EL INDÍGENO AND HIGH-ALTITUDE HUMAN OCCUPATION IN THE SOUTHERN ANDES, MENDOZA (ARGENTINA)

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The site El Indígeno contains the greatest known concentration of hunter-gatherer residential features in the southern Andes. Located at 3,300 m asl in a meadow in the Cordillera of west-central Argentina, the site is notable for its 133 habitation structures, that—when considered along with the other characteristics of the site—represent an anomalous but perhaps not entirely unexpected adaptation to the highest altitude environment in the region. Based on radiocarbon dating and artifact typologies, the site was occupied between ca. 800 and 1500 B.P. It consequently represents the latest step in the indigenous colonization of what is arguably the most marginal environment in the region. This chronology suggests that the site was occupied when nearby lowland regions were under their most intensive use and during a time when new resources were incorporated into the high-altitude hunter-gatherer diet. In this article I report on research conducted at El Indígeno and compare the results of these studies to the regional record, ultimately concluding that regional population increase affiliated with the spread of increasingly complex socioeconomic systems most parsimoniously explains the intensive occupation of this large, high-altitude hunter-gatherer site.

El sitio arqueológico conocido como El Indígeno contiene la mayor concentración de estructuras habitacionales de cazadores-recolectores en los Andes del sur. Localizado a 3300 msnm en una vega cordillerana del Centro Oeste Argentino, se destaca no solo por sus 133 estructuras sino por otros elementos, los cuales representan una anómala pero quizás no del todo inesperada adaptación al entorno de mayor altitud en la región. Sobre la base de dataciones radiocarbónicas se estableció su cronología entre ca. 1500 y 800 años A.P., por lo que representa uno de los últimos pasos en la colonización prehispánica del sur de Mendoza. Esta cronología sugiere además que el sitio fue ocupado cuando todas las regiones próximas estaban siendo utilizadas intensivamente, y durante un tiempo en el que nuevos recursos fueron incorporados en la dieta de los cazadores-recolectores. Aquí se presentan los resultados de los trabajos llevados a cabo en El Indígeno, los cuales son comparados con el registro arqueológico regional. Finalmente se concluye que el incremento en la población a nivel regional, asociado con la dispersión de una creciente complejidad del sistema socioeconómico, puede explicar de forma más parsimoniosa la ocupación intensiva de este sitio de altura.

Worldwide, high elevation archaeology has produced critical empirical information and diverse theoretical perspectives regarding the driving mechanisms behind human use of marginal environments (Aldenderfer 1998, 2006; Basgall and Giambastiani 1995; Bender and Wright 1988; Bettinger 1991, 1994, 2000; Brantingham et al. 2007; Grayson 1991; Madsen et al. 2000; Morgan et al 2012a, 2012b; Nash 2012; Scharf 2009; Walsh 2005; Yacobaccio 2013; Zeanah 2000). Although marginality is a dynamic quality determined by environmental productivity, accessibility, and predictability relative to population density and human adaptive mechanism (Mondini and Muñoz 2004; Neme and Gil 2008; Outram 2004), high altitudes are generally considered marginal for several reasons. Aldenderfer (1998, 2006) defines high altitudes as areas above 2,500 m asl. These areas are often characterized by rugged topography that limits access to resources, as well as lower biotic productivity compared to lowland settings, frequently harsh and unpredictable climatic conditions, reduced oxygen availability, increased caloric requirements for people who choose to live in such settings, and pronounced seasonality (Aldenderfer 2006; Baker 1968; Morán 2000; Pianka 1982; but see Walsh et al. 2006).

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Latin American Antiquity 27(1), 2016, pp. 96–114

DOI: 10.7183/1045-6635.27.1.96

The south-central Andes of Argentina and Chile is one of the highest regions in the Americas, with peaks between 4,500 and 7,000 m asl. Here, biotic productivity is very low and soil formation weak, particularly above 3,300 m asl. At this elevation, vegetation is sparse and gives way to rock deserts and small plants. Steep and incised topography typically impedes movement across the landscape. Given these parameters, it is clear that environments above ca. 3,000 m asl in southern Mendoza Province, as elsewhere, are generally less productive and less predictable than those found in lower elevations, and are consequently "marginal" (Böcher et al. 1972; Roig 1972).

The indigenous populations who live in highland ecosystems today have developed social and economic strategies well-suited to cope with the limitations of living in marginal, high-altitude environments (Lozny 2013). These strategies include decreased overall mobility, increased caloric intake, storage and caching behaviors, and technological innovations related to habitation and clothing that deal with cold and radiation stress. Adaptation to altitude also includes physiological changes for non-transhumant populations (Baker 1968; Beall 2007; Moran 2000; Orlove and Guillet 1985; Thomas 1979).

The idea of the marginality of high-altitude environments and the ensuing necessity for novel human behavioral adaptations is reflected in circumstantial archaeological evidence worldwide. Per this work, most high altitude ecosystems around the world were intensively occupied and exploited only when resource exploitation in lower-elevation localities was radically intensified. This arguably resulted in the need to expand into more marginal regions that entailed less efficient foraging strategies (Aldenderfer 2006; Bettinger 1991; Brantingham et al. 2006, 2007; Morgan et al. 2012a; Zeanah 2000). Consequently, early use of high altitude systems was typically infrequent, opportunistic, often focused on hunting large game, and characterized by strategies that tended to avoid risk and to share territories. In most places where intensified high-altitude land use later developed, these strategies were typically inverted and characterized by more frequent and logistically oriented occupations, intensive exploitation of plant resources, and increased territoriality (Aldenderfer 1998, 2006; Brantingham and Gao 2006; Brantingham et al. 2007; Moran 2000; Orlove and Guillet 1985).

Because of these factors, it was until recently believed that most of the southern Andean high country was not intensively used by hunter-gatherers. As a result, no systematic hunter-gatherer oriented research was carried out in these locales throughout most of the twentieth century, especially in the periglacial environment. Most of the models used to characterize the use of mountain environments in South America focused on explaining pastoralist adaptations. Pastoral land use was argued to have entailed a seasonal transhumance pattern where populations moved between different ecologic floors and different elevations depending on season (Lynch 1973; Morgan 2009; Murra 1972; Schiapacasse and Niemeyer 1975). These models explain high-altitude occupation after the introduction of domestic animals (llama, alpaca), but they do not explain the causes behind intensive high-elevation hunter-gatherer occupations due mainly to the difficulty of transposing pastoral models onto hunter-gatherer populations.

During the early 1970s, mountain climbers located two of the most important hunter-gatherer high-elevation sites in the region: Los Peuquenes and El Indígeno (Lagiglia 1997). After this discovery, a more systematic approach to the hunter-gatherer archaeology of the region was undertaken, one which focused on large high-elevation sites with multiple domestic features. Today, five highland archeological localities are under study and several clusters of sites have been identified in the Argentine Andes between 34° and 36° SL (Durán et al. 2006; Lagiglia 1997; Neme 2007).

El Indígeno, the focus of this article, contains the largest number (n = 133) of hunter-gatherer habitation structures in the southern Andes. It is located at 3,300 m asl in the alpine tundra zone, close to the Argentina-Chile border. Its characteristics are similar to other high elevation sites in the world (Bettinger 1991; Morgan et al. 2012b; Nash 2012; Scharf 2009; Thomas 1982, 1994), making it a good place to address questions about what conditioned human use of high elevation areas. In this article, I describe the characteristics of El Indígeno: spatial structure, chronology, subsistence remains, and technological orientation. These characteristics are used to reconstruct the occupational history and function of the site within the context of regional settlement and subsistence systems. Based on these data, it is argued that the occupation of the site was conditioned perhaps in part by climatic changes but more likely by changes in lowland adaptive patterns. This information is then used to explore more general ideas about human adaptation to high-elevation environments.

Environmental Context

Mountain environments present several characteristics that are limiting to human populations. Among these are vertical and patchy biotic zonation, steep topography, pronounced climatic variability, and unpredictable resource productivity and distribution (Aldenderfer 1998; Baker 1968; Moran 2000; Pianka 1982; Rhoades and Thompson 1975). These characteristics are common in the south-central Andes. The southern Andes also have strong effect on climate, most notably in creating a pronounced rain shadow to the east of the Cordillera (Argentinean side) in contrast to the wet western slope (Chilean side).

Much of the Andean landscape exhibits glacial topography (Corte 1976), especially in areas over 3,800 m asl. At these elevations, valleys are narrow and steeply incised, their upper regions covered by glaciers (Volkheimer 1978). In southern Mendoza Province at elevations above 2,000 m asl the summer season is, for all intents and purposes, nearly nonexistent and the weather is particularly variable due to the region's complex topography (Capitanelli 1972; Solbridg et al. 1984).

High elevation areas across the region are generally well drained, with abundant creeks and lakes that flow into the Diamante and Atuel rivers. Precipitation on the eastern slope ranges from 300 mm at lower elevations to 800 mm at higher elevations (mainly as snow in the winter) (Abraham 2000; Volkheimer 1978). Average annual temperature is 9°C at Laguna El Sosneado (2,000 m asl) and 0°C at 3,000 m asl. In this higher area, maximum and minimum temperatures are 25°C and -30°C, respectively. At this latitude (33° SL) the limit of biotic productivity is ca. 3,700 m asl (Abraham 2000; Böcher et al. 1972; Cabrera 1976) and glaciers are common above ca. 3,800 m asl.

High-elevation flora is typical for the *Altoandina* phytogeographic province, but plant distribution and abundance are also strongly conditioned by soils, water traps, and insolation (Böcher et al. 1972; Roig 1972). For these reasons, vegetation cover is rare at higher altitudes, where plants consist mainly of shrubs and gramineous steppe taxa with some areas covered by meadows and lichens. Asteracea and Poacea are the main families represented at this altitude; common genera are *Azorella* and *Oxalis* (Böcher et al. 1972; Roig 1972). Most of the plant species have well developed roots and stems adapted to cold, xeric, windy conditions (Cabrera 1976; Roig 1960). *Berberis empetrifolia* is the highest-elevation plant resource exploited by Andean hunter-gatherers for subsistence; it is found at elevations as high as ca. 3,000 m asl. Other important subsistence resources like *Schinus poligamus*, *Rodophiala rhodolirion,* and *Senna arnottiana* grow just below 2,700 m asl. Different species of *Adesmia* spp. were used as firewood, a critical resource, which can grow as high as 3,400 m asl.

Faunal diversity is generally very low in the highlands and is characteristic by the *Fauna de Grandes Alturas* (Roig 1972). It consists mainly of two large animals: guanaco (*Lama guanicoe*) and mountain lion (*Puma concolor*). It also includes lizards (*Liolaemus genus*), rodents (*Akodon* spp. and Phillotys spp.), and birds (e.g., *Chloephaga picta*, *Merganetta armata*, *Attagis gally,* and *Vultur gryphus*).

Paleoenvironment

On the eastern side of the Andes (at ca. 33º SL), paleoenvironmental reconstructions are based on scant palynological, charcoal, glacial, and sedimentological proxy data with generally coarse temporal resolution (D'antoni 1983; Markgraf 1983; Navarro and Whitlock 2010; Stingl and Garleff 1985; Tripaldi et al. 2012; Zárate 2002). These data extend back in time to ca. 3000 B.P. The main climatic variation seen in these data over three millennia is glacial advance occurring ca. 400 B.P., likely associated with the Little Ice Age (Espizua 2005; Stingl and Garleff 1985). Based on the charcoal and palynological record in Laguna El Sosneado (located 38 km from El Indígeno), wetter and colder conditions also prevailed ca. 2500-2000 cal B.P. (Navarro and Whitlock 2010).

Higher resolution climate records are found outside the Andes in Chile. These include marine sedimentary records from the Pacific coast and lake cores from Laguna Aculeo and Laguna Chepical (Jenny et al. 2002; Jong et al. 2013; Lamy et al. 1999, 2002). There is some consistency between these records and those from the eastern Andes. In Chile and in the high Andes, climate was generally colder and more mesic over the last 2000 years when compared to the entire Holocene (Jenny et al. 2002; Jong et al. 2013; Lamy et al. 2002). A drier period was detected in Laguna Aculeo between 200 B.C. and A.D. 200, followed by five periods of flooding: A.D. 200–400, A.D. 500–700, A.D. 1300–1700, A.D. 1400–1600 and 1850–1998, the last being the most pronounced (Jenny et al. 2002). The authors relate these events to the increased intensity of the Westerlies between ca. A.D. 200 and 950, concurrent with increased lake levels and biotic productivity (Jenny et al. 2002). Around A.D. 950–1930 the frequency and intensity of flood events increased, as well, especially ca. A.D. 1300–1700 and 1850–1930. These events correspond to the Little Ice Age signal detected by different proxy records in central Chile (Jenny et al. 2002; Jong et al. 2013; Lamy et al. 2002). Finally, late Holocene climatic conditions, especially during the last 2,000 years, were marked by stronger and more frequent ENSO events, which increased the overall variability of the climatic system of the southern hemisphere (Jenny et al. 2002; Lamy et al. 1999).

Unfortunately, the regional paleoenvironmental record lacks the resolution to reconstruct specific plant and animal communities over the last 3,000 years, but the magnitude of climatic variation during the time when El Indígeno was occupied likely affected these communities. I can only speculate about how much biotic composition, density, and distribution varied over this time, but by ca. 1500 B.P., when El Indígeno's occupation began, ENSO-related flood events increased, indicating more mesic conditions (Jenny et al. 2002; Lamy et al. 1999). Mesic conditions would likely increase vegetation cover, especially in valley bottoms. However, increases in precipitation at higher altitudes could have the inverse effect because more snow cover might reduce growing season and consequently restrict plant productivity, which would keep herbivore (i.e., guanaco) populations in check.

Regional Archaeological Background

The first southern Andean occupations date to ca. 9000 B.P. and spread rapidly thereafter across most mountain ecozones below 2,500 m asl. The higher elevation zones, on both the western and eastern slopes, were essentially unoccupied until ca. 2000 B.P. At this time, some high valleys above 2,500 m asl began to be exploited by human populations from both the western and eastern Andean slopes (Cornejo and Sanhuesa 2003; Neme and Gil 2008). In central Chile, some agricultural societies appeared. Their material inventories include the Llolleo, Bato, and later Aconcagua complexes (Falabella and Stehberg 1989; Falabella et al. 2007). However, Cornejo and Sanhueza (2003, 2011) argue that central Chilean mountain ecosystems (from ca. 1,200 to ca. 3,500 m asl) were exclusively occupied by hunter-gatherers who had frequent interactions with their farming neighbors. From this perspective, the only access agricultural groups had to mountain resources was through the hunter-gatherer groups that lived in and exploited mountain ecosystems.

This is not an anomalous situation. As different ethnographic and archaeological studies demonstrate that agriculturalists living in frontier zones often interacted closely with their hunter-gatherer neighbors, with whom they traded and, in some cases, upon whom they depended for survival (Headland and Reid 1989; Layton et al. 1991; Spielman and Eder 1994; Winterhalder and Goland 1997). It is therefore likely that domestic plants found at sites attributed to hunter-gatherers were acquired through exchange. In central western Argentina, however, hunting and gathering remained the dominant subsistence pattern, both in the Andes and on the plains until the arrival of the Spanish (Gil et al. 2011; Llano et al. 2011).

The first high-elevation archaeological work in the region began in the 1970s when El Indígeno was discovered. The San Rafael Natural History Museum organized the first fieldwork at the site, which included a preliminary survey and excavation (Lagiglia 1997). Three other high-elevation sites were excavated after El Indígeno: Laguna el Diamante, Los Peuquenes, and Risco de los Indios. All four sites are characterized by proximity to mountain passes, habitation structures, late occupation periods (between ca. 1900 and 300 B.P.), abundant pottery, and the presence of non-local goods like shells from the Pacific coast, plants from the Andean forest, and pottery from central Chile (Durán et al. 2006; Neme 2007; Neme et al. 2015).

All the high-altitude archaeological sites from southern Mendoza are believed to represent hunter-gatherer occupations. There is no evidence for other kinds of activities like pastoralism, mining, or defense (Durán et al. 2006; Lagiglia 1997; Neme 2007). The nearest Argentinean sites containing evidence for these types of activities are in northern Mendoza and San Juan, ca. 200 km from El Indígeno (Bárcena 2001; Michieli 2009) and in central Chile (ca. 100 km from El Indígeno, over high Andean passes); the latter post-date the arrival of the Inca in the region (Stehberg 1992). There is, however, one osteometric study that connects Diamante River watershed archaeological sites to pastoral groups (Gasco 2012) but it relies on only three specimens of several hundred identified at the site. Considering problems related to osteometric methodology (L'Heureux 2010; Yacobaccio 2010) and the absence of other indicators of pastoralism (e.g., corrals, dung deposits, etc.) a pastoralist assignation for these faunal samples must be considered extremely tentative at this time.

By the time the first high-elevation sites in the Diamante River area were occupied ca. 2000 B.P., other important changes in human behavior had taken place across the greater region. Most of these relate to changes in subsistence. Most notable is a greater focus on hunting smaller and more diverse animal species (Neme 2007; Neme and Gil 2008). This was accompanied by similar changes in plant exploitation, where smaller and more costly-to-process taxa were included in regional diets (Llano 2010; Llano et al. 2011). Changes in technology include the adoption of pottery and the bow and arrow, as well as an increase in long-distance material conveyance (Durán 2000; Giesso et al. 2011; Neme and Gil 2008).

El Indígeno

El Indígeno is located at 3,300 m asl on a basalt flow within a meadow watered by a creek, which flows to the Barroso River, a tributary of the Diamante River (Figure 1). The basalt is highly weathered, and the site is covered by clasts derived from this flow that were used to build its structures. The basalt flow causes the creek to form several small ponds and sediment traps, which has allowed soils to develop near the creek and resulted in the formation of the meadow. The presence of *Adesmia* spp.—commonly used as firewood—makes the meadow particularly attractive to human habitation. The basalt flow also protects the site area from high winds and retains heat from the sun well into the afternoon and evening on summer days.

The main part of the site is composed of 133 structures running roughly north-south along the creek (Figures 2 and 3); the structures cluster into six main groups. The maximum length and width of the site are 225 m and 135 m, respectively, for a total area of ca. 30,000 m^2. Four clusters of structures contain only two or three habitation structures each, and are spread across the basalt flow in an area of ca. 1.4 km^2 (Neme 2007). Two of the site's structures are U-shaped, the rest are semicircular with an average diameter of 4 m (Figure 4).

Previous Research

The initial fieldwork at the site took place in 1973 when four circular structures were excavated (Structures 17, 18, 21, and 52) (Lagiglia 1997; Lagiglia et al. 1994). Only one of the structures was completely excavated (Structure 17); in the others, small test pits were dug. All excavations were conducted using 10 cm arbitrary levels. During the excavation, soil and sediments were sieved using 5 mm mesh, no flotation samples were taken, and only a sample of the better-preserved faunal material was collected. Excavations produced copious amounts of sherds, stone tools, and debitage. Some of the more interesting surface finds were nine complete pots, which were found turned upside-down (Figure 5), one with half a squash (*Lagenaria siceraria*) inside (Lagiglia 1997). Nearly every structure was

Figure 1. Location of El Indígeno archaeological site.

equipped with *manos* and milling stones.

Stone tools recovered during the initial excavations included scrapers, projectile points, and flakes made of basalt, obsidian, chalcedony, sandstone, quartzite, and rhyolite. The notched triangular projectile points (Figure 5) were made from obsidian and date to the last 2,000 years B.P. (Durán 2000). One charcoal sample from Structure 17, level 2 (10-20 cm) was radiocarbon dated to 980 ± 90 rcy B.P. (900 ± 90 cal B.P. [at 1 sigma]) (Lagiglia et al.1994). This date is consistent with the age of the Aconcagua style pottery found in the same level.

Pottery included southern Mendoza types like Overo (Figure 5) and Central Chilean types like Llolleo, Aconcagua, and Diaguita chilena, among others (Lagiglia 1997; Falabella et al. 2001; Sanhueza et al. 2004). The shape of the pottery containers included bowls (*escudillas*), pots, and vessels. The abundance of pottery from the western slope led Falabella et al. (2001) to argue that the site was occupied by groups from central Chile.

Lagiglia (1997) obtained a small archaeofaunal sample from Structure 52 (Table 1), which shows a focus on hunting big game, mainly guanaco, supplemented by a small quantity of migratory birds (probably *Chloephaga picta*) (Neme 2007). The guanaco age profile shows a high frequency (41 percent) of young specimens (juvenile and neonates). Unfortunately the faunal sample was poorly preserved and not all the bones unearthed were collected. Given the 5 mm mesh size, it is

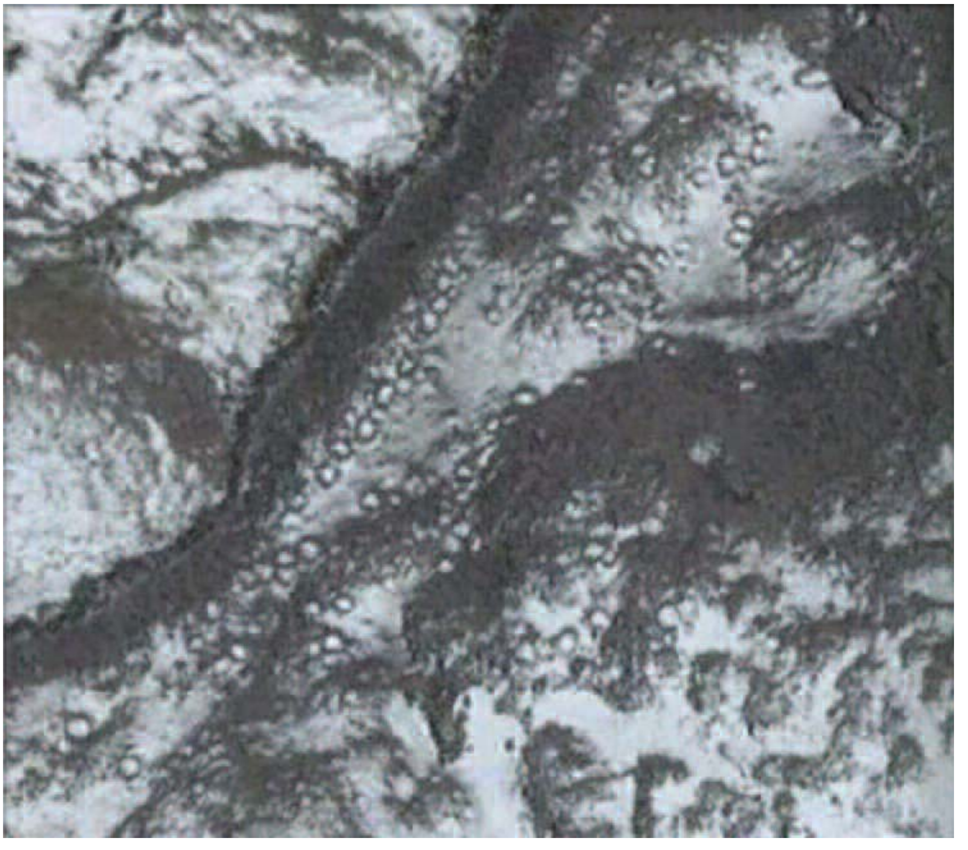

Figure 2. Satellite image of El Indigeno showing residential structures (Google Earth source).

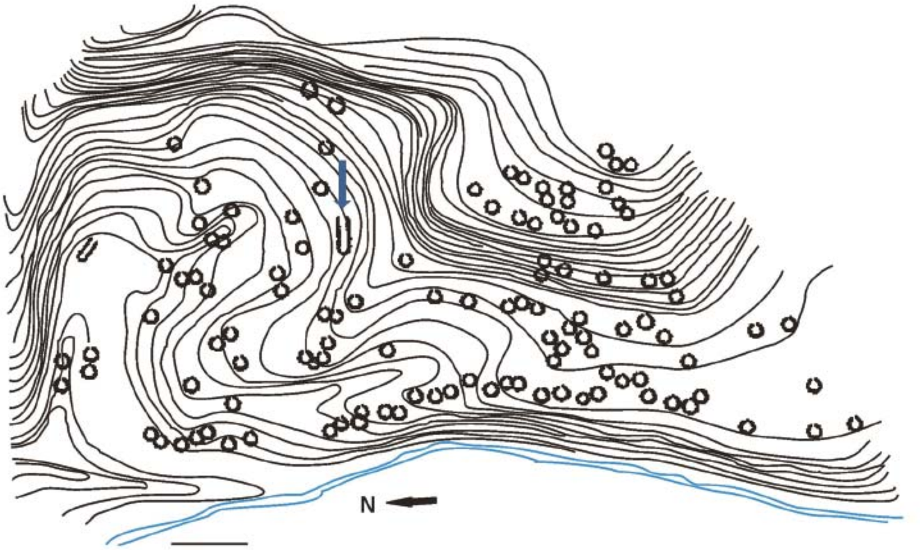

Figure 3: El Indígeno site with the arrangement of the habitation structures. The arrow shows Structure 96.

Figure 4. Habitation structures at El Indígeno.

likely that only larger taxa and larger, more recognizable bones of smaller animals were recovered.

Latest Research

In 1994, two units were excavated in another structure (Structure 96) and systematic surface sampling was conducted (Figure 6). Structure 96 was selected due to its unique, "U" shape and considerable size (12 m long). Structure 96 is located in the northern portion of the site, where the structures appear to be in generally poorer condition yet are also covered by more sediments than those in the southern part of the site. It was thought that perhaps these sediments capped and therefore preserved intact deposits.

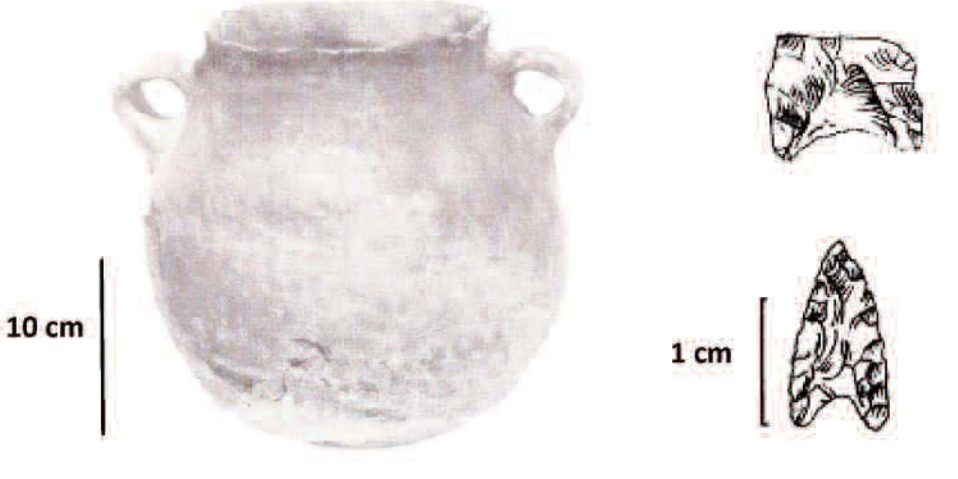

Figure 5. Overo vessel type from El Indígeno site and notched triangular projectile points made from obsidian (Lagiglia 1997; Neme 2006).

Table 1. Archaeofaunas from Structure 52

Taxa	NISP
Mammalia	4
Mammalia (Large)	6
Artiodactyla	9
Lama sp.	9
Lama guanicoe	23
Bird	2
Unidentified	151
Total	204

Two units were excavated in the interior of Structure 96: A-1 (1 x 1 m) and B-2 (2 x 2 m). Excavations proceeded in 5 cm arbitrary levels with all matrix passed through 2 mm mesh. Five-liter flotation samples were collected from each level. Five natural strata were identified (Figure 7), all composed mainly of sandy deposits (Neme 2007).

The excavation continued until sterile sediments were encountered: 45 cm below surface (9 arbitrary levels) in unit A-1, and 55 cm below surface (11 levels) in unit B-1. Four radiocarbon dates were generated, three from hearth charcoal samples and the fourth from a maize cob (Table 2 and Figure 8). These assign Structure 96 a date between ca. 1500 and 850 B.P. (1390-800 cal B.P. [1σ]), which correlates well with the dates generated by Lagiglia et al. 1994: 900 ± 90 cal B.P. [at 1σ]. However, some glass beads and one Chilean coin from 1887 appeared on the surface (Lagiglia 1997), suggesting that use of the site continued into historic times.

Lithic artifacts consist of one triangular notched obsidian projectile point dating to the Late Prehistoric Period (last 2,000 years B.P.), one basalt core, and 64 flakes. The latter are comprised of obsidian (38 percent), chert (29 percent), basalt (15 percent), quartzite (10 percent), and rhyolite (3 percent), as well as undetermined (5 percent) stone. Obsidian sourcing (using XRF) of three samples indicates one was derived from a source within the south (Las Cargas, some 90 km south of El Indígeno); the other two samples originated from an unknown source (Durán et al. 2004). Flake types range from primary flakes to pressure flakes and retouch chips, indicating core reduction, tool manufacture, and tool maintenance.

A total of 162 sherds were recovered. These are classed as Overo and Llolleo types, which are found on both the eastern and western slopes of the Andes (Falabella et al. 2001). Their stratigraphic distribution suggests that the Llolleo type was more common earlier in the occupation of the site, while the Overo type was more common in later times.

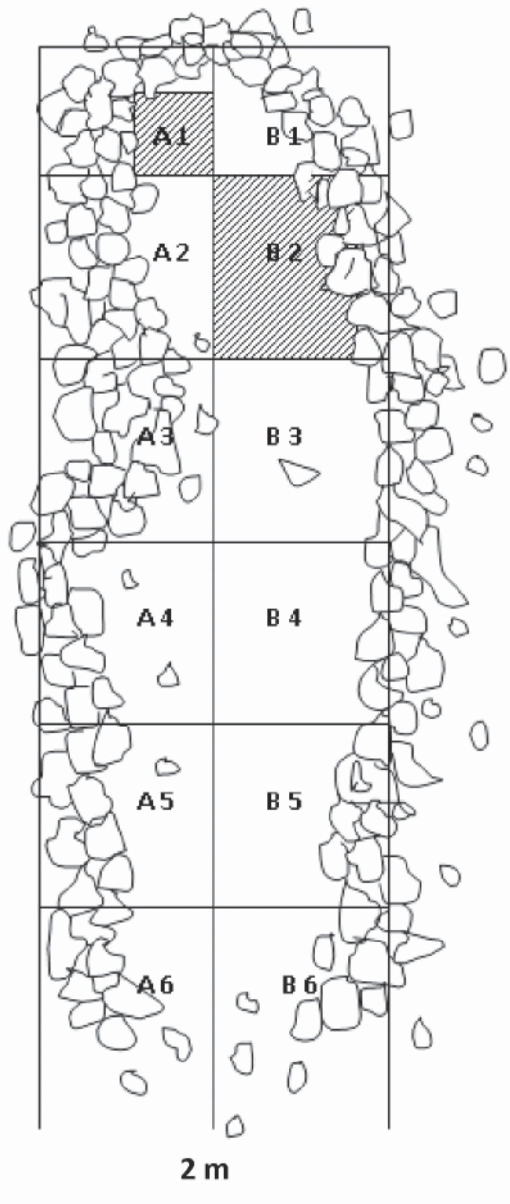

Figure 6. Structure 96 plan view showing excavated units (A-1 and B2).

Ten macrobotanical remains were recovered: five are *Zea mays* (starch and caryopses), one

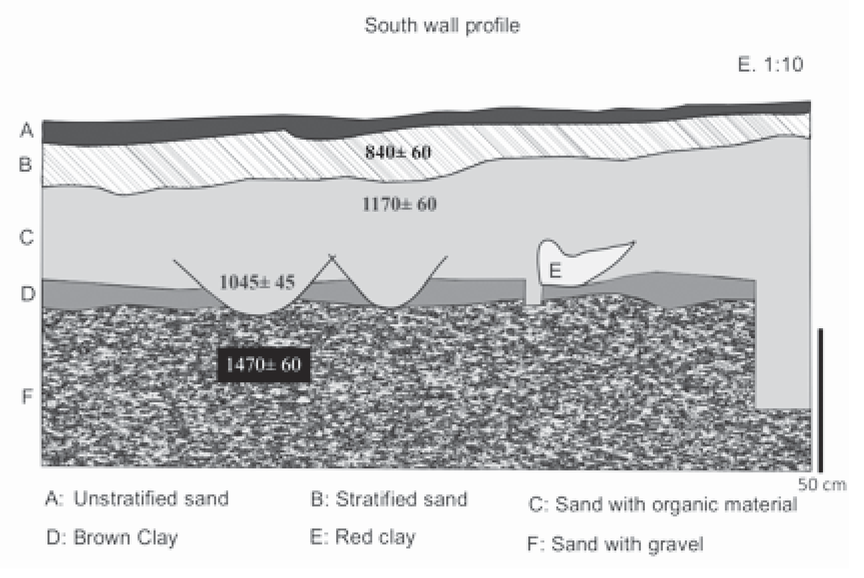

Figure 7. Profile of unit B-2.

Lagenaria siceraria (epicarp), two *cfr. Empetrum rubrum* (fruit), and two are unidentified specimens. *Empetrum rubrum* (wild) is the only specimen endemic to the alpine zone; the remainder had to have been transported from much lower elevations (the closest sites with domesticates are located some 60 km west of the highest peaks in central Chile). Adornments were recovered as well: one steatite labret and 115 stone beads necklaces. One infant incisor also was recovered.

Discussion

El Indígeno appears to have been repeatedly occupied by mobile hunter-gatherers between 1400 and 800 years ago, in part due to the many benefits of the site's setting: water, abundant materials for building structures, protection from the wind, access to firewood, gentle topography, exposure conducive to melting snow earlier than nearby locales, pasture for guanaco, and ponds that draw migratory birds. One of the most important of these factors is access to firewood, which can be particularly limited in alpine settings. However, it is important to note that even though there are considerable local incentives for occupying El Indígeno, the site setting remains marginal compared to lower elevation settings. Its high elevation requires human populations to cope with hypoxia, increased caloric requirements, cold temperatures, wind, insulation, and uncertainty with regard to climatic conditions. In fact, incentives such as those found at El Indígeno are exceedingly rare above 2,500 m asl, and it is clear that El Indígeno is one of the few places in the greater region where this many beneficial environmental characteristics occur together.

Site History and Function

The chronology of the excavated structures, the differences in ceramic types, and the variability in structural preservation (which is better in the southern portion of the site) suggests that the structures were not built and occupied contemporaneously. On the contrary, different groups likely added new structures to the site over time. Apparently some of the younger structures were made using materials from older structures, which is why the younger ones in the south are better preserved than those in the northern portion of the site.

Given the nature of the faunal remains at El Indígeno, it is clear that guanaco hunting was the principal subsistence activity associated with the site and that hunting large fauna was the main reason why hunter-gatherers in this region exploited highland environments. The artiodactyl index for all of the high elevation sites studied in the region (El Indígeno, Los Peuquenes, and Laguna del Diamante) is over 90 percent, showing

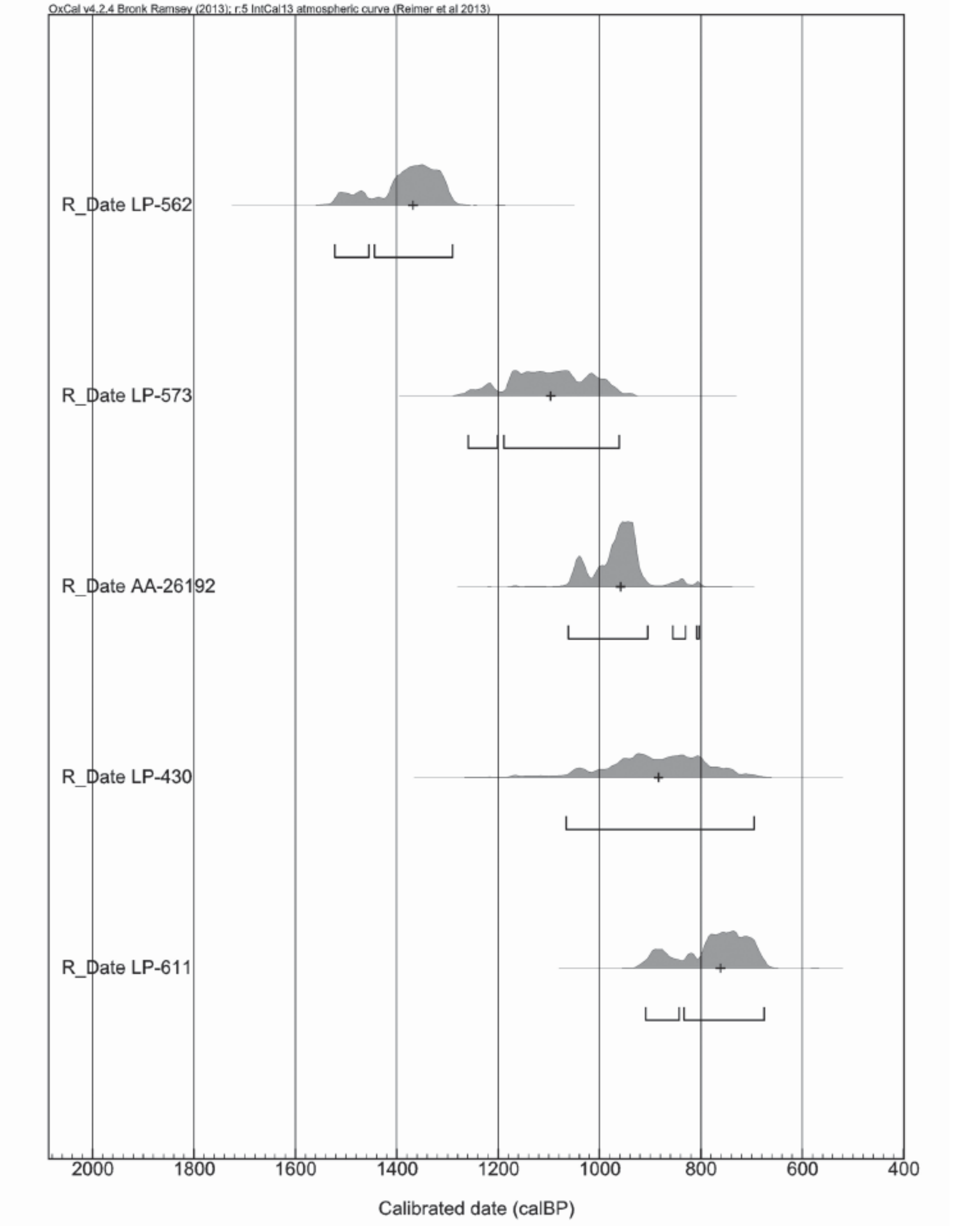

Figure 8. Dates calibrated with Oxcal V4, 2.4 Bronk Ramsey (2013), and presented with two sigma range. IntCal 13 atmospheric curve (Reimer et al. 2013).

very clearly that the exploitation of high-return resources like guanaco was the subsistence focus at these sites (Neme et al. 2013).

However, plant processing was important, as well, as shown by the macrofloral remains and the *manos* and milling stones associated with each structure. The diversity and composition of the site features and artifact assemblages consequently suggest that it was not simply a logistical, ostensibly male-oriented hunting site. On the contrary, the high frequency of processing equipment, pottery, and seeds indicate that family groups likely occupied the site.

It is clear that at El Indígeno hunting was supplemented by the use of vegetal resources from lower elevations. These might include the central

Table 2. Radiocarbon Dates from El Indígeno Site.

Structure	Unit	Level	Lab. Code	^{14}C Date	Cal years BP* Max	Min	Median	Sample	Reference
17	-	2	LP-430	980 ± 90	1066	696	884	Charcoal	Lagiglia et al. 1994
96	B2	4	LP-611	840 ± 60	909	675	762	Charcoal	Neme 2007
96	B2	6	LP-573	1170 ± 60	1259	961	1097	Charcoal	Neme 2007
96	B2	9	AA-26192	1045 ± 45	1062	804	959	Corn cob	Neme 2007
96	B2	11	LP-562	1470 ± 60	1522	1290	1368	Charcoal	Neme 2007

*Calibrated at 2σ range using Oxcal V4, 2.4 (Bronk Ramsey 2013) and IntCal 13 atmospheric curve (Reimer et al. 2013).

valleys of Chile (i.e., domesticates like *Zea mays*) or wild resources (e.g., *Empetrum rubrum*) from lower ecozones to the east and west of the site. In an interestingly analogous situation, research in North America's Great Basin indicates that occupants of alpine villages (Bettinger 1991; Morgan et al. 2012b; Nash 2012; Thomas 1982) subsidized their diet with lowland resources, not only to lengthen their stay in high-elevation places, but also to reduce risk when travelling through the mountains (Nash 2012; Scharf 2009). This appears to also be the case at El Indígeno, where the travel costs associated with accessing the site from lowland settings are quite high.

Another important activity was exchange of non-local goods coming from at least 300 km away. Some of this material (*Zea mays*, *Lagenaria*, *Empetrum*, obsidian, silica, steatite, pottery, and mollusk shells) was brought to the site from lower elevations and probably originated with groups other than El Indígeno's inhabitants. The first Spanish explorers who arrived in the region mentioned that hunter-gatherers from southern Mendoza went to the western slope of the Andes in Chile every summer to meet people and exchange maize, blankets, feathers, salt, and pottery (Bibar 1966).

Seasonality and Mobility

Given the several meters of snow that cover the site from early autumn to late spring (some years even longer), environmental conditions largely preclude all but summer occupations of El Indígeno. Summer occupations are further indicated by guanaco age profiles from the site, which are marked by an abundance of juveniles. This corresponds to archaeofaunal data from other Andean "villages" in the region, in which over 60 percent of the guanaco bone consisted of juvenile individuals. These high proportions of immature specimens could be understated, given that weathering tends to destroy immature specimens of less dense bone (González et al. 2012).

I contend that the seasonality of the occupation of El Indígeno, the environmental limitations of the high-altitude environment, and the conveyance of extralocal goods (especially volcanic toolstone) indicate that the people who occupied this and other similar sites spent a considerable portion of the year in the lower elevation Diamante and Atuel river valleys on the eastern slope of the Andes. Many of the resources (obsidian and lower-elevation wild plant foods) that were transported to El Indígeno are available on the piedmont and in the intermontane valleys on the eastern slope of the Andes, below the worst of the winter snow, between 1,600 and 2,500 m asl. Importantly, such a transhumance system would not require trips onto the plains east of the Andes, as some researchers have suggested (Lagiglia 1997).

However, it is also likely that the site was occupied or at least visited by groups from both sides of the Andes, especially when taking into consideration the fact that sharing territories is common for peoples who live in high-elevation environments (Aldenderfer 1998; Orlove and Guillet 1985). The presence of Chilean pottery and mollusk shells from the Pacific coast lends support to this scenario, as does the presence of domesticates in the deposits at El Indígeno. Because research conducted in the Chilean high-mountain region suggests that the populations who inhabited the high Chilean Andes never adopted farming (Cornejo and Sanhueza 2003, 2011), the presence of domesticates and Chilean pottery styles must be related to interaction between western lowland farmers and highland hunter-gatherer populations.

The Origins of Mountain Villages

El Indígeno was occupied between 1500 and 800 B.P. Other smaller high elevation sites with similar characteristics suggest this "village" pattern began in the southern Mendoza region around 2000 B.P. (Durán et al. 2006; Neme 2007). This pattern included not only travel to distant high-elevation resource patches, but also a substantial amount of labor invested in constructing the multiple structures found at these sites. This elicits the question: why did people begin intensively exploiting and seasonally residing in these high-elevation marginal environments at some point around 2000 B.P. and not before?

One possible explanation is a climatic shift that could have changed the relative return rates between the lower and higher elevation resource patches. In this sense, an improvement in the biotic productivity of high-elevation patches or a decrease in biotic productivity at lower elevations could make the alpine zone more attractive, essentially "pulling" (in the former case) or "pushing" (in the latter) humans to more intensively occupy the high Andes. There indeed appears to be some superficial temporal correlations between changes in the environment and human occupation. The first occupations (ca. 1400 cal B.P.) of El Indígeno are contemporaneous with one of the wetter periods in the last 2,000 years (Jenny et al. 2002; Navarro and Whitlock 2010). Cessation of regular use of the site (ca. 800 cal B.P.) could also arguably be linked to the harsher climatic condition associated with the onset of the Little Ice Age (although the most recent dates from El Indígeno are roughly 150-200 years too old) (Jenny et al. 2002; Jong et al. 2013; Lamy et al. 2002; Stingl and Garleff 1985).

Attributing a causal relationship to these very rough temporal correlations between climate and the history of human occupations is confounded by other paleoclimatic data from the Andes. First, the paleoclimatic record indicates that there were several wet episodes over the last 2,000 years that do not correspond to alpine village occupations (Jenny et al. 2002; de Jong et al. 2013; Lamy et al. 2002; Navarro and Whitlock 2010). More importantly, the onset of human occupations at El Diamante, another high-elevation site in the southern Mendoza region, matches the driest recognized period in the sequence at ca. 2100 B.P. (Durán et al. 2006; Jenny et al. 2002; Lamy et al. 2002). In this case, the beginning of human occupation at the oldest high-elevation sites (Laguna El Diamante and El Indígeno) would have diametrically opposed climatic triggers (wet vs. dry), consequently weakening gross environmental change explanations for intensive human occupation of the Andean alpine zone.

Alternative explanations for the processes that drove high-elevation intensification are found in the lowlands (Bettinger 1994, 2000). Approximately 2,000 years ago, a series of important changes occurred in the lifeways of populations living in southern Mendoza. These include alterations in technological, subsistence, and settlement patterns, which were apparently forced by an imbalance between population and resources (Neme 2007; Neme and Gil 2008). First, there was a decrease in the artiodactyl index through time in the south-central Argentinean Andes beginning ca. 2000 B.P. concurrent with an increase in the exploitation of smaller, lower-ranked species (Neme 2007; Otaola et al. 2012). A similar process has been recognized for plant resources: there was a decline in the proportion of high return rate plants (*Schinus* ssp., *Prosopis* ssp. and *Geofroea* sp.) through time and new plant species began to be exploited, widening diet breadth (Llano 2010; Llano et al. 2011). These new plants include those domesticated prior to and around ca. 2000 B.P. outside the Andes (*Zea mays*, *Lagenaria* sp., *Phaseolus* sp., *Chenopodium* sp,. and *Cucurbita* sp.) and ca. 1000 B.P. in the mountains (*Zea mays* and *Lagenaria* sp.) (Hernandez 2002; Lagiglia 1968; Llano 2010). The meaning and the importance of the domestication process on the eastern slope of the Andes is still under debate (Gil 2006, 2003; Gil et al. 2014), but the data suggest that human populations were expanding dietary range, likely in response to increasing population density (i.e., "intensification *sensu stricto* [s.s.]" per Morgan 2015). If true, this situation resembles that seen in the alpine zone of the Uinta Mountains of northeastern Utah during the Formative Period. Here, maize intensification has been linked not only to increasing human population densities in the lowlands, but also to more intensive exploitation of mountain environments made possible, in part, by transporting maize into the mountains as a way of subsidizing hunting and increasing hunting returns (Nash 2012; see also Morgan et al. 2012a).

Scharf (2009) challenges the argument that environmentally-mediated, increased return rates in high-elevation patches incentivized high-elevation land use based on evidence from the White Mountains in California. Scharf argues that population pressure at lower elevations incentivized people to carry seeds, a costly endeavor, from lower elevations to sustain populations in alpine locales. At El Indígeno there is no evidence for the use of local, high-elevation plant resources that might suggest an improvement of highland plant productivity. On the contrary, the macrobotanical remains recovered from El Indígeno (as well as from other high-elevation sites in southern Mendoza) indicate that people transported wild and domestic plant resources (*Schinus* sp., *Empetrum rubrum*, *Berberis empetrifolia, Zea mays, Cucurbita* sp.) from lower elevations. Given the correlation between the floral and faunal assemblages at El Indígeno, it appears that increased population density in the lowlands helped drive these phenomena.

Additional support for the argument of increased population densities in the lowlands comes in the form of archaeological evidence from southern Mendoza whereas the number of archaeological sites and radiocarbon dates rises sharply between 2000 and 1000 B.P. (Neme and Gil 2009, 2012). Isotopic studies suggest significant changes in human diet during this period, particularly towards eating a wider variety of resources and more C4 plants (possibly maize) (Gil et al. 2011, 2014). Zooarchaeological data from both high and low-elevation sites display evidence for bulk animal processing strategies (sensu Binford 1978; Metcalfe and Jones 1988) and considerable bone fragmentation, both strongly suggestive of intensive animal processing. Increased dietary range, intensive carcass processing, and increase in site numbers, particularly at lower elevations, are all consistent with the idea that an imbalance between human populations and resources triggered more intensive human occupation and exploitation of Andean high-elevation ecosystems between roughly 2000 and 1000 B.P. (Neme 2007; Neme and Gil 2008).

Final Remarks

El Indígeno and other high-elevation "village" sites in southern Mendoza indicate that their occupants had a deep knowledge of the Andean landscape and its resources, even in particularly limiting alpine tundra ecosystems. These sites appear to have been occupied on a seasonal basis by mobile populations whose primary economic activity was guanaco hunting supplemented by plant foods, many of which were transported to the highlands from lower elevations. Extralocal obsidian, ceramics, and domestic and wild macrofloral remains indicate this seasonal round extended to both the western and eastern sides of the Andes, likely undertaken by different groups operating out of both Chile and Argentina (Cornejo and Sanhueza 2003, 2011; Lagiglia 1977; Neme and Gil 2008). Only in northern Mendoza province and in the west-central valleys of Chile were there farmers from whom transhumant Andean hunter-gatherers could have obtained the domesticated plants found in high-elevation residential sites like El Indígeno.

The hunting of large fauna is similar to patterns seen around the world in high-elevation settings (Grayson 1991; Madsen et al. 2000; Nash 2012; Zeanah 2000). The advantage of high-elevation "village" sites for the hunting of large fauna might be explained by (1) the transport costs involved in moving captured prey after the kill and (2) the higher caloric costs of operating in high-elevation settings; both would increase the amount of energy needed to exploit these types of resources. The cost of transportation would decrease the closer human predators got to the home ranges of targeted prey, which, in turn, might explain the proliferation of high elevation "village" sites in the Andes in the Late Holocene (sensu Morgan et al. 2012a). By necessity, hunters would have to target high rather than low-ranking prey at these locations given the greater caloric returns afforded by such energy-maximizing prey choices (Bettinger et al. 2009:629; Grayson 1991; Madsen et al. 2000; Zeanah 2000). Further, to reduce transport costs for hunted game, entire family groups occupied sites like El Indígeno, carrying lowland (and in some case cultivated) resources to high-elevation sites for on-site processing, ostensibly as a way of subsidizing a diet focused on large game (Morgan 2009; Nash 2012). Such behavior, while entailing substantial residential mobility, would increase hunting returns and decrease the risks of occupying alpine zones (Morgan 2012; Zeanah 2000; but see Grove 2010).

Both wild and domestic plants from lower elevations were processed on the site: all the structures were equipped with *manos* and *metates* even though there are no edible plants available in the alpine zone of this part of the Andes. We do not yet know the significance of domesticates in the macrofloral assemblages at sites like El Indígeno, but apparently they were indeed processed and consumed there (they were burnt). Researchers working in high-elevation areas in North America suggest that transported, low-elevation plant foods (including maize) helped sustain people at high altitudes for longer periods of time than if such resources were not transported to the highlands (Morgan 2008; Nash 2012; Scharf 2009). The transport of low-elevation resources consequently would reduce the risk of focusing mainly on large game in such marginally-productive environments. At the same time, this would increase the likelihood of successful hunts simply as a function of increased residence time in the area (Morgan 2009; Nash 2012).

The archaeological and ethnohistoric record of southern Mendoza indicates that El Indígeno's occupants obtained domesticates via exchange, most likely from farmers to the west, in what is modern-day Chile (Durán 2000; Michieli 1983). This assertion is supported by the proximity of El Indígeno to the Las Leñas pass (4,200 m asl), which likely facilitated exchange between populations from both side of the Andes and increased the diversity of goods seen in the archaeological record at the site. Given that the meadow in which El Indígeno is located is isolated from other productive patches and is the only locus where firewood is plentiful in the area, it is perhaps not surprising that the site was reoccupied and used intensively over the course of its occupational history.

By ca. 1500 B.P. when El Indígeno was first occupied, other similar sites were also being used (e.g., Laguna del Diamante 2), especially along the Cordillera (e.g., LD-S4, LD-S1, Risco de los Indios and Los Peuquenes) (Durán et al. 2006; Neme 2007). I argue that this intensification of seasonal highland residential occupations was brought about by increasing demographic pressure in lower-elevation valleys, especially on the western side of the Andes. This resulted in domesticates (mainly maize) becoming the dominant staple in these valleys, at the expense of game and wild plants, as indicated by the archaeological and isotopic record (Fallabela and Stehberg 1989; Falabella et al. 2007). On the eastern slope of the Andes, however, hunting and gathering remained the dominant subsistence strategy, although several indications suggest that new resources were also being incorporated into regional diets, making them both broader and more costly (Gil et al. 2010, 2011; Llano et al. 2010; Neme 2007). Per this model, population packing and affiliated subsistence intensification on both sides of the Andes appear to have pushed people to intensify their seasonal exploitation of marginal Andean environments above 3,000 m asl. Further research at high elevations and in the lower-elevation valleys in and around the southern Andes are clearly called for in order to confirm or discard this hypothesis.

Acknowledgments. This research is part of the Agencia Nacional de Promoción Científica y Técnica (PICT IDAC ICES 2007-610) project. Thanks are extended to: Adolfo Gil for his help throughout the project and for his comments on the manuscript draft; Christopher Morgan for his help with the English and for his suggestions on the first draft; Miguel Giardina, Mario Neme, and Gabriel Neme for their help in the field; Carina Llano, who identified the macrobotanical remains; and to the anonymous reviewers whose close reading and comments helped me improve the original manuscript considerably. Finally, special thanks are extended to Rene Lima, the *puestero* who guided us to the site, and to Humberto Lagiglia, who first extended me the opportunity to learn about the high-elevation archaeology of southern Mendoza.

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Submitted November 13, 2014; Revised April 15, 2015; Accepted January 11, 2016.