



KEYWORDS: *Late Holocene – Mobility – Social networks – Petroglyph*

ROCK ART RELATEDNESS AND CIRCULATION PATHS IN NORTHEAST PATAGONIA, ARGENTINA

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Abstract. This work presents original information from the recording of petroglyphs in Paredón de los Grabados, located in the middle course of the Salado stream, Río Negro Province, Argentina. The Salado basin connects the foothills of the Somuncura Plateau with the west coast of the San Matías Gulf. Due to its intermediate geographic location, the site becomes a relevant point for the study of mobility and social interaction between the Atlantic coast and the Patagonian interior. Different lines of evidence suggest the recurrent use of the place during the late Holocene, including historical times. Comparative analysis indicates that these petroglyphs share more similarities with interior rock art than with coastal rock art. Social and chronological implications of such patterns of connectivity are discussed.

Introduction

In this paper, we approach the issue of the human circulation paths and interaction networks among hunter-gatherer societies from northeast Patagonia through a comparative study of rock art. This goal is part of a major archaeological project that explores the mobility and settlement systems of the hunter-fisher-gatherer populations who inhabited the region since the Middle Holocene to post-contact times (Borella *et al.* 2019a). Our starting point is the study of a new site with petroglyphs, located in a subsidiary creek of the Salado stream in its middle course, and named Paredón de los Grabados (hereafter PG). This locus is 48 km west of the Atlantic Ocean and 30 km north of Sierra Grande city, in Río Negro province (Fig. 1). The Salado stream connects the foothills of the Somuncura Plateau with the Atlantic coast in a semiarid landscape where water is a critical resource. Due to its relatively central position in respect to other sites with rock art from the region, PG becomes a crucial point for evaluating mobility vectors and social interaction networks between the Patagonian coast and its interior (Fig. 1). Therefore, the objective is to characterise its petroglyphs in order to compare them to the rock art information from other sites of southeast Río Negro.

Our study of rock art is based on the concept of style, which we understand as part of the variability of material culture that participates in nonverbal communication processes. In this fashion, style encodes and expresses information about diverse social aspects, such as identity, status, wealth, ownership, religious belief and political affiliation (Wobst 1977; Wiessner 1983; Whallon 2011; see Hegmon 1992 and

Domingo Sanz and Fiore 2014 for syntheses). From the information-exchange perspective, several authors emphasised the active role of style as a visual system that reinforces social interaction networks in poor environments with unpredictable distributions of resources (Gamble 1982; Jochim 1983; Osborn and Hitchcock 2019). In such contexts, social bonds — i.e. kinship, inter-group cooperation, alliances — are favoured strategies because they create safety nets under situations of resource scarcity (Whallon 2011). Although the environment is a relevant cause, socio-demographic factors also influence the fluidity and flexibility of social networks. David and Lourandos (1998: 197–198) stated that populations of low density and reduced patterns of aggregation, like those from the arid Australian regions, exhibited relatively more open social systems, while populations of higher density and increased levels of aggregation, as in the more fertile or ecologically diverse regions of Australia, tended to display more closed and territorially bounded social formations. Open networks are characterised by broad and homogeneous distributions of cultural traits, while more closed networks are congruent with the development of regional styles. According to these authors, the regionalisation process in Australia occurred during the late Holocene as a conjunction of environmental, socio-demographic and socio-political issues. In north-central Chile, Troncoso *et al.* (2016) highlighted historical dynamics and social organisation as significant elements that need to be considered in addition to the environment for understanding the structuration of social networks.

The maintenance of regional networks requires

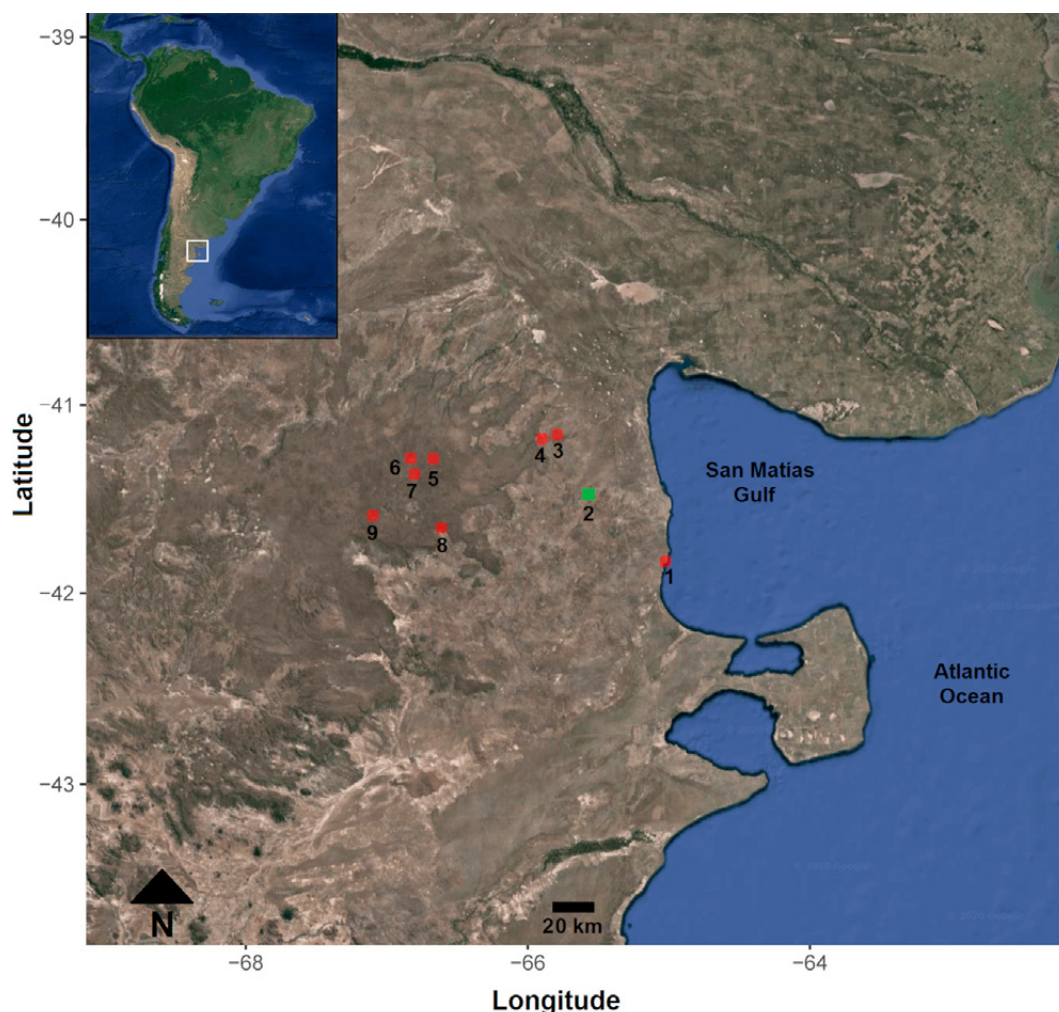


Figure 1. Location of the studied sites in southeast Río Negro: 1. Punta Odriozola (PO); 2. Paredón de los Grabados (PG, analysed here); 3. Cueva Galpón (CG); 4. Rinconada Catriel (RC); 5. Piedra Pintada de Corral Curá; 6. Laguna Azul (LA); 7. El Ganso (EG); 8. Los Manantiales (LM); 9. Bardas de Antonio (BA).

mobility; social bonds are reaffirmed in the context of these movements, through which material culture circulates using gift-giving or exchange, ceremony and ritual (Wiessner 1982; Conkey 1984; Whallon 2006: 261). Hunter-gatherer regional networks have been explored in the Patagonian region through the stylistic analysis of different kinds of material culture. The expression of identity has been evaluated from the spatial and temporal distribution of style in rock art (Albornoz and Cúneo 2000; Belardi 2004; Crivelli 2006; Boschín 2009), decorated stone plaquettes and axes (Belardi 2004), beads (Fiore 2012; Leonardt 2016a), decorated bone harpoons (Fiore 2012), lithic projectile points (Prates 2008) and cranial vault modification (Serna et al. 2018). Other processes approached through this theoretical framework for the study of rock art are colonisation (Fiore 2006), regionalisation (Re et al. 2009), social fission and fusion (Belardi and Goñi 2006), territoriality (Carden 2008; Romero and Re 2014; Barberena et al. 2016), human circulation (Bellelli et al. 2008; Podestá et al. 2008) and social interaction (Belardi 2004; Scheinson 2011; Carden and Borella 2015; Vargas et al. 2019). Visual communication systems have also

been explored through the study of the circulation of different items of material culture, such as lithic materials (Flegenheimer et al. 2013), decorated Rheidae eggshell fragments (Fiore and Borella 2010; Carden and Martínez 2014), decorated stone plaquettes and axes (Acevedo 2015; Lynch et al. 2018) and painted bones (Romero and Barberena 2017). Based on this regional background, if PG constitutes a crucial locale in the pathway between the coast and the interior in the semi-desert environment of northeast Patagonia, human transit or interaction networks between these areas should be evidenced by stylistic similarities in rock art.

Archaeological background: evidence of mobility and interaction networks in northeast Patagonia

The coast of Río Negro province was inhabited since at least 6000 years BP. Archaeological investigations carried out in the San Matías Gulf (hereafter SMG) revealed fishing activities in coastal scenarios very different from the current ones. The density and diversity of the archaeological materials recovered in marine inlets (bays and coves) evidence their intensive occupation. Geoarchaeological studies indicated that,

from the middle Holocene, a series of changes in the coastal morphology caused the adjustment of the coast and the disappearance of the inlets, modifying the fishing practices and the collection of molluscs (Favier Dubois and Kokot 2011; Favier Dubois and Scartascini 2012). From the late Holocene, there was gradual incorporation of other resources available in the environment for subsistence, both marine and terrestrial (Borella et al. 2011; Borella and L'Heureux 2014; Borella et al. 2015a, 2015b; Marani 2018; Scartascini 2017). Changes detected from human palaeodiets (Favier Dubois et al. 2009a) were also documented through lithic technology, which revealed different hunting techniques developed during the late Holocene (Cardillo and Alberti 2015; Alberti and Cardillo 2018). The diversification of diet recorded for this period was possibly a response to a resource instability that affected the traditional modes of subsistence. It may be interpreted as an intensification strategy since it enhanced the carrying capacity of the environment with the aid of new technologies (i.e. pottery and small projectile points related to the bow and arrow) and more intensive use of grinding implements. This situation was possibly triggered by a demographic increase at c. 1000 years BP that led to the saturation of the coastal springs, which were the most favourable spots for human settlement (Favier Dubois et al. 2009a). Evidence of mobility or social networks in the SMG is constituted by different kinds of materials, such as lithics, rock art, portable art and personal ornaments. Although there are primary and secondary sources of good quality rocks that were widely exploited for making tools in the area, obsidian artefacts were also found (Alberti 2016). Since this raw material is not naturally available in coastal Patagonia, it must have been transported from inland sources (Stern 2018). From the geochemical analyses of the obsidian, at least five interior sources were identified in Chubut and Neuquén provinces, at distances between 200 and 560 km from the Atlantic coast (Cardillo and Scartascini 2007; Favier Dubois et al. 2009b; Alberti et al. 2016).

Furthermore, the analysis of the designs engraved in fragments of Rheidae eggshells from the north coast of the SMG revealed motifs that are also present on other supports (e.g. stone axes and plaquettes, pottery, rock art) in distant areas from continental Patagonia. These similarities suggested the existence of an extensive system of communication beyond the objects on which the images were produced (Fiore and Borella 2010). Other potential markers of human circulation in the SMG are engraved valve spoons and shell beads (Deodat 1967; Cardillo and Borella 2017). Long-distance communication systems were also proposed through the formal analysis of petroglyphs in Punta Odriozola site (hereafter PO), located on the west coast of the SMG (Fig. 1). These motifs are spatially associated with other archaeological remains and several traces of shell middens dated in c. 3000 years

BP (Borella et al. 2015; Cardillo et al. 2017; Scartascini and Borella 2017). The comparative analysis of rock art revealed significant similarities with labyrinthine motifs from interior Santa Cruz province, at distances between 700 and 900 km south from PO (Carden and Borella 2015).

In the Paileman Range, located in the north-eastern foothills of the Somuncura Plateau, two sites with rock art were registered (Fig. 1). Cueva Galpón (hereafter CG) is a large cave with red, black and white paintings, where two graves were recovered and dated to c. 3000 years BP (Carden and Prates 2015; Prates et al. 2016). One of the burials was deposited over a grass bed with several funeral offerings, such as plant ropes, a colihue (*Chusquea culeou*) reed foreshaft and a small pouch of viscacha (*Lagidium viscacia*) hide with human hair in its interior (Prates et al. 2016). The material culture associated to the other burial consists of shell and bone beads, a fragment of a native copper plate, textile remains, a lithic 'bola' and a 920 g lump of red pigment. The presence of superimpositions indicated different events of rock art production; Carden and Prates (2015) proposed that the cave was repeatedly used for ritual purposes unrelated to the domestic sphere. This is an unusual case since the regional evidence from north Patagonia shows that caves with rock art and human burials also have evidence of domestic activities. The absence of archaeological materials such as stone tools, pottery sherds, hearths and archaeofauna in CG may be related to the lack of freshwater sources near the cave (Prates and Mange 2016). Although the study of inter-regional interaction is still in process, several elements suggest long-distance exchange networks, such as the colihue reed, which grows in the humid forests of the cordilleran region, and the shell beads from the Atlantic coast (Prates et al. 2011). Rinconada Catriel (RC) is a large rockshelter with painted motifs, where Gradin identified a sequence of three stylistic modalities (Gradin 2003). Red dots and dragged lines made with fingertips and hand prints constitute the first one, while the second is composed of red rectilinear motifs (zigzags, crenellated lines, staggered lines, parallel and perpendicularly arranged lines) related to Menghin's style of 'Grecas'. The third one is the best preserved; it includes rectilinear black and red motifs, such as a complex labyrinth, crosses, 'Z' and zigzags combined with dots. According to the author, the three modalities were temporally framed in the last 1000 years; the third one corresponded to the latest moments of the pre-Hispanic occupation. Although it is not associated with permanent water sources, RC is close to several natural wells that accumulate rain from the slopes of the Paileman Range (Prates and Mange 2016).

The first archaeological information from the north-eastern portion of the Somuncura Plateau corresponds to Gradin's (1971) survey of a series of lagoons — Laguna Azul, El Ganso and La Maciega — in which he registered stone habitation structures whose material culture was later studied by García and Pérez de Micou

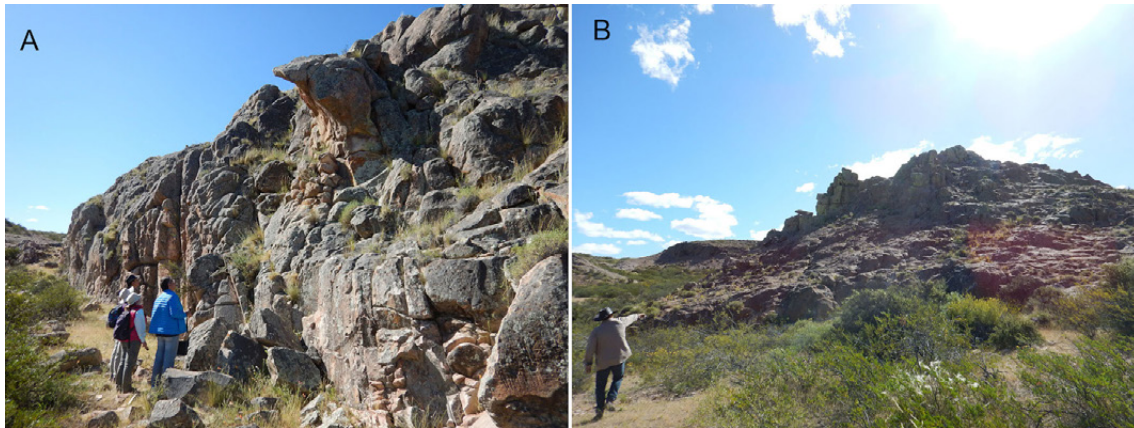


Figure 2. A. Close view of PG. B. general view of the outcrop.

(1980). Although Gradin (2003) found red paintings in La Pintada de Corral Curá, approximately 10 km east of Laguna Azul, he did not mention other rock art evidence from the area. Almost four decades later, these sites were revisited, and new rock art information was obtained after the recording of red paintings in Laguna Azul (LA) and petroglyphs in El Ganso (EG) (Fig. 1). Also, a new site with petroglyphs and red paintings, named Bardas de Antonio (BA), was located 30 km south of these basins (Blanco et al. 2013; Miotti et al. 2014; Blanco 2015; Fig. 1). Another site with rock art from the Somuncura Plateau is Los Manantiales (LM) (Fig. 1). It is composed of red and yellow paintings, as well as petroglyphs, some of which are overpainted in red (Albornoz 2003). Given its high altitude (above 1000 m a.s.l), the Somuncura Plateau is available during the spring and summer, which are the birth and breeding seasons of guanacos. In this harsh environment, the deep basins offer shelter and water and concentrate high biodiversity. Miotti et al. (2016) defined them as nodes within the high seasonal mobility and circulation networks of the hunter-gatherer populations. Prates and Mange (2016) proposed that these places could have been controlled from the foothills of the plateau for the exploitation of guanacos.

LA was dated to c. 1900 and c. 1700 years BP; the material evidence from the semicircular stone structures — pottery fragments, lithic artefacts and archaeofaunal remains — supported the hypothesis of multiple activities, from which they were interpreted as domestic spaces (Miotti et al. 2016; Lynch and Terranova 2019; Vargas Gariglio et al. 2019). On the other hand, the circular structures were related to the control of animal resources due to their high panoramic visibility of the surrounding landscape (Miotti et al. 2016). The presence of allochthonous lithic raw materials in LA pointed towards inter-regional exchange systems. Chalcedony was related to the Aneken quarry in Somuncura, 110 km west from this site, while the black obsidian sources are in the southern portion of this plateau (Chubut province), more than 200 km far (Lynch and Terranova 2019). Long-distance communication systems are also evidenced by the designs engraved on the stone

plaquettes, which resemble motifs that circulated widely in Patagonia on the same kinds of objects, as well as on other supports, i.e. shells, Rheidae eggshells, pottery and rock art (Lynch et al. 2018).

Paredón de los Grabados: landscape and archaeological context

The information presented in this work is original since no previous archaeological research occurred in the study area. It is located in extra-Andean Patagonia, characterised by a temperate climate with low annual rainfall (<200 mm from April to September) and strong western winds. This arid-semiarid environment is covered by xerophilous vegetation and a shrub-gramineous steppe (León et al. 1998). Together with the Verde Stream, the Salado Stream is one of the two most important basins in southeast Río Negro province. Its sources are located in the eastern foothills of the Somuncura Plateau, from which it drains into the Atlantic Ocean. Currently, it carries water intermittently throughout the year. Given the environmental characteristics of the region, where freshwater is a critical resource, this watercourse was possibly a natural corridor for human populations in the past (Borella et al. 2019a). In its middle course, it borders outcrops of the Marifil Volcanic Complex, which is part of the North Patagonian Massif, characterised by the presence of siliceous rocks (Márquez et al. 2011).

In 2016, rural inhabitants informed about the presence of rock art near El Salado farm, after which the Ministry of Culture of Río Negro requested a management plan in order to enable touristic guided visits (Borella et al. 2017). A step of the management plan involved the recording of rock art along more than 50 m of the rock face to be included in the touristic path (Fig. 2a). The present study is based on this documentation, with some additional observations from other sectors not included in the guided visit (Fig. 2b).

Different types of stone tools and glass fragments were collected on the surface, and five 1 m² test pits were excavated up to 50 cm deep in order to detect materials in stratigraphic position. No results were

obtained from the test pits, from which absolute chronology remains a pending objective. Among the lithic materials, a great variety of flaked tool types, including projectile points, was observed on surface scatters around the studied sector. Ground stone tools were also recovered, such as a 'bola' and a basalt mortar and pestle of non-local raw material. Other sectors with rock art, pottery fragments and stone habitation structures were registered outside the visit section near the petroglyphs, and are currently being processed and analysed. The evidence recorded so far indicates that this is a redundantly occupied place with good conditions of shelter, availability of freshwater, lithic raw materials, fauna and plant resources (Borella et al. 2019a).

Methodology

The recording of rock art in PG required dividing the site into sectors and panels. Sectors were distinguished after major motif discontinuities in the outcrop, while panels were delimited by the presence of fractures or changes in the orientation, and inclination of the rock faces (Loendorf 2001). Our study of the rock art's formal variability considers 'motifs' as units of analysis and evaluates their relation to morphological classes and subclasses, their colour, size and technique (Gradin 1978; Carden 2008; Fiore 2009). The different techniques for producing petroglyphs are characterised according to the kind of movement of the instrument on the rock support as defined by Álvarez and Fiore (1995); Bednarik (2007); Blanco (2015) and Vergara and Troncoso (2015a):

- Pounding (or direct percussion): implies striking the rock support with a simple instrument, such as a cobble with a sharp edge. When hammering is superficial, it leaves small and shallow concave percussion pits; when it is deeper, grooves exhibit U-shaped cross-sections.
- Abrasion: this technique requires scraping the support through the bidirectional movement of an instrument whose edge is perpendicular to the direction of use.
- Incision: implies cutting the support using the unidirectional or bidirectional movement of an instrument whose edge moves parallel to the direction of use. In motifs made by this technique, grooves exhibit V-shaped cross-sections.

The analysis of superimpositions was combined with the evaluation of the petroglyphs' relative degree of varnish cover and weathering conditions in order to define a sequence of rock art production (Keyser 2001; Bednarik 2007; Re 2010, 2016). The chronology was also inferred through the recognition of post-contact elements (objects and inscriptions) in the rock art assemblage.

Location patterns were defined through the position and orientation of the rock supports and the distance of motifs from the ground; two recorders measured the latter aspect with a 50 m flexible tape (Fig. 3: sector 1).

The available circulation surface around the panels was considered for estimating ease of movement around them. Four kinds of access to motifs, related to the difficulty of reaching the panels where they are located, were defined based on these variables. These categories are derived from the experience of female and male adult rock art recorders between 165 and 175 cm tall:

- access 1: direct;
- access 2: indirect, requiring help from other people, fallen rocks or scaffolding;
- access 3: indirect, requiring further means of scaffolding and collaboration for climbing vertical cliffs;
- access 4: indirect, requiring climbing slopes.

The assumption behind location analysis is that the selection of support for making rock art involves choices, such as the possibility of observing the image again, of making it visible for other people, and preserving it through time (Aschero 1997: 19). The number of participants in rock art production and its future consumption could be anticipated through placing it in specific locations (Criado Boado 1991; Hartley and Volley Vawser 1997; Carden 2008; Bradley 2009; Quesada and Gheco 2011). Motifs placed in hidden places on the rocks or in very dark or backlit sectors point towards private contexts of production and use (Lenssen-Erz 2004) and suggest that the act of producing them was more important than their future visualisation (Taçon and Ouzman 2004; Carden 2013). Conversely, depictions placed deliberately in locations for being seen by people approaching a site have the character of signals when they can be perceived from a considerable distance (Bradley et al. 1994; Lenssen-Erz 2004; Crivelli 2006). Combined with location, motif size is another relevant variable that conditions bodily movements for observing them (Loubser 2013). Five size categories were defined according to the area covered by motifs:

- very small: less than 100 cm²
- small: between 100 and 249 cm²
- medium: between 250 and 599 cm²
- large: between 600 and 2500 cm²
- very large: more than 2500 cm²

In the case of simple lines, strokes and single dot alignments, size categories were defined through their length:

- very short: up to 5 cm
- short: between 6 and 15 cm
- medium: between 16 and 50 cm
- long: between 51 and 150 cm

Groove depth was also measured in order to distinguish petroglyphs that are observable by their colour contrast with the rock support and those that can also be visualised by relief difference, especially when sunlight reaches the panels. Grooves less than 0.5 cm deep are considered sub-superficial, those between 0.5 to 0.9 cm are defined as shallow, those between 1 to 1.9 cm are deep, while those deeper than 2 cm are

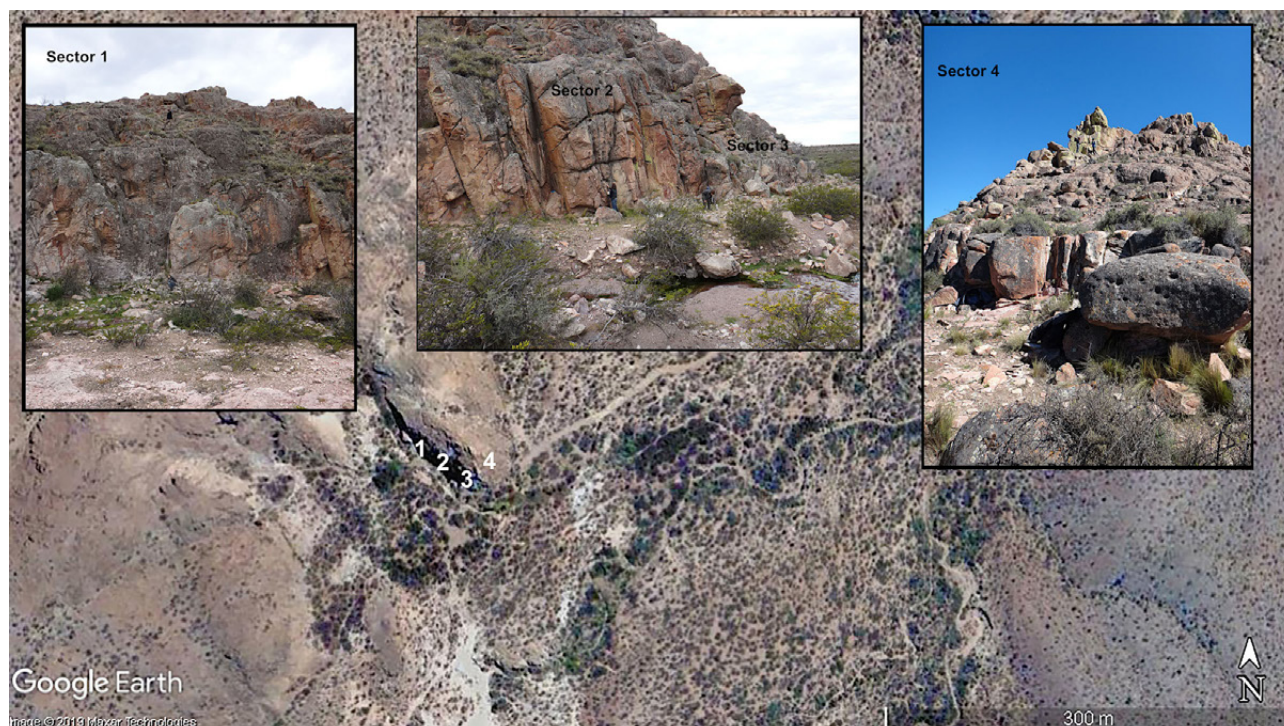


Figure 3. Delimited sectors in PG.

very deep.

The comparative study evaluates the relationship between PG and other sites with rock art in northeast Patagonia (Fig. 1). It is focused on the presence-absence of motifs, considering three different attributes: morphology, size and technique. The morphological analysis is centred in PG's motifs with a subclass detail in order to seek which kinds of motifs from this site are repeated in the other rock art assemblages. From this common repertoire, morphological relatedness between PG and each one of the other sites is calculated according to the number of shared subclasses. It is considered weak if the common motifs cover up to 30% of the total shared subclasses, medium if they cover between 31% and 70%, and strong if they are above 70%. The estimation of size relatedness evaluates how many of the shared motif subclasses between two sites are also similar in their dimensions (length and width). The technical relatedness between two sites is calculated according to how many of their shared motifs were also made by the same techniques. Three technical categories are considered: petroglyphs (in the different varieties defined above), overpainted petroglyphs and paintings. Size and technical relatedness are weak if similarity covers up to 30%, medium between 31% and 70%, and strong above 70%.

Results

The first subsection of the results refers to the main tendencies obtained from the formal analysis of PG's rock art. The second subsection considers the implications of the location patterns, and the third one provides elements for the estimation of a relative chronology. Finally, the fourth subsection analyses the

relatedness between PG and other sites of northeast Patagonia.

1. Motif information

The recorded rock face is more than 50 m long and between 10 and 12 m high. It was divided into four sectors and 43 panels in which 210 motifs are distributed (Fig. 3 and Table 1). The majority of motifs is concentrated in sector 2 and indicates that this spot was preferentially selected for producing rock art.

Sector	n panels	% panels	n motifs	% motifs
1	13	30	30	14
2	16	37	143	69
3	8	19	22	10
4	6	14	15	7
Total	43	100	210	100

Table 1. Distribution of panels and motifs in PG.

Except for two red pictograms, the remaining motifs are petroglyphs, one of which was overpainted in red. Lichens are an important agent affecting the preservation of the petroglyphs in PG, some of which are much exfoliated. Among the extractive production techniques, pounding is the most abundant ($n=197$, 95%), followed by a combination of pounding and abrasion ($n=9$, 4%), abrasion ($n=1$, 0.5%) and pounding combined with incision ($n=1$, 0.5%). Groove depths were measured in petroglyphs not covered by lichens that could be reached by the recorders. In the measured sample, most grooves are sub-superficial; this group is numerically followed by shallow grooves, deep grooves and a few very deep grooves (Table 2). In motifs deeper than 0.5 cm the image is observable not

only by colour contrast with the rock support but also by relief difference. This condition accentuates their visibility when sunlight reaches the panels.

Groove depth cm	n motifs	% motifs
Sub-superficial: < 0.5	85	54
Shallow: 0.5–0.9	57	35
Deep: 1–1.9	19	12
Very deep: 2–25	3	2
Total	164	100

Table 2. Groove depth in petroglyphs from PG.

The two painted motifs are a straight line and aligned short strokes. Among petroglyphs, the most abundant motifs are lines, followed by dots, circles, cupules and animal footprints. The remaining classes are scarce and cover very low percentages (Table 3). Internal variability within some classes of motifs is also high. Dots are isolated, grouped in fields, dispersed,

aligned (some alignments being more than 1 m long) or geometrically arranged as ovals and circles (Table 3 and Fig. 4). Cupules are isolated, grouped or attached. Lines are simple (straight, curved, meandering), parallel, perpendicular, cross-shaped, 'ladder' shaped, cross-hatched or U-shaped. Some of them exhibit complex irregular shapes that insinuate anthropomorphous images (Table 3 and Fig. 4). Circular figures are simple, concentric, with interior dots or adjunct lines. Other geometric figures are more irregularly shaped and may be attached in patterns; one of these was overpainted in red, surpassing the pounded area (Table 3 and Fig. 5). Animal footprints and a human footprint were also identified. The former correspond to birds and felines; both can reach dimensions that far exceed the real footprints' sizes (Table 3 and Fig. 5). The only motif classified as an object was interpreted as a personal ornament (see below). Together with two representations of cattle brands, it is probably post-Hispanic (Table 3).



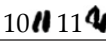
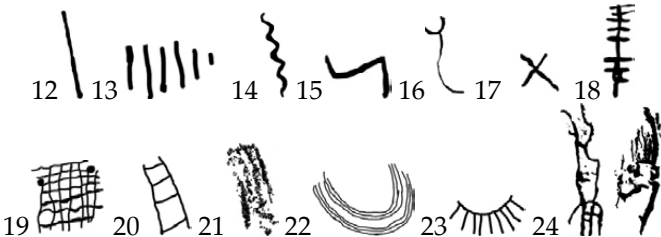

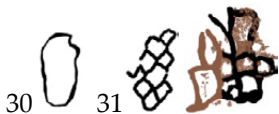




Motif classes	Motif subclasses	n motifs	% motifs
Dots		56	27.2
Cupules		21	10.1
Strokes		3	1.5
Lines		73	35.4
Circles		27	13.1
Polygons		3	1.5
Anthropomorph?		1	0.5
Tracks		19	9.2
Objects		1	0.5
Cattle brands		2	1
Total: 10	Total: 37	Total: 206	100

Table 3. Motif variability in PG. Non-identified motifs are excluded.

2. Location patterns

Rock faces selected as panels are mostly vertical planes; this condition is relevant for defining how they could be accessed for producing and closely observing rock art. The analysis excludes motifs in fallen rocks whose original position is unknown. Access 1 motifs are the most abundant; they are located up to 2.15 m, within the manual field of a kneeling or upright person in the base of the outcrop (Table 4) and can be easily observed by anyone who approaches the panels (Fig. 6a). This group is followed numerically by access 2 motifs, which tend to surpass the manual field and are on vertical planes between 2.20 and 3.20 m high (Table 4). The access to these panels must have been relatively simple for tall people or with the aid of fallen rocks or other people (Fig. 6b).

Very few motifs are of access 3; they are between 3.25 and c. 5 m above the ground.

Access	n motifs	% motifs
1: < 1 – 2.15 m	137	69
2: 2.20 – 3.20 m	38	19
3: 3.25 – approx. 5 m	5	8
4: 3 – > 5 m	19	9
Total	199	100

Table 4. Kinds of access to the rock art panels of PG.

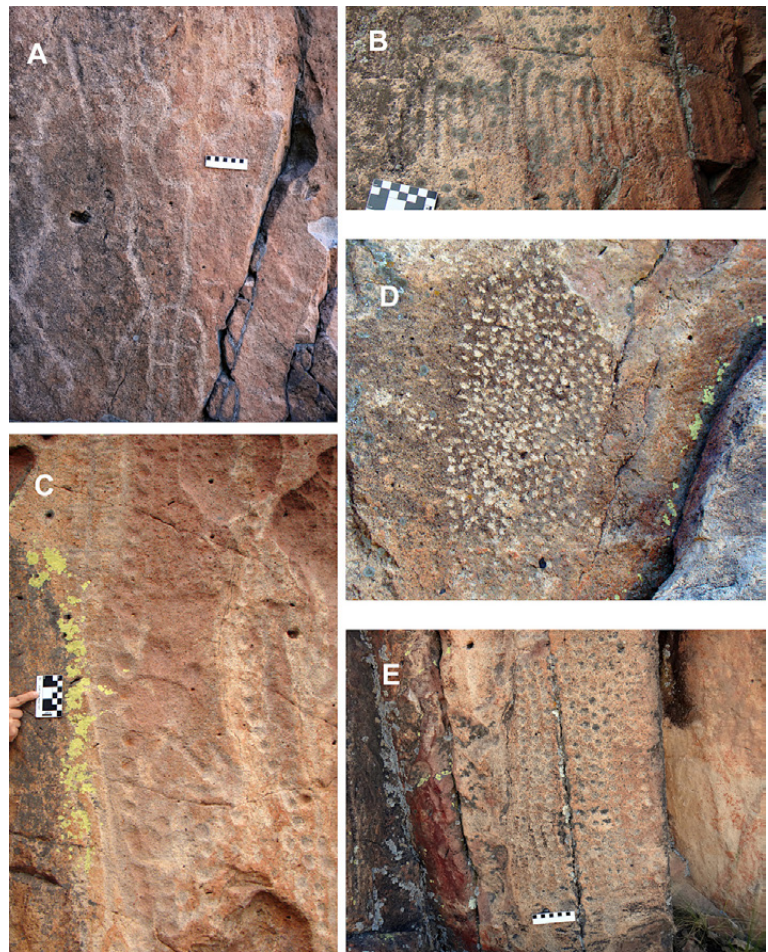


Figure 4. Variability of motifs in PG. A. Lines that resemble anthropomorphous figures; B. Parallel lines interpreted as a condor by local residents; C. Long lines and aligned dots. D. Dotted area; E. Parallel aligned dots.

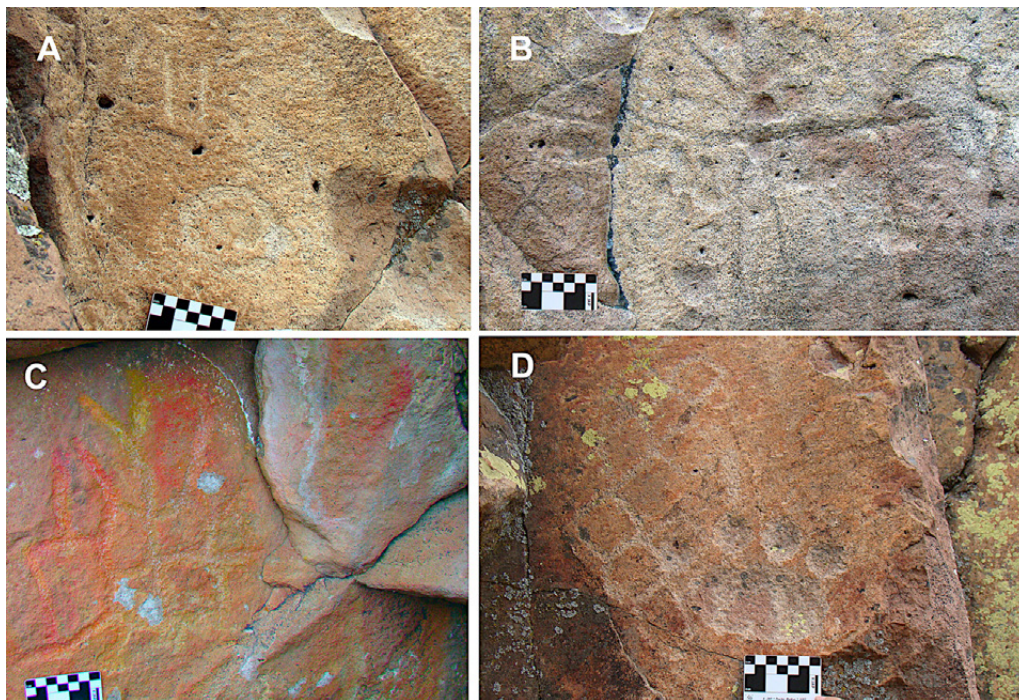


Figure 5. A. Concentric circle with an overlapped dot; B. Polygonal figure on the right; C. Attached geometric figures overpainted in red (D Stretch lab 33.3% scale: 10); D. Diamond pattern with superimposed oversized feline footprint.



Figure 6. A. Panel 28: Access 1; B. Panel 29: Access 2.

Further means of scaffolding and collaboration may have been necessary in order to reach these panels on steep cliffs. The most outstanding example is panel 3, which is at approximately 5 m height and must have required climbing a cliff to reach a tiny step for producing the petroglyphs (Fig. 7a, b). Access 4 motifs are between 3 m and more than 5 m above the ground. The highest panels are not necessarily the most difficult to reach, such as panel 43, located on the top of the outcrop, which can be approached through a straightforward climb across a gentle slope (Table 4, Fig. 8a). At the panel, there is enough space available to produce motifs or to observe them in detail (Fig. 8b). Although other access 4 motifs require climbing through more pronounced slopes to observe them closely and the standing surface below them is minute, they are also relatively easy to reach (Fig. 8c).

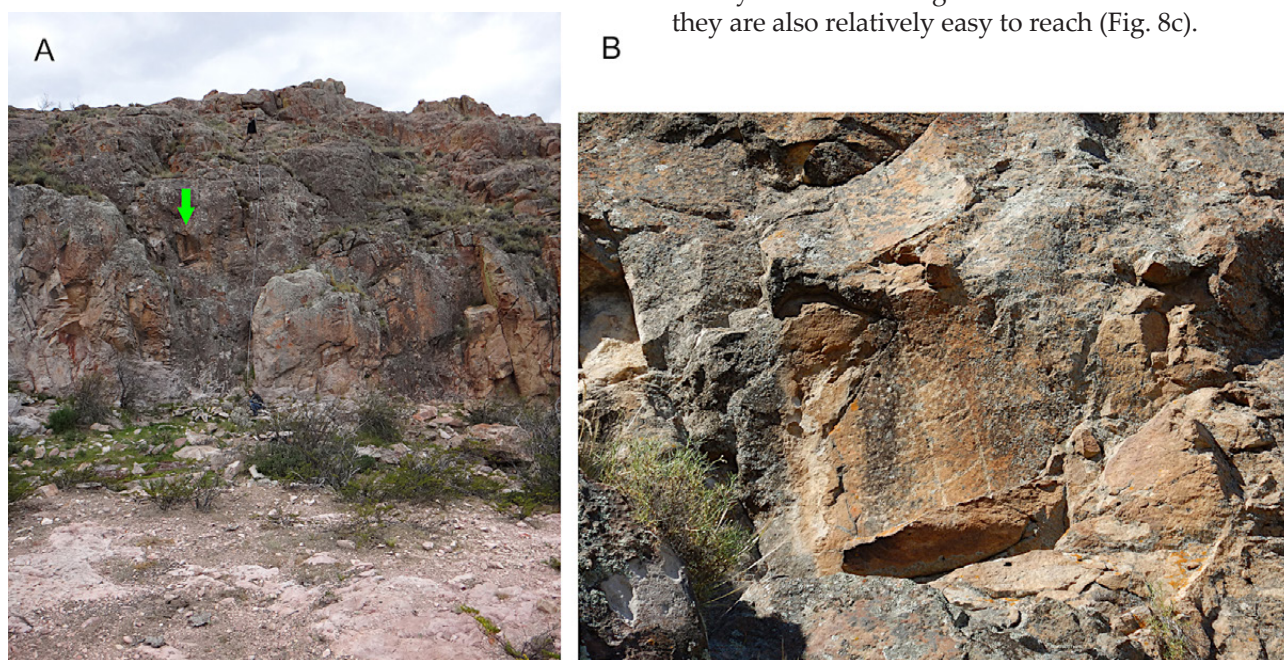


Figure 7. A. Access 3 to Panel 3; B. Close view.

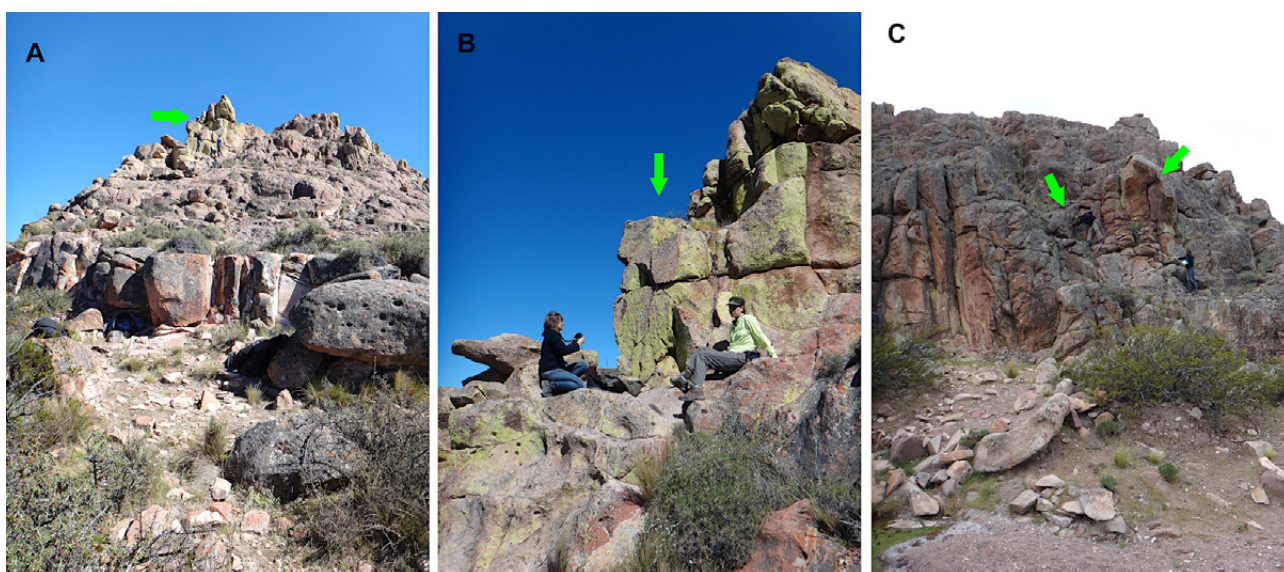


Figure 8. Access 4 motifs. A and B. General and close view of Panel 43; C. Panels 36 and 37.

Access	n motifs	Size range cm ²	x size cm ²	length range cm	x length cm	depth range cm	x depth cm
1: <1–2.15 m	137	6.25–1800	257.1	10–78	28.8	0.2–2.5	0.49
2: 2.20–3.20 m	38	12–1312	318.6	10–140	36.8	0.2–0.75	0.26
3: 3.25–approx. 5 m	5	100–9790	3119	–	–	0.2–0.6	0.28
4: 3–>5 m	16	25–7392	1532.1	7–10	8.5	0.4–1	0.65

Table 5. Motif dimensions, according to their kind of access.

No matter the height of motifs and their relative ease of access, most of them can be observed from the base of the outcrop, especially when the rock supports receive direct sunlight. This circumstance allowed detecting motifs that had not been previously registered; for example, the circular and curvilinear concentric motifs from the highest panel could only be observed in the morning. Conversely, other motifs could only be registered under the incidence of the afternoon sun. The impact of direct sunlight on grooves deeper than 0.5 cm enhances the perception of bas-reliefs. This condition led to evaluate groove depth and motif size related to the kind of access in order to estimate the visualisation strategies of the people who produced them. Results show that motif size increases with height; average motif size in access 1 and access 2 motifs is medium, while it is very large in access 3 motifs and large in access 4 motifs (Table 5). No direct relation was found between motif length and height in simple lines, strokes and single dot alignments. The longest motifs of this kind are access 1 and access 2, located between less than 1 m to the ground and 3.20 m (Table 5). There is also no direct relation between groove depth and kind of access because the deepest grooves are in access 1 and access 4 motifs, distributed from less than 1 m from the ground to the top of the outcrop. However, access 1 average groove depth is influenced by the concavity of the cupules, which are very small motifs whose diameter rarely surpasses 10 cm. These tendencies suggest that high panels were selected for making motifs to be seen from the base of the outcrop by their large size and their deep grooves, which were enhanced by direct sunlight. Some of these panels were difficult to reach and offered little space once they were approached, which limited the positions that could be adopted in order to produce petroglyphs or interact with them closely.

3. The relative chronology of petroglyphs

The analysis of 19 cases of superimpositions, combined with the evaluation of varnish degree and weathering, did not reveal clear tendencies for proposing a rock art sequence for PG. Dots predominately overlies other motifs; however, their varnish degree is not more developed than the underlying motifs'. Cupules tend to have the most developed varnish degrees, although they may overlie or underlie other kinds of motifs. The strong erosive conditions observed in the site due to an intense lichen growth complicated the evaluation of varnish because some motifs exhibit light and dark

tones in their grooves. A single case was registered in which red paint was applied over a petroglyph (see Fig. 5c), although it is not sure if this application corresponds to the same production event of the petroglyph or a later event.

The scarce pottery fragments retrieved near the area of the rock art panels suggest a Late Holocene chronology since no ceramic evidence older than 2000 years BP has been found so far in north Patagonia and the east Pampean-Patagonian transition (Fernández and Vitores 2008; Favier Dubois et al. 2009a; Cúneo 2010; Eugenio and Aldazabal 2013; Barberena et al. 2015; Borella et al. 2015; Gómez Otero et al. 2015; Borges Vaz et al. 2016; Miotti et al. 2016; Borges Vaz 2018; Borella et al. 2019b; Vargas Gariglio et al. 2019). Different archaeological vestiges evidence the occupation of PG in post-contact times, such as stone habitation structures and garbage dumps with remains of metal, earthenware, wood, glass fragments and glass bottles. Two cattle brands on different faces of a boulder evidence the production of rock art in post-contact times (Fig. 9a). Although both petroglyphs have low varnish degrees, one of them was superimposed on a 'bird footprint' by pounding and abrading (Fig. 9b) while the other one, exhibiting the lightest patina, was superimposed to a dotted oval figure through pounding and incision (Fig. 9c). The technical and varnish differences indicate that they were produced in different moments, the latter being the most recent. In the Somuncura Plateau, Blanco (2015) registered thin lines made by incision over other petroglyphs made by percussion. The same kinds of motifs are superimposed on pounded motifs in different regions of Chile. In semiarid northern Chile, Vergara and Troncoso (2015b) distinguished Colonial from post-Colonial petroglyphs. The former are situated between the 16th and 18th centuries and are characterised by European subject matter (e.g. horse riders, Christian crosses) made by the same techniques of the pre-Hispanic motifs (i.e. pounding). The latter are thin lines made by incision, probably with metal knives, sometimes superimposed to pre-Hispanic and Colonial petroglyphs. According to the authors, they correspond to the period between the 18th and 19th centuries. In Argentina, livestock branding for marking ownership was practised from the beginning of the Spanish colony and continues at present times (Schiaffini 2019). The production of these kinds of marks on rock supports was a common practice among drovers (*arrieros*) and herders (*crianceros*) of indigenous

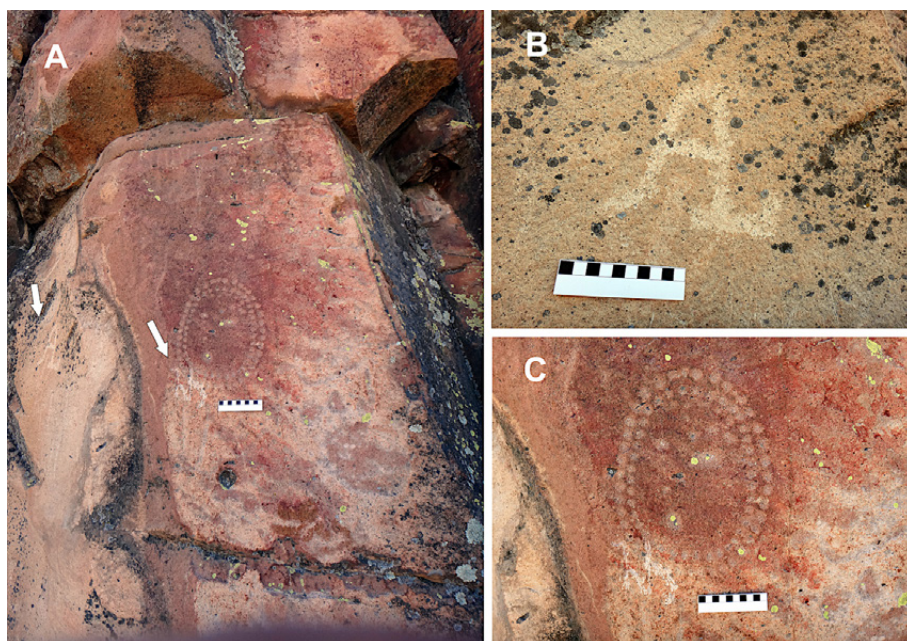


Figure 9. Cattle brands in Paredón de los Grabados. A. General view; B and C. Close views.

descent in different provinces of Argentina, such as San Juan, Neuquén and Santa Cruz (Podestá et al. 2006, 2011; Acevedo et al. 2013; Hajduk et al. 2016). An interesting inverse relationship between rock art and cattle marks was recorded by Moldes (1999), who mentioned that at the end of the 19th century and the beginning of the 20th century, Mapuche herders of Río Negro maintained their native symbolic universe by marking their livestock with brands resembling motifs from the region. Common figures reproduced

kind of attachment before using solid silver chains was linking silver coins with suspension holes in their borders to wool headbands through small shackles (Reccius 1983). It should not be ruled out that similar ornaments could have also been made with other kinds of materials in pre-Hispanic times. Circular shell beads have been frequently recovered in the archaeological record of the Patagonian region (Zubimendi 2015). Particularly in the SMG, shell, saponite and malachite circular beads with central suspension holes were

registered in surface and through the excavation of shell middens and human burials dated between c. 3000 and 400 years BP (Cardillo and Borella 2017). However, circular or oval beads with suspension holes in their borders are more likely candidates as elements of an ornament similar to the petroglyph described here. Such kinds of shell beads were retrieved in Casa de Piedra de Ortega and Pilcaniyeu, west Río Negro. In the former site, they were associated with the archaeological layers of c. 1400 years BP and post-Hispanic age (Fernández and Ramos 2008), while in the latter they were dated between c. 2500 years BP and the 19th century (Boschín 2009; Leonardt 2016a). Shell beads with suspension holes in their borders have also been



Figure 10. Motif resembling a trarilonco (silver ornament used by Mapuche women).

registered in Chenque 1 site from South La Pampa (central Argentina), dated between c. 1000 and 350 years BP (Cimino et al. 2004; Berón 2018). The archaeological record of continental Patagonia opens our interpretation of this petroglyph because it widens the possibilities of raw materials for making personal ornaments. However, it is relevant to note that circular archaeological shell beads from this region most commonly exhibit central holes, particularly within the last 2000 years (Leonardt 2016b).

4. Comparative analysis in northeast Patagonia

From the available rock art information of northeast Patagonia, it is evident that five sites located between 40 and 128 km from PG share motifs with this place. These are PO, in the SMG, CG and RC, in the Pailmán Range, and EG and BA, in the Somuncura Plateau (Fig. 1). The degree of relatedness between these rock art assemblages varies according to the three motif attributes considered: morphology, size and technique. As concerns morphology, 25 of the 37 subclasses of motifs identified in PG (68%) are also present in the other sites. Among these 25 subclasses, six (24%) are shared with PO, 18 (72%) with CG, five (16%) with RC, 10 (40%) with EG and 18 (72%) with BA (Table 6). Therefore, the morphological relatedness of PG with CG and BA is strong, while it is medium with EG, and weak with PO and RC (Fig. 11).

Shared motif subclasses between PG and PO are simple forms prevalent in the Patagonian region and extra-regionally (Table 6). Except for lines longer than 1 m, their size is small and medium. Oversized bird footprints are only present in PG. Although the predominant technique identified in both sites is pounding, grooves are sub-superficial in PO, while they are sub-superficial, shallow, deep and very deep in PG. The most complex motifs from PO have no counterparts in north Patagonia; they resemble labyrinthine figures from the interior plateaus of Santa Cruz province, between 700 and 900 km south (Carden and Borella 2015). Thus, the morphological relatedness between PG and PO is weak, while their size and technical relatedness is medium (Fig. 11). Motif subclasses from CG present in PG especially correspond to the latest painting episode identified by Carden and Prates (2015). It is composed of red and white paintings larger than those from previous episodes are. Some examples are multiple alignments of dots, oversized animal footprints, patterns of

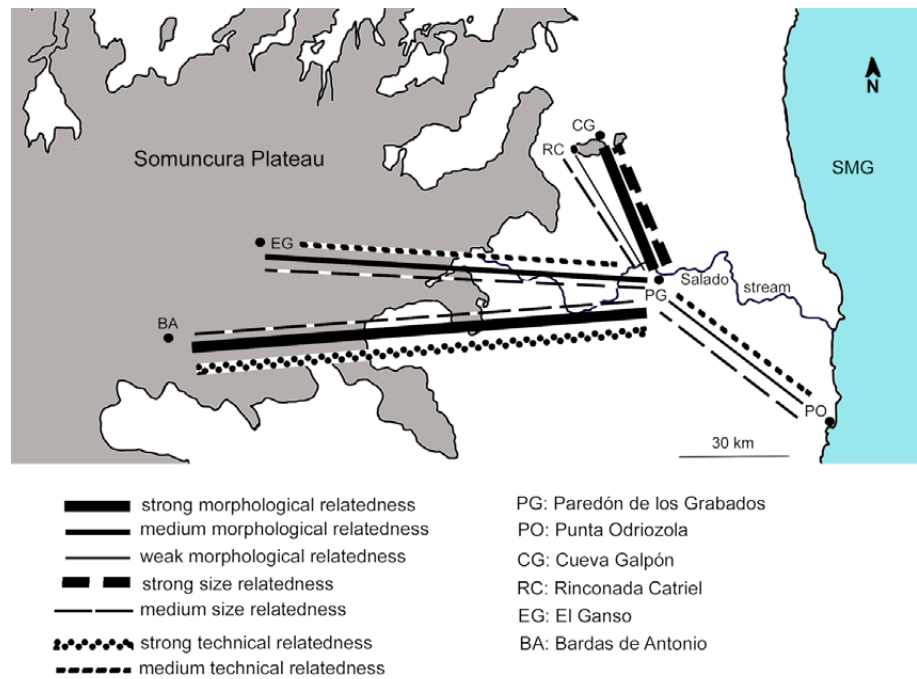


Figure 11. Rock art relatedness between PG and other rock art sites from northeast Patagonia.

attached geometric figures, as well as lines and dot alignments longer than 1 m (Table 6). The largest white paintings can be better observed from the entrance of the cave than from close up. Therefore, PG's and CG's motifs strongly relate in morphology and size, but they are not technically related (Fig. 11).

Motif subclasses from PG repeated in RC are grouped dots and simple lines (Table 6). The former are red and black and correspond to the first and third stylistic modalities defined by Gradin (2003 a), while the latter are red paintings from the second stylistic mode. Although parallel and perpendicular lines are large in both sites, the remaining shared subclasses are medium and small in RC, while they are medium, large and very large in PG. Thus, the morphological relatedness between these sites is weak, while their size relatedness is medium, and their technical relatedness is lacking. Common motifs between PG and EG (Table 6) are generally smaller in the latter; pounding is the dominant technique in both sites, with deeper grooves in PG. Their relatedness is medium in morphology, size and technique. Pounding is the dominant technique in motifs shared between PG and BA. Even though motif size tends to be smaller in BA compared to PG, Blanco (2015) registered fields of dots and parallel lines covering large areas of the supports, as well as large concentric circles with deep grooves on conspicuous rocks. The circular motifs resemble PG's concentric 'U' lines of panel 43 in their morphology and high visibility (see Fig. 8b). Consequently, the morphological and technical relatedness between PG and BA are strong, while their size relatedness is medium (Fig. 11). Although there is little information about Los Manantiales, in the Somuncura Plateau (site








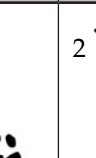










































































Salado Stream	SMG	Pailemán Range		Somuncura Plateau	
PG	PO	CG	RC	EG	BA
    		   		 	   
					
          	 	        	  	 	       
   	 	   		  	   
 					
 				 	 

Table 6. Shared motifs between PG and other rock art sites from northeast Patagonia. Numbers indicate motif subclasses identified in PG according to Table 3. Images from other sites were reproduced from Carden and Borella (2015) for PG; Carden and Prates (2015) for CG; Gradin (2003a) for RC; Blanco (2015: 264–333) for EG and BA.

No. 8 in Fig. 1), Alborno (2003) mentions petroglyphs overpainted in red. According to her description, the red paint exceeds the groove area; such as we registered

in PG. Blanco (2015) also registered this technique in spirals from BA.

Discussion

Comparative rock art analysis indicates a strong morphological and size relatedness between PG and CG, which is 40 km north from the former site in the Pailemán Range, at Somuncura's foothills. The technical difference between these sites may be explained by an intention to make images durable, considering that paintings have more chances of preservation in sheltered places than in open-air sites. However, the funerary archaeological context of CG is also relevant for understanding the presence of paintings in this site. The spatial contiguity of a grave with a large lump of red pigment to a rock art panel with red paintings suggested that this burial and the first painting episode were closely related practices (Carden and Prates 2015). Although this hypothesis remains to be tested through compositional analyses of the buried pigment and the rock paintings, it implies that the paint itself had particular connotations beyond motifs.

A strong morphological and technical relatedness was registered between PG and BA, which are 128 km distant. The presence of large and very large motifs with deep grooves in prominent panels from these sites suggests signalling behaviours. These nodes within the hunter-gatherer circulation paths are related to freshwater sources where faunal and plant resources concentrate. The archaeological evidence shows that they were redundantly occupied (Blanco 2015; Miotti et al. 2016; Lynch et al. 2018; Borella et al. 2019a). The reproduction of similar motifs in the middle course of the Salado stream and the Somuncura Plateau can be explained by the circulation of ideas that were reproduced through common ritual practices by people who made a complementary use of these environments, whether by relocating their camps in different seasons or by social networks. The act of marking these places through highly visible images can also be understood as part of the definition of flexible hunter-gatherer territorial rights (Ingold 1986: 130–164). In PG, situated halfway between the coast and the interior, they could also be signalling this key spot linked to the Salado stream, which was a crucial circulation path in the arid-semiarid landscape.

The relatedness between PG and the remaining sites is weaker, especially with RC (Pailemán Range) and PO (SMG). The lack of specific similarities between the petroglyphs of PG and PO should not dismiss the possibility of complementary use of interior and coastal environments. Instead, it may be explained by the different chronologies of the associated archaeological contexts. While the hunter-fisher-gatherer assemblages to which PO's petroglyphs are closely linked were dated to c. 3000 years BP, no radiocarbon dates could be obtained so far from PG. Although different kinds of material culture support a late chronology that reaches a post-Hispanic age, it is still necessary to solve until what extent the production of petroglyphs can be traced back. Until further evidence is recovered, the most reasonable chronological estimation for

this rock art is a maximum of c. 2000 years BP. This inference is based on the strong similarities detected with the northeast Somuncura Plateau, whose human occupations date between c. 1900 and 1700 years BP in Laguna Azul (Miotti et al. 2016; Vargas Gariglio et al. 2019). On the other hand, similarities with the Pailemán range refer to the last 1000 years BP in RC (Gradin 2003) and to the latest painting episode of CG, whose unknown age postdates 3000 years BP (Carden and Prates 2015).

The post-Hispanic petroglyphs are related to the increasing complexity of the socioeconomic and political relationships that characterised this period. If our interpretation was correct, the presence of a salient *trarilonco* motif (silver jewellery) in PG could be framed in the Mapuche expansion during the 19th century from the region of Valdivia in Chile to the Argentine Pampas and northeast Patagonian steppe. Their spread to Argentina was prompted by the necessity of acquiring cattle and driving it to Chile for commercial purposes. This process increased competition, alliances and power relationships that led to the emergence of chiefdoms (Aldunate 1983). Silver ornaments were important status and wealth markers among *loncos* (chiefs), who used them mainly as horse gear, while their wives and daughters wore them as jewels. They were important elements of exchange for obtaining cattle in the Pampas; at the same time, they sealed alliances with the local groups, who reinforced their hierarchy and power through the possession of these objects (Aldunate 1983; Campbell 2015). Furthermore, Mapuche women wore *trariloncos* for protective purposes in ritual and political gatherings (Morris Von Bennewitz 1992). In this social milieu, the presence of such kind of ornament in PG's rock art is the product of the expanded social networks operating in the process of the state formations of Chile and Argentina. Within these networks, not only the objects circulated through exchange but also the ideas related to their political and magic power. Their singular expression in PG suggests the relevance of this place as a ritual gathering point.

On the other hand, cattle brands reproduced on rocks were identity markers that represented their ownership (Podestá et al. 2006). Currently, among the Mapuche herders of Chubut and Río Negro provinces (Patagonia, south Argentina) they are also symbols of friendship, social alliances and kinship relations since cattle branding events demand collective work and acquire a festive character (Schiaffini 2019). In San Juan province (central-west Argentina), brands were recurrently reproduced on prominent rocks along watercourses and functioned as landmarks that signalled the best routes for driving cattle into Chile within an extremely arid landscape (Podestá et al. 2006). Considering the strategic location of PG for human transit and its ecological setting in an arid-semiarid environment, possibly the cattle brands reproduced there could have had a similar role, such as the older petroglyphs which they overlap had, in

the more distant past.

Conclusions

The morphological, technological and size characterisation of PG's petroglyphs led to subsequent comparative analysis with other rock art assemblages from northeast Patagonia. The analysis was based on the assumption that information exchange, inter-group cooperation and alliances are favoured social strategies in risky and unpredictable environments (Gamble 1982). If PG was a crucial locale in the pathway between the coast and the interior, the expectation was to find stylistic similarities between these areas, since style reinforces social interaction networks. Preliminary results support stronger relationships with the Somuncura Plateau and the Pailemán Range than with the San Matías Gulf. An aspect that distinguishes PG's petroglyphs from most of the other motifs is their larger average size related to a tendency to select elevated panels. These patterns suggest that their producers planned the visibility of the images because panels were highly valued as landmarks that guided mobility and facilitated social communication in the Patagonian steppe. In the context of effective human occupation of different spaces (*sensu* Borrero 1994–95) and higher demography within the late Holocene, these attributes could also be hinting to an increasing territorial behaviour among the hunter-gatherer groups, which became more competitive during the European contact period.

The stylistic differences between PG and the coastal petroglyphs do not exclude the hypothesis of connectivity between these areas since they are the product of the different temporalities of the archaeological contexts to which they are associated. Due to its geographic situation in the middle course of the Salado stream, PG remains a relevant potential nexus between the Atlantic coast and the interior. The results obtained from the analysis of its rock art shed light on the changing social scenarios and contexts of meaning through which petroglyphs were produced. Despite these changes, PG remained to be a persistent place in the northeast Patagonian landscape (Schlanger 1992; Prates and Di Prado 2013). It is necessary to develop complementary lines of inquiry to test further our ideas and advance in the knowledge of the circulation paths and networks of the people who inhabited this region. Some promising avenues in our agenda are the sourcing of lithic and shell raw materials (Gómez Otero and Stern 2005; Favier Dubois et al. 2009b; Miotti et al. 2012; Zubimendi and Moreno 2014; Alberti et al. 2015, 2016; Banegas et al. 2015; Hermo et al. 2015; Alberti 2016; Fernández et al. 2017; Martínez et al. 2017; Barberena et al. 2018, among others) and the study of $\delta^{18}\text{O}$ (Serna 2018; Serna et al. 2019).

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