Biological and cultural evidence for social maturation at Point Hope, Alaska: Integrating data from archaeological mortuary practices and human skeletal biology

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by

Lauryn Justice
Bachelor of Arts
University of North Carolina – Wilmington, 2014

Director: Daniel Temple
Department of Anthropology for Master’s Thesis

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For my grandparents, David and Claudia Clay, whose unwavering love and constant support makes me believe I can achieve anything.
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This thesis explores social age in a sample of hunter-gatherers from Point Hope, Alaska using dental estimates of age-at-death and archaeological mortuary practices. Constructions of age based on biological milestones are not always applicable cross-culturally as maturation is also a cultural event. In addition, the social ontology of identities within hunter-gatherers represents a neglected area of bioarchaeological research. Radiographs were taken of 36 mandibles associated with Ipiutak (AD 400-750) and Tigara (AD 1100-1700) cultural groups. Ages were estimated based on tooth formation. Data regarding grave goods, body positioning, and spatial orientation were interpolated from the original site report. In both cultures, subadults in the 0.1 to 3.0 year cohort are buried face down, without grave goods. Between Ipiutak and Tigara subadults, individuals within the 4.0 to 12.0 year cohort are interred face up, supine, their head spatially oriented towards the west, with animal implements such as ivory carvings. In
some instances, individuals between 2.1 to 10.0 years of age, are buried with adults, and
the burial is overlain with grave goods. These findings indicate similarity in social
development between Ipiutak and Tigara cultures, though stylistic variations in grave
goods suggest transformations in the symbolic nature of these implements. This study
demonstrates the value of integrating the archaeological mortuary record with biological
data to enhance perspectives on the development of social boundaries associated with
biological age in past communities.
CHAPTER ONE

This study explores social age in a sample of hunter-gatherers from Point Hope, Alaska using dental estimates of age-at-death and archaeological mortuary practices. In the past, processual approaches to mortuary analysis tended to view age as a concrete biological event in respect to the achieved versus ascribed nature of identities in past social organizations. However, it is more pragmatic and realistic to understand age as a fluid, culturally contingent social process, which may offer a greater insight into human development and how it is culturally mediated. Postprocessual archaeology advocates for a greater understanding of age as defined by ritual and symbolic frameworks. In viewing age as a social process, previous lifeways may be better understood due to the fact that humans are social beings that grow in social worlds. In bioarchaeology, studies of social maturation particularly pertaining to hunter-gatherer identity represent a largely neglected area of research.

This thesis, concerning the Point Hope, Alaska, Ipiutak and Tigara hunter-gatherers, demonstrates that ideas and actions concerning age, identity, and burial practices remain anchored in resilient frameworks of ethnic identity. This finding transcends both past mortuary analysis and bioarchaeological approaches that tended to envision simplistic hunter-gatherer societies especially in the face of change. Here, hunter-gatherers are considered complex and nuanced in respect to biological data that
enhances perspectives on the development of social boundaries associated with biological age in past communities. The following chapter presents an introduction, which includes a social history of the study of hunter-gatherers in anthropology as well as a brief overview of the history of mortuary practices in bioarchaeological research. The remaining chapters are arranged as follows: Chapter Two introduces the Point Hope archaeological site and provides known dietary and behavioral information of the Ipiutak and Tigara inhabitants. Chapter Three provides an overview of the burial ways and funerary rituals at Point Hope, Chapter Four includes results concerning biological data of immature individuals, and Chapter Five presents a discussion concerning social ontological processes and helps explain how the Ipiutak and Tigara cultures negotiated the social boundaries of development.

**Anthropological conceptualizations of hunter-gatherers**

By and large, previous anthropological research treated hunter-gatherers as though they were a group of peoples representative of the most archaic way of life (Sollas, 1915; Testart et al., 1988). In fact, much of anthropological theory is built upon ideas concerning hunter-gatherers as “primitive”, or peoples that are not sufficiently developed or have yet to evolve. As early as 1651, philosopher Thomas Hobbes famously condemned hunter-gatherer lifestyles as “solitary, poor, nasty, brutish and short” (1962, p. 100 [original 1651]). This Hobbesian view of hunter-gatherers remained unchallenged for nearly 300 years as eighteenth and nineteenth century social theorists employed unilineal evolutionary schemes as a means to an end.
By the Age of Enlightenment, the French philosopher Montesquieu developed a tripartite evolutionary scheme, which suggested hunting cultures are savage as they lack knowledge provided by the arts and sciences. A step above savagery, Montesquieu argued, is herding which he associated with barbarism, and above barbarism is civilization. While he does not draw clear distinctions between savagery and barbarism, Montesquieu suggests that arts and sciences allow for self-sufficient, political peoples (Singer and Montesquieu, 2013). Anne Robert Jacques Turgot, another Enlightenment thinker, also offered thoughts concerning hunter-gatherers as the basal stage of human social evolution. Turgot envisioned hunter-gatherers as isolated peoples that had no choice but to spend their lives hunting because “the fruits which the earth produces in the absence of agriculture are not enough” (Turgot and Meek, 1973, p. 65 [original 1808]). These Enlightenment interpretations of hunter-gatherers ultimately promulgated views that made unilineal, or cultural, evolution the reigning anthropological paradigm by the middle of the nineteenth century.

By the nineteenth century, Europe’s colonial expansion included the Americas, India, Southeast Asia, and parts of Africa. These colonial encounters led to conjectural writings about “the other” in which colonizers used polarizing language to discuss those who are different, or not Western, as a means to condone imperialism (Said, 1978). Arguably, the discipline of anthropology was born out of this line of thinking in that social theories aimed to propagate ideas of Western elitism and explain differences between cultures, past and present. Cultural evolution is one such theory. Hinged upon the fetishization of human differences, Western perspectives during the nineteenth
century created a dichotomous view of the ethnological record and categorized cultures as either primitive or civilized. Cultural evolution theorists aimed to explain the social and cultural progress achieved by Western nations while accounting for the simple nature of “primitive” cultures. This model purported that culture develops from simple to complex forms, and the complexities of culture are rooted in technology, subsistence, and material culture (Tylor, 1871; Spencer, 1876; Morgan, 1877). Anthropologist Edward Burnett Tylor suggested in a fashion similar to Montesquieu that societies passed through three basic stages of development; savagery, barbarism, and civilization. In order to account for cultural variation, Tylor and other cultural evolutionists such as Spencer and Morgan, suggested different cultures occupied different stages of evolution. In this view, more “primitive” peoples had simply not evolved to reach higher, civilized stages. These theorists suggested hunter-gatherers were primordial and resembled ancient societies in that they lacked laws, morals, and agriculture, which were considered key components of civilization (Tylor, 1871; Spencer, 1876; Morgan, 1877).

Similarly, Lewis Morgan used the stages proposed by Tylor; savagery, barbarism, and civilization, but subdivided savagery and barbarism into upper, middle, and lower sections (1877, p. 5) Morgan distinguished each stage based on technological achievement, subsistence strategy, marriage, family, and political organization. According to Morgan, the hallmark of middle savagery is the acquisition of a fish diet and the discovery of fire. Upper savagery on the other hand is characterized by use of the bow and arrow. He further suggests lower barbarism is characterized by pottery, middle barbarism by animal domestication and irrigated agriculture, and upper barbarism is
distinguished through the use of iron smelting. Civilization, the most complex stage of culture in this model, includes a phonetic alphabet and the use of writing (Morgan, 1877). In this way, Morgan suggested that the stages of technological development were associated with a particular sequence of different cultural patterns. Not only does unilineal evolutionism assume that all cultures follow the same progression and have the same ultimate goals, it equates culture with material culture.

Franz Boas offered a critique of unilineal evolution through American historical particularism. Historical particularism suggests that anthropologists must carry out detailed regional studies of individual cultures in order to discover the distribution of culture traits and to understand the individual processes of culture change at work. Simply put, Boas sought to reconstruct the histories of cultures through fieldwork so as not to generalize (1911). Boas stands in stark contrast to earlier theorists in that his work emphasized the importance of cultural relativism.

With the added emphasis of fieldwork, anthropology experienced a paradigm shift by the 1950s. Julian Steward’s (1955) *Theory of Culture Change* completely revised the way anthropology studied hunter-gatherers. Steward revisited cultural evolution but developed a multilinear approach, which, unlike unilinear evolution, accounted for the influence of the environment on social organization, Steward referred to this approach as cultural ecology. Cultural ecology is the study of human adaptation to social and physical environments and it seeks to understand human culture in specific environmental contexts. For Steward, cultural ecology was hinged upon the study of the relationships between subsistence, technology, and the environments in which they were utilized. He
specifically believed that these relationships had the ability to shape behavioral attitudes towards kinship, customary law, childrearing practices, communal work, and religious rituals. For example, Steward suggested ‘primitive’ hunter – gatherers exploit their environments through a range of specific culturally derived hunting techniques because they are limited by the size and social composition of their group. However, when agriculture is practiced, “man is freed from the exigencies of hunting and gathering and it becomes possible for considerable aggregates of people to live together” (Steward, 1955, p. 39). Steward’s cultural ecology paradigm was largely interested in using comparative methods to suggest universal truths. While Steward’s work was formative, it still walked a fine line of cultural determinism. Nevertheless, his initial work provided the infrastructure for cultural ecology, as it is known today. More importantly, Steward’s publications greatly influenced a new generation of anthropologists who challenged previous conceptions of hunter-gatherers (Barnard, 2014).

In 1966, Richard Lee and Irven DeVore held the Man the Hunter conference at the University of Chicago. This symposium culminated in a book concerning new approaches to the study of hunter-gatherers (Lee and DeVore, 1968). William S. Laughlin’s chapter (1968) in particular paints hunting and gathering as a social way of life, emphasizing that hunters operate with a systematic knowledge of animal behavior as well as appropriate social behaviors with other hunters. This work also emphasizes various complexities involved in the hunter-gatherer life course. For example, Laughlin highlights the importance of children in the hunting system, as they are trained for appropriate action early in life. He specifically highlights the exercise of tendon
lengthening among Aleut children. In early childhood, adult males stand behind male children and repeatedly stretch out their arms over their backs. This exercise allows the shoulder joint to have greater mobility, thus a spear or harpoon may be thrown farther distances. Laughlin suggests that the importance of programming children in hunting and gathering communities reflects the sophisticated intellect of hunter-gatherers, as they are required to understand their surrounding environment and animal behaviors in ways that require innate skill and creativity.

As demonstrated by Laughlin, anthropological research has the capacity to demonstrate the social complexities surrounding hunter-gatherer identity. However, studies of ethnicity and social complexity pertaining to hunter-gatherer identity represent a largely neglected area of research. Ethnicity is often overlooked in studies concerning hunter-gatherers because Western perspectives tend to ignore ethnicity and generalize hunter-gatherer identity (Kent, 2002). Kent (2002) argues that hunter-gatherer ethnicity exists as a negotiation between emic and etic perspectives and is usually absent from research due to the assumption that hunting and gathering cultures are easily assimilated.

There are, however, numerous examples that properly demonstrate the enduring legacy of hunter-gatherer populations in terms of subsistence economy and identity. Stemming from the field of cultural ecology, resilience theory can provide a more comprehensive approach to understanding cultural transitions among hunter-gatherers. Resilience theory has the potential to demonstrate cultural adaption to new environments while encapsulating the persistence of cultural identities. Here, resilience refers to the ability of groups to sustain cultural integrity in the wake of external pressures and how changes are
further buffered by cultural and environmental relationships (Hoover and Hudson, 2016; Redman and Kinzig, 2003). Research by Campbell and Butler (2010) and Hoover and Hudson (2016) demonstrate how the integration of bioarchaeology into resilience frameworks enables a deeper understanding of previous lifeways.

Campbell and Butler (2010) investigate human-salmon interactions of the last 7,500 years in Pacific Northwest foraging populations. With present-day salmon populations in decline, Campbell and Butler aim to understand the resilience of past foraging populations who depended on salmon as a main dietary resource. These authors found that salmon dominated archaeological faunal assemblages and that salmon proportions varied little compared to other fish over the course of 7,500 years, which suggests previous foraging communities sustainably used salmon populations and did not overfish. In further evaluating human population size, harvest pressures, habitat enhancement, suppression of competing predators, resource flexibility, and social and institutional beliefs, Campbell and Butler (2010) determined sustainable resource conservation was rooted in ideas concerning spawning salmon.

Pacific Northwest foraging populations practiced a “first salmon ceremony” and specific rules determined who was allowed to catch and process the first salmon run of the season. After the first salmon ceremony, a period of seven days passed and ritual leaders would enact ritual sequences that lasted another 10 days. These rituals ultimately served as a means to renew salmon abundance. After the ritual ceremonies had ended, fishing could commence. Campbell and Butler (2010) suggest that the elaborate rituals and time constraints controlled human foraging behavior and thus controlled salmon
populations so that they were not overfished. This study demonstrates resiliency of cultural identity in that foraging populations responded to and negotiated with their environment in order to maximize and maintain natural resources for 7,500 years.

Similarly, Hoover and Hudson (2016) incorporate resilience theory in their study of Jomon hunter-gatherers from northwest Kyushu, Japan (14,500 – 500 BC). These authors suggest human resilience can be measured through population health, as health is demonstrative of the capacity of human populations to respond to perturbations. In using dental markers of developmental stress from six continuous hunter-gatherer sites in northwest Kyushu, Hoover and Hudson (2016) found no statistically significant differences in developmental stress between pre-agricultural hunter-gatherers and persistent hunter-gatherers during the agricultural period. These results suggest Jomon hunter-gatherers were resilient in the face of social and ecological changes, such as the influx of immigrant agricultural populations to Kyushu. Resilience theory grants hunter-gatherers agency, as opposed to unilineal theories that treat hunter-gatherers as groups who are simply waiting to adopt agriculture.

**History of mortuary practices**

Nearly a century of discourse in the field of archaeology has surrounded methods that attempt to effectively reconstruct social dimensions and complexities of populations through the study of mortuary analysis. Arthur Saxe and Lewis Binford arguably stand out as the point of origin for the processual, or representationalist school of thought. In the 1960s, archaeology underwent a renewed interest in burial customs, but used their study as a middle-range crutch to help support the big picture of processual cultural
ecology and evolution. The primary focus of the processualist approach involves
generalized techniques used in the mortuary process and interpretation of direct evidence
provided from that of interment. This process attempts to analyze burial data and provide
answers to questions regarding social patterns relating to the structure and changes in
mortuary practices.

Binford and Saxe argued mortuary patterns reflected social structures. Research
by Binford (1971) suggested social rank and status correlate directly with mortuary
treatment of the deceased thus linking mortuary practices with social complexity.
Binford’s research expanded a hypothesis developed by Saxe (1971), who suggested the
complexity of a community and importance of an individual resided solely in evidence
from interment, upon which the Binford – Saxe model was developed. Binford’s research
regarding mortuary practices relied heavily on cross-cultural generalizations, he argues,
“there should be a direct correlation between the structural complexity of mortuary ritual
and status systems within socio – cultural systems” (1971, p. 18). He suggests mortuary
practices expressed in one population can be directly compared to another. Essentially,
Binford and Saxe believed cemeteries everywhere had an inherent structure that allowed
observers to infer organizational principles underlying the community in question, hence
their attention to rank, status, and structural complexities (Brown, 1995). As their line of
research was categorical and typological in nature, Binford and Saxe’s processualist
methods were incapable of or failed to consider certain factors such as cosmology,
emotions behind interment, or symbolic meaning pertaining to mortuary practices.
Tainter (1978) similarly excludes symbolic meaning and allots grave goods and energy
expenditure to the social status of the deceased. The issue with Tainter’s model is that while it attempted to address some of the challenges in the Binford-Saxe approach, it too is reductionist in nature and assumes “value” can be quantified. This model would be nearly impossible to apply universally because there is no way to accurately attribute or measure the amount of energy expended on one burial versus another across time and space.

The exclusion of symbolic factors from the processual approach ultimately fails to embody all the dimensions involved in the burial process, making mortuary practices more complex than initially perceived. While rank and status may be determined from evidence gathered from mortuary practices, the incorporation of context from external variables sheds light on symbolic meaning within each ritual activity. To address the shortcomings of processualist methods, archaeological theory aimed to provide a holistic approach to mortuary analysis in the development of postprocessual archaeology.

Postprocessual theorists postulate that processual archaeology is too simplistic, naïve, and etc. Their main critique of processual archaeology is that the Binford-Saxe hypothesis is ahistorical and atemporal and disconnected from the sweep of historical, ideological, and ritual processes that shape burial. Carr (1995) argues that the Binford-Saxe approach did not account for variables that would allow an archaeologist to assess the impact of cosmology or beliefs on mortuary practices. He further suggests that symbolism and philosophical – religious beliefs encompass a society’s worldview and these should be assessed in mortuary studies in order to fully understand social complexity. Further, the multiple approaches that came to form under the postprocessual
label also allowed for a wider range of social identity in that they viewed age and sex differently from processualists. Processual approaches to mortuary analysis tend to view age as a concrete biological event in respect to the achieved versus ascribed nature of identities in past social organizations (Binford, 1971; Brown, 1981; Chapman, 1995, 2013). However, it is more pragmatic and realistic to understand age as a fluid, culturally contingent social process.

Developing with clear influences from the postprocessual school of thought, Sofaer (2000, 2006, 2011), Gowland (2006), along with Halcrow and Tayles (2008, 2011) advocate for a greater understanding of age as it corresponds to children in the archaeological record. These authors contend bioarchaeologists need to shift their focus away from biological age, as it is not always applicable cross-culturally, and focus instead on age as a social, culturally mediated event. Social age differs from biological age in that social age acknowledges childhood as a socially and culturally constructed category, as well as recognizes the significance of rites of passage in prehistoric lifeways (Sofaer, 2006). In viewing age as a social event previous lifeways may be better understood due to the fact that humans are social and grow in social worlds. In understanding age as fluid across cultures and time, bioarchaeologists may better discern social ontologies and transformations of identity in the archaeological record.

Burial practices are essential when attempting to understand social age, symbolism, and observe transformations of identity because they lend themselves to cultural narratives. Finlay (2014) contends mortuary contexts are crucial in reconstructing hunter-gatherer identity and personhood because burial implements and arrangements are
indicative of identity and can reflect social relations and social age from which ontology may be studied. An example of this includes Jomon hunter-gatherers from Japan. Individuals dated to the Middle Jomon cultural phases (5000-6000 BP) at the Nakanoya Matsubara site were buried in oval pits while their heads are oriented towards a large stone (Kobayashi, 2005). When further surveying the landscape the volcanic cone of Mount Asama can be seen in the distance. This strategic layout of Jomon burials suggests a great degree of planning was involved in their interment process and that the landscape was significant in regards to their cosmological beliefs.

The Jomon also appear to reproduce the social ontology of individual identities in death and burial. For example, infants, 0.3 to 2.0 years of age, are buried in jars. Individuals aged 2.0 to 5.0 years are buried with adult men, while subadults aged 5.0 years and older are buried independently (Yamada, 1997). This suggests a component of identity that appears to symbolically demonstrate phases of life and identity that corresponds to increasing independence as an individual grows.

A recent study by Temple (2017) examines the social and ecological parameters of Jomon childhood based on the presence of linear enamel hypoplasia (LEH). Age-at-defect formation was estimated for Jomon children and 90 percent of LEH were between 2.1 and 4.8 years. Previous research concerning Jomon skeletal remains and age at breastfeeding cessation (Tsutaya et al., 2013) reports significant reductions in breast milk occur between 3.0 and 4.0 years of age. Based on age-at-defect, the results of Temple’s study suggest the physiological stresses incurred during infancy/childhood transitions are aligned with weaning and the cessation of breast-feeding. Concomitant with Jomon
mortuary treatment, these results indicate children had identities that were distinct and socially negotiated by the broader community. This research demonstrates that childhood is a socially and ecologically defined phase of life history that can be explored as a means to better understand previous ideas concerning ontology.

Similarly, Sofaer-Derevenski (2000) explores age as a social event among adults in the Copper Age of the Carpathian Basin. She observes that metalworking was used to display social differences among male and female life, specifically in terms of age and gender. Sofaer – Derevenski notes that burial positioning and grave goods coincide with ideas concerning gender identity and biological age. This is further demonstrated through burials from the Tiszapolgár phase at the Tiszapolgár-Basatanya site where sudden changes in burial implements are observed as an individual ages. This research concluded that changes in burial implements coincide with biological age in that age represents a socially recognized divergence in life course stages. For example, at the age of 5.0 years, individuals are buried with rings, copper beads, or arm rings. However, in burials of individuals aged 25 years, the implements gained in childhood are removed. Sofaer-Derevenski suggests this demonstrates gradual changes in life courses of the Tiszapolgár that are socially defined through aspects of age and gender.

These examples suggest mortuary treatment is associated with the symbolic aspects of communal life, and specifically, circumstances where mortuary treatment symbolically reflects the social ontologies of personhood. These examples further illustrate that bioarchaeology is ideally situated to investigate and reconstruct perceptions of identity in past communities. As demonstrated here, reconstruction of ritual action and
social identity may be discerned from mortuary practices and provide insight into hunter-gatherer social structures. This thesis will document and interpret transformations of hunter-gatherer social identity using the immature human skeletal remains and archaeological descriptions of burials from the Point Hope, Alaska cemetery to help explain the achievement of personhood using the mortuary record. This study will contextualize the rich burial record documented for the Point Hope skeletal remains with estimations of age-at-death. The results will help demonstrate how Ipiutak and Tigara cultures negotiated the social boundaries of development, and how these boundaries may be tethered to or transcend biological aspects of age.
CHAPTER TWO

Point Hope is situated on a narrow strip of land that juts out into the Chukchi Sea. Locals refer to this strip as Tikiqiag or Tiagara, which translates to “finger” in the native Iñupiaq language. Located nearly 190 miles north of the Arctic Circle, Point Hope, Alaska marks the westernmost point north of Bering Strait. Initially excavated by Helge Larsen and Froelich Rainey from 1939 to 1941 at the discretion of Knud Rasmussen, their excavation at Point Hope yielded nearly 10,000 artifacts, 500 skeletons, and remnants of 575 houses occupied over a series of generations of hunter-gatherers (Larsen and Rainey, 1948). In 1948, the two excavators published a monograph of their findings, which included detailed drawings and descriptions of burials, grave goods, houses, and hunting tools. Based on differences observed between artifacts found in houses and burials, Larsen and Rainey believed it was obvious that the remains of two different cultural occupations were represented at Point Hope. They proceeded to name their newly discovered site, Ipiutak, the native term for a narrow sand bar that separates two lagoons (Larsen and Rainy, 1948, p. 15).

Thanks to earlier arctic excavations the pair were also able to recognize the presence of the Thule cultural occupation, which was first discovered and described by Danish archaeologist Therkel Mathiassen, who excavated parts of the Hudson Bay in the
1920s. Mathiassen was the first to realize the existence of the Thule culture, which he believed was based primarily upon whale hunting and characterized by permanent settlements and advanced harpoon technology (1927). Mathiassen’s discovery led Larsen and Rainey to surmise that the more recent cultural occupation at Point Hope was part of the Thule culture because they observed harpoon heads and other whale hunting equipment associated with many homes and graves (Larsen and Rainey, 1948). In their work, Larsen and Rainey continually referred to the Thule occupation at Point Hope as the Tigara phase. Albeit spelled incorrectly, the term Tigara was chosen because it sounded like the Iñupiat word Tiagara, which means finger (Larsen and Rainey, 1948). In an impressive feat for the 1940’s Rainey was able to carbon date remains from the Point Hope site in order to secure dates for each occupation. Wood from the site provided dates of circa 1000 AD for Ipiutak and circa 1500 AD for Tigara (Larsen and Rainey, 1948). However, recent radiocarbon dates place Ipiutak cultural occupations at Point Hope between 400 and 750 AD, and subsequent Thule cultural occupations of Tigara peoples between 1100 and 1700 AD (Giddings, 1964; Hilton et al., 2014).

**Early perspectives**

In their initial analysis of Ipiutak culture, Larsen and Rainey proposed that Point Hope represented a locus of winter and early spring seasonal settlements and that the homes were occupied at different periods by hunters and their families (1948). However, more recent data suggests that Point Hope was a permanent settlement and seasonal settlements actually occurred in Alaska’s interior. In using Narroll’s rule (1962), which suggests that each person requires 25 square feet to live comfortably, Mason (1998) was
able to reconstruct the average population of the Ipiutak occupation. In assuming that roughly twenty or thirty years separate each generation, so that between twelve and fifteen generations lived at Point Hope between 600 AD and 900 AD, then dividing the total living space for 575 houses (or 65,000 sq. ft) by generation number, Mason (1998) estimates that between 175 and 215 individuals lived at Point Hope during the Ipiutak occupation. A recent ArcGISOnline spatial calculation conducted by the author (04.12.2017) suggests that the geographical area of Point Hope is roughly 80,000 square feet. This implies that the occupants at Point Hope inhabited the majority of their surrounding landscape. Other data that suggests Point Hope was not a seasonal residence includes recent excavations from The Brooks Range in Alaska. The Brooks Range excavations produced two large oval housing structures, called qargi (Mason, 1998). These structures had an interior size of roughly 400 feet and have radiocarbon dates between 1509 years BP and 1332 years BP; or between 491 AD and 668 AD (Mason, 2014). Few artifacts were found within these buildings such as masks, antlers, and hunting equipment that suggests qargi sheltered seasonal activities for Ipiutak events such as trading, hunting, or ritual purposes. Furthermore, not a single burial is reported from these interior settlements, which further indicates that the Ipiutak cemetery is representative of a permanent population.

In an attempt to develop a working timeline of the cultural occupations at Point Hope, Larsen and Rainey originally believed that a “Near-Ipiutak” culture succeeded the Ipiutak cultural period and predated Tigara occupations. However, recent research suggests Larsen and Rainey’s timeline was largely inaccurate (Fitzhugh and Kaplan,
1982; Jensen, 204; Maley, 2014). Based on artefactual evidence and radiocarbon dates, “Near-Ipiutak” is a misnomer. Researchers agree that what was originally conceived to be “Near Ipiutak” is actually representative of the Norton cultural tradition, which predated Ipiutak culture between 2500 and 2000 RCYBP (Giddings, 1964; Jensen, 2014). It is thus likely that Ipiutak culture developed in situ at Point Hope from nearby Norton cultural occupations at Kotzebue and Norton Sound as both cultures produced similar artifacts such as blade insets, discoidal scrapers, and bifacial knives (Larsen and Rainey, 1948; Jensen, 2014; Mason, 2014). However, the complete absence of pottery, rubbed slate, oil lamps, and whale-hunting accoutrements distinguish Ipiutak culture from other North Alaskan cultural traditions, making their coastal lifestyle an enigma compared to their cultural forebears and descendants.

While cultural occupations existing concurrently with the Ipiutak were developing useful technological complexes such as ice-hunting equipment, Ipiutak culture continued to remain separate and distinct. Despite occupying a coastal area where cultural predecessors practiced whaling, namely the Norton (2500 – 2000 RCYBP), Okvik/Old Bering Sea (AD 1 – 700), and subsequent Thule occupations (AD 1300 – 1700), Ipiutak hunter-gatherers actively eschewed whaling and instead mainly hunted caribou, seals, and walrus (Larsen and Rainey, 1948; Mason, 1998; Hilton et al., 2014). While it remains unknown why the Ipiutak were reluctant to whale hunt, the surfeit of ivory found at the Ipiutak site suggests successful walrus hunting ventures. In abstaining from whale hunting practices, Ipiutak peoples lacked the proper resources needed to fashion whale blubber or oil lamps, resigning them to burn wood as a source of heat, light, and food
preparation (Larsen and Rainey, 1948). With average temperatures failing to reach above 12° Fahrenheit, Point Hope is indeed a harsh polar environment and the absence of whale blubber undoubtedly required the Ipiutak to exploit other natural resources from their surrounding environment in order to survive. Excavations and reconstructions of Ipiutak houses at Point Hope indicate that their floor plans included large open fireplaces in the middle of their housing structures in order to burn wood. While Point Hope remains the type-site for Ipiutak culture, other Ipiutak sites have since been discovered at Kotzebue, Deering, Cape Krusenstern, and Onion Portage, Alaska (Larsen, 2001; Mason, 2014). Resembling the Point Hope site, these settlements also lacked pottery, whale-hunting equipment, rubbed slate, and oil lamps, which further suggests all Ipiutak settlements chose to desist from whaling (Mason, 1998).
Additionally, burials from all Ipiutak sites are securely dated between 400 and 700 AD and as archaeologists have not discovered burials following these dates it may be concluded that these settlements faced grave circumstances that led to the end of their culture (Mason, 1998, 2014). Maley (2014) posits that extreme weather events, circa 800 and 1400 AD, probably depleted natural resources and caused many coastal populations to migrate inland in search for land mammals. Radiocarbon dates and material artifact analysis suggests this inland migration included the Ipiutak from Point Hope and the
Birnirk cultural occupation (AD 500 - 1000) from Point Barrow, the northernmost point of the United States (Maley, 2014). It is theorized that during this migration, the Birnirk and Ipiutak contemporaneously occupied the same southern interior settlements and as a result of their contact, both cultures are identified as ancestors of the Tigara. Phenotypic distance suggests the Tigara are more similar to the Birnirk (0.079) at Point Barrow than to the Ipiutak (0.026) (Maley, 2014). These data corroborate interpretations of inland migrations because phenotypic distances from each other as well as neighboring groups suggests that one population was an initial occupying group and a second population moved in after a hiatus.

As climate improved and migrations to coastal settlements resumed, the Tigara cultural occupation repopulated Point Hope by 1100 or 1300 AD (Hilton et al., 2014). The Tigara people were part of the Thule culture (AD 1300 – 1700). Thule culture is a complex whale hunting culture characterized by its elaborate harpoons and variations of Birnirk artifacts, and is regarded as the progenitor of modern Inuit culture. Birnirk culture (AD 500 - 1000) predated Thule culture and is also known as a whale hunting culture. Many Birnirk sites have produced elaborate harpoon and marine technologies fashioned out of antlers rather than ivory (Stanford, 1976; Mason, 1998). The Birnirk culture, however, lacked art such as sculptures, carvings, and masks (Larsen and Rainey, 1948; Auger, 2005; Hilton et al., 2014). Excavations of Birnirk sites indicate that only their clay pots incorporated simplistic motifs (Larsen and Rainey, 1948). Given the ancestor-descendant relationships between Birnirk, Ipiutak, and Thule cultures, it seems that the Tigara peoples at Point Hope maintained whaling subsistence strategies as observed in
Birnirk culture and continued to incorporate stylistic designs in their material culture as observed among the Ipiutak, thus the Ipiutak predilection for symbolic sculpture and art is maintained in Tigara culture.

**Subsistence economy and collective action**

Contemporary studies that examine dental and skeletal remains from Point Hope shed light on the ways in which dietary and behavioral strategies differed between Ipiutak and Tigara cultural groups. These studies provide greater insight into Point Hope hunter-gatherer activities and allow for an in-depth analysis of the circumpolar life course. Research concerning tooth loss, incisor microwear, occlusal molar microwear, pathological lesions, and the growth and development of immature remains aims to enhance perspectives concerning the ways that the individuals at Point Hope interacted with each other and their environment in order to reach a shared goal. The results of these studies can further elucidate identities as hunter-gatherer subsistence depends on collective social-action and cooperation within a shared environment (Ingold, 1998, 2000).

In studies concerning antemortem tooth loss of anterior teeth, Ipiutak and Tigara males exhibited low prevalence of anterior tooth loss (Costa 1980; Madimenos, 2005). Reported incisor loss between groups is 5.3% for Ipiutak males and 8.8% for Tigara males. Ipiutak rates of loss were correlated with chronological age whereas Tigara rates were not. This is to say that antemortem tooth loss observed in Ipiutak males corresponds with aging or senescence (Costa, 1980). However, Ipiutak and Tigara females exhibit much higher rates of antemortem anterior tooth loss. Costa (1980) observed average
incisor loss percentages of 19.4% among Ipiutak females and 16.4% among Tigara females. Unlike the Ipiutak male patterning of antemortem tooth loss, Ipiutak female rates did not correspond to chronological age, but Tigara females did (Costa, 1980). Costa (1980) surmised that females displayed higher rates of antemortem tooth loss in both populations because they often used their teeth as tools. Ethnographic accounts of the Sadlermiut, an Inuit population of Southampton Island, suggests a sexual division of labor affected the degree of wear and antemortem trauma of the dentition. Mayhall (1977) suggests that female tasks among Inuit groups often entail the practice of chewing animal hides or skins in order to soften them for the construction of boots, clothing, or umiaks. This practice resulted in extreme wear on the anterior dentition and ultimately resulted in tooth loss. Females were also responsible for chewing animal tendons, or sinews, for thread, this was accomplished by pulling sinews across anterior tooth surfaces. This clamping, or power—grasping activity leaves traces on enamel and suggests a sexual division of labor was prevalent among artic foraging groups (Ryan, 2011). A later study concerning Ipiutak and Tigara microwear speaks to this point and suggests males and females between both groups used their incisor teeth in dietary and behavioral strategies but in radically different ways (Krueger, 2014).

Krueger (2011, 2014) advocates for incisor microwear texture analyses as they are extremely useful for understanding the diets and behaviors of subsistence groups. Because enamel cannot be regenerated over an individual’s lifetime, teeth are in effect blank slates upon which a permanent record of dietary and habitual behaviors can be manifest. This of course is in stark contrast to bones, which have the ability to remodel
over the course of a lifetime, often concealing aspects of an individual’s life history. In light of this, more studies are paying attention to anterior teeth because they have the ability to provide evidence of non-dietary behaviors (Smith, 1983; Molnar and Molnar, 1990). Non-dietary anterior tooth use and abrasive loads leave distinct marks and furrows on teeth, and in studying these textures researchers are able to trace the etiology of the tooth wear in order to better understand dietary and behavioral activities of populations. Krueger (2014) examined adult Ipiutak and Tigara labial incisors for dental microwear using a light microscope and used Toothfrax and SFrax scale-sensitive fractal analysis (SSFA) software for surface texture characterization. Her study includes four texture variables, complexity, anisotropy, textural fill volume, and heterogeneity to characterize the microwear. The results of her study indicate that the incisor microwear signatures of the Ipiutak and Tigara are diametrically opposed. The patterns of wear on Ipiutak incisors indicate that they used their incisors in non-dietary related tasks such as clamping and processing of caribou and seal hides. Krueger (2014) reached this conclusion as Sadlermiut and Ipiutak microwear is nearly congruent. Krueger (2014) also found that extremely high textural fill volumes indicate that the Ipiutak were exposed to dietary abrasives, which are most likely associated with food preparation or storage processes. Tigara microwear, however, suggests their population used the anterior dentition related to behavioral strategies less than the Ipiutak. Furthermore, their low textural fill volume suggests the Tigara had exposure to only moderate levels of dietary abrasive loads.

While faunal remains from Point Hope suggest that both groups exploited fish and seal, the Ipiutak relied on caribou whereas the Tigara relied more heavily on whales
rather than caribou for sustenance (El Zaatari, 2014). Examinations of macroscopic
dental wear indicate that the majority of individuals between both populations exhibit
extreme degrees of occlusal wear. Among the Ipiutak, tooth wear reached its maximum
in individuals between 26 and 30 years of age, whereas the Tigara maximum tooth wear
was not reached until nearly 40 years or older (Costa, 1982). However, the level of
observed dental wear between the Ipiutak and Tigara was much higher than surrounding
dentitions from the Kodiak Islands. The reason for this stems from the fact that Point
Hope is a coastal location and the inhabitants most likely had a large amount of grit in
their diets. Point Hope inhabitants prepared their meat by placing them on open racks,
which were probably exposed to winds carrying sand and grit from the surrounding
coastal region (Costa, 1977). The abrasive particles consumed with the meat affected the
dentition in that molar teeth from Point Hope are often chipped, cracked, or broken
antemortem (Costa, 1977).

A more direct documentation of the dietary differences between the Ipiutak and
Tigara is available through the study of occlusal molar microwear using scanning
electron microscopy analyses (El Zaatari, 2008, 2014). Occlusal molar microwear
analyses have the potential to capture the effects of the mechanical properties of food. As
previously discussed, ingested abrasives leave distinct marks on enamel, making the
study of dental microwear lucrative for understanding differences in diet between
populations. El Zaatari collected dental cast data from 44 adults from Point Hope (17
Ipiutak, 27 Tigara) and for comparative purposes, occlusal molar microwear data were
also collected from Aleut and Arikara populations. Ethnohistoric accounts suggest the
Aleut and Arikara relied on marine mammals for subsistence and they were also known for extensively chewing frozen and dried animal meat and skin (Hrdlička, 1945).

The results ultimately reveal that both the Ipiutak and Tigara have significantly higher levels of occlusal molar surface complexity compared to the Aleut and Arikara populations. The patterns of microwear between the Ipiutak and Tigara suggest that both groups relied heavily on meat. While meat itself is not hard enough to mark the enamel surface, El Zaatari (2010, 2014) observed microwear signatures caused by abrasion from particles ingested with meat. Even though ethnohistory accounts suggests the Aleut and Arikara relied on meat, the higher levels of surface complexity observed among the Point Hope populations suggests greater potential of sand and grit particles attached to meat. Archaeological evidence suggests that the Tigara consumed high amounts of frozen meat that was either dried on open racks or stored under-ground (Larsen and Rainey, 1948). This process of meat freezing most likely facilitated the consumption of sand and other abrasive particles, thus subjecting the Tigara to consuming high amounts of grit with their food (El Zataari, 2014). While it is only assumed that the Ipiutak practiced similar food preparation techniques, considering the extreme arctic conditions at Point Hope, the Ipiutak probably ingested high amounts of sand particles as well.

Beyond this, the different levels of observed anisotropy suggest dietary differences. Anisotropy reflects the differences in the directionality of jaw movements. For example, the higher the anisotropic value the more the surface is dominated by parallel striations, thus higher values most likely reflect ingestion of tough foods (El Zataari, 2014; Krueger 2010, 2014). The Ipiutak have significantly less anisotropic...
surfaces when compared to the Tigara (El Zataari, 2014). The higher value observed among the Tigara suggests that they were eating larger amounts of tough foods. This could be linked to consuming and chewing higher levels of uncooked meat whereas the Ipiutak might have relied less on frozen meat, since whale was not included in their diet, and they relied on smaller mammals such as caribou to supplement their diets. El Zaatari (2014) also observed age related variations between the Ipiutak and Tigara. Age related differences were observed only in the Ipiutak sample. Individuals in the 16.0 to 25.0 year age group have lower scales of complexity concerning microwear than individuals in the 26.0 to 35.0 year age group, which suggests the latter group was ingesting higher amounts of abrasive particles with their diets. This might be related to the age at which Ipiutak individuals attained maximum tooth wear observed by Costa (1982). In all, material culture, faunal remains, and dental macrowear and microwear suggest that the two Point Hope cultural occupations had significantly different diets.

Postcranial skeletal lesions are pathological lesions indicative of fractures, spondylolysis, various developmental defects, and infectious diseases (Rothschild and Martin, 2006; Hilton et al., 2014). These pathological lesions can impact cultural behaviors as well as the levels of comorbidities within a population and among foraging populations the prevalence of postcranial skeletal lesions can ultimately be used as a comparative framework to address the effects of subsistence-related physical activities associated with sex and age. It is in this vein that Hilton et al. (2014) investigated the prevalence of postcranial skeletal lesions of adult Ipiutak and Tigara individuals. Their research aimed to reconstruct lifeways of these past communities by assessing endemic
and chronic diseases within groups that exploited different subsistence and behavioral strategies. Their study comprised of 43 Ipiutak skeletons (25 males and 18 females) and 155 Tigara skeletons (82 males and 73 females) as Tigara burials comprise the largest component of the excavated remains. Ages in this particular study were further broken down into categories of “young” adults (18 – 39 years of age) and “old” adults (≥ 40 years of age). Each postcranial skeleton included in the study was macroscopically examined for pathological lesions indicative of trauma, non-specific infections, infectious disease, developmental anomalies or defects, and extreme degenerative joint disease.

Hilton et al.’s (2014) study found that the Tigara exhibit a higher prevalence of postcranial skeletal lesions compared to the Ipiutak. Nearly 65% of the Tigara sample (101 individuals) exhibits at least one lesion from the list described above. Among Tigara males, 52 individuals (63% of the male sample) possess at least one skeletal lesion relative to the 49 Tigara females (67% of the female sample) that possess at least one skeletal lesion. Beyond this, 25 Tigara individuals exhibit multiple lesions of different types. While Tigara males as a group have a higher frequency of healed upper and lower limb fractures, the most pervasive postcranial skeletal lesion among the Tigara sample is spondylolysis. Spondylolysis is a stress fracture that involves the separation of the vertebral neural arch in the area between the superior and inferior articular processes, often referred to as the pars interarticularis (Larsen, 1997). This condition usually affects the fifth lumbar vertebra, although it can sometimes occur in the cervical vertebrae. Spondylolysis results from excessive mechanical loads over periods of time, thus it generally affects laborers, over-trained athletes, and individuals involved in physically
demanding activities (Larsen, 1997). While the Ipiutak exhibited some instances of postcranial skeletal lesions, the most dramatic difference between the two cultures is the higher prevalence of postcranial skeletal lesions among the Tigara females relative to their Ipiutak counterparts, 66.0% versus 5.50% respectively (Hilton et al., 2014). Tigara males also exhibit a higher prevalence of postcranial skeletal lesions than their Ipiutak counterparts, 62.0% versus 36.0% respectively. Hilton et al. (2014) posit that the high rates of postcranial skeletal lesions, most corresponding to spondylolysis and limb fractures, observed in Tigara remains are indicative of strenuous physical demands brought upon by whale hunting.

There are many ethnographic studies that speak to the arduous activity that is whaling (Murdoch, 1892; Nelson, 1969; Alvard and Nolin, 2002; Sakakibara, 2007). In a study concerning modern Indonesian whalers, Alvard and Nolin (2002) note that whale hunting places an entire crew at risk for severe injury and even death. Limbs can be amputated, as they are susceptible to being caught in harpoon crossfire, and boats can be capsized and dragged for miles by harpooned whales (Alvard and Nolin, 2002). Not to mention that retrieving, hauling, and butchering whale carcasses are laborious tasks in and of themselves. Faunal remains from Point Hope suggest that the Tigara primarily hunted bowhead whales (*Balaena mysticetus*). Bowhead whales are typically 18 feet in length and can weigh up to 100 tons (Hoekstra et al., 2002). Given this information, Hilton and colleagues suggest that lifting and transporting heavy animal parts attributed to the prevalence of spondylolysis in the Tigara population at Point Hope (2014). Furthermore, the prevalence of postcranial skeletal lesions among Tigara females
suggests that they had a more strenuous workload compared to earlier Ipiutak females. Contributing factors to this increase may surround new tasks related to whale hunting. Spencer (1977) suggests that whaling season requires extensive labor time and effort by male and female adults. Whaling is ultimately a “boom or bust” activity, which is to say that successful whaling ventures provide a sizeable yield, but unsuccessful ventures require the surrounding community to engage in other subsistence activities in order to make up for the loss (Hilton et al., 2014, p. 173). Concomitant with these ideas, the postcranial skeletal lesions observed in Tigara skeletal remains indicate that foraging intensity increased substantially with the Tigara occupation. This is based on the fact that whale hunting is a dangerous activity that requires the surrounding community to engage in a complex social organization that prepares for instances of resource dearth.

**Growth and development of immature remains**

While the majority of research concerning Ipiutak and Tigara lifeways involves adult remains, at present, only a few studies incorporate the immature samples from Point Hope (Cowgill, 2014; Temple et al., 2011). This fact is surprising as the Point Hope sample is one of the largest of northern latitude skeletal material in the world (Cowgill, 2014). Immature remains tend to be of great importance to the study of bioarchaeology as they can provide information concerning health, fertility, demography, disease, and ritual activity concerning mortuary patterns (Halcrow and Tayles, 2008; Cowgill, 2014). Due to poor preservation, immature individuals remain an understudied demographic in the bioarchaeological record, thus information gleaned from immature skeletons constitutes a holistic reconstruction of the prehistoric life course.
Cowgill (2014) studied the immature individuals from Point Hope in order to observe changes in body proportions over the course of growth. Her study spans a range of time periods, geographic locations, and subsistence strategies (California Amerindian, Dart, Indian Knoll, Kulubnarti, Luis Lopes, Mistihalj, and Point Hope). In order to understand how environments influence growth, long bone measurements were taken in addition to femoral and humeral cross-sectional measurements. In all, Cowgill’s (2014) sample size is made up of 570 immature individuals (all under 18 years of age). Cowgill (2014) found that eco-geographic distributions of body proportions are understood as morphological adaptations to climate. This conclusion stems from Bergmann’s and Allen’s rules that suggest climate affects body proportions as a means to increase or decrease surface area of the body for thermoregulation. Allen’s rule holds that a body is linear in warm climates whereas a body is rounded and compact in cold climates because small, round bodies have a smaller surface area compared to volume. Bergmann’s rule states that body size tends to be large in cold climates and small in warm climates because larger bodies have a smaller surface area. This simply means that in cold climates, where individuals need to retain heat, bodies are larger and more compact. In warm climates, where individuals need to expel heat, bodies are smaller and linear. Ruff (1994) helps to demonstrate these rules in describing the human body as a cylinder or a cube. In viewing the human body as a cylinder, surface area is dictated by changes in breadth, by widening the cylinder surface area is reduced, by narrowing the cylinder surface area increases. This demonstrates that human physique is either narrow or wide because human breadth is associated with climate. In viewing the human body as a cube,
greater surface area is related to mass. Ultimately, elongation or shortening of the cube influences surface area.

Furthermore, populations from higher latitudes experience foreshortening of appendages, which ultimately improves the ability to retain heat, and populations in low latitudes experience elongation of distal limbs related to proximal limbs. Despite variation, these differences observed in adults are seen immediately in ontogeny. This is demonstrated in Cowgill (2014) in which the author suggests climatic correlations in the Point Hope skeletal sample remain constant throughout growth. Thus, limb proportions represent a pattern of variation that exists immediately in ontogeny and is present in adults. This suggests that morphological adaptations are more genetically canalized than what we see in stature and body mass. In the case of environment, natural selection is acting on variation in heritable traits and favors particular variations in certain environments.

Archaeological evidence suggests that cultural occupations at Point Hope span nearly two millennia. This point speaks to the ways populations were able to employ differing subsistence strategies to successfully interact with their surrounding ecological environment, albeit a drastic one, in order to obtain key resources. This is to say that even though the Ipiutak and Tigara cultures are characterized by their distinct subsistence strategies, these hunter-gatherers were far from monolithic. As demonstrated through their exploitation of differing natural resources, the Ipiutak and Tigara populations were rather dynamic. What makes the Point Hope discovery so interesting is that different
cultural occupations were able to inhabit this harsh environment, endure climatic extremes, and ultimately transform Point Hope into a habitable landscape.

**Current perspectives**

Though it is seven decades old, Larsen and Rainey’s monograph remains an invaluable source of information concerning aspects of Ipiutak and Tigara foraging lifeways. As permafrost continues to thaw due to human induced climate change, coastal areas erode thus placing villages and communities at risk of complete loss (Melvin et al., 2017). Given Point Hope’s location on the Alaskan coast, the extensive data provided by the initial excavators allows modern-day researchers to continue to investigate the life histories of peoples from an area that is actively deteriorating. The inclusion of burial data, drawings of burial structures, and reconstructions of floor plans, cultural artifacts, and material technology in their initial publication allows researchers to explore new lines of thinking. The continued study of Point Hope remains important because Larsen and Rainey’s analysis of Ipiutak and Tigara culture was circumspect and no doubt their study was restricted by the technology available in 1948. However, technological advancements over the past 70 years allows the field of bioarchaeology to reinvestigate these circumpolar lifeways, providing new data and precise results that help to reconstruct the lived experiences of these arctic hunter-gatherers.

While relatively little bioarchaeological research exists concerning Point Hope, the research that has been conducted treats age as a biological event, particularly evaluating variation in morphology over development. In addition, many of the archaeological mortuary remains from this site are described with the intent to better
understand the process of ceremony and ritual at this site (Larsen and Rainey, 1948; Hilton et al., 2014). Despite providing important insights into the ceremonial and ritual beliefs of the Point Hope inhabitants, these studies do not provide a developmental perspective on these data, and at present, no information on the ontology of identity within this society has been published.
CHAPTER THREE

As previously discussed, material culture from Point Hope reflects the distinct subsistence strategies employed by each cultural occupation. It is worth noting that of the 10,000 cultural artifacts discovered at Point Hope, over 2,000 of the Ipiutak artifacts are associated in some way to land mammals and land mammal hunting (Larsen and Rainey, 1948; Krueger, 2014). Tigara artifacts, however, are almost entirely made up of whale hunting implements such as open boats or umiaks, harpoons, and whale bones (Larsen and Rainey, 1948). This particular aspect of Ipiutak and Tigara culture is of importance because despite the Tigara relationship with Birnirk culture, the Tigara inhabitants exhibit material proclivities similar to that of the Ipiutak.

The hallmark of Ipiutak culture is the distinct stylistic motifs observed in their sculptures and artefactual remains. While it is hypothesized that Ipiutak culture developed in situ at Point Hope from the nearby Norton cultural occupation, Ipiutak culture is further distinguished because the intricate motifs and designs incorporated in artifacts from the site are not found in any other cultural period in Northwest Alaska (Larsen and Rainey, 1948; Auger, 2005; Hilton et al., 2014). Ipiutak artifacts are demarcated by a distinctive aesthetic that includes lines, circles, dots, and stippling. The Point Hope site is replete with material culture with this distinctive pattern as well as
ivory carvings that emulate various arctic animals such as polar bears, walrus, seals, arctic loons, as well as miniature human heads. These ivory carvings often include lines that resemble exoskeletons, which is reminiscent of a shamanic belief system (Larsen and Rainey, 1948; Fitzhugh and Kaplan, 1982; Mason, 1998; Auger, 2005; Hill, 2011; Mason, 2014). Even with a cultural separation of nearly 500 years, archaeological evidence indicates that Tigara artifacts maintain a distinctive appearance, relatively similar to their Ipiutak counterparts. This ultimately speaks to the resilient cultural and ideological frameworks of the Point Hope inhabitants in that their subsistence strategies were versatile but their overarching social structure was able to persevere. The burial practices at Point Hope also speak to this point. The Tigara inhabitants at Point Hope not only produce material depictions and artifacts similar to their Ipiutak forebears, but their funerary rituals seem to endure a cultural separation as well.

**Burial Practices**

Owen Mason (1998, 2006, 2009, 2014) is arguably the only archaeologist to extensively discuss Ipiutak and Tigara burial practices since Larsen and Rainey first published their field notes in 1948. However, Mason’s analyses pay particular attention to Burials 51, 61a, 64, and 77 due to the presence of conical, jet-inlaid, ivory eyes and prophylactic facemasks that are often attributed to arctic shamanistic practices (Larsen and Rainey, 1948; Morrow and Volkman, 1975; Fitzhugh and Kaplan, 1982; Sutherland, 2001; Mishler, 2003; Eliade, 2004; Auger, 2005; Hilton et al., 2014). These discoveries are undoubtedly unique but there has been virtually no discussion concerning Ipiutak and Tigara subadult burials. Subadults at Point Hope are often afforded elaborate burial
treatment, not to mention subadults interred with adults make up nearly one-quarter of all Point Hope burials. In devoting necessary attention to the burial treatment of subadults, circumpolar hunter-gatherer lifeways can be better understood because at present anthropologists have only rendered a snapshot of Ipiutak and Tigara life courses. The inclusion of subadults into the mortuary analysis of Point Hope offers valuable insight into the social structure of circumpolar hunter-gatherers and allows their lifeways to be wholly represented.

**Grave Goods**

Arrowheads, arrowpoints, swivels, openwork carvings, ivory carvings depicting humans and animals, ornamental chain linked objects, and various loon implements make up the majority of grave goods discovered at Point Hope. Rare objects include masks, ivory eyes, and mouth covers. Arrowheads and arrowpoints are distinguished in that arrowheads constitute the shaft in which arrowpoints are situated in for hunting purposes. In fact, grave goods associated with bow and arrow hunting make up 72% of Ipiutak burials containing graved goods (Larsen and Rainey, 1948). The prominence of bow and arrow related grave goods is undoubtedly due to Ipiutak hunting strategies that exploit terrestrial mammals such as caribou and deer (Hill, 2011). Swivel implements are made from antlers and have shaft like openings that typically resemble an animal’s open mouth and have jet-inlaid ivory eyes, however, it is unknown how or why swivels were used in Ipiutak culture but Larsen and Rainey (1948) surmise that they served some ceremonial purpose.
Openwork carvings are similar to swivels, but they lack a shaft like opening. Made from bone, antler, or ivory, these carvings are intricately designed. Some appear to spirally twist while others are made to resemble humans or birds. While no use for openwork carvings are definitively known, it is possible they were used as jewelry or coat adornments (Larsen and Rainey, 1948). Ivory carvings depicting humans and animals are the quintessential Ipiutak and Tigara artifact. These carvings often depict animals with external skeletons and human faces with tattoos and labrets, and these designs may have roots in shamanic belief systems (Auger, 2005; Hill, 2011; Hilton et al., 2014), which will be addressed in a later section. Ornamental chain linked objects, also abundant in Point Hope burials, are literally segments of chain links made from ivory. Larsen and Rainey (1948) theorize that these chains may have been used to suspend swivels or openwork carvings during shamanic ceremonies.

While Ipiutak and Tigara grave goods include antler and ivory artifacts carved to resemble animals such as walrus, seals, and whales, these arctic hunter-gatherers also exhibit an affinity for loons given the profusion of loon related grave goods. Arctic loons are large water birds that are known for diving underwater to catch prey (Sloan, 2014). Given that Ipiutak and Tigara hunter-gatherers occupied the coast, it is unsurprising that these birds are prominently featured in many burials. Grave goods of this nature include needles made from bird bones as well as mouth covers that resemble beaks. Additional burial implements include openwork carvings, ivory carvings, harpoon sockets, harpoon heads, and ivory nose plugs, all of which are carved to resemble arctic loons. Some burials even include loon skulls with jet-inlaid ivory eyes (Larsen and Rainey, 1948). A
A historic Inuit myth called “The Blind Boy and the Loon,” might help to shed heuristic light on the significance of loons in burials between both cultural occupations.

The first published version of “The Blind Boy and the Loon” dates back to the early 1800’s, however, researchers believe the story has deeper roots in Alaskan mythology spanning thousands of years (Morrow and Volkman, 1975; Mishler, 2003; Sloan, 2014). In this tale, a blind boy and his sister go hunting together. The boy shoots and kills an animal with a bow and arrow, but his sister lies to him and tells him that his arrow hit a tree. The sister takes the dead animal for herself and cooks it, but as the meat is cooking the boy smells it and realizes he has been deceived. Some time later, a loon appears and tells the boy that he knows he has been deceived and that he can help him regain his eyesight. The boy grabs on to the loon and they repeatedly dive underwater until the boy regains his sight. As the boy walks to the shore, he pretends to be blind and his sister continues to lie to him, so he kills her. As the sister dies, her spirit is transformed into a narwhal, where she is banished to the sea (Morrow and Volkman, 1975; Mishler, 2003; Auger, 2005; Hill, 2011; Sloan, 2014). In this myth, the loon is all seeing and all knowing. It is theorized that the Ipiutak and Tigara cultures shared versions of this myth, which might explain the significance of loons and other burial implements, such as ivory eyes, that allow the deceased to “see” (Sloan, 2014). In fact, researchers suggest the loon implements discovered at Point Hope are reflective of shamanic rituals in that shamans, as the loon in the myth, are believed to have healing powers and second sight (Larsen and Rainey, 1948; Eliade, 2004; Auger, 2005; Sloan, 2014).
Rather uncommon grave goods that are featured in Ipiutak and Tigara burials include facemasks, ivory eyes, and mouth covers. The masks unearthed at Point Hope are classified as either antler “death masks” or ivory masks. Antler “death masks”, carved from caribou or deer antlers, feature cyclical carvings and are simply placed over the deceased at the time of interment (Larsen and Rainey, 1948; Hilton et al., 2014). The ivory masks, however, have received more attention due to their associations with subadult and shaman burials (Auger, 2005; Hill, 2011; Mason, 2014). Burial 64 is arguably one of the most famous burials from the Ipiutak cemetery, it is recognized by a large ivory mask that features carvings of multiple animal faces, two botfly larvae carvings, one on each side of the mouth cover, as well as four carved eyelets that included jet-inlays at the time of interment. This mask also features a nose cover as well as perforations around the mouth that might suggest pendants were attached to this mask at some point. It is unknown whether or not these masks were intended solely for funerary rituals or shamanic ceremonies (Larsen and Rainey, 1948). Funerary rituals, as defined here, refer to mortuary behaviors that are specific to individual identity and involve an element of communication with human and non-human entities. A smaller ivory mask is featured in Burial 77 where it was interred on top of the chest of a subadult aged 7.0 years old. This particular child was buried between the knees of an adult male, and an adult female was interred simultaneously, facing the adult male (Larsen and Rainey, 1948).

The ivory mask in Burial 77 is similar to the adult mask in Burial 64 in that it also features jet-inlays, a nose cover, a mouth cover, and attached pendants. However, the
subadult mask does not include animal carvings or botfly larvae carvings. The mouth covers found in Burials 8, 41, and 61a are similar to the facemasks in that they simulate prophylactic devices (Larsen and Rainey, 1948). These mouth covers have perforated holes that suggest they were tied to the deceased before or during interment. It should also be noted that individuals buried with mouth covers were also buried with nose plugs and ivory eyes. The Ipiutak and Tigara often placed conical ivory eyes with jet-inlaid pupils into the eye orbits of humans and animals during interment, which might be a practice aimed at allowing the deceased to see, or navigate, the afterlife (Morrow and Volkman, 1975; Mishler, 2003; Auger, 2005; Hill, 2011; Sloan, 2014). Larsen and Rainey (1948) suggested these funerary rituals indicate the foragers at Point Hope were part of a ghost cult, however there is no literature or ethnographic evidence to corroborate this idea.

Overall, differences observed in grave goods between the Ipiutak and Tigara largely demonstrate varying subsistence strategies. For example, Ipiutak graves were adorned with arrowpoints, arrowheads, antlers, and ivory carvings of caribou, walrus, and seals reflecting their relationships with the animals that provided them sustenance (Hill, 2011). Tigara burials incorporate harpoons, harpoon heads, harpoon shafts, and whale implements that speak to their reliance on whale hunting for survival. However, arctic loons are featured in burials from both groups and span adult and subadult burials. This distinction is part of what makes the Ipiutak find so exceptional and allows anthropologists to better discern ceremonial and funerary rituals at Point Hope. Beyond
the observed differences in grave goods, funerary rituals between the two groups are largely the same. Specifically, the mortuary treatment of subadults is homogenous.

**Burial Positioning**

There are two distinct burial types at Point Hope, which are classified as either surface burials or underground burials. Due to the thick layers of permafrost, underground burials did not exceed 80 cm in depth (Larsen and Rainey, 1948). Surface burials, however, tended to be associated with elaborate grave goods such as ivory carvings, openwork carvings, arrowheads, ornamental daggers and bands, and decorated swivels. Burial data from Point Hope shows Ipiutak and Tigara adults were buried with their heads pointed towards the west. Exceptions to this were observed in Burials 51 and 61 where the heads of these two adults are pointed towards the east (Larsen and Rainey, 1948). These are believed to be shaman burials based on their associated burial implements of ivory eyes, mouth covers, and nose plugs, differential burial positioning, and evidence of post-depositional femur removal (Larsen and Rainey, 1948; Mason, 2014). Mason (2014) suggests femur removal from mortuary contexts demonstrates a communal fear of shamans in that they possess the ability to rise from the dead and walk out of the grave.

It is widely argued that Ipiutak and Tigara hunter-gatherers maintained cultural practices that included shamanism (Larsen and Rainy, 1948; Morrow and Volkman, 1975; Fitzhugh and Kaplan, 1982; Sutherland, 2001; Mishler, 2003; Eliade, 2004; Auger, 2005; Hill, 2011; Mason, 2014). Ethnohistoric research indicates that Inuit shamans are believed to possess knowledge of healing as well as powers that allow them to contact
other realms, control famine, and restore community imbalance (Eliade, 2004). Inuit shamans are also known to be able to transform their identities by turning themselves into animals or leaving their human bodies through vision quests during which they journey to the afterlife, supposedly making their skeletons visible to those in the community (Eliade, 2004; Auger, 2005; Hilton et al., 2014). Ipiutak and Tigara artifacts demonstrate this concept through stylistic variations, like an “x-ray” motif, that depict animals and humans with external skeletons (Larsen and Rainey, 1948). Vision quests are transformative states attained through trances. When in a trance, shamans gain second-sight, a phenomenon that allows them to see into the future or into the souls of others (Eliade, 2004). Inuit mythologies and ethnohistoric research also suggest that shamans use animal implements or amulets in order to summon an animal’s inua, or life force, to act as a guide to carry the shaman to his or her intended destination (Eliade, 2004; Auger, 2005; Hill, 2011). Through analogous cases, especially among other Inuit collectives in Alaska, grave goods found at Point Hope, namely the facemasks, animal carvings, and ivory eyes, indicate shamanic transformation and allude to the use of animal guides (Larsen and Rainey, 1948; Eliade, 2004, Auger, 2005; Mason, 2014).

Eliade (2004) contends that masks are imperative to shamanic rituals among the Chukchee shamans of Alaska. During Chukchee shamanic rituals, masks allow the wearer to take on an identity of an animal by calling upon their presence, or inua, to be a helping spirit in the ritual. In this way, there is a direct connection between the wearer, the animal, and the beyond. The role of the animal spirits cannot be understated because animals have the ability to guide, teach, and reveal mysteries to the shaman (Eliade,
2004). These animal spirit helpers ultimately authenticate the shaman’s journeys into the beyond, and the use of masks further demonstrates the incarnation of powerful animal guides. Similarly, ethnohistoric accounts of the Yupiit and Iñupiat of Northwest Alaska suggest masks allow the wearer to see as an animal, which enables the wearer to see and experience the world as the animal(s) portrayed on the mask (Ingold, 2000). To this end, the masks at Point Hope allegorize shamanic transformation through the depiction of animals. In revisiting the ivory mask from Burial 64, the botfly larvae depicted on the mask suggests shamanic possession. Mason (2014) writes, “larvae often gestate within a single caribou nasal passage and induce a lunacy in the animal that suggests shamanic possession, recalling that like shamans, botflies are so incredibly fast as to prevent human sight” (p. 54). Other ethnohistoric accounts of surrounding Inuit communities suggest that shamans and living members often wore masks during funerary rituals as a means to alter their identities and protect the broader community against invasion by spirits of the deceased (Auger, 2005). Many Inuit groups plug the noses of the deceased for this same reason; this practice serves as a preventative measure that maintains the inua of the deceased within the body and ultimately within the grave (Fitzhugh and Kaplan, 1982; Auger, 2005).

As previously discussed, Arctic shamans invoked animal spirits in order to embark on vision quests, and the arctic loon burial implements constitute a rich arena for reconstructing ideas concerning shamanism and the afterlife between the Ipiutak and Tigara. Inuit mythologies, such as “The Blind Boy and the Loon,” undoubtedly draw a specific connection between healing and the loon’s natural abilities such as vision, flying,
and diving (Volkman and Morrow, 1975; Fitzhugh and Kaplan, 1982; Mishler, 2003; Auger, 2005). Based on their prominence in Point Hope burials and Inuit mythology, it may be proposed that the arctic loon frequently acted as a shaman’s helping spirit. The loon can dive to great depths, is a skilled flier, and it is important to note that its vision in both air and water is superb (Auger, 2005). All of these abilities make the loon an ideal guide for the shaman on his spirit journeys, in that the loon has natural abilities fit for a range of environments. The prevalence of loon related artifacts between Ipiutak and Tigara burials suggests both cultural occupations revered arctic loons. Hill (2011) suggests the loon implements at Point Hope may represent the invocation of inua, allowing the deceased to have a vision guide in the afterlife. Furthermore, the symbolism invoked by the arctic loon is suggestive of immersion, which speaks to the complexities of Ipiutak and Tigara beliefs concerning shamans, death, and the afterlife.

Ivory eyes, included in human eye orbits, animal carvings, masks, and loon skulls, also allude to the importance of shamans and sight. Vision and sight are demonstrative of shamanic belief systems in that shamans mediate between the visible world and the invisible world. Their abilities to embark on vision quests and achieve second-sight is arguably what sets these individuals apart from the rest of the collective. With this idea in mind, the ivory eyes found in Burial 21, Burial 24, Burial 41, and Burial 51 might be literal representations of second-sight. Second-sight is an ability that allows shamans to transport themselves into the souls of others which enables them to heal an individual of sickness or disease (Eliade, 2004). Shamans may also use second-sight to see into the future and predict events of nutritional dearth and as a result, shamans attempt to ward off
these events (Eliade, 2004). It may be argued that ivory eyes are used in funerary rituals at Point Hope as a means to allow shamans to keep their abilities of second-sight in order to maintain community balance.

Other artifacts suggestive of shamanic practices at Point Hope are antler sucking tubes which are believed to have been used in healing rituals, and open work carvings that are likely shamanic accoutrements given that they have no utilitarian purpose and tend to portray animals or miniature human faces that might represent animal guides or another person or animal’s inua (Larsen and Rainey, 1948; Morrow and Volkman, 1975; Fitzhugh and Kaplan, 1982; Sutherland, 2001; Mishler, 2003; Eliade, 2004; Auger, 2005; Hill, 2011). Ethnohistoric accounts of the Yupik and Iñupiat also imply that bad inua can enter the body of deceased and cause it to rise out of the grave and haunt the living (Auger, 2005). While this discussion aims to demonstrate the cosmological structure of the Ipiutak and Tigara, the funerary treatment of children at Point Hope demonstrates how social age is intertwined with ideas concerning shamanism, inua, and the afterlife.
Figure 2. Map of Point Hope denoting Ipiutak and Tigara burial Plots (Larsen and Rainey, 1948).
Materials and Methods

This study uses mortuary practices as an index of social maturation. The particular aspects of mortuary practices that were evaluated for this study includes grave goods, directional orientation of the head, burial position within the grave, and surface and underground interments. The burial information was extrapolated from Larsen and Rainey’s (1948) original monograph and further tabulated in an Excel spreadsheet. The grave goods surveyed among subadult burials from Point Hope includes animal implements, which this paper defines as any grave good that is carved to emulate an animal, or any residual element from an animal such as a bone, hide, antler, or tusk. According to the original site report individuals were buried with their heads spatially oriented towards the cardinal directions of East, West, and South. Burial position within the grave was also analyzed, as individuals were buried face down or face up. Information concerning underground and surface burial treatment was also included in the survey of mortuary practices in order to better understand the extent of funerary rituals at Point Hope. All of this burial information was evaluated and contextualized within the entire Point Hope cemetery as a means to understand variation of mortuary treatment among Ipiutak and Tigara subadults.

Many bioarchaeological studies rely on a specific range of methods to assess chronological or biological age of human remains. In estimating age, researchers are able to better reconstruct identities and life history events as biological age provides a baseline on which studies can link further interpretations through the analysis of age-related patterns in the mortuary record. In bioarchaeology, dental age is one method of biological
age assessment, which is comparable to ages estimated from skeletal development (Smith, 1991). Compared to the skeleton, the dentition is far less affected by developmental insults; therefore dental development tends to be the single best physiological indicator of biological age in subadults (Smith, 1991; Liversidge and Molleson, 2004; Liversidge, 2009; AlQahtani et al., 2010, 2014). Each tooth type; incisors, canines, premolars, and molars, develops in a predictable pattern over the course of 20 years and formation and eruption of teeth can be used to estimate age up to early adulthood (AlQahtani et al., 2010). Studies that use the dentition to estimate age incorporate radiographs to view unerupted permanent teeth and roots still within the alveolar process. Through the use of radiographs, researchers estimate age by comparing the stage of tooth formation in the alveolar process, alveolar eruption, and full eruption with known dental formation standards (Smith, 1991; Liversidge and Molleson, 2004; AlQahtani et al., 2010, 2014).

A 1991 study by Smith provided a review of methods employed to assess dental development. Smith’s research spans the work of Demirjian et al. (1973), Moorrees et al. (1963), Garn et al. (1965), Gleiser and Hunt (1955), Nolla (1960), and others. The aim of her chapter is to assess the developmental standards for permanent dentition and deciduous dentition. Smith (1991) suggests that there are six methods, ranged A – F, utilized for tooth formation chronologies; A) cumulative distribution functions or probit analysis; B) average of age at first appearance less one – half interval between examinations; C) mean age of subject in a stage; D) alternative methods (she cites her own study); E) mean stage for subject age group; and F) maturity scales. The dental
development standards established by Smith (1991) use data previously published by Moorrees et al. (1963), which were adjusted for age prediction by assigning an age midway between the observed stage of crown and root development and the subsequent stage. Smith finds the standards set by Moorrees et al. (1963) to be the most reliable when tested on known-age samples, and Smith’s own evaluation of her technique suggests that her dental estimation methods produces errors under six months in children between four and ten years (1991).

The standards developed by Liversidge and Molleson (2004) for deciduous teeth are similarly adjusted for age prediction and, unlike previous studies, contain data on anterior tooth development in addition to canine and molar development. In their study, Liversidge and Molleson (2004) made a composite cross-sectional radiographic study of 61 living children aged 2 to 5 years, 121 children of known age-at-death buried in the Spitalfields cemetery in London, and 133 medieval children’s mandibles from archaeological sites in Scotland. This study devised new stages of deciduous tooth formation in the style of Demirjian et al. (1973) and age of attainment data for eruption is adapted for prediction by calculation the midpoint from the previous stage, like the method employed by Smith (1991). Ratings of A – H were assigned to deciduous teeth and age of attainment was calculated by probit analysis. This study found that deciduous teeth grow faster and are likely to predict age more accurately than permanent teeth in early childhood.

In 2010, AlQahtani and colleagues published The London Atlas of human tooth development and eruption. The aim of the London Atlas is to provide a comprehensive
evidence-based chart to estimate age using both tooth development and alveolar eruption for individuals between 28 weeks gestational age and 28 years (AlQahtani et al., 2010). In order to develop this extensive atlas, these researchers conducted a cross-sectional study that included individuals aged 28 weeks in utero to two years of age, made up of 50 individuals of known age-at-death from the Spitalfields collection, and 126 individuals, made up of 69 males and 57 females, from the Maurice Stack collection in England. Individuals aged 2 to 24 years of age were represented in this study by 528 archived dental panoramic radiographs from the Institute of Dentistry in London. Furthermore, this sample was made up of two ethnic groups. Nearly half of the sample was European and the other half was Bangladeshi (AlQahtani et al., 2010). Furthermore, each chronological age in the London Atlas is represented by 12 males and 12 females, which was an intentional measure by the authors to equalize accuracy across all age groups. Tooth developmental and alveolar eruption stages were observed on the right side of the mandible from each radiograph, and each developing tooth was assessed according to modified Moorres et al. (1963) stages. However, AlQahtani and colleagues (2010) differentiate the last three stages of development based on dentin edges at the root end, the apex width, and the width of the periodontal ligament space. This study operated under the assumption that root length is complete when the dentin edges are parallel with an open apical end and a wide periodontal ligament space (Rc), apex half is the stage where the root terminal is narrowing at the apical end A ½), and tooth development reaches completion when the root apex is closed radiographically (Ac).
Tooth development and eruption stages were assessed twice and each tooth was drawn by hand in order to correct interobserver error (AlQahtani et al., 2010). After drawing, the authors scanned and colored each tooth and tabulated the London Atlas of Human Tooth Development and Eruption according to developmental, eruption, and resorption stages. While previous charts and atlases provide inadequate age ranges that do not cover the entire dentition (Schour and Massler, 1941; Ubelaker, 1978), the London Atlas covers ages 1 to 23 years. Additionally, the atlas shows tooth development and eruption for every six months of the chronological year and is tooth specific in that it defines each tooth by the development of its enamel, dentin, and pulp cavity. While this atlas undoubtedly marks an improvement in estimating age using tooth development and alveolar eruption, it should be noted that this study refers to emergence from alveolar bone whereas in Ubelaker’s (1978) chart, eruption refers to gingival emergence. It can be seen that AlQahtani et al. (2010) provide new reference standards for the discipline of anthropology that ultimately demonstrates that averaging estimates from multiple teeth produces the most accurate results (Smith, 1991).

In a 2014 study, AlQahtani et al. aimed to assess the accuracy of estimating age from developing teeth using the Atlas (AlQahtani et al., 2010), Schour and Massler’s atlas (1941), and Ubelaker’s atlas (1978). In order to do this, a large sample of skeletal remains with known age-at-death was used. Individuals aged between 31 weeks utero and 4.27 years were represented by 183 individuals, and a further sample included 1506 individuals, which represented individuals aged between 2.07 and 23.86 years. In addition to skeletal remains, archived dental radiographs of living patients were also
used. From this, the age estimates were made using all developing teeth using each of the atlases in question and then compared to known chronological age.

In all, the London Atlas was the method that produced the closest age estimate to the chronological age at 53%, compared to 39% for Schour and Massler and 40% for Ubelaker (AlQahtani et al., 2014). Furthermore, the London Atlas is the only chart to depict the third molar in great detail. In removing the third molar from the age estimates, AlQahtani et al. (2014) found that Schour and Massler and Ubelaker’s methods still under estimate ages by nearly 0.5 years. In comparison, the London Atlas had a mean difference of 0 years. This study ultimately showed that while all three methods of estimating age using dental development is nearly accurate, the London Atlas performed the best.

As demonstrated here, dental development studies are important to bioarchaeological studies because determining age-at-death is a vital component for identifying individuals and understanding life history events. Thus, it is critical that bioarchaeologists implement the most reliable systems and reference standards in order to accurately estimate age. As Smith (1991) suggested in her extensive review of dental formation standards, averaging estimates from multiple teeth produces the most accurate results. AlQahtani and colleagues (2010, 2014) and Liversidge and Molleson (2004) have incorporated Smith’s (1991) standards and have further illustrated the importance of using the deciduous dentition to estimate accurate age-at-death. It is hoped that bioarchaeology incorporates these reference standards in order to make results comparable and easily translated. Dental formation methods are convoluted and
researchers have only just developed a reliable method for accurately determining age-at-death in skeletal samples (Smith, 1991; Liversidge and Molleson, AlQahtani et al., 2010, 2014). The major improvements provided by the London Atlas will undoubtedly aid bioarchaeological studies, including this one, for years to come.

The skeletal samples used in this study were derived from the Point Hope, Alaska archaeological site. The Point Hope skeletal materials are currently housed at the American Museum of Natural History in New York City. Burial data was interpolated from the original site report.

Radiographs were taken of 70 subadult mandibles associated with the Ipiutak (AD 400 – 750) and Tigara (AD 1300 – 1700) cultural groups. Radiographs of these mandibles were obtained using the NOMAD Pro Hand-Held X-Ray System (Aribex, Provo, Utah) and Dr. Suni Plus Intraoral Digital Light Sensor (SUNI Medical Imaging Inc., San Jose, California). Age-at-death was estimated using tooth formation and eruption. Tooth formation and eruption stages were recorded according to standard protocols for the deciduous and permanent dentition and ages were assigned to each tooth based on reference standards (Liversidge and Molleson, 2004; AlQahtani et al., 2010).

This study surveyed radiographs of each subadult mandible from Point Hope and recorded tooth formation stages based on the London Atlas of Human Tooth Development and Eruption (AlQahtani et al., 2010). Anterior mandibular tooth formation was recorded based on the following stages: 1. ci: initial cusp formation; 2. Cco: coalescence of cusps; 3. Coc: cusp outline complete; 4. Cr ½: crown half completed with dentine formation; 5. Cr ¾ crown three quarters completed; 6. Crc: crown completed
with defined pulp roof; 7. Ri: initial root formation with diverge edges; 8. R ¼: root length less than crown length; 9. R ½: root length equals crown length; 10. R ¾: three quarters of root length completed with parallel ends; 11. Rc: root length completed with parallel ends; 12. A ½: apex closed (root ends converge) with wide periodontal ligament space; 13. Ac: apex closed with normal periodontal ligament space width. Multi-rooted tooth formation was recorded based on the same stages, however, stage 8 varies only slightly: R ¼: Root length less than crown length with visible bifurcated area (AlQahtani et al., 2010).

Once tooth formation stages were recorded in a table according to burial number, (Figure 3), the author used AlQahtani and colleagues’ tooth development data and London Atlas to estimate age-at-death (2010). In order to account for observer error, ages were estimated on three separate occasions and the average age obtained for all teeth was used as a final estimate of age-at-death in each subadult. Where tooth formation was not possible to observe, tooth eruption was used to estimate age. Here, eruption stages were recorded as not emerged, emerged past the alveolus, and emerged into occlusion (AlQahtani et al., 2010). In all, this study represents 36 subadults, comprised of 15 Ipiutak subadults and 21 Tigara subadults. 34 subadult mandibles were excluded from this study due to lack of contextual evidence, such as corresponding burial data. Final age-at-death estimates were recorded in an Excel spreadsheet according to specimen and burial number, burial data regarding grave goods, body positioning, and spatial orientation were interpolated from the original site report. For purposes of simplicity, ages were rounded to the nearest tenth and are reported in Table 1. The following
analysis will link these data to the material components of the mortuary record with the aim of highlighting age-related grave good patterning, specifically among subadults.

The results of this study were discerned using visual evaluations of box plots to understand differences in the distribution of age categories relative to mortuary treatment (Figures 5 – 9). The box plots will compare age with variations of mortuary treatment as a means to observe intentional depositional patterns concerning Ipiutak and Tigara subadults. Box plots of face up and face down burial positions by cultural period are calculated and compared to age to provide a visual display of the data for each cultural group within the Point Hope sample (Figure 5). Data concerning directional orientation of the head within the grave by cultural period are also compared to age to discern patterns of funerary treatment among subadults (Figure 6). Data concerning subadult grave goods were incorporated from the original site report and grouped by cultural period and then compared to age (Figure 7). The assortment of grave goods, specifically, animal implements is imperative to this study as it aims to understand the ways in which burial implements coincide with socially defined aspects of age. A box plot is also calculated as a means to illustrate ages at which subadults are afforded burials with adults from the community (Figure 8). Surface burials and underground burials are grouped by cultural period and compared to age as well (Figure 9). The original site report by Larsen and Rainey (1948) paid particular attention to surface and underground burials, thus, this study seeks to observe whether or not this particular burial treatment speaks to socially defined age groups. Differences were assigned where overlap between interquartile ranges is absent or minimal. Interquartile range refers to a measure of statistical
dispersion between the 75\textsuperscript{th} and 25\textsuperscript{th} percentiles. These differences can demonstrate points at which variation in mortuary treatment is observed. Descriptive statistics for Figures 5-9 can be found in Tables 2-6. Standard errors of mean age relative to burial treatment were also compared because the sample sizes may be too small to extract statistically meaningful differences between means.
### Figure 3. Example of author's tooth development and eruption data table for Burial 10

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<th>Mandible</th>
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<th>Permanent Teeth</th>
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<td>1I</td>
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</tbody>
</table>
Figure 4. Example of mandibular radiograph taken by the author
Table 1. Ipiutak and Tigara subadult burial data

(Grave goods: A1+= one animal implement, A2+= two or more animal implements; Head orientation: W=West, S=South; Head position: FU= Face up, FD= Face down; Body position: SUP= supine, PRO= prone; Special burial: WA= with adult, WSH= with shaman)

<table>
<thead>
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<th>Burial Number</th>
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<th>Grave Goods</th>
<th>Head orientation</th>
<th>Head Position</th>
<th>Body Position</th>
<th>Ipiutak/Tigara</th>
<th>Special Burial</th>
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<td>W</td>
<td>FU</td>
<td>SUP</td>
<td>I</td>
<td>WA</td>
</tr>
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<td>A1+</td>
<td>N/A</td>
<td>N/A</td>
<td>N/A</td>
<td>I</td>
<td></td>
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<tr>
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<td>W</td>
<td>FU</td>
<td>SUP</td>
<td>I</td>
<td>WSH</td>
</tr>
<tr>
<td>Burial 26</td>
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<td>A2+</td>
<td>W</td>
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<td>N/A</td>
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<td>WA</td>
</tr>
<tr>
<td>Burial 31</td>
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<td>FU</td>
<td>SUP</td>
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</tr>
<tr>
<td>Burial 32</td>
<td>8</td>
<td>A2+</td>
<td>W</td>
<td>FU</td>
<td>SUP</td>
<td>I</td>
<td>WA</td>
</tr>
<tr>
<td>Burial 33</td>
<td>10</td>
<td>A2+</td>
<td>W</td>
<td>FU</td>
<td>SUP</td>
<td>I</td>
<td>WA</td>
</tr>
<tr>
<td>Burial 37</td>
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<td>FU</td>
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</tr>
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<td>FU</td>
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<td>FU</td>
<td>SUP</td>
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</tr>
<tr>
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<td>FU</td>
<td>SUP</td>
<td>I</td>
<td>WA</td>
</tr>
<tr>
<td>Burial 60</td>
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<td>A1+</td>
<td>S</td>
<td>FD</td>
<td>PRO</td>
<td>I</td>
<td></td>
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<td>Burial 69</td>
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<td>W</td>
<td>FU</td>
<td>SUP</td>
<td>I</td>
<td></td>
</tr>
<tr>
<td>Burial 77</td>
<td>5</td>
<td>A1+</td>
<td>W</td>
<td>FU</td>
<td>SUP</td>
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<td>SUP</td>
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<td>None</td>
<td>S</td>
<td>FD</td>
<td>PRO</td>
<td>I</td>
<td></td>
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<tr>
<td>Burial 132</td>
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<td>None</td>
<td>S</td>
<td>FD</td>
<td>PRO</td>
<td>I</td>
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<td>Burial 169</td>
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<td>None</td>
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<td>FD</td>
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<tr>
<td>Burial 174</td>
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<td>None</td>
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<td>FD</td>
<td>PRO</td>
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<tr>
<td>Burial</td>
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<td>A1+</td>
<td>W</td>
<td>FU</td>
<td>SUP</td>
<td>T</td>
<td>WA</td>
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<td>W</td>
<td>FU</td>
<td>SUP</td>
<td>T</td>
<td>WA</td>
</tr>
<tr>
<td>Burial 191</td>
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<td>A2+</td>
<td>W</td>
<td>FU</td>
<td>SUP</td>
<td>T</td>
<td>WA</td>
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<tr>
<td>Burial 196</td>
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<td>FD</td>
<td>PRO</td>
<td>T</td>
<td></td>
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<td>FD</td>
<td>PRO</td>
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<td>A1+</td>
<td>W</td>
<td>FU</td>
<td>PRO</td>
<td>T</td>
<td>WA</td>
</tr>
<tr>
<td>Burial 168</td>
<td>10</td>
<td>A2+</td>
<td>W</td>
<td>FU</td>
<td>PRO</td>
<td>T</td>
<td></td>
</tr>
<tr>
<td>Burial 209</td>
<td>12</td>
<td>A2+</td>
<td>W</td>
<td>FU</td>
<td>PRO</td>
<td>T</td>
<td></td>
</tr>
<tr>
<td>Burial 215</td>
<td>7</td>
<td>A1+</td>
<td>W</td>
<td>FU</td>
<td>PRO</td>
<td>T</td>
<td></td>
</tr>
<tr>
<td>Burial 191</td>
<td>8</td>
<td>A2+</td>
<td>W</td>
<td>FU</td>
<td>PRO</td>
<td>T</td>
<td></td>
</tr>
<tr>
<td>Burial 221</td>
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<td>A1+</td>
<td>W</td>
<td>FU</td>
<td>N/A</td>
<td>T</td>
<td></td>
</tr>
<tr>
<td>Burial 230</td>
<td>12</td>
<td>A2+</td>
<td>W</td>
<td>FU</td>
<td>PRO</td>
<td>T</td>
<td></td>
</tr>
<tr>
<td>Burial 231</td>
<td>7</td>
<td>A1+</td>
<td>W</td>
<td>FU</td>
<td>N/A</td>
<td>T</td>
<td></td>
</tr>
<tr>
<td>Burial 232</td>
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<td>A1+</td>
<td>W</td>
<td>N/A</td>
<td>PRO</td>
<td>T</td>
<td></td>
</tr>
<tr>
<td>Burial 477</td>
<td>4</td>
<td>A1+</td>
<td>W</td>
<td>N/A</td>
<td>PRO</td>
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<td></td>
</tr>
</tbody>
</table>
CHAPTER FOUR

Results are presented as Box plots in Figures 5-9. Summary statistics for each box plot are found in Tables 2-6. Ipiutak and Tigara subadults in the 0.0 to 3.0 year cohort were buried face down while Ipiutak and Tigara subadults within the 4.0 to 12.0 year cohort are interred face up (Figure 5). Among Ipiutak subadults there is a clear delineation among face up interments with the youngest individual interred at 1.0 year, however, the interquartile range suggests the majority of Ipiutak face up interments span 5.0 years to 10.0 years. Among Tigara subadults, the majority of face up interments span 7.0 years to 9.0 years, with the youngest individual interred at 4.0 years and the oldest individual interred at 12.0 years.

Data concerning the directional orientation of the head within the grave (Figure 6) indicate that Ipiutak subadults in the 2.0 to 3.0 year cohort and Tigara subadults in the 1.0 to 2.0 year cohort are buried with their heads spatially oriented towards the south. At older ages it can be observed that Ipiutak subadults, aged 5.0 years to 10.0 years, are buried with their heads spatially oriented towards the west. Older Tigara subadults also mirror this pattern in that there is a clear delineation of directional orientation towards the west from 4.0 years to 12.0 years.
Clear delineations between ages and animal implements are also observed in the data presented in Figure 7. Ipiutak subadults ranging from 1.0 year to 7.0 years receive only one animal implement in their burial, interquartile ranges indicate that the majority of Ipiutak subadults receiving one animal implement are between the ages of 3.0 years to 6.0 years. The overlap of data represented by interquartile ranges suggest that older Ipiutak subadults aged 7.0 years to 10.0 years are interred with two or more animal implements. There is a range of data, however, that suggests some Ipiutak subadults aged 2.0 years to 10.0 years do not receive any animal implements at the time of burial. Tigara subadults ranging from 6.0 years to 9.0 years receive only one animal implement, and the delineation between Tigara individuals who receive 2 or more animal implements is less defined with the group consisting of Tigara subadults aged 7.0 years to 11.0 years. There is a clear outline of Tigara subadults who do not receive animal implements, aged 1.0 to 2.0 years; however there is an individual aged 9.0 years who is an outlier within this group.

The data presented in Figure 8 speaks to the parameters of Ipiutak and Tigara joint burials. The data illustrates the range of Ipiutak and Tigara joint burials. Individuals aged 2.0 years to 10.0 years are co-interred with adults. The majority of these burials, however, are observed among subadults aged 6.0 years to 9.0 years. Figure 7 also demonstrates that an individual, aged 5.0 years, was co-interred with a shaman.

Another aspect of Ipiutak and Tigara burials that was investigated concerns surface burials and underground burials. Larsen and Rainey’s original burial report includes data on the depth of burials, underground burials do not exceed 80 cm in depth.
(1948). This particular burial treatment was investigated in order to determine whether or not age played a role in the depth of burial. The data in Figure 9 indicate that there is no clear delineation between age, and cultural period, concerning surface or underground burials. Ipiutak subadults that receive surface burials range from 1.0 year to 10.0 years, with the majority ranging from 5.0 years to 10.0 years. Ipiutak subadults that receive underground burials range from 2.0 years to 10.0 years with the majority of subadults in this particular group spanning 3.0 years to 8.0 years. Tigara subadults receiving surface burials span ages 4.0 years to 12.0 years, however the interquartile range places the majority of individuals in this group between 6.0 years and 10.0 years. Tigara subadults that received underground burials represent a wider breadth of ages from 1.0 year to 12.0 years.

When interpolated with the burial data from the original site report, these results indicate Ipiutak and Tigara subadults in the 0.0 to 3.0 year cohort are buried face down, with their heads spatially oriented towards the south. Between Ipiutak and Tigara subadults, individuals within the 4.0 to 12.0 year cohort are interred face up, supine, their heads spatially oriented towards the west, with animal implements such as walrus tusks or ivory animal carvings. In some instances, individuals ranging from 4.0 to 10.0 years are buried with adults, often these subadults are placed between the legs of adult males or buried in the arms of adult females, and the burial is overlain with grave goods. Among Ipiutak subadults, there is a clear delineation concerning grave good allocations, for example individuals ranging from 1.0 to 6.0 years are interred with only one animal implement whereas individuals 7.0 to 10.0 years receive two animal implements. Among
Tigara subadults, individuals are not interred with grave goods until the age of 4.0. Tigara subadults within the 4.0 to 12.0 year cohort may be interred with one or two animal implements.
Table 2. Summary Table for the data represented in Figure 5
Figure 6. Directional orientation of head by age and cultural period

<table>
<thead>
<tr>
<th>Directional orientation</th>
<th>Mean</th>
<th>N Individuals</th>
<th>Std. Deviation</th>
<th>Std. Error</th>
</tr>
</thead>
<tbody>
<tr>
<td>Ipiutak South</td>
<td>2.750</td>
<td>4</td>
<td>.5000</td>
<td>.25000</td>
</tr>
<tr>
<td>Tigara South</td>
<td>1.500</td>
<td>4</td>
<td>.57735</td>
<td>.28868</td>
</tr>
<tr>
<td>Ipiutak West</td>
<td>7.2727</td>
<td>11</td>
<td>2.83164</td>
<td>.85377</td>
</tr>
<tr>
<td>Tigara West</td>
<td>8.000</td>
<td>16</td>
<td>2.47656</td>
<td>.61914</td>
</tr>
<tr>
<td>Total</td>
<td>6.4286</td>
<td>35</td>
<td>3.31028</td>
<td>.55954</td>
</tr>
</tbody>
</table>

Table 3. Summary Table for the data represented in Figure 6
Figure 7. Number of animal implement grave goods by age and cultural period

<table>
<thead>
<tr>
<th>Animal Implements</th>
<th>Mean</th>
<th>N Individuals</th>
<th>Std. Deviation</th>
<th>Std. Error</th>
</tr>
</thead>
<tbody>
<tr>
<td>A1 Ipiutak</td>
<td>4.50</td>
<td>6</td>
<td>2.16795</td>
<td>.88506</td>
</tr>
<tr>
<td>A1 Tigara</td>
<td>7.3333</td>
<td>9</td>
<td>1.87083</td>
<td>.62361</td>
</tr>
<tr>
<td>A2+ Ipiutak</td>
<td>8.50</td>
<td>4</td>
<td>1.91485</td>
<td>.95743</td>
</tr>
<tr>
<td>A2+ Tigara</td>
<td>8.8571</td>
<td>7</td>
<td>3.02372</td>
<td>1.14286</td>
</tr>
<tr>
<td>None Ipiutak</td>
<td>5.40</td>
<td>5</td>
<td>3.78153</td>
<td>1.69115</td>
</tr>
<tr>
<td>None Tigara</td>
<td>3.00</td>
<td>5</td>
<td>3.39116</td>
<td>1.51658</td>
</tr>
<tr>
<td>Total</td>
<td>6.4167</td>
<td>36</td>
<td>3.26343</td>
<td>.54391</td>
</tr>
</tbody>
</table>

Table 4. Summary Table for data represented in Figure 7

1 One (1) animal implement included in the grave

2 Two or more (>2) Animal implements included in the grave
Figure 8. Ipiutak and Tigara joint burials by age

<table>
<thead>
<tr>
<th>Ipiutak and Tigara Joint Burials</th>
<th>Mean</th>
<th>Number of individuals</th>
<th>Std. Deviation</th>
<th>Std. Error of Mean</th>
</tr>
</thead>
<tbody>
<tr>
<td>Shaman/Subadult Burials</td>
<td>5.000</td>
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<td></td>
<td></td>
</tr>
<tr>
<td>Adult/Subadult Burials</td>
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<td>13</td>
<td>2.46514</td>
<td>.68371</td>
</tr>
<tr>
<td>Total</td>
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<td>14</td>
<td>2.42356</td>
<td>.64772</td>
</tr>
</tbody>
</table>

Table 5. Summary Table for the data represented in Figure 8
Figure 9. Surface or underground burial type by age and cultural period

<table>
<thead>
<tr>
<th>Surface or underground burial</th>
<th>Mean</th>
<th>Number of individuals</th>
<th>Std. Deviation</th>
<th>Std. Error of Mean</th>
</tr>
</thead>
<tbody>
<tr>
<td>Surface Burial Ipiutak</td>
<td>6.200</td>
<td>5</td>
<td>3.83406</td>
<td>1.71464</td>
</tr>
<tr>
<td>Surface Burial Tigara</td>
<td>8.2222</td>
<td>9</td>
<td>2.58736</td>
<td>.86245</td>
</tr>
<tr>
<td>Underground Burial Ipiutak</td>
<td>5.6667</td>
<td>9</td>
<td>3.000</td>
<td>1.000</td>
</tr>
<tr>
<td>Underground Burial Tigara</td>
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<td>12</td>
<td>3.67114</td>
<td>1.05977</td>
</tr>
<tr>
<td>Total</td>
<td>6.4286</td>
<td>35</td>
<td>3.31028</td>
<td>.55954</td>
</tr>
</tbody>
</table>

Table 6. Summary Table for the data represented in Figure 9
In the past, bioarchaeological studies often treated age as a biological or chronological event. Specific physiological markers, such as epiphyseal fusion or molar eruption, determine biological age, which translates to chronological age, or the number of years since an individual was born (Sofaer 2000, 2006, 2011; Gowland, 2006; Halcrow and Tayles, 2008, 2011). Recent research in bioarchaeology advocates for an understanding of social age, which is defined as a culturally constructed understanding of age-appropriate attitudes and behaviors for individuals within an age category (Gowland, 2006; Halcrow and Tayles; 2008, 2011; Sofaer, 2011) In failing to understand age as a social event, perceptions of previous life ways are misrepresented as age is diluted to a simple calendrical representation or passing of time. With this in mind, social age illustrates a conscious move away from biological determinism and aims to bridge cultural and biological aspects of the body (Halcrow and Tayles, 2011). Since the body is both a biological and a cultural product, age must be contextualized as a developmental process that transcends physiological events. Social age identity categories certainly exist in human societies (Yamada, 1997; Sofaer, 2000, 2006, 2011; Gowland, 2006; Halcrow and Tayles, 2008; 2011; Schillaci et al., 2011), and biology needs to be considered but it must be situated within a greater understanding of human development as a whole, including social relations, culturally specific life experiences, and local attitudes towards age and aging.
Mortuary treatment, including grave goods and burial positioning, must be carefully considered when assessing social age categories in a population, as mortuary treatment helps delineate social boundaries defined in the life course (Kamp, 2001; Gowland, 2006; Halcrow and Tayles, 2011; Ekengren, 2013). Grave goods can be viewed as ways in which past societies symbolically constructed, negotiated, or reinforced social identities and when examined in conjunction with skeletal evidence, they provide a unique way of accessing social identities of past communities. In this study, burials of all ages were analyzed in order to contextualize the treatment of individuals throughout the entire life course. The reason for this is that personhood and social age categories can only be truly understood in relation to the ways that identities are played out over the entire life course. Thus, the differences observed in mortuary treatment speak to individual biographies within the broader context of the society.

This study does not assume biological age is synchronous with social age. Rather, the use of biological age is implemented here to explore socially defined boundaries in the mortuary record from Point Hope. In reconstructing funerary rituals from Point Hope, it can be seen that subadults received prescribed mortuary treatments according to specific, culturally recognized, social identities. As discussed in depth earlier in this chapter, adults, unlike shamans, are buried supine, with their hands over their pubic regions, and their heads towards the west. This fashion remains true with subadults ranging from 4.0 to 12.0 years. However, children between the ages of 0.1 to 3.0 years are buried face down, hands under their pubic regions, with their heads oriented towards the south. The burials of this particular age cohort lacked grave goods and their ritual
treatment evokes well-documented Inuit myths about worms and larvae. The Inuit believe that the soul of a child destined to become a bad spirit is “fed by the souls of the relatives of the impure” (Auger, 2005, p. 64). These impure souls could take the forms of larvae and infiltrate children through gateways such as the eyes, nose, ears, and mouth and it is believed that children are susceptible to this ruination up to the age of three years (Auger, 2005). The practice of burying children face down until the age of three is possibly influenced by this historic Inuit belief as this funerary ritual seems to purposefully obstruct the gateways of susceptible children. In a similar vein, this cohort did not receive animal implements in their burials. This idea is reminiscent of Inuit practices that seek to maintain bad inua within the grave. The absence of animal implements or amulets within this particular cohort further suggests that the community wanted to prevent a soul’s bad inua from transforming into an animal that could come back and disturb the community. This containment reflects beliefs regarding the ontology of personhood by demonstrating that the body, as a representative of a spirit, can change over the course of the lifetime. This change is further demonstrated by the differential burial treatment afforded to subadults of older ages.

Ipiutak and Tigara subadults ranging from 4.0 to 12.0 years are buried face up, supine, with their hands over their pubic regions, and heads oriented towards the west. Grave goods from this cohort include animal carvings or other animal implements, such as walrus tusks or walrus hides. As previously discussed, the animal implements included in Ipiutak and Tigara subadult burials are suggestive of culturally distinct subsistence strategies. For example; Tigara burials include whale vertebrae, whalebone shovels, and
cut whale scapulae, all of which are suggestive of Tigara whaling practices. Ipiutak animal implements, however, include walrus teeth, walrus tusks, or ivory carvings made to mirror seals or walrus. While burial practices alone cannot reconstruct human consciousness, it is clear that funerary rituals concerning subadults ranging from 4.0 to 12.0 years emphasized the inclusion of animal accoutrements; this cohort also marks the earliest age at which loon implements are interred with subadults. The intentional depositional patterns of animal remains reflect the ways in which Ipiutak and Tigara populations perceived and experienced the world around them.

Archaeological and ethnohistoric data from other coastal Alaskan sites suggest relational ontologies pertaining to prey animals as other-than-human persons has existed for at least a millennium (Auger, 2005; Hill, 2011; Sloan, 2014). Hill (2011) further suggests the material and symbolic representation of prey animals from Inuit funerary contexts speaks to the ways in which hunters negotiated and maintained their relationships with animals. Other research claims hunters used animal implements, such as carvings or bones, to summon an animal’s spirit, or *inua* similar to the ways in which shamans used implements to invoke a particular ability or behavior of an animal, such as speed, cleverness, or hunting prowess (Fitzhugh and Kaplan, 1982; Auger, 2005; Hill, 2011). In light of the literature concerning animal spirits and *inua*, it is no mistake that this cohort marks an age where prey animals are intentionally included in graves.

Burials concerning the 4.0 to 12.0 year age group also represent the majority of subadult interments with adults, making up nearly one-quarter of all Point Hope subadult interments. Ipiutak Burial 77 features two articulated adult skeletons and one subadult.
All three skeletons lay together in a walled surface tomb. The adults lay side by side and the adult female was interred facing the adult male. The subadult, aged nearly 5.0 years, lay with their head towards the west in between the femurs of the adult male. A set of ivory carvings lied on the knees of the male adult and an ivory mask lay on the chest and pelvis of the subadult. Under the sacrum of the female adult was a flint flake. This burial was located 50 meters (164 feet) from the adjoining burial ground.

The grave goods in this funerary context were four incised antler-sucking tubes, one carved ivory rod that was impaled into the cervical vertebrae of the adult male, one loon skull with ivory eyes, and a set of ornamental chain links. Considering the spatial isolation and the burial implements, this burial likely reflects that of a shaman or a shaman’s apprentice. Similarly, the subadult in Ipiutak Burial 32, aged nearly 8.0 years, was interred with two adults. Individuals in this grave were placed supine with their heads towards the west, and their skulls were placed 25 cm apart (Larsen and Rainey, 1948). Their burial included one swivel, five animal carvings, one ornamental band, three bird bone tubes, one arrow-straightener, one knife, and two unidentified fragments. Located 10 meters west of Ipiutak Burial 32, Ipiutak Burial 33 features three adults and one subadult. The subadult, aged 10.0 years, is buried to the right of the adults. This grave includes one ivory pick, three animal carvings, two perforated brown bear jaws, three whetstones, one knife, and four arrowheads. Ipiutak Burial 46 is a double burial, an articulated adult interred with a subadult. The subadult is aged 10.0 years. Both the adult and subadult were positioned with their heads towards the west, but the subadult was
placed in the right arm of the adult. One ice pick, two animal carvings, one worked antler, and two unidentified fragments were included in their burial.

Tigara Burial 37 includes an articulated adult and subadult, aged 9.0 years, in a surface log tomb. In this burial, a whalebone shovel was placed on legs of the adult and part of a fishing spear lay beneath the subadult’s skeleton. An ornamental band, a hammer, two arrowpoints, and a bird bone were placed within their grave, and below the adult were twelve bird needles. Tigara Burials 103, 168, 196, and 221 follow a similar pattern. Tigara Burial 103 features a subadult aged 10.0 years. This subadult was interred on top of an adult skeleton and excavation yielded eleven arrowheads, one arrowpoint, a stone lamp, two animal carvings, two blade fragments, and an ivory point. Tigara Burial 168 includes two adult skulls and a subadult skeleton, aged 6.0 years old, and fragments of wood encased their grave. Their burial implements included eight arrowheads, two bird arrowheads, two arrowpoints, one whaling harpoon head, one fishing spear, one walrus tooth, one antler fragment, and two unidentified fragments. Tigara Burial 196 features a subadult, estimated to be 6 years of age, interred with an adult. The subadult was placed with their head against the pelvis of the adult and their grave included a whalebone, two animal carvings, and one antler carving. Tigara Burial 221 included a subadult that is 10 years of age, buried with two adults. This subadult showed evidence of a healed fracture, and interred by the subadult’s femur was an incised animal bone, two arrowheads, and a harpoon head.

Concomitant with Inuit ideas concerning *inua*, this thesis theorizes that the funerary rituals concerning individuals from 4.0 to 12.0 years are aimed at making a
social distinction that corresponds with age and identity. The greater numbers of implements buried with subadults between the ages of 4.0 to 12.0 years may reflect the complexity of changing social identities or *inua* at these later ages. In this sense, older subadults may be buried with animal implements so that they may transfer their *inua* to animal spirit guides and return to Earth in the form of a non-human person. Beyond this, the directional orientation of subadults between 4.0 to 12.0 years demonstrates a change in the complexity of *inua* as these individuals are interred identical to adults. In acknowledging the existence of malevolent spirits and the susceptible nature of individuals between the ages of 0.1 to 3.0 years, it may be proposed that Ipiutak and Tigara funerary rituals speak to a socially recognized boundary that is delineated by the ability to ward off impure souls. The disparate funerary treatment of these age groups ultimately represents the presence of social age in the archaeological record and demonstrates the ability of bioarchaeology to enhance perspectives on the development of personhood in previous populations.

Between both cultures there is no distinction concerning subadult age among surface burials or underground burials. The heterogenous pattern of surface and underground burial treatment most likely reflects ecological constraints of the Point Hope landscape. Because Point Hope is an area that is situated upon thick layers of permafrost it may be concluded that individuals who died during different seasons were afforded burials that were convenient to the immediate weather conditions. This is to say that during winter permafrost layers are thicker and more difficult to dig through, thus, surface burials might indicate a communal solution to adverse weather conditions. These
findings ultimately illustrate ontological significance in Arctic hunter-gatherer lifeways and demonstrate ways in which social development is associated with biological age in past communities. In understanding age as a culturally contingent process, these results can enhance perspectives on the development of personhood within the Point Hope population.

Resilience theory is a conceptual framework that grants agency to human groups in that it emphasizes the inevitability of change and the inevitability of human adaptation, in some capacity (Redman and Kinzig, 2003; Redman, 2005). Resilience, in this context, refers to the capacity of a socio-ecological system to endure external changes while continuing to maintain internal function, structure, identity, and responses (Walker et al., 2004). Resilience in and of itself is comprised of four main parts: latitude, resistance, precariousness, and panarchy. Latitude refers to a particular threshold, or the maximum amount that a socio-ecological system can be changed before it can no longer recover; resistance refers to the potential of the socio-ecological system to be changed for better or worse; precariousness refers to how close a socio-ecological system is to reaching the threshold, and panarchy refers to any surrounding influences that can impact the socio-ecological system at a given time, such as unforeseen political events or climate change (Walker et al., 2014). Bioarchaeology is perfectly suited to contribute to studies of resiliency because the archaeological record speaks to the ways in which past social organizations interacted with their surrounding ecological environments.

In understanding and applying the components of resiliency to past communities, hunter-gatherer lifeways may be understood as ultimately complex because the resilience
of a socio-ecological system is wholly dependent on human actors who adapt to changes so that the system does not change beyond repair. Human actors can adapt through a myriad of ways, individuals can invoke social memories of the past, recalling periods of destruction so that the social organization can adapt to changes and move the socio-ecological system towards an ideal state, or “basin of attraction” (Redman and Kinzig, 2003). Conscious human actions in the wake of change represent reorganization in the adaptive cycle of resilience (Holling and Gunderson, 2002). The adaptive cycle of resilience, depicted as a figure 8, suggests socio-ecological systems experience a sequence of events controlled by four functions; growth, conservation, release, and reorganization. Growth, or r, reflects the exploitation of land for resources where conservation, or K, represents a slowed accretion of natural resources (Redman and Kinzig, 2003; Walker et al., 2004; Redman, 2005). Release, or Ω, represents periods of sudden change that influence the overarching socio-ecological system in that the organization becomes vulnerable to collapse. Following the release stage, human actors must respond by reorganizing and moving the socio-ecological system towards a period of growth once again (Redman and Kinzig, 2003). Upon reorganization, human actors may adjust their socio-ecological system to resemble a cultural predecessor or adopt new functional attributes. It is in this way that human actors can move socio-ecological systems towards the same, or new, “basin of attraction” (Redman and Kinzig, 2003).

Resilience theory presupposes that change in socio-ecological systems is irregular and as a result, slow accretion of natural resources interrupted by periods of sudden perturbations influence legacies of social groups (Redman, 2005). Simply put, socio-
ecological perturbations constitute interactions and negotiations between fast and slow variables. These interactions and negotiations are guided by very particular dynamics and opportunities, as comprehended by human actors in specific cultural contexts. Where there are fixed rules for achieving high and constant yields, separate from scale and context, socio-ecological systems often lose resilience (Walker et al., 2004). This is to say that these socio-ecological systems are more vulnerable to disturbances that could have been subsumed. In this way, the role of human actors in resilience theory cannot be understated, humans and their socio-ecological systems must continue to be flexible as change is inevitable and the scale of destabilizing forces may change over time (Redman, 2005). In essence, resilience requires humans to be self-reflective, engaged with their socio-ecological system, and goal oriented. In granting human groups agency and viewing individuals as active problem solvers, socio-ecological systems may be moved toward a desired state because humans actively serve as resilience theorists (Redman, 2005).

Cultural networks allow for the exchange of ideologies, information, as well as other goods and resources. These networks are often maintained through ritual obligations or reciprocity among social groups. Redman (2005) suggests continuity and change can be measured in terms of biology, social organization, or life-style. In the wake of change, social groups actively decide which cultural aspects of identity they are willing to change as long as other cultural characteristics are maintained. In the archaeological record, there are instances where social groups reorganize as a means to maintain their cultural integrity (Hoover and Hudson, 2016). Many bioarchaeological
studies tend to view reorganization as assimilation, specifically between hunter-gatherers and agricultural groups. However, it is important to point out that hunter-gatherers produce collective social-action within their population because hunting, gathering, and interacting with their socio-ecological domains continuously shape local identities (Ingold, 1988, 2000). This is to say, hunter-gatherer social action is dependent upon subsistence strategies in that they are constantly interacting with each other and their surroundings to reach a shared goal. Hunter-gatherer subsistence depends on autonomous action and interaction in which cooperation shapes social action. Concomitant with resilience theory, social groups undoubtedly create and pass on culture. Culture comprises symbols, meaning, and behaviors about ways of doing things. In contrast to longevity, resilience recognizes that the flexibility, and the ability of humans to adapt to changing structures, that speaks to resiliency. Ipiutak and Tigara hunter-gatherers demonstrate resiliency in their shared spiritual landscape. While the Ipiutak culture came to a sudden end, Tigara hunter-gatherers repopulated the “basin of attraction” at Point Hope and continued to maintain ethnic identities, as demonstrated with the mortuary rituals associated with child burials, reflecting a broader social ontological process that represents not only an interconnected aspect of Ipiutak – Tigara connections but a resilience of the broader cultural identity itself.

As discussed in Chapter Two, unforeseen ecological milieus forced the Ipiutak cultural occupation (AD 400 – 750) and the Birnirk cultural occupation (AD 500 – 1000) to abandon their coastal residences and migrate towards interior sites such as Onion Portage, Teller, and Itkilik Lake (Maley, 2014). Maley (2014) infers extreme weather
events initiated this move, and a 2005 study by D’Arrigo and colleagues (2005) corroborates this line of thinking through the analysis of tree rings from Seward Peninsula, Alaska. Kotzeube Sound separates Seward Peninsula from Point Hope. While Seward Peninsula is located to the south of Kotzebue Sound, Point Hope is located to the north. The location of Seward Peninsula allows the results of D’Arrigo and colleagues’ study (2005) to correspond to weather event data co-occurring at Point Hope. D’Arrigo et al.’s (2005) study of tree ring sequences found that much of the time between 1000 to 1200 AD were much cooler than the 20th century (p. 230). These cooler temperatures likely resulted in increased storm activity among much of northern Alaska, thus causing coastal occupations to become less sustainable and forced people to seek shelter at inland sites (Mason and Bowers, 1998). It is widely argued that during this migration, the Birnirk and Ipiutak contemporaneously occupied the same interior settlements and their genetic and cultural admixture resulted in the Tigara population (Maley, 2014).

Nearly 400 years after the Ipiutak’s occupation at Point Hope ended, the Tigara repopulated Point Hope by 1100 AD. The Tigara occupation was part of the Thule culture, which is characterized as a complex whale hunting culture and is similar to the Birnirk culture. As stated in Chapter Two, studies concerning occlusal molar microwear and postcranial skeletal lesions indicated that the Tigara greater proportions of frozen meat relative to their Ipiutak counterparts and that high rates of postcranial skeletal lesions resulted from strenuous physical demands brought upon by whale hunting (Costa 1977, 1980, 1982; El Zaatari, 2014; Hilton et al., 2014). Faunal assemblages from the Ipiutak occupation at Point Hope suggest the Ipiutak mainly relied on sea mammals such
as seals and walruses, but not whales. Remains of seals and walruses make up nearly 98% of the faunal assemblage excavated at the Ipiutak settlement, and the remaining 2% constitute birds and fish (Lester and Shapiro, 1968). However, despite differences in subsistence strategies, the Tigara at Point Hope exhibited predispositions for stylized artifacts that were similar to the Ipiutak cultural occupation. The fact that there is change in surrounding ecological landscapes and subsistence strategies is reflective of environmental stressors, which forced Ipiutak and Tigara populations to respond and ultimately adapt. When viewed in light of resilience theory, it may be seen that the hunter-gatherers at Point Hope reacted to surrounding influences as a means to maintain cultural integrity. This is to say that the Ipiutak and Tigara populations were flexible in that they were able to make conscious decisions to change as much as their cultural identity would allow. Perhaps this is why the Ipiutak did not adopt whale hunting.

The move away from and later repopulation of Point Hope demonstrates resilience in that the Ipiutak were able to endure external changes, such as extreme weather events, and reorganize their social structure and initiate a move towards interior sites. This demonstrates resilience in that the Ipiutak were able to successfully adapt to their new surrounding ecological landscape and repopulate. The subsequent Tigara cultural occupation also demonstrates resilience in that they were able to adapt to the surrounding ecological landscape at Point Hope while continuing to maintain internal functions such as social structure, subsistence strategies, and reigning cultural identities from their ancestors (Larsen and Rainey, 1948; Hilton et al., 2014; Redman and Kinzig, 2003; Redman, 2005).
That being said, resilience of a socio-ecological system depends on humans who are able to adapt to their environment so that their overarching system does not collapse (Redman and Kinzig, 2003; Redman, 2005). One of the ways that humans are able to adapt includes invoking social memories of the past (Redman and Kinzing, 2003; Redman, 2005). In spite of employing whaling as a subsistence strategy, the Tigara occupation at Point Hope indicates similarities to their ancestral Ipiutak population through the persistence of mortuary treatment of subadults. This persistence ultimately demonstrates cultural and ecological adaptation through the invocation of social memory in that the Tigara were able to repopulate Point Hope and maintain cultural ideologies from both the Birnirk and Ipiutak. The conscious human actions surrounding funerary rituals as demonstrated by the Ipiutak and Tigara suggests adaptation through social memory in that the data presented here implies persistence in the social treatment concerning age. While it is demonstrated here that the Ipiutak and Tigara populations are examples of resilient populations because they actively completed the adaptive cycle of resilience, this paper further suggests that the Ipiutak and Tigara populations are resilient because the human actors within these populations adapted to changes so that their entire social organization could withstand perturbations (Holling and Gunderson, 2002; Redman and Kinzig, 2003; Redman, 2005).

The data here indicates that hunter-gatherers at Point Hope recognized social boundaries associated with the development of age. The application of resilience theory to this archaeological data elucidates how hunter-gatherers acted as purveyors of resilience in order to maintain their cultural identity in the wake of change. As previously
discussed, the resilience of a socio-ecological system requires humans to be self-reflective, flexible, and goal oriented as change is inevitable. For the Ipiutak, their socio-ecological system faced external pressures and change in the form of weather events, influencing the entire panarchy. As a result, the Ipiutak foragers were flexible and reorganized into a new system. Their reorganization required them to move their “basin of attraction” so that they could take advantage of opportunities in their new socio-ecological system in the form of growth and conservation, or r and K, thus continuing their adaptive cycle of resilience (Redman and Kinzig, 2003; Redman, 2005).

The interaction between Birnirk and Ipiutak populations also represents resilience dynamics of socio-ecological systems. Resilience theory emphasizes a synchronic interpretation of interactions (Redman, 2005). This is to say that small-and-fast, intermediate, and large-and-slow adaptive cycles are concurrently operating. When Birnirk and Ipiutak populations cohabit an ecological system, it is the interactions between small-and-fast and large-and-slow that determine the resilience of a socio-ecological system in that both groups are forced to share a basin of attraction, face changes, reorganize, and adapt. This idea further suggests resilience in that social groups must be flexible in order to maintain cultural characteristics that are embedded in their social fabric (Redman and Kinzig, 2003). The data presented here helps to explain how small-and-fast, immediate, and large-and-slow adaptive cycles operate. The Ipiutak migration to an interior site may be described as a small-and-fast adaptive cycle in the sense that extreme weather prompted an immediate response. In adapting to the change, the Ipiutak were able to continue through their cycle of long-and-slow because their
subsistence strategies and cultural ideologies remained innate aspects of their social identities. In a similar vein, the Tigara adaptation to Point Hope represents a long-and-slow adaptive cycle because they were able to repopulate their ecological landscape while retaining important aspects of their cultural identity, as demonstrated by their mortuary practices. However, Tigara subsistence strategies represent a small-and-fast adaptive cycle as subsistence yields tend to be threatened by external changes such as prey or weather events, thus forcing human actors to continue along the same lines of thinking or invoke social memory and adopt previous strategies (Redman, 2005). Small-and-fast adaptive cycles run the risk of becoming large-and-slow adaptive cycles if the human actors fail to adapt or adapt quickly (Redman, 2005).

Nearly 400 years later, Tigara hunter-gatherers repopulated Point Hope, Alaska (Maley, 2014; Mason, 2014). As demonstrated by this move, the Tigara experienced change, or panarchy, as weather events allowed them to reoccupy the coast, thus moving their “basin of attraction” to the site of their cultural predecessors. As the Tigara reorganized at Point Hope, they continued their adaptive cycle in the growth phase by exploiting whales in their surrounding environment. While the Ipiutak and Tigara differed in their exploitation of natural resources, the Tigara illustrate the capacity of resilience as it speaks to cultural ideas that are inherent to ethnic identity. Tigara hunter-gatherers had undergone minor adjustments to maintain itself (i.e. moving their “basin of attraction”), however, the continuity of funerary rituals despite a separation of 400 years, speaks to the ability of human systems to create, maintain, and pass on culture despite change. These findings speak to the importance of understanding symbolic expressions of
maturity in the archaeological record. The integration of estimations of physiological age with archaeological mortuary practices has the capacity to reveal the social and symbolic components of maturation. These symbols may persist through ethnic resiliency across environmental disruptions and help preserve cultural identities.


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BIOGRAPHY

Lauryn Justice graduated with her Bachelor of Arts from the University of North Carolina - Wilmington in 2014. She received her Master of Arts in anthropology from George Mason University in 2017. She looks forward to continuing her career in bioarchaeology by pursuing a Ph.D.