Lithic Technology

ISSN: 0197-7261 (Print) 2051-6185 (Online) Journal homepage: http://www.tandfonline.com/loi/ylit20

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To cite this article: V. Lynch & L. Miotti (2016) Morphological and Functional Variability on the Endscrapers in Cueva Maripe Site (Santa Cruz Province, Argentina), Lithic Technology, 41:1, 60-74

To link to this article: http://dx.doi.org/10.1080/01977261.2015.1107300

Published online: 08 Apr 2016.

MORPHOLOGICAL AND FUNCTIONAL VARIABILITY ON THE ENDSCRAPERS IN CUEVA MARIPE SITE (SANTA CRUZ PROVINCE, ARGENTINA)

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The aim of this paper is to study the end-scrapers recovered from Cueva Maripe site (Santa Cruz Province, Argentina). These artifacts have been repeatedly recorded along the entire sequence of the site occupations; therefore, the following work is focused on the morphological and functional variability of these instruments, to discuss some expectations regarding the permanence of certain kinds of design over time. The results allowed identifying different activities developed with these tools along the Cueva Maripe occupations, as the work on bone, wood, and hide. However, the morphological variability identified was mainly related to different kinds of flakes or blades selection and on the particular features of the edges which would indicate some versatility in design and little functional specialization. These features would account for the permanence of these instruments in the site from the early Holocene, as well as at a regional level in the central plateau of Santa Cruz.

Este trabajo tiene por objetivo el estudio de los raspadores recuperados del sitio arqueológico Cueva Maripe (Prov. De Santa Cruz, Argentina), dado que se registran recurrentemente a lo largo de toda la secuencia de ocupación del sitio. Por lo tanto, el siguiente trabajo se encuentra focalizado en la variabilidad morfológica de estos conjuntos y su relación con la variabilidad funcional, a fin de discutir expectativas en cuanto al porqué de la permanencia de determinadas formas de diseño a través del tiempo. Los resultados alcanzados permitieron identificar el desarrollo de diferentes tareas a partir de estos instrumentos en las distintas ocupaciones de Cueva Maripe, desde el trabajo sobre hueso y madera hasta el tratamiento de pieles o cueros. Sin embargo, las diferencias morfológicas identificadas, principalmente en la selección de formas bases, como en las características particulares de los filos utilizados, permitirían plantear cierta versatilidad en el diseño y poca especialización funcional, lo que habría llevado a la permanencia de estos instrumentos en el sitio desde el Holoceno temprano, como así también a nivel regional en distintos sectores de la meseta central de Santa Cruz.

KEYWORDS: *End-scrapers, Microwear analysis, Hunter–gathers, Southern Patagonia*

ENDSCRAPERS AND HUNTER–GATHERER SOCIETIES

The techno-morphological studies about the end-scrapers were numerous in the history of world archeology (Andrefsky 2005; Bamforth 1979; Dibble 1987; Hayden 1979; Miller 2013, 2014; Seeman *et al.* 2013; Shott 1995) and in some cases it has been shown that this kind of tools probably constitutes the typological category that has a greater degree of functional convergence related to hides processing (Blades 2003; Hayden 1986; Kamminga 1982; Morrow 1997; Odell 2004; Shea 1992; among others). This overall trend of specialization contrasts with some exceptions documented on several localities, where such characteristics are not appreciated and in some cases, have come to mark the importance of different places where the manufacturers are located (Ibáñez and Gonzalez 1996; Jardón 1990). In this sense, the ethnographic references describe that at communities of cold or temperate climates with high exploitation of animal resources, the end-scrapers use would be related to hide processing, while in warmer latitudes there is an increase of functional variability and of woodworking (Coqueugniot 1983).

In different archaeological contexts of Patagonia (Argentina) the recurrence of these tools allowed carried out particular studies about their production and use, even at historic moments when others raw materials as glass and ceramic material

DOI: 10.1080/01977261.2015.1107300

were incorporated (Álvarez *et al.* 2000; Belardi *et al.* 2013; Cardillo and Charlin 2009; Cattáneo and Aguerre 2009; Clemente Conte and Gómez Romero 2008; De Angelis and Mansur 2010; De Angelis *et al.* 2009; Guráieb 2004; Mansur and Lasa 2005; Marchione and Bellelli 2013). While the results of these researches have concluded that, regardless of their origin spatial-temporal, the end-scrapers has common features (low time and energy investment in their manufacture and certain morphological homogeneity)—Hayden 1986; Keeley 1980; Yacobaccio 1988—; in this regard we wonder which would be the causes related to this temporal and spatial continuity and if would have occurred significant changes in their production and use in the Patagonia area?

Several authors argue that the functional requirements are some of the factors that structure the technological practices and have their equivalent on the material culture diversity (Bleed 1986; Dibble 1995; Hiscock 2007); therefore, interpretations of these factors as possible causes of the artifactual diversity, cannot be explained without the knowledge of the activities on which were involved (Álvarez and Briz I Godino 2009; Álvarez *et al.* 2010).

In this sense the Cueva Maripe site, located in the central plateau of Santa Cruz (Argentina) could be a valuable reference due to the recurrence of end-scrapers in its occupational sequence from Early Holocene. In previous studies other aspects of these instruments were included; evidences of hafting process and the functional-morphological analysis of the end-scrapers exclusively recovered in the middle Holocene occupations (Lynch 2013; Lynch and Hermo 2015). New radiocarbon dates and the application of Georeferenced Information System (GIS) intrasite helped to increase the degree of temporal resolution of the site (Miotti *et al.* 2014). Therefore, the following paper proposes to continue with the techno-morphological and functional variability study of the end-scrapers recovered throughout all the occupational sequence of Cueva Maripe site; in order to discuss about the permanence of certain design over time, as also, the technological practices and uses developed by hunter–gatherer societies from the Pleistocene–Holocene transition (*c.* 13.000–9500 BP).

Cueva Maripe Site

Is located in the center of the Deseado Massif plateau (Santa Cruz Province, Argentina), at 47° 51′ south and 68°56′ west. Is an external cave of considerable size (24 m of wide and 26 m deep) internally divided in two chambers: north chamber (NC) and south chamber (SC), with particular features microenvironmental based on sun exposure and conditions of humidity (Lynch *et al.* 2015; Miotti *et al.* 2014) (Figure 1).

The archaeological context was grouped into three assemblages. The assemblage 1 corresponds to layer 5 of NC and UA3 (analytical unit 3) SC, related to Pleistocene/Holocene transition occupations and Early Holocene, from *c.* 9518 ± 50 to 7153 ± 64 years BP. The lithic technology is mainly unifacial tools performed on flakes which present abundant long edges (Hermo and Lynch 2015; Lynch 2014); while the fauna involves mainly guanaco (*Lama guanicoe*), currently living in the region (Miotti *et al.* 2014). Although up to 8500 years BP, the Pleistocene fauna existed in the area, in Maripe has not been registered any species yet. The coexistence and exploitation of mega-mammals with the first hunter–gatherers of the central plateau has also been identified in other nearby sites such as Los Toldos, Piedra Museo, El Ceibo, La María, La Gruta 3, and Cerro Tres Tetas (Brook *et al.* 2015; Marchionni and Vázquez 2012; Miotti 1998; Miotti 2003; Miotti and Salemme 2004; Miotti *et al.* 1999; Paunero 2003, Paunero *et al.* 2008; Salemme and Miotti 2008). However in all first occupations in Patagonia, the guanaco (*L. guanicoe*) was the species mainly used, as in the rest of the Maripe occupational sequence (Marchionni 2013).

The assemblage 2 is constituted by the materials recovered at layer 4 NC and AU2 in SC and is related to the middle Holocene occupations. Several carbon dating have been done and in the base of layer 4 dates of *c.* 5376 ± 45 years BP to *c.* 3210 ± 60 years BP were obtained, while at AU2 in SC was dated at *c.* 7703 ± 47 to *c.* 4113 ± 39 years BP (Miotti *et al.* 2014) (Table 1).

The lithic technologies show remarkable differences with previous occupations, due to the increase of blades production, the presence of three bola-stone fragments and also the increase of non-local raw materials as obsidian (a volcanic rock which does not have known local sources) (Hermo and Lynch 2015; Hermo and Magnin 2012; Hermo and Miotti 2011; Lynch 2014; Magnin 2015).

The assemblage 3 (C3) (layer 2/3 NC and AU1 SC) corresponds to the later occupations of the cave from the late middle Holocene to late Holocene, dated at *c.* 4100 ± 39 to 1078 ± 40 years BP (Hermo and Lynch 2015; Lynch 2014; Miotti *et al.* 2014). At this assemblage blades and flakes

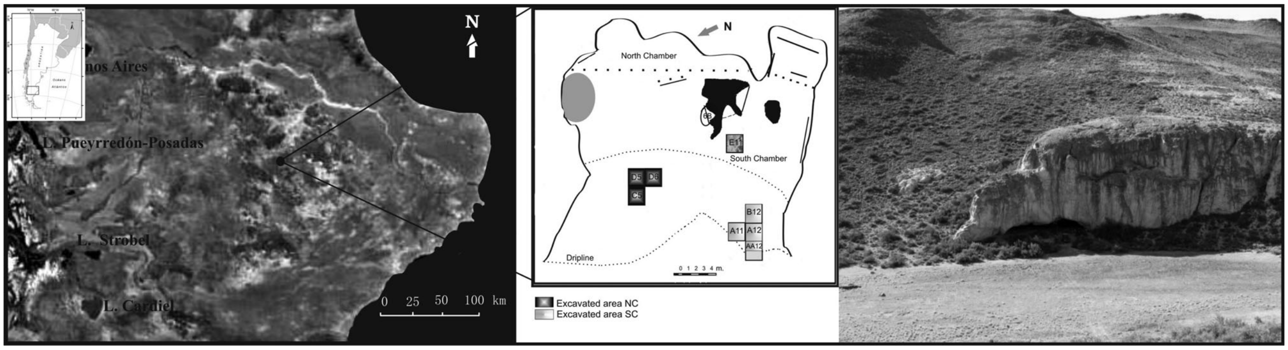


FIGURE 1. Cueva Maripe location in the central plateau of Santa Cruz province (Argentina).

were used for the manufacture of the end-scrapers and also a wide variety of raw materials. The increase of non-local raw material would be related to a high mobility proposed for the late Holocene and by the process of territorial consolidation that occurs since the middle Holocene (Borrero 1989–1990; Espinosa and Goñi 1999; Goñi 2011; Hermo and Lynch 2015).

Materials and Methodology: Techno-Morphological and Microwear Analysis

The analysis was carried out based on end-scrapers[1] recovered from different occupations identified at the Cueva Maripe site and included a total number of 194 elements with 425 active edges. However,

Table 1. Radiocarbon dating (Miotti *et al.* 2014)

N	Layer	Square	Sector	Code	^{14}C years BP	Cal. BP	Material
North chamber							
1	5	D6	SW	AA951	9177 ± 56	10,496–10,234	Carbón
2	5	D5	NW	AA65179	8992 ± 65*	10,249–9,912	Carbón
3	5	C5	NW	AA95127	8827 ± 87	10,181–6,909	Hueso
4	5	D5	SE	AA95126	8012 ± 80	9,091–8,608	Hueso
5	5	C5	SE	AA65178	8762 ± 50*	10,115–9,556	Carbón
6	5	C5	NW	AA99069	7153 ± 50	8,152–7,858	Carbón
7	4	D5	SE perfil E	AA99071	5376 ± 45	6,284–6,004	Carbón
8	4	D5	SE	AA99070	5137 ± 45	5,990–5,749	Carbón
9	4	D6	SE	AA65173	5084 ± 49*	5,928–5,716	Carbón
10	4	C5	NE	AA99067	4002 ± 43	4,782–4,300	Carbón
11	4	C5	NW	AA99068	3791 ± 42	4,383–3,992	Carbón
12	4	C5	NE	LP-1497	3210 ± 60*	3,579–3,272	Carbón
13	–	P6B	SE	AA95123	3535 ± 62	3,980–3,642	Hueso
14	–	P6B	SW	AA95124	1907 ± 48	1,949–1,719	Hueso
South chamber							
1	4	A12	SW	AA65175	9518 ± 64*	11,102–10,594	Carbón
2	4	A12	SE	AA65174	8333 ± 63*	9,479–9,136	Carbón
3	3	B12	SW	AA65177	7703 ± 47*	8,584–8,411	Carbón
4	3	A12	SE	AA65181	4113 ± 39*	4,821–4,522	Carbón
5	2	B12	SW	AA65176	1078 ± 40*	1,061–928	Carbón
6	3	A12	SE	AA95121	155 ± 35	285-(-2)	Carbón
7	4	B12	SW	AA95122	2655 ± 39	2,849–2,736	Carbón
8	2	A11	NW	AA95118	1403 ± 46	1,394–1,264	Hueso

the study of end-scrapers design[2] was only done with complete artifacts samples while the microwear analysis included also distal fragments.

The design analysis was carried out taking into account some variables from the descriptive proposal of Aschero (1975, revision 1983) and Aschero and Hocsman (2004). The variability of raw materials used, relative sizes, and specific measures (length, width, and thickness) of complete and fractured end-scrapers were considered and also others particular features of used edges related to the working materials and kinematics employed (length, width, thickness, working angle, and the shape of the edges).

The artifacts examined during this study were subjected to low (10–63×) and high magnifications (50–500×), where the observation and description of surface alterations, striations, and characteristic patterns of edge damage are emphasized (Ibáñez *et al.* 2014; Keeley 1980; Mansur-Franchomme 1986–1990; Odell 2004; Semenov 1964; Vergès Bosch and Ollé Cañellas 2011).

The variability in polish formation on utilized edges is related to tool use on different materials (e.g., soft tissue, hide, bone, wood, etc.) and to the applied forces and motions (e.g., cutting, scraping, and wedging). In this manner, the presence of specific microwear polishes can be used to relate tool use to specific contact materials. The identification of optically distinct polishes is the focus, although edge damage or rounding, fractures, and linear indicators are also used to make inferences about contact material and use motion (Keeley 1980; Lerner *et al.* 2007). Ultimately, tool use can then be related to patterns of activity and thus aid in the reconstruction of the organization of prehistoric cultural behaviors.

This method not only allows identifying use traces but also technological traces and taphonomic alterations (Levi-Sala 1993) using several optical media (binocular microscope, metallographic, and microscopy ESEM). Therefore, artifacts were examined on a binocular loupe *Nikon SMZ* 200 with a range of magnification from 10× to 63× and using an incident light microscope *Nikon Epiphoto* 200 with photo attachment and a range of magnification from 100× to 500×. The analysis was based on a reference collection of 183 tools made on siliceous rocks and used on different materials (bone, wood, hide, gramineous, and minerals) and conditions, manually or by hafted devices to identify tools functions in specific motions and materials (Lynch 2014; Lynch and Hermo 2015).

It was also applied different statistical tests to analyze trend and variations in the sample. Therefore, it was used non-parametric tests as Mann–Whitney *U*-test, Kruskal–Wallis ANOVA, and Pearson χ^2 (Chi-squared) test (Shennan 1992).

Results

Main features of the sample

In the assemblage 1 a total of 21 end-scrapers (37 active edges) were recovered, these artifacts were mainly unifacial tools made on angular flakes with limited retouch, however, were also manufactured on pebbles and blades. Most of the end-scrapers recovered from this assemblage were fractured ($n = 13$, 68 per cent) and had *medium-long* module ($n = 3$) and *standard-medium* sizes ($n = 5$) (*sensu* Aschero 1975, 1983) (Figure 2).

These artifacts were manufactured on different raw materials mostly cryptocrystalline and of good knapping quality, as in all archaeological sequence at Cueva Maripe site. However, there are some distinctions between the different occupations. At earliest moments a low variability of raw materials was used (Figure 3). In the assemblage 1 the end-scrapers recovered were manufactured on different types of siliceous rocks as silicified ignimbrites and other varieties of siliceous rocks (Hermo 2008; Lynch 2014; Magnin 2015).

The rest of the assemblages recorded a wide variety of siliceous rocks with an increase of opal and chalcedony. On the other hand, the obsidian, as non-local raw material appears for the first time in the sequence (cores, blades, and flakes). Previous studies (energy-dispersive X-ray fluorescence and trace element by instrumental neutron activation analysis) indicated that the obsidian is from the areas Pampa del Asador, Pampa de La Chispa, and the alluvial fan of Cerro Bayo, located 120–195 km west (Belardi *et al.* 2006; Espinosa and Goñi 1999; Stern 1999, 2004). The presence of obsidian hundreds of kilometers from their quarries allowed proposing a more widespread network of raw materials exchange in Santa Cruz province. About these arguments, the assemblage 2 at Cueva Maripe site registered non-local raw material and long-distance objects such as marine shells (Hermo 2008; Hermo and Lynch 2015; Magnin 2011; Miotti 2008). But also technological changes were reflected, as the increase of the artifacts number recovered, new technologies as bolas and the production and use of blades technology on different instruments

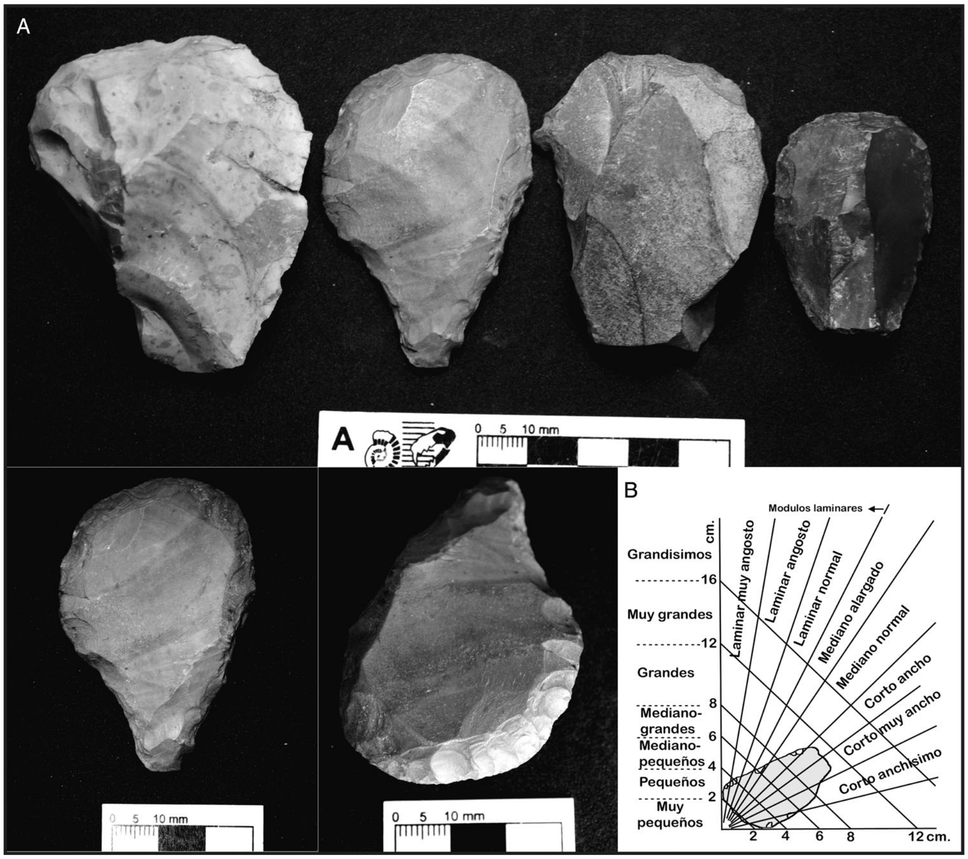


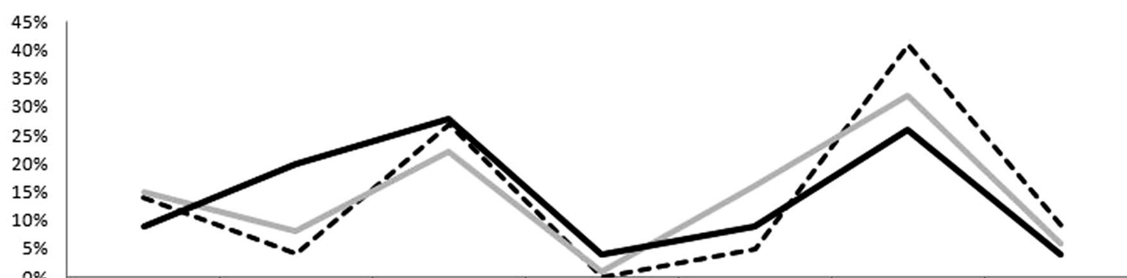
FIGURE 2. (a) End-scrapers recovered at the assemblage 1, early Holocene occupations in Cueva Maripe site. (b) Bagolini's graph (sizes and length/width modules, Aschero 1975 Rev. 1983; rendering by Dr Hermo).

types (Hermo and Lynch 2015; Hermo and Magnin 2012; Hermo and Miotti 2011).

Therefore, the end-scrapers recovered from the mid-Holocene occupations ($n = 82$, 193 active edges) show some of these changes since there is an increase of blades used for manufacturing these artifacts and the former present different morphologies: simple ($n = 16$), doubles, ($n = 6$), multiple ($n = 3$), and undifferentiated ($n = 1$).

In this sense, at the assemblage 2 there is a significant frequency of blades used on end-scrapers production regarding others blanks used in the rest of the sequence ($\chi^2 = 13.7$, df = 6, $P < .05$). On the other hand, there is a greater number of complete end-scrapers ($n = 39$) and slight increase of *medium-small* sizes ($n = 11$, 28 per cent) (Figure 2).

At the assemblage 3 the largest number of end-scrapers were recovered ($n = 92$, 195 edges). The



	Chalcedony	Indet.	silicified ignimbrite	Obsidian	Opal	siliceous rock	petrified wood
Assamblage 1	14%	4%	27%	0%	5%	41%	9%
Assamblage 2	15%	8%	22%	1%	16%	32%	6%
Assamblage 3	9%	20%	28%	4%	9%	26%	4%

FIGURE 3. Raw materials identified in the complete sequence of Cueva Maripe site.

TABLE 2. CENTRAL AND DISPERSION MEASURES OF THE COMPLETE AND FRACTURED SCRAPERS THROUGHOUT THE CUEVA MARIPE SEQUENCE

	Entire end-scrapers							Fractured end-scrapers						
		Length		Width		Thickness			Length		Width		Thickness	
	n	Mean	DS	Mean	DS	Mean	DS	*n*	Mean	DS	Mean	DS	Mean	DS
LH	33	40.5	10.3	27.6	4.5	9.6	2.4	59	31.7	9.80	25.1	6.58	7.94	2.98
MH	39	43.2	11.8	28.7	9.3	9.2	2.9	43	39.2	14.6	29.2	7.90	9.71	3.85
P/H	6	41.0	10.9	31.7	7.9	12.1	8.1	14	48.9	27.2	37.9	21.0	13.83	10.3

LH: Late Holocene, MH: Mid-Holocene, P/H: Plesitocene–Holocene transition/Early Holocene

raw materials used were mainly local with the exception of the obsidian that shows an increase (Figure 3). However, unlike earlier moments, high percentages of distal fragments were recorded ($n = 60$, 65 per cent) and the size proportions are maintained (*large-medium* size 59 per cent and *small-medium* size 31 per cent).

In late Holocene occupations the largest sizes have not been practically registered. In spite of this, no significant differences of the end-scrapers were found between length ($H = 1.11$; $n = 76$; $P > .05$), width ($H = 4.51$; $n = 76$; $P > .05$), and thickness ($H = 0.93$; $n = 76$; $P > .05$) (Table 2).

However, mean differences of whole scrapers and fragmented, on widths ($U = 46$; $n = 22$; $P > .05$ and $U = 553.5$; $n = 77$; $P > .05$) and thickness ($U = 52.5$; $n = 22$; $P > .05$ and $U = 719.50$; $n = 77$; $P > .05$) between the assemblages 1 and 2, were not statistically significant. This could indicate some standardization in the basic shapes through the fragmentation of these supports. In the assemblage 3, are two different statistically groups regarding their measures because the fractured scrapers were narrower and thinner than complete artifacts.

GENERAL FEATURES OF THE EDGES

An important aspect to consider is the question of the extent and distribution of the edges analyzed. At the first occupations of the cave, 36 edges were recognized. The 50 per cent of these edges ($n = 18$) corresponds to double end-scrapers, followed by higher percentages of natural edges with complementary traces ($n = 4$, 25 per cent).

The frontal edges had an average length close to 29 mm and less acute angles (72°) than those located in lateral sectors of the pieces with longer (36 mm) and sharper edges (53°).

However, the angles were mostly acute (less than 60°), showing a trend of less acute angles at the earliest moments of occupation, where several edges were considered exhausted due to high degree of retouch (above 85°) (Table 3).

Moreover, in the assemblage 1, the mainly rocks used for the manufacture of these exhausted scrapers were mainly local raw materials such as petrified wood and silicified ignimbrite (ISG1). But in the case of ISG1, is from long-distance quarry (Cantera del Rojo) *c.* 11.59 km, while petrified wood from the secondary deposit LP-P1, located 4 km from the site.

TABLE 3. CENTRAL AND DISPERSION MEASURES OF THE EDGES IDENTIFIED THROUGHOUT THE SEQUENCE OF CUEVA MARIPE SITE

	Edge angles sizes			Edge angle < 80° $n = 27$			Edge angle > 80° $n = 7$		
	n	Mean	DS	Size (mm)	Mean	DS	Size (mm)	Mean	DS
Late Holocene	195	58	17.1	Length	23.8	8.2	Length	24.6	7.9
				Width	7.5	4.3	Width	7.1	3.3
				Thickness	6.2	4	Thickness	5.7	2.6
Mid-Holocene	193	59.3	16.8	Length	27.9	11.7	Length	27.94	8.27
				Width	5.2	2.2	Width	7.28	3.45
				Thickness	3.4	1.7	Thickness	5.53	3.75
Plesitocene–Holocene transition/early Holocene	36	61.9	18.7	Length	30	9.8	Length	39.1	21.9
				Width	5.1	1.5	Width	7.3	2.5
				Thickness	3.1	1.2	Thickness	3.7	1.1

Contrast to these first occupations, in the assemblage 2, the length of distal edges is smaller (26 mm) with slightly acute angles (59°). These artifacts present double or multiple edges, being natural edges with complementary traces the mostly represented ($n = 51$, 47 per cent).

With regard to the edge angles and the raw materials used, the end-scrapers made on silicified ignimbrites have greater angles variability, with higher percentages of acute angles (>60° to greater than 80°). However, it draws attention the presence of a single obsidian scraper (non-local raw material) which edge angle exceeded 90° and could indicate a preference in maintaining its edges.

In the assemblage 3, something similar to previous occupations is happening, where double-edged tools are the most represented, mostly natural edges with complementary traces ($n = 12$, 48 per cent) and double endscrapers ($n = 2$, 8 per cent).

In contrast to the assemblage 2, an increase of the obsidian use was recorded. However, these scrapers showed more acute edges than in mid-Holocene occupations. The variability of the edge angles on silicified ignimbrites scrapers and other silicified rocks ranging from <60° to >80°.

In summary, the endscrapers recovered at Cueva Maripe site were mainly acute angles; lower than 80°, being the most numerous those with angles smaller than 60°. This allowed argue that the end-scrapers would have been discarded while still having some potential utility (Table 4).

MICROWEAR AND DESIGN ANALYSIS

In the assemblage 1, a 32 per cent ($n = 12$) of the end-scrapers evidence use traces and a considerable number was affected by alterations ($n = 9$, 24 per cent).

The sedimentary abrasion is the most frequent alteration from these early occupations. However, it was registered one case of heat treatment and appears to have been exposed to direct fire (heat damage), due to discoloration and scaling of the surface.

Regarding the motions employed, an exclusively use for scraping was registered at these first occupations, with the exception of only one case used for cutting hard material undifferentiated. In this sense and joint to the similar results obtained from the rest of the sequence, reinforces the idea that was used a homogenous behavior in movement developed. Thereby on distal edges the used motions have exclusively been transversal, showing a clear correlation between the motions employed and the location of the active edge on the artifact. These data indicate that distal edges of the scrapers show a morpho-potential specialization in relation to the kind of motion executed. The continuous retouch on distal edges of the scrapers provides a high degree of fracture resistance on transversal motions, allowing increasing its effectiveness. In contrast, these retouches reduce the effectiveness of the active edge if other types of motions such as longitudinal or drilling are employed (Calvo *et al.* 2011; González and Ibáñez 1993; Ibáñez and González 1999; Moss 1983).

On the other hand, in the assemblage 1 most of the work identified was on hard material undifferentiated ($n = 4$, 50 per cent bone or wood), as in the rest of the sequence (Figure 4). However, soft materials were also used but in smaller proportions (hide or skins; $n = 2$, 25 per cent). The used edges on these activities, were more straight (69°) and long (49 mm) than those used on harder materials, with a length of 30 mm and acute angles (63°). Although these differences were not statistically significant ($U = 7.00$; $n = 11$; $P > .05$), different types of edges (sharp, rectilinear, or convex) would be related to a better penetration angle on the worked materials and as a remnant for the maintenance process due to the relative hardness of these materials (wood or bone). This would indicate that the edge morphologies are a selected variable in the manufacturing and use process of end-scrapers. In previous studies (Álvarez *et al.* 2000; Cattáneo and Aguerre 2009), the worked edges on soft materials increased their efficiency using more right angles, with convex and regular morphologies, as these edges do not have protrusions that could generate damage in the worked material.

On the other hand, in the assemblage 1 the distal edges worked on hard materials had normal retouched edges, except for one case normal retouch with spurs (Aschero 1975:27), while those used on soft materials have some variability (normal with spurs, scalloped, and irregular jagged edges). These characteristics, together with the underdevelopment of soft material traces and the presence of multiples retouches and microfractures, would allow assuming that these edges have been reactivated until the end of their use life.

TABLE 4. EDGE ANGLES REGISTERED AT THE COMPLETE SEQUENCE IN MARIPE CAVE SITE

Edge angles	At the assemblage 1	%	At the assemblage 2	%	At the assemblage 3	%
<60	20	54	90	47	91	46
60–64	3	8	19	10	29	15
65–69	1	3	25	13	21	11
70–74	1	3	17	9	23	12
75–79	5	13	20	10	10	5
80–84	3	8	13	7	13	7
85–89	3	8	7	3	6	3
>90	1	3	2	1	2	1
Total	37	100	193	100	195	100

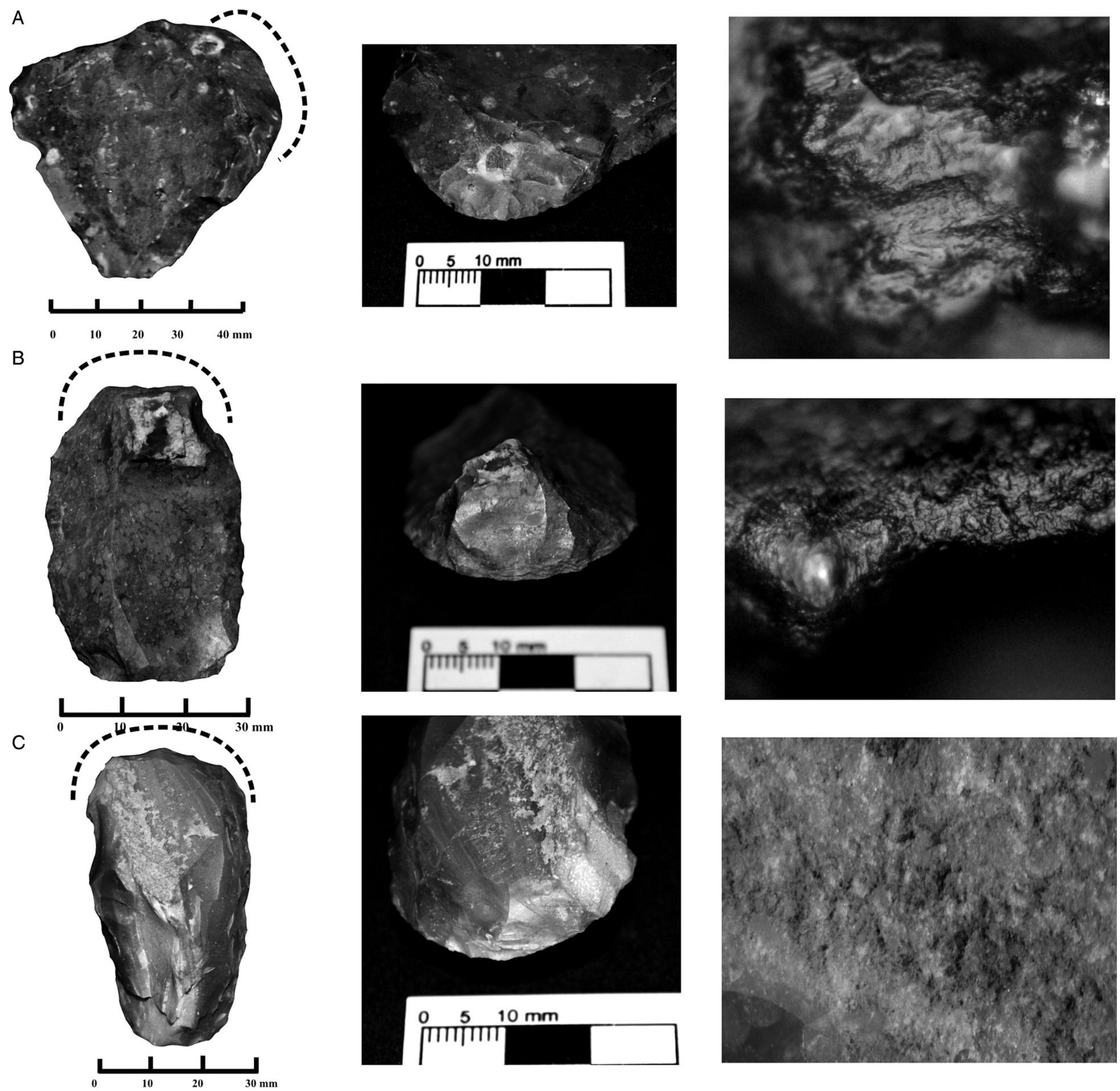


FIGURE 4. (a and b) Bone and hard material micropolishes (200×) on scraping motions. (c) Ventral surface of end-scraper with probably mineral or pigment residues (100×).

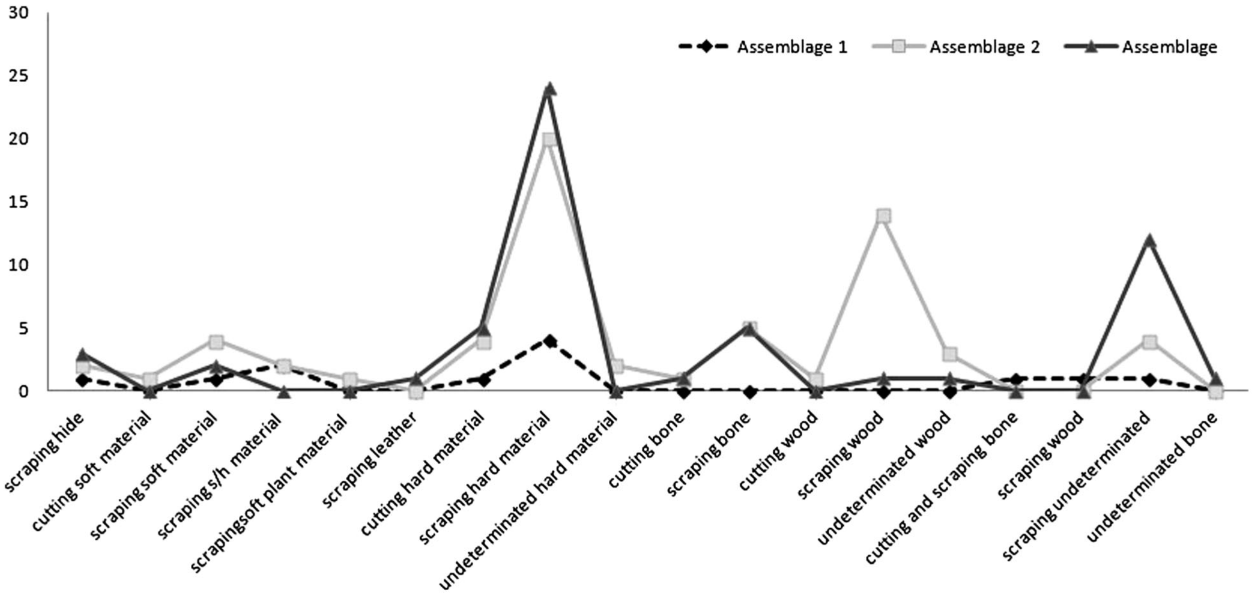


FIGURE 5. Worked materials and motions used in Cueva Maripe site.

The complementary edges, recorded a low percentage of use traces, however in some cases cutting activities on hard material undifferentiated and bone were identified.

Unlike these early occupations, in the assemblage 2 showed an increase of the end-scrapers number and on the variability of the activities carried out. The total number of the edges analyzed was 193, the 33 per cent ($n = 64$) has use traces and a considerable number could not be identified due to different degrees of alteration ($n = 62$, 32 per cent).

In the assemblage 2, the distal edges were used on hard material indeterminate ($n = 17$, 46 per cent) and unlike the assemblage 1, an increase on hard plant material (wood) in scraping motions ($n = 10$, 27 per cent) was recorded (Figure 5).

The work on other materials such as hide ($n = 6$, 16 per cent), grasses ($n = 1.3$ per cent), and bone ($n = 3$, 8 per cent) were less recorded. Significant differences relative to the work on hard materials between the length of used edges in different kinematics ($U = 7.00$; $P < .05$) as in the thickness ($U = 40.50$; $P \leq .05$) and used angle ($U = 6.00$; $P < .05$) were identified (Figure 6). Therefore, used edges on cutting motions were significantly longer (mean close to 55.5 mm), less thick

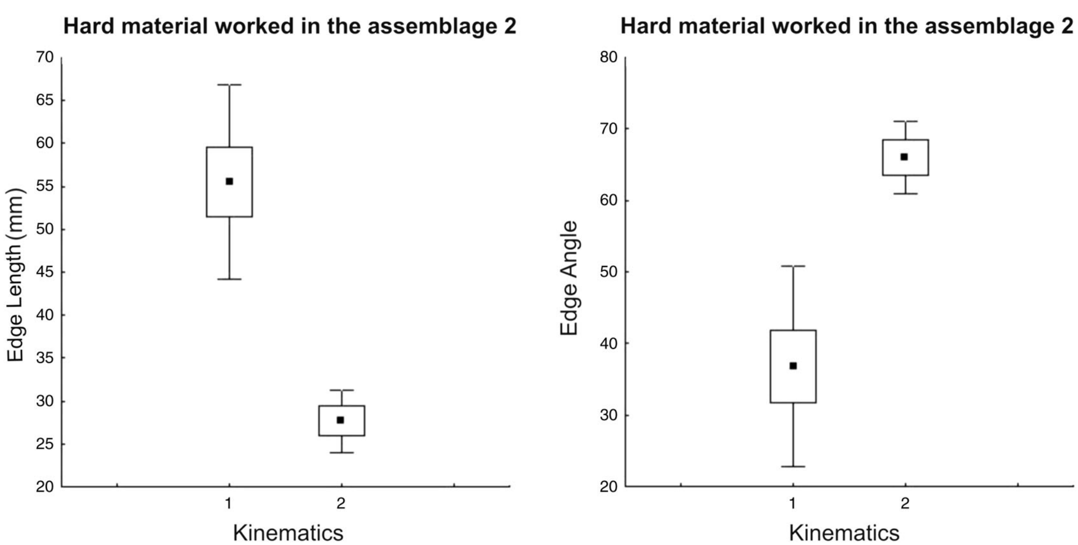


FIGURE 6. Significant differences registered at the assemblage 2 in work on hard material.

(2.6 mm), and with acuter angles than those employees on scraping motions.

In the assemblage 3 a total of 195 edges were registered, 59 edges recorded use traces (30 per cent), followed by not determined ($n = 64$, 33 per cent), not determined by alterations ($n = 67$, 34 per cent), and unused ($n = 5$, 3 per cent). The alteration degree identified was moderate to severe, as at the others assemblages. The sedimentary abrasion was the most frequent alteration but bright spots and heat treatment were also identified.

Regarding the worked materials on distal edges, a decrease on plant materials use was recorded (wood and gramineous) ($n = 2$, 6 per cent). However, the work on hard material undifferentiated ($n = 15$, 47 per cent) was registered on high percentages and not so highest on bone ($n = 3$, 10 per cent).

Activities on soft materials (hide or skin) were recorded but in smaller proportions and only on scraping motions ($n = 2$, 16 per cent; $n = 1$, 3 per cent, respectively). The complementary edges were mainly used on hard material undifferentiated ($n = 10$) and less proportions on bone ($n = 2$), hide ($n = 2$), and soft materials ($n = 3$). In the rest of the edges it was identified the kinematics (scraping or cutting motions) but not the worked materials.

No significant differences between the worked edges on soft and hard materials (on length, width, thickness, and edge angle) were identified. However, the end-scrapers used on hard material with different kinematics recorded some differences.

As at the assemblage 2, the used edges on cutting motions are located on lateral portions of the tool and showed significantly acuter angles (*c.* 49°) than those used for scraping on hard material (68°). Such differences could be caused by the exerted force on distal or medial portions of the tool on scraping motions, so straightest angles and a greater thickness in these sectors would avoid possible fractures and extend their use life (Figures 6 and 7).

On the other hand, no significant differences between the lengths of distal edges in scraping motions on different materials (hard and soft) and states were recorded. However, it was recognized that on hard materials were used a wider and thicker edges, than those used on soft materials. This could be caused by maintenance process and due to the exerted force used on this kind of material.

Discussion and Conclusions

In the early moments of Cueva Maripe occupations (assemblage 1) certain morphological variability on the scrapers was registered. Such differences can be seen in the metric variables of width and thickness of the sets analyzed. However, these differences would not be so marked and would reflect that there are clear limits on the sizes of these kinds of tools.

The variations identified were probably due to the blanks used in addition to the individual life stories of the artifacts considered. The end-scrapers recovered at the first occupations were exclusively manufactured on flakes while at later occupations were replaced by blades or laminar shapes on their production. This could be related to previous studies like those of Cardillo and Charlin (2009), since they determined certain morphological differences in the end-scrapers recovered in south of Patagonia, specifically in the Pali Aike volcanic field during late Holocene, dominated by more elongated forms than those recovered from Norpatagonia, mainly in San Matías gulf at the Rio Negro coast (Cardillo and Charlin 2009).

On the other hand, in the assemblages 1 and 2 no significant differences between fractured and complete artifacts were identified. This might be indicating the production of intentional fracture of certain blanks, absent at later occupations with a decrease on the tools sizes.

Regarding the raw materials used in the end-scrapers production, there is an increase on rocks variability towards the late Holocene occupations, registering raw materials of higher distance like obsidian, petrified wood and different varieties of chalcedony. The obsidian has an extra regional source and was introduced by anthropic action. So, it may be assumed that the possibility to obtain this kind of raw material would imply long-distance movements to exploit quarries or the procurement of very distant raw materials by exchange and its use would not only be determined by its function but also by social and symbolic factors, as the prestige (Hermo and Miotti 2011).

However, despite the availability of high quality rocks (Hermo and Lynch 2015; Magnin 2015), the main use of siliceous rocks as silicified ignimbrites and other siliceous varieties identified, would involve some selection of raw materials used in the manufacturing process of the end-scrapers, given their particular features (capable

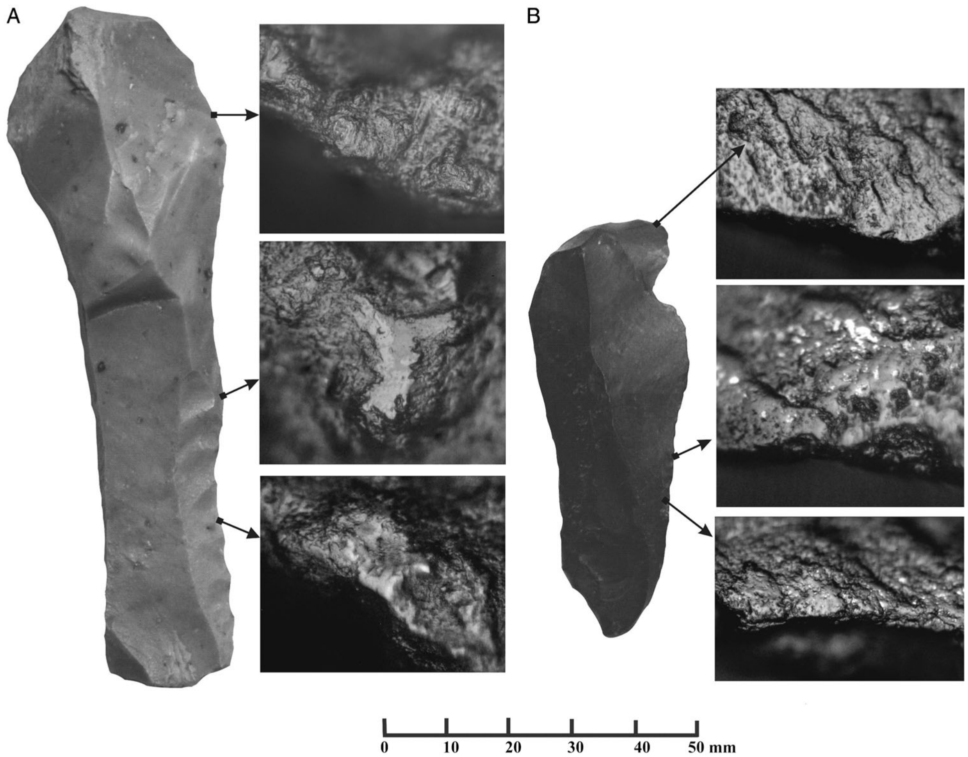


FIGURE 7. End-scrapers manufacturing on blades recovered at the assemblage 2 in Cueva Maripe site. (a) N°: MAD5-150. Hard material or bone micropolishes (200×) on scraping or cutting motions. (b) N°: MAD5-318. Wood micropolishes (200×) on scraping or cutting motions.

of generating edges with different morphologies) or due to their relative hardness, which would facilitate the work on different materials and states.

These qualities would be expressed in the uses for which these instruments were designed. Although several authors have recorded a functional association between the end-scrapers and hide processing activities (Álvarez *et al.* 2000; Cattáneo and Aguerre 2009; Yacobaccio 1988), the results at Cueva Maripe are far from these arguments.

The wide variability of worked materials identified allows proposing that there is a low functional specialization on the scrapers recovered from this site. The differences would be mainly marked at the assemblage 2 in the middle Holocene occupations.

In these occupations there is an increased on different plant resources used from normal and scalloped convex edges morphologies and mostly on scraping motions. The activities related to wood processing possibly included debarking, scraping, and smoothing of this material.

As has been already noted in previous studies, it was recognized wood polishes on proximal portions of the end-scrapers which, added to the small-medium size of the artifacts observed and an intensive retouch of the edges, would suggest the use of hafts (Lynch and Hermo 2015).

Probably, the marked increase on wood work identified would be related to the manufacture of these elements or others perishable technologies used for hunter–gatherers societies. Miller's research (2014) remarked the importance of these kinds of materials, as textiles, ropes, and basketry that represent a major component of the toolkit of ethnographically known hunter–gatherers in North America. However, the possibility of identifying these kinds of materials at early archaeological records is difficult and depends on specific methodologies to infer their presence. Therefore in the study area of Patagonia, as in others nearby sites like the Río Pinturas area (CCP5 site), the high frequency of work on plant materials evidenced by the presence of hafts at the archaeological context or inferred by micro-wear analysis results, shows the importance of this resource in hunter–gatherer societies during the middle Holocene (Aschero *et al.* 1992–1993; Fermé *et al.* 2015; Lynch and Hermo 2015). In this sense, the vegetable resources at Cueva

Maripe would provide the raw material for the manufacture of different artifacts, that together with other materials used (skin, hide, bone, and gramineous) would have increased by then, allowing inferring that during the mid-Holocene, hunter–gatherer societies define an internal structure of the spaces in the basecamps, with different activity areas (Miotti *et al*. 2014).

Similarly at later occupations, there is an increase of end-scrapers used on bone material, these might be related to prey processing and consumption activities (guanacos complemented by reidos), as in the bone tools production (i.e., retouches or punches) (Marchionni 2013; Miotti and Marchionni 2014).

In conclusion, the main differences identified in the end-scrapers morphology recovered at the entire sequence of Cueva Maripe site, are related to the base shapes selected in their production and on their retouched edges used. Despite this, the design of these tools presents some degree of standardization and the final morphology depends on certain kind of potentially effective edges to achieve the objective desired. This mean that the edge potential is priority above the edge morphology wherein are configured (Hayden 1979; Kelly 2000; Shott 1995). These particular features provide a temporal and spatial continuity that would be reflected on the production of these instruments at different archaeological contexts of Southern Patagonia.

Acknowledgements

We would like to thank the neighbors and authorities of Pico Truncado and members of the research team who were part of the field crew. This work was possible thanks to CONICET postdoctoral scholarships, as well as UNLP 665 and PICT 0176 grants.

Notes

[1]Unifacial tool with marginal retouches on distal, proximal or both edges; with convex morphology (Shott 1995).

[2]Imposing a shape on certain raw material is a conscious work on which certain technical procedures are chosen. Those morpho-functional traits that enable more efficient mode action are prioritized over another (Aschero 1992).

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