



HUMAN BIOGEOGRAPHY AND FAUNAL EXPLOITATION IN DIAMANTE RIVER BASIN, CENTRAL WESTERN ARGENTINA

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ABSTRACT. A biogeographic model used to describe human peopling of southern Mendoza, Central Western Argentina, proposed an intensification process activated by an increase in population growth rate during the Late Holocene. During this process, high-ranked resources at the surroundings of residential camps were depleted, and hunter gatherers broadened their diet by incorporating a larger number of low-ranked prey and domesticated plant resources. In this paper we evaluate an alternative hypothesis, focusing on zooarchaeological data from the Diamante River Basin. The results show that faunal resource intensification does not appear to have occurred in the Diamante River Basin during the late Holocene. Faunal consumption in Diamante River Basin mainly reflects the local fauna in each ecological zone. The data do not show a lack of higher ranked resources. We suggest it is more likely that the demographic increase was not significant enough to cause an impact on the faunal resources. The archaeological evidence should be improved and analyzed in smaller scales to continue with the intensification debate.

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1. INTRODUCTION

Land use by hunter-gatherers shapes subsistence and therefore different mobility strategies (Kelly, 1992). Central Western Argentina has patchy resources determined by a combination of arid and high elevation environments, commonly associated with the conditions of the arid diagonal that cross cuts South America transversally. Small scale groups had to manage uncertainties and changes in the variance of faunal distribution dependently of seasonality and primary productivity of different ecological zones. A biogeographic model proposed to explain human peopling of the southern Mendoza province (Fig. 1) suggests that during the Late Holocene, around 2000 years BP., changes in human demography produced a reduction in residential mobility. In this context of increased demography, people had to intensify the exploitation of several resources leading to the depression of the high-ranked ones in the surrounding areas of the residential camps (Neme, 2007; Neme & Gil 2008a, b; Neme et al., 2012; Neme et al., 2015). Therefore, hunter-gatherers had to incorporate lowered ranked taxa into their diet due to the overhunting of guanacos (*Lama guanicoe*) (Neme, 2007; Neme & Gil, 2008a; Neme et al., 2012; Neme et al., 2015). Llano et al. (2011) proposed the plant use increased during the period in which resource intensification purportedly accelerated. However, there is some archaeological evidence that does not match this model. Whether or not mobility declined deserves further discussion. Guanaco overhunting is not clear and plant use intensification in the Diamante River is not yet apparent (Gil et al., 2011; Ugan et al., 2012; Otaola et al., 2015; Wolverton et al., 2015).

In this paper we test two alternative models related to the intensification process within a biogeographical perspective. The first hypothesis states that after an increase in population growth rate hunter-gatherers become more sedentary. This might cause the depletion of the high ranked resources and consequently a broader diet. The alternative hypothesis states that the increased demography did not cause people to become more sedentary, nor was the packing threshold reached, and an intensification of faunal resources did not occur. Although we need different archaeological evidence to robustly contrast both hypotheses, in this paper we are taking a preliminary zooarchaeological approach to Diamante River Basin Archaeology following the principles of optimal foraging models.

Within an evolutionary ecological perspective, Optimal Foraging Models are useful to address prehistoric hunter-gatherer decision-making (Stephen & Krebs, 1986; Bettinger, 1991, 2009; Kelly, 1995; Bird & O'Connell, 2006; Winterhalder, 1981). The applications of these models are particularly interesting in Central Western Argentina because of its diverse and patchy environments. The Diet Breadth Model allowed the discussion of the intensification model in this region (Neme, 2007; Neme & Gil, 2008, Llano et al., 2011). The Diet Breadth Model predicts that high-ranked prey items will always be taken on encounter and that the less profitable resources will be added to the diet in descending rank order (MacArthur & Pianka, 1966; Bird & O'Connell 2006: 147). On the other hand, the Central Place Foraging Model states that foragers will choose to increase their rate of energy delivery to a central place by processing carcasses; therefore, leaving parts of low caloric utility at the kill sites (Orians and Pearson 1979, Cannon 2003; Metcalfe & Barlow 1992; Nagaoka 2005; 2006).

In Table 1, we present two possible scenarios describing two alternative hypotheses. For each hypothesis zooarchaeological implications are presented. In the intensification scenario human demography increases and the packing threshold is reached. With increased sedentism and the depletion of high ranked resources, lower ranked preys are incorporated in the diet. In this case, within the logic of the Central Place Foraging Model, foragers had to travel farther from central places to obtain higher ranked resources. This would have increased field processing time and only high ranked portions of carcasses would be expected in the recovered faunal material. Therefore, we assume a selective transport of anatomical units of high-ranked prey resources and a broader diet, including lower-ranked resources (Table 1). Bone fragmentation is also assumed to be high because foragers will expend more time extracting marrow and grease from bones (Fisher 2018; Outram 2002; Ugan 2005a).

In the non-intensification scenario, there is an increase in human demography, but the packing threshold is not reached. Residential mobility is not restricted; in this scenario there were enough places to move and resources were not depleted. Therefore, we expect the presence of high-ranked prey in the assemblages since there was not a decline in its availability. As it is not necessary to reduce the weight of the load to be transported to distant residential camps, all the skeletal parts of high-ranked prey would be present in the zooarchaeological record without a selection of the higher ranked items. Therefore, we expect to find all skeletal elements and the taxonomic diversity of each assemblage should be a reflection of local availability, since hunter gatherers are consuming what is in the surroundings of their camps. Bones should not be highly fragmented because foragers would be expending less time extracting nutrients from them (Table 1). To test either of these faunal expectations in the zooarchaeological record, we explore aspects of faunal assemblages from the Diamante River Basin.

TABLE 1

2. AREA OF STUDY

The Diamante River Basin extends from West to East crossing three main phytogeographic areas with altitudinal differences that influence vegetation and animal communities. These areas are the Altoandino, Patagonia and Monte deserts (Figure 1). From the morpho-climatic aspect, this region is highly variable because of its geographical relief, dominant masses of maritime air and rainy season. This area is exposed to anticyclones from the Atlantic and the Pacific Ocean. Influenced by Pacific anticyclones, the Andes belong to the Altoandino and Patagonia deserts, while the oriental plains, influenced by the Atlantic anticyclones, belong to the Monte Desert (Roig, 1972). Due to the distance travelled, the Atlantic winds produce low precipitation, while the winds from the Pacific precipitate at the mountain range of the Andes, arriving at this region as dry and warm winds (Abraham and Rodríguez, 2000; Norte, 2000). In the Monte Desert, most of the precipitation occurs in the summer, while in the Patagonia and Altoandino deserts, precipitation occurs mainly in the winter (Norte, 2000). Precipitation ranges from 200 mm in the Monte Desert to 1000 mm or more in the Upper Cordillera (Norte, 2000).

FIGURE 1

Six of the archaeological sites analyzed in this paper are from the Patagonia Desert, and three in the Altoandino Desert (Figure 1). The Altoandino Desert is developed in a high mountain climate, cold and dry with frost all year round and rainfall in the form of snow in areas with an altitude above 2500 m. The average annual temperature is lower than 8°C and the vegetation consists mainly of grassy steppes composed of *Mulinum crassifolium* species and *Adesmia subterranea* (Cabrera 1976, Roig 1972). The characteristic vegetal community is the *coironal*, with a predominance of *Stipa*, *Festuca* or *Poa* (Cabrera 1976). In this desert, during the summer months, the presence of springs is common (Roig 1972), offering food and water for animals. Human occupation in this region is only possible during warm seasons, at the end of the spring and summer.

The Patagonian Desert develops between 2300 and 1000 m., with a dry, cold climate and intense winds. The predominant vegetation is the shrub steppe, grasses, and cotyledons; grassy steppes are in the parts of greater humidity. The presence of some elements of Monte, mostly next to water streams or the river course marks an ecotone character between the phytogeographic provinces of Monte and Patagonia (Cabrera 1976). Human occupation in this region is possible throughout the whole year.

The faunal community in each of these deserts is mainly determined by primary productivity, which is related to the production of vegetal coverage. Variations in primary productivity have an important impact on human subsistence strategies (Kaplan and Hill 1992). This will vary not only with the levels of annual precipitation but also with the capacity of the soils to retain water (Rosenzweig 1968). Evapotranspiration and water percolation can negatively affect primary productivity. Even though the Altoandino desert has a higher annual precipitation than the Patagonian Desert, the water is retained only in those areas such as springs, places that are very attractive to animals and humans.

Although there is not a strict correlation between altitude and diversity (Mc Cain and Grytnes 2010; Rahbek 1995), there exists a general pattern of declining species richness of flora and fauna with increasing altitude (Pianka 1982). This is also observed in zoological and botanical studies made in our area of study (Roig 1972; Roig et al. 2000; Videla et al. 1997). In the Altoandino desert fauna is present from 2300 masl till the vegetation disappears at 4000 masl (Roig 1972). There are large mammals such as puma (*Felis concolor*) and guanaco (*Lama guanicoe*); medium sized mammals such as red fox (*Pseudalopex culpaeus*), and small mammals such as small rodents (*Akodon andinus*, *Ctenomys mendocius* and *Phyllotis darwini*). In areas with springs and in Laguna del Diamante Lake, there are also aquatic birds.

Within the Patagonian Desert, below 2300 masl, guanaco and puma are still the largest sized mammals present, but the red fox is replaced by the grey fox. In this area we can find medium sized rodents such as chinchillón (*Lagidium viscaccia*) and Vizcacha (*Lagostomus maximus*), and other rodents of small size (less than 1 kg.), like Tuco-Tuco (*Ctenomys mendocinus*). There also live edentates, such as *Chaetophractus villosus* and *Zaedyus pichiy*, carnivores such as the wildcat (*Felis geoffroyi*) and the skunk (*Conepatus chinga*). In addition there lives a large number of birds, among the most important we find the Rheidae, which are located in well-defined niches living in this ecological zone (Roig 1972). It is also possible to find saurians, among which we find batrachians and reptiles. Two fish species are native from this area: *Pygidium borelli* and *Hatcheria* sp. (Roig 1972). Despite this large list of available native species, the archaeological record is dominated by guanacos, edentates, and large sized rodents such as Patagonian Mara, Chinchilla and Vizcacha.

Faunal resources in the middle (Patagonia dessert) and upper basin (Altoandino desert) are distributed heterogeneously in the landscape. Due to the lack of optimal conditions for the generation of soils and moisture to let vegetation grow continuously, these deserts present a patchy distribution of resources. There are differences in the time they were first occupied and the way in which people take advantage of the available resources. Patagonia sites have been occupied since the beginning of the early Holocene, with exploitation of local resources by highly mobile hunter-gatherers (Giardina et al. 2017). Altoandino sites were occupied later, around 1000 years B.P. as residential bases of hunter gatherers focused on hunting of guanacos. Sites were occupied for several weeks during summer seasons, when these highlands areas are without snow cover and guanacos also migrate to those areas (Neme 2007, Neme et al. 2017; Morgan et al. 2017).

3. ARCHAEOLOGICAL SITES AND METHODOLOGY

For this analysis, we consider zooarchaeological samples from nine archaeological sites that date to the Late Holocene in the Diamante River basin. None of these sites have been defined as special purpose sites (Neme 2007, Neme et al. 2016, Giardina et al., 2017, Morgan et al., 2017). These include Altoandino desert open air sites that date from 1500 to 500 BP; El Indígena, Risco de los Indios and Laguna del Diamante-4 which present unique features within the region (Table 1 supplementary material). Their main characteristics are the presence of semicircular-housing structures built with local rocks and a higher frequency of pottery (Durán et al. 2006; Neme et al., 2016; Morgan et al., 2017). They are located near springs and lakes, which form attractive patches for aquatic and terrestrial fauna. There is a strong presence of non-local materials that denotes contact between populations from both sides of the Andes. These sites have been defined as residential sites with prolonged summer

residence, as these locations are inaccessible during winter due to the snow cover (Neme et al., 2016; Morgan et al., 2017).

The other archaeological sites included in this analysis come from the Patagonian Desert from both the Early and Late Holocene occupation periods. For the purpose of this research, we are focusing on the range of dates from 2200 to 500 BP, as this is the time frame proposed for the intensification process (Table 1 supplementary material). These sites are located in caves, except for El Perdido 4 and 5, which are open air sites that lack structures. In the assemblages from the cave sites, there is evidence for the consumption of domestic and wild plants (Giardina et al. 2017).

Faunal Variables analyzed

The variables used to test the zooarchaeological expectations for each hypothesis are related to taxonomic composition, guanaco butchering, and transport behavior.

We studied the taxonomic structure of the assemblages by considering taxonomic richness and estimating NTAXA at family level. Using these criteria, we avoid misrepresentation in taxonomic richness due to differential fragmentation (Grayson 1984; Lyman 2008). We noticed that some taxa entered the zooarchaeological assemblages as a consequence of natural processes as a product of animal activity which affects the taxonomic composition of the assemblages (Giardina, 2010). These remains were not included in the analyses. Importantly, we observe a strong and positive relation between sample size and NTAXA ($R^2=0.95$; $p<0.01$). This means that the number of species found in each site might be driven by the size of the samples. For this reason, our focus is on dietary evenness as measured using Simpson's 1/D, following the formula $1/\sum n_i [n_i-1]/N[N-1]$; because this index is less sensitive sample size effects than other diversity indices (Lyman 2008:196).

Greater values represent increased evenness in an assemblage, showing the broadening of the diet.

The profitability of a prey species depends on two factors: the number of calories they contain and the handling cost. So, the net rank of a species consists of its caloric value minus its handling cost (Dusseldorp 2010). Before Corbat's work (2016), prey species were ranked following the logic that larger animals provide a greater number of calories than smaller ones (Broughton 1994a, 1994b; Nagaoka 2001, 2002; Ugan 2005b). However, there are many fauna, which when considering handling costs, have returns that are negatively correlated with carcass size meaning that in some cases "bigger is not better" (Lupo and Schmitt, 2016, Stiner et al. 1999; Stiner and Munro 2002). The Prey Rank Model made for Central Western Argentina exhibits something like this. Armadillos (*Zaedyus pichiy*, *Chaetophractus villosus* and *Chaetophractus vellerosus*), with a body weight around 1 to 3 kg, are among the smallest prey animals, but they are easy to capture and have relatively low handling costs, making their net return high (Otaola et al., 2015b; Corbat et al. 2016). Rheidae eggs are also easy to obtain when they are available in the spring season (del Hoyo et al., 1992) and have low handling cost. Rhea are one of the largest animals present in the area, giving about 14 kg of meat and fat per animal, but they are very difficult to capture (Giardina 2018). We estimate if the highest-ranked prey were present in the assemblages taking Corbat (Corbat et al. 2016) rank order into account. Other indices used to assess the structure of the assemblages were NISP proportion of guanaco remains (pGUA, Otaola et al., 2015).

Studies in prey demography had been carried out using a broader spatial scale, considering assemblages that can be analyzed diachronically to assess the availability of guanaco and if they were depleted, (Neme et al. 2012). Unfortunately, in most of the assemblages from the Diamante River Basin, we did not have fine-grained chronological information available for these types of analyses. In the sites expressing better chronological

information, guanaco samples are not large enough. However, we were able to test guanaco butchering, transport and consumption strategies, as a proxy of how intense guanacos had been exploited and if they were transported to the residential camps from afar.

The relationship of economic utility and skeletal parts present at a site has been used ethnographically to analyze strategies of prey transport from kill sites to residential bases (Binford, 1978; Bird et al., 2009; Lupo, 2001; 2006, 2007; O'Connell et al., 1990). The expectation from foraging theory suggests foragers will travel farther when large game decline, resulting in a greater selective transportation to central camps. We made Spearman's rank order correlations between meat utility index (MUI) and marrow index (MI) values of guanaco and the normed NISP (NNISP) to identify skeletal part transportation decisions (Borrero, 1990, Mengoni Goñalons 1996). Importantly, when considering the different utility indices, we first studied the correlation between the skeletal part representation and mineral bone density of guanacos (Lyman 1984; Stahl, 1999). We observed the degree of density-mediated attrition by using Spearman's rank correlation between bone survival in terms of NNISP and published volume density values (Stahl, 1999). We analyzed the intensity of fragmentation looking at the ratio of NISP to MNE of guanaco bones and the median of NISP:MNE, only considering bones with high content of bone grease (Binford 1978). High NISP per MNE implies intense fragmentation (Lyman 1994; Wolverton 2002).

4. RESULTS.

All the assemblages from our study exhibited presence of guanaco, the highest ranked prey. In the Altoandino desert, the zooarchaeological record is mainly composed by local fauna, which includes guanaco, red fox and aquatic birds (Table 2). These resources are also partially complemented with non-local ones such as armadillos, ostrich eggs, and domestic and wild plants from lower altitudinal floors (Durán et al., 2006; Neme et al., 2016). In the

Patagonia desert, in addition to the guanaco and red fox that belongs to both elevations, we observe grey fox, a great amount of Rheidae eggshell, medium sized rodents like chinchillón and vizcacha, and edentates such as armadillos. Another large animal found in these sites is the puma, whose distribution also corresponds to both deserts; Altoandino and Patagonia (Table 2).

TABLE 2

The NTAXA index demonstrates a larger number of prey exploited in LD-S4 and Alero Montiel. Each of these assemblages showed the faunal availability of their surroundings. LD-S4 faunas are composed by taxa that are also present in Patagonian desert but with the addition of aquatic birds from Laguna del Diamante. Alero Montiel, located in the Patagonia Desert, has a great amount of terrestrial fauna that inhabit the Patagonian desert. Table 3 shows the results of the NTAXA analyses and which taxa are present in each assemblage at family level. We observe that assemblages with lower NTAXA like El Indigeno and RI in Altoandino desert and C. Manantial, EP5, EP4 and Potrerillos in Patagonia are nested in the assemblages with higher NTAXA (Table 3).

TABLE 3.

Guanacos (Camelidae) are present in all the assemblages and are the dominant faunal resource in most of them, as it can be observed by the pGUA index. Hence, the Simpson's index (1/D) shows very low values (Figure 2). There is not a statistically significant difference among the Altoandino samples and the Patagonian samples (Kruskall wallis test for medians of pGUA;

H=0.26; p=0.6 and of 1/D index; H=0.6; p=0.42). In the Altoandino desert, Guanacos predominate all the assemblages, with high values of pGUA and low values of Simpson's evenness index (Figure 2). In the Patagonia desert, there is more variability among assemblages, sites have both high and low values of pGUA.

FIGURE 2

Even in small samples, guanaco tend to be the most represented taxon. Three assemblages from the Patagonia desert (El Perdido 4; El Perdido 5 and Carrizalito) have NISP of Camelidae equal or less than 10; for this reason we decided to exclude them from the following analyses and establish comparisons among three sites from Altoandino and three sites from Patagonia desert.

Correlation among element frequencies and mineral bone density was not strong in almost all the assemblages. Only Risco de los Indios had a positive correlation, indicating that preservation is not good at this site. In cases like this, we infer that the assemblage suffered heavy attrition and is biased. The correlation between %NISP and Meat and Marrow index shows that the assemblages do not have a strong relation between food utility and skeletal representation. Regarding guanaco bone grease extraction, fragmentation in all the cases was not high, as is indicated by the low values of the ratios of NISP to MNE (Table 4).

TABLE 4

In summation, in the Diamante River Basin, we did not find evidence of depression of the highest ranked resources. Guanacos and armadillos, the higher ranked prey, are well represented in the assemblages. In addition, low ranked prey are present in all of the assemblages across ecoregions. We infer that this is not related to scarcity in the higher ranked prey items, but to the exploitation of areas with specific resources such as Laguna el Diamante, and areas where springs are located, such as Risco de los Indios and El Indígena. We observe the same trend at the Patagonia Desert. There is at least one site, Alero Montiel, with a great number of taxa consumed, independently of higher ranked prey availability. It is important to remember that those sites with a greater NTAXA are also some of the sites with the bigger sample size, showing that sample size affects the estimation of animal species consumed in each of these assemblages. However, for each desert, the sites with lower NTAXA are nested in the assemblages with higher values of this index. This shows that, even though sample size affects NTAXA, the samples might have been derived from the same underlying population (see Lyman 2008: 167).

In addition, from the analyses of skeletal profiles in guanacos, we observed bone elements of different economic utility. This might not be caused by differences in bone preservation, except for Risco de los Indios that had a positive correlation between NISP and bone mineral density.

5. DISCUSSION AND CONCLUDING REMARKS

The faunal analyses presented in this paper are discussed within a biogeographic perspective and pivoting the intensification concept, which was broadly approached in

several research projects of Central Western-Argentina (Neme & Gil 2008; Neme et al. 2015; Otaola 2012; Otaola et al. 2013, 2015; Wolverton et al. 2015). Morgan (2015) proposes that the intensification concept should be used following a strict “Boserupian” definition which entails declining foraging efficiency, understood as the increase in total productivity per unit of time and space (i.e. Boserup 1965; Broughton 1999). In this region, intensification was used to explain how people solve population resource imbalances by the addition of more labor and a decreased foraging efficiency, an approach similar to Boserup’s and stated in the scenario proposed in table 1 (Neme 2007; Neme et al. 2015). In a finer resolution, Llano et al. (2011) proposed plant use intensification focusing at Diamante River Basin. However, we find several problematic issues in how the archaeobotanical data were interpreted. The authors argued that the archaeobotanical evidence shows the broadening of the diet with the incorporation of lower ranked vegetal taxa in the last 1500 years. However; some of those specimens were used to make artifacts (Llano et al., 2011; Llano, 2014:101) and some of the archaeobotanical samples used to argue in favor of the intensification model come from stratigraphic units without a clear chronological assignation (Llano, 2010:356). Even though the findings on how botanical resources had been used are very valuable to understand hunter-gatherers’ adaptations at Diamante Basin, their chronology is not confident enough to put them in the intensification debate.

Regarding the faunal analyses in Diamante River Basin, the patterns found here contrast with the patterns of intensification among hunter-gatherers in other parts of the world. In all those cases, low ranked prey were incorporated to the diet in association with a decrease in large sized prey (Broughton 1994b; 1997; 1999; Butler & Campbell 2004; Janetski 1997; Quintana & Mazzanti 2014; Stoessel 2014; Tivoli & Zangrando 2011).

Other modes of increasing production such as diversification, specialization and innovation, which do not necessarily entail a decreased in foraging efficiency, should not be

defined as intensification. Our research showed that zooarchaeological assemblages from Diamante River Basin do not clearly exhibit a decrease in foraging efficiency, since the high ranked resources are always dominant in the assemblages.

These zooarchaeological evidences match better with the expectations of the non-intensification scenario presented in Table 1. The analyses from both deserts did not show significant differences among the results. High-ranked faunal resources are present in all the assemblages and there is not a special strategy for body part transport. In addition, we did not find evidence for guanaco overexploitation, nor was their exploitation being intensified in any of the areas. The presence of lower ranked prey in the assemblages studied here, are part of a strategy of exploitation of fauna available in the areas surrounding the occupied sites. Our vision of how people take advantage of the faunal resources in Diamante River Basin is not framed within an intensification process because we observed that these faunal exploitation strategies might not necessarily have implied a decrease in foraging efficiency. However, to improve the feasibility of intensification, we need to generate data in settlement patterns, land use, packing threshold and demography. Additionally, we need to test the hypothesis of a reduction in residential mobility and development of territoriality as it was previously stated (Neme, 2007). A smaller scale study on isotopic analyses using samples from Diamante River Basin is already being considered to test the hypothesis of changes in residential mobility during the Late Holocene.

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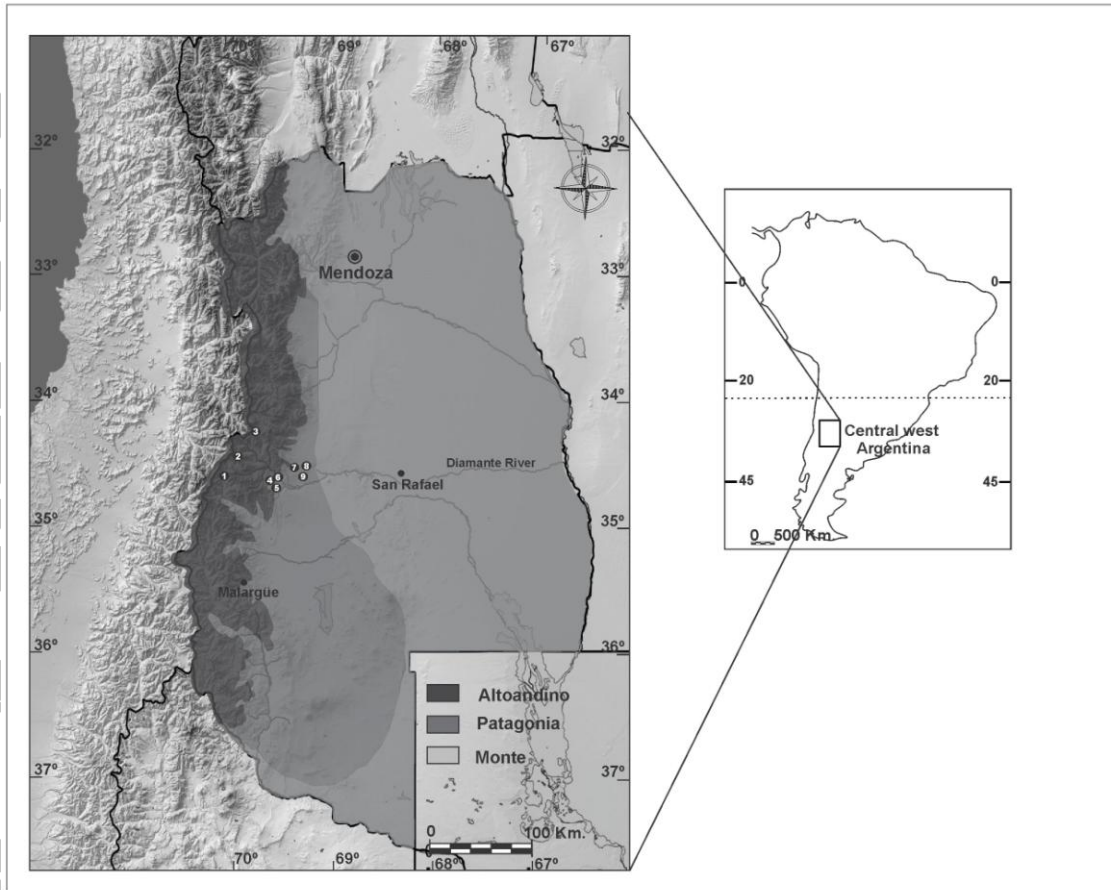


Figure 1. Archaeological sites considered in this paper and main phytogeographic deserts. 1. El Indigeno, 2: Risco de los Indios; 3. Laguna del Diamante-4; 4.El Perdido 4; 5. El Perdido 5; 6. Cueva el Manantial; 7 Carrizalito; 8. Alero Montiel; 9. Potrerillos.

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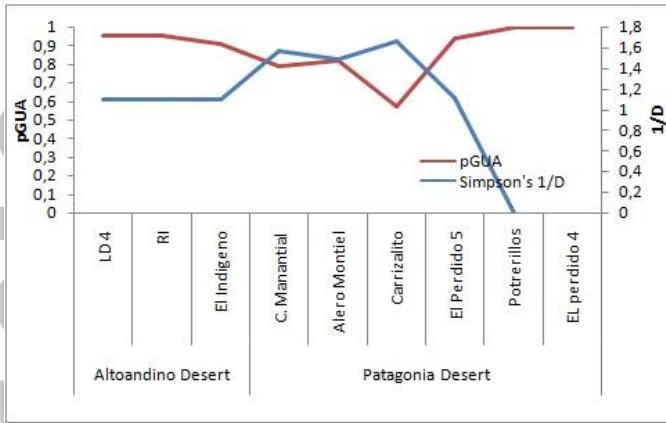


Figure 2: Simpson's 1/D and proportion of guanaco (pGUA) indices. Assemblages are grouped according to its location in Altoandino or Patagonia desert.

Accepted

Table 1 Two alternative hypotheses and the zooarchaeological expectations for Diamante River Basin assemblages.

		Intensification	No-Intensification
Human demography and resource balance	Hypothesis	Increased demography, packing threshold was reached.	Increased demography, but packing threshold was not reached.
Faunal Expectations	Resource exploitation	Intensification of faunal exploitation. Best ranked resources depressed. Diet Breadth: Low ranked preys are now incorporated to the diet.	Intensification is not observed. No clear evidences of resource depression. Diet Breadth: Some preys from specific areas are now incorporated to the diet.
	Big game processing (guanacos)	More processing in killing sites. Only well ranked body parts are transported to the residential sites. More fragmentation in the bones for grease extraction.	No differential processing of the preys. All body parts are present in the assemblages. Bones are not highly fragmented.

Table 2 Taxonomic representation measure for subsistence resources recovered from archaeological sites of Diamante River Basin.

All taxa are measured in NISP, except for Rheidae eggshells that we only indicate presence (X) or absence (-)

Taxon	Altoandino Desert			Patagonia Desert					
	Laguna Diamante 4	Risco de los Indios	El Indígena	Cueva El manantial	El Perdido 4	El perdido 5	Alero Montiel	Carrizalito	Potrerrillos
Bird indet.	-	-	2	-	-	-	4	8	-
Medium size Bird indet.	27	-	-	-	-	-	-	-	-
Charadriiformes indet.	2	-	-	-	-	-	-	-	-
Anatidae indet.	30	-	-	-	-	-	-	-	-
Anas sp.	6	-	-	-	-	-	-	-	-
<i>Anas platalea</i>	1	-	-	-	-	-	-	-	-
<i>Anas specularioides</i>	1	-	-	-	-	-	-	-	-
<i>Attagis gayi</i>	1	-	-	-	-	-	-	-	-
<i>Choelephaga melanoptera</i>	1	-	-	-	-	-	-	-	-
<i>Lophonetta specularioides</i>	1	-	-	-	-	-	-	-	-
Paseriforme Indet.	1	-	-	-	-	-	-	-	-
Anseriformes indet.	1	-	-	-	-	-	-	-	-
Suboscine indet.	1	-	-	-	-	-	-	-	-
<i>Rhea pennata</i>	-	-	-	-	-	-	-	1	-
Mammalia indet.	320	255	10	34	9	23	50	19	7
Artiodactyla indet.	24	-	9	-	-	-	4	1	-
Camelidae indet.	13	35	-	11	1	11	23	4	3
Lama sp.	161	-	10	-	-	-	42	8	-
<i>Lama guanicoe</i>	83	49	22	12	3	7	37	3	1
<i>Felis concolor</i>	-	-	-	-	-	-	1	2	-
<i>Pseudalopex culpaeus</i>	-	1	-	3	-	-	-	-	-
<i>Pseudalopex griseus</i>	-	-	-	-	-	-	1	-	-
<i>Lagostomus maximus</i>	-	-	-	-	-	-	1	-	-
<i>Lagidium viscacia</i>	-	-	-	-	-	-	7	-	-
Dasipodidae indet.	-	-	-	2	-	1	4	4	-
<i>Chaetophractus</i> sp.	-	-	-	-	-	-	2	4	-
<i>Zaedyus</i> sp.	3	-	-	-	-	-	5	-	-
Indet.	14539	1085	151	220	88	632	51	22	1
Total NSP	15254	1428	204	282	101	674	237	78	8
Total NISP	715	343	53	62	13	42	186	56	4
Dasipodidae Dermal bones	11	3		16		27	16	17	
Presence of Ostrich eggshells	X	-	-	X	-	-	X	X	-

Table 3 Taxa present per sites in Altoandino and Patagonia desert. Black cells show presence.

Desert	Arch. site.	Camelidae	Dasiposidae	Canidae	Felidae	Rheidae	Charadriidae	Anatidae	Thinocoridae	Chinchillidae	NTAXA
Altoandino	LD-4	■	■				■		■		5
	Risco Indios	■		■							3
	El Indigeno	■									1
Patagonia	A.Montiel	■	■	■	■	■				■	5
	Carrizalito	■		■	■	■					4
	C. Manantial	■		■	■	■					3
	El Perd. 5	■		■							2
	Potrerillos	■									1
	El Perd 4	■									1

Table 4 Correlation values for density-mediated destruction (DMD) Marrow index and correlation values for FUI to NNISP- *Bones with high grease utility values are the: humerus, radius, ulna, femur, tibia, calcaneus and metapodials.

	LD-S4	RI	EI	C. Manantial	A. Montiel	Carrizalito
Meat Index	$r_s = -0.28$; $p = 0.23$	$r_s = -0.10$; $p = 0.66$	$r_s = -0.01$; $p = 0.95$	$r_s = -0.09$; $p = 0.7$	$r_s = -0.37$; $p = 0.12$	$r_s = -0.24$; $p = 0.32$
Marrow Index	$r_s = 0.5$; $p = 0.25$	$r_s = -0.88$; $p = 0.01$	$r_s = 0.18$; $p = 0.69$	$r_s = 0.22$; $p = 0.63$	$r_s = -0.09$; $p = 0.19$	$r_s = 0.08$; $p = 0.9$
BMD Index	$r_s = 0.25$; $p = 0.23$	$r_s = 0.47$; $p = 0.01$	$r_s = 0.14$; $p = 0.48$	$r_s = 0.08$; $p = 0.06$	$r_s = 0.22$; $p = 0.28$	$r_s = 0.25$; $p = 0.23$
NISP:MNE guanaco	1,66	1,17	1,2	1,09	1,5	1,08
NISP:MNE with high grease utility values*	1,4	1	1	1	1,15	1