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Distinctive Unifacial Technology during the Early Holocene in Southern South America

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Abstract

The early Holocene archaeological record in Northwest Santa Cruz province in southern Argentina is remarkable in its richness. Among the lithic remains, most notable is a stemless triangular projectile point dating to ~8.5 - 10 uncalibrated kya. As part of a long term program directed to explore and understand diverse aspects of lithic technologies from Patagonia, this paper reports new observations on a set of notable unifacial tools existing in the assemblage accompanying them. Based on archaeological and experimental data we hypothesize they were produced from thick flake-blanks with one face totally or partially covered by flake scars sometimes reaching the longitudinal symmetry axis. This fact suggests that before being finished, it was reduced by detaching flakes from the edge to its center. This recent technological discovery allowed deepened on a new regional issue related with early Holocene unifacial tools that emerge as a peculiar style of covering unifacial flaking with subtle production differences to other similar implements. Together with the triangular points, this particular way of preforming the tool before and/or during the final shaping might be another distinctive manufacturing technique used by early Holocene hunter-gatherers in the area.

Keywords

Early Holocene, Lithic Technology, Unifacial Tools, Patagonia, South America

1. Introduction

Located in the Patagonian region in southern Argentine Republic, the Northwest of Santa Cruz province is a significant place in the history of the archaeology of the southern part of South America. There, an important record of huntergatherer occupations has been identified in several stratified and surface sites (e.g. Gradín et al., 1976, 1987). Since the early 1980s a long-term archaeological project has been underway in the studied area in particular (Aschero, 1981-82). Different kinds of evidence, mainly rock art, as well as faunal, botanical and lithic remains, have borne witness to the diverse topics related to the regional archaeological process (Aschero et al., 1992, 1992-93, 1996a, 1996b, 2005, 2007; Castro et al., 2012; De Nigris, 2004; Fugassa et al., 2005, 2006, 2010; Martínez Tosto et al., 2012, 2016; Sacchi et al., 2016). One of the most important focuses on this research has been lithic studies, mainly from a morpho-technological perspective (e.g. Civalero, 1995, 1999, 2000, 2009, 2016; Civalero & Aschero, 2003; Civalero & Franco, 2003; Civalero & De Nigris, 2005; Civalero et al., 2007).

As part of a long term research program directed to explore and understand diverse aspects on lithic technologies from the Americas in general and Patagonia in particular, a set of unifacial tools were the subject of observational and experimental replicative studies (e.g. Nami, 2010, among many others). Hence, this paper reports the preliminary results on a specific technique of stone tool manufacture identified in the lithic assemblage used by early Holocene hunter-gatherers from southern Patagonia.

2. Provenance of the Artifacts.

The examined specimens come from three sites (**Figure 1**). Cerro Casa de Piedra (47˚57'S, 72˚05'W) is a volcanic rhyolitic hill with several rock shelters facing northwards. It is situated in the transition ecotone of a deciduous wood and bushy steppe in the Lake Burmeister and Roble River valleys in Perito Moreno National Park (**Figure 1**). One of the main sites, the Cerro Casa de Piedra 7 (CCP7) cave, has a sedimentary deposit ~2 m deep spanning the Pleistocene-Holocene transition to the Late Holocene. The stratigraphic section shows 19 natural layers deposited on the cave´s bedrock. Following the retreat of the local glaciers at the end of the Pleistocene, dung and bone recovered from layer 19 shows that at ~10.6 kya, it was a refuge for extinct and extant fauna (the milodontidae family and *Lama guanicoe*). Furthermore, the archaeological remains show a long sequence of human occupation spanning 10.6 and 3.4 kya (Aschero et al., 2007), as well as a very short occupation at 1.9 kya (Civalero et al., 2006-07). The lower layers (14 to 18) at CCP7 yielded evidence of diverse topics related to hunter-gatherers living there during the initial Holocene at ~7.8 - 9.6 uncalibrated kya (Civalero, 2009; Civalero & Aschero, 2003; Civalero & Franco, 2003; Civalero & De Nigris, 2005), or ~8.5 - 11.4 calibrated kya (**Table 1**).

The Milodón Norte 1 cave (CMN1, S 47˚18'22.4" 71˚53'55.9"W) is currently situated ~2 km east of Lake Pueyrredón. However, at the time of human occupation, it was located close to the shore of an ancient paleolake (Horta & Aschero, 2010; Horta et al., 2011, 2013; Sacchi et al., 2016). The deposit yielded vestiges of hunter-gatherers who inhabited the area up to 7.9 uncalibrated kya. Below a tephra layer deposited by one of the Hudson volcano eruptions at ~6.8 uncalibrated kya (Stern pers. comm. 2008), the lower stratigraphic layers (7 and 8)

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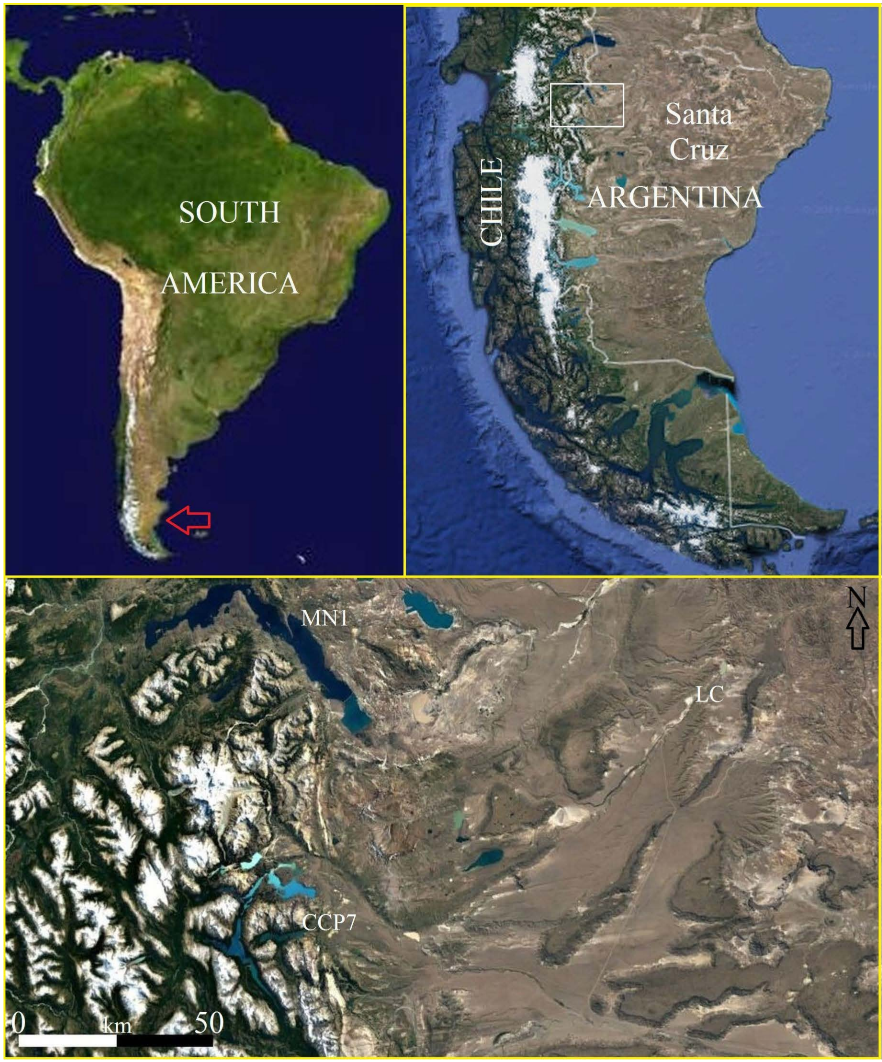

Figure 1. Map of South America and the location of Santa Cruz province and XII region in Argentina and Chile, respectively, in southern Patagonia. The Cerro Casa de Piedra 7 (CCP7), Mylodon cave north 1 (MN1) and Laguna de los Cisnes (LC) sites in Northwest Santa Cruz province, shown as a rectangle (after Google Maps, 2016).

contain the remains of the initial regional occupation. Among them, there are two remarkably large unifacial tools (**Figure 2(l)**) that were recovered very close to one another at the bottom of and below a large inclined rock without any contextual relationship. Due to its location, material rarity, and lack of and/or scarce use, this find was considered to be a cache (Sacchi et al., 2016). Radiocarbon assays obtained from the layers containing the remains of the initial occupations of CCP7 and CMN1 are shown in **Table 1**. They were corrected with the Oxcal 4.2.4 calibration program (Bronk Ramsey & Lee, 2013) employing the ShCal13 curve for the southern hemisphere (Hogg et al., 2013).

Playa Cisnes 2 (PC2, 47˚30'20.8'' S, 70˚34'27.3''W) is located in a steppe environment; it is an open-air site situated on the northwest beach of the endorheic Los Cisnes lagoon. Surface and partially buried lithic finds exposed along 30 m showed a significant morphological variation, suggesting a palimpsest of arti-

Table 1. List of uncalibrated and calibrated radiocarbon dates from the CMN1 and CCP7 sites.

Site	Layer	Material	^{14}C age yr BP	Cal age ranges (yr BP)	Laboratory number	Reference
CMN1	8	Charcoal	7790 ± 30	8595 - 8436 (95.4%)	UGAMS 4020	Sacchi et al., 2016
"	7(2)	"	7982 ± 45	8990 - 8632 (95.4%)	AA101222	"
CCP7	14	"	8460 ± 400	10,418 - 8429 (95.4%)	UGA 7382	
"	15	Twigs	9730 ± 100	11,256 - 10,726 (95.4%)	Beta 59925	Civalero & Aschero, 2003
"	16	Wood	8920 ± 200	10,438 - 9525 (94.5%) 10,490 - 10,459 (0.9%)	UGA 7383	"
"	17	Charcoal	9100 ± 150	10586 - 9700 (95.4%)	LP 364	"
"	17	Wood	9640 ± 190	11,406 - 10,371 (94.0 %) 10,357 - 10,299 (0.9 %) 11,593 - 11,566 (0.4 %) 11,466 - 11,459 (0.1 %)	UGA 7384	"
"	17(3)	Bone	9390 ± 40	10,697 - 10,480 (88.7 %) 10,469 - 10,426 (6.7 %)	UGA 9987	Civalero & De Nigris, 2005
"	17(3)	Extinct herbivore dung	10,620 ± 40	12,657 - 12,513 (69.3 %) 12,499 - 12,434 (26.1 %)	UGA 9986	"
"	18(2)	"	10,530 ± 620	13,712 - 10,561 (95.4 %)	UGA 7385	Civalero & Aschero, 2003
"	19	*Lama guanicoe* bone	10,690 ± 72	12,715 - 12,540 (81.7 %) 12,496 - 12,435 (11.7 %) 12,531 - 12,515 (2.0 %)	UGA 873	Aschero et al., 2007

facts of different ages. However, by the finding diagnostic tool (**Figures 2(h)-(i)**), a significant number of finds were attributed to the initial Early Holocene occupation (Civalero, 2016).

3. Morphological and Technological Observations

As seen above, the archaeological record of the early Holocene human occupations in this area is remarkable in its richness. Besides the rock art (Aschero, 1981-82, 1996a), it has diverse wood, bone, and stone tool remains (Civalero, 2000, 2009, 2016; Scheinsohn, 2010; Caruso & Civalero, 2014; Caruso et al., 2015). Among the latter, there is a distinctive stemless triangular projectile point with straight or slightly convex borders and bases (**Figures 2(a)-(j)**) made mainly from obsidian from the Pampa del Asador source and heat-treated chert (Civalero, 1999; Espinosa & Goñi, 1999; Stern, 1999). Formerly identified in the Fell and Pali Aike caves as "period III" at the southern tip of Patagonia (Bird 1946, 1960), its earliest use in Northwest Santa Cruz was consistently dated at ~9 - 10 kya (Gradín et al., 1987; Civalero, 2000; Cattáneo, 2006; among others). Different from points, and produced from diverse materials (obsidian, chert, basalt, among others) the assemblage accompanying them include unifacial implements characterized by their morphological and dimensional variability (Gradín et al., 1976; Aguerre, 1979), and display a wide degree of resharpening (Dibble, 1995, Baena Preysler & Carrión Santafé, 2010). From a production viewpoint, many were simply made by short retouches on thin flake-blanks less

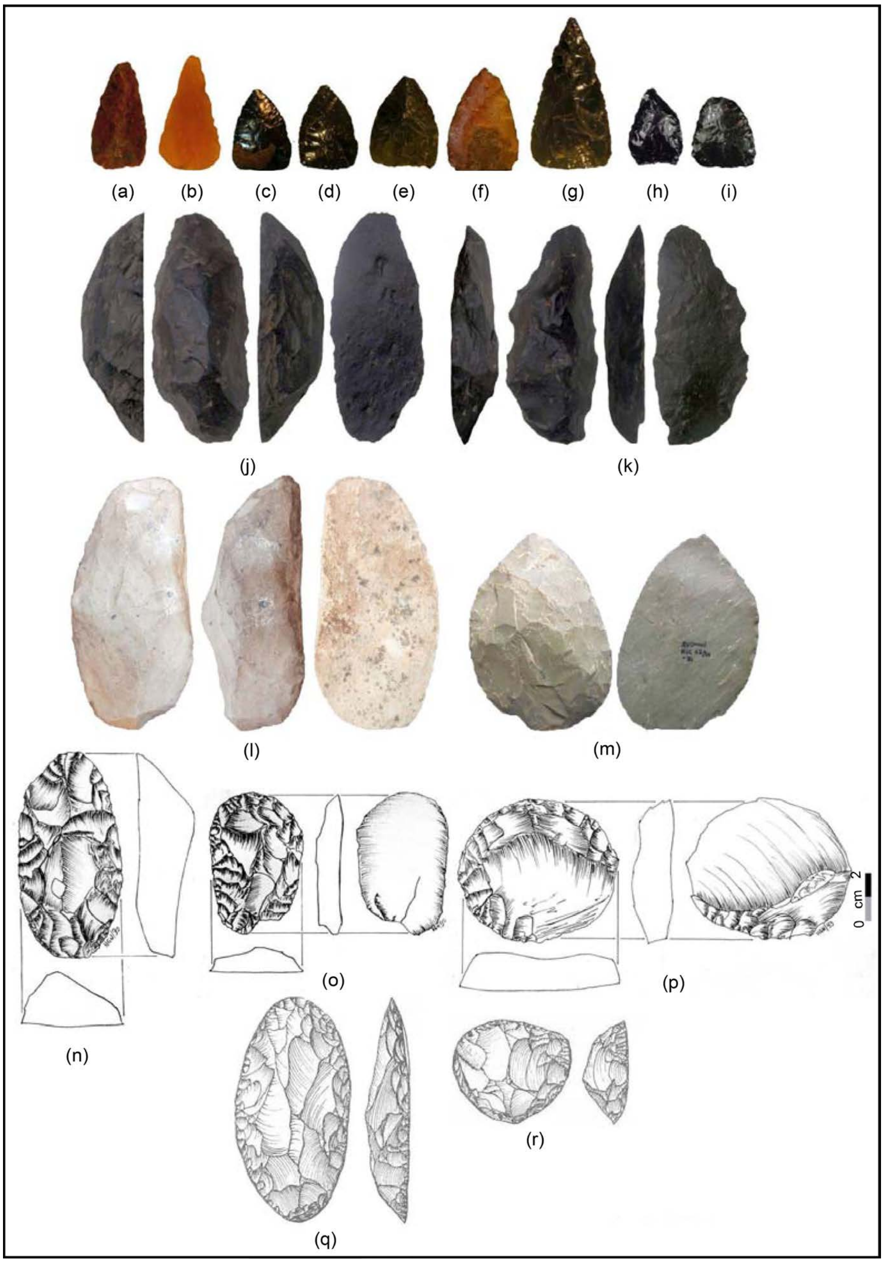

Figure 2. Early Holocene projectile points from (a-i) and unifacial tools (j)-(r). CCP7 layers 12 (a)-(e), 14 (f), 18 (g), PC2 (h) (i); (j) (k) CCP7 layers 14 and 18; (l) CMN1; (m) Alero del Valle; (n)-(p) Cueva del Medio; (q) (r) Unused and extremely resharpened scrapers from Ethiopia (after Clark, 1981: Figure 3(a) Figure 3(b)).

than 12 mm thick. However, at the above sites others were produced from blanks thicker than those previously mentioned (e.g. Civalero & Franco, 2003, Civalero, 2016). Besides the flake-blanks clearly detached by direct percussion, a significant number display attributes that indicate bipolar flaking (Nami, 2000). This was used to reduce exhausted percussion cores, discarded tools used as bipolar cores, and obsidian nodules probably coming from Pampa del Asador, located ~50 km from CCP7. A notable fact about this group of unifacial tools is that one blank's surface is totally or partially covered by flake scars that sometimes reach the longitudinal symmetry axis. This phenomenon suggests that before finishing them with short retouches, the face was reduced by detaching flakes from the edge to its center (**Figures 2(j)-(p)**). Different to large flake-scars resulting from shaping the working edge of a thick unifacial tool, such as scraper planes (Gradín et al., 1987: Figure 4 Figure 5), experimental research in progress has led to the hypothesis that this kind of flaking is a particular way of preforming a tool before and/or during the shaping (**Figure 3 Figure 4**, Nami & Civalero, 2016). In fact, when flake-blanks are not obtained from prepared cores (e.g. Nami, 2006, 2015: Figure 7), most ordinary hard-hammer flakes have some blunt or irregular edges (Whittaker, 1994: p. 31); then, as in bifacial reduction on a large thick flake—as observed in **Figures 3-5** the initial shaping must be done with the purpose of preparing an edge where one is absent, otherwise it is too sharp or low-angled for further chipping (Callahan, 1979: p. 67). Sometimes, like

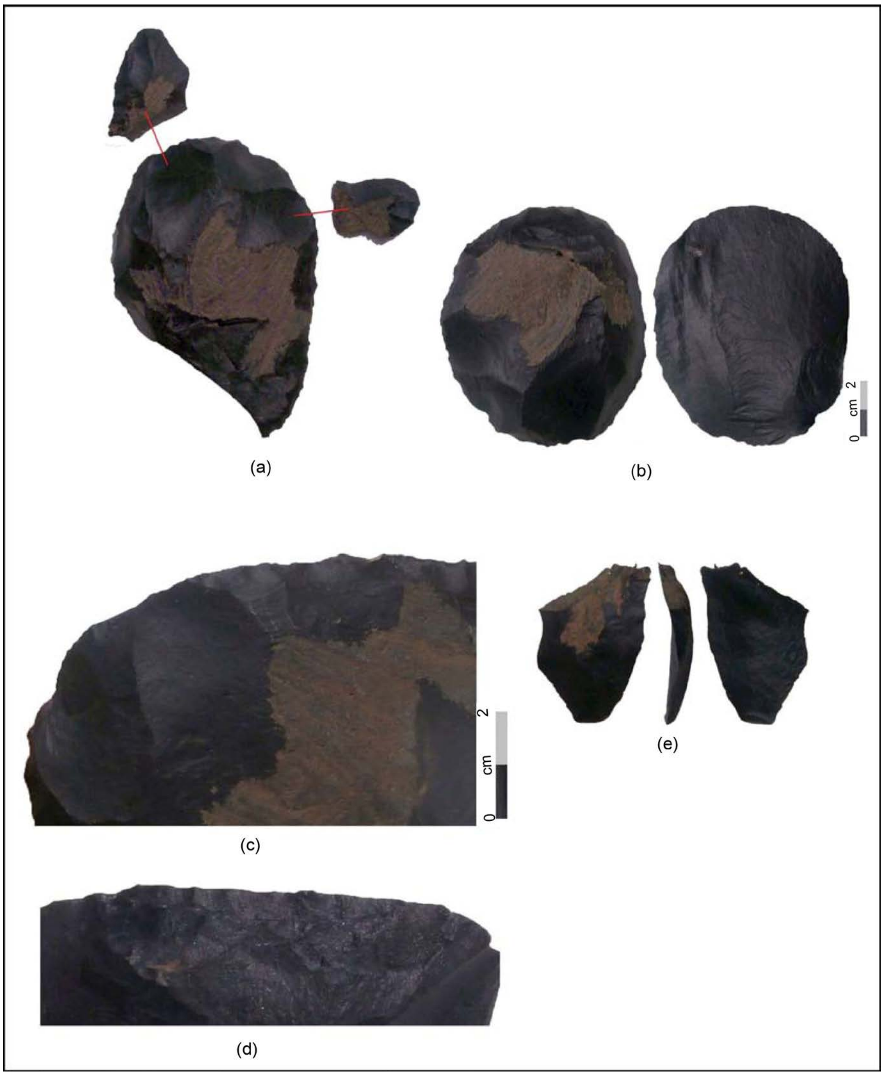

Figure 3. (a) Flake-scars and flakes detached by soft antler percussion flaking; (b) finished circular scraper with partial unifacial reduction, (c) (d) close-up of flake-scars obtained by soft (c) and hard (d) percussion flaking; (e) example of debitage obtained with an antler billet.

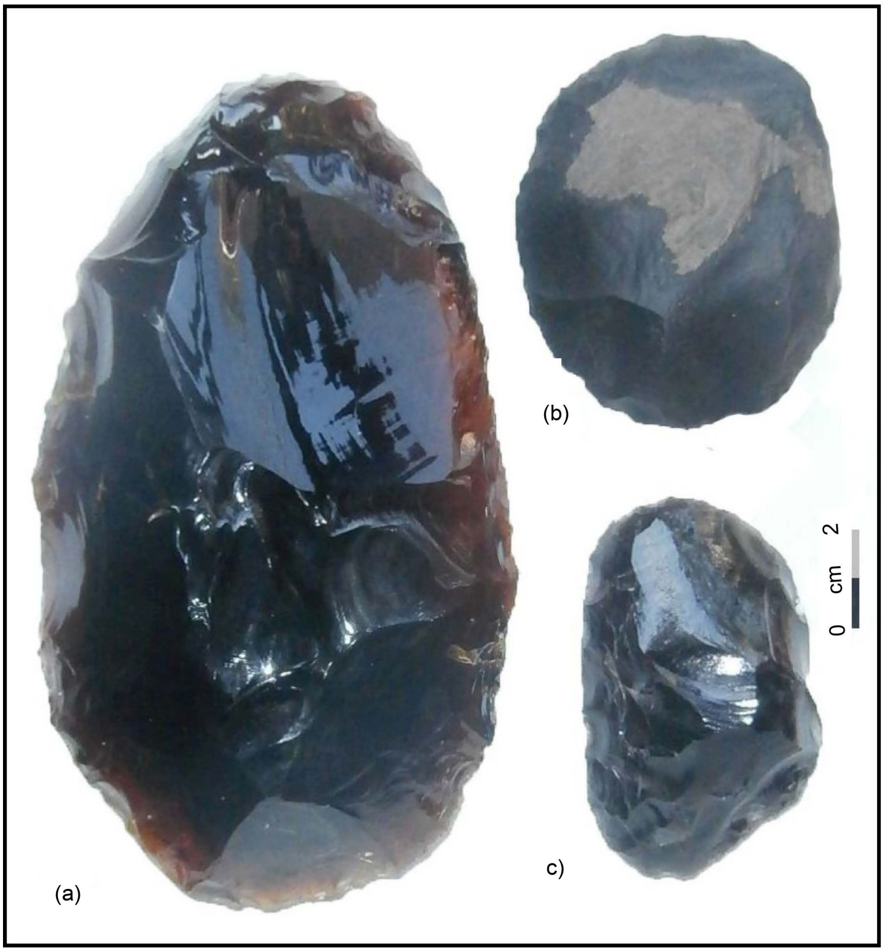

Figure 4. Examples of experimental specimens made with the technical features discussed in this paper. a) large side-scraper made on a partial bifacially reduced blank by soft percussion; (b) (c) unifacial tools flaked by hard and soft percussion flaking. Materials: (a) industrial glass; (b) dacite from Paso Limay, Río Negro, Argentina; (c) Obsidian, Maule lagoon, Chile.

standard unifacial tools (Whittaker 1994: 116-118, Figure 6.35), this step may produce edges useful for cutting or scraping (**Figure 5(b)**). However, after that, with the aim of forming a uniform face, before and/or during the final shaping, unifacial and/or partial bifacial reduction is performed using soft or hard percussion according to the material (**Figure 3 Figure 4**, **Figure 5(c)**). Lastly, the final shaping is done by regularizing the desired edge either by soft or hard percussion flaking. In nutshell, before and/or during retouching the functional edge, the dorsal face of the flake-blank was partially or totally reduced by detaching covering flakes from the edge to its midpoint (**Figure 5(d)**, Nami & Civalero, 2016). It is worth mentioning that in comparison with lithic tools of more complex production such as bifacials, in general unifacial implements show a simpler manufacturing technique. However, despite their apparent simplicity, published as well personal observations on a significant number of Patagonian end- and side-scrapers suggest that since the terminal Pleistocene to Late Holocene they exhibit diverse manufacturing strategies, and hence technological

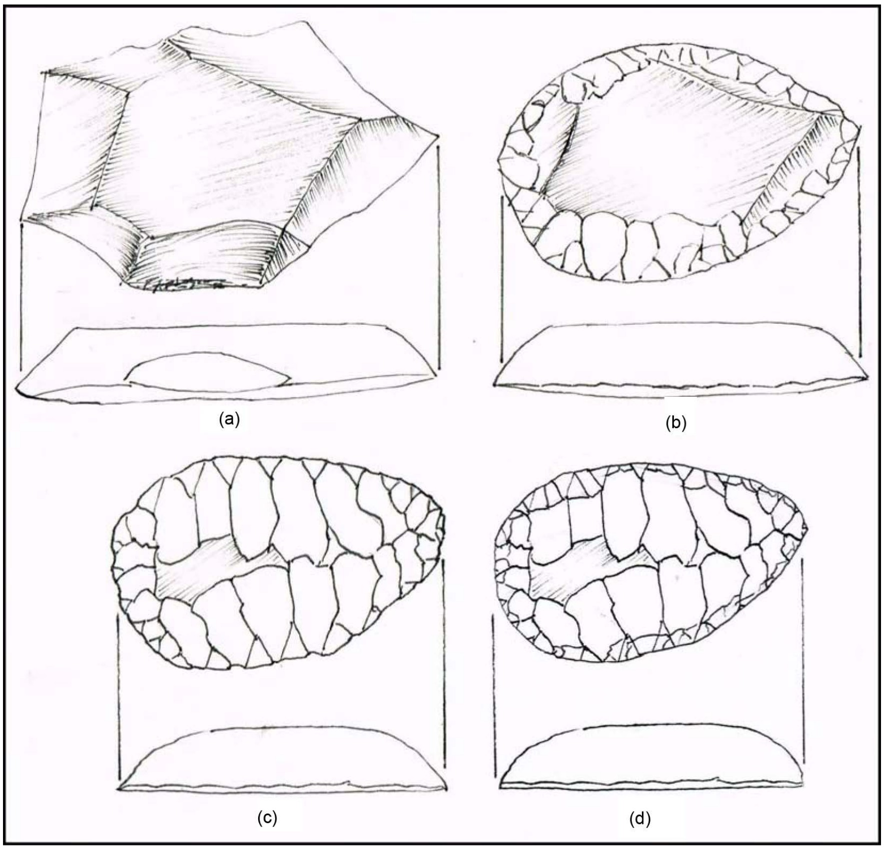

Figure 5. Schematic idealized reduction sequence of the discussed unifacial tools. (a) Flake-blank; (b) rought out or initial shaping; (c) unifacial reduction; (d) final shaping.

differences. For example, there are other reduction sequences made from flakes obtained from prepared cores (Nami, 1997, 1999: Figure 4(a)), previously bifacially reduced blanks (Nami several pers. obs.; see Aguerre, 2003: Figure 8 Figure 9), or blades and thin laminar flakes with one or two arrises (Gradín et al., 1987: Figure 22, Figure 25-27; Gradín & Aguerre, 1994: Figure 3; Onetto, 1994). These variations might be considered stylistic (Sackett, 1982; Reedy & Reedy, 1994; Nami, 1997-98). In fact, scraper production and manufacturing style (Weedman Arthur, 2008: p. 83) are issues that may be considered in our case (Civalero, 2016). We think that the particular way of making the tools reported here represents a particular type of technological knowledge (Schiffer & Skibo, 1987) mainly related to its fabrication method during the early Holocene.

In light of the aforementioned facts, it was possible to identify unifacial tools with a similar manufacturing method from other sites in southern Patagonia. In the Pali Aike volcanic region in the Chico River basin, a tool with remarkable unifacial covering flaking was exhumed from the lower levels of the Alero del Valle rockshelter (**Figure 2(m)**, Nami, 2009). Moreover, in Fell's cave there is a specimen with these features in the layer 8, associated with triangular points and dated at 6485 ± 115 and 6560 ± 115 uncalibrated radiocarbon years (Bird, 1988: Figure 76, middle row right). Cueva del Medio in southern Chile yielded similar points both on the surface and in the stratigraphy (Nami, 1987). Interestingly, some unifacial implements from the surface show technological similarities to those found at the sites reported above (**Figure 2(n)-(p)**).

4. Concluding Remarks

Recent discoveries and observations on a set of early Holocene unifacial tools from southern Patagonia allowed deepened on a new regional technological issue. Characterized by a uniform unifacial flaked face made before and/or during the final shaping, the described artifacts emerge as a peculiar style of covering unifacial flaking with subtle production differences to other similar tools. Curiously, a resembling unifacial reduction was still in use for making certain hide-scrapers in Ethiopia during the twentieth century (Gallagher, 1977; Clark, 1981; Clark & Kurashina, 1981; Weedman Arthur, 2008). Ethno-archaeological research has revealed that during the first steps of manufacture, which were carried out in a quarry, the initial unifacial shaping was done intentionally to achieve the desired thickness and to reduce weight during transportation to the place of habitation (Gallagher, 1977: 408). Interestingly, Clark (1981: Figure 3) reported a notable unused scraper resembling certain Patagonian pieces (**Figure 2(q)**). Worth mentioning that, in other areas of South America there are pieces that might be manufactured in a similar way. Actually, from the comparative lithic technology viewpoint (Nami, 1997), similar unifacial tools were employed in different part of the world. A few examples from South America come from Arroyo Seco 2 site, Buenos Aires, Argentina (Fidalgo et al., 1986: Figure 7a-b, 10a-c), and Piauí, Brazil (Pagli et al., 2016: Figure 10: 5, 11: 2, 4); Interestingly, northwest of the continent in Colombia and Ecuador, some of the so-called "plane-convex scrapers" (López Castaño, 1999: Plate 10, Figure 11-12; Bell, 1965: Figure 23(a) Figure 23(b)) or "tortoise scrapers" (Temme, 1982: 153: 1, 157) might be cited.

Finally, noteworthy that in the socio-cultural process of the southern part of South America, following the widespread use of "fishtail" or "Fell" points during the last millennium of the Pleistocene (Flegenheimer et al., 2013; Nami, 2014), in the early Holocene technological diversification can be witnessed in the employment of diverse kinds of lithic assemblages (Bueno et al., 2013; Hoguin, 2014; Lourdeau et al., 2014; Escudero et al., 2016). In Patagonia, stemless triangular projectile points have been widely used (Bird, 1988; Gradín et al., 1987; Crivelli Montero et al., 1993, Nami, 1999; Aguerre, 2003; Durán et al., 2003; Cattáneo, 2006; among others). Remarkably, their distribution extends to other areas north of this region (Restifo & Hoguin, 2012; Cortegoso, 2014; Escola, 2014; Nami, 2014; Patané Aráoz & Restifo, 2016). In Northwest Santa Cruz province in Southern Patagonia in particular, in addition to triangular armature tips the aforementioned unifacial tools might become another regional distinctive artifact used by early Holocene hunter-gatherers.

Ongoing research on more archaeological and experimental specimens will provide new and complementary information to understand unknown technological topics on unifacial reduction strategies in South America.

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