Lithic raw material procurement for projectiles points in the prehistory of Uruguay

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Abstract:

This paper focuses on current research on early colonisation of the Atlantic coast of South America during the early Holocene. We present advances in the investigation of raw material procurement at the *Rincón de los Indios* site, located in the eastern part of Uruguay. The technological studies suggest that some aspects of different styles of projectile points are related with environmental adaptation processes, experienced by the first American people in the New World. The occupation of new spaces and new forms of exploitation of resources changes the organisation of lithic technology. The distance to good quality rocks were critical for the opportunities and economic organisation of hunting groups. The study of changes in lithic procurement strategies for projectile points helps us develop a more comprehensive knowledge of this important social adaptation process which occurred during this period. These patterns started to become stabilised in the latter part of the early Holocene across the extended territory and confirm the efficient land occupation associated an intensive hunter-gatherer economies.

Keywords: Uruguay; early Holocene; lithic procurement strategies; projectiles points

1. Introduction

The Atlantic coast of South America was inhabited by hunter-gatherer societies during the Pleistocene-Holocene transition (Miotti 2006). In Uruguay is represented by site Urupez II in Maldonado coast (Meneghin 2006). These groups were contemporary with mega-fauna mammals which they eventually hunted, and produced a single type of projectile point called a "fishtail point" (ca. 10,700-10,200 B.P.) (Prates et al. 2013). Early human dispersal episodes along the Atlantic coast were related to the evolution of the biomes of the Atlantic Forest and Pampa, and were also associated with extended lowlands (Dias 2011; López Mazz 2013). During that period new projectile point styles adapted to new faunal and environmental conditions emerged (López Mazz 2013). During the Holocene (ca. 9,000-6,500 B.P.) lithic technology shows stabilised technological patterns for projectile points. Femenías & Iriarte (2000) described four types of projectile points to the Holocene in different region of Uruguay according a metric variable, shapes and stem bases (i.e., Yaguanesa, Zapucay, Paso del Puerto

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and Yaguarí styles). This paper describes and analyses the set of projectile points recovered during research at Rincón de los Indios archaeological sites (López Mazz 2001, 2013) (see Table 1). The databases permit the identification of procurement strategies and know the preference resources of lithic raw material used by the ancient people in the region. This information allow us to discuss about social mobility and economic organisation of post-Pleistocene hunter-gatherer groups.

1.1. Landscape and human settlements

Uruguay situated mostly along the border between temperate and sub-tropical zones (30-35º S to 58-54 W) (Figure 1). The Uruguayan landscape shares environmental characteristics with its neighbours, Brazil and Argentina - extended fluvial plains and lowlands (*bañados*), grassy plains (*pampas*), hills (*sierras*), lagoons, and marine coast.

The radiocarbon database for early human occupation distinguishes two different and large areas (López Mazz 2013). The first one is on the North side of the Uruguay River Basin, ca. 10,900 Pay Paso site (Suarez 2009), close to the tropical lowlands of Matto Grosso. The second large area is the Atlantic Ocean and La Plata River, ca. 11,600 Urupez II site (Meneghin 2006), with an extended border of grass plains, lowlands, lagoons and marine influence. As explained in the following paragraphs, better social and economic possibilities for human life took place during the Early Holocene in both regions.

Before approximately 10,000 B.P, there was a narrow river called the Paleo Paraná (Ayup 2006; Bracco et al. 2011) where the La Plata River is today. The Paleo Paraná flowed into the Atlantic Ocean by an ancient delta-shaped drainage, close to the marine platform.

The Pleistocene-Holocene transition was dominated by changes in the climatic conditions with an increase in temperature of 3 or 4 ºC , larger and more developed alluvial plains, lagoons and lowlands landscapes. The post-Pleistocene environmental landscape was composed of a mosaic of ecological zones, affected by latitude, topography and marine influence; with expanded lowlands and seasonal forest (Leal & Lorscheitter 2007).

The rising of the sea levels began around 17,500 B.P., starting at ca. 120 m below sea level, and reaching and submerging the coastal plains around 6,000 B.P (Ayup 2006; Bracco et al. 2011). This event produced more restrictions on the lands available for settlement and submerged early archaeological sites. Research on the lowlands landscapes of *India Muerta* (Iriarte 2006) shows vegetation and climate changes since 14,810 B.P. For the La Plata River (Cavalotto & Violante 2004) research has identified sea level fluctuations with the development of marshes and flooded environments. The ecological structure of the Pleistocene-Holocene landscape influenced the economic organisation and social mobility of the hunter-gatherers. We believe that the colonisation of the north, centre and east of Uruguay, was highly influenced by the dynamic of the border between the Atlantic Forest and the Pampa Biome.

The formation, development and expansion of the Atlantic Forest Biome began during the Pleistocene-Holocene transition, stimulated by an increase in humid and warm conditions. This Atlantic Forest was limited at the end of the Pleistocene to the bottoms of the valleys (Leal & Lorscheitter 2007). Between ca. 12,300 and 9,800 B.P., the Atlantic Forest expanded to the South, and arrived ca. 7,000 to 4,000 B.P. at the Río Grande plateau, with the coast line stabilising around 3000 B.P. (Días 2011:359). The Atlantic Forest was one of the most bio diverse forests with tropical species, associated with seasonal communities. This forest was connected through open spaces to ecosystem strongly influenced by fluvial and maritime dynamics extended (IBGE 1986). At the border between Uruguay and Brazil a palm forest (*Butia capitata*) associated with human land occupation extended since 8,400 B.P. and specially during the mound builder period ca. 5,000-2,000 B.P. (López Mazz 2001).

The first archaeological settlements of Uruguay and the south of Brazil took place around ca. 11,000 B.P. (Meneghin 2006, Suárez 2009) they correspond to hunter-gatherers camp sites with similar domestic discard pattern and seasonal occupation, which suggest high foraging mobility (López Mazz & Bracco 1994; Dias 2004, 2011; Suárez 2009; López Mazz 2013). These early settlements were situated close to important rivers and water bodies (in Uruguay - the La Plata and Negro Rivers, and the Negra Lagoon) (Guidon 1989; Hilbert 1991; Austral 1995; Suarez 2009; Nami 2013), throughout the rocky marine peninsula (Atlantic Coast) (López Mazz 2001 López Mazz et al. 2009, 2011) as well as on hilltops (e.g., Cerro Los Burros) (Meneghin 2004, 2006).

1.2. Rincón de Los Indios Archaeological site.

The Rincón de Los Indios archaeological site is situated in a strategic crossing place in an extended lowland landscape close to hills (Figure 1), and exhibits an intensive occupation between ca. 9000 B.P. and the 17th century. The archaeological sequence shows that the site was occupied by “mound builder” groups, since 4000 B.P. (López Mazz 2001) and in historic times by *Güenoa* or *Minuan* Indians (17th century) (López Mazz & Bracco 2010).

The information produced recently by excavation (25m^2) came from two dated (C14) hunter-gather occupation levels, with ages between 8,800 and 7,100 years B.P. (n= 6) (Table 1). The distribution of radiocarbon dates in the stratigraphy shows a first occupation level (SU 23/34) with two radiocarbon dates of 8,800 B.P. From the next occupation level (SU 6/15) there are three radiocarbon dates between 8,500 and 8,300 B.P. (see Figure 2), without not a sterile layers between them.

The both archaeological assemblage is composed of lithic material, produced during different stages of the lithic production system. There are also very fragmentary remains of bone, teeth, and samples of charcoal (López Mazz 2013). At this excavation a very compact occupation as an occupation soil, with a hearth structure, small post holes and other features was identified. Faunal remains recovered from cultural levels (8800 - 8300 B.P.) were composed of *ñandú coq* eggs (*Rhea americana*) *nutria* (*Myocastor coypus*) rodents teeth, fish sp. and cervidae sp. Burned palm fruit (*Butia capitata*) seeds were also recovered.

Previous analyses of the lithic material (López Mazz et al. 2011) suggest a procurement strategy organised around the exploitation of local (up to 15 km distance) white and transparent quartz. The procurement system includes regional (from 15 to 100 km distance) rhyolite and quartzite. Because of its quality for knapping projectile points, production was oriented towards the acquisition of extra-regional (more than 100 km) raw material such as agate, chert, chalcedony, jasper and other microcrystalline rocks (Figure 3) (López Mazz et al. 2011).

Table 1. Radiocarbon dates in year B.P. for the. Rincón de los Indios site.

Stratigraphic Unit (SU)	Date	Laboratory
SU 6/15	7,100±160	URU515
SU 6/15	7,220±840	AA99811
SU 6/15	8,384±63	AA1000363
SU 6/15	8,510±40	CURL6078
SU23/34	8,800±60	AA10298
SU23/34	8,809±56	AA99813

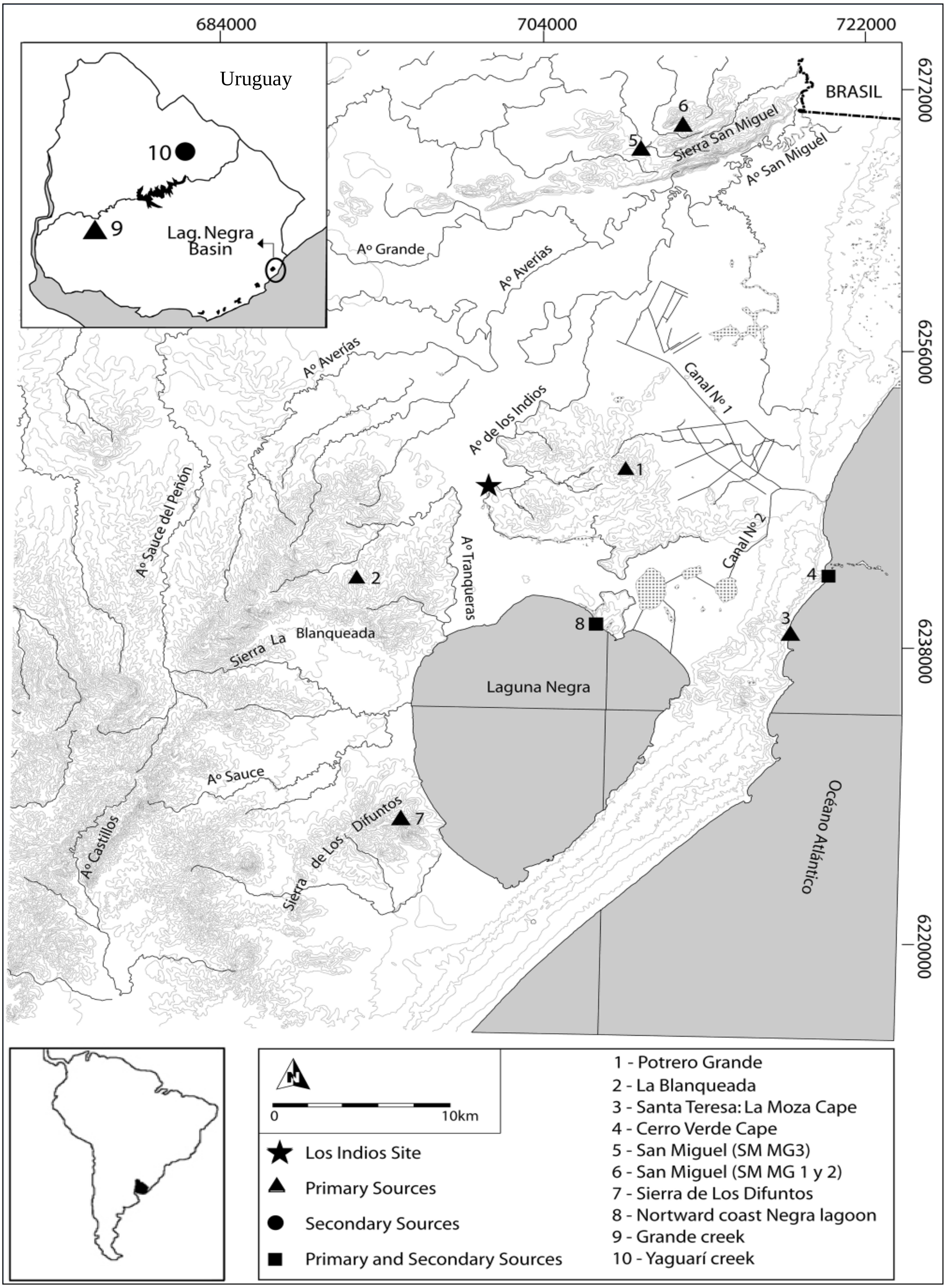

Figure 1. Rincón de los Indios archaeological site and raw materials quarries. (Modified from López Mazz et al. 2011).

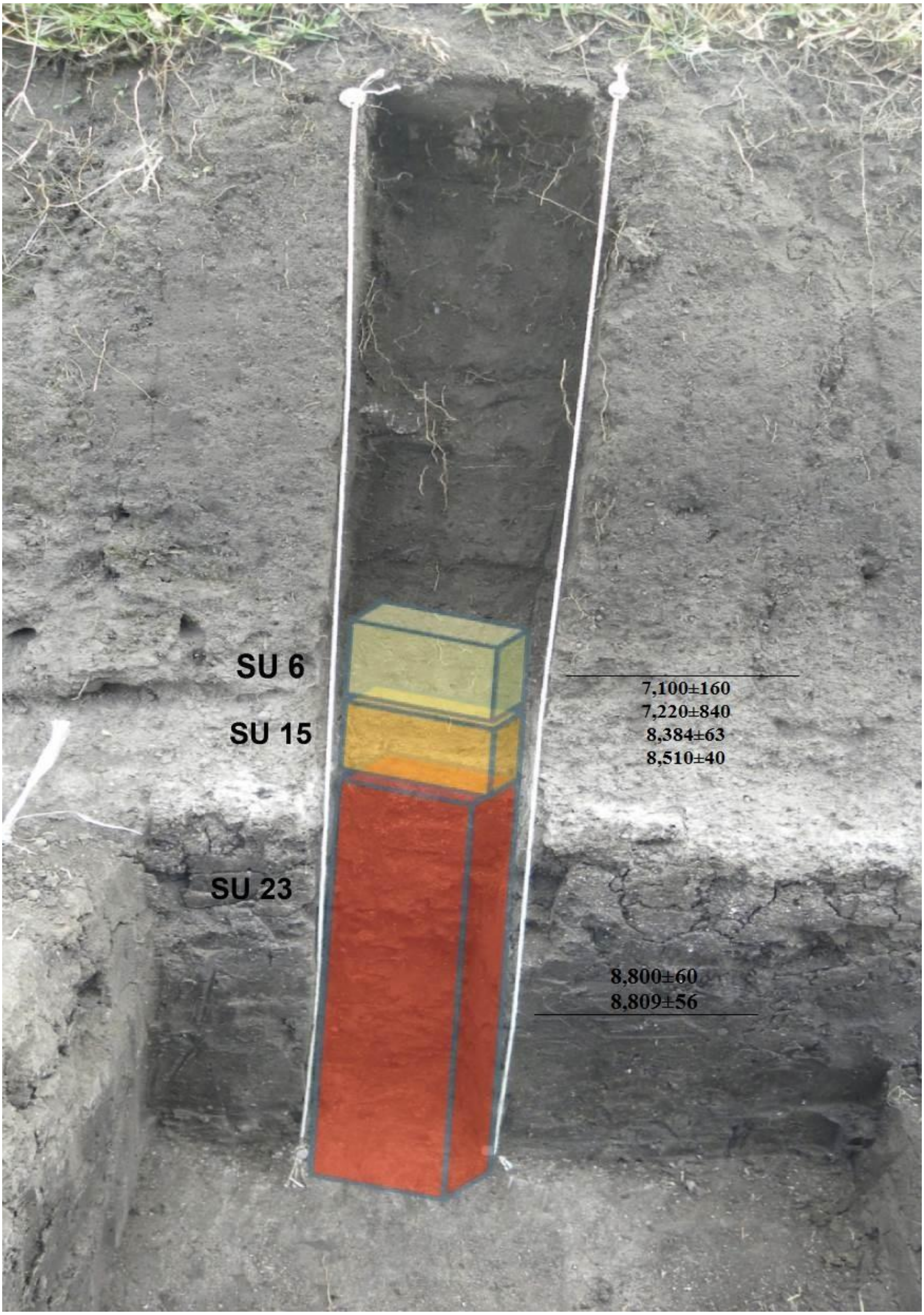

Figure 2. Profile with dated stratigraphic units.

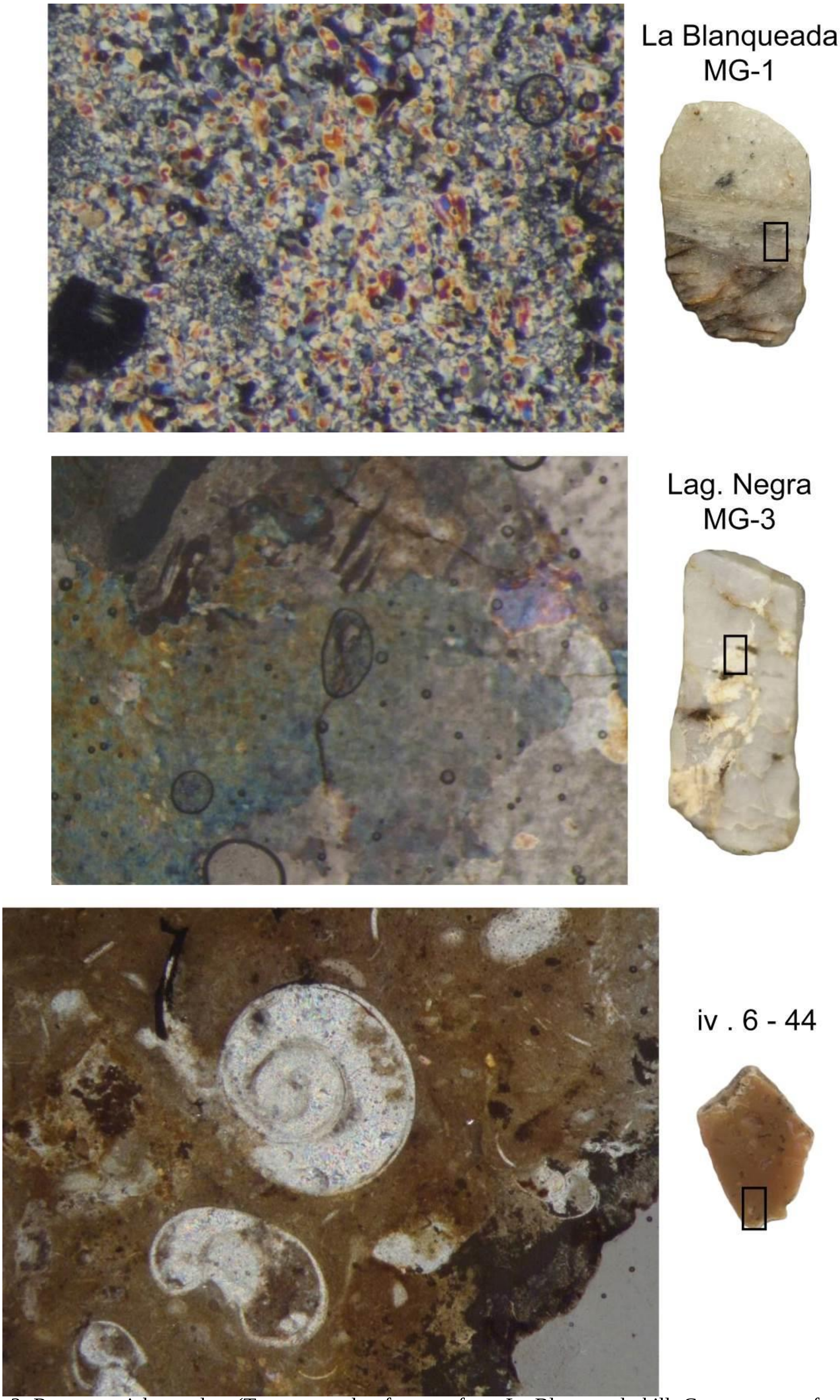

Figure 3. Raw material samples. (Top: a sample of quartz from La Blanqueada hill. Centre: quartz from Negra Lagoon. Bottom: archaeological chert) Scale x 100, cross-polarised light.

2. Methods

Our methodology includes a previous petrographic examination to characterize lithic resources recovered from *Rincón de Los Indios* archaeological site. This descriptive procedures and assign is based in this previous analyses (see: López Mazz et al. 2009, 2011) and include representative samples of most raw materials presents in the archaeological record in the prehistory of Uruguay. In the previous work were examined 19 thin sections of archaeological materials from the earliest level of the Rincón de Los Indios site, and 13 geological materials from quarries and potential quarries (see Figure 1) using a Leitz Wetzlar Laborlux 12 pol S model petrological microscope at 100-300X magnification (López et al 2011). The mineral identification criteria of Kerr (1965) and Mason's classification of metamorphic rocks (1990) were adhered to.

Samples of local raw material were collected in the nearby hills (La Blanqueada, Potrero Grande, De Los Difuntos, and San Miguel) and coastal headlands and gravels (northern coast of the Negra lagoon, the Atlantic coast, and the La Moza and Cerro Verde outcrops). One sample taken from an extra-regional archaeological quarry (see for details López Mazz et al. 2011). The archaeological samples were selected from among the most common (near 90%) flint-type lithic materials found at the Rincón de Los Indios site (i.e., quartzite and quartz).

On the other hand, we analysed the spatial distributions of the raw material characterize in this previous analysis. We looked for the distributions, distances and morphologies of the raw materials to explore evidence of variation in technology organization and economic systems. Finally, we applied comparative analyses of the assemblages from the earliest components (8,800 – 8,300 B.P.). Our focus stresses the formal variation and morphological aspects of the assemblages, to discuss general trends emerging from our analysis of this data set.

3. Results and discussion

Research over the last 20 years has produced a collection and database of new samples of lithic raw materials for hafted biface and unifaces. A database (N= 95) was produced from the Rincón de los Indios site (Figure 4). Raw materials used for production were quartzite (number= 30), chert (N= 22), quartz (= 19), opal (n=7), agate (n= 6), rhyolite (n= 5), fossil wood (n= 3), unidentified (n= 2) and quartzitic sandstone (n= 1). Raw materials confirm the economic strategy previously proposed (Gascue et al. 2009), based on a combined exploitation of extra-regional (chert, agate or chalcedony, opal) regional (quartzite; rhyolite) and local (quartz and quartzite) materials from outcrops or secondary sources (e.g., boulders) (López Mazz et al. 2009).

Archaeological samples from the end of the Pleistocene-Holocene transition and the Early Holocene come from the Los Indios site. Excavation at this site enabled the comparison between two different early occupations and produced a historic interpretation of human adaptation processes.

For both SU which were dated a great variety of raw materials in very similar percentages were recovered. Quartz and quartzite is the most representative. The results of lithic analyses from both SU's are very similar, and suggest that between 8800 and 8300 B.P. the procurement strategy and economic mobility were almost the same. The lithic procurement strategy and the tools produced (projectile points and scrapers) show a well-established production system, as Dias (2004, 2011) has suggested for the south of Brazil.

The lithic variability in the early cultural levels of the site, shows a great number of hafted bifaces in different stage of production, reshaping and discard (n= 39) (Figure 5). The hafted bifaces from SU 23/34 (n=20) were produced from quartzite (5), quartz (6); chert (4);

opal (3), agate (1) and rhyolite (1). For SU 6/15 (n= 19) they were produced from quartz (5); chert (5); quartzite (3); agate (3); and opal (2) and rhyolite (1).

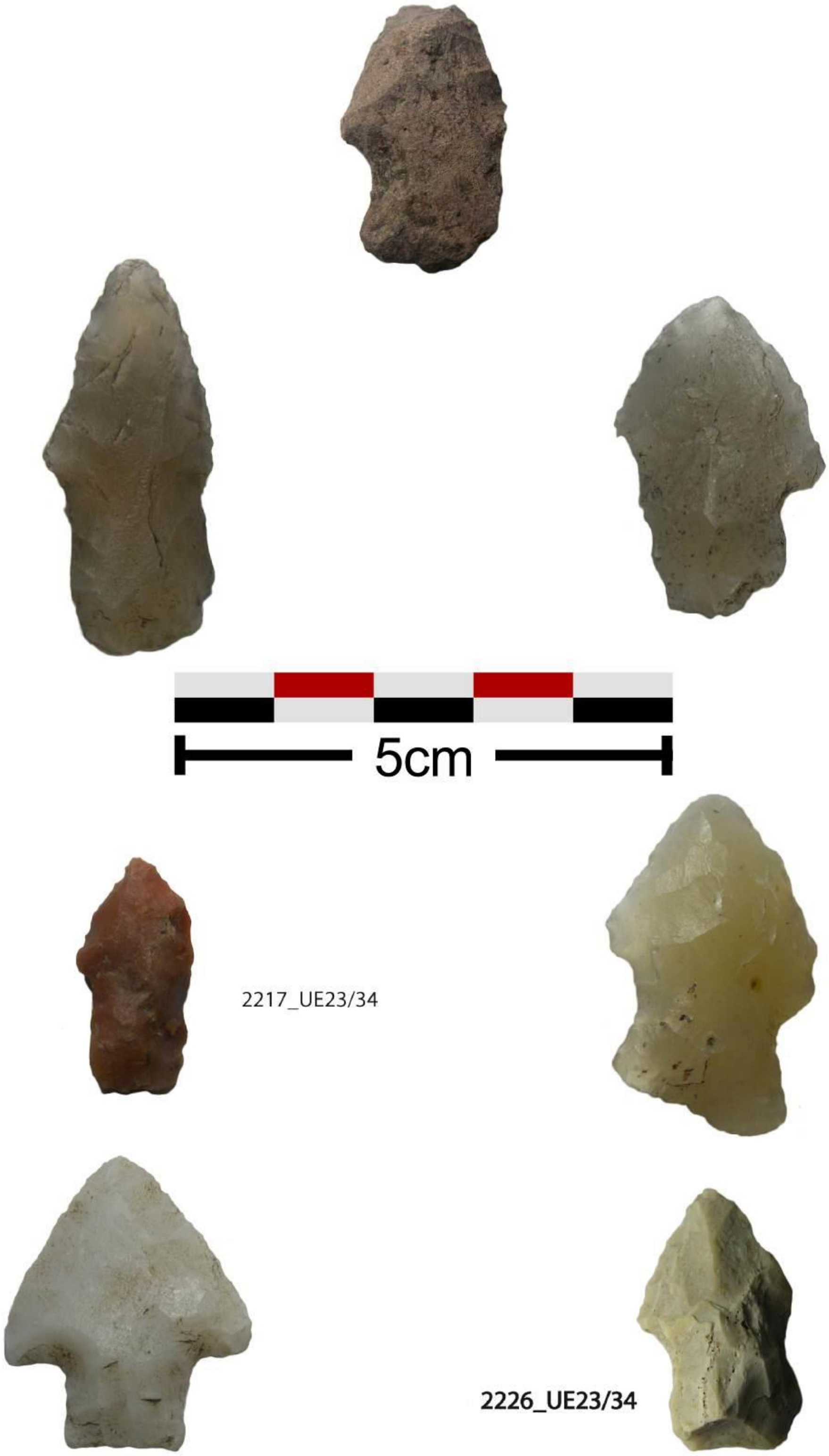

Figure 4. Hafted bifaces recovered from excavation.

From a technological perspective, in SU 23 there are three formal types of artefacts. Mostly all are projectile points with bifacial reduction (11/16) but only one was thinned by soft percussion flaking with patterned flake removal sequence. The rest of the sample has only marginal bifacial retouch. The projectile points are mostly fractured (n= 7). Only two stems were recovered and one of them has "fishtails" characteristics. The samples show evidence of maintenance and recycling among some of the scrapers and knives. Most of the projectile points are triangular, stemmed shapes with shoulders with a wide range of morphological and size differences. The evidence suggests that the quality and size of raw material available and the extended long usage history produce variability in forms.

The rest of the samples are two bifaces and a micro end-scraper from a unifacial flake with marginal retouch. Both bifaces are made from quartz. One of them presents bifacial retouch and is fractured in the final stage of manufacturing and the other one was abandoned in the first stages of manufacturing.

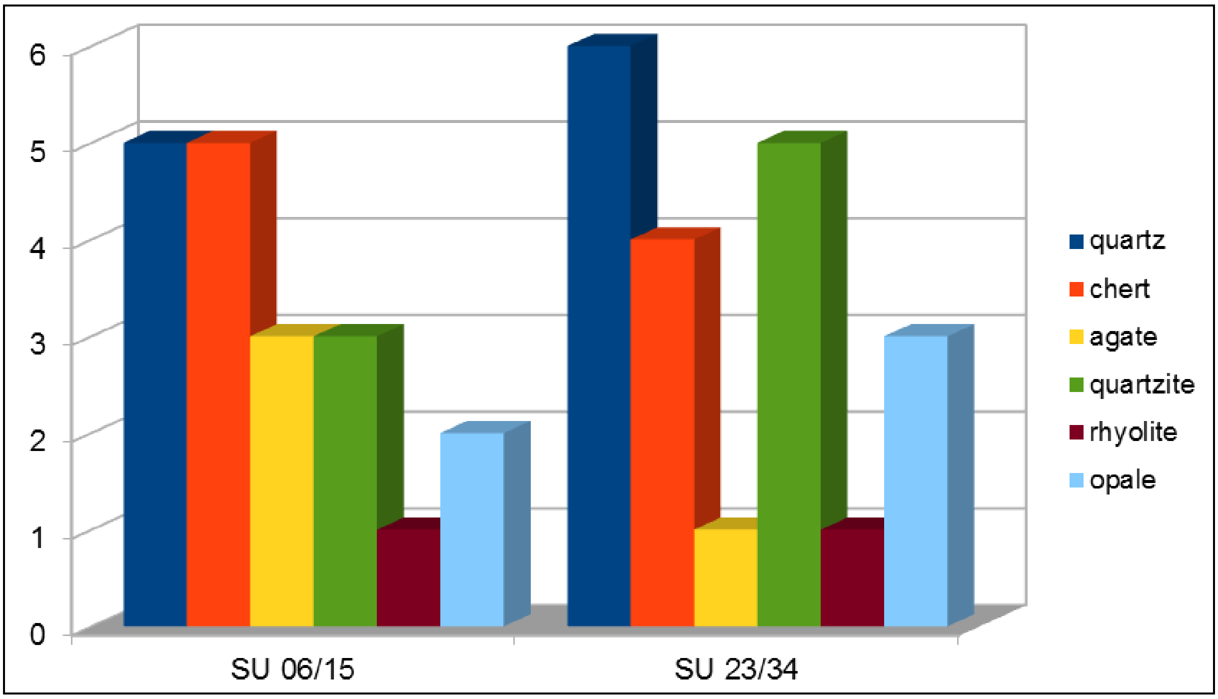

Figure 5. Raw material for each Stratigraphic Unit.

4. Conclusions

The technological analyses of the lithic artefact samples recovered from 2012-2013 at the VE excavation, support similar results previously reached (López Mazz et al. 2009; 2011; Gascue et al. 2009). In this sense, archaeological inference and interpretation on the strategy of lithic procurement can be reported with a more empirical basis (see: López Mazz et al. 2009, López Mazz & Gascue 2007). On the other hand, work hypothesis about economic organisations and social mobility require better conditions to be confirmed.

Lithic raw material procurement shows a post-Pleistocene adaptation process to a minor reduction in social mobility, oriented towards exploitation of the regional concentration of resources. In the Middle Holocene (Mound Builders Period), the best quality lithic resources came far from this lowlands territory in construction (López Mazz et al. 2009; Gascue et al. 2009; Iriarte & Marozzi 2009). More siliceous rocks will allow the production of well finished instruments and allowed a broad set of knapping tools, nevertheless projectile points (in different styles) were made from all the recorded raw materials. Projectile point has been adapted to available regional and local rocks, but there is a reduction of the possibilities to apply controlled forces in knapping. As in previous works (López Mazz et al. 2009; Gascue et al. 2009; Iriarte & Marozzi 2009) we observed that the quality of bifacial reduction and retouching became worse than the ones produced from good quality rocks. The bifacial technology started to lose quality.

Technological studies of projectile points suggest that some aspects of different styles are related with environmental adaptation processes, suffered by the first people in the New World. New environmental conditions (more forest and lowlands) could help to develop variability in projectile types. Other variable aspects are related with a life history and recycling processes of the projectile points, as shown in Fig. 4. The size, form and variety of metric dimensions of hafted bifaces are very sensitive in life history of a projectile point (Flenniken & Raymond 1986). However, the presence of arrow-sized points could be related with the introduction, dispersal of bow and arrow and replacement of the atlatl. The coexistence of the two weapons systems seems possible at the early Holocene. This aspect just has begun to be studied in the new regional database set recovered.

The presence of projectile points of different raw materials in both SUs could be related to new patterns of mobility, exchange and land use practices. The early cultural levels of the site (excavation VE - SU 23) indicate only a minor presence of projectile points from extra-regional sources. We hypothesize that replaced damaged projectile points were not brought back to the residence camp, instead, they are replaced with local raw material in the field. Those brought back to camp were resharpened and were used like scrapers or cutting tools.

The established patterns of projectile points since ca. 9000 B.P. across the extended territory (and interactive cultural sphere) from La Plata River to São Paulo State (Brazil) confirm the efficient land occupation. This shows an intensive hunter gatherer economy (Miller 1987; Schmitz 1987; López Mazz & Bracco 1994; Mentz Ribeiro 1991; López Mazz 2001; Juliani et al. 2011) is consistent with a progressively social complexity and new interaction cultural sphere (Días 2004, 2011).

A change in lithic procurement strategies for projectile points helps us to develop a more comprehensive knowledge of the singular social adaptation process. Changes in distance to good quality raw materials are critical for hunting options and for economic organisation could reflect new patterns of settlement and social mobility.

Moreover, the chronological sequence of projectile points has become a very useful methodological tool to classify different occupations in the post-Pleistocene by the Atlantic coast of South America.

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