Technology from hunting blinds: A study of lithic assemblages in Late Holocene stone structures from Patagonia (Argentina)

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Abstract:

Stone structures called *parapetos* are a highlighted feature of the archaeological record in central-western Santa Cruz, Patagonia. More than 500 have been registered so far with varied sizes and shapes and clustered in different amounts. They are located in basaltic plateaus, over 700 masl. These hunter-gatherer structures are believed to be mainly related to hunting activities though some sites have revealed a more general function. Radiocarbon dates reveal that they are a typical Late Holocene technology.

This work discusses the characteristics of lithic materials recovered in these particular sites with a specific spatial and temporal distribution in Patagonia. We evaluate the existence of variability in lithic artefacts related to stone structures recovered in different areas: Pampa del Asador (Cerro Pampa), Guitarra Plateau, Asador Plateau and the Strobel Plateau. Diverse types of hunting blind sites have been included: isolated structures and grouped ones located in different topographic and ecological contexts. Materials were recovered from inner and outer surfaces of structures as well as from stratigraphic contexts. The sample includes tools, debitage and cores; more than 10000 lithic artefacts are included.

Results show that there are similarities in the characteristics of artefacts discarded in *parapetos* from different areas. However, variability in the type and characteristics of artefacts in each assemblage could account for a wider array of activities being carried out in *parapetos* from the northern sector of the region under study. Thus, strategies for occupying highlands during the Late Holocene differed.

The evidence discussed summarises more than 20 years of on-going investigations in the region. It provides exceptional information based on systematic analysis of a significant sample of lithic artefacts in hunting blinds.

Keywords: stone structures; lithic artefacts; Patagonia; highlands; Late Holocene

1. Introduction

Stone structures called *parapetos* are a highlighted feature of the archaeological record in highlands and plateaus from Southern Patagonia (Figure 1). These open-air sites are found in

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different parts of the world and their function is mainly related to hunting activities (Aschero & Martínez 2001; Belardi *et al.* 2017; Binford 1978; Brooks & Yellen 1987; Gradin 1959-1960; 1971; 1976; Hitchcock & Bleed 1997; Hitchcock *et al.* 2019; Moreno 2012; O'Connell *et al.* 1992, among others).

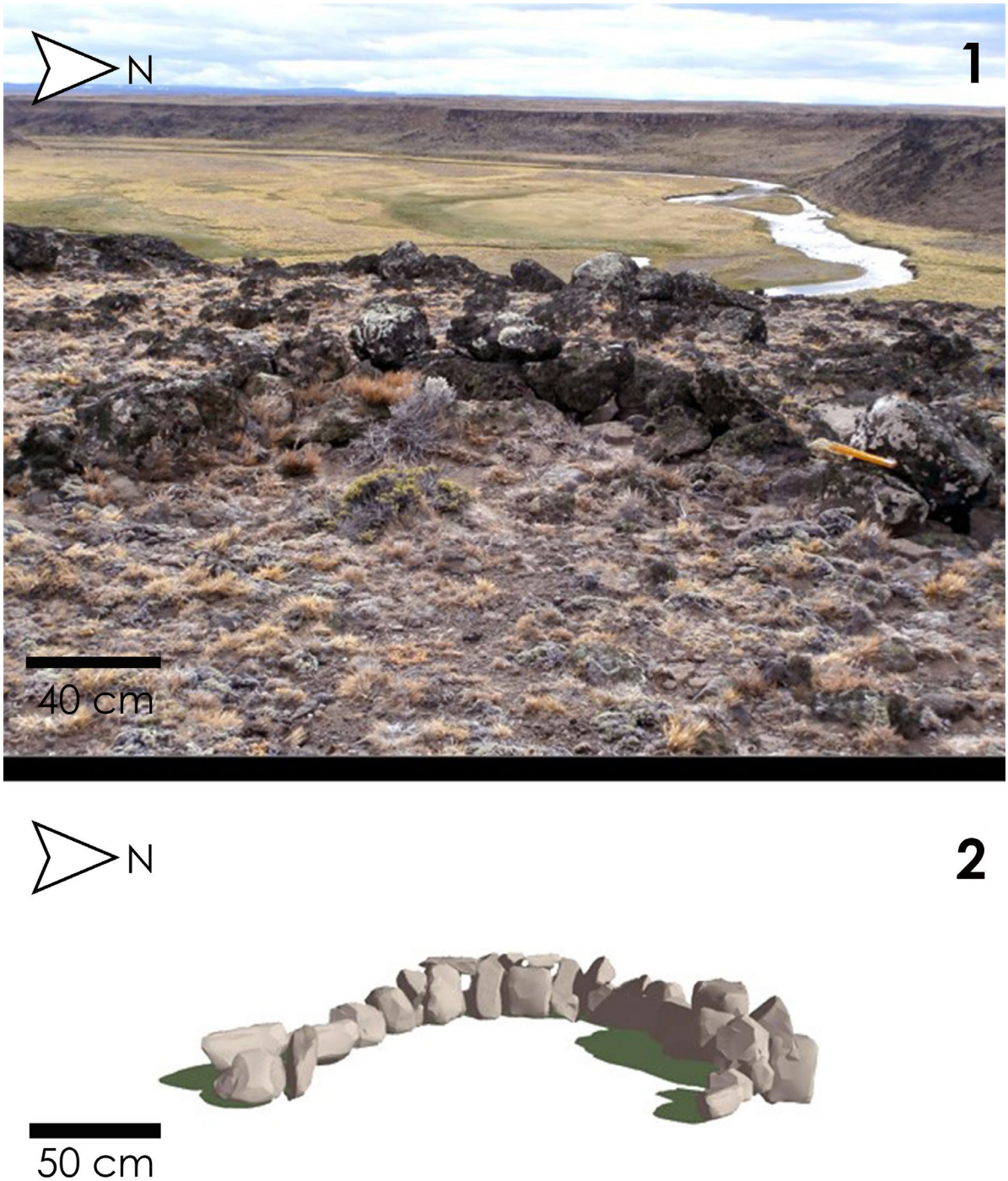

Figure 1. *Parapetos* in central-western Santa Cruz province, Patagonia, Argentina. 1. Example of a *parapeto* in the Strobel Plateau. 2. Sketch of a *parapeto*.
Figura 1. Parapetos en el centro-oeste de la provincia de Santa Cruz, Argentina. 1. Ejemplo de parapeto en la meseta del Strobel. 2. Esquema de parapeto.

In our research area, located in central-western Santa Cruz province in Patagonia, Argentina (Figure 2), an exceptional number was registered: 556 structures have been

recorded so far (Flores Coni *et al.* 2021). Radiocarbon dates reveal that they are a typical Late Holocene technology as chronologies for these sites start 2000 years BP, when there was a regional humidity decrease (Stine & Stine 1990) and continue until European contact times (Flores Coni *et al*. 2021). These were essential as part of the technology hunter gatherers implemented for the colonisation and effective occupation of highlands (Cassiodoro 2011: 180; Goñi 2010: 252).

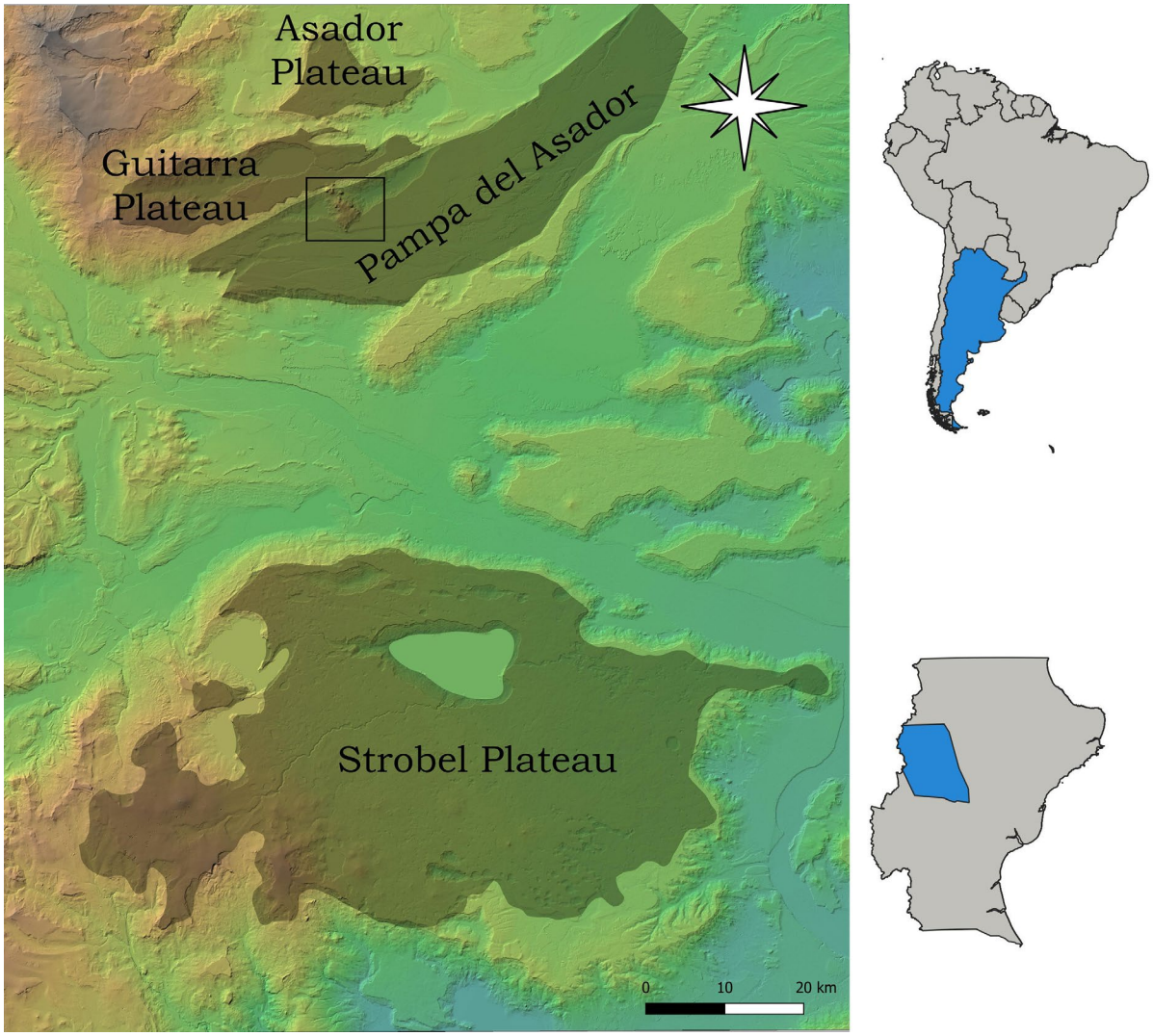

Figure 2. Areas under study in Santa Cruz province, Patagonia, Argentina. In a black square: Cerro Pampa.
Figura 2. Áreas bajo estudio en la provincia de Santa Cruz, Patagonia, Argentina. En recuadro negro: Cerro Pampa.

Structures have different archaeological evidence inside. Mainly lithic materials though also zooarchaeological evidence as well as ceramic sherds were recorded (Aragone & Cassiodoro 2006; Aragone *et al.* 2010; Dellepiane 2014; 2019, among others). Different scales of analysis were used to study the variability of lithic artefacts in stone structures: stratigraphic analyses, intra structure analyses, comparisons between structures from the same site as well as comparisons between structures from different sites within the same area (Aragone & Cassiodoro 2005- 2006; Cassiodoro 2011: 116; Cassiodoro & Flores Coni 2010, 2019; Dellepiane 2019: 80; Dellepiane & Cassiodoro 2019; Dellepiane & Flores Coni 2016; Flores Coni 2014; 2018: 122; 2019; Goñi *et al.* 2016). However, a major large scale inter plateaus comparative analysis has not been addressed yet.

The goal of this work is to evaluate the presence of variability in the characteristics of lithic materials recovered in stone structures on a broad scale. This comparative study will enable the discussion of similarities and differences between assemblages from stone structures. Ultimately, we seek to evaluate the functionality and role of structures within the specific strategies implemented by hunter gatherers for the occupation of highlands. For this, we consider and compare evidence from different areas from central-western Santa Cruz province in Patagonia, Argentina: Pampa del Asador (Cerro Pampa), Guitarra Plateau, Asador Plateau and Strobel Plateau (Figure 2).

1.1. Stone structures

Stone structures have been subject of archaeological and ethnoarchaeological studies around the world, mainly related to the use of ambush techniques and part of an intercept hunting strategy in hunter gatherer groups (Binford 1978; Brooks & Yellen 1987; Crowell & Hitchcock 1978; Hitchcock *et al.* 2019, among others).

In Patagonia, this type of site has been recorded in different study regions and is located mainly in highlands and plateaus. Some of the most important researches have been carried out in Meseta de Somuncurá (Blanco *et al.* 2010; Boschín & Castillo 2005; García & Pérez de Micou 1979; Gradin 1971; Miotti 2010; Miotti *et al.* 2016; Prates *et al*. 2013; Vargas Gariglio *et al.* 2019), the central Deseado Massif (Carden *et al*. 2001; Magnin 2010: 35), the extreme south of the Deseado Massif (Franco *et al.* 2021), Buenos Aires Lake Plateau (Gradin 1976; 1996), Cardiel Chico and San Adolfo plateaus (Belardi *et al.* 2013; 2016*;* 2017) as well as in Punta del Lago Viedma locality (Belardi *et al.* 2016).

In our study region stone structures were built by the accumulation of rocks forming a short wall, without using mortar. Their walls are usually oriented against the prevailing westerly winds and immediately available rocks were used in their construction. Their shape is mainly semi-circular though circular and straight constructions were also registered (Cassiodoro 2011: 147; Cassiodoro & Flores Coni 2010; Flores Coni 2014; 2018; 2019a; Flores Coni *et al.* 2021; Goñi *et al.* 2011-2012; Gradin 1959-1960, among others). The earliest chronology for these sites starts 2000 years BP. However, as from 1000 years BP a persistent use of stone structures is registered as there is evidence of the simultaneity in the use of different structures and also the re-use of structures in time (Flores Coni *et al*. 2021). The cumulative process of structures construction implies that after 500 years BP, highlands held a landscape supplied with hunting blinds (Flores Coni *et al.* 2021). This technology was a fundamental part of the strategy of provisioning places (Binford 1979; Kuhn 1992) during the Late Holocene; in this case highlands were provisioned with blinds.

As mentioned, a total of 556 have been recorded in the region under study with varied sizes and shapes and clustered in different amounts. *Parapetos* may be found isolated or in groups of two or more structures with scarce metres of distance in between. Some exceptional sites have been recorded with more than 10 structures associated in each of the areas under study (except Asador Plateau) (Cassiodoro *et al.* 2016; Dellepiane & Flores Coni 2016; Flores Coni 2014; 2019a; Goñi *et al.* 2016). As for their emplacement, it is variable and there is no clear pattern. They can be found near water, lagoons, or rivers, and also in open plains (Cassiodoro *et al.* 2016; Flores Coni 2019a; Flores Coni *et al.* 2021).

The specific characteristics of structures and the hunting strategies in which they were involved were discussed in previous works (Aragone & Cassiodoro 2006; Aragone *et al.* 2010; Cassiodoro 2011: 171; Cassiodoro & Flores Coni 2010; 2019; Dellepiane 2019: 320; Dellepiane & Cassiodoro 2019; Dellepiane & Flores Coni 2016; Flores Coni 2014; 2019, Flores Coni *et al.* 2021; Goñi *et al.* 2011-2012; 2016, among others). The analysis based on site scales revealed that some structures were clearly related to hunting *per se* while others

were related to more general activities and may have also functioned as temporal residential camps (Cassiodoro 2011: 171; Dellepiane 2019: 320; Dellepiane & Cassiodoro 2019; Flores Coni 2019a). The latter was also suggested for structures in Somuncurá Plateau, in northern Patagonia (Gradin 1971; Miotti *et al.* 2016).

1.2. Study region: Environmental and archaeological characteristics

The central-western portion of Santa Cruz province (Patagonia, Argentina) comprises highlands and plateaus, which were occupied by hunter-gatherer groups in the past related to seasonal hunting of guanaco (*Lama guanicoe*), the main prey in Southern Patagonia.

The study areas in this work are highlands located over 700 m.a.s.l. (Figure 2): Strobel Plateau, Guitarra Plateau, Asador Plateau and Pampa del Asador (Cerro Pampa). Climate is cold-arid with an average temperature between 0° and 12° C and prevailing strong winds from the west (Oliva *et al.* 2001). Annual rainfall fluctuates between 200 and 400 mm and occurs mainly in winter. These characteristics, together with altitude, determine a high seasonality, with great snowfall and low availability of resources during the cold season. Conversely, during spring and summer there is a great availability of pastures, maximum photoperiod and a higher faunistical diversity, given by the presence of guanacos, choique (*Rhea pennata*) and other minor species, especially birds. These characteristics imply great possibilities for obtaining faunistic resources in highlands (Dellepiane 2019: 322; Flores Coni *et al.* 2021; Gradin 1959-1960).

Strobel Plateau is a Miocene basaltic plateau located between 700 and 1200 m.a.s.l. (Figure 2). It is limited by the Cardiel Lake in the south, the Muerte Plateau in the west and the Chico River in the north and east. Strobel Plateau is characterised by the presence of many lagoons surrounded by basaltic walls and extended plains in between.

Archaeological evidence in this area accounts for Late Holocene occupations, starting after 3214 years BP but with a higher intensity after 1300 years BP (Re *et al.* 2017). Rock art stands out, the quantity and diversity of engravings highlight this area in the region (Belardi & Goñi 2006; Guichón 2018: 216; Re 2010: 123). Technological evidence (stone structures and lithic artefacts) and archaeofaunal record refer to specific tasks carried out related to hunting activities (Dellepiane 2019: 173; Flores Coni 2018: 531). As for stone structures, these are found all over the plateau, near lagoons but also in plains and in natural elevations.

No sources of raw materials have been recorded in this area with the exception of some scattered clasts of tuff that were probably used locally (Flores Coni 2019b).

It has been stated that during the Late Holocene the Strobel Plateau had a logistical and seasonal use, where activities were focused in hunting and transmission of information (Belardi & Goñi 2006; Flores Coni 2018: 491; Goñi *et al*. 2014: 155; Guichón 2012, 2018; Re 2010: 298; Re *et al*. 2017). Moreover, a population convergence process would have occurred during this period (Belardi & Goñi 2006; Goñi *et al*. 2007; Re 2010: 341).

Pampa del Asador (Figure 2) is a 1200 km² Plio-Pleistocene fluvial-glacial sedimentary deposit located between 900 and 1000 m.a.s.l. It is surrounded by Guitarra Plateau towards the north, Belgrano River in the south and west and it is limited by National Route 40 in the east.

The main black obsidian source is found in this area, used by hunter gatherers from all Patagonia since the Pleistocene and Early Holocene times (Stern 2018). Other lithic raw materials are also available in this area as basalts, siliceous rocks, tuffs and dacites (Cassiodoro *et al.* 2015; 2022; Espinosa & Goñi 1999).

Occupations in this area start as from 2000 years BP. An elevation of 1351 m.a.s.l., called Cerro Pampa, is a highlighted feature in the landscape. The main archaeological sites and natural obsidian deposits are located close to this hill. For this reason, in this work, the

area is hereafter referred to as Cerro Pampa (Figure 2). Stone structures and open-air sites with lithic, ceramic and archaeofaunal evidence stand out (Cassiodoro 2011: 116; Dellepiane 2019: 118; Goñi *et al.* 2011-2012). Stone structures were built close to each other. A logistical strategy was implied in the use of this area during the Late Holocene, with a seasonal occupation for the procurement of prey and also importantly the acquisition of lithic raw materials (Cassiodoro 2011).

Guitarra Plateau is a Miocene basaltic plateau (Ramos 2002) with an altitude between 1000 and 1400 m.a.s.l. (Figure 2). It is located immediately north of Pampa del Asador, and between Águila Plateau (to the west) and National Route 40 (to the east). It is limited to the north by the Asado r plateau.

First occupations in this area date to the Middle Holocene even though the plateau was fully colonized by the Late Holocene. Rock art and stone structures are important evidence of the archaeological record found in Guitarra Plateau (Cassiodoro *et al.* 2016; Cassiodoro & Flores Coni 2010; 2019; Goñi *et al.* 2010; Re & Guichón 2009). The latter appear in plains, in areas near lagoons and near Guitarra Lake. In the shore lake there is availability of some siltstone pebbles (Goñi *et al.* 2010).

A logistical and seasonal use was proposed for this area which also probably had a transit function connecting sectors considering its location in the Patagonian steppe (Goñi *et al*. 2010).

Asador Plateau (Figure 2) is another Miocene plateau from the periandean sector (Ramos 2002). It has an average altitude of 1100 m.a.s.l. and is located straight north of Guitarra Plateau and south of Salitroso-Posadas lake basins. Archaeological research has just begun in the area and initial surveys have revealed the presence of open-air sites, including stone structures as well as sites in basaltic walls related to lagoons where lithic material and scarce rock art was recorded (Cassiodoro *et al*. 2021). No chronological data has yet been obtained though indirect evidence suggests a wider temporal occupation including the Middle Holocene (Cassiodoro *et al.* 2021). Given its location and the characteristics of the archaeological record, this plateau has also been proposed as an area that connected sectors with different environmental characteristics such as the lake basins in the north and plateaus in the south (Cassiodoro *et al.* 2021).

The peopling models for the region (see Goñi 2010: 250) suggest that hunter-gatherer occupations were highly conditioned by climatic and environmental variations in a scenario characterised by progressive aridity during the Late Holocene, with epic droughts during the global scale episode known as Mediaeval Climatic Anomaly (MCA) (Stine 1994). New demographic conditions and new general mobility strategies were adopted in this environmental context (Belardi & Goñi 2006; Cassiodoro 2011: 180; Goñi 2000; 2010: 250; Goñi *et al.* 2019). Highlands were incorporated into mobility ranges as they offered complementary resources to the ones found in lower environments and were used logistically during summer and spring (Goñi 2000; 2010: 151). Thus, the full colonization of these highlands occurred during the Late Holocene, specifically in the last 2500 years, and was connected to the use of lower environments in the meso-region (Goñi 2010: 262).

2. Sample and methods

In our study region 556 stone structures have been recorded so far. The Strobel Plateau registers the highest frequency followed by Guitarra Plateau (Table 1). The Asador Plateau was only recently incorporated into research projects; therefore, less years of study as well as a smaller surveyed area is considered resulting in less stone structures; moreover, it does not include stratigraphic samples. For this reason, in this case, some comparative analyses may be unbalanced.

Table 1. Number of stone structures and lithic artefacts related to them in each of the areas of the region under study.
Tabla 1. Cantidad de parapetos y artefactos líticos asociados en cada una de las áreas de la región bajo estudio.

Area	N Stone structures	N Stone structures with lithic material	N Stone structures analysed	N artefacts
Asador Plateau	32	30	6	173
Cerro Pampa	34	33	3	3865
Guitarra Plateau	88	83	12	2896
Strobel Plateau	402	368	125	5154
Total	**556**	**514**	**146**	**12088**

Not all structures contain lithic artefacts; some do not present any materials on their surface. For this study, we have considered 146 structures with lithic artefacts (Table 1). These correspond to the total of structures and assemblages that have been studied to date.

Lithic assemblages include tools, debitage and cores recovered in inner and outer surfaces of structures, as well as materials recovered in excavations. A total of 12088 artefacts were studied (Table 1).

The outer surface of structures corresponds to the surface from the wall up to 2 metres distance in all directions parallel to the wall. Previous works in the area have shown that activities inside and outside structures were similar (Cassiodoro & Flores Coni 2019) thus allowing to present data together. Stratigraphic samples correspond to Cerro Pampa (3277 artefacts), Guitarra Plateau (1312 artefacts) and Strobel Plateau (670 artefacts). There is no stratigraphic sample for Asador Plateau.

Artefacts´ analysis was based on Aschero´s guidelines (1975; 1983). To avoid possible biases, undifferentiated tools were not included, as well as distal flakes missing the platform. Tools which were fractured but were recognizable for artefact type were considered. Variables measured are the frequency of raw materials in debitage (complete and fractured flakes and blades with platform), cores and tools. For debitage, length was also considered as a measure of size. In the case of Cerro Pampa, a sample of 30% of the obsidian debitage was analysed given the great number recovered.

To calculate the proportion of tools and cores per structure (Table 2), we divided the total of tools and cores recovered in stone structures (Table 3) by the number of analysed structures with lithic materials in each area (Table 1).

Table 2. Amount of tools and cores per structure in each area.
Tabla 2. Cantidad de instrumentos y núcleos por estructura en cada área.

	Strobel Plateau	Cerro Pampa	Guitarra Plateau	Asador Plateau
Tools and cores per structure	5.2	222	28.16	7.83

Table 3. Lithic artefacts in stone structures from each of the areas under study.
Tabla 3. Artefactos líticos en las estructuras de piedra de cada área bajo estudio.

	Strobel Plateau		Cerro Pampa		Guitarra Plateau		Asador Plateau	
	N	%	N	%	N	%	N	%
Debitage	4503	87.36	3199	82.7	2558	88.32	126	72.83
Tools	618	11.99	502	12.98	284	9.9	44	25.43
Cores	33	0.64	164	4.24	54	1.86	3	1.73
Total	**5154**	**100**	**3865**	**100**	**2896**	**100**	**173**	**100**

3. Results

Structures with lithic material in all the areas under study contain larger amounts of debitage than tools (Table 3). Asador plateau, shows a higher proportion of tools compared to the other areas. Cerro Pampa exhibits a higher proportion of cores, which is related to the availability of raw materials in the area, whereas Strobel Plateau presents a very low proportion of cores.

Additionally, it should be considered that raw material nodules have been recorded in structures from Cerro Pampa and Guitarra Plateau. In Cerro Pampa 20 pebbles were recovered: 13 of obsidian, 2 of rhyolite, 2 of sandstone, 1 of tuff, 1 siliceous, and 1 of fossilized wood; all probably exotic with the exception of obsidian. In Guitarra Plateau, 4 siltstone pebbles and 3 siliceous ones were recovered as well as one of rhyolite and one of sandstone. Siltstone and siliceous stones are available in the homonymous lake, close to where the structures are located. These were interpreted as raw material caches (Cassiodoro 2011: 117; Cassiodoro & Flores Coni 2010).

In order to compare the number of lithics discarded in structures from each area, an average of instruments and cores per structure was calculated (Table 2). There are great differences between areas in the number of artefacts per structure. Cerro Pampa stands out given the frequency of artefacts which is clearly related to the availability of lithic raw materials. Pebbles and cores are processed, and mainly expedient artefacts are manufactured.

Something similar could be noted for Guitarra Plateau, though numbers are quite smaller. This highland is located immediately north of Cerro Pampa and therefore, activities related to raw material processing could also be implied in this area.

As for Strobel and Asador Plateau, these show the smallest numbers; compared to Cerro Pampa, these areas hold a considerably higher number of structures but much less artefacts were discarded.

3.1. Debitage

As for debitage, internal flakes are the most frequent type in structures from all areas (Table 4). In Cerro Pampa and Asador percentages of external flakes are considerably higher implying that initial stages of the reduction sequence occurred more frequently in these areas. In the Strobel Plateau, rejuvenation flakes are more frequent than in any other area.

As for raw materials obsidian is the main raw material in Strobel, Cerro Pampa and Guitarra, while basalt is the most frequent in Asador (Table 5).

As regards debitage size and considering only non-fractured items (Table 6), Strobel and Guitarra plateaus exhibit high percentages of very small flakes (less than 2 cm in length) while Cerro Pampa shows a higher frequency of bigger ones and variability of sizes; all the range of sizes is represented in this area. This could be related to the processing of raw materials.

Asador shows a completely different pattern. The most frequent size is that of 4,1 to 6 cm in length, while the smallest ones are very scarce. Even though this could be connected to the raw material itself (being larger than others), we believe this could be due to the lack of excavations in this area. It should be borne in mind that very small flakes are generally recovered in sieves.

Table 4. Types of debitage in the stone structures from each of the areas under study.
Tabla 4. Tipos de desechos de talla en las estructuras de piedra de cada área bajo estudio.

	Strobel Plateau		Cerro Pampa		Guitarra Plateau		Asador Plateau	
	N	%	N	%	N	%	N	%
Internal flakes	3622	80.44	2081	65.05	1991	77.83	85	67.46
External flakes	201	4.46	769	24.04	306	11.96	26	20.63
Core rejuvenation flakes	22	0.48	70	2.19	64	2.5	8	6.35
Rejuvenation flakes	395	8.77	114	3.56	44	1.72	1	0.79
Undifferentiated flakes	252	5.59	106	3.31	72	2.81	3	2.38
Blades	11	0.24	59	1.84	81	3.17	3	2.38
Total data	**4503**	**100**	**3199**	**100**	**2558**	**100**	**126**	**100**

Table 5: Raw materials from debitage in stone structures in the areas under study.
Tabla 5. Materias primas de los desechos de talla de las estructuras de piedra de cada área bajo estudio.

	Strobel Plateau		Cerro Pampa		Guitarra Plateau		Asador Plateau	
	N	%	N	%	N	%	N	%
Basalt	236	5.24	931	29.1	368	14.39	66	52.38
Dacite	62	1.37	3	0.09	5	0.20	-	-
Undetermined	85	1.88	-	-	-	-	-	-
Siltstone	65	1.44	3	0.09	44	1.72	-	-
Obsidian	3116	69.19	1838	57.46	1597	62.43	59	46.83
Intermediate to acid composition Tuff	55	1.22	-	-	1	0.04	1	0.79
Rhyolite	44	0.97	14	0.43	34	1.33	-	-
Siliceous rocks	786	17.45	376	11.75	464	18.14	-	-
Tuffs	54	1.19	6	0.18	15	0.59	-	-
Sandstone	-	-	-	-	9	0.35	-	-
Lutite	-	-	-	-	3	0.12	-	-
Volcanic	-	-	2	0.06	2	0.08	-	-
Other	-	-	2	0.06	7	0.27	-	-
Andesite	-	-	6	0.18	8	0.31	-	-
Granite	-	-	-	-	1	0.04	-	-
Quartzite	-	-	18	0.56	-	-	-	-
Total	**4503**	**100**	**3199**	**100**	**2558**	**100**	**126**	**100**

Table 6. Debitage length (in cm) from stone structures in each of the areas under study.
Tabla 6. Longitud de los desechos de talla (en cm) de las estructuras de piedra de cada área.

Length (cm)	Strobel Plateau		Cerro Pampa		Guitarra Plateau		Asador Plateau	
	N	%	N	%	N	%	N	%
Less than 2	941	60.28	745	36.9	1076	60.55	5	2,27
2-4	540	34.59	947	47.02	471	26.51	66	30
4.1-6	61	3.90	216	10.72	164	9.23	99	45
6.1- 8	18	1.15	72	3.57	50	2.81	40	18.18
8.1-12	-	-	21	1.04	16	0.90	10	4.55
More than 12	-	-	13	0.64	-	-	-	-
Total	**1560**	**100**	**2014**	**100**	**1777**	**100**	**220**	**100**

3.2. Tools

The most frequent tool in structures from each area differs (Table 7). In the Strobel Plateau projectile points stand out; they are mainly fractured, and stems are the most represented fragment (Figure 3). Some structures in this area present more than 20 stems in their internal surfaces (Flores Coni 2018: 231). In Asador and Guitarra plateaus, utilised flakes are the most frequent tool together with endscrapers. In Cerro Pampa retouched flakes show the biggest proportion.

Table 7. Tool types in the stone structures from each of the areas under study.
Tabla 7. Tipos de instrumentos en las estructuras de piedra de cada área bajo estudio.

	Strobel Plateau		Cerro Pampa		Guitarra Plateau		Asador Plateau	
	N	%	N	%	N	%	N	%
Retouched Flake	67	10.84	184	36.65	52	18.31	9	20.45
Utilised Flake	41	6.63	89	17.73	60	21.13	11	25
Bola	2	0.32	-	-	1	0.35	-	-
Knife	20	3.23	13	2.59	13	4.58	1	2.27
Sidescraper	57	9.22	27	5.38	49	17.25	10	22.73
Endscraper	141	22.81	94	18.73	60	21.13	11	25
Scraper Plane	-	-	2	0.40	1	0.35	-	-
Grinding artefact	-	-	6	1.2	4	1.41	-	-
Drill	2	0.32	-	-	-	-	-	-
Bifacial Preform	9	1.45	2	0.40	7	2.46	-	-
Projectile Point	197	31.87	30	5.98	8	2.82	2	4.55
Bifacial Artefact	78	12.1	34	6.77	8	2.81	-	-
Stone Hammer	4	0.64	16	3.19	13	4.58	-	-
Axe	-	-	1	0.20	-	-	-	-
Used Stone	-	-	1	0.20	6	2.11	-	-
Anvil	-	-	3	0.60	-	-	-	-
Stone Hammer & Grinding Artefact	-	-	-	-	1	0.35	-	-
Anvil & Grinding Artefact	-	-	-	-	1	0.35	-	-
Total	**618**	**100**	**502**	**100**	**284**	**100**	**44**	**100**

This could imply that the main activities carried out in structures from different areas were diverse: Strobel Plateau more related to weapon replacement while in the other plateaus processing of materials was a frequent activity. Finally, Cerro Pampa exhibits evidence of expedient artefacts being used, probably related to the availability of raw materials and the processing of other materials.

Variability of tools is also different in each area: structures from Cerro Pampa and Guitarra plateau exhibit greater numbers of types of tools with 14 and 15 classes each, while Strobel plateau shows 11 and Asador only 6. The case of Strobel Plateau stands out considering it contains the biggest sample, but the number of tool types is the lowest.

Finally, exceptional evidence is the presence of grinding artefacts in some areas. These have been recorded in *parapetos* from Cerro Pampa and Guitarra plateau and are absent in structures from Strobel and Asador plateaus.

This evidence suggests a wider array of activities carried out in structures from Cerro Pampa and Guitarra Plateau.

Figure 3. Projectile points stems in stone structures from the Strobel Plateau.
Figura 3. Pedúnculos de puntas de proyectil en estructuras de piedra de la meseta del Strobel.

As for the raw materials in which tools were manufactured (Table 8), all areas show a wide proportion of obsidian, being this the main rock used in lithic artefacts. However, even though the Asador Plateau shows a high proportion of obsidian, the main raw material recorded in structures from this area is basalt.

Table 8. Raw materials from tools in stone structures from each of the areas under study.
Tabla 8. Materias primas de instrumentos en estructuras de piedra de cada área bajo estudio.

	Strobel Plateau		Cerro Pampa		Guitarra Plateau		Asador Plateau	
	N	%	N	%	N	%	N	%
Obsidian	401	64.88	334	66.53	163	57.39	17	38.64
Siliceous rocks	117	18.93	60	11.95	40	14.08	6	13.64
Basalt	25	4.04	60	11.95	45	15.85	19	43.18
Tuffs	26	4.2	4	0.8	1	0.35	-	-
Siltstone	15	2.42	4	0.8	5	1.76	-	-
Dacite	11	1.77	4	0.8	1	0.35	-	-
Intermediate to acid composition tuff	10	1.61	-	-	-	-	1	2.27
Rhyolite	9	1.45	7	1.39	1	0.35	1	2.27
Undetermined	4	0.64	6	1.2	9	3.17	-	-
Sandstone	-	-	1	0.2	5	1.76	-	-
Quartzite	-	-	10	1.99	-	-	-	-
Volcanic	-	-	10	1.99	2	0.7	-	-
Other	-	-	2	0.4	12	4.22	-	-
Total	**618**	**100**	**502**	**100**	**284**	**100**	**44**	**100**

Other raw materials that stand out are basalt and siliceous rocks; these are evenly used in Cerro Pampa and similarly in Guitarra (though there is a slight higher proportion of basalt in the latter), while in Strobel siliceous rocks are the second most used rock far higher than basalt.

As for variability, Cerro Pampa and Guitarra Plateau present a wider range of rocks used for tools, including sandstone, volcanic and others. This stands out if we consider that even though Strobel´s sample is bigger, there is less variability.

When considering the mostly represented tool types, the selection of obsidian predominates in all areas except for Asador (Figure 4).

Endscrapers were mainly made in obsidian; in all areas more than 60% of this tool type were made in this rock with the exception of Strobel with a slight lower proportion (56%); 30% of them were made in siliceous rocks in Cerro Pampa and Guitarra and more than 35% in Strobel and Asador. In some areas as Cerro Pampa and Strobel plateau a minor percentage of them were manufactured in basalt and other raw materials as rhyolite, siltstone, dacite and tuffs (Figure 4a).

As for retouched flakes, more than 70% of these were made in obsidian in Cerro Pampa and Guitarra. Strobel also evidenced selection though with a smaller proportion of 53%; a bigger proportion of siliceous rocks were used for this tool type as well as others like tuff. On the contrary, in Asador, these artefacts were mainly manufactured in basalt (55%), though the rest are of obsidian (Figure 4b).

Once again obsidian was the main raw material used for the manufacture of projectile points in all areas. An interesting difference is noted in that more than 90% of projectile points were made of obsidian in Guitarra, Strobel and Asador plateaus, while in Cerro Pampa, where the source of this raw material is found, only 67% of projectile points were manufactured in this rock; the rest were made in siliceous rocks mainly (Figure 4c).

The same raw material was selected for a variety of tools regardless of distance and regardless of the availability of other local raw materials in the areas under study. Obsidian from Pampa del Asador was the main rock used for manufacturing specific tools.

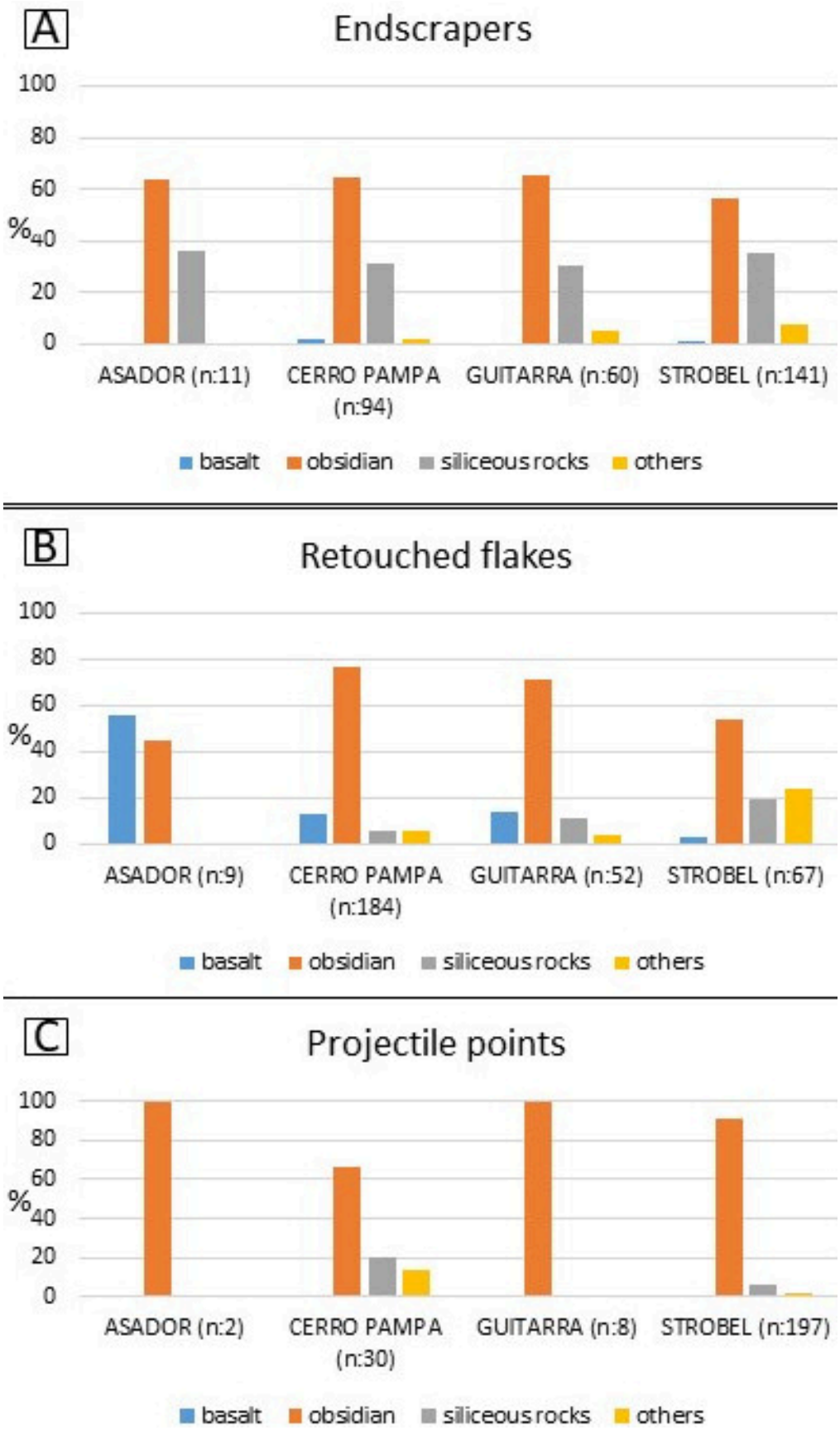

Figure 4. Raw materials for the most frequent tools registered in stone structures.
Figura 4. Materias primas de los artefactos formatizados más frecuentes registrados en *parapetos*.

3.3. Cores

Mainly Cerro Pampa, but also Guitarra Plateau, show a high number of cores in stone structures. Many of them are in stratigraphy, specifically in the lower levels (Cassiodoro 2011: 117; Cassiodoro & Flores Coni 2010). These may be interpreted as site furniture (Binford 1979) where good quality raw material is available stored in stone structures.

Cores in structures from Strobel, Cerro Pampa and Guitarra are mainly of obsidian (Table 9). Their proportion is considerably higher in Cerro Pampa and Guitarra which is closely related to their location in proximity to this rock source. There is a wide variety of core types in these two areas with variability in the reduction of cores, although a low degree of reduction was recorded in the latter (Cassiodoro *et al.* 2020). Conversely, in Strobel Plateau, obsidian cores have almost no cortex and were discarded when exhausted.

Table 9. Raw materials from cores in stone structures in areas under study.
Tabla 9. Materias primas de núcleos en estructuras de piedra de las áreas bajo estudio.

	Strobel Plateau		Cerro Pampa		Guitarra Plateau		Asador Plateau	
	N	%	N	%	N	%	N	%
Obsidian	16	48.48	122	74.4	29	53.7	1	33.3
Basalt	-	-	21	12.8	5	9.25	1	33.3
Siliceous rocks	12	36.36	10	6.1	14	25.9	1	33.3
Dacite	1	3.03	-	-	1	1.85	-	-
Siltstone	-	-	-	-	3	5.5	-	-
Intermediate to acid composition tuff	-	-	-	-	-	-	-	-
Rhyolite	-	-	1	0.6	-	-	-	-
Tuffs	4	12.12	2	1.2	2	3.7	-	-
Andesite	-	-	1	0.6	-	-	-	-
Quartzite	-	-	7	4.2	-	-	-	-
Total	**33**	**100**	**164**	**100**	**54**	**100**	**3**	**100**

As for variability, Cerro Pampa and Guitarra stand out given the amount of raw material types present. Asador exhibits a very low frequency of cores.

4. Discussion

Stone structures called *parapetos* in the central-western region of Santa Cruz province (Patagonia) are one of the most characteristic technologies of highlands. Their use by hunter-gatherers in the past was related to the seasonal and logistical occupation of these environments during the Late Holocene. This work explores variability in lithic artefacts discarded in them which allows to further explore the functionality these structures had and the differential occupation of each area during the Late Holocene.

In a broad spatial scale, lithic assemblages from stone structures in highlands give evidence of the same type of basic activities carried out in them: lithic reduction tasks, rejuvenation of tools and handling resources. Moreover, similar trends in the use of lithic raw materials were observed. These are the same in all highlands, mainly obsidian, basalt and siliceous rocks. Obsidian, available in Pampa del Asador, is the main raw material used in all areas regardless of distances or type of artefact. Considering the seasonal use of these spaces, there is a clear selection of an optimal rock for procurement tasks and handling of resources in a short term.

However, *parapetos* exhibit variability in the type and characteristics of artefacts in each assemblage which suggests differences in specific activities held in the structures from each area.

In the Strobel plateau, structures show a strong pattern of low artefactual diversity and a considerable representation of one tool type: projectile points. In this regard, the frequency of this tool stands out and clearly shows the relevance of hunting activities developed in them which is also reinforced by the presence of bolas. Additionally, there is evidence of processing activities carried out given the presence of tools as endscrapers, sidescrapers and retouched flakes, all of these probably related to carcass processing. Furthermore, rejuvenation tasks were carried out in structures, clearly evidenced by the type of debitage found in them. Comparatively, the number of tools and cores is strikingly low with very few lithics per structure, indicating low discard of them. This can be related to low permanence and scarce re-utilization.

All together, these results reveal the extreme functional specificity of these sites in Strobel, related to hunting stands. The use of structures was limited not only in activities, but probably in time; thus, a large number of structures was built but these were used restrictedly. This specificity could be related to a spatial segregation of activities in Strobel Plateau where basaltic walls in lagoons were sectors for developing other complementary activities to the ones carried out in stone structures.

Conversely, in structures from Cerro Pampa a great number of artefacts was discarded which evidences an intense utilisation and re-use of structures although closeness to obsidian and other raw materials sources (like siliceous rocks and basalt) clearly influenced the activities carried out in structures from this area. Many artefacts are related to the availability and handling of lithic resources, directly accessible in Pampa del Asador: hammer stones, cores, presence of bigger debitage with cortex. The latter are related to the first stages of lithic reduction.

Moreover, more types of tools were recorded. Thus, a variability of activities was carried out in structures from Cerro Pampa. The presence of grinding artefacts evidence additional and particular types of activities executed. These tool types may be used for a diversity of resources, thus adding variability to the possible tasks undertaken. Evidence of ceramics has also been found in these structures (Cassiodoro 2011:144) which implies even more types of activities executed. Additionally, some artefacts such as anvils or unused nodules refer to site furniture (Binford 1979) and the reuse of some structures. Chronological evidence supports the latter as many structures exhibit different occupations with gaps of 800 years in some cases and more than 1000 years in others (Cassiodoro 2011: 12; Dellepiane & Cassiodoro 2019; Flores Coni *et al*. 2021; Goñi *et al.* 2011-2012).

The absence of shelter in this area may account for a more varied use of these structures as their walls offered protection from prevailing winds. Thus, Cerro Pampa evidences less segregation of activity areas. Therefore, stone structures concentrated a wide array of activities; they were the spaces built for the development of the necessary activities to be done while visiting the area.

In Guitarra Plateau, the evidence of lithic reduction stages reveals similarities to Strobel Plateau, where mostly last stages of tool production and rejuvenation occurred inside structures. However, similarly to Cerro Pampa, there is an ample variety of tools, and there are grinding artefacts as well as anvils and nodules. Therefore, the activities carried out in structures from Guitarra would not have been as specific and limited as in Strobel Plateau.

In sum, Guitarra Plateau exhibits an intermediate position between the more specific characteristics mentioned for Strobel and the wider variety recorded in Cerro Pampa. The number of artefacts discarded is considerably lower than Cerro Pampa though substantially higher than Strobel and Asador plateaus. This may be because Guitarra Plateau is close to

Pampa del Asador, a regional lithic raw material source. Therefore, some of the activities developed in structures from this area may be related to handling nodules. Moreover, its location within the Patagonian steppe and the fact that Guitarra Plateau might have functioned as a transit area connecting low lake basins; the latter could also imply differences in the use of structures thus, not only related to hunting stands.

As previously mentioned, investigations at Asador Plateau have just begun. Therefore, no conclusive trends may be obtained for the moment. However, some patterns appear to be different to Cerro Pampa and Guitarra, located immediately to the south. Fewer tasks were performed, and basalt was the main raw material used.

Altogether, the characteristics of lithic assemblages suggest that the specific use of structures in each area was distinctive and closely related to the resources each highland offered and the spatial configuration of each environment as regards shelter and availability of other resources. The construction of stone structures did not imply a singular and exclusive type of use. This technology was the same (built stone structures) but was flexible in the region: they comprised sites related to very specific tasks but also others where more varied activities were carried out. Therefore, stone structures implied the construction of a specific workspace that allowed the development of a set of alternatives according to the logistical strategy used in the occupation of each area. Ultimately, strategies varied in the occupation of highlands.

5. Concluding remarks

The construction of stone structures was part of the strategy for the occupation of highlands during the Late Holocene in central-western Santa Cruz, Patagonia. These areas would have been accessible and incorporated within hunter-gatherers´ landscape dynamics during this period, related to the increase in aridity, the need of resources available in plateaus and the possibility of new circulation patterns due to the accessibility of new areas. The stone structure technology enabled the development of different tasks and activities related to the available resources in each highland and the specific configuration each area had as regards shelter, water and other characteristics. Differences in lithic assemblages in stone structures from each area were identified and allowed to deepen the understanding of the strategies hunter-gatherers implemented in occupying highlands from Southern Patagonia.

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Data accessibility statement

All data is available in the text.

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Tecnología de parapetos: Un estudio de los conjuntos líticos en estructuras de piedra del Holoceno tardío en Patagonia (Argentina)

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Resumen:

Las estructuras de piedra denominadas parapetos son un rasgo prominente del registro arqueológico del centro-oeste de Santa Cruz, Patagonia (Argentina). Se trata de construcciones antrópicas formadas por la acumulación de rocas inmediatamente disponibles sin argamasa formando una pequeña pared que ofrece reparo contra los vientos predominantes. Más de 500 de estas estructuras han sido registradas hasta el momento en el campo en la región bajo estudio. Si bien la técnica constructiva es la misma, se observan en variados tamaños y formas y pueden hallarse tanto aisladas como agrupadas en diferentes cantidades. Se localizan casi de manera exclusiva en mesetas basálticas y sectores altos de la región, por arriba de los 700 msnm. Estas estructuras de los cazadores-recolectores se asocian principalmente a actividades cinegéticas, aunque algunos sitios evidencian funciones más generalizadas. Las dataciones radiocarbónicas indican que se trata de una tecnología propia del Holoceno tardío con fechados posteriores a los 2000 años AP y su uso se vincula principalmente a la ocupación logística y/o estacional de los sectores altos por parte de los grupos humanos que habitaban la región en el pasado.

Este trabajo discute las características de los materiales líticos recuperados en estos sitios cuya distribución temporal y espacial es tan particular en Patagonia. Evaluamos la existencia de variabilidad en los artefactos líticos hallados en asociación a estructuras de piedra presentes en diferentes áreas ubicadas en la región bajo estudio: Pampa del Asador (Cerro Pampa) y las mesetas del Guitarra, Asador y Strobel. Diversos tipos de sitios de parapetos fueron incluidos para lo cual se tomaron en cuenta tanto estructuras aisladas, como agrupadas, así como localizadas en diferentes contextos topográficos y ecológicos. Los materiales líticos analizados fueron recuperados tanto de las superficies interiores como exteriores de las estructuras y se incluyen, además, materiales provenientes de estratigrafía. La muestra se compone de instrumentos, desechos de talla y núcleos en variadas materias primas, lo que suma más de 10000 artefactos analizados.

Los resultados obtenidos permiten destacar que hay similitudes en las características de los artefactos descartados en los parapetos de diferentes áreas. Un aspecto a resaltar se vincula al uso de las materias primas, donde la obsidiana negra, proveniente de Pampa del Asador, es el recurso lítico más destacado en casi todas las áreas. Sin embargo, se observa variabilidad en la estructura artefactual de algunos parapetos, especialmente de aquellos ubicados en el sector norte de la región bajo estudio. Esto podría dar cuenta de un mayor rango de actividades llevado a cabo en las estructuras localizadas en dicho sector. Tomando esto en consideración, se evalúan y discuten las diferencias en las estrategias de ocupación de las mesetas y sectores altos durante el Holoceno tardío.

La evidencia presentada en este trabajo sintetiza más de 20 años de investigaciones en la región donde sistemáticamente se han relevado y estudiado dichas estructuras de piedra, así como la

evidencia asociada a éstas. En este sentido, los resultados y discusión proveen información excepcional basada en un análisis detallado de una muestra significativa de artefactos líticos hallados en parapetos, sitios característicos de la región bajo estudio.

Palabras clave: estructuras de piedra; artefactos líticos; Patagonia; mesetas y sectores altos; Holoceno tardío