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CHAPTER 1 INTRODUCTION

1.1 Introduction

Migration and mobility are core concepts in the social sciences and are important foci for attempts to understand multiple aspects of past human behavior from an archaeological perspective. Owing in part to its island setting and to decades of research on the topic of migration by the eminent Caribbean archaeologist Irving Rouse (Rouse 1952, 1964, 1986, 1989a, b, 1992), an interest in migrations and colonizations has characterized Caribbean archaeology since its beginnings. The Caribbean region has also been a fertile ground for the development of many migration methods and theories (Curet 2005; Keegan 1985; Keegan and Diamond 1987; Rouse 1986; Siegel 1991). Migrations and migration-related processes have also been invoked as explanations for various patterns of cultural change and variation in the pre-Columbian Caribbean (Berman and Gnivecki 1993, 1995; Booden et al. 2008; Coppa et al. 2008; Curet and Hauser 2011a; Fitzpatrick and Ross 2010; Hofman et al. 2007a; Hoogland and Hofman 1993a, 1999a; Keegan and Diamond 1987a; Keegan 1995; Rodríguez Ramos 2007; Rouse 1986, 1989b, 1992a; Siegel 1991). More recently the topic of migration has itself become a subject of investigation within this context [for extensive reviews of the topic of migration in the Caribbean, see (Curet 2005, 2011)]. However, in general, the vast majority of archaeological approaches to migration and mobility, in the Caribbean and beyond, can be characterized as macro-scalar. In this context, macro-scalar is polythetic referring both to the long-term, cumulative effects of migration(s) and also to the behavior of larger scale units, such as cultures or 'peoples'. From an archaeological perspective these are most evident through observations of spatial-temporal patterning in the material record.

Less common are micro-scalar approaches to understanding human migrations and mobility, examples of these approaches would include biogeochemical methods such as trace element and especially isotopic analyses. These approaches differ from macro-

scalar ones in part due to their focus on processes occurring at much smaller temporal scales and by smaller scale social groups such as households, families, or individuals. The analysis and associated identification of a particular behavioral process, in this case migration, can be conducted at the scale of individual persons and this process can be repeated for multiple individuals and groups permitting a bottom-up approach (Hakenbeck 2008) to elucidating patterns of human mobility and migration. From this perspective, micro- and macro-scalar approaches can be seen as complementary approaches applied to similar phenomena.

The study presented herein is the outcome of one component of a large scale, international and inter-disciplinary research project focusing on mobility and exchange in the ancient circum-Caribbean. This research programme, ‘Communicating Communities in the Circum-Caribbean’ is funded by the NWO (The Netherlands Organization for Scientific Research) and directed by Prof. Corinne Hofman of the Faculty of Archaeology, Leiden University, The Netherlands. In the present study, I apply multiple isotope analyses to human skeletal materials from across the Caribbean islandscape to investigate patterns of migration and mobility from a micro-scalar perspective. The analyzed skeletal populations derive from a broad range of cultural, chronological, and geographic contexts within the Caribbean region. The primary analytical tool employed is strontium isotope analysis, complemented by carbon and oxygen isotope analyses. Additionally, a large component of the current project involved the mapping of biosphere strontium isotope variation in order to interpret the strontium isotope data obtained from the human sample populations. The resulting datasets concerning human migrations and origins are then applied to assess existing various hypotheses concerning past human migrations and mobility in the region and to develop new hypotheses in this regard. Particular emphasis is placed on elucidating: the size and composition of nonlocal or migrant groups, the possible types of migration that occurred in the past, and the consequences and implications of these migration patterns on the social relationships and interactions amongst and between ancient societies and communities of the Caribbean region.

1.2 Research Problem Statement

The identification of migration, versus other related but distinct processes, based on the examination of material culture patterning alone is problematic for several reasons. Traditional archaeological approaches to migration often rely solely on the appearance and supposed movement of material culture as a proxy for the actual movement of people. Problems arise in distinguishing migration from other related processes which may result in similar patterns in the distribution of cultural material remains, such as diffusion (the movement of ideas), trade and exchange (the movement of objects and materials), independent evolution and invention (the autochthonous development of similar ideas or cultural ‘traits’), or emulation (the copying of behaviors). Furthermore, the processes of transculturation, acculturation, and assimilation often occur within multiple forms of symmetric and asymmetric relationships between migrant and local groups, in which the behaviors of one or both are modified rapidly enough that the presence of distinct groups is masked or made archaeologically invisible (Carr 1995; Clark 2001) [but see (Cusick 1998; Spielman 1991) for discussions of the variety of culture contact situations and their consequences].

Owing in part to the preceding difficulties in distinguishing these similar but distinct phenomena, archaeologists have attempted to develop rigorous methods to identify prehistoric and historic migrations [e.g., (Rouse 1958, 1986)]. While initial colonization and ultimate abandonment may be relatively easier to identify archaeologically, other types and forms of migration require quite stringent criteria to distinguish migration from the other aforementioned processes, making the confident identification of past migration(s) quite difficult and relatively rare [see (Haury 1958) for an exception]. However, there has been a widespread tendency to assume that migration did not take place in most cases where the evidence was not definitive (Rouse 1958, 1986) rather than the more accurate conclusion that we just do not know (Snow 1995). This tendency may have resulted in a gross underestimation of the existence, frequency, roles, consequences, and importance of migrations in prehistory. Migration was likely much more common than most previously employed criteria account for and much migration may elicit little or no (archaeologically observable) cultural change. However,

this does not mean that migration is irrelevant because the comprehension of migration is still important if not essential for understanding many aspects of social behavior and other related processes (Anthony 1990, 1997; Burmeister 2000; Cameron 1995; Clark 2001; Curet 2005; Duff 1998). For example, a basic component of demography consists of calculating changes in population size over time. Population change equals population size, plus births, minus deaths, plus or minus migration (Anthony 1990). To ignore migration is to ignore an essential component of basic demography and requires one to either pretend that demography can be done with mortality and fertility rates alone, or to discount the role of demography for understanding long-term social processes (Lee 1966). Therefore, considerations of migration processes are vital to paleodemographic methods and theory (Curet 2005).

The recent renewal of interest in migration studies is characterized by the utilization of anthropological insights to shed light on ancient and modern migrations and migration-related processes and behaviors. These include approaches focusing on the observation and analysis of certain aspects of settlement (Cameron 1995; Duff 1998) and material culture patterns (Carr 1995; Clark 2001), mortuary and osteological patterns (Konigsberg 1988), and various combinations thereof (Burmeister 2000; Curet 2005). Advances in biogeochemical analyses in the last few decades, particularly isotope provenance studies, have prompted a flurry of research into ancient migrations based on a set of material evidence previously neglected or underutilized in archaeological studies of migration, namely skeletal remains. Despite the overall successes of such approaches to a broad array of research questions from different geographic and cultural settings throughout the world, isotope studies of human provenance have been under-utilized to date in the Caribbean.

Approaches to migration studies utilizing bioarchaeological and biochemical perspectives overcome some limitations of previous approaches by not relying on the movement and distribution of material culture as a proxy for the movement or migration of people. In fact, human remains can be perceived as a subset of material remains possessing data uniquely suited to investigating certain aspects of social behavior (Sofaer 2006). By shifting the focus from macro- to micro-level scales, one can identify and study actual migrants and not the long-term, cumulative effects of multiple behavioral

processes, of which only some may be migration. Furthermore, such a perspective helps to overcome the traditional normative bias of earlier studies by providing more nuanced and finer-scaled explorations of intra-societal differences in human behavior. In other words, such approaches can then be utilized to make inferences at more appropriate scales of analysis through observation and analysis of the appropriate corresponding units. After all, it is people, as individuals, households, families, lineages, and other small groups that migrate, not cultures or material culture repertoires [paraphrasing (Anthony 1990)].

For too long, archaeological discourses on human movement, migration, and mobility have been dominated by macro-scalar perspectives. This has been especially true for the Caribbean region, where until quite recently most research on this topic has concentrated on colonizations and the migrations of large scale units, such as cultures or even supra-cultural units such as ceramic series, and movements occurring over very long periods of time (Berman and Gnivecki 1995; Carlson 1999; Hofman et al. 2007a; Keegan 1995; Rouse 1986, 1992; Siegel 1991; Sullivan 1981). Only in recent years has there been an explicit focus on the movements of individuals or smaller scale groups (Curet 2005; Hofman and Hoogland 2011; Keegan 2009; Siegel 2010). This emphasis on smaller scale processes and units not only provides a much needed counter-balance to existing approaches but is warranted in its own right if the archaeological community is truly interested in examining the migration patterns of individuals. I do not propose that micro-scalar approaches in general, or isotope studies more specifically, should replace more traditional, macro-scalar, material-based approaches, only that they are highly complementary and can potentially provide new insights and perspectives on a wide range of questions concerning human migration(s).

1.3 Research Project Description

The approach advocated herein is derived from the perspective that: 1) migration may or may not be absent or present, rare or common, ubiquitous or universal; 2) that migration is amenable to archaeological investigation (utilizing theories, methods, tools, and classes

of material that are appropriate to the questions that we seek to answer); and 3) that we should not assume *a priori* the existence, nature, rates, or patterns of migration but seek to examine them individually and empirically. An essential first step involves the articulation of bioarchaeological and anthropological theories of migration with refined methods and techniques for the identification and investigation of past migrations.

Accurate and reliable identification of migrants and migration in the archaeological record is a necessary pre-requisite for interpreting the full-range of past human behaviors as migration is inextricably intertwined with, influences, and is influenced by a great variety of socio-cultural processes. The development and advancement of isotope analyses of human remains have permitted the reliable identification and assessment of past migration patterns at the scale of individuals. When conducted within a multi-disciplinary and multi-scalar research program, in conjunction with requisite contextual data, and utilizing more nuanced and updated theories of migration these methods can permit reappraisals of the roles of mobility and migration(s) in Caribbean prehistory. The aim of this research project is to apply these approaches to ancient populations from the Caribbean to address or readdress hypotheses concerning the extent, nature, and dynamics of ancient migrations and related processes in the socio-cultural developments of this region.

The Caribbean region possesses several geographic and geological parameters that make it ideally suited to this type of approach: 1) the nature of islands necessitates the existence of some form of maritime transport and associated technology and knowledge of seafaring for inter-insular migrations to have taken place; 2) the Antilles in particular possess a particularly complex and varied geological history, providing the requisite degree of isotopic variation that is essential for strontium isotope studies of migration; 3) archaeological evidence indicates that people have been migrating to, within, and around the Caribbean for thousands of years; 4) ethnohistoric documentation indicates that migration and mobility were occurring at the time of European contact; 5) the presence of multi-island archaeological cultures or cultural realms and the widespread occurrence of imported or exotic trade goods suggest that both the means and motivations of inter-island movements were in existence throughout much of the region's prehistory.

Isotope analysis involves the characterization of isotopic compositions (signals or signatures) for a particular material. This type of analysis can be conducted on human remains to identify migrants and investigate migration. This approach is based on the following premises [for more thorough discussions see (Bentley 2006; Montgomery 2010; Price et al. 2002)]; that strontium exists naturally in several forms or isotopes, the ratios of which vary spatially in relation to the biogeochemical environment (primarily in relation to the age and lithology of the associated bedrock geology). Due to chemical similarities with calcium, strontium is often taken up by and incorporated into the skeletal tissues of animals (including humans) and is particularly concentrated in calcium-rich bioapatite. Strontium passes through the food chain without undergoing substantial isotopic fractionation and is incorporated into human skeletal tissues. Because dental enamel does not undergo significant remodeling once mineralization is complete, this particular tissue type preserves the biogenic strontium signal of the biogeochemical environment in which it developed. In other words, when an individual migrates they possess an identifiable indicator of their place of origin via the strontium isotope ratio of their dental enamel. If this signal is distinct enough from that of the region where the individual died and was buried, then it is possible to identify that individual as a nonlocal (and possibly as a migrant). For this reason, strontium (as well as a number of other isotope systems) isotope analysis represents a powerful tool for examining migrations and mobility from the archaeological record. Due in part to their density and structure, teeth are also highly resistant to diagenesis or postmortem contamination (Budd et al. 2000), and owing to their overall durability they are the most likely skeletal element to be preserved in archaeological deposits (Robinson et al. 1986).

It is important to stress that a wide range of archaeological, bioarchaeological, and biogeochemical data is necessary to address specific research questions and to test particular hypotheses for any given site assemblage or population with this approach. Furthermore, some of the most intriguing patterns produced by previous applications of this approach are that: 1) substantial proportions of certain archaeological burial populations are comprised of migrants or nonlocals (Price et al. 2001, 2008); and 2) individuals identified as migrants based on isotopic analysis often presented little or no indication that they were migrants based on the analysis of associated material remains

(Bentley et al. 2002; Bentley et al. 2003). These results indicate that further applications of these approaches to other cultural contexts and regions is justified and that these approaches need not be limited only to situations in which the associated material culture assemblages suggest the presence of migrants/migration.

The goals of the proposed research project are multi-faceted and include the following objectives:

- 1) To determine if nonlocals are present amongst several ancient Caribbean skeletal populations.
- 2) To assess the number and proportion of nonlocal migrants in these populations and assess the demographic composition of migrant groups relative to local groups.
- 3) To compare migrants verse locals in reference to mortuary, osteological (demographic), and paleodietary data.
- 4) To analyze spatial variations in migration patterns within and between different sites, settlements, islands, and areas within the circum-Caribbean region.
- 5) To analyze temporal variations in migration patterns within these ancient populations.
- 6) To contribute to the development of databases of isotope variation within the Caribbean region.

1.4 Organization of the Dissertation

In the following chapter, I provide an overview of archaeological approaches to migrations studies (Chapter 2). I begin with a brief history of the role of migration within the discipline of archaeology itself, including some of the general trends throughout the history of the discipline and some current themes and directions of migrations studies. Subsequently, I assess Irving Rouse's seminal contributions to migration theories and methods, followed by a critical assessment of his approach to the identification and analysis of migrations in prehistory. This is followed by a detailed discussion of specific insights into various aspects and concepts of migrations and migration processes derived from a broad array of related disciplines including especially anthropological perspectives on human migrations. This chapter concludes with an overview of the role of migration in

the archaeology of the Caribbean and an introduction to different approaches to the archaeological study of migrations in the region.

In Chapter 3, I present the basic principles of isotope archaeology with a specific focus on strontium isotopes in various environmental systems and research disciplines. A brief history of the use of strontium isotopes in archaeology is followed by a detailed discussion of the basic premises, assumptions, and limitations of strontium isotope approaches to human provenance and migration studies. I then present a general review of specific archaeological applications of strontium isotope analyses in different geographic and cultural contexts, and briefly note some related applications of this method in other fields. Lastly, I detail the basic principles of other isotope systems to provide a background for some of the stable isotope data that are incorporated into this study.

Chapter 4 presents the specific details of the methodology and techniques employed in this research project. The sample collection strategy and design are outlined for different sample types including human dental samples as well as animal and plant samples. The specific details of sample processing are then provided for the different types of sample materials (e.g., dental enamel, shell, plant tissues). The laboratory methods and protocols for sample dissolution and the separation and purification of strontium from sample matrixes are then provided. I then describe the mass spectrometric analysis and details of instrumentation for the measurement of strontium isotope composition via thermal ionization mass spectrometry (TIMS), including notes on error, precision, and reproducibility of results. Lastly, the principles of oxygen and carbon isotope analyses of enamel carbonate from human teeth are outlined, including descriptions of sample processing and measurement via isotope ratio mass spectrometry (IRMS).

The focus of Chapter 5 is the archaeological contexts of the analyzed skeletal materials. This chapter begins with a presentation of the geographic and chronological settings of the study area and some notes on terminology. This is followed by a brief description of the individual site settings and archaeological contexts of the skeletal populations from which the human skeletal materials were obtained. This section also

includes any available information derived from analyses of the studied burial populations

Chapter 6 is a presentation of the results of this study divided into several parts. First, I present the strontium isotope results from the bioavailable samples as a whole, and then relative to associated geology, and per island/region. Next, I present the strontium isotope results from all of the human samples as a whole, and then for each of the different sample populations in this study. Lastly, I present the oxygen and carbon isotope results that were obtained from a subset of the total human sample population.

Chapter 7 is a discussion of the results. I begin with a discussion of the biosphere mapping component of this project and the implications of these results for strontium isotope provenance studies in the region. This is followed by a detailed discussion and interpretation of the human strontium isotope results, beginning with a discussion of the approach taken to the identification of nonlocals for each sample population. Next, I identify and assess the numbers, proportions, and possible origins of the individuals identified as nonlocals for each of the sites in this study. Next, I discuss general patterns of mobility at the scale of individual populations and for the entire dataset in reference to associations between residential origins various other relevant parameters, including age at death; biological sex; chronological age, grave goods; and dietary practices. Then, I discuss the carbon and oxygen isotope results in terms of assessing variations in dietary patterns at various scales and exploring the potential origins of specific nonlocal individuals. Lastly, I conclude this chapter with some final thoughts concerning the results discussed throughout this chapter.

In the final chapter (Chapter 8) I summarize the main findings of this study. I present the major conclusions in reference to advances in our understanding of spatial variation of bioavailable strontium isotopes in the Caribbean. I then summarize the main conclusions of the human provenance study, including some insights and proposals concerning specific aspects of patterns of human migration in the ancient Antilles. I provide some interpretive considerations, particularly in reference to the possible size and composition of migrating groups, and by inference, to the types of human migration and mobility that best match the patterns identified in this study. I then provide a few final thoughts on some of the most important archaeological implications of the present study,

concerning various ongoing debates and dialogues in Caribbean archaeology with reference to specific hypotheses and models of migration, mobility, and interaction. Lastly, I present an assessment of the methodological approach taken in this research project and conclude with some general proposals for future research directions that could hopefully build upon, improve, and advance the work presented herein.

