Early Horizon and Early Intermediate Period rock art of the Nasca valley (department of Ica, Peru)*

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Introduction

Detailed observations are crucial for the scientific study of rock art, and Reflectance Transformation Imaging (RTI) provides much needed data in the technical analysis of this form of expression. Its use can contribute significantly to the study of rock art by allowing an analysis that goes beyond a definition of styles and iconographic motifs, making it possible to thoroughly examine the technical aspects of petroglyph manufacture as well as address relevant conservation issues at these fragile sites. The petroglyphs of the Nasca valley were made on poorly cemented sandstone and they have sustained considerable damage due to the natural weathering of the rocks. This project sought to photograph the rock art at two Nasca valley sites (Fig. 1) and track the natural weathering processes that have damaged the petroglyphs.

Reflectance Transformation Imaging (RTI)

We adopted RTI, a computational photography technique, because RTI images are helpful in documenting characteristics of petroglyphs that are often lost in line drawings or may not be clearly visible in single digital photographs. RTI involves taking a series of photographs of the same subject with the camera in a fixed position and a different light angle for each of the photographs in the set (Mudge et al. 2006; Cultural Heritage Imaging 2013). During processing, RTI software uses the angle of the light in each photograph along with the reflectance information registered in each pixel to calculate surface normals for those points and therefore creates a digital representation of the three dimensional surface. The final image can be virtually lit from different angles in a viewer, allowing an interactive and thorough examination of the surface that is not possible through conventional photography. RTIs can also be digitally enhanced for better viewing.

Site Descriptions

The sites selected for this study, X02[1] (Jumana) and QMA01 (Majuelos), are approximately 300 meters above the sea level. These sites share some common characteristics, the most important of which is that they both have petroglyphs that can be compared to motifs on

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[1] These were the site names used in Nieves 2007.

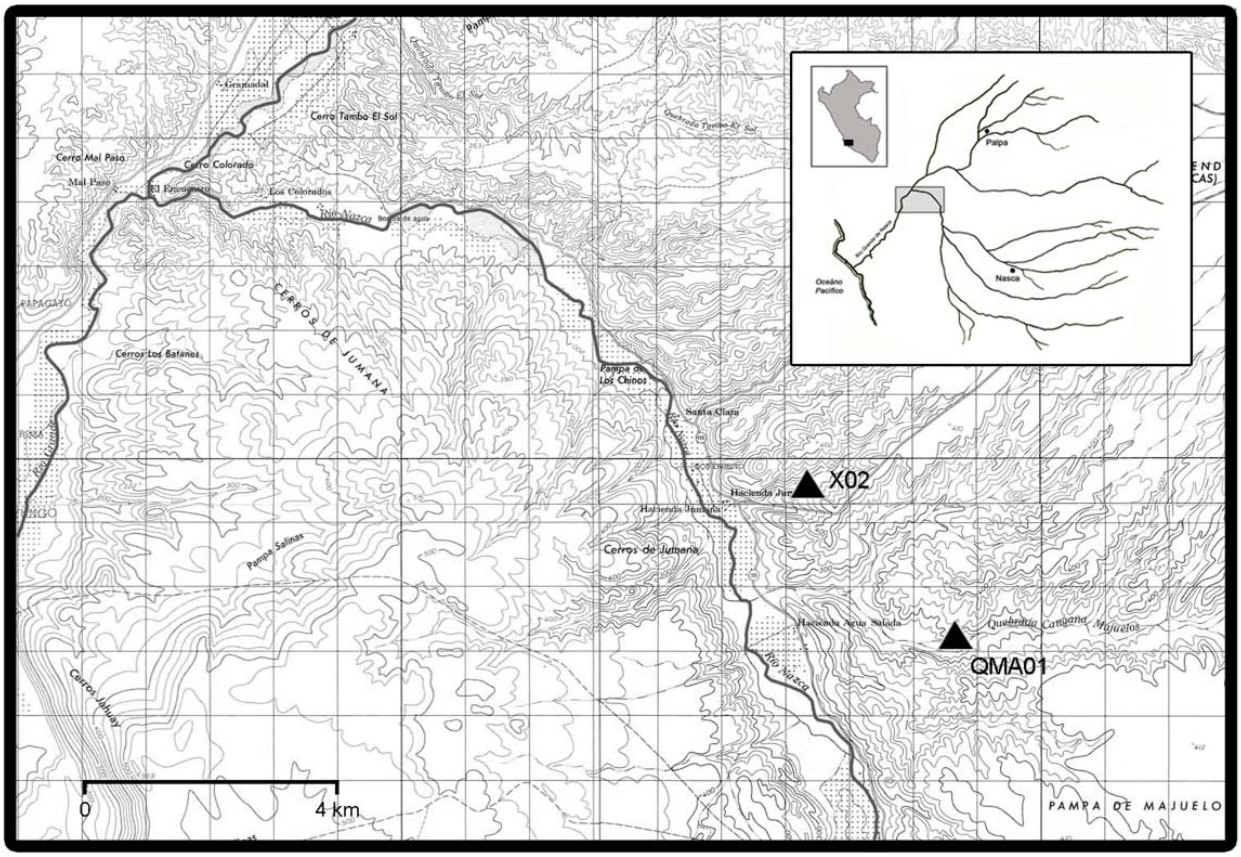

Figure 1. Map of the lower Nasca valley, showing the location of Sites X02 and QMA01.

portable objects that date to the later phases of the Early Horizon and the early phases of the Early Intermediate Period. Although there are limitations to dating rock art based on similarities of attributes or styles, we consider this type of comparison a necessary first step in organizing and categorizing motifs within the larger corpus of rock art at Nasca Valley sites.

Site X02 (Jumana)

The first site, X02 or Jumana[2], has evidence of petroglyphs and pictographs (Fig. 2). The site, formed primarily by a colluvial deposit, is located in one of the quebradas or dry stream beds in northeastern side of the Nasca valley. It consists of a series of sandstone boulders that broke off in irregular, angular fragments from the sedimentary strata in the upper portion of the slope.

There are noticeable differences in the preservation of rock art at X02 related to the degree of weathering of the rock surfaces. The rocks in the lower portion of the colluvial deposit have rounded profiles caused by high exfoliation and aeolian erosion, and they show very little of the initial patination on the surface. The rocks that are located higher on the slope have exposed flat facets, in some cases showing the original patina of the rock. This distinction is significant because pictographs have survived primarily on the original patinated surfaces.

[2] Some of the information that refers to X02 was also included in Echevarría and Nieves 2014.

Site QMAO1 (Majuelos)

The second site, QMA01, is a petroglyph site located inside a small quebrada that is part of the larger Quebrada Majuelos (Fig. 3). Different depositional layers or strata are clearly visible at QMA01. As a result of weathering these took the form of a rock wall. Large blocks of stone broke off the lower portion of the rock wall along fractures likely caused by the stress generated due to the weight of the rock above. This left the upper strata as a natural overhang over the sandstone walls that served as rock art panels. The boulders that broke off rolled into the small quebrada.

There are looting holes, fragments of bone, and badly weathered pottery sherds that were once part of polychromatic Nasca culture ceramics within this quebrada. Unfortunately, there is also evidence of recent graffiti on the rock art panels.

Results

The Pictographs and Petroglyphs at X02 (Jumana)

The evidence at Site X02 or Jumana clearly demonstrates the fragile condition and high deterioration of the rock art sites of the Peruvian south coast. Rock 3, for example, has a laminated appearance and is crossed by natural fractures from which an exfoliation process began. As these sheets broke, they exposed a granulated and irregular subsurface of the rock. Pictographs survived in the original patinated surfaces and were therefore part of the earliest manufacturing episode on Rock 3 (Fig. 4).

Figure 2. Site X02. Nasca valley.

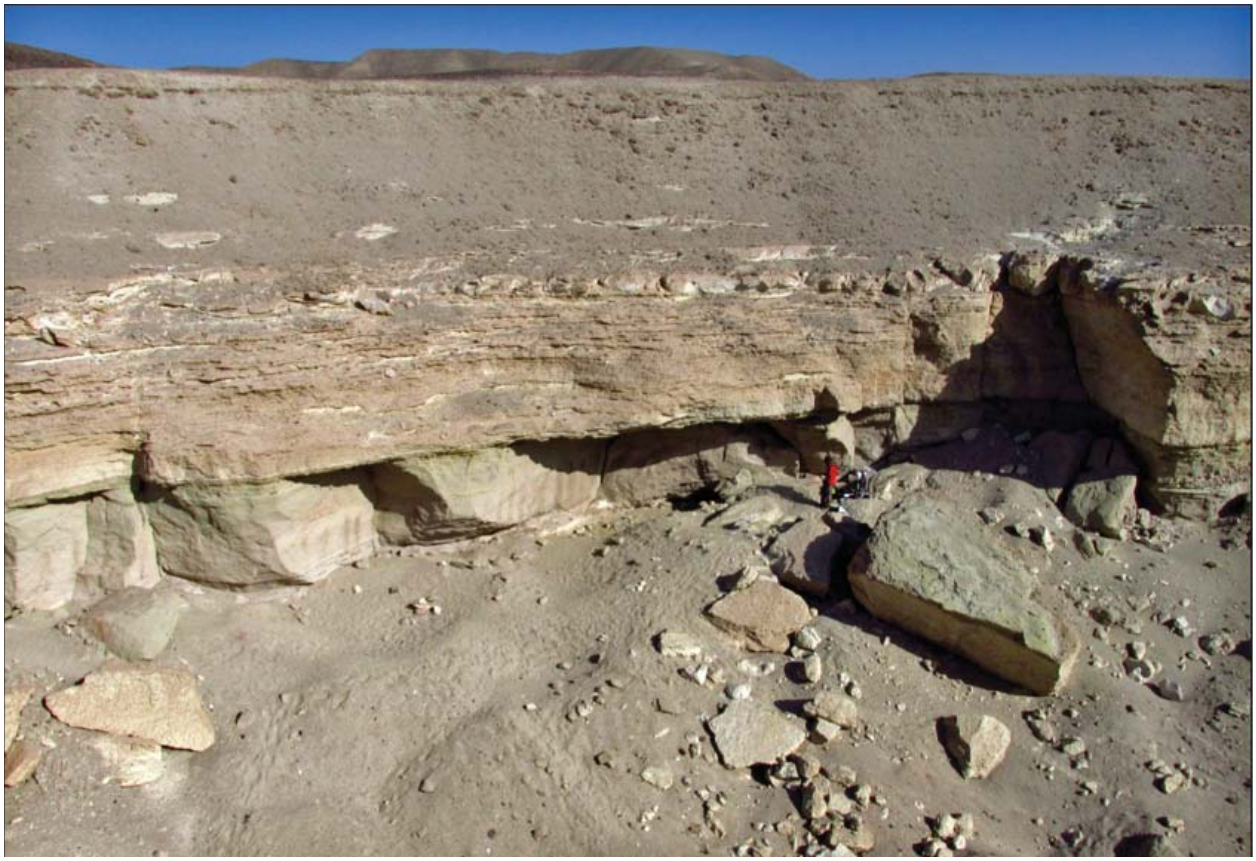

Figure 3. Site QMA01. Nasca valley.

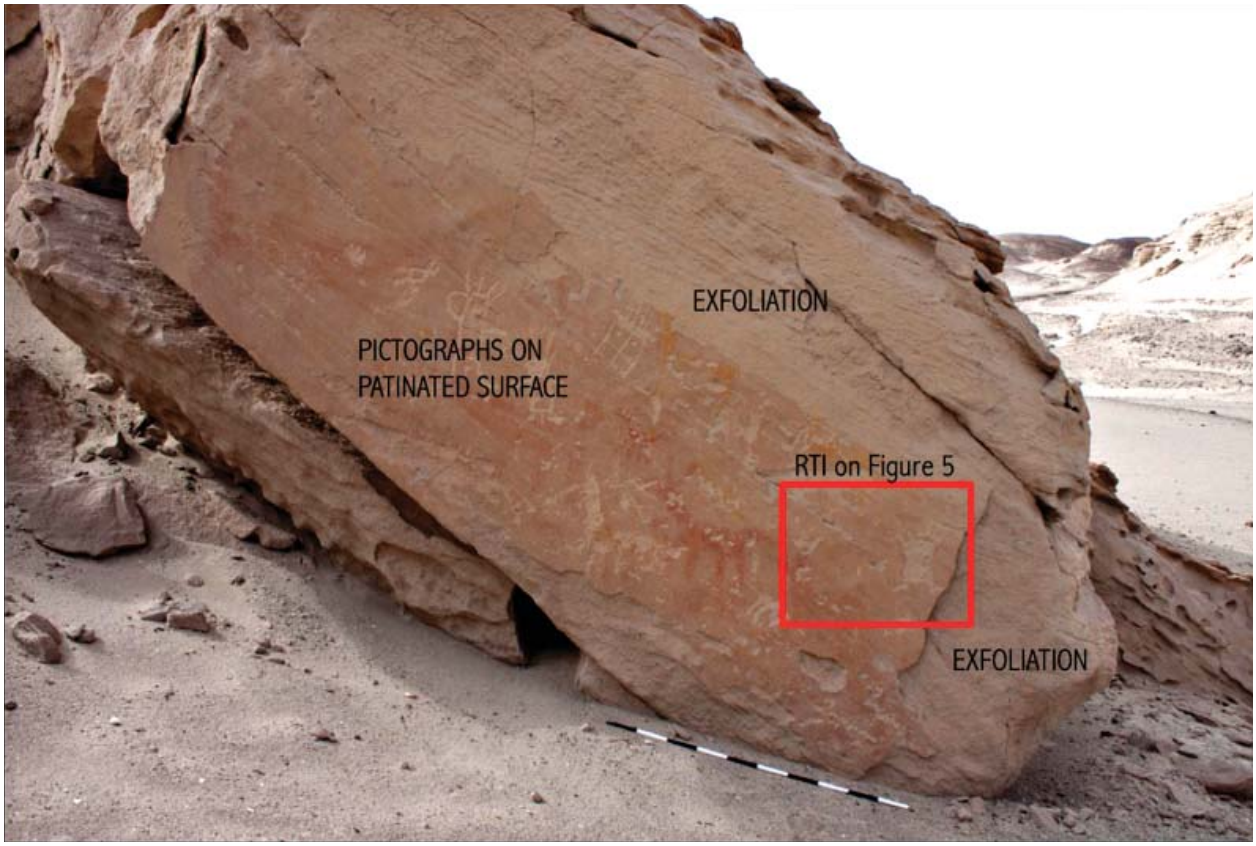

Figure 4. Rock 3, Site X02, Nasca valley. The exfoliation process has already destroyed some of the petroglyphs and pictographs. The highlighted area is the detail shown in the RTI of Figure 5.

We were able to document and identify different manufacturing techniques that postdate the pictographs at X02. In some cases, different techniques were used within a single motif (Fig. 5). There is evidence of re-carving of some of the motifs at X02 as well. It is clear that the site itself was not the result of a single event, but that there were multiple manufacturing episodes on each of the boulders.

Deep Grooves and Light Incisions at QMA01

The petroglyphs at QMA01 display a great range of variability in terms of technique and scale. Some representational motifs are only a few centimeters wide and lightly incised, while others are monumental in scale, unlike the petroglyphs found in any of the other rock art sites in the lower Nasca valley. The larger motifs were made with wide and deep grooves.

Among the RTI image captures at QMA01, we made several of Panel F in order to analyze motifs and attributes that were not clearly visible in ambient light photographs or were inaccurately depicted in earlier drawings of this panel. Panel F (Fig. 6) has examples of both the lightly incised motifs, but it also has one of the larger motifs made with deep grooves. Donald Proulx (1999) identified the large motif on Panel F as the early Nasca Mythical Killer Whale (MKW) based the stylistic and iconographic similarities with the MKW representations on Nasca ceramics.

One of the large petroglyph's attributes, evident in the RTIs but yet missed in the previous drawings of this petroglyph, involves the shape of its eye. The eye had been previously drawn as a single, large circle (Nieves 2007; Orefici 2012). However, RTIs clearly indicate that the eye of this large MKW consists of two concentric circles (Fig. 7), an attribute that makes this motif even more consistent with early Nasca culture representations of the MKW. This characteristic was difficult to see in ambient light photographs due to the significant stone loss (scaling) on the upper left portion of the eye.

Although the large MKW on Panel F was made with deeply carved grooves, there are other petroglyphs on the same panel which were lightly incised. These incised motifs have been somewhat protected, but are still very difficult to photograph with ambient light. For example, above the large MKW, between its top fins and tail, there is a smaller, incised version of the same motif. The RTI of this smaller, incised MKW (Fig. 8) indicated it had an extended arm similar to the one on the large MKW. The incised lines that make the small MKW have been smoothed out or rounded due to a combination of abrasion due to aeolian sediment transport and granular disintegration and this makes it difficult to see any of the overlapping between most of the incised lines that make this motif's body. However, there are indications of later activity over this smaller, incised MKW. There are round

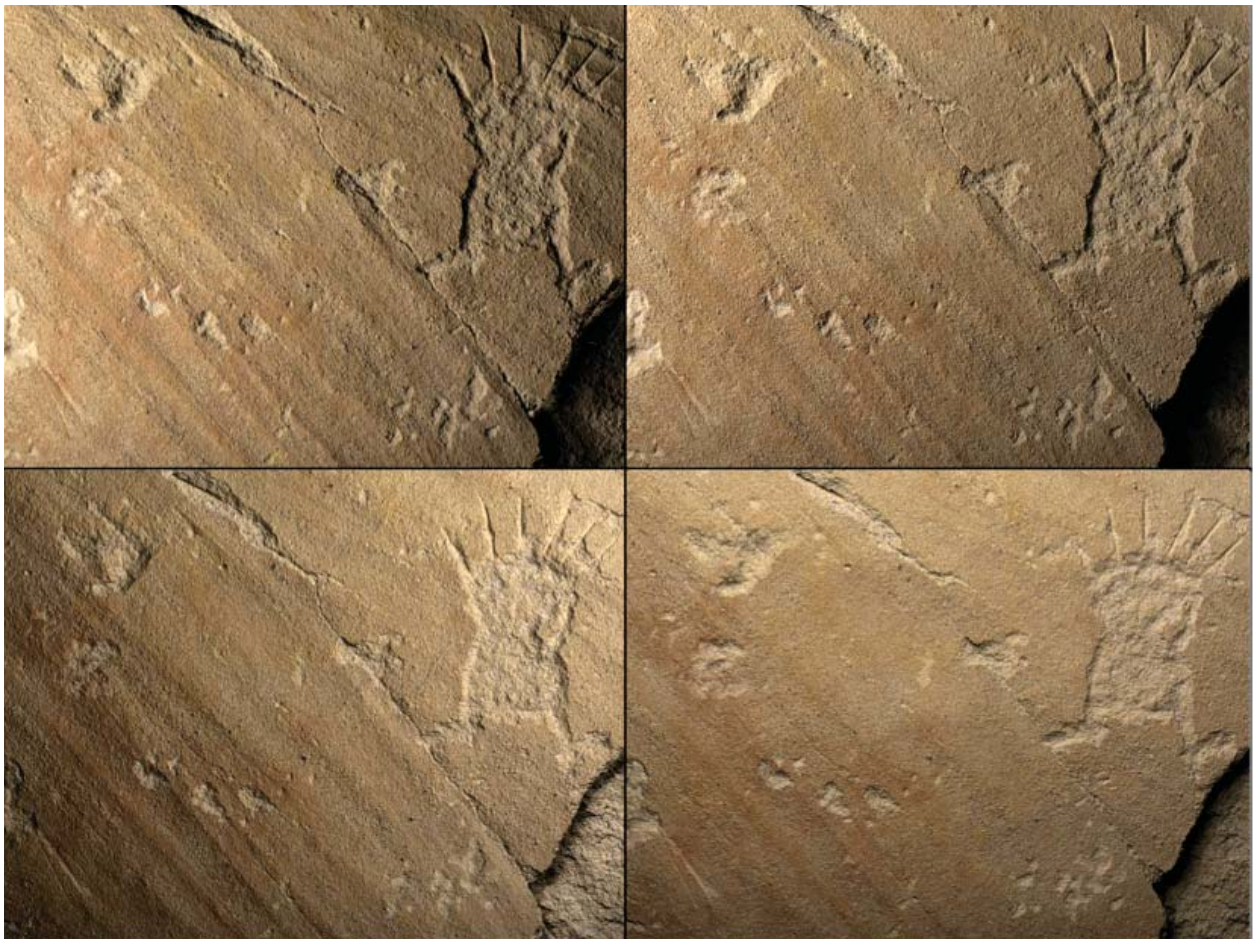

Figure 5. Rock 3, Site X02, Nasca valley. RTI of the right side of the rock art panel seen in Figure 4 (Top two: Diffused Gain mode; Bottom two: Normal Unsharp Masking; All images have different light angles.). This RTI clearly indicates two separate manufacturing techniques on the anthropomorphic figure: direct percussion and incision. The exfoliation process is clearly visible along fractures.

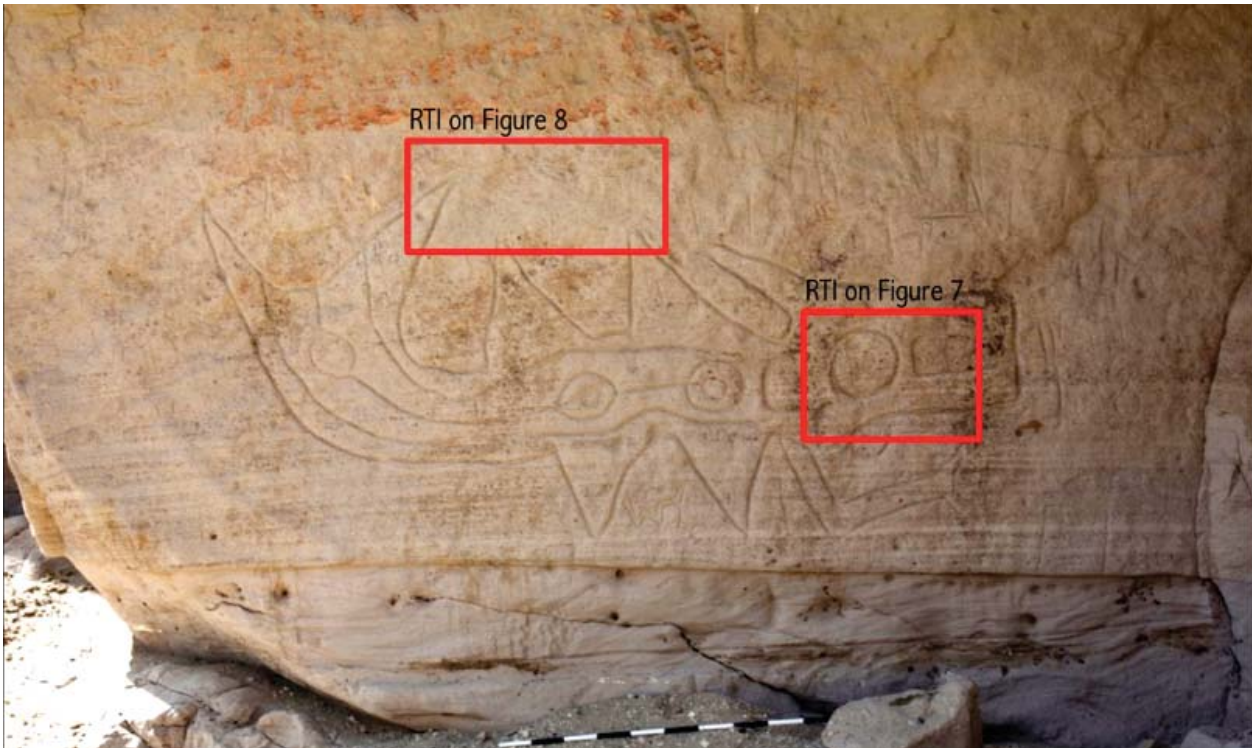

Figure 6. Panel F, QMA01, Nasca valley. In this ambient light photograph, the large Nasca Mythical Killer whale is clearly visible, but the smaller incised motifs are not. The highlighted areas are the RTIs illustrated in Figures 7 and 8.

Figure 7. Panel F, QMA01, Nasca valley. RTI of the eye of the Mythical Killer Whale (location shown on Figure 6; top two: Diffuse Gain Mode; bottom two: Normal Unsharp Masking; all of these RTIs have different light angles). The eye of the orca was made with two concentric circles. This detail is difficult to see in ambient light photographs due to the damage caused by the scaling of the rock surface on the upper portion of the eye.

pits carved around this figure and in some cases these pits have damaged parts of the petroglyph. A later, diagonal incision also cut across part of one of the circular pits and through the incisions on the tail of the incised MKW. We can determine this sequence based on the superimposition of the marks and the different degrees of weathering. The small MKW has therefore suffered damage from both natural processes and through later mark-making activity at the site.

Although it is difficult to determine the time elapsed between petroglyph manufacturing episodes in any of the panels or boulders, it is clear that these rock art sites were undergoing continuous change. Multiple contributors were involved in the manufacture of petroglyph panels but also in the modification of earlier motifs and rock art panels, suggesting an enduring awareness of these sites and continuous use of these locations.

Recommendations

Unfortunately, the same natural processes that contributed to the formation of these sites will ultimately be a factor in the destruction of the rock art panels. However, a more pressing problem that will affect the condition of the sites and accelerate the process of deterioration on rock art panels involves the increase in tourist traffic and the use of off-road vehicles to bring visitors into the quebradas. Limiting access to the quebradas that have rock art sites is therefore a necessity. With the aim to preserve these important Peruvian sites, these rock art sites should be closely watched and supervised, access should be restricted (much like the pampas with geoglyphs in the area), and the rock surfaces must be documented and evaluated on a periodic basis to detect any additional deterioration.

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Figure 8. Panel F, QMA01. Nasca valley. RTI of the smaller, incised Mythical Killer Whale (location shown on Figure 6; top left: Diffuse Gain; top right: Image Unsharp Masking; bottom left and right: Normal Unsharp Masking; all images have different light angles). The circular pits and the diagonal incision that crosses the incised Mythical Killer Whale's tail are later and intrusive. At least in this panel, the circular pits are part of a later manufacturing episode than the making of the Mythical Killer Whale petroglyphs.

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