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Mollusk Foraging and Gendered Labor at Litekyan (Ritidian) During the Spanish Contact Period in Guam[1]

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Abstract— Archaeological excavations at a 17th century multi-building *latte* household in the village of Litekyan (Ritidian) in northern Guam yielded a rich assemblage of mollusk shells. Analysis of the assemblage provided new insights on gendered labor as it was enacted through the foraging, cooking, consumption, and discard of mollusk shells where the labor of men and women was spatially segregated at two adjacent and contemporaneous *latte* buildings. The archaeological excavation of sixteen 1 x 1 m units alongside each of the two *latte* buildings recovered the mollusk shell assemblages from a single stratigraphic layer. Together, the analysis of eight units from the *latte* household excavation yielded an aggregate of 5,052.8 g of mollusk shell and a NISP count of 2603 intact shells and shell fragments. Taxonomic identification of shell from the two *latte* excavations offered an opportunity to compare their respective assemblages and determine whether (or not) they aligned with the expectations of ethnographic accounts of gendered labor in coastal societies. The unexpected diversity of mollusk taxa at the men's *latte* building (compared to the women's *latte* building), may reflect their access to a relatively broad resource catchment through inter-island trade and travel. If so, this pattern qualifies (but does not dismantle) the worldwide ethnographic generalization that women typically dominate mollusk foraging due to its compatibility with childcare and other domestic tasks. Moreover, unless a heretofore undocumented cultural taboo required women and men to eat in separate places, mollusks were consumed and discarded at both *latte* by all household members (i.e., women, men, and children). These findings raise new questions and provide valuable baseline information for developing further research in the Mariana Islands.

Introduction and Background

Ferdinand Magellan's 'discovery' of the indigenous CHamoru people in the Mariana Islands in 1521 was the first documented instance of European contact in Oceania. Figure 1 shows the island chain's location, approximately 2498 km E of the Philippines, home port of the Spanish Manila-Acapulco Galleon Trade. During the ensuing centuries, massive disruptions by the Spanish in the seventeenth and eighteenth centuries limited systematic ethnographic reporting on traditional CHamoru culture (Petersen 2009). In recent times, the people of Guam have been profoundly interested in documenting and regaining control of their traditional cultural heritage narrative. They

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have done so by welcoming archaeologists to independently assess the economic organization of traditional domestic household structures at Litekyan, currently addressed as Ritidian, with respect to gendered labor. Current studies (e.g., Amesbury et al. 2020, Bayman & Peterson 2016, Miller et al. 2021) exploring various roles and identities within a cultural context have become an essential aspect of archaeology because gender, status, age, roles in society, and other dimensions of variability profoundly impact worldview and how others perceive it (Vacca 2014). One such facet relates to gendered preparation and consumption of food in traditional societies. We can create a broader discourse relating to gendered foodways within the context of Oceania by examining oral traditions, considering intangible cultural heritage, and scrutinizing current archaeological materials (see Bayman et al. 2020). Accordingly, archaeologists have been developing methodological and analytical approaches to detect material signatures of nuanced gendered identities and processes within the archaeological record (Graff 2018, Van Gilder 2020).

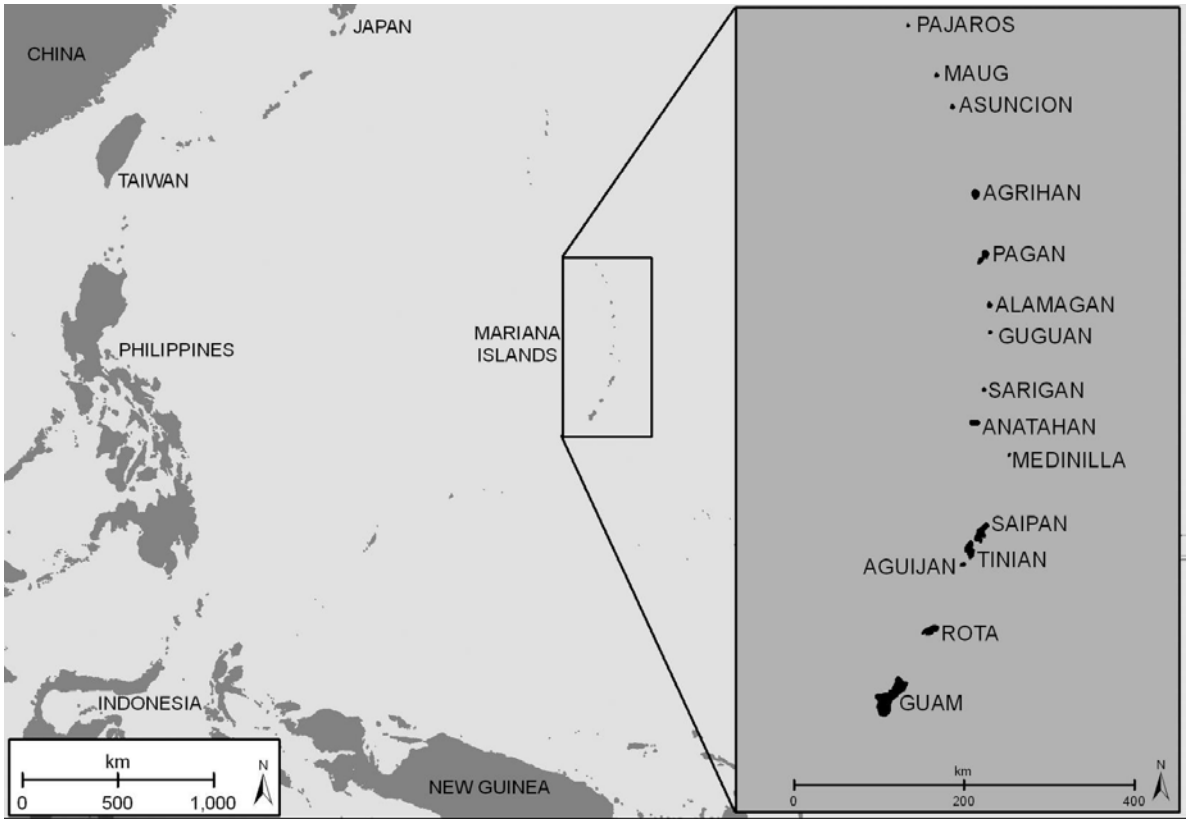

Figure 1. Map of the Mariana Islands chain (Carson 2015:5).

This study follows in the wake of recent archaeological studies in the Mariana Islands. Of significance, it is synchronic in nature: it compares two contemporaneous *latte* buildings that were parts of a single, integrated multi-building household. Further examination of traditional CHamoru household organization may have implications for how other households in the Marianas Islands, including but not restricted to Guam, were composed during and before the Spanish contact period. Previous studies (Bayman et al. 2012, Miller et al. 2021) revealed that labor at a multi-building household was gendered, and the economic activities of men and women were conducted at different *latte* buildings. The analysis of marine mollusks for this study considers whether women and men consumed and discarded the same kinds of mollusks at their respective *latte* building. If there are

differences in mollusks at the two *latte* buildings, what are the implications of that pattern for interpreting gendered labor in traditional households?

The findings of this paper add to previous research and attempts to draw further interpretations of traditional household economies from the marine assemblage to determine how mollusks relate to ascribed gender roles recalled in oral traditions and contact-period documentary accounts about CHamoru society. The University of Guam/University of Hawai'i at Mānoa field school excavations for three summers (2008-2010) focused on excavating the two contemporaneous *latte* sets that were part of a single multi-building household. The contents revealed in its stratigraphy are from a fixed period of activity during the mid-to-late 17th century. Because the site was rapidly abandoned, it has an exceptionally rich archaeological assemblage that captures the spatial organization of activities that were underway at the household at the moment its residents relocated. The stratigraphy and cultural materials at the *latte* household imply that it was used at the inception of *La Reducción* in the late 1600s, an event that is chronicled in Spanish document records about the village of Litekyan (Ritidian) (Jalandoni 2014).

Archaeological Context of Study

The erstwhile village of Litekyan is located at the northernmost tip of Guam (Fig. 2). As the largest and southernmost of the fifteen Mariana Islands in the far western Pacific, Guam embodies the complex outcomes of long-term natural and cultural history with a 3,500-year material record of heritage resources unrivaled in the remote western Pacific (Carson 2014). Litekyan is one of the oldest known habitation sites in the Marianas and Remote Oceania, with initial settlements predating the Lapita legacy in Melanesia and Polynesia between 1500–1100 B.C. (Carson 2014). Table 1 below offers a succinct chronological overview of the village into three major periods, beginning with the most recent events to the initial settlements. The earliest period (i.e., Pre-*Latte*) witnessed the initial establishment of coastal settlements and significant changes to the coastal ecosystem. The middle period (i.e., *Latte* Period) was characterized by the addition of settlements away from the coastlines, and the development of long-distance maritime trade. Finally, the inception of Spanish contact and colonialism followed Magellan's landfall in 1521.

Table 1. Chronological Chart of Ritidian Archaeological Record

Years	**Major Periods**
A.D. 1521–- 1698	Magellan's landfall in 1521; Jesuit mission in 1668; *La Reducción* in 1698.
A.D. 1000 -1700	*Latte* Period.
1500 B.C. – A.D. 1000	Pre-*Latte* Period.

Prior to Spanish contact, large villages replaced with houses built atop stone pillars known as *latte* were constructed in the Mariana Islands by A.D. 1000 (Carson 2014). Litekyan was constructed linearly along the coastline, with their house fronts facing outward (*mata na*) toward the sea. The village likely also had communal structures such as the men's houses (*I Mangguma' uritao*) and menstrual houses (Peterson 2012). The inhabited space at Litekyan expanded to 100,000 m² (or 0.1 km), and the eight clusters of *latte* sets discovered in the village (Carson et al. 2015) are derived from the paired rows of *latte* pillars (*haligi*) that supported capital stones (*tasa*) (Laguana et al. 2012). The areas to the sides of the *latte* buildings yield concentrations of artifacts and refuse and are dubbed the 'midden zone.' The material culture at *latte* sites exhibits a variety of changes along with modifications in land use (Carson 2012), with the material remains of the *Latte* Period (AD 1000-

1700) dominating the regional record (Dixon et al. 2020). Moreover, ethnohistoric accounts in the Mariana Islands speak to some of these same sites (Carson 2014).

Litekyan and many other villages were abandoned in the late 1600s during a period known as *La Reducción*, wherein the Spanish attempted to control native CHamoru populations (Jalandoni 2014). During *La Reducción,* the residents of households at Litekyan and other outlying villages were forcibly relocated to a small number of large, concentrated settlements. Only the stone foundations of *latte* sites survive today, often partly or completely collapsed. The remains of Litekyan are within the Ritidian Unit of Guam National Wildlife Refuge (GNWR) and managed by the US Fish and Wildlife Service (USFWS) (Carson 2014). The map presented in Figure 2 shows the area of the refuge, with the site for this study located near the West End Cave.

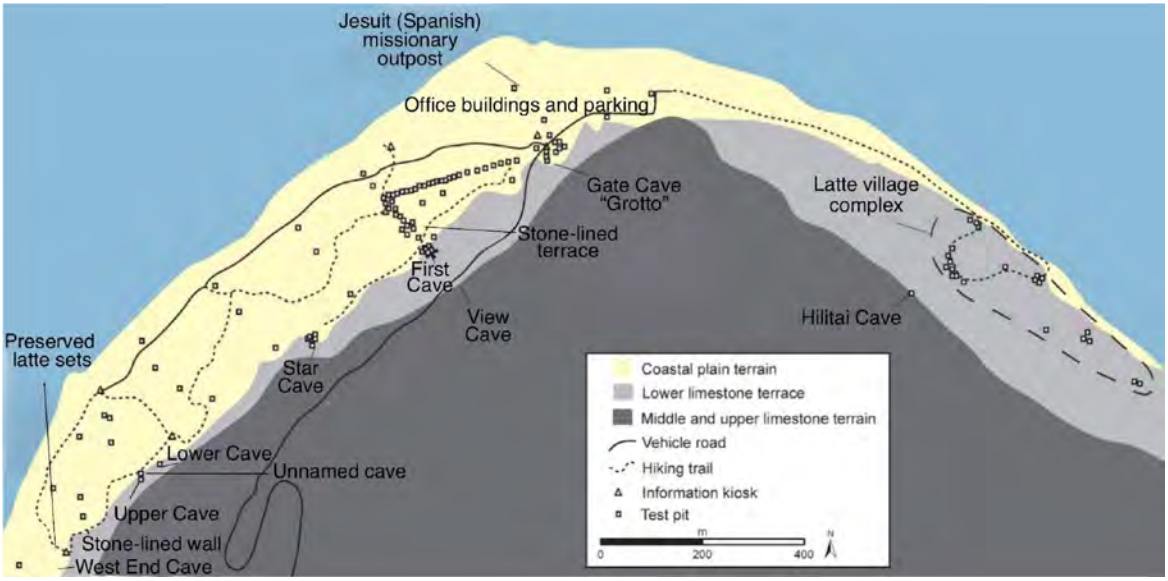

Figure 2. Map of the Guam National Wildlife Refuge showing the location of the two excavated *latte* (near the West End Cave) (Fig. 60 in Carson 2017).

The *Latte* Period is construed as the last indigenous CHamoru cultural era before large-scale transformations during the Spanish colonial era. Figure 3 is a depiction of how J.A. Pellion imagined what that period looked like at the time. Thus, the Litekyan site in the GNWR provides an opportunity to examine the archaeological record of traditional CHamoru household economic organization during the early Spanish contact period of 1521 to 1698 A.D. (Jalandoni 2014). The household complex studied in this paper (See Figs. 4 and 5) has a short time frame in comparison to the *longue durée* of the broader village, revealing a brief occupation in the mid to late 1600s. The two *latte* sets excavated during the field schools consist of four pairs of upright pillars (See Fig. 5). Four pairs are the modal number for *latte* sets in the Marianas archipelago, although they range from as few as three pairs to as many as fourteen (Russell 1998). The end-to-end orientation of the two *latte* buildings, the single stratigraphic layer of artifacts, and the fact they produced non-local artifacts like forged iron ship nails, and a 17th century East Asian porcelain, indicate the site was contemporaneous with the Spanish contact period. Because there is no evidence of recycling *latte* stones or other materials at either of the buildings, archaeological deposits in this locale are intact and undisturbed. The forcible abandonment of Litekyan during *La Reducción* in 1698 (Jalandoni 2014) ensured that these buildings were occupied during the last intensive traditional use of the area.

Figure 3. Painting by J.A. Pellion (1819). Village life in Guam.

Figure 4. Photograph of the completed excavation of *latte* set 1 (Photo courtesy of Hiro Kurashina).

In a preliminary study, Bayman et al. (2012) investigated the organization of economic household activities the CHamoru practiced during the Spanish contact period. The photograph in Figure 4 shows the completed excavation of *Latte* set 1 in 2008. The excavation teams identified five major classes of cultural materials derived from domestic activities: stone mortars (*lusong*), pottery and burnt clay, unworked marine shell remains and faunal bone, stone and shell tools/debitage, and human skeletal remains. *Latte* set 1 exhibited a concentration of food preparation and storage activities in the form of broken ceramic vessels, chipped stone, terrestrial and marine shells, wood charcoal, and plant microfossils (i.e., sweet potato taro, banana), whereas *Latte* set 2 offered evidence of other craft activities via its fishhooks, shell adzes, and bone tools (e.g., awls). The presence of sweet potato – a Spanish introduction in Micronesia via the Manila Galleon (Yen 1974) – corroborates other archaeological evidence of the household's contact period occupation (i.e., the glass bead, iron ship nails, and East Asian porcelain).

Bayman et al.'s (2012) findings disclosed that the two *latte* structures exhibited differences in economic activities during the early Spanish period. An institutionalized gendered labor system likely enforced this apparent division of labor. Differences in craft and subsistence activities at the two adjacent and contemporaneous *latte* buildings imply their occupants were members of a single cooperative household that distinguished their economic activities by gender (Russell 1998). The archaeological evidence that adjacent *latte* buildings at Litekyan were functionally differentiated demonstrates that traditional CHamoru household economic organization should be investigated with broad horizontal excavations rather than isolated units.

Miller et al. (2021) evaluated and refined the interpretations of (Bayman et al. 2012) by examining ceramic assemblages from the same two *latte* structures. Figure 5 illustrates the cooking hearth features that were identified along the "back patio" portion of *Latte* 1, where Bayman et al. (2012) concluded that women's labor was undertaken. Miller et al. (2021) determined that the ceramic vessels at the two *latte* buildings were used for different purposes. The ceramic vessels at *Latte* 1 were used for cooking and storage, whereas vessels at *Latte* 2 were used for serving and consuming meals. Their research utilized observations of the archaeological record to detect spatial dimensions of gendered labor and household organization missing from Spanish accounts and found that the production and pottery use within the household has significant implications for household archaeology. The charcoal and hearth features found in *Latte* 1 (see Fig. 5) were used for cooking and their absence at *Latte* 2 is notable (Miller et al. 2021).

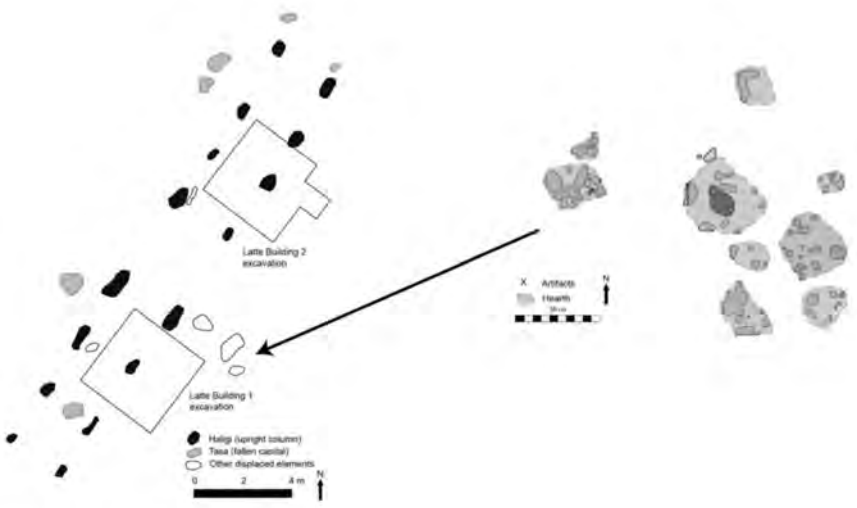

Figure 5. Household excavation site (Miller et al. 2021). *Latte* Building 1 reveals cooking hearth features alongside its structure.

Marine Resource Foraging in the Mariana Islands

Harvesting marine resources is a practice traced back to the initial colonization of remote Oceania, with the earliest recorded settlements revealing a heavy reliance on marine foraging rather than horticulture (Nunn & Carson 2015). Fin fish and other edible aquatic fauna were the major sources of animal protein of the early CHamoru people (Russell 1998, Thompson 1945). Traditional fishing grounds had names shared by clans or matrilineage (Cunningham 1992). Each district had a chief (*måyotdomu*) who controlled fishing practices and access to their respective marine territories. Thus, any given group confined their activities of fishing, farming, plant gathering, and hunting to their own district (Jennison-Nolan 1979). Oral traditions reveal a division of labor according to sex and caste; women typically made herbal medicines and coconut oil, manufactured pots, wove mats and other articles to display or store food, and cooked with other women while men constructed houses and canoes, fashioned tools and fishing gear from wood, stone, and shell, and constructed canoes and housing (Jennison-Nolan 1979). The lower caste (*manachang*) was restricted to land use activities such as food gathering and farming while men of the chiefly class (*matua*), could fish and navigate the open ocean on deep sea fishing expeditions (Jennison-Nolan 1979).

As small packages of meat sealed in heavy inedible shells, shellfish are considered a minor source of calories and protein in comparison to other sources of meat from the viewpoint of a human predator. However, they serve as an efficient and reliable protein staple, dwelling in predictable locations that can be universally exploited by all group members, including women, children, and aged individuals (Erlandson 1988). Cross-culturally, men did not participate in these activities as often as women despite their ability to collect and carry back significantly larger amounts of mollusks (Waselkov 1987); instead, men focused on terrestrial hunting or pelagic fishing. Maintaining the freshness of shellfish required limits on the distance live mollusks could be transported in quantity with simple technologies; any transport beyond those limits exceeds energy gained from the food (Waselkov 1987). CHamoru women's matrilineal ties to the land and child-related responsibilities likely kept them within the vicinity of their village; the *latte* household investigated for this study is approximately 75 m inland from the shoreline. Similarly, there is evidence in Hawaiian oral traditions women and children mainly harvested *Strombus* and other easily-obtained shellfish within the lagoon due to their compatibility with childcare, low danger, and proximity to the household (Connors 2009).

Strombus, or *do 'gas,* are among the most common gastropods recovered from site middens in Guam and raise questions about a possible change in dietary preference, cooking recipes, and other factors not transparently expressed in archaeological material records (Carson 2014). Other *latte* sites in Hagåtña village and northern Guam reveal that mollusks such as *Trochus*, lobster, and crab might also have been eaten (Jennison-Nolan 1979). Women also participated in net fishing with the men using large drag nets (*chenchulo*), casting nets (*talaja*), and hand nets (*lagua' atchuman*) (Thompson 1945). The Chamorro-English Dictionary (Topping et al. 1975) listed over one hundred types of fish, but this study focuses on mollusks. Long clams (*Palos*), *Tridacna* (*Hima*), members of the *Turbinidae* family (*Pulan*), several species of the *Neritidae* family (*Pedis*) and *Charonia trinonis* (*Kulo'*) were harvested in shallow reefs while *Turbo* (*alilang pulan*) and *Trochus* (*Alileng*) were harvested in the middle and outer reefs and intertidal waters and required freediving by men (Cunningham 1992, Jennison-Nolan 1979).

Cunningham (1992) highlights the typical forms of cooking in CHamoru traditional culture: *Tunu* (roasting over embers), *Na'lagu* (cooking in a pot), *Saibok* (boiling starches), *Changkocha* (boiling protein foods), *Chahan* (cooking in a deep pit, not present in this site), and *Kelaguen* (cooking without fire). Gastropod shells were scrubbed vigorously in seawater at the beach and then boiled in coconut milk to remove toxins and cause the animal to protrude from the shell just enough so that it could be extracted in one piece and eaten whole (Jennison-Nolan 1979). Miller et al. (2021) contemplated the possibility that women and preadolescent boys and girls prepared and consumed their meals in vessels at *Latte* 1 while men consumed food from smaller serving vessels at the

adjacent *latte* building where they engaged in other kinds of craftwork. The traditional separation of men and women during the consumption of meals is customary in some societies in the Pacific (e.g., Hawaii), so perhaps it was also practiced in the Mariana Islands. Another facet of economic labor division in traditional CHamoru culture is the *mangkalamya*. Children were typically socialized into a specific gender to learn crafting from a same-sex parent or another relative in a wide range of skilled but unspecialized tasks. Exceptions were made in certain cases where an individual exhibited expertise in tasks ascribed to the opposite gender, such as a man who was proficient at weaving, or a woman who was skilled at offshore fishing (Bayman et al. 2012).

Besides their contributions as a source of protein, mollusks had many other uses. Table 2 highlights the most common uses for CHamoru mollusk resources, with most of the species in the site collection underreported. In addition to their value as a source of protein, marine shells also played a vital role in many ancient political economies, functioning as prestige goods (e.g., Bayman 2002). Amesbury et al. (2020) argue that shell ornaments, such as *Conus* and *Spondylus*, marked social status attributes such as rank clan membership and leadership. Other shells, such as *Isognomon* and *Tridacna*, proved useful as tools for woodworking and other tasks (Bayman et al. 2012). Moreover, pieces of cowrie (*Cypraea*.) shells were sometimes used to make octopus lures in the Mariana Islands (Carson & Hung 2021).

Table 2. Known mollusk usage in CHamoru traditional culture and the most common uses for the most abundant shells in the archaeological record.

Taxon	Food	Tool	Jewelry	Shell Money
Anadara	x	x		
Canarium	x			
Clithon	x			
Codakia	x			
Conus			x	
Ctena	x			
Cypraea		x	x	
Luria	x			
Lyncina	x			
Monetaria		x	x	x
Nerita	x			
Patelloida	x			
Quidnipagus	x			
Rhinoclavis			x	
Sabia	x			
Spondylus			x	
Tectarius	x			
Tellina	x			
Tridacna	x	x		
Trochus	x	x		
Turbo	x	x	x	

Materials and Methods

Examination of the mollusk shell collection was undertaken in the Micronesian Area Research Center (MARC) at the University of Guam, where the excavated collections are curated. A sample of four units was selected in the landward 'back patio' of each of the two *latte* sets where crafting, cooking, or other practices took place (Fig. 6). In previous studies, the orientation of a typical *latte* house was such that one side faced the direction of the coastline where public events are thought to have transpired (Esteban 2002). The checkerboard strategy we used exemplifies a systematic approach to sampling that provides even coverage of the area where the expected subsistence and craft activities were conducted. Land shells, such as *Achatina fulica* and *Pythia scarabaeus,* were identified and weighed but were excluded from this report, as is customary in analyses of mollusk assemblages. The intact *Trochus* shells, *Isognomon* fishhooks, and worked *Tridacna maxima* shells that were previously identified as tool shells (rather than food shells) had been weighed and counted by Bayman et al. 2012; these items were not subject to further analysis by this study.

All molluscan remains were identified to the lowest possible taxa using relevant monographs and identification manuals (i.e., Carpenter & Niem 1998, Cernohorsky 1972, Poppe 2008), and Indo-Pacific molluscan reference collections held at the University of Queensland. Due to the richness of atoll molluscan fauna (Kay & Johnson 1987) and Indo-Pacific Mollusca generally (Bouchet et al. 2002:421), taxa were identified solely by diagnostic features present on individual fragments, rather than assuming fragments derive from dominant taxa (Szabó 2009, Wolverton 2013). Taxonomic nomenclature was verified using the World Register of Marine Species online database (WoRMS Editorial Board 2022). This approach to identification results in lower resolution foraging reconstructions due to fewer species-level identifications, yet it is preferable to avoid the introduction of errors through overidentification. Due to trampling and other formation processes (Reitz & Wing 1999, Schiffer 1987) that had fragmented and degraded the mollusk shell assemblage – such as crafting and food preparation – this taxonomically-conservative approach was deemed necessary.

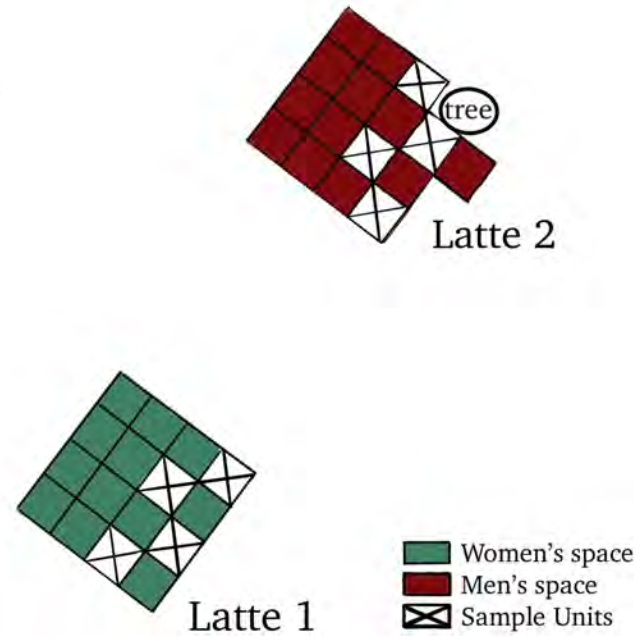

Figure 6. Visual representation of *Latte* 1 and 2. The units that were sampled are highlighted with an X.

Where possible, a physical catalog of marine shells in the MARC was the primary reference for identifying the collections at the taxa, genus, and species levels. Their names were subsequently updated with the World Register of Marine Species (WoRMS). WoRMS is an online register moderated by taxonomic and thematic experts to provide an authoritative and comprehensive catalog of names of marine organisms, prioritizing valid and past names of organisms so the register can serve as a guide to interpret taxonomic literature (WoRMS Editorial Board 2022). The Number of Identified Specimens per Taxon (NISP) count of each unit preceded the initial identification and became the most reliable counting system for this project due to time constraints and the fragmented nature of some of the specimens. MNI and NISP are the most commonly used methods by zooarchaeologists to examine differences within and between assemblages (Claassen 1998, Grayson 1984, Walker 1992) and each has certain limitations. NISP on its own assumes that all specimens are equally affected by chance or by deliberate breakage. If used uncritically, this assumption often creates misleading results and sample inflation while MNI independently might only represent animal segments rather than whole animals (Grayson 1984). Both methods ideally would be used together, and with more time and further study, recording this Litekyan household's MNI counts could provide a more precise approximation of the actual number of animals within this study's sample population.

In addition to the collection of NISP counts the identified specimens were weighed in aggregate with a digital scale to the tenth place to determine fragment weights, as no scale with a hundredth decimal place or finer was available. Weight is often recorded to expedite shell quantification in cases where shell and bones are highly fragmented or high in number; however, weight alone does not illuminate an *in situ* assemblage (Grayson 1984). For example, weight does not account for the degree of fragmentation in molluscan remains. Additionally, since weight has variances between taxa and is a byproduct of various taphonomic processes, it is nearly impossible to know for certain the number individuals collected from each species solely by their weight (Poteate & Fitzpatrick 2013). Thus, for the purposes of this study, the following analyses will rely on the recorded NISP counts.

Lastly, the mollusks were ranked for both *latte* sets and statistical calculations of density, diversity, richness and evenness were compared to determine if there are noticeable differences between the men's and women's labor spaces. This was deemed necessary due to the difference in sample size at the two *latte:* the total weight of analyzed mollusks from *Latte* 1 was 2964.3 grams, whereas the total weight at *Latte* 2 was 2088.50 grams. Quantifying biodiversity is difficult due to various methods designed to examine the multidimensional property of natural systems; the existing indices aim to describe general properties of communities for comparing different regions, taxa, and trophic levels despite a lack of consensus about which indices are most appropriate and informative (Morris et al. 2014). Density measures the volume of taxa per area excavated with the formula Density = mass/volume. Diversity appraises taxa abundance with no upward limit; the higher the index, the more diverse the taxa are in the habit. Richness calculates the number of taxa within a habitat, and evenness represents their relative abundance between the values of zero and one, with high values indicating that relatively equal numbers of individuals belong to each taxa (Morris et al. 2014). This study employed the Shannon Diversity Index (*H'*) Online Calculator (https://www.omnicalculator.com/ecology/shannon-index) a commonly used index for measuring the diversity of taxa in a community, accounting for richness and evenness with the mathematical equation $H' = -\sum[(p\text{i}) \times \log(p)]$, where ($p$i) is the proportion of individuals if i-th taxa in a community (n/N); n individuals of a given taxa; (N) total number of individuals in a community; and ($\sum$) is the sum (Nolan & Callahan 2006).

Results of Analysis

The mollusk assemblage from the sample units in the multi-building household comprises an aggregate sum of 5,052.8 g of shell and a NISP count of 2603 aggregate intact shells and shell fragments. The study could not identify 15.37% of the shells due to their alteration by animal predation, cultural formation processes (e.g., tool-making), or natural taphonomic impacts. Table 3 enumerates the mollusks identified at the genus level that were consumed and discarded at the two *latte* buildings, with the left column representing *Latte* 1's NISP counts and aggregate weight and *Latte* 2's measurements to the right. The highest concentrations of shells within the analyzed midden belong to food mollusks such as *Canarium* (formerly identified as *Strombus*), *Turbo*, *Tellina*, and various unidentified *Conidae* species (See Figure 7 for a representative sample of one of the excavation units). Of these abundant shells, the genus *Conus* was unlikely to be consumed due to its venomous nature (Kohn et al. 1960), but some sources hypothesize that it was used in making tools or jewelry (Amesbury 1999, Amesbury et al. 2020, Kirch 1988).

Table 4 summarizes the genera identified in the sampled excavation units and organizes them according to their native habitats. Identifying where each genera originated is important for investigating whether or not their geographic location aligns with the expectations of the gendered labor hypothesis i.e., that women gathered mollusks near the shore, whereas men secured mollusks along the outer reef edges and beyond. Toward that end, four observations for the genera were tabulated: predominant habitats, the gender/status of those likely to harvest the mollusks, the genera found in each habitat with their total NISP counts, and the total NISP that is likely attributed to each habitat.

As noted previously, documentary sources and ethnographic accounts indicate that women usually foraged alongside rocky shorelines, intertidal zones and sandy substrates, whereas men typically gathered mollusks on the slopes of fringing coral reefs and in deep ocean waters. Table 4 reveals that the most concentrated area of genera is within the sandy substrate where the women and children (rather than men) were presumed to gather mollusks. What is currently unclear is the presence of genera from freshwater and brackish habitats, as the freshwater catchment is historically associated with the commoner (*manachang)* class (Givens 2000). Including the NISP counts with their corresponding genera reveals which habitats were hotspots for mollusk procurement, and Table 4 shows that the most frequently harvested habitat is the sandy substrate (where women would have foraged) followed by the fringing coral reef and rocky shores (where men would have foraged).

Figure 7 is a visual representation of one of the sample excavation units. It reveals that the condition of the *Canarium mutabile* ranges from intact to highly fragmented. The *Turbo* shells are highly fragmented and less abundant, but due to their heaviness of the shell, it ranks higher in aggregate weight. The *Tellina* shells are also highly fragmented and varied in their relative abundance per unit. The entirety of the shell assemblage has a uniform ashy gray hue, perhaps through natural taphonomic processes, or the heating of food with hearths, as hypothesized by Bayman et al. (2012) and Miller et al. (2021).

LATTE 1

The mollusk assemblage from *Latte* 1 is both taxonomically rich and even, represented by 23 families, 25 genera, and 30 species (total NISP = 1304, Table 3). The Shannon diversity index = 2.58; evenness = 0.751, richness (number of genera) = 31, average population size = 42.1. The average NISP per excavated unit is 326. Figure 8 shows the rankings of units 1 - 4, with *Conus, Turbo, and Canarium* as the most common gastropods in terms of NISP. *Canarium*, formerly classified as *Strombus*, is a preferred food mollusk typically boiled in coconut milk before consumption (Jennison-Nolan 1979). This finding aligns with the concentration of textured surface sherds from ceramic vessels used for cooking at *Latte 1* (Miller et al.2021). The *Turbo*

Table 3. Number of Identifiable Specimens Present and aggregate weights for mollusk shells from Latte 1 and Latte 2.

	Latte 1		*Latte 2*	
Taxon	**NISP (% of total)**	**Weight in g (% of total)**	**NISP (% of total)**	**Weight in g (% of total)**
Anadara	17 (1.30%)	30.1 (1.01%)	13 (1.00%)	19.6 (0.94%)
Asaphis	5 (0.38%)	4.9 (1.7%)	12 (0.92%)	16.5 (0.79%)
Barbatia	0	0	2 (0.15%)	1.2 (0.06%)
Canarium	188 (14.41%)	212.6 (7.17%)	259 (19.94%)	248.1 (11.88%)
Cerithiidae *sp.*	17 (1.30%)	26.6 (0.90%)	4 (0.30%)	1.5 (0.07%)
Cerithium	81 (6.21%)	251.8 (8.49%)	103 (7.93%)	111.3 (5.33%)
Clithon	0	0	1 (0.08%)	0.2 (0.01%)
Codakia	29 (2.23%)	289.1 (9.75%)	4 (0.31%)	4.2 (0.20%)
Conus	189 (14.49%)	502.5 (16.95%)	0	0
Conidae	0	0	124 (9.55%)	228.9 (10.96%)
Conidae *sp.*	0	0	11 (0.85%)	18.1 (0.87%)
Ctena	0	0	2 (0.15%)	3.3 (0.16%)
Cypraeidae *sp.*	5 (0.38%)	9 (0.30%)	75 (5.77%)	84 (4.02%)
Cypraea	21 (1.61%)	29.8 (1.00%)	0	0
Drupa	27 (2.07%)	60.6 (2.04%)	17 (0.62%)	16 (0.77%)
Drupella	1 (0.08%)	0.4 (0.01%)	3 (0.23%)	0.5 (0.02%)
Gafrarium	1 (0.08%)	1.7 (0.06%)	8 (0.62%)	3 (0.14%)
Gutturnium	21 (1.61%)	45.9 (1.55%)	37 (2.85%)	71.7 (3.43%)
Lucinidae *sp.*	0	0	8 (0.62%)	6.1 (0.29%)
Luria	2 (0.15%)	5.5 (0.19%)	0	0
Lyncina	27 (2.07%)	86.7 (2.92%)	0	0
Modiolus	4 (0.31%)	5.9 (0.20%)	0	0
Moneteria	27 (2.07%)	48.9 (1.65%)	53 (4.08%)	70 (3.35%)
Mytilidae *sp.*	0	0	1 (0.08%)	0.9 (0.04%)
Naticidae *sp.*	0	0	3 (0.23%)	2.8 (0.13%)
Nerita	18 (1.38%)	8.4 (0.28%)	24 (1.85%)	5.6 (0.27%)
Neritidae *sp.*	0	0	37 (2.85%)	12.5 (0.60%)
Patelloida	10 (0.77%)	6.1 (0.21%)	3 (2.23%)	1.6 (0.77%)
Pseudonebularia	0	0	1 (0.08%)	0.5 (0.02%)
Quidnipagus	25 (1.92%)	22.1 (0.75%)	19 (1.46%)	14.7 (0.70%)
Rhinoclavis	2 (0.15%)	0.6 (0.02%)	2 (0.15%)	0.5 (0.02%)
Sabia	0	0	1 (0.08%)	0.9 (0.04%)
Spondylus	5 (0.38%)	5.6 (0.19%)	0	0
Tarebia	1 (0.08%)	1 (0.03%)	0	0
Tectarius	0	0	1 (0.08%)	43.8 (2.10%)
Tellina	150 (11.50%)	170.6 (5.76%)	80 (6.16%)	119 (5.70%)
Tellinidae *sp.*	0	0	5 (0.38%)	3.1 (0.15%)
Tenguella	0	0	5 (0.38%)	6.1 (0.29%)
Terebra	3 (0.23%)	6.8 (0.23%)	0	0
Tridacna	20 (1.53%)	255 (8.60%)	15 (1.15%)	36.3 (1.74%)
Tridacnidae *sp.*	0	0	1 (0.08%)	3.5 (0.17%)
Trochidae *sp.*	2 (0.15%)	23.6 (0.80%)	5 (0.38%)	85.6 (4.10%)
Truncatellidae *sp.*	2 (0.15%)	0	0	0
Turbo	189 (14.49%)	536 (18.08%)	131 (10.08%)	218.2 (10.45%)
Unidentified Shell	188 (14.42%)	218 (7.35%)	212 (16.32%)	486.3 (23.38%)
Vasum	27 (2.07%)	98.5 (3.32%)	17 (1.31%)	142.4 (6.82%)
Total	**1304**	**2964.3**	**1299**	**2088.5**

Table 4. Mollusk genera and their corresponding habitats along with hypothesized gender and social status. *Chamorri* are the chiefly class and *manachang* are the commoner class (Paulay 2003; Roth 1976).

Predominant habitat(s)	Status	Genera found in habitat (NISP)	Total NISP
Above sea		*Tectarius* (1)	1
Intertidal waters	Men/ *Chamorri*	*Modiolus* (4), *Pseudonebularia* (1), *Tectarius* (1)	6
Sandy substrate	Women/ *Chamorri*	*Canarium* (447), *Conus* (313), *Tellina* (230), *Monetaria* (80), *Gutturnium* (58), *Drupa* (44), *Quidnipagus* (44), *Vasum* (44), *Nerita* (42), *Tridacna* (36), *Anadara* (30), *Lyncina* (27), *Gafrarium* (9), *Rhinoclavis* (4), *Terebra* (3), *Ctena* (2), *Luria* (2), *Pseudonebularia* (1)	1416
Fringing Coral Reef	Women/Men/ *Chamorri*	*Turbo* (320), *Conus* (313), *Cypraea* (101), *Monetaria* (80), *Gutturnium* (58), *Quidnipagus* (44), *Tridacna* (36), *Codakia* (33), *Lyncina* (27), *Asaphis* (17), *Trochus* (7), *Spondylus* (5), *Drupella* (4), *Modiolus* (4), *Ctena* (2), *Luria* (2), *Pseudonebularia* (1), *Sabia* (1), *Tectarius* (1)	1056
Brackish water	*Manachang*	*Nerita* (42), *Clithon* (1)	43
Rocky shores	Women/ *Chamorri*	*Patelloida* (13), *Spondylus* (5), *Tenguella* (5), *Drupella* (4), *Pseudonebularia* (1)	28
Fresh water	*Manachang*	Tarebia (1)	1

Figure 7. A representative sample of one of the excavated units. (Photo by Rico Roldan)

fragments within the collection were common and likely produced by cooking techniques and manufacturing (Dixon et al. 2006) as well as associated with betel nut (*pugua'*) chewing, which was a common social practice among both men and women. Betel nut chewing is still practiced in Guam. Pugua' is chewed with papulu (pepper) leaves and slaked lime (*åfok*) and was traditionally kept in a small container made from coconut shell (*ha'iguas*), bamboo, or marine shell, such as the *Turbo* shell (*alilang pulan*) (Russell 1998). As noted earlier, Tridacna shell adzes were removed from this study. Thus, some of the *Tridacna* fragments may be byproducts of tool making and/or food preparation. In a comparative ethnographic study in Fiji, Jones & Quinn (2009) observed women and adolescents conducting inshore fishing 3–6 days a week, regularly consuming shellfish in small quantities. Their case study revealed how women and children typically eat shellfish as a snack while fishing along the shore, and children crack open shellfish and snack on them while roaming the reefs at low tide. Other island groups may have practiced this modern activity, including the traditional CHamoru society, which would suggest that those practices would not be represented in the archaeological record as the actors did not use the same areas for breaking open the shell.

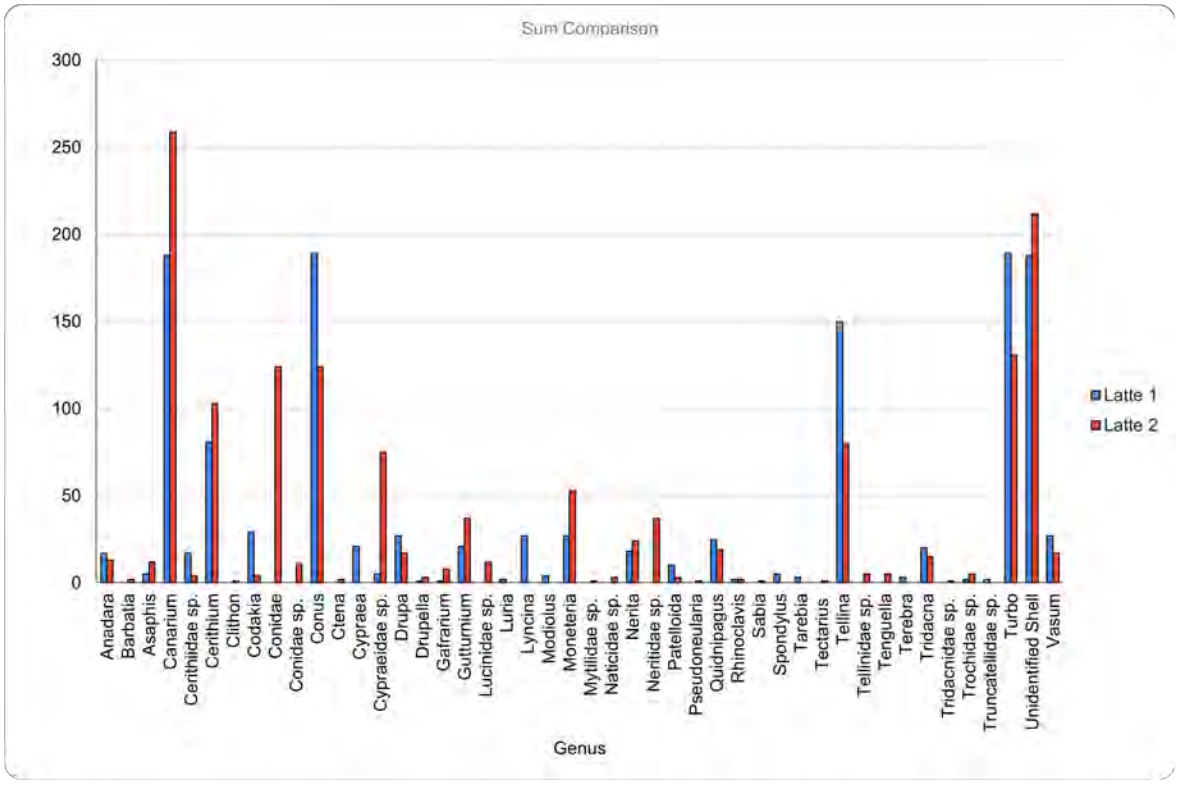

Figure 8. Rank order analysis of Latte 1 and Latte 2 mollusks.

LATTE 2

The mollusk assemblage from Latte 2 is both taxonomically rich and even, represented by 22 families, 26 genera, and 26 identified species (total NISP = 1299, Table 3). The Shannon diversity index = 2.64; evenness = 0.732, richness (number of genera) = 37, average population size = 35.1. The average NISP per excavated unit is 324. Figure 8 displays the ranking of each taxa in units 5 - 8, which was characterized as a men's locale associated with crafting activities that are signaled by its abundance of shell adzes, fishhooks, and more than eleven times the beads found in *Latte* set 1

(Bayman et al. 2012). *Canarium* comprises an astonishing 19.94% of the entire collection even though they were recovered from a *latte* building that lacked hearths, and instead contained relatively small ceramic vessels for food consumption (Miller et al. 2021). According to documentary sources, *Cyprea* and *Monetaria* were made into shell money, while *Trochus* and *Conus* shells were often bisected into jewelry (Russell 1998), which may, along with the large number of beads discovered within, suggest that jewelry-making was predominantly a men's task.

Latte 2 yielded a higher frequency of unidentifiable shells, which may be byproducts of tool-making (e.g., shell adzes, fishhooks). Men could have consumed meals while working (Miller et al. 2021), and food gastropods and the minimal fragments of bivalves seemingly confirm this behavior. The results from Shannon's index show that *Latte* 2 is marginally higher than *Latte* 1, boasting more diversity in marine mollusk taxa, and yet the difference in the average NISP per excavated unit is negligible. This could mean the denizens of the multi-building household (i.e., *Latte* 1 and *Latte* 2) were not necessarily pulling from different sources since they are so close together. Perhaps they removed the empty shells and discarded them before serving. Another possibility is that everyone -- i.e., women, men, and children all ate together at *Latte* 2, which could also account for the greater (albeit minor) diversity of taxa at the men's *latte*. Eating away from the smoke that would have emanated from the numerous hearths at *Latte* 1 could have encouraged the consumption of food in the vicinity of *Latte* 2 and elsewhere. The greater diversity of mollusk taxa at the men's *latte*, albeit relatively marginal, could also be symptomatic of their access to a broader resource-catchment via offshore fishing, inter-island travel, and exchange.

The mollusk assemblage from *Latte* set 2 yielded more unidentifiable shells than *Latte* 1, which may indicate different behavioral practices related to shell processing and other cultural formation processes. The finer fragments are likely to be byproducts of tool-making, but they might also relate to the smashing of mollusk shells at or near their apex to release internal pressure and extract their flesh. Linares de Sapir (1971) noted that the Diola of southern Senegal still prepare their gastropods in this manner. Researchers who boiled terrestrial gastropods for taphonomy experimentation confirmed that boiling leaves no visible trace on mollusk shells (Aldeias et al. 2019, Oertle & Szabó 2022). As shown in Table 3, *Canarium* comprises a total of 14.42% of the entire assemblage at *Latte* 1 versus 19.94% of the *Latte* 2 assemblage. The *Trochidae* shows a NISP difference of 5, but a substantial difference in weight due to their larger, intact shells. Previous studies surmised that men were more likely to collect *Turbo* and *Trochus* from their habitats due to their proximity to the fishing sites near the sloping outer edge of the reef when men go deepsea fishing (Russell 1998).

Discussion and Conclusions

The analysis of the mollusk assemblages from the two *latte* buildings indicates that the absence and presence of certain taxa during the early Spanish period is significant and requires further study. The assemblages are derived from both a subsistence economy and a craft economy and finding that individual *latte* building members "specialized" in different economies is significant because previous interpretations of *latte* buildings (i.e., Dixon et al. 2006) implied that their functions were redundant. The somewhat greater diversity of mollusks at the men's *latte* raises the tantalizing question as to whether this pattern is symptomatic of their broader catchment due to economic activities such as deep-water fishing. The diversity of mollusks at the men's *latte* could also be due to inter-island trade in goods such as shell ornaments. Several scholars (Amesbury et al. 2020, Bayman et al. 2012) suggested that marine shell ornaments (and other high-value goods) in burials in Guam circulated through ethnographically-documented customs, such as the *Kula* ring in the Trobriand Islands (Malinowski 1922) or the *sawei* tribute system in Micronesia (Alkire 1980, Fitzpatrick 2008, 2018, Hunter-Anderson & Zan 1996). It is also likely that the diversity of mollusks at the men's *latte* was generated by a custom wherein men, women, and children ate together.

In either case, it is important to note that the traditional hierarchical structure reported during Spanish contact recalls a system where differences in sex and caste determined what one could and could not do (Thompson 1945). For example, only the *matua* (elites) could fish and sail the open ocean on deep sea fishing expeditions while the *manachang* (commoners) were only permitted to fish for eels in the inland rivers by hand or with sticks, and they were not allowed to use hooks, nets or spears. Considering the high number of marine shells recovered by the field school excavations, along with several fish bones and crab shells, we hypothesize that the residents of this household were members of the elite *matua* class. Only men of the *matua* class could venture out into pelagic waters and gather deep-water shellfish, but once they were brought home, women had complete autonomy over family life and property (Souder 1992).

The following questions could be considered during future research on the organization of gendered labor at this *latte* household at Litekyan: how does the mollusk assemblage at this *latte* household compare with assemblages from contemporaneous households in Guam and elsewhere in the Mariana Islands? How does it compare with earlier *latte* households (i.e., prior to the Spanish contact)? Why are certain mollusk taxa only present at the women's *latte*, whereas other mollusk taxa are only present at the men's *latte*? Finally, how might more detailed research on the taphonomy of the household complex's mollusk assemblage help to better understand their use and discard?

The investigation of this multi-building household at Litekyan provided important baseline information (e.g., genera and species) on *Latte* Period mollusks foraging and use (i.e., food, tools, jewelry). Our analysis of mollusk shells recovered from a Spanish contact period household complements previous research (Bayman et al. 2012; Miller et al. 2021) on its gendered labor. While the earlier research at Litekyan documented a gendered division of labor within the multi-building household – wherein the craft activities of men and women were spatially segregated – this study implies that mollusks were consumed in a communal fashion given their abundance at both *latte* buildings. Documentary accounts of traditional culture in Guam do not reference a cultural taboo that required women and men to eat separately. Still, the greater diversity of mollusks at the men's *latte* (albeit marginally so) potentially reflects their access to a broader resource catchment. In either case, these findings qualify – but do not dismantle – the ethnographic generalization that women dominate mollusk foraging economies in traditional societies.

This examination of mollusk foraging in relation to gendered labor complements and enriches more conventional research that is often aligned with the theoretical imperatives of evolutionary ecology and optimal foraging theory models. Given the relatively modest amount of protein and calories in mollusks, it was likely embedded in (and secondary to) other economic activities such as fishing, gardening, and hunting. The analysis of the mollusk shell assemblage from the adjacent *latte* buildings further illuminates differences in economic activities at the two structures during the early Spanish contact period during the 17th century. Archaeological investigations of household economy and gendered labor are important for identifying the spatial locations of tasks conducted by women and men in traditional societies. This study is uniquely synchronic in its comparison of two contemporaneous *latte* buildings that were parts of a single, integrated multi-building household. Researchers working elsewhere in Oceania and beyond might also profit from applying this approach to the investigation of gendered labor in traditional households.

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