University of Alberta

An Analysis of Site Selection Behaviours and Landscape Use in the Prince Rupert Harbour Area

by

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ABSTRACT

I discuss the coastal occupation history of the Coast Tsimshian in terms of the distribution of known archaeological sites in the Prince Rupert Harbour, located on the northern coast of British Columbia. I identify patterns in site selection behaviours that emerged over the past 5000 years since sea level stabilization. These observations are analyzed using geographic information systems (GIS) to understand how these past human populations used and organized themselves on the landscape. This spatial analysis provides information on the development of certain subsistence practices and the environmental factors that influenced the placement of sites in the landscape. These factors are considered in relation to non-environmental factors such as defensibility, visibility, and proximity to other sites, which would have directed site location decisions during times of increased conflict. These patterns in site characteristics are used to understand the agency of the settlement history in the Prince Rupert harbour area.

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Chapter 1: Introduction

1-1 Introduction

The goal of this thesis is the analysis of pre-contact settlement patterns of the northern Northwest Coast region using Geographic Information Systems (GIS). The primary issue being addressed is how site location preferences were altered by periods of conflict and increasing social complexity in the Prince Rupert Harbour region of British Columbia. The spatial organization of villages was disrupted by a time period of warfare and abandonment that, without evidence of increased conflict, may have been interpreted as being influenced by environmental factors, such as the depletion of resources. By observing how these sites were distributed throughout the region through time, the factors that influenced site selection behaviours can be better understood. These decisions were influenced by subsistence strategies, seasonal movements, and social relations between groups. Resilience theory, which uses social memory to explain the continued occupation of an area across multiple time scales, is applied to a post-conflict context, when groups reclaimed their territory and used previous habitations to guide settlement choice many generations later.

In this study, several variables are analyzed for each village site in the Prince Rupert Harbour (PRH) region (Figure 1.1) to explore environmental factors that influenced site selection. These are primarily locational variables, such as proximity to resources, aspect for preferential winds, and protection from rough ocean waters. However, when these are compared to the traits of non-habitation shell middens in PRH, it becomes apparent several sites were not selected for habitation that were equally, if not more, suitable for habitation according to the environmental variables selected for analysis. I suggest that these environmental factors played a secondary role in the decision making processes of the pre-contact groups, due to the large foraging radius of each village through the use of canoes (Patton 2012:52). I argue that non-environmental traits, such as social memory and defensiveness, were the primary determining factors that influenced site selection in PRH.

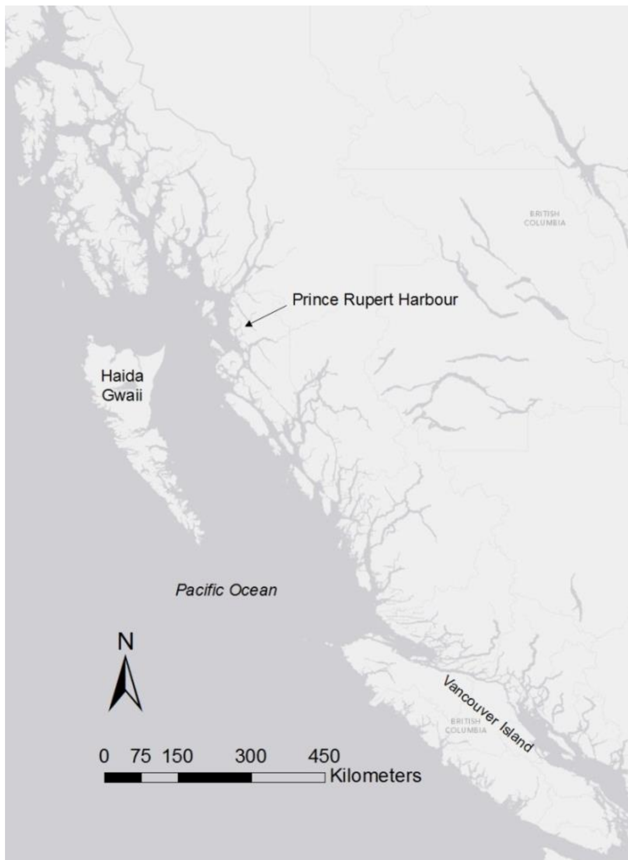

Figure 1.1: The location of Prince Rupert Harbour on the British Columbia coast

The study region is the PRH, located on the northern Northwest Coast, northeast of Haida Gwaii and south of the Alaskan border (Figure 1.1). This has been an area of interest for many anthropologists, as there is a large collection of ethnographic materials from 19th and early 20th centuries on the Tsimshian. The region has also been the subject of many expansive archaeological investigations since the 1960s (Archer 1992, 2001; Coupland 1996, 2006; Coupland *et al*. 2010; MacDonald and Cybulski 2001; MacDonald and Inglis 1981; Martindale *et al*. 2010). Past research reveals a history of people with large complex villages and households, sophisticated fishing and storage techniques, and periods of increased warfare and resiliency. Although there has been research of the harbour at a regional level (Archer 2001), there has not been a GIS based study of settlement patterns and changes in land use through time in the Prince Rupert Harbour area.

To address the goals of this thesis, known habitation sites were mapped in GIS software to graphically represent the distribution of sites at different times during the late Holocene. GIS is essentially a spatially referenced database of archaeological sites that has many tools that can be used to analyze, model and display data in order to answer complex research questions (Aldenderfer & Maschner 1996; Kvamme 1989). This makes it a valuable tool to archaeologists that seek to understand the spatial patterns of the archaeological record.

1-2 Research Questions

The following questions will be addressed in this thesis:

1. What environmental patterns influenced site selection decisions in the Prince Rupert Harbour region?
2. What non-environmental patterns affected these site selection behaviours?
3. Was there a spatial structure to the placement of habitation sites?

4. How did these determinants of settlement pattern change over time, particularly during times of increased conflict?
5. What variables may have made non-habitation shell middens unsuitable for villages?

The objective of this research is to enhance the current understanding of human habitation in PRH and on the Northwest Coast in general. This analysis is unique in its approach to the sites of PRH at a regional level rather than studying a single site or a small sample of sites. This will also be of value to future archaeological investigations in the area, as it will identify variables that inform site selection behaviours and, therefore, areas of high potential for site discovery.

1-3 Organization of Thesis

This thesis will be organized as follows: Chapter two presents the paleo-environmental, archaeological, and cultural background information of PRH that is necessary to fully comprehend the analyses and discussion of the following chapters. In chapter three, the theoretical challenges of spatial analysis are discussed, as well as the measures taken in archaeology to address these challenges. In chapter four, GIS and the limitations of this software are discussed before introducing the variables and methods used for the thesis in chapter five. The results of these analyses are presented in chapter six and discussed in chapter seven. By the end of this chapter, the regional settlement history of Prince Rupert Harbour will be achieved and insight into pre-contact site selection behaviours will be better understood.

Chapter 2: Prince Rupert Harbour Study Area

2-1 Introduction

This chapter will provide the necessary background information for those readers unfamiliar with Prince Rupert Harbour (PRH) and the region's history. Each section presents the context for the research questions and identifies the gaps in the current knowledge that need to be addressed. The chapter is organized into four sections: Section 2.2 provides the environmental history of PRH, including information on climate change, changing sea levels, flora, and fauna. This section provides the environmental context for the site selection decisions of the pre-contact Tsimshian and also explains the reasons why this thesis focuses on the post 3500 BP history of the harbour. Section 2.3 presents the previous archaeological investigations of PRH since the 1960s and the current temporal frameworks that are recognized by researchers in the region. This section acknowledges the work of prior archaeological studies and identifies gaps in the archaeological record in need of further research that will be addressed in this thesis. In section 2.4, the *adawx* or the oral histories of the different Tsimshian lineages are discussed. The nature of these stories and methods of transmission are presented, as well as the challenges of using this information in an archaeological context. Finally, in section 2.5, the mobility and subsistence strategies of the pre-contact Coast Tsimshian are discussed. This section gives the reader a better understanding of the villages of these groups and the seasonal patterns of movement between summer and winter habitations, which is essential to comprehend settlement patterns of PRH.

2-2 The Environmental History

Prince Rupert Harbour is located within the Western Hemlock forest biome, in which paleobotanical evidence suggests cedar was present from as far back as 10000 BP, but was more common after 6000 BP (Donald 2003:293). Forest cover in this area is dominated by western hemlock (*Tsuga heterphylla*), although there are several other common species including western red cedar (*Thuja plicata)*, pacific silver fir (*Abies amabilis*), lodgepole pine (*Pinus contorta*), yellow cedar (*Chamaecyparis nootkatensis*), and red alder (*Alnus rubra*) (Patton 2012:48). However, it is not until about 3500 BP that large scale plank houses, wooden boxes for coffins, and large dugout canoes developed (Ames 1994:217; Donald 2003:293). The lack of evidence for woodworking and lack of sites dated to prior to 3500 BP seems to suggest people were not living in the region prior to this time period. This is the result of a lack of sampling, as this time period is poorly understood due to the climate and sea level change that characterized the early Holocene in this region.

The sea level history since the end of the late Wisconsin Glaciation (18000-14000 BP) in PRH, as well as the rest of the Northwest Coast, has been quite dynamic. While the sea level curve for PRH is still preliminary (Figure 2.1), the current literature characterizes this sea level history as one of an initial drastic decline followed by a gradual recession to modern levels (Fedje *et al*. 2005; McLaren 2011).

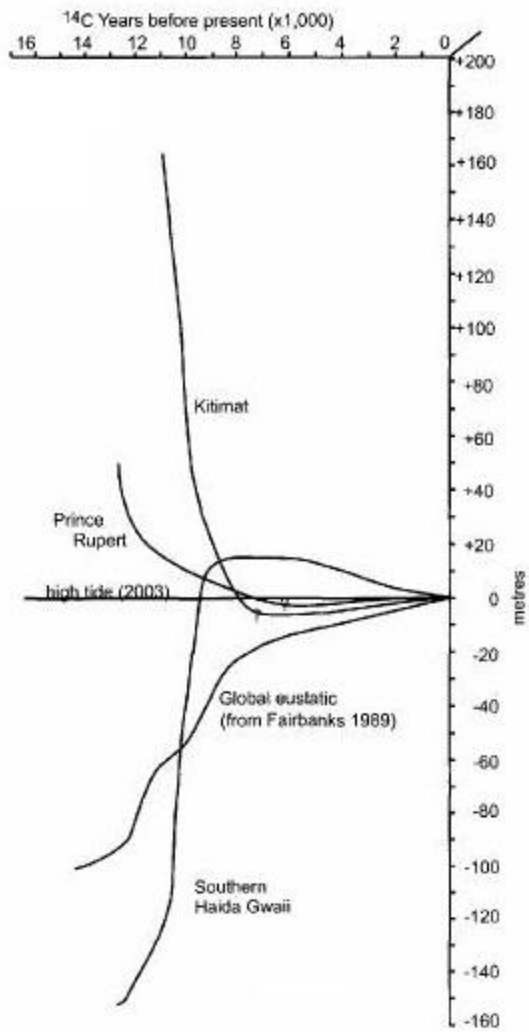

Figure 2.1: Sea level curve of Prince Rupert and other areas of the Northern Northwest Coast (Fedje *et al*. 2005)

PRH is located on the eastern side of the Hecate Strait, which was subject to isostatic depression around 12500 BP, causing a displacement of sub-crustal material and the resulting rise of the western Hecate Strait. As a result, sea levels were significantly higher on the outer mainland and significantly lower on the inner coast. Around 11000 BP, this area experienced an isostatic rebound, causing the sub-crustal material replacement and a lowering of the western Hecate Strait. By 9000 BP, these events stabilized and sea levels gradually dropped to modern levels over the next 4000 years (Fedje and Christensen 1999). However, it must be noted that the data used to construct this sea level curve is based on ancient landforms and a few known archaeological sites (Fedje *et al*. 2005); therefore, this curve is in need of refinement through lake-core analysis (McLaren 2011).

Once the sea levels stabilized, the Northwest Coast was consistently populated. The region is a very ecologically productive, but can be highly variable over short distances in the abundance of plant and animal species (Patton 2012:36). Resources, particularly terrestrial productivity, decline in abundance and diversity along the Northwest Coast as one moves north (Matson and Coupland 1995). This northward decline in resources could be the result of a number of environmental factors, including a northward decrease in temperature on land and an increase in annual precipitation (Matson and Coupland 1995:30). PRH in particular receives high amounts of rainfall; however, only 4.5% of precipitation falls as snow in mild winters (Patton 2012). Despite the decline in terrestrial resources, aquatic resources remain abundant, especially salmon, although some have argued (Moss 1993) that past researchers have over emphasized the importance of this anadromous species to the diet of human groups. This is especially true of the early inhabitants of the Northwest Coast, because rivers were blocked by glacial ice and unavailable for spawning. Even as glacial ice began melting, rivers were made unstable by the influx of glacial waters. It is not until after 5000 BP that sea levels and rivers stabilized and the exploitation of salmon significantly developed (Donald 2003:296). During this time, the cooler, wetter climate, and mature forest environment resulted in a more productive, predictable and healthy intertidal and riverine resource base (Cannon 2000). Between 3500 and 2500 BP, these factors encouraged sedentism in the harbour, an increased procurement of burrowing bivalves, and the intensification of salmon consumption, as evident in the increase in the number of sites, size of middens, and size of houses (Coupland 1998; Martindale and Marsden 2003). While Moss (1993) may be correct in criticizing researchers that inflate the importance of salmon in other parts of the Northwest Coast, zooarchaeological research confirms that salmon did play a significant role in the diets of pre-contact PRH inhabitants (Coupland *et al.* 2010). However, there are also several other species of fish that these groups would either travel to the Skeena watershed or to open water to fish for, such as: dogfish, ratfish, herring, eulachon, and halibut. Although fish accounted for the majority of the meat consumed by these groups, they also hunted sea mammals, bears, and deer, as well as gathering the shellfish from the intertidal surrounding their villages (Patton 2012). There were also plant resources that factored into the diet, including berries, some roots, shoots, and marine algae (Matson and Coupland 1995:30).

2-3 The History of Archaeological Research

There have been ongoing investigations in PRH since the 1960s by academic researchers and CRM archaeologists (Archer 1992, 2001; Coupland 1996, 2006; Coupland et al. 2010; MacDonald and Cybulski 2001; MacDonald and Inglis 1981; Martindale et al. 2010). One of the earliest investigations was conducted in 1954, when Charles Borden tested GbTo-10, also known as the Co-op site, and produced dates of 3000 years old (Patton 2012:121). From 1966-

1980, the North Coast Prehistory project excavated 11 sites within PRH (MacDonald and Inglis 1980). In the early 1980s, David Archer led the Prince Rupert Harbour Radiocarbon Dating Project, which was an extensive survey and mapping project that identified 71 new sites (Patton 2012:123). In the 1990s and early 2000s, Coupland and colleagues investigated McNichol Creek (GcTo-6) (Coupland *et al*. 1993; Coupland *et al*. 2003), as well as several other villages (Gbto-28, GbTo-31, Gbto-46, and GbTo-77) as a component of the North Coast Housing Project (Coupland 2006; Patton 2012). These large scale excavations analyzed household remains to address questions relating production and social organization (Patton 2012:124). Most recently, Andrew Martindale and colleagues cored 21 sites and mapped several sites using high resolution mapping equipment in Prince Rupert Harbour. The use of percussion cores is more efficient than the systematic excavation of shell midden sites, due to the difficulty of excavating shell heavy matrix, as well as the required shoring of deep excavation units in order to conform to worker safety legislation (Martindale *et al*. 2009). As a result of the difficulties of shell midden matrix, sites have been subject to varying degrees of investigation. This may skew the archaeological record to inflate the importance of some sites based solely on the amount of research that has been done on that particular site. The amount of data available from the site may not even be a result of perceived importance of the researchers, but simply the site may have been threatened by the encroaching modern city of Prince Rupert. Several sites also have a lack of information due to gardening practices of the post-contact inhabitants of PRH that levelled house depressions for gardens

(MacDonald and Cybulski 2001:16). However, the use of high precision mapping instruments can reveal subtle depressions that are not apparent to the naked eye. Through the use of these instruments, data can be recovered from these sites, but only a few sites in PRH have been the subject of such investigation.

Despite the abundance of research done in PRH, many archaeologists continue to use the archaeological sequence compiled by MacDonald and Inglis (1980), which was constructed largely from artifact typologies (Patton 2012:127). The archaeological sequence begins with Period III (5000 BP to 3500 BP), characterized by shallow and discontinuous shell midden accumulations. Also characteristic of this period are cobble tools, bilaterally barbed bone harpoons, geometric decorative motifs, and few structural features (Macdonald and Inglis 1980:45). At this time, sea levels stabilized and modern marine ecosystems developed as evidenced by the appearance of shell middens and increased sedentism (Martindale *et al*. 2009:1566). Period II (3500 BP to 1500 BP) is characterized by rapid midden build up, large house constructions, social differentiation, delayed return economies, population increase, and physical injuries characteristic of intergroup hostility (Cybulski 2001; MacDonald and Inglis 1980:52; Martindale *et al.* 2009:1566). It is during this time that there is increased osteological evidence of warfare; however, the osteological record is largely limited to the Middle Period, and therefore it is difficult to make generalizations about populations throughout the region through time (MacDonald and Inglis 1980:59). The tool kit also peaks with chipped stone tools, labrets, and trade items such as obsidian and dentalia (MacDonald and Inglis

1980:52). During Period I (1500 BP-Contact) the ethnographically known complex hunter gatherers emerged and the "Northwest Coast Pattern was in full stride" as there is an increase in zoomorphic art, ranked village structures, toggling harpoons, stone splitting adzes, bone scrapers, and, towards the end of this period, European trade goods (Macdonald and Inglis 1980:52; Martindale *et al*. 2009:1566).

2-4 The *Adawx*

The use of oral traditions by archaeologists has been debated extensively by those who see their usefulness (Echo-Hawk 2000; Whiteley 2002) and those who do not (Mason 2000). While most archaeologists see the value in using oral histories about the recent past, particularly in the post-contact context (Martindale 2003), there is contention over the acceptance of the historicity of oral traditions. These stories are important because they provide a human context to the settlement patterns, but also because it is important to include the indigenous voice in an effort to decolonize archaeological research, which has privileged the western scientific framework for interpreting the past (Nicholas 2005).

Most mythic traditions do not have a sense of chronology, which is frustrating for some Western academics (McMillan and Hutchinson 2002). However, the oral texts of the northern Northwest Coast seem to be different than those found in other parts of the world in that "Tsimshian oral traditions… seem preoccupied with chronological order. Which does not preclude cyclical time scales and mythological time frames; it implies recognition of linearity in

Indigenous history analogous to archaeology" (Martindale 2003:168). This attention to accuracy and chronology is evident in this account from James Young (2005) who was the son of Henry Young, a Haida historian: "they'd take my dad and sit him among them and tell him a story. The next night, the fire was still going and my dad had to tell the story back to the grey-haired old men. If he missed one word – just one word- the story was over" (Nang Kiing.aay7uuans 2005:141). The Tsimshian would also perform the *adawx* (oral history of a particular lineage) at socially sanctioned public events, such as feasts, helping to transmit them to younger generations and helping to ensure accurate historiography (Martindale 2003). However, it is important to note that the nature of oral texts is not simply lists of words recounted, but rather narratives that are structured around events and people, where the wording can vary but its historical accuracy is maintained (Martindale 2003:162).

Oral histories are particularly important on the Northwest Coast where the environment is typically poor for the preservation of archaeological materials because of the wet coastal climate, the predominance of wood and plant materials in the technology, and generally acidic soils (Harris 2003; Martindale 2003). Therefore, all evidence of earlier lifeways has not survived in the archaeological record and oral texts may be all that remain. Traditionally, archaeologists have looked to the ethnographic record as a means of understanding the ancient past in part because ethnographic accounts are not as complex as oral histories and are therefore easier to fit into western models of explanation. However, most ethnographic data was recorded in the early twentieth century after many of the traditions had disappeared (Martindale 2003; McMillan and Hutchinson 2002). But oral histories should not be utilized only in the absence of archaeological data; they should be incorporated because they may add another line of evidence that enhances and substantiates archaeological interpretations. As a result, a richer understanding of history is created, one that incorporates cultural and historical content from an indigenous perspective as a counterpoint to the traditional dominance of materialist database of archaeology (Harris 2003:61; Martindale 2003:165)

2-5 The Coast Tsimshian Mobility and Subsistence Strategies

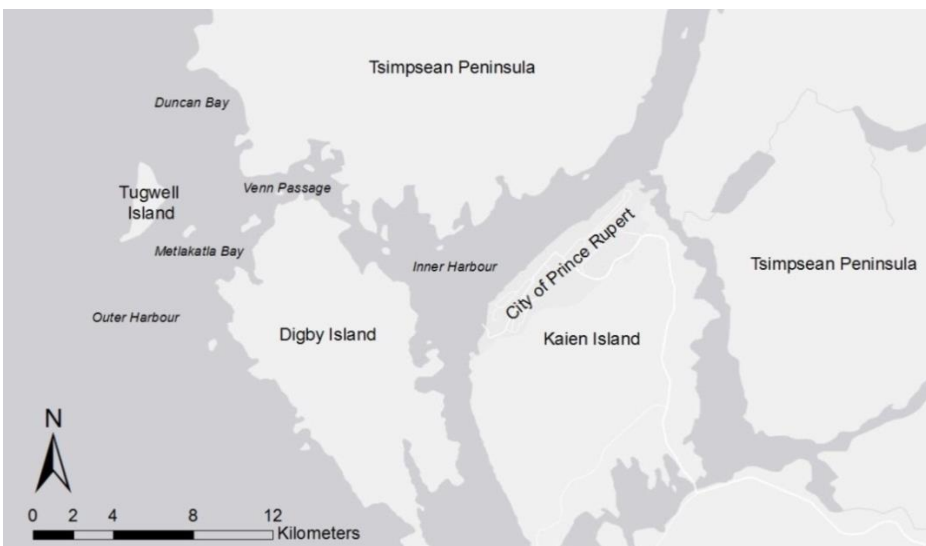

Figure 2.2: The Prince Rupert Harbour and the names of landmarks

The PRH territory (Figure 2.2) was traditionally occupied by the Coast Tsimshian, who organized themselves into nine local groups that established winter villages throughout the harbour. These winter villages were typically made up of a number of separate dwellings which would house four to six families per household and were the primary food processing and storage facilities (Ames

1994:218; Matson and Coupland 1995:26). At these winter villages, people would subsist off shellfish and dried fish obtained from their summer resource locations in the watershed of the Skeena River or their early spring migrations to the Nass River for eulachon (Coupland *et al*. 2010:190). However, seasonal indicators in the faunal assemblage at smaller sites, such as McNichol Creek, suggest these people did not leave their winter village to fish for eulachon on the Nass River (Coupland, Bissell, and King 1993:71). Within each household, the most senior noble acted as the head of the household and controlled resource rights and wealth important to social standing (Donald 2003:297; Matson and Coupland 1995:26). Despite these systems of ownership, the political structures of the Northwest Coast were weakly developed and heads of households had little influence beyond their houses (Donald 2003:297; Matson and Coupland 1995:29). While there was no intercommunity political organization, the village was sometimes a political unit while the household the economic unit within local groups (Ames and Maschner 1999:18). These houses were integrated into larger social and economic spheres through exchange and kin ties (Ames 1994:216). However, Coupland and colleagues (1993:71) go on to suggest that further archaeological research in PRH may reveal a site hierarchy in late prehistoric times with larger villages, such as Boardwalk and Lachane, in primary roles and small villages such as McNichol Creek in secondary roles. Therefore, the lack of seasonal movement of the people at McNichol Creek may be explained by a lack of resource rights at either the Skeena or Nass River and perhaps smaller villages like these would have to trade for certain resources.

The groups of the PRH coast are characterized as complex hunter-gatherers-fishers. As mentioned above, their economies were based on large amounts of stored foods of few but very productive resources (Ames and Maschner 1999:25). Storage of resources required a significant labour investment to harvest and process these foods quite rapidly, within 72 hours of the fish being caught (Ames and Maschner 1999:26). However, as discussed in 2.2, the diet must have been supplemented by resources other than salmon, as there is some evidence of small-scale cultivation and gardening in ethnographic sources and traditional knowledge (Patton 2012). However, past research (Chisholm *et al*. 1983) suggests that the protein portion of the diets of past humans of the British Columbia coast were highly focused on marine resources. Through stable isotope analysis the contribution of marine resources to diet can be determined. This is indicated by $\delta^{13}C$ values, in which a -20 ± 0.9 per mil value suggests a mostly terrestrial C_3 plants diet while -13 ± 0.9 per mil represents a largely marine based diet (Cannon *et al*. 1999). Of the 48 samples used in this study, four were from Prince Rupert Harbour sites (GbTo 23, GbTo 31, GbTo 33, and GbTo 36) with the average being -13.5 ± 0.99 per mil (Chisholm *et al*. 1982:397). Another contributor to pre-contact diet in this area that is often overlooked is shellfish, which is likely the result of male ethnographers ignoring the largely female subsistence activity in the 19th and early 20th centuries (Moss 1993). Shells were often ignored in initial excavations in the harbour, with archaeologists treating the shell like soil instead of data (Supernant pers. comm. 2013). Despite this lack of attention, shellfish were probably very important to the diets, especially in winter months when salmon stocks were diminished.

While the importance of shellfish to the diets of Northwest Coast peoples continues to be debated (Moss 1993), their shells were used as construction materials for habitation sites. This was first proposed by Blukis Onat (1985), who suggested that shell middens have very good drainage which was especially important in high precipitation areas like PRH. However, not all shell middens are habitation sites, as some shell middens will be small unstructured patches that represent short term encampments or processing areas while others can be large, structured villages (Martindale *et al*. 2009:1565).Within these villages, there are also different activity areas that build up as a result of deposition of refuse throughout the village. The shell matrix of these large villages often consists of other faunal remains and artifacts, but can contain features such as post holes, house floors and human burials (Martindale *et al*. 2009:1565). The organization of shell midden villages usually consists of a front midden, an area of house depressions, and a back ridge. These areas have been studied by other researchers (Coupland *et al*. 2003) to determine their function in the site. Due to the complex stratigraphy of the front midden at McNichol Creek, it was interpreted to be a common area in the village (Coupland *et al*. 2003:167). The back midden was quite homogenous concentration of shell matrix with no evidence of processing or manufacturing; therefore, it serves the function of secondary refuse disposal and internment of human burials (Coupland *et al*. 2003:156). However, the back ridge at K’nu (GcTo-1) has been interpreted as a protective ridge with a possible gate that circles the house area (MacDonald and Cybulski 2001:19); therefore, these features may have also enhanced the defensibility of locations.

Defensible features may have been important during the period of 2000 BP – 1500 BP, a time of increased warfare and temporary abandonment of harbour by the Coast Tsimshian. This was recorded in the oral histories of the Tsimshian, as stories from this time usually contain chronological markers such as "the war with the Tlingit" or "when the Tlingit lived on Dundas Island" (Martindale 2006:172). Other lines of evidence include the osteological record of trauma associated with conflict, such as trophy skulls, weapons, and defensive fractures, which are recorded in burials associated with this time period (Ames 1994; Stewart *et al*. 2009). The Tsimshian eventually formed alliances and reclaimed their territory; however, settlement patterns were altered on their return (Marsden 2001:82). These post conflict changes in settlement patterns may be explained by defensive strategies; however, there were also many societal changes, as many of the Tlingit clan groups became houses among the Tsimshian (MacDonald and Cybulski 2001:20; Marsden 2001:85).Therefore, much of the knowledge about the Tsimshian seasonal round discussed in this section was derived from the ethnohistoric understanding of the Tsimshian and it would be incorrect to impose this system of seasonal mobility on all past groups, as the timing of this development is still debated by archaeologists (Martindale and Marsden 2003). The establishment of Hudson's Bay posts, missions, and canneries, and the rapid decline in population due to the introduction of European diseases, changed Tsimshian livelihoods and altered social relations. Many

Houses moved from the Metlakatla Pass villages to the trading post at Fort Simpson in 1831, and later to Port Simpson (Lax Kw'alaams) at the mouth of the Nass River. A large migration occurred again when some Houses moved from Lax Kw'alaams to a utopian Christian community at Metlakatla under the direction of William Duncan (MacDonald and Inglis 1980; Patton 2012:101). Therefore, continued archaeological investigation of the pre-contact history of PRH is useful in fully understanding the Tsimshian seasonal round, when it developed, and how greatly it was altered by the arrival of Europeans.

2-6 Summary

This thesis will focus on the Coast Tsimshian that occupied PRH from 3500 BP until European contact. Although it is known from the archaeological (Martindale *et al.* 2009; McLaren 2011) and oral records that this area was occupied in the early Holocene, there is a significant lack of data from archaeological sites dated to prior to 4000 BP. The temporal framework developed by MacDonald and Inglis (1980) will be used to discuss changes in settlement patterns with particular attention paid to the late Middle Period (2500 - 1500 BP). It was during this time period PRH experienced increased conflict with northern invaders (Marsden 2001), which significantly altered settlement behaviours in terms of defensibility and proximity to resources.

Chapter 3: Theoretical Approach

3-1 Introduction

In this chapter, the theoretical challenges of conducting a settlement pattern analysis are presented and discussed. In section 3.2, the first issue addressed is the environmentally deterministic character of many of these studies and how other non-environmental factors must be considered. The criticisms of other scholars are presented as well as the measures undertaken in this thesis to consider the social factors that influenced site selection behaviours. In section 3.3, in an effort to not be environmentally deterministic, the human agency of site selection behaviours is considered which continues into section 3.4 Resilience theory. This theory considers the visibility of archaeological sites on the landscape and how memory influences site selection behaviours of a group's descendants. In section 3.5, the limitations of the data are discussed including how sites were recorded, the challenges of ArcGIS data, and varying degrees of investigation sites have received. In section 3.6, these criticisms are taken further as the way archaeologists perceive archaeological sites is questioned. The difficulties of determining what constitutes a site is discussed, as well as how archaeologists categorize and interpret these sites may be vastly different than how these people in past perceived them.

3-2 Environmental Determinism

When studies focus solely on environmental variables, our interpretations may be biased towards environmental factors because we fail to consider social factors that influenced human history. This criticism is not unfounded as other variables that factored in the decision making process are often ignored (Ebert

2000). When applied to mobile foragers, settlement studies based on purely environmental characteristics may fit into expected patterns quite well; however, when applied to more complex groups, like those of PRH, they do not work because these "prehistoric inhabitants do not seem to follow the rules established by models of subsistence or general economic efficiency" (Maschner 1996:176). The environmentally deterministic character of settlement studies is recognized, but it cannot be ignored that certain environmental variables are consistently represented in known sites, such as: elevation, shelter from storms, orientation, and access to water (Maschner and Stein 1995). It is not saying that because we use certain variables, particularly environmental, to generate results that people in the past were informed by these same variables when making site decisions (Kvamme 2006; Mackie 2003) or that every variable important in the determination of site location has been identified (Maschner and Stein 1995). Rather, it is the use of coincidences that are present in the known sites that inform our search for other sites in order to improve our understanding of past settlement patterns.

3-3 Agency in Settlement Selection

Although environmental changes would no doubt have a significant impact on the way of life of inhabitants of PRH, it is incorrect to portray humans as passive agents reacting to environmental change without considering the influence that an individual's culture and own self-interest have on their everyday decisions. This is important to understand that the archaeological record and cultural evolution are the result of human agency – "the product of the decisions people make and the behavioural consequences of those decisions" (Ames and Maschner 1999:30). The material record that archaeologists study is the result of everyday actions, the consequences of those actions, and how people alter their lives as a result of those consequences. The fact that the evolution of social complexity and economy are the result of human decision making within limited social and temporal contexts should not get lost (Ames and Maschner 1999:30). These societies did not have the ethnographic pattern in mind as an end goal; this was rather the unintended consequence of thousands of years of day-to-day decisions (Ames and Maschner 1999:30). The behaviours of these individuals will be further altered by these consequences and also affected by other individuals in response to these consequences (Ames and Maschner 1999:30). Furthermore, this dynamic process was also interrupted by the arrival of Europeans and, given another thousand years, the record would have looked much different in terms of settlement size and locations (Mackie 2003:279). However, settlement locations may have remained consistent, as certain areas of the landscape gained social importance through continued use and resilience in the social memories of descendent populations.

3-4 Resilience Theory

An aspect of human agency that must be considered is that these populations may have had a historical connection to an area; this may explain why some groups continued to live in a location that may have once been productive but, because of human impact, became suboptimal (Mackie 2003:277). Resilience theory takes into account the high visibility of previous behaviours inscribed on the landscape (Thompson and Turck 2009:256), which is very true of the Prince Rupert Harbour region. Much like we look at shell midden sites to understand the past, descendant groups would have looked at these "social memories" emblazoned on the land as guides for settlement choice (Thompson and Turck 2009:273). In Prince Rupert Harbour, shell middens are highly visible on the landscape as mounded features visible on the shore. These would have been suitable areas for re-habitation for future groups (Ebert 2000), particularly those that settled the landscape after the out-migration of the late Middle Period. As mentioned earlier, these sites were also highly desirable for the drainage properties of shell middens (Onat 1985); rather than building a new shell midden for habitation, it is much easier to simply reoccupy. Therefore, it is possible that what we are interpreting as continuity may in fact be the reoccupation of early Holocene sites (Martindale *et al*. 2009:1574). The presence of petroglyphs was another element that contributed to the resilience of the Coast Tsimshian occupation of PRH. These features may have been landscape markers, an indication of a location of symbolic importance or an association with a particular House or lineage. In conjunction with oral histories, these rock art sites preserved knowledge of landscape and transmitted this knowledge to successive generations of Tsimshian.

3-5 Limitations of Data

There are some complicating factors in this analysis that should be mentioned. First, the fact that this thesis uses data compiled by several researchers since the 1960s (Coupland *et al*. 2010) is an area of potential error. Differences in mapping techniques, as well as advancements in mapping technology, will make some of the locational data more accurate than others (Kvamme 2006). Particularly, those sites recorded before the advent of global positioning systems (GPS) may be incorrectly recorded (Ebert 2000). Furthermore, it is unclear whether areas that demonstrate a lack of sites result from the true absence of archaeological sites, the lack of archaeological survey, or the destruction of sites by recent landscape modification. The sites that are currently known could be further biased by: archaeologists discovering sites in places with easier access; the location of sites discovered through cultural resource management projects focused on areas to be developed, rather than areas of research interest; and the ease of finding the larger and more obtrusive village sites (Kvamme 2006). Because PRH has been intensively studied by archaeologists since the 1960s, this should be less of an issue (at least for post 4000 BP sites). Still, the archaeological sites have been investigated to varying degrees of completeness. Some sites have not been as intensively studied while others yield less information owing to site disturbance. The latter factor is particularly true for those sites near Metlakatla Pass that were leveled by First Nations for gardens (MacDonald and Cybulski 2001:16). Such limitations of the data used in this thesis were unavoidable, but by recognizing these limitations, the influence of these factors on the results could be taken into account in explanations of PRH settlement patterns. However, the theoretical approach to these data can also impact interpretation, in particular, the western scientific view and definition of sites, which are often classified and interpreted as bounded activity areas.

3-6 Sites as Bounded Activity Areas

The term “site” is a meaningless concept because it suggests that human activity happened within discrete boundaries (Kvamme 2006). The pre-contact groups of the Northwest Coast would not have viewed the land in this manner; therefore, archaeologists should not view the landscape in this manner. One way to avoid the “site-centric” approach to the archaeological record is to view features and deposits as “phenomena that reflect continuous use of an area rather than as markers as discrete, bounded sites” (McCoy and Ladefoged 2009:280). However, it is hard to get away from the site concept because it is necessary for the ease of record keeping and communicating information in databases (McCoy and Ladefoged 2009:280).

When conducting settlement studies, archaeologists have a tendency to consider sites as independent entities instead of as components within a system (Ebert 2000). Site locations may have been influenced not only by the locations of other sites within that same system, but also by what lies between two sites (Ebert 2000). Therefore, the environmental variables that were deemed important may be proxies for other variables that were actually important, such as proximity to a social center or the ease of travel between two locations (Kvamme 2006; Mackie 2003). It must be considered that the location of sites influences the likelihood of another site in the vicinity, which may also influence the differences in site sizes (Mackie 2003). This is important to consider when observing the spatial relationships between sites, especially in terms of quantifying the number of sites. Certain smaller sites may be directly related to nearby larger sites, which is why

Mackie (2003) buffered large midden sites by a radius of 500 m in order to create 'midden zones.' It is important, however, that these sites be truly contemporaneous. This must be verified through stratigraphic cores and calibrated dates from basal and terminal deposits.

3-7 Summary

The use of environmental variables in a settlement pattern analysis is unavoidable, but it is important that the environmental nature of the variables not dominate our interpretation. Other aspects that must be considered are culture, social memory, defensibility, and the presence of other sites. All these factors may have contributed to the resilience of coastal occupation in PRH. Therefore, trends in settlement patterns cannot be fully understood without multiple lines of evidence. However, the interpretation of PRH settlement history is complicated by several limitations in the way data was preserved, recorded, and represented. The results generated by these data can be influenced by the lack of information, due to disturbance or minimal archaeological attention, indicating trends in site selection behaviours that did not exist. There was also a significant amount of information about Coast Tsimshian mobility and settlement organization not preserved in the archaeological record of these sites. Resource and social activities were not spatially constrained within these villages. Spaces between habitation sites may also have influenced site placement, as canoe travel allowed movement between villages and other locations in PRH. However, the application of anthropological approaches to research questions is limited by the nature of spatial technologies, as is discussed in the next chapter.

Chapter 4: Spatial Analysis and Archaeology

4-1 Introduction

In this chapter, spatial analysis and Geographic Information Systems (GIS) are discussed in two parts. First, the history of spatial analysis is presented and the application of GIS to archaeological research questions is discussed in section 4.2. This will provide the reader with a fundamental knowledge of the software as well as the many features that are suited to spatial analysis. In section 4.3, the disadvantages and difficulties of using GIS in an archaeological context are discussed, as well as the measures taken in this thesis to account for these problems.

4-2 Geographic Information Systems

Spatial analysis in archaeology is the study of the spatial organization of human behaviour in the past. Through the analysis of spatial data, using statistical and other methods, archaeologists can make inferences as to how individuals constructed, manipulated, and experienced space. The fundamentals of spatial analysis were borrowed from the field of Geography and modified by archaeologists during the 1970s and 1980s (Connolly and Lake 2006:149). In the last two decades, there have been several advancements in the precision of spatial technologies, such as geographic information systems (GIS), global positioning systems (GPS), and the use of lasers to collect spatial data. One of the most important advancements was the increased size and complexity of data sets that enabled archaeologists to shift from a more traditional site-centric settlement pattern approach to a fuller understanding of dynamic landscapes and their archaeological interpretation (McCoy and Ladefoged 2009). With the popularity of post-processual thought in archaeology and the resulting "shift towards more contextually orientated and relativist studies of human behaviour", spatial analysis briefly fell out of fashion in the 1980s (Conolly and Lake 2006:7). However, with advancements made in GIS technology in the early-mid 1990s, spatial analysis entered what Conolly and Lake (2006:7) term a "post-pioneer phase."

Archaeologists have become more ready to take on questions of spatial analysis as they become more adept in using GIS. GIS is software for collecting, managing, analysing and mapping spatial data, generally using geographic coordinates. Its greatest strength is its ability store multiple layers of archaeological data and for analyzing these data in different combinations and scales, which is important for studies of migration and settlement patterns (McCoy and Ladefoged 2009:265). This allows archaeologists to organize data more efficiently, potentially prompting new ideas (Conolly and Lake 2006). As GIS has advanced, so too has the complexity of questions that can be answered using spatial data.

4-3 Disadvantages of using GIS

"Often GIS based analyses do themselves a disservice by spending too much time pointing out the problems, difficulties, and deficiencies of archaeological data instead of the reasons why GIS is suited to studying human locational behaviour" (Kvamme 2006:6). However, these issues must be discussed for those readers unfamiliar with GIS or other forms of spatial technology. At its most basic level, the variables and features included on a map are subject to what the author determines to be important. The selection and weighing of variables come with bias based on the researchers past field experience (Kvamme 2006). However, as mentioned earlier, with the innovation of digital maps, archaeologists can be less selective when constructing maps, because these comprehensive maps allow the overlaying of many layers of data (Parslow 1999).

With the advancement of technologies, there are associated drawbacks and cautions that researchers must heed. There is a risk that the researcher will become dependent on data management and may shy away from more analytical questions simply because it is not immediately obvious which buttons to push (Conolly and Lake 2006). Another issue is that as archaeologists spend more time in understanding spatial technologies, they lose basic skills, such as the correct use of a compass (McCoy and Ladefoged 2009). Another concern is that the unsophisticated application of spatial technology without regard to theory and has caused gratuitous applications lacking in purpose or appropriateness. However, archaeologists are becoming more familiar with spatial technologies with the emerging of excellent textbooks (Conolly and Lake 2006), courses dedicated to the application of GIS to archaeological research problems, and a focus on meaningful results of GIS analysis (McCoy and Ladefoged 2009).

As mentioned above, post-processual archaeologists reject the positivist approach associated with the use of GIS, and propose instead that human action can only be understood by taking the perspective of those involved (Conolly and Lake 2006; McCoy and Ladefoged 2009). People in the past might have been very different and may have had very different ways of thinking. They did not experience space as a top down view of the world, commonly referred to as the "God view"; instead, they experienced the world in three dimensions (Conolly and Lake 2006). For these reasons, it is important to consider other lines of evidence such as ethnographic and oral records, which may give a sense of how these groups perceived the landscape. Archaeologists can also forget what exactly they are mapping, as Kvamme (2006:13) points out, noting that it is not often clear what exactly researchers are mapping, as they often conflate the systemic and archaeological context in their models. The systemic context refers to the dynamic behavioural state of the human group while the archaeological context refers to the non-behavioural static archaeological record (Kvamme 2006:13). As mentioned in section 2.2, critics argue that there is an increase in environmental determinism; this is a bias towards interpretations of the environment as a causal factor in culture change which often ignores historically contingent social structures and human agency (McCoy and Ladefoged 2009). However, archaeologists have found pragmatic uses of spatial technology for research that highlights the importance of documenting the dynamic relationship between the environment and human history, as well as research that points to the significance of agency and historical contingency (McCoy and Ladefoged 2009).

While this thesis addresses simple research questions about the proximity of villages to certain resources, there is also an attempt to answer complex research questions that apply GIS to social behaviours. In particular, the symbolic importance of particular regions indicated by the presence of features, such as petroglyphs, burials, and previously occupied sites. Without considering these social factors, this study would be environmentally deterministic and remove the human settlement decisions that were culturally and individually motivated.

4-4 Summary

In this chapter, the advantages and disadvantages of using GIS software for settlement pattern analysis in archaeology were discussed. This was particularly important for those unfamiliar with GIS to understand before continuing on to the following chapters. But most importantly, as discussed above, it is important to maintain an anthropological perspective when using GIS (Parslow 1999:52). The landscape did not determine the distribution of these pre-contact populations; humans distributed themselves for many reasons, including social and economic reasons (Parslow 1999:52).

Chapter 5: Variables and Methods Selected For Analysis

5-1 Introduction

In this chapter, the reasons why certain variables were selected for analysis, how these variables were obtained and how they are represented in ArcMap, and the reasons certain sites were omitted from this analysis are discussed. First, all the variables are discussed as to why they are important in terms of determining the site selection behaviours of pre-contact groups in PRH. These include: aspect, site size, intertidal size, ranked or egalitarian villages, proximity to resources, calmness of water, general age, presence of other features, arc of view, and line-of-sight. Second, how these variables were determined for each site is shown, as well as how they are graphically represented in ArcMap. For some of the variables there was a certain degree of interpretation in assigning a site to a certain category (i.e., aspect) or in quantifying certain variables (i.e., intertidal size). Third, this thesis analyzes data from 37 different habitation sites in PRH, but there were several sites that were omitted due to incomplete data. This was for several reasons, including a lack of archaeological attention, post-contact gardening, and destruction due to modern development. In the final three sections, the ArcMap tools that will be used in this thesis are also presented and the methods for using these analytical tools are discussed. These tools include: density and nearest neighbour analysis (5.7), buffer and intersect (5.8), and viewshed analysis (5.9).

5-2 Aspect

The first variable that was selected for analysis was aspect, which essentially means the cardinal direction the site was oriented. This was considered an important variable as a southern orientation was preferred by the geographically similar Tlingit for the southern winds and winter warmth (Maschner and Stein 1995). This was easy to determine through the observation of polygon shapefiles georeferenced on top of high resolution satellite imagery and site maps. For the majority of sites, determining aspect was straightforward, as most sites are backed by densely forested and inclined areas which preclude the orientation of the site toward the mountains. It was expected that the majority of sites would be oriented towards the shore, because this was an area where people arrived and departed by canoe.

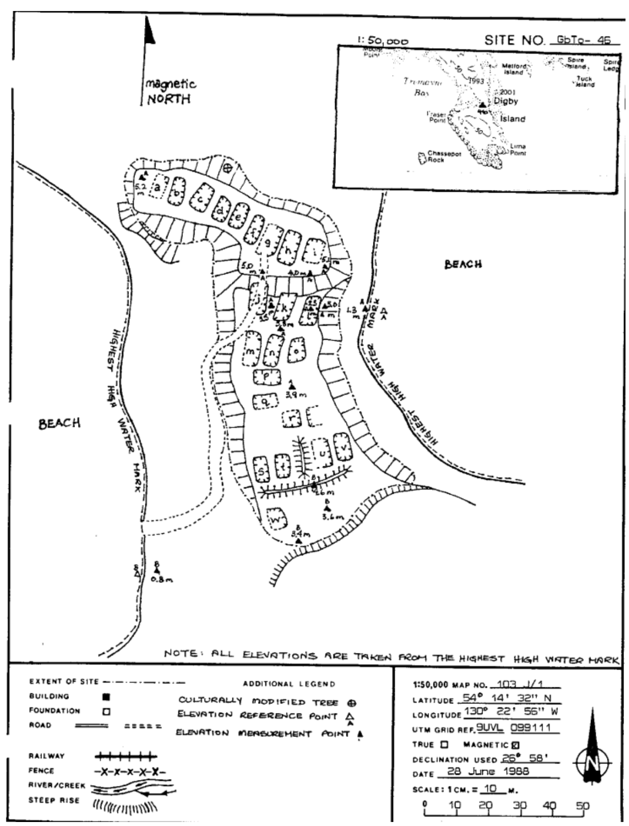

Figure 5.1: Site map of GbTo-46

There were some areas that required some interpretation, such as GbTo-46, which is located on a narrow strip of land and could be considered oriented east or west by observing the shapefile. Observation of the site map (Figure 5.1) and site form was informative but not enough to determine if it was an east or west facing site. From the site map, it appears the village initially had a southeast orientation that was relatively egalitarian. The southerly extension of the site appears to be a later addition due to the high variability in house size and orientation. This interpretation is based on an interpretation of GcTr-10, investigated by the Dundas Island Archaeological Project, which had a similar spatial arrangement of house depressions (Martindale *et al*. 2010). If there were accurate dates for the different areas of the shell midden, it could be considered to have a SW orientation for one time period and E/W for a later period, but these data are not available. The site form suggests that the western side of the site is much more open but the eastern side provides easier access by boat. Considering this information, it is fair to say this site could be classified as having an aspect of both east and west. Therefore, for the simplicity of the aspect analysis, the aspect of Gbto-46 was excluded but the site was not omitted from the other analyses.

5-3 Site Size

Acknowledging that the majority of shell middens 2000 m^2 or larger are village sites (Martindale *et al*. 2010), these sites were categorized into small, medium and large villages. These were determined by arbitrary designations of small sites as <5000 m^2, medium sites as 5000-10000 m^2, and large villages as >10000 m^2. The information on site size was obtained from site forms and from the village shapefiles created by Dr. Andrew Martindale in which the area of these polygons were accurate to the site area listed in the site forms and more than accurate enough for these broad size designations. This variable is important because the size of a shell midden is an indication of intensity of use and population size (Mackie 2003:262; Maschner and Stein 1995). Population size could be determined another way, such as according to number of houses, as was done in Erlandson et al (1992:44); however, because of the varying degrees of disturbance in the PRH, this could not be done.

5-4 General Age

The habitation sites were all assigned general BP ranges based on calibrated radiocarbon data from several sources (Archer 1992, 2001; Coupland *et al*. 2010; Cybulski 1992; MacDonald and Inglis 1981; Southon and Fedje 2003) that were compiled in a paper by Morley Eldridge and Iain McKechnie. The sites were categorized into five age ranges of every 500 years: 3500-3000 BP, 3000-2500 BP, 2500-2000 BP, 2000-1500 BP, and 1500-1000 BP. Each of these will be used throughout the thesis to represent the age ranges for the village sites. These radiocarbon dates were calibrated by Andrew Martindale and are presented here using the 2-sigma values (See Table 6.1: 2-Sigma Cal BP range). The radiocarbon years obtained by Archer (1992, 2001) had to be further corrected for the marine reservoir effect in Prince Rupert Harbour of 400 ± 70 for marine samples with uncalibrated dates prior to 2500 BP and 455 ± 60 for marine samples with uncalibrated dates between 2500 and 1500 BP (Patton 2012: 142). The depletion of ocean C^{14} content is known as the Marine Reservoir Effect, a phenomenon that occurs when cooler and denser water sinks deep within the water column, losing its point of atmospheric C^{14} input (Russell *et al*. 2011). While travelling through these deep waters, carbon decay occurs, before upwelling and mixing with surface waters that are somewhat enriched relative to the deep waters (Russell *et al*. 2011). These general ages are important to allow certain analyses to be performed that require that the sites be contemporaneous, such as viewshed, where it would be incorrect to say two sites were in each other's lines of sight when they were occupied a 1000 years apart. Three sites are not included in Table 6.1 as Martindale provided only radiocarbon years for Gbto-31 (49 dates ranging from 125 to 4230 RC years BP), GbTo-33 (33 dates ranging from 560 to 4630 RC years BP) and GcTo-6 (17 dates ranging from 670 to 2860 RC years BP). Without detailed RC dates, an accurate BP range cannot be determined for these three sites, but based on the range of dates it can be assumed that GbTo-31 and GbTo-33 were occupied during all five time periods and GcTo-6 from at least 2000 BP until 1000 BP.

There is, however, an imbalance in sample size for the sites included in this study. Certain sites such as Boardwalk (GbTo-31) and Lachane (GbTo-33) have been intensively studied with 30+ samples that give clarity to the initial and terminal occupation of these sites and well defined BP ranges can be established. However, other sites do not have any radiocarbon dates as of yet and some with as little as one radiocarbon date. Therefore, the date ranges assigned to these sites should be considered only preliminary, as they will be refined in the future as more radiocarbon dates are received to clarify the occupation history of the region. Several village sites were omitted from this study because they lacked any chronological information. These sites were: GbTo-17, GbTo-20, GbTo-25, GbTo-72, GcTo-1, GcTo- 4, GcTo-5, GcTo-10, GcTo-11, GcTo-41, and GcTn-9.

Table 5.1: Radiocarbon and Calibrated Dates of villages.

Borden	**Ballpark Terminal**	**Lab code**	**14C Age years BP**	**14C Age SD**	**Sample**	**2-sigma Cal BP Range**
GbTo-10	2450	GaK-1477	3040	110	charcoal[4]	2330-2690
GbTo-18	2000	GaK-1876	2000	100	charcoal[4]	1710-2300
		GSC-1439	2220	130	charcoal[4]	1890-2700
		GSC-1439 2	2240	170	charcoal[4]	1880-2720
		GaK-1877	2480	100	charcoal[4]	2340-2750
		S-1427	2565	80	human bone[4]	1700-2200
		GaK-1878	2610	100	charcoal[4]	2360-2920
		S-1425	2700	80	charcoal[4]	1890-2330
		S-1426	2930	80	human bone[4]	2190-2700
		S-1412	3225	105	charcoal[4]	3170-3700
		S-1411	3440	85	charcoal[4]	3470-3900
		S-1413	3620	110	charcoal[4]	3640-4240
		GaK-1880	4130	90	charcoal[4]	4430-4840
		GaK-1879	4790	100	charcoal[4]	5310-5730
		S-1409	4875	125	charcoal[4]	5320-5900
		S-1410	5555	140	charcoal[4]	6000-6650
GbTo-2	800	WSU-4366	1250	90	marine shell[1]	650-1090
GbTo-24*	N/A	CAMS-49625	1560	40	charcoal[5]	1360-1530
		CAMS-49623	2040	50	charcoal[5]	1890-2130
		CAMS-49626	2370	50	marine shell[5]	1390-1780
		CAMS-49624	2780	50	marine shell[5]	1920-2300
GbTo-28	1100	WSU-4375	1445	90	marine shell[1]	880-1300
		WSU-4376	2200	70	marine shell[1]	1650-2120
		TO12061	1370	60	charcoal[3]	1180-1390
		TO10897	2170	50	charcoal[3]	2010-2330

*(Archer 1992[1], 2001[2]; Coupland et al 2010[3]; MacDonald and Inglis 1981[4]; Southon and Fedje 2003[5]; Cybulski 1992[6])

Table 5.1: Continued

Borden	Ballpark Terminal	Lab code	14C Age years BP	14C Age SD	Sample	2-sigma Cal BP Range
		TO10896	2180	60	charcoal[3]	2010-2340
		TO12062	2260	60	charcoal[3]	2120-2360
		TO12063	2740	60	charcoal[3]	2750-2960
GbTo-30	850	S-2549	1640	90	human bone6	640-1040
		S-2548	2430	90	human bone[6]	1511-2015
GbTo-32	1450	WSU-4378	765	70	marine shell[2]	1250-1640
		WSU-4377	1980	100	marine shell[2]	1380-1930
GbTo-34	625	S-925	620	100	charcoal[4]	480-740
		S-991	1525	55	charcoal[4]	1310-1530
		S-873	1830	105	charcoal[4]	1520-2000
		S-926	1890	70	charcoal[4]	1630-1990
		S-1145	2485	60	charcoal[5]	2360-2730
		S-871	2655	65	charcoal[4]	2520-2930
		S-990	2740	110	charcoal[3]	2510-3210
		S-1144	3135	55	wood[5]	3220-3460
		S-872	3285	110	charcoal[4]	3270-3830
		S-1408	4100	140	charcoal[4]	4160-4960
		S-927	4460	120	charcoal[4]	4830-5460
		S-924	4970	100	charcoal[4]	5480-5920
GbTo-4	1200	WSU-4367	1525	90	marine shell[1]	940-1370
		WSU-4368	2580	70	marine shell[1]	2150-2670
GbTo-46	1750	TO11029	1810	50	charcoal[3]	1610-1870
		TO10898	1840	60	charcoal[3]	1610-1920
		TO11030	1890	50	charcoal[3]	1710-1940
		TO10899	1910	60	charcoal[3]	1710-1990
		TO11028	2150	50	charcoal[3]	2000-2310
		WSU-4379	2130	95	marine shell[2]	1510-2060
		TO11031	2550	50	charcoal[3]	2470-2760
		WSU-4380	2190	95	marine shell[1]	1570-2130
GbTo-57	1450	WSU-4381	2015	90	marine shell[2]	1460-1980
		WSU-4382	1765	65	marine shell[2]	1250-1620

Table 5.1: Continued

Borden	Ballpark Terminal	Lab Code	14C Age years BP	14C Age SD	Sample	2-sigma Cal BP Range
GbTo-59		WSU-4383	2470	70	marine shell[1]	1980-2470
		WSU-4384	2800	80	marine shell[1]	2360-2880
GbTo-66	1700	WSU-4387	2045	60	marine shell[2]	1530-1940
		WSU-4388	2190	90	marine shell[2]	1590-2120
GbTo-7	1500	WSU-4370	1905	95	marine shell[1]	1320-1830
		WSU-4369	2320	100	marine shell[1]	1770-2320
GbTo-70	1650	WSU-4389	1990	90	marine shell[2]	1410-1930
		WSU-4390	2110	100	marine shell[2]	1490-2050
GbTo-77	1950	TO12055	1990	50	charcoal[3]	1830-2100
		TO11033	2120	50	charcoal[3]	1950-2180
		TO11032	2210	50	charcoal[3]	2070-2340
		TO12054	2250	50	charcoal[3]	2150-2340
		WSU-4392	2525	100	marine shell[2]	2030-2670
		TO12056	3040	60	charcoal[3]	3070-3380
		WSU-4391	2810	100	marine shell[2]	2350-2940
GbTo-78	1600	WSU-4394	1970	80	marine shell[2]	1400-1880
		WSU-4393	2360	90	marine shell[2]	1830-2330
GbTo-8	1250	WSU-4371	1675	90	marine shell[1]	1083-1550
		WSU-4372	2150	70	marine shell[1]	1570-2030
GbTo-89	1700	WSU-4395	1995	70	marine shell[2]	1470-1920
		WSU-4396	2035	90	marine shell[2]	1480-2000
GbTo-9	1550	WSU-4374	1905	90	marine shell[2]	1330-1820
		WSU-4373	2035	90	marine shell[2]	1480-2000
GcTo-27	1500	WSU-4401	1825	95	marine shell[1]	1270-1750
		WSU-4402	2295	70	marine shell[1]	1790-2270
GcTo-28	1500	WSU-4404	1835	90	marine shell[1]	1280-1750
		WSU-4403	1985	100	marine shell[1]	1400-1950
GcTo-39	1500	WSU-4405	1825	90	marine shell[1]	1270-1730
		WSU-4406	1975	100	marine shell[1]	1390-1930
GcTo-51	1250	WSU-4408	1615	90	marine shell[1]	1030-1500
		WSU-4407	2125	100	marine shell[1]	1550-2130
GcTo-52	1600	WSU-4409	1905	75	marine shell[2]	1350-1810
		WSU-4410	2130	90	marine shell[2]	1520-2050

There is a further consideration in that the dates for each site are representative of the history of human activity at the site and not the occupation history of the village. Therefore, some of the dates may correspond to periods before the village was established at the site. An example of this is the McNichol Creek site (GcTo-6), which other researchers (Stewart *et al*. 2009:225) have stated was first occupied around 1600 BP, differing considerably with the radiocarbon dates that suggest the site occupied as early as 2000 BP. The dates of initial and terminal occupation need to be refined through further research, but for this study the calibrated dates will be used to establish BP ranges, although these dates may not correspond to the village chronology.

5-5 Egalitarian vs. Ranked Villages

In contrast to the southern Northwest Coast, the households of the northern Northwest Coast were generally larger in size and patterns of rank were much more defined (Matson and Coupland 1995:33). The more rigid social organization represented in these households has been attributed to the reduced resource variability in the north and, therefore, lower levels of reliability (Matson and Coupland 1995:32). Ranked villages were different than egalitarian villages in that there were differences in the sizes and organization of households, as was discussed briefly in section 5.2. Households are identified by the large depressions that remain after the site has long been abandoned. However, many of these village sites have been disturbed by horticulture activities of human groups that came much later. This destruction has severely limited what researchers can say about the settlement history of PRH. An example is Archer's (2001:209) study of egalitarian and ranked houses, where his sample of 60 known village sites had to be reduced to 21 due to damage.

The emergence of ranked villages on the north coast of British Columbia is dated to approximately AD 100 (Archer 2001:203); however, other researchers have suggested an earlier date of 500 BC (MacDonald and Inglis 1980:45). Archer's dates need to be corrected for the marine reservoir effect so MacDonald and Inglis are most likely correct in their date of 500 BC. In order to provide quantifiable data to compare one site to another, Archer used the coefficient of relative variation or CRV (Archer 2001:213). This is calculated by dividing the standard deviation by the mean and multiplying by 100; the higher the CRV value the higher the variability between house sizes (Archer 2001:213). A more up to date list of ranked vs. egalitarian villages was obtained through Andrew Martindale (in prep); however, it is considered a preliminary list. Some sites do not have designations due to intense post-contact gardening practices and some are considered villages simply because they have a name attributed to it through the *Adawx*.

The approach to determining the beginnings of social complexity is criticized by Patton (2012:18) in that the social organization of PRH was likely more complex that these simple categories of ranked or egalitarian; however, these patterns in village organization do exist and is a line of evidence that should not be ignored. Two sites were included in study although they were categorized as not villages in the spreadsheet: first, Gbto-18 was included although it is quite disturbed and does not have an *Adawx* name but it has a very refined chronology;

second; Gbto-31, better known as Boardwalk, was designated as a Shell Midden in the list compiled by Martindale. Other researchers (Coupland *et al*. 1993) consider it a village site and it is also one of the most intensively studied sites in PRH.

5-6 Presence of Other Features

The relationship between habitation sites and other types of archaeological sites is considered in this analysis. These other site types include: shell middens, rock art sites, burials, fish traps and weirs.

Shell Middens

The placement of habitation sites on the landscape may have been influenced by other site types, in particular small shell middens that may have been resource extraction areas. The villages would have sent out task groups to these locations for several reasons; it may have had particular high yields or possibly not to overharvest the intertidal associated with the village. If these are not absent from the landscape, the distances between village sites begin to make more sense, when considering sites as catchment areas.

Following Mackie (2003), the sites were buffered by 500 m to see if any non-habitation shell middens could be included into a village's midden zone (Figure 5.2). However, dates from non-habitation shell middens are severely lacking, therefore caution must be expressed when considering these sites as resource areas for the dated habitation sites.

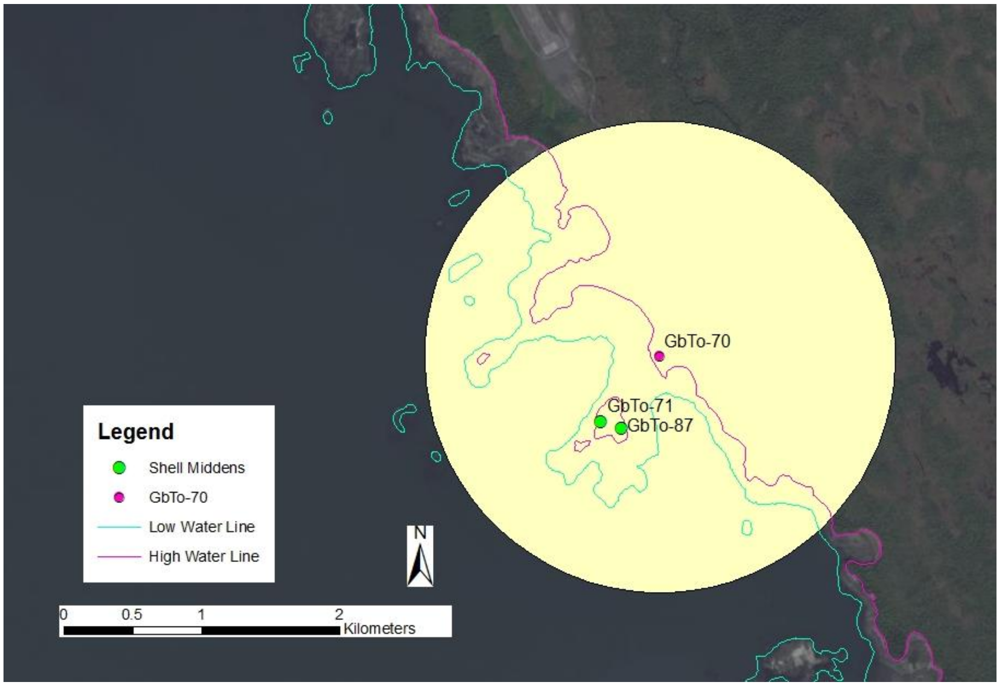

Figure 5.2: 500 m buffer around GbTo-70 showing the associated shell middens

An analysis of shell midden location is also useful to this thesis in that these areas represent resource extraction areas that were not selected to be habitation sites. Therefore, there may be certain variables that make these locations undesirable for village sites. The sites are analyzed using the same variables for the village sites to determine if there are any patterns in these sites that could suggest why they were not selected for habitation. Figure 5.3 illustrates all shell midden sites (n= 90) that are located within PRH not identified as habitations in the sources used for this thesis. It is important to note that some of these shell middens may have been villages disturbed by the gardening practices of the post-contact inhabitants of PRH. This disturbance may have levelled house depressions and destroyed other lines of evidence that indicated the presence of a village. However, many of these sites lack intensive archaeological investigations, so the designation as a non-habitation shell midden is considered preliminary.

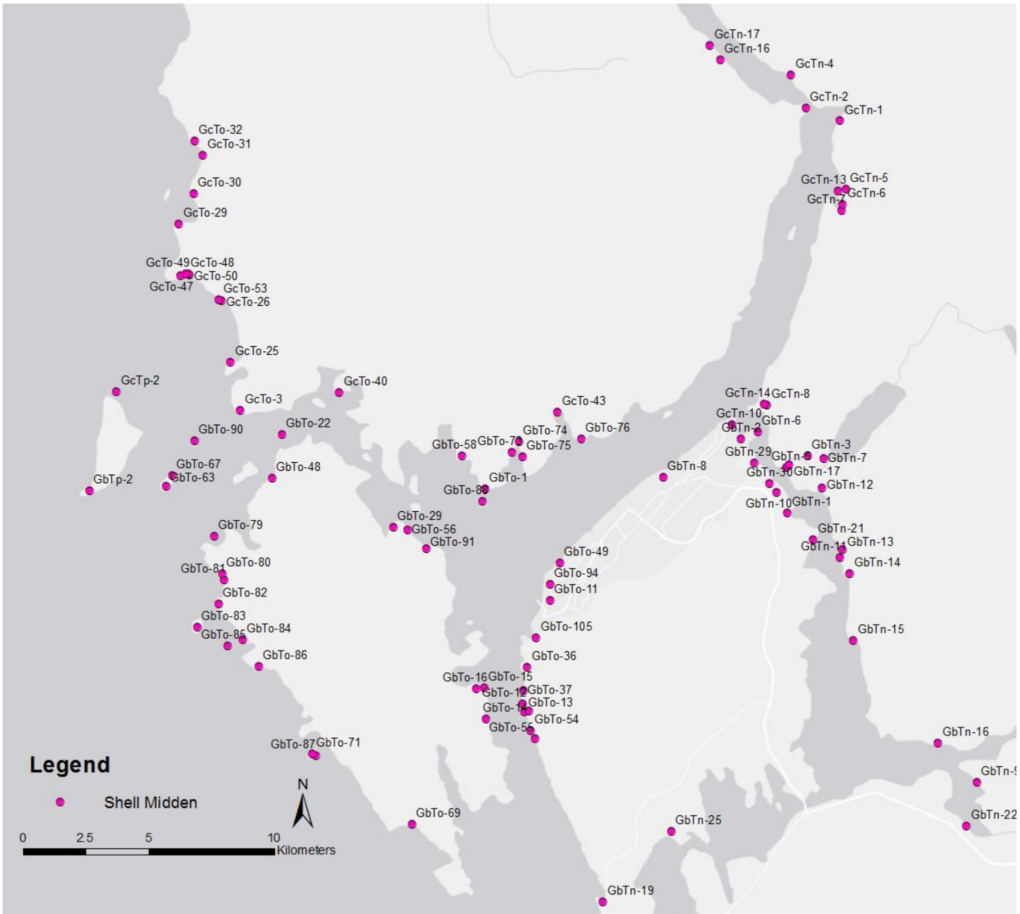

Figure 5.3: Non-habitation shell middens located in Prince Rupert Harbour

Rock Art and Burials

It is important to consider the association of villages to petroglyphs and burials, as these features have clear symbolic importance (Luby *et al*. 2006:209) and may explain why some groups continued to live in a particular area after the resources became stressed. In terms of resilience theory and social memory, these features may have made these locations areas of importance that continued to be visited after abandonment. Villages that are considered to be associated with one or both of these features, as indicated on site forms, and are considered the same site. Villages that were adjacent to these particular site types but have been given a separate Borden designation were also included.

Fish Weirs and Traps

Fish weirs and traps are important because these ingenuities would improve the yields of a particular waterway, making a location more desirable for habitation and able to support a larger population (Stewart 1982; Prince 2005). However, few weirs and traps have been identified in the harbour, although a single stone fish trap is located at the mouth of McNichol Creek (Patton 2012:69). The lack of fish traps may be the result of industrial and urban development, but because of the lack of fish weir sites, these data were omitted from the analysis.

5-7 Density and Nearest Neighbour Analysis

A density analysis was performed to calculate the frequencies of sites within polygons of irregular areas based on environmental characteristics (Thompson and Turck 2009:261). This is a simple task as all it requires is the clip the habitation sites by each of the polygons created that represent these different environmental areas. This was done following Erlandson *et al*. (1992:44), where they broke up the coast into four categories: outer coast (exposed), outer bay (semi protected), inner bay (protected), or riverine (pericoastal). The shorelines in PRH and in the vicinity of the Skeena estuary are highly indented and this results in much of the coastline being protected from direct ocean conditions. This is considered preferable by pre-contact inhabitants of the Northwest Coast for shelter from storms and access to certain species of shellfish who prefer calm waters over rough waters (Maschner and Stein 1995; Patton 2012).

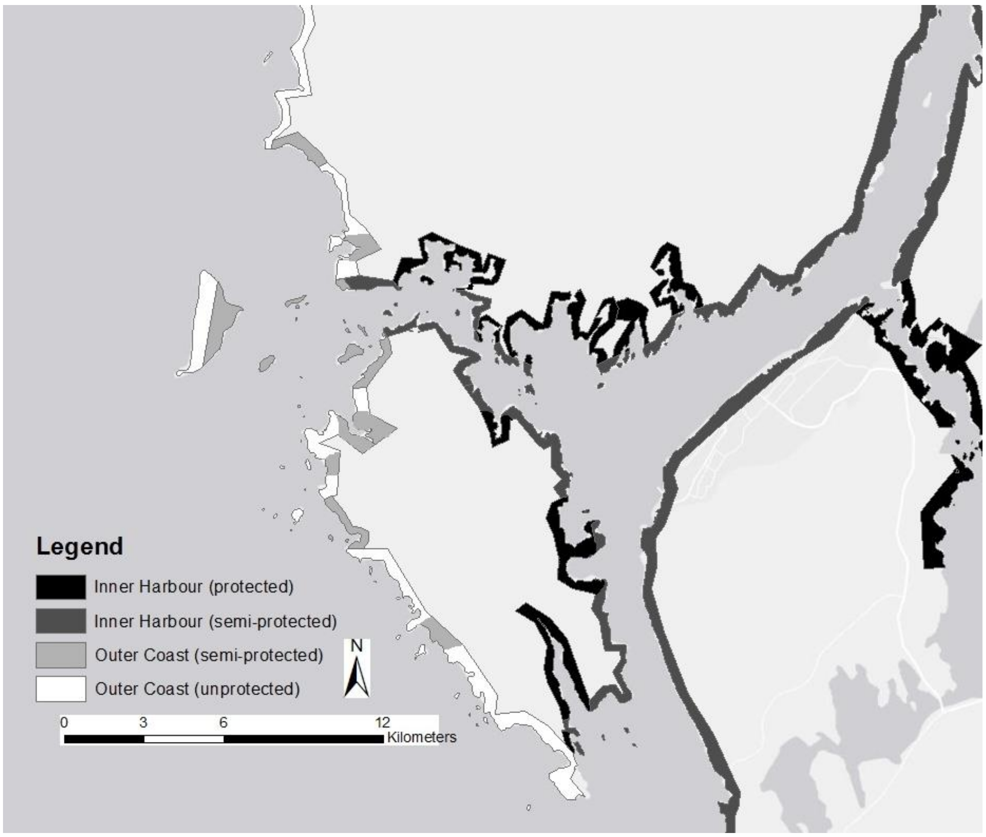

Figure 5.4: Different characteristics of the inner and outer harbour coastline

The coastline of the region was divided into four different categories in terms of protection from rough sea waters. These categories are as follows: Outer Coast (non-protected), Outer Coast (semi-protected), Inner Harbour (Semi-protected), and Inner Harbour (protected). This was done by drawing polygons of each category based on high resolution satellite imagery which are presented in Figure 5.4. There is some interpretative bias in this approach, but it was refined several times with feedback from Dr. Supernant. The site forms were also valuable in this exercise as several had information on the roughness of waters or smaller rock formations that provided some protection that were not as apparent in the satellite imagery.

Density analysis was also supplemented by a nearest neighbour analysis, a method which is one of the easiest ways to calculate if sites are statistically classified as clustered, dispersed, or random. This analysis generates a report that illustrates the difference between observed distance between sites and the expected distance between sites, assigning the distribution a z-score (Figure 5.5). It is calculated by dividing the mean of the observed distance between each point and its nearest neighbour by an expected value of *R* if the distribution was random. The z-values of 1.96 or greater indicate significant uniformity and values of -1.96 or lower indicate a trend towards significant clustering (Connolly and Lake 2006:165). This was done for each time period to determine if there was a trend for these village sites to become clustered over time; however, it must be noted that the increase in sites through time might leave no other option for sites to become more clustered. Another limitation of this calculation is that it detects spatial patterning between 1st nearest neighbours and not at higher order scales (Connolly and Lake 2006:165). To put it simply, it recognizes cluster patterns but does not recognize if there is a clustering of clusters. Secondly, nearest neighbour is significantly influenced by the size of the area to be analyzed, as the greater amount of empty space surrounding a central distribution of random points, the more likely it is that the pattern will be identified as clustered (Connolly and Lake 2006:166).

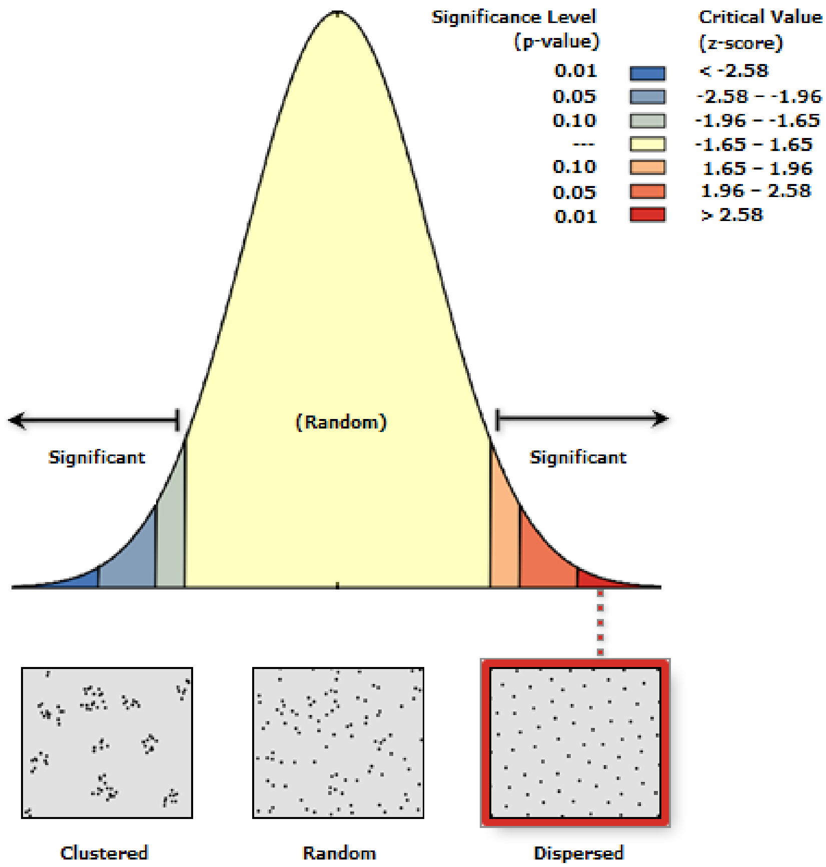

Figure 5.5: Report of the nearest neighbour analysis of 3500-3000 BP settlements

5-8 Buffer and Intersect Analysis

These are simple tools that can be used to determine if certain features are within a specified radius of another feature. This was used to analyze the proximity of sites to certain resources. However, it is important to understand the complications of using modern resource data. Modern data is used but the limitations are well known, as the changing climate and human impact on this region may have drastically changed the location of resources (Kvamme 2006:7).

This is particularly true of the area surrounding the modern city of Prince Rupert, where the resources are now gone due to the high amounts of harbour traffic and pollution. Disturbance of the city impacts the regional assessment of the harbour, as it gives the impression that this area of the harbour was not occupied in the past. Therefore, there should be some attempts at palaeoenvironmental reconstruction which, no matter how poor, is better than using present day data (Kvamme 2006:19). However, information on the historical location of resources is lacking and data required to reconstruct the environment is beyond the scope of this thesis. It appears that, although there has been change in the past 4000 years, "the basic ecological structure of PRH and the adjacent area appear to have been in place for thousands of years" (Patton 2012:53). The resources that will be discussed in this thesis are herring spawn areas, kelp beds, salmon streams, and fresh water resources.

Herring Spawn

Herring were important to the diets of the inhabitants of PRH for two reasons: for the fish itself and for their eggs. First, ethnohistoric accounts of the Tsimshian suggest that they harvested herring in the early spring (Miller 1997:21). However, this species of fish would migrate inshore in the late winter and would congregate in deep bays and inshore channels prior to spawning, allowing it to be fished at a number of different times throughout the year (Patton 2012:61). At other times during the year, herring may have been preferred as they use up most of their oil reserves by the time they spawn in the early spring (Miller 1997:21). Second, this fish is important for their eggs, which are considered a delicacy of Northwest Coast peoples (Stewart 1982). These eggs are deposited on seaweed in the early spring in certain areas annually, which was exploited by fisherman who would harvest this spawn-covered seaweed and pre-set material such as branches that were easier to harvest (Stewart 1982). Information on herring spawn locations was obtained through the provincial government through DataBC and is represented in ArcMap by a line along the coast. Areas highlighted by this line are the areas in which herring currently spawn on a yearly basis.

Kelp Beds

Kelp was a very important resource for the Tsimshian fishers as it was a commonly utilized material for making strong fishing lines. Kelp bulbs were also used to make large bentwood hooks (Stewart 1982). According to Miller (1997:21), the Tsimshian would harvest kelp in May, but it is not clear whether it was bull kelp (*Nareoceptis luetkeana*) or giant kelp (*Macrocystis pyrifera*) that were harvested (Patton 2012:50). This information on kelp forests was obtained through DataBC and is represented in ArcMap by light green circles.

Salmon Streams

As mentioned earlier, salmon was a particularly important species to the diet of pre-contact groups that lived in PRH. While the majority of salmon was obtained from the Skeena during the summer months, salmon spawn in all four seasons in a variety of locations (Patton 2012:65). There are ten streams that empty into the harbour that receive small runs of the five salmon species common to the area: pink, sockeye, chum, coho, and chinook. These ten streams are indicated in Figure 5.6 and were obtained from a recently published dissertation (Patton 2012:66). It must be noted however, these runs are small and inconsistent in comparison to the runs that take place on the Skeena River (Patton 2012:66).

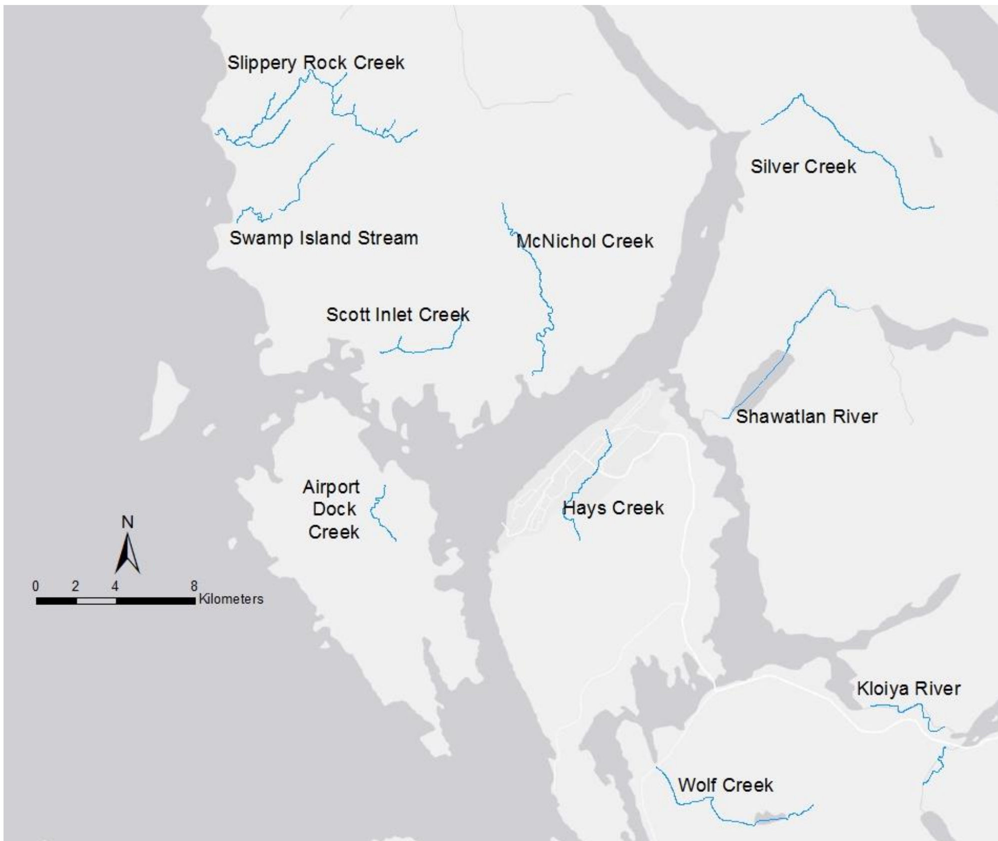

Figure 5.6: Streams that empty into Prince Rupert Harbour that receive small salmon runs

Fresh Water sources

Drinkable water is an important resource and proximity to a reliable source is absolutely necessary for survival in many parts of the world. In Prince Rupert Harbour this may not be case as the precipitation rates in this area are among the highest in British Columbia. If the groups that inhabited this region developed sophisticated water collecting techniques (Supernant 2012, pers.

comm.) the proximity to fresh water resources may not have been necessary. This may explain why some islands were inhabited as these would have no fresh water resources.

To determine the proximity to fresh water resources for drinking water, the ArcMap tool of buffer was used to determine which sites were located within 10m, 10-200m, and 200m+ of a freshwater resource. These categories were selected following the designations determined by Maschner (1996). These fresh water sources were based on river and stream data obtained from the Provincial government through DataBC. This approach was abandoned when this generated results that very few sites (n=2) were located within 10 m of these streams and rivers and only a few were located within 500 m of fresh water sources. This raised questions as to the resolution of the stream data and if many of the smaller streams were included in these data. As an alternative, site forms indicate the distance to the nearest fresh water source. This also verified the limitations of the stream data, as sites that are indicated to be within 10 m of a stream were not identified through the buffer of the stream data in ArcGIS.

Intertidal Size

The size of intertidal is important because this information may be correlated to the size of sites, following the logic that the larger the intertidal, the larger the population that could be supported by this resource area. Intertidal zones were particularly important during the winter months as a supplement to the salmon preserves. The larger sites would also need a larger intertidal, as shells may have been used as a construction material to model these shell mounds for habitation. Therefore, a large intertidal would result in a greater yield of shellfish, possibly making a location desirable for a habitation.

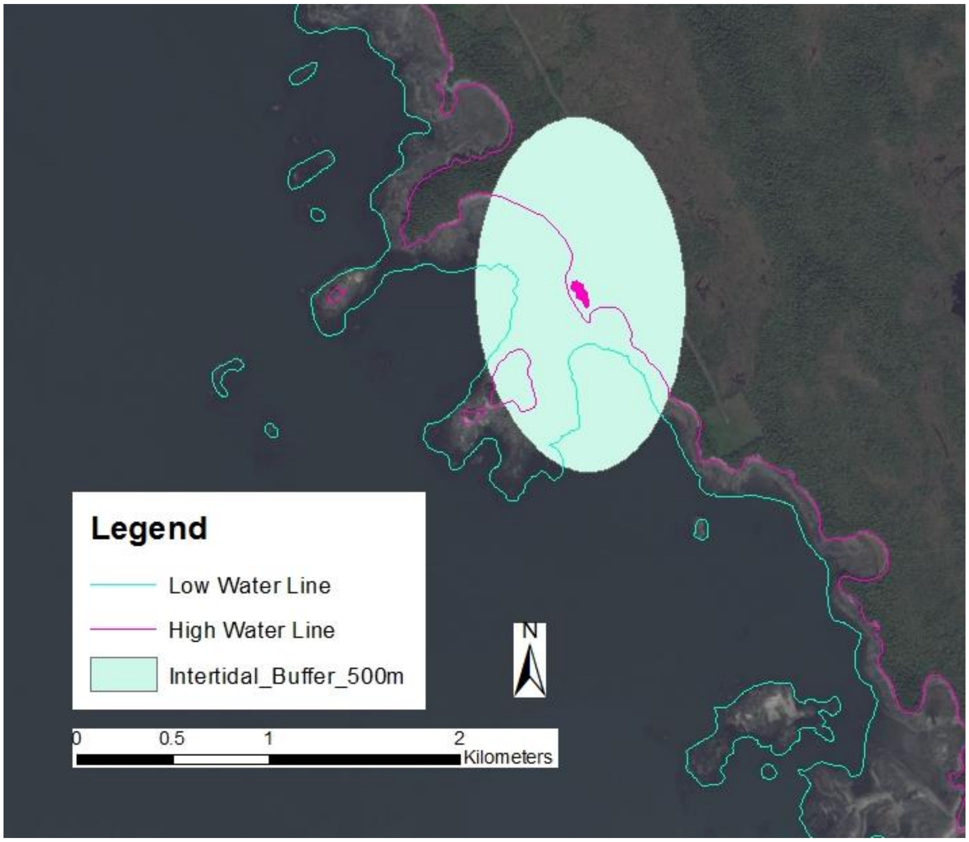

Figure 5.7: Buffer around GbTo-70 and the intertidal indicated by low and high water lines

To measure intertidal in a quantifiable and comparable way, each site polygon was buffered by a 500 m radius to see how much area of the intertidal intersects with this buffer (Figure 5.7). A 500 m buffer was used based on Mackie's (2003) suggestion that everything within this radius is considered within a 'midden zone.' The only portions of the intertidal that were included in this measurement were the portions that were adjacent to the site in question and could be accessed by foot. Instead of point data, the site polygons were used to generate the buffer as this resulted in a more accurate representation of intertidal area for the site. Information on the intertidal was derived from high and low tide data obtained from DataBC, the accuracy of which was verified through observation of high resolution satellite imagery obtained through !Bing.

5-9 Viewshed Analysis

One of the most common uses of spatial technology is the use of the GIS viewshed function, which is “a method of calculating the total area visible from a point within a raster model of regional topography relative to the viewer’s local elevation and height” and “give decaying value to increasingly distant locations within a viewshed” (McCoy and Ladefoged 2009:272). This function works by projecting a straight line-of-sight from the viewpoint to the target. If elevations of all intervening map cells fall below the line-of-sight, then the two points are held to be intervisible. If, on the other hand, the elevation of one or more intervening cells falls above the line-of-sight, then the line-of-sight is interrupted and so the two points are held to not be intervisible (Connolly and Lake 2006:227).

There are two aspects of visibility considered in this thesis that can be measured in two ways: arc of view and line-of-sight. First, arc of view is the ratio of a circle around a site that provides an excess of 100 m of unobstructed view over both land and water (Martindale and Supernant 2009:194). This is important as sites would have stationed lookouts, particularly during the late Middle Period, for incoming intruders. The less area that could be seen from the village the more vulnerable the village would be to attack. Following Martindale and Supernant (2009:194), arc of view is calculated as the ratio of the circle around a site that provides in excess of 100 m of view over water:

$$V = V_{100} \text{ (Degrees of visibility in excess of 100m)} / P \text{ (Degrees of approach around the site)}$$

This will give the site a *V* between 0-1; the higher the value, the more unobstructed the viewshed is and therefore the greater the visibility. Second, line-of-sight is the total number of sites that can be seen from a site. This is important in terms of the defensibility of a site as an early warning system between sites. If intruders entered the harbour and attacked a village they could signal other villages of the impending attack.

There are some theoretical issues in using GIS software to calculate intervisibility. The first of which is the curvature of the Earth, meaning there is a maximum distance that the observer can see even over open water (Connolly and Lake 2006:229). This is a problem that can be overcome by creating a radius or maximum distance of the viewer, which in this study is 5 km. Secondly, the accuracy of viewshed analyses depends on the quality of DEM and how well this represents reality. It is also important to note that the DEM used in this thesis is a modern DEM, although the PRH landscape may not have changed that much in the last 5000 years since the sea levels stabilized. The most common criticism of visibility analyses is the palaeovegetation factor in that tree height may have blocked the viewer's line-of-sight of certain cells (Connolly and Lake 2006:231). This problem did not affect the arc of view results because only the visibility over approachable water was important to this analysis. However, there were several villages deemed intervisible by the line-of-sight analysis that may have been disrupted by vegetation. To account for this problem, the line-of-sight analysis was performed only considering sites to be intervisible over open water. Any villages within the viewshed raster that were visible only over land were considered not intervisible. Lastly, the height of the observer must be considered, as your results will be skewed if visibility is calculated from ground level. In this thesis, an average height of 1.7 m was decided on.

To generate a viewshed for each village, three types of data were used. First, DEM data obtained from DataBC clipped by village polygons. This had varied success as the resolution of the DEM was 25 m and the spacing of these elevation points could miss sites altogether or have several points for a single village. Second, Total Station data collected by myself and Dr. Supernant in the summer of 2012 was used; however, these data were only available for four sites that were intensively mapped: Gbto-4, GbTo-34, GbTo-70, and GcTo-39. Third, for those sites where neither data were available, the ArcMap tool feature to point was used to generate a point from the village polygons. However, these points have two drawbacks in that the point is generated to the centre of the feature and it does not have an elevation attributed to it. The centeredness of the point is an issue because this may affect the quality of the viewshed in that typically a lookout point would be established near the edge of the site and at a number of locations. To determine the elevation, the ArcMap tool extract values to point was to interpolate a value for the point based on the surrounding DEM data.

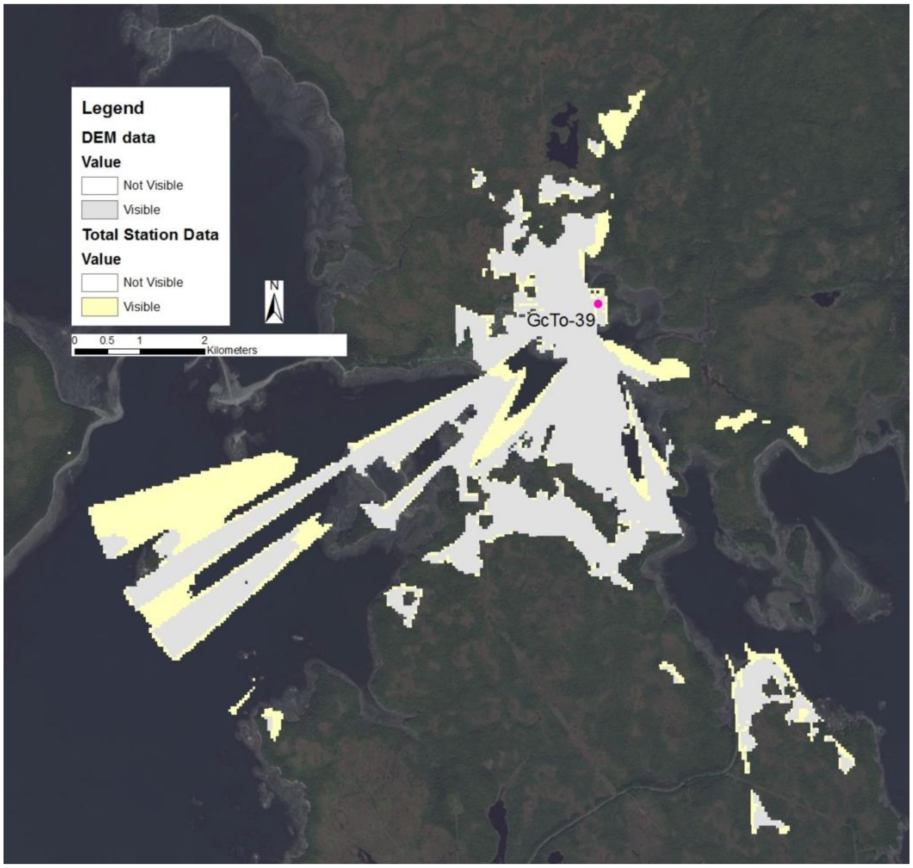

Figure 5.8: Difference for GcTo-39 viewsheds using Total Station vs. DEM data

To determine if these different types of data would affect the results of this analysis in any way, viewsheds were generated using all three types of data for GcTo-39 which had all three types available (GbTo-70 had all three types but because of its location on the outer coast of Digby Island all three viewsheds were virtually identical; GbTo-34 and GbTo-4 were missing the data generated by clipping the DEM). The viewsheds generated using feature to point data or by clipping the DEM by features were identical but there was a slight change in the viewshed generated using total station data (Figure 5.8). The only area where there was significant difference is near Tugwell Island; however, the number of contemporary sites (n = 5) that can be seen from GcTo-39 does not change. Also, when determining which sites were visible from a village, the polygon shapefiles were used instead of simple point data which does not truly represent the village. Therefore, if any portion of the viewshed raster comes in contact with the polygon of the site, it is considered visible from the site.

5-10 Summary

The variables listed in this chapter will be used to determine which of these factored in the site selection decisions of the Coast Tsimshian that inhabited PRH from 3500-1000 BP. The following sites were omitted from the study based on a lack of data available: GbTo-17, GbTo-20, GbTo-25, GbTo-72, GcTo-1, GcTo- 4, GcTo-5, GcTo-10, GcTo-11, GcTo-41, and GcTn-9. However, the remaining 37 sites still gives a strong representative sample of PRH sites and will be analyzed using various ArcGIS tools, including Density and Nearest Neighbour Analysis; Buffer and Intersect; and Viewshed Analysis.

Chapter 6: Results

6-1 Introduction

In this chapter, the results of the settlement pattern analysis are presented and discussed. The chapter is divided into four sections: 6.2 Proximity to Resources, 6.3 Patterns in Site Distribution, 6.4 Non-Habitation Shell Middens, and 6.5 Defensibility. In section 6.2, the results of the buffer and intersect analysis are presented and the methodological issues, particularly the use of modern resource data, are addressed. The data shows trends in resource proximity but these results may have been influenced by modern human development. Also, there may have been several non-environmental explanations for these patterns. In section 6.3, the results of the nearest neighbour analysis are presented and the limitations of this analysis are also considered. There was a trend toward a clustered distribution, but issues of sample size vs. study area may have influenced the results. Other patterns in site distribution are presented in terms of site location and aspect, but also in several other village characteristics, such as: site size, intertidal size, ranked vs. egalitarian, association with rock art, and association with burials. In section 6.4, the non-habitation shell middens located within the harbour were analyzed using the same applicable variables used in the previous two sections. It is interesting to consider what factors made these sites unsuitable for occupation and what these observations reveal about the sites that were selected for village sites. Finally, section 6.5 presents the results of the viewshed analysis in terms of line-of-sight, which demonstrates the intervisibility between villages, and arc of view, which demonstrates the total degrees of approachable water that can be seen from each village. A Table (6.1) containing data for sections 6.2 and 6.3 will be at the beginning of section 6.2, while Tables for Non-Habitation Shell Middens and Defensibility will be at the beginning of their respective sections. Through observation of these data, apparent patterns in site selection and temporal trends are discussed briefly, but will be revisited in Chapter 7.

6-2 Proximity to Resources

The following tables contain the results of the analysis and are indicated as follows: distance to fresh water (water), proximity to kelp beds (kelp), proximity to herring spawning grounds (herring), aspect, location, ranked or egalitarian village (R or E), intertidal size (intertidal), site size (site), associated burials (burials), and associated art (art). These are divided into five separate tables based on general age category of the site: 3500-3000 BP (Table 6.1), 3000-2500 BP (Table 6.2), 2500-2000 BP (Table 6.3), 2000-1500 BP (Table 6.4), and 1500-1000 BP (Table 6.5).

Table 6.1: Data for sites dated to 3500-3000 BP

Borden	Water	Kelp	Herring	Aspect	Location	R or E	Intertidal	Site	Burials	Art
GbTo-18	>200m	no	no	N/A	IHSP	?	S	M	Y	N
GbTo-31	<10m	no	no	W	IHP	?	M	S	Y	N
GbTo-33	<10m	no	no	W	IHSP	R	?[1]	M	Y	N
GbTo-34	<10m	no	yes	W	IHSP	R	M	M	Y	Y
GbTo-64	10-200m	no	no	N	IHSP	E	S	L	N	N
GbTo-77	10-200m	yes	yes	W	OHSP	E	S	S	Y	N

[1]Modern development has made a measurement of intertidal impossible

Table 6.2: Data for sites dated to 3000-2500 BP

Borden	Water	Kelp	Herring	Aspect	Location	R or E	Intertidal	Site	Burials	Art
GbTo-4	>200m	no	yes	S	IHSP	R	L	L	N	Y
GbTo-10	>200m	no	no	W	IHSP	R	?[1]	M	Y	N
GbTo-18	>200m	no	no	N/A	IHSP	?	S	M	Y	N
GbTo-31	<10m	no	no	W	IHP	?	M	S	Y	N
GbTo-33	<10m	no	no	W	IHSP	R	?[1]	M	Y	N
GbTo-34	<10m	no	yes	W	IHSP	R	M	M	Y	Y
GbTo-46	>200m	yes	no	W/E	OHSP	E	M	S	Y	N
GbTo-59	>200m	no	yes	S	IHP	E	M	S	N	Y
GbTo-64	10-200m	no	no	N	IHSP	E	S	L	N	N
GbTo-77	10-200m	yes	yes	W	OHSP	E	S	S	Y	N

[1]Modern development has made a measurement of intertidal impossible

Table 6.3: Data for sites dated to 2500-2000 BP

Borden	Water	Kelp	Herring	Aspect	Location	R or E	Intertidal	Site	Burials	Art
GbTo-4	>200m	no	yes	S	IHSP	R	L	L	N	Y
GbTo-5	<10m	no	no	E	IHSP	R	S	M	N	N
GbTo-7	<10m	no	yes	S	IHP	R	S	M	N	N
GbTo-8	10-200m	no	yes	S	IHP	R	M	M	N	N
GbTo-9	10-200m	no	yes	E	IHP	R	S	M	N	N
GbTo-18	>200m	no	no	N/A	IHSP	?	S	M	Y	N
GbTo-23	>200m	no	no	W	IHSP	R	L	M	Y	N
GbTo-24[2]	>200m	no	yes	E	OHSP	R	L	L	Y	N
GbTo-28	<10m	no	no	N	IHSP	R	M	L	N	N
GbTo-31	<10m	no	no	W	IHP	?	M	S	Y	N
GbTo-33	<10m	no	no	W	IHSP	R	?[1]	M	Y	N
GbTo-34	<10m	no	yes	W	IHSP	R	M	M	Y	Y
GbTo-46	>200m	yes	no	?	OHSP	E	M	S	Y	N
GbTo-59	>200m	no	yes	S	IHP	E	M	S	N	Y
GbTo-64	10-200m	no	no	N	IHSP	E	S	L	N	N
GbTo-66	>200m	no	yes	W	OHSP	R	S	S	Y	N
GbTo-70	10-200m	yes	yes	W	OHSP	E	S	S	N	N
GbTo-77	10-200m	yes	yes	W	OHSP	E	S	S	Y	N
GbTo-78	<10m	yes	yes	W	OHSP	R	S	M	N	N
GbTo-89	>200m	no	yes	W	OHSP	R	M	M	Y	N
GcTo-6	<10m	no	yes	S	IHP	R	S	M	N	N
GcTo-27	>200m	yes	yes	S	OHSP	E	M	S	N	N
GcTo-51	10-200m	yes	yes	S	OHSP	R	M	M	N	N
GcTo-52	<10m	yes	yes	W	OHSP	R	M	L	N	N

[1]Modern development has made a measurement of intertidal impossible

[2]GbTo-24 includes the neighbouring sites on Tugwell Island (GcTp-3 and GbTp-3).

Table 6.4: Data for sites dated to 2000-1500 BP

Borden	Water	Kelp	Herring	Aspect	Location	R or E	Intertidal	Site	Burials	Art
GbTo-3	<10m	no	yes	S	IHSP	R	L	L	N	Y
GbTo-4	>200m	no	yes	E	IHSP	R	L	M	N	N
GbTo-5	<10m	no	no	E	IHSP	R	M	M	N	Y
GbTo-6	>200m	no	no	S	IHP	R	S	M	N	N
GbTo-7	<10m	no	yes	S	IHP	R	M	M	N	N
GbTo-8	10-200m	no	yes	E	IHP	R	M	M	N	N
GbTo-19	<10m	no	yes	N	IHSP	R	S	M	N	Y
GbTo-21	>200m	no	no	N	IHSP	R	L	L	N[3]	Y
GbTo-23	>200m	no	no	W	IHSP	R	L	M	Y	N
GbTo-24[2]	>200m	no	yes	E	OHSP	R	L	L	Y	N
GbTo-26	<10m	no	no	N	IHSP	R	S	M	N	N
GbTo-28	<10m	no	no	N	IHSP	R	M	L	N	N
GbTo-31	<10m	no	no	W	IHP	?	M	S	Y	N
GbTo-32	<10m	no	no	E	IHSP	R	S	L	Y	N
GbTo-33	<10m	no	no	W	IHSP	R	?[1]	M	Y	N
GbTo-34	<10m	no	yes	W	IHSP	R	M	M	Y	Y
GbTo-35	>200m	no	no	N	IHSP	R	S	M	N	Y
GbTo-57	>200m	no	yes	S	IHP	R	M	S	N	N
GcTo-2	<10m	no	yes	S	IHSP	R	S	M	N	Y
GcTo-6	<10m	no	yes	S	IHP	R	S	M	N	N
GcTo-27	>200m	yes	yes	S	OHSP	E	M	S	N	N
GcTo-28	>200m	yes	yes	W	OHNP	E	M	S	N	N
GcTo-39	<10m	no	yes	W	IHP	E	S	M	N	N
GcTo-51	10-200m	yes	yes	S	OHSP	R	M	M	N	N

[1]Modern development has made a measurement of intertidal impossible

[2]GbTo-24 includes the neighbouring sites on Tugwell Island (GcTp-3 and GbTp-3).

[3]There are burials at GbTo-21 but they are from a historic graveyard.

Table 6.5: Data for sites dated to 1500-1000 BP

Borden	Water	Kelp	Herring	Aspect	Location	R or E	Intertidal	Site	Burials	Art
GbTo-2	>200m	no	yes	S	IHSP	R	L	L	N	N
GbTo-31	<10m	no	no	W	IHP	?	M	S	Y	N
GbTo-33	<10m	no	no	W	IHSP	R	?[1]	M	Y	N
GbTo-34	<10m	no	yes	W	IHSP	R	M	M	Y	Y
GcTo-6	<10m	no	yes	S	IHP	R	S	M	N	N

[1]Modern development has made a measurement of intertidal impossible

Herring Spawn

As seen in Figure 6.1, there are three locations where herring does not spawn in the modern PRH: northern Digby Island (GbTo-5, GbTo-6, GbTo-21, GbTo-26, GbTo-28, GbTo-35, and GbTo-64); eastern Kaien Island (GbTo-10, GbTo-18, GbTo-31, GbTo-33); and southern Digby Island (GbTo-28, GbTo-32, and GbTo-46).

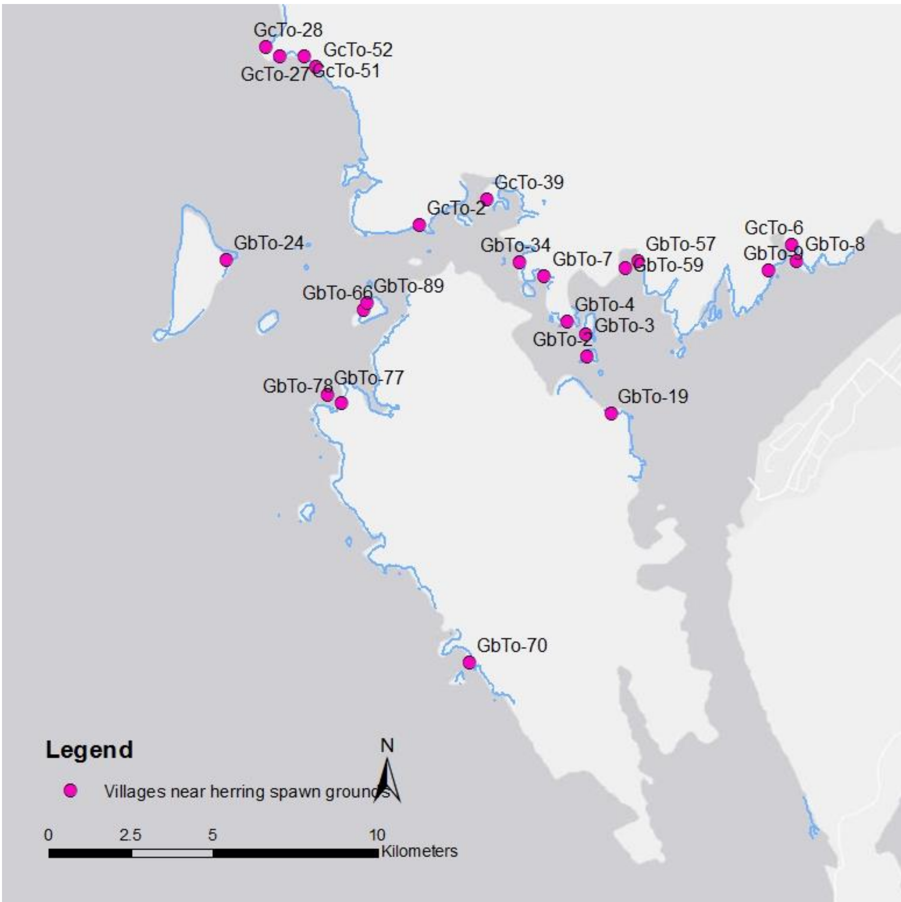

Figure 6.1: Sites associated with herring spawn grounds

The lack of herring spawning grounds on eastern Kaien Island is likely explained by the presence of the modern city of Prince Rupert and the high traffic area where GbTo-10 and GbTo-33 are located. Therefore, those two sites were not included in this analysis. The lack of herring spawn on northern Digby may be explained by the high amount of boat traffic that passes through the Venn passage. This does not explain why herring still spawns in other parts of the passage and, in particular, around Metlakatla, which experiences a high amount of boat traffic. For each time period, the percentage of sites within 500 m of a herring spawning grounds is illustrated in Figure 6.2. These results demonstrate that there was an increasing trend over time to areas where herring spawn.

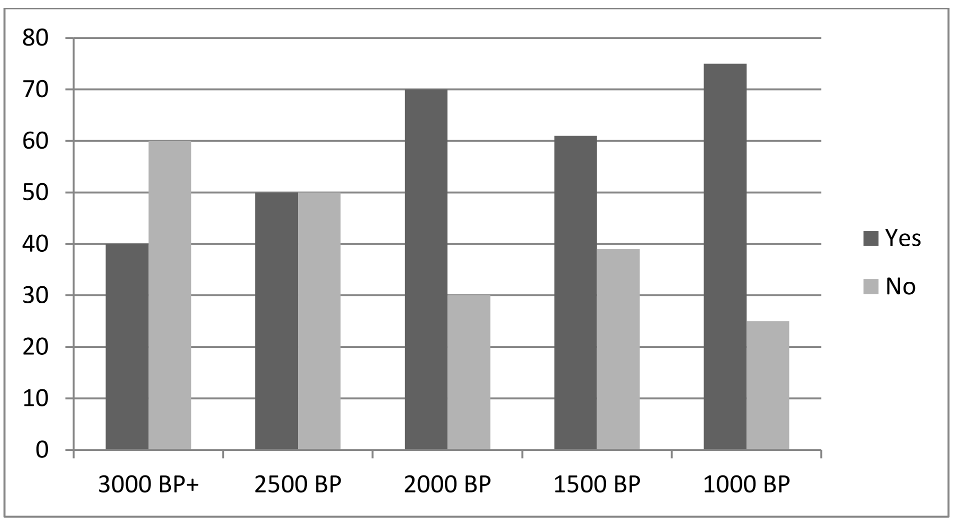

Figure 6.2: Percentage of sites associated with herring spawn grounds

Kelp Beds

Of the 37 sites included in this study, 29 (78.4%) were not located near kelp beds as illustrated in Figure 6.3. The modern data on Kelp beds demonstrates that this resource is only found on the outer coast (Figure 6.4). Only eight sites (GbTo-46, GbTo-70, GbTo-77, GbTo-78, GcTo-27, GcTo-28, GcTo-51, and GcTo-52) are situated near kelp forests.

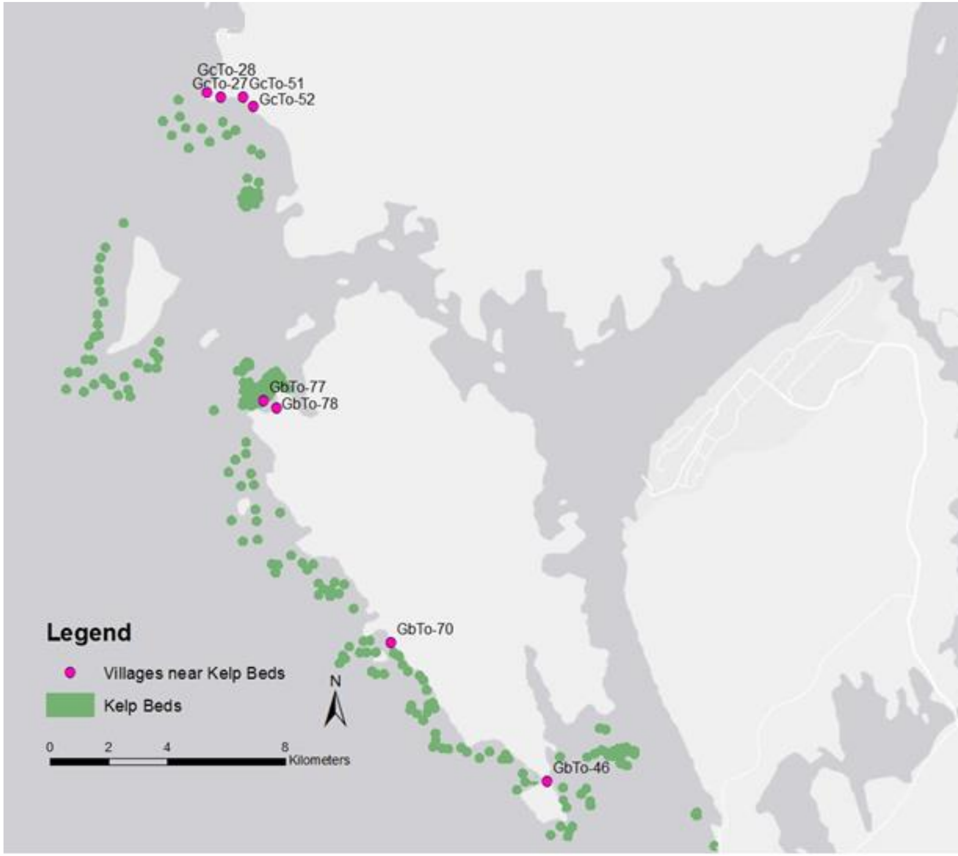

Figure 6.3: The location of kelp beds and the villages located near them

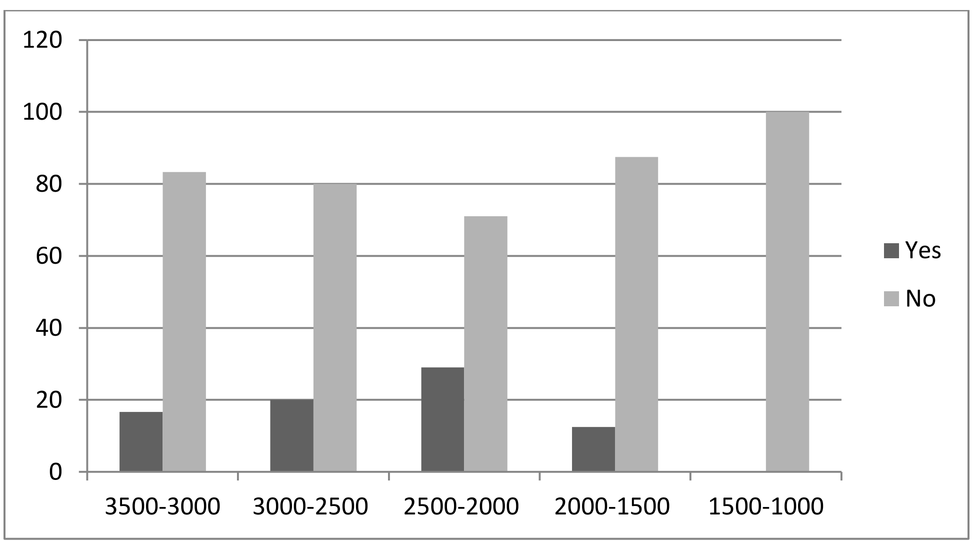

Figure 6.4: Percentage of sites associated with Kelp Beds

As mentioned earlier, the lack of kelp beds in the inner harbour may be the result of the high amount of boat traffic that passes through harbour and Venn passage. Through time, there appears to be a trend away from these resource areas, much more drastically from the herring spawning grounds. For the five time periods, the percentage of sites located near kelp beds is illustrated in Figure 6.4. The presence of sites near kelp beds peaks between 2500-2000 BP and then declines between 2000-1500 BP. However, this migration away from kelp rich areas may have been for other reasons discussed later, such as the defensibility of the inner harbour.

Water sources

The 37 sites were all assigned to one of three categories based on distance from a fresh water source: <10 m (n = 15), 10-200 m (n = 6), or >200 m (n = 16) (Figure 6.5). When observed over time, the percentage of sites within each category by time period is illustrated in Figure 6.6. These numbers suggest that proximity to fresh water sources became more important through time; however, due to the large number of sites located more than 200 m away, it seems it was not absolutely necessary. As mentioned earlier, innovations in water collecting techniques may have made proximity to fresh water sources unnecessary.

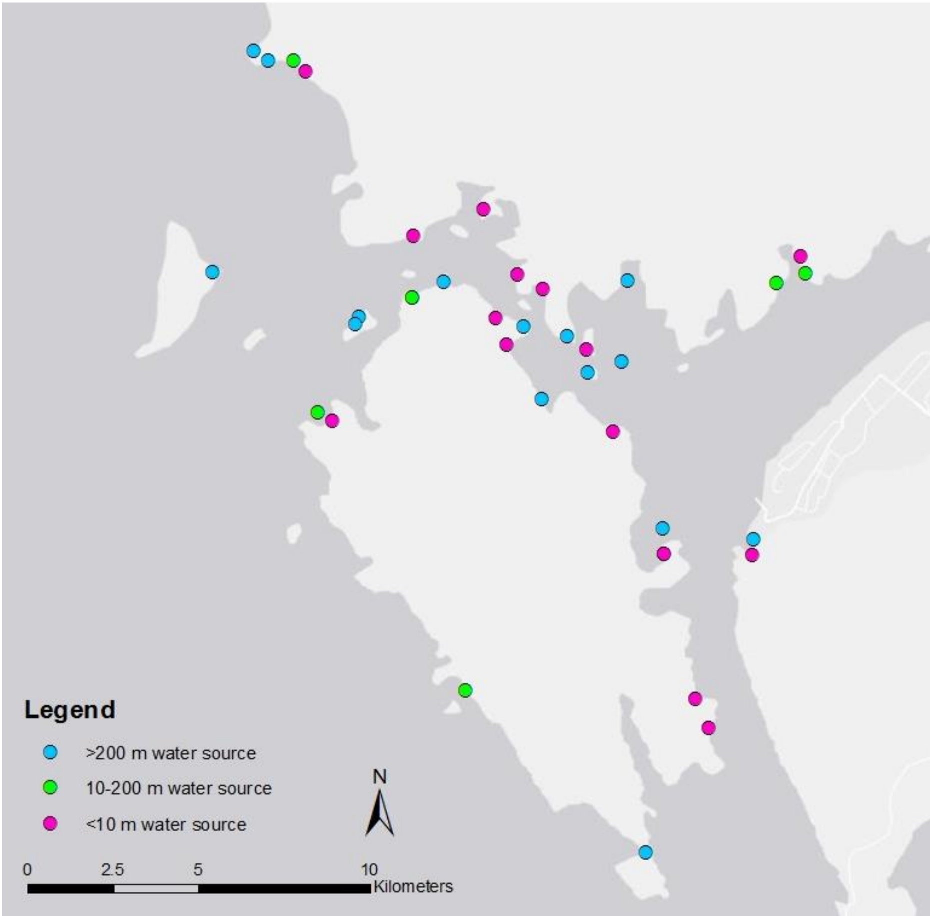

Figure 6.5: Sites categorized by distance to fresh water sources

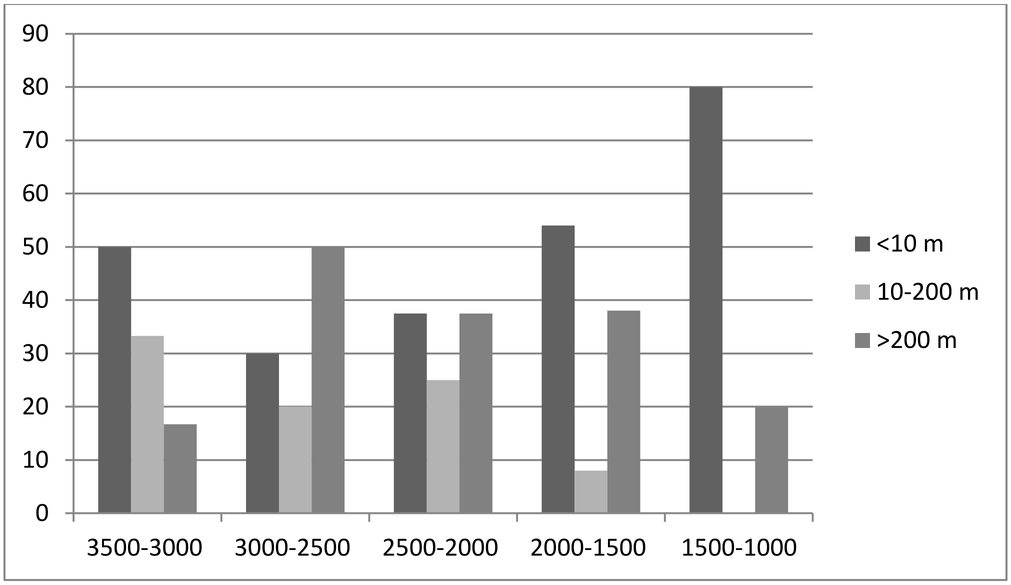

Figure 6.6: Percentage of sites by distance from water sources

Salmon Streams

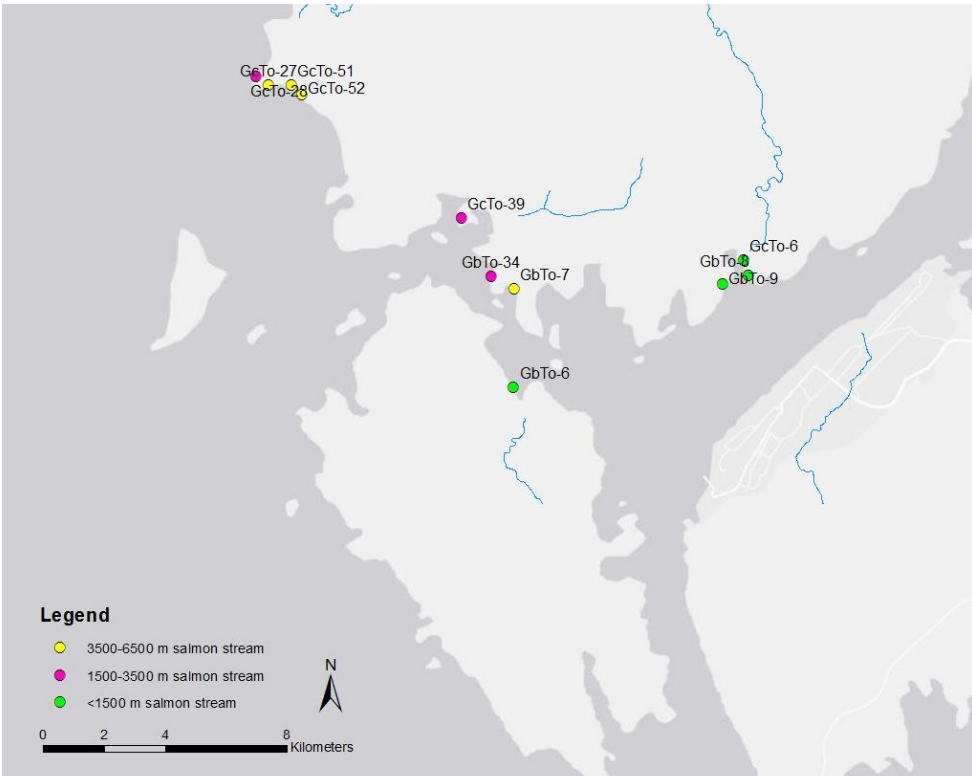

Figure 6.7: Proximity of villages to salmon streams

The number of villages located near salmon streams by distance category is as follows: (n=4) <1500 m, (n=3) 1500-3500 m, and (n=4) 3500-6500 m. The rest of the sites were more than 6500 m away from any of the salmon streams that empty into Prince Rupert Harbour. It seems immediate proximity to salmon streams was not important, which may be explained by the nature of this resource as only periodically available.

Shell Middens

Table 6.6: Non-habitation Shell Middens within 500 m of villages

Village	#Middens	Borden
GbTo-3	0	N/A
GbTo-4	0	N/A
GbTo-5	0	N/A
GbTo-6	1	GbTo-29
GbTo-7	0	N/A
GbTo-8	1	GbTo-76
GbTo-9	0	N/A
GbTo-10	1	GbTo-105
GbTo-18	0	N/A
GbTo-19	1	GbTo-91
GbTo-23	0	N/A
GbTo-24	0	N/A
GbTo-26	0	N/A
GbTo-28	0	N/A
GbTo-31	0	N/A
GbTo-32	0	N/A
GbTo-33	1	GbTo-105
GbTo-34	0	N/A
GbTo-35	0	N/A
GbTo-46	0	N/A
GbTo-57	0	N/A
GbTo-59	0	N/A
GbTo-64	1	GbTo-22
GbTo-66	0	N/A
GbTo-70	2	GbTo-71, 87
GbTo-77	1	GbTo-79
GbTo-78	1	GbTo-79
GbTo-89	0	N/A
GcTo-2	0	N/A
GcTo-6	2	GcTo-43,GbTo-76
GcTo-27	4	GcTo-47, 48, 49, 50
GcTo-28	1	GcTo-47
GcTo-39	1	GcTo-40
GcTo-51	4	GcTo-47, 48, 49, 50
GcTo-52	3	GcTo-49, 50, 53

Of the 37 sites included in this study, 15 sites had a non-habitation shell midden located within 500 m of the site. However, only five of these villages have two or more of these shell middens associated with them. Because of a lack of dates associated with these shell midden sites, it is incorrect to assume these sites are contemporaneous with the village sites. However, given that 40.5% (n=15) of the villages had a non-habitation shell midden within 500 m, it seems the majority of the sites supported themselves with their local intertidal or were travelling by canoe to other resource areas, which may have had additional resources located nearby.

6-3 Patterns in Site Distribution

A nearest neighbour analysis was performed on the villages for each of the five time periods and the results are listed in Table 6.7. These results show that at no point in the history of PRH were villages organized in a statistically clustered way with z-values less than -1.96. However, these data do suggest that during the Late Middle Period (2000 – 1500 BP), which was the time of abandonment and reoccupation of the harbour, villages became more clustered. This is indicated by the R-values of 0.88 and 0.90 respectively, which are less than 1, indicating a clustered distribution of sites (Conolly and Lake 2006:165). The clustered nature of these two time periods can be seen in Figures 6.10 and 6.11, in which the villages become concentrated in the Venn passage located north of Digby Island. This is in contrast to the other three time periods which are illustrated in Figures 6.8, 6.9, and 6.12, when there appears to be a less structure to the placement of villages. However, this trend towards clustering may have been influenced by the dramatic increase of the sample size of sites dated to 2500-2000 BP and 2000-1500 BP. In these time periods, the sample size was 24 villages, while the other three time periods have significantly smaller sample sizes (3500-3000 BP = 6; 3000-2500 BP = 10; and 1500-1000 BP = 5). Nearest neighbour analysis is influenced by the size of the area analyzed (Conolly and Lake 2006:166) and given that the same study area was used for all five time periods, it is not surprising that those time periods with the most sites appeared to be the most clustered. Therefore, the results of the nearest neighbour analysis should be considered preliminary, but observation of Figure 6.10 and Figure 6.11 shows there was trend toward clustering in these two time periods, particularly in Venn passage.

Table 6.7: Results of Nearest Neighbour Analysis

Time Period	R-value	Z-value	P-value	C/R/D
3000 BP+	1.55	2.60	0.01	Dispersed
2500 BP	1.24	1.45	0.15	Random
2000 BP	0.88	-1.11	0.27	Random
1500 BP	0.90	-0.90	0.37	Random
1000 BP	2.18	5.04	0	Dispersed

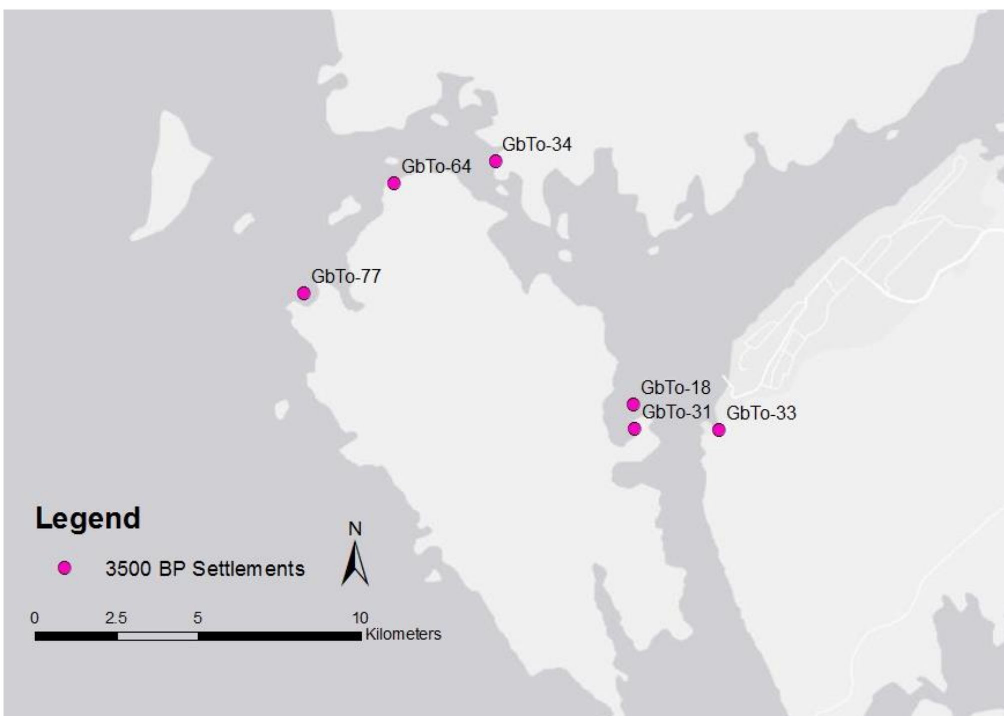

Figure 6.8: Village sites dated to 3500-3000 BP

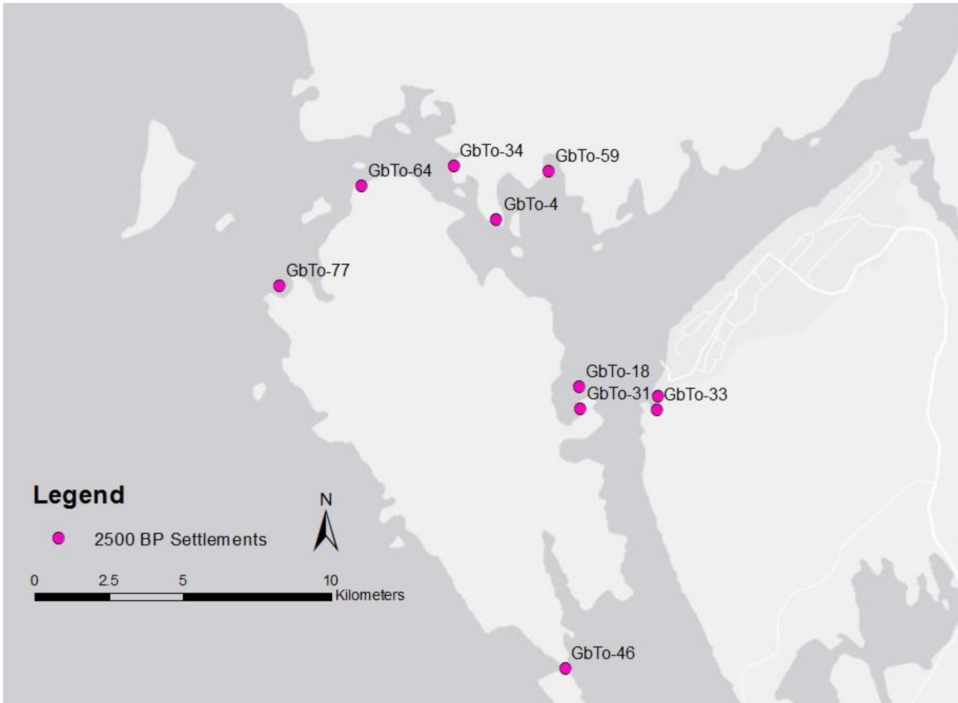

Figure 6.9: Village sites dated to 3000-2500 BP

Figure 6.10: Village sites dated to 2500-2000 BP

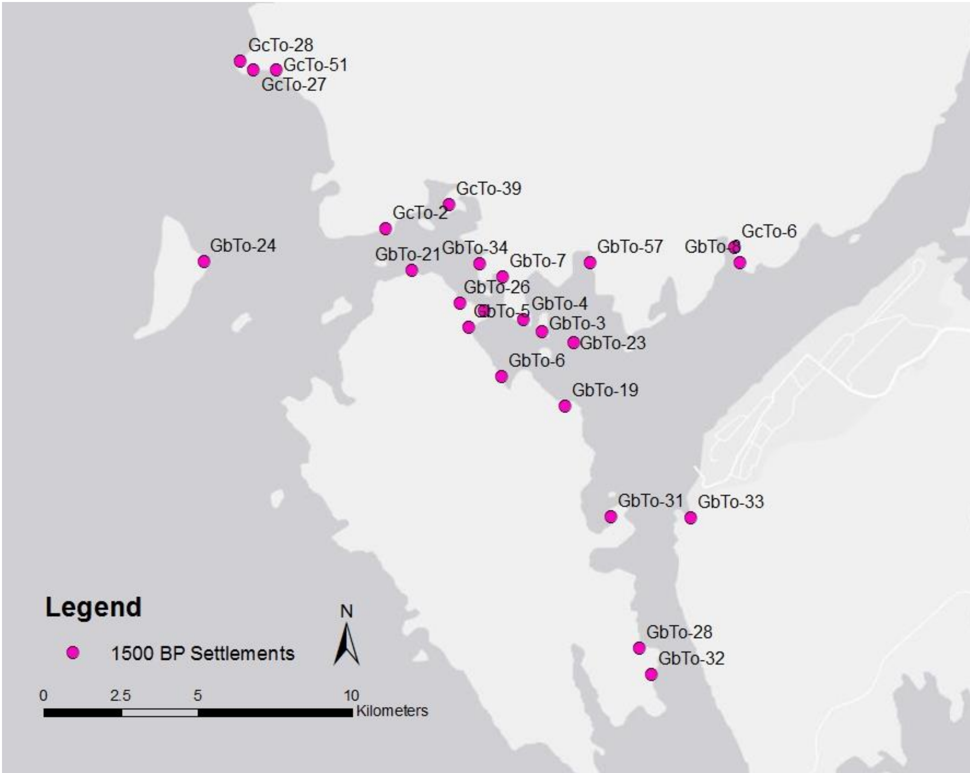

Figure 6.11: Village sites dated to 2000-1500 BP

Figure 6.12: Village sites dated to 1500-1000 BP

Aspect

Of 35 sites (GbTo-18 and GbTo-46 were omitted for reasons discussed in section 5.2) included in this study, each was categorized as having an aspect of one of the four cardinal directions: north (n = 5), south (n = 11), east (n = 6), and west (n = 13) which can be seen in Figure 6.13 and the temporal trend is illustrated in Figure 6.14. It was expected that the majority of the sites would face south, because these sites would have benefitted from warm southern winds. However, there were more sites that face west, which could be explained by the fact that sites located within the Venn Passage faced west to see incoming visitors or intruders as they entered the harbour channels. Also, the large number of sites on western sides of Digby Island, Kaien Island, and Tsimpsean Peninsula had little option in the direction that these villages face, because most villages faced the intertidal in order to maximize this resource area. Therefore, aspect may have been strongly influenced by location.

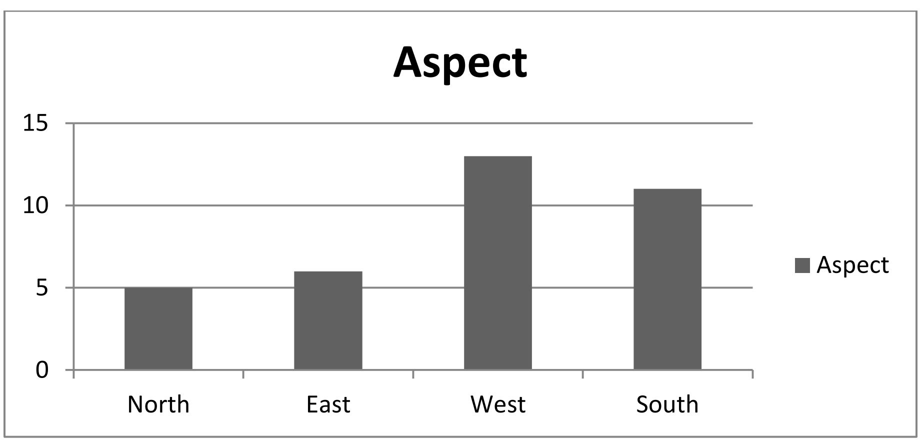

Figure 6.13: Number of villages by aspect

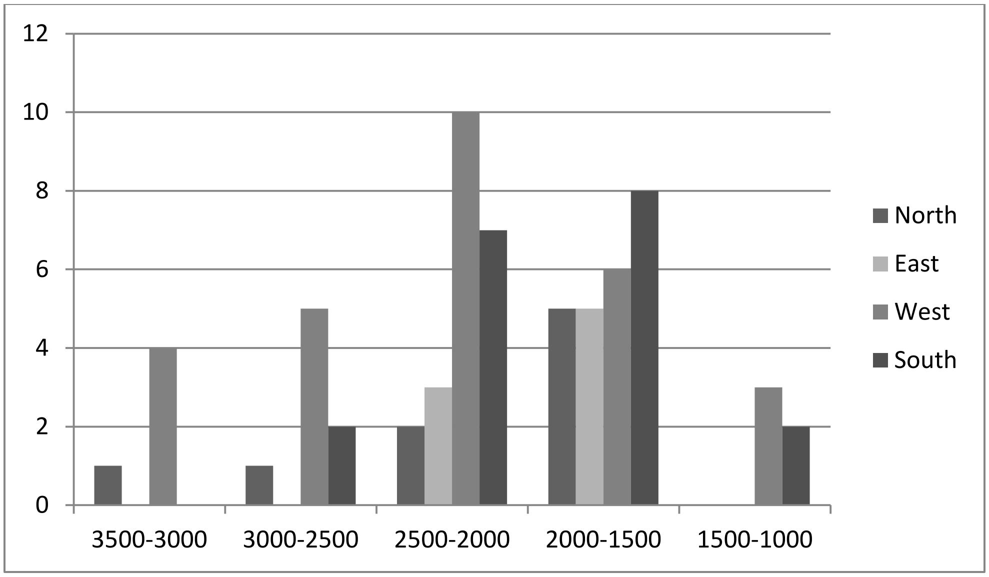

Figure 6.14: Temporal trends in village aspect

Location

The 37 sites included in this study were categorized according to the four environmental polygons based on protection from oceanic conditions: outer harbour not-protected (n = 1); outer harbour semi-protected (n = 10); inner harbour semi-protected (n = 17); and inner harbour protected (n = 9) which can be seen in Figure 6.15 and the temporal trend is illustrated in Figure 6.16.

Figure 6.15: Location of village sites

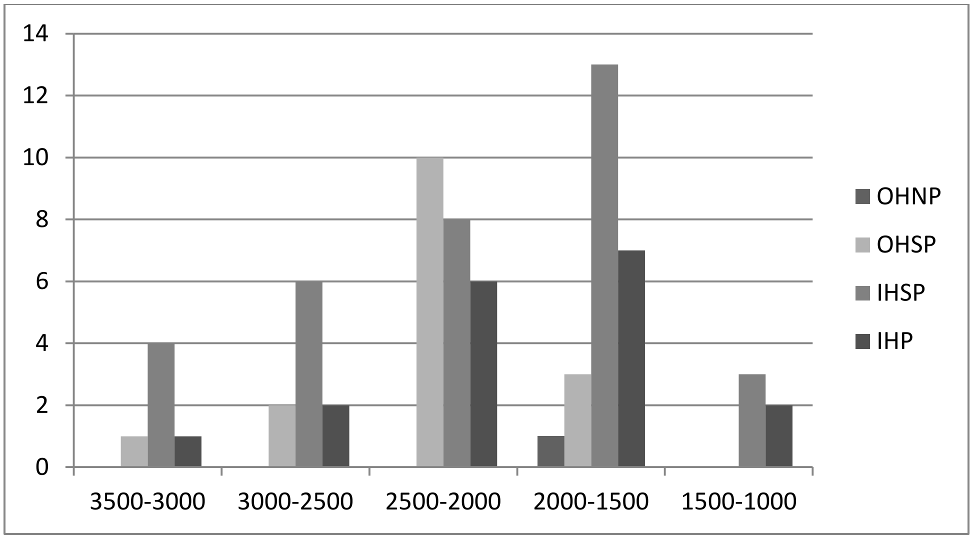

Figure 6.16: Temporal trends in village location

From these data, it is shown that while there was a significant number of villages located on the outer coast, with the exception of one (GcTo-28), all of these sites had some form of protection by either nearby islands or the indented nature of the coastline. These data show that the outer coast was gradually abandoned over time with 83% of sites located in the inner harbour between 2000-1500 years ago and 100% 1500-1000 years ago. This is a significant result as these sites were occupied after the period of increased warfare approximately 1900-1700 BP; therefore sites may have clustered in the Venn Passage for proximity to other sites for increased defensibility.

Ranked vs. Egalitarian

The 35 sites included in this study (no designation for GbTo-18 and GbTo-31) were each categorized into either ranked (n= 27) or egalitarian (n =8) based on the perceived social complexity of the village from the data provided by Martindale (in prep). The distribution of these sites in PRH is illustrated in Figure

6.17 and the temporal trend for ranked and egalitarian sites is illustrated in Figure 6.18. These data show that egalitarian villages made up a significant portion of the villages in this study prior to 2500-2000 BP, but after the period of conflict in the late middle period, egalitarian villages were significantly reduced and became none existent in 1500-1000 BP. However, of the four sites considered ranked dated to 3000-2500 BP, three of these sites (GbTo-4, GbTo-33, and GbTo-34) were occupied until 1500 BP. Therefore, these villages may have been egalitarian during earlier time periods and had their village layout modified during later times periods, possibly due to increasing populations or the increase of warfare.

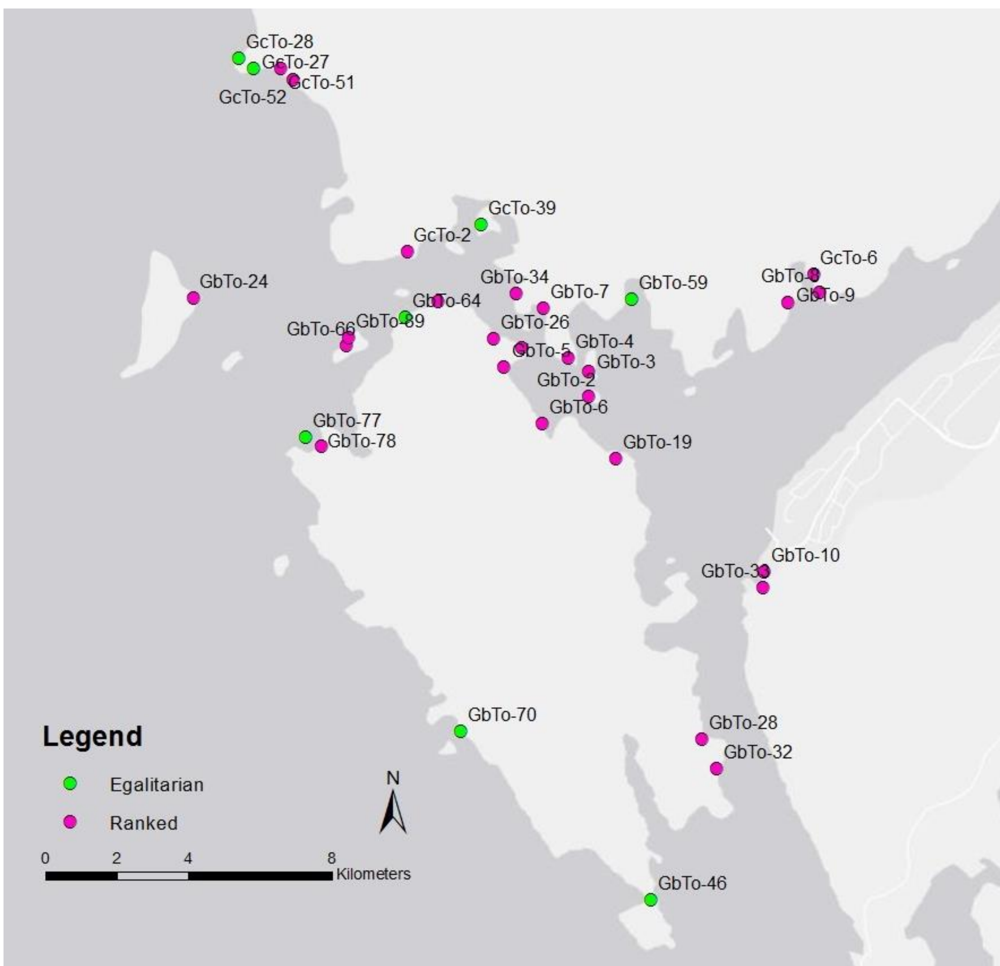

Figure 6.17: The distribution of ranked and egalitarian sites in PRH

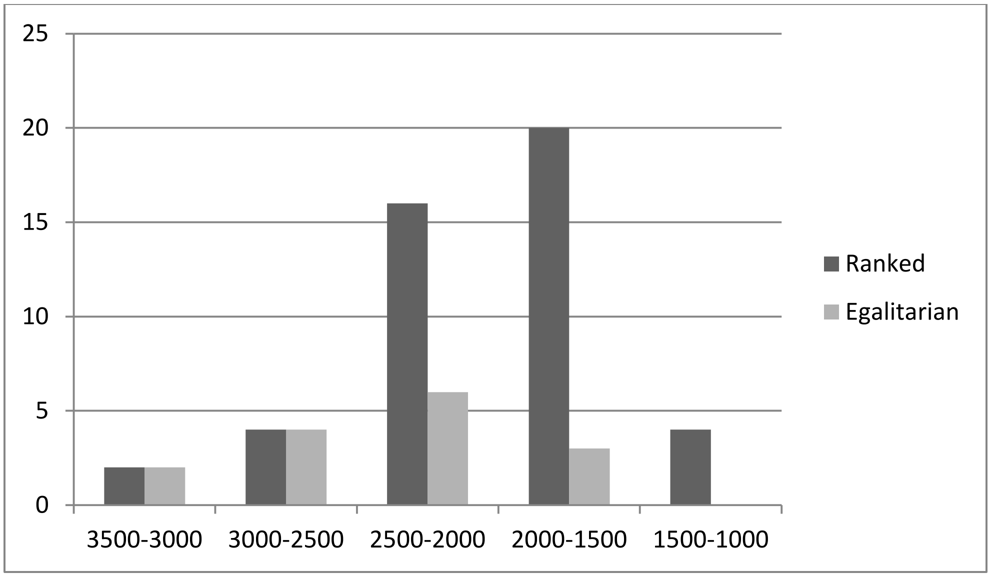

Figure 6.18: Temporal trends in ranked vs. egalitarian villages

Intertidal Size

There were 35 sites analyzed in terms of intertidal size. GbTo-10 and GbTo-33 were not included because modern development made the calculation of the intertidal impossible in these locations. The sites are shown in Figure 6.21, organized into three categories based on intertidal size: small <300000 m^2 (n = 17), medium 300000 m^2 – 500000 m^2 (n = 12), and large >500000 m^2 (n = 6) (Figure 6.19). The temporal trend of intertidal size is illustrated in Figure 6.20. As can be seen in the data, a large intertidal is not particularly common in any of the time periods, with the majority of villages having either a small or medium intertidal. The large number of villages with small intertidals (n = 17) suggests that intertidal size was not a determining factor in site selection decisions or, more accurately, there was no correlation between size and the productiveness of intertidal. The large number of non-habitation shell middens (n = 90) located throughout the harbour indicates that a productive intertidal in the immediate vicinity of the village was not necessary. The size of intertidal may have been for reasons other than shellfish productivity; the large number of small intertidals may indicate a defensive decision to limit the accessibility to the village. However, the temporal trend demonstrates that the number of small intertidals (n = 10) was the same before and after the period of conflict and abandonment and that the number of large intertidals increases from 3 to 4 in 2000-1500 BP.

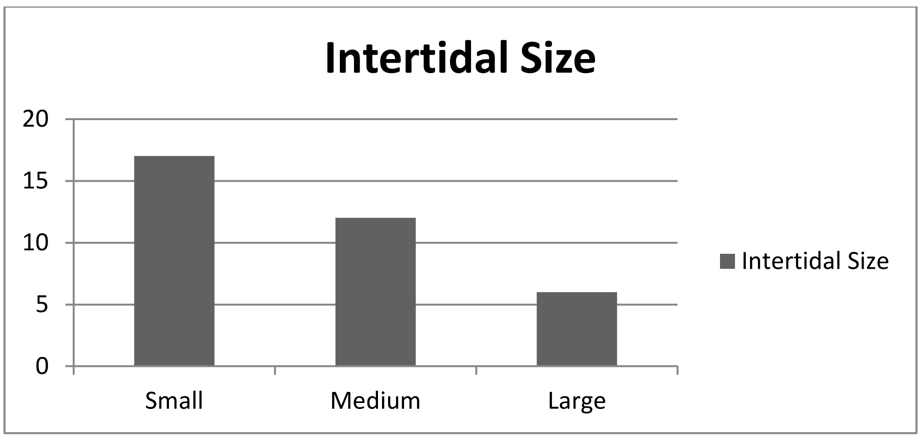

Figure 6.19: Number of sites by intertidal size

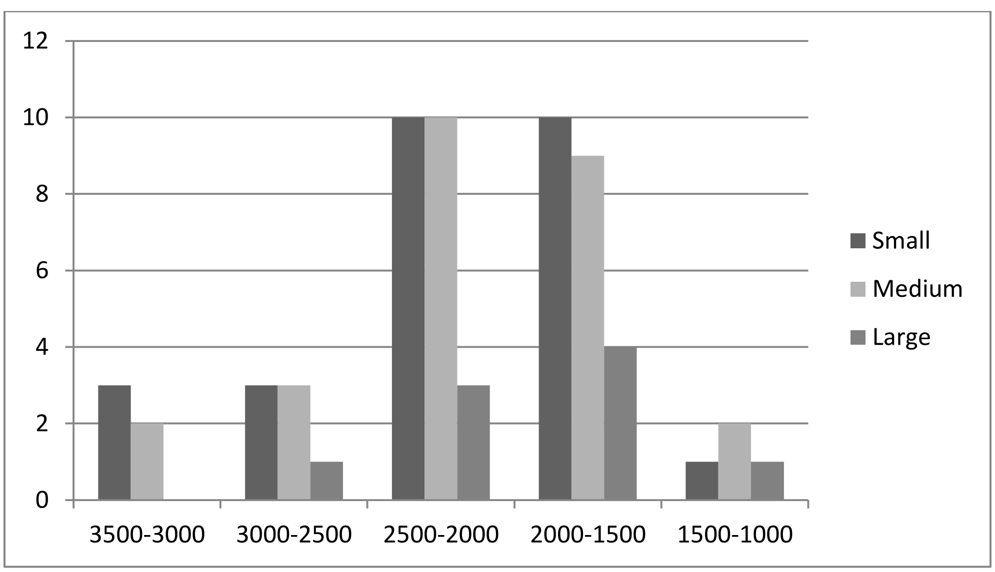

Figure 6.20: Temporal trends in intertidal size

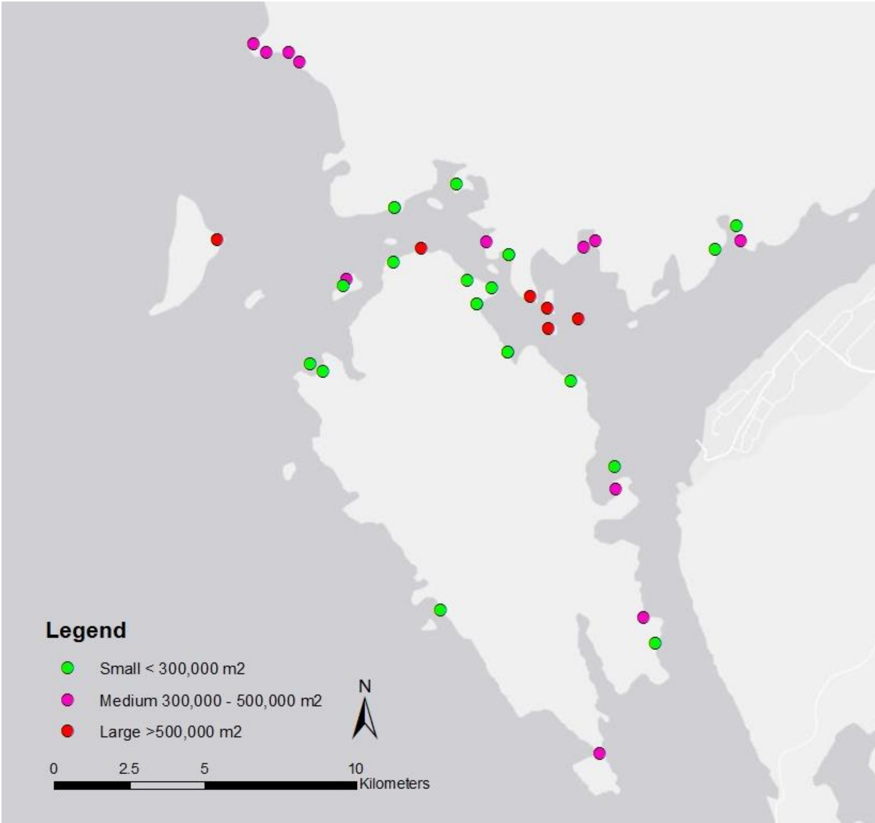

Figure 6.21: Village sites in PRH categorized by size of intertidal

Site Size

The 37 villages included in this analysis were categorized into three site types based on size: small (n = 9), medium (n = 19), and large (n = 9) (Figure 6.23). These sites and how they were distributed in PRH can be seen in Figure 6.22. The temporal trend to site size is illustrated in Figure 6.24. These data show that there was a trend over time of less small sites, with an increase in medium sites and large sites staying relatively the same. This could be an indication of more groups aggregated into villages for greater numbers, which would have served as a deterrent to invaders.

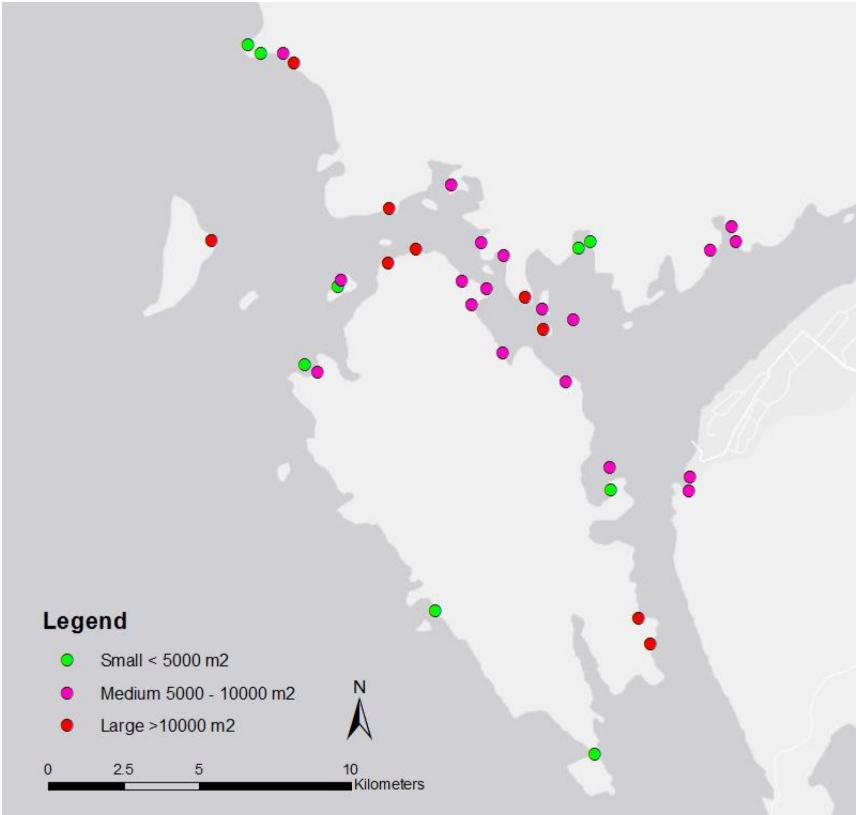

Figure 6.22: The distribution of villages by size in the Prince Rupert Harbour

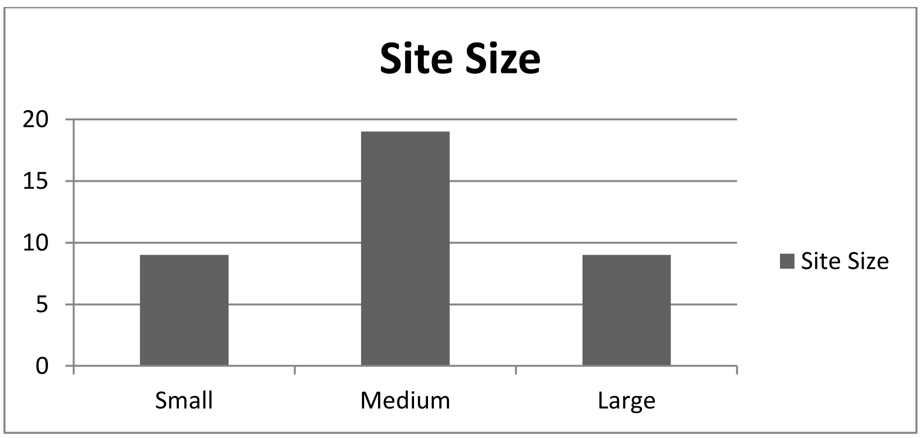

Figure 6.23: The distribution of villages by size in the Prince Rupert Harbour

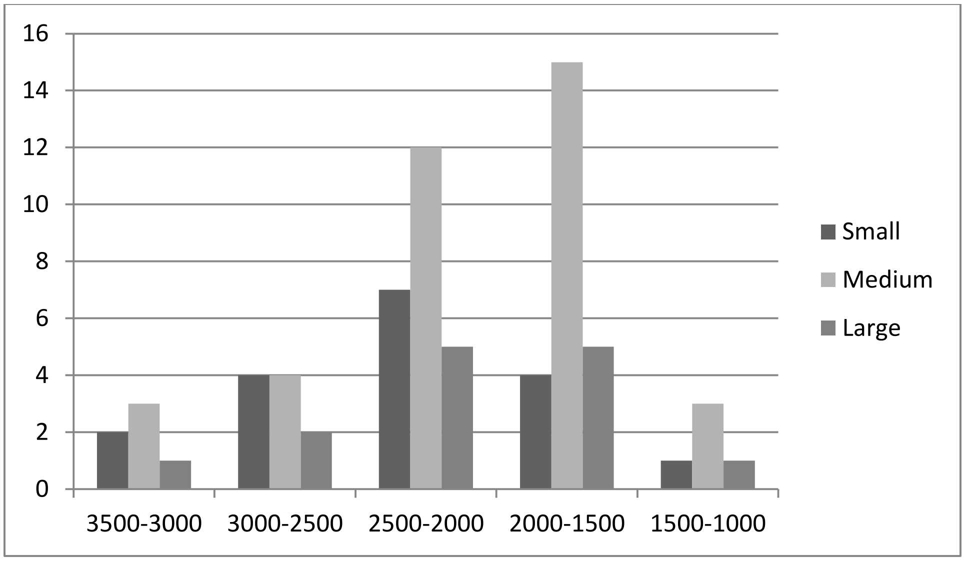

Figure 6.24: Temporal trends in villages by size in the Prince Rupert Harbour

Presence of Other Features

The 37 sites were analyzed to determine which villages were associated with other features, such as: Rock art sites (n = 11) (Figure 6.25) and Burials (n = 11) (Figure 6.27). The temporal trend for these Rock art sites is illustrated in Figure 6.26. These data indicate an apparent jump in sites associated with rock art around approximately 2000-1500 BP and it is interesting to note that all the rock art sites were concentrated in Venn passage, the channel between northern Digby and the southern Tsimpsean Peninsula (Figure 6.25). The increase in villages associated with rock art after the harbour was reoccupied may indicate an increased symbolic or historical importance of Venn passage post conflict. These petroglyphs and pictograms may have commemorated particular battles and, in conjunction with oral records, served as places of remembrance. There may have also been a trend towards using petroglyphs to mark territory, either to hostile outside groups or to other Tsimshian groups within the harbour. As illustrated in Figure 6.18, there was an increase in ranked villages post conflict and with this increased social complexity there may have been a greater need to display ownership over a particular resource area.

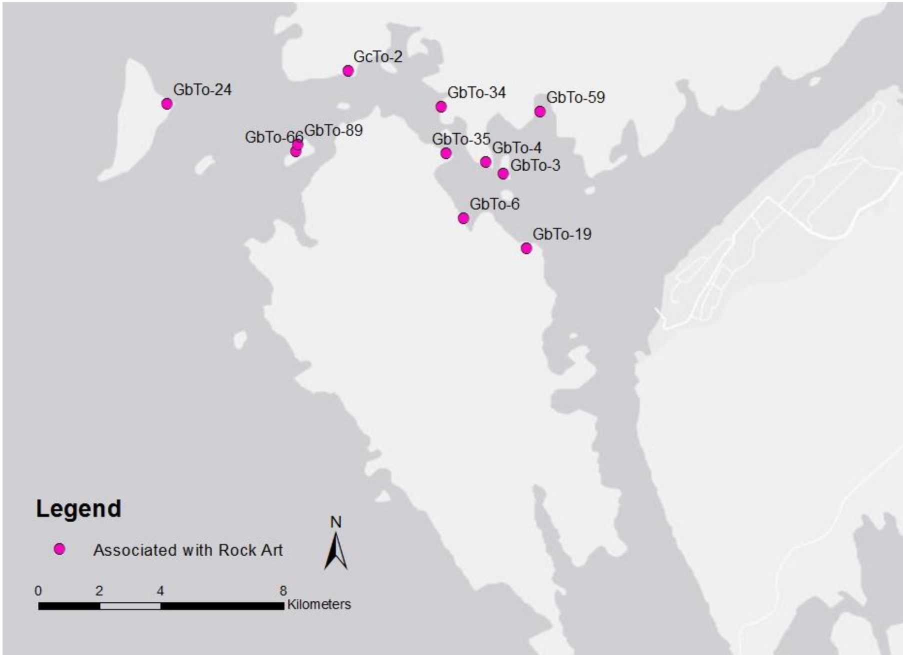

Figure 6.25: Villages with associated Rock Art

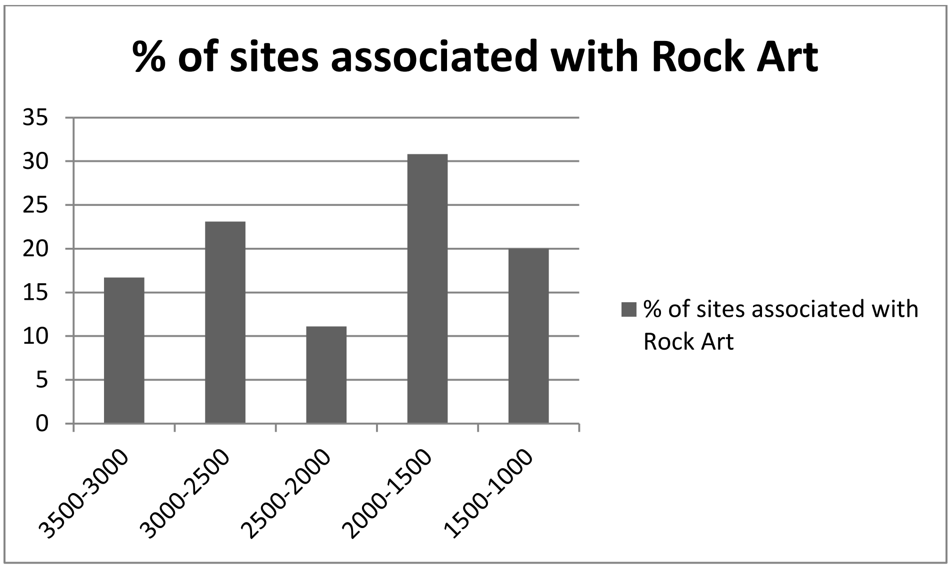

Figure 6.26: Temporal trends to villages with associated Rock Art

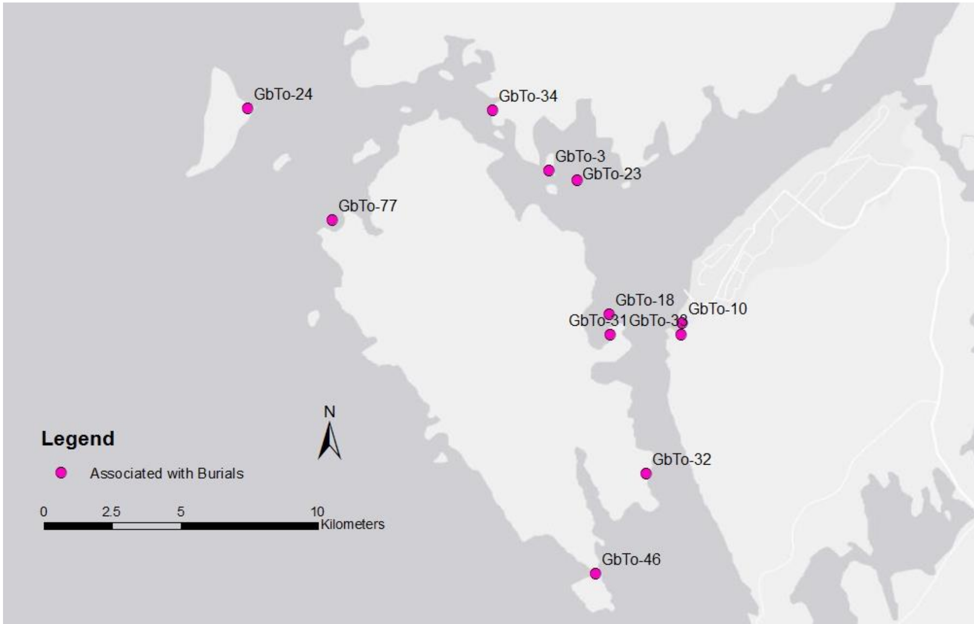

Figure 6.27: Villages associated with burials

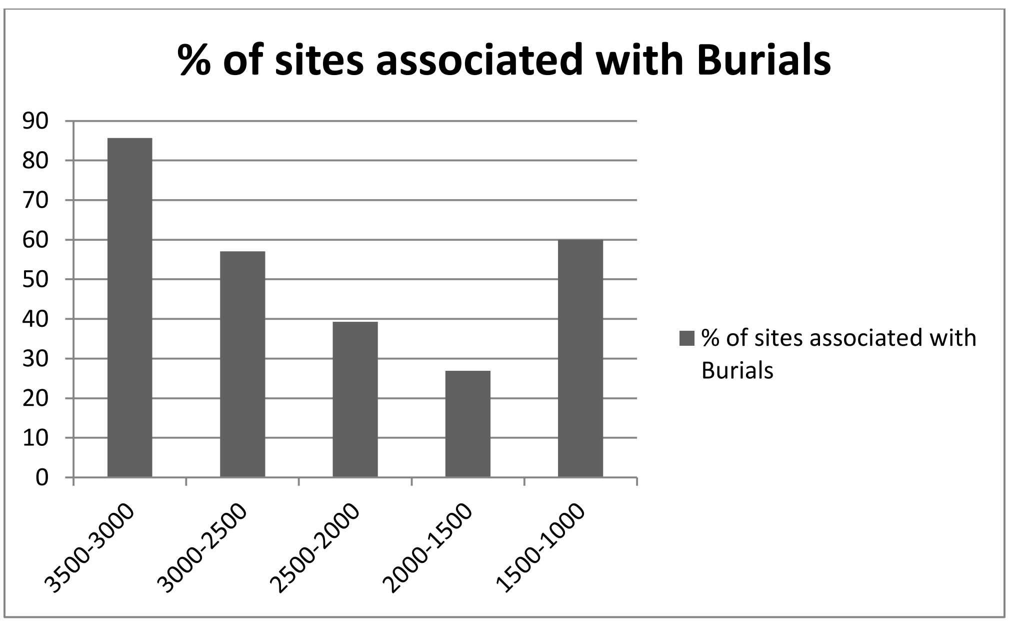

Figure 6.28: Temporal trends to villages with associated burials

Figure 6.27 does not appear to show any patterns in the distribution of villages associated with burials. The temporal trend for villages associated with burial sites is illustrated in Figure 6.28. These data show that there was a decreasing trend of villages associated with burials; however, there was an increase during the 1500-1000 BP time period. This can be explained by the smaller sample size of this time period, with 3 of the 5 sites associated with burials. It should be noted that these three sites, GbTo-31, GbTo-33, and GbTo-34, are the only sites that were consistently occupied from 3500-1000 BP. The consistent occupation of these villages may have been the result of a connection a descendant population had to the location due to the burial of an ancestor. The results also demonstrate that the villages dated to the post-conflict context (2000-1500 BP) had the lowest percentage of associated burials, which may be explained by the large number (n=11) villages occupied for the first time.

6-4 Non-Habitation Shell Middens

Table 6.8 contains the results of the buffer and intersect analysis of the proximity of non-habitation shell midden sites to resources: salmon streams, kelp beds, and herring spawning grounds. Also included is information on site characteristics such as location and aspect which will be compared to the same data for the villages in the next chapter.

Table 6.8: Non-habitation shell midden data

Borden	Herring	Kelp	Salmon	Location	Aspect
GbTn-1	N	N	1500-3500	IHP	S
GbTn-10	N	N	1500-3500	IHP	E
GbTn-11	N	N	3500-6500	IHP	N
GbTn-12	N	N	1500-3500	IHP	S
GbTn-13	N	N	3500-6500	IHP	S
GbTn-14	N	Y	3500-6500	IHP	S
GbTn-15	N	N	6500+	IHP	S
GbTn-16	N	N	3500-6500	IHP	S
GbTn-17	N	N	<1500	IHP	S
GbTn-19	Y	Y	6500+	IHSP	W

Table 6.8: Continued

Borden	Herring	Kelp	Salmon	Location	Aspect
GbTn-2	N	N	1500-3500	IHP	N
GbTn-21	N	N	3500-6500	IHP	S
GbTn-22	N	N	<1500	IHP	N
GbTn-25	N	N	3500-6500	IHP	S
GbTn-29	N	N	1500-3500	IHP	N
GbTn-3	N	N	<1500	IHP	S
GbTn-30	N	N	1500-3500	IHP	N
GbTn-5	N	N	<1500	IHP	S
GbTn-6	N	N	1500-3500	IHP	N
GbTn-7	N	N	<1500	IHP	E
GbTn-8	N	N	<1500	IHSP	N
GbTn-9	N	N	1500-3500	IHP	W
GbTo-1	Y	N	3500-6500	IHP	S
GbTo-105	N	N	6500+	IHSP	W
GbTo-107	N	N	6500+	IHSP	W
GbTo-11	N	N	6500+	IHSP	W
GbTo-12	N	N	6500+	IHSP	W
GbTo-13	N	N	6500+	IHSP	W
GbTo-14	N	N	6500+	IHP	N
GbTo-15	N	N	6500+	IHP	N
GbTo-16	N	N	6500+	IHSP	N
GbTo-22	Y	N	3500-6500	IHSP	?
GbTo-29	Y	N	<1500	IHSP	N
GbTo-36	N	N	6500+	IHSP	W
GbTo-37	N	N	6500+	IHSP	W
GbTo-48	Y	N	6500+	OHSP	N
GbTo-49	N	N	3500-6500	IHSP	N
GbTo-54	N	N	6500+	IHSP	W
GbTo-55	N	N	6500+	IHSP	W
GbTo-56	Y	N	1500-3500	IHSP	E
GbTo-58	Y	N	6500+	IHP	S
GbTo-63	Y	Y	6500+	IHSP	E
GbTo-67	Y	Y	6500+	IHSP	E
GbTo-69	N	Y	6500+	OHSP	S
GbTo-71	Y	Y	6500+	OHNP	W
GbTo-73	Y	N	3500-6500	IHP	S
GbTo-74	Y	N	3500-6500	IHP	S
GbTo-75	Y	N	3500-6500	IHP	S
GbTo-76	Y	N	<1500	IHP	W
GbTo-79	Y	Y	6500+	OHNP	N
GbTo-80	Y	Y	6500+	OHNP	W
GbTo-81	Y	Y	6500+	OHNP	W
GbTo-82	Y	Y	6500+	OHNP	W
GbTo-83	Y	Y	6500+	OHSP	W
GbTo-84	Y	Y	6500+	OHSP	W
GbTo-85	Y	Y	6500+	OHSP	E
GbTo-86	Y	Y	6500+	OHSP	S
GbTo-87	Y	Y	6500+	OHSP	E
GbTo-88	Y	N	3500-6500	IHP	N

Table 6.8: Continued

Borden	Herring	Kelp	Salmon	Location	Aspect
GbTo-90	Y	N	6500+	IHSP	?
GbTo-91	Y	N	1500-3500	IHSP	?
GbTo-94	N	N	6500+	IHSP	W
GbTp-2	Y	Y	6500+	IHSP	S
GcTn-1	N	N	<1500	IHSP	W
GcTn-10	N	N	1500-3500	IHP	?
GcTn-13	N	N	6500+	IHSP	N
GcTn-14	N	N	1500-3500	IHP	S
GcTn-16	N	N	3500-6500	IHP	N
GcTn-17	N	N	6500+	IHP	E
GcTn-2	N	N	1500-3500	IHP	S
GcTn-4	N	N	3500-6500	IHP	S
GcTn-5	N	N	6500+	IHP	W
GcTn-6	N	N	6500+	IHP	W
GcTn-7	N	N	6500+	IHP	W
GcTn-8	N	N	1500-3500	IHP	S
GcTo-25	Y	Y	6500+	OHSP	N
GcTo-26	Y	Y	3500-6500	OHSP	S
GcTo-29	Y	N	<1500	OHNP	N
GcTo-3	Y	N	3500-6500	IHSP	S
GcTo-30	Y	N	<1500	OHSP	W
GcTo-31	Y	N	1500-3500	OHNP	W
GcTo-32	Y	N	1500-3500	OHNP	S
GcTo-40	Y	N	<1500	IHP	E
GcTo-43	Y	N	<1500	IHP	S
GcTo-47	Y	Y	3500-6500	OHSP	S
GcTo-48	Y	Y	3500-6500	OHSP	S
GcTo-49	Y	Y	3500-6500	OHSP	S
GcTo-50	Y	Y	3500-6500	OHSP	S
GcTo-53	Y	Y	3500-6500	OHNP	W
GcTp-2	Y	Y	6500+	IHSP	N

Figure 6.29 shows that the percentage of these sites located near kelp beds was 27% (n = 24) and herring spawning grounds was 47% (n = 42). In Figure 6.30, the distances of sites located within 6.5 km of a salmon stream are illustrated with: (n=11) <1500 m, (n=16) 1500-3500 m, and (n=22) 3500-6500 m. It is also interesting to note that 70 of these sites were located near one or more of these resources, which may have determined their placement on the landscape.

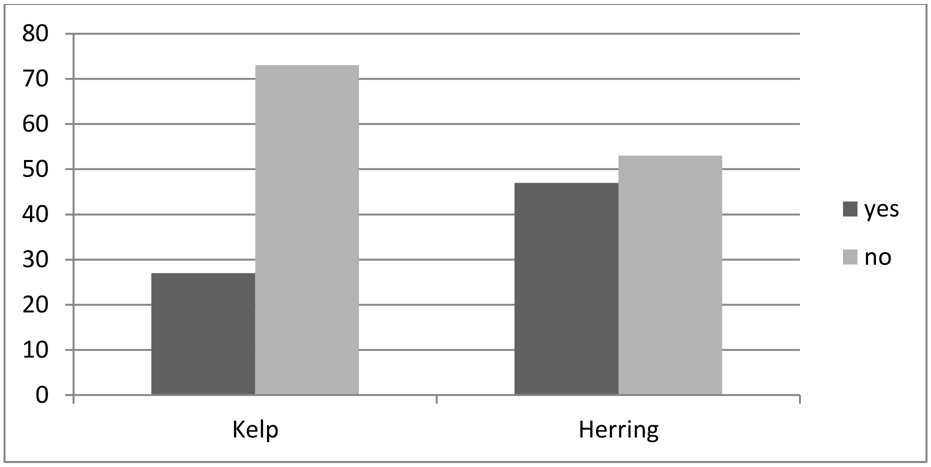

Figure 6.29: The percentage of Non-Habitation Shell Middens located near resources

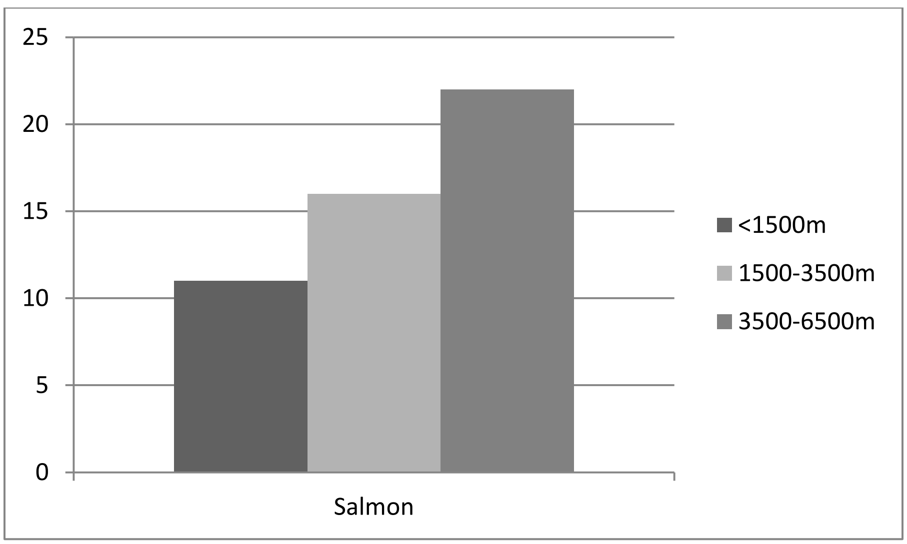

Figure 6.30: The number of Non-Habitation Shell Middens located near salmon streams

The non-habitation shell midden sites location on the coastline is illustrated in Figure 6.31 and is as follows: 10% (n = 9) OHNP, 15.5% (n = 14) OHSP, 28.9% (n = 26) IHSP, and 45.6% (n = 41) IHP. In Figure 6.32 the sites are categorized by aspect and are as follows: north 23.5% (n = 21), south 34.4% (n = 31), east 11.1% (n = 10), and west 30.6% (n = 28). There seems to have been a preference for the inner harbour with 74.5% (n = 67) of the sites located in these two categories. In terms of aspect, the preference was a southern exposure and, to a lesser extent, a western exposure, but should be noted that the prevalence of western exposures was due to the fact 25.5% (n = 23) of these sites are located on western outer-coast and have no other option in terms of aspect.

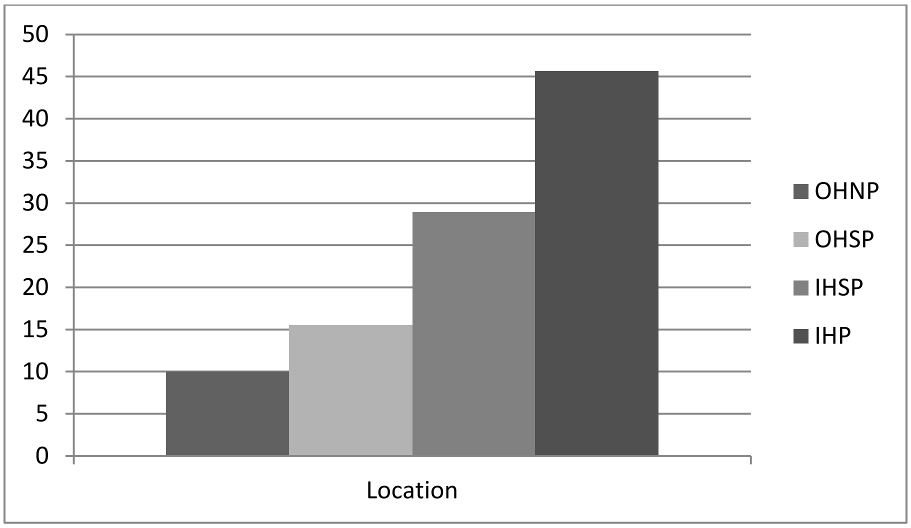

Figure 6.31: Percentage of Non-Habitation Shell Middens located in coastline categories

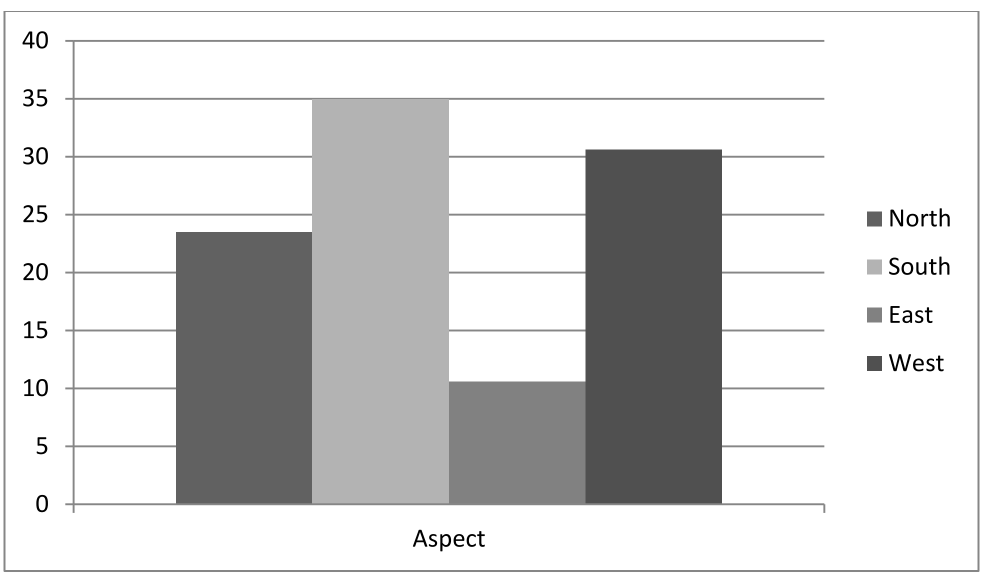

Figure 6.32: Percentage of Non-Habitation Shell Middens categorized by aspect

6-6 Defensibility

A line-of-sight analysis was performed for the 37 sites in this study and the results are listed in the following tables. Each table lists the intervisibility between contemporaneous sites by time period: 3500-3000 BP (Table 6.9), 3000-2500 BP (6.10), 2500-2000 BP (6.11), 2000-1500 BP (6.12), and 1500-1000 BP (6.13). An assessment of visibility for each village is listed in Table 6.14 including: arc of view, degrees of approachable water, and visibility (V).

Table 6.9: Intervisibility of villages dated to 3500-3000 BP

Borden	GbTo-18	GbTo-31	GbTo-33	GbTo-34	GbTo-64	GbTo-77
GbTo-18			Y			
GbTo-31						
GbTo-33						
GbTo-34						
GbTo-64						
GbTo-77						

Table 6.10: Intervisibility of villages dated to 3000-2500 BP

Borden	GbTo-4	GbTo-10	GbTo-18	GbTo-28	GbTo-31	GbTo-33	GbTo-34	GbTo-46	GbTo-59	GbTo-64	GbTo-77
GbTo-4		Y				Y			Y		
GbTo-10	Y		Y	Y		Y			Y		
GbTo-18		Y				Y					
GbTo-28											
GbTo-31											
GbTo-33	Y	Y									
GbTo-34											
GbTo-46											
GbTo-59	Y	Y	Y								
GbTo-64											
GbTo-77											

Table 6.11: Intervisibility of villages dated to 2500-2000 BP

Borden	GbTo-4	GbTo-5	GbTo-7	GbTo-8	GbTo-9	GbTo-18	GbTo-23	GbTo-24*	GbTo-28	GbTo-31	GbTo-33	GbTo-34	GbTo-46	GbTo-59	GbTo-64	GbTo-66	GbTo-70	GbTo-77	GbTo-78	GbTo-89	GcTo-6	GcTo-27	GcTo-51	GcTo-52
GbTo-4		Y									Y			Y										
GbTo-5	Y						Y																	
GbTo-7																								
GbTo-8					Y	Y															Y			
GbTo-9				Y																	Y			
GbTo-18				Y			Y							Y										
GbTo-23		Y									Y			Y										
GbTo-24												Y			Y	Y		Y	Y	Y		Y	Y	Y
GbTo-28											Y													
GbTo-31							Y																	
GbTo-33	Y				Y		Y																	
GbTo-34																								
GbTo-46																								
GbTo-59	Y						Y																	
GbTo-64								Y												Y				
GbTo-66								Y														Y		
GbTo-70																								
GbTo-77								Y											Y					
GbTo-78								Y										Y						
GbTo-89								Y							Y	Y						Y		
GcTo-6					Y																		Y	Y
GcTo-27								Y								Y				Y			Y	Y
GcTo-51								Y								Y				Y				Y
GcTo-52								Y								Y				Y		Y	Y	

Table 6.12: Intervisibility of villages dated to 2000-1500 BP

Borden	GbTo-3	GbTo-4	GbTo-5	GbTo-6	GbTo-7	GbTo-8	GbTo-19	GbTo-21	GbTo-23	GbTo-24*	GbTo-26	GbTo-28	GbTo-31	GbTo-32	GbTo-33	GbTo-34	GbTo-35	GbTo-57	GcTo-2	GcTo-6	GcTo-27	GcTo-28	GcTo-39	GcTo-51
GbTo-3		Y	Y	Y			Y		Y						Y				Y					
GbTo-4	Y		Y	Y			Y								Y		Y	Y	Y					
GbTo-5	Y	Y							Y															
GbTo-6	Y	Y	Y		Y				Y															
GbTo-7				Y													Y							
GbTo-8																								
GbTo-19	Y	Y	Y						Y									Y		Y				
GbTo-21	Y									Y						Y			Y				Y	
GbTo-23	Y		Y	Y			Y								Y									
GbTo-24																Y		Y	Y		Y	Y		Y
GbTo-26																Y							Y	
GbTo-28															Y									
GbTo-31																								
GbTo-32																								
GbTo-33	Y	Y							Y			Y												
GbTo-34				Y				Y			Y						Y		Y					
GbTo-35	Y	Y		Y	Y		Y									Y							Y	
GbTo-57		Y					Y		Y															
GcTo-2	Y	Y								Y						Y	Y						Y	
GcTo-6																								
GcTo-27										Y														Y
GcTo-28										Y														
GcTo-39								Y			Y								Y					
GcTo-51										Y											Y			

Table 6.13: Intervisibility of villages dated to 1500-1000 BP

Borden	GbTo-2	GbTo-31	GbTo-33	GbTo-34	GcTo-6
GbTo-2			Y		
GbTo-31					
GbTo-33	Y				
GbTo-34					
GcTo-6					

The results of the line-of-sight analysis demonstrate an increasing trend for villages to share intervisibility. In Table 6.9, the data shows sites dated to 3500-3000 BP shared low intervisibility with each other. Only GbTo-33 could be seen from GbTo-18, which may be explained by a lack of warfare during this time period or space between villages was maximized for larger catchment areas. In Table 6.10, the sites dated to 3000-2500 BP demonstrate there was more intervisibility between villages compared to the previous time period, but visibility was limited to the sites at the east end of Venn Passage (GbTo- 59 and GbTo-4) and those that occupy the passage between Digby and Kaien Island (Gbto-10, GbTo-18, and GbTo-33). 5 of the 10 sites occupied during this time were relatively isolated, sharing no intervisibility with any other village. Table 6.11 demonstrates the period of increased warfare (2500-2000 BP) and that more villages, especially GbTo-24, share intervisibility with several other sites. Three sites (GbTo-7, GbTo-46, and GbTo-70) do not share intervisibility with any other villages, which may be the reason the GbTo-46 and GbTo-70 were not re-occupied in the post conflict context. GbTo-7 was re-occupied after the harbour was reclaimed (Table 6.12); however, GbTo-7 shared intervisibility with GbTo-35 which was initially occupied during the 2000-1500 BP time period. Table 6.12 shows the line-of-sight results for those sites dated to 2000-1500 BP. These data show that all of the sites located within Venn passage could see at least one other site, which may have been for defensive purposes. Finally, Table 6.13 shows the line-of-sight results for the 1500-1000 BP time period. There was low intervisibility between villages during this time with only GbTo-2 and GbTo-33 sharing intervisibility.

Table 6.14: Visibility of Prince Rupert Harbour Villages

Village	Viewshed Arc	Approachable Water	Visibility (V)
Gbto-2	290	290	1.00
GbTo-3	190	230	0.82
GbTo-4	140	190	0.74
GbTo-5	65	85	0.76
GbTo-6	90	170	0.53
GbTo-7	10	90	0.11
GbTo-8	105	175	0.60
GbTo-9	105	170	0.62
GbTo-10	140	210	0.67
GbTo-18	110	150	0.73
GbTo-19	140	200	0.70
GbTo-23	90	90	1.00
GbTo-21	120	180	0.67
GbTo-24	320	360	0.89
GbTo-26	130	190	0.68
GbTo-28	190	200	0.95
GbTo-31	20	110	0.18
GbTo-32	160	200	0.80
GbTo-33	60	90	0.67
GbTo-34	130	145	0.90
GbTo-35	40	70	0.57
GbTo-46	150	250	0.60
GbTo-57	40	80	0.50
GbTo-59	50	140	0.36
GbTo-64	190	220	0.86
GbTo-66	120	150	0.80
GbTo-70	165	175	0.94
GbTo-77	120	190	0.63
GbTo-78	95	185	0.51
GbTo-89	220	220	1.00
GcTo-2	150	200	0.75
GcTo-6	35	85	0.41
GcTo-27	110	200	0.55
GcTo-28	185	195	0.95
GcTo-39	90	110	0.82
GcTo-51	110	180	0.61
GcTo-52	110	180	0.61

The results of the arc of view analysis are listed in Table 6.14. These data show there was good visibility at the majority of the villages over open water, only 4 sites (GbTo-7, GbTo-31, Gbto-59, and GcTo-6) had *V* scores of less than 0.50. 12 of the 37 sites had high visibility with *V* scores of 0.80 or higher making these sites less vulnerable to unexpected attacks. The high visibility of some of these sites may explain why they continued to be occupied or were re-occupied after the period of warfare. Villages such as GbTo-24, GbTo-28, GbTo-32, and GcTo-28 are all located at access points to the harbour. Given the high visibility of these sites, they may have been strategically placed to monitor the movement of people in and out of the harbour.

6-6 Summary

Based on the results presented in this chapter, the following statements about the settlement history of Prince Rupert Harbour can be made:

1. The proximity of sites to known resources increased through time although, with the exception of fresh water sources and herring, does not appear to have factored into site selection decisions.
2. During periods of increased warfare in PRH, the sites dated to 2500-2000 BP and 2000-1500 BP were statistically more clustered than the sites dated to the other three time periods.
3. Patterns in site orientation and location suggest that southern or western exposures were preferable, as well as inner harbour locations, which increased through time.

4. On average, non-habitation shell middens were located in close proximity to one or more resource; however, in terms of site orientation and location, many were preferable locations for villages but were not selected.
5. The number of ranked villages increased through time but, as noted earlier, villages expanded and modified the arrangement of households over time, which may mask previous egalitarian village organizations.
6. Villages associated with petroglyphs increased considerably between 2000-1500 BP and were concentrated in Venn passage north of Digby. Villages associated with burials decreases over time but three sites that were occupied through all five time periods were associated with burials.

Chapter 7: Discussion and Conclusions

7-1 Introduction

In this chapter, the results presented in chapter 6 will be used to address the research goals of this thesis while considering other lines of evidence, including archaeological, historical, and oral records. Using the theoretical framework outlined in chapter 3, this chapter will demonstrate that environmental factors played a small role in pre-contact site selection behaviours in Prince Rupert Harbour. Non-environmental and social factors appear to have been the primary determinant of site selection decisions, particularly after periods of increased conflict between 2000 – 1500 BP. As a result of increased warfare and the subsequent out-migration of the harbour, defensibility and resilience played a major role in settlement decisions.

7-2 Proximity to Resources

The proximity of pre-contact Coast Tsimshian village sites to certain resource areas was not a primary factor in the selection of habitation sites. Of all the variables selected for analysis, only proximity to herring grounds seems to have been important, with 24 of the 37 sites (64.7%) associated with this resource. However, this may be explained by the ubiquitous nature of herring grounds throughout the harbour as illustrated in Figure 6.1. The area where herring does not currently spawn is most likely the result of high amounts of boat traffic and the modern city of Prince Rupert; therefore, the amount of sites in proximity to these spawning grounds may have been much higher. There were a large number of villages (n=15) within 500 m of non-habitation shell middens, which may have acted as resource extraction camps for the village. However, there is a lack of dates from these shell midden sites and contemporaneity with the villages cannot be assumed. It must also be noted that 70 of these 90 sites are located near either herring spawning grounds, kelp beds, or within 6.5 km of a salmon stream; therefore, the proximity of these shell midden sites to village sites may be a proxy for some other variable that actually influenced the placement of these sites in a particular location.

The lack of proximity to resources may be explained by the fact that resource locations were owned beyond the immediate vicinity of an inhabited winter village and could be reached within a day's journey (Patton 2012:8). Ames (2002) calculates that people could travel by canoe at approximately 4.5 km per hour and at this speed each village within the inner harbour had a foraging radius of as much as 30 km (Patton 2012:52). When observing which sites were located near salmon streams, it is a small number with only 11 of the 37 villages located within 6.5 km of a stream. The rest of the villages were located within at least 10 km of these streams but, given the average speed of a canoe being 4.5 km per hour, each village was at least a 2 hour travel from one of these streams which could be reached and fished with enough time to return to the village within a day.

Although proximity to resources does not seem to have been a primary determinant of site selection, there were some temporal trends that can be explained by an increasing consciousness of defense. When the Tlingit were living on Dundas and Porcher Islands, located south of the Nass River, they never attacked the villages but only those people sent out from the village to go to resource camps (Marsden 2001:74). As these attacks on the Tsimshian continued to intensify, the Tsimshian eventually abandoned their villages and moved up the Skeena River (Marsden 2001:76). For this reason, the Tsimshian may have situated their villages closer to resources during the period of increased conflict, especially after they reclaimed the harbour from the northern aggressors. The less distance these task groups had to travel, the less vulnerable they were to attack. This is indicated by the results, as there was an increase in the percentage of villages in proximity to herring spawning grounds (3500-3000 BP = 40%, 3000-2500 BP = 50%, 2500-2000 BP = 70%, 2000-1500 BP = 61%, and 1500-1000 BP =75%) and fresh water sources (3500-3000 BP = 50%, 3000-2500 BP = 30%, 2500-2000 BP = 37.5%, 2000-1500 BP = 54%, and 1500-1000 BP = 80%). However, this same trend was not reflected in the results of the percent of villages in proximity to kelp beds as it fell from 29% between 2500-2000 BP to 12.5% between 2000-1500 BP.

As demonstrated in Maschner's (1996) study of Tebenkof Bay, proximity to resources was sacrificed for those locations optimal for defense. Maschner (1996:186) suggests middle phase villages were located in the middle of the bay, allowing them equal access to salmon streams and resources of the outer waters, as well as intertidal resources. In contrast, late phase sites were located on exposed straight shorelines with much poorer intertidal resources but in much more defensible locations in terms of surface water viewshed (Maschner 1996:187). In PRH, the movement of sites away from kelp bed areas can be explained by the location of this resource on the outer west coast of Digby Island and the Tsimpsean Peninsula. It is possible that immediate access to this resource was given up for the proximity to other villages within the Venn passage. Another explanation may be that these kelp beds were exhausted over time or a possible increase in population may have caused villages to fission periodically to less resource rich areas (Erlandson *et al*. 1992:46).

7-3 Patterns in Site Distribution

There were some resources within the immediate vicinity of every village such as cedar, which was used for making canoes, baskets, and other forms of material culture (Ames 1994:217; Donald 2003:293). There is also the presence of shellfish at every village, which played an important role in site construction (Onat 1985) and Northwest Coast diet (Moss 1993). However, there may have been certain locations with more productive intertidal zones, which are quantified in this thesis by intertidal size. The majority of village sites (n = 28) can be classified as either a small or medium intertidal. The number of sites with large intertidals increased through time but was still small relative to the other two site size categories. It is important to consider that the intertidals categorized as large may be the result of the method of analysis used. The 500 m buffer around a large site polygon will capture a larger area; therefore, these results may be primarily influenced by site size. Of the 9 villages classified as large (area > 10000 m^2), 5 of these sites had large intertidals, so there may be some correlation between intertidal size and site size. However, 2 of these 9 sites had small intertidals, so there was not a straightforward correlation between site size and intertidal size. This also demonstrates that the presence of a large intertidal may have contributed to the presence of a large village, but was not necessary. Therefore, intertidal size was not a variable that determined site selection behaviours but the presence of an intertidal was necessary. All of the 37 villages had intertidals of at least 100000 m^2, which may explain the absence of villages in certain areas of the harbour where intertidals were <100000 m^2. In Figure 7.1, a small cove east of GcTo-6 has an intertidal of <100000 m2 and was never selected as a location for a village.

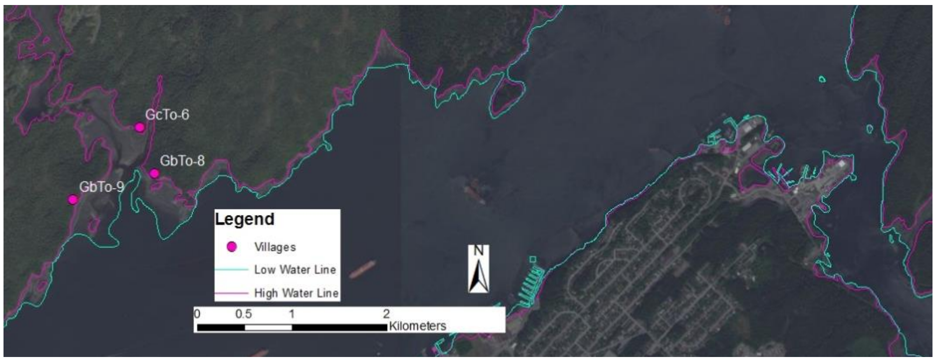

Figure 7.1: Areas with small intertidals

In terms of space between sites, there was a trend toward clustering in 2500-2000 BP (*R* value = 0.88) and 2000-1500 BP (*R* value = 0.90). During these time periods, sites become clustered in Venn passage, which is located north of Digby Island. The increase of villages approximately 2000-1500 BP may be an indication of increased population or increased coastal adaptations, but can also be the result of the preliminary nature of the chronology used in this thesis or issues of differential preservation and identifiability of these earlier time periods (Erlandson *et al*. 1992:47). However, by observing Figure 6.11, there was a concentration of villages in Venn passage during the 2000-1500 BP time period, which may have been for defensive or social reasons but may have sacrificed preferable locations in terms of calmness of water and aspect.

In terms of site orientation, the preference for these villages appears to be either a western or southern aspect. A western orientation was prevalent because of the large number of sites located on the western coast of Digby Island and the Tsimpsean Peninsula. It may have also been a factor of defensibility as villages within Venn passage with western aspects may have been oriented in this manner to see either intruders entering the harbour or other sites signalling the impeding attack. A southern orientation is explained by a preference warm southern winds and winter warmth (Maschner and Stein 1995). However, the number of sites with either a north or east orientation increased significantly during the 2000-1500 BP time period with 10 of the 24 sites categorized as either north or east. This can be explained by the increased concentration of sites in Venn passage, leaving few territories unoccupied for new villages established during this time. As a result, there was a lack of preferable locations with southern exposures and these villages had to establish themselves in these less desirable locations. Of the 11 sites that were first occupied during this time, 5 of the sites were either northern or eastern in exposure.

Another trend seems to be a movement towards the inner harbour areas, which may have been for the preference of the calmer waters of the inner harbour. During the 2000-1500 BP time period, 83.3% (n=20) of villages are located within the inner harbour, with the majority of these sites in the Venn passage. However, this may have been for reasons other protection from oceanic conditions as several locations on the outer coast offered protection from rough ocean waters in the form of offshore islands. Of the 11 sites located on the outer coast, only one site (GcTo-28) was categorized as having no form of protection from rough ocean waves.

From these results, it seems the traditional inhabitants of PRH preferred to situate their villages in locations protected from rough ocean waters and oriented in either a southern or western direction. However, an analysis of non-habitation shell middens suggests that village locations were determined by more than environmental factors.

Non-habitation shell midden sites are interesting because they reveal that there were several locations that, based on the environmental variables selected in this study, would have been suitable for habitation sites. In terms of aspect, 65.6% (n=59) of these sites have an aspect of either south or west and 74.4% (n=67) of these sites are located within the inner harbour. 70 of these 90 sites also have the additional benefit of being in close proximity to one or more of the resource variables selected for analysis in this thesis. As mentioned earlier, the further a village was away from a resource, the more vulnerable their resource task groups were to attack. Despite these preferable locations and accessibility to resources, these sites were not selected to be habitation sites; therefore, the selection of locations in the Venn passage was not based exclusively on environmental variables. As was illustrated in Figure 5.3, the majority of these non-habitation shell middens are located throughout the harbour with preferences for channel passages and the outer coast. However, only 14 of these 90 sites were located in Venn passage where the majority of village sites were located, particularly in the 2500-2000 and 2000-1500 BP time periods. These 14 sites were most likely resource camps for the villages within Venn passage and 5 of these sites (GbTo-22, Gbto-29, GbTo-76, GcTo-40, and GcTo-43) were located within 500 m of a village site. However, without radiocarbon dates from these shell middens, the relationship with the villages cannot be assumed. The 76 other shell midden sites were not occupied due to their location in places other than Venn passage. Venn Passage seems preferable for habitation in two ways: defensiveness and the resilience of this area in the social memory of the inhabitants of PRH.

7.4 Defensibility

There are several lines of evidence that point to periods of increased warfare in the Prince Rupert Harbour region from 2000-1500 BP (Cybulski 2001; Marsden 2001; Martindale and Marsden 2003). This is recorded in the oral histories of the Tsimshian, as stories from this time usually contain chronological markers such as “the war with the Tlingit” or “when the Tlingit lived on Dundas Island” (Martindale 2006:172). This is verified by the archaeological record as trauma associated with conflict, such as trophy skulls, weapons, and defensive fractures, are recorded in burials associated with this time period (Ames 1994; Stewart *et al*. 2009). There was also the architectural construction of defensive features such as rock walls and palisades, which can be indicators of defensiveness due to the significant labour costs required to construct these features (Martindale and Supernant 2009:194). While there are not many of these features in PRH, there are some possible examples of these type of fortifications, such as the large protective ridge with a possible gate that circles the house area at K’nu (GcTo-1) (Macdonald and Cybulski 2001:19).

As a result of increased warfare, deposition at a number of the villages ceased, suggesting a number of villages were abandoned for a period of time between 2000 BP and 1500 BP. These include sites such as Boardwalk (GbTo-31), Philips Point (GbTo-28), and Tremayne Bay (GbTo-46) (Archer 2001; Stewart *et al*. 2009:205). While Boardwalk and Philips Point were eventually re-occupied, Tremayne Bay was not and the data listed in Table 6.2 (2500-2000 BP) and Table 6.3 (2000-1500 BP) demonstrates that 9 villages (GbTo-9, GbTo-18, GbTo-46, GbTo-64, GbTo-66, GbTo-70, GbTo-77, GbTo -78, and GbTo-89) were not re-occupied. It is tempting to suggest that the sites first occupied during the 2000-1500 BP time period may have been settled by the groups that abandoned these villages. Table 6.3 demonstrates 11 villages were occupied for the first time during the 2000-1500 BP time period: GbTo-3, GbTo-6, GbTo-19, GbTo-21, GbTo-26, GbTo-32, GbTo-35, GbTo-57, GcTo-2, GcTo-28, and GcTo-39. In terms of location, 6 of the 9 villages that were permanently abandoned were located on the outer coast and 10 of the 11 villages first occupied after the period of warfare were located in the inner harbour. The one site not located in the harbour is GcTo-28, which may have been positioned on the outer coast for defensive reasons discussed later in this chapter. This suggests that when the groups that were driven out of the harbour returned to drive the Tlingit out of their territory, they re-established themselves in the harbour in different locations. This is supported by the oral records that mention these groups, they looked:

> "…over the land suitable for location. Some of these tribes set out at once to seek a new place… and choose a good land for their

> village site. Many other tribes followed and made other settlements along both sides of Metlakatla passage… by this time each tribe has two villages one at Metlakatla and another one up the Skeena River" (Marsden 2001:82).

If each village could see at least one other village within Venn passage, a warning system may have been developed where, if one site observed intruders, every other village within the harbour could have been signaled. This may explain why sites such as GbTo-70 and GbTo-46 were abandoned after 2000 BP and not reoccupied in 1500 BP. These two sites are generally isolated on the southern end of Digby Island and did not share intervisibility with any other villages (Table 6.11). However, the increased intervisibility during the periods of conflict may have been influenced by internal factors as well. Many resource locations in the harbour were owned (Patton 2012); therefore, villages may have wanted to monitor the activities of other local groups to ensure resource property rights were observed.

When observing the distribution of villages dated to 2000-1500 BP (Figure 6.11) the majority of these sites (n=18) are located in either Venn passage or the inner harbour. The remaining villages seem to be positioned in strategic locations: Gbto-24 was located on Tugwell Island at the mouth of Venn passage; GcTo-28 located on the western coast of the Tsimpsean peninsula north of GbTo-24; and GbTo-28 and GbTo-32 were located on southern Digby Island at the passage between Digby Island and Kaien Island. These habitations may have been the primary lookout locations during and after times of increased conflict because, although they cannot see all villages, each may have been the first in a series of signals between sites as all sites can see at least one other site approximately 1500 years ago. This interpretation is further supported by the high visibility (*V*) scores of these particular villages: GbTo- 24 (0.89), GbTo-28 (0.95), GbTo-32 (0.80), and GcTo-28 (0.95). However, as listed in Tables 6.11 and 6.12, Gbto-28, GbTo-32, and GcTo-28 did not share intervisibility with many other villages located in the harbour but did share intervisibility with villages with high intervisibility. GcTo-28 was visible from GbTo-24, which shared intervisibility with an additional 10 contemporaneous villages (Figure 7.2). GbTo-28 and GbTo-32 were visible from GbTo-33, which shared intervisibility with an additional 5 contemporaneous villages (Figure 7.3). Based on these results, it was not likely that intruders could enter the harbour without being detected by at least one of these villages.

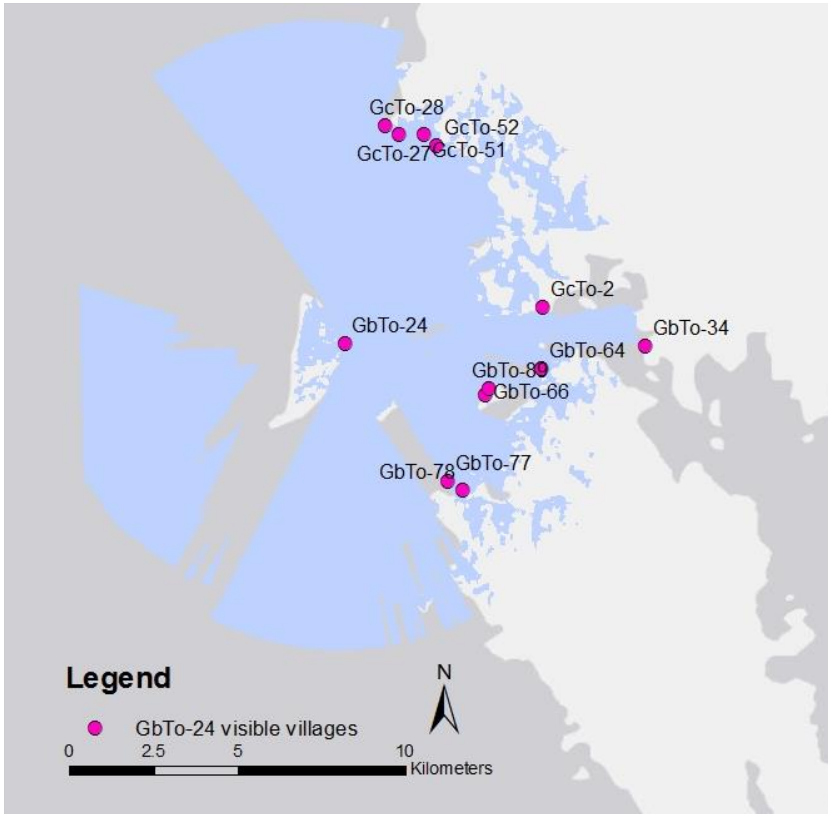

Figure 7.2: Villages visible from GbTo-24

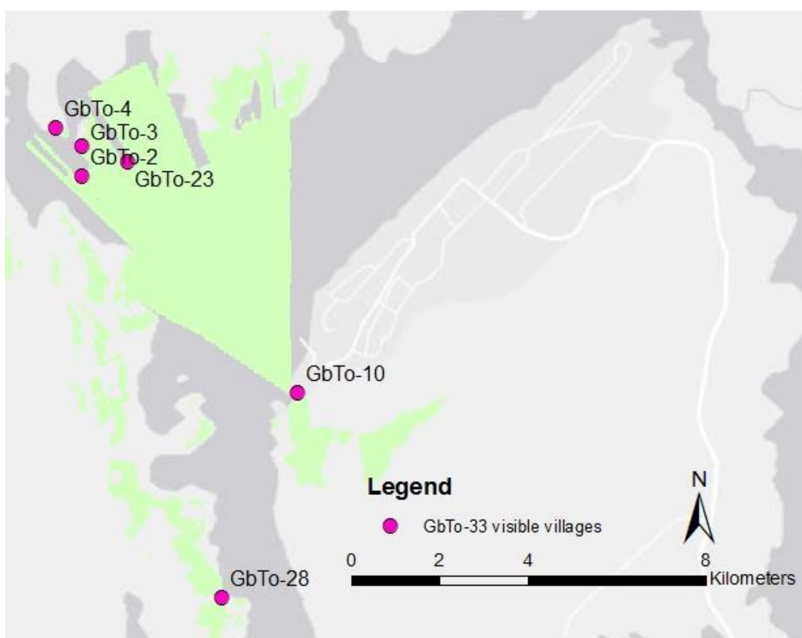

Figure 7.3: Villages visible from GbTo-33

7-5 Resilience theory

As mentioned in sections 7-2 and 7-3, proximity to resources and locational factors, such as aspect and calmness of water, were not the primary factors that influenced site selection decisions in Prince Rupert Harbour. After the period of warfare, the Venn passage was densely occupied, as seen in Figure 6.11. This preference for Venn passage was explained in the previous section as motivated by a concern for defense, but there may be other social factors. As discussed in section 7-3, there were many non-habitation shell middens that were not selected to be villages, although they exhibited several variables that would be preferable. The reason these sites were not villages is most likely due to fact they were not located in the Venn passage which, along with the defensive qualities, seems to have been a location of symbolic importance. As seen in Figure 6.25, the 11 villages associated with rock art were all located within the Venn passage. These petroglyphs may have been important for several reasons: spiritual importance, such as "The Man who fell from Heaven;" historical importance, such as the commemoration of the battles that took place in Venn passage; or perhaps ancestral importance, as the petroglyphs may be some form of lineage or House markings. Considering the theoretical perspective of resilience theory, these groups had a connection to the past through these rock art sites that were literally inscribed on the landscape. The tribes who returned to PRH after the war with the Tlingit looking for new areas to inhabit may have been guided by the visibility of past villages that were either abandoned or re-occupied to guide settlement choice. Although the Tsimshian were only displaced from the harbour for a few generations, the social memory of preferable site locations remained emblazoned on the landscape.

A final aspect that may have influenced re-occupation of certain villages was the presence of burials which may have been places of remembrance. Descendants of a particular lineage may have felt a connection to a certain site based on the presence of their ancestors. Although there are only 11 sites that can be identified as having burials present, 6 of these sites (GbTo-23, GbTo-24, GbTo-31, GbTo-32, GbTo-33, and GbTo-34) were re-occupied during the 1500 BP time period and the latter three were occupied during all five time periods. The resilience of these villages in the social memory of these descendant populations may also explain why some of these sites were re-occupied although they were not located in Venn passage, such as GbTo-31, GbTo-32, and GbTo-33.

7-7 Conclusions

As outlined in section 1.2, this thesis addressed several research questions about the site selection behaviours of the pre-contact Coast Tsimshian. Environmental variables were not the primary factors that influenced the site location decisions of the traditional inhabitants of the Prince Rupert Harbour. The sophistication of canoe travel made resource proximity unnecessary, as most of these locations could easily be reached within a day's travel. The location of villages in terms of calmness of ocean waters appears to have increased in importance through time, but this study suggests this is a proxy for non-environmental variables that determined village organization. There were several shell middens located in the harbour that were suitable for habitation in terms of aspect and location, but were not selected to be villages. This can be explained by the location of these shell middens in areas that were not of symbolic or historical importance and also the defensive spatial structure adopted post conflict. As a result of an increased period of warfare and subsequent abandonment of the harbour between 2000-1500 BP, many villages located on the outer coast were abandoned for locations within the Venn passage. This was an area where tribes may have had a historical or symbolic connection to due to the highly visible nature of previous villages and petroglyphs; but was also highly defensible due to the close proximity of sites to each other which increased intervisibility between these villages and strategically placed villages on Tugwell Island, southern Digby Island, and the western Tsimpsean Peninsula.

7-8 Future Potential of this Study

This thesis demonstrates an application of GIS methods to answer research questions pertaining to the settlement history of Prince Rupert Harbour. This is the first spatial analysis of the archaeological sites in this region at a broad scale, which can serve as a guideline for future researchers not only in PRH but in other coastal environments throughout the world. As these settlement patterns become better understood, more sites and areas of high research potential can be identified to expand the archaeological record and aid in heritage preservation. This study may contribute to the future of studies of settlement patterns that utilize GIS in that environmental variables were not given primacy but non-environmental factors seemed to be the most influencing variables of pre-contact site selection behaviours in PRH.

This thesis contributes to the existing knowledge of the settlement history of Prince Rupert Harbour; however, there are many aspects that remain unclear due to a lack of data. The continued work of the Prince Rupert Harbour Archaeological Project will address the following gaps in the PRH archaeological record. First, as mentioned earlier, high powered mapping instruments can detect some house depressions that have been damaged by post-contact gardening activities. The intensive study of these disturbed sites can improve our knowledge of the transition from egalitarian to ranked villages. Second, this transition can be further aided by a refined chronology through the intensive coring of village sites for radiocarbon samples. Third, the occupation history of this region prior to 5000 BP is still poorly understood due to the preliminary sea level curve. Through lake core analysis (McLaren 2011), the sea level history will be better understood and may enable the discovery of relict shorelines and archaeological sites dated to the Early Holocene.

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