15 Community Engagement in Geologic Assessments of Thamudic Inscriptions and Petroglyphs in the Wadi Rum Protected Area, Jordan

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Introduction

Carved on the slopes of monolithic mountains surrounded by rolling sands, the numerous petroglyphs and inscriptions of the hyper-arid Hisma region epitomize the intricate and tenacious connection between humans and the desert. Straddling the Kingdoms of Jordan and Saudi Arabia and covering much of the southwestern edge of the Arabian Peninsula, the Hisma Desert houses some of the most dramatic and iconic desert landscapes in the world (Figure 15.1), features which are showcased and conserved in the Wadi Rum Protected Area (WRPA) in southern Jordan. The stark uniqueness of the reserve's landforms has inspired substantial literature on desert geomorphology (e.g., Rahman 1985; Goudie 2013), but hidden within the textbook-esque inselbergs, pediments, valleys, and ergs is an entirely different aspect of the region's complicated human-environment interaction: expansive networks of intricate, overlapping, and multi-lingual petroglyphs and inscriptions. The mere existence of this rock imagery proves a long and rich occupational history in this harsh and desolate desert. However, their content also provides significant archaeological and climatological information. Depicting scenes of large camel trains, hunting prey no longer found in the region, the domestication of livestock the current climate could not support, the rock imagery throughout the Hismaic area provide scholars a myriad of tantalizing research questions and glimpses into what ancient life may have been like in the past (Borzatti von Lowenstern and Masseti 1995; Corbett 2012)—they are even listed twice among the outstanding universal values of the WRPA's inclusion in the UNESCO World Heritage program as one of the programs rare Natural and Cultural World Heritage Sites (WHC 2011).

Despite the immense scientific and cultural value of the region's rock art and inscriptions, very little research has been conducted to assess their physical geological condition. As is common with rock art sites around the

DOI: 10.4324/9780429355349-20

world, various archaeologists and epigraphers have conducted field surveys to document and interpret the content of the region's inscriptions and carvings (e.g., Fares-Drappeau 1997; Ruben and Nasser 1999), but usually dismiss or neglect assessing their tangible context and overall stability, which is vital to instituting effective long-term conservation policies and planning (Dorn et al. 2013a; Groom 2017). Of course, while such epigraphic and rock art documentation projects provide profound knowledge and insight into the history of the region and the indigenous people who lived there, they tend to focus on a single aspect of an extremely complex and dynamic stone heritage resource.

Additionally, and unfortunately frequent with rock art sites, the local community who have lived in the region for generations—possible descendants of the ancient people who marked the stones in the first place—along with local site managers responsible for protecting the cultural resources, are completely segregated from nearly all academic explorations in the valley. Aptly described by a local community leader in Rum Village: "They come, they do research, they leave, and we learn nothing." Not only does this dissonance understandably frustrate local communities but it also robs academia of the immense wealth of local

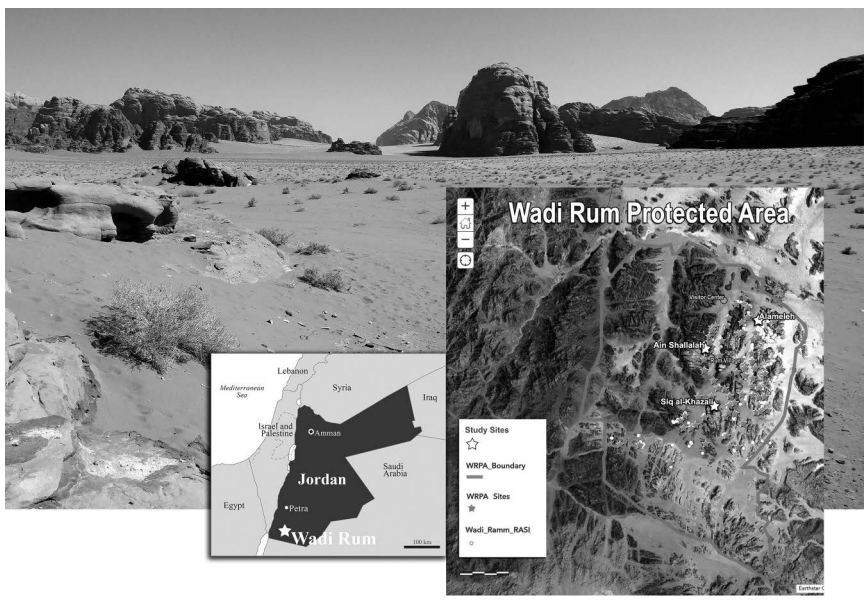

Figure 15.1 Dramatic landscape of the Hisma Desert with the stark red sand, tall inselberg mountains and panoramic views. Inset map shows the locations of Jordan within the Middle East and the WPPA in the south. Additional map showing the breadth of sites assessed as part of the Rock Art Rangers Program including the 3 sites highlighted in this chapter. Cartography by K. M. Groom 2018.

knowledge and inherent familiarity with the valley's vast carved heritage and long-standing occupational history. Proposing a new integrated approach to research, the primary purpose of this chapter is to showcase the benefits, both scientific and social, of promoting community engagement in heritage assessment analyses using the Wadi Rum Rock Art Rangers program as a case study.

Supporting existing WRPA conservation and research efforts, the authors conducted an interdisciplinary stability analysis throughout the Protected Area employing several members of WRPA staff, volunteer participants of the USAID-funded Sustainable Cultural Heritage through the Engagement of Local Communities Project (SCHEP), and multiple international and Jordanian scholars to provide a complementary geological perspective to Wadi Rum's expansive stone imagery inventory. After a brief overview of the SCHEP program and explanation of methods employed, site analyses and results of the study are outlined, followed by a discussion of project implications and conclusions, as well as the potential—and necessity—for subsequent research on the geologic stability and the bolstering of community involvement in future management of petroglyphs and inscription across the wider Hismaic Region.

SCHEP recruitment

Working with nine heritage sites across Jordan, SCHEP is a collaborative service and research program run through American Center of Oriental Research (ACOR) and funded by USAID focused on building local capacity and self-agency to help manage and protect Jordan's vast cultural heritage resources. Both Jordanian and foreign scholars manage each SCHEP project with an emphasis on encouraging a unique community-first approach and hands-on style of teaching and engaging local communities.[1]

Specific to Wadi Rum, SCHEP's leadership—many of whom served with the Jordanian Department of Antiquities for several years—aided in establishing working relationships with the director of WRPA, as well as larger overseeing governmental bodies, such as Aqaba Special Economic Zone Authority (ASEZA). A core team consisting of Jordanian and international scholars, local community leaders, and key personnel from the WRPA was created to test methods and lead the Wadi Rum SCHEP program. The local core team members were instrumental in facilitating research outings in the protected area as well as recruiting participants for the Rock Art Rangers and Rock Art Stability Index (RASI) documentation programs.

Methods

Primary stability assessments were collected using RASI, a rapid non-invasive field survey designed to provide detailed geologic stability information without requiring complicated, and often cost-prohibitive technical training in rock decay and geomorphological sciences (Cerveny et al. 2016;

Groom et al. 2019). Individually rating over three-dozen specific rock decay forms and processes, RASI is organized into five thematic categories, each addressing a different aspect of geologic stability and, inversely, weaknesses (Dorn et al. 2008). These categories range from general, such and "Site Setting" and "Large Erosion Events" looking at the host stone as a whole, to the very specific "Incremental Loss" gaging minute and consistent micro-scale decay processes. The index also incorporates a section dedicated to indicators of future decay potential ("Impending loss") where researchers identify evidence of building vulnerability or the beginning stages of larger deterioration issues. The fifth category of the index addresses the complicated relationship between stone imagery and different rock coatings and biofilms. Since some rock coatings are considered stabilizing agents for rock art (Dorn 1998), they are scored differently than those known to promote decay.

Once a researcher is trained to accurately identify the various rock decay elements analysed in RASI, they then complete the survey by rating each individual feature on a pre-defined scale of 0 (non-existent) to 3 (dominant)– thereby providing management with not only a numerical "RASI score" to aid conservation prioritization but also give an indication of which decay processes pose the most risk to each site. More information on RASI is available on Stone Heritage Research Alliance, Limited Liability Company (SHRA) website: www.shralliance.com. This organization owns the index copyrights and the only agency in the world currently offering professional RASI training services, as well as its sister index: the Cultural Stone Stability Index (CSSI) designed for historic buildings, archaeological sites, monuments, and many other forms of heritage stone (e.g., Allen et al. 2018).

For ease of use and application, each panel was assessed using a custom-built interface within Esri's Survey123™ and Collector™ apps on smartphones/tablets—the results of which are stored in an online geo-database now administered by ASEZA (the Jordanian governmental body overseeing the WRPA). Essentially, for each panel, a single Global Positioning System (GPS) location was recorded within the app and then researchers proceeded to complete a RASI assessment and take anywhere from two to five photographs of the rock art panel and its geologic context. Both the completed RASI score, and photographs are inherently tied to the collected GPS point, so each panel collection was uploaded as a grouped dataset to the project's dedicated online Geographic Information System (GIS) database. If data collection took place in a region with decent cell reception, each panel submission was uploaded immediately; however, since most sites assessed in the project were too remote, the data was simply saved to the collecting device (i.e., individual smartphones and/or tablets). Once back within cell range or connected to the internet, the whole batch of collected data points would be uploaded at once. Despite the region's remote location and limited reception, field GIS techniques have been successfully utilized in the past (see Corbett 2012) and since the WRPA is home to tens of thousands of petroglyphs and inscriptions, collecting data digitally helped ensure each

data "package" (i.e., GPS with corresponding RASI score and photographs) remained intact within the larger database.

Results

RASI fieldwork and data collection took place during multiple two-to-three-week intensive field seasons. This was supplemented by minimal, but continuous, research done by a handful of dedicated WRPA staff and volunteer participants. With the project spanning slightly over a year, a running total of 1179 individual panels (discrete rock faces with a shared aspect housing one or more inscription/image) spread across more than 85 different sites (groupings of panels within a definable location) have been assessed—each dataset included a dedicated RASI score, photograph, and geographic location stored in the project's online geo-database. These collected RASI scores can now be analysed geospatially within the online framework to visualize the broad distribution of primary decay threats within the WRPA and determine which sites may be suitable for tourism development depending on panel stability.

A few useful over-arching stability observations can also be inferred based on the fairly comprehensive compilation of data collected throughout the WRPA--although various autocorrelations and statistical limitations do exist in such assessments. For example, when comparing average scores and category sums across the five main RASI categories (Table 15.1), the "site setting and geologic context" category appears significantly more influential than expected, especially when compared to other categories with considerably more recorded features. Of course, categories with more decay features may have a higher count of "not present (0)" scores, which would inherently lower averages. That said, comparing these values can still provide useful insight into which decay patterns and behaviours are present in the WRPA. For instance, the negative average score for the "Rock Coatings" category indicates, in general, the stabilizing influences of many rock coatings found in the region—such as mature desert varnishes and case hardening (Dorn et al. 2012; Dorn et al. 2013b), which outweigh the negative impacts of salts and anthropogenic activities in the study area.

Table 15.1 Comparison between average RASI scores and their respective category sums, displaying potential statistical differences between the overarching categories

	Site Setting	*Impending Loss*	*Large Erosion Events*	*Small Erosion Events*	*Rock Coatings*
Average score	0.82	0.56	0.29	0.56	−0.26
Mode	0.75	0.50	0.20	0.64	−0.25
Category sum averages	971.00	663.60	343.00	665.75	−305.25

Beyond average category scores, specific averages for each assessed rock decay feature can help quickly identify which processes are most prominent within the study area. It is important to note that with over 1,000 panels recorded in this study and many decay features scoring "not present (0)", most average feature scores are decimals, indicating any decay feature with an average score of 1 or above is a widespread or significant concern. For Wadi Rum, these threats include scaling and flaking of the rock surface in both impending (1.26 points) and active decay categories (1.08 points), rounding and blurring of petroglyph edges leading to loss of clarity (1.30 points), and general intrinsic weaknesses within the lithology itself (1.46 points).

Generic assessments such as these can be useful for park management, but the benefit and applicability of the RASI geo-database is more apparent when used to analyse specific sites and smaller clusters of panels. To demonstrate this, RASI data and score interpretations for three key sites within the WRPA are presented: Ain Shallalah—a spring on the eastern face of Jabel Rum just above Rum Village; Siq al-Khazali—a slot canyon on the northern tip of Jabel Khazali and the primary rock art tourism site of Wadi Rum; and Alameleh—an archeologically significant site depicting various ancient technologies and cultural events, also a popular destination for tours originating from the neighbouring Disi Village (See Figure 15.1). These three sites exemplify regional decay patterns, lithologies, as well as heritage management challenges—both anthropogenic and natural—influencing the long-term sustainability of Wadi Rum's irreplaceable rock art and inscriptions.

Ain Shallalah

Straddling the contact between the region's dark volcanic basement rock and the hardened Umm Ishrin sandstone, Ain Shallalah is a unique site nestled in a small crook of the mountain "Jabel Rum", directly west of Rum Village in the very centre of the WRPA. This site not only houses the protected area's most complete Nabataean shrines and inscriptions, but these panels have also developed a thick calcrete coating unlike anywhere else in the surrounding region. The pleasant atmosphere created by the perennial trickling of spring water, protection from the harsh desert sun, and the smell of wild spearmint growing nearby—all within an easy hike from the village below—has made Ain Shallalah a popular destination for tourists and locals alike.

Unfortunately, RASI analyses revealed several human-driven decay processes and negative impacts of the site's high foot traffic and relatively unrestricted visitation. Including several panels along the trail leading to the spring itself, 21 individual RASI assessments were recorded for this site. Final RASI scores ranged from 36 (Panel 1) to 68 points (Panel 9) with a site average of 53.2 points—well above the total project average (32.2 points) (Figure 15.2). As might be expected, the panels nearest the spring and flat picnic area exhibited the most anthropogenic decay, mostly modern carving, paint, and chiselling sections of Nabataean inscriptions. The site's

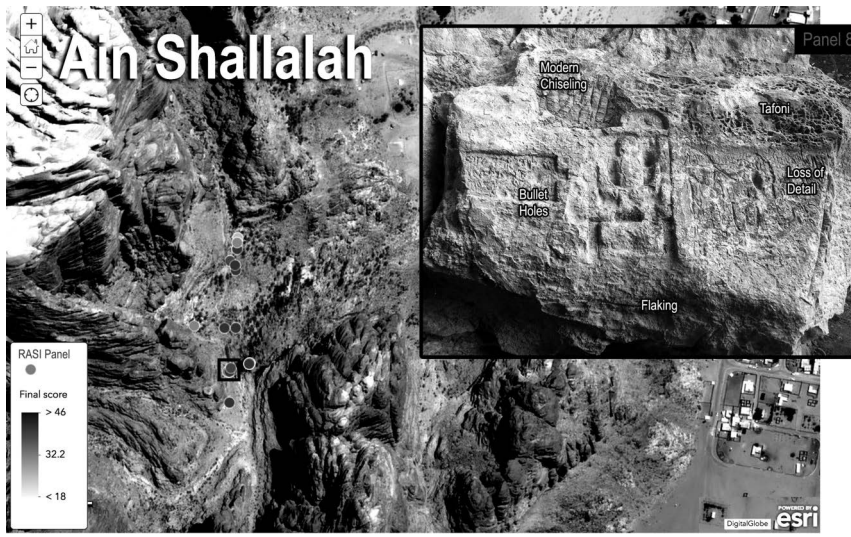

Figure 15.2 Map of RASI panels at Ain Shallalah with colour saturation indicating RASI score and small inset overlay showing Panel 8 with its location marking on the map with a black square. Photography and cartography by K.M. Groom.

primary natural decay processes identified via RASI are interesting, as they are also commonly found in limestone—possibly reflecting the high calcrete and carboniferous characteristics of the Umm Ishrin sandstone on which most of Wadi Rum's petroglyphs are located (Rahman 1985). Specific RASI elements with consistently higher scores at Ain Shallalah include the development of tafoni (pitting), textural anomalies either inhibiting or enhancing surface deterioration, widespread flaking (typically of the calcrete coating taking subsurface material with it), and polygenetic decay explicitly leading to loss of detail and/or clarity of motifs.

Serving as an appropriate representative of stone stability—or more aptly instability—currently exhibited at Ain Shallalah, Panel 8, near the spring, showcases the site's uniqueness as well as visible examples of all the above-mentioned conditional challenges. Among the most academically significant panels at the spring, the centre of Panel 8 displays what has been interpreted as a Nabataean shrine with two distinctive Nabataean inscriptions on either side (Dudley and Reeves 2007; Hayajneh 2009). Additionally, there is the possibility of an additional item in the upper left corner where a large section of the stone face has been crudely removed. The thick calcrete layer covering much of the panel's surface has obscured some of the writing, but the removal of this coating has caused more damage to the inscriptions—as seen along the lower sections of Panel 8 where the texture of the stone is

dominated by small flakes and scales preparing to detach. In areas where the rock coating is more secure, the surface has begun developing networks of cavities and pitting, known as tafoni (Groom et al. 2015), along the upper right corner of the panel—also dramatically changing the overall texture of the stone surface. Consistently higher scores in the "Impending Loss" RASI category—for Panel 8 and most others at Ain Shallalah—indicate the site's rock art and inscriptions will only continue to deteriorate, especially if human interaction and land-use remain unregulated.

As a site commonly utilized by the Rum community, Ain Shallalah also prompted excellent discussions among the program volunteers, exemplifying inherent necessity to include local stakeholders in stability research. Many, if not all, of the program participants already voiced concerns regarding trash and rubbish found at the site, admitting they could do better about promoting clean-ups or better land-use practice; but once they started collecting RASI scores, they were surprised to learn just how fragile these panels actually were. In the middle of data collection, local site managers and WRPA staff began talking with local guides and community leaders about ideas for better protecting the site, with some even trying to identify the individuals responsible for the more invasive vandalism so they could be held accountable. RASI analyses with higher scores at Ain Shallalah not only provided credence to existing concerns about the site, but by including community members in the data collection process, also allowed for a more organic, and potentially effective, response to these issues. Rather than an external power trying to enforce new rules, program participants can promote change from within the community, teaching by example to respect the site for future generations.

Siq al-Khazali

Arguably, the most famous rock art site in the whole Hisma Desert, Siq al-Khazali—commonly known as "Khazali Canyon"—features numerous petroglyphs, overlapping inscriptions, and singularly unique motifs within a dramatic slot canyon at prominent location near the centre of the WRPA. The site's easy accessibility, interesting setting, and high concentration of engravings have made it a key-stone tourist attraction within the protected area—so much so that the site is included on nearly every tour itinerary and also featured heavily on promotional material for the park. Reflecting the prolific occupational history of Wadi Rum, Khazali's RASI analysis included 38 individual panels, with petroglyph ages spanning from Neolithic (>3000 BCE) to Thamudic (~300 BCE–400 CE) and Early Islamic (~600–800 CE) (Ruben and Nasser 1999). In fact, several inscriptions within the canyon are cited as some of the earliest known examples of written modern Arabic (Hayajneh 2009)—adding to the site's interest, as well as its historical and epigraphic value. With the canyon itself being quite narrow (2–3 meters at the widest), the daily influx of large tour groups and visitors has

certainly had a profound influence on the site. This is reflected in the site's RASI results, but the canyon's unique lithological variances seem even more significant regarding panel stability and decay.

The final RASI scores for Khazali varied dramatically from a mere 12 points (Panel 18—a nearly perfect score) up to 80 points (Panel 33—practically falling apart), making the site average of 33.4 points a relatively poor representative for the site as a whole, even though it aligns well with the WRPA's total average (32.2 points). That said, when viewed geographically, a few spatial patterns emerge. For instance, panels exhibiting the inner canyon's higher RASI scores (42–50, Average: 45.6) are located above the opening and along the upper ledges out of hands reach (Figure 15.3). Primary decay threats for these panels, as identified via the index, include typical sandstone vulnerabilities such as rampant flaking and splintering (i.e., disintegration of stone matrices along weakened layers of concentrated bedding planes (Goudie et al. 1994)), and the ever-present threat of graffiti and vandalism, particularly along the outer edges of the canyon opening.

Alternatively, and somewhat counter-intuitively, the panels with the lowest scores (14–32, Average: 26.2–indicating higher stability and resilience), are located directly alongside the path leading into the canyon and experience regular human interaction, as most visitors use the panels as handholds to safely move through the narrow canyon. Human contact is usually considered damaging to rock art (Whitley 2005), so finding such low RASI scores within arm's reach in Khazali was surprising, but not entirely inexplicable: each of the "stable" panels are contained within a single meter-thick geologic strata with an unusually thick silica coating, which has, over time,

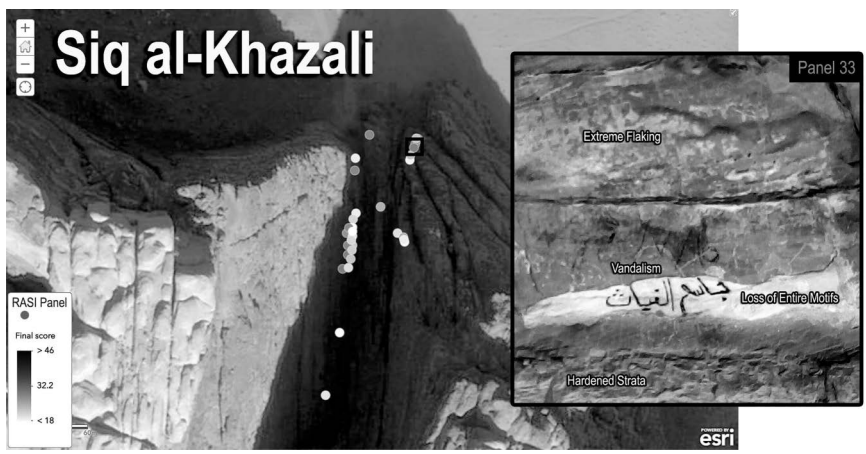

Figure 15.3 Map showing the location and RASI scores within Khazali Canyon. The inset overlay is a photograph of Panel 33 and its location is marked on the map with a black box. Photography and Cartography by K.M. Groom.

effectively encased the rock art and inscriptions under a shiny, and highly resilient, epoxy-like outer layer. Further research is necessary to determine the relationship between nearly constant human contact, periodic flooding, and the development of this coating, but its presence has certainly been a stabilizing agent for Khazali's inner panels, at least for now. While the surfaces are currently relatively solid, sub-surface deterioration leading to the complete detachment of entire panels in a single devastating event remains a concern. This type of low-frequency high-impact decay is demonstrated along the lower portion of the site's highest scoring panel (Panel 33 - RASI score: 80), where large sections of inscriptions and petroglyphs have detached, exposing the extremely friable and brittle subsurface, which now threatens the rest of the panel's overall stability.

Contrary to Ain Shallalah, which is popular with locals and visitors alike, nearly all foot traffic in and around Khazali canyon is tourist related, making tour guide inclusion in stability assessments immensely important. Most of the local volunteers in the Rock Art Rangers program are seasoned guides in the area with years of experience working around Khazali. However, many guides in the area would simply drop visitors off at the mouth of the canyon to explore the crevice unsupervised, leaving the area vulnerable to graffiti and vandalism (one of the site's main problems identified via RASI). Armed with a greater understanding of rock decay, as well as basic epigraphic and historical knowledge of the canyon, program participant guides now regularly lead groups through the canyon to discuss the rich heritage and importance of the site, both enriching the visitor experience as well as more closely monitoring their behaviour and discouraging vandalism.

Additionally, local engagement in research and stability assessment at such a prominent site in the park has been very effective in raising awareness among tour guide associations from various villages. For example, one of the participating tour guides caught a tourist attempting to carve their name in the outer canyon wall. Not only did the guide immediately alert proper authorities but was also able to provide the offender accurate information regarding the devastating impact their action could have on the stability of the stone. Similarly, by promoting from within the community, the attitude towards and willingness to participate in protective activities has also increased at Khazali. During a preliminary workshop to remove graffiti in the outer canyon, several local guides (not officially part of the program) openly helped and happily joined the efforts lead by WRPA staff and foreign scholars—such as the successful removal of the black spray paint on Panel 33 shown in Figure 15.4 by WRPA staff and local volunteers.

Alameleh

Differing slightly from the other sites explored in this paper, Alameleh houses a single large and complex panel with only a few outliers on either

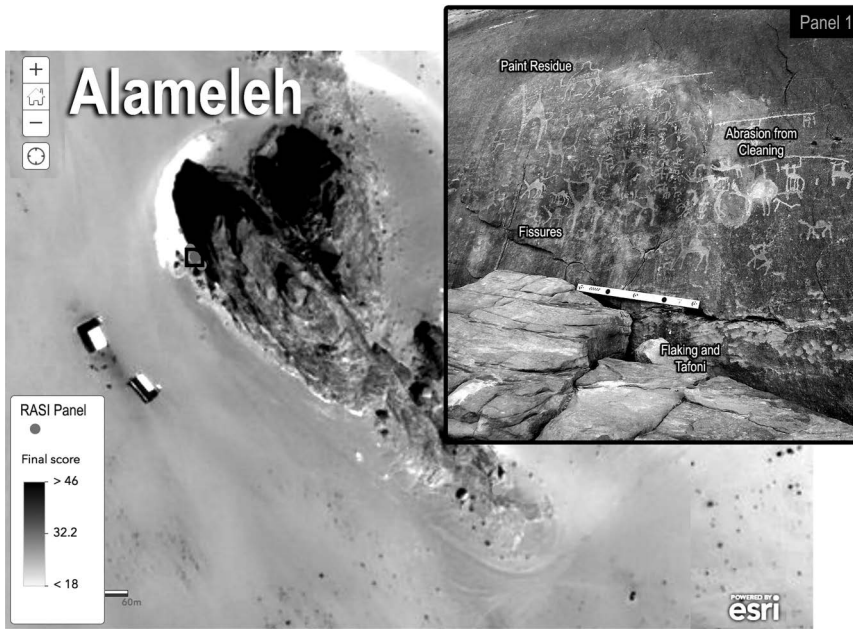

Figure 15.4 Map showing the location and scores of RASI panels on the small outcrop of Alameleh. The primary panel is shown in the overlay and marked with a black box on the map. Photograph by C.D. Allen and Cartography by K.M. Groom.

side. Despite the site's limited number of panels, the concentration, diversity, and clarity of motifs and inscriptions on this small outcrop make Alameleh a prime tourist destination, an invaluable epigraph and academic resource. The site's unique features include large depictions of camel trains, hunting scenes, herding activities, texts and inscriptions of multiple styles—representing the relatively high literacy rate among Thamudic peoples (Stein 2009)—and an interesting visualization of technological evolutions in the region (i.e., moving from spears, bows and arrows to swords to firearms and rifles). On top of the site's profound historical value, it also demonstrates the effective application of RASI as a practical conservation and/or "emergency response" research tool: less than two years ago, the main panel at Alameleh was vandalized with latex paints. ASEZA and the WRPA responded quickly by contracting a professional conservator to clean the site. However, as with even the best restoration applications, faint evidence of both the vandalism event and subsequent restoration remains--evidence that can be recorded and monitored via repeated RASI analysis as the panel continues to recover.

Officially, there are five panels at Alameleh (a cluster of four along the northern ridge and a single panel on the outcrop's southern tip)—all five

were analysed, but this discussion will focus primarily on the site's key panel (appropriately designated Panel 1), as it dwarves the rest in both size and complexity (Figure 15.4). With a final RASI score of 42 (only slightly over the project average), the geology substrate of the main Alameleh panel is fortunately quite stable, especially when considering its complicated history with human interaction. The most prevalent decay features include the development of cavernous decay (tafoni), impending scaling and flaking of the stone surface, and decay related to numerous fissures (cracks) independent of the outcrop's bedding plane. Residue from the site's vandalism is still present and scored high in the "anthropogenic rock coating", as did "abrasion" and "[natural] rock coating detachment", both being common side effects of conservation efforts when cleaning a panel of this size. Additionally, the panel is housed on a relatively uniform section of sandstone meaning the site does not contain the various textural and superficial anomalies exacerbating decay elsewhere in the WRPA.

Nearing the outer border of the official protected area, Alamaleh is a popular rock art destination for tours originating from Disi Village--one of the largest villages in the area. With both Khazali and Ain Shallalah squarely within park boundaries, the inclusion of border sites such as Alameleh is vital in encouraging cross-tribal engagement in stone heritage conservation. Program volunteers from multiple different tribes and villages participated in site visitation, discussion, and stability assessment at Alameleh to showcase shared heritage, as well as collective challenges facing the entire region, which include vandalism and other common sandstone decay features (e.g., splintering, flaking, and rock coating detachment). While the social relations among Wadi Rum's Bedouin tribes remain somewhat complicated, gaining equal knowledge of stone decay and rock art assessment may encourage more cross-tribal efforts to protect the area's universal cultural and natural heritage, such as those exhibited at Alameleh. Including what is generally considered a "Disi site" in this geographically comprehensive stability assessment both validates the site's universal value for all tribes but also, potentially, helps foster a more collaborative attitude in relation to protecting ALL rock art and inscription sites within the protected area, and beyond.

Discussion and conclusion

Arguably, one of the key strengths of RASI is that the index forces the scorer to slow down and see the rock art for what it is: vulnerable. The perception that all rock is hard or invincible is, unfortunately, relatively common, much to the detriment of stone heritage sites across the world--especially open-air rock art sites. In many cases, the casual sentiment of "It's lasted this long so it's fine" often leads to misdiagnosing stability concerns, disregarding major issues, or simple indifference regarding long-term site sustainability. By engaging local tour guides and community members alongside

site management professionals in rock art stability assessments in the Wadi Rum Protected Area of southern Jordan, the Rock Art Rangers program illustrates how community collaboration in scientific research can have a profound influence on promoting effective site management. This study has not only provided numerical values to help guide site management in the creation of new protective policies under the purview of the WRPA but also fostered support and understanding in the local community, who helped gather those values, which in turn help promote beneficial social change to uphold those policies. Rather than relying on data collected by an outside entity, the communal structure of SCHEP and the Rock Art Rangers programs provides local community members social agency and the opportunity to actively participant and contribute to the protection of their shared heritage.

While tourism has been proven to put considerable physical strain on fragile stone heritage resources (Archer et al. 2005; Brandt 2011; Caletrío 2011), such as the rock art and inscriptions of the Hisma, these activities are often a financial necessity to provide the resources and personnel required to effectively manage them. With such a complicated relationship between conservation, tourism, and sustainable development, collaboration between official management agencies and local communities becomes even more vital to the long-term stability of heritage sites. The SCHEP-model's ability to foster this type of cooperation is, arguably, the program's greatest success—as is evident in the Wadi Rum Protected Area. Of course, future research is still required to complete a truly comprehensive rock art and inscription database of the entire region, but the fact that local tribes people are still working alongside WRPA staff and government employees is testament to the lasting influence of community engagement efforts and collaborative research.

Acknowledgements

This work would not have been possible without (continued and sustained) support from the WRPA and ASEZA, both of which provided in-kind funding that helped with training, lodging, and transport, and without whom projects like this would not be as beneficial to the local community. A very special thank you and sincerest appreciation also goes to the amazing people of Wadi Rum for their continued interest in RASI, their unwavering support of this project, and sincere desire to help people learn about their fascinating history. Funding for this project was made available from the SCHEP, housed at ACOR in Amman, Jordan, and sponsored by USAID.

Note

1 More information about SCHEP and the individual projects can be found on their website: www.usaidschep.org.

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