Introduction

"A wonderful fact to reflect upon, that every human creature is constituted to be that profound secret and mystery to every other. A solemn consideration, when I enter a great city by night, that every one of those darkly clustered houses encloses its own secret..."

— Charles Dickens, A Tale of Two Cities

Lamanai and Ka'kabish, two Precolumbian Maya centres in north-western Belize, have been sites of archaeological investigation and interpretative progress for several decades, with archaeologists exploring many facets of their developmental history. A large amount of research has focused on the long stratigraphic sequences at Lamanai and Ka'kabish, which date from the Middle Preclassic (1000-400 BC) to Late Postclassic (AD 1250–1521), and Colonial periods (AD 1521–1708) of Maya history (Aimers 2007a; Graham 2004, 2011; Haines 2013; Howie 2012; Pendergast 1986a, Powis 2002). Existing studies have identified relatively long culture-histories for each site, but they have yet to embark on a structure-by-structure temporal reconstruction of the settlement dynamics of the civic-ceremonial centres and the structures surrounding them. Archaeologists have excavated many of the structures at Ka'kabish and Lamanai, but most of the relevant information has remained in note form or as site reports, without it being used for broad space-time reconstructions. This is the major goal of this project – to create a fine-grained model of the settlement dynamics, or changes in the density and distribution of structures through time and across space at Lamanai, Ka'kabish, and the inter-site settlement zone – an area inbetween the two centres – and compare the model to environmental evidence from pollen cores in the New River Lagoon, a body of water adjacent to Lamanai. By analysing the spatio-temporal distribution of settlement and comparing it to evidence from pollen cores, this study aims to understand the human and environmental dynamics at Ka'kabish, Lamanai, and the inter-site settlement zone. This relationship is later compared to the human and environmental dynamics at other sites in the region and across the greater Precolumbian Maya world.

At Lamanai, archaeologists have studied the material evidence of occupation from many periods of Maya history, with projects focusing on the ceramics of the Preclassic (Powis 2002, 2004) and Terminal Classic-Early Postclassic periods (Howie 2012), as well as changes in the paleoenvironment from the beginning of the Holocene to the present (Metcalfe *et al.* 2009; Rushton *et al.* 2013). The site of Lamanai was visited by archaeologists in the mid-1920s and returned to in the late-1930s and mid-1960s, however, the first excavation and systematic survey of the site was conducted in the 1970s. Excavations in the civic-ceremonial centre and evidence from pollen collected adjacent to Lamanai suggest that the site was occupied as early as 1600 BC (Hanna *et al.* 2016), spanned the period of the Maya collapse, and continued to be a focus of settlement after the arrival of the Spanish (Graham 2004, 2011; Metcalfe *et al.* 2009; Pendergast 1982a; Rushton *et al.* 2013). These studies uncovered the length of occupation at Lamanai, but there has yet to be an analysis of settlement dynamics and changes in settlement over time. Archaeologists have speculated that the peak periods of population at Lamanai were in several different time periods, however, these speculations are based on data that is limited to the core of the site.

At Ka'kabish, a Precolumbian Maya centre 10 km northwest of Lamanai, archaeologists have only recently begun to understand the historical trajectory of the site (Haines 2008, 2010, 2013; McLellan and Haines 2013, Tremain 2011). In the early 1980s, archaeologists surveyed several domestic structures in cleared milpa, or corn fields next to the core of the site, using ceramic materials collected from the surface to identify Early Postclassic period occupation (Haines 2008: 4). Several years later, archaeologists from the Maya Research Program mapped the civic-ceremonial centre (Guderjan 1996). These archaeologists compared ceramics at the site to existing type-variety sequences, which suggest a long history of occupation, beginning as early as the Late Preclassic (400 BC–AD 300) period and continuing until the end of the Late Classic period (AD 600–900). More recently, archaeologists have identified evidence of occupation during the Middle Preclassic (1000–400 BC) and Postclassic periods (AD 900–1521) (Haines 2013; McLellan 2013). The history of archaeological study at Ka'kabish is shorter than Lamanai, however, several lines of evidence can be used to reconstruct a structure-by-structure analysis of Ka'kabish. Unlike Lamanai, which has benefitted from the governmental protection of a natural reserve, Ka'kabish has been extensively looted, with some excavations bisecting the primary axis of monumental structures. The trenches from these excavations have been mapped to understand the developmental history of structures in the civic-ceremonial centre (Tremain 2011). These data, and other information from excavations in the civic-ceremonial centre, are used in my research to understand the settlement dynamics of Ka'kabish, with the

goal of comparing the historical trajectory of Ka'kabish to Lamanai.

To complement the chronological reconstruction of Lamanai and Ka'kabish, I surveyed several areas peripheral to the site cores, which are collectively referred to as the inter-site settlement zone and represent a hinterland. Ceramic material from each structure identified in the inter-site settlement zone was collected and analysed to recreate the settlement dynamics of the periphery, or hinterland, of Lamanai and Ka'kabish. By reconstructing the settlement dynamics of Lamanai, Ka'kabish, and the inter-site settlement zone, I intend to provide a detailed and thorough understanding of the historical trajectory of the region. This reconstruction is subsequently compared to the settlement dynamics of other sites in the Precolumbian Maya world to highlight consistency and variability in the archaeological record.

Research Questions

The major research question addressed by this study is: What are the settlement dynamics at Ka'kabish, Lamanai, and the inter-site settlement zone, and how do these compare to the environmental evidence of pollen cores from the New River Lagoon, as well as the core-hinterland dynamics at other Maya sites in the greater region of Northern Belize?

To answer this question, it is important to identify several key characteristics of the study zone, such as:

1. What is the character of the settled landscape between Ka'kabish and Lamanai (number of structures; patterns and distribution of settlement; modifications to the natural environment) and how does this compare to other sites in Northern Belize?
2. How does the chronology of the inter-site settlement zone compare to the chronology of the two civic-ceremonial centres – Lamanai and Ka'kabish – as well as chronology of other sites in Northern Belize?
3. How does the distribution and density of occupation (as defined by the location and date of each structure) in the inter-site settlement zone change over time, and how does this compare to occupation of the centres, as well as other sites in Northern Belize?
4. To what extent is there consistency or variation in material culture found at structures in the region within and between these two major centres?
5. What does the environmental evidence from pollen cores collected adjacent to Lamanai suggest about the settlement patterns at Lamanai, Ka'kabish, and the inter-site settlement zone?

Review of Chapters

Chapter's 1, 2, and 3, look to: 1) provide an overview of Precolumbian Maya history and the historical development of archaeological settlement pattern studies, 2) discuss the theoretical background of settlement studies and urbanism in Maya cities, 3) describe the character and composition of Maya cities, 4) analyse evidence of landscape modifications and their effect on past environments. The goal of Chapter 1 is to place my work within the broader context of Maya studies and show how the reconstruction of settlement dynamics at Lamanai, Ka'kabish, and the inter-site settlement zone, adds to the narrative of Precolumbian history. Chapter 2 highlights the ways in which my work builds on the theoretical development of settlement pattern studies, especially as it relates to low-density urbanism. Chapter 3 presents some of the ambiguities in Precolumbian Maya studies, with a goal of assessing the way the configuration – the plan, or layout – of the settlement affected the environment in the past.

Chapter 4 outlines the methods used to collect and analyse data from Lamanai, Ka'kabish, and the inter-site settlement zone. At Lamanai and Ka'kabish, I reviewed and reused existing data from unpublished fieldwork notebooks, site reports, and published articles, to identify the occupation date of each excavated structure in the civic-ceremonial centres. I surveyed 6 fields over the course of 7 years along a 10 km corridor between Lamanai and Ka'kabish to add to our understanding of core-periphery dynamics and to further understand the historical trajectory of the area. To visually assess and analyse the distribution and chronology of structures at Lamanai, Ka'kabish, and the inter-site settlement zone, I created kernel density maps and, in some cases, relative-risk surfaces (see pg. 43 for an explanation of relative-risk surfaces). I used interpolation to visualize the density of ceramics in the inter-site settlement zone and to identify changes in the density of ceramics across space. Chapter 4 presents a new method for analysing core-periphery dynamics at Precolumbian Maya sites – a method that has yet to be used in current studies of spatial and chronological distributions of settlement.

Chapter 5 is divided into two sections: one that focuses on the Precolumbian Maya at Lamanai and the other at Ka'kabish. For each site, there is a summary of the ceramics that were identified and a discussion of their chronology. The dates from the ceramics at each structure at Lamanai and Ka'kabish are used to present maps of the changes in settlement over time. This is the first time data has been used Lamanai and Ka'kabish to recreate changes in the settlement over time and offers a unique perspective on the growth and decline of these centres.

Chapter 6 provides a structure-by structure analysis of the architectural and ceramic evidence from the area between Ka'kabish and Lamanai, from Settlement Zones A to F. I analyse the spatial distribution and composition of structures in the settlement zone and categorise the structures in a morphological system based on structural features and relative placement location (see pg. 42 for an explanation of the typology). In the final section, I combine the spatial distribution, density, and chronology, of individual structures to recreate the settlement dynamics of the inter-site settlement zone. Chapter 6 offers a fine-

grained understanding of changes in the periphery of major settlements (Lamanai and Ka'kabish) over time.

Chapter's 7, 8, and 9, present the results of my project and places them within the larger study of Maya archaeology. The purpose of this section is to: 1) compare the settlement dynamics of Lamanai, Ka'kabish, and the inter-site settlement zone, to the environmental data from pollen cores collected adjacent to Lamanai, 2) compare the human and environment dynamics of the study area to sites in the greater region of Northern Belize, 3) assess the manner in which the results of the project address several methodological and theoretical problems in Maya archaeology. This section starts with a local perspective, moves to a regional perspective, and ends with a culture-wide perspective of Precolumbian Maya history.

Chapter 10 summarizes my major conclusions. The first part reiterates my research questions and offers responses to each question. The second part outlines the implications for future study and discusses the direction for future research. The last part of this chapter offers concluding remarks about Precolumbian Maya studies and my experience in attempting to understand their societies. I provide a new perspective on settlement dynamics at Lamanai, Ka'kabish, and the inter-site settlement zone, as well as sites in Northern Belize, and address several current themes in Maya archaeology, such as spatial organization, low-density urbanism, human/environment interactions, and sustainability.