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Heterarchical political ecology: Commoner and elite (meta)physical access to water at the ancient Maya city of Aventura, Belize

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ABSTRACT

Humans engage both material and immaterial qualities of the environment to achieve political ends. Water is necessary for biophysical existence, but also holds symbolic and ideological power. Physically controlling access to water sources and communing with deities to control rainfall are both ways ancient Maya rulers exerted power over commoner populations. In some Classic Period (250–900 CE) city-centers governed by divine rulership, hierarchical control of water during episodes of drought led commoners to "vote with their feet" and abandon these cities. While many larger cities in the Maya area were undergoing vast sociopolitical reorganization and large-scale depopulation towards the end of the Classic Period, the medium-sized city of Aventura was thriving. In contrast to the hierarchical control of water seen at these other cities, in this article I demonstrate that commoners and elite alike at Aventura were able to access important water resources, and the city flourished. I argue that heterarchy is an appropriate model for the political ecology of Aventura because although there was inequality, people of all socioeconomic statuses had access to water, even in times of scarcity. Access to water resources cut across hierarchical lines, contributing to Aventura's success at the end of the Classic Period.

1. Introduction

When water is scarce, it may seem natural to restrict access in order to preserve this essential resource. However, restricting access is not the only way to address water scarcity. The ancient Maya city of Aventura in northern Belize provides an example of a city that was able to thrive amidst regional drought when many other cities were being abandoned. I argue that open access to water resources contributed to Aventura's success during this time period. Although there was inequality in the city, commoners and elites alike had access to the equally important biophysical and metaphysical aspects of water. In order to interrogate the power structures that contributed to the city's ability to thrive, I take a heterarchical approach to the political ecology of Aventura that considers both vertical and horizontal lines of power.

Heterarchy is a power structure in which both horizontal (decentralized power) and vertical (centralized power) configurations exist. Heterarchy is not at odds with hierarchy, it rather subsumes multiple hierarchies. A heterarchy's structure is constantly being re-negotiated and allows for multi-scalar approaches, as different power relationships emerge at different scales (Crumley 1987, 1995; McIntosh 2005). A heterarchical approach to political ecology allows for attention to the creative ways commoners negotiate their engagement with the environment within broader political structures. Human-environment interactions are extremely complex, and heterarchy highlights the myriad of configurations of power entangled with environmental practices and outcomes. The environment affords different sources of power. For example, controlling physical access to water for irrigation is not the same as claiming connections to deities that control rainfall, although they may certainly be related. A heterarchical model allows for these different means of attaining power to be considered. Heterarchy is also applicable across multiple scales, which is significant because different types of power relationships emerge when examining households, communities, cities, and regions.

Aventura, located in northern Belize, provides an ideal case study to apply a heterarchical approach to political ecology. The Corozal Bay area in which Aventura is located was outside the purview of divine rulership of larger ancient Maya polities to the south and further inland (Robin et al., 2016a,b). The city's height of occupation was from approximately 750–1150 CE, a time period of regional sociopolitical reorganization (Aimers 2007; Iannone et al. 2014). The landscape was also drying during this time, as episodes of drought have been well-documented across the Maya area (Dunning et al. 2012; Gill et al. 2007; Lachniet et al. 2012; Valdez and Scarborough 2014). At Aventura, geological features known as pocket *bajos* are ubiquitous across the

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landscape. These non-draining areas of low elevation, which are up to 2 km^2 in area and up to 3 m deep, are seasonally inundated today and likely held water year-round in the past (Grauer 2020a: 87-88). This easy access to water may have been key to Aventura's success, particularly during times of drought. In this article, I outline the excavations of two households at Aventura, one commoner and one elite. I demonstrate that at Aventura, commoners and elites alike had access to both biophysical and metaphysical qualities of water in pocket *bajos*, which were equally important in ancient Maya ontologies. Pocket *bajo* access cut across hierarchical lines of power at Aventura, indicative of heterarchical political ecology, and contributed to the city's ability to thrive amidst episodes of drought.

2. Political ecology

I use *political ecology* to mean the ways in which configurations of power are related to human-environment interactions. The inception of political ecology as a field of study is attributed to the combination of cultural ecology and political economy (Bryant 1992; Escobar 1999: 2; Watts and Peet 2004; Wolf 1972). Critical geographer Paul Robbins defines political ecology as, "a field that seeks to unravel the political forces at work in environmental access, management, and transformation" (2012: 3). Often, political ecology is defined in contrast to *apolitical* ecology, that is, the assumption that the environment is somehow separate from political structures and inequality. It is important to note that political ecology is not *more* political than other modes of inquiring about the environment and human-environment relationships, it is just more *explicitly* political (Robbins 2012: 14).

While political ecology often focuses on access to resources, not all ontologies consider natural resources as something "out there" to be extracted and accumulated. Many Indigenous scholars have pushed back against the assertion that such a divide is universal and argue that Euro-Western scholars should take Indigenous ontologies seriously (Hunt 2014; Langford 1983; Lugones 2010; Ortiz 1969; Sundberg 2014; Todd 2016; V. Watts, 2013). In such ontologies, which Euro-Western scholars describe as "relational ontologies" (C. Watts, 2013), nonhuman actors are active parts of society (V. Watts, 2013: 21). In non-capitalist ancient Maya ontologies, there was no hard and fast separation of nature and culture (Dedrick et al. 2020; Harrison-Buck 2012; Lucero 2018). I have argued elsewhere (Grauer 2020a) that water features at Aventura were active in the creation of the city and the maintenance of society. Thus, substances such as water should be taken seriously as political actors that interact with humans and are involved in the creation and enactment of inequalities (Marisol de la Cadena 2010: 336).

Euro-Western scholars have engaged with concepts akin to Indigenous ontologies under the umbrellas of "new materialisms" and "posthumanism." When taken to their ontological extreme, new materialisms and posthumanisms have the potential to equate humans and nonhumans, which can be problematic. For example, equating some humans with objects has been used as justification for enslavement (Hauser 2015: 198–201). Additionally, claiming environmental phenomena are equally as responsible for environmental injustices such as environmental racism removes responsibility from human actors (de León, 2015: 40). Conflating humans and nonhumans runs the risk of ignoring inequalities and power relationships.

Various concepts put forth by material feminists are helpful in breaking down nature/culture, human/nonhuman, and material/immaterial without discounting uneven relationships between humans. For example, Elizabeth Grosz (2001) utilizes "mimesis" to demonstrate that boundaries are fluid and porous, Stacy Alaimo (Alaimo, 2010) argues trans-corporeality is a way to conceptualize movement between human and nonhuman materialities, and Nancy Tuana (2008) demonstrates that an interactionist ontology has the potential to avoid realism vs. social constructivism dichotomies. What these concepts have in common is that they do not conflate humans and nonhumans completely. Breaking down dichotomies such as nature/culture have inherently political outcomes. Grosz and Grosz (1994) has argued that breaking down the nature/culture divide politicizes the body instead of treating it as a biological pregiven entity. Keller (1985) has similarly argued that failing to break down the dichotomy of nature/science perpetuates the configurations of power that benefit from such a division. Tuana (1983, 1996) has demonstrated that logic derived from the nature/culture divide is used to perpetuate sexist and racist practices. Political ecology's focus on the interconnectedness of power, economy, and ecology is another conceptual tool scholars can utilize to reconcile the false dichotomy of nature and culture without disregarding uneven relationships between humans (Biersack 2006: 2; Tsing 2015: 5).

A central tenet of political ecology is that environmental outcomes are directly affected by political structures. Historically, top-down approaches to political ecology have supported the idea that hierarchy is needed in order to maintain resources for a society. Wittfogel's (1959) model of hydraulic civilizations is a classic example of a centralized, top-down model. Wittfogel's model posits that states emerged in order to develop extensive irrigation systems in environmentally challenging conditions (Janusek and Kolata 2004: 405). People at the top of the political hierarchy had the power to organize the labor necessary for construction and maintenance of large-scale systems. In this view, institutions are necessary for successful resource management. Hardin's "tragedy of the commons" (1968), which he later revised as the "tragedy of the *unmanaged* commons" (1991), in particular champions the theory that without institutions managing resources, resources will deplete. Such top-down models emphasize the ways in which people in power control and manage resources, often as a means of obtaining and retaining power. These are inherently hierarchical models, in addition to rulers' power over other people, the term "resource management" itself assumes humans' position above the environment.

More recent scholarship has pushed back on top-down models, arguing that people at the bottom of and at different points in a social hierarchy develop ways to engage with the environment. Many of these studies highlight the communal qualities of environmental practices and often argue that collaboration and coordination, not conflict or coercion, characterize strategies that are more stable and successful over time (e.g., Erickson 1993; Ostrom 1990, 2009; Scarborough and Lucero 2010). For example, Scarborough (2009) has argued that ways of engaging with the environment that develop on the ground instead of imposed by a ruling class, characterized by accretional growth, are more flexible and therefore more resilient in turbulent times. While often glossed as "bottom-up," such approaches consider agentive capacities across several facets of society in the context of broader power relations (Robin 2013: 32; Sheets 2000: 228). The heterarchical approach I put forth in this article builds off these studies by explicitly highlighting how people at different places within a hierarchy can have equal access to resources.

2.1. Water and power

Water management is an excellent medium to examine political ecology in ancient Maya society because it so perfectly enmeshes biophysical/material and metaphysical/immaterial sources of power. Water is a key resource that is ubiquitous, yet often difficult to obtain for both geographical and political reasons. Rainfall is highly seasonal in the subtropical regions of Mesoamerica, and in the northern lowlands, surface water is scarce. In large cities with divine rulership, rulers physically restricted access to water infrastructure such as canals and reservoirs (Lucero 2006: 37). Water's intimacy with ideology, ritual, and power makes it a material not only key for biophysical survival of individuals, but for the survival of political systems as well (Lucero and Fash, 2006: 4; Stensrud, 2016). Water was central to ancient Maya cosmology, as the earthly realm of the cosmos was portrayed as a crocodile or turtle submerged in water across time and space (Houston 2010; Scherer 2015). Openings in the earth associated with water such as caves, reservoirs, and *cenotes* were often treated as watery entrances to the underworld (Isendahl 2011: 192; Lucero and Kinkella 2015;

Moyes et al. 2009). Such cavities in the earth's surface were physical links between human and nonhuman worlds (Bassie-Sweet 1996; Brady and Ashmore 1999; Schele and Freidel 1990; Thompson 1959).

The largest Maya city-centers were characterized by divine rulership, and rulers' power was entangled with water, both as a physical resource and a cosmologically powerful substance. At large centers, such as Tikal, Calakmul, and Caracol, rulers at the top of the hierarchy asserted control over economic systems and resources, including water (Wyatt 2014: 451). As Wyatt describes it, "This neo-Wittfogelian perspective, or political economy approach, proposes that elites assume control of productive systems to assure a reliable supply of staple and wealth finance" (2014: 452). Even if leaders were not directly controlling access to water, they were responsible for providing resources to repair and maintain water systems as well as performing key water rituals (Lucero and Fash 2006: 7).

Divine ancient Maya rulers used symbolism and ritual related to water in order to legitimize their power. To assert metaphysical connections to water, divine rulers engaged in actions such as staging water rituals to demonstrate to commoners that rulers had access to supernatural qualities of water and displayed symbolism related to water from commoner households on larger scales (Lucero 2006; Scarborough 1998). As configurations of power changed, so too did ritual activities associated with water. The abrupt abandonment of water-centered ritual activity, particularly at cave sites, indicates a loss of faith in the elite, which played a role in the so-called Classic "collapse" ca. 900 CE (Moyes et al., 2009: 201). Lucero and Kinkella (2015) argue for an increase in ritual pilgrimage to *cenotes* at Cara Blanca, Belize that are situated outside of city centers between 800 and 900 CE, during which time there were several droughts. They argue that this was a failed attempt at mediating environmental change and also signifies a lack of faith in the divine elite.

Large-scale water infrastructure and watery imagery in elite contexts indicate that elites in these large city-centers controlled, or sought to control, both biophysical and metaphysical aspects of water with varying degrees of success. Commoners were also agentive in the construction of power structures related to environmental relationships. For example, McAnany argues that elites' use of imagery from agrarian contexts such as water and *maize* "has been broadly misconstrued as an attempt by elites to use imagery that could be understood by the 'illiterate masses'; I suggest instead that elites appropriated organic motifs precisely because of their powerful association with agrarian themes of regeneration and inheritance" (2013: 164). That is, while elites utilized symbolism to wield power, the symbolism emerged from commoner households. Such an example highlights the problems with over simplifying ancient Maya political ecology as top-down and demonstrates the importance of considering both vertical and horizontal lines of power, namely, heterarchy.

2.2. Heterarchy

Because ways of engaging with the environment are rarely solely top-down or bottom-up, it is helpful to have a model that teases out complex power structures related to human-environment relationships. Janusek and Kolata (2004) argue that human-environment interactions depend on complex social relationships that cannot be characterized as solely hierarchical or egalitarian. I propose heterarchy can be applied to political ecology in order to bridge this false dichotomy. Furholt and colleagues have recently (2020) proposed heterarchy, along with Marxism, anarchism, and collective action theory, can be used as a means to synthesize top-down and bottom-up approaches to political economy. Ancient Maya political economy has been frequently described as heterarchical (Potter and King 1995; Scarborough, Valdez, and Dunning 2003). Both vertical and horizontal methods of production and exchange were present in ancient Maya political economy: some goods were produced on small scales and traded locally, while other goods were produced on large scales and traded regionally (Potter and King 1995).

While heterarchy has been used to discuss ancient Maya political economy, it is not as widely applied explicitly to ancient Maya political ecology. In order to apply a heterarchical model to political ecology, it is important to understand different types of power dynamics in ancient Maya society. McAnany (2013) demonstrates that power relationships in ancient Maya communities without divine rulership rested in kinship, and particularly relationships with the ancestors. Deriving power from connections to ancestors is related to the first-founder principle, which states that people who settled a certain area first were able to establish their households near the highest quality material resources. Since they had lived in a given location the longest, they had the most time to accumulate goods and resources. The first-founder principle encapsulates social power as well. As McAnany writes, "the ancestors, through the structure of the lineage, serve to underwrite and reinforce social and economic inequality" (2013: 111). Descendants of the founders of a settlement had the deepest ties to the land, the most ancestors in that place. These metaphysical ties coupled with access to physical resources would have been ways to assert authority over others. A heterarchical political ecology allows for nonhumans, such as ancestors and landscape, to be active by resisting the urge to assume human hierarchical control over the environment. As discussed above, this is in line with ancient Maya ontologies.

Heterarchy invites us to consider how power relations emerge differently at multiple scales. Yaegar and Canuto (2000) argue that an examination of communities, a social unit between the scale of household and region, bridges the bottom-up and top-down approaches (Robin 2003: 331). The scale of community also lends itself to an analysis of multiple configurations of power. While ancient Maya households likely exercised levels of autonomy regarding agriculture and water practices, they were simultaneously integrated with regional structures of power, intra-city hierarchy, and intra-household relationships (Robin 2013; Sheets 2000: 228). A heterarchical view of human-environment relationships reconciles these various scales and hierarchies. For example, at Copán in Honduras where there was hierarchical divine rulership, Davis-Salazar (2003) has demonstrated that lagoons located in residential areas of the city were forms of communal property that encouraged collaboration and resisted strict centralist control. The ubiquity of these features across the site, their small size, and the presence of evidence for community-building activities such as feasting around their perimeters suggest lagoons were indeed managed on the community level, not strictly by divine rulers. Similarly, Trachman (2007, 2009, 2010) has demonstrated household water practices on the Río Bravo Escarpment in Belize were organized heterarchically around water features. While one household, Grupo de Lluvia, was located at the head of the reservoir that fed the canals which brought water to other households, the community at large was connected by water. Although the household at the headwater likely exerted some power over water, the features were communally managed.

Another benefit of a heterarchical model that attends to multiple types of power is it breaks down the commoner-elite binary. Ancient Maya society was not organized into a two-tiered system (Blackmore 2011). Variability in architectural elaboration in households between the ultra-elite and commoners may not represent a "middle class," another step in a hierarchy, but instead may indicate the vitality of lineages as an organizing social force (McAnany 2013: 163). Aventura was not encapsulated in a strict hierarchy on an inter-site scale, but within the city there was certainly socioeconomic inequality.

3. Aventura

Aventura is a medium-sized ancient Maya city located in what is now northernmost Belize (Fig. 1). The city is composed of six main temple plazas, with its highest temple reaching 20 m. The city was occupied as early as the Late Preclassic Period (300 BCE-250 CE) and saw its first period of large-scale construction during the Early Classic (250–600 CE)

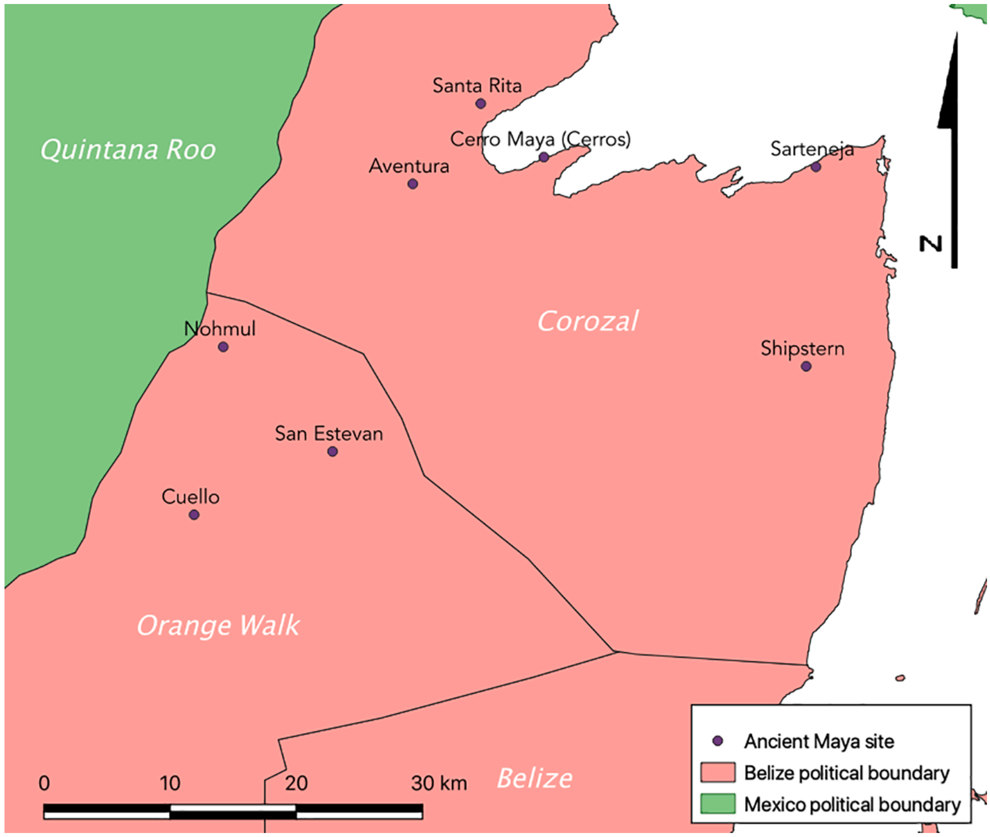

Fig. 1. Map showing the location of Aventura in relation to some key ancient Maya sites in northern Belize.

(Kosakowsky 2016: 2). The city was at its height of population during the Extended Terminal Classic (750–1100 CE) (Kosakowsky 2016: 1-3; Sidrys 1983).

The Aventura Archaeology Project (AAP) is the first large-scale archaeological project to conduct sustained research at the site (Grauer et al. 2020; Robin et al., 2016a,b, 2017, 2018; Robin, 2019). It builds upon previous research by Raymond Sidrys out of UCLA in 1974 (Sidrys 1983) and excavations conducted by the Belize Institute of Archaeology in 2007. In total, AAP has surveyed 1.2 km^2 of the site core, identified 63 household groups and five pocket *bajos*, and conducted horizontal excavations in six households and three pocket *bajos* (Fig. 2).

3.1. Power structures

On an inter-site scale, Aventura is outside of the purview of divine rulers in hierarchically organized regions. The Petén, in northeastern Guatemala, is an example of strict hierarchical organization on both intra- and inter-site scales (Folan 1992). Large site size with considerable monumental architecture and ornately decorated *stelae* with hieroglyphs are commonplace in this region (Berlin 1958). Centers such as Tikal were governed by a series of divine rulers, and simultaneously held dominion over smaller, less powerful sites (Chase and Chase 1996; Marcus 1976; Martin and Grube 1995). Such centers lacked their own fertile farmland, and in exchange for farmer's labor, elites in centers provided water during the dry season (Lucero 1999, 2018). Aventura's location has previously been described as "peripheral" due to its distance from large centers and lack of elite markers such as hieroglyphs and carved monuments (Sidrys 1983: 376). More recent scholarship has argued that rather than peripheral, the Corozal Bay area where Aventura is located was a very strategic and beneficial settlement location due to its proximity to both riverine and marine resources (McAnany 2013; Walker 2016). While the Corozal Bay area was connected to the Petén through trade, it was also autonomous (Masson 2002).

Within the site itself, significant diversity in house size suggests there is a great degree of socioeconomic difference. During survey, AAP classified households at Aventura into three types representing commoners, mid-range, and elite households. Commoner households range from 0 to 1 m in height, and excavations reveal small, low platforms and domestic artifacts. Mid-range households range from 1 to 2.5 m in height, and excavations reveal masonry platforms and structures with domestic artifacts. Elite households are 2.5–6 m in height and excavations reveal large masonry platforms and structures with domestic artifacts (Grauer et al. 2020; Nissen, 2018). Although these categories are somewhat arbitrary, they serve as bases for hypothesis generation. For example, masonry superstructures are more labor-intensive to construct than perishable structures, as the construction material is larger and needs to be cut into square blocks, which may indicate greater access to resources and labor. Additionally, variability in architectural elaboration between households can be an indicator of the relative amount of power a given lineage has (McAnany 2013: 163).

During his test pit program of nine commoner households at Aventura in 2018, Nissen found that height variation in commoner mounds was largely due to occupational length. Mounds closer to 0 m in height had fewer construction sequences and were constructed more recently than the commoner larger mounds (Grauer et al. 2020; Nissen, 2018). If, as McAnany argues, power on the household level is rested in kinship relationships to the ancestors, it follows that the larger mounds may be representative of higher status households not simply because they had access to more resources or time to accumulate more goods, but because they had a deeper history of ties to the land. Higher mounds as a result of accumulative construction indicates higher status in part because, "architecture expresses the concept of descent through the continuous use with modifications of a structure" (McAnany 2013: 113). Configurations of power at Aventura were based on connections to the ancestors.

Fig. 2. Map showing AAP's survey area displaying mounds, platforms, and pocket *bajos*.

3.2. Ecology and pocket bajos

Aventura is located in the southern portion of the coastal plain of the Yucatan Peninsula, which makes up the majority of the northern Maya Lowlands. The southern Yucatan Peninsula is relatively flat and of low elevation, ranging from sea level to 50 m above sea level. This peninsula is a plateau of karstic limestone floating on the ocean of Late Tertiary to Holocene seafloors (Rejmánková et al., 2008: 915; Walker 2016: 4). The karstic qualities of the limestone bedrock of the Yucatan Peninsula make it prone to cracking and sinking. Karstic depressions, areas where the bedrock has sunk, are non-draining areas of low elevation, and they were (and are) important resources because they have the potential to provide both water and agricultural land (Munro-Stasiuk et al. 2014). Additionally, karstic depressions had ideological importance in ancient Maya society, as they were seen as watery portals to the underworld (Brady and Ashmore 1999; Lucero and Kinkella 2015).

In his original 1974 survey, Sidrys identified three low-lying areas of approximately 0.2 km^2 in area within Aventura's city-center that he designated as *bajos.* When archaeologists today discuss *bajos,* they are referring to large karstic depressions (2–1000 km^2 in area) whose bases are above the water table and contain clayey soils and dense scrub vegetation (Beach et al. 2006; Dahlin et al. 2005; Dunning et al. 2015; Hansen et al. 2002). The "*bajos*" at Aventura more closely align with the definition of "pocket *bajos,*" which are geologically similar to *bajos* except that they are smaller (less than 2 km^2 in area). They are found along the margins of *bajos* inland at higher elevations, as well as along the eastern coastal plain where Aventura is located. Pocket *bajos* are far less studied than their larger cousins (Dunning et al. 2015; Lentz et al. 2014; Parker 2015). The people living around Aventura refer to these spaces as *bajos* today, and for the purposes of this article, I use the term pocket *bajo* to avoid confusion with the archaeological and geological definition of *bajo.* The landscape within and immediately surrounding Aventura is dominated by pocket *bajos*. These geological features were integrated into the city of Aventura and were important for its inhabitants.

Access to water in pocket *bajos* was likely key in Aventura's continued occupation during the regional droughts of the Classic Period. While today they are seasonally inundated and fill with water during the rainy season, it is likely pocket *bajos* contained standing water year-round during ancient Maya occupation. Although they are rainfed and connected to the New River drainage system, their location on the coastal plain suggests proximal distance to the water table influences their ability to retain water. In a pocket *bajo* excavation in 2019, we encountered a historic period glass bottle fragment between the interface of a thick layer of clay loam and bedrock. The earliest date for this bottle is the end of the 19th century CE (M. Oland, personal communication), and the presence of this artifact at the interface of the two deepest stratigraphic layers suggests the soil deposited on top eroded into the pocket *bajo* sometime around 1900 CE. Historic colonial accounts suggest by the 1880′s, these areas of low elevation flooded periodically (Burden 1935). A radiocarbon date was taken from the clay loam stratigraphic layer, 0.8 m below the surface. The uncalibrated age is $123 + -363$ ^{14}C years BP, corresponding to calendar years 1684–1930 CE with 68% certainty. These dates corroborate oral histories that indicate pocket *bajos* at Aventura held water year-round as recently as the War of Castes in Mexico (1847–1901), when the historic village of San Jose de los Abanes was founded (Oland 2018; R. Aban, personal communication July 19, 2017). These multiple lines of evidence suggest that pocket *bajos* at Aventura began to fill with sediment during the end of the 19th century CE and were seasonally inundated by the early 20th century CE. The maintenance of karstic depressions for water management, particularly prevention of erosion, has been documented elsewhere in the Maya area (Munro-Stasiuk et al. 2014).

4. Households

Survey and household excavations were used in order to investigate different types of access to pocket *bajos* in commoner and elite contexts. In AAP's survey of Aventura, the group was used as the primary cultural unit of analysis. A "group" as defined by AAP is collection of archaeological features that are within 20 m of each other. The 20-meter cut-off point was derived from ethnographic observations that contemporary Maya extended family house compounds tend to encompass an area with a 20-meter radius, as well as archaeological investigations that indicate most people disposed of refuse at a distance of 20 m (Robin 1999: 142, 360). Beyond civic-ceremonial plazas, most groups consist of groups of mounds (the remains of stone structures which were often ancient houses) and thus plausibly represents the social unit of the ancient household. In the following sections, I provide an overview of results from settlement survey that documented the spatial relationships between households and pocket *bajos,* as well as the excavations of two households, which provided evidence for access to biophysical and metaphysical qualities of pocket *bajos.*

4.1. Survey

AAP has mapped a total of 1.2 km^2 of the site core of Aventura. During survey, we mapped archaeological features such as mounds and platforms as well as pocket *bajos.* Previous work by Sidrys and initial site core survey by AAP established that three pocket *bajos* were nestled in the city-center of Aventura, with one, Bajo 2, directly abutting the 20 m-tall main temple. The association of Bajo 2 with civic-ceremonial architecture suggests an elite setting. There are also three household groups located along the northern edge of Bajo 2, all of which contain a mound that measured higher than 3 m during survey, which is AAP's cutoff for categorizing a household as elite (Grauer et al. 2020; Nissen, 2018). The presence of both civic-ceremonial architecture and residential dwellings related to Bajo 2 suggest it was important for both the leaders of Aventura and elite people living nearby.

In 2017, AAP conducted a transect leading 1 km northeast from Aventura's central plaza in order to gain a better understanding of settlement patterns beyond the site core. This survey found two additional pocket *bajos* surrounded by household groups. The furthest from the central plaza, Bajo 4, is 1 km northeast of the center of the site core. The low heights (39% less than 50 cm, 46% less than 1 m, 15% less than 2 m) of the mounds around Bajo 4 suggests they were associated with commoner residences (Ashmore and Wilk, 1988; Lohse and Valdez 2004; Robin 2003). The presence of these pocket *bajos* outside of the site core in proximity to commoner residences suggests that pocket *bajos* were important to commoners and elite alike.

In its totality, the survey found that 13 household groups were located within 20 m of a pocket *bajo* at Aventura. Of these 13 households, four were commoner, six were mid-range, and three were elite. These findings invite the possibility that households of all socioeconomic statuses had the opportunity to access the resources contained in pocket *bajos*. However, proximity alone does not equal access. Thus, these results were used to form the hypothesis that households of varying statuses had access, which was tested with the excavation of one commoner household on the edge of Bajo 4, and one elite household on the edge of Bajo 2.

4.2. Commoner household group 54

Group 54 (G54) is a commoner household located near the edge of Bajo 4 approximately 1 km west of the site core. G54 is in an area of smaller mounds than the site core, with the nearest elite household located 250 m away (Fig. 3). This household was selected for excavation because it is the furthest household group surveyed from the site core and it is very close—approximately 16 m— to a pocket *bajo*. This group consists of five mounds, with the three largest mounds organized around the north, west, and south edges of an open space, some of which were residential and some of which were ancillary. Gonlin (1993) and Sheets (1992) have identified some key difference in residential structures and ancillary structures at the sites of Copán and Cerén. Residential

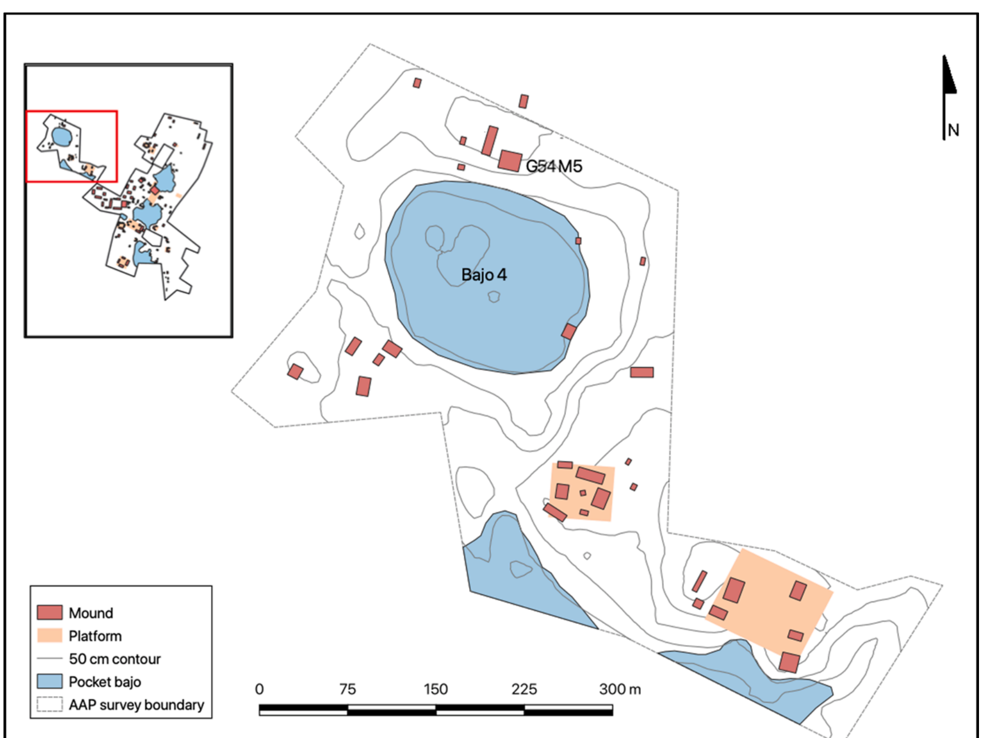

Fig. 3. Map showing the location of G54M5 in relation to Bajo 4 and other archaeological features. The groups on platforms to the south are elite households.

structures' areas are typically larger in area (13.5–66 m^2 at Copan and 14.72 m^2 at Cerén) than ancillary structures (12.62–25.22 m^2 at Copán and 10–10.4 m^2 at Cerén). Additionally, at both sites, residential mounds are usually rectangular, have one or more levels, and are prominently located in either the front or central area of a compound,. In contrast, ancillary structures are typically square or circular, only one level, and located in a non-central location such as the back of a compound (Robin 1999: 94). At Group 54, the large rectangular mounds organized around the central area were likely residential spaces. The two smaller square structures, one to the west of the grouped mounds and one to the south, were likely ancillary structures.

Excavations in the western ancillary structure, Group 54 Mound 3 (G54M3), revealed evidence of two burned areas with high amounts of charcoal, likely hearths. Underneath the hearths was a midden containing ceramics and groundstone. These features and artifacts, coupled with the fact that G54M3 is ancillary, suggest it was likely a kitchen (Grauer 2020b). The residential mound selected for excavation was Group 54 Mound 5 (G54M5), which is the largest structure in height and area in the group, and the closest residential structure to the pocket *bajo*. G54M5 was measured at 0.71 m in height during survey and is oriented 70 deg east of north.

Excavations at G54 reveal that human occupation started as early as the Late Preclassic (BCE 300–250 CE). The first signs of landscape modification are in the form of a 0.25 by 0.52 m high platform carved directly into bedrock that stood 0.18 m high and was associated with Late Preclassic artifacts stratigraphically below the refuse excavated just north of ancillary structure G54M3. Relative dating from ceramics indicate the Terminus Post Quem for the refuse deposit was the Middle Classic, and a radiocarbon date from the refuse dated to 429–541 CE with 68% certainty. Residential structure G54M5 consisted of a platform and two substructures that would have supported perishable superstructures in antiquity. The platform was constructed in sixteen phases of alternating fills, ballasts, and floors with a total of four floors. These construction phases range from the Early Classic through the Extended Terminal Classic (250–1100 CE) (Grauer 2020b; Walker 2020). A radiocarbon date was secured for the second deepest level of Fill 15 (sample ID Op14.K.9.C1). The uncalibrated date is 1734 + -37 ^{14}C years BP, corresponding to calendar dates 250–345 CE with 68% certainty.

4.3. (Meta)physical pocket Bajo access at G54

G54M5 sits atop the slope that leads into Bajo 4. The platform of G54M5 consisted of three terraced levels from the top of the structure toward Bajo 4 to the south. Off the lowest level of this platform, we encountered a small step leading toward Bajo 4. The terraced platform was the substructure for the perishable building on its summit. The step was constructed to abut the lowest substructural terrace. Additionally, the terrace levels were much wider than the step. The lowest level measured 1.5 m deep, and the second level measured 2.5 m deep while the step only measured 0.5 m deep. These physical characteristics of the construction of G54M5′s platform along with the spatial relationship to Bajo 4 suggest the commoners living at G54 were physically accessing the pocket *bajo* from the south side of this mound (Fig. 4).

During excavation, we encountered a secondary burial, Secondary Burial 9, on the middle terrace, just off the edge of the highest terrace of the platform (Fig. 4). Secondary Burial 9 was composed of a smashed Azcorra Interior Black Slip bowl, dating to the Late to Terminal Classic, that contained several human teeth. The categorization of deposits containing human remains has been debated in Maya archaeology (Hendon 2000: 47; Kunen et al. 2002: 19), and AAP defines secondary burials as deposits containing human remains that have been moved from their primary deposition location. The human remains uncovered in Secondary Burial 9 included the root of a molar, half of a premolar crown, and three tiny fragments of bone that may have been human, but were too poorly eroded to say for sure. The minimum number of individuals was one, and blunting wear on the premolar with no dentine

Fig. 4. Orthomosaic of G54M5 excavations showing the side of the structure facing the pocket *bajo*. The edges of the platforms and step are outlined in black. The three green arrows indicate platform levels, the blue arrow (closest to Bajo 4) indicates the step, and the star indicates the location of Secondary Burial 9. The test pit at the top of the trench penetrated into the substructure. North is the top of the image, and Bajo 4 is to the south. The width of the trench is two meters. (For interpretation of the references to colour in this figure legend, the reader is referred to the web version of this article.)

exposed suggests they have been a young adult (Moles 2020).

It was not uncommon for people to re-enter burials in ancient Maya society to interact with physical remains of the deceased (e.g., Chase and Chase 1994). Deposits whose only human remains are teeth are known as "tooth caches" and are thought to be a votive offering (Coe 1965; Pendergast et al. 1968; Saul and Hammond 1974). I hesitate to label Secondary Burial 9 a tooth cache because of the low number of teeth recovered and the possibility that the other bone fragments were remnants of cranial or mandibular bones, which would be indicative of a body part, not just teeth. Ancient Maya ancestor veneration often incorporated physical remains of the deceased and activities such as incense burning (Gillespie 2000: 473; McAnany 2013: 33) and was performed to (re)articulate social ties. Engaging with body parts of deceased family members linked present generations to past ones (Geller 2012: 124). As Gillespie notes, "Primary and secondary mortuary rituals transformed the dead into ancestral spirits, who…were mediators between living human beings and powerful cosmic forces" (2002: 69). Secondary Burial 9 may indicate ancestor veneration that incorporated physical remains of household members, effectively turning them into ancestors in order to access nonhuman realms. The act of ancestor veneration did significant social work, forming social memory as a means to forge social identities and relations (Joyce 2001: 13). Interestingly, Secondary Burial 9 was encountered in between the living space and the pocket *bajo*. This spatial relationship may indicate a connection between ancestor veneration and Bajo 4, and suggests commoners living at G54 were accessing the community-building qualities of the pocket *bajo*.

4.4. Elite household Group 22

Group 22 (G22) is an elite household on the northwestern edge of Bajo 2. It is composed of three mounds and one platform. G22 was selected for excavation because it is 205 m northeast of the main temple, directly across Bajo 2 (Fig. 5). The largest mound at G22, Group 22 Mound 3 (G22M3), is 3.1 m in height and is oriented 92 deg from north. G22M3′s height and architectural elaboration suggests people living at G22 were of the upper echelons of society, and its location within the site core provides an interesting comparison to G54, which is located on the periphery of the city. The mound G22M3 was excavated to examine the relationship between architectural construction and the pocket *bajo* edge. G22M3 sits on platform Group 22 Platform 1 (G22P1). Excavations at Group 22 included looter trench cleaning, trench excavations, and horizontal wall exposure excavations. A looter trench had previously exposed the superstructure of G22M3, and the cleaning of the looter trench provided a guide for new excavations. The excavations consisted of a trench in front of G22M3 that ran from the edge of Bajo 2 to the superstructure of G22M3.

Excavations indicate that human occupation started at G22 as early as the Late Preclassic (BCE 300–250 CE). The first signs of landscape modification are from the deposition of *sascab*, eroded limestone, in the Middle Classic. The platform G22P1 was built in a single construction phase in the Late to Terminal Classic (Kosakowsky 2019). The substructure of G22M3 sat atop the platform and has three terraced levels built in two construction phases. The substructure supported a masonry superstructure with one room and a vaulted stone roof. Excavations revealed that G22M3 was built in four construction phases. In its final phase the G22M3 substructure measures 3.1 m in height, making it one of the tallest households at Aventura outside of the site core.

4.5. (Meta)physical pocket Bajo access at G22

The room in the superstructure had a single doorway that faced west, directly toward Bajo 2. In the front of the structure, there was a stairway that lead down into the pocket *bajo* (Fig. 6). Due to the eroded status of the *sascab* that covered the stairway, it was impossible to tell how many stairs were present in antiquity. This particular household was less than 10 m away from two smaller mounds occupied at the same time period, but rather than face them, it was oriented to face the pocket *bajo*. Additionally, the staircase lead directly into Bajo 2, facilitating physical movement between the dwelling and the pocket *bajo*. This construction indicates people living at G22M3 were able to access the materials contained in Bajo 2.

Similar to Group 54, elites living at Group 22 were performing household ancestor veneration in between their house and the pocket *bajo*. Excavations of this elite household on the edge of Bajo 2 revealed that a Middle Classic *sascab* platform that was constructed had a large (40 cm) gap in it, in which the remains of a single side of an adult pelvis (ilium) was placed (Grauer 2020b; Moles 2020). This bone deposition,

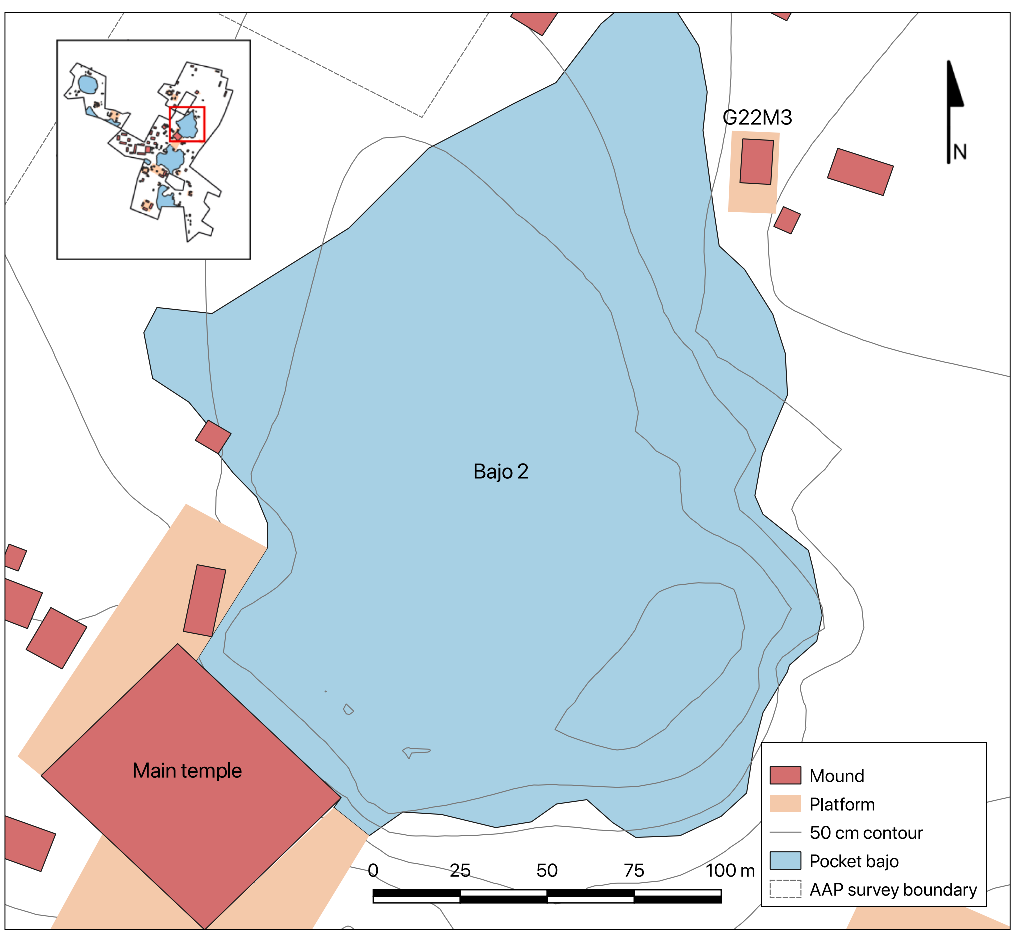

Fig. 5. Map showing the location of G22M3 in relation to Bajo 2, the main temple, and other archaeological features.

Fig. 6. Looking east toward G22M3. The line of stones in the foreground are the lowest level of the substructure, and the drop-offs in *sascab* are the terraces of the substructure. The stairway was exposed in the northern profile of the trench, and remnants can be seen to the left. The wall of stone is the superstructure.

Secondary Burial 1, was designated a secondary burial because no other bones were encountered, particularly femurs, which have the best preservation due to their robusticity (Moles, personal communication). That is, it is likely that the ilium was moved from its primary location and placed in the cut, perhaps as part of a practice of ancestor veneration. Matrix surrounding this secondary burial dated to the Middle Classic (Kosakowsky 2019). Directly on top of this cut in the platform was evidence of a burning event. The spatial relationship between Secondary Burial 1, the edge of G22P1, and Bajo 2 suggest that ancestor veneration at G22M3 was associated with the pocket *bajo.*

Bajo 2 was clearly important to the household at Group 22. Instead of facing nearby smaller mounds that date to the same time period, G22M3 was constructed to face the pocket *bajo*. Due to the multiple construction phases from different time periods, it is clear that Bajo 2 was important to Group 22 throughout time. In the Middle Classic, construction on the edge of the pocket *bajo* in the form of a layer of *sascab* suggests people were undertaking modification of the ecological landscape. The placement of a singular human bone in a cut in this *sascab* during this time suggests the relationship with the pocket *bajo* went beyond pure subsistence: the metaphysical properties of Bajo 2 were equally important. As with G54, people living at G22 were creating ancestors in between their dwelling and a pocket *bajo*, forging social relationships in association with the geological feature.

5. Discussion

On a city-wide scale, access to pocket *bajos* was not exclusive to elites. While the results from survey established the hypothesis that some households of different statuses had physical access to pocket *bajos*, excavations confirmed this. Data from survey clearly indicate that households from commoner to elite all had the opportunity for physical access due to proximity, and excavations indicate they constructed their households in such a way that allowed for physical access. The architectural elements most indicative of physical access to the material qualities of pocket *bajos* were steps. At the commoner household G54, a terraced platform with a small step off the edge led from the living space toward Bajo 4. At the elite household of G22, a *sascab* staircase lead from the front door of the superstructure, down the terraced substructure, and into Bajo 2. These constructions would have facilitated physical movement between the household and the pocket *bajo,* suggesting people living at both households were able to physically access the material water of biophysical importance in their respective pocket *bajos.*

Both households exhibit evidence of access to the equally important metaphysical aspects of water in pocket *bajos* through the act of ancestor veneration. Ancestor veneration did significant social work, including identity formation and social group creation. The acts of burning incense and engaging with materials of the deceased actively linked the living to cosmological forces. Clearly, pocket *bajos* were important to the people living at both households for more than just their ability to retain water for sustenance. Nonhumans such as ancestors and pocket *bajos* were active in the political ecology of Aventura (Grauer 2020a). Heterarchical political ecology is compatible with ancient Maya ontologies in part because it does not assume human hierarchical control over the environment: it has the potential to shift power to nonhuman actors. Heterachy's potential to include nonhuman actors in configurations of power is a fruitful line of inquiry for future research.

This decentralized water management contrasts with hierarchical access to markers of elite status seen at Aventura, such as access to resources (including labor) to construct larger dwelling structures. The combination of horizontal and vertical modes of access at Aventura are indicative of heterarchical political ecology. While elites likely wielded power over commoners to some degree, commoners were able to access both biophysical and metaphysical qualities of important water resources near their dwellings. Of course, just because commoner and elite households were able to access physical and metaphysical qualities of water does not mean they were equal. G22M3 sat directly across Bajo 2 from the main temple in the city's central plaza, indicating it may have carried more ideological power than Bajo 4. Additionally, the specific ecologies of the various pocket *bajos* during ancient Maya occupation at Aventura are currently being investigated by the author using microbotanical analysis. The heterarchical model proposed here allows for the addition of these varying degrees of hierarchy.

Another appealing aspect of a heterarchical model is that it is applicable at varying scales of analysis. Although households of all socioeconomic statuses had access to water during drought at Aventura, this does not mean that every individual had equal access. Power structures relating to pocket *bajo* access may have varied at the intrahousehold scale. For example, lines of difference such as gender and age may have impacted how various household members engaged with pocket *bajos.* Of course, just because these commoner and elite households had biophysical and metaphysical access to pocket *bajos*, this does not mean *every* household of varying statuses at Aventura had access. Of the 63 groups mapped at Aventura, 13 groups (20%) are within 20 m of a pocket *bajo* edge, meaning 80% of groups are not. As with households located on pocket *bajo* edges, households that are not located on pocket *bajo* edges range from commoner to elite. Even if not all commoners had access to pocket *bajos,* heterarchy can still be used to describe the political ecology of Aventura because it allows for multiple lines of power. While further excavation of a wider range of households would be needed to investigate these topics, the heterarchical model proposed here is well-suited to address such multi-scalar analyses.

6. Conclusion

In this article, I presented an example of heterarchical political ecology. I sought to examine the political ecology of Aventura in its ontological context by considering access to equally important biophysical and metaphysical qualities of pocket *bajos* in commoner and elite contexts. Material differences between households are evident in the archaeological record, and surely Aventura was not egalitarian. However, access to pocket *bajos* did not structure inequality on the city-wide scale. The pocket *bajos* were active organizing forces in the creation of community, and like people, they were a part of many hierarchies and assemblages. On the city-wide scale, they may have acted as equalizers. This indicates households at Aventura had the opportunity to be ranked in different ways, in line with a heterarchy. Heterarchy has been used to describe ancient Maya political economy, and the case of pocket *bajos* at Aventura demonstrates it can be used to describe ancient Maya political ecology as well.

Aventura's success during a time of regional ecological change and sociopolitical reorganization likely had to do with relationships to the environment and configurations of power. Less hierarchical than cities with abundant stelae and divine rulers who restrict access to water resources, commoners and elites alike had both physical access to water resources and access to their community-building qualities. Power was not derived from restricting access to water, even in times of drought. The set of power relationships that structured water management at Aventura does not sit easily within a Euro-Western capitalist ontology, where resource accumulation for control and power is commonplace. In the case of Aventura, a household's ability to access water regardless of socioeconomic status may have mitigated the effects of sociopolitical and ecological uncertainty.

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