Chapter 5
Exploring Culinary Practices Through GIS Modeling at Joya de Cerén, El Salvador

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Introduction

Most archaeological sites are palimpsests of human activity, and interpreting the blurred, composite material traces of past daily practices can be challenging. The analysis of culinary practices in the past is equally complicated, as the organic residues and ceramic objects that are often utilized as evidence are not often found in situ at archaeological sites (Bray 2003; Fuller 2005). As a result, the spatial

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relationships between preserved culinary objects rarely lend themselves to fine-grained approaches that consider the culinary dimensions of lifeways at the level of lived experience. Nevertheless, just such an opportunity is afforded by the archaeological site of Joya de Cerén, thanks to its level of preservation and unique circumstances of site formation.

Joya de Cerén, sometimes referred to as the "Pompeii of the New World," was discovered in southern El Salvador in 1976 when a bulldozer exposed part of a domestic structure. Since 1978, three decades of archaeological work (Sheets 2002a) have established that the site was buried under nearly five meters of volcanic tephra due to the eruption of the Loma Caldera volcano (Miller 2002) on an August evening between 610–671 C.E. (McKee 2002). The Cerén community likely fled prior to its destruction, as human remains have not been found at the settlement. It does not seem, however, that the community had enough time to take their possessions with them—most objects were left in the exact places they were used (McKee 1999). These objects include ceramics, worked bone, ground stone tools, chipped stone tools, and figurines, often found within collapsed and yet well-preserved wattle-and-daub structures. The volcanic eruption also preserved a great deal of the plants consumed by the local community, both the domesticated plants grown in and around the site, as well as the wild varieties (Lentz et al. 1996; Lentz and Ramirez-Sosa 2002).

Through the instant preservation of the materials of everyday life discarded exactly in their location of use, Cerén has provided a research team led by Payson Sheets the rare opportunity to disentangle the ambiguous patterns that typify archaeological datasets in order to answer questions directly related to the daily lifeways of Cerén's past inhabitants (Sheets 2000, 2002a). Because of these unique conditions, it presents an ideal case in which to model the spatial dimensions of past culinary lifeways. Since the spatial relationships between culinary objects at Cerén almost entirely correlate to their original use-contexts, it is possible to employ spatial database-based approaches, such as that provided by GIS, to query associations of culinary objects at the scale of community and household. Geographic Information Systems (GIS) software has been widely applied in archaeology, especially in regard to landscape studies (Siart et al. 2008), least-cost pathways (Taliaferro et al. 2010), and predictive settlement modeling (Church et al. 2000). Yet the potential of manipulating spatially organized datasets for intra-site exploratory data analysis has been less-often realized (for notable exceptions, see Boudreaux 2007; Van Derwarker et al. 2014; Wilson 2008). As a result, one of the more basic scalar units of archaeological research—the excavated site—still has the potential for continued methodological development vis-à-vis spatial database modeling (Neubauer 2004).

In collaboration with the project director Payson Sheets and the original excavators and specialists at Céren, a research team at UC Berkeley under the direction of Christine Hastorf created a spatial database based on the site's rich archaeological dataset. The primary motivation was to explore the aforementioned relationships between daily culinary practice, household economies, and spatial structuration. The construction of a spatial database, a secondary objective of the

project, enabled analyses and visualizations of object associations impossible through other means. The Céren project therefore has, and continues to have, multiple research objectives, only one of which is discussed below.

Research Design

The research design for this iteration of the Cerén GIS Project was predicated on investigations by the original research team (under Payson Sheets) of household economies related to culinary practices and the settlement-wide distribution of task-areas in particular. This orientation is drawn from the term *taskscape*, a concept developed by Ingold (2000) that views the spaces within which activities are performed not as static, strictly bounded locales, but rather as fluid and mutable areas, analogous to understandings of landscape—for "just as landscape is an array of related features, so—by analogy—taskscape is an array of related activities" (1993: 158). Taskscapes are "the entire ensemble of tasks, in their mutual interlocking" (2000: 158), understood as having spatial aspects for the purposes of analysis, a conceptual notion that archaeologists are capable of utilizing to great effect. Using the concept of *taskscape*, focus is placed on the practical operations of households at Cerén, the "constitutive acts of dwelling" (Ingold 2000: 158) that take the form of an array of activities over time. Since archaeologists excavate dwellings and domestic objects rather than social groups, the excavators inferred households from the relative clustering or dispersal of structures and features at Cerén (Wilk and Rathje 1982). Households were numbered according to order of excavation, and the associated objects and features were assigned membership accordingly (Sheets 2002a). Although the site appears to be a static snapshot in time of the types of activities people were engaged in during the moments before the volcanic eruption, underlying and informing these activities were the practices, materials, and historicity of a dynamic taskscape.

During the course of excavation, site excavators recorded the presence of production-related objects in an area designated Household 1. Examples include grinding platforms (*metates*), grinding stones (*manos*), ceramic vessels, and the seed remains of food plants (Sheets and Simmons 2002: 181). The metates were likely utilized in food preparation, specifically the grinding of seeds such as maize kernels (Beaudry-Corbett et al. 2002: 56). The GIS project explored the associations of objects such as metates with other objects in their immediate vicinity, hypothesizing that locations with metates were active areas of food processing for individuals within households, and potentially primary foci for food distribution. The co-occurrence of other objects or organic remains can be linked with food production, distribution, and storage activities—all argued to be particularly important in Household 1 (Sheets and Simmons 2002: 181).

Establishing the Cerén GIS Spatial Database

Due to the impracticability of analyzing the site's entire extent, which includes several other households, only the Household designated as "1" was sampled in this study. Household 1 represents the most completely excavated set of structures at Cerén, with five structures containing carefully provenienced objects, faunal, and botanical remains (Beaudry-Corbett et al. 2002). The Cerén GIS began with several objectives in mind: first, to produce an accurate, rectified cartographic representation of the excavated area, including accurate data-as-points, and second, to use the subsequent spatial database to carry out exploratory data analysis and employ spatial statistics (Mayer 2006). The first goal was executed in three stages: (1) mapping all structures, (2) delineating distinct architectural and environmental features, and (3) plotting all objects and organic remains with their attribute data. This created the spatial database necessary to apply inferential and descriptive spatial statistics. The second goal explored this spatial data (Andrienko and Andrienko 2006) through density analyses of certain object groups as well as with proximity-based measures on the positions of objects and organic remains in this area.

To establish a cartographic representation of the settlement, the team began with published data and unpublished field reports by the excavators and specialists of Cerén (Sheets 2002a; Sheets and Brown 1996; Sheets and Kievet 1992; Sheets and McKee 1989, 1990; Sheets and Simmons 1993). With their assistance, the team assembled spreadsheets containing attribute data for three object classes (ceramic, groundstone, and chipped stone), two classes of organic remains (botanical and faunal), site drawings at multiple scales of resolution, and GoogleEarth imagery. ESRI ArcGIS 10.1 software was utilized as the spatial database and as the cartographic platform for spatial analyses and site visualizations. A multistep procedure was employed to incorporate the multiple complementary datasets; the first step involved transforming the published map of Cerén into a working tool interpretable by GIS. Due to the presence of a protective hangar over the site, absolute projected coordinates for the site datum could not be established. Instead, an arbitrary projection was created in UTM using a local site datum. This provided the anchor for the base map (based on Sheets 2002a: 2) upon which the structure maps produced by excavators were overlain. Each structure map (found in the unpublished *informes*, or excavation reports) was anchored to the base map using the excavators' original grid system, when available. For structures that were mapped before the grid system was established, anchor points were judgmentally attached onto features on the site-wide base map. It is anticipated that the representation of certain structures may not precisely reflect their real-world positions, but through adjustments to the structure positions the error margin (calculated through georeferencing in GIS) lies within a few centimeters.

Within the current Cerén GIS framework (Fig. 5.1), structure walls are represented through polygons, and archaeological contexts around architectural features and structure areas are layered, operationalized as "floors", "patios", and "benches",

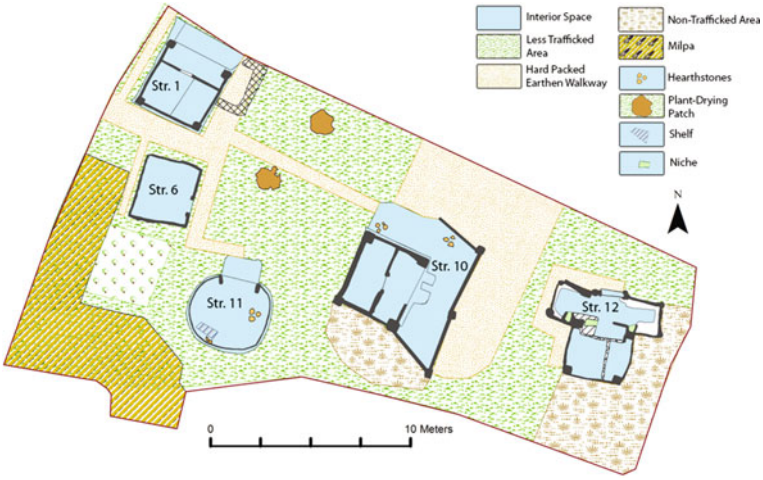

Fig. 5.1 A GIS representation of Household 1 at Cerén with a legend providing details regarding the illustrated archaeological contexts and features. The *red line* around the Household indicates the extent of excavation. The hatched addition shown on Structure 1 represents a low wall, and the green polygon to the right of the milpa (maize field) on the west side of the Household is a kitchen garden. A one meter drip-line is not shown, but surrounded each structure, except for Structure 12, which contained a 30 cm drip-line

and defined within the database as "exterior" or "interior" spatial locations. Surrounding features such as gardens, plant drying patches, and hearths were also incorporated and represented as polygon features. A 1.5 m buffer was calculated for each structure to simulate the extent of the thatched roofing (see Fig. 5.2), given the extent of the drip lines encountered during excavation (McKee 2002: 60) and the extent noted historically (e.g., Wauchope 1938). The objects and organic remains are represented as point data, as each item possesses precise and discrete X, Y coordinates. The attribute data for each of these classes was appended to each object. In many cases, the attribute data was derived from multiple sources. For instance, the paleoethnobotanical data was derived from publicly available Field Specimen Lists (http://Cerén.colorado.edu/Cerén_FS_Lists/readme.html), published reports (Lentz et al. 1996; Lentz and Ramirez-Sosa 2002), and collaboration with excavators and analysts (Lentz and Sheets, *pers. comm.*). Each object therefore contained different attribute data specific to its class. With all of these data sources assembled (and always in the process of improvement through additional clarification and data), a query-able spatial Cerén database was established.

Initial investigations of Cerén using this GIS database employed spatial statistics to explore possible "task-spaces" in Household 1 on a general, exploratory level. These more exploratory analyses focused on locating the spatial patterning of select object classes using average nearest neighbor analyses as well as the clustering of object-specific values using the Getis-Ord Gi* statistic (Getis and Ord 1992).

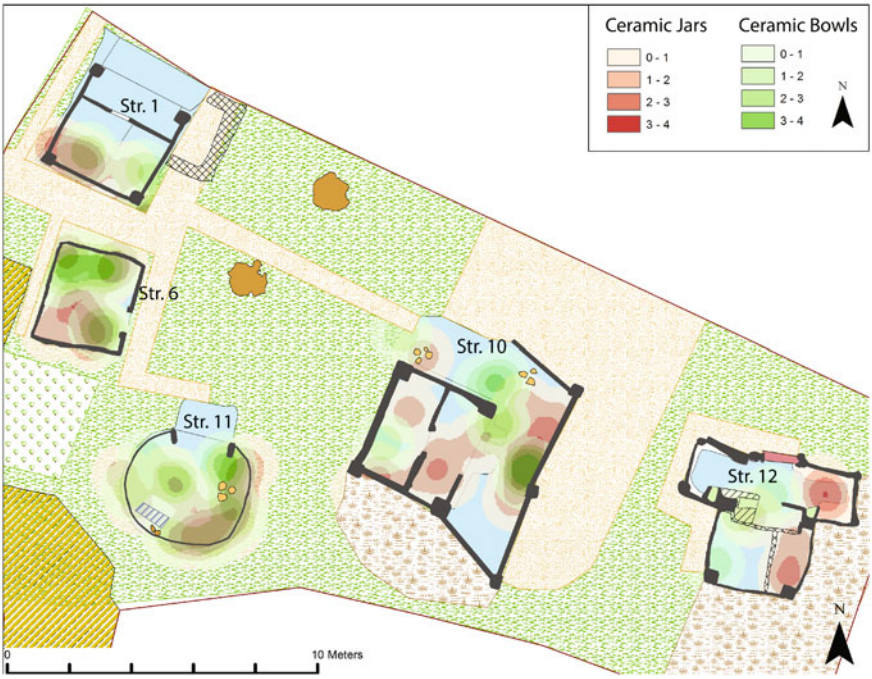

Fig. 5.2 General distribution of ceramics in the structures of Household 1. *Dark red* and *dark green* color contour lines indicate areas with >2.0 vessels/m^2, based on a kernel density analysis of only ceramic vessels identified as bowls or jars within a 1 m radius. *Light orange* stippling outside of structure walls indicates schematized structure drip lines

Tentative results included the clustering of botanical remains found in ceramic vessels in Structures 1 and 6. Likewise, most of the clustering of objects and organic remains seem to occur within structures, rather than without, which points to structures as the center of activities, especially during the hot, humid temperatures brought on in August during the mid-rainy season (cf. Sheets and Woodward 2002: 189).

The analyses performed for this study were less focused on the application of spatial statistical techniques on the existing dataset, and more focused on modes of dynamically querying the available data to understand the relationship between built spaces and household economies and culinary practices. Although similar analyses have been carried out elsewhere in Mesoamerica (e.g., Ashmore and Wilk 1988; Fletcher 1983; Hendon 1996; Levi 1996; Manzanilla and Barba 1990), the richness and condition of the Cerén dataset allows for more confidence in potential inferences usually impossible at sites with less remarkable preservation.

Culinary Practices: Bowls, Jars, and Small Household Tasks

One way to analyze household spaces is to contrast areas that were used for active tasks, such as food preparation or consumption, with areas used mainly for storage. This allows consideration of both in what specific locations certain activities were taking place, and also how the presence, division, or overlap of different activities can illuminate the nature of each space, and the types of functions different structures had. In *Before the Volcano Erupted: The Ancient Cerén Village in Central America*, Beaudry-Corbett et al. (2002) addressed this topic by discussing the distribution of jars and bowls across households. She suggested that bowls (smaller, lower, and more open vessels) were associated with food processing, consumption, and very small-scale transport. Meanwhile jars (larger, taller, more closed vessels) would be best suited to stationary storage of large quantities of material, or, in the case of jars with handles (or those of a smaller size and weight) well suited to both stationary storage and transport of larger quantities over longer distances (Beaudry-Corbett and Bishop 2002: 122). Thus in an area reserved primarily for storage, we would expect to see large, storage-type jars almost exclusively. In an area used for food consumption (but not for storage or processing) we would expect mainly bowls, and perhaps an occasional small jar from which food would be served. In an area used for processing, there might well be an overlap of bowls and jars of various sizes. Likewise we might expect overlapping types in places where many different activities took place.

A preliminary density raster analysis of ceramic bowls in Household 1 shows that within most of these structures in this household, bowls are either found singly or in groups of two to three. In this analysis, we used kernel density rather than point density, as it uses a kernel function to create a smooth surface between points to calculate relative density (Fotheringham et al. 2000: 45–49). In the absence of any known patterning to the data, a search radius of 1 m (cell size = 0.05 m) was chosen. This value was meant to approximate a minimum search space within a "casual" grabbing and leaning distance around the remains.

Within Household 1, groups of bowls tend to be closer to walls rather than in the centers of rooms. These bowls were sometimes nested, suggesting they were not in active use. A separate density analysis of jars (represented in red) shows a slightly different pattern than bowls, usually clustering in much larger groups. Three of the Household 1 structures (1, 10, and 11) have groupings of seven or more jars, always along a structure wall. The storehouse Structure 6 does not follow this pattern, however, with a cluster of jars in the center of the room. This could reinforce the interpretation of the space as not in use at the time of the eruption as a locus of daily activities.

By overlaying bowl and jar density, it can be seen that ceramics tend to be segregated and clustered by type in the domicile Structure 1 and the "ritual" Structure 12, but mixed in the other Household 1 structures (Fig. 5.2). This pattern suggests that in some areas, food was stored and consumed but probably not

actively processed. When examining the specific loci of activities, we also see that the Structure 1 domicile and the Structure 12 ritualized location were marked by more highly differentiated activities, rather than frequently overlapping practices seen in other structures. To explore the complex patterns in practices represented by bowls and jars in the other structures, other object types and attributes were considered.

Culinary Sets: Clustering of Materials

In addition to the investigation of the distribution of jars and bowls in the context of food preparation and storage in active spaces, characteristics of vessels with close provenience were also explored to identify culinary practices across the structures of Household 1. To address this topic, the aforementioned spatial density analysis was used to delimit "culinary sets" based on especially dense areas of jars and bowls (seen above). Cluster analysis was used to compare these "culinary set" contents, and associations were then examined between vessels and their botanical contents.

One attribute recorded for most ceramics was the presence or absence of handles. Following Redfield (1950), we proposed that jars and bowls with handles were easier to transport and were probably more actively used in tasks involving heavier materials, large quantities of materials, or materials that were transported longer distances. To explore sets of ceramics used together in culinary practice, a second kernel density raster (radius = 0.5 m; cell size = 0.05 m) was generated of all ceramic objects with secure provenience information in Household 1 (n = 119; Fig. 5.3). Associated culinary sets were defined as all ceramic objects within areas that met the following conditions: (a) kernel density in the area was greater than 3.0 vessels/m^2; (b) the area contained greater than four vessels; (c) the area was entirely in interior or exterior space (i.e., walls separate sets); (d) areas could not be greater than ca. 2.5 m in diameter. Vessels not identified as either jars or bowls were included in the density raster, but are excluded from interpretation. Table 5.1 summarizes eight culinary sets containing a total of 59 vessels that were identified in Household 1. The locations of culinary sets included in this analysis are indicated by dashed lines in Fig. 5.3, and the contents of each culinary set are presented in Table 5.1. To visually summarize relationships between culinary sets, a hierarchical cluster analysis (Ward's method, Ward 1963) was performed using counts of the following four categories: jars with handles, jars without handles, bowls with handles, and bowls without handles (Fig. 5.3, top right).

Structures 11 and 6, interpreted as a kitchen and storeroom, respectively, each contained three culinary sets. Both structures contained two culinary sets that were grouped together in Cluster 3 of the hierarchical cluster analysis (sets 6A, 6B, 11A, and 11B) and one culinary set in Cluster 1 (sets 6C and 11C; see Fig. 5.3). In both structures, the two culinary sets from Cluster 3 were adjacent to one another. Culinary sets in Cluster 3 contained exclusively jars with handles (or no jars) and

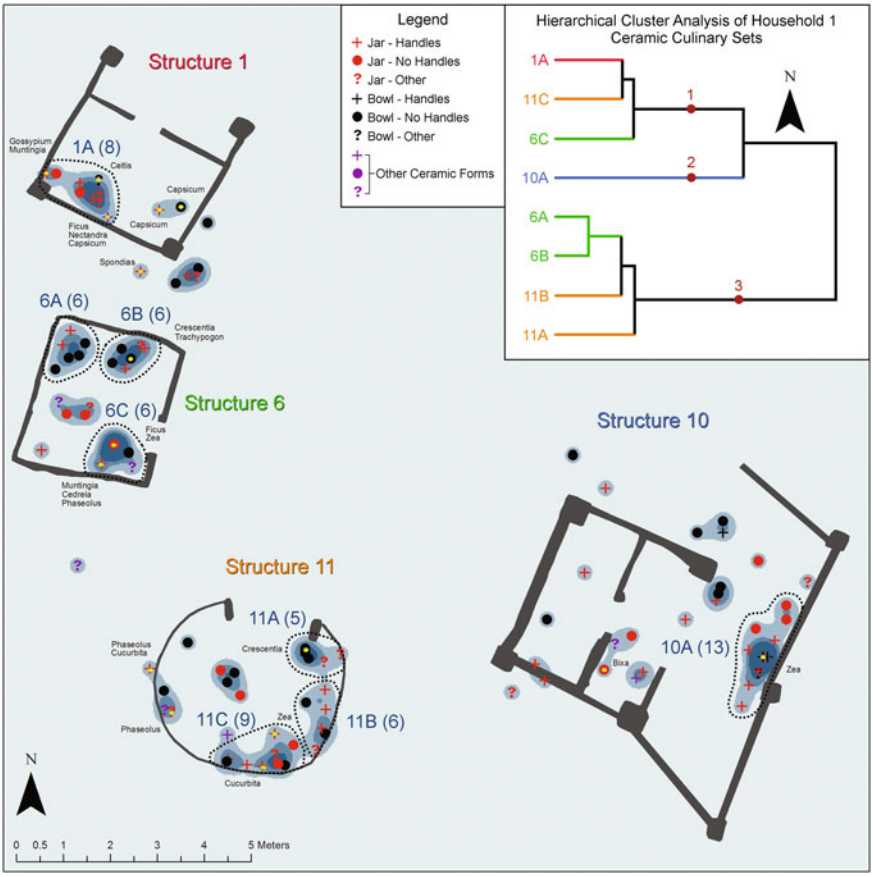

Fig. 5.3 Distribution of ceramics in Household 1 structures. No culinary sets were identified in Structure 12 (not shown). *Dark blue* color contour lines indicate areas with >3.0 vessels/m^2, based on a kernel density analysis of all ceramic vessels with 0.5 m radius. Vessels are color-coded according to form (*red* = jar; *black* = bowl; *green* = unknown form) and assigned a symbol according to presence or absence of handles (*cross* = handles present; *circle* = handles absent; *question mark* = presence or absence of handles unknown). Culinary sets are indicated by *dashed lines* and identified in *dark blue* lettering with number of vessels in parentheses. *Top right*—hierarchical cluster analysis (Ward method on a Manhattan distance; dendrogram scale proportional to actual cluster distance) of contents of culinary sets based on the following four categories: jars with handles, jars without handles, bowls with handles, and bowls without handles. Samples included in cluster analysis are color-coded by structure number. Numbered *red dots* on the cluster analysis dendrogram identify clusters used in interpretation

bowls without handles, and bowls were generally more abundant than jars (Table 5.1). Sets in Cluster 1 were more diverse, with greater numbers of jars than bowls and jars both with and without handles. Culinary sets in Cluster 3 may represent areas of more active processing, while those in Cluster 1 may have been for longer term storage. Structure 1, interpreted as a domicile, contained one

Table 5.1 Categories of ceramic vessels in Household 1 culinary sets

Structure	Cluster	Jar—Handle	Jar—No Handle	Jar—Unknown	Bowl—Handle	Bowl—No Handle	Bowl—Unknown	Total
1	1A	4	2	1	0	0	1	8
6	6A	2	0	0	0	4	0	6
6	6B	2	0	1	0	3	0	6
6	6C	3	1	0	1	1	0	6
10	10A	6	3	0	3	0	1	13
11	11A	0	0	2	0	3	0	5
11	11B	3	0	1	0	2	0	6
11	11C	4	2	1	0	2	0	9
	Total	24	8	6	4	15	2	59

Vessels not identified as jars or bowls omitted

Cluster 1 culinary set comprised exclusively of jars, also indicating storage. Structure 10 contained the only culinary set in Cluster 2. This set was distinct from all others in containing greater than ten vessels and containing only bowls with handles.

The distribution of jars and bowls with and without handles in Household 1 described above appears patterned, suggesting that they reflect taskscapes—composites of various tasks cycling in conjunction or independently of one another in patterns of dwelling activity (Ingold 1993: 153). It is interesting that Structures 6 and 11 were similar in number, positioning, and contents of culinary sets, with two "active" sets and one "storage" set. The ceramic assemblages of these two structures may each present examples of non-domicile, household-level food processing taskscapes, with a majority of ceramics in "active use" groups, and a smaller set of ceramics used primarily for storage. While the culinary set in Structure 1 primarily indicates storage, that of Structure 10 may represent a different kind of taskscape associated with inter-household food processing and consumption, as indicated by the larger numbers of overall vessels, and particularly of more easily transportable serving vessels (bowls) with handles. This accords with Sheets' (2002a) interpretation of Structure 10 as a communal structure associated with food consumption.

Culinary Stations: Tasks Near Metates

Since the food processing and subsequent storage of processed remains often occurs in specialized taskscapes, the next analysis was to utilize the locations of stationary metates as valuable heuristic analytical units. Metates are grinding stones of various sizes and elaboration, found throughout Mesoamerica in elevated contexts (such as low tables), directly atop ground surfaces, discarded in refuse areas, or incorporated into architecture (e.g., Plunket and Uruñuela 2000). Grinding stones may be used

inside or outside the home (Clark 1988). Metates, according to Michael Searcy, are "costly tools, valued by family members over many generations" (2011: 3), sometimes passed on to newlyweds (2011: 72), and kept for up to 150 years (2011: 73; see also Webster et al. 1997: 57). They may be used periodically over the year or multiple times throughout the day (Searcy 2011: 76).

Grinding stones can reveal information including which foods were processed, how foods were processed, intensive or infrequent use of locations, local or distant sourcing of materials, and shifts in style over time (Clark 1988; Hayden 1987; Schneider 2002: 92). Answering such questions can build into discussions of lifeways, economic networks, and social patterns, as well as nutritional status, group identity, and enculturation (Moholy-Nagy 2003; Schneider 2002: 10). Object biographies of metates can address "the material that was chosen for the tool and why; the design of the object; how the object was used (and possibly recycled); [and] why and how the object was discarded" (Schneider 2002: 92; similar to Searcy 2011: 4). In archaeological contexts, it is difficult to tell the difference between a metate left in-use, resting, stored, or discarded as they are usually heavy and difficult to transport (following Plunket and Uruñuela 2000: 81) and thus may remain stationary regardless of status at time of abandonment.

Like the majority of objects at the settlement, metates at Cerén are most often found in elevated contexts, as opposed to resting in contact with the floor (Sheets 1998: 66). None of the metates recovered in Household 1 are in discard areas or incorporated into architecture, so they may be considered provisionally in-use, that is, "belonging to the world of the living" (following Plunket and Uruñuela 2000: 81). In earlier studies, Sheets has associated metates with individuals, households, and broad economies, while Sweely (1998) has addressed power relations implicated by locations of activities including maize grinding. Given that "the predominant pattern in traditional Maya villages is for an economically active female to have a single *mano* and *metate*" (Sheets 1998: 74), Sheets has interpreted the lone mano-metate set in Household 4 as likely belonging to "one economically active female" (Sheets 1998: 70). He has compared this situation with that of four active women in Household 1, where several metates were mounted on *horquetas* (forked sticks) while another was in contact with the floor (Sheets 2000: 225). One metate is a miniature, palm-sized, and legged form, which Sheets (2000: 221) suggests was used for grinding hematite, perhaps for use as body paint.

Of the four metates likely used for maize, Sheets hypothesizes that three, demonstrating light use-wear (Sheets 2002b: 148), were used only as "overflow" for large-scale events related to the nearby Structure 10 (Sheets 2000: 225; 2002b: 148), activities noted ethnographically as related to grinding mills in modern town centers (Searcy 2011: 30). Sheets implicates extra-household economies, believing that the corn undergoing grinding in the Household 1 area, from the three metates exhibiting light use-wear, was "perhaps to feed participants in religious rituals" (1998: 74). If this is the case, surrounding materials may also correspond with this "episodic household craft specialization in service to a religious organization" (Sheets 1998: 74). (Another hypothesis is that that new grinding stones were acquired and stored in anticipation of passing along the "heirloom" implements to

children when marrying, a modern practice documented by Searcy 2011: 138.) The fourth *metate* used for maize grinding was found resting on the ground of the kitchen structure (Structure 11), adjacent to a three-stone hearth and a vessel containing soaked maize kernels (see Fig. 5.1).

Thus, as heavy- and less-portable fixtures in the structures of Household 1, metates index fairly stable culinary stations, active spaces where the people of Cerén ground maize, seeds, and other organic and inorganic goods. When the distribution of vessels and botanical remains are visualized together, it is possible to see that metates tend to be located within the clusters of jars with handles (see, *inter alia*, Fig. 5.4b). In essence, the people of Cerén who were engaged in grinding activities appear to have kept easily movable jars containing soon-to-be processed foods within arm's reach. In contrast, jars without handles are located at slightly greater distances from these "grinding stations" with only one exception. These more distant jars contain different types and smaller quantities of materials. Of these vessels, Sheets has posited that "some may have been used to transport the soaked maize kernels for grinding, others may have been used to catch the ground *masa*, and the polychrome bowl may have been used as a food serving vessel" (Sheets 1998: 85).

To further explore nodes of activities related to metates, two near analyses were performed, initially using a 0.5 m small-scale radius as a heuristic bootstrap. This 50 cm radius defines a hypothetical arm-length distance from a metate while seated. Near Analysis calculates the distances between some point feature and any number of other features. Using the output of the Near Analysis Table, it was possible to generate a map of the locations of the objects that occur within 50 cm of the metates (Fig. 5.4a, b). Unsurprisingly, the closest items to two of the three metates on the western portion of Household 1 were fragments of manos. Likewise, in the kitchen structure (Structure 11), the three objects closest to a metate near the kitchen hearth were a complete mano, a ceramic jar with handle, and a bowl (Fig. 5.4b).

The association of these objects in such a spatially circumscribed zone implicates metates as locales of not only food production but also of food distribution. The propinquity of a ceramic jar with handles, again the most likely to contain seed remains, is probably not accidental. More illustrative is how relatively free of objects the spaces around metates seem to be. The metate in the storehouse, Structure 6, is near another metate fragment and three bowls. The "neatness" of this space may be a feature of the Cerén taskscape at this particular moment in time. Sheets has posited that, along with areas at greater distances from structures (at least a few meters), metate preparation areas were "single-function activity areas" (1998: 94), whereas most other areas at Cerén were multifunctional, with clean-up after each activity (1998: 94).

Given that 50 cm is an arbitrary search radius, the near analysis was extended by another 50 cm in order to examine the differences in the kinds and numbers of objects that appear in between these spaces (Fig. 5.4). With few exceptions, the enlargement of the search space only yielded more ceramic vessels, the majority of which were handle-less bowls, but also including more jars with handles. Considering that these items are within "leaning" distance of a seated individual,

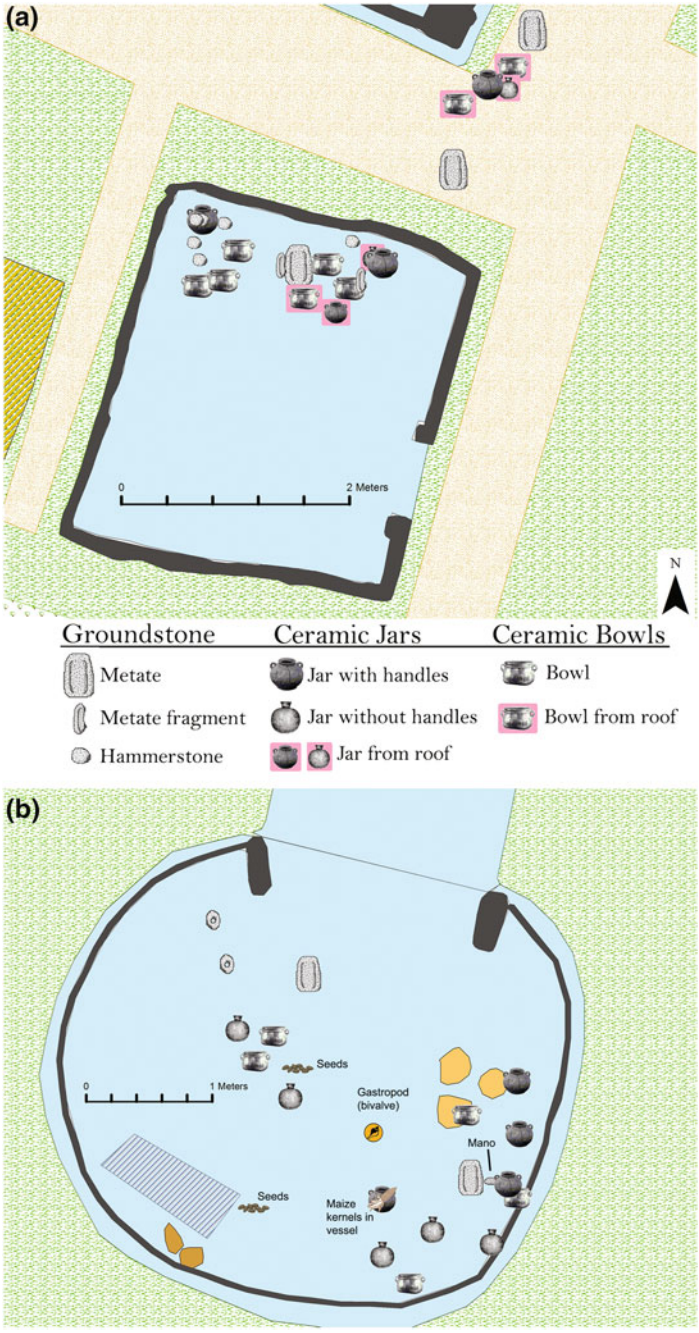

Fig. 5.4 Distribution of objects within a 1 m radius in select structures in Household 1. *Panel a* represents Structure 6, and *panel b* represents Structure 11. The legend for the symbology of the recovered objects is in between the two images, and symbols not represented in the legend are supplemented by on-graphic text

the additional presence of bowls and jars reinforces the centrality of metates within a spectrum of culinary practices: production, distribution, consumption and storage.

The findings of this paper are consistent with ethnographic and ethnohistoric descriptions in the Maya area of various practices relating metates to food storage, preparation, serving, and consumption (Hanks 1990: 331; Redfield and Villa Rojas 1934), as well as finger bowls for washing [de Landa 1978 (1566): 34]. Searcy notes that for modern highland Maya women who use metates, the process of grinding corn usually incorporates a small nearby container of water for use in wetting the soaked maize and preventing the masa from sticking to hands (Searcy 2011: 114, 119). Ethnographic and historic photographs taken in the region almost inevitably depict containers of various sizes located in close proximity to metates and grinding activities. A variety of foodstuffs may be ground on a single metate (Searcy 2011: 76), likely resulting in a variety of materials kept conveniently nearby in vessels within arms-reach. According to Sheets (1998: 74), modern women in El Salvador are very particular about the height of the grinding surface, given the angle of the back while carrying out the arduous task of grinding. Those involved in grinding at Cerén would likely be equally attentive to the positioning of the metate and various materials meant to facilitate activities related to metate use.

As compared with other communities in the ancient Maya world, the site of Cerén continues to demonstrate strong similarities with regard to metates as culinary stations. Inomata and Stiver (1998) recovered sets of culinary materials at the rapidly abandoned site of Aguateca, Guatemala. The metate in the elite household associated with structure M8-10 was located near large ceramic jars "used for the storage of food and liquid" (Inomata and Stiver 1998: 438). Figures in their text reveal that metates were located well within arm's reach (50 cm) of only one or two ceramic vessels (three of the metates) or none (two of the metates) in this structure (Inomata and Stiver 1998: 438–439). Given the different contexts of abandonment (warfare vs. volcanic eruption) and nature of the household (elite vs. commoner) some differences are to be expected between Aguateca and Cerén. These variations are perhaps accounted for by shifts in materials in a time of siege at Aguateca for structural fortification and hoarding of prepared foodstuffs, in place of the immediate flight of the Cerén community. In contrast, a westerly room of structure M7-35 was described as a food storage and preparation area and/or possibly the living space of a servant, given that "a large part of the bench was taken up by the metate and storage jars" (Inomata and Stiver 1998: 442), the metate lying within arm's reach (50 cm) of at least three vessels. This pattern is quite similar to that of Cerén, aside from the fact that no hearths are mentioned in the Aguateca study.

In another context with in situ preservation, Julia Hendon's work at Patio B of Group 9N-8 at Sepulturas, Honduras, uncovered deposits containing entire objects left under building collapse. Hendon notes a cluster of "three metates, a portable brazier for heating food, several storage jars, and obsidian blades" (Hendon 1997: 36). Although no figures correspond with this text, given the narrative it is likely that the metates were stationed within arm's length of the nearby objects. Less pristine contexts have also demonstrated the clustering of vessels with metates. At the site of Piedras Negras, in Guatemala, for instance, a nearly complete metate

(PN-46F-8) was found in one of the rooms of structure J-33, near a broken but complete vessel (Golden 2002: 251–252). Overall, however, it remains difficult to recover additional evidence of metates in situ, as ethnographic evidence documents either the sale or removal of valuable groundstone items prior to departure from a residence (Lange and Rydberg 1972). Moreover, several works have documented the retrieval and reutilization of pre-Columbian metates by modern populations (e.g., Lange and Rydberg 1972: 430; Hartman 1907: 39 cited in Lange and Rydberg 1972: 430–431).

In imagery depicting grinding stones, the pattern of vessels located near metates continues. It is rare, however, to find depictions of food preparation in Classic period art (Houston et al. 2006: 107), much less the specific task of grinding on a metate. At least one plate depicts a vessel located just next to a metate [JM03204 in Montgomery (2000)]. Several ceramic dishes depict metate use by women, in each case with at least one nearby vessel (Kerr 631 in Houston et al. 2006: 111; Kerr 1272 in Coe and Kerr 1982: 94). Two-dimensional representations, however, appear to differ from three-dimensional representations. The few examples of sculpture and figurines depicting the use of metates do not tend to include nearby vessels, but are usually comprised simply of a woman grinding with a metate and mano. In Central Mexico, the Borgia, Florentine, and Mendoza codices all depict maize grinding on a metate with one or more vessels within easy reach. The Codex Mendoza helpfully labels the vessels near a metate, in a panel depicting children completing various chores (Berdan and Anawalt 1992: folio 59V). In this panel, a young woman is seated next to a three-stone hearth with a *comal* atop it, while an *olla* and a tripod *escudilla* vessel sit within easy reach.

Given the evidence presented by the nearest neighbor and density analyses in GIS, it is apparent that certain groundstone tools and vessels are strongly associated with metates. When compared with other communities and time periods, the combined results build a strong case for metates as persistent culinary stations; taskscapes that incorporated a variety of materials and implements, conveniently kept within close range.

Culinary Agents: What the Duck Saw

In addition to the investigation of household-wide spatial activities, it is possible to explore the relationship of objects and organic remains on the scale of an individual structure, and more finely, even within the spaces of a structure. One particularly poignant example of this can be seen in the corner of Structure 6: while no human witnesses remained in Cerén at the time of the eruption, a single domestic duck was left behind, tied by one foot to a pole in the wall of the structure.

Just as spatial analyses of primary contexts have offered glimpses into activities of the people who built these homes, even the patterns of a duck's experience are

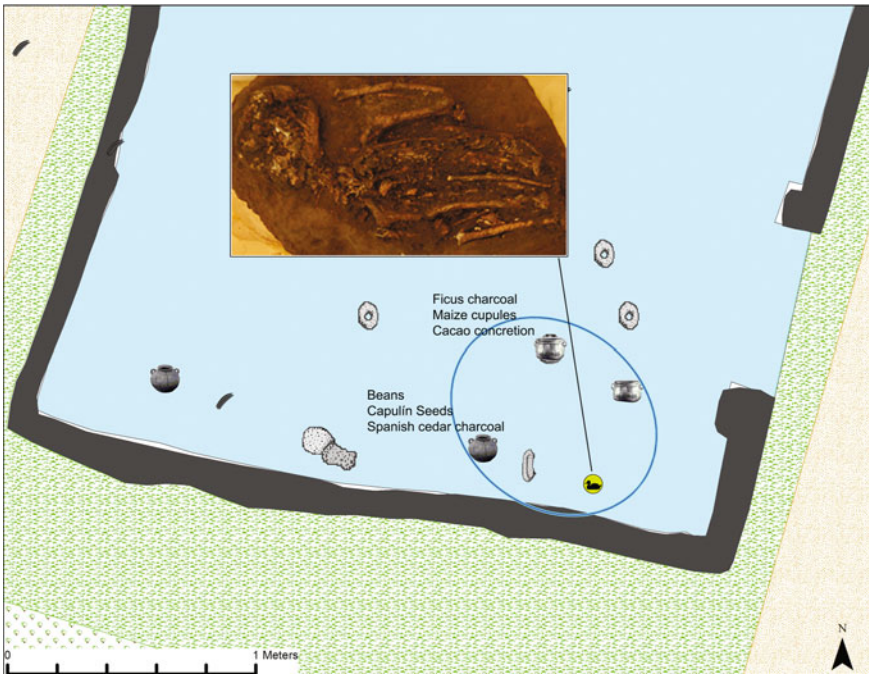

Fig. 5.5 Distribution of objects and organic remains (labels represent anatomical parts of a plant or general type—e.g., charcoal) around remains of a duck (Anatidae) which is symbolized by a *yellow circle* with a black duck silhouette. The *blue circle* represents the object "cluster" discussed in the text. The other symbols correspond to those in Fig. 5.4

visible (Fig. 5.5). This corner of Structure 6 is largely cleared of clutter as compared to other areas in the same structure, but the few nearest objects suggest an animal carefully tended. Nearest to the duck is a bowl of beans braced by a metate fragment and set at a comfortable height for the animal. The bracing at the base perhaps lent extra stability so that the duck would not tip the bowl. A second small bowl was empty at the time of excavation, but may well have been the vessel for the duck's water. Slightly farther away, though still in reach, is a stack of three bowls with a quantity of corn at similar height. Was the duck so well looked-after as to have multiple food sources at its disposal?

The bird was kept only a few feet from what seems to be an active work area, or the storage space of active culinary equipment, with mano and metate and numerous bowls and jars. One wonders if someone working in that space regarded the duck as a pet, a bit of company during tedious jobs. Perhaps someone from the Cerén community may have felt a twinge of sadness at leaving the bird to its fate. Or perhaps these foods were simply meant to rapidly fatten a duck intended for the stewpot, and tragedy lay only in the fact that delicious poultry went to waste.

Conclusions

The combination of density analyses and near analyses provides strong evidence that food production, storage, and distributive activities at Cerén were organized into spaces that were relatively discrete and clustered. The distribution of jars and bowls points to a nonrandom distribution of these objects that played a role in how the Cerén community organized their productive space. Jars and bowls occupied clearly divided spaces, such as in Structure 1, where their active separation might have been related to their intended use or even ideas about how, and where, such materials must be temporarily stored. Metates seem to be in close proximity with jars with handles, a ceramic type spread throughout Household 1. The site excavators have argued that the presence of so many metates in Household 1 might point to periods of enhanced production for activities related to Structure 10 (the "feasting" structure).

The association of botanical remains in handled jars, the distribution of metates, and the close proximity of these objects provides a high-resolution perspective on how these activities might have been organized on the August evening prior to the Loma Caldera explosion. The presence of the duck, and the relatively object-free space around it, only reinforces the notion that spaces were not inert physical areas to be filled with lifeless objects but dynamic spaces where things imbued with value were arranged in meaningful ways. On display, on the one hand, is a remarkable snapshot of Cerén lifeways at a particular moment in time. However, also visible are taskscapes, comprised of the combined set and series of tasks, with each task taking meaning from a position within a broader ensemble and in relation to spatial entanglements (Ingold 2000).

GIS can be an invaluable tool in investigating these various facets of life at Cerén due to its ability to provide multi-scalar analyses of practice. It is clear from this case study that GIS analyses at the excavation-level can yield insights into daily life to complement studies on large-scale settlement and related phenomena. In combination, these approaches yield a more robust set of lifeways and a deeper view of household spatiality, providing a rich set of analogs for use at other Mesoamerican sites where preservation is less remarkable (Cf. Webster et al. 1997).

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