THE POWER OF SALT: A HOLISTIC APPROACH TO SALT IN THE PREHISTORIC CIRCUM-CARIBBEAN REGION

By

JOOST MORSINK

A DISSERTATION PRESENTED TO THE GRADUATE SCHOOL
OF THE UNIVERSITY OF FLORIDA IN PARTIAL FULFILLMENT
OF THE REQUIREMENTS FOR THE DEGREE OF
DOCTOR OF PHILOSOPHY

UNIVERSITY OF FLORIDA

2012

To my father and mother, Johan & Ireen

ACKNOWLEDGMENTS

Many people have been instrumental in the completion of this study. First, and foremost, I would like to thank Dr. William Keegan. Besides being the best advisor I could have wished for, Bill has also been a good friend. Many of the thoughts in this study are a product of our interaction and he constantly pushes me to explore new academic boundaries and topics. His willingness to share all his resources at the Florida Museum of Natural History, including collections, the Ripley Bullen Library and office space, have much improved the quality of my work. Without his recommendation letters I could not have ever received the funding that I did and finished in such a timely matter. Finally, his effort and investment of time to comment on my writings is much appreciated.

I would also like to thank Dr. Susan Gillespie. She has been a crucial part of my transformation from a ‘European archaeologist’ to an ‘American four-field anthropologist’ and her classes form a strong foundation of the theoretical orientation in this study. I am very grateful for her guidance throughout my stay at UF and her ability to summarize and focus my thoughts has significantly helped me move forward in my academic development.

I like to thank Dr. Susan deFrance for all her help and sharp remarks. Often, I would get too distracted with theory and she would put be back in place and remind me that this is a much more practical study. Her knowledge about the Caribbean region and positive attitude motivated me to write this thesis. Finally, her recommendation for the Elizabeth Eddy study writing grant gave me the financial basis to quickly finish this study.

I would like to thank Dr. Mark Brenner for his insights on salt production. His emphasis on the ecology of salt ponds and their seasonality has significantly pushed the agenda and brought me to my interpretations. Also, I would like to thank him for inviting me to visit the salt works in Las Coloradas, Yucatan, Mexico. Seeing the salt works first hand and experiencing the warm and welcome atmosphere of Yucatan made me realize how connected this region is to the Caribbean.

This study would not have been possible without the financial aid by many institutions. I thank the Fulbright center in the Netherlands, the Prins Bernhard Cultuurfonds, the National Science Foundation, the Florida Museum of Natural History Associates and the Department of Anthropology for providing their resources. I am extremely proud to be a recipient of these grants.

The Department of Environmental and Coastal Resources, in particular Dr. Wesley Clerveaux and Dr. Eric Salamanca, and the Turks & Caicos National Trust, in particular Ethlyn Gibbs, for all their help, facilities and hospitality during our stay there. Special thanks to Officer Wilson, aka supercop, for saving our project.

I would like to thank Sylvia Chappel and Michael Dion for all their help during my fieldwork in St. Lucia and Turks & Caicos Islands. It was incredible to see how much devotion these two women have to help people like me in the field. Besides their much appreciated financial contribution, I truly enjoyed interacting and working with them.

I would like to thank the reminder of my field crew, Christopher Altes and Isaac Shearn. They stuck with me on ‘the rock’ throughout the six weeks and together we conquered the millions and millions of mosquitoes. Without both their hard work, this fieldwork would not have been as successful as it was. Chris deserves more acclaim.

Throughout my stay at UF, he became a really good friend. His help with GIS, maps and data management is much appreciated, as much as the times we brew beer together.

Many thanks Michelle LeFebvre for her analysis of the zooarchaeological data of the site. Without her expertise, this part of the analysis would not have had the quality it has now. I am very happy that she was willing to go beyond a mere analysis and help with the interpretation process.

I thank Josh Torres for sharing his expertise and forms for the pottery analysis. Interactions with him have always been pleasant and helpful. It is great to have a peer working on similar issues in the Caribbean region and discuss solution that we could provide to the field.

I would like to thank Debby Mullins and Betsy Carlson as well. They are partially responsible for my move to UF. They both gave me the confidence that this would be a good career move and made me feel welcome when I arrived in Gainesville. I could not have asked for a better welcome-committee.

My gratitude also goes out to my peers at UF, especially Gypsy Price and Zack Gilmore. Having a social life is as important as an academic one. Discussions in and out of class have significantly helped me formulate my arguments. More importantly, both helped me to retreat sometimes from academia and enjoy some free time. I would also like to thank Kristina Ballard for her willingness to draw my pottery.

I would like to thank my friends in the Netherlands, especially Jimmy Mans and Renske Baten. Leaving your home country and the people you love was not an easy decision. However, the way I was welcomed every time I returned reminded me how strong these relationships are. That, in combination with the friends that visited, gave me the confidence to continue my work at UF. They have no idea how much they supported me.

I would like to thank Kathy, Bobby, Robert and Erin as well for welcoming me in their family. Being away from home was not always easy, but it was much easier by their openness and hospitality.

My deepest gratitude to my father and mother, Johan and Ireen. I could not have asked for better support from my family. Although their financial support facilitated my stay, their moral support was essential for my success. They have always given me the confidence to choose what I wanted to do. This study is as much theirs as it is mine.

Finally, my biggest thank you goes out to Anna. She is the best thing that has happened to me in these years in Gainesville.

TABLE OF CONTENTS

page

LIST OF TABLES

LIST OF FIGURES

Abstract of Dissertation Presented to the Graduate School
of the University of Florida in Partial Fulfillment of the
Requirements for the Degree of Doctor of Philosophy

THE POWER OF SALT: A HOLISTIC APPROACH TO SALT IN THE PREHISTORIC CIRCUM-CARIBBEAN REGION

By

Joost Morsink

May 2012

Chair: William F. Keegan
Major: Anthropology

This study examines the importance of salt, or sodium chloride, from an anthropological perspective. Arguments explaining the relation between power and salt in independent social contexts often solely rely on the material qualities of this resource. Emphasizing people's practices redirects the argument to the way salt is used to create human relationships. This study focuses on how people utilize salt to engage in social relationships.

Salt and salted goods are edibles. Consumption is the final act involved in this resource. However, salt's relation to power depends only indirectly to consumption practices, as exchange of salt and salted goods often precedes consumption. The exchange of goods as gifts creates and imbalance of power between the donor and receiver through acts of indebting. The donor establishes a superior position vis-à-vis the receiver. Salt preserves and allows food to be stored. As a result, food can be accumulated beyond local needs, exported and exchanged. Salt facilitates exchange of edibles. Edibles that are primarily produced for exchange are conceptually divided from edibles produced from consumption. Where *food* is harvested to overcome nutritional needs, *produce* is employed in social relations and provides for a social requirement.

The case-study of MC-6, Middle Caicos, Turks & Caicos Islands, indicates that salt was a powerful resource in the prehistoric Caribbean. Salt was harvested from the nearby Armstrong Pond, which produces vast quantities of this resource. The site's unique structural layout and artifact assemblage are the result of an emphasis of practices at this location, due to the presence of salt.

From a practice-oriented approach it is obvious that salt, in and of itself, is not the only reason for MC-6's significance. The environment of MC-6 harbors different qualities important for its local economy, namely the fertile marine Caicos Bank and a hot and dry environment perfect for cotton production. Salt, fish and cotton form an economic triangle of mutual compatible practices. The extraordinary qualities of the material world surrounding MC-6 provided the perfect basis for the exploitation of these three resources. MC-6's significance is a product of the interaction between people and the environment and how these qualities were transformed into social power and status.

CHAPTER 1
INTRODUCTION

This study examines the importance of salt in prehistoric communities. The power of salt, or sodium chloride, emerges out of the way salt is used and how it changes social relationships between people. Gift exchange of edible goods transforms economic production into values of power and status. Salt's ability to preserve edibles allows for accumulation of resources and display of material wealth, ultimately facilitating exchange practices. Gift giving establishes a debt between donor and receiver and creates social inequality inducing an imbalance of power between the two social agents involved. It is this specific creation of social inequality through gift exchange of edible goods that makes salt so powerful. Salt alters social relationships through its use. Identities and values of people and salt are both defined through interaction.

Archaeological evidence from MC-6, Middle Caicos, Turks & Caicos Islands indicates that salt was of considerable importance in the Caribbean past. This site is unique and incomparable to other sites in the region. Architectural alignments, stone structures and a central plaza are all material manifestations of the site's importance in the past. Salt, exploited at the nearby Armstrong Pond, was the economic incentive to settle this location on Middle Caicos. As soon as the pond changes to a salt producing pond, people move into the area and establish the village. MC-6's unique qualities must be attributed to exclusive access of salt from Armstrong Pond.

People at MC-6 focused their economy on two other resources, namely fish and cotton. The Caicos Bank, a fertile marine bank to the south of MC-6, provided the fish that could be salted and exported. Cotton, on the other hand, grows extremely well in the Caicos climate and was exchanged throughout the Caribbean region in pre-colonial and colonial times. Furthermore, cotton was an essential component for the nets used for fishing. In addition, labor investments in these three industries are seasonal specific and do not overlap in time, making it an ideal combination of yearly routines.

The regional significance of MC-6, as materialized by the site's architecture, emerged from the successful manipulation of salt's material qualities by people on Middle Caicos. Utilizing salt as a preservative for fish, people at MC-6 transformed a perishable food into a non-perishable. Salted fish was exchanged with people from Hispaniola and provided proteins and salt, both dietary needs for people living in inland locations on the larger islands. These exchanges also provided the people at MC-6 with the perfect social context to convey and negotiate their social status in a public environment through gift-giving practices, including cotton, inducing a relation between power and salt.

The intrinsic connection between salt and power has been widely recognized throughout the world. For example, ancient China built the Great Wall through taxes on salt, the Roman Empire paid their soldiers with salt and salt production along the north coast of Yucatan, Mexico, received full attention in pre-Hispanic Maya economies. These distinct and unrelated societies all recognized that salt was a medium through which power could be exercised. Control over salt provided the means to dominate and people in power employed this resource to maintain and/or increase their social status.

The universality of this relationship between salt and power suggests that certain material qualities are the source of that power. Salt has three important qualities, namely taste, dietary need and the ability to preserve foods. Salt is one of the four tastes of the human palate and salted foods are considered to taste better than unsalted dishes. Second, salt is a dietary need and plays a vital role in many important bodily functions. A lack of salt in a daily diet will lead to severe health issues and even death. The fact that people enjoy the taste of salt is often interpreted as an evolutionary adaptation to secure consumption in relation to this dietary need. Finally, salt extracts liquids and produces an environment inhospitable for bacteria. Salt cures and prevents edibles from decay.

The dietary need for salt and its capacity to preserve foods are often used to explain the power of salt. This argument focuses on the nutritional requirement assumes that the 'natural need' for salt induces a differentiation between owners and non-owners. In the never-ending quest for salt, non-owners find themselves at the mercy and rule of owners. The argument linking power and salt to its capacity to preserve edibles emphasizes the need to maintain sufficient nutrients for a population, which can be difficult in the absence of refrigeration. In most environments, edible goods do not last indefinitely and producers are limited by the rate of decay. Seasonal differentiation in food supplies poses an incredible problem to communities lacking a preservative. Overproduction has no function unless surplus is actually employed and utilized to feed people. Salt's ability to preserve mass quantities of otherwise perishable edibles facilitates the distribution of edibles to people over a longer period of time.

These two explanations both relate salt's power directly to its material qualities. Salt is a static product that has certain characteristics and these characteristics produce the social values of the resource. There is a strict directionality in this argument, namely from the natural condition of the salt, i.e. its material quality, to the social values and concepts of power. Power inherently resides in these material qualities. Salt *is* power and the qualities universally display social inequality independent of social context. The use of salt is always assumed, but never problematized. Consumption is a given, an unquestioned action that has no impact on its material qualities and relation to power.

However, there are many uses of salt that do not generate power or inequality. For example, one can observe how salt changes characteristics during humid and dry days, alternating between brine and rock (Kurlansky 2003). Salt is often placed on the kitchen table for people to use while eating dinner. In winter, salt is used as a deicer in times of frost and snow. It is unlikely that any of these practices produce power relations. Hence, the use of salt is essential for understanding its relation to power and, therefore, must be problematized first. Salt *is not* power, it *becomes* power through the way it is used. The material qualities of salt only have meaning in relation to how salt is employed and how people interact with this resource. The actions involved in salt create its power.

1.1 Relationism

This study follows a relationist ontology. This ontology assumes that everything, including people, objects and the world, are all made of relations. The 'form' or 'definition' of things is a nexus of relational elements that come into being through interaction (Barrett 1994; Bourdieu 1977; Giddens 1984; Ingold 2000; Munn 1986; Robb 2010; Thomas 1996). In other words, nothing is self-contained or exists *a priori* to the creation of any relationship. To make sense of the world, people need to engage with it. And through this engagement, people also create themselves in relationship to this world. Being in the world is a necessity for both the world and people to exist. Qualities, values and meaning are dependent on their contexts and situations in which they are formed. As these forms are context-dependent, they are relational. Relations create things, because things are not in and of themselves laden with meaning and symbolism, ready to be understood by the passive observer.

As these relations are constantly created anew, the emphasis of this relationist ontology lies in the *creation* of the relation and not in *the* relation as such. The process of establishing a certain relationship is the unit of analysis, rather than the form or definition of the relation per se. Human action is foregrounded as the fundaments of meanings and values of people, things and their environment. Movement is a necessary component for the creation of these relationships (Ingold 1995, 2000). The lived world is simultaneously the stage for action, but also a construct of the action that takes place in it (Munn 1986:8). This exact process, the production of social life through practices, is the main subject of both Bourdieu’s (1977, 1990) practice theory and Giddens’ (1984) structuration theory.

Although these relations are constantly created anew, a relationist ontology is not subjectivist. In the process of creating relationships, certain options are ruled out, as the past structures present interactions in similar ways. Relationships are always based on previous acts of creation. These past interactions establish a basis or structure, which restricts certain possibilities. As practices in the present automatically become part of that past, their performance immediately alters the structure. Even if the structure is continued and seems unaltered, the additional layer of past practices that conform to the structure lead to an affirmation and objectification of this structure. In sum, relationships are part of historical trajectories that are constantly emerging and adapting in the present (Barrett 1994; Bourdieu 1977; Giddens 1984; Ingold 2000; Munn 1986; Robb 2010; Thomas 1996).

This continuity of structures is based in the material world. Although the world is constantly created through relationships, its material qualities are rather stable and produce relatively constant references. The material world, therefore, is an active agent in the formation of these repetitive structures. Gell (1998) was one of the first scholars to point out the role of objects and their material qualities as important agents in our daily lives. The material qualities of objects moderate which inferences are logical and which ones are not, limiting the possibilities of relations and interpretations. Latour (2005) and others (Gosden 2005; Ingold 2007; Miller 2005b) have built upon this idea of agency of objects and all emphasize that people's ephemeral life is structured through the relative stability and durability of objects and the world.

Relationships are, however, not bounded to the present and the past. To the contrary; people are future-oriented. Actions in the present change the relations and knowledgeable agents, aware of its structure, will try to manipulate and negotiate their actions to increase their success in the future. People are mostly invested in these future situations and less so in the present. This part of practice is conscious and intentional, aimed at gaining respect and status through actively shaping existing structures for the future (Giddens 1984; Ingold 2000; Munn 1986; Robb 2004). Practices in the present have relations with the past and the future, but their true focus is future-oriented.

1.2 Value and Power

Two concepts central in this thesis, namely value and power, are relational too. Value and power are both defined in their specific context. Value is not something abstract or absolute, but a product of the potential that something has in the future (Graeber 2001; Munn 1986). People constantly evaluate value by the outcomes of past practices and project that value into the future in relation to expected results. Value is, therefore, not quantifiable, because it is continuously contested and (re)affirmed. Yet, value is neither hyper-fluctuating nor constantly changing, because it is simultaneously bounded by social structures. Based on past negotiation, general structures *or* regimes of value (Appadurai 1986; Gosden 2004) restrict the manipulation of value at a larger scale. Value is an outcome of the investment of time and labor dedicated to obtain desires and objects of importance. The relative distribution of people's commitment to dedicate energy, intelligence and concern to these desires is what produces value (Graeber 2001:45).

Power is relational, just like value, and refers to the ability to influence actions of others. Power is context specific and totally founded upon the capacity to change social relations in the future. Existing structures or frameworks of reference guide negotiation and manipulations of power relations. Furthermore, power is produced through action and defined by investments of time and energy of people to change social relations with others (Mann 1986). Power is not possessed by people, but it creates people. People 'with' power have that status because they enact it (Robb 2010:498-499). Without this enactment, power cannot be communicated to others and might as well be absent. This relational aspect of power implies that it is a culturally specific entity, totally structured upon past practices. Power is a relationship that emerges out of its performance (Robb 2010:499)

A reoccurring theme here is the continuous interaction between microscales and macroscales. People practice on the microscale, in the present at a very particular place and time. Yet, these practices always refer to other times and places that are not present. People determine the value, power, meaning and quality of any practice always in relation to other past practices and future objectives. Hence, the status of these concepts is codependent on its context and cannot exist in a social vacuum outside of these relations (Robb 2010). Microscales and macroscales constantly interact and are both incorporated in practices.

1.3 A Practice-Oriented Relationist Approach to Salt

The approach followed throughout this study focuses on the actions that create, maintain, manipulate or negotiate social relationships. Consequently, questions concerning the value and power of salt are unimportant, because these ‘states’ are constantly recreated in practice. Any status or form is in a continuous state of becoming, never finalized or concluded. Attention is therefore directed to the ways people use salt and how value and power are created through effects of its use. The value and power of salt rely completely on salt’s capacity to change future social relations. Practices are foregrounded as they produce social life and are the source of meaning.

A significant improvement of a practice-oriented approach over other approaches is that the people enacting these practices, the native population in our archaeological record, are placed over contemporary categories and classifications. To arrive at a possible approximation of indigenous belief systems and concepts of value and power, past practices are an essential starting point to avoid the projection of present frameworks of reference onto the past. Classification of archaeological artifacts is not a goal in this perspective, as results categorize what these artifacts are outside of the relations in which these objects were used.

To emphasize, the archaeological record and its objects have a very specific role in this perspective. Rather than being the unit of analysis, the ultimate product of research, a practice-oriented approach uses the material record to understand how artifacts are used in the past in the creation of social relations. Hence, these social relations are the unit of analysis and the artifacts are the unit of observation. In this perspective, objects transform from passive reflections of social identity to active agents within a social network of relations. Artifacts are consciously employed by past peoples to communicate certain future intentions. This means that objects in the archaeological record signify what people wanted to be, but not what they were. Previous approaches have often amalgamated the unit of observation and unit of analysis into one category, namely artifacts, but this perspective clearly separates these two and centers practices as the unit of analysis.

This theoretical perspective is a guideline for interpretive models. Other theories and methodological models are used throughout this manuscript. First, Nancy Munn's (1977, 1986) idea of the 'transformation of value' explains how salt-related practices produce value and power. Second, Thomas' (1996, 1999) 'economy of substances' and Ingold's (1993) taskscape clarify how different practices form relational networks among each other. These three theories serve as methodological tools and apply a practice-oriented approach more specifically in this research. Equally as important, these three theories are all compatible with each other, as they are all based on a relationist ontology.

1.4 The Power of Salt

The present study is subdivided into two sections. First, a general discussion of salt provides a basis for this inquiry. Chapter 2 discusses the material qualities of salt and describes its economy. Salt has very specific qualities that produce a material foundation for practices involved in its exploitation and production. Furthermore, salt is not a homogeneous category and many different salts exist, depending on conditions in which they are produced and how they are extracted. The two main explanations for salt's importance in the past, the dietary need and the capacity to preserve edibles, are considered in detail.

As argued above, these material conditions are not the sole cause of salt's importance in prehistoric societies and attention must be directed to its uses. Salt is ultimately consumed by people. Chapter 3 explains the sociality of consumption, which shows that the ability to preserve edibles changes conditions in which people can negotiate their social status. This is the practiced foundation of the importance of salt. The accumulation of edibles facilitates feasting practices as larger supplies of edibles can be used to give larger feasts. Also, edibles can be distributed and exchanged over vast distances, incorporating more people into a network of exchange. In sum, the importance of salt emanates from all practices that occur before salt is consumed.

Exchange practices transform the value of salt and determine the power of this resource. Through exchange, debts and obligations between exchange partners are created, establishing imbalances of power (Munn 1977, 1986). Salt modifies the social context of interaction and influences the mechanics of how social relations are created. Exchange results in an imbalance of power. Salt facilitates exchange of edibles and changes conditions of power between donors and receivers. Hence, salt's power emanates from this transformational process where material qualities are negotiated and manipulated to alter social relations between people.

An important conceptual distinction between *food* and *produce* must be made to understand the importance of exchange. Often times, anthropologists simply assume that edibles are food, a material produced for consumption. However, edibles that are salted and accumulated may also be produced for exchange. Producers of these edibles are not interested in acts of consumption, but purposefully acquire edibles to give away and create debts. That consumption is part of later practices is only of secondary importance. These edibles are labeled here as *produce*, goods that are consumable but are intended for exchange and the creation of social relations. This term *produce* is not only applicable to salted foods, but any type of edible that is primarily produced for exchange purposes.

Within a social arena where people are conscious and aware of this possibility to increase social status through salt, people re-orient themselves toward the limited places of production of this resource. The sociality of consumption informs the sociality of production. Control over salt production sites becomes a desired good and protection of its wealth might lead to the formation of land ownership. Private land requires labor, as non-owning groups might pursue access as well. This, then, restricts the mobility of people and poses physical boundaries to other practices that people can and cannot do. The repercussions of orienting practices to salt production and ownership are vast. Chapter 4 evaluates these consequences.

Once established and integrated into an economy, salt determines social life on many levels. Chapter 5 discusses how these practices on a microscale produce structures on the macroscale. Ideological connotations to salt are widespread and the association of this resource with power did not go unnoticed in many different societies. However, these ideologies are a product of the microscale, of repetitive practices that bring durable macroscale structures into existence. Subsequently, these macroscalar structures reinform practices on the microscale. The power of salt is a result of macroscalar structures and microscalar practices reinforcing each other through social interaction.

The second section of the study zooms in on MC-6, Middle Caicos, Turks & Caicos Islands, as a case study concerning how these social relations are brought into being at a microscale. Extensive previous research, including my fieldwork in 2010, at MC-6 identified salt as the main economic product at this archaeological site (Keegan 2007; Sullivan 1981). Chapter 6 has two functions. It introduces the general Caribbean prehistory and establishes a context in which MC-6 is situated. In addition, it also provides an example of how a culture-history framework provides a very specific theoretical basis for how the archaeological record is explained. This perspective is incompatible with a practice-oriented approach. Therefore, it will also serve as a comparison of how a practice-oriented approach, as applied in the subsequent chapters, is different from culture-history and how the proposed framework provides a better explanation of MC-6's past.

Chapter 7 starts from the microscale, emphasizing the importance of practices at MC-6. This site is extraordinary and the material culture left behind has no equal in the entire Caribbean region. The first section of the chapter illustrates how different practices involved in the exploitation of salt, fishing and the production of cotton, together form one relational network of interdependent practices. This network, or 'taskscape (Ingold 1993), forms the theoretical backbone for interpretation of its material remains. A six-week, NSF-supported excavation of MC-6 investigated two objectives in relation to local practices in this prehistoric taskscape. First, the history of the salt pond was reconstructed to establish that salt production was actually possible when people were living at the site. Second, excavations at MC-6 were partially focused on the reconstruction of the habitation history of people and to determine when people started to live at the site. The evidence suggests that, as soon as conditions became favorable for the production of salt, people moved to MC-6 and established a village. This confirms the importance of salt for this local economy.

Excavation at the site served other objectives as well. Other practices, including storing and transporting salt, production of cotton and cotton artifacts and more mundane activities such as the production of pottery and basketry-making and food production, are expected to be part of MC-6's taskscape. This approach is radically different from the culture-history perspective. Theoretical assumptions about practices and their relationships with each other are prioritized and positioned first. Although placing practices before archeological evidence is a central premise of conducting a practice-oriented relationist approach, it has the added advantage of explicitly recognizing theoretical assumptions as part of the interpretation. Too often, underlying assumptions are left unconsidered and implicitly guide the writer's line of thought.

Chapter 8 relates these practices on the microscale to the structures that are in place throughout the Caribbean region. MC-6's significance emerges from local practices at the site, but its power and significance only exist in relation to other places and people. The site's extraordinary qualities only have meaning in relation to other places lacking these qualities. MC-6 does not exist in isolation, i.e. in a social vacuum. Rather, practices on the microscale were informed by structures on the macroscale.

The macroscale, therefore, is as important in regard to the meaning, value and power of MC-6 as local practices performed at the site.

This study approaches an economic product, in this case salt, from a holistic perspective in which the practices involved with this product are placed central to its discussion. Although the material qualities provide an underlying basis for discussion, the meaning and significance of any economic material relies exclusively on how people use it. Starting from the microscale and ‘simple’ economic production, the argument shows how day-to-day practices form durable and pervasive structures that organized social life. It redirects attention to the microscale and how individuals engaged with their lived world.

The way people use artifacts indicates what future intentions people have. For archaeologists, these future intentions are part of our past. Yet, people engaging in these practices faced an uncertain future and they consciously tried to alter conditions in their favor. Considering artifacts for what they are obscures how these artifacts were used in the negotiation of social life. Artifacts were intentionally employed to change conditions in the future. Every person is limited through the structure of society, but these restrictions can always be negotiated. People consciously engage with existing structures and manipulate and negotiate their social position. This intentional behavior of people is the main subject of this study.

CHAPTER 2
AN ECONOMY OF SALT

This chapter discusses the economic aspects of salt, including different production techniques, specific environmental conditions and salt's function in relation to human consumption. Salt has very specific material qualities that determine how this resource can be used. For a practice-oriented approach, practices need to be centrally placed. It seems counterintuitive to place material conditions first. Yet, these material conditions structure practices in many ways. They restrict when and where people can extract the resource, but also enable preservation of edibles. These restrictions and possibilities, founded on the material qualities of salt, are the basis for this entire study and the subject of this chapter.

The material qualities of salt demonstrate that salt is a highly sought-after commodity with relatively restricted availability. This dynamic interplay between high demand and low supply allows a reconstruction of salt's value in pre-modern situations. Modern standards of cheap and widely available salt cannot be transposed into the past. Throughout the chapter, different geographical and temporal case-studies emphasize its cross-cultural importance. This discussion underlines the universal significance of salt and indicates why archaeology, in general, should pay more attention to this resource.

Extraction and production practices are explicated and the two main uses of salt, namely for consumption and preservation of edibles, are discussed in detail. The social consequences of all these practices are left unconsidered for the moment. Although a holistic and practice-oriented perspective does not perceive these social factors to be independent of the economic parameters and material qualities, this artificial divide is the main reason why salt has not always received the attention it deserves. To illustrate this point, the artificial distinction is maintained for now and deconstructed in later chapters. For now, the discussion will concentrate on how salt determines how, when and where people can extract, produce and utilize this resource.

2.1 Salt Extraction

Salt can be extracted in three different ways: mining, boiling and collection after solar evaporation (Andrews 1983; Kurlansky 2003:3; McKillop 2002; Parsons 2001). These three categories serve as holistic points of departure in relation to the production of salt, but there are many subtle and delicate variations on these themes. The principal factor that determines how salt is extracted is the quality of the source. All salt originates from the sea, but it can be found as both a solid and in solution. The different natural occurrences of salt require different extraction practices and determine processes of production. The differences between these three categories of production illuminate potential factors that regulate practices.

Mining involves the collection of salt from natural layers. These layers are dried ancient seabeds. Rock salt, the evaporative deposit that is left behind, is also known as halite. Rock salt can occur on the surface, for example the saltflats in Bolivia, as well as underground, for instance near the village of Hallstatt in Austria. In the Tarma region of eastern Peru, Tibesar (1950) describes a formerly covered salt vein that surfaced after a possible landslide. In all cases, the rock salt is extremely hard and needs to be disintegrated before harvest. Himalayan pink salt is an example of mined salts that are sometimes sold in complete bricks. The pinkish color of this salt is caused by small amounts of iron in the salt (Bitterman 2010). Most cheap industrial salts are mined.

Besides traditional mining techniques, which use wooden shafts with stone, bronze or copper axes (Bromehead 1940; Grabner et al. 2007; Joosten et al. 2006; Kurlansky 2003), large scale mining is mostly mechanical. Large-scale mining is the main reason why salt is so cheap these days (Kurlansky 2003). Sometimes halite deposits are extracted by adding water. The halite is dissolved and salt is brought into solution again. Subsequently, the salty water (brine) is pumped out of the ground and heated over fires (Kurlansky 2003). In these cases, the mining of halite deposits is combined with the second category of production, i.e. boiling.

Boiling increases the rate of evaporation from the brine, resulting in higher levels of salinity. In the past, people placed seawater or brine in pottery vessels and placed them above a fire. After prolonged boiling, the salt crystalizes on the inside of the vessels. The pottery vessels that are specifically made for salt production are called *briquetage* and are often destroyed after their use (Flad 2005, 2007; Flad and Hruby 2007; Kurlansky 2003; McKillop 1995, 2002; McKillop and Sabloff 2005; Parsons 2001). The salt attaches so strongly to the pottery that the vessel has to be broken to make extraction possible (McKillop 2002). *Briquetage* is a good archaeological indicator of large scale salt production and is recognized in multiple distinct areas, for example the Sichuan Basin, China (Flad 2005, 2007; Flad and Hruby 2007), southern Belize (McKillop 1995, 2002; McKillop and Sabloff 2005), France (Olivier and Kovacik 2006), Mississippi area (Muller 1984, 1987), and Mexico (Charlton 1969; Hewitt et al. 1987; Williams 1999).

Brine is found in several forms. For example, brine can be found in salty marshes, either in close proximity to the sea or inland. Inland salt marshes form when halite deposits are mixed with rainwater. Other examples are brine wells, which are naturally occurring springs that contain a lot of salt. These brine springs develop when a natural spring passes an underground halite deposit before it reaches the surface, increasing the salinity of the water in the process. Brine can also be made artificially. Saltmakers in the Valley of Mexico collect soils with high salt contents and construct conical funnel-like structures. The soil is placed in these structures and clean water is added at the top. Through filtration, the water absorbs salts and the brine is collected at the bottom of the cone (Parsons 2001).

Boiling of brine is not as straightforward as extraction from a mine. Although mining your way through a halite deposit is intensive and physically demanding, the production of salt through boiling demands more labor and resources for two reasons. First, the brine needs to be prepared to increase salinity. The saltmakers in the Valley of Mexico deliberately collect soils with high salt contents (Parsons 2001). McKillop (2002) mentions that seawater from the nearby lagoon in Belize has higher salinity content than the sea, i.e. >35g L^{-1}. She also mentions the possibility of pouring high salinity seawater into old seafaring canoes to increase the salinity of the brine. The salinity of the brine would increase by adding the salt that infiltrated the wood while the canoe was used for seafaring (McKillop 2002). Saltmakers in Japan construct bamboo towers with several levels, letting the brine filter from top to bottom. The tower increases the total surface area and facilitates wind passage, boosting evaporation of water without additional fuel costs (Bitterman 2010).

The second factor that increases costs of boiling is fuel. The brine needs to be boiled for an extensive period of time to allow all the water to evaporate. Especially in cases where salt is produced on a large scale, fuel resource depletion is a potential hazard for this economic practice. In drier areas, where large trees are absent, this can pose significant costs to the production process. For example, local saltmakers in the Valley of Mexico utilized plant and animal fuel prior to 1970, but recently switched to rubber from tires and shoes to reduce costs. In the dry valley, trees are scarce and too expensive for fuel. Despite the health risks involved in the large-scale burning of rubber, this fuel is less expensive and a reduction in cost was needed to compete with large industrial salt producers in the region (Parsons 2001). Therefore, both the preparation of the brine and the process of cooking are time, labor and resource intensive.

Salt can also be obtained through burning water hyacinths, as practiced in the Xingu region in Brasil (Heckenberger 2005). In this region, some groups also eat dirt to obtain the essential amount of salt (Michael Heckenberger personal communication 2010). Furthermore, the burning of specific palms produces ash that contains salt, which can be utilized as a source (MacKinnon and Kepecs 1989; McKillop 2002). Peat was burned in the Netherlands and Belgium for the same purpose (Kurlansky 2003:133). These practices produce a lower quality salt, because many impurities are present in the ash. Also, burning of water hyacinths produces a high amount of potassium carbonate (K_2CO_3), a white salt. Despite its salty taste, this potassium carbonate does not substitute for NaCl and suffice for human bodily functions, which will be discussed later.

The final category of salt production is the most straightforward procedure. In certain places, environmental conditions are such that saline water evaporates so fast that salt crystalizes. This technique is called solar evaporation, because solar energy is a key factor in the evaporation process. In these specific places, salt can be harvested on the ground or at the edges of a body of water. In other places, such as Brittany, France, environmental conditions are favorable for the production of salt, but human intervention, through an elaborate system of different ponds and selective use of seawater, increases salt production (Bitterman 2010; Kurlansky 2003).

Salt extraction and production is relatively easy in situations where salt occurs naturally without intervention. The only procedure that is sometimes required is breaking or grinding of salt as it becomes a relatively hard conglomeration when evaporation continues for a long time (Augusto Oyuela-Caycedo, personal communication). On the other hand, large blocks of hard salt were used in Colombia for long-distance trades because small granular salt did not last in the humidity of the tropical rainforest for a long time (Cardale 1981: in Parsons 2001). In situations where the granular salt is higher valued, managing the brine or salt in early stages of the process prevents the formation of larger and harder blocks of salt. Despite these idiosyncratic preferences, the exploitation of salt is relatively straightforward.

When people do intervene, labor requirements increase for two reasons. First, salt pans are constructed and maintained before the salt can be extracted. Second, practices of raking the salt are physically demanding and often take place during the heat of the day, when solar evaporation is highest. Costs also increase, because tools need to be acquired and facilities are necessary to store the harvest. Although human intervention increases production, it also increases the cost of the whole operation.

Human intervention can also change and direct the quality of the salt. In Guérande, Brittany, France for example, two different types of salt are produced, namely *sel gris* (gray salt) and *fleur de sel* (salt flowers). Both types are produced in the same salt ponds, but *sel gri*s is produced after a longer process of solar evaporation and collected through raking, while *fleur de sel* is collected by carefully removing thin crystals of salt that are formed on the surface of the pond (Bitterman 2010). The production of *fleur de sel* only happens on days when a strong warm wind blows over the salt ponds, whereas *sel gris* can be collected at the end of the day. *Fleur de sel* needs to be collected when the warm wind blows over the water and only occurs during the day. *Fleur de sel* is one of the most favored salts and used in many top-quality restaurants (Bitterman 2010).

2.2 Evaporation

In the example of *fleur de sel,* it becomes apparent that different techniques and times of collecting the salt affect its quality, suggesting that practices involved in the collection are meaningful and intentional. To understand the choices and the decision making processes of people involved in the production of salt, the factors that determine this process require more attention. The rate of water evaporation in salt ponds is related to multiple factors, namely surface area of the water, depth of the water, original salinity of the water, wind energy, solar energy and precipitation. Although water always evaporates from bodies of water, salt crystals only form when the brine concentration reaches sodium chloride content of more than 25% per volume and it works as a strong limiting factor in the process (The Salt Institute 2011). For example, rain water decreases salinity levels and prohibits crystallization. In other dry situations, highly saline waters can be absent, preventing the crystallization of salt. A delicate balance of all factors is essential for the solar evaporation of salt and therefore salt only occurs naturally in specific locations across the world. Solar evaporated salt is relatively scarce and highly dependent on local conditions. All factors deserve more attention.

First, solar energy is the most important factor. Evaporation must exceed water influx to increase salinity levels and allow crystallization. Rates of evaporation depend mostly on the temperature of the water and solar energy that heats it; more solar energy, more evaporation. Warmer water molecules have higher kinetic energy and evaporate quicker. Solar energy is not simply equal to hours of sun, but also depends on the height of the sun in comparison to the horizon. The higher the sun is above the horizon, the higher the solar energy is per unit surface area. Even long sunny days at higher latitudes do not provide enough energy to produce salt from seawater, as the solar energy per unit surface area is low and does not provide the necessary amount to increase the temperature of water.

Second, larger surface areas provide a better environment for wind to blow over the pond. If vegetation around salt ponds hinders evaporation, larger ponds allow wind to touch the water and carry water molecules away from the pond.

Third, the depth of the pond is important, because it is directly related to the total volume of water. Shallower bodies of water hold less water and have a higher surface area:volume ratios than deep lakes. Furthermore, the temperature of smaller volumes of water increases faster, which increases evaporation. Both the surface area:volume ratio and the decreased energy requirements are both factors that are related to the depth of the pond or lake.

Fourth, original salinity of the water determines if salt crystals are able to actually form. Even if rainfall is absent and sun and wind are available, salt will not crystalize in sufficient quantities if the original salinity is low. In these circumstances, salt exists in quantities too low to make its exploitation economically viable, especially on a large scale. Solar evaporation is only possible with salty water from the sea or thick brines from brine wells. These sources have high concentrations of sodium chloride and form salt crystals after evaporation. To keep production going, a constant or periodic influx of water occurs in most bodies of water. Salt ponds near the sea, for example, are fed through either infiltration through saline ground water or periodically filled at high or spring tides. In all situations, influx of highly saline water is necessary to produce salt through evaporation.

Wind is another factor in the process of evaporation. Wind energy transports water molecules away from the salt pond and prevents water molecules from being re-absorbed into the pond. Wind also decreases the air pressure above the pond, allowing more water molecules to escape from the water. A constant wind over a salt pond does facilitate the process of evaporation quite substantially. Formation of *fleur de sel* in Brittany, France, is an example of how wind energy can affect the rates of evaporation. In these circumstances, the wind increases evaporation to such a degree that crystals form on the water surface.

Finally, rainfall is an important factor in evaporation. Rainfall dilutes salty water and can only be present in low amounts to allow formation of salt crystals. Salinity levels of rain water are low and can completely outcompete rates of evaporation. Furthermore, rain water decreases the temperature of already heated bodies of water, impeding evaporation rates. Not only occasional showers, but also more intensive episodes, such as tropical storms and hurricanes can significantly dilute and cool down saline waters. In addition, precipitation can destroy (freshly) harvested salt and bring it back into solution. Rainfall is not only a limiting factor in the actual production of salt, but is also a severe threat that can ruin a harvest. Rain is a crucial and often limiting factor for natural production of salt.

The limiting environmental conditions significantly constrain the time of year when salt can be produced. Very few places that rely on either boiling or solar evaporation are able to maintain production year-round. Production of sea salt through evaporation is highest in May in Mexico, just before the start of the rainy season (Ewald 1985; Parsons 2001). Saltmakers in the Valley of Mexico gather the saline soils in that same period, because the drought exposes the salinity in the soils, facilitating collection of the most saline deposits. Bermudians moved to Grand Turk and Salt Cay during the summer months throughout the 17th and 19th century and stayed on Bermuda during the winter. In the montaña in the Tarma region of Peru, salt is mostly collected in July, August and September (Tibesar 1950). Although the salt is collected as a solid and present year-round, the driest months are still preferred. July, August and September are also the driest and hottest months in Brittany, France, and the production of *sel gris* is mostly restricted to these months. The *fleur de sel* only occurs on these summer days when conditions are favorable (Bitterman 2010).

This underlines how important environmental conditions are in the production of salt. For solar evaporation, seasonal shifts restrict the availability of fresh salt in most circumstances. The precise balance among multiple factors that is needed is so fragile that it only occurs during specific months of the year. As a result, salt production is seasonally bounded and people who engage in these practices have other jobs during the remaining months of the year. It also causes a lot of stress in the months of production, as all tools and other features such as salt pans need to be completely in place and working when the conditions are favorable.

People were aware of these environmental factors in the past and tried to manage these variables, as is demonstrated by salt pans. Salt pans have several characteristics. First, salt pans are located near water with high salinity, often the sea. Second, salt pans are often shallow, with low volume and high surface area. The surface area allows more water molecules to escape, while at the same time it increases the surface that can be heated by the sun. The low total volume supports a rapid increase in temperature, which also increases evaporation. Third, salt pans are often a combination of different enclosed areas and water with different salinities is moved from one pan to the other. The steps are necessary to increase the salinity of the brine, before it goes into the final evaporation pond. It also allows sediments and other impurities to settle, omitting them from the final product. In most situations, impurities and sediments hurt the quality of the final product. Hawaiian salts are an exception, where clays are added to the salt. These sediments change the flavor and are thought to have medicinal qualities (Bitterman 2010). Fourth, already crystalized salt is raked and extracted from the pans. This constant process of raking and extraction of salt opens up volume for new brine to be added to the pond, while at the same time the remaining water in the freshly raked salt can evaporate outside the pan.[1] Finally, construction and maintenance of salt pans is planned and executed in the seasons when salt is not produced. The seasonality of salt production is anticipated and a future-oriented

[1] Bitterman (2010) provides a detailed description of the practices of salt raking. Although his description is focused on the salt works in Guérande, Brittany, France, similar procedures are followed in other areas of the world.

perspective is required to maximize the results in the months when production is high. The year-round practices all revolve around the production months, indicating that people are fully aware of the changes and fluctuations. However, this does not explain why people wanted salt so much. To fully understand and appreciate the reasons why salt was of such significance in past economies, the role of salt for humans must be explored.

2.3 Uses of Salt

Evidence for past salt production and extraction shows that people used this resource. Yet, the functions of salt are diverse and manifold. The Salt Institute (2011) counts 14,000 uses for salt, including consumption, pharmaceuticals, softening hard water and industrial uses of salt. The largest use of salt in the United States today is for deicing roads, approximately 40% of a year's production. Overall, pharmaceutical, industrial and road safety account for the largest part of annual salt consumption are relatively new uses for salt.

There are also many medicinal uses of salt (Astrup et al. 1993; Ewald 1985; Kurlansky 2003; McKillop 2002; Parsons 2001). Most medicinal uses are related to the electrolyte balance of sodium and chloride ions. Furthermore, specific sources produce salt with other 'impurities', such as magnesium, potassium or iron, and people can consume these salts to overcome certain deficiencies. Some springs are considered to have medicinal qualities, without direct evidence for what factors are of medicinal purpose, such as the salt springs near Ixtapa in Chiapas, Mexico (Ewald 1985:9,43) or the Dead Sea in the Levant. A combination of honey and salt is used in Yucatan to recover from child birth, without direct evidence of its medicinal benefits (Ewald 1985:9).

A post-colonial use of salt in the New World was silver mining (Ewald 1985; Parsons 2001). Salt and mercury were both ingredients for refining silver ores in the patio-process, where salt was mixed in with water and crushed silver ores (Ewald 1985:12). This specific use of salt was the main reason why salt production came into colonial hands, because the Spaniards needed to secure the quantity, quality and price of this essential product for silver production. High prices as a result of low salt supply would ruin profits. It is important to take this post-colonial practice into account when reading historical documents, as the silver industry produced an enormous increase in the demand for salt that was not evident in a pre-colonial setting.

Parsons (2001:241-248) discusses another use of salt that might also have been practiced in pre-colonial times. In many parts of the world, salt is used as a mordant by traditional cloth dyers. The solution of salt (and lime) fixes colors in cloth and ensures that the colors will last longer. This association between salt makers and cloth dyers is particularly apparent in West Africa, where processes of leaching salt out of the soil are associated with practices of producing dyes and dying cloth (Parsons 2001:241). In Mexico, *tequesquite*, a salty crust that forms when salt marshes or springs dry up after the rainy season, was of particular interest for this use as it is not only composed of sodium chloride, but also sodium carbonate, sodium sulfate, sodium nitrate, potassium chloride and potassium sulfate. All these constituents help the color attach to the fabric (Parsons 2001). Although Parsons does not mention any specific documents that describe these practices in pre-colonial times, it is very likely that people were aware of this quality of salt.

The industrialization of salt production resulted in a lower price for this resource, simultaneously opening other venues for its use. The lower price enabled people to employ salt in situations where it previously would have been too costly. Most of the uses described above are more recent uses for salt. In pre-modern situations, salt served two primary uses; consumption and preservation. Salt was eaten and added to dishes to enhance its taste. Further, salt was added to perishable edibles to preserve them. As a preservative, salt is ultimately consumed as well. These two uses are the most important for social contexts in the past and a holistic anthropological perspective of this resource. Therefore, these two uses are described separately.

2.4 Consumption of Salt

The consumption of salt has been a contested topic in the last couple of years in the United States and other regions in the Western world. Currently, the average intake of sodium per capita exceeds the recommended daily values. The Center for Disease Control and the US Department of Health and Human Services recommend 1,500 mg/day for middle-aged and older adults and blacks and 2,300 mg/day for others (CDC 2010). Today, the average intake of sodium is double that and research suggests that high sodium diets increase blood pressure and chances for heart failure and strokes. Most salts are consumed through processed or restaurant foods, about 77%, compared to only 10% from table salt and cooking (CDC 2010). The high amounts of salt and other substances, such as fats and sugars, in processed and restaurant foods contribute to obesity and type-2 diabetes. Both are huge health issues and people are becoming more aware of the risks.

Other research, however, has shown that healthy kidneys are perfectly capable of extracting excess salt from the human body. People who are physically fit are capable of balancing the right amount of salt in their bodies and do not experience any negative effects from consumption of salt above recommended values (Bitterman 2010; The Salt Institute 2011). Bitterman (2010) states that healthy kidneys can process three pounds of salt a day when sufficient water is consumed. A long-term study on the effects of salt on hypertension demonstrated a correlation, albeit harmless, between salt intake and hypertension. The same study indicated that low-salt diets are harmful and increase cardiovascular mortality. High sodium intake is not necessarily good for the human body, but a reduction of salt intake is less desirable and increases mortality rates (Stolarz-Skrzypek et al. 2011). This shows that salt is vital for human health. As with anything in life, moderation seems to be the key.

Salt is a dietary need for humans and a lack of salt will lead to health issues and eventually death (Andrews 1983; Astrup et al. 1993; Denton 1982; Kurlansky 2003; McKillop 2002; Sullivan 1981). For example, a water-only diet will lead to death from lack of salt, rather than food starvation. The human body is incapable of producing salt, and the daily loss through urine, faeces, sweat, tears and other excretions demand daily replenishing. In extreme conditions, such as desert-like conditions or illness, the body loses not only water, through excessive sweating or diarrhea, but also large amounts of salt (Denton 1982:45). Soldiers in World War II were found to lose 24 liters of sweat during a day in the North African desert, resulting in a loss of between 70 and 100 grams of salt (Denton 1982:85). Hydration is not the only issue that one needs to be concerned with in these circumstances.

Salt is a dietary requirement for very specific reasons. Pure salt is made out of sodium, the cation Na^+, and chloride, the anion Cl^-. It is peculiar that both Natrium, the metal form of sodium (Na) and chlorine, the gas (Cl_2), are poisonous to the human body. Natrium reacts very powerfully with water, producing a liquid (NaOH), a gas (H_2) and heat.[2] The gas expands, a process that is further amplified by increased temperature creating an explosion. Because the human body is mostly made of water, the metal Natrium is very dangerous. For Chlorine other health risks are involved. Chlorine in high concentrations in the air can cause severe irritation to body tissues, including lungs and nose, producing breathing difficulties and chemical pneumonitis, the accumulation of fluids in the lungs. A reaction with water produces hydrochloric acid, a powerful acid that burns the skin (Bitterman 2010:36).[3] Fortunately, both Natrium and Chlorine are very reactive and do not occur in their elementary form without human interference.

The functions of sodium in the body are incredibly diverse. Sodium is the main cation in our body and the regulation of sodium concentrations within the body is vital for some elementary bodily functions (Denton 1982:4). Sodium is dissolved in blood plasma, extracellular fluid and lymphatic fluid and its balance is regulated by water intake. The differences in concentrations determine the exchange of fluids and other elements between cells, blood and other bodily fluids. Hence, there is a strict relation between sodium concentrations and water in the human body (Andrews 1983; Astrup et al. 1993; Bitterman 2010; Denton 1982; McKillop 2002). Furthermore, sodium is a positively charged ion that is essential for the function of the nervous system and muscle contractions (Astrup et al. 1993; Denton 1982; McKillop 2002).

---

[2] The complete reaction of Natrium with water is: $2Na(s) + 2H_2O \rightarrow 2NaOH(aq) + H_2(g)$
[3] The complete reaction of Chlorine with water is: $2Cl_2(g) + 2H_2O \rightarrow 4HCl\ (aq) + O_2\ (g)$

Early symptoms of sodium deficiency, or hyponatremia, are headaches and nausea, but these symptoms can quickly lead to more severe problems such as muscle spasms, seizures and heart rhythm problems. Eventually, this will lead to coma or death. A decline in sodium concentration also facilitates the growth of viruses, bacteria, yeasts and molds in the body, causing secondary health issues (Astrup et al. 1993; Bitterman 2010; Denton 1982). Sodium deficiency is quite common, especially among herbivores. Plants have little sodium content and a diet primarily based on plants is not sufficient to overcome the daily loss. Additional sources are necessary to maintain appropriate sodium balance and multiple animals have been observed eating soils or gathering at salt licks to add sodium to their system. Omnivores and carnivores sustain a healthy sodium balance from the meat that they consume, containing sufficient sodium to overcome their daily loss (Denton 1982).

Hypernatremia, the opposite of hyponatremia, is very uncommon and generally caused not by consuming too much sodium, but rather through depletion of water through excessive sweating or other ways of losing fluids. Any increase in the sodium concentration immediately induces thirst, thereby helping balance the sodium concentration, and people naturally respond to these situations. This strong natural response reduces the number of people who suffer from hyponatremia and it only occurs in situations where water intake is restricted (Bitterman 2010; Denton 1982).

Although Denton’s (1982) book ‘The Hunger for Salt’ focuses on the sodium in salt, chloride also has essential roles in bodily functions. Chloride serves as an electrolyte in the nervous system (Andrews 1983; Astrup et al. 1993; Bitterman 2010; McKillop 2002), facilitates protein digestion as it triggers the enzyme pepsin in the stomach and it is part of important neurotransmitters in the brain (Bitterman 2010). Furthermore, hydrochloric acid in the stomach kills bacteria and viruses, protecting the body. A lack of chloride significantly affects these functions and jeopardizes health.

The dietary need for salt may explain why salt is one of the four things human's tastes (Astrup et al. 1993; Denton 1982). Salty products are often considered pleasant and enjoyable. The reason for this quality ensures that people consume salt in sufficient amounts. Our hunger for salt is a result of evolution and salt deficiencies were avoided by an increased longing for it. This longing for salt prohibited a lack of sodium and chloride ions in our system and the possible shut-down of some vital organs and functions in the human body.

As shown, both sodium and chloride are essential for survival, yet numerous areas in the world lack salt, especially inland areas far removed from the saline waters of the sea. Such areas are completely dependent on local encrustations, rocks or brine wells. This is the exact reason why so many herbivores gather at salt licks, because access to salt is crucial for survival, but restricted at the same time. These locations form excellent places for omnivores and carnivores to find prey, because the aggregation of animals is expected and locally concentrated.

Dietary need for salt has often been the main focus of archaeological analysis of its significance. Especially with large population, the need for salt becomes very prominent. Recommended values for salt intake vary between 0.5 and 5 grams a day in normal circumstances (Andrews 1983:9; see also Sullivan 1981) to 30 grams per day in tropical environments where loss increases as a consequence of high rates of perspiration. In the case of the World War II soldiers in the African desert, 70-100 grams would have even been required. Andrews (1983:9) argues that 8 to 10 grams/day were required in the Maya lowlands. For a region with 1 million inhabitants, a daily requirement of 8 grams a day means 8,000 kg a day or 2.92 million kg per year. What emerges is a structural need for salt in tropical regions where sources of salt were relatively rare, difficult to exploit or completely absent.

When meat is consumed fairly regularly, this dietary need is not a problem. Animal meat contains salt and consumption of meat, therefore, satisfies the dietary requirement. However, with the advent of agriculture, diets changed drastically and meat was consumed less. This change in diet led immediately to a higher demand for salt. This correlation between a high requirement for salt and agricultural economies is often emphasized, also because a more sedentary way of living decreases the opportunities to collect salt when a source is absent. An increased economic focus on plants eventually results in an increased economic focus on salt (Andrews 1983; Andrews and Mock 2002; Bitterman 2010; Bloch 1976; Carlson et al. 2009; Ewald 1985; Flad 2007; Hewitt et al. 1987; Kepecs 2004; Kurlansky 2003; MacKinnon and Kepecs 1989; McKillop 1995, 2002; Muller 1987; Tibesar 1950; Williams 2002, 2010). Especially in hot and humid environments where sources of meat are limited, such as the Maya lowlands and the tropical lowlands of South America, salt and salt trade were essential.

2.5 Preservative Quality of Salt

Besides the dietary need, salt has another valuable quality for economic purposes. Salt preserves. Adding salt to meat and vegetables changes their chemical composition and prevents decay. This chemical process has two functions that allow edibles to last. First, sodium and chloride concentrations are beyond the levels in which bacteria and other microbes can live. Second, salt extracts water and prohibits bacteria from absorbing water for their growth. Salt is an extremely powerful resource that can transform the properties of a perishable into a product that can be stored and preserved. Ketchup, for example, was ‘invented’ by trying to preserve tomatoes by adding salt to them (Kurlansky 2003). Many products that are still widely available, such as soy sauce, hard salami and prosciutto, salted fish, are the result of salting practices that were used to preserve products for longer periods of time.

Cooling or smoking are two other practices that preserve meats and vegetables and are common in many places around the world. In the Western world, some smoked food items, like smoked eel, are even considered delicacies. These other ways of preserving edibles, however, have obvious disadvantages. Ice does not occur everywhere or last year-round. Refrigerators and electricity are means to lower temperature and overcome the lack of ice, but this technology is very recent, invented in 1876 by Carl Paul Gottfried von Linde in Germany. Only after World War II did refrigerators become commonly used, as prices dropped and electricity was more available.

The process of smoking has two disadvantages. First and foremost, smoking is very fuel intensive. Just as for boiling brine to extract salt, large amounts of wood are necessary for smoking. Moreover, not all wood is desirable for burning and hardwoods are preferred. [4] On a small scale, this might not present too many difficulties, but on larger scales the supply of hardwood can become problematic. With respect to this point, a large amount of energy needs to be invested in the cutting of trees and procurement of wood.

[4] Smoking with pine is not recommended. The resin in pine turns the taste of the meat bitter.

In situations where salt is produced by boiling, the resource requirements for salting and smoking would be similar and there would be advantage to using one procedure versus the other. Both salting and smoking require a significant amount of wood to preserve meats and vegetables. However, a second disadvantage of smoking is timing. When a fire is started for smoking, all meats and/or fish must be available. When the fire is out and fresh meats and/or fish are caught, the process needs to start all over again. Because smoking is fuel-intensive, it is unlikely that there is a constant fire to which meats can constantly be added when these practices happen on relatively small scales.

This problem of timing is absent for salting, because salt can be added continuously and is not restricted to certain specific times. As long as there is a supply of salt, freshly caught meats and fish can be immediately cured by putting them into a container with salt. This can be done on a day-to-day basis and is incredibly flexible. Finally, the consumption of salt-cured food items can simultaneously provide additional salt for dietary purposes. So, besides the preservative qualities of salt, salted meats, fish and/or vegetables are used as sources of dietary salt.

Food preservation before the invention of the refrigerator was a serious issue. Investing energy in resources that eventually would not last was a major concern and ways to preserve items were crucial in most economies. Especially in times of need, such as droughts, severe storms or other phenomena that can destroy harvests, preserved foods were important for survival. In regions where ice is unavailable year-round, preservation practices are limited to salting and smoking.

2.6 Salt's Importance in the Past

Although the uses of salt argue for a prominent place of salt as an important resource in the past, it is easy from a contemporary perspective to underestimate its importance. Salt is cheap and available everywhere. This, as we have seen, stands in sharp contrast with past conditions (Andrews 1983; Kurlansky 2003; McKillop 2002). Partially, this is a result of industrialization where mining and solar evaporation facilities are much larger and reduce relative costs. In addition, the process of globalization increased mobility of goods and people, reducing the prices of transportation. Although salt can only be mined, boiled or harvested in very specific locations, the effort expended for transport has been reduced compared to the past.

Modern exploitation of salt drives an expansion of scale that lowers price, whereas salt's economy previously was centered on low supply and scarcity. The locations where salt production occurs have not changed much, but the scale and intensity have. The scale of exploitation of salt has grown dramatically and global annual production approximates 250 million metric tons. During the Civil War, 3,000 workers produced approximately 225,000 tons of salt in the United States. Nowadays, 4,000 workers produce 22,500,000 tons of salt (The Salt Institute 2011).

Salt was highly valued, even in the recent past. In 1782, a bushel of salt[5] in the Ohio Valley was worth $3 (Jakle 1969). When these three dollars are compared to the wages of unskilled labor at that time and unskilled labor nowadays, the total value of a bushel of salt in today's society would be $1,290 (MeasuringWorth 2011). The price of one bushel of salt is $30.46 on today's market, about 2.3% of the value two centuries

[5] 1 bushel is 9.3 gallons or 35.2 L. Bushel is a measure of volume, not weight.

ago.[6] The high price of salt in 1782 also underlines that salt was a highly valued and scarce commodity.

Salt's description as 'white gold' comes as no surprise (Kurlansky 2003; McKillop 2002). Control over salt was fairly easy to establish, because of the restricted number of locations and relatively low quantity of salt. These factors, in combination with the high demand for salt, facilitated taxation of this resource. The construction of the Great Wall in China was largely funded by taxes on salt (Kurlansky 2003:31). Roman soldiers were paid in salt, which is the origin of the word *salary*. Rome sometimes subsidized the price of salt, a sort of tax cut, but also raised it to increase tax income during the Punic Wars with Carthage (Kurlansky 2003:63). In France, the *gabelle* was a poll tax instigated by the Crown and one of the most hated laws in French history (Bitterman 2010; Kurlansky 2003). All salt was taxed equally, enforcing a 'fair' process whereby everybody was taxed the same amount. However, nobility, religious leaders and other people of high stature received provisions. An almost constant state of war existed between the *gabelous*, the collectors of the *gabelle*, and the *faux-sauniers,* smugglers of salt. One of the first actions of the new Assembly after the French revolution was repealing the *gabelle* (Kurlansky 2003:234), underlining how much the salt tax was a symbol of the power of the established elite.

Examples of salt producing economies are vast and illustrate its importance. In 1603 and 1605, salt production in Yucatan, Mexico, exceeded 17,000 metric tons (Andrews 1983:135-137). Andrews (1983:135) states that these numbers are conservative and only represented a few large salinas in the region, while other

[6] This is calculated assuming one bushel is approximately 50 lbs, and 1 lb of salt costs $0.61. A 26-oz. pack of Morton Salt sells for $0.99.

numbers relating to the maximum potential of these salt flats are much higher. Although a demand for salt significantly increased by the early 1600s because of the silver mines, this was partially met by increased production on the mainland and the pacific coast of Mexico (see Ewald 1985). On Puerto Rico, the chief (*cacique*) of San German, Agueybana, traded 729 fanegas of salt with the Spanish between 1516 and 1520. Following Andrews (1983:135) a conservative estimate would lead to a total of almost 84,000 kg of salt from one location within four years. This is a yearly production of over 20,000 kg, which must have been a significant part of the economy in southwestern Puerto Rico. This is significant, especially because this island is not particularly known for its salt production. The Dutch, lacking a climate conducive to solar evaporation in Europe, targeted specific islands in the Caribbean region to produce salt, such as Aruba, Curacao, Bonaire, St. Eustatius and St. Maarten, but also Île de la Tortue and Tobago. Bermudians traveled over 1,300 km by sea twice a year to Grand Turk and Salt Cay for salt. During six months, Bermudians raked and harvested salt, while in the winter they would sell the salt to European ships that were travelling to the United States. There, the salt was mainly used for salting cod. Rumors still persist on Salt Cay that George Washington personally ordered Turks & Caicos salt for his army. If this rumor is true or not remains to be seen, but his revolutionary army did acquire Turks & Caicos salt, despite the fact that these islands were still part of the British crown. Furthermore, during the Civil War in the United States, the northern troops sailed around Florida to attack the salt works in the Gulf of Mexico, in order to deprive the Confederacy of a source of salt, which was needed to preserve foods for the army (Kurlansky 2003). The Muisca of Colombia produced salt from brine wells and exported salt bricks beyond their territory (Kurella 1998; Peña 2008). The presence of coal mines for fuel decreased the costs for boiling, thereby increasing profits from salt. All these cases show that salt was of major importance throughout the circum-Caribbean region and that local economies were heavily focused upon its exploitation.

2.7 Archaeology and Salt

The limited availability and high price of salt in the past provided a strong motivation for production of this resource in places where environmental conditions were favorable. When investigations concern regions where natural production is possible, this must to be taken into account. Salt might be absent in the archaeological record, making its existence invisible, but practices involved in the exploitation do leave traces. Regardless of the extraction process, the exploitation of salt is often managed and/or manipulated by humans to increase production by speeding up the process of evaporation. Boiling and construction of salt pans are expected in locations that favor salt production.

Even without detailed information on the exact uses of salt in prehistoric communities, material evidence demonstrates that people were invested in its exploitation. For example, McKillop's data on boiling practices of brine in southern Belize (McKillop 1995, 2002, 2010; McKillop and Sabloff 2005) and the solar evaporation works on the northern coast of Yucatan (Andrews 1983; Andrews and Mock 2002) materialize the value of salt in Mayan economies. Although each region produces a different salt, Yucatecan salt is solar evaporated and Belizean salt, known as *sal cocida*, is boiled, the fact that both regions were primarily concerned with its exploitation demonstrates that salt was an important commodity in the Maya region. It also shows that places where salt can be procured are fully exploited, implying that salt was utilized in large quantities in the region.

Most archaeological research focuses on the production part of the process, rather than on the uses of salt. Partially, this can be ascribed to the invisibility of salt, which disappears when consumption takes place. On the other hand, archaeological case-studies center on artifacts rather than actual practices, privileging the materials used during the production process rather than the product and its functions. It is often assumed that people used it for consumption, either as an additive for taste or as a byproduct of preservation. Other uses of salt are only sporadically mentioned and differentiation between byproduct or taste enhancer is rarely explicated.

This tendency in archaeology can be ascribed to an artifact-centered approach. Discussions mainly address the objects involved in the production process, but shy away from possible uses. This artifact-oriented approach is often guided by the underlying assumption that archaeology should be restricted to studies of material evidence, neglecting the 'invisible' side of salt-related practices. Implicitly, archaeological studies of salt restrict themselves to the production processes for which there are artifacts and overlook the actual distribution and consumption. Although people obviously engage in production practices to ultimately use salt, the important reasons why people produce this resource are mostly neglected. Issues of consumption and preservation are neglected, because of a lack of archaeological visibility. Explanations of the importance of salt are therefore restricted to these material qualities.

2.8 Conclusion

This chapter argued for the importance and value of salt in the (recent) past. Salt was clearly a sought-after commodity with a high price, sometimes artificially raised though taxes. Our contemporary bias obscures its significance in past societies, but these examples show the enormous possibilities for an archaeological focus on salt. Across time and space beyond the recent past, salt was of value. Especially in regions where environmental conditions are favorable for the production of salt, this resource deserves more attention. Despite salt's invisibility in the archaeological record, these examples from the past emphasize that this resource had a profound impact on (pre)historic economies.

The importance of the required quantities of salt needed in tropical environments and prices of salt in the late 18th century demonstrate that people really needed salt and were willing to pay a high price for it. The potential for profit was high, especially when a salt resource could be controlled. Furthermore, the required quantities of the Maya lowland, estimated at 8,000 kg per day, underline that these demands are not easily met without some large-scale economic exploitation. The quantities required for the dietary needs of humans to maintain appropriate sodium and chloride concentration in the body necessitates an elaborate network of supply, transportation and distribution. Given the above amounts required, it is very unlikely that every family would traverse large distances to independently provide enough salt for their needs.

However, a relationist practice-oriented approach must incorporate practices of consumption and distribution. This study cannot restrict itself to production processes to achieve a holistic perspective on salt. The archaeological focus on artifacts has to be abandoned and attention must to be directed to questions of why people actually produce this resource. Indeed, people require salt and salt can also overcome issues of preservation, but this does not explain why salt is so valuable and often related to power. A holistic perspective must involve the investigation of practices how people utilized this resource after production.

CHAPTER 3
THE SOCIALITY OF SALT

This chapter explains how salt facilitates the transformation of material wealth and food production into social status and power differentiation. The previous chapter provided a material basis for a discussion on the nutritional importance of salt in the past. However, a holistic perspective must move beyond these material facts and integrate how salt is used within a social context. The sociality of salt focuses on the social consequences of salt's physical properties. Salt transforms the material world, especially when food is preserved; perishable foods suddenly become durable edibles. The power of salt is strongly related to this change in the material world and its social consequences. Produce exchange and the creation of debts are central processes in this argument. This chapter argues that people consciously utilized salt's physical qualities to produce social inequality.

Ethnographic and archaeological examples show a close relationship between salt, power, social complexity and inequality (Andrews 1983; Andrews and Mock 2002; Brown 1999; Ewald 1985; Flad 2005; Flad and Hruby 2007; Godelier 1971; Kennedy 2007; Kepecs 2004; Kurlansky 2003; McKillop 1995, 2002, 2010; McKillop and Sabloff 2005; Muller 1984, 1987; Parsons 2001; Williams 2002). This resource is a gateway to power in many disconnected societies. Elites often controlled salt and it was consciously perceived as a source of social wealth. The consistency of this relation between salt and social inequality across different cultures suggests that basic material qualities of salt induce differentiation of power. Most arguments, therefore, simply equate salt's nutritional need for human consumption and ability to preserve food items with foundations of social inequality.

The nutritional argument corresponds with other anthropological literature on social inequality and complexity, which recognizes food surplus production as the primary basic requirement. Social complexity increases the percentage of non-producers in a society, requiring an intensification of food production. The loss of labor to non-producing institutions is corrected by intensification and overproduction by producing institutions. Mass produced staples provide a surplus and provide the financial basis for complex forms of social organization (D'Altroy and Earle 1985). In short, overproduction of certain scarce resources is needed to nourish elites that do not produce food themselves. Both salt and surplus production fit this scenario, i.e. that control over salt or surplus production functions as a vehicle to control people and gain social status.

However, there is a fundamental difference between salt and surplus production that cannot explain why these goods establish social inequality on nutritional grounds alone. Whereas the importance of salt is based on its limited availability, surplus production, by definition, implies abundance. Where a lack and structural nutritional need for salt induces power, surplus production establishes inequality through excessive amounts of available nutrients. In this argument, both scarcity and abundance are perceived as essential qualities, but it fails to demonstrate how these differences in quantities correlate with power. This difference in quantities between salt and surplus suggests that another common quality is important in the transformation from material to social wealth.

Salt and surplus are both edibles and the use of these resources always involve some acts of consumption. Recognizing the importance of consumption practices is the first step to move away from material qualities that induce power to a practice-oriented approach that emphasizes the ways people use material wealth as a structural element in this transformational process. Consumption is needed to meet nutritional requirements, but the way people meet these requirements is an inherently social practice. People with different backgrounds and cultures eat differently. Although a nutritional argument underlines the importance of day-to-day production and consumption and how food drives higher forms of complexity, which are aspects that are underlined by a practice-oriented approach, social aspects of food consumption are neglected and summarized as a mere biological process to absorb nutrients. But food is so much more than nutritional values alone and it creates forms of social identity and relations among people.

Still, the importance of the sociality of consumption leaves the mechanism of how nutrients translate into power totally unexplained. At some point, nutritional values are transformed into social status. Consumption, in isolation of other practices, does not explain how this takes place. In this chapter, Munn's (1977, 1986) concept of value transformation guides the discussion. Although her case-study specifically focuses on Gawa, an island in the Massim region, Munn (1977, 1986) explains how processes of exchange are social mechanisms to transform and alter values of products into social relations. As part of the *kula* ring, exchange of valuables is obviously important, but she also emphasizes the importance of food within this process. Food exchange forms the ultimate foundation on which *kula* exchanges are built. This idea of the central role of food exchange in the transformation of material to social values is transposable into other contexts and not restricted to the island of Gawa alone.

This chapter discusses the transformational process in four steps. First, the physicality of salt structures people's practices in much more pervasive and particular ways than consumption alone. The social consequences of these material qualities of salt are important for the transformational processes. Second, attention is directed to food as an inherently social phenomenon. As salt is a consumable and a food, the social context of food is critical for understanding the social consequences of salt's material qualities. Third, exchange is discussed and how these practices transform material wealth into social status. Finally, discussion of food and exchange is reverted back to the materiality of salt and how this resource facilitates the transformation of value. This original practice-oriented approach to salt explains how strong correlations between salt and power emerge in so many different spatially and temporally disconnected situations.

3.1 Salt

Salt's physical properties significantly impact the process of value transformation from food to positions of social inequality. Nutritional requirements for salt force an economic focus on this resource, while the preservative qualities affect the materiality of food. The social significance of salt emerges out of the physical qualities *and* how this product is concomitantly utilized. Salt-related practices are as meaningful as the qualities specific to this product. The consequences of the material characteristics and how salt is employed both require explanation to understand how this resource affects local economies. Eight consequences of salt are discussed now.

First, a nutritional need for salt induces a social need. In locations where sources of salt are lacking, such as tropical lowlands and other locations far removed from the sea, the exchange of salt requires a vast network of transportation and distribution. In situations where one million people in a tropical environment have no access to salt, as mentioned in the previous chapter, 8,000 kg of salt have to be imported on a yearly basis. There is a structural need for exchange in these circumstances, but these structural needs have simultaneously a social component. In the presence of a market economy, taxes on salt, such as the French *Gabelle* and the Chinese example of the Great Wall (Kurlansky 2003), are social statements of donor-receiver contracts and impact spheres of social relations beyond mere economic terms. In the absence of a market economy, the exploiter and distributer of salt will establish personal relationships with the receiver. The nutritional requirement for salt transforms into a social requirement of exchange and interaction and mandates a network of social relations. The impression that salt leaves on an economy creeps into social spheres and its exchange is neither wholly economic nor social, but both.

Second, the preservative qualities of salt strongly influence the methods and pattern of exchange. Salt increases the potential to exchange food resources over long distances. Without preservation, specifically in hot and humid environments, long-distance exchange of food resources is difficult. Food items that are preserved can be transported for longer periods of time without loss of value, allowing for an increased distance between place of origin and place of exchange and consumption. Spatial scales of exchange are expanded and salt provides the opportunity to enlarge an existing exchange network.

Third, risks involved in the exchange of perishable foods are significantly reduced. The ability to modify food and preserve it for longer periods prevents foods from being lost. Salt moderates these risks and guarantees that food resources can be used before decay sets in. Products that have high potential to decay are unlikely to be exchanged because of the risk involved, but salt mediates these risks and opens up possibilities for exchange. The role of food items in larger spheres of exchange and value transformation increases significantly through salt.

Fourth, the risk of long-distance voyages decreases as well. Preserved foods can be utilized for nutritional purposes during voyages that they last multiple days. When new resources are absent or difficult to exploit during these voyages, preserved foods are a solution. Additionally, food procurement strategies may delay the trip and lower its efficiency. Access to salted foods stimulates the exchange over large distances and results in decreased social distances. The physical distance remains the same, but the availability of preserved foods diminishes the risks and raises the efficiency of these exchange voyages, lowering perceived boundaries that inhibit contact.

Fifth, salt facilitates accumulation of food products. In the case of perishable materials, decay prevents accumulation and foods vanish before they can be used. Salted foods can be preserved and overproduction can be stored. Without a preservative, the process of decay dictates subsequent distribution and consumption practices. Freshly caught or harvested foods need to be immediately moved to their final destination to ensure consumption before the item is lost. Accumulation is not possible and large quantities cannot be maintained for extended periods of time. Salt's ability to preserve food also allows foods to be stored and accumulated for times of need.

Sixth, seasonal shifts can be negotiated by salt, as periods that impose a shortage on populations are potentially balanced by over-exploitation of resources at other times.

Without a preservative, year-round settlements cannot be maintained in places with seasonal shortages, even when other seasons are characterized by incredible surpluses of certain foods. Seasonal shortages necessitate the mobility of people and because of this need, increase the costs of the exploitation when seasonal surpluses do occur. The ability of salt to preserve food makes it possible to store surplus that can be used later during seasonal shortages and, consequently, reduces the costs of seasonal exploitation.

Seventh, the availability of salt increases efficiency in production. In situations where production is limited by decay rather than available labor, foods are left unexploited. Overproduced food items are lost because people are unable to consume them before the food decays. The rotting process dictates rates of production. With salt, labor can be fully exploited and overproduced foods are preserved and employed at later times. In the Caribbean region, for example, there is no incentive to capture more than a seven day fish supply in any one trip without access to a preservative, because all of the extra labor invested in fishing is lost as soon as the fish becomes inedible. With access to salt, the cost-benefit ratio increases and more production is possible in shorter periods of time and with less input of labor.

Finally, salt allows an economy to shift its focus from food procurement to other practices. Accumulated salted foods can be consumed on days, weeks or even months that people are not working to get their meal together. In a situation lacking a preservative, this sort of specialization beyond food production is difficult to maintain. Having to work constantly for sufficient amounts of food restricts available labor and time. Efficiency is increased, because more resources can be exploited in a shorter period of time and still be used. Previously, the extra time of exploitation would be lost as soon as the food would perish and labor was needed again to overcome this loss.

These eight consequences of material qualities of salt and salted foods indicate that this resource completely changes the way people can do things. Previously impossible practices enter the realm of possibility. The physicality of salt has important social consequences. In order to explore these social consequences in more detail, as discussed above, the social context of food and exchange both need to be explored further.

3.2 Food

Food is not food until it is eaten. Preferences for certain foods, situations where food is expected and/or required, the way food is eaten and with whom food is shared are all facets of food consumption that are incredibly important for the social significance of food (DeBoer 2001; Eves 1996; Hamilakis 1999; Holtzman 2006; Mintz and Du Bois 2002). Through consumption, food is experienced. These experiential qualities of food are specifically important for salt, as salt is one of the four basic tastes that our palate can differentiate. Salt adds flavor to food and simultaneously serves nutritional purposes. People's capacity to differentiate salt in our taste means that people experience salt through their senses. Biological and material factors play a role, but the consumption of salt or salted foods is a very specific social experience.

Culturally specific food preferences depend more on social needs than mere nutritional requirements. Smith (2006:480) argues that staple crops, for example, are selected in relation to their ease of harvest, ease of preparation, taste and value. Domesticated food crops show signs of changed morphology and include decreased bitterness and the removal of toxins in root crops, vegetables and fruits, underlining the social dimension of food-crop decisions (Fuller 2002 in Smith 2006:481). People decide among a variety of alternatives for staples, which implies that these crops have important social aspects that are often disregarded. Because staples are incredibly varied and widely available in our contemporary diet (rice, potatoes, wheat etc.), societies that produce and consume only one staple may seem restrictive. Restrictions in food choice might lead to the assumption that people are struggling to make a living and emphasis is placed on nutritional aspects of food. However, these people do not decide to base their economy on a restrictive number of staples to maintain sufficient nutrients. Rather, these choices are based on options in production, preparation and consumption of these specific cultigens (Smith 2006:480).

Food also serves as a basis for social relations (Hamilakis 1999; Holtzman 2006; Mintz and Du Bois 2002). Food establishes and strengthens social bonds between individuals and/or groups and sharing meals is a universal way to establish friendships and relationships of trust (DeBoer 2001; Eves 1996; Hamilakis 1999; Holtzman 2006; Mans 2011; Mintz and Du Bois 2002). Individuals seldom produce all the food they consume, necessitating some form of exchange and sharing. Furthermore, a division of labor in the production and preparation of foods induces a need to share within households (multiple contributions in Collier and Yanagisako 1987). Food exchange is fundamental to social relations in all human societies.

One of the reasons why food has such a prominent role in societies is its repetitive character, as food is consumed on a daily basis. Production, preparation and consumption create daily routines that inform many activities that take place on a regular basis. Theoretical frameworks followed in this study, such as practice theory

(Bourdieu 1977, 1990) and structuration theory (Giddens 1984), emphasize the importance of daily activities for social structure. Repetitive practices form and structure social perceptions and attitudes, operating as guidelines for social interaction. Daily routines involved in the production, preparation and consumption of food are incredibly powerful practices that can generate these cultural dispositions that structure social life. The repetitive character of food consumption is a potential medium through which social relations can be manipulated or strengthened, especially because the repetitive character of food consumption can become unquestioned and routinized.

Through a process of repetition of daily routines, certain social relations become ingrained in people's social memory (Connerton 1989; Morsink in press-b; Van Dyke and Alcock 2003). Once ingrained, social memory is constantly evoked through the consumption of food and concomitant activation of the senses (Eves 1996; Hamilakis 1999; Holtzman 2006). Holtzman (2006) stresses the structured character of food preparation, distribution and consumption that recall memories of similar past activities, including ideas of gender differences and divisions of labor. Especially at large communal gatherings, feasts and rituals, food consumption is a powerful tool to strengthen or manipulate social relations (Eves 1996; Hamilakis 1999; Holtzman 2006).

Food-oriented practices ultimately result in consumption, a sensuous bodily practice, and provide an excellent avenue to negotiate social structures. Through the senses, including vision and smell, food is experienced and this sensuousness of food evokes reactions (Eves 1996; Hamilakis 1999; Holtzman 2006). Hamilakis (1999) states that the repetitive, sensuous and bodily qualities of food consumption serve extremely well for the generation, maintenance, legitimation and deconstruction of authority and power. People recall and stimulate values and meanings of food on a daily basis, which concomitantly inform and strengthen future perceptions. Strong repetitive bodily experiences induce a prominent and pervasive social significance to food.

Food, therefore, serves as an excellent vehicle of social identity. Consumption of similar foods creates a social bond of relatedness. Furthermore, food structures practices beyond immediate consumption and choices in staples generates similar agricultural cycles, including garden preparation, planting and harvest seasons across large regions. Identical yearly patterns of consumption and production practices embody shared social identity and foods create social cohesion (Holtzman 2006). For example, differentiation between elite and non-elite diets within one social context is another way to structure social identities through food. Certain foods are only accessible to elites and cannot be afforded or procured by non-elites, making the act of consumption itself a statement of someone's social class and identity (Deagan 2004; deFrance in press). Indeed, what you eat is who you are.

As one of the four basic tastes in the human palate, salt is extremely suited for structuring practices and social memory. The consumption of salt, especially in a situation where salt is scarce, invokes a strong sensuous experience. People recognize when salt is added to their food and become aware of its presence. Its unique and pleasant taste communicates social connotations through consumption. Salt not only enhances the taste of food, it enhances strategies to form and manipulate social relationships. It works as a social enzyme, as its specific material qualities catalyze the transformation from nutrition to social relations. Social facets of food consumption, therefore, correspond to aspects of salt consumption.

3.3 Physicality of Food and Future-oriented Practices

As discussed above, foodways fulfill both nutritional and social needs. Choices that are made in consumption practices are critical to questions of power, identity and status. Consequently, archaeological research concerning food should focus on the social consequences of how food is used, rather than restrictive perspectives on what is consumed. The meaning food has in a specific cultural context depends on people's intentions and how food satisfies certain needs. Despite the fact that archaeologists often acknowledge the social realm of food, the perceived lack of material correlates of social intentions is often presented as the reason why detailed investigations into these questions for past peoples are limited. However, the material evidence is not lacking, it just needs to be recognized.

The physicality of food items is the material correlate and evidence for the intentions of past peoples. Different foods have different material qualities and which foods are consumed reflect which qualities people chose and preferred. Taste, size, production processes and durability are all factors that differentiate foods. From a whole gamut of possibilities, horticultural and agricultural societies choose and grow very specific products. Reoccurring choices for certain qualities are likely intentional and conscious, providing a point of entry into underlying cultural preferences. A reduction in food diversity is a deliberate result from selective processes that are aimed to satisfy nutritional and social needs. Ethnic foods are the result of prolonged practices of explicit decisions from a wide variety of options and these foods materialize immaterial social considerations. Material qualities of certain foods are the material evidence that archaeologists need to recognize.

A direct consequence of this perspective is that food production is based on the ways the producer intends to employ the food. The production processes are directly related to the practices people employ and certain foods are specifically selected to satisfy these future needs. This will dictate which food is appropriate and its production processes. Although practices of production and consumption are disconnected in time, and often considered separately in archaeological analysis, they are strongly related by their shared underlying motives. Practices of production and consumption have linked temporalities and are synchronized to each other. Decisions are not made in isolation of other practices and it is crucial to understand the connection between production and consumption to comprehend how food is utilized to suffice social needs.

This relational network of different practices, or taskscape (Ingold 1993), emphasizes a future-oriented perspective of people. Engaging in activities, individuals always consider how their actions will affect the future. Practices in the present are based on the past, but oriented towards the future. Decisions based on immediate circumstances have (un)anticipated long-term consequences and agents consciously engage in practices to improve their social position in respect to these prospective circumstances. Different temporal spheres are connected and people consciously try to manipulate social relations in the present in anticipation of the future. People live intellectually more in the future than the physical present. This also entails that present activities only make sense in reference to future circumstances of social interaction.

This future-oriented perspective of people is specifically visible in food-related practices. Food is a negotiator of social bonds and status, and practices involved in its production are focused on the future employment of food to manipulate existing social bonds. Certain edibles are consciously selected because they facilitate the negotiation of existing social relations. Selected foods are materializations of intentions and time and labor are allocated toward the production of very specific resources. Unselected resources will have qualities that are perceived as having less or no relevance toward certain future objectives. A consideration of which resources are selected and which are disregarded illuminates the qualities that pertain to future intentions and the social needs that people aim to meet.

Yam in Melanesia is an excellent example of how material qualities are important for future-oriented practices. Yam is the staple root crop in a large part of Papua New Guinea and Melanesia. From a nutritional perspective, yams are excellent staples because of their high caloric values and a lack of proteins can be easily compensated for by adding meat to the diet. On caloric values alone, yam is a good choice. However, other crops that could also be used for calories, such as taro, are much less abundant. Weiner (1976) explicitly states that people of the Massim region choose yams because they can be stored for a maximum of six months. Taro can only be preserved for a couple of weeks after harvest and is therefore produced in significantly lower quantities. Preservation, as a material quality and a biological process, is the material quality selected for in this case-study.

People actively manipulate material qualities of crops to extend preservation. People intentionally garden, plant, harvest and store foods at very specific times of the year to maximize preservation. Crops are planted in a specific season and gardens are maintained to ensure the quality of the product. Factors that can ruin crops, such as excessive rainfall or pests, decide times of harvest. People tend to control ripening processes of fruits to protect them from hazards and decay and in the case of Melanesia, yam storage facilities are relatively dry and cool to prolong preservation. Gardens are constantly monitored and require a significant amount of labor investment to maximize their production (Malinowski 1935). Preservation is a social process, a material quality that is produced through interaction with people. People have to actively engage with food products to prevent products from decay.

In the case of Melanesia, the choice for yams is based on future-oriented display of yams in yam storage houses. Melanesian yam storage houses are elaborate structures and are built throughout the region to expose and display wealth. A full storage house is a material manifestation of the success of its owners, as it physically communicates and references the productivity and fertility of the owning group. A full yam house is a symbol of social status and identity. As such, the choice of yams is not established on nutritional qualities. The ability to store and display yams for long periods of time enables Massim people to convey and communicate their power in more successful ways. The nutritional and economic values of yams are not unimportant, but the material quality that yams preserve can function as an index of wealth and success, which dominates as the crucial factor for the decision-making process regarding which crop to grow.

Moreover, there is a differentiation in uses between different sorts of yams and not all are employed in one homogeneous social arena. Large yams are exclusively shared and exchanged with outsiders, while smaller or partially damaged ones are consumed within the group (Malinowski 1922, 1935; Munn 1977, 1986, 1990; Strathern 1988; Weiner 1976, 1992). Despite the fact that larger yams are often more fibrous, less sweet and require more processing, the use of these yams is not focused on consumption. But larger yams are difficult to grow and their production requires a lot of labor. Smaller or damaged yams are much easier to grow. These larger yams, therefore, are materializations of labor, attention, dedication, fertility and productivity. The physical properties of the yam reflect and symbolize the social values of its owner.

These processes and decisions in production and exchange are not part of some ‘anthropological reality’ that Massim people themselves are unaware of. Rather, people explicitly follow these structures of food-related practices. These practices are discursive and openly negotiated, underlining how deliberately people use food to communicate their social position. All major anthropological works from the region describe how much effort, time and labor are directed to gardening (Malinowski 1935; Munn 1986; Strathern 1988; Weiner 1976). These efforts have little to do with maintaining sufficient caloric intake to survive, but are totally focused on how food can be employed in the future to establish new social relations and promote social identities of the producers of these goods.

An economic emphasis on foods that preserve over long periods of time primarily depends on social factors. The objective of Massim people is the production of large yams that can be used for display and exchange, rather than just quantity in general for household use (Munn 1986; Weiner 1992). The giver of a gift uses the material object to communicate a certain quality to the receiver. The product yam is better at conveying a message of fertility and productivity than yam as a food and, for these reasons, carefully selected by the giver. Before food is gifted, time and effort are often directed in the quality and presentation of the food, visualizing and materializing the diligence and efforts. People actively select specific objects for exchange and are very conscious of what they give, to whom they give it and how they give it.

This example underscores that the physicality of food demands anthropological consideration. The material qualities of food are important in respect to their ability to negotiate social relations. Durability, as a material characteristic of certain foods, facilitates exchange and gift-giving practices for two reasons. First, accumulation is not possible when food items immediately perish. Communal display is impossible and most foods decay before use. Second, food that is an index of success and wealth displays this message as long as it is present. The longer it lasts, the longer the message is communicated.

These advantages for exchange practices of food items that preserve are applicable in situations outside the Massim region. Food exchange functions as a social cohesive throughout the world and in many social contexts preservation of food is an issue. Also outside the Massim region, future-oriented practices of food production are focused on exchange of food. Production of food is better appreciated within a framework where exchange and social relations are foregrounded, rather than in a mere economic and caloric paradigm void of these social imperatives. Food resources that are consciously selected for their ability to preserve must be considered through a paradigm of social relations and gift giving.

3.4 The Gift of Food

In a situation of exchange, food is a gift rather than a consumption item. Food is given away as an object and its production is never intended to meet nutritional needs. The production of food for local needs is a by-product that is easily met. Certain crops, such as the yams in Melanesia, are purposefully grown to be given away. From an exchange perspective, all efforts that are directed toward the production of larger yams become clear. Massim people invest incredible amounts of energy in the production process of large yams, while larger yams are less sweet and processing takes more time (Malinowski 1935). But nutritional aspects are, for the Massim, totally irrelevant and yams are intended for exchange. Yams symbolically communicate the values of the producer.

However, Malinowski (1922, 1935), Weiner (1976, 1992) and Munn (1977, 1986) all assume that the production of edible products implies that these products are eaten. Although the items might have indeed been consumed at a later stage, their production process was not intended with this in mind. Although these scholars recognize that these items are gifted, they do not establish a distinction between foods produced for exchange those produced for consumption. A practice-oriented approach specifically emphasizes the uses of products and intentions of people. If exchange and consumption are two different intentions, then these need to be divided.

Therefore, a conceptual separation must be made between food and produce. Produce denotes the raw material, while food is processed and ready for consumption. This division between food and produce is crucial in understanding the Melanesian gift of yams, as yams are exchanged as *produce* and not as food. The size of the raw product communicates values of fertility and productivity in the yam storage houses and exchange, but processed yams that are cooked and served as food lose their physical appearance. The loss of physical appearance coincides with a loss of ability to communicate a message of fertility and productivity. Without the physicality of the raw product, the material evidence of the farmer’s diligence and dedication is absent. The receiver cannot know whether the donor is a good farmer or produced small damaged yams and processed these into the food. In order to physically display fertility and productivity, the raw material is indispensable.

Surplus is, in this situation, an incorrect term. Surplus means that it is essentially overproduced and considered something extra, without immediate requirements. However, if edibles are grown and harvested as produce, these items are not extra nor are they overproduced. These objects are consciously and intentionally grown for display and exchange, not for consumption. Although these objects are eventually consumed by their receivers, their primary purpose is to exchange and communicate messages about their donors. Because people can always engage in more exchange relations, produce is never in surplus. Fulfillment of nutritional requirements is a welcome byproduct of the original intention of producing gifts.

Why so much attention is given to gift giving depends on the social significance of exchange. Exchange follows a very strict pattern, as described by Marcel Mauss (1990) in his seminal essay. An object is given to a partner and the receiver is obliged to accept the gift and reciprocate in the future. The obligation to give and receive emanates from the social relation an exchange establishes or (re-)signifies. To refuse to give is to deny the social relationship between the giver and receiver. The obligation to receive follows this same principle, as a refusal would nullify the giver's attitude to establish or maintain a social relation and immediately increase tensions between giver and intended receiver. After the gift is accepted, another item needs to be reciprocated. In comparison to the future-oriented approach to the production of food, the exchange of objects is future-oriented in relation to the return gift.

Gift exchange causes debts between donor and recipient, creating an imbalanced relation of power (Peebles 2010; Schwartz 1967). Return gifts, especially in delayed reciprocity, are reciprocated with interest (Mauss 1990:18). These return gifts are anticipated and the original gift is given with the expectation of this interest. The original giver not only engages in the gift to establish a social bond between him/her and the receiver, but also expects interest that subsequently can be employed in other situations. Through the gift, the donor establishes a moral obligation with the receiver that can only be compensated through a gift with interest. Through giving, the donor indebts the receiver who is impelled to overcome the established imbalance (Komter and Vollebergh 1997; Peebles 2010). The creation of a contractual debt is the underlying basis for gift giving (Boas 1966:77 in Hayden 1995:52; Mauss 1990; Schwartz 1967).

Tension and negotiation are inextricably connected to practices of gift giving (Godelier 1999; Komter and Vollebergh 1997; Komter 1996; Lévi-Strauss 1969; Mauss 1990; Mol 2007, 2010; Schwartz 1967; Strathern 1988; Weiner 1992). Participants in an exchange are aware of these contractual debts and both agents constantly negotiate their social position. The donor must make a decision as to which available products are gifted and to whom. Donors want to engage in as many exchange relations as possible, maintaining large social networks and gaining access to many resources. Simultaneously, gifts must be of a certain value to sufficiently communicate the donor’s interest to the receiver and the quality of the gift determines the social relation between the two. A donor has a difficult job, as (s)he must determine how small the gift can be that can still convey a message of respect to the receiver.

Although gift-giving seems to have an altruistic basis, the tension and negotiation that is often observed during these practices cross-culturally are almost characteristic of barter. Prices and exchanged products are the subject of continuous negotiations between donor and receiver and all but mindlessly gifted. Because gift-exchange is such a powerful tool to acknowledge and form social relationships, a failure to conclude an exchange directly implies a failure to create a social bond. If gift-giving can avoid tension and aggression by establishing social obligations, an inadequate gift or inability to repay interest induces social distress and physical violence (MacIntyre 1983; Malinowski 1935; Mauss 1990; Mol 2007). Peace and conflict are social opposites and are both determined through exchange.[1]

An imbalance of gift exchange is favored, because the presence of debt means peace. This is one of the reasons why return gifts are often overcompensation. A return gift that equals the original gift potentially terminates the exchange relation and disrupts the need for a subsequent return gift. Absence of debt discontinues the exchange relation and permits hostile sentiments to arise. Furthermore, the moment of the return gift is an appropriate venue for the original receiver to establish a debt with his exchange partner and reverse the relationship. The original receiver was indebted

[1] Among the islanders of Tubetube, in the Massim region, the relationship between war and exchange was, in the 19th century, structurally present and *kune* or *kula* exchange went together with war (MacIntyre 1983: 11) Tubetube is small and has no fertile lands which cannot explain Tubetube's central place in the *kula* exchange network. A high peak on the island provides a wide vista that includes all surrounding islands, which allows islanders to spot possible visitors from afar. Other islands lack this defensive advantage and Tubetube islanders often initiate war from small uninhabited islands near other villages. Tubetube islanders gained their position within the *kula* or *kune* exchange through force. Without war and aggressive activities toward other communities, Tubetube lacked the economic basis for surplus production and access was established through force. But the nature and practices involved in these two different types of contact are, for Tubetube Islanders, very similar. During trade or war, the goal is to obtain valuables, either as objects or person. Long-distance voyages were prepared for both warfare and exchange, as intended exchange relations could potentially change to war and war raiding voyages could change to exchange relations. The presence or absence of debt determines the exact relationship of war or exchange (MacIntyre:22-32).

before the return gift, but through overcompensation the original receiver establishes a position of superiority over the original donor. The original receiver is now in a superior position in relation to the donor. Gift-giving is future-oriented and focused on the anticipated return gift that, through debt and interest, has a higher value than the original gift.

These social dynamics of gift giving extend over many social fields. The sharing of produce/food and providing small amounts of labor by helping another person are daily exchanges. These exchanges reinforce or establish social bonds and are reciprocated in other situations. In contrast, formal gift exchanges occur at specific times and locations in a public setting. The underlying structure and dynamics of gift-giving in large ceremonies is similar to quotidian exchange practices, but their dimension and magnitude is amplified. Higher valued gifts create larger debts. A public display of the exchange contributes to the debt, as other participants acknowledge and observe its creation (Dietler 2001; Dietler and Hayden 2001; Godelier 1999; Hayden 2001; Rosman and Rubel 1971; Weiner 1992). When gift giving practices are amplified, special circumstances are required to increase their potential success.

The process of transformation from produce to social wealth is exchange. Exchange establishes contractual debts and creates and maintains positions of power between the donor and receiver. Sharing of produce and food are both a universal basis for many social relationships and form the foundation of many inequalities of power by indebting receivers. Through exchanges, produce and food establishes debts and positions of power and transforms social status. Situations where exchanges are socially amplified, such as feasts, become incredibly potent events in which debts can be created and social inequality is established.

3.5 Feasts

Feasts provide an appropriate context for large displays of contractual debts and are ideal circumstances for establishing positions of power. To understand the dynamics of future-oriented practices of produce production and exchange, feasting practices have to be considered in detail. Feasts are special situations in which many items are exchanged in a public setting. Feasts occur at very specific moments and always involve the consumption and sharing of edibles (Dietler 2001; Hamilakis 1999; Hayden 2001; Rosman and Rubel 1971; Rubel and Rosman 1978). These highly ritualized gatherings are often held in situations when social identities and positions are changed, such as initiation rites, weddings, succession of offices and burials (Dietler and Hayden 2001:9; Rosman and Rubel 1971).

Two social dimensions are amplified during feasts, namely gift giving and positions of power. Exchange practices include the sharing and consumption of food and produce and the gift exchange of commodities and valuables. Power is negotiated as social relations between givers, receivers, hosts, guests and other participants of the ceremonies. Feasts are spatial and temporal concentrations of these two aspects of social relations. Power is negotiated and a large amount of attention is paid to the exchanges that occur. The act of accepting the gift includes the act of accepting a position of humility and obligations toward the gift-giver. At future feasts, this relation is either compensated or reversed through overcompensation.

The social importance of feasts has been widely recognized (Blitz 1993; Carlson 1999; DeBoer 2001; Dietler 1996, 2001; Dietler and Hayden 2001; Eves 1996;

Friedman and Rowlands 1978; Hayden 1995, 1996, 2001; Hendon 2003; Joyce and Henderson 2007; Pauketat et al. 2002; Rosman and Rubel 1971; Rubel and Rosman 1978). Feasts are amplified events of exchange where power is created, maintained, negotiated or lost. Although the discussion here focuses on relatively short timescales, where positions of power are negotiated through exchange, from a larger diachronic perspective feasts have the potential to objectify and structurally define differences in status. Or, as Dietler (1996:89) states:

> As public ritual events, in contrast to daily activity, feasts provide an arena for the highly condensed symbolic representation of social relations. Like all rituals, they express idealized concepts, that is the way people believe relations exist or should exist rather than how they are necessarily manifested in daily activity. However, in addition to this idealized representation of the social order, they also offer the potential for manipulation by individuals or groups attempting to alter or make statements about their relative position within the social order as it is perceived and presented. As such, feasts are subject to manipulation for both ideological and more immediately personal goals.

This perspective on larger periods of time is specifically the subject of Hayden's (1995) argument, as he argues that specific successive feasts provide the public and communal setting to establish social stratification and institutionalized inequality. Adopting an evolutionary approach, Hayden (1995) asserts that certain strong individuals, 'aggrandizers,' within egalitarian societies utilize feasting for self-interest. By working hard in the fields and producing more than their immediate consumption, these individuals compete with each other and finance the costs of feasts. These aggrandizers employ the produced surpluses in strategic ways during these feasts to maximize profit and establish positions of power. Anticipated return gifts with interest improve the social status of the original giver. The enormous expenses that are needed for a feast provide the individual with the practical benefit of increased social status, which ultimately leads to access to women and more reproductive success (Hayden 1995, 2001).

Hayden's ecological materialist approach fails to recognize the complex nature of social relationships. Hayden uses an evolutionary paradigm, asserting that feasts provide benefits for reproductive success. Feasts are episodes where display of reproductive fitness is communicated and natural selection, in the form of marriages, occurs. A number of assumptions originate from this paradigm. First and foremost, aggrandizers are disconnected from social networks and behave purely out of self-benefit. This inevitably leads to the position where direct family and other related people do not affect the aggrandizer's decisions nor do they benefit from his success. Obviously, people are never isolated from social relations and this argument does not hold. Second, the assumption of a universal 'practicality' of feasts directly related to rationality and self-interest in Hayden's argument does not allow for idiosyncratic definitions of practicality (Dietler and Hayden 2001:16). The underlying paradigm of evolution is also recognized in the successive stages of social inequality. For Hayden, these stages are set and societies of low social complexity and inequality will go through specific predetermined sets of intermediate phases. All societies finally arrive at a complex state with large differences in social status between individuals. This notion of social evolution leads to the conclusion that besides aggrandizers' 'practicality' and self-interest, stages of social organization are universal. History is neglected and stages are predetermined and always trend toward more social complexity (see Morsink 2010 for a discussion on chiefdoms in the prehistoric Caribbean and the problematic underlying paradigm of social evolution). Finally, Hayden (1995:23) equates surplus to power and despite his emphasis on feasting, he pays little attention to the relationship between surplus, exchange and positions of power and focuses on the valuables that are exchanged rather than food.

The strong objections to Hayden's approach should, however, not completely overshadow the positive and useful part of the argument. Hayden's central focus on feasts as potential situations of social interaction and negotiation of power is warranted. Feasts always involve larger social gatherings and are ideal social contexts for the manipulation of social positions and identities. Feasts are held for very specific reasons and hosts want to communicate a new social relation to the attendants. Among Northwest coast societies, Rosman and Rubel (1971) found that burials of chiefs were only appropriate times of feasts when succession was possibly contested and not predetermined by kinship practices. When kinship practices unequivocally appointed certain successors, no open and communal communication of the new positions was necessary and feasting would not accompany the burial of the deceased chief. Yet, when kinship practices left room for negotiation, the successor needed a feast to establish his right to the position of power. To make clear that the position of chief is not lost with the chief's burial, the prospective chief uses a burial feast to communicate his succession to the position of power. The success of the feast depends on the realization and public acceptance of the new person of power.

The size of the feast is, therefore, crucial and determines its success. A host amasses as many people as possible to witness the new position of power. More eyes observing the host in this new social position results in more mouths that communicate this new order. Attendants are vital components of a feast. Guests are invited and persuaded by gifts, but in return for these gifts they accept and conform to the message that the host is trying to communicate. For example, among the Tsimshian of the Northwest coast, guests are invited and paid during potlatch ceremonies that mark the succession of chiefs. The guest's presence simultaneously acknowledges that the host is accepted as a legitimate heir for the position of status (Rosman and Rubel 1971).

Another reason why guests are important is to ensure that gifts are eventually returned. A public display of gift exchange openly communicates the debt that is established. A receiver of a valuable might be tempted to deny the original gift when this is not communicated in a public setting. Denying the existence of the gift only leads to loss of social status *vis-à-vis* the original donor, but not to a wider public. The benefit of not returning the gift might be considered larger than reciprocating and maintaining a positive relationship with the donor. In a situation where a valuable is openly gifted, social status is not only lost with the donor but also with all the people who witnessed the event. The increased risk of losing status in a larger social network works as a security deposit for the return gift, because the potential benefits of denial are significantly reduced (Godelier 1999; Mauss 1990; Munn 1986; Strathern 1988; Weiner 1976, 1992).

Valuables are often described as the source from which the power of a feast emanates. The *potlatch* on the Northwest coast (Boas 1966; Rosman and Rubel 1971) and the *kula* ring (Malinowski 1922; Munn 1986; Strathern 1988; Weiner 1976, 1992) are renown ethnographic examples of highly elaborative feasts that involve the exchange of high prestige valuables. Although the focus of these events is indeed on the exchange of valuables, the underlying foundation of exchange relations is based upon produce and food exchange. Hayden (1995) equates surplus production and power, but his focus on the feast and concomitant exchange of valuables leads him away from his original statement that it all starts with produce. The highly elaborative structure of feasts forms a façade and obscures the importance of produce as the foundation of power differentiation.

3.5.1 Diachronic Perspective on Feasting as a Social Strategy

The emphasis on exchange of valuables as the basis of power and social inequality in societies originates from a synchronic perspective on specific feasting events in the ethnographic literature. The descriptions of these events, such as the famous *kula* or *potlatch* ceremonies, focus on the main ceremony in these multi-day rituals which involve the exchange of valuables. For all people present, native or anthropologist, there is no doubt that all other events are only of secondary importance. Because feasting ceremonies are recognized as important social events in the negotiation and manipulation of power and primary attention is given to the exchange of valuables during these events, power is equated with valuables. Feasts are simultaneously characterized by exchange practices of valuables and negotiations of social inequality, inevitably leading to the assumption that inequality originates from valuables.

This short-term perspective fails to recognize the full extent and social significance of preparations and strategies that are involved before the exchange of valuables takes place. Two different levels of analysis must be differentiated, (1) practices involved with a particular feast and (2) practices that potentially result in a role of importance during a feast. Practices involved with a particular feast are the accumulation of food resources, sending out invitations, building of special structures, etc. Although this level often receives attention, the significance of these preparations is less explored. The immediate and explicit nature of these strategies for actual feasts is undeniable, but how these strategies play vital roles in the communication of power is often neglected. Without preparations, the negotiation of social inequality and the exchange of valuables will lose much of their impact and power is less efficiently communicated. In relation to food, a feast without food is impossible and food's central role must be acknowledged. Feasts comprise a vast array of practices that all contribute to its significance and, as a result, all these events deserve equal attention.

Although this level of analysis includes a larger temporal scale and incorporates a wider perspective on feasting practices, it still neglects long-term practices that enable a person to be in the position of holding a feast. Not everybody can organize a feast and especially large feasting ceremonies require years and years of preparation. The difficulty for hosts lies within access to all resources at once. Food, labor, payments and valuables are necessities that are difficult to acquire, but even more difficult to accumulate all at one particular event. Hence, in order to understand what feasting practices entail, all practices that have the intention of gaining access to crucial resources must be considered. The temporal and spatial scales of a feasting taskscape are massive. Certain individuals that want to ultimately gain a role of importance during large-scale feasting events will engage in multiple practices that extend over a long period of time.

To overcome problems of timing and planning for feasting events, potential hosts rely on help from others beyond the immediate kin group. The host must establish a relation with other people in which (s)he can demand favors to successfully accumulate all resources at one particular time. Gift giving is the social mechanism that secures help from individuals outside the immediate kin group. A potential host uses gifts to indebt others who are required to return a favor at some point. By indebting a large group of people, a person establishes a position that can rely on favors from others. The bigger the favor that is needed, the larger the gift that is gifted. Through gift exchange, hosts actively change social relations with outsiders that are capable of providing labor and resources in the future. Planning and managing of feasts, therefore, comprise previous gift exchange in which potential hosts establish foundations for feasts.

This clarifies why younger people are often incapable of functioning as hosts for large ceremonies, as they lack the time, life experience and resources to establish social networks that are needed to successfully support a big feast. A long history of relatively small-scale exchanges is essential before someone can participate in or host large feasting events. The exchange of valuables is restricted to persons of higher status, who are often older, but people of lower standing intentionally maneuver themselves within a social arena to gain access to valuables. People who lack access to valuables still engage in exchanges and deliberately dedicate their resources to transcend the current situation. Exchange practices are similar to a career and to convince people who you are a committed exchange partner that deserves a valuable, individuals build a resume of non-valuable exchange.

This point, the building of a resume of non-valuable exchange, brings us back to the importance of produce exchange. Sharing edibles is the foundation of many social relations and forms the backbone of any exchange of valuables. Structural long-term commitment to produce exchange builds social networks that, at a later time, can be called upon when needed. This point also emphasizes that produce is, in these circumstances, a commodity. It is exchanged for its value as an exchange item, not for its nutritional values. *Produce*, rather than food, is utilized as a medium through which people without direct access to large exchange networks and valuables create avenues where these objects and resources might become part of their network in the future. It is the repetitive exchange of produce of relatively low value over extended periods that constructs the social foundations that are required in future events.

Hence, time is a crucial factor in the dynamics of exchange that transform economic 'surplus' ultimately into social valuables. This transformational process is explained by Munn (1977, 1986) in detail. She describes how edibles are used and employed at different times and how this eventually results in access to *kula* valuables. In the first stage of exchange, produce is either used to hold a feast to construct a canoe and pay for the labor (Munn 1986) or given to people who own a canoe to compensate for its use (Munn 1977, 1986).[2] Access to a canoe is only part of a long-distance exchange. During the second stage, produce is employed to pay for labor to man the boat and engage in a voyage. In the third stage, produce is needed to establish and/or maintain an exchange relationship with an overseas partner. Finally, after the successive employment of produce at different times and places, established long-distance exchange partners provide access to *kula* valuables (Munn 1977). These

[2] Munn's (1977, 1986) argument uses food to describe these processes. However, she specifically mentions that these exchanges mostly involve yams. For consistency within this Chapter, produce is used here.

different stages, obviously, happen with great intervals and this process describes years and years of exchange relations.

Munn (1977, 1986) points to three important aspects of exchange in her example. First, produce is the basis for all exchanges and a requirement to transcend one exchange sphere into the other. The exchange of produce, canoes, valuables and marriage partners is ultimately connected through produce, and throughout the successive stages the value of produce is transformed into more desirable goods. Second, different situations of exchange, such as produce exchange between two families, are consciously manipulated to gain access to desired goods, such as canoes. The choices that are made as to who will receive which gifts are future-oriented with the gifts that are reciprocated in mind. If access to a canoe is desired at some point, gifts are allocated to families that either have one or can help build one, but not to other families that cannot help with this effort. Finally, from a life time perspective, these different spheres of exchange are temporally connected. Access to valuables requires a long period of antecedent exchanges. The temporal connection between these exchanges is part of the preparation to ultimately gain access to valuables and women.

In her discussion, Munn (1977) specifically focuses on the canoe, as this is an essential ‘commodity’ that is needed for long-distance travel and *kula* valuables in the Massim region. But the general trend from produce to commodities to valuables can be projected beyond this ethnographic case-study. It is exactly this transformational quality, through successive stages of exchange, that underlines and argues for the economic basis for social inequality. During a life-time, members of a society will actively and consciously negotiate their position within a social network. Produce is strategically employed to gain access to other commodities and valuables. Through time, members prioritize different exchanges and, step by step, move closer and closer to their final goal. The different temporalities and spatialities of these exchanges are all interconnected and are part of one planned program, a career that aims at hosting large feasts.

3.5.2 A Career of Produce Exchange

The conceptual division between produce and food in combination with a diachronic life-perspective on exchange explains how economic production translates to social inequality. Hayden (1995, 2001), D'Altroy and Earle (1985) and others totally overlook these two points in discussions concerning the ways in which economic production both finances and forms the foundation of social inequality. First, food and produce are identical and edibles are just considered as containers of nutrients that feed people. The exchange value of produce is completely neglected. Second, time depth of repetitive cycles of produce exchange is not acknowledged. The link between economic production and inequality is conceived as surplus production that feeds people who are not producing food themselves.

Yet, the essence of the process of transformation from economic production to social wealth and power, central to Munn's (1977, 1986) argument, involves the production of *produce*, an exchange object that is simultaneously an edible. Continuous production of produce allows the owner to engage with more exchange partners and establish larger debts. People dedicate significant amounts of labor and time in the production of produce. Especially young adolescents are particularly interested in these endeavors, as they are trying to 'buy' a place in an exchange network. However, the ‘buy’ is not about paying enough money, but establishing sufficient debts with other agents in the exchange network that they owe you something valuable back.

This approach emphasizes the importance of yearly repetition of these exchanges which form the foundations for valuable exchange. Rather than Hayden’s evolutionary approach, a life-time diachronic perspective explains how economic production of produce eventually results in social status and inequality. During their life, members of any society go through different stages and these stages develop into each other. Synchronized with these developments, exchanges constantly and progressively provide access to higher spheres of exchange. Even in situations where social inequality is institutionalized, the position of status of an elder is based on a life-time of accomplishments and exchanges. At the beginning, a person only has means to preserve food, but through strategic uses of produce, individuals open up new avenues to other materials. The ability to transform the value of edibles into more durable items, such as valuables, determines the success of an individual.

The reason why social status is desired is related to the benefits that emanate from it. Increased social status gives individuals privileges that others do not have. Marriage partners, as a final sphere of exchange, provide access to previously inaccessible resources. The exchange of women, as described in most anthropological work, establishes a direct link and alliance between two families and both families gain access to each other’s resources (Ensor 2011; Fox 1967; Lévi-Strauss 1969; Malinowski 1929; Munn 1986; Murdock 1949; Rosman and Rubel 1971). Access to these resources is the privilege that people of social status have over others. Women, however, are not objects that are exchanged by males. Rather, marriages are heavily negotiated and manipulated to gain as much social status as possible for both families and by both sexes. Females have active roles in these decisions and cannot be perceived as objects void of agency that pass through the male hands that control them.

Yet, there are objects and immaterial goods exchanged during these ceremonies. The alliance between two families brings along long-term rights and mutual obligations. A focus on women or other objects that are exchanged limits itself to short-term impacts of the wedding ceremony, directing attention away from the long-term consequences and importance of the social bond that is forged between two families. Marriages are necessary ceremonies to establish enduring links that provide possibilities for both families to make use of each other's resources, rather than short-term events where objects and women are exchanged. Both families are more occupied with the consequential exchanges than the exchanges that actually occur during the event. A marriage institutes a strong basis for shared interests, mutual concerns and cooperation, formulating a social foundation to access each other's properties (Fox 1967; Malinowski 1929; Munn 1986; Murdock 1949; Rosman and Rubel 1971).

Relatives by marriage, or affines, are an important social category. Helms (1998:56) states 'affines constitute spatial/temporal Others', following general rules of exogamy. Affinal relations are bonded through marriage, but simultaneously disconnected through the rule of exogamy. Affines are the closest relatives outside the original kin group. Strong reciprocal relations exist between affinal groups and exchange continues after marriage, including adoption, grants of land, hospitality, aid in payments and reciprocal labor (Brown 1964:355). Helms (1998) and Rosman and Rubel (1971) both discuss how affines play central roles in certain ceremonies, such as burials and transitions of chiefly positions. Affines are, therefore, specifically chosen and the important roles affine play underline that marriages are strategies to gain access to certain resources. Affines are an important social category.

The leading role of affines in certain rituals, e.g. while direct kin is mourning or observing the ceremony, stems from the affinal status of ‘Other’. Key in this division of labor is that someone else, outside your own kin group, needs to communicate how important your kin group is. Affines are distanced enough to play the role of outsider, while simultaneously being close enough to feel committed to the cause of the original kin group. Especially when the original kin group is of status, affines might be actually invested in their efforts as it projects back on them as well. However, this strong reciprocal relation includes strong antagonistic feelings, as affines are primary sources of labor and wealth and to maximize profit, negotiations need to take place at the cutting edge (Brown 1964; Helms 1998; Rosman and Rubel 1971).

With the ultimate goal of gaining access to affinal resources, previous exchanges of produce, labor and valuables will engage and target exchange partners that help achieve this goal. People who are incapable of providing produce and gifts are unlikely perceived as potential exchange partners, because people lacking resources are probably not invested in sharing resources. Individuals strategically employ their resources by using their produce in exchanges with specific people who, like them, produce significant quantities of quality goods. Cooperation between the two would mutually benefit both families. Families are constantly in competition with each other to produce a high quality and quantity of produce to publicly display their status and ability to produce, but also to negotiate which other family would be a good candidate for a marriage exchange.

If quality and quantity of produce are symbols, then labor must be the value that is communicated. Marriages and kinship relations form a structure to organize labor and create a stable foundation for cooperation. Families acquire labor through marriages. Concomitantly, in certain situations specific marriage rules apply and families need to negotiate within certain social limits. Not every family can be considered and other social values, besides the acquisition of labor, are important as well. Hence, exchange practices are influenced by kinship practices and *vice versa.* Within the possibilities set within the general framework of kinship relations, people exchange with other people who they perceive as potential benefactors to their social unit.

3.6 A Feast of Salt

The consequences of the material properties of salt, as described in the beginning of this chapter, clearly influence these practices of exchange, feasting and the transformation of economic wealth to social inequality. Salt transforms food into produce, from a consumption item to an object of material wealth. The ability to preserve edibles for longer periods of time strongly affect how people can employ this resource in a social landscape and totally changes the social context of exchange. Perishable and non-perishable items have both different connotations and exchange, and therefore communicate different values. Salted produce conveys messages of social power more efficiently than perishable items.

Items that decay must be eaten within a certain period, undeniably linking the product to consumption and its nutritional values. Without consumption, the total exchange value is lost. The physical characteristics of perishable foods irrefutably connect the gift with its nutritional values and consumption. Harvest of perishable items is focused on consumption. Absence of consumption will either delay harvest or harvest will not take place. If items cannot be eaten, then energy investment in production and harvest are futile. In other words, a lack of consumption leads to under-exploitation of resources.

However, salted foods last and resemble objects. The durable quality of salted food disconnects these edibles from consumption practices. Salt makes overproduction possible, as items are not lost and energy investments are ‘captured’ within the non-perishable nature of the edible. Harvest and consumption are consciously and temporally disconnected practices that have little effect on each other. Exploitation of available resources can be maximized and preserved. The separation of exploitation or production practices from consumption changes the status from food to produce and concomitantly changes the context of exchange. Because harvest and consumption are temporally disconnected, exchange practices are not dependent upon the perishable nature of food. Exchange is not dictated by decay anymore.

Furthermore, the possibility of accumulation has strong repercussions for feasting practices. Access to accumulated produce means that feasts can employ larger amounts of food and thus include more people. Stored produce can all be utilized at specific ceremonies. For an economy lacking a preservative, the display and sharing of food and produce during feasts is limited to the quantities that can be caught and/or harvested in the period before these items start to decay. In the Caribbean, fish must be used within seven days of capture, unless there is some method of preservation (Caribbean Commission 1952). Salted goods last for years and the possibilities to communicate and display wealth increase significantly. Without a preservative, methods of display are considerably limited.

In addition, the taste of salt improves its communication skills, as it triggers the senses when consumed. Eves (1996) argues that memories of feasts are produced through continuous stimulation of the senses. In the case of New Ireland, Papua New Guinea, an overconsumption of food during specific feasts induces diarrhea, a heavy sensuous experience. According to Eves (1996), these strong experiences are favored by the host, because future instances of diarrhea evoke memories of his feasts, increasing its success and effectiveness of the messages that are communicated. The taste of salt evokes memories in similar ways, especially in situations when salt is scarce. The increased flavor of the food and the taste of salt remind the consumer of the presence of salt, inducing a reminder of how the salt ended up in the food.

Outside the realm of feasting, the sharing and exchange of edibles is facilitated as well. First, accumulated foods can be used in unexpected/unanticipated situations, such as sudden visits or a change in the availability of resources. Storage maintains a steady basis for these kinds of exchanges and short-term shortages are less likely to happen. Second, the increased efficiency of resource procurement strategies decreases the relative costs for persons who have access to salt, making an exchange less expensive. People and groups with access to salt have the capacity to preserve, maintain and exchange a produce with much less difficulty than people who only have access to food resources. Access to salt, therefore, is a crucial element to negotiate and maintain positions of status within large social networks. A third possibility is that preserved foods are potentially more desirable gifts as opposed to perishable items. The non-perishable nature of the gift expands the possibilities for the receiver, as (s)he can continue to trade these items, store them for future occasions or consume them immediately. Perishable items can only be consumed immediately. This point, of course, is easily contested when projected into the past, but preserved food items also affect the decision-making processes of the receivers, not only the donors.

Finally, the object-like nature of salted foods conveys a physical representation of the labor of the owning group. Quantities of accumulated produce are an undeniable materialization of efforts and success in production, symbolizing the labor and fertility of its owners. Display and exchange of these items communicate these values. Preserved items, as materialization of production, symbolize the efforts and energy investments of producers. Salted produce behaves in even more efficient ways than the Melanesian yams, because these edibles last much longer than six months. Salt creates objects that, through gift exchange, communicate messages of power and establish positions of social inequality.

3.7 Salt Fish, the 'Double' Gift

Salted fish, considered a delicacy in Jamaica and Trinidad, was originally a slave food. Cod was fished in the North Atlantic Ocean and transported into the Caribbean to feed the slaves. Salted cod was also transported back to Europe as food for the masses (Kurlansky 2003). Salt acted here as the mediator of distance and time and the North Atlantic Ocean could never be exploited for its resources to sustain and maintain populations in Europe and the Caribbean without the preservative qualities of salt. Yet, the importance of salt extends beyond the ability to exploit distant resources for local consumption.

Salted fish is simultaneously a source of protein and salt, which are both vital nutritional elements. In certain regions, proteins might not be of much importance, as meat and fish are widely available and relatively easy to preserve. Locations near the sea provide access to marine resources, while in other areas terrestrial and /or avian fauna are abundant. In other regions, such as the New Guinea highlands, large domesticated animals provide access to proteins (Rappaport 1968; Rubel and Rosman 1978). Yet, regions lacking a source of protein demand influx and exchange to overcome this problem.

For example, large terrestrial fauna are absent in the Caribbean archipelago and proteins are scarce in the interior regions of islands. Besides the possible adoption of a corn-based horticultural economy (Keegan 1986), marine resources are the only available source for protein in the Caribbean region. For small islands, this does not present a large problem, as marine resources are easily accessible and exploited. Yet, human populations on larger islands have a problem with respect to protein procurement, because lack of proteins in the diet poses significant health issues and exchange and distribution structures are needed to maintain an appropriate influx of fish. At the same time, regular exploitation of the sea is incredibly costly due to the large distance. Additionally, the restricted preservation of fish significantly reduces the possibilities of exchange and a constant day-to-day exchange is required to maintain sufficient protein levels of interior diets. The costs of such an exchange and distribution structure are incredibly high.

Salted fish obviously decreases costs and facilitates the transport of these materials to the interior. Salted fish can be transported in larger amounts, as items can be accumulated. Also, distribution networks are easier to maintain because social distances are reduced. But the main advantage of this structure lies in the 'double gift' of salted fish, as it transports two important nutrients for daily consumption at the same time. Especially in regions lacking both, this combination induces a powerful exchange network in which the original owner can establish many debts with potential receivers.

Salt and fish both have values, but within a context where both proteins and salt are scarce, the value of salted fish is greater than the sum of its parts. The nutritional requirements create an undeniable demand and provide a solid basis for exchange. Furthermore, salted fish is a non-perishable and functions more like an object symbolizing the fertility and power of its producers in exchange. An economic unification of salt and fish provides simultaneous opportunities to exchange food resources over wider regions *and* communicate social status and power. Although nutritional requirements generate exchange, social needs cause an explosion of the exchanges that exaggerate these requirements. More production creates more power and people maximize their efforts for exploitation to further their position within a social network.

3.8 Conclusion

In summary, gift exchange of food is better comprehended as an exchange of objects (produce) rather than edibles for consumption (food). Gift giving is a social contract between donor and receiver and through successive stages in one's lifetime, display and exchange of produce are primary means to establish exchange relations. More produce production leads to more exchange relations and more acts of indebting, subsequently creating social inequalities of power. Produce, as an exchange object and symbol of labor, is the primary way to negotiate social positions within a community. Produce production and exchange are fundamental for understanding the transformational process from economic products to social wealth. Feasts are important temporal and spatial concentrations of these practices. Although exchange also takes place in more mundane, day-to-day settings, feasts are transformational events broadening the social arena in which manipulation of social power occurs.

The importance of salt is not directly related to the material qualities of this resource. The power of salt, recognized by many societies, emerges from the ways this resource is used by people rather than what its physical characteristics are. Yet, material qualities of salt have very specific results, including the ability to preserve edibles and accumulate these resources. These two outcomes are socially mitigated and people have to actively engage with salt and other resources to ensure these consequences. However, these practices facilitate exchange and feasting practices and provide an unique opportunity to owners to negotiate their social status through acts of indebting. Owners of salt and salted fish are more successful in displaying their material wealth and establishing debts with receivers, ultimately resulting in power and social inequality.

This chapter discusses how material qualities of salt affect consumption practices. People adapt their practices and employ the material qualities in very specific ways that allow them to communicate their position of power and status more efficiently. This is only half of the story. The material qualities of salt have also very specific repercussions on the processes of production. This is the subject of the next chapter.

CHAPTER 4
THE SOCIALITY OF PRODUCTION

Because of qualities of salt described in the previous chapter, access and control over salt is a source of potential power. A holistic approach to salt, therefore, must incorporate the sociality of production. Material qualities impose certain restrictions on the production practices and form the basis of the argument. However, production is a social phenomenon that is guided, but not determined, by these material qualities. The ability to establish exclusive access to salt sources implies ownership and social tension between owners and non-owners. The need to maintain control also forces a gender-specific change in the organization of labor. Additionally, the seasonal quality of salt forces a focus on extraction practices when salt is available, but also requires a change of practices in parts of the year when salt is unavailable. Although these aspects of production are difficult to establish in an archaeological setting, these points demand attention in order to explore the full gamut of practices involved with this resource.

Bodies of power have consciously tried to control access to and production of salt. The Roman Empire deliberately expanded their empire in certain directions to include more salt works, such as Ostia and Parma, but also Celtic, Greek, North African and Black Sea salt works (Kurlansky 2003:63-64). In 1930, Gandhi's 'salt march' was aimed at deconstructing the exclusive rights of the British reign to salt works. In the Yucatan, Maya people built cities like Xcambo in the middle of a salt marsh, establishing a seat of power in a less than optimal setting for a settlement. During the U.S. Civil War, the Confederacy was severely inhibited by the Union's attempts to destroy salt works along the Georgia and Florida coasts and diminish their supply (Kurlansky 2003:274-275).

These examples show that people in different contexts were very aware that access to salt was crucial.

An important reason for salt's importance in state-organized societies is that salt was needed to accumulate food resources to feed an army away from home. Furthermore, their absence meant a lack of male labor at home, possibly causing a deficit in production while the war continued. To keep supplies at the levels required to sustain a large population, overproduction and storage were absolute necessities. Salt, especially in relation to meats for proteins, was essential for storage. Attacking an opponent's salt production, diminishing its returns, would inevitably lead to a food shortage for the opponent's army. Diverting the opponent's labor away from the army to production gives the attacker an incredible advantage. In non-state societies, political power originates from salt through its ability to transform overproduction into storable produce, which subsequently can be gifted in exchanges. In either case, salt is a highly valued resource.

Access to salt production sites equals access to power. Yet, material qualities of salt resources structure production practices in comparable manners that material qualities direct consumption practices, as discussed in Chapter 3. Three material qualities are important for production practices. First, salt only occurs in very restricted geographic locations. Access is, therefore, restricted. Second, qualities of salts are location specific and not all salts are alike. Color, moisture content and grain size are important physical characteristics that differ across production sites, and have important consequences for their intended use. Finally, salt is often seasonally bounded and only available year-round in mines. Salt flats and boiling practices depend heavily on local climate conditions that are only favorable for production during specific times of the year.

From a relationist approach, salt production practices are intrinsically connected to exchange, feasting and consumption practices. Because salt has such a pervasive impact on exchange and feasting practices, production has to be affected too. The potential to aggrandize power leads people to focus economically on this resource and dedicate labor to its exploitation. However, choices have to be made and social organization has to be adapted to these circumstances. Material qualities of salt have social consequences in the production process. This chapter will illustrate how these material qualities affect social relations.

4.1 Salt and Private Land

The geographic restrictions of naturally available salt allow groups to control production and exchange and establish ownership. Owners maximize profits through exclusive rights and access to salt and exploitation by competing groups is either prohibited or allowed on the basis of payments. This places the owners in a superior position in contrast to non-owners, as owners have something that non-owners want and need.

The advantages of salt ownership are also obvious to other groups that lack direct access to production locations. Non-owning members of a society are aware of the potential power of salt, as they observe that access to salt enables owners to store larger food resources, maintain larger regional exchange networks, hold larger feasts and accumulate and aggrandize social status more successfully. Identification of these consequences of successful exploitation and utilization by non-owning groups may result in an increased interest in these locations and lead to conflicts over ownership.

Ownership needs to be established and continuously secured to maintain access and control. Non-owning groups might start a feud or wage war to gain access. Restricted occurrences of salt production sites facilitate control and access, but concomitantly increase social tension and possibilities of physical violence.

Ethnographic studies, however, also discuss communal ownership of salt resources. In Salinas de Mira, Ecuador, salt specialists from other highland regions are allowed to use local brine springs, and access to salt is not restricted to local villagers only (Pomeroy 1988:140). Communal use of salt rich soils is also observed by Parsons (2001:20) near Mexico City and no individual or group claims ownership over these resources. However, this was a very recent development and, until the 1950s, salt makers had to make a payment to either individuals or villagers who had rights to these locations. Regional developments of industrialization in salt production and the import of cheap salt decreased costs so much that people stopped considering salt as a highly valued exchange item (Parsons 2001). These case-studies indicate that ownership over salt resources cannot be assumed and taken for granted.

Yet, the shift from privately owned to communal use in the Mexican example provides a case in which situational salt sources are expected to be private possessions. The introduction of cheap industrial salt led to a devaluation of local salts. The price dropped significantly and salt was widely available. While demand for salt remained the same in this region, supply went up and costs went down. The status of salt changed from a valuable that is difficult to obtain to a commodity that is inexpensive and easy to procure. Private ownership of salt diminished after it lost its value. The devaluation of salt led to a depreciation of the salt sources and local salt-makers could not afford to compete with industrial salt when the compensation was added to the price. However, in a context where salt is scarce and valuable, ownership is established over production sites and compensation is needed for its use.

Examples of ownership over salt production are ample, underlining its value in most contexts. Maya coastal salinas, for one, were property of lords or villages (Ewald 1985:17). In early colonial times, the Spanish reported many feuds between local lords and villagers over rights and access to salt works across Mexico, supporting the claim that salt works were considered private possessions (Ewald 1985:18). Early historical documents from Puerto Rico indicate that local chiefs and villages privately owned salinas as well. These documents mention Salinas de Agueybana, Salinas de Abey and Salinas de Guánica, relating these salinas with people and villages (Tanodi 2009:83, 86). Agueybana and Abey were chiefs, the first lived in the southwest near San German and the latter in the province that is today called Salinas. Guánica is a village that is located between San German and Salinas along the south coast. Finally, examples of Chinese, Roman and French taxes on salt are further evidence for ownership and restrictions to access in these particular regions (Kurlansky 2003).

Archaeological case-studies are scarce. Dever (2007), however, discusses a diachronic perspective on the organization of salt production in the village of Chengue in Tairona National Park on the north coast of Colombia. Dever (2007) distinguishes between a ‘top-down’ and a ‘bottom-up’ process in the formation of social differentiation. His scenarios contrast with one another. In the top-down situation elites from other villages initiated a community near the salt-producing lagoon to establish and maintain rights to access, where in the bottom-up situation social differentiation emerged out of local practices and involved local villagers. The gradual development of intra-village differentiation of wealth leads Dever (2007) to suggest that these processes are instigated by local people maneuvering in a local setting rather than outsiders establishing a structure that includes social stratification in the first place. In either case, differentiation in wealth and social status in the village of Chengue signifies that certain members have more privileges and access to the main economic product, namely salt, than others.

In order to maximize profits, access and control are essential. Ownership over these resources is secured and other groups are denied. Ownership, however, has serious social consequences. Land becomes a valuable and can be privately possessed. In regions where resources are heterogeneously distributed and available to everyone, or when resources are abundant, land is not a value that needs to be secured. The strong relation between a social group and the land they own has important consequences.

4.2 Places of Salt Production

The spatial concentration of salt resources, in conjunction with the natural variation between different salts establishes a strong relation between the salt and the location of origin Most salts, nowadays, are a commodity and devoid of social qualities and references of particular places. But exceptions, such as Himalayan Pink salt (which is not collected in the Himalaya, but rather just south in Kewra, Pakistan), Hawaiian salts and *fleur de sel* from France, have specific characteristics and uses and are clearly related to their place of production. Even more so, these gourmet salts are specifically advertised in relation to their production location to increase their status as ‘special’ salt. But most kitchen salts, produced by major companies like Morton, Cargill, North

American Salt Company and Akzo Nobel, lack reference to places of origin. Differentiation is made between salt, kosher salt and sea salt, but these nominations only reference production processes.

All these salts are processed, including Kosher salts, to increase purity and standardize the chemical composition. Techniques to refine salt produce high-purity content of natrium and sodium. These processes are industry-oriented and have little to do with consumption. The contemporaneous homogeneity in salts is a byproduct of industrial demands for pure salts. As a result, all salts are alike and it is difficult to recognize variations in color and taste (see Bitterman 2010).

The industrialization of salt production standardized salt and disconnected it from its social value, which references place of production. Procedures to refine and grind the salt make it uniform and all salts are white and have small grains. The natural diversity in color, grain size and form is completely lost, disassociating the salt from its natural diversity. Material qualities of all these processed salts are alike and impossible to differentiate. Looking at, tasting or feeling the salt grains does not link these grains to specific locations in the landscape. Homogenization of salts also deleted the social connotations associated with their places of production.

In pre-industrial settings, however, salts were not homogeneous. For example, impurities differentiated salts. Impurities were either added, for example with the grey salt during raking, or present in solution when the water evaporated, such as the iron in Himalayan pink salt. Besides adding colors, impurities change taste as well. Naturally occurring impurities, such as magnesium, potassium and calcium, are elements that occur in sea water and change the flavor of salt. These elements and their flavor are lost through purification. The loss includes elements that are essential for human nutrition.

In the absence of processes to refine salts, every location of salt production produces slightly different salts. Impurities in the salt occur in different qualities and quantities, but different production processes cause variation in color, texture, taste and potential uses (see Bitterman 2010 for a complete discussion on different salts, their tastes and uses). These variations in material qualities also affect its potential use and not all salts have the same 'use-value'. For example, *fleur de sel* has a high moisture content and is not suited for curing or preserving meats and fish. Yet, the moisture and irregular crystals of *fleur de sel* make it an excellent finishing salt. The high moisture content retards the salt from going into solution when it is sprinkled on top of food and different sizes and shapes of crystals continuously release a salty taste when consumed, rather than all at once with regular shaped crystals (Bitterman 2010).

Salt is not just salt; every production site produces a different salt with specific characteristics and potential uses. A normative approach denies variation in salts, but a relationist perspective exposes how past peoples observed, experienced and maybe even purposefully created these differences in site specific qualities of particular salts. These site specific characteristics must be taken into account in studies that deal with salt production and distribution. Different salts might have been exchanged in different networks and used for different purposes. Neglecting the variation in salts leads to a homogeneous perspective of salt exchange and related networks of social relations.

For instance, multiple salt production strategies were used in the Maya region. In Yucatan, salt is produced by solar evaporation (Andrews 1983; Ewald 1985). At coastal *lagunas* in Belize, McKillop (1995, 2002, 2010) found ample evidence for boiling practices in the past. Solar-evaporated salts are of higher purity and whiter color than traditionally boiled salts. Especially when brines are processed to increase salinity by pouring them into old seafaring canoes, as suggested by McKillop, more impurities infiltrate the water. In earlier writings, McKillop (1995) argued for a differentiation of these two salts and their exchange networks. Solar evaporated salts were exchanged over vast regions between elites, where Belizean salt production was for local consumption. This idea was later abandoned, because Belizean salt also was exported and not restricted to local consumption (McKillop 2002; McKillop and Sabloff 2005).

Yet, the physical differences between the two salts are great and evidence that both were produced for distant markets is not evidence for one sphere of exchange. Solar-evaporated salts could still be more expensive and only available to elites or people of standing, while Belizean salts were cheaper and for commoners. These two trade networks could both be controlled by elites, but just made for different markets. Both salts were distributed in large regions to fulfill inland demands, but these demands were based on different needs. People inland all required salt, but choices of different quality salts allowed people to make decisions and communicate certain social relations with the salt they bought. If price was an issue, then the cheaper variety was purchased, but more expensive salt communicates ideas of social and economic wealth and therefore serves other needs. Similarity in production methods for non-local markets cannot be used as evidence for similarities of exchange networks and social meanings of different salts.

The strong relation between physical qualities of salt and place of origin is strengthened when physical qualities of salt from specific locations render it extremely suited for specific functions. The qualities of *fleur de sel* as finishing salt are discussed above, but other salts are utilized for different purposes. For example, Liverpool and Turks Islands salt are extremely suited to cure meats and fish. These salts are dry and have very few impurities that spoil or bitter the taste (Shields 2007). During the American Revolution, rumor has it that George Washington personally ordered Turks & Caicos salt for his troops. In the army and navy logs of 1838, it states that pork had to be salted with Turks Island salt (Homans 1838:32, 96, 112, 128, 160, 192, 208). During this war, well preserved food items inevitably referenced the Turks Islands, as other available salts were not as capable of properly preserving meat. Through consumption and experience, relations between the food and the Turks Islands were developed. Material aspects of salt communicate their places of origin through the way they affect practices and how they are used and experienced.

4.3 Inalienable Salt

The undeniable bond between a specific salt and its place of production is constantly transmitted in exchanges. If people are knowledgeable of site specific qualities of particular salts, then physical qualities communicate references to these places. A pinkish colored salt at the grocery stores reminds people of the Himalayas, and *fleur de sel* evokes an idea of France and Hawaiian salts reference these pacific islands. References and connotations to certain places of production reach far beyond a name or a region, but include all other meanings and values people connect with these places. Himalayan pink salt unmistakably evokes images of snowed capped mountains, while *fleur de sel* references all the good things French cuisine has to offer, including wines and a Burgundian life style. Hawaiian salts will always be connected with an image of a volcanic tropical island. Unique qualities of different salts associate these salts with references to their place of origin.

However, as discussed before, these places are also connected to people who own these production locations. Hence, the distribution and exchange of salt concomitantly distributes social meanings of places and people. When places and ownership are linked, the relation between salt and its original owner are as well. A triangulation of meanings and values of salt, place and ownership are inextricably bonded and communicated as a package. Private ownership over specific land establishes a social connection between a location-specific product and owners. For example, the Salinas de Agueybana are not just naturally occurring locations where salt can be collected, but the location and the salt are both representations of Agueybana's wealth and power.

This connection between salt, place of production and owners of salt works contributes to the power of salt. Salt is a medium of communication that, through its material and social characteristics, diffuses notions of identity and power of places and people. Physical consumption of salt is concomitantly a social consumption of meanings and values of owners and places of origin. Even far away from the location of production and in the absence of owners, salt displays and broadcasts social values and meanings. Receivers and consumers of exchanged salts are, through the undeniable link between the salt, the site of production and its owner, continuously reminded of the power of the donor. Owners are always socially connected to the product that they oversee.

Hence, salt is an inalienable possession (Mauss 1990; Weiner 1992) in a pre-industrial setting. Although the product changes hands and 'ownership' is transmitted, social relations to producers and places of production are preserved. The physical form of salt is exchanged, but the social meanings and values never alter. Receivers are reminded, through the physicality of salt, who controls and exchanges it. As long as the physical qualities are unique and the salt is not consumed, the material qualities will act as mnemonic devices. Its presence recalls all the connected meanings to the observer. To discontinue the communication of social values and meanings, salt has to be consumed or physically removed from the social arena.

Mauss (1990) even posited that inalienable gifts are actually not gifted at all, as owners keep some sort of possession. He argues that these items are better understood as loans, because original owners maintain rights of ownership over exchange valuables. However, his examples only concern valuables and do not include more mundane exchange items, such as salt. Salt is truly exchanged, because of the expected and intended consumption of this gift. After salt is consumed, it is physically removed from the material world and cannot be gifted back in its original form.

However, salt is not a commodity that is exchanged without social implications. Commodities are void of social meaning and are completely disconnected from their original giver. Responsibilities and rights of commodities end after the final exchange and givers and receivers have no obligations to one another. Yet, salt is a gift that has particular values that cannot be altered. Connotations to places of production prohibit a complete change of actual ownership. Owners maintain some sort of social ownership over their product and even though the product is consumed and receiver has all the rights to do with the salt whatever he likes, some aspects are never truly transferred. Salt falls within Weiner's category 'giving-while-keeping' as the gift changes hands, but the original owner/producer is never disconnected from the gifted item and maintains some sort of historical connection (Weiner 1992). Salt finds itself between a commodity and a valuable.

Inalienable possessions are perfect gifts, because these gifts are never totally given and, therefore, have increased values. The inalienability of salt increases its demand as an exchange resource, as salt transforms into a medium of communication of social wealth and power. Salt is a display of power and corresponds, besides places of production, to social groups that have the capacity to control these resources. References to social groups and their power are even communicated in their physical absence and broadcast over a wide region. Salt is exchanged over larger regions than owners can visit, and a distribution of salt is a non-personal statement of their capacity and power.

4.4 Salt, Gender and Mobility

Rights and ownership over salt production sites entails that investments of labor are needed to maintain and secure this possession. Labor is organized to establish jurisdiction and control access to immobile wealth, such as land and salt ponds. At a minimum, people need to be present during times of production and ensure that only individuals with controlled entry collect and procure salt. The immobility of the source of wealth immobilizes people, as stationary wealth gives the opportunity to rivals to access these resources when owners abandon the land. So, people adapt their way of living to accommodate the need to protect wealth. A diachronic development in which salt ponds become objects of value incorporates a change in the organization of labor and restricts people's mobility.

The organization of labor is directly related to the division of labor (Collier and Yanagisako 1987). People cross-culturally organize labor along two axes of male and female domains. Males and females are appointed different jobs, but together they form an economic unit of production. Both genders cooperate and are dependent upon one another. Boundaries between the two are established through enactment of these gender-specific jobs, which entails that they are interpretable, unfixed and esoteric. Although practices will always be differentiated through gender, the specific division is culturally specific and is not grounded in some biological, predetermined way.

Despite the fact that a gender division of labor is culturally specific, some structures do reappear in different contexts. These reoccurring structures are a product of human reproduction and the labor that is required to rear a child. Women are restricted in their capacities to move and perform demanding physical labor during pregnancy, resulting in a necessary shift in these practices to a male realm. Furthermore, after pregnancy, women are confined though practices of breast feeding and child rearing, restricting their mobility. This division of labor emerges out of the restrictions posed by biology, but is not a biological fact predetermined at birth. Different biological functions of male and female anatomy in cycles of reproduction enforce a distinction in what women and men are physically capable of doing. These distinctions are cultural interpretations of what it means to be masculine or feminine, which is gender. [1]

[1] The gendered division of labor stretches between masculine and feminine ideals. Deviations are, of course, present, but these anomalies have little effect on general social structures and ideas.

The organization of labor, therefore, must be perceived from a gender perspective. The gendered division of labor affects how people organize themselves. The desire to protect salt production sites from others and the concomitant immobilization of people is not homogeneously distributed across the two genders. Furthermore, practices that involve the exploitation of resources, including exchange and feasting practices, are gendered as well. Understanding processes of adaptation to a salt-oriented economy has to start from the assumption that male and female practices are differentiated and both genders are unequally affected by these changes. Males and females might both modify their practices, but in dissimilar ways.

In addition, a change in practices is only required for people who own salt production sites. Specialization in salt production induces an economic differentiation between groups of people. Although the main focus of economic production of salt-owning groups is directed to the maximization of this resource, other economic practices will be abandoned or receive less attention. Yet, other people in that region continue or even redirect more labor to economic practices that are now abandoned by salt-owning groups. Economies are plural and multiple groups engage in different practices (Ensor 2000). Only people who are invested in the protection, control and exploitation of salt have to alter their way of living.

Salt affects mobility in two ways. First, protection of salt production sites leads to an immobilization of people. To maintain control, protection demands that people are present at the site. Second, salt facilitates long-distance voyages and increases mobility, as stated in the previous chapter. Exchange in large social networks requires an increase in mobility. Salt simultaneously restricts and demands mobility. Salt concentrates human resources to maintain possession of the production site, while it disperses people at times of exchange. People negotiate between the demands of protection and exchange, and mobility is adjusted according to these demands.

Protection of salt ponds means that intergroup conflict occurs and others are willing to take control by force. Cross-culturally, wars, feuds and raids are in the hands of men rather than women, irrespective of other kinship practices such as residency and inheritance (Divale and Harris 1976). Even in societies with a strong matrilineal focus, men tend to be in positions of power and control (Schneider and Gough 1961). Divale and Harris (1976) label this structural aspiration to be in control of wealth ‘the male supremacy complex.’ Feuds and war establish and determine positions of power, directing males into this social arena of interaction. The desire of authority results in a gender division in warfare practices.

Warfare practices are gendered and, therefore, structure the mobility of males only. However, the format of warfare determines if mobility is high or low. Divale (1974) argues that the mobility of males is determined by the difference between internal and external warfare. According to Divale (1974), external and internal warfare have precise structures. Internal warfare is very common in societies without centralized governments and, as a result, destabilizes social cohesion and weakens a society *vis-à-vis* outsiders. Competition occurs between peers within a society. External warfare is an adaptive strategy to a situation where alien communities are considered a larger threat than peers and all efforts are concentrated toward these outsiders. Local and interpersonal feuds are submerged and all resources are located to fighting “the other.“

External warfare directs attention to foreign lands and wealth, where internal warfare focuses on the wealth and land of direct neighbors.

External warfare necessitates high mobility of males, because males need to move beyond the boundaries of their social network to engage in war. A context in which external warfare may arise is migration of people into already populated regions. Internal warfare restricts the mobility of males, because immediate neighboring enemies necessitate local protection. An economic focus on salt increases the significance of salt production sites within a region and in the absence of a clear government or external enemy, internal warfare is likely to arise as the dominant form of competition. Access to power through the economic exploitation of salt results in antagonistic feelings between owners and non-owners. Non-owners will try to gain access, while owners will try to protect and secure their rights.

In this situation, where power is related to immobile wealth, i.e. case land in the form of salt production sites, it is expected that kin-related males spatially concentrate in this specific location to communally protect the interest of the kin-group. Immobility and scarcity of salt production sites demands a certain organization of labor and affects residency patterns. Gender roles in relation to mobility and warfare are flexible and adapt and change to new circumstances. Salt, therefore, affects mobility in a gender specific way. An adaptation to a salt-centered economy demands males become less mobile and protect the production locations.

However, salt also requires an increase in mobility during times of exchange. Perishable items are preserved and can now be transported to regions further away and exchange takes place in a larger social network. Larger distances need to be crossed and people are away from home longer to serve these larger networks. Labor is allocated to exchange voyages to accommodate and maximize profits of salt and salted foods. A significant problem arises in relation to the mobility patterns of people, because people need to stay at one location to protect the resource, but at the same time they need to move to exchange the resource and fully exploit its potential.

In addition to this problem of mobility, long-distance exchange voyages are cross-culturally part of a male realm as well. Child-rearing practices limit a female's ability to move around and be far from home for longer stretches of time. Also, long-distance voyages over land and sea are hazardous endeavors and children are too valuable to be lost during these episodes of exchange. Finally, exchanges are quintessential episodes to negotiate relations of power and long distance voyages always involve exchanges with overseas or distant exchange partners. The male desire to establish and maintain a position of power also applies to exchange practices and it is likely that males want to engage in these overseas exchanges.

Male mobility is heavily influenced by salt. Production sites must be protected against invaders and long-distance exchange networks need to be maintained. Salt restricts male mobility in relation to protection, but is simultaneously required for exchange. A conundrum arises in respect to how to allocate male labor in salt-centered economies. This situation can either be manipulated by allocating a certain group of males to protection and another group to exchange practices or by allocating all males to protection and, at a different time, all males to exchange. In the first case, both protection and exchange are year-round, but are continuously less then optimal. Production sites can be better protected and more goods can be exchanged, but the restrictions in male labor moderate the possibilities. In the second case, protection and exchange are not year-round practices, but when they occur, they are maximized. The choice between these two scenarios is facilitated by another material quality of salt.

4.5 Seasonality of Salt

Salt production is often seasonal. Year-round changes in weather determine evaporation rates and a lack of sufficient solar energy or an abundance of rain totally retard or destroy production. Throughout the year, especially in situations where salt production is dependent on solar energy, only a few months are adequate for production. Even in situations where salt is extracted from brine through boiling and does not depend on solar energy, salt extraction is often dependent on beneficial circumstances. Brine wells sometimes only produce sufficient amounts of brine after the rainy season (Ewald 1985; Parsons 2001) and soils that contain salt can only be observed at the end of the dry season (Parsons 2001). The collection of the brine or soils, in these cases, is not dependent on solar energy, but on other climate-related factors.

Production on intra-annual time-scales is regionally specific. In mainland Mexico and Yucatan, production is highest just before the rainy season starts in June (Ewald 1985; Parsons 2001). The collection of salty soils in the Valley of Mexico also happens just before the rainy season starts, as the salt colors the soil white and the best soils are easy to identify. In the Turks & Caicos Islands, two dry seasons occur, one in April and May and a second one in July and August (Sears and Sullivan 1978). For salt production, July is the peak season (Sullivan 1981). In France, the warmest months, August and September, also produce the most salt. Especially for the production of *fleur de sel*, hot summer winds are necessary (Bitterman 2010).

Because of its potential power, it is safe to assume that maximum salt production occurs during months when salt is available. As a consequence, other production or exchange practices are limited during times when salt production is high. Priority is given to salt production over the production of other, less powerful, items. The future-oriented perspective, especially in relation to a taskscape (Ingold 1993), is reflected here again. Multiple, seemingly unrelated practices are organized on one economy that, in the case of salt, emerges out of the need for labor at very specific times during the year.

The problematic division in male labor between protection and exchange practices is possibly negotiated through the seasonality of salt. Salt-related practices do not require the spatial concentration of kin-related males year-round and male mobility is exclusively restricted at times when salt is available. During the off-season, male mobility is manageable. Although possession of the salt production site is lost when production is not possible, males can retake position and control the resource when conditions improve. The necessity to control access disappears when salt is absent and males are free to move without detrimental consequences of losing a valuable resource. Although salt significantly restricts male mobility in certain months of the year, it enables and promotes mobility in others because year-round control is not essential. Bermudians followed this exact pattern during the 17th and 18th century. For six months of the year Bermudians moved to Salt Cay and produced salt, while after the salt season they returned to Bermuda and sold it to passing ships.

The influence of salt on an economy surpasses the seasonal mobility of males and affects economic practices during non-production seasons as well. Practices of exchange, planting crops, fishing, net-making and transportation are all, at least partially, dependent on salt. People plan and manage their resources so that at crucial times of the year, production is maximized. Salt becomes a binding factor that establishes a foundation upon which other practices are built. As salt is the main economic item in certain social networks, other economic activities are indirectly focused on salt. The consequences of the material qualities of salt extend way beyond the immediate practices involved in exploitation and consumption.

4.6 Conclusion

A gamut of practices surfaces through a detailed discussion of small-scale phenomena in a salt-centered economy. The increased potential to display wealth and exchange goods through salt provides the social context for its exploitation. Salt forms a central point of attention within a web of multiple related practices that are all affected by this resource. Although the social context in which salt was used is not explicitly evident in the archaeological record, salt's material qualities structure people and practices in very specific ways. These material qualities provide a sufficient foundation to approximate parameters on which people in the past based their decisions. Both Chapter 3 and 4 have focused on these social consequences of material qualities.

An economic focus on the exploitation of this resource is directly related to people using salt to preserve food and utilize salted produce to negotiate and manipulate social relations through exchange. These spatially and temporally disconnected practices inform each other and are intrinsically related. The power of salt emanates from both its material quality to preserve and accumulate produce that can be used in exchange, as it is based on the restricted and localized access that facilitate control and location-specific qualities that communicate ideas of places and people. All these practices are part of one sociality of salt.

Finally, people adapt to salt. Salt changes practices and social relations between people, granting it power and agency (for non-human agency, see Gosden 2001, 2005; Ingold 2007; Latour 2005; Miller 2005a; Robb 2004). In order to fully exploit this resource, people are committed to seasonal exploitation and are restricted from other production activities. Also, increased exploitation of salt will eventually result in differences in social status as well, changing the way different groups relate to one another. Without salt, economic practices and networks of social relations look vastly different. Salt is a participant and interacts as a powerful object within social relations.

CHAPTER 5
THE IDEOLOGY OF SALT

The physicality of salt guides ideology. A holistic, practice-oriented approach departs from the notion that ideology emerges from practices. From this anthropological perspective, ideology is not perceived as a structure distanced or disconnected from quotidian practices, but as a dynamic integrated part of people's perception of the world that constantly interacts with people and the material world. Physical properties of salt guide practices in very distinct ways, as described in Chapter 3 and 4. Salt structures practices of economic production, seasonal activities, gendered mobility and communal gatherings and ultimately transforms positions of power and control. Salt penetrates many realms of daily activities and influences how people see the world they inhabit. Consequently, ideological values, meanings and symbolic references of salt are remarkably consistent throughout different social contexts. In spatially and temporally disconnected societies, salt has been an important symbol of fertility, sexuality, continuity and durability.

Ideology, or worldview, is an abstract thought of how the world is structured. As objectified knowledge, ideology is an interpretation of how things are supposed to be (Barrett 1994:71). It is an ideal and shared representation of how the world and people are organized. As a superstructure, ideology is a generalized framework of reference and predispositions that affect how people act and think. These cognitive structures or systems of meaning are immaterial and intangible, but have very strong repercussions on how people engage and live their world.

The immaterial aspect of ideology is difficult to interpret for archaeologists working with only material remains of the past. Knowledge is a mental construct and the archaeologist’s inability to talk to people in the past blocks the only inlet into these underlying structures (Barrett 1994:71). This perception often leads to the conclusion that archaeologists cannot look into past people’s minds and should refrain from being ‘paleopsychologists’ (Binford 1965). The immaterial nature of ideology forms a boundary for archaeologists just working with tangible and material products of ideological structures.

A completely idealistic representation of ideology, however, excludes any material foundation for these generalized perceptions of the world, disregarding physical and tangible structures that shape knowledge and ideas. Grounded in the work of Marx, anthropological emphasis has shifted to the crucial importance of modes of production as everyday practices that inform people of ideological structures. Bourdieu (1977) and Foucault (1977) both focus on the material world and how it directs and constructs interaction between people. Foucault’s examples of hospitals, assembly lines, classrooms and Bentham’s panopticon, are materially structured, which creates a new general ideology of discipline (Foucault 1977). The physical and tangible world affects ideologies and how people construct mental images of it.

Marxist perspectives perceive ideology as a religious and political system that is instituted by the elites to control the masses. Through dominant ideologies, elites maintain power and justify their position. Grounded in economic practices, religious and political systems are objectified and the general population accepts these structures as given and unchangeable. Ideology is a tool to appropriate and maintain positions of power over the population and present a ‘false’ image of social relationships while masking the true nature of power relations (Barrett 1994:77).

A practice-oriented relationist approach to ideology, however, deviates from Marx's perspective of this concept as an invention of the rich to rule the poor, which leaves no room for neutral or positive aspects of ideology for the larger population. But other symbolic dimensions, like art and religion, are integral parts of all social actions and life, rather than disconnected and separate immaterial dimensions that only express social hierarchies (Geertz 2003). Ideology and other symbolic realms give meaning and value to daily life and are much more than unconscious blueprints of power relations. To be clear, power relations are still part of these symbolic realms, but not all expressions are focused on the power differentiation between groups of people.

From a practice-oriented approach, ideology is a structure. It is an objectified construction of how things are. Yet, this structure is dynamic and in a constant state of becoming. People engage with these structures and manipulate and negotiate their action within its boundaries. Ideology is a constant back and forth between its performance and the objectified knowledge. Hence, performance is simultaneously a product and the producer of the objectified knowledge. This dynamic definition of ideology, where every practice that embodies the structure is concomitantly an expression and a foundation of it, redirects attention to the bodily and material aspects of ideology.

Therefore, the physicality of practices and the world play a vital role in the formation of certain ideas and symbolic structures. Without bodily expressions and material correlates, symbolic and intangible realms do not exist. And if these realms have no repercussions on how people behave, they require no attention. Practices on the microscale provide the basis for ideology on a macroscale, which subsequently reinforms the microscale about how practices are supposed to be enacted. Ideology is not an immaterial cognitive tool unaffected by the material world, but a product of history and repetition.

Historical sequences of practices follow different paths and alter, strengthen, maintain, justify, objectify, naturalize and institutionalize certain relationships. People engaging in practices are able to intentionally change the underlying structure through their participation. Individuals are aware of frameworks of reference that structure practices and can consciously manifest their intentions, within the boundaries of the framework, to communicate new ideas or objectify existing relationships. Certain individuals will find it in their best interest to maintain current social relations while others will contest present structures and communicate new notions. The direction of historical sequences is not predetermined and their routes are constantly challenged, depending on how people act upon underlying structures and how successful their endeavors are.

Agency, in this perspective, is located at the interval between individuals and frameworks of reference in which they live. The ability to negotiate their social position within the boundaries of these frameworks grants power to both structure and individuals. Agency is relational and determined by the interaction between an individual or a coherent social group and the social structure in which they are enmeshed (Barrett 2000; Brumfiel 2000; Dobres 2000; Ritzer 2001; Ritzer and Gindoff 1994). The individual cannot act outside the rules and limits set by the structure, but within the possibilities, people can actively and consciously present themselves in certain ways that might alter their options in the future. The structure cannot exist without people who practice these structures, while people require this structure to know how they are supposed to act. Agency is a product of interaction between an individual's intentions and structure.

The dynamic interplay between microscales and macroscales is not always balanced and in some situations, certain scales are more important than others. In the case of ideological macroscales, certain structures are maintained and strengthen over such long time scales that they become very resistant to change. Repeated statements of their underlying 'truth' objectify and naturalize these 'truths' to such a degree that people unconsciously accept them. These structures move from a realm where they are discursive and negotiated to another level where contestation or manipulation is almost impossible. In these circumstances, the macroscale has more power than the microscale and practices are strictly structured and engrained.

Bourdieu (1977:159-171) labels these unquestionable structures as *doxa*: Subjective arbitrary structures that are accepted as objective and natural through prolonged repetition of practices of validation. *Doxa* communicates the 'natural world', how things are; a constructed reality that is generally accepted. These *doxic* structures are so enmeshed and unconscious in people's lives that they are completely unfamiliar with their existence. The processes of objectification are so successful that the subjective basis is completely forgotten. Heterodoxy or orthodoxy[1] are its opposite and includes frameworks of reference for which subjectivity is acknowledged and, therefore, constantly contested.

---

[1] Heterodoxy differs from orthodoxy, but both are opposites of *doxa*. Heterodoxy refers to the acknowledgement of different 'truths' that coexist and multiple individuals or groups are aware of their different perspectives. Orthodoxy refers to a statement about the 'truth' that is generally accepted, but that remains questionable and discursive.

In relation to *doxa,* agency seems to be dislocated from the individuals and totally resides in social structure. A relational aspect between the individual and structure is abandoned as structure is unquestionable, implicit and unconscious, removing any form of agency from individuals who are enmeshed in these structures. The structures dictate people's action. However, doxic structures can move into discursive realms and become contested again. The resistance to change and unquestionable nature is not necessarily ever-lasting. On a continuum between individual agency and structure, microscale and macroscale, *doxa* is located as close to structure as possible, while heterodoxy remains close to the individual's side of the equation.

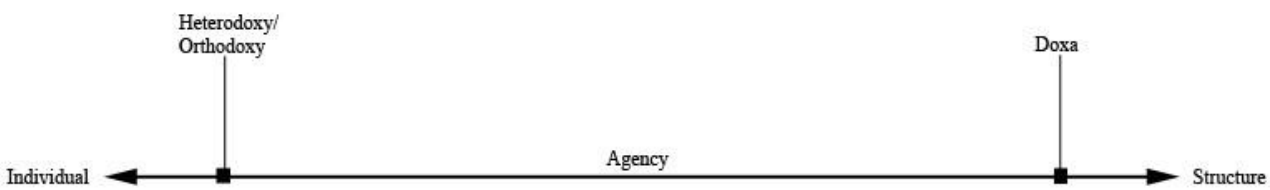


Figure 5-1. The relation between doxic and heterodoxic structures, agency, individuals and structure

Ideology is doxic, an unquestionable and accepted statement of what reality is and how the world is structured. Ideology is relatively static, resistant to change and forms an ideal long-term basis for people to understand their environment. Its fixed character limits the flexibility in individual interpretations and stabilizes social relationships. Without deeply rooted underlying structures, social life would be too fluid and nothing would make sense. Perceptions lack structure and the communication of communal ideas would be severely restricted. Yet, practices are necessary to confirm and perpetuate these structures. Without repetition, unconscious underlying structures are forgotten and disappear. Furthermore, the emphasis on continuity and perpetuity leaves little space for an individual's ability to confront and contest these frameworks, but ideology is never completely devoid of manipulation and negotiation of its foundations. Ideology is abstract, as it structures how people behave and act, while at the same time it needs these practices to confirm its status as unchallenged.

5.1 Material Worlds and Objects

Whereas lives of people are ephemeral and relatively short, these ideological structures are stable and last. Individuals and their ever-changing lives are unlikely a basis for lasting structures that outlive them. The durability and continuity of ideological constructs must be grounded in something besides practices, something that is a physical representation of perpetuity. The material aspects of people and their bodies are not specifically suited to convey messages of continuity and durability. The stability in practices and social structures emanates from agents other than humans.

Objects are stable indexes of continuity (Gell 1998; Gosden 2005; Ingold 2007; Latour 2005; Miller 2005b). The material world, full of objects, provides a relatively fixed background for yearly practices. The repetitiveness of seasons and material qualities of objects induce a repetition in practices, providing a performance-based structure for ideological concepts. The material world is predictive and the stability of climates and features in the landscape establish boundaries to the possibilities of human practices. These material qualities of the world and objects do not determine practices *per se*, but they restrict certain possibilities and open up others. People have to adhere to objects and the material world during their daily routines.

Practice-oriented approaches to past landscapes utilize material manifestations of ideology and mainly focus on architectural features. Monumental structures are such material manifestations that provide structure to practices and these monuments reflect and concomitantly change and shape perceptions of the world (Barrett 1994, 1999;

Barrett and Ko 2009; Bradley 1998, 2002; Richardson 1982; Thomas 1996, 1999, 2001; Tilley 1993, 1994, 2004). Especially in the British Isles, archaeologists became aware how these built structures were transforming the way past peoples understood the landscape. The monuments were fixed and stable material objects that informed people how the world was structured.

Rather than understanding these structures as final representations, researchers started to become aware of the changing nature of these large monuments and the successive stages and building sequences. The monuments are not static structures that had a perpetual static meaning, but form part of the material world that structures and is simultaneously structured by people who live in that landscape. People engaging with these material boundaries negotiated the set boundaries of this material world and implemented structural and material alterations to the monuments. Yet, the material world of these monuments influenced people's practices in every successive stage and how subsequent additions or alterations were implemented (Barrett 1999)

Jones (1998:301-302) stresses that these landscape approaches to monumental architecture in archaeological literature preference buildings and other human objects that enculture the landscape, leaving little to no room for other, non-human agents. Although most scholars depart from the notion that people inhabit the natural world, the preconditions play no part in the process of enculturation. The structures that guide human practices are built and are, in these approaches, not grounded in the natural landscape. In his attempt to move away from exclusively human aspects of the landscape, Jones (1998) turned his attention to another part of material culture, namely animals.

> Animals are then constitutive of the experience of place. Experiences are linked through memory and may be evoked through the use of objects, such as animals, which embody the memory of a particular place. Animals are, then, a medium by which places may be linked through social and symbolic practice. Given this, it is possible to perceive animal species not as uniform entities, but as qualitatively different according to a series of different cultural priorities such as their relationship and proximity to humans; spatially, temporally and morphologically. Animals may be simultaneously classified by the places which they inhabit, while also serving as a means of classifying the landscape.
>
> Cultural landscapes are therefore never uniform, but are made up of a series of places which, according to a myriad of cultural perceptions, are graded differently. This differential grading of the landscape allows us to consider ways in which access to, and knowledge of, various places may be controlled through dominatory social relations (Tilley, 1996). Furthermore, the products of these places such as raw materials and animal resources may be similarly controlled. The procurement, use and deposition of specific species, within certain contexts, may be socially prescribed and may occur according to appropriate temporal and spatial rules, and be undertaken by specific members of the social group (Crocker, 1985). (Jones 1998:303)

Barrett (1994, 1999), Bradley (1998) and Thomas (1996, 1999) agree wholeheartedly with Jones that places are defined by practices, but Jones's approach to landscape archaeology starts before monuments and buildings are constructed and become part of that landscape. Barrett's (1994) discussion on Avebury, for example, focuses on a diachronic development of different phases of monumental construction and associated practices within this specific landscape and explains how these phases (un)intentionally influenced each other. Human-induced physical alterations of the material world are foregrounded, while non-human participants within this process are neglected. Non-human agency is restricted to man-made inanimate objects, but other natural features of the landscape are left out.

Besides buildings and animals, other non-human agents in an environment include more permanent features of the landscape, such as mountain tops, shores, wetlands and rivers (Bradley 2000). These features change people's activities and how they move in a landscape, shaping perceptions of the environment. The location of raw materials, especially when they are exploited for specific uses, structure practices as well (Thomas 1996, 1999). Thomas (1996, 1999) describes how the Neolithic exploitation of flint in Sussex mines mimicked and referenced the deposition of human remains. Human burials were excavated and disarticulated remains were deposited at different sites. Similar practices involve flint mining and deposition, as flint came from underground sources in Sussex, and through exchange, flint axes were discarded in different regions. Flint from Sussex became intrinsically related to human remains through the intrinsic relation between both practices. These practices are not reflections of the social meaning and value, but they structure and articulate these meanings through their performance.

Salt is an object that structures practices and, therefore, affects ideologies as well. Furthermore, physical aspects of salt structure practices in a very specific way. In salt-centered economies, practices involved in the construction and maintenance of social networks of power are particularly focused on the production and consumption of salt. The preservative, nutritional and sensuous qualities of salt increase it's potential to signify power during communal gatherings and feasts, whereas limited availability and restricted locations of production influence ideas of ownership and gendered mobility. People adapt to these material restrictions imposed by salt, because of salt's ability to communicate and display positions and ideas of power in more effective ways.

When ideology is a construction of how people relate to one another and the world, and salt alters power relations between people, salt cannot be neglected. The significance of salt in ideological realms is not a product of salt in and of itself, nor is it a product of human cognition irrespective of the material world. People engage with the physical aspect of salt and salt's physical qualities guide practices that involve relations of power, producing a context in which power and salt are intrinsically linked. The very specific way salt structures practices, as discussed in Chapter 3 and 4, enforces similar connotations to this resource in different social contexts. Irrespective of social context, people have to adapt to these basic material boundaries of salt. Salt induces relatively stable practices, creating the foundation for widespread and similar ideological connotations to this particular resource.

5.2 Durability and Continuity of Salt

Salt preserves and changes a perishable into a non-perishable. Salt creates durable items that last and remain, from foods that decay and vanish. Although this change is instigated by people's practices, it is the material quality of salt that ensures the preservation of edibles. People are very aware of the role salt plays in this process. Practices of salting primarily intend to transform inherent qualities of food from perishable to lasting and enduring products for consumption, but these practices require salt. Salt and salting practices cooperate to make edibles last.

The contrast in characteristics of unprepared and salted food is of such a scale, that the material qualities of this contrast communicate this change. Unprepared foods are always impermanent and disappear if left alone, whereas salted foods preserve and can be kept for years without refrigeration. The temporary nature of food stands in such contrast with enduring salted foods that people are constantly reminded of salt's qualities. Furthermore, these material consequences of salt alter people's practices in such a pervasive way it demands attention. Salt alters food in such a significant way that the material becomes an index of its durability and continuity.

Salt is also eternal. Salt never disappears, even when it visually escapes. Put in solution, salt becomes invisible and intangible. Yet, the taste of the liquid is salty, a reminder of its inexplicit presence. After evaporation of the salty liquid, salt crystals reappear and form the same amount of salt that went into solution. With contemporary knowledge of atoms and ions in solution, this process is easy to explain, but this transition of visible to invisible and back to visible salt is almost 'magical.' This process fascinates Kurlansky (2003) to such a degree that he dedicates the first pages of his book by describing how a rock salt from Spain went through successive stages of salt to brine and back to salt in his house. The perseverance of salt bestows it an even larger value of continuity and perpetuity.

In concordance with these ideas of continuity and perpetuity, Plato states that salt is dear to gods (Kurlansky 2003) and in the Iliad, Homer mentions that salt is sacred and divine. Homer ascribes these qualities to salt, because it preserves incorrupt items and prevents them from dissolution (Homer 1767:236). The effect salt has on perishable items is transposed to other non-edibles. The ability to preserve food in an edible state is compared to the divine ability to maintain a pristine state of being. Unscrupulous behavior deteriorates the body and moves it further away from a moral life, but by maintaining and abiding morals, individuals approximate divine behavior. Unchanging, pure and immaculate behavior of gods is equated with salt and its durability and ability to prevent decay. Plutarch parallels the spread of salt through our body after consumption to the spread of the soul, the most divine part within our body, and both act cohesively to keep our body from falling apart (Plutarch 2006:184). Gods and souls are omnipresent and never change, holding the same qualities as salt.

Concepts of perpetuity in relation to salt are referenced in the Bible as well (Trumbull 1899:19). In three specific places, the bible mentions a ‘covenant of salt,’ an agreement between god and another party that is perpetual and unalterable. When Aaron and his sons are seeded in priesthood, a covenant of salt confirms Aaron’s permanent commitment to his new status. David’s rule over the kingdom of Israel is a covenant of salt with god, as his reign is perpetual and unchangeable. Lastly, Moses orders people to make sacrifices of salt after meals that strengthen their continuous bond with god. Salt’s material is an index of social durability in these contexts.

Sharing of salt also references the perpetual character of social relations and covenants. As salt was often controlled by bodies of power, such as governments or elites, the exchange of salt references the permanent social obligation of the receiver to the institution of power. The institution provides salt to the people as a vital nutrient, requesting in return loyalty and devotion. The physical consumption of salt equals the social consumption of the reign of its controller. Trumbull (1899:19) states:

> In many lands, and in different ages, salt has been considered the possession of the government, or of the sovereign of the realm, to be controlled by the ruler, as a source of life, or as one of its necessaries, for his people. In consequence of this the receiving of salt from the king’s palace has been deemed a fresh obligation of fidelity on the part of its subjects. This is indicated in the Bible passage with reference to the rebuilding of Zerubbabel of the Temple at Jeruzalem, under the edict of Cyrus, king of Persia. “The adversaries of Judah and Benjamin” protested against the work as a seditious act. In giving their reason for this course they said: “Now because we eat salt of the palace [because we are bound to the king by the covenant of salt], and it is not meet for us to see the king’s dishonor, therefore have we sent and certified the king.

Because salt preserves, it also sustains life. According to Trumball (1899:51-71), the nutritional need for salt induces a relation between salt and life. Salt deficiency was often recognized as the source of sickness and other health issues. Blood, as a source of life, is salty and Trumbull mentions multiple examples in which salt and blood substitute for one another in certain rituals (Trumbull 1899:35-50). Salt protects from harm and preserves good health. In medieval times, European farmers soaked grains in a brine to prevent a deadly fungal infestation, labeled ergot. In Japanese and Haitian culture, salt was also used to suppress evil spirits and protect people from harm (Kurlansky 2003). The intimate relation between salt and life is especially visualized through the process of mummification, in which prepared bodies were salted. The salting of human flesh was a vital step to preserve the human body in order to continue life in the afterlife. The desert environment of Egypt causes perspiration and the loss of salt, raising the need for additional salt in a diet. In Egypt, salt was a daily requirement to live a healthy life, but also needed to remain “living” after death.

As a source of life, the sun is another symbol that relates to salt. In many religions, the sun plays an important role, either as a main god or as a source of light. Sunlight, in contrast to the darkness of the night, enables plants to grow and fields to prosper. The resemblance between the words sun and salt is not just present in the English language. In Greek, *hals* and *helios,* in Welsch *hal* and *haul,* in Irish *sal* and *sul* all signify that there is some etymological connection between these words (Trumbull 1899:74). Finally, the eternal cycle of sunrise and sunset represent continuity.

There is a symbolic relation between gold and the sun, as both are shiny, yellow of color and both remain unaltered. Old folklores often prescribe exposure to sunlight in cases of disease or health-related discomfort. The light and the warmth that the sun emits, allows life to prosper. There is also a metaphorical connection between salt and gold, as salt was historically known as 'white gold.' This relation between the two materials is often explained in mere economic terms, departing from the notion that both salt and gold are scarce and have high values (Andrews 1983; Kepecs 2004; Kurlansky 2003; McKillop 2002). But this expression of white gold for salt refers also to the quality of durability and continuity, as both salt and gold are unchangeable. Gold is one of the few metals that is resistant to corrosion. The lack of oxidization causes the color to maintain its brightness. Gold and salt are both durable, shiny and valuable.

Another connection between gold and salt exists. Oliver (2000) mentions that *guanin* or *tumbaga*, a sacred copper-gold alloy in the prehistoric Caribbean and South American mainland, tasted salty. The example of *guanin* by Oliver (2000) also symbolically represents the sun and the light it emits. With evaporated salt, the sun is a producer or salt. While people need the sun and salt to live, salt needs the sun to form. Furthermore, salt crystals act as prisms in the sun and produce the appearance of a rainbow. A triangle of salt, gold and the sun arises as a symbol of perpetuity.

5.3 Fertility and Sexuality of Salt

According to many cultural beliefs, salt is an aphrodisiac and intensifies sexual desires (Kurlansky 2003). Although the relation between the physicality of salt and symbols of durability and continuity are relatively straightforward, the connection between salt and fertility and sexuality is less evident. Material qualities of salt do not necessarily increase sexual desires or fertility. The connotations to these concepts of sexuality and fertility are indirectly established through practices and observations that concern salt, salt making and salt consumption. These references to sexuality and fertility seem less apparent and unambiguous as the connotations to durability and continuity, but this discussion of its reoccurring nature will show how material qualities of salt function as an index of these two concepts.

A possible connection between salt and sexual desire might stem from the bodily reaction to its consumption after undernourishment. A lack of salt causes multiple health problems which obviously decrease sexual desires. Where and when salt was scarce and difficult to obtain, a lack of salt would numb a population and decrease their sexual appetite. Consumption of salt would revitalize people and sexual desires would return. In this context, salt works in similar ways as oysters did in medieval times. Oysters, a well-known aphrodisiac, are high in vitamin C and travelers from Europe with scurvy and vitamin C deficiencies would instantly feel better after the consumption of these bivalve mollusks. The lack of vitamin C on the ships that travelled the Atlantic Ocean caused severe health issues and indirectly affected sexual desire, but consumption of vitamin C, in these cases in the form of oysters, would restore a person's health and revive his/her sexual desire.

Kurlansky (2003) notes that many cultures relate the fertility of the sea directly to the saltiness of its water. The abundance of marine resources stems from the water, and the particular salty taste of the water increases its fertility. In addition, fish in particular have far more offspring than land-based animals. The massive amounts of eggs in roe are a material reflection of a fish's fertility. In similar ways, sea-turtles lay an incredible number of eggs per nest and a minimum of approximately 50 eggs is often met. Hawksbill turtles, though, can lay up to 200 eggs per nest and most sea turtle species lay more than one clutch a season. Finally, most sea animals, especially whales, are larger than land animals, indicating that the sea is far a better environment for animals to grow.

A third and final source that relates sexuality and fertility to salt is the salty taste of bodily fluids. The human body contains up to 250 grams of salt (Adshead 1992) and all human bodily fluids taste salty (Adshead 1992; Astrup et al. 1993; Bitterman 2010; Ewald 1985; Kurlansky 2003; McKillop 2002). Sweat and tears are less directly related to fertility and sexuality, but bodily fluids like urine and especially blood and semen have obvious connotations to sexuality and fertility. The relation between reproductive organs and female and male fertility is linked with the discharge and exchange of these fluids. The link between salt and fertility is based on the presence of salt in these fluids that are central to human reproduction.

Examples of cultural references of to salt and sexuality or fertility are infinite. Women in the 12th century in France salted their men to make them virile. Salting would not only increase sexual desire, but also a man's fertility and ability to produce offspring (Kurlansky 2003:4). The Latin word for a man in love is *salax*, the root for the English word *salacious* (Trumbull 1899:94). Latin provides another possible explanation for the relation between salt and sexuality. According to Pliny (1856), salt is naturally igneous and the verbs *saltus* means 'to leap' or 'to jump,' just like the sparkles of salt in fire. The Latin verb *salis* underlines this relationship as it means 'to salt,' 'to sprinkle before sacrifice' and 'to jump, leap, bound and jump' (Trumbull 1899:96). Love and a state of being in love are often symbolically referred to as sparkles of fire.

As salt is related to sexual desire and fertility, the opposite of these concepts, abstinence, occurs with taboos on salt. Plutarch (2006:184) states that Egyptian priests, for example, did not consume salt to repress sexual thoughts and desires. To abstain from salt was to abstain from sex. Dayak from Borneo, Indonesia, abstain from sex and salt after head hunting raids (Kurlansky 2003:3). Headhunting, as an act of life taking, is a social opposite of sex, sexuality and fertility which are symbols of life-giving. Both life-giving and life-taking practices are central aspects of fertility for many New Guinean societies (Lemonnier 2006:229). In the Dayak case, fertility rites are immediately followed by a taboo on sex and salt. Another example comes from the Chibcha in Colombia who live near the modern capital Bogotá. Their economy concentrated around naturally occurring brine wells and the production of salt. Twice a year, Chibchan salt lords refrained from sex and salt to honor their gods (Kurlansky 2003:3, 205). Caribs inhabiting the Lesser Antilles in early historic times also observed a taboo on the consumption of salt (Boomert 2000).

Fray Ramón Pané (1999) left an account of the indigenous population of Hispaniola during the early years of colonization. One of the stories he recorded hints at the existence of a relation between salt, fish and fertility within these communities. The story involves *Yaya*, the supreme god who has no name, his son *Yayael* and his mother at first. *Yayael* was killed by his father, after *Yayael's* second attempt to kill his father. His bones were placed in a gourd and hang in the house. One day, *Yaya* wanted to see his son and together with his wife he took the gourd down. *Yayael's* bones were transformed into fish. Later, a group of four brothers intrudes the house and accidently drop the gourd. From the gourd, fish and seawater emerged and created the sea (Pané 1999:13-14).

Multiple aspects of the story reference fertility. The gourd is a symbol of the womb and just like the four brothers who come from the womb of their mother, the fish come from the womb and bones of *Yayael*. Fertility is related to females and their womb, childbirth and social reproduction. Furthermore, the fish in the gourd are used as food and supply the brothers with nutrition. The fertility of the fish is used to nourish people. Finally, the breaking of the gourd that initiates the pouring of water and creation of the sea is a symbolic representation of the breaking of the water in childbirth. In this story, social reproduction and food production are both symbolized by a gourd, fish and the sea. The sea resembles the fluid in the amniotic sac that is released during childbirth. Just like seawater, the fluid in the amniotic sac is salty. The saltiness of the sea enables and increases the fertility of the fish, but the fluid in the amniotic sac increases the fertility of the mother and her child(ren).

5.4 Salt Magic

Salt is a magical substance. Because of the precarious environmental conditions that are needed for salt production, saltmakers and saltrakers are intensively invested in this process. Especially in situations where salt production is not a given and a lot of energy is invested in its production, the uncertainty of success increases people's attention to this process. Bitterman (2010) describes how paludiers, saltrakers in France, are incredibly invested in observing all phenomena that allow salt to emerge from the brine. Season, wind, sun, temperature, color of the brine and specific salt bed characteristics are factors that are all considered. The production of special salts, like *fleur de sel*, who rely on very specific conditions demand even more experience from the saltmaker. In France, the making of salt involves a lot of superstition and rituals (Bitterman 2010).

Saltmaking, therefore, involves knowledge. The process of evaporation is dependent on so many factors and good saltmakers needs to be very knowledgeable about these factors to make salt. Someone who is unfamiliar with the dynamics of production will have a really hard time producing salt. Furthermore, even when someone manages to make salt, the quality will most likely be lower than that of an experienced raker. Saltraking is done by specialists, people who have experience and know how salt behaves. The knowledge that is required elevates the social position of the people involved in the production process.

This even holds true for contemporary large-scale production sites. The biology of the brine is extremely important for the successful production of salt and the introduction of certain bacteria can reduce production by more than 70% (Dr. Joseph Davis, personal communication 2010). Dr. Joseph Davis, emeritus professor at the University of Florida, works all over the world and is contracted by big salt companies to consult on the biology of the brine. Although he states that his work is relatively simple and straightforward, these big companies are unable to overcome their problems without his help and his knowledge is highly valued.

Salt raking and production are ‘magical’ processes that are only understood by a few people within a society, which imbues these knowledge-keepers with something special and increases their social status. In this respect, saltrakers and saltmakers can be compared to, for example, Melanesian farmers who are constantly involved in magic to increase the production of their fields (Malinowski 1935), or iron smelters in Africa (Merwe and Avery 1987). These highly specialized routines also involve many factors that influence production, and uncertainty about its outcome is negotiated by increased symbolic behavior. Schmidt (1997) discusses in detail the importance of gender relations and sexuality for iron smelters in Africa and argues that many technical difficulties are attributed to superstition and ideology, such as women breaking menstruation taboos or men engaging in sexual activities during important episodes of iron smelting.

5.5 Conclusion

This chapter argued that material qualities of objects, in this case salt, structure people's lives in such a pervasive way that even informs them on ideological levels. The persistence of certain symbolic connotations with salt is the foundation of the widespread distribution of specific symbolic references to salt. This discussion shows how the transformation from material qualities to mental concepts of the world are created and maintained through practices. Because salt structures practices in a very particular way, ideological connotations are relatively similar in different contexts. The examples provided here emphasize how practices involved in salt produce the foundation for certain ideological structures.

The argument here has mainly focused on how practices on a microscale, restricted and confined by the material qualities of salt, inform structures on the macroscale. As discussed, material qualities of salt structure practices in such pervasive ways that in many different societies relations between salt, continuity, durability, fertility and sexuality emerged as important symbols. These macroscalar idioms and symbolic references, once in place, reflect back onto practices on the microscale. Ideas of continuity, durability, fertility and sexuality now informed people's behavior and how practices were performed. The potential power of salt through salt was simultaneously informed and guided by ideas of social reproduction, fertility and continuity. The material qualities inform idealist qualities, reinvesting these physical aspects with social references.

Chapters 3, 4 and 5 all discuss how the material qualities of salt inform multiple socialities in people's lives. People attend and adapt to these material qualities, because of the benefits salt has for the negotiation of power and social status. The remaining chapters in this study focus on a case-study and inform on how these qualities of salt are culturally engrained in a specific context. So far, the argument is very general and explains how important salt is, but now its application will focus on MC-6, an archaeological site on Middle Caicos, Turks & Caicos Islands. This case-study illustrates how these general socialities are enmeshed within a prehistoric Caribbean context.

CHAPTER 6
THE PREHISTORY OF THE CARIBBEAN

This chapter describes the general cultural background of the Caribbean region and introduces the context of the archaeological site MC-6, the subject of the next two chapters. First, a short description of prehistoric migrations into the Caribbean archipelago illuminates processes of initial colonization. Second, migrations and pottery styles are discussed in more detail for the Bahamian archipelago to provide a solid context into which MC-6 is placed. Furthermore, this description provides a typical example of how a culture-historical paradigm is applied to the region. This approach is incompatible with the practice-oriented relationist approach that is followed in the subsequent chapters. Finally, the shortcomings of the culture historical approach are evaluated and a new perspective is set forth. A practice-oriented relationist approach overcomes the shortcomings of a culture-historical perspective and explains the archaeological record in a detailed manner that places people first. This chapter illustrates, in comparison to the subsequent chapters, how different these approaches are.

6.1 Caribbean Culture History

The first migration into the Caribbean archipelago began around 5000 B.C.E. This was relatively late, considering that people inhabited the surrounding region thousands of years before. Most likely, navigation from the mainland into the Caribbean region was a physical barrier. These first migrants did not leave a vast quantity of material culture behind and sites have only been recognized on Cuba, Hispaniola and Puerto Rico (Rodríguez Ramos et al. 2010; Rouse 1992). Artifacts are chert blades, resembling contemporaneous Belizean stone tool assemblages, suggesting a possible migration from the Yucatan peninsula into the Caribbean islands (Wilson 2007). Rouse (1992) refers to these people as Casimiroid and has assigned multiple subgroups, depending on small differences between artifact assemblages. This period is called the lithic age.

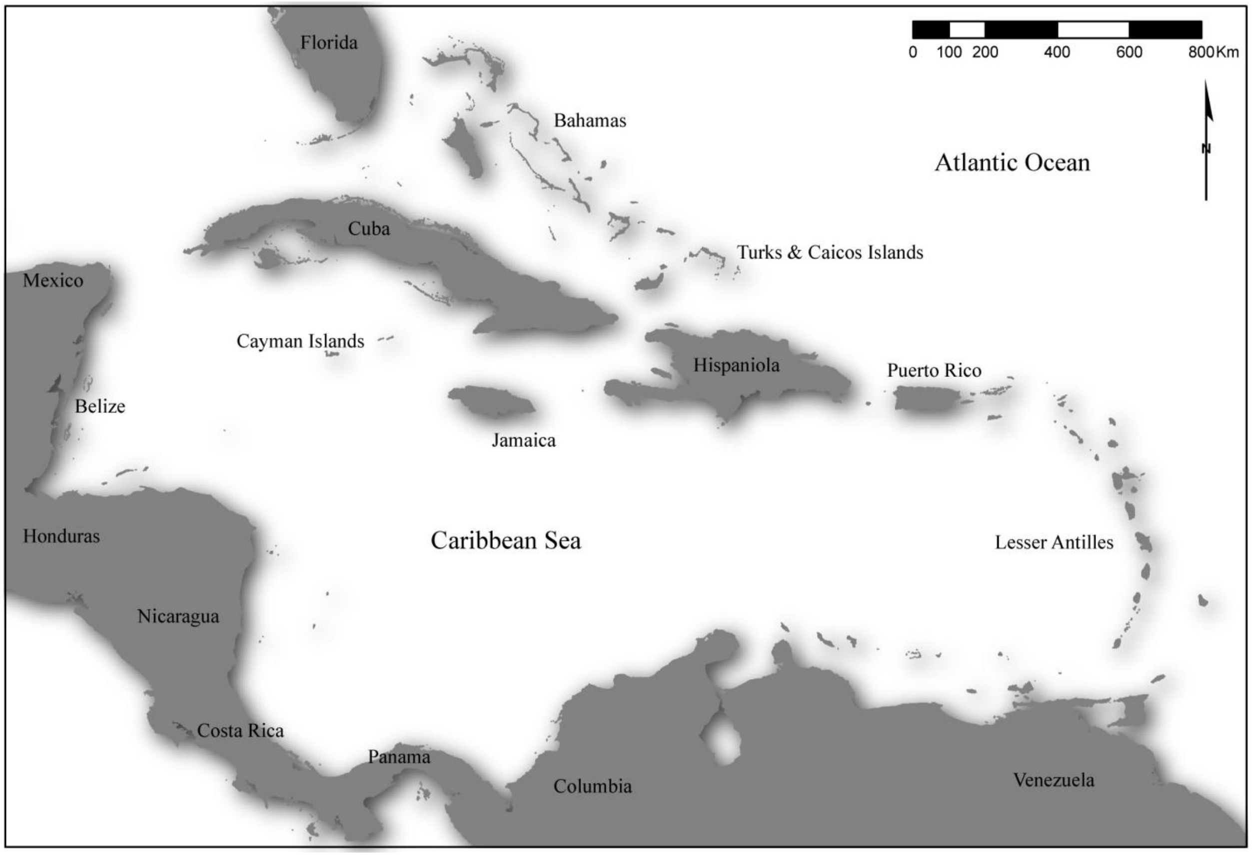


Figure 6-1. Circum-Caribbean region

The next period, starting around 3000 B.C.E., with a new ground-stone technology in the archaeological record, is called the archaic age. According to Rouse (1992), the introduction of a new technique equals the introduction of new people. He proposes Trinidad as a likely place of origin, because this technology was locally in use around 6000 B.C.E. Keegan (2013) rightfully points out that this difference of 3000 years in association with the uncritical assumption that a new technology represents a new migration is an argument that undermine this line of reasoning. Yet, these changes occur and the archaeological record shows a time of relative stability afterwards.[1]

The relative stability changes considerably around 500 B.C.E., when a new migration of people reaches the islands. This new migration is characterized by a pottery style called Saladoid. This highly elaborate pottery is of high quality, thin and easily recognized by white on red, white on black and zone-incised crosshatching designs (Keegan 2000; Rouse 1992). Artifacts with similar designs and production techniques are found along the Orinoco River, pointing to the South American mainland as the most likely candidate for its origins. The earliest dates in the Caribbean region that are associated with these Saladoid deposits come from the Northern Lesser Antilles and Puerto Rico, indicating other islands along the chain were bypassed during early voyages (Haviser 1997).

Saladoid pottery shows relative homogeneity across the whole region, which is interpreted as a *lingua franca* and a veneer reflecting close cultural connections between distanced communities (Keegan 2000). Differences were subsumed over similarities and people emphasized social cohesion between groups (Keegan 2000, 2009; Morsink 2010, 2011). In a situation of new migration from South America, continued contact with the place of origin is crucial when conditions suddenly change and endanger the continuity of the group. Strong social relations with villages in a less precarious setting provide insurance for people exploring new environments and establishing new villages (Keegan 2000; Kirch 2002; Morsink 2011).

This sudden expansion from South America is associated with the Arawak diaspora (Heckenberger 2002, 2005). Besides the movement of people, the Arawak

[1] For a current discussion on migrations into the Caribbean region, see Keegan (2013).

diaspora is characterized by a ‘constellation of cultural features’ (Heckenberger 2002:111), including (1) settled village life, (2) institutionalized social hierarchy, and (3) a tendency to form vast regional societies, labeled as regionality (Heckenberger 2002; Santos-Granero 2002). This Arawak diaspora is, therefore, more than just the migration of new people into a new area, introducing a language and pottery style, but a cultural process that includes vastly different practices that are previously unrecorded in the Caribbean region.

Keegan (2013, n.d.) argues that the rapid migration of people into the Caribbean follows a process of Arawakization. The introduction of Saladoid pottery is normally perceived as a sudden migration of multiple groups of people settling the islands, but Keegan proposes that migrating men from the South American mainland infiltrated previous archaic villages and populations. This process, described by Max Schmidt (1917) from ethnographic examples in Arawak villages, follows a very specific pattern. Arawak men migrate into an already existing non-Arawak village and introduce new technology, including pottery and agriculture. A shift towards agriculture creates a relation of dependency, as agricultural practices and knowledge are held by the infiltrator. Rapidly, local people adapt the new way of living and the infiltrator establishes a position of power. Keegan (n.d.) proposes similar processes in early Caribbean villages.

Although this process of Arawak enculturation of local people is a plausible explanation of the rapid dispersion of these cultural features across the region, it does not explain why this migration never enters eastern Hispaniola. Although Saladoid pottery has been recorded from eastern Hispaniola, Hofman (personal communication

2009) suggests that these samples are actually from Puerto Rico. Hofman did not find any Saladoid pottery from secure deposits and all artifacts seem to come from private collections with unknown provenience. The halt in migration has been attributed to antagonism between Saladoid people and Archaic populations on Hispaniola. Differences between these two groups are perceived to delay the introduction of pottery and other cultural features (Rouse 1992).

It is not until approximately 600 C.E. that subsequent changes occur and a material separation is noticed between the Lesser and the Greater Antilles. In the Lesser Antilles, Troumassoid pottery appears, which develops into Suazoid after 1000 C.E. The quality of these pottery styles is significantly less than Saladoid materials and ceramic vessels are thicker, less decorated and painted designs vanish almost completely. Suazoid pottery in particular is of notable low quality. Both Troumassoid and Suazoid styles do not show any homogeneity across different regions and more local relations are emphasized. In general, other material correlates of social identity, such as houses, heirlooms and burials, become more important and pottery withdraws from the social arena as an important symbol (Morsink 2011).

The traditional perspective of cultural developments in the Greater Antilles perceives Ostionoid pottery as a development from Saladoid in Puerto Rico (Rouse 1992), but Keegan (2006) argues that developments on Hispaniola have a distinct origin and emerge out of local practices by archaic people already on the island. Ostionoid is not a linear progression from Saladoid, but a separate style with a different culture background. In either case the quality of the pottery decreases and overall designs reduce to red paint. Also, vessel shapes change from bell-shaped pots in Saladoid times to boat-shaped vessels and straight-sided bowls (Keegan 2000; Rouse 1992). The style that developed out of Saladoid is called Ostionan Ostionoid. Besides changes in pottery styles, settlement patterns seem to diverge in multiple smaller settlements (Curet 2005; Torres 2011) and other communal spaces, such as plazas, start to arise in the landscape (Curet and Stringer 2010; Curet and Torres 2010; Oliver 1998; Torres 2010, 2011).

In conjunction with cultural developments in the Lesser Antilles, Ostionoid pottery also shows many regional characteristics and dissimilarities. A number of regional variations received other names, as these clearly demarcate different groupings of artifacts. First, Elenan Ostionoid is produced in eastern Puerto Rico, Virgin Islands and Northern Lesser Antilles and is contemporaneous with Ostionan Ostionoid of western Puerto Rico. According to Rouse's scheme (Rouse 1992:32), these two groups are separated by space. Elenan Ostionoid is further differentiated in an early Cuevas style and a later Santa Elena style and continue up until contact.

Further to the west, Meillacan Ostionoid is found on western Hispaniola (often associated with contemporary Haiti), Jamaica and Cuba. Meillacan pottery is modeled and incised, thin and of a high quality. Although Meillac pottery found in north-east Haiti, around the contemporary village of Meillac, after which this style is named, is red, this style is mainly characterized by its dark black color. The color difference is a result of reduced firing conditions, where red is produced in oxygen-rich and black in reduced firing conditions. This style emerges around 1000 C.E. and is produced until contact, but has antecedents as early as 350 B.C.E.

Around 1200 C.E., Chican Ostionoid pottery appears in the archaeological record, mainly in Hispaniola. This pottery style is characterized by elaborate vessel forms, incised, modeled and punctate designs, very few red painted wares and white-slipped bottles. This pottery style is associated with the Classic Taíno, the people Columbus encountered on Hispaniola. Ethnohistoric sources describe chiefs, or *caciques*, in the region, indicating social stratification and institutionalized hierarchical relations. It is assumed that complex social organization emerged at the same time as this pottery style. Although Hispaniola was the heartland for the Taíno and their Chican pottery, Chican designs on pottery and shell are found on Cuba, Puerto Rico, The Bahamas and the Lesser Antilles. This regional distribution indicates the power that these *caciques* had within the region and were able to disperse their control far from the villages where they lived.

6.2 The Bahamian Archipelago

The earliest dates for human occupation in the Bahamian archipelago are 700 C.E. (Berman and Gnivecki 1995; Keegan 1992, 1997, 2007). Seafaring obviously did not provide any difficulties for the people inhabiting the Greater Antilles, but no evidence of people in the region is found until this relatively late date. Throughout the Antilles people moved and settled islands, but the Bahamian archipelago was left alone. However, at the time of contact multiple settlements on most islands and cays show clear evidence of human occupation. The short period of time in this archaeological record of approximately 800 years is very dynamic. This section describes the context in which MC-6 was founded and became an important settlement in the region.

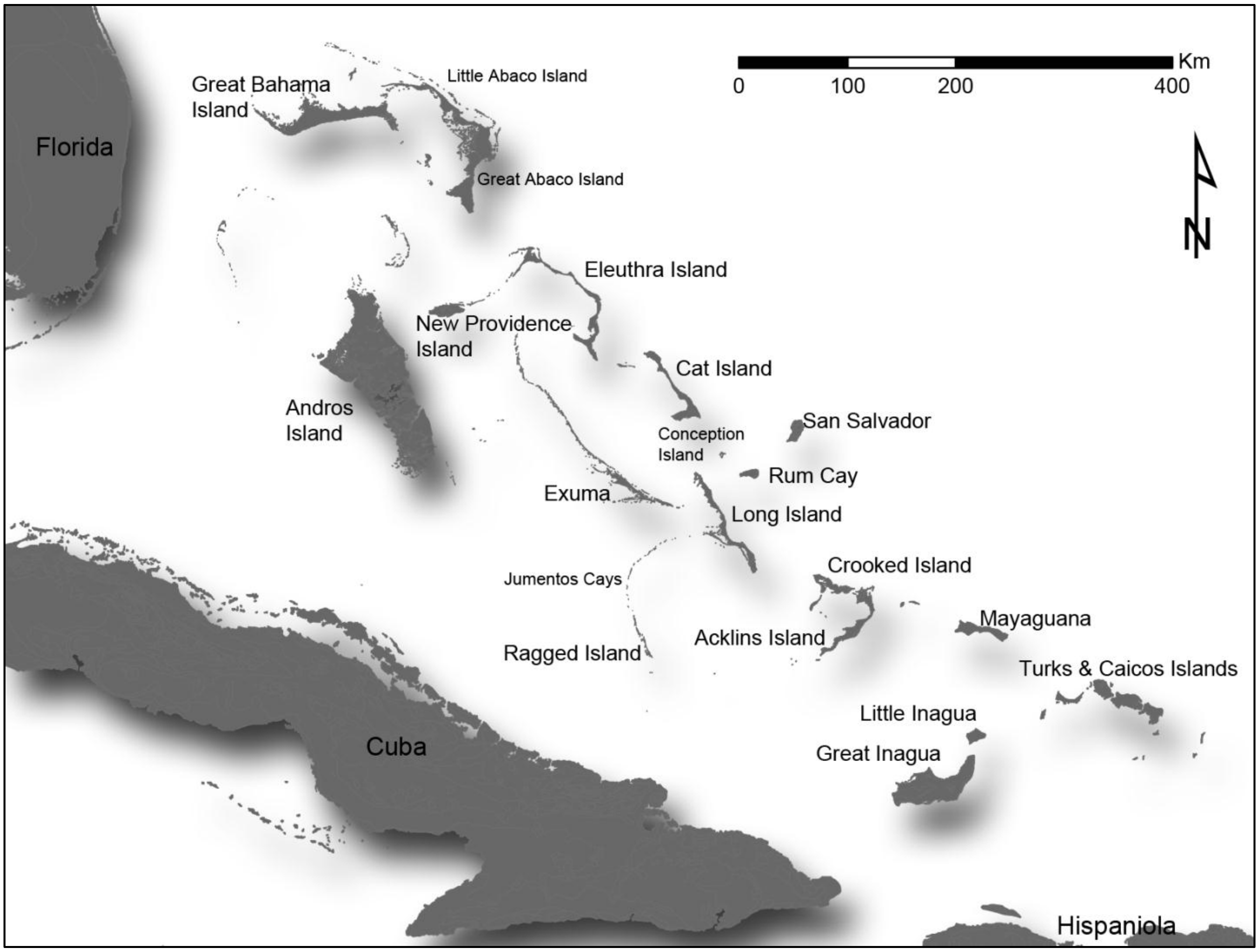


Figure 6-2. Bahamian Archipelago

The earliest evidence of people in the Bahamas comes from two sites in the region, namely the Three Dog site on San Salvador in the central Bahamas and the Coralie site (GT-3) on Grand Turk in the Turks & Caicos Islands. Radiocarbon dates from both villages indicate that people were occupying these regions around the same time, namely 700 C.E. Both sites are situated in close proximity to the sea and excavations yielded a substantial amount of archaeological material. Settlement location suggests that exploitation of marine resources was the primary objective of these voyages.

Despite the similarity in dates and current political or geographical backgrounds, the two sites differ vastly and past identities do not overlap with contemporary borders.

The materials recovered from both locations demarcate independent processes of colonization. Both sites are in the Bahamian archipelago, but the people and cultural affiliation that these people exhibit strongly suggest that these people and processes of colonization had little to do with one another. It might be the case that these groups of people, who took long-distance voyages, were not aware of each other's movements at all. These sites are discussed independently.

6.2.1 Three Dog Site, San Salvador

The Three Dogs site is situated on the southwestern edge of San Salvador, directly above Loaf Bay. The site is partially destroyed by storm-activity, prohibiting a complete reconstruction of the site's pattern (Berman and Gnivecki 1991). Although storm activity did partially destroy the site, it also exposed archaeological remains, including bone, pottery and shell. Fresh water might have been locally available and a historic well is located close to the prehistoric settlement. Although the site shows evidence for prolonged activity at this location, it is unclear if this was year-round or only seasonal (Berman and Gnivecki 1991, 1995).

A number of prehistoric activities are recognized from archaeological remains. First, the site yielded evidence for specialized activities such as bead-making and wood-working. Second, griddle sherds, graters and a hoe suggest that manioc or other crops were locally produced and harvested, showing that people stayed at least a period of time. Finally, untempered clay discs and coils also indicate that pottery was made locally and support the idea that materials from this site represent long-term visits (Berman and Gnivecki 1991). Materials associated with bead-making might lead to the conclusion that this location was targeted for a specific purpose, but other data point to a more mundane use of the site.

Of special interest is the pottery assemblage at this site. Of the 718 sherds larger than 1 cm^2, 555 are locally classified as Palmetto Ware (or Palmettan Ostionoid). This pottery style is made from local clay deposits of aeolian African dusts carried across the Atlantic Ocean. Burned shell, often *Strombus gigas,* is used as temper in absence of volcanic deposits prominent in Hispaniolan and Cuban samples. Furthermore, the shell temper is large and even shell pieces larger than 1 cm occur. The pottery is relatively thick and crude. Griddles sometimes show impressions of basketry on the bottom, a characteristic that is not found in any other style in the Caribbean region (Berman and Hutcheson 2000; Hutcheson 1999, in press). The quality of the pottery is very poor, caused by low firing temperatures. Granberry and Winter (1993) differentiate three substyles - Abaco Redware, Crooked Island Ware, and Palmetto Ware - but the distinctions are rarely followed. The term Palmetto Ware will be used here as a generic term for the shell-tempered redware common at these sites.

The contrast between this local Bahamas pottery and imports from Hispaniola and Cuba is vast. But the early date of Three Dogs also indicates that people on San Salvador relatively quickly focused their attention to locally available resources after initial colonization. If the production of this distinct style was a conscious break with their place of origin or an unconscious and unintended consequences because some resources are absent in the Bahamas is unknown. In any case, people produced a local style and this developed into a regional ‘standard’ that was used throughout the Bahamian archipelago at contact. The Three Dog site is the earliest evidence of Palmetto Ware in the region and has been dated to approximately 700 C.E. Berman and Gnivecki (1995) link the pottery found at Three Dog site to Cuba. Reduced firing conditions characteristic of the pottery is similar to firing techniques recognized at the Arroyo de Palo on Cuba. This argues that the production technique of Palmetto Ware is similar to wares from Mayari in north-eastern Cuba. Despite the differences in clays and tempers, the techniques of making and firing pots are so close that Cuba is a likely place of origin of its producers (Berman and Gnivecki 1991, 1995).

Figure 6-3. Palmetto Ware rims. The red color is best seen at a fresh break, as the bottom right sample shows. Also notice the shell temper in this specimen.

6.2.2 Coralie Site, Grand Turk

The Coralie site is 450 km south-east of San Salvador, on the northern part of Grand Turk. This part of the island is dissected by an inlet and lagoon called North Creek, dividing a western and eastern part. The east is a limestone ridge approximately 10 m high, while the western part is formed by a sand dune. The Coralie site is located on the sand dune, just south of where the lagoon connects to the Atlantic Ocean. This settlement provided easy access to both the lagoon and the ocean and was in close proximity to a seasonal well that has contained potable water for at least the last 300 years (Carlson 1999; Keegan 1997).

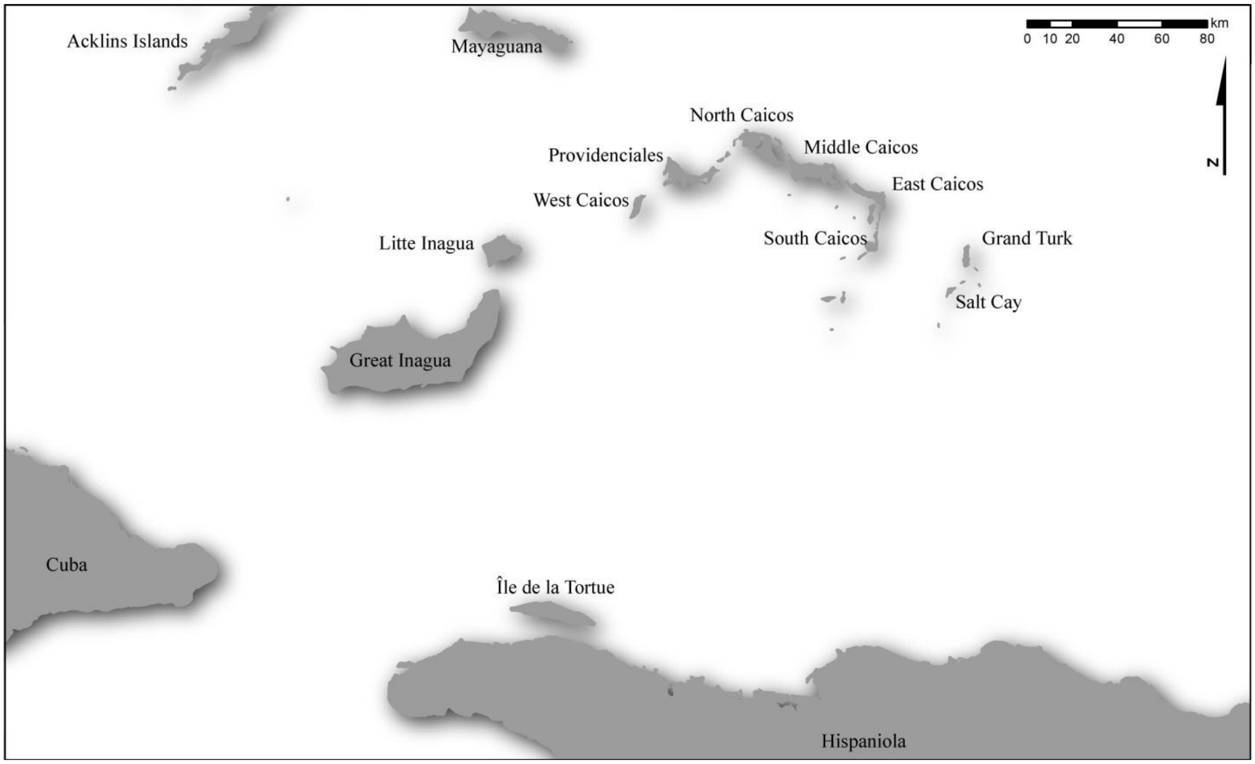


Figure 6-4. Turks & Caicos Islands and surrounding region

The lagoon is an excellent microenvironment for the exploitation of resources. First, the constant influx of water from the ocean prohibits the lagoon from drying out or salt concentrations getting too high for fish, turtles and mollusks. Second, the lagoon is protected and relatively calm compared to the ocean. Third, these natural inlets sometimes function as natural traps for certain animals. Animals that enter the lagoon through the small entrance sometimes cannot find the exit and are trapped. Archaeological excavations at Spanish Water, Curaçao, revealed earbones or periotica of at least 41 dolphins, which were likely trapped within the lagoon and caught and butchered on the banks (Hoogland and Hofman 2011).

First signs of human presence at this site are dated to cal 705 C.E. and continue until approximately 1100 C.E. (Carlson 1999; Keegan 1997). All pottery, more than 1800 sherds, is classified as Ostionan Ostionoid and contains mineral and sand temper unavailable on limestone islands like Grand Turk. Local production is absent and products must have been imported from adjacent Hispaniola or Cuba. In addition, most sherds lack a dark core, whereas sherds on Hispaniola often do show this feature. The lack of a reduced core decreases the pottery's stability and cracks and breaks are more likely to occur. A possible explanation is that these pots were over-used and placed over fires for longer times than in Hispaniola. The cost of transportation forced people to keep using these pots over and over until they cracked or broke after their integrity was reduced (Keegan 1997:21).

Although crude wares are present, a number of vessels are of high quality and display elaborate designs. Boat-shaped vessels are similar to 'classic' Ostionan pottery from Hispaniola as well as red painted sherds that were recovered. One effigy bowl represents a turtle that also corresponds to Ostionan Ostionoid style. The presence of griddles is indicative of at least simple preparation of food. Both stylistic properties and the presence of mineral and sand temper point to Hispaniola, only 120 km to the south, as the place of origin for these first settlers (Keegan 1997:21-22).

The faunal material from the site is even more impressive than the pottery. A large amount of turtles, mainly green turtle (*Chelonia mydas*), iguanas (*Cyclura carinata*) and fish were targeted by people at Coralie. Also, a native tortoise (*Geochelone* sp.) that was previously unknown to the island and is similar in appearance to the Galapagos tortoise, was exploited. Most fish were large, between 5 and 20 kg. Invertebrates are scarce, except for conch (*Strombus gigas*). The carapace of a green sea turtle was locally used to prepare meals and found overlaying multiple hearths in the deposits at Coralie (Carlson 1999; Keegan 1997, 2007).

This faunal assemblage is indicative of the devastating effects on local fauna by overexploitation during initial human colonization. The native tortoise is extinct and was unknown before these archaeological finds. Furthermore, iguana bones are giant in earlier deposits but significantly decrease in size in later periods. Finally, large fish were targeted in earlier phases too, but even those seem to get smaller as time progresses. Initial colonists obviously targeted the large species and consumed them locally (Carlson and Keegan 2004). Export is difficult to assess, but some products must have been brought back to Hispaniola as 'exotics' and food.

Depositional processes at Coralie also indicate that habitation was most likely seasonal and short-term (Carlson 1999). Artifacts are distributed over a wide area, approximately 200 x 50 m, in relatively shallow deposits only 50 centimeter thick. This is contrary to what one might expect from a formal 400-year old village that is occupied year-round and has designated refuse or midden areas. However, the excavation yielded at least one permanent structure of some sort. In one area, postholes are encountered in a semi-structured fashion, leading Keegan (1997:24) to suggest that a structure at least 15 m long was erected at Coralie. Although the exact relation between these postholes and an actual structure remain unclear, these postholes do represent some (semi-) permanent investment in the local setting by people visiting the site.

The archaeological material from Coralie shows that people were continuously visiting this site over an extended period of time, but never established a true colony of year-round inhabitants. The primary goal of these people was extracting the rich resources available on Grand Turk and transporting these riches to Hispaniola (Carlson 1999; Keegan 1997). Locally, people also feasted or at least consumed part of the caught resources, but always returned ‘home.’ After 1100 C.E., the site was ‘abandoned’ and periodic visitors stopped visiting the site. Early Ostionan pottery not only disappears from Grand Turk, but in the region as a whole including Hispaniola, and these groups adopted other styles of pottery.

6.2.3 A Second Wave of Colonists

Around 1000 or 1100 C.E., significant changes occur in the archaeological record. While local Palmetto Ware spread throughout the archipelago, Meillac-making people occasionally visited the region.

Although the Coralie site was abandoned by Ostionan Ostionoid people around 1100 C.E., another site on Grand Turk, Governor Beach (GT-2), was established. All but one sherd from this site was of the Meillacan style, showing a clear change in the cultural affiliation of people who utilized resources at this site. The one non-Meillacan sherd was Ostionan, which could be interpreted as some interaction with the final occupants of Coralie. Governor Beach is located next to the only other potable water source on Grand Turk. Access to water must have been important, but this pattern suggests that people actively disconnected their activities from Coralie’s past (Keegan 2007).

This break with the past is also recognized by archaeological materials other than pottery. Governors Beach was a bead workshop and specialized craft production was the main activity. Especially the Thorny Jewelbox shell (*Chama sarda*) was procured and shaped into disc-shaped beads. These shells are known for the brilliant red color which they maintain for many centuries after they die. Conch, for example, loses its pink shine in a decade, but the Thorny Jewelbox shells that were recovered from Grand Turk were bright red, even after at least 500 years of burial. In total, approximately 1,500 complete beads and 4,400 partially finished or broken beads were found during archaeological fieldwork. Other shells show evidence of use as manufacturing tools for these beads, such as knappers and anvils made of conch (*Strombus gigas*) (Carlson 1993; Keegan 2007:88).

Governor Beach is also classified as a seasonal camp rather than a year-round village. *Codakia orbicularis*, for example, were all collected during the dry season, which is a relatively quiet time of the year in agricultural societies (Keegan 2007:89). Furthermore, just like Coralie, the pottery assemblage is of very high quality and relatively few sherds are classified as purely use-objects. Elaborate designs and at least two effigy bowls echo similar high-prestige items from Coralie, but the pottery style and designs are completely different. At Governor Beach, one effigy bowl resembles a porcupine fish, which is known for its toxicity and is used as a hallucinogenic (Keegan 2007:89).

A possible reason why Meillacan people visited these islands, besides bead production, is the exploitation of marine resources. The archaeological record from Île à Rat (La Amiga), situated in the Baie de L'Acul on the north coast of Haiti, displays significantly smaller marine resources than the ones discovered on Grand Turk around 1000 C.E. The samples from Coralie point to 5-20 kg per fish, while samples from Île à Rat range from 1-2 kg per fish. Overfishing of local resources might have been the result of increasing demands of larger population sizes on the mainland of Hispaniola, but the significant difference between the two samples indicate that environmental stress was already present at 1000 C.E. Carlson (1993) found a large amount of cranial elements of grunts in the sample from Governors Beach and interpreted this as evidence for preparation practices for transport to Hispaniola. The spawning season for Margate grunt, the most commonly identified fish, is from September to April. This would increase fishing yields, but grunts can be caught year-round and this is not a specific indication of seasonality, although it does overlap with the *Codakia orbicularis* data on seasonality.

Meillacan and Ostionan people obviously differed in their reasons for visiting Grand Turk. While earlier camps exploited the abundance of marine and terrestrial resources on Grand Turk, extinction of certain species and the decrease in abundance of others, mainly large animals, directed attention to other available resources, such as the Thorny Jewelbox shell. Ostionan people focused on food, while Meillacan people emphasized bead production. Besides the fact that pottery is imported on both the Coralie and Governor Beach site and that the pottery vessels that are found are generally of high quality and elaborate, these two sites are evidence for a change through time in the use of resources on Grand Turk (Carlson and Keegan 2004).

One final observation of Governor Beach is needed. The site shows signs of sudden disruption and abandonment. Approximately 400 complete beads were thrown into a fire and the elaborate effigy bowls seems to have been purposefully destroyed and scattered. Pieces of one bat pot were found in three different places. Also, a Triton's trumpet (*Charonia variegata*) was intensively used and worn to such a degree that it is possible to see how this instrument was originally used. The raised surfaces were worn flat where the individual fingers touched the shell. This wear occurred only in those places and by putting your fingers on the worn spots you could produce a sound by blowing the trumpet. These are all extremely valuable objects and would not have been left behind without a reason. Keegan (2007:90) argues there was a battle and that these people were driven away from the island back to Hispaniola. The group responsible for this episode of panic was, according to Keegan (2007), Lucayans from nearby islands.

Recent research has identified another Meillacan bead-making workshop on the north side of the island. The site is located on the other side of the peninsula from Coralie. One of the test pits yielded a tiny sherd that might be classified as Palmetto ware. Faunal remains are predominantly grunt and parrotfish, likely a product of local consumption practices. Six whole beads, 18 broken beads and 44 pieces of bead-making debitage were recovered. *Chama sarda* is the predominant shell that was used for these beads, but other shells, including conch (*Strombus gigas*) were present as well. Two radiocarbon samples, one charcoal and one conch shell, were dated and place the site in the 14th century (Carlson 2010).

The archaeological evidence on Grand Turk suggests a distinct break between Ostionan Ostionoid and Meillacan Ostionoid times. The two pottery styles are not only distinct in appearance, but occur in different times, and people visited the island for different reasons. This distinct break between Ostionan and Meillacan traditions is also recognized in Jamaica where Ostionan sites also predate Meillacan finds and there is little evidence for interaction (Allsworth-Jones 2008; Keegan and Atkinson 2006).

Table 6-1. Radiocarbon dates from GT-3 and GT-4 (Carlson 2010:13; Carlson and Keegan 2004).

Site	Beta #	Material	Conventional C14 Age (BP)	Calibrated 2 Sigma (AD) 95% probability
GT-3	80911	Charcoal/Wild Lime	1280 +/-60	650-885
GT-3	93912	Shell	1170 +/-60	665-905
GT-3	98698	Charcoal	1230 +/ -60	670-970
GT-3	80910	Charcoal Palm	1160 +/-60	720-1105
GT-3	61151	Charcoal	1120 +/-120	650-1160
GT-3	114924	Charcoal	1120+/-50	800-1015
GT-3	98697	Charcoal	1010 +/ -50	970-1165
GT-3	93913	Shell	930 +/-60	895-1145
GT-3	96700	Wood cf. Bullwood	940 +/-60	995-1125
GT-3	98699	Charcoal	900 +/-50	1040-1215
GT-3	1l2311	Wood Andira	Modem	
GT-4	276523	charcoal	680+/-40	1270-1320 AND 1350-130
GT-4	276524	Conch shell	1120+/-50	280-1490

Grand Turk never harbored year-round inhabitants. The lack of available potable water throughout the year might have been a constraining element. The settlement locations of all archaeological sites seem to have targeted the two seasonal wells that are present on the island. Potable water was a factor in making settlement location choices. Although the lack of a continuous source of water is a plausible cause for the absence of year-round villages, this completely fails to explain why imported pottery is predominant in these settlements. So far, only one Palmetto Ware sherd has been recovered, while plenty of high-quality Ostionan and Meillacan pottery is found. Transportation should not have been an issue, because Lucayan villages that are dominated by Palmetto Ware are found in close proximity to the island. Furthermore, Palmetto Ware is found on Middle Caicos by 1000 C.E., which means that there is an overlap of 200-300 years with Meillacan sites on Grand Turk. It is unclear why this pattern of ceramic traditions is structured in such a way that local pottery from the Bahamian archipelago is absent on Grand Turk.

This also directs attention to neighboring islands. Across the Turks Islands Passage, 35 km to the west, the Caicos bank harbors a number of larger islands and keys. From east to west, the larger islands include South Caicos, East Caicos, Middle Caicos, North Caicos, Pine Cay, Providenciales and West Caicos. The archaeological evidence from these islands shows, again, a very distinct pattern. Surveys by Shaun Sullivan in the 1970s yielded no sites on South and East Caicos, only one site on Pine Cay and two sites on Providenciales. However, Sullivan found seven sites on Middle Caicos (Sears and Sullivan 1978). This led Sullivan to reevaluate Middle Caicos and a more intensive survey increased this number to 35 sites for this island (Sullivan 1981). Subsequent research provided more evidence for archaeological sites on other islands, but Middle Caicos still stands out and must have been the most important island in the region (Keegan 1997:33).

Table 6-2. Approximate land area, open-air and cave sites in the Caicos Islands. List compiled by G.A. Aarons, Bahamas Department of Archives, and Brian Riggs, Turks & Caicos National museum. Adopted from Keegan (1997:33).

Island	Approximate Land Area (km^2)	Open-air site	Cave site
South Caicos	8	7	0
East Caicos	37	2	4
Middle Caicos	50	36	8
North Caicos	36	9	4
Providenciales	15	9	2
West Caicos	8	3	2
Other Caicos	5	10	2

However, not all sites can be compared, as some, like MC-3, only yielded one large undecorated imported sherd in an 8-cm-deep fire pit (Sullivan 1981:130), whereas other sites are large settlements. Furthermore, large settlements can also be the product of long-term practices of revisiting the same location, moving horizontally through the landscape. Short-term visits of a small group of people throughout many years results in a palimpsest, which at first sight, seems to be one large village. This is, for example, the case for the Clifton site on New Providence, the Bahamas (Vernon 2007) and sites on Grand Turk.

Five large sites, MC-6, MC-8/10, MC-12, MC-32 and MC-36 have been identified on Middle Caicos through intensive survey and excavation. Either Palmetto Ware or Meillacan pottery is predominant and all postdate 1000 C.E. Hence, it took multiple centuries after the initial arrival of people in the region before larger villages were established. In addition, attention was redirected to Middle Caicos rather than Grand Turk, where the first people went. These sites were part of changing dynamics within the region and set the stage for MC-6 to become the dominant settlement in the Turks & Caicos Islands. Little work has been done at MC-36 and its size and potential importance are solely based on the surface scatter, located near the contemporary village of Conch Bar, but MC-8/10, MC-12 and MC-32 are discussed in further detail here. MC-6 will be discussed in the next chapters.

MC-8/10. MC-8 and 10 were first recognized by Sullivan in his extensive survey of Middle Caicos. Located in the southwest of the island, the sites border the salina. The salina is a vast flat plain of wet land between the permanent dry land of Middle Caicos and the Caicos Bank. Occasionally, the salina floods completely when storms come in from the south or tide is higher than normal. From the edge of permanent dry land to the edge of the water is approximately 6 km, but there is less than 25 cm difference in elevation (Keegan 2007:142). The lack of direct access to the Caicos Bank is unexpected for people who heavily rely on canoe transportation.

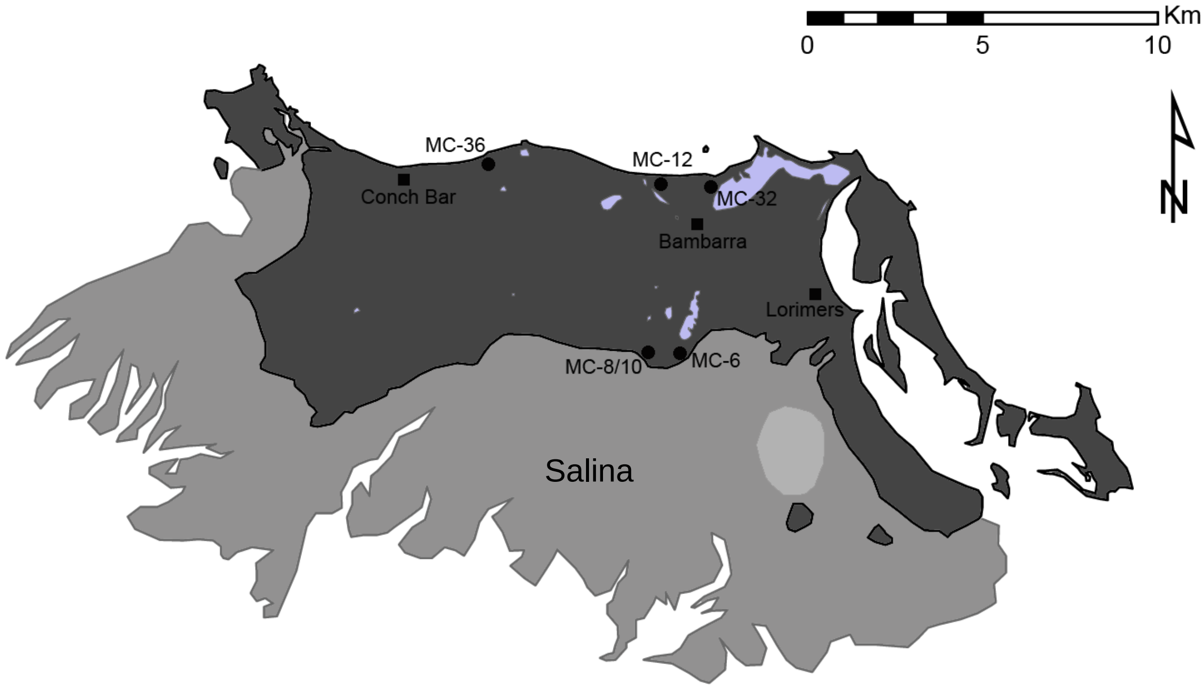


Figure 6-5. Middle Caicos with contemporary villages and important archaeological sites

Valdés (1994, cited in Keegan 2007:142), however, argues that average sea levels may have been more than 50 cm higher around Columbus' arrival in the region. This suggests that the salina was completely inundated and the sea reached the permanent dry land. Furthermore, major storms and hurricanes are capable of moving large amounts of sediments into new locations and removing them elsewhere. Nowadays, fishermen in the islands comment on the impact of these storms and how they affect navigation (Sinelli 2010:41). The salina could have been the result of one or more major storms that deposited large amounts of sediment against the south coast of the island. Finally, if sea levels are raised to the edge of dry land in a Digital Elevation Model (DEM) of the island, then suddenly all sites in the southern part of Middle Caicos are located on the shore, even sites that are today located inland. It is, therefore, safe to assume that both MC-8 and MC-10 were directly approachable by boat from the Caicos Bank and analysis of Armstrong Pond, presented in Chapter 7, supports this conclusion.

Both sites are located in close proximity of one another and are separated by only 70 m. Site dimensions, as recorded by Sullivan (1981), based on surface scatters are, 110x160 m for MC-8 and 160x80m for MC-10. Over 2,500 sherds were collected and well over 90% were Meillacan and of Hispaniolan origin. Petrographic analysis points more specifically to the Fort Liberte area on the north coast of Haiti (Cordell 1998). Sullivan (1981) first recognized a stone alignment at MC-8, but subsequent research resulted in its rejection. At MC-10, Sullivan recognized a square pattern in the vegetation that was different from surrounding areas and bordered by a square arrangement of rocks. The square area was interpreted as a plaza and the stone alignment as the foundation of a structure. These data, according to Sullivan (1981) suggest long-term habitation.

However, subsequent research indicated that deposits on both sites are relatively shallow, rejecting the idea that these are long-term villages. The deepest stratum yielded charcoal, which dates to cal 1130 ± 50 C.E. Furthermore, both sites are only separated by a former tidal inlet that was recognized in the field (Sinelli 2001). Aster DEM underlines the existence of this inlet, as does Landsat 7 imagery that isolates infrared as an indication of soil hydration and vegetation. Sinelli, therefore, concluded that MC-8 and MC-10 are just two components of the same site that are situated across from each other, with a tidal inlet in between.

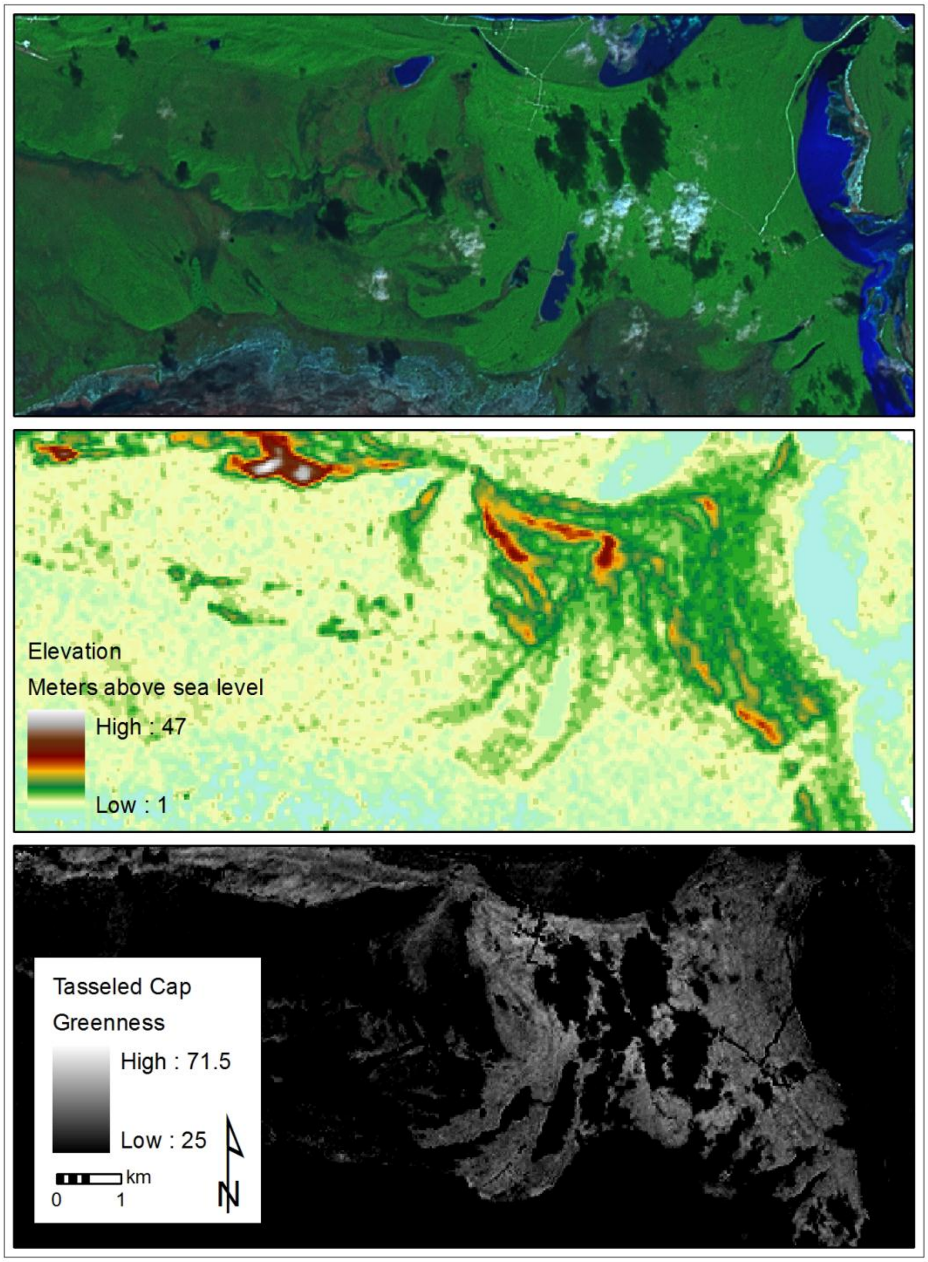


Figure 6-6. Satellite, DEM and Tasseled Cap Greenness (TCG) maps for southeast Middle Caicos. DEM shows light inlet in between green ridges to the south of Armstrong Pond. TCG shows health of vegetation as a representation of underlying vegetation. This shows different vegetation where inlet of MC-8/10 would have been situated.

Activities at the site copy Meillacan sites at Grand Turk and bead making is the dominant occupation. People at MC-8/10 collected Thorny Jewelbox shell (*Chama sarda*) and processed them into disc-shaped beads, resembling GT-2 and GT-4. The rich Caicos Bank was exploited for its marine resources as well and fishing must have been part of the attraction of this location (Keegan 2007; Sinelli 2001). Another possible activity, the collecting of salt from the nearby Armstrong Pond, is rejected by Keegan (2007). This site, just like Governor Beach and GT-4 on Grand Turk, was a seasonal camp for bead production and exploitation of marine resources.

Keegan (2007) rejects the idea of seasonal salt exploitation for a number of reasons. First, settlement location is not at the closest location from the pond and, for example, the location for MC-6 would have been more optimal. Second, if Meillacan people at MC-8/10 copied practices of the people on Grand Turk and visited during the same time of the year, namely spring, salt would not have been available. Although salt could be collected in May, the connection between the salina and the pond would significantly dilute the salinity levels and prevent salt production.

MC-12. Recent development on Middle Caicos has destroyed MC-12 completely, but Sullivan (1981) surveyed the area and excavated a large part of the settlement. Sullivan (1981) recognized the site by contemporary vegetation. As with so many other sites on the island, archaeological deposits were often associated with guinea grass (vegetation changed significantly on the island since Sullivan's work, and this association cannot be transferred into a present-day context). The pattern of the guinea grass is a large elongated oval of 115x50 m. The site is located near Bambarra, a small village near the center of the island. Situated on the south end of the archaeological site, a small fresh-water pond might have provided the villagers with potable water.

The materials recovered from MC-12 are different from those at MC-8/10. Although surface collection resulted in an artifact assemblage in which 29% of the vessels were imported, a test excavation yielded 201 sherds and less than 5% were of non-local origin. This lower percentage was found during excavations conducted in 1982, but unfortunately the field notes from these excavations were lost (Keegan 2007). The vast majority of the pottery was Palmetto Ware, the locally produced pottery from the Bahamian archipelago. Both Chican and Meillacan designs are among the imported sherds, which means that Chican pottery from Hispaniola is now imported as well. One date was recovered, cal 1142-1422 C.E. at 2ơ range. Keegan conducted additional excavations in 1991 prior to the construction of a new road, but these were on the southern margins of the site and yielded few artifacts.

The faunal material is mainly reef fish. Parrotfish are most abundant and were the major target, but jack, porcupine fish, bonefish, grunt and grouper were caught as well. Three iguanas were identified and one dog. A dog is a non-native species and must have been brought by the people living at MC-12. Mollusks include conch, West Indian top shells, tellins, tiger lucines, etc. These faunal remains are typical of Lucayan settlements which predominantly exploited reef fish and mollusks throughout the Bahamian islands (Keegan 2007:139-140).

During subsequent research at MC-12, before bulldozers destroyed the site, Sullivan found a structure. Although the results have never been published, Keegan (2007:140), a participant in the 1982 excavations, states that in a 10x10 m excavation five post stains were found. These post stains were regularly spaced at 3 m interval in a circle and most likely represented the outer ring of a house. The inner space within the postholes was hard compacted sand and felt like cement; a stamped house floor. Both the developer and locals from Bambarra reported that they found greenstone axes at the site, but all were found after the site was destroyed. Although destroyed, it was concluded that MC-12 was a large (semi-)permanent Lucayan village on Middle Caicos that was established around 1000 C.E.

MC-32. MC-32 is located to the east of MC-12, approximately 1 km east of the present Bambarra landing. The site measures approximately 150x100 m and surface collection yielded 286 sherds, of which 67 (23%) were imports. As with MC-12, the ratio of import-local went down significantly from subsurface test excavation. Of the 180 sherds from a 1x1 m, only 8% (n=14) were imported. Style for these imported wares is not described by Sullivan (1981), because they lacked decoration and archaeology at that time did not have specific criteria for distinguishing these styles in absence of decorative elements.

Faunal remains are again typical of a Lucayan settlement. Parrotfish are the dominant fish and mollusks are present as well. Sullivan (1981) did find a large number of conch shells close to the site, probably shell debris as the result of meat extraction from the conch. Another local resource that was exploited was salt, as the ridge on which MC-32 is located separates the sea from a salt pond. People in Bambarra were still collecting salt here when Sullivan was doing his research. It is possible that this pond was also used as a pen in times that salinity levels were lower and fish and conch could survive in this environment (Keegan 2007; Sullivan 1981).

Throughout the 1990s and in 2000, Keegan and colleagues tested the site in further detail. Soil analysis limited the site area to 70x40m (Roth 2002). In the middle of the site, dense midden deposits yielded large sherds and intact deposits of a number of individual fishes, meaning that the site is minimally disturbed. During the 1993 transect, 1,957 sherds were collected (13% import) and the 2000 excavations yielded another 320 sherds (64 imports). Both Meillacan and Chican motifs were encountered. Furthermore, Keegan (2007:167) mentions that a large percentage of the Palmetto Ware pottery from MC-32 is decorated, quite unusual for this pottery style. Most of Palmetto Ware pottery is plain (Sears and Sullivan 1978), but the sample from MC-32 shows incision, punctuation and matt-impressed designs on the bottom of griddles and bowls.

Charcoal from the center of the site yielded a date of cal 1290±50 C.E., which suggests it was a village contemporaneous with MC-12. The status of this site as a settlement, however, is questioned by materials recovered in the excavations. The large amount of decorated and large pieces of pottery, the high incidence of imported wares compared to other Lucayan sites and the large amount of iguana and sea turtle finds that are commonly perceived as high status foods suggests that this site is a special activity area, for example for feasts, rather than a (semi-) permanent village (Keegan 2007:168). Finally, the finds of Old World rats (*Rattus rattus*), indicate that this site was still in use after Europeans arrived in the New World.

6.2.4 Colonization of the Bahamian Archipelago

The colonization of the Bahamian archipelago has been perceived as a progressively outward movement of people from Hispaniola into the region. This movement of people is completely reconstructed on the basis of pottery styles and how these styles diachronically relate to one another. Sears and Sullivan (1978), Keegan and colleagues (Keegan 1992; Keegan and Diamond 1987; Keegan and Maclachlan 1989) and Winter et al. (1985) all state that the Turks & Caicos Islands or Great Inagua are the most likely places for early settlements. Ostionan Ostionoid and later Meillacan

Ostionoid pottery found on Grand Turk and the Caicos Islands support this view. Hence, people from the south moved into the region and transported pottery styles from the homeland, but after a number of consecutive decades/centuries in the region, people distanced themselves socially and started making a new pottery style, namely Palmetto Ware.

Granberry (1991) uses toponyms of islands in the region to reconstruct routes of migration. Grand Turk, or *Abawana*, translates as 'first small country,' Middle Caicos, or *Aniyana*, means 'western waters headland,' North Caicos, or *Caicos*, means 'northern outlier' and Providenciales, or *Yucanacan*, means either 'high northern smaller island' or 'people's smaller island'. However, Great Inagua, or *Inagua*, means small Eastern Island (for a full list of Bahamian toponyms, see Granberry 1991; Granberry and Vescelius 2004). The toponym of Great Inagua indicates that people settling the island originated from Inagua's west, as they named it eastern island. The only island to the west of Great Inagua is Cuba. Granberry (1991) concludes that the island must have been settled from Cuba. If the migration into the Turks & Caicos Islands took place from Great Inagua, then one would expect different toponyms. Especially Grand Turk, translated as 'first small country' does not fit within this framework, because it is the island that is farthest away from Great Inagua. Based on the toponyms, Granberry (1991) argues for colonization of the Turks & Caicos Islands from Hispaniola, whereas the rest of the Bahamian archipelago is settled from Cuba.

Toponyms recorded after 1492, however, are less than reliable sources for initial waves of migration. Earliest dates of occupation in the region point to 700 C.E., which is 800 years before the arrival of Europeans. In 800 years, names of islands can change and have little or nothing to do with voyages and colonization of the first people in the Bahamian archipelago. Of course, these toponyms have value and do show certain relationships between different islands, but these relations could have changed significantly during this time. Both Berman and Gnivecki (1995) and Keegan (2007), therefore, propose that these toponyms and geographic relations between islands represent trading networks or other long-distance sets of relations, including kinship, around 1500 C.E. rather than 800 years before.

Despite the difference in time between episodes of colonization and the recording of the toponyms, the directionality that some toponyms imply might indicate certain preferable navigational routes between Cuba and the central and north Bahamas rather than the Turks & Caicos Islands. This connection between Cuba and the Bahamas is further strengthened by the pottery from the Three Dog site. Berman and Gnivecki (1991, 1995) have consistently argued for this route as the primary episode that led to the Palmetto Ware-making Lucayan people in the Bahamian archipelago. The archaeological data underlines their argument.

The most conclusive evidence is pottery. The Palmetto Ware from the Three Dogs site resembles the Arroyo de Palo pottery from Cuba. People on San Salvador made pottery from local resources, but utilized similar technology and decoration techniques to make this local ware. This is not a radical break, but a smooth transition in which new local and unknown clay resources are used to fabricate pottery on San Salvador. Second, the early date of 700 C.E. predates any context with Palmetto Ware in the Turks & Caicos by at least 300 years. Despite the intensive research on all these islands, radiocarbon dates consistently postdate 1100 C.E. for Lucayan sites.

Another point that argues for Cuba as the point of origin is physical distance. The distance between the part of Cuba where Arroyo de Palo pottery is found and San Salvador is 335 km, but Ragged Island, the first island between the two on a direct route lies only 110 km off the coast of Cuba. The remaining journey could have followed shallow banks and islands, including Long Island and Rum Cay. The shortest distance from Cuba to an island in the Bahamian archipelago is 90 km northeast from the far eastern tip to Great Inagua. It is, therefore, conceivable that people crossed the distance to Ragged Island and Jumentos Cays on the way to the larger islands of the Bahamas. Archaeological materials from Islas de la Reina, north of Cuba, also indicate that people on Cuba were already exploiting marine resources along the north coast and smaller islands (Cooper 2007). Furthermore, Hispaniola is located significantly further away, approximately 450 km, a route that crosses multiple islands that would have been better candidates for settlement location in early episodes of colonization. Finally, microliths from San Salvador are inconclusive in relation to questions of colonization, despite the fact that lithics had to be imported and a local source is absent. Both the material and bipolar technique are not specific enough to differentiate between points of origin in Cuba or Hispaniola.

The colonization of the central Bahamas from Cuba rather than Hispaniola is supported by recent research on computer-simulated voyages in the region. Callaghan (1990, 2001, 2010, 2011) has used computer simulations for a number of issues regarding the colonization of the Caribbean, but has mainly focused on early migration from the South American mainland into the Lesser Antilles. Altes (2011b) uses SARMAP (Search And Rescue MAP) software to reconstruct possible navigation routes between the Bahamas, Cuba and Florida. This software specializes in predictive modeling of drifts of objects and missing persons at sea, but can also be used to understand the directionality of certain sea currents, winds and other dominant patterns that affect voyaging. Altes (personal communication, 2011) used the software for the Turks & Caicos Islands, the Bahamas, Cuba and Hispaniola as well. The results show very distinct patterns. Random drifts from the Fort Liberté area on Hispaniola move to the Turks & Caicos Islands. Voyages departing from more eastern locations on Hispaniola's north coast have less chance of arriving at these islands and are likely to drift to the east. Voyages from Cuba and the northwestern tip of Hispaniola mostly reach Great Inagua and very few drift to the Turks & Caicos Islands. Although this program does not consider any sort of directional voyaging, which obviously alters routes, it does support the idea that natural conditions promote different routes of navigation from Cuba and Hispaniola to the Bahamian archipelago.

Both the Coralie site on Grand Turk and the Three Dog site on San Salvador yield evidence of the earliest wave of occupation in the Bahamian archipelago. However, the archaeological materials are so distinct, that these waves of migration must have been the product of two independent processes. People from Hispaniola periodically visited Grand Turk to extract the rich resources that are locally available, while people from Cuba migrated to San Salvador to establish a long-term village, introducing agriculture and crops into the region. While people on Grand Turk maintained strong cultural affiliation with Hispaniola and only used imported Ostionan Ostionoid pottery, people in San Salvador created an independent culture with possibly minimal influences from their place of origin, namely Cuba.

A possible explanation for the relative late occupation of these islands comes from paleoecological data. Kjellmark (1996) analyzed a 2-m sediment core from Church's Blue Hole on Andros Island and found that Andros was covered with shrubs that thrive in open dry areas. Kjellmark (1996) states that the environment got progressively wetter, starting around 500 C.E., and these dry shrubs were replaced by other vegetation that requires more water. This rise in precipitation might have allowed fresh water to accrue in certain lower areas for the first time in centuries, providing the necessary potable water source for people to survive in the islands. Yet the first inhabitants of San Salvador did not migrate into the region in large numbers. The core from Andros does not show a rapid incline in charcoal until approximately 1350 C.E., indicating that impacts of people before that time had relatively little impact on the local environment on Andros.

Around 1000-1100 C.E., local development of Palmetto Ware and Lucayan culture had gained so much precedence in the region, that people started to settle other areas as well. One of their major foci was Middle Caicos and multiple settlements were erected. Lucayan people and Palmetto pottery originate from the central Bahamas and then spread throughout the region (Berman and Gnivecki 1995; also Sinelli 2010).While Ostionan Ostionoid peoples were driven away from Grand Turk by Meillacan people, Lucayan people with their Palmetto Ware took over the islands. Meillacan people were pushed back to Hispaniola and their hegemony in the region was broken. Lucayans maintained their own culture, but interacted on a regular basis with adjacent islands. The result was that people living in the Bahamian archipelago were culturally distinct from the people the Greater Antilles when Columbus arrived in the region.

This perspective breaks with Keegan (1992, 1997) and Sullivan (1981) who both argued for the Turks & Caicos Islands as the place of origin for Palmetto Ware. However, their perspective was guided by Rouse's unilinear framework in which Palmetto Ware had to be a local development from Meillacan pottery, which developed from Ostionoid pottery. Because sites that exclusively contain Meillacan and Ostionoid pottery are absent in the central Bahamas, they concluded that Palmetto Ware must have originated from the Turks & Caicos Islands. Their perspective foregrounded pottery rather than people. Focusing on living people and abandoning Rouse's scheme provides a new perspective on regional developments.

6.3 Culture History in Caribbean Archaeology

This discussion gives an overview of cultures and pottery styles in the Caribbean past, with an emphasis on the Bahamian archipelago. This kind of approach to the archaeological record follows a culture-historical framework and traces peoples and styles through space and time. Basically, this history of the Caribbean is minimized to a simple table where space and time are differentiated and different cultures are inserted. Culture-history aims at a classification model in which artifacts and people are categorized in distinct groupings (e.g. McKern 1939). The underlying goal is to produce an understanding of the distribution of artifacts and people through space and time. This culture-historical framework is still a dominant paradigm in Caribbean archaeology.

Rouse (1965) was one of the first scholars to argue that people must be placed first in archaeological research. His solution to this problem was to emphasize ethnic complexes and people, rather than the materials these people produced. However, Rouse maintained the space-time systematics as a central research objective. Rouse is the grandfather of Caribbean archaeology and his development as a scholar is intrinsically connected to his work in this region. The questions Rouse struggled with and tried to answer are as important as the theoretical framework he tried to promote. Caribbean archaeology, culture-history and Rouse are inextricably connected and, therefore, demand consideration. Keegan (2010) provided a detailed description of these dynamics and developments, but some comments deserve special attention here.

Rouse's research specifically countered Julian Steward's hypothesis of circum-Caribbean chiefdoms that were the result of a migration from the Andean highlands into the Caribbean basin (Steward 1948; Steward and Faron 1959). Rouse's problem with Steward's suggestion was twofold. Rouse (1953) objected to the notion that the Caribbean people moved from the Andes into the archipelago and rejected the assumption that Caribbean chiefdoms are the result of diffusion from the Andes rather than a local development. These goals set out in his research determined his fieldwork and his theoretical framework.

Rouse's first goal was established by pointing to the Orinoco River drainage as the location where Saladoid pottery emerged, predating the Caribbean samples. As mentioned, the Saladoid migration is linked to the Arawak diaspora (Heckenberger 2002; Santos-Granero 2002) and it is commonly agreed upon that these groups entered the Caribbean from the South American lowlands rather than the Andes. Although recent dates collected from the Orinoco valley might be different from the dates used by Rouse (Barse 2009), he succeeded in redirecting attention to the Tropical Lowlands for places of origins for Caribbean people.

The perceived lack of continuous interaction between the Antilles and other regions is a direct result of Rouse's second research goal. Because Caribbean chiefdoms were the outcome of local processes of social evolution and development, contact between Caribbean and non-Caribbean peoples was denied. Contact, for Rouse, was stopped after initial settlement in the region, because continued contact could result in the diffusion of chiefdoms from the Andes mountains into the lowlands and ultimately the Caribbean islands. Hence, Rouse only acknowledged three migrations into the region, Lithic people, Archaic people and the Ceramic people, who made Saladoid pottery. Rouse also completely ignored the Bahamas and viewed these islands as peripheral to the Caribbean.

Ostionoid pottery, according to this hypothesis, must have been the outcome of local developments and could not have been introduced by another migration. Although with certain ceramic traditions this did not pose too much of a problem for Rouse, other pottery styles are significantly different from Saladoid and suggest processes other than mere local developments. Huecoid pottery from Vieques and Puerto Rico, for example, is cotemporaneous with and significantly different from Saladoid (Chanlatte Baik and Narganes Storde 2005), but in order to maintain the hypothesis of one ceramic migration this was deemed a local development after initial introduction. Later, Rouse (1992:86-87) acknowledged that this pottery represented another migration.

Other pottery styles, however, including Meillacan and Chican Ostionoid, show little similarity to Saladoid and the later Ostionoid pottery, but are always classified as subseries to the larger Ostionoid series. If Chican pottery is used to classify Taíno people, and Taíno chiefdoms were local developments, then, for Rouse, Chican pottery must have been a development from Saladoid peoples. To designate Meillacoid or Chicoid as a separate series would entail two more migrations of people into the region.

Because this argues against the original position taken by Rouse, these styles were presented as subseries and derivatives of Ostionoid pottery. His position, in opposition to Steward's hypothesis, determined this conclusion, not the observation in stylistic similarities and chronological developments.

Besides these points, other assumptions in Rouse's model are problematic as well. First, despite the incorporation of other lines of argument, pottery remains the primary indicator of separate cultures. Second, within any c culture, based primarily on the distribution of pottery through time and space, variation is almost absent. Saladoid people live in a certain way and produce certain artifacts, while Ostionoid people do things differently. Yet, all Saladoid or Ostionoid people do the same thing and basically share everything. Within one category, characteristics are similar through time and space and idiosyncrasies are unimportant for describing general trends. Third, development from one culture to the other is linear and sequential and new traditions are immediately accepted and incorporated throughout the region. In summary, local variation and developments are neglected.

In recent decades, critiques of Rouse's model have increased and scholars have started to question these assumptions. For example, contact between the Isthmo-Columbian region of South and Central America has, through Rouse's explicit rejection of this area as a place of origin, received little attention until recently. The 'fact' that Caribbean people came from the South American lowlands denied any relation to this region and little effort was directed to investigate communication. However, multiple studies in the last decade have shown strong similarities between the Isthmo-Columbian region and certain artifacts from the Caribbean (Geurds and Broekhoven

2010; Hofman and Hoogland 2011; Rodríguez Ramos and Pagán 2006, 2007). Caribbean people were not unidirectionally focused on the Orinoco valley, but maintained contact throughout the circum-Caribbean basin.

Another point of contention that is raised is the origins of Meillacan and Chican motifs in late prehistory. Keegan (2000, 2006) and Rodríguez Ramos et al. (2008) argue against the original hypothesis that Meillacan wares are a product of changes in pottery decoration amongst Ostionan Ostionoid peoples and cultures. They perceive the vast differences between Meillacan and Ostionan Ostionoid pottery as evidence of another local development. Rather than a product of Ostionoid people, they claim that Meillacan pottery is produced by people with Archaic roots. In short, Ostionan Ostionoid pottery is a development from Saladoid peoples, while Meillacan wares are produced by people who inhabited Hispaniola before Saladoid people entered the archipelago. Archaic people adopted a new pottery style with their own cultural markings, which had little to do with the migration and culture of people from the Orinoco basin around 500 B.C.E.

Although these critiques are warranted, it is too easy to attack Rouse and his model on questions that he never set out to answer. Without his ground-breaking fieldwork and publication record, Caribbean archaeology would not be in the position it is now. His model was originally designed to trace population movements and historical developments within the Caribbean region and provide the evidence that was needed to counter Steward’s hypothesis of circum-Caribbean chiefdoms. For Rouse, test pits were sufficient to identify certain pottery styles (or people) per site or even on complete islands, and analysis was limited to a 1x1 unit. His methods were adapted to his research objective, like any other good researcher does. Although recent research from the Isthmo-Columbian region and on the origins of Meillacan pottery has indicated that Rouse's model completely breaks down east of Puerto Rico, the crux of the problem lies more specifically with scholars who uncritically and/or unconsciously follow these assumptions and the theoretical paradigm set forth in the model.

In the end, studies that focus on grand changes on scales of analysis that encompass large regions and time scales cannot escape from making generalizations between sites that share certain traits, such as pottery style. These categories necessarily involve scales that exceed an individual's perception. Changes in certain regions that occur over a time-frame of 200 years, a resolution that would make many archaeologists happy, are developments that are never completely observed by individuals that were 'living' this change. Because no person lives 200 years, time is an obvious issue, but the spatial scale of analysis is problematic as well. Individuals have different social relations across the landscape and do not perceive the region in a normative manner.

In the Caribbean, for example, the changes between Saladoid and Ostionoid are difficult to understand without standardizing Saladoid and Ostionoid people at some level. The goal of researching these changes then, aims at recognizing a 'Saladoid methodological individual' and comparing this individual with an 'Ostionoid methodological individual'. These individuals behave under standardized circumstances at particular time periods. These normalized portraits of supposedly typical individuals are both the product of generalizing data, and the representation of generalizations. In this approach, early sites on Antigua are comparable to late sites in Martinique, despite spatial and temporal distance between these entities. The same process of generalization is applied to Ostionoid sites. Although all sites within one of these categories are comparable, Saladoid and Ostionoid sites that overlap in time and are located in close proximity to each other are not.

However, both ‘typical’ Saladoid and Ostionoid individuals never existed and archaeologists, therefore, compare statistical illusions rather than actual individuals who lived in the past. In an effort to make the excavation data representative of a certain category, decreasing the input of individual idiosyncratic characteristics, the product finally ends up not representing anything. Why aim our research at discovering a person who is a modern cognitive product that had no impact on people living in the past when our actual goal is to understand people’s way of living in the past? If archaeological research wants to be close to people, rather than artifacts, then another approach is needed.

The foundation for this line of argument is the assumption that in order to understand parts of a culture, the whole is a necessary first step. Categories of pottery, for example, are the first step in analysis, rather than investigating the practices in which these particular sherds were used. The parts of any culture (individual practices) make no sense unless there is a clear picture of the general framework (the categories) in which the individual plays a (small) role. As a result, archaeologists start with regional studies and later focus on the detailed excavation of one site. Today, this is done as ‘common’ archaeological practice in Caribbean archaeology and few people question why regional studies are the first step in archaeological research.

This assumption that small parts of a society can only be understood when the whole is known is a fundamental flaw in archaeological reasoning. Typically, spread throughout a large region, multiple sites are tested. These test excavations are all small-scale and a number of intellectual steps are taken to interpret these finds. First, the test excavation is taken as a representative sample of the whole site, irrespective of its location within the site. Second, the site is taken as a representative sample of the whole region or time, irrespective of its position within the region and time of occupation. Third, data from different sites are compared and categories based on time and space are defined by artifact categories. Hence, a small test excavation is finally deemed representative of large regional structures, while the actual data only reflect very specific processes that happened in one particular location within a site.

In these approaches, the scale of data recovery does not reflect the scale of interpretation. The archaeological data from a 1x1 m excavation is immediately extrapolated to the site and the region, while the data really only describe the 1x1m and nothing else. In addition, the processes that produced that 1x1 m involve individual people, while these larger scales normalize behavior and do not reflect individual practices. Every step made in the analysis draws the interpretation away from the actual data, removing the conclusion from its foundation and reducing the input of actual people. Whereas the data that archaeologists study are produced at a microscale in the past, archaeologists ignore this and state that the macroscale is the only scale that can be measured. However, archaeologists can understand the parts in detail as the data are produced at this exact scale. The whole, therefore, should not be the main goal.

It has to be concluded that archaeologists tend to focus on material categories. Two factors might explain how these problems arose in Caribbean archaeology. First, pottery is almost the only non-perishable artifact that preserves after deposition and it is found throughout the region. Pottery designs are 'cultural' phenomena and it makes sense to focus on pottery when interpreting the Caribbean archaeological record. In addition, the differences between the pottery styles throughout the Caribbean archipelago are extensive. All different styles of pottery discussed in this chapter are easy to recognize and classify and very few pieces leave doubt as to which group they belong. These differences are so vast that it is impossible to deny their importance, including people's perceptions in the past. These pottery styles are not just facts fabricated by archaeologists studying the area, but must have had some indigenous meaning. The material disparity between Saladoid and Meillacan pottery strongly suggests dissimilar cultural roots of the people using these styles. Hence, it is easy to equate these pottery styles with people.

Although almost every contemporary scholar in the Caribbean understands that you cannot simply equate a pottery style with a group of people, it is exactly what many do. Categories of artifacts, especially pottery series in the Caribbean region, are only considered with respect to what they represent and how they are associated with other assemblages. Certain sherds are immediately assigned to these larger categories, while little attention is given to local variations. This underlines the implicit notion that these artifact assemblages, which encompass large scales of time and space, are valid categories to understand social relationships between people. Furthermore, archaeological analysis is restricted to the decorative elements of pottery and how they are representations of certain identities. As a result, social identities only exist in the larger spatial and temporal scales, similar to the categories of pottery styles. In this regard, these archaeologically constructed identities are not structural or relational. They adopt the notion that common practices, in this case pottery decoration, reflect normative practices that can be used to identify groups of 'peoples and cultures.' While similarities and differences in pottery decorations may highlight shared or different practices, the meanings of these practices are left unconsidered.

Geography is the second point that has unconsciously guided research in the Caribbean. The Caribbean archipelago is made of multiple islands in two long, often intervisible, arcs stretching from north-eastern South America to Florida in the north and Yucatan in the west. The specific structured setting of these islands has guided archaeologists in their interpretation of colonization processes. Without detailed excavation data and radiocarbon dates, scholars assumed that the region was colonized in a ‘stepping-stone’ fashion. People from South America migrated via Trinidad and Tobago to Grenada, colonized the island, moved north through the Grenadines and settled St. Vincent, colonized the island and so forth. The layout of the islands, rather than archaeological data, directed research. However, it is clear now that the southern Lesser Antilles were bypassed in earlier episodes and the northern Lesser Antilles and Puerto Rico were first targeted by groups from the mainland (Haviser 1997).

Diversity between different islands is another geographic aspect that has directed research in certain ways (Hofman and Hoogland 2011). Every island is distinct and has certain characteristics that it does not share with other islands in the region, such as clay and chert resources, isotope signatures and micro-climates. Volcanic temper in pottery on limestone islands, such as in the Bahamian archipelago or Anguilla must have been introduced from elsewhere. The diversity in resources, pottery styles and isotope signatures are archaeologically traceable and provide information on the dynamic relations between people and islands. The diversity in islands has resulted in a large literature on mobility and exchange between different islands (Altes 2011a; Berman and Gnivecki 1995; Bright 2011; Callaghan 2010; Carlson 1999; Cordell 1998; de Waal 2006; Fitzpatrick and Ross 2010; Hofman et al. 2007; Hofman et al. 2008; Hofman et al. 2010; Hofman et al. 2011; Hoogland et al. 2010; Keegan 2006; Keegan and Diamond 1987; Knippenberg 2001, 2004, 2006; Laffoon and de Vos 2011; Laffoon and Hoogland in press; Laffoon et al. 2010; Lalueza Fox et al. 2003; Martínez-Cruzado 2010; Mol 2007, 2010; Rouse 1992).

These studies have significantly increased our understanding of the Caribbean past. How, where and when people moved through the archipelago are important questions. However, it must be acknowledged that contemporary geographical and political divisions have guided research on these islands, despite the fact that these boundaries might have had little meaning in the past (Boomert and Bright 2007). We have to question if these research questions would have been of similar importance were these regions all connected by land and not divided by water.

The problem of scale remains. How do excavated data represent the interpretations that are drawn from them? Although the tides are changing, the culture-historical framework is still evident in Caribbean archaeological practice. Archaeological interpretations mostly involve large scales at spatial and temporal axes and excavation data is placed within existing frameworks. Even though new questions and research models have developed, the underlying space-time systematics, including all of their problematic assumptions, remain the same.

6.4 A Practice-oriented Relationist Approach

The perspective advocated here, a practice-oriented relationist approach, has many advantages over a culture-historical paradigm.[2] A number of points have already been made in the introduction, but for the argument, some will be discussed in more detail. First and foremost, people are truly the main subject of study. Second, this perspective is historical. Third, the initial scale of analysis is reduced to the microscale. Fourth, macroscale phenomena are not excluded from interpretative models, as relations at this scale affect relations on the microscale as well. Fifth, the scale of analysis actually represents scales that are intelligible to people in the past, rather than products of archaeological models only. Sixth, this model allows for agency on the level of individuals and materials. Seventh, day-to-day activities form the basis of social life. Eighth, multiple coexisting interpretations are possible and there is no one right way of doing archaeology, without falling into the subjectivist, post-modern trap where everything is possible. Finally, archaeological investigations become dynamic descriptions of how past people experienced their world, rather than a mere descriptive monologue of how things were.

The difference in ontologies between a practice-oriented relationist approach and culture-history produces these differences. Culture-historical analysis has a realist ontology and assumes that, considering sufficient research, the truth about the past will

[2] Although this document focuses its argument against a culture-historical paradigm, other paradigms are certainly included.

be revealed. More excavations will result in more detailed understanding of the space-time dynamics of particular artifact assemblages, ultimately providing the background that is needed to explain socio-political structures, ideology and other factors of social life. People have no active role in the production of this reality, as it is located outside their day-to-day life and interaction with others. Therefore, only one explanation for the archaeological record is valid (Keegan 2010). Multiple, equally valid, interpretations are impossible. The true nature of the past is out there and observable.

The argument here follows a relationist ontology. The world, including its objects and subjects, are all relational. These relationships are created through performance and interaction. However, the materiality of the world does pose certain boundaries to these performances and relationships, causing certain arguments to be false and untrue. Performance is the main subject of study in a relationist approach, because neither people nor objects ‘exist’ without actions and the creation of relations. Yet performances are confined and the physicality of people and objects induces certain causal inferences (Gell 1998), while other relations are denied by the material boundaries. Multiple coexisting interpretations are possible and there is no one right way of doing archaeology. The eight points are now discussed to explain these differences in more detail.

First, people are placed central in this analysis. In a practice-oriented relationist approach, the focus lies on the active construction of relations between agents and their environment (Barrett 1994; Bourdieu 1977; Giddens 1984; Ingold 2000; Munn 1986; Ritzer and Gindoff 1994; Thomas 1996). Placing emphasis on the interaction between individuals, objects and the world directs attention to the processes of how relations are established (Gell 1998; Gosden 2005; Latour 2005; Munn 1977). Furthermore, the active construction of these relationships is continuous and never ends. Social life does not stop and relations are constantly contested, negotiated, manipulated or reaffirmed (Bourdieu 1977; Giddens 1984; Heidegger 1977). Because past people play a vital role in the creation of these past relationships, the importance of these agents must be acknowledged and emphasized. A practice-oriented relationist perspective cannot work without considering real people who lived the past.

The unit of analysis is, therefore, the construction of the relation, rather than its outcome. Because objects and people are always in a 'state of becoming' (Heidegger 1977) and relationships are continuously (re-)produced, it is futile to focus on one specific state and describe it. The process of construction is constant and never ends, while 'states' are always short-lived. Instead of aiming effort at understanding what people are (i.e. the 'state'), this perspective aims to understand how people consciously engaged in certain practices to alter social relationships with themselves and others (i.e. the 'becoming').

History is an essential part of this process. In culture-historical approaches, categories, for example Saladoid or Ostionoid people, are ahistorical and change only happens at the beginning and the end of these units determined by space and time. Despite large temporal differences within these categories, people are considered similar and historical sequences are unimportant. However, as mentioned, the construction of relationships is constant. This process happens in the present, but is dependent on past structures (Bourdieu 1977; Giddens 1984). And the status of these past structures is altered through the performance of these practices, as their performance either denies, affirms or reifies their existence. Hence, these structures are in a ‘state of becoming’ as well and are subject to historical sequences. Even if structures do not seem to change, the continuous reproduction of these structures increases their objectification and modifies through time (Bourdieu 1977). Hence, history is vital in this process.

The initial scale of analysis must involve the microscale, because this is the scale in which these relations are constructed. Scales of analysis must zoom in on the particulars of everyday life, of real people creating social relationships and bonds (Bourdieu 1977; Foucault 1977; Giddens 1984). The large space-time boundaries of culture-history totally exceed the dynamic creation of relationships in quotidian practices. As the ‘state of becoming’ is constant, an appropriate scale for its analysis focuses in on these smaller scales of analysis. Furthermore, the importance of history and historical change or continuity also requires that temporal and spatial axes are reduced in a practice-oriented relationist approach.

There is a strong and persistent misperception among archaeologists that this microscale of analysis is incomprehensible from the archaeological record. The fact that archaeologists cannot work with records that exactly describe minute-to-minute practices does not lead to the conclusion that these records are fabricated in large time sequences. Sites are not constructed by a Saladoid or Ostionoid agent that decided how the archaeological record should be formed over a timeframe of 1000 years, but real people constructed structures, disposed meals, made tools and engaged with other people in daily activities. Artifacts and the accumulation of archaeological materials are deposited by individual agents. It is, therefore, not only possible to approximate these scales, but it is the only way to start an analysis. The archaeological record is the product of small processes of deposition. Extrapolating small excavation units to generalizations of the site, islands and other large-scale phenomena creates an artificial distance between the archaeological record and its analysis. Hence, this shift to a microscale of analysis actually helps archaeological analysis, as the scale of analysis resembles the scale of data collection.

Yet, the macroscale is still important and must be integrated in analysis. As mentioned, history and historical sequences structure future practices and function as a frame of reference on which activities are based (Barrett 1994, 1999; Bourdieu 1977; Van Dyke and Alcock 2003). This means that microscale phenomena reference the past, introducing a larger temporal scale, and other places where previous practices took place, introducing a larger spatial scale. Although the relations are created in the present, these same relations constantly reference other times and places (Barrett 1994; Ingold 2000; Jones 2005; Morphy 1995; Munn 1986; Thomas 1996). History provides a structure that is used in the present, but through practices, this history is altered and another 'layer' is added. Present activities happen on a microscale, in the 'here-and-now,' but their meaning and significance is a product of the continuous back-and-forth between the present, the past and the future (Helms 1998; Hirsch 1995).

Interpretive models, therefore, resemble scales that are understandable and significant for people in the past. By placing such a strong focus on human interaction, archaeological models approximate aspects of social life that are significant for the people who produced that past. Categories that are a product of modern scholarly work that are incomprehensible for people in the past are neglected, because this approach stays so close to the scale in which people create relations in the past. Categories that encompass both large spatial and temporal dimensions, such as a 1000-year pottery style distributed across multiple islands, would have never had any reality in the perception of a single person who lived anytime during that period. Changing the scope of research to these smaller scales of the people living in the past, while not neglecting the importance of the larger scales, overcomes this problematic distance of past people's perception.

Furthermore, past people are active components in this process of history and have agency. Again, in large categories of a culture-historical approach, agents have no existence and change only happens when new styles/categories emerge, what has been called the 'methodological individual.' The emphasis on individuals and the processes of negotiation, manipulation and affirmation of past structures entails that people are consciously engaging with these structures and practices to inform themselves and increase their position within a social arena. People do not adopt a certain way of life because that life reflects what they are; they actively make decisions from the possibilities that are available to them. They adopt practices that communicate what they want to be! This means that agents are knowledgeable about their environment and act upon it for their benefit in the future (Giddens 1984; Ingold 2000).

Practice theory (Bourdieu 1977, 1990) and structuration theory (Giddens 1984) also argue for the importance of daily life. The repetitive quality of practices that occur on a day-to-day basis, such as food production, procurement, preparation and consumption, child rearing and interaction with other people produces the basis for the structures that organize social life. Within this day-to-day life, material objects, such as the house (Bourdieu 2009), structure these practices as well. This is another advantage for archaeologists. Quotidian practices produce by far the most archaeological materials, providing a large amount of data with which to work. Although special occasions, such as feasts and funeral, are still relevant occurrences, mundane activities are more important to understand social life and this information is more accessible in the archaeological record.

When this perspective is adopted, dynamic interpretive models are generated in which objects and subjects are in constant movement and interaction (Barrett 1994; Jones 2005; Thomas 1996). Rather than a static description of how artifacts look and how they fit in with space-time systematics, their role within a process is determined. Artifacts are part of the practices of negotiation and manipulation, giving these objects an active role in this process. This also gives these objects agency (Gell 1998; Gosden 2005; Latour 2005; Miller 2005b), as they have the capacity to change social relations and influence the course of history. Furthermore, this paradigm allows for multiple interpretative models to coexist and different approaches and datasets can all be combined within this research approach.

In conclusion, a practice-oriented relationist approach clearly separates the unit of observation and the unit of analysis. In contrast, other archaeological research models equate these two phenomena. Pottery or any other artifact remains the unit of observation in the approach advocated here, but these objects are utilized to understand how practices create certain social identities. The unit of analysis is not the pottery as such, but the practices that involve pottery. Pottery is not a passive reflection of past identities, but an active agent that changes people’s identity. The question is not necessarily what objects people used in the past, but how and why they used these objects. In this perspective, objects are points of entry to understand networks of social relations in which these artifacts were consciously employed to accomplish desired ends, rather than mere distribution patterns of certain artifact types.

6.5 Conclusion

This chapter introduced Caribbean prehistory. A general overview of the patterns that are recognized through time mainly concentrate on the migration of people throughout the Caribbean archipelago and the pottery styles that are associated with these movements of people, with an emphasis on the prehistory of the Bahamas. This chapter partially provided the cultural and regional background for the case-study in the next chapter.

Besides providing a general introduction to the region, this discussion also illustrates how certain archaeological studies have flaws and assumptions that must be avoided. Especially the lack of people in a culture-history approach is difficult to embrace when this is supposedly the main subject of study. Many scholars have noticed these problems and have tried to adopt new perspectives and/or approaches, but find it extremely difficult to move away from these space-time systematics and categories of ‘cultures.’ The crux of the problem lies deeper. In order to overcome the problems that are posited by a culture-historical model, its ontological (and epistemological) foundations need to be abandoned. One of the main problems that prohibits the adoption of a new paradigm is the lack of new research questions or the reformulation of old ones. Principal research objectives seldom involve the local practices on which social life is based, but start from large-scale phenomena. A new set of questions significantly facilitates this required paradigm shift.

A practice-oriented relationist approach provides the tool to establish that shift. Even if pottery seems to correspond to some ethnic group or social identity, the questions change. Previously, certain styles were used to determine to which group the people living at the site belonged. However, this new perspective understands these objects from a completely different point of view. Any object that communicates a certain ethnic or socio-political affiliation is totally unnecessary when these relations are commonly accepted and taken for granted. If everyone knows who you are, there is no reason to communally display that identity. Hence, the fact that these pottery styles seem to convey some sort of identity implies that these identities are questioned. People using these pottery styles are aware of the messages they communicate by adopting certain wares. They use pottery to establish new relations in anticipation of the future and how other people will recognize them as social personae.

The questions that are asked from the archaeological record, therefore, change. In a culture-historical paradigm, pottery analysis is mostly restricted to style (decoration) and possibly vessel form. A practice-oriented approach tries to understand how these pots were used in a social context. As a result, questions arise concerning how different vessels are related to each other and other artifacts. Who is making these vessels and for what purpose? Are there other possibilities available that can satisfy the needs for which these vessels are used? What is the use context of these vessels and how do they communicate certain values and meanings? Can we recognize local patterns of faunal, shell or coral remains that show a correlation between local uses of pottery?

It is one thing to recognize and critique the ‘old,’ it is another to find a methodological tool to overcome these problems. The first step is to abandon the macroscale and refocus on the scale from which archaeological data are recovered. Second, it is moving away from artifacts to practices as the unit of analysis. Now, categories of artifact groups are left aside and are not the final product of archaeological investigation, but these objects are used as units of observation to comprehend how people acted and interacted. Following this theoretical approach, the first research step involves the microscale only. From there, steps to larger scales can be made. This is the structure followed in the next two chapters.

CHAPTER 7
THE TEMPORALITY OF A CARIBBEAN TASKSCAPE

Practices structure social life. In order to understand the sociality of MC-6, Middle Caicos, Turks & Caicos Islands, daily practices must be foregrounded. This chapter is, in content and structure, a direct response to the problems posed in Chapter 6 and places people first. From a practice-oriented approach, economic practices are related through materials, places and times. Two concepts, namely an economy of substances (Thomas 1996, 1999) and taskscape (Ingold 1993) are used here as methodological tools to demonstrate how a practice-oriented approach can be applied to this specific case-study. These methodological tools both illustrate how practices in daily life structure how people perceive the environment.

People living at MC-6 prioritized certain practices, making them more important than others. For MC-6, the exploitation of salt, fish and possibly cotton were the three main economies. The choices of locally exploited resources are consciously selected and compatible with each other, comprising a system of activities that are codependent. Finally, a relational perspective on these different economies informs how people locally constructed relationships and made sense of their world.

Attention, for now, is restricted to MC-6 and its microscale. Although previous research at MC-6 and other sites in the immediate region show a strong relation to other islands in the Caribbean archipelago, especially with Hispaniola (Keegan 2007; Sullivan 1981), these relationships are considered in Chapter 8. Social relationships are formed and performed on a microscale and establish the structures through which the world is perceived. The focus on the microscale is needed when people are foregrounded and practices are placed central in the analysis. This Chapter discusses how day-to-day activities structure people's lives.

This argument here intentionally starts with a discussion on the two theoretical concepts that are used for analysis, namely an economy of substances (Thomas 1996, 1999) and taskscape (Ingold 1993). Theoretical assumptions guide research questions and define sampling strategies in the field. Underlying theoretical principles determine what questions are asked of the archaeological record and how these questions can be addressed by excavations and other techniques. The collection of data is a subjective practice that is informed by the assumptions and expectations of the researcher. In other words, theories are first in academic practices, rather than added perspectives that inform 'objective' data that is recovered during fieldwork. These theories are not mere additions after fieldwork is concluded, but directly structure decisions in the field. That is exactly why these theories start this chapter.

7.1 An Economy of Substances

Thomas (1996) introduced the concept of economy of substances, while working in Neolithic Britain. He collected his data following certain established artifacts (pottery, artifacts made from specific animals, axes made from specific raw materials) and provenience classes (burials, henges, pits), but this did not meet his expectations of certain structural relations between the two and clear cultural horizons of distinct sets of artifacts were completely absent and categories of artifacts overlapped with each other. In his attempt to identify relations between certain objects, like marine shell, stone axes or boar tusks, Thomas (1996, 1999) realized that this methodology was not appropriate for conceptualizing this data. Basically, 'cultural packages' were not apparent in Neolithic Britain (Thomas 1996:166).

Despite the lack of clear groupings of certain artifacts, Thomas (1996) did find that combinations of artifacts in specific contexts occur. These combinations were a product of exclusion, where artifact groups were categorically excluded from certain spaces. For example, worked bone and boar's tusks never occur in henges, but were found in association in burials and pits with Groove Ware pottery. The significance of artifacts, according to Thomas (1996, 1999), lies much more in their absence in certain places rather than where they are found. Hence, the relation was not just between artifacts, but between the location and the artifact.

Furthermore, these artifacts were all found in caches or hoards, which were intentional depositions of objects. The burials of these artifacts were conscious acts and these objects were not randomly discarded. Instead of using artifacts in a specific context and reusing them in another context at a later time, these acts of burial fixed and defined certain identities and meanings of these artifacts (Thomas 1996:164). The act of deposition materialized a constant relation between the artifact and the place. And if the objects defined identities at deposition, then the meaning of the place was dependent upon the object. The place made the objects at the same time that the objects defined the place. These Neolithic depositions were linked through the act of burying artifacts, but different artifacts simultaneously created different locations. All hoards were similar and distinct at the same time (Thomas 1996).

Although this pattern repeated consistently across time and space, it was also too complex, according to Thomas (1996:167-168), to be kept as a formalized list. It is unlikely that people kept a specific account of all the possibilities and where certain artifacts could or could not be deposited. The spatial and temporal distance between these hoards, burials and pits prevented these acts of burial from being observed by all people at all times. A simplified structure of certain principles from which people can constantly draw is much more likely and easier to communicate. Knowledgeable agents used these principles to associate certain artifacts, because they were similar in a sense, while other relations were consciously deconstructed as they conflicted with one another. The artifacts as such, therefore, were not important, but their meaning and use emanated from these principles and the embedded values that they received from them. The circulation and use of objects and materials in the process of constructing meanings and identities of place is what Thomas (1996, 1999) calls an economy of substances.

This approach is clearly relational, as it is not about what objects mean in and of themselves and in isolation from one another, but how social identities are constructed through conscious practices that draw from generalized principles and create and establish new combinations of objects and identities. This idea of an economy of substances emphasizes how objects, through their use, change social relationships and establish, negotiate or manipulate current structures. In the case of Neolithic depositions, objects are integral parts of creating spaces and objectifying their status as places where objects can be deposited. The place is as much part of the object as the object is part of the place (Thomas 1996, 1999).

The material qualities of objects inhibit agency, which is identified and evaluated through their use. This perception of objects resonates with Gell’s (1998:13) notion of *abduction of agency*. Objects have certain material qualities that are undeniable and enforce certain sets of relations while rejecting others. These material qualities, or ‘indexes,’ create a causal inference that is constituted in the material world. This is not to say that these relations are always and everywhere the same, but that the process of making these inferences is limited to very specific outcomes. In sum, the material world matters and, therefore, the material qualities of the objects that inhabit that world matter too (Gell 1998; Gosden 2005; Latour 2005; Miller 2005b).

In addition, the relative simplicity of underlying principles for an economy of substances requires knowledge of these principles. Knowledge is gained through experience and personal histories of individuals. Especially in the case of isolated places and depositions, the framework of reference on which meanings are based is not available to everyone. The restricted context of certain practices, such as deposition and creation of hoards, involves a degree of secrecy in which not only certain objects are excluded, but individuals too. Knowledge about which objects are appropriate for which context is a major form of social power, as groups of people are excluded from this esoteric information (Thomas 1996). Nevertheless, these identities are socially acknowledged in communal settings and are enacted in larger social spheres as well.

Following this line of reasoning, it has to be accepted that these actions of creating artifacts and places simultaneously creates individuals and personal identities. Through the performance of these actions within an economy of substances, individuals are separated and recognized independently. Within this process of creating individual personalities and identities, objects and places play a crucial role. Thomas (1996:180) formulates this relation between people and objects in the following way:

> There is a sense, then, in which we might suggest that in the later Neolithic persons were created by artefacts, rather than vice versa. For while people always have the ability to act, their action is always constrained by their

> own social circumstances. While people construct their own identities, they do so on the basis of a set of resources which is made available to them.

His case study of flint axes and chalk objects explains this interaction between objects, places and people (Thomas 1999). Thomas (1999) states that pottery, chalk objects and flint axes all share a similarity in the way they are produced, namely extracting resources from the ground and opening up the earth. The construction of monumental architecture, such as henges, long barrows or megalithic chambered tombs involved similar practices of extraction and deposition. Furthermore, the deposition of hoards is the inverse practice of quarrying, and instead of revealing objects to the world, deposition hides them and places them back into the earth. At crucial times in their use history, objects and monuments go through cycles that concern the opening and closing of the earth (Thomas 1999:74).

A western perspective might differentiate these categories of artifacts, architecture and practices in distinct classes, but these artifacts and monuments all involve practices of extraction from and deposition into the earth. Thomas (1999) argues that a focus on these objects hinders archaeologists in the present from making adequate interpretations of what these significant objects meant for people in the past. Focusing on past practices involved in the life cycles of these artifacts provides a point of entry into past perceptions of the world. For Neolithic Britain, practices show a strong emphasis on the opening and closing of the earth, which indisputably structured how the environment was appreciated.

Two critiques, however, emanate from this discussion. First, Thomas (1996, 1999) reasons from the archaeological record to practices and his analysis departs from archaeological materials. Practices are indeed incorporated, but only after the objects and their context are described. Although this critique is mainly focused on how his argument is structured, it unconsciously places objects and places before people, rather than vice versa. A practice-oriented approach must depart from practices and involve objects and places, foregrounding the agency people have in adopting certain objects to create social identities. This critique is subtle, as Thomas (1996, 1999) explicitly recognizes how practices produce context and processes of interaction create identities. Yet, objects are placed central in the discussion.

The second critique is that the objects Thomas (1996, 1999) uses for his analysis are extraordinary, like gifts and status items, whereas a practice-oriented approach focuses on the mundane and more daily activities. Bourdieu (1977, 1990), Giddens (1984) and Foucault (1977) all strongly insist that basic quotidian routines, the minutiae of social life, are the foundation of larger structures. Hence, structures of extraordinary exchanges and interaction, like the ones discussed by Thomas (1996, 1999), are based upon more simple and everyday practices. The archaeological focus on objects drives Thomas (1996, 1999) away from the underlying ordinary economies and generates an argument based on structures that are only a product of more daily routines.

7.2 The Temporality of the Taskscape

Ingold (1993) specifically focuses on the performance of daily tasks and how these tasks structure perceptions. According to Ingold (1993), time and landscape, as central themes in anthropology, can only be appreciated in respect to these tasks. All subfields in anthropology, including cultural and biological anthropology and archaeology, deal with people and how they live. So, these central themes need to be understood to make the connections between these different fields and build bridges for scholarly interaction. Defining these two concepts of time and landscape, therefore, is a necessary first step.

For both concepts, Ingold tries to move away from static descriptions that classify both landscape and time as fixed entities. The landscape, according to Ingold (1993), is not a set of predisposed structures that is ready to be acknowledged by people, but a set of relations that emerges out of the interaction of people within that environment. Knowledge about a place is not inscribed or omnipresent, but a product of people doing things within these landscapes. Accordingly, the construction of characteristics of certain places is not an act of understanding the qualities attached to a place, but an act of *gathering*, as these qualities develop through living (Ingold 1993:155).

Ingold (1993) uses the concept of dwelling, borrowed from Heidegger (1977), for these acts of creating and understanding the environment through living in a place. This 'being-in-the-world' is a constant process and perceptions and ideas are consistently reevaluated and negotiated. Dwelling involves the creation and manipulation of relations through which people make sense of the world. Hence, dwelling is a historical act and changes through time, just like the ideas and understandings attached to places change. The landscape, then, is the world as it is known to the people who live therein and dwell in it (Ingold 1993).

This relational perspective on landscape also applies to time. Time is not a chronological sequence of objective periods, such as seconds or years, but an experienced phenomenon that is based on our acts of dwelling. For example, expressions such as 'time flies when you are having fun' indicate that 'having fun' is directly related to the experience of time, but also that other acts of dwelling that are not considered ‘fun’ and make time go slower. Dwelling makes time, as the performance in the landscape determines what time is. In fact, our system of recording time in years, months and days all result from living in a world where certain natural phenomena reoccur. The categories are not pre-existing in the brain, but are formed through the objectification of certain observations, all dependent upon the revolution of the world around the sun and the rotation of the earth on its axis, subsequently engrained in existing social structures.

Yet, time undeniably progresses and historical sequences must be accepted to a certain point by everyone. Even cyclical time changes, as meaning and ideas of every cycle depend on past cycles. Every new cycle has the added value of the past cycle, which that past cycle did not have when it started. The acts of dwelling and how we live in the world determine our appreciation of it only to a certain degree, as people are still dependent on some form of forward movement through time. Acts of dwelling are responses to the past, as past structures form a basis for interaction, while at the same time these acts immediately inform the future and change the structure upon which these acts respond. Another layer of experience is continuously added to the existing structure. This progressive but experienced time is what Ingold (1993:157) calls temporality.

Ingold (1993:158) proposes the concept of ‘tasks’ to denote the practical and fundamental acts of dwelling. As notions of time and space develop through interaction, temporalities and landscapes are based upon these tasks. Tasks are not haphazard or isolated, but performed by people who are aware of the underlying structures and principles that guide them. This means that a task’s meaning is relational and dependent upon other tasks. Furthermore, tasks are future oriented and certain activities are performed in anticipation of expected situations, producing a network of relations between different tasks. Relations between an ensemble of tasks form a taskscape.

The temporality of the taskscape, then, is the relational properties between different tasks through time. Because tasks are always future oriented, the meaning of these tasks strongly relies upon these future performances. For example, the meaning of tilling and fertilizing a garden is heavily dependent upon harvesting and use of the final product. Through their performance and repetition over time, tasks build structures for social life and direct perceptions. People attend to one another and evaluate other people's tasks, creating a social environment that produces a frame of reference (Ingold 1993:160). Tasks, therefore, are the foundation for social life.

Ingold's (1993) argument on the temporality of the taskscape resonates in many important aspects with Thomas's (1996, 1999) economy of substances. Both emphasize how relations are created through performance and how people incorporate these performances in reference to the future. People are active constituents and become knowledgeable through their observations of their own and other people's actions. However, while Ingold (1993) emphasizes the importance of tasks and practices, his argument is overly theoretical. Ingold insists upon the importance of the material world, but never illuminates how certain aspects of the material world induce specific practices. Objects and other material phenomena are left unconsidered. This position, most likely a remnant of his phenomenological approach informed by Heidegger, leaves the material world almost outside the perception of people.

A combination between the taskscape and an economy of substances, therefore, overcomes the disadvantages of both. Thomas (1996, 1999) emphasizes the roles of the material world and objects, while Ingold (1993) focuses on the mundane activities and the role they play in structuring social life. In the approach advocated here, it is an application of a ‘mundane’ economy of substances and a more material ‘temporality of taskscape’ as explained by both authors. In a continuous effort to place people and their practices first, the term taskscape is adopted here. Taskscapes are the foundations for social life and restricted by material qualities of the lived-in environment. To approach an understanding of social life in the Caribbean past, the material conditions that restricted certain practices need to be explored.

7.3 A Day at MC-6

Both concepts described above are more practical applications of practice theory, but still lack the specificity of cultural practices at a microscale. Economies of substances, temporalities and taskscapes are all dependent upon their context within certain social settings. These concepts, therefore, do not provide specific information on what people actually did at MC-6. Furthermore, people prioritize their efforts and intentionally focus on certain practices and resources, while others receive less attention. Many products are seasonal, such as crops, salt, fishes, fruits and other useful plants, restricting the time of their potential exploitation. Not every resource can be exploited fully, because of the lack of labor and time, so choices have to be made. These decisions are conscious reflections of future-oriented people who engage with the local environment and utilize products to express themselves socially.

Archaeological evidence from MC-6 suggests that the exploitation of salt and fishing are the two main activities (Keegan 2007; Sullivan 1981). Decisions on a daily basis would have prioritized these practices over others. Other practices, involving other local or non-local resources were performed as well, but received less attention and devotion on particular days. The following discussion describes how decisions were made on a daily basis at MC-6, providing a narrative of how people engaged with their environment. This narrative explains what important factors were pertinent to people living at this location.

One spectrum of the taskscape, however, must be considered first. Every taskscape is dependent on the division of labor. Men and women are not alike and most societies have a very strict distinction between masculine and feminine practices (Collier and Yanagisako 1987). Ethnographic data suggest that women in general tend to work close to the village and garden, take care of children, while men focus on physical labor and practices outside the village boundaries. Decisions are not made solely on the basis of what needs to be done, but also on who is socially allowed to perform these tasks.

First and foremost, decisions are based on immediate nutritional needs. Every day, procurement of food and water are primary objectives in daily practices. Confined to the immediate surroundings of the habitation site, these important needs are often met by women's practices. Women collect water, take care of children, plant and weed gardens, harvest crops, process and cook food. These practices often occur in a communal setting in cooperation with cognates and affines to the exclusion of men. These activities are coordinated in socially constructed taskscapes in which individual women attend to each other's needs.

When these daily requirements are fulfilled, labor can be allocated to other practices that are less pertinent. For example, women can collect materials for crafting (e.g., baskets, pots, weaving, etc.), produce these crafts and manufacture tools. These practices involve much longer time-scales, as these products might facilitate certain practices in the (near) future. Baskets are needed to transport salt between Armstrong Pond and MC-6 when the salt season begins and fishing nets must be ready before the fishing season starts. To ensure that these tools are present, women plan and manage their time in relation to these anticipated needs. Before the fishing season, attention is devoted to tasks that involve fishing tools, while the period before salt harvesting is primarily assigned to basket making.

For men, a division of labor between immediate and anticipated needs also determines which practices are performed. Furthermore, kin-related males often collaborate and cooperate in similar ways as women do, submerging these individual tasks into a socially constructed taskscape as well. Immediate decisions that require attention are the clearing and burning of fields, which are season specific. Furthermore, hunting and fishing provided groups with the necessary proteins in their diet.

These practices involve a number of different techniques, such as line fishing, net fishing and capturing marine resources in weirs. Which technique is used each day depends on local conditions. Net fishing is extremely efficient when men cooperate in larger groups and drive fish, especially mobile species such as bonefish, into the direction of the nets by disturbing the water. Keegan observed this practice on the north coast of Haiti. However, there are times when net fishing is not an efficient strategy. Placing and harvesting of traps does not require communal efforts and is more likely an individual’s responsibility and property. Also, after rainstorms and other weather patterns, the composition of the water changes and fishermen are hesitant to make trips to the open water. Their labor would be relocated to, for example, fishing weirs near tidal inlets. These practices involved larger groups and were also communally coordinated. The use of weirs, constructed by men, could have been monitored and the catch harvested by women and children. The use of “fish poisons” (e.g., *Datura* sp.) could further increase yields. Men can also dive for conch and other invertebrates, an activity that was facilitated by, and supplemental to, fishing. Conch is often captured near small cays where the meat is extracted and the shell left behind. There are huge modern and prehistoric piles of conch shells around the Caicos Bank (Sinelli 2010).

These are just a few examples of factors that guided decision-making processes at MC-6. Every day, people decided from a whole gamut of possibilities which activities they were going to perform that day. Immediate and future needs were constantly taken into consideration and people made decisions in relation to these needs and other factors, such as weather patterns and seasonal abundances. The narrative above describes a ‘typical’ day, but of course other resources were exploited too. Although important, these resources were always of secondary importance to people at MC-6. The subsequent discussion focuses on the three most important resources, salt, fish and cotton and how their material aspects structured decision-making processes.

7.4 Salt, Fish and Cotton

People who settled the site of MC-6 must have done so for a reason. In search of a good place of habitation, multiple variables are evaluated and a decision is made. The complete lack of fertile soils, quarries of valuable stones and chert and good clay sources is, for example, compensated for by direct access to the Caicos Bank and

Armstrong Pond. This settlement location reflects a cultural motivation and preference to simultaneously exploit fish and conch from the bank and salt from Armstrong Pond. Although other practices are certainly not denied, the major activities are expected to involve these specific resources that are special to MC-6. These major practices, in combination with the possible production of cotton, are the focus of the remainder of this chapter.

The local abundance of both salt and fish and the ideal climatic conditions for cotton production suggest that these economic activities are the major foci of people living at MC-6. These practices are restricted by the material conditions of these three resources and induce a very specialized economy. These material conditions are undeniable and people have to adhere to these restrictions. Salt, fish and cotton demand specific taskscapes of interrelated activities at certain times within the production process.

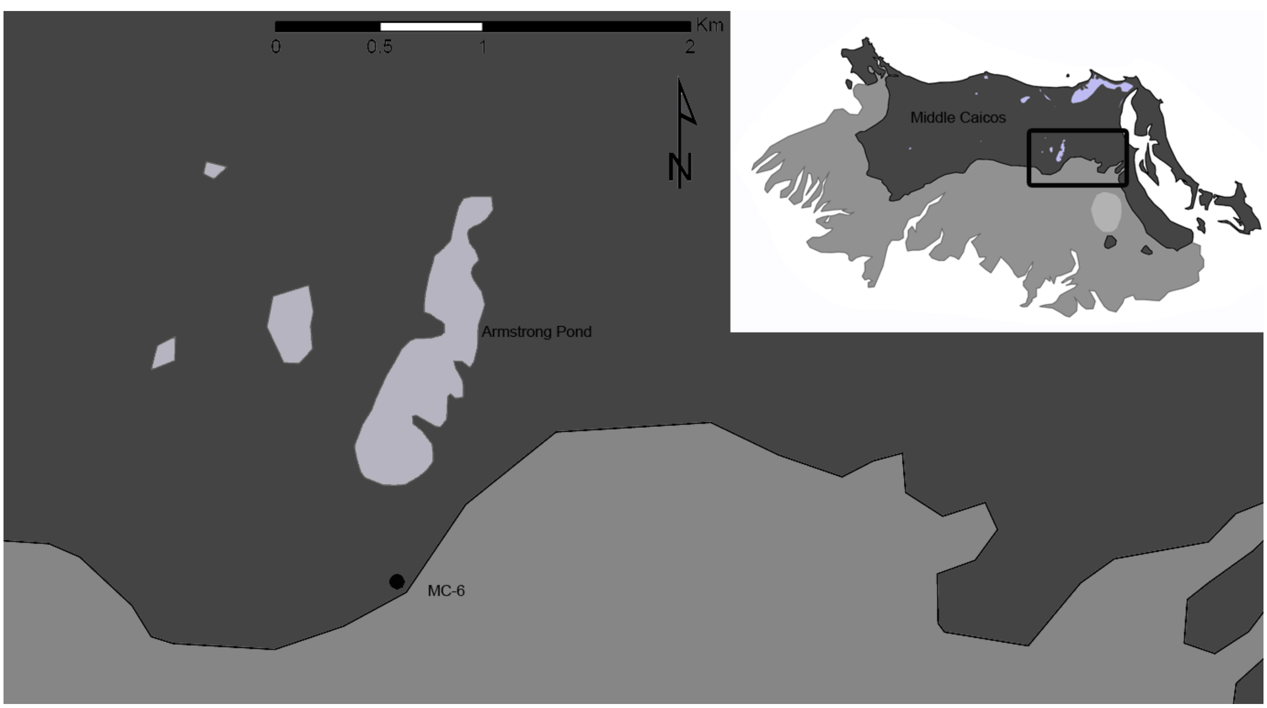


Figure 7-1. Location of MC-6 and Armstrong Pond.

To understand the sociality of salt and MC-6, my fieldwork was specifically focused on recognizing practices related to salt at MC-6 and Armstrong Pond. Coring at Armstrong Pond was done to establish if salt was available when people lived at MC-6. Excavations at MC-6 were meant to determine local salt-centered practices at the site. However, the sociality of MC-6 is not restricted to this resource alone and excavations also provided information on other activities, related to fish, cotton and other resources, at the site. Evidence for these practices is presented in relation to these activities.

7.5 Salt

Solar-evaporated salt crystalizes at the edges of Armstrong Pond. Salt production practices were therefore undoubtedly spatially concentrated at the pond. After solar evaporation, salt was collected on the pond's banks. After evaporation, salt is hard as a rock and difficult to break. To avoid the hard work of breaking the salt into smaller pieces, salt can be collected as a thick brine and left in a pile for further drying. This technique, for example, is practiced by French saltmakers in Brittany. In the case of MC-6, brine could have been placed in baskets to allow excess water to drain.

Armstrong Pond was the location where people extracted salt. A description of the pond is warranted. Armstrong Pond is a 1.5 km long and 200 m wide saltwater pond that stretches roughly along a north-south axis in the southeastern part of Middle Caicos. A small peninsula on the western bank divides the pond into a northern and southern half. The pond is relatively shallow and water is never deeper ~1 m in a couple of locations. However, water levels fluctuate. During the 2010 field season, a wide shore along the western part of pond was dry, but in previous years the water reached the edge of the hardwood forest (Keegan 2010, personal communication). Yet, the whole area surrounding the pond is relatively flat and little differentiation in elevation is present. Even if water was high, a person could stand anywhere in the pond. Also, cracks on the bottom surface, as a result of drought, are observed in even the deepest parts of the pond, supporting the idea that levels fluctuate significantly. Limestone bedrock borders most of the pond, the typical substrate of all islands in the Bahamian archipelago, except for a sandy area in the far south-western part.

Figure 7-2. Northern edge of Armstrong Pond. Isaac Shearn walks into the pond to take a core sample.

This pond has all the characteristics for large-scale salt production. First, the pond is large and shallow, increasing the surface to volume ratio. The large exposure to solar energy leads to a pronounced cline in water temperature and the edges of the pond often get uncomfortably warm during the day. Second, water infiltrates the pond through the sediment, most likely from the southeast corner where an old gully was likely situated. This is the same gully that might have connected Armstrong Pond to MC-8/10. Hence, the salty water that reaches the pond comes from the Caicos Bank and has a higher salinity than the surrounding Atlantic Ocean. The surface to volume ratio on the Caicos Bank is also high, resulting in an increase in evaporation and salinity levels before the water reaches Armstrong Pond. Third, impurities in the water slowly settle in the calm waters of the bank, leading to higher purity levels of the salt produced from this water. Finally, water temperatures in the Caicos Bank are higher than the surrounding ocean and increase evaporation rates at Armstrong Pond.

In addition to these local conditions of the pond, the climate on Middle Caicos is favorable for salt production as well. Sears and Sullivan (1978) subdivided the Bahamas in three climate zones and classified Middle Caicos as ‘dry tropical’. This category has the least amounts of precipitation across the vast Bahamian archipelago (400mm in dry to 800mm in wet years), with two extensive dry periods in winter and summer. Middle Caicos is not the driest of these islands and averages 750 mm per year, but Sullivan (1981) states that rainfall on Middle Caicos is in perfect balance, because drier islands lack a stable source of fresh water, while wetter islands receive too much fresh water which retards or prohibits salt production.

The lack of rainfall in this micro-climate has multiple causes. First, limestone islands lack mountainous areas, like the Greater Antilles or most islands in the Lesser Antilles, which generate clouds and rainfall. Second, the Turks & Caicos Islands are on the northern range of southeasterly trade winds and major hurricanes seem to have little impact on this region (Sullivan 1981). Yet, the Turks & Caicos Islands have been hit multiple times in recent years and hurricanes caused major damage, including the destruction of a 6-month old causeway between North and Middle Caicos by hurricanes Hanna and Ike in 2008. Although rainfall is high during these times, hurricanes only disrupt normal patterns for brief amounts of time and the normal pattern is resumed shortly after the hurricane passes. Furthermore, hurricanes tend to hit the Turks & Caicos Islands later in the season, because of their northern location. These islands have higher chances of getting hit after the salt season is over. Finally, the 'islands effect' diverts clouds around, rather than over the islands. In summer, the landmass is significantly warmer than the water, producing a very local change in air pressure and directing clouds and rain away from land.

Wind is the last climatic factor that significantly impacts the rate of salt production. Besides days when nearby tropical systems disrupt normal conditions, trade winds constantly hit Middle Caicos. Winds are strong and constant, coming from the Atlantic Ocean in the southeast. In colonial times, Bermudians made use of these trade winds for salt production and removed all the trees on Salt Cay and Grand Turk to increase the evaporation rate above the ponds, proving how important a stable source of wind is for the production process. Despite vegetation on Middle Caicos, the constant breeze flows over Armstrong Pond.

The rate of evaporation is evidenced by the specific gravity of the water from the pond. Two samples were taken at the same location, along the western part of the pond in a shallow beach area in the south, only one week apart. On June 11th, 2010, right after big rain showers the sample indicated a specific gravity of 1.018 or 24 ppt. This is lower than sea water. On the 18th of that same month, water from the same location yielded a specific gravity of 1.021 or 29 ppt. This is still below the salinity of sea water, but in only seven days, evaporation of the pond raised the salinity by 5 ppt. Especially at the end of June, days were extremely warm and dry. The process of evaporation must have been even higher during these days, further increasing salinity levels.

Relatively little climatic change occurred in the last couple of centuries (Curtis et al. 2001; Higuera-Gundy et al. 1999; Hodell et al. 1991; Kjellmark 1996), which suggests that these favorable conditions were present for people at MC-6 as well. Low rainfall, high temperatures, dry-seasons in the winter and summer and the constant trade winds from the southeast were factors that favored salt production on Middle Caicos. Yet, Armstrong Pond has a dynamic history. For example, as mentioned in Chapter 6, a now dried gully might have connected MC-8/10 to the pond, suggesting at least some changes in the local environment. A reconstruction of the pond's past is necessary to establish if salt production was even possible when people lived at MC-6.

7.5.1 Reconstructing Armstrong Pond's Past

My NSF-funded research specifically tried to reconstruct the diachronic development of the pond. Two strategies were used. First, along a north-south axis, a total of 50 cores were placed in the middle of the pond, each 30 m apart.[1] Halfway down the length of the pond, the peninsula crossed this axis and six cores were placed 150 m east, maintaining a complete picture of the saltpond's sedimentation. This strategy provided an overview of the pond which was used for the second stage of investigations at the pond. In the southern part of the pond, a single core was extracted, sealed and transported to the Florida Museum of Natural History for more detailed analysis.

[1] Three additional cores were collected. Two cores (core #1 and 2) in the northern section were placed to test the corer and one core (core #60) was placed in the northwest side above the peninsula to determine the rate of sedimentation in that area.

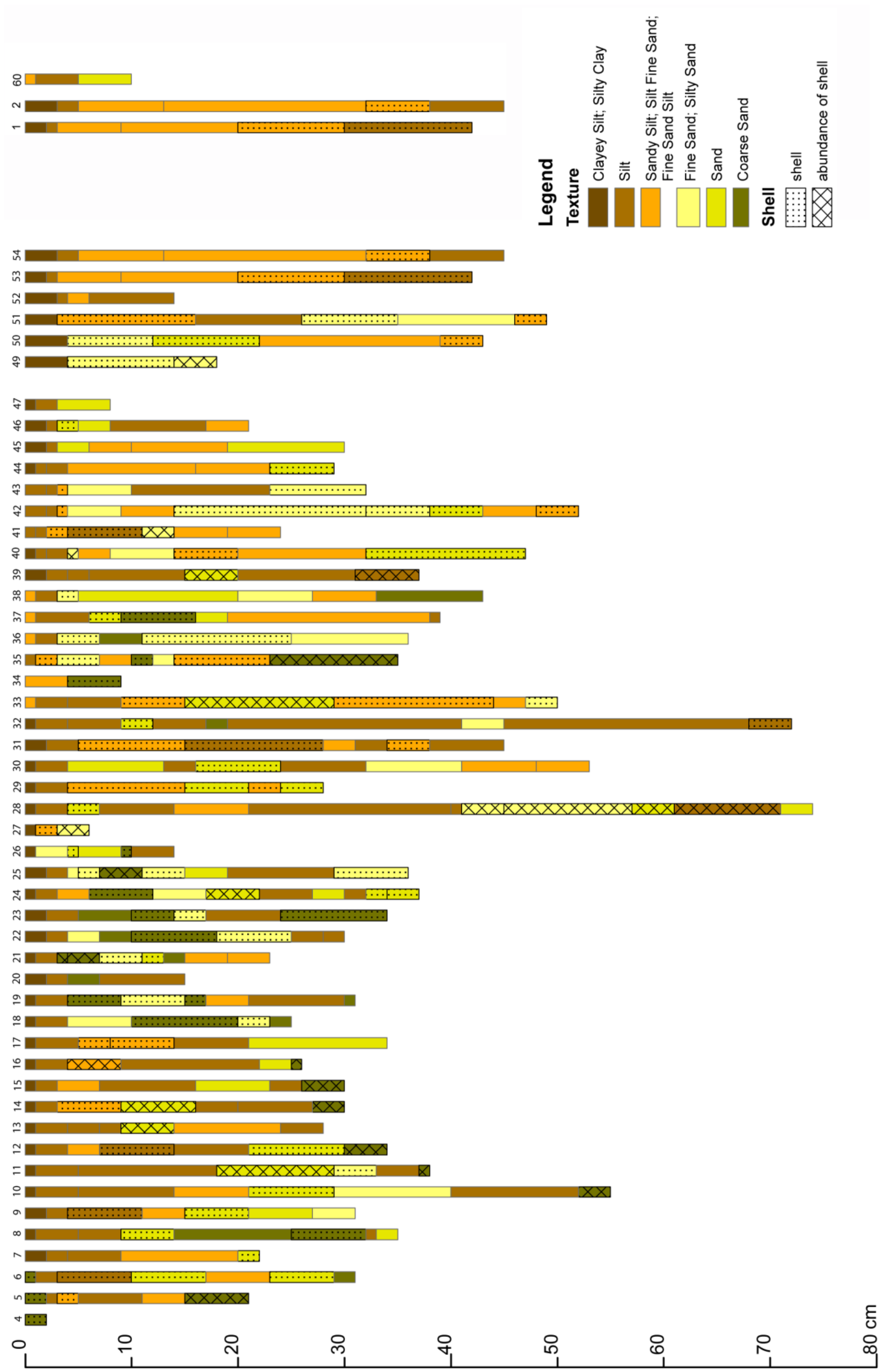


Figure 7-3. Location of cores from Armstrong Pond from the south to north. Cores 1,2 and 60 are separate as they were not extracted on the main axis.

Cores were extracted by a special piston corer designed for coring in wet conditions. This piston corer was developed at the University of Florida (Fisher *et al.* 1992) and specific qualities make it extremely suited for this research. First, the piston corer has a vacuum breaker and prevents sediment disturbance when the piston is removed. Second, the 3" 4-ft Lexan polycarbonate tube is transparent and allows a quick assessment of the potential of the sample. Third, samples can be easily extracted and sampled from the core in the field, increasing the quantity of cores that can be extracted per unit time (Fisher *et al.* 1992).

Certain patterns were observed from the coring data. First, all cores were heterogeneous and different layers of sediment had different textures. Second, colors were relatively similar, all in the grey range, typical of sediments extracted from anaerobic conditions. Third, bedrock forms the foundation throughout the pond and was never deeper than 1 meter from the bottom of the pond. Fourth, different parts of the pond had different rates of sedimentation.

The differences in textures between layers are significant. The top layer throughout the pond had a clayey silty texture, partially formed by decomposing organic materials, such as leaves from surrounding trees. Other layers, composed of sand and coarse sand, denote a completely different depositional environment. Clay, silt and sand are always deposited in different settings and a vertical differentiation between different layers is the result of different sequential depositional environments. The environmental dynamics of Armstrong Pond, therefore, were dissimilar from what can be observed in the present. The cores were used to reconstruct the context of deposition in the past.

The different amounts of clay, silt and sand particles can be used to infer in which sort of water environment these sediments settled in. Basically, small particles only settle in completely stagnant or slow moving water, whereas larger particles can settle when water is flowing. Pebbles, for example, reflect fast moving bodies of water, whereas sand is deposited in slower flowing environments and clays only settle when water is calm for a long period of time (Waters 1992). The differences in sedimentation reflect different episodes of water movement in the pond and the presence of sand and coarse sand sediments indicates that Armstrong Pond has not always been as quiet as it is today.

Despite the relative short interval of 30 m between cores, it was difficult to link strata in adjacent core samples in the northern part of the pond. Certain textures, colors or inclusions, such as shell or roots, in one core were not observed in similar layers at similar depths in adjacent cores. Some repetition between cores did occur, but only for a limited number of cores and never throughout a large area. This horizontal heterogeneity is the result of very localized sedimentation patterns.[2] For example, four cores (#34-37) just north of the peninsula all yielded a layer of coarse sand between a minimum depth of 9 cm and a maximum of 19. Three of the four samples also contained small amounts of shell within this layer. This consistent pattern over 120 m is not present in the next core (#38).[3] However, both cores 38 and 39 have layers of sand at approximately the same depth as the coarse sand, with the layer in core 39 also

[2] Although the depth of the sediments in comparison with the water table was not recorded, partially because the water table was constantly fluctuating due to rainstorms during the fieldwork, it does not seem to affect the interpretation. The heterogeneity between cores cannot be explained by relative water depth.

[3] Core 38 contained coarse sand, but only at a depth of 33 cm. This is too deep in comparison to the other four cores and it probably reflects another depositional process.

containing shell. In core 40 and 41, sand is absent, but layers of silty sands and sandy silts occur, again containing shell. A horizontal continuity is absent throughout this 240 m long transect.

These localized patterns of sedimentation were also observed in the area east of the peninsula. The cores from this axis were placed 150 m east of the main axis and yielded no coarse sands. Layers were predominantly silts, especially in the deeper parts. The eastern border of the pond has a high ridge of limestone, prohibiting large-scale influx of new sediments from that direction. Therefore, sediments in this area must have entered the pond from the west, depositing the coarser materials before reaching this part of the pond. The lack of coarser materials provides evidence that water and sediment influx to the pond must have come from the west rather than the east.

The south area of the pond showed more horizontal homogeneity and more layers could be linked to each other. Yet, the integrity extends, as in the north, across only a couple of cores. Cores 21 to 26 all had a coarse sand layer between 10 and 18 cm. Except for core 21, these coarse sand layers contained shell and superimpose fine sands or sandy silts. Cores 10 to 16 all had a coarse sand layer in the bottom. Cores 5 to 12, a 210 m distance along the north-south axis, all yielded a silty layer between 9 and 21 cm. Between cores 6 and 12, a sandy layer with shell was consistently present between 14 and 30 cm.

These localized patterns of deposition are the result of small-scale processes of sedimentation that only affect parts of the pond in a very particular manner. How these processes unfold throughout the pond is best described by an example from the northern part of the pond. The pattern described above indicates a gradual transition from coarser to finer sediments in a northern direction. This suggests that sediments from the northwestern side of the peninsula entered Armstrong Pond at a relative high velocity, depositing coarse sand, and slowed down further into the pond, depositing sands and silts. The further away from the point of entry, the lower the velocity of the water and the smaller the particles that are deposited. As a result, the cores throughout the pond show very inconsistent horizontal integrity, due to the deposition of different types of sediments during one depositional event.

This hypothesis is underlined by two observations. First, sandy beaches along the pond only occur for a small part north of the peninsula and in the southwest part of the pond. Sandy beaches are the result of sedimentation processes and can only occur in these locations when bedrock is shallow relative to other locations around the pond. Hence, these beaches are surface layers of sedimentation when water tables were higher and sediments were flowing toward Armstrong Pond. Second, along the west part of the pond, multiple shallow depressions are situated and during the first couple of days of the field season, rainstorms filled the small depressions with fresh water. After the rains, water flows from the small depressions into Armstrong Pond, especially just north and south of the peninsula and in the southwest part along the pond. These are exactly the locations of the sandy beaches.

The data from this first stage of coring provides a general overview of the variation in Armstrong Pond. The data also show that at two very specific points, the center west and southwest of the pond, water flows into the pond. Core 10 was selected for more detailed analysis. This location was determined for a number of reasons. First, core 10 yielded clear stratigraphic differentiation. Second, the pattern of core 10 was consistent with cores 11 and 12, suggesting relative stability and similarity in this part of the pond. Third, core 10 was the deepest core in this southern part. Finally, spatial proximity to the site suggests that the southern part of the pond was used by the people at MC-6. Every centimeter of sediment was described separately. Sediments were sieved through 1 mm, 600 µm and 250 µm, collected and bagged. During the first stage of coring, no charcoal was recognized anywhere in the sample. Sieving the sample through small meshes would collect charcoal if present, but no charcoal was retrieved. Nine shell samples distributed over the complete column were radiocarbon dated.

Clay and silt predominate in the uppermost 5 cm of this core, which is consistent with all cores throughout the pond. This layer is partially formed by decomposing material that collects in the pond. Between 5 and 11 cm, a layer of silt with little shell was recorded. The layer between 11 and 14 cm is similar to the previous layer, only a few small sand particles are detected throughout. Between 14 and 15 cm was a transition to fine sand, and fine sand predominates until 17 cm. Underneath the fine sand is a 4-cm layer of sand that is significantly coarser than the previous layer. This layer also contained a large amount of shell. At 21 cm, the sediment transitions again to fine sands and silts and shell was only observed sporadically. Between 27 and 29 cm, coarse sand and small rocks form a layer that also contains small amounts of shell. Below 29 cm, a layer of silt contains small stones for 3 cm, which disappear and the layer is completely void of any material larger than 250 µm between 33 and 37 cm. A 3-cm-thick layer of fine sand follows and contains some shell. Between 40 and 44 cm a layer of sand with few shells was detected. After 2 cm of fine sand and silt with shell, a final layer of coarse sand with rocks and shell concludes this core at 51 cm.

Contemporary conditions are ideal for salt production at Armstrong Pond, as was observed by Sullivan (1981). The cores underline this. In order to produce the salt crystals, evaporation needs to significantly exceed water input. Input of new water is therefore undesired and, for salt production, the body of water needs to be calm. As the particle size of sediments is directly related to the dynamics of the water in which it settles, smaller particles designate calmer waters than larger particles. It might be expected that salt production took place during times that silts or clays were deposited in the pond. The top layer, representing current conditions, consists of clay and silt and follows this line of reasoning.

Two layers of silt in core 10 were also tested by x-ray diffraction to understand their chemical signature. Both silt layers are 100% calcite. There are two possible sources for the calcite. First, calcite could be the silt fraction of weathered limestone that enters the water. Second, calcite is formed during evaporation. Calcium carbonate is far less soluble than other salt, like halite. One of the major products that forms before sodium chloride solidifies is calcite and calcite deposits are often found in association with salt and evaporative ponds (Euliss et al. 1989; Sanz et al. 1995; Tanji et al. 1992). This association between salt ponds and calcite deposits is also present at Río Lagartos, Yucatan, Mexico. This large lagoon and nature park on the north coast of the Yucatan peninsula harbors an excellent environment for solar evaporation and salt production from sea water. Near the salt ponds at Las Coloradas, tourists can take 'mud-baths', which are basically calcite deposits that form during prolonged evaporation of sea water. The XRD analysis possibly supports that salt was formed during the episodes when these silty calcite layers were deposited in Armstrong Pond. A third process might explain the presence of calcium carbonate. As algae photosynthesize, the pH is raised and calcium carbonate is precipitated from the water column.

The strong correlation between both these calcite deposits and salt production and particle size and water conditions in the pond also suggests that more sandy layers represent episodes in the past where salt production was unlikely. As sand designates a significant influx of fresh water, these conditions are definitely less optimal than episodes when silts are deposited and conditions are more stable. As for core 10, both sandy and silty layers are observed. Starting from the bottom, coarser deposits gradually transition into a silty layer between 37 and 29 cm. This calm period is abruptly disrupted by a subsequent period of high influx of water, designated by a coarser sand, which follows the same trend and slowly transitions into another silty layer between 11 and 5 cm. Silty layers, therefore, represent periods of time when salt production might have been possible, whereas deposits of sand and coarser sand designate periods when conditions for salt production were less optimal.

The nine radiocarbon dates retrieved from the core can be used to assign calendar dates to these episodes. These dates were obtained from shell material in the column. The earliest date, from the bottom of the sample, shows that the first deposition in Armstrong Pond occurred around 2500 B.C.E. Conditions for salt production are not favorable until 800 B.C.E. at the earliest, which is the earliest date from the deepest silty layer. Conditions remain favorable for a long time, as another date from the top of this layer yields 800 C.E. Things abruptly change shortly after 1100 C.E., as evidenced by a coarse sand layer that reflects a much more open environment. After 1300 C.E. the pond slowly transitions to a salt-producing pond again, starting with sandy deposits in the beginning of the 14th century and more favorable silty deposits in the 15th century.

The top 30 cm, therefore, describe the natural history of the pond when people are moving through the landscape and observing the phenomena that occurred at Armstrong Pond. Shortly after people move into the area, a major episode changes the salt pond significantly, completely disrupting possible salt production. This episode of change is reflected in the core by a layer of coarse sand, reflecting a period when high energy water was flowing into the pond. The subsequent layer, consisting of sand and silt, denotes a quieter period that might have been conducive for small-scale salt production. The date from this layer at a 2 σ range is cal AD 1077-1085 (0.008 probability) and cal AD 1098-1292 (0.992 probability). [4] The next date is from the sand layer that is slightly coarser than the layers above and below it, designating a period of increased water activity. This date ranges at 2 σ between cal AD 1297-1418 (1.000 probability). Note that the extremes of these two dates are only 5 years apart and it is possible that these shifts occured rather rapidly. The next date comes from a layer with silt and some fine sand, which represents a period of relative stability and stagnant water, probably conducive for salt production. The dates from this layer at a 2 σ range are cal AD 1424-1534 (0.942 probability), 1558-1563 (0.006 probability), 1573-1583 (0.011 probability) and 1592-1619 (0.041 probability). Conditions are even better afterwards, as the layer consists of only silt. This layer yielded a date at a 2 σ range of cal AD 1314-1450 (1.000 probability).

---

[4] All dates are corrected for the marine reservoir effect, taking the average data from Bahamas, Jamaica and Puerto Rico. The marine reservoir effect is dependent on currents rather than geology of the islands and an average between the three regions gives the most accurate result. Taking the Bahamas sample only would result in less accurate results with a larger standard deviation.

The date at the top superimposes the second to last date, meaning that the top date is relatively younger than the date below it. The calibrated years seem to be reversed. However, the relative age determines the top layer as the youngest. This means that the actual date of the silt and fine sand layer is probably more to the lower end of the range that the radiocarbon date yields, probably between 1424 (the lowest on the 2 σ range for that layer) and 1450 (the latest on the 2 σ range for the one above). Basically, the 'earlier' date in the top pushes the actual date of the one below that back.

In summary, conditions for salt production started to improve during the 14th century, as this is the time when the sand layer that is slightly coarser is deposited. From there onwards, conditions only get better and around the beginning of the 15th century the pond is calm and influx of water and sediments is closed. To understand the changes in environment, it is imperative to look at where the influx of water is coming from. As mentioned earlier, a gully might have connected Armstrong Pond with the salina. This gully was flanked by MC-8/10 on the edge of the salina. Because MC-8 and MC-10 are on both ends of this now dried up gully, these sites were likely present when the gully was open and full of water. One date from the lowest levels at MC-10 yielded at 2 σ range cal AD 1020-1240. This is consistent with the data from the pond, as sand was deposited in the pond during this period. This gully, through time, became shallower, turning into a tidal gully before finally completely filling up and disconnecting the pond from the salina. This process ends around the beginning of the 15th century. The gradual sedimentation of the gully created ideal conditions for the exploitation of salt at Armstrong Pond.

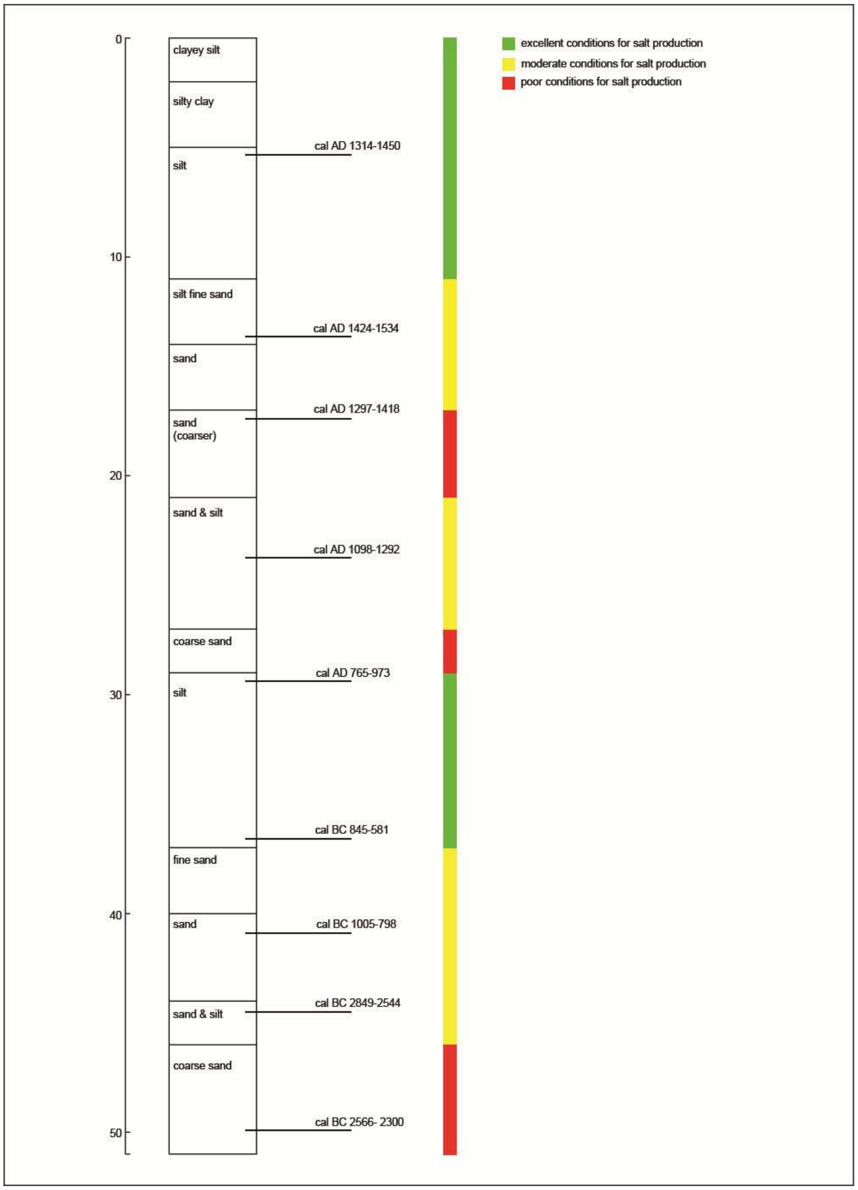


Figure 7-4. Core 10 with associated C-14 dates. The colored bar on the right shows when conditions are favorable for salt production.

7.5.2 To the Site…

Armstrong Pond's history can be compared to MC-6. During my fieldwork in 2010, a total of 5 m^2 test units were strategically placed throughout the site; inside three structures (II, IV, and VI), as recognized by Sullivan (1981) and one in the midden area between structure IV and the central plaza. Initial excavations started at structure II, which was first recognized in the field. As initially intended, the excavation covered the whole structure in separate 1 m^2. Many difficulties arose quickly. First, the long trail between our house and the site took at least 1.5 hours one way, diminishing our work time by 3 hours every day. Second, the soil is full of rocks, significantly increasing the time it took to excavate the units. Third, being close to the salina led us to believe that we would catch a fresh breeze, cooling us down during the heat of the day. Yet, the vegetation changed drastically since Keegan last excavated in 2000 and the whole site was covered in a hardwood forest, 'protecting' us from the wind. Last, but definitely not least, mosquitoes hatched while we were there and literally covered the site. It took them less than 30 seconds to overcome the 30% deet that I poured over my arm. These islands are known for their mosquito plagues after the first rains in the wet season, but even 80-year old locals had never seen it as bad as during the few weeks we were there.

These circumstances changed the excavation strategy. Attention was redirected to one specific 1 m^2 at structure II only. The goal was to excavate inside a structure and within 1 m^2 we found spatial relations between multiple stones on the outside, suggesting this unit is definitely inside a structure. Unfortunately, the consistency between stones in structure II is a recent development as, at 50 cmbd, a parachute was encountered. Sullivan placed parachutes at the bottom of his test units, meaning that we had re-excavated one of his units and all soils above were disturbed.[5] Another parachute was found underneath a rock in the center of structure III, exactly the reason why structure III is not part of this study. At structure IV, the most promising structure

[5] However, Sullivan did not continue to the bedrock. Two more levels were excavated *in situ*. All artifacts above the parachute are still incorporated into the analysis, because these are still artifacts from this site and likely from its general vicinity. Stratigraphic differences, however, will not reflect past conditions and are therefore neglected.

due to its integrity and clear stone construction, two 1 m^2 were placed next to each other, completely covering a north-south axis on the bottom of the pit. At the last structure, number VI, another 1 m^2 was placed in the middle, edging the raised midden structure to its west. Finally, a 1 m^2 was placed in between structure IV and the central plaza to understand the relation between the structure, the plaza and the historical stages of the site.

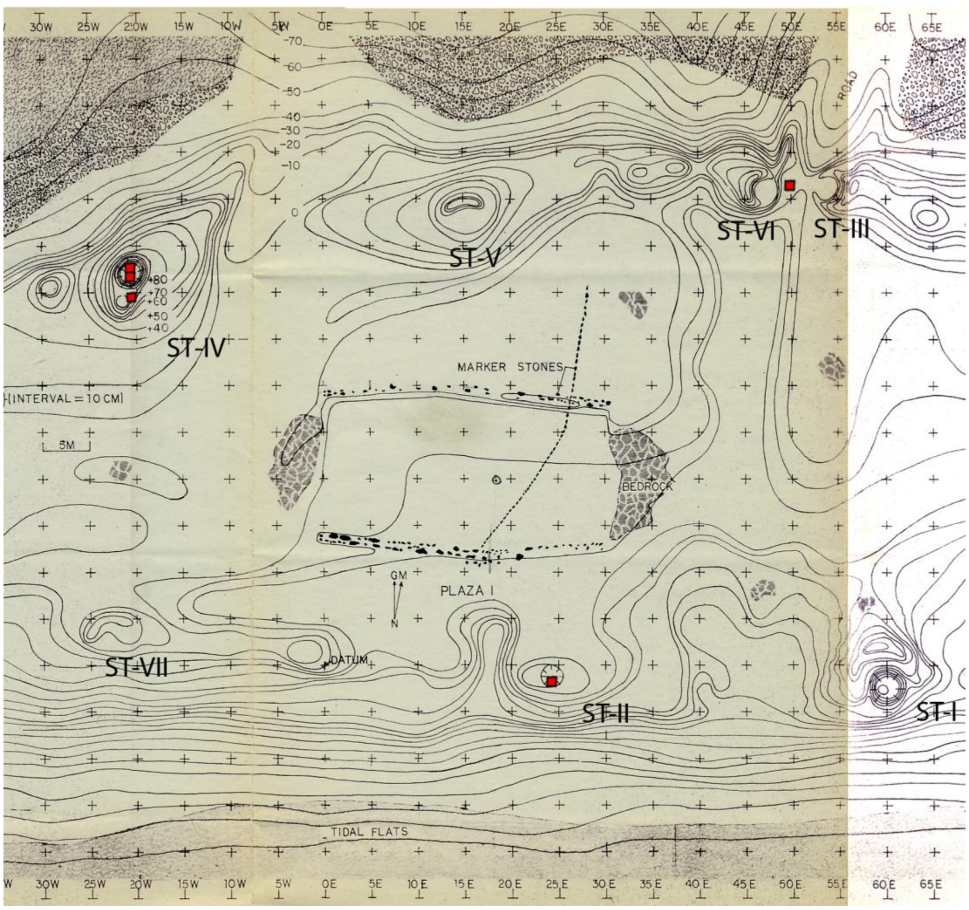


Figure 7-5. Map of central part of MC-6 with excavation units in red. This map including the plaza and its alignments, structures I, II, III, IV, VI and VI and was made by Shaun Sullivan.

The ten radiocarbon dates from archaeological site MC-6 show a very distinct pattern of when people lived at MC-6. The test unit between structure IV and the central plaza provides a clear stratigraphy of the midden area. Six different levels of 10 cm are independently analyzed and five different charcoal samples are dated. The charcoal samples are all retrieved from different layers and only level 3 did not yield charcoal. The lowest stratum, level 6 representing the earliest occupation at the site, yields at 2 σ range cal AD 1308-1361 and 1386-1419. All three dates from the levels above, except for level 1, have similar ranges from the beginning of the 14th century until the beginning of the 15th century. Respectively, level 5 yields cal AD 1317-1354 and 1389-1430, level 4 yields cal AD 1293-1333 and 1336-1398, level 2 yields cal AD 1308-1361 and 1386-1419, all at a 2 σ range. The top layer yields a much later date, at a 2 σ range cal AD 1492-1525 and 1557-1603 and 1611-1631. These dates suggest that the midden was built up in a relatively short period of time and people maintained that layout until they abandoned the site almost 300 years later.

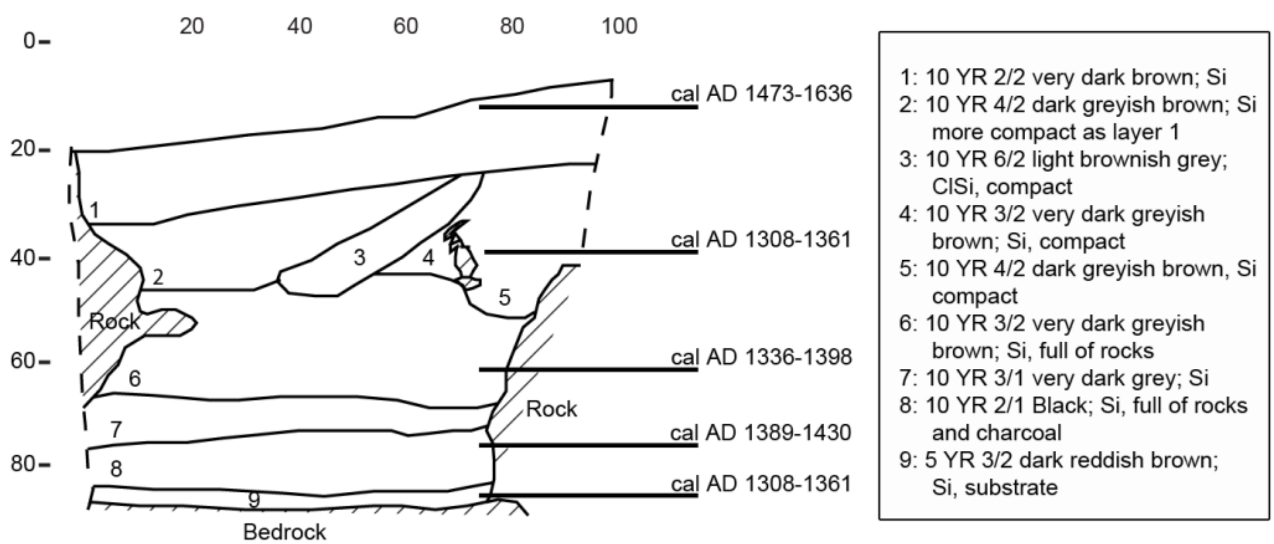


Figure 7-6. North profile of N7E7 with C-14 dates (Midden area south of structure IV).

Earliest dates from structure IV are in agreement with these dates from the midden area, cal AD 1297-1374 and 1376-1401. However, the dates from structure VI and II are later. The date from structure IV, level 2 (out of 4 total levels) yielded cal AD 1415-1451 at a 2 σ range and the second to last level of structure II was cal AD 1415-1451 at the 2 σ range. Although these levels are not from the bottom of these units, they still indicate that these locations were later additions. The layout of the midden surrounding structure IV was established first; not too long after other parts were added to the general layout of the site.

Table 7-1. C-14 dates from MC-6. Last date is uncalibrated and courtesy of the Caribbean Research Foundation (Keegan 2007:142). Two dates from bone are from O'Day (2002:4). See Appendix C for calibration report of dates.

Site	#	Material	Conventional C14 Age (BP)	Calibrated 2 Sigma (AD) 95% probability
MC-6	UGAM 8772	Charcoal	470 +/-25	1415-1451
MC-6	UGAM 8773	Charcoal	580 +/-25	1304-1364 and 1384-1414
MC-6	UGAM 8774	Charcoal	550 +/-25	1317-1354 and 1389-1430
MC-6	UGAM 8775	Charcoal	610 +/-25	1297-1374 and 1376-1401
MC-6	UGAM 8776	Charcoal	470 +/-25	1415-1451
MC-6	UGAM 8777	Charcoal	340 +/-25	1473- 1636
MC-6	UGAM 8778	Charcoal	570 +/-25	1308-1361 and 1386-1419
MC-6	UGAM 8779	Charcoal	620 +/-25	1293-1333 and 1336- 1398
MC-6	UGAM 8780	Charcoal	550 +/-25	1317-1354 and 1389-1430
MC-6	UGAM 8781	Charcoal	570 +/-25	1308-1361 and 1386- 1419
MC-6	Beta-155 021	Bone	270 +/-40	1430-1530 and 1560-1630
MC-6	Beta-155 020	Bone	130 +/-40	1460-1660
MC-6				1367-1507

7.5.3 And Back to the Pond…

The general pattern indicates that people started moving into the area just before 1400 C.E. and dates from lower levels at the site do not go further back in time. In combination with the history of Armstrong Pond and the gradual sedimentation of the gully, it was concluded that initial habitation of MC-6 started at the moment that Armstrong Pond was disconnected from the salina. Furthermore, this episode changed the condition at Armstrong Pond and salt became naturally available at the edges of the pond. In short, as soon as Armstrong Pond is producing salt, MC-6 was founded. The exploitation of salt was, therefore, the likely incentive for people to establish a site at

MC-6. It is necessary to return to the salt exploitation practices at the pond, as described at the beginning of this section.

Salt flats are often managed to increase the production of this resource. Salt producers enhance the environmental conditions that facilitate salt production, while factors that detract from salt production are prevented or negotiated. Salt flats and basins are obvious examples of these practices. At MC-6, an elaborate network of evaporation and production ponds is absent, but one detrimental factor was negotiated. Along the sandy beaches of Armstrong Pond, numerous stones form particular alignments. These stones are significantly larger than the surrounding sand of the beach. In combination with the spatial cohesion that these alignments exhibit, it is assumed that these stones were aligned by humans.

The location of all alignments is very specific and a large concentration was observed in the northwestern part of the peninsula, some along the southwestern shore of the pond and another large concentration in the far south. Eighteen alignments were recorded by GPS.[6] Most alignments are V-shaped or C-shaped, with the open end away from the pond. After the heavy rains during our field season, small depressions could not contain all the surplus fresh water and it overflowed into Armstrong Pond. The little streams from these depressions into the pond occurred at two main locations, namely the places where the alignments are concentrated. These alignments were still directing the water to flow in very specific directions along these inlets of fresh water. These structures were constructed to manage the input of fresh water into the pond.

[6] The GPS that was used was a handheld Garmin and accuracy was often limited to more than ±4m. The alignments are mapped, but the lack of accuracy clearly shows in some of the odd forms. The photos show how clear these alignments were in the field.

Fresh water dilutes the brine and can significantly retard the crystallization process. The construction of these alignments indicates management of the pond and its resources.

Figure 7-7. Stone alignments at Armstrong Pond. After the rains, the alignment on the right was submerged in the water.

Another function for these structures, suggested by Sullivan (1981), was as collection basins of the freshly harvested brine and/or salt. Abundant water would drain back into the pond and salt was collected at central locations. If used for this purpose, however, one would expect these alignments to be placed at multiple locations along the pond and not just specifically in two locations. Furthermore, some of the alignments are far from the edges of the pond. This function proposed by Sullivan (1981) is, therefore, unlikely. These alignments are possibly also historical constructions. A historic cotton plantation was located north of Armstrong Pond and colonists might have also extracted salt here. Yet, no historic artifacts were found near the pond and the cotton plantation might not have exploited this resource at a large economic level. Commercial salt production was concentrated on Grand Turk and Salt Cay, and economic exploitation on Middle Caicos is not expected.

These alignments were constructed for management purposes. People living at MC-6 were well aware of the factors that influence the crystallization process of salt and constructed these alignments to increase production. By consciously diverting fresh water in certain directions, dilution was reduced and salt production maximized. Furthermore, a reduction in production was avoided and the impact of rains minimized. Although people might not have been able to restrict fresh water from going into the pond, they understood that directing the flow of fresh water in certain directions benefited production.

Besides these alignments, little material evidence was retrieved from the area that suggests human presence. No artifacts were collected in the cores and no pottery was found on the banks of the pond. One artifact, a *Strombus gigas* shell, was found on the northwestern side. This shell was extremely worn and must have been transported to this location, but any context for when this occurred is lacking. It might have been used as a hammer for breaking hard halite deposits. Other data connecting people and the pond are absent.

To conclude, the exploitation of salt was the main economic reason to establish MC-6. As soon as the pond changed into a salt-producing pond, people started to live at this location. Stone alignments along the pond were constructed to manage the occasional fresh water input, reflecting that people were conscious about the processes and factors of solar evaporation. Salt was collected along the banks of Armstrong Pond. Other practices might have occurred at Armstrong Pond, but no material evidence has been retrieved as of yet. The practices at Armstrong Pond, therefore, seem to be limited to just the production and collection of salt.

7.5.4 MC-6 and Salt

In order to follow the path of salt, attention must be directed to MC-6. People carried salt from Armstrong Pond to the site. Possibly, woven baskets or cotton sacks were used, as these materials are light and flexible. Placed in bags or baskets, the freshly harvested salt was transported. Carts or any other forms of terrestrial transportation are unknown for the Caribbean at this time, so people likely walked. The distance to MC-6 is only 600 m and, therefore, not too labor intensive.

There is evidence where this movement took place. Between the salt pond and the archaeological site, Sullivan (1981:170-174) recognized a road. This road is between 7 and 9 m wide and flanked by two rows of stone. Stones are very common in this environment and the 'construction' of this wall might have been the product of clearing the road of all the debris rather than a conscious construction of a wall. Clearing this space of stones, which are often sharp and can cause severe damage to feet[7], facilitated the transport of the salt. Carrying heavy loads of salt would have increased the probability of injuries and the construction of a sandy road would have eased the process. The road connects the sandy beach of the pond to the sandy beach of the salina. The clear structure of this road and the invested effort in its construction clearly determine how salt was moved from the pond to the salina. In other words, the road is a materialization of people moving between the pond and the site.

Halfway between the pond and the site, on the west side of the road, Sullivan (1981:174) recognized a 'road-house', a two-chambered structure constructed of stone walls. Test units in this 'road-house' yielded very little archaeological material; one

[7] During fieldwork and daily treks to the site, our shoes suffered severely from the sharp edges of the limestone rocks.

sherd of imported pottery and charcoal, leaving its function unclear. The scarcity of archaeological evidence echoes the finds at the pond. From this point, few manufactured and non-perishable materials were brought to the pond.

The road enters MC-6 from the north. The overall structure of the site is formed by northern and southern raised middens surrounding a plaza. The road interrupts the northern ridge and goes between two elevated midden areas, leading directly onto the plaza. Hence, the structure of the road indicates that salt was introduced to the site in the central plaza rather than to individual houses and/or other structures present at the edge of the salina.

Approaching the site with salt, people would have walked straight into the plaza. The elevation of the ridges on either side of the road must have been experienced as physical demarcations of the site boundary. Passing these ridges meant that you entered the site and its plaza. Once at the plaza, the salt must have been stored. Because salt is not available year-round and production peaks especially in a four week period in July and August, it is thought that most efforts was expended during harvest season of the resource. Some structure contained the freshly harvested salt for future purposes.

Sullivan (1981) extensively mapped MC-6 using a transit during his fieldwork and recognized multiple features in this area (see Appendix D). Besides the two raised middens surrounding the central plaza, Sullivan describes multiple structures on top of these middens. These structures are conical depressions within the ridges, sometimes surrounded by stone rows. At the top, these structures are approximately 5 m wide, but the low interior is often not wider than 2 m. In a way, they look like volcanoes with a crater inside. While mapping, Sullivan worked in clear environment after removing guinea grass and hardwood. Structures, raised middens and other features were relatively easy to recognize, after this considerable energy investment. The conditions were different in 2010 the hardwood forest covered MC-6, hindering observations during my fieldwork. Yet, some of these structures that Sullivan recognized are very distinct from their surroundings, especially structures I and IV. Both structures are deep depressions in high points of the midden, surrounded by stones on the interior. These structures leave little to the imagination and are clearly intentional.

The structures, as depressions in the midden, could have potentially served as storage facilities. The salt entered the site in the middle of the plaza and then was purposefully distributed and stored among the different structures until it was used. Although Sullivan (1981) identified these structures as houses, as he claims to have found a posthole in one of the test units within a structure[8], Keegan (2007) always doubted this interpretation. Stone foundations of round house structures are unknown from the prehistoric Caribbean and, therefore, seem to be specific for the practices of salt production. In search of other locations for houses, Keegan (2007) excavated multiple areas, but no evidence was found. In the end, Keegan (2007) adopted Sullivan's interpretation, with the possibility that the subfloors in the depressions were used as storage facilities.

The movement of salt from Armstrong Pond to these possible storage facilities was tested through chloride and x-ray diffraction (XRD) soil tests. Chloride is a component of salt and, when stored in a specific location, is expected in the soil at MC-6 for three reasons. First, the site has not been disturbed in recent or historic times.

[8] No maps, drawings or photographs have been reproduced on this posthole.

Second, the salt collected at Armstrong Pond has very durable qualities, and Sullivan (1981) observed that a pile of salt made by him and his crew lasted through the wet season, despite the many rains. Third, the stone pit features and depressions create protected areas, which contribute to the preservation of chloride in the soil.

In total, 49 samples were collected for chloride testing.[9] At the bottom of excavation units inside structure II, IV and VI, as identified by Sullivan (1981), fifteen samples were collected. The average per structure is used for comparison.[10] Four samples were collected at the bottom of the test unit in between structure IV and the central plaza.[11] Within the boundaries of the site, eighteen samples were taken outside the structures and twelve samples were collected from a larger area surrounding MC-6, including the salina, Armstrong Pond and along the trail between the road and the pond. All chloride samples were analyzed by the Analytical Research Laboratory of the Institute of Food and Agricultural Sciences at the University of Florida, following EPA Method 325.2.

The analysis aims at the identification of different values per specific area. These sample locations provide data on how concentrations of chloride in the soil are unequally distributed throughout the region. Also, it makes comparison possible between certain categories of areas, such as inside and outside MC-6 or inside and outside of structures. High concentrations of chloride are expected inside, rather than outside the structures if these structures were used as salt storage facilities.

---

[9] See Appendix B for all data from Chloride soil samples.
[10] Chloride concentrations for structures are averaged. Structure II = 572.0 mg/kg ((637.8+568.3+530.0+540.7)/5)), structure IV = 508.9 mg/kg ((641.3+542.0+545.1+534.3+598.5+192.3)/6) and Structure VI = 1092.2 mg/kg ((1086+1357+833.7)/3).
[11] These four samples are also averaged for comparison. N7E7 2996.5 mg/kg ((3713+2479+2876+2918)/4).

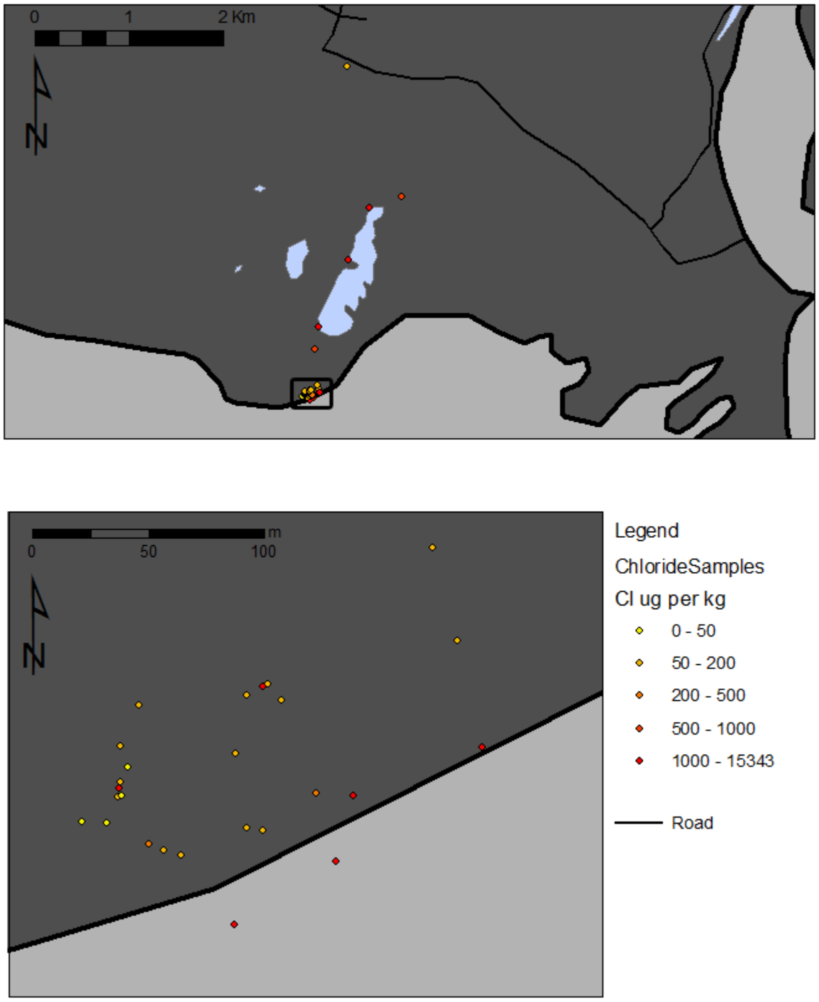


Figure 7-8. Location of chloride soil samples. Lower figure is zoomed in on MC-6. Note the correlation between high chloride concentrations (red dots) and location close to the salina or Armstrong Pond.

A significant disadvantage of chloride is its high mobility in soils and chloride tends to disappear over time. Unfortunately, this characteristic affected the samples of this study. Samples with high chloride content are restricted to the salina and Armstrong Pond. Two excavation units yielded high concentrations too, structure VI and the unit in the midden area between structure IV and the central plaza. However, structure VI is not as clear as other structures at MC-6 and Sullivan's (1981) interpretation is uncertain. The two clear structures that were tested, structure II and IV, did not yield different data from the surrounding environment. Hence, the chloride data does not argue for these structures as being salt storage facilities. Either these structures were used as storage facilities and salt disappeared over time, or these structures were used for something other than for the storage of salt. Another possibility, however, is that salt was traded in baskets of specific sizes, as a certain measure of weight and value. These baskets might have limited leaching and prevented large quantities of salt from disappearing into the soil underneath these storage units.

A second soil test, XRD, approaches the question of the function of these structures from a different angle.[12] The soils in the Turks and Caicos Islands derive from a carbonate substrate, i.e. ancient coral reefs and the accumulation of oolitic limestone precipitates from shallow marine environments (Sealey 2006). Pockets in the environments, however, are different. Trade winds transport dust over the Atlantic Ocean from Africa. Rainwater deposits the small particles of African dust and transports these soils into small pools, where they accumulate over time (Shattuck 1905). These localized pockets of African clays are red in color and stand out from the normal white soils that predominate in the environment. Important for the XRD analysis, these particles of African origin are chemically very distinct from the carbonate substrate. Clay particles, silicates, and mainly quartz are not found in the substrate, but are significant components in the African dust (Muhs et al. 2007; Prospero and Lamb 2003).

Along the trail to MC-6, multiple pockets of this red clay are present. These African dusts also could have accumulated in the sediment of Armstrong Pond. Dust particles in the pond are possibly present as impurities in the salt for two reasons. First, particles in suspension become impurities in the salt during crystallization. Second, scraping the

[12] See appendix C for all data from XRD analysis

salt from the surface inevitably adds some African soils and dust particles to the salt.[13] In sum, African dust particles are expected to be present as impurities in the salt.

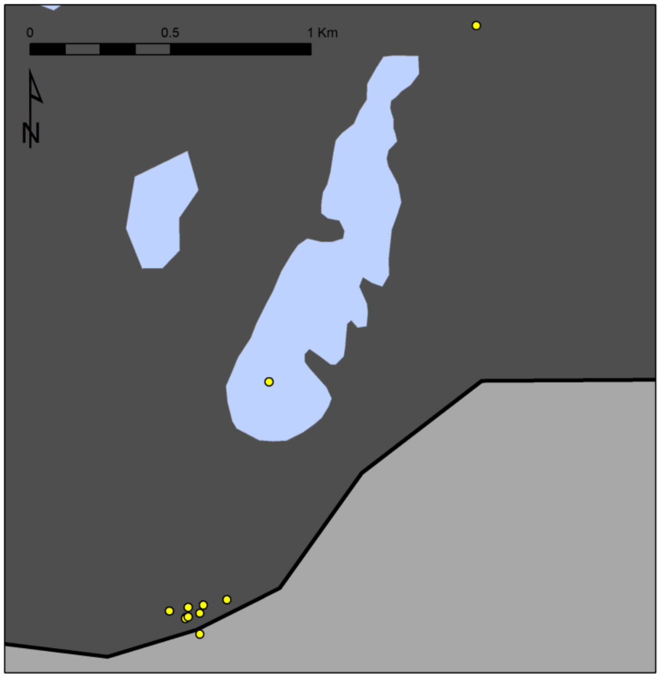


Figure 7-9. Locations of XRD samples. Location in the pond is core 10, the location northeast of the pond is the location of the African red soil.

Higher concentrations of clay silicates and quartz are expected within these structures compared to the surrounding environment, if salt was transported from the pond to the stone pit features for storage. Because the salt, including the impurities, was stored for an extensive period of time, particles leached out were left behind at the bases of the structures. Samples from Armstrong Pond, other red clay pockets in the area and soils from the bottom of these structures can be compared. This comparison can be used to differentiate the origins of the clays in the structures, from for example Armstrong Pond or other clay sources in the area.

[13] The French *sel gris* or grey salt results from scraping parts of the grey substrate of the salt ponds with the salt during the production process. The addition of the soil gives the salt a different color and taste and is desired by the producer and consumers of the salt.

Twelve samples were tested using x-ray diffraction (XRD). Two samples were from core 10, the same location where the core for detailed analysis was taken. Two distinct silt layers are present in this core and both were tested. The clay particles are unlikely to settle in the layers of bigger fractions of deposits, as the turbulent water will keep the clay in suspension. Structures II, IV, VI and the test unit outside structure IV were also tested. One red clay source on the trail was sampled, to compare different local signatures of clays. One sample was taken outside the boundaries of the midden area, just east of the MC-6 and close to the salina.[14] Four samples were collected from within the boundaries of the site. These last five samples from inside and outside the site determined the general geochemical composition of this particular region.

Samples were analyzed at the Department of Geological Sciences at the University of Florida. This preliminary test of the utility of x-ray diffraction for salt studies specifically targeted quartz and clay particles (Hillier 1999, Lanson 1997, Srodon *et al.* 2001, Till and Spears 1969). Before analysis, a 5 g soil sample was powdered and sieved through 63 μm to exclude most of the carbonate substrate that will taint the results (Hillier 1999, Lanson 1997). Because analysis was directed at the dust particles of African origin, the tested sample included all fractions from coarse silt to clay. A Rigaku Ultima IV for general x-ray diffraction was used for analysis.[15]

Definite patterns are lacking in the results and the movement of salt from the salt pond to MC-6 was not specifically identified. This is a consequence of the absence of African dusts in the samples from the pond. Analysis shows that both silty layers are 100% calcite $(Ca,Mg)CO_3$ and no quartz or other clays are present in these layers. The

[14] This area was designated by Sullivan as Plaza II and will be discussed later in the chapter.
[15] See Appendix C for complete report

intent of these tests was thwarted by the absence of the clays and quartz, which were expected in the sample. Calcite is the normal limestone background and no comparison is, therefore, possible between the samples from the structures and the pond. However, this result cannot be used to reject the hypothesis that salt was moved from the saltpond to MC-6, but the lack of any signature of clay and quartz prevents any inference.

In other samples, quartz was found. The sample from the red clay deposit, as expected, yielded a total of 63.2% SiO_2. This particular sample has by far the largest percentage of quartz, underlining its non-local origin. Most of the quartz particles are very small, as these are transported by wind and the soils have a clayey texture. Hematite, the iron-oxide that colors these soils red, is another large component in this sample, 36.8%. Clays, such as kaolinite, halloysite, dickite and gibbsite are also present, but only in very small quantities. This red clay soil represents a natural formation and it is unaffected by humans and occurs throughout the environment.

Locations outside the excavation units in the structures of MC-6 yielded significant differences in the concentrations of quartz. The salina is composed of mostly calcite and aragonite, but in addition yields 24% halite.[16] The halite is solidified salt, which is the result of the high sea water table in this area. Quartz is detected, but only in minor quantities. Within the site, in the western part of the central plaza, quartz is 1.5% of the total and the remaining 98.5% is calcite and aragonite. The same pattern shows for the middle of the plaza, with no quartz, 1% carbon, and 99% calcite and aragonite. The

[16] Aragonite has chemically the same signature as calcite ($CaCO_3$), but has a different crystalline structure. Most samples also yield trace elements. However, the current analysis is not appropriate to determine these trace elements and is, therefore, omitted here. Finally, this is the same location of plaza II as discussed in footnote 12, Chapter 7.

sample from the bottom of structure II yielded only 3.4% quartz, with 96.6% calcite and aragonite. Quartz is similar in quantities from structure VI, namely 3%, with the remaining 97% calcite and aragonite. In the test unit north of structure IV, the pattern again reflects the dominance of calcite and aragonite (96.5%) and low quantities of quartz (1.9%). In general, the natural signature of most soils inside and outside MC-6 show the pattern of limestone (calcite and aragonite) with minimal traces of quartz (between 1.5 and 3.4%). Three samples are different, namely the samples taken east of the central plaza of MC-6, between structures IV and V from just behind the midden deposits and from the bottom of structure IV, which yielded higher quartz percentages.

Given our capacity to measure the movement of salt from the pond to MC-6, this practice is only materially manifested by the road. People were aware of the pond and the significance of its salt and experienced previous difficulties in moving the salt from the pond to the salina. To facilitate this ongoing process of transportation, the road was constructed and used. The road is not an artifact that made people move, but a product of repetitive movements from the pond to the salina. The road did not cause people to exploit Armstrong Pond and salt, but resulted from its exploitation. Although soil analysis does not provide additional evidence, the spatial relation between the pond and the site, exemplified by the road, provides clear evidence of people utilizing salt and transporting it to MC-6 and beyond.

7.5.5 Salt and Beyond

The data, so far, have only considered the practices that involve salt. The strong connection between Armstrong Pond and MC-6 supports the view that salt is of major importance for the people living there. Following the practice-oriented approach, the practices that engage this resource need to be discussed in detail. These practices are an important part of daily practices and govern local interaction and structure perceptions. The next step involves the uses of the stored salt. Salt is a food and consumption is part of its economy. But how salt is consumed is part of its sociality. Salt can be added to food as a taste enhancer, to overcome a dietary lack or as a preservative.

Sullivan (1981) suggested that the importance of MC-6 and its relation to salt stemmed from the dietary need for salt. Especially in a hot and humid environment, people lose substantial quantities of salt through perspiration. Keegan (2007), in reaction to Sullivan's hypothesis, directs attention to the preservative qualities of salt and its ability to store food items. The Caribbean climate is again important, but for other reasons. The hot and humid environment of the Caribbean prohibits preservation of fish and other sources of meat for extended periods, as these items will start to decay after a week (Caribbean Commission 1952). The importance of salt and its impact on socio-political relations is extensively discussed in Chapter 3. As argued in that chapter, salted foods are better suited to negotiate social power and status than the raw resource.

The next step in the process is transport. Salted goods are capable of communicating social power and status, but when consumed locally, these messages are less effective (see Chapter 3). Two lines of evidence support the transport of salted fish. First, salt at Armstrong Pond is produced in massive quantities. Sullivan's crew of sixteen people collected 120 gallons of salt in only fifteen minutes. Sullivan (1981:174) projected that half of the production rate could be maintained over a six-hour workday and estimated the season high in salt production at four weeks in July and August.

Calculated from a total group of 50 people involved in this activity, over 13,500 bushels of salt could have been collected. This is more than 330,000 kg of salt![17] Even with a daily intake of 30 g, this would support a total of 11 million people in one day or more than 30,000 people for an entire year.

Annual discrepancies and the fact that salt is a finite resource at the site and collection methods can outcompete the solar evaporation and rates of production, these numbers still show that salt production is beyond local needs. A required addition of 30 g a day is high as well, but would still support more than 30,000 people for a year, while the size of MC-6 (less than 200 m long and 70 m wide, as measured by Sullivan (1981) does not suggest a population of this size. Local production, therefore, exceeds local dietary needs.

Second, O'Day identified a large amount of cranial elements of fish in relation to other parts of the body (Keegan 2007), a pattern that Carlson (1993) also recognized in the samples from Governors Beach on Grand Turk. Keegan (2007) argues that this pattern is the result of preparation of fish before transport. The local consumption of a complete fish results in an equal distribution of parts of the body in fish bones. The relative abundance of cranial elements suggests that heads were removed before the rest of the fish was moved elsewhere. Salting and transport benefit if only the most edible part of the fish is used. The zooarchaeological pattern could be the result of salting practices and transport of salted fish to other regions.

To utilize salt, people at MC-6 had to look for a reliable supply of food. This directs attention to other natural resource available to people living at MC-6, namely those from

---

[17] 1 bushel is 9.3 gallons. 1 Bushel of salt weighs between 50 lbs (fine salt) and 70 lbs (coarse salt). A low average of 25 kg per bushel is used in this calculation.

the Caicos Bank. Although the salina separates the site from the bank, it is unlikely that the salina was present when people lived at the site (see Chapter 6, as discussed with MC-8/10). Furthermore, the Caicos Bank is a shallow sea with sandy and sea grass bottom, which is the ideal environment for many animals, especially bonefish and conch. Besides Armstrong Pond and salt, MC-6 has direct access to resources from the Caicos Bank that could be salted.

7.6 Fishing

Fishing, therefore, was a large part of MC-6's economy. Catching methods throughout the Caribbean were diverse, including net fishing, line fishing, traps and poison (deFrance in press; Keegan 2007; LeFebvre et al. 2006; Newsom and Wing 2004; Wing and Wing 2001). Fishermen tend to have certain routines and preferences while fishing, for example the time of day they fish or the bait they use. Other factors that have to be taken into account are the availability of certain species during the year. Small seasonal changes occur on the basis of water temperatures, spawning seasons and migration routes. Fishing involves a close interaction between the fisher and the material world.

Tools are essential for fishing practices. Fish weirs are constructed to catch or collect fish. Traps and nets are woven from fibers and cotton and net weights and hooks are manufactured from shell or other materials. The weaving of traps is still practiced on many of the Caribbean islands and a wide variety of fibers are used. Net weights can be of stone, but Keegan et al. (2009) argue that shell also was used in the Caribbean (primarily *Codakia orbicularis* and *Lucina pectinata*). A wetland site in Florida, Key Marco, preserved organic material and excavations yielded shells with netting still attached. These artifacts are similar in shape and usewear as Caribbean samples, suggesting similar functions for these tools in the Caribbean past. At MC-6, nine C-shaped shell artifacts are possibly net weights. These artifacts are made from the dense and durable part of the Queen Conch, the central column, and are only 1-5 cm long. These relatively small artifacts are relatively heavy and could have been hung at the bottom of the nets. Other possible evidence for fishing is shell hooks. Only one hook, made of Queen Conch, however, was found in the materials and four other semicircular tools have dubious functions. Line fishing was practiced, but does not seem to have been the preferred method.

Fish lures might have been manufactured at MC-6 as well. Two shell species, namely *Pteria colymbus* and *Pinctada radiata*, were locally procured and manufactured into artifacts*. Pteria colymbus* has an Number of Individual Specimens (NISP) of 16, total weight of 12 gr, averaging 0.75 g per specimen, while *Pinctada radiata* has an NISP of 52, total weight of 34 gr, averaging 0.65 g per specimen. For specimens identified to the species levels, these two have, by far, the lowest average weight. Both are oysters and are characterized by their iridescent lining on the inside. Furthermore, *Pteria colymbus* occasionally holds pearls. *Pinctada radiata* is edible and is caught for consumption, but *Pteria colymbus* is unpalatable. The high NISP and the low average weight of all shell combined are evidence that these species were specifically targeted for their shiny pearl insides. These shiny pearl insides reflect the sunlight in shallow waters and attract the attention of fishes, and thus make excellent fish lures.

Figure 7-10. C-shape artifacts, possibly used as net weights.

Figure 7-11. Pieces of *Pteria colymbus* and *Pinctada radiata*, possible used for the manufacture of fish lures. The shiny pearl on the shell is noticeable.

Obtaining resources for fishing nets, net weights and traps is not too difficult on Middle Caicos. Shells are abundant in this marine environment and can be gathered in MC-6’s immediate vicinity. Although O'Day (2002) states that the resources are beyond the boundaries of a 5 km radius, she assumes that the salina was dry at the time the site was occupied. Fibers for fish traps were likely growing on the island. Although direct evidence for the presence of fibers on the island is absent, the locally produced pottery indicates that people at MC-6 were well aware of woven fibers and tools. This project’s excavations yield a total of 128 local sherds with clear impressions of basketry. This technique is most commonly used on griddles, used for cooking purposes, and very specific to the Bahamian archipelago (Berman and Hutcheson 2000; Hutcheson 1999, in press). The technology and materials for weaving basketry, therefore, were available to the people at MC-6. In addition, Middle Caicos supports one of the most active local basket production centers, using all local materials, anywhere in the Caribbean.

Figure 7-12. Basketry impressed Palmetto ware. All three sherds are pieces of griddles

Shell remains provide another line of evidence for basketry weaving or trap construction. Twenty-three shell tools, labeled needles, were excavated during the field season. These tools are relatively thin pieces of Queen Conch shell and elongated with one flat and one pointy end. Two more very similar artifacts are present, but these have two flat ends and no point. The exact function of these tools is unclear, but it is possible that these were used as needles for weaving baskets. Fish bones, such as ribs and spines were possibly used as tools for these practices too. The two artifacts without pointy ends could have been used as spacers to maintain a consistent pattern across the artifact. Despite their unclear function, the high quantity of this specific type of artifact indicates that it was used for a common practice at the site.

Figure 7-13. Needles made of conch. Some specimens have two flat sides and might have been used as spacers

People went out on the Caicos Bank and targeted bonefish, which comprise the most common bones in the samples from MC-6, but other fish were also caught. Other resources, such as turtles and conch, were caught as well (Keegan 2007; Sinelli 2010; Sullivan 1981). Conch is still a local specialty of the Caicos Islands and is one of the major export products. The zooarchaeological analysis underlines how important fish and other marine resource were in past diets. Although other animals are present as well, such as birds and iguana, fish were the main source of protein. People at MC-6 regularly fished the Caicos Bank to procure these resources.

Canoes are, necessarily, a part of fishing. Besides the fact that people could not have colonized the Caribbean region without seafaring technology, these fishing trips must have relied on canoes. The ethnohistoric sources describe the canoes that the people used in the Caribbean region and often comment on their sizes and the locals' ability to maneuver them on the waters. The English word canoe comes from the indigenous name of this vessel; *kanoa*. Yet, canoes or other related artifacts are rarely found and very little material evidence is present for canoes. One of the few artifacts that has been retrieved, is a paddle from Grand Turk (Carlson 1999). The paddle is dated to the 11th century, clearly placing it in a prehistoric context. Canoes would have been essential for people living at MC-6.

The canoes used at MC-6 are likely non-local. Columbus (Dunn and Kelley 1989) and Fernández de Oviedo y Valdés (1851) both commented on the immense size of canoes that were cut from one complete tree. The Ceiba or Silk Cotton tree was used to build canoes, the largest native tree in the region. The climate, however, on the Caicos Islands is not conducive for the growth of these giant trees and canoes had to be imported into the region. For Middle Caicos, Hispaniola is the closest place from which canoes could have been imported. Without the introduction of canoes, people at MC-6 would have been very isolated and their export would have come to a halt. A stable contact for canoes was necessary to maintain production. The importance of trade in canoes and the creation of intersubjective exchange relations is also emphasized by Munn (1977, 1986) in her Melanesian context.

7.7 Cotton

Pre-Columbian availability of cotton at MC-6 is less certain than salt and fish. Cotton is a cultigen. To grow cotton, fields must be cleared by chopping down trees and bushes, stones need to be removed, soil has to be tilled, seeds must be planted and the cotton balls must be harvested. The harvested cotton balls are either transported as raw materials or spun and woven into cotton products, such as hammocks, cloths and fishing nets. Most of the artifacts involved in these practices are not particular to the growing and processing of cotton. However, there are suggestions that cotton was a major product at MC-6.

Even if the evidence for cotton production is weak, gardening must have been a significant part of the local economy. Tools involved in gardening practices are not necessarily restricted to cotton and other agricultural products must have been produced as well. The garden was probably located in the area that Sullivan (1981) designated a second plaza. Because Keegan (2007) did not find any archaeological remains in this area, he interpreted it as a gardening area. Yet, the energy that was invested in this part of the landscape, as the location is completely empty of stones and seems to be deliberately constructed, suggest some ‘special’ use. Other areas surrounding the site were also used, such as north of the central plaza, but this was less formal and small heaps of stones are spread everywhere. Stones are present everywhere on Middle Caicos, so these heaps are probably the result of clearing an area for gardening purposes (Sullivan 1981). To free up space for cultigens, stones were placed together, forming small piles while the remaining area was used to plant crops.

If the people at MC-6 practiced slash and burn for their farming, however, then larger trees and other obstacles would still be present in the garden. The formation of small stone piles or completely emptying the area of rocks would have been severely hindered by these obstacles. This suggests that this garden was cleared of all vegetation. Special attention was directed toward the construction of this garden, which suggests that this is not an ‘ordinary’ field for mundane crops. The investment of energy is probably the result of more formal gardening practices involving a high status, valuable crop.

The first stage of gardening involves clearing fields with axes. One small greenstone axe was found during excavations in 2010, but this axe was too small for cutting down trees. Sullivan (1981:372) recovered four broken axes and Brian Riggs collected another greenstone axe near the pond (Keegan personal communication 2012). After the field is cleared, the vegetation is left to dry and then burned. After that, the field is prepared for planting. Shell artifacts for gardening purposes were found. In total, six hoes, ten fragments of hoes and two possible preforms were found in the 2010 excavation units. These hoes could have been used to mix the burned vegetation into the soil, till the soil, build small mounds to increase production and harvest root crops. Wooden digging sticks could have been used for these practices as well. Shell hoes are basically the lip of the Queen Conch shell, rounded at the bottom and either used by hand or placed on a stick. Most of the artifacts show significant wear on the rounded edge of the shell, which is evidence for prolonged and heavy use.

Figure 7-14. Green stone axe. Although the item is broken, the edge is still smooth and in relation to its small size for an axe, the artifact does not seem to have been manufactured for only utilitarian purposes.

Figure 7-15. Complete or broken hoes. All are made of the lip of the conch shell.

A wide variety of cultigens was likely grown in these gardens, including bitter manioc, corn, squash, beans, peppers, peanuts, pineapple, palm nuts and *Zamia* roots (Rouse 1992). Nowadays, one mango tree grows in Bambarra, but a local who grew up in St. Vincent commented on how barren Middle Caicos is and especially despised its lack of fruits.

Agricultural potential on Middle Caicos is low. Most soils have a calcium carbonate base, which lacks nutrients for plants, and clays to retain water. In the dry environment of these islands, the soil's inability to absorb and preserve water for drier periods is a significant disadvantage for agricultural practices. In contrast to most soils in these islands, the pockets of red clays do hold nutrients and water. These characteristics make these red clay soils highly desired as the agricultural potential of these soils is far better than those of surrounding soils.

That people were well aware of these soil qualities of local grounds is attested by the soil samples from three locations; the garden (or 'plaza II'), on the north side of the northern ridge between structure IV and V and inside structure IV. XRD analysis of samples from these locations, as mentioned, indicates a pattern different from the surrounding soils or the red clay pocket. Quartz percentages of these samples are 4.8%, 10.9% and 29.5%, respectively. These numbers are much larger than the percentages from the other locations within and outside the site, but significantly lower than the 'pure' red clay sample (63.2%) discussed previously. Furthermore, hematite or iron oxide, so characteristic of these red clays, is totally absent. In conclusion, these samples are between the two extremes that occur in the natural environment, namely predominantly calcite with very little (<3%) quartz and red clays that consist of quartz, hematite and some clays.

This difference between these three locations and the ‘normal’ availability of quartz suggests that soils were moved around. Quartz is non-local and only found in the red clays. Furthermore, particle size is small, as it is transported by air to these islands. The small size of the quartz particles makes it impossible to select these particles from the matrix of the red clays. These red clays, locally known as pineapple soils, are rich in nutrients and specific plants grown extremely well here. In the past, people collected these nutrient-rich soils and distributed them in the gardens. Hence, the presence of quartz in these three locations is the result of enrichment of local soils with red clay. People actively moved richer soils to the east and north side of the site to increase the quality of the gardens.

Furthermore, the small quartz particles retain water and prevent immediate leaching of water and nutrients during rain (John Jaeger, personal communication 2012). Water attaches to the small particles of quartz in a similar way as it does clay. In a hot and dry environment like MC-6, adding small quartz particles to the soils might have made a valuable difference in times of a drought. Besides the nutrients, the capacity of these red soils to retain water after rain increases the success of harvest.

The absence of hematite is another line of evidence that these soils were added for agricultural purposes. Hematite is an iron oxide (Fe_2O_3) and comprises 36.8% of the total sample of red clay and causes the red color of this soil. Hematite does not leach from the soil and the red color remains over time. However, when organic materials are mixed with these hematite-rich soils, a chemical reaction from Fe^{3+} to Fe^{2+} is initiated. In contrast to Fe^{3+}, Fe^{2+} does leach from the soil and disappears over time (Jonathan Martin, personal communication 2012). The lack of hematite in the 'garden soils' around MC-6 is caused by people trying to enrich these soils with organic materials, changing its chemical composition and ultimately causing iron to leach from the soil.

A final line of evidence that these soil relocation practices are meaningful and purposeful is that quartz is restricted to certain areas of the site. A possible explanation for this localized occurrence is that the tested locations are local deposits of the red clay. Yet, the 'garden area' or plaza II is flat and the midden area is raised, whereas these local pockets of red clay accumulate in depressions in the environment. Furthermore, quartz percentages from inside structure IV and from the location in between structure IV and V are very high, whereas the sample from the midden area just north of structure IV yields only 1.9% of quartz. This sample is located in closer proximity to structure IV (5 m) than the sample between IV and V (34 m).[18] The difference could be the result of a depression in the pre-MC-6 environment that cannot be observed nowadays, as the bedrock inside structure IV is 60 cm lower than the bedrock beneath the midden area, but these samples are from the northern part of the site which Sullivan (1981) interpreted as garden areas. Hence, the difference in hematite content between the natural red clay samples with high quartz content within the site, basically restricted to areas designated as garden areas, is evidence that people consciously moved and altered soils to increase production and overcome the challenges that are posed by natural soils surrounding the area. Although the movement of soil might seem an extreme practice, Roth (2002) showed that the central

[18] This distance is measured from GPS points taken in the field. The GPS used in the field often had an error margin of approximately 4 m, although the points of structure IV and the midden area were taken over longer periods of time to reduce that margin and, therefore, are more reliable.

plaza was made of soil from the salina and people living at MC-6 did transport and deposit soils elsewhere at MC-6.

Besides the possible lack of sufficient fresh water, crops grown near the salina must have been salt tolerant. The constant trade wind still blows salt onto the site and crops that cannot stand saline conditions will not last. Certain species, such as peanuts, cassava, corn and peppers are all sensitive to salt according to the Food and Agriculture Organization of the United Nations (FAO 2012). Although corn was grown along the road from Bambarra to Lorimers on Middle Caicos, indicating that salt does not completely restrict this crop from growing here, conditions are not ideal.

Despite the lack of good soils, agricultural production is still possible. Conditions on Middle Caicos are far from ideal to produce vast quantities of agricultural products, but local needs can be met. Making a living from agricultural products is possible, but substantial time and labor are necessary. Yields from local gardens, therefore, were likely for local consumption only and were not produced for export to larger population centers. Production for export requires too much energy investment to make it worthwhile.

Cotton, on the other hand, is very tolerant of salt and grows extremely well in saline conditions. Furthermore, cotton does not require nutrient rich soils and only needs minimal amounts of water. Actually, in the period after germination, particularly during the time that the cotton bolls are exposed, rain has a detrimental effect on the quality of cotton. The dry climate of Middle Caicos is extremely well suited for the production of cotton, whereas people have severe difficulties in growing other crops in these regions.[19]

Besides preferential natural conditions, other evidence suggests that cotton was grown. Nowadays, wild cotton still grows just east of the site near the edge of the salina. The location of these plants is important. The seeds for these plants could have been blown over from adjacent historic plantations, but cotton plants would then also be expected at the edge of Armstrong Pond and other more open environments for example. Except for this location, no cotton was observed during my fieldwork. Furthermore, the location where the plants grow is exactly the garden area identified by Keegan (2007), who reports that these plants have been observed in this location in the past 30 years with no evidence of human cultivation. This seems hardly a coincidence.

Figure 7-16. Cotton growing on the edge of the pond. Multiple plants were scattered in the area to the east of the central plaza at MC-6.

[19] See Appendix F for contemporary climatic data that combines temperature and precipitation. The Turks & Caicos Islands stand out as hot and dry environments, even in relation to other Caribbean regions.

Columbus was gifted enormous quantities of cotton when he entered the Bahamian archipelago (Dunn and Kelley 1989). Although spindle whorls are good archaeological indicators of cotton production, these artifacts are rarely encountered in archaeological sites in the region. Except of a study on eastern Puerto Rico, where Torres and Carlson (2011) found a large quantity of spindle whorls from pre-colonial archaeological sites, few archaeological indicators of a fiber industry are found. The contradiction between ethnohistorical documents mentioning the importance of cotton and the absence of archaeological indicators at MC-6 could be a product of the use of different, perishable materials or a completely different set of artifacts. Another possible explanation is that these practices were restricted to certain areas within the site that have not been excavated. Other artifacts used in the processing of cotton are needles, for weaving purposes. The needles discussed above in relation to basketry could also have been used for cotton. The same holds true for fish bones as tools for these practices. Finally, the c-shaped net weights could also be used as spacers for weaving and basketry, as they lack sharp edges and would not cut the fiber.[20]

Despite the lack of direct evidence, the formal layout of the garden, the significant investment of energy in clearing the area of stones and adding soils from elsewhere, material evidence of formalized tools for gardening purposes, beneficial environmental circumstances and current cotton plants at the site, all argue that gardening practices did not involve a mundane crop at MC-6. Rather, the special qualities of the site and the gardens suggest that an important crop was grown in large quantities at the site. This crop was, most likely, cotton.

---

[20] These artifacts are found at other sites in the region, but their function is unclear. Another possibility is that these ‘artifacts’ are by-products of tool production and are not tools in and of themselves.

7.8 Material Conditions of MC-6

Practices involved in the exploitation and production of salt, fish and cotton are restricted by very specific material boundaries. While other practices can be performed on almost a daily basis throughout the year, the practices in these major economies at MC-6 cannot. The taskscapes of these individual resources have material restrictions that are imposed on people's practices, starting with salt.

Salt production is relatively straightforward. Available salt is scraped from the surface of the salt pond, collected in larger piles and transported to the site. A taskscape of salt production is small as few practices are incorporated into this process. However, the production process is restricted by one material condition, namely the availability of salt. People can manage Armstrong Pond to a certain degree, and they did by placing alignments that direct the influx of fresh water, but they are still dependent upon the presence of favorable conditions for solar evaporation and natural salt production. Although relatively simple, the taskscape of salt production is bounded by salt itself.

Hence, practices within the production process are dependent on the availability of salt at the edges of Armstrong Pond. Most factors that determine the rate of production remain relative constants, such as the salinity of source water, depth of the pond, surface area, and wind. Two factors, however, are variable; solar energy and precipitation. Throughout the year, solar energy and precipitation differ and strictly control the availability of salt. In order for salt to crystalize at Armstrong Pond, solar energy needs to be high and precipitation needs to be low. These two factors form the material boundary for a taskscape of salt.

Two times during the year, these conditions occur (Sears and Sullivan 1978). At the end of the dry season, in the months April and May, lack of rainfall and increased solar energy after winter are conducive to the formation of salt crystals. Rains dilute the salinity levels in the pond, but also decrease the temperature of the water and cloud cover reduces solar energy, terminating salt production. In June, the rains disappear and Middle Caicos is dry again. Solar energy is highest in this period and, at Middle Caicos, capable of compensating for the loss of salinity due to dilution by rain water. In addition, solar energy is highest during the day and crystals are mostly produced during midday. Sullivan (1981) observed a second period of salt production, namely four weeks in July and August. Afterward, solar energy decreases again and rainstorms occur in association with hurricanes. According to Sullivan (1981), the four week period in July and August is the high season for salt production.

Fish is available year-round on Middle Caicos. The Caicos Bank is an incredible marine resource that constantly harbors many resources. However, species do vary through time and shifts in availability do occur. Not all species occupy the flats throughout the year. Other species are available year-round, but have peaks in certain months. These periodic changes in fish are material boundaries that restrict fishing practices for certain species and are dependent on spawning seasons and water temperature.

At MC-6, zooarchaeological data from my 2010 excavations suggests that people fished very specifically. The data from the midden area and inside structure IV, based on weight, yielded 28.0% *Albula vulpes* and 31.9% Acintopterygii. All other fish were 3.0% or less based on weight. The high percentage of *Albula vulpes,* commonly known as bonefish, suggests that many of the specimens identified to the family level are, in fact, bonefish as well. These quantities are consistent with previous analysis at the site by O'Day (2002).

Today, bonefishing is very popular in the Bahamas and tourists spend their holidays fishing for this species. However, bonefish are not eaten and only caught, because they are difficult to catch and struggle when hooked on a line. Most people do not like the taste of bonefish and it is common practice to release the fish. Even in other prehistoric Caribbean sites, bonefish is not a common food. The people at MC-6 did eat the fish and specifically targeted this species. This might have had two reasons. First, bonefish feed in small schools on invertebrates in shallow waters, which makes capture by net efficient. Moreover, bonefish is a ‘white meat’ fish that is very lean and most lipids are located in the liver (Murchie et al. 2010). After cleaning out the viscera, most lipids are extracted. ‘Oily’ fish have lipids throughout their body (the white lines, for example, in salmon, tuna or eel). The lack of oils facilitates salting practices, because lipids are difficult to extract and there is a higher chance of spoilage. This is why cod, another lean ‘white meat’ fish, is often used for salting purposes as well.

Bonefish are available year-round, but local fishing guides point to March, April and May as the high season. The shallow waters of the banks are too warm in June, July and August and the fish migrate to deeper waters. However, bonefish can still be caught during these months, as long as fishing happens early in the morning. The water cools down enough at night for the fish to reenter the flats and feed on these shallow banks. If fishing happens early, then bonefish season stretches from late spring to early summer.

Although not as restrictive as the material conditions for salt production, fishing for bonefish is still dependent on periodically shifting circumstances. The archaeological record indicates a high preference for bonefish, which has a high season between March and August. This strongly suggests that fishing practices mainly took place during that same period. Although fishing for bonefish could have occurred in other months as well, the revenues would be significantly lower per invested time.

Considering salt production, cotton production and fishing, the taskscape for cotton production is the most complex of the three. To produce this crop, multiple steps of preparation and maintenance are necessary. Cotton production forms part of a delayed reciprocal system where investments are made and revenues are collected much later. These practices involve tilling, planting, maintaining and harvesting the crop. Success of cotton production is also restricted by material conditions and certain qualities determine when these practices take place. Cotton seeds only germinate and grow when soil temperatures are consistently above 60 degrees. After germination, the cotton plant grows for two months before it forms flowers. The flowers last for three weeks then fall, leaving a green pod behind. This pod is the cotton boll, which produces the fibers after maturation. These bolls are open for about six weeks and harvest needs to take place before the quality diminishes or rains color it yellow and knock it to the ground (Cotton Counts 2012; Yafa 2005).

On Middle Caicos, temperature of the soil is not a limiting factor and is above the minimum temperature year-round. However, fresh water is scarce and a limiting factor for cotton production. Germination requires water and droughts delay the growth cycle. After germination, however, rain showers are unwelcome and potentially ruin harvests.

Rains, therefore, are essential, but only at specific times. Hence, tilling and planting need to occur before the rainy season starts in May (Yafa 2005).

Although in most subtropical and tropical climates cotton production is possible year-round, MC-6's local cycle is very time specific. The material conditions, specifically the availability of water, determine when cotton is grown. Because tilling, planting and harvesting are all practices that are dependent upon the growth cycle of cotton, these practices are structured by the availability of water. In order to maximize production, all practices must be performed in relation to the rains in May. Tilling and planting happens just before the rains come, and 3-4 months later harvest takes place. If germination occurs in the middle of May, then tilling and planting occurs in March and April and harvest is done at the end of August, September and October.

7.9 Seasonality

Practices involved in the exploitation of salt, fish and cotton are strictly bounded by the changing conditions of the material world according to the seasons. All three resources are not homogenously distributed throughout the year and are more available at certain times than others. MC-6 spatially concentrates access to these three resources, but every resource has its own time of the year. Practices in the taskscape of salt are condensed at the end of the dry season and at the height of summer; fishing mostly takes place between May and August; practices involved in cotton production are concentrated in February to March and August to October. Seasonality is the decisive material condition that structures human practices in a yearly cycle.

It has to be emphasized here that seasonality is not a 'natural given,' a condition that is objective and omnipresent. Seasonality is experienced by people through practices that are time-specific. The rhythm of the seasons determines what people can do and what is possible in the world, guiding actions and performances. If people want to exploit salt at MC-6, then they are bounded to the times when it is available. These periods when salt is available become important, only because people have to change their daily activities. However, if salt was not a desired product and demand was low, people would have neglected this material and focused on something else. Seasonality, as a concept of different times of the year, is a direct product of practices that are dependent upon these changes. As long as these changes affect daily life, even in the smallest of ways, people will differentiate and notice these changes. It all depends if these material conditions alter what people do.

The standard differentiation, however, into four seasons had no repercussions for daily life in the prehistoric Caribbean. The changes between spring, summer, autumn and winter are strongly dependent on weather changes, especially in temperature, in the Western world. In most of the northern hemisphere, these changes influence agricultural cycles and, therefore, people's practices. These Western notions have little to do with material conditions and cycles in the Caribbean, because these drastic changes in temperature simply do not occur. On Middle Caicos, temperatures are relatively constant throughout the year and it is extremely doubtful that the four seasons were as important in the past as they are in the Western world today.

Seasonal differentiation in the Caribbean is not dependent on change in temperatures as much as it is on changes in precipitation. Whereas the temperature remains relatively constant throughout the year, precipitation is distributed disproportionately. Most of the year is dry, but rains start in May and drastically change the weather pattern. In addition, hurricane season lasts from the beginning of June until

October and immediately follows the onset of rains. Even though weather patterns differ between regions and even islands, this general pattern of increased precipitation starting in May and subsequent possibility of tropical depressions and hurricanes is experienced throughout the Caribbean region. The distinction between the wet and dry season is of major importance throughout the circum-Caribbean region.

Returning to MC-6's past, this seasonal differentiation between the dry and the wet seasons must have been part of the local economy. Salt is available during a couple of weeks before the wet season starts and then it takes a couple of months for Armstrong Pond to recuperate from the large influx of fresh water. The taskscape of cotton is completely dependent on the rains and practices are oriented toward the time when the rains start. Tilling and planting occurs in time for the first rain, so the available fresh water can be utilized maximally. Because of this timing in relation to the first rains, harvest is indirectly dependent upon the wet season as well. Practices involved in both economic resources are time sensitive in relation to the start of the wet season. Hence, the wet season affected past practices and structured how people organized their economy. From a practice-oriented approach, then, it must be acknowledged that this change was considered important and provided a framework of reference for future practices.

In summary, a change in practices is accompanied by a change in precipitation. The availability of the three major economic resources at MC-6 is highly variable and dependent on seasonal weather conditions. Precipitation brings a structural material condition that people must adhere to and observe if they want to economically focus on all of these resources. In order to exploit salt and cotton, the start of the rains in May is a vital moment within both production cycles. The distinction between the wet and dry season does not emanate out of the presence or absence of specific resources and a change in precipitation, but emerges out of the change in people's practices that engage with these resources. The seasonal difference between wet and dry is an experienced and practiced distinction, a distinction that is grounded in past practices of people living at MC-6. Therefore, the perspective outlined above approaches indigenous categories of seasonal variation, rather than a mere projection of contemporary models into the past.

7.10 Temporality

The seasonal differentiation in practices and the repetitive yearly cycles underline their temporal character. People exploiting the salt resources at the end of the dry season are aware of the second opportunity they will have in the summer and tilling and planting practices of cotton are completely oriented to the harvest later that year. These practices and cycles are known to people because of the experiences in the past. People are knowledgeable about these repetitive structures, because of a long history of dwelling at MC-6 and other places where these resources are extracted. Temporalities of these taskscapes are constantly attended to and people are managing and planning when to start certain practices and stop others.

Material conditions of the environment dictate when salt, fish and cotton are available. Because people at MC-6 chose to exploit these resources, a yearly cycle of related practices can be reconstructed that is based on these material conditions of the environment. During the months of February, March and April, people tilled the soil and planted seeds. Everything related to cotton production is prepared in expectation of the coming rains that are needed to produce the plant. At first, the garden needs a lot of work and everything needs to be cleaned, but after the seeds are planted, things are quiet. At the moment that the cotton planting becomes less demanding, larger groups of bonefish start to appear on the flats. Fishing practices are much more successful than in previous months and many more fish are caught per trip. At the same time, salt crystalizes at the edge of the pond and can be harvested. When the rains start in May and June, life is relatively quiet. Fishing revenues are still high, as bonefish occupy the flats in massive quantities, but gardens need only little maintenance and salt is not produced at the moment. Not coincidentally, this period of respite from terrestrial endeavors, in which the people of MC-6 engaged primarily in work on the open seas, was when mosquitos rule the island.

In July, the weather is drier, except for the occasional hurricane or tropical depression. If fishing happens in the early morning, bonefish are still plentiful. Furthermore, Armstrong Pond starts to produce salt again, now in even larger quantities then before. To maximize production, all freshly produced salt needs to be extracted and transported away from the salina. All attention is directed to the production of new salt, rather than further drying out the already produced salts. Cotton plants are flowering, but do not require attention as of yet.

At the end of August, solar energy diminishes and salt production comes to a halt. At this moment, the cotton bolls are open and the fibers can be collected. The timing of the harvest, of course, is dependent upon how fast the cotton grew over the summer and if tropical depressions or hurricanes are threatening the harvest. The period in which harvest takes place can extend until October. The bolls are harvested and stored to protect them from rains or other misfortunes that ruin their quality.

Between October and April, no economic practices involved in the production of salt or cotton occurs and bonefish are likely caught only in small quantities. The dry season is perfect for other activities, such as production of pottery, manufacturing and repairing of fishing nets, (re)building alignments that direct fresh water into Armstrong Pond or constructing the road. Pottery production is also ideal during this period, because sudden rains can totally destroy all pots and these chances are lowest during the dry season. Other practices, including the production of wooden artifacts and shell tools as described above, take place during this relatively slow period as well.

Finally, the risk of hurricanes or tropical depressions is lowest between the months of October and April. October is often avoided by sailors in the region, because winds are variable, but the lack of wind might not have been a significant factor for people who moved on the ocean by manual power (paddling) instead of than wind energy. MC-6's economy was based upon export of local products to other places. Long distance travels and exchange is preferred during these months. Salted fish lasts for at least a year and can still be moved within this time period. Voyages last multiple days and products in the canoe are worth a substantial amount. It is foolish to risk losing all your wealth to weather conditions, when these are predictable and can be avoided. This quiet period of activities at MC-6 coincides with the best period for long duration exchanges and it is likely that people plan these voyages for months in which the water is safe.

It is obvious that the decisions for these particular economic practices, involving the economic exploitation of salt, fish and cotton, are far from haphazard, but form a productive yearly cycle in which designated seasonal activities succeed each other.

Throughout the year, the economy changes and attention is constantly directed to the resources that are available at time-specific intervals. The combination of salt, fish and cotton is not only chosen because these products are scarce and in high demand, but also because the exploitation of both resources happens at different months and taskscapes of these resources are compatible with each other. If both the high season for cotton and salt, for example, overlapped, decisions would have to be made and labor would have to be divided. As it stands, all available labor can be employed fully on one resource at a time and maximize revenue. Furthermore, these three resources leave a void from October to March, which is the perfect time to exchange these products overseas. In summary, the four taskscapes, including salt and cotton production, fishing and long-distance exchange, constitute a highly compatible yearly cycle in which people can fully exploit the seasonal heights of valued products and opportunities.

7.11 A Caribbean Economy of Substances

So far, two sets of relationships between taskscapes of salt, cotton and fish have been established. First, all these taskscapes are spatially concentrated at MC-6. Specific environmental conditions at the site amalgamate these resources at a central material point in the landscape. The second set is temporal, as these taskscapes are compatible with one another. Repetitive yearly cycles emanate from season specific abundances of these resources. Hence, relationships are established between people, their environment and their yearly cycle. However, if this is truly an economy of substances (Thomas 1996, 1999), one last set of relationships must be explored to fully understand how people engage with their lived-in world, namely objects.

Salt is an object that is consumed and used as a preservative. Salt is a dietary necessity, especially in the tropical climate of the Caribbean where perspiration and secretion of salt requires compensation. For most places within the archipelago, the sea is an adequate source. However, further inland, especially in the Greater Antilles, salt is scarce. Besides salt, a stable resource of proteins is also lacking in these regions, because large terrestrial fauna are absent. In the Caribbean, fish does not last longer than a week, even if kept in a cool and dry environment (Caribbean Commission 1952). The rapid decay of protein sources and distance between the sea and inland settlements both restrict day-to-day transport of goods and people, but salted fish can overcome these problems and would be a perfect adaptation to these circumstances. Salted fish cures and can be accumulated and shipped in bulk. Furthermore, salted fish overcomes the lack of protein *and* salt in these inland regions at the same time, maximizing its potential.

Yet, because fish decays so quickly, salt must be present when fish are caught and processed. The exploitation of fish has no function with respect to the export of fish if salt is absent and the fish is left to decay. In the case of MC-6, fishing for export is useless after all salt is exported and Armstrong Pond is no longer producing. The material qualities of fish demand the presence of salt, if this resource is to be used beyond local consumption. Fishing practices have to be adjusted to the production of salt. The taskscape of fish is directly related to the taskscape of salt.

It is, therefore, not surprising to see that fishing practices mainly target a fish (bonefish) that is abundant on the Caicos Bank during the same season as salt production. Other fish have different seasons or live in different environments, such as reef and pelagic fish. The obvious preference of bonefish in the sample of MC-6 is as much the result of cultural practices and preferences as it is of material conditions posed by the availability of salt and fish species. The local ‘diet’ resembles a negotiation between the material world and the intentions of people. Salt and fish, therefore, comprise one taskscape, as both practices are interdependent.

The height of the salt season, between July and August, does not coincide with the season of the bonefish, unless fishing happens early in the morning. This is not out of the realm of possibility. Salt raking is labor intensive and physically demanding work and often practiced during the cool of the night (Bitterman 2010; Ewald 1985; Kurlansky 2003; McKillop 2002). Freshly produced salt is extracted every day when the sun goes down and the heat subsides. Whereas salt was raked in the late evening and early night, the few hours before sunrise would have been used to catch bonefish on the flats. This division of labor throughout the day avoids the heat and the afternoons could be used to rest and enjoy the shade and breeze.

Cotton also plays an essential role in the network of related practices. First, the tilling of the soil and the planting of the seeds cannot take place at the same time when salt is available, i.e. when salt is the main economic focus. To maximize the production of salt, all attention and labor is devoted to this product. Tilling and planting practices are directly related to salt production and, hence, fishing practices. The same holds true for harvest, which must be after the salt production halts. Both cotton and salt are highly valued products, so to maximize benefits both practices need to occur at different times. Although distinct, the practices are adjusted to each other.

Moreover, cotton is indirectly a critical product in the exploitation of salt. Salt's importance at MC-6 is directly related to fishing and the abundance of marine resources on the Caicos Bank. These fish were likely caught with nets, which are made of cotton. So, in order to maximize the profits from salt, fishing efficiency must be maximized. To maximize fishing practices, cotton needs to be produced. A cycle of codependence between each of these products emerges. To use salt, people need to fish and to fish, people need to grow cotton. To exploit one, people need all three. This relational property between cotton and the other two resources is another suggestion that supports the hypothesis that people at MC-6 produced cotton.

This relational perspective between all these practices is missed when objects are absent in the argument. The network of codependent practices emanates from the uses of tools made of specific materials. Cotton nets are as important as the fish and the salt in this economy. The movement of salt from the salt pond to the site and beyond might have happened in cotton bags to facilitate transport. Not the practices *per se*, but the crucial role of objects and how objects structure daily practices truly produces the links between these acts of dwelling. The circulation of salt, fish and cotton creates local identities and histories and forms an economy of substances (Thomas 1996, 1999).

7.12 The Temporality of a Caribbean Taskscape

The temporality of the taskscape of MC-6 involves much more than the independent succession of certain practices per time of year. Although separated by time, these practices are constantly linked through the perception of people. The relationships between these different resources and activities involved in the exploitation are founded in one another. The tilling of the soil and the planting of the seeds is done in anticipation of the harvest, which produces cotton. The cotton is produced with a very specific goal in mind, namely the export of the raw product, but also the ability to make nets. The nets are made with a future practice in mind as well, namely the fishing of bonefish on the flats. And again, the fishing is only done in reference to the presence of salt.

Practices associated with salt, cotton and fish are dependent upon one another and related through time, space and material conditions. Hence, they comprise one total taskscape in which every practice occurs only in reference to another. Isolated practices, happening without any relation to other activities, do not occur. The economy of MC-6 is incredibly focused and adapted to seasonal changes, regional demands and the availability of products that are necessary for the exploitation of its main resources. The temporality of the prehistoric taskscape of MC-6 comprises a yearly cycle of strongly related endeavors that all work together.

This taskscape is a concept that is founded on practices, local perceptions of the environment and how people relate to their world. This practice-oriented relational approach approximates indigenous creations of local space and time, because the foundation of these creations is founded in past practices rather than in contemporary perspectives about the past. This perspective also emphasizes how all practices are future-oriented and people consciously managed and planned their economic behaviors in respect to time.

This future-oriented perception of people at MC-6 and its taskscape is also materialized in the meticulous and obsessive efforts of local people to track time. The alignments on the central plaza of MC-6 point to celestial bodies that mark very specific moments in time. Sirius, Vega, Altair, Fomalheut, Alpha Crucis, Orion and the summer solstice are the main bodies to which the alignments point. All these stars and constellations move through the sky and appear and disappear at very regular intervals. These intervals are important.

Sirius is the brightest star in the sky and is visible most of the year, except for a ten week hiatus. Between the middle of April and the Summer Solstice, Sirius leaves the sky. Vega is part of the constellation Lyra and the fifth brightest star in the night sky. Because of precession of the equinoxes, the term pole star, now referring to Polaris, changes over time and Vega will be the ‘pole star’ in about 12,000 years. Currently, Vega is known as one of the three stars that form the Summer Triangle. With Deneb and Altair, another star that is referenced by the alignments, the summer triangle is situated right above the sky in the northern hemisphere during summer. In spring, the triangle appears in the early morning and in autumn, it is still seen until November. The stars also appear at twilight dusk in middle to late June and at dusk and early evening at the end of summer. Fomalheut is visible low on the horizon during fall and early winter. Alpha Crucis is the brightest star in the constellation commonly known as the Southern Cross. It is visible year-round in the southern hemisphere, but only in winter and spring in the northern hemisphere. Procyon, is the eighth brightest star and forms, together with Betelgeuse and Sirius, the Winter Triangle. In March, Procyon is at its highest point and in June it sets not long after dark. Late winter through spring, the Winter Triangle is easiest to recognize (Earthsky 2012).

Orion is a very well-known constellation, commonly known as the Hunter. In native South American cosmologies this formation of stars is referred as a ‘one-legged man’ (Keegan and Carlson 2008:18). Betelgeuse, the star referenced by the alignments, Rigel and Bellatrix are all three incredibly bright stars, making Orion easy to recognize when it is in the night sky. However, in March Orion disappears to return in the sky in July. From July onwards, Orion rises into the sky until mid-September, when its sits at the center at dawn. In mid-December, Orion is in the middle of the sky during the night. These cycles through which Orion ‘travels’ are good indicators of solstices and the vernal equinox (Keegan and Carlson 2008).

The temporality of MC-6’s taskscape was strongly connected to these cycles of celestial bodies. The repetitive cycles of these stars were observed throughout the years and reference times that were important to people at MC-6. The alignments were not made to observe these important moments, but were a product of these observations. By materializing these points within the landscape with durable materials, people observed the movement of stars in more detail and predict when Orion would disappear from the sky or when Vega appeared. The alignments were the result of these observations and predictions. The structures at the central plaza were constructed to facilitate the tracking of time through these celestial bodies. Time was a construct of practice, rather than an arbitrary assignment of days, minutes and hours.

The meaning that these celestial bodies had at MC-6 have little to do with the four seasons, as discussed above, but much more with the distinction between the dry and the wet season and all its related practices. The Winter Triangle is high in the night sky when the conditions at sea are calm and risks are low for long-distance travelling. As soon as the Summer Triangle appears, the gardens need to be tilled and the seeds of cotton must be planted. When Orion slowly moves away and becomes invisible, practices need to focus on the production of salt and catching fish. This moment in

Orion's cycle also introduces the wet season and the start of the rains. When Orion is back and appears in July, the high season for salt production nears again. When Orion is near the center of the sky at dawn, cotton is ready to be harvested. In mid-December, at the winter solstice, there is still time to travel, but when Orion starts to descend again, long-distance voyages become less frequent as the soils for cotton harvest need to be tilled again.

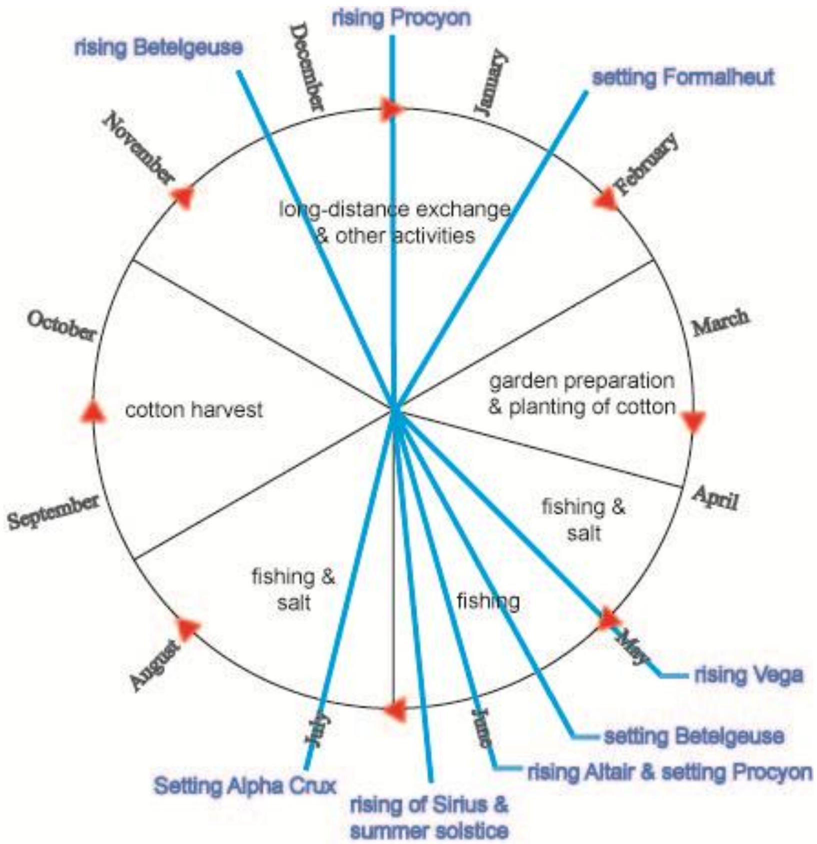


Figure 7-17. A calendar of yearly routines, celestial cycles in relation to the months

The temporality of this prehistoric Caribbean taskscape incorporates observations of celestial cycles in reference to local practices. The changes in the patterns of celestial bodies coincide with the changes in practices. The local correspondence of these economic and celestial cycles results in an emphasis on its importance and the construction of these alignments. This also means that people attend to the stars when they perform certain practices, including navigation to Hispaniola and back, and are constantly evaluating their position in reference to earthly practices and concerns. The economic activities are not only interdependent and synchronized, they also form a whole of practices that included observations of celestial bodies and physical movement in the landscape.

7.13 The Distinction Between Wet and Dry

This network of relations between economic practices, yearly cycles, exchange relations and movements of celestial bodies is too complex to be kept as a list, as Thomas (1996, 1999) rightfully points out. He argues that these networks are founded on and created through simplified structures from which people draw and gather knowledge while engaging with the world. For MC-6, this simplified structure seems to be based on a categorical distinction between wet and dry as abstract divisions. Wet and dry became conceptual instruments through which value was negotiated by the inhabitants living at MC-6. This distinction, as fundamental as the nature-culture dichotomy present in Western thought (Dwyer 1996; Latour 1993), organized people's local perception of the environment and practices.

Salt emerges from the water through evaporation and although salt can be tasted in seawater, it is invisible and only becomes apparent after crystallization. Sufficient evaporation only takes place in a hot and dry environment and the salt accrues at the edges where water and land meet. Cotton is extracted on the land and also thrives in dry and hot climates. Cotton needs to be planted when the soil is warm and requires a wet season after planting for germination. However, precipitation would ruin the harvest when the cotton is flowering and cotton bolls are maturing; the dryer the season, the better the quality of the cotton. Fish is obviously extracted from the sea, but fishing requires nets and canoes. Canoes and nets are both products from the dry land, but are used on the water. The fish are living in salty seawater and cannot survive in the dry environment, from which the tools that catch them are made. Salt and cotton are antagonistic to wet, as they are abundant in dry and hot environments. To the contrary, fish is antagonistic to dry and die when taken out of the water. Local people must have been aware of these relations.

Local economic practices constantly negotiate the boundary between wet and dry, possibly producing an objectified structure which guides other practices. An example is the construction of the central plaza. The soil in this part of the site is non-local and was extracted from the salina (Roth 2002). People moved into the water, extracted the sand, transported it to the site and deposited it there. Sand, a dry matter, is extracted from the water and placed onto the land. The movement of people and sand changes from wet to dry contexts. Sand could have been extracted from anywhere, but people intentionally chose the salina as the source. Although tenuous, this division of concepts might have emanated from the constant interaction between practices and these two conditions.

7.14 Conclusion

People are constantly confronted with a whole gamut of possibilities during day-to-day life. Yet, people prioritize certain practices over others and focus attention to specific resources while others are left aside. At MC-6, a multitude of practices is recognized in the archaeological record, but the exploitation of salt, fish and possibly cotton received most attention. These three resources have very particular yearly cycles that structure how people engage with these resources and determine when certain practices occur. This interaction between people and local resources produces multiple taskscapes surrounding these products.

This discussion also shows how local practices are all interrelated and comprise one comprehensive taskscape. Rather than identifying singular economic activities, the taskscape provides the methodological tool to understand how dissimilar practices form a whole of integrated activities. As people plan and anticipate the future, they act upon it. At MC-6, people combined multiple practices that together were both time and resource compatible. The times of exploitation were dissimilar, so that available labor did not have to be split between two activities, and products increased each other's success. Practices are the foundation of social life.

A theoretical combination of Ingold's (1993) taskscape and Thomas' (1996, 1999) economy of substances provides an excellent interpretive tool to move forward from identifying different practices and objects to a structure that guides decision-making processes in the past. Ingold (1993) emphasizes the importance of daily routines and the mundane, while Thomas (1996, 1999) argues for the crucial role objects play in this process. As a result, this Chapter shows how people's daily lives were structured by material conditions of the environment and how these restrictions changed the way people lived. People adapted to these physical restrictions and created a new framework of reference that guided their perception of the lived environment.

CHAPTER 8
MC-6 AND THE CIRCUM-CARIBBEAN REGION

Starting from the microscale, the previous chapter provided the basis for MC-6's significance. However, people living at MC-6 constantly referenced other people, times and places, while long-distance exchange partners in these other places referenced MC-6. The site does not exist in isolation, a social vacuum, disconnected from other people and places, but it is enmeshed in a large network of relations. It is essential to place MC-6 within this relational network, at a macroscale, to understand why local resources at MC-6 are of such importance. Although local practices are the basis for social life, these practices are intrinsically connected to larger structures and social networks. MC-6 has its own history and developed over time, different people visited or lived at the site and exchange partners changed. This chapter explores how values and meanings associated with MC-6 are constructed beyond the local milieu.

A number of characteristics are unique to MC-6; architectural alignments to the stars, stone structures, a constructed central plaza and brass artifacts are all uncommon in the prehistoric Caribbean archaeological record. In comparison to the larger region, MC-6 was special. Yet, ideological connotations connected to the alignments, stars, plaza and stone structures were part of larger social structures that extended beyond the boundaries of the site.

Ideological references emerge from people dwelling the landscape (De Certeau 1984; Ingold 1995, 2000; Morphy 1995). People at MC-6 created their environment through interaction, by engaging locally with the material world. Certain meanings were not imposed onto the landscape, as a superstructure 'on top of the natural conditions,' but rather performed practices produced these meanings. This entails that historical sequences of local practices constantly reproduced a framework of reference and over time certain associations were institutionalized and materialized at the site. MC-6's archaeological record is a product of the site's significance, a materialization of people's efforts to make this place into something special.

Hence, practices involved in the exploitation of the three resources discussed in Chapter 7, salt, fish and cotton, produced MC-6's macro-regional importance. It is, therefore, imperative to discuss how these local resources fit into a larger Caribbean economy. As mentioned before, the Caribbean region is diverse and environments differ throughout the region. Not all places are as suited for salt production as Middle Caicos, while agricultural potential is higher in other regions. MC-6 is exceptional because the unique resources at the site demanded very specialized practices in comparison with practices elsewhere in the region. A variety of highly localized resources will require locating specific practices and ultimately result in different taskscapes and temporalities.

One reflection is needed before attention is directed to the macroscale. In this chapter, historical sources are used in the argument, in particular, sources that describe situations immediately after 1492. Although historical documents must always be used with caution and cannot be simply projected into the past (Maclachlan and Keegan 1990), multiple reasons warrant their use here. First, radiocarbon dates from the site overlap with historical dates. Second, early historical documents describe local economies that were little affected by European contact. Large scale resource production during early historical times is most likely the result of locally institutionalized economies rather than the product of limited interaction with Europeans. These documents do not describe the effective European rule in the region, but illustrate a sophisticated pre-colonial economy of products produced at a large scale meant for export.

8.1 Salt

Overall, the circum-Caribbean region is ideal for solar evaporation and the large-scale production of salt. A constant breeze, hot weather, high solar energy, high temperature of sea water are all factors that create perfect conditions for salt production. However, not all locations produce salt. For example, many volcanic islands have very steep cliffs that descend into the sea and provide little space for the flat bays or lagoons where salt ponds occur. Furthermore, certain environmental features, such as mountains, attract rain and have micro-climates that are detrimental to salt production. Finally, dry and wet seasons are not synchronized across the region and certain places are more often hit by hurricanes and tropical depressions than others.[1] This section will explore the locations of salt production in the region, working from recent times back into the past.

Large commercial evaporation ponds are located along the north coast of Venezuela and Colombia, Mexico and the Bahamas (Great Inagua). The salt production of these facilities is impressive; saltworks in Yucatán produce approximately 500,000 tons a year (ISYSA 2012) and Morton's plant on Great Inagua produces over 1 million tons a year (Sealey 2006). Large evaporation ponds are filled by pumps and mountains of salt are collected by heavy machinery. Scale is the key to these modern industries. Although the expanse of these enterprises cannot be projected into the past, they

[1] See Appendix E and F. Appendix E shows differences in sea surface temperature in the circum-Caribbean region. Appendix F shows differences in precipitation and temperature.

indicate that certain places in the landscape, such as Yucatán and Great Inagua, have ideal conditions for the production of this resource.

Smaller scale production also takes place, mostly for local consumption. One of the larger facilities is located on the southwestern tip of Puerto Rico, Cabo Rojo. Other locations, like for example near Fort Liberté and between Fort Liberté and Cap Haitien[2], Haiti, produce salt as well on a very small scale. On the shores of Guantanamo Bay, Cuba, salt has been a major economic resource for some time now (Murphy 1953). [3] These small scale production locations show that salt is still produced throughout the region.

The low price of salt these days makes it impossible to generate enough money on only small-scale production. However, in the recent past and historical times, multiple other locations throughout the region produced salt. Salt was Anguilla's main industry until the 1980s but disappeared when tourism increased and salt prices dropped. Salt ponds and lagoons dominate the island, especially in the southeast part. Similarly, St. Maarten, St. Eustatius, Curaçao and Aruba were used by the Dutch for salt. The lack of appropriate climatic conditions and sources of salt in the Netherlands led the Dutch to explore this economy in the Caribbean (Kurlansky 2003). Also, Grand Turk and Salt Cay were important places for salt production in historical times. As mentioned in Chapter 2, Turks salt was praised for its high quality and often specifically requested for curing meats. How important and valuable this resource was between the 17th and 19th century is attested to by voyages of over 1,300 km that Bermudians undertook from their home island to Grand Turk to exploit this resource every year. Salt

[2] Salt is exploited on the coast at the site of La Navidad, Haiti. This location was also the seat of an important chief in the region. This site, excavated by Deagan (2004), is also known as En Bas Saline.
[3] These locations are easy recognizable from satellite imagery.

production was only moved from these islands to Great Inagua, because the sea surrounding the islands is too shallow for large vessels that shipped the harvested salt. Conditions on Great Inagua are less favorable than on Grand Turk, but the former can accommodate ships at a deep-water port. Annual production is still over 1 million tons.

It is often assumed that these historical examples are a product of European intervention. Local native peoples in the region were not interested in this resource, but after European contact the colonists realized the potential of the Caribbean climate and established this profitable industry. However, the potential power of salt was recognized at MC-6 in pre-colonial times. If people were aware of salt's power on Middle Caicos, then it is safe to assume that people living at other locations conducive for salt production might have focused on this resource too. These historic industries are very likely continuations of prehistoric economies. Rather than emphasizing the importance and knowledge of Europeans to exploit the Caribbean region best, the role of the native population should be acknowledged.

Two examples support this claim that most historical industries are continuations of prehistoric practices; Anguilla and southwestern Puerto Rico. Anguilla is situated in the northern Lesser Antilles and had a large salt industry until recently. The archaeological record shows a very different pattern on Anguilla than on other islands in its vicinity. First, habitation densities are very high on the island, especially in later periods. Second, 80% of the pottery has volcanic temper, which is non-local to this limestone island and these products had to be imported. Third, large sites, such as Rendezvous Bay and Sandy Ground, appear to be exclusive production sites of the highly valued calcirudite *zemis,* or idols. Yet the source of the calcirudite is located on

St. Maarten, just across the water but within sight of the beach on Anguilla (Crock 2000; Crock and Petersen 2004; Knippenberg 2006; Petersen and Crock 2001).

Anguilla is barren, has little fertile soil and fresh water is scarce. The one source for fresh water, Fountain Cavern, can be reached through a hole in the ground and a deep descent into the cave. Petroglyphs are evidence that people used this source in the past (Crock 2000; Crock and Petersen 2004). Only marine resources are abundant, with the Anguilla Bank located just to the south. Although these conditions are not advantageous for large scale agricultural production for export, most artifacts found on Anguilla were imported from adjacent islands. The question arises as to how people could afford to import goods without the potential to export and exchange. Although the calcirudite *zemis* were indeed exported, the question of why these had to be made on Anguilla and not near the source on St. Maarten remains unclear. How did this island become important, while local resources seem to be absent?

Crock (2000) and Crock and Petersen (2004) argue that Anguilla was a port of trade, a hub between the Lesser and Greater Antilles. The strategic exploitation of this physical location by chiefs was established as an intermediate place between these two interaction spheres. Marine resources on the Anguilla Bank were definitely exploited, but the main reason why these non-local products are all spatially concentrated on the island is the result of local entrepreneurs who successfully negotiated their physical position between two regions and institutionalized their social status as vital intermediates within a large exchange network. Ideological references to these local chiefs and Fountain Cavern attracted non-local goods to the island.

Early settlements and larger settlements in later times, however, are all located near saltponds (Crock 2000; Crock and Petersen 2004). The Rendezvous Bay site, for example, is located on a sand bar that separates a saltpond from the sea. The configuration of the sandbar has probably been reasonably stable, as radiocarbon dates shows occupation from around 500 C.E. onward (Crock and Petersen 2004). The large concentration of later sites, particularly in the southeast, coincides with an abundance of saltponds in that region. Based on settlement location, salt production must have been the main activity on Anguilla. The strong connection between this resource and the exact location of multiple sites is undeniable.

The second example is even more convincing. The paramount chief on Puerto Rico, Agueybana, lived near San Germán.[4] Between 1516 and 1520, Agueybana traded 729 fanegas or 84,000 kg of salt with the Spanish (Tanodi 2009:83). In other locations along the coast of this part of Puerto Rico, other chiefs also controlled saltworks, producing this resource and trading it with the Spanish. Salt clearly was a major industry. These early dates, within 20 years of first contact, suggest that the extent of this economy was not an exclusive result of European influence. During these first years, contact must have been superfluous and the Europeans did not make a strong impact on local economies. Also, it is doubtful that a production of more than 20,000 kg for export per year by one chief, i.e. enough to satisfy a European demand, without a long history of expertise and knowledge of salt production.

Salt was obviously important in the prehistoric Caribbean region. MC-6 and Anguilla both possess archaeological examples of high quality materials found in close association with salt ponds, whereas the example from Puerto Rico indicates how

[4] This example is also referenced in Chapters 2 and 4.

extensive this economy really was. This strongly suggests that other locations where conditions are favorable were exploited as well. A number of suggestions have been made where salt production might have been an important economy, including Anegada (Davis and Oldfield 2003), Martinique (Allaire 1991), Barbados (Drewett 2004) and the eastern part of Puerto Rico (Carlson et al. 2009). This economic emphasis on salt also directs attention to sites that were located behind salinas in the past, such as Anse à la Gourde on Guadeloupe (Hofman et al. 2001) or Giraudy on St. Lucia (Hofman et al. 2004), as these settlements might have been involved in the exploitation of this resource too.

The example from eastern Puerto Rico deserves more attention. The archaeological sites are not located next to a saltpond, but a mangrove bay where salinity levels were much higher than the surrounding sea. Instead of the normal 35 ppm, measurements from these bays yielded 80 ppm. Excavations yielded only ceramic vessels of very low quality. The most common vessel form is the open plates. This suggests that people collected the water from the bay and left the water to evaporate and produce salt. The lack of other artifacts in these archaeological contexts suggests that these artifacts were used for specific purposes. Finally, this example shows that salt-production sites do not always require a salt pond and other techniques were also used in the Caribbean region (Carlson et al. 2009).

As discussed in Chapter 4, these source areas do not produce the same salt. Some salt will have fewer impurities than others. Higher moisture levels and differences in grain size and color are also expected. Conditions in certain locations are more favorable than others. Middle Caicos stands out in this respect, as it is one of the few locations that has a second dry season in July and August (Sears and Sullivan 1978). Even Anguilla has wetter summer months than other times of the year and salt production in Yucatan, Mexico, is also restricted to the end of the dry season in April and May (Andrews 1983; Ewald 1985). But in the Turks & Caicos Islands, dry weather returns after the rains in May and June, creating ideal conditions for a second period of salt production. At the time that solar energy is highest, most salt works in the circum-Caribbean area are subject to the detrimental effects of precipitation. Yet, Armstrong Pond has its yearly high in salt production. The timing could have been crucial, as MC-6 could provide salt to other regions when other sites stopped producing. Another benefit is that Armstrong Pond has higher production yields, as salt is produced during a longer period of time and provided an advantage over many other salt producing sites in the region.

Regarding the inalienability of certain salts, the production process described in Chapter 7 could be of importance. As mentioned, salt may have been placed in baskets to dry. These baskets, then, leave an impression of the weaving on the dried salt. This impression became a symbol of the wealth of the salt and its producer. The different designs, as recognized on griddles (Berman and Hutcheson 2000; Hutcheson 1999, in press), might represent different families or other social groups that controlled salt resources. The design is an index of its original location of production, the control over salt, the social identity of its owners and finally the power of this resource. In other words, the material impression on salt functioned as an index of its maker, its place and social wealth. These specific types of weaving became brands and symbolize the different groups, communicating their identity along with the exchange of salt.

Subsequently, these designs are placed on other malleable products, such as pottery, to reaffirm the status of these symbols in association with certain social groups. The design changes the material world and creates an inalienable link between the salt, its maker and the place where it was produced.

The evidence above indicates that salt was an important resource in the Caribbean and that people were exploiting this resource throughout the region prior to the arrival of Europeans. Obviously, salt would only become important if there was a demand for this resource. The demand for salt was created through two processes. First, dietary requirements must be fulfilled, and in a Caribbean climate perspiration causes high amounts of salt to leave the body. Salt must be digested daily to keep up with this loss. However, dietary requirements can easily be met by adding sea water to the food. Even if salt is unavailable as a solid, sea water can always be obtained fairly easily on most Caribbean islands. Settlements are often located near the sea and the dietary requirement cannot function as the main reason for salt's importance in these locations. But even in the Caribbean, there are places that do not have access to salt. On the larger islands, inland settlements are located far from the sea and access to either salt or sea water must have been very difficult. At certain places on Hispaniola, the sea is over 100 km away. In addition to the distance, accentuated terrain hinders easy transport. Furthermore, the transport of sea water is unnecessarily heavy and difficult. The demand for salt in these settlements far from the sea must have been high and required the import of this valuable resource.

The second demand emanates from salt's capacity to display and negotiate positions of power through exchange and feasting. This social quality of salt attracted people to this resource and generated a local demand. The consequences of gaining power and status through exchange and gift giving of salted produce attracted people to this resource and increased their willingness to devote time and labor to its exploitation. People who could meet their dietary demand with salted sea water were possibly still part of large social networks of exchange, because their local access to salt for dietary needs did not restrict gift exchange of salted produce. Yet, with the extra impetus of a dietary need, obviously, salt exchange will be more successful. Coastal people could function as middle men, exchanging the salt from MC-6 with people in the interior. Although they did not need these items, they could trade with inland with people who did require the resource.

Outside of the immediate Caribbean region, salt would have been in even higher demands. Although many locations along the coast of the Caribbean Sea are conducive for salt production, the enormous hinterland often lacks good salt resources, creating a possible market for this product. Brine wells are absent in the Amazon basin and scarce in Mesoamerica, though large populations lived in these regions. Export of Caribbean salts to these regions is difficult, if not impossible, to determine, but the vast market for salt cannot be denied. The surplus of salt in the Caribbean region could have been exported to these mainland regions and traded for goods lacking on the islands.

An example is worth considering in this context. The Muisca of the Colombian highlands were known for their salt production through the boiling of brines from local wells, but also imported gold and cotton. The products were subsequently used to make export products again. The cotton was made into woven blankets and locally available copper was added to the gold, producing *tumbaga* or *guanín* (Kurella 1998; Peña 2008).

Other objects, such as Queen conch, tobacco, hayo (coca), yopo or cohoba, tobacco and exotic feathers, were imported, evidence of a large and elaborate network of exchange (Peña 2008). Despite the local availability of boiled and mined salt, sea salt was still imported and mainly used by elites (Oyuela-Caycedo personal communication 2009). Hence, products from the Caribbean, namely cotton, cohoba and sea salt, were in local demand, whereas Caribbean demands for *guanín*, green stone and feather could be supplied from this region. The Muisca might have been trading for products from the Caribbean islands.

One significant difference, however, exists between the mainland regions surrounding the Caribbean Sea and the Antilles in relation to dietary requirements and salt. On the mainland, part of this need can be compensated for by the consumption of animal meat. Meat contains salt and adding meats to the diet partially meets this requirement. Large land mammals are present on the mainland, but absent on the Antilles. Monkey, deer, capybara, coati, tapir and jaguar are large game that were caught and partially supplemented salt deficiencies in mainland regions. Although these animals were never a substantive part of the diet, people in the Caribbean required more salt than their mainland counterparts. Places like Hispaniola for example, therefore, needed this resource.

8.2 Fish

The lack of large land animals creates another resource demand, namely protein. Protein is a dietary requirement that needs to be satisfied. Fish and other marine resources, such as conch and turtle, are common Caribbean sources of protein. The archaeological record unequivocally illustrates that fish formed a significant part of the diet in many sites in the region (deFrance in press; LeFebvre et al. 2006; Newsom and

Wing 2004; Wing and Wing 2001). Initially, fish appear to be plentiful and a lack of proteins seems almost unimaginable. Prehistoric peoples in the Caribbean archipelago could easily meet local protein requirements through fishing practices.

This is, however, a complete misconception of fisheries in the Caribbean for multiple reasons. First, most fish have seasons and many species migrate or spawn at specific times. Fish is, therefore, not abundant year-round. Second, banks, coral reefs and open waters harbor vastly different species and determine which animals are present and which are not. Species are unevenly distributed across waters. Finally, fishing practices differ. Pelagic fishing on open water is more dangerous than fishing in a shallow enclosed bay, protected from waves and wind. Catching certain species involves more effort and risk than others. In sum, fish are heterogeneously distributed, depending on the time of the year and the local conditions of the sea.

In respect to fishing practices, banks are ideal. The shallow waters are calm and full of fish and other marine species, including conch. Hence, the risk is low and the rate of success is high. Some of the larger banks in the Caribbean are Little and Great Bahama Bank, Silver Bank, Caicos Bank, Sal Cay Bank, Anguilla Bank and Saba Bank. Other regions have shallow waters too, like southwest Cuba, the bank between Barbuda and Antigua, southwest Puerto Rico and the sea surrounding the Virgin Islands. Most of these banks and shallow seas are easily accessible from an island, but, for example, Silver Bank is more than 60 km north of the northeastern tip of Hispaniola.

So, the supply of proteins in the region is not just a given and people invested significant amounts of labor and time to overcome their need (Keegan et al. 2008). For example, the zooarchaeological record from Île à Rat (La Amiga) situated in the Baie de

L’Acul on the north coast of Haiti, as discussed in Chapter 6, shows signs of overexploitation of local resources. The average size of fishes in the sample is 1-2 kg, while a contemporaneous site on Grand Turk yielded bones of fishes between 5 and 20 kg. People living on Hispaniola were extracting too many resources, depleting the seas of larger fish. Fishing costs increased over time for similar return rates, making it more time-consuming and labor-intensive (Keegan et al. 2008). This suggests that demands for fish were high and people were forced to exploit less efficient sources, ultimately even engaging in long-distance voyages to Grand Turk (Carlson 1993, 1999). Access to fish, therefore, is challenging.

According to Columbus (Dunn and Kelley 1989; Keegan 2007), the interior of Hispaniola was the main location of large chiefdoms and population centers. There especially, away from the sea and with many mouths to feed, access to fish was restricted. In order to satisfy protein requirements in these interior regions, fish was transported from the coast to the hinterland. A significant amount of labor and time investment was needed to ensure a constant and stable import of proteins to these large population. Furthermore, transport of fish from the coast to the interior is hindered by processes of decay. This means that fish needed to be transported as soon as it was caught, reducing the efficiency and raising the costs. Without the ability to cure fish before transport, possibilities were severely limited.

The export of conch is a relatively easy. The conch industry was massive on the Turks & Caicos Islands and millions of pounds were exported to Haiti up to the late 1970s (Hesse and Hesse 1977). Conch preserves for six months after a relatively easy procedure. The extracted muscle is beaten to break the muscle fibers and left to dry on a rack. Three days in the sun is sufficient to completely dry the conch and preserve it. Furthermore, the taste of dried conch is stronger than fresh conch. Conch has the advantage that salt is not needed to preserve this source of protein.

The exchange of conch, however, also has a disadvantage. As discussed in Chapter 3, the ‘double gift’ of salted fish is an even better solution for the problems in the interior of Puerto Rico, Jamaica and especially Cuba and Hispaniola. These inland locations lacked salt and fish, so the demand for both was high. Furthermore, adding salt to the fish increases the efficiency of fishing practices (more fish can be caught without the possibility of losing the goods to decay) and transportation (fish can be accumulated and all transported at once in bulk, rather than in constant small transports). The combination of fish and salt suits these situations.

Also, the fact that both resources are dietary requirements increases the ability of donors (traders) of salted fish to establish debts with people in the interior. Having access to both salt and fish becomes a huge source of power. The supply is completely in the hands of a few, while large populations demand it daily. Unequal distribution of these two resources produces strong imbalances of power. The negotiation position of people in the interior is relatively weak, because they absolutely need these resources, whereas the people controlling the salt and salted fish can relatively easily exploit these resources beyond their own nutritional needs. The benefits are vast for owners, whereas the people in the interior are in a completely dependent situation.

Archaeological evidence from Saba underline this connection between large chiefdoms and the need for protein. The island lacks sources of salt, but has direct access to the Saba Bank. At Kelbey’s Ridge, a small village that was inhabited during the late ceramic age, significant amounts of Chicoid pottery were found, relating this village to the Greater Antilles where this style is prominent. Furthermore, excavation yielded a number of large hearths, 2x3 m (Hoogland and Hofman 1991; Hoogland 1996; Hoogland and Hofman 1993). Corinne Hofman (personal communication 2011) interprets these large hearths as smoking pits for fish caught on the Saba Bank. Kelbey's Ridge was an outpost of the larger chiefdoms on the Greater Antilles and functioned as a production site of smoked fish for protein requirements on other islands. The invested labor and resource requirements of smoking over salting, as described in Chapter 3, are negotiated by the increased demand for fish in the region.

In this context, it might not come as a surprise that places that grant access to both salt and fish become important locations. Of course, MC-6 is one of them, but other locations discussed above show a similar pattern. Sites on Anguilla have direct access to the Anguilla Bank and a shallow bank is also located on the southwestern tip of Puerto Rico near Cabo Rojo. Anegada is amidst the bank of all the Virgin Islands and Anse à la Gourde on Guadeloupe is located on the eastern part of the island that has rich fishing grounds as well. When salt is naturally available in close proximity to productive marine banks, native populations seem to have fully exploited these places. The demand in the Caribbean region was not just salt, but mostly salted fish.

8.3 Cotton

Cotton suffers from similar archaeological problems as salt, because the material is perishable and does not last in the material record. Evidence for cotton is difficult to obtain and little information is known about its uses in the past. Despite its archaeological invisibility, cotton was of major importance in the prehistoric Caribbean (Morsink in press-a). Columbus remarks on the vast quantities of cotton he encounters on Hispaniola (Dunn and Kelley 1989). Columbus observed 6,000 kg of this product in one house alone and he estimated production yields of 184,000 kg per field. Tributes to the Spanish were paid in cotton products and raw unprocessed balls of cotton were offered as gifts. Hence, native people perceived cotton to be an appropriate gift or tribute, attesting that this product was much more than just a commodity in the region. Furthermore, Anacoana, a powerful female on Hispaniola, oversaw cotton production and produced cotton products herself (Tyler 1988). Anacoana was the sister of Behecchio and Caonabó's wife, the two most important caciques on Hispaniola when Columbus arrived in the region. Anacoana's role affirms the significance of cotton, as this resource was under her direct control and command, while less important resources were not. Anacoana's power was partially displayed by her authority and jurisdiction over cotton.

In historic times, cotton production maintained its position as a major economy in the Caribbean. Throughout the region, cotton plantations were erected and the ideal combination of hot and dry conditions was fully exploited. Caribbean cotton is known for its high quality, as this ideal climate produces a strong, white and soft cotton ball (Kozy 1983; Yafa 2005). Sea Island Cotton, especially, was renowned for its softness and quality and was sometimes even mixed with silk (Yafa 2005). Although cotton was produced in many locations, including the northern coast of Hispaniola as described by Columbus (Dunn and Kelley 1989), certain islands became known for their cotton production. Barbados (Menard 2006), Anguilla (Mitchell 2009) and the Bahamas and Turks & Caicos Islands (Kozy 1983; Yafa 2005) were the primary locations for the production of this resource. These islands are all very dry and have perfect climate conditions for high quality cotton production.

Despite the lack of substantive evidence for cotton production in the archaeological record, the ethnohistorical accounts repeatedly refer to cotton as an important resource in this region. The extent of cotton plantations in historical times underlines that the region is extremely suited for the production of cotton. These historical industries might have used local knowledge about locations and cotton varieties to increase their yields. As the native population exploited the resource on a large scale, their expertise of where and when to grow this crop must have been vast. At the very minimum, colonists observed the remnants of prehistoric fields of wild cotton and realized that these locations were ideal for plantations.

8.4 Taskscapes Across the Region

The combined economic exploitation of salt, fish and cotton might not have been exclusive to Middle Caicos. This triangle of resources forms such a mutually beneficial economy that other locations with similar conditions might be expected to engage in these practices and yearly cycles too. For example, the pattern on Barbados and Anguilla resembles Middle Caicos in many ways. On a barren, dry and rocky island, away from the Taíno heartland in the Greater Antilles, historical documents indicate that salt and cotton production were the two main industries. Furthermore, fishing grounds are easy to reach on both islands. Barbados lacks direct access to a large bank, but fly-fishing is incredibly popular on the island and the archaeological record suggests that this was one of the major activities in the past as well (Drewett 1991, 2004). The taskscapes of people living on these islands might have been very similar to the one described on Middle Caicos.

The analogy between Middle Caicos and Anguilla goes even further. The archaeological record on these two islands yields vast amounts of non-local pottery and extraordinary material culture, such as the production of religious idols. Both locations show a strong connection between the local environment that is conducive for salt, fish and cotton exploitation and a material record with high status artifacts. This relationship indicates that people on both Anguilla and Middle Caicos were utilizing and exploiting local resources and, through exchange, gaining social status and power. In the case of Anguilla, this economic triangle might have provided the power that was needed to gain exclusive access to St. Maarten's calcirudite source. Based on the availability and successful exchange of important local resources on Anguilla, the people spread their control throughout the region. This explains how people on Anguilla could exert power beyond the physical boundaries of the island, as their power emanated from the control over resources specific to the island.

However, the limited distribution of salt, fish and cotton is one of the main catalysts in generating importance to these resources. From a macrosale perspective, the significance of MC-6 can be explained by the local availability of these valuable economic products. This, therefore, must entail that other regions had different qualities that were beneficial for the production of other resources. These other resources were important too in a prehistoric economy and have to be integrated in a macroscalar perspective. The role of MC-6 is as much determined by what MC-6 has to offer as by what it is lacking. These other resources were defined by different practices, calendars, distribution patterns and demand rates. Hence, other people, outside of Middle Caicos and Anguilla, were involved in different taskscapes and yearly routines.

For example, other crops flourish in wetter and richer soils, such as those present on volcanic islands. Ethnohistoric sources emphasize the importance of manioc, but starch residue and isotope analysis consistently indicate that corn was a major part of the prehistoric Caribbean diet (Mickleburgh and Pagán 2011; Pagán 2008, 2011; Stokes 2005). Corn grows particularly well on volcanic nutrient rich soils and wetter climates. Although seasonal information on planting and harvesting is hardly discussed for the prehistoric Caribbean, more information is available from the Maya area. Corn, the main crop, is planted at the end of the dry season, in this region April and May. Months before planting, the fields are cleared and left to dry. Then, the vegetation is burned and the soil is tilled. Corn grows during the wet season, in June, July and August. Harvesting takes place at the end of August and September (von Hagen 1957). In addition, a second growing season from December to March/April is possible in Belize (Toledo Maya Cultural Council and Toledo Alcaldes Association 1997).

Tobacco, another important crop, also prospers in wetter climates. Furthermore, preparations for tobacco planting start at the end of winter and early spring, when the gardens are prepared and the seeds are planted. Before the onset of winter, the leaves are collected and dried (Whitty 2000). Manioc is dormant during the dry season, but grows when the rains start. The agricultural cycle resembles in many ways the cycle of corn. The rains are vital for germination and growth. When the seeds are placed in the ground too early and water is lacking in the earlier stages of the plant's cycle, the whole crop can be ruined. Both manioc and corn can be preserved, when processed into pulp and baked on griddles. The taskscape of these crops incorporate these other processing activities and involve a long cycle of complex routines.

On Hispaniola, people engaged in intensive agriculture. Small raised mounds were built for optimal drainage and water retention on large fields (*conucos*). The building and maintaining of these fields was labor intensive, but also increased yields from these fields. If planted at the end of the dry season, these mounds must have been constructed during the dry season. It is apparent that these agricultural cycles, for example on Hispaniola, require a lot of management and planning as well, in very similar ways as the people at MC-6 planned their seasons. The preparation of gardens, burning of vegetation, tillage of soil, planting of seeds, maintaining the gardens and harvesting the crops all occurred at very specific times in the year. For optimal yields, management and planning were crucial.

The similarity between these agricultural cycles on Hispaniola[5] and the one observed on Middle Caicos might suggest that these people had comparable routines. The gardens were prepared at the same time, as the planting of the seeds and the harvest. The distinction between the wet and dry season was a major factor in the planning of these practices and it was necessary to predict the coming of the rains in these economies too. Different soil types and longer rainy seasons altered the economic focus from salt, fish and cotton to other products, but local practices were still synchronized in relation to the wet and dry season. Certain preparations had to be concluded before the rains, while other activities took place after the rains disappear again.

The repetition of these practices, cycles and yearly routines produce a temporality in similar ways as on Middle Caicos. However, the taskscape involved different

[5] Hispaniola consisted of multiple economies that existed alongside each other. However, for this argument, the internal dynamics are simplified for the entire island.

relational properties and products. Salt, fish and cotton are not comparable to manioc, corn, tobacco and other agricultural products. Practices involved in the large scale exploitation of agricultural produce were different in both regions. Although the yearly cycles likely followed a similar calendar, the two regions produced different taskscapes and networks of relations. As much as these cycles can be compared, they also are distinct from each other.

Groups on Hispaniola engaged in strict agricultural economies might also have a different distribution of labor. In relation to horticulture, intensive agriculture requires a lot of physical labor in gardening practices. This could have led to a reorientation of male labor to agricultural production instead of fishing/hunting practices (Aberle 1961; Divale and Harris 1976). The intensification of agricultural production of Hispaniola might have led to a complete change in gender practices. This change might have increased social distance between males on Hispaniola and the Bahamian islands, as these male-associated activities in both regions were so vastly different.

The distinction between these two taskscapes has very important repercussions. Because people are on similar yearly schedules, these two different taskscapes require labor at the same moment. These two taskscapes are, therefore, completely incompatible. One of the reasons why salt, fish and cotton are often found in association is because these products require labor at different times of the year, which is the reason that people can combine these three into one annual routine. A combination of cotton, corn and manioc, however, is far from ideal. Because these products have similar cycles, land and labor both had to be divided. If corn required labor during the wet season and cotton during the dry season, one could exploit these two resources by alternating seasonally. But they do not and attention had to be divided and production yields would have been less optimal.

Labor requirements also restrict the mobility of people (Chapter 4). It is physically impossible for one group to grow cotton on Middle Caicos and corn on Hispaniola. As both local agricultural cycles are time-specific, these two economies cannot be shared and controlled by the same people. Hence, the overlap of periodic labor requirements enforces a differentiation in economies and specializations. Certain groups decide to plant and grow corn, in combination with other products that fit that taskscape, while other crops that are incompatible are not grown. Although these decisions are, of course, based on cultural preferences and ideas, the materiality of the growing cycles partially determine what decisions can be made. In sum, natural growing cycles of certain plants restrict the possibilities of agricultural practices.

With respect to these two different taskscapes, people on Hispaniola and on Middle Caicos must have lived separate lives for most of the year. Because growing cycles and labor requirements kept them near their own fields, interaction between these two regions must have been relatively infrequent during most of the year. During other, less intensive times, such as winter in Middle Caicos, contact was intensified and most products were exchanged. Furthermore, as daily practices form a backbone of social identities (Bourdieu 1977; Giddens 1984), these separate calendars and routines produced dissimilar identities. The physical distance combined with the different agricultural and production practices created a social distance, indirectly producing different social identities.

The colonization of the Bahamian archipelago, as described in Chapter 6, might explain this process better. The early movement of people from Cuba to San Salvador and other islands in the central Bahamas (Berman and Gnivecki 1991, 1995) was initiated to exploit the salt ponds on these islands (Berman personal communication, 2012). The mobility of these people was restricted at the end of the dry season and in the middle of summer by the availability of salt. Yet, contacts with their place of origin were closely kept during other times of the year. Initial waves of colonization are hazardous endeavors and close kinship relations function as insurance in case something goes wrong (Keegan 2000; Kirch 2002; also Morsink 2011).

However, besides the physical distance, prolonged stays of these people away from their homes on Cuba also produced a social distance. Daily lives were not shared anymore and practices diverged. Other difficulties might have also arisen, such as the availability of certain artifacts such as pottery. The import of pottery is costly, as pots are heavy and are prone to break during transport or use. People on the islands might have decided, during their stay, to explore local resources and produce pottery on the islands. Rather than an intentional decision to make a different ‘type’ or ‘class’ of pottery, the production of local pottery might just have been a response to longer stays on these islands. The similarity in production techniques on Cuba and San Salvador (Berman and Gnivecki 1995) indicates that the production of the first ‘Palmetto Ware’ was not more than an unintentional consequence of producing pottery from local resources.

Yet, as time progressed and lives between these regions diverged, the local pottery became an undeniable index (c.f. Gell 1998) of local identity. Although the quality of this Palmetto pottery is incredibly poor, the social connotation with local personalities and status became an important marker. The divergence in life-styles resulted in unintentional consequences (c.f. Joyce 2004) of separated material cultures, that over time became embedded in local ideas of identity and social cohesion. At first, Palmetto pottery referenced Cuban pottery, but a historical sequence of prolonged habitation and separation let a new context unfold in which this island-based pottery style emerged as a marker of a distinct social group. In subsequent episodes of colonization and habitation, this pottery style was adapted to signify alliances and communicate a social connection.

The difference in social identities, therefore, is founded upon local practices rather than grounded in the fabrication of different material cultures or the use of distinct symbols. The decision to exploit salt on the Bahamian islands resulted in a physical separation between two formerly connected groups. This decision unintentionally led to a separate material culture and identity, but the basis of this change emerged from distinct local taskscapes that are incompatible with each other. A life on the islands creates a different relational network between practices and economic products than on the mainland, creating a new framework of reference between people, places and times. Ultimately, different social identities emanate from dissimilar daily activities and yearly routines.

The creation of social differences through incompatible taskscapes also provides a new way of understanding historical sequences in the colonization of the Turks & Caicos Islands. Early sites are short-term camp sites focused on the exploitation of shells and the production of beads, while later sites are long-term habitation settlements that exploit salt, fish, conch and cotton. Short-term sites exclusively yield Ostionan or Meillacan pottery, while long-term habitation sites are dominated by Palmetto Ware. Short-term visits focused on the exploitation of shells and the production of beads, both practices that were compatible with the taskscapes of the visitors. Continuous habitation was not an option, because of obligations on Hispaniola. When, for example, Armstrong Pond started to produce salt, people from Hispaniola had difficulties adapting their taskscapes to the requirements on the island if they wanted to exploit this resource. Furthermore, they lacked the knowledge that other resources could be produced in combination with salt to make a sustainable living on the poor soils of limestone islands. However, people living in the islands north of Middle Caicos were already enmeshed in a Bahamian island taskscape and could easily move into the region and establish long-term settlements.

The introduction of Palmetto Ware into the region, as observed in the archaeological record, is the result of groups that have a yearly lifestyle, a taskscape, which is more compatible with labor requirements for the exploitation of local resources in relation to people living on Hispaniola. This transition from people visiting the islands from Hispaniola and people inhabiting the island year-round was likely a much more tranquil transition than war, as suggested by Keegan (1997). People from Hispaniola could enjoy the products of these islands through trade with the locals, while maintaining the original cycle of yearly routines. A temporal overlap between some Meillacan and Palmetto sites can also easily be explained, because people from Hispaniola were not interfering with resources that were desired by the locals living on the islands and, therefore, could coexist next to each other.

A symbiosis of two incompatible, but mutually complementary taskscapes existed side-by-side in this region of the Caribbean archipelago. Where people on the Caicos Islands fully exploited local environmental conditions and economically focused on salt, fish and cotton, people on Hispaniola focused on different products. Through exchange, these items were shared and access was granted. These different economic practices created dissimilar taskscapes and ultimately social identity, yet at the same time these people were fully aware that they were mutually benefitting from their regional specialties. Distinct as these two taskscapes were, people remained close to each other through exchange.

8.5 The Middle Caicos-Hispaniola Connection

People on Middle Caicos mainly interacted with people on Hispaniola, rather than Cuba, for a number of reasons. First, the earliest occupants came from Hispaniola. Petrographic analysis of the pottery assemblage from the Coralie site points to Hispaniolan origins, in particular the Fort Liberté region (Cordell 1998). Second, based on spatial relations, the Turks & Caicos Islands are located in closer proximity to Hispaniola than Cuba. Third, Altes reconstructed seafaring voyages between Middle Caicos and Hispaniola using SARMAP (see Chapter 6). The Fort Liberté area is the only location from which random drifts have a significant chance of ending in the Turks & Caicos Islands. Although these random drifts do not take intentional voyaging into consideration, these data show that voyages between this part of Hispaniola and Middle Caicos are the easiest to navigate. Fourth, historical toponyms of the Turks & Caicos Islands suggest that people approach the islands from the south, rather than from the (north)west in late historic times, as explained in Chapter 6 (Granberry 1991; Granberry and Vescelius 2004). Except for the Turks & Caicos Islands, names of islands in the

Bahamian archipelago point to Cuba as their main spatial reference. Fifth, Caonabó, the most important chief in the Caribbean region at the time of arrival of Columbus, is identified as a person from the Bahamian archipelago (Keegan 2007). Caonabó must have grown up in the Bahamas and moved to Hispaniola to take this position of power. This would not have happened if strong reciprocal contacts were absent between these regions.

This specific case of Caonabó is intriguing, as it is rather unexpected that a person from the social periphery of the ‘heartland of Taíno culture’ assumes such a role of social status and power. For such an important person to come from a Lucayan island, a solid social network based on the exchange of people and goods is an advantage. To ascend to such a position, Caonabó must have been able to display a long history of kinship relations and wealth to people on Hispaniola. This leads Keegan (2007) to suggest that MC-6 was Caonabó’s home town, as this settlement shows by far the most elaborate structures and wealth in the Lucayan region. True or not, if the main activity on most of these islands were focused on the exploitation of salt, fish and cotton, Caonabó’s power is ultimately grounded in these three products. Keegan (2007) argues that local products in the Bahamas, namely salt and fish, were in high demand on Hispaniola in late prehistoric times. Increased social complexity and larger population sizes required additional sources of fish and salt to provide for the people inland. Caonabó, a local who must have had kinship ties with people still close to these resources, was capable of supplying a steady rate of these vital resources. He used his social background to import salt and salted fish into the interior of Hispaniola, establishing a solid basis for his position of power.

Locations, such as MC-6, were instrumental in the development of social complexity and increase in population on Hispaniola. Without a steady supply of salt and salted fish, populations could not grow in the interior of the island. To meet the dietary requirement for salt and proteins in the interior of Hispaniola, additional sources had to be introduced. The trade in salt and salted fish from the Turks & Caicos Islands was not an outcome of an existing network, but the main impetus for social change on Hispaniola and central to the institutionalization of certain positions of power, such as the one held by Caonabó. The rapid development of social complexity in the Caribbean region could be related to people exploiting vast amounts of salt in the Bahamian archipelago.

8.6 The 'Stranger' Salt?

Caonabó's identification as a Lucayan directs Keegan (2007) to the story of the 'stranger king'. In many societies, there is a story about an immigrant deposing the throne and establishing a new power by marrying the daughter of the former king. Keegan (2007) argues that Caonabó is such a stranger king who grew up in Middle Caicos, moved to Hispaniola and assumed power. Part of Keegan's argument is that this pattern of Caonabó's mobility is consistent with avunculocal residency rules in a matrilineal society. Every male, following such a residency pattern, moves from the place where he grows up to his maternal uncle where he is brought together with his kin-related males (Ember 1974; Keegan 2007; Keegan and Maclachlan 1989). This specific argument is not further considered, but attention is directed to Caonabó being a stranger.

One of the qualities of a stranger king is his ahistorical background (Keegan 2007). A person who comes from afar, from a place unfamiliar and maybe even unknown to the people he rules, has no historical baggage. Stranger kings arrive in the place that they rule as an adult and stories and memories of their childhood or adolescent years are absent. Although this seems to counter the idea that kings or chiefs obtain positions of power through kinship and strong objectified notions of their divine ancestry, the lack of historical connotations to a stranger king also allows origin myths and other fictional stories to be more powerfully negotiated. The lack of actual memories of the person's past provides a perfect social arena to claim mythical ancestry and other redeeming qualities that elevate social status.

Being a stranger, coming from afar, also means that the place of origin was beyond the horizon. This quality was highly esteemed by Taíno people. Just like people, objects from beyond the horizon were also related to mythical qualities and origins. This is one of the reasons why Spanish products were so highly esteemed by the native population of the Caribbean. In particular, shiny objects were considered *turey* or from the sky or heavenly. Other examples of *turey* are feathers and gold, but also shiny brass objects, mirrors and other products are included in this category (Keegan 2007; Keegan and Carlson 2008; Oliver 2000). Objects from unknown places are magical, their sources and production processes are obscured and their beauty is admired and desired.

Middle Caicos was beyond the horizon for the people on Hispaniola. Voyages to these islands involve multiple day trips in which a significant part of the journey involves a vista completely devoid of land, as Hispaniola and the Caicos Islands were both too far away. It is very likely that objects from the Turks & Caicos Islands were considered *turey* or heavenly. Early voyages from Hispaniola targeted two different categories of resources on the island: 1) large fish, turtles and tortoises, and 2) shells for making beads. Although some of the animals were consumed locally, most products were likely brought back to Hispaniola (Carlson 1993, 1999; Keegan 2007).

The massive size of these non-local fishes in combination with their unknown place of origin must have induced some special meaning to the people who were not part of these short-term voyages. Furthermore, the production of beads increases this idea of these distant islands as 'magical' places. The brilliant red color of the beads might have been interpreted as heavenly or *turey* too. One final remark about these early voyages is warranted. As discussed in Chapter 4, long-distance voyages and high mobility are often associated with males, rather than females. Furthermore, the beads in these early sites are predominantly made of *Chama sarda*, which is red in color. Red is the Taíno color of masculinity (Keegan 2007). Although this is admittedly speculative, these islands might have had connotations of masculinity and males in general.

Even if this interpretation is invalid, the long historical sequence of voyaging, extraction of large fish and the production of special beads probably gave the Turks & Caicos Islands an elevated status. The products from these islands were special and production sequences were unknown. Most people on Hispaniola never visited these islands, but these products communicated how different and beautiful the islands were. When people move into these islands from the central Bahamas and establish long-term habitation sites, the special status of these islands was already established in Hispaniola.

The export of salt, fish and cotton would have only confirmed the special status of these islands. As mentioned in previous chapters, salt and cotton from Middle Caicos had an incredible high quality and Turks & Caicos salt and cotton were both praised for their white color in historical times. Furthermore, the color of another export product, namely conch is also white. The shiny salt crystals and the white color of salt, cotton and conch might have reminded people of shiny bright stars and other *turey* objects. These products travelled from over the horizon to Hispaniola and had qualities similar to the sun, moon and stars in the sky.

The architectural alignments to the stars at MC-6 further emphasize this strong relation between the site, sky and heaven. Beyond the local calendar of practices and activities, the stars are an important part of larger regional structures and Taíno worldviews. According to a myth recorded just after initial contact, *Anacacuya,* a mythical cacique, was drowned by his brother *Guayahona.* In an attempt to claim all the women for himself, *Guayahona* pushed *Anacacuya* in the water after *Anacacuya* bent over the ridge of a canoe to look at a conch shell in the water. *Anacacuya* rose from the water into the sky and became a star (Pane 1999). The name *Anacacuya* is translated as the 'light at the center' and is associated with Orion (Keegan and Carlson 2008). The alignments to Orion further connect MC-6 to the sky, stars and other bright objects.

Another product that has strong connotations to the sky and *turey* is gold. However, Taíno preferred *guanín*, a copper-silver-gold alloy over pure gold. This product was highly esteemed by the native people and they were eager to trade pure gold with the Spanish for their copper-gold alloys. *Guanín* was related to symbols of fertility, the sun and other products, including plants, turtles and the divine humming-bird Yeréttê (Oliver 2000). Although this is not a natural resource on the island, Oliver (2000) reports that this alloy tastes salty. The relation between MC-6, *turey* and salt is constantly reaffirmed.

In addition, the symbol of power related to the sky is the rainbow, which connected heaven and earth. In similar ways, the chief negotiated these realms for people living at MC-6 and the double rainbow, a rainbow reflected in the water, was a symbol of the chief and chiefly power. In the Turks & Caicos Islands, the rates of evaporation are so intense that rainbows occur almost on a daily basis and on the calm waters of the Caicos Bank, the double rainbow might have been observed frequently. Keegan (2007) argues that the lay-out of MC-6 and stone alignments reflect this double rainbow.

A second connection between rainbows and MC-6 exists. The color of the rainbow is also associated with iridescent shells, like oysters. *Pteria colymbus* and *Pinctada radiata*, as described in Chapter 7, are interpreted as possible fish lures because of their shiny lining. Reflected in the sunlight in shallow waters, these objects attract fish. Yet, their reflection might have also represented a rainbow in the water. Furthermore, two pieces were shaped in a semi-circular way, which are either two independent artifacts or two pieces of a broken circle. These artifacts are shell inlays that were attached to wooden artifacts, such as *duhos* (ceremonial seats) or statues, often with resins from trees in the Pinaceae family, possible *Pinus caribaea* (Ostapkowicz et al. 2011). These trees are common on Middle Caicos and surrounding islands, but scarce on Hispaniola. These shells are associated here with high status artifacts that are symbols of chiefly power and status.

The products of MC-6 were heavenly. Objects crossed the horizon to get to Hispaniola and originated from the islands with a long history of producing extraordinary products. In addition, these products are associated with the color white and the shininess of the crystals reminded people of the stars and rainbows. Salt and other products were as ‘strange’ as the stranger king, without a history or clear idea of the past. Production processes and locations of origin could easily be mystified, establishing specific qualities to these products. People on Hispaniola might have even ‘expected’ that products from the Turks & Caicos Islands were of the highest quality. This might have reinforced the status of these islands as places of extraordinary and ‘heavenly’ qualities.

8.7 MC-6

The argument here has emphasized how practices at the microscale influence the macroscale. However, this is a dialectic process and larger regional structures also affect the microscale. Ideological connotations, diversifications of resources and kinship ties, for example, all are parameters that exist on larger regional scales. All of these factors were important to social life at MC-6. As mentioned, the site never existed in a social vacuum and the people who lived at MC-6 were always strongly connected to these larger regional networks of exchange. In these larger regional networks, exchange was not limited to the movement of ideas, goods and people, but also the movement and creation of identity and reality. Exchange establishes and generates social relationships, defining the status of people and their world. Attention, therefore, is redirected to MC-6 and how local ideas and identities were created in reference to these larger structures.

As much as MC-6 was foreign and across the horizon for people on Hispaniola, the same is true in the opposite direction. Products that traveled the opposite way, such as canoes, *guanín* or gold objects and tobacco, were valuable to people on MC-6.

Stories about important chiefs, large population centers, mountains and rivers must have accompanied these objects and impressed the inhabitants of the Turks & Caicos Islands who never visited Hispaniola. If MC-6 was considered special by people on Hispaniola, then Hispaniola was considered special by people at MC-6.

People involved in these long-distance voyages were important sources of knowledge about the two islands so distant from each other. Only a few people moved between them, and held knowledge of how these islands stood in relation to one another. People who stayed on either end would never know what the other island was like and totally relied on these travelers for information. This also means that knowledge about the other place was kept by a relatively small group of people, who could use this knowledge for their own benefit. The fact that certain people could tell stories about the splendors of either island must have at least attracted attention from curious people who were interested in unknown faraway islands and resources.

The directionality of these long-distance voyages was mostly from Hispaniola to MC-6 and back, than from MC-6 to Hispaniola and back to Middle Caicos. The ceramic assemblage shows that most pottery was Palmetto Ware, but MC-6's structural features, such as the formalized stone alignments, central plaza, gardens, stone structures and road, are completely unknown in the Bahamian archipelago. However, stone alignments and formalized settlements are known on Hispaniola (Keegan 2007). MC-6 is not a typical Hispaniolan or Lucayan village, but a place with unique qualities. These structures were made to impress visitors and, therefore, unnecessary when people living at MC-6 traded their wares on Hispaniola. The unique combination of features created an image of equality, if not superiority to its visitors. Visiting MC-6 was a sensuous experience and its splendor was a materialization of its power. In addition, hosting people and feasts enabled the people living at MC-6 to engage with a wide variety of exchange partners, instead of a single trade partner, from multiple locations and increasing the effectiveness of their gifts. MC-6 was a place where people and identities gathered, which created something exclusive and incomparable in the whole region.

People, and not regions, create these relations. Even though these interactions took place at a large scale and people on Hispaniola and Middle Caicos must have had some idea of each other's existence, exchange relations were formed and negotiated by very few people who make these trips. Furthermore, exchange is a social contract that establishes a very specific connection between two agents, never between two islands or larger regions. Although the regions where these exchange partners live are important in respect to the social identities involved, Hispaniola and Middle Caicos never exchanged, but people from these islands did (Morsink in press-a). Hence, objects moved between very specific people and referenced these intersubjective relationships rather than connections between islands.

Feasts are events that are specifically suited for the creation and negotiation of these intersubjective relations through gift giving (Dietler 2001; Dietler and Hayden 2001; Helms 1998; Munn 1986; Rosman and Rubel 1971). Arrivals of people from afar were special occasions that were likely accompanied by feasts. Other phenomena, like changes in seasons or social events like deaths, births and even successions of power are all part of life. Many of these phenomena are not left unnoticed and specific rituals, including food and drinks, are held. In sum, certain episodes are socially important enough to engage in ‘special’ activities that distinguish them from daily routines. MC-6 is no exception.

Multiple lines of evidence from the material record indicate feasting practices at MC-6. First, eight pottery vessels have convex out rims, five have outflaring rims and seven are plates, all displaying an open orifice. These vessels were likely used for serving foods in a communal setting, because they openly display the food (DeBoer 2001). People within this communal setting can reach for food and these actions are observed by the other participants. In addition, the most common food in the prehistoric Caribbean is the pepper pot, which is a liquid and cannot be contained in these vessels. That these plates could not hold the ‘normal’ quotidian food might mean that these dishes were used for special foods. The seven plates, of which six are from structure IV, do not hold liquids and suggest that at least some aspect of food consumption was communal. This is consistent with Deagan’s (2004) conclusion that prehistoric Caribbean feasts were communal events.

Table 8-1. Vessel lots with open orifices per excavation location.

Location	Convex out	Outflaring	Plate
Midden	1	1	
Structure II	5		1
Structure IV	2	2	6
Structure VI			
Total	8	3	7

Second, zooarchaeological data provide some information. One non-native species is recognized, namely a species in the family Emydidae, a fresh water turtle. Fresh water turtles do not live on the islands, although it is possible that this is similar to the extinct tortoise that is found at the Coralie site, Grand Turk (Carlson, personal communication). A large bone from structure II is another hint for feasting. It was first thought that this was a complete plastron of a turtle and the porous bone underneath supported this identification. However, the bone is incredible thick, over 10 cm, and looks mammalian. Although the bone has not been identified, it is probably a whale vertebra. The flat side, previously interpreted as the outside of the plastron, is the part that contacts the next vertebra. Humpback whales seasonally migrate from the warm water of the Dominican Republic to Newfoundland and further north. In their migration, they often swim through the Turks Island passage between the Turks Islands and the Caicos bank between January and March. A large part of this massive animal is missing, but one whale would have provided a large amount of meat. Whales and dolphins are known to beach themselves in these islands. The recovery of a beached whale would probably have initiated a feast.

The archaeological remains from inside structure IV are potentially the product of feasting practices. First, six of the seven plates are from this specific location. Furthermore, the deposits inside of this structure yielded large amounts of pottery (total weight of 2600 g from both test units), bone (43 NISP from one of the test units), shell (50 g from both test units) and coral (16 g from both units) and these items were purposefully deposited here. One imported rim sherd was decorated with a fish or frog motif. Finally, four related pieces of brass, a non-native artifact and probably obtained through interaction with the Europeans are deposited here.

These deposits are not random and a mere product of haphazard practices. Brass was unknown in the pre-colonial Caribbean region and this artifact references interaction with the European invaders. Sullivan (1981) found another brass ornament across the plaza in structure I. This small ornament had a crescent shape and is interpreted as *caracoli*, a metal object highly valued by the Caribs in the Lesser Antilles (Sullivan 1981:145). A straight line connects structure IV to the center stone on the middle of the plaza to structure I. That two brass ornaments were found in these two structures is unlikely a coincidence. The difference in bone assemblages between structure IV and the adjacent midden is not significant, except for the presence of 8 NISP of snakes (Colubridae) inside the structure and none in the midden.

However, and most importantly, the phosphorus soil tests are significantly different, namely an average of 1448 mg/kg inside the structure and 7385 mg/kg in the midden. The average for the midden is consistent with Roth's analysis, but the inside of structure IV is in the same range as the 'empty' plaza (Roth 2002). The total phosphorus concentration should have been much higher if food remains on bones or in vessels were discarded inside the structure. Therefore, fish and meats were prepared and eaten outside this structure and only deposited, after consumption. This practice of dumping finished food remains must have been the product of specific eating practices that were different from the mundane, as these would accumulate in a 'normal' midden as seen between the structure and the plaza.

Finally, pottery found at MC-6 shows a specific pattern as well. Most rims, used for vessel lot analysis, were unique and could not be associated with other sherds. Almost every rim was designated a separate vessel lot, even though most did not comprise more than 5% of the total diameter. For most pots, therefore, at least 95% of the rim was missing. In structure IV, for example, 26 vessel lots are identified from all individual rim sherds. The 269 imported sherds that were found came from 45 unique vessels. With low average weights per sherd, the pottery from the site seems to be deliberately broken. The pattern here describes a high amount of vessels, but small numbers of sherds per vessel and these sherds are all relatively small. This is the opposite of what would be expected in a location where pots were broken and left, namely few vessels and sherds, but high average weight per sherd. In addition, the difference between local and non-local pottery was also recognized by native people. Thin and black pottery with volcanic temper is quite different from the red and thick pottery with shell temper. The pottery is an index of place. These different pots reference different places and people. These archaeological deposits are, therefore, not typical of what would be expected for a midden deposit reflecting mundane practices.

Table 8-2. Phosphorus concentration from inside structures and midden area of MC-6. N7E7 is the midden area and shows significantly higher concentrations than inside structures.

ID#	Location	TotaP (mg/kg)
1	center structure II	1801
2	center structure IV	1979
3	NW structure IV	1671
4	NE structure IV	1304
5	W boundary N3E2, N4E2	4601
6	E boundary N3E2, N4E2	1986
7	SW structure IV	4031
8	SE structure IV	2138
9	Center structure VI	1407
10	NW structure VI	1366
11	NE structure VI	1570
12	SE N1E1	1497
13	NE N1E1	1420
14	NW N1E1	1882
15	SW N1E1	2237
16	NW N7E7	7361
17	NE N7E7	9344
18	SE N7E7	5341
19	SW N7E7	7494

Table 8-3. Count of vessel lots per excavated location

Location	Count Of Vessel Lots
Midden	28
Structure II	84
Structure IV	26
Structure VI	13

The unusual assemblage of pottery suggests that people established intersubjective relations through pottery. The deliberate acts of breaking pots and depositing only a certain part of the vessel are both conscious acts that reference other people, times and places. The material aspects of imported pottery reminded people of their non-local origin and extra-local social relations, including trade partners, affines and other people from afar. Furthermore, observing these sherds in ways similar to an archaeologist, they realized that many parts of the total vessel were missing. The advantage that they might have had in interpreting this pattern, though, is that they were knowledgeable about where the other pieces went! The physical presence of clearly different vessels form non-local origins reminded the observer of links to places where these pots came from, who imported them, from whom these vessels were obtained and where the reminder of these pots were.

This process of creating links through deliberate acts of breaking artifacts and moving pieces to different contexts is a practice that Chapman (2000) also recognizes in the Balkan Neolithic. He describes this process as acts of fragmentation. He emphasizes that these acts of fragmentation are done in a context with two agents, in which both decide to break the objects and both take a piece. The broken piece is a physical index and reminder of the social relation between these two and the object acts as a mnemonic device for the social contract that was established. In later situations, people might break these pieces even further, creating multiple and complex relationships. Yet, the broken piece reminds the owner that a part is missing and simultaneously establishes a relation to other places and people who own the other pieces. This connection and creation of a relational network is what he calls enchainment (Chapman 2000:6).

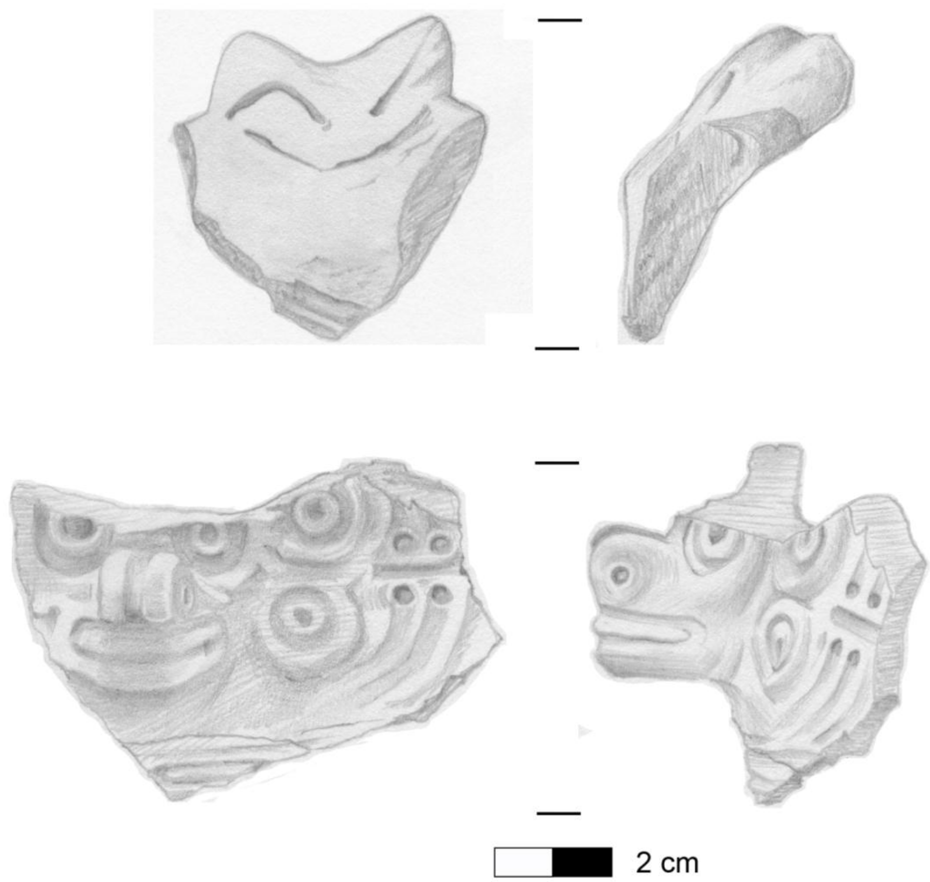


Figure 8-1. Drawings of the fish/frog and bat sherd. Drawings by Kristina Ballard.

Two pieces of pottery found at MC-6 might have been used in practices of enchainment and fragmentation; the frog/fish and the bat sherd. The frog/fish rim, found inside structure IV, is part of a handle and the pot most likely had another decorated handle when it was complete. No other matching sherds were found in its vicinity and this decorated piece was the only sherd from that vessel. This type of decoration is normally found in the Greater Antilles and, therefore, references these locations. In relation to the sherd with the bat motif, retrieved from structure II, no other sherds matching this vessel were found. This decoration is typical of a bottle and the style is associated with the ‘Classic’ Taínos, especially on Hispaniola.

Both sherds are fragments of larger vessels and the remaining parts were deposited in other locations. Physical properties of these sherds reminded the observer of the people who shared this vessel, the locations on Hispaniola and the other locations where the other parts of the vessel were. A complex relational network between these fragments, people involved in the exchange and fragmentation and locations where these sherds came from and were deposited, was created. People at MC-6 were constantly reminded by these mnemonic devices of their contacts on Hispaniola. People at MC-6 were always engrained in a web of social relations that included people and places on Hispaniola.

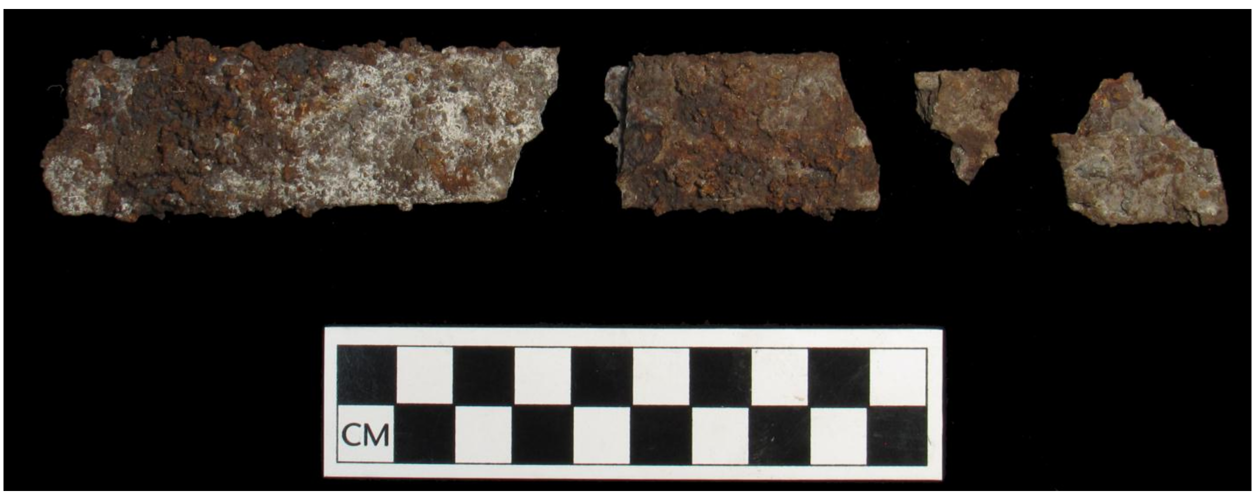


Figure 8-2. Metal object found in structure IV. The original objects could have been a knife

The two brass objects, discussed previously, were of a similar nature. These materials were unknown before contact. The material qualities of brass immediately reminded the observers of the presence of Europeans in the region and suggest some sort of beneficial interaction with these groups. Likely, both items were exchanged and the Europeans must have received something of value in return. These two brass objects linked MC-6 to Europeans and their emerging power in the New World.

8.8 Conclusion

The significance of MC-6 was as much created at MC-6 as it was on Hispaniola and other locations in the Caribbean region. The importance of salt, fish and cotton only make sense in a circum-Caribbean perspective considering that these resources are scarce elsewhere. Demand for these products needed to be high for MC-6 to become important. People at MC-6 might have created this demand by supplying their goods to Hispaniola and establish debts. As a possible consequence, the import of salt and protein facilitated population growth and the institutionalization of social complexity, and Hispaniola subsequently became dependent upon a steady supply from MC-6 and other salt-producing places. This also directs attention to historical developments and the interaction between MC-6 and other regions. Salt only established its regional importance in relation to larger populations and increased social complexity on Hispaniola and other islands. MC-6 was completely enmeshed in a large regional network of exchanges through which values were created and the site gathered its status. To understand MC-6, it must be appreciated outside of its isolation on Middle Caicos.

Although the final discussion of this Chapter mainly focused on Hispaniola, salt, fish and cotton were important exchange products throughout the Caribbean region, even with mainland South America and Mesoamerica. Caribbean archaeology is often considered in isolation of the wider region, although more recent publications have tried to incorporate this circum-Caribbean perspective (Geurds and Broekhoven 2010;

Hofman et al. 2010; Hofman et al. 2011; Rodríguez Ramos 2010, 2011; Rodríguez Ramos and Pagán 2006; Torres and Rodríguez Ramos 2008). Emphasis, however, is placed on how these mainland regions influenced people in the Caribbean after initial colonization, with this interaction often portrayed unidirectionally. Although material evidence of Caribbean goods might be absent in South America or Mesoamerica, something must have been returned. The lack of material evidence suggests that return gifts were perishable goods. Salt, salted fish and cotton are top candidates for high-quality products coming from the Caribbean that were in demand elsewhere. Other goods, such as peppers and tobacco, should also be considered.

Furthermore, the use of early historical documents can illuminate these exchange networks and which products were important in prehistoric communities. The invasion by Europeans is often thought of as a radical change with the past. New people arrive with new ideas. The rapid decline of local populations resulted in a total loss of indigenous cultural knowledge. Yet, this discussion shows that at least some of the major colonial industries were in some way continuations of prehistoric practices. Cotton and salt were not European 'inventions' that suddenly received attention because of a large demand for these resources in the home countries of the colonists. They were important components of native economies that endured through time. The image of these 'peaceful Arawaks' living 'in harmony with nature' distracts from the entrepreneurship that these people had. These people were well aware of the benefits that the Caribbean had to offer and they fully engaged in the exploitation of these resources.

The landscape, as an experience of dwelling, constantly changes. When Europeans arrived, the demand for salt was shifted from local populations to Europe. Although salt remained an important export product for the Caribbean, its meaning shifted from local values and connotations to associations with a European power. In similar ways, meanings and values of the Turks & Caicos Islands must have changed when people from the central Bahamas migrated into the area and established permanent settlements. The character of periodic visits from Hispaniola shifted and people stopped visiting the islands to extract resources personally. During the exchange of materials, two different identities were created at both ends of the spectrum.

In relation to social change, this discussion shows how practices of economic exploitation create different identities. The concept of taskscape explained how these different identities were created. Starting from the microscale, the taskscapes involved in products on Hispaniola and the Turks & Caicos Islands were incompatible with each other. It is physically impossible for one person to grow corn, tobacco, manioc and other products on Hispaniola while raking salt, fishing and growing cotton on Middle Caicos. The demand for labor at specific times of the year completely overlap and at least two groups of people are necessary to exploit both sets of resources. The decisions they made in their economic practices restricted mobility and interaction became less frequent, because all these practices were labor intensive and localized. Building from the microscale, taskscapes explain how local identities were established and maintained and how unintentional consequences of prolonged habitation provided the seeds for local expressions of personhood.

This Chapter provided another methodological tool that demonstrates how a practice-oriented perspective can approach these concepts. Starting from the bottom, i.e. what people do on a day-to-day basis, it is possible to address issues that emerge at a larger scale. At the same time, these issues on a larger scale influenced practices on the microscale. This constant feedback between people and larger social structures and frameworks of reference made MC-6 into what it was.

CHAPTER 9
CONCLUSION: THE POWER OF SALT

Salt is a powerful resource that has not received the attention it deserves. The connection between power and salt is often recognized, but the mechanisms that translate material qualities of salt into social status and power are not often considered. This study argues that salt transforms food *into* produce, which subsequently can be employed in exchange relations. Through exchange, different positions of power between donor and giver are established. In combination with resource specific qualities of different salts, produce is an inalienable gift that symbolizes the power of the group that controls production. This process is spatially concentrated and materialized at MC-6. Approaching this site from a practice-oriented perspective illustrates how people engaged with salt and established a local economy based on the exchange of salted produce. MC-6's position in the Caribbean region was special, as material conditions were successfully negotiated and people maximized the potential of the spatial concentration of resources at the site.

This strong structural, almost universal relation between salt and power has been recognized by many scholars (i.e. Adshead 1992; Andrews 1983; Andrews and Mock 2002; Astrup et al. 1993; Bloch 1976; Brown 1999; Denton 1982; Ewald 1985; Flad 2005, 2007; Godelier 1971; Hewitt et al. 1987; Jakle 1969; Jones 1964; Kepecs 2004; Kroeber 1976; Kurlansky 2003; MacKinnon and Kepecs 1989; McKillop 1995, 2002; McKillop and Sabloff 2005; Muller 1984, 1987; Nenquin 1961; Parsons 2001; Pomeroy 1988; Tibesar 1950; Trumbull 1899; Williams 2002). Salt's current price, quality and quantity stand in sharp contrast to the past. Salt, the white gold, was a symbol of wealth. Explanations of how this economic resource transforms its inherent value into social status and power are often limited to identifying salt's material qualities, namely the dietary need for this product or its ability to preserve. Few mechanisms are offered regarding how this process takes place and what happens between the exploitation of this resource and consumption. A holistic anthropological perspective is lacking.

This study fills this void. Reasoned from a practice-oriented relationist approach, this discussion changes the emphasis of research from the material qualities of salt, i.e. the dietary need and the ability to preserve, to how these material qualities influenced how people used this resource. Hence, the focus of this research is on the processes involved in the exploitation and uses of salt, rather than its form and static characteristics. Salt's importance is due to people's interest and desire to exploit it. Therefore, people have to be placed first.

This study argues for a conceptual division between food and produce. These two concepts relate to different ways that food is used by people. Edible goods produced for consumption only are foods. Most studies just assume that the production of edibles is for consumption. Edibles produced with the intention of consumption are labeled food. Because most foods are ultimately consumed, this category seems applicable to all edible goods. In the end, edibles are consumed, so all practices that take place before that point are all aimed at this final conclusive event. Consumption is the reason why food is harvested.

Produce, however, is focused on the exchange of edible goods. Although consumption indeed follows the exchange, these products are grown for exchange and not for consumption. People grow produce to give these items away to engage in social relationships and establish exchange networks. Eating is only a byproduct that occurs after the edible fulfills its main function, namely creating a debt between donor and receiver. Produce is, therefore, better appreciated in an exchange paradigm. Production is optimized to gather more resources that, subsequently, can be employed in exchange relations. This practice of produce exchange is firmly grounded in ethnographic examples and sharing of food is a universal way to establish social relations. Munn (1977) argues very specifically that edible goods, in her study yams, are the basis for every exchange relation. Even in *kula,* a highly competitive exchange circle of valuables, the paths between exchange partners are founded upon the exchange of produce.

Because of its ability to preserve food, salt changes the processes of exchange. Whereas decay forces people to use edibles in a short period after harvest, salted goods can be preserved and kept for future situations. People can use edibles in the way they choose and are not limited by the time the item lasts. Immediate consumption is unnecessary and food is stored for times of need. People are, with salt, able to accumulate large amounts of produce that were previously impossible to gather at a large scale. Although some edibles preserve naturally, such as yams and manioc, other edibles do not and it is especially the status of these products that is completely altered through salt.

Salt transforms edible goods previously associated with food into produce. Highly sought goods, such as meat and fish, are suddenly capable of becoming produce instead of food. These goods can be ‘over’-produced and salt prevents this ‘surplus’ from loss. Seasonal abundances, for example, can now be fully exploited beyond local needs. Accumulation of previously perishable items is possible and can be used as gifts. Salt opens up new avenues to exchange certain objects. Salt enables people to use edibles differently, especially in exchanges.

Exchange creates a debt between the giver and receiver, causing an imbalance of power in which the giver is superior to the receiver. The receiver owes the giver and the ‘gift’ is not without expectations. To undo this imbalance, the receiver must return a gift of at least equal value. However, interest is often expected, especially after a delay between the original and the return gift. Hence, through exchange, the giver establishes a power position that is nullified or reversed after he/she receives more than the original gift. By giving valuables away, the giver expects to increase his wealth through anticipated return gifts.

In the case of salt, this means that more *produce* means more debts and, subsequently, more power and wealth. More produce basically allows the owner to give more away to more people. Because edibles can now be produced beyond local needs without the consequence of losing this overproduction to decay, accumulated goods through salting practices can now be employed in more successful ways to negotiate social status and power.

This mechanism of produce exchange describes how economic production of edible goods generates structures and positions of power. People who grow and harvest more produce are better at creating and establishing positions of power with respect to others with whom they exchange. Often, economic surplus is equated with social status, but the mechanism of exchange is crucial to understand how this economic wealth is transformed into social wealth. The importance of this mechanism is often neglected in anthropological studies. However, economic wealth only *becomes* social wealth through exchange; it *is not* social wealth in and of itself.

The exploitation of salt is future-oriented. The ultimate goal in this process is establishing debts, positions of power and access to previously unavailable resources through exchange partners. All practices that precede these exchanges have these ambitions in mind. The positions of power and access to resources are the constant focus of people producing salt, establishing debts and engaging with long-distance exchange partners. Salt becomes an object that is used for future gains and immediate nutritional requirements are of less concern. Salt is harvested to overcome social, rather than nutritional needs.

People are drawn to locations of salt production, because of the potential of this resource. Places where salt occurs are limited and very spatially concentrated. An overall scarcity of this resource is balanced with very local abundance. Places of abundance become places of attention and people gather at these locations to exploit salt. People adapt their daily practices to produce this resource and fulfill its demand. Certain places in the environment are considered more important than others (Basso 1996). Salt production sites became spatial foci for importance, because of salt's potential.

One last characteristic of salt is important to understand the mechanisms of exchange, namely its inalienability. Salts from different sources and different production methods have very specific qualities that establish relationships between the salt and its source. Common salt, nowadays, is a commodity, stripped of its social values because of uniform color, grain size and purity. Yet, gourmet salts still show that salt is not just salt. Himalayan pink salt is intrinsically connected to the Himalayas and all its connotations. Sel gris and *fleur de sel* are both produced in the same salt evaporation ponds, but the way salt is evaporated and collected produce two salts that differ in quality, color, purity and, not unimportantly, price. The production processes and places of these salts are intrinsically connected to their material qualities.

So, people in control of these places and production processes become related to these qualities as well. Their power over production will eventuate in their control over exchange in salt and salted goods. Gift giving creates a bond between the donor and receiver, the object that is transferred is a material reminder of the exchange. Successful practices of gift giving of very particular salt results in a direct relation between the salt and its original owner. The material quality of the salt becomes an index of the power and control of the person or social group. Social identities of people in power are directly linked to the specific attributes of the salt they control.

Salt illuminates the significance of exchange within this transformation of economic production to social power. The relation between overproduction of staples and power differentiation is often associated with the ability to feed people who are not working in food production. Because people can now be fulltime specialists, as food is not a limiting factor, social stratification is established. However, it is through processes of exchange and gift giving that the social context is created, a context in which producers accept and tolerate this division of labor. Through continuous exchanges, certain power relations are objectified through time. The differentiation of power is the result of overproduction by groups that are now non-producers who, in preceding situations, successfully employed overproduced materials to objectify their social status.

After objectifying these social positions, the division of labor is changed. Social inequality is a product of economic production and the exchange of produce

This focus on the ways people use salt explains why this resource is so often related to power and regarded of such high value. Salt transforms foods into produce and through exchange, these produce 'objects' become symbols of economic wealth that establish debts and power differences. Salt is an inalienable gift that is intrinsically connected to its place of origins, its producer and its symbolic references to power. The power of salt emanates from the ways people apply this resource in the social world and how they employ it to manipulate social relations. Through salt, more and larger debts are established, placing the original donor in a superior position vis-à-vis other groups and people in their social environment.

9.1 MC-6

MC-6, Middle Caicos, the Turks & Caicos Islands, the case study of this study, materializes the importance of salt in a prehistoric Caribbean economy. The site is located at the fringes of 'classic' Taíno territory, north of the island of Hispaniola. Ethnohistoric sources point to Hispaniola and Cuba as the main centers of the Caribbean economy at the end of the 15^{th} and beginning of the 16^{th} centuries. Material culture, population numbers, chiefs and religious leaders all point to the 'cultural superiority' of these islands in relation to other places. The Lucayan islands are not part of this Taíno high culture and important sites are therefore not expected here. Yet, MC-6 has a very formal structural layout, stone structures, a clear central plaza and stone alignments that point to crucial positions of celestial bodies.

The importance of MC-6 has previously been linked to the presence of salt (Keegan 2007; Sullivan 1981). MC-6 is located next to the largest salt producing pond in the whole region, namely Armstrong Pond. The Turks & Caicos Islands are well-known for their salt products of high purity and quality. During two periods of the year, namely in April and May before the rainy season and in July and August in the middle of summer, conditions at Armstrong Pond are conducive for the natural production of salt. At these times, Armstrong Pond produces vast quantities of salt and little effort is needed to exploit this valuable resource.

However, as mentioned earlier, the mere presence of salt provides no explanation for the importance of MC-6. This immediately exposes the main problem of a culture historical approach, as the main intention of this paradigm is to classify and categorize what sites are and how they fit into the large picture. This is best explained by an example. Sullivan (1981), working within a culture historical framework, identified MC-6 as a late prehistoric site by the presence of Chicoid pottery. The site is interpreted as a product of interaction with 'Taíno culture bearers' (Sullivan 1981:430). The presence of two plazas, elaborate stone structures and prestige objects are evidence for the presence of elites at the site. This elite structure of social organization was not a product of local historical sequences, but considered by Sullivan as an outcome of diffusion from Hispaniola into the region. Besides the introduction of a stratified society, religion was transposed as well, in the form of a *zemi* cult.

In an attempt to classify the site, Sullivan (1981:425-430) labeled MC-6 as a gateway community. MC-6 was an intermediary between the location of resources, in this case salt from Armstrong Pond, and its long-distance exchange relation with Hispaniola, as evidenced by the non-local pottery that appears at the site. Gateway communities are characterized by commodity exchange from either sparsely populated areas or increased demands in trade. Furthermore, these types of settlement are located at the edges of ‘natural corridors of communication’ (Hirth 1978:37, quoted in Sullivan 1981:427).

The site was established around 950 C.E., simultaneous with Chicoid expansion of Taíno culture bearers. People on Hispaniola decided that the resources needed to be exploited on Middle Caicos and established a production center that would provide the necessary resources. Before that time, societies on Hispaniola had not evolved into chiefdoms that could have organized these sorts of endeavors. The Turks & Caicos Islands were colonized from the south and people kept contact with their places of origin on Hispaniola.

However, this interpretation is completely guided by a culture historical framework. Local expressions of identities are submerged into these larger classes of ‘cultures.’ The large-scale categories are imposed on MC-6 and Sullivan (1981) tries to fit the archaeology to this framework. Sullivan’s (1981) interpretation aims at the classification of this site within an existing framework rather than understanding how these people related to these larger scales. In fact, people are absent and social identities are normalized. For Sullivan (1981), MC-6 is an expression of Taíno culture on Middle Caicos.

For example, evidence for elites at MC-6 is absent, but assumed from the social stratification that exists among Taíno groups. Radiocarbon dates are not used to place the site in its own temporality, but to affirm that it was part of the larger development of Taíno expansion. The migration from Hispaniola is postulated because of the presence of pottery styles that appear to originate from that island and material culture is understood as a representation of identities. Conclusions are drawn from the general framework and data from MC-6 is used to reaffirm this ‘accepted’ structure. MC-6 are normalized, fitted to be part of the larger structure and only appreciated from the macroscale.

9.2 Practice-oriented Relationist Approach

The perspective followed throughout this document totally distances itself from themes in culture history. An interpretation of MC-6 departs from a theoretical perspective and aims at understanding social relations from a microscale. The taskscape of MC-6 is proposed as a basic foundation of social life and the material record is appreciated in relation to that perspective. The emphasis is placed on practices and how people engage with their world, rather than what the material culture ‘represents.’ Moreover, local histories are the basis of social life, rather than large macroscales of analysis. To appreciate the social life of people at MC-6, local practices must be placed first. Interpretations must be solidly grounded in the local context, rather than how this site fits into the larger picture.

An analysis of MC-6’s microscale identified numerous activities and resources that were locally exploited. Salt seems to be the most important resource, as people start inhabiting the site as soon as Armstrong Pond changes and environmental conditions are optimal for the production of salt. However, people also fished the riches on the Caicos Bank, mostly bonefish and conch. Cotton is another possible resource that was exploited. Although these three might have been the main focus of the people living at MC-6, other practices definitely took place. Pottery was produced, gardens were maintained, crops were grown, tools were made, and valuables were produced.

In contrast with other regions in the Caribbean, the local climate on Middle Caicos, with two dry seasons, is ideal for both salt and cotton production. This climate, in combination with Armstrong Pond and the Caicos Bank, made MC-6 special and a spatial concentration with access to important and highly valued resources. One of the advantages of MC-6’s environment is that it harbors so many valuable resources in relatively close proximity. This local environment is a perfect combination. At a microscale, people decided to exploit these resources and their local practices shaped social life.

A relational network of interdependent practices, a taskscape, emerges from the exploitation of salt, fish and cotton. Seasonal changes and time-specific abundances were integrated into the economy and people tried to plan their efforts and practices in correspondence to these changes. The taskscape of MC-6 had a temporal scale of yearly routines adapted to the yearly cycles of these resources. Seasonal shifts in precipitation resonated with shift in practices, and people, adapted their daily activities in anticipation of these changes on longer time scales.

Furthermore, cotton, fish and salt are one economy, as the exploitation of one influences the other. Salt has more value, in the prehistoric Caribbean, when it is combined with proteins rather than just the raw product. To maximize salt, fish must be maximized as well. Fishing revenues increase with net fishing, which enables catching large amounts of fish at once. Nets, made of cotton, are vital tools in this effort. To maximize fishing, cotton production had to be maximized. The production of cotton, fish and salt all comprised one complete economy of interdependent resources.

This also implies that this whole economy was ultimately focused on the production of salted fish and cotton as important export products. Production of salted fish and cotton beyond local needs has very little effect if these products were only used at MC-6. A demand for these products outside MC-6 is needed to make exploitation profitable at such a distant location. The resources at MC-6 are only of importance because this combination of environmental factors is unique in the region. A salt pond, a fertile marine bank and a hot and dry environment with two dry seasons in the year are exclusive characteristics of MC-6.

The importance of MC-6 is founded on the local availability of certain resources that are in demand in places that could be reached through exchange. Export to regions afar, most likely the island of Hispaniola, extended the spatial scale of reference. The social value and meaning of MC-6 and its products only make sense on a broader temporal and spatial scale. MC-6's status emerges from its place within that larger framework.

Salt has power as it structures people. This takes place in two different ways. First, it *enables* people to overcome dietary needs, to enhance the taste of food and to preserve edible goods. It facilitates accumulation of produce and subsequent exchange practices, creating debts and establishing positions of power. Second, it *restricts* when and where people can be. Seasonal availability limits the times of exploitation, meaning people have to adapt their yearly routines to its presence. Salt also occurs in very specific places, impeding the mobility of people. Once established as a resource of value, salt production sites require protection.

The material qualities of salt enable and restrict people's practices. Salt has agency and changes social relations and practices. Whereas the benefits of salt lure people into the exploitation of the product, the disadvantages confine people's possibilities and decision making processes. People are drawn to salt for many reasons, but by being drawn to it, salt limits people. In most cases, it seems that salt's appeal exceeds its restrictions. Controlling salt conferred huge benefits in social networks of exchange and facilitated the creation of power differences.

9.3 New Avenues of Research

A number of questions that arise from this study deserve more attention in future research. First, and foremost, this anthropological perspective emphasizes the role of salt in prehistoric communities. Although this study is restricted to the Caribbean region, the mechanisms through which salt gains its importance are not. The first part of the study provides a tool to understand how salt might have been used to acquire power in situations outside the geographic boundaries of Caribbean region. The processes of how salt influences value transformation from economic production to social status and wealth remain the same. Other archaeological case-studies involved in the production and exchange of salt are better appreciated within the perspective discussed here.

In places and times where and when salt was a structural problem and sources were uncommon or non-existent, people must have adapted a system to overcome the dietary need. Certain locations, such as the Amazon basin and the inland Maya lowlands, lacked direct access to salt resources. However, many other regions in the world are distant from salt resources and must have adapted to these needs. This study emphasizes the potential of salt in these social contexts.

The heterogeneous distribution of salt sources also implies some sort of diversification and specialization, especially in sedentary social groups. This research on salt indicates that other regions in the Caribbean might have focused on other economic resources and had their own sort of specialization. Often, prehistoric economies are conceived of as if all villages were doing the same thing. However, salt emphasizes that certain local conditions are specifically suited for the exploitation of particular resources, whereas other resources are either unavailable or are really time-intensive to be productive. The differential distribution of resources induces disparate economies and dissimilar quotidian practices. This also means that other groups have different practices and societies and/or economies often categorized under one concept actually consist of multiple coexisting economies (Ensor 2000).

This heterogeneity within an economy produces different social identities as well. The materiality and repetitive character of daily practices also means that a person's social identity becomes associated with his/her specialization. Blacksmiths, carpenters and glassblowers are specializations, but simultaneously social identities with their own yearly routines, esoteric knowledge and temporalities. The foundation of social life lies within these quotidian practices and taskscapes. Reasoning from an economy of substances and a taskscape it is possible to understand the connection between the variation in resources and variation in social identities. Because social identities are founded upon daily practices that are directed to the exploitation of local resources, the social identity is to a significant degree dependent upon the local resources that are exploited. Practices relate the place where people live with their daily life and the social person they are becoming. The variation in the late prehistoric Caribbean region that is observed in the material record might have been the result of regional specializations that created different and incompatible temporalities of taskscapes.

For late prehistoric groups, early historical documents might inform on these different taskscapes and resources that are exploited. Examples used in this study indicate that early historical documents can be used to reconstruct past economies. In situations where the impact of the Spanish was still minimal, large quantities of certain resources are likely a product of indigenous practices and economies. Furthermore, the Spanish documents also indicate from whom the products were received and where these resources were exploited. This historical information can provide new insights into how different economies were distributed throughout the islands.

This historical research might be crucial for understanding the role of cotton in the region. The evidence for cotton is minimal, but Spanish documents are informative about its massive economic impact in the Caribbean region. New research could focus on pollen data of cotton in salt ponds, located in close proximity to possible prehistoric cotton fields. If the economy of cotton was indeed as important as the chronicles suggest, understanding the distribution and exploitation of this resource is of incredible importance. Cotton, like salt, probably was a major economic focus for prehistoric Caribbean people.

Salt and cotton are both products that could have been transported beyond the geographic boundaries of the region. Current research provides more and more evidence of continued interaction with other regions surrounding the Caribbean Sea. Unfortunately, the perception of this interaction is often unidirectionally and emphasizes how circum-Caribbean regions continued to influence people on the islands. Cotton and salt of high quality and quantity are produced in the Caribbean region and in demand in regions surrounding the islands. Especially in relation with the potential power of salt, attention must be focused on how Caribbean peoples influenced these surrounding regions as well.

Local differentiation within the site was left unexplored here. Settlements are not normalized entities without internal differences and the identities created per stone circle/structure could have been different. Future research should focus on the differences within the site, between the different structures and parts of the site. In relation to this internal differentiation, gender and the division of labor have not been fully explored. Men and women were most likely engaged in different practices, establishing and manipulating social identities between these groups. This is only one step towards the microscale, but the social variation within the site has to be assumed and acknowledged.

Finally, the distinction between food and produce has the potential to explain the relation between 'overproduction,' 'surplus' and power in many different social circumstances and this conceptual division is applicable to non-salted edibles as well. The choice for durable edibles is often explained as an economic solution for anticipated shortages, but it might have been much more of a social than an economic decision. Durable edibles, like salted foods, might function more as produce than food. The production of edibles focuses as much on social needs as it does on nutritional needs. Although food is an absolute need, most prehistoric groups had multiple options to satisfy this need. The questions must not involve what they ate, but how they ate and why.

The production of sufficient foods seems not to have been the biggest problem for most prehistoric societies, but how to negotiate social relations through food was. Understanding the material aspects, including seasonality and durability of certain crops, provides a better understanding of how people created social identities through interaction and exchange. An exchange paradigm for produce completely changes how food is perceived from an anthropological perspective and provides the methodological tool and mechanism that transforms economic wealth into social status.

The future-oriented perspective on daily practices, and in this case, food and produce provisioning, also points to other considerations for archaeologists. Material products in the archaeological record provide information regarding how people were engaging in relations and manifested themselves in social arenas where identities are constantly contested. The static material record is not a representation of how relationships are, but how they were formed and negotiated. Objects, including salt, are essential components that fabricate people and relationships. Anthropological analysis should not be focused on the material, but the relations that were created through the material.

This study shows how material qualities of economic products enable and restrict people's practices. It discusses how people adapt their daily life to the material boundaries of the world and engage with physicality of objects and their environment. Furthermore, this study shows how people utilize certain material aspects of salt, such as the nutritional qualities and ability to preserve perishables, to satisfy social, rather than biological needs. Values and meanings are created in the process of interaction and exchange, and salt's ability to increase social status for its owner through acts of indebting imbues this resource with power. Finally, this study, starting from the microscale, i.e. how people actually engage with their material world, provides a methodological tool to understand and perceive the social world from a perspective that is grounded in native practices.

APPENDIX A
CALIBRATION REPORT C-14 DATES

```
     RADIOCARBON CALIBRATION PROGRAM*
                            CALIB REV6.0.0
                Copyright 1986-2010 M Stuiver and PJ Reimer
          *To be used in conjunction with:
          Stuiver, M., and Reimer, P.J., 1993, Radiocarbon, 35, 215-230.
                  Annotated results (text) - -
                  Export file - c14res.csv
Core 1
 UGAMS-8763
 shell
 Radiocarbon Age BP    840 +/-   25
   Delta R =   35.0 +/-    56.0
 Calibration data set: Marine/INTCAL09             # Reimer et al. 2009
   % area enclosed       cal AD age ranges             relative area under
                                                   probability distribution
   68.3 (1 sigma)     cal AD 1333- 1360                    0.273
                             1386- 1438                    0.727
   95.4 (2 sigma)     cal AD 1314- 1450                    1.000
```

```
 Core 2
 UGAMS-8764
 shell
 Radiocarbon Age BP    620 +/-   25
   Delta R =   35.0 +/-    56.0
 Calibration data set: Marine/INTCAL09             # Reimer et al. 2009
   % area enclosed       cal AD age ranges             relative area under
                                                   probability distribution
   68.3 (1 sigma)     cal AD 1443- 1498                    1.000
   95.4 (2 sigma)     cal AD 1424- 1534                    0.942
                             1558- 1563                    0.006
                             1573- 1583                    0.011
                             1592- 1619                    0.041
```

```
 Core 3
 UGAMS-8765
 shell
 Radiocarbon Age BP    830 +/-   25
   Delta R =   35.0 +/-    56.0
 Calibration data set: Marine/INTCAL09             # Reimer et al. 2009
   % area enclosed       cal AD age ranges             relative area under
                                                   probability distribution
   68.3 (1 sigma)     cal AD 1320- 1373                    0.723
                             1377- 1397                    0.277
   95.4 (2 sigma)     cal AD 1297- 1418                    1.000
```

```
 Core 4
 UGAMS-8766
 shell
```

```
Radiocarbon Age BP   1110 +/-   25
  Delta R =   35.0 +/-    56.0
Calibration data set: Marine/INTCAL09            # Reimer et al. 2009
  % area enclosed       cal AD age ranges            relative area under
                                                 probability distribution
  68.3 (1 sigma)     cal AD 1177- 1267                   1.000
  95.4 (2 sigma)     cal AD 1077- 1085                   0.008
                            1098- 1292                   0.992
```

```
Core 5
UGAMS-8767
shell
Radiocarbon Age BP   1400 +/-   25
  Delta R =   35.0 +/-    56.0
Calibration data set: Marine/INTCAL09            # Reimer et al. 2009
  % area enclosed       cal AD age ranges            relative area under
                                                 probability distribution
  68.3 (1 sigma)     cal AD 784- 794                     0.071
                            796- 896                     0.929
  95.4 (2 sigma)     cal AD 729- 746                     0.020
                            765- 973                     0.980
```

```
Core 6
UGAMS-8768
shell
Radiocarbon Age BP   2840 +/-   30
  Delta R =   35.0 +/-    56.0
Calibration data set: Marine/INTCAL09            # Reimer et al. 2009
  % area enclosed       cal AD age ranges            relative area under
                                                 probability distribution
  68.3 (1 sigma)     cal BC 812- 733                     1.000
  95.4 (2 sigma)     cal BC 845- 581                     1.000
```

```
Core 7
UGAMS-8769
shell
Radiocarbon Age BP   3000 +/-   25
  Delta R =   35.0 +/-    56.0
Calibration data set: Marine/INTCAL09            # Reimer et al. 2009
  % area enclosed       cal AD age ranges            relative area under
                                                 probability distribution
  68.3 (1 sigma)     cal BC 935- 823                     1.000
  95.4 (2 sigma)     cal BC 1005- 798                    1.000
```

```
Core 8
UGAMS-8770
shell
Radiocarbon Age BP   4360 +/-   30
  Delta R =   35.0 +/-    56.0
Calibration data set: Marine/INTCAL09            # Reimer et al. 2009
  % area enclosed       cal AD age ranges            relative area under
                                                 probability distribution
  68.3 (1 sigma)     cal BC 2746- 2573                   1.000
```

```
  95.4 (2 sigma)     cal BC 2849- 2544                    0.976
                            2521- 2498                    0.024
```

```
Core 9
UGAMS-8771
shell
Radiocarbon Age BP   4190 +/-   30
  Delta R =   35.0 +/-    56.0
Calibration data set: Marine/INTCAL09              # Reimer et al. 2009
  % area enclosed       cal AD age ranges              relative area under
                                                   probability distribution
  68.3 (1 sigma)     cal BC 2495- 2350                    1.000
  95.4 (2 sigma)     cal BC 2566- 2300                    1.000
```

```
FS 18
UGAMS-8772
charcoal
Radiocarbon Age BP    470 +/-   25
Calibration data set: intcal09.14c                 # Reimer et al. 2009
  % area enclosed       cal AD age ranges              relative area under
                                                   probability distribution
  68.3 (1 sigma)     cal AD 1427- 1444                    1.000
  95.4 (2 sigma)     cal AD 1415- 1451                    1.000
```

```
FS 34
UGAMS-8773
charcoal
Radiocarbon Age BP    580 +/-   25
Calibration data set: intcal09.14c                 # Reimer et al. 2009
  % area enclosed       cal AD age ranges              relative area under
                                                   probability distribution
  68.3 (1 sigma)     cal AD 1319- 1351                    0.691
                            1390- 1406                    0.309
  95.4 (2 sigma)     cal AD 1304- 1364                    0.671
                            1384- 1414                    0.329
```

```
FS 35
UGAMS-8774
charcoal
Radiocarbon Age BP    550 +/-   25
Calibration data set: intcal09.14c                 # Reimer et al. 2009
  % area enclosed       cal AD age ranges              relative area under
                                                   probability distribution
  68.3 (1 sigma)     cal AD 1328- 1341                    0.292
                            1395- 1419                    0.708
  95.4 (2 sigma)     cal AD 1317- 1354                    0.380
                            1389- 1430                    0.620
```

```
FS 37
UGAMS-8775
charcoal
Radiocarbon Age BP    610 +/-   25
```

```
Calibration data set: intcal09.14c                # Reimer et al. 2009
  % area enclosed       cal AD age ranges             relative area under
                                                  probability distribution
  68.3 (1 sigma)     cal AD 1303- 1327                    0.417
                            1342- 1366                    0.401
                            1383- 1395                    0.182
  95.4 (2 sigma)     cal AD 1297- 1374                    0.777
                            1376- 1401                    0.223
```

```
FS 40
UGAMS-8776
charcoal
Radiocarbon Age BP    470 +/-   25
Calibration data set: intcal09.14c                # Reimer et al. 2009
  % area enclosed       cal AD age ranges             relative area under
                                                  probability distribution
  68.3 (1 sigma)     cal AD 1427- 1444                    1.000
  95.4 (2 sigma)     cal AD 1415- 1451                    1.000
```

```
FS 45
UGAMS-8777
charcoal
Radiocarbon Age BP    340 +/-   25
Calibration data set: intcal09.14c                # Reimer et al. 2009
  % area enclosed       cal AD age ranges             relative area under
                                                  probability distribution
  68.3 (1 sigma)     cal AD 1492- 1525                    0.332
                            1557- 1603                    0.463
                            1611- 1631                    0.205
  95.4 (2 sigma)     cal AD 1473- 1636                    1.000
```

```
FS 48
UGAMS-8778
charcoal
Radiocarbon Age BP    570 +/-   25
Calibration data set: intcal09.14c                # Reimer et al. 2009
  % area enclosed       cal AD age ranges             relative area under
                                                  probability distribution
  68.3 (1 sigma)     cal AD 1322- 1348                    0.579
                            1392- 1410                    0.421
  95.4 (2 sigma)     cal AD 1308- 1361                    0.598
                            1386- 1419                    0.402
```

```
FS 49
UGAMS-8779
charcoal
Radiocarbon Age BP    620 +/-   25
Calibration data set: intcal09.14c                # Reimer et al. 2009
  % area enclosed       cal AD age ranges             relative area under
                                                  probability distribution
  68.3 (1 sigma)     cal AD 1299- 1323                    0.405
                            1347- 1369                    0.393
                            1380- 1392                    0.202
```

```
  95.4 (2 sigma)     cal AD 1293- 1333                    0.394
                            1336- 1398                    0.606
```

```
 FS 51
 UGAMS-8780
 charcoal
 Radiocarbon Age BP    550 +/-   25
 Calibration data set: intcal09.14c               # Reimer et al. 2009
   % area enclosed       cal AD age ranges            relative area under
                                                  probability distribution
   68.3 (1 sigma)     cal AD 1328- 1341                    0.292
                             1395- 1419                    0.708
   95.4 (2 sigma)     cal AD 1317- 1354                    0.380
                             1389- 1430                    0.620
```

```
 FS 52
 UGAMS-8781
 charcoal
 Radiocarbon Age BP    570 +/-   25
 Calibration data set: intcal09.14c               # Reimer et al. 2009
   % area enclosed       cal AD age ranges            relative area under
                                                  probability distribution
   68.3 (1 sigma)     cal AD 1322- 1348                    0.579
                             1392- 1410                    0.421
   95.4 (2 sigma)     cal AD 1308- 1361                    0.598
                             1386- 1419                    0.402
```

References for calibration datasets:
PJ Reimer, MGL Baillie, E Bard, A Bayliss, JW Beck, C Bertrand, PG Blackwell,
CE Buck, G Burr, KB Cutler, PE Damon, RL Edwards, RG Fairbanks, M Friedrich,
TP Guilderson, KA Hughen, B Kromer, FG McCormac, S Manning, C Bronk Ramsey,
RW Reimer, S Remmele, JR Southon, M Stuiver, S Talamo, FW Taylor,
J van der Plicht, and CE Weyhenmeyer (2009), Radiocarbon 51:xxx-yyy.
KA Hughen, MGL Baillie, E Bard, A Bayliss, JW Beck, C Bertrand, PG Blackwell,
CE Buck, G Burr, KB Cutler, PE Damon, RL Edwards, RG Fairbanks, M Friedrich,
TP Guilderson, B Kromer, FG McCormac, S Manning, C Bronk Ramsey, PJ Reimer,
RW Reimer, S Remmele, JR Southon, M Stuiver, S Talamo, FW Taylor,
J van der Plicht, and CE Weyhenmeyer (2009), Radiocarbon 46:1059-1086.

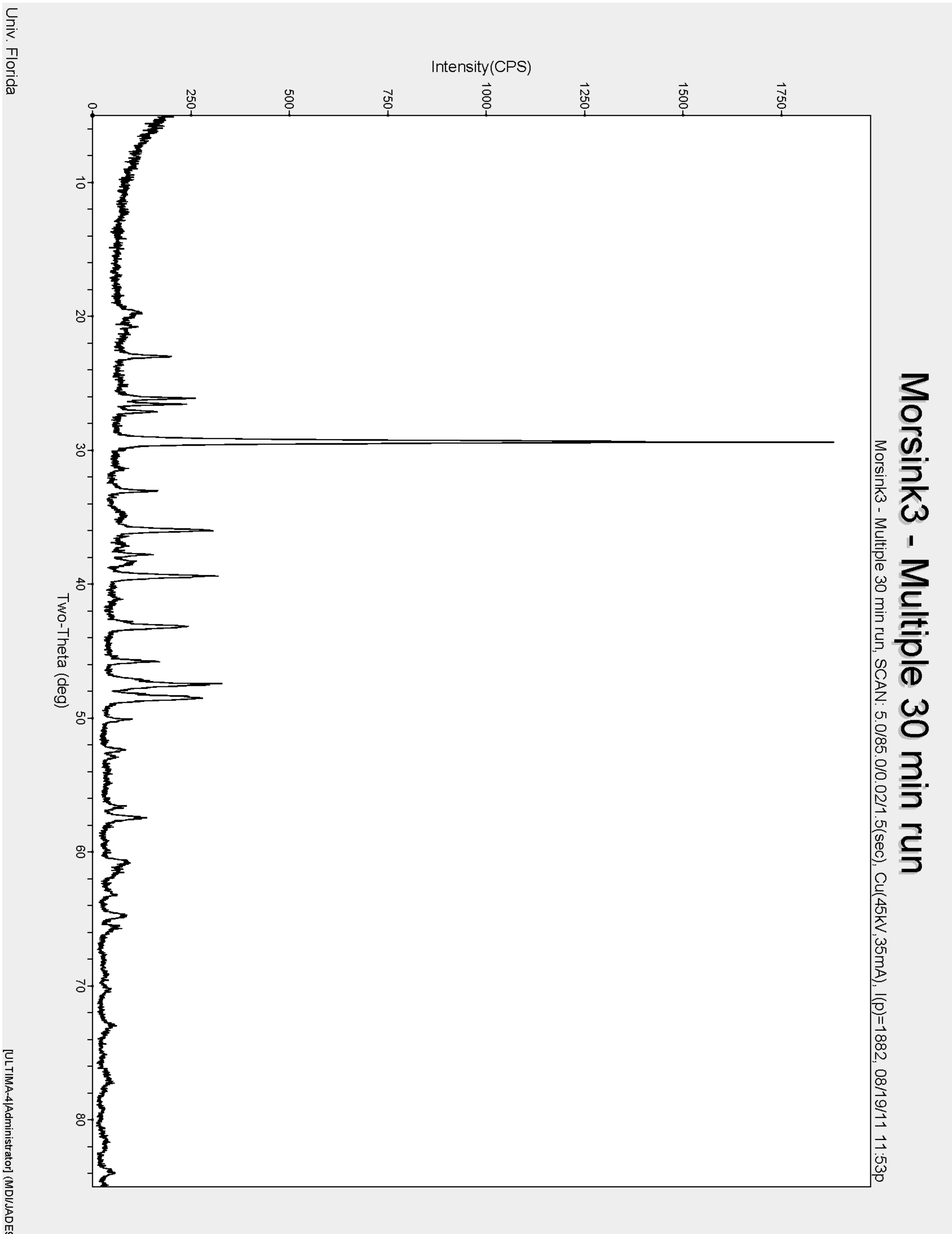
Comments:
* This standard deviation (error) includes a lab error multiplier.
** 1 sigma = square root of (sample std. dev.^2 + curve std. dev.^2)
** 2 sigma = 2 x square root of (sample std. dev.^2 + curve std. dev.^2)
where ^2 = quantity squared.
[ ] = calibrated range impinges on end of calibration data set
0* represents a "negative" age BP
1955* or 1960* denote influence of nuclear testing C-14

NOTE: Cal ages and ranges are rounded to the nearest year which may be too precise in many instances. Users are advised to round results to the nearest 10 yr for samples with standard deviation in the radiocarbon age greater than 50 yr.

APPENDIX B
CHLORIDE SOIL SAMPLE TESTING RESULTS

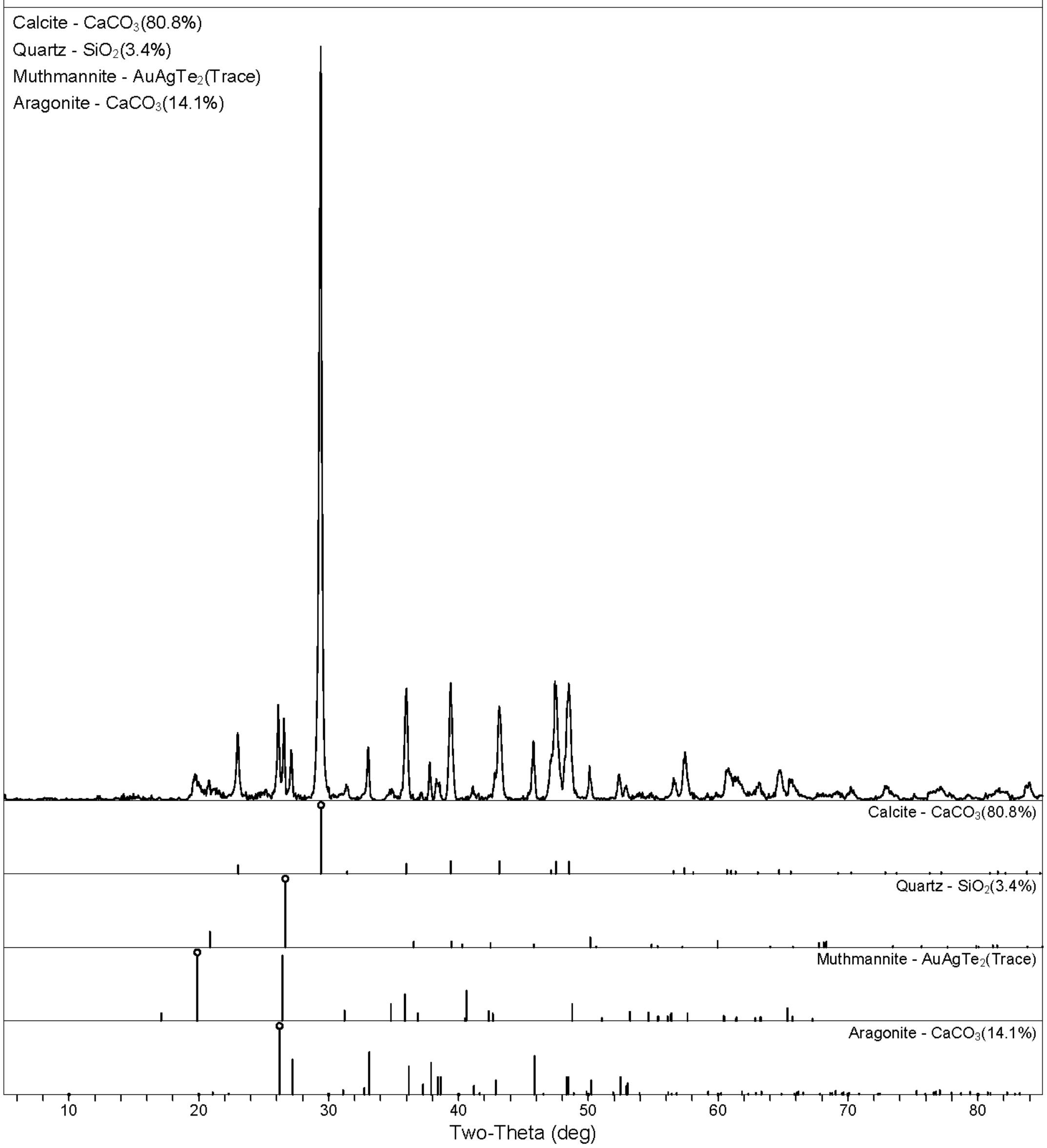
ID#	Location	Cl(mg/kg)
1	structure II	637.8
2	structure IV	716.4
3	NW structure IV	641.3
4	NE structure IV	542.0
5	W boundary N3E2,N4E2	545.1
6	E boundary N3E2,N4E2	534.3
7	SW structure IV	598.5
8	SE structure IV	192.3
9	Center N6E6	1086
10	NW N6E6	1357
11	NE N6E6	833.7
12	SE N1E1	568.3
13	NE N1E1	530.0
14	NW N1E1	540.7
15	SW N1E1	583.3
16	NW N7E7	3713
17	NE N7E7	2479
18	SE N7E7	2876
19	SW N7E7	2918
20	ssl1	587.0
21	ssl 3	130.1
22	ssl 3.1	35.99
23	ssl 4	60.74
24	ssl 5	41.01
25	ssl 6	65.23
26	ssl 7	174.0
27	ssl 8	83.73
28	ssl 9	56.54
29	ssl 10	181.1
30	ssl 11	11320
31	ssl 12	98.81
32	ssl 13	297.9
33	ssl 14	42.80
34	ssl 15	31.08
35	ssl 16	194.5
36	ssl 17	96.79
37	ssl 18	189.8
38	ssl 19	61.16
39	ssl 20	15343
40	ssl 21	1181
41	ssl 22	254.5
42	ssl 23	92.90
43	ssl 24	590.8
44	ssl 25	2127
45	ssl 26	101.0
46	ssl 27	6444
47	ssl 28	12240
48	ssl 29	3664
49	ssl 30	78.19

APPENDIX C
XRD SAMPLE RESULTS

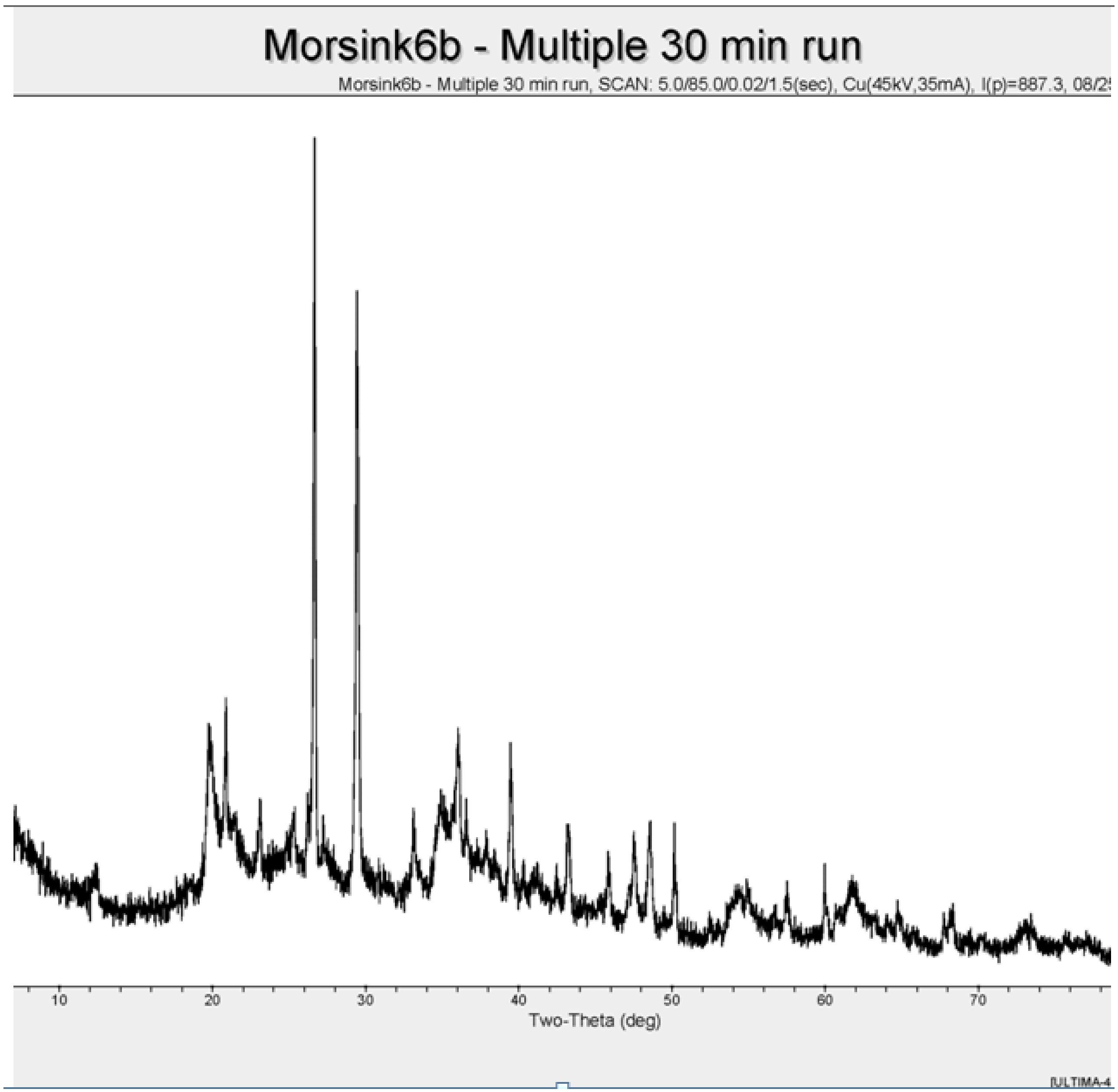


[Morsink3.raw] Morsink3 - Multiple 30 min run	Phase ID Report
SCAN: 5.0/85.0/0.02/1.5(sec), Cu(45kV,35mA), I(p)=1592, 08/19/11 11:53p	

Client Information:	Analyst Information:
Name: Tania	Name: Tania
Voice: Fax:	Voice: Fax:
E-Mail:	E-Mail:
Sample ID: Morsink3 - Multiple 30 min run	Sample ID: Morsink3.raw

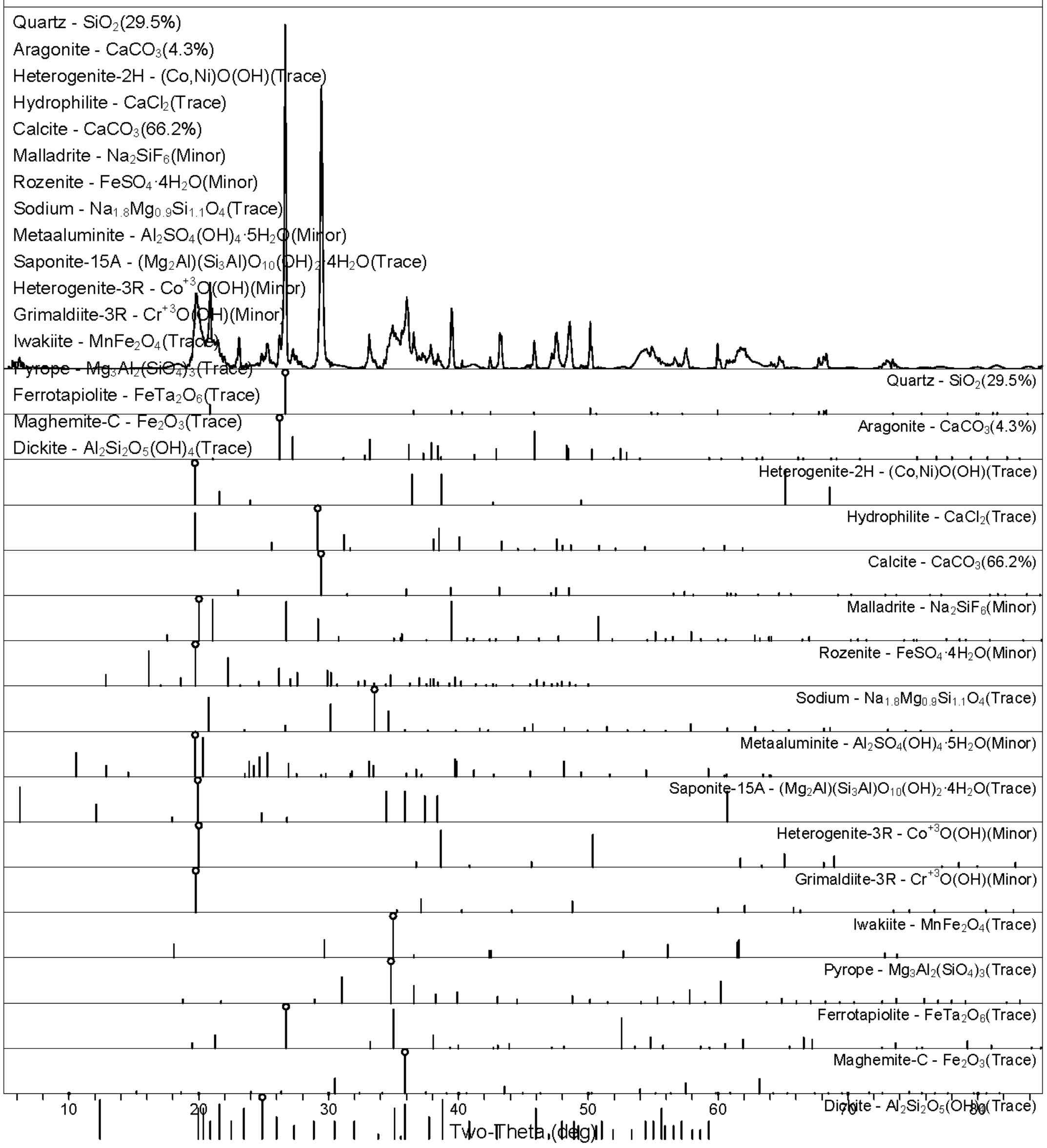


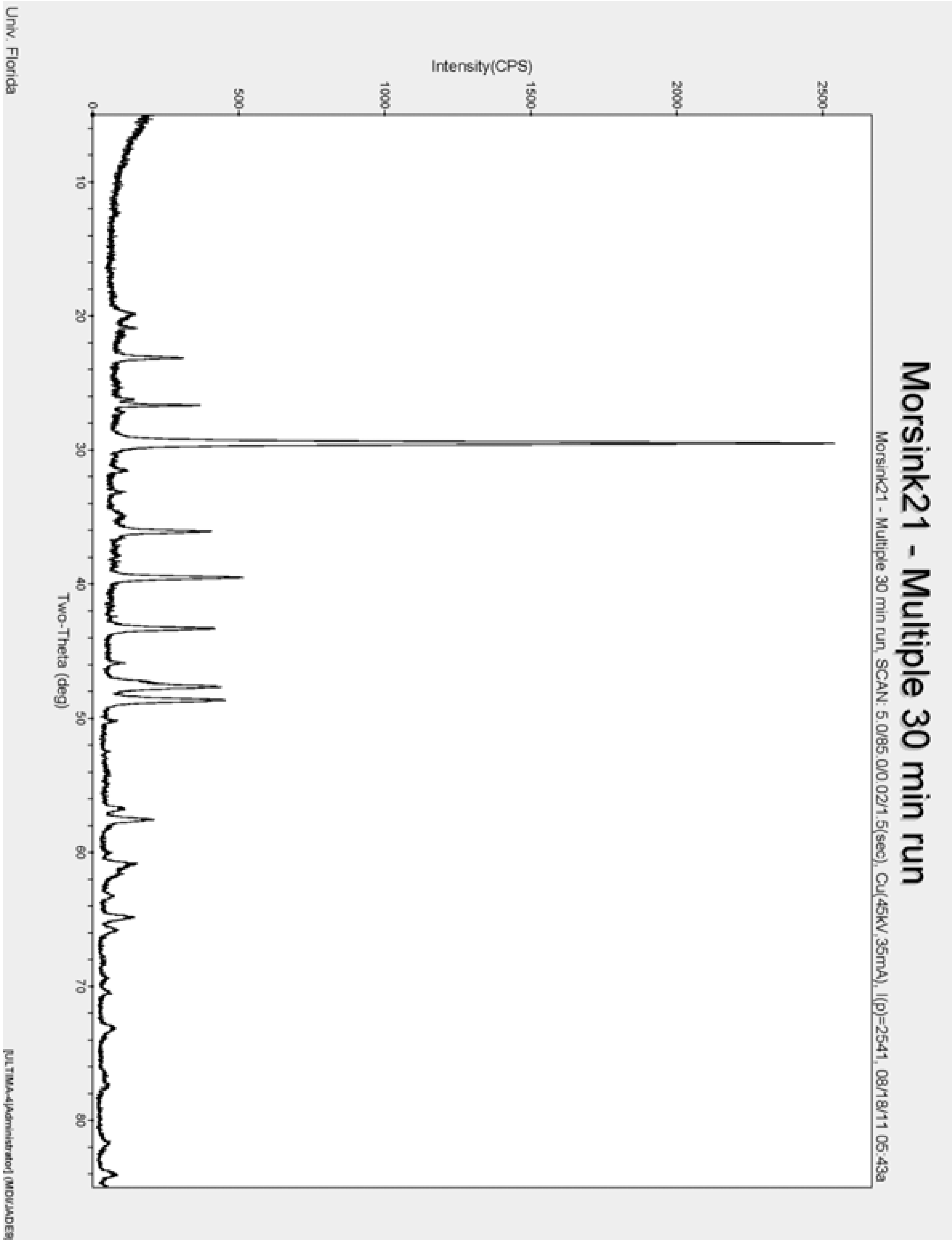
Univ. Florida [ULTIMA-4|Administrator] (MDI/JADE9)


Morsink6b - Multiple 30 min run
Morsink6b - Multiple 30 min run, SCAN: 5.0/85.0/0.02/1.5(sec), Cu(45kV,35mA), I(p)=887.3, 08/2
10
20
30
40
50
60
70
Two-Theta (deg)
[ULTIMA-4

[Morsink6b.raw] Morsink6b - Multiple 30 min run	Phase ID Report
SCAN: 5.0/85.0/0.02/1.5(sec), Cu(45kV,35mA), I(p)=731.1, 08/25/11 08:39p	

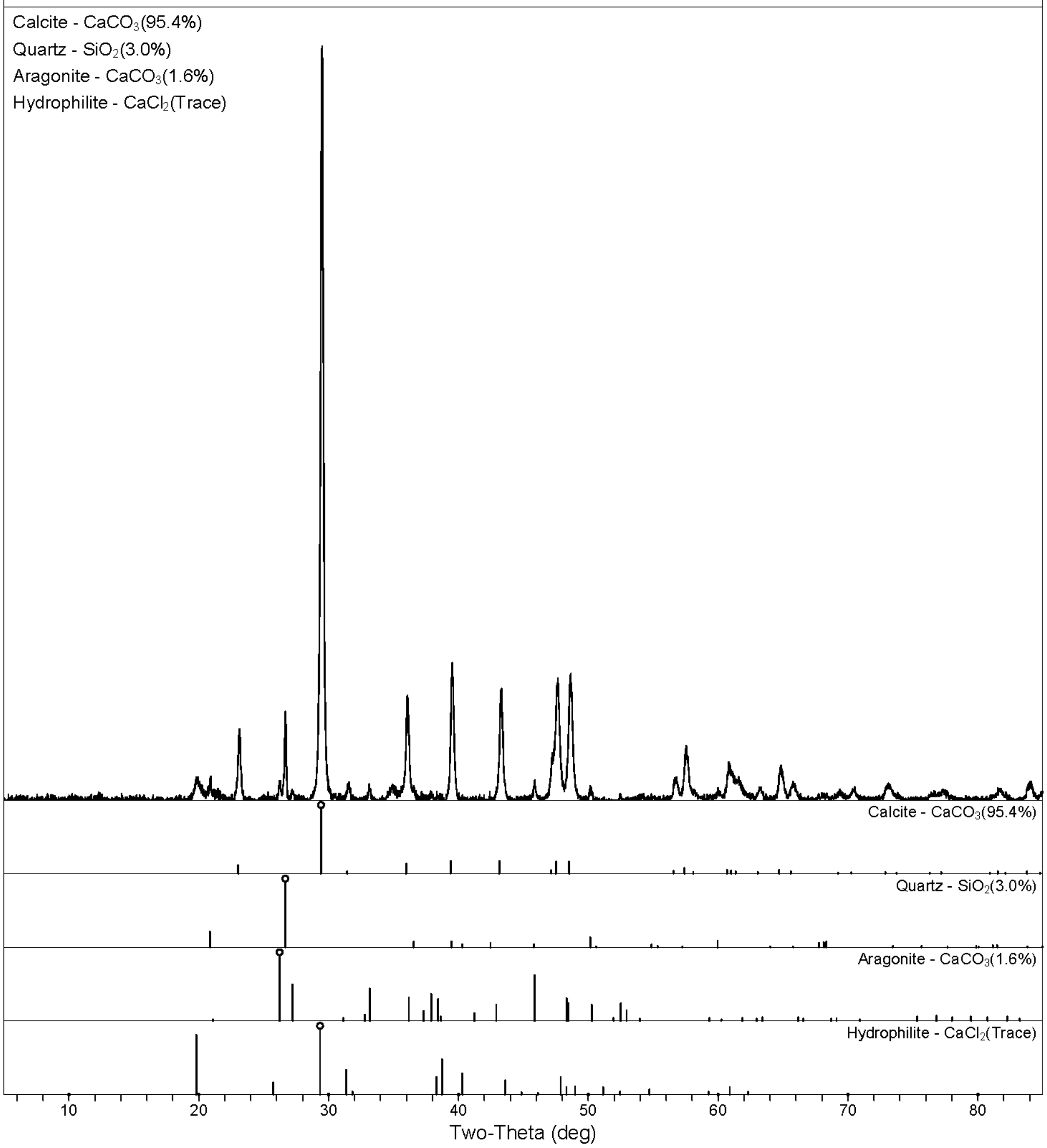
Client Information:	Analyst Information:
Name: Tania	Name: Tania
Voice: Fax:	Voice: Fax:
E-Mail:	E-Mail:
Sample ID: Morsink6b - Multiple 30 min run	Sample ID: Morsink6b.raw




Morsink21 - Multiple 30 min run
Morsink21 - Multiple 30 min run, SCAN: 5.0/85.0/0.02/1.5(sec), Cu(45kV,35mA), I(p)=2541, 08/18/11 05:43a
Intensity(CPS)
Two-Theta (deg)
Univ. Florida

[Morsink21.raw] Morsink21 - Multiple 30 min run	**Phase ID Report**
SCAN: 5.0/85.0/0.02/1.5(sec), Cu(45kV,35mA), I(p)=2472, 08/18/11 05:43a	

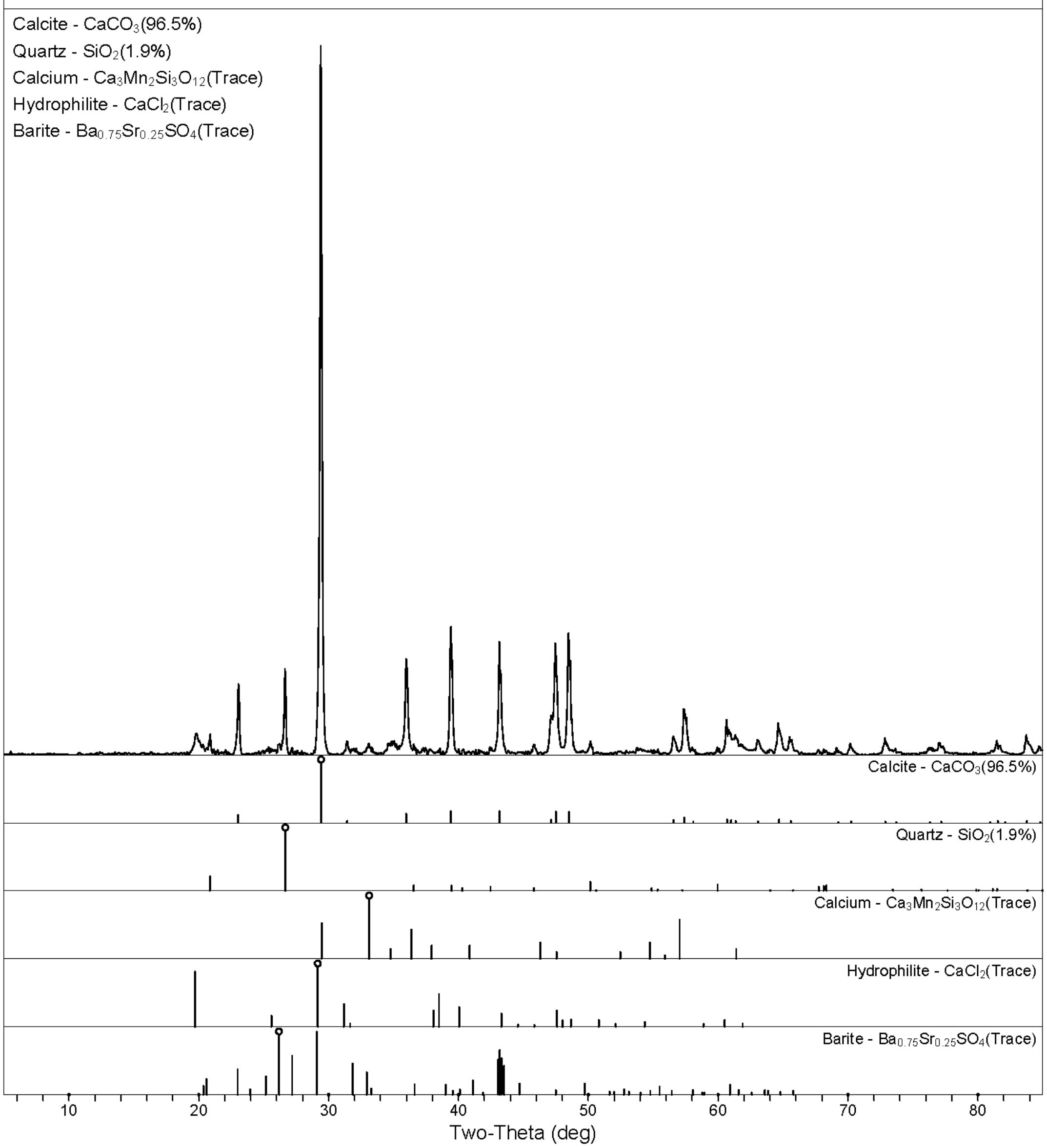
Client Information:	Analyst Information:
Name: Tania	Name: Tania
Voice: Fax:	Voice: Fax:
E-Mail:	E-Mail:
Sample ID: Morsink21 - Multiple 30 min run	Sample ID: Morsink21.raw



Univ. Florida [ULTIMA-4|Administrator] (MDI/JADE9)

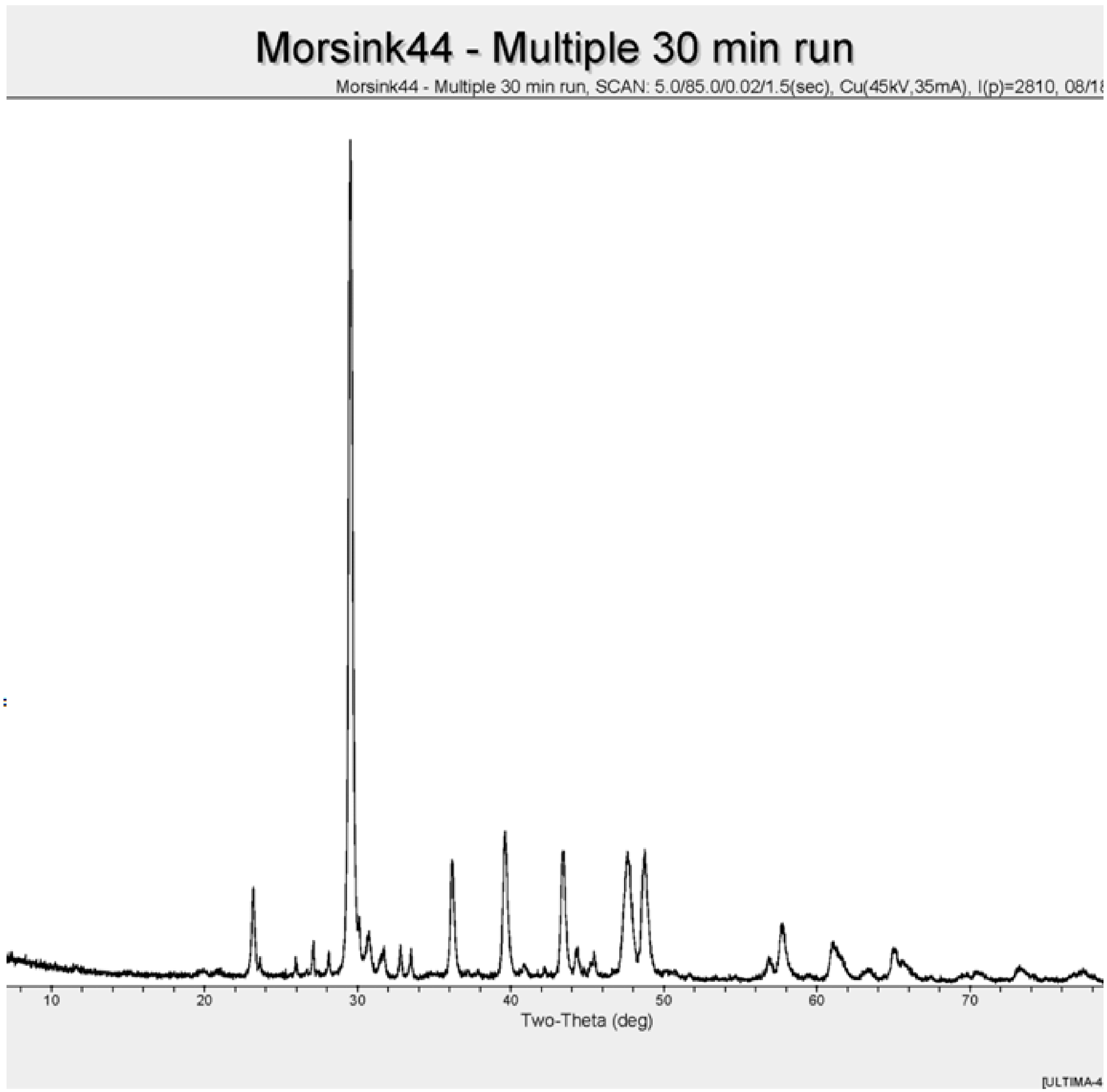
[Morsink37.raw] Morsink37 - Multiple 30 min run	Phase ID Report
SCAN: 5.0/85.0/0.02/1.5(sec), Cu(45kV,35mA), I(p)=2391, 08/18/11 12:20p	

Client Information:	Analyst Information:
Name: Tania	Name: Tania
Voice: Fax:	Voice: Fax:
E-Mail:	E-Mail:
Sample ID: Morsink37 - Multiple 30 min run	Sample ID: Morsink37.raw



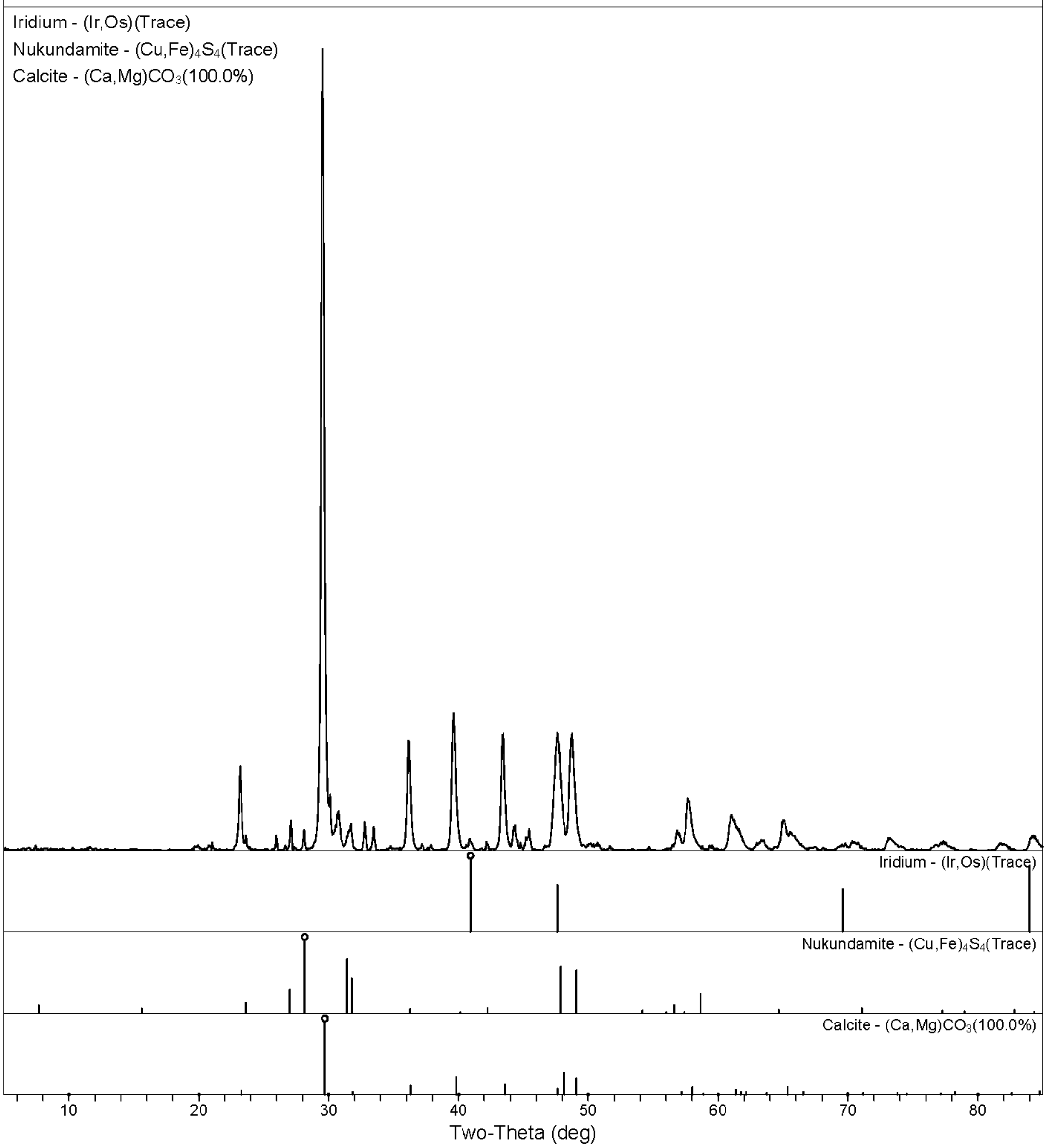
Univ. Florida

[ULTIMA-4|Administrator] (MDI/JADE9)


Morsink44 - Multiple 30 min run
Morsink44 - Multiple 30 min run, SCAN: 5.0/85.0/0.02/1.5(sec), Cu(45kV,35mA), I(p)=2810, 08/1
10
20
30
40
50
60
70
Two-Theta (deg)
[ULTIMA-4

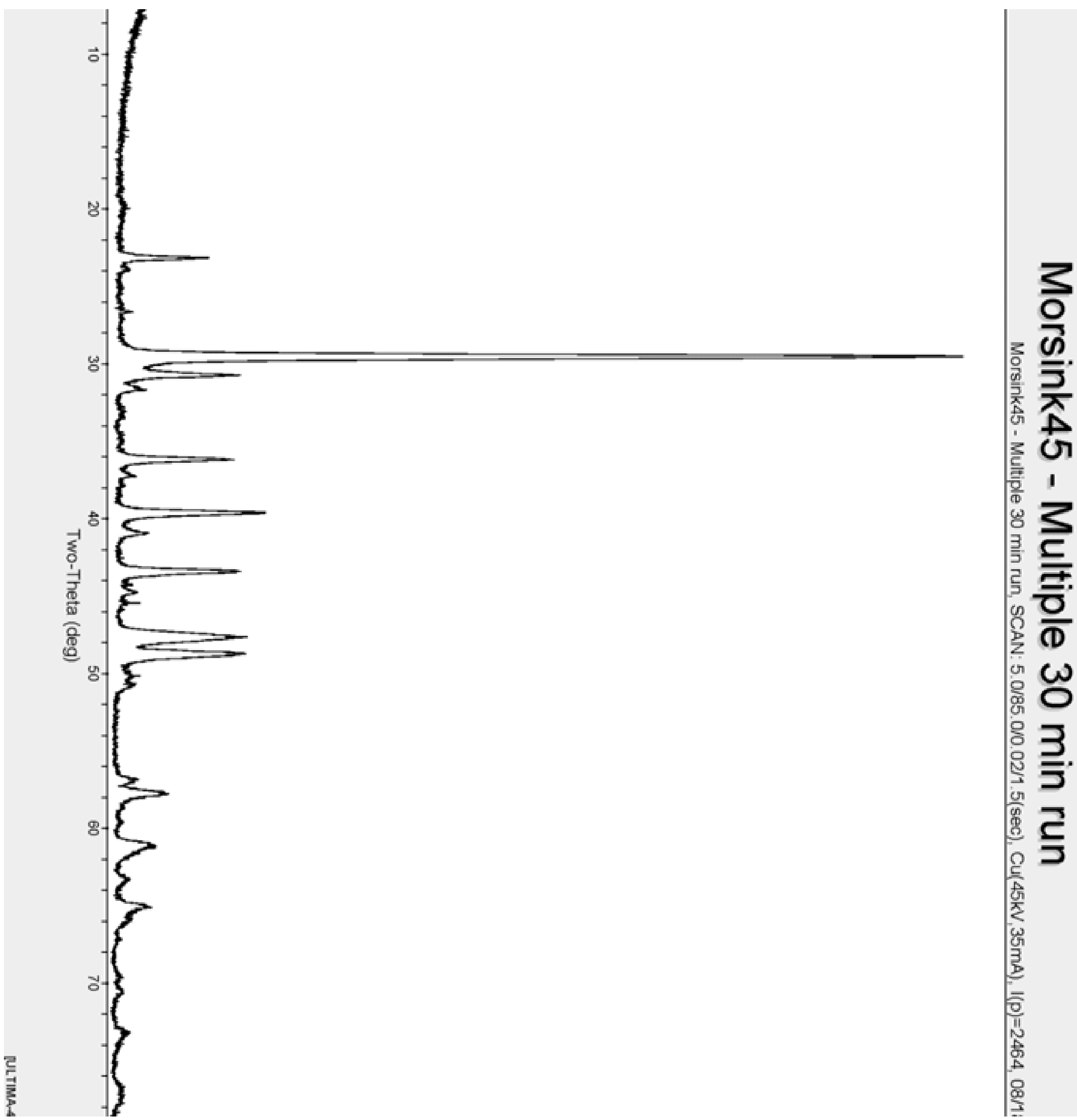
[Morsink44.raw] Morsink44 - Multiple 30 min run	Phase ID Report
SCAN: 5.0/85.0/0.02/1.5(sec), Cu(45kV,35mA), I(p)=2783, 08/18/11 09:01a	

Client Information:	Analyst Information:
Name: Tania	Name: Tania
Voice: Fax:	Voice: Fax:
E-Mail:	E-Mail:
Sample ID: Morsink44 - Multiple 30 min run	Sample ID: Morsink44.raw



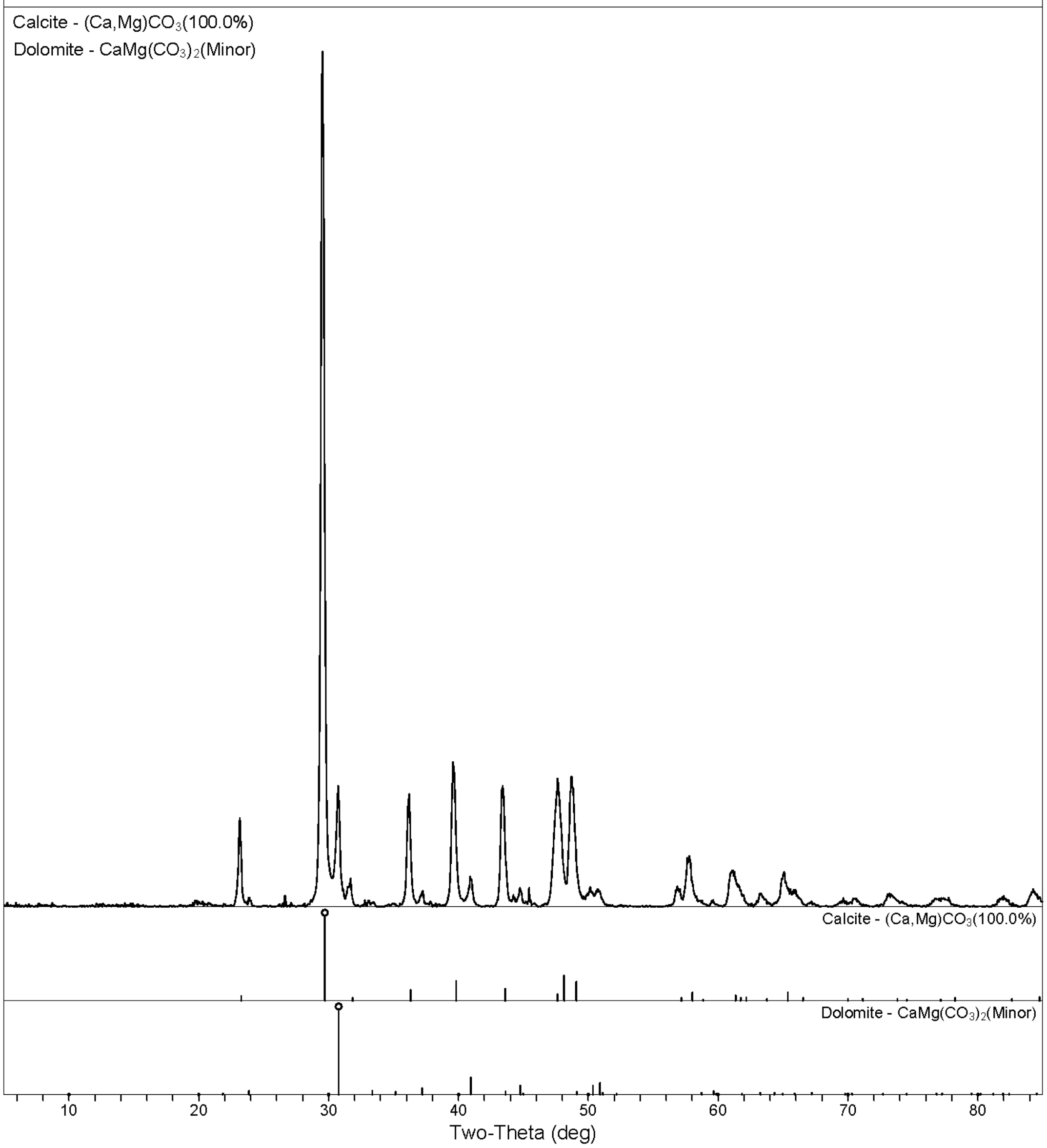
Univ. Florida

[ULTIMA-4|Administrator] (MDI/JADE9)


Morsink45 - Multiple 30 min run
Morsink45 - Multiple 30 min run, SCAN: 5.0/85.0/0.02/1.5(sec), Cu(45kV,35mA), I(p)=2464, 08/1
10
20
30
40
50
60
70
Two-Theta (deg)
[ULTIMA-4

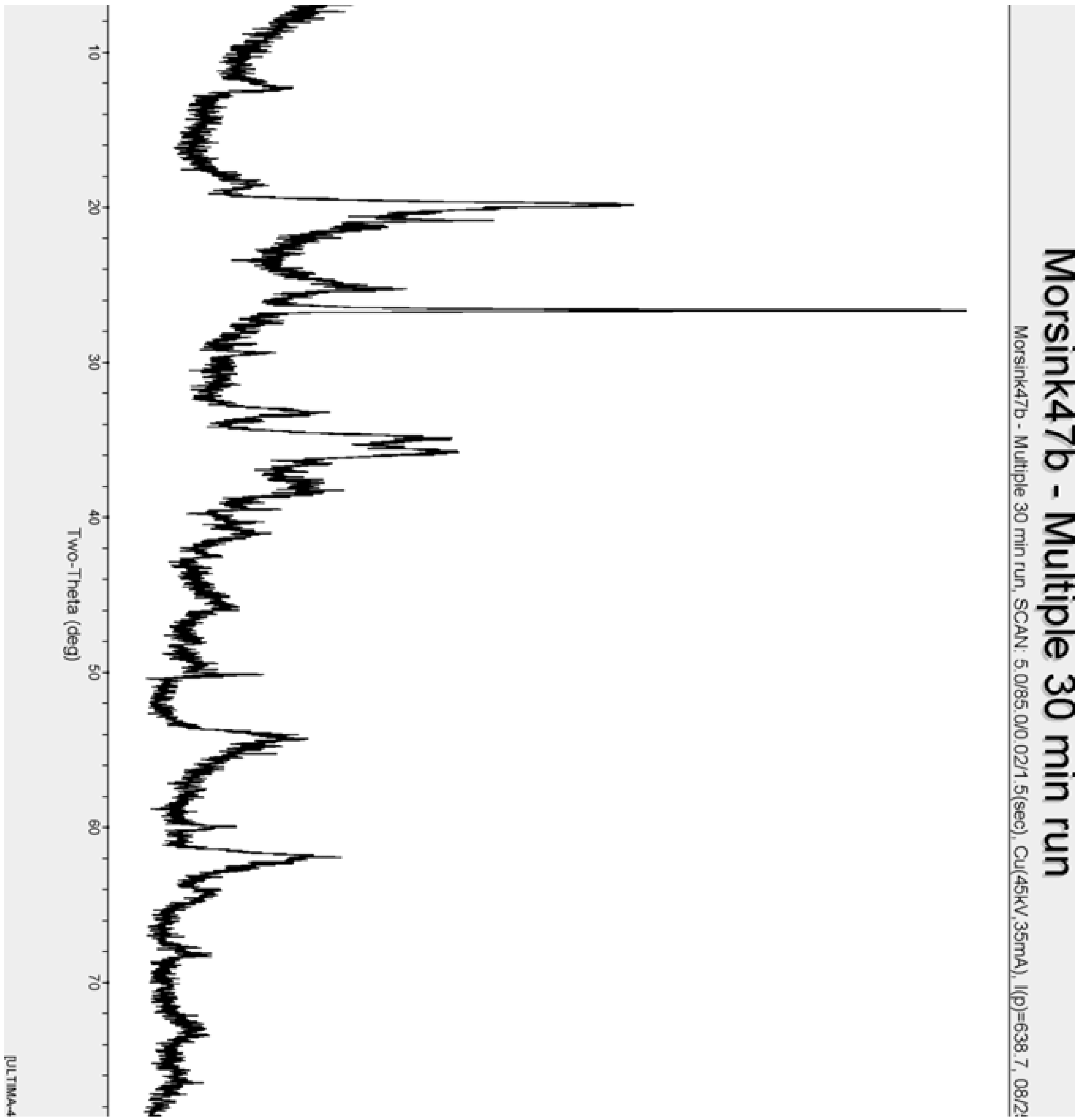
[Morsink45.raw] Morsink45 - Multiple 30 min run	Phase ID Report
SCAN: 5.0/85.0/0.02/1.5(sec), Cu(45kV,35mA), I(p)=2428, 08/18/11 03:38p	

Client Information:	Analyst Information:
Name: Tania	Name: Tania
Voice: Fax:	Voice: Fax:
E-Mail:	E-Mail:
Sample ID: Morsink45 - Multiple 30 min run	Sample ID: Morsink45.raw

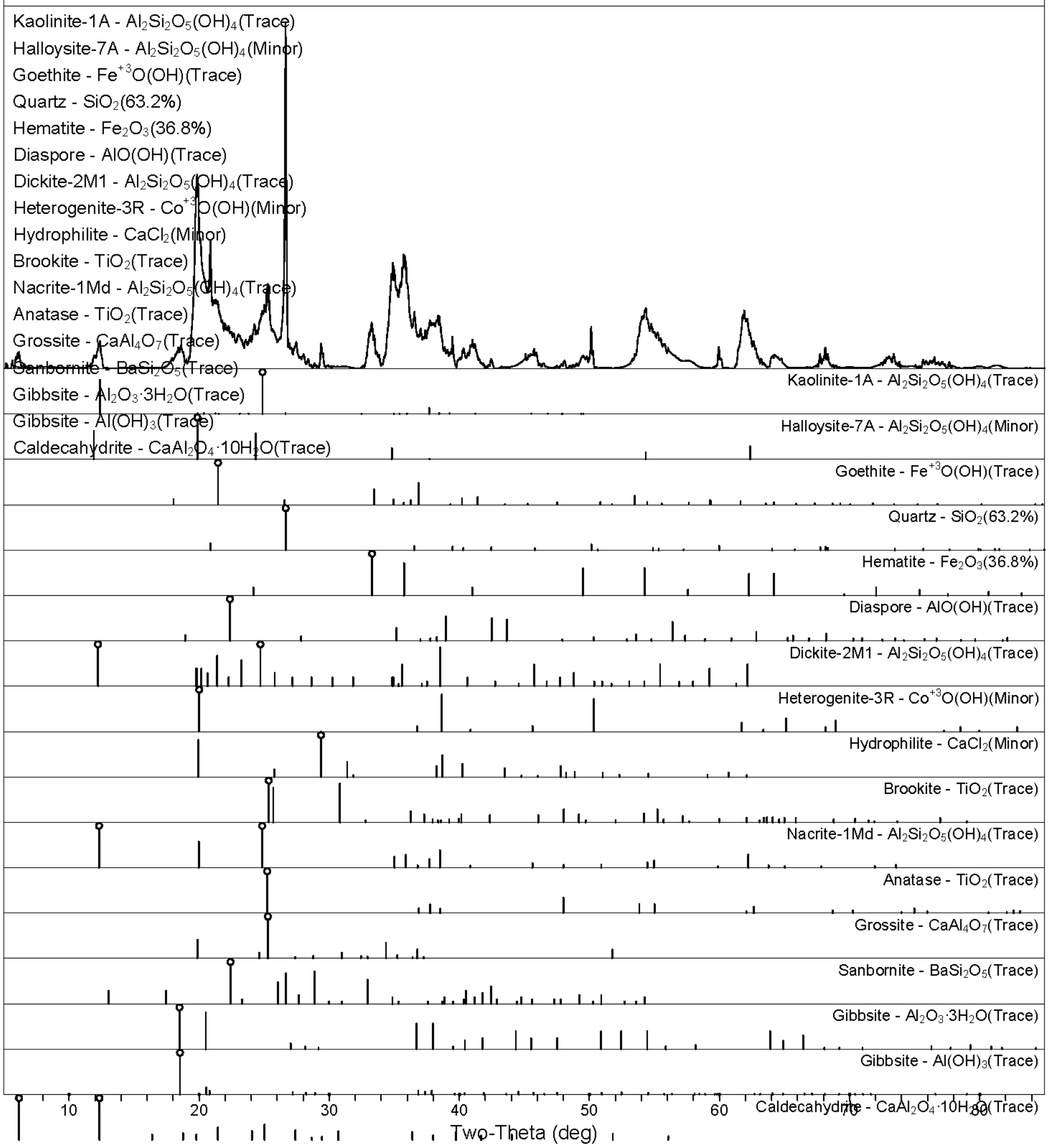


Univ. Florida

[ULTIMA-4|Administrator] (MDI/JADE9)

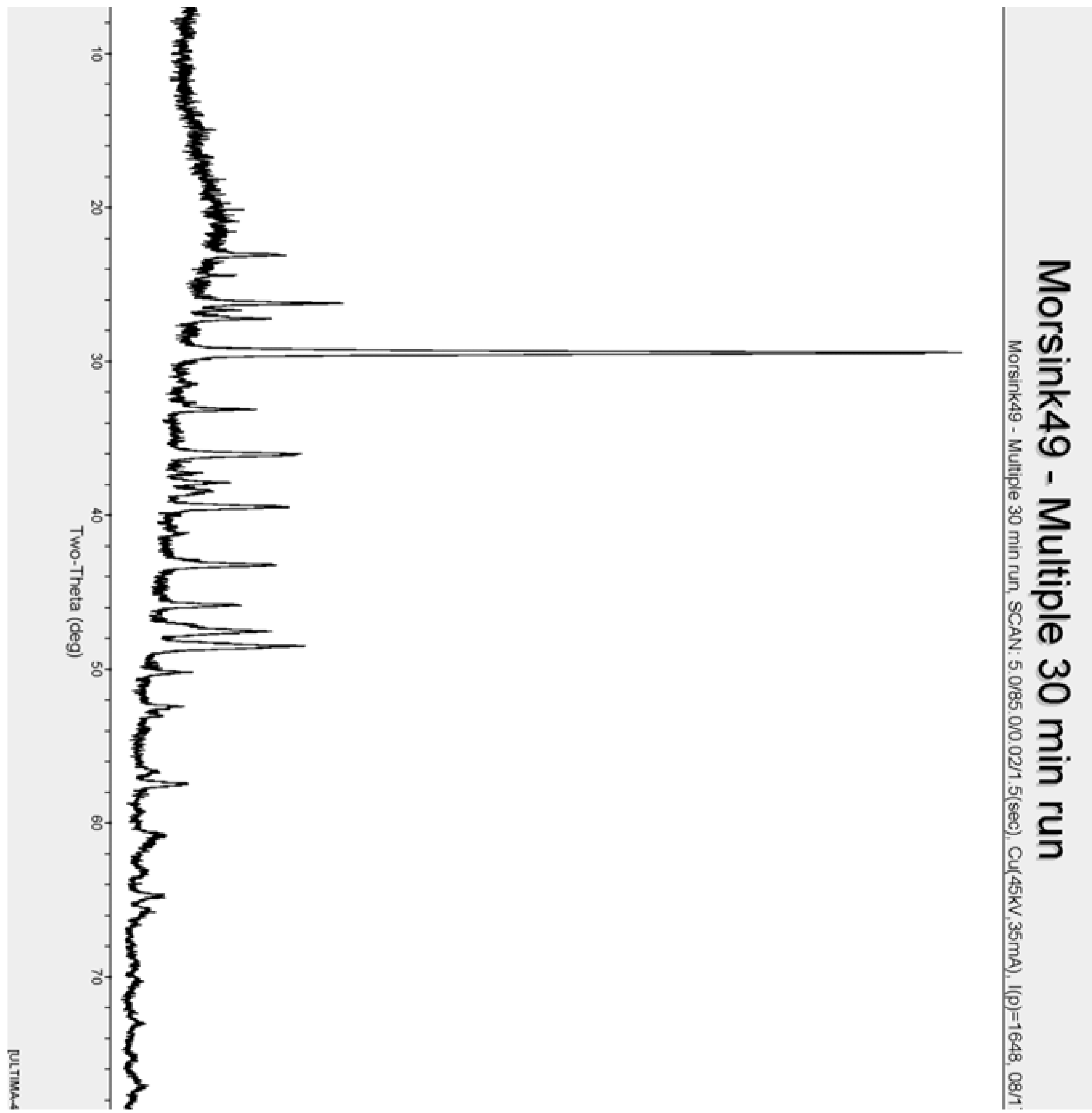

Morsink47b - Multiple 30 min run
Morsink47b - Multiple 30 min run, SCAN: 5.0/85.0/0.02/1.5(sec), Cu(45kV,35mA), I(p)=638.7, 08/2
10
20
30
40
50
60
70
Two-Theta (deg)
[ULTIMA-4

[Morsink47b.raw] Morsink47b - Multiple 30 min run	Phase ID Report
SCAN: 5.0/85.0/0.02/1.5(sec), Cu(45kV,35mA), I(p)=556.7, 08/25/11 11:57p	
Client Information:	Analyst Information:
Name: Tania Voice: Fax: E-Mail: Sample ID: Morsink47b - Multiple 30 min run	Name: Tania Voice: Fax: E-Mail: Sample ID: Morsink47b.raw



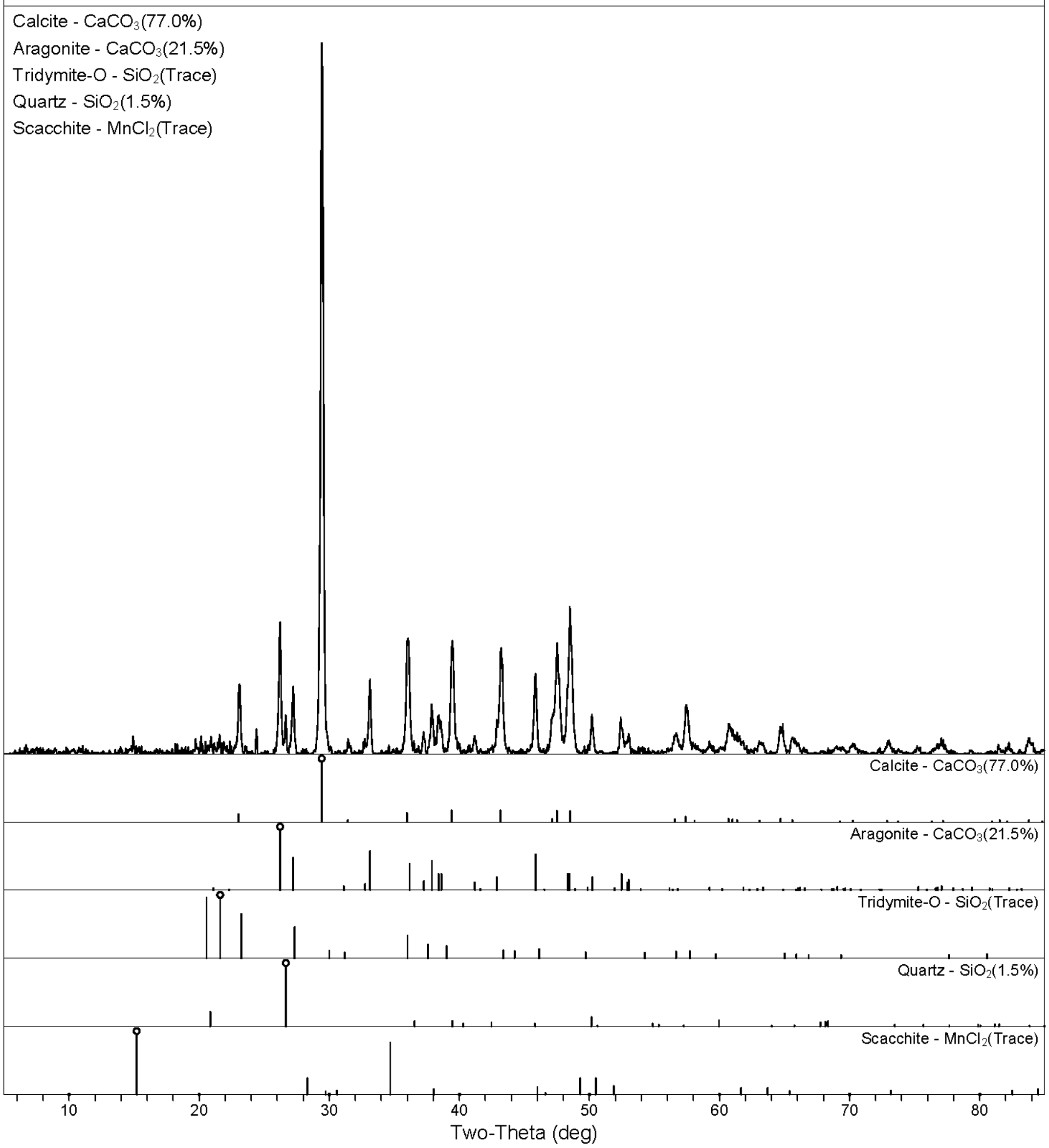
Univ. Florida

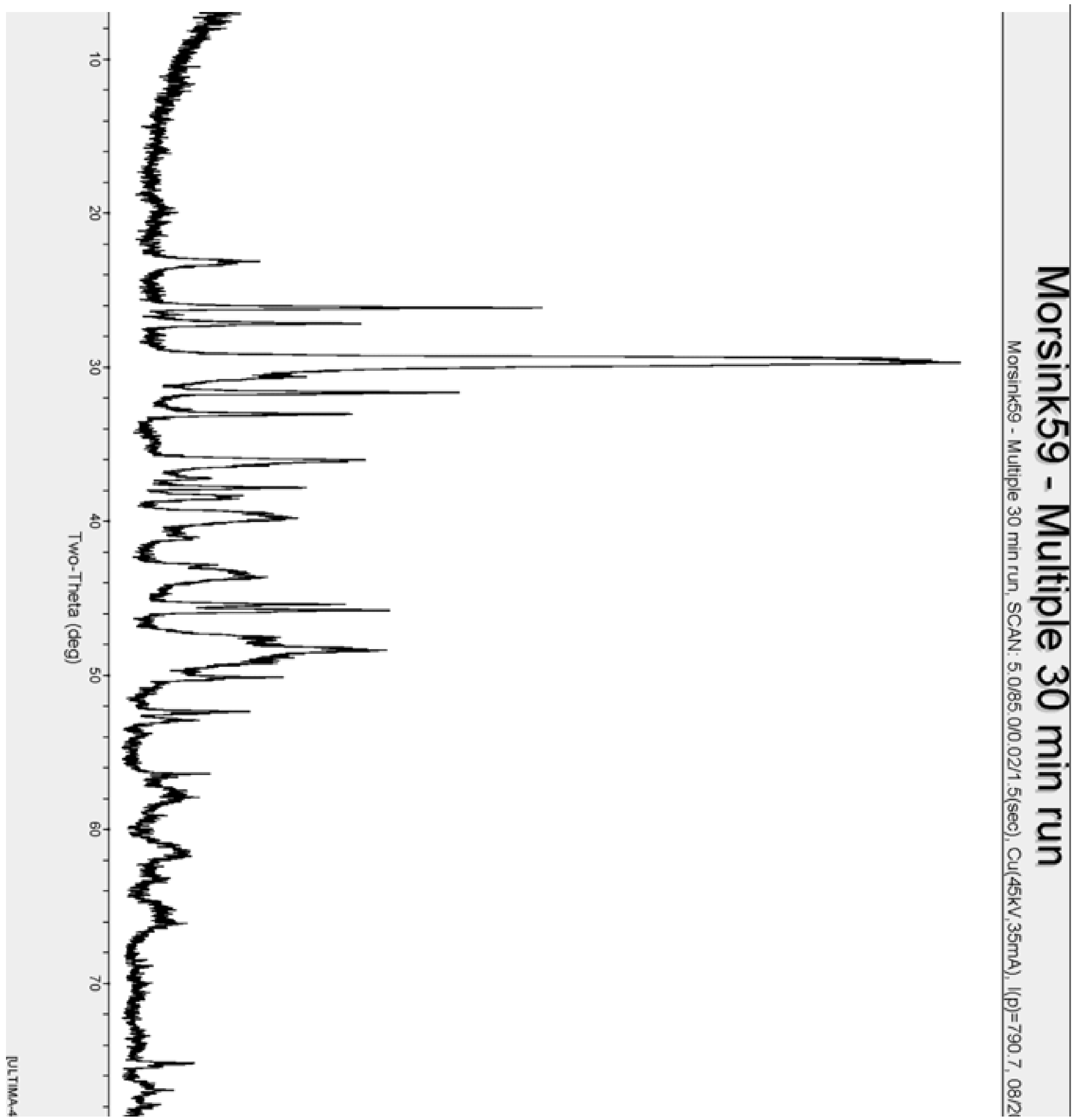
[ULTIMA-4|Administrator] (MDI/JADE9)


Morsink49 - Multiple 30 min run
Morsink49 - Multiple 30 min run, SCAN: 5.0/85.0/0.02/1.5(sec), Cu(45kV,35mA), I(p)=1648, 08/1
10
20
30
40
50
60
70
Two-Theta (deg)
[ULTIMA-

[Morsink49.raw] Morsink49 - Multiple 30 min run	Phase ID Report
SCAN: 5.0/85.0/0.02/1.5(sec), Cu(45kV,35mA), I(p)=1436, 08/17/11 11:04p	

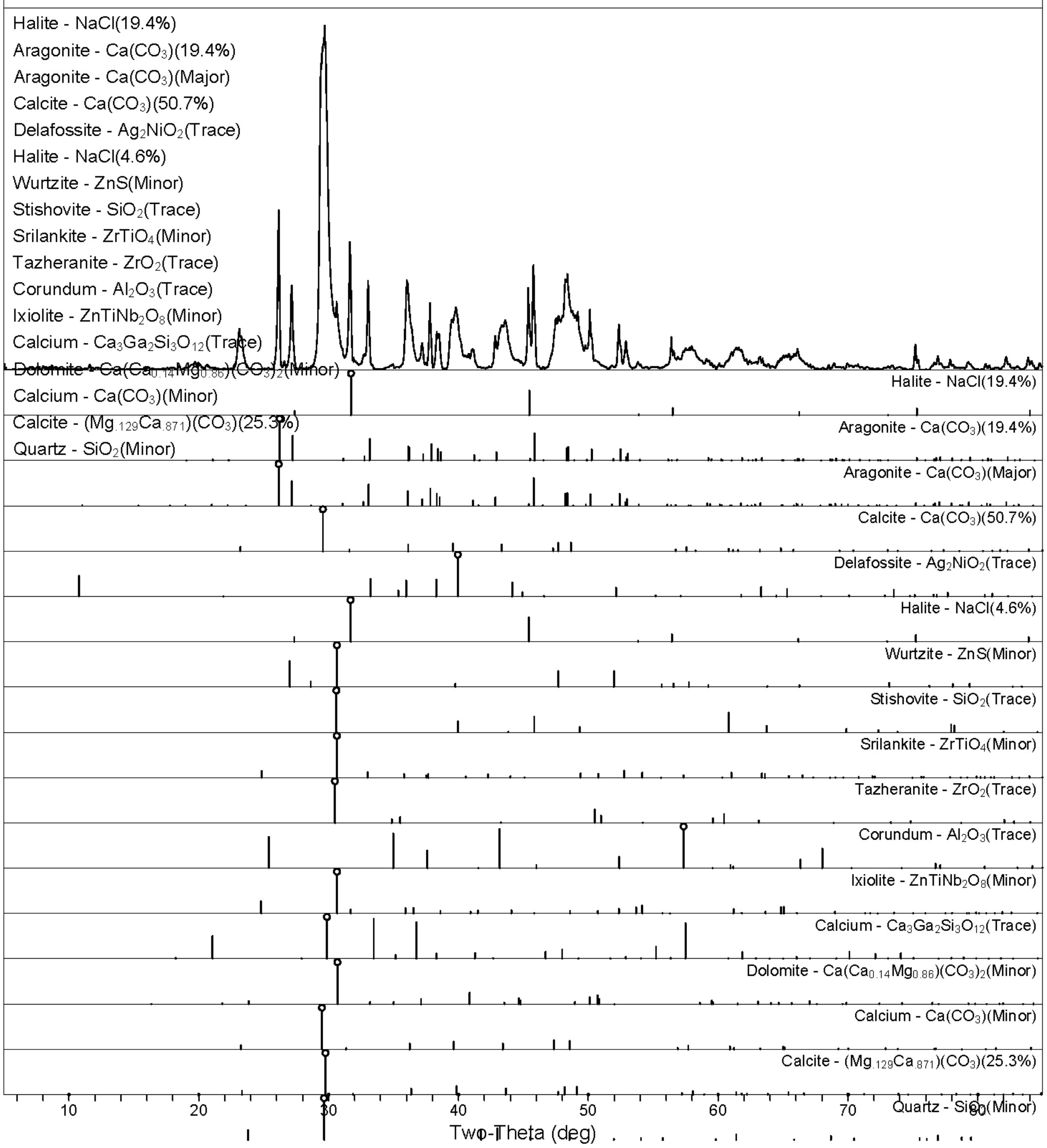
Client Information:	Analyst Information:
Name: Tania	Name: Tania
Voice: Fax:	Voice: Fax:
E-Mail:	E-Mail:
Sample ID: Morsink49 - Multiple 30 min run	Sample ID: Morsink49.raw




Morsink59 - Multiple 30 min run
Morsink59 - Multiple 30 min run, SCAN: 5.0/85.0/0.02/1.5(sec), Cu(45kV,35mA), I(p)=790.7, 08/2
10
20
30
40
50
60
70
Two-Theta (deg)
[ULTIMA-4

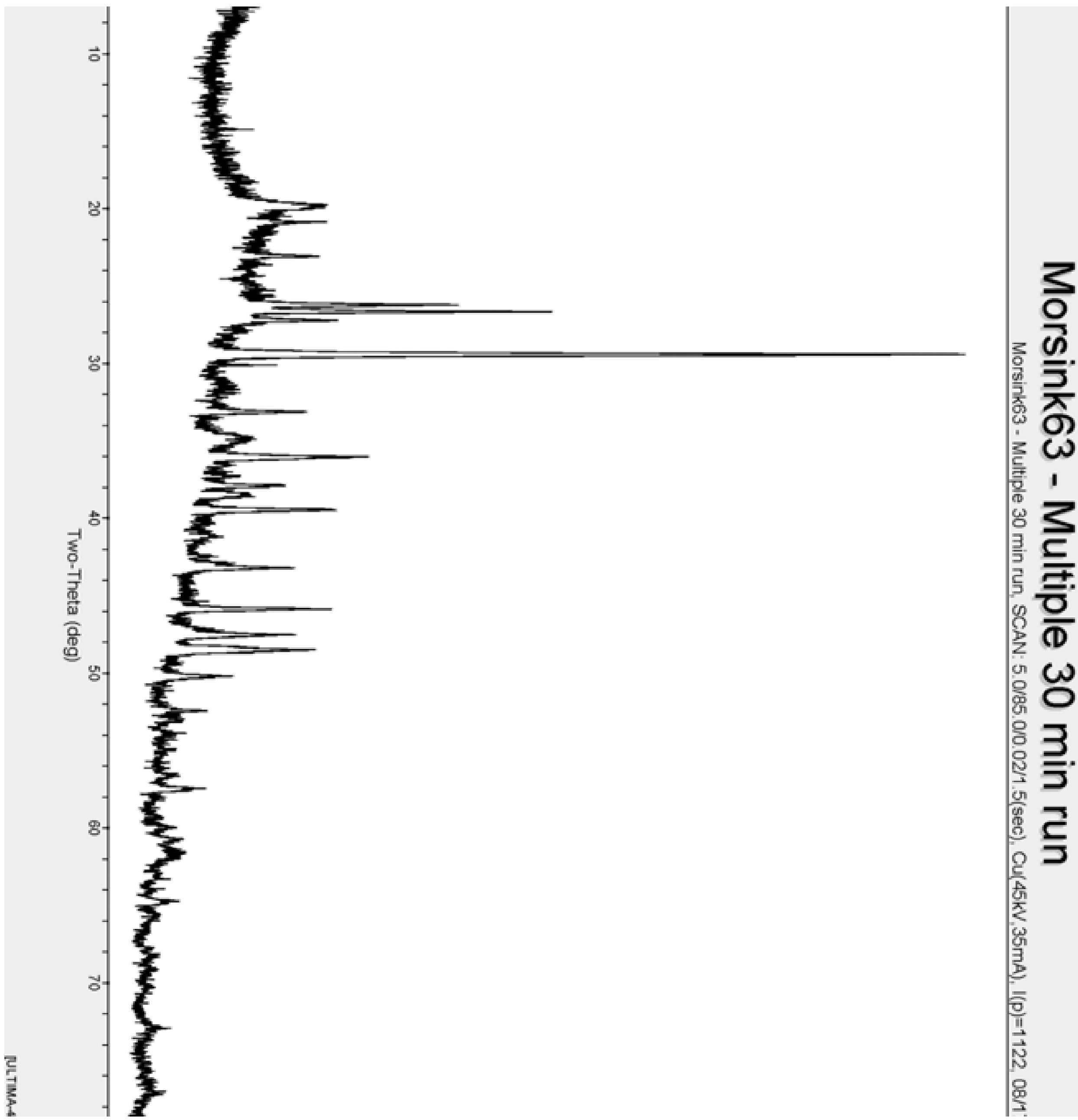
[Morsink59.raw] Morsink59 - Multiple 30 min run	Phase ID Report
SCAN: 5.0/85.0/0.02/1.5(sec), Cu(45kV,35mA), I(p)=743.1, 08/20/11 03:11a	

Client Information:	Analyst Information:
Name: Tania	Name: Tania
Voice: Fax:	Voice: Fax:
E-Mail:	E-Mail:
Sample ID: Morsink59 - Multiple 30 min run	Sample ID: Morsink59.raw



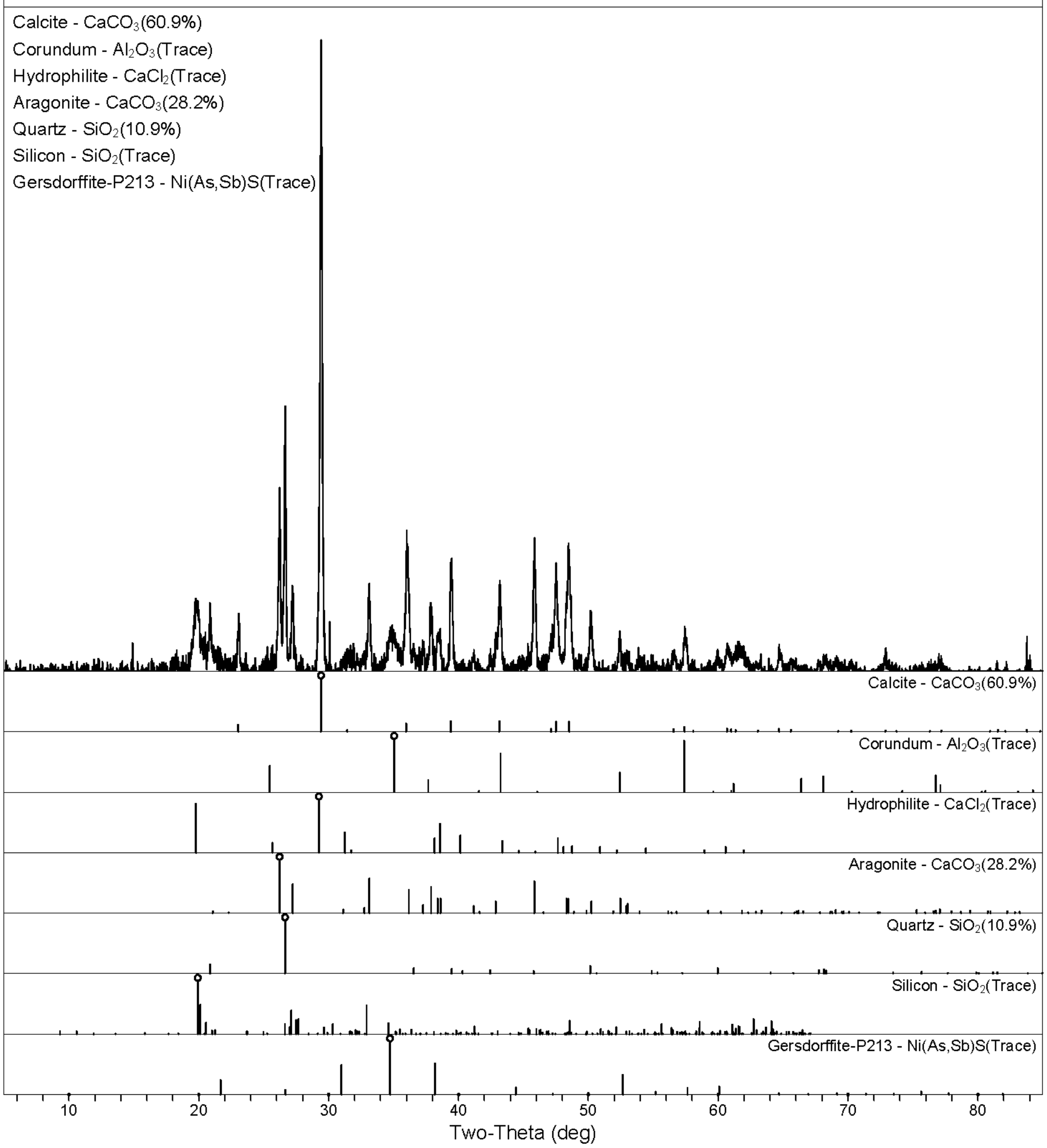
Univ. Florida

[ULTIMA-4|Administrator] (MDI/JADE9)

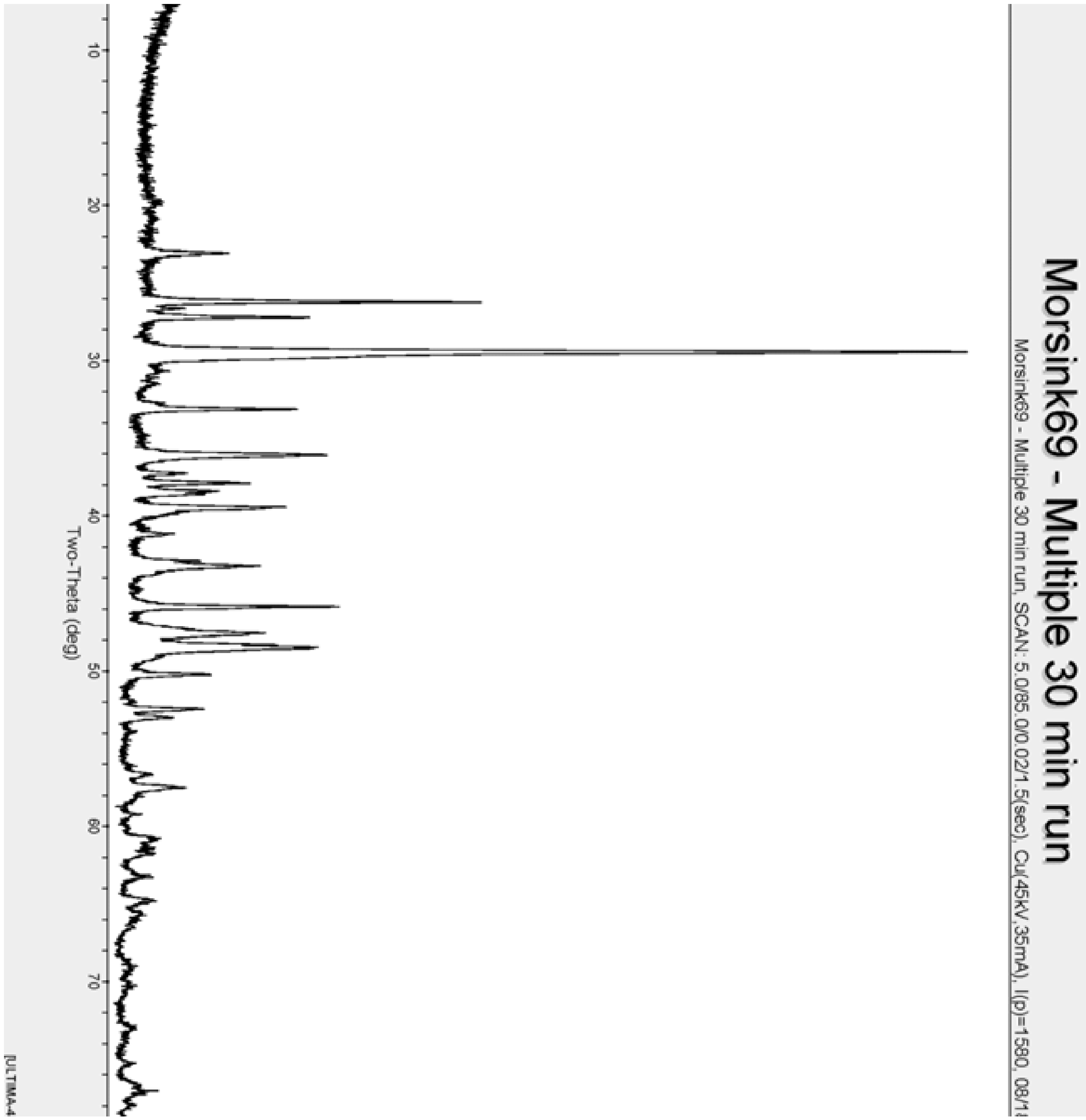

Morsink63 - Multiple 30 min run
Morsink63 - Multiple 30 min run, SCAN: 5.0/85.0/0.02/1.5(sec), Cu(45kV,35mA), I(p)=1122, 08/1
10
20
30
40
50
60
70
Two-Theta (deg)
[ULTIMA-4

[Morsink63.raw] Morsink63 - Multiple 30 min run	Phase ID Report
SCAN: 5.0/85.0/0.02/1.5(sec), Cu(45kV,35mA), I(p)=971.6, 08/17/11 07:46p	

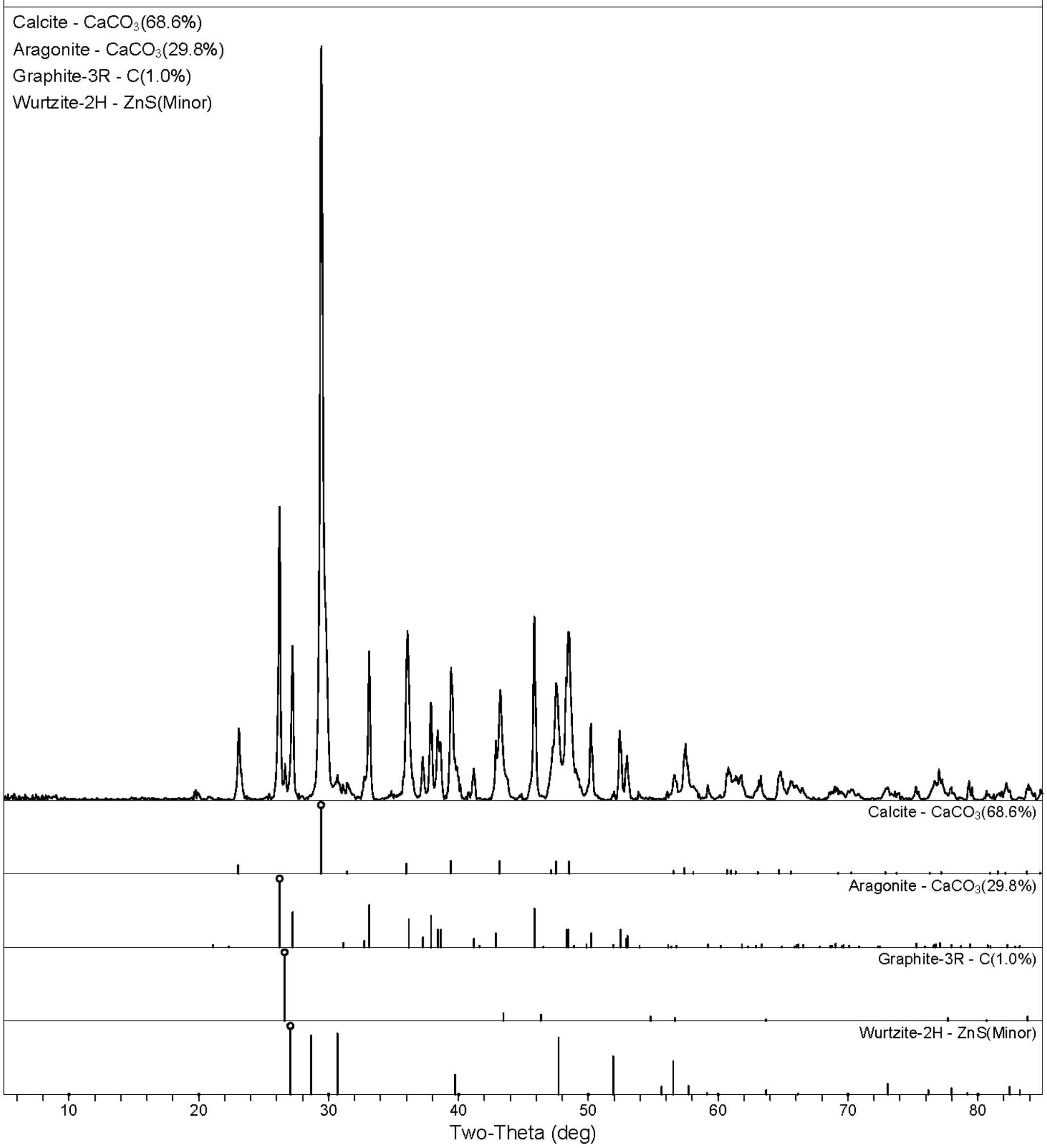
Client Information:	Analyst Information:
Name: Tania Voice: Fax: E-Mail: Sample ID: Morsink63 - Multiple 30 min run	Name: Tania Voice: Fax: E-Mail: Sample ID: Morsink63.raw



Univ. Florida [ULTIMA-4|Administrator] (MDI/JADE9)

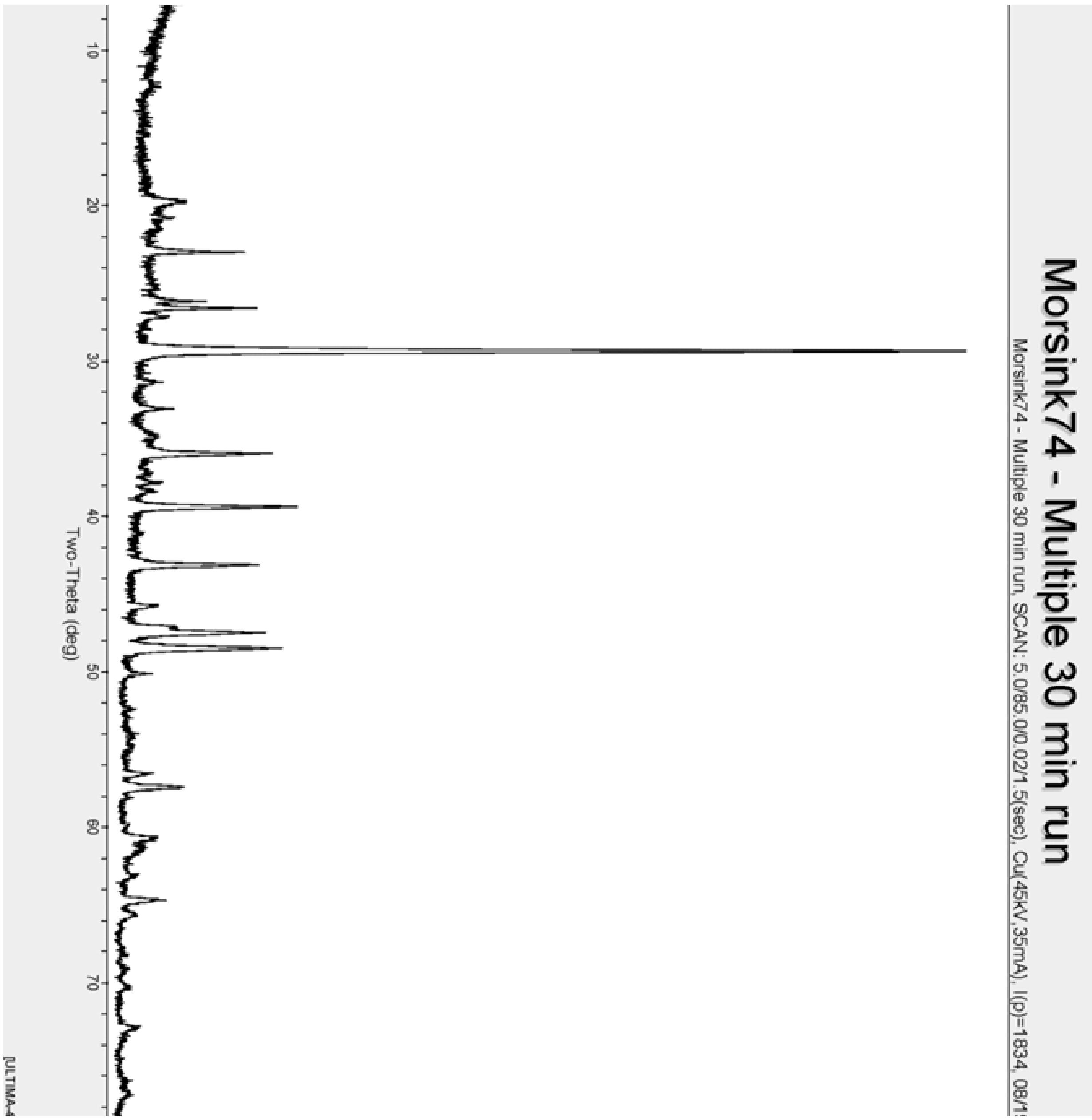

Morsink69 - Multiple 30 min run
Morsink69 - Multiple 30 min run, SCAN: 5.0/85.0/0.02/1.5(sec), Cu(45kV,35mA), I(p)=1580, 08/1
10
20
30
40
50
60
70
Two-Theta (deg)
[ULTMA-4

[Morsink69.raw] Morsink69 - Multiple 30 min run		Phase ID Report
SCAN: 5.0/85.0/0.02/1.5(sec), Cu(45kV,35mA), I(p)=1511, 08/18/11 02:23a		
Client Information:	Analyst Information:	
Name: Tania Voice: Fax: E-Mail: Sample ID: Morsink69 - Multiple 30 min run	Name: Tania Voice: Fax: E-Mail: Sample ID: Morsink69.raw	

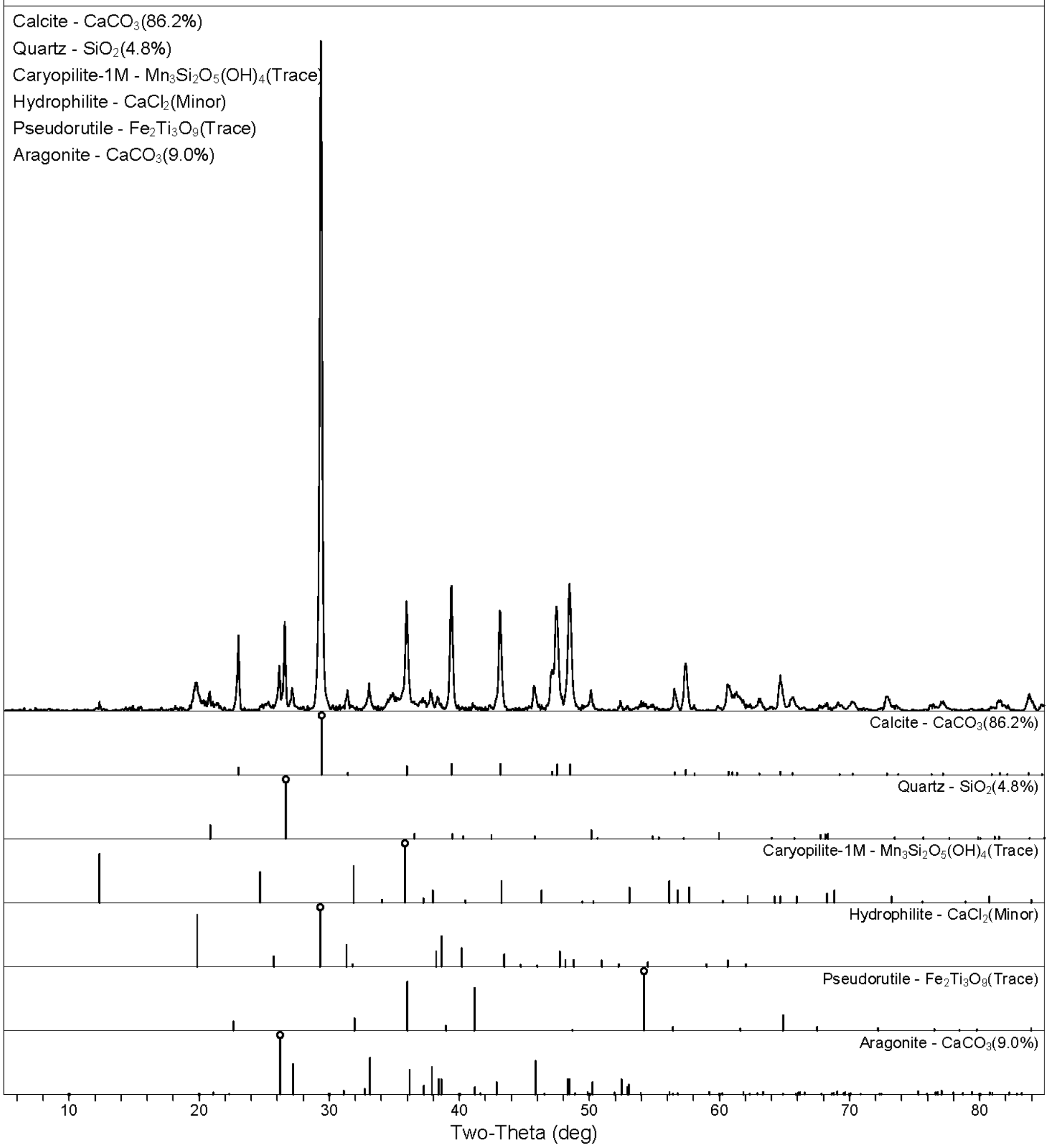


Univ. Florida

[ULTIMA-4|Administrator] (MDI/JADE9)


Morsink74 - Multiple 30 min run
Morsink74 - Multiple 30 min run, SCAN: 5.0/85.0/0.02/1.5(sec), Cu(45kV,35mA), I(p)=1834, 08/1
10
20
30
40
50
60
70
Two-Theta (deg)

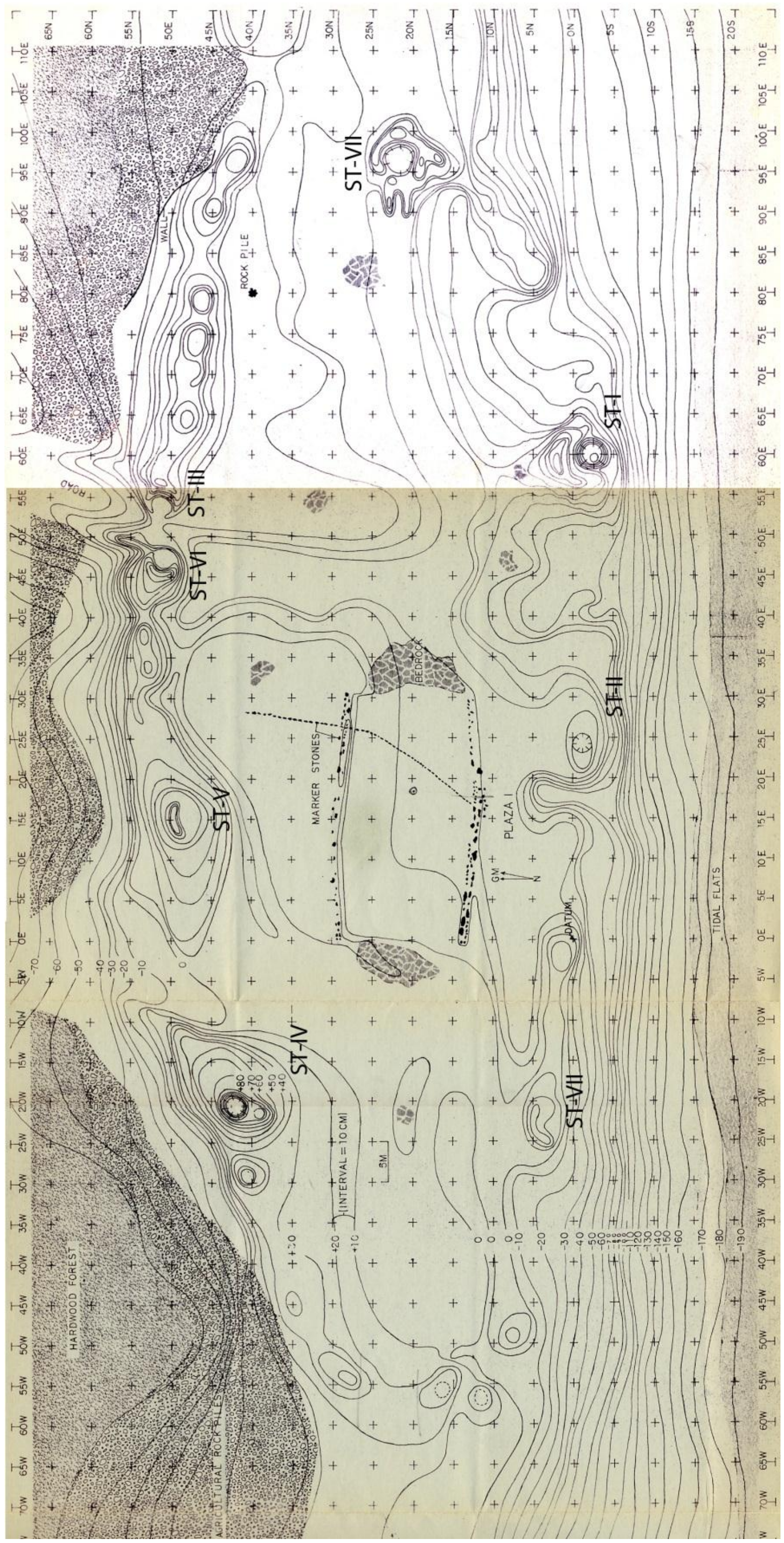
[Morsink74.raw] Morsink74 - Multiple 30 min run	Phase ID Report
SCAN: 5.0/85.0/0.02/1.5(sec), Cu(45kV,35mA), I(p)=1759, 08/19/11 08:34p	
Client Information:	Analyst Information:
Name: Tania Voice: Fax: E-Mail: Sample ID: Morsink74 - Multiple 30 min run	Name: Tania Voice: Fax: E-Mail: Sample ID: Morsink74.raw



Univ. Florida

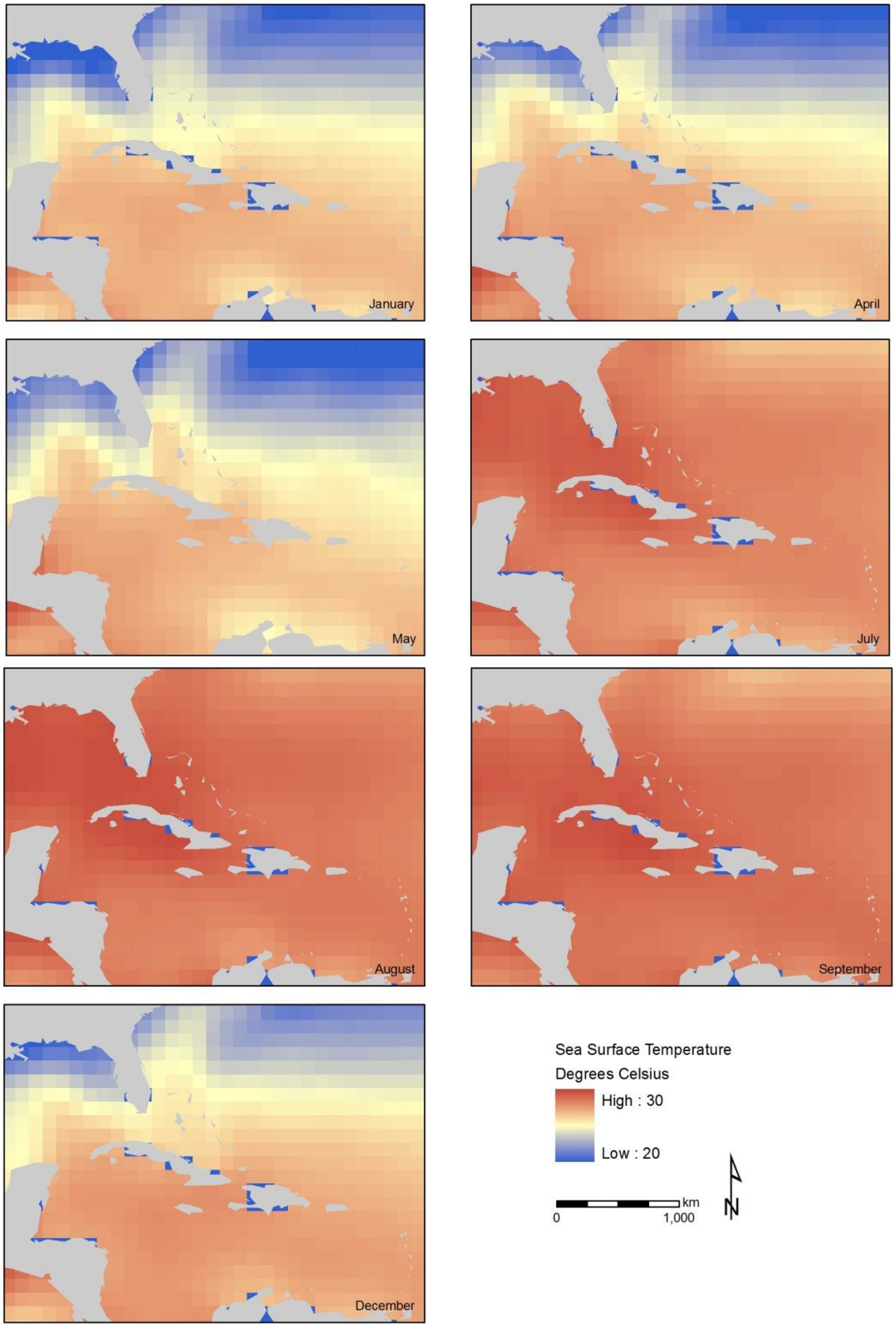
[ULTIMA-4|Administrator] (MDI/JADE9)

APPENDIX D
MAP OF MC-6



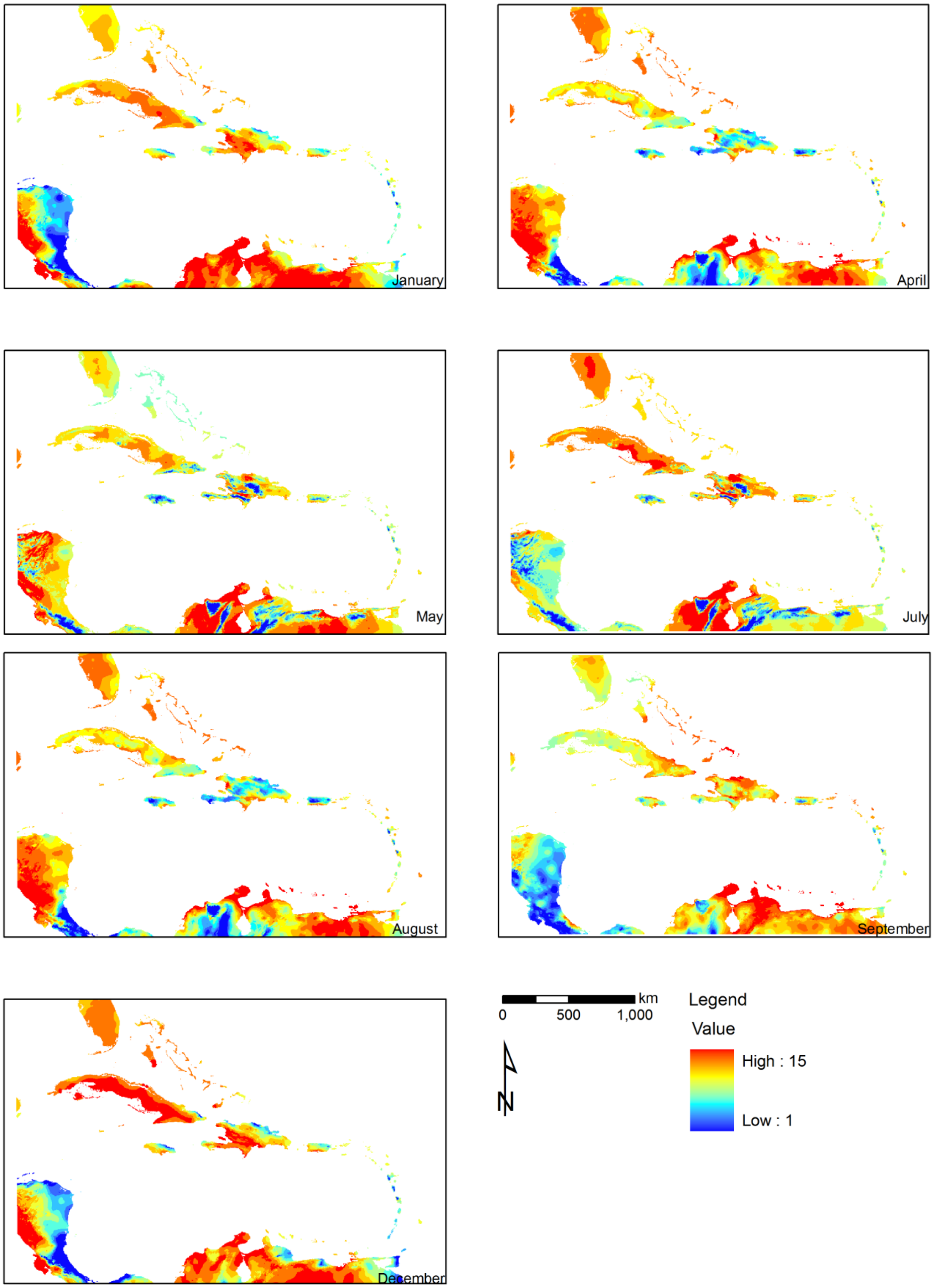
Map made by Sullivan, using a transit. Map was not published in his study

APPENDIX E
SEA SURFACE TEMPERATURES OF THE CIRCUM-CARIBBEAN REGION BY MONTH



APPENDIX F

RECOMBINED MAP OF TEMPERATURE AND PRECIPITATION IN CIRCUM-CARIBBEAN REGION



NASA Surface meteorology and Solar Energy (SSE) data

APPENDIX G
POTTERY

Attribute Table courtesy of Dr. Josh Torres and SEARCH Inc.

ATTRIBUTE CODE LIST

FORM

1- Regular Body Sherd
2- Shoulder In >
3- Shoulder Out > -
4- Base Flat
5- Base Concave
6- Base Convex
7- Base Annular/Pedestal
8- Handle/strap below rim
9- Handle/strap above rim
10- Handle/strap with Button
11 – Handle/strap Indeterminate
12- Hand Lug Residual (vestigial)
13- Handle/Residual w/inc
14- Handle/Tubular
15- Handle/Tabular (describe in comments)
16- Handle/Applique (describe in comments)
17- Handle/Zoomorphic
18- Handle/Anthropomorphic
19- Handle Biomorphic
20- Handle Lug or cylindrical
21- Handle Loop (wide)
22- Body sherd with button
23- Ridge
24- Buren (cassava griddle)
25- Worked Sherd
26- Effigy Fragment (Describe)
27- Topias
28- Incense Burner
29-Jar/Neck
30-Other (Describe)
31- RIM
32-Spindle Whorl
33-Lip
99- Indeterminate

THICKNES (THK): Use caliper to measure thickness most representative of the sherd (mm).

WEIGHT (WGHT): Weight of the vessel in grams (0.0).

RIM

1- Parallel
2- Thickened In/Ext
3- Thickened In Round
4- Thickened In Angular
5- Thickened Ext. Round
6- Thickened Ext. Angular
7- Thinned
8- Flat Out-Platformed
9- Flat In-Platformed
10- Rounded Out-Platformed
11- Rounded In-Platformed
12- Flat Double Platformed
13- Out-folded
14 - In-folded
29 – Not Applicable
99- Indeterminate

ORIENTATION

1- Straight Vertical
2- Composite
3- Straight Out
5- Convex Vertical
8- Outflaring
9- Plate
10- Buren (Cass. Griddle)
11- Jar

6- Convex In	12- Misc.
7- Convex Out	99- Indeterminate

ORIFICE DIAMETER (DIAM): If RIM--Use polar graph paper measuring chart to attain ORIFICE DIAMETER in cm.

VESSEL PERCENTAGE: If RIM use polar graph paper to measure percentage of the orifice represented. If under 5% put 4%.

LIP: If RIM document lip form.

1-Tapered	6-Rounded Out Beveled
2-Flat Beveled In	7-Flat
3-Flat Beveled Out	8-Rounded
4-Double Beveled	29 – Not Applicable
5-Roounded In-Beveled	99-Indeterminate

PASTE TEXTURE (PST_TXT)

0- Non-tempered	3- Medium/Coarse 0.5 - 1.0 mm
1- Fine ~0.25 mm	4- Coarse >0.5 mm
2- Medium 0.25 - 0.5 mm	

(Note: Use Sand Grain Sizing Folder; use most abundant grain size).

PASTE TYPE (PST_TYPE): Composition of paste after Cordell (2008:261-272).

1-Volcanic	5-Mixed Felsic
2-Quartz	6-Vitrified
3-Limestone	7-Maphic/Micaceous
4-Felsic	39 – Not Measured
	99-Indeterminate

Add 1 to the beginning of the number to denote paste containing grog temper.
Add 2 to the beginning of the number to denote paste containing shell temper (not limestone).

EXTERIOR, INTERIOR SURFACE PASTE COLOR AND CORE COLOR (SRF_CLR/INT_CLR/CORE_CLR):

1- Brown	8- Other (Specify in comments)
2- Buff/Cream	9- Indeterminate
3- Orange	10-Reddish Brown
4- Red	11-Orangish-Brown
5- Black (not smudging) 1	2-Dark Brown
6- Smudging Black (Is not paint)	13-Pale Brown
7- White/Gray	14-Orangish Red
	29 – Not Measured

SURFACE TREATMENT/INTERIOR AND EXTERIOR (SRF_TRT/ INT_TRT):

1-Smoothed	4-Burnished	7-Painted
2-Smoothed/Floated	5-Slipped	8-Indeterminate
3-Smudged	6-Erroded/Battered	9-NONE

PAINT/SLIP (PNT_SLP): Paint or slip observed on sherd

1- Red Slip	7- Black on Buff	12- Black on Red	17-Pale Brown Slip
2- Orange Slip	8- White on Buff	13- White on Red	18-Red Paint
4- White Slip	9- Red on Buff	14- Polychrome	99- Indeterminate
5- Pink Slip	10- Negative Design	15- Other	
6- Orange on Buff	11- White on Orange	16- Brown Slip	

(Note: Describe design in comments. For Polychromes list colors in comments. If black, make sure is not smudging.)

PAINT/SLIP LOCATION (PNTSLP_LOC):

1- Int. Wall	7- Lip	13-Shoulder
2- Ext. Wall	8- Int. Rim/Ext. Wall	
3- Both Walls	9- Ext. Rim/Int. Wall	15- Other
4- Int. Rim	10- Handle	
5- Ext. Rim	11- Multiple Locations	
6- Both Rims	12- Interior Wall Lip	99- Indeterminate

PLASTIC TECHNIQUE (PLAS_TECH):

1-Incision	6-Punctated	11-Other
2-Appliqué	7-Finger Nail Incised	
3-Modeling	8-Finger Nail Impressed	
4-Excision	9-Text/Basket Impressed	
5-Perforation	10-Combination (describe in comments)	

PLASTIC TECHNIQUE LOCATION (PLAS_LOC):

1- Int. Wall	7- Lip	13-Shoulder
2- Ext. Wall	8- Int. Rim/Ext. Wall	14-
3- Both Walls	9- Ext. Rim/Int. Wall	15- Other
4- Int. Rim	10- Handle	
5- Ext. Rim	11- Multiple Locations	
6- Both Rims	12- Interior Wall Lip	99- Indeterminate

INCISIONS (INSION):

1-Vertical Line	9-Cross Hatched
2-Horizontal Line	10-Cross Hatched, Zoned
3-Parallel, Vertical Lines	11-OTHER
4-Parallel, Vert. Lines w/added feature (describe in comments)	
5-Curvilinear	12 - Multiple

6-Circle
7-Semicircles
8-Punctation
29 - None
99-Indeterminate

(Note: List all numbers that apply in ascending order. Describe the design(s) in comments and sketch if poss.)

USE WARE EXTERIOR AND INTERIOR (USE_EXT, USE_INT)
1-Sooting
2-Scraping
3-Post production oxidation
4-Staining/Residue Absorption
5- Pitting
6- Heavy Pitting
7 -
8 -
9 – None Observed

SERIES/STYLE:
1-Hacienda Grande
2-La Hueca
3-Cuevas
4-Cuevas/Monserrate
5-Monseratte
6-Santa Elena
7-Cuevas/Ostiones Puro
8-Ostiones Puro
9-Ostiones Modificado
10-Capa
11-Boca Chica
12-Esperanza
13-Saladoid
14-Elenan Ostionoid
15-Ostionan Ostionoid
16-Chican Ostionoid
17-UID Saladoid
18-UID Ostionoid
19-Meillacan Ostionoid
20- PalmettoWare
99-Indeterminate

Vessel Lot #	FS	Location	Level	Thickness	Width	Length	Diameter	Vessel %	Style	Sherd Form	Orientation	Rim	Lip Form	Incisions	Paint/Slip
1	43	Midden	1	9	39	54	0	4	Palmetto Ware	31	01	01	07	29	99
2	43	Midden	1	12	47	38	0	4	Palmetto Ware	31	01	07	02	29	99
3	43	Midden	1	0	0	0	18	6	Palmetto Ware	31	01	01	07	29	99
4	43	Midden	1	8	42	43	0	4	Palmetto Ware	31	99	07	06	29	99
5	43	Midden	1	0	16	19	0	4	Palmetto Ware	31	01	05	03	29	99
6	43	Midden	1	7	64	50	34	5	Palmetto Ware	31	05	03	02	29	99
7	43	Midden	1	10	55	46	0	0	Palmetto Ware	31	01	01	03	29	99
8	43	Midden	1	11	69	40	0	0	Palmetto Ware	31	02	01	07	29	99
9	43	Midden	1	11	41	30	0	0	Palmetto Ware	31	08	01	08	29	99
10	43	Midden	1	34	0	10	0	4	Palmetto Ware	31	01	08	07	29	99
11	43	Midden	1	0	25	0	0	4	Palmetto Ware	31	01	01	07	29	99
12	43	Midden	1	0	0	25	0	4	Palmetto Ware	31	01	13	03	29	99
13	43	Midden	1	0	0	34	0	4	Palmetto Ware	31	01	07	03	29	99
14	43	Midden	1	0	0	32	0	4	Palmetto Ware	31	06	03	05	29	99
15	43	Midden	1	0	23	0	0	4	Palmetto Ware	31	01	04	02	29	99
16	46	Midden	2	9	45	28	0	0	Palmetto Ware	31	01	01	05	29	99
17	46	Midden	2	10	79	62	0	0	Palmetto Ware	31	01	01	07	29	99
18	46	Midden	2	12	51	32	32	5	Palmetto Ware	31	02	01	07	29	99
19	46	Midden	2	18	72	27	60	5	Palmetto Ware	24	10	01	06	29	99
20	47	Midden	3	9	50	54	30	5	Meillacan	31	05	03	06	29	99
21	47	Midden	3	7	61	33	0	10	Meillacan	01				29	99
22	47	Midden	3	6	22	18	0	0	Meillacan	01				29	99
23	43	Midden	1	4	53	36	0	0	Meillacan	06				01	99
24	53	Midden	4	7	51	36	0	4	Meillacan	31	02	03	05	29	99
25	53	Midden	4	4	27	25	0	0	Meillacan	01				08	
26	54	Midden	5	6	32	28	0	4	Meillacan	31	07	08	07	29	99
27	54	Midden	4	6	19	16	0	0	Meillacan	01				29	01
28	56	Midden	0	18	58	23	0	4	Palmetto Ware	24				29	99
29	38	Structure VI	1	0	59	26	0	4	Palmetto Ware	31	05	04	01	29	99
30	38	Structure VI	1	0	32	20	0	4	Palmetto Ware	31	01	04	07	29	99
31	38	Structure VI	1	0	28	24	0	4	Palmetto Ware	31	06	06	08	29	99
32	39	Structure VI	2	6	79	39	26	8	Meillacan	31	05	01	08	29	99
33	39	Structure VI	2	0	39	16	22	6	Meillacan	31	01	01	07	29	99
34	38	Structure VI	1	4	28	8	0	0	Meillacan	01				29	99
35	39	Structure VI	1	6	49	41	0	0	Meillacan	01					

Vessel Lot #	FS	Location	Level	Thickness	Width	Length	Diameter	Vessel %	Style	Sherd Form	Orientation	Rim	Lip Form	Incisions	Paint/Slip
36	38	Structure VI	1	0	18	22	0	0	Meillacan	31	01	07	05	01	99
37	39	Structure VI	2	13	50	4	0	4	Palmetto Ware	31	05	09	07	29	99
38	39	Structure VI	2	0	28	28	0	0	Palmetto Ware	31	01	01	08	29	99
39	39	Structure VI	2	0	33	19	0	0	Palmetto Ware	31	01	08	07	29	99
40	39	Structure VI	2	0	21	12	0	0	Palmetto Ware	31	01	01	07	29	99
41	39	Structure VI	2	7	20	15	0	0	Palmetto Ware	01					01
42	24	Structure IV	1	0	19	20	0	4	Meillacan	31	08	02	07	29	99
43	24	Structure IV	1	0	31	20	0	4	Palmetto Ware	31	01	01	07	29	99
44	24	Structure IV	1	0	26	17	0	4	Palmetto Ware	31	01	01	08	29	99
45	24	Structure IV	1	5	26	27	0	0	Meillacan	01				29	99
46	25	Structure IV	2	0	21	28	0	4	Meillacan	31	09	13	07	99	99
47	25	Structure IV	2	0	22	22	0	4	Palmetto Ware	31	09	08	07	29	99
48	25	Structure IV	2	0	40	23	0	4	Palmetto Ware	31	05	05	07	29	99
49	25	Structure IV	2	7	36	19	0	0	Meillacan	01				29	99
50	26	Structure IV	3	0	26	18	16	5	Meillacan	01	09	07	08	29	99
51	26	Structure IV	3	0	19	12	0	4	Meillacan	31	09	01	07	02	99
52	26	Structure IV	3	7	38	44	0	4	Meillacan	17	08			05	99
53	26	Structure IV	3	0	25	26	0	4	Palmetto Ware	31	07	02	07	29	99
54	27	Structure IV	4	0	33	23	0	4	Palmetto Ware	31	09	02	08	29	99
55	29	Structure IV	1	0	21	15	0	4	Meillacan	31	03	01	07	29	99
56	29	Structure IV	1	0	26	23	0	4	Meillacan	31		07	08		
57	29	Structure IV	1	0	31	55	0	4	Meillacan	01					
58	29	Structure IV	1	0	49	46	0	4	Meillacan	01					
59	29	Structure IV	1	17	59	39	0	4	Palmetto Ware	24	10	03	08	29	99
60	29	Structure IV	1	15	62	36	0	4	Palmetto Ware	24	10	03	08	29	99
61	30	Structure IV	2	11	44	39	0	4	Palmetto Ware	31	05	01	07	29	99
62	29	Structure IV	1	12	24	32	0	4	Palmetto Ware	31	05	07	07	29	99
63	30	Structure IV	2	13	53	34	0	4	Palmetto Ware	31	09	01	06	08	99
64	30	Structure IV	2	0	22	23	0	4	Palmetto Ware	31	03	06	08	29	99
65	31	Structure IV	3	5	69	50	15	15	Meillacan	31	07	03	07	29	99
66	31	Structure IV	3	0	51	22	16	10	Meillacan	31	06	07	07	29	99
67	29	Structure IV	3	0	33	17	14	5	Meillacan	31	11	01	08	29	99
68	12	Structure II	5	10	44	60	0	4	Palmetto Ware	31	05	14	08	29	99
69	9	Structure II	4	0	22	26	0	4	Palmetto Ware	31	01	01	05	29	99
70	9	Structure II	1	0	23	19	0	4	Palmetto Ware	31	03	01	07	29	99

Vessel Lot #	FS	Location	Level	Thickness	Width	Length	Diameter	Vessel %	Style	Sherd Form	Orientation	Rim	Lip Form	Incisions	Paint/Slip
71	9	Structure II	1	0	38	22	0	4	Palmetto Ware	31	01	01	07	29	99
72	9	Structure II	1	0	16	22	0	4	Palmetto Ware	31	01	01	08	29	99
73	9	Structure II	1	0	38	22	0	4	Palmetto Ware	31	01	01	03	29	99
74	9	Structure II	1	14	41	36	0	4	Palmetto Ware	31	01	03	07	29	99
75	9	Structure II	1	0	26	21	0	4	Palmetto Ware	31	01	01	05	29	99
76	9	Structure II	1	0	7	19	0	4	Palmetto Ware	31	01	08	07	29	99
77	9	Structure II	1	9	27	35	0	4	Palmetto Ware	31	01	01	02	29	99
78	9	Structure II	1	0	31	20	0	4	Palmetto Ware	31	01	03	01	29	99
79	9	Structure II	1	0	31	25	0	4	Palmetto Ware	31	03	06	07	29	99
80	9	Structure II	1	0	29	26	0	4	Palmetto Ware	31	06	14	08	29	99
81	9	Structure II	1	0	26	24	0	4	Palmetto Ware	31	03	05	07	29	99
82	10	Structure II	4	0	50	18	26	5	Palmetto Ware	31	03	04	05	29	99
83	10	Structure II	4	0	38	26	0	0	Palmetto Ware	31	05	04	07	29	99
84	10	Structure II	4	0	7	15	0	0	Palmetto Ware	31	01	03	05	29	99
85	10	Structure II	4	8	54	49	34	5	Palmetto Ware	31	01	03	08	29	99
86	10	Structure II	4	0	31	20	0	0	Palmetto Ware	31	01	01	05	29	99
87	10	Structure II	4	0	53	14	34	5	Palmetto Ware	31	06	14	07	29	99
88	10	Structure II	4	0	20	30	0	0	Palmetto Ware	31	03	04	01	29	99
89	10	Structure II	4	0	29	26	0	0	Palmetto Ware	31	03	02	05	29	99
90	10	Structure II	4	0	31	27	0	0	Palmetto Ware	31	01	03	01	29	99
91	12	Structure II	5	0	26	26	0	0	Palmetto Ware	31	05	14	07	29	99
92	12	Structure II	5	0	52	17	28	6	Palmetto Ware	31	07	14	02	29	99
93	12	Structure II	5	0	10	0	0	0		06					
94	12	Structure II	5	0	37	21	0	0	Palmetto Ware	31	06	01	07	29	99
95	12	Structure II	5	0	70	20	44	5	Palmetto Ware	31	07	01	08	29	99
96	12	Structure II	5	0	28	22	0	0	Palmetto Ware	31	07	01	07	29	99
97	12	Structure II	5	0	37	29	0	0	Palmetto Ware	31	07	05	08	29	99
98	12	Structure II	5	0	35	25	0	0	Palmetto Ware	31	07	03	05	29	99
99	19	Structure II	7	6	42	14	0	0	Meillacan	31	09		07	29	99
100	12	Structure II	12	0	27	21	0	0		01					
101	10	Structure II	4	0	24	22	0	0	Meillacan	31	11	07	01	01	99
102	10	Structure II	4	0	33	29	0	0	Meillacan	31	07	01	05	29	99
103	12	Structure II	5	0	26	15	0	0	Meillacan	01					02
104	12	Structure II	5	5	67	39	0	0	Carrier/Chicoid	01				11	99
105	2	Structure II	1	6	37	36	22	5	Meillacan	31	05	13	01	29	99

Vessel Lot #	FS	Location	Level	Thickness	Width	Length	Diameter	Vessel %	Style	Sherd Form	Orientation	Rim	Lip Form	Incisions	Paint/Slip
106	2	Structure II	1	5	35	34	4	25	Meillacan	31	06	01	08	29	99
107	2	Structure II	1	10	43	51	0	0	Palmetto Ware	31	01	06	06	29	99
108	2	Structure II	1	11	37	37	0	0	Palmetto Ware	31	02	06	07	29	99
109	2	Structure II	1	0	26	19	0	0	Palmetto Ware	31	01	07	06	29	99
110	2	Structure II	1	0	16	12	0	0	Palmetto Ware	31	02	08	07	29	99
111	7	Structure II	2	0	31	27	0	0	Meillacan	31	01	05	01	29	99
112	7	Structure II	2	0	38	19	0	0	Meillacan	31	02	07	08	29	99
113	7	Structure II	2	0	22	25	0	0	Meillacan	31	01	01	08	29	99
114	7	Structure II	2	11	33	31	0	0	Palmetto Ware	31	02	01	07	29	99
115	7	Structure II	2	10	32	35	0	0	Palmetto Ware	31	03	06	07	29	99
116	7	Structure II	2	0	26	21	0	0	Palmetto Ware	31	01	01	07	29	99
117	7	Structure II	2	0	27	24	0	0	Palmetto Ware	31	02	01	07	29	99
118	7	Structure II	2	0	25	20	0	0	Palmetto Ware	31	01	01	07	29	99
119	7	Structure II	2	0	29	21	0	0	Palmetto Ware	31	01	01	08	29	99
120	7	Structure II	2	0	25	19	0	0	Palmetto Ware	31	01	06	06	29	99
121	7	Structure II	2	0	22	14	5	14	Palmetto Ware	31	06	01	07	29	99
122	7	Structure II	2	18	60	38	0	0	Palmetto Ware	24					
123	1	Structure II	1	0	25	14	0	0	Palmetto Ware	31	01	29	07	99	99
124	1	Structure II	1	0	30	20	0	0	Palmetto Ware	31	01	13	08	29	99
125	1	Structure II	1	0	21	27	0	0	Palmetto Ware	31	01	01	07	29	99
126	1	Structure II	1	10	28	39	0	0	Palmetto Ware	31	07	04	06	29	99
127	1	Structure II	1	0	37	23	0	0	Palmetto Ware	31	07	01	07	29	99
128	1	Structure II	1	0	39	22	0	0	Palmetto Ware	31	06	01	07	29	99
129	1	Structure II	1	0	21	21	0	0	Palmetto Ware	31	07	01	07	29	99
130	1	Structure II	1	0	18	25	0	0	Palmetto Ware	31	01	13	07	29	99
131	1	Structure II	1	0	31	29	0	0	Palmetto Ware	31	08	14	01	29	99
132	1	Structure II	1	0	24	18	0	0	Palmetto Ware	31	07	05	08	29	99
133	1	Structure II	1	0	37	17	0	0	Meillacan	31	07	03	06	29	99
134	1	Structure II	1	0	28	22	0	0	Meillacan	31	03	01	06	29	99
135	6	Structure II	1	0	33	24	0	0	Meillacan	31	01	04	08	29	99
136	6	Structure II	1	0	20	17	0	0	Meillacan	31	07	01	07	29	99
137	6	Structure II	1	0	25	25	0	0	Meillacan	31	08	01	08	29	99
138	6	Structure II	1	0	31	21	0	0	Meillacan	01				128	
139	6	Structure II	1	0	25	12	0	0	Palmetto Ware	31	01	13	08	29	99
140	6	Structure II	1	0	46	27	0	0	Palmetto Ware	31	06	01	08	29	99

Vessel Lot #	FS	Location	Level	Thickness	Width	Length	Diameter	Vessel %	Style	Sherd Form	Orientation	Rim	Lip Form	Incisions	Paint/Slip
141	6	Structure II	1	0	44	20	0	0	Palmetto Ware	31	06	04	07	29	99
142	3	Structure II	1	5	25	31	0	0	Meillacan	31	11	01	08	08	99
143	3	Structure II	1	0	26	13	0	0	Palmetto Ware	31	01	01	08	99	99
144	11	Structure II	1	6	58	38	0	0	Meillacan	01				29	99
145	11	Structure II	1	4	31	29	0	0	Meillacan	01				29	99
146	11	Structure II	1	0	25	14	0	0	Palmetto Ware	31	01	14	08	01	99
147	11	Structure II	1	0	17	20	0	0	Palmetto Ware	31	03	01	07	29	99
148	11	Structure II	1	0	26	15	0	0	Palmetto Ware	31	03	01	07	29	99
149	11	Structure II	1	0	23	14	0	0	Palmetto Ware	31	01	01	08	29	99
150	11	Structure II	1	0	28	15	0	0	Palmetto Ware	31	01	01	07	29	99
151	11	Structure II	1	0	20	12	0	0	Palmetto Ware	31	01	01	06	29	99

Vessel lot #	Firing	Comments
1	Reduced core with post firing oxidation	soot outside
2	Completely oxidized	>23 cm diameter, boat vessel unlikely
3	Reduced core with post firing oxidation	lip form is irregular, part is slightly lt beveled out. 5 pieces total are mostly as described. One herd is heavily sooted on outside
4	Reduced core, reduced inside	rim heavily worn, unable to determine orientation or vessel diameter
5	Completely oxidized	two small fragments of rim
6	Reduced core with post firing oxidation	outside heavily worn, seems that layer has fallen off
7	Reduced core with post firing oxidation	boat vessel, most likely
8	Completely oxidized	rim very irregular, possible boat vessel. Slight inclining angle 1 cm below rim, hinting at holding for liquid
9	completely reduced	possible boat vessel. Interior is worn, while exterior is not. Processing of materials inside without fire?
10	Completely oxidized	heavily oxidized, flat platform as rim
11	Reduced core with post firing oxidation	
12	Reduced core with post firing oxidation	outfolded rim is attached to vessel
13	Reduced core with post firing oxidation	an angle in orientation might start at 21 mm below rim
14	Reduced core, reduced inside	wear on inside, more than outside. Form is extraordinary
15	completely reduced	thickening on inside is real small. Inside is worn, while outside does not show any wear. Stripes on outside show evidence of 'brushing'. Two smaller sherd are in this vessellot because they looked most like it, and couldn't be lot by themselves
16	Reduced core with post firing oxidation	thickness at lowest part. Boat vessel
17	Reduced core with post firing oxidation	boat vessel
18	Completely oxidized	two pieces, one piece has ridge on inside at 12 mm under rim. However, cannot determine two different lots.
19	Completely oxidized	diameter > 50cm, description of lipform as top part is 'inside' of pot. Bottom shows grass impression, top smooth
20	Completely oxidized	slight oxidation on outside
21	Reduced core with post firing oxidation	outer diameter (not orifice) would be 14 cm max. small serving bowl
22	Reduced core with post firing oxidation	outside is yellow white in color. Resembles waterjar seen in jamaican sample
23	Reduced core with post firing oxidation	round form, could be base of vessel
24	Completely oxidized	diameter approximately 28 cm. soot outside. Almost completely oxidized, inside slightly reduced
25	Reduced core with post firing oxidation	vessel lot is determined by firing characteristics, but mainly on ((mending?) hole. Also, the inside shows brushing in a radiating fashion, which might hint at boatvessel.
26	completely reduced	serving plate, more than 20 cm in size
27	Reduced core with oxidized exterior	vessel lot determined by presence of slip, outside shows signs of brushing

Vessel lot #	Firing	Comments
	(rapid cooling)	
28	Completely oxidized	wallclean @ close, diameter is large (over 50 cm), basketry impressions on bottom, top smooth
29	Completely oxidized	Diameter >30 cm
30	Completely oxidized	fillet rim like meillacan wares
31	Reduced core with post firing oxidation	boatvessel
32	completely reduced	overall black color, but some lighter (oxidized spotts), little thicker where vessel bends from convex out to convex vertical. Burnished outside
33	Completely oxidized	oxidation is light, still has a darker color to it
34		vessel lot based on paste and thickness. Light colored, thin and light of weigt. Waterbottle or alcohol container?
35	Reduced core with post firing oxidation	vessellot based on paste, thickness and color
36	Reduced core with post firing oxidation	two parallel lines to rim, made when vessel was wet (typical meillacan)
37	Reduced core with post firing oxidation	boatvessel is likely, rim is not really regular, rim form is mix between flat in-platformed and folded. The inside seems to be folded, but the lip is very flat
38	Completely oxidized	
39	Completely oxidized	flatt in or out difficult to determine. Definitely different vessel based on paste, thickness and color
40	Reduced core with post firing oxidation	small, but rim good defined. Smaller(thinner) than vessel lot 39
41	Completely oxidized	vessel lot determined on presence of slip on one side of sherd. Not precise ib out- or inside. Small fragment
42	completely reduced	plate (serving)
43	Completely oxidized	
44	Completely oxidized	
45	Completely oxidized	vessel lot defined on paste, whiter color, coarser (up to 1.5 mm), possible water one side (outside?) seems to be rougher.
46	completely reduced	fillet rim typical of meillacan small though
47	Completely oxidized	plate
48	Reduced core with oxidized exterior (rapid cooling)	rim is very irregular and shapes are difficult to define. Not a plate though
49	Reduced core with oxidized exterior (rapid cooling)	outside crème colored (very light) and only thin layer is oxidized. Paste has a lot of quartz in it. Vessel lot determined by paste and color
50	completely reduced	very flat/shallow, no extra elevation to hold food on platter
51	Reduced core with oxidized exterior (rapid cooling)	deeper plate and two horizontal incision on outside just underneath the rim
52	Completely oxidized	fish/frog motive. Lines are made when clay is wet. Looks like lug/handle on outside of vessel, but piece too small

Vessel lot #	Firing	Comments
53	Completely oxidized	wear on inside, open vessel
54	Reduced core with oxidized exterior (rapid cooling)	plate with little lip standing up, buttowards bottom thick
55	completely reduced	one body sherd, possibly part of this vessel lot, had reed punctuation on outside
56		ORIENTATION UNKNOWN. Rim seems to be thinned. Real small part of rim is present, but there is decoration. Two pieces of clay applique in a v-shape with incisions in the middle is located just below the rim with point upwards.
57	Reduced core with oxidized exterior (rapid cooling)	surface is red from oxidation. Vessel lot determined based on this characteristic.
58	Completely oxidized	outside of vessel is crème colored, inside is grey. Core is oxidized. Three pieces have this characteristic. Vessel lot is determined on this characteristic
59	Completely oxidized	large diameter. Smooth top, rough bottom. 4 body pieces of a griddle in this level have basketry impression and likely belong to same vessel.
60	Completely oxidized	large diameter. Is different vessel lot than VL#59 because of thickness and top of vessel is smoother than previous lot. Also, temper is denser in this sample. Light indications of basketry on bottom
61	Completely oxidized	this is either a boat vessel or it is larger than 50 cm in diameter
62	Completely oxidized	orientation difficult to determine, small part of rim. Also, inside in completely flat and does touch table completely when place outside up. The thickining and uneven surface outside does not suggest that this is a plate though.
63	Completely oxidized	three reed punctuations in rim, plate is very large (definitely more than 30 cm in diameter
64	Completely oxidized	light ridge just below rim on outside (not present in ny other sherd in this unit). Also much flatter on top than other sherds.
65	completely reduced	soot on outside! Still reduced. Outside and inside burnished.
66	Reduced core with oxidized exterior (rapid cooling)	slight convex in, almost straight. Light brown color after oxidation of the outside
67	Reduced core with post firing oxidation	jar with relative large diameter. Completely burnished outside and inside, excellent to hold liquids. Outside is brown in color, while inside is reddisher. On edge one really smooth spot, black in color.
68	Completely oxidized	fillet rim
69	Completely oxidized	
70	Completely oxidized	
71	Reduced core with oxidized exterior (rapid cooling)	
72	Completely oxidized	
73	Completely oxidized	

Vessel lot #	Firing	Comments
74	Reduced core with oxidized exterior (rapid cooling)	
75	Completely oxidized	
76	Reduced core with oxidized exterior (rapid cooling)	
77	Reduced core with oxidized exterior (rapid cooling)	
78	Reduced core with oxidized exterior (rapid cooling)	
79	Reduced core with post firing oxidation	
80	Completely oxidized	
81	Completely oxidized	
82	Reduced core with oxidized exterior (rapid cooling)	
83	Reduced core with oxidized exterior (rapid cooling)	boat vessel. Rim looks in orientation, lip form and rim like one vessel lot from previous level, but that sherd is heavily eroded while this sherd is in much better shape.
84	Completely oxidized	
85	Reduced core with post firing oxidation	fillet rim, like meillacan vessels
86	Completely oxidized	
87	Completely oxidized	same as vessel lot 85, but infolded rim is different
88	Reduced core with post firing oxidation	complex form of rim. From bottom, sherd is convex vertical and top 1 cm is straight out. At point of angle, sherd is a little thicker.
89	Reduced core with oxidized exterior (rapid cooling)	
90	Completely oxidized	
91	Completely oxidized	
92	Completely oxidized	
93		water or beer jar
94	Reduced core, reduced outside	
95	Reduced core with post firing oxidation	
96	Reduced core with post firing oxidation	could also be plate, piece too small to see vessel form
97	Completely oxidized	
98	Reduced core with oxidized exterior (rapid cooling)	
99	completely reduced	plate with a rim that stands up for approximately 1 cm. the angle is approximately 85 degrees. There are non-rim pieces of meillac with multiple lines incised and punctuation, and these could

Vessel lot #	Firing	Comments
		be part of one vessel.
100		water jar,
101	Completely oxidized	red with grey core. Sherd is well oxidized and this depends on the oxigen available
102		smothered outside, rough inside.
103		white paint, vessel lot determined by presence of white paint
104	Completely oxidized	water jar
105	Completely oxidized	fillet rim, boat vessel, reddish of color, maybe from meillac/ fort liberte region
106	Completely oxidized	jar/spout. Lots of curvature, paste looks grey, no obvious signs of pitting. Two large body piece of a water jar were also found in this layer.
107	Reduced core with oxidized exterior (rapid cooling)	
108	Reduced core with oxidized exterior (rapid cooling)	almost looks like buren (thickness, edge) but the paste is not oxidized what you would expect with buren
109	completely reduced	some surface indications of oxidization, but none in core
110	Completely oxidized	small but good quality piece for palmettoware
111	Reduced core, reduced outside	slight oxidization. Angular thickening like filletrim, but smoothened so you cannot see the actual fold anymore.
112	Reduced core with oxidized exterior (rapid cooling)	
113	Reduced core with oxidized exterior (rapid cooling)	thin oxidized layer on outside
114	Completely oxidized	
115	Reduced core with post firing oxidation	
116	Completely oxidized	really fine palmetto ware, no large shell inclusion, smooth outside
117	Reduced core with oxidized exterior (rapid cooling)	
118	Reduced core with oxidized exterior (rapid cooling)	very similar to 117, but different paste
119	Reduced core with oxidized exterior (rapid cooling)	
120	Completely oxidized	
121	Completely oxidized	small container, oxidized so maybe liquids? Palmetto
122		griddle
123	Reduced core with oxidized exterior (rapid cooling)	
124	Completely oxidized	

Vessel lot #	Firing	Comments
125	Reduced core with post firing oxidation	
126	Completely oxidized	
127	Completely oxidized	
128	Reduced core with oxidized exterior (rapid cooling)	boat vessel?
129	Completely oxidized	
130	Completely oxidized	
131	Completely oxidized	fillet rim
132	Completely oxidized	
133	completely reduced	
134	completely reduced	
135	completely reduced	
136	completely reduced	
137	Reduced core, reduced inside	OUTSIDE OXIDIZED
138	completely reduced	BASED ON THICKNESS (7MM) AND INCISIONS
139	Completely oxidized	
140	Completely oxidized	
141	Reduced core with oxidized exterior (rapid cooling)	
142	completely reduced	top is convex out, but to 16 mm under rim it is convex in. Not jar, but this
143	Completely oxidized	
144	completely reduced	vessel lot based on paste
145	Reduced core with oxidized exterior (rapid cooling)	
146	Completely oxidized	
147	Reduced core, reduced inside	
148	Completely oxidized	different from vs# 147 based on paste
149	Completely oxidized	
150	Completely oxidized	
151	Completely oxidized	

APPENDIX H
CORAL

ID	FS#	Species	Count	Weight	Tool	Remarks
1	1	Elk Coral	1	20		No obvious wear, only broken fragments
2	1	Star Coral	22	173	6	6 obvious tools, rest are too small fragments. Some angled wear
3	1	Brain Coral	11	54	1	Rasp or abraider, 1 burned
4	1	UID	3	27		very worn
5	2	Brain Coral	5	350	1	1 obvious tool, one large piece with variable wear
6	2	Star Coral	5	60	3	3 tools, some angled wear
7	2	Staghorn Coral	1	22	1	Abraider/Rasp
8	3	Star Coral	11	36	2	2 tools, all small fragments
9	3	Staghorn Coral	1	14	1	1 tool, abraider/rasp
10	6	Star Coral	22	639	1	1 large 577 gr rasp, rest fragments
11	6	Brain Coral	7	35	1	1 obvious tool
12	6	Staghorn Coral	1	7	1	abraider/rasp
13	7	Staghorn Coral	1	62		worn
14	7	Star Coral	35	175		
15	7	Brain Coral	12	35	1	1 tool, rest fragments
16	11	Brain Coral	4	27	1	1 obvious tool
17	11	Star Coral	11	36	2	2 tools
18	10	Star Coral	21	106		
19	10	UID	2	14		
20	12	Staghorn Coral	1	4	1	1 tool, abraider/rasp
21	12	Star Coral	6	61		1
22	4	Star Coral	19	80	3	3 tools
23	4	Brain Coral	16	58	2	2 tools
24	41	Star Coral	2	8		fragments
25	9	Star Coral	10	268	5	5 tools
26	9	Brain Coral	5	17	1	1 tool
27	38	Star Coral	13	32	3	3 tools, fragments, all are debitage
28	43	Star Coral	37	279	8	8+ tools, but basically all could be
29	43	Brain Coral	3	60		0 tools
30	43	Staghorn Coral	2	89	2	2, 1 very worn
31	13	Brain Coral	1	10		
32	13	Star Coral	5	52		
33	47	Brain Coral	4	31		
34	19	Brain Coral	4	6		
35	16	Star Coral	1	1		

ID	FS#	Species	Count	Weight	Tool	Remarks
36	29	Star Coral	39	72	1	1 large piece, rest fragments
37	29	Brain Coral	13	77		
38	29	Staghorn Coral	2	50		
39	32	Star Coral	1	1		small fragment
40	53	UID	1	0		
41	56	Star Coral	1	1		
42	55	Star Coral	2	12	1	1 tool
43	39	Brain Coral	2	8		
44	39	Star Coral	15	62	1	1
45	46	Staghorn Coral	2	6		2 small pieces
46	46	Star Coral	5	80	1	1, pieces mend into one tool
47	25	Star Coral	10	28		
48	25	Brain Coral	5	35	2	2 tools, both may mend into one
49	30	Star Coral	5	24		
50	30	Brain Coral	9	29	1	1
51	31	Staghorn Coral	1	16		not much wear
52	31	Brain Coral	2	2		
53	41	Star Coral	4	57		1 large piece
54	22	Brain Coral	1	23		no visual wear
55	24	Brain Coral	18	12		small fragments
56	24	Star Coral	14	19		
57	20	Brain Coral	1	1		fragments
58	27	Brain Coral	4	10		all fragments
59	27	Star Coral	3	57	2	2 are flat, so tools
60	26	Brain Coral	9	33		fragments
61	26	Star Coral	7	16		
62	14	Star Coral	1	7		fragment

APPENDIX I
SHELL

ID	FS	Unit	Location	Level	Species	MNI	NISP	Tool	Comments
1	41	N6E6	Structure VI	3	Strombus gigas	0	9	debitage, one specimen is long and thin. 5 burned, same piece probably	strombus sp
2	41	N6E6	Structure VI	3	Transenella sp	0	1	Maybe transenella stimpson, which has a more colorful variation in the bahamas. Maybe used for decorative units. Maybe found while hunting for strombus	one right
3	41	N6E6	Structure VI	3	Codakia orbicularis	0	3	2 fragments, one edge of the shell almost to the hinge, end edge is possible flaked off	
4	41	N6E6	Structure VI	3	UID	0	3	fragments	debitage
5	41	N6E6	Structure VI	3		0	1	debitage	fragments
6	39	N6E6	Structure VI	2	Strombus gigas	1	42	6 needles, two are from column (sturdier), four from outside with 2 sharp point at end. 7 base of column pieces, one is of outer whorl. Maybe woodworking?	5 burned. 4 nodules little compared to sample).
7	39	N6E6	Structure VI	2	Codakia orbicularis	0	11	4 edges, no formal tools though. End edge seems to be in tact.	no hinges
8	39	N6E6	Structure VI	3	Oliva reticularis	1	1	bead	most likely caribaeensis, chris is sure
9	39	N6E6	Structure VI	2	Cittarium pica	0	2	receptacle, scoop/shapers	receptacle stands straigt on table, cuts are parallel
10	39	N6E6	Structure VI	2	UID	0	1	no formal tool	inflated, robust, no hinge, some interior sculpting, other worn (chama looking) It is not one of the ID's from O'day 2002.
11	39	N6E6	Structure VI	2	Diplodonta spp	0	4	small fragments, no formal tools	shinny on inside
12	39	N6E6	Structure VI	2	Tellin sp.	0	1	no formal tool	
13	39	N6E6	Structure VI	2	Tellina listeri	0	2	no formal tool	
14	39	N6E6	Structure VI	2	UID	0	3	shiny oysters	probably oysters, 2 are more 'pearly' of color, two small pieces are white and shiny
15	39	N6E6	Structure VI	2	UID	0	56	debitage	24 probably conch (14 g)

ID	FS	Unit	Location	Level	Species	MNI	NISP	Tool	Comments
16	38	N6E6	Structure VI	1	Strombus gigas	0	23	debitage	
17	38	N6E6	Structure VI	1	Cittarium pica	0	1		part of column
18	38	N6E6	Structure VI	1	Cittarium pica	0	3		cf. Not sure if it was pica
19	38	N6E6	Structure VI	1	Bivalve	0	11		
20	38	N6E6	Structure VI	1	Tellina listeri	0	4	debitage	
21	38	N6E6	Structure VI	1	Donax Denticulada	0	1		
22	38	N6E6	Structure VI	1	Codakia orbicularis	0	12	no obvious wear.	small frags. L lgr frag, but no apparent cultural modifications.
23	38	N6E6	Structure VI	1	strombus sp.	0	1		v. nacreous frag. ID'd by BK
24	38	N6E6	Structure VI	1	Bivalve	0	3		worn frags
25	38	N6E6	Structure VI	1	Coral	0	2	not apparent	Two frags of brain coral
26	56	N7E7	Midden	0	Strombus sp.	0	4	no formal tools.	1 nodule, worn (it looks like an eye). 3 jagged whorl pc.
27	56	N7E7	Midden	0	Codakia orbicularis	0	3	no	Includes lg frag of edge, no wear
28	56	N7E7	Midden	0	Tellina radiata	0	1	No apparent wear	1r hinge. Exterior almost looks flaked off.
29	56	N7E7	Midden	0	gastropod	0	1	n/a	small frag, looks like Astrea.
30	56	N7E7	Midden	0	Bivalve		2	n/a	nacreous, golden.
31	55	N7E7	Midden	6	Chione sp.	0	1	n/a	1r hinge. oddly cut. Small.
32	55	N7E7	Midden	6	Strombus sp.	0	3		1 pc. of outer shell, near nodules; 2 frags
33	55	N7E7	Midden	6	Pinctada radiata	0	5	n/a	small frags, with concentric lines. Pink ad gold.
34	55	N7E7	Midden	6	Asaphis deflorata		1	n/a	Exterior almost completely worn off.
35	5	N7E7	Midden	6	Tellina sp.	0	1	n/a	small fragment with thick parrallel lines
36	54	N7E7	Midden	5	Cittarium pica	1	4	debitage, removed part outer whorl in a v-shaped cut, aperture is intact	
37	54	N7E7	Midden	5	Strombus gigas	0	6	debitage	one piece exposed to heat

ID	FS	Unit	Location	Level	Species	MNI	NISP	Tool	Comments
38	54	N7E7	Midden	5	Codakia orbicularis	0	2	scraper, very rounded edge	
39	54	N7E7	Midden	5	Bivalve	0	4		debitage
40	54	N7E7	Midden	5	gastropod	0	3		debitage
41	53	N7E7	Midden	4	Strombus gigas		45	1 hammer (base), 1 discoid spacer/planer, 4 rounded "hooks"	No spires, no sypthons. At least 2 pc burn. All very fragmentary, except hammer.
42	53	N7E7	Midden	4	Codakia orbicularis	0	10		One with uneven edge break, no wear (expedient tool)
43	53	N7E7	Midden	4	Tellina listeri	0	6		all very fragmentary
44	54	N7E7	Midden	4	Tellinidae	0	2		Small fragments, thing shell, nacreous, slight curve.
45	53	N7E7	Midden	4	Pinctada radiata	0	2		Shiny, pinkish and gold. Fragments.
46	53	N7E7	Midden	4	UID		51		very small frags.
47									
48	53	N7E7	Midden	4	Cittarium pica		1		small fragment
49	47	N7E7	Midden	3	Chione cancelata	0	1		1R
50	47	N7E7	Midden	3	Slipper shell		1	n/a	Small slipper shell
51	47	N7E7	Midden	3	Cittarium pica		6		2 burned, exposed to heat
52	47	N7E7	Midden	3	Strombus gigas	1	33	2 hoes, 1 needle, 1 rounded hook	Larger fragments, incl. one apex (v. worn). 5 pcs that look like column removal debitage.
53	47	N7E7	Midden	3	Tellina listeri	0	2		fragements with groove
54	47	N7E7	Midden	3	Codakia orbicularis	1	4	1 pc with some edge wear, but not formal tool	1L, small frag
55	47	N7E7	Midden	3	Tellinidae	0	3		small frags, thin with lines
56	47	N7E7	Midden	3	UID		3		small fragments
57	46	N7E7	Midden	2	Pinctada radiata	0	2	shell inlay, circle for eye	

ID	FS	Unit	Location	Level	Species	MNI	NISP	Tool	Comments
58	46	N7E7	Midden	2	Pinctada radiata	0	9	small flakes, one big piece. Probably production location (or debris location of manufacture) of radiata ornaments	
59	46	N7E7	Midden	2	Strombus gigas	0	13	two nodule, 2 c-shaped tools/fragments	
60	46	N7E7	Midden	2	Chione sp.	0	1	edible/ by-catch for hunting strombus	
61	46	N7E7	Midden	2	Chitonidae	0	1	Chiton	
62	46	N7E7	Midden	2	Codakia orbicularis	1	9	1 left, serated on lateral side, length is 79 mm, width 84 mm	could be used for cutting fiber
63	46	N7E7	Midden	2	Tellina listeri	0	12	fragmentary	
64	46	N7E7	Midden	2	UID	0	25		
65	46	N7E7	Midden	2	Brachidontes exutus	0	1	shiny, purple yellow when fresh	right unit
66	43	N7E7	Midden	1	Anomalocardia brasiliana	0	1		small fragment, Chris is sure but photos in book don't match
67	43	N7E7	Midden	1	UID	0	1		cf. great tellin, shiny exterior, large, growth lines only at margin
68	43	N7E7	Midden	1	Tellina listeri	1	15		one left, one right that both fit, so likely was brought to site as complete unit
69	43	N7E7	Midden	1	Brachidontes exutus	0	1		missing hinge, left
70	43	N7E7	Midden	1	Strombus gigas	0	80	one hoe, three tips one with obvious wear, two needle, one spacer for weaving/netmaking/basketry making?, 5 c-shaped tools,	8 obviously fired
71	43	N7E7	Midden	1	Codakia orbicularis	1	25	three lateral edges (long units broken off from the edge of the cutting edge)	one right
72	43	N7E7	Midden	1	Pinctada radiata	0	3	one big pieces, two smaller fragments	
73	43	N7E7	Midden	1	Cittarium pica	0	5	fragments. One part would be perfect cut-out for larger tools that we found in N6E6? With V-shaped cut	
74	43	N7E7	Midden	1	Chitonidae	0	1		
75	43	N7E7	Midden	1	Chama sarda	0	2		

ID	FS	Unit	Location	Level	Species	MNI	NISP	Tool	Comments
76	43	N7E7	Midden	1	Lucina pectinada	0	1		
77	43	N7E7	Midden	1	Bivalve	0	3		probably luccinae
78	43	N7E7	Midden	1	Tellina sp.	0	5	fragments	
79	43	N7E7	Midden	1	UID	0	43	fragments	
80	38	N6E6	Structure VI	1	Strombus gigas	0	2	shell inlay, teeth	
81	29	N4E2	Structure IV	1	Chama macerophylla	0	1	small fragment, bead production	
82	29	N4E2	Structure IV	1	Crepidula plana	1	1		intertidal (but we don't have nerites in site)
83	29	N4E2	Structure IV	1	Oliva reticularis	1	1	bead	
84	29	N4E2	Structure IV	1	Strombus gigas		43	one huge lip; colum extracted. 2 tips both with wear, 1 massive c-shaped unit, one nodule, one hoe, small and large debitage	
85	29	N4E2	Structure IV	1	Codakia orbicularis	1	14	fragmentary, no formal tools/wear	one left, one right, do NOT match
86	29	N4E2	Structure IV	1	Tellina listeri	1	9	no formal tools, fragmentary	two hinge
87	29	N4E2	Structure IV	1	Pinctada radiata	0	8	fragmentary	one piece is larger
88	29	N4E2	Structure IV	1	Cittarium pica	0	8	very small fragments	
89	29	N4E2	Structure IV	1	UID	0	35		
90	30	N4E2	Structure IV	2	Strombus gigas	1	34	hammer (very worn), one tip, mostly fragments,without specific tools, one maybe hoe	
91	30	N4E2	Structure IV	2	Codakia orbicularis	0	20	one edge with pink color, outside is abraded from it; no formal tools	
92	30	N4E2	Structure IV	2	Pinctada radiata	0	7	no tools, debitage	
93	30	N4E2	Structure IV	2	Cittarium pica	0	2	fragments	
94	30	N4E2	Structure IV	2	Bivalve	0	1	fragment	cf lucina
95	30	N4E2	Structure IV	2	Tellina sp.	0	2	fragments	
96	30	N4E2	Structure IV	2	UID	0	12	fragments	
97	31	N4E2	Structure IV	3	Anomalocardia brasiliana	1	1		right

ID	FS	Unit	Location	Level	Species	MNI	NISP	Tool	Comments
98	31	N4E2	Structure IV	3	Strombus gigas	0	12	one nodule	
99	31	N4E2	Structure IV	3	Codakia orbicularis	0	5	no formal tools, one has maybe edges on lateral side	
100	31	N4E2	Structure IV	3	Tellina listeri	0	1		
101	31	N4E2	Structure IV	3	UID	0	18		
102	32	N4E2	Structure IV	4	Strombus gigas	0	1	hoe fragment	
103	22	N4E2	Structure IV		Strombus gigas	0	2	one burned, other is c-shaped tool/debitage	wall clean
104	24	N3E2	Structure IV	1	oliva sp.	0	1	bead?	one half of the oliva
105	24	N3E2	Structure IV	1	Codakia orbicularis	0	1	no formal tool	
106	24	N3E2	Structure IV	1	Strombus gigas	0	13	one needle, one large c-shaped, one siphonal canal which is burned	
107	24	N3E2	Structure IV	1	Tellina sp.	0	3	fragments	
108	24	N3E2	Structure IV	1	UID	0	13		
109	4	N1E1	Structure II	2	Codakia orbicularis	0	6	no formal tool, but one valve almost complete and edge is broken off	
110	4	N1E1	Structure II	2	Tellina listeri	0	6	no formal tools	one piece was beach wash with concreted sand inside
111	4	N1E1	Structure II	2	Chiton	0	1		
112	4	N1E1	Structure II	2	Nerita sp.	0	2		
113	4	N1E1	Structure II	2	Strombus gigas	1	57	six tips of which one is a pick, other has a flat surface, one c-shaped, one top lightly weathered/used, two big pieces have at least column extracted	we got at least 6 canals, so MNI most likely to be much higher
114	2	N2E0	Structure II	1	Codakia orbicularis	0	7		one left hinge
115	2	N2E0	Structure II	1	Tellina listeri	0	2		
116	2	N2E0	Structure II	1	Pinctada radiata	0	1		
117	2	N2E0	Structure II	1	Anomalocardia brasiliana	0	1		one left
118	2	N2E0	Structure II	1	Cittarium pica	0	2		

ID	FS	Unit	Location	Level	Species	MNI	NISP	Tool	Comments
119	2	N2E0	Structure II	1	Strombus gigas	1	25	one lip (hoe), one top, lightly battered, one needle, one vertical piece of the lip that has a little wear on one outside end, not sure of its use	
120	2	N2E0	Structure II	1	UID	0	8	fragments	
121	2	N2E0	Structure II	1	Cardiidae sp	0	1		bycatch
122	2	N2E0	Structure II	1	Veneridae sp	0	1		one right
123	2	N2E0	Structure II	1	Latirus sp	1	1		rocky intertidal (like chiton)
124	2	N2E0	Structure II	1	Tegula sp.	1	1		rocky intertidal
125	26	N3E2	Structure IV	3	Fasciolaria tulipa	1	1		no other parts of shell in sample, siphonal canal
126	26	N3E2	Structure IV	3	Charonia variegata	1	1		end tip of siphonal canal
127	26	N3E2	Structure IV	3	Codakia orbicularis	0	3	fragments, no formal tools	
128	26	N3E2	Structure IV	3	Strombus gigas	0	37	one pick, 2 needles, one colum used as picks	
129	26	N3E2	Structure IV	3	UID	0	13		
130	11	N2E1	Structure II	1	Strombus gigas	0	6	one c-shape, two colums that night be picks, one needle	
131	11	N2E1	Structure II	1	Tellina listeri	0	2	no formal tool	
132	11	N2E1	Structure II	1	Codakia orbicularis	0	1	no formal tool	
133	6	N1E2	Structure II	2	chiton sp.	0	1	no formal tool	large, 28.45 mm wide
134	6	N1E0	Structure II	2	Strombus gigas	0	47	one hoe, two large c-shaped, one needle, one remnant of hoe? Two nodules, Rest debitage	some were burned
135	6	N1E0	Structure II	2	Codakia orbicularis	1	19	one edge, no tool use clearly visible	all incredibly robust, mature big codakias
136	6	N1E0	Structure II	2	Veneridae sp	0	1		beach wash, filled with sediment inside and concretion outside
137	6	N1E0	Structure II	2	Nerita versicolor	1	1		food
138	6	N1E0	Structure II	2	Pinctada radiata	0	3		
139	6	N1E0	Structure II	2	Cittarium pica	0	3		
140	6	N1E0	Structure II	2	Tellina listeri	1	5	very fragmentary	

ID	FS	Unit	Location	Level	Species	MNI	NISP	Tool	Comments
141	6	N1E0	Structure II	2	UID	0	26		
142	3	N3E0	Structure II	1	Strombus gigas	1	14	one piece prob fire exposed, one pick, one c-shaped	
143	3	N3E0	Structure II	1	Codakia orbicularis	0	4		one left
144	3	N3E0	Structure II	1	Chione sp.	0	1		one left, broken
145	3	N3E0	Structure II	1	Pinctada radiata	0	1		small fragment
146	25	N3E2	Structure IV	2	Pinctada radiata	0	5	small fragments, very shiny	
147	25	N3E2	Structure IV	2	Codakia orbicularis	1	7	one large shell without edge, exhausted scraper?	very large and robust codakia
148	25	N3E2	Structure IV	2	Strombus gigas	0	13	one preform for hoe? Rest debitage	
149	25	N3E2	Structure IV	2	Charonia variegata	0	1		ID identified by O'Day's 2002 list, not 100% sure
150	25	N3E2	Structure IV	2	Pinctada radiata	0	5		shiny as radiata, pieces are small though
151	25	N3E2	Structure IV	2	UID	0	13		fragments
152	7	N2E0	Structure II	2	Strombus gigas	0	55	one nodule, one c-shaped tool, one hoe, two broken hoe	
153	7	N2E0	Structure II	2	Codakia orbicularis	1	17	couple of broken edges, very fragmented	
154	7	N2E0	Structure II	2	chiton sp	0	1		
155	7	N2E0	Structure II	2	Tellina listeri	0	5		one left hinge
156	7	N2E0	Structure II	2	oliva sp.	0	1	broken bead	
157	7	N2E0	Structure II	2	Diplodonta sp	0	1		
158	7	N2E0	Structure II	2	Chama sarda	0	1		one top
159	7	N2E0	Structure II	2	Pteria colymbus	0	1	very shiny, shell has pearls	other 'pinctada radiata' might have been Pteria colymbus
160	7	N2E0	Structure II	2	UID	0	25		fragments
161	7	N2E0	Structure II	2	Cherithium sp	1	1		concreted soil inside and outside
162	1	N1E0	Structure II	1	Pteria colymbus	0	7		very golden color

ID	FS	Unit	Location	Level	Species	MNI	NISP	Tool	Comments
163	1	N1E0	Structure II	1	Tellina listeri	0	8	small, fragmentary	
164	1	N1E0	Structure II	1	Chama sarda	0	3	one small preform for a bead, round and 9 mm in diameter	both pieces fit together and form one complete shell
165	1	N1E0	Structure II	1	Cittarium pica	0	5		small fragments
166	1	N1E0	Structure II	1	Chione cancelata	0	1		one left
167	1	N1E0	Structure II	1	Codakia orbicularis	0	17	one serated edge, scraper	no hinge, fragments
168	1	N1E0	Structure II	1	Strombus gigas	2	46	one pick, two broken hoes, two needle, one nodule	we just realized that none of the shells have extraction holes that we have seen
169	1	N1E0	Structure II	1	UID	0	12		fragments
170	1	N1E0	Structure II	1	Olivella sp	1	1	bead	
171	1	N1E0	Structure II	1	Chione sp.	0	1		too robust and thick for chione though
172	1	N1E0	Structure II	1	Cittarium pica	0	3		fragments
173	10	N1E1	Structure II	4					strat A
174	10	N1E1	Structure II	4	Nerita sp.	0	1		
175	10	N1E1	Structure II	4	Codakia orbicularis	0	15		two right
176	10	N1E1	Structure II	4	Cittarium pica	0	2		
177	10	N1E1	Structure II	4	Strombus gigas		21	two broken hoes, one needle	
178	10	N1E1	Structure II	4	Brachidontes exutus	0	1		one right
179	10	N1E1	Structure II	4	Pteria colymbus	0	2		
180	10	N1E1	Structure II	4	Tellina listeri	0	10		fragments
181	10	N1E1	Structure II	4	UID	0	25		
182	28	N3E2	Structure IV	4	Codakia orbicularis	0	1	one whole shell, edge nodged scraper	second layer
183	28	N3E2	Structure IV	4	Strombus gigas	0	3	fragments	
184	28	N3E2	Structure IV	4	Tellina listeri	0	3		fragments
185	28	N3E2	Structure IV	4	oliva sp.	0	1	bead?	fragment of outer whorl

ID	FS	Unit	Location	Level	Species	MNI	NISP	Tool	Comments
186	28	N3E2	Structure IV	4	Charonia variegata	0	1		very small fragment
187	28	N3E2	Structure IV	4	Cittarium pica	0	1		
188	27	N3E2	Structure IV	4	Laevicardium laevigatum	0	1	complete valve, no wear	
189	27	N3E2	Structure IV	4	Tellina listeri	0	1		fragment
190	27	N3E2	Structure IV	4	Codakia orbicularis	0	2		fragments
191	27	N3E2	Structure IV	4	Strombus gigas	0	11	no tools, no colum pieces, all outer frgments, tool production	
192	27	N3E2	Structure IV	4	UID	0	10		
193	14	N1E1	Structure II	6	Cypraecassis testiculus	1	1	no bead	context b
194	14	N1E1	Structure II	6	Strombus gigas	0	5	fragments	context b
195	14	N1E1	Structure II	6	Turbinidae sp	0	1		
196	14	N1E1	Structure II	6	Pinctada radiata	0	1		
197	14	N1E1	Structure II	6	UID	0	3		fragments
198	21	N1E1	Structure II	80	Pteria colymbus	0	1	one large flat piece	wallclean @ 80 cmbd
199	21	N1E1	Structure II	80	Codakia orbicularis	0	3		wallclean @ 80 cmbd
200	21	N1E1	Structure II	80	Strombus gigas	0	1		wallclean @ 80 cmbd
201	21	N1E1	Structure II	80	Tellina listeri	0	1		wallclean @ 80 cmbd
202	19	N1E1	Structure II	7	Tellina listeri	0	1		
203	19	N1E1	Structure II	7	UID	0	1		
204	20	N1E1	Structure II	7	Strombus gigas	0	1		
205	16	N1E1	Structure II	6	Strombus gigas	0	1	edge of hoe, or removed to make hoe	feature
206	16	N1E1	Structure II	6	Pteria colymbus	0	1		feature 1
207	16	N1E1	Structure II	6	UID	0	1		fragment
208	10	N1E1	Structure II	4	Spondylus	0	2		

ID	FS	Unit	Location	Level	Species	MNI	NISP	Tool	Comments
209	9	N1E1	Structure II	4	Tellina listeri	0	5		one left hinge
210	9	N1E1	Structure II	4	Codakia orbicularis	1	8		
211	9	N1E1	Structure II	4	chiton sp.	0	1		
212	9	N1E1	Structure II	4	Strombus gigas	1	28	one hamer, one hoe, one broken hoe, two c-shapes	
213	9	N1E1	Structure II	4	Arcopagia faustae	0	1		
214	9	N1E1	Structure II	4	Chama sarda	0	1		
215	9	N1E1	Structure II	4	UID	0	19		
216	9	N1E1	Structure II	4	Cypraecassis sp.	0	1		
217	12	N1E1	Structure II	5	Codakia orbicularis	0	7		one right hinge
218	12	N1E1	Structure II	5	Cittarium pica	0	4		
219	12	N1E1	Structure II	5	Tellina listeri	0	8		no hinge
220	12	N1E1	Structure II	5	chiton sp.	0	1		
221	12	N1E1	Structure II	5	Strombus gigas	0	25	two broken hoe fragments, two needles	two pieces were triangular and had one specific pointy point
222	12	N1E1	Structure II	5	UID	0	25		
223	13	N1E1	Structure II	6	Codakia orbicularis	0	7		one piece burned
224	13	N1E1	Structure II	6	Tellina listeri	0	2		
225	13	N1E1	Structure II	6	Cittarium pica	0	1		burned
226	13	N1E1	Structure II	6	Strombus gigas	0	20	one pick with clearly worn point, one broken hoe, one end of pick clearly not used, three small needles	one preform for bead, small circle
227	13	N1E1	Structure II	6	UID	0	7		
228	12	N1E1	Structure II	5	Brachidontes exutus	0	3		
229	12	N1E1	Structure II	5	Pteria colymbus	0	1		
230	12	N1E1	Structure II	5	Periglypta listeri	0	1		
231	12	N1E1	Structure II	5	Tellina sp.	0	1		possibly angular tellin

ID	FS	Unit	Location	Level	Species	MNI	NISP	Tool	Comments
232	13	N1E1	Structure II	6	Pteria colymbus	0	3		
233	13	N1E1	Structure II	6	Chiton	0	1		
234	13	N1E1	Structure II	6	Diplodonta spp	0	1		
235	13	N1E1	Structure II	6	Pitar Circinata	0	2		

APPENDIX J
ZOOARCHAEOLOGICAL ANALYSIS

Taxa	Element	NISP	MNI	Wt. (g)	Notes	FS	UNIT	LEVEL	cmbd
Acanthurus sp.	vertebra	1	1	0.08		24	N3E2	1	54-80
Acanthurus sp.	vertebrae	4	1	0.40		43	N7E7	1	33-60
Acanthurus sp.	vertebrae	2	1	0.26	1 is anterior	46	N7E7	2	60-70
Acanthurus sp.	vertebra	2	1	0.26		47	N7E7	3	70-80
Acanthurus sp.	dorsal spine	1		0.35		47	N7E7	3	70-80
Acanthurus sp.	vertebra	1	1	0.10		53	N7E7	4	80-90
Acanthurus sp.	vertebrae	3	1	0.24		54	N7E7	5	90-100
Acanthurus sp.	vertebra	1	1	0.21		55	N7E7	6	100-110
Actinopterygii	vertebrae	39		2.75		53	N7E7	4	80-90
Actinopterygii	spine/rib	4		0.41		24	N3E2	1	54-80
Actinopterygii	uid fragments	9		0.45		24	N3E2	1	54-80
Actinopterygii	vertebrae	9		0.64		24	N3E2	1	54-80
Actinopterygii	vertebrae	3		0.15		24	N3E2	1	54-80
Actinopterygii	spine/rib	13		2.00	1 spine w/hyperostosis, likely Jack?	25	N3E2	2	80-90
Actinopterygii	uid fragments	33		1.83		25	N3E2	2	80-90
Actinopterygii	vertebrae	8		0.53		25	N3E2	2	80-90
Actinopterygii	vertebrae	3		0.28		25	N3E2	2	80-90
Actinopterygii	cleithrum	1		0.09		25	N3E2	2	80-90
Actinopterygii	cleithrum	1		0.04		25	N3E2	2	80-90
Actinopterygii	maxilla	1		0.87	large specimen	25	N3E2	2	80-90
Actinopterygii	hyomandibular	1		0.56	large specimen	25	N3E2	2	80-90
Actinopterygii	vertebrae	99		10.82	1 very large specimen; 2 are likely atli, but top disintegrated, 1 is quite large and both are BG/BB/BW	43	N7E7	1	33-60
Actinopterygii	vertebrae	46		2.54		43	N7E7	1	33-60
Actinopterygii	uid fragments	457		30.12		43	N7E7	1	33-60

Taxa	Element	NISP	MNI	Wt. (g)	Notes	FS	UNIT	LEVEL	cmbd
Actinopterygii	uid elements	9		0.45	bagged separately for possible id in future	43	N7E7	1	33-60
Actinopterygii	spine/rib	182		13.90		43	N7E7	1	33-60
Actinopterygii	upper pharyngeal grinder	2		0.36	Grunt?	43	N7E7	1	33-60
Actinopterygii	parasphenoid	2		0.19		43	N7E7	1	33-60
Actinopterygii	parasphenoid	1		1.43	Snapper?	43	N7E7	1	33-60
Actinopterygii	ceratohyal/epihyal	2		0.40	Snapper?	43	N7E7	1	33-60
Actinopterygii	ceratohyal/epihyal	1		0.10		43	N7E7	1	33-60
Actinopterygii	upper pharyngeal grinder	1		0.06	Grunt?	43	N7E7	1	33-60
Actinopterygii	parasphenoid	1		0.17	Snapper?	43	N7E7	1	33-60
Actinopterygii	epihyal	1		0.12	Snapper?	43	N7E7	1	33-60
Actinopterygii	palatine	1		0.09	Snapper?	43	N7E7	1	33-60
Actinopterygii	palatine	2		0.19	Snapper?	43	N7E7	1	33-60
Actinopterygii	urostyle	1		0.07	Grunt?	43	N7E7	1	33-60
Actinopterygii	parasphenoid	1		0.02	Grunt?	43	N7E7	1	33-60
Actinopterygii	cleithrum	3		0.17	Snapper?	43	N7E7	1	33-60
Actinopterygii	cleithrum	3		0.19	Snapper?	43	N7E7	1	33-60
Actinopterygii	suboperculum	1		0.16	Snapper?	43	N7E7	1	33-60
Actinopterygii	otolith	1		0.31		43	N7E7	1	33-60
Actinopterygii	vertebrae	25		1.93		46	N7E7	2	60-70
Actinopterygii	spine/rib	154		11.42		46	N7E7	2	60-70
Actinopterygii	uid fragments	579		34.64		46	N7E7	2	60-70
Actinopterygii	uid fragments	10		1.14	in separate bag incase able to id in future, suboperculums too close between grunt and snapper	46	N7E7	2	60-70
Actinopterygii	upper pharyngeal grinder	3		0.29		46	N7E7	2	60-70
Actinopterygii	upper pharyngeal grinder	1		0.04	broke during analysis, 2 bits	46	N7E7	2	60-70

Taxa	Element	NISP	MNI	Wt. (g)	Notes	FS	UNIT	LEVEL	cmbd
Actinopterygii	parasphenoid	1		0.07		46	N7E7	2	60-70
Actinopterygii	cleithrum	3		0.11		46	N7E7	2	60-70
Actinopterygii	cleithrum	4		0.37		46	N7E7	2	60-70
Actinopterygii	parasphenoid	1		0.10		46	N7E7	2	60-70
Actinopterygii	urostyle	3		0.17		46	N7E7	2	60-70
Actinopterygii	penultimate	1		0.24		46	N7E7	2	60-70
Actinopterygii	dentary	1		0.35		46	N7E7	2	60-70
Actinopterygii	maxilla	1		0.02		46	N7E7	2	60-70
Actinopterygii	atli	5		0.52	burned atlas is larger than others	46	N7E7	2	60-70
Actinopterygii	vertebrae	26		4.20		47	N7E7	3	70-80
Actinopterygii	vertebrae	8		0.39		47	N7E7	3	70-80
Actinopterygii	spine/rib	94		5.64		47	N7E7	3	70-80
Actinopterygii	uid fragments	205		15.05		47	N7E7	3	70-80
Actinopterygii	uid elements	7		0.67	bagged separately for future id	47	N7E7	3	70-80
Actinopterygii	parasphenoid	1		0.29		47	N7E7	3	70-80
Actinopterygii	upper pharyngeal grinder	2		0.21		47	N7E7	3	70-80
Actinopterygii	supracleithrum	1		0.19		47	N7E7	3	70-80
Actinopterygii	ceratohyal	1		0.11		47	N7E7	3	70-80
Actinopterygii	ceratohyal	1		0.02		47	N7E7	3	70-80
Actinopterygii	cleithrum	1		0.05		47	N7E7	3	70-80
Actinopterygii	cleithrum	1		0.05		47	N7E7	3	70-80
Actinopterygii	cleithrum	1		0.03		47	N7E7	3	70-80
Actinopterygii	cleithrum	1		0.05		47	N7E7	3	70-80
Actinopterygii	cleithrum	2		0.09		47	N7E7	3	70-80
Actinopterygii	ceratohyal	1		0.04		47	N7E7	3	70-80
Actinopterygii	cleithrum	1		0.14		47	N7E7	3	70-80
Actinopterygii	cleithrum	1		0.07		47	N7E7	3	70-80
Actinopterygii	preoperculum	1		0.02	edges eroded, small sp.	47	N7E7	3	70-80

Taxa	Element	NISP	MNI	Wt. (g)	Notes	FS	UNIT	LEVEL	cmbd
Actinopterygii	cleithrum	2		0.08		47	N7E7	3	70-80
Actinopterygii	atlas	1		0.26	cf. Gerres sp.? cf. Haemulidae?	47	N7E7	3	70-80
Actinopterygii	spine/rib	60		4.14		53	N7E7	4	80-90
Actinopterygii	uid elements	8		0.87	in separate bag for future id	53	N7E7	4	80-90
Actinopterygii	uid fragments	109		6.02		53	N7E7	4	80-90
Actinopterygii	vertebrae	14		0.91		53	N7E7	4	80-90
Actinopterygii	supracleithrum	1		0.04		53	N7E7	4	80-90
Actinopterygii	upper pharyngeal grinder	2		0.18		53	N7E7	4	80-90
Actinopterygii	upper pharyngeal grinder	1		0.11		53	N7E7	4	80-90
Actinopterygii	cleithrum	2		0.09		53	N7E7	4	80-90
Actinopterygii	cleithrum	1		0.04		53	N7E7	4	80-90
Actinopterygii	palatine	1		0.15		53	N7E7	4	80-90
Actinopterygii	palatine	1		0.22		53	N7E7	4	80-90
Actinopterygii	parasphenoid	2		0.18		53	N7E7	4	80-90
Actinopterygii	atlas	1		0.09		53	N7E7	4	80-90
Actinopterygii	pterygoid	1		0.25	try to id further, no pterygoid teeth present	54	N7E7	5	90-100
Actinopterygii	spine/rib	28		2.60		54	N7E7	5	90-100
Actinopterygii	uid fragments	77		5.32	1 cleithrum, 1 articular, 1 hyomandibular, 1 possible dentary	54	N7E7	5	90-100
Actinopterygii	vertebrae	22		1.59		54	N7E7	5	90-100
Actinopterygii	vertebrae	5		0.50	1 is an atlas fragment	54	N7E7	5	90-100
Actinopterygii	preoperculum	1		0.10		54	N7E7	5	90-100
Actinopterygii	palatine	1		0.38		54	N7E7	5	90-100
Actinopterygii	preoperculum	1		0.12		54	N7E7	5	90-100
Actinopterygii	cleithrum	2		0.08		54	N7E7	5	90-100
Actinopterygii	epihyal	2		0.16		54	N7E7	5	90-100
Actinopterygii	epihyal	1		0.13		54	N7E7	5	90-100

Taxa	Element	NISP	MNI	Wt. (g)	Notes	FS	UNIT	LEVEL	cmbd
Actinopterygii	cleithrum	1		0.11		54	N7E7	5	90-100
Actinopterygii	spine/rib	15		1.02		55	N7E7	6	100-110
Actinopterygii	uid fragments	64		3.95	1 right maxilla fragment	55	N7E7	6	100-110
Actinopterygii	vertebrae	6		0.66		55	N7E7	6	100-110
Actinopterygii	vertebrae	21		2.21		55	N7E7	6	100-110
Actinopterygii	cleithrum	1		0.02	cf. Lutjanidae?	55	N7E7	6	100-110
Actinopterygii	cleithrum	1		0.04	cf. Lutjanidae?	55	N7E7	6	100-110
Actinopterygii	cleithrum	1		0.07	cf. Lutjanidae?	55	N7E7	6	100-110
Actinopterygii	parasphenoid	2		0.28	Grunt?	55	N7E7	6	100-110
Actinopterygii	atlas	1		0.11		55	N7E7	6	100-110
Actinopterygii	vertebrae	143		10.78		46	N7E7	2	60-70
Albula vulpes	otoliths	2	2	0.85		24	N3E2	1	54-80
Albula vulpes	vertebrae	20		2.05	anterior=12, posterior=8	24	N3E2	1	54-80
Albula vulpes	grinder plate	3		0.29		24	N3E2	1	54-80
Albula vulpes	cf. atlas	1		0.10	anterior	25	N3E2	2	80-90
Albula vulpes	otoliths	3	3	1.16		25	N3E2	2	80-90
Albula vulpes	otoliths	1		0.89	larger than all left otoliths, MNI 1	25	N3E2	2	80-90
Albula vulpes	premaxilla	1		0.05	not sure of side	25	N3E2	2	80-90
Albula vulpes	vertebrae	20		1.88	anterior=12, posterior=8	25	N3E2	2	80-90
Albula vulpes	vertebrae	1		0.06	posterior	25	N3E2	2	80-90
Albula vulpes	grinder plate	1		0.17		25	N3E2	2	80-90
Albula vulpes	upper pharyngeal grinder	1		0.26		43	N7E7	1	33-60
Albula vulpes	hyomandibular	1		0.49		43	N7E7	1	33-60
Albula vulpes	operculum	1		0.24		43	N7E7	1	33-60
Albula vulpes	operculum	1		0.16		43	N7E7	1	33-60
Albula vulpes	operculum	1		0.08		43	N7E7	1	33-60
Albula vulpes	quadrate	1		0.15		43	N7E7	1	33-60
Albula vulpes	quadrate	1		0.20	largest specimen	43	N7E7	1	33-60
Albula vulpes	quadrate	1		0.11		43	N7E7	1	33-60

Taxa	Element	NISP	MNI	Wt. (g)	Notes	FS	UNIT	LEVEL	cmbd
Albula vulpes	quadrate	2		0.12	both small size	43	N7E7	1	33-60
Albula vulpes	cf. vomer	1		0.08		43	N7E7	1	33-60
Albula vulpes	dentary	2		0.23		43	N7E7	1	33-60
Albula vulpes	dentary	4		0.46		43	N7E7	1	33-60
Albula vulpes	otolith	18	18	7.64		43	N7E7	1	33-60
Albula vulpes	otolith	5	5	2.08		43	N7E7	1	33-60
Albula vulpes	otolith	15		5.45	1 possible portion BB	43	N7E7	1	33-60
Albula vulpes	otolith	3		1.09		43	N7E7	1	33-60
Albula vulpes	vertebrae	290		31.84	anterior = 147, posterior = 143	43	N7E7	1	33-60
Albula vulpes	vertebrae	31		2.42	anterior = 4, posterior = 26	43	N7E7	1	33-60
Albula vulpes	basioccipitals	2		0.20		43	N7E7	1	33-60
Albula vulpes	upper pharyngeal grinder	2		0.90		43	N7E7	1	33-60
Albula vulpes	lower pharyngeal grinder	3		0.89	2 nearly whole	43	N7E7	1	33-60
Albula vulpes	grinder plate	22		2.32		43	N7E7	1	33-60
Albula vulpes	vertebrae	251		28.19	anterior=106, posterior=145	46	N7E7	2	60-70
Albula vulpes	vertebrae	19		1.47		46	N7E7	2	60-70
Albula vulpes	otoliths	12		5.58		46	N7E7	2	60-70
Albula vulpes	otoliths	15	15	6.14		46	N7E7	2	60-70
Albula vulpes	basioccipital	4		0.74		46	N7E7	2	60-70
Albula vulpes	parasphenoid	4		3.26	4 different individuals	46	N7E7	2	60-70
Albula vulpes	lower pharyngeal grinder	4		2.93	4 different individuals	46	N7E7	2	60-70
Albula vulpes	upper pharyngeal grinder	1		0.59	not sure about side	46	N7E7	2	60-70
Albula vulpes	upper pharyngeal grinder	5		1.37		46	N7E7	2	60-70
Albula vulpes	lower pharyngeal grinder	1		0.29		46	N7E7	2	60-70
Albula vulpes	operculum	4		1.39		46	N7E7	2	60-70

Taxa	Element	NISP	MNI	Wt. (g)	Notes	FS	UNIT	LEVEL	cmbd
Albula vulpes	dentary	3		0.31		46	N7E7	2	60-70
Albula vulpes	dentary	4		0.37		46	N7E7	2	60-70
Albula vulpes	quadrates	2		0.13		46	N7E7	2	60-70
Albula vulpes	quadrates	2		0.12		46	N7E7	2	60-70
Albula vulpes	quadrates	1		0.09		46	N7E7	2	60-70
Albula vulpes	quadrates	3		0.23		46	N7E7	2	60-70
Albula vulpes	operculum	1		0.14		46	N7E7	2	60-70
Albula vulpes	operculum	1		0.16		46	N7E7	2	60-70
Albula vulpes	maxilla	1		0.04		46	N7E7	2	60-70
Albula vulpes	quadrates	2		0.24		46	N7E7	2	60-70
Albula vulpes	premaxilla	1		0.03	not sure about side	46	N7E7	2	60-70
Albula vulpes	basioccipital, parasphenoid	1		0.16		46	N7E7	2	60-70
Albula vulpes	basioccipital	1		0.25		46	N7E7	2	60-70
Albula vulpes	grinder plates	21		2.71		46	N7E7	2	60-70
Albula vulpes	hyomandibular	1		0.30		47	N7E7	3	70-80
Albula vulpes	dentary	1		0.14		47	N7E7	3	70-80
Albula vulpes	maxilla	1		0.22		47	N7E7	3	70-80
Albula vulpes	grinder plates	3		0.75		47	N7E7	3	70-80
Albula vulpes	otoliths	5		2.08		47	N7E7	3	70-80
Albula vulpes	otoliths	2		0.81		47	N7E7	3	70-80
Albula vulpes	otoliths	4	4	0.77		47	N7E7	3	70-80
Albula vulpes	otoliths	4	4	1.07		47	N7E7	3	70-80
Albula vulpes	atli	2		0.22		47	N7E7	3	70-80
Albula vulpes	basioccipital	2		0.70		47	N7E7	3	70-80
Albula vulpes	vertebrae	13		0.52	1 is anterior	47	N7E7	3	70-80
Albula vulpes	vertebrae	107		11.84	anterior=52, posterior=55	47	N7E7	3	70-80
Albula vulpes	articular	1		0.05		53	N7E7	4	80-90
Albula vulpes	epihyal	1		0.09	not sure on side	53	N7E7	4	80-90
Albula vulpes	grinder plates	4		0.45		53	N7E7	4	80-90

Taxa	Element	NISP	MNI	Wt. (g)	Notes	FS	UNIT	LEVEL	cmbd
Albula vulpes	operculum	1		0.08	dorsal 1/4	53	N7E7	4	80-90
Albula vulpes	operculum	1		0.09	dorsal 1/4 w/possible burned surface	53	N7E7	4	80-90
Albula vulpes	otoliths	4		2.06		53	N7E7	4	80-90
Albula vulpes	otoliths	1		0.64		53	N7E7	4	80-90
Albula vulpes	otoliths	6	6	2.21		53	N7E7	4	80-90
Albula vulpes	otoliths	1	1	0.42		53	N7E7	4	80-90
Albula vulpes	quadrate	2		0.40		53	N7E7	4	80-90
Albula vulpes	quadrate	1		0.07		53	N7E7	4	80-90
Albula vulpes	vertebrae	10		0.79		53	N7E7	4	80-90
Albula vulpes	vetebrae	70		7.15	anterior=31, posterior=39	53	N7E7	4	80-90
Albula vulpes	atlas	1		0.13		54	N7E7	5	90-100
Albula vulpes	operculum	1		0.31		54	N7E7	5	90-100
Albula vulpes	otolith	1	1	0.50		54	N7E7	5	90-100
Albula vulpes	otolith	1	1	0.34		54	N7E7	5	90-100
Albula vulpes	otolith	1		0.46		54	N7E7	5	90-100
Albula vulpes	otolith	1		0.38		54	N7E7	5	90-100
Albula vulpes	parasphenoid	3		0.68	MNI 2	54	N7E7	5	90-100
Albula vulpes	vertebrae	48		5.18	anterior=18, posterior=30	54	N7E7	5	90-100
Albula vulpes	vomer	1		0.23		54	N7E7	5	90-100
Albula vulpes	grinder plate	3		0.23		54	N7E7	5	90-100
Albula vulpes	grinding plates	1		0.27		55	N7E7	6	100-110
Albula vulpes	operculum	2	2	0.54		55	N7E7	6	100-110
Albula vulpes	otoliths	2		0.84		55	N7E7	6	100-110
Albula vulpes	otoliths	1		0.63		55	N7E7	6	100-110
Albula vulpes	vertebrae	40		4.30	anterior=13, posterior=27	55	N7E7	6	100-110
Albula vulpes	grinding plates	2		0.18		55	N7E7	6	100-110
Ardea sp.	quadrate	1	1	0.18		24	N3E2	1	54-80
Athene cunicularia	coracoid	1	1	0.08		53	N7E7	4	80-90
Athene cunicularia	humerus	1	1	0.20		54	N7E7	5	90-100

Taxa	Element	NISP	MNI	Wt. (g)	Notes	FS	UNIT	LEVEL	cmbd
Aves	longbone shaft	1	1	0.16		24	N3E2	1	54-80
Aves	uid fragment	1		0.15	coracoid frag?	24	N3E2	1	54-80
Aves	tibiotarsus	1		0.14		25	N3E2	2	80-90
Aves	uid shaft fragments	6		0.33		25	N3E2	2	80-90
Aves	cervical vertebra	1		0.07	missing spinous process	43	N7E7	1	33-60
Aves	long bone	2		0.33	possible humerus shaft?	43	N7E7	1	33-60
Aves	long bone	3		0.64	possible femur shafts?	43	N7E7	1	33-60
Aves	phalange	1		0.05		43	N7E7	1	33-60
Aves	longbone	7	1	1.77		46	N7E7	2	60-70
Aves	vertebra	1		0.05		46	N7E7	2	60-70
Aves	uid shaft fragment	1		0.44		46	N7E7	2	60-70
Aves	longbone shaft	2		0.07		47	N7E7	3	70-80
Aves	cf. femur shaft	1		0.43		47	N7E7	3	70-80
Aves	longbone shaft	5		1.25		53	N7E7	4	80-90
Aves	cf. 2nd digit	1		0.07		53	N7E7	4	80-90
Aves	longbone	2		0.57		54	N7E7	5	90-100
Aves	uid fragments	2		0.08		54	N7E7	5	90-100
Aves	cervical vertebra	1	1	0.09		55	N7E7	6	100-110
Aves	longbone	4		0.88		55	N7E7	6	100-110
Belonidae	vertebra	1	1	0.07		25	N3E2	2	80-90
Belonidae	quadrate	1	1	0.08		43	N7E7	1	33-60
Belonidae	vertebrae	3		0.12		43	N7E7	1	33-60
Belonidae	vertebrae	9	1	0.49		46	N7E7	2	60-70
Belonidae	vertebra	1	1	0.04		47	N7E7	3	70-80
Brachyura	claw	2		0.18		46	N7E7	2	60-70
Brachyura cf. Gecarcinidae	claw	2	1	0.24		46	N7E7	2	60-70
Burhinus sp.	humerus	1	1	0.92		25	N3E2	2	80-90
Burhinus sp.	carpometacarpus	1	1	0.21		46	N7E7	2	60-70
Burhinus sp.	femur	2	1	0.24	2 bits mend	47	N7E7	3	70-80
Calamus sp.	premaxilla	1	1	0.06		43	N7E7	1	33-60

Taxa	Element	NISP	MNI	Wt. (g)	Notes	FS	UNIT	LEVEL	cmbd
Calamus sp.	articular	1	1	0.91		46	N7E7	2	60-70
Carangidae	vertebra	1		0.15		43	N7E7	1	33-60
Carangidae	vertebrae	3		0.57		46	N7E7	2	60-70
Carangidae	vertebra	4		0.37		46	N7E7	2	60-70
Carangidae	quadrate	1		0.15		46	N7E7	2	60-70
Carangidae	quadrate	1		0.07		46	N7E7	2	60-70
Carangidae	quadrate	1		0.06	missing ventral tip	46	N7E7	2	60-70
Carangidae	vertebra	1		0.08	posterior	53	N7E7	4	80-90
Carangidae	vertebra	1		0.06	posterior	54	N7E7	5	90-100
Carangidae	quadrates	2		0.13		55	N7E7	6	100-110
Carangidae	vertebrae	2		0.26	1 posterior	55	N7E7	6	100-110
Carangidae/Lutjanidae	articular	1		0.02		46	N7E7	2	60-70
Caranx cf. latus	premaxilla	1		0.04		53	N7E7	4	80-90
Caranx cf. latus	premaxilla	1	1	0.13		53	N7E7	4	80-90
Caranx sp.	palatine	1		0.04		43	N7E7	1	33-60
Caranx sp.	palatine	1	1	0.06		43	N7E7	1	33-60
Caranx sp.	quadrate	1		0.05		43	N7E7	1	33-60
Caranx sp.	dentary	1		0.16		53	N7E7	4	80-90
Caranx sp.	dentary	1	1	0.13		54	N7E7	5	90-100
Caranx sp.	maxilla	1		0.31		54	N7E7	5	90-100
Caranx sp.	maxilla	1	1	0.12		55	N7E7	6	100-110
Caranx sp.	maxilla	1		0.10		55	N7E7	6	100-110
Caranx sp. cf. latus	premaxilla	1		0.11		43	N7E7	1	33-60
Caranx sp. cf. latus	premaxilla	1	1	0.09		46	N7E7	2	60-70
cf. Acanthurus sp.	vertebra	1		0.09	a bit smooshed	46	N7E7	2	60-70
cf. Acanthurus sp.	vertebra	1		0.26		47	N7E7	3	70-80
cf. Albula vulpes	hyomandibular	1		0.19		43	N7E7	1	33-60
cf. Aves	long bone	4		0.59		43	N7E7	1	33-60
cf. Aves	longbone	3		0.39		46	N7E7	2	60-70
cf. Aves	longbone shaft	4		0.50		53	N7E7	4	80-90

Taxa	Element	NISP	MNI	Wt. (g)	Notes	FS	UNIT	LEVEL	cmbd
cf. Brachyura	uid fragments	2	1	0.19		25	N3E2	2	80-90
cf. Carangidae/Lutjanidae	quadrate	2		0.11		43	N7E7	1	33-60
cf. Carangidae/Lutjanidae	quadrate	2		0.31		43	N7E7	1	33-60
cf. Carangidae/Lutjanidae	quadrate	1		0.08		43	N7E7	1	33-60
cf. Carangidae/Lutjanidae	articular	1		0.53	missing anterior and posterior ends	43	N7E7	1	33-60
cf. Caranx sp.	operculum	1	1	0.05		24	N3E2	1	54-80
cf. Cheloniidae	cf. rib	1		0.15		47	N7E7	3	70-80
cf. Cyclura carinata	rib	1		0.09		55	N7E7	6	100-110
cf. Gecarcinidae	cf. upper claw	1		1.55	pathological? Texture and bumps on point, but odd shape	43	N7E7	1	33-60
cf. Haemulidae	vertebrae	4		0.12		43	N7E7	1	33-60
cf. Haemulidae	vertebra	24		1.11	anterior	46	N7E7	2	60-70
cf. Haemulidae	maxilla	1		0.05		46	N7E7	2	60-70
cf. Haemulidae	hyomandibular	1		0.05	1 process broken off	46	N7E7	2	60-70
cf. Haemulidae	vertebrae	4		0.21		47	N7E7	3	70-80
cf. Lutjanidae	preoperculum	2		0.12		43	N7E7	1	33-60
cf. Lutjanidae	operculum	1		0.05		43	N7E7	1	33-60
cf. Lutjanidae	operculum	1		0.03		43	N7E7	1	33-60
cf. Lutjanidae	hyomandibular	2		0.16	not enough of dorsal 1/2	43	N7E7	1	33-60
cf. Lutjanidae	articular	1		0.08	missing ventral 1/2	46	N7E7	2	60-70
cf. Lutjanidae	dentary	1		0.10	cf. Apsilus dentatus	46	N7E7	2	60-70
cf. Lutjanidae	basioccipital	1		0.05		46	N7E7	2	60-70
cf. Lutjanidae	articular	1		0.02	small specimen	54	N7E7	5	90-100
cf. Lutjanidae	operculum	1		3.00	small specimen	54	N7E7	5	90-100
cf. Lutjanidae	operculum	1		0.04	small specimen	55	N7E7	6	100-110
cf. medium/large Mammalia	uid fragments	4	1	5.37	3 articulate, MNI=1, possible diaphysis fragment but with unusual "flare" at one end	53	N7E7	4	80-90

Taxa	Element	NISP	MNI	Wt. (g)	Notes	FS	UNIT	LEVEL	cmbd
cf. Pandion haliaetus	claw	1	1	0.14	0.14	54	N7E7	5	90-100
cf. Rallus sp.	synsacrum	1	1	0.25		43	N7E7	1	33-60
cf. Scaridae	quadrate	1		0.03	sided from comparative specimen	46	N7E7	2	60-70
cf. Serranidae	articular	1	1	0.11		25	N3E2	2	80-90
cf. Serranidae	dentary	1		0.03		46	N7E7	2	60-70
cf. Serranidae	basioccipital	1		0.09		53	N7E7	4	80-90
Cheloniidae	carapace/plastron	4	1	0.79		24	N3E2	1	54-80
Cheloniidae	uid fragments	13		4.68	2 bits articulate	43	N7E7	1	33-60
Cheloniidae	marginals	6		5.80	small individuals	43	N7E7	1	33-60
Cheloniidae	cf. coracoid	1		1.50	small individual	43	N7E7	1	33-60
Cheloniidae	uid fragments	2		1.06	1 is possible metacarpal	43	N7E7	1	33-60
Cheloniidae	phalange	0	1	0.19	small individual	43	N7E7	1	33-60
Cheloniidae	cf. phalange	3		0.33	small individuals	43	N7E7	1	33-60
Cheloniidae	plastron	2		4.71	shape, texture like sea turtle, but very small, juvenile/subadult?	43	N7E7	1	33-60
Cheloniidae	carapace	1		0.32	with rib fragment attached	43	N7E7	1	33-60
Cheloniidae	plastron/carapace	13		7.77		43	N7E7	1	33-60
Cheloniidae	plastron	4	1	1.92	size, texture, very small - likely a hatchling	43	N7E7	1	33-60
Cheloniidae	plaston/carapace	7		3.93		43	N7E7	1	33-60
Cheloniidae	plastron	1		1.50		43	N7E7	1	33-60
Cheloniidae	uid fragments	21		5.13	texture likely sea turtle	46	N7E7	2	60-70
Cheloniidae	xiphiplastron	1	1	3.14		46	N7E7	2	60-70
Cheloniidae	plastron	3		9.70		46	N7E7	2	60-70
Cheloniidae	carapace	2		1.88	1 cf. neural?	46	N7E7	2	60-70
Cheloniidae	rib	3		0.67		46	N7E7	2	60-70
Cheloniidae	vertebrae	1		0.19		46	N7E7	2	60-70
Cheloniidae	neural	1		4.27		46	N7E7	2	60-70
Cheloniidae	neurals	2		2.88		46	N7E7	2	60-70

Taxa	Element	NISP	MNI	Wt. (g)	Notes	FS	UNIT	LEVEL	cmbd
Cheloniidae	peripherals/marginals	4		7.31		46	N7E7	2	60-70
Cheloniidae	cf. peripherals/marginals	4		2.84		46	N7E7	2	60-70
Cheloniidae	cf. plastron	2		6.89		46	N7E7	2	60-70
Cheloniidae	metacarpal/metatarsal	1		0.54		46	N7E7	2	60-70
Cheloniidae	uid fragments	10		2.20		47	N7E7	3	70-80
Cheloniidae	coracoid	1	1	11.41		47	N7E7	3	70-80
Cheloniidae	carapace	2		3.39		47	N7E7	3	70-80
Cheloniidae	rib	1		0.46	off carapace	47	N7E7	3	70-80
Cheloniidae	cf. phalange	1		0.23		47	N7E7	3	70-80
Cheloniidae	cf. plastron	1		0.56		47	N7E7	3	70-80
Cheloniidae	carapace/plastron	1		0.68	likely sea turtle, but heat treated surface and small size	47	N7E7	3	70-80
Cheloniidae	uid fragments	6		1.04	likely sea turtle	53	N7E7	4	80-90
Cheloniidae	carapace/plastron	2		1.13	1 possible neural fragment	53	N7E7	4	80-90
Cheloniidae	cf. cranial fragment	1	1	1.28		53	N7E7	4	80-90
Cheloniidae	cf. phalange	1		0.35	1 possible hack mark	53	N7E7	4	80-90
Cheloniidae	metatarsal/metacarpal	2		0.91	smaller than comparatives	53	N7E7	4	80-90
Cheloniidae	plastron/carapace	1		0.34		54	N7E7	5	90-100
Cheloniidae	cf. phalange	2		0.86	2 bits articulate	54	N7E7	5	90-100
Cheloniidae	skull	1	1	0.39		54	N7E7	5	90-100
Cheloniidae	carapace	1		0.95		54	N7E7	5	90-100
Cheloniidae	carapace	1		0.13		55	N7E7	6	100-110
Cheloniidae	carapace/plastron	4		1.46		55	N7E7	6	100-110
Cheloniidae	cf. longbone	1		0.15		55	N7E7	6	100-110
Cheloniidae	uid fragments	2		0.22		55	N7E7	6	100-110
Cheloniidae	carapace	2		3.55		55	N7E7	6	100-110
Cheloniidae	phalange	3	1	1.37		55	N7E7	6	100-110

Taxa	Element	NISP	MNI	Wt. (g)	Notes	FS	UNIT	LEVEL	cmbd
Cyclura carinata	thoracolumbar vertebra	1	1	0.21		24	N3E2	1	54-80
Cyclura carinata	thoracolumbar vertebra	1		0.19	likely Iguanidae	25	N3E2	2	80-90
Cyclura carinata	articular	1	1	0.15		25	N3E2	2	80-90
Cyclura carinata	dentary	1		0.11		25	N3E2	2	80-90
Cyclura carinata	thoracolumbar	1		0.31		43	N7E7	1	33-60
Cyclura carinata	caudual vertbrae	1		0.10		43	N7E7	1	33-60
Cyclura carinata	articular	1		0.18		43	N7E7	1	33-60
Cyclura carinata	pelvic girdle	1		0.70		43	N7E7	1	33-60
Cyclura carinata	maxilla	2	2	0.51	w/some teeth	43	N7E7	1	33-60
Cyclura carinata	maxilla	1		0.24		43	N7E7	1	33-60
Cyclura carinata	dentary	1		0.18	w/some teeth	43	N7E7	1	33-60
Cyclura carinata	vertebrae	3		0.79		46	N7E7	2	60-70
Cyclura carinata	vertebrae	1		0.06		46	N7E7	2	60-70
Cyclura carinata	radius	1	1	0.22	distal tip broken off	46	N7E7	2	60-70
Cyclura carinata	cranium	1		0.22		46	N7E7	2	60-70
Cyclura carinata	innominate	1		0.31		46	N7E7	2	60-70
Cyclura carinata	pelvis	1		0.19		47	N7E7	3	70-80
Cyclura carinata	basioccipital	1	1	0.30		47	N7E7	3	70-80
Cyclura carinata	cf. cervical vertebra	1		0.14		53	N7E7	4	80-90
Cyclura carinata	thoracolumbar vertebrae	2		0.50	1 missing neural spine	53	N7E7	4	80-90
Cyclura carinata	dentary	1	1	0.20		53	N7E7	4	80-90
Cyclura carinata	articular	1		0.54		53	N7E7	4	80-90
Cyclura carinata	vertebra	1		0.10	possible caudal vertebra	54	N7E7	5	90-100
Cyclura carinata	caudal vertebra	1		0.20		54	N7E7	5	90-100
Cyclura carinata	pterygoid	1	1	0.25	no pterygoid teeth present	54	N7E7	5	90-100
Cyclura carinata	dentary	1		0.32		54	N7E7	5	90-100

Taxa	Element	NISP	MNI	Wt. (g)	Notes	FS	UNIT	LEVEL	cmbd
Cyclura carinata	thoracolumbar vertebrae	3		0.45		54	N7E7	5	90-100
Cyclura carinata	thoracolumbar vertebra	1		0.30		55	N7E7	6	100-110
Cyclura carinata	thoracolumbar vertebra	1		0.09		55	N7E7	6	100-110
Cyclura carinata	pterygoid	1	1	0.26		55	N7E7	6	100-110
Cyclura carinata	articular	1		0.20		55	N7E7	6	100-110
Decapoda cf. Brachyura	uid fragments	3		0.59		46	N7E7	2	60-70
Decapoda cf. Brachyura sp.	uid fragments	14		3.67	several are likely claw fragments	43	N7E7	1	33-60
Diodontidae	puffer spines	1	1	0.20		54	N7E7	5	90-100
Diodontidae	puffer spines	1		0.70		54	N7E7	5	90-100
Epicrates chrysogaster	vertebrae	8	1	0.87		25	N3E2	2	80-90
Epinephelus sp.	maxilla	1		0.15		46	N7E7	2	60-70
Epinephelus sp.	vomer	1	1	0.12		46	N7E7	2	60-70
Epinephelus sp.	dentary	1		0.17		46	N7E7	2	60-70
Epinephelus sp.	palatine	1	1	0.15		47	N7E7	3	70-80
Exocoetidae	vertebrae	2	1	0.07		43	N7E7	1	33-60
Gecarcinidae	claw	2	1	0.64		24	N3E2	1	54-80
Gecarcinidae	claw	1	1	0.30	based on texture	54	N7E7	5	90-100
Gecarcinidae cf. Cardisoma sp.	upper claw	1		2.09		43	N7E7	1	33-60
Gecarcinidae cf. Cardisoma sp.	lower claw	3	1	3.31		43	N7E7	1	33-60
Gecarcinidae cf. Cardisoma sp.	body fragment	1		0.81		43	N7E7	1	33-60
Gecarcinidae cf. Cardisoma sp.	claw	20		6.25		43	N7E7	1	33-60
Gecarcinidae cf. Cardisoma sp.	claw	2	1	1.04		47	N7E7	3	70-80
Gecarcinidae cf. Cardisoma sp.	cf. lower claw	1		0.29		47	N7E7	3	70-80
Gecarcinidae cf. Cardisoma sp.	claw	1	1	0.19		53	N7E7	4	80-90

Taxa	Element	NISP	MNI	Wt. (g)	Notes	FS	UNIT	LEVEL	cmbd
Gecarcinidae cf. Gecarcinus sp.	claw	1	1	0.24		43	N7E7	1	33-60
Gerreidae	post temporal	1	1	0.03		25	N3E2	2	80-90
Gerreidae	upper pharyngeal grinder	1		0.16		25	N3E2	2	80-90
Gerreidae	vertebra	2		0.17	both anterior	46	N7E7	2	60-70
Gerreidae	atlas	1		0.11		53	N7E7	4	80-90
Gerreidae	vertebrae	2		0.18		53	N7E7	4	80-90
Gerreidae cf. Gerres cinereus	premaxilla	1	1	0.03		47	N7E7	3	70-80
Gerreidae cf. Gerres cinereus	quadrate	1		0.08		46	N7E7	2	60-70
Gerreidae cf. Gerres cinereus	premaxilla	2	2	0.26	1 lg., 1 sm.	46	N7E7	2	60-70
Gerreidae cf. Gerres cinereus	maxilla	1	1	0.20		53	N7E7	4	80-90
Gerridae	quadrate	2	2	0.14		55	N7E7	6	100-110
Gerridae	quadrate	1		0.07		55	N7E7	6	100-110
Haemulidae	vertebrae	8		0.55	all anterior	43	N7E7	1	33-60
Haemulidae	maxilla	1		0.03		43	N7E7	1	33-60
Haemulidae	operculum	1		0.07		43	N7E7	1	33-60
Haemulidae	operculum	1		0.02		43	N7E7	1	33-60
Haemulidae	post temporal	3		0.15		43	N7E7	1	33-60
Haemulidae	post temporal	1		0.05		43	N7E7	1	33-60
Haemulidae	hyomandibular	1		0.03		43	N7E7	1	33-60
Haemulidae	palatine	1		0.07		43	N7E7	1	33-60
Haemulidae	premaxilla	1		0.07		43	N7E7	1	33-60
Haemulidae	preoperculum	1		0.07		43	N7E7	1	33-60
Haemulidae	vertebrae	15		0.96	all anterior, do not use for MNI	46	N7E7	2	60-70
Haemulidae	preoperculum	3		0.30		46	N7E7	2	60-70
Haemulidae	post temporal	1		0.04		46	N7E7	2	60-70
Haemulidae	operculum	2		0.06		46	N7E7	2	60-70
Haemulidae	preoperculum	1		0.02		46	N7E7	2	60-70
Haemulidae	post temporals	2		0.07		46	N7E7	2	60-70

Taxa	Element	NISP	MNI	Wt. (g)	Notes	FS	UNIT	LEVEL	cmbd
Haemulidae	vertebrae	4		0.18	anterior vertebrae	47	N7E7	3	70-80
Haemulidae	preoperculum	2		0.29		47	N7E7	3	70-80
Haemulidae	post temporal	1		0.04		47	N7E7	3	70-80
Haemulidae	post temporal	1		0.04		53	N7E7	4	80-90
Haemulidae	post temporal	1		0.05		53	N7E7	4	80-90
Haemulidae	vertebrae	2		0.28	anterior	53	N7E7	4	80-90
Haemulidae	vomer	1		0.05		53	N7E7	4	80-90
Haemulidae	post temporal	1		0.04		54	N7E7	5	90-100
Haemulidae	preoperculum	1		0.04		54	N7E7	5	90-100
Haemulidae	vertebrae	4		0.24		55	N7E7	6	100-110
Haemulon sp.	quadrate	1	1	0.06		24	N3E2	1	54-80
Haemulon sp.	quadrate	1		0.05		43	N7E7	1	33-60
Haemulon sp.	quadrate	1		0.06		43	N7E7	1	33-60
Haemulon sp.	premaxilla	1	1	0.07		43	N7E7	1	33-60
Haemulon sp.	premaxilla	1	1	0.05		43	N7E7	1	33-60
Haemulon sp.	maxilla	2		0.22		46	N7E7	2	60-70
Haemulon sp.	articular	3		0.24		46	N7E7	2	60-70
Haemulon sp.	quadrate	1		0.06		46	N7E7	2	60-70
Haemulon sp.	otolith	1		0.15		46	N7E7	2	60-70
Haemulon sp.	maxilla	1		0.06		46	N7E7	2	60-70
Haemulon sp.	quadrate	2		0.12		46	N7E7	2	60-70
Haemulon sp.	dentary	2		0.06		46	N7E7	2	60-70
Haemulon sp.	premaxilla	1		0.17		46	N7E7	2	60-70
Haemulon sp.	premaxilla	1		0.10	missing proximal tip	46	N7E7	2	60-70
Haemulon sp.	premaxilla	2	2	0.19		46	N7E7	2	60-70
Haemulon sp.	premaxilla	3	3	0.13		46	N7E7	2	60-70
Haemulon sp.	premaxilla	2	2	0.14	missing proximal tip	46	N7E7	2	60-70
Haemulon sp.	dentary	1		0.20		46	N7E7	2	60-70
Haemulon sp.	articular	2		0.12		46	N7E7	2	60-70
Haemulon sp.	dentary	1		0.02		46	N7E7	2	60-70

Taxa	Element	NISP	MNI	Wt. (g)	Notes	FS	UNIT	LEVEL	cmbd
Haemulon sp.	maxilla	1		0.03		46	N7E7	2	60-70
Haemulon sp.	maxilla	1		2.41		47	N7E7	3	70-80
Haemulon sp.	articular	1		0.11		47	N7E7	3	70-80
Haemulon sp.	atlas	1		0.14		47	N7E7	3	70-80
Haemulon sp.	articular	2	2	0.11		47	N7E7	3	70-80
Haemulon sp.	dentary	1	1	0.08		53	N7E7	4	80-90
Haemulon sp.	premaxilla	1		0.03		53	N7E7	4	80-90
Haemulon sp.	quadrate	1		0.07		53	N7E7	4	80-90
Haemulon sp.	maxilla	1		0.11		54	N7E7	5	90-100
Haemulon sp.	premaxilla	1		0.07		54	N7E7	5	90-100
Haemulon sp.	quadrate	1	1	0.04		54	N7E7	5	90-100
Haemulon sp.	quadrate	1	1	0.07		54	N7E7	5	90-100
Haemulon sp.	articular	1	1	0.11		55	N7E7	6	100-110
Haemulon sp.	quadrate	1		0.05		55	N7E7	6	100-110
Haemulon sp.	dentary	1		0.06		46	N7E7	2	60-70
Haemulon sp.	hyomandibular	2		0.21		46	N7E7	2	60-70
Haemulon sp.	hyomandibular	1		0.08		46	N7E7	2	60-70
Labridae	lower pharyngeal grinder	1	1	0.18		43	N7E7	1	33-60
Labridae cf. Bodianus sp.	dentary	1	1	0.09		54	N7E7	5	90-100
Labridae cf. Halichoeres sp.	lower pharyngeal grinder	1	1	1.77		53	N7E7	4	80-90
Lacertilia	thoracolumbar vertebra	1		0.53	posterior end is not intact	43	N7E7	1	33-60
Lacertilia	vertebra	1		0.10		43	N7E7	1	33-60
Lacertilia	vertebra	1		0.11		43	N7E7	1	33-60
Large Sea Mammalia	tooth root	2	1	0.75	two pieces articulate	43	N7E7	1	33-60
Lutjanidae	vertebra	1	1	0.31		24	N3E2	1	54-80

Taxa	Element	NISP	MNI	Wt. (g)	Notes	FS	UNIT	LEVEL	cmbd
Lutjanidae	vertebrae	5		0.63	anterior verts	43	N7E7	1	33-60
Lutjanidae	articular	3		0.68		43	N7E7	1	33-60
Lutjanidae	articular	1		0.17		43	N7E7	1	33-60
Lutjanidae	articular	4		0.33		43	N7E7	1	33-60
Lutjanidae	post temporal	2		0.50	1 large specimen	43	N7E7	1	33-60
Lutjanidae	post temporal	1		0.04		43	N7E7	1	33-60
Lutjanidae	quadrate	1		0.04		43	N7E7	1	33-60
Lutjanidae	vertebra	1		0.33		46	N7E7	2	60-70
Lutjanidae	quadrates	2		0.08		46	N7E7	2	60-70
Lutjanidae	quadrates	3		0.19		46	N7E7	2	60-70
Lutjanidae	preoperculum	5		0.64		46	N7E7	2	60-70
Lutjanidae	palatine	1		0.04		46	N7E7	2	60-70
Lutjanidae	post temporal	1		0.04		46	N7E7	2	60-70
Lutjanidae	post temporal	2		0.09		46	N7E7	2	60-70
Lutjanidae	articular	2		0.15		46	N7E7	2	60-70
Lutjanidae	articular	1		1.10		46	N7E7	2	60-70
Lutjanidae	articular	4		0.30		46	N7E7	2	60-70
Lutjanidae	post temporal	1		0.02		46	N7E7	2	60-70
Lutjanidae	preoperculum	1		0.05		46	N7E7	2	60-70
Lutjanidae	cleithrum	2		0.15		46	N7E7	2	60-70
Lutjanidae	cleithrum	1		0.03		46	N7E7	2	60-70
Lutjanidae	cleithrum	3		0.23		46	N7E7	2	60-70
Lutjanidae	cleithrum	1		0.04		46	N7E7	2	60-70
Lutjanidae	cleithrum	4		0.20		46	N7E7	2	60-70
Lutjanidae	cleithrum	2		0.10		46	N7E7	2	60-70
Lutjanidae	quadrate	1		0.42		47	N7E7	3	70-80
Lutjanidae	quadrate	1		0.10		47	N7E7	3	70-80
Lutjanidae	vertebrae	2		0.25	anterior vertebrae	47	N7E7	3	70-80
Lutjanidae	articular	1		0.09		47	N7E7	3	70-80

Taxa	Element	NISP	MNI	Wt. (g)	Notes	FS	UNIT	LEVEL	cmbd
Lutjanidae	dentary	1		0.03	small surface not clean, likely Lutjanus sp.	47	N7E7	3	70-80
Lutjanidae	articular	3	3	0.18		53	N7E7	4	80-90
Lutjanidae	post temporal	1		0.07		53	N7E7	4	80-90
Lutjanidae	quadrate	1		0.20		53	N7E7	4	80-90
Lutjanidae	quadrate	1		0.06		53	N7E7	4	80-90
Lutjanidae	basioccipital	2		0.50	2 bits articulate	54	N7E7	5	90-100
Lutjanidae	preoperculum	1		0.12		54	N7E7	5	90-100
Lutjanidae	vertebrae	2		0.18	anterior vertebrae	54	N7E7	5	90-100
Lutjanidae	preoperculum	1		0.10		55	N7E7	6	100-110
Lutjanidae	preoperculum	1		0.07		55	N7E7	6	100-110
Lutjanus sp.	hyomandibular	1		0.02		43	N7E7	1	33-60
Lutjanus sp.	atli	3		0.50	2 are thicker like L. griseus	43	N7E7	1	33-60
Lutjanus sp.	hyomandibular	1		0.17		47	N7E7	3	70-80
Lutjanus sp.	dentary	1	1	0.19		47	N7E7	3	70-80
Lutjanus sp.	hyomandibular	1	1	0.02		54	N7E7	5	90-100
Lutjanus sp.	premaxilla	1		0.45		54	N7E7	5	90-100
Lutjanus sp.	dentary	1	1	0.11		55	N7E7	6	100-110
Lutjanus sp.	maxilla	1		0.07		55	N7E7	6	100-110
Lutjanus sp.	premaxilla	1		0.10		55	N7E7	6	100-110
Lutjanus sp.	vomer	1		0.43		43	N7E7	1	33-60
Lutjanus sp.	dentary	3	3	0.22		43	N7E7	1	33-60
Lutjanus sp.	dentary	2		0.61		43	N7E7	1	33-60
Lutjanus sp.	dentary	1	1	0.06	tooth row not intact	43	N7E7	1	33-60
Lutjanus sp.	premaxilla	2		1.31		43	N7E7	1	33-60
Lutjanus sp.	premaxilla	1		0.25		43	N7E7	1	33-60
Lutjanus sp.	premaxilla	1		0.20		43	N7E7	1	33-60
Lutjanus sp.	maxilla	2		0.45		43	N7E7	1	33-60
Lutjanus sp.	maxilla	1		0.09		43	N7E7	1	33-60
Lutjanus sp.	otolith	1		0.41		46	N7E7	2	60-70

Taxa	Element	NISP	MNI	Wt. (g)	Notes	FS	UNIT	LEVEL	cmbd
Lutjanus sp.	hyomandibular	5	5	0.45		46	N7E7	2	60-70
Lutjanus sp.	maxilla	2		0.17		46	N7E7	2	60-70
Lutjanus sp.	maxilla	1		0.04		46	N7E7	2	60-70
Lutjanus sp.	premaxilla	1		0.07		46	N7E7	2	60-70
Lutjanus sp.	premaxilla	1		0.06		46	N7E7	2	60-70
Lutjanus sp.	premaxilla	1		0.09		46	N7E7	2	60-70
Lutjanus sp.	dentary	1		0.20		46	N7E7	2	60-70
Ostraciidae	vertebra	1	1	0.08		43	N7E7	1	33-60
Ostraciidae	scale	1	1	0.07		53	N7E7	4	80-90
Ostraciidae	scales	3	1	0.19		54	N7E7	5	90-100
Ostraciidae	scale	1		0.08		55	N7E7	6	100-110
Ostraciidae	vertebrae	2	1	0.43		55	N7E7	6	100-110
Portunidae	upper claw	2	1	1.12	cf. Callinectes sp., 2 frags articulate	43	N7E7	1	33-60
Portunidae	upper claw	1	1	0.28		47	N7E7	3	70-80
Portunidae	upper claw	1	1	0.30		54	N7E7	5	90-100
Sauria	cf. dentary	1		0.17		54	N7E7	5	90-100
Scaridae	vertebrae	2		0.17		25	N3E2	2	80-90
Scaridae	hyomandibular	1		0.29		43	N7E7	1	33-60
Scaridae	hyomandibular	1		0.14		43	N7E7	1	33-60
Scaridae	vertebrae	2		0.33		43	N7E7	1	33-60
Scaridae	urostyle	1		0.20		43	N7E7	1	33-60
Scaridae	hypural plates	3		0.52		43	N7E7	1	33-60
Scaridae	hyomandibular	2		0.16		46	N7E7	2	60-70
Scaridae	fin/ray	1		0.07	possible metapterygium	53	N7E7	4	80-90
Scaridae	hyomandibular	1		0.14		53	N7E7	4	80-90
Scaridae	operculum	1		0.10		53	N7E7	4	80-90
Scaridae cf. Sparisoma sp.	atlas	1	1	0.07	broken and eroded	24	N3E2	1	54-80
Scarus sp.	lower pharyngeal grinder	1	1	0.11		24	N3E2	1	54-80
Scarus sp.	maxilla	1		0.13		43	N7E7	1	33-60

Taxa	Element	NISP	MNI	Wt. (g)	Notes	FS	UNIT	LEVEL	cmbd
Scarus sp.	dentary	1	1	0.05		43	N7E7	1	33-60
Scarus sp.	dentary	1		0.36		43	N7E7	1	33-60
Scarus sp.	dentary	1	1	0.34		43	N7E7	1	33-60
Scarus sp.	upper pharyngeal grinder	1		0.21		43	N7E7	1	33-60
Scarus sp.	upper pharyngeal grinder	2		0.26	different individuals	43	N7E7	1	33-60
Scarus sp.	dentary	1	1	0.10		43	N7E7	1	33-60
Scarus sp.	upper pharyngeal grinder	1		0.61		46	N7E7	2	60-70
Scarus sp.	upper pharyngeal grinder	1		0.07		46	N7E7	2	60-70
Scarus sp.	operculum	1		0.14		46	N7E7	2	60-70
Scarus sp.	dentary	1		0.10		46	N7E7	2	60-70
Scarus sp.	premaxilla	2	2	0.18		46	N7E7	2	60-70
Scarus sp.	premaxilla	1		0.10	missing proximal tip	46	N7E7	2	60-70
Scarus sp.	upper pharyngeal grinder	1	1	0.13		47	N7E7	3	70-80
Scarus sp.	atlas	1		0.11		53	N7E7	4	80-90
Scarus sp.	lower pharyngeal grinder	2	2	0.52		53	N7E7	4	80-90
Scarus sp.	dentary	1	1	0.11		54	N7E7	5	90-100
Scarus sp.	upper pharyngeal grinder	1		0.17		54	N7E7	5	90-100
Scarus sp.	premaxilla	1	1	0.07		55	N7E7	6	100-110
Sciaenidae	atlas	1	1	0.16		47	N7E7	3	70-80
Scombridae	vertebrae	1	1	0.33	poterior/caudal	43	N7E7	1	33-60
Serranidae	vomer	1	1	0.11		43	N7E7	1	33-60
Serranidae	dentary	1		0.17		43	N7E7	1	33-60
Serranidae	operculum	1		0.14		46	N7E7	2	60-70
Serranidae	vertebra	1		0.10	anterior	46	N7E7	2	60-70
Serranidae	preoperculum	1		0.26		53	N7E7	4	80-90
Serranidae	operculum	1		0.39		54	N7E7	5	90-100

Taxa	Element	NISP	MNI	Wt. (g)	Notes	FS	UNIT	LEVEL	cmbd
Serranidae	palatine	1		0.10		54	N7E7	5	90-100
Serranidae	quadrate	1		0.21		54	N7E7	5	90-100
Serranidae cf. Epinephelus sp.	premaxilla	1	1	0.47		54	N7E7	5	90-100
Serranidae cf. Epinephelus/Mycteroperca sp.	atlas	1	1	0.16		53	N7E7	4	80-90
Serranidae cf. Mycteroperca sp.	articular	1	1	0.25		54	N7E7	5	90-100
Serranidae cf. Mycteroperca sp.	articular	1		0.18		54	N7E7	5	90-100
Sparidae cf. Calamus sp.	premaxilla	1		0.04		43	N7E7	1	33-60
Sparisoma sp.	lower pharyngeal grinder	1	1	0.20		25	N3E2	2	80-90
Sparisoma sp.	premaxilla	1		1.32		43	N7E7	1	33-60
Sparisoma sp.	maxilla	1		0.33		43	N7E7	1	33-60
Sparisoma sp.	dentary	1		0.76		43	N7E7	1	33-60
Sparisoma sp.	dentary	1	1	0.10		43	N7E7	1	33-60
Sparisoma sp.	upper pharyngeal grinder	1		0.79		43	N7E7	1	33-60
Sparisoma sp.	upper pharyngeal grinder	1		0.12		43	N7E7	1	33-60
Sparisoma sp.	upper pharyngeal grinder	1		0.17		43	N7E7	1	33-60
Sparisoma sp.	lower pharyngeal grinder	2		0.50		43	N7E7	1	33-60
Sparisoma sp.	dentary	1	1	0.38		43	N7E7	1	33-60
Sparisoma sp.	dentary	1		0.17		43	N7E7	1	33-60
Sparisoma sp.	premaxilla	1		0.08		43	N7E7	1	33-60
Sparisoma sp.	articular	1		0.10		43	N7E7	1	33-60
Sparisoma sp.	quadrate	1		0.07		43	N7E7	1	33-60
Sparisoma sp.	lower pharyngeal grinder	1		0.16		46	N7E7	2	60-70
Sparisoma sp.	lower pharyngeal grinder	1		0.23		46	N7E7	2	60-70

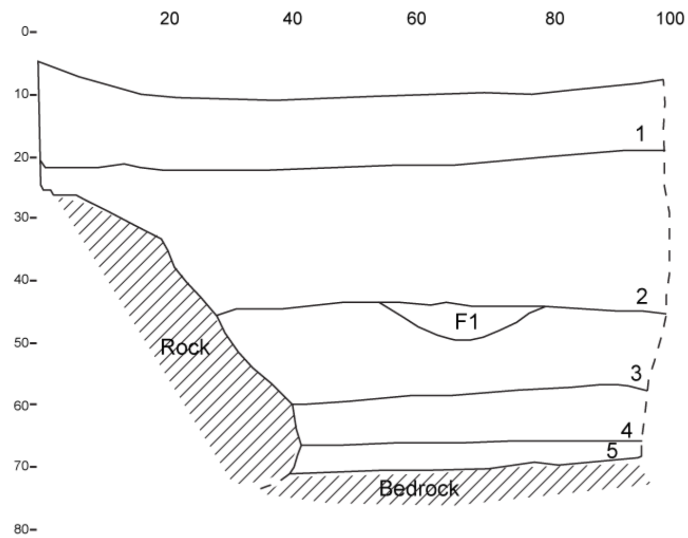
Taxa	Element	NISP	MNI	Wt. (g)	Notes	FS	UNIT	LEVEL	cmbd
Sparisoma sp.	dentary	1	1	0.13		46	N7E7	2	60-70
Sparisoma sp.	dentary	1	1	0.15		46	N7E7	2	60-70
Sparisoma sp.	dentary	1		0.12		46	N7E7	2	60-70
Sparisoma sp.	articular	1		0.27		46	N7E7	2	60-70
Sparisoma sp.	dentary	1	1	0.19		53	N7E7	4	80-90
Sparisoma sp.	dentary	1	1	0.13		53	N7E7	4	80-90
Sparisoma sp.	upper pharyngeal grinder	1		0.39		53	N7E7	4	80-90
Sphyraena barracuda	lacrymal	1	1	0.10		25	N3E2	2	80-90
Sphyraena barracuda	premaxilla	1		0.11		25	N3E2	2	80-90
Sphyraena barracuda	dentary	1	1	0.11		43	N7E7	1	33-60
Sphyraena barracuda	dentary	1	1	0.61		43	N7E7	1	33-60
Sphyraena barracuda	premaxilla	1		0.27		43	N7E7	1	33-60
Sphyraena barracuda	articular	1		0.37		43	N7E7	1	33-60
Sphyraena barracuda	palatine	1		0.07		43	N7E7	1	33-60
Sphyraena barracuda	vertebrae	8		0.62		43	N7E7	1	33-60
Sphyraena barracuda	cf. palatine	1		0.06		43	N7E7	1	33-60
Sphyraena barracuda	dentary	1	1	0.07		43	N7E7	1	33-60
Sphyraena barracuda	premaxilla	1		0.09		43	N7E7	1	33-60
Sphyraena barracuda	premaxilla tooth	1		0.39		43	N7E7	1	33-60
Sphyraena barracuda	palatine	1		0.37	missing anterior tip	46	N7E7	2	60-70
Sphyraena barracuda	quadrate	1	1	0.09		46	N7E7	2	60-70
Sphyraena barracuda	dentary	1		0.09		46	N7E7	2	60-70
Sphyraena barracuda	vertebra	1		0.19		46	N7E7	2	60-70
Sphyraena barracuda	uid fragment w/teeth	1		0.13	part of palatine?	46	N7E7	2	60-70
Sphyraena barracuda	palatine	1	1	0.13	smaller individual than one below, MNI=2	47	N7E7	3	70-80
Sphyraena barracuda	palatine	1	1	0.90		47	N7E7	3	70-80
Sphyraena barracuda	palatine	1	1	0.05		47	N7E7	3	70-80
Sphyraena barracuda	dentary	1	1	0.16		55	N7E7	6	100-110
Sphyraena barracuda	maxilla	1		0.19		55	N7E7	6	100-110

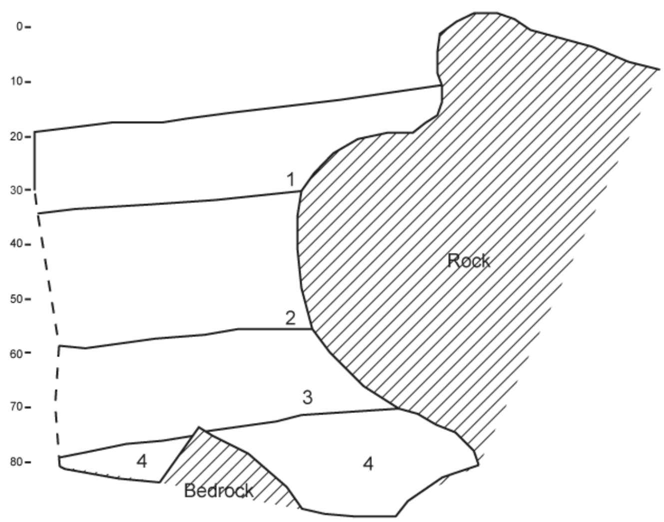
Taxa	Element	NISP	MNI	Wt. (g)	Notes	FS	UNIT	LEVEL	cmbd
Sphyraena barracuda	premaxilla	2		0.19	2 bits articulate	55	N7E7	6	100-110
Sphyraena barracuda	vertebrae	2		0.29		55	N7E7	6	100-110
Sphyraena barracuda	vertebra	1	1	0.22	posterior	53	N7E7	4	80-90
Vertebrata	uid elements	3		0.47	cf. fish?	25	N3E2	2	80-90
Vertebrata	uid fragments	2		0.09		25	N3E2	2	80-90
Vertebrata	uid fragments	17		5.15	likely mostly fish, turtle, and possible bird	43	N7E7	1	33-60
Vertebrata	uid fragments	13		2.11	several likely reptilian and possible bird	46	N7E7	2	60-70
Vertebrata	uid fragments	17		1.64		47	N7E7	3	70-80
Vertebrata	uid fragments	14		1.49		53	N7E7	4	80-90
Vertebrata	uid fragments	13		1.77	at least one likely bird	54	N7E7	5	90-100
Vertebrata	uid fragments	13		0.98		55	N7E7	6	100-110
Zenaida sp.	ulna	1	1	0.20	compares well with Zenaida asiatica	47	N7E7	3	70-80

Analysis done by Michelle LeFebvre

APPENDIX J
EXCAVATION PROFILES

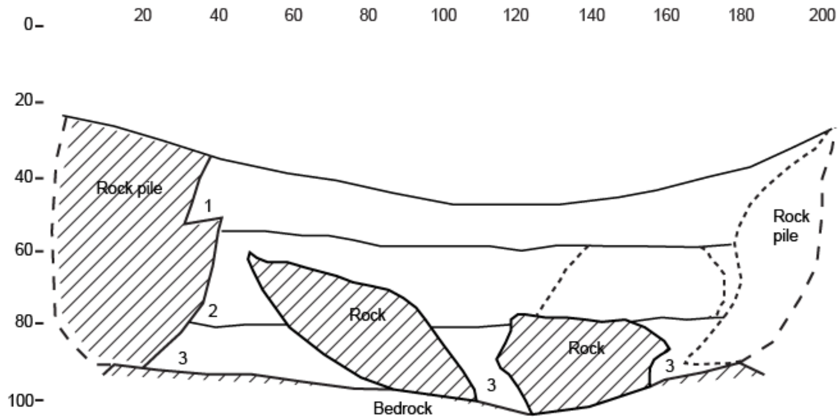
Structure II



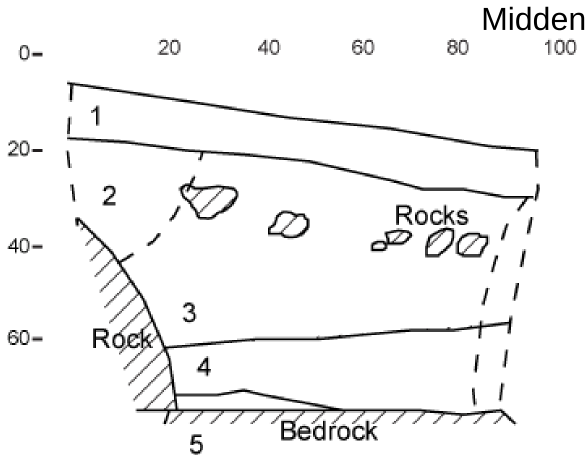


1: 7.5Y 3/2 SaSi, very loose (shell, rocks, pottery)
2: 10YR 2/2 SaSi, compact (midden)
3: 10YR 3/1 SaSi, compact
4: 10YR 3/4 SaSi, compact, abundance of stone
5: 7YR 4/4 Si, compact, sterile subsoil
Feature 1: 10YR 2/1 Si, compact darker than surrounding soil

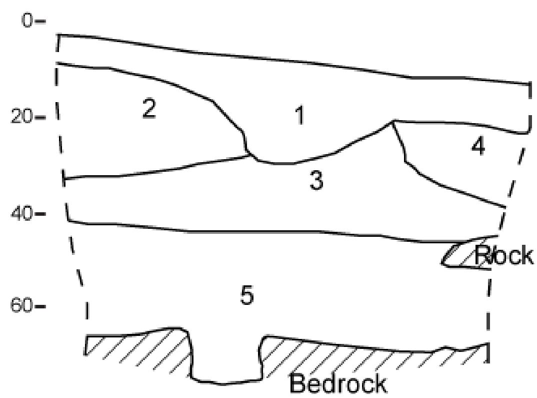
Structure IV

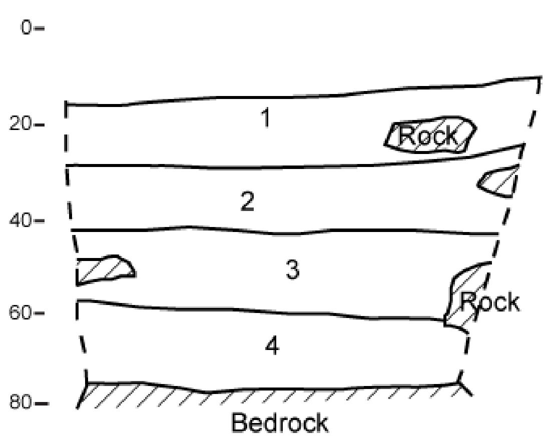


1: 10YR 2/2 very dark brown, SaSi
2: 10YR 3/1 very dark grey, Si (with little sand)
abundance of rocks
3: 5YR 4/3 reddish brown, Si, sterile substrate

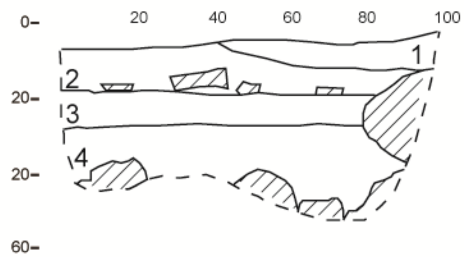


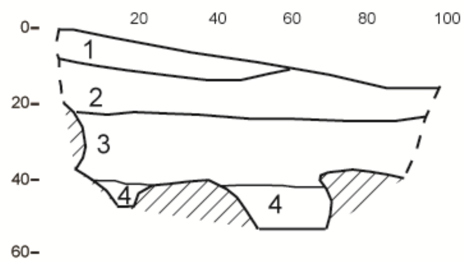
1: 10YR 2/2 very dark brown, Si
2: 10YR 4/2 dark grayish brown, Si (countours are vague, but this is a lighter pocket of deposit)
3: 10YR 3/2 very dark grayish brown, Si, abundance of rocks
4: 10YR2/1B;ack, Si, abundance of charcoal
5: 5YR 3/2 dark redish brown, sterile subsoil

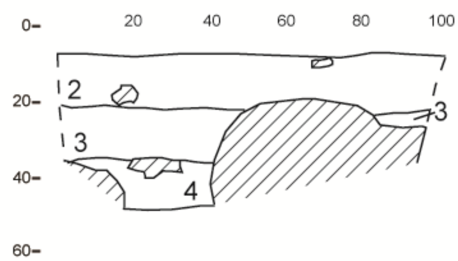




Structure VI







1: 10YR 5/2 grayish brown, Si (sterile)
2: 10YR 3/1 very dark grey, Si (midden)
3: 10YR 2/1 Black, Si, compact, full of bone
4: 5YR 3/4 dark reddish brown, Si, sterile substrate

LIST OF REFERENCES

Aberle, D. F.

1961 Matrilineal descent in cross-cultural perspective. In *Matrilineal kinship*, edited by D. M. Schneider and K. Gough, pp. 655–727. University of California Press, Berkeley.

Adshead, S. A. M.

1992 *Salt and civilization*. St. Martin's Press, New York.

Allaire, L.

1991 Understanding Suazey. *Proceedings of the Proceedings of the Thirteenth International Congress for Caribbean Archaeology*:715–728. Willemstad, Curaçao.

Allsworth-Jones, P.

2008 *Pre-Columbian Jamaica*. University of Alabama Press, Tuscaloosa.

Altes, C. F.

2011a Going with the Flow: Circum-Caribbean Currents, Canoes, Trade and Colonization. Paper presented at the Southeastern Archaeological Conference, Jacksonville, FL.

2011b Spatial Organization in Ancient Puerto Rico: Rank-Size Analysis of Saladoid Sites in South-Central Puerto Rico and the Island of Vieques, Anthropology, University of Florida, Gainesville.

Andrews, A. P.

1983 *Maya salt production and trade*. University of Arizona Press, Tucson.

Andrews, A. P. and S. B. Mock

2002 New Perspectives on the Prehispanic Maya Salt Trade. In *Ancient Maya political economies*, edited by M. A. Masson and D. A. Freidel., pp. 307. AltaMira Press, Walnut Creek.

Appadurai, A.

1986 Introduction: Commodities and Politics of Value. In *The Social Life of Things: Commodities in Cultural Perspective*, edited by A. Appadurai, pp. 3-62. Cambridge University Press, Cambridge.

Astrup, P., P. Bie, H. C. Engell and J. Lines

1993 *Salt and water in culture and medicine*. Munksgaard, Copenhagen.

Barrett, J. C.

1994 *Fragments from antiquity : an archaeology of social life in Britain, 2900-1200 BC*. Blackwell, Oxford UK & Cambridge USA.

1999 The Mythical Landscapes of the British Iron Age. In *Archaeologies of Landscape: Contemporary Perspectives*, edited by W. Ashmore and B. Knapp, pp. 253-265. Blackwell, Oxford.

2000 A Thesis on Agency. In *Agency in Archaeology*, edited by M.-A. Dobres and J. E. Robb, pp. 61-68. Routledge, London.

Barrett, J. C. and I. Ko
2009 A Phenomenology of Landscape: A Crisis in British Landscape Archaeology? *Journal of Social Archaeology* 9:275-294.

Barse, W. P.
2009 The Early Ronquin Paleosol and the Orinocan Ceramic Sequence. *Bulletin of the Peabody Museum of Natural History* 50(1):85-98.

Basso, K. H.
1996 Wisdom Sits in Places: Notes on a Western Apache Landscape. In *Senses of Place*, edited by S. Feld and K. H. Basso, pp. 53-90. School of American Research, Santa Fe.

Berman, M. J. and P. L. Gnivecki
1991 The Colonization f the Bahamas Archipelago. A view for the Three Dog Site, San Salvador Island. *Proceedings of the Proceedings of the Fourthteenth Congress of the International Association for Caribbean Archaeology*. Barbados.

1995 The colonization of the Bahama archipelago: a reappraisal. *World Archaeology* 26(3):421-441.

Berman, M. J. and C. D. Hutcheson
2000 Impressions of a lost technology: A Study of Lucayan Taíno Basketry. *Journal of Field Archaeology* 27(4):417-435.

Binford, L. R.
1965 Archaeological Systematics and the Study of Culture Process. *American Antiquity* 31:203-210.

Bitterman, M.
2010 *Salted. A manifesto on the world's most essential mineral, with recipes*. Ten Speed Press, Berkeley.

Blitz, J.
1993 Big Pots for Big Shots: Feasting and Storage in a Mississippian Community. *American Antiquity* 58:80-96.

Bloch, M. R.
1976 Salt in human history. *Interdisciplinary Science Reviews* 1(4):336-352.

Boas, F.
1966 *Kwakiutl ethnography*. University of Chicago Press Chicago.

Boomert, A.
2000 *Trinidad, Tobago and the lower Orinoco interaction sphere. An Archaeological/ethnohistorical study*. Ph.D. dissertationbLeiden University, Leiden. Cairi Publications, Alkmaar.

Boomert, A. and A. J. Bright
2007 Island archaeology: in search of a new horizon. *Island Studies Journal* 2(1):3-26.

Bourdieu, P.
1977 *Outline of a Theory of Practice*. Cambridge University Press, Cambridge.

1990 *The Logic of Practice*. Translated by R. Nice. Polity Press, London.

2009 The Berber house, or the world revisited. In *The Anthropology of Space and Place. Locating culture*, edited by S. M. Low and D. Lawrence-Zúniga, pp. 131-141. Blackwell Publsihing.

Bradley, R.
1998 Ruined Buildings, Ruined Stones: Enclosures, Tombs and Natural Places in the Neolithic of South-west England. *World Archaeology* 30(1):13-22.

2000 *An Archaeology of Natural Places*. Routledge, London.

2002 *The Past in Prehistoric Societies*. Routledge, London.

Bright, A.
2011 *Blood is thicker than water. Amerindian intra- and inter-insular relationships and social organization in the pre-Colonial Windward islands*. Sidestone Press, Leiden.

Bromehead, C. E. N.
1940 The Evidence for Ancient Mining. *The Geographical Journal* 96(2):101-118.

Brown, I. W.
1999 Salt manufacture and trade from the perspective of Avery Island, Louisiana. *Midcontinental journal of archaeology* 24(2):113-151.

Brown, P.
1964 Enemies and affines. *Ethnology* 3(4):335-356.

Brumfiel, E. M.
2000 On the Archaeology of Choice: Agency Studies as a Research Stratagem*.* In *Agency in Archaeology*, edited by M.-A. Dobres and J. E. Robb, pp. 21-33. Routledge, London.

Callaghan, R. T.
1990 Mainland Origins of the Preceramic Cultures of the Greater Antilles, Department of Anthropology, University of Calgary. University Microfilms: Michigan, Calgary.

2001 Ceramic age seafaring and interaction potential in the Antilles: a computer simulation. *Current Anthropology* 42:308-313.

2010 Crossing the Guadeloupe Passage in the Archaic Age. Island shores, distant pasts: archaeological and biological approaches to the pre-Columbian settlement of the Caribbean. University Press of Florida, Gainesville.

2011 Patterns of Contact between the Islands of the Caribbean and the Surrounding Mainland as a Navigation Problem*.* In *Islands at the Crossroads: Migration, Seafaring, and Interaction in the Caribbean*, edited by L. A. Curet and M. W. Hauser, pp. 59 – 72. University of Alabama Press, Tuscaloosa.

Cardale, M.
1981 Las salinas de Zipaquirá. *Su explotación indígena. Fundación de Investigaciones Arqueológicas Nacionales. Banco de la República, Bogotá*.

Caribbean Commission
1952 *Fisheries of the Caribbean* Central Secretariat, Kent House, Port-of-Spain, Trinidad.

Carlson, E.
1993 Strings of Command: Manufacture and Utilization of Shell Beads among the Taino Indians of the West Indies, Department of Anthropology, University of Florida, Gainesville.

1999 Aftermath of a Feast: Human Colonization of the Southern Bahamian Archipelago and Its Effects on the Indigenous Fauna, Department of Anthropology, University of Florida, Gainesville.

2010 *Cultural Resource Survey of the Corktree Development Area, Grand Turk, Turks and Caicos, B.W.I.* .

Carlson, E., W. F. Keegan and J. Morsink
2009 Ceramic-only mangrove edge sites in Puerto Rico: A hypothesis for salt production. Paper presented at the IACA, Antigua.

Carlson, L. A. and W. F. Keegan
2004 Resource depletion in the prehistoric northern West Indies. In *Voyages of discovery: the archaeology of islands*, edited by S. M. Fitzpatrick, pp. 85–107. Praeger, Westport, Connecticut.

CDC
2010 Sodium Intake Among Adults—United States, 2005−2006. *JAMA: The Journal of the American Medical Association* 304(7):738-740.

Chanlatte Baik, L. and Y. Narganes Storde
2005 *Cultura La Hueca*. Museo de Historia, Antropología y Arte, Universidad de Puerto Rico, Río Piedras.

Chapman, J.
2000 *Fragmentation in archaeology: People, places, and broken objects in the prehistory of south-eastern Europe*. Routledge, London.

Charlton, T. H.
1969 Texcoco fabric-marked pottery, tlateles, and salt-making. *American Antiquity* 34(1):73-76.

Collier, J. F. and S. J. Yanagisako
1987 *Gender and kinship: Essays toward a unified analysis*. Stanford University Press, Stanford.

Connerton, P.
1989 *How Societies Remember*. Cambridge University Press, Cambridge

Cooper, J.
2007 Island Interaction in the Prehistoric Caribbean: an archaeological case study from northern Cuba, Institute of Archaeology, UCL, Londen.

Cordell, A.
1998 Possible Manufacturing Origins of Ostionoid Pottery from the Bahamas. Paper presented at the 55th Annual Meeting of the Southeastern Archaeological Conference, Greenville, South Carolina.

Cotton Counts
2012 The Story of Cotton, http://www.cotton.org/pubs/cottoncounts/story/how.cfm

Crock, J. G.
2000 Interisland interaction and the development of chiefdoms in the eastern Caribbean. Ph.D Dissertation, University Microfilms, University of Pittsburgh, Ann Arbor.

Crock, J. G. and J. B. Petersen
2004 Inter-island exchange, settlement hierarchy, and a Taino-related chiefdom on the Anguilla Bank, Northern Lesser Antilles. In *BAR International Series*, edited by A. Delpuech and C. L. Hofman, pp. 139-158. vol. 1273, Oxford.

Curet, L. A.
2005 *Caribbean paleodemography : population, culture history, and sociopolitical processes in ancient Puerto Rico*. University of Alabama Press, Tuscaloosa.

Curet, L. A. and L. M. Stringer
2010 *Tibes : people, power, and ritual at the center of the cosmos*. Caribbean archaeology and ethnohistory. University of Alabama Press, Tuscaloosa.

Curet, L. A. and J. Torres
2010 Plazas, Bateys, and Ceremonial Centers: The Social and Cultural Context of Tibes in the Ancient History of Puerto Rico. In *Tibes: People, Power, and Ritual at the Center of the Cosmos*, edited by L. A. Curet and L. M. Stringer, pp. 261-286. University of Alabama Press, Tuscaloosa.

Curtis, J. H., M. Brenner and D. A. Hodell
2001 Climate Change in the Circum-Caribbean (Late Pleistocene to Present) and Implications for Regional Biogeography. In *Biogeographies of the West Indies Patterns and Perspectives*, edited by C. A. Woods and F. E. Sergile, pp. 35-54. 2 ed. CRC Press, Boca Raton.

D'Altroy, T. N. and T. K. Earle
1985 Staple Finance, Wealth Finance, and Storage in the Inka Political Economy [and Comments and Reply]. *Current Anthropology* 26(2):187-206.

Davis, D. and K. Oldfield
2003 Archaeological Reconnaissance of Anegada, British Virgin Islands. *Journal of Caribbean Archaeology* (4):1-11.

De Certeau, M.
1984 *The Practice of Everyday Life*. University of California Press, Berkeley.

de Waal, M. S.
2006 Pre-Columbian social organisation and interaction interpreted through the study of settlement patterns. An archaeological case-study of the Pointe des Châteaux, La Désirade and Les Îles de la Petite Terre micro-region, Guadeloupe, F.W.I., Leiden University, Leiden.

Deagan, K.
2004 Reconsidering Taino social dynamics after Spanish conquest: Gender and class in culture contact studies. *American Antiquity* 69(4):597-626.

DeBoer, W. R.
2001 The Big Drink: Feast and Forum in the Upper Amazon. In *Feasts: Archaeological and Ethnographic Perspectives on Food, Politics, and Power*, edited by M. Dietler and B. Hayden, pp. 215-239. Smithsonian Institution Press, Washington.

deFrance, S. D.
in press Zooarchaeology in the Caribbean: Current Research and Future Prospects. In *Oxford Handbook of Caribbean Archaeology*, edited by W. F. Keegan, C. L. Hofman and R. Rodríguez Ramos. Oxford University Press, Oxford.

Denton, D. A.
1982 *The hunger for salt: an anthropological, physiological, and medical analysis*. Springer-Verlag, Berlin.

Dever, A.
2007 Social and economic development of a specialized community in Chengue, Parque Tairona, Colombia. *Unpublished Ph.D Dissertation, University of Pittsburgh*.

Dietler, M.
1996 Feasts and commensal politics in the political economy. Food power and status in prehistoric Europe. In *Food and the status quest: an interdisciplinary perspective*, edited by P. Wiessner and W. Schiefenhövel. Berghahn Books, Providence.

2001 Theorizing the Feast: Rituals of Consumption, Commensal Politics, and Power in African Contexts. In *Feasts: Archaeological and Ethnographic Perspectives on Food, Politics, and Power*, edited by M. Dietler and B. Hayden, pp. 65-114. Smithsonian Institution Press, Washington D.C.

Dietler, M. and B. Hayden
2001 Digesting the Feast—Good to Eat, Good to Drink, Good to Think: An Introduction. In *Feasts: Archaeological and Ethnographic Perspectives on Food, Politics, and Power*, edited by M. Dietler and B. Hayden, pp. 1-20. Smithsonian Institution Press, Washington D.C.

Divale, W. T.
1974 Migration, external warfare, and matrilocal residence. *Cross-Cultural Research* 9(2):75.

Divale, W. T. and M. Harris
1976 Population, warfare, and the male supremacist complex. *American Anthropologist* 78(3):521-538.

Dobres, M.-A.
2000 *Technology and Social Agency: Outlining A Practice Framework for Archeology* Blackwell, Oxford.

Drewett, P. L.
1991 *Prehistoric Barbados*. Institute of Archaeology, University College London and Barbados Museum and Historical Society.

2004 Post-Saladoid society on Barbados. In *Late Ceramic Age Societies in the Eastern Caribbean*, edited by A. Delpuech and C. L. Hofman. vol. BAR International Series 1273. Archaeopress, Oxford.

Dunn, O. and J. E. Kelley
1989 *The Diario of Christopher Columbus's first voyage to America*. University of Oklahoma Press, Norman.

Dwyer, P. D.
1996 The Invention of Nature. In *Redefining Nature: Ecology, Culture and Domestication*, edited by R. Ellen and K. Fukui, pp. 157-186. Berg, Oxford.

Earthsky
2012 http://earthsky.org.

Ember, M.
1974 The conditions that may favor avunculocal residence. *Cross-Cultural Research* 9(3):203-209.

Ensor, B. E.
2000 Social formations, modo de vida, and conflict in archaeology. *American Antiquity* 65(1):15-42.

2011 Kinship Theory in Archaeology: From Critiques to the Study of Transformations. *American Antiquity* 76(2):203-227.

Euliss, N. H., Jr., R. L. Jarvis and D. S. Gilmer
1989 Carbonate Deposition on Tail Feathers of Ruddy Ducks Using Evaporation Ponds. *The Condor* 91(4):803-806.

Eves, R.
1996 Remembrance of Things Passed: Memory, Body, and the Politics of Feasting in New Ireland, Papua New Guinea. *Oceania* 66:266-277.

Ewald, U.
1985 *The Mexican salt industry, 1560-1980: a study in change*. G. Fischer Stuttgart and New York.

FAO
2012 Agricultural drainage water management in arid and semi-arid areas. Irrigation and Drainage Paper, http://www.fao.org/DOCREP/005/Y4263E/y4263e0e.htm.

Fernández de Oviedo y Valdés, G.
1851 *Historia general y natural de las Indias, islas y tierrafirme del mar Oceano*. Imprenta de la Real Academia de la Historia, Madrid.

Fitzpatrick, S. M. and A. H. Ross
2010 *Island Shores, Distant Pasts. Archaeological and Biological Approaches to the Pre-Columbian Settlement of the Caribbean*. University of Florida Press, Gainesville.

Flad, R. K.
2005 Evaluating Fish and Meat Salting at Prehistoric Zhongba, China. *Journal of Field Archaeology* 30(3):231-253.

2007 Rethinking the context of production through an archaeological study of ancient salt production in the Sichuan Basin, China. *Archeological Papers of the American Anthropological Association* 17(1):108-128.

Flad, R. K. and Z. X. Hruby
2007 " Specialized" Production in Archaeological Contexts: Rethinking Specialization, the Social Value of Products, and the Practice of Production. *Archeological Papers of the American Anthropological Association* 17(1):1-19.

Foucault, M.
1977 *Discipline and Punish: The Birth of the Prison*. Penguin Books, London.

Fox, R.

1967 *Kinship and marriage: An anthropological perspective*. Cambridge University Press, Cambridge.

Friedman, J. and M. J. Rowlands

1978 *The Evolution of Social Systems*. Random House, New York.

Geertz, C.

2003 Thick description: toward an interpretive theory of culture. In *Culture. Critical concepts in sociology*, edited by C. Jenks, pp. 87-125. vol. 173-197. Routledge, London.

Gell, A.

1998 *Art and Agency: An Anthropological Theory*. Oxford University Press, Oxford.

Geurds, A. and L. V. Broekhoven

2010 The similarity trap: engineering the greater-Caribbean, a perspective from the Isthmo-Colombian area. *Journal of Caribbean Archaeology* Special publication No. 3: Mobility and exchange from a Pan-Caribbean perspective:52-75.

Giddens, A.

1984 *The Constitution of Society: Outline of the Theory of Structuration*. University of California Press, Berkeley.

Godelier, M.

1971 *" Salt Currency" and the Circulation of Commodities Among the Baruya of New Guinea*. American Anthropological Association.

1999 *The enigma of the gift*. University of Chicago Press, Chicago.

Gosden, C.

2001 Making Sense: Archaeology and Aesthetics. *World Archaeology* 33(2):163-167.

2004 *Archaeology and Colonialism: Cultural Contact from 5000 BC to the Present*. Cambridge University Press, Cambridge

2005 What Do Objects Want? *Journal of Archaeological Method and Theory* 12(2):193-211.

Grabner, M., A. Klein, D. Geihofer, H. Reschreiter, F. E. Barth, T. Sormaz and R. Wimmer

2007 Bronze Age dating of timber from the salt-mine at Hallstatt, Austria. *Dendrochronologia* 24(2-3):61-68.

Graeber, D.

2001 *Toward an anthropological theory of value: the false coin of our own dreams*. Palgrave Macmillan, New York.

Granberry, J.

1991 Lucayan toponyms. *Journal of the Bahamas Historical Society* 13(1):3-12.

Granberry, J. and G. S. Vescelius

2004 *Languages of the pre-Columbian Antilles*. University Alabama Press, Tuscaloosa.

Granberry, J. and J. H. Winter

1993 Bahamian Ceramics*. Proceedings of the Proceedings of the fifthteenth International Congress for Caribbean Archaeology*. San Juan, Puerto Rico.

Hamilakis, Y.

1999 Food Technologies/Technologies of the Body: The Social Context of Wine and Oil Production and Consumption in Bronze Age Crete. *World Archaeology* 31(1):38-54.

Haviser, J. B.

1997 Settlement strategies in the early ceramic age. In *The Indigeneous people of the Caribbean. University Press of Florida, Gainesville*, edited by S. M. Wilson, pp. 57-69. University of Florida Press, Gainesville.

Hayden, B.

1995 Pathways to power: principles for creating socioeconomic inequalities. In *Foundations of social inequality*, edited by T. Price and G. M. Feinman, pp. 15-86. Plenum Press, New York.

1996 Feasting in Prehistoric and Traditional Societies. In *Food and the Status Quest: An Interdisciplinary Perspective*, edited by P. Wiessner and W. Schiefenhovel, pp. 127-146. Berghahn Books, Oxford.

2001 Fabulous Feasts: A Prolegomenon to the Importance of Feasting. In *Feasts: Archaeological and Ethnographic Perspectives on Food, Politics, and Power*, edited by M. Dietler and B. Hayden, pp. 23-64. Smithsonian Institution Press, Washington D.C.

Heckenberger, M. J.

2002 Rethinking the Arawakan Diaspora: Hierarchy, Regionality, and the Amazonian Formative. In *Comparative Arawakan Histories: Rethinking Language Family and Culture Area in Amazonia*, edited by J. D. Hill and F. Santos-Granero, pp. 99-122. University of Illinois Press, Urbana.

2005 *The ecology of power: culture, place, and personhood in the southern Amazon, AD 1000-2000*. Routledge, New York.

Heidegger, M.

1977 *Basic Writings*. Harper & Row, New York.

Helms, M. W.

1998 *Access to origins: affines, ancestors, and aristocrats*. University of Texas Press, Austin.

Hendon, J.

2003 Feasting at Home: Community and House Solidarity among the Maya of Southeastern Mesoamerica. In *The Archaeology and Politics of Food and Feasting in Early States and Empires*, edited by T. Bray, pp. 203-233. Kluwer Academic/Plenum Publishers, New York.

Hesse, R. and K. O. Hesse

1977 The conch industry in the Turks and Caicos Islands. *Underwater Naturalist* 10(3):4-9.

Hewitt, W. P., M. C. Winter and D. A. Peterson

1987 Salt Production at Hierve el Agua, Oaxaca. *American Antiquity* 52(4):799-816.

Higuera-Gundy, A., M. Brenner, D. A. Hodell, J. H. Curtis, B. W. Leyden and M. W. Binford

1999 A 10,300 14C yr record of climate and vegetation change from Haiti. *Quaternary Research* 52(2):159-170.

Hirsch, E.

1995 Introduction: Landscape: Between Place and Space. In *The Anthropology of Landscape: Perspectives on Place and Space*, edited by E. Hirsch and M. O'Hanlon, pp. 1-30. Clarendon Press, Oxford.

Hodell, D. A., J. H. Curtis, G. A. Jones, A. Higuera-Gundy, M. Brenner, M. W. Binford and K. T. Dorsey

1991 Reconstruction of Caribbean climate change over the past 10,500 years. *Nature* 352(6338):790-793.

Hofman, C., M. Hoogland and A. Delpuech
2001 *Guadeloupe, Saint-Francois, Anse a la Gourde: Fouille programmée pluriannuelle 1995-2000. Rapport de Synthèse*. U.M.R/Leiden University/D.R.A.C.

Hofman, C., M. Hoogland and W. F. Keegan
2004 *Archaeological Reconnaissance at Saint Lucia, West Indies*. Faculty of Archaeology, Leiden University Florida Museum of Natural History, University of Florida. Submitted to Fieldwork report.

Hofman, C. L., A. J. Bright, A. Boomert and S. Knippenberg
2007 Island rhythms: The web of social relationships and interaction networks in the Lesser Antillean archipelago between 400 BC and AD 1492. *Latin American Antiquity* 18(3):243-268.

Hofman, C. L., A. J. Bright, M. L. P. Hoogland and W. F. Keegan
2008 Attractive ideas, desirable goods: examining the Late Ceramic Age relationships between Greater and Lesser Antillean societies. *The Journal of Island and Coastal Archaeology* 3(1):17-34.

Hofman, C. L., A. J. Bright and R. R. Ramos
2010 Crossing the Caribbean Sea. Towards a holistic view of pre-Colonial mobility and exchange. *Journal of Caribbean Archaeology* Special publication No. 3: Mobility and exchange from a Pan-Caribbean perspective:1-18.

Hofman, C. L. and M. L. P. Hoogland
2011 Unravelling the multi-scale networks of mobility and exchange in the pre-colonial circum-Caribbean. In *Communities in Contact. Essays in archaeology, ethnohistory & ethnography of the Amerindian circum-Caribbean*, edited by C. L. Hofman and A. van Duijvenbode. Sidestone Press, Leiden.

Hofman, C. L., A. A. A. Mol, R. Rodríguez Ramos and S. Knippenberg
2011 Networks Set in Stone: Archaic-Ceramic Interactions in the Early Prehistoric Northeastern Caribbean*. Proceedings of the Paper presented at the XXIV Congress of the International Association for Caribbean Archaeology*. Martinique.

Holtzman, J. D.
2006 Food and Memory. *Annual Review of Anthropology* 35:361-378.

Homans, B.
1838 *The Army and Navy chronicle*. New Series 6, Washington City.

Homer
1767 *The Iliad*. Translated by A. Pope. Robert and Andrew Foulis, Glasgow.

Hoogland, M. and C. Hofman

1991 A 14th Century Taino Settlement on Saba, Netherlands Antilles. *Proceedings of the 14th International Congress for Caribbean Archaeology*:1-23. Barbados.

Hoogland, M. L. P.

1996 In search of the native population of pre-Columbian Saba (400-1450 A.D.), Part. 2: Settlements in their natural and social environment., Faculty of Archaeology, Rijksuniversiteit Leiden, Leiden.

Hoogland, M. L. P. and C. L. Hofman

1993 Kelbey's Ridge 2, A 14th Century Taíno Settlement on Saba, Netherlands Antilles. *Analecta Praehistorica Leidensia* 26:164-181.

Hoogland, M. L. P. and C. L. Hofman

2011 Archaeological Investigations at Spanish Water, Curaçao. *Proceedings of the The twenty-third congress of the International Association for Caribbean Archaeology*:631-640. Antigua.

Hoogland, M. L. P., C. L. Hofman and R. G. A. M. Panhuysen

2010 Interisland Dynamics: Evidence for Human Mobility at the site of Anse a la Gourde, Guadeloupe. In *Island Shores, Distant Pasts: Archaeological and Biological Approaches to the Pre-Columbian Settlement of the Caribbean*, edited by S. M. Fitzpatrick and A. H. Ross. University Press of Florida, Gainesville.

Hutcheson, C. D.

1999 Reweaving the Strands: Continued Exploration into Basketry Technology for Prehistoric Bahamians. *Proceedings of the Eighteenth International Association for Caribbean Archaeology*:185-198. St. George, Grenada.

in press From Whence They Came, Nobody Knows or Do We? Basketry Impressed Ceramics from the Wolper Collection. *Proceedings of the Thirteenth Symposium on the Natural History of the Bahamas*:1-10. San Salvador, Bahamas.

Ingold, T.

1993 The Temporality of the Landscape. *World Archaeology* 25(2):152-174.

1995 Building, Dwelling, Living: How Animals and People Make Themselves at Home in the World. In *Shifting Contexts: Transformations in Anthropological Knowledge*, edited by M. Strathern, pp. 57-80. Routledge, London.

2000 *The Perception of the Environment: Essays on Livelihood, Dwelling, and Skill*. Routledge, London.

2007 Materials against Materiality. *Archaeological Dialogues* 14(1):1-16.

ISYSA
2012 Facilities. *http://www.isysa.com.mx/facility.htm*.

Jakle, J. A.
1969 Salt on the Ohio Valley frontier, 1770-1820. *Annals of the Association of American Geographers* 59(4):687-709.

Jones, A.
1998 Where Eagles Dare: Landscape, Animals, and the Neolithic of Orkney. *Journal of Material Culture* 3(3):301-324.

2005 Lives in Fragments?: Personhood and the European Neolithic. *Journal of Social Archaeology* 5:193-224.

Jones, E.
1964 The symbolic significance of salt in folklore and superstition. *Essays in Applied Psycho-Analysis* 11.

Joosten, I., M. R. van Bommel, R. H. Keijzer and H. Reschreiter
2006 Micro analysis on Hallstatt textiles: colour and condition. *Microchimica Acta* 155(1):169-174.

Joyce, R. A.
2004 Unintended Consequences? Monumentality as a Novel Experience in Formative Mesoamerica. *Journal of Archaeological Method and Theory* 11(1):5-29.

Joyce, R. A. and J. S. Henderson
2007 From Feasting to Cuisine: Implications of Archaeological Research in an Early Honduran Village. *American Anthropologist* 109:642-653.

Keegan, L. T., W. F. Keegan, E. A. Carlson and C. F. Altes
2009 Shell Net Weights from Florida and Puerto Rico. Paper presented at the IACA, Antigua.

Keegan, W. F.
1986 The optimal foraging analysis of horticultural production. *American Anthropologist* 88(1):92-107.

1992 *The people who discovered Columbus: The prehistory of the Bahamas*. University Press of Florida Gainesville, Florida.

1997 *Bahamian archaeology: Life in the Bahamas and Turks and Caicos before Columbus*. Media Pub.

2000 West Indian archaeology. 3. Ceramic Age. *Journal of Archaeological research* 8(2):135-167.

2006 Archaic influences in the origins and development of Taino societies. *Caribbean Journal of Science* 42(1):1-10.

2007 *Taíno Indian myth and practice: the arrival of the stranger king*. University of Florida Press, Gainesville.

2009 Central Plaza Burials in Saladoid Puerto Rico: An Alternative Perspective. *Latin American Antiquity* 20(2):375-385.

2010 Boundary-work, Reputational Systems, and the Delineation of Population Movements in the Prehistoric Caribbean. *Journal of Caribbean Archaeology* Special Publication No. 3:138-155.

2013 Caribbean Islands: archaeology. In *EGHM Prehistory Volume*.

n.d. Max Schmidt and the Arawakan diaspora: A view from the Antilles. In *The Arawak Dispersion*, edited by A. Oyuela-Caycedo and M. Fischer, Manuscript in preparation.

Keegan, W. F. and L.-G. Atkinson

2006 The Development of Jamaican Prehistory. In *The Earliest Inhabitants: The Dynamics of the Jamaican Taíno*, edited by L.-G. Atkinson. University of the West Indies Press, Kingston, Jamaica.

Keegan, W. F. and E. Carlson

2008 *Talking Taino*. University of Alabama Press, Tuscaloosa.

Keegan, W. F. and J. M. Diamond

1987 Colonization of islands by humans: a biogeographical perspective. *Advances in archaeological method and theory* 10:49-92.

Keegan, W. F., S. M. Fitzpatrick, K. S. Sealey, M. J. LeFebvre and P. T. Sinelli

2008 The Role of Small Islands in Marine Subsistence Strategies: Case Studies from the Caribbean. *Human Ecology* 36(5):635-654.

Keegan, W. F. and M. D. Maclachlan

1989 The evolution of avunculocal chiefdoms: a reconstruction of Taino kinship and politics. *American Anthropologist* 91(3):613-630.

Kennedy, C. M.

2007 The Other White Gold: Salt, Slaves, the Turks & Caicos Islands, and British Colonialism. *Historian* 69(2):215-230.

Kepecs, S.
2004 Salt: White Gold of the Ancient Maya. *Ethnohistory* 51(2):448.

Kirch, P. V.
2002 *On the road of the winds: an archaeological history of the Pacific Islands before European contact*. University of California Press, Berkeley.

Kjellmark, E.
1996 Late Holocene climate change and human disturbance on Andros Island, Bahamas. *Journal of Paleolimnology* 15(2):133-145.

Knippenberg, S.
2001 Flint Collecting Strategies on Long Island*. Proceedings of the 19th International Congress for Caribbean Archaeology*:10. Aruba.

2004 Distribution and exchange of lithic materials: three-pointers and axes from St. Martin*.* In *Late Ceramic Age Societies in the Eastern Caribbean*, edited by A. Delpuech and C. L. Hofman, pp. 121-138. vol. BAR International Series 1273. Archaeopress, Oxford.

2006 Stone artefact production and exchange among the Northern Lesser Antilles*.* dissertation, Faculty of Archaeology, Leiden University, Leiden University, Leiden.

Komter, A. and W. Vollebergh
1997 Gift giving and the emotional significance of family and friends. *Journal of Marriage and the Family* 59(3):747-757.

Komter, A. E.
1996 Reciprocity as a principle of exclusion: Gift giving in the Netherlands. *Sociology* 30(2):299.

Kozy, C. J.
1983 A History of the Georgia Loyalists and the Plantation Period in the Turks and Caicos Islands, Middle Tennessee State University, Ann Arbor, University Microfilms International.

Kroeber, A. L.
1976 *Salt, dogs, tobacco* 6. Kraus Reprint Co.

Kurella, D.
1998 The Muisca: Chiefdoms in transition*.* In *Chiefdoms and Chieftaincy in the Americas*, edited by E. M. Redmond, pp. 189–216. University Press of Florida, Gainesville.

Kurlansky, M.

2003 *Salt: a world history*. Walker and Co., New York.

Laffoon, J. and B. de Vos

2011 Diverse Origins, Similar Diets: An Integrated Isotopic Perspective from Anse à la Gourde, Guadeloupe. In *Communities in Contact. Essays in archaeology, ethnohistory & ethnography of the Amerindian circum-Caribbean*, edited by C. L. Hofman and A. van Duijvenbode. Sidestone Press, Leiden.

Laffoon, J. E. and M. L. P. Hoogland

in press Migration and Mobility in the Circum-Caribbean: Integrating Archaeology and Isotopic Analysis. In *Migrations in Prehistory and Early History: Stable Isotopes and Population Genetics – New Answers to Old Questions?*, edited by G. Grupe, J. Burger and T. D. Price. TOPOI, Berlin.

Laffoon, J. E., M. L. P. Hoogland and R. Valcárcel Rojas

2010 Exploring Mobility and Origins in Caribbean Contexts: An Integrated Isotopic Perspective. Paper presented at the Paper presented at the Annual Meeting of the Society for American Archaeology, St. Louis, Missouri.

Lalueza Fox, C., M. T. P. Gilbert, A. J. Martínez Fuentes, F. Calafell and J. Bertranpetit

2003 Mitochondrial DNA from pre Columbian Ciboneys from Cuba and the prehistoric colonization of the Caribbean. *American journal of physical anthropology* 121(2):97-108.

Latour, B.

1993 *We Have Never Been Modern*. Translated by C. Porter. Harvard University Press, Cambridge, Massachusetts.

2005 Third Source of Uncertainty: Objects Too Have Agency. In *Reassembling the Social: An Introduction to Actor-Network-Theory*, pp. 63-86. Oxford University Press, Oxford.

LeFebvre, M. J., G. DuChemin and S. D. DeFrance

2006 Fishing Variability in the Caribbean: Perspectives from the Antillean and Bahamian Islands. *Proceedings of the Society for American Archaeology Meetings*. San Juan, Puerto Rico.

Lemonnier, P.

2006 Fertility among the Anga of Papua New Guinea: a Conspicuous Absence. In *Population, reproduction, and fertility in Melanesia*, edited by S. J. Ulijaszek. Berghahn Books, Oxford.

Lévi-Strauss, C.

1969 *The elementary structures of kinship*. Beacon Press, Boston.

MacIntyre, M.
1983 Warfare and the Changing Context of 'Kune' on Tubetube. *The Journal of Pacific History* 18(1):11-34.

MacKinnon, J. J. and S. M. Kepecs
1989 Prehispanic saltmaking in Belize: new evidence. *American Antiquity* 54(3):522-533.

Maclachlan, M. D. and W. F. Keegan
1990 Archeology and the Ethno-Tyrannies. *American Anthropologist* 92(4):1011-1013.

Malinowski, B.
1922 *Argonauts of the western Pacific*. Dutton, New York.

1929 *The sexual life of savages in north-western Melanesia: an ethnographic account of courtship, marriage and family life among the natives of the Trobriand Islands, British New Guinea*. H. Liveright, New York.

1935 *Coral gardens and their magic*. G. Allen & Unwin ltd, London.

Mann, M.
1986 *The sources of social power: A history of power from the beginning to AD 1760* 1. Cambridge University Press, Cambridge.

Mans, J. L. J. A.
2011 Trio movements and the Amotopoan flux. In *Communities in contact: essays in archaeology, ethnohistory and ethnography of the Amerindian circum-Caribbean*, edited by C. L. Hofman and A. Duijvenbode, pp. 231-249. Sidestone Press, Leiden.

Martínez-Cruzado, J.
2010 The history of Amerindian mitochondrial DNA lineages in Puerto Rico. In *Island shores, distant parts: archaeological and biological approaches to the Pre-Columbian settlement of the Caribbean*, edited by S. M. Fitzpatrick and A. H. Ross, pp. 54-80. University Press of Florida, Gainesville.

Mauss, M.
1990 *The Gift*. Routledge, London.

McKern, W. C.
1939 The Midwestern Taxanomic Method as an Aid to Archaeological Culture Study. *American Antiquity* 4(4):301-313.

McKillop, H.

1995 Underwater archaeology, salt production, and coastal Maya trade at Stingray Lagoon, Belize. *Latin American Antiquity* 6(3):214-228.

2002 *Salt: white gold of the Ancient Maya*. University Press of Florida, Gainesville.

2010 Ancient Maya canoe navigation and its implications for Classic to Postclassic Maya economy and sea trade: a view from the south coast of Belize. *Journal of Caribbean Archaeology* Special publication No. 3: Mobility and exchange from a Pan-Caribbean perspective:93-105.

McKillop, H. and J. A. Sabloff

2005 Finds in Belize document Late Classic Maya salt making and canoe transport. *Proceedings of the National Academy of Sciences of the United States of America* 102(15):5630-5634.

MeasuringWorth

2011 MeasuringWorth, http://www.measuringworth.com/uscompare/.

Menard, R. R.

2006 *Sweet negotiations : sugar, slavery, and plantation agriculture in early Barbados*. University of Virginia Press, Charlottesville.

Merwe, N. J. v. d. and D. H. Avery

1987 Science and Magic in African Technology: Traditional Iron Smelting in Malawi. *Africa: Journal of the International African Institute* 57(2):143-172.

Mickleburgh, H. L. and J. R. Pagán

2011 Dirty Teeth and Ancient Diet: Preliminary Work on Ancient Starch Grains Recovered from Human Dental Calculus from Throughout the Caribbean. Paper presented at the XXIV International Congress for Caribbean Archaeology, Martinique.

Miller, D.

2005a *Materiality*. Duke University Press, Durham and London.

2005b Materiality: An Introduction. In *Materiality*, edited by D. Miller, pp. 1-50. Duke University Press, Durham.

Mintz, S. W. and C. M. Du Bois

2002 The Anthropology of Food and Eating. *Annual Review of Anthropology* 31:99-119.

Mitchell, D.

2009 cotton and salt. *The Anguilla Archeological and Historical Society* Selected Readings: "Anguilla from the Archives" series(11):1-11.

Mol, A. A. A.

2007 *Giving Guaízas: Towards an organic model of the exchange of social valuables in the Late Ceramic Age Caribbean*. Sidestone Press, Leiden.

2010 Something for nothing: exploring the importance of strong reciprocity in the Greater Caribbean. *Journal of Caribbean Archaeology* Special publication No. 3: Mobility and exchange from a Pan-Caribbean perspective:76-92.

Morphy, H.

1995 Landscape and the Reproduction of the Ancestral Past. In *Anthropology of Landscape: Perspectives on Place and Space*, edited by E. Hirsch and M. O'Hanlon, pp. 184-209. Clarendon Press, Oxford.

Morsink, J.

2010 Chiefdoms and Maisons: Socio-political organization in the Caribbean. Paper presented at the SAA, St. Louis.

2011 Social Continuity in the Caribbean Past: A maison-perspective on cultural continuity. *Caribbean Connections* 1(2):1-12.

in press-a Exchange as a Social Contract: A Perspective from the Microscale. In *The Oxford Handbook for Caribbean Archaeology*, edited by W. F. Keegan, C. L. Hofman and R. Rodrígues Ramos.

in press-b Quotidian life and social practice at Anse à la Gourde. In *Anse à la Gourde, Lesser Antilles*, edited by C. L. Hofman, M. L. P. Hoogland and A. Delpuech. Sidestone Press, Leiden.

Muhs, D. R., J. R. Budahn, J. M. Prospero and S. N. Carey

2007 Geochemical Evidence for African Dust Inputs to Soils of Western Atlantic Islands: Barbados, the Bahamas, and Florida. *Journal of Geophysical Research* 112:1-26.

Muller, J.

1984 Mississippian specialization and salt. *American Antiquity* 49(3):489-507.

1987 Salt, chert, and shell: Mississippian exchange and economy. In *Specialization, Exchange, and Complex Societies*, edited by E. M. Brumfield and T. K. Earle, pp. 10-21. Cambridge University Press, Cambridge; New York.

Munn, N. D.
1977 The spatiotemporal transformations of Gawa canoes. *Journal de la Société des Océanistes* 33(54):39-53.

1986 *The Fame of the Gawa: a Symbolic Study of Value Transformation in a Massim (Papua New Guinea) Society*. Cambridge University Press, Cambridge.

1990 Constructing Regional Worlds in Experience: Kula Exchange, Witchcraft and Gawan Local Events. *Man* 25:1-17.

Murchie, K. J., S. J. Cooke and A. J. Danylchuk
2010 Seasonal Energetics and Condition of Bonefish from Different Subtropical Tidal Creeks in Eleuthera, the Bahamas. *Marine and Coastal Fisheries* 2(1):249-262.

Murdock, G. P.
1949 *Social structure*. MacMillan, New York.

Murphy, M. E.
1953 The History of Guantanamo Bay 1494-1964. *http://www.cnic.navy.mil/guantanamo/About/History/GuantanamoBay HistoryMurphy/Volume1/Chapter1/index.htm*.

Nenquin, J. A. E.
1961 *Salt; a study in economic prehistory* 6. De Tempel.

Newsom, L. A. and E. S. Wing
2004 *On Land and Sea: Native American Uses of Biological Resources in the West Indies*. University of Alabama Press, Tuscaloosa.

O'Day, S. J.
2002 Late Prehistoric Lucayan Occupation and Subsistance on Middle Caicos Island, Northern West Indies. *Journal of Caribbean Science* 38(1-2):1-10.

Oliver, J.
1998 El Centro Ceremonial de Caguana, Puerto Rico. Simbolismo iconográfico, cosmovisión y el poderío caciquil Taíno de Boriquen. BAR International series 727, Oxford.

2000 Gold Symbolism Among Caribbean Chiefdoms: Of Feathers, Çibas and Guanín Power Among Taíno Elites. In *Precolumbian Gold. Technology, style and iconography*, edited by C. McEwan, pp. 198-219. British Museum Press, London.

Olivier, L. and J. Kovacik
2006 The ‘Briquetage de la Seille’(Lorraine, France): protoindustrial salt production in the European Iron Age. *Antiquity* 80(309):558-566.

Ostapkowicz, J., A. Wiedenhoeft, C. Bronk Ramsey, E. Ribechini, S. Wilson, F. Brock and T. Higham
2011 Treasures . . . of black wood, brilliantly polished’: five examples of Taíno sculpture from the tenth-sixteenth century Caribbean. *Antiquity* 85:1-18.

Pagán, J. R.
2008 Envisioning Ancient Human Plant Use at the Río Tanamá Site 2 (AR-39) Through Starch Analysis of Lithic and Clay Griddle Implements. In *A Multidisciplinary Approach to the Data Recovery at Two Village Sites on the Río Tanamá*, edited by E. Carlson, pp. 241-257. Southeastern Archaeological Research, US Corps of Engineers, Jacksonville., Copy available at the Puerto Rico State Historic Preservation Office: San Juan.

2011 Assessing Ethnobotanical Dynamics at CE-11 and CE-33 Through Analysis of Starch Grains, Plant Processing, and Cooking Artifacts. In *Phase III Data Recovery Investigations at Three Prehistoric Archaeological Sites (CE-11, CE-32, and CE-33), Municipality of Ceiba, Naval Activity Puerto Rico*, edited by E. Carlson and J. Torres, pp. 325-374. Southeastern Archaeological Research, Inc, Copy available at the Puerto Rico State Historic Preservation Office: San Juan.

Pane, F. R.
1999 An account of the Antiquities of the Indians, edited by d. university, pp. introductie XII t/m XXIV, 4 t/m 37,, Durham & London.

Pané, F. R.
1999 *An account of the antiquities of the Indians*. Translated by S. C. Griswold. Duke University Press, North Carolina.

Parsons, J. R.
2001 *The last saltmakers of Nexquipayac, Mexico: an archaeological ethnography*. Anthropological Papers 92. Museum of Anthropology, University of Michigan, Ann Arbor.

Pauketat, T. R., L. S. Kelly, G. J. Fritz, N. H. Lopinot, S. Elias and E. Hargrave
2002 The Residues of Feasting and Public Ritual at Early Cahokia. *American Antiquity* 67:257-279.

Peebles, G.
2010 Anthropology of Credit and Debt. *Annual Review Of Anthropology* 39:225-240.

Peña, M. A. I.
2008 The Muisca Calendar: An approximation to the timekeeping system of the ancient native people of the northeastern Andes of Colombia, Département d'Anthropologie, Faculté des études supérieures, , Université de Montréal, Montréal.

Petersen, J. B. and J. G. Crock
2001 Late Saladoid to Late Prehistoric Occupation in Anguilla: Site Setting, Chronology and Settlement Hierarchy*. Proceedings of the Proceedings of the 18th International Congress for Caribbean Archaeology*:124-135. Grenada.

Pliny
1856 *Natural History*. Translated by J. Bostock and H. T. Riley V. Henry G. Bohn, London.

Plutarch
2006 *The Complete Works: Essays and Miscellanies*. Echo Library, Teddington.

Pomeroy, C.
1988 The Salt of Highland Ecuador: Precious Product of a Female Domain. *Ethnohistory* 35(2):131-160.

Prospero, J. M. and P. J. Lamb
2003 African droughts and dust transport to the Caribbean: Climate change implications. *Science* 302(5647):1024.

Rappaport, R. A.
1968 *Pigs for the ancestors: ritual in the ecology of a New Guinea people*. Yale University Press, New Haven.

Richardson, M.
1982 Being-in-the-Market Versus Being-in-the-Plaza: Material Culture and the Construction of Material Reality in Spanish America In *The Anthropology of Space and Place: Locating Culture*, edited by S. M. Low and D. Lawrence-Zuniga, pp. 74-91. Malden, MA, Blackwell.

Ritzer, G.
2001 Methodological Relationsim: Lessons for and from Social Psychology*.* In *Explorations in Social Theory*, pp. 128-144. Sage, London.

Ritzer, G. and P. Gindoff
1994 Agency-Structure, Micro-Macro, Individualism-Holism-Relationism: A Metatheoretical Explanation of Theoretical Convergence between the United States and Europe*.* In *Agency and Structure: Reorienting Social Theory*, edited by P. Sztompka, pp. 2-23. Gordon & Breach, Yverdon (Switz).

Robb, J.

2004 The Extended Artefact and the Monumental Economy: A Methodology for Material Agency. In *Rethinking Materiality: The Engagement Of Mind With The Material World*, edited by E. DeMarrais, C. Gosden and C. Renfrew, pp. 131-139. McDonald Institute for Archaeological Research, Cambridge.

2010 Beyond Agency. *World Archaeology* 42(4):493-520.

Rodríguez Ramos, R.

2010 What is the Caribbean? An archaeological perspective. *Journal of Caribbean Archaeology* Special publication No. 3: Mobility and exchange from a Pan-Caribbean perspective:19-51.

2011 The Circulation of Jade across the Caribbeanscape. In *Communities in Contact. Essays in Archaeology, Ethnohistory, and Ethnography of the Amerindian Circum-Caribbean*, edited by C. L. Hofman and A. Duijvenbode. Sidestone Press, Leiden.

Rodríguez Ramos, R., E. Babilonia, L. A. Curet and J. Ulloa

2008 The Pre-Arawak Pottery horizon in the Antilles: A new approximation. *Latin American Antiquity* 19(1):47-63.

Rodríguez Ramos, R. and J. R. Pagán

2006 Interacciones Multivectoriales en el Circum-Caribe Precolonial: Un Vistazo Desde Las Antillas. *Caribbean Studies* 34(2):103-143.

2007 Las Antillas en el Contexto del Circun-Caribe: Cincuenta Años Después. *Proceedings of the Proceedings of XXI Congress of the International Association for Caribbean Archaeology*:778-786. St. Augustine, Trinidad.

Rodríguez Ramos, R., J. Torres and J. Oliver

2010 Rethinking time in Caribbean Archaeology: The Puerto Rico case study. In *Island Shores, Distant Pasts*, edited by S. M. Fitzpatrick and A. H. Ross. University Press of Florida, Gainesville.

Rosman, A. and P. G. Rubel

1971 *Feasting with mine enemy: rank and exchange among northwest coast societies*. Columbia University Press, New York.

Roth, L. T. R.

2002 Total phosphorus use area determination of Lucayan settlements, Middle Caicos, Turks and Caicos Islands, British West Indies, Archaeology, University of Calgary, Calgary.

Rouse, I.
1953 The Circum-Caribbean Theory: An Archaeological Test. *American Anthropologist* 55:188-200.

1965 The place of 'peoples' in prehistoric research. *Journal of the Anthropological Institute of Great Britain and Ireland* 95(1):1-15.

1992 *The Tainos: Rise and decline of the people who greeted Columbus*. Yale University Press, New Haven.

Rubel, P. G. and A. Rosman
1978 *Your own pigs you may not eat: a comparative study of New Guinea societies*. University of Chicago Press.

The Salt Institute
2011 Salt FAQ's.

Santos-Granero, F.
2002 The arawakan matrix: ethos, language and history in native South America. In *Comparative Arawakan histories: Rethinking language family and culture area in Amazonia*, edited by J. D. Hill and F. Santos-Granero, pp. 25-50. University of Illinois Press, Urbana.

Sanz, M. E., A. M. A. Zarza and J. P. Calvo
1995 Carbonate pond deposits related to semi-arid alluvial systems: examples from the Tertiary Madrid Basin, Spain. *Sedimentology* 42(3):437-452.

Schmidt, M.
1917 *Die Aruaken: Ein Beitrag zum Problem der Kulturverbreitung*. Veit & Comp.

Schmidt, P. R.
1997 *Iron technology in East Africa : symbolism, science, and archaeology / Peter R. Schmidt*. Indiana University Press ; James Currey, Bloomington : Oxford.

Schneider, D. M. and K. Gough
1961 *Matrilineal kinship*. University of California Press, Berkeley.

Schwartz, B.
1967 The social psychology of the gift. *American Journal of Sociology* 73(1):1-11.

Sealey, N. E.
2006 *Bahamian landscapes: an introduction to the geography of the Bahamas*. 3rd ed. Collins Caribbean.

Sears, W. H. and S. D. Sullivan
1978 Bahamas prehistory. *American Antiquity* 43:3-25.

Shattuck, G. B.
1905 *The Bahamas Islands*. The Johns Hopkins Press, The Macmillan Company, London.

Shields, D. S.
2007 The Search for the Cure. The quest for the superlative American ham. *Common-Place* 8(1).

Sinelli, P. T.
2001 Archaeological Investigations of Two Prehistoric Sites Representing a Hispaniolan Colonization of Middle Caicos, Turks and Caicos Islands, Department of Anthropology, University of Florida, Gainesville.

2010 All islands great and small: The role of small cay environments in indigenous settlement strategies in the Turks & Caicos Islands, University of Florida, Gaiensville.

Smith, M. L.
2006 The archaeology of food preference. *American Anthropologist* 108(3):480-493.

Steward, J. H.
1948 *Handbook of South American Indians: The Circum-Caribbean tribes*. United States Government Printing Office.

Steward, J. H. and L. C. Faron
1959 *Native People of South America*. McGraw Hill, New York: .

Stokes, A. V.
2005 Ceramic-Age Dietary Patterns in Puerto Rico: Stable Isotopes and Island Biogeography. In *Ancient Borinquen: Archaeology and Ethnohistory of Native Puerto Rico*, edited by P. E. Siegel, pp. 185-201. University of Alabama Press, Tuscaloosa.

Stolarz-Skrzypek, K., T. Kuznetsova, L. Thijs, V. Tikhonoff, J. Seidlerová, T. Richart, Y. Jin, A. Olszanecka, S. Malyutina, E. Casiglia, J. Filipovský, K. Kawecka-Jaszcz, Y. Nikitin and J. A. Staessen
2011 Fatal and Nonfatal Outcomes, Incidence of Hypertension, and Blood Pressure Changes in Relation to Urinary Sodium Excretion. *JAMA: The Journal of the American Medical Association* 305(17):1777-1785.

Strathern, M.
1988 *The gender of the gift : problems with women and problems with society in Melanesia*. University of California Press, Berkeley.

Sullivan, S. D.
1981 Prehistoric Patterns of Exploitation and Colonization in the Turks and Caicos Islands*.* Ph.D., Department of Anthropology, University of Illinois, Champaign-Urbana.

Tanji, K., C. Ong, R. Dahlgren and M. Herbel
1992 Salt deposits in evaporation ponds: an environmental hazard? . *California Agriculture* 46(6):18-21.

Tanodi, A.
2009 *Documentos de la real hacienda de Puerto Rico (1510-1545)* II. Centro de Investigaciones Históricas, Universidad de Puerto Rico, Río Piedras.

Thomas, J.
1996 *Time, Culture, and Identity: An Interpretive Archaeology*. Routledge, London.

1999 An Economy of Substances in Earlier Neolithic Britain*.* In *Material Symbols: Culture and Economy in Prehistory*, edited by J. E. Robb, pp. 70-89. Center for Archaeological Investigations, Occasional Paper No. 26. Southern Illinois University, Carbondale.

2001 Archaeologies of Place and Landscape*.* In *Archaeological Theory Today*, edited by I. Hodder, pp. 165-186. Polity and Blackwell, Malden, MA.

Tibesar, A. S.
1950 The salt trade among the montaña Indians of the Tarma area of eastern Peru. *Primitive Man* 23(4):103-108.

Tilley, C.
1993 Art, Architecture, Landscape [Neolithic Sweden]*.* In *Landscape: Politics and Perspectives*, edited by B. Bender, pp. 49-84. Berg, Oxford.

1994 *A Phenomenology of Landscape: Places, Paths, and Monuments*. Berg, Oxford.

2004 *The Materiality of Stone: Explorations in Landscape Phenomonology: 1*. Berg, Oxford.

Toledo Maya Cultural Council and Toledo Alcaldes Association
1997 *Maya atlas: the struggle to preserve Maya land in southern Belize*. North Atlantic Books, Berkeley.

Torres, J.M. and L. A. Carlson
2011 Spindle Whorls and Fiber Production: Evidence from two Late Ceramic Age Sites in Eastern Puerto Rico. Paper presented at the The 24th Congress of the International Association for Caribbean Archaeology, Martinique.

Torres, J. M.
2010 Tibes and the Social Landscape: Integration, Interaction and the Community. In *Tibes: People, Power, and Ritual at the Center of the Cosmos*, edited by L. A. Curet and L. M. Stringer, pp. 231-260. University of Alabama Press, Tuscaloosa.

2011 The Social Construction of Community, Polity and Place in Ancient Puerto Rico (A.D. 600 - 1200), Department of Anthropology, University of Florida, Gainesville.

Torres, J. M. and R. Rodríguez Ramos
2008 The Caribbean: A continent divided by water. In *Archaeology and Geoinformatics*, edited by B. Reid. The University of Alabama Press, Tuscaloosa.

Trumbull, H. C.
1899 *The Covenant of Salt. As based on the significance and symbolism of salt in primitive thought*. Charles Scribner's Sons, New York.

Tyler, S. L.
1988 *Two Worlds: The Indian Encounter with the European, 1492-1509*. University of Utah Press, Salt Lake City.

Van Dyke, R. M. and S. E. Alcock
2003 *Archaeologies of memory*. Wiley-Blackwell, Malden, MA.

Vernon, N.
2007 Investigations at the Clifton Site: A Specialized Lucayan Site on New Providence Island, The Bahamas, Department of Anthropology, University of Florida, Gainesville.

von Hagen, V. W.
1957 *The Ancient Sun Kingdoms Of The Americas*. The World Publishing Company, Ohio.

Waters, M. R.
1992 *Principles of Geoarchaeology: A North American Perspective.* University of Arizona Press, Tucson.

Weiner, A. B.
1976 *Women of value, men of renown: new perspectives in Trobriand exchange*. University of Texas press.

1992 *Inalienable possessions: the paradox of keeping-while-giving*. University of California Press, Berkeley.

Whitty, E. B.
2000 Growing Tobacco in the Home Garden. *Agronomy Department, Florida Cooperative Extension Service, Institute of Food and Agricultural Sciences, University of Florida* SS-AGR-73.

Williams, E.
1999 The ethnoarchaeology of salt production at lake Cuitzeo, Michoacán, México. *Latin American Antiquity* 10(4):400-414.

2002 Salt production in the coastal area of Michoacan, Mexico: An ethnoarchaeological study. *Ancient Mesoamerica* 13(02):237-253.

2010 Salt production and trade in Ancient Mesoamerica. In *Pre-Columbian Foodways: Interdisciplinary Approaches to food, culture, and markets in Ancient Mesoamerica*, edited by J. Staller and M. Carrasco, pp. 175-190. Springer, New York Dordrecht Heidelberg London.

Wilson, S. M.
2007 *The archaeology of the Caribbean*. Cambridge University Press, Cambridge.

Wing, S. and E. Wing
2001 Prehistoric fisheries in the Caribbean. *Coral Reefs* 20(1):1-8.

Winter, J. H., J. Granberry and A. Leibold
1985 Archaeological investigations w thin the Bahamas. *Proceedings of the Proceedings of the Tenth International Congress for the Study of the Pre-Columbian Cultures of the Lesser Antilles*:83-92. Fort-de-France, Martinique.

Yafa, S. H.
2005 *Big cotton: How a humble fiber created fortunes, wrecked civilizations, and put America on the map*. Viking Adult, New York.

BIOGRAPHICAL SKETCH

Joost Morsink is a social anthropologist who specializes in archaeology with a regional focus on the Caribbean archipelago. His academic education has been in two different international programs and he received both Bachelor of Arts (2004) and Master of Philosophy (2006) in archaeology from Leiden University, the Netherlands and his Ph.D. from the University of Florida (2012).

He received multiple scholarships, including a Fulbright, a Prins Bernhard Cultuurfonds, a Dissertation Improvement Grant from the National Science Foundation, an Elizabeth Eddy writing scholarship and Charles H. Fairbanks Dissertation award from the Department of Anthropology and the Bullen Award for Student Excellence in Florida/circum-Caribbean Anthropology Research from the Florida Museum of Natural History.

Joost Morsink also contributed to peer-reviewed journals, such as *Caribbean Connections*, and shared his field research with a wider non-academic public through publication in the popular magazine *Times of the Islands*. His current research on the importance of food and exchange is the subject of a chapter in *The Oxford Handbook of Caribbean Archaeology* (in press). Furthermore, Joost has been an invited participant in multiple sessions at professional conferences and gained museum experience during his research assistantship at the Florida Museum of Natural History. Joost holds the position of editor of book reviews (*JCA*), assistant editor of the Oxford Handbook, is a member of the Committee of the Americas, Society for American Archaeology and holds an Courtesy Assistant Curator Position at the Florida Museum of Natural History.