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# The Intra and Inter-Household Organization of Dorset Period Butchery and Disposal of Harp Seal at Phillip's Garden (EeBi-1): An examination of two midden assemblages from House 10.

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UNIVERSITY OF CALGARY

The Intra and Inter-Household Organization of Dorset Period Butchery and Disposal of Harp Seal at Phillip's Garden (EeBi-1): An examination of two midden assemblages from House 10.

by

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## **Abstract**

Phillip's Garden is a large Middle Dorset period seal hunting site in the Port au Choix area of northwestern Newfoundland, Canada. Harp seal dominates all Phillip's Garden middens in quantities of up to 99% in faunal assemblages. This thesis investigates two midden assemblages from House 10, a large single house at this multi-household aggregation site, to determine the household organization of harp seal processing, consumption, and disposal activities during the height of site occupation. The contents of two middens located at the front and rear of House 10 are analyzed for seal body part representation, cutmarks, and associated tools and artifacts. Results of these analyses demonstrate that each midden has similar body part representation, though interesting contrasts are observed and investigated. Differences in the associated tool and artifact types and counts for each midden are also noted. Midden analysis results are used to isolate and interpret the types of activities that would have contributed to the differential distribution of seal body parts, tools, and artifacts between the front and rear middens of House 10. Evidence of an intra-household organization of harp seal processing and disposal activities has interesting implications in the interpretation of an inter-household communal organization of harp seal resource management at Phillip's Garden. The results of these analyses suggest that a framework of social organization was involved in the process of butchering, processing, consuming, and disposing of harp seals within and between households at Phillip's Garden.

*Keywords: zooarchaeology, Middle Dorset, Paleo-Inuit, Phillip's Garden, harp seal, midden, butchery, disposal, cutmarks, social organization, houses, Newfoundland*

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## List of Abbreviations

ASTt	Arctic Small Tool Tradition
ATC	Associated Tool/Artifact Count
BDV	Bone Density Value
BP	Years Before Present
BPR	Body Part Representation
Cal BP	Calibrated Years Before Present
CMF	Cutmark Frequency
%CMF	Cutmark Frequency Proportional to Sample Size
CML	Cutmark Location
F386	Feature 386, rear midden of House 10
F388	Feature 388, front midden of House 10
GPR	Ground Penetrating Radar
GPS	Global Positioning System
MAU	Minimum Animal Unit
%MAU	Minimum Animal Unit Proportional to Sample Size
MNE	Minimum Number of Elements
%MNE	Minimum Number of Elements Proportional to Sample Size

MNI	Minimum Number of Individuals
MUI	Meat Utility Index
NISP	Number of Identified Specimens

## **1. Introduction**

### **1.1 Chapter Introduction**

This chapter begins by defining the purpose of this thesis research. This is followed by a brief definition and description of Dorset period Paleo-Inuit culture in the eastern Canadian Arctic, Greenland, and Newfoundland to contextualize the cultural focus of this thesis. An overview of the previous zooarchaeological work conducted on faunal assemblages from Phillip's Garden is then presented to situate the research questions that guide this thesis. The thesis sample is described and the anticipated limitations affecting the sample are discussed. Lastly, a review of how the upcoming chapters are organized is provided.

### **1.2 Statement of Research Intent**

This thesis research analyzes two faunal assemblages from the Dorset period Paleo-Inuit site of Phillip's Garden (EeBi-1) at Port au Choix, Newfoundland. Phillip's Garden was a key harp seal (*Phoca groenlandicus*) hunting site that was seasonally used and occupied by the Dorset Paleo-Inuit in Newfoundland. The aim of this analysis is to present and investigate evidence of how midden location and contents can be analyzed to determine disposal patterns at individual households. These patterns can then be used to provide insight into how the butchery, processing, consumption, and disposal of harp seal was organized both within and around an individual household, as well as how these activities functioned site-wide between multiple households at Phillip's Garden. In this thesis, complete bones and partial/fragmented pieces of bones are referred to as "elements." The terms "element" and "specimen" are used interchangeably to describe both whole and partial fragments of bone.



### **1.3 The Dorset Period**

Phillip's Garden is a Middle Dorset period settlement. The Dorset developed out of the Arctic Small Tool tradition (ASTt) and emerged in the eastern Canadian Arctic approximately 2500 BP (Collins 1950). The Dorset period represents a time of maximum expansion throughout the eastern Canadian Arctic, Newfoundland and the nearby island of Saint-Pierre, and Greenland (Leblanc 2008, Ryan 2016, Appelt et al. 2016). For the eastern Canadian Arctic generally, the Dorset period is preceded by Paleo-Inuit communities who made distinctive tools: the ASTt and the Pre-Dorset, a variation of the ASTt (4500 to 2700 BP). The Dorset period is divided into Early Dorset (2600/2500 to 2300/2000 BP), Middle Dorset (2300/2000 to 1500/1200 BP) and Late Dorset (1200 to 500 BP) (Fitzhugh 2001, Ryan 2016, Milne and Park 2016). The dates for each cultural period vary regionally, so some dates are presented in ranges.

The Dorset Paleo-Inuit encompassed a sizeable expanse of the eastern Arctic, settling in regions spanning from Victoria Island and Labrador in Canada to the northwestern coast of Greenland (Appelt et al. 2016). Dorset period culture is characterized by semi-sedentism, as demonstrated in the limited evidence of substantial transportation technology beyond small, personal kayaks (Appelt et al. 2016). The Dorset Paleo-Inuit also displayed an affinity for artistic and symbolic craftsmanship, as evidenced in their elaborate wood carvings and figurines (Hardenberg and Stirling 2015). The Pre-Dorset and Early Dorset periods saw extensive movement and settlement of groups throughout the eastern Canadian Arctic and into Greenland (Maxwell 1985, Ryan 2016). The Middle Dorset period is characterized by the widespread abandonment of the High Arctic and Greenland and a massive population expansion southward down the coast to Labrador and Newfoundland (McGhee 1976, Maxwell 1985, Ryan 2016). The Late Dorset period is largely distinguished by the various population movements and possible local extinctions that occur beginning 800 BP, when Late Dorset groups began to retreat from the once-dense

occupations around the Foxe Basin and Hudson Strait and moved in reduced populations to the previously abandoned regions in the north and west (Maxwell 1985, Appelt et al. 2016). By 700 to 600 BP, the significantly reduced Late Dorset populations existed only in isolated regions, such as northern Labrador (Fitzhugh 2001, Ryan 2016).

In Newfoundland, Labrador, and regions of Quebec, the term Groswater Paleo-Inuit is used to define the Pre-Dorset (Wells 2002). The Port au Choix region had a Groswater occupation prior to the Middle Dorset occupation, with two notable sites being Phillip's Garden West (EeBi-11) and Phillip's Garden East (EeBi-1), each one kilometer apart. The Groswater occupation of the Port au Choix region is approximated to be 2800 to 1750 cal BP (Wells 2002). The Middle Dorset were the second and final Paleo-Inuit occupation of Newfoundland. The Dorset Paleo-Inuit at Phillip's Garden occupied the site between 1990 to 1180 cal BP (Eastaugh and Taylor 2011). The distribution of Middle Dorset period sites in Newfoundland and Labrador is variable over time but sites are consistently concentrated on the coastlines. Interestingly, while Early Dorset, Middle Dorset, and Late Dorset period sites have been located in Labrador, only Middle Dorset period sites have so far been identified in Newfoundland (Cox 1978, Tuck and Fitzhugh 1986, LeBlanc 2008). In this thesis, the term Middle Dorset is often shortened to Dorset when being used to describe the Middle Dorset period Paleo-Inuit occupation of Phillip's Garden.

#### **1.4 Zooarchaeology at Phillip's Garden: Situating the Project**

The existing body of archaeological research conducted at Phillip's Garden is extensive. Various studies have reconstructed Dorset period life at the site by investigating the hunting and processing of seal meat and skin, tool and artifact construction and use, site population, house construction style, and the communal organization of houses (Renouf 2011a). Previous zooarchaeological studies at Phillip's Garden have concluded that harp seal greatly dominates faunal assemblages, in

some assemblages constituting up to 99% of all faunal remains present (Harp 1976, Murray 1992, Hodgetts et al. 2003, Hodgetts 2005). While seal species can be difficult to differentiate in faunal assemblages due to overlap in the size and appearance of seal bones between species, previous studies on the faunal material from Phillip's Garden (Murray 1992, Hodgetts et al. 2003, Hodgetts 2005) confirm that the great majority of identifiable seal bones at Phillip's Garden are harp seal (*Phoca groenlandicus*). Given the very high proportion of harp seals in identifiable seal bone assemblages, my analysis of seal bones will assume that all are harp seals. These and other studies have investigated and verified the role of harp seal as a focal subsistence source and key facet of Dorset period Paleo-Inuit culture (Hodgetts et al. 2003, Renouf and Bell 2008), reconstructed the butchery process using ethnographic analogical evidence (Wells 1988 in Renouf 2011b, Wells 2012), and studied the post-processing activities and artifact production of sealskin, bone, and blubber materials (Bell et al. 2005, Knapp 2008, Renouf and Bell 2008, Renouf et al. 2009, Wells and Renouf 2014).

While theories of a general social organization of seal butchery have been discussed in most texts concerning Dorset period seal activities (Wells 2011, Renouf 2011b, Murray 2011), there is no preceding study of how the activities of butchery, processing, consumption, and subsequent disposal were specifically organized within and around a Dorset house at Phillip's Garden. The high quantities of harp seal remains retrieved across the site and the seasonal nature of harp seal hunting suggests that the hunting, butchery, consumption, and processing of harp seal were communally organized events that likely involved the pooled labour of multiple families from different households to maximize harp seal procurement (Renouf 2011b). To date, no previous research has considered how disposal practices may have shaped the location and composition of middens. This thesis research seeks to understand what role the occupants of an

individual house had in this communal effort by analyzing the composition of two middens from House 10, which was occupied during the height of Phillip's Garden site use and population. An intra-household reconstruction of butchery, processing, consumption, and disposal activities at House 10 based on midden analysis can offer interesting insights into how these activities were organized at the inter-household, site-wide level. Trends observed in the House 10 midden analysis are likely applicable to other large houses at Phillip's Garden. This thesis establishes a systematic method of analyzing the contents and characteristics of middens at large houses at Phillip's Garden to reconstruct butchery, processing, consumption, and disposal activities at the intra-household level. These methods can then be applied to midden assemblages from other houses in the future to further elucidate the inter-household site-wide organization of harp seal resource management at Phillip's Garden.

## **1.5 Outline of Thesis**

### *1.5.1 Project Overview*

This project employs a body part representation analysis, cutmark analysis, associated tool and artifact analysis, and a spatial analysis of two middens to reconstruct Dorset period practices of butchery, processing, consumption, and disposal at Phillip's Garden. Samples of harp seal remains from two midden features (F388 and F386) at the front and rear of House 10 at Phillip's Garden are identified and analyzed for cutmarks. At Phillip's Garden, the Middle Dorset period is further divided into early, middle, and late phases (see Background, section 2.3 for elaboration on Middle Dorset phases in Newfoundland). The middle phase period marks the height of site use and population. House 10 is a typical Middle Dorset middle phase house with a well-documented excavation history. Houses at Phillip's Garden are positioned with entrances facing the ocean and are identified by the presence of slight surface depressions and (sometimes) flat stones (Wells et

al. 2012). This project seeks to determine what, if any, differences there are between the two midden features in terms of body part representation (BPR), cutmark frequency (CMF), cutmark location (CML), and associated tool and artifact counts (ATC) to assess if patterns of social and spatial organization of butchery, processing, and disposal activities are evident at House 10. Results of this investigation will be used to theorize how these single household activities operated within the larger context of the multi-household aggregation site of Phillip's Garden.

During the excavation of House 10 in 2011, the presence of articulated segments of seal remains in the front midden and higher fragmentation and disarticulation of seal remains in the rear midden was noted (Wells et al. 2012). To confirm, contrast, and establish these and other observations previously made on the midden samples, the harp seal bones recovered from both middens were analyzed to determine the elements (bone types) and proportions of elements present. The frequency of cutmarks on elements is also analyzed, and qualitative descriptions of those cutmarks are produced to determine the activity (skinning, disarticulation, and flesh removal) and the tool type used to create them. Differences or similarities in BPR, CMF, CML, and ATC between the front midden and the rear midden of House 10 will provide greater insight into how harp seal related activities related to disposal were organized. By understanding how the disposal of harp seal, tools, and artifacts occurred around a single household, the organization of harp seal related activities can be interpreted on an inter-household and site-wide level. Such insights are relevant because the physical remains of BPR, CMF, CML, and ATC provide a tangible trace of human intention and traditional practices in the butchery process from the initial skinning and disarticulation of the seals to the portioning and more intensive or meticulous removal of flesh for consumption, and finally the disposal of remains. By reconstructing the process of these events, interpretations of some aspects of Dorset period social organization at Phillip's Garden can be

made. This research is guided by the following main question: how did the occupants of House 10 organize harp seal processing, consumption, and disposal within and around the house during the height of site occupation? This investigation uses the additional five questions below to guide sample analysis:

1. Are there differences in what element types show signs of butchery, cutmark frequency, and location of cutmarks on elements between midden F388 and midden F386?
2. Are there differences in seal body part representation between midden F388 and midden F386?
3. Could any differences in body part representation, cutmark frequency, cutmark location, and associated tool count suggest a difference in how the middens were conceived, utilized, and organized by the house occupants?
4. What inferences can be made about the spatial and social organization of disposal activities within and around a single house at Phillip's Garden?
5. Can an intra-household analysis of processing, consumption, and disposal organization be used to interpret the inter-household communal organization of harp seal processing at Phillip's Garden?

This investigation is relevant because these butchery, processing, consumption, and disposal practices are the social facilitation of an economic and cultural activity; these practices are learned, taught, and continually repeated. The repetition of these practices is self-sustaining as it reinforces a specific way of completing a task (e.g., butchery, processing, disposal) and that in turn reinforces identity. The practice of butchering, processing, consuming, and disposing of harp seal remains in a socially repetitive way places individuals in familiar locations at the site of the activity; in this case, at the front and rear of a large house (House 10). Any observed differences

in the contents of these middens, such as the types and condition of the bones found (articulated, disarticulated, fragmented) and the associated artifacts, could indicate how each midden functioned and what types of activities contributed to the deposition and composition of its contents. These observations can indicate systems, strategies, and frameworks of organization implemented and upheld by the individuals who created, maintained, and sustained the middens throughout the multiple occupations of House 10. Ultimately, in reconstructing how processing, consumption, and disposal of harp seal occurred at the level of a single household, the relationship between multiple households in the organization of butchery and processing at the site-wide level can be interpreted.

### *1.5.2 Thesis Sample*

Generally, preservation of organic material is quite high at Phillip's Garden due to the site's unique environment and geography (Wells 2002, Hodgetts et al. 2003, Hodgetts 2005, Renouf 2011a, Wells 2011). A variety of factors influencing preservation at the site converge to create an ideal circumstance for faunal preservation. A detailed explanation of preservation conditions at Phillip's Garden is provided in Section 2.5 of the Background chapter. The front and rear midden are comparable samples for their (1) similar preservation conditions and (2) assumed contemporaneity. In this thesis, "contemporaneity" does not describe simultaneous use, nor does it define midden accumulation as a single event. Rather, the term contemporaneous is used here to represent the continuous accumulation of harp seal and related refuse as a result of continued and repeated practices enacted throughout different occupations of House 10 during the middle phase.

The preservation between the two samples is very similar because both samples were retrieved from the same stratigraphic level during excavation and the middens were not spatially distanced across different areas of the site but were instead situated within approximately 12

meters of each other, around the same house. The proximity and stratigraphic relationship between the two midden features suggest that both samples would have been subject to the same post-depositional processes that could influence element survivorship. These processes will be reviewed and discussed in the Background chapter.

The middens are assumed to be contemporaneous features. This assumption cannot yet be proven, as there is no radiocarbon date for the front midden that can be compared to the radiocarbon date of the rear midden, and other radiocarbon dates collected from different features at House 10 span a fairly broad time period of over approximately 140 years. Existing dates from House 10 are based on the radiocarbon analysis of charred wood:  $1602 \pm 49$  BP (P-694),  $1630 \pm 40$  BP (Beta 211269), and  $1712 \pm 40$  (P-695) (Harp 1976, Renouf et al. 2005, Renouf 2011c, Wells et al. 2012). When calibrated, the dates demonstrate a range between 1480 and 1620 cal BP (Renouf 2011c). However, the middens are assumed to be contemporaneous and related features on the basis that both result from accumulated depositional practices by House 10 occupants throughout the middle phase. The volume, stratigraphy, and associated artifacts and tools in each midden indicate that neither midden represents a single depositional event (e.g., one season or year of refuse). Instead, this thesis research assumes that both middens reflect the accumulation of practices and activities that resulted in the deposition of harp seal elements and other artifacts over multiple seasons and years of House 10 occupation. This assumption will be tested and examined in the Results and Discussion chapters by considering the element composition of each assemblage separately and together as a whole. The results of the midden analysis will be used to test this assumption and distinguish between two possible scenarios:

1. The middens represent depositional episodes from completely separate occupations (not contemporaneous), or



2. Butchery and deposition are organized in such a way that different harp seal carcass portions from similar processing events are deposited in both middens during the same occupation(s) or different seasons of occupation in the same years (contemporaneous).

Other contextual factors for midden composition are considered in relation to any differences or similarities in BPR and CMF. These factors include the different types and frequencies of tools and artifacts, the bone density of elements represented, and the meat utility of different seal body parts. Combined, the assemblages from both middens yield 5238 elements, including counts of unidentifiable bone fragments. The front midden F388 assemblage contained 2543 elements and the rear midden F386 assemblage contained 2695 elements. When only identifiable elements are accounted for, the combined sample size is 2858. The sample is further described in the Background and Methodology chapters. The combined sample size is sufficient to allow the detection of any existing patterns. If patterns are evident, they can then be used as a template in the assessment of other midden assemblages from different houses at Phillip's Garden which will allow for a more comprehensive understanding of how butchery, processing, consumption, and disposal activities may have been organized site-wide.

### *1.5.3 Sample Limitations*

Like all archaeological samples, especially faunal assemblages, this project sample has limitations. Several taphonomic processes could have affected which bones survived in the archaeological record. These processes include, but are not limited to, differential bone density of elements and the differential utility values of elements influencing human choice in what body parts are found at the site, disposed of at the kill site, or carried to other locations (Lyman 1985, Lyman et al. 1992). A further limitation to this sample is that a direct relationship between midden F388 and F386 cannot be established with absolute certainty. This is due to the wide range of radiocarbon

dates available for different features at House 10 and the absence of a radiocarbon date for midden F388. While a direct relationship between the two middens with radiocarbon dating evidence verifying their precise contemporaneity is not available, it is nevertheless likely the two middens are related features that were used contemporaneously due to their similar stratigraphy and shared connection to House 10. Further, it must be noted that verifying the contemporaneity of the midden features is not necessary for their comparison. Any observed differences in BPR, CMF, and ATC between the midden samples would suggest that each midden was more often used for different purposes, even if they were not used simultaneously.

Lastly, neither midden assemblage can be considered a complete representation of all faunal, tool and artifact material of that midden. F388 and F386 were not excavated to the full extent of either midden area due to time and logistical constraints. Therefore, not all material was retrieved from the middens, and it must be acknowledged that any differences between the contents of the middens may be in part a result of data discrepancy. However, the excavated material used in this thesis sample is of a substantial size and is considered a representative sample of each feature, and appropriate measures and statistical methods are applied to compare samples of different sizes (as described in the Methodology chapter). Therefore, any possible impact of data discrepancy on observed trends and patterns is believed to be minimal.

#### *1.5.4 Thesis Organization*

This thesis consists of six chapters, beginning with this Introduction. The Background chapter provides a detailed overview of the Phillip's Garden archaeological site and area. The environmental and cultural contexts of the site are presented in conjunction with a review of the history of archaeological excavation and investigation at Phillip's Garden. Findings in previous studies of harp seal butchery, processing, and disposal at Phillip's Garden are synthesized and the

theoretical framework used in this thesis is presented. The analysis of middens F388 and F386 is contextualized with midden research in general, in the Arctic, and at other Dorset period sites. The organization of houses at the site is then discussed with a specific focus on House 10, where the thesis samples were recovered. The Methodology chapter introduces the relevant concepts of zooarchaeological quantification and qualification. The thesis sample is described in greater detail before sample-specific quantification and qualification methods are outlined. Discussions of cutmark analysis and body part representation analysis follow. In the Results chapter, results of the sample analysis are presented. Results for each midden assemblage are first presented individually, then together to identify any existing patterns or trends evident. Following the presentation of results, the Discussion chapter reviews the patterns and notable observations evident in the comparison of BPR, CMF, CML, and ATC between the two midden assemblages. These patterns are comprehensively assessed to determine what interpretations can be made about how butchery, processing, consumption and disposal activities were organized at House 10, and what this organization at the intra-household level can suggest about a site-wide inter-household organization of harp seal resource management. Final remarks regarding these insights and interpretations, as well as discussion of areas of further research and investigation, are made in the Conclusion chapter.

## **2. Background**

### **2.1 Chapter Introduction**

This chapter provides a comprehensive overview of the Phillip's Garden site. To contextualize the sample and research questions, I begin with a general review of the Middle Dorset period culture and archaeological sites in Newfoundland. This is followed by an introduction to Phillip's Garden, its environment and geography and a review of harp seal activity in the region. A summary of past work on Dorset period harp seal butchery, disposal, and harp seal related activities at Phillip's Garden is then presented, including a discussion of cutmark and midden studies in archaeology. This is followed by an explanation of the various Phillip's Garden site components, general house features, and a description of House 10. After situating House 10 at Phillip's Garden in the context of cultural and environmental influences and other relevant Dorset culture midden investigations, the significance of this thesis research is stated. The theoretical framework that will guide the interpretation of results in this research is then introduced.

### **2.2 The Middle Dorset Period in Newfoundland**

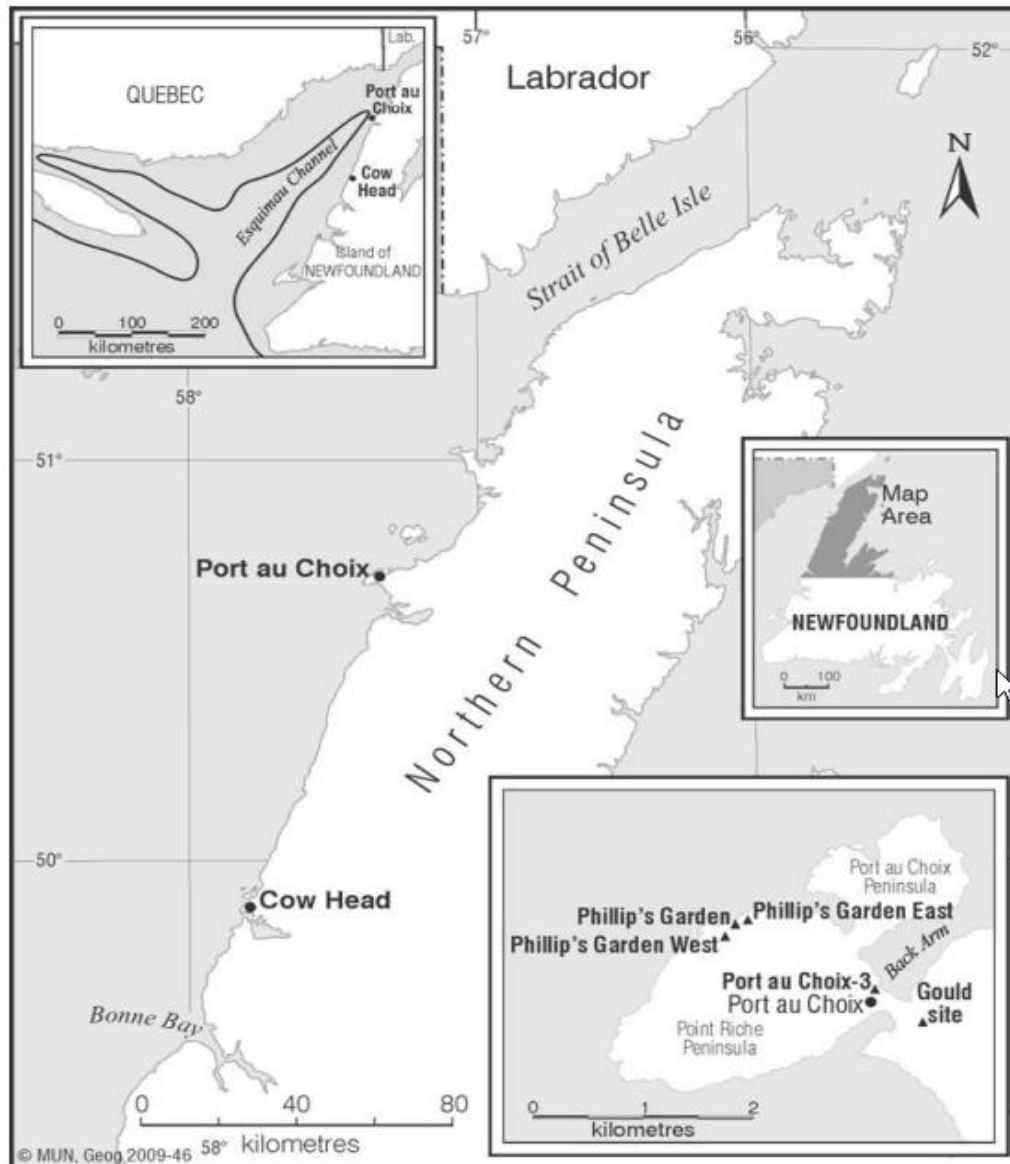
Following the end of the Early Dorset period approximately 2000 BP, the Middle Dorset period marks a time of largescale demographic shifts and the abandonment of most High Arctic regions in eastern Canada and Greenland (McGhee 1976, Maxwell 1985, Jensen 2005, LeBlanc 2008). Consequently, Middle Dorset period sites are found in the eastern Arctic and are concentrated in the subarctic regions of Labrador and further south on the islands of Newfoundland and Saint Pierre (Harp 1976, Cox 1978, Jordan 1980, Fitzhugh 1980). In Labrador, Newfoundland, and Saint Pierre, sites are located along the coastlines (Cox 1978, Tuck and Fitzhugh 1986, Hodgetts et al. 2003, LeBlanc 2008). The location of sites along the coasts reflects the Dorset reliance on marine mammal subsistence. In Newfoundland, only Middle Dorset period sites have been identified. The

most notable Middle Dorset period sites in Newfoundland include this thesis study site of Phillip's Garden, the largest village/hunting site in Newfoundland, as well as the Stock Cove (CkA1-3) and Dildo Island (CjAj-2) sites in Trinity Bay (LeBlanc 2003, Wolff et al. 2019) and the Fleur de Lys soapstone quarry site (EaBa-I) in northeastern Newfoundland (Erwin 2016).

The Middle Dorset in Newfoundland began to gradually wane approximately 1100 BP (Renouf 2011b). The abandonment of the Phillip's Garden site in 1180 cal BP marks the general end of the Middle Dorset occupation of Newfoundland (Renouf and Bell 2009, Renouf 2011b). The Middle Dorset are believed to have retreated to the High Arctic regions of northern Labrador and Nunavut, reoccupying areas previously abandoned at the end of the Early Dorset period; this northward movement and reoccupation marks the end of the Middle Dorset period and the start of the Late Dorset period, which spanned approximately 1500 to 600 BP (Fitzhugh 1976, Maxwell 1985, Friesen 2007). Speculation on what triggered the abandonment of Newfoundland by the Middle Dorset Paleo-Inuit typically considers climatic variability triggering environmental stress, and it has been suggested that continued warming trends observed across the Arctic regions may have played a significant role (Renouf and Bell 2008, Renouf and Bell 2009). Warming temperatures may have impacted the sea icepack conditions and the availability of harp seal, creating a subsistence instability that precipitated the Middle Dorset abandonment of Newfoundland (Hodgetts et al. 2003, Renouf and Bell 2008, Renouf 2011b). The overexploitation of focal resources has also been suggested as a plausible cause of general population decrease and demographic shifts during the Dorset period in the eastern and central Canadian Arctic (Savelle and Dyke 2009).

### **2.3 Phillip's Garden Overview**

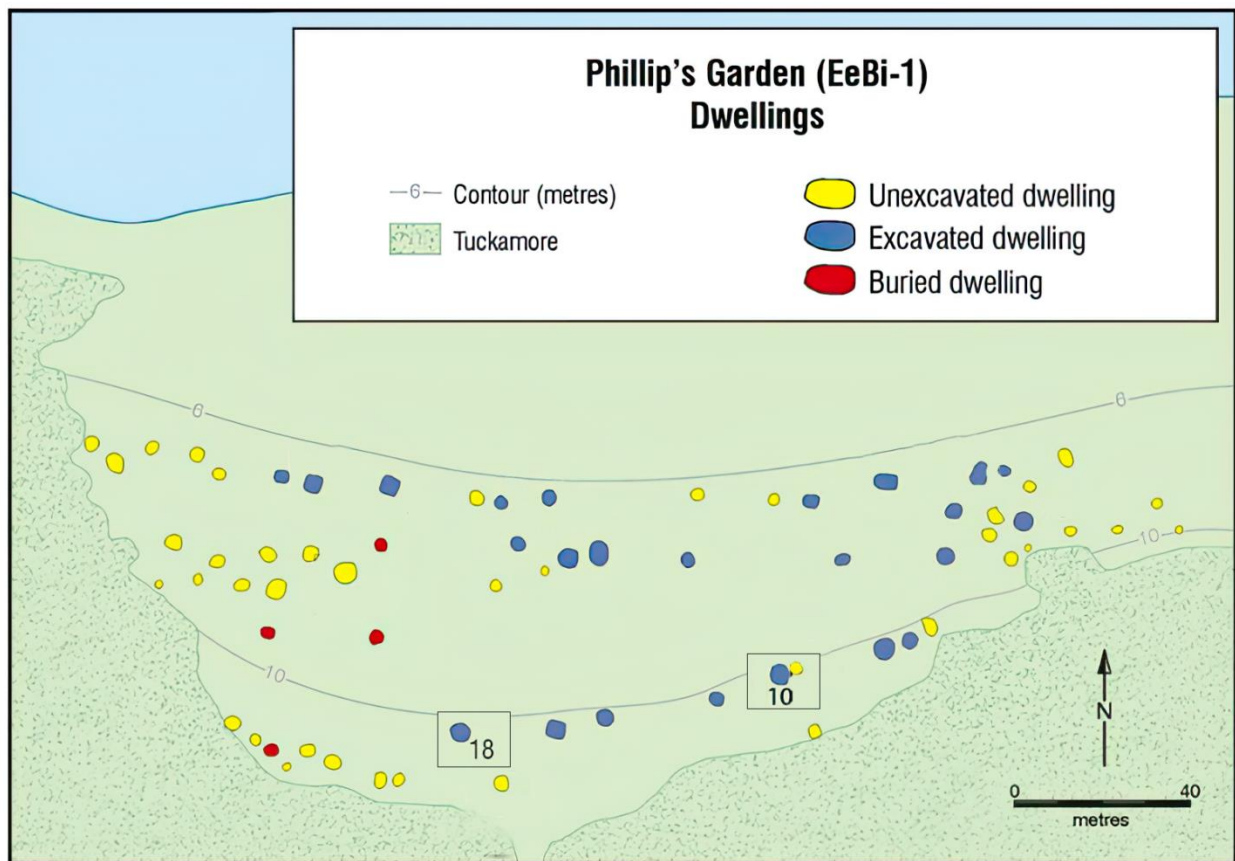
Phillip's Garden is situated in the Port au Choix National Historic Site on the northwest coast of Newfoundland (Figure 1). The Port au Choix region was intensively occupied by different cultures for over 5500 years; these cultures include the Amerindian, Groswater, and Dorset (Renouf 2011a). The Groswater and Dorset Paleo-Inuit occupations both practiced marine-focused subsistence and resided primarily on the outer coastal areas of Port au Choix. Phillip's Garden was a coastal site with a Dorset occupation and the nearby sites of Phillip's Garden East and Phillip's Garden West represent the Groswater occupation of the region. The Dorset occupation of the Port au Choix region followed its abandonment by the Groswater in 1750 BP and spanned 800 years (1990 to 1180 cal BP). Phillip's Garden is "one of the richest and most intensively occupied Dorset Palaeo[Inuit] sites within this culture's geographic range" (Renouf 2011a: 2). Phillip's Garden was a seasonal site that was established for the primary purpose of hunting and processing harp seals, a species which consistently and predictably migrated through the waters off the northwest Newfoundland coast.



**Figure 1 Map of Port au Choix and Surrounding Areas, Marking Phillip's Garden (Renouf 2011: 2).**

As the largest Dorset site yet known in Newfoundland, Phillip's Garden plays a prominent role in studies of Dorset period social organization and subsistence strategies. The site was intensively occupied by large aggregations of Middle Dorset period groups and families during the spring seal hunting season. Smaller groups would have likely occupied the site either continuously or sporadically during the remaining summer, fall, and winter seasons (Erwin 2011,

Renouf 2011a). The site spans a 2.17-hectare meadow on the coast of the Point Riche Peninsula (Figure 1). This meadow is bordered by stunted-spruce forest on its landward side (Renouf and Murray 1999, Eastaugh and Taylor 2011) and is positioned on a series of raised terraces rising up to 11 metres above sea level. Cultural material remains are numerous, beginning 20 centimetres below the surface. A total of 68 dwellings were initially identified and mapped at Phillip's Garden in 1984 (Robinson 2014, Robinson and Wells 2018). As large, semi-subterranean structures, they were visible on the surface of the meadow, particularly when light conditions were low in the morning and evening. The distribution of these dwellings across the site is displayed in Figure 2.



**Figure 2** Map of Phillip's Garden Dwellings with House 10 and 18 Identified (adapted from Wells et al. 2012: 3).



Following further geophysical surveys including ground penetrating radar (GPR), magnetometry, and global positioning system (GPS) investigations conducted in 2001, 2011, and 2012 (Eastaugh 2002, Tudor and Renouf 2013, Robinson 2014, Robinson and Wells 2018), the total potential number of dwelling features is now thought to be as high as 170, a substantial increase from the 68 dwellings initially recorded (Robinson and Wells 2018). The geophysical surveys account for the dwellings that are not visible in all light conditions, are shallower, or are buried beneath midden deposits (Robinson and Wells 2018). Figure 3 displays all potential dwellings and associated features identified to date. The green and red encircled areas represent depressions that are likely dwellings (green), and buried dwellings (red).

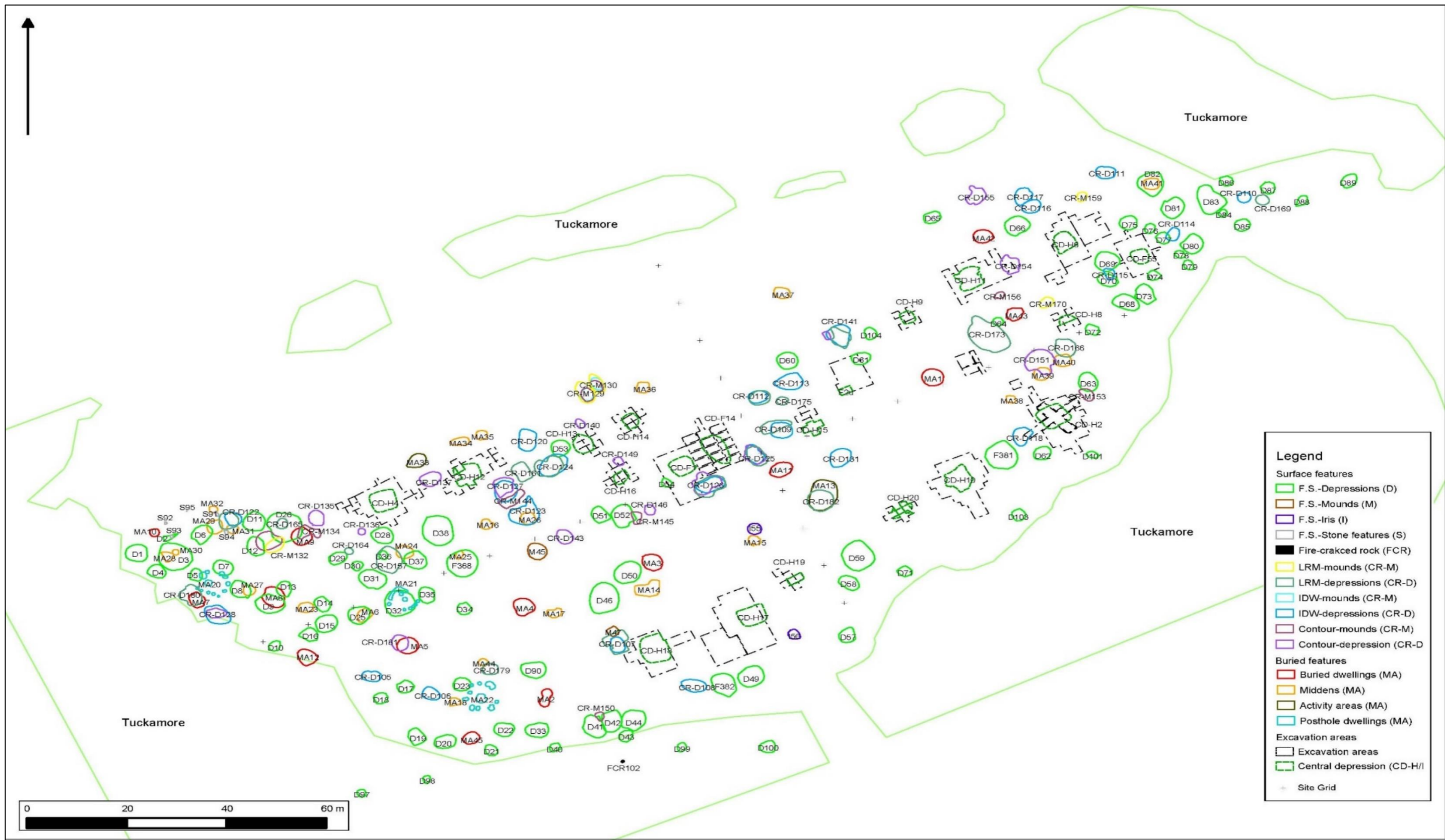


Figure 3 Complete Map of All Identified Features at Phillip's Garden, Showing Increased Dwelling Count (Robinson 2014: 155).

Phillip's Garden underwent three major occupational phases during the Middle Dorset period (Renouf and Bell 2009). The early phase (1990 to 1550 cal BP) saw intermittent and small-scale seasonal occupation. The middle phase (1550 to 1350 cal BP) was the height of occupation, where the site was used intensively each spring season. It is likely in this middle phase period that the site population was at its most dense (Erwin 1995). A high number of radiocarbon dates collected from the site date to the middle phase (Renouf and Wells 2014). The late phase of site occupation (1350 to 1180 cal BP) was similar to the early phase in that it had smaller-scale and more sporadic seasonal occupations prior to total site abandonment by 1180 cal BP (Eastaugh and Taylor 2011). While accurate population estimates are unknown, this bell curve trend of increasing and decreasing occupation through the three phases is substantiated by studies of house architecture and the faunal assemblages associated with each occupation phase (Renouf and Murray 1999, Wells and Renouf 2014).

Renouf and Murray (1999) observe that in the comparison of an early phase house and middle phase house at Phillip's Garden, the construction of the early phase house is more ephemeral with its perimeter and central depression not clearly defined. In contrast, the construction of the middle phase house is considered more substantial, and the clear definition of multiple features (indicating multiple construction episodes) suggests it was built for long-term, permanent occupation by multiple families (Renouf and Murray 1999, Wells and Renouf 2014). While these types of architectural differences are typically attributed to different seasons of occupation elsewhere in the Arctic (with more ephemeral structures used in warmer seasons, and more permanent structures used for colder seasons), this is not expected to be the case at Phillip's Garden. Because these architectural differences have been correlated to shifts in population density (Erwin 1995, Eastaugh and Taylor 2011), the larger and more substantial construction of houses

that contain multiple families is thought to reflect the population increase and subsequently large spring aggregations during the middle phase (Renouf and Murray 1999, Wells and Renouf 2011). Reoccupations of dwellings is an expected occurrence at intensive resource procurement sites like Phillip's Garden. Whereas changes in house architecture can be used to explain population *increase* between the early and middle phase, changes in faunal assemblages indicate a population *decrease* between the middle and late phase. The late phase displays marked changes in subsistence practices at Phillip's Garden, where faunal assemblages demonstrate an increase in the diversification of species, indicating a decrease in harp seal availability and procurement (Hodgetts et al. 2003). The decrease in harp seal availability coincides with the population decrease and eventual abandonment of Phillip's Garden in the late phase (Hodgetts et al. 2003, Wells and Renouf 2014). Phillip's Garden was such an instrumental site that its abandonment likely precipitated the Dorset period population collapse in Newfoundland (Renouf and Bell 2009).

#### **2.4 History of Archaeological Investigation and Excavation at Phillip's Garden**

Phillip's Garden has a history of intensive archaeological investigation. The site was first known archaeologically in 1927 when William Wintenburg initially explored the area (Wintenburg 1939). The first major excavation and investigation of Phillip's Garden was conducted by Elmer Harp Jr. in 1949-50 and 1961-63 (Harp 1951, 1964, 1976). Harp focused these excavations on semi-subterranean house features which are visible as depressions on the ground surface. In total, he fully excavated 7 and partially excavated 13 of these dwellings.

The Port au Choix Archaeology Project, directed by Dr. Priscilla Renouf of Memorial University of Newfoundland, began in 1984 and investigations at Phillip's Garden continued in the project name after her death in 2014. As part of the Port au Choix Archaeology Project, excavations were conducted in 1986, 1987, 1991, 1992, 1993, 1999 and 2002. In addition, midden

deposit excavations occurred in 1990-1992 (Renouf 1992, Renouf 1993, Renouf 2002) and 2001 (Hodgetts 2002). In 2005, 2006, 2007, and 2011, the Port au Choix Archaeology Project reinvestigated four of the dwellings previously excavated by Elmer Harp Jr. (Cogswell 2006, Cogswell et al. 2006, Renouf 2006, 2007, Wells et al. 2012). The Port au Choix Archaeology Project excavations of Harp's earlier investigations revealed that Harp had only uncovered the center of house features, while the entrances, side and rear platforms, post holes, and other house features that lay around the periphery of the central depression had not yet been excavated (Renouf 2003, Cogswell et al. 2006, Wells et al. 2012).

## **2.5 Phillip's Garden Environment and Geography**

In general, organic materials are typically poorly preserved or altogether absent because of high acidity soils typifying archaeological sites in Newfoundland. In addition, other taphonomic processes that speed the degradation of organic materials at archaeological sites are high microbial activity in the soil and aerobic (oxygen rich) environments (Hollesen et al. 2017). However, the environmental conditions at Phillip's Garden contribute to the excellent preservation of organic materials. The northwest coast of Newfoundland is incredibly rich in limestone geological deposits and limestone bedrock (DeGrace 1974). Limestone is an alkaline material, allowing it to neutralize acidic agents in the ground soil. Consequently, limestone serves as a primary factor in the high degree of organic preservation at Phillip's Garden. The sandy soils that make up the base of Phillip's Garden allow for adequate drainage and the deposit of many centuries of faunal material and fat (seal blubber) contribute to the exceptional faunal preservation in middens at the site (Wells 2002). As a result, large amounts of preserved animal bone have been retrieved from site excavations, as well as large assemblages of organic artifacts (Renouf 2011a, Wells 2011).

Phillip's Garden is a terraced site, meaning it has several platform-like areas raised above sea level (Figure 4). This is due to isostatic rebound and is very common in coastal Arctic archaeological sites (Bell et al. 2005, Erwin 2011). Isostatic rebound refers to the rise of landmasses (like terraces) following the retreat of ice sheets and glaciers, whose significant weight causes an isostatic depression of the landscape (Walcott 1972). The landscape rises in response to the removal of this weight. This process of isostatic rebound has been occurring across the eastern Canadian Arctic for 10,000 years, following the deglaciation of the region (Savelle and Dyke 2002). The impact of isostatic rebound on the landscape is evident in the locations of Arctic culture sites across arctic and sub-arctic landscapes. The palaeotopographies that result from isostatic rebound, such as the creation of shorelines and formation of river channels (major subsistence sources), directly correlate with the location of Paleo-Inuit archaeological sites (Ross and Friesen 2022).

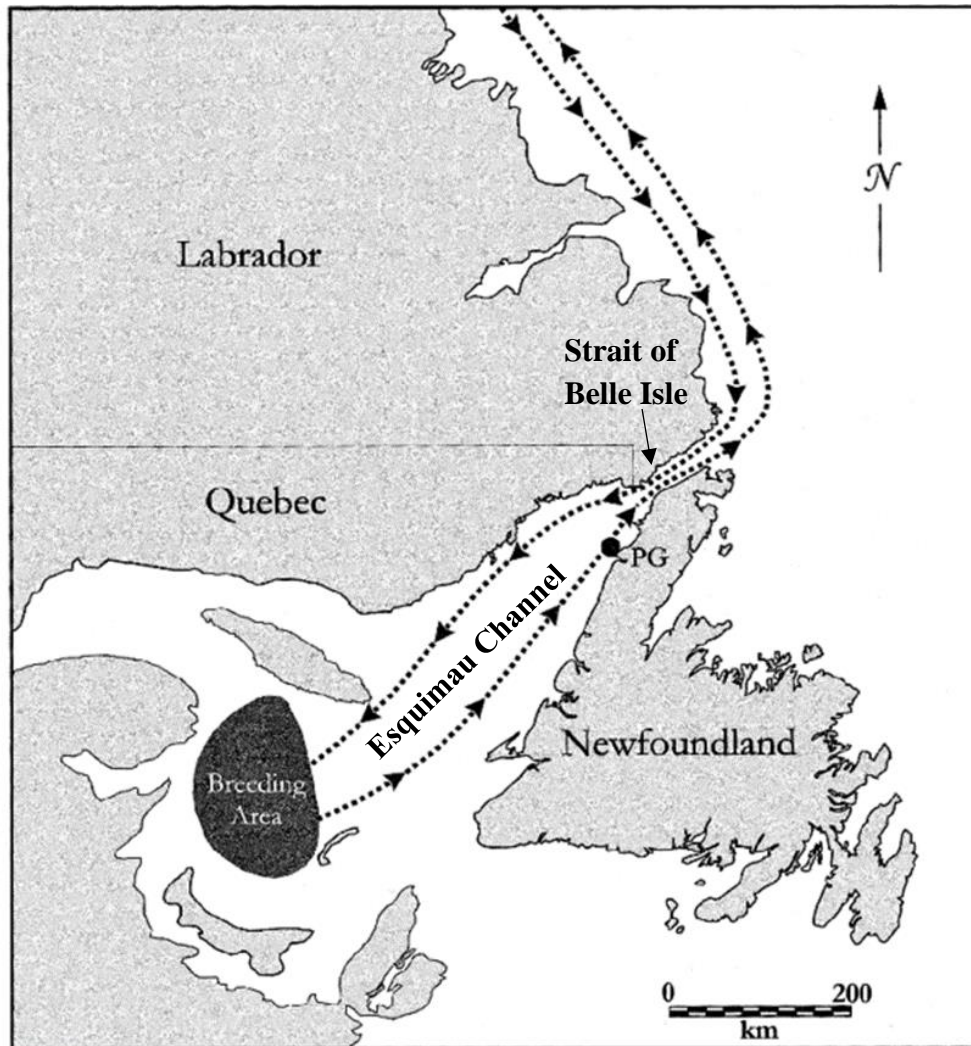


**Figure 4** Photograph of Limestone Terracing at Phillip’s Garden (Wells et al. 2012: 1).

## **2.6 Harp Seal Seasonality and Migration**

Socially, economically, and culturally, harp seal was the focal point of Dorset period life at Phillip’s Garden. The site occupation was tied to the seasonal arrival of harp seals twice each year through the Strait of Belle Isle. As a narrow channel that becomes even narrower seasonally due to icefloe along the coasts, the Strait of Belle Isle creates a bottleneck passage that harp seals migrate through at predictable times of the year: winter and spring (Figure 5). Recent studies on the migration of harp seal in this region have observed a southward journey towards a harp seal breeding ground in the Gulf of St. Lawrence in December, and a return northward movement

following the retreating ice pack in April and May (LeBlanc 1996, Hodgetts et al. 2003, Renouf 2011a).



**Figure 5** Map of the Harp Seal Migration Route, Breeding Area, and Esquimau Channel (adapted from Renouf 2011: 2 and Hodgetts et al. 2003: 110).

Phillip’s Garden was an ideal hunting location because it is situated centrally on the coast of the Strait of Belle Isle ‘bottleneck’ on the Point Riche Peninsula. Harp seal prey species, including capelin, northern shrimp, and plankton, concentrate in areas of marine upwelling (Hodgetts et al. 2003). This type of marine upwelling occurs on the coasts of deep-water channels like the Esquimau Channel (Figure 5). The Point Riche Peninsula lays just one kilometer from



where harp seals would concentrate to feed during their migrations, as it is “the closest point of land along the channel’s entire length” (Hodgetts et al. 2003: 107). The large spring gatherings of people at Phillip’s Garden were strategically planned to intercept the northward migration of harp seal along the Point Riche Peninsula. The site was also used to intercept seals in the winter, though at a much-reduced scale in comparison to the interception of seals in the spring (LeBlanc 1996, Wells 2002, Hodgetts 2005). The reduced scale of harp seal hunting in the winter is due to the decreased accessibility of harp seals from the Point Riche Peninsula for the following reasons. First, the seal herd is more dispersed and tends to hug the southern Labrador coast during the winter southward migration. Second, the unpredictable early winter icepack conditions would have made a winter hunt a more dangerous endeavour with a lower seal recovery rate (Leblanc 1996, Wells 2002). On this basis, the bulk of harp seal hunting at Phillip’s Garden is understood to have occurred at the site during the spring and at a reduced scale during the winter (Hodgetts 2005, Wells 2012).

The main seasonality indicator used to form the basis of this assumption is the faunal material. As harp seal constitutes the vast majority of all faunal assemblages at Phillip’s Garden, and other species occur in very small percentages, it is very likely that during the middle phase the site was only intensively occupied when harp seal could be procured. When the known harp seal migration pattern is considered, it is argued that the seasonal use of this site was largely limited to the winter and spring seasons (Hodgetts 2005). It is possible that an occupation of the site in the summer and fall may have also occurred, but to a notably lesser extent. Hodgetts (2005) uses bone measurements of Phillip’s Garden faunal material to determine the season of harp seal hunting. She asserts that Phillip’s Garden was used for seal hunting in both the winter and spring seasons, though notes that it is still unclear if both a winter and spring hunt were pursued every year by

Phillip's Garden occupants (Hodgetts 2005). Hodgett's (2005) further asserts that the unique characteristics of the faunal assemblages and relative absence of large storage pits and caches at the site further indicate that Phillip's Garden was not frequently or substantially occupied during seasons where harp seal was not available (summer and fall).

Essentially, the combination of feeding grounds, deep water channels, a narrow strait, and an aptly located peninsula forms an excellent hunting location, as evidenced in the intensive and centuries-long occupation of the Phillip's Garden area by both the Groswater and Dorset Paleo-Inuit. The archaeological record of Phillip's Garden demonstrates that nearly all aspects of life revolved around the harp seal.

## **2.7 Harp Seal Hunting, Butchery, Disposal, and Seal-related Activities**

The predictability and abundance of an annual harp seal hunt supported the development of Phillip's Garden as a major Dorset settlement, where the organization of houses and daily activities were shaped by the harp seal hunt. Previous studies of the faunal remains from the site emphasize the specialized nature of subsistence activities at Phillip's Garden. Several researchers have illustrated the overwhelming dominance of harp seal bone amongst the excavated faunal remains (Harp 1976, Murray 1992, Renouf and Murray 1999, Renouf 2000, Renouf 2002, Hodgetts et al. 2003, Hodgetts 2005). During the middle phase of the Dorset occupation of Phillip's Garden, the faunal remains recovered from the site consist upwards of 90% harp seal. In some areas of the site this abundance is as high as 99%, with remains of fish, bird, whale, and terrestrial mammals constituting the small remainder of the assemblage (Hodgetts et al. 2003). The harp seal hunt and all of the associated activities including butchery, skin and fat processing, and disposal practices were clearly significant social events at Phillip's Garden.

### 2.7.1 *Harp Seal Hunting*

The harp seal hunt was evidently successful for most of the 800-year Dorset occupation of Phillip's Garden. The spring migration concentrates harp seals on the headland of Phillip's Garden in the thousands (Renouf 2011b). While the biannual arrival of large numbers of harp seals was a highly predictable event, the time during which they were in the Port au Choix region was relatively short. Harp seals would have been available to hunt for only a few days, or at most a couple of weeks, during their migration past the Point Riche Peninsula (Renouf 2011b). Further, the harp seal migration is influenced by ice conditions and ice movement. As harp seal breeding and molting depend on sufficient pack ice (as do the human hunters), even slight variations in local temperature and wind patterns can affect the timing and routing of the harp seal migration (Hodgetts et al. 2003). With a relatively short window of opportunity precariously balancing on ideal ice pack conditions, the harp seal hunt would have involved a large-scale organization of pooled labour to maximize the recovery of seals to sustain the Paleo-Inuit Dorset population at Phillip's Garden and probably elsewhere.

The seal hunting at Phillip's Garden is reflected in the tool assemblage recovered from the various site excavations. Nearly 30,000 tools were recovered and constitute the tool assemblage (Renouf 2011b). The assemblage mainly consists of microblades (22.5% of assemblage), harpoon endblades (11.1% of assemblage), harpoon heads (2.7% of assemblage) and slate tools and scrapers (5.3% of assemblage) (Renouf 2011b). The sparsity of harpoon heads and foreshafts (between 0.01% and 2.7% of the organic tool assemblage) indicates that harpoon heads and foreshafts would have been recycled and continuously reused for hunting (Renouf 2011b). This sparsity of harpoon heads and foreshafts can also be due to the disposal of harpoon heads at the kill site on the icefloe edge rather than the residential processing site of Phillip's Garden.

The Dorset Paleo-Inuit would have hunted the harp seals either from shore or at the icefloe edge using a variety of harpoons (Park and Mousseau 2003). Because the torpedo-like shape of a seal lends itself to dragging, the seals could then be transported from the kill site back to the residential aggregation site where butchery and processing would take place (Wells 2011). Whalebone sled shoes for the construction of small sleds would have been used to transport carcasses at the site (Wells and Renouf 2014). Transportation of seals by sled from the kill site to the residential site for their butchery and processing is a widely used strategy across Arctic cultures and regions (Balicki 1970, Vick 1983, Vallee et al. 1984, Morey and Sørensen 2002). This transportation of whole seal carcasses from the kill site to the residential site suggests that intra and inter-household processing and consumption activities have a strong influence on how the carcass is butchered and disposed of (Diab 1998).

### *2.7.2 Seal Butchery at Phillip's Garden*

Typically, the butchery of an animal carcass occurs in two main stages: primary butchery and secondary butchery. Primary butchery refers to the preliminary processing of the carcass, during which major body parts are separated and removed (Fisher 1984). Consequently, primary butchery can leave cutmarks in areas of major disarticulation, such as near joint areas at the base of limbs (Binford 1981). Primary butchery often occurs at or near the kill site, where less valuable portions of the carcass are removed, processed, and disposed of, and the remaining valuable portions are transported back to the residential site (Binford 1981). However, in the case of Phillip's Garden, it is expected that the seals were transported from the kill site on the coast/ice edge to the nearby residential site for primary butchery (Wells 2011). This is confirmed in previous studies of midden faunal assemblages from Phillip's Garden, which have observed that all seal body parts are represented to some extent, and elements with relatively low representation, such as the ribs and

vertebrae, can be accounted for due to taphonomic processes (Hodgetts et al. 2003). Secondary butchery is the practice of processing a carcass beyond the initial processing already performed during primary butchery (Fisher 1984). The modifications made during secondary butchery are specific to the type of animal carcass, but generally include a more thorough or meticulous disarticulation of body parts and the stripping of skin and flesh into packages for cooking and eating. Cutmarks and other bone modifications that occur on bone elements or on areas of an element that are not compatible with the major disarticulation of primary butchery (e.g., the shafts of long bones) are likely the product of secondary butchery.

While there are no direct ethnographic accounts available for the process of Dorset period seal butchery, Wells (1988) reconstructed the likely method of butchery using cutmark patterns on a faunal assemblage retrieved from a midden at Phillip's Garden dated to the middle phase. Wells (1988) described in detail the butchery process, summarized in Renouf (2011b) as follows:

The seal was laid on its back for skinning and butchering. The hide was cut at the skull near the ears and where the flippers joined the long bones. The head and tongue were removed, the vertebral column was disarticulated into meat packages and the limbs were disarticulated from the flippers. The scapula and pelvis were disarticulated from long bones at the proximal end and the flippers were disarticulated at the distal end. Cutmarks showed that meat was removed from the ribs and front limbs. There was some evidence of cutting meat from the flippers (Wells 1988 in Renouf 2011b: 136).

The above details the sequence of butchery but does not describe the spatial and social dimensions of carcass reduction and processing. Large communal hunts across the Arctic involve significant labour coordination to process skins, meat, blubber, and cordage. These processing activities are time and labour intensive. This forms the base question of how these activities were divided and

organized amongst occupants of Phillip's Garden. To determine if these activities were shared communally, handled individually by households, or a combination of both, the midden samples are analyzed for the element types they contain, the nature of cutmarks on elements, and associated tool counts. Upon initial sample assessment, the appearance of thin, shallow cutmarks on elements in the faunal assemblage suggests that microblades were the primary tool for butchering. As demonstrated by Wells (1988), cutmark analysis is an important consideration in studies of butchery because it allows for the reconstruction of butchery activities, which can aid in building interpretations of the social and spatial organization of butchery and processing activities at the household and communal levels.

### *2.7.3 Cutmarks*

Cutmarks are human bone surface modifications that allow for archaeological interpretation of past human butchery and animal processing practices. Cutmarks are indicative of different activities, such as skinning, disarticulation, and meat removal. These activities can be inferred based on the location and nature of the cutmark(s) on a given element (Binford 1981). While cutmarks are often unintentional (i.e., accidental) modifications to bone surfaces and it is possible to butcher an entire animal and leave no cutmarks (Shipman and Rose 1984), cutmarks can occur consistently and predictably in large samples of elements from butchery and animal processing contexts. In seal assemblages, as with most faunal assemblages, the frequency and location of cutmarks can represent different stages of the butchery process and the butcher's intentions; disarticulation, cutting for transport, processing, curing, skinning, stripping sinew, and cutting for eating can all leave cutmarks on an element. Cutmarks, while rare, are an important facet of faunal analysis because they can reveal a palimpsest of butchering and processing events that may be separated and understood by revealing when and where these butchery actions occurred.

Cutmarks are particularly rare in seal bone assemblages, typically appearing on only 5% of elements in a sample (Lyman 1994). Compared to ungulate faunal samples, which usually yield 12% cutmark frequencies, very few cutmarks are expected in seal faunal assemblages (Lyman 1994). This is due to the unique anatomy of a seal. Typically, areas of disarticulation would yield the most cutmarks as there is a higher possibility of accidentally cutting the bone when separating these elements at the joints. However, in seals this disarticulation occurs around joints and limbs that are heavily covered by cartilage and fat. This cartilage and fat surrounding the joints would bear the brunt of the tool contact, reducing the chance of a tool inflicting a mark on actual bone during skinning and disarticulation. This differs from other mammals like ungulates where, particularly for the distal limbs, the bone is present directly beneath the skin without a substantial layer of cartilage and fat. Despite their relative rarity, cutmarks on seal bones can reveal a great deal of information about the processing and consumption practices of the Paleo-Inuit at Phillip's Garden during the Dorset period.

It is assumed that cutmarks resulting from butchery and processing activities at Phillip's Garden are evident in the harp seal remains at the site. This assumption has been proven correct in previous zooarchaeological studies of harp seal remains at Phillip's Garden (Wells 1988, Hodgetts 2005). The main Dorset tool types used in the disarticulation and processing of harp seals at the site leave consistent cutmarks in predictable locations on different elements. The main tool types associated with the midden assemblages in this project sample are microblades, blade-like flakes, and bifaces. The thin, shallow marks left by microblades have been observed as the most common cutmarks in previous studies of Dorset period faunal assemblages. Wider, chop-like cutmarks inflicted from chopping actions are observed infrequently, suggesting bifaces were less commonly used in harp seal butchery at this site. The differences between the two types of cutmarks and how

they are distinguished during analysis are further described in section 3.10 of the Methodology chapter. In sum, it is clear that cutmarks serve as an important means of analyzing the butchery activities that lead up to the disposal of harp seal remains: they are the tangible remains of cultural practices.

#### 2.7.4 *Middens*

This thesis analyzes two midden samples to assess if they were created by similar or different accumulative deposition processes. This section reviews the key tenets of midden analysis to situate the research in this thesis. This section first defines what middens are and how they are formed. It then discusses the use of studying middens in archaeological investigations as well as general approaches to midden research in archaeology. Once the fundamentals of midden research in archaeology are outlined, the use of studying middens in the Arctic is then examined. Studies of famous midden sites in the Arctic are used as examples of what knowledge can be gained from past Arctic cultures through midden analysis. This is followed by a summary of other Dorset period midden excavations and studies in the eastern Canadian Arctic. The methods and research questions used for the investigation of Dorset period middens at a variety of sites across the Arctic will be referenced to contextualize this study of Middle Dorset period middens at Phillip's Garden. Lastly, a previous midden analysis study of the Groswater occupation of the Phillip's Garden area and its comparison to another midden analysis study at the nearby Dorset site of Peat Garden North will be summarized to preface possible parallels between the Groswater and Dorset disposal of harp seal remains around house features at Phillip's Garden.

Middens are areas of refuse accumulation and aggregation (Schiffer 1987). Middens are usually located around households, dwellings, and other activity-based areas and structures. The term 'midden' encompasses a wide array of different types and forms of waste areas or refuse



deposits. The way a midden forms is determined by the environmental and cultural influences of its location. The preservation conditions specific to a site's environment and geography, as well as the process in which a midden forms and the type of refuse it contains, determine what, and how much, of a midden's original contents (i.e., all contents from initial deposition) remain in the archaeological record. Middens can form as mounds or as sheets of debris, either shallow or deep depending on the longevity and intensity of their use; middens can also be formed as pits dug into the earth and filled with refuse (Shillito 2015). Middens are aggregations of debris resulting from human waste activity, and typically include food remains (e.g., animal bones, plant remains) manufacturing byproducts of fuel (e.g., fat, grease), human and animal excrement, tools (lithics, lithic debitage) and organic artifacts (e.g., bone, antler, animal hide or byproducts) (Shillito 2015). Therefore, objects from many facets of daily life accumulate in middens. As a result, middens are significant sources of information on the diet, economic activities, and political and social structures of past cultures (Hayden and Cannon 1983, Beck and Hill Jr. 2004).

As general areas of refuse deposition, middens can be found at most archaeological sites across time periods, geographical regions, and cultures. Paradoxically, studying these 'fringe' areas of archaeological sites can actually answer central questions about the cultures who created and occupied those sites. Michael Schiffer (1987) outlines the many ways archaeologists can systematically study refuse deposition. Schiffer (1987) asks archaeologists to consider the relationship between a refuse area and its location, contents, and convenience to better understand human activity and behaviors at any archaeological site. Midden analysis can be used to determine and reconstruct household discard patterns, social division or grouping, intra and inter-household relations, settlement density, and subsistence patterns (Beck and Hill Jr. 2004). At sites with multiple households or dwellings, Beck and Hill Jr. (2004) argue that midden analysis allows for

comparison between household/family groups and can be used to produce interpretations of social relations and power structures. Hayden and Cannon (1983) assert that midden analysis is an extremely useful means of understanding a past culture but warn archaeologists must consider not only what is present, but what is missing. Archaeologists should assess whether any apparent absences in midden assemblages can be accounted for due to differential preservation, or if they are a result of selective disposal (Hayden and Cannon 1983).

Generally, middens in Arctic contexts represent the intentional disposal of refuse and mainly consist of faunal material. The type of faunal material represented in any midden is specific to its location and culture. Due to the typically good preservation at Arctic sites, many archaeological investigations center around midden features. In the Canadian Arctic and in Greenland, there have been major discoveries of the daily life, material culture, and spatial organization of Arctic culture sites resulting from midden excavations. For example, the Greenland sites of Qajaa and Qeqertasussuk are considered ‘cornerstone sites’ in Greenland archaeology for the major influence their investigations had on our understanding of human history in Greenland (Olsen 1998). The site of Qajaa provided insight into the early Saqqaq culture, whose “origin, subsistence and relationship to later cultures [was] not [previously] known in detail” (Elberling et al. 2011: 1331). Subsequent studies from the materials retrieved from middens at both sites have sought to better understand these aspects of the Saqqaq culture (Grønnow 2017). These studies have yielded exciting results; the preserved thick midden layers have clarified the timeline of cultural periods in West Greenland, provided insight into unique hunting traditions based on artifact and tool finds, illustrated a changing subsistence strategy based on the difference of faunal material between layers, and, in Qeqertasussuk, have even produced a complete human genome of a Saqqaq culture period man using a piece of preserved hair found in the midden (Grønnow 1994,

Meldgaard 2004, Rasmussen et al. 2010). At both sites, the middens provide “a solid background against which such processes of change and actual changes in resource exploitation can be elucidated” (Grønnow 1988: 27).

The above relates the general importance that studying middens has on our understanding of prehistoric humans and Arctic cultures. It is also useful to consider studies of Dorset period middens in the eastern Canadian Arctic for direct comparisons to the midden assemblages at Phillip’s Garden. Dorset period middens are typically deep formations with substantial accumulation, indicating many Dorset sites would have been densely populated when occupied and focused on local resources (Ryan 2016). Many studies of Dorset period middens have been conducted at numerous sites across Nunavut and Labrador, and each site supports theories of seasonal migration where different sites bear evidence of focal resource hunting (Jordan 1980, Cox and Spiess 1980, Lemoine and Darwent 1998, Friesen 2004, Howse 2008, Friesen 2009).

Midden studies have also been employed to better understand processes of important economic activities, such as at the Late Dorset sites of Tasiarulik and Arvik on Little Cornwallis Island, Nunavut. The walrus remains from middens at these sites were analyzed with the intent to derive the process of tusk ivory reduction, an activity assumed to be a major aspect of daily life (Lemoine and Derwent 1998). Lemoine and Darwent (1998) reconstructed the processes of ivory separation from walrus crania based on damage inflicted to the bones during the removal of tusks. They note that at the Arvik site, two middens were determined to be strictly used for walrus crania butchery and processing, with the presence of tusk ivory and tusk bone fragments suggesting these areas were also used to free tusk ivory from the crania. This conclusion is supported by the extremely high representation of walrus in the midden faunal assemblages. This high concentration of walrus led Lemoine and Darwent (1998) to conclude that the site was used as a summer and

spring walrus hunting and processing site, with walrus stored in caches for winter consumption. One midden consisted almost entirely of walrus crania and maxilla, whereas the other midden, while still dominated by walrus crania, also included bearded seal cranial and postcranial remains (Lemoine and Darwent 1998). These midden studies serve as examples of how faunal assemblages retrieved from middens at Dorset sites can be used to infer both seasonal settlement patterns based on the seasonal availability of a focal resource (like walrus) and associated economic activity, like walrus tusk ivory extraction.

Other significant Late Dorset sites with associated midden studies are the Bell, Freezer, and Cadfael sites of Victoria Island, Nunavut. All three sites contain Late Dorset components, and faunal assemblages have been retrieved from the middens associated with Dorset houses (Friesen 2004, Howse 2008, Friesen 2009, Park 2016). The Freezer, Bell, and Cadfael sites all have areas with deep middens outside of identified dwellings. Excavations of the middens and midden areas outside of houses sought to determine the period, intensity, and purpose of Late Dorset occupation at these sites, and to assess the possibility of Dorset-Thule contemporaneity (Friesen 2004, Howse 2008, Friesen 2009). Faunal material and artifacts were retrieved in large samples from each site during excavation. Friesen (2009) notes that while the analyses of the samples retrieved were not wholly complete at the time of publication, the initial sorting and classification of the faunal samples into genus/species to determine what animals are represented at these sites yielded interesting results.

The preliminary conclusions drawn from this initial assessment of the midden faunal samples recovered from these three Late Dorset sites offer valuable insight into seasonality, subsistence, and settlement patterns of the Late Dorset occupying this area of Victoria Island. Friesen (2009) and Howse (2008) suggest that the high mammal counts in the Bell site assemblage

clarify its position as a fall season caribou hunting site. Friesen (2009) asserts that high representation of seal and bird bone in the Cadfael site assemblage position it as a seasonal summer site, and the intense fish representation at the Freezer site likely reflects a seasonal late summer/early fall occupation, coinciding with the major char fish run in August. Beyond identifying the seasonality and focal resources of each site, the results of the midden analysis and radiocarbon dates at each site can also speak to economic changes towards the end of the Late Dorset occupation of this area (Friesen 2009). Specifically, these results indicate a process of intensification, where human societies will attempt to maximize food procurement in a certain area (Binford 2001, Friesen 2009). While there are different ways intensification can manifest, in the case of the Bell, Freezer, and Cadfael sites, a process of intensification is reflected as an “an increasing effort to obtain focal species” (Friesen 2009: 244). The presence of a dominating species in the faunal assemblages of each site (char at Freezer, caribou at Bell, and seal/bird at Cadfael) support this theory of economic intensification by the Late Dorset occupants of these sites (Friesen 2009).

As demonstrated at the Tasiarulik, Arvik, Freezer, Bell, and Cadfael Late Dorset sites, analysis of faunal assemblages retrieved from middens can inform on the seasonal settlement patterns, subsistence, and economic motivations behind site selection and occupation. In Labrador, the contents of Middle Dorset period middens are also used to better understand subsistence settlement patterns (Jordan 1980). Of note is the site of Avayalik-I, where components in the lower levels of the midden deposits were noted by Jordan (1980) to be perfectly preserved. The combination of permafrost in the lower level and rapid midden accumulation allows for excellent organic preservation despite the acidic soil (Jordan 1980). The recovery of stone tool assemblages in the midden as well as radiocarbon dates produced from preserved willow twigs and charcoal

samples place the midden in the Middle Dorset period (Jordan 1980). Of the nearly 1700 mammalian remains retrieved from the midden, walrus was the focal resource of the site constituting 35% of the assemblage (Jordan 1980), much like at the Late Dorset sites of Tasiarulik and Arvik in Nunavut (Lemoine and Darwent 1998). Jordan (1980) argues that while walrus bones numbered fewer than seal bones, the difference in meat and fat mass between the two animals indicate that walrus would have been the primary consumption resource. Small seals would have been the secondary focus in diet at this site, with seal bone remains constituting over 50% of the assemblage (Jordan 1980). Of these seal remains, ringed seal dominates, with fewer counts of harbor and harp seal present. Other species represented include, in small percentages, bearded seal, fox, polar bear, caribou, and narwhale (Jordan 1980). Bird bones are numerous and diverse in the assemblage (Jordan 1980). This faunal data suggests that the Avayalik-I site was occupied from late winter to spring and summer for icefloe edge and open water hunting of walrus and seal (Jordan 1980).

The discovery and presence of another Middle Dorset period site with a deep midden feature nearby Avayalik-I further demonstrates the seasonal-subsistence settlement patterns used by the Middle Dorset in this area of the Arctic. The site of Akulialuk appears to be where the Dorset in this area would have settled in the summer, fall, and early winter (Jordan 1980). The midden assemblage recovered from Akulialuk consists almost entirely of small seal species, with harp seal dominating the assemblage (Jordan 1980). Substantial amounts of bird bone from a wide array of species are also of note at Akulialuk (Cox and Spiess 1980). The summer, fall, and early winter occupation of the site would have been designed to intercept the southern harp seal migration (Jordan 1980). Jordan (1980) and Cox and Spiess (1980) demonstrate that the northern Labrador Middle Dorset followed subsistence settlement cycles based on changing seasonal focal

resources. In summary, it was determined that in the late winter to early summer, walrus was the primary resource, as evidenced in the high quantities of walrus bone in the Avayalik-I site midden. In the late summer to early winter, seal (especially harp seal), and bird become the focal resources, as evidenced in the high quantities of seal bone and bird bone at the Akulialik site midden. These two midden studies demonstrate how the hunting and migration patterns of the northern Labrador Paleo-Inuit during the Dorset period can be reconstructed by the analysis of middens at different sites in the area.

The Dorset period midden studies at the Tasiarulik and Arvik (Little Cornwallis Island), Bell, Freezer, and Cadfael (Victoria Island) and Avayalik-1 and Akulialuk (Labrador) sites demonstrate that middens are areas of spatially organized activity and resource deposition that can provide insight into the social, cultural, and economic activity of a cultural group in a given area of the Arctic. These studies also demonstrate how researchers can use species representation in midden samples to determine the season of occupation, subsistence patterns, and infer the activities that would have constituted the daily lives of the site occupants. Common between these aforementioned midden studies is the use of intersite comparisons, especially when discussing seasonality and settlement mobility (Friesen 2009, Jordan 1980, Cox and Spiess 1980). An intersite midden analysis for the Phillip's Garden area was conducted for the Groswater occupation. Phillip's Garden East and Phillip's Garden West are 1 kilometer apart from each other, and Phillip's Garden is situated in between the two sites. Phillip's Garden East and Phillip's Garden West are assumed to have been occupied by the Groswater at the same time on the basis of overlapping radiocarbon dates, evidence of the same seasonal species exploitation, and similar preservation conditions (Wells 2011). In an examination of faunal assemblages from House 12 at Phillip's Garden East and three midden features on a hillside at Phillip's Garden West, Wells

(2002) observes a differential BPR of harp seals between sites. At Phillip's Garden East, where faunal material was excavated in and around a house feature, it was noted that the overall faunal assemblage contained considerably more crania and cranial elements and fewer limb and flipper elements than the faunal material excavated from the hillside middens at Phillip's Garden West (Wells 2002, Wells 2011). At Phillip's Garden West, front limb, front flipper, and hind limb elements occur frequently, and crania and cranial elements are minimally represented (Wells 2011). With assumed equal preservation conditions between sites and overlapping radiocarbon dates, these observed differences in seal BPR between Phillip's Garden West and Phillip's Garden East indicate there was an organization of butchery that divided processing tasks between the two sites (Wells 2002, Wells 2011). The goal of this Groswater intersite midden analysis was to better understand the relationship between the Phillip's Garden East and Phillip's Garden West sites, to ultimately interpret what the organization of hunting, butchery, processing, and disposal was.

Wells (2002) proposes three scenarios that can describe the relationship between the two sites. The first scenario suggests the sites were functionally divided into primary and secondary butchery sites. In the second scenario, Wells (2002) posits there may have been a ritualistic aspect to the separation of seal crania that resulted in notably higher seal crania frequencies in Phillip's Garden East faunal assemblages and almost none at Phillip's Garden West. The third scenario is considered the most unlikely, as it asserts the sites could have existed independent of each other with minimal cooperation or contact. These scenarios are presented in more detail below.

The first scenario closely considers butchery and consumption. Wells (2002, 2011) suggests that the two sites could have been connected and functionally divided to process seal carcasses in a cooperative fashion, where the primary butchery took place at Phillip's Garden East (functioning as a hunting camp) and low MUI elements were deposited (crania and rear flippers)



while other body parts were transported to Phillip's Garden West for further processing and consumption. This scenario is complicated by the presence of houses with hearth features at Phillip's Garden East, though Wells (2002, 2011) notes that this could reflect Phillip's Garden East being used as a hunting and primary butchery site where some members of the Groswater group would reside during processing, while other members would reside at Phillip's Garden West where further processing and consumption occurred of the remaining higher meat utility body parts (Wells 2011).

If the differential representation of body parts between the sites is not a result of functional choices in butchery and disposal, Wells (2002, 2011) asserts that the second scenario could involve a ritual aspect. Activities occurring at Phillip's Garden West could have necessitated the removal of seal crania (Wells 2002). The lithic assemblage from Phillip's Garden West contains a high number of elongated and finely serrated endblades that do not appear as distinctly functional tools, suggesting that they may have been used for ritual processing of seals rather than functional butchery (Ryan 2011, Wells 2011). The differential body part representation between Phillip's Garden East and Phillip's Garden West, coupled with the lithic evidence at Phillip's Garden West, indicates possible ritual activities (Wells 2011). The possibility of these ritual activities occurring is supported by various ethnographic accounts that observe the processing and treatment of seal crania in northern regions. Numerous ethnographic accounts of northern hunting communities note the significance people place on the seal crania. For example, ethnographic accounts of Inupiat hunters note the special treatment of seal crania following primary butchery, where the skulls were piled in front of houses to keep the souls of the seals content (Murdoch 1982). In studies of Alaskan hunters on Nunivak Island, seal crania are kept on shelves inside dwellings facing the entrance door (Lantis 1947); this is similar to communities in the Yukon Delta and Nelson Island, where

seal crania are placed inside dwelling near entrances by the women at Nelson Island and the people of the Yukon Delta (Fienup-Riordan 1994).

Wells (2011) asserts that a third scenario would be that the two sites were independent of one another. In this scenario, both sites would have been contemporary settlements where different activities took place (Wells 2002). This scenario would position Phillip's Garden East as a site focused on the hunting, butchering, and initial processing of seals, where some seal body parts were transported elsewhere (Wells 2002). Phillip's Garden West, then, would be a more intensive residential site that focused primarily on domestic activities related to the hunting, butchery, processing, consumption, and disposal of harp seals, completely separate from the activities occurring at Phillip's Garden East (Wells 2002). However, Wells (2002, 2011) argues that it is unlikely the two contemporary sites would have not had some degree of contact due to their close proximity and strong evidence of simultaneous occupation.

Wells' (2002) Groswater study of midden and faunal assemblages operated at the intersite level. A study of the Newfoundland Dorset site of Peat Garden North utilizes midden analysis on an intrasite level (Hartery and Rast 2003, Hodgetts et al. 2003). Peat Garden North (EgBf-18) lays 60 km north of Phillip's Garden, and analysis of midden faunal assemblages indicate a comparatively more diverse subsistence strategy; while harp seal is still present, it does not dominate the assemblage like it does in assemblages recovered from Phillip's Garden (Hodgetts et al. 2003). The presence of other animal remains (different seal species, caribou, beaver, and a variety of bird species) serve as evidence of Middle Dorset period seasonal subsistence variation in Newfoundland (Hodgetts et al. 2003). Whereas past studies of midden faunal assemblages recovered from Phillip's Garden present extremely high proportions of harp seal (up to 99% in some assemblages), in studies of a midden assemblage from Peat Garden North, only 43% of the

assemblage consists of seal (Hodgetts et al. 2003). This finding substantiates the argument that, in Newfoundland, Dorset period subsistence practices were highly focused on harp seal only at Phillip's Garden (Hodgetts et al. 2003). While seal was still an important resource at Peat Garden North, it was not the sole focus (Hodgetts et al. 2003). These findings were further used to infer seasonal settlement mobility of the Dorset period Paleo-Inuit in Newfoundland; the heavy reliance on harp seal at Phillip's Garden suggests it was seasonally occupied in early winter and spring, whereas Peat Garden North's diversity of species in midden assemblages indicate a summer occupation (Hodgetts et al. 2003). Therefore, theories of regional variability and seasonal settlement of the Groswater and Dorset period Paleo-Inuit in Newfoundland have been substantiated using midden analysis on both inter and intrasite levels.

The design of the midden analysis used in this thesis considers the approaches of the aforementioned studies. At large sites exhibiting long-term occupation, middens are spatially organized activity areas. At Phillip's Garden, middens are discrete features associated with houses (Cogswell et al. 2006, Wells et al. 2012). Their placement suggests that there would have been organization around disposal. Middens at Phillip's Garden consist almost entirely of harp seal bone, with occasional deposits of charcoal, other animal bones, and tools also present (Hodgetts et al. 2003, Cogswell et al. 2006, Wells et al. 2012). Middens at Phillip's Garden also have observed differences; the middens in the front of a house have more articulated bone segments with relatively few other remains while the middens at the rear of the house, when present, contain more disarticulated bones intermixed with other refuse. Prime examples of this pattern have been observed in two middle phase dwellings, House 18 and House 10. Both houses contained notably articulated segments of harp seal vertebrae and high frequencies of seal crania in their front middens (Cogswell et al. 2006, Wells et al. 2012). See Figures 6 and 7. The high crania counts can

be linked to ritual processes that result in the deposition of seal skulls at the front of dwellings, as observed in the Groswater intersite midden analysis by Wells (2002). It is likely that the differential placement of middens around the houses represents an organizational system developed around seal butchery and processing activities that operated at both the intra and inter-household levels.



**Figure 6** Photograph of an Articulated Seal Vertebral Column Amongst Other Faunal Material in F388 from the 2011 Field Season (credit: Patricia Wells).



**Figure 7** Photograph of an Articulated Seal Vertebrae Column from Midden F129, Located Near the Entrance of House 18. Photograph is from the 2005 Field Season (credit: Patricia Wells).

By analyzing the contents of two discrete midden features at House 10, the activities surrounding harp seal processing can be inferred and the role of House 10 occupants in the overall system of harp seal processing at Phillip's Garden can be reconstructed. Similar to how Lemoine and Darwent (1998) compared the faunal assemblages of two discrete middens at two closely related sites to reconstruct processes of walrus tusk ivory extraction, and to how Wells (2002) compared faunal assemblages from two Groswater sites to interpret an intersite organization of harp seal butchery and processing activities, this thesis study compares two middens located at the same site and around the same house feature. Following Wells (2002) and Hodgetts et al. (2003), the body part representation of harp seal at House 10 will be used to determine what parts of the seal were (and were not) frequently brought to House 10 for their disarticulation, processing, consumption, and eventual disposal. In addition to examining the assemblage for body part representation to account for what is present and what is missing, the cutmark frequency and location of cutmarks as well as the associated tools and artifacts found in each midden at House 10 will be considered in the reconstruction of an interrelated, site-wide organization of harp seal butchery, processing, consumption and disposal activities.

#### *2.7.5 Harp Seal-related Activities*

Harp seal was clearly the focal point of life at Phillip's Garden. Daily life likely revolved around the seal, from the initial establishment of the site to the hunting, butchery, and processing activities that took place. These butchery and processing activities can be reconstructed from their remains in the archaeological record. Renouf and Bell (2008) argue that meat consumption and fuel collection in the form of blubber was not the sole motivator for the largescale hunting of harp seal by the Dorset period Paleo-Inuit at Phillip's Garden; the processing of sealskins and subsequent creation of clothes, shoes, and other items was of equal importance. The ability to craft waterproof,

warm clothing and boots, kayak and dwelling covers, bedding, bags etc., positions sealskin as an integral commodity across Arctic cultures, and this is particularly evident in the Dorset period occupation of Phillip's Garden. Both consumption-based and product creation activities are evidenced in the tools recovered from excavations at the site. Microblade and biface tools recovered from butchery and disposal areas indicate the removal of meat, blubber, and the extraction of sinew. The scraper tools are evidence of skinning and hide working, especially the bevelled-edge tabular slate tools (Renouf and Bell 2008). Further, other artifacts such as awls and needles indicate hide sewing activities (Knapp 2008, Wells 2012).

Based on the significant scale of seal hunting and subsequent processing activities, it has been suggested that these labour-intensive tasks may have had a ritualistic function in addition to the obvious utilitarian functions. Renouf and Bell (2008) argue that Phillip's Garden served as a central facilitator of social and ritual functions; by aggregating an otherwise dispersed population into one site, Phillip's Garden would have provided a seasonal opportunity for Paleo-Inuit family groups and subcommunities to join together in social and ritual activities that could establish and reinforce a shared cultural identity. Numerous morphologically accurate and stylized carvings of seals were produced throughout the site occupation, further supporting the ritualistic function of aggregating at Phillip's Garden (Wells 2012). The main purpose of Phillip's Garden as a large-scale seal hunting and processing site is interdependently productive; it supported a large community but necessarily required an equally large labour force to sustain that community (Renouf 2011b). The organization of residential dwellings at Phillip's Garden illustrates how an aggregated population managed the social and economic sectors of life at the site.

## **2.8 Houses at Phillip's Garden**

The seasonal periods of intensive population aggregation at Phillip's Garden would have required a high degree of intra and inter-household organization. The 68 confirmed dwellings at the site, now thought to be as high as 170 dwellings (Robinson and Wells 2018), were substantial in both quantity and in individual size; house range in size from 74.7 m<sup>2</sup> to 105 m<sup>2</sup> (Renouf 2011b). The design of a coordinated seal hunt and subsequent processing activities involved a highly organized labour force, and the organization of this labour force likely also extended to the organization of residential life. The high level of communal organization through dwelling design exhibits an intent for multi-family households that would be better able to coordinate the brief but highly intensive periods of seal hunting and processing events (Renouf 2011a, 2011b). The presence of rear and side platforms in many of the dwellings suggest that multiple families may have occupied single dwellings, with possibly up to six families per dwelling (Eastaugh and Taylor 2011). The strategy of combining multiple family units into single households has also been observed in the central Canadian Arctic during the Early and Middle Dorset periods; the occasional melding of family groups into single large houses during seasonal aggregations is believed to have precipitated the emergence of the longhouses (communal, multi-family dwellings) characteristic of the Late Dorset period (Savelle and Dyke 2009). Further, Phillip's Garden can be considered a permanent site rather than a temporary one, as it was consistently occupied for 800 years. The predictability of the seal migration, coupled with the durability and design of the dwelling features, suggest that houses at Phillip's Garden were designed and built with the intent of long-term use (Erwin 2011).

The internal layout of a typical dwelling at Phillip's Garden consists of sleeping platforms in the east, west, front and rear areas of larger houses. Houses also typically contained an axial feature at their center with post holes on both ends of this axial feature, interior storage pits or



caches, and exterior middens. As these dwellings were likely built for long-term use, it follows that many dwellings would have been reoccupied (Renouf 2006). This theory of reoccupation is further supported by the presence of middens and storage pits, where the substantial accumulation of material in midden and storage areas suggests an intensive use of the dwellings over long periods (Erwin 2011).

House size has been determined to correlate to population density, where larger dwellings would have been designed to house multiple families per household (Renouf 2011b). The largest dwellings at Phillip's Garden produce radiocarbon dates that place these dwellings in the middle phase of occupation, when the site population was highest (Erwin 1995). Smaller dwellings typically date to the early and late phases of site occupation, which experienced more sporadic and less populated seasonal occupations (Renouf and Murray 1999, Renouf 2011b). Houses comparable to House 10 could have housed from three to six families; the interior features suggest that the households were communally occupied as a single unit with shared activity areas for eating, cooking, and sleeping (Renouf 2011b).

## **2.9 House 10 at Phillip's Garden**

House 10 is a typical middle phase house at Phillip's Garden. It is of average architectural build and size for the middle phase, and it contains the expected features. House 10 has undergone three separate excavations: a partial excavation by Harp in 1962, a partial excavation by Renouf in 2004, and a full excavation by Renouf in 2011. Harp conducted the initial excavation of House 10 in 1962 (Harp 1962). This excavation focused on the central depression of the dwelling and uncovered multiple features including the inner edges of the dwelling walls, an axial feature, and numerous pits. Harp excavated to the floor level of the dwelling, but not below. In 2004, Renouf excavated a cross section trench of House 10 (1.4 by 14.5 m in size), laid across the center of the

dwelling, generally east to west (Renouf et al. 2005). This excavation revealed a western and eastern platform and two central pits amongst other features. Renouf returned to House 10 in 2011 to conduct an excavation of the entire area of the dwelling (with a small exception in the rear platform of the house), extending the excavation footprint to include the areas immediately outside of the house walls. As a result, Renouf was able to describe in detail the architecture and features of House 10 and its surrounding areas. See Figure 8 for the layout of these excavations (Wells et al. 2012).

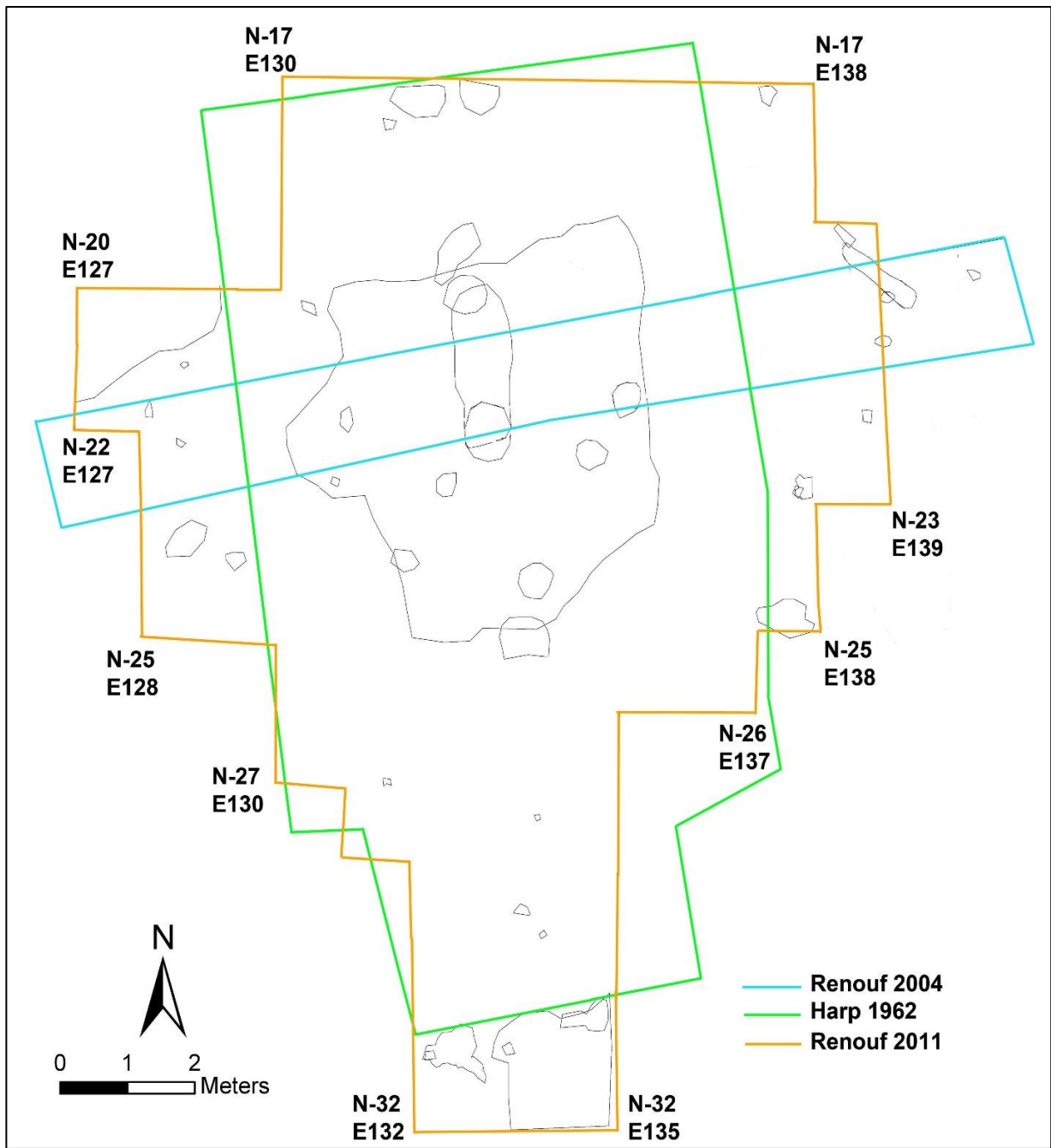
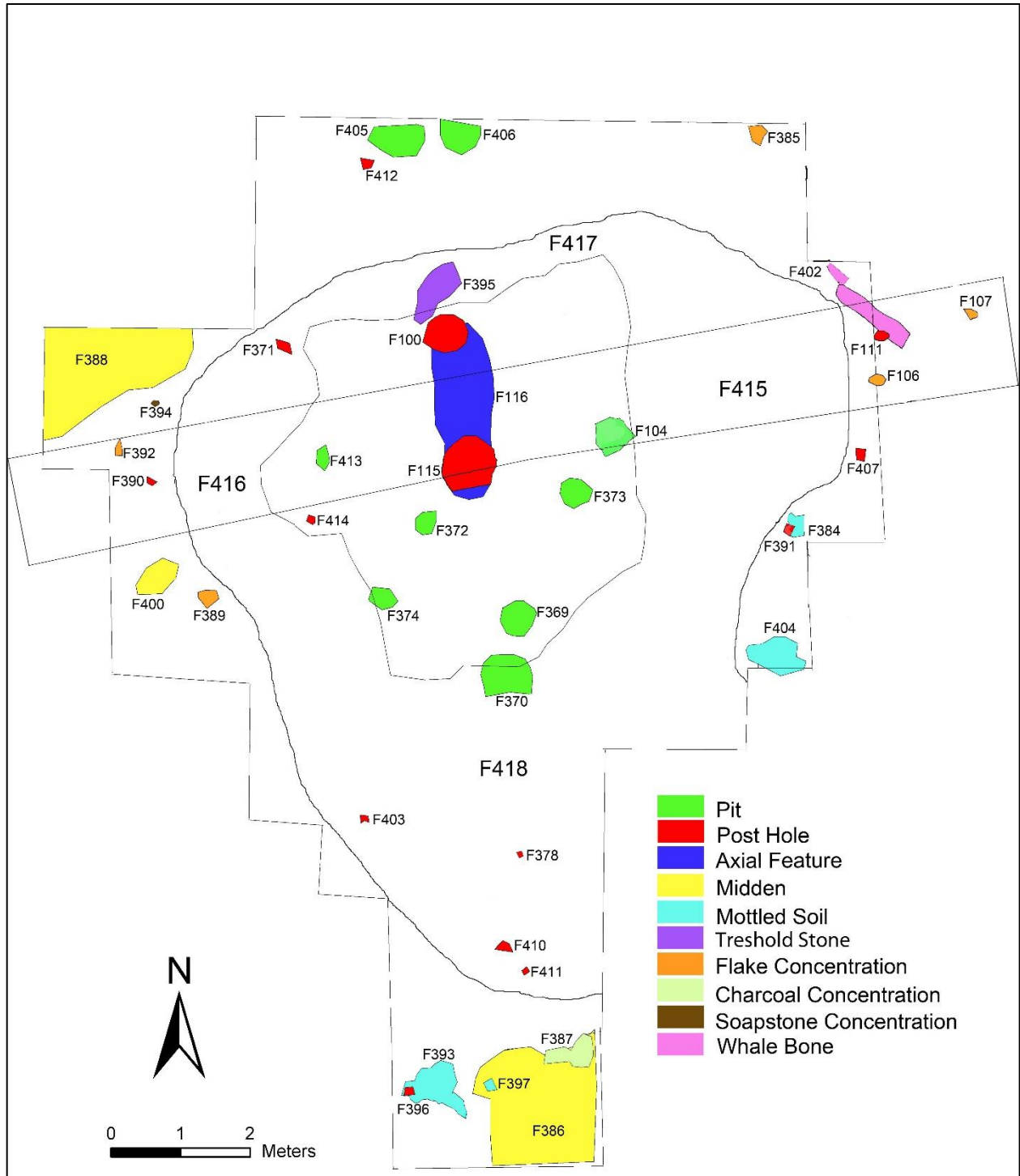


Figure 8 Map of Previous Excavations at House 10 (Wells et al. 2012).

House 10 consists of western, eastern, front and rear platforms, perimeter berms, concentrations of lithics, charcoal and soapstone, a whalebone slab, post hole, and midden features (see Figure 9). Based on the 2011 excavation, Wells et al. (2012) describe House 10 as large, measuring at 115 m<sup>2</sup>. It has a central depression that is bisected by a well-defined axial feature (Wells et al. 2012). House 10 has two large pits at the rear of the central depression, another feature typical of middle phase dwellings (Wells et al. 2012). The perimeter and platforms of House 10 are well defined, and the dwelling is widest at its middle and narrowest at the front entrance (Wells et al. 2012). At 115 m<sup>2</sup>, House 10 is the largest middle phase house so far excavated at Phillip's Garden. It is further described as:

...subrectangular in shape and faced the sea with an orientation toward the northwest... The front of the dwelling was constructed of stones embedded in the surrounding sand, with a number of larger, flat stones marking the entrance midway along the berm. Wide, flat platforms of built-up stones surrounded the central depression of the house on its western, southern and eastern perimeter (Wells et al. 2012: 25).

An analysis of seal butchery and disposal practices at House 10 can therefore potentially be considered a reliable representation of other Dorset period houses and the spatial organization of these activities at Phillip's Garden during the middle phase.



**Figure 9** Map of House 10 and Identified Features (Wells et al. 2012).

### 2.9.1 *Midden F388 and F386*

In the 2011 excavation, it was discovered that House 10 has two midden features: a midden at the front of the house (F388), and at the rear of the house (F386). While similar in content, each midden had unique characteristics. The front midden F388 is positioned on the northwest side of House 10. Only a portion of the midden was contained in the 2011 excavation area, and its full extent remains unknown. F388 contained a remarkable amount of faunal material in stratigraphic Level 2, especially harp seal remains. Articulated segments of adult harp seal vertebrae and several nearly whole crania (missing mandibles) were recovered amongst a vast amount of disarticulated adult, juvenile, and (occasionally) newborn harp seal remains (Wells et al. 2012). Two whale vertebrae were also recovered (Wells et al. 2012). Beyond faunal material, F388 yielded a few charcoal flecks and a mixture of broken and unbroken artifacts (45 tools were recovered). The excavation of F388 extended north and west of the excavation area for the house, covering an area of 4 m<sup>2</sup> (Wells et al. 2012).

Excavation of the rear midden F386, located south of the rear platform of House 10 was not all-encompassing; the midden extended beyond the east and south perimeters of the excavation area. The excavation of F386 covered an area of 2.5 m<sup>2</sup> (Wells et al. 2012). F386 also had an abundance of seal remains, though it was noted that these remains were highly disarticulated (Wells et al. 2012). Many of these remains were recovered in stratigraphic Level 2 and were found in association with a dense charcoal deposit (F387, see Figure 8) in the northern end of the midden excavation. F386 yielded a higher frequency of artifacts and tools compared to F388, with a total of 262 tools recovered.

House 10 radiocarbon dates range from approximately 1480 to 1620 cal BP (Renouf 2011c). These dates suggest that House 10 was reoccupied over a span of approximately 140 years,

so it is assumed that House 10 was likely occupied throughout most of the entire 200-year middle phase. As House 10 is an ideal representation of a large dwelling with multiple occupations at Phillip's Garden, it can credibly be considered microcosmic study of the organization of Dorset period seal butchery, processing, and disposal activities during the height of the Dorset period Paleo-Inuit occupation of Phillip's Garden.

### **2.10 The Significance of Dorset Period Disposal of Harp Seal in and Around the House**

The nature of spatial organization around harp seal butchery, processing, and disposal at Phillip's Garden is interesting for many reasons. The physical traces of butchery (cutmarks) and disposal (body part representation) can inform on how butchery was a key social event at the site and can further determine the role that the occupants of House 10 had in these activities. The types of body parts frequently disposed of at the front and rear midden of House 10, along with the associated tools and artifacts in each midden, can inform of the activities that precipitated this disposal, from the time the seal arrived at the site to the processing, consumption, and eventual disposal of seal body parts in the House 10 middens. These acts of processing seals to derive their valuable products would have brought people together in a series of tasks that were enacted in a way that all participants recognized, shared, and perhaps transformed.

### **2.11 Theoretical Framework: Agency, Structure, Practice, and the 'Taskscape'**

The creation and sustained use of middens, coupled with the butchery, processing, and disposal practices that populate these middens with animal remains, tools, and artifacts, allows for the observation of past human behaviors and social structures. Theoretical frameworks of agency and practice are particularly useful in understanding the significance of middens as focal areas of life, inherent in the production of human practices and social identity. Human agency and practice are

important considerations in archaeological studies of middens, which attempt to gain understanding of butchery and disposal practices.

When applying theories of agency and practice in archaeology, the work of Anthony Giddens (1984) and Pierre Bourdieu (1977) is fundamental; their definitions and concepts of structure and practice remain important pillars to understanding agency. Tim Ingold's (2000) concept of the 'taskscape' expands on the frameworks of agency, structure, and practice discussed by Giddens and Bourdieu. I limit my theoretical discussion to the works of Giddens, Bourdieu, and Ingold because they remain relevant and applicable to prehistoric archaeological contexts and can be specifically applied to the human activities of butchery and disposal at Phillip's Garden.

Giddens defines structures as repeated patterns of social action (Giddens 1984). The concept of structures, according to Giddens, is central to agency; structures both enable people to act and constrain how they act (Renfrew and Bahn, 2005). Structures are co-productive of individuals; individuals perpetuate structures through their actions, and these structures influence, enable, or limit individual actions (Giddens 1984). Giddens (1984) refers to this process as 'structuration'. Renfrew and Bahn (2005) add that a result of this duality of structure is "that any action reproduces many beliefs and habits, of which the actors intend or are even conscious of only a few" (pg. 2-3). Of note is the dialectic between structure and agency outlined by Giddens (1984), where individuals are social agents whose actions and decisions are contextualized by the structures (rules, resources, systems) that already exist; these structures are continuously maintained because of the opportunities they provide. Giddens (1984) positions individuals as agents with the potential to participate in the structuring of their world; agents function within and through social structures. These structures are practices that are so commonly reproduced they seem innate. Giddens (1984) views individuals as neither entirely passive, subject to structures, or



as wholly free, able to transcend beyond these structures. In sum, agency operates within and through structures, and structures both constrain and enable human activity and agency (Giddens 1984).

Bourdieu (1977) also uses the concept of structures when discussing practice theory. Bourdieu (1977) notes the role agents play in structuring their social lives through their daily routines and practices, or habitus. Bourdieu (1977) argues that these practices, or habitus, are both structured and structuring, similar to how Giddens (1984) asserts that individuals both create structures and are influenced and constrained by structures. Bourdieu (1977) defines these structures as the institutions, rules, beliefs, and other social systems that are beyond individual control and may even exist outside awareness. The structures that constrain individuals do not necessarily dictate their specific actions; instead, these structures provide templates of practical logic that individuals use to understand situations and subsequently strategize through them (Renfrew and Bahn 2005). Consequently, these structured templates do not remain static because their practiced use will both reproduce the template but can also alter it should the situation call for an adaptive strategy.

Bourdieu's (1977) concept of practice and Giddens' (1984) theory of structuration both define the dialectic between agent and structure and discuss the practices that agents can engage in to alter those structures (Dornan 2002). Tim Ingold (2000) builds on the concepts of agency, structuration, and practice as it relates to human connection with place and landscape. Ingold (2000) asserts that the act of dwelling is a means of people engaging with the world. He introduces the term "taskscape" (as an alternative to landscape) to better articulate how places draw their significance from the activities that were engaged in or at them (Ingold 2000). The taskscape is the site of tasks, which Ingold further defines as "any practical operation, carried out by a skilled

agent in an environment, as part of his or her normal business of life” (pg. 195). Tasks, therefore, form the basis of dwelling. Ingold (2000) further asserts that tasks are not separate events; each task draws meaning in relation to other tasks “performed in series or in parallel, and usually by many people working together” (pg. 195). The relationship between tasks, their ‘mutual interlocking’, constitutes the taskscape as a collection of related activities (Ingold 2000). A taskscape, then, is inherently social; even in the performance of an individual task, that individual is attending to others either in the act or result of their task (Ingold 2000). Further, Ingold (2000) argues that the existence of the taskscape relies on individuals to engage in activities of dwelling, that it “must be populated with beings who are themselves agents, and who reciprocally ‘act back’ in the process of their own dwelling. In other words, the taskscape exists not just as activity but as interactivity” (pg. 199). A taskscape is also inherently temporal: the habitual behaviours and activities that define and inscribe the taskscape guides, and is guided by, the agents’ perception of reality (Ingold 2000).

Combined, the theoretical approaches of Giddens (1984), Bourdieu (1977), and Ingold (2000) offer interesting interpretations of the process of butchery, processing, and disposal surrounding a dwelling at Phillip’s Garden. By analyzing the contents of the front and rear middens, the taskscape of House 10 can be better understood; the decisions made by the agents regarding the organization of harp seal butchery, processing, consumption, and disposal around the dwelling are remnants of social activities. These activities are performed in and through structures of power and tradition. Structures of power are not inherently hierarchical. At Phillip’s Garden, it is possible that power structures materialize in the decision-making processes of harp seal hunting and related activities. The different decisions required in the management of the harp seal resource at Phillip’s Garden would be mediated at the household and communal levels. The

structure of power is evident in the differential distribution of tasks: different agents would have different responsibilities in the breakdown of butchery, processing, consumption, and disposal tasks. Repeated behaviors in butchery, processing, and disposal can be considered “structures” that are reified through their repetition by human agents. The structure of a socially organized framework of butchery, processing, consumption, and disposal tasks used by the Dorset Paleo-Inuit at Phillip’s Garden was the social facilitation of an economic and cultural activity; these practices were learned, taught, and continually repeated. The repetition of these practices was self-sustaining as it reinforced a specific way of completing a task (e.g., butchery, processing, disposal) and that in turn produced and reinforced identity. The practice of dividing the tasks of butchering, processing, and disposal of harp seal remains in a socially repetitive way placed individuals in familiar locations at the site of the activity; in this case, in the front and rear of the taskscape of House 10. These practices were enacted over a long period of time (at House 10, for at least 140 years), resulting in a palimpsest of activity and substantiating the temporal element of the taskscape.

The structure of tradition in butchery refers to the different learned and taught strategies a butcher can use, or templates a butcher can follow, in their practice. These structures of power (organization) and tradition can be inferred, to an extent, from the archaeological record. By studying the spatial distribution of the middens around House 10 and the body part representation of the seals in each midden, the practices and strategies of the butchers can be interpreted. The insights these studies offer can provide answers as to how seals were dismembered, what cutmarks on bones can reveal about how flesh and skin was separated from bone, and how the selective disposal of carcasses was decided. These insights can also reflect templates of strategic butchery and discard practices. Butchery, skinning, fuel extraction and other post-processing activities,

cooking, and finally discard of the seal carcass act as mutually interlocking tasks, carried out by agents who engage socially with one another through these tasks. The practice of these activities is structured and structuring; the way seals were processed and disposed of at House 10 followed a template that would have been taught, passed on, and continually reproduced without major alteration by House 10 agents between seal hunting seasons and possibly between generations. Ultimately, when House 10 is considered as a taskscape created by the perception of the landscape through time by the agents, inferences on the social organization of butchery and disposal activities become possible. In analyzing the remains of seals and associated tools in the middens of the House 10 taskscape, the structures that would have formed (and been formed by) the social agents of House 10 can be inferred and interpreted.

## **2.12 Chapter Summary**

Phillip's Garden is a significant archaeological site that has immense potential in revealing information about Middle Dorset period life and culture in Newfoundland. As many aspects of life at Phillip's Garden revolved around the procurement and processing of harp seal, an analysis of butchery and disposal of harp seal remains at a typical dwelling, such as House 10, can provide important insights into how butchery and disposal practices were socially and spatially organized activities. The use of agency and practice theory contextualizes results of this midden analysis with the human behaviors and structures that are inherent in the production of these middens.

### **3. Methodology**

#### **3.1 Chapter Introduction**

A major frame of analysis in this thesis is to compare the body part representation of harp seal between the two middens F388 and F386 to understand any apparent differences. This chapter begins with an overview of standard methods of sample quantification in zooarchaeological studies. The different types of sample quantification used in zooarchaeological studies are presented with discussion on their applicability to this thesis study. These types of quantification methods include number of identified specimens (NISP), minimum number of individuals (MNI), minimum number of elements (MNE), and minimum animal unit (MAU) analysis. To account for processes that could affect the differential preservation of seal body parts in each midden, methods of bone density and meat utility analysis are reviewed. Methods of identifying and qualifying cutmarks in samples are then discussed. Finally, the specific methods employed in this thesis study of harp seal bones with evidence of bone modification (cutmarks) are presented.

#### **3.2 Sample Quantification**

Zooarchaeological studies can vary greatly in both the nature of the questions being asked and in the characteristics of the study sample itself. While zooarchaeological studies may not lend themselves to direct comparison, the methods of quantification used for sample analysis can be reviewed and compared. The methods used in data analysis for zooarchaeological projects, while to a degree specific to the question(s) being asked of any given sample and the unique conditions of the sample collection, use standard means of quantification. Basic zooarchaeological quantifications include calculating the number of individual specimens (NISP), the minimum number of individuals (MNI), the minimum number of elements (MNE), and the minimum animal unit (MAU) in a sample. These quantification methods can express different qualities of

zooarchaeological samples effectively, but each method has limitations that will be discussed below. The terms “element” and “specimen” are used to describe the discrete whole, partial pieces, and fragments of seal bone that are examined in this thesis.

### **3.3 Number of Identified Specimens (NISP)**

NISP is the most basic and widely used quantification of taxonomic abundance (proportion of species present in a bone assemblage) in zooarchaeology (Cannon 2013). An individual specimen is defined as either a whole element or fragment of an element (Reitz and Wing 1999). NISP represents the raw, unaltered faunal assemblage from a site or feature and is the basis from which all other quantification information is calculated. It is the result of totaling the frequency of categorical specimens to organize and present zooarchaeological samples descriptively (Lyman 2018). Despite being most commonly used method of measuring taxonomic abundance, NISP is heavily critiqued. Grayson (2014) reviews 11 major critiques of NISP analysis. The critiques most relevant to this thesis are as follows: when used as the sole measure for determining taxonomic abundance, NISP results can be skewed by butchering patterns (i.e. where certain animal parts are left at the kill site versus other animals that are returned whole); identification bias is inherent, as some animals and species are more easily identifiable than others; the differential preservation of certain bones due to lower bone density biases data; intra-species skeletal differences (e.g., some mammals have fewer bones than others) results in taxa being under or overrepresented; NISP assumes all elements are “equally affected by chance or deliberate breakage” (Grayson 2014: 21) and therefore cannot account for butchery-related bone fragmentation of select taxa. While relying on NISP analyses as the sole index of species abundance is problematic, when NISP is combined with a minimum number analysis (MNI or MNE), it stands as a valuable quantification method (Klein and Cruz-Urbe 1984).

As the sample used in this thesis consists almost exclusively of harp seal bone, butchery was likely performed at the residential site instead of the kill site, and there is excellent faunal preservation at Phillip's Garden, many of these limitations of NISP quantification are avoided. In this thesis, NISP quantification is used as a basis for comparing the frequency of cutmarks relative to total sample size.

### **3.4 Minimum Number of Elements (MNE)**

A second quantification approach in zooarchaeological studies is calculating the minimum number of elements (MNE). MNE modifies the NISP to estimate how many different skeletal elements are present in a fragmented bone sample per taxonomic category. MNE compensates for the fragmentation issues that limit NISP quantifications (Lyman 1994). There is no consensus for how MNE should be calculated, and MNE is often calculated with specific considerations for the assemblage at study. MNE calculations for a given sample assemblage can vary widely depending which factors are considered, such as age, sex, side, and size of elements. When applying MNE analysis, the factors used in calculating the MNE of a sample assemblage must be clearly stated. In this study, MNE is calculated using age, side, and a zone designation system, described later in this chapter. To account for differences in sample size between F388 and F386, %MNE is used, where 100% = the total MNE of each sample, and elements are presented as proportional amounts of the sample.

### **3.5 Minimum Number of Individuals (MNI)**

The MNI of a bone assemblage is calculated by determining the “skeletal-element based minimum number of individuals (MNI)...generally calculated by also taking specimen age and side into account” (Grayson and Frey 2004: 28). In calculating the MNI for specific taxa in a bone assemblage, the bones are grouped by element type and further divided by age, side, and sex of

the animal where applicable. The highest number of represented elements, that is, the most abundant element of a taxa, is the MNI (Grayson 2014). For example, if there are 25 left harp seal femora in an assemblage, and this is the highest count for any one element in the assemblage, then the MNI of seals represented in that assemblage is 25. This number is further subject to age and sex considerations.

Like NISP, MNI is a useful but limited means of quantification. Major criticisms contend that MNI is easily inflated when applied to highly fragmented assemblages (Klein and Cruze-Urbe 1984) and that there is no consensus across zooarchaeological studies of how MNI is calculated. For instance, factors such as age or sex will influence calculation methods and yield different MNI results (Grayson 1984). If the factors used to calculate MNI for an assemblage are not clearly stated, and the raw data for that assemblage is not provided to the reader, MNI calculations can be manipulated to best support the hypothesis of the study (Grayson 2014). Further, the abundance of rarer taxa in an assemblage can be overrepresented or exaggerated (Grayson 1978), and MNI calculations are not additive like NISP calculations are, meaning “lumped” samples would reduce MNI counts:

...if a species sample contains three left distal humeri, two right distal humeri, two left proximal ulnae, and one right proximal ulnae, the MNI is 3 (NISP = 8). If a second sample contains three left distal radii, two right distal radii, two left proximal ulnae, and one right proximal ulnae, its MNI is also 3 (NISP = 8). However, if the two samples are now lumped before MNI calculation, the new MNI is 4, not 6 (NISP = 8 + 8 = 16) (Klein and Cruze-Urbe 1984: 28).

Similar to NISP and MNE, MNI is also affected by differential preservation of taxonomic elements (Grayson 2014). Lastly, like NISP, MNI does not account for patterns in body part representation



when comparing different samples (Klein and Cruz-Urbe 1984). As differences in seal body parts found in different midden features is a key question of this thesis, both NISP and MNI alone are not sufficient quantification methods. In this thesis, MNI calculations will take side and age (state of fusion) into consideration, but not sex or element size. Use of MNI analysis will be limited to comparing differences between the two middens and understanding the character of the combined assemblage. In addition to NISP, MNE, and MNI, MAU analysis will be used to assess which seal body parts were deposited in F388 and F386.

### **3.6 Minimum Animal Units (MAU)**

While the minimum number of elements (MNE) is a useful calculation of the components of different body parts represented, applying minimum animal unit (MAU) analysis accounts for the variation of element frequencies. For example, if there are 2 femora and 5 cervical vertebrae in seals; when only MNE is considered, there is potential to assume that cervical vertebrae are more represented than humeri in an assemblage or midden deposit. To avoid this issue of apparent over-representation of elements, the minimum animal unit is calculated. Minimum animal units are the result of dividing an element type by the number of times that element occurs in an individual seal (Binford 1984, Grayson 1984, Grayson and Frey 2004). By applying MAU analysis, the frequencies of different elements can be directly compared (Wells 2002). To account for the difference in sample sizes between the front midden F388 and the rear midden F386, %MAU is used in this study. %MAU standardizes the samples by expressing the highest MAU value in each midden sample as the standard (100%) and dividing all other MAU values by this standard and multiplying by 100 to allow for proportional comparison (Binford 1978, Bunn et al. 1988).

To assess how different parts of the seal are represented in each midden, I follow Wells (2002) and group elements into seven portions. Using the summed MNE values for each element

in a group, the MAU values for each element is calculated by dividing the total MNE per element by the number of times it occurs in a single skeleton. The seven portions of the seal skeleton and the elements grouped in each portion are presented in Table 1, below.

<b>Animal Unit</b>	<b>Group of Elements</b>
Head	Cranium, mandible
Spine	Cervical, thoracic, lumbar, sacral, caudal vertebrae
Front Limbs	Scapula, humerus, radius, ulna
Front Flippers	Carpals, metacarpals, phalanges*
Hind Limbs	Pelvis, femur, tibia, fibula
Hind Flippers	Tarsals, metatarsals, phalanges*
Ribs	Ribs

\* Phalanges are not assigned left or right side, nor were they differentiated front or hind during sample cataloguing. Therefore, the sum of phalanges in each sample will be divided in half equally between front and hind flippers.

**Table 1 Animal Units Groups and Their Associated Elements.**

Essentially, MAU analysis allows for the element distribution between middens to be assessed on the basis of body parts rather than individual elements. While NISP, MNE, MNI, and MAU are useful methods to account for the body parts and elements that are present and absent, they do not explain why some elements may occur more or less frequently than others. The bone density and perceived meat utility of seal body parts are necessary considerations in analyses of faunal assemblages.

### **3.7 Bone Density and its Relationship to BPR**

Body part representation in an assemblage is not solely the reflection of human choices in discard. Bone density can differentially affect which bones survive in archaeological contexts. Essentially, the mineral density of bones can explain why some skeletal parts are more or less likely to survive

the taphonomic processes of post-deposition (Lam et al. 2003). Soil acidity and alkalinity, ground disturbance, and other destructive taphonomic processes can be mediated by bone density. The highest density bones, such as some cranial bones, are more likely to survive in the archaeological record (Symmons 2002, Lam et al. 2003). Bone density studies that provide reference frameworks for studies of the same taxa in different faunal assemblages are averages, and as such, do not display the variation that can occur in bone density on the basis of age, sex, genetics, and nutrition. Despite this, bone density scales are still useful in understanding the differential survival of the same taxa in a faunal assemblage. Because bone density is a factor that has observed properties in relation to the type of body part and age group, bone density must be considered in interpretations of BPR.

At sites where taphonomic processes that jeopardize organic preservation have been intensely active, “observed skeletal profiles and age group frequencies seldom directly reflect patterns of [dietary] selection, prey processing, discard and human transport” (Gutiérrez et al. 2010: 3226). However, because Phillip’s Garden has excellent preservation due to its environmental conditions and because the focus of this study is seal bones, where it has been observed that phocid bone density is higher than terrestrial mammals due to concentrated trabecular bone and thicker cortical bone in limb elements (Lyman et al. 1992), bone mineral density is not a primary factor in BPR in this study. To confirm this, BPR results from each midden will be analyzed in relation to the available bone density values for those body parts, as determined by Chambers (1992; cited in Lyman 1994). Chambers (1992, cited in Lyman 1994) performed photon absorptiometry measurements on seal bone elements to produce species-specific bone mineral density values. See Table 2, next page, for Chambers’ (1992, cited in Lyman 1994) adapted table of bone density in phocid seals, where the increased mineral density percentage is

considered to correlate to an increased survivorship percentage in phocid assemblages. Bone density values (BDV) are measurements of element bulk density and are reported as  $g/cm^3$ . For some elements, different parts of the bone were used as scan sites and produced different BDV approximations. For this study, elements with multiple density values were averaged, and the average BDV for these elements is used.

<b>Element</b>	<b>BDV</b>	<b>Element</b>	<b>BDV</b>
Astragalus/Talus	0.55	Rib	0.45*
Atlas (Vertebrae)	0.42	Humerus	0.60
Axis (Vertebrae)	0.49	Radius	0.63
Cervical (Vertebrae)	0.35	Ulna	0.35
Mandible	0.98*	Femur	0.50
Fibula	0.85*	Tibia	0.48
Pelvis	0.55	Calcaneus	0.45
Sacrum (Vertebrae)	0.34	Thoracic (Vertebrae)	0.37
Scapula	0.52*		

\*Elements with multiple scan sites and subsequent multiple BDV are averaged to present one BDV.

\* Bone density results were not available for all phocid elements.

**Table 2 Bone Density Values for Phocid Elements (adapted from Lyman 1994: 248).**

### **3.8 Meat Utility Index and its Relationship to BPR**

While bone density can help inform why certain seal bones occur more or less frequently in this sample, the non-taphonomic factor of human selection must also be considered. Meat utility is the selection of certain animal parts for use or discard on the basis of their flesh weight (more meat/blubber per animal part) or perceived value (better taste, hide, or use of carcass parts for other activities). Creating an index of meat utility for different taxa is helpful in interpreting observations of BPR in assemblages. This is because it is assumed that even in cases where an animal carcass is transported from the initial kill site, the body parts with the highest meat utility index will make it into a midden assemblage. Lyman et al. (1992) performed an experimental phocid butchery study to create a meat utility index for seals. Lyman et al. (1992) divided and weighed different seal body parts and concluded that their study can be applied to other phocid pinniped faunal assemblages. See Table 3 for the resulting index, adapted from Lyman et al. (1992).

Element	Average Flesh Weight	MUI %
Cranium	1324	20.7%
Cervical	2205	34.5%
Thoracic	1389	21.7%
Lumbar	1858	29.1%
Pelvis*	2723	42.6%
Rib+	6393	100%
Sternum	169	2.6%
Scapula+	1295	20.3%
Humera+	690	10.8%
Radius/Ulna+	284	4.4%
Tibia/Fibula+	1062	16.6%
Front Flipper	144	2.3%
Rear Flipper	493	7.7%
Femur	309	4.8%

\* Includes sacrum, caudal vertebrae, and both sides of pelvis.

+ One (left, right) side only.

**Table 3 Meat Utility Index for Phocid Seals Based on 3 Harp Seals (adapted from values in Lyman et al. 1992: 537).**

Ethnoarchaeological data in the eastern Canadian Arctic (Lyman et al. 1992), as well as observations of BPR at Phillip's Garden, Phillip's Garden East, and Phillip's Garden West for Groswater and Dorset faunal assemblages (Wells 2011), suggest that entire seal carcasses are transported from the kill site to the residential site for butchery. This means that:

...a significant proportion of the variability in frequencies of phocid seal remains from eastern Canadian Arctic contexts may not be reflective of primary processing and transport, but rather of taphonomic processes that affected skeletal parts during and after residential site occupations. Such processes include caching, dog feeding and natural post-depositional processes (Lyman et al. 1992: 544).

This study and previous studies have not identified dog feeding as an influence on midden composition and as previously discussed, the excellent preservation conditions at Phillip's Garden largely mitigate destructive taphonomic processes. Therefore, MUI analysis will be helpful in interpreting the human choices in the design of organized butchery, processing, and consumption activities and will assist in theorizing how these activities may have been socially and spatially organized at Phillip's Garden. To calculate the significance that meat utility has on what body parts are represented in each midden, I will analyze the BPR of each midden using MNE and MAU in relation to the meat utility index for different groups of elements to assess any apparent correlation.

### **3.9 Statistical Confirmation of Observed Rank Order Relationships**

To compare the MNE, MAU, and CMF alone and against MUI and BDV between F388 and F386, the theory of rank order relationship is used. Specifically, I apply the statistical method of Spearman's rank-order correlation coefficient (Spearman's Rho) to determine the significance of any presenting rank order relationships between F388 and F386. By calculating the statistical significance of rank order relationships in this thesis sample, the importance of observed

differences or similarities in the comparison of midden contents between F388 and F386 can be determined. Without statistical confirmation of any observed similarities or differences in the rank order of elements for each midden sample, it is possible for statistically insignificant patterns to be used for interpretation. Therefore, the statistical significance of any observed patterns in element distribution between midden samples will be determined and used to guide interpretation of the practices that influenced disposal at House 10.

In Spearman's Rho, the ranks of data are used to measure correlation (Rogerson 2001). To determine rank order correlation, the lowest value of each sample is assigned a rank of 1, and the highest value of each sample is assigned a rank of  $n$  (Rogerson 2001). The formula for Spearman's Rho is:

$$r_s = 1 - \frac{6 \sum_{i=1}^n d_i^2}{n^3 - n}$$

In this formula,  $r_s$  is the rank order correlation;  $d_i^2$  is the squared difference between the ranks in each sample for observation  $i$  and  $n$  is the sample size (Rogerson 2001). An absolute positive correlation is expressed as 1, and an absolute negative correlation is expressed as -1. Any value between an absolute positive and an absolute negative expresses the degree of a positive or negative rank order correlation. The closer to 0 a value is, the weaker its correlation. The further from 0 a value is, the stronger its correlation. A  $t$  statistic can then be calculated and used to produce a  $p$  value to test the statistical significance of any correlations.

In datasets where rankings between two samples are tied or the dataset consists of less than 10 pairs of ranked data, Kendall's Tau will be applied instead of Spearman's Rho. Kendall's Tau measures the relationship between two columns of ranked data and produces more accurate results when applied to datasets with multiple tied ranks or datasets that have less than 10 ranks of data.



Kendall's Tau is a non-parametric test, meaning it does not assume the data distribution is normal between two datasets. The first dataset is ranked in a column from lowest to highest value. The second dataset is ranked and placed in a second column, but the order of variables is the same as the order in the first column. Concordant and discordant pairs are then calculated based on the second column. Concordant pairs are the number of larger ranks below a certain rank, and discordant pairs are the number of smaller ranks below a certain rank. The columns of concordant and discordant pairs are then summed and put into the following formula to produce a correlation coefficient:

$$\tau = \frac{n_c - n_d}{0.5n(n - 1)}$$

In this formula,  $n$  is the number of rankings (sample size),  $n_c$  is the number of concordant pairs and  $n_d$  is the number of discordant pairs. Kendall's Tau correlation coefficient will result in a value ranging from -1 to 1, where -1 indicates an inverse negative relationship between variables (e.g., when one variable increases, the other variable decreases), 0 indicates no relationship between variables, and 1 indicates a positive relationship between variables (e.g., when one variable increases, the other variable increases). A  $z$  score can then be calculated and used to derive the  $p$  value (significance) of the correlation coefficient.

While previous zooarchaeological studies of material from Phillip's Garden have applied Spearman's Rho as the primary statistical test (Wells 2002, Hodgetts et al. 2003), the nature of the dataset in this thesis positions Kendall's Tau as a more appropriate measure. Upon compiling different rank orders for various correlation tests for BPR, BDV and MUI, it was immediately apparent that there were frequently either too few pairs (less than 10 rank order pairs), too many tied ranks, or a combination of both. Because Kendall's Tau accounts for these issues and can

therefore provide a more accurate depiction of the relationship between different ranked datasets, it was more frequently applied. For both Spearman's Rho and Kendall's Tau, the following is used to guide interpretation of correlation coefficients in this thesis:

When  $r_s$  or  $\tau = -0.1$  to  $0.1$ , then there is no (notable) correlation.

When  $r_s$  or  $\tau = 0.2$  to  $0.3$ , then there is a weak positive correlation.

When  $r_s$  or  $\tau = -0.2$  to  $-0.3$ , then there is a weak negative correlation.

When  $r_s$  or  $\tau = 0.4$  to  $0.6$ , then there is a moderate positive correlation.

When  $r_s$  or  $\tau = -0.4$  to  $-0.6$ , then there is a moderate negative correlation.

When  $r_s$  or  $\tau = 0.7$  to  $0.9$ , then there is a strong positive correlation.

When  $r_s$  or  $\tau = -0.7$  to  $-0.9$ , then there is a strong negative correlation.

When  $r_s$  or  $\tau = 1$ , then there is a perfect positive correlation.

When  $r_s$  or  $\tau = -1$ , then there is a perfect negative correlation.

Significance tests are applied to each  $r_s$  (rank order correlation) to determine the confidence that its value is not a product of sampling outliers. These are expressed as  $p$ . The smaller the  $p$  value, the more confidence there is that the  $r_s$  is a true reflection of the correlation between rankings of different samples (Rogerson 2001). In this thesis, confidence is set at 95% (where  $\alpha = 0.05$ ). Values below 0.05 indicate high significance, and values above 0.05 indicate minimal or no significance. For example, a  $p$  value of 0.01 results in 99% confidence that the rank order relationship is accurate.

### **3.10 Cutmarks and Their Qualification in Zooarchaeology**

In this study, the term “cutmark” refers to any mark left on an element that is decidedly the result of a slicing or chopping motion inflicted by a tool. The term “cutmark”, when used to indicate the presence of bone modification on an element, can imply a single cutmark or a group of related cutmarks, deemed to have resulted from the same cutting event. The Dorset tool types used in the disarticulation and processing of harp seals at the site leave consistent cutmarks in predictable locations on different elements. The two main tool types reflected in the bone surface modification in this project sample are microblades and bifaces. Both (1) microblade and (2) biface cutmarks are evident in this project sample; the different tools produce different types of cutmarks.

A (1) microblade cutmark is inflicted upon an element by the sharp edge of a tool or other implement during the butchery or processing stage (Fisher 1995). They are only inflicted when there is direct contact between the cutting tool/implement and the bone surface. Cutmarks are identified as being a linear indentation that is narrow in width and typically V-shaped in cross-sectional perspective.

A (2) biface cutmark is a wide and truncated linear indentation that may have either a V or U-shaped cross-section (Binford 1981, Fisher 1995). It is assumed that these cutmarks result from a chopping action rather than a slicing one. Biface cutmarks are expected to occur in areas of an animal carcass that are resistant to microblades and other slicing implements due to being dried or frozen (Binford 1984), or in the case of seals, covered in large amounts of cartilage and fat. Biface cutmarks may also appear in areas of major disarticulation and dismemberment, where a chopping implement and motion is used. In this thesis, I follow Binford (1981) in comparing the frequency of cutmarked bones in each element group (data retrieved from the initial NISP quantification) to calculate cutmark frequency (CMF).

### **3.11 Review of the Thesis Sample**

Harp seal bone elements collected in excavation of Phillip's Garden during 2011 field season are used in this thesis. The sample was divided into two subsamples: F388 (2543 elements) and F386 (2695 elements). Of the total 5238 elements in the sample, 2380 of these elements were unidentifiable fragments. F388 yielded 1523 identifiable elements and 1020 unidentifiable fragments. F386 yielded 1335 identifiable elements and 1360 unidentifiable fragments.

Element analysis included a cataloguing of element type, age (based on stage of epiphyseal fusion), presence or absence of cutmarks, cutmark type (slicing, typically made by a microblade or flake, and sawing or chopping typically made by a biface), and cutmark location on the element. Sex is not considered, and element size is used only observationally in the case of newborn or fetal elements. Due to the fragmented nature of the sample used in this thesis, MNE and MAU were selected as the methods of quantification in addition to NISP. To calculate MNE, elements were catalogued with age and side noted (where applicable) and with zone representation recorded. Zone designation allows for fractions of a skeletal element to be summed and counted as a complete element, where appropriate (Klein and Cruze-Urbe 1984). This method also prevents counting fragments of the same element more than once. The method of zone designation utilized in this thesis follows Hodgetts (1999) and Wells (2002). Zones are diagnostic landmarks or areas on elements that are assigned numerical designations. Diagnostic areas are easily identifiable, including articular ends and morphological features, such as muscle attachments. A zone must include over half the portion to be counted; this avoids counting two parts of the same element twice. In recording the zones present on any given element, the MNE can then be calculated by totaling the most frequent zone per element present while accounting for side (left or right) where

relevant (see section 3.11.3 for further description). The MAU uses the MNE counts to calculate how many body parts are represented in an assemblage.

### *3.11.1 Method of Data Collection in Analysis of Cutmarks on Harp Seal Elements from F388 and F386*

To later calculate the MNE and MAU for this thesis sample, relevant information was catalogued in the analysis of the bones. This information included:

- Feature information: feature number, lot number (unique identifier), and stratigraphic level;
- Element (e.g., “vertebrae”);
- Element type, where applicable (e.g., if element was “vertebrae”, then element type may be “thoracic”);
- Element count (per entry): fragments of the same element type that were assigned the same zone designation/age/side were sometimes combined and entered as a group;
- Side: for elements that could be identified as being from the left or right side of the body, this information was noted. Some elements were not put through this identification, such as the vertebrae (which are axial bones) and the phalanges, as a total number of phalanges could be totaled and assigning them right/left or front/hind can be difficult;
- Zone(s);
- Epiphysis or diaphysis;
- Age;
- Cutmark(s)

The upcoming sections describe how age, zones, and cutmarks are determined and identified.

### *3.11.2 Harp Seal Age Determination*

The state of epiphysial fusion and its corresponding age determination varies between different elements of the seal body. In determining element age, I follow Hodgetts (1999) who references the (at the time, unpublished) work of Storå (2000, 2001). Table 4 is adapted from Hodgetts (1999)

and Storå (2000, 2001). Elements that fully fuse during different stages of development are listed corresponding to that age bracket.

Age	State of Complete Epiphysial Fusion
<b>Newborn</b>	Pelvic bone, Acetabulum Scapula, supraglenoid tubercle (Tuber scapulae)
<b>Juvenile</b>	Crural bone, the tibial and fibular part of the proximal epiphysis Femur, proximal epiphysis Humerus, distal epiphysis Radius, proximal epiphysis
<b>Young to Mature Adult</b>	Humerus, proximal epiphysis Femur, distal epiphysis Ulna, proximal (Olecranon) Ulna, distal epiphysis Radius, distal epiphysis Crural bone (tibia and fibula), distal epiphyses

**Table 4 Phocid Age Determination Through State of Epiphyseal Fusion.**

States of fusion were assessed as belonging to one of the following categories: unfused, partly fused, fused with fusion line present, and fully fused. For this analysis, young adult and adult were grouped and considered one category. Generally, age determination considered the following:

*Newborn:* Unfused epiphyses, underdeveloped cortical bone, low bone density (based on observed element weight), obvious size difference. In this thesis, “newborn” can also refer to late-stage fetal individuals.

*Juvenile:* Juveniles were distinguished for their unfused, partly fused, and fusion line present states of epiphyseal fusion. In cases where both proximal/distal and

anterior/posterior epiphyses were unfused, juveniles were distinguished from newborns based on size and bone cortical texture.

*Adult:* Fused with fusion line present and fully fused epiphyses on proximal/distal and anterior/posterior ends of vertebrae, long bones, and phalanges; developed cortical bone (in the case of Phillip's Garden preservation, this resulted in a dense and smooth cortical bone).

Aside from obvious size differentiation in newborn bones, size alone could not be used to differentiate between adult and juvenile diaphyses or bones where other markers of age were not apparent. For these elements, "indeterminate" age was assigned. Some elements had special considerations in age determination. These considerations were:

*Ribs:* All adult and juvenile ribs were usually assigned "indeterminate" in age, as differences between adults and juveniles were not distinct enough to confidently categorize the elements. In rare cases, a rib was assigned juvenile based on the clearly unfused epiphysis of the rib head.

*Phalanges and Metacarpals/tarsals:* In phalanges and the first metacarpal and metatarsal, the distal epiphyses fuse in newborn and early juvenile seals, but the full fusion of the proximal epiphyses occur only in adult seals (Storå 2001). Phalanges with complete proximal and distal epiphysial fusion were identified as adult. Distal and proximal fusion of the second to fifth metacarpals/tarsals begins in juvenile seals and is complete in adult seals (Storå 2001). Fused with fusion line present or fused distal with unfused proximal epiphyses of phalanges were assigned juvenile. Fused with fusion line present or unfused proximal and distal epiphyses of metacarpals/tarsals were assigned juvenile. Unfused

proximal epiphyses of phalanges, metacarpals, and metatarsals that had other markers of newborn age determination present were assigned newborn.

*Crania/Cranial Fragments:* The crania of seal have two distinct bone types, the dense, cortical bone of the auditory bullae and the thin, porous bone of remaining cranial structures such as the brain case and maxilla. This cortical bone develops from a young age in seals (Kahle et al. 2019) and cranial elements are often too fragmented to provide notable difference in element size. Therefore, all cranial fragments and elements were assigned “indeterminate” age.

*Carpals and Tarsals:* Harp seal carpals and tarsals do not have epiphyses, so fusion lines (or lack thereof) could not be used to determine age, nor could size be a reliable indicator. Therefore, all carpals and tarsals were assigned “indeterminate” age.

*Unidentifiable Elements and Unidentifiable Fragments:* Assigned “indeterminate” age.

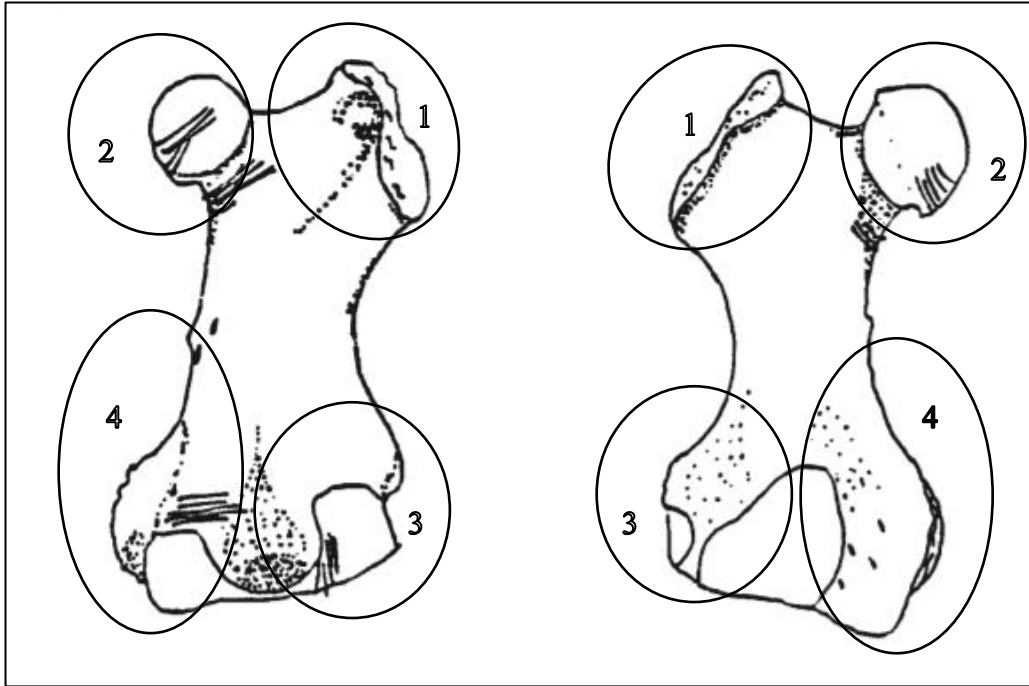
It must be stated that phocid elements, like all mammal elements, are subject to variable fusion rates. For example, differentiation between late-stage juvenile and early adult seals can be difficult, and misrepresentations of juvenile and adult age elements is possible. However, this possibility is not concerning, as age representation of elements between the two middens is an additive lens of analysis in this thesis: it will be used to qualitatively examine the characteristics of each midden sample but will not be solely relied on when building interpretations of disposal practices at House 10.

### *3.11.3 Harp Seal Element Zone Designation*

Each element was divided into diagnostic zones. The number and location of the zones is specific to any given element. The number of zones assigned to an element can range from 1 to 6 in this



thesis sample. Zones are selected based on their distinct characteristics. For example, Figure 10 is a diagram of the zones used to identify a phocid femur.



**Figure 10 Element Zone Designation of a Femur. Anterior and Posterior View of Phocid Femur with Labelled Zone Designation (adapted from Wells 2002).**

For an element to fulfill a zone (or multiple zones), more than 50% of the zone must be present in the specimen (Hodgetts, 1999, Wells, 2002, Wells 2011). Identifiable and unidentifiable fragments that do not have more than 50% of a zone present are included in the database as recorded element fragments for overall NISP calculations but are not marked as fulfilling any zones. Distinct features on elements are selected for zone designation and the number of zones will vary across element types. For example, the femur has 4 diagnostic zones. When the database isolates all femur entries for one sample, then further isolates a specific age group, the highest number of elements fulfilling a zone will be used as the MNE for that element type. For instance, if the sample yields 23 adult femur entries, and the zones are divided as follows: Zone 1 (13) Zone 2 (21) Zone 3 (5) Zone 4 (15), because Zone 2 has the highest number of elements, the MNE for

adult femora in this sample is therefore 21. However, body side (left or right) and element age are also considered; therefore, a combination of zones, age, and body side will be used to generate MNE.

#### *3.11.4 Cutmark Analysis*

Cutmarks made by Dorset period cutting tools can be identified by examining each element under a magnifying lamp. If a cutmark is present, its type (microblade or biface cutmark) location, orientation, and size/length in millimeters is recorded and described. Cutmarks are only recorded if they are distinct, as compared to marks made by root etching, bone cracks due to pathology, drying or weathering, and trowel marks from excavation (Fisher 1995). To differentiate a cutmark from these other possibilities, a set of criteria to exclude marks that are not cutmarks was followed. To identify marks as cutmarks, a second set of criteria was referenced.

##### *3.11.4.1 Criteria to Exclude Non-Dorset Tool Marks on Elements*

To confirm the presence of a cutmark, a set of criteria was used to first exclude marks caused by other processes. These include:

*Root etching:* Marks imparted on bone surfaces from the acidic residue of plant roots growing against the bone (Fisher 1995). Root etching marks are U-shaped in cross section and are not straight or consistently straight, or straighter marks are in groups of curving marks. Root etching marks are usually wider than cutmarks and are relatively shallow in depth.

*Preservation and age-related marks:* Newborn and early juvenile bones have a weaker cortical bone, and impacts from depositional movement (e.g., rocks, other bones, post-excavation damage, etc.) can leave marks that appear similar to cutmarks but are wider, shorter, and not straight. In all ages of bones (newborn, juvenile, and adult), some elements

are more susceptible to cracking of the cortical bone in a direction parallel to the element. These cracks are usually longer, spread further apart than groups of cutmarks, and often start from the epiphyses.

*Morphology:* Areas where ligaments, nerves, or blood vessels attach often leave straight grooves (Shipman and Rose 1984). These are distinguished from cutmarks for their location on the element (e.g., if they extend from a foramen).

*Excavation Tools/Trowel marks:* Wider and lighter in colour compared to cutmarks, due to the recent exposure of the bone interior where there is less staining, and no soil has settled in the marks (Fisher 1995). Excavation marks usually have inconsistent placement on the element compared to where cutmarks are usually found.

Marks created by animal activity in post-depositional contexts (e.g. gnawing by foxes and other scavengers or grooves created by the claws of burrowing rodents) have not been observed in this sample or noted as observations in other analyses of Phillip's Garden assemblages, so they are not included in this list.

#### *3.11.4.2 Criteria to Include Dorset-Tool Cutmarks on Elements*

Actual cutmarks made by Dorset tools on seal elements from Phillip's Garden are distinguished from the above marking processes for their fulfillment of the criteria listed below. Generally, as long as two of the below criteria (characteristics, location, and grouping) are evident in a cutmarked element, that element is recorded and described as having cutmark(s). The criteria are:

*Characteristics:* Narrow width for shallow cutmarks, a V or Y-shaped cross-section for deeper cutmarks, generally ranging from 0.5 mm to 1 cm in length. Stained and filled with soil (i.e., a distinctly darker colour than the surrounding bone).

*Location:* General butchery studies (Binford 1981, Shipman 1986) and studies specifically examining Dorset butchery at Phillip's Garden (Wells 1988, Murray 1992) suggest that certain areas of different elements are more susceptible to sustaining cutmarks during butchery and processing, such as the proximal and distal ends of limb elements from disarticulation, and the dorsal surfaces of cranial and flipper elements during skinning. When cutmarks with characteristics of Dorset tool marks are found in these areas of an element, the likelihood of those marks being cutmarks increases.

*Grouping:* On some groups of elements, such as long bones, ribs, and vertebrae, cutmarks made by Dorset tools often appear in groups of multiple cutmarks that are closely parallel and similar in length. This type of grouping and placement indicates an area of repetitive cutting or slicing motion which results in groups of multiple short and parallel cutmarks (Binford 1981).

In first following this exclusionary process of eliminating other possible reasons for marking on an element, then following an inclusionary process for assessing tool cutmarks, the likelihood of recording a mark not made by a Dorset period tool is significantly decreased. The conservative selection of what marks were recorded as cutmarks may mean that some cutmarks were disregarded if they were not distinct. However, by taking this conservative approach, the marks that are recorded as Dorset period tool cutmarks yield a higher accuracy. Therefore, while there may be more cutmarks in the sample than are recorded, there is a very small likelihood of there being less cutmarks in the sample than are recorded.

### **3.12 Chapter Summary**

The main quantification methods used in this thesis sample are NISP, MNE, MAU, and CMF. To account for the processes that could affect differential preservation of seal body parts in F388 and

F386, BDV and MUI analyses are applied. By categorizing elements according to zone, age, and side, MNE counts for each midden feature that will express differences (or lack thereof) in the distribution of seal body parts can be calculated. In using exclusionary and inclusionary sets of criteria for identifying and confirming cutmarks on elements, the frequency of cutmarks recorded yields a higher accuracy.

## **4. Results**

### **4.1 Chapter Introduction**

The objective of this thesis is to determine if there is any evident social organization in the division of butchery, processing, consumption, and disposal activities within and between households at Phillip's Garden. To determine how these activities may have been organized at the household level, similarities and differences in body part representation (BPR), cutmark frequency (CMF), and associated tool and artifact count (ATC) between the front and rear midden of House 10 are analyzed. Similarities and differences in BPR are assessed using four major frames of analysis. The first is the number of individual specimens (NISP). The following three frames of analyses are calculated from the NISP and are the minimum number of elements (MNE), minimum number of individuals (MNI), and minimum animal units (MAU). These frameworks allow for the direct comparison of body parts and element frequencies between F388 and F386 and the assessment of what elements are present or absent in the combined House 10 sample.

Differences in the representation of adult, juvenile, newborn and indeterminate age seals (based on states of epiphyseal fusion in elements) are also presented to assess if the age of seals was a factor in their disposal locations. Following the presentation of BPR results for the individual midden samples and, when relevant, the combined House 10 midden sample, factors that may affect element and body part survivorship are considered. These factors are bone density value (BDV) and meat utility index (MUI) value. BDV and MUI are applied against element and body part frequencies to assess the presence and/or extent of their influence on BPR. Combined, these analyses will demonstrate any evident patterns in differential BPR between F388 and F386 and will determine if BDV and MUI are influential factors in the distribution of body parts between

the middens. Once any evident patterns in BPR between F388 and F386 are determined and accounted for, the CMF of each midden is presented.

The distribution of cutmarks across element types and the location of cutmarks (CML) on those elements is reviewed for each midden sample individually, then in comparison. After CMF and its distribution amongst elements and body parts in both middens is established, factors influencing CMF are considered. These factors include the ATC of each midden and the MUI. ATC can reveal the different types and intensities of butchery and processing activities that occurred to the elements deposited in each midden based on the type of tools associated with the sample and the quantities of those tools. MUI will be used to assess if there are any relationships between the CMF of elements and body parts and their associated MUI, as the perceived value or utility of different body parts for consumption may affect the likelihood of cutmarks occurring on different elements. Findings of all the above analyses are consolidated in the chapter summary, section 4.9.

#### **4.2 Number of Identified Specimens (NISP) Data Review**

The first frame of analysis for BPR in the House 10 middens is the number of identified specimens (NISP). NISP data is presented in Table 5. NISP counts for each midden reflect all elements (whole, partial, and fragmented) that could be identified as an element type. Main observations based on NISP data are that there are more cranial, vertebrae, scapula, pelvis, and rib elements in F388 than are recorded in F386. F386 contains higher numbers of mandibles, more limb bones (humerus, radius, ulna, femur, patella,) and more flipper elements (carpal, metacarpals, metatarsals, phalanges) than F388. The next three frames of analyses (MNE, MNI, and MAU) are produced based on this NISP data. Despite F388 and F386 being different sample sizes, the element totals for both assemblages exceed 1000 elements when the sample is quantified into NISP

for the individual samples, and MNE for the combined sample. Samples of at least 1000 elements are considered sufficient for taxonomic representation (Grayson 1984).



Element	F388 NISP	F386 NISP	Element	F388 NISP	F386 NISP
Cranium (cranial cap with nasal aperture intact, no mandible)	3	0	Rib	64	53
Cranial fragment	241	85	Rib fragments	86	105
Auditory bulla	51	17	Sternum fragments	18	21
Auditory bulla fragment	N/A	48	Scapula	14	5
Occipital condyle	17	6	Humerus	7	38
Mastoid process	1	0	Radius	9	50
Zygomatic arch	16	2	Ulna	2	23
Nasal aperture	13	1	Carpal	21	27
Hyoid	2	1	Metacarpal	50	70
Mandible	8	17	Pelvis (one side)	14	5
Teeth	25	16	Baculum	1	3
Atlas vertebrae	3	2	Femur	8	20
Axis vertebrae	0	0	Patella	6	11
Cervical vertebrae	6	8	Tibia	18	16
Thoracic vertebrae	56	5	Fibula	11	10
Lumbar vertebrae	35	10	Tibia and fibula crural bone	1	7
Sacrum vertebrae	0	1	Tarsal	35	28
Caudal vertebrae	36	23	Metatarsal	33	75
Vertebrae (type unknown)	133	102	Metatarsal/carpal (unknown)	8	30
Vertebrae fragments	271	97	Phalanges	206	297
			<b>NISP Total</b>	<b>1523</b>	<b>1335</b>

**Table 5 NISP Counts Per Element Type for F388 and F386.**

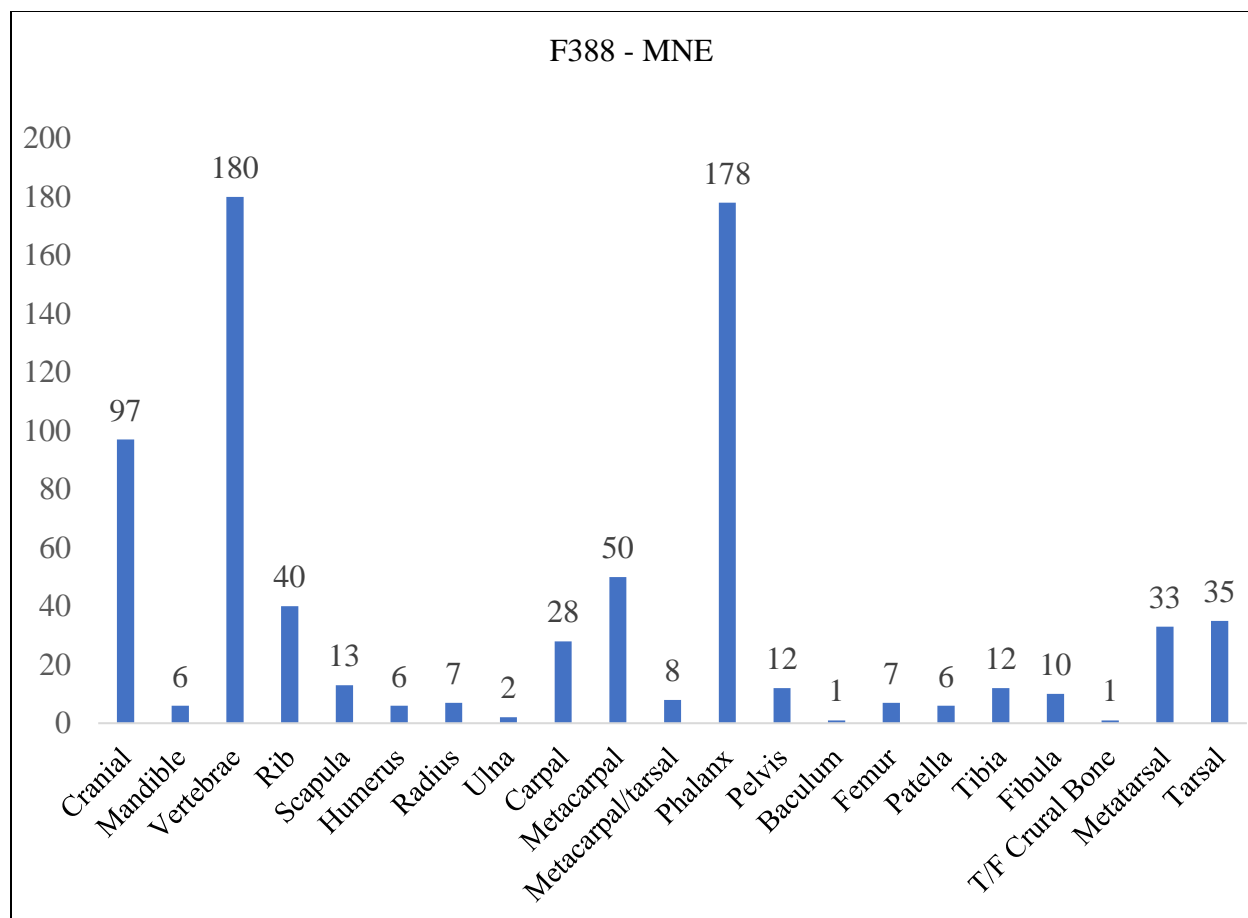
### **4.3 Minimum Number of Elements (MNE) and BPR Results**

Total element and element fragment counts (NISP) were converted to minimum number of element (MNE) values to reflect the number of whole and nearly whole elements more accurately in the midden assemblages. This conversion reduces the totals of elements and element types in comparison to the NISP but ensures that different fragments of the same element are not counted twice by sorting elements by age, side, and zone. Using MNE values in the analysis of BPR allows for the samples to be more accurately represented. The entire MNE table with cutmark frequency (CMF) information is included in Appendix B.

Elements that are too fragmented to be designated as any zone are not included in calculations of MNE. This is to keep data representation consistent across both samples and to ensure no element counts or proportions are exaggerated due to higher fragmentation in a sample. The following sections present the results of the MNE analysis for both F388 and F386. Comparison of the MNE results is then made between F388 and F386 to assess if the differences in element frequencies observed in the NISP data are also apparent in the MNE data. Graphs demonstrating the breakdown of elements by element type for cranial, vertebrae, and flipper elements are included in Appendix A.

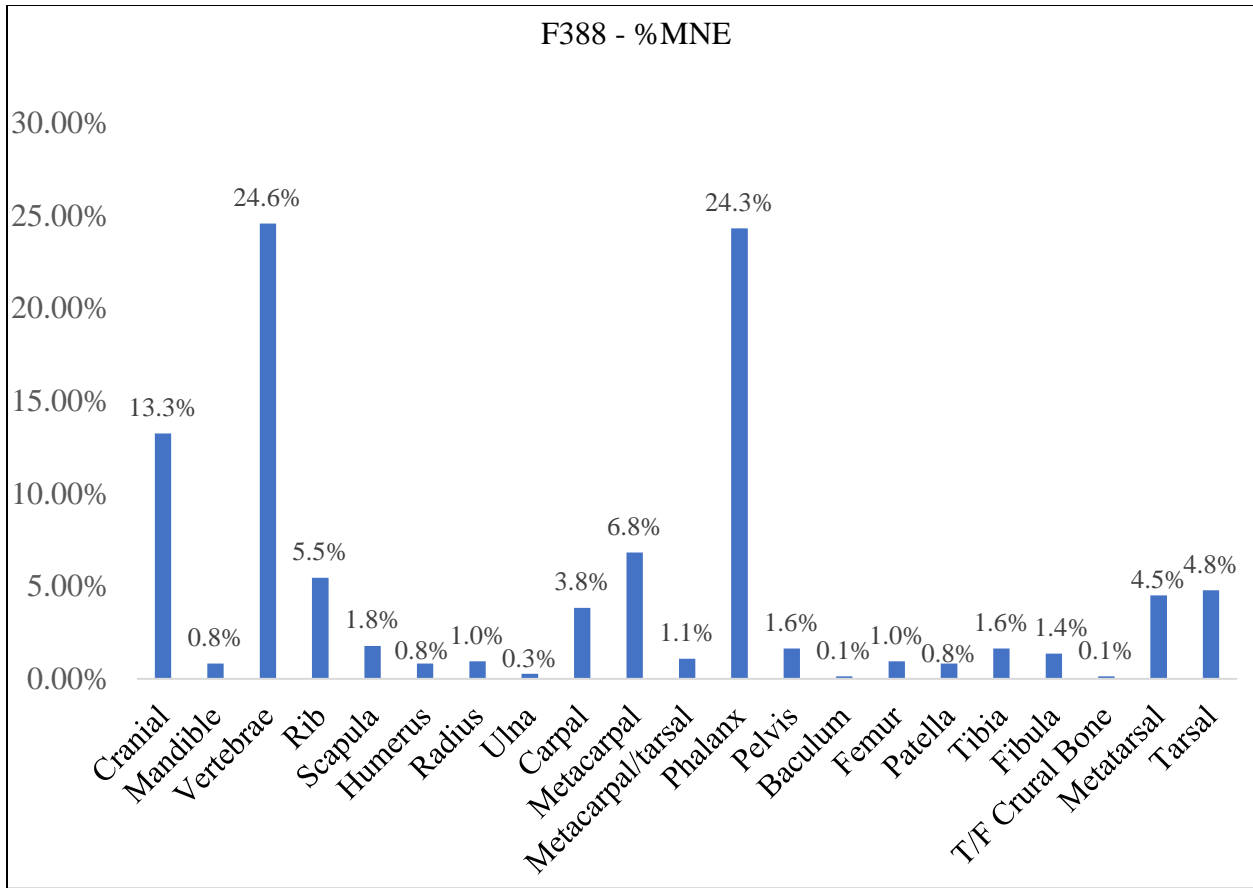
#### *4.3.1 MNE/BPR of F388*

F388 yields a total NISP of 1523 elements. When age, side, and zone designation are considered and unidentifiable fragments and identifiable element fragments too small to be assigned a zone designation are removed, F388 yields a total MNE of 732. See Figure 11 for the distribution of elements and element types in the MNE analysis by count.



**Figure 11 MNE Distribution with Element Count for F388.**

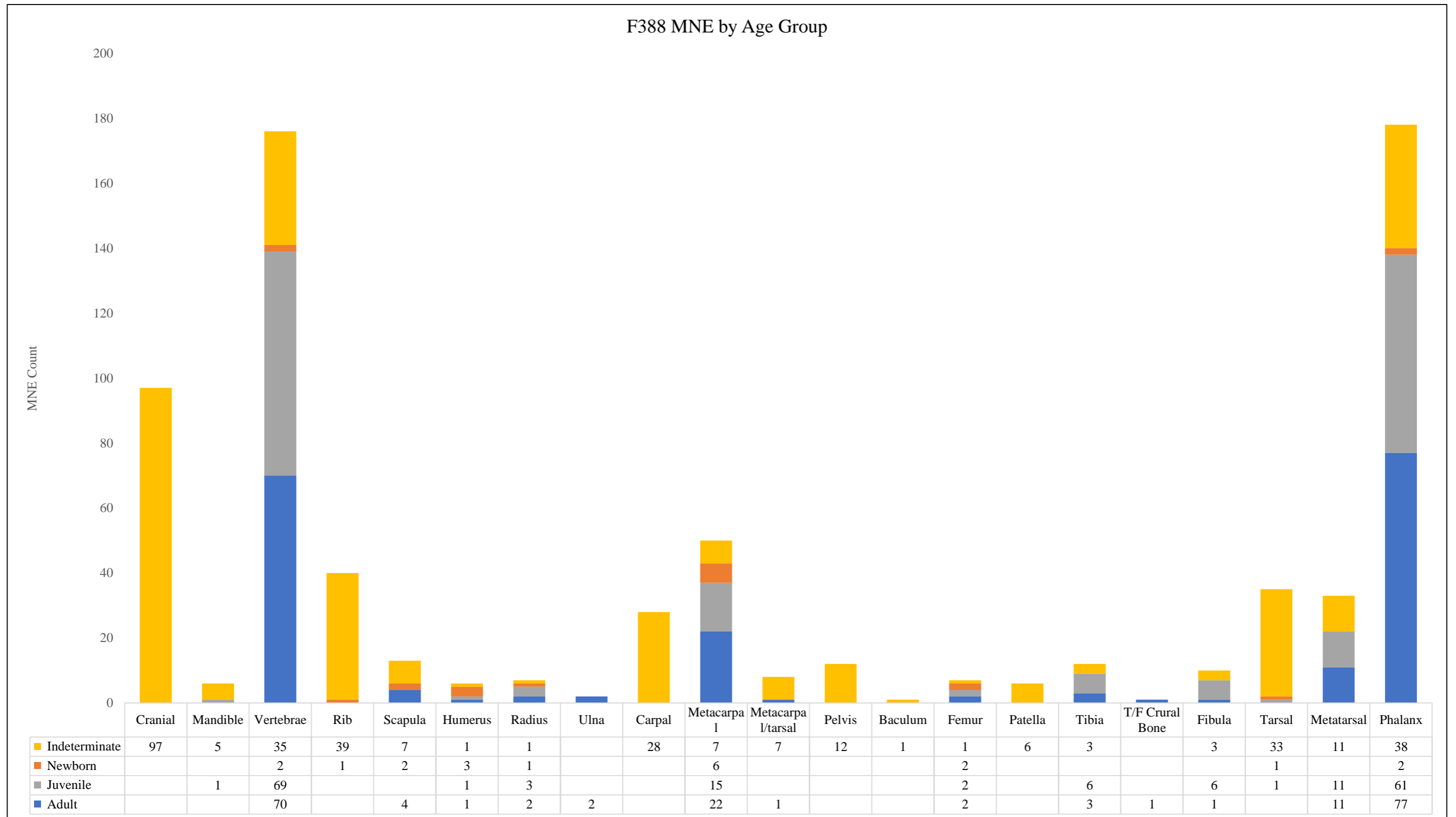
Results of the MNE distribution by count for F388 reflect what was observed in the NISP of F388: vertebrae, cranial, and rib elements occur in high frequencies. Metatarsals, tarsals, metacarpals, carpals, and phalanges also occur in high frequencies. To account for the different sample sizes between F388 and F386, MNE results are also presented as %MNE (Figure 12). In %MNE, the total MNE for F388 = 100% and element frequencies are shown proportionally.



**Figure 12 %MNE Distribution for F388.**

#### 4.3.1.1 MNE/BPR of F388 by Age

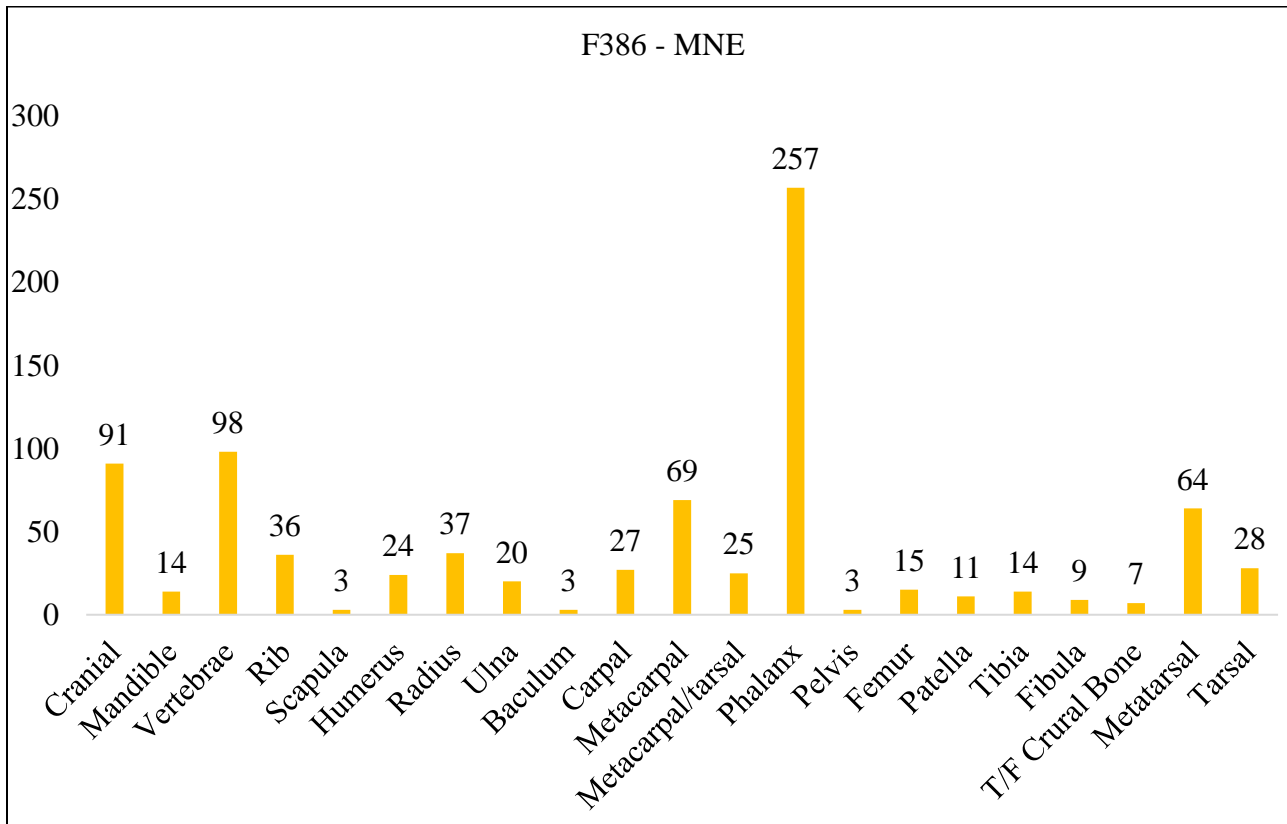
With the general distribution of elements in F388 accounted for in the NISP and MNE results, the breakdown of the MNE distribution by element age is considered. See Figure 13 for the breakdown of elements by age based on MNE data for F388. Most elements in F388 are of adult, juvenile, and indeterminate age. Adult and juvenile elements are similarly represented in the phalanges, vertebrae, metacarpals/tarsals, tibia and fibula elements. Newborn elements are the least represented group.



**Figure 13** MNE Distribution with Element Count Per Age Group for F388.

#### 4.3.2 MNE/BPR of F386

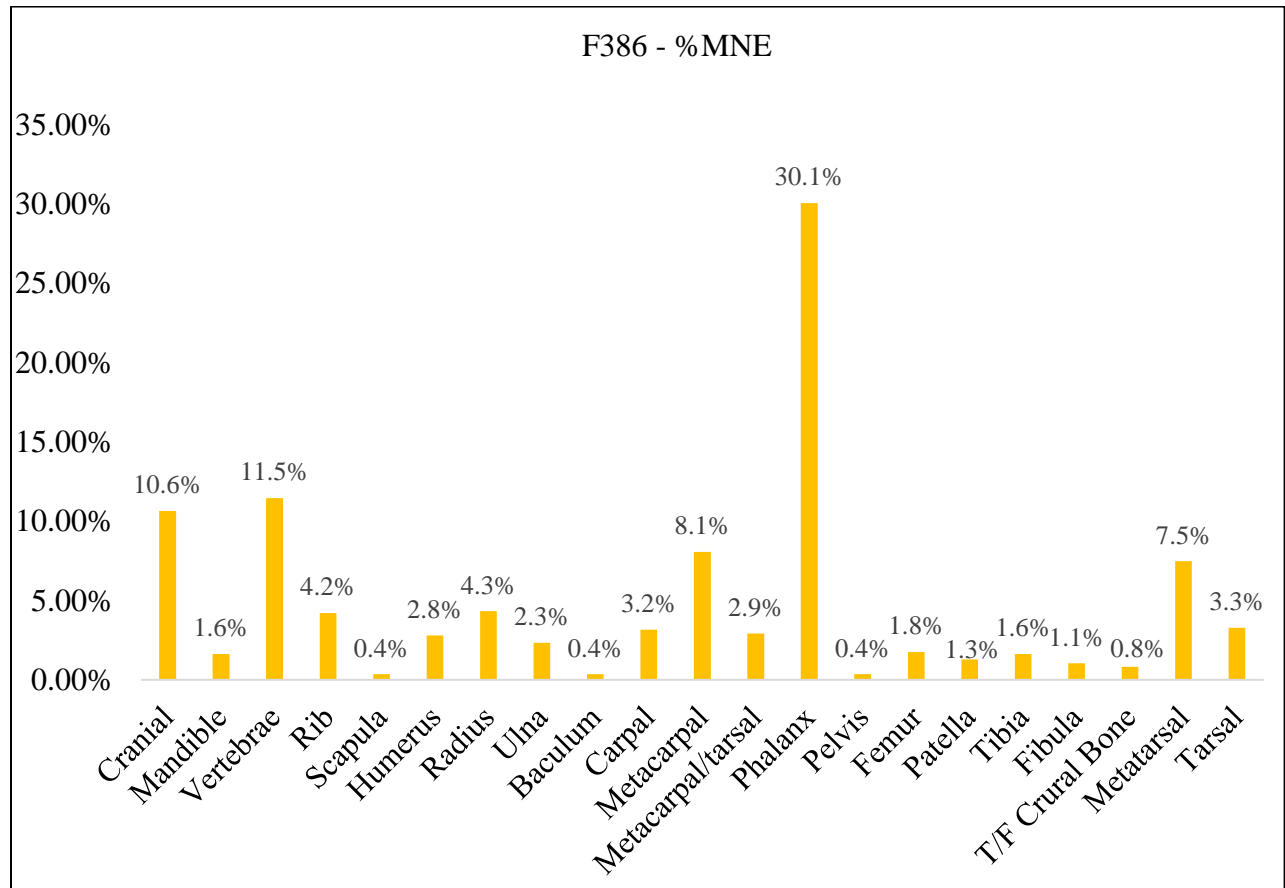
F386 yielded an NISP of 1335 overall elements. When zone designation is considered and unidentifiable fragments and element fragments too small to be designated a zone are removed, F386 yields a total MNE of 855. See Figure 14 for the distribution of elements in the MNE by element count.



**Figure 14 MNE Distribution with Element Count for F386.**

The observations made based on the NISP data for F386 are similarly represented in the MNE distribution. F386 displays a high frequency of flipper elements (notably the phalanx, metacarpal and metatarsal elements) and front limb elements (radius, humerus, and ulna elements). There is also a high frequency of cranial and vertebrae elements.

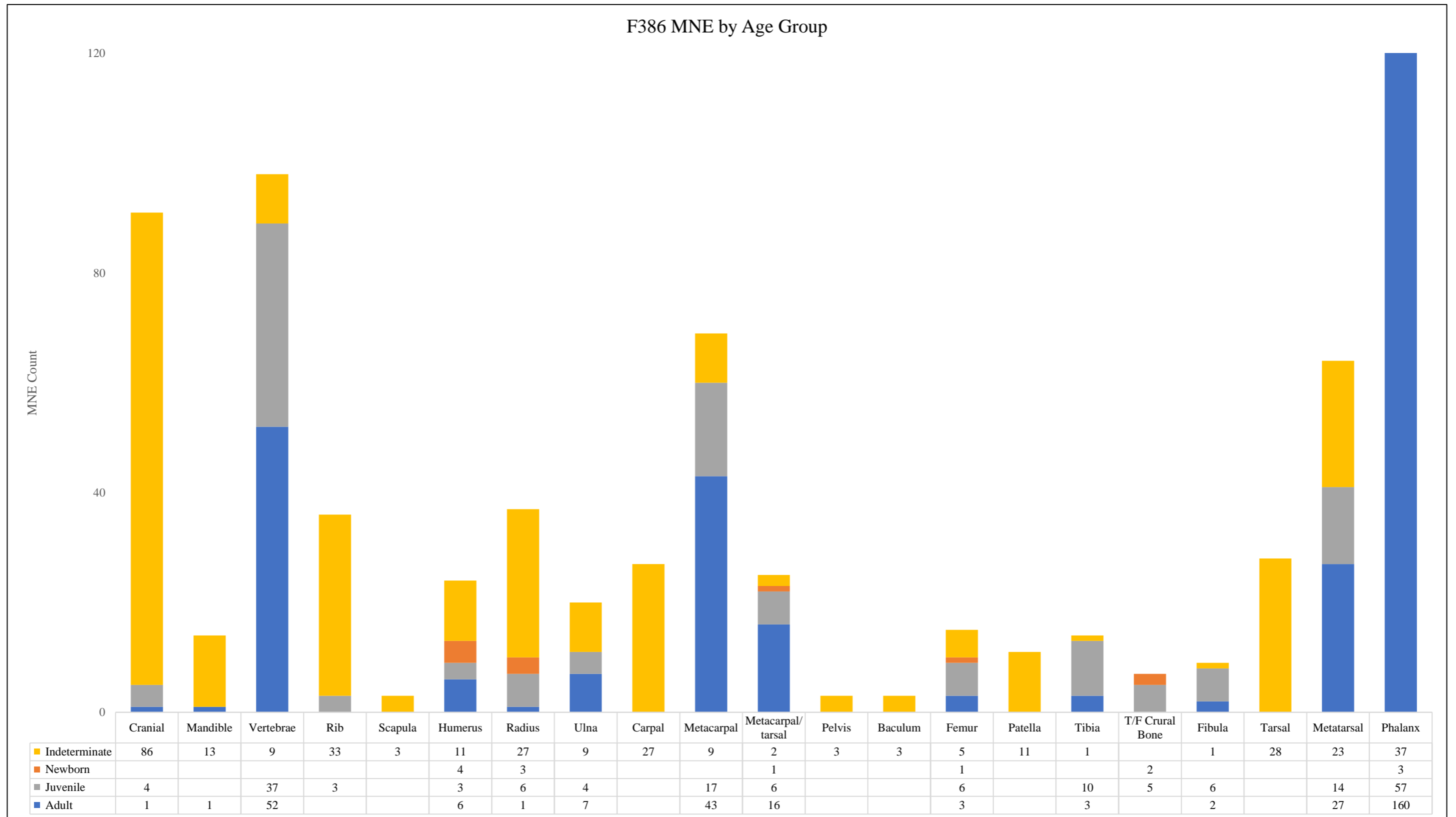
%MNE for F386 is presented in Figure 15. In %MNE, the total MNE for F386 = 100% and element frequencies are shown proportionally.



**Figure 15 %MNE Distribution for F386.**

#### 4.3.2.1 MNE/BPR of F386 by Age

Most elements in F386 are of adult and indeterminate age. Juvenile elements are not significantly represented aside from phalanx, vertebrae, metatarsal/carpals, tibia and fibula elements. Newborn elements are the least represented age group. See Figure 16 for the breakdown of elements by age in F386.



**Figure 16 MNE Distribution with Element Count Per Age Group for F388.**



#### 4.3.3 *Comparison of MNE/BPR Results for F388 and F386*

MNE comparisons of sample F388 and F386 are presented as %MNE to account for the difference in MNE sample size, where the total %MNE count per sample = 100% for each sample. See Figure 17.

It must be noted that direct comparisons may not be possible for auditory bulla elements and radius elements. The entire auditory bulla element was assigned a single zone, as most auditory bulla elements in the first analyzed sample (F388) were largely intact. Consequently, all auditory bullae with enough of the element intact to assign it a left or right side were counted as one element, even if less than 50% of the element was intact enough for zone designation in the F388 sample. This may have resulted in different parts of the same auditory bulla fragment being entered as separate elements, exaggerating the total auditory bulla count for that left or right side. However, this occurrence would happen rarely as most auditory bulla elements in this sample were intact. In the F386 samples, this method of single zone designation for the entire element was no longer considered tenable as the assemblage was comparatively more fragmented. For F386, only auditory bulla fragments that had over 50% of the element present and intact enough to be assigned a left or right side were entered as individual ‘auditory bulla’ elements. Fragments that were not intact enough to be assigned a left or right side were entered as ‘auditory bulla fragments.’ As a result, the total MNE of auditory bullae may be slightly exaggerated in F388 and comparatively underemphasized in F386, though any discrepancies are considered minimal. In radius elements, only the distal epiphysis can differentiate between juvenile and adult elements. In cases where the distal epiphysis of a radius was not intact, the element was recorded as age indeterminate. When calculating MNE, age groups were used to determine which elements are separate and which could be fragments of the same element. It is likely that the MNE for radius elements is exaggerated due

to age indeterminate elements not being grouped with either adult or juvenile elements during the MNE calculation (i.e., some age indeterminate fragments of a radius may have been part of other adult or juvenile radius fragments, but because they were separated from the distal epiphysis, these elements were entered separately and consequently inflate the MNE count).

%MNE Comparison of F388 and F386

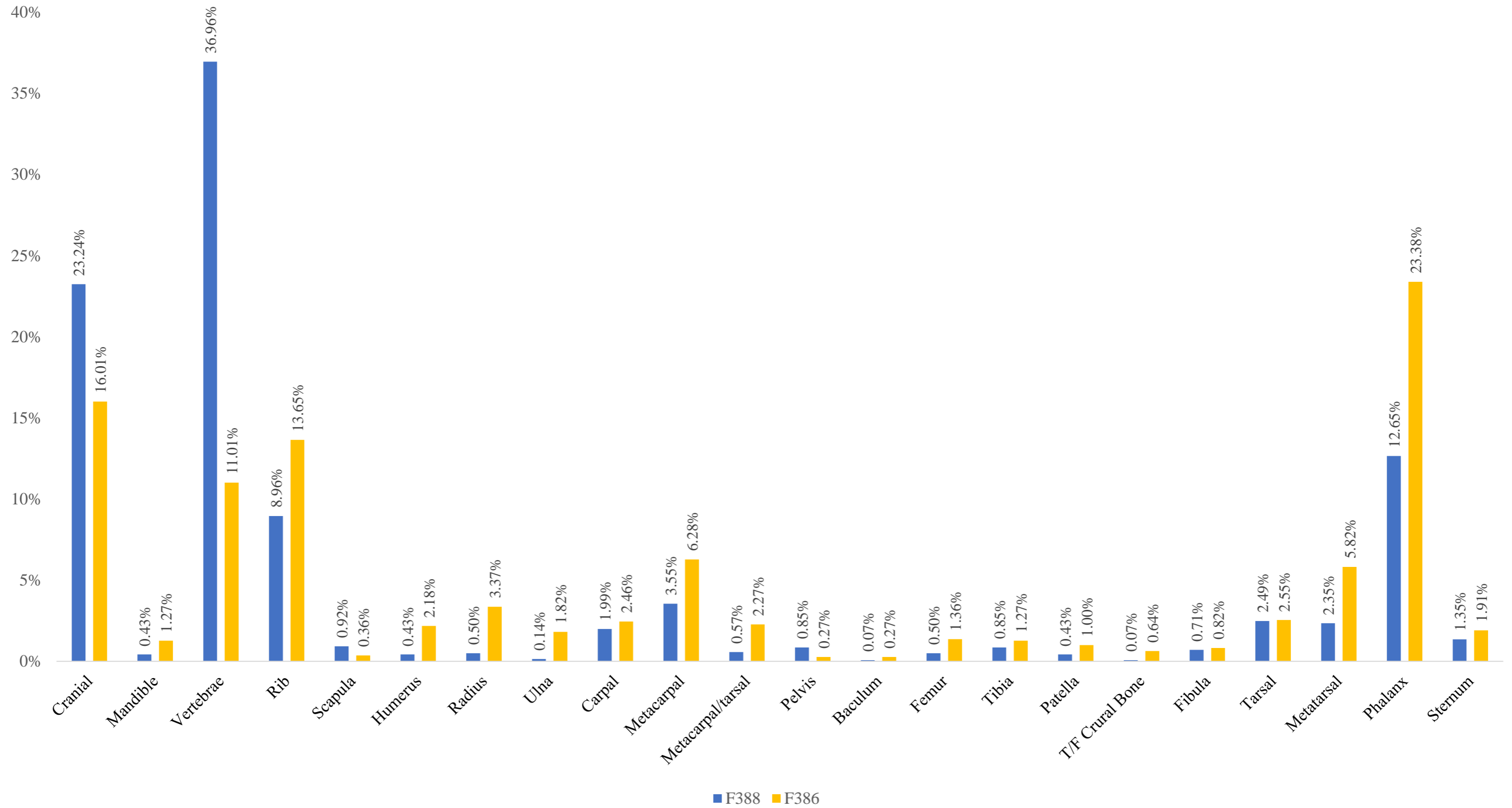


Figure 17 %MNE Comparison of F388 and F386.

Notable differences between F388 and F386 %MNE results are evident in the following: F388 is observed to have higher proportional frequencies of cranial, vertebrae, pelvis, scapula, and rib elements; F386 contains higher proportional frequencies of mandible, humerus, radius, ulna, carpal, metacarpal, baculum, femur, tibia, fibula, baculum, tarsal, metatarsal, and phalanx elements. The observed similarities and differences in MNE and %MNE between F388 and F386 cannot alone be assigned interpretive value; MAU and %MAU need to be calculated and considered in the interpretation of midden characteristics. Following the comparison of assemblages by element ages and the presentation of MNI results below, MAU and %MAU is reviewed.

#### *4.3.3.1 Comparison by Adult, Juvenile, Newborn and Age Indeterminate MNE for F388 and F386*

Adults are the most represented age group in phalanges, vertebrae, metacarpal, and metatarsals for both F388 and F386. Juveniles are the second highest representation in these element groups. Juveniles represent the majority of tibia and fibula elements for both F388 and F386. Juveniles are the most represented group in femur elements for F386 but are equally represented with adult and indeterminate age femora in F388. Newborn elements are more prevalent in F388, with representation in phalanges, vertebrae, metacarpals, scapula, radius, femur, and humerus elements. Newborns elements are only minimally represented in phalanx, metacarpal, humerus, radius, and tibia/fibula crural bone in F386. Elements or parts of elements that are of indeterminate age are represented in nearly all element groups. For both F388 and F386, cranial, rib, carpal, tarsal, radius, pelvis, patella, baculum, scapula, humerus, tibia, and fibula all contain age indeterminate elements. F386 has a higher proportion of age indeterminate elements overall. Direct proportional comparisons of elements by age groups are displayed in Figure 18 through 21. Elements are shown as %MNE of their age group, where the sum of the MNE for that age group = 100%. For example,

adult vertebrae elements in F388 are shown as 35.5% of the sample, meaning that vertebrae make up 35.5% of all adult elements in F388.

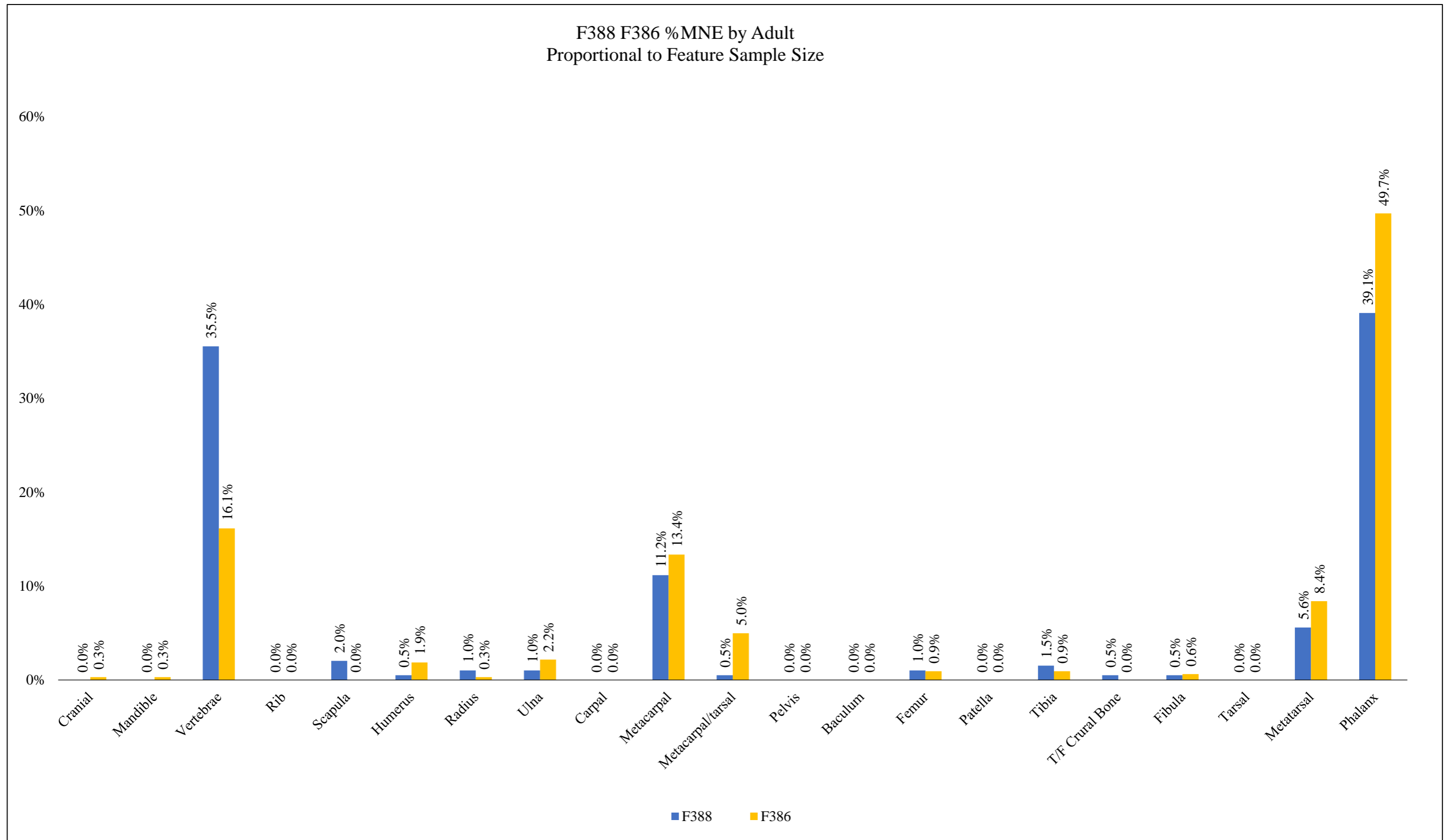


Figure 18 %MNE Comparison of Adult Elements for F388 and F386.

F388 F386 %MNE by Juvenile  
Proportional to Feature Sample Size

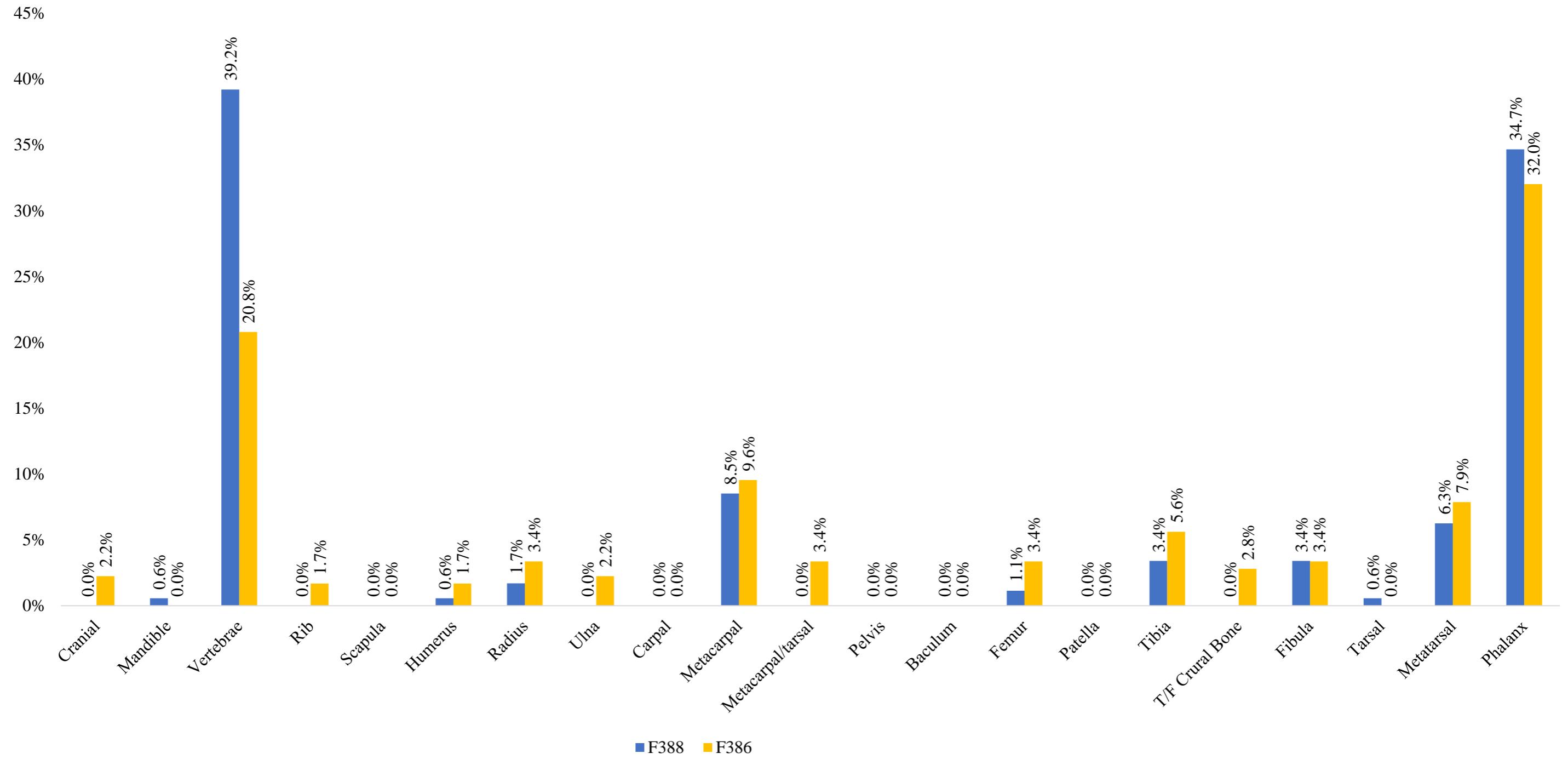


Figure 19 %MNE Comparison of Juvenile Elements for F388 and F386.

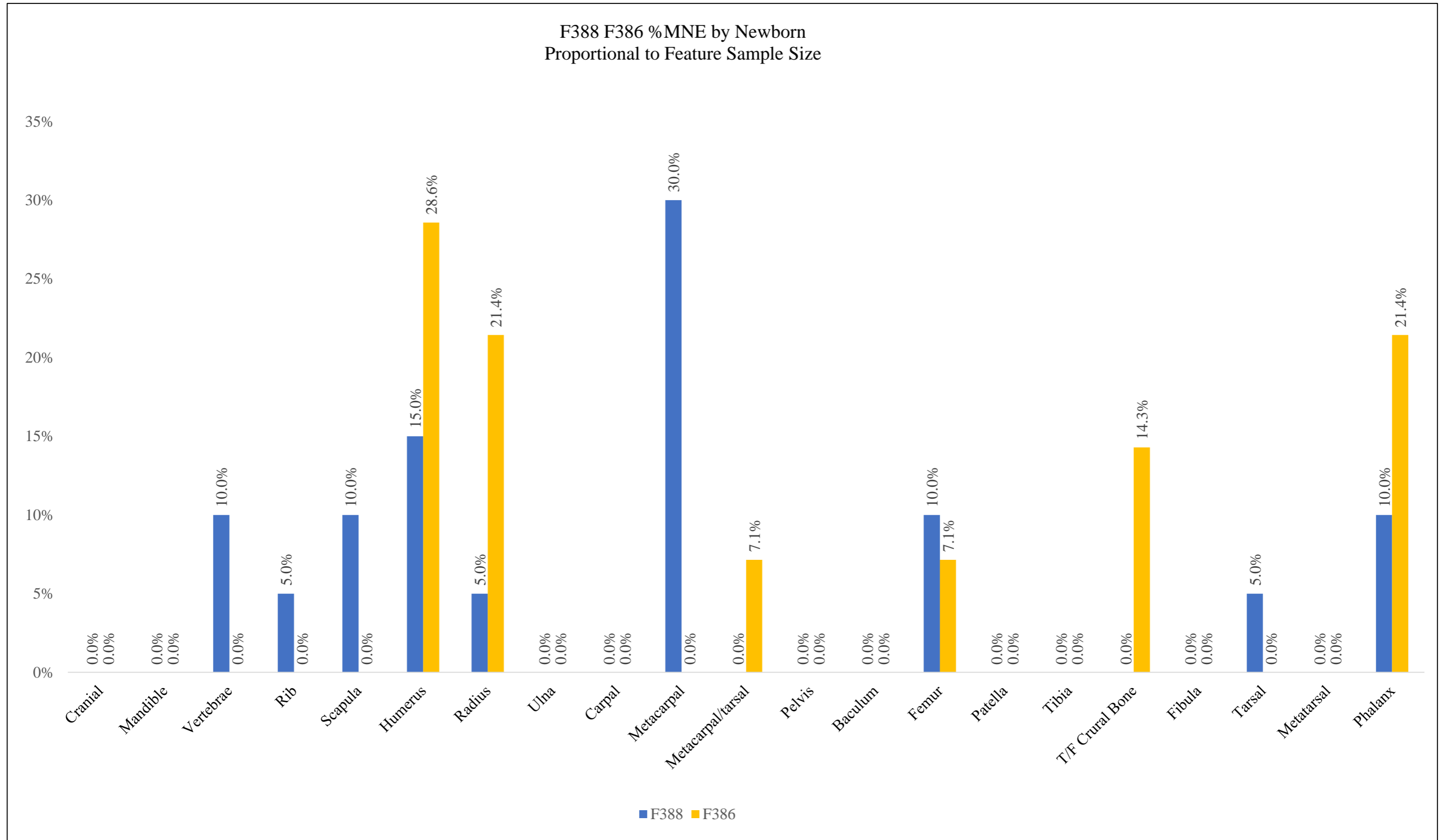


Figure 20 %MNE Comparison of Newborn Elements for F388 and F386.



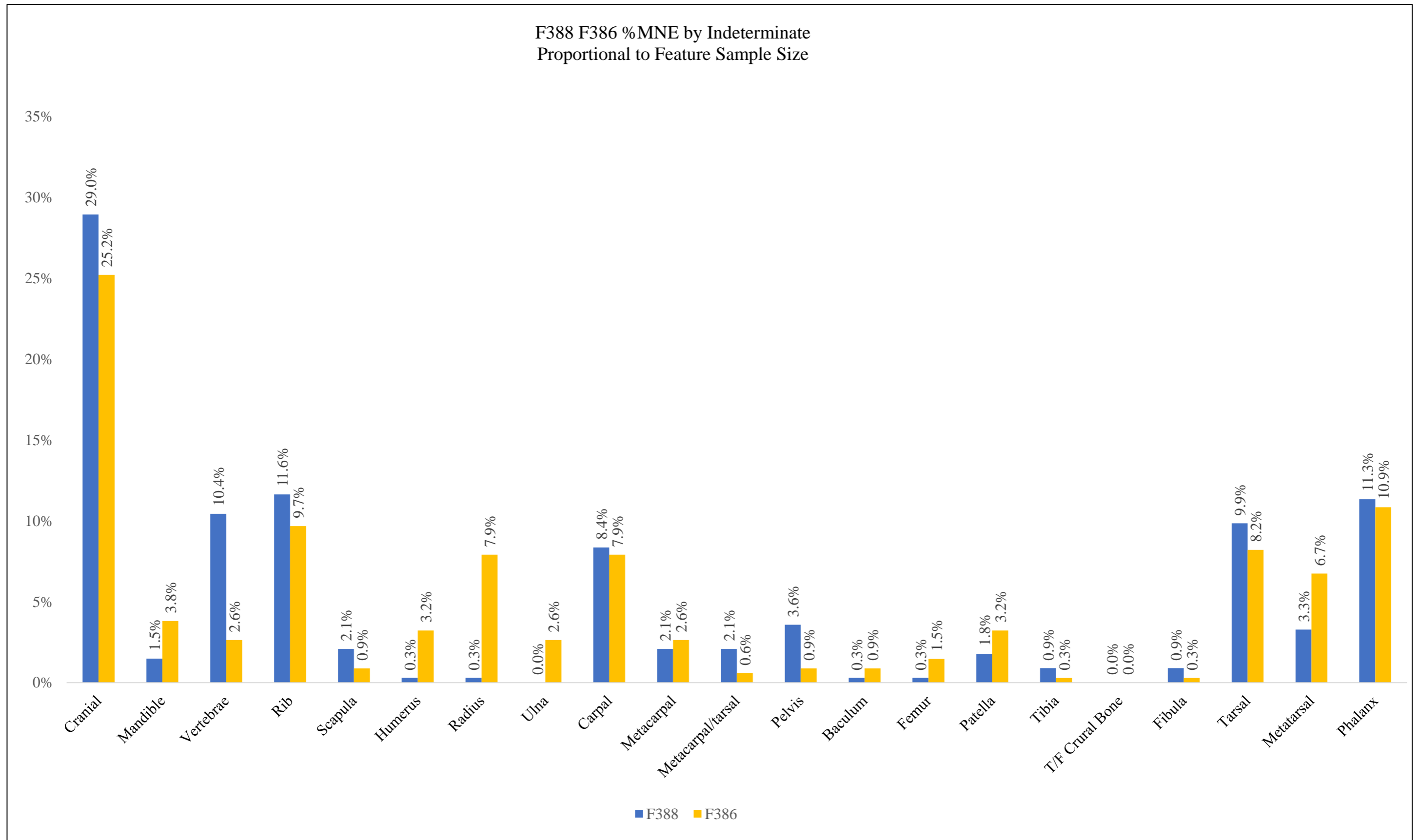


Figure 21 %MNE Comparison of Indeterminate Elements for F388 and F386.

While MNE analysis is useful in presenting a more accurate distribution of elements than the NISP, it is limited. Because MNE does not account for how many times an element occurs in a seal body, some elements, such as cranial, vertebral, and flipper elements, may be overrepresented, and elements that occur less frequently, such as scapula, pelvis, and limb bones, may be underrepresented in analyses of BPR. To account for this, minimum number of individuals (MNI) and minimum animal unit (MAU) analyses are also applied to the F388 and F386 samples to better understand the distribution of elements and body parts between the two middens.

#### **4.4 Minimum Number of Individuals (MNI)**

The MNI is calculated from the MNE and is based on the most frequently occurring element in an assemblage, with body side and age taken into consideration. For each element, the most frequent zone present is used to generate the MNI for the sample based on that element. Body side and stages of fusion (age) are then considered, which can increase the MNI based on that element. The element with the highest MNI represents the minimum number of individual (i.e., different) seals in that sample.

For F388, the highest recurring elements were right-side auditory bullas, indicating the MNI for this midden is 24. Auditory bullas were all recorded as age indeterminate elements. For F386, the highest recurring element was the right-side radius, indicating the MNI for this midden is 23. When age is considered, the MNI for F386 based on right-side radius elements increases to 26. When the MNE for F388 and F386 are combined, the overall right-side radius count increases the MNI to 29, and the overall right-side auditory bulla counts increase the MNI to 28. Therefore, the MNI for the combined sample including F388 and F386 is based on right-side radius elements, which total 29. The different element types used to calculate MNI in each midden further demonstrate differences in body part representation between middens. Whereas the right-side

auditory bulla was the most frequently occurring element for F388, occurring 24 times, right-side auditory bullas only occur 4 times in F386. The right-side radius occurs 26 times in F386 but only 3 times in F388. The combined MNI between F388 and F386 (29), is relatively similar in count to the individual MNI per midden (24 for F388 and 26 for F386). This could indicate different primary practices contributing to midden composition in the organization of seal processing and disposal between the front and rear middens of House 10, where the front limb elements are more frequently deposited in the rear midden compared to the front midden. To understand the possible motivations behind this system of organization by House 10 occupants, differences in BPR are further assessed through MAU analysis.

#### **4.5 Minimum Animal Unit (MAU) and %MAU Results**

Minimum animal unit (MAU) analysis compensates for the issues in the under and over representation of elements that can occur in MNE analysis. MAU counts are calculated using the MNE of different elements divided by the number of times those elements occur in the seal body. To account for different sample sizes, %MAU is also used. %MAU standardizes the sample size by making the highest element MAU count as 100% of the sample. The remaining element MAU counts are converted to proportional percentages based on that 100% MAU.

MAU and %MAU results are first presented by element for the combined sample, grouping both F388 and F386 elements. MAU results for each midden are then presented. Next, elements are combined into element groups, where the MAU counts are summed and adjusted. MAU element groups are divided into head (cranium and mandible), vertebrae (atlas, axis, cervical, thoracic, lumbar, sacrum), ribs, front limb (scapula, humerus, radius, ulna), front flipper (carpal, metacarpal, front phalanges), hind limb (pelvis, femur, tibia, fibula), and hind flipper (tarsals,

metatarsal, hind phalanges). Tables 6 through 9 and Figures 26 through 29 present the MAU and %MAU results for each element type and element group.

#### *4.5.1 MAU for the Combined Midden Sample*

When the F388 and F386 samples are combined, the most frequently occurring animal unit is the radius. This is followed by the cranium, humerus, metacarpal, hind phalanx, metatarsal, ulna, and femur units (Table 6).

<b>Element</b>	<b># in</b>	<b>MNE</b>	<b>MAU</b>	<b>%MAU</b>
Cranium (based on nasal aperture for F388 and auditory bulla for F386)	1 and 2	20	20	90.8%
Mandible	2	20	10	45.4%
Atlas	1	5	5	22.7%
Axis	1	0	0	0%
Cervical	5	12	2.4	10.9%
Thoracic	15	55	3.6	16.3%
Lumbar	5	36	7.2	32.7%
Sacrum	1	1	1	4.5%
Ribs	30	76	2.5	11.4%
Scapula	2	16	8	36.3%
Humerus	2	37	18.5	83.9%
Radius	2	44	22	100%
Ulna	2	22	11	49.8%
Carpal	14	55	3.9	17.6%
Metacarpal	10	135	13.5	61.3%
Front phalanges	30	217.5*	7.25	32.9%
Pelvis	2	15	7.5	34.1%
Femur	2	22	11	49.8%
Tibia	2	26	13	59%
Fibula	2	19	9.5	43.1%
Tarsal	14	63	4.5	20.4%
Metatarsal	10	113	11.3	51.3%
Hind phalanges	30	217.5*	7.25	32.9%
<b>Total</b>	<b>185</b>	<b>1223</b>	<b>233.1</b>	

\* Overall phalanx counts are divided in half for front and hind phalanges.

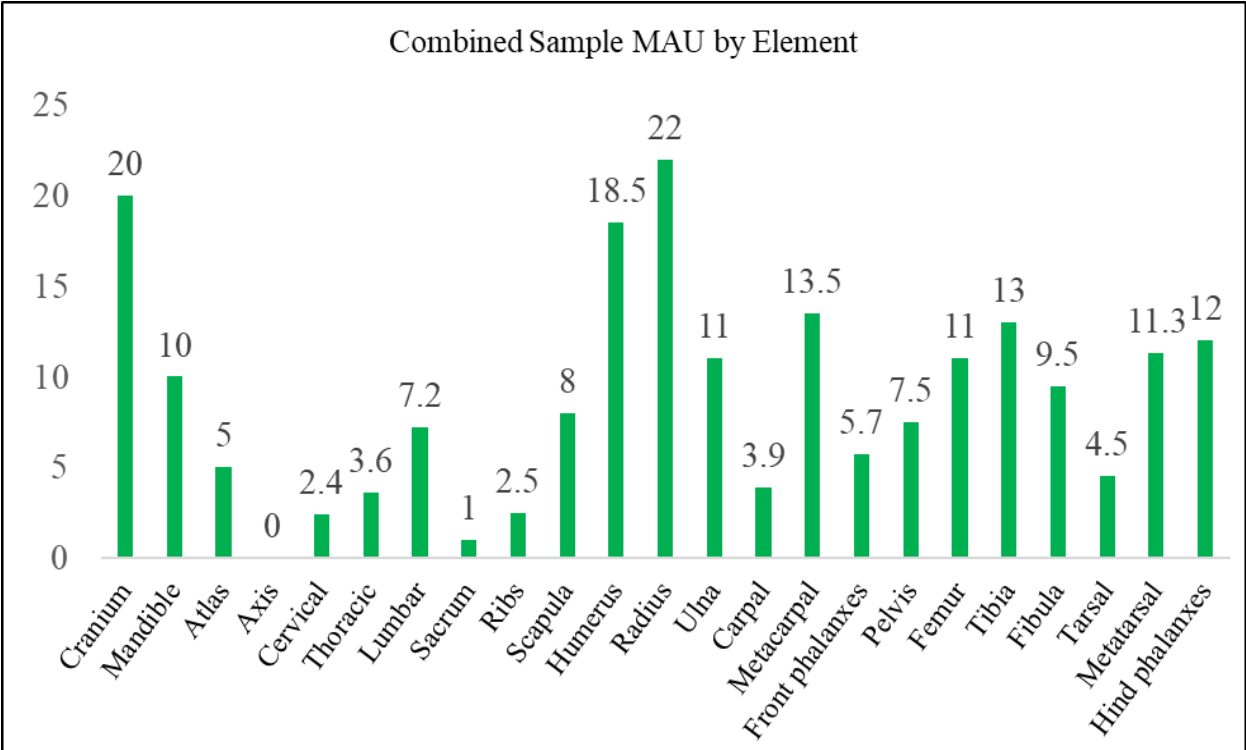
**Table 6 MNE, MAU and %MAU Values for the Combined Sample.**

When animal units are summed into their respective element groups, the most frequently occurring animal unit in the combined sample is the head. This is followed closely by the front limb, and in descending order by the hind limb, hind flipper, front flipper, vertebrae, and ribs (Table 7).

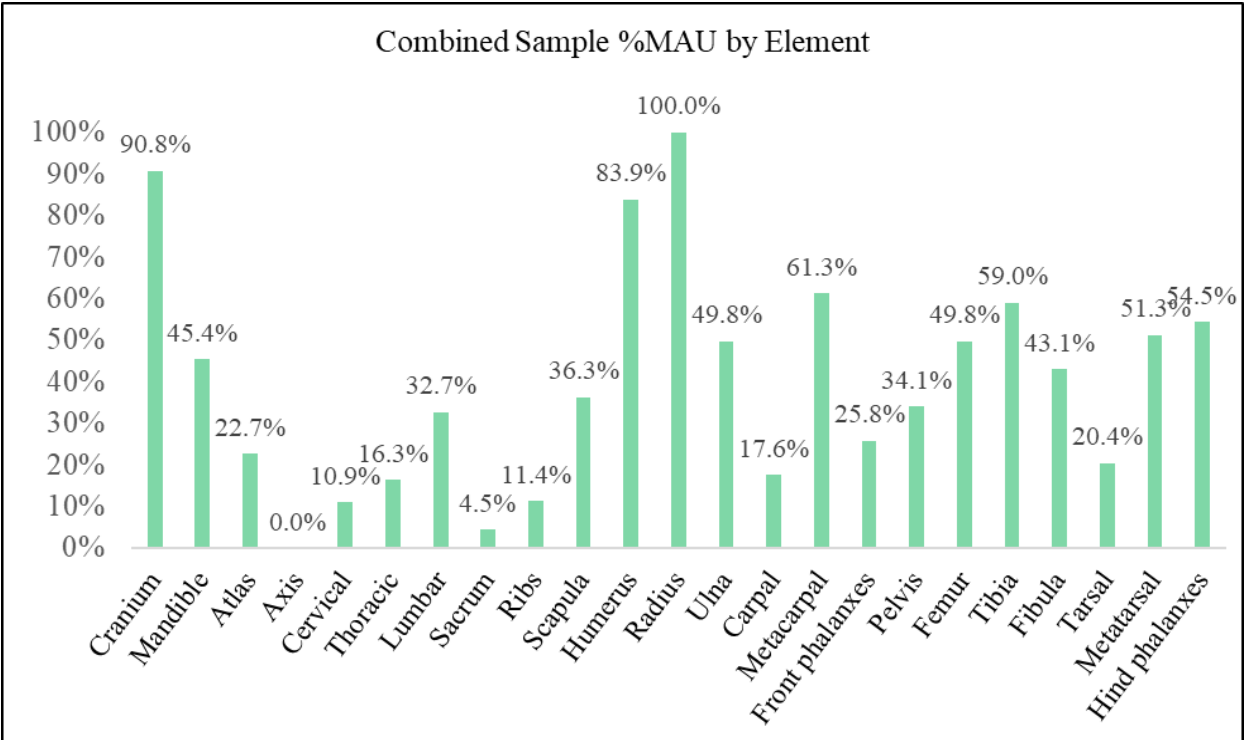
<b>Combined Sample Element Group</b>	<b>MAU</b>	<b>%MAU</b>
Head (Cranium and Mandible)	15	100%
Vertebrae (Atlas, Axis, Cervical, Thoracic, Lumbar, Sacrum)	3.2	21.1%
Ribs	2.5	16.5%
Front Limb (Scapula, Humerus, Radius, Ulna)	14.8	97.7%
Front Flipper (Carpal, Metacarpal, Front Phalanges)	8.2	54.6%
Hind Limb (Pelvis, Femur, Tibia, Fibula)	10.3	67.9%
Hind Flipper (Tarsal, Metatarsal, Hind Phalanges)	7.7	51.3%

**Table 7 MAU and % MAU Values Summed by Element Group for Combined Sample.**

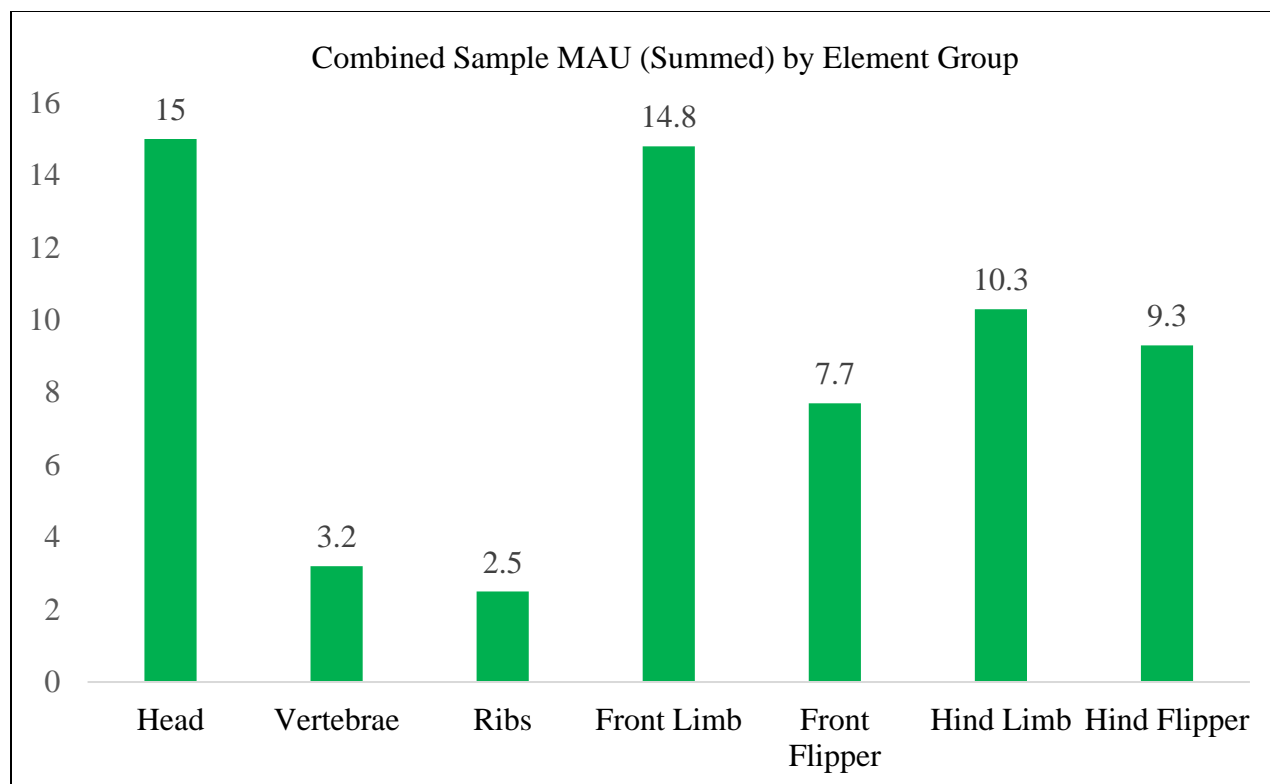
Figures 22 and 23 (next page) present the results of the MAU and %MAU analysis for the combined sample in graphs.



**Figure 22 MAU by Element for the Combined House 10 Midden Sample.**



**Figure 23 %MAU by Element for the Combined House 10 Midden Sample.**



**Figure 24 MAU by Element Group for the Combined Sample.**

Figure 24 displays the combined sample MAU by summed element group. When the two middens are combined and the overall sample is considered, the head, limb, and flipper animal units occur most frequently in the assemblage. The rib and vertebrae animal units occur relatively infrequently. The next two sections review the MAU and %MAU analysis for the F388 and F386 midden samples individually.

#### 4.5.2 MAU Results for F388

For F388, the cranium is the most frequent portion of the seal carcass present (Table 8). The nasal aperture elements were used to calculate the MAU count for the cranium because they were the most frequently occurring cranial element aside from auditory bullas. Auditory bullas were not used because fragmented and whole auditory bullas were not consistently differentiated during



sample cataloguing, so auditory bulla MNE is a less reliable indicator of cranium representation.

Based on nasal apertures, F388 displays a notably high cranium MAU of 12.

Element	# in Skeleton	MNE	MAU	%MAU
Cranium (nasal aperture)	1	12	12	100%
Mandible	2	6	3	25%
Atlas	1	3	3	25%
Axis	1	0	0	0%
Cervical	5	6	1.2	10%
Thoracic	15	51	3.4	28.3%
Lumbar	5	27	5.4	44.9%
Sacrum	1	0	0	0%
Ribs	30	40	1.3	10.7%
Scapula	2	13	6.5	54.1%
Humerus	2	13	6.5	54.1%
Radius	2	7	3.5	29.2%
Ulna	2	2	1	8.3%
Carpal	14	28	2	16.6%
Metacarpal	10	54	5.4	44.9%
Front phalanges	30	89*	2.9	24.2%
Pelvis	2	12	6	49.9%
Femur	2	7	3.5	29.2%
Tibia	2	12	6	49.9%
Fibula	2	10	5	41.6%
Tarsal	14	35	2.5	20.7%
Metatarsal	10	37	3.7	30.7%
Hind phalanges	30	89*	2.9	24.2%
<b>Total</b>	<b>181</b>	<b>550</b>	<b>88.1</b>	

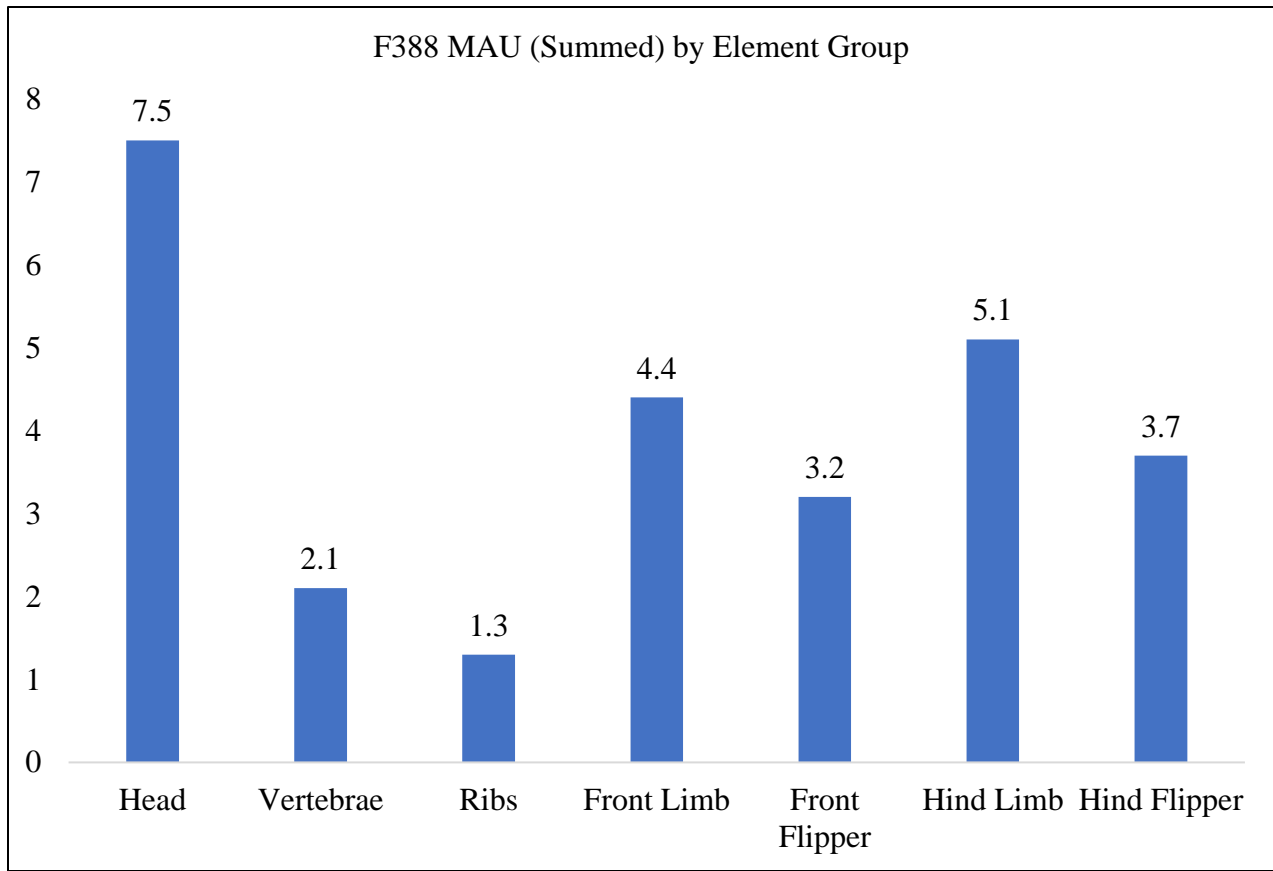
\* Overall phalanx counts are divided in half for front and hind phalanges.

**Table 8 MNE, MAU and %MAU Values for F388.**

In order of most to least frequent MAU (summed) element groups, F388's MAU (summed) ranking is as follows: head, hind limb, front limb, hind flipper, front flipper, vertebrae, ribs (Table 9). Figure 25 displays the MAU (summed) counts for F388 in a graph.

<b>F388 Element Group</b>	<b>MAU</b>	<b>%MAU</b>
Head (Cranium and Mandible)	7.5	100%
Vertebrae (Atlas, Axis, Cervical, Thoracic, Lumbar, Sacrum)	2.1	28%
Ribs	1.3	17.2%
Front Limb (Scapula, Humerus, Radius, Ulna)	4.4	58.6%
Front Flipper (Carpal, Metacarpal, Front Phalanges)	3.2	42.6%
Hind Limb (Pelvis, Femur, Tibia, Fibula)	5.1	67.9%
Hind Flipper (Tarsal, Metatarsal, Hind Phalanges)	3.7	49.2%

**Table 9 MAU and % MAU Values Summed by Element Group for F388.**



**Figure 25 MAU by Element Group for F388.**

When MAU is used to complement MNE analysis, it becomes evident that the high representation of vertebrae elements observed in the NISP and MNE results is not as extreme when adjusted for how many times those vertebrae elements occur in a seal body. What remains consistent, however, is the proportionally high cranial element frequency.

#### 4.5.3 MAU Results for F386

For F386, the elements of the front limb (humerus, radius, ulna) are the most frequent units of the seal carcass present (Table 10). Auditory bulla elements were used to calculate the MAU of heads because they occurred most frequently. Unlike in F388, the auditory bullas in F386 were only entered as full elements when more than 50% of the element was intact. If the elements were too fragmented, they were entered separately as ‘auditory bulla fragments.’ Therefore, the MNE of auditory bullae is a reliable representation of head animal units in F386.

<b>Element</b>	<b># in Skeleton</b>	<b>MNE</b>	<b>MAU</b>	<b>%MAU</b>
Cranium (auditory bulla)	2	16	8	43.3%
Mandible	2	14	7	37.8%
Atlas	1	2	2	27%
Axis	1	0	0	0%
Cervical	5	6	1.2	6.5%
Thoracic	15	4	0.2	1.1%
Lumbar	5	9	1.8	9.6%
Sacrum	1	1	1	20.7%
Ribs	30	36	1.2	6.5%
Scapula	2	3	1.5	8.1%
Humerus	2	24	12	64.8%
Radius	2	37	18.5	100%
Ulna	2	20	10	54.1%
Carpal	14	27	1.9	10.3%
Metacarpal	10	81	8.1	43.7%
Front phalanges	30	128.5*	4.3	23.3%
Pelvis	2	3	1.5	8.1%
Femur	2	15	7.5	40.6%
Tibia	2	14	7	37.8%
Fibula	2	9	4.5	24.3%
Tarsal	14	28	2	10.7%
Metatarsal	10	76	7.6	41.1%
Hind phalanges	30	128.5*	4.3	23.3%
<b>Total</b>	<b>181</b>	<b>673</b>	<b>114</b>	

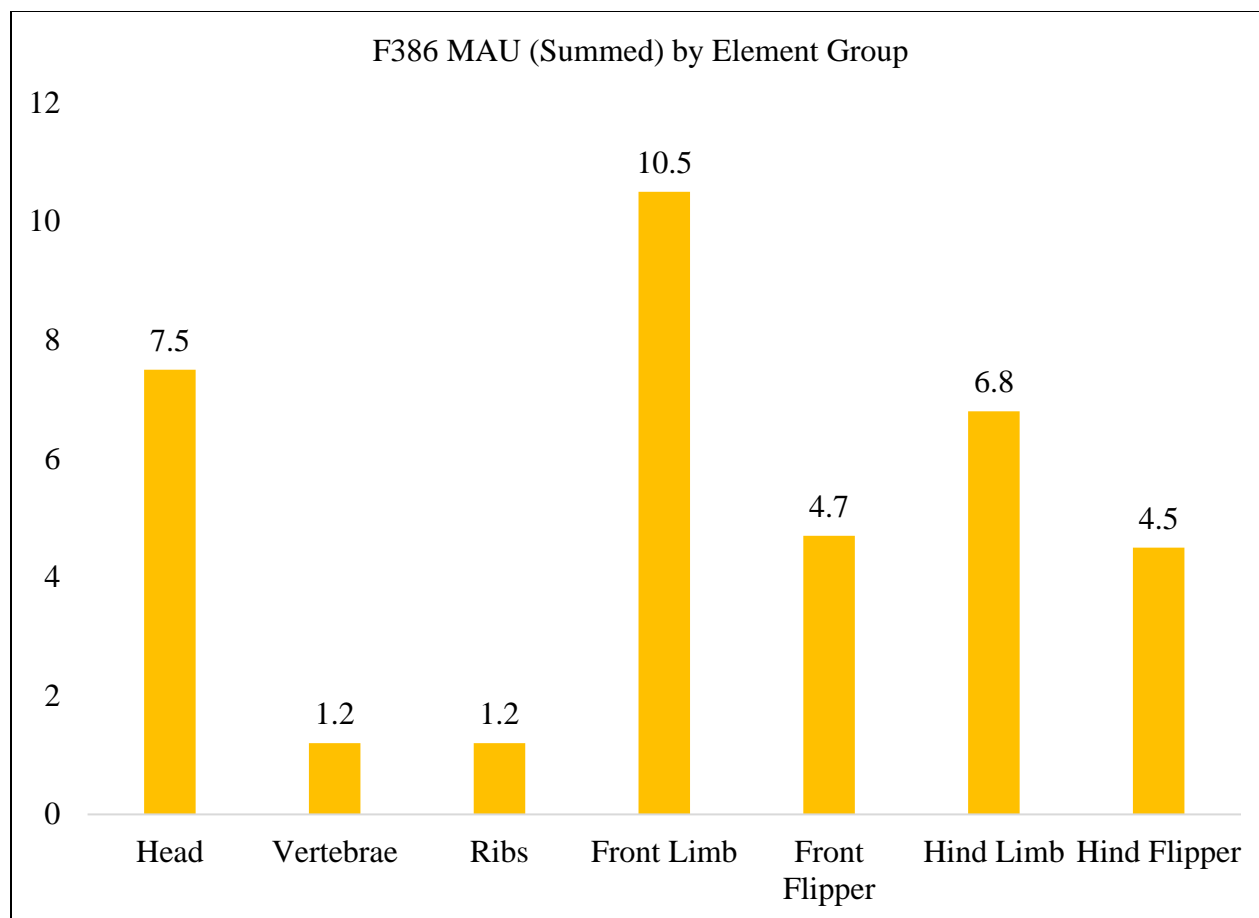
\* Overall phalanx counts are divided in half for front and hind phalanges.

**Table 10 MNE, MAU and %MAU Values for F386.**

In F386, the front limb is the most frequently occurring animal unit. In order of most to least frequent MAU element groups, F386's MAU (summed) ranking is as follows: front limb, head, hind limb, hind flipper, front flipper, vertebrae, ribs (Table 11). Figure 26 displays the MAU (summed) counts for F386 in a graph.

<b>F386 Element Group</b>	<b>MAU</b>	<b>%MAU</b>
Head (Cranium and Mandible)	7.5	71.3%
Vertebrae (Atlas, Axis, Cervical, Thoracic, Lumbar, Sacrum)	1.2	11.3%
Ribs	1.2	11.3%
Front Limb (Scapula, Humerus, Radius, Ulna)	10.5	100%
Front Flipper (Carpal, Metacarpal, Front Phalanges)	4.7	44.7%
Hind Limb (Pelvis, Femur, Tibia, Fibula)	6.8	64.7%
Hind Flipper (Tarsal, Metatarsal, Hind Phalanges)	4.5	42.8%

**Table 11 MAU and % MAU Values Summed by Element Group for F386.**



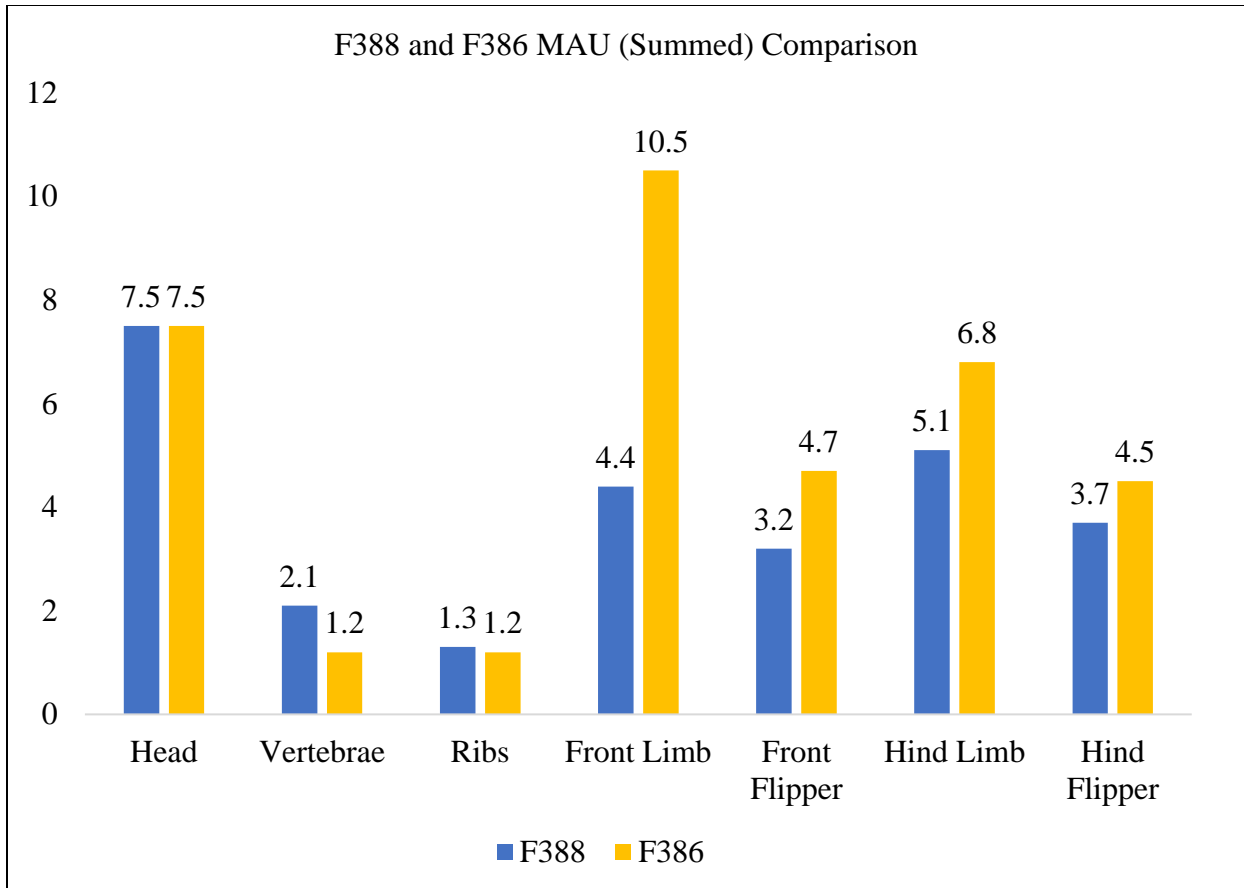
**Figure 26 MAU by Element Group for F386.**

The high humerus, radius, and ulna counts observed in the MNE analysis of F386 are again apparent in the MAU analysis. High cranial counts are still evident, though this can largely be attributed to the high mandible frequency in F386.

#### *4.5.4 Comparison of MAU Results for F388 and F386*

In MAU (summed) counts, F388 and F386 show similar amounts of head and rib units (Figure 27). However, it should be noted that the head unit combines cranial elements and mandible elements. F386 has a high MNE count for mandibles, but relatively low MNE count for other cranial elements compared to F388. Therefore, while F388 and F386 display an equal distribution of head units, this distribution does not account for the distribution of different cranial element types between the two middens. Because the mandible can be removed from the cranium during butchery, the mandible elements can be considered separate from the seal head. There are notable differences in the distribution of seal head parts between the front and rear midden: F386 has a remarkably higher mandible count than F388, and an overall lower count of all other cranial elements. This is inverse to F388, which displays a low mandible count but a higher count of all other cranial element types. Therefore, despite having an overall equal head count between the two middens, if the separation of the mandible from the crania during butchery is accounted for, there is evidently more crania but less mandibles in F388, and less crania but more mandibles in F386. F386 has a higher front limb, front flipper, hind limb, and hind flipper count compared to F388. Ribs and vertebrae are similarly represented in low frequencies between the two middens, with slightly higher occurrences in the front midden F388.

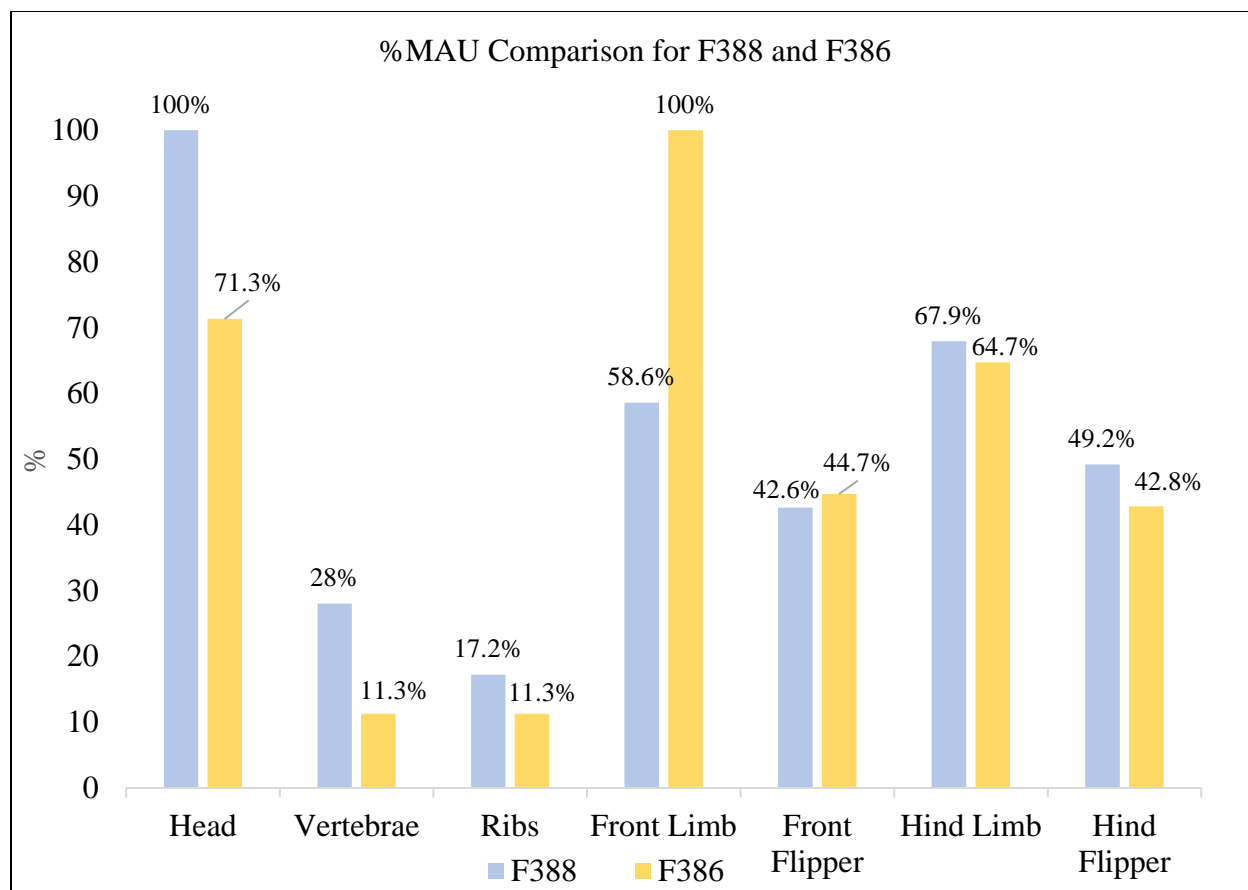




**Figure 27 Comparison of (Summed) MAU Counts for F388 and F386.**

#### 4.5.5 Comparison of %MAU Results for F388 and F386

When the %MAU of F388 and F386 is compared, the middens are generally similar with low representation of vertebrae and ribs, similar frequencies of hind limb and flipper elements and front flippers. However, there is a notably higher frequency of front limbs in F386. Heads are well represented in both samples, but are more prominent in F388.



**Figure 28** %MAU Comparison for F388 and F386.

#### 4.5.6 Using MAU to Estimate Whole and Portioned Seal Counts at House 10

While the MNI analysis provides an estimate on how many individual seal bodies are present in the House 10 samples by using the maximum number of the same occurring element, the above MAU results can be used to determine how many whole individual seal bodies or portions of individual seal bodies are present in the combined House 10 assemblage. This is determined by using the MNI and MAU to calculate how many different whole seals, and portions of different seals, are present.

The MAU results for F388 have the lowest occurring animal unit as the sacrum and axis, both occurring 0 times. Without further qualifiers, this would suggest that there were no whole

seals in F388. However, just because the sacrum and axis units do not occur in the House 10 sample does not mean that those elements are entirely missing from the House 10 middens: neither midden sample includes the entire contents of that midden because neither midden was excavated to its full extent (Wells et al. 2012). In addition, the vertebrae elements rank very low in BDV, suggesting these elements may have been deposited but did not survive in the archaeological record, or alternatively, they were carried away from the site. Therefore, the absence of a sacrum and axis in F388 alone is not requisite evidence to suggest that whole seals were not being brought to House 10.

The MAU data alone does not confidently confirm whether seals were more often transported to House 10 as whole or portioned carcasses. When the MNE evidence is considered in conjunction with the MAU data, the discrepancies in pelvis and scapula elements compared to head and limb/flipper elements suggests that there are more limbs and head units than there are pelvis, scapula, rib, and vertebrae elements. Even when rib and vertebrae counts are disregarded to account for their differential survival rates in post-depositional contexts, the proportion of limb/flipper and cranial elements to pelvis/scapula elements would suggest that portions of seals were more frequently deposited at House 10. The suggestion that portions of seals were more frequently brought to House 10 does not negate the possibility that whole seals were also brought to House 10: the existing dataset does not provide a strong enough basis for this determination. Ultimately, it is not possible to determine the ratio of whole to portioned seals being deposited at House 10 based on the available data.

#### *4.5.7 Kendall's Tau and Significance Testing for MAU Results of F388 and F386*

To confirm similarities and differences in BPR between F388 and F386, MAU values are ranked against one another. Due to multiple ties in rank order between F388 and F386 for both MAU and

MAU (summed), Kendall's Tau was applied instead of Spearman's Rho. When all 23 MAUs for F388 and F386 are ranked, the Kendall's Tau correlation coefficient is a weak positive correlation. The confidence that this correlation is statistically significant is high ( $\tau = 0.325$ ,  $p = 0.03$ ). A weak positive correlation with high confidence suggests that, at least minimally, animal units increase similarly between F388 and F386.

Kendall's Tau was also applied to the MAU (summed) groupings for F388 and F386. The small sample size of only 7 rankings is not sufficiently large enough to assess patterns accurately. Nevertheless, the rank order relationship correlation coefficient between F388 and F386 for MAU (summed) was calculated ( $\tau = 0.81$ ,  $p = 0.0108$ ). A  $\tau$  value of 0.81 indicates there is a positive relationship between the rank order of F388 and of F386. The  $p$  value of 0.0108 confirms there is high confidence that the relationship between the two columns of ranked data is statistically significant. Results of the larger sample size MAU rank order correlation (where  $n = 23$ ), are considered more reliable. Therefore, it is determined that there is a weak positive correlation between the MAU frequencies of F388 and F386.

4.5.8 Summary of MAU and %MAU Results

In Figure 29, results of the F388, F386, and the combined House 10 sample MAU analysis is presented. Data is presented in a line graph to illustrate similarities and differences in observed trends between the samples.

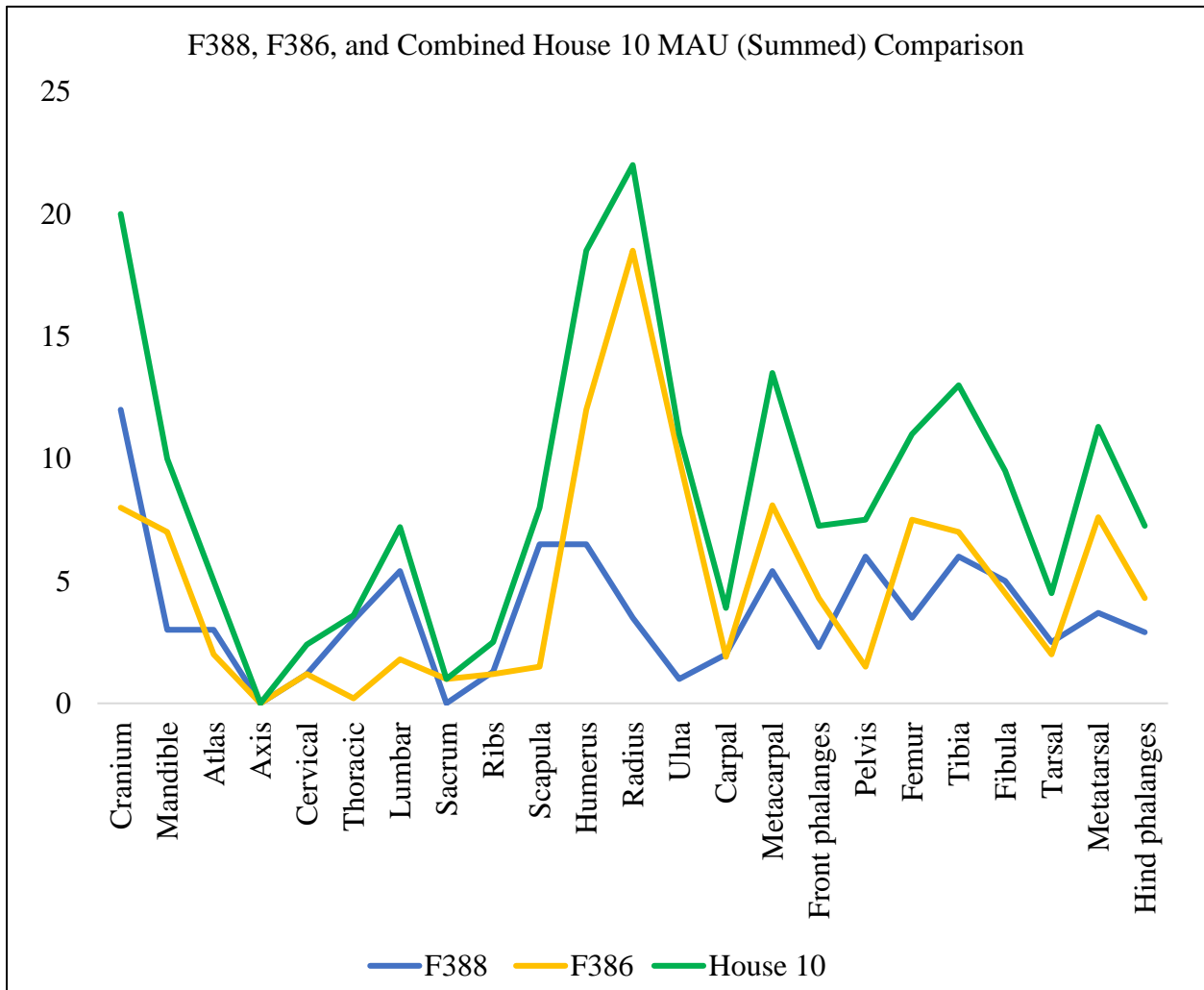
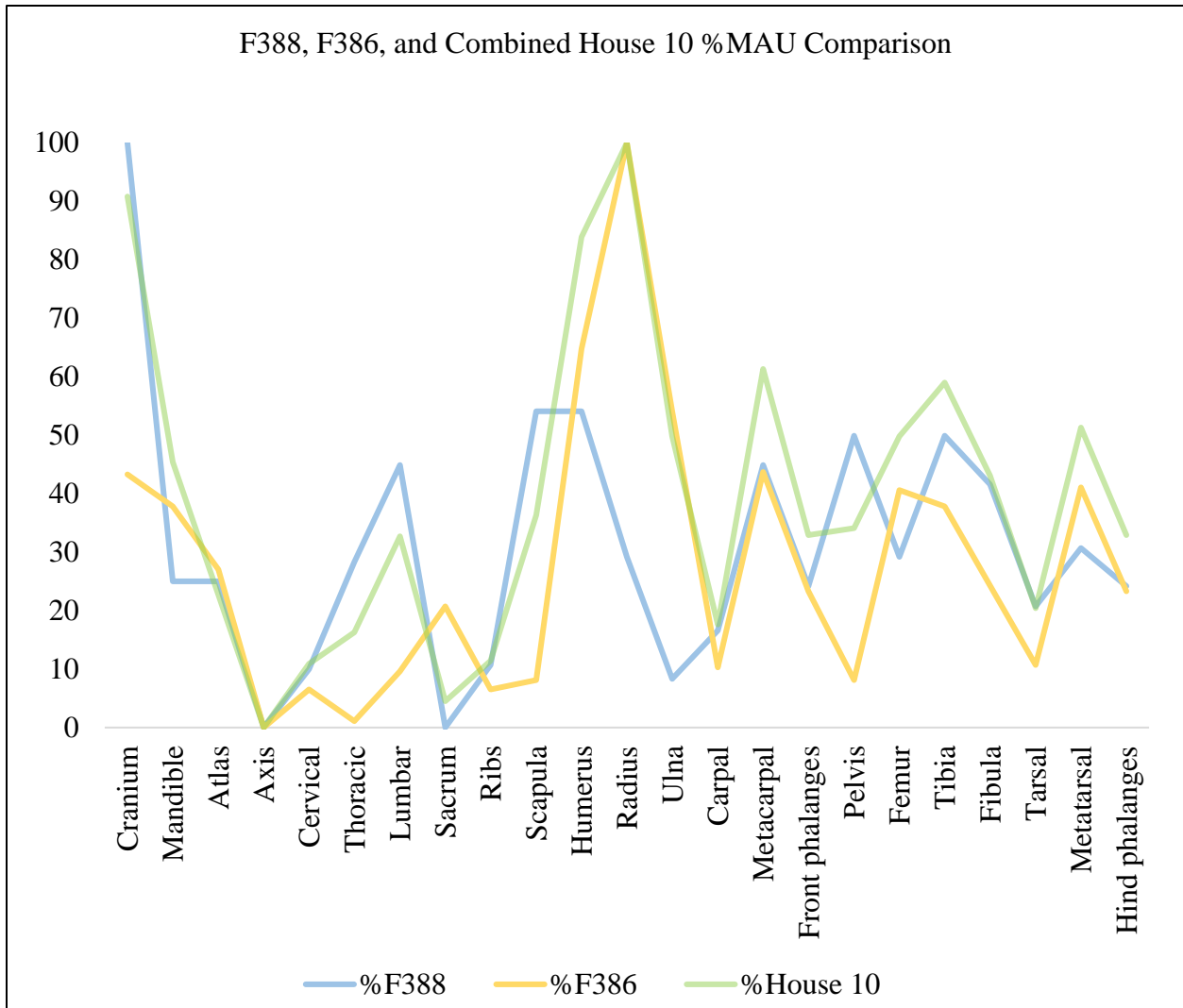


Figure 29 F388, F386, and Combined House 10 MAU (Summed) Comparison.

In Figure 30, the results of the F388, F386, and combined House 10 sample %MAU analysis is presented.



**Figure 30 F388, F386, and Combined House 10 %MAU Comparison.**

When the MAU and %MAU results for F388 and F386 are presented against the combined House 10 results in Figure 29 and 30, the positive and negative correlations between element types in F388 and F388 are apparent. These differences between F388 and F386 are notable enough that they affect the overall House 10 distribution. For example, in Figure 30, the radius is the highest proportional element for F386 and for the overall combined sample, but is inversely

underrepresented in F388. This indicates that while the BPR of both middens is similar, there are enough differences to suggest that each midden was subject to different sets of primary disposal practices by the occupants of House 10. The implications of this observation will be investigated in the Discussion chapter.

In summary, when the results of the NISP, MNE, %MNE, and MAU analysis are considered together, patterns of higher cranial, vertebrae, scapula, and pelvis element frequencies in F388 and higher mandible, limb, and flipper frequencies in F386 are observed. When %MAU is applied, the observation of higher cranial element frequencies in F388 and higher front limb frequencies in F386 is maintained, but the distribution of vertebrae, hind limb, and flipper elements is more normalized between the two samples. These observed differences in BPR between F388 and F386 produced by the NISP, MNE, MNI, and MAU analyses will be evaluated against the bone density values (BDV) of elements and the meat utility index (MUI) for phocid seal body parts to assess if either factor could be a primary cause of the differential BPR between F388 and F386.

#### **4.6 Bone Density Value (BDV) and BPR Results**

Bone density values compiled from previous studies (Chambers 1992 cited in Lyman 1994) are used to determine if variability of BPR in F388 and F386 could be a result of density mediated destruction. It is assumed that the bone density of elements in both samples is affected similarly by taphonomic post-depositional processes due to their shared preservation conditions. Therefore, any correlation between BDV and BPR should be evident in both samples. If BDV is indeed a primary factor in BPR for F388 and F386, it would result in a positive correlation between BDV and BPR, where more dense bones correlate with higher element frequencies in MNE and MAU counts, and less dense bones correlate with lower element frequencies. As noted in section 3.7 of

the Methodology chapter, bone density values are not available for all elements. Some elements have multiple scan sites and, subsequently, have multiple bone density values (Lyman 1994). For this study, elements with multiple bone density values use the average of those values.

#### *4.6.1 BDV and BPR of F388 and F386*

Table 12 compiles the known bone density values for phocid elements and the associated proportion of those elements in the %MNE results for each midden assemblage. Elements are presented in order of highest to lowest BDV. The higher the BDV, the denser the bone is and, consequently, the more likely it is to survive in the archaeological record. Therefore, if BDV is a primary factor in BPR, it is expected that high BDV elements will have high MNE counts.

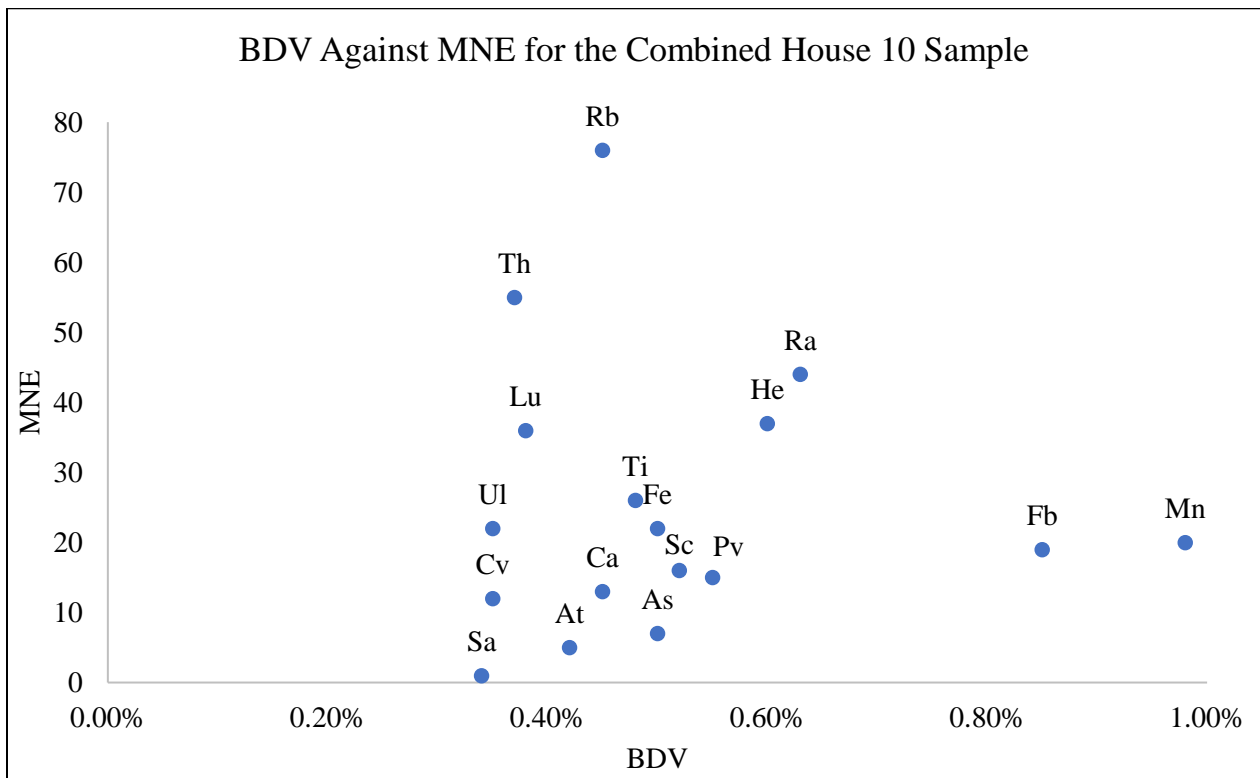


<b>Element</b>	<b>BDV</b>	<b>House 10 MNE</b>	<b>F388 %MNE</b>	<b>F386 %MNE</b>
Mandible	0.98*	20	0.8%	1.6%
Fibula	0.85*	19	1.4%	1.1%
Radius	0.63	44	1.0%	4.3%
Humerus	0.60	30	0.8%	2.8%
Pelvis	0.55	15	1.6%	0.4%
Scapula	0.52*	16	1.8%	0.4%
Femur	0.50	23	1.0%	1.8%
Astragalus/Talus	0.50	7	0.4%	0.5%
Tibia	0.48	26	1.6%	1.6%
Calcaneus	0.45	13	1.1%	0.6%
Rib	0.45*	76	5.5%	4.2%
Atlas Vertebrae	0.42	5	0.4%	0.2%
Lumbar Vertebrae	0.38	36	3.7%	1%
Thoracic Vertebrae	0.37	55	7.0%	0.5%
Cervical Vertebrae	0.35	12	0.8%	0.7%
Ulna	0.35	22	0.3%	2.3%
Sacral Vertebrae	0.34	1	0.0%	0.1%

\* Values that have been averaged.

**Table 12 Bone Density Value (BDV) and F388 and F386 %MNE Frequency.**

The expectation that high BDV will correlate with high BPR is reflected in some of the results in F388 and F386, but multiple anomalies to this premise are noted: the low MNE frequency for ulna elements in F388 (0.3%) correlates with the low BDV assigned to the ulna; however, despite having a low BDV, ulna elements are relatively well represented in F386 (2.6%); mandibles are the most dense elements and are well represented in F386 (1.8%), but minimally represented in F388 (0.8%); despite its relatively low BDV, thoracic vertebrae are well represented in F388 at 7%. In Figure 31 BDV is plotted against MNE for the combined sample of House 10. The House 10 sample is first combined (F388 and F386 totaled together) and assessed against BDV to produce a baseline correlation for the whole sample before comparing individual midden sample correlations.



**Figure 31 Scatterplot of BDV Against MNE for the Combined House 10 Sample.**

The combined House 10 sample demonstrates a very weak positive correlation between higher BDV and higher MNE of elements, but the very high  $p$  value indicates that the weak positive correlation is not statistically significant (Spearman's Rho is  $r_s = 0.184$ ,  $p = 0.47$ ). A perfect correlation between BDV and MNE would be reflected as a straight line from the bottom left corner of the scatterplot to the top right corner. Figure 31 displays multiple outliers that deviate from this expected outcome. Despite the high density of fibulas and mandibles, there are relatively few of these elements in either midden sample. Conversely, ribs are relatively well represented despite their low density, which is highly unusual. The upcoming sections compare BDV against MAU to determine if this correlation is similarly observed in the individual midden samples.

#### *4.6.2 BDV and MAU for F388*

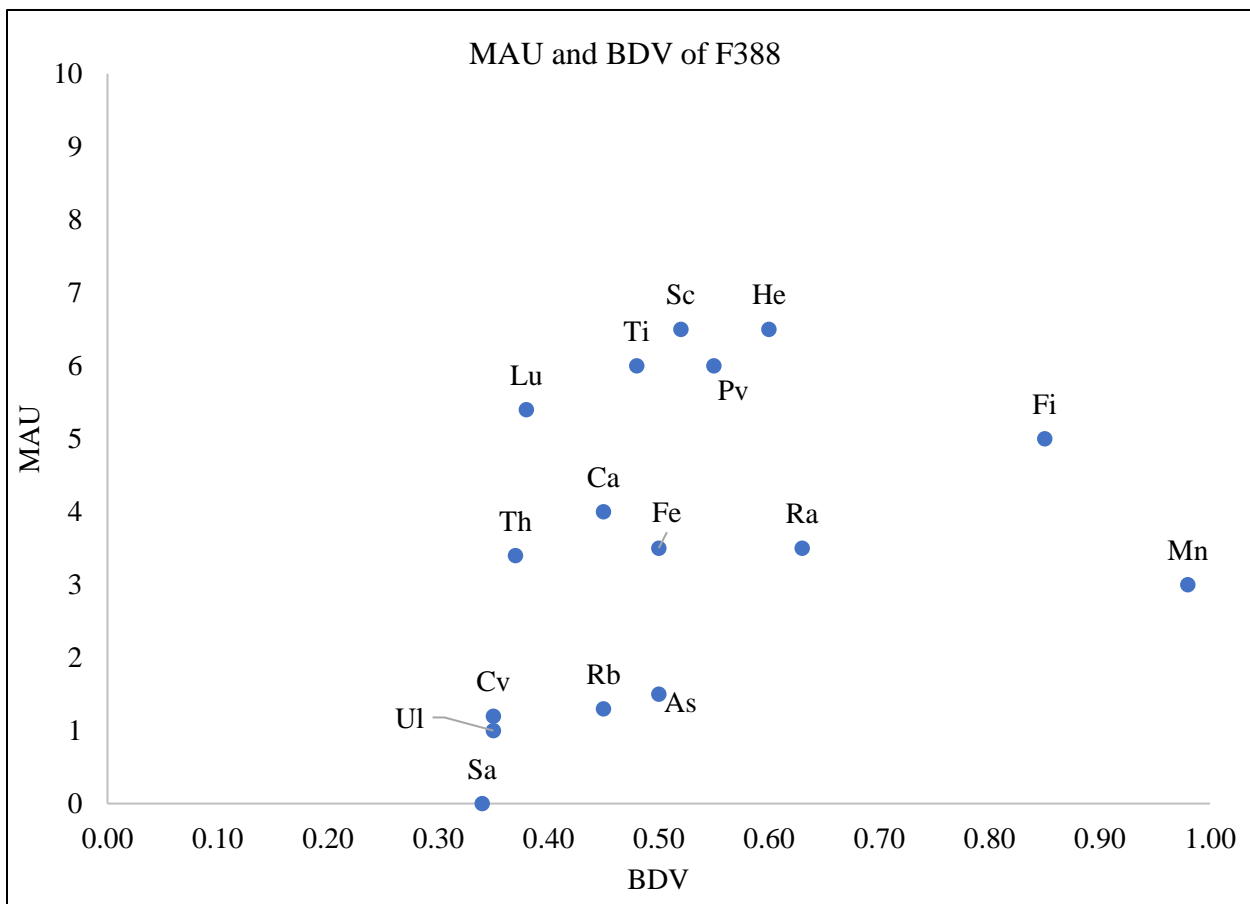
A comparison of BDV and MAU for F388 and F386 is applied to assess if the anomalies and patterns present in the comparison of BDV and MNE for 388 and F386 occur consistently. The BDV of elements is compiled against the associated MAU values for F388 in Table 13.

<b>Element</b>	<b>BDV</b>	<b>MAU</b>
Mandible (Mn)	0.98*	3
Thoracic Vertebrae (Th)	0.37	3.4
Lumbar Vertebrae (Lu)	0.38	5.4
Sacrum (Sa)	0.34	0
Cervical (Cv)	0.35	1.2
Rib (Rb)	0.45*	1.3
Scapula (Sc)	0.52*	6.5
Humerus (He)	0.60	6.5
Radius (Ra)	0.63	3.5
Ulna (Ul)	0.35	1
Pelvis (Pv)	0.55	6
Femur (Fe)	0.50	3.5
Tibia (Ti)	0.48	6
Fibula (Fi)	0.85*	5
Astragalus/Talus (As)	0.50	1.5
Calcaneus (Ca)	0.45	4

\* Values that have been averaged.

**Table 13 BDV and MAU for F388 Phocid Elements.**

The consistencies and anomalies to the expectation that high BDV will result in high BPR that were noted in the comparison of BDV and MNE are again noted when BDV is compared to MAU for F388. Overall, there appears to be a moderate positive that is statistically significant between BDV and MAU evident for F388, as illustrated in Figure 32 (Spearman's Rho is  $r_s = 0.545$  and  $p = 0.03$ ). This suggests that there are more instances of higher bone density/higher MAU than lower bone density/higher MAU.



**Figure 32** Scatterplot of MAU Frequencies of Harp Seals for F388 Against Bone Mineral Density Values for Seals.

#### 4.6.3 BDV and MAU for F386

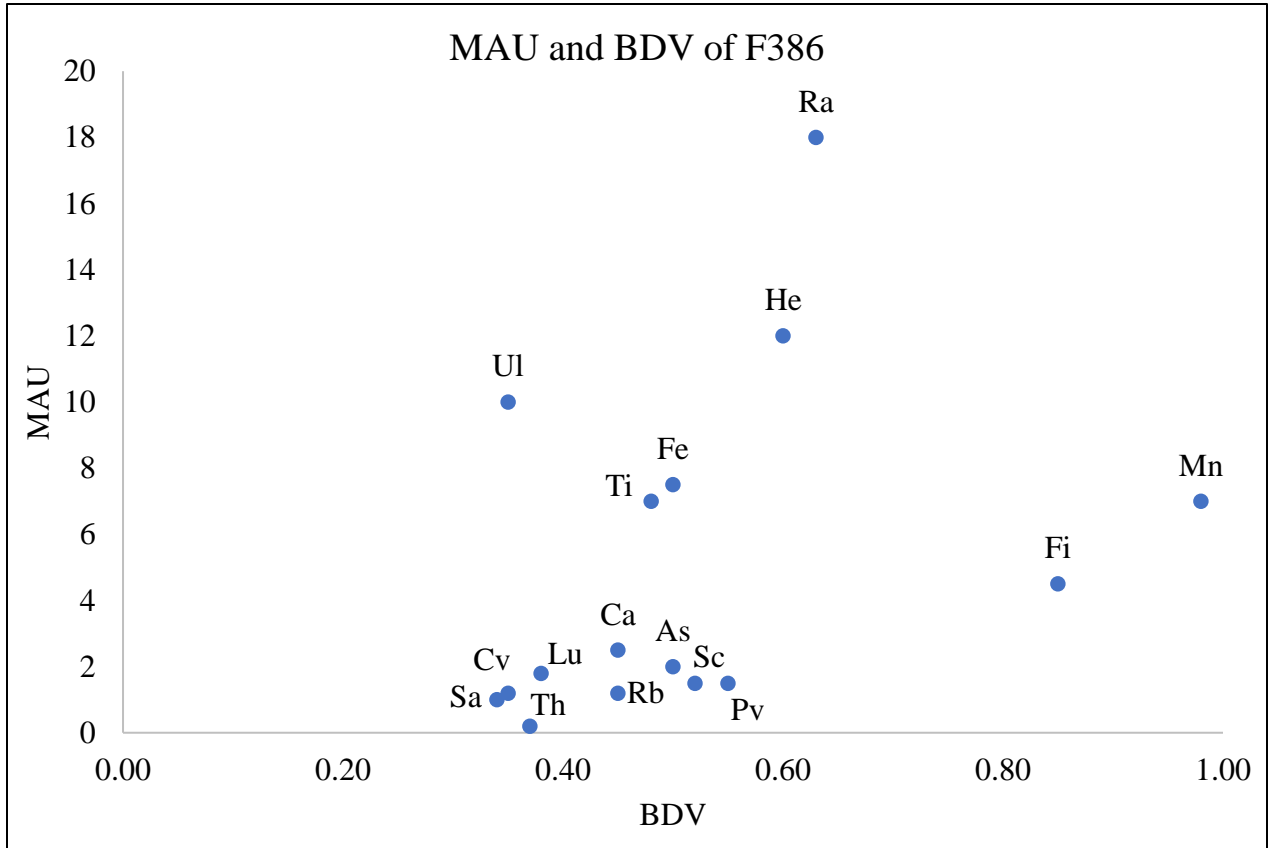
In Table 14 BDV is again compiled against the MAU of associated elements to assess any relationship between BDV and MAU in F386.

<b>Element</b>	<b>BDV</b>	<b>MAU</b>
Mandible (Mn)	0.98*	7
Thoracic Vertebrae (Th)	0.37	0.2
Lumbar Vertebrae (Lu)	0.38	1.8
Sacrum (Sa)	0.34	1
Cervical (Cv)	0.35	1.2
Rib (Rb)	0.45*	1.2
Scapula (Sc)	0.52*	1.5
Humerus (He)	0.60	12
Radius (Ra)	0.63	18.5
Ulna (Ul)	0.35	10
Pelvis (Pv)	0.55	1.5
Femur (Fe)	0.50	7.5
Tibia (Ti)	0.48	7
Fibula (Fi)	0.85*	4.5
Astragalus/Talus (As)	0.50	2
Calcaneus (Ca)	0.45	2.5

\* Values that have been averaged

**Table 14 BDV and MAU for F388 Phocid Elements.**

Figure 33 plots BDV against MAU for F386. No strong correlation is apparent, but there is a moderate positive correlation that is statistically significant. The increase in BDV shows a moderately corresponding increase in MAU for F386 (Spearman's Rho  $r_s = 0.537$  and  $p = 0.03$ ).



**Figure 33** Scatterplot of MAU Frequencies of Harp Seals for F386 Against Bone Mineral Density Values for Seals.

#### 4.6.4 Comparison of BDV and MAU for F388 and F386

In the scatterplots plotting BDV against MNE for the combined sample and against MAU for the F388 and F386 individual samples, a positive correlation is similarly illustrated. Spearman's Rho calculations for both F388 and F386 demonstrate moderate positive correlations with high significance levels (for F388,  $r_s = 0.545$  and  $p = 0.03$ ; for F386,  $r_s = 0.537$  and  $p = 0.03$ ). These results indicate that BDV may moderately positively correlate to increases in MAU in both individual samples and in the combined House 10 sample.

Overall, the moderately positive results for F388 and F386 indicate that BDV may account for some level of similarity in BPR in both middens, where higher density bones occur more frequently than lower density bones. A positive correlation between high BDV and high MAU for associated elements supports the assumption that preservation conditions between middens are the same, and the elements are equally subject to the same density-mediated post-depositional processes that could affect survivorship. However, a positive correlation between BDV and MAU does not explain the differences in BPR between middens, nor does it account for the high MAU of low BDV elements like the ulna and flipper elements in F386. Consequently, MUI is also considered as another factor possibly affecting BPR in the House 10 middens.

#### 4.7 Meat Utility Index (MUI) and BPR

To assess any correlation between BPR and relative food utility of elements in each midden, the meat utility index (MUI) for phocid seals (Lyman et al. 1992) is considered in relation to the %MNE and MAU counts for the F388 and F386 samples. Table 15 compiles the known MUI values for phocid seals (as presented in section 3.8. of the Methodology chapter) and the associated proportion of those elements in the %MNE for each midden assemblage. Highly fragmented pieces of crania are not used; only nasal aperture and near-whole skulls are used to represent the MNE of



entire crania in each assemblage. For front flipper MNE calculations, metacarpals and carpals are combined. For rear flipper MNE calculations, metatarsals and tarsals are combined. Overall phalanx MNE counts per midden were divided equally between front and rear flipper MNE counts, as phalanx elements were not differentiated between front and rear during cataloguing.

<b>Element</b>	<b>MUI %</b>	<b>F388 %MNE Frequency</b>	<b>F386 %MNE Frequency</b>
Cranium	20.7	1.9%	0.1%
Cervical	34.5	0.8%	0.7%
Thoracic	21.7	7.0%	0.5%
Lumbar	29.1	3.7%	1.1%
Pelvis*	21.3*	1.6%	0.4%
Rib+	100.0	5.5%	4.2%
Sternum	2.6	0.8%	0.9%
Scapula+	20.3	1.8%	0.4%
Humera+	10.8	0.8%	2.8%
Radius/Ulna+	4.4	1.3%	6.5%
Femur	4.8	0.9%	1.7%
Tibia/Fibula+	16.6	3.0%	2.7%
Front Flipper	2.3	22.8%	26.35%
Rear Flipper	7.7	21.5%	25.85%

\* The pelvis MUI provided by Lyman et al 1992 includes both sides of the pelvis; as pelvis elements in this sample are entered individually, this value is shown as half of the full pelvis value (42.6).

+ One (left, right) side only.

**Table 15 MUI % Values and F388 and F386 %MNE Frequency.**

In studies of BPR and MUI where the differential transport of elements from the kill site to the residential site is considered, it is typical that high MUI elements are returned to the residential site, whereas elements of low MUI or general utility would remain at the kill site (Binford 1978). This trend is not applicable at Phillip's Garden, where seals were likely transported whole from the kill site to the residential site. Because seals would have been transported whole to the residential site, it is expected that elements of both high and low MUI would be equally represented in the Phillip's Garden midden samples. Interestingly, this is not the case. While some high MUI elements are well represented in the House 10 sample, such as the pelvis, scapula, and crania, there are very few ribs and vertebrae, two elements that rank very high in MUI. Overall, there seems to be a larger distribution of low MUI elements in the House 10 sample (the distal limbs and flippers), than high MUI elements. Of particular interest is the anomaly of the ribs and vertebrae, which rank very high in MUI value but occur relatively infrequently in the House 10 sample. Normally, this inversion of the expected scenario (where high MUI elements would occur frequently), would be attributed to differential preservation: the ribs are long and thin, and the vertebral bones are porous with many thin articular facets prone to depositional and post-depositional destruction, suggesting that the absence of these high MUI elements can be attributed to differential survival based on BDV. However, as the previous sections have demonstrated, BDV was not a major factor in differential BPR. To better assess the influence of MUI on BPR, MUI is compared against MAU counts for each midden sample.

#### 4.7.1 MUI and MAU for F388

MUI values are compared to MAU counts for F388 in Table 16 to assess the nature of the correlation between MUI and MAU.

<b>Element</b>	<b>MUI %</b>	<b>F388 MAU</b>
Cranium (Cr)	20.7	7.5
Cervical (Cv)	34.5	1.2
Thoracic (Th)	21.7	3.4
Lumbar (Lu)	29.1	5.4
Pelvis* (Pv)	42.6*	6
Rib+ (Rb)	100.0	1.3
Sternum (St)	2.6	0
Scapula+ (Sc)	20.3	6.5
Humera+ (He)	10.8	6.5
Radius/Ulna+ (RU)	4.4	2.3
Femur (Fe)	4.8	3.5
Tibia/Fibula+ (TF)	16.6	5.5
Front Flipper (FF)	2.3	3.2
Rear Flipper (RF)	7.7	3.7

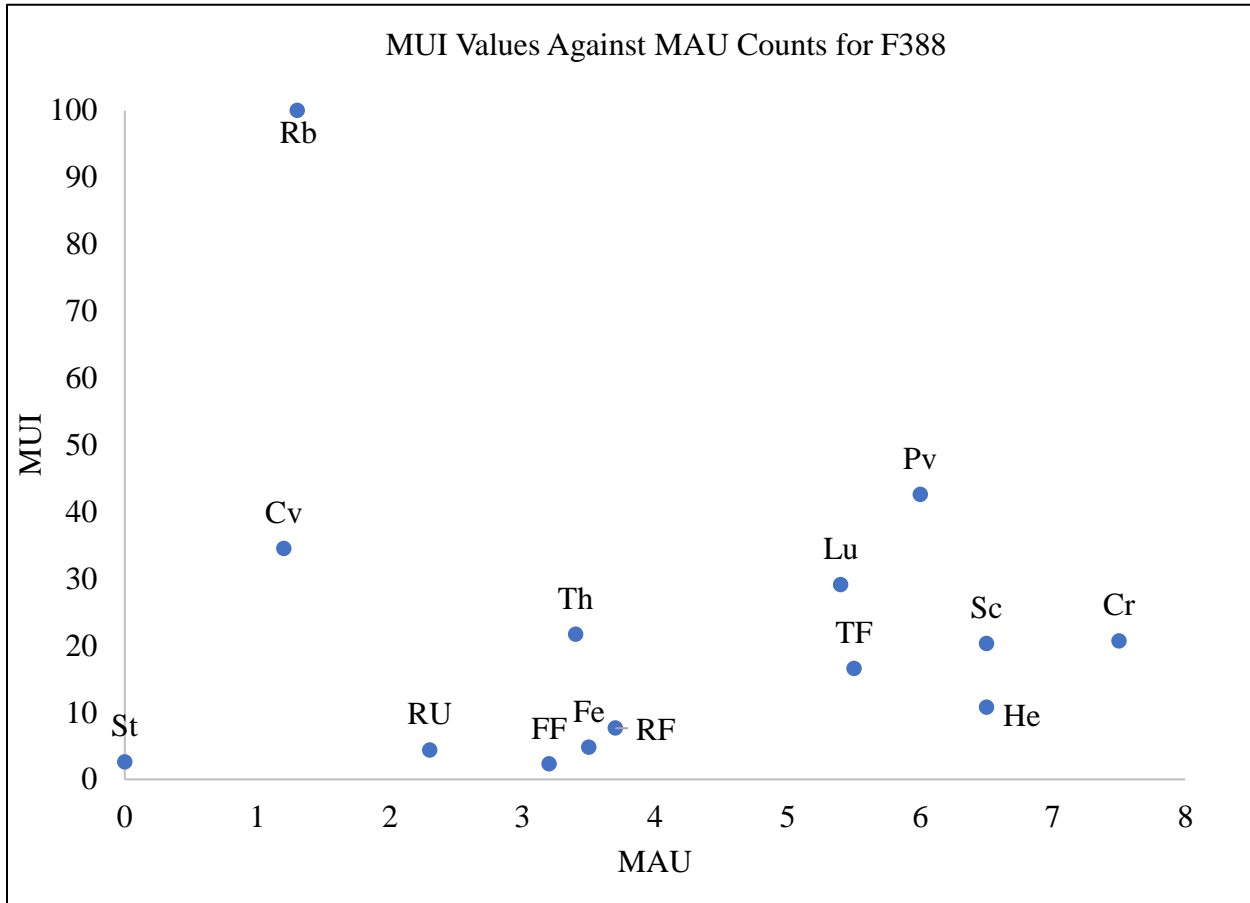
\* Includes both sides of pelvis.

+ One (left, right) side only, MAU is the average of the combine elements.

**Table 16 MUI and Associated MAU for F388.**

Similar patterns are observed in the comparison of MUI to MAU in F388 that were previously noted in the comparison of MUI and MNE in the cranial, pelvis, vertebrae, and scapula elements (high MUI value elements) are reflected in relatively higher MAU counts, suggesting a

weak positive correlation that is not statistically significant (Spearman's Rho is  $r_s = 0.17$  and  $p = 0.56$ ). Elements of low MUI value (limbs and flippers) also occur relatively frequently suggesting a negative correlation. When MUI is plotted against MAU for F388 in a scatterplot (Figure 34), the observed positive and negative correlations are not shown to be significant.



**Figure 34** Scatterplot of MAU Counts Against MUI of Harp Seal for F388.

#### 4.7.2 MUI and MAU for F386

MUI values are compared to MAU counts for F386 in Table 17 and plotted in a scatterplot (Figure 35).

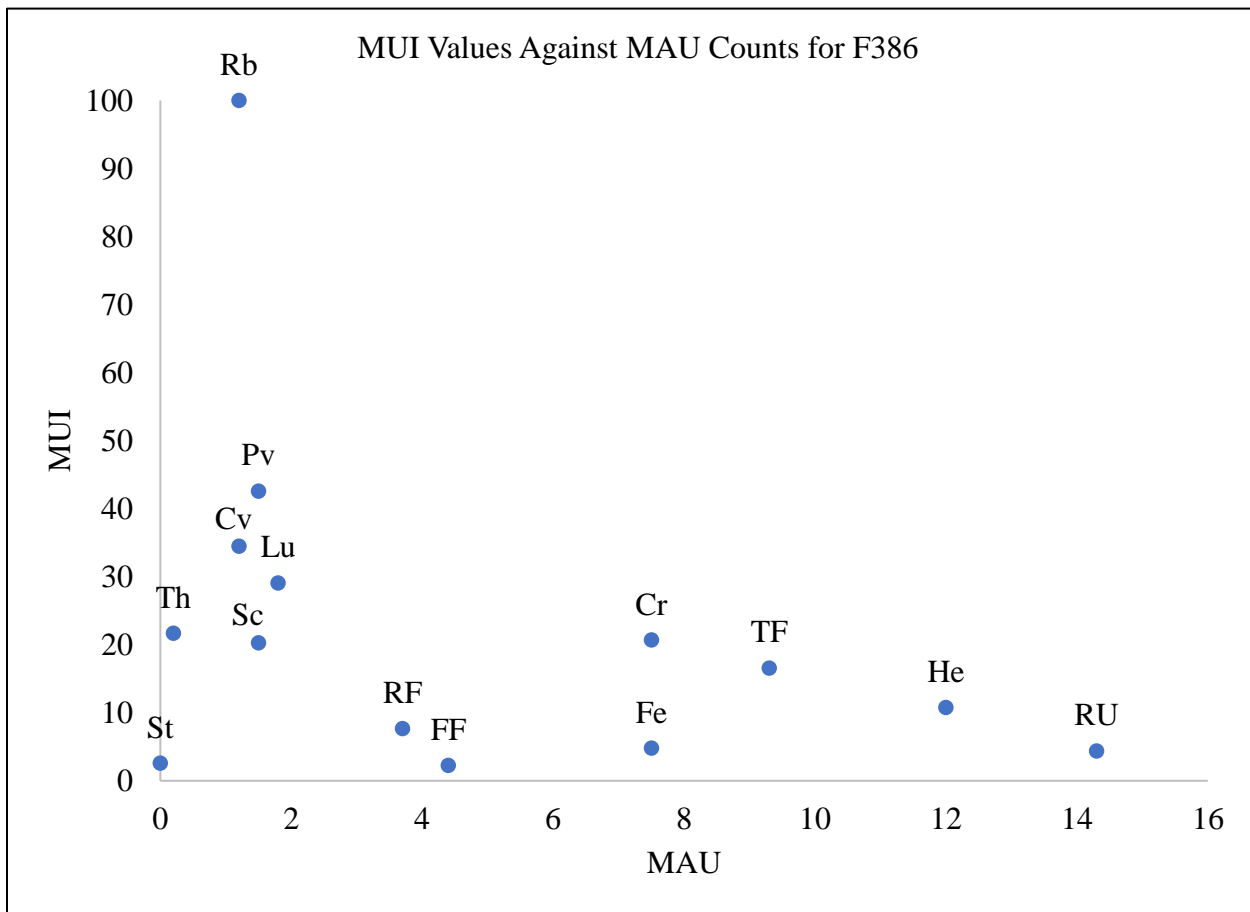
<b>Element</b>	<b>MUI %</b>	<b>F386 MAU</b>
Cranium (Cr)	20.7	7.5
Cervical (Cv)	34.5	1.2
Thoracic (Th)	21.7	0.2
Lumbar (Lu)	29.1	1.8
Pelvis* (Pv)	42.6*	1.5
Rib+ (Rb)	100.0	1.2
Sternum (St)	2.6	0
Scapula+ (Sc)	20.3	1.5
Humera+ (He)	10.8	12
Radius/Ulna+ (RU)	4.4	14.3
Femur (Fe)	4.8	7.5
Tibia/Fibula+ (TF)	16.6	9.3
Front Flipper (FF)	2.3	4.4
Rear Flipper (RF)	7.7	3.7

\* Includes both sides of pelvis.

+ One (left, right) side only, MAU is the average of the combine elements.

**Table 17 MUI and Associated MAU for F386.**

For the F386 sample, the data table displays a subtle negative correlation between high MUI and low MAU, and low MUI and higher MAU. A positive correlation between the high MUI value of the cranium and a high cranial MAU count is observed in F386 like it was in F388, but this is an isolated observation as it does not extend to the pelvis, scapula, and vertebrae elements like it did in the F388 comparison. The Spearman's Rho calculation demonstrates a weak positive correlation that is not statistically significant ( $r_s = 0.386$  and  $p = 0.173$ ),



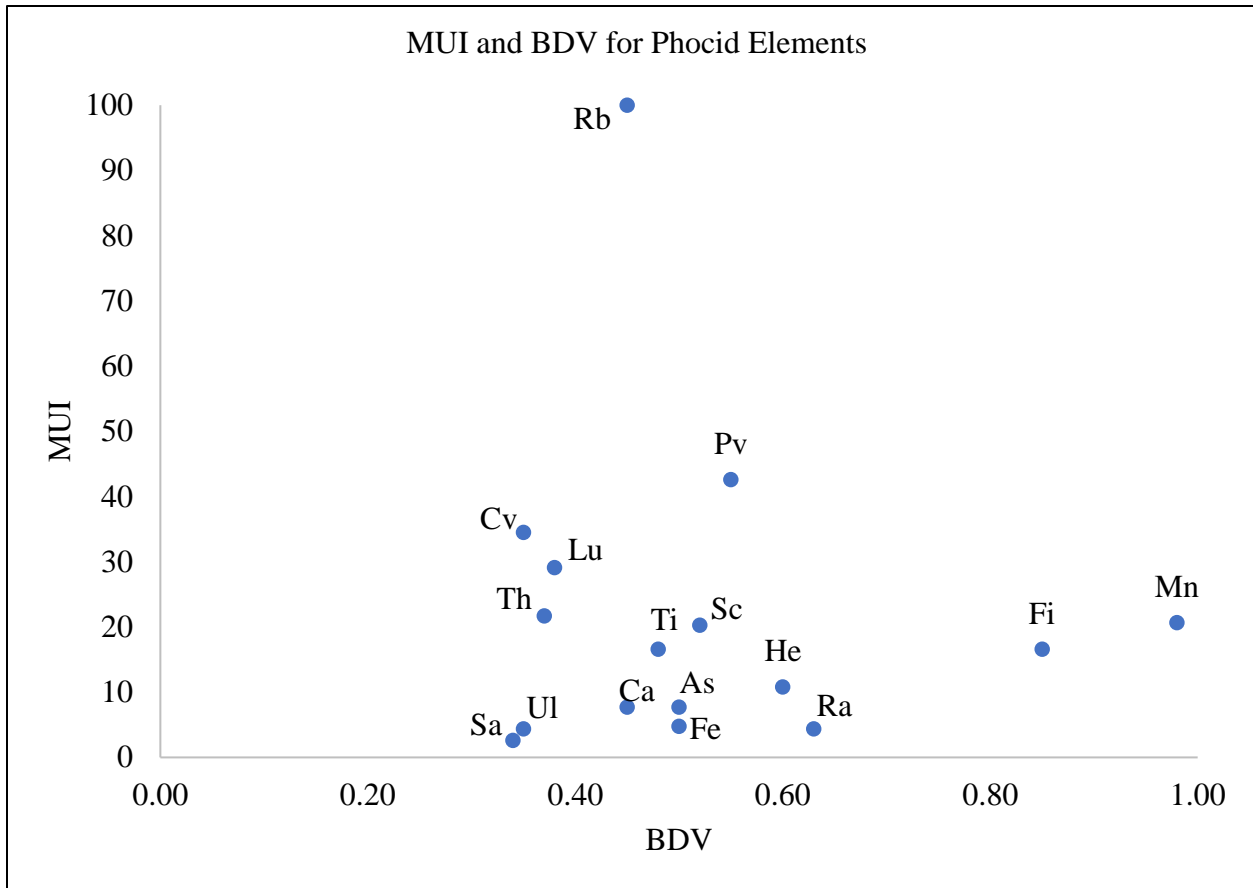
**Figure 35** Scatterplot of MAU Counts Against MUI of Harp Seal for F386.

#### 4.7.3 Comparison of MUI and MAU for F388 and F386

In summary, Figures 34 and 35 plot MUI against the MAU for the same elements/element groups in samples F388 and F386 to assess any correlation. Spearman's Rho calculations for F388 demonstrate no correlation ( $r_s = 0.17$  and  $p = 0.56$ ), which would suggest that there is no relationship between MUI and MAU in this sample. The high  $p$  value indicates that there is low confidence in the statistical significance of the slightly positive correlation coefficient result. The correlation coefficient for F386 demonstrates a weak positive correlation ( $r_s = 0.386$  and  $p = 0.173$ ), but the  $p$  value again indicates low confidence in the statistical significance of that correlation. In conclusion, the weak positive correlation coefficients for F388 and F386 both have low confidence, suggesting that the observed correlations are not statistically significant and therefore indicate that MUI has little to no influence on BPR in either the F388 or F386 sample.

#### 4.7.4 BDV and MUI Relationship

The MUI for elements that also have a known BDV are compared in a scatterplot to assess any relationship between MUI and BDV that could inform interpretations of BPR (Figure 36). When Spearman's Rho is calculated, the correlation is a weak negative with low confidence ( $r_s = -0.371$  and  $p = 0.236$ ). These results indicate that MUI and BDV do not have a statistically significant relationship.



**Figure 36 Scatterplot of Meat Utility Values Against Averaged Density Values for Phocid Elements.**

In review, based on comparisons of BDV and MUI against BPR in both middens, it is demonstrated that neither BDV nor MUI significantly influence the differential BPR between F388 and F386. Differential BPR might instead reflect conscious choices in the social organization and division of butchery, processing, consumption, and disposal practices at House 10 between the front and rear midden. To better understand the behaviors and activities associated with the disposal of harp seal at House 10, the upcoming sections present the cutmark frequency of elements in each sample and consider this data in relation to the associated tool and artifact counts and the location of cutmarks on elements.



## 4.8 Cutmark Frequency (CMF) and BPR Results

Cutmark Frequency (CMF) counts are drawn from the NISP totals rather than the MNE totals. This ensures all cutmarks recorded on element fragments are included for elements that could be assigned an element type during identification but were too fragmented to be given a zone designation for MNE analysis. However, the number of cutmarks recorded on element fragments not included in MNE counts is minimal, so %CMF is compared against %MNE to assess any patterns between BPR and CMF (Figures 37 and 38). Comparing against %MNE as opposed to overall NISP counts better accounts for element fragmentation and therefore presents comparison of %CMF and %MNE more proportionally. No cutmarks on unidentifiable fragments are included in these results.

### 4.8.1 *CMF of F388*

F388 yields a total NISP of 1523 elements. Of the 1523 identifiable elements, there is a total of 89 cutmark(s) recorded. Therefore, F388 has a CMF of 5.8% when only identifiable elements are considered. Of this 5.8%, 1.2% are adult, 1.2% are juvenile, and the remaining 3.5% are of indeterminate age. 97.7% of the cutmarks are recorded as microblade cutmarks; the remaining 2.3% are biface cutmarks. In F388, cutmarks frequently occur on the cranial, mandible, vertebrae, rib, scapula, ulna, pelvis, tibia, fibula, and phalanx elements. Cutmarks occur mostly on vertebrae (32 cutmarks), cranium (15 cutmarks) and ribs (11 cutmarks). Figure 37 compares %CMF to %MNE for F388.

%CMF Compared to %MNE for F388

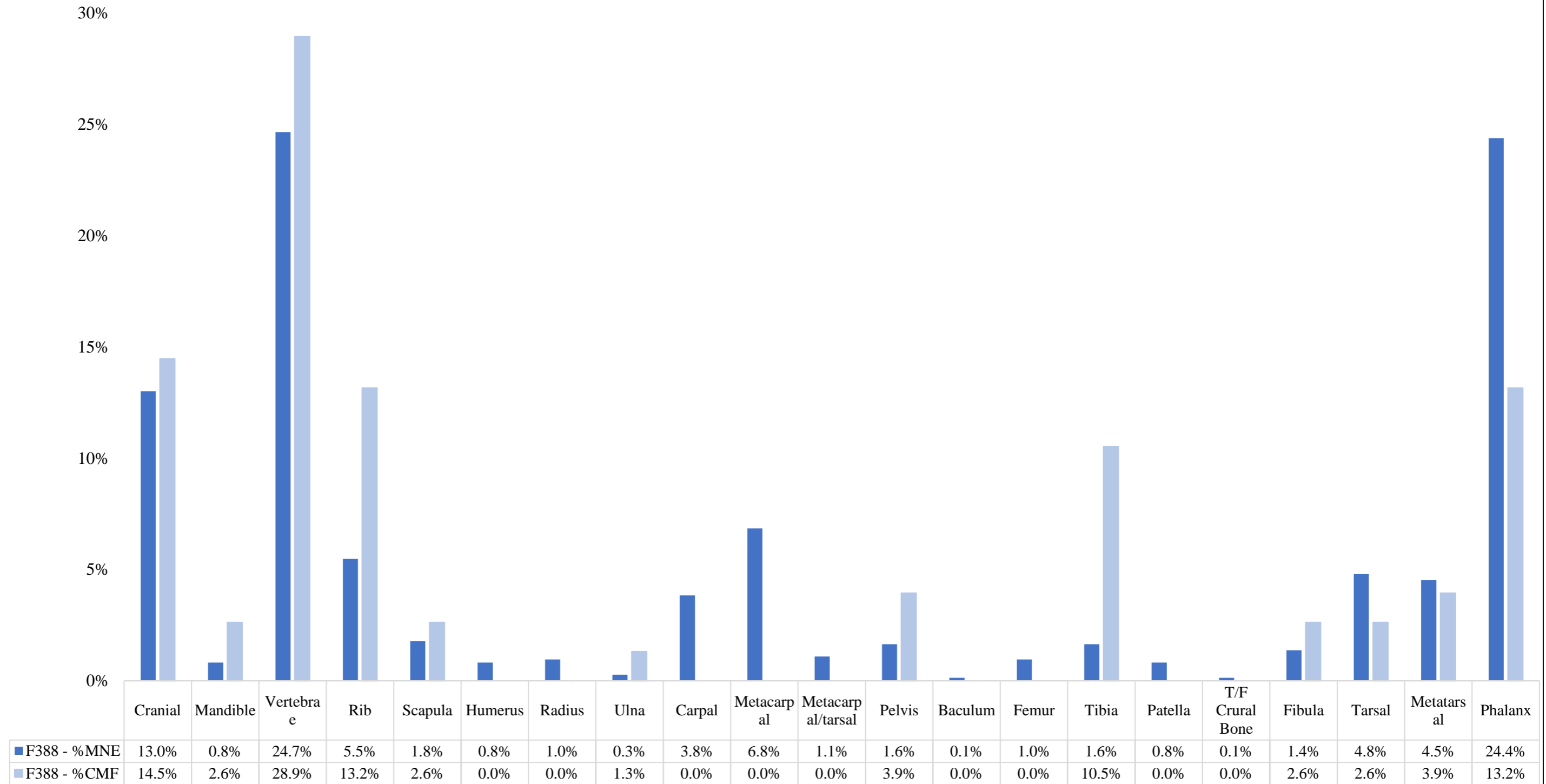


Figure 37 %CMF Comparison to %MNE for F388.

#### 4.8.2 *CMF of F386*

F386 yields a total NISP of 1335 elements. Of the 1335 identifiable elements, there is a total of 88 cutmark(s) recorded. Therefore, F386 has a CMF of 6.6% when only identifiable elements are considered. Of this 6.6%, 1.8% are adult, 1.2% are juvenile, 0.2% are newborn, and the remaining 3.6% are of indeterminate age. Of the 88 cutmarks, 86 (97.3%) are recorded as microblade cutmarks. The remaining 2 (2.7%) are biface cutmarks. In F386, cutmarks typically occur on the metatarsal, tarsal, phalanx, cranial, vertebrae, fibula, tibia, ulna, radius, humerus, and rib elements. Cutmarks occur mostly on flipper elements (37 cutmarks) and vertebrae (18 cutmarks). The remaining 33 cutmarks are distributed in fewer counts amongst various elements. Figure 38 compares %CMF to %MNE by element in F386.

%CMF Compared to %MNE for F386

25%

20%

15%

10%

5%

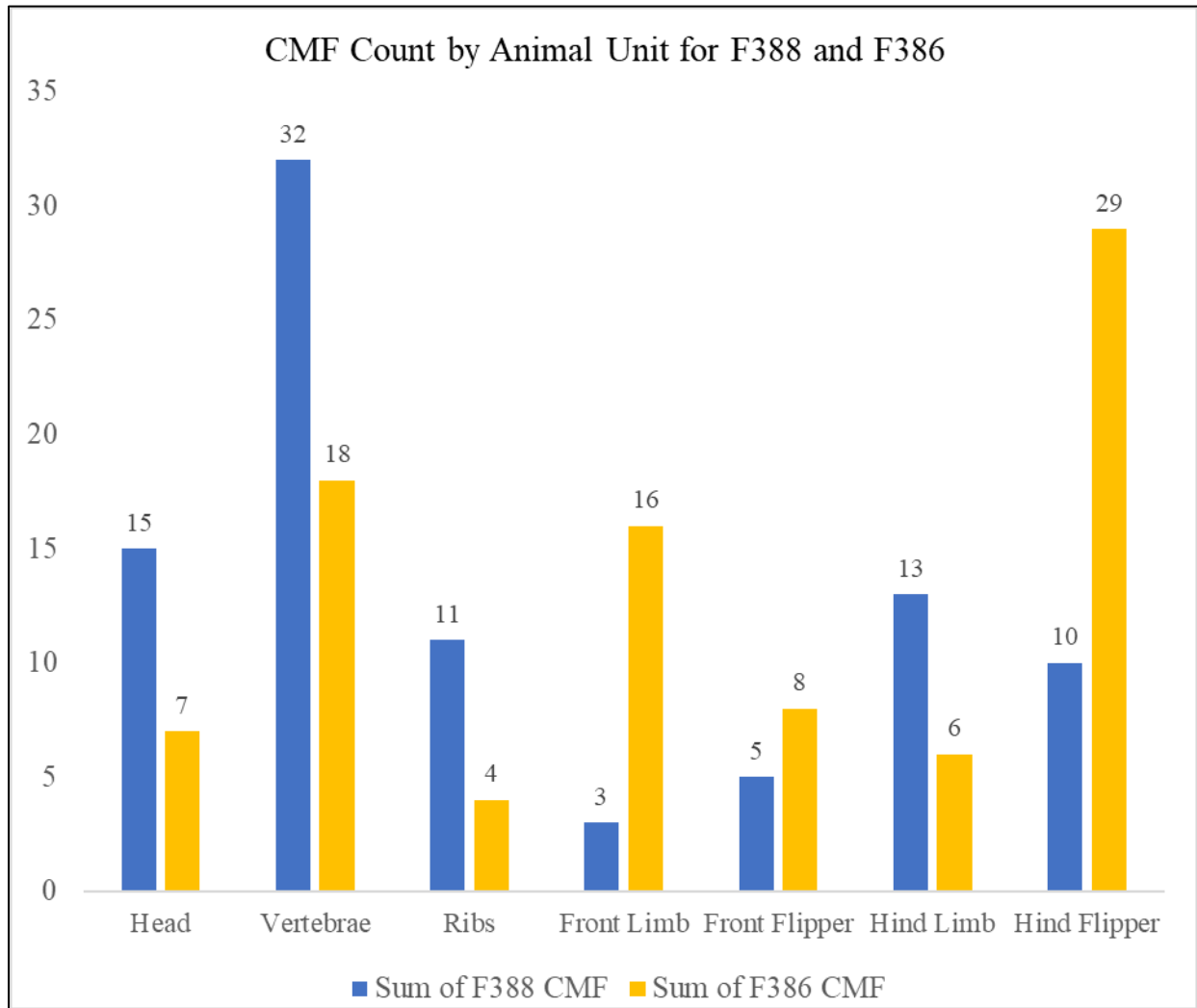
0%

	Cranial	Mandible	Hyoid	Vertebrae	Rib	Sternum	Scapula	Humerus	Radius	Ulna	Carpal	Metacarpal	Metacarpal/tarsal	Pelvis	Baculum	Femur	Patella	Tibia	T/F Crural Bone	Fibula	Tarsal	Metatarsal	Phalanx
F386 - %MNE	15.9%	1.3%	0.1%	11.0%	13.6%	1.9%	0.4%	2.2%	3.4%	1.8%	2.5%	6.3%	2.3%	0.3%	0.3%	1.4%	1.0%	1.3%	0.6%	0.8%	2.5%	5.8%	23.4%
F386 - %CMF	5.4%	2.7%	1.4%	9.5%	5.4%	0.0%	0.0%	5.4%	6.8%	5.4%	0.0%	1.4%	0.0%	0.0%	0.0%	2.7%	0.0%	2.7%	0.0%	2.7%	8.1%	21.6%	18.9%

Figure 38 %CMF Comparison to %MNE for F386.

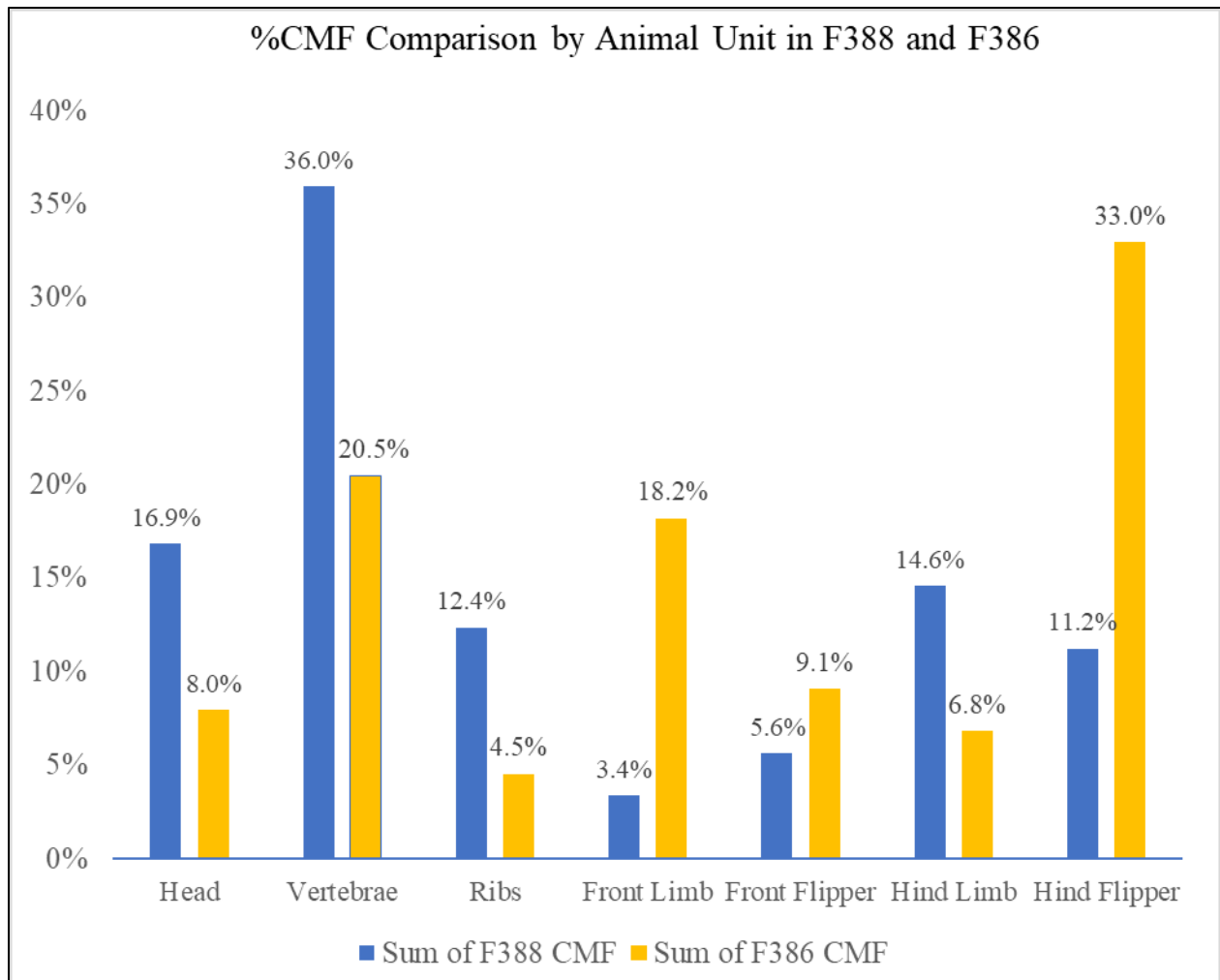
#### 4.8.3 Comparison of CMF and %CMF for F388 and F386 by Animal Unit

CMF counts for F388 and F386 are summed and combined to demonstrate CMF for the different animal unit groups for F388 and F386. These results are compared against each other in Figure 39.



**Figure 39** CMF Count by Animal Unit for F388 and F386.

F388 displays notable higher CMF counts in the head, vertebrae, rib, and hind limb animal units than F386. Conversely, F386 displays higher CMF counts for the hind flipper, front flipper, and front limb animal units. Figure 40 displays this information as %CMF rather than CMF count. The same patterns are observed.



**Figure 40** %CMF Comparison by Animal Unit in F388 and F386.

#### 4.8.4 Associated Tool Count (ATC) and CMF for F388 and F386

In addition to analyzing which elements cutmarks frequently occur on, the associated tools and artifacts recovered from each midden are also considered. Midden F388 yields only 45 tools and artifacts. Midden F386 yields 262 tools and artifacts intermixed with the faunal material in the assemblage. The types of tools found in each midden are compiled in Table 18.

<b>Tool Type</b>	<b>F388 Count</b>	<b>F386 Count</b>	<b>Tool Type</b>	<b>F388 Count</b>	<b>F386 Count</b>
Endblade	3	13	Slate (worked, unknown tool type)	0	12
Microblade	6	38	Bone (worked, tool unknown)	8	8
Biface	2	10	Bead (bone)	2	0
Scraper	6	34	Lampstand	4	1
Core	1	20	Needle	2	0
BLT-1 (burin-like tool)	1	6	Schist slab	0	12
Sidescraper	0	1	Sled shoe	3	0
Preform	0	64	Soapstone	6	28
Abrader	0	7	Barbed point	1	0
Sideblade	0	1	Charcoal	0	7
<b>ATC Total</b>	—	—	—	<b>45</b>	<b>262</b>

**Table 18 Table of Tools and Artifact Types and Counts for F388 and F386.**

When considering the observed difference in CMF between F388 (5.8%) and F386 (6.6%), the increase in CMF in F386 suggests a positive correlation with the increase in ATC. A positive correlation is also evident in F388, which yields a lower CMF and lower ATC. Therefore, as the ATC increases in F386, so too does the CMF; as the ATC decreases in F388, so too does the CMF. The differences in the types of tools found in each midden can also inform on the activities that may have influenced deposition in those midden areas. The comparatively high frequencies of endblades, microblades, bifaces, scrapers, cores, preforms, abraders, slate and schist tools in F386 indicate a variety of butchery and processing activities that could contribute to the higher CMF for the rear midden. The high frequencies of needle, lampstand, bead, and sled shoe artifacts in the

F388 could indicate a different set of domestic activities that were involved in the disposal practices contributing to the front midden. An assessment of where these cutmarks typically occur on elements can inform on the types of activities that could have inflicted them.

#### 4.8.5 *Cutmark Locations (CML) by Element*

The location and direction of cutmarks (CML) on elements can indicate the type of butchery or processing activity that may have inflicted it. By examining the location and direction of cutmarks on elements, these activities can be inferred. To contextualize the discussion below, the following quote from Patricia Wells (1988, in Renouf 2011) regarding the process of harp seal butchery is revisited:

The seal was laid on its back for skinning and butchering. The hide was cut at the skull near the ears and where the flippers joined the long bones. The head and tongue were removed, the vertebral column was disarticulated into meat packages and the limbs were disarticulated from the flippers. The scapula and pelvis were disarticulated from long bones at the proximal end and the flippers were disarticulated at the distal end. Cutmarks showed that meat was removed from the ribs and front limbs. There was some evidence of cutting meat from the flippers (Wells 1988 in Renouf 2011b: 136).

The location of cutmarks on elements was noted and described during sample cataloguing. Different elements have different classification systems for describing CML. Elements and their cutmark descriptions are presented in Tables 19 through 25, organized by MAU (summed) element groups. In this thesis, the term ‘transverse’ is used to describe cutmarks that occur perpendicular to the direction of the element; the term ‘parallel’ is used to describe cutmarks that occur in the same direction of an element, for example, in the proximal-distal direction of a long bone; the term ‘oblique’ is used to define cutmarks that occur diagonally (in between a proximal and parallel



direction). ‘N/A’ is assigned when there is no available data for that category (i.e., no cutmarks for that element) in the midden sample.

Head Animal Unit	Cutmark Location(s) for F388	Cutmark Location(s) for F386
<b>Cranium</b>	Eye orbit and nasal aperture (dorsal aspect) (transverse, oblique)  Auditory Bulla (dorsal aspect, transverse, parallel)  Occipital Condyle (dorsal aspect) (transverse)  Zygomatic Arch (dorsal aspect) (ventral aspect) (transverse, parallel, oblique)	Auditory Bulla (dorsal aspect) (transverse, parallel)  Occipital Condyle (dorsal aspect) (transverse)  Hyoid (anterior aspect) (transverse)
<b>Mandible</b>	Proximal end (dorsal aspect) (transverse)  Medial surface (dorsal aspect) (transverse)	Distal end (dorsal aspect) (transverse)  Medial surface (ventral aspect) (parallel)

**Table 19 Cutmark Locations of Head Animal Unit Elements for F388 and F386.**

On the head, cutmarks occur on the cranium, mandible, and hyoid bones. For both F388 and F386, cutmarks are recorded on mandible elements on the proximal and distal ends, on the dorsal aspect in a transverse direction. These cutmarks are likely the result of attempts to remove the mandible from the cranium during butchery. Cutmarks to the cranium occur on the auditory bulla, occipital condyles, nasal aperture areas, and the eye orbit areas (e.g., zygomatic arches and preorbital processes). Most cutmarks run in transverse and oblique directions and are likely results from hide removal/skinning (Wells 2002). One hyoid element from F386 also exhibited a cutmark on its anterior aspect, probably resulting from the tongue removal process.

<b>Vertebrae Animal Unit</b>	<b>Cutmark Location(s) for F388</b>	<b>Cutmark Location(s) for F386</b>
<b>Cervical Vertebrae</b>	Posterior end (dorsal aspect)  In groove of articular facet (dorsal aspect)  In groove of articular facet (ventral aspect)	Anterior end (dorsal aspect)
<b>Thoracic Vertebrae</b>	In groove of articular facet (dorsal aspect)  In groove of articular facet (ventral aspect)  Spinous process (dorsal aspect)  Spinous process (ventral aspect)	N/A
<b>Lumbar Vertebrae</b>	In groove of articular facet (dorsal aspect)  In groove of articular facet (ventral aspect)	In groove of articular facet (dorsal aspect)  In groove of articular facet (ventral aspect)  Transverse process (dorsal aspect)  Transverse process (ventral aspect)
<b>Sacral Vertebrae</b>	N/A	Posterior end (ventral aspect)
<b>Caudal vertebrae</b>	N/A	Medial Aspect (ventral aspect)

**Table 20 Cutmark Locations of Vertebrae Animal Unit Elements for F388 and F386.**

The vertebrae include the cervical, thoracic, lumbar, sacral, and caudal elements. Many cutmarks occur on vertebrae elements. In all vertebrae types of both middens, cutmarks typically occur in grooves of articular facets on both dorsal and ventral sides, though cutmarks are also recorded on vertebral bodies. Cutmarks typically run in transverse directions. Dorsal aspect cutmarks indicate the separation of different sections of the vertebral column, while ventral aspect cutmarks likely result from meat removal, or indicate rib separation in thoracic elements. One cutmark recorded on an atlas element in F388 is likely a result of disarticulation of the skull from the spine. F386 has one caudal element cutmark recorded, which could have been inflicted during skinning.

<b>Rib Animal Unit</b>	<b>Cutmark Location(s) for F388</b>	<b>Cutmark Location(s) for F386</b>
<b>Ribs</b>	Rib head (dorsal aspect) (transverse)	Rib head (dorsal aspect) (transverse)
	Sternal end (dorsal aspect)	Sternal end (dorsal aspect)
	Rib head (ventral aspect)	Rib head (ventral aspect)
	Medial/midshaft surface (ventral aspect)	Medial/midshaft surface (ventral aspect)
	Medial/midshaft surface (dorsal aspect)	Medial/midshaft surface (dorsal aspect)

**Table 21 Cutmark Locations of Rib Animal Unit Elements for F388 and F386.**

In rib elements, cutmarks can occur on either end (sternal or spinal), and on the midshaft. Cutmarks typically occur on the dorsal aspect but can also occur on the ventral aspect. Rib cutmarks vary in direction for both middens, and can occur in transverse, oblique, and parallel directions. Cutmarks occurring near the rib head likely result from the ribs being separated from the spine (Wells 2002). Cutmarks occurring along the rib shaft and towards the sternal end on both the dorsal and ventral surfaces probably result from meat removal actions (Wells 2002).

<b>Front Limb Animal Unit</b>	<b>Cutmark Location(s) for F388</b>	<b>Cutmark Location(s) for F386</b>
<b>Scapula</b>	N/A	Proximal end, glenoid fossa (dorsal aspect) (transverse)  Medial surface (dorsal aspect) (parallel)
<b>Humerus</b>	N/A	Distal end (anterior aspect) (transverse)  Distal end (on epiphysis) (transverse)  Proximal end (on epiphysis) (transverse)  Midshaft (anterior aspect) (transverse)
<b>Radius</b>	N/A	Distal end (on epiphysis) (transverse, oblique)  Proximal end (lateral aspect) (transverse)  Midshaft (anterior aspect) (transverse)
<b>Ulna</b>	Distal end (lateral aspect) (transverse)	Proximal end (lateral aspect) (transverse, parallel)  On epiphysis (oblique)  Midshaft (ventral aspect) (transverse)

**Table 22 Cutmark Locations of Front Limb Animal Unit Elements for F388 and F386.**

The bones of the front limb include the scapula, humerus, radius, and ulna. Cutmarks occurring on the scapula only occur on F386 scapula elements. These cutmarks occur on the glenoid fossa and medial surface, on the dorsal aspect of the scapula; cutmarks around the glenoid

fossa would have been inflicted during disarticulation from the humerus, whereas cutmarks on the medial surface could have resulted from meat removal (Wells 2002). Cutmarks on humerus elements also only occur in F386. The locations of these cutmarks vary, occurring on both the distal and proximal ends around epiphyses and on the midshaft. All cutmarks are in transverse directions. Cutmarks on the proximal and distal epiphyses could have resulted from disarticulation from the scapula and radius. Midshaft cutmarks could reflect meat removal. In radius elements, cutmarks only occur in F386. Similar to the humerus elements, these cutmarks occur on the proximal, distal, and midshaft areas of the radius elements and run in transverse or oblique directions. Cutmarks on ulna elements occur in both F388 and F386 elements. In F388, these cutmarks occur on the distal end in a transverse direction. In F386 ulna elements, cutmarks occur on the proximal end, epiphyses, and the midshaft, and likely result from the disarticulation of the ulna from the radius. In summary, most forelimb cutmarks occur in the F386 sample and indicate disarticulation from other forelimb elements and meat extraction.

<b>Front Flipper Animal Unit</b>	<b>Cutmark Location(s) for F388</b>	<b>Cutmark Location(s) for F386</b>
<b>Carpals</b>	N/A	N/A
<b>Metacarpals</b>	Midshaft (dorsal aspect) (transverse)	Proximal end (dorsal aspect) (transverse)
<b>Phalanges</b>	Distal end (dorsal aspect)	Proximal end (dorsal aspect)
	Distal end (ventral aspect)	Midshaft (dorsal aspect)
	Proximal end (dorsal aspect)	Midshaft (lateral aspect)
	Proximal end (ventral aspect)	
	Midshaft (ventral aspect)	
	Midshaft (lateral aspect)	

**Table 23 Cutmark Locations of Front Flipper Animal Unit Elements for F388 and F386.**

The front flipper includes carpals, metacarpals, and phalanges. No cutmarks are recorded on carpal elements from either midden. Cutmarks on the metacarpals occur on the midshaft dorsal aspect of elements in F388, and on the dorsal aspect of the proximal end of metacarpal elements in F386. Cutmarks on phalanges occur on both the proximal and distal ends of the elements, on both the central and dorsal sides. Cutmarks can also occur on the midshaft on the dorsal and lateral aspects of phalanges in F386. In both F388 and F386, these cutmarks typically present in a transverse direction and are likely the result of skinning and disarticulation.

<b>Hind Limb Animal Unit</b>	<b>Cutmark Location(s) for F388</b>	<b>Cutmark Location(s) for F386</b>
<b>Pelvis</b>	Shaft between pubis and acetabulum (posterior aspect)  Shaft between ischium and acetabulum (posterior aspect)	N/A
<b>Femur</b>	N/A	Proximal end, femoral head (transverse)  Distal end (transverse)
<b>Tibia</b>	Distal end (posterior aspect) (parallel)  Midshaft (posterior aspect) (transverse)  Midshaft anterior aspect) (transverse)  On epiphysis (oblique)	Proximal end (posterior aspect) (transverse and oblique)  On epiphysis (oblique)
<b>Fibula</b>	Distal end (anterior aspect) (parallel)  Distal end (anterior aspect) (parallel)  Proximal end (posterior aspect) (oblique)	Proximal end (anterior aspect)

**Table 24 Cutmark Locations of Hind Limb Animal Unit Elements for F388 and F386.**

The hindlimb includes the pelvis, femur, tibia, and fibula elements. Cutmarks to the pelvis occur only on F388 pelvis elements on the shaft areas surrounding the acetabulum (closest to the acetabulum, on the shafts extending towards the pubis and ischium). These cutmarks can be interpreted as results of disarticulation (Wells 2002). Cutmarks to the femur are only reported in F386 elements and occur on both the proximal and distal ends in transverse directions. Cutmarks



on the distal end of the femur are likely due to its disarticulation from the tibia and fibula elements. Cutmarks to the fibula occur more often on F388 fibula elements, on the distal and proximal ends, in transverse, oblique, and parallel directions. Cutmarks to F386 fibula occur only on the proximal end. These cutmarks may have resulted from attempts to separate the fibula from the tibia for meat removal. Tibia cutmarks occur on the distal and proximal ends and, in F388, cutmarks occur along the midshaft in both posterior and anterior aspects. For both F388 and F386, cutmarks are also recorded on the proximal epiphyses. These cutmarks typically run in transverse and oblique directions and likely result from disarticulation (proximal and distal end cutmarks) and meat removal (midshaft cutmarks).

<b>Hind Flipper Animal Unit</b>	<b>Cutmark Location(s) for F388</b>	<b>Cutmark Location(s) for F386</b>
<b>Tarsals</b>	Grooves of articular surfaces/on articular facets (transverse)	Grooves of articular surfaces/on articular facets (transverse)
<b>Metatarsals</b>	Proximal end (ventral aspect) (transverse)  Distal end (lateral aspect) (parallel and transverse)	Proximal end (dorsal aspect)  Proximal end (lateral aspect)  Distal end (dorsal aspect)  Distal end (ventral aspect) (oblique)  Midshaft (dorsal aspect) (oblique)
<b>Phalanges</b>	Distal end (dorsal aspect)  Distal end (ventral aspect)  Proximal end (dorsal aspect)  Proximal end (ventral aspect)  Midshaft (ventral aspect)  Midshaft (lateral aspect)	Proximal end (dorsal aspect)  Midshaft (dorsal aspect)  Midshaft (lateral aspect)

**Table 25 Cutmark Locations of Hind Flipper Animal Unit Elements for F388 and F386.**

The hind flipper includes tarsal, metatarsal, and phalanx elements. Cutmarks occur on the tarsal elements of both F388 and F386 in the grooves of articular surfaces/on articular facets in transverse directions; these cutmarks are likely the result of disarticulation from the hindlimb. In F388, metatarsal cutmarks occur on the proximal (ventral aspect) and distal (lateral aspect) end of elements in transverse directions. In F386, metatarsal cutmarks occur on the proximal ends (dorsal and lateral aspects) and on the distal ends (dorsal and ventral aspect) in transverse and oblique

directions. Cutmarks are also recorded as occurring on metatarsal epiphyses. Like the front flipper, cutmarks occurring on the phalanges of the rear flipper are on both the proximal and distal ends of the elements, on the central and dorsal sides. Cutmarks can also occur on the midshaft of the dorsal and lateral aspects in transverse directions, resulting from skinning or disarticulation (Wells 2002). In summary, ATC and CML are useful frames of analysis when considering the types of behaviors and tools that may have resulted in differential cutmark frequencies between F388 and F386. The human motivation behind these behaviors and tool type selections may, to some extent, be explained by MUI values of elements in relation to their CMF.

#### *4.8.6 CMF and MUI Comparison for F388 and F386*

Cutmarks occur as part of the butchery process during the disarticulation of body parts and in the separation of flesh and skin from bone. Seal elements that are of high meat utility would presumably correlate to areas of the body with higher cutmark frequencies because of more intensive butchery to maximize meat or blubber extraction. This includes the cranium, ribs, vertebrae, pelvis, and scapula. Presumably, elements with a higher MUI would have a higher frequency of recorded cutmarks as a result of the attention paid to the maximum meat extraction of these parts during butchery. However, the inverse can also be true; body parts and elements with low flesh weights (and subsequently low MUI values) may also display a higher CMF due to the relative lack of flesh between the skin and bone, such as flipper elements. Without the buffer of flesh and fat between skin and bone, these elements may be more likely to have cutmarks inflicted during skinning.

In Table 26, F388 and F386 CMF is reported as %CMF (where the total CMF counts per sample = 100%) with the associated MUI element(s). Hind flippers combine %CMF percentages of metatarsal, tarsal, and half of the overall phalanx CMF count per midden sample to account for

phalanges not being differentiated into front and hind during cataloguing. Front flippers combine %CMF percentages of metacarpals, carpals, and half of the overall phalanx CMF count per midden sample.

Element	MUI %	F388 %CMF	F386 %CMF
Cranium	20.7	17.1 %	8.1%
Cervical	34.5	5.3%	5.5%
Thoracic	21.7	13.2%	0.0%
Lumbar	29.1	10.4%	2.7%
Pelvis*	21.3*	3.9%	2.8%
Rib+	100.0	3.2%	5.4%
Sternum	2.6	0.0%	0.0%
Scapula+	20.3	2.5%	0.0%
Humerus+	10.8	0.0%	5.4%
Radius/Ulna+	4.4	1.3%	12.2%
Femur+	4.8	0.0%	2.7%
Tibia/Fibula+	16.6	13.2%	5.4%
Front Flipper	2.3	6.6%	10.9%
Rear Flipper	7.7	13.2%	39.2%

\* Pelvis includes sacral and caudal elements.

**Table 26 MUI and Associated CMF Per Element in F388 and F386.**

F388 demonstrates a positive correlation between high vertebral (thoracic and lumbar), cranial, and tibia/fibula MUI and high CMF. Low CMF of other high MUI elements such as the scapula, pelvis, and ribs show a negative correlation between MUI and CMF of these elements. Overall, there is a weak positive Spearman's Rho correlation coefficient with low confidence ( $r_s$

= 0.349 and  $p = 0.221$ ) suggesting that the weak correlation between MUI and CMF for the F388 sample is not statistically significant.

Compared to F388, F386 displays an inverse relationship between high MUI and low CMF in vertebrae, pelvis, rib, and scapula, elements. This inversion is demonstrated in flipper elements, which have a low MUI but high CMF in F386. The same is evident for the front limbs where radius, ulna, and humerus elements display a high CMF despite low MUI values. This pattern is confirmed by a weak negative Spearman's Rho correlation coefficient with low confidence ( $r_s = -0.219$  and  $p = 0.453$ ). These results indicate that the weak negative correlation between CMF and MUI in the F386 sample is not statistically significant.

To summarize, these results display a slight pattern of high MUI/high CMF correlation in F388 for head and vertebrae elements and low MUI/low CMF correlation for limbs and flippers; F386 displays a high MUI/low CMF of head and vertebrae elements and a low MUI/high CMF for front limbs and front and rear flippers. These observations are confirmed by a weak positive correlation coefficient in F388 and a weak negative correlation coefficient in F386, though neither correlation is statistically significant. However, because these elements occur slightly more frequently in each midden (higher head/vertebrae proportions in F388 and high limb/flipper proportions in F386), the high CMF for those elements in each sample is already accounted for (i.e., these elements are statistically more likely to have higher CMF because the samples contain higher proportions of those elements). Therefore, similar to how it was observed that MUI does not significantly correlate to MNE or MAU in either F388 or F386, it is unlikely MUI significantly correlates to CMF in either midden sample. Rather, it is possible that the weak correlation between CMF and MUI may point to the intention of the butcher to skin rather than deflesh the seals.

#### 4.9 Chapter Summary

This chapter first presented results of the BPR study, which used NISP, MNE, MNI, and MAU analyses to represent the distribution of seal body parts between F388 and F386. Through these analyses, it was observed that the front midden F388 had slightly higher counts and proportions of cranial and vertebrae elements, as well as scapula, pelvis, and rib elements. The rear midden F386 had lower counts of those elements, and higher counts of the limb and flipper elements. When %MAU was applied, the distribution of these elements was shown to be relatively similar between middens. When the elements were assessed to determine the MNI of each midden, both are shown to have a relatively equal amount of different seal bodies present, (24 in F388 and 26 in F386) and the MNI for the combined sample is only slightly higher (29). The MNI used the most frequently occurring element in each midden for this calculation, which was a cranial element for F388 and a front limb element for F386. The minimal increase in MNI when the sample is combined further demonstrates how the midden samples contain different proportions of body parts, but nearly all body parts are present in both middens. When the MNI and MAU results are considered together, it is unclear if portions of seal carcasses or whole seals were predominantly brought to House 10 for the butchery, processing, consumption, and eventual disposal of remains. When %MAU is considered, ribs and vertebrae occur very infrequently in both middens. To assess possible factors affecting the survivorship of elements in and between the two middens, BDV and MUI were compared against the BPR of F388 and F386. BDV is seen to similarly affect both midden samples, suggesting differences in BPR are not solely caused by density related destruction. MUI displays weak correlations with the increase or decrease in element frequency, and there is likely little to no relationship between BDV, MUI and BPR that is significantly affecting the distribution of elements between the middens.

CMF analysis demonstrates a higher proportional frequency of cutmarks in F386 compared to F388. This increase is made more notable when the higher level of fragmentation in the F386 sample is considered; due to fragmentation, more elements were recorded as unidentifiable and were not analyzed for cutmarks in F386. Consequently, there is a possibility that the CMF for F386 is higher than what is currently observed. CMF was further analyzed against MNE distribution to assess patterns in which elements were more often recorded with cutmarks. F388 displays a higher CMF for head and vertebrae elements and F386 displays a higher CMF for limb and flipper elements, though this observation is likely a reflection of the higher proportions of those elements in their respective samples, which increases the likelihood of those elements having cutmarks. CMF was further analyzed to determine if any patterns in the location of cutmarks (CML) were apparent. The locations of cutmarks on elements in both midden samples suggest that a variety of butchery and skinning activities may have occurred to elements disposed of in both F388 and F386. The CMF sample size is too small to assess whether some activities that result in specific types and locations of cutmarks occur more or less frequently in either midden.

To better understand the activities and tools associated with certain cutmark types and locations, the associated tool and artifact count (ATC) of each midden sample was reviewed. The high disparity in tool types and frequencies between F388 and F386 may indicate that different activities were associated with each midden space in the division of processing and disposal tasks in and around House 10. Lastly, CMF was considered in comparison to the MUI of seals to determine if elements of higher meat utility or consumption would display more or less cutmarks. F388 demonstrated a weak positive correlation of high MUI/high CMF for head and vertebrae elements, whereas F386 demonstrated a weak negative correlation of low MUI/high CMF for limb and flipper elements in F386. It is posited that the high MUI/high CMF for elements in F388 could

reflect efforts at maximum meat extraction where cutmarks are more likely to be inflicted. The low MUI/high CMF correlation observed in F386 reflects the lesser amount of fat and flesh between skin and bone, which may lead to the infliction of more cutmarks during the skinning process. However, it is acknowledged that these results may be more of a reflection of the relative frequencies of those elements increasing the CMF potential accordingly for those elements in each midden. Consequently, MUI is not observed to strongly influence the CMF in either midden sample. Ultimately, the distribution of body parts, tools, and artifacts between middens is more likely a reflection of the human choices in discard and disposal made by the occupants of House 10.



## **5. Discussion**

### **5.1 Chapter Introduction**

To determine how harp seal resource management activities were organized at Phillip's Garden across multiple households, the organization of disposal at House 10 is examined. By investigating disposal patterns at House 10 between two different refuse areas (F388 and F386) with different deposition characteristics, the possible ways that butchery, processing, consumption, and disposal of harp seal were organized at the household level can be interpreted. Further, how that household organization was designed to assist in the organization of resource management at the site-wide level can be theorized.

This chapter begins by first situating the two midden features associated with House 10 (F388 and F386) as comparable samples. This is followed by a review of the results of the data analysis presented in the previous chapter. Results of the body part representation (NISP, MNE, MNI, and MAU), survivorship (BDV and MUI) cutmark (CMF and CML), and other midden content (ATC) analyses will be consolidated. The observed differences in the BPR, CMF, and ATC between the front and rear midden will be evaluated. Based on these results, the processing, consumption, and disposal practices that influence midden location and deposition at House 10 are interpreted. Building on these interpretations, House 10 can be tentatively used as a model for how seal processing was organized within and across other Phillip's Garden houses during the middle phase in the site-wide organization of harp seal resource management. Four scenarios that can explain the activities occurring at House 10 in the site-wide organization of harp seal activities based on the F388 and F386 midden contents and characteristics are presented. One scenario is selected as the most likely, and the organization of harp seal activities at the household level is further theorized based on this scenario. Both a functional and ritual explanation is presented

regarding the differential deposition of seal crania at House 10. Speculation on the role of seasonality in the organization of middens at House 10 is discussed and noted as an area of future research. Following this, the theoretical framework of this research is revisited, and the chapter concludes with a summary.

## **5.2 Assessing Midden Feature Contemporaneity**

This thesis research began with the assumption that F388 and F386 were not the results of separate, individual depositional episodes but were instead the accumulation of harp seal refuse and household debris over multiple House 10 occupations throughout the middle phase. This assumption was formed during the initial assessment of the assemblage which demonstrated a high volume of faunal material and different amounts of artifactual material in each midden, suggesting that each midden was the result of accumulative practices and activities that were unique from each other. In addition, the physical locations of the middens were considered; both middens were excavated on the same stratigraphic levels and are located immediately outside of House 10, at the front and rear of the dwelling. The same stratigraphic level of recovery but different locations around House 10 further suggests the middens were used for different purposes.

As stated in the Introduction chapter, the term contemporaneous is used in this thesis to describe the continuous accumulation of harp seal and related refuse as a result of repeated behaviours enacted during different occupations of House 10 throughout the duration of the middle phase, spanning approximately 200 years. The term is not used to suggest simultaneous use of the midden features, as that cannot be established based on the available data. In the review of the thesis sample in the Introduction chapter, two possible scenarios were posed:

1. The middens represent depositional episodes from completely separate occupations (not contemporaneous), or

2. Butchery and deposition are organized in such a way that different harp seal carcass portions from similar processing events are deposited in both middens during the same occupation(s) or different seasons of occupation in the same years (contemporaneous).

It is possible that both the first and second scenarios occurred conjunctively. While the available data cannot confirm this with any degree of certainty, it does indicate that the front and rear middens were both used during the middle phase and are therefore comparable samples. Further, the BPR and ATC results confirm that neither midden represents a single depositional episode, but instead consist of the remains of disposal practices which would have occurred throughout the multiple occupations of House 10 during the middle phase (these occupations spanning at least 140 years, according to the House 10 radiocarbon dates).

Consequently, both middens represent the palimpsest of disposal activities in and around House 10 throughout its middle phase occupations, and comparisons between them are therefore founded and worthwhile. The differences in the front and rear middens suggest that disposal of seal body parts, tools, and artifacts indicate behavioural trends that reflect unique sets of activities contributing to midden deposition at the front and rear of House 10. If the middens were near-exact copies of each other and contained identical characteristics, the argument for their contemporaneity would be weakened: each midden could then represent separate refuse areas from different occupations that used each midden for the same types of activities that result in very similar deposition and midden characteristics. As this is not the case, analyses and interpretations of the midden features are therefore made on the assumption that the middens are contemporary features, in the sense that they both accumulated during the middle phase occupations through multiple deposition episodes.

### **5.3 Differential Body Part Representation Between F388 and F386**

Before presenting candidate scenarios for the activities that may have influenced the BPR, CMF, and ATC of each midden, the depositional characteristics of F388 and F386 must first be reviewed. Results of the NISP demonstrate that nearly all element types are represented in both middens, though it was immediately noted that elements were not equally distributed between the middens. To account for the difference in sample sizes and fragmentation levels, MNE, %MNE, MAU and %MAU quantification was used. Both the MNE and MAU results demonstrate a similar general pattern of element distribution between the two middens, though there are some differences of note. Whereas F388 has a higher frequency of cranial, scapula, and pelvis elements and lower frequencies of limb and flippers elements, F386 displays the opposite; limb and flipper elements constitute the majority of the midden sample. Both samples have low quantities of the high MUI vertebrae and ribs, though these elements are noted to occur more frequently in F388 than in F386. The specific results of the MNE and MAU analyses are outlined below.

Differences in the proportion of these elements as represented in the MNE and %MNE analysis in each midden are summarized as follows: F388 contained higher quantities of vertebrae and vertebrae fragments; F388 also contained more cranial elements, whole crania, and cranial fragments; more pelvis and scapula elements are recorded in F388; ulna, radius, patella, humerus, and femur elements are relatively underrepresented in F388. Comparatively, midden F386 contained higher frequencies of front and hind limb elements (femur, patella, tibia, fibula, ulna, radius, humerus). While there was a lower frequency of cranial elements overall in F386, there were over twice the number of mandibles present than in F388. Higher quantities of limb and flipper body parts in midden F386 and cranial and vertebrae body parts in F388 suggests that,

assuming no differential preservation, more of these body parts were disposed of in each respective midden. Rib elements are similarly represented in both midden assemblages in low frequencies.

The patterns evident in the MNE and %MNE comparisons are also reflected in the MAU results for each midden, though the vertebrae frequencies in both middens are reduced. The MAU analysis indicates that for F388 the head (7.5 MAU) is the most frequently represented element group. In F388 this is followed, in order, by the hind limb (5.1 MAU), front limb (4.4 MAU), hind flipper (3.7 MAU), front flipper (3.2 MAU), vertebrae (2.1 MAU), and ribs (1.3 MAU). For F386, the front limb (10.5 MAU) is the most frequent portion of the seal carcass present. The remaining ranking of animal units in F386 is the head (7.5 MAU), hind limb (6.8 MAU), hind flipper (4.5 MAU), front flipper (4.7 MAU), vertebrae (1.2 MAU), and ribs (1.2 MAU). It should be noted that the MAU (summed) counts has a limitation specific to this thesis sample: in MAU counts, head units do not account for the separation of the mandible from the cranium for disposal elsewhere. Consequently, the head count for F386 may be inflated due to the high frequency of mandibles present, which does not reflect the low frequency of most other cranial elements.

Both F388 and F386 contain some level of representation for all elements and body parts. The presence of all body parts in each midden suggests that both F388 and F386 were used for the disposal of all parts of the seal and is supportive of the suggestion that whole seals were brought to House 10. However, when the results of the MNE, %MNE, MAU and %MAU analyses are considered together, it is evident that each midden was used more often for the disposal of certain parts of the seals; the front midden F388 for the head, pelvis, scapula and vertebrae, and the rear midden F386 for the limbs, flippers, and mandibles. The differential distribution of these body parts supports the suggestion that portions of seal (rather than just whole seals) may have also been brought to House 10. Ultimately, the available data suggests that both whole and portioned seals

may have been brought to House 10, but it is not possible to confirm if one type (whole or portioned) occurs more consistently, as the differential preservation of elements must also be considered.

### *5.3.1 Factors Influencing Element Survivorship and BPR: Age, Bone Density, and Meat Utility*

Before interpretations of the human choices and social organization that could have contributed to the differences in BPR between F388 and F386 can be made, other influences on element survivorship must be assessed. The age of elements is closely related to bone density, because younger seal elements are less likely to survive due to low bone density and porous cortical surfaces which can exacerbate the impact of several post-depositional taphonomic processes (Symmons 2002, Lam et al. 2003). However, because elements of all age groups were observed in both middens, it is assumed that the excellent preservation at Phillip's Garden facilitated the survivability of the occasional newborn elements disposed of in the middens. Aside from a small increase in newborn element representation in F388, there is no significant difference in the age representation of body parts between midden F388 and F386. Again, assuming there is no differential preservation of elements between the two middens that would affect the survivability of different age elements, this suggests that the age of seals was not a factor in choosing which midden (the front or rear) to use for disposal. Bone density differences between element types is a more likely influence on element survivorship.

Using bone mineral density values compiled by Chambers (1992, cited in Lyman 1994), both midden samples were analyzed to assess if bone density could explain the differences or account for the evident similarities in BPR. A high BDV is expected to correlate with a high element frequency (positive correlation), as the denser a bone is, the more likely it is to survive in the archaeological record. The opposite is also true, a low BDV is expected to correlate with a low

element frequency. When MNE proportions of F388 and F386 were compiled and compared against the associated element BDV, a few anomalies in this hypothesis were noted. These anomalies were also evident when BDV was compared to MAU results, though generally it was observed that many high-density elements did display the expected higher frequencies. F388 and F386 demonstrate similarly moderate positive correlations between BDV and BPR with high significance levels (for F388,  $r_s = 0.545$  and  $p = 0.03$ ; for F386,  $r_s = 0.537$  and  $p = 0.03$ ). These results indicate that BDV moderately positively correlates to increases in MNE and MAU in both samples. The similar positive correlations observed between BDV and MNE and BDV and MAU in both samples indicates that elements in F388 and F386 were likely equally affected by taphonomic processes of bone density mediated destruction. Therefore, BDV does not explain the observed differences in BPR between F388 and F386.

When considering factors that could affect the BPR of each midden assemblage, the differential levels of fragmentation between the two assemblages must be accounted for. Of the entire front midden F388 sample (2543 elements), 1020 of these elements are unidentifiable fragments. Therefore, 40% of the assemblage was too fragmented to be identified. Comparatively, the rear midden F386 contained 2695 elements and 1360 of these elements are unidentifiable fragments, resulting in 50% of the F386 assemblage being too fragmented for identification. In both samples, all whole and partial elements could be identified, and only small fragments went unidentified. The 10% proportional difference in unidentifiable elements between the middens is interesting; assuming both the front and rear middens have minimal differential preservation, then the higher level of fragmentation in F386 could be a result of bone density differences. The moderately positive correlation between BDV and BPR in F386 could explain the different fragmentation levels; because F386 has higher quantities of lower density elements (e.g., ulna and

flipper elements), it is possible that the sample was more susceptible to fragmentation than the front midden sample, which had larger proportions of higher density elements. Further, the association of a charcoal concentration discovered with the harp seal elements in the F386 midden during excavation could also indicate that these elements were more often subjected to cooking, boiling, or roasting processes that would weaken the bone structures and account for the higher fragmentation rate. While fragments of burned bone were observed very rarely in sample analysis, evidence of boiling or cooking activities that do not alter the appearance of an element (in ways that are recognizable upon element observation) is highly possible: both the associated charcoal deposit as well as multiple soapstone fragments (soapstone being the material used for cooking vessels) recovered from the rear midden support the possibility that the elements disposed of in F386 were frequently subjected to boiling, cooking, or roasting activities.

Element age and bone density have so far been determined to not be a primary influence in the differential body part representation between middens. A third possible influence could be meat utility differences between elements and body parts. In their compilation of a MUI for phocid seals, Lyman et al. (1992) determined that the rib cage was of the highest food utility, followed in rank from high to low food utility by the pelvis, cranium, vertebrae, proximal limb elements (radius, ulna, humerus, femur, tibia/fibula) and lastly, the distal limb elements (carpals, tarsals, metacarpals, metatarsals, and phalanges). Lyman et al. (1992), like Binford (1984) and Bunn et al. (1986), assert that a MUI is useful when applied as an analytical frame of reference in the interpretation of BPR in faunal assemblages. Generally, if MUI plays a role in BPR, it is because elements of high MUI are more likely to occur in residential site assemblages than elements of low MUI, which would be disposed of at the kill site. Since differential transport of body parts from the kill site to the residential site is not a factor at Phillip's Garden, it is expected that both high



and low MUI elements would be equally represented in Phillip's Garden faunal assemblages. Both midden assemblages in this thesis study demonstrate only very weak correlations between MUI and MAU, indicating that the qualitative variable of food preference is only minimally responsible for the differential selection of body parts for consumption and eventual discard at houses (Diab 1998). When BDV is eliminated as a major contributing factor to differential BPR, the higher frequency of low MUI elements (the limbs and flippers) in comparison to the lower frequency of some of the highest MUI elements (the ribs and vertebrae) suggests that human choices in the butchery and selective disposal of seal body parts is the main cause of differential BPR. Therefore, these results are more likely a product of differential BPR due to unconventional human disposal choices for each midden sample rather than being a product of differential preservation due to MUI.

The two middens share the same stratigraphic levels of excavation and the same environmental influences on preservation, and element BDV and MUI are eliminated as contributing factors to the observed differential BPR. This confirms the hypothesis that the BDV and MUI of seal elements are not primary influences on BPR in F388 and F386. BPR in both middens is more likely a result of human choices in the organization of harp seal processing and disposal activities within and around House 10. These butchery, processing, consumption, and disposal practices can be revealed and reconstructed by analyzing cutmarks.

#### **5.4 Differences in Cutmark Frequency and Location Between Midden F388 and Midden F386**

A CMF of 5% is the average for assemblages of phocid bones (Lyman 1994). The overall cutmark frequency of both midden samples is higher than this average; 5.8% in F388 and 6.6% in F386. The CMF of F386 is particularly high. This high CMF is made even more notable in that the

quantity of identifiable elements in F386 is lower than in F388. Since only identifiable elements were analyzed for cutmarks during cataloguing and F386 has substantially more unidentifiable elements than F388, it is possible that the true CMF for F386 is even higher than 6.6% since it contains a higher proportion of element fragments that were not analyzed for cutmarks. However, F386 is still considered a sufficient sample as the sample size exceeds 1000 NISP (Grayson 1984).

In F388, most cutmarks occur on the vertebrae (35% of F388 cutmarks), cranial elements (17%), and ribs (12.5%). In F386, most cutmarks occur on the metatarsals (18% of F386 cutmarks), phalanges (15.7%), and radii (14.6%). These observations correlate with the MNE differences between assemblages, where F388 contains a higher amount of cranial and vertebrae elements, and F386 contains a higher amount of front limb and front/hind flipper elements. Therefore, a high CMF for these elements is expected. In both assemblages, cutmarks are almost always recorded as microblade cutmark types and very few biface cutmarks are noted. Below, observations on where cutmarks occur on cutmarked elements are made and the correlation between CMF and the ATC for each midden is discussed.

#### *5.4.1 Factors Influencing Cutmark Frequency and Location: Associated Tool Count and Meat Utility Comparisons*

In reviewing the placement of cutmarks on elements from both F388 and F386, it is evident that elements in both middens underwent processes of skinning, disarticulation, and meat removal. In both middens, cutmarks on elements are in predictable locations and any differences between cutmark locations on elements between F388 and F386 can be attributed to the positive correlation between higher frequencies of elements and a resulting higher CMF. Essentially, the more cutmarks recorded per element group in one midden (correlated to a higher MNE of that element), the more likely for those cutmarks to occur on a variety of locations on those elements, and vice versa: the less represented an element is in one midden, the less likely it is for cutmarks to occur

often enough that all possible cutmark locations are present. The CMF sample size is not large enough to indicate if the elements demonstrating evidence of these butchery and processing behaviours were more or less frequently associated with the front or rear midden. To inform on the possible division of the primary practices associated with each midden and the reflection of these practices in the midden composition, the associated tool and artifact count is considered.

When the ATC of F388 and F386 is considered in conjunction with the respective CMF of each assemblage, it is observed that the rear midden F386 contains a substantially higher concentration of tools (262) and has an unusually high cutmark frequency recorded on elements (6.6%). This may suggest that the higher density of tools deposited in the rear midden is reflective of practices that were more focused on the processing of elements for consumption amongst other domestic activities where cutmarks and tool deposition are more likely to occur. This interpretation is supported by the opposite observation made in F388, where the low ATC (45) correlates to a CMF of 5.8%, which is more typical of the average CMF in phocid assemblages (5%), but low in comparison to the F386 CMF (6.6%). The increased fragmentation and ATC in the rear midden support an interpretation of different associated activities related to element and artifact deposition between the front and rear midden of House 10.

When CMF is compared to MUI values for the associated elements, the weak positive correlation in F388 and the weak negative correlation in F386 is determined to not be statistically significant, and it is concluded that there is no observed correlation between CMF and MUI. The inverse correlations between middens (positive for F388 and negative for F386) is accounted for by the inverse MNE distribution, where F388 has higher frequencies of high MUI elements and F386 has higher frequencies of low MUI elements.

## **5.5 Theorizing the Organization of Butchery and Processing Tasks Within and Between Households**

Based on the results of the BPR and CMF analyses, two things can be inferred about the social organization of butchery and disposal around House 10. First, the presence of two midden features around one house used during the middle phase that display both similarities and differences in the types of body parts, the proportions of body parts, and the types of tools and artifacts being disposed of in each midden suggests that there was an organization of disposal around House 10. Second, the presence of nearly all body parts in both middens suggests that this organization was not strict or rigid; at times and to different extents, both middens were used for the disposal of all body parts. This is further reflected in the locations cutmarks occur on elements, demonstrating that elements in both middens were subjected to skinning, disarticulation, meat removal, and consumption activities. When building on the assumption that the two middens are comparable features (both accumulated during the middle phase occupations of House 10), the different primary behaviours related to each midden have interesting implications in the consideration of a spatial organization of butchery and processing activities at both the household and site-wide levels. These implications are inferred from the elements present in the middens, as well as the elements absent.

F388 and F386 both contain the same types of elements. While the distributions of elements between the front and rear middens demonstrate observed differences in the head and limb elements, both samples have very low counts of rib and vertebrae elements. Rib and vertebrae elements both rank high in the MUI, so their absence is interesting. The relative absence of ribs and vertebrae elements in both middens represents a “reverse utility” scenario, where the elements highest in meat or general utility are low in density so they produce a negative hyperbolic relationship between utility and element frequency (Grayson 1989). Therefore, in typical faunal

assemblages, the absence of these elements is explained based on the lower rates of their survivorship, either due to density mediated destruction or to consumption activities. However, at Phillip's Garden, the BDV studies show that both samples were equally affected by density-mediated destruction, and the excellent organic preservation conditions suggest that the density-mediated taphonomic destructive processes were not a significant influence on element survivorship in this sample. The ribs and vertebrae have similar density values as some of the limb bones which, as noted, occur very frequently in the sample. If the cause for missing rib and vertebrae portions is not only due to preservation-related influences, then it is likely the result of selective processing and disposal behaviours.

It is commonly observed that Arctic communities travel and converge at aggregation sites to pool labour and organize hunting, butchery, and processing activities to maximize the amount of food and materials being produced (Savelle and Dyke 2014, Friesen 2022). When tasks of hunting, butchery and processing are divided amongst subgroups of people in a larger community, focal resources can be more effectively managed, resulting in more of that resource being procured. Phillip's Garden is a good example of an Arctic aggregation site where this division of labour occurred. House 10 would have operated in the site-wide context of hunting, butchery, processing, and consumption activities. Upcoming, I offer four scenarios that can explain the BPR results of the House 10 sample and provide explanations for the presence and absence of different elements. These scenarios all seek to offer possible answers to the main question guiding this thesis: how were processing, consumption, and disposal activities organized at House 10, and what does the household organization suggest about the organization of harp seal management at the site-wide level? In the next section, four scenarios that address the different possibilities for the butchery

and disposal of harp seal at Phillip's Garden middle phase based on the contents of the House 10 middens are presented.

#### *5.5.1 Four Candidate Scenarios for the Organization of Hunting, Butchery, Processing, and Consumption at Phillip's Garden During the Middle Phase*

In the first scenario, whole seals are dragged to House 10 where their butchery, processing, and eventual disposal occurs in a spatially organized way. This scenario is supported by the MNI, which can be used to infer that the disposal of whole seals was divided between the front and rear midden, suggesting that, at times, whole seals would have been brought to House 10. The combined MNI between F388 and F386 (29), is relatively similar in count to the individual MNI per midden (24 for F388 and 26 for F386). The MNI counts for each midden are calculated using different elements of the seal (the auditory bulla for F388 and the radius for F386). This, combined, with the NISP and MNE results which demonstrate all elements (aside from an axis element) are present when the two midden samples are combined, suggests that it is very possible whole seals were transported to House 10 and disposed of between the two middens. In this scenario, households may have both operated as individual hunting crews, or pooled labour with other households for the hunting activity only. If whole seals were frequently brought to individual houses after the hunt, then the ensuing harp seal processing activities would have occurred mostly within individual households rather than at the communal, multi-household level. The slight increase in high MUI elements in the front midden may represent defleshing at the front of House 10 for consumption inside the house. Elements that are more difficult to deflesh, such as the limbs and flippers, may have been transported inside of the house where they could be further processed and defleshed via boiling, cooking, or roasting methods before being disposed of out the back of the house in the rear midden. This would account for the higher frequency of cutmarks on elements in the rear midden and the higher ATC that suggest processing and cooking activities (various

blade tools, charcoal concentration, and soapstone fragments). This scenario is weakened by the missing/low frequency portions of seals (the ribs and vertebrae, which occur infrequently compared to the head and limb elements, which occur very frequently), and by the elements missing from the overall sample entirely (axis vertebrae), which do not allow for it to be established with certainty that whole seals were frequently brought to House 10. While BDV and MUI can be used to account for low proportions of ribs and vertebrae to an extent, the low proportions of other high MUI elements with higher BDV, such as the scapula and pelvis elements, suggests that seals could have also been brought to House 10 in portions.

The second scenario considers the communal aspect of large aggregation sites and the physical spatial element of butchery, processing, and disposal at Phillip's Garden. To maximize harp seal procurement and processing, it is likely that multiple households joined together to hunt and butcher seals. These group hunts would bring whole seals back to Phillip's Garden where they would be communally butchered either near dwellings or perhaps in a central, open area. A mix of portioned seals and whole seals would be transported back to individual houses. The primary tasks of drying meat for storage, preparing skins, rendering blubber, creating cordage etc., would be divided amongst the multiple households. Portions of the seal that could not be prepared for storage because they are more difficult to deflesh or have a low MUI (such as the cranial, limb, and flipper elements) would then be distributed between the multiple households for daily consumption and processing activities before being disposed of at house middens. The communal organization and division of tasks that form the basis of this scenario is strengthened by the spatial distribution of houses at Phillip's Garden, where multiple large dwellings are located proximal to each other across the site. This distribution would suggest that, beyond just aggregating in one location, the occupants of these households would coordinate many aspects of daily life at the site and pool

their labour. This scenario is weakened by the absence of an identified communal butchery area at Phillip's Garden. No large middens not associated with a dwelling have been located at the site, suggesting that butchery and disposal likely more often occurred at individual houses.

In the third scenario, whole seals are dragged to House 10 where they are butchered, processed, and then disposed of between the front and rear middens. In this scenario, different to the first scenario, the high MUI portions like the ribs/back flanks (i.e., the ribs and vertebrae) are separated from the seal during butchery at House 10 and are subsequently taken somewhere else at the site for drying/storage or processed to be taken away from the site for later consumption. This scenario accounts for the low frequency of the rib and vertebrae body parts at House 10 but does not explain why limb and flipper elements occur more than the remaining elements of the seal (ribs and vertebrae excluded). If whole seals were indeed frequently brought to House 10 for butchery and only the ribs and vertebrae were removed and taken elsewhere, then the limb and flipper count would be expected to occur in relatively equal frequencies with the pelvis, scapula, and crania body portions. However, this is not the case, so this scenario does not explain the disproportionally high limb and flipper element count compared to other elements such as the pelvis and scapula. This scenario is weakened by the differential survival rates of elements at Phillip's Garden. Even when preservation is known to be good, some elements simply survive the decomposition process differently: the non-limb and flipper elements (ribs and vertebrae especially) may have indeed been frequently disposed of at House 10 and are just no longer present in the archaeological record. It is not possible to confidently attribute the absence of these elements to either transport/storage elsewhere, or element destruction during decomposition alone.

The fourth scenario combines aspects of the first, second and third scenarios. Here, the aggregation nature of the site is centrally considered. With the small, seasonal window of harp seal



hunting, the aggregation community of Phillip's Garden would have had peaks of activity where the communal tasks of hunting and processing are taking place. During these peaks, seals would have been returned to House 10 as both whole and portioned carcasses, depending on where the primary butchery occurred (either at House 10 or other elsewhere). In this scenario, the presence of all elements at House 10 could reflect the likelihood of whole seals being brought to House 10 for processing and consumption, or different portions of the seal being divided between households for consumption where the accumulation of different portions over time results in all elements of the seal eventually being present. The ratio of whole to portioned seals being brought to House 10 cannot be determined based on the available data, so for this scenario, both whole and portioned seals are considered equally likely to have been brought to House 10. The higher counts of high MUI elements, such as the crania, scapula, pelvis, and to lesser degree (but comparatively more than F386), the ribs and vertebrae in the front midden could reflect the processing of these elements at the front of the dwelling upon arrival of the seal carcass at House 10, before the meat (stripped from the bones) was taken inside the house for further processing and consumption, following the discard of those bones in the front midden. The high frequency of limb and flipper elements along with a high ATC in the rear midden could reflect these low MUI elements being processed for meticulous meat extraction either inside or outside of House 10 before being disposed of in the rear midden.

The above four scenarios are all generated based on the data retrieved from the midden analysis results of F388 and F386. However, the data analyses for the House 10 midden samples do not distribute credibility equally between all the scenarios. I argue that the fourth scenario, which combines aspects of the first, second, and third scenarios, is the most likely interpretation of an organizational system of harp seal management at Phillip's Garden. The MNE and MAU

data analyses support the notion that a mix of whole and portioned seals were brought to House 10. The different frequencies of seal body parts evident in the midden samples support the idea that whole seals may have been divided during primary butchery and disposed of between the front and rear midden of House 10 based on processing needs, where the high MUI elements that are easier to deflesh are processed and disposed of at the front of the house, while the low MUI elements harder to deflesh are processed inside the dwelling before being disposed of at the back of the house. This interpretation explains the differential distribution of elements between F388 and F386. This scenario also accounts for why the ribs and vertebrae occur so infrequently at House 10, as it suggests that these elements may have sometimes been processed elsewhere on site to be dried and taken to other sites for off-season consumption, but also considers the likelihood that they are absent due to their higher susceptibility to post-depositional destruction. This scenario offers an interesting glimpse into the relationship between a single household and the community: households could have represented different hunting crews, who both hunted for their individual households and joined forces with other household crews to maximize seal procurement and divide butchering and processing tasks amongst the labour pool. The division of labour and tasks would have adapted to the needs of the household and entire community throughout site occupation both before, during, and after the spring aggregation. What the above scenarios do not yet explain is the notable difference in crania representation between the front and rear midden. The next section explores this observation and its implications.

#### *5.5.2 A Functional and Ritual Explanation for the Differential Distribution of Seal Crania at House 10*

In the comparison of BPR between the front and rear middens of House 10, there is an unequal distribution of seal crania. More whole crania and cranial elements occurred in the front midden compared to the rear midden. Interestingly and as noted before, more mandibles occurred in the

rear midden than the front midden. The difference in the amount of seal crania deposited between the two middens could have both functional and ritual explanations. Functionally, the seal heads are high in MUI (as the brains are high in fat), but the extraction of meat from the heads is difficult. It is possible that the heads were simply removed and discarded at the front of the house before other portions were stripped and taken inside the house for further processing. It is further possible that the separation of the mandible from the crania and its deposition in the rear midden reflects efforts at extracting meat from the mandible and could indicate tongue removal. The presence of cutmarks on two mandibles (on both the dorsal and ventral aspects) and a cutmark on a hyoid bone in the rear midden sample is supportive of the likelihood of tongue removal (Wells 2002). The processing required for the meat extraction of the mandible may have been similar to the limb and flipper portions in terms of required effort; the mandible may have been removed from the crania for further processing inside the house, then eventually disposed of in the rear midden.

While a functional explanation can account for the differential distribution of seal crania and mandibles between the two middens, the possibility that these differences are the result of ritual activity is also plausible. As discussed in the Background chapter, the ritual placement of seal skulls at or near the entrance of dwellings is a common practice amongst various Arctic hunting communities (Murdoch 1892, Lantis 1947, Fienup-Riordan 1994, Wells 2002, Wells 2011). The location of F388 adjacent to the entrance of House 10 could suggest that the front midden area was also used for the ritual placement of seal skulls. As demonstrated, F388 is the only midden at House 10 to have multiple near-whole crania present in the assemblage. At Phillip's Garden, the presence of full crania and the higher frequency of cranial elements in the front midden of House 10 is also evident at House 18, where one midden near the front entrance was noted to have both fragmented and intact seal crania (Cogswell et al. 2006). It is possible that the suggested

ritual placement of seal skulls at the front of the dwelling near midden F388 required the separation of the mandible from the crania, and the mandibles were eventually discarded into the rear midden F386.

The earlier Paleo-Inuit occupation of the Port au Choix area, the Groswater, are also believed to have practiced a ritual treatment of seal skulls. In her study of Groswater midden assemblages from Phillip's Garden East and Phillip's Garden West, Wells (2002, 2011) observed a higher frequency of cranial and rear flipper elements at Phillip's Garden East and a much lower frequency of cranial elements, but higher frequency of front limb, rear limb, and front flipper elements, at Phillip's Garden West. Seal crania were found near the entrance of the Phillip's Garden East dwelling and are posited to have been ritually placed there by the hunters (Wells 2011).

Like how Wells (2002) suggests that Phillip's Garden East operated as the hunting and primary butchery site, where seal crania were deposited at the entrance of the dwelling where the hunters would have resided, the same observation is noted at Phillip's Garden for House 10 and 18. While the placement of seal skulls at or near dwelling entrances is a documented occurrence in multiple Arctic hunting culture contexts (Murdoch 1892, Lantis 1947, Fienup-Riordan 1994), the case for similar behaviour at House 10 is interesting; the placement of these ritually significant elements in a refuse midden does not, at first, seem convincing. I argue there are two possible explanations for this. First, it is possible that seal crania were placed near or immediately inside the house entrance. Perhaps as more seal crania were brought to the house, or as crania were trampled by foot traffic, they were then replaced and deposited into the middens, primarily the front midden. This would explain the high frequency of crania at the front of House 10. However, this possibility is weakened by the absence of crania and cranial remains recovered from

excavations inside the walls of House 10. In addition, the area in front of House 10 was not fully excavated, so it also remains possible that there exists a deposit of seal crania adjacent to the front midden, and the high crania count in F388 is the result of this deposit spreading, either in the depositional or post-depositional context, into the midden area. The second explanation is that these ritually significant crania were indeed placed in front of the dwelling, regardless of their proximity to, or placement within, the front midden.

While the deposition of a ritually significant object into a midden seems curious, there is precedent for ritually important objects being recovered from middens in Dorset contexts. Many elaborate carvings, tools, and other artifacts assumed to have held a ritual significance are often found in middens at Dorset period sites (Lemoine et al. 1995, Wells 2002, Zságer 2010, Wells 2011, Hardenberg 2013, Betts et al. 2015). Lemoine et al. (1995) note that Late Dorset ivory carvings and figurines can be found in discard middens on Little Cornwallis Island, and the authors stipulate there is no correlation between the presence of these ivory carvings and figurines and the type of feature they are recovered from (dwellings or discard middens). Polar bear bones are also afforded special treatment in Dorset contexts; at a Dorset period settlement on Dundas Island in the High Arctic, several bear forelimbs and eleven skulls, with at least one skull having painted red ochre dots, were all believed to have been retained on site for ritual purposes and were recovered in the midden and surrounding landscape of the site (McGhee 1976, Sutherland 2003, Zságer 2010). Dorset polar bear effigies (figurine carvings) associated with shamanistic rituals are also commonly recovered from middens. In a study of Dorset polar bear effigies, Betts et al. (2015) note that of their study assemblage, approximately two thirds were recovered from dwelling contexts, and the remaining third was recovered from midden deposits at various Early, Middle, and Late Dorset sites. Dorset period middens generally, and the House 10 middens specifically,

were likely multifaceted activity areas that were used for more than just the disposal of refuse. While the placement of ritually significant objects in a refuse area may not be an expected or widely observed practice in other cultural or archaeological contexts, it is very possible that this practice occurred at Phillip's Garden and the high seal crania count in the front midden is a result of a ritual treatment of these elements.

With the site-wide organization of harp seal butchery, hunting, processing, and consumption theorized based on the results of the House 10 midden analysis, and the placement of seal skulls discussed, it is now prudent to more closely consider how House 10 operated under the situational conditions that the fourth scenario outlines.

#### **5.6 House 10 Occupant Behaviors and Activities Influencing Midden Deposition between F388 and F386**

The selected fourth scenario focuses on the communal aspects of task organization at a large Arctic culture aggregation site. At most other Dorset aggregation sites, nearly every aspect of life was in some form communally related or organized, suggesting an egalitarian framework of power. Friesen (2007) describes the egalitarian social frameworks evident in the Late Dorset aggregation sites. Longhouses (communal houses which would house multiple families/groups) and hearth rows (concentrations of near-identical hearths built in close proximity to facilitate group cooking and processing at aggregation sites) are considered two primary markers of egalitarian social structure in the Late Dorset period (Friesen 2007).

The design of the Middle Dorset period Phillip's Garden site has interesting parallels and contrasts to the markers of egalitarian frameworks at Late Dorset aggregation sites. Phillips Garden does not have a longhouse structure or hearth row feature. However, it is possible that the large houses at Phillip's Garden may have acted as individual "longhouses" in the sense that they likely

housed multiple families who would have been sharing space and resources. Like in longhouses, it is possible that the social structure for the occupants of each large house was not hierarchical, and the division of tasks and labour was based on “ties of mutual aid and responsibility” (Friesen 2007: 205) rather than power rankings. It is also possible that there were not discrete divisions both within and between large multifamily households at Phillip’s Garden, and houses effectively represented microcosms of the larger community.

There are no discrete hearth features so far identified at Phillip’s Garden. This obviously differs from what is commonly observed in the Late Dorset aggregation sites, where hearth features are concentrated into rows and are easily identified by their uniform construction style. The identification of burned areas suggestive of cooking activities have been located both internal and external to houses at Phillip’s Garden. These cooking areas at Phillip’s Garden are largely informal and marked by burned areas with associated flat stones or are interpreted as being one of the uses of the typical Middle Dorset period dwelling axial feature. Axial features are usually situated between the side and rear platforms in large houses, such as House 10. Similar to discrete hearths, these axial features would have existed as the focal points around which occupants gathered. Unlike with typical hearth rows which can be remarkably uniform (Friesen 2007), the informal and disparate design and size of possible cooking areas at House 10 suggests that different processing activities may have been divided amongst house occupants and the space both within and around House 10 was used accordingly.

#### *5.6.1 Speculation on the Influence of Seasonal Occupation at Phillip’s Garden on Midden Organization*

As stated, the different frequencies of seal body parts evident in the midden samples support the idea that a mix of whole and portioned seals may have been divided during primary butchery and disposed of between the front and rear midden of House 10 based on processing

needs, where the high MUI elements that are easier to deflesh are processed and disposed of at the front of the house, while the low MUI elements harder to deflesh are processed inside the dwelling before being disposed of at the back of the house. The higher ATC in the rear midden reflects the disposal of tools used in the processing of the limbs and flippers in the rear midden along with those body parts. These factors combine to support the assertion that middens were spatially organized to reflect strategies and practices of harp seal resource management at the intra and inter-household levels at Phillip's Garden.

What this interpretation does not consider is seasonality. As discussed, Phillip's Garden was a hunting village that was densely populated in the late winter and spring to intercept the northward migration of the harp seal pack. While the population of the site would have been at its height during this time, Phillip's Garden was also likely either continuously or sporadically populated by a smaller subset of the aggregation throughout the year (Murray 1992, Erwin 2011, Wells 2012). The differences in midden composition between the front and rear of House 10 could both reflect different activities associated with their use during the spring aggregation, and the focused use of each midden during other seasons throughout the year (the front midden in the winter and the rear midden in the spring). However, this thesis study did not apply measures to determine seasonality based on faunal material in the middens, as has been performed in previous studies of other Phillip's Garden faunal material (Hodgetts 2005). Therefore, any interpretation of midden organization based on seasonality is entirely speculative and unsupported by the data in this thesis. However, such speculation is worth discussing, as an approach to midden organization at Phillip's Garden using seasonality indicators (such as bone measurements to determine seasonality of the harp seals present in both middens based on age, as demonstrated by Hodgetts 2005) would be worthwhile in future studies of Phillip's Garden houses that have more than one



midden feature from the same phase of site occupation. While seasonality was not measured in this thesis, the differences in BPR and ATC can be used to speculate on the role seasonality would have played in midden organization at Phillip's Garden. The BPR and ATC results can be considered suggestive of alternative interpretations of midden organization that share similarities with aspects of the midden formation practices of two other Arctic hunting cultures: the Willow Lake Dene (Janes 1983) and the Nunamiut Inuit (Graham et al. 1982).

Janes (1983) observed that the Willow Lake Dene managed hunting camp sites through regular seasonal maintenance operations. Following the snowmelt, the refuse and debris surrounding dwellings would be collected into piles and burned (Janes 1983). The burning of the debris would result in highly fragmented and burned faunal material intermixed with an assortment of tools and other house or site debris in the middens (Janes 1983). While there is no evidence of largescale surface burning or midden scatter at Phillip's Garden, the cleaning aspect of the Willow Lake Dene midden formation reflects similarities to the interpreted activities that contributed to the rear midden formation at House 10. It is possible that some the elements, whole, partial, and especially fragmented, were discarded in the house during cooking processes around the dwelling axial feature. Upon either leaving the dwelling at the end of the spring aggregation, or upon return to the dwelling before other periods of occupation throughout the year, this debris may have been collected and disposed of at the rear of the house, in F386. This debris would include the fragmented limb, flipper, and mandible elements that were processed inside the house, along with the many tools used to process them. The charcoal and soapstone fragments that resulted from cooking activities are also included in this collection of debris. This interpretation suggests that the House 10 rear midden is formed primarily by a series of intermittent large scale deposition episodes of house debris prior to or following a seasonal occupation, in conjunction with the

continuous accumulation of larger (whole and partial) seal elements during the occupations of House 10. As there is no way to separate discrete deposition episodes in either midden, it must again be stated that this interpretation is purely speculative.

The Nunamiut Inuit midden formation analogy also positions seasonality as a major contributing factor to midden formation. Graham et al. (1982) consider the spatial organization of midden features at habitation sites as a seasonally strategized adaptation: at winter sites, middens are placed close to the dwelling entrance for ease of access and because the cold temperatures and snowfall would delay the decomposition of material in the midden. At sites used during warmer seasons, middens would be placed further from the dwelling to minimize odour and insects that could not only prove bothersome to site occupants, but in the case of insects, interfere with food processing activities (Graham et al. 1982). The higher counts of scapula, pelvis, rib and vertebrae elements in the front midden may also reflect the high MUI portions that were dried and stored during the spring hunting season being consumed by the smaller group of House 10 occupants in non-peak seasons of site occupation during the summer, fall, and winter, or can be reflective of harp seal hunting during the southward migration of the seal pack in December. In the spring during the height of the seal hunt, refuse may have been directed to the rear midden to minimize the smell of decomposition and the interference of insects during food processing inside the dwelling.

Both the interpretations of intra and inter-household midden organization supported by the data in this thesis and the above speculation on seasonal aspects of midden formation consider how occupants at Phillip's Garden and House 10 conceived, perceived, and structured their living space and activity areas. With the interpretative approach of this thesis now fully discussed, the theoretical framework of this research will be revisited.

## **5.7 Agency, Structure, Practice, and the Division of the House 10 ‘Taskscape’**

Returning to the theoretical framework applied in this thesis, the concepts of agency, structure, practice, and taskscape can be used to better understand the organization of butchery and disposal at House 10. If the two middens represent the palimpsest of tasks occurring in and around House 10 throughout the middle phase, the similarities and differences in BPR, CMF, and ATC between F388 and F386 can be credibly used to theorize the types of activities that contributed to midden formation. The theoretical interpretation of activities occurring at House 10 will first be considered at the intra-household level before discussing the application of structure, agency, and taskscapes on the inter-household level.

At the intra-household level, the midden spaces of House 10 are purposeful and structured spaces that resulted from the deliberate planning and execution of household harp seal management activities. Middens, as both a site feature and representation of human behaviour, exist as structures, and their use is structuring. As a structure, these middens are templates in the division of tasks and activities. The House 10 middens are structuring in that the different activities they are used for organizes the social labour of the household occupants. The activities that resulted in the creation and accumulation of the front and rear midden would have been continually repeated within and between different occupations of House 10 throughout the middle phase. The evidence of these activities appear as patterns and trends in the differential BPR, ATC, and CMF of the two middens. The differences between the middens are not considered random; the occupants of House 10 developed a system of disposal regarding where different practices would take place, and where refuse from those activities would be disposed of between the front or rear of the house. The location of these activities is evidence of people repeatedly acting in ways mutually agreed upon, deciding how and where disposal should take place. These repetitive

activities reinforce the understanding of how the site should be lived in, and the middens are the physical result of this reinforcement. While the middens cannot be definitively placed in the same precise temporal context of simultaneous use, the results of their comparison indicate that House 10 occupants perceived the middens as having different purposes.

The results of the House 10 midden analyses also suggest that individual households operated as part of a larger cooperative task system at Phillip's Garden, suggesting a structured inter-household management. The taskscape of the overall site would have been coordinated into mutually interlocking task areas; where the primary butchery would take place, where the skins were processed, where blubber was rendered, cordage sewn, meat cured and dried, etc. The midden data from House 10 reveals that the household occupants repeated sets of activities that not only formed their physical taskscape in the creation of two midden spaces, but also formed the structure of these activities, which would have required the organization of tasks at the household level to coordinate with the organization of tasks at the site-wide level. The temporal aspect of the taskscape is evident in the creation and continual reinforcement of differential disposal between the front and rear of the house. The amount of time in which these activities took place throughout the middle phase is as important as the types of activities occurring. For these middens to accumulate differently, the unique sets of activities that contributed to the differential BPR, ATC, and CMF of the front and rear midden would have needed to be sustained over long periods of time, throughout and between the different occupations of House 10.

## 5.8 Future Research

The results of this thesis study substantiate all previous claims that houses at Phillip's Garden were used as workspaces in the processing, consumption, and disposal of harp seals. It is still unknown if the trends observed in BPR between the front and rear midden of House 10 are site-wide and occur at other large middle phase houses or are only specific to House 10. Similar studies of the midden assemblages of other middle phase houses are needed to confirm and expand the current proposed system of organization at Phillip's Garden. By applying the same methods of analysis used in this thesis study to other faunal assemblages retrieved from different houses at Phillip's Garden, any similarities and differences can be used to elucidate how multiple households pooled and organized their labour during the seasonal settlement of Phillip's Garden. Further areas of future research include the precise radiocarbon dating of the front and rear midden levels of House 10 to establish midden contemporaneity and seasonality studies of the faunal material that use bone measurement methods to determine seasons of site occupation between the winter and spring (following Hodgetts 2005). Seasonality studies of assemblages retrieved from other Phillip's Garden houses that have two or more middens from the same phase of site occupation would be a particularly interesting continuation of the investigation into the organization of harp seal resource management activities through midden analysis at this site.

## 5.9 Chapter Summary

This thesis project has attempted to isolate and identify harp seal resource management practices at House 10 and suggest possible interpretations of the organization of this management at the site-wide level. Middens represent a structured way of organizing activities of butchery, processing, consumption, and disposal of harp seal at Phillip's Garden. The structuring activities of deciding what harp seal remains, tools, and artifacts are deposited in which midden are cultural acts. By isolating the practices that contributed to the accumulation of material in the front and rear middens of House 10, the structure of how these practices were divided and enacted can be interpreted, and nuanced differences in the butchery, processing, and disposal of refuse at House 10 become indicators of cultural acts. Ultimately, the human choices in the organization of harp seal disposal at Phillip's Garden on an intra and inter-household level proves to be a worthwhile lens of analysis when attempting to better understand the daily life of the Middle Dorset Paleo-Inuit at one of their largest known aggregation sites.

## **6. Conclusion**

### **6.1 Project Summary**

This thesis project has analyzed and compared two midden faunal assemblages from a Middle Dorset period house at the Phillip's Garden site in Port au Choix, Newfoundland. The middens at the front (F388) and rear (F386) of House 10 were compared to assess similarities and differences in harp seal body part representation, age representation, cutmark frequency and location of cutmarks on elements, and associated tools and artifacts. Factors affecting preservation and survivability of elements, such as meat utility and bone density, were considered and used to interpret results when comparing the body part representation of F388 and F386. The overarching aim of this thesis is to present and investigate evidence of harp seal disposal in and around a typical middle phase Dorset period house at Phillip's Garden to determine the relationship between the intra and inter-household organization of harp seal butchery, processing, consumption, and disposal activities. In the Introduction, five questions were posed to guide the investigation of how processing, consumption, and disposal activities were organized at House 10, and how that household organization reflected and assisted a site-wide organization of harp seal related activities at Phillip's Garden. Those questions were:

1. Are there differences in what element types show signs of butchery, cutmark frequency, and location of cutmarks on elements between midden F388 and midden F386?
2. Are there differences in seal body part representation between midden F388 and midden F386?

3. Could any differences in body part representation, cutmark frequency, cutmark location, and associated tool counts suggest a difference in how the middens were conceived, utilized, and organized by the house occupants?
4. What inferences can be made about the spatial and social organization of disposal activities within and around a single house at Phillip's Garden?
5. Can an intra-household analysis of processing, consumption, and disposal organization be used to interpret the inter-household communal organization of harp seal processing at Phillip's Garden?

The Discussion chapter explored these topics in detail. Below, the answers to these questions are summarized.

*Are there differences in seal body part representation between midden F388 and midden F386?*

There are observed similarities and slight differences in body part representation between midden F388 and F386. The front midden F388 contained proportionally more cranial, scapula, and pelvis elements. The rear midden F386 contained proportionally more mandible, front limb, hind limb, and flipper elements, including radius, ulna, humerus, femur, mandible, phalanx, metacarpal, metatarsal, carpal and tarsal elements. Nearly all elements of the seal were represented to differing extents in both middens. Neither midden has significant frequencies of rib and vertebrae elements when MAU analysis is applied, though the front midden is observed to contain more of these elements overall. The proportion of age groups of elements between the two midden assemblages was similar, though the front midden F388 was observed to have a slightly higher newborn element frequency than the rear midden. The difference in newborn representation is



minimal, so the age of harp seal remains is not considered a primary influence in BPR between the middens at House 10.

*Are there differences in what elements show signs of butchery, cutmark frequency and location of cutmarks on elements between midden F388 and midden F386?*

There are differences in CMF between F388 and F386. F386 has a higher CMF than F388. The substantial increase of associated tools in F386 could indicate more intensive processing activities associated with the elements being disposed of in the rear midden, which would increase the likelihood of cutmark events on elements. There are not consistent differences in the locations of cutmarks on elements between F388 and F386, and any differences must be considered minimal due to the small sample sizes (89 cutmarks in F388 and 88 cutmarks in F386).

*Could any differences in body part representation and cutmark frequency/location suggest a functional difference in how the middens were conceived and organized by the house occupants?*

The similarities in BPR indicate that, at times, both middens were used for the disposal of all parts of the seal. However, the differences observed in the distribution of BPR, ATC, and CMF between the two middens suggests that each midden was more often associated with different sets of practices, activities, and behaviours. It is observed that the front midden F388 was more frequently used for crania, vertebrae, scapula and pelvis element disposal and the rear midden was more frequently used for limb and flipper element disposal. This could reflect the different seasonal occupations of House 10, the different uses of the two midden spaces during the same season of occupancy, or a combination of both. The front midden is theorized to be where high MUI seal portions which may have been processed inside the house (scapula, pelvis, crania) and other household debris were frequently disposed. While ribs and vertebrae occur infrequently in both middens, they are observed to occur more often in the front midden, further suggesting that

high MUI elements are typically processed and deposited in the front midden. The rear midden is theorized to be the area of disposal for elements more often processed for consumption inside or outside of the house and then deposited in the rear midden; the high limb and flipper count and significantly high ATC suggests that meat extraction from low MUI elements was a primary behaviour that resulted in the rear midden composition. The charcoal concentration and soapstone remnants suggest that these elements were frequently subjected to cooking, boiling, and roasting activities, which could have occurred inside the house or in cooking areas external to the house.

*What inferences can be made about the spatial organization of disposal activities within and around a house at Phillip's Garden?*

The differences in midden composition between the front and rear middens of House 10 suggest different sets of behaviors and practices are associated with each midden, where the front midden typically operated as the disposal area for general house refuse, higher MUI and easier to deflesh body portions, and the ritually significant seal skulls. The rear midden may have been frequently used for the deposition of limb and flipper elements which were boiled, roasted, or had their flesh meticulously extracted with blade tools for consumption, resulting in a high deposition of fragmented limb and flipper bones, a charcoal concentration, and a high ATC that included soapstone fragments (possibly pieces of broken pots and vessels used in cooking). The high count of mandibles but relatively low count of other cranial features suggests that the mandibles may have been frequently separated from the seal skulls placed at the front of the house and deposited in the rear midden. The similarities between middens suggest that the primary activities outlined above that are associated with each midden occurred, at times and to lesser extents, in both midden areas. Because the front and rear midden samples of House 10 display similarities as well as differences, neither midden can be assigned a specific functional purpose. The middens can,

however, be associated with the different sets of practices and activities described above, which would have contributed to the unique characteristics of each midden feature.

*Can an intra-household analysis of processing, consumption, and disposal organization be used to interpret the inter-household communal organization of harp seal processing at Phillip's Garden?*

I will answer this question with a summary of the theorized inter-household and intra-household organization at Phillip's Garden. Like all Arctic aggregation sites, Phillip's Garden was a site where combined labour forces were necessary in ensuring maximum focal resource procurement. The pooling of labour likely extended beyond the initial hunting of harp seals to the organization of butchery, processing, consumption, and disposal activities across the multiple households occupied during the height of the middle phase. In analyzing the contents of two midden features associated with one of the largest multifamily households at Phillip's Garden, House 10, the possible division of labour and activities for the entire site can be inferred. I theorize that during the harp seal hunting season, households pooled labour and shared tasks of hunting, butchery, and processing. Harp seals were brought to House 10 as both whole and partial carcasses for processing and consumption. Seal skulls were likely ritually placed at the entrance of House 10, in or near the front midden. The ribs and vertebrae occur in low frequencies either as a result of differential preservation, their removal from House 10 for processing and storage elsewhere, or a combination of both.

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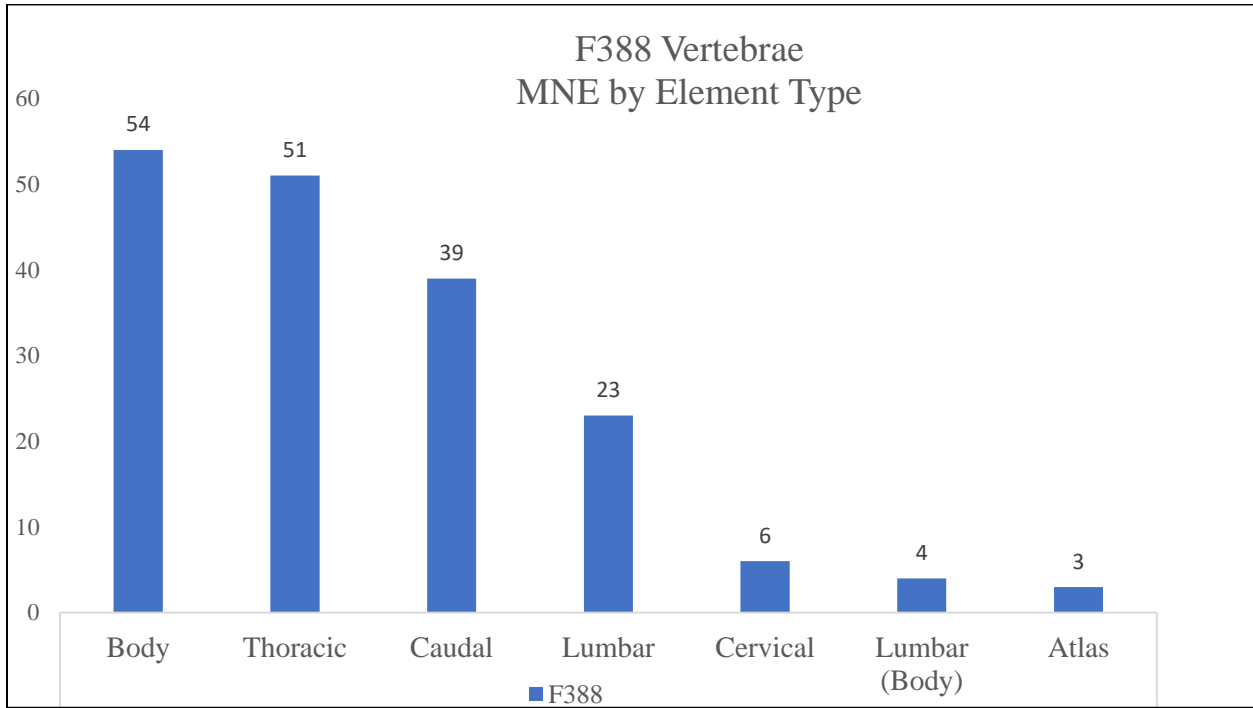
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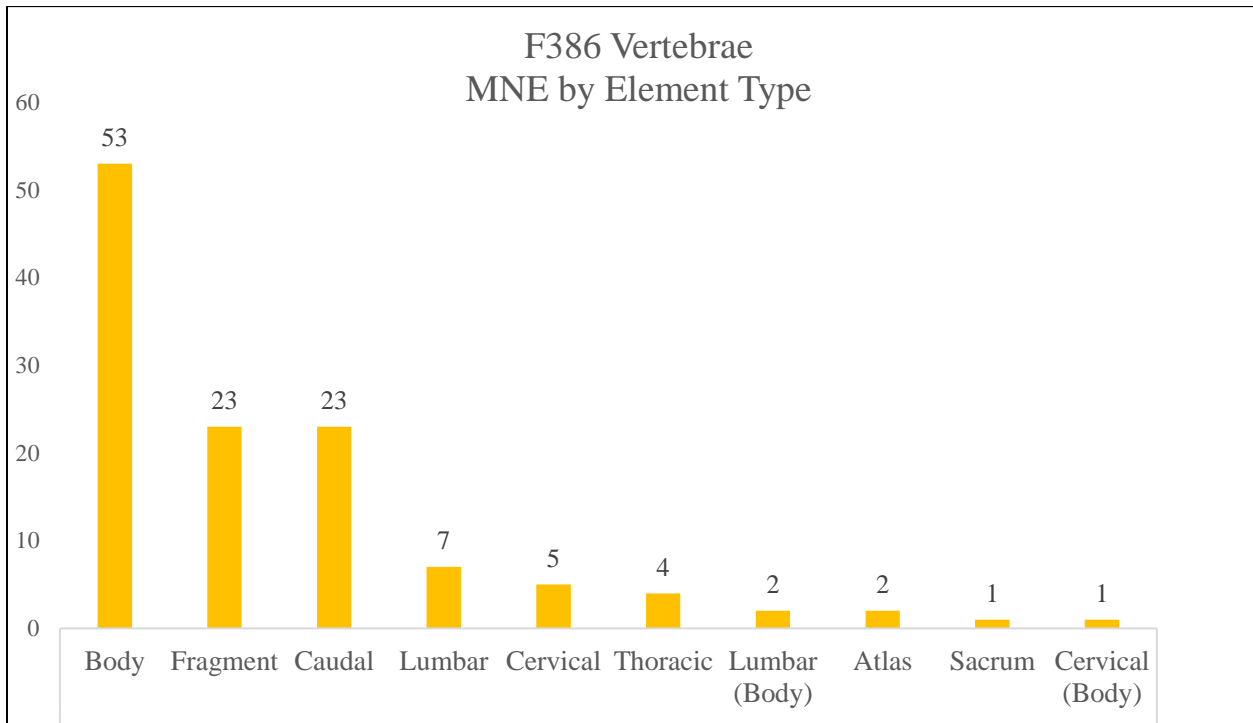
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## Appendix A

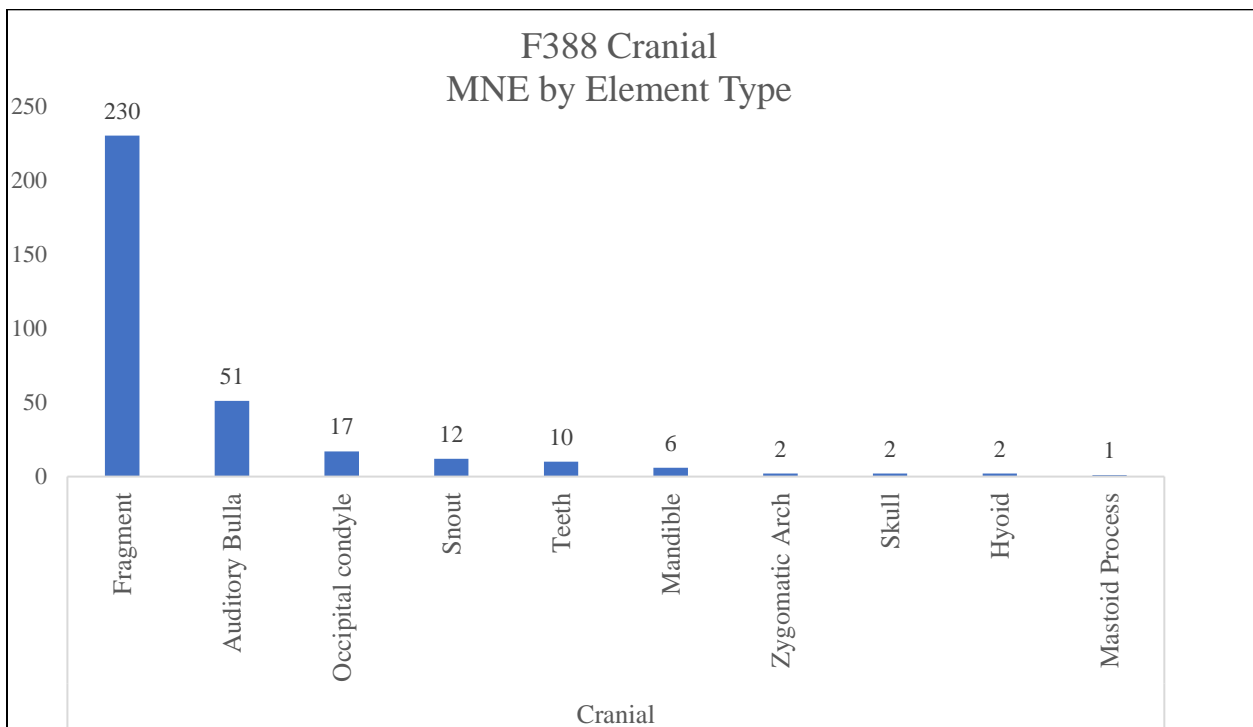
Graphs of F388 and F386 element types and MNE counts for head, vertebrae, front flipper, and rear flipper animal units.



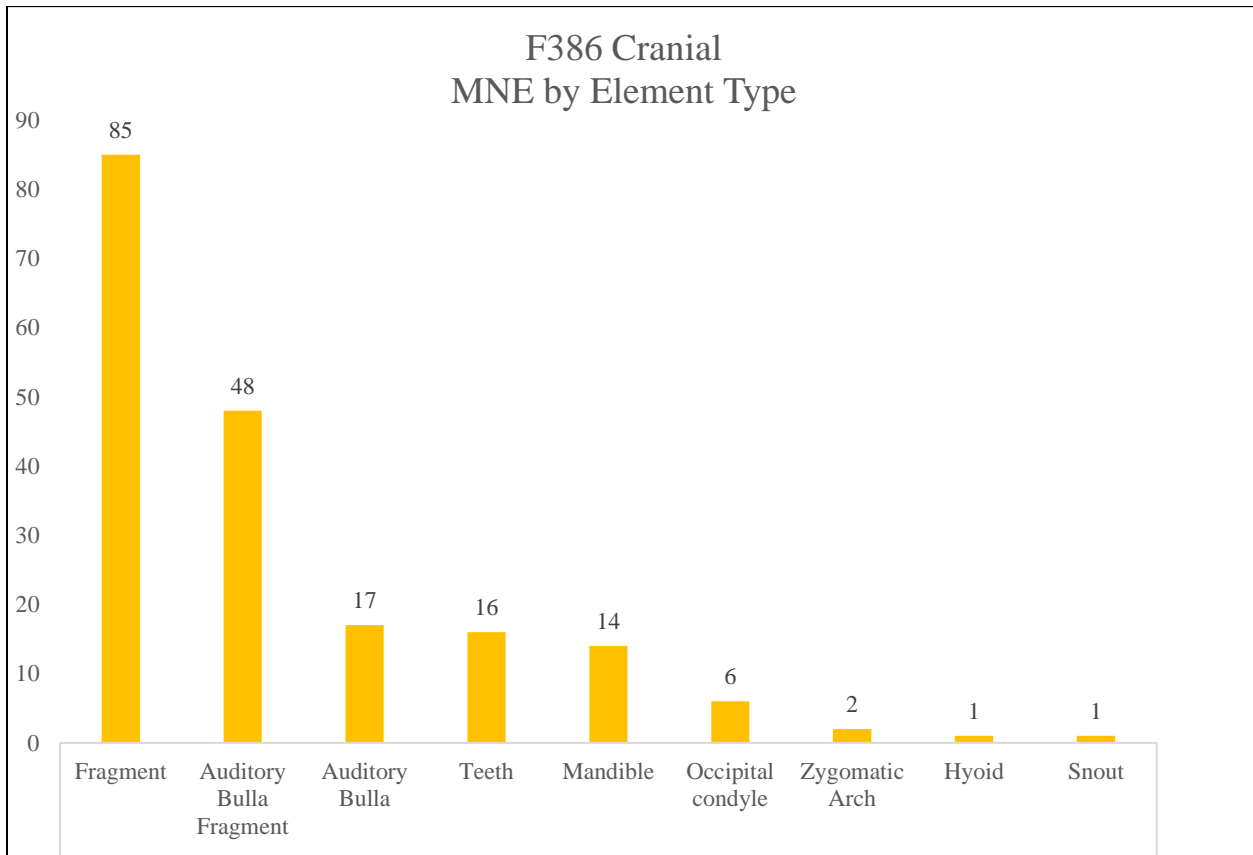
**Figure 41 MNE Count of Vertebrae by Element Type for F388.**



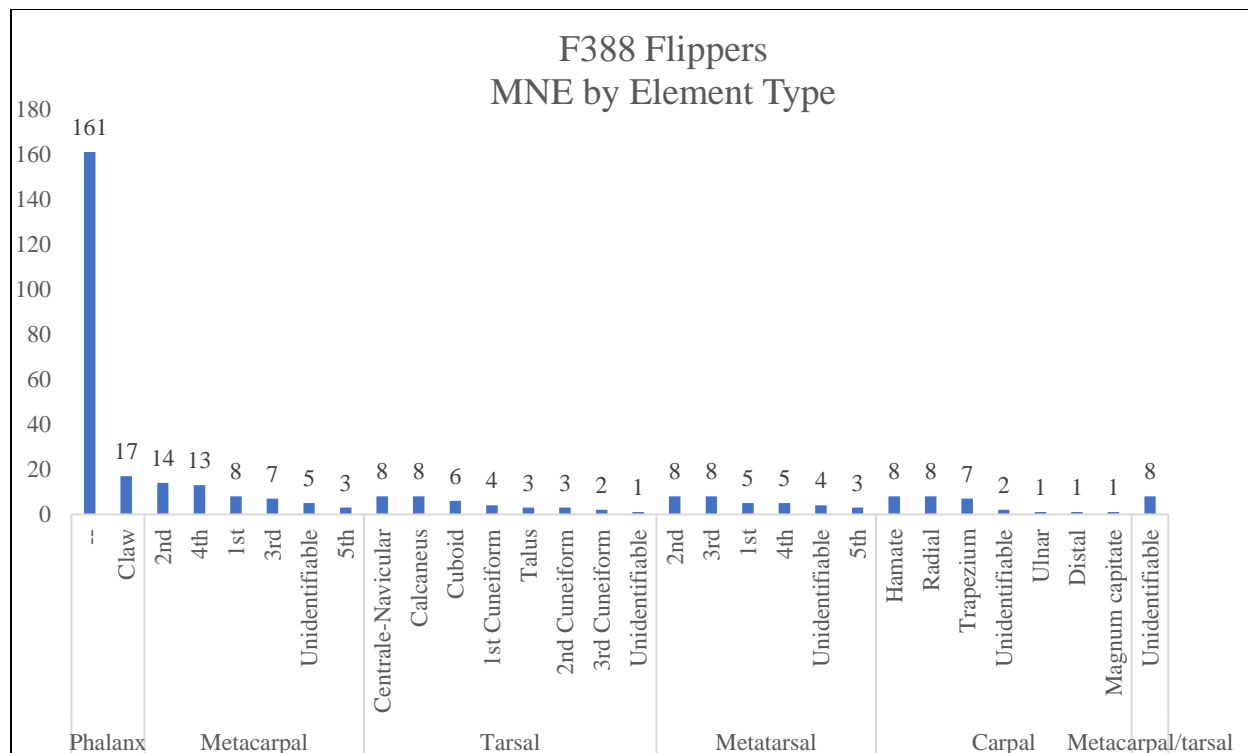
**Figure 42 MNE Count of Vertebrae by Element Type for F386.**



**Figure 43 MNE Count of Cranial Elements by Element Type for F388.**

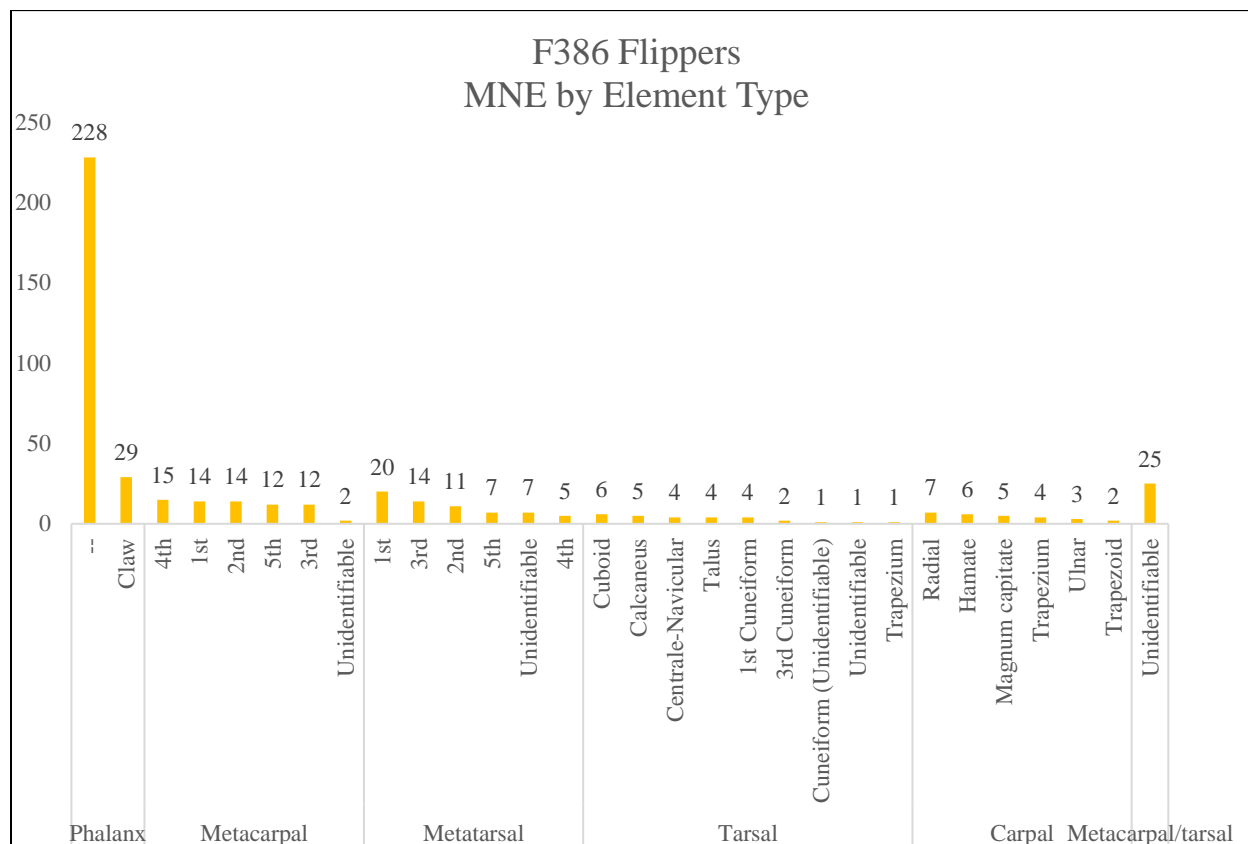


**Figure 44 MNE Count of Cranial Elements by Element Type for F386.**



**Figure 45 MNE Count of Front and Hind Flipper Elements by Element Type for F388.**





**Figure 46 MNE Count of Front and Hind Flipper Elements by Element Type for F386.**

## **Appendix B**

**Table 27 MNE Data Table with MUI, BDV, and CMF Totals.**

Chart Data F388 = Front of House

F386 = Back of House

Feature	Element	Element Type	Total MNE	Adult MNE	Juvenile MNE	Newborn MNE	Indeterminate MNE	MNE CMF	Adult CMF	Juvenile CMF	Newborn CMF	Indeterminate CMF	MB CMF	BF CMF
F388	Baculum	--	1				1							
F388	Carpal	Distal	1				1							
F388	Carpal	Hamate	8				8							
F388	Carpal	Magnum capitate	1				1							
F388	Carpal	Radial	8				8							
F388	Carpal	Trapezium	7				7							
F388	Carpal	Trapezoid												
F388	Carpal	Ulnar	1				1							
F388	Carpal	Unidentifiable	2				2							
F388	Cranial	Auditory Bulla	51				51	3				3	3	
F388	Cranial	Auditory Bulla Fragment												
F388	Cranial	Fragment	230				230	2				2	2	
F388	Cranial	Mastoid Process	1				1							
F388	Cranial	Occipital condyle	17				17	2				2	2	
F388	Cranial	Skull	2				2	2				2	2	
F388	Cranial	Snout	12				12	2				2	2	
F388	Cranial	Teeth	10				10							
F388	Cranial	Zygomatic Arch	2				2	2				2	2	
F388	Femur	--	7	2	2	2	1							
F388	Fibula	--	10	1	6		3	2		1		1	2	
F388	Humerus	--	6	1	1	3	1							
F388	Hyoid	--	2				2							
F388	Mandible	--	6		1		5	2				2	2	
F388	Metacarpal	1st	8	3	4		1							
F388	Metacarpal	2nd	14	8	3	1	2							
F388	Metacarpal	3rd	7	2	4	1								
F388	Metacarpal	4th	13	6	3	3	1							
F388	Metacarpal	5th	3	2	1									
F388	Metacarpal	Unidentifiable	5	1		1	3							
F388	Metacarpal/tarsal	Unidentifiable	8	1			7							
F388	Metatarsal	1st	5		5									
F388	Metatarsal	2nd	8	3			5	2	1			1	2	
F388	Metatarsal	3rd	8	2	4		2	1		1			1	
F388	Metatarsal	4th	5	2	2		1							
F388	Metatarsal	5th	3	1			2							
F388	Metatarsal	Unidentifiable	4	3			1							
F388	Patella	--	6				6							
F388	Pelvis	--	12				12	3				3	3	
F388	Phalanx	Claw	17	6	7		4							
F388	Phalanx	--	161	71	54	2	34	10	6	4			10	
F388	Radius	--	7	2	3	1	1							
F388	Rib	Fragment	86				86	1				1	1	
F388	Rib	--	40			1	39	10				10	9	1
F388	Scapula	Fragment												
F388	Scapula	--	13	4		2	7	2	1			1	2	
F388	Sternum	Fragment	19				19							
F388	T/F Crural Bone	--	1	1										
F388	Tarsal	1st Cuneiform	4				4							
F388	Tarsal	2nd Cuneiform	3				3							
F388	Tarsal	3rd Cuneiform	2				2							
F388	Tarsal	Calcaneus	8			1	7	2				2	2	
F388	Tarsal	Centrale-Navicular	8				8							
F388	Tarsal	Cuboid	6				6							
F388	Tarsal	Cuneiform												
F388	Tarsal	Talus	3		1		2							
F388	Tarsal	Trapezium												
F388	Tarsal	Unidentifiable	1				1							
F388	Tibia	--	12	3	6		3	8	3	4		1	7	1
F388	Ulna	--	2	2				1	1				1	

Feature	Element	Element Type	Total MNE	Adult MNE	Juvenile MNE	Newborn MNE	Indeterminate MNE	MNE CMF	Adult CMF	Juvenile CMF	Newborn CMF	Indeterminate CMF	MB CMF	BF CMF
F388	Unidentifiable	Fragment	1020				1020							
F388	Vertebrae	Atlas	3				3	2				2	2	
F388	Vertebrae	Body	54	20	22	2	10							
F388	Vertebrae	Caudal	39	17	11		11							
F388	Vertebrae	Cervical	6	3	2		1	2	2				2	
F388	Vertebrae	Cervical (Body)												
F388	Vertebrae	Fragment	340		12	1	327	9				9	9	
F388	Vertebrae	Lumbar	23	11	11		1	8	3	4		1	8	
F388	Vertebrae	Lumbar (Body)	4	2	2									
F388	Vertebrae	Sacrum												
F388	Vertebrae	Thoracic	51	19	23		9	10	1	3		6	10	
F388	Vertebrae	--												
F386	Baculum	--	3				3							
F386	Carpal	Distal												
F386	Carpal	Hamate	6				6							
F386	Carpal	Magnum capitate	5				5							
F386	Carpal	Radial	7				7							
F386	Carpal	Trapezium	4				4							
F386	Carpal	Trapezoid	2				2							
F386	Carpal	Ulnar	3				3							
F386	Carpal	Unidentifiable												
F386	Cranial	Auditory Bulla	17	1	1		15							
F386	Cranial	Auditory Bulla Fragment	48		3		45	3				3	3	
F386	Cranial	Fragment	85				85							
F386	Cranial	Mastoid Process												
F386	Cranial	Occipital condyle	6				6	1				1	1	
F386	Cranial	Skull												
F386	Cranial	Snout	1				1							
F386	Cranial	Teeth	16				16							
F386	Cranial	Zygomatic Arch	2				2							
F386	Cranial	--												
F386	Femur	--	15	3	6	1	5	2	1	1			2	
F386	Fibula	--	9	2	6		1	2	1	1			2	
F386	Humerus	--	24	6	3	4	11	7		1	2	4	3	1
F386	Hyoid	--	1				1	1				1	1	
F386	Mandible	--	14	1			13	2				2	2	
F386	Metacarpal	1st	14	11	2		1							
F386	Metacarpal	2nd	14	8	2		4							
F386	Metacarpal	3rd	12	8	2		2							
F386	Metacarpal	4th	15	9	5		1							
F386	Metacarpal	5th	12	6	6			1	1				1	
F386	Metacarpal	Unidentifiable	2	1			1							
F386	Metacarpal/tarsal	Unidentifiable	25	16	6	1	2							
F386	Metatarsal	1st	20	8	7		5	5	2	2		1	5	
F386	Metatarsal	2nd	11	3	2		6	4	1	1		2	4	
F386	Metatarsal	3rd	14	4	4		6	4		3		1	4	
F386	Metatarsal	4th	5	3			2	1	1				1	
F386	Metatarsal	5th	7	4			3							
F386	Metatarsal	Unidentifiable	7	5	1		1	2	2				2	
F386	Patella	--	11				11							
F386	Pelvis	--	3				3							
F386	Phalanx	Claw	29	26	2		1	1	1				1	
F386	Phalanx	--	228	134	55		36	13	6	3		4	13	
F386	Radius	--	37	1	6	3	27	5		1		4	4	1
F386	Rib	Fragment	114				114	1				1	1	
F386	Rib	--	36		3		33	3				3	3	
F386	Scapula	Fragment	1	1										
F386	Scapula	--	3				3							
F386	Sternum	Fragment	21				21							
F386	T/F Crural Bone	--	7		5	2								
F386	Tarsal	1st Cuneiform	4				4	1				1	1	

Feature	Element	Element Type	Total MNE	Adult MNE	Juvenile MNE	Newborn MNE	Indeterminate MNE	MNE CMF	Adult CMF	Juvenile CMF	Newborn CMF	Indeterminate CMF	MB CMF	BF CMF
F386	Tarsal	2nd Cuneiform												
F386	Tarsal	3rd Cuneiform	2				2							
F386	Tarsal	Calcaneus	5				5	1					1	
F386	Tarsal	Centrale-Navicular	4				4	1				1	1	
F386	Tarsal	Cuboid	6				6	2				2	2	
F386	Tarsal	Cuneiform (Unidentifiable)	1				1							
F386	Tarsal	Talus	4				4							
F386	Tarsal	Trapezium	1				1	1				1	1	
F386	Tarsal	Unidentifiable	1				1							