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TAPHONOMIC ANALYSIS OF AN ASSEMBLAGE OF *LAMA GUANICOE* (ARTIODACTYLA, CAMELIDAE) FROM THE LATE HOLOCENE (PAMPEAN REGION, ARGENTINA)

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ABSTRACT: **The present work analyzes the taphonomic characteristics of an assemblage of *Lama guanicoe* recovered from the fluvial deposits of Chacra La Blanqueada Formation, at García del Río locality. This locality is situated in the middle valley of the Napostá Grande Creek (south of the Pampean Region, Buenos Aires Province, Argentina). A radiocarbon date of 2342 ± 47 years BP allows the assignment of this assemblage to the late Holocene. The MNI (Minimum Number of Individuals) and the population structure suggest the presence of a family group or part of a mixed group. The available evidence indicates that, throughout their taphonomic history, the remains were affected by processes related to a floodplain subenvironment. Also, the marks of anthropic activity suggest that the death of the animals was circumstantially used as a low-cost and low-risk resource, highlighting the relevant role of this species in the regional hunter-gatherer communities.**

INTRODUCTION

Lama guanicoe (guanaco) is a wild camelid characteristic of South America, with a complex social organization that includes mixed groups, family groups, male groups, female groups, and solitary individuals, related to reproduction, breeding, and migration among other social behaviors. The flexible social behavior and ecophysiological characteristics of this species allow it to adapt to different environments. Today, this species is distributed from the north of Peru to Tierra del Fuego Province in Argentina, mainly in the Andean mountain range.

In the Pampean Region (Argentina), particularly in Buenos Aires Province, the guanaco is presently restricted to relictual native populations distributed in the Sierras Australes ranges (Ventana and Curamalal), the Villarino district, and the islands of the Bahía Blanca estuary. However, in southwestern Buenos Aires Province, in the Sierras Australes ranges and surrounding plains, this species was abundant from the late Pleistocene to the late Holocene, as indicated by findings in numerous paleontological and archaeological sites (Fig. 1). Even in the twentieth century, around 1925, Mac Donagh (1949) noted that in the Curamalal ranges (Sierras Australes) these camelids formed large groups that included 30 or 40 individuals, with a total population of approximately 500 individuals.

Quaternary mammalian faunas of the Pampean Region, one of the most abundant and diverse in South America, are generally analyzed from a systematic and/or biochronostratigraphic perspective (e.g., Alberdi et al. 1995; Cione and Tonni 2005; and references therein). However, taphonomic studies on large mammals are scarce (e.g., Gutierrez and Kaufmann 2007; Kaufmann and Álvarez 2007; Pomi 2009; Tomassini et al. 2010). Most taphonomic work that includes remains of guanaco has been aimed at evaluating the modifications produced by anthropic activity (Borrero 1990a, 2001; Miotti and Salemme 1998; Mengoni Goñalons 1999).

Here, we analyze the taphonomic and paleoecological characteristics of an assemblage of *L. guanicoe* from the floodplain deposits of Chacra La Blanqueada Formation, at the García del Río locality, in the middle valley of Napostá Grande Creek (south of the Pampean Region, Argentina); a direct radiocarbon age for the bones of *L. guanicoe* allows the assignment of the assemblage to the late Holocene.

DEPOSITIONAL AND STRATIGRAPHIC SETTING

García del Río (38° 21′ 32.3″ S, 62° 9′ 10.7″ W) is located in the southwest of Buenos Aires Province (Pampean Region, Argentina), about 40 km from Bahía Blanca city, in the middle valley of Napostá Grande Creek (Fig. 1). The sequence analyzed is represented by cliffs exposed along several kilometers, with variable heights that reach approximately eight meters (Fig. 2). Stratigraphic correlations are based on previous studies by Grill (1995) and Deschamps (2003) in this locality.

The stratigraphic succession begins with 1.8 m of massive muddy siltstones, with colors that range from light brown (5YR 6/4) to yellowish brown (10YR 5/4). There is evidence of carbonate concretions and root traces are abundant. The muddy siltstones grade to 1.3 m of massive sandy siltstone with a grayish-brown color (5Y 3/2) overlying this deposit. It was possible to identify numerous root traces as well as *Biomphalaria peregrina* and *Succinea meridionalis* gastropod remains. These two levels correspond to the Middle Section and Upper Section of the Agua Blanca Sequence respectively.

Overlying an erosion surface at the top of Upper Section of the Agua Blanca Sequence is 1 m of siltstones and muddy siltstones with colors that range from light brown (5YR 6/4) to light gray (N7). This deposit is generally massive, although it is possible to distinguish fine diffuse and discontinuous lamination at the base. Root traces are common in the upper part. The vertebrates recovered were found in the middle part of the deposit and included numerous remains of *L. guanicoe* (Artiodactyla, Camelidae) and scarce material belonging to *Ctenomys* cf. *C. talarum* (Rodentia, Ctenomyidae), *Cavia aperea* (Rodentia, Caviidae), and

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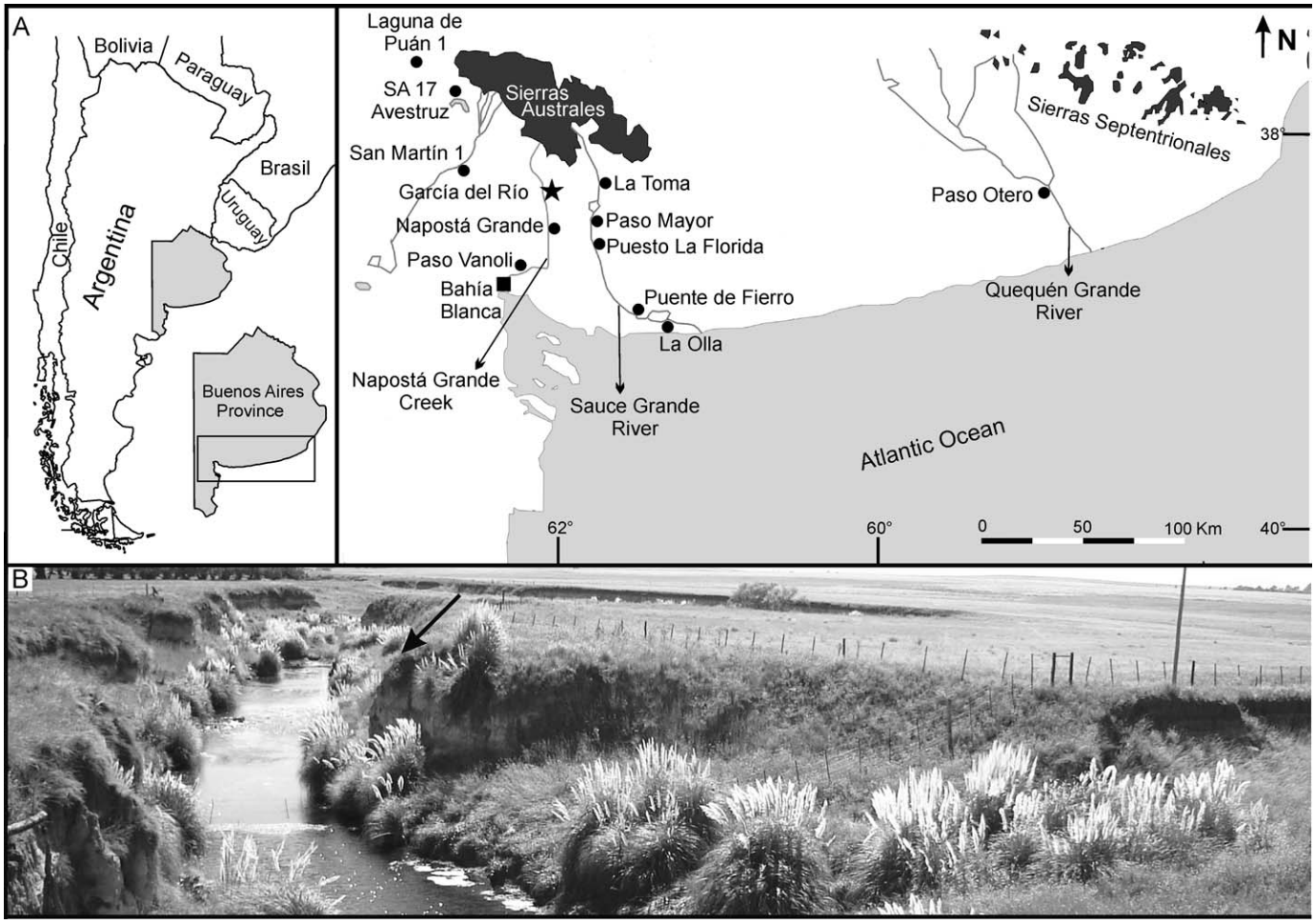

FIG. 1.—Location of study area. **A**) Map showing García del Río and other localities of the southwestern Pampean Region with *Lama guanicoe* records. **B**) Napostá Grande Creek at the García del Río locality. Arrow indicates the excavated site.

Chaetophractus villosus (Cingulata, Dasypodidae). This level corresponds to the Chacra La Blanqueada Formation.

The Chachra La Blanqueada Formation grades into 0.5 m of massive sandstone with a dark-gray color (N4). Root traces are abundant in the upper section. This level corresponds to the Matadero Saldungaray Formation.

The Chacra La Blanqueada Formation has been interpreted as floodplain deposits, originated from the settling of materials provided during flooding events, with the subsequent development of paleosols (Rabassa 1989; Zavala and Quattrocchio 2001). Palynological analysis shows an assemblage representative of an herbaceous psammophytic steppe, with scarce shrubby woodland elements, analogous to the pollen spectrum identified in current superficial samples from the western Pampean Region. This indicates arid to semiarid conditions (Grill 1995). Ostracodes indicate the presence of environments with fresh to slightly brackish water, shallow depth, and low energy and oxygenation (Martínez 2002).

Radiocarbon dates for Chacra La Blanqueada Formation were obtained in two localities situated in the valley of the Sauce Grande River, near García del Río (Fig. 1). Based on a palynological sample, Borromei (1995) assigned an age of 2830 ± 90 ^{14}C years BP for the base of this unit at Bajo San José locality; while based on peat and wood samples, Rabassa (1989) and Rabassa et al. (1991) mentioned variable ages between 1570 ± 45 and 900 ± 50 ^{14}C years BP at La Toma locality (Fig. 1). Considering these dates and the faunal assemblages, the Chacra La Blanqueada Formation has been assigned to late Holocene–historical times (Rabassa 1989; Deschamps 2003, 2005).

MATERIALS AND METHODS

Remains analyzed in the present work were recovered by one of the authors (CB) between 1999 and 2003. An area of 6 m^2 was excavated and divided into six 1-m grids. The excavation was performed using archaeological techniques, starting from the surface, down to a depth of 1.12 m. The specimens studied are deposited in the Área de Arqueología del Departamento de Humanidades de la Universidad Nacional del Sur (Bahía Blanca, Buenos Aires Province, Argentina), under the acronym GR II.

Radiocarbon dating was obtained using the Accelerator Mass Spectrometry (AMS) method, at the National Science Foundation-Arizona AMS Facility of the University of Arizona (Tucson, Arizona, United States). The sample selected was a right unciform of *L. guanicoe*, which was recovered at a depth of 0.92 m.

Taxonomic identifications were made based on comparisons with modern material from the Colección Osteológica del Área de Arqueología, Departamento de Humanidades, Universidad Nacional del Sur. The taphonomic study included the evaluation of different features.

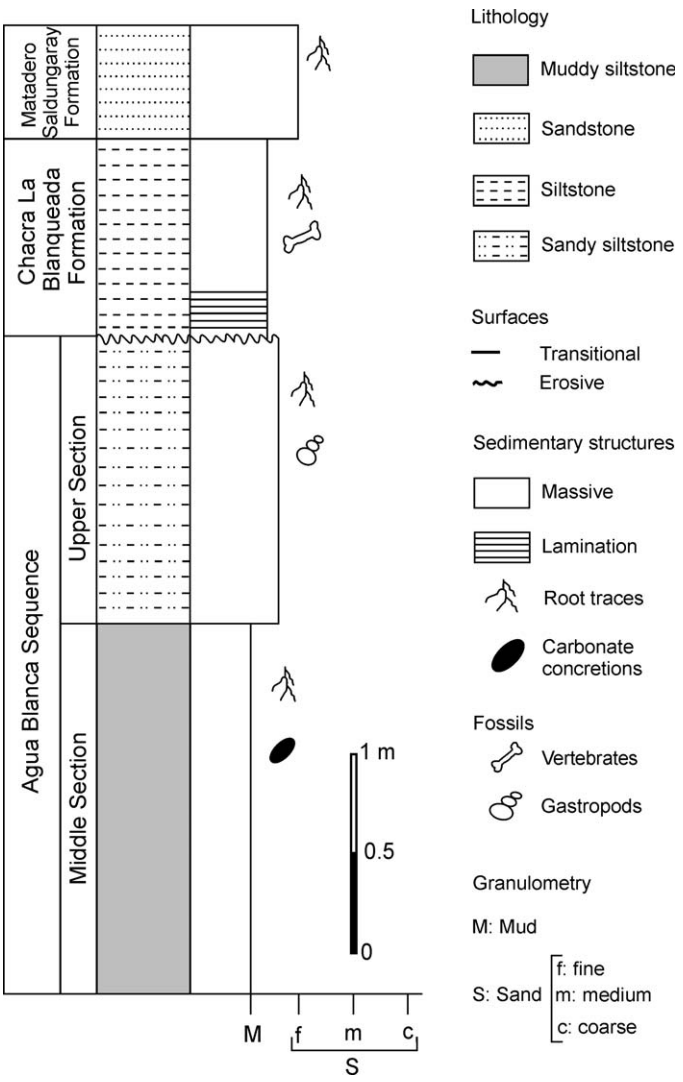

FIG. 2.—Stratigraphic section at the García del Río locality.

Taphonomic Features

Anatomic Representation.—This aspect was determined through different units of analysis. NISP (Number of Identified Specimens per Taxon), MNE (Minimum Number of Elements) and MNI (Minimum Number of Individuals) were calculated following Badgley (1986). MAU (Minimum Number of Anatomic Units) and %MAU were calculated following Klein and Cruz-Uribe (1984).

The analysis of hydrodynamic sorting followed the categories proposed by Kaufmann et al. (2011) for skeletal elements of *L. guanicoe*, according to their susceptibility to transport. Based on experiments performed in an artificial flume with slow flow velocities (15 and 30 cm/sec), using newborn, juvenile, and adult specimens, these authors defined three groups: group 1 = elements with high hydraulic-transport potential; group 2 = elements with variable behavior; group 3 = elements with low hydraulic-transport potential. However, the authors proposed a simplified differential transport model considering only groups 1 and 3.

For the present study, we considered only the remains assigned to adult individuals, given that this was the only category in which the number of skeletal elements found was representative.

Age of Individuals.—The age at the moment of death was estimated on the basis of dental characteristics, size, and degree of development and ossification of elements. The remains evaluated were grouped into different categories following the age classification proposed by Kaufmann (2009) for *L. guanicoe*: newborn (0–12 months old), juvenile/subadult (12–36 months old) and adult (more than 36 months old).

Sex of Individuals.—According to Kaufmann (2009) and Kaufmann and L'Heureux (2009), the sex of *L. guanicoe* individuals can be determined by the size and shape of the pelvis and the permanent canines recovered in isolation. The canine analyses include four measures: total length, root length, mesiodistal diameter, and buccolingual diameter. Since no pelves were found in García del Río, sex was determined using isolated canines.

Anthropic Activity.—This was analyzed based on the presence of modifications (e.g., butchering marks, burned bones) in the remains (e.g., Binford 1981; Shipman 1983).

Degree of Weathering.—This was evaluated following the six stages defined by Behrensmeyer (1978), on the basis of studies on modern mammal bones in Amboseli Park (Kenya). Stage 0 represents remains with no evidence of weathering, while stage 5 indicates an extreme degree of weathering.

Degree of Abrasion.—This was analyzed according to the three categories proposed by Alcalá (1994), where category 0 represents remains with intact surfaces, category 1 represents remains with rounded edges, and category 2 represents remains with polished external surfaces.

Degree and Type of Breakage.—The degree of breakage was evaluated based on whether the remains were complete or incomplete. The types of fracture were evaluated only for long bones, following the classification proposed by Marshall (1989).

Degree of Bioerosion.—This was assessed based on the presence of modifications caused by the mechanical action of other organisms (e.g., Lyman 1994; Behrensmeyer et al. 1989).

Skeletal Articulation.—This was evaluated according to the stages of articulation of skeletal elements proposed by Behrensmeyer (1991).

Spatial Density.—This was analyzed on the basis of the number of remains by surface unit (e.g., Behrensmeyer 1991).

RESULTS

Radiocarbon dating yielded an age of 2342 ± 47 (AA71655, $\delta^{13}C$ ‰: −18.6) years BP. NISP of the assemblage was 87, while MNE was 84. MNI was 5 and included three adult individuals, one juvenile/subadult, and one newborn (Table 1). The shape and size of the isolated canines led to the identification of a male and possibly a female among the adult individuals.

Most of the elements of the appendicular and axial skeleton were present. However, the MAU and %MAU values indicated some differences with respect to their degree of representation (Table 1). In this sense, the best-represented elements were axis, mandibles, radius-ulna, phalanges, and metapodials. Conversely, sternum, pelvis, patella, magnum, first tarsal, and caudal vertebrae were absent, while ribs, maxilla, and femur were some of the elements with low representation (Fig. 3).

The analysis of the remains identified as adult individuals allowed the recognition of the two groups proposed by Kaufmann et al. (2011)

TABLE 1.—*Representation of* Lama guanicoe *skeletal elements and indexes. Le. = left; Ri. = right; Nl. = nonidentifiable laterality; Ax. = Axial; Vert. = vertebra; Ext. = external; Lat. = lateral.*

	Newborn				Juvenile-Subadult				Adult				Indeterminate				Indexes				
Skeletal elements	Le.	Ri.	Nl.	Ax.	Le.	Ri.	Nl.	Ax.	Le.	Ri.	Nl.	Ax.	Le.	Ri.	Nl.	Ax.	NISP	MNE	MAU	%MAU	MNI
Canine												1					1	1	0.17	5.56	1
Incisor												2					2	2	0.33	11.11	1
Molar				1								2					3	3	0.19	6.25	1
Maxilla										1							1	1	0.5	16.67	1
Mandible						1			1	1							3	3	1.5	50	2
Skull												1					1	1	1	33.33	1
Atlas																1	1	1	1	33.33	1
Axis												3					3	3	3	100	3
Cervical vert.								1				1					2	2	0.4	13.33	2
Thoracic vert.								3				4				1	8	6	0.5	16.67	2
Lumbar vert.								1				1				1	3	3	0.43	14.28	2
Sacral vert.												1					1	1	1	33.33	1
Rib												2				1	3	2	0.08	2.78	1
Scapula					1		1										2	2	1	33.33	1
Humerus									1	1					1		3	3	1.5	50	2
Radius			1														1	1	0.5	16.67	1
Ulna			1														1	1	0.5	16.67	1
Radius-ulna									1	3							4	4	2	66.67	3
Cuneiform									1	1							2	2	1	33.33	1
Scaphoid									1	2							3	3	1.5	50	2
Lunate										1							1	1	0.5	16.67	1
Pisiform										2							2	2	1	33.33	2
Unciform										1							1	1	0.5	16.67	1
Trapezoid											1						1	1	0.5	16.67	1
Femur										1							1	1	0.5	16.67	1
Tibia			1		1												2	2	1	33.33	2
Cuboid									1		1						2	2	1	33.33	1
Ext. cuneiform										1							1	1	0.5	16.67	1
Lat. malleolus					1				1								2	2	1	33.33	2
Navicular										1							1	1	0.5	16.67	1
Astragalus					1					1							2	2	1	33.33	2
Calcaneus									1	1							2	2	1	33.33	1
Metapodial			4						1	2	3						10	10	2.5	83.33	3
1st phalanx			1				1				3						5	5	1.25	41.67	3
2nd phalanx							2				3						5	5	1.25	41.67	2
3rd phalanx											1						1	1	0.25	8.33	1

according to their susceptibility to hydraulic transport. However, there was a clear predominance of group 3, which includes elements with low hydraulic-transport potential (Fig. 4A, B). According to studies performed on modern guanaco (Elkin 1995), the elements included in group 3 present high structural densities.

Evidence of human activity was sparse but significant. Two deep incisions with a linear outline and a V-shaped section were identified on a sacral vertebra, affecting the articular facets in the anterior and posterior portions of the element (Fig. 5A). Additionally, a stone tool was found inside the incision situated at the anterior portion (Fig. 5B).

Weathering was absent (stage 0) in 45.98% of the remains. Among the affected materials, the majority presented cracks parallel to the fiber structure and exfoliation of the outer surface, corresponding to stages 1 (32.18%) and 2 (14.94%), respectively. A lower percentage of the remains (6.90%), all assigned to newborn and juvenile/subadult specimens, showed deeper and wider cracks, and a fiber texture due to compact bone alteration. These remains were included in stage 3 (Table 2). No remains with signs of more advanced weathering (stages 4 and 5) were identified. The most affected skeletal elements were vertebrae, metapodials, phalanges, and radius-ulna.

Abrasion was absent (category 0) in 91.95% of the remains. The scarce number of elements affected included vertebrae, malleolus, scaphoids, and astragalus. Most of them (6.90%) showed slight signs of rounding on the edges and were included in category 1, whereas only one of the remains (1.15%), a malleolus, also showed signs of polishing on the external surface, which led to its inclusion in category 2 (Table 2).

Complete remains, which represented 62.07% of the total, included mainly phalanges, tarsus and carpus elements, radius-ulna, and isolated teeth. The incomplete materials (37.93%) were mostly represented by vertebrae (Table 2). Most elements (78%) assigned to newborns were incomplete. Among the incomplete long bones (NISP = 11), it was possible to identify different types of fractures, including sawtoothed or splintered (45.46%), longitudinal (27.27%), and smooth perpendicular (27.27%).

Bioerosion was absent in 64.37% of the remains. Trace fossils produced by the growth of roots on their surface were recognized in 34.48% of the remains (Table 2). These marks form a dendritic pattern, with irregular contours and a rounded, flattened-U bottom, and correspond to the corrosichnia ethological category (Mikuláš 1999). Only one of the remains (1.15%), a scaphoid, showed traces attributable to gnawing produced by rodent incisors (Table 2). The marks, located at one of the edges of the element, are represented by paired parallel grooves, with little depth and a flat bottom.

Articulated remains, with their relative anatomical positions preserved, represented 13.79% of the total and included vertebrae, phalanges, and carpus and tarsus elements. The remaining materials were isolated and dispersed. A density of 36.25 remains/m^2 was obtained.

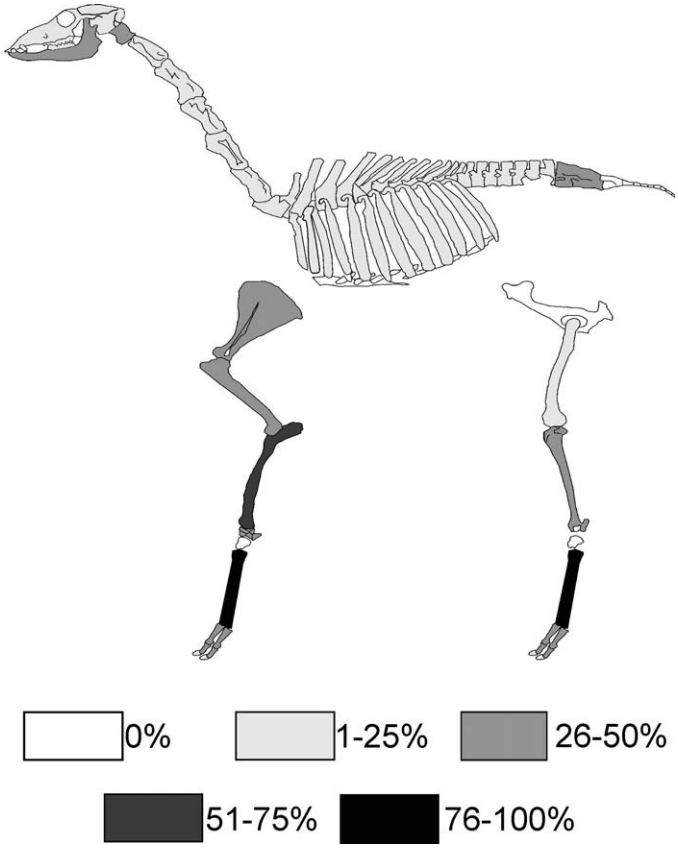

FIG. 3.—Anatomical representation (%MAU) of the *Lama guanicoe* assemblage recovered.

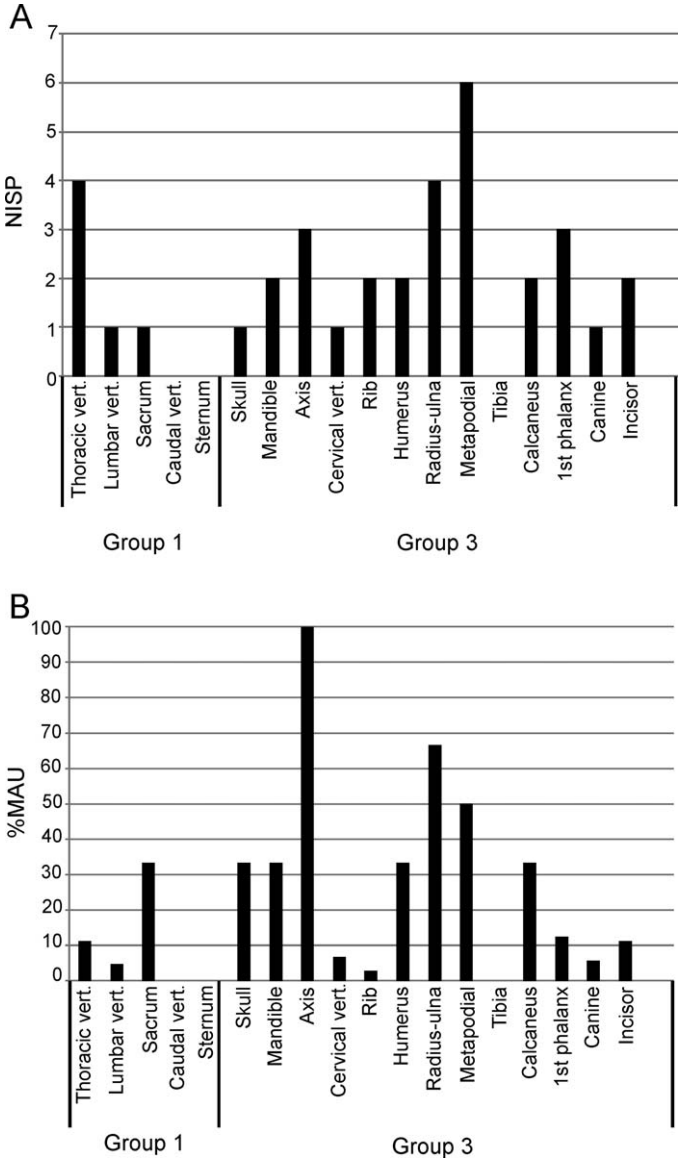

FIG. 4.—Representation of adult guanaco skeletal elements according to Kaufmann et al. (2011) groups. **A**) NISP. **B**) %MAU.

DISCUSSION

The radiocarbon date obtained (2342 ± 47 years BP) indicates that the assemblage corresponds to the late Holocene. This chronology coincides with the age previously proposed for the Chacra La Blanqueada Formation (e.g., Rabassa 1989; Borromei 1995; Deschamps 2005). In this sense, the taxa recovered also appear together in numerous deposits of the Pampean Region with similar chronologies (e.g., Deschamps and Tonni 1992; Mazzanti and Quintana 2001; Deschamps 2005; Salemme and Madrid 2007).

The composition of the García del Río assemblage was compared with the population structure of the modern guanaco groups, especially those formed by individuals of different sex and age. In the present day, mixed groups comprise migratory populations which, during the winter, incorporate males and females of different ages. These groups can have from ten to several hundred individuals. In spring, the groups split apart and form family groups, which represent the center of the social system of the guanaco and are composed of 5 to 13 individuals, including one adult male, females, and newborns (Franklin 1982; Ortega and Franklin 1995; Kaufmann 2009). Thus, taking into consideration the MNI (=5) obtained and the identification of specimens of different age and sex, the studied assemblage could represent a family group or part of a mixed group.

As previously mentioned, the evidence of anthropic activity includes cut marks on a sacral vertebra and an associated stone tool. No other tools were found in the fossiliferous level. With respect to anatomical representation, the studied assemblage differs from those related to guanaco hunting and processing. Whereas at García del Río virtually all skeletal elements were represented, killing sites are dominated by the vertebral column, pelvis, and skull, and residual camps are dominated by appendicular skeleton (Binford 1978, 1981).

There are no marks (e.g., punctures, pits, grooves, scores, furrows) produced by predators or scavengers. Furthermore, the analysis of the anatomical representation at García del Río shows important differences with respect to the values obtained in modern guanaco assemblages originating from predation. In predator assemblages, skulls, vertebrae (lumbar, cervical and sacral), ribs, and the proximal portion of limbs are well represented, while the distal portion of limbs (phalanges, metapodials, and tarsus and carpus elements) are poorly represented (e.g., Kaufmann 2009).

The available evidence allows us to reject both anthropic activity and predator and/or scavenger activity as possible causes of the death of the individuals and the accumulation of their remains. In this context, the presence of only one specimen modified by anthropic activity indicates circumstantial use of the carcasses. This strategy has been proposed as being a low-cost and low-risk source of food for hunter-gatherers of the

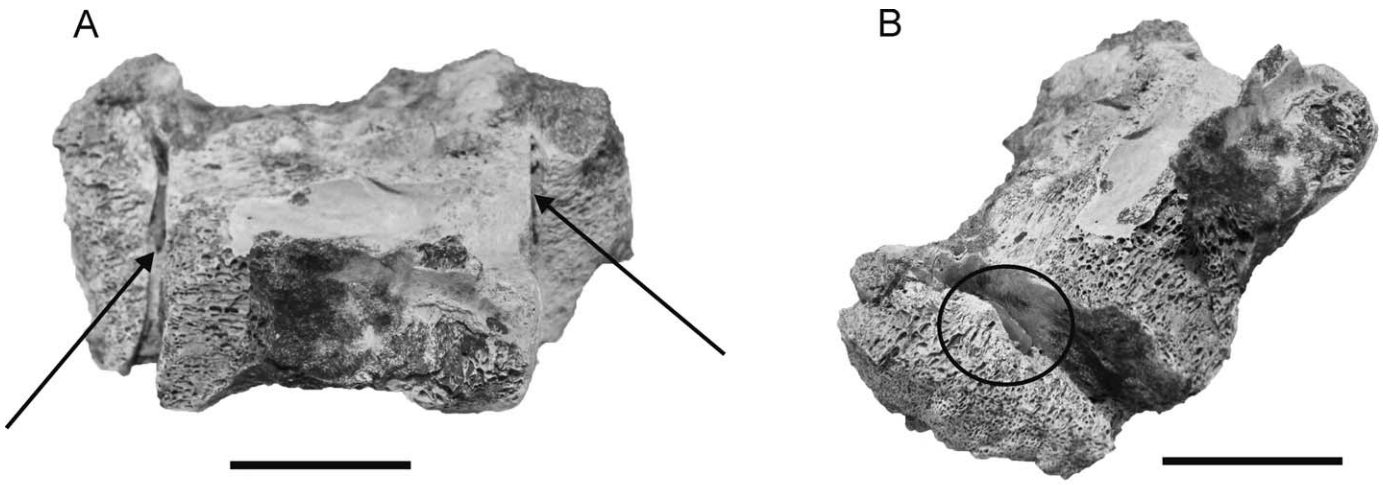

FIG. 5.—*Lama guanicoe* sacral vertebra. **A**) Lateral-ventral view. Arrows show the cut marks. **B**) Cranial-ventral view. Circle shows the flake inside the incision. Scale bar = 2 cm.

Holocene of Patagonia, Argentina (e.g., Borrero et al. 2005; Belardi and Rindel 2008).

Based on the characteristics and disposition of the marks identified on the sacral vertebra, it is possible to infer that the purpose was to cut the muscles in order to separate the column from the pelvis. In butchering models for large mammals, this action is related to obtaining the posterior limb, an anatomical portion with high economic utility return (e.g., Binford 1981; Borrero 1990a). Similar interpretations have been mentioned for Holocene assemblages of guanaco recovered from archaeological sites of Patagonia (Mengoni Goñalons 1999; Gómez Otero et al. 2002; Cordero 2009).

Behrensmeyer (1975) indicated that an assemblage composed mostly of skeletal elements included in any of the Voorhies groups (Voorhies 1969), used to evaluate the susceptibility to hydraulic transport, represents evidence of sorting processes. In this case, although it was possible to identify the different groups proposed by Kaufmann et al. (2011) for *L. guanicoe* adult specimens, the predominance of group 3 indicates hydrodynamic sorting toward elements with low hydraulic-transport potential. As previously mentioned, the elements included in this group have high values of structural density.

TABLE 2.—*Taphonomic features of* Lama guanicoe *remains.*

Taphonomic features	Description	NISP
Weathering degree	Stage 0	40
	Stage 1	28
	Stage 2	13
	Stage 3	6
	Stage 4	0
	Stage 5	0
Abrasion degree	Category 0	80
	Category 1	6
	Category 2	1
Breakage degree	Whole skeletal elements	54
	Incomplete skeletal elements	33
Type of fractures	Sawtoothed (= splintered)	5
	Longitudinal	3
	Smooth perpendicular	3
Bioerosion degree	Without bioerosion	56
	Roots traces	30
	Rodent incisor traces	1

Considering these data as well as the characteristics of the floodplain deposits of Chacra La Blanqueada Formation, water flows during flooding events would have been low-energy surface runoff, with the capacity to transport mainly remains with low structural density and high hydraulic-transport potential. Conversely, the materials with high structural density and low hydraulic-transport potential would have been little affected by such flows, in such a way that the displacement in respect to the place of death was probably minimum or null. Several authors (e.g., Bayón and Zavala 1999; Zavala and Quattrocchio 2001; Quattrocchio et al. 2008) have indicated that in the late Holocene (ca. 2000 years BP), the valley of Napostá Grande Creek was characterized by temporary flows with low energy and shallow confinement as well as the occurrence of occasional overflow forming ponds in the surrounding plains.

The presence of different weathering stages indicates that the burial of the remains was gradual. Additionally, the record of several elements with no evidence of this process and the absence of the more extreme stages of weathering (stages 4 and 5) suggest that the time of exposure was relatively short. The identification of the highest stage (stage 3) only in newborn and juvenile/subadult specimens is probably related to the fact that immature individuals are more susceptible to being quickly affected by weathering processes (Behrensmeyer 1978; Fiorillo 1989). These interpretations are consistent with studies on weathering performed in modern guanaco remains at the Pampean Region (Massigoge et al. 2010).

The identification of few remains with abrasion, most of them with slight evidence, indicates that the time of exposure to the abrasive action of the sedimentary particles in motion was short. This is consistent with the low energy inferred for the water flows that affected the deposits, and suggests that the remains may have suffered little or no transport. These interpretations are consistent with observations in floodplain subenvironments (e.g., Behrensmeyer 1982; Bridge 2003).

Predominance of complete remains indicates that the period of exposure to the different destructive taphonomic processes was short. In this sense, the complete remains are mainly represented by skeletal elements with high structural density (e.g., metapodials, phalanges, tarsus and carpus elements). Conversely, most of the incomplete remains are skeletal elements with low structural density (e.g., vertebrae). The high percentage of incomplete remains corresponding to immature specimens would be related to their higher fragility.

Considering that sawtoothed (=splintered) and longitudinal fractures are typically related to weathering and trampling processes (Behrens-

meyer 1978; Behrensmeyer et al. 1989; Marshall 1989), their abundance would indicate that, in many cases, the materials were affected while exposed at the surface. Although evidence of trampling is typical in remains recovered in floodplain deposits (e.g., Behrensmeyer 1982), in this case, no other features indicative of this process (e.g., scratches, grooves) were recorded. The presence of scarce transversal fractures suggests that some elements were affected after their burial, when they were already mineralized, probably by the lithostatic load of the overlying deposits (Lyman 1994; Alcalá and Martín Escorza 1998).

Several remains show fossil traces produced by root growth, suggesting a temporary shallow burial in a plant-supporting substrate (Lyman 1994; Montalvo 2002). This is in agreement with a floodplain subenvironment (e.g., Behrensmeyer 1982; Bridge 2003). The finding of only a single element with gnaw marks would indicate that rodents had no relevant influence on the preserved assemblage.

The presence of diverse states of articulation (*sensu* Behrensmeyer 1991) represents differences in the exposure time, which allows us to infer the gradual burial of the remains. The articulated remains suggest the existence of connective tissue and a quick burial (Hill 1979; Hill and Beherensmeyer 1984). However, the predominance of isolated and dispersed remains indicates that persistence at the surface was enough to disarticulate and separate the skeletal elements. Studies performed on different modern ungulates, including *L. guanicoe*, show that the vertebrae, phalanges, and tarsus and carpus elements constitute anatomical portions usually disarticulated in advanced stages (e.g., Hill 1979; Borrero 1990b; Borrero et al. 2005).

The high density of skeletal elements is related to the low energy and scarce transport potential inferred for the water flows. No evidence of other processes (e.g., trampling, predator and/or scavenger activity) capable of mobilizing and dispersing the remains were recorded.

CONCLUSIONS

The assemblage of *Lama guanicoe* recovered from the Chacra La Blanqueada Formation, in García del Río locality, is assigned to the late Holocene on the basis of a radiocarbon date of 2342 ± 47 years BP. This date represents the first numerical age obtained for this formation in the valley of Napostá Grande Creek.

In this work, it was possible to identify the presence of at least five individuals of different age and sex, probably members of a family or mixed group. The assemblage is comprised of remains that were little affected by water flows during flooding events and accumulated at or nearby the place of death (autochthonous or parautochthonous). The time of exposure at the surface was relatively short and burial happened gradually. Throughout their taphonomic history, the remains were affected by biostratinomic and fossil-diagenetic processes related to a floodplain subenvironment. Evidence of anthropic activity suggests the circumstantial use of the dead guanaco and provides new data on the importance of this species in the subsistence of the regional hunter-gatherer groups.

Taking into account that most works evaluate systematic and biostratigraphic aspects, this detailed taphonomic analysis increases knowledge of Argentinean Quaternary faunal assemblages from a different perspective. Also, considering that most taphonomic evaluations that include remains of *L. guanicoe* have focused on assemblages formed by anthropic activity, this study provides new information about the characteristics of guanaco assemblages formed by processes associated with fluvial environments in plains. This is interesting because many Argentinean Pleistocene–Holocene paleontological and archaeological sites, especially in the Pampean Region, in which this species is present, are related to these environments. Finally, this work provides a point of comparison for the study of other assemblages, particularly of large mammals, with similar characteristics.

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