

WILD OR DOMESTICATED? CAMELIDS IN EARLY FORMATIVE ROCK ART OF THE ATACAMA DESERT (NORTHERN CHILE)

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The absence of suitable methodologies to distinguish between wild and domesticated camelids in rock art has limited the interpretation of visual preferences of Andean prehispanic cultures. Although rock art's contextual information may provide some indications that help to differentiate between wild and domesticated animals, uncertainty prevails because the relation to camelid forms is indirect. Zoological and zooarchaeological knowledge of South American camelid morphology is used as a means of comparison and identification in Atacama Desert rock art attributed to the Initial Pastoral phase (1500–500 B.C., Early Formative period, northern Chile). Based on this analysis, there are strong arguments for a distinctive graphic representation of wild as opposed to domesticated camelids, as well as a correspondence of these representations to two different modes of subsistence—one of hunters and the other of husbandry-pastoralist societies—which would have coexisted during this transitional period.

La ausencia de metodologías para distinguir entre camélidos silvestres y domesticados en el arte rupestre ha provocado importantes limitaciones en la interpretación de las preferencias visuales de las culturas andinas prehispánicas. Aunque el contexto de las representaciones rupestres proporciona en ocasiones algunos elementos para fundamentar enunciados de este tipo, siempre existe cierto grado de incertidumbre, pues estos nunca están directamente relacionados con las formas de los camélidos. En el presente artículo, los conocimientos zoológicos y zooarqueológicos acerca de la morfología de los camélidos sudamericanos, son utilizados como una fuente de comparación e identificación del arte rupestre de la región atacameña, en particular aquel que los arqueólogos asocian al período de pastoreo inicial, 1500 – 500 a.C. (Formativo Temprano Inicial, norte de Chile). Ahora disponemos de argumentos para sostener que durante esta época los artistas representaron camélidos silvestres en un estilo y domesticados en otro, registrando en el imaginario cultural la presencia de dos modos de producción, uno cazador y otro pastoril, que coexistieron durante este período de transición.

Camelid domestication in the Andean region began 5,000 years B.P. with the development of two tame varieties (llamas and alpacas) whose characteristics differ markedly from those of their related wild kin (vicuñas and guanacos) (Nuevo-Freire and Ozzán 1996; Wheeler 1998). This field of knowledge is of great interest for a number of disciplines, and diverse specialists have developed procedures to differentiate wild from domesticated camelid species in the archaeological record (Benavente et al. 1993; Kent 1987; Miller 1979; Reigadas 1994a; Stanley et al. 1994; Wing 1978; Jacobaccio and Madero 1992; Jacobaccio et al. 1997–1998). There is little doubt that our current understanding of the origins of

Andean domesticates and the evolution and social changes associated with this new form of pastoralism is indebted to these studies.

While there is consensus among faunal experts on how to distinguish between wild and domesticated camelids in the archaeological record, this is not the case for those studying rock art depictions. The lack of methods to distinguish wild from domesticated species in rock art has severely limited our ability to comprehend the means by which the ancient inhabitants of the Andean region culturally organized and represented their surrounding world. This is especially acute in those places where camelid domestication has been effectively recorded through other methods

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Efforts to resolve this archaeological dilemma have been few and the proposals have generally been grounded in the representational contexts or in iconographic associations. Thus, while a hunting scene would imply wild camelids, one of pasturing behavior would indicate domesticated species. Klarich and Aldenderfer (2001) have recently developed a more complex interpretative model to differentiate hunter-gatherer from pastoral rock art in southern Peru. These authors propose that human actions are not the only factor to be considered in order to segregate wild from tame animals within representations because the number of animals, their group organization, the size of individuals, and the behavioral postures represented are also important in order to achieve the desired differentiation. Nonetheless, models based exclusively on relations coming from the representational context cannot be considered sufficient because there is no direct relation to the camelid designs themselves or their particular attributes.

Berenguer (1996) has recognized these limitations and summarized the documented information on Andean camelids in his search for criteria to distinguish wild and domesticated varieties during the Initial Pastoralist phase (3000–2500 B.P.) in Atacama Desert rock art (Aschero 1996; Berenguer 1995, 1996, 1999; Gallardo 2001; Gallardo et al. 1999; Núñez et al. 1997). The author uses the high iconicity of art—i.e., a similarity relation between the art and the actual objects represented (Pierce 1988:144–148)—during this cultural period. However, his conclusion about the correspondence of the depictions to domestic instead of wild species is based more upon extrinsic elements (such as oral tradition or the social significance of a herd to initial pastoralist societies) than intrinsic ones (e.g., morphological characteristics) because he concludes the latter have not been clearly recorded in rock art designs (Berenguer 1996:110).¹ Here, we adopt a less pessimistic view and offer a corpus of data linked to morphological differences between South American camelids as a means of developing an intrinsic identification strategy of wild-versus-domesticated camelids in prehistoric Andean art.

Camelid Domestication and Size Transformations

The process of domestication in the Andean area

involved a significant change in the ecological relationship between the inhabitants of the region and camelids. This consisted of removing the animals from the sphere of natural selection in order to insert them into the cultural realm. While there was not total reproductive control during the first stages of this process, the transformation of the living conditions of the animals produced modifications in their behavior and general morphology.

The relationship that best describes this situation during the initial stages of domestication has been defined as “herd protection” (Harris 1996) or “pre-domestication” (Ducos 1999). These concepts imply human intervention in favor of a certain species by means of providing protection against predators and facilitating access to food sources. Thus, wild camelids were introduced into the sphere of human societies without reproductive isolation from the rest of the wild population. This generated habituation mechanisms, that is, discouraging negative responses to human presence and promoting taming among the protected population. Later this situation may have progressed to captivity with a higher degree of protection, likely consisting of a physical barrier between the captive and the wild populations (Yacobaccio and Vilá 2002).

These modifications in natural conditions started changes in wild camelid behavior and morphology as a direct response to these new selective pressures. The conditions of “herd protection” and even more so, “captivity,” modify and limit the natural selection process that acts upon wild camelid populations by introducing “unconscious selection” (Zohary et al. 1998) or “non-intentional selection” (Ladizinsky 1998). It is said to be “unconscious” because the modifications are not intentionally desired, but are rather a consequence of the altered life conditions of wild animals. This situation also occurs under natural conditions, as in the case of white tailed deer where, due to summer food resources impoverishment, the population size diminishes (Purdue and Reitz 1993). The opposite—or population-size increases—has been observed under conditions of captivity and protection. Zoological research on guanacos maintained in captivity in Patagonia has demonstrated that once they are given better fodder, herd-size increases in the following generations (Gómez et al. 1991; Sarasqueta 1995).

It is well known that vicuña and guanaco exhibit forms of social organization based upon hierarchy and territoriality (Cajal 1985; Franklin 1983; Puig and Videla 1995). These characteristics are more rigid among vicuñas than in guanaco populations; the former have more stable territories and are thus more spatially predictable and are also strictly organized in family groups. Guanaco, on the other hand, form small groups, are migratory, and territorially lax. Guanaco herds tend to be dispersed, only occasionally forming seasonal mixed groups during wintertime (Puig and Videla 1995). Finally, guanaco family groups are more numerous (averaging 1 male to 8 females) compared to those of the vicuña (averaging only 1 male to 3-4 females). Nonetheless, common to both groups is aggressive behavior by adult males, which is particularly true for the alpha male leader (Puig and Varela 1995; Vilá 1992, 2000).

Certainly, protection strategies exerted on animals in the wild ("non-intentional selection") provoked new behavioral and phenotypical responses in them as well. Undoubtedly, herd protection, and to a greater degree, captivity, favored the selection of features related to the successful co-existence of camelids and humans. This would have resulted in enhanced docility and reduced aggressiveness (e.g., Sarasqueta 1995 for data relating to guanaco) and therefore the progressive destructuring of the alpha male system. As animals were isolated from their natural predators, this would have also reduced their fear of humans and tendency to flee. In terms of responses in camelid phenotypes, a lack of predators would have contributed to increased variation in coat colors. The defensive, bicolored coats were replaced by multicolored coats (Zohary et al. 1998), specifically of brown and tan varieties in the case of camelids (Reigadas 1994a, 1994b).

Accompanying the processes of domestication, there are a number of modifications in the shape and size of the animals: a reduction in the limb/body ratio, body-size augmentation due to enhanced nutritional conditions, changes in the distribution and increases of body fat (Mengoni 1996:38), and the aforementioned transformations in fur type and coverage. Increases in camelid body size have been detected from as early as 4500 B.P. through osteometric techniques applied to collections from several South-Central Andean archaeological sites, including Tulán 52, Puripica 1, Chiu Chiu (ceme-

tery), Inca Cueva 7 and the Unquillar rockshelter (Aschero and Yacobaccio 1998-99; Cartagena 1994; Hesse 1982; Yacobaccio 2001a). This shift has also been documented for the same period in the Central Andes and later (around 3500 B.P.) in the Lake Titicaca region (Kent 1982; Moore 1989; Webster 1993). Additionally, allometric evidence from the archaeological site of Huachichocana II (from 3400 B.P.) has provided evidence for the existence of an extinct animal that would have been similar in size to the modern llama (Yacobaccio 2001a:21). A shift in body size has also been linked to animal domestication in other regions, such as with goat and sheep in southwest Asia. (Zeder and Hesse 2000; Zohary et al. 1998). Moreover, it has been proposed that some of these changes may have been the consequence of special induced environmental pressures affecting the animals in and around human settlements. If this were the case, this would support the use of herd protection strategies instead of intentional selection in the early stages of the domestication process (Tchernov and Horwitz 1991).

Based on the concurrence of climatic changes following the Middle Holocene period, the earliest evidence of domestication, and the increasing social and economic complexity of hunter-gatherer groups (Yacobaccio 1998, 2001b), these modifications must have been surprisingly fast, as is supported by radiocarbon dates. Changes in the ecology of wild populations and the establishment of new selective conditions could have unintentionally initiated the aforementioned modifications and generated founder herds upon which to solidify this new relationship between humans and camelids.

Table 1 shows observed relationships in proportions of limbs to body size in a small sample, one that ideally will be increased for future research (there is only one alpaca). In general, major variations in an animal population are related to age and sex (Reitz and Wing 1999), as age differences and sexual dimorphism affect animal size. However, body proportions, or "anatomical design," are more constant, especially among camelids, because sex is monomorphic (Franklin 1983; Vilá 1993). Due to these consistent measures, we chose to work with proportional rather than absolute measures when recording data. Data were collected using a flexible meter rule on living camelid populations

Table 1. Proportions of Limbs/Body in South American Camelids.

Type	N	HL/B	FL/B	Ratio	
				HL	FL
Llama	2	1.05:1	.90:1	1-1.1	.85-.95
Alpaca	1	1:1	0.85-1	—	—
Vicuña	6	1.62:1	1.42:1	1.38-1.8	1.25-1.57
Guanaco	3	1.55:1	1.38:1	1.46-1.6	1.27-1.5

HL = hind limbs; B = body; FL = fore limbs; see Figure 1.

from Northwestern Argentina. Body measure was taken on the back of the animal, in its broadest section, approximately at the eighth thoracic vertebrae. Limbs were measured in their full length from the proximal humerus and femoral epiphysis to the mid plantar area (Figure 1).

As seen in Table 1, variation in guanaco and llama are small, although not statistically significant in terms of populations (in the wild case) or big herds (in the domesticated case). Although these measurements are not typically used in specialized literature—body length and chest height are most

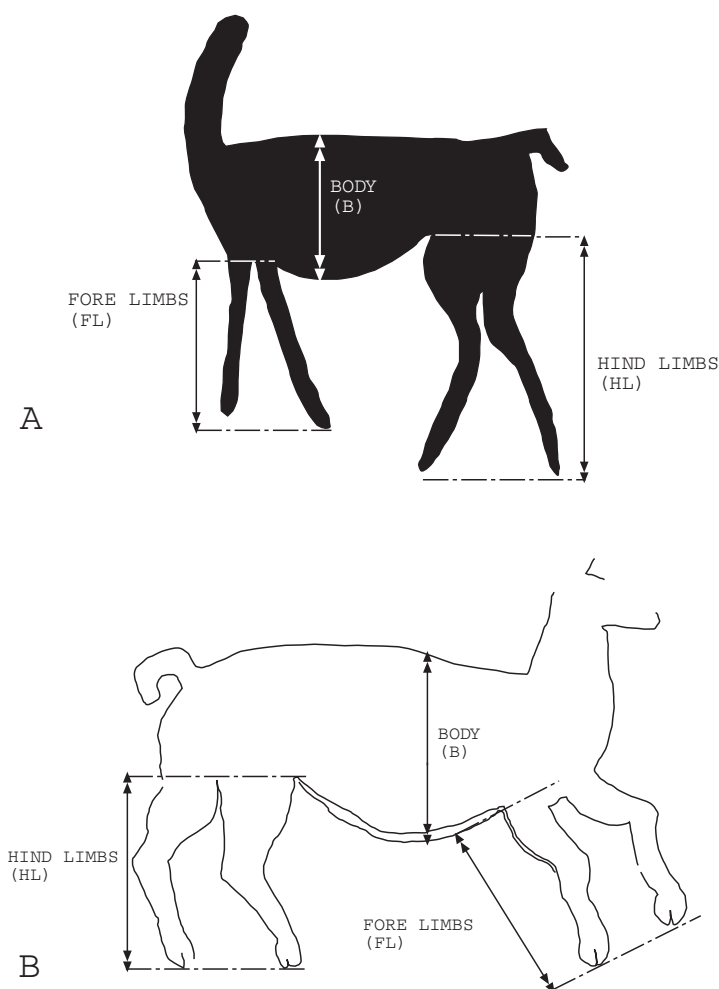


Figure 1. Measurement on camelids of Confluencia Style(A) and Taira-Tulán Style (B). (Drawing by Bernardita Brancoli.)

commonly used—the data presented here correspond to general camelid text descriptions. For example, Cardozo (1954) describes the vicuña in the following manner: “Its general appearance is characterized by an anterior height of 90 cm whereas its croup, at 110 cm, is taller.” In relation to the guanaco, the same author states, “the hindquarters [are] longer than its front limbs” (Cardozo 1954:107,122; our translation). Calle-Escobar emphasizes the same points for the vicuña, “the anterior third is shorter than the hindquarters,” and in the guanaco “the hind legs are longer than the front legs” (1984:251, 267). Both authors characterize vicuña as having a curved back ascending toward the tail while the back of the guanaco is straighter. In the domesticated llama, Cardozo (1954; our translation) states that it has a “body covered by a thick fur, presenting an upper line, which is humpless, that is nearly horizontal and an almost straight, curveless back.” Calle-Escobar emphasizes the same idea when stating, “the upper line [of the llama] is predominantly horizontal” (Calle-Escobar 1984:229). Loin horizontality thus implies a certain size equivalence ratio between the front and hindquarters.

Although preliminary, our measurements, as well as the previously mentioned descriptions, permit us to confirm that wild camelids exhibit distinctive extremity-to-body ratios. These ratios in domesticated species are nearly equal, but in wild camelids they vary between 1.38:1 and 1.8:1. In other words, in wild camelids the hindquarters are longer relative to the front quarters and both exhibit higher values relative to the animal’s body size. The opposite is true among domestic camelids, for which a more equal relation between front and hindquarters has been recorded.

Camelids of Salado River Rock Art, Northern Chile (Initial Early Formative Period 3500–2500 B.P.)

The oldest Atacama Desert rock art (northern Chile) has been recorded around 5000 B.P. in association with the Late Archaic period (Berenguer 1999; Berenguer et al. 1985; Núñez 1983; Núñez and Santoro 1988). The most common rock art figures are those of engraved camelids that have been detected in the valleys that drain into the Salar de Atacama and the upper course of the Loa River.

Unfortunately, since no quantitative studies have yet been undertaken, a general stylistic definition based on camelid attributes and associations has yet to be developed. Published instances confirm a majority of camelid figures depicted in profile with two legs and one ear represented (Berenguer 1995:15; Dransart 1991; Núñez et al. 1997). In all of them, there is concern for the form of the animal and its volume is represented in two dimensions. Depictions of animated or moving figures are also common, but unfortunately they often lack the attributes in our analysis or they are not well executed.

Along the Salado River, principal tributary of the Loa River, no Archaic residential sites such as Puripica and Kalina, nor any panels belonging to this period, have been registered. However, some of the rock art sites stylistically attributed to the Early Formative period include engraved, and even painted figures, reminiscent of the former Archaic era (Figure 2). While this may be a simple coincidence, it is significant that the rock art from the Early Formative Tulán 54 village site suggests the continued presence of the preceding design patterns during this subsequent phase of cultural development (Núñez 1992a:91).²

While the lack of Archaic period sites in the area supports the attribution of the Salado River rock art style (Confluencia Style) to the Early Formative period, our own arguments for this interpretation were based on different associations. At the start of our investigation, the presence of atlatls and darts, the depiction of vegetal fiber skirts, and a scene of hunting by encirclement (Figure 3), led us to attribute this style to a Late Archaic context (3000–1500 B.C.).³ However, the absolute dates obtained for the initial occupation of two of the most important sites containing Confluencia Style rock art paintings (Gallardo 1998, 1999; Gallardo and Vilches 1996; Gallardo et al. 1996; Gallardo et al. 1999) actually pertain to the Early Formative period (1500 to 500 B.C.), shifting the dates of this style out of the Archaic period.

Confluencia rock art is characterized by figures painted in red pigment. The figures are relatively small and tend to be naturalistically proportionate, as length and width are more or less regular. Camelids constitute the principal figures, outnumbering human beings more than two to one. The forms are representational and include camelid

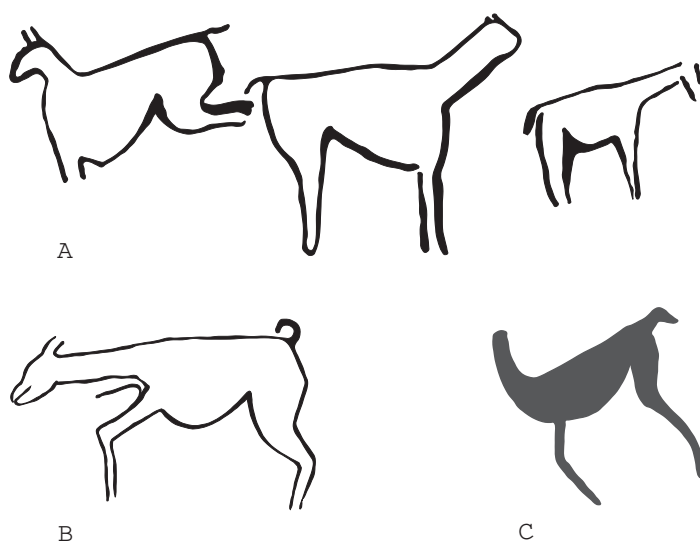


Figure 2. Camelids of Archaic tradition: (A) Engraved camelids. Site 2Loa67/4. Length maximum 52.5 cm (B) Engraved camelid with red pigment on incisions. Site 2Loa91/2. Maximum length 34.3 cm (C) Red painted camelid. Site 2Loa16/2 (detail). Maximum length 12.3 cm. (Drawing by Bernardita Brancoli, Andrea Müller and Isabel Christie.)



Figure 3. Painted hunters with spear throwers, darts, and camelids (red and yellow). Site 2Loa15/13 (detail). Confluencia Style. Maximum length, 54 cm. (Drawing by Bernardita Brancoli.)

Table 2. Comparison of Main Characteristics between Confluencia and Taira-Tulan Styles.

Characteristics	Confluencia Style	Taira-Tulán Style
Form	Naturalistic	Naturalistic
Technique	Painted	Engraving/Picto Engraving
Size	Regular	Variable
Composition	Scenic	Conglomerates
Superposition	No	Yes
Placement	Rock Shelter	Large Rock Face
Distribution	Local	Regional

anatomical features; movement is generalized; almost all the figures are in profile, and they commonly form group scenes.⁴

In strictly stylistic terms, and according to present knowledge of the Atacameña area, the Confluencia Style is restricted to the Salado River Basin, an area intensely surveyed for the last 15 years. This geographically limited distribution seems to be a trademark of the Confluencia Style, a feature that is not shared with apparently contemporaneous assemblages of Taira-Tulán Style engraved camelids (see Table 2).⁵ Panels showing this latter rock art style, also occur in the Salado Basin but have been found much more widely distributed, from the Upper Loa River to the Tulán drainage in the south of the Salar de Atacama (Berenguer and Matínez 1986, 1989; Le Paige 1965; Núñez et al. 1997; Philippi 1860; Ryden 1944; Spahni 1976; Tamblay and Herrera 1994; Valenzuela 2000). As Berenguer (1995) correctly perceived, the Taira-Tulán Style seems to be part of a regional visual system (Figure 4).⁶ As in the panels known from Taira, Tulán, and Tuina (Berenguer 1995: Figures 10, 13; Núñez et al. 1997: Figure 4), the Taira Tulán figures from Salado River are presented in a two-dimensional space. However, they differ from the neat profiles that characterized Archaic art in the cutting and unfolding of the unexposed animal parts that allowed the artist to draw the four feet and two ears on a single plane. In less technical terms, animals are shown as if we could see them from back, front, and profile, all at the same time. Like the Confluencia Style, the Taira-Tulán Style's anatomical features are also quite detailed, but the Confluencia Style differs in that the number of animals clearly surpasses the number of human figures. Additionally, the Taira-Tulán assemblages are conglomerates of images resulting from successive and multiple aggregations instead of scenes.⁷

Although camelids dominate the species present

in the Taira-Tulán Style, birds as well as felines and vizcachas (burrowing rodents) have also been registered. All the figures were made by percussion and scraping and only a few of them show red paint or traces of it. Because all figures were exposed to environmental damage, it is impossible to determine if they were all originally painted.⁸ Figures of different sizes were typically depicted, in contrast to the Confluencia Style's trend towards small figures (Gallardo 2001). Superposition is one of the most conspicuous features of Salado River panels, as well as those of the Atacameña region overall. This is not limited to the drawing of one figure over another (Figure 5) but also includes re-engraving of grooves and the addition of new lines and new figures formed from pre-existing ones (Gallardo 2001).⁹

Analysis and Identification

As outlined above, Confluencia painted camelids are mostly naturalistic and frequently organized in moving herds, fighting scenes, or in association with spear and dart hunters. Based on the general contexts of these pictorial representations, it is possible to argue that the camelid depictions correspond to wild varieties such as vicuña and guanaco. However, as stated previously, these conclusions are based on partial evidence and rely on the representations of camelids and not intrinsic data collected from camelids themselves. Their morphological features further support conclusions that the depictions represent wild varieties. Zoological and zooarchaeological research indicates substantial morphological changes in animal morphology resulting from domestication. According to specialists, this pattern is clearly portrayed in the anatomical proportions of wild and domesticated South American camelids; however, no studies of this type have been undertaken until now using camelid rock art representations.

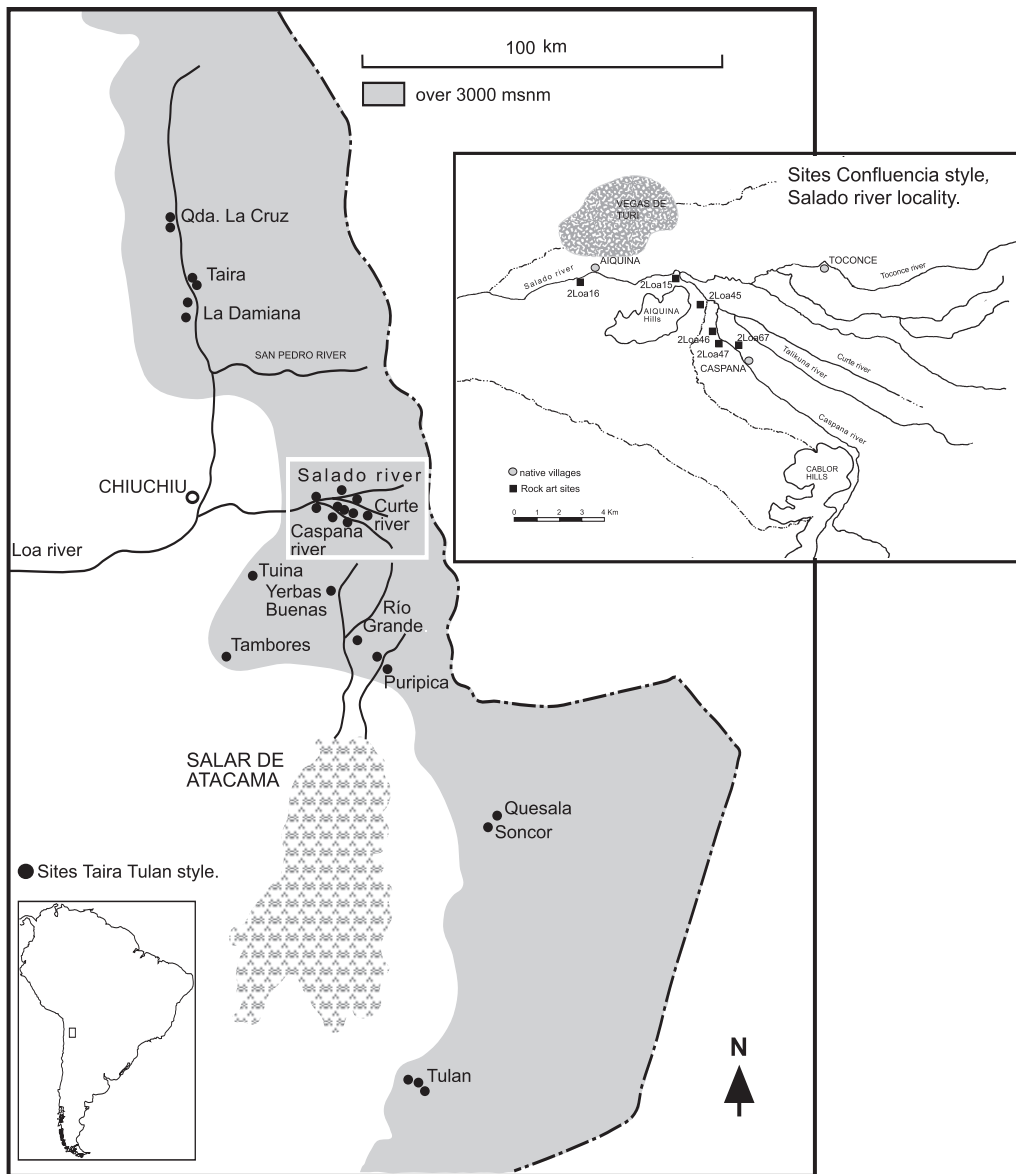


Figure 4. Distribution of the Taira-Tulán and Confluencia styles in the Atacameña region and locality of Salado River (Atacama Desert, Northern Chile).

In the database of Confluencia Style camelids, front limbs are sufficiently preserved for measurement in 69.75 percent of figures, and rear limbs in 68.07 percent. Moreover, due to their lateral representation mode, hoof and body measurements were taken in the same way that they are taken on live animals (Figure 1). The mathematical results of this particular type of representational measurement (where body width is used as a denominator) can be seen in Table 3: the ratio for hind

limbs/body is 2.34:1, and for fore limbs/body is 1.67:1. The larger values of limbs in relation to the body is revealed in the box and whisker plots (Figure 6), where 75 percent of the measurements surpass 1 in value, signifying that the limbs are longer than the width of the bodies. If we compare these values with the information available on Andean camelid morphology, the Confluencia Style illustrations show stronger correspondence to wild than to domesticated species, a conclusion consistent



Figure 5. Engraved panel, Taira-Tulán Style. Site 2Loa13/1 Maximum length 777 cm. (Drawing by Bernardita Brancoli.)

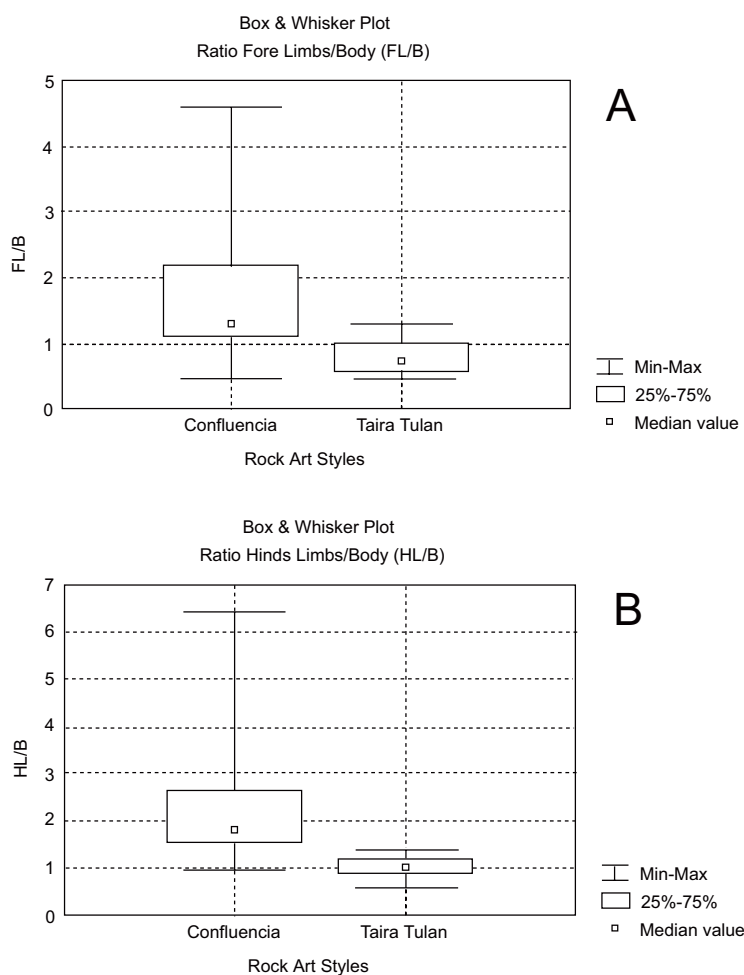


Figure 6. Box and whisker plots (A) Fore limbs/body and (B) Hind limbs/body. (Drawing by Bernardita Brancoli.)

Table 3. Ratios of Limbs/Body in Camelids in the Confluencia Style ($n=119$).

Ratio	Cases (Complete)	Mean	Minimum	Maximum	Std.Dev.
HL/B	81	2.34	.94	6.43	1.24
FL/B	83	1.67	.49	4.60	.87

HL = hind limb; B = body; FL = fore limb.

Table 4. Ratios of Limbs/Body in Camelids in the Taira-Tulán Style ($n=194$).

Ratio	Cases (Complete)	Mean	Minimum	Maximum	Std.Dev.
HL/B	23	1.01	.58	1.38	.22
FL/B	20	.79	.42	1.27	.26

HL = hind limb; B = body; FL = fore limb.

Table 5. Ratios of Limbs (Without Hoofs)/Body in Camelids in the Taira-Tulán Style.

Ratio	Cases	Mean	Minimum	Maximum	Std.Dev.
HL/B	41	.92	.54	1.76	.26
FL/B	45	.68	.31	1.15	.22

HL = hind limb; B = body; FL = fore limb.

with the hunting contexts in which they are represented.

Examples of naturalistic Taira-Tulán Style are abundant, but unfortunately a characteristic of the style is the partial representation of camelid morphology. Due to this limitation, the present analysis only includes those animals with clear limb and body representations. For example, animals with complete body and limbs but unengraved hooves were not included. If linking wild camelids to the Confluencia Style seems reasonable, the results of a similar analysis of the Taira-Tulán Style is more controversial. While some archaeologists consider the depictions to represent wild animals (for example: Aschero 1996; Gallardo 2001; Gallardo and Castro 1992; Mostny 1969; Mostny and Niemeyer 1983), others consider them to be llamas based upon ethnographic, ethnohistoric, and zoological data (Berenguer 1995, 1996, 1999; Berenguer and Martínez 1986, 1989; Núñez et al., 1997). The latter position is not the result of an art analysis per se, nor of their contextual representations. Based on the iconic rationale of the rock art producers, or their knowledge and technical abilities to represent aspects of the perceptible world in their works, we argue that it is not possible to construct a hypothesis based outside of the intrinsic characteristics of the art. Further, we offer this analysis of camelid

morphology as a means to promote more discussion on the subject.

The results for a small sample of complete figures (front limbs represent 10.3 percent of all figures and hind limbs 11.86 percent) and two additional cases from outside our study area are shown in Table 4: the ratio for hind limb/body is 1.01:1 and for front limb/body is 1:1.29.¹⁰ This trend toward close limb and body values can be observed in the box and whisker plots (Figure 6) where most of them meet near to value 1, meaning similar length for limbs and body. Proportions of the Taira-Tulán assemblage are clearly different from those of Confluencia wild camelids, and similar to those known for domesticated camelids.

Certainly, the analyzed sample is small. However, we applied the procedure to complete figures with no hooves, where limbs end with two open lines (Figure 7). Results for this operation were slightly different (Table 4), but with proportions that approached Taira-Tulán camelids rather than Confluencia wild ones: the ratio for hind limb/body is 1:1.09 and for front limb/body is 1:1.46. This suggests that although limbs are depicted without hooves, artists did not transgress the proportion rule that governed their art style. It is difficult to know with available values for complete Taira-Tulán figures whether the figures are llamas or

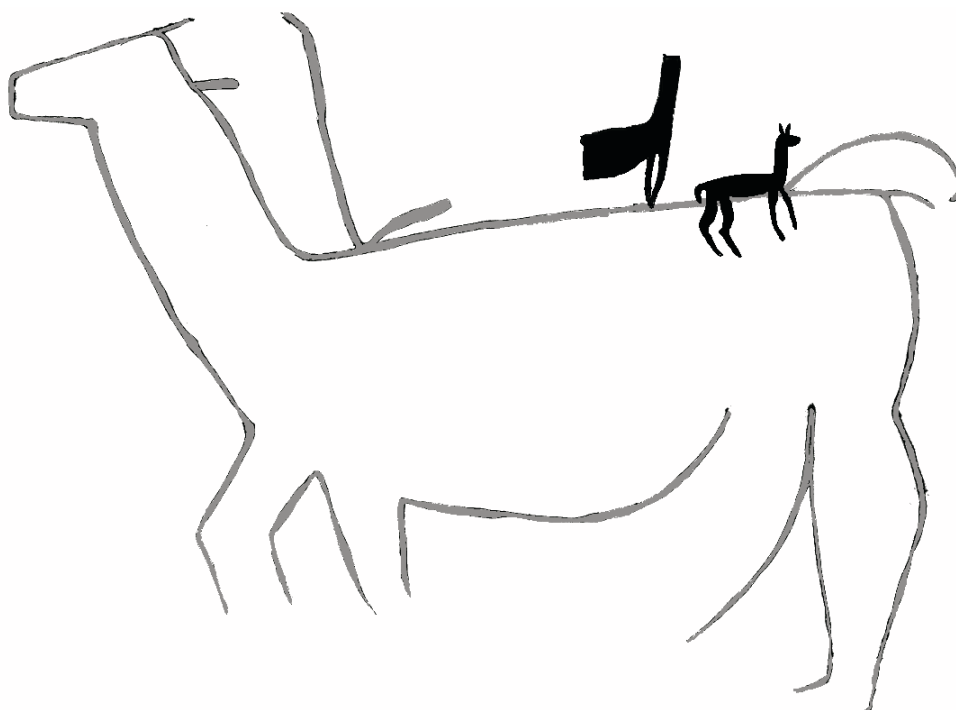


Figure 7. Taira-Tulán Style camelid without hooves in superposition with Confluencia Style camelids. Site 2Loa47/3. (detail). Maximum length 135 cm. (Drawing by Bernardita Brancoli.)

alpacas; however, results do suggest that they represent domesticated rather than wild animals.

Conclusions

Identification of domestic and domesticated species in rock art is straightforward when it refers to fauna introduced by new populations, such as in the western expansion of the horse, cow, sheep, and goat (Cole 1990; Gallardo et al. 1999). When animals are depicted as beasts of burden, or are used for traction (Francfort 1998:Figure 17.7), mounts (Anati 1996:Figure 64), or as flocks led by a shepherd (Lothe 1962:141), identification is clear. However, when these contextual elements are absent, identification is less evident. Addressing this interpretative difficulty is especially important in regions of animal domestication and where animals are abundantly represented in paintings and engravings (Berenguer and Gallardo 1999; Guffroy 1999; Melart 1967, 1975).

Evidence for initial domestication in the Atacameña region is dated to 4500 B.P. (Cartajena

1994; Hesse 1982; Núñez 1983, 1989, 1992b). Maintaining herds in order to trade goods over long distances began a thousand years later (Benavente 1978, 1984, 1988–89; Núñez 1989, 1994, 1995). Associated with this latter period (the Initial Early Formative), we found the Taira-Tulán style at numerous regional sites. The figures correspond to naturalistic camelid engravings and are sometimes painted red. Panels representing this style have been recorded along the Loa River Basin as well as the small streams draining into the Salar de Atacama. In direct superposition and in association with these engravings, we found a painted Confluencia assemblage whose distribution seems restricted to the Salado River Basin, a major tributary of the Loa River. Its figures are tiny, naturalistic, and show different animation effects. Most of them represent camelids, which are occasionally hunted by groups armed with spears and darts.

The representational contexts in the Confluencia Style suggest the presence of wild species. Morphological and comparative analysis support this conclusion. In contrast, the engraved Taira-Tulán

camelids lack representational contexts permitting us to hypothesize their wild or domesticated status. Thus, some investigators argue that they represent domesticated species while others argue in favor of wild ones. Our investigation supports the former camp, suggesting that the Taira-Tulán camelid figures are domestic. Because no evidence of alpacas has been found in the archaeofaunal record of the Initial Pastoralist stage, it is likely the animals depicted were llamas. Beyond methodological contributions, our analyses reveal that creators of rock art in the Initial Pastoralist period possessed a knowledge and practice with regard to the visible world that was effective in the production of iconic images and necessary for the expression of cultural content at the formal level. This suggests that they introduced graphic distinctions into their artwork that permitted differentiating not only camelids from humans and other animals—such as foxes, birds, and rodents—but also among camelids themselves. Now it is not only clear that ancient inhabitants of the Atacama Desert developed two different art strategies in terms of style and locale (Gallardo 2001; Gallardo et al. 1999), but they also introduced two different faunal referents into them. These findings enrich our understanding of the Early Formative world, for the presence of a differentiation among species in contemporaneous art styles seems to reconcile, through imagery, the substantial contrast between two different economic systems that coexisted during that period (Gallardo 2001; Núñez 1989, 1991). These two modes of production included an older mode based in the firmly rooted tradition of hunting and a newer mode of pastoralism that reorganized labor efforts in activities that, one way or another, would tend to supplant the social practices of the former. This opens important new lines of investigation with respect to the beliefs of the first pastoral communities of the Atacama Desert, as it illustrates that the hunt continued to be important not only in an economic context, but in the cultural imagination of local peoples.

Finally, although the Atacameña border regions also developed early camelid domestication, their rock art styles do not always possess the graphic representations needed for the type of proposed analysis. Northwestern Argentina is home to numerous rock art panels pertaining to Archaic and Early Formative periods (Aschero and Podestá

1986; Aschero et al. 1991). However, the camelids represented are rare and schematic, and no morphological analysis can be applied to them. In eastern Bolivia, no rock art has been registered from these time periods. In the extreme northern region of Chile, although camelid representations are profuse and similar in shape to the Confluencia Style, they are attributed to a later Formative date (Niemeyer 1972). Less common are reports of early rock art in the highlands of central and southern Peru, where some sites do exhibit naturalistic animal figures appropriate for anatomical and morphological analyses (Guffroy 1999). Our newly developed methodological approach can be used in conjunction with other perspectives that have attempted to differentiate between wild and domesticated camelids in the rupestrial art of the southern Andes (Klarich and Aldenderfer 2001).

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Notes

1. Intrinsic versus extrinsic criteria for animal identification in rock art are discussed in Clottes (1989).

2. In spite of the differences between Archaic and Early Formative periods in the region, these periods are in many ways similar and absolute dates are close in time (Nuñez 1992:303).

3. Dates for the first settlement at the Confluencia (2Loa15) and Los Danzantes (2Loa47) sites are: 1435–915 cal B.C. (2 sigma calibrated, $p = .95$, charcoal, Beta-144002) and 925–505 cal B.C. (2 sigma calibrated, $p = .95$, charcoal, Beta-117561), respectively. The estimated $\delta^{13}\text{C}$ ratio in both cases was -25 . Calibrations were performed by INCAL98 calibration program as described by Stuiver et al. (1998) and calculated according to Talma and Vogel (1993).

4. Confluencia rock art comes from a total of seven sites studied up to the present. Although the area has been intensively surveyed, the existence of additional very small sites (with few figures) is still possible. In all, 179 painted figures pertain to this style. Of these, 132 are red and 47 present a combination of yellow ochre and red paint. The majority measure less than 20 cm in length and no more than 15 cm in width. The average length ($n = 151$) is 12.41 cm with a standard deviation of 5.20. The average width ($n = 161$) is 9.40 cm with a standard deviation of 4.46. Anatomical traits are present in the upper and lower bodies of camelids in 69.83 percent of the cases, and absent in only 1.12 percent of the sample. Movement is represented in 91.84 percent of the sample and only 8.16 percent of the total does not present it. In terms of the figures, 119 camelids, 52 humans, 2 canines, 1 rodent, and 5 undetermined animals were recorded. Of the figures, 81.56 percent are organized in scenes (a “scene” requires at least two figures), the rest appearing alone on the panel or in camelid groups whose spatial organization is unclear, though possibly corresponding to herds.

5. Two archaeological sites with stratigraphic levels pertaining to the Early Formative period and associated with the Taira-Tulán Style are: Taira, located on the upper Loa River (Berenguer 1996:95) and Los Danzantes (2Loa47), located on Caspana River (in superposition, under a Confluencia Style camelid); see Note 3. At both sites, the dated levels coincide with initial site settlement, this being the only aspect common to both.

6. This rock art style comes from 24 known sites, 22 of which have been recorded by our project. The Taira-Tulán style primarily depicts camelids ($n = 194$), although anthropological figures ($n = 19$), felines ($n = 17$), birds ($n = 14$), frogs ($n = 2$), rodents ($n = 2$), canines ($n = 1$), and nonidentified ($n = 1$) have also been identified. One characteristic of this style is the representation of animal parts rather than

complete animals (incomplete camelids comprise 65 percent of the total).

7. "Conglomerates" refers to a group of designs whose composition results from juxtaposition (or the drawing of different figures in contiguity).

8. While rock art preservation is generally good, deterioration has affected some panels. The Confluencia Style paintings are usually very resistant. Thus, and even at very sunny and open sites, design traces can usually be seen by the naked eye and/or later reworked with computer imaging programs (for example, *Photoshop*). The Taira-Tulán paintings are less resistant to the natural elements, occasionally resulting in complete disfigurement of part of the panel. This is the reason it is impossible to determine if all or only part of the panels were painted. In terms of engraving, some sites show exfoliation, although this never affects the entire panel. This damage is easily recorded because the engraved fragments fall to the ground. If this process affected the whole panel, it would be quickly detected during fieldwork, which has not

been the case. Even though partial and localized exfoliation has also been detected at Taira-Tulán sites, it has not affected the registration process.

9. Superimposition is the addition of figures or redrawing of previously existing figures. Cases of superimposition in rock art are not uncommon. Nonetheless, graphic operation is much more complex in the Taira-Tulán panels. In addition to superimpositions, additions also exist. We have detected at least three types of superimposition: (1) part of the figure is used to create another and entirely different one (for example, adding on a new neck or head), (2) a new line is added to a previously existing one, and (3) a line is scraped over an old engraving, thus producing width and thickness differences in relation to the other lines composing the figures.

10. Taira (Berenguer 1996; Figure 1) and Tuina (Núñez et al 1997; Figure 5).

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