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## Chapter 6

# The Huarhua Rock Salt Mine: Archaeological Implications of Modern Extraction Practices

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As many of the chapters in this volume demonstrate, there is much still to learn about mining and quarrying in the ancient Andes. This is particularly true in regards to the mining of halite or rock salt. Though one of the most widely traded and highly valued exchange goods among indigenous communities, rock salt was of little consequence to the metal hungry Conquistadores and has thus far managed to escape the interests of archaeologists. A tentative sketch can be made of early silver, gold, copper, obsidian, mercury, and hematite mining from historical, ethnographic, and archaeological resources (e.g., Berthelot 1986; Eerkens et al. 2009; Petersen 1994, 2010; Shimada 1994). Yet outside of a handful of references in early Spanish documents, we know almost nothing about the ancient exploitation and exchange of rock salt.

In this chapter, we hope to explore some aspects of ancient rock salt mining through the observations that each of us made during independent visits from 1999 to 2007 to a currently operating rock salt mine in southern Peru. We stress that our time in and around the mine was quite limited—our combined stay at the site was less than a month, but we had the opportunity to talk at different parts of the year

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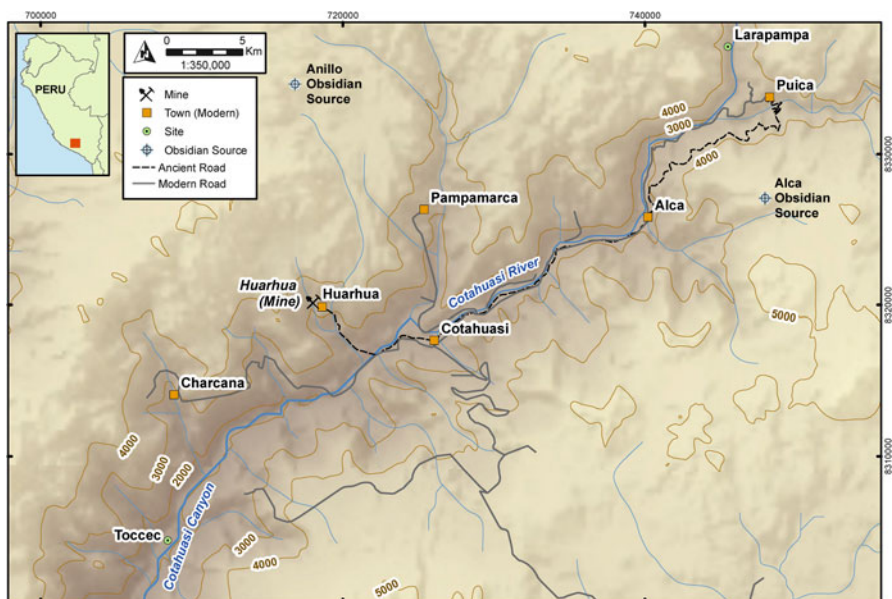
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with the villagers, miners, traders, and customers that were affected by the rock salt trade. Although mining practices have undoubtedly changed through the centuries, we believe that what we learned about the methods and organization of modern halite extraction at this mine may provide some preliminary insights into how rock salt mines could be managed and controlled in the past.

## The Huarhua Mine Today

The Mina de San Francisco de Asisi is located a few minutes walk from the village of Huarhua in the Cotahuasi Valley (Fig. 6.1). The mine is located within a salt dome found amid a series of sedimentary rocks that include limestone, a deep-water ocean sediment. The rock salt comes in a variety of colors and textures. Different inclusions, impurities, and structural defects in the salt's crystal lattice cause the various shades of black, red, pink, and white (e.g., Sonnenfeld 1995). Ground water seeping through the mine alters the salt's texture and the salt is often layered in alternating bands of color ranging from 0.5 cm to 0.75 m in thickness. The Huarhua salt is a highly valued commodity in the region's economy and has a wide variety of uses—from seasoning to preservative, saltlick, and medicine—that varies with the color and texture of the salt. Transported primarily through llama and burro



**Fig. 6.1** Location of the Huarhua salt mine in the Cotahuasi Valley. Salt similar to that mined in Huarhua was found in tombs at Toccec and Larapampa. The town of Huarhua is adjacent to the precipitous Quebrada Espanja. From the community a trail traverses and then descends to the present entrance of the mine. Image courtesy of Bing Maps/Digital Globe, 16 April 2010



**Fig. 6.2** Children in front of the gate of the Huarhua mine

caravans, the salt is exchanged in the southern Peruvian Departments of Arequipa, Cuzco, Apurímac, and Ayacucho (Flores Ochoa and MacQuarrie 1994: 125–127).

The Huarhua mine today is reached by a narrow trail that runs along a steep slope that separates the village from the mine entrance. A padlocked gate restricts access into the mine (Fig. 6.2). To reach the rock salt deposits, a shaft cuts approximately 300 m straight into the heart of the mountain. The mine then breaks into six tunnels, named Torro Moso, Choccon, Atutikana, Haiutaccanai, Pique, and Socoban, that meander through the deposit. All of the shafts come together at different levels into one central chamber that measures almost 60 m in height. The chamber, as well as some of the wider sections of tunnels, is supported by leaving in place pillars of unmined salt. The amount of salt extracted from the source fluctuates depending on the number of active miners. In 1999, there were 23–39 miners who worked the source actively during at least part of the year (our informants differed on the exact number of people who worked the mine). These miners and their families extracted approximately 100,000-kg of salt during that year.

Like other salt sources in Peru, the mine became the property of the state in 1969 with the formation of the Empresa Pública de la Sal (EMSAL) (Palomino Meneses 1985: 165). State control over the mine, however, did not seem to have markedly changed how salt was exploited according to villagers. The mine continued to be run by a cooperative made up largely, but importantly not exclusively, of people living in the nearby village of Huarhua for the next 3 decades. All associates of the mine paid an “exceso” of one arroba of salt (approximately 11.4 kg) to the cooperative for every quintal (around 45.5 kg) extracted. The arroba of salt was then sold to third parties to pay both the state taxes and fund the general maintenance of the mine and the cooperative. Associates were also granted a small amount of salt for personal consumption that was not taxed by the cooperative.



**Fig. 6.3** Extracting rock salt in the mine

The cooperative would choose a head of operations for the mine and this individual held the key to the mine's entrance. Other fixed term positions were determined by the cooperative with expectations that each member would fulfill a variety of roles during their lifetimes. Cooperative members and their family members had rights to a particular part of the mine and each group worked the mine with very little hierarchical control. One of the few concessions made to the state was the hiring of an engineer to annually inspect the mine and mark the pillars of rock salt used to maintain the mine's integrity with large red "X"s and skulls and cross bones.

Our description of the collective is written in the past tense because in 2007 one of the more politically connected members of the collective staked a claim to the entire mine and changed the lock on the gate. Though many were afraid to speak out, some members of the collective have put forward a formal legal challenge asserting the long-standing communal ownership of the mine. Extraction has steeply declined in recent years as the case makes its way through the Peruvian judiciary system. The mine at least temporarily remains under private ownership and the *exceso* to work the mine has doubled to two *arrobas*. From a group of 23–31 associates just before the dispute, only 15 continue to remove salt from the Huarhua source. Mining log books that record activities at the mine over the last few decades are of critical importance in this dispute. Unfortunately, we have not yet been granted access to this invaluable source of data.

The change in ownership has not altered salt extraction techniques. The salt is still quarried with only the use of a hammer and chisel (often just a rock and a piece of rebar) (Fig. 6.3). A hole is burrowed deeper and deeper into the salt by banging the chisel into the rock. Chunks of rock salt are then obtained by pushing the chisel back and forth until the salt breaks off and fall to the ground. Ladders are used to reach higher areas (Fig. 6.4), while candles, and much more rarely flashlights, are used to



**Fig. 6.4** Ladders used to reach higher areas in the mine



**Fig. 6.5** Locals organizing bags of salt by candlelight

provide illumination for workers (Fig. 6.5). Most of the quarried salt is shoveled into bags that can hold about 11.5 kg of salt, and then loaded into wheelbarrows or on to one's shoulder. Particularly large chunks of salt are sometimes left intact to sell as saltlicks for animals.

Until the last few years, the salt was provisionally weighed at the mine's entrance, loaded on to burros or llamas for the short trip to Huarhua, and then brought to the cooperative office in the village to be re-weighed, officially recorded, and for the



**Fig. 6.6** Llama caravan bearing rock salt near the mine's entrance

excise to be taken. Since 2007, all parts of this transaction occur at the mine's entrance. Miners, both under the cooperative and now private ownership, have been occasionally known to transport salt as well. In most cases, however, the mined salt is passed on to traders who bring their animal trains to the mine (Fig. 6.6). Though these traders are regular visitors to the mine, and sometimes have a relative among the members of the cooperative, they are not members themselves. Loaded on to burros and llamas, the salt begins its circulation through the barter networks that stretch far across the southern Peruvian highlands (Concha Contreras 1975: 71; Inamura 1981: 70–73; Trawick 2003: 48–69).

### **Ancient Use of the Huarhua Mine?**

Although the Huarhua mine has likely long been an important source of salt for the people of the south-central Andes, there is no direct evidence for the early use of the mine. Mining is notorious for obliterating evidence of earlier exploitation (Stöllner 2008a: 73), and this is practically the case in rock salt mining since the best opportunity to date a mine often comes from examining the talus outside of its entrance. Rock salt mining usually leaves little talus (you can eat pretty much everything that you take out of the mine), and there is generally less of a mess within which artifacts

can be more easily lost or buried. In the case of the Huarhua mine, there is also little chance of finding Pre-Columbian material on the steep, eroded slopes around the mine. A landslide buried one of the entrances in 1997, and we expect that similar geologic episodes in the past have destroyed any early evidence of the mine's use.

Nonetheless, villagers suggest that the mine dates to before the Spanish Conquest and their assertions are backed by at least three lines of indirect archaeological evidence. First, the modern village of Huarhua was likely founded in the Pre-Columbian period. The village sits on a small plateau just a few minutes walk from the mine, and ceramic sherds collected in the village date from the Middle Horizon through the Colonial Periods. Ten tombs dating from the Middle Horizon through Late Intermediate Periods were also found in the agricultural terracing above the site (Jennings 2002: 566).

The second line of indirect archaeological evidence for the salt mine's earlier use is the passage of a major pre-Columbian trail through the site (Fig. 6.1). Climbing up from the Cotahuasi River, the wide, well-maintained trail begins at a suspension bridge and then runs through terracing that abuts the trail on both sides. This trail was likely a major Inca road that connected Cuzco to the sea (Jennings and Yépez Álvarez 2008: 143–144). The empire likely built the road on top of a preexisting trail that led out of the valley—terracing, at least elsewhere in the valley, was likely constructed in the Middle Horizon (Jennings 2006: 360), but the placement of the road through the village of Huarhua might also reflect Inca interest in facilitating access to the rock salt mine.

Perhaps the best evidence for earlier use of the Huarhua mine is the documentation in looted tombs at two sites located elsewhere in the Cotahuasi Valley of two large chunks of rock salt that are similar in appearance to those mined today at Huarhua. A chunk of salt was found just inside a looted tomb at Larapampa, a funerary site dating from the Middle through Late Horizon that is almost 30 kg upriver from the mine. The second piece of salt was documented in the rubble of a destroyed tomb more than 20 kg down river at the Middle through Late Horizon site of Toccec (Fig. 6.7). Since the Huarhua mine is the only known rock salt source in this part of Peru, the salt found at both sites was most likely extracted from this mine. The location of the finds not only provides a minimum distribution radius, but also raises the possibility that salt was sometimes a ritually significant object for the pre-Columbian people of the Cotahuasi Valley.

## Contextualizing Ancient Salt Production at Huarhua

Even if we can build a strong case for the long-standing exploitation of Huarhua's salt, we still unfortunately know nothing about the organization of production in the mine beyond people's recollections back to the mid-twentieth century. Yet, the few references to earlier salt production elsewhere in Peru leads us to believe that the cooperative practices followed at the Huarhua mine until the last few years may have been longstanding.





**Fig. 6.7** The woman in the foreground holds a piece of rock salt found outside of a looted tomb at Toccec

The only rock salt source for which extensive early Spanish documentation exists is the Cerro de Sal in the Tarma area of southern Peru (Tibesar 1950; Verese 2002, 2006). In the seventeenth and eighteenth centuries, several groups from the Amazon and eastern Andes visited the site on annual trips that occurred usually in the months of July, August, and September. The salt was quarried from an exposed 18-m wide vein near Cerro de Sal's summit that ran for 16.5 km (Tibesar 1950: 103–104). As many as 500 people would work the vein using iron axes and river cobbles to carve out blocks of salt that weighed between 15 and 22 kg (Tibesar 1950: 103–106). While some of the salt was transported away in baskets, most of the salt was carried down to the Paucartambo River where it was loaded on to balsa rafts for passage into the jungle. Most of the rafts were made on the spot, packed from bow to stern with salt, and then loosely tied together into flotillas of 10–20 vessels (Tibesar 1950: 106).

The accounts are unclear regarding control of the salt quarry. Although people visiting the site paid the local cacique in clothing, feathers, pottery, and other goods, this seems to have been more for the privilege of moving through his lands rather than for his permission to access the source (Tibesar 1950: 107). The argument for

a long-held tradition of open access to the vein is further strengthened by the 300 years of vigorous protests by indigenous groups in regards to the taxation and control of the salt source by the Spanish Crown and private companies (Brown and Fernández 1991; Verese 2002: 83, 132–133). In the winter of 1897, these clashes turned violent when groups of Campa from the eastern Andean foothills attacked and burned the farms of English settlers who were working for a Peruvian company that was preventing them from accessing the salt (Verese 2002: 132).

The exploitation of Cerro de Sal exemplifies rock salt's great appeal. The groups that visited said that they traveled for days to the mountain because the rock salt both tasted better than locally available brine salt and was easier to obtain in large quantities. After a few moments of work, a person could break off the salt required for a family's annual sustenance (Tibesar 1950: 104). As Michael Brown and Eduardo Fernández noted for Andean rock salt in general (1991: 18):

...if veins of mineral salts are known, Indians are willing to travel hundreds of miles, risking privation and enemy attack, to unearth the precious substance in large quantities.

These colonial accounts suggest that the Cerro de Sal vein was considered an open access resource. This is not unusual (Weller 2002). Considered among the most basic necessities of life, access to salt has often been seen as an inalienable right—recall Gandhi's march to the ocean in protest of the British salt monopoly. This open access is in practice usually limited to those salt sources that require little effort to exploit. These sources, such as a deposit on the edge of the sea or an exposed vein, are perhaps seen as available to all because no person or group has invested heavily to make the salt accessible.

Huarhua is *not* one of these easily accessible sources. Though the basic tools of extraction used in the mine would have been similar to those used to pry chunks of salt off of the Cerro de Sal vein, considerable investment and coordination is required to hollow out a mountain using the techniques of chamber-and-pillar mining (Stöllner 2008b: 6). Cross-culturally, property rights are strongly linked with efforts to create, improve, or access a resource (Earle 2000). The Huarhua salt may have been considered an open access resource in theory, but the tunnels and other investments that were necessary to acquire this salt were likely privately held (just as the iron axes used to work the open access Cerro de Sal vein were privately owned).

Historical accounts of the brine salt makers of Maras and San Blas give a sense of how private ownership rights could occur within an open access salt source. Since at least the seventeenth century, the salt makers have successfully asserted ownership over the production infrastructure of saltpans, ovens, etc. that they have created over the centuries. Importantly, they do not make a claim on the salt source itself, nor do they claim that the source was the property of the local community (Espinoza Soriano 1984; Kumaki 2011; Palomino Meneses 1985). Though theoretically open to all, the salt makers effectively control the source since they own the means of production required to make salt out of the brine water.

Who then were the pre-Columbian salt makers at these sites and what was their relationship to local communities? Espinoza Soriano's work on the San Blas salt makers is particularly illuminating. He suggests that the saltpans were "occupied

and controlled by multi-ethnic micro-colonies” that came from many regions in antiquity (Espinoza Soriano 1984: 192, first author’s translation)—a claim supported by Daniel Morales’ archaeological work at San Blas (1998) that showed salt production associated with a diversity of ceramic styles dating back to the second millennium BC. These micro-colonies of salt makers were part of the resilient vertical archipelagos that brought a wide variety of resources back to distant communities (Murra 1972). The colonists who lived in these archipelago communities had few local ties, and instead were provisioned through exchanges with their home regions. The San Blas salt makers were therefore a critical part of regional economies, and even the Incas chose not to interfere with traditional production and exchange at the site (Espinoza Soriano 1984: 199).

After Spanish Conquest, the San Blas salt makers were adamant that they should not be counted as locals. They possessed no fields or pasture land in the region, and argued that they were not obligated to pay the tribute or provide the labor service that was assigned to local groups. Instead, they claimed that their lone responsibility was to provide salt to the distant communities to which they belonged (Espinoza Soriano 1984: 201). As these connections withered during the colonial era, the salt makers found it more and more difficult to survive without reliable access to local food sources. Yet, the groups steadfastly refused efforts to integrate them into the surrounding communities of San Blas and continued to make their claims of independence until much of the source fell into private hands in the mid-nineteenth century (Espinoza Soriano 1984: 221).

The pre-2007 ownership nuances of the Huarhua rock salt mine are in line with what we know from these other salt sources. The salt in the Huarhua mine was seen in theory as an open access resource. Neither the cooperative nor the adjacent village owned the salt itself, and the state’s universal claim to all salt sources was tolerated as long as their interference at the mine was minimal. In practice, however, the cooperative’s claim to the salt was widely acknowledged because of its continual investment in the mine.

Though the Huarhua source was not owned by the cooperative, it was controlled by it. Mines have limited number of access points—a characteristic driven home by the miner who effectively blocked entry into the Huarhua mine by padlocking its only entrance—and so it was easy to restrict access to the salt. The nearby Alca obsidian source in contrast was nearly impossible to control since it could be easily quarried and was spread out across almost 50 km<sup>2</sup> (Jennings and Glascock 2002). Anyone could hypothetically come to Huarhua and dig into the mountainside for salt. Starting a new tunnel to reach the deeply buried deposits, however, would have been prohibitively costly for an individual or small group that could far more easily access the mine’s salt through barter, purchase, or by joining the cooperative.

We can glean nothing from our meager sources about how a cooperative may have organized production during earlier periods. Each member of the cooperative took turns in positions of authority until quite recently at the Huarhua mine, and members were granted a great deal of autonomy in how and where they worked in the mine. The means of production (a hammer stone, rebar, and a wooden ladder) were not a barrier to participation in the collective, and traders from different groups were

welcome to come to the mine to barter for salt. One explanation for the limited organizational hierarchies in the mine is that it was part of the wider decline in hereditary political power that occurred following the Spanish Conquest (e.g., Gose 2008). If Huarhua's early miners came from a variety of different communities like those documented at San Blas (Espinoza Soriano 1984), however, then it is more difficult to imagine standing centralized control over the source by a single stakeholder. Instead, earlier mining may have been organized in a manner similar to that used today.

## **Salt Mining, Common Resources, and State Control in the Ancient Andes**

If we use the Huarhua salt mine as a tentative window into possible past practices, then what are some of the implications for understanding rock salt mining in pre-Columbian Peru? One implication of our work is to raise the possibility that rock salt mines, and perhaps other kinds of mines, could be worked communally. Mining demands, of course, depend upon the desired minerals and the matrix within which they are found (Stöllner 2003b). Rock salt is soft and easy to mine. It is largely impermeable, but also plastic enough so that shifting salt seals fractures created through tectonic shifts and mining activities. The stability and softness of rock salt would have been attractive to earlier miners, and this matrix would have been particularly conducive for people working within largely self-supervised groups. Miner could work a particular section independently, with little worry that work elsewhere in the mine would lead to cave-ins, gas blasts, or other hazards that are commonly associated with mining.

Though the massive rock salt mines of continental Europe were often run by the state during later periods, the earliest shafts were often created in periods that preceded the development of the state in a region (Alexianu et al. 2011; Barth 1982; Boenke 2005; Megaw et al. 2000; Stöllner 2003a). Centralized administration by the state or other authority is therefore not a necessary prerequisite to large-scale mining—Andean rock salt miners could have created an extensive, complex tunnel system without being organized by Inca, Wari, or Moche officials. Andean states almost certainly controlled some mining activities (e.g., Berthelot 1986), but the Huarhua data suggests that state control needs to be demonstrated rather than assumed.

A second implication of our work is to raise the possibility that rock salt, like other salt sources, was considered an open access resource that did not belong to the surrounding community. In the cases of a source where the salt was easily obtainable, anyone could come to the source to remove the resource. In the cases where significant investments to extract salt were necessary, then anyone that made these efforts was given exclusive rights to those areas where that person's investments occurred. Local groups would have had the same right to invest in extracting from the source, and so it makes sense that a resource was often worked in part by those that lived nearby. Whoever worked the source likely had a responsibility to share salt widely.

If a rock salt mine could have been worked by outside groups, then a foreign enclave of salt makers in a valley would not necessarily suggest foreign control of that valley—even indirect or hegemonic. A group of Wari colonists living near a mine, for example, did not necessarily signal control over the mine or surrounding groups. If a salt source was not inherently the property of local communities, then salt workers might actually have had few ties to nearby villages and instead been part of vertical archipelagos stretching out from distant communities like those documented by Espinoza Soriano at San Blas (1984).

We were only able to obtain a tentative glimpse into the operation of the Huarhua salt mine during our brief stays there. Nonetheless, we suggest that more intensive studies of cooperative mines like Huarhua can potentially provide important insights into the ways in which mining and quarrying were organized in the pre-Columbian Andes. Each year, however, more and more of these mines are transformed by the economic forces of globalization, the mandatory addition of iodine, and the penetration of the modern nation state. Our conversations at the Huarhua mine were often tinged with nostalgia as people lamented the mine's state, and now, private ownership, as well as the decline of the salt trade. They talked with a mix of optimism and fear about the construction of a road to Huarhua that is slowly making its way to the village, and they fantasized about iodine-injecting machines that could make their salt more marketable in Lima and abroad. In short, they recognized that the old ways of mining are swiftly crumbling—archaeologists should take notice of this vanishing source of information.

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