

# SALT PRODUCTION IN THE COASTAL AREA OF MICHOACAN, MEXICO

## *An ethnoarchaeological study*

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### Abstract

This study of saltmaking in coastal Michoacan underscores the value of ethnoarchaeology as a tool for assessing ancient saltmaking activities. Common salt (sodium chloride) was a strategic resource of great importance for Mesoamerica during pre-Hispanic and Colonial times. This study deals with salt production in La Placita and neighboring areas of coastal Michoacan and Colima, in western Mexico. The primary goals are to document traditional saltmaking techniques—in particular, the material culture, organization of work, ecological setting, and levels of production observed in the study area, as well as the importance of salt manufacture and trade for the area's economy and culture over time. Ethnographic observations together with ethnohistorical and archaeological data shed light on the pre-Hispanic production, use, and commerce of salt in the coastal area of Michoacan, one of the least studied regions in Mesoamerica. There are three types of sites in the study area: (1) sites where salt is currently being produced; (2) abandoned sites where salt production was carried out until some fifty years ago; and (3) archaeological sites where salt may have been produced and/or distributed in ancient times. The material evidence of salt production consists of: (1) *terrerros*, or mounds of leached soil; (2) *eras*, or solar evaporation pans; and (3) specialized pottery types. Finally, this paper uses archaeological and historical evidence, as well as oral traditions, to discuss ancient salt exchange and trade networks.

Salt was a strategic resource of great importance for Mesoamerica during pre-Hispanic and Colonial times. Although today most people have ready access to salt throughout the world, historically common salt (or sodium chloride) had great importance when it was a scarce resource; lack of this product could endanger a community or affect the affairs of a state. A sudden shift in the supply or demand of salt could play havoc with the trade networks of empires, and competition for this strategic resource even led to war (Andrews 1983:1; see also Adshead 1992; Multhauf 1978; Parsons 1989, 1994, 1996, 2001). Salt was important in Mesoamerica for the simple reason that producing localities were not evenly distributed on the landscape, and many sedentary communities that needed salt did not have immediate access to it (Andrews 1980, 1983).

Salt was important for ancient Mesoamerica because the indigenous diet lacked abundant animal protein, thus suffering from a deficit in sodium chloride, which is critical for the physiological functions of most animals, including humans (Dauphinee 1960; Mendizábal 1928). In the preindustrial world, salt was used for tanning animal skins, as well as to make pigments, to preserve animal flesh, as a mordant for fixing textile dyes, as a medium of exchange, and as a component in the preparation of soaps and cleansing agents, among many other uses (Parsons 1994). During the sixteenth century and later in New Spain, sodium chloride retained its status as a strategic resource because it was used in the production of silver through the process known as *de patio*, apart

from its use as a complement to cattle feed and for the tanning of skins (Gutman 1972; Reyes [editor] 1995).

The area of Mesoamerica we now know as western Mexico (Michoacan, Jalisco, Colima, Nayarit, and Sinaloa) has distinguished itself throughout history as a major producer of high-quality salt (e.g., Good 1995; Gutman 1972; Liot 2000; Mendizábal 1928; Reyes [editor] 1995a; Valdez and Liot 1994; Weigand 1996; Weigand and Weigand 1997; Williams 1998, 1999a, 1999b). However, most research in Mesoamerica has centered on the Maya area, on central Mexico, or on other areas of “nuclear” Mesoamerica, neglecting the northwestern portions of this cultural area.

This study deals with salt production in La Placita and neighboring areas of coastal Michoacan and Colima, Mexico (see Figure 1). This topic has never before been studied in depth in this area; the coast of Michoacan is in fact one of the least studied areas in the whole of Mesoamerica. The primary goals of this study are to document traditional saltmaking techniques—in particular, the material culture, organization of work, and levels of production in the coastal area of Michoacan—as well as the importance of salt manufacture and trade for the area's economy and culture through time. Ethnographic observations together with ethnohistorical and archaeological data shed light on the pre-Hispanic production, use, and commerce of salt in the coastal area of Michoacan. This ethnographic information offers parallels to pre-Hispanic salt production that allow for a better understanding of this ancient industry.



lation increased considerably during the saltmaking season (from late March or early April to the beginning of June), as many people came from other places to work in the saltworks. They settled in a dispersed pattern around the estuary during the salt season.

According to Don Francisco Gregorio, one of the older *salineros* (saltmakers) of La Placita, the town's inhabitants used to live almost exclusively from the salt, with hardly any farming and no cattle raising. In exchange for salt they obtained all they needed to subsist. During the part of the year that salt was not being produced, they supported themselves by exploiting wild resources: They hunted deer in the hills, dug for turtle eggs on the beach, fished in the estuary, and caught abundant *chacal* (estuary shrimp), *moyo* (crab), and *jaiba* (crayfish). Many of the plant and animal species exploited for food were seasonal, but others were found year-round, such as the *chacal*. In summary, the main subsistence activities were fishing, hunting, and gathering, together with some agriculture, and exchange of a few foodstuffs such as beans with other communities.

Some 3 km northwest of the La Placita estuary there is another salt-producing estuary known as Salinas del Padre. Between these two estuaries is a third, known as El Presidio, which produced salt until some fifty years ago. Around that time, whole families came from Maquili to the Salinas del Padre to work the salt. They even brought the schoolteacher for the children's education during the saltmaking season. Everybody got together to open the estuary with their shovels, and once it became full of saltwater, they closed it. As many as forty families came with their own drinking water, because no potable water was available in the area. The land-holding unit, known as *hijuela*, consisted of the following: (1) the salt *pozo* (the saltmaking unit); (2) a plot of land for growing crops; (3) a plot of land for cattle raising; and (4) a house lot.

## SALT PRODUCTION ON THE COAST OF MICHOACAN

The saltmaking season in the coastal area of Michoacan and Colima takes place in the driest part of the year (roughly from early April to mid-June). During the rainy season, the fresh water drastically reduces the level of salinity in the estuary and in the soil around it, and the greater cloud cover reduces the sunlight for the evaporation of brine. Saltmakers carry out other activities when saltmaking is not possible, such as fishing, agriculture, and paid labor, within the area and away from it. Many *salineros* migrate every year to the greater cities of the country, or even to the United States. Recent years have seen a dramatic plunge in the price of salt nationwide, which has forced an increasing number of saltmakers to abandon the activity. As seen at La Placita, they get more money from other kinds of work that are easier to perform.

Men traditionally have worked in the saltworks, because, as they say themselves, this kind of work is too hard for women, who come only to collect the salt, receiving part of the production as payment. Most of the women are related to the *salineros* through blood, marriage, or ritual kinship.

### Ethnohistorical Information

Although the ethnohistorical information we have for the coastal area of Michoacan and adjoining regions of western Mexico is by no means abundant, it can be used to gain some insight into the techniques of salt production in use during the sixteenth century

and later. During the latter part of the sixteenth century, for example, the *Relación de la provincia de Zacatula* (1579) tells us:

[I]n the town of Asuchitlan . . . there is an estuary near the sea, into which water from the sea enters in the rainy season, and in the summer the mouth of the estuary is closed with sand. Some years when it rains, a little salt is congealed in parts of this estuary. This salt is quite grainy and white, it is very good salt. . . . Four leagues from this estuary, near the town called Xolochucan there is another great estuary. Water from the sea enters this estuary, and salt congeals in it, not as thick as the other one, but it is very good salt. In these two estuaries when the salt is about to congeal great quantities of fish die, because the water is very hot. They extract the salt from under the water, and from these estuaries the whole province gets its salt, both the Spaniards and the natives, and it is exported to the mines and to other towns [Acuña 1987:459].

Another source from the same period, the *Relación de la provincia de Motines* (1580), describes the leaching process, which was carried out using clay pots:

They make salt, in small amounts and with great difficulty. First they sprinkle the beach with pots using seawater, and after two or three sprinklings, they pile the sand up. Once the piles are made they take two *ollas* or *tinajas* and put one on top of the other. The uppermost [vessel] has some small holes in the bottom, like a flute, and putting some *petates* [reed mats] on top of the holes, they put into the top *tinaja* some of the sprinkled sand, filling it to slightly more than half, and then they put sea water, which trickles into the lower *tinaja*. This distilled water is very salty, and they take it from their *cántaros* [vessels] and take it to their homes to boil, firing it until it congeals and becomes salt. This is the art and mode of making salt in this town, as well as in Motín, Maruata, Pasnori and Cachan [Acuña 1987:171].

The same *Relación geográfica* mentions other coastal towns where salt was produced: “[I]n the town of Epatlan there are *salinas* [saltworks] where they [the Indians] used to live, and nowadays they make salt. . . . [F]rom one *fanega* of earth they take a quarter of salt . . . which they sell to support themselves. . . . They do the same kind of work with the sand of the beach” (Acuña 1987:152), and “Tlatictla [present-day La Tlicla; see Figure 1] is the town that is near the sea. . . . They obtain in this town seafood, fish and make some salt” (Acuña 1987:164).

By the time the *Relaciones geográficas* were written (ca. 1580), however, many of the coastal towns were no longer inhabited because of a drastic demographic collapse due mainly to disease and famine. Therefore, most of the ancient saltworking communities must have become extinct shortly after the conquest and were not recorded by the Spanish officials who wrote the *Relaciones*. The dramatic situation in the sixteenth and seventeenth centuries has been described this way:

The great epidemic of 1576–78 was followed by the 1588 year of epidemic and famine and then came more epidemics in 1595–96. The resultant great diminution of Indian population, together with political and economic factors, contributed to the adoption of the policy of many congregations during the period 1592–1605. . . . The year 1613 is also known as one of general hunger and famine. . . . In 1643 there was an epidemic that nearly finished off the Indians that had not succumbed to the earlier pestilences. Some estimates ran as high as a mortality of [five-sixths] of the Indians. . . . The years 1692–1696 were years of hunger and famine [Brand et al. 1960:72–74].



Figure 2. Filtering device, known as *tapeixtle*, used for leaching estuary water to produce brine. This *tapeixtle* is still under construction; the *taza*, or tank for storing brine, under the upper platform has yet to be coated with lime plaster.



Figure 3. Shallow pools made of sand and lime, known as *eras*. They are used in the solar evaporation of the brine. The *tapeixtle* is seen in the back.

Because salt was such a valuable resource, it should not come as a surprise that there were conflicts for the possession of saltworks throughout the Colonial period. One of the earliest accounts of such a conflict comes from Colima. In 1576, the towns of Petlazoneca and Tecoman, not far from the study area, fought over saltworks on the coast. The conflict, which had lasted for a long time, flared up when boundary stones set up twenty-five years earlier to distinguish the saltworks belonging to each community disappeared. The Indians of Tecoman said that all the saltworks belonged to them, but a native of Petlazoneca, an Indian (*indio natural*) named Juan Antonio, claimed that he had received a saltwork as inheritance from his father. This fight between the towns was finally resolved when the Colonial authorities gave the disputed saltwork to Juan Antonio. The remaining saltworks were retained by Tecoman, including “all lands . . . and saltpeter deposits up to the water of the said estuary” (Barlow 1949:42–46).

### The Process of Salt Production

This section provides a brief description of the modern salt-producing artifacts and sites, as well as the processes of production and the social organization of work. It is followed by a discussion of the possible archaeological implications of these observations.

Most of the tools and features used for making salt in La Placita are no longer being used in the nearby saltmaking locations, such as Cuyutlan, Colima. It appears to be just a matter of time before they stop being used at La Placita, as well.

Saltmaking in La Placita involves leaching the soils from the beach around the estuary. This body of water in the dry part of the year shrinks to a small portion of its size, leaving a salty crust on the soil, known locally as *salitre*. The salty earth is leached with salty water from the estuary, thus producing a concentrated brine

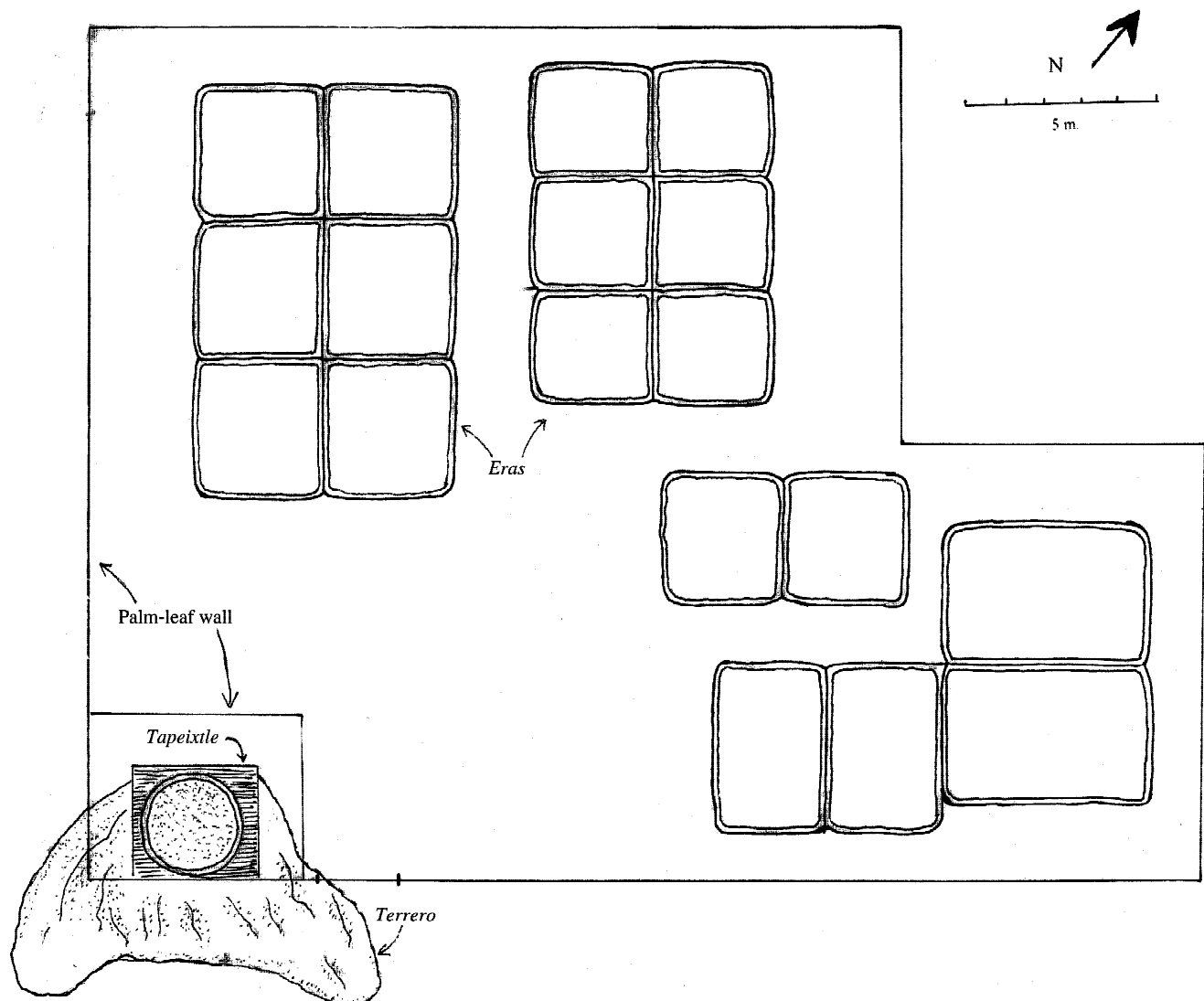


Figure 4. Map of a production unit at La Placita, known as *plan*, indicating the major features and work areas.



Figure 5. The sand mixed with lime is being applied to the surface of the *era* using a wooden slat, or *paleta*.



Figure 6. This wooden instrument, known as a *menapil*, is used to smooth the surface of the *era*.

that is later evaporated by the sun to obtain the final product, crystallized salt.

The leaching process is carried out in the *tapeixtle* (Figure 2). This wooden structure, whose Nahuatl name means “bed,” consists of a flat platform made of branches supported by tree trunks. The upper part of the *tapeixtle* is called the *cajete*, the bottom part is called the *taza*, and both together are known as the *pozo*. The *cajete* is made of mud (from the soil that is discarded after leaching) and is formed by a ring made with branches and banana tree leaves, known as *ñagual*. The filtering device is made of several layers of grass, small stones, and sand. Constructing a *tapeixtle* takes three men about three days. The hardest part is putting the beams (made of palm trunks) in place: The beams are heavy, and up to five extra men are needed for this task. The *tapeixtle* has to be fixed periodically. The grass, branches, and sand have to be changed at least every other year. It takes three men roughly one week to do this, as the wood has to be brought from the hills.

Once enough water has been poured on the *salitre* inside the *cajete*, the brine starts to trickle down into the *taza*, where it accumulates (the *taza* has a capacity of 6,000–8,000 L). From the *taza*, the brine is taken with buckets to the *eras*, or evaporation pans made of beach sand with lime. *Eras* on average measure 6 m × 3 m (Figure 3), and each *plan* has about 18 *eras*, although not all of them are used at the same time (Figure 4).

Once an *era* has been built—or repaired, if it was in use during the previous season—it has to be filled up with twenty buckets of brine (one bucket holds 20 L). Subsequently, two or three buckets a day are put into the *era*. After five days, it is possible to collect the first batch of salt. Thereafter, salt is collected every other day, on average 25–30 kg every time. Each *plan* (or saltmaking unit) produces an average of 7 tons of salt during the season, if the weather conditions are good.

To scrape the crystallized salt from the *era*, the *salineros* use part of the pod or husk of the palm tree known as *cayuco*, which is soft but firm, so as not to damage the fragile surface. The *eras* should never be left without water, because under the intense heat of the sun their surface will warp and crack. Each year, at the start of the saltmaking season (around April), the *salinero* repairs all the *eras* that have not been in use since the previous year. This takes three days with the help of an assistant, or *mozo*. A new coat of lime–sand mixture has to be applied to each *era* every time, so they have many layers of plaster, one for each year that the *era* has been used. We counted as many as twenty layers in some *eras*. This “stratigraphy” would let us know how long an *era* was under production in an archaeological situation.

Today, lime is produced industrially in Mexico; it is therefore not difficult for the *salineros* to find. In the past, they had to buy the lime from specialists, who made it by burning limestone in kilns. These kilns had to be worked by specialists, who exploited



Figure 7. The surface of the *era* is polished with a stone to make it smooth and more compact, thus averting leaks.



Figure 8. Once the salt has crystallized, it is taken from the *era* with a basket, or *chiquihuite*. (Note the mounds of salt in the *eras*.)

nearby sediments of limestone and took the processed lime to the saltworks. Some large kilns were fired continuously for several days and burned 2–3 tons of lime (it takes 1 ton of lime to cover 20 *eras*).

To put the sand mixed with lime on the *era*, the *salineros* use a small wooden slat (*paleta*) about 20 cm long (Figure 5). To smooth the sand–lime mixture, they use another wooden tool, a *menapil* (Figure 6). Finally, they polish the *era* with a stone (Figure 7). The *salineros* use buckets to carry salty water from the estuary to the *cajete* and brine from the *taza* to the *eras*. In the past they used *balsas*—vessels made of gourds that the *salineros* themselves planted—before clay pots were used. When *salineros* came from other areas to work at La Placita they buried their pots and other tools at the end of the saltmaking season and unearthed them when they returned the following year. Thus, they did not have to carry their tools all the way home and back each year.

A trade network used to exist whereby artisans that made baskets, pots, and so on came to the salt-producing villages and exchanged their goods for salt. In addition to the tools and features discussed earlier, the *salineros* use the following tools at La Placita:

*Chiquihuites*. Small baskets (20 kg capacity) used to take the crystallized salt out of the *era* (Figure 8).

*Huiriles*. Large baskets or sacks (80 kg capacity) used to take the *salitre* from the beach around the estuary to the *tapeixtle*; usually carried in pairs on horseback (Figure 9).

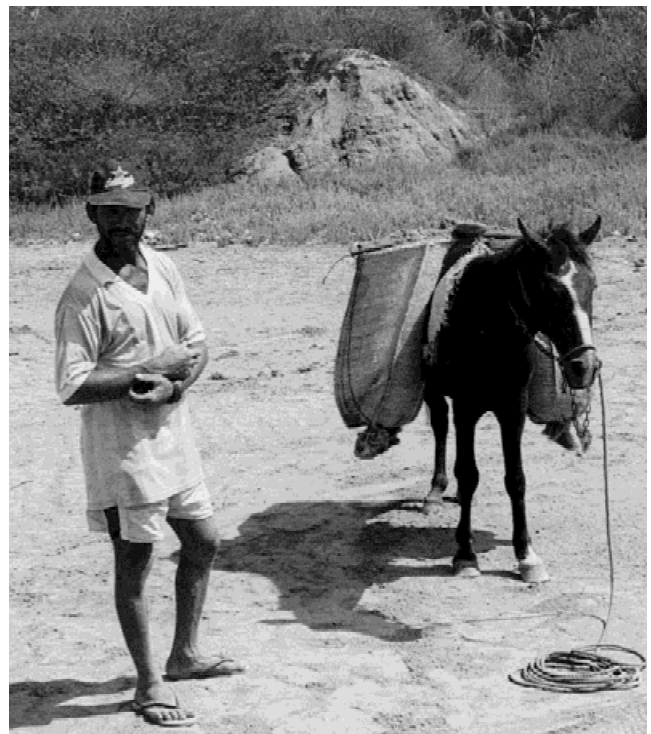


Figure 9. The *salitre* (salty earth) is taken on horseback from the beach around the estuary to the *tapeixtle*.





Figure 10. The *gata* is a wooden implement used to scratch the surface of the soil, making it easier to remove the upper salt-bearing crust.

**Gata.** Triangular wooden artifact with iron nails on the underside, which is pulled by a horse (Figure 10). It is used to scratch the surface of the earth, to make extracting the uppermost layer of soil, or *salitre*, easier.

**Shovels.** These are made of wood or metal and are used to move earth and *salitre* from one part of the *plan* to another. They are also used during the construction of the *tapeixtle* and the *eras*, as well as during the daily work—for instance, for loading and unloading the *salitre* or leached soil in the *cajete*.

**Guancipo.** A ring made out of a banana leaf some 10 cm in circumference that is used to protect the surface of the *era* when placing the *chiquihuite* on top of it.

**Rodillo.** A palm-tree trunk used as a roller to break the clods of earth that form in the *salitre* layer on the soil.

The process of salt production at La Placita can be divided into four phases: (1) *salitre* is excavated from the soil around the estuary and put in the *tapeixtle*; (2) water is taken from the estuary and put in the *tapeixtle*; (3) leached brine is taken out of the *taza* and put in the *eras*; and (4) the crystallized salt is taken out of the *eras* and packed.

To carry out the leaching process, some seventy *chiquihuites* of *salitre* and eighty buckets of salt water are put into the *tapeixtle* (this will produce enough brine to fill some fifteen *eras*). The leached brine will trickle down into the *taza* for four or five hours.

The *salitre* is excavated from the *comederos*, the area of the beach adjoining the estuary, which has the highest level of soil salinity. Before the *salitre* is extracted with the shovel, it is prepared by scratching the earth with the *gata*, which is pulled by a horse. This will make the earth less compact and allow the *salineros* to make small heaps of *salitre* easily. This salty earth is now

carried by horseback from the *comederos* to the *pozos*. In the old days, the *salineros* carried the baskets of *salitre* on their heads. They had to make as many as seventy trips between the estuary and the *tapeixtle*, a taxing job in the unforgiving heat of the day.

The leached soil is taken out of the *tapeixtle* and heaped on top of the *terrero*, where it accumulates until it is withdrawn by shovel and spread out on the *comederos*. After a few days it becomes once again rich in salt and can be recycled and used anew.

## DISCUSSION

What follows is a discussion of some of the archaeological implications that the ethnographic and ethnohistorical observations presented here have for our understanding of the processes linked with pre-Hispanic salt production in the coastal area of Michoacan. The goal of this section is to highlight the ethnographic parallels to pre-Hispanic salt production through a systematic correlation of material remains associated with both pre-Hispanic and modern activities (see Table 1).

### Saltmaking Sites in the Study Area

The coast of western Mexico in ancient times was a very important provider of salt to the inland populations. Numerous saltmaking sites have been discovered along the coast, in Sinaloa, Jalisco, Colima (Weigand and Weigand 1997:5–8), and Nayarit (Mountjoy 2000:102–103). From pre-Hispanic times until some fifty years ago, the stretch of the coast of Michoacan and Colima, from Cuyutlan in the north to Maruata in the south (Figure 1), was a veritable salt emporium, with countless sites, large and small, where salt was produced. Three types of sites were found during the survey of the coast: (1) sites where salt is currently being produced (pre-Hispanic materials found in most of these sites attest to their occupation in ancient times); (2) sites where salt production was

**Table 1.** Summary of saltmaking activities and their possible archaeological correlates at La Placita, Michoacán [cf. Parsons 1996:Table 2]

Activity	Modern Tool or Feature	Ancient Tool or Feature	Archaeological Correlates
Leaching brine	<i>Tapeixtle</i>	Pits or filtering devices of undetermined nature	Pits; stone alignments; concentrations of leached soil (mounds or <i>terreros</i> )
Water/brine transportation	Buckets	Clay pots	Potsherds; whole pots of a particular type
Solar evaporation of brine	<i>Eras</i>	<i>Eras</i>	Stone alignments, lime-coated flat surfaces ( <i>eras</i> ); masses of large, shallow ceramic vessels
Lime manufacture (for coating <i>eras</i> )	Kilns	Kilns	Kilns, concentrations of burned soil, ash
Mixing lime with earth; coating of <i>eras</i>	<i>Paleta, Menapil</i>	?	?
Polishing of <i>era</i> surface	River cobble	River cobble	Whole or fragmented cobbles, with signs of use (polishing)
Carrying the salt from the <i>era</i>	Baskets ( <i>chiquihuites</i> )	Baskets ( <i>chiquihuites</i> )	Textile fragments (preserved by salt)
Moving <i>salitre</i> from the beach to the <i>tapeixtle</i>	Big sacks ( <i>huiriles</i> )	Textile bags or sacks	Textile fragments (preserved by salt)
Scratching the surface of the earth; digging or cutting of <i>salitre</i> crust	<i>Gata</i> ; shovels	Stone artifacts such as obsidian knives or scrapers	Stone tools with worn surfaces, possibly with salt incrustations
Transportation and storage of crystallized salt	Textile or basketry containers (sacks, baskets)	Pottery vessels (mass-produced, therefore of low quality)	Potsherds or whole vessels of a “disposable” kind
Temporary residence near saltmaking sites	<i>Parajes</i> (huts made of branches, thatch, etc.)	Houses, workshops, storage facilities	Stone alignments, foundations, domestic refuse concentrations (lithics, pottery, bone, etc.)

carried out until some fifty years ago, but that are now abandoned (in most of these sites, pre-Hispanic material is found on the surface); and (3) archaeological sites where salt may have been produced in ancient times; some of these appear to be habitation as well as production sites.

At the beginning of the nineteenth century, the year-round population of the saltmaking area in coastal Colima was not even fifty persons, but during the saltmaking season, from the sixteenth century on, up to five thousand people congregated in these sites. To the *salineros* who came from throughout the province were added muleteers and merchants, who came mostly from Michoacan and Nueva Galicia (present-day Jalisco), but also from relatively distant regions, such as Mexico City, Queretaro, Guanajuato, and Taxco, Guerrero (Reyes 1995:149). In El Ciruelo, near Cuyutlan, Colima, the author visited such a seasonal settlement. The *salineros* come every year to live in their huts, but stay here only during the saltmaking season (from February until mid-June). The rest of the year, the site is vacant. This temporary settlement has no electricity, running water, or other amenities, but it boasts a chapel. Mass is conducted there during special occasions, such as the day of the Holy Cross (May 4th), the day of the *salineros*. The rest of the year, the *salineros* return to their permanent homes, where they work their plots, growing maize, sugarcane, or other products, or work in the towns throughout the region. The same situation was common in Salinas del Padre, according to the informants. During the saltmaking season, a temporary settlement was formed with about forty or fifty small huts made of grass or thatch, which were known as *parajes*.

After talking with the informants and checking the material evidence on the ground, sixteen abandoned salt-producing sites (of type 2, as discussed earlier) were identified, but the total was probably much higher in pre-Hispanic times (Figure 1). Around all the estuaries found along this portion of the coast are many saltmaking sites with the remains of *eras* and *tapeixtles* that have been abandoned for the past fifty years.

Several ancient sites were found associated with saltworks in the area between Salinas del Padre and Maruata (Figure 1). In the northwestern section of the estuary in Salinas del Padre we found an archaeological site of great proportions, with mounds and abundant surface material. Walking around the streets in La Placita, we found much pre-Hispanic material, which suggests that both *salinas*—La Placita and Salinas del Padre—had big, contiguous settlements in ancient times.

Of all the archaeological sites we found, the largest is Pueblo Nuevo, which has at least forty mounds and many house foundations made of stone, as well as plenty of archaeological material on the surface (pottery, shell, obsidian, bone, etc.). One of the local inhabitants showed the author several potsherds, stone axes, and two copper chisels, all of them from the Postclassic period. Pueblo Nuevo is located on the old road to Coalcoman; it is in a strategic location with respect to the saltworking area and ideally situated for control of the trade routes through which salt was exported to the Sierra de Coalcoman and beyond.

#### Archaeological Correlates

Unlike other strategic resources that were produced and exchanged among indigenous peoples in the coastal area of Michoacan—for instance, obsidian, shells, metals, turquoise, among many others—salt is usually not preserved in the archaeological record. Thus, identification of the archaeological sites where salt was produced, stored, or traded is somewhat difficult. However, in light of the ethnographic and ethnohistorical information discussed earlier, we can postulate the existence of several kinds of material evidence that serve as markers of salt production in a specific site (see Table 1). The main indicators of salt production using pre-Hispanic techniques in the study area are as follows: mounds of discarded soil, or *terreros*; evaporation pans, or *eras*; and specialized pottery types associated with salt-production sites. What follows is a brief discussion of each one.



Figure 11. Modern saltmaking site at La Placita showing the *terrero*, or mound of leached soil. The *tapeixtle* is at the back of the picture, surrounded by a wall of branches and banana leaves.

*Terreros*. This term applies to the mounds of leached soil (Figures 11 and 12) found at many saltmaking sites throughout Mesoamerica; they are also known as *tlateles* or *saladeras*. According to Catharine Liot (1998), this is the paramount feature left over by salt production with indigenous techniques. In the Sayula basin of Jalisco, for example, these mounds of leached earth, known locally as *tepalcateras*, usually measure several meters in extension and height and are covered by great quantities of potsherds. They are also found in abundance in the Lake Cuitzeo basin, Michoacan (Williams 1999a, 1999b).

Eduardo Noguera (1975; see also Charlton 1969, 1971) studied salt production in the Basin of Mexico, where he identified the *tlateles* or *saladeras*, mounds of soil formed by the process of saltmaking by leaching. These formations were frequent in the shores of Lake Texcoco (Noguera 1975:117; Sanders et al. 1979).

Like all archaeological features, *terreros* are subject to destruction. After a survey of the saltmaking zone in the coastal area of Colima and Michoacan, the author found that the *terreros* at Boca de Pascuales had been razed to plant palm trees. In El Real, however, we found an area with many *terreros* beside the highway.



Figure 12. Abandoned saltmaking site showing the *terreros*, or mounds of leached earth.

Until some thirty-five to fifty years ago, salt was produced here. The *salineros* made temporary encampments near the *pozos*. We found abundant archaeological material on the surface of the site.

In Colola, several *terreros* and even some parts of an abandoned *tapeixtle* attest to the salting activities that were carried out at the site until some fifty years ago, although their antiquity is as yet unknown. We also found some abandoned *eras* partially covered by earth here, as well as in Ixtapilla and other nearby sites.

*Eras.* Although we have no proof that *eras* were used for evaporating brine on the coast of Michoacan in pre-Hispanic times, these features were certainly known in Mesoamerica before the arrival of the Spaniards. For example, the *Relación geográfica de Coxcatlan* (Puebla, sixteenth century), shows rectangular elements called *pilas de sal* (Sisson 1973). According to Sisson (1973:83), archaeological evidence has shown that these *pilas* are in fact shallow pools used for the solar evaporation of brine, identical to the *eras* discussed earlier. Sisson indicates that these *eras* were probably coated with lime, much as they are now, so another archaeological feature to look for would be the kilns where the limestone was prepared (Sisson 1973:91). Pre-Hispanic solar evaporation ponds have also been reported in the Maya area (Andrews 1983:31).

Abandoned *eras* were found in many sites within the study area (Figure 13). They usually appear as low pans outlined by their rims, although in many cases they have been destroyed, and nothing remains but small crumbs of lime-coated hardened earth. However, it should be pointed out that no *eras* have been found on the coast of Michoacan that are of unequivocal pre-Hispanic origin.

*Pottery.* Pre-Hispanic salting techniques, particularly *sal cocida* (boiling the brine over fire), required vast numbers of pottery vessels (Williams 2001). The best-known salting pottery in Mesoamerica is perhaps that called “Texcoco Fabric Marked,” which was used in the Basin of Mexico during the Postclassic period (Charlton 1969, 1971; Parsons 1994; Sanders et al. 1979). Today, however, it is thought that these pottery vessels were used not in the actual making of the salt but, rather, in the preparation and transportation of the “salt loaves” that were common in Aztec markets (Parsons 1996:446; Smith 1998:131).

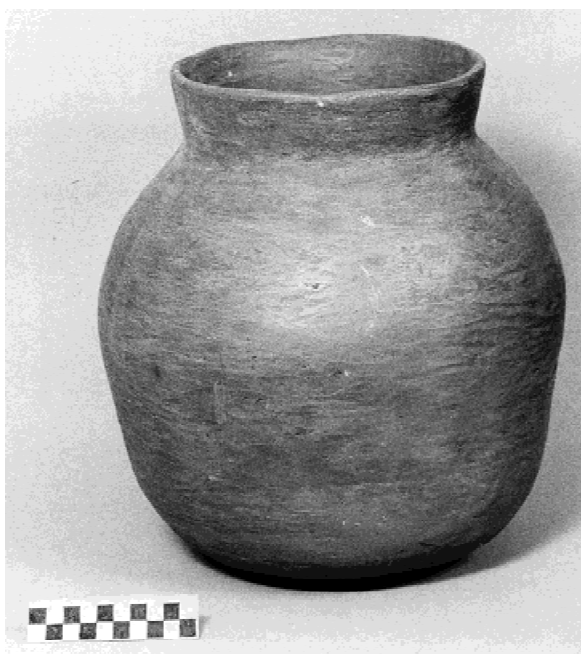
We have been unable so far to identify the pottery used for making salt on the coast of Michoacan and Colima in pre-Hispanic times. This task remains for future fieldwork. We have, however, data from other regions of West Mexico that may to some extent fill this void. For example, for Sayula Lake, Jalisco, Liot (1998:142–146; see also Noyola 1994) has described several ceramic types that are diagnostic of salting in the area.

The research conducted by Frederick W. Sleight in the 1960s in the Sayula basin indicated that the “millions of brick-red potsherds” found in the area came from utilitarian vessels, such as shallow bowls with thick walls, used in conjunction with a hearth or kiln for evaporating the brine (Sleight 1965:158–160). The salting industry generated an important specialized activity in the Sayula area: the large-scale production of ceramic vessels. There were many production centers that supplied the *salineros* with pans and pots (Weigand 1993:201), although sometimes the *salineros* made their own pottery.

Of all the active *salineros* interviewed on the coast of Michoacan in the course of fieldwork, none remembered having used—or even having seen—clay pots in the saltworks, and most of them reported that neither their parents nor their grandparents used clay



Figure 13. Abandoned saltmaking site showing the *eras* that remain on the surface after many years of disuse.



**Figure 14.** Clay pot made in Maruata, a Nahua village in the study area, using pre-Hispanic techniques. Vessels similar to this one were once used to carry water and brine. Scale in centimeters.

vessels for making salt. However, through interviews with older (age 80–90) *salineros*, as well as through the analysis of potsherds found on the surface of most saltmaking sites, and by comparison with specimens in the Museo de la Sal (Cuyutlan, Colima), it was possible to establish that a type of clay pot still being manufactured in many Nahuatl-speaking villages on the coast of Michoacan (Ostula, La Ticla, Huizontla, Coire, Pomaro, and Maruata) may resemble ancient saltmaking vessels (Figure 14). The author observed the elaboration of clay pots in a Nahua home in Maruata, which is described in detail elsewhere (Williams 2001).

#### Salt Exchange and Trade Networks

Salt has lost most of its monetary value in Mexico in the past twenty years or so, because it is industrially produced in mass quantities, and its price is regulated by the government (Ewald 1997:261). That has not always been the case. According to an informant, salt was the “white gold” of the coast around 1925. During the saltmaking season, La Placita had a temporary market to which merchants came from many distant places. In this market it was possible to find pottery wares from Patamban; steel knives from Sayula; machetes from Coalcoman; sweets from Colima; sombreros from Sahuayo; huaraches (sandals) from Pihuamo; blankets and *orongos* (an outer garment made of wool) from Tapalpa; bedspreads from San Juan Parangaricutirimicuaro (Paricutin, or San Juan de las Colchas), among many other products. Also linked with the economic boom generated by the salt, there was a modest *cantina* in La Placita where one could have a few drinks and find a lady for the night (Méndez Acevedo 1999).

According to an informant from Maquili, the salt that was produced in Coalcoman was exchanged for maize, beans, toma-

toes, etc. The *salineros* needed no money, because everything could be paid for with salt, even pistols. The *arrieros* (muleteers) used to come from Tepalcatepec, Apatzingan, and Uruapan. They had as many as sixty mules. There was a *camino real* from Los Reyes and Periban to Pueblo Nuevo. The *arrieros* brought their own food; they went to Coalcoman with salt, as well as bananas and coconuts. It took them three days to get there.

Some of the *arrieros* bought and sold salt, which they would store in a nearby town. People still come to La Placita from Coalcoman, Apatzingan, and the cattle-raising area (in the hills between Jalisco and Michoacan) to buy salt, which is a very important ingredient for making cheese. People came to get salt from Aguililla, from the whole of the Sierra, from Huizontla, El Otate, El Rincon, San Jose de la Montaña, Coalcoman, Pomaro, Coire, and Ostula. They exchanged salt for several products: maize, beans, brown sugar, soap, cheese, chick peas, potatoes, mangoes, bananas, *mamey*, prunes, onions, sugar, firewood, and so on. One measure of beans or prunes was worth the same as one of salt.

People came to Ixtapilla from Chacala (three hours away, in the sierra) looking for salt. They exchanged salt for chickens, mangoes, and venison; for the latter they could get much salt. In April, people came from Cofradia to Ixtapilla and returned to their homes after the salt season was over. There was a good communication network. The muleteers knew whether there was salt in Ixtapilla and came to get it if La Placita had not produced enough.

Information from other areas of coastal western Mexico is useful to throw more light on salt trade on the coast of Michoacan. In the neighboring regions of the study area (Colima to the north and Guerrero to the south) muleteers carried salt over vast distances until they were replaced by the railroad some fifty years ago. In Guerrero until 1939, for example, Nahuas from the Balsas Valley marketed salt from the Costa Chica of Guerrero as itinerant sellers. For generations they had combined salt trading in the dry season with agriculture during the rainy season (June to October). To obtain salt, the Nahuas formed caravans of twenty to twenty-five burros or mules driven by ten to twelve men. The trek from the Balsas Valley to the coast was about 150 km through mountainous terrain, requiring several days of travel. Coastal informants spoke of the constant arrival and departure of mule trains consisting of hundreds of pack animals from different highland towns (Good 1995:8–10).

All the means of transportation available in the Colonial period (mule trains, carts, and ships) required many parallel activities or industries to provide the goods and services necessary in each case, such as road maintenance, construction, and administration of inns, supply of pasture, fabrication of harnesses and ropes, construction of carts, ferries, boats, and so on (Reyes 1998:150).

Muleteers had an exceptional economic and social impact in Colima. Salt trading and transportation by mule trains became one of the activities of great importance within the region’s economy. The supply of many indispensable products depended on the muleteers that arrived at or departed from Colima, taking salt to the centers of distribution and consumption. Because of their sheer numbers, both muleteers and their animals became the foremost consumers of goods and services, and the foremost contributors of *alcabalas*, or sales taxes (Reyes 1998:151).

During the sixteenth century, the *encomenderos* and *corregidores* relied almost exclusively on *tamemes* (Indian porters) for the transportation of salt. This practice remained until the beginning of the seventeenth century. Carriers took salt to several places,

some of them quite distant from the coast of Colima, such as Mexico City. Eventually, the viceroy of New Spain tried to forbid the use of *tamemes*, but what really ended this inhuman practice was the scarcity of Indians brought about by famine and epidemics, as well as the increasing necessity to move greater volumes of salt and to do it faster (Reyes 1998:152).

Although the coastal area of southwestern Michoacan was never fully incorporated into the Tarascan empire (Beltrán 1994; Pollard 1993:Map 8.1), salt produced here surely found its way—together with many other goods, among them precious seashells—to the Tarascan heartland, in the Lake Patzcuaro basin. These contacts between the coast and the highlands of Michoacan in pre-Hispanic times are attested to by marine shell artifacts that have been reported from inland Michoacan—for example, at Tingambato (Piña Chan and Oi 1982:Figure 26); Huandacareo (Macías Goytia 1989:182–184); and the Zacapu area (Arnauld et al. 1993:163–167), among others. At Uricho, a major site excavated by Helen Pollard in the Lake Patzcuaro basin, artifacts made of seashell (plaques, beads, bracelets, and earrings) have been found in elite burials pertaining to the Epiclassic and Late Postclassic periods (Pollard 1996:Tables 3, 4).

According to Pollard, “the Lake Patzcuaro basin naturally lacks salt, obsidian, chert, and lime, all products used by most households in the Protohistoric period” (Pollard 1993:113). The core of the Tarascan state during the sixteenth century was not a viable economic unit; it thrived only through the exchange of goods and services in regional and supraregional patterns (Pollard 1993:113). Salt must have been one of the most important items of trade between the coast and highlands of Michoacan during the Protohistoric period. There is not much information about these patterns of exchange, but oral traditions in some of the Indian villages on the coast mention aspects of this trade. In Pomaro, a Nahuaspeaking community, an elderly Tarascan speaker who was a leader of the Indian community told of a trade route on which he had traveled in his youth, transporting salt from the coast to the Lake Patzcuaro basin. Pomaro was the last coastal town before the muleteers entered the Sierra Madre del Sur on their way to the lake area of highland Michoacan (Efraín Cárdenas, personal communication, 2000). Furthermore, according to the *Relación de la provincia de Motines* (1580), in the sixteenth century there was a well-established trade route that went from the province of Motines to Patzcuaro. This trail went by way of Uruapan, covering a distance of 37–38 leagues. It was relatively straight but traversed hilly terrain and had to cross many gorges. Another, slightly longer route (40 leagues) went by way of Periban, Santa Ana, and San Pedro, and crossed easier terrain (Acuña 1987:179) (see Figure 1). In Colonial times, a road network connected the coast to Patzcuaro, going from Coahuayana to Zacatula along the coastal area, and from Zacatula to Uruapan and Patzcuaro. Many of these roads existed in pre-Hispanic times (Espejel 1992:Maps 3, 4).

### Salt Requirements and Source Areas

There is not much information about the minimum requirements of salt for human consumption in pre-Hispanic Mesoamerica. Although the necessary amount of sodium chloride in the diet varies considerably from person to person and region to region, depending on climate, diet, and working habits, the average per capita consumption has been calculated at some 10 g a day throughout Mesoamerica (Andrews 1983:9).

Based on the number and distribution of settlements during the late pre-Conquest period, the total population of the Lake Patzcuaro basin (the nuclear area of the Tarascan Empire, where Tzintzuntzan, its capital, was located) is estimated to have been between 60,750 and 105,000, with a mean figure of 80,000 (Pollard 1993:79), including the population of Tzintzuntzan, which is estimated at 25,000 to 30,000 (Pollard 1993:32). Using these figures as a base, we can calculate the minimum consumption of salt in the Tarascan heartland: 10 g of salt multiplied by 80,000 individuals totals 800 kg of salt a day, or 292,000 kg a year. This figure takes into account only the salt consumed in the diet. One would have to add the salt needed for many other uses, such as food preservation, tanning of skins, making textile dyes, and so on.

Because the Tarascan core area around Lake Patzcuaro lacked natural sources of salt, as mentioned earlier, this resource had to be brought in from the far corners of the empire. In fact, three major salt-producing areas were under direct Tarascan control or connected to the state capital by the far-flung trade routes of the empire: the Lake Cuitzeo basin (Williams 1999a, 1999b), the Sayula basin (Valdez and Liot 1994; Weigand 1993), and the coast of Michoacan (Williams 2003).

According to the *Relacion de Michoacan*, the most important ethnohistorical source on the Tarascan state from the sixteenth century, there was a state official called the *ocambecha*, whose role consisted of carrying out censuses, organizing the people for public works, and collecting tribute. The tribute paid to the state by all subject peoples included salt, fish, maize, blankets, gold, silver, and copper, among many other products (Roskamp 1998:11).

A recent study of salt production in the Lake Cuitzeo basin showed the existence of no fewer than eleven salt-producing and/or tributing communities (Williams 1999b:Figure 2), which in the sixteenth century paid the Spanish crown varying amounts of salt every twenty to thirty days (Williams 1999b:Table 1). The Lake Cuitzeo basin was firmly under Tarascan political control, but the situation in Lake Sayula to the west may have been different. The Tarascan state had to wage wars of conquest on several occasions before this area of Jalisco became part of the empire (Brand 1971:637). In San Juan de Atoyac, a site within the Lake Sayula basin, archaeologists found many burials with offerings of Tarascan style: pottery; metal artifacts such as axes, chisels, and bells; insignia of status such as bronze tweezers; and obsidian earspools and lip plugs. The excavators concluded that the archaeological evidence found at this site confirms the substantial presence of elite Tarascans in the area. The excavations unearthed a great number of objects pertaining to the Tarascan culture in domestic contexts. Historical sources mention the salt deposits in the Sayula basin as the factor that brought the Tarascans to the region in the first place. The Tarascan state tried to broaden its resource base through the domination of those areas with strategic resources, such as salt, that were absent or scarce in the Tarascan heartland (Valdez and Liot 1994:302–305). Other strategic resources found in the Sayula area included copper, tin, and several kinds of clays and rocks (Valdez et al. 1996:330; see also Weigand 1993), as well as many wild plants with medicinal or industrial applications. A total of 124 of these have been documented (Valdez et al. 1996:333).

Finally, the northwest coast of Michoacan and adjoining areas of coastal Colima should be mentioned as an area that produced great amounts of salt. Based on the production figures reported by informants for the pre-1950 period, the whole of the coast must

have produced hundreds of tons of salt, which was exchanged or paid as tribute to the Tarascan state.

## CONCLUSIONS

This article has shown the great strategic importance that salt had for the coast of Michoacan in pre-Hispanic times. Salt production as an economic activity has greatly diminished in the study area, to the point that it may become extinct in the near-future. During the 2000 field season, only four *salineros* were working at La Placita. The saltworks in nearby Salinas del Padre have already incorporated the modern production techniques seen at Cuyutlan, Colima, which use plastic sheets instead of lime coating for the *eras*, and gasoline pumps and rubber hoses instead of buckets to move water and brine. The techniques, tools, and features reported in this article will probably disappear from La Placita as the old *salineros* die and their knowledge and traditions are forgotten.

Many technological, ecological, and cultural changes have taken place in the study area since the Spanish Conquest. The present study should be considered in the context of these historical changes if it is to be of use in reconstructing cultural processes that took place in the area in ancient times (e.g., Williams 1999a, 1999b; Parsons 1994, 1996).

This study of saltmaking in coastal Michoacan has underscored the value of ethnoarchaeology as a tool for assessing ancient saltmaking activities. It has discussed a traditional technological complex that illustrates a case of cultural adaptation to a particular ecological setting. Through the use of archaeological, ethnohistorical, and ethnographic data, this article has revealed that some methods, tools, and features still in use bear a striking resemblance to those reported in the sixteenth century. The diagnostic features and artifacts discussed here can be used to identify saltmaking localities in the archaeological record, thus increasing our ability to detect this activity, since salt itself is usually not preserved for long periods of time.

## RESUMEN

La sal común, o cloruro de sodio, fue un recurso estratégico de gran importancia para Mesoamérica durante tiempos prehispánicos y coloniales. El presente estudio trata de la producción de sal en La Placita y sitios vecinos de la costa de Michoacán y Colima, México. Los objetivos principales son documentar las técnicas tradicionales de elaboración de sal, en particular la cultura material, la organización del trabajo, el entorno ecológico y los niveles de producción en el área de estudio, así como determinar la importancia de la manufactura y comercio de sal dentro de la economía regional a través del tiempo. Se usan observaciones etnográficas conjuntamente con datos etnohistóricos y arqueológicos para arrojar luz sobre la producción, uso, y comercio de sal en la época prehispánica dentro del área de estudio. Se discuten tres tipos de sitios: (1) sitios donde se produce sal actualmente; (2) sitios abandonados, donde se llevó a cabo la producción salinera hasta hace unos 50 años; y (3) sitios arqueológicos

donde se pudo haber producido o intercambiado sal en la época prehispánica. La evidencia material de producción salinera consiste de lo siguiente: (1) *terrerros*, o sea montículos de tierra lixiviada; (2) *eras*, o sea pilas de evaporación; y (3) tipos cerámicos especializados. Se discuten los requerimientos mínimos de sal en la zona nuclear tarasca prehispánica (la cuenca de Pátzcuaro) y las zonas que pudieron haber satisfecho esta demanda—a través del tributo o del comercio—incluyendo la costa de Michoacán.

La aportación principal del presente trabajo es en el ámbito de la etnoarqueología. Usando información tanto contemporánea como histórica se contribuye directamente a la interpretación del registro arqueológico en una región del Occidente de México donde hasta ahora no se habían llevado a cabo este tipo de estudios.

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