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The Hustle and Bustle of the Coast Salish Potlatch An Exploratory Case Study of Gift Economic Exchange and Bird Resources at the Village of Xwe'Chi'eXen, 45WH1

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By

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of the Requirements for the Degree
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Abstract

Bird remains are regularly found in archaeological deposits in the Salish Sea region. Predominant paradigms to explain the distribution of archaeological faunal remains primarily focus on diet. Yet, uses of bird remains for purposes other than food are also widely represented in ethnographies. The economic structure of the potlatch is an alternative model to account for the presence of archaeological avifauna. Avifaunal materials contribute to a continuous social system as both food and wealth objects. How avian resources were harvested, transformed into commodities, and used to signal rank and prestige in the context of the potlatch are considered. This study explores how these themes are reflected in the archaeological record over the last 3,500 years of occupation at the village of Xwe'Chi'eXen, 45WH1. A total of 2,109 bird bones were analyzed from two time components that generally correspond with the Locarno Beach and Marpole typological phases. Several patterns consistent with formalization of the gift economy over time were observed. A high frequency of duck wings, and evidence of butchery suggests that wings were intentionally removed, possibly for their flight feathers. Concentrations of bird remains at two locations may indicate potlatch or other ritual related deposition. Increases in frequency of naturally aggregating taxa, and changing patterns of avian diversity over time, are interpreted as increasing reliance on mass harvest hunting techniques. These lines of evidence are argued to represent intensification in the gift economy that result in the formalization of harvest locations as lineage property.

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CHAPTER 1: INTRODUCTION

For millennia indigenous peoples have inhabited the shores and waterways of the Northwest Coast of North America. Over time, they developed unique and ingenious methods for extracting food and other resources from their environments (Ames and Maschner 1999). The success of these resource procurement techniques developed in tandem with the development of cultural complexity in the form of intricate economic relationships among groups, and which materialized as a rich diversity of cultural goods (Ames 2003). This paper focuses on how Coast Salish peoples, of the central Northwest Coast, traditionally extracted birds from the environment, and incorporated the products of birds into their systems of wealth and value. Specifically it is a case study focused on the bird remains that were deposited prehistorically at the village of Xwe'Chi'eXen (Smart et al. 2016), which has since become known as the Cherry Point archaeological site, 45WH1 (Figure 1).

Figure 1. The location of Xwe'Chi'eXen, 45WH1, looking south toward Rosario Strait. Image from National Register of Historic Places Nomination form (Miss 1998).

One major assumption made in most archaeological faunal analyses is that animal remains are worthy of study because they document the diet of prehistoric peoples. While this insight has framed important questions to fill in gaps of our understanding of prehistoric human behavior, it is only part of the story. Animals that were procured by peoples in the past were incorporated into their economic systems and represented values beyond dietary contribution. Thirty years ago, Monks (1987) offered a challenge for Pacific Northwest zooarchaeologists to see beyond their obsession with salmon, their "salmonopia", and pursue research objectives that incorporated evidence about human use of terrestrial mammals, birds, and other marine resources. Since that time many Pacific Northwest archaeologists have met that call, broadened their horizons, and our understanding of the relationship between human and animal communities is richer for it. This thesis offers a similar challenge for Pacific Northwest zooarchaeologists to see beyond their *foodopia* and consider the alternative ways that captured animals contributed to prehistoric Coast Salish economies. Avifaunal remains are one class of archaeological material that has been understudied, despite the wide representation of birds in Coast Salish oral traditions, and art. Therefore, the *hustle* referred to in the title is the economic exchange of resources through the potlatch and gift-giving, and the *bustle* is another term for a feathered headdress, one of the several material-cultural goods that were produced using bird resources (Figure 2) (Curtis 1913; Barnett 1955:169).

This thesis attempts to take a different approach to address patterns of animal remains at archaeological sites. It seeks to use details present in ethnographic accounts to construct a model that explains a broader range of reasons why peoples ancestral to the modern Coast Salish would have acquired animal resources, particularly by looking at the gift economy characteristics of Northwest Coast groups. The location of Xwe'Chi'eXen is a prime candidate for this type of inquiry because: i) it is an archaeological site that has yielded a large number of bird bones, a material that has been understudied archaeologically, ii) it is located in an area that is well documented ethnographically, iii) it is located in an area that has a well developed archaeological chronology.

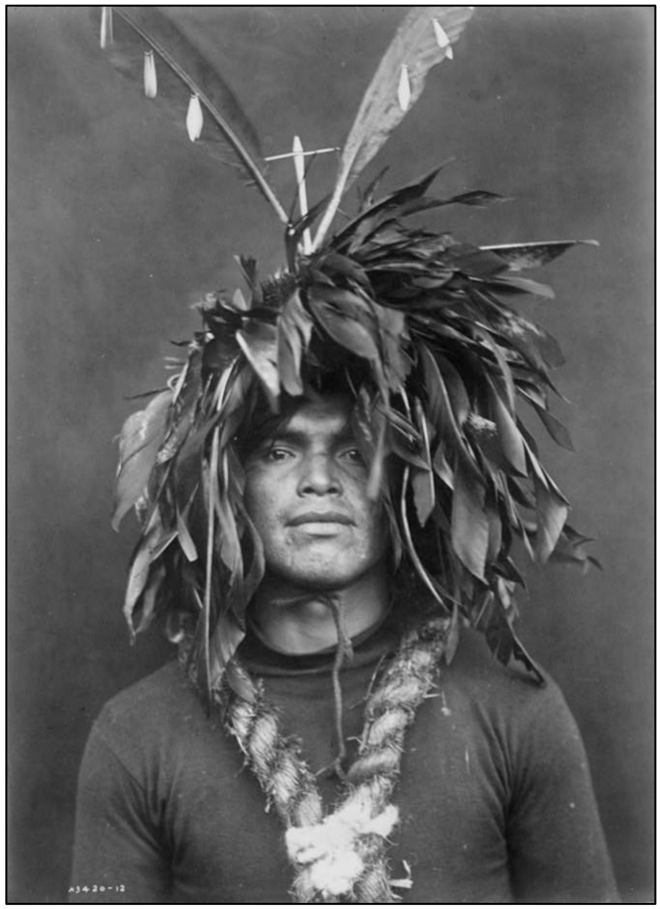

Figure 2. Image of a Cowichan man wearing a "Warrior's feathered headdress" or bustle c. 1913. The original photograph was captured by Edward Curtis (1913: 76), who posed his subject in traditional regalia. This image is cropped from the original, which is larger. This image is in the public domain, Library of Congress photography archives LC-USZ62-118582.

Research Objectives

The objectives of this study are to review the ethnographic literature to identify evidence of bird procurement, use, and details of how they related to indigenous concepts of property. Insights gained from these ethnographic descriptions will be used to posit models to help explore the patterning of bird remains from Xwe'Chi'eXen.

Thesis Organization

Chapter II sets the stage for the archaeological inquiry. It positions the story of bird procurement at Xwe'Chi'eXen in time and place. It includes a description of the environment, a description of the broad scaffold of regional prehistory, including the specific research trajectory of Salish Sea avifaunal studies, and the specific research trajectory of the archaeological studies that have previously been conducted at Xwe'Chi'eXen.

Chapter III sets the stage for the ethnographic inquiry. It positions the story of bird procurement at Xwe'Chi'eXen in cultural context. It includes a summary of documented hunting methods. It summarizes descriptions that may illuminate how the products of bird resources intersect systems of value, and posits an economic model, potlatch economy, that will be used to frame a narrative of change over time.

Chapter IV describes in detail the archaeological methods used. It describes how the data was originally collected, how data was identified and recorded, and how this information was structured for analysis. It describes what data was included, what data was excluded. It describes how deposits were grouped to model two time periods of study, an early phase and a late phase. And it describes organizational structures, and statistical methods used to highlight patterns in space, and over time.

Chapter V presents the results of the archaeological methods. It describes the patterns were found at Xwe'Chi'eXen and within the broader Salish Sea region.

Chapter VI summarizes these results and discusses implications for the findings in the context of Gift Economic exchange. It closes with a discussion of avenues for further research.

CHAPTER 2: SITE CONTEXT

This chapter focuses on the physical environment and archaeological context within which this discussion is situated. It opens with a description of the physical environment of the region, is followed by a summary of the conventional regional prehistory that is used as the backdrop for the present study. Archaeological work that has been conducted for Xwe'Chi'eXen is then summarized. The chapter closes with a review of approaches to zooarchaeological research questions in the region.

Physical Environment

Xwe'Chi'eXen is located on a bluff overlooking the Strait of Georgia within the northern extent of the Puget Lowlands ((Figure 3)This location is near the center of the Salish Sea which is a geographic term that collectively describes the Strait of Juan De Fuca, the Strait of Georgia, and Puget Sound (Freelan 2009). These waterways and the hummocky terraced lowlands surrounding them were initially formed during the terminal Pleistocene, ca. 15,000 to 13,000 years ago (Gibbard and Head 2010; Thorson 1980). At this time the advances and ultimate retreat of the Puget Lobe of the Cordilleran Ice Sheet incised what is now Puget Sound and the Strait of Georgia. The ebbs and flows of the ice sheet also deposited huge volumes of mixed and unconsolidated sediments as glacial-marine drift, and reworked glaciofluvial deposits. Unconsolidated sediments corresponding to these geological processes at Cherry Point date to 11,000 to 12,000 years ago (Cooper et al. 2015; Goldin 1992; Easterbrook 1976), and formed the basal substrate on which the inhabitants of Xwe'Chi'eXen resided.

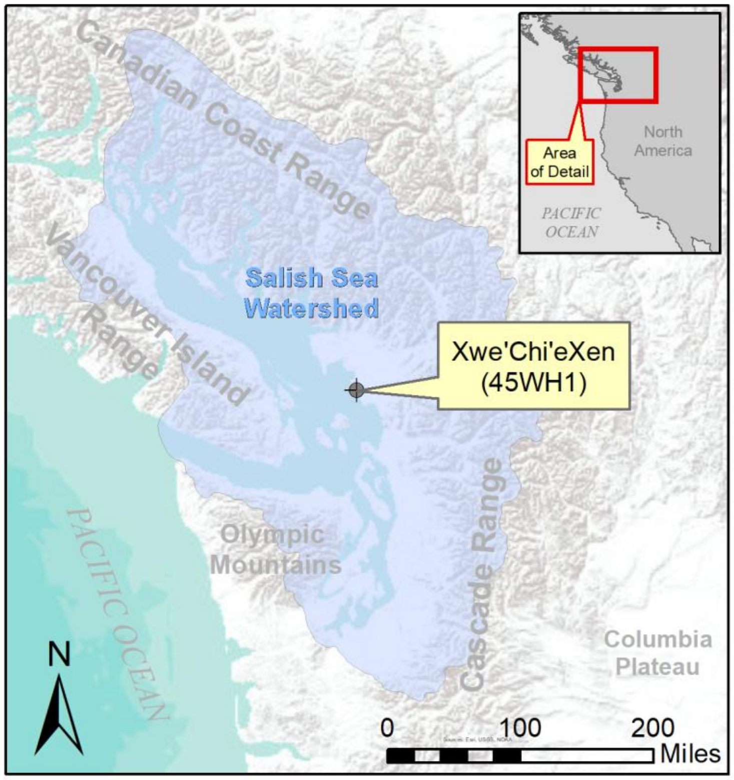

Figure 3. Location of the village Xwe'Chi'eXen, 45WH1, in relation to surrounding mountain ranges and the Salish Sea watershed.

The current climate consists of a rainy season in the winter months, followed by a dry season in summer months (Kruckberg 1991). Generally the terrestrial ecology west of the Cascade range consists primarily of boreal rain forests, however the varied topography also supports drier grasslands in locations affected by the rain-shadow of the Olympic Mountains and Vancouver Island Ranges. The current ecology of the location of Cherry Point, and its adjacent waters is rich and diverse (Department of Natural Resouces 2010; Huckel/Weinman Associates 1996). The glacial terrace on which Xwe'Chi'eXen is located, supports an array of terrestrial flora and fauna, including mixed forest, shrubland, and grassland communities. The flora typically includes an upper canopy of predominantly coniferous trees, an understory composed predominantly of a variety of berries and other shrubs, and invasive grasses introduced in the last 200 years (Huckel/Weinman Associates 1996). Terrestrial mammals reside in the environment surrounding Xwe'Chi'eXen, including ungulates, carnivores, and rodents. Offshore and intertidal communities are equally rich and diverse; a fact that is reflected today in its management as the Cherry Point Aquatic Reserve. The off shore and intertidal cobble substrate supports a relatively dense aquatic floral community including red and green varieties of algae, and beds of eel grass (Department of Natural Resouces 2010). All six major species of salmon have historically been represented in this habitat, as well as anadromous varieties of trout, and forage fish. Forage fish include sand lance, surf smelt, and most notably Pacific herring. Pacific herring, are of particular note because the represent an important place in food web of the local ecology. They are mid-level predators that prey on crustaceans and fish larvae (Department of Natural Resouces 2010:106). However they also form the food base for a variety of other species including marine invertebrates, several species of fish, marine mammals, and several species of birds. Between 1977 and 1996 the average spawning run at Cherry Point included in excess of 6,000 tons of Pacific herring (Luxa 2008; Bargmann 1998:20; Stick et al. 2014). This is three times the amount of fish measured at the second largest herring spawning location in Washington waters at Port Gamble. The Cherry Point herring-spawning run is also the latest seasonal run in Washington State waters, taking place from March to June, peaking in early May (Stick et al. 2014).

Birds represent a set of fauna whose preferred habitat includes both terrestrial and aquatic biomes. The Marine Ecosystem Analysis project identified 37 of the most commonly occurring marine bird taxa in the San Juan Islands region of the Salish Sea (Wahl et al. 1981). This list includes bald eagles (*Haliaeetus leucocephalus*), alcids (Alcidae), loons (Gaviidae), gulls (Laridae), cormorants (Phalacrocoracidae), grebes (Podicipedidae), and several species of waterfowl (Anatidae). Tracking Christmas Bird Count numbers on these same taxa, Bower (2009) found that bird populations for 14 of these taxa have been in significant decline over the last 30 years. The largest declines he found were for common murre (*Uria aalge*), western grebe (*Aechomophoris occidentalis*), red-throated loon (*Gavia stellate*), and Bonaparte's gull (*Larus philadelphia*). Since the bird surveys specifically targeted marine bird taxa, they under represent the total diversity to be expected at Cherry Point (Wahl et al. 1981; Bower 2009; Joyce et al. 2014). Alternative sources like the eBird Northwest citizen science initiative can provide a broader picture of the birds that occur at Cherry Point since they include species that are both marine oriented, and terrestrial taxa. For the month of December 2017, 130 bird taxa were observed within the 10 km radius of Cherry Point. These taxa included members of 16 avian orders (Society 2018). Terrestrial oriented orders included hawks (Accipitridae), falcons (Falconidae), woodpeckers (Picidae), pigeons and doves (Columbidae), humming birds (Trochiidae), owls (Strigidae), and perching birds (Passeriformes). Marine oriented orders included waterfowl (Anatidae), shorebirds and gulls (Charadriiformes), kingfishers (Alcedinidae), rails and herons (Rallidae), loons (Gaviidae), and grebes (Podicipedidae). However, since these identifications are from a crowed-sourced data set collected by non-specialists, it is possible that the diversity represented in it is overestimated.

The migrations of diving waterfowl appear to be strongly correlated with the time and locations of large herring spawning events (Baldassarre 2014). This pattern is particularly strong among surf scoters (*Melanitta perspicillata*), and white winged scoters (*Melanitta fusca).* Certain congregations in the Salish Sea have included estimations of as many as 650,000 surf scoters feeding on spawning herring, however, this count is considered anomalously high. Nevertheless as late as the early 1990s, Cherry Point surf scoter congregations have been estimated to include approximately 25,000 birds (Woodcock). This number has since been in decline, and ecologists have suggested that the coeval decline of the running herring is the likely cause (Joyce et al. 2014; Bower 2009; Bargmann 1998).

Regional Archaeological Prehistory

Ames and Maschner's chronology (1999) has most often been used to provide regional and inter-site context for the interpretation of Xwe'Chi'eXen. Other authors have forwarded other chronological models (Cooper et al. 2015; Stein 2000; Matson and Coupland 2009); however the disagreements tend to be based on the timing of events, rather than the basic pattern of assemblage composition (Mitchell 1990). They all are based on the typological phases developed by Borden (1950), which was refined by Mitchell (1971), and later Burley (1980). Ames and Maschner's description of the chronology has one major advantage over the others: it is geographically scalable. Broad trends that are generally applicable for the Pacific Northwest at large, and over long spans of time, are captured by their period assignments. Therefore, their chronological model allows for a broad range of inter-site comparison by using an established local lexicon, and by providing coarse-scale groupings for more general comparison.

Evidence for human occupation in Western Washington spans over 10,000 years. Although evidence from the earliest times is sparse, dates from secure contexts at sites such as the East Wenatchee Clovis site (Mehringer and Foit 1990), the Manis Mastadon site in Sequim (Waters et al. 2011), and the Olcott assemblage from the Bear Creek site in Redmond (Kopperl et al. 2015), establish that peoples first came to the Salish Sea deep in antiquity. Ames and Maschner (1999) separate one major division in their chronology: evidence of the First Inhabitants, and evidence of what they term the Pacific and Modern periods (Table 1). Generally the earliest site components, representing the First Inhabitants*,* tend to primarily contain lithic materials. Later site-components, representing the Pacific and Modern periods, tend to be larger, contain shell midden material, and represent a much greater diversity of artifact materials and styles (Ames 2003). Artifacts from the

First Inhabitants period have been characterized and described by the Old Cordilleran, and Olcott typological phases, among others. In the Strait of Georgia and the Salish Sea more-generally the artifacts from the Pacific and Modern periods have been characterized and described by the St. Mungo, Locarno Beach, Marpole, and Gulf of Georgia typological phases.

Table 1. Chronology of the archaeology of the Salish Sea, and the general Pacific Northwest as presented by Ames and Maschner (1999), and Ames (2003). The gray shaded portion of this timeline indicates the temporal focus of the present study.

Gregorian Calendar	*Ames and Maschner (1999:66)* *period*		*typological phase*	*general composition*	*WWU theses*	*years ago*
AD 2000	Pacific and Modern	Late Pacific	Historic	Artifacts consistent with global trade.	Analytical Unit I (AUI)	0
AD 1500			Gulf of Georgia	Triangular slate tools that are smaller than those found in the Marpole phase, ground stone celts, bone pins, spindle whorls, sculpted stone effigy pipes, nipple tipped mauls, celts, flaked stone points, flaked stone scrapers, pit houses and fortified settlements.		500
AD 1000						1000
AD 500		Middle Pacific	Marpole	Ground slate tools, stone celts, labrets, hand mauls, perforated stone, bone needles, unilaterally barbed antler harpoons and points, stone and bone sculpture. Toggling projectiles, and composite harpoon valves are few or absent.		1500
AD 1						2000
500 BC			Locarno Beach	Toggling projectiles including composite harpoon bone valves, unilaterally barbed bone points, slate tools, bird bone needles, microblades, ground stone labrets, bipolar reduced stone flakes, net sinkers, bone and antler wedges, and quartz crystal microblades.	Analytical Unit II (AUII)	2500
1000 BC						3000
1500 BC						3500
2000 BC		Early Pacific	St. Mungo	Stone narrow angle uniface tools, scrapers, utilized flakes, notched and denticulate tools, ground stone artifacts. Pit houses and early shell midden deposits.		4000
2500 BC						4500
3000 BC						5000
3500 BC	First Inhabitants	Archaic	Old Cordilleran and Olcott	Stone cobble tools, flake tools, leaf shaped bifaces, and leaf shaped projectiles.		5500
4000 BC						6000
4500 BC						6500
5000 BC						7000
5500 BC						7500
6000 BC						8000
6500 BC						8500
7000 BC						9000
7500						9500
8000 BC						10000
8500 BC						10500
9000 BC						11000
9500 BC						11500
10000 BC						12000
10500 BC						12500
11000 BC		Paleoindian	Clovis	Large robust fluted stone projectile points.		13000
11500 BC						13500
12000 BC						14000

Ames and Maschner (1999) group prehistoric evidence from approximately 3500 BC onwards into the Pacific and Modern Periods, which they subdivide into the Early Pacific, the Middle Pacific, and the Late Pacific periods. In the Salish Sea, the Early Pacific Period generally corresponds with the St. Mungo typological phase and spans a time period from approximately 3500 BC to 1500 BC. The Middle Pacific Period generally corresponds with the Locarno Beach typological phase and spans a time period from approximately 1,500 BC to AD 500. The Late Pacific Period generally corresponds with the Gulf of Georgia typological phase and spans from approximately AD 500 to 1800. From AD 1800 to the present day is the known as the Historic Era and is characterized by artifacts that are consistent with a global economy. Evidence of human occupation at Xwe'Chi'eXen encompasses approximately 3,500 years in the Middle and Late Pacific period based on radiocarbon evidence (discussed in more detail in the following section). Therefore the remainder of this section will focus on archaeological interpretations of cultural change during the Middle Pacific and Late Pacific periods.

The Locarno Beach phase is named for the type-site located at Locarno Beach, West Point Gray, Vancouver, British Columbia. This artifact phase was originally described as an "Eskimoid" assemblage due to the excellent preservation of bone and antler artifacts that reminded the original investigators of Inuit tool traditions (Mitchell 1990). Comparison of Salish Sea artifact assemblages with the material culture of Inuit peoples were the basis of early models of culture change, that relied on population replacement to drive changes in assemblage composition. Since that time, the paradigm has shifted, and population replacement is considered an outdated interpretive model. However, the basic characterization of these artifacts has remained stable. Specifically, Locarno

Beach assemblages contain a proliferation of bone and antler barbed points and toggling harpoon artifacts, as well as quartz crystal micro-blades, micro-blade cores, labrets, and slate artifacts.

The Marpole phase is often described as a continuation of the industries and styles established during the Locarno Beach phase (Matson and Coupland 1994). It is named after the Marpole area of Vancouver, near Sea Island and Mitchell Island, where its type-site is located. Slate industries and unilaterally barbed bone points continue in the Marpole phase. What distinguishes Marpole assemblages from Locarno Beach phase assemblages is a decrease in toggling projectile points and composite harpoon valves, as well as quartz crystal microblades, and there is an overall increase in artifacts interpreted as wealth objects. Specifically, there are more blanket pins, hand mauls, perforated stones, and stone celts. This pattern is often interpreted as an increase of cultural complexity because styles become more ornate in this period and suggests more craft specialization (Moss 2011).

Gulf of Georgia phase assemblages look like the continuation of traditions established during the Marpole. However, slate tools tend to become smaller and triangular in shape (Ames and Maschner 1999), stone effigy pipes begin to appear, tackle consistent with the capture of large fish (Ames 2003:30), and potentially birds, reappear, midden burials decline and settlements begin to show evidence of fortification.

The first person to make the case for the assignment of the artifacts from Xwe'Chi'eXen to the Locarno Beach and Marpole phases was Mary Blodgett, under the guidance of Dr. Garland Grabert. She says:

> Locarno Beach culture type is represented at Cherry Point by the large number of chipped slate knives or scrapers and cobble and spall tools. Two artifacts similar to Gulf Islands complex artifacts and a tentatively identified

> labret fragment are also present. One bilaterally barbed harpoon was found that also appears to be a Locarno Beach type....The Marpole type is also well represented at Cherry Point. Several triangular chipped basalt points were found that can be assigned to the Marpole type. Woodworking tools such as adzes, antler wedges, bone chisels and one nipple-top maul are evidence of the woodworking industry usually associated with the Marpole culture type. The perforated stones found can also be correlated with the Marpole type. (Blodgett 1976: 80-81)

Blodgett goes on to argue that the presence of herring rake teeth, unilaterally barbed points, and toggling harpoon valves, are consistent with the Gulf of Georgia phase, but her argument for this phase assignment is less detailed. Interestingly in subsequent research of Xwe'Chi'eXen discussions of the Gulf of Georgia phase components of are few and far between. This may be due to the fact that the characteristics that define the Gulf of Georgia phase are less distinct than those described for the Marpole phase, and that it is likely that the field sampling methods were too coarse-grained to detect depositional changes that may correlate with this change in the material culture. Further, descriptions of the field conditions suggest that in certain areas of the site, the upper levels had been removed by grading prior to the archaeological excavations in preparation for a residential development that was never completed (Grabert 1988). These limitations are discussed in greater detail in the following section.

Previous Archaeology at Xwe'Chi'eXen

The earliest known description of cultural settlement at Xwe'Chi'eXen is in Dr. Wayne Suttles doctoral dissertation as a location for the procurement of ducks, herring, and sockeye salmon

(1951:34). As its Smithsonian trinomial indicates, Xwe'Chi'eXen was the first archaeological site recorded in Whatcom County, recorded soon after Suttles in 1954. Over the past 70 years, several archaeological investigations have taken place at Xwe'Chi'eXen. The history of archaeological research at Xwe'Chi'eXen is in some ways an institutional history of the development and direction of Northwest Coast archaeological research at Western Washington University (WWU), which was formerly Western Washington State College of Education. WWU archaeological excavations occurred during eight field seasons between 1954 and 1986 (Markam 1993). In total WWU field schools excavated and estimated volume of 263 cubic meters of material (Smart et al. 2016:5), and yielded a collection of over 4,000 cataloged artifacts as well as samples of marine invertebrate shell, vertebrate bone, and soil, among other materials. The earliest excavations at Xwe'Chi'eXen were under the direction of Dr. Herbert C. Taylor in the mid 1950s. The documentation of his field methods and his collections are sparse. Nearly all that remains from the effort by Taylor includes a plan map of an excavation trench, and sparse field collections with little record of provenience. Following Taylor's work, the remainder of WWU's the excavations at Xwe'Chi'eXen were under the direction of WWU archaeologist Dr. Garland Grabert. Grabert was an interesting character, his professional career began during his enlistment in the U.S. Army Engineer Corps. Following his service he utilized his G.I. bill to attend university focusing on the archaeology of the Plateau region of Washington State (Kimball 1989). He conducted archaeological excavations at multiple locations in Whatcom County, including 6 field seasons at Xwe'Chi'eXen between 1969 and 1986.

The data and materials collected from these efforts are reported in a body of literature accumulated over the past 40 years. The following discussion summarizes these works in groups to highlight the general trends in the research. The first group of archaeological reports on Xwe'Chi'eXen include the unpublished site report manuscript by Grabert (1988), a master's thesis analysis of artifacts collected during the 1975 field school season (Blodgett 1976), an analysis of a the faunal material collected during the 1976 field school season (Hanson and Van Gaalen 1994), and a master's thesis analysis of the historic-era component of the site (Markham 1993). This body of literature contains the primary evidence of the fieldwork since most of the documents contributing to it, were written by individuals that conducted the site excavations. Specifically, these works capture information about the field methods used, as well as the general impressions of the deposits as they were observed in-situ. The one exception is Virginia Markahm's Master's thesis (1993). Although Markham was not involved with the original site excavations her thesis used the archival site record to produce the most complete synthesis of information regarding how the field methods were undertaken. Therefore, these works establish the major patterns and interpretations on which subsequent research has been based. Field method descriptions germane to the present investigation include the fact that excavation units, termed "Cut's" by the original investigators were plotted on a 3 m x 3 m grid and ranged in size but were most often 2 m x 2 m (Hanson and Van Gaalen 1994; Palmer 2015:7). The cuts were excavated in 20 cm levels, and excavated material was passed through 0.25 in. wire mesh screen. Therefore, although the data from the site is coarse in scale, it was collected systematically.

Hanson and van Gaalen were the first to analyze a sample of the vertebrate faunal material from Xwe'Chi'eXen (1994). Their study focused on assessing the interpretation that the site represented a fishing settlement. Specifically, it focused on identifying and analyzing the fish, birds, and mammals from the Marpole phase component of Trench 6, which included all of the E29 excavation cuts. Of the bony fishes, they found an abundance salmon and flatfish. Avian faunal remains were less common, but included an abundance of ducks and grebes. Mammals consisted primarily of deer and elk. They found that the faunal remains supported the interpretation of the site as a fishing and fish processing settlement, and suggest that seasonal occupation at the site was between summer and fall.

The next group of research included four master's theses conducted in the mid 1990s under the advisement of WWU archaeologist Dr. Sarah K. Campbell. One focused on distinguishing between the lithic debitage produced from free-hand vs. bipolar reduction techniques of stone (Desilets 1995). Another focused on identifying and characterizing the method of reduction of the slate artifacts from the collection (Donald 1995). The third focused on identifying and characterizing the sequence that was used to reduce mammal bone for artifact production (Dugas 1996). These analyses were primarily descriptive of the assemblage, and characterized the chaîne-opératoir of various artifact materials. Since few radiocarbon age estimations existed for the site at the time, none of these analyses attempted to subdivide the assemblage chronologically.

The most recent group of research projects from Xwe'Chi'eXen, of which this thesis is a part, was conducted between the late 2000s through the mid-2010s. Some studies used specific artifacts and materials from Xwe'Chi'eXen for regional comparisons. They included an analysis of bone and antler barbed points (Rorabaugh 2009), a geochemical characterization of fine grained volcanic artifacts (Osiensky 2014), an analysis of quartz crystal microblades (Kannegaard 2015), a bone isotope study of ungulate faunal remains (Tierney 2012), and analyses of stone labrets (Shantry 2014; Rorabaugh and Shantry 2017). Other studies were more intensive explorations of materials from Xwe'Chi'eXen. They included an analysis of the mammalian faunal remains (Dubeau 2012), an analysis of the edged cobble artifacts (Palmer 2015), and an unfinished analysis of the bony fish (Osteichthyes) faunal remains (Todd 2012). These intensive investigations were also the first to attempt to track chronological change at a site-wide level. Dubeau's use of a two phase deposition model (2012), which he described as "Analytic Unit 1" and "Analytic Unit 2" formed the basis for Palmer's (2015) and Todd's (2012) models. Dubeau's model attempts to capture a coarse-scale break in the sediment character reported at the site: deposits of dense shell generally represent younger deposits in superposition to older deposits containing sparse shell and dark colored sediment.

Radiocarbon age estimations reported by previous authors have indicated that there is evidence for occupation at Xwe'Chi'eXen from approximately 3,710 to 90 conventional radiocarbon years before present (Palmer 2015; Dubeau 2012). Since the present investigation is an intensive study of Xwe'Chi'eXen avifauna, it can be grouped with these sources, and an attempt was made to model time in a manner consistent with these authors. Details about how this was done are described in Chapter 4.

In addition to the master's theses research, cultural resources management field reports and NAGPRA repository collection reports have been generated in support of the continued management of the site and its collection. These works include the Department of Archaeology and Historic Preservation (DAHP) site record (DAHP 2011), an inventory survey for the Gateway Pacific Terminal (Cooper et al. 2015), and inventories in support of efforts to repatriate human remains and funerary goods to descendant communities (Arthur 2006; Smart et al. 2016). The DAHP site record includes descriptions of the site from several authors, including its determination as a significant prehistoric archaeological site under criterion D of the National Historic Preservation Act (NHPA)(Miss 1998). The inventory survey conducted by Cooper et al. (2015) has been the most extensive subsurface fieldwork since the WWU field school excavations. The focus of the survey was to delineate the site boundary in a manner that was as minimally invasive to the site as was possible. They accomplished this goal through systematic pedestrian survey along the cobble beach to identify surface features, and systematic excavation of auger pits on top of the bluff to identify the extent of the shell midden deposits. Results of these efforts more than doubled the area of the site. Its boundaries were redrawn to encompass additional shell midden on top of the bluff to the northwest of the area excavated by Grabert, and also encompassed features below the bluff on the cobble beach. Features on the cobble beach included six boulders modified with cupule petroglyphs and several elongated depressions. Cooper et al. (2015) interpreted these elongated depressions as clamming beds, however, Lummi Tribal member Al Scott Johnny has suggested that they may represent canoe slips (personal communication with Dr. Sarah K. Campbell 2018). More research is needed to fully assess the function of the features.

Interpretations of Pacific Northwest Zooarchaeology

Archaeological methods are materials focused. Therefore, research problems tend to be related to the physical properties of the materials being studied. Faunal analyses, the study of the remains of animals from archaeological site deposits, have tended to focus on problems relating to tracking changes in environment as evidenced by the kinds, and quantities of animals found from particular archaeological contexts (Brewer 1992). Collectively, these directions of study labeled human ecodynamics, and historical ecology (Armstrong et al. 2017), have often approached problems related to resource extraction from a perspective called optimal foraging theory (Ugan 2005). Optimal foraging theory is an ecological model that assumes that animals will pursue food in such a way as to minimize the expenditure of energy and to maximize energy gained (Smith 1983). In the early 1980s, archaeologists adopted this model to address questions related to hunter-gatherer food procurement and consumption. Although optimal foraging theory was developed by ecologists to explain animal behavior, and is often portrayed as an outgrowth of biological methods, its foundations are economic. These models assume behaviors that increase efficiency and decrease waste can be measured quantifiably, and are objective between species, cultures, or individual experiences. Measures like calories, modeled as "energetic returns", are used as a proxy for currency and are tracked over linear time. As an economic model its framework it is a specifically capitalist in orientation and assumes that the subjects of study are rational actors, with complete knowledge, who seek to optimize gains and minimize losses. These frameworks beg the question: are calories and time appropriate variables for cultures that do not hold the same cultural construction of value and wealth as Western society? Although the physical factors of human biology and ecological constraints will necessarily affect individual behavior, these models fail to account for the Coast Salish economic systems as it was observed ethnographically.

A similar kind of criticism for the treatment of faunal remains from Northwest Coast archaeological assemblages was presented by Moss (2012), who contends that the prevailing model of resource intensification does not adequately account for the patterns reported in the avifaunal literature. She suggests archaeologists have attributed too many of the patterns revealed by faunal analysis to culture, and cultural change, and that they more readily explain variability in the natural populations from which the hunted animals came. She goes on to argue that too much of the literature has been focused on cultural complexity, arguing that it is a model that we have imposed on the record in order to construct historical narratives about social structure. She points to recent trends toward the study of heterarchical social structure, and anarchy, such as the work of Angelbeck and Grier (2012), as a possible alternative model to pursue. This argument is synchronic in so far as it correlates stability in the archaeological record with heterarchical social structure. So while, this theoretical focus is appealing from an anthropological perspective, it is currently unclear how such an orientation could account for change over time. This thesis therefore opts for a more traditional framework drawing Marxian historical materialism as the driver of change over time.

In the mid 1980's, Monks proposed what he termed a "prey as bait" interpretive model for prehistoric northwest Coast subsistence (Monks 1987). His case study at Deep Bay, in Southern British Columbia, focused on the interactions between predator and prey communities and the rock-alignment tidal traps contributing to the Deep Bay archaeological site. The traps were designed to isolate small ponds with the ebb tide thus trapping schools of herring from the open sea. Monks proposed that the herring spawning activity is likely to have attracted several other animal predators other than humans. Humans, as apex predators, are likely to have taken advantage of this circumstance and used this opportunity to also hunt supplemental resources such as seals, and several species of predatory birds. Given that the waters adjacent to Xwe'Chi'eXen supports the largest recorded herring stocks in Washington State (Cherry Point Environmental Aquatic Reserve Management Plan 2010), it is reasonable to assert that a similar situation occurred there prehistorically (see section *Physical Environment*).

CHAPTER 3: ETHNOGRAPHIC CONTEXT

In my preliminary reading for this project, certain ethnographic details stuck out. Blankets, of which duck down was woven into the yarns, also acted as a medium of exchange. In fact Suttles's informant Julius Charles remarked that the geographical region in which Xwe'Chi'eXen is located was "so rich in waterfowl, that the people here were better dressed than any others" (Suttles 1951:80). Suttles presents a paradox relating to the hunting of birds vs. the hunting of large mammals. The locations for waterfowl netting were owned by lineages, but the locations for deer netting were not (Suttles 1987a:20). These social facts raised questions in my mind about the social construction of value and wealth in traditional Coast Salish society. I was curious to explore how wealth was constructed in this economy, and how birds as a commodity were produced, exchanged, and consumed to signal success and influence.

This chapter focuses on the ethnographic context. It was compiled from several sources about the Northwest Coast, the majority of which focused on the Straits Salish, or central Coast Salish groups more broadly. A brief summary of the traditional lifestyle of Straits Salish peoples, including their residence, kinship system, and social structure leads to a detailed look at the potlatch as mode of production. A detailed look at the central feature of traditional Straits Salish economy necessitates looking at a system of gift exchange, especially the potlatch. The discussion of the potlatch sets up a theoretical perspective that uses Marxian historical materialism as a lens to interpret the ethnographic. Using this framework, specific ethnographic information is compiled about how birds are converted into commodities through their extraction from the environment, their processing, and exchange in order to build a set of expectations for the archaeological data. These expectations are presented in the final section of this chapter.

Traditional Lifestyle of Straits Salish Peoples

Historically, peoples of the Pacific Northwest Coast were noted for their complex hunter-gatherer political economy (Ames and Maschner 1999, Moss 2011). Complex hunter-gatherer political economy in the Salish Sea consisted of a large scale semi-sedentary settlement pattern, a system of inherited rank bolstered by the tradition of the potlatch, and regular warfare and raiding between groups (Moss 2011). Also central to this behavioral shift was the capture of food surplus, and the development of food storage (Ames and Maschner 1999).

The traditional lifestyle of the Coast Salish of Haro and Rosario Straits involved a semi-sedentary settlement pattern focused around seasonal resource procurement areas (Stern 1934; Barnett 1938b; Boxberger 1989). The multi-family longhouses served as large communal structures for groups of related kin that were typically, but not exclusively, patrilocal (Suttles 1987a). Within an individual longhouse the physical position of individual families were ranked according to social status. Social status of families and individuals was a function of individually held rights and privileges, which were both inherited and achieved. Kinship and inheritance was traced bilaterally. Households followed "chiefs", but this position was not a formalized office as it was for Chiefdoms in other parts of the world (Miller and Boxberger 1994). According to Suttles, a chief within Straits Salish societies was a member of a community holding rank and privilege who was "merely the man who organized the potlatch", and that in times of conflict a warrior would assume the role of leader (Suttles 1951:77). The hallmark of chiefdom-level societies elsewhere, political unity, was not observed in the Salish Sea ((Drucker 1963; Angelbeck 2009; Carneiro et al. 2017). While there are differing views regarding traditional Coast Salish social structure, what is clear is that the Potlatch was an integrated part of the social structure that bolstered the claim of individuals for leadership roles.

Potlatch as Mode and Relations of Production

The potlatch is arguably the "most famous cultural practice" of the peoples of the Northwest Coast cultural area (Kottak 1996). The potlatch was a ritual ceremony, but it was also the center of a broad gift economic system that mediated trade and exchange. As an event, potlatches consisted of a large gathering of affinial relatives for feasting, dancing, and gift giving. Social theorizing about the implications of gift giving was most famously formalized in Marcel Mauss's essay *The Gift* (1950). According to Mauss, non-market economies facilitate the exchange of resources and wealth through systems of gift giving. Mauss's major insight was that acts of gift giving and gift receiving were not individual, isolated exchanges. They were, in a sense, legal instruments that established social contracts between individuals and groups. Giving gifts indebt the receivers, who are then obligated to return gifts of equal or greater value. This social phenomenon has been recorded in non-market economies throughout the world (Graeber 2011), and is also reproduced among individuals in modern market economies through customs like birthday celebrations and Christmas. There has been much debate regarding the origins, and social functions of the potlatch; however, it is broadly agreed that the potlatch was a central custom in the Salish Sea. Since Suttles works are very relevant in terms of geographical focus, and economic focus, this section draws primarily on his insights regarding the function of the potlatch.

What was strange to early ethnographers about the gift-economic system of the Pacific Northwest was that rivals would compete to give away not just some of their wealth, but all of it. Mauss termed the potlatch as a "total prestation of the agonistic type" (Mauss 1950: 8), meaning that the giving of gifts and the ritualistic destruction of property was so complete, that it sparked competitive antagonistic rivalries between social equals. Codere described the practice as the "ostentatious and dramatic distribution of property by the holder of a fixed, ranked, and named social position, to other position holders (1966:63)." Codere continues "The purpose of it is to validate the hereditary claim to the position and to live up to it by maintaining its relative glory and rank against the rivalrous claim of others." As a ritual the potlatch is often associated with rites of passage, name changes, or other events that were used to monument newly acquired rights of an individual within the society (Kottak 1996). In other words, the display of wealth at a potlatch event, and its redistribution though gift giving, served to validate claims to social rites by establishing relationships of indebtedness between individuals.

The social aspect of potlatch exchange went so far as to indebt, not only participants in a transaction, but the witnesses to that transaction. One example of this was described about the Kwakiutl, now the Kwakwaka'wakw, by Indian Agent W.M. Halliday, who was one of the major proponents of outlawing the practice in Canada in the mid 19th Century.

> All matters of business were settled at these gatherings, and as they had no written records, all transactions were made in public, so that the common people were witnesses of the business done, or the arrangements made or provided for. The negotiations often commenced secretly, but before the conclusion it was necessary for the principals who were participating to give something away to the rest of the people who were present, in order that they might witness the sealing of the contract. The gifts might be large or small, according to the means of the people or the magnitude of the question involved, but the more they gave away, the more they rose in their own

> estimation and also they hoped to rise accordingly in the estimation of the general public. (Halliday 1935: 5)

Since his perspective, as a Euroamerican, promotes the primacy of written documents to record evidence of economic transactions, he fails to recognize that within the local symbolic system, the gifts given are the bills and receipts marking the transaction. If an individual is perceived as having not adequately reciprocated what they have received, then it is within the rights of the person to whom they owe their debts to be able to ridicule them publically (Barnett 1938a; Benyon 2000). In parts of the Northwest Coast, but not described specifically for the Coast Salish, this is so codified that a debt holder is within their rights to raise a Ridicule Pole (Jonaitis and Glass 2010:4; Field 2013:xxxi) or prominently display a Ridicule Mask. These objects act as public monuments of a debtor's shame, as well as legal instruments within the community. They are bills for goods and services owed.

To Mauss gift giving is a "total social fact" which means that gift giving as a practice has implications for all major cultural aspects of a society. He said:

> All these phenomena are at the same time juridical, economic, religious, and even aesthetic and morphological, etc. They are juridical because they concern private and public law, and a morality that is organized and diffused throughout society; they are strictly obligatory or merely an occasion for praise or blame; they are political and domestic at the same time, relating to social classes as well as clans and families. They are religious in the strict sense, concerning magic, animism, and a diffused religious mentality. They are economic. The idea of value, utility, self-interest, luxury, wealth, the acquisition and accumulation of goods—all these on the one hand—and on

> the other, that of consumption, even that of deliberate spending for its own sake, purely sumptuary: all these phenomena are present everywhere, although we understand them differently today. (Mauss 1950: 101)

It is for this reason that the potlatch gift economics, and birds as commodities, are a focus of the present study. Potlatching and gift giving are at once social and material. The manner in which resources are harvested, modified, and shared among individuals and groups have social consequences. So the question is, can we use the frameworks of potlatch and gift exchange to develop models and expectations to explain changes in the material record? Such a model would have applicability to any material that was conceivably acquired and exchanged within this system. Nevertheless, any material would be constrained by its own physical properties that make it valuable to people. Products, such as food and artifacts, created from bird parts function for various utilitarian and symbolic purposes in traditional Coast Salish society (Stern 1934; Barnett 1955). Based on these and other ethnographic data, I am going to develop hypotheses about archaeological avifauna based on their possible role in the potlatch economy.

Suttles notes that there has been a tendency to treat the prestige economy as separate from the food economy (Suttles 1987a). This tendency has been reproduced by archaeological studies because we tend to pursue questions regarding rank and prestige through the analysis of formal artifact types (Ames and Maschner 1999:180–185), and questions about the subsistence economy through the analysis of faunal remains (Dubeau 2012; Hanson 1995). Suttles goes on to refute such a separation stating that "it is more reasonable to assume that, for a population to have survived in a given environment for any length of time, its subsistence activities and prestige-gaining activities are likely to form a single integrated system by which that population has adapted to its environment"(Suttles 1987:16). Even so, he and other authors continue to handle food and wealth one at a time, because the way they enter into the economy is related to their extraction and ultimate function. According to Suttles, wealth objects, including modified artifacts are what conferred prestige (Suttles 1951). They did so by marking inherited rights, or by displaying the gift debt that bolster's ones social position. Food was both freely taken from the environment (Boxberger 1989), and freely given among individuals (Suttles 1987a).

Instead of focusing on the physical aspects of the material, perhaps another approach is to focus on how materials mark certain rights and privileges. One potentially useful distinction is articulated by the economist Duran Bell (2004:99) who differentiates between *rights of person* with *property rights*. According to Bell, rights of person are "inalienably attached to the person on the basis of some intrinsic characteristics of that person" (2004:99) and cannot be conferred to other individuals through sale. He gives the example of the right to citizenship. A person cannot sell their citizenship to another individual. Property rights, on the other hand, are rights "for which alienation is fully expected and socially facilitated". Suttles remarks that in the Coast Salish worldview the natural world is viewed as a source of power (1951). As such, products from the natural world formed a kind of commons. Individuals could not be alienated from access to food because it was a right of person, for all members of Coast Salish society. Further, they could not be alienated if the food was acquired through the means of their own labor, if a bird was speared, or a fish gaffed, it was theirs because they acquired it (Boxberger 1989). Abstract ownership to animals in the natural world, as the English monarchs exerted over the claim of all swans, did not exist in the Coast Salish system. Rights to harvest locations did, however.

Beyond the gift exchange of surplus food, bird resources also contribute to the gift economy as raw materials that would be modified into wealth objects. Property rights in Coast Salish society was exhaustive (Donald 1997:26). Property rights were explicitly defined for tangible objects like material goods, but also for resource extraction areas, as well as classes of what we would today call intellectual property, for example the right to do certain dances, or to use specific artistic motifs. Intellectual property rights have another association with birds, and that is through the association of certain spirit helpers that would aid hunters and fishers in the food quest. Several of these characters are mentioned in the ethnographic accounts including Sinetlqi, who would take the form of a mallard (Stern 1934:19), sg^{u}lōβ, the pheasant spirit (Haeberlin and Gunther 1930:71), or swō'kwad, the loon spirit who would aid warriors (Haeberlin and Gunther 1930:72). These are worth mentioning because associations with these spirit helpers often granted individuals the right to display masks and costumes depicting the animal manifestations of them, and were often adorned with feathers, wings, and scalps of the birds that they represent.

Specific facilities for the harvesting of large quantities of food were owned and controlled by specific lineages. They include locations and infrastructure like poles for raised duck nets (Suttles 1989, Gunther 1927), reef netting locations for salmon (Boxberger 1994), and clam gardens (Lepofsky et al. 2015). Holders of the titles to resource gathering locations served as stewards of that resource for their extended kin groups. This definition of owned property indicates that the facility owners reserved the right to deny access to others for their use and enjoyment. Such was the case at Semiahmoo, and at the Klallam village at Washington Harbor, where individual houses owned pairs of poles for duck netting (Suttles 1951). Interestingly, at other locations such as the duck poles at Pole Pass off of Orcas Island, or Mosquito Pass on San Juan Island, the raised poles operated as a common facility, and the only property requirements were the net and lines. It is unclear what was more normative, duck poles for which lineage ownership was made explicit, or duck poles that served as common property. In either case, what is important to note is that rights to exclude others, to alienate them, from the potential gains of duck poles were exercised at least some of the time. Its reasonable to conclude that the upfront labor investment, or long-term special knowledge of such favored hunting and fishing grounds, are what established their original recognized ownership which were then conferred to succeeding generations through inheritance. And, although food for survival and immediate consumption was a right of person, the harvest of foodstuffs in mass quantities could contribute to the production of wealth for individuals, lineages, and communities at large. Suttles asserts the following relationship between food and wealth:

> A man with a temporary abundance of food had three choices: (1) he could *share* it with his fellow villagers, if they could consume it [...] (2) he could *preserve* it, if it was preservable and he had the labor force and time before the next harvest [...] (3) he could take it to his in-laws in another village (where this particular food might be scarce) and receive in return a *gift* of wealth [...] If he got more wealth than he gave, he could always *potlatch* and convert the wealth into glory [...] (Suttles 1987:60)

This set of normative behaviors can be imagined as operating as a closed system between an individual and his or her affinial kinship network (Figure 4). This diagram reads from the bottom up. Such that, if certain conditions are met, the individual is able to move up the diagram through a series of operations. For example, if a lineage has a surplus of food, then they are able exchange their temporary abundance into value outcomes, that predominantly take the form of accumulated social obligations. Its reasonable to think that temporary abundances of items like duck meat could have been the result of exchanges within and between communities in such a fashion. The preservation of duck meat or other fowl is possible, because it can be smoked and dried similar to salmon. Stern (1934:42), however, notes that duck meat was generally not preserved, and was processed for immediate consumption. An abundance of duck meat is therefore likely to enter the gift economy more readily than other food resources for which storage for later use was common; for example salmon and eulachon. The best way to get a delayed return on ducks was to give away the excess.

Hunting of avian resources was practiced widely throughout the Coast Salish cultural area. Specific ethnographic examples suggest that these resources contributed to the production of wealth, through systems of gift-giving and exchange. When considered in a Marxian evolutionary framework, changes in the relations of production (social relationships) can be used to track and predict changes in the means of production (material conditions) (Patterson 2003).

Pamela Amoss (2017), describes a similar scenario to explain the relationship between central Coast Salish people and dogs. She argues that social status was facilitated by their kinship system, and that the access to inherited rights was tied to the accumulation of credit. Credit was generated by luxury items, and their value relative to other commodities was tied to the skill and labor investment of an item, as well as access to rare raw materials, which was environmentally predetermined. She argues that blankets, were one class of materials, that we can think of as "coinage" (Amoss 2017:144). The production of blankets from mountain goat wool, was one way that groups in marginal areas could produce items that would allow them to exchange gifts with groups in more salubrious areas. The shift from the production of Mountain Goat only blankets, to those produced with both mountain goat and dog wool, and allowed groups in the richer areas to undercut the value of blankets from those in poorer areas. I am asserting that duck down as additives to blanket wool and bird plumage for other signaling uses also contributed to the economy of social obligation. In this way, rights of ownership to the means of production, the duck net locations, and rights to display certain specific plumages were controlled in order to concentrate wealth generated from bird collection with certain individuals and lineages.

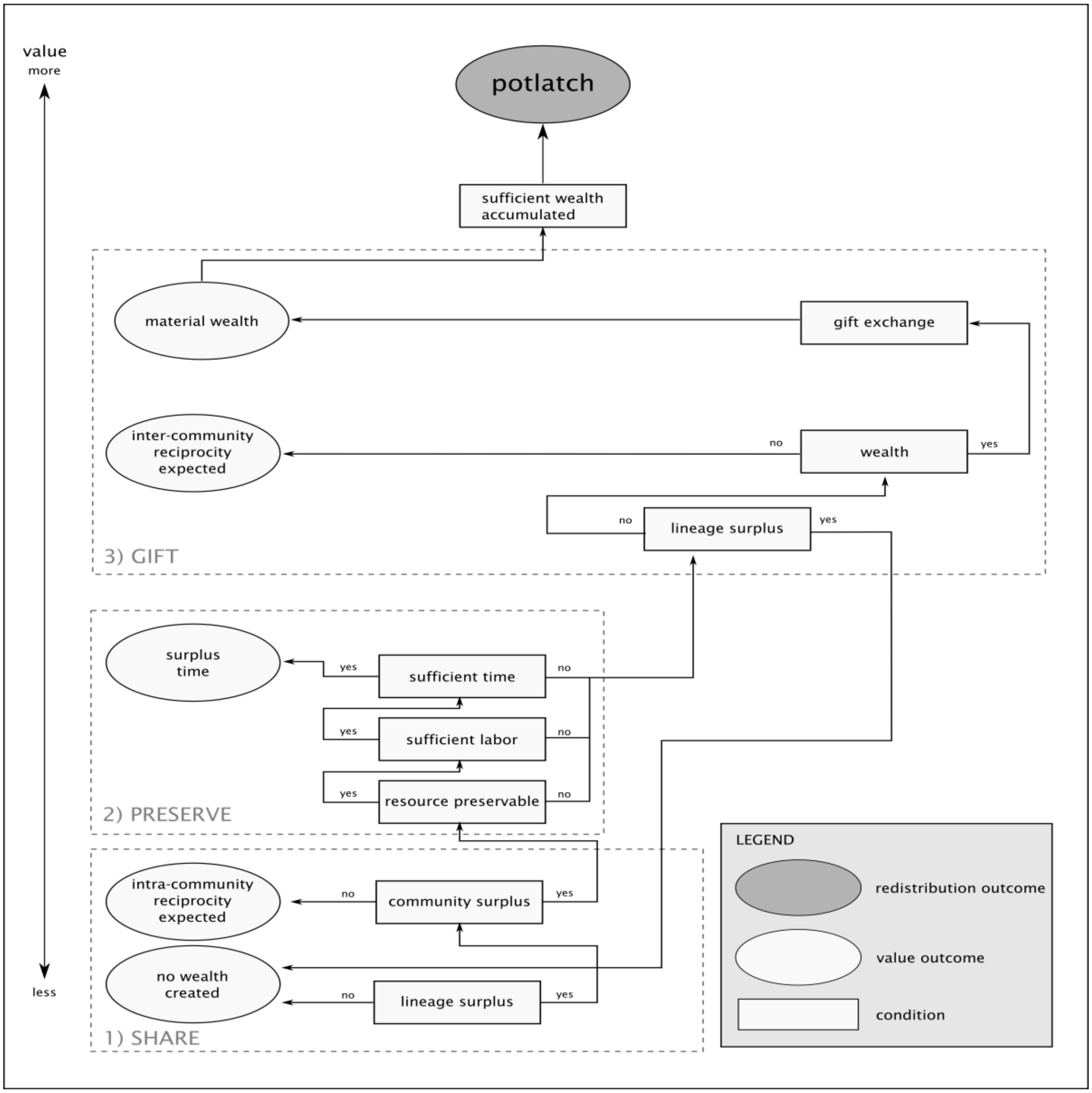

Figure 4. Diagram illustrating the process of gift exchange in the traditional Coast Salish economy. Information from Suttles (1987a:60).

How then, can we transform these facts into a theory of historical change over time? There are many directions we can go, but given the materials and social structures that we have isolated, a

Marxian perspective is the obvious choice. What do we have? We have resources available to people through an agreed upon commons, i.e. the natural world. We have forces of production of extreme reward that come at the price of high risk. This is evident in access to extreme abundance, for short periods of time, like access to a flock of surf scoters congregating around a run of spawning herring. These events are known, and can be anticipated to have seasonal regularity, but the timing and intensity of these events are unknown. According to Suttles (1968), and Donald (1994), the two factors that most constrain the outputs of this economic system are i) the stochastic nature of the availability of large surpluses of resources, and ii) limits on access to available labor to adequately process these large surpluses. We have the means of production, represented as productive facilities like raised duck nets. These facilities aid the extraction of resources from the commons, but access rights to their use and enjoyment is defined and controlled. We have relations of production limited by the presence of inherited rights to access the means of production, but the absence of bureaucratic political structures to compel non-voluntary labor to process the surpluses attained. Instead, labor is induced through a currency of social capital and debt, through gift economy and potlatching. This is the dominant mode of production during ethnographic times. Here I assume that the potlatch economic system is in place in the distant past and represent the relations of production that drove historical change over time. That is to say that it is not the accumulation of wealth objects that drove resource intensification. Material accumulation is the symptom. The accumulation of gift-debt among individuals, instead, is what required individuals and kin groups to seek greater yields of resources, including those derived from hunted birds.

Assuming that the descriptions and interpretations of the social economic structures are sound, what then are we left with? We have a society that views material property in a way that is nearly diametrically opposed to our own, and a food system that is dependent on facilities that support such a system. Hunting of avian resources was practiced widely throughout the Coast Salish cultural area, and specific ethnographic data suggest that these resources contributed to the production of wealth, through systems of gift-giving and exchange.

The Means of Production

Generally, Coast Salish bird hunting techniques were closely aligned with techniques they had developed for marine resources. Raised nets for ducks are analogs of reef nets for salmon, and the very tackle they used to procure herring was used to bait and coax diving fowl to a watery grave. Ethnographic descriptions clarify some relations of Coast Salish peoples with their avian neighbors, and cloud others. On the one hand, the descriptions show that Coast Salish peoples hunted and utilized a diversity of birds, but use of the word ‘ducks’ to indicate all shorebirds, waterfowl, and diving birds, also introduces doubt on the efficacy of the ethnographic record to accurately reflect the use of specific taxa. This section discusses bird hunting techniques utilized by the Straits Salish, which were used at several locations throughout the central Salish Sea (Figure 5).

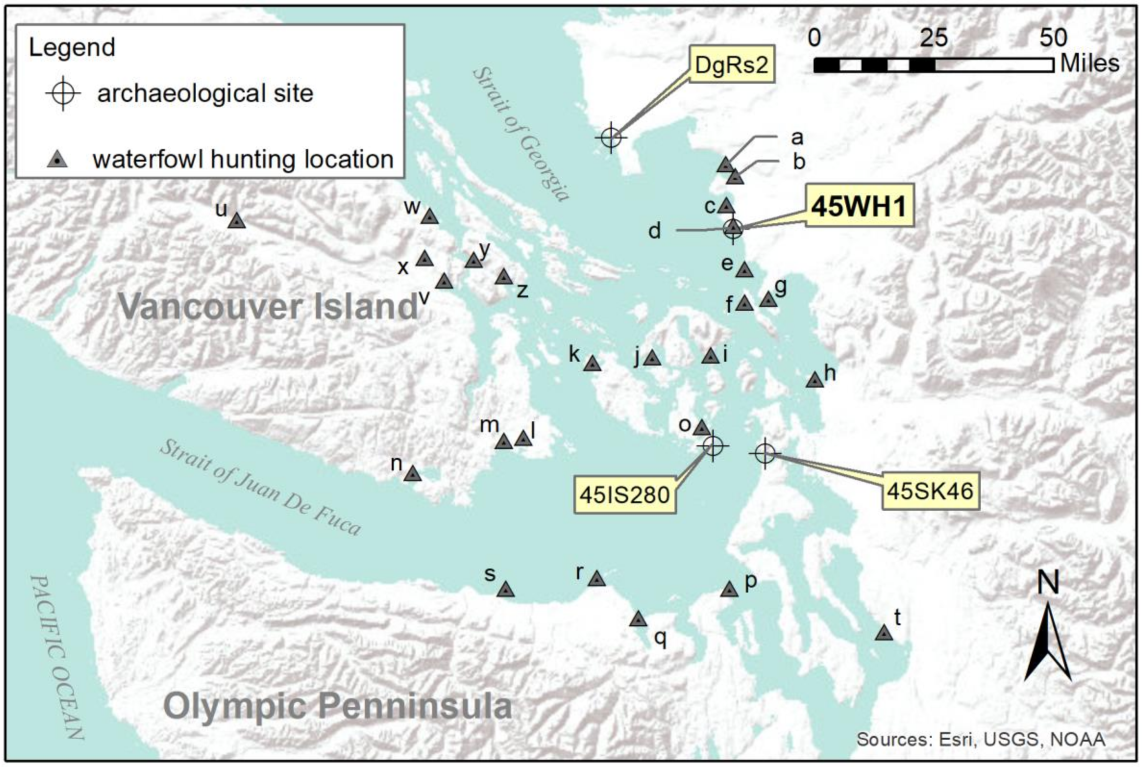

Figure 5. Location of Xwe'Chi'eXen , 45WH1, and comparison sites, in relation to the locations that duck hunting was documented ethnographically. a, Tongue Spit (Suttles 1951:72); b, Drayton Harbor (Suttles 1951:28); c, Birch Bay (Suttles 1951:28); d, Cherry Point (Suttles 1951:34); e, Sand Point (Tremain 1975:19); f, Village Point (Tremain 1975:19); g, Portage Island (Suttles 1951:34); h, Samish Island (Suttles 1951:42); i, Obstruction Pass (Suttles 1951:34); j, Pole Pass (Suttles (1951:72); k, Mosquito Pass (Suttles 1951:33); l, Victoria Harbor (Suttles 1951:14); m, Esquimalt Harbor (Suttles 1951:14); n, Sooke Inlet (Suttles 1951:8); o, Mud Bay Lopez Island (Suttles 1951:42); p, Port Townsend (Alexander and Sykes 1798); q, Washington Harbor (Gunther 1927:205); r, Dungeness (Gunther 1927:205), s, Eddies Hook (Gunther 1927:205); t, mission beach (Haeberlin and Gunther 1930); u, Cowichan Lake east of Youbou (Rozen 1985:219); v, Cowichan Bay (Rozen 1985); w, mouth of Bonsall Creek (Rozen 1985:127); x, Somenos Lake (Rozen 1985:188); y, Burgoyne Bay (Rozen 1985:134); z, Fulford Harbor (Rozen 1985:243).

Birds were hunted using a variety of techniques in traditional Coast Salish culture including individual harvest techniques, and mass harvest techniques (Ames 2003; Bovy 2007). Individual-harvest techniques were designed to yield one animal per hunting-action, and included the use of thrusting implements, projectiles, and traps and snares. Since a kill derived from individual harvest methods were the product of an individuals own labor, they could not be alienated from the kill as a commodity. In contrast, mass-harvesting techniques were designed to yield many animals in a very short period of time, and included the use of raised nets, and submerged nets, and hand nets. Mass harvest techniques required facilities that at least some of the time could be alienated from certain individuals since access to their yields were defined as property to specific kin groups. Suttles provides the broadest treatment of Straits Salish bird hunting techniques (1951). The traditional ethnographic accounts document that many of these techniques were specific to Haro and Rosario Straits, but it is reasonable to assume that they have wider applicability to the Salish Sea and the broader Northwest Coast. Certain artifacts recovered from Xwe'Chi'eXen, for example, are consistent with these techniques, and when viewed in relation to the avifauna also present, suggest that these techniques were employed at this location prehistorically (Figure 6). The following discussion draws on several sources with specific ethnographic relevance to Coast Salish peoples in the central Salish Sea. The authors reviewed include Curtis (1913), Gunther (1927), Haeberlin and Gunther (1930), Suttles (1951), Barnett (1955), and Stern (1969). Suttles's descriptions were particularly useful because they were very geographically relevant, and provided a broad scope traditional fowling practice.

Figure 6. Artifacts recovered from Xwe'Chi'eXen, 45WH1 including those that that are consistent with the hunting methods described in the ethnographic accounts (a, d, e, f, g), or are made of bird bones (b, and c). a, stone net weight, Cat. 1117, S2W4 40-60; b, bone tube, possible bird long bone, Cat. 851, S1W10 40-60 cm; c, Worked large Anatidae carpometacarpus, Cat. 2945 S6E11 40-60 cm ; d, possible bone gorget, Cat. 1470, S9E4 +8-20; e, unilaterally barbed point, Cat. 2577 S24E27 20-80 cm; f, unilaterally barbed point, Cat. 854 S1E6 0-20; g, stone net weight, Cat. 1193, S5E4 ground surface.

Individual Harvest Hunting Techniques

The Coast Salish hunted birds individually using several techniques including the use of spears, projectiles, and traps and snares. Many of these techniques utilized canoes in order to approach groups of ducks (Anatidae), or other waterfowl. By canoe, individual birds were captured using barbed spears (Barnett 1955), with bow and arrows (Curtis 1913), and were clubbed. These techniques used various means of camouflage in order to conceal the hunters, including hunting at night, using canoe blinds, and using fire to manipulate shadows (Suttles 1951; Barnett1955:95-96). In the Lummi dialect of Northern Straits Salish (Thompson and Kinkade 1990) bird spears were called *teskeman* (Stern 1934:41). The specific construction of individual spears varied between descriptions, but the shafts were reported to be as long as 11 ft in length with approximately five barbed bone points attached to one end (Suttles 1951). The barbed bone points would become entangled in the birds feathers' trapping it, rather than piercing it like other lance implements. Bird spears were often used as thrusting implements' however they were occasionally thrown as projectiles.

Other projectiles used for individual capture of birds included arrows, and sling stones. General hunting bows were made of yellow cedar (*Cupressus nootkatensis)* or Western yew (*Taxus brevifolia*), however, bird-specific bows are described as of a lower quality and were often made of hardhack (*Spiraea tomentosa*) (Barnett 1955). Arrows are described as measuring the length from the shoulder to the finger tips, which is generally reported as 2.5 ft, with shafts made of Western redcedar (*Thuja plicata*), and were tipped with blunted points, or two-pronged barbed points (Barnett 1955). According to Suttles (1951), bows and arrows were used in tandem with canoes and blinds to capture ducks (Anatidae), whereas swans (*Cygnus sp*.) were stalked and shot in shallow estuaries. Additionally, arrows were either tethered for retrieval or were marked with specific identifications. None of the ethnographies reviewed noted what identifications meant regarding ownership of the arrow, the kill, or both. Stern notes that the use of bow and arrow for ducks was more for sport than for food, but they were used on cormorants and loons (1934). Barnett (1955) also reports the use of slings, but he did not describe them in detail. Instead he suggests that they were a "minor weapon" and that they were primarily used by boys to acquire grouse (Phasianidae). Presumably, these were slings made of plant fiber or mammal hide, and the projectiles used were stones.

Certain types of traps are also included as individual-capture techniques. Slip-loop snares are reported for the capture of shorebirds (Charadriidae) (Barnett 1955), and grouse (Phasianidae)

(Suttles 1951). Suttles describes the use of decoys to bait grouse snares, and explains that the elderly primarily used this technique. Additionally, the capture of eagles is described as having been conducted by baiting locations with dead fish (Barnet 1955:98) and using a "foot hook" attached to a pole for capture.

Additional techniques include hand capture and the use of gorgets. In the southern Northwest Coast the Tolowa are documented as having captured juvenile cormorants by hand (Gould 1966:85). Although no ethnographic resources directly described this method of hunting in the Salish Sea, Bovy (2007) suggests that the archaeological signature at the Watmough Bay site 45SJ280, is consistent with this hunting method. Drucker (1963:51) reported that the Kwakuitl (Kwakwaka'wakw) and Nootka (Nuu-cha-nulth), used "baited gorgets" to capture diving ducks. Drucker doesn't expand upon this statement, but presumably the technique worked the same for birds as it did for fish. The gorget, which is a bone bipoint (see Figure 6, *artifact d*), would be girdled in the middle with a lead line, baited and then cast like any fishing line tackle. When a duck would take the bait, the gorget would toggle, and lodge in the bird's throat.

Mass Harvest Hunting Techniques

Large raised nets were used in flyways to capture entire flocks of waterfowl (Underhill 1944). In the Lummi dialect they were called *tequam* (Stern 1934:41). This technique is one of the most often discussed bird hunting techniques in traditional ethnographies of the Coast Salish cultural area. It consisted of hoisting large rectangular nets up one or several pairs of large wooden poles in order to capture entire flocks of migratory birds (Figure 7). Although specific details vary between accounts, the overall picture is relatively consistent. Typically poles were approximately 30 to 40 ft tall, but occasionally described as tall as 80 to 100 ft (Gunther 1927; Underhill 1944). They were braced at the bottom with three to four smaller poles that acted as deadmen. The span between poles is often quoted as being approximately 100 ft (Suttles 1951: 71, Gunter 1927), but the true span at a particular location was dictated by the local topography. Poles were positioned on sand spits, tombolos, and between islands and larger land-masses. During Vancouver's 1792 expedition, poles consistent with these descriptions were observed (see Figure 5, *water fowl hunting location p.*). Since their use was not observed, however, their function was the subject of speculation among Vancouver's crew (Barnett 1955:103). Modern utility poles are a useful analogy for a contemporary audience to illustrate what they might have looked like and what some of the physical constraints of their construction might have entailed. Modern utility poles are typically 35 ft in height, buried to a depth of 6 ft (Commission 2017). Untreated cedar poles set in soils, are likely to have had a useful life of a decade or less.

Figure 7. "Remarkable Supported Poles" on a tombolo near Port Townsend, WA (Alexander and Sykes 1798). Image is cropped from the original, which is larger. Image used with permission, courtesy of The Newberry Library, Chicago. Call # Ayer Art Alexander."

Materials used in the fabrication of the actual nets include willow bark, or nettle fibers (Suttles 1951; Gunther 1927). Several techniques were employed to make the cordage less visible, including: a very fine cord gauge (Underhill 1944), dying the fibers darker colors (Suttles 1951), and favoring low visibility times of day for hunting. The gauge of the net mesh is described as approximately the same diameter as a pintail duck (*Anas acuta*) torso (Gunther 1927). The circumference of a pintail duck torso is approximately 10.25 in (Noonies Taxidermy Supply, Accessed January 31, 2017), so the net gauge likely had a diameter of approximately 3.25 in. Like fish nets, duck nets were intended for specific kinds of waterfowl; Underhill (1944:47) reports that raised nets were used on teal, mallard, and canvasbacks, and Suttles (1951: 72) reports that they were used on all water fowl from widgeon to goose size. However, since birds travel in flocks that occasionally include a mix of several types of birds, shore birds (Charadriidae) were occasionally captured as bycatch (Underhill 1944:49).

In use, nets were raised up the poles by two or more hunters attending to the working ends of lines of a simple pulley system (Suttles 1951). The lines were actively attended, because the net would be dropped once the flock made contact with it, and the hunters would dispatch the captured birds with clubs or by strangling. Raised nets were used at Tongue Spit near Semiahmoo, Sand Point, Portage Island, Obstruction Pass, Pole Pass, Mosquito Pass, Samish Island, Sooke Inlet, an unidentified location near Port Townsend, and an unidentified location near the southern extent of Admiralty Inlet (see Figure 5). Gunther describes “twelve poles two for each house” at Washington Harbor (Gunther 1927:205), which Suttles suggests indicates corporate ownership of the duck nets by households.

Another mass-capture hunting technique involved the use of nets submerged below the water’s surface, known as *tlupulyen* in the Lummi dialect (Stern 1969:41). This technique employed the use of nets laid horizontally in relatively deep water that supported eel grass beds, or other herring habitat, in order to capture ducks and other diving birds (Suttles 1951). The waterfowl preying on herring and their roe would dive beneath the nets, then, following the seafloor toward the surface of the water, be prevented from surfacing. Suttles informants reported that this tackle would be assembled "over night", and would yield 10 to 30 ducks. The technical constraints of this technique, and the preference for laying tackle during the night, suggests that the method was tide dependent, therefore it is likely that this figure is per tidal cycle. It is likely to have only been an option during very low tides, which further limits when it could have been done to a couple of nights per lunar month. Surf scoters (*Melanitta perspicillata)* range in weight from approximately 2.0-2.5 lbs (Baldassarre 2014). Assuming that a feathered surf scoter would be approximately 1.5 lbs, this hunting method could yield 15 to 45 lbs of meat during a successful use. The tackle itself is described, as a 4-5 ft wide by 75 feet long, and supported by upright posts at 6 ft intervals (Stern 1934). The net was composed of willow bark, or nettle fibers, and was suspended beneath and parallel to the waters surface. Stone cobble weights girdled with plant fiber lashing, and floating buoys would suspend the net at the desired depth of approximately 15 ft beneath the water's surface near the top of eel grass (Suttles 1951).

Stern (1969) reports that horizontal nets were used at Village Point on Lummi Island, and at Sandy Point, approximately 6 miles south of Xwe'Chi'eXen. Based on Suttles and Sterns descriptions, geographer David Tremain asserts that this relationship between the spawning herring, and the capture of diving birds was known and actively pursued by Coast Salish peoples. Given the known relationship between diving waterfowl and spawning herring (see Chapter 2, *Physical Environment*), and the technical overlap in the tackle used for their procurement, it is reasonable to assume that there is a relationship between techniques. Underhill (1944) reports that nets ensnared birds as small as plovers and snipe, but she does not specify whether she was referring to raised nets or submerged nets. Since Suttles (1951), and Gunther (1927), each describe that the raised nets had an effective net-gauge range that allowed smaller ducks to pass through, it seems reasonable to assume that shorebird bycatch was more likely a product of submerged nets. Further, Underhill asserts that fishnets could have been reused to function for waterfowl.

Hunting with hand-nets was a technique somewhat in-between individual harvest and mass-harvest hunting. It is discussed here since it more closely meets our operational definition of mass-harvest techniques: techniques that acquired several animals in a single action. Hand nets were called *tetecan* in the Lummi dialect (Stern 1934:42). The hand-net was approximately 6 ft by 8 ft stretched between two cross-pieces on a long cedar pole that acted as an adjustable frame (Suttles 1951:77). Typically, hand nets were used in tandem with canoes. As a canoe approached a flock the hunter either "swung the net down over the ducks as they swam toward him" (Suttles 1951:78). Or, the hand net was raised in the bow of the canoe, like a sail to the wind, and when the flock spooked the birds, they would fly toward the wind and into the net. Since their operation caught the wind, they were analogous to dip-nets in water currents for fish.

Generally, Coast Salish bird hunting techniques were closely aligned with techniques the Coast Salish had developed for marine resources. Since fish and birds congregate and move within fluid mediums, fish in the sea, and birds in the air, these techniques took advantage of bottlenecks of tidal current and wind. Salmon schooling in currents were caught by reef nets suspended in the water's flow (Suttles 1951; Boxberger 1989), and analogously, flocks of ducks were caught in nets raised above sand spits. Further, the very tackle they used to procure herring was used to bait and coax diving fowl to a watery grave. Similarly, and more straightforward, bird spears and foot hooks operate like leisters and gaffs.

Birds as Commodities

A diversity of birds represented in the ethnographic accounts primarily include waterfowl such as ducks and geese (Anatidae), shorebirds (Charadriidae), gulls (Laridae), cormorants (Phalacrocoradcidae), and loons (Gaviidae), but terrestrially oriented taxa also appear including birds of prey (Accipitridae), woodpeckers (Picidae), owls (Strigidae), and perching birds (Passeriformes) including crows and ravens (Corvidae). In addition to descriptions of birds that correlate with known bird taxa, there are also descriptions of mythical birds including Thunderbird and Tcaptcap. Underhill (1944) presents a table listing 15 species of ducks, 3 species of geese, 13 "smaller birds", 1 loon, 2 cormorants, 2 herons, 4 gulls, 1 crane, 2 grouse, and 1 snipe that were hunted. She notes that the smaller birds were likely present as bycatch and were not sought after. This section describes in detail, the commodities produced by the birds described, in terms of their food value, and in terms of their wealth value.

Food

Most of the ethnographies reviewed focused on the hunting methods described in the previous section. Use as food is the presumption behind the description of their procurement since they were often presented in the context of other observed subsistence behaviors, such as gathering plant foods, or mammal hunting. Despite that orientation in the ethnographies, specific references to bird preparation and cooking are under represented. Many descriptions concerning food uses are just statements about what was hunted or what was eaten. Underhill (1944:71) lists forty-four species that were hunted, but she notes that certain species were taken for specific non-food uses. Suttles notes that "Two or three species of upland birds were eaten, and more than forty species of waterfowl and shorebirds, ranging in size from sandpipers to twenty-pound swans" (Suttles

1987:23). Birds explicitly described for their food-value included ducks (Anatidae), geese (*Grus sp.*), swans (*Cynus sp.*), seagulls (Laridae), cormorants (Phalacrocoracidae), eagles (Accipitridae), and grouse. In addition to bird meat, the eggs of grouse (Phasianidae), lark (probably *Sturnella neglecta*), loon (Gaviidae), cormorant (Phalacrocoracidae), and seagull (Laridae) were collected (Gunther 1927:205; Haeberlin and Gunther 1930:21; Barnett 1955:63). Multiple accounts mention that totem birds were eaten except for ravens (Corvidae), crows, and owls (Strigidae)(Barnett 1955; Gunther 1927). Presumably this taboo was related with concerns for safety, since they represented powerful spirits, raven was a trickster, and owls were associated with death (Barnett 1955:148). Accounts of specific preparations were somewhat sparse, but Haeberlin and Gunther (1930:21) describe that ducks were prepared by boiling their meat in cedar baskets, or by spit roasting them over a fire. Other accounts of bird food preparation are related to childbirth. Barnett describes that the Sanetch served a ritual meal of "four bites of seal, clam, codfish, duck, and devilfish" to women going into labor (1955:138). Stern describes that the Lummi had a remedy to aid labor that included a cocktail of herbs, salt water, and goose, and swan fat" (1935:4). In addition to bird consumption as prescriptive treatments, there were also social morés associated with bird-food consumption during certain times in an individual's life. Morés were associated with pregnancy, generally expected mothers would abstain from eating cormorant (Phalacrocoracidae) (Barnett 1955:128), and Lummi women would abstain from eating seagull (Laridae) and crane (Gruidae) meat during pregnancy because folk wisdom held that it would produce a whiny baby (Stern 1934:13). Pubescent boys of the Sanetch were told to abstain from the same foods used as remedies for expectant mothers (Barnett 1955:150, 152), and Lummi boys would avoid bird gizzards because their consumption would make them weak (Stern 1934:17). Neither pubescent boys, nor pubescent girls of the Homalco, Klahuse, and Slaiäman would consume seagull (Laridae) eggs during initiation rites (Barnett 1955:168).

Wealth

Bird down and skins were widely used in textiles, including blankets, capes, and hats and leggings. Strips of duck skin that retained soft down were spun with nettle, cattail, and dogwool fibers to create the yarns of the Stamwhal blanket (Wickersham 1896:22; Barnett 1955:71, 119; Drucker 1963:87). Capes and cloaks were sewn together from the skins of geese and several other birds to form cloaks (Barnett 1955:72). Bird skins were also worn as hats; in particular loon skin hats were worn by shamans (Barnett 1955:149). Bird feathers and body parts were worn as adornments and are often associated with specific ceremonial regalia for rituals like the Sx□ ʷáyx□ ʷəy dance. Sx□ ʷáyx□ ʷəy regalia included masks adorned with eagle feathers and down, as well as leggings made of swan skins that retained down, and feathers. For certain masks, whole bird heads representing horns, were also used (Barnett 1955:158). The regalia itself was used to imitate specific animals including raven, owl, and merganser, among others. Eagle feathers were worn for the "washing dance" (Barnett 1955:162), and attached to tunics and clubs for the "fluttering dance" (Stern 1934:64). The Homalco used eagle feathers and eagle down for the *tal* mask (Barnett 1955:170).

Other artifacts from bird carcasses that could have been gifted in this system include drinking tubes (Stern 1934, Barnett 1955), worked bird bone points for fishhook barbs (Barnett 1955:85, (Monks 1977), feather fletching for arrows (Barnett 1955:101), and the use of whole bird wings as whisk brooms (Petruzelli and Hanson 1998), among other uses. Drinking straws, known as *qokpakam* (Barnett 1955:164) in the Pentlatch dialect of Central Salish, were fashioned from swan bones, or other bird long bones. These drinking straws were associated with protecting the teeth of pubescent boys or girls during their rites of passage. Several types of feathers were used for arrow fletching including eagle, cormorant, and duck (Barnett 1955:101; Haeberlin and Gunter 1930:26).

Culin (1907:156) indicates that the dice-game *Shuswap* was widely played by Central Coast Salish groups and that at least one group, possibly the Snohomish, used bird radiuses to tally scores. Outside of the Coast Salish area, in the southern portions of the Northwest Coast the Tolowa used pileated woodpecker scalps as a type of "currency" (Suttles 1987a).

Underhill (1944) itemizes birds that were for their feathers, and those that were used for magic purposes. Birds used for their feathers included birds of prey, e.g. hawks and ospreys (Accipitridae and Pandionidae), as well as woodpeckers and flickers (Picidae), and the Western Robin (*Turdus migratorius*). She also mentions that three birds were used for magic only. They included rufus hummingbird, Vaux's swift, and the Western Belted Kingfisher. Its unclear if the magical use involved the use of the physical materials of the birds, or if they were petitioned as spirit helpers.

Assumptions and Expectations

This study assumes that generally, the environment has remained stable from approximately 3,500 years ago to the present. Although this assumption introduces a presentist bias to the interpretation of the avifauna from the site, it uses current avian biogeographic conditions as the baseline to which past conditions can be compared. To a certain extent, the assumption of environmental stability is related to limitations to the chronological model for the site. Given the relatively short life span of most bird species, populations are likely to fluctuate on a decadal, or even a century scale. Since the chronological resolution is relatively imprecise, however, and can only track changes in bird taxa at the millennial scale, the environmental changes we might expect to see are unlikely to be detected. I assume, therefore, that patterns detected in the taxonomic and element distributions reflect patterns in cultural selection. The impacts of post depositional processes is related to time. I expect, all other things being equal, that avifauna from older deposits will be more fragmented than avifauna from younger time periods since the older avifauna have been exposed to natural forces of deterioration for a longer period of time.

Gift economic exchange is globally prevalent (Graeber 2011:29; Humphrey 1985), but potlatch is regionally specific. This suggests that the origins of potlatch economy is rooted deep in prehistory, but that it developed over time. Ethnographies show that the potlatch was highly developed in the 19th and 20th centuries (Suttles and Jonaitis 1990:84–86). In other parts of the Northwest Coast the potlatch ritual intensified in the historic era due to the injection of new kinds of luxury goods such as coppers, and Hudson Bay blankets into this system (Codere 1990; De Laguna 1990); this is also likely to be true in the Coast Salish area. This narrative suggests that the potlatch economic system evolved from low intensity to high intensity. It is reasonable that we can project this pattern into the past: that potlatch economy was developed from a simpler base of reciprocity in its origins, and later flourished into a highly developed system of accumulated gift debt. By extension, if food resource intensification did occur, then perhaps it too was the result of the accumulation of gift debt by individuals and groups. Waterfowl in particular are likely to have contributed in this way because they were harvested for immediate consumption (Stern 1934:42), and they were hunted in the winter (Suttles 1987b) when potlatching was most prevalent. Both of these conditions make it reasonable that waterfowl caught *en-masse* are likely to have made good potlatch food, as well as a source of wealth through down. Assuming that these premises are true, and that bird resources contributed to this pattern of cultural change, I can assert some expectations regarding the pattern of avifauna found in archaeological deposits. If we think of the development of the gift economy as a long-term cultural process, and if mass harvest hunting methods developed in response to increases in social obligations, then the archaeological signature of mass harvest may be a useful proxy for increases in gift economic exchange. Given that premise, bird hunting techniques should be more opportunistic and more broad based earlier in time, and less opportunistic and more targeted later in time. We should expect, therefore, that earlier archaeological deposits should contain more bird taxa that are more evenly distributed among categories, and later archaeological deposits should contain fewer bird taxa that are less evenly distributed among categories.

Other signatures of potlatch related deposition of avifauna are rooted in other premises related to specific non-food related products of bird procurement, biogeographic limits of individual taxa, and the identification of individual deposition events. According to Underhill (1944:49) the feathers of hawks (Accipitridae), ospreys (Pandionidae), woodpeckers (Picidae) and western robin (Turdidae), were collected. The flight feathers of eagles (Accipitridae), and swans (large Anatidae) were used for wealth-related artifacts (Barnett 1955:158). Given the differences in plumage patterns, it is likely that the bird body part and taxon will be related. For instance the presence of distal wing elements, e.g. wing phalanx, and carpometacarpus may be evidence of procurement for primary flight feathers. Ducks were used for their down, which may be evident in the presence of more axial elements. Some signatures of potlatch-related deposition are likely linked to the movement of related kin across space. The presence of extra local bird taxa may represent down the line exchanges between kin networks. We can also expect that some signatures of potlatch deposition will be related to the fact that a potlatch is an individual event in which large groups of people participate. Avifaunal evidence of such an event may include identifying specific deposits with a high diversity of avian families, which would indicate that an array of bird types were discarded in a relatively short time frame; this pattern may indicate the manufacture and exchange of gifts of bird taxa not used for food purposes. Other evidence may include the accumulation of a large number of birds consistent with food consumption in deposits representing short time frames; this pattern may indicate feasting.

CHAPTER 4: METHODS

This research relies on three kinds of evidence: biogeography, ethnographic descriptions, and archaeological remains (Figure 8). These categories of evidence systematically link the inquiry to the physical and social universes that constrain the range of interpretation. Biogeography provides limits on what kinds of bird taxa were available to ancestral Coast Salish peoples. Ethnographic descriptions provide limits as to how Coast Salish peoples are known to have interacted with avian communities. Finally, the archaeological remains provide the material evidence of bird discard at Xwe'Chi'eXen.

This chapter describes the details of the methods used. It opens with a description of the biogeographical and ethnographic constraints that frame the problem. It is followed by a discussion of the specific archaeological methods used to collect the archaeological data, and identify patterns hidden within this cloud of information.

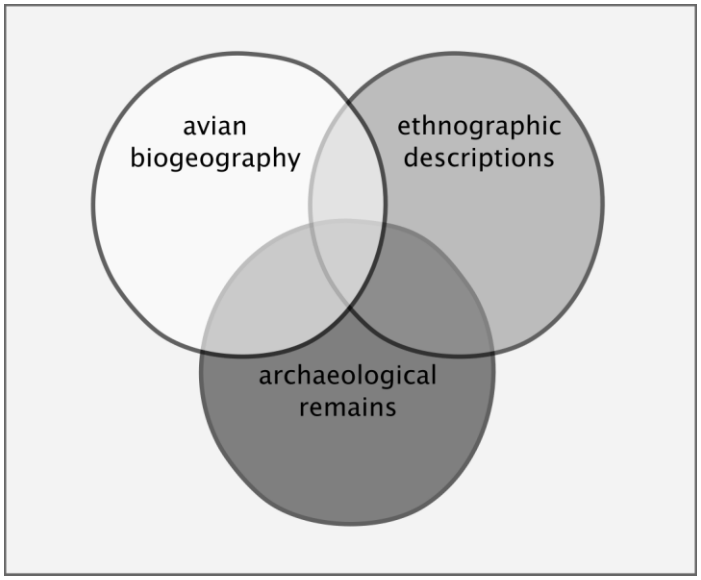

Figure 8. Three kinds of evidence contribute to this study: avian biogeography, ethnographic descriptions, and archaeological remains.

Biogeography

Potential avian diversity was indicated by the archaeological sites with which this thesis draws a comparison: 16 bird taxa from 5 families were reported at Tsawaassen, DgRs2, 16 bird species from 8 families were reported at Lighthouse Point, 45SK46, and 47 bird species form 23 families were reported from Watmough Bay, 45SJ280 (Bovy 2006:74-77). This reported diversity is largely a function of sample size, and also of the proficiency of the individual faunal analysts. Nevertheless, it established that a wide range of taxa could potentially be present in the Xwe'Chi'eXen assemblage. Therefore to account for as wide a range of potential taxa as possible, while simultaneously filtering out noise, a taxonomic list for comparison would need to be tailored for Xwe'Chi'eXen.

Compiling lists of potential taxa is one of the procedures foundational to all other zooarchaeological methods (Brewer 1992; Driver 2011; Wolverton 2013). Since the assignment of taxonomic identifications is a confirmatory process, compiling taxonomic lists serve to "set the universe" (Wolverton 2013:386). This, according to Wolverton, is the first comprehensive step of conducting a faunal analysis. For this investigation three lists were compiled: most likely, somewhat likely, and least likely. The first included, most likely, included the 37 taxa established as the most commonly occurring marine birds in the Salish Sea (Table 2) (Bower 2009). The second and third lists were compiled from data presented by Bell et al. (2006). They present 320 bird species that are commonly observed in Washington State (Appendix A). The second list, Somewhat Likely, was a subset of 160 bird specimens listed in (Bell et al. 2006) that were reported as endemic, and within ten miles of Xwe'Chi'eXen. This selection procedure should be qualified with the following caveats: range was assessed on a presence and absence basis and did not distinguish resident species from seasonal migrants, and the ten-mile limit was an arbitrary decision criteria the purpose of which was to filter out unlikely species. The third list, Least Likely, included the remaining 123 taxa listed by Bell et al. 2006).

Table 2. List of bird taxa most likely to occur at Xwe'Chi'eXen. It includes the waterbird species that occurred most commonly in the Salish Sea during the 20th and 21st Centuries AD (Bower 2009).

*Common Name**	*Order*	*Familiy*	*Genus*	*Species*
bald eagle	Accipitriformes	Accipitridae	Haliaeetus	*H. leucocephalus*
northern pintail	Anseriformes	Anatidae	Anas	*A. actua*
American wigeon				*A. americana*
green-winged teal				*A. crecca*
mallard				*A. platyrhynchos*
lesser scaup			Aythya	*A. affinis*
greater scaup				*A. marilla*
canvasback				*A. valisineria*
brant			Branta	*B. bernicla*
Canada goose				*B. canadensis*
bufflehead			Bucephala	*B. albeola*
common goldeneye				*B. clangula*
Barrow's goldeneye				*B. islandica*
long-tailed duck			Clangula	*C. hyemalis*
harlequin duck			Histronicus	*H. histronicus*
white-winged scoter			Melanitta	*M. fusca*
surf scoter				*M. perspicillata*
black scoter				*M. nigra*
red-breasted merganser			Mergus	*M. serrator*
common merganser				*M. merganser*
ruddy duck			Oxyura	*O. jamaicensis*

continued on p. 55

*Common Name**	*Order*	*Familiy*	*Genus*	*Species*
pigeon guillemot	Charadriiformes	Alcidae	Cepphus	*C. columba*
ancient murrelet			Synthliboramphus	*S. antiquus*
common murre			Uria	*U. aalge*
mew gull		Laridae	Larus	*L. canus*
glaucous-winged gull				*L. glaucescens*
Bonapart's gull				*L. philadelphia*
common loon	Gaviiformes	Gaviidae	Gavia	*G. immer*
Pacific loon				*G. pacifica*
red-throated loon				*G. stellata*
great blue heron	Pelicaniformes	Ardeidae	Ardea	*A. herodias*
western grebe	Podicipediformes	Podicipedidae	Aechmophorus	*A. occidentalis*
horned grebe			Podiceps	*p. auritus*
ring-necked grebe				*P. grisgena*
double crested cormorant	Suliformes	Phalacrocoracidae	Phalacrocorax	*P. auritus*
pelagic cormorant				*P. pelagicus*
Brandt's cormorant				*P. penicillatus*

*Bold typeface indicates inclusion in Underhill's list of birds commonly hunted in Washington (1944:48).

Ethnographic Descriptions

Ethnographic literature was reviewed in a systematic manner in order to frame the archaeological inquiry, and is presented in large part in the previous chapter (Chapter 3). Literature was reviewed and information pertinent to this study compiled using principles of content analysis presented by Bernard (2011:443–47). Sources reviewed primarily consisted of primary-source ethnographic accounts from the early 20^{th} Century; these sources included the works of Curtis (1913), Gunther (1927), Haeberlin and Gunther (1930), Stern (1934), Underhill (1944), Suttles (1951), and Barnett (1955). Other kinds of sources also contributed including accounts from secondary syntheses of ethnographic data (Drucker 1963; Suttles and Maud 1987); archaeological studies and reports (Bovy 2008; Petruzelli and Hanson 1998). All of these sources rely on what Donald (1995:61-62) refers to as "memory ethnography". Therefore the main limitation is that these kinds of sources are already reconstructions of a traditional lifestyle, positioned at some vaguely defined time in the past. As the research progressed, it became clear that a review was more appropriate for the task. The data that was tabulated from this effort is presented in Appendix B.

Archaeological Remains

Archaeological methods employed consisted of the reorganization of legacy field data, data collection and taxonomic identification of specimens, and exploratory statistical characterization and analysis to reveal patterns hidden in the data.

Reorganization of Legacy Data

This research assembles avifauna from approximately 80% of the material excavated between 1969 and 1976. It includes 54 of the 66 cuts excavated during those field school years (Figure 9). The collections from the 1954, 1956, 1985, and 1986, field seasons were excluded because the field methods used during these seasons differed substantially (see Chapter 2, *Previous Archaeology at Xwe'Chi'eXen*). In order for a cut to be included in the analytical assemblage it had to meet two specific criteria: i) the cut had to retain enough of the legacy data, i.e. profile drawings, photographs and/or radiocarbon dates, that the material from it could be assigned to chronological units, and ii) that the cut contain avifaunal remains of any antiquity.

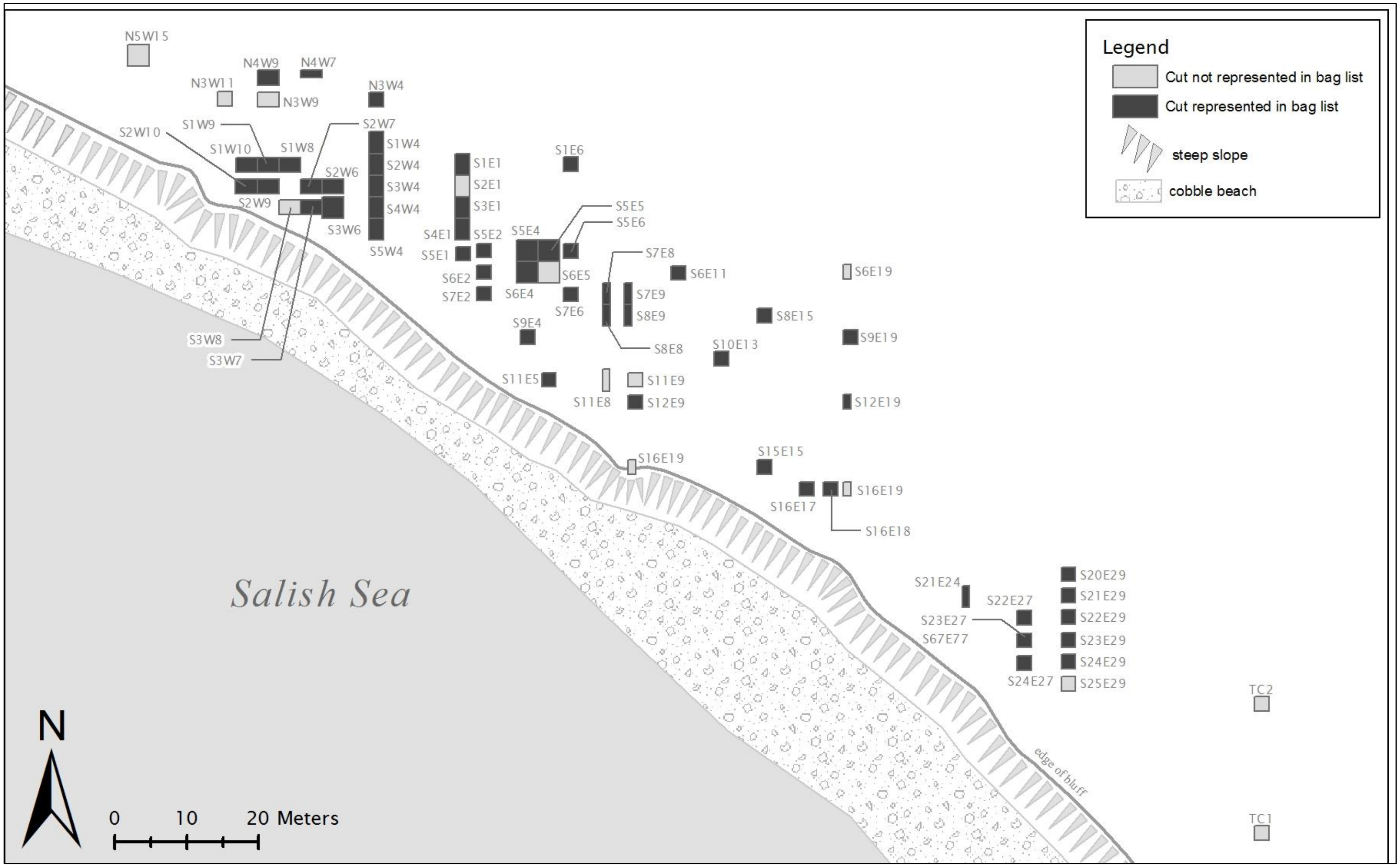

Figure 9. Large scale map showing the excavation cuts included in the analysis.

The first task in assembling the avifaunal assemblage was to identify the locations within the collection that bird bones were likely to be housed, and to rework them into an organizational structure that would aid data collection and information recall for the present inquiry. Since the 45WH1 collection has been the focus of several research and student training objectives over the last 30 years, portions of the collection were differentially organized at the outset of the investigation. These efforts included student thesis research, museum inventory projects to meet NAGPRA compliance requirements, museum training for undergraduate students that included the sorting of sample materials, and rehousing of materials to meet collection prescriptions. Each of these efforts had their own set of objectives, so the collection existed as a set of subgroups each with its own internal consistency. Cataloged artifacts were organized by material type, and Catalog Number. Analytical assemblages, such as Matt DuBeau's mammalian fauna (2012), and Mary Todd's bony fish fauna (2012), retained their own internal organization tailored for their research questions.

The majority of the avifauna, including the material analyzed by Hanson and van Gaalen (1994) (see Chapter 2, *Previous Archaeology at Xwe'Chi'eXen*), was selected and organized by Crystal Richards (now Crystal Hanna), for an undergraduate student research project in 2007 and 2008. The subset organized by Richards included 545 specimens identified to element. This formed the foundation of the assemblage examined in this document. At the outset of the research, however, an unknown quantity of avifauna remained in other parts of the Xwe'Chi'eXen collection. Some avifauna remained unsorted in level bags, and other pieces were sorted incorrectly into the mammal bone, and fish bone assemblages. The inverse was also true, some fish bone and mammal bone incorrectly sorted as bird had to be removed from the assemblage. Sorting and identification occurred concurrently with a project to identify and repatriate human remains and funerary objects from the Xwe'chi'eXen collection (Smart et al. 2016). This project, which was a collaborative effort with the Lummi Nation, painstakingly sorted through and reorganized the entire site collection.

Therefore, no bone fragments identified as avifauna from the 54 cuts included in this research assemblage were excluded from the analysis.

During the original fieldwork, excavated material was passed through 0.25 in wire mesh screen. This field sampling procedure introduced a systematic bias on the sample of avifauna. I ran a single trial experiment to see how this screen size would affect the assemblage, by passing several control skeletons from the comparative collection of Mike Etnier through 0.25 in wire mesh screen. I found that there was over 60 percent screen loss for birds that were pigeon size or smaller (Table 3). Although this experiment was very limited in scope, the premise retains face validity: smaller bird bones are more likely to pass through 0.25 in screen then larger bird bones. Therefore the assemblage is more likely to be composed of large and very large birds as a function of the field methods.

Table 3. Number of bones lost when passed through 0.25 in wire mesh screen.

*Size**	*Description*	*Comparison taxon†*	*Comparison Skeleton‡*	*Total Count*	*Screen Loss§*	*Screen Loss as %*
Tiny	finch size	chickadee	A-157	65	56	86%
Small	thrush size	American robin	A-097	72	52	72%
Medium	pigeon size	pigeon	A-072	86	53	62%
Large	chicken size	mallard	A-173	71	25	35%
Very Large	goose size	snow goose	A-181	193	75	39%

*Size from Ayres et al. (2003), as presented in Serjeantson (2009). † Comparison is based on birds with a comparable wingspan. They are listed by common name. ‡ Comparison identification from the comparative collection of Mike Etnier. § Number of bones that passed through 0.25 in. wire mesh screen.

The general stratigraphic pattern recorded at the site is that there is a deposit of dark material containing little shell beneath a deposit of dense shell midden material (Blodgett 1976:32; Dubeau 2012:76). Therefore the chronological groupings used in the analysis, the Analytical Units, attempt to capture information about these two strata. Where Analytical Unit I (AUI) represents the early deposits and Analytical Unit II (AUII) represents the late deposits (Figure 10). Most Analytical Unit assignments were compiled from previous authors: Dubeau (2012) assigned deposits from 34 cuts, Palmer assigned deposits from 37 cuts (2015), and Todd assigned deposits from 26 cuts (2012). These assignments were combined, discrepancies between the records were reconciled by assigning the deposits unique identifiers which were labeled contexts (Appendix D), which was a list of unique proveniences that included horizontal and vertical location. This volume also includes new Analytical Unit assignments for an additional 23 cuts. The general interpretation of these chronological groupings has been that the early deposit, AUI, corresponds with the Locarno Beach typological phase, and the later deposit, AUII, corresponds to the Marpole and Gulf of Georgia typological phases (Palmer 2015; Dubeau 2012).

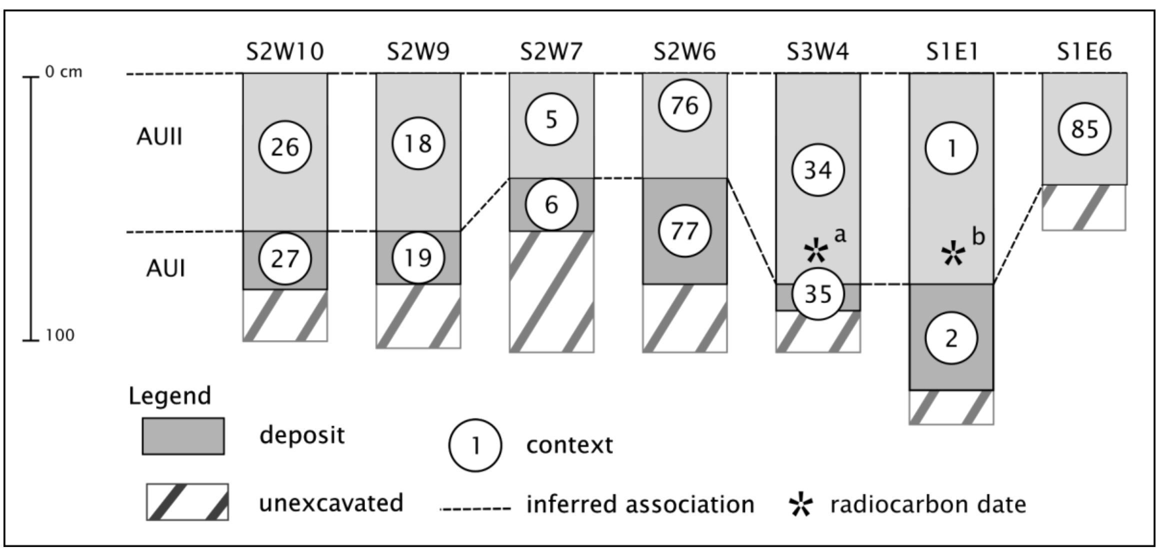

Figure 10. Idealized stratigraphic profiles along an idealized transect from S2W10 to S1E6. They are arranged from southwest to northeast. a, 1300±200 conventional radiocarbon years BP; b, 2340±200 conventional radiocarbon years BP.

To date, 20 radiocarbon age estimations have been analyzed from Xwe'Chi'eXen by researchers from WWU (Table 4). The general dating strategy that has developed over the years has been to submit dates from cuts that had not been previously dated, and to prioritize provenances with typologically diagnostic artifacts like quartz crystal microblades, or barbed bone and antler points (Personal Communication with Dr. Sarah Campbell 2017). Eight of the previously analyzed radiocarbon dates come from deposits assigned to AUI, and 12 radiocarbon dates are from deposits assigned to AUII. The conventional radiocarbon ages from AUI range from 3,570 to 2,420 conventional radiocarbon years before present (BP) and the conventional radiocarbon ages from AUII range from 3,710 to 90 conventional radiocarbon years BP. It is likely that the oldest date and the youngest dates from AUII can be identified as outliers using the 1.5 times IQR heuristic (Figure 11). The older date, 3710±60, is further confounded by a date inversion within the strata from which the date came. Taber's radiocarbon date from S4W4 40-60 cm (2010), is older than Blodgett's from the neighboring Cut S3W4 from 72 cm (1975). Since Blodgett's date is from a more-secure context, taken on wood charcoal from a single depth, it is likely that Taber's date is the overestimation. One possible explanation for the overestimation is the "old shell problem" (Rick et al. 2005), since the date was based on a sample of aggregate shell.

Table 4. Conventional radiocarbon age estimations by Analytical Unit. They are organized from young to old within their respective Analytical Unit.

Analytical Unit	*CUT*	*Depth**	*Dating Method*†	*Material*	*Conventional RYBP*	*Submitted by*	*Year Submitted*
AUII	S21E29	40-60	14C	ungulate bone	0090±30	M. DuBeau	2012
	S22E27	60-80	14C	unknown	1127±20	A. Rorabaugh	2014
	S9E4	20-40	14C	unknown	1136±22	A. Rorabaugh	2014
	S21E29	80-100	14C	ungulate bone	1140±30	M. DuBeau	2012
	S24E29	60-80	14C	wood charcoal	1230±40	J. Palmer	2012
	S8E8	80-100	14C	marine invertebrate shell	1280±40	A. Steingraber	2011
	S3W4	70-80	14C	wood charcoal	1300±200	M. Blodgett	1975
	S1W10	60-80	AMS	marine invertebrate shell	1470±25	A. Rorabaugh	2009
	S9E19	50-60	14C	wood charcoal	1640±200	M. Blodgett	1975
	S24E27	120-140	14C	unknown	2050±25	A. Rorabaugh	2014
	S1E1	60-80	14C	wood charcoal	2340±200	M. Blodgett	1975
	S4W4	40-60	14C	marine invertebrate shell	3710±60	E. Taber	2010
AUI	N3W9	20-40	14C	ungulate bone	2420±30	J. Palmer	2015
	S7E8	160-175	14C	wood charcoal	2630±240	Blodgett	1975
	S16E17	80-100	14C	marine invertebrate shell	3240±30	M. Todd	2012
	S16E17	40-60	14C	marine invertebrate shell	3260±50	M. Todd	2012
	S1W10	80-100	AMS	marine invertebrate shell	3340±30	A. Rorabaugh	2009
	S10E13	80-100	14C	unidentified marine shell	3360±30	A. Palmer (formerly A. Leick)	2012
	S11E5	40-60	14C	unknown	3461±25	A. Rorabaugh	2014
	S4E1	40-60	14C	marine invertebrate shell	3570±50	E. Taber	2010

*Depth is reported in cm below the reference line of a respective Cut. † Where 14C refers to either gas counting or liquid scintillation but is not reported; and AMS refers to accelerator mass spectrometry (Bowman 1990).

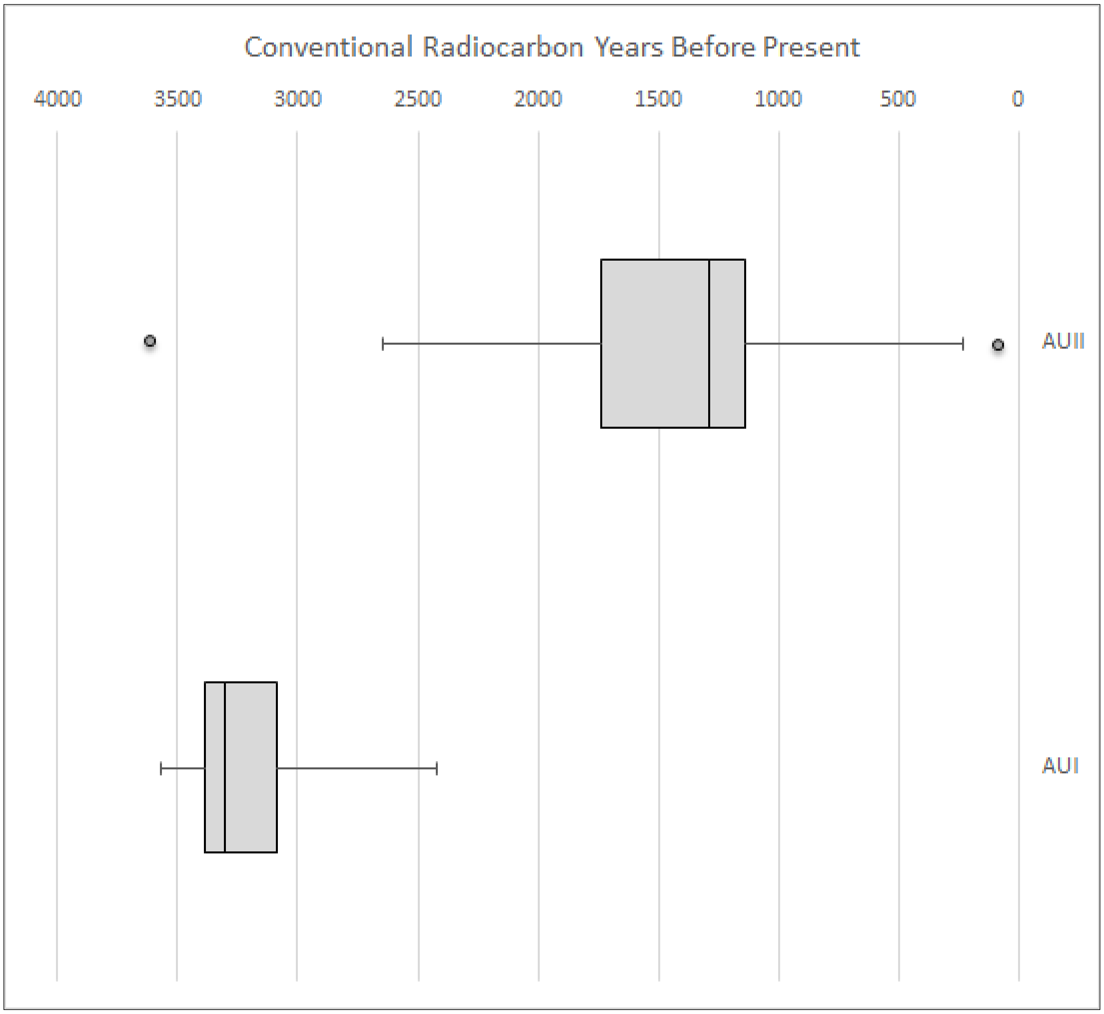

Figure 11. Box and whiskers plot showing the median, quartiles, and outliers of the conventional radiocarbon dates returned from Xwe'Chi'eXen materials by Analytical Unit. Outliers are defined as dates beyond one and a half times the inter quartile range.

Data Collection and Taxonomic Identification

Data was collected for 2,109 bone specimens from 54 excavation cuts, which make up the avifaunal Assemblage (Figure 12: *Assemblage, and Subset A*). This level of data collection is the coarsest in terms of observed attributes, all specimens have cut and level provenience. which includes cut, level, and subunit, and if possible, skeletal element identification. This information was recorded in the Bag List (Appendix E).

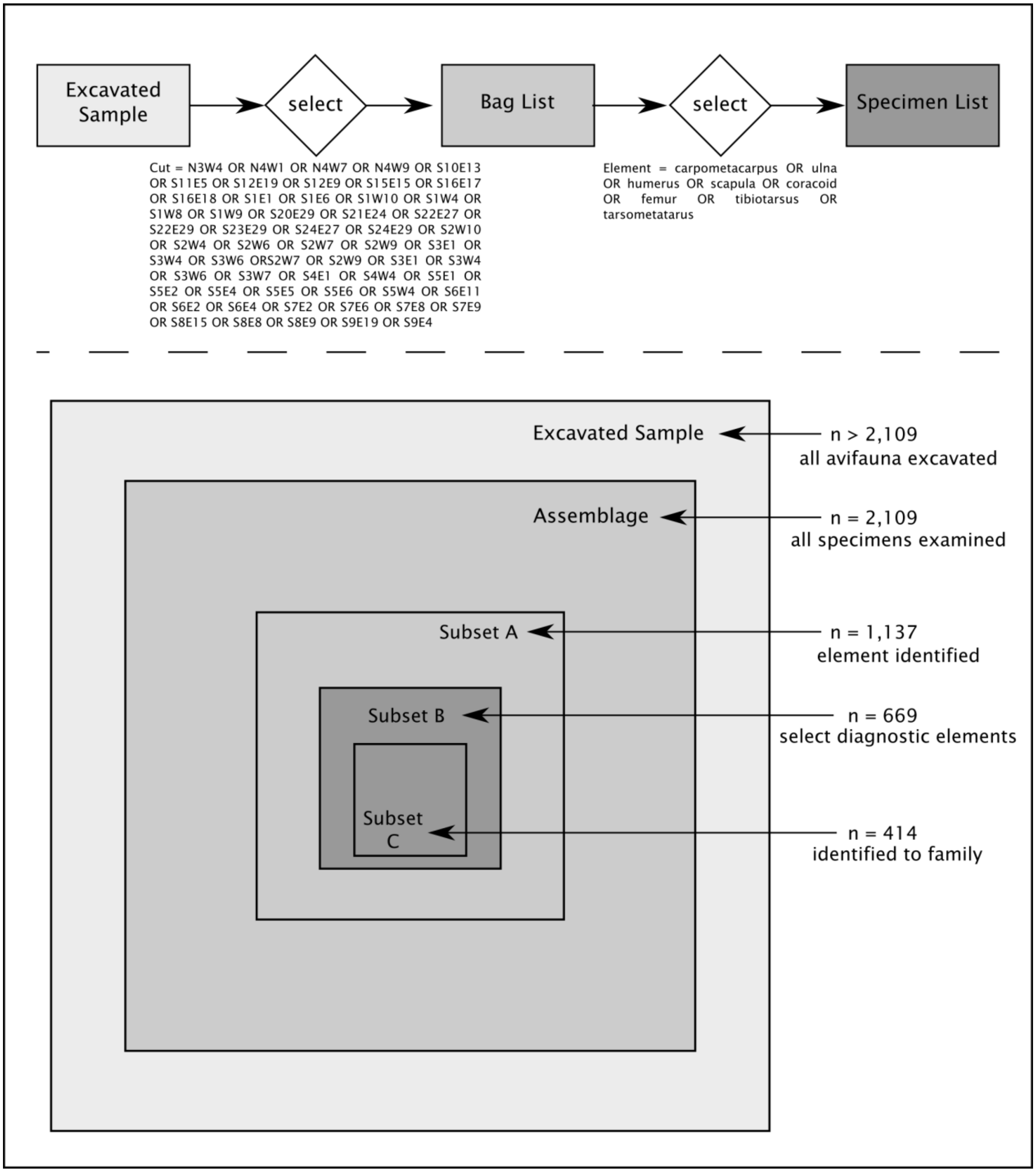

Figure 12. The selection procedure, and subsets of avifaunal material used in the analysis. Note that medium gray indicates that this data is recorded in the Bag List, and dark gray indicates that this data is recorded in the Specimen List. The size of the squares that represent each group are proportional to the NISP of the respective group.

Qualitative attributes were collected only for appendicular, and pectoral girdle elements: femur, tibiotarsus, tarsometatarsus, humerus, carpometacarpuse, ulna, coracoid, and scapula (Figure 12, *Subset B and Subset C*). For each specimen, data on the presence or absence of evidence of burning, presence or absence of cut-marks, determination of age, side of the body, amount of the element present, and specimen taxon were recorded. Evidence of burning was detected visually, aided by a 10X magnification jeweler's loupe, by the presence of discoloration and mineralization of the bone with reference to descriptions by Serjeantson (2009:149–53). Evidence of butchery was also identified visually aided by a jeweler's loupe, by the presence or absence of cut-marks. If evidence of butchery was present, the location of the cut marks was recorded with reference to Cohen and Serjeantson's bone zones (1996:109–12). Age of a particular specimen was recorded as one of two ordinal groups sub-adult, or adult. Sub-adult included specimens that exhibited porous bone with incomplete epiphyseal fusion consistent with descriptions by Serjeantson (2009:36–41). Adult specimens were identified as those that did not have porous bone structure, and had complete epiphyseal fusion. Side was determined for a complete reference bone based on siding instructions and illustrations in Gilbert et al. (1996). The specimens were then compared to the reference bone. Amount of the element present was recorded as the presence or absence of each of the zones described by Cohen and Serjeantson (1996:109–12), per specimen. Completeness was measured as the proportion of the number of zones present over a total of eight zones per specimen. Identification of specimen taxon was the most involved data recording procedure and is described in the following paragraphs.

Taxonomic identification procedures followed guidelines outlined by Lyman (2002), Driver (2011), and Wolverton (2013). None of the specimens were identified by association; each specimen identification was based on its own morphology. Taxonomic identification followed the procedure outlined in Figure 13. Each specimen went through two rounds of comparison and one round of verification. The first comparison was in reference to standard keys, the second comparison was to reference skeletal collections the third comparison was to verify its identification to ensure standards of quality control as defined by Wolverton (2013). During the first identification round, the size and gross morphology of the specimen was compared to the illustrated details in the avian skeleton identification keys by Gilbert et al. (1996), Cohen and Serjeantson (1996), and Serjeantson (2009). Typically this would narrow the identification down to a handful of taxonomic families. During the second round, the specimen would be compared to several reference skeletons that were among the taxa included in lists of potential taxa (see section *Biogeography*). During the third round, the initial identifications were verified by reexamining the specimens with reference to another set of reference skeletons of comparable size and morphology. The final list of taxonomic identifications were generalized to the family taxonomic level for analysis. The reference skeletons used for this comparison belong to the personal reference collection of Mike Etnier, or the University of Washington Burke Museum.

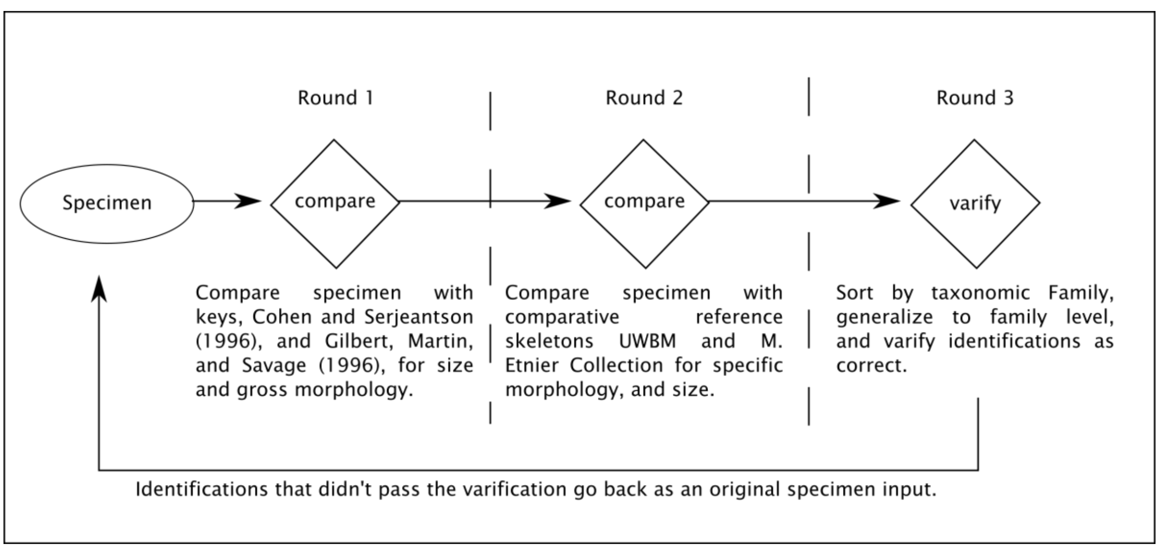

Figure 13. Analysis process diagram showing the three round identification procedure.

The data described above was collected in a four-tiered database (Figure 14). Ultimately, the purpose of the data structure was to allow for unambiguous tabulation of the data over space and time. The database included the following tables: Analytical Unit, Context List, Bag List, and Specimen List (Appendices A-F). They were related to one another hierarchically using Microsoft Access® 2016. The top tier consisted of the Analytical Unit table, which recorded the two chronological groupings: AUI and AUII. The second tier consisted of the Context List table. This table consisted of an exhaustive list of unique proveniences defined by horizontal cut and vertical level. The Bag List table carried information about the avian remains including specific provenience and skeletal element. The Specimen List table carried information about the lowest subset of avian remains that would be analyzed in the greatest detail. One Analytical Unit related to many Context List records; one Context List record related to many Bag List records; one Bag List record related to many Specimen List records.

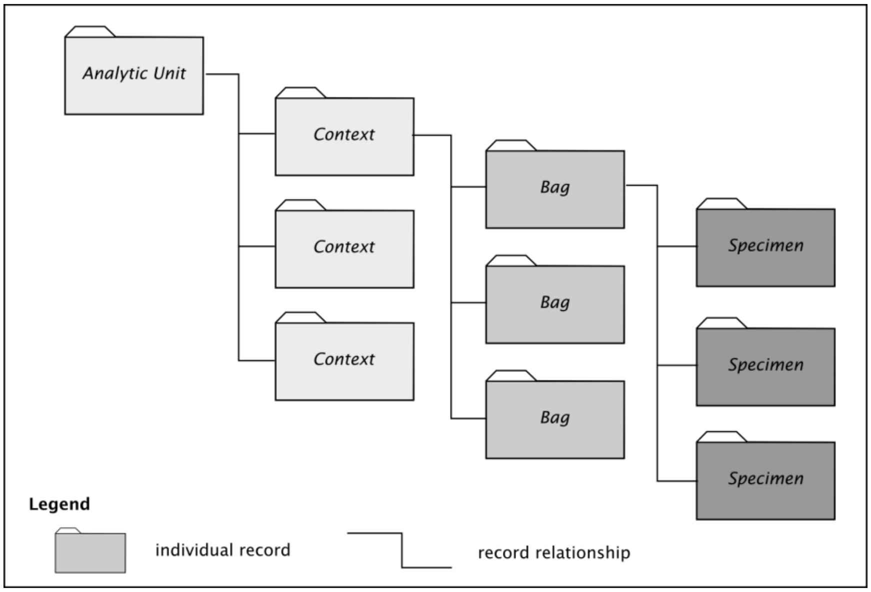

Figure 14. The database structure for archaeological materials. Note the shades of gray used for the Bags List, and Specimen List. These shades of gray will be used in subsequent figures and tables to highlight the scale of the samples discussed later in the text.

Statistical Characterization

Statistical methods were primarily aimed toward an exploratory characterization of the avifaunal assemblage over space and time. Standard faunal analytical measures such as number of identified specimens (NISP), and minimum number of individuals (MNI) were used to quantify abundance (Banning 2002), taphonomy was measured as the average "completeness" of specimens from a single context (see *Data Collection and Taxonomic Identification*). Fragmentation was addressed using a Differences Between Proportions z test (Freund 2001:330). In order to address questions of skeletal element choice, the wing to leg ratio was calculated using the method described by Bovy (2002). The statistical significance was assessed using Pearson's χ^2 Goodness of Fit test (Freund 2001:345), where expected values were derived from the number of skeletal elements of complete bird skeletons. χ^2 Goodness of Fit tests were also used to assess if differences in element representation, and taxonomic representation were statistically significant. For these tests, the proportion of counts in categories from the earlier time period, AUI, was used to model expected values in the later time period, AUII. Diversity was measured in terms of taxonomic richness and evenness. Where richness was measured as the number of taxonomic families identified, and evenness was measured using three standard diversity indices for nominal level data including Shannon's Equitability Index, Simpson's Index of Diversity, and the Index of Qualitative Variation.

Calculation of minimum number of individuals (MNI) per family followed the following procedure. The Specimen List was queried for a specific family and Analytical Unit. Records returned from this query were further sorted by element. The most frequently occurring paired element, e.g. carpometacarpus, coracoid, femur, humerus, or ulna, was selected. From this selection, the most commonly occurring side, left or right, was selected. From this selection, the most commonly occurring distal zone, 1 or 2, or 7 or 8, was selected. If none of these zones were present, a shaft zone was chosen instead, e.g. zones 3 or 4, or 5 or 6. The final count reports a conservative estimate for the minimum number of individuals represented from the NISP of a respective family, from a respective Analytical Unit.

The distribution of specimens among taxonomic families was characterized in terms of the richness and evenness of the distributions. Where richness was measured as the number of categories per sample, and evenness was measured using three indices: Simpson's Index of Diversity (1-D), Shannon's Equitability Index (E), and the Index of Qualitative Variation (IQV). Simpson's Index of D was calculated as $1 - D = 1 - \left(\frac{\Sigma\, n(n-1)}{N(N-1)}\right)$. Where n is the number of specimens identified to a particular taxon, and N are the total number of specimens. Shannon Equitability Index was calculated as $E = H/H_{max}$. Where H is calculated as the summation of the quantity: proportion of specimens of a particular family to total specimens (p) multiplied by the natural logarithm of p: $H = \sum_{i=1}^{k} p_i \ln p_i$. And where H_{max} is the theoretical maximum value of H, which is the natural logarithm of the total number of families (S): $H_{max} = \ln(S)$. The Index of Qualitative Variation was calculated as $\frac{(k*[N^2-\{\sum f^2\}])}{(N^2*[k-1])}$; where k is the number of families, N is the total number of specimens, and f is the number of specimens per family. These indices were calculated for both analytical units, and for selected comparison sites to identify patterns of diversity over regional space, and time.

Archaeological Sites Used for Comparison

Xwe'Chi'eXen is compared to three other archaeological sites in the Salish Sea: 45SK46, located at Lighthouse Point near Deception Pass, and 45SJ280 located at Watmough Bay on Lopez Island, and DgRs2 located at Tsawwassen north of the Point Roberts peninsula (see Figure 5). All three of these sites are coastal shell midden sites that contain avifaunal remains that date to a similar antiquity as Xwe'Chi'eXen (Table 5). For 45SK46, all counts of avifauna were used for this comparison. For 45SJ280 only counts of avifauna from test excavation units were used for this comparison (Bovy 2006:2054-2055), no baulk samples were included. For DgRs2 only counts reported for areas A and C were used for comparison (Kusmer 1994:31, 89). Wing to leg ratio comparisons were only made for 45SK46, and 45SJ280, because the element distribution is not reported for DgRs2.

Watmough Bay – 45SJ280

The archaeological site at Watmough Bay, 45SJ280, is located on the southeast portion of Lopez Island in an incised rocky inlet that opens to Rosario Strait (Bovy 2007). Watmough Bay is currently undeveloped and is managed by the San Juan County Land Bank. Site 45SJ280 similar to

Xwe'Chi'eXen in the following ways: the site was originally excavated in the late 1960s, material was excavated in arbitrary 20 cm levels, and that material was passed through 0.25 in wire mesh screen, and generally stratigraphy included a deposit of dense shell midden material in superposition to a deposit of dark shell-free sediment (Bovy 2006). These excavations yielded a variety of materials including shell, and non-bird vertebrate fauna. However, published literature on this site has focused primarily on site material accumulation rates (Stein et al. 2003), and the avifaunal assemblage (Bovy 2007, 2006).

Table 5. Chronological components and their associated radiocarbon age estimation ranges.

Archaeological Site Designation	*Location*	*Components*	*Radiocarbon Age Estimations*
45WH1	Xwe'Chi'eXen (Cherry Point)	AUII: Ground surface to base of dense shell midden.	90*-3710† conventional RYBP
		AUI: Dark sediment beneath dense shell midden present to the base of the excavation.	2420‡-3570† conventional RYBP
45SJ280	Watmough Bay	Upper: 0-80 or 90 cm below ground surface	AD 300-700§
		Lower: 80 or 90 cm below ground surface	950-550 BC
DgRs2	Tsawwassen	Area A: Marpole and later components	210-1830‖ RYBP
		Area C: Marpole and later components	860-2060 RYBP
45SK46	Lighthouse Point	AUIV	1550 conventional RYBP#
		AUII-AUIII	3310-3650 conventional RYBP

* Dubeau (2012). † Taber (2010). ‡ Palmer (2015). § Bovy (2006). || Kusmer (1994:16, 72). It is unclear if radiocarbon years before present is measured age, or conventional age.. # Mather (2009:50).

Tsawwassen – DgRs2

The archaeological site at Tsawwassen, DgRs2, is located on the northern extent of the Point Roberts peninsula. It is located in an area at the base of the Tsawwassen upland that is open to the Strait of Georgia and immediately south of the Fraser River delta. Substrate of the site includes mixed deposits of glaciomarine drift that is eroding downslope, as well as deltaic sediments transported by the longshore current (Stryd 1991:18). Traditionally, Tsawwassen was location that was known as a good place to acquire mallards (*Anas platyrhynchos*), and loons (*Gavia sp.*) (Bouchard and Kennedy 1991:154). The site consists of three discrete berms of shell midden separated by natural swales that are devoid of cultural materials (Stryd 1991:13). There is a long history of archaeological investigations at this location; the archaeological site was first mentioned by Harlan Smith in 1921, who is well known for his participation in the Jessup Expedition, and it was also visited in 1935 by Frederica De Laguna, who is famous for her contributions to the anthropology of southeast Alaska and the Arctic. Cultural heritage management archaeological investigations were conducted for seven areas of the site in support of improvements made to British Columbia Highway 17. The site encompasses an area of approximately 17 acres and the occupation spans the Locarno Beach, Marpole, and Gulf of Georgia periods. Nearly 5,200 artifacts were recovered as a result of these investigations, and represent a variety of functional activities including hunting, fishing, and wood working (Stryd 1999). Additionally these investigations found several features including nearly 60 post molds, approximately 20 hearths, and approximately 50 pit features of undetermined function.

Lighthouse Point – 45SK46

The archaeological site at Lighthouse Point, 45SK46, is an isolated pocket of shell midden located on a promontory that protrudes into Deception Pass. Deception Pass is a waterway that is affected by strong shifts in tidal current due to the funneling of water between Rosario Strait and Admiralty Inlet. Given the site's small size, its location in a relatively hazardous waterway, and its age, the site was assessed and interpreted as a "limited activity, task specifics site"(Mather 2009:68). Artifacts recovered from this site include flaked stone points, microblades, slate knives, Gulf Island Complex objects, stone and bone beads, cobble tools, stone cores, and hammer stones. Fauna recovered from the site include bony fishes including salmon, flounder, cod and rockfish, six avian families including ducks and geese (Anatidae), eagles (Accipitridae), coots (Rallidae), cormorants (Phalacrocoracidae), grebes (Podicipedidae), and loons (Gaviidae), and few marine and terrestrial mammals including seal (Pinnipedia), deer (Ungulates), and dogs (Canidae).

CHAPTER 5: ARCHAEOLOGICAL RESULTS

This chapter presents the results of the analytical procedures. The opening section, Overall Assemblage, describes the general condition of the examined remains and summarizes the total counts of avifaunal remains by analytical unit. The purpose of this section is to present the general patterns over time and space that are observed at Xwe'Chi'eXen. The next section, Element and Family Representation, describes the distributions of skeletal elements and taxonomic families to identify change of relative frequencies over time. It closes with a discussion of how the attributes element and family intersect, in order to identify evidence of preferences for certain parts that may be related to plumage varieties. The next section looks at an established regional pattern, the overabundance of wings, and describes how the Xwe'Chi'eXen fits into this pattern. The next section looks at qualitative attributes that were recorded including evidence of butchery, evidence of cooking, and the age of the birds recovered. This is followed by a description of the two cuts with NISP, S16E18, and S24E27, to assess if they are consistent with deposition expectations for the potlatch as an event. The next section looks at assemblage diversity from multiple sites, and multiple time frames, in order to assess the premise that mass harvest hunting techniques increased in response to development of potlatch related debt accumulation.

Overall Assemblage

I examined 2,109 individual specimens from 54 cuts. Twenty-three cuts contained bird bone from AUI, and 52 cuts contained bird bone from AUII (Figure 15; Appendices D, and E). Avifauna was present in both analytical units of 17 cuts. The condition of the bone fragments ranged from fair to excellent. The exterior cortex of the bone was intact for all specimens identified to skeletal element, and for most of the unidentified and unidentifiable bone fragments. Bone fragments ranged in color from very pale brown (10YR8/3; Bag 36, Specimen 47) to very dark grayish brown, (10YR3/2; Bag 62, Specimen 104), with the majority of the bone fragments trending toward the very pale brown end of the color spectrum. These colors are based on individual specimens that are representative of the overall assemblage.

Summary counts of avifauna are presented in Table 6. The subsampling reduced the assemblage based varying degrees of specificity for the attribute data that was collected (see Figure 12). Removing unidentified and unidentifiable elements reduces the Assemblage by 46 percent, which yields Subset A. Choosing specific diagnostic elements reduces Subset A by 41 percent, which yields Subset B. Selecting only those elements that can be identified to the family taxonomic level reduces Subset B by 38 percent, which yields Subset C. At all scales of observation, approximately 25 percent of the specimens are from AUI, and 75 percent of the specimens are from AUII. These proportions are also maintained when counts are converted to an estimate of the minimum number of individuals. Subset C was used to calculate the MNI of 101 birds.

Table 6. Summary counts by analytical unit.

Overall Assemblage		*Bag List*		*Specimen List*		
Analytical Unit	*Cuts with bird bone*	*Assemblage**	*Subset A†*	*Subset B‡*	*Subset C§*	*minimum number of individuals*
AUII	52	1602	826	508	321	76
AUI	23	507	311	161	93	25
TOTAL	**54**	**2109**	**1137**	**669**	**414**	**101**

*number of specimens identified as bird; † number of specimens with element identified; ‡ number of specimens for which qualitative attributes were recorded. § number of specimens identified to taxonomic family.

Avifauna is present in samples from excavation cuts throughout the site. The spatial distribution of the bone specimens can be represented using a dot-density thematic map. This type of map randomizes the point location of an individual bird bone within its respective cut. A dot density map can, therefore, illustrate a reasonable representation of the overall the spatial pattern of the distribution for visual analysis. Figure 15 shows the spatial distribution of bird bones at Xwe'Chi'eXen, where the grey rectangles represent an individual cut, blue dots represent bird bone from AUI, and red dots represent bird bone from AUII. This map shows that bird bone from AUI was found in relatively few cuts, with one large cluster in the southeast at cut S16E18. It also shows that bird bone from AUII occurs in a dense cluster in the southeast portion of the site, at cuts S24E27, S21E29, and S24E29. Since the point locations are randomized within their respective cut, this illustration is merely a simulation, and should not be used as the basis for more-rigorous spatial methods.

In summary there is an increase in frequency of bird remains at the site over time. In the early phase, the specimens are predominantly clustered at one location focused around cut S16E18. In the late phase bone specimens are more evenly distributed across the site, but there are still dense clusters in the southeast focused around the cuts along the E27 and E29 grid meridians. Given the fair to excellent condition of the avifuana, it is reasonable to assume that depositional integrity has been maintained. The spatial distribution is, therefore, likely to reflect cultural behaviors at Xwe'Chi'eXen rather than natural processes. Certain factors may limit this interpretation, such as the scattering of remains by scavengers. These effects are likely to be negligible since the spatial data is also coarse and limited to the 2 m by 2 m excavation cuts. One of my expectations is bone fragmentation will increase with more time since deposition. This expectation is assessed in detail in the following section.

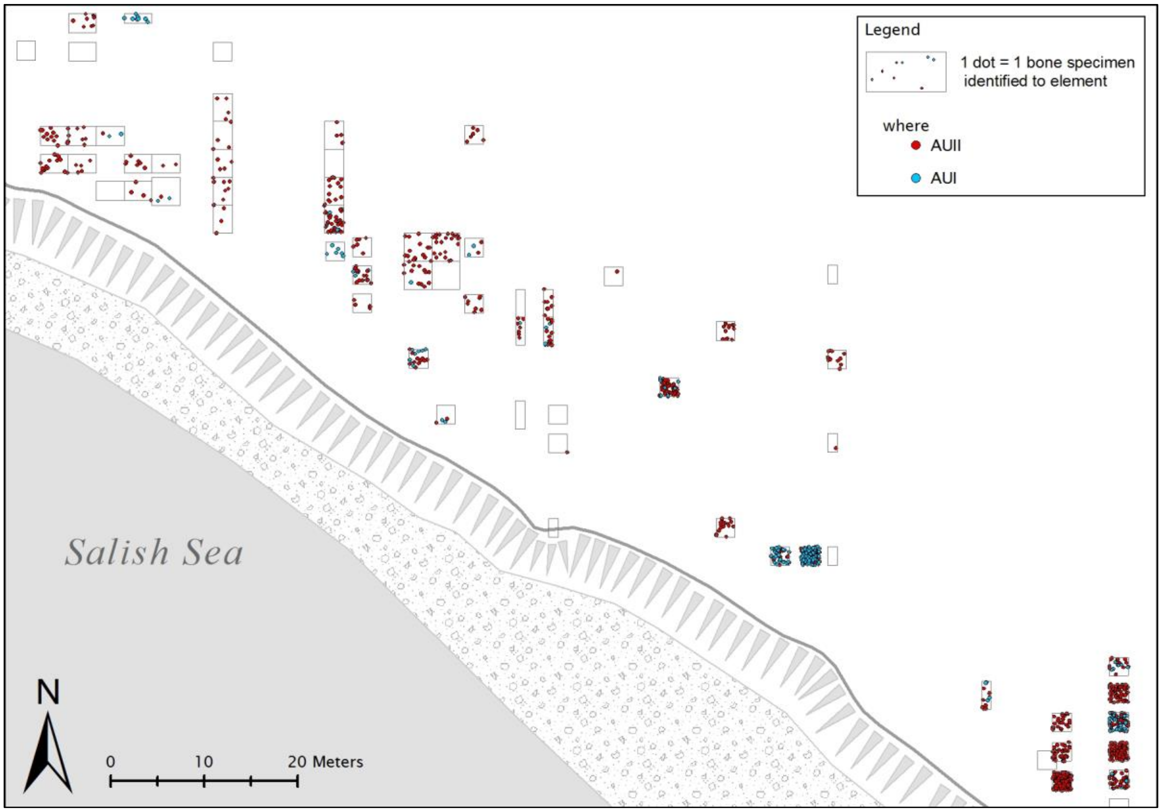

Figure 15. Dot density thematic map showing the general locations of the bird bone specimens identified to element, Subset A. One dot on the map represents one specimen. The dots are positioned randomly within their respective cut.

Element and Family Representation

This section characterizes the assemblage in terms of the elements and taxonomic families that are represented. First element identifiability, and completeness are reported to assess my expectation that time since deposition is the major factor contributing to the fragmentation of the assemblage. Next, the distribution of identified skeletal elements is characterized as two samples: an older sample, AUI, and a later sample, AUII. Differences between the two element distributions are described, and tested for statistical significance. Next, the distribution of identified avian families is characterized as two samples: an older sample, AUI, and a younger sample, AUII. Differences between the two distributions of avian families are described and tested for statistical significance.

Finally, the premise that differences in plumage between taxa are likely to affect which skeletal elements were discarded into the deposit is assessed.

Element Identifiability

Approximately half of the specimens are identified to element. Of the remainder, 28 percent are considered unidentified (Table 7). They include shattered bone fragments that retain potentially identifiable landmarks that could not be matched with the available comparative specimens. They consist of both axial and appendicular elements. Unidentifiable specimens represent approximately 18 percent of the assemblage. They consist of shattered bone fragments and are generally more fragmented and do not retain landmarks that could be used to ascertain the element that the fragment represents. Unidentifiable specimens consist predominantly of fragments of long bone shafts.

I expected that the older sample avifauna would be more fragmented than the younger sample of avifauna. Element identifiability is used as a measure of fragmentation. A differences between proportions z-test indicates that the proportion of specimens identified to element to all specimens in the AUI sample ($x_{AUI} = 312$, $n_{AUI} = 506$, $p_{AUI} = 0.61$) is significantly greater than the proportion of specimens identified to element to all specimens in the AUII sample ($x_{AUII} = 826$, $n_{AUII} = 1603$, $p_{AUI} = 0.51$), $z = 3.73$, $p < 0.05$. In other words, the older sample, AUI, is less fragmented than the younger sample, AUII, at the 95 percent confidence level. This is the reverse of my expectation: the older specimens are actually more complete than the younger specimens.

Table 7. Element identifiability by analytical unit.

Analytical Unit	*Identified to Element*	*Percent Element Identified*	*Element Unidentified**	*Percent Element Unidentified*	*Element Unidentifiable*	*Percent Element Unidentifiable*	**Total**
AUII	826	52	443	28	334	21	**1603**
AUI	312	62	157	31	37	7	**506**
Total	**1138**	**54**	**600**	**28**	**371**	**18**	**2,109**

Another measure for fragmentation is completeness. Completeness was recorded as the presence or absence of eight bone zones (see Chapter 4). Since completeness records both the amount of bone present, as well the parts of a bone that are present, it can address questions about taphonomy as well as butchery and processing. Completeness is recorded for all 669 bird bones of Subset B (Table 8). A χ^2 goodness of fit test using the relative frequency of specimen completeness of AUI to model expected frequencies for specimen completeness of AUII found that the two samples are significantly different: χ^2 (d.f. =7, n_{AUI}=508, n_{AUII}=161) = 104.69, $p < 0.05$. In terms of completeness the two distributions are very similar, but AUI is a slightly more complete than AUII. Again, this is the reverse of my expectation that the older specimens would be more fragmented than the younger specimens. This pattern suggests that the deposit at Xwe'Chi'eXen has been relatively stable for a long period of time, and that bird bone fragmentation may be more related to human causes than post depositional causes.

Table 8. Element completeness by analytical unit. Summarizes element completeness for the selected diagnostic elements, Subset B.

Completeness (eighths present)	*AUI*	*AUI %*	*AUII*	*AUII %*
1/8th	16	10%	50	10%
2/8ths	31	19%	107	21%
3/8ths	23	14%	71	14%
4/8ths	54	34%	179	35%
5/8ths	1	1%	20	4%
6/8ths	15	9%	44	9%
7/8ths	5	3%	7	1%
8/8ths	16	10%	30	6%
TOTAL	**161**	**100%**	**508**	**100%**

Distribution of Elements

This section focuses on the portion of the assemblage that was identifiable to element, designated Subset A. Specimens identifiable to element are dominated by appendicular elements; appendicular elements account for 83 percent, axial elements account for 16 percent (Table 9). Eighty-five percent of the appendicular elements are wing bones, and the remaining 15 percent are leg bones. This dominance of wings is also reflected in the fact that the top six appendicular elements are wing elements; by rank order they include, carpometacarpi, wing phalanxes, ulnas, humeri, radii, and coracoids. The most commonly occurring leg elements are tibiotarsi, femurs, and tarsometatarsi. The dominance of wings fits a pattern broadly identified from Northwest Coast assemblages of avifauna (Bovy 2002, 2012; Bovy et al. 2016), which is considered in detail in the section Regional Comparison. Irrespective of the wing and leg distinction, the least common appendicular elements are cuneiform, scapula, fibula, and foot phalanx. These are all small and slender elements, which suggests that screen loss likely contributes to their underrepresentation. The most commonly occurring axial elements were vertebrae. This is likely due to the fact that there are more vertebrae than any other skeletal element in a complete bird skeleton; however, given that birds typically have between 13 to 25 vertebrae, their count underrepresents what we should expect given complete preservation. The second and third most common axial elements were cranium and synsacrum, which are large and irregular elements that have distinctive anatomical features.

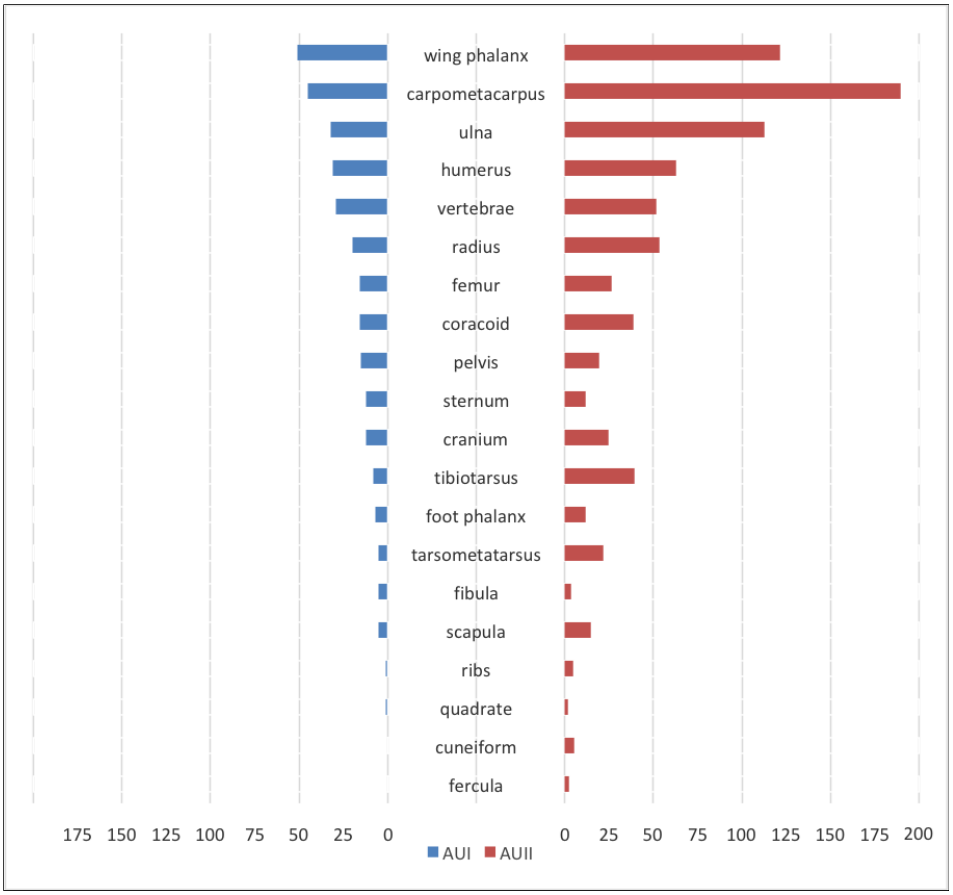

Figure 16. Skeletal element representation by number of specimens identified by element. The blue bars represent AUI, and the red bars represent AUII. Elements presented in rank order of AUI specimens.

Counts of elements are significantly different between the two analytical units when assessed with a χ^2 goodness of fit test where relative frequency of specimens in AUI was used to model expected frequencies in AUII: χ^2 (d.f. = 19, n_{AUII}=826, n_{AUI}=311) = 1163.12, $p < 0.05$. Rank order differences were observed between the two analytical units. Carpometacarpi overtook the wing phalanxes in AUII, and frequency of the lower leg elements also increased in AUII. The major pattern was the predominance of wing elements irrespective of analytical unit.

Family Representation

Only specimens identified as one of eight diagnostic elements were identified to family (see Figure 12). In this group, 414 bird bone specimens were identified to 13 avian taxonomic families (Table 9). Although more specific identifications were made on a case-by case basis, identification to the family taxonomic level was the lowest level used for the quantitative analysis.

Anatidae, which represents ducks and geese, dominate the assemblage accounting for approximately 68 percent of the Subset C specimens. The next two most commonly occurring families each represent approximately 6 percent of Subset C. They are Accipitridae (eagle and hawk) and Corvidae (jay and crow). The remaining ten taxa each represent 5 percent or less of Subset C. By order of abundance they include Alcidae (auk and murre), Laridae (gull), Podicipedidae (grebe), Gaviidae (loon), Picide (woodpecker), Phasianidae (grouse and quail), Pandionidae (osprey), Phalacrocoracidae (cormorant), Charadriidae (shorebird), and Strigidae (owl). The MNI calculated 1-62 birds. Again, ducks and geese dominate the assemblage, with the remainder of the assemblage representing 7 or fewer birds per taxa, or 1-7% per taxa of the total MNI. The MNI is a conservative estimate, and numbers reported here underrepresent the true minimum count of birds represented in the assemblage

Table 9. Taxonomic family representation in Subset C: Number of Identified Specimens (NISP), and minimum number of individuals (MNI), by Analytical Unit.

	AUI				AUII				TOTAL			
	NISP	*NISP %*	*MNI*	*MNI %*	*NISP*	*NISP %*	*MNI*	*MNI%*	*NISP Total*	*NISP Tot. %*	*MNI Tot.*	*MNI Tot. %*
Accipitridae	16	17.20%	2	8.00%	9	2.80%	2	2.63%	25	6.04%	4	3.96%
Alcidae	4	4.30%	1	4.00%	17	5.30%	6	7.89%	21	5.07%	7	6.93%
Anatatidae	55	59.14%	12	48.00 %	228	71.03%	50	65.79 %	283	68.36 %	62	61.39%
Charadriidae	1	1.08%	1	4.00%	0	0.00%	0	0.00%	1	0.24%	1	0.99%
Corvidae	4	4.30%	1	4.00%	21	6.54%	4	5.26%	25	6.04%	5	4.95%
Gaviidae	1	1.08%	1	4.00%	10	3.12%	2	2.63%	11	2.66%	3	2.97%
Laridae	2	2.15%	1	4.00%	14	4.36%	2	2.63%	16	3.86%	3	2.97%
Pandionidae	3	3.23%	1	4.00%	0	0.00%	0	0.00%	3	0.72%	1	0.99%
Phalacrocorac idae	1	1.08%	1	4.00%	1	0.31%	1	1.32%	2	0.48%	2	1.98%
Phasianidae	4	4.30%	2	8.00%	1	0.31%	1	1.32%	5	1.21%	3	2.97%
Picidae	1	1.08%	1	4.00%	7	2.18%	4	5.26%	8	1.93%	5	4.95%
Podicipedidae	1	1.08%	1	4.00%	12	3.74%	3	3.95%	13	3.14%	4	3.96%
Strigidae	0	0.00%	0	0.00%	1	0.31%	1	1.32%	1	0.24%	1	0.99%
Totals	**93**	100%	**25**	100%	**321**	100%	**76**	100%	**414**	100%	**101**	100%

Counts of bird specimens by family are significantly different between the two analytical units when assessed with a χ^2 goodness of fit test, where relative frequency of specimens by family in AUI was used to model expected frequencies in AUII: χ^2(d.f. =13, n_{AUII}=321, n_{AUI}=91) = 977.98, $p < 0.05$. Irrespective of time, Anatidae (ducks and geese), dominate the assemblage. The relative frequency increases over time, however, from approximately 60 percent in AUI to over 70 percent in AUII. Because the taxa that increase are waterfowl, and are particularly amenable to mass harvest techniques due to their predictable migrations and propensity to aggregate, this is consistent with our expectation that targeted mass harvesting would also increase over time. Other food related taxa that are known to form large aggregations also increase, including Alcidae (auks and murres), and Laridae (seagulls), and Podicipedidae (grebes). Accipitridae (eagles and hawks), a set of taxa that were valued for their plumage, and were also eaten, actually decrease in relative abundance from AUI to AUII. Since eagles are reported to have been captured using individual harvest techniques, this pattern also supports our premise that individual capture techniques would decline in importance. Two commensal taxa, Corvidae (jays and crows), and Laridae (seagulls), increased in abundance from AUI to AUII, which was not one of the original expectations developed for the study. This increase could relate to an increase in settlement intensity. Increases in the human population of Xwe'Chi'eXen, increases in duration of seasonal occupation, or both, would inevitably produce increased food waste that would attract scavengers including ravens, crows, and gulls. this This interpretation is limited, however, due to the small sample size.

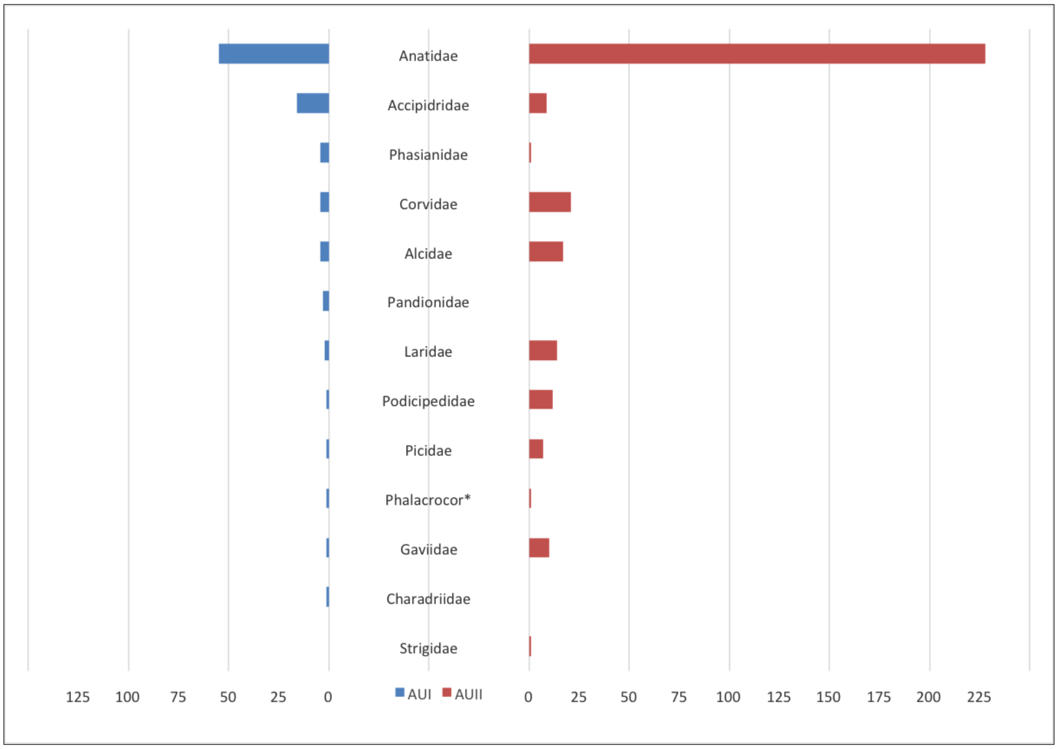

Figure 17. Taxonomic abundance of the assemblage. The order in which they are presented is rank order of families in AUI.

Relationship Between Family and Element

It was hypothesized that given the differences in plumage patterns between taxa, and the different uses of flight feathers and down reported ethnographically, that there may be a relationship between body part representation and family representation. Table 10 shows the counts of specimens by family and diagnostic element. This table shows that the major factor affecting how many body parts were represented for which bird families, was sample size. All elements were represented for the most abundant family, Anatidae (ducks and geese). The only other avian family for which this was the case was Corvidae (jays and crows). Given the high occurrence of zero values for the less commonly occurring families, it is impossible to assess if there is a relationship between family and element for all families within the given sample. However, we can collapse the less commonly occurring families, and reframe the inquiry to address a more specific question: is there a relationship between "duckiness" and body part representation?

Table 10. Contingency table showing the count of specimens by family and element. Note that only the selected diagnostic elements identified to family are presented (Subset C).

	SKELETAL ELEMENT								
FAMILY	*scapula*	*coracoid*	*humerus*	*ulna*	*carpometacarpus*	*femur*	*tibiotarsus*	*tarsometatarsus*	***TOTAL***
Accipidridae	1	4	5	3	0	6	4	2	**25**
Alcidae	0	1	0	18	0	1	1	0	**21**
Anatidae	6	15	14	47	168	9	11	13	**283**
Charadriidae	0	0	0	1	0	0	0	0	**1**
Corvidae	1	7	3	1	3	5	1	4	**25**
Gaviidae	0	0	4	1	4	0	2	0	**11**
Laridae	3	3	0	7	3	0	0	0	**16**
Pandionidae	0	2	0	0	0	0	1	0	**3**
Phalacrocoridae	0	0	1	0	1	0	0	0	**2**
Phasianidae	1	0	4	0	0	0	0	0	**5**
Picidae	0	0	0	7	0	0	0	1	**8**
Podicipedidae	0	0	1	5	4	0	2	1	**13**
Strigidae	0	1	0	0	0	0	0	0	**1**
TOTAL	**12**	**33**	**32**	**90**	**183**	**21**	**22**	**21**	**414**

In order to assess if there is a relationship between duckiness and element representation, we can compile a new contingency table (Table 11), for which all non-Anatidae taxa are collapsed into the category: All Other. A χ^2 test of independence indicates that the variables are not independent. There is a statistically significant relationship between duckiness and skeletal element: χ^2 (d.f. = 7, n=414) = 86.316, $p < 0.05$. The relationship indicated by the χ^2 test is likely due to the high frequency of Anatidae carpometacarpi. Duck distal wings occur more frequently than any other combination of family and element, and they do so in a statistically significant way. This is pattern is similar to one observed regionally, the over abundance of bird wings when compared to natural conditions. How Xwe'Chi'eXen fits this regional pattern is assessed in the next section.

Table 11. Contingency table showing the intersection of the variables duckiness (Anatidae vs. All Other), with skeletal element.

	SKELETAL ELEMENT								
GROUP	*scapula*	*coracoid*	*humerus*	*ulna*	*carpometacarpus*	*femur*	*tibiotarsus*	*tarsometatarsus*	***TOTAL***
Anatidae	6	15	14	47	168	9	11	13	**283**
All Other	6	18	18	43	15	12	11	8	**131**
TOTAL	**12**	**33**	**32**	**90**	**183**	**21**	**22**	**21**	**414**

Wing to Leg Ratio

The pattern elucidated in the previous section, that Anatidae carpometacarpus occur much more frequently than any other family body part combination, suggests that there is an overabundance of wings. Bones from bird wings occur far more frequently than bird leg bones in

Salish Sea archaeological sites generally (Bovy 2002, 2012; Bovy and Watson 2012). This section compares ratio of wing bones to leg bones to expectations based on counts of bones in typical bird skeletons, as well as to other archaeological sites at Lighthouse Point (45SK46), and Watmough Bay (25SJ280) (see Chapter 4).

As modeled by Bovy (2002), whole birds have 8 wing bones, and 6 leg bones. Bird wing bones include 2 humeri, 2 radii, 2 ulnas, and 2 carpometacarpi; bird leg bones include 2 femurs, 2 tibiotarsi, and 2 tarsometatarsi. We can, therefore, expect that a random sample of bird remains should have a wing bone, to leg bone ratio of 8/6, or 1.3. At Xwe'Chi'eXen, the total wing to leg ratio of 4.64 is significantly different than chance occurrence (Table 12). The wing to leg ratios for 45SJ280, 45SK46 were much closer to the expected values, however, they still reflected a wing bias. At 45SJ280 wing to leg ratio differed significantly from random. The calculated wing to leg ratio likely underestimates the magnitude of this bias, since wing digits were the highest occurring elements at this site (Bovy 2006:67). The wing digits, which were not used to model the χ^2 expected values, are likely to be a better indicator of the wing bias at 45SJ280. At 45SK46, there was a slight overabundance of wings, wing to leg ratio= 1.6, however, there was too little evidence to conclude that this was not due to chance occurrence. This result was different than the one reported by Mather (2009:141), who found that there was a statistically significant difference between her observed counts and expected counts. These result could not be replicated because it was not explicit which elements were used to calculate expected values.

The wing bias observed at Xwe'Chi'eXen is high relative to the wing to leg ratios at 45SJ280, and 45SK46 but is well within the range reported by Bovy (2002:973). Between analytical units Xwe'Chi'eXen starts out with a high and statistically significant wing bias in AUI (wing to leg ratio =

4.41), this increases in AUII (wing to leg ratio =4.72). Whatever behaviors are related to the wing selection, they begin early in the sites occupation and increase later in time.

Table 12. Wing to leg ratios for the sites included in thesis studies and the results of their respective χ^2 hypothesis tests.

Sample	*n*	*observed wing elements*	*observed leg elements*	*expected wings* n(8/14)*	*expected legs† n(6/14)*	*wing to leg ratio (#wings/#legs)*	χ^2	*p*
Expected	--	8	6	0.57	0.43	1.3	--	--
45SK46 (Mather 2009:141)	75	46	29	42.75	31.5	1.6	0.45	0.5
45SJ280 (Bovy 2006: 2054-2055)	1819	1179	640	1036.83	763.98	1.84	39.61	<0.001
45WH1: AUII	449	420	89	290.13	213.78	4.72	130.97	<0.001
45WH1: AUI	157	128	29	89.49	65.94	4.41	37.26	<0.001
45WH1: Total	702	584	118	379.62	279.72	4.64	168.18	<0.001

*2 humerus + 2 ulna + 2 radius + 2 carpometacarpus = 8 wing elements in a typical bird; † 2 femur + 2 tibiotarsus +2 tarsometatarsus = 6 leg elements in a typical bird.

Qualitative Attributes

Qualitative attributes are recorded for the 669 specimens that constitute Subset B (see Chapter 4: Method). They include evidence of modifications due to butchery and burning as well as a determination of age. Evidence related to modifications were explored to determine how birds were being processed for both food consumption, and consumption for raw materials to make wealth objects. Evidence related to the age of individuals was explored to determine seasonality, and method of harvest.

Modification

I looked for evidence of butchery on all identifiable elements (Subset B). The vast majority of the specimens did not have cut marks (Table 13). Specimens without cut marks were present in 52 excavation cuts, and specimens with cut marks were present in 29 excavation cuts. Relatively more excavation cuts in the northwest portion of the site contained avifauna with cut marks, however, avifauna with cut marks were spatially distributed throughout the site.

All eight of the selected diagnostic elements had cut marks. Humeri were the most common, representing nearly 50 percent of the specimens with cut marks (Figure 18). Following humeri, by order of abundance, were tibiotarsus, carpometacarpus, ulna, femur, coracoid, scapula, and tarsometatarsus. The majority of the cut marks on humeri were recorded on zones 5 and 6, which are on the bone shafts adjacent to the distal margins of the element. This suggests that the butchery was related to the removal of the bird wings at the elbow. Primary and secondary flight feathers articulate with the wing below the elbow. Flight feathers are likely to have had wealth associations in the past, since they were incorporated into ceremonial regalia. The removal of wings may have been related to processing bird carcasses for their feathers, or it may represent discard of parts less valued for food.

Table 13. Count of specimens with cut marks from the selected diagnostic elements (Subsets B and C).

	Subset B	*Subset C*
Number specimens with cut marks	45	19
Number specimens with cut marks as %	7%	5%
Number of specimens without cut marks	624	395
Number of specimens without cut marks as %	93%	95%
Total	**669**	**414**

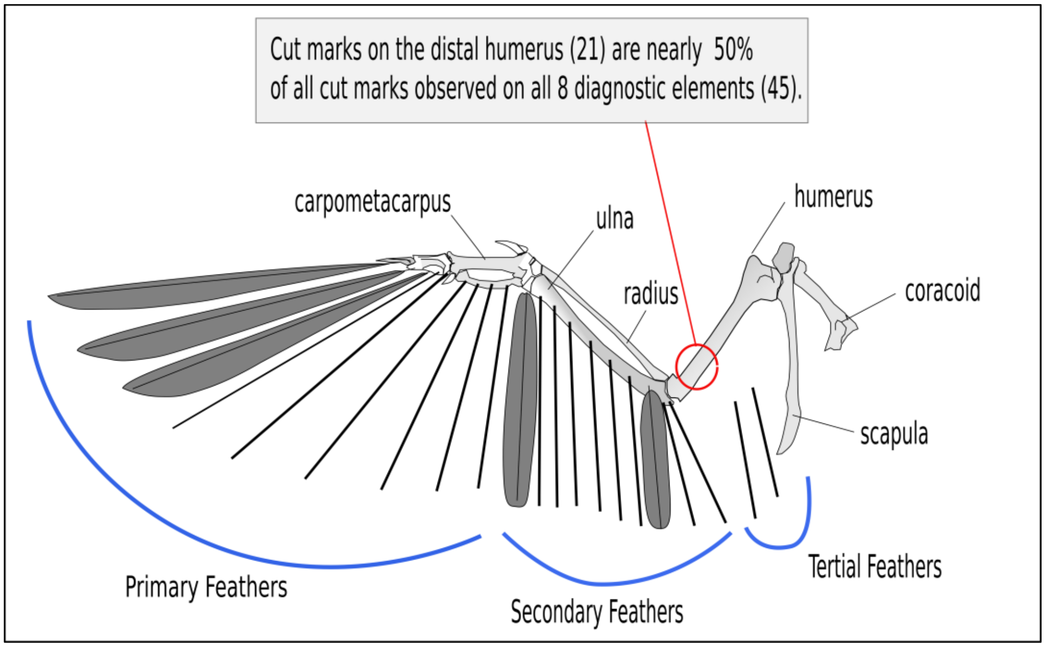

Figure 18. Typical bird wing showing the wing elements in relation to the flight feathers. This image is adapted from the original by L. Shymal (2007) which is licensed under the Creative Commons: CC By-SA 2.5. Adaptations from the original only include changes to the annotation and call-out lines to illustrate the location of cut marks.

Cut marks were observed on specimens of 7 avian families. The families are, by rank order of abundance, Anatidae (ducks and geese), Accipitridae (eagles), Gaviidae (loons), Phasianidae (grouse and quail), Corvidae (jays and crows), Phalacrocoracidae (cormorants), and Picidae (woodpeckers). Cut marks on humeri were present in all families except for Picidae (woodpecker). The cut mark recorded for this taxon was on the proximal ulna, which is still consistent with removal of the distal wing. The removal of wings for Anatidae (ducks and geese) is may be related to food processing. There is little meat on a distal wing in relation to breast or thighs, therefore it's reasonable to interpret a deposit of distal wing bones as discarded material from meal preparation. That doesn't explain why wings also appear to be removed for other taxa that had less food value. Plumage of eagles (*Haliaeetus leucocephalus*), swans (*Cygnus sp.*), and woodpeckers (Picidae), were explicitly described as being used for purposes of signaling certain rights (Stern 1934:65, Barnett 1955:149, 158, 169). Although the material association is not explicit, similar rights related to an individual person's connections with raven, loon and pheasant were also described (Barnett 1955:148, Haeberlin and Gunther 1930:71-72).

Evidence of burning, taken to represent evidence of cooking, was observed for 6 percent of the assemblage only. The majority of the burned specimens are clustered in the southeast at cuts S23E27, S24E27, S21E29, S23E29, and S24E29 (see Figure 15). Given the high density of avifauna from this area, it is likely that the location was a cooking area. Four other cuts located in the central and northwest portions each contained one burned bone per cut; they are S1W10, S5E6, S8E9, and S10E13. Burned bone specimens were identified for 4 avian families; they were, by order of abundance, Anatidae (ducks and geese), Alcidae (murres), Gaviidae (loons), and Podicipedidae (grebes). Ducks, murres, and grebes, are all naturally aggregating species that are likely to have been captured using mass harvest techniques; the exception is Gaviidae (loons), who are more solitary. The low occurrence of burned bone jibes with Haeberlin and Gunther's (1930:23) statement that boiling was the preferred preparation for ducks, and that spit roasting was employed to a lesser degree.

Table 14. Counts of burned specimens from the selected diagnostic elements (Subsets B and C).

	Subset B	*Subset C*
Number of burned specimens	37	22
Number of burned specimens as %	6%	5%
Number of specimens not burned	632	392
Number of specimens not burned as %	94%	95%
Total	**669**	**414**

Age

The vast majority of the specimens were from adult birds (Table 16). In Subset B, 93 percent of the specimens were adults, and 7 percent were subadults. Adult specimens were present in 52 cuts, and subadult specimens were present in 13 cuts. Most cuts containing subadult specimens were located in the middle portion of the site, from S3E1 in the northwest to S24E27 in the southeast. In all cuts that contained subadult specimens, adult specimens were also present. So, there was no evidence that subadult birds were being targeted at Xwe'Chi'eXen. At a finer scale, Subset C, all thirteen taxonomic families included adult specimens. Six taxonomic families included subadult specimens; they were, by order of abundance, Corvidae (jays and crows), Anatidae (ducks and geese), Phasianidae (grouse and quail), Accipitridae (eagles), Alcidae (auks and murres), and Picidae (woodpeckers). Given the coarse scale of the identifications, and the presence of overwintering or resident species within each of the identified families, it was not possible to make an interpretation about seasonal use of the site.

Table 15. Count of adult and subadult specimens from Subsets B and C.

	Subset B	*Subset C*
Number of adult specimens	622	414
Number of adult specimens as %	93%	95%
Number of subadult specimens	47	21
Number of subadult specimens as %	7%	5%
Total	**669**	**414**

Taxonomic Diversity

Taxonomic diversity was related to two sets of expectations: first, locations within the site with high taxonomic richness were hypothesized to be indicators of deposits consistent with potlatch events, second, a pattern of declining evenness over time was hypothesized as consistent with the development of mass harvest techniques, which was asserted to have developed in tandem with the formalization of the potlatch economy. This section explores patterns of taxonomic diversity within Xwe'Chi'eXen samples, and then it explores patterns of diversity between sites.

Site Level Taxonomic Diversity

One measure of diversity of the assemblage is taxonomic richness, which is the number of families represented. When calculated for each context, and plotted by rank order, it is clear that relatively few families occurred in many contexts, and relatively many families occurred in relatively few contexts (Figure 19, Table 16). The few families that occurred in relatively many contexts were Anatidae (ducks and geese), Corvidae (jays and crows), and Accipitridae (eagles).

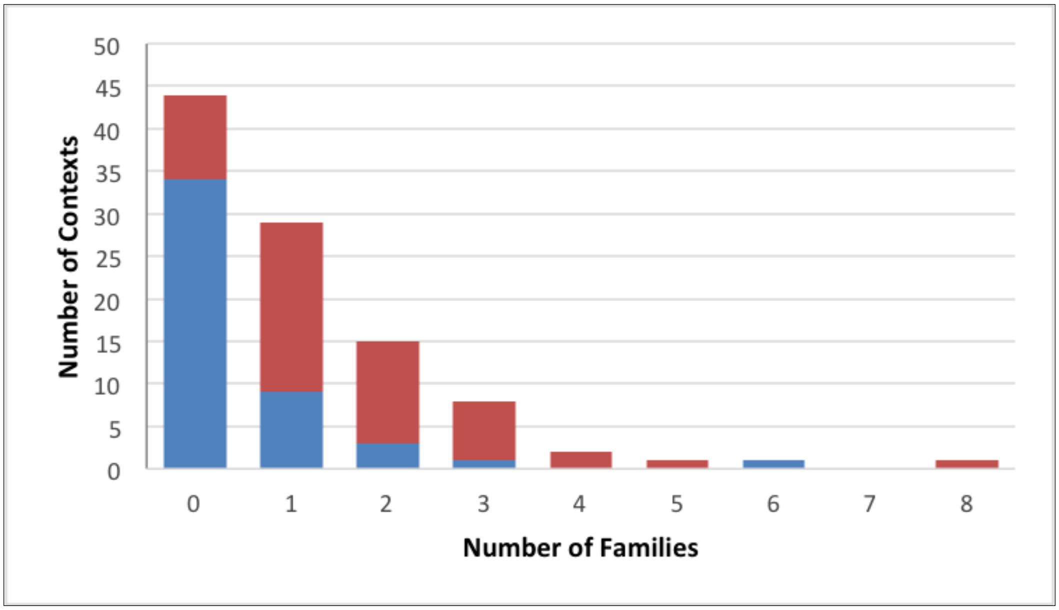

Figure 19. Taxonomic richness as Number of families by number of contexts.

Table 16. Taxonomic richness as number of families per context by Analytical Unit. Where richness is defined as the number of families per context.

NUMBER OF FAMILIES	*NUMBER OF CONTEXTS*		
Taxonomic Richness	*AUI*	*AUII*	*TOTAL*
0	34	10	**44**
1	9	20	**29**
2	3	12	**15**
3	1	7	**8**
4	0	2	**2**
5	0	1	**1**
6	1	0	**1**
7	0	0	**0**
8	0	1	**1**
TOTAL	**48**	**53**	**101**

Generally, the individual contexts from AUII are richer taxonomically, than the contexts from AUI. This is likely due to sample size since there was more avifauna from AUII. Patterns of richness across space can be explored through visual analysis of a thematic map. Figure 20 illustrates taxonomic richness per cut, where cool colors represent relatively few families per cut and warm colors represent relatively many families per cut. The spatial distribution indicates that at most locations fewer than five families are represented. Two locations in the southeastern portion of the site at cut S16E18, and cut S24E27, contain the most families. These two cuts are also the two cuts most abundant with avifauna.

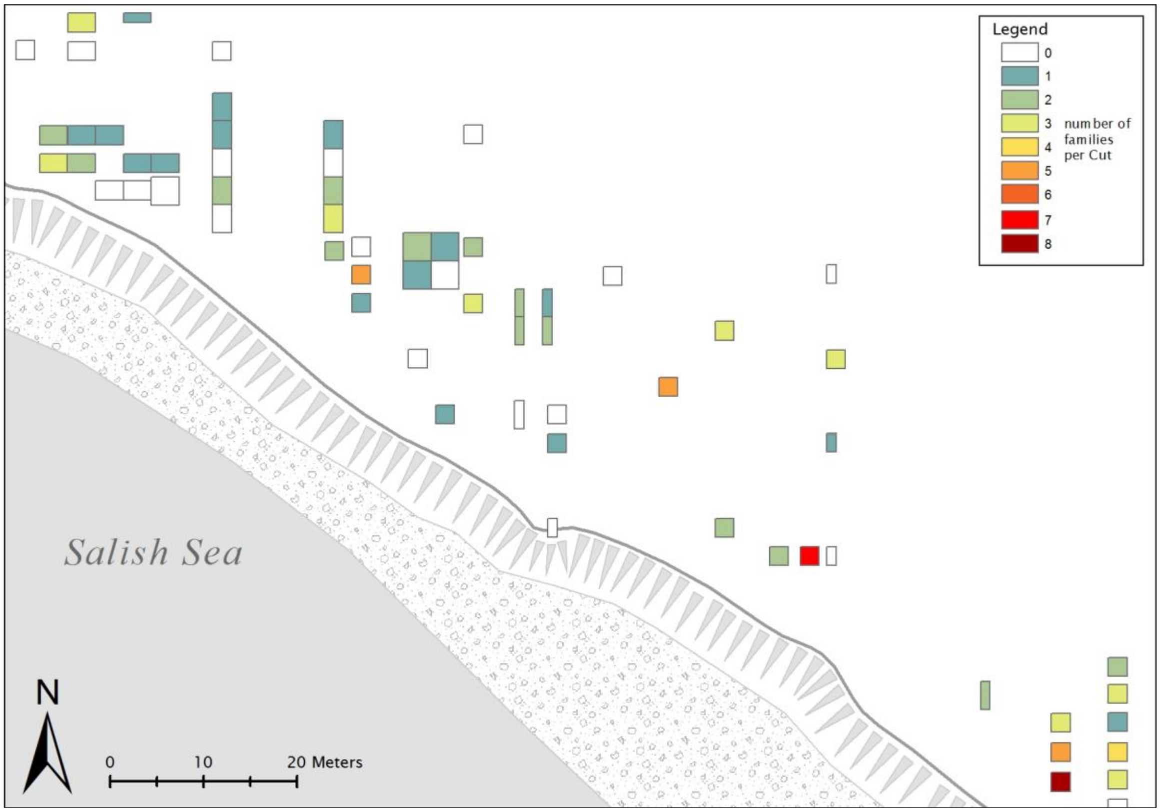

Figure 20. Taxonomic richness by cut, where cool colors contain few avian families, and warm colors contain many avian families.

The cut that is most abundant with avifauna, S16E18, is the second highest in terms of taxonomic richness. The majority of the material excavated from S16E18 was assigned to the older phase, AUI, because an age estimation dating to 3260±50 conventional radiocarbon years before present was obtained from the 40-60 cm excavation level of the neighboring excavation cut: S16E17 (see Table 4). The AUI deposit, context 61, represented a minimum of 11 birds representing 7 avian families (MNI) for 3.2 cubic meters of excavated material (Table 17). In terms of MNI, the families were relatively evenly distributed. Corvidae was the most common family, with three individuals represented. Ravens and crows (Corvidae) were mentioned in the ethnographies as being associated with taboos against their food consumption (Barnett 1955:63). Ducks (Anatidae), grouse

(Phasianidae), and eagles (Accipitridae) were described as having been eaten (Haeberlin and Gunther 1930:21, 23; Gunther 1927:205). Ospreys (Pandionidae), and woodpeckers (Picidae) were mentioned as having been used for their feathers (Underhill 1944:71). So, a range of food and non-food use is evident at this cut. Sixty-eight percent of the non-Anatidae abundance for all of the AUI avifauna was concentrated in S16E18.

Table 17. Vertical distribution of NISP and MNI for the cut with the most avifauna: S16E18.

AU	*Context*	*Level*	*NSPE*	*NISP*	*MNI*	*Families and MNI*
AUII	60	0-20	0	0	1	Anatidae=1
		20-40	15	1		
AUI	61	40-60	10	6	11	Corvidae=3, Anatidae= 2, Phasianidae=2, Accipitridae=1, Charadriidae=1, Pandionidae=1, Picidae=1
		60-80	85	23		
		80-100	51	9		
		100-120	18	2		
		120-140	0	0		
		140-160	0	0		
		160-180	0	0		
		180-190	0	0		
		Total	**169**	**36**	**14**	

Cut S24E27, which has the second highest count of avifauna, is an excellent contrast to the pattern at S16E18. S24E27, is the most taxonomically rich cut in the site. The majority of the material excavated from S24E27 was assigned to the younger phase, AUII, because an age estimation dating to 2050±25 conventional radiocarbon years before present was returned from the

120-140 cm excavation level of this cut (see Table 4). The AUII deposit, context 61, represented a minimum of 21 birds representing 8 avian families from 3.2 cubic meters of excavated material (Table 18). In terms of MNI, the families not evenly distributed among families. The majority of birds, MNI=13, were ducks (Anatidae). This more closely resembles the general pattern at Xwe'Chi'eXen. The remaining families all represented a minimum of 2 or fewer birds per taxon. Seven of eight taxa from S24E27 are likely to have been collected for their food value. This is further supported by the cluster of burned specimens from this area of the site. The one non-food taxon was Picidae (woodpecker); the feathers of woodpecker were used as hair adornments by shamans, and they were associated with spirit helpers that were associated with wood carving (see Chapter 3, *Birds as Commodities*) (Barnett 1955:148-149).

Table 18. Vertical distribution of NISP and MNI for the cut with the second most avifauna: S24E27.

AU	*Context*	*Level*	*NSPE*	*NISP*	*MNI*	*Families and MNI*
AUII	52	0-20	0	0	21	Anatidae=13, Alcidae=2, Accipitridae=1, Corvidae=1, Gaviidae=1, Laridae=1, Picidae=1, Podicipedidae=1
		20-40	13	8		
		40-60	19	15		
		60-80	35	29		
		80-100	33	26		
		100-120	5	4		
		120-140	1	0		
		140-160	0	0		
AUI	53	160-180	0	0	0	NA
		180-200	0	0		
		Total	**106**	**82**	**26**	

Regional Taxonomic Diversity

I also explored taxonomic diversity at the regional scale in order to identify patterns in richness and evenness between sites over time. Because mass harvest locations are a high-yielding means of production, their formalization as property is linked to the accumulation of gift debt. Targeted mass capture is likely to have increased over time in response to gift debt accumulations. I expect, therefore, that since opportunistic individual harvest hunting techniques were more prevalent early in time that early assemblages of avifauna would be i) taxonomically richer, and ii) taxonomically more even. I also expect that since targeted mass capture would be more prevalent later in time that later assemblages will be taxonomically less rich, with more of the distribution concentrated in one or two categories. I compared older, and younger components of Xwe'Chi'eXen (45WH1) with older and younger components of Watmough Bay (45SJ280). I though this comparison was appropriate for several reasons: the two sites had a similar stratigraphy with a deposit of sparse shell underneath deposits of dense shell, these components were comparable in age (see Table 5), and the two sites were excavated using comparable methods; they were excavated in 20 cm levels, and material was passed through 0.25 in wire mesh screen. Over time taxonomic richness declines at both sites (Table 17). At Watmough Bay, the decline in taxonomic richness is very likely to be related to a decline in sample size between components. At Xwe'Chi'eXen, however, there is a decline in richness with a concurrent increase in sample size. So, the decline in taxonomic richness may a behavioral cause.

All three of the diversity indices used calculate evenness in the distribution in relation to richness and sample size. Therefore, comparison across samples can be made more readily using these measures. All three diversity measures show that evenness declines over time at both sites.

This difference is more pronounced at Watmough Bay than it is at Xwe'Chi'eXen. This is likely due to the large number of Phalacrocorax (cormorant) specimens that were present in the lower levels of Watmough Bay (Table 18). The decline in evenness at both sites supports the assertion that targeted mass capture techniques increase in prevalence, and by extension the assertion that potlatch related gift debt also increases.

Table 19. Diversity indices showing changes between older and younger components of Xwe"Chi'eXen (45WH1), and Watmough Bay (45SJ280).

Component	*Sample*	*Shannon's Equitability* H/H_{max}	*Simpson's Index of Diversity* *1-D*	*IQV*	*Richness*	*n*
Younger	45SJ280: Upper*	0.27	0.29	0.31	17	3139
	45WHI: AUII	0.49	0.48	0.53	11	321
Older	45SJ280: Lower†	0.35	0.57	0.60	20	4312
	45WHI: AUI	0.57	0.62	0.67	12	93

* 0-80 or 90 cm; † 80 or 90 cm to the base of the excavation (Bovy 2006:66-72).

Diversity was also explored for regional variation. The results of this showed that richness is still a function of sample size, and no strong regional patterns were highlighted. The pattern of change over time was lost when the components were combined as total site evenness for Watmough Bay, and Xwe'Chi'eXen. Thus these measures are more suited for detecting patterns of change over time, than patterns of change over space irrespective of time.

Table 20. Avian family NISP for all sites used in comparison.

Sample	*45WH1*	*45SK46*	*DgRs2*	*45SJ280*
Accipidridae	25	0	11	47
Alcidae	21	3	0	257
Alecedinidae	0	0	0	6
Anatidae	283	92	175	4249
Ardeidae	0	0	0	104
Cathartidae	0	0	0	9
Charadriidae	1	0	0	3
Columbidae	0	0	0	4
Corvidae	25	0	3	36
Diomedeidae	0	0	0	2
Falconidae	0	0	0	6
Gaviidae	11	2	9	49
Gruidae	0	0	0	17
Haematopodidae	0	0	0	13
Icteridae	0	0	5	0
Iscolopacidae	0	0	0	0

continued on p. 104

Sample	*45WH1*	*45SK46*	*DgRs2*	*45SJ280*
Laridae	16	4	0	164
Passerillidae	0	0	1	0
Pandionidae	3	4	0	0
Phalacrocoridae	2	6	0	2408
Phasianidae	5	0	0	20
Picidae	8	0	0	12
Podicipedidae	13	2	1	44
Procellariidae	0	0	0	1
Rallidae	0	1	4	1
Scolopacidae	0	0	0	2
Strigidae	1	0	0	2
TOTAL	**414**	**114**	**209**	**7456**

Table 21. Diversity indices for 45WH1 and comparison sites is presented by rank order of the sample size.

Site	*Shannon's Equitability* H/H_{max}	*Simpson's Index of Diversity* *1-D*	*IQV*	*Richness*	*n*
45SJ280	0.37	0.57	0.60	20	7451
45WH1	0.51	0.52	0.56	13	414
DgRs2	0.37	0.29	0.33	8	209
45SK46	0.41	0.35	0.39	8	114

CHAPTER 6: SUMMARY AND CONCLUSIONS

Avian faunal remains are common components of archaeological deposits in the Salish Sea. Although the focus on avifauna has increased in recent years, they continue to represent a class of material that is underutilized for the interpretation of archaeological sites. Further, the zooarchaeological focus has broadly inserted a specific functionalist bias into our interpretation of animal remains: that they represent the remains of food. Using a Marxian framework this paper isolated several economic relationships specific to the operation of the potlatch economy as described by Barnett (1935), Suttles (1951, 1986), and Amoss (2017). This perspective allowed me to develop a theory that encompassed the commodification of bird products for their food value as well as for their wealth value. In traditional Coast Salish society, social status was deeply interconnected with different kinds of rights, including rights to access the most high-yielding means of production for bird resources: raised nets through flyways, and submerged nets for the capture of diving ducks feeding on herring and herring roe.

The archaeological literature for the Salish Sea shows that there is a socioeconomic shift from the Locarno Beach phase to the Marpole phase. The Locarno Beach phase, which occurred from approximately 3,500-2,500 years ago, is typically interpreted as a time of broad based foraging. In contrast the Marpole phase, which occurred from approximately 2,500-1,500 years ago, is typically interpreted as a time when settlement shifted toward larger villages, and there was an intensification of resource harvesting activities. Intersecting with my Marxian framework this would imply intensification in the gift economy which I attempt to show in the avifauna.

The deposit at Xwe'Chi'eXen contained a moderate to high abundance of avian taxa when compared to sites at Tsawwassen, Lighthouse Point, and Watmough Bay. The preservation of the avifauna was stable over time, and there was a statistically significant difference in bone fragmentation from the Locarno Beach phase through the Marpole Phase. This difference, however, was the reverse of my initial expectation and showed that there was relatively more fragmentation earlier in time, and relatively less fragmentation later in time. This suggests that the pattern of fragmentation may be of cultural origin, since it is not related to time since deposition. Statistically significant changes over time were also detected in the distribution of skeletal elements and the distribution of taxonomic families. The main pattern of the element distribution was there were many wing bones to few axial and leg bones irrespective of time. Differences in element counts between time periods were due to changes in the rank order. Ducks dominate the assemblage for both phases; the later phase, however, saw an increase in relative abundance of ducks. Other differences in family representation were due to changes in the rank ordering of families. Raptors decline, which is interesting because they are associated with wealth objects, but they were also captured using individual harvest techniques, specifically by foot hook. Therefore the decline in raptors suggests a decline in the production of wealth related goods, but also contributes to the pattern of increasing importance of targeted mass harvest techniques. There were also increases in murres, seagulls, and grebes, taxa that are likely to represent mass harvesting since they have a tendency to form aggregations, and had food value.

The main pattern observed by the element representation was an overabundance of wing elements. A wing bias is typical for archaeological deposits in the region, and it has also been detected globally. The wing bias at Xwe'Chi'eXen was higher than observed at the Lighthouse Point, and Watmough Bay, but within the range of ratios at sites that were reported by Bovy (2002). Evidence of butchery in the form of cut marks was evident in approximately 7 percent of the selected diagnostic elements. Where evidence of butchery was observed it was consistent with the intentional removal of lower wings from fresh carcasses. The removal of wings may represent discarding parts not valued for food, or harvesting feathers for utilitarian or symbolic purposes. These options are not mutually exclusive.

I examined the two cuts most with the most abundant avian remains to see if there was a signature consistent with deposition related to potlatch events. At cut S16E18, 35 birds identified to family from the Locarno Beach phase deposit show a relatively even distribution between 7 families. This location is distinctive insofar as it is both the most taxonomically rich context from the Locarno Beach component, and it is even among the many families represented. The high representation of non-food birds that have ethnographically documented ritual significance suggest that the deposit could reflect a ceremonial event. In contrast, at cut S24E27 all of the avifauna are from the Marpole phase deposit. One hundred eighty two specimens were identified to eight families. This deposit was not evenly distributed among families. The majority of the remains were ducks; two or fewer birds (MNI) were represented among the remaining seven families. This location is more consistent with potlatch-associated deposition because many food birds, primarily ducks, and several wealth-associated families are present.

The final set of expectations was derived from the notion that there is a relationship between the use of mass harvest hunting facilities, like duck net poles, and the accumulation of gift debt. The argument is that accumulations in gift debt encouraged the development of methods to produce greater resource yields to maintain balanced debt relationships with ones network of kin. Once mass harvesting techniques and technologies were developed, lineages exerted rights of ownership over the locations and infrastructure that made mass harvesting possible. Ownership rights allowed lineages to control access to these facilities as a means of production over commodities like duck meat, down, and feathers. Increased formalization of the potlatch economy was therefore expected to result in increases in the use of mass harvest techniques. Taxonomic diversity was asserted to be an indicator of the relative importance of targeted mass harvest techniques. I found that taxonomic evenness declined over time at both Xwe'Chi'eXen and Watmough Bay, and that taxonomic richness decreased at Xwe'Chi'eXen. Both of these measures suggest that mass harvest hunting increased in importance over time.

Avenues for future research include exploring additional ethnographic and ethnohistoric sources for information about how Coast Salish peoples related to birds both materially, and symbolically. This may result in more specific expectations for potlatch-associated deposition. Additionally, this research compiled a set of locations where waterfowl were hunted (see Figure 5). Characterization of the environments in which traditional duck hunting practices took place may be useful for constructing a set of expectations for duck hunting areas of the Northwest Coast where the ethnographic descriptions are not as complete. Other research projects could utilize experimental methods to more precisely define how large the yields of raised or submerged nets should be expected. The presence of commensal species may also be an indicator of increased settlement; more work should be done to explore how the presence of ravens, crows, and seagulls may relate to human habitation.

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Appendix A: List of Possible Bird Taxa

List	*Taxon*	*Common Name*	*Bower 2009**	*Ranges within 10 mi*	*Origin*	*Comparison Specimen*†
most likely	*Branta bernicla*	brant	yes	yes	endemic	UWBM-36964
most likely	*Branta canadensis*	Canada goose	yes	yes	endemic	
most likely	*Anas americana*	American wigeon	yes	yes	endemic	
most likely	*Anas platyrhynchos*	mallard	yes	yes	endemic	ME_A-173
most likely	*Anas acuta*	northern pintail	yes	yes	endemic	
most likely	*Anas crecca*	green-winged teal	yes	yes	endemic	UWBM-68229
most likely	*Aythya valisineria*	canvasback	yes	yes	endemic	
most likely	*Aythya marila*	greater scaup	yes	yes	endemic	
most likely	*Aythya affinis*	lesser scaup	yes	yes	endemic	
most likely	*Histrionicus histrionicus*	harlequin duck	yes	yes	endemic	
most likely	*Melanitta perspicillata*	surf scoter	yes	yes	endemic	UWBM-20349
most likely	*Melanitta fusca*	white-winged scoter	yes	yes	endemic	UWBM-26597
most likely	*Melanitta nigra*	black scoter	yes	yes	endemic	
most likely	*Clangula hyemalis*	long-tailed duck	yes	yes	endemic	
most likely	*Bucephala albeola*	bufflehead	yes	yes	endemic	
most likely	*Bucephala clangula*	common goldeneye	yes	yes	endemic	
most likely	*Bucephala islandica*	barrow's goldeneye	yes	yes	endemic	
most likely	*Mergus merganser*	common merganser	yes	yes	endemic	UWBM-15492
most likely	*Mergus serrator*	red-breasted merganser	yes	yes	endemic	
most likely	*Oxyura jamaicensis*	ruddy duck	yes	yes	endemic	UWBM-12538
most likely	*Gavia stellata*	red-throated loon	yes	yes	endemic	
most likely	*Gavia pacifica*	Pacific loon	yes	yes	endemic	UWBM-50634
most likely	*Gavia immer*	common loon	yes	yes	endemic	
most likely	*Podiceps auritus*	horned grebe	yes	yes	endemic	UWBM-35917
most likely	*Podiceps grisegena*	red-necked grebe	yes	yes	endemic	
most likely	*Phalacrocorax penicillatus*	Brandt's cormorant	yes	yes	endemic	
most likely	*Phalacrocorax auritus*	double-crested cormorant	yes	yes	endemic	
most likely	*Phalacrocorax pelagicus*	pelagic cormorant	yes	yes	endemic	UWBM-42454
most likely	*Haliaeetus leucocephalus*	bald eagle	yes	yes	endemic	UWBM-63860
most likely	*Larus philadelphia*	Bonaparte's gull	yes	yes	endemic	
most likely	*Larus canus*	mew gull	yes	yes	endemic	UWBM-28572
most likely	*Larus glaucescens*	glaucous-winged gull	yes	yes	endemic	
most likely	*Uria aalge*	common murre	yes	yes	endemic	UWBM-44827
most likely	*Cepphus columba*	pigeon guillemot	yes	yes	endemic	UWBM-42060

*Appears on list of 27 most common aquatic taxa in the Salish Sea. † This list is not exhaustive. It records the reference skeletons most frequently used for size and morphology comparisons. ME = Collection of Dr. Mike Etnier; UWBM = Collection of University of Washington, Burke Museum.

List	Taxon	Common Name	Bower 2009*	Ranges within 10 mi	Origin	Comparison Specimen[†]
most likely	*Synthilboramphus antiqus*	ancient murrlet	yes	yes	endemic	UWBM-18579
most likely	*Aechmophorus occidentalis*	western grebe	yes	no	endemic	UWBM-14217
most likely	*Ardea herodias*	great blue heron	yes	no	endemic	
somewhat likely	*Anser albifrons*	greater white fronted goose	no	yes	endemic	
somewhat likely	*Chen caerulescens*	snow goose	no	yes	endemic	ME_A-181
somewhat likely	*Cygnus columbianus*	tundra swan	no	yes	endemic	
somewhat likely	*Aix sponsa*	wood duck	no	yes	endemic	UWBM-18420
somewhat likely	*Anas strepa*	gadwall	no	yes	endemic	
somewhat likely	*Anas penelope*	Eurasian widgeon	no	yes	endemic	
somewhat likely	*Anas discors*	blue-winged teal	no	yes	endemic	
somewhat likely	*Anas cyanoptera*	cinnamon teal	no	yes	endemic	
somewhat likely	*Anas clypeata*	northern shoveler	no	yes	endemic	
somewhat likely	*Aythaya americana*	redhead	no	yes	endemic	
somewhat likely	*Aythya collaris*	ring-necked duck	no	yes	endemic	
somewhat likely	*Lophodytes cucullatus*	hooded merganser	no	yes	endemic	
somewhat likely	*Podilymbus podiceps*	pied-billed grebe	no	yes	endemic	UWBM-30468
somewhat likely	*Podiceps nigricollis*	eared grebe	no	yes	endemic	
somewhat likely	*Botaurus lentiginosus*	American bittern	no	yes	endemic	UWBM-31085
somewhat likely	*Butorides virescens*	green heron	no	yes	endemic	
somewhat likely	*Cathartes aura*	turkey vulture	no	yes	endemic	UWBM-81580
somewhat likely	*Pandion haliaetus*	osprey	no	yes	endemic	UWBM-79102
somewhat likely	*Circus cyaneus*	northern harrier	no	yes	endemic	
somewhat likely	*Accipiter striatus*	sharp-shinned hawk	no	yes	endemic	
somewhat likely	*Accipiter cooperi*	Cooper's hawk	no	yes	endemic	
somewhat likely	*Accipiter gentilis*	northern goshawk	no	yes	endemic	
somewhat likely	*Buteo jamaicensis*	red-tailed hawk	no	yes	endemic	UWBM-31812
somewhat likely	*Buteo lagopus*	rough-legged hawk	no	yes	endemic	
somewhat likely	*Aquila chrysaetos*	golden eagle	no	yes	endemic	UWBM-59391
somewhat likely	*Falco sparverius*	American kestrel	no	yes	endemic	
somewhat likely	*Falco columbarius*	Merlin	no	yes	endemic	
somewhat likely	*Falco rusticolus*	Gyrfalcon	no	yes	endemic	
somewhat likely	*Falco peregrinus*	peregrine falcon	no	yes	endemic	
somewhat likely	*Rallus limicola*	Virginia rail	no	yes	endemic	

List	Taxon	Common Name	Bower 2009*	Ranges within 10 mi	Origin	Comparison Specimen[†]
somewhat likely	*Porzana carolina*	sora	no	yes	endemic	
somewhat likely	*Fulica americana*	American coot	no	yes	endemic	
somewhat likely	*Grus canadensis*	sandhill crane	no	yes	endemic	UWBM-63790
somewhat likely	*Pluvialis squatarola*	black-bellied plover	no	yes	endemic	
somewhat likely	*Charadrius semipalmatus*	semipalmated plover	no	yes	endemic	
somewhat likely	*Charadrius vociferus*	killdeer	no	yes	endemic	UWBM-18450
somewhat likely	*Haematopus bachmani*	black oystercatcher	no	yes	endemic	UWBM-68264
somewhat likely	*Tringa melanoleuca*	greater yellowlegs	no	yes	endemic	
somewhat likely	*Tringa flavipes*	lesser yellowlegs	no	yes	endemic	
somewhat likely	*Triga solitaria*	solitary sandpiper	no	yes	endemic	
somewhat likely	*Acitis macularius*	spotted sandpiper	no	yes	endemic	
somewhat likely	*Numemius phaeopus*	whimbrel	no	yes	endemic	
somewhat likely	*Arenaria interpres*	ruddy turnstone	no	yes	endemic	
somewhat likely	*Arenaria melanocephala*	black turnstone	no	yes	endemic	
somewhat likely	*Alphriza virgata*	surfbird	no	yes	endemic	
somewhat likely	*Calidris alba*	sanderling	no	yes	endemic	
somewhat likely	*Calidris pusilla*	semipalmated sandpiper	no	yes	endemic	
somewhat likely	*Calidris mauri*	western sandpiper	no	yes	endemic	
somewhat likely	*Calidris minutilla*	least sandpiper	no	yes	endemic	
somewhat likely	*Calidris bardii*	bairds sandpiper	no	yes	endemic	
somewhat likely	*Calidris melanotos*	pectoral sandpiper	no	yes	endemic	
somewhat likely	*Calidris alpina*	dunlin	no	yes	endemic	
somewhat likely	*Calidris himantopus*	stilt sandpiper	no	yes	endemic	
somewhat likely	*Limnodromus griseus*	short-billed dowitcher	no	yes	endemic	
somewhat likely	*Limnodromus scolopaceus*	long-billed dowitcher	no	yes	endemic	
somewhat likely	*Gallinago delicata*	Wilson's snipe	no	yes	endemic	
somewhat likely	*Phalaropus lobatus*	red-necked phalarope	no	yes	endemic	
somewhat likely	*Stercorarius parasiticus*	parasitic jaeger	no	yes	endemic	
somewhat likely	*Larus pipixcan*	Franklin's gull	no	yes	endemic	
somewhat likely	*Larus heermanni*	Heerman's gull	no	yes	endemic	
somewhat likely	*Larus delawarensis*	ring-billed gull	no	yes	endemic	
somewhat likely	*Larus californiacus*	California gull	no	yes	endemic	UWBM-13947

List	Taxon	Common Name	Bower 2009*	Ranges within 10 mi	Origin	Comparison Specimen[†]
somewhat likely	*Larus argentatus*	herring gull	no	yes	endemic	UWBM-43911
somewhat likely	*Larus thayeri*	Thayer's gull	no	yes	endemic	
somewhat likely	*Larus occidentalis*	western gull	no	yes	endemic	
somewhat likely	*Larus hyperboreus*	glaucous gull	no	yes	endemic	
somewhat likely	*Sterna caspia*	Caspian tern	no	yes	endemic	
somewhat likely	*Sterna hirundo*	common tern	no	yes	endemic	UWBM-46896
somewhat likely	*Brachyramphus marmoratus*	marbled murrelet	no	yes	endemic	
somewhat likely	*Cerorhinca monocerata*	rhinoceros auklet	no	yes	endemic	UWBM-14230
somewhat likely	*Patagioenas fasciata*	band-tailed pigeon	no	yes	endemic	
somewhat likely	*Zenaida macroura*	mourning dove	no	yes	endemic	
somewhat likely	*Tyto alba*	barn owl	no	yes	endemic	UWBM-268229
somewhat likely	*Bubo virginianus*	great horned owl	no	yes	endemic	UWBM-31344
somewhat likely	*Asio otus*	long-eared owl	no	yes	endemic	
somewhat likely	*Asio flammeus*	short-eared owl	no	yes	endemic	
somewhat likely	*Aegolius acadicus*	northern saw-whet owl	no	yes	endemic	
somewhat likely	*Chordeiles minor*	common nighthawk	no	yes	endemic	
somewhat likely	*Cypseloides niger*	black swift	no	yes	endemic	
somewhat likely	*Chaetura vauxi*	Vaux's swift	no	yes	endemic	
somewhat likely	*Selasphorus rufus*	rufous hummingbird	no	yes	endemic	
somewhat likely	*Ceryle alcyon*	belted kingfisher	no	yes	endemic	
somewhat likely	*Sphyrapicus ruber*	red-breasted sapsucker	no	yes	endemic	
somewhat likely	*Picoides pubescens*	downy woodpecker	no	yes	endemic	
somewhat likely	*Picoides villosus*	hairy woodpecker	no	yes	endemic	
somewhat likely	*Colaptes auratus*	northern flicker	no	yes	endemic	
somewhat likely	*Dryocopus pileatus*	pileated woodpecker	no	yes	endemic	UWBM-18562
somewhat likely	*Contopus cooperi*	olive-sided flycatcher	no	yes	endemic	
somewhat likely	*Contopus sordidulus*	western wood-pewee	no	yes	endemic	
somewhat likely	*Empidonax traillii*	willow flycatcher	no	yes	endemic	
somewhat likely	*Empidonax hammondi*	Hammond's flycatcher	no	yes	endemic	
somewhat likely	*Empidonax difficilis*	Pacific-slope flycatcher	no	yes	endemic	
somewhat likely	*Sayornis saya*	Say's Phoebe	no	yes	endemic	
somewhat likely	*Lanius excubitor*	northern shrike	no	yes	endemic	

List	Taxon	Common Name	Bower 2009*	Ranges within 10 mi	Origin	Comparison Specimen†
somewhat likely	*Vireo cassinii*	Cassin's vireo	no	yes	endemic	
somewhat likely	*Vireo huttoni*	Hutton's vireo	no	yes	endemic	
somewhat likely	*Vireo gilvus*	warbling vireo	no	yes	endemic	
somewhat likely	*Vireo olivaceus*	red-eyed vireo	no	yes	endemic	
somewhat likely	*Cyanocitta stelleri*	Steller's Jay	no	yes	endemic	
somewhat likely	*Corvus brachyrhynchos*	American crow	no	yes	endemic	
somewhat likely	*Corvus corax*	common raven	no	yes	endemic	
somewhat likely	*Tachycineta bicolor*	tree swallow	no	yes	endemic	
somewhat likely	*Tachycineta thalassina*	violet-green swallow	no	yes	endemic	
somewhat likely	*Stelgidopteryx serripennis*	northern rough-winged swallow	no	yes	endemic	
somewhat likely	*Petrochelidon pyrrhonota*	cliff swallow	no	yes	endemic	
somewhat likely	*Hirundo rustica*	barn swallow	no	yes	endemic	
somewhat likely	*Poecile atricapillus*	black-capped chickadee	no	yes	endemic	ME_A-157
somewhat likely	*Poecile rufescens*	chestnut-backed chickadee	no	yes	endemic	
somewhat likely	*Psaltriparus minimus*	bushtit	no	yes	endemic	
somewhat likely	*Sitta canadensis*	red-breasted nuthatch	no	yes	endemic	
somewhat likely	*Certhia americana*	brown creeper	no	yes	endemic	
somewhat likely	*Thryomanes bewickii*	Bewick's wren	no	yes	endemic	
somewhat likely	*Trogodytes aedon*	house wren	no	yes	endemic	
somewhat likely	*Trogodytes troglodytes*	winter wren	no	yes	endemic	
somewhat likely	*Cistothorus palustris*	marsh wren	no	yes	endemic	
somewhat likely	*Regulus satrapa*	golden-crowned kinglet	no	yes	endemic	
somewhat likely	*Regulus calendula*	ruby-crowned kinglet	no	yes	endemic	
somewhat likely	*Myadestes townsendi*	Townsend's solitaire	no	yes	endemic	UWBM-19136
somewhat likely	*Catharus ustulatus*	Swainson's thrush	no	yes	endemic	
somewhat likely	*Catharus guttatus*	hermit thrush	no	yes	endemic	
somewhat likely	*Turdus migratorius*	American robin	no	yes	endemic	ME_A-097
somewhat likely	*Ixoreus naevius*	varied thrush	no	yes	endemic	
somewhat likely	*Anthus rubescens*	American pipit	no	yes	endemic	
somewhat likely	*Bombycilla garrulus*	Bohemian waxwing	no	yes	endemic	
somewhat likely	*Bobycilla cedrorum*	cedar waxwing	no	yes	endemic	UWBM-14175
somewhat likely	*Vermivora celata*	orange-crowned warbler	no	yes	endemic	

List	Taxon	Common Name	Bower 2009*	Ranges within 10 mi	Origin	Comparison Specimen[†]
somewhat likely	*Dendroica petechia*	yellow warbler	no	yes	endemic	
somewhat likely	*Dendroica coronata*	yellow-rumped warbler	no	yes	endemic	
somewhat likely	*Dendroica nigrescens*	black-throated gray warbler	no	yes	endemic	
somewhat likely	*Dendroica townsendi*	Townsend's warbler	no	yes	endemic	
somewhat likely	*Oporornis tolmiei*	McGillivray's warbler	no	yes	endemic	
somewhat likely	*Geothlypis trichas*	common yellowthroat	no	yes	endemic	
somewhat likely	*Wilsonia pusilla*	Wilson's warbler	no	yes	endemic	
somewhat likely	*Piranga ludoviciana*	western tanager	no	yes	endemic	
somewhat likely	*Pipilo maculatus*	spotted towhee	no	yes	endemic	
somewhat likely	*Spizella arborea*	American tree sparrow	no	yes	endemic	
somewhat likely	*Spizella passerina*	chipping sparrow	no	yes	endemic	
somewhat likely	*Passerculus sandwichensis*	savannah sparrow	no	yes	endemic	
somewhat likely	*Passerella iliaca*	fox sparrow	no	yes	endemic	
somewhat likely	*Melospiza melodia*	song sparrow	no	yes	endemic	
somewhat likely	*Melospiza lincolnii*	Lincoln's sparrow	no	yes	endemic	
somewhat likely	*Zonotrichia albicollis*	white-throated sparrow	no	yes	endemic	
somewhat likely	*Zonotrichia leucophrys*	white-crowned sparrow	no	yes	endemic	
somewhat likely	*Zonotrichia atricapilla*	golden-crowned sparrow	no	yes	endemic	
somewhat likely	*Junco hyemalis*	dark-eyed junco	no	yes	endemic	
somewhat likely	*Calcarius lapponicus*	Lapland longspur	no	yes	endemic	
somewhat likely	*Pheucticus melanocephalus*	black-headed grosbeak	no	yes	endemic	
somewhat likely	*Agelaius phoeniceus*	red-winged blackbird	no	yes	endemic	
somewhat likely	*Sturnella neglecta*	western meadowlark	no	yes	endemic	
somewhat likely	*Euphagus cyanocephalus*	Brewer's blackbird	no	yes	endemic	
somewhat likely	*Molothrus ater*	brown-headed cowbird	no	yes	endemic	
somewhat likely	*Icterus bullockii*	Bullock's oriole	no	yes	endemic	
somewhat likely	*Carpodacus purpureus*	purple finch	no	yes	endemic	
somewhat likely	*Carpodacus mexicanus*	house finch	no	yes	endemic	
somewhat likely	*Loxia curvirostra*	red crossbill	no	yes	endemic	
somewhat likely	*Carduelis pinus*	pine siskin	no	yes	endemic	
somewhat likely	*Carduelis tristis*	American goldfinch	no	yes	endemic	
somewhat likely	*Coccothraustes vespertinus*	evening grosbeak	no	yes	endemic	

List	Taxon	Common Name	Bower 2009*	Ranges within 10 mi	Origin	Comparison Specimen[†]
somewhat likely	*Passer domesticus*	house sparrow	no	yes	endemic	
least likely	*Callipepla californica*	California quail	no	yes	intruduced	
least likely	*Columbia livia*	rock pigeon	no	yes	introduced	ME_A-072
least likely	*Calypte anna*	Anna's hummingbird	no	yes	introduced	
least likely	*Sturnus vulgaris*	European tarling	no	yes	introduced	
least likely	*Branta hutchinsii*	cackling goose	no	no	endemic	
least likely	*Cygnus buccinator*	trumpeter swan	no	no	endemic	
least likely	*Alectoris chukar*	chukar	no	no	introduced	
least likely	*Perdix perdix*	gray partridge	no	no	endemic	
least likely	*Phasianus colchius*	ring-necked pheasant	no	no	introduced	
least likely	*Bonsa umbellus*	ruffed grouse	no	no	endemic	
least likely	*Centro urophasianus*	greater sage-grouse	no	no	endemic	
least likely	*Falcipennis canadensis*	spruce grouse	no	no	endemic	
least likely	*Lagopus leucura*	white-tailed ptarmigan	no	no	endemic	
least likely	*Dendragapus obscurus*	blue grouse	no	no	endemic	UWBM-53278
least likely	*Tympanuchus phasianellus*	sharp-tailed grouse	no	no	endemic	
least likely	*Melagris gallopavo*	wild turkey	no	no	endemic	
least likely	*Oreortyx pictus*	mountain quail	no	no	endemic	
least likely	*Aechomphorus clarkii*	Clark's grebe	no	no	endemic	
least likely	*Phoebastria nigripes*	black-footed albatross	no	no	endemic	
least likely	*Fulmaris glacialis*	northern fulmar	no	no	endemic	
least likely	*Puffinus creatopus*	pink-footed shearwater	no	no	endemic	
least likely	*Puffinus bulleri*	Buller's shearwater	no	no	endemic	UWBM-55463
least likely	*Puffinus griseus*	sooty shearwater	no	no	endemic	
least likely	*Puffinus tenuirostris*	short-tailed shearwater	no	no	endemic	
least likely	*Oceandroma furcata*	fork-tailed storm petrel	no	no	endemic	
least likely	*Oceanodroma leucorhoa*	Leach's storm-petrel	no	no	endemic	
least likely	*Pelecanus erythrorhyncos*	American white pelican	no	no	endemic	
least likely	*Pelecanus occidentalis*	Brown pelican	no	no	endemic	
least likely	*Ardea alba*	great egret	no	no	endemic	
least likely	*Nycticorax nyticorax*	black-crowned night-heron	no	no	endemic	
least likely	*Elanus leucurus*	white-tailed kite	no	no	endemic	
least likely	*Buteo lineatus*	red-shouldered hawk	no	no	endemic	
least likely	*Buteo swainsoni*	Swainson's hawk	no	no	endemic	
least likely	*Buteo regalis*	ferruginous hawk	no	no	endemic	
least likely	*Falco mexicanus*	prairie falcon	no	no	endemic	
least likely	*Pluvalis fulva*	Pacific golden plover	no	no	endemic	
least likely	*Charadrius alexandrinus*	snowy plover	no	no	endemic	
least likely	*Himatopus mexicanus*	black-necked stilt	no	no	endemic	

List	Taxon	Common Name	Bower 2009*	Ranges within 10 mi	Origin	Comparison Specimen†
least likely	*Recurvitrosa americana*	American avocet	no	no	endemic	
least likely	*Catoptrophorus semipalmatus*	willet	no	no	endemic	
least likely	*Heteroscelus incanus*	wandering tattler	no	no	endemic	
least likely	*Numemius americanus*	long-billed curlew	no	no	endemic	
least likely	*Lumosa fedoa*	marbled godwit	no	no	endemic	
least likely	*Calidris canutus*	red knot	no	no	endemic	
least likely	*Calidris ptilocnemis*	rock sandpiper	no	no	endemic	
least likely	*Phalaropus tricolor*	Wilson's phalarope	no	no	endemic	
least likely	*Phalaropus fulicarius*	red phalarope	no	no	endemic	
least likely	*Stercorarius pomarinus*	pomarine jaeger	no	no	endemic	
least likely	*Stercorarius longicaudus*	long-tailed jaeger	no	no	endemic	
least likely	*Xema sabini*	Sabines's Gull	no	no	endemic	
least likely	*Rissa tridactyla*	black legged kittiwake	no	no	endemic	
least likely	*Sterna paradisaea*	arctic tern	no	no	endemic	
least likely	*Sterna forsteri*	Forster's tern	no	no	endemic	
least likely	*Childonias niger*	black tern	no	no	endemic	
least likely	*Ptychoramphus aleuticus*	Cassin's auklet	no	no	endemic	UWBM-48515
least likely	*Fratercula cirrhata*	tufted puffin	no	no	endemic	UWBM-33390
least likely	*Otus flammeolus*	flammulated owl	no	no	endemic	
least likely	*Megascops kennicottii*	western screech-owl	no	no	endemic	UWBM-20680
least likely	*Bubo scandiacus*	snowy owl	no	no	endemic	
least likely	*Glaucidium gnoma*	northern pygmy owl	no	no	endemic	
least likely	*Athene cunicularia*	burrowing owl	no	no	endemic	
least likely	*Strix occidentalis*	spotted owl	no	no	endemic	
least likely	*Strix varia*	Barred owl	no	no	introduced	
least likely	*Strix nebulosa*	great gray owl	no	no	endemic	
least likely	*Aegolius funereus*	boreal owl	no	no	endemic	
least likely	*Phalaenoptilus nuttallii*	common poorwill	no	no	endemic	
least likely	*Aeronautes saxatalis*	white-throated swift	no	no	endemic	
least likely	*Archilochus alexandri*	black-chinned hummingbird	no	no	endemic	
least likely	*Stellula calliope*	calliope hummingbird	no	no	endemic	
least likely	*Melanerpes lewis*	Lewis's woodpecker	no	no	endemic	
least likely	*Melanerpes formicivorus*	acorn woodpecker	no	no	endemic	UWBM-46845
least likely	*Sphyrapicus thyroideus*	Williamson's sapsucker	no	no	endemic	
least likely	*Sphyrapicus nuchalis*	red-naped sapsucker	no	no	endemic	
least likely	*Picoides albolrvatus*	white-headed woodpecker	no	no	endemic	
least likely	*Picoides dorsalis*	American three-toed woodpecker	no	no	endemic	
least likely	*Picoides arcticus*	black-backed woodpecker	no	no	endemic	

List	*Taxon*	*Common Name*	*Bower 2009**	*Ranges within 10 mi*	*Origin*	*Comparison Specimen*[†]
least likely	*Empidonax minimus*	least flycatcher	no	no	endemic	
least likely	*Empidonax wrightii*	gray flycatcher	no	no	endemic	
least likely	*Empidonax oberholseri*	dusky flycatcher	no	no	endemic	
least likely	*Myiarchus*	ash-throated flycatcher	no	no	endemic	
least likely	*Tyrannus tyrannus*	eastern kingbird	no	no	endemic	
least likely	*Lanius ludovicianus*	loggerhead shrike	no	no	endemic	
least likely	*Perisoreus canadensis*	gray jay	no	no	endemic	
least likely	*Aphelocoma californica*	western scrub-jay	no	no	endemic	
least likely	*Nucifraga columbiana*	Clark's nutcracker	no	no	endemic	
least likely	*Pica hudsonia*	black-billed magpie	no	no	endemic	
least likely	*Eremophila alpestris*	horned lark	no	no	endemic	
least likely	*Progne subis*	purple martin	no	no	endemic	
least likely	*Riparia riparia*	bank swallow	no	no	endemic	
least likely	*Poecile gambeli*	mountain chickadee	no	no	endemic	
least likely	*Poecile hudsonia*	boreal chickadee	no	no	endemic	
least likely	*Sitta carolinensis*	white-breasted nuthatch	no	no	endemic	
least likely	*Sitta pygmaea*	pygmy nuthatch	no	no	endemic	
least likely	*Salpinctes obsoletus*	rock wren	no	no	endemic	
least likely	*Catherpes mexicanus*	canyon wren	no	no	endemic	
least likely	*Cinclus mexicanus*	American dipper	no	no	endemic	
least likely	*Sialia mexicana*	western bluebird	no	no	endemic	
least likely	*Sialia currucoides*	mountain bluebird	no	no	endemic	
least likely	*Catharus fuscescens*	veery	no	no	endemic	
least likely	*Dumetella carolinensis*	gray catbird	no	no	endemic	
least likely	*Oreoscoptes montanus*	sage thrasher	no	no	endemic	
least likely	*Vermivora ruficapilla*	Nashville warbler	no	no	endemic	
least likely	*Dendroica occidentalis*	hermit warbler	no	no	endemic	
least likely	*Dendroica palmarum*	palm warbler	no	no	endemic	
least likely	*Setophaga ruticilla*	American redstart	no	no	endemic	
least likely	*Seiurus noveboracensis*	northern water thrush	no	no	endemic	
least likely	*Icteria virens*	yellow-breasted chat	no	no	endemic	
least likely	*Pipilo chlorurus*	green-tailed towhee	no	no	endemic	
least likely	*Spizella breweri*	Brewer's sparrow	no	no	endemic	
least likely	*Pooecetes gramineus*	vesper sparrow	no	no	endemic	
least likely	*Chondestes grammacus*	lark sparrow	no	no	endemic	
least likely	*Amphispiza belli*	sage sparrow	no	no	endemic	
least likely	*Ammodramus savannarum*	grasshopper sparrow	no	no	endemic	
least likely	*Melospiza georgiana*	swamp sparrow	no	no	endemic	
least likely	*Plectrophenax nivalis*	snow bunting	no	no	endemic	

List	*Taxon*	*Common Name*	*Bower 2009**	*Ranges within 10 mi*	*Origin*	*Comparison Specimen*[†]
least likely	*Passerina amoena*	lazuli bunting	no	no	endemic	
least likely	*Dolichonyx oryzivorus*	bobolink	no	no	endemic	
least likely	*Aegelaius tricolor*	tricolored blackbird	no	no	endemic	
least likely	*Xanthocephalus xanthocephalus*	yellow-headed blackbird	no	no	endemic	
least likely	*Leucosticte tephrocotis*	gray-crowned rosy-finch	no	no	endemic	
least likely	*Pinicola enucleator*	pine grosbeak	no	no	endemic	
least likely	*Carpodacus cassinii*	Cassin's finch	no	no	endemic	
least likely	*Carduelis psaltria*	lesser goldfinch	no	no	endemic	

Appendix B: Ethnographic Data

Culture Region	*Culture*	*Source*	*Major Class*	*Minor Class*	*Taxa*	*DESCRIPTION*
General Comparative	Central California Groups	Howard 1929:372	use	procurement	Anatidae	Describes the use of "a series of nooses over the surface of the water" for hunting waterfowl.
Central Maritime	Coast Salish	Barnett 1955:101	use	artifact	Aves	Describes that arrows were fletched with two feathers, see figure 36.
Central Maritime	Coast Salish	Curtis 1913:66	use	procurement	Anatidae	Describes the hunting ducks with the use of two-foot long cedar shafted arrows with stone or bone points.
Central Maritime	Coast Salish	Barnett 1955:98	use	procurement	Aves	Describes bird hunting by boys using bows and arrows and hunting blinds.
Central Maritime	Coast Salish	Barnett 1955:100	use	procurement	Anatidae	Describes the use of bow and arrow to capture birds.
Central Maritime	Coast Salish	Barnett 1955:100	use	procurement	Aves	Describes bows used for bird hunting as "inferior", and made of hardhack, not yellow cedar.
Central Maritime	Coast Salish	Barnett 1955:102	use	procurement	Aves	Describes the use of blunt pointed arrows to stun birds of either hardwood, or fiber wrapping. See fig. 37.
Central Maritime	Coast Salish	Barnett 1955:102	use	procurement	Anatidae	Describes the use of two pronged arrows for duck hunting. Prongs were long thin pieces of bone with outward facing barbs.
Central Maritime	Coast Salish	Barnett 1955:102	use	procurement	Aves	Describes bird arrows as having retrieving lines.
Central Maritime	Coast Salish	Barnett 1955:102	use	procurement	Aves	Describes that arrows without retrieving lines were painted with patterns for identification.
Central Maritime	Coast Salish	Barnett 1955:98	use	procurement	Anatidae	Describes the use of duck-head decoys.
Central Maritime	Coast Salish	Haeberlin and Gunther 1930:26	use	artifact	Anatidae	Describes the use of duck feathers for fletching.
Central Maritime	Coast Salish	Barnett 1955:158	use	artifact	Accipitridae	Describes the use of six eagle feathers and eagle down for the swaihwe mask.
Central Maritime	Coast Salish	Barnett 1955:106	use	ritual	Accipitridae	Describes the use of eagle down associated with special ritual preparation of mountain goat and bear.
Central Maritime	Coast Salish	Barnett 1955:119	use	artifact	Accipitridae	Describes the practice of mixing down and other additives to wool as a central coast Salish practice. Northern groups didn't mix additives into their wool.
Central Maritime	Coast Salish	Barnett 1955:158	use	artifact	Anatidae	Describes the use of swan feathers for the neck of swaihwe regalia.
Central Maritime	Coast Salish	Drucker 1963:87	use	artifact	Anatidae	Describes the spinning of duck and goose down into wool for weaving blankets.
Central Maritime	Coast Salish	Barnett 1955:71	use	artifact	Anatidae	Describes the use of duck down in wool blankets.
Central Maritime	Coast Salish	Barnett 1955:158	use	artifact	Aves	Describes the use of a bird head as the nose of a swaihwe mask.
Central Maritime	Coast Salish	Barnett 1955:158	use	artifact	Aves	Describes the use of two bird heads as the horns of a swaihwe mask.

Culture Region	*Culture*	*Source*	*Major Class*	*Minor Class*	*Taxa*	*DESCRIPTION*
Central Maritime	Coast Salish	Barnett 1955:72	use	artifact	Aves	Describes the use of bird skins to make caps.
Central Maritime	Coast Salish	Barnett 1955:149	use	artifact	Gaviidae	Shamans wore loon skin hats
Central Maritime	Coast Salish	Barnett 1955:149	use	artifact	Picidae	Shamans wore woodpecker feathers in their hair.
Central Maritime	Coast Salish	Barnett 1955:151	use	artifact	Aves	Describes that during seclusion, part of a girls coming of age ritual, a bone drinking tube was used to protect her teeth. This is likely to be hollow bird bone.
Central Maritime	Coast Salish	Barnett 1955:158	use	artifact	Aves	Describes that during seclusion, part of a girls coming of age ritual, a bone drinking tube was used to protect her teeth. This is likely to be hollow bird bone.
Central Maritime	Coast Salish	Barnett 1955:93	use	artifact	Accipitridae	Describes the use of eagle down to attract a blackfish spirit helper.
Central Maritime	Coast Salish	Barnett 1955:150	use	artifact	Aves	Feathers described as part of a shaman's magic ritual.
Central Maritime	Coast Salish	Barnett 1955:170	use	artifact	Anatidae	Describes swan's feathers as a typical part of the skirt of the swaihwe dancers.
Central Maritime	Coast Salish	Barnett 1955:85	use	artifact	Anatidae	Describes the use of a "splinter of duck bone" as the barb to a single-barbed composite trolling hook.
Central Maritime	Coast Salish	Suttles 1987:33	use	food	multiple	Describes that "Two or three species of upland birds were eaten, and more than forty species of waterfowl and shorebirds, ranging in size from sandpipers to twenty-pound swans."
Central Maritime	Coast Salish	Barnett 1955:63	use	food	multiple	Lists seagulls and ducks among animals eaten.
Central Maritime	Coast Salish	Barnett 1955:63	use	food	multiple	Lists the eggs of grouse, loon, shag, duck, and seagull as eaten.
Central Maritime	Coast Salish	Haeberlin and Gunther 1930:21	use	food	multiple	Describes that pheasant, lark and duck eggs were eaten.
Central Maritime	Coast Salish	Haeberlin and Gunther 1930:69-70	use	procurement	Phasianidae	Describes sguloB, the pheasant spirit. This spirit helper was necessary to catch Pheasants in a trap.
Central Maritime	Coast Salish	Haeberlin and Gunther 1930:69-70	use	procurement	Passeriformes	Describes swu't, a bird spirit helper, likely represented by a small passerine, would aid in hunting.
Central Maritime	Coast Salish	Haeberlin and Gunther 1930:71	use	procurement	Anatidae	Describes tc!lā'dzo', a spirit helper associated with fishing and hunting. It would take the form of a duck decoy.
Central Maritime	Coast Salish	Haeberlin and Gunther 1930:71	use	procurement	mythical	Describes xwë'kwad, thunderbird, a spirit helped that was associated with rain and thunder.
Central Maritime	Coast Salish	Haeberlin and Gunther 1930:71	use	procurement	Gruidae	Describes that informant Edward Perceval owned a headdress associated with Crane spirit, which was inherited from his grandfather.
Central Maritime	Coast Salish	Underhill 1944: 47-49	use	procurement	multiple	Describes the use of nettle fiber mist-nets for duck hunting, and the use of small barbed arrows for small bird hunting. This source also describes the weaving of feathers and skins into cloaks.
Central Maritime	Coast Salish	Suttles 1987:20	use	procurement	Anatidae	Describes that "most duck-net sites were owned; deer-net sites were not […]".

Culture Region	*Culture*	*Source*	*Major Class*	*Minor Class*	*Taxa*	*DESCRIPTION*
Central Maritimee	Coast Salish	Stern 1934	use	procurement	multiple	Describes the use of horizontal dive nets for bird hunting.
Central Maritime	Coast Salish	Suttles 1990:459	use	procurement	Aves	Describes the use of mist-nets, bow and arrow from canoe blinds, dive nets, and snares for bird hunting.
Central Maritime	Coast Salish	Drucker 1963:51	use	procurement	Anatidae	Describes the use of mist-nets for duck hunting.
Central Maritime	Coast Salish	Barnett 1955:102	use	procurement	Anatidae	Describes the use of nets for duck hunting.
Central Maritime	Coast Salish	Barnett 1955:103	use	procurement	Anatidae	Describes the use of flyway mist nets to capture ducks .
Central Maritime	Coast Salish	Barnett 1955:103	use	procurement	Aves	Describes that the knowledge of flyway mist nets was not known deep in the mainland inlets.
Central Maritime	Coast Salish	Gunther 1927:198	use	procurement	Anatidae	Describes the collection of seagull eggs, the use of mist-nets to capture flocks of ducks, and the use of dip nets to capture ducks, swans, and geese.
Central Maritime	Coast Salish	Suttles 1987:71	use	procurement	Anatidae	Describes seasonal subsistence activities, including winter night waterfowl hunting "with flares".
Central Maritime	Coast Salish	Barnett 1955:89	non-use	oral tradition	multiple	Story of Human Raven and first salmon ceremony. The story opens with them duck hunting. Raven keeps a fishbone breaking proper ceremony protocol. When the Salmon return to human form they cannot keep their heads up. The description of the bone sounds like its an otolith.
Central Maritime	Coast Salish	Barnett 1955:148	non-use	oral tradition	Accipitridae	Eagles were spirit guides associated with hunting.
Central Maritime	Coast Salish	Barnett 1955:148	non-use	oral tradition	multiple	"some fishing birds" were spirit guides associated with fishing. .
Central Maritime	Coast Salish	Barnett 1955:148	non-use	oral tradition	Picidae	woodpeckers were spirit guides associated with woodcarving.
Central Maritime	Coast Salish	Barnett 1955:148	non-use	oral tradition	Strigidae	Owls were spirit guides associated with clairvoyance and prophecy.
Central Maritime	Coast Salish	Barnett 1955:148	non-use	oral tradition	Strigidae	Owls were believed to be the reincarnated dead.
Central Maritime	Coast Salish	Barnett 1955:148	non-use	oral tradition	Corvidae	Ravens were spirit guides associated with dancing.
Central Maritime	Coast Salish	Barnett 1955:148	non-use	oral tradition	Charadriiformes	Water birds were spirit guides associated with dancing.
Central Maritime	Coast Salish	Barnett 1955:148	non-use	oral tradition	Accipitridae	Eagles were spirit guides associated with hunting.
Central Maritime	Coast Salish	Barnett 1955:150	non-use	oral tradition	Accipitridae	Anecdote of a Shaman instructing his clients that they'd find a dead body below his spirit, an eagle nesting in a tree.
Central Maritime	Coast Salish	Barnett 1955:95	use	procurement	Anatidae	Describes that ducks were hunted at night.
Central Maritime	Coast Salish	Barnett 1955:95-96	use	procurement	Anatidae	Describes that duck night hunting involved torches and blinds.
Central Maritime	Coast Salish	Curtis 1913	use	artifact	multiple	Describes cormorant feathers and eagle feathers being used for arrow fletching.
Central Maritime	Coast Salish	Haeberlin and Gunther 1930:26	use	procurement	Aves	Describes that slings were used to hunt birds. Describes them as 3 ft. long made of willow bark cord, with a łałemt with a hide pocket.

Culture Region	*Culture*	*Source*	*Major Class*	*Minor Class*	*Taxa*	*DESCRIPTION*
Central Maritime	Coast Salish	Barnett 1955:98	use	procurement	Charadriiformes	Describes the use of "slip-loop snares" for shorebirds.
Central Maritime	Coast Salish	Drucker 1963:51	use	procurement	Aves	Describes the use of spears with several hardwood points for bird hunting.
Central Maritime	Coast Salish	Barnett 1955:96	use	procurement	Anatidae	Describes the use of five pronged pointed spears for duck hunting.
Central Maritime	Coast Salish	Barnett 1955:99	use	procurement	Anatidae	Describes the use of five pronged pointed spears to capture ducks.
Central Maritime	Coast Salish	Barnett 1955:63	use	food	multiple	Lists owls, and ravens among animals not eaten.
Central Maritime	Coast Salish	Barnett 1955:128	use	food	multiple	Describes that expectant mothers did not eat duck or "shag" aka cormorant.
Central Maritime	Coast Salish	Haeberlin and Gunther 1930:21	use	food	multiple	Describes that several varieties of ducks and grouse, and pheasants (squlōb) were eaten by the Coast Salish of Puget Sound.
Central Maritime	Coast Salish	Haeberlin and Gunther 1930:25	use	procurement	Anatidae	Describes that ducks, mallards in particular, were hunted using 6 ft. wide hand nets in canoes.
Central Maritime	Coast Salish	Haeberlin and Gunther 1930:23	use	food	Anatidae	Describes that ducks were most often boiled in cedar baskets, and that they were occasionally spit roasted.
Central Maritime	Coast Salish	Haeberlin and Gunther 1930:25	use	procurement	Podicipedidae	Describes that "helldivers" which is another name for grebes, and were hunted using five pointed spears.
Central Maritime	Comox	Barnett 1955:90	use	artifact	Accipitridae	Describes the use of eagle down for ritual purposes.
Central Maritime	Comox	Barnett 1955:94	use	artifact	Accipitridae	Anecdote of a relative of informant George Mitchell. In a dream, a wolf spirit guide told George Mitchell's relative to put eagle down on his head for special hunting power.
Central Maritime	Comox and Pentlatch	Barnett 1955:70	non-use	oral tradition	Anatidae	Depicts a wooden bark frayer (fig. 15) carved as the form of a duck.
Central Maritime	Cowichan	Barnett 1955:162	use	artifact	Accipitridae	Describes the use of four eagle feathers as part of the dance regalia of the "washing" dance.
Central Maritime	Cowichan	Barnett 1955:162	non-use	oral tradition	Strigidae	Anecdote about how Edward Paul's spirit helper, an owl, caused a man to misfire
Central Maritime	Cowichan	Barnett 1955:160	non-use	oral tradition	Anatidae	Describes skaiyep, the bleeding mouth spirit, as a kind of duck.
Central Maritime	Cowichan	Barnett 1955:103	use	procurement	Aves	Describes a mist net on the Chemanius River on Vancouver Island.
Central Maritime	Cowichan	Barnett 1955:160	non-use	oral tradition	Picidae	Describes tsiq!t, a species of woodpecker, as a spirit who gave power to doctors that "massaged rather than sucked."
Central Maritime	Duwamish	Ott 2014	use	procurement	Anatidae	Describes the location of a raised duck net Tquap used by the Duwamish on the former shoreline in the area near Belltown.
General Pacific Northwest	General Pacific Northwest	Underhill 1944:71	use	food	multiple	Lists 44 species of waterfowl used as food, 7 species of land birds used for their feathers, and 3 species of bird used for magic.
General Pacific Northwest	General Pacific Northwest	Drucker 1963:51	use	procurement	Aves	Describes the use of "small throwing nets mounted on pole frames that could be used from canoes on black stormy nights."
Northern Maritime	Haida	Gilbert et al. 1996:4	use	food	multiple	Describes of the "killing and eating of the crest animals."

Culture Region	*Culture*	*Source*	*Major Class*	*Minor Class*	*Taxa*	*DESCRIPTION*
Northern Maritime	Haida	Drucker 1963:92	non-use	oral tradition	multiple	Describes the tattooing of crest animals onto young persons during the Potlatch.
Central Maritime	Homalco	Barnett 1955:169	use	artifact	Accipitridae	Describes a girls coming of age headdress, which includes upright eagle feathers and eagle down.
Central Maritime	Homalco	Barnett 1955:170	use	artifact	Accipitridae	Describes the use of eagle feathers and eagle down as part of the tal masks.
Central Maritime	Homalco	Barnett 1955:176	non-use	oral tradition	Corvidae	Describes Raven as a clairvoyant spirit. People with raven as a spirit guide could speak to Raven.
Central Maritime	Homalco	Barnett 1955:167	use	artifact	Aves	Describes that pubescent boys were required to use a drinking tube. This artifact may have been a hollow bird bone.
Central Maritime	Homalco	Barnett 1955:168	use	food	eggs	Describes that pubescent boys and girls refrained from consuming seagull eggs.
Central Maritime	Klahuse	Barnett 1955:168	non-use	oral tradition	mythical	Anecdote about rubbing the sparks of a thunderbird to provide power to a bow and arrow. The sparks are referred to as the "claws of a bird's wings". Its unclear what this means.
Central Maritime	Klahuse	Barnett 1955:105	use	artifact	Accipitridae	Describes the use of eagle down in the preparation of a young hunters first kill.
Central Maritime	Klahuse	Barnett 1955:105	use	procurement	Aves	Describes that a young hunter did not eat his first several kills (3--5), "lest he get no more".
Central Maritime	Klallam	Gunther 1927:205	use	food	multiple	Describes that some totem birds such as gulls and eagles were eaten, however ravens and crows were not.
Central Maritime	Klallam	Gunther 1927:223	use	artifact	Anatidae	Water tight basketry was done with a duck wing bone awl in Klallam language, s'tsõ'm
Central Maritime	Kwakuitl	Drucker 1963:51	use	procurement	Anatidae	Describes the use of underwater gorget traps for capturing ducks.
Central Maritime	Lummi	Stern 1934:65	use	artifact	Accipitridae	Describes the use of eagle feathers in the regalia of the "fluttering dance". Describes them being attached to clubs and tunics.
Central Maritime	Lummi	Stern 1934:16	non-use	oral tradition	Aves	Describes traditional wisdom wherein children were warned not to harm young birds, lest their children meet the same fate.
Central Maritime	Lummi	Stern 1934:19	non-use	oral tradition	Anatidae	Describes the spirit Sinetlqi occasionally taking the form of a mallard duck.
Central Maritime	Lummi	Stern 1934:22	non-use	oral tradition	mythical	Describes the thunderbird spirit.
Central Maritime	Lummi	Stern 1943:66	non-use	oral tradition	Passeriformes	Describes "lizards or colored birds", possibly passerines, as the slaves of Sinetlqi.
Central Maritime	Lummi	Stern 1934:22	non-use	oral tradition	Anatidae	Describes individual's encounters with the spirit xhaltup.
Central Maritime	Lummi	Stern 1934:68	use	artifact	Anatidae	Describes the use of a swan's wing bone as a drinking straw.
Central Maritime	Lummi	Stern 1935:18	use	artifact	Accipitridae	Describes the use of a white tipped eagle feather to swab a young mans throat to give him a strong voice.
Central Maritime	Lummi	Stern 1935:14	use	food	Anatidae	Describes a cocktail of herbs, saltwater, and goose and swan fat, used to aid child labor.
Central Maritime	Lummi	Stern 1934:23	use	procurement	Anatidae	Describes duck hunting as a specialized skill a young man may have acquired during coming of age training.
Central Maritime	Lummi	Stern 1934:13	use	food	Laridae	Describes how Lummi women would abstain from seagull and crane meat for fear of producing a whiny baby.

Culture Region	*Culture*	*Source*	*Major Class*	*Minor Class*	*Taxa*	*DESCRIPTION*
Central Maritime	Lummi	Stern 1934:17	use	food	Aves	Describes how young men were instructed to abstain from eating bird gizzards that was believed to be associated with weakness.
Central Maritime	Lummi	Stern 1934:24	use	procurement	Anatidae	Describes duck hunting as one of several activities conducted following breakfast.
Southern Maritime and Riverine	Maidu	Howard 1929:372	use	procurement	Anatidae	Describes the use of nets and decoys for duck hunting.
Southern Maritime and Riverine	Maidu	Howard 1929:372	use	procurement	multiple	Describes the use of nets for hunting geese pigeons and crows.
Central Maritime	Makah	Wickersham 1896:22	use	artifact	Anatidae	Describes weaving long strands of duck down into the warp of blankets.
Central Maritime	Maswiam	Barnett 1955:177	use	artifact	Aves	Describes the use of a drinking tube, possibly bird long bone, during a girl's seclusion ritual.
Central Maritime	Nanaimo	Barnett 1955:98	use	procurement	Accipitridae	Describes baiting eagles with dead salmon at the end of salmon spawning season.
Central Maritime	Nanaimo	Barnett 1955:161	non-use	oral tradition	Anatidae	Anecdote about how Albert Westley's father became a doctor in which ducks are a major character. Westley's father dies while trying to save a frog as he seeks a spirit guide. The ducks find his body in the water and bring him to shore, the ducks wash him, cleaned him, and put a mark on his tongue, and he was revived soon after.
Central Maritime	Nanaimo	Barnett 1955:163	non-use	oral tradition	Strigidae	Describes a swaihwe mask that was owned by Westly known as "little owl". This mask burned in a fire.
Central Maritime	Nanaimo	Barnett 1955:145	use	artifact	mythical	Objects believed to be thunderbird feathers were observed as symbols of power.
Central Maritime	Nanaimo	Barnett 1955:98	use	procurement	Accipitridae	Describes catching eagles with a "foot-hook".
Central Maritime	Pentlatch	Barnett 1955:164	use	artifact	Aves	Describes that pubescent boys , qokpakam, were required to use a drinking tube. This artifact may have been a hollow bird bone.
Central Maritime	Sanetch	Barnett 1955:156	non-use	oral tradition	mythical	Describes "tcaptcap" a mythical red breasted whistling bird also believed in by the Cowichan and Nanaimo.
Central Maritime	Sanetch	Barnett 1955:72	use	artifact	Anatidae	Describes the use of the skins of geese, and other birds to make cloaks.
Central Maritime	Sanetch	Barnett 1955:119	use	artifact	Anatidae	The stamahwaL blanket was made of dog wool mixed with duck down "or the pappus of the cattail or fireweed […]"
Central Maritime	Sanetch	Barnett 1955:153	non-use	oral tradition	Anatidae	Describes "tcaptcap a red breasted whistling bird of doubtful existence" also believed in by the Cowichan and Nanaimo.
Central Maritime	Sanetch	Barnett 1955:158	non-use	oral tradition	multiple	Describes five swihwe masks including saw bill duck (merganser), raven, owl, beaver, and spring salmon.
Central Maritime	Sanetch	Barnett 1955:158	non-use	oral tradition	multiple	Describes the dance steps of the swihwe dancers slow steps for the raven and beaver, fast steps for the saw bill and salmon.
Central Maritime	Sanetch	Barnett 1955:138	use	food	Anatidae	Describes a ritual meal associated with the birth of a child. It consisted of "four small bites of seal codfish, clam, duck and devilfish."
Central Maritime	Sanetch	Barnett 1955:156	use	oral tradition	Aves	Describes a shamanistic trick employed during an initiation ritual that involved piercing a stone with feathers.
Central Maritime	Sanetch	Barnett 1955:152	use	food	Anatidae	Describes a taboo against codfish, clams, seals, ducks, and devilfish observed by pubescent boys during initiation.

Culture Region	*Culture*	*Source*	*Major Class*	*Minor Class*	*Taxa*	*DESCRIPTION*
Central Maritime	Sanetch	Barnett 1955:150	use	food	Anatidae	Describes a taboo against codfish, clams, seals, ducks, and devilfish observed by pubescent boys during initiation.
Central Maritime	Snohomish	Haeberlin and Gunther 1930:25-26	use	procurement	raised net	Describes that the Snohomish would use raised nets in lone standing trees "tu'kub" to capture ducks. Also mentions that one was located near "Snuqalmie Jim's House near Mission Beach".
Central Maritime	Snohomish	Culin 1907:156	use	artifact	Aves	Bone dice game counters.
Northern Maritime	Tlingit	Petruzelli and Hanson 1998:5	use	artifact	Aves	Describes of the use of articulated wings as whiskbrooms.
Southern Maritime and Riverine	Tolowa	Suttles 1987:49	use	artifact	Picidae	Describes woodpecker scalps as a form of currency in southern Tolowa area of northern California.
Southern Maritime and Riverine	Tolowa	Gould 1966:85	use	procurement	Phalacrocoracidae	Describes historic-era collection of juvenile cormorants as easy prey.
General Comparative	Wampanoag (?)	Wood 1634:33	use	procurement	Phalacrocoracidae	Description of catching cormorants by hand.
Southern Maritime and Riverine	Wintun	Howard 1929:372	use	procurement	Anatidae	Describes the use of nets and decoys for duck hunting.
General Comparative	Yokuts	Howard 1929:372	use	procurement	Anatidae	Describes the use of nets and decoys for duck hunting.
General Comparative	Yokuts	Howard 1929:372	use	procurement	multiple	Describes the use of "a series of nooses to capture pigeons and eagles.

Appendix C: Analytical Unit List

ANALYTICAL UNIT	*CONTEXTS*	*DESCRIPTION*
I	2, 4, 6, 8, 10, 11, 13, 15, 17, 19, 21, 23, 25, 27, 29, 31, 33, 35, 37, 39, 41, 43, 45, 47, 49, 51, 53, 55, 57, 59, 61, 63, 65, 67, 69, 71, 73, 75, 77, 79, 81, 83, 87, 89, 91, 93, 95, 98	Materials assigned to the early period. These materials were typically recovered from silty sediment beneath the deposits of dense shell-midden material. Interpreted as a component contributing to the Locarno Beach typological phase.
II	1, 3, 5, 7, 9, 12, 14, 16, 18, 20, 22, 24, 26, 28, 30, 32, 34, 36, 38, 40, 42, 44, 46, 48, 50, 52, 54, 56, 58, 60, 62, 64, 66, 68, 70, 72, 74, 76, 78, 80, 82, 84, 85, 86, 88, 90, 92, 94, 96, 97, 99, 100, 101	Materials assigned to the later period. These materials were typically recovered from dense shell-midden material. Interpreted as a component contributing to the Marpole typological phase.

Appendix D: Context List

Context	*AU*	*Cut*	*Depth*	*Description*	*Assigned by*
1	II	S1E1	0-80	Deposits present from ground surface to 80 cm below reference line. Context 1 was assigned to AUII due to the radiocarbon age estimation that was younger than Dubeau's (2012) decision criteria. It overlays Context 2.	Dubeau 2012
2	I	S1E1	80-120+	Deposits present from 80 cm below reference line to the base of the excavation. This context was assigned to AUI because it includes deposits beneath Context 1, which according the principle of superposition, and is therefore older. It underlays Context 1.	Sholin: This Document
3	II	S2W6	0-40	Deposits present from ground surface to 40 cm below ground surface. Forty cm below ground surface roughly corresponds to the interface between an upper layer of dense shell, and a lower layer of dark brown soil with gravel. It overlays Context 4.	Dubeau 2012
4	I	S2W6	40-80+	Deposits present from 40 cm to the base of the excavation. It underlays Context 3.	Dubeau 2012
5	II	S2W7	0-40	Deposits present from ground surface to 40 cm below ground surface. Forty cm below ground surface roughly corresponds to the interface between an upper layer of dense shell, and a lower layer of dark brown soil with gravel. It overlays Context 6.	Sholin: This Document
6	I	S2W7	40-60+	Deposits present from 40 cm to the base of the excavation. It underlays Context 5.	Sholin: This Document
7	II	S4E1	0-40	Deposits from ground surface to 40 cm below reference line. This Context roughly corresponds to the deposit of dense shell and everything on top of it. It was assigned to AU 2 because it is in superposition to Context 8, and is necessarily younger.	Sholin: This Document
8	I	S4E1	40-100+	Deposits from 40 cm below reference line to the base of the excavation. It corresponds to deposits of "light humus", and "till". This context was assigned to AUI due to the radiocarbon age estimation that is older than Dubeau's (2012) decision criteria. It is beneath Context 7.	Dubeau 2012
9	II	S3E1	0-60	Deposits from ground surface to 60 cm below reference line. This Context roughly corresponds to the deposit of dense shell and everything on top of it. It was assigned to AUII because it is in superposition to Context 10, and is necessarily younger.	Dubeau 2012
10	I	S3E1	60-120+	Deposits from 40 cm below reference line to the base of the excavation. It corresponds to deposits of "light humus", and "till". This context was assigned to AUI due to the radiocarbon age estimation from S4E1 that is older than Dubeau's (2012) decision criteria. It is beneath Context 9.	Dubeau 2012
11	I	N4W7	0-90+	Deposits from ground surface to 90 cm below reference line, the base of the excavation. It was assigned to AUI for continuity with Dubeau 2012.	Dubeau 2012
12	II	N4W9	0-40	Deposits from ground surface to 40 cm below ground surface. This roughly corresponds to the level of Feature 25-69. Grabert's (1988: 57) description of this feature suggests that the dense shell midden deposits end at the depth of Feature 25-69. It overlays Context 13.	Sholin: This Document
13	I	N4W9	40-120+	Deposits from 40 cm to the base of the excavation. This Context was assigned to AUI because it is beneath Context 12.	Sholin: This Document
14	II	S3W7	0-52	Deposits from found surface to approximately 52 cm below ground surface. This corresponds to Layers I, II, and III. It was assigned to AUII for continuity with Dubeau (2012). This means that the floor of the West Structure is also assigned to AUII. It is above Context 15.	Dubeau 2012
15	I	S3W7	52-95+	Deposits beneath Layer III, from approximately 52 cm below ground surface to the base of the excavation. It is beneath Context 14.	Sholin: This Document
16	II	S1W8	0-45	Deposits present from ground surface to the base of the dense shell deposit, approximately 45 cm below reference line. It is above Context 17.	Sholin: This Document
17	I	S1W8	45-80+	Deposits beneath the dense shell layer "undisturbed earth layer" to the base of the excavation. It is beneath Context 16.	Sholin: This Document
18	II	S2W9	0-60	Deposits present from ground surface to approximate base of dense shell. It is above Context 19.	Dubeau 2012
19	I	S2W9	60-80+	Deposits beneath dense shell, present to the base of the excavation. It is beneath Context 18.	Dubeau 2012
20	II	S5E6	0-40	Deposit present from ground surface to the base of shell approximately 40 cm below reference line. It is above Context 21.	Sholin: This Document

Context	*AU*	*Cut*	*Depth*	*Description*	*Assigned by*
21	I	S5E6	40-100+	Deposits beneath the dense shell deposit to the base of the excavation. It is beneath Context 20.	Sholin: This Document
22	II	S6E2	0-80	Deposits from ground surface to the base of the dense shell. Includes "turf", "shell", and "ash". It is above Context 23.	Sholin: This Document
23	I	S6E2	80-120+	Deposits beneath the dense shell to the base of the excavation. Includes "pebble humus", and "till". It is beneath Context 22.	Sholin: This Document
24	II	S5E2	+ 2-60	Deposits from ground surface to the base of the dense shell. Includes "turf", "shell", and "ash". It is above Context 25.	Sholin: This Document
25	I	S5E2	60-120	Deposits beneath the dense shell to the base of the excavation. Includes "pebble humus", and "till". It is beneath Context 24.	Sholin: This Document
26	II	S2W10	0-60	Deposits present from ground surface to 60 cm below reference line. It consists of spoil material from the 1969 excavation, a layer of pebbly soil, and a lens of shell. It overlays Context 27.	Dubeau 2012
27	I	S2W10	60-82+	Deposits present from 60 cm below reference line to the base of the excavation. It consists of black pebbly soil. It underlays Context 26.	Dubeau 2012
28	II	S1W10	0-80	Deposits present from ground surface to 80 cm below reference line. It consists of "dark soil medium shell medium to large pebbles". It was assigned to AUII because a radiocarbon age estimation from this context was younger than Dubeau's (2012) decision criteria. It overlays Context 29.	Palmer 2015
29	I	S1W10	80-120+	Deposits beneath 80 cm below ground surface to the base of the excavation. It consists of "dark gray soil [sparse] shell small pea gravel", and "lite brown 'clay like' soil some gravel no shell". It was assigned to AUI because the a radiocarbon age estimation from this context returned a date beneath Dubeau's (2012) decision criteria.	Palmer 2015
30	II	S1W4	0-55	Deposits present from ground surface to 40 cm below reference line. This context included features 1-70, and 5-70. Grabert (1988: 67) describes that the ground surface of this context had been recently truncated by a bulldozer scrape. It is above Context 3.	Dubeau 2012
31	I	S1W4	55-120+	Deposits beneath 55cm below ground surface present to the base of the excavation. It is beneath Context 30.	Dubeau 2012
32	II	S2W4	0-60	Deposits present from ground surface to 60 cm below reference line. It includes feature 2-70. This context overlays Context 33.	Dubeau 2012
33	I	S2W4	60-80+	Deposits present from 60 cm below reference line to the base of the excavation. It underlays Context 32.	Sholin: This Document
34	II	S3W4	0-80	Deposits from ground surface to 80 cm below the reference line. It includes feature 12-70 (Grabert 1988:67). Dubeau (2012) assigned this context to AUI due to a radiocarbon age estimation that is younger than his decision criteria. It is above Context 35.	Dubeau 2012
35	I	S3W4	80-90+	Deposits from 80 cm below reference line to the base of the excavation. It is beneath Context 34.	Sholin: This Document
36	II	S4W4	0-70	Deposits from ground surface to 70 cm below the reference line. This depth was chosen for continuity with the assignments made for S3W4. It contains feature 8-70 (Grabert 1988:68).	Sholin: This Document
37	I	S4W4	70-135+	Deposits from 70 cm below reference line to the base of the excavation. It was assigned to AUI because it is beneath Context	Sholin: This Document
38	II	S6E11	0-60	Deposits of dense shell from ground surface to approximately 60 cm below the reference line. It is above Context 39.	Sholin: This Document
39	I	S6E11	60-85+	Deposits of brown dirt and pebbles from approximately 60 cm below the reference line to the base of the excavation.	Sholin: This Document
40	II	S9E19	0-80	Deposits of shell, sandy soil and gravel, present from ground surface to 75 cm below the reference line. It overlays Context 41.	Palmer 2015
41	I	S9E19	80-120+	Deposits of dark soil and gravel from approximately 75 cm below the reference line to the base of the excavation.	Sholin: This Document
42	II	S12E19	0-70	Deposits of dense shell, brown silt and pebbles from ground surface to the base of the dense shell, approximately 70 cm below ground surface. It is above Context 43.	Todd 2012

Context	*AU*	*Cut*	*Depth*	*Description*	*Assigned by*
43	I	S12E19	70-140+	Deposits of "dark clay", and "coarse yellowish" sand beneath context 42 and present to the base of the excavation.	Sholin: This Document
44	II	S7E9	0-80	Deposit of "Midden" and "Weathered Midden" present from ground surface to approximately 80 cm below reference line.	Dubeau 2012
45	I	S7E9	80-160+	Deposits of Clay and pebbles beneath Context 44 and present to the base of the excavation.	Dubeau 2012
46	II	S10E13	0-80	Deposits of dense shell present from ground surface to approximately 90 cm below ground surface. It is above Context 47.	Palmer 2015
47	I	S10E13	80-160+	Deposits beneath the dense shell and present to the base of the excavation. It underlays Context 46.	Palmer 2015
48	II	S15E15	0-60	Deposits from ground surface to approximately 60 cm below ground surface. The approximate depth of the termination of the dense shell deposits. It is above Context 49.	Sholin: This Document
49	I	S15E15	60-110+	Deposits beneath the dense shell and present to the base of the excavation. It is beneath Context 48.	Sholin: This Document
50	II	S21E24	0-80	Deposits from ground surface to the base of dense shell midden. It is above Context 50.	Sholin: This Document
51	I	S21E24	80-215+	Deposits beneath the dense shell midden and present to the base of the excavation. They include layers of "banded gravel and midden", "pebbles and cobbles", an "A-horizon", and sand. It is beneath Context 51.	Sholin: This Document
52	II	S24E27	0-160	Deposits from ground surface to approximately 140 cm below "datum line". It was assigned to AUII due to the radiocarbon date that returned an age estimate younger than Dubeau's (2012) decision criteria. It is above Context 53.	Palmer 2015
53	I	S24E27	160-200+	Deposits from approximately 140 cm below ground surface to the base of the excavation.	Sholin: This Document
54	II	S22E27	0-100	Deposits of shell midden material from ground surface to approximately 100 cm below datum. It was assigned to AII due to a radiocarbon date from the 60-80 level that was younger than Dubeau's (2012) decision criteria. It is above Context 55.	Palmer 2015
55	I	S22E27	100-200+	Deposits beneath the dense shell midden material from approximately 100 cm to the base of the excavation. It is beneath Context 54.	Sholin: This Document
56	II	S23E27	0-130	Deposits of shell midden material from ground surface to approximately 130 cm below datum. It is above Context 57.	Sholin: This Document
57	I	S23E27	130-205+	Deposits beneath the shell midden from approximately 130 c below datum to the base of the excavation. It is beneath Context 56.	Sholin: This Document
58	II	S16E17	0-40	Deposits from ground surface to 40 cm below reference line. This context represents surficial deposits. It was assigned to AUII because it is in superposition to Context 59.	Todd 2012
59	I	S16E17	40-140+	Deposits from approximately 40 cm below ground surface to the base of the excavation. This Context was assigned to AUI because a radiocarbon date from the 40-60 level returned an age estimation older than Dubeau's (2012) decision criteria.	Palmer 2015
60	II	S16E18	0-40	Deposits from ground surface to 40 cm below reference line. It was assigned for continuity with the strata in Cut S16E17. This context represents surficial deposits. It was assigned to AUII because it is in superposition to Context 61.	Sholin: This Document
61	I	S16E18	40-181+	Deposits from approximately 40 cm below reference line to the base of the excavation. This depth range was assigned for continuity with Context 59.	Todd 2012
62	II	S21E29	0-100	Stratified deposits of dense shell midden from ground surface to approximately 100 cm below reference line. It was assigned to AUII because two radiocarbon dates are well below Dubeau's (2012) decision criteria. It is above Context 63.	Palmer 2015
63	I	S21E29	100-180+	Deposits of dark clay beneath the midden material present from approximately 100 cm below reference line to the base of the excavation. It is beneath Context 62.	Sholin: This Document
64	II	S24E29	0-80	Deposits of dense shell present from ground surface to approximately 80 cm below ground surface. This context was assigned to AUII because a radiocarbon age estimation on ocean spray wood charcoal returned a date that was younger than Dubeau's (2012) decision criteria.	Palmer 2015
65	I	S24E29	80-130+	Deposits of dark clay beneath the dense shell present from approximately 80 cm below ground surface to the base of the excavation. It is beneath Context 64.	Sholin: This Document
66	II	S20E29	0-90	Stratified deposits of dense shell midden from ground surface to approximately 90cm below ground surface. It was assigned to AUII for continuity with Context 62. It is above Context 67.	Sholin: This Document

Context	*AU*	*Cut*	*Depth*	*Description*	*Assigned by*
67	I	S20E29	90-120+	Deposits of dark clay beneath the dense shell present from approximately 90 cm below ground surface to the base of the excavation. It is beneath Context 66.	Sholin: This Document
68	II	S22E29	0-80	Stratified deposits of dense shell midden from ground surface to approximately 80 cm below ground surface. It was assigned to AUII for continuity with Context 62. It is above Context 69.	Sholin: This Document
69	I	S22E29	80-120+	Deposits of dark clay beneath the dense shell present from approximately 90 cm below ground surface to the base of the excavation. It is beneath Context 68.	Sholin: This Document
70	II	S23E29	0-100	Stratified deposits of dense shell midden from ground surface to approximately 100 cm below reference line. It is above Context 71.	Sholin: This Document
71	I	S23E29	100-120+	Depostits of dark clay beneath the dense shell present to the base of the excavation. It is beneath Context 70.	Sholin: This Document
72	II	S12E9	0-40	Deposits of dense shell present form ground surface to approximately 40 cm below reference line. It is above Context 73.	Sholin: This Document
73	I	S12E9	40-87+	Deposits of pebbles and sand beneath the dense shell, from approximately 40 cm below reference line to the base of the excavation.	Sholin: This Document
74	II	S11E5	0-40	Deposits from ground surface to 40 cm. This Context was assigned to AUII because it is in superposition to Context 75.	Sholin: This Document
75	I	S11E5	40-80+	Deposits from approximately 40 cm to the base of the excavation. It is beneath Context 75.	Palmer 2015
76	II	S3W6	0-25	Deposits from ground surface to 25 cm. This context was assigned to AUII because it is in superposition to Context 77.	Sholin: This Document
77	I	S3W6	25-62+	Deposits from approximately 25 cm to the base of the excavation. It was assigned to AUI for continuity with Dubeau's (2012) assignment.	Dubeau 2012
78	II	S5E1	0-40	Deposits from ground surface to approximately 40 cm. It was assigned to Analytic Unit 2 for continuity with Dubeau's assignment. It is above Context 79.	Dubeau 2012
79	I	S5E1	40-120+	Depots from approximately 40 cm to the base of the excavation. It was assigned to AUI because it is beneath Context 78.	Sholin: This Document
80	II	S5W4	0-80	Deposits from ground surface to approximately 80 cm below ground surface. This context was assigned to AUII for continuity with Dubeau's (2012) assignment. It is above Context 81.	Dubeau 2012
81	I	S5W4	80-100+	Deposits from approximately 80 cm below ground surface to the base of the excavation. It is beneath Context 80.	Sholin: This Document
82	II	S1W9	0-60	Deposits of dense shell from ground surface to approximately 60 cm below ground surface. It is above Context 83.	Sholin: This Document
83	I	S1W9	60-80+	Deposits of "undisturbed earth" beneath the dense shell. It is beneath Context 82.	Sholin: This Document
84	II	S7E2	0-110+	Deposits present from ground surface to the base of the excavation. The profile illustration shows a single uniform deposit.	Sholin: This Document
85	II	S1E6	0-42.5+	Deposits from ground surface to the base of the excavation.	Sholin: This Document
86	II	N3W4	0-40	Deposits from ground surface to approximately 40 cm. It is above Context 87.	Sholin: This Document
87	I	N3W4	40-91+	Deposits from approximately 40 cm to the base of the excavation. It is beneath Context 86.	Dubeau 2012
88	II	S6E4	0-90	Dense shell deposits from ground surface to approximately 90 cm below reference line. It is above Context 89.	Sholin: This Document
89	I	S6E4	90-120+	Deposits of gravel and "dark moist soil" from approximately 90 cm below reference lie to the base of the excavation. It is beneath Context 88.	Sholin: This Document
90	II	S9E4	0-40	Deposits of sandy soil, crushed shell and pebbles from ground surface to approximately 40 cm below ground surface. Context 90 is above Context 91.	Palmer 2015

Context	*AU*	*Cut*	*Depth*	*Description*	*Assigned by*
91	I	S9E4	40-85+	Deposits of sandy soil from approximately 40 cm below ground surface to the base of the excavation. Context 91 is below Context 90.	Sholin: This Document
92	II	S7E8	0-60	Deposits of dense shell from ground surface to approximately 60 cm below ground surface. It is above Context 93.	Dubeau 2012
93	I	S7E8	60-175+	Deposits of dark clay and coarse brown sand from approximately 60 cm to the base of the excavation. It is beneath Context 91.	Dubeau 2012
94	II	S8E8	0-100	Deposits of dense shell from ground surface to approximately 100 cm below reference line. It is above Context 95.	Dubeau 2012
95	I	S8E8	100-120	Deposits of pebbles and scattered cobbles from approximately 100 cm below reference line to the base of the excavation. It is beneath Context 94.	Sholin: This Document
96	II	S7E6	0-80+	Deposits of dense shell from ground surface to the base of the excavation approximately 80 cm below reference line.	Sholin: This Document
97	II	S8E9	0-80	Deposits of dense shell from ground surface to approximately 80 cm below ground surface. This context is above Context 98.	Dubeau 2012
98	I	S8E9	80-150+	Deposits of "dark clayish soil loam and pebbles" from approximately 80 cm below ground surface to the base of the excavation.	Dubeau 2012
99	II	S5E4	0-60+	Deposits of dense shell from ground surface to the base of the excavation.	Sholin: This Document
100	II	S5E5	0-25+	Deposits of dense shell from ground surface to approximately 25 cm below ground surface, the base od the excavation.	Sholin: This Document
101	II	S8E15	0-70+	Deposits of dense shell from ground surface to approximately 70 cm below reference line, the base of the excavation.	Sholin: This Document

Appendix E: Bag List

Bag #	*AU*	*Cut*	*Context*	*Depth*	*Level*	*Subunit*	*Element*	*Count*
0001	II	S1W8	16	20-40	not recorded	A-I	humerus	1
0002	II	S6E4	88	60-80	not recorded	not recorded	humerus	3
0003	II	S3E1	9	20-40	not recorded	A-I	humerus	1
0004	II	S5E5	100	0-20	not recorded	not recorded	humerus	2
0005	II	S1W10	28	40-60	not recorded	not recorded	humerus	1
0006	II	S21E29	62	40-60	not recorded	not recorded	humerus	1
0007	II	S5E5	100	00-00	not recorded	not recorded	humerus	1
0008	II	S1W9	82	40-60	not recorded	not recorded	humerus	1
0009	I	S8E9	98	100-120	not recorded	not recorded	humerus	1
0067	II	S24E27	52	100-120	not recorded	not recorded	carpometacarpus	3
0011	II	S4E1	7	20-40	not recorded	A-I	humerus	4
0012	I	S16E18	61	60-80	not recorded	A-I	humerus	15
0013	I	S16E18	61	80-100	not recorded	not recorded	humerus	3
0014	II	S10E13	46	60-80	not recorded	not recorded	humerus	4
0015	II	S4E1	7	20-40	not recorded	not recorded	tibiotarsus	2
0016	II	S2W10	26	40-60	not recorded	not recorded	humerus	2
0017	II	S23E29	70	80-100	not recorded	not recorded	humerus	1
0018	II	S22E27	54	20-40	not recorded	not recorded	humerus	1
0019	II	S21E29	62	60-80	not recorded	not recorded	humerus	1
0020	II	S21E29	62	20-40	not recorded	not recorded	humerus	1
0021	I	S4E1	8	60-80	not recorded	not recorded	humerus	1
0022	I	S8E9	98	80-100	not recorded	not recorded	humerus	1
0023	II	S2W7	5	20-40	not recorded	not recorded	humerus	2
0024	I	S5E1	79	40-60	not recorded	not recorded	humerus	1
0025	II	S7E9	44	60-80	not recorded	not recorded	humerus	1
0026	II	S5W4	80	20-40	not recorded	not recorded	humerus	1
0027	II	S8E9	97	60-80	not recorded	not recorded	humerus	1
0028	II	S2W9	18	40-60	3	not recorded	humerus	1
0029	II	S4W4	36	40-60	not recorded	not recorded	humerus	1
0030	I	S22E29	69	80-100	not recorded	not recorded	humerus	1
0031	II	S10E13	46	0-20	not recorded	not recorded	humerus	1
0032	I	S16E18	61	100-120	not recorded	not recorded	humerus	1
0033	II	S23E27	56	40-60	not recorded	not recorded	humerus	3
0293	II	S24E27	52	100-120	not recorded	not recorded	radius	1
0397	II	S24E27	52	100-120	not recorded	not recorded	carpometacarpus	1
0036	II	S1E6	85	0-20	not recorded	not recorded	humerus	2
0037	II	N4W9	12	20-40	not recorded	not recorded	carpometacarpus	3
0038	I	S6E2	23	80-100	not recorded	not recorded	carpometacarpus	2

Bag #	*AU*	*Cut*	*Context*	*Depth*	*Level*	*Subunit*	*Element*	*Count*
0039	II	S8E8	94	60-80	4	A, B, C	carpometacarpus	1
0040	I	S11E5	75	40-60	not recorded	not recorded	carpometacarpus	1
0041	I	S10E13	47	80-100	not recorded	not recorded	carpometacarpus	1
0042	II	S12E19	42	20-40	not recorded	not recorded	carpometacarpus	1
0043	II	S15E15	48	40-60	not recorded	not recorded	carpometacarpus	2
0044	II	S15E15	48	20-40	not recorded	not recorded	carpometacarpus	1
0045	I	S16E17	59	60-80	not recorded	not recorded	carpometacarpus	1
0046	II	S22E27	54	60-80	not recorded	not recorded	carpometacarpus	2
0047	II	S22E27	54	40-60	not recorded	not recorded	carpometacarpus	1
0048	II	S22E27	54	80-100	not recorded	not recorded	carpometacarpus	2
0049	II	S23E27	56	80-100	not recorded	not recorded	carpometacarpus	10
1077	II	S24E27	52	100-120	not recorded	not recorded	unidentifiable	2
0051	II	S16E18	60	20-40	not recorded	not recorded	carpometacarpus	4
0052	II	S16E18	60	20-40	not recorded	not recorded	wing phalanx	4
0053	II	S22E29	68	40-60	not recorded	not recorded	carpometacarpus	1
0054	II	S21E29	62	20-40	not recorded	not recorded	carpometacarpus	1
0055	II	S21E29	62	60-80	not recorded	not recorded	carpometacarpus	6
0056	II	S21E29	62	40-60	not recorded	not recorded	carpometacarpus	2
0057	II	S21E29	62	80-100	not recorded	not recorded	carpometacarpus	7
0058	II	S24E29	64	40-60	not recorded	not recorded	carpometacarpus	2
0059	II	S23E27	56	40-60	not recorded	not recorded	carpometacarpus	1
0060	II	S12E9	72	20-40	not recorded	not recorded	carpometacarpus	1
0061	II	S20E29	66	20-40	not recorded	not recorded	carpometacarpus	1
0509	II	S24E27	52	120-140	not recorded	not recorded	carpometacarpus	1
0063	II	S16E18	60	20-40	not recorded	not recorded	cuneiform	1
0066	II	S24E27	52	20-40	not recorded	not recorded	carpometacarpus	4
0065	II	S16E18	60	20-40	not recorded	not recorded	rib	1
0148	II	S24E27	52	20-40	not recorded	not recorded	ulna	3
0218	II	S24E27	52	20-40	not recorded	not recorded	tarsometatarsus	3
0068	II	S23E29	70	80-100	not recorded	not recorded	carpometacarpus	2
0069	II	S23E29	70	60-80	not recorded	not recorded	carpometacarpus	22
0070	II	S23E29	70	40-60	not recorded	not recorded	carpometacarpus	7
0071	II	S4E1	7	20-40	not recorded	not recorded	carpometacarpus	3
0072	I	S5E1	79	40-60	not recorded	not recorded	carpometacarpus	2
0073	II	S16E17	58	20-40	not recorded	not recorded	carpometacarpus	2
0074	I	S16E17	59	40-60	not recorded	not recorded	carpometacarpus	3
0075	I	S16E18	61	80-100	not recorded	not recorded	carpometacarpus	2
0076	II	S3W7	14	20-40	not recorded	not recorded	carpometacarpus	1
0077	II	S2W4	32	20-40	not recorded	not recorded	carpometacarpus	1
0078	II	S1W10	28	40-60	not recorded	not recorded	carpometacarpus	1

Bag #	*AU*	*Cut*	*Context*	*Depth*	*Level*	*Subunit*	*Element*	*Count*
0079	I	N4W7	11	30-50	not recorded	not recorded	carpometacarpus	1
0080	II	S1E1	1	20-40	not recorded	not recorded	carpometacarpus	1
0081	II	S6E2	22	60-80	not recorded	not recorded	carpometacarpus	1
0082	II	S7E9	44	0-20	not recorded	not recorded	carpometacarpus	2
0083	II	S8E9	97	20-40	not recorded	not recorded	carpometacarpus	2
0084	II	S8E15	101	0-30	not recorded	not recorded	carpometacarpus	1
0085	II	S9E19	40	20-40	not recorded	not recorded	carpometacarpus	1
0086	II	S22E29	68	60-80	not recorded	not recorded	carpometacarpus	16
0087	I	S22E29	69	80-100	not recorded	not recorded	carpometacarpus	20
0088	I	N4W7	11	30-50	not recorded	not recorded	ulna	1
0089	II	N4W9	12	20-40	not recorded	not recorded	wing phalanx	1
0090	II	S1W10	28	40-60	not recorded	not recorded	ulna	3
0091	II	S1E1	1	40-60	not recorded	not recorded	ulna	1
0092	II	S1E6	85	20-40	not recorded	not recorded	ulna	1
0093	II	S2W4	32	20-40	not recorded	not recorded	ulna	1
0094	II	S2W6	3	0-20	not recorded	not recorded	ulna	2
0095	II	S2W7	5	20-40	not recorded	not recorded	ulna	1
0096	II	S2W9	18	0-20	not recorded	not recorded	ulna	1
0097	II	S2W10	26	40-60	not recorded	not recorded	ulna	2
0098	II	S3E1	9	20-40	not recorded	A-I	ulna	3
0099	II	S3W4	34	40-60	not recorded	not recorded	ulna	1
0100	I	S3W6	77	25-40	not recorded	not recorded	ulna	2
0101	II	S4W4	36	0-40	not recorded	not recorded	ulna	1
0102	II	S4E1	7	20-40	not recorded	A-I	ulna	4
0103	II	S5E2	24	20-40	not recorded	not recorded	ulna	1
0104	I	S5E1	79	40-60	not recorded	D, E, F	ulna	2
0105	II	S6E4	88	60-80	not recorded	not recorded	ulna	3
0106	II	S7E6	96	40-60	not recorded	not recorded	ulna	3
0107	II	S7E2	84	60-80	not recorded	not recorded	ulna	1
0108	II	S11E5	74	20-40	not recorded	not recorded	ulna	1
0109	II	S5E5	100	0-20	not recorded	not recorded	ulna	4
0110	II	S5E6	20	0-20	not recorded	not recorded	ulna	1
0111	I	S5E6	21	40-60	not recorded	not recorded	ulna	2
0112	II	S6E2	22	60-80	not recorded	not recorded	ulna	3
0113	I	S6E2	23	80-100	not recorded	not recorded	ulna	1
0114	II	S6E2	22	40-60	not recorded	A-I	ulna	1
0115	II	S1E6	85	0-20	not recorded	not recorded	ulna	1
0116	II	S7E9	44	60-80	not recorded	not recorded	ulna	1
0117	II	S8E8	94	30-40	2	not recorded	ulna	1
0118	II	S10E13	46	0-20	not recorded	not recorded	carpometacarpus	1

Bag #	*AU*	*Cut*	*Context*	*Depth*	*Level*	*Subunit*	*Element*	*Count*
0119	II	S8E8	94	40-60	3	not recorded	ulna	2
0120	II	S8E15	101	0-20	not recorded	not recorded	ulna	2
0121	II	S8E15	101	30-50	not recorded	not recorded	ulna	2
0122	II	S7E8	90	20-bottom of shell	not recorded	not recorded	ulna	1
0123	II	S9E19	40	20-40	not recorded	not recorded	ulna	2
0124	II	S9E19	40	40-60	not recorded	not recorded	ulna	1
0125	II	S15E15	48	40-60	not recorded	not recorded	ulna	1
0126	I	S16E18	61	60-80	not recorded	not recorded	scapula	1
0127	I	S16E17	59	40-60	not recorded	not recorded	ulna	1
0128	I	S16E17	59	60-80	not recorded	not recorded	ulna	2
0129	I	S16E18	61	40-60	not recorded	not recorded	ulna	1
0130	I	S16E18	61	60-80	not recorded	not recorded	ulna	9
0131	I	S16E18	61	80-100	not recorded	not recorded	ulna	2
0132	II	S20E29	66	20-40	not recorded	not recorded	ulna	2
0133	II	S20E29	66	40-60	not recorded	not recorded	ulna	1
0134	II	S21E24	50	20-40	not recorded	not recorded	ulna	2
0135	II	S21E24	50	40-60	not recorded	not recorded	ulna	1
0136	I	S21E24	51	80-100	not recorded	not recorded	ulna	1
0137	II	S21E29	62	20-40	not recorded	not recorded	ulna	1
0138	II	S21E29	62	40-60	not recorded	not recorded	ulna	2
0139	II	S22E27	54	20-40	not recorded	not recorded	ulna	1
0140	II	S22E27	54	40-60	not recorded	not recorded	ulna	1
0141	II	S22E27	54	80-100	not recorded	not recorded	ulna	1
0142	II	S22E29	68	20-40	not recorded	not recorded	ulna	1
0143	II	S22E29	68	60-80	not recorded	not recorded	ulna	1
0144	II	S23E27	56	0-20	not recorded	not recorded	ulna	2
0145	II	S23E27	56	40-60	not recorded	not recorded	ulna	2
0146	II	S23E27	56	120-120	not recorded	F1	ulna	1
0147	II	S23E29	70	80-100	not recorded	not recorded	ulna	1
0288	II	S24E27	52	20-40	not recorded	not recorded	radius	1
0535	II	S24E27	52	20-40	not recorded	not recorded	humerus	1
0543	II	S24E27	52	20-40	not recorded	not recorded	sternum	1
1046	II	S24E27	52	20-40	not recorded	not recorded	unidentifiable	7
0152	II	S24E29	64	20-40	not recorded	not recorded	ulna	3
0153	II	S24E29	64	40-60	not recorded	not recorded	ulna	2
0154	II	S23E27	56	120-120	not recorded	F1	femur	1
0155	II	S6E4	88	60-40	not recorded	not recorded	femur	1
0156	II	S5E4	99	00-00	not recorded	not recorded	femur	2
0157	II	S10E13	46	60-80	not recorded	not recorded	femur	2
0158	II	S7E8	90	20-bottom of shell	not recorded	not recorded	femur	1

Bag #	*AU*	*Cut*	*Context*	*Depth*	*Level*	*Subunit*	*Element*	*Count*
0159	II	S22E27	54	80-100	not recorded	not recorded	femur	1
0160	I	S16E18	61	80-100	not recorded	not recorded	femur	4
0161	II	S4E1	7	20-40	not recorded	A-I	femur	1
0162	I	N4W7	11	30-50	not recorded	not recorded	femur	1
0163	II	S16E18	60	20-40	not recorded	not recorded	femur	1
0164	II	S23E29	70	80-100	not recorded	not recorded	femur	1
0165	I	S16E18	61	40-60	not recorded	not recorded	femur	2
0166	I	S16E18	61	100-120	not recorded	not recorded	femur	3
0167	II	S15E15	48	40-60	not recorded	not recorded	femur	1
0168	II	S8E9	97	60-80	not recorded	not recorded	femur	1
0169	II	S5E4	99	20-40	2	not recorded	femur	2
0170	II	S8E9	97	40-60	not recorded	not recorded	femur	1
0034	II	S24E27	52	40-60	not recorded	not recorded	humerus	1
0172	I	S16E18	61	60-80	not recorded	not recorded	femur	3
0173	II	S16E18	60	20-40	not recorded	not recorded	tibiotarsus	1
0174	II	S5E4	99	00-00	not recorded	not recorded	scapula	1
0175	II	S4E1	7	20-40	not recorded	A-I	scapula	2
0176	II	S10E13	46	60-80	not recorded	not recorded	scapula	1
0064	II	S24E27	52	40-60	not recorded	not recorded	carpometacarpus	10
0178	I	S10E13	47	80-100	not recorded	not recorded	scapula	1
0179	I	S21E24	51	80-100	not recorded	not recorded	scapula	1
0180	I	S16E18	61	100-120	not recorded	not recorded	tibiotarsus	1
0181	II	S16E17	58	20-40	not recorded	not recorded	tibiotarsus	1
0182	II	S7E6	96	0-20	not recorded	not recorded	tibiotarsus	1
0183	II	S21E29	62	20-40	not recorded	not recorded	tibiotarsus	2
0184	II	S24E29	64	40-60	not recorded	not recorded	tibiotarsus	1
0185	II	S21E24	50	60-80	not recorded	not recorded	tibiotarsus	2
0186	II	S9E19	40	40-60	not recorded	not recorded	tibiotarsus	1
0187	II	S5E4	99	00-00	not recorded	not recorded	tibiotarsus	1
0188	II	S6E2	22	0-20	not recorded	A-I	tibiotarsus	1
0189	II	S8E15	101	50-70	not recorded	not recorded	tibiotarsus	1
0190	II	S8E15	101	30-50	not recorded	H	tibiotarsus	1
0191	II	S10E13	46	60-80	not recorded	not recorded	tibiotarsus	2
0192	II	S15E15	48	20-40	not recorded	not recorded	tibiotarsus	1
0193	II	S5E4	99	20-40	2	not recorded	tibiotarsus	1
0194	II	S8E8	94	40-60	3	not recorded	tibiotarsus	1
0195	II	N4W9	12	20-40	not recorded	not recorded	tibiotarsus	1
0196	II	S15E15	48	20-40	not recorded	not recorded	tibiotarsus	1
0197	II	S3W7	14	20-40	not recorded	not recorded	tibiotarsus	1
0198	II	S5E2	24	20-40	not recorded	not recorded	tibiotarsus	3

Bag #	*AU*	*Cut*	*Context*	*Depth*	*Level*	*Subunit*	*Element*	*Count*
0149	II	S24E27	52	40-60	not recorded	not recorded	ulna	3
0200	II	S24E27	52	40-60	not recorded	not recorded	tibiotarsus	1
0254	II	S24E27	52	40-60	not recorded	not recorded	coracoid	2
0202	I	S16E18	61	100-120	not recorded	not recorded	tibiotarsus	1
0203	I	S16E18	61	60-80	not recorded	not recorded	tibiotarsus	2
0204	I	S16E18	61	80-100	not recorded	not recorded	tibiotarsus	2
0205	I	S16E18	61	60-80	not recorded	not recorded	sternum	1
0206	II	S8E8	94	80-100	5	not recorded	cranium	1
0207	II	N4W9	12	20-40	not recorded	not recorded	tarsometatarsus	2
0208	II	S1W4	30	35-55	not recorded	G, H, I	tarsometatarsus	1
0209	II	S2W10	26	40-60	not recorded	not recorded	tarsometatarsus	1
0210	II	S1W10	28	23-40	not recorded	not recorded	tarsometatarsus	1
0211	II	S1W10	28	60-80	not recorded	not recorded	tarsometatarsus	1
0212	II	S8E15	101	30-50	not recorded	S. 1/2 of level	tarsometatarsus	1
0213	I	S16E18	61	40-60	not recorded	not recorded	carpometacarpus	1
0214	I	S16E18	61	80-100	not recorded	not recorded	tarsometatarsus	3
0215	II	S21E24	50	60-80	not recorded	not recorded	tarsometatarsus	1
0216	II	S22E27	54	60-80	not recorded	not recorded	tarsometatarsus	1
0217	II	S23E27	56	40-60	not recorded	not recorded	tarsometatarsus	1
0255	II	S24E27	52	40-60	not recorded	not recorded	femur	3
0289	II	S24E27	52	40-60	not recorded	A	radius	3
0525	II	S24E27	52	40-60	not recorded	not recorded	scapula	1
0221	II	S24E29	64	40-60	not recorded	not recorded	tarsometatarsus	1
0222	II	N4W9	12	0-20	not recorded	not recorded	coracoid	1
0223	II	S9E19	40	20-40	not recorded	not recorded	coracoid	1
0224	II	S2W9	18	40-60	not recorded	not recorded	coracoid	1
0225	II	S2W7	5	20-40	not recorded	not recorded	coracoid	2
0226	II	S2W10	26	20-40	not recorded	not recorded	coracoid	1
0227	II	S3E1	9	20-40	not recorded	A-I	coracoid	1
0228	II	S4W4	36	0-40	not recorded	A-I	cranium	1
0229	II	S4E1	7	20-40	not recorded	A-I	coracoid	2
0230	I	S8E8	95	100-120	not recorded	not recorded	coracoid	1
0231	II	S5E5	100	0-20	not recorded	not recorded	coracoid	5
0232	II	S6E2	22	60-80	not recorded	not recorded	coracoid	1
0233	II	S6E4	88	60-40	not recorded	not recorded	coracoid	1
0234	II	S7E8	90	20-Bottom of Shell	not recorded	not recorded	coracoid	1
0235	II	S8E15	101	0-20	not recorded	not recorded	coracoid	1
0236	II	S9E4	90	positive 80 -negative 20	not recorded	not recorded	coracoid	1
0237	I	S9E4	91	40-60	not recorded	not recorded	coracoid	1

Bag #	*AU*	*Cut*	*Context*	*Depth*	*Level*	*Subunit*	*Element*	*Count*
0238	II	S10E13	46	60-80	not recorded	not recorded	coracoid	1
0239	II	S15E15	48	20-40	not recorded	not recorded	coracoid	1
0240	II	S16E17	58	20-40	not recorded	not recorded	coracoid	2
0241	I	S16E17	59	40-60	not recorded	not recorded	coracoid	2
0242	I	S16E18	61	60-80	not recorded	not recorded	coracoid	2
0243	I	S16E18	61	80-100	not recorded	not recorded	coracoid	1
0244	I	S16E18	61	100-120	not recorded	not recorded	coracoid	2
0245	II	S20E29	66	20-40	not recorded	not recorded	coracoid	1
0246	II	S21E24	50	60-80	not recorded	not recorded	coracoid	1
0247	II	S21E29	62	20-40	not recorded	not recorded	coracoid	1
0248	I	S1W8	17	40-60	not recorded	not recorded	coracoid	1
0249	II	S20E29	66	40-60	not recorded	not recorded	coracoid	1
0250	II	S22E29	68	60-80	not recorded	not recorded	coracoid	1
0251	II	S23E27	56	40-60	not recorded	not recorded	coracoid	1
0252	II	S23E29	70	20-40	not recorded	not recorded	coracoid	1
0253	II	S23E29	70	60-80	not recorded	not recorded	coracoid	1
0544	II	S24E27	52	40-60	not recorded	not recorded	sternum	2
0546	II	S24E27	52	40-60	not recorded	not recorded	cranium	3
0554	II	S24E27	52	40-60	not recorded	not recorded	wing phalanx	1
1127	II	S24E27	52	40-60	not recorded	not recorded	unidentified	55
0258	II	S2W10	26	40-60	not recorded	not recorded	radius	2
0259	II	S3E1	9	20-40	not recorded	A-I	radius	2
0260	I	N4W7	11	30-50	not recorded	not recorded	radius	2
0261	II	S1W4	30	35-55	not recorded	G, H, I	radius	1
0262	II	S1W4	30	35-55	not recorded	A-I	radius	1
0263	I	S1W8	17	40-60	not recorded	not recorded	radius	1
0264	II	S1W10	28	40-60	not recorded	not recorded	radius	2
0265	II	S5E2	24	40-60	not recorded	not recorded	radius	1
0266	II	S5E5	100	00-00	not recorded	not recorded	radius	1
0267	II	S6E2	22	60-80	not recorded	not recorded	radius	1
0268	II	S7E2	84	60-80	not recorded	not recorded	radius	1
0269	II	S7E6	96	40-60	not recorded	not recorded	radius	1
0270	II	S8E15	101	30-50	not recorded	not recorded	radius	2
0271	II	S9E19	40	20-40	not recorded	not recorded	radius	1
0272	II	S11E5	74	20-40	not recorded	not recorded	radius	1
0273	II	S10E13	46	60-80	not recorded	not recorded	radius	1
0274	I	S16E17	59	60-80	not recorded	not recorded	radius	1
0275	I	S16E18	61	80-100	not recorded	not recorded	radius	2
0276	I	S16E18	61	60-80	not recorded	not recorded	radius	10
0277	I	S16E18	61	100-120	not recorded	not recorded	radius	1

Bag #	*AU*	*Cut*	*Context*	*Depth*	*Level*	*Subunit*	*Element*	*Count*
0278	II	S20E29	66	40-60	not recorded	not recorded	radius	1
0279	II	S24E29	64	40-60	not recorded	not recorded	radius	3
0280	II	S21E24	50	40-60	not recorded	not recorded	radius	1
0281	II	S21E29	62	40-60	not recorded	not recorded	radius	2
0282	II	S21E29	62	80-100	not recorded	not recorded	radius	2
0283	II	S22E27	54	40-60	not recorded	not recorded	radius	2
0284	II	S23E27	56	20-40	not recorded	not recorded	radius	3
0285	II	S23E27	56	40-60	not recorded	not recorded	radius	1
0286	II	S23E27	56	100-120	not recorded	not recorded	radius	2
0287	II	S23E29	70	60-80	not recorded	not recorded	radius	1
0010	II	S24E27	52	60-80	not recorded	not recorded	humerus	7
0050	II	S24E27	52	60-80	not recorded	not recorded	carpometacarpus	11
0150	II	S24E27	52	60-80	not recorded	not recorded	ulna	7
0171	II	S24E27	52	60-80	not recorded	not recorded	femur	3
0201	II	S24E27	52	60-80	not recorded	not recorded	tibiotarsus	2
0219	II	S24E27	52	60-80	not recorded	not recorded	tarsometatarsus	3
0294	I	S16E18	61	80-100	not recorded	not recorded	rib	2
0295	I	S16E18	61	40-60	not recorded	not recorded	scapula	1
0296	II	S21E29	62	40-60	not recorded	not recorded	rib	1
0256	II	S24E27	52	60-80	not recorded	not recorded	coracoid	2
0298	II	S1W9	82	40-60	not recorded	not recorded	foot phalanx	1
0299	II	S7E2	84	60-80	not recorded	not recorded	foot phalanx	1
0300	II	S5E4	99	00-00	not recorded	not recorded	foot phalanx	1
0301	II	S5E5	100	00-00	not recorded	not recorded	foot phalanx	2
0302	I	S16E18	61	60-80	not recorded	not recorded	foot phalanx	4
0303	I	S16E18	61	80-100	not recorded	not recorded	foot phalanx	1
0304	II	S9E19	40	20-40	not recorded	not recorded	foot phalanx	1
0305	II	S9E19	40	20-40	not recorded	not recorded	wing phalanx	2
0290	II	S24E27	52	60-80	not recorded	not recorded	scapula	1
0307	II	S2W9	18	20-40	not recorded	not recorded	foot phalanx	1
0308	II	S8E9	97	0-20	not recorded	not recorded	foot phalanx	1
0309	I	S8E9	98	80-100	not recorded	not recorded	foot phalanx	1
0310	I	S16E18	61	100-120	not recorded	not recorded	foot phalanx	1
0311	II	S5E4	99	00-00	not recorded	not recorded	pelvis	4
0312	II	S10E13	46	60-80	not recorded	not recorded	pelvis	5
0313	I	S10E13	47	80-100	not recorded	not recorded	pelvis	3
0314	I	S16E18	61	60-80	not recorded	not recorded	pelvis	6
0315	I	S16E18	61	80-100	not recorded	not recorded	pelvis	5
0316	II	S22E27	54	60-100	not recorded	not recorded	pelvis	1
0291	II	S24E27	52	60-80	not recorded	not recorded	radius	7

Bag #	*AU*	*Cut*	*Context*	*Depth*	*Level*	*Subunit*	*Element*	*Count*
0318	II	S24E29	64	40-60	not recorded	not recorded	pelvis	1
0319	II	S5E5	100	0-20	not recorded	not recorded	cranium	1
0320	I	S16E18	61	60-80	not recorded	not recorded	cranium	11
0321	II	S21E29	62	40-60	not recorded	not recorded	cranium	1
0322	II	S6E4	88	0-20	not recorded	not recorded	cuneiform	1
0323	II	S5E5	100	0-20	not recorded	not recorded	quadrate	2
0324	II	S1W10	28	60-80	not recorded	not recorded	wing phalanx	1
0325	II	S1W4	30	35-55	not recorded	not recorded	wing phalanx	1
0326	II	S3E1	9	20-40	not recorded	not recorded	wing phalanx	3
0327	II	S5E5	100	0-20	not recorded	not recorded	wing phalanx	1
0328	II	S8E15	101	20-60	not recorded	not recorded	wing phalanx	1
0329	I	S9E4	91	40-60	not recorded	not recorded	wing phalanx	1
0330	II	S7E6	96	20-40	not recorded	not recorded	wing phalanx	1
0331	II	S7E8	90	20-40	not recorded	not recorded	wing phalanx	1
0332	II	S7E8	90	0-20	not recorded	not recorded	wing phalanx	1
0333	II	S8E9	97	60-80	not recorded	not recorded	wing phalanx	4
0334	II	S6E11	38	40-60	not recorded	not recorded	wing phalanx	1
0335	II	S10E13	46	60-80	not recorded	not recorded	wing phalanx	2
0336	II	S16E17	58	20-40	not recorded	not recorded	wing phalanx	3
0337	I	S16E17	59	40-60	not recorded	not recorded	wing phalanx	2
0338	II	S15E15	48	40-60	not recorded	not recorded	wing phalanx	2
0339	I	S16E18	61	60-80	not recorded	not recorded	wing phalanx	7
0340	I	S16E18	61	40-60	not recorded	not recorded	wing phalanx	2
0341	II	S20E29	66	20-40	not recorded	not recorded	wing phalanx	1
0342	I	S20E29	67	100-120	not recorded	not recorded	wing phalanx	2
0343	I	S22E29	69	80-100	not recorded	not recorded	wing phalanx	24
0344	II	S22E29	68	60-80	not recorded	not recorded	wing phalanx	8
0297	II	S24E27	52	60-80	not recorded	not recorded	rib	1
0306	II	S24E27	52	60-80	not recorded	not recorded	foot phalanx	1
0347	II	S21E29	62	40-60	not recorded	not recorded	wing phalanx	1
0348	II	S21E29	62	60-80	not recorded	not recorded	wing phalanx	9
0349	II	S21E29	62	80-100	not recorded	not recorded	wing phalanx	10
0350	II	S23E29	70	60-80	not recorded	not recorded	wing phalanx	15
0351	II	S23E29	70	80-100	not recorded	not recorded	wing phalanx	2
0352	II	S24E29	64	20-40	not recorded	not recorded	wing phalanx	1
0353	II	S24E29	64	40-60	not recorded	not recorded	wing phalanx	3
0354	II	S7E9	44	60-80	not recorded	not recorded	wing phalanx	1
0355	II	S9E19	40	20-40	not recorded	not recorded	pelvis	1
0356	I	S16E18	61	60-80	not recorded	not recorded	quadrate	1
0357	I	S16E18	61	80-100	not recorded	not recorded	wing phalanx	4

Bag #	*AU*	*Cut*	*Context*	*Depth*	*Level*	*Subunit*	*Element*	*Count*
0358	I	S21E24	51	100-120	not recorded	not recorded	tarsometatarsus	1
0317	II	S24E27	52	60-80	not recorded	not recorded	pelvis	2
0360	II	S20E29	66	40-60	not recorded	not recorded	wing phalanx	1
0361	II	S21E29	62	60-80	not recorded	not recorded	cranium	1
0362	II	S21E29	62	80-100	not recorded	not recorded	cuneiform	1
0363	I	S22E29	69	80-100	not recorded	not recorded	tibiotarsus	2
0364	I	S22E29	69	80-100	not recorded	not recorded	ulna	1
0365	II	S23E29	70	40-60	not recorded	not recorded	wing phalanx	12
0366	II	S23E29	70	60-80	not recorded	not recorded	tibiotarsus	1
0367	II	S24E29	64	60-80	not recorded	not recorded	wing phalanx	3
0368	II	S5E5	100	00-00	not recorded	not recorded	vertebrae	2
0369	II	S10E13	46	60-80	not recorded	not recorded	vertebrae	16
0370	I	S16E17	59	40-60	not recorded	not recorded	vertebrae	1
0371	II	S16E18	60	20-40	not recorded	not recorded	vertebrae	2
0372	I	S16E18	61	100-120	not recorded	not recorded	vertebrae	6
0373	II	S21E29	62	20-40	not recorded	not recorded	vertebrae	2
0345	II	S24E27	52	60-80	not recorded	not recorded	wing phalanx	2
0374	II	S24E27	52	60-80	not recorded	not recorded	vertebrae	2
0376	I	S16E18	61	60-80	not recorded	not recorded	coracoid	1
0377	II	S2W10	26	40-60	not recorded	not recorded	vertebrae	2
0378	II	S3E1	9	20-40	not recorded	not recorded	vertebrae	1
0379	II	S5E4	99	00-00	not recorded	not recorded	vertebrae	1
0380	I	S16E18	61	60-80	not recorded	not recorded	vertebrae	10
0381	I	S16E18	61	80-100	not recorded	not recorded	vertebrae	12
0382	II	S22E29	68	40-60	not recorded	not recorded	vertebrae	1
0383	II	S22E29	68	60-80	not recorded	not recorded	vertebrae	1
0384	II	S21E29	62	40-60	not recorded	not recorded	vertebrae	1
0385	II	S4W4	36	40-60	not recorded	not recorded	vertebrae	3
0386	II	S10E13	46	40-60	not recorded	not recorded	carpometacarpus	3
0387	I	S4E1	8	60-80	not recorded	not recorded	coracoid	2
0388	I	S16E17	59	80-100	not recorded	not recorded	wing phalanx	4
0389	II	S10E13	46	60-80	not recorded	not recorded	fibula	1
0390	II	S4W4	36	20-40	not recorded	not recorded	cranium	1
0391	I	S7E8	91	100-120	not recorded	not recorded	wing phalanx	1
0392	II	N4W9	12	20-40	not recorded	not recorded	fercula	1
0393	I	S6E4	89	100-120	not recorded	not recorded	tarsometatarsus	1
0394	I	S16E18	61	60-80	not recorded	not recorded	fibula	2
0395	I	S16E18	61	80-100	not recorded	not recorded	fibula	1
0396	I	S16E18	61	80-100	not recorded	not recorded	sternum	7
1124	II	S24E27	52	60-80	not recorded	not recorded	unidentified	27

Bag #	*AU*	*Cut*	*Context*	*Depth*	*Level*	*Subunit*	*Element*	*Count*
0398	I	S16E17	59	60-80	not recorded	not recorded	humerus	2
0399	II	S15E15	48	20-40	not recorded	not recorded	humerus	2
0400	II	S7E2	84	40-60	not recorded	not recorded	ulna	1
0401	II	S7E2	84	40-60	not recorded	not recorded	wing phalanx	1
0402	II	S5E4	99	00-00	not recorded	not recorded	fibula	1
0403	II	S5E4	99	00-00	not recorded	not recorded	coracoid	1
0404	I	S6E2	23	80-100	not recorded	not recorded	wing phalanx	1
0405	II	S5E5	100	0-20	not recorded	not recorded	pelvis	2
0406	II	S1E6	85	0-20	not recorded	not recorded	sternum	1
0407	I	S7E8	91	60-80	not recorded	not recorded	humerus	1
0408	I	S7E8	91	60-80	not recorded	not recorded	femur	1
0409	II	S7E9	44	0-20	not recorded	not recorded	humerus	1
0410	II	S7E9	44	0-20	not recorded	not recorded	pelvis	1
0411	II	S7E9	44	20-40	not recorded	not recorded	humerus	1
0412	II	S15E15	48	20-40	not recorded	not recorded	carpometacarpus	2
0413	II	S16E18	60	20-40	not recorded	not recorded	scapula	1
0414	II	S6E4	88	60-80	not recorded	not recorded	pelvis	1
0415	II	S6E4	88	60-80	not recorded	not recorded	scapula	2
0416	II	S6E4	88	60-80	not recorded	not recorded	fercula	1
0417	II	S8E8	94	0-30	not recorded	not recorded	vertebrae	1
0418	I	S16E18	61	40-60	not recorded	not recorded	coracoid	1
0419	II	S10E13	46	0-20	not recorded	not recorded	carpometacarpus	1
0420	II	S10E13	46	40-60	not recorded	not recorded	cuneiform	1
0421	II	S10E13	46	60-80	not recorded	not recorded	rib	1
0422	I	S10E13	47	80-100	not recorded	not recorded	humerus	2
0423	I	S10E13	47	80-100	not recorded	not recorded	fibula	1
0424	II	S8E9	97	40-60	not recorded	not recorded	sternum	1
0425	I	S10E13	47	80-100	not recorded	not recorded	radius	1
0426	II	S2W4	32	0-20	not recorded	not recorded	ulna	1
0427	II	S3W4	34	40-60	not recorded	not recorded	wing phalanx	1
0428	I	S16E18	61	40-60	not recorded	not recorded	sternum	2
0429	II	S5W4	80	20-40	not recorded	not recorded	carpometacarpus	1
0430	II	S5W4	80	40-60	not recorded	not recorded	femur	1
0431	II	S7E6	96	40-60	not recorded	not recorded	ulna	1
0432	II	S1W9	82	40-60	not recorded	not recorded	wing phalanx	2
0433	II	S1W9	82	40-60	not recorded	not recorded	carpometacarpus	2
0434	II	S1W10	28	40-60	not recorded	not recorded	vertebrae	1
0435	II	S7E6	96	40-60	not recorded	not recorded	ulna	1
0436	II	S2W7	5	20-40	not recorded	not recorded	vertebrae	1
0437	II	S2W7	5	20-40	not recorded	not recorded	sternum	1

Bag #	*AU*	*Cut*	*Context*	*Depth*	*Level*	*Subunit*	*Element*	*Count*
0438	II	S3W4	34	20-40	not recorded	not recorded	sternum	1
0439	II	S3W4	34	20-40	not recorded	not recorded	vertebrae	1
0440	II	S4W4	36	40-60	not recorded	not recorded	cranium	1
0441	II	S1E1	1	40-60	not recorded	not recorded	sternum	1
0442	II	S3E1	9	20-40	not recorded	not recorded	cranium	1
0443	II	S3E1	9	20-40	not recorded	not recorded	tibiotarsus	1
0444	II	S3E1	9	20-40	not recorded	not recorded	ulna	1
0445	I	S5E1	79	60-80	not recorded	not recorded	scapula	1
0446	II	S4E1	7	20-40	not recorded	not recorded	vertebrae	5
0447	II	S4E1	7	20-40	not recorded	not recorded	pelvis	1
0448	II	S4E1	7	20-40	not recorded	not recorded	tarsometatarsus	2
0449	II	S4E1	7	20-40	not recorded	not recorded	wing phalanx	1
0450	II	S4E1	7	20-40	not recorded	not recorded	foot phalanx	1
0451	II	S4E1	7	20-40	not recorded	not recorded	sternum	1
0452	I	S4E1	8	40-60	not recorded	not recorded	ulna	2
0453	I	S4E1	8	40-60	not recorded	not recorded	sternum	1
0454	I	S4E1	8	60-80	not recorded	not recorded	ulna	1
0455	I	S16E17	59	60-80	not recorded	not recorded	femur	1
0456	II	S20E29	66	0-20	not recorded	not recorded	carpometacarpus	1
0457	II	S20E29	66	20-40	not recorded	not recorded	scapula	1
0458	II	S20E29	66	60-80	not recorded	not recorded	sternum	1
0459	I	S20E29	67	100-120	not recorded	not recorded	carpometacarpus	4
0460	I	S20E29	67	100-120	not recorded	not recorded	pelvis	1
0461	II	S21E29	62	0-20	not recorded	not recorded	vertebrae	1
0462	II	S21E29	62	0-20	not recorded	not recorded	scapula	1
0463	II	S21E29	62	0-20	not recorded	not recorded	carpometacarpus	1
0464	II	S21E29	62	0-20	not recorded	not recorded	ulna	1
0465	II	S21E29	62	0-20	not recorded	not recorded	wing phalanx	1
0466	II	S21E29	62	20-40	not recorded	not recorded	sternum	1
0467	II	S21E29	62	20-40	not recorded	not recorded	wing phalanx	1
0468	II	S21E29	62	40-60	not recorded	not recorded	tibiotarsus	1
0469	II	S20E29	66	20-40	not recorded	not recorded	cranium	1
0470	II	S21E29	62	60-80	not recorded	not recorded	pelvis	1
0471	II	S3W7	14	20-40	not recorded	not recorded	cranium	2
0472	II	S21E29	62	80-100	not recorded	not recorded	femur	1
0473	II	S23E29	70	0-20	not recorded	not recorded	carpometacarpus	1
0474	II	S23E29	70	0-20	not recorded	not recorded	foot phalanx	1
0475	II	S23E29	70	20-40	not recorded	not recorded	ulna	2
0476	II	S23E29	70	20-40	not recorded	not recorded	carpometacarpus	2
0477	II	S23E29	70	20-40	not recorded	not recorded	tibiotarsus	1

Bag #	*AU*	*Cut*	*Context*	*Depth*	*Level*	*Subunit*	*Element*	*Count*
0478	II	S23E29	70	20-40	not recorded	not recorded	foot phalanx	1
0479	II	S23E29	70	40-60	not recorded	not recorded	tibiotarsus	1
0480	II	S23E29	70	40-60	not recorded	not recorded	sternum	1
0481	II	S23E29	70	40-60	not recorded	not recorded	vertebrae	2
0482	II	S7E8	90	0-20	not recorded	not recorded	cranium	1
0483	II	S23E29	70	60-80	not recorded	not recorded	cuneiform	1
0484	II	S23E29	70	60-80	not recorded	not recorded	vertebrae	3
0485	II	S2W10	26	40-60	not recorded	not recorded	cranium	3
0486	I	S9E4	91	40-60	not recorded	not recorded	cranium	1
0487	II	S22E29	68	40-60	not recorded	not recorded	fibula	1
0488	II	S22E29	68	40-60	not recorded	not recorded	cranium	1
0489	II	S24E29	64	60-80	not recorded	not recorded	vertebrae	1
0490	II	S24E29	64	60-80	not recorded	not recorded	tibiotarsus	1
0491	II	S24E29	64	60-80	not recorded	not recorded	ulna	2
0492	II	S24E29	64	60-80	not recorded	not recorded	carpometacarpus	12
0493	I	S24E29	65	80-100	not recorded	not recorded	wing phalanx	1
0494	I	S24E29	65	80-100	not recorded	not recorded	carpometacarpus	3
0495	II	S23E27	56	40-60	not recorded	not recorded	scapula	1
0496	II	S2W9	18	40-60	not recorded	not recorded	scapula	1
0497	II	S1E1	1	20-40	not recorded	not recorded	cranium	1
0498	II	S1E6	85	20-40	not recorded	not recorded	cranium	1
0499	II	S8E9	97	60-80	not recorded	not recorded	fercula	1
0500	I	S16E18	61	100-120	not recorded	not recorded	fibula	1
0501	I	S16E18	61	100-120	not recorded	not recorded	wing phalanx	1
0502	I	N4W7	11	30-50	not recorded	not recorded	coracoid	1
0503	I	N4W7	11	30-50	not recorded	not recorded	sternum	1
0504	II	S2W4	32	20-40	not recorded	not recorded	wing phalanx	1
0505	I	N4W7	11	50-70	not recorded	not recorded	femur	1
0506	I	S7E8	91	80-100	not recorded	not recorded	coracoid	1
0507	I	S11E5	75	40-60	not recorded	not recorded	ulna	1
0508	II	S8E15	101	30-50	not recorded	not recorded	fibula	1
0035	II	S24E27	52	80-100	not recorded	not recorded	humerus	3
0510	I	S16E17	59	60-80	not recorded	not recorded	wing phalanx	1
0511	II	S24E29	64	60-80	not recorded	not recorded	rib	1
0512	II	S24E29	64	60-80	not recorded	not recorded	radius	1
0513	II	S8E9	97	60-80	not recorded	not recorded	radius	1
0514	I	S16E17	59	80-100	not recorded	not recorded	radius	2
0515	II	S24E29	64	40-60	not recorded	not recorded	femur	1
0516	II	S1W10	28	40-60	not recorded	not recorded	humerus	1
0517	II	S16E17	58	20-40	not recorded	not recorded	femur	1

Bag #	*AU*	*Cut*	*Context*	*Depth*	*Level*	*Subunit*	*Element*	*Count*
0062	II	S24E27	52	80-100	not recorded	not recorded	carpometacarpus	13
0519	II	S8E15	101	0-30	not recorded	not recorded	humerus	1
0520	II	S2W10	26	20-40	not recorded	not recorded	cranium	3
0521	II	S10E13	46	40-60	not recorded	not recorded	humerus	3
0522	II	S10E13	46	40-60	not recorded	not recorded	tibiotarsus	2
0523	II	S22E27	54	40-60	not recorded	not recorded	tibiotarsus	1
0524	II	S23E27	56	80-100	not recorded	not recorded	scapula	1
0151	II	S24E27	52	80-100	not recorded	not recorded	ulna	10
0526	II	S23E27	56	80-100	not recorded	not recorded	coracoid	2
0527	I	S7E8	91	100-120	not recorded	not recorded	ulna	1
0528	I	S16E17	59	80-100	not recorded	not recorded	ulna	2
0529	II	S23E27	56	80-100	not recorded	not recorded	ulna	2
0530	II	S6E2	22	20-40	not recorded	not recorded	humerus	1
0531	II	S7E8	90	40-60	not recorded	not recorded	humerus	1
0532	I	S16E17	59	80-100	not recorded	not recorded	humerus	1
0533	I	S16E17	59	100-120	not recorded	not recorded	humerus	1
0534	II	S23E27	56	80-100	not recorded	not recorded	humerus	2
0177	II	S24E27	52	80-100	not recorded	not recorded	scapula	1
0536	I	S6E2	23	100-120	not recorded	not recorded	carpometacarpus	1
0537	II	S6E2	22	40-60	not recorded	not recorded	carpometacarpus	1
0538	II	S7E8	90	40-60	not recorded	not recorded	carpometacarpus	3
0539	II	S15E15	48	0-20	not recorded	not recorded	carpometacarpus	4
0540	I	S16E17	59	100-120	not recorded	not recorded	carpometacarpus	2
0541	I	S16E17	59	80-100	not recorded	not recorded	carpometacarpus	1
0542	II	S6E2	22	20-40	not recorded	not recorded	cuneiform	1
0199	II	S24E27	52	80-100	not recorded	not recorded	tibiotarsus	2
0220	II	S24E27	52	80-100	not recorded	not recorded	tarsometatarsus	3
0545	II	S23E27	56	40-60	not recorded	not recorded	vertebrae	1
0257	II	S24E27	52	80-100	not recorded	not recorded	coracoid	1
0547	II	S22E27	54	60-80	not recorded	not recorded	wing phalanx	2
0548	II	S22E27	54	40-60	not recorded	not recorded	wing phalanx	5
0549	II	S6E2	22	20-40	not recorded	not recorded	wing phalanx	1
0550	II	S5E6	20	0-20	not recorded	not recorded	wing phalanx	1
0551	II	S5E2	24	20-40	not recorded	not recorded	wing phalanx	1
0552	II	S1W10	28	23-40	not recorded	not recorded	wing phalanx	1
0553	II	S3W6	76	0-25	not recorded	not recorded	wing phalanx	1
0292	II	S24E27	52	80-100	not recorded	not recorded	radius	4
0555	II	S1W10	28	23-40	not recorded	not recorded	cranium	1
1001	II	S10E13	46	40-60	not recorded	not recorded	unidentifiable	3
1002	II	S1W10	28	23-40	not recorded	not recorded	unidentifiable	8

Bag #	*AU*	*Cut*	*Context*	*Depth*	*Level*	*Subunit*	*Element*	*Count*
1003	II	S1E6	85	0-20	not recorded	not recorded	unidentifiable	5
1004	II	S1E1	1	20-40	not recorded	not recorded	unidentifiable	10
1005	II	S1E6	85	20-40	not recorded	not recorded	unidentifiable	3
1006	II	S9E19	40	0-20	not recorded	not recorded	unidentifiable	1
1007	I	S8E9	98	100-120	not recorded	not recorded	unidentifiable	2
1008	II	S7E8	90	40-60	not recorded	not recorded	unidentifiable	17
1009	II	S6E11	38	40-60	not recorded	not recorded	unidentifiable	1
1010	II	S7E2	84	40-60	not recorded	not recorded	unidentifiable	3
1011	II	S7E6	96	60-80	not recorded	not recorded	unidentifiable	1
1012	II	S8E8	94	0-30	not recorded	not recorded	unidentifiable	1
1013	I	S8E8	95	100-120	6	A, B, C	unidentifiable	2
1014	II	S7E6	96	20-40	not recorded	not recorded	unidentifiable	9
1015	I	S5E6	21	40-60	not recorded	not recorded	unidentifiable	2
1016	II	S3W4	34	40-60	not recorded	not recorded	unidentifiable	2
1017	II	S5E6	20	0-20	not recorded	not recorded	unidentifiable	2
1018	II	S8E8	94	60-80	not recorded	not recorded	unidentifiable	2
1019	II	S24E29	64	0-20	not recorded	not recorded	unidentifiable	6
1020	II	S8E15	101	20-60	not recorded	not recorded	unidentified	1
1021	II	S22E29	68	60-80	not recorded	not recorded	unidentifiable	6
1022	II	S23E29	70	40-60	not recorded	not recorded	unidentifiable	2
1023	II	S10E13	46	0-20	not recorded	not recorded	unidentifiable	9
1024	I	S8E9	98	80-100	not recorded	not recorded	unidentifiable	3
1025	I	S9E4	91	60-80	not recorded	not recorded	unidentifiable	1
1026	I	S4E1	8	40-60	not recorded	not recorded	unidentifiable	4
1027	II	S6E4	88	40-60	1	not recorded	unidentifiable	2
1028	II	S5E4	99	20-40	2	not recorded	unidentifiable	4
1029	II	S8E15	101	0-20	not recorded	not recorded	unidentifiable	10
1030	II	S7E6	96	0-20	not recorded	not recorded	unidentifiable	1
1031	II	S3E1	9	0-30	not recorded	not recorded	unidentifiable	1
1032	II	S7E9	44	20-40	not recorded	not recorded	unidentifiable	2
1033	II	S9E4	90	20-40	not recorded	not recorded	unidentifiable	3
1034	II	S6E11	38	20-40	not recorded	not recorded	unidentifiable	1
1035	II	S9E19	40	20-40	not recorded	not recorded	unidentifiable	7
1036	II	S7E2	84	60-80	not recorded	not recorded	unidentifiable	2
1037	II	S20E29	66	0-20	not recorded	not recorded	unidentifiable	2
1038	I	S20E29	67	100-120	not recorded	not recorded	unidentifiable	1
1039	II	S21E29	62	60-80	not recorded	not recorded	unidentifiable	26
1040	II	S1W10	28	60-80	not recorded	not recorded	unidentifiable	1
1041	II	S2W10	26	0-20	not recorded	not recorded	unidentifiable	1
1042	II	S7E2	84	0-40	not recorded	not recorded	unidentifiable	1

Bag #	*AU*	*Cut*	*Context*	*Depth*	*Level*	*Subunit*	*Element*	*Count*
1043	II	S6E2	22	0-20	not recorded	not recorded	unidentifiable	1
1044	II	S2W10	27	60-80	not recorded	not recorded	unidentifiable	1
1045	II	N4W9	12	0-20	not recorded	not recorded	unidentifiable	2
0346	II	S24E27	52	80-100	not recorded	not recorded	wing phalanx	2
1047	II	S5E2	24	20-40	not recorded	not recorded	unidentifiable	10
1048	I	S21E24	51	80-100	not recorded	not recorded	unidentifiable	1
1049	II	N4W9	12	20-40	not recorded	not recorded	unidentifiable	20
1050	II	S21E29	62	0-20	not recorded	not recorded	unidentifiable	9
1051	II	S1W9	82	40-60	not recorded	not recorded	unidentifiable	21
1052	II	S2W9	18	0-20	1	not recorded	unidentifiable	1
1053	II	S2W9	18	20-40	not recorded	not recorded	unidentifiable	2
1054	II	S2W9	18	40-60	not recorded	not recorded	unidentifiable	1
1055	I	N4W7	11	0-20	not recorded	not recorded	unidentifiable	2
1056	II	S9E19	40	40-80	not recorded	not recorded	unidentifiable	1
1057	II	S1W8	16	20-40	not recorded	A-I	unidentified	2
1058	II	S9E19	40	40-60	not recorded	not recorded	unidentifiable	1
1059	II	S23E29	70	80-100	not recorded	not recorded	unidentifiable	7
1060	II	S2W6	3	0-20	1	not recorded	unidentifiable	2
1061	I	S2W6	4	40-60	not recorded	not recorded	unidentifiable	1
1062	I	S3W6	77	25-40	not recorded	not recorded	unidentifiable	1
1063	II	S3W7	14	22-57	not recorded	not recorded	unidentifiable	2
1064	II	S1W4	30	35-55	not recorded	not recorded	unidentifiable	4
1065	II	S8E8	94	30-40	not recorded	not recorded	unidentifiable	2
1066	II	S23E29	70	20-40	not recorded	not recorded	unidentifiable	7
1067	II	S4W4	36	0-40	not recorded	not recorded	unidentifiable	1
1068	II	S5W4	80	20-40	not recorded	not recorded	unidentifiable	3
1069	II	S5W4	80	40-60	not recorded	not recorded	unidentifiable	2
1070	II	S7E8	90	20-bottom of shell	not recorded	not recorded	unidentifiable	4
1071	II	S1E1	1	0-20	not recorded	A-I	unidentifiable	5
1072	II	S21E24	50	20-40	not recorded	not recorded	unidentifiable	1
1073	II	S1E1	1	40-60	not recorded	not recorded	unidentifiable	5
1074	II	S3W4	34	20-40	not recorded	not recorded	unidentifiable	4
1075	II	S22E27	54	80-100	not recorded	not recorded	unidentifiable	1
1076	II	S22E29	68	20-40	not recorded	not recorded	unidentifiable	3
0359	II	S24E27	52	80-100	not recorded	not recorded	wing phalanx	1
1078	II	S12E9	72	0-20	not recorded	not recorded	unidentifiable	1
1079	I	S5E1	79	60-80	not recorded	not recorded	unidentifiable	1
1080	I	S16E18	61	100-120	not recorded	not recorded	unidentifiable	3
1081	I	N4W7	11	30-50	not recorded	not recorded	unidentifiable	7
1082	II	S23E29	70	0-20	not recorded	not recorded	unidentifiable	4

Bag #	*AU*	*Cut*	*Context*	*Depth*	*Level*	*Subunit*	*Element*	*Count*
1083	II	S6E2	22	0-20	not recorded	A-I	unidentified	3
1084	I	S7E8	91	80-100	not recorded	not recorded	unidentifiable	1
1085	I	S11E5	75	40-60	not recorded	not recorded	unidentifiable	2
1086	II	S8E15	101	30-50	not recorded	not recorded	unidentifiable	1
1087	I	S16E17	59	60-80	not recorded	not recorded	unidentifiable	1
1088	II	S10E13	46	60-80	not recorded	not recorded	unidentifiable	3
1089	II	S23E27	56	20-40	not recorded	not recorded	unidentifiable	1
1090	II	S22E27	54	40-60	not recorded	not recorded	unidentifiable	1
1091	II	S24E29	64	40-60	not recorded	not recorded	unidentifiable	8
1092	II	S8E15	101	0-30	not recorded	not recorded	unidentifiable	4
1093	II	S7E6	96	40-60	not recorded	not recorded	unidentifiable	6
1094	I	S9E4	91	40-60	not recorded	not recorded	unidentifiable	2
1095	II	S7E8	90	0-20	not recorded	not recorded	unidentifiable	1
1096	II	S2W10	26	20-40	not recorded	not recorded	unidentifiable	11
1097	II	S20E29	66	60-80	not recorded	not recorded	unidentifiable	2
1098	I	S16E17	59	100-120	not recorded	not recorded	unidentified	2
1099	II	S15E15	48	0-20	not recorded	not recorded	unidentifiable	1
1100	I	S12E19	43	80-100	not recorded	not recorded	unidentified	1
1101	II	S5E5	100	00-00	not recorded	not recorded	unidentifiable	3
1102	I	S5E1	79	40-60	not recorded	not recorded	unidentified	1
1103	II	S3W6	76	0-25	not recorded	not recorded	unidentified	1
1104	II	N3W4	86	20-40	not recorded	not recorded	unidentified	2
1105	II	S6E4	88	60-80	not recorded	not recorded	unidentified	7
1106	I	N4W7	11	30-50	not recorded	not recorded	unidentified	2
1107	II	S4W4	36	40-60	not recorded	not recorded	unidentified	3
1108	I	S8E8	95	100-120	not recorded	A, B, C	unidentified	1
1109	II	S5E4	99	40-60	not recorded	not recorded	unidentified	1
1110	I	S22E29	69	80-100	not recorded	not recorded	unidentified	30
1111	I	S8E8	95	120-140	not recorded	not recorded	unidentified	2
1112	II	S3E1	9	20-40	not recorded	A-I	unidentified	3
1113	II	S5E5	100	0-20	not recorded	not recorded	unidentified	2
1114	II	S1W9	82	20-40	not recorded	not recorded	unidentified	3
1115	II	S8E8	94	40-60	not recorded	not recorded	unidentified	2
1116	II	S2W10	26	40-60	not recorded	not recorded	unidentified	20
1117	II	S7E9	44	0-20	not recorded	not recorded	unidentified	13
1118	II	S8E9	97	60-80	not recorded	not recorded	unidentified	4
1119	II	S1W10	28	40-60	not recorded	not recorded	unidentified	7
1120	II	S22E27	54	60-80	not recorded	not recorded	unidentified	3
1121	II	S22E29	68	40-60	not recorded	not recorded	unidentified	23
1122	I	S16E18	61	60-80	not recorded	not recorded	unidentified	62

Bag #	*AU*	*Cut*	*Context*	*Depth*	*Level*	*Subunit*	*Element*	*Count*
1123	II	S21E29	62	20-40	not recorded	not recorded	unidentified	37
0375	II	S24E27	52	80-100	not recorded	not recorded	vertebrae	1
1125	I	N4W7	11	50-70	not recorded	not recorded	unidentified	1
1126	I	N3W4	87	40-60	not recorded	not recorded	unidentified	5
0518	II	S24E27	52	80-100	not recorded	not recorded	femur	1
1128	II	S2W4	32	20-40	not recorded	not recorded	unidentified	4
1129	II	S24E29	64	60-80	not recorded	not recorded	unidentified	8
1130	I	S24E29	65	80-100	not recorded	not recorded	unidentified	10
1131	II	S4E1	7	20-40	not recorded	A-I	unidentified	16
1132	II	S24E27	52	80-100	not recorded	not recorded	unidentified	11
1133	II	S5E4	99	00-00	not recorded	not recorded	unidentified	26
1134	II	S5E5	100	0-20	not recorded	not recorded	unidentified	36
1135	II	S21E29	62	80-100	not recorded	not recorded	unidentified	14
1136	II	S20E29	66	20-40	not recorded	not recorded	unidentified	15
1137	II	S24E29	64	20-40	not recorded	not recorded	unidentified	8
1138	II	S20E29	66	40-60	not recorded	not recorded	unidentified	8
1139	II	S22E27	54	20-40	not recorded	not recorded	unidentified	6
1140	II	S21E29	62	40-60	not recorded	not recorded	unidentified	20
1141	II	S8E9	97	40-60	not recorded	not recorded	unidentified	4
1142	I	S16E18	61	40-60	not recorded	not recorded	unidentified	15
1143	II	S16E18	60	20-40	not recorded	not recorded	unidentified	41
1144	I	S16E18	61	80-100	not recorded	not recorded	unidentified	9
1145	I	S16E17	59	40-60	not recorded	not recorded	unidentified	8
1146	I	S10E13	47	80-100	not recorded	not recorded	unidentified	8
1147	II	S16E17	58	20-40	not recorded	not recorded	unidentified	7

Appendix F: Specimen List

Specimen #	*Bag #*	*zones with cut marks*	*burned*	*side*	*age*	*zone 1*	*zone 2*	*zone 3*	*zone 4*	*zone 5*	*zone 6*	*zone 7*	*zone 8*	*Family Identification*	*Tentative Identification*	*Comment*
1	0001	NA	no	L	A	0	0	1	1	1	1	1	0	Anatidae	*Melanitta perspicillata*	
2	0002	3	no	L	S	1	0	1	1	0	0	0	0	Corvidae	Corvidae	
3	0003	NA	no	L	S	0	0	0	0	1	1	1	1	Anatidae	*Anas platyrhynchos*	
4	0010	NA	no	R	A	0	0	1	1	0	0	0	0	NA	large aves	Compare with small loons. Ayres et al. (2003) terminology.
5	0005	NA	no	L	A	0	0	0	0	1	1	1	1	NA	large aves	Ayres et al. (2003) terminology.
6	0006	NA	no	R	A	0	0	1	1	1	1	0	0	Anatidae	Anatidae	
7	0007	4	no	R	A	0	0	1	1	0	0	0	0	NA	medium aves	Ayres et al. (2003) terminology.
8	0008	3, 4, 5, 6	no	I	A	0	0	1	1	1	1	0	0	NA	medium aves	
9	0009	5, 6	no	R	A	0	0	0	0	1	1	1	1	Accipitridae	Accipitridae	Photograph. Possibly incised. Compare with *Halaetus leucocephalus*.
10	0010	3	no	L	A	1	1	1	1	0	0	0	0	Anatidae	*Melanitta fusca*	
11	0010	6	yes	R	A	0	0	1	1	1	1	0	0	NA	Anseriformes	
12	0010	NA	no	R	A	1	1	1	1	0	0	0	0	Anatidae	*Melanitta perspicillata*	
13	0010	NA	no	R	A	1	0	0	0	0	0	0	0	Anatidae	*Melanitta perspicillata*	
14	0010	NA	no	L	A	0	0	1	1	0	0	0	0	Anatidae	Anatidae	
15	0011	NA	no	L	S	0	0	0	0	1	1	1	1	Corvidae	Corvidae	Smaller than *Corvus brachyrhincos*. Compare with Steller's Jay. Specimens 15 and 16 are paired elements.
16	0011	NA	no	R	S	0	0	0	0	1	1	1	1	Corvidae	Corvidae	Smaller than *Corvus brachyrhincos*. Compare with Steller's Jay. Specimens 15 and 16 are paired elements.
17	0012	NA	no	L	A	1	1	1	0	0	0	0	0	Anatidae	Anatidae	
18	0012	NA	no	L	A	0	0	0	0	1	0	1	0	Accipitridae	Accipitridae	Compare with eagle. Same as sp. 9, and 19.
19	0012	NA	no	R	A	0	0	0	0	0	0	1	0	Accipitridae	Accipitridae	Compare with eagle. Same as sp. 18, and sp. 9..
20	0012	NA	no	L	A	0	1	0	0	0	0	0	0	NA	very large aves	Compare with condor, eagle, pelican, and swan. Same as sp. 8, sp.18, and sp. 19.
21	0012	NA	no	L	A	0	0	0	0	1	1	1	1	NA	very large aves	Compare with Gaviiformes.
22	0012	NA	no	R	A	0	0	0	0	1	1	1	1	NA	very large aves	Compare with Gaviiformes.

Specimen #	Bag #	zones with cut marks	burned	side	age	zone 1	zone 2	zone 3	zone 4	zone 5	zone 6	zone 7	zone 8	Family Identification	Tentative Identification	Comment
23	0012	4	no	R	A	0	0	1	1	0	0	0	0	NA	very large aves	
24	0012	5	no	L	S	1	1	1	1	1	1	1	1	Phasianidae	Phasianidae	Compare with grouse, and partridge. Ruled out crows, ravens, kittiwakes, ducks, fulmars, gulls, pigeons and murres, and cormorants.
25	0012	4	no	R	S	1	1	1	1	1	1	0	0	Phasianidae	Phasianidae	Compare with grouse, and partridge. Ruled out crows, ravens, kittiwakes, ducks, fulmars, gulls, pigeons and murres, and cormorants.
26	0012	6	no	L	S	0	0	0	0	1	1	1	1	Phasianidae	Phasianidae	Compare with grouse, and partridge. Ruled out crows, ravens, kittiwakes, ducks, fulmars, gulls, pigeons and murres, and cormorants.
27	0012	NA	no	R	A	0	0	0	0	1	0	1	0	Anatidae	Anatidae	Compare with *Melanitta sp.*
28	0013	NA	no	R	A	1	1	1	1	0	0	0	0	Anatidae	Anatidae	Smaller than *Chen caerulescens* and *Cygnus Buccinator*. Ayres et al (2003) size terminology.
29	0013	NA	no	L	A	1	1	1	1	1	1	1	1	NA	small aves	
30	0014	NA	no	R	S	1	1	1	1	0	0	0	0	Phasianidae	Phasianidae	Compare with grouse, and partridge. Ruled out crows, ravens, kittiwakes, ducks, fulmars, gulls, pigeons and murres, and cormorants.
31	0016	NA	no	R	A	0	0	0	0	1	1	1	1	Anatidae	*Melanitta sp.*	
32	0017	NA	yes	R	A	0	0	0	0	1	0	1	1	Podicipedidae	*Aechmophorus sp.*	
33	0018	NA	no	R	A	1	1	1	1	0	0	0	0	Anatidae	Anatidae	
34	0020	NA	no	L	A	0	0	0	0	1	1	1	1	Anatidae	*Mergus sp.*	Four pieces.
35	0022	3, 4, 5	no	L	A	1	1	1	1	1	1	1	1	NA	small aves	Smaller than *Oxyuria jamaicensis*, larger than *Myadestes townsendi.*
36	0024	4,5	no	R	S	1	1	1	1	1	1	1	0	NA	small aves	
37	0027	NA	no	R	A	0	0	1	1	1	1	1	1	NA	small aves	
38	0028	3, 5, 6	no	L	A	0	0	1	1	1	1	0	0	Gaviidae	*Gavia sp.*	Large loon. Compare with *Gavia immer*.
39	0029	5, 6	no	R	A	0	0	0	0	1	1	1	1	Gaviidae	*Gavia sp.*	Large loon. Compare with *Gavia immer*.
40	0031	NA	no	R	A	1	1	1	1	1	1	0	0	NA	small aves	No clear cut marks, however, there are parallel striae along the shaft. These are very faint. Reminiscent of running a blade down a bone shaft to remove meat.
41	0032	NA	no	R	S	1	1	1	1	1	1	1	1	NA	small aves	
42	0033	3, 4	no	R	A	1	1	1	1	0	0	0	0	Phalacrocoracidae	*Phalacrocorax sp.*	Photograph. Cut marks are consistent with groove-and-split processing.
43	0033	NA	no	L	A	1	1	1	1	0	0	0	0	NA	small aves	Sp. 43 is short. Compared with loons and grebes, pneumatic fossa is inconsistent with all specimens

Specimen #	*Bag #*	*zones with cut marks*	*burned*	*side*	*age*	*zone 1*	*zone 2*	*zone 3*	*zone 4*	*zone 5*	*zone 6*	*zone 7*	*zone 8*	*Family Identification*	*Tentative Identification*	*Comment*
																compared.
44	0033	NA	no	L	A	1	1	1	1	1	1	0	0	NA	small aves	Sp. 44 is long. Compared with loons and grebes, pneumatic fossa is inconsistent with all specimens compared.
45	0034	NA	no	R	A	0	0	0	0	1	1	0	0	NA	medium aves	
46	0035	NA	no	R	A	1	1	1	1	0	0	0	0	NA	medium aves	
47	0036	6, 5, 3	no	R	A	0	0	1	1	1	1	0	0	NA	very large aves	
48	0037	5	no	L	A	0	0	1	0	1	0	1	1	NA	medium aves	Ruled out herring gulls, ducks, and murres.
49	0037	3	no	R	A	1	1	1	0	0	0	0	0	Anatidae	Anatidae	Smaller than *Anas platyrhynchos.*
50	0037	6	no	R	A	0	0	0	0	0	0	1	1	NA	medium aves	
51	0038	NA	no	R	A	0	0	0	0	1	0	1	1	Phalacrocoracidae	*Phalacrocorax sp.*	Large cormorant. Compare with *Phalacrocorax auritus.*
52	0038	8, 6	no	R	A	0	0	0	0	1	0	1	1	Gaviidae	*Gavia sp.*	
53	0039	NA	no	R	A	0	0	0	0	1	0	1	1	Anatidae	small Anatidae	
54	0040	NA	no	R	A	0	0	1	0	1	0	1	1	NA	medium aves	
55	0041	NA	no	L	S	0	0	1	0	1	0	0	0	NA	very large aves	Phalacrocorax ruled out.
56	0042	NA	no	L	A	1	1	1	0	1	0	1	1	Laridae	*Larus sp.*	
57	0043	NA	no	L	A	0	0	0	0	1	1	1	1	Anatidae	small Anatidae	Compare with ruddy duck and pintail.
58	0043	NA	no	L	A	0	0	1	0	1	0	1	1	Anatidae	Anatidae	Compare with scoter and ruddy duck.
59	0044	NA	no	R	A	0	0	0	0	1	0	1	1	Anatidae	Anatidae	
60	0044	NA	no	L	A	0	0	0	0	0	0	1	1	NA	large aves	Ayers 2003 size class.
61	0045	NA	no	L	A	0	0	1	0	1	0	1	1	Anatidae	Anatidae	
62	0046	NA	no	L	A	0	0	0	0	1	1	1	0	Anatidae	Anatidae	
63	0046	NA	no	R	A	1	1	1	0	1	0	0	0	Anatidae	Anatidae	
64	0047	NA	no	R	A	0	0	0	0	1	0	1	1	Anatidae	Anatidae	
65	0048	NA	no	I	A	0	0	1	0	1	0	1	0	Anatidae	medium Anatidae	
66	0048	NA	no	R	A	0	0	1	0	1	0	1	1	Anatidae	Anatidae	
67	0047	NA	no	R	A	0	0	0	0	1	1	1	1	Anatidae	Anatidae	

Specimen #	Bag #	zones with cut marks	burned	side	age	zone 1	zone 2	zone 3	zone 4	zone 5	zone 6	zone 7	zone 8	Family Identification	Tentative Identification	Comment
68	0050	NA	no	R	A	0	1	1	1	1	1	1	0	Anatidae	Anatidae	
69	0050	NA	no	L	A	0	0	1	0	1	0	1	1	Anatidae	Anatidae	
70	0050	NA	no	L	A	0	1	1	1	0	0	0	0	Anatidae	medium Anatidae	
71	0050	NA	no	L	A	0	0	1	0	1	0	1	1	Anatidae	Anatidae	Compare with *Melanitta sp*. or *Oxyuria Jamaicensis*. These should be about the right size.
72	0050	NA	no	L	A	0	0	1	0	1	0	1	1	Anatidae	*Aix sponsa*	
73	0050	NA	no	R	A	1	1	1	0	1	0	0	0	Anatidae	Anatidae	
74	0050	NA	yes	R	A	0	0	1	0	1	0	1	1	NA	medium aves	
75	0050	NA	no	R	A	0	0	0	0	1	0	1	1	Anatidae	Anatidae	Mallard size, but the tuberosity for metacarpal is more flaring. Compare to the divers.
76	0050	NA	no	L	A	0	0	0	0	1	0	1	1	Anatidae	Anatidae	
77	0050	NA	no	L	A	1	0	1	0	0	0	0	0	Anatidae	Anatidae	
78	0050	NA	no	L	A	0	0	0	0	1	0	1	1	Anatidae	Anatidae	
79	0062	NA	no	R	A	0	0	1	0	1	1	1	1	Anatidae	*Melanitta sp.*	
80	0062	NA	no	R	A	0	0	1	0	1	0	1	1	NA	medium aves	Similar to Melanitta, but too few landmarks diagnostic of taxon present.
81	0062	NA	no	R	A	0	0	0	0	1	0	1	1	Anatidae	*Melanitta sp.*	
82	0062	NA	no	L	A	0	0	0	0	1	0	1	1	Anatidae	anatidae	
83	0053	NA	no	R	A	0	1	1	0	0	0	0	0	Anatidae	*Mergus sp.*	
84	0054	NA	no	R	A	0	0	1	1	1	0	0	0	NA	large aves	Similar to *Branta bernicla*, but too few landmarks diagnostic of taxon for a positive identification.
85	0055	NA	no	R	A	0	1	1	0	1	0	1	1	Anatidae	*Melanitta sp.*	
86	0055	NA	yes	R	A	0	0	1	0	1	0	0	0	Anatidae	medium Anatidae	
87	0055	NA	no	L	A	0	0	1	0	1	0	0	0	Anatidae	medium Anatidae	
88	0055	NA	no	L	A	0	0	0	0	1	0	1	1	Anatidae	*Melanitta sp.*	
89	0055	NA	no	L	A	0	1	1	0	1	0	0	0	NA	medium aves	
90	0056	NA	no	R	A	0	0	0	0	1	0	1	1	Anatidae	*Melanitta sp.*	
91	0056	NA	no	L	A	0	0	0	0	1	0	1	1	Anatidae	*Melanitta sp.*	
92	0057	NA	no	L	A	0	1	1	0	0	0	0	0	Anatidae	medium Anatidae	

Specimen #	Bag #	zones with cut marks	burned	side	age	zone 1	zone 2	zone 3	zone 4	zone 5	zone 6	zone 7	zone 8	Family Identification	Tentative Identification	Comment
93	0057	NA	no	L	A	0	0	1	0	1	0	1	1	Anatidae	*Melanitta sp.*	
94	0057	7, 5	no	L	A	0	0	0	0	1	0	1	1	Anatidae	*Branta bernicla*	
95	0057	NA	no	R	A	0	0	0	0	1	0	1	1	Anatidae	*Melanitta perspicillata*	
96	0058	NA	no	R	A	0	0	1	0	1	0	1	0	Anatidae	Anatidae	
97	0059	NA	yes	L	A	0	0	1	0	1	0	0	0	NA	medium aves	
98	0060	NA	no	R	A	0	1	1	0	0	0	0	0	Anatidae	Anatidae	
99	0061	NA	no	R	A	1	1	0	0	0	0	0	0	Podicipedidae	Podicipedidae	
100	0062	NA	no	R	A	1	1	1	1	1	0	1	1	Anatidae	*Melanitta perspicillata*	
101	0062	NA	no	R	A	0	0	1	0	1	1	1	1	Anatidae	large Anatidae	Brant size or larger.
102	0062	NA	no	R	A	0	0	1	0	1	0	0	0	Anatidae	*Melanitta sp.*	The curvature of the extensor tendon groove is a match.
103	0062	NA	yes	R	A	0	0	1	0	1	0	1	0	Anatidae	*Melanitta sp.*	
104	0062	NA	yes	L	A	0	0	0	0	1	1	1	1	Anatidae	large Anatidae	Brant size or larger.
105	0062	NA	no	R	A	0	0	0	0	1	0	1	1	Anatidae	*Melanitta sp.*	The curvature of the extensor tendon groove is a match.
106	0062	NA	no	R	A	0	0	0	0	1	0	1	1	Anatidae	medium Anatidae	
107	0062	NA	no	L	A	0	1	1	0	0	0	0	0	Anatidae	*Melanitta sp.*	
108	0062	NA	no	L	A	0	0	1	0	1	1	1	1	Anatidae	medium Anatidae	
109	0064	NA	yes	R	A	0	0	0	0	1	0	1	1	Gaviidae	*Gavia sp.*	
110	0064	NA	no	R	A	1	0	1	0	0	0	0	0	Anatidae	*Melanitta perspicillata*	
111	0064	NA	no	R	A	0	1	1	0	0	0	0	0	Anatidae	*Melanitta perspicillata*	
112	0064	NA	no	L	A	0	1	1	0	0	0	0	0	Anatidae	*Melanitta sp.*	
113	0064	NA	no	L	A	0	0	1	0	1	0	1	1	Anatidae	*Melanitta perspicillata*	The curvature of the extensor tendon groove is a match.
114	0064	NA	yes	L	A	0	0	1	0	1	0	1	1	Anatidae	*Melanitta perspicillata*	The curvature of the extensor tendon groove is a match.
115	0064	NA	no	L	A	0	0	0	0	1	0	1	1	Anatidae	medium Anatidae	Digital facets are shaped differently than *Melanitta sp.*
116	0066	NA	no	L	A	0	0	1	1	0	0	0	0	Anatidae	*Melanitta sp.*	
117	0066	NA	no	R	A	0	1	1	1	0	0	0	0	Anatidae	*Melanitta sp.*	
118	0066	NA	yes	L	A	0	0	0	0	1	0	1	1	Anatidae	*Melanitta sp.*	Classified as burned because the ceramic tinkling sound it makes when it is dropped on the table.

Specimen #	*Bag #*	*zones with cut marks*	*burned*	*side*	*age*	*zone 1*	*zone 2*	*zone 3*	*zone 4*	*zone 5*	*zone 6*	*zone 7*	*zone 8*	*Family Identification*	*Tentative Identification*	*Comment*
119	0067	NA	no	R	A	0	1	1	0	0	0	0	0	Corvidae	Corvidae	Also similar to picidae.
120	0067	NA	no	R	A	0	0	1	0	1	1	1	1	Podicipedidae	Podicipedidae	Slightly larger than *Aechmophorus occidentalis*.
121	0067	NA	yes	R	A	0	0	1	0	1	0	1	1	Anatidae	*Melanitta fusca*	
122	0068	NA	no	L	A	0	1	1	0	0	0	0	0	Anatidae	Anatidae	
123	0069	NA	no	L	A	0	0	1	1	1	0	0	0	Anatidae	*Melanitta perspicillata*	The curvature of the extensor tendon groove is a match.
124	0069	NA	no	R	A	0	0	0	0	1	1	1	1	Anatidae	*Anas crecca*	
125	0069	NA	no	L	A	0	0	1	0	1	1	1	1	Anatidae	*Melanitta perspicillata*	
126	0069	NA	no	R	A	0	0	1	0	1	1	1	1	Laridae	Laridae	Match with *Larus californiacus* but smaller.
127	0069	NA	no	R	A	0	1	1	0	0	0	0	0	Anatidae	*Melanitta perspicillata*	
128	0069	NA	no	L	A	1	1	1	0	0	0	0	0	Anatidae	medium Anatidae	Rounded polical facet is different than *Melanitta sp.* specimens. May be erosion of the bone.
129	0069	NA	no	R	A	0	1	1	0	0	0	0	0	Anatidae	*Melanitta perspicillata*	
130	0069	NA	no	R	A	0	1	1	0	0	0	0	0	Anatidae	*Melanitta perspicillata*	
131	0069	NA	no	R	A	0	0	0	0	1	1	1	1	Anatidae	*Melanitta perspicillata*	
132	0069	NA	no	R	A	0	0	0	0	1	1	1	1	Anatidae	*Melanitta perspicillata*	
133	0069	NA	no	R	A	0	0	0	0	1	1	1	1	Anatidae	*Melanitta fusca*	
134	0069	NA	no	R	A	0	0	0	0	1	1	1	1	Anatidae	*Melanitta perspicillata*	
135	0069	NA	no	R	A	0	0	0	0	1	0	1	1	Anatidae	*Melanitta perspicillata*	
136	0069	NA	no	R	A	0	0	0	0	1	0	1	1	Anatidae	*Melanitta perspicillata*	
137	0069	NA	no	L	A	0	0	0	0	1	0	1	1	Anatidae	*Melanitta fusca*	
138	0069	NA	no	L	A	0	0	0	0	1	1	1	1	Anatidae	large Anatidae	Morphological match with Brant, but slightly larger.
139	0069	NA	no	L	A	0	0	0	0	1	1	1	1	Anatidae	*Melanitta perspicillata*	
140	0069	NA	no	R	A	0	0	0	0	1	0	0	0	Anatidae	*Melanitta perspicillata*	The curvature of the extensor tendon groove is a match.
141	0069	NA	no	I	A	0	0	1	0	0	0	0	0	NA	medium aves	Similar to *Melanitta*, but too few landmarks diagnostic of taxon present.
142	0070	NA	no	L	A	0	1	1	0	1	1	1	1	Anatidae	medium Anatidae	similar to *Melanitta perspicillata*, but the facet for digit 3 is shaped differently. Compare with specimen 147.
143	0070	NA	no	L	A	0	1	1	0	1	0	0	0	Anatidae	*Melanitta perspicillata*	

Specimen #	Bag #	zones with cut marks	burned	side	age	zone 1	zone 2	zone 3	zone 4	zone 5	zone 6	zone 7	zone 8	Family Identification	Tentative Identification	Comment
144	0070	NA	no	L	A	0	0	0	0	1	0	1	0	Anatidae	*Melanitta perspicillata*	
145	0070	NA	no	L	A	0	0	0	0	1	0	1	1	Anatidae	*Melanitta perspicillata*	
146	0070	NA	no	R	A	0	0	0	0	1	0	1	1	Anatidae	*Melanitta perspicillata*	
147	0070	NA	no	R	A	0	0	0	0	1	0	1	1	Anatidae	medium Anatidae	Distal landmarks are consistent with *Anas crecca* and *Melanitta perspicillata*, however, it is intermediate in size between these two taxa. Compare with specimen 142.
148	0071	NA	no	R	A	0	1	1	0	0	0	0	0	Corvidae	Corvidae	
149	0072	NA	no	L	A	0	1	1	0	0	0	0	0	Anatidae	medium Anatidae	Larger than *Anas Platyrhynchos*.
150	0072	NA	no	R	A	0	0	1	0	1	0	1	1	NA	small aves	Ruled out *Oxyura jamaicensis*, *Myadestes townsendi*, *Cepphus columba*, and *Charadrius vociferus*.
151	0073	NA	no	L	A	0	0	1	0	1	0	0	0	Anatidae	Anatidae	
152	0073	NA	no	L	A	0	0	1	0	1	0	1	1	NA	medium aves	Ruled out *Oxyura jamaicensis*, *Myadestes townsendi*, *Cepphus columba*, and *Charadrius vociferus*.
153	0074	NA	no	R	A	0	0	0	0	1	0	1	1	Anatidae	medium Anatidae	
154	0074	NA	no	R	A	0	0	1	0	1	0	1	1	Anatidae	medium Anatidae	
155	0074	NA	no	L	A	0	0	0	0	1	0	1	1	NA	medium aves	
156	0075	NA	no	L	A	0	0	1	0	1	0	1	1	Anatidae	medium Anatidae	Larger than *Anas platyrhynchos.*
157	0076	NA	no	R	A	0	0	1	1	1	0	0	0	NA	medium aves	Similar to specimen 155.
158	0077	NA	no	R	A	0	0	1	0	1	0	1	1	Anatidae	medium Anatidae	
159	0078	NA	no	R	A	0	0	0	0	1	0	1	1	Anatidae	medium Anatidae	
160	0079	3, 5	no	R	A	0	0	1	1	1	1	1	1	Anatidae	medium Anatidae	
161	0080	NA	no	R	A	0	0	1	0	1	0	1	1	Anatidae	medium Anatidae	
162	0081	NA	no	L	A	0	0	1	0	1	0	1	1	Anatidae	medium Anatidae	
163	0082	NA	no	L	A	0	0	1	0	1	0	1	1	Anatidae	Anatidae	
164	0083	NA	no	R	A	0	0	0	0	1	0	1	1	Anatidae	small Anatidae	
165	0084	NA	no	L	A	1	0	1	0	0	0	0	0	Anatidae	medium Anatidae	Polical facet is shaped like those found on the ducks.
166	0085	NA	no	R	A	0	0	1	0	1	0	1	1	Laridae	Laridae	Match with *Larus argentatus.*
167	0086	NA	no	R	A	0	1	1	0	1	1	1	1	Anatidae	*Melanitta perspicillata*	

Specimen #	*Bag #*	*zones with cut marks*	*burned*	*side*	*age*	*zone 1*	*zone 2*	*zone 3*	*zone 4*	*zone 5*	*zone 6*	*zone 7*	*zone 8*	*Family Identification*	*Tentative Identification*	*Comment*
168	0086	NA	no	L	A	0	0	1	0	1	1	1	1	Anatidae	*Melanitta perspicillata*	
169	0086	NA	no	R	A	0	1	1	0	0	0	0	0	Anatidae	*Melanitta perspicillata*	
170	0086	NA	no	R	A	1	1	0	0	0	0	0	0	Anatidae	medium Anatidae	
171	0086	NA	no	R	A	0	1	0	0	0	0	0	0	NA	medium aves	Likely a medium Anatidae, however too few landmarks remain for a positive ID.
172	0086	NA	no	R	A	0	0	0	0	1	0	1	1	Anatidae	*Melanitta perspicillata*	
173	0086	NA	no	L	A	0	0	1	0	1	0	1	0	Anatidae	*Melanitta perspicillata*	
174	0086	NA	no	R	A	0	0	1	0	0	0	0	0	NA	medium aves	Likely medium to large Anatid, however too few landmarks diagnostic of taxon are present for an affirmative ID.
175	0086	NA	no	L	A	0	0	1	0	1	1	1	1	Anatidae	*Melanitta perspicillata*	
176	0086	NA	no	R	A	0	0	1	0	0	0	0	0	NA	medium aves	Likely medium to large Anatid, however too few landmarks diagnostic of taxon are present for an affirmative ID.
177	0086	NA	no	R	A	0	0	0	0	1	1	1	1	Anatidae	large Anatidae	Larger than Branta bernicla
178	0086	NA	no	R	A	0	0	0	0	1	1	1	1	Anatidae	Melanitta perspicillata	
179	0086	NA	no	L	A	0	0	0	0	1	0	0	0	NA	large aves	There are too few landmarks diagnostic of taxon for an affirmative ID.
180	0086	NA	no	R	A	0	0	0	0	1	1	1	1	Anatidae	large Anatidae	Larger than Branta bernicla
181	0087	NA	no	R	A	0	1	1	1	1	1	1	1	Anatidae	Anatidae	Smaller than *Anas platyrhynchos*, larger than *Melanitta perspicillata.*
182	0087	NA	no	L	A	0	1	1	0	1	0	1	0	Anatidae	Anatidae	
183	0087	NA	no	L	A	0	1	1	0	1	0	1	0	Anatidae	Anatidae	
184	0087	NA	no	L	A	0	1	1	0	1	0	0	0	Anatidae	Anatidae	
185	0087	NA	no	R	A	0	1	1	0	1	0	0	0	Anatidae	Anatidae	
186	0087	NA	no	L	A	0	0	1	0	1	1	1	1	Anatidae	Anatidae	
187	0087	NA	no	L	A	0	0	1	0	1	0	1	1	Anatidae	Anatidae	
188	0087	NA	no	R	A	0	0	1	0	1	0	1	1	Anatidae	Anatidae	
189	0087	NA	no	R	A	0	0	1	0	1	0	1	1	Anatidae	Anatidae	
190	0087	NA	no	R	A	0	0	1	0	1	0	1	1	Anatidae	Anatidae	
191	0087	NA	no	L	A	0	0	1	0	1	0	1	1	Anatidae	Anatidae	

Specimen #	Bag #	zones with cut marks	burned	side	age	zone 1	zone 2	zone 3	zone 4	zone 5	zone 6	zone 7	zone 8	Family Identification	Tentative Identification	Comment
192	0087	NA	no	L	A	0	0	1	0	1	0	1	1	Anatidae	Anatidae	
193	0087	NA	no	R	A	0	0	1	0	1	0	1	1	Anatidae	Anatidae	
194	0087	NA	no	L	A	0	0	0	0	1	0	1	1	Anatidae	medium Anatidae	Compare with *Melanitta sp.*
195	0087	NA	no	R	A	0	0	0	0	1	0	1	1	Anatidae	medium Anatidae	Compare with *Melanitta sp.*
196	0087	NA	no	L	A	0	0	0	0	1	0	1	1	NA	medium aves	Compare with *Melanitta sp.*
197	0087	NA	no	R	A	0	0	0	0	1	0	1	1	NA	medium aves	Compare with *Melanitta sp.*
198	0087	NA	no	L	A	0	0	0	0	1	0	1	1	Anatidae	Anatidae	
199	0087	NA	no	L	A	0	0	0	0	1	0	1	1	NA	small aves	Compare with Podicipediformes.
200	0088	NA	no	L	A	0	0	1	1	1	0	0	0	NA	medium aves	
201	0457	NA	no	L	A	1	1	0	0	0	0	0	0	NA	medium aves	D. Hansen identified as Anatinae. I decided there are too few landmarks for a positive identification. It could also be a medium sized gull.
202	0090	NA	no	L	A	0	0	0	0	1	1	1	1	Anatidae	large Anatidae	Goose.
203	0090	NA	no	I	A	0	0	0	0	1	1	0	0	NA	medium aves	Ruled out Anatidae and Phalacrocorax.
204	0090	NA	no	I	A	0	0	0	0	1	1	0	0	NA	very large aves	Goose size.
205	0091	NA	no	L	A	0	0	0	0	1	1	1	1	NA	medium aves	Ruled out *Melanitta sp*. and *Phalacrocorax sp.*
206	0092	NA	no	L	A	1	1	1	1	1	1	0	0	NA	medium aves	Ruled out *Melanitta sp.* and *Phalacrocorax sp.*
207	0093	NA	no	L	A	1	1	1	1	0	0	0	0	Anatidae	small Anatidae	
208	0094	NA	no	L	A	1	1	1	1	1	1	1	1	Anatidae	medium Anatidae	
209	0094	NA	no	I	A	0	0	1	1	0	0	0	0	NA	medium aves	
210	0095	NA	no	I	A	0	0	0	0	1	1	0	0	NA	medium aves	
211	0096	5, 6	no	I	A	0	0	0	0	1	1	0	0	NA	medium aves	Polished.
212	0097	NA	no	R	A	1	1	1	1	1	1	0	0	Laridae	Laridae	Smaller than *Larus argentatus*, and with *Larus canus*.
213	0097	NA	no	L	A	0	0	0	0	1	1	1	1	Anatidae	medium Anatidae	
214	0098	NA	no	L	S	0	0	0	0	1	1	1	1	Anatidae	large Anatidae	
215	0098	NA	no	R	A	1	1	1	1	1	1	0	0	Anatidae	*Aix sponsa*	
216	0098	NA	no	R	A	0	0	0	0	1	1	1	1	Anatidae	Anatidae	

Specimen #	*Bag #*	*zones with cut marks*	*burned*	*side*	*age*	*zone 1*	*zone 2*	*zone 3*	*zone 4*	*zone 5*	*zone 6*	*zone 7*	*zone 8*	*Family Identification*	*Tentative Identification*	*Comment*
217	0099	NA	no	R	A	0	0	0	0	1	1	1	1	NA	medium aves	Compare with *Cephus columba*.
218	0100	NA	no	I	A	0	0	0	0	1	1	0	0	NA	very large aves	Fits with specimen 219.
219	0100	NA	no	I	A	0	0	0	0	1	0	0	0	NA	very large aves	Fits with specimen 218.
220	0101	NA	no	L	A	0	0	0	0	1	1	1	1	Anatidae	small Anatidae	
221	0102	NA	no	R	S	0	0	0	0	1	1	1	1	NA	medium aves	Compare with Corvidae.
222	0102	NA	no	R	S	1	1	1	1	1	1	0	0	NA	medium aves	Fits with specimen 221.
223	0102	NA	no	R	S	0	0	0	0	1	1	1	1	NA	medium aves	Compare with Corvidae.
224	0103	5	no	I	A	0	0	0	0	1	1	0	0	NA	medium aves	
225	0104	NA	no	R	A	1	1	1	1	1	1	0	0	Alcidae	Alcidae	
226	0104	NA	no	R	A	0	0	0	0	1	1	1	1	Anatidae	medium Anatidae	
227	0105	NA	no	R	A	1	1	1	1	1	1	0	0	NA	medium aves	Ruled out *Cepphus columba*, ruled out *Uria aalge*, ruled out *Uria lomvia.*
228	0105	NA	no	L	A	1	1	1	1	1	1	0	0	NA	medium aves	Ruled out *Cepphus columba*, ruled out *Uria aalge*, ruled out *Uria lomvia.*
229	0105	NA	no	R	S	0	0	0	0	1	1	1	1	NA	small aves	Possible Anatidae, but there is an extra tubercle on the ventral surface.
230	0106	NA	no	R	A	0	0	1	1	1	1	1	1	Laridae	*Larus argentatus*	
231	0106	NA	no	L	A	0	0	1	1	1	1	0	0	Anatidae	*Melanitta perspicillata*	
232	0106	NA	no	R	A	0	0	0	0	1	1	1	1	Gaviidae	*Gavia sp.*	Smaller than Pacific loon, compare with *Gavia stellata.*
233	0107	NA	no	R	A	1	1	1	1	1	1	0	0	Anatidae	Anatidae	
234	0108	NA	no	R	A	0	0	0	0	1	1	1	1	Anatidae	small Anatidae	
235	0109	NA	no	I	A	0	0	0	0	1	1	0	0	NA	medium aves	Two part refit. Possibly a gull based on the prominent quill knobs, however, its not definitive.
236	0109	NA	no	I	A	0	0	0	0	1	1	0	0	NA	medium aves	
237	0109	NA	no	I	A	0	0	0	0	1	0	0	0	NA	medium aves	
238	0110	2	no	R	A	1	1	1	1	1	1	0	0	Picidae	*Colaptes auratus*	
239	0111	NA	yes	L	A	0	0	0	0	1	1	1	1	Anatidae	Anatidae	Larger than *Melanitta sp*.
240	0111	NA	no	L	A	0	0	0	1	1	1	0	0	NA	medium aves	
241	0112	NA	no	L	A	1	1	1	1	1	1	1	1	Laridae	Laridae	

Specimen #	Bag #	zones with cut marks	burned	side	age	zone 1	zone 2	zone 3	zone 4	zone 5	zone 6	zone 7	zone 8	Family Identification	Tentative Identification	Comment
242	0112	NA	no	L	A	0	0	0	1	1	1	0	0	Laridae	Laridae	
243	0112	NA	no	L	A	0	0	0	0	1	1	1	1	Anatidae	Anatidae	Larger than *Melanitta sp.*
244	0113	NA	no	I	A	0	0	0	0	1	1	0	0	Laridae	Laridae	Identification based on size and two prominent parallel rows of qill knobs.
245	0114	NA	no	L	A	0	0	0	0	1	1	1	1	Anatidae	*Oxyuria jamaicensis*	
246	0116	NA	no	L	A	0	0	0	0	1	1	1	1	NA	small aves	Similar to podiceps but not a match.
247	0117	NA	no	R	A	0	0	1	1	1	1	0	0	NA	medium aves	
248	0119	NA	no	R	A	1	1	1	1	0	0	1	0	Picidae	Picidae	
249	0120	NA	no	R	A	0	0	0	0	1	1	1	1	NA	small aves	Compare with Anatids, and Alcidae.
250	0120	NA	no	R	A	1	1	1	1	0	0	0	0	NA	medium aves	
251	0121	NA	no	L	A	1	1	1	1	1	1	1	1	Alcidae	Alcidae	*Uria aalge*
252	0121	NA	no	L	A	1	1	1	1	0	0	0	0	NA	medium aves	Compare with plover.
253	0122	NA	no	I	A	0	0	0	0	1	0	0	0	NA	very large aves	
254	0123	NA	no	R	A	1	1	1	1	1	1	1	1	Picidae	Picidae	
255	0123	NA	no	R	A	0	0	0	0	1	1	1	1	NA	small aves	Compare with plover.
256	0124	NA	no	L	A	1	1	1	1	1	1	1	1	Anatidae	medium Anatidae	
257	0125	NA	no	R	A	1	1	1	1	0	0	0	0	Anatidae	medium Anatidae	Larger than and Mallard Hen.
258	0127	NA	no	R	A	1	1	1	1	0	0	0	0	Anatidae	medium Anatidae	Compare with *Anas platyrhynchos*.
259	0128	NA	no	R	A	0	0	0	0	1	1	1	1	Anatidae	Mel*anitta perspicillata*	
260	0129	NA	no	R	A	0	0	0	0	1	1	1	1	Anatidae	small Anatidae	Compare with *Oxyuria jamaicensis*.
261	0130	NA	no	L	S	1	1	1	1	1	1	0	0	Accipitridae	Accipitridae	Match with Cohen and Searjeantsen drawing of Haliaeetus.
262	0130	NA	no	L	A	0	0	0	0	1	1	1	1	Anatidae	Anserini	Specimens 262 and 263 are paired elements.
263	0130	NA	no	R	A	0	0	0	0	1	1	1	1	Anatidae	Anserini	Specimens 262 and 263 are paired elements.
264	0130	NA	no	R	A	0	0	0	0	1	1	1	1	Accipitridae	*Halaetus leucocephalus*	
265	0130	NA	no	L	A	0	0	0	0	0	0	1	1	Accipitridae	*Halaetus leucocephalus*	
266	0130	NA	no	L	A	1	1	1	0	0	0	0	0	Anatidae	Anserini	Compare with Canada goose.

Specimen #	*Bag #*	*zones with cut marks*	*burned*	*side*	*age*	*zone 1*	*zone 2*	*zone 3*	*zone 4*	*zone 5*	*zone 6*	*zone 7*	*zone 8*	*Family Identification*	*Tentative Identification*	*Comment*
267	0130	NA	no	R	S	1	1	1	1	1	1	0	0	Picidae	Picidae	
268	0131	NA	no	L	A	1	1	1	1	1	1	1	1	Charadriidae	Charadriidae	Compare with plovers.
269	0131	NA	no	R	A	0	1	1	1	1	1	1	1	NA	Passeriformes	
270	0151	NA	no	I	A	0	0	0	0	1	0	0	0	NA	very large aves	
271	0132	NA	no	L	A	0	0	0	0	1	1	1	1	Podicipedidae	Podicipedidae	Same size as *Podiceps nigricolis*.
272	0132	NA	no	I	A	0	0	0	0	1	0	0	0	NA	medium aves	
273	0133	NA	no	L	A	1	1	1	1	0	0	0	0	Anatidae	*Anas sp.*	
274	0134	NA	no	L	A	1	1	1	1	1	1	0	0	NA	small aves	Unique triangular cross-section. Compare with Sternidae.
275	0134	NA	no	R	A	0	1	1	1	0	0	0	0	Corvidae	Corvidae	
276	0135	NA	no	L	A	1	1	1	1	1	1	1	1	NA	small aves	Compare with galliformes. This specimen has the same curvature.
277	0136	NA	no	R	A	0	0	0	0	1	1	1	1	Anatidae	Anatidae	Mallard size, slightly different distal condyles.
278	0137	NA	no	R	A	0	0	0	0	1	1	1	1	Anatidae	Anatidae	Larger than a mallard.
279	0138	NA	no	R	A	0	0	0	0	1	1	1	1	Alcidae	*Uria aalge*	This specimen fits with specimen 280.
280	0138	NA	no	L	A	1	1	1	1	1	0	0	0	Alcidae	*Uria aalge*	This specimen fits with specimen 279.
281	0139	NA	no	R	A	1	1	1	1	1	0	0	0	Podicipedidae	Podicipedidae	Compare with *Podilymbus podiceps.*
282	0140	NA	no	R	A	1	1	1	1	1	1	0	0	Podicipedidae	Podicipedidae	Compare with *Podilymbus podiceps*
283	0141	NA	no	L	A	1	1	1	1	1	1	0	0	Alcidae	Alcidae	Smaller than Uria aalge. Compare with *Cepphus columba.*
284	0142	NA	no	L	A	0	0	1	1	1	0	0	0	Anatidae	Merginae	Match with *Melanitta perspicilatta*, however, too few diagnostic landmarks for positive id.
285	0143	5	no	R	A	0	0	0	0	1	1	1	1	Anatidae	*Melanitta sp.*	
286	0086	NA	no	I	A	0	0	0	0	1	1	0	0	NA	medium aves	Likely Anatidae, based on the tendon groove. However, there are too few landmarks for a positive ID.
287	0144	NA	no	R	A	1	1	1	1	1	1	0	0	Alcidae	*Cepphus columba*	
288	0145	NA	no	L	A	0	1	1	1	1	1	1	1	Alcidae	*Uria aalge*	Specimens 288 and 289 are paired elements.
289	0145	NA	no	R	A	0	1	1	1	1	1	1	1	Alcidae	*Uria aalge*	Specimens 288 and 289 are paired elements.
290	0146	NA	no	L	A	1	1	1	1	1	1	1	1	NA	small aves	Compare with passeriformes. Ayers et al. (2003) size terminology.
291	0147	NA	yes	R	A	0	0	0	0	1	1	1	1	Alcidae	*Uria aalge*	

Specimen #	Bag #	zones with cut marks	burned	side	age	zone 1	zone 2	zone 3	zone 4	zone 5	zone 6	zone 7	zone 8	Family Identification	Tentative Identification	Comment
292	0148	NA	no	L	A	1	1	1	1	1	0	0	0	Alcidae	*Cepphus columba*	
293	0148	NA	no	R	A	0	0	0	0	1	1	1	1	Anatidae	Anatidae	
294	0148	NA	no	L	A	0	0	0	0	1	1	1	1	Alcidae	*Cepphus columba*	
295	0149	NA	no	R	A	0	0	0	0	1	1	1	1	Anatidae	medium Anatidae	
296	0149	NA	no	L	A	1	1	1	1	0	0	0	0	Anatidae	*Melanitta perspicillata*	
297	0149	NA	no	R	A	1	1	1	1	0	0	0	0	Alcidae	Alcidae	Smaller than *Uria aalge*. Compare with *Cepphus columba*.
298	0150	NA	no	L	A	1	1	1	1	1	1	1	1	Anatidae	*Melanitta perspicillata*	
299	0150	NA	no	R	A	1	1	1	1	1	1	0	0	Anatidae	*Melanitta sp.*	
300	0150	NA	no	L	A	1	1	1	1	1	1	0	0	Anatidae	*Melanitta perspicillata*	
301	0150	NA	yes	L	A	1	1	1	1	1	1	0	0	NA	medium aves	Similar to Anatidae, but ventral coyle is too large.
302	0150	NA	no	R	A	1	1	1	0	0	0	0	0	Anatidae	Anatidae	Larger than a mallard, smaller than a snow goose. Compare with Brandt.
303	0150	NA	no	R	A	0	0	0	0	0	0	1	1	Anatidae	Anatidae	Larger than a mallard, smaller than a snow goose. Compare with Brandt.
304	0151	NA	no	L	A	0	0	0	0	1	1	1	1	Anatidae	*Melanitta perspicillata*	
305	0151	NA	no	R	A	0	0	0	0	1	1	1	1	Anatidae	*Melanitta perspicillata*	
306	0151	NA	no	L	A	1	1	1	1	1	1	1	1	Alcidae	Alcidae	Compare with tribe Synthliboramphini (murrletes).
307	0151	NA	no	L	A	1	1	1	1	1	1	0	0	Anatidae	*Anas platyrhynchos*	
308	0151	NA	no	L	A	1	1	1	1	1	1	0	0	Laridae	small Laridae	Smaller than a Red-legged Kittiwake.
309	0151	NA	no	R	A	0	0	0	0	1	1	1	1	Picidae	Picidae	Fits with specimen 311.
310	0151	NA	no	R	A	0	0	0	0	0	0	1	1	Anatidae	*Anas platyrhynchos*	
311	0151	NA	no	R	A	1	1	1	1	0	0	0	0	Picidae	Picidae	Fits with specimen 309.
312	0151	NA	no	R	A	0	0	0	0	0	0	1	1	Anatidae	Anatidae	Compare with Brandt.
313	0152	NA	no	L	A	1	1	1	1	1	1	1	1	Anatidae	small Anatinae	Sp. 313 and 314 are paired elements.
314	0152	NA	no	R	A	1	1	1	1	1	1	1	1	Anatidae	small Anatinae	Sp. 313 and 314 are paired elements.
315	0152	5, 6	no	I	A	0	0	0	0	1	1	0	0	NA	very large aves	
316	0153	NA	no	R	A	0	0	0	0	1	1	1	1	Podicipedidae	Podicipedidae	

Specimen #	Bag #	zones with cut marks	burned	side	age	zone 1	zone 2	zone 3	zone 4	zone 5	zone 6	zone 7	zone 8	Family Identification	Tentative Identification	Comment
317	0153	NA	no	I	A	0	0	1	1	1	1	0	0	NA	medium aves	
318	0115	NA	no	I	A	0	0	0	0	1	0	0	0	NA	very large aves	
319	0154	NA	no	L	A	1	1	1	1	1	1	0	0	Anatidae	*Melanitta sp.*	
320	0155	NA	no	R	A	1	1	1	1	0	0	0	0	Corvidae	Corvidae	
321	0156	NA	no	I	A	0	0	0	0	0	0	1	1	Accipitridae	*Haliaetus leucocephalus*	Two pieces, refit.
322	0157	NA	no	R	S	1	1	1	1	1	1	1	1	Corvidae	Corvidae	Specimens 322, and 323 are paired elements.
323	0157	NA	no	L	S	0	0	0	0	0	0	1	1	Corvidae	Corvidae	Specimens 322, and 323 are paired elements.
324	0158	NA	no	L	S	0	0	0	0	1	1	1	1	NA	medium aves	Ayres et al. (2003) size class.
325	0159	NA	no	R	S	0	0	0	0	1	1	1	1	NA	small aves	
326	0160	NA	no	R	A	1	1	1	1	0	0	0	0	Anatidae	Anserini	
327	0160	NA	no	R	A	0	0	0	0	1	1	1	1	Anatidae	Anserini	
328	0160	NA	no	L	A	0	0	0	0	1	1	1	1	NA	medium aves	
329	0161	NA	no	R	A	1	1	1	1	1	1	1	1	Corvidae	Corvidae	
330	0164	NA	no	L	A	1	1	1	1	1	1	1	1	Alcidae	*Uria aalge*	Compare to specimens 320, 322, and 329.
331	0165	NA	no	L	A	1	1	1	1	0	0	0	0	Accipitridae	*Halaetus leucocephalus*	
332	0165	NA	no	R	A	1	1	1	1	1	1	0	0	Anatidae	*Melanitta perspicillata*	
333	0166	NA	no	L	A	1	1	1	1	0	0	0	0	NA	medium aves	Similar to Accipitriformes, but no pneumatic foramen.
334	0166	NA	no	L	A	1	1	0	0	0	0	0	0	NA	Charadriiformes	Similar to *Haematopus bachmani*, and medium sized Larids.
335	0167	NA	no	L	A	1	1	1	1	0	0	0	0	Anatidae	*Melanitta perspicillata*	
336	0168	NA	no	L	A	1	1	1	1	0	0	0	0	Anatidae	*Melanitta perspicillata*	
337	0169	NA	no	L	A	1	1	1	0	0	0	0	0	Accipitridae	*Halaetus leucocephalus*	
338	0169	NA	no	R	A	0	0	0	0	1	1	1	1	Anatidae	*Melanitta perspicillata*	
339	0170	NA	no	L	A	0	0	0	0	1	1	1	1	NA	medium aves	Similar to Anatidae, but not exclusively so.
340	0171	2, 4, 8	no	L	A	1	1	1	1	1	1	1	1	Anatidae	*Melanitta perspicillata*	
341	0171	NA	yes	R	A	1	1	1	1	1	1	0	0	Anatidae	*Melanitta perspicillata*	

Specimen #	Bag #	zones with cut marks	burned	side	age	zone 1	zone 2	zone 3	zone 4	zone 5	zone 6	zone 7	zone 8	Family Identification	Tentative Identification	Comment
342	0172	NA	no	R	A	1	1	1	1	0	0	0	0	Accipitridae	*Halaetus leucocephalus*	Larger that comparison specimen. Also a match with *Aquila chrysaetos.*
343	0172	8	no	L	A	0	0	0	0	0	0	1	1	Accipitridae	*Halaetus leucocephalus*	Larger that comparison specimen. Also a match with *Aquila chrysaetos.*
344	0172	NA	no	R	A	0	0	0	0	0	0	0	1	Accipitridae	*Halaetus leucocephalus*	Larger that comparison specimen. Also a match with *Aquila chrysaetos.*
345	0174	NA	no	R	A	1	1	1	1	0	0	0	0	Anatidae	medium Anatidae	
346	0175	3, 4	no	L	A	1	1	1	1	0	0	0	0	NA	large Passeriformes	
347	0176	NA	no	R	S	1	1	1	1	1	1	0	0	NA	large Passeriformes	
348	0177	NA	yes	R	A	1	1	1	1	0	0	0	0	Anatidae	medium Anatidae	Match with *Melanitta sp.*
349	0178	NA	no	R	S	1	1	1	1	1	1	0	0	NA	large Passeriformes	
350	0179	NA	no	L	A	1	1	1	1	1	1	0	0	Corvidae	Corvidae	
351	0180	NA	no	L	A	0	0	0	0	1	1	1	1	Anatidae	*Melanitta perspicillata*	
352	0181	6	no	R	S	0	0	0	0	0	1	1	1	Anatidae	*Melanitta perspicillata*	
353	0182	NA	no	I	A	0	0	0	1	0	0	0	0	NA	very large aves	
354	0183	NA	no	R	A	0	0	0	0	1	1	1	1	Anatidae	Anserini	
355	0184	NA	no	I	A	0	0	0	0	1	1	1	1	Podicipedidae	*Aechmophorus sp.*	
356	0185	4, 6	no	R	A	0	0	1	1	1	1	0	0	NA	medium aves	
357	0185	5,6	no	R	A	0	0	0	0	1	1	1	1	NA	medium aves	
358	0186	NA	no	L	A	0	0	0	1	1	1	0	0	NA	medium aves	
359	0187	NA	no	R	A	1	1	1	1	0	0	0	0	NA	medium aves	
360	0188	NA	no	R	S	1	1	1	1	0	0	0	0	Anatidae	medium Anatidae	
361	0189	NA	no	L	A	0	0	0	0	1	1	1	1	Anatidae	small Anatinae	
362	0190	NA	no	L	A	0	0	0	1	0	0	0	0	NA	very large aves	
363	0191	NA	no	L	S	0	0	0	0	1	1	1	1	Alcidae	Alcidae	Reasonable match with *Uria lomvia*. Supracondylar bridge of *Uria aalge* is of a different morphology.
364	0192	NA	no	L	A	0	0	1	1	0	0	0	0	NA	medium aves	
365	0193	NA	no	R	A	0	0	0	0	0	0	1	1	Accipitridae	*Halaetus leucocephalus*	
366	0194	NA	no	L	A	0	0	1	1	0	0	0	0	NA	medium aves	

Specimen #	Bag #	zones with cut marks	burned	side	age	zone 1	zone 2	zone 3	zone 4	zone 5	zone 6	zone 7	zone 8	Family Identification	Tentative Identification	Comment
367	0195	NA	no	R	A	1	1	1	1	0	0	0	0	Gaviidae	Gaviidae	
368	0197	5, 6	no	R	A	0	0	0	0	1	1	1	1	NA	medium aves	Compare with Alcidae and Murres.
369	0198	NA	no	L	A	0	0	1	1	0	0	0	0	NA	medium aves	
370	0198	NA	no	R	A	0	0	1	1	0	0	0	0	NA	medium aves	
371	0199	NA	no	R	A	0	0	0	0	1	1	1	1	Anatidae	Anatidae	
372	0199	NA	yes	L	A	0	0	0	0	1	1	1	1	Anatidae	*Aix sponsa*	
373	0200	NA	yes	R	A	0	0	1	1	0	0	0	0	Anatidae	Anatidae	
374	0201	NA	no	L	A	1	1	1	1	0	0	0	0	Anatidae	*Melanitta sp.*	Paired element of sp. 375.
375	0201	NA	no	R	A	1	1	1	1	0	0	0	0	Anatidae	*Melanitta sp.*	Paired element of sp. 374.
376	0202	NA	no	R	A	1	1	1	1	0	0	0	0	Accipitridae	Accipitridae	Too small to be *Halaetus leucocephalus*.
377	0203	NA	no	R	A	1	1	1	1	0	0	0	0	Accipitridae	*Halaetus leucocephalus*	
378	0203	NA	no	L	S	0	0	0	0	1	1	1	1	Anatidae	*Aix sponsa*	
379	0204	NA	no	L	A	1	1	1	1	1	1	1	1	NA	Accipitriformes	
380	0204	NA	no	I	A	1	1	1	1	0	0	0	0	Pandionidae	*Pandion haliaetus*	Compared with other Accipitriformes. Landmarks are uniquely Osprey.
381	0245	NA	no	L	A	0	0	0	0	0	1	0	1	NA	medium aves	
382	0207	NA	no	L	A	1	1	1	0	0	0	0	0	Anatidae	*Melanitta perspicillata*	
383	0207	NA	no	R	A	0	0	0	0	1	1	1	1	Corvidae	Corvidae	
384	0208	NA	no	R	A	1	1	1	1	0	0	0	0	Podicipedidae	Podicipedidae	Compare wit Podiceps auritus.
385	0209	NA	no	L	A	1	1	1	1	1	1	0	0	Anatidae	Anatidae	Similar to *Melanitta perspicilatta*, but shorter.
386	0209	NA	no	L	A	0	0	1	1	1	1	1	1	Anatidae	*Melanitta perspicillata*	
387	0210	6	no	L	A	0	0	0	0	1	1	1	1	Accipitridae	*Halaetus leucocephalus*	
388	0211	NA	yes	L	A	0	0	1	1	1	1	0	0	Anatidae	*Melanitta perspicillata*	
389	0212	NA	no	L	A	1	1	1	1	1	1	1	1	Picidae	Picidae	Larger than *Melanerpes formicivorus*.
390	0214	NA	no	R	A	1	1	1	1	1	1	1	1	NA	Charadriiformes	Sp. 390 and 391 are paired elements. Very close match with gulls and oystercatchers. Not with Jaegers.
391	0214	NA	no	L	A	1	1	1	1	1	1	0	1	NA	Charadriiformes	Sp. 390 and 391 are paired elements. Very close match with gulls and oystercatchers. Not with Jaegers.

Specimen #	Bag #	zones with cut marks	burned	side	age	zone 1	zone 2	zone 3	zone 4	zone 5	zone 6	zone 7	zone 8	Family Identification	Tentative Identification	Comment
392	0215	NA	no	L	A	1	1	1	1	1	1	1	1	Corvidae	Corvidae	Match made on hypotarsal ridge.
393	0216	NA	no	L	S	1	1	1	1	1	1	1	1	Anatidae	Anatidae	
394	0217	NA	no	R	A	0	0	0	0	1	1	1	1	Anatidae	Anatidae	Smaller than Scoter. Compare with other types of duck.
395	0218	NA	no	I	A	0	0	1	1	1	1	0	0	NA	medium aves	Short angular shaft.
396	0218	NA	no	L	A	0	0	0	0	1	1	1	1	Anatidae	Anatidae	Good match with Scoter.
397	0219	NA	no	L	A	0	0	0	0	0	0	1	0	Accipitridae	*Halaetus leucocephalus*	
398	0220	NA	no	I	S	1	0	1	1	1	1	0	0	NA	large aves	Ayers 2003 size class.
399	0220	NA	no	R	A	0	0	0	0	0	0	1	1	Anatidae	*Melanitta perspicillata*	
400	0220	NA	no	I	A	0	0	1	1	1	1	0	0	Anatidae	medium Anatidae	
401	0221	NA	no	L	A	0	0	0	0	1	1	1	1	Anatidae	Aythyini	
402	0160	NA	no	L	S	1	1	1	1	1	1	1	1	Corvidae	Corvidae	
403	0426	NA	no	I	A	0	0	0	0	1	1	0	0	NA	large aves	Ayers 2003 size class.
404	0219	NA	no	I	A	0	0	0	0	0	1	1	0	Anatidae	medium Anatidae	Scoter size
405	0219	NA	no	I	A	0	0	1	1	1	1	0	0	Anatidae	medium Anatidae	Scoter size
406	0201	4	yes	R	A	0	0	1	1	0	0	0	0	NA	medium aves	
407	0201	NA	yes	R	A	0	0	1	1	0	0	0	0	NA	medium aves	
408	0150	NA	yes	I	A	0	0	0	0	1	1	0	0	NA	medium aves	Large quill knobs. Compare with Laridae.
409	0290	NA	yes	L	A	1	1	1	1	0	0	0	0	Anatidae	small Anatidae	
410	0397	NA	no	L	A	0	0	0	0	1	0	1	0	Anatidae	medium Anatidae	
411	0074	NA	no	R	A	0	1	0	0	0	0	0	0	Anatidae	Anatidae	
412	0128	NA	no	I	A	0	0	1	1	1	1	0	0	NA	medium aves	
413	0398	NA	no	R	A	0	0	0	0	1	1	0	0	NA	medium aves	
414	0399	NA	no	I	A	0	0	1	1	0	0	0	0	Gaviidae	*Gavia sp.*	Large loon. Compare with *Gavia immer*.
415	0399	NA	no	R	A	0	0	0	0	1	1	1	0	Gaviidae	*Gavia sp.*	Large loon. Compare with *Gavia immer*.
416	0400	NA	no	L	A	0	0	1	1	1	1	0	0	NA	medium aves	
417	0004	NA	no	I	S	0	0	0	0	0	0	1	1	NA	large aves	Ayers 2003 size class.

Specimen #	Bag #	zones with cut marks	burned	side	age	zone 1	zone 2	zone 3	zone 4	zone 5	zone 6	zone 7	zone 8	Family Identification	Tentative Identification	Comment
418	0036	NA	no	R	A	0	0	0	0	0	0	1	1	NA	very large aves	
419	0407	NA	no	R	A	0	0	0	0	1	1	1	1	NA	small aves	Ayres et al. (2003) size terminology.
420	0408	NA	no	R	A	0	0	0	0	1	1	1	1	NA	tiny aves	This very small bone fragment fell on the floor and was lost. However, this data is correct.
421	0409	NA	no	L	A	1	0	0	0	0	0	0	0	NA	very large aves	
422	0411	5	no	R	A	0	0	1	1	1	1	1	0	NA	small aves	
423	0025	NA	no	I	A	0	0	0	0	1	1	0	0	NA	very large aves	
424	0119	NA	no	L	A	0	0	0	0	1	0	1	0	NA	very large aves	Same as specimen 425.
425	0118	NA	no	I	A	0	0	0	0	0	0	1	0	NA	very large aves	Same as specimen 424.
426	0014	NA	no	R	S	0	0	0	0	0	0	1	1	NA	small aves	
427	0422	6	no	L	A	0	0	0	0	1	1	0	0	NA	very large aves	
428	0429	NA	no	L	A	0	0	0	0	0	0	1	0	NA	medium aves	
429	0026	NA	no	I	A	0	0	0	0	1	1	0	0	NA	medium aves	
430	0430	NA	no	L	A	0	0	1	1	1	1	0	0	NA	medium aves	Similar to *Melanitta perspicilatta*. No reliable landmarks present.
431	0002	NA	no	I	A	1	1	1	1	0	0	0	0	NA	small aves	Ayres et al. (2003) size terminology.
432	0002	NA	no	I	A	1	1	1	1	0	0	0	0	NA	small aves	Ayres et al. (2003) size terminology.
433	0011	NA	no	I	S	0	0	0	0	0	0	0	1	NA	medium aves	
434	0011	NA	no	I	S	0	1	0	0	0	0	0	0	NA	medium aves	
435	0010	NA	no	L	A	0	0	0	0	1	1	1	1	NA	medium aves	Ruled out Laridae, Gavidae, and Podicipedidae.
436	0012	NA	no	I	A	0	0	0	0	0	0	0	1	NA	very large aves	
437	0012	NA	no	L	A	0	0	1	0	0	0	0	0	NA	very large aves	
438	0012	1	no	L	A	1	0	0	0	0	0	0	0	NA	very large aves	
439	0012	NA	no	I	A	1	0	0	0	0	0	0	0	NA	very large aves	
440	0013	NA	no	L	A	1	1	1	1	1	1	1	1	NA	small aves	Ayres et al. (2003) size terminology.
441	0014	NA	no	I	S	0	0	1	1	1	1	0	0	NA	small aves	Compare with Bovy dissertation fig. 2-8.
442	0014	NA	no	I	S	0	0	1	1	1	1	0	0	NA	small aves	Compare with Bovy dissertation fig. 2-8.
443	0015	NA	no	I	A	0	0	1	1	0	0	0	0	NA	large aves	Ayers 2003 size class.

Specimen #	*Bag #*	*zones with cut marks*	*burned*	*side*	*age*	*zone 1*	*zone 2*	*zone 3*	*zone 4*	*zone 5*	*zone 6*	*zone 7*	*zone 8*	*Family Identification*	*Tentative Identification*	*Comment*
444	0015	NA	no	R	S	1	0	1	1	0	0	0	0	NA	medium aves	
445	0019	NA	no	I	A	0	0	1	1	1	1	0	0	NA	medium aves	Compare with *melanitta sp.*
446	0021	5	no	L	A	0	1	1	1	1	1	1	0	NA	medium aves	Ayres et al. (2003) size class.
447	0023	NA	no	I	A	0	1	0	0	0	0	0	0	NA	small aves	Proximal end fragment.
448	0023	NA	no	I	A	0	0	1	1	1	1	0	0	NA	small aves	Shaft fragment.
449	0029	NA	no	I	A	1	1	0	0	0	0	0	0	NA	small aves	Proximal end fragment.
450	0030	NA	no	R	A	0	0	0	0	1	0	1	0	Anatidae	*Melanitta sp.*	
451	0035	6, 8	no	R	A	0	0	0	0	1	1	1	1	NA	medium aves	
452	0035	NA	yes	I	A	0	0	1	1	1	1	0	0	NA	medium aves	
453	0473	NA	no	L	A	0	1	1	0	1	0	0	0	Podicipedidae	Podicipedidae	Compare wit *Podiceps auritus.*
454	0456	NA	no	R	A	0	0	0	0	1	1	1	1	Anatidae	Anatinae	
455	0463	NA	no	L	A	1	1	0	0	0	0	0	0	NA	Falconiformes	
456	0464	NA	no	R	A	0	0	0	0	1	1	1	1	Picidae	Picidae	Larger than *Melanerpes formicivorus*, smaller than *Dryocopus pileatus.*
457	0475	NA	no	R	A	1	1	0	0	0	0	0	0	Podicipedidae	*Aechmophorus sp.*	
458	0476	NA	no	L	A	1	1	1	1	1	0	1	1	Anatidae	*Melanitta perspicillata*	Compare wity Aythayini, and Mergus.
459	0476	NA	no	R	A	0	1	1	0	0	0	0	0	Anatidae	*Melanitta perspicillata*	Compare wity Aythayini, and Mergus.
460	0477	NA	no	L	A	0	0	0	0	1	1	0	0	NA	medium aves	Size comparable to *Melanitta perspicilatta.* Too few landmarks diagnostic of taxon present.
461	0058	NA	no	L	A	0	0	1	0	1	0	0	0	NA	medium aves	Likely Anatidae, but too few landmarks for positive ID.
462	0051	NA	no	R	A	0	0	0	0	0	0	1	0	NA	large aves	Ayers 2003 size class.
463	0051	NA	no	L	A	1	1	0	0	0	0	0	0	Anatidae	Anatidae	
464	0051	NA	no	L	A	0	0	1	0	1	0	0	0	NA	medium aves	
465	0051	NA	no	R	A	0	0	0	0	1	0	0	0	NA	medium aves	
466	0086	NA	no	R	A	0	0	0	0	1	0	0	0	NA	medium aves	There are too few landmarks diagnostic of taxon for an affirmative ID.
467	0070	NA	no	L	A	0	1	0	0	0	0	0	0	NA	medium aves	Likely a medium Anatidae, cf. *Melanitta perspicillata.* However too few landmarks remain for a positive ID.
468	0068	NA	no	L	A	0	0	0	0	1	0	1	0	Anatidae	Anatidae	

Specimen #	*Bag #*	*zones with cut marks*	*burned*	*side*	*age*	*zone 1*	*zone 2*	*zone 3*	*zone 4*	*zone 5*	*zone 6*	*zone 7*	*zone 8*	*Family Identification*	*Tentative Identification*	*Comment*
469	0055	NA	no	L	A	0	0	0	0	1	0	0	0	NA	medium aves	
470	0087	NA	no	I	A	0	0	1	0	1	0	0	0	NA	medium aves	
471	0069	NA	no	R	A	0	0	0	0	1	0	0	0	NA	small aves	
472	0069	NA	no	L	A	0	1	1	0	0	0	0	0	NA	medium aves	Likely a medium Anatidae, however too few landmarks remain for a positive ID.
473	0069	NA	no	R	A	0	0	0	0	0	0	0	1	Anatidae	small Anatidae	Same morphology as *Melanitta perpicilatta*, and *Anas crecca,* intermediate in size between these two taxa.
474	0183	NA	no	I	A	0	1	1	1	0	0	0	0	NA	medium aves	
475	0247	NA	no	R	A	1	1	1	1	0	0	0	0	Anatidae	medium Anatidae	Good match with bot *Melanitta fusca*, and *Branta bernicla.*
476	0252	NA	no	R	A	1	0	1	0	0	0	0	0	Anatidae	medium Anatidae	
477	0213	NA	no	R	A	0	1	1	0	0	0	0	0	Anatidae	medium Anatidae	
478	0249	NA	no	L	A	0	0	1	1	0	0	0	0	Anatidae	*Melanitta perspicillata*	D. Hansen identified as *Melanitta sp.* Cannot rule out *Aythya americana.*
479	0253	NA	no	R	A	1	1	1	1	0	0	0	0	Anatidae	*Melanitta fusca*	Match with *Melanitta fusca.*
480	0144	NA	no	L	A	0	0	0	0	1	1	1	1	Alcidae	Alcidae	Reasonable match with *Aethia cristatella*. Compare with *Cephus columba.*
481	0475	NA	no	I	A	0	0	0	0	1	1	0	0	NA	medium aves	
482	0509	NA	no	I	A	0	0	0	0	1	0	0	0	NA	medium aves	Too few landmarks diagnostic of taxon are present for an affirmative identification.
483	0494	NA	no	R	A	0	0	0	0	1	0	0	0	NA	medium aves	Too few landmarks diagnostic of taxon are present for an affirmative identification.
484	0494	NA	no	L	A	1	1	1	0	1	0	0	0	Anatidae	*Melanitta perspicillata*	D. Hansen identified these as *Mergus sp.* They are closer to *Melanitta sp.* in my opinion.
485	0082	NA	no	I	A	0	0	1	0	1	0	0	0	Anatidae	medium Anatidae	Likely Anatidae, similar to surf scoter. Too few landmarks for confident ID. The possible tendon groove suggests it is a left, however there are too few landmarks to orient the bone.
486	0066	NA	yes	R	A	0	0	0	0	1	0	1	1	Anatidae	*Melanitta sp.*	Classified as burned because the ceramic tinkling sound it makes when it is dropped on the table.
487	0162	NA	no	L	A	0	0	0	0	1	1	0	0	NA	medium aves	Distal end Is very curved.
488	0196	4, 5, 6	no	L	A	0	0	0	0	0	0	1	1	NA	medium aves	
489	0204	NA	no	L	A	1	1	1	1	1	1	0	0	Corvidae	Corvidae	Compare with *Corvus corax*
490	0102	NA	no	L	A	1	1	0	0	0	0	0	0	NA	medium aves	Paired with 222.

Specimen #	*Bag #*	*zones with cut marks*	*burned*	*side*	*age*	*zone 1*	*zone 2*	*zone 3*	*zone 4*	*zone 5*	*zone 6*	*zone 7*	*zone 8*	*Family Identification*	*Tentative Identification*	*Comment*
491	0071	NA	no	L	A	1	1	0	1	0	0	0	0	Corvidae	Corvidae	
492	0071	NA	no	L	A	1	1	0	0	0	0	0	0	NA	very large aves	Compare with *Haliaetus leucocephalus*, *Cynus sp*, and other large birds.
493	0075	NA	no	R	A	0	0	0	0	1	0	1	1	NA	medium aves	
494	0083	NA	yes	R	A	0	0	1	0	1	0	0	0	NA	medium aves	Likely Anatidae, but too few landmarks for positive ID.
495	0126	NA	no	R	A	1	1	0	0	0	0	0	0	Accipitridae	Accipitridae	Match with Cohen and Searjeantsen drawing of Haliaeetus.
496	0130	NA	no	I	A	0	0	0	0	1	1	0	0	NA	very large aves	
497	0130	NA	no	I	A	0	0	0	0	1	1	0	0	NA	very large aves	
498	0163	NA	no	R	A	0	0	0	0	1	1	0	0	NA	medium aves	
499	0455	NA	no	L	A	0	0	1	1	1	1	0	0	NA	small aves	
500	0398	NA	no	R	A	0	0	1	1	1	1	0	0	NA	medium aves	
501	0166	NA	no	L	A	0	0	0	0	1	1	1	1	NA	medium aves	
502	0173	NA	no	L	A	0	0	0	0	1	1	0	0	NA	medium aves	
503	0175	NA	no	R	A	1	1	1	1	1	1	0	0	Laridae	small Laridae	Morphology matches *Larus argentatus*, but the specimen is smaller in size to control.
504	0191	NA	no	I	S	1	1	1	1	0	0	0	0	NA	large aves	Ayers 2003 size class.
505	0203	NA	no	R	A	0	0	0	0	1	1	1	1	Accipitridae	*Halaetus leucocephalus*	
506	0358	NA	no	L	A	1	1	1	1	1	1	0	0	NA	small aves	Compare with Corvidae.
507	0363	NA	no	I	A	0	0	1	1	0	0	0	0	NA	very large aves	
508	0363	NA	no	I	A	0	0	1	1	0	0	0	0	NA	very large aves	
509	0364	NA	no	L	A	1	1	0	1	0	0	0	0	NA	small aves	Compare with picidae.
510	0366	NA	no	I	A	0	0	1	1	0	0	0	0	NA	small aves	
511	0376	NA	no	R	S	1	1	1	1	1	1	1	1	NA	small aves	Compare with Corvidae.
512	0386	NA	no	L	A	0	0	0	0	1	0	1	1	NA	small aves	Compare with Kittiwake.
513	0387	NA	no	L	A	1	1	1	1	1	1	1	1	NA	small aves	
514	0387	NA	no	L	A	1	1	1	1	1	1	1	1	NA	small aves	
515	0393	NA	no	I	A	1	0	1	1	1	1	1	0	NA	medium aves	

Specimen #	Bag #	zones with cut marks	burned	side	age	zone 1	zone 2	zone 3	zone 4	zone 5	zone 6	zone 7	zone 8	Family Identification	Tentative Identification	Comment
516	0403	NA	no	I	A	1	0	1	1	0	0	0	0	NA	very large aves	
517	0222	NA	no	R	A	1	1	1	1	0	0	0	0	Anatidae	medium Anatidae	Match for redhead and Mallard hen.
518	0223	NA	no	L	A	0	0	0	0	1	1	1	1	NA	medium aves	
519	0224	NA	no	R	A	1	1	1	1	1	1	1	1	Anatidae	Melanitta fusca	
520	0225	NA	no	R	A	1	1	1	1	1	1	1	1	NA	small aves	Compare with passeriformes and picidae. Smaller than a common crow, not an auklet or a kittiwake.
521	0225	NA	no	R	A	1	1	1	1	1	1	0	0	Anatidae	Anatidae	Match with *Anas platyrhinchos.*
522	0226	NA	no	L	A	1	1	1	1	1	1	1	1	Strigidae	Strigidae	Small owl. Compare with *Megascops kennicottii.*
523	0227	NA	no	R	A	1	0	1	1	0	0	0	0	Anatidae	medium Anatidae	Compare with *Branta bernicla*, and *Branta hutchinsii*.
524	0229	NA	no	L	A	1	1	1	1	0	0	0	0	Corvidae	Corvidae	
525	0229	NA	no	R	A	1	1	1	1	0	0	0	0	Corvidae	Corvidae	
526	0231	NA	no	R	A	1	0	0	0	0	0	0	0	Accipitridae	*Halaetus leucocephalus*	Too large to be an Osprey or a red-tailed hawk.
527	0231	NA	no	I	A	1	0	0	0	0	0	0	0	Accipitridae	*Halaetus leucocephalus*	Too large to be an Osprey or a red-tailed hawk.
528	0231	NA	no	I	A	0	0	0	0	0	0	0	1	Accipitridae	*Halaetus leucocephalus*	Too large to be an Osprey or a red-tailed hawk.
529	0231	NA	no	I	A	0	1	0	0	0	0	0	0	NA	large aves	Ayers 2003 size class.
530	0231	NA	no	I	A	0	0	0	0	0	1	0	0	NA	large aves	Ayers 2003 size class.
531	0232	NA	no	L	A	1	1	1	1	1	1	1	1	Corvidae	Corvidae	
532	0233	NA	no	L	A	1	1	1	1	1	1	1	1	Corvidae	Corvidae	
533	0234	NA	no	I	A	0	0	0	0	1	0	0	0	NA	large aves	Ayers 2003 size class.
534	0235	NA	no	I	A	0	0	0	0	1	1	1	1	Anatidae	medium Anatidae	Match with *Melanitta fusca.*
535	0236	NA	no	I	A	0	0	0	0	1	0	0	0	NA	large aves	No diagnostic landmarks.
536	0237	NA	no	I	A	0	0	0	0	0	0	1	0	NA	medium aves	No diagnostic landmarks.
537	0238	NA	no	I	S	1	1	1	1	1	1	1	1	Corvidae	Corvidae	
538	0239	NA	no	R	A	1	0	0	0	0	0	0	0	NA	medium aves	Reasonable match with Brant, but procoracoid is too small.
539	0240	NA	no	L	A	1	1	1	1	0	0	0	0	Laridae	medium Laridae	
540	0240	NA	no	L	A	0	0	0	0	1	1	1	1	Laridae	medium Laridae	

Specimen #	*Bag #*	*zones with cut marks*	*burned*	*side*	*age*	*zone 1*	*zone 2*	*zone 3*	*zone 4*	*zone 5*	*zone 6*	*zone 7*	*zone 8*	*Family Identification*	*Tentative Identification*	*Comment*
541	0241	NA	no	L	A	1	1	1	1	0	0	0	0	Anatidae	medium Anatidae	
542	0241	NA	no	I	A	0	1	0	0	0	0	0	0	NA	medium aves	
543	0518	NA	no	L	A	0	0	1	1	1	1	0	0	NA	medium aves	Smaller than *Melanitta Perspicilatta*. No reliable landmarks present.
544	0242	NA	no	L	S	1	1	1	1	1	1	1	1	Corvidae	Corvidae	
545	0242	NA	no	R	A	1	1	1	1	1	1	1	1	Pandionidae	*Pandion haliaetus*	
546	0243	NA	no	L	A	1	1	1	1	1	1	0	1	Pandionidae	*Pandion haliaetus*	
547	0244	NA	no	R	A	1	1	1	1	0	0	0	0	NA	medium aves	
548	0246	NA	no	L	A	1	1	1	1	1	1	1	1	Corvidae	Corvidae	
549	0250	NA	no	I	A	0	0	1	0	0	0	0	0	NA	medium aves	
550	0251	NA	no	L	A	1	1	1	1	1	1	0	1	Anatidae	*Melanitta perspicillata*	
551	0254	NA	no	L	A	1	1	1	1	0	0	0	0	Anatidae	*Melanitta fusca*	
552	0254	NA	no	R	A	1	1	1	1	0	0	0	0	Laridae	*Sterna hirundo*	
553	0256	NA	yes	L	A	1	0	1	1	0	0	0	0	Anatidae	medium Anatidae	
554	0256	NA	no	L	A	1	0	1	1	0	0	0	0	Anatidae	Anatidae	Similar to *Buteo jamaicensis*.
555	0257	NA	no	R	A	1	0	1	1	0	0	0	0	NA	small aves	
556	0230	NA	no	R	A	1	0	1	1	0	0	0	0	NA	medium aves	Similar to *Phalacrocorax pelagicus*.
557	0248	NA	no	R	A	0	0	1	1	0	0	0	0	NA	medium aves	
558	0517	NA	no	I	A	0	0	0	0	1	1	0	0	NA	medium aves	
559	0515	NA	no	R	A	0	0	1	1	1	1	0	0	NA	medium aves	Similar to *Melanitta Perspicilatta*. No reliable landmarks present.
560	0505	NA	no	R	A	1	1	0	0	0	0	0	0	NA	medium aves	Similar to *Melanitta Perspicilatta*. No reliable landmarks present.
561	0472	NA	no	I	A	0	0	1	1	1	1	0	0	NA	medium aves	
562	0004	NA	no	R	A	0	0	0	0	0	0	1	0	Accipitridae	*Halaetus leucocephalus*	
563	0255	NA	yes	I	A	0	0	1	1	1	1	0	0	NA	medium aves	
564	0255	NA	yes	L	A	0	0	0	0	1	1	0	0	NA	medium aves	
565	0255	NA	yes	R	A	0	0	1	1	1	1	0	0	NA	medium aves	

Specimen #	Bag #	zones with cut marks	burned	side	age	zone 1	zone 2	zone 3	zone 4	zone 5	zone 6	zone 7	zone 8	Family Identification	Tentative Identification	Comment
566	0519	NA	no	R	A	0	0	0	0	1	1	0	0	NA	medium aves	Smaller than *Melanitta Perspicilatta*. No reliable landmarks present.
567	0516	NA	no	I	A	0	0	1	1	1	1	0	0	NA	medium aves	
568	0448	NA	no	R	A	1	1	0	0	0	0	0	0	Corvidae	Corvidae	
569	0448	NA	no	R	A	0	0	0	0	1	1	1	1	Corvidae	Corvidae	
570	0295	NA	no	R	A	1	1	1	1	1	1	0	0	Phasianidae	Phasianidae	Compared with *Dendragapus obscurus*, landmarks match but is too large, possibly *Bonsa umbellus*.
571	0415	NA	no	L	A	0	1	1	1	0	0	0	0	NA	large Passeriformes	Compare with Corvidae.
572	0415	NA	no	R	A	1	1	1	1	1	1	0	0	NA	large Passeriformes	Compare with Corvidae.
573	0445	NA	no	L	A	1	1	1	1	1	1	0	0	Anatidae	*Melanitta* fusca	
574	0413	NA	no	I	A	0	1	1	0	0	0	0	0	NA	very large aves	Compared with *Cygnus buccinator* and *Haliaetus lecocephalus*. But the morphology is not quite right for either.
575	0462	NA	no	R	A	1	1	1	1	0	0	0	0	Anatidae	*Melanitta sp.*	
576	0495	NA	no	L	A	1	1	1	1	1	1	0	0	Laridae	Laridae	Morphology matches *Larus argentatus*, but the specimen is smaller in size to control.
577	0496	NA	no	R	A	1	1	1	1	1	1	0	0	Anatidae	*Melanitta sp.*	
578	0418	NA	no	L	A	0	0	1	0	0	0	0	0	Accipitridae	*Halaetus leucocephalus*	
579	0502	NA	no	R	A	0	0	0	0	1	1	0	1	Anatidae	medium Anatidae	Match with Me*lanitta perspicilatta*, however, too few diagnostic landmarks for positive id.
580	0506	NA	no	L	A	0	0	1	0	0	0	0	0	NA	very large aves	
581	0431	NA	no	R	A	0	0	1	1	1	1	0	0	NA	medium aves	Likely a medium Anatidae, however too few landmarks remain for a positive ID.
582	0435	NA	no	I	A	0	0	0	0	1	0	0	0	NA	small aves	
583	0444	5	no	R	S	0	0	1	1	1	1	0	0	NA	medium aves	
584	0452	NA	no	L	A	1	1	0	0	0	0	0	0	Alcidae	Alcidae	Murrlete, match with both *Synthliboramphus antiquus*, and *Brachyramphus marmoratus*.
585	0452	NA	no	L	A	0	0	0	0	1	1	1	1	Alcidae	Alcidae	Murrlete, match with both *Synthliboramphus antiquus*, and *Brachyramphus marmoratus*.
586	0454	NA	no	R	A	0	0	0	0	0	0	1	1	Alcidae	Alcidae	Murrlete, match with both *Synthliboramphus antiquus*, and *Brachyramphus marmoratus*.
587	0491	NA	yes	L	A	0	0	0	0	1	1	1	1	Alcidae	Alcidae	Match with *Uria lomvia*.
588	0491	NA	no	R	A	0	0	0	0	0	0	1	1	NA	small aves	Smaller than a *Sythliboramphus antiqus* and *Ptychoramphus aleuticu*. Ayers et al. (2003) size

Specimen #	Bag #	zones with cut marks	burned	side	age	zone 1	zone 2	zone 3	zone 4	zone 5	zone 6	zone 7	zone 8	Family Identification	Tentative Identification	Comment
																terminology.
589	0507	NA	no	R	A	0	0	1	1	1	1	0	0	NA	medium aves	Prominent quill knobs like gulls, angular cross section like Alcids. Too few landmarks for positive ID.
590	0443	NA	no	L	A	1	1	1	1	0	0	0	0	Gaviidae	*Gavia sp.*	Good match with *Gavia pacifica.*
591	0468	NA	no	I	A	0	0	1	1	0	0	0	0	NA	very large aves	No landmarks diagnostic of taxon.
592	0479	NA	no	I	A	0	0	1	1	0	0	0	0	NA	medium aves	Cross section consistent with *Larus sp*. Too few landmarks diagnostic of taxon remained for positive identification.
593	0490	NA	no	L	A	1	1	1	1	0	0	0	0	Podicipedidae	*Aechmophorus sp.*	
594	0057	NA	no	L	A	0	0	0	0	1	0	0	0	NA	medium aves	Likely a medium Anatidae, however too few landmarks remain for a positive ID.
595	0057	NA	no	R	A	0	0	0	0	1	0	0	0	NA	medium aves	Likely a medium Anatidae, however too few landmarks remain for a positive ID.
596	0057	NA	no	L	A	0	0	0	0	1	0	0	0	NA	medium aves	Likely a medium Anatidae, however too few landmarks remain for a positive ID.
597	0064	NA	yes	R	A	0	0	1	0	1	1	1	1	Anatidae	*Melanitta perspicillata*	The curvature of the extensor tendon groove is a match.
598	0064	NA	yes	I	A	0	0	1	0	1	0	0	0	NA	medium aves	Likely a medium Anatidae, however too few landmarks remain for a positive ID.
599	0064	NA	yes	L	A	0	0	0	0	1	0	0	0	Anatidae	Melanitta perspicillata	The curvature of the extensor tendon groove is a match.
600	0433	NA	no	R	A	0	0	0	0	1	0	1	1	Anatidae	*Melanitta sp.*	
601	0433	NA	no	L	A	0	1	0	0	0	0	0	0	NA	medium aves	Likely a medium Anatidae, however too few landmarks remain for a positive ID.
602	0459	NA	no	R	A	1	1	1	1	1	1	1	1	Podicipedidae	Podicipedidae	Compare with *Aechmophorus occidentalis*.
603	0459	NA	no	R	A	1	1	1	0	0	0	0	0	Anatidae	*Melanitta perspicillata*	
604	0459	NA	no	L	A	1	1	1	0	0	0	0	0	Anatidae	*Melanitta perspicillata*	
605	0459	NA	no	L	A	0	0	0	0	1	1	1	1	Anatidae	*Melanitta sp.*	
606	0492	NA	no	L	A	1	1	1	1	1	1	1	1	Anatidae	*Melanitta perspicillata*	
607	0492	NA	no	R	A	1	1	1	1	1	1	1	1	Anatidae	*Melanitta perspicillata*	
608	0492	NA	yes	R	A	0	0	1	0	1	1	1	1	NA	medium aves	The facet for digit 3 is shaped slightly different than *Melanitta perspicilatta*
609	0492	NA	no	R	A	0	0	1	0	1	1	1	1	Anatidae	*Melanitta perspicillata*	
610	0492	NA	no	L	A	0	0	1	0	1	0	1	1	Anatidae	*Melanitta fusca*	
611	0492	NA	yes	L	A	1	1	1	0	1	0	0	0	Anatidae	*Melanitta perspicillata*	

Specimen #	*Bag #*	*zones with cut marks*	*burned*	*side*	*age*	*zone 1*	*zone 2*	*zone 3*	*zone 4*	*zone 5*	*zone 6*	*zone 7*	*zone 8*	*Family Identification*	*Tentative Identification*	*Comment*
612	0492	NA	no	L	A	1	1	1	0	0	0	0	0	Anatidae	*Melanitta perspicillata*	
613	0492	NA	no	I	A	0	0	0	0	1	0	0	0	NA	medium aves	Too few landmarks diagnostic of taxon are present for an affirmative identification.
614	0492	NA	no	L	A	0	0	1	0	0	0	0	0	Anatidae	medium Anatidae	
615	0492	NA	no	R	A	1	1	1	0	0	0	0	0	Anatidae	medium Anatidae	Landmarks consistent with *Melanitta perspicilatta*, but slightly smaller in size.
616	0492	NA	no	L	A	0	0	0	0	1	1	1	1	Anatidae	medium Anatidae	Landmarks consistent with *Melanitta perspicilatta,* but slightly smaller in size.
617	0492	NA	no	L	A	0	0	0	0	1	1	1	1	Anatidae	*Melanitta perspicillata*	
618	0494	NA	no	R	A	1	1	1	1	1	1	1	1	Anatidae	*Melanitta perspicillata*	D. Hansen identified these as *Mergus sp.* They are closer to *Melanitta sp.* in my opinion.
619	0386	NA	no	L	A	1	1	1	0	1	0	1	1	Anatidae	large Anatidae	
620	0386	NA	no	L	A	1	1	1	0	1	0	0	0	Anatidae	medium Anatidae	
621	0422	NA	no	R	A	1	1	0	0	0	0	0	0	Accipitridae	Accipitridae	
622	0521	NA	no	L	S	1	1	1	1	1	1	0	0	NA	medium aves	
623	0521	NA	no	L	S	0	0	0	0	1	0	0	0	NA	medium aves	Fits with 622.
624	0521	NA	no	L	S	0	0	0	0	0	0	1	1	NA	medium aves	Fits with 622.
625	0522	NA	no	R	A	0	0	0	0	0	0	1	1	NA	large aves	
626	0522	NA	yes	R	A	0	0	0	0	0	0	1	1	NA	medium aves	
627	0218	NA	no	R	A	1	1	1	1	1	1	0	0	NA	large aves	Ayers 2003 size class.
628	0523	NA	no	L	A	0	0	0	0	1	1	1	1	NA	large aves	Ayers 2003 size class.
629	0524	NA	no	L	A	1	1	1	1	0	0	0	0	Laridae	Laridae	Morphology matches *Larus argentatus*, but the specimen is smaller in size to control.
630	0525	NA	no	L	A	1	1	1	1	0	0	0	0	NA	medium aves	Ayers et al. (2003) size class.
631	0254	NA	no	I	A	1	0	1	0	0	0	0	0	NA	large aves	Ayers 2003 size class.
632	0526	3	no	L	A	1	0	1	0	1	1	0	0	NA	large aves	Ayers 2003 size class.
633	0526	NA	no	L	A	1	1	1	1	1	1	0	0	Alcidae	Alcidae	
634	0527	NA	no	R	A	0	0	1	1	0	0	0	0	Laridae	Laridae	Based on size and prominent quill knobs.
635	0528	NA	no	R	A	1	1	1	1	1	1	0	0	Anatidae	Anatidae	Compare with *Melanitta sp.*
636	0528	NA	no	L	A	0	0	0	0	0	0	1	1	Anatidae	Anatidae	Compare with geese.

Specimen #	*Bag #*	*zones with cut marks*	*burned*	*side*	*age*	*zone 1*	*zone 2*	*zone 3*	*zone 4*	*zone 5*	*zone 6*	*zone 7*	*zone 8*	*Family Identification*	*Tentative Identification*	*Comment*
637	0529	NA	no	R	A	1	1	1	1	1	1	1	1	Anatidae	Anatidae	Compare with *Melanitta sp.*
638	0529	NA	no	L	A	1	1	1	1	1	1	0	0	Anatidae	Anatidae	
639	0530	NA	no	L	A	1	0	0	0	0	0	0	0	NA	large aves	Ayers 2003 size class.
640	0531	NA	no	L	A	0	0	0	0	0	0	1	1	NA	large aves	Ayers 2003 size class.
641	0532	NA	no	L	A	0	0	0	0	1	1	1	1	NA	large aves	Ayers 2003 size class.
642	0533	NA	no	R	A	0	0	1	1	0	0	0	0	NA	large aves	Ayers 2003 size class.
643	0534	NA	no	L	A	1	1	1	1	0	0	0	0	NA	large aves	Ayers 2003 size class.
644	0534	NA	no	R	A	1	1	1	1	0	0	0	0	NA	large aves	Ayers 2003 size class.
645	0535	NA	no	L	A	0	0	0	0	0	0	1	1	NA	large aves	Ayers 2003 size class.
646	0072	NA	no	R	A	0	0	0	0	0	0	1	0	NA	large aves	Ayers et al. (2003) size class.
647	0536	NA	no	R	A	0	0	1	0	1	0	1	0	NA	medium aves	Ayers et al. (2003) size class.
648	0537	NA	no	R	A	1	1	1	0	1	0	1	0	Anatidae	large Anatidae	
649	0538	NA	no	L	A	0	0	0	0	0	0	1	0	Anatidae	large Anatidae	
650	0538	NA	no	R	A	0	0	0	0	1	0	1	0	NA	large aves	Ayers 2003 size class.
651	0538	NA	no	R	A	0	0	0	0	1	0	1	0	Anatidae	Anatidae	Compare with *Melanitta sp.*
652	0539	NA	no	L	A	1	0	1	0	0	0	0	0	Gaviidae	*Gavia sp.*	Larger than *Gavia pacifica*, likely *Gavia immer*.
653	0539	NA	no	L	A	1	1	1	0	1	0	1	1	Anatidae	Anatidae	Compare with *Melanitta sp.*
654	0539	NA	no	R	A	1	1	1	0	0	0	0	0	Anatidae	Anatidae	Compare with *Melanitta sp.*
655	0539	NA	no	R	A	0	0	0	0	1	0	1	1	Anatidae	Anatidae	Compare with *Melanitta sp.*
656	0540	NA	no	R	A	1	1	0	0	0	0	0	0	Anatidae	Anatidae	
657	0541	NA	no	L	A	0	1	0	0	1	0	1	1	Anatidae	Anatidae	Mallard size.
658	0049	NA	no	R	A	1	1	1	1	1	1	1	1	Gaviidae	*Gavia sp.*	Match with *Gavia pacifica.*
659	0049	NA	no	R	A	1	1	1	0	1	0	1	1	Anatidae	Anatidae	Common Goldeneye size.
660	0049	NA	no	R	A	1	1	1	0	0	0	0	0	Anatidae	Anatidae	Goose size, fits with specimen 660.
661	0049	NA	no	R	A	0	0	0	0	1	0	1	1	Anatidae	Anatidae	Goose size, fits with specimen 661.
662	0049	NA	no	L	A	1	1	1	1	1	0	1	1	Anatidae	Anatidae	Scoter size.

Specimen #	*Bag #*	*zones with cut marks*	*burned*	*side*	*age*	*zone 1*	*zone 2*	*zone 3*	*zone 4*	*zone 5*	*zone 6*	*zone 7*	*zone 8*	*Family Identification*	*Tentative Identification*	*Comment*
663	0049	NA	no	L	A	1	1	1	1	1	1	1	1	Anatidae	Anatidae	Scoter size.
664	0049	NA	no	R	A	1	1	1	0	1	0	1	1	Anatidae	Anatidae	Scoter size.
665	0049	NA	no	L	A	1	1	1	1	1	1	0	0	Anatidae	Anatidae	Scoter size.
666	0049	NA	no	R	A	1	1	1	1	1	0	1	1	Anatidae	Anatidae	Scoter size.
667	0049	NA	no	L	A	0	0	1	0	1	0	1	1	Anatidae	Anatidae	Scoter size.
668	0198	NA	no	R	S	0	0	1	1	1	1	0	0	NA	medium aves	Ayers et al. (2003) size class.
669	0540	NA	no	R	A	0	0	0	0	1	0	0	0	Anatidae	Anatidae	Compare with *Melanitta sp.*