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Mining Ways of Life in the Southern Andes: Historical Anthropological Archaeology in Mendoza, Argentina

Osvaldo Sironi [1]

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Abstract This paper presents an analysis of archaeological materials found at the mining sites Minas Paramillos Sur and Mina La Atala, located in the Paramillos de Uspallata and Divisadero Largo's reserve. The goals of this research are to document consumption patterns of the mining proletariat and to make comparative intra- and inter-site comparisons of artifact trends. Within the framework of historical archaeology, we analyze these artifacts in the successive stages of occupation and within sociocultural contexts marked by peripheral industrial capitalism. In order to do this, we take into account three central elements: the environment, sociocultural practices (diets, techniques, and production technologies, personal care, spatial distribution, etc.), and the political-economic context. The results show that the mining populations of northwestern Mendoza in the nineteenth and twentieth centuries worked in precarious conditions and were socially marginalized by a hegemonic discourse of greater economic development in the province.

Keywords Working class · Modes of life · Andean mining · Mendoza · Argentina

Introduction

The Andean literature include many examples of the importance of mining in prehispanic contexts, the Spanish conquest, the configuration of the colonial system, the processes of independence, the expansion of capitalism, and the development of national state economies. Unfortunately, archaeology has not made significant contributions to an in-depth understanding of mining's importance, nor has it offered detailed

✉ Osvaldo Sironi
osironi@mendoza-conicet.gob.ar

[1] National Scientific and Technical Research Council (CONICET), Argentine Institute for Nivology, Glaciology and Environmental Sciences (IANIGLA), Av. Ruiz Leal S/N. Parque Gral. San Martin, 5500 Mendoza, Argentina

studies of how complex technological, sociocultural, economic, political, and military processes have developed around industrial mining. These aspects have been evidenced archaeologically during the prehispanic periods. Diverse approaches such as colonial history, historiography, ethnography, and anthropology have made valuable contributions to our understanding of the articulation of mining with historical development in the Andes. However, archaeological investigations remain extremely scarce, mostly limited to the archaeology of industrial mining. This is a limitation to our understanding of the history of mining in the Andes, not only because archaeology can reveal the oldest and longest history of this activity in the region, but for the contribution it can make from the study of materiality to an understanding historical mining and their impacts on current sociocultural processes (Salazar and Vilches 2014). Europe, Australia and the USA have a consolidated tradition of systematic research on industrial mining. This kind of analytical approaches were presented in Spain (Pozo-Antonio et al. 2017; Willies 1989), Great Britain (Alfrey and Clark 1993; Palmer and Neaverson 1994, 1998), Australia (Lawrence 2005), United States (Hardesty 1988, 2010; Knapp 1998; Landon and Tumberg 1996; Schmitt and Zeier 1993), among others. In South America, the countries that stand out are Chile (Aldunate et al. 2008; Castro et al. 2012; García-Albarido et al. 2008) and Bolivia (De France 2003; Gil Montero 2017).

Around 1880, modern states of Latin America were consolidated and great changes began as they entered the international capitalist circuit. Beginning in the middle of the nineteenth century, technological advances of the industrial revolution led colonial empires to establish new markets that consumed manufactured goods and provided raw materials. In the international market, Latin American countries were oriented toward productive specialization according to the model of the international division of labor: those who contributed raw materials and those who refined them (Ansaldi and Giordano 2012; Halperin Donghi 1993; Harvey 2004; O'Connor 1998). In other words, this international division of labor is developed mainly by the transformation promoted by the industrial revolution in the mining operations, since it was present, and in some places was especially relevant during the nineteenth century. It should be noted that there is a significant difference between the extraction of small amounts of precious minerals such as silver and/or gold and the extraction of huge quantities of ore for industrial processes, such as copper and/or tin. This enormous transformation influenced the whole organization of mining work, technology, etc. In Argentina, this new colonial pact was backed by an innovative elite, who held a fervent belief in order and progress. Their economic liberalism and fierce political conservatism allowed them to maintain power (Ansaldi and Giordano 2012).

This work is framed in a theoretical-methodological perspective oriented to the analysis of the conditions and ways of life of working populations in a specific historical period of capitalist industrialization. In the northwest of Mendoza, it is characterized by the development and transformation of the productive forces and the social relations of production in mining contexts from the nineteenth century to the twentieth century, from the *pirquineros* to the industrial *mining communities*.

The concept of way of life (Vargas 1998) is central to our approach. This category is "*a social expression of the organization of the productive forces in relation to a specific medium, with a view to the objectification of production, which undoubtedly generates a specific cultural response*" (Veloz Maggiolo 1984: 11, author's translation). From this, industrial archaeology can offer an anthropological view of the sociocultural

structures of the mining community, that is, it can reconstruct the history of mining groups and how they developed their modes of life in particular environments. This discipline builds analytical links between written, oral, and material expressions. Interweaving history and anthropology (Little 1994) makes possible a dialectic investigation between socioeconomic and geographical structures as well as historical events (Cerdà Pérez 2011; Last 1995; McGuire 2008; Palmer and Neaverson 1998).

In this context, we present the results of research at the mining sites Minas Paramillos Sur -MPS- and Mina La Atala -MLA- (Fig. 1). The research is based on the idea that archaeological objects have the potential to reveal the ways that minerals were mined and that workers lived at these mines during the nineteenth and twentieth centuries in northwestern Mendoza, Argentina. The general objective is to provide data on the practices of consuming food and beverages and health practices as well as on the construction of domestic and work spaces during the sites' occupation periods before abandonment. More specifically, the goals are to analyze and quantify the typological, morphological, and functional characteristics of the archaeological remains to provide information on consumption patterns of the mining proletariat (people from Argentina - Mendoza, San Luis, San Juan, La Rioja-, Chile, France, Germany, Switzerland, Austria, and Spain) (Segundo Censo de la República Argentina 1895). Then, we establish intra- and inter-site comparative correlations of the artifact tendencies in terms of uses and activities at both sites. MPS is an industrial site for the exploitation of metal minerals from the nineteenth century, isolated from urban centers; unlike MLA which is a site corresponding to the twentieth century, adjacent to the city of Mendoza and characterized by exploiting shales of bituminous.

Our objectives may also be discussed as a result of the analysis of documentary information, from journals and travelers' accounts (Haigh 1920; Vicuña Mackenna 1856), newspaper articles (*Diario El Constitucional* 1879; *Diario Los Andes* 1921), official government reports (Archivo de la Dirección de Minas de la Provincia de

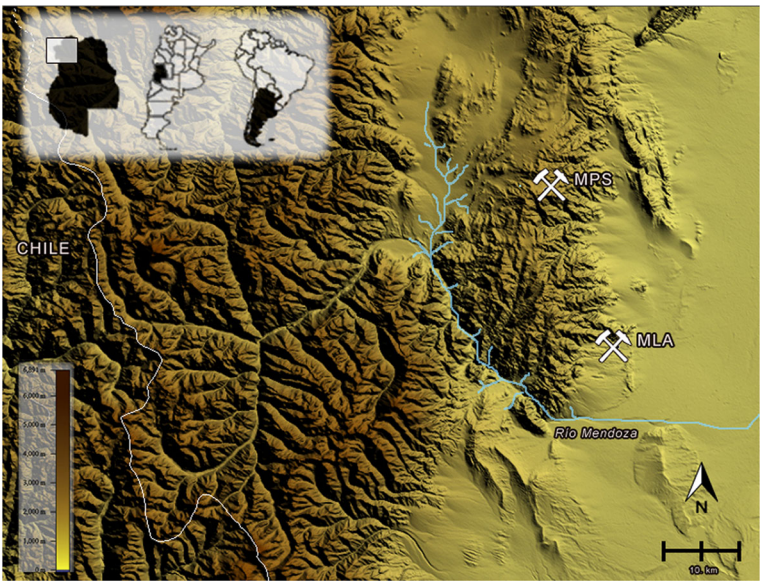

Fig. 1 Map of the northwest of Mendoza and the sector of MPS and MLA

Mendoza 1917, 1939; Bialet Massé 1904; Lallemant 1890; Segundo Censo de la República Argentina 1895). The information obtained allows us to specify general aspects related to the characteristics and functionality of the sites, as well as to characterize the social actors of mining.

Materials and Methods

We analyzed all the archaeological material from the historic sites MPS and MLA. There was a total of 4710 artifacts, mostly at MPS (3748), but also a large number at MLA (962). This number includes vitreous objects, metal and ceramics fragments, and archaeobotanical and archaeozoological remains. These data made it possible to a) identify and characterize the function of the various spaces in the architectural complexes, b) verify chronological sequences to compare with other mining sites, and c) reconstruct lifeways at both sites based on the archaeological material in living and working spaces.

The analysis of archaeological materials is organized around technological, morphological, and compositional characteristics (typology and artifact function) as well as the degree of representation and participation in the sociocultural life of the workers of these mining sites. For this reason, we work within the following analytical categories of practices and social contexts (Bulmer 1975; Weissel 2008): mining production, eating habits, construction, health, among others, in order to place the archaeological information in regional context. In other words, we consider the artifacts to be the result of the social management of resources for the production of households chores and use of productive inputs (means of production) and analyzing their role in the reciprocity of solidarity of human groups (Lull 2007).

The analytical categories were agglutinated and processed under the indices *richness*, *diversity* (heterogeneity), and *evenness* (homogeneity) (Bobrowsky and Ball 1989; Weissel 2008). The richness analysis targets the number of artifact classes or variables and its relationship with sample size, that is, the representativeness of the sample. In other words, this index indicates the relative quantity of each artifact class or variables. This index is an important first approach to weigh the utility of the sample in terms of its size and to study characteristics of artifact functionality.

In addition, heterogeneity is a diversity index that provides more information on the composition of a set, that is, the number of categories present. Likewise, the analysis of homogeneity reinforces the interpretation of diversity of intrasite uses and materials, since it represents the equitability in the distribution of relative proportions in the different classes or categories (Lanata 1996). In other words, diversity indices inform us about the structural qualities of the archaeological record's form, composition, and variability, which are categories best suited for making inferences about human behavior (Lanata 1996; Weissel 2008).

The *diversity index* (H) reflects taxonomic heterogeneity based on the relationship between the number of categories and the relative abundance of each category. As an index of *equitability* (H'), it takes into account both the number of individuals and the number of categories. It varies from 0, for data sets with a single category, to high values for data sets with many categories with few items in each category. From each *artifact class*, a picture of the distributional properties of the archaeological record was

developed, which was compared for different spaces and isolated sites (Weissel 2008). In this way, richness, diversity, and equitability (for conceptual details and formulas, see Bobrowsky and Ball 1989) indices were interpreted from the site data based on Shannon and Weaver's (1949) index for heterogeneity and Simpson's (1949) index for homogeneity. These indices make it possible to infer the characteristics of consumption and disposal in different periods of the sites' occupational histories.

Environmental and Local Conditions: MPS and MLA

The historical archaeological site MPS is located in the area around Paramillos de Uspallata, which is an area with historic silver, gold and copper mines; 32°30′36.64"S, 69°05′35.71"W, 3065 masl (see Fig. 2). The environment is typical of the phytogeographic province *puna*, which is cold with a wide daily thermal amplitude, dry (100–200 mm annual precipitation, mostly in the summer), and strong seasonal differences (Cabrera 1971). Reports of the mines Paramillos Sur begin with intermittent exploitations as early as the seventeenth century, which include periods of intense activity as well as total abandonment due to the lack of investment, tools, technicians, and an efficient communication network. From the mid-nineteenth century onwards, the area became more important, since large ranches were started in the region with an influx of English capital (Cueto 2003; Lallemant 1890).

The historical archaeological site MLA is located in the alluvial basin Divisadero Largo, an area between 32°52′22″–32°52′46"S and 68°56′12″–68°55′28"W. This area has a piedmont ecology with dense concentrations of solid mineral such as oil shale. The architectural complex is located on the north side of the Divisadero Brook at 1054 masl and was built with adobe, stone, bricks, and concrete. The complex is associated with two bituminous slate veins known as Jiron A and Jiron B and four clay quarries. The La Atala mine has an approximate depth of 50 m of bituminous shale, which was initially used to produce gas for public lighting in the city of Mendoza by the Gas Company of Mendoza, which was founded on March 1, 1889, and directed by the engineer Carlos Fader, father of the well-known painter Fernando Fader (*Diario Los Andes* 1921). Later, exploited to initiate the production of pozzolanic cement around the middle of the twentieth century (Fig. 3).

Archaeological work was carried out on two spatial scales: at both sites, MPS and MLA, and the areas immediately around them, according to the limits declared in the mining cadastral records (Archivo de la Dirección de Minas de la Provincia de Mendoza 1917, 1939). Fieldwork methods involved intensive pedestrian surveys in order to delimit and differentiate the mining and domestic areas. We also did an architectural survey and assessed the state of conservation of the enclosures, which were part of a topographic maps of the complexes. We mapped and collected surface artifacts and conducted systematic excavations inside and outside the enclosures, which allowed us to assess the occupation spans for both sites. Table 1 shows the three levels' average depths below surface and approximate dates.

There are two periods clear detectable at MPS. The first is from the middle of the nineteenth century, which is represented by carrascal ceramic glazes, square glass gin bottles as well as nails and other metal items like bullet casings and hand tools. The second phase corresponds to the first half of the twentieth century, defined by a

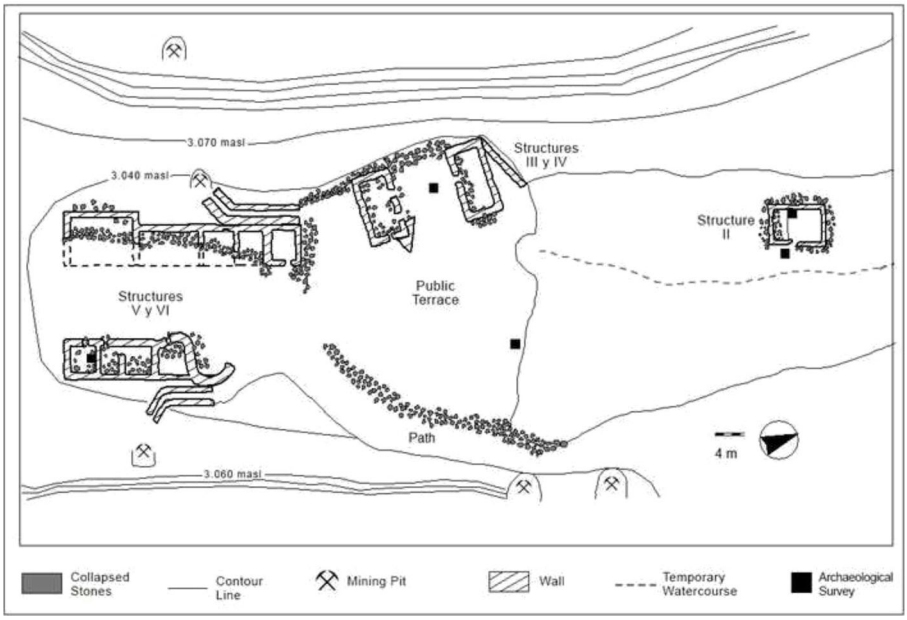

Fig. 2 View of MPS administrative and housing facilities (Structures III–VI)

woman's shoe, whiteware ceramics, peaks of wine bottles, and fragments of metal tins. In the case of MLA, the first occupations were at the end of the nineteenth century (after 1890), represented by few glass fragments of sherry bottles. The abundant glass

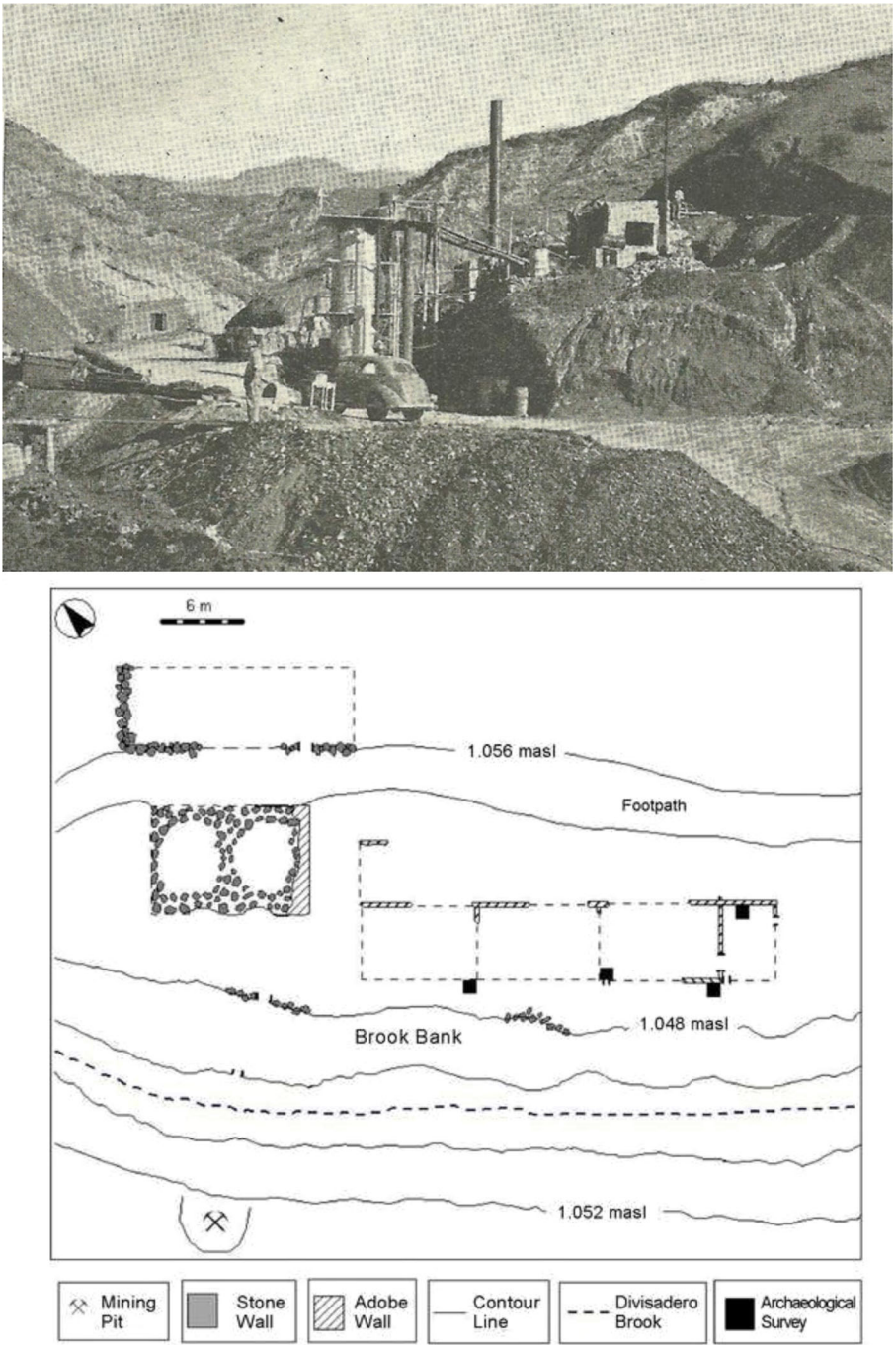

Fig. 3 Architectural groups A and B at MLA, built to extract oil shale. From Borrello (1956: 605)

and metal fragments, as well as a few whitewares and a male shoe, are the materials from the first half of the twentieth century (Sironi 2015, 2018).

Table 1 Dates and stratigraphy of MPS and MLA

Site	Excavation level	Depth (cm)	Relative date (AD)	Density of materials per levels (N/m^3)
Minas Paramillos Sur	Level 1	0–20	1950–1970	540.57
	Level 2	20–60	1910–1950	
	Level 3	60–100	1870–1910	
Mina La Atala	Level 1	0–35	1940–1970	240.5
	Level 2	35–70	1910–1940	
	Level 3	70–120	1890–1910	

Mining Lifestyles: Trends in Artifacts and Activities

The interpretations of the artifact trends focused on the uses and activities represented by the archaeological material. In combination with documentary sources, artifact trends reflect the mining lifestyles at MPS and MLA. Overall, they shed light on the social organization of mining as well as working and health conditions.

Minas Paramillos Sur

Table 2 summarizes the artifacts trends at MPS. Historical artifacts were counted (N = 3748) and tallied by raw material and activity, for example, the number of metal artifacts in the categories of construction, tools, transportation, etc. The material types that stand out are historical ceramics (redware, whiteware, porcelain, and glazed wares), kitchen utensils (dishes, cups, glasses, and spoons), personal effects (buckles, necklaces, cosmetic products, stiff-soled shoes), bottles of alcoholic beverages, medicinal flasks, nails, canned foods, cartridge cases, archaeobotanical remains (*Juglans regia*, *Prunus persica*, and *Cucurbita sp.*), and fauna remains (*Bos taurus*, *Lama guanicoe*, and *Capra hircus*).

Table 2 summarizes the evidence for the following activities: mining, lighting, transport, food consumption, personal effects, and health care. Remains of tools are scarce. The presence of metal tools such as chisels, crowbars, and hooks (Fig. 4) confirm the expected activities of an extractive mineral processing site. During his tenure as administrator of the Paramillos de Uspallata mine in 1885–90, German Avé-Lallemant (1890: 59) commented on the challenges of mining in the area (e.g., floods): “for the vertical mine shafts, we first used simple mining drills, and then the miners removed the rocks and water, to a depth of up to 60 meters. Then, as the water level rose, we used winches pulled by two mules, and finally we used steam power” (author’s translation). Specifically, these miners are the *barreteros*, who "run the drills for the shot, drilling the rock with the aid of a drill and an iron mallet... they loosen ores to take it out of the mine" (Alonso 1995: 36–37, author’s translation).

Lighting in the mines was done with kerosene lamps and rapeseed oil: “Every worker has his own lamp and buys his own oil” (Lallemant 1890: 62, author’s translation).

The main evidence of transporting supplies from Mendoza to Paramillos is horseshoes and metal containers of machinery oil found at MPS. This agrees with the historic

Table 2 Quantities and percentages of materials by type and activity at MPS

Category	Material types	Quantity	%	Activities	%
Mining ore	Metal	31	0.82	Mining production	0.88
Administration	Glass	1	0.03		
	Metal	1	0.03		
Building	Metal	189	4.99	Construction	11.36
	Glass	241	6.37		
Transport	Metal	4	0.11	Energy	0.9
Lighting	Glass	30	0.79		
Archaeozoology	Domestic fauna	40	1.06	Food consumption	20.5
	Native fauna	55	1.45		
	Unidentified mammal	205	5.42		
	Unidentified bird	1	0.03		
Archaeobotany	Peach	16	0.42		
	Nut	5	0.13		
	Grape	1	0.03		
Preserved food	Metal	203	5.36		
	Glass	237	6.26		
Hunt	Metal	13	0.34		
Household utensils	Metal	2	0.05	Eating habits	63
	Glass	41	1.09		
	Redware	2,303	60.86		
	Whiteware	38	1		
Clothing	Metal	4	0.11	Personal effects	1.07
	Glass	9	0.24		
	Leather	27	0.72		
Heath care	Glass	35	0.92	Health	0.92
Wastes	Metal	33	0.87	Housekeeping	1.37
	Glass	19	0.5		
TOTAL		3784	100		

reports of mules being used for transportation (Morales Guiñazú 1943). In 1826, Miers (1826: 347) confirmed the use of mules, describing how they were used as for transport and cargo: "mules are always preferred for travelling in the mountains because their steps are surer than those of horses, they are more cautious, less startled in case of danger, and are hardier and better adapted to the fatigue and lack of food they must endure on the journey; a horse quickly becomes tender-footed when treading over the loose, sharp stones covering the tracks, and is soon rendered unable to walk: even the mule could not bear it unless it were shod."

Horses and cows were shod before making commercial trips into the Andes, and also in mountain areas because horseshoes protect their hooves (*Diario El Constitucional* 1879). The use of steam machinery for the drainage of mines is also confirmed by Lallemant (1890: 53): "the Mendoza carriage road through Las Higueras,

Fig. 4 Mining tools from MPS

Salto and Paramillo pass ... is in perfect condition and we have prepared this road to handle heavy traffic, even carriages with very heavy loads such as machinery for the mines. We have even carried items that weighed 48 tons [2208 kg] in ox-drawn carriages ...” (author’s translation).

Food consumption (Henry 1991) is reflected in faunal and botantic remains, food cans, bullet casings, and household utensils. The calculation of NISP (Number of Identified Specimens), MNE (Minimum Number of Elements), and MNI (Minimum Number of Individuals) (Mengoni Goñalons 2010) for the faunal record provided data on the frequency of animal species. Categorized by genus, species, and wild or domestic, the first trend that stands out is that more isolated sites have more wild (and larger animals) than domestic animals, and the axial skeletons of both species were consumed. Some bones have cut marks and fractures that were probably the result of preparing stews that maximize fat calories from bone marrow. High calorie diets are expected in populations subjected to heavy physical exertion in cold environments (Sironi et al. 2013).

According to Lallemant (1890: 63), miners received the following weekly rations: “¾ kilograms of beef; 1 pound of bread; 1 pound of potatoes, or corn, or rice, or wheat; 12 ounces of salt. The meat would be fillets with bones, as this increases the weight” (author’s translation). This citation confirms that the weekly ration was less than

miners' energy requirements. Food rations were complemented by buying or hunting wild animals: "guanacos are usually in troops of 8 to 10... The mule drivers hunt them with dogs and there are men who make a living hunting these animals. Hunts are done by groups of 8 to 10 people who take at least a hundred dogs and the mules necessary to carry the hides and the meat of the animals they kill. From the hides, they make excellent lassos, mainly from the neck, and they sell the meat to the miners of Uspallata for 4 reales per bushel, because it is almost as tasty as beef though not as nutritious" (Vicuña Mackenna 1856: 448, author's translation). This description has archaeological correlates: gun holsters and percussion caps, which indicate that people hunted wild animals for sport or food: "we saw many guanaco troops, which are driven down to the valleys and lower hills in the winter… for fun and to kill time, we agreed to take turns going out with our shotguns to look for guanacos..." (Haigh 1829: 92–97). This observation is confirmed on May 10, 1895, when the 250 people who lived in the Paramillos of Uspallata were surveyed. In this census, it was recognized the presence of nine muleteers, who surely fulfilled the function of supplying meat of native fauna and possibly other products to the mining sites, although they are not mentioned in the documentation (Segundo Censo de la República Argentina 1895). Although the stable or eventual link with these sites is not clear, it is possible to affirm that they were a fundamental part of the food supply in this type of site.

In sum, material evidence for eating habits is diverse, which is also reflected in ceramics, glass, and metal objects. Redware vessels were used for water storage, as water is critical in this environment; industrial ceramics like whiteware, confirms the wide dispersion and success of this product. Metal and glass food containers were also found at long distances from where they were made. It should be noted that in the area of Paramillos, the mine manager Lallemant (1890: 49) confirms that water was scarce, but it was obtained from the mines, and that water had certain properties that were ingested by the inhabitants: "The water from the mines is very good, with no special taste or characteristics. It is very hard, and leaves strong incrustations in the boiler, which are mainly of lime sulfate. It is impossible to cook chickpeas, beans, and in general, legumes, to a point of sufficient softness in an ordinary pot; This is because water boils at 89–90°C" (author's translation).

Products such as necklace beads, a female shoe (Fig. 5), work shoe soles, and cosmetic items are personal effects that suggest the existence of mixed male–female groups at mining sites. It is remarkable that the presence of females is invisible in the historic documentation. Certainly we cannot say that these houses were inhabited by families. The stories of owners and travelers do not mention this

Fig. 5 Female shoe (early twentieth century)

possibility, although they do not deny it either. On the other hand, the ideal of the industrial worker was that of the unmarried worker and for that reason perhaps it was chosen not to mention the failure of such an aspiration. This situation allows us to hypothesize certain aspects of the mining context, since the presence of feminine objects suggests that the mining authorities had the right to move with their families, or that women were hired for various tasks. We only have documentary evidence that indicates the presence of a cook among the inhabitants of the Paramillos.

The presence of fragments of medicine bottles allows us to infer that people at MPS used medicine to care for themselves (Haro Encinas 2000) in situations when the collective well-being ruptured, possibly due to marginal living and environmental conditions. In this case, ruptures of collective well-being are social stressor—technological changes and socioeconomic situations that make people suffer—and environmental stressors—extreme temperatures, weather conditions, noise, etc. (Slipak 1996). The environmental conditions of MPS are physical environmental stressors that affected the health of the mining community. They are described well by mine manager Lallemant (1890) and Chilean historian Vicuña Mackenna (1856). Lallemant (1890: 49) recorded the atmospheric pressure every month of the year: "low atmospheric pressure, as is known, leads to altitude sickness (*puna* or *sorroche*). It involves shortness of breath, severe asthma, headaches, upset stomach, and if prolonged, vomiting with blood" (author's translation).

Another physical challenge is extreme dryness: "the skin of a newcomer to Paramillo suffers much from this dryness, and the lips, hands and even face are broken, or as the miners say, they burn, even to the point of bleeding. This is often happens in late winter and early spring" (Lallemant 1890: 50, author's translation). It is clear that the continuously unpleasant conditions were not only experienced by the privileged, as is the case of this engineer, but also the miners. "The most common disease in Paramillos is rheumatism, which in some periods becomes so frequent that seems like an epidemic. In 1886–87, cholera came to the mine and killed seven men; all cases of this disease occurred in the population from El Sauce, where it became common in the filthy huts of the police station. In 1889, smallpox infected a large number of people and killed more than twenty" (Lallemant 1890: 51, author's translation). The industrial proletariat was also exposed to Chagas, a disease that is transmitted by the insect vinchuca: "*our tired bodies became nocturnal banquets for the vinchucas*" (Vicuña Mackenna 1856: 448, author's translation).

Vicuña Mackenna (1856: 450) summarized the physiological and environmental stressors at MPS in the following way: "the mountains have many more terrible particularities...in addition to altitude sickness, which causes indigestion and headaches, there are dangers of *burning*, or instant gangrene, on parts exposed to the ice that can paralyze the circulation of blood, the death by *frost* that precedes a sweet and deceptive dream, *blindness* that hurts the eyes and can result in complete blindness from being exposed to the reflection of the snow for long periods, and lastly the frequent and terrible diseases of the lungs that develop suddenly here, not to mention the dangers of the trail and the violence of the hurricanes which in the summer itself are sudden and terrible" (author's translation and emphasis).

In addition to the adverse climatic conditions and health hazards, the poor housing conditions are detailed: "the mining proletariat lived in miserable little houses without

doors, in holes, lying on the ground. I wanted to improve this miserable and brutal state of the unhappy lot; I ordered doors for the huts and wooden pallets upon which they could sleep, but the doors and pallets were thrown onto the fire very soon afterwards!" (Lallemant 1890: 53, author's translation). In short, the harsh climatic conditions and the unhealthy conditions made it "very unpleasant to stay in those heights, and this is one of the main reasons why the workers do not stay there for long" (Lallemant 1890: 51, author's translation).

Mina La Atala

The archaeological materials that stand out at MLA (Fig. 6) are building materials (bricks, adobe, and mortar remnants), nails, wine jars, medicine bottles, bullet caps, and faunal remains (*Bos taurus*), among other types of less frequent materials.

Artifacts from MLA ($N = 947$) reveal tendencies in people's modes of life and activities related to mining, transportation, health care, personal effects, and food consumption, similar to MPS, but in smaller quantities (Table 3).

There are hardly any remains of tools. Most are metal items with generalized purposes such as tool handles. This scarcity of hand tools in mining industrial scale is to be expected, and we know from other regional mining contexts that such items would have been reused and taken with the workers when worksites were abandoned.

The elements associated with energy only refer to mechanical transport such as spare parts and remains of containers of machine oil. The faunal remains indicate a diet based on domestic animals such as *Bos taurus* complemented with canned foods and fruits, as seen metal, botanic, and glass remains. Similar to MPS, bullet casings indicate hunting of native animals for leisure or food. The objects related to food consumption are less common and not as diverse, among which ceramics and glass stand out.

The fragments of medicine and cosmetic bottles (including a container lid marked "Veritas") are present in MLA, which suggest personal health care and grooming practices. Unlike MPS, there are no materials specific to women nor are there references to women in historical documents.

Fig. 6 Whiteware and archaeozoological remains from MLA

Table 3 Quantities and percentages of artifacts and activities at MLA

Category	Artifact type	Quantity (N)	Percentage (%)	Activities	Percentage (%)
Mining ore	Metal	1	0.10	Mining production	0.1
Building	Metal	81	8.42	Construction	68.54
	Glass	116	12.06		
	Adobe	59	6.13		
	Brick	204	21.21		
	Binder (gypsum, lime mortar)	131	13.62		
	Reed	7	0.73		
	Cement	9	6.37		
Transport	Metal	4	0.11	Energy	0.11
Archaeozoology	Domesticated fauna	18	1.87	Consumption/ Food consumption	29.83
Food containers	Metal	22	2.29		
	Glass	243	25.26		
Hunting	Metal	4	0.41		
Household utensils	Glass	2	0.21	Eating habits	1.46
	Whiteware	12	1.25		
Clothing	Metal	1	0.10	Personal grooming	0.20
	Glass	1	0.10		
Health care	Glass	15	1.56	Health	1.56
Waste	Metal	11	1.14	Housekeeping	1.76
	Glass	6	0.62		
TOTAL		947	100		

The archaeological literature has often shown that the number of archaeological remains depends on natural and cultural processes and the degree of the site's integrity. Therefore, adequate sample size is not a factor that can be decided by the researcher. This paper tracks the relationship between sample sizes and 1) *richness*, the abundance of artifact types or activities, 2) *diversity,* the number of categories and the relative frequencies of each, and 3) *evenness*, the distribution of relative proportions of different types or items. Table 4 shows a proportional increase between sample size and richness (Bobrowsky and Ball 1989), hence this is a representative sample, as well as a balanced sample design and typology. Likewise, we can say that the samples have a clear *homogeneity*. As for the artifact types, there are six at MPS and five at MLA, which are distributed in 10 activity categories.

Artifact heterogeneity and homogeneity is similar at the two sites (Fig. 7), which indicates similar modes of life. This implies that both sites are homogeneous in terms of artifact type diversity, as well as in daily activities that represent these artifacts, which indicate relatively similar ways of life. This comparison shows a clear delimitation and functional organization of space according to sectors of extraction, collection, administration and housing. Chiavazza and Prieto Olavarría (2012) postulated a high concordance between the administrative, productive, and

Table 4 Artifact distributions and indices at MPS and MLA

Artifact distributions		MPS	%	MLA	%
Artifact types	Metal	480	12.68	124	13.09
	Glass	617	16.31	383	40.44
	Archaeozoology	301	7.95	18	1.9
	Archaeobotany	22	0.58	–	–
	Redware	2,303	60.86	12	1.27
	Whiteware	38	1	–	–
	Leather	23	0.61	–	–
	Building materials	–	–	410	43.3
	TOTAL	3,784	100	947	100
Diversity Index (H)		1.1376		1.0245	
Evenness Index (H')		1.0337		1.1723	
Embedded activities	Mining production	33	0.87	1	0.11
	Construction	430	11.37	607	64.1
	Energy	34	0.9	4	0.42
	Food consumption	767	20.27	287	30.31
	Eating habits	2,397	63.35	14	1.48
	Personal grooming	36	0.95	2	0.21
	Health	35	0.92	15	1.58
	Housekeeping	52	1.37	17	1.79
	TOTAL	3,784	100	947	100
Diversity Index (H)		1.1376		0.5717	
Evenness Index (H')		0.4489		0.5091	

domestic spheres for Los Hornillos mining site (Mendoza, Argentina), although such agreement was not measured by crossing variables of wealth, diversity and homogeneity, as discussed here.

This spatial configuration shows a tendency of social and labor marginality by the industrial proletariat of MPS and MLA, who were disciplined by the *conchabo* (Roig 1970; Beigel 2004), as well as by the architectural design, which intends to keep the workers inside and separated from the work spaces. The barracks-like design was a device for economic discipline and easy surveillance, since its immediate access to public spaces minimized privacy (Sironi 2015, 2018).

Conclusion

The goals of this paper require a perspective that combines analysis strategies and scales from both archaeology and history. Through these, the evidence of mining practices in the Precordillera of Mendoza, in addition to historical documentation, have made it possible to illuminate features of mining and miners' modes of life.

Both sites present evidence of the exploitation of mineral resources (mining pits, shafts, and ramps). Water plays a fundamental role for human survival, as can be seen

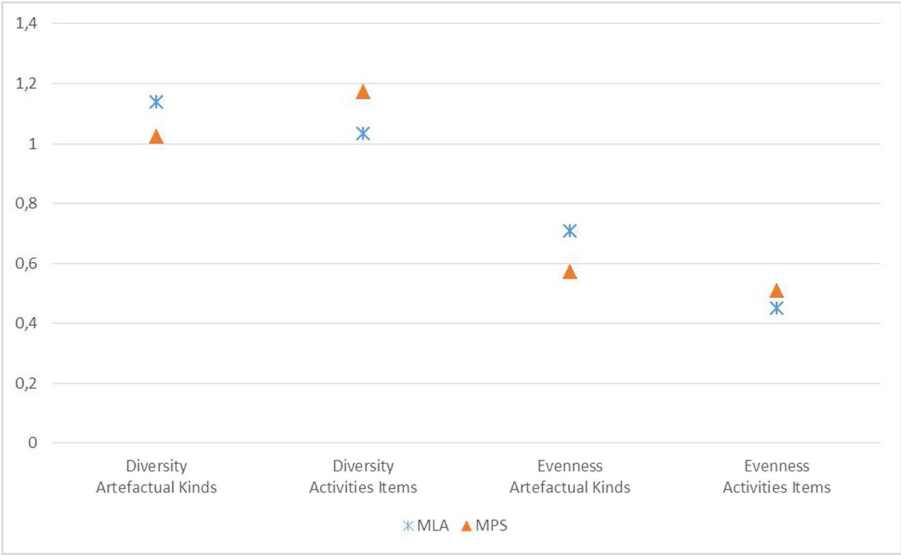

Fig. 7 Scatter plot comparing artifact types and activity items (Diversity and Evenness) at MPS and MLA

from water containers and housing locations, which are close to temporary stream beds. This is expected for mining areas.

The combination of archaeological materials and historic documentation reveal a subsistence system based on hunting for food (in axial bone processing marks, bullet casings, and documentary references), preserved food containers (metal and glass) and fruits (archaeobotanical remains). These material patterns make us think of precarious conditions and social and labor marginalization because there are active subsistence strategies, possibly in response to the non-availability and differential access to permanent foods or perhaps to supplement official rations.

The studies of glass artifacts contribute evidence of the consumption of alcoholic beverages and medicinal products from the late nineteenth to middle twentieth centuries at MPS and MLA. Based on the presence and absence of glass artifacts in archaeological contexts, we can infer that the consumption of beverages in MLA is relatively low, both in work contexts and in the domestic areas of the mining proletariat. In MPS, this trend is the opposite, with relatively high consumption. This low quantitative and stratigraphic presence of glass remains could indicate that at MLA, workers were not allowed to drink alcoholic beverages in labor contexts, given its proximity to the central area of the mine. On the other hand, in mining contexts like MPS, practices of consumption of alcoholic beverages could be understood as behaviors evading the policies established by the administrator, which pretended to conform "a superior nucleus of very hardworking, honest and sober men" (Lallemant 1890: 53, author's translation). Another example of something not mentioned in historical documents is medical treatments for diseases among workers; there is a tendency towards self-sufficiency and self-medication, as shown by glass artifacts of medicinal products.

This research proposal goes beyond a technical study that considers remains to be passive objects that reflect action of workers, who are isolated from social networks and alienated from their labor. In this sense, the impact of modern mining productive

systems created transformations in the ways of life of the mining groups of northwestern Mendoza, which are reflected in the processes of subsumption of labor to capital, as expected in the peripheral capitalism of the nineteenth and twentieth centuries through wage labor. As a result, we see that mining was driven by a diverse group of workers from diverse regions who were attracted by the wages that the mines offered. This was part of a process of ethnogenesis (Barth 1969; Bartolomé 2006) that is synthesized in the mining industrial proletariat of the Precordillera of Mendoza. This is a result of the economic policies of the oligarchic and authoritarian Argentine state (Oszlak 1997), based on the advice of interest groups (Ferrando Badía 1977): European scientists and specialists hired by the Argentinian government, including Martin de Moussy (1860), Rickard (1863), Hoskold (1889), Lallemant (1890), among others, who sought to reconfigure the social and natural environment based on narratives that exalted a civilizing project: for this it was important the replacement of the *pirquineros* (by others very workers), of their artisan techniques (by the technological innovation on a large scale), of their miserable *ranchitos* (by dwellings inhabited by honest and sober men). The authors in question seemed to play an absolutely functional role to the interests they defended, since despite the active role played by mining in the consolidation of colonial territory, and the important role that played at the discursive level in characterizing it as a mining region, in fact this never became a predominant economic activity in the local scene.

The information presented here does not exhaust, in any way, the possibilities of analyzing material living conditions in the different contexts of social change inherent in industrial capitalism. We believe that we have used adequate criteria to examine contradictions between forces of production, that is, technology and its control, and the organizational instances implicit in the forms of social relationships linked to production, and that these analytical approaches can provide valuable information at a scale not usual in historical studies.

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