverse areas, being active until about 8500 years ago in the south but older in the north. In addition, there are differences at different topographic situations. Both topography and sedimentation rate affect the possible burial depth of a Late Pleistocene deposit. For example, at Arroyo Seco and El Guanaco (Interserrana area), early occupations are situated in eolic sediments surrounding depressions at more than a meter deep (Politis et al., 2016; Bayón et al., 2004). At Tandilia, on the hilltop of CSC, the FTP level is in an A horizon 20-10 cm deep, and at the same area but in a slope position at LCH 3, it is in a B soil horizon at about 1 m of depth. Yet, at the Salado basin, in the higher positions and at the North area, sediments assigned to the Early Holocene are at very surficial levels at the base of the present A soil horizon (Zárate et al. 2000–2002; Kemp et al., 2006).

Several major rivers traverse the pampas and flow into the Atlantic (Salado, Quequén Grande, Quequén Salado and Sauce Grande); their valleys constitute areas with higher Holocene chronological resolution exhibiting higher sedimentation rates than the plain environments (Zárate, 2015). The main agents acting in these environments are alluvial sedimentation and pedogenesis. The river valleys are exceptional environments to study both paleoenvironmental and sea level changes, and the regional occupational history. Some sections of these valleys have been systematically surveyed (for example, Martínez, 2008–2009, Martínez and Gutiérrez, 2011; González, 2005).

Other environments with specific characteristics within the general loess mantle are the Ventania and Tandilia ranges, which exhibit a variety of microenvironments with different visibility. As mentioned, sedimentary rates vary according to slope positions with deeper deposits in slopes and intermontane sections, and less sedimentation on hilltops. These areas usually have a high site visibility, as rockshelters and caves are easy to identify and sample.

Table 1
Dated sites with Fishtail projectile points in the Southern Cone.

	Country	^{14}C date BP	Dated material	Lab code	FTP n	References
1-Tres Arroyos	Chile	10,280 ± 110	Mammal bone	DIC. 2732	3	Massone and Prieto, 2004
		10,420 ± 100	Mammal bone	DIC. 2733		
		10,600 ± 90	Charcoal	BETA 101023		
		10,580 ± 50**	Charcoal	BETA 113171		
		10,575 ± 65**	*Dusicyon avus* bone	OXA 9245		
		10,630 ± 70**	*Vicugna* sp. bone	OXA 9246		
		10,685 ± 70**	*Hippidion* sp. bone	OXA 9247		
		11,085 ± 70**	*Panthera onca* bone	OXA 9247		
		10,130 ± 210**	Charcoal bone	OXA 9666		
5- Fell's Cave	Chile	10,395 ± 30**	Charcoal	UCIAMS 104660	19	Bird 1969; Waters et al., 2015
		10,395 ± 40**	Charcoal	UCIAMS 106044		
		10,675 ± 40**	Charcoal	UCIAMS 104662		
		10,760 ± 60**	Charcoal	UCIAMS 106043		
		10,835 ± 50**	Charcoal	UCIAMS 106047		
		10,810 ± 50**	Charcoal	UCIAMS 106048		
6-Cueva del Medio	Chile	10,310 ± 70	Charcoal	GR-N 14913	1	Nami and Nakamura, 1995
		10,350 ± 130	Bone	BETA 58105		
		10,430 ± 80	Charcoal	BETA 52522		
		10,550 ± 120	Bone	GR-N 14911		
		10,930 ± 230	Charcoal	BETA 39081		
		10,710 ± 100**	*Hippidion saldiasi* bone	NUTA 1811		
		10,860 ± 160**	*Hippidion saldiasi* bone	NUTA 2331		
		11,040 ± 250**	*Lama* cf. *owenii* bone	NUTA 2197		
		10,430 ± 100**	*Lama* cf. *owenii* bone	NUTA 1734		
		11,120 ± 130**	*Lama* cf. *owenii* bone	NUTA 1737		
		10,960 ± 150**	*Lama* cf. *owenii* bone	NUTA 2330		
114-TaguaTagua 2	Chile	10,120 ± 130	Charcoal	BETA 45520	3	Núñez et al., 1994
9-Piedra Museo AEP-1	Argentina	10,470 ± 60**	Charcoal	OXA 9249	2	Miotti et al., 2003
		10,470 ± 65**	Charcoal	GRA 9837		
		10,400 ± 80**	Camelid bone	AA 8428		
36-Cerro El Sombrero Abrigo 1	Argentina	10,725 ± 90**	Charcoal	AA-4765	2	Flegenheimer and Zárate, 1997
		10,675 ± 110 **	Charcoal	AA-4767		
		10,480 ± 70**	Charcoal	AA-5220		
		10,270 ± 85**	Charcoal	AA-4766		
37-Cerro La China 1	Argentina	10,804 ± 75**	Charcoal	AA-8953	1	Flegenheimer, 1980
		10,790 ± 120**	Charcoal	AA-1327		
		10,745 ± 75**	Charcoal	AA-8952		
		10,720 ± 150	Charcoal	I-12741		
		10,525 ± 75**	Charcoal	AA-8954		
37-Cerro La China 2	Argentina	11,150 ± 135**	Charcoal	AA-8955	2	Zárate and Flegenheimer, 1991
		10,560 ± 75**	Charcoal	AA-8956		
11-Abrigo Los Pinos	Argentina	10465 ± 65**	Charcoal	AA-24045	1	Mazzanti et al., 2012
		10415 ± 70**		AA-24046		
12-Amalia Sitio 2	Argentina	10.425 ± 75**	Charcoal	AA-35499	1	Mazzanti et al., 2012
13-Paso Otero 5	Argentina	10.440 ± 100**	Undet. Mega-mammal bone	AA-39363	2	Martínez et al., 2015
		10.190 ± 120**	Undet. Mega-mammal bone	AA-19291		
116- El Tigre (K-87)	Uruguay	10,955 ± 50**	Charcoal	UCIAMS 125383	1	Suárez, 2017b
		10,930 ± 20**	Charcoal	UCIAMS 125384		
		10,905 ± 20**	Charcoal	UCIAMS 125381		
		10,595 ± 25**	Charcoal	UCIAMS 125379		
		10,580 ± 50**	Charcoal	UCIAMS 125393		
		10,510 ± 45**	Charcoal	UCIAMS 145434		
		10,425 ± 20**	Charcoal	UCIAMS 125380		
		10,410 ± 60**	Charcoal	UCIAMS 145433		
41-Urupez II	Uruguay	10.800 ± 30**	Charcoal	BETA 380727	2	Meneghin, 2015
		10.800 ± 40**	Charcoal	BETA 381967		

**AMS.

Some other areas, as the Salado Depression, have been and are subject to periodic flooding and this affects sites in all but the higher landscape positions. Holocene sea transgression was a major factor affecting the northern coast of Buenos Aires province, and obliterating any possible older sites.

The Atlantic coast exhibits different visibility conditions with varied site formation processes. Many collections come from the area that is intensely used for recreational purposes; people walk by the seaside frequently and there are many amateur collectors. The cliffs, that partially flank the seacoast, are an extensive natural stratigraphic cut with Late Pleistocene-Holocene deposits in their uppermost section.

In the dune system, Bonomo (2005) has identified wind and water as the two main agents affecting visibility and integrity; both are currently active processes that strongly modify deposits. Yet, exceptional deposits in the coastline have yielded the most detailed records of past Holocene occupations (Bayón and Politis, 1997, 2014). This low gradient coast was affected by sea level changes; during early human occupation, the coast was more than 40 km towards the east (Ponce et al., 2011). That is, Late Pleistocene/Early Holocene coastal sites are now underwater.

The Paraná Delta is a different geomorphological area of recent formation where sediments are mostly alluvial. They were deposited from Mid-Holocene onwards and therefore are not expected to

yield early sites. At the time of FTP occupation, the Río de la Plata -now a wide river separating Uruguay and Argentina- flowed into the ocean further east and exhibited a narrow course (Cavallotto et al., 2005). Early sites in this area have extremely low visibility and should be underwater or beneath the alluvial sediments.

5. Research intensity and FTP findings

We recorded 169 excavated and dated sites in the Humid Pampas (Supplementary material Table A1). Considering the number of excavated sites per area (Fig. 3), the most intensely studied areas are the Delta and adjacent plains, South, Interserrana and Tandilia.

The Delta area has the most numerous excavated and dated archaeological sites. However, neither early sites nor FTP are recorded and all the dates correspond to the Late Holocene (Fig. 3a; Supplementary material Table A1).

In the South area, dates span from Mid to Late Holocene. While the plains south of Ventania have a longer, but less intense, research history and only one surface FTP is known; the Colorado River Basin investigations started more recently but with notorious intensity (Supplementary material Table A1). No FTPs were found in this last sector.

Interserrana and Tandilia areas are the ones with the longest systematic research history, especially for the Late Pleistocene (Prates et al., 2013). In the Interserrana area, seven (29%) of 24 recorded sites correspond to the Late Pleistocene (8.2%) and Early Holocene (20.8%). Arroyo Seco 2, the earliest site in the Pampean Region, is located in this area. It is an open air, multi-component site with an occupation gap in the FTP period (Politis et al., 2014, 2016, Supplementary material Table A1). Only Paso Otero 5 yielded dates corresponding to the FTP chronology in the area (Table 1) and it is the only site in the Interserrana area with excavated FTPs. One surfacial FTP was recorded for the interior of the Interserrana area (Politis, 1991).

The Tandilia ranges, present an opposite situation regarding FTP findings. Early sites in Tandilia are mainly in rockshelters in the east and central-east (Mazzanti et al., 2012; Flegenheimer et al., 2015a) micro-regions and there is a high frequency of FTPs in stratigraphic and radiocarbon dated contexts (Fig. 3; Tables 1 and 2). Of the 22 sites considered for this area, 10 (45.4%) correspond to the Pleistocene-Holocene transition and five of them yielded FTP (Flegenheimer et al., 2015a; Mazzanti et al., 2012). Cerro El Sombrero Cima, in central-east Tandilia, with around 130 FTP recovered both from surface and stratigraphic contexts, is also situated in the area. Other undated findings are a surface FTP in La Querencia (Flegenheimer and Bayón, 1996) and a FTP preform found at the quarry site El Picadero, which exhibits a complex site formation process (Colombo, 2013). So far, this is the only FTP recovered in a quarry context in the region.

Along the Atlantic coast, there are 15 dated sites. FTP findings ($n = 7$) are all surface findings, mainly in the sector corresponding to the Interserrana area seacoast (Flegenheimer and Bayón, 1996; Bonomo, 2005) (Fig. 2). Human presence is well established by the Early Holocene by four human remains recovered in the 19-20th centuries that were recently dated (Politis et al., 2011b; Bonomo et al., 2013), but no Late Pleistocene dates were obtained so far. Late Holocene sites are frequent as surface scatters located in blowouts in the mobile dunes system (Bonomo, 2005, 2011) and few dates are available (Supplementary material Table A1). Further south on the coast, six exceptional and related sites show a unique context corresponding to the end of the Early Holocene-Mid Holocene (*ca.* 7400-6900 BP): La Olla 1, 2, 3 and 4 (Bayón and Politis, 2014); Monte Hermoso 1 (Bayón and Politis, 1997) and Barrio Las Dunas 1 site, (Bayón et al., 2012; Bayón and Politis, 2014).

The North has 14 dated sites with mostly Late Holocene dates which are concentrated near water courses. Two surface FTPs were recorded (Ameghino, 1915; Nami, 2007), and two sites with early human remains were dated (Ávila, 2011; Politis et al., 2011b). One of the two skeletal remains from Arroyo de Frías (Fig. 2) is the earliest known for the region (Politis et al., 2011b) and corresponds to the FTP chronological range (Table 2).

In the West area there are few excavated and dated sites (Supplementary material Table A1). Still, Early to Late Holocene occupations and a surface FTP were recorded (Flegenheimer and Bayón, 1996; Politis et al., 2012; Messineo and Scheiffler, 2016).

In the Salado Depression sites correspond to Late Holocene

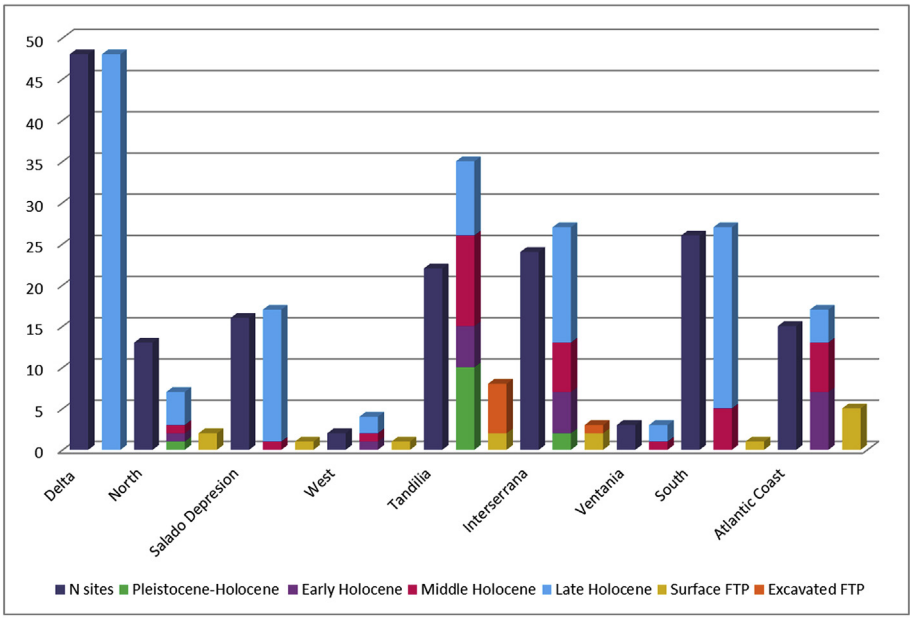

Fig. 3. Frequency of sites and Fishtail point findings per area mentioned in the text.

Table 2
Archaeological sites with FTP chronology in the Humid Pampa sub-Region of Argentina.

	Site function	FTP		^{14}C yr BP	Cal yr BP	Labcode	Archaeologicalassemblage	References
		Surface	Stratigraphy					
1-Cerro La China 1 (37a Fig. 1)	Domestic	–	1	10,804 ± 75 10,790 ± 120 10,745 ± 75 10,720 ± 150 10,525 ± 75	12,780–12,600 12,810–12,550 12,730–12,540 12,510–12,280 12,780–12,450	AA-8953 AA-1327 AA-8952 I-12741 AA-8954	Lithic artifacts (n = 644), faunal remains (n = 3), pigments, abrasive rocks	Flegenheimer, 1980; Flegenheimer et al., 2015a
2-Cerro La China 2 (37b Fig. 1)	Hunting/kill site	–	2	11,150 ± 135 10,560 ± 75	13,160–12,880 12,550–12,330	AA-8955 AA-8956	Lithic artifacts (n = 84), pigments, abrasive rocks	Zárate and Flegenheimer, 1991; Flegenheimer et al., 2015a
3-Cerro La China 3	Multiple activities, domestic	–	–	10,610 ± 180	12,690–12,270	AA-1328	Lithic artifacts (n = 1094), pigments, abrasive rocks	Flegenheimer, 1986/87; Flegenheimer et al., 2015a
4-Cerro El Sombrero Abrigo 1 (36b Fig. 1)	Primary processing	–	2	10,725 ± 90 10,675 ± 110 10,480 ± 70 10,270 ± 85	12,720–12,500 12,690–12,430 12,460–12,220 12,210–11,765	AA-4765 AA-4767 AA-5220 AA-4766	Lithic artifacts (n = 406), charcoal, ochers	Flegenheimer and Zárate, 1997; Flegenheimer and Leipus, 2007
5- Cerro El Sombrero Cima (36b Fig. 1)	Lookout, weapon re-equipment, disposal of broken tools and FTP, significant place	97	33	No date	No date	–	Lithic artifacts (>10400), ocher, abrasive rocks	Flegenheimer et al., 2015a
6-Cueva Tixi	Residential camp	–	–	10.375 ± 90 10.045 ± 95	11,775–12,541 11,232–11,929	AA-12130 AA-12131	Lithic artifacts (n = 2845), faunal remains (n = 7729)	Mazzanti and Quintana, 2001; Mazzanti et al., 2012; Mazzanti and Bonnat, 2013
7-Cueva Burucuyá	Specific and/or ephemeral activities	–	–	10.672 ± 56	12,435–12,703	AA94640	Lithic artifacts (n = 106), hearths (n = 5)	Mazzanti et al., 2012; Mazzanti and Bonnat, 2013
8-Cueva El Abra	Residential camp, multiple long-term activities	–	–	10.270 ± 200	11,268–12,550	AA94641	Lithic artifacts (n = 7600), pigments, faunal remains	Mazzanti et al., 2012; Mazzanti and Bonnat, 2013
9-Abrigo Los Pinos (11 Fig. 1)	Residential camp, multiple long-term activities	–	1	10465 ± 65 10415 ± 70	12,028–12,549 11,961–12,541	AA-24045 AA-24046	Lithic artifacts (n = 3398), pigments, hearths (n = 6)	Mazzanti et al., 2012; Mazzanti and Bonnat, 2013
10-Amalia Sitio 2 (12 Fig. 1)	Specific ephemeral activities	–	1	10.425 ± 75	11,970–12,546	AA-35499	Lithic artifacts (n = 30)	Mazzanti et al., 2012; Mazzanti and Bonnat, 2013
11-Paso Otero 5 (13 Fig. 1)	Secondary processing and consumption	–	2	10.440 ± 100 10.190 ± 120	11,839–12,561 11,268–12,380	AA-39363 AA-19291	Lithic artifacts (n = 86), faunal remains (n = 77.114)	Martínez, 2006; Armentano et al., 2007; Martínez and Gutiérrez, 2011
12-Arroyo de Frías	n/d	–	–	10300 ± 60	11,724–12,390	CAMS-16598	Human remains	Politis et al., 2011b

times (Supplementary material Table A1), a slightly earlier date (3500 years BP) was obtained for the area from human remains discovered by Ameghino in El Siasgo (Escosteguy et al., 2017). Only one FTP has been reported but without contextual data (Eugenio, 1983). Ventania has very few dated sites, they correspond to the Mid Holocene and Late Holocene (Supplementary material Table A1) and no FTPs are recorded.

6. Past social practices: assemblages and intersite variability

In the Pampean Region several sites could correspond to FTP peoples, some of them include points, others do not (Table 2). The sites mentioned above in central-east Tandilia show a great intersite variability, both related to different functions and to landscape choice (Flegenheimer, 1994; Flegenheimer and Mazzia, 2013; Flegenheimer et al., 2015a). This variability concerns differences in the archaeological assemblage, site emplacement, the presence of different moments of the production sequence at different sites and technical choices (i.e: bifacial/unifacial flaking ratios, bipolar flaking) (Flegenheimer et al., 2015a).

These contexts within the FTP chronological range in central-east Tandilia include five sites (Table 2). A domestic setting in a rockshelter (LCH1) with varied tool types, a broken FTP preform and faunal remains (*Eutatus seguini* and *Lagostomus maximus*). An open air site (LCH2) with a small lithic assemblage and two FTPs, where hunting activities are inferred from the presence of projectile points throughout the entire occupation sequence. On the same hill there is a multipurpose site with a variety of domestic activities (LCH3) which yielded the most varied tool assemblage and is the densest of these sites (Table 2). The assemblage at LCH3 does not include FTP's or any other complete bifacial artifact (Flegenheimer et al., 2015a). CS A1 is a small rockshelter with an early occupation represented by lithic artifacts and two medium-sized FTPs (Flegenheimer et al., 2015a). In addition, at the site ocher pieces were found cached and arranged (Flegenheimer et al., 2003; 2004). According to microscopic use-wear analysis (Flegenheimer and Leipus, 2007), A1 was interpreted as a place of fresh hide processing. Finally, CSC has a commanding view of the surrounding plains and hills (Flegenheimer et al., 2003). It is the most extensive and dense early site in the region and its large collection of FTPs and the peculiarities of the assemblage makes it especially relevant for our discussion. Preservation of organic remains at the site is very poor and no samples are available for radiocarbon dating, but the site is assigned to the terminal Pleistocene considering

morphological, technological and raw material similarities of lithic artifacts with nearby dated assemblages. Also, the site is internally very homogeneous and no artifacts diagnostic of later occupation periods were recovered. Numerous lithic tools, mostly broken (90%), and flakes were found on the surface and in stratigraphic position (Flegenheimer et al., 2015a). So far, 130 FTPs have been recovered from this hilltop in a continuum of sizes ranging from very small (miniatures) to large. Most FTPs are broken or damaged and represented by stem fragments, yet recycled points and preforms are also present. Miniatures (n = 6) are complete with no evidences of use (Flegenheimer et al., 2015b). FTPs at CSC show complex and varied life histories, uses and roles loosely linked to their sizes (Bayón and Flegenheimer, 2003; Flegenheimer et al., 2015b; Mazzia and Flegenheimer, 2015; Flegenheimer and Weitzel, 2017). Other very distinctive objects were found at CSC: an engraved discoidal stone, discoidal stones fragments and small ground spheres (Flegenheimer et al., 2013b; Mazzia and Flegenheimer, 2015). The hilltop is interpreted as a lookout place where a narrow range of activities were carried out, among them refurbishing and repairing weapons, and hunt sighting. It has been proposed that it was a special and significant place to early people, which was selected for the intentional discard of broken FTPs and tools (Flegenheimer, 1986; Weitzel, 2012; Flegenheimer and Mazzia, 2013; Flegenheimer et al., 2013a).

Intersite variability, as a reflection of a settlement system with complementary functions and activities (Flegenheimer et al., 2015a; Mazzanti et al., 2012) includes other Late Pleistocene sites from eastern Tandilia and the surrounding plains (Table 2; Fig. 2). Abrigo Los Pinos and Amalia site 2, about 40–60 km away in eastern Tandilia yielded one FTP each. Abrigo Los Pinos is a long-term multiple activities site and Amalia site 2 shows evidences of an ephemeral occupation (Mazzanti, 2003; Mazzanti et al., 2012). A few meters away from Abrigo Los Pinos are other rockshelters without FTPs: Cueva Tixi and Cueva El Abra are domestic sites of long-term multiple activities, while Cueva Burucuyá shows ephemeral specific activities (Mazzanti et al., 2012).

In the Interserrana plains, on the right margin of the Quequén Grande River, Paso Otero 5 site is a specific activity site of secondary processing and consumption of hunted/scavenged megafauna (Martínez and Gutiérrez, 2011). Two broken FTPs were recovered associated to a small lithic assemblage and hundreds of bones (Martínez and Gutiérrez, 2011).

Human skeletal remains in a primary burial originally recovered in the 19th century were recently dated to the Late Pleistocene (Politis et al., 2011b). The skeleton recovered in the left bank of Arroyo de Frías was possibly associated with lithic artifacts, eggshells and megafauna bones (Politis and Bonomo, 2011) and corresponds to the FTP chronological range. The site is located in the North area, more than 500 km away northwards from the Tandilia and Interserrana sites.

In sum, there are 12 sites that can be assigned to the FTP period. Most of them are located in the Tandilia ranges, in caves and rockshelters and a few are open-air sites. Seven have FTPs and although the others do not, they share some technical traits and toolstone selection. Surface FTPs were also recovered in all the areas exhibiting sites with FTP chronology. Among all these sites, CSC stands out due to the high concentration of FTPs (Fig. 4) and the great variability they exhibit.

7. Discussion

Recent chronological information from archaeological sites in the South American Southern Cone supports the proposal of an early peopling ca. 14,500 cal BP (i.e: Miotti et al., 2003; Prates et al., 2013; Politis et al., 2014; Suárez, 2017; Suárez et al., 2017). So far, diagnostic artifacts or projectile technology for these early groups were not found (Politis et al., 2016; Suárez, 2017). Suárez et al. (2017) proposes a "regional social and technological reorganization" for the Uruguayan archaeological record that started with people using FTPs around 12,800 cal yr BP ago. In the following millennia, first Tigre points and later Pay Paso points, replace the FTPs in Uruguay; a process that probably included the plains of Brazil, NE Argentina and the north of Chile (Suárez, 2017; Suárez et al., 2017). This process has not been recognized yet in the Pampean Region, where after FTPs disappear, projectile points are not recorded until the Mid Holocene.

FTPs are widely distributed throughout the Southern hemisphere, from Central America to Tierra del Fuego (Flegenheimer et al., 2013a). It has been proposed that people using FTPs were engaged in long distance social networks and shared some

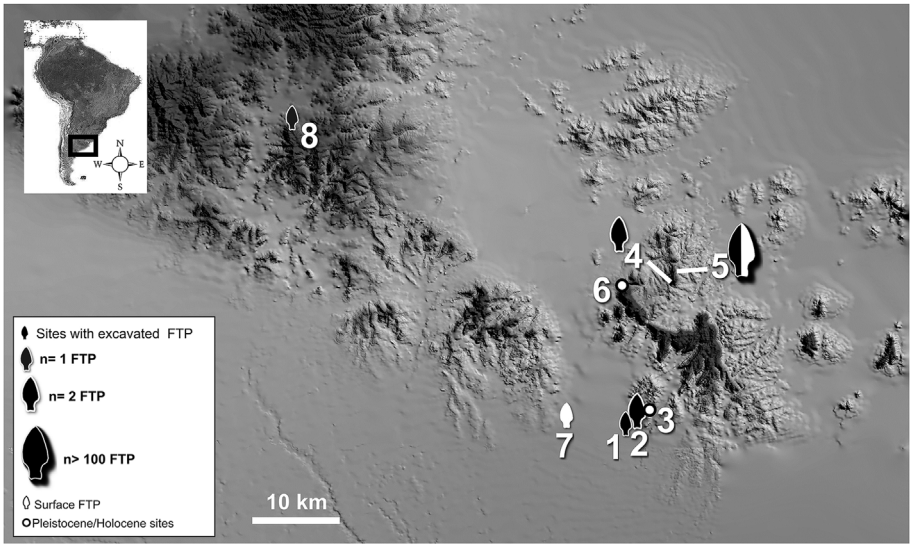

Fig. 4. Distribution of archaeological sites assigned to the Pleistocene/Holocene transition and Fishtail point distribution in the central east portion of the Tandilia ranges Ref. 1: Cerro La China 1, 2: Cerro La China 2, 3: Cerro La China 3; 4: Cerro El Sombrero Abrigo 1; 5: Cerro El Sombrero Cima; 6: Cueva Zoro; 7: La Querencia; 8: El Picadero.

technological traits (Politis, 1991; Flegenheimer et al., 2003, 2013a,b; Suárez et al., 2017) and probably a perception of the world (Flegenheimer et al, 2013a, b). Still, this wide distribution of FTPs is fairly discontinuous, with notorious gaps. What accounts for this pattern?

At a scale of greater detail, current FTP distribution in the Pampean Region exhibits a discontinuous spatial patterning. Both surface and excavated FTPs are highly concentrated in a section of the Tandilia ranges (Fig. 4) and, secondly, in the Interserrana area, especially in the portion of its seacoast (Fig. 2). Other areas show sparse and isolated surface findings and there are notorious gaps in most of the Humid Pampas: in the Delta, Salado Depression, West, Ventania, most of the North area and the western sector of Tandilia and Interserrana areas. Furthermore, there are several sites with a FTP chronology but without diagnostic remains.

Scientific and taphonomic biases that might be affecting FTP distribution are similar to those already analyzed for radiocarbon trends by others (Prates et al., 2013; Martínez et al., 2015). In general, regional paleoenvironmental conditions were not limiting factors for human occupation as in other regions of the Southern Cone. A major instability in the past must have been sea coast level which was rapidly ascending at time of occupation (Ponce et al., 2011). Also, the Delta area suffered significant changes which obliterated previous deposits. Yet, Late Pleistocene/Early Holocene deposits have been preserved in other situations. Currently the best stratigraphic visibility is exhibited in the large river valleys and in the Atlantic cliffs where early deposits can be observed in natural sections. Site location in the ranges is also subject to survey due to the existence of rockshelters, yet, findings in the plains are more dependent on casual circumstances in which local populations play a major role.

In some areas, like the Delta, lower Colorado basin and the coastal sector of the North and Salado Depression areas, the absence of FTPs might be strongly affected by taphonomic and visibility biases that resulted from intense geomorphological processes (i.e: Cavallotto et al., 2005; Martínez and Martínez, 2011). In the interior of the Salado Depression on the other hand, "shallow sites" with low resolution and integrity that might include early occupations (Zárate et al., 2000–02), do not have dates older than *ca*. 3500 (González, 2005; Escosteguy et al., 2017). It is possible that the absence of FTP chronology is affected by scientific biases and that FTPs might be found in the future. Yet, they have not been recognized in local amateur collections except for the case recorded by Eugenio (1983). In the North (except its coastal section) and West areas, surface FTPs and Late Pleistocene and Early Holocene sites have been found. Both these areas have a low and discontinuous research intensity that might be an important factor affecting our knowledge of the early occupations. In Ventania, with good archaeological visibility many rockshelters with rock art have been studied but there are very few dated sites, making it difficult to assess the absence of early evidences. The Interserrana and Tandilia areas are the ones with the longest research history, with high research intensity and continuity and with the most numerous FTP findings. Also, as discussed by others (i.e: Flegenheimer and Zárate, 1993; Prates et al., 2013) these areas have microenvironments that favor good preservation, good archaeological visibility and human settlement. As other colleagues have observed, people with FTPs favored hilly environments with good visibility of the surrounding plains and places with rock availability, abundant water and biotic resources, as the Tandilia ranges and Interserrana grasslands by the end of the Pleistocene (Mazzanti et al., 2012; Prates et al., 2013). However, only one site has been recorded along a river, which is Paso Otero 5. This differs from what can be expected from general models that sustain early peopling could have occurred along the valleys (Anderson and Gillam, 2000; Miotti and Salemme, 2004) it is not clear whether this trend is related to the history of research or is representing a past practice. So, in these two areas, Tandilia and Interserrana, different biases might be affecting our knowledge, but also, the FTP distribution pattern might be a reflection of their real concentration in the past.

As mentioned, very dynamic site formation processes in the coast do not favor preservation. Yet, it is a highly visited area today. The existence of isolated surface FTPs is a clear reflection of both these situations.

In addition, in Tandilia at a microregional scale we have recorded great intersite variability within a network of places used by people with FTP. This network includes places where no points were discarded, as LCH3, some with few points as A1 or LCH1 and LCH2 and an outstanding place, CSC, with an exceptional concentration of 130 points. We have previously proposed that this site was a significant place for early peoples, who intentionally discarded worn out FTPs in this extensive hilltop. This practice produced a hilltop with a high concentration of FTPs, and we believe is partly responsible for the scarcity or absence of FTPs in other sites. The practice of replacing FTP at a specific place has influenced discard at other sites in the larger spatial and social network. This influence can be observed in this network at sites with scarce points, such as La Amalia 2 and Los Pinos in Tandilia, Paso Otero 5 at the Quequén River, as well as in the assemblages at sites without points in Tandilia, such as LCH3, Cueva Tixi, Cueva Burucuyá, and Cueva El Abra.

At a larger scale a similar pattern of discontinuous distribution is observed (Fig. 1). Concentrations in Uruguay and the Argentine Pampas stand out. Southern Patagonia, southern Brazil, Central Chile and central Argentina exhibit more dispersed findings. Comparing with previous distribution maps (Borrero, 1983) the tendency of discontinuity has persisted even if nowadays we have a more complete record of both surface findings and stratified sites. The two concentrations of sites identified in Uruguay and Tandilia are located in similar hilly environments and separated by a lowland area with low point density. Uruguay and Tandilia also show evidence of social relations through raw material analysis (Flegenheimer et al., 2003) and the presence of oversized FTPs and discoidal stones, which may have served other roles besides hunting (Bayón and Flegenheimer, 2003; Suárez et al., 2017). The area between both has been studied and sediments corresponding to the Pleistocene–Holocene transition are preserved in some situations. Therefore, we suggest that this gap probably has a past correlation, the area could correspond to paths, as possible communication routes or people might have moved along the coast and sites are nowadays underwater, in which case the interior was probably not much visited.

The relation with Patagonia is sustained by similarities between CSC and Amigo Oeste (Miotti and Terranova, 2015) (Fig. 1), which share landscape characteristics such as geomorphology of the hills, good visibility of hunting grounds, similar assemblages with broken and exceptional tools and large numbers of FTP (Flegenheimer et al., 2013a). Therefore, similar past practices associated to FTP discard are inferred for these two hilltops. A practice that concentrates FTPs in particular places and that might have left others with few or no FTPs at all.

8. Conclusion

In synthesis, although information about FTP distribution is increasing, it is still discontinuous at the scale of the Southern Cone. Although some concentrations of early sites can be explained by the history of research and modern high population areas with good

visibility and/or good preservation, others probably are due to human choices; certain landscapes and resources, such as hills and rocks, were especially attractive for early settlers. Furthermore, as sites occupied by early hunter gatherers were selectively used for different purposes, they do not always include materials that are diagnostic of people using FTPs, making them difficult to identify. Also, the practice of depositing FTPs at specific places leaving others without these diagnostic artifacts is relevant when discussing the record of their distribution. In this case, topography and typology have to be considered together when specialized deposits are found at distinctive places (Bradley, 2017).

Another question that arises is: can we recognize early sites without points as places occupied by the same people if they are not integrated in a spatial network? Could distant sites with similar chronology such as Arroyo de Frías correspond to these same people? Can we expect to find other sites with high concentrations of FTPs like Cerro El Sombrero Cima and Amigo Oeste?

What has this exercise taught us? Usually mobility is the main social practice considered when assessing early site distribution. Yet, we have highlighted that past activities such as discard practices and the relation with particular places, and the resulting social landscapes affect the archaeological record. Therefore, we propose that a comprehensive analysis of social practices is relevant to the discussion of point distribution.

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Appendix A. Supplementary data

Supplementary data related to this article can be found at https://doi.org/10.1016/j.quaint.2018.01.005.

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