Vertebrate Faunal Analysis of the Hiikwis Site Complex (DfSh-15 and DfSh-16) in Barkley Sound, British Columbia

by

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B.A., Vancouver Island University, 2010

A Thesis Submitted in Partial Fulfilment
of the Requirements for the Degree of

MASTER OF ARTS

in the Department of Anthropology

Supervisory Committee

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Abstract

The Hiikwis site complex, located in Barkley Sound on the west coast of Vancouver Island, consists of two traditional Nuu-chah-nulth village sites: Uukwatis (DfSh-15) and Hiikwis proper (DfSh-16). Uukwatis, the older of the two sites, was occupied from at least 2870 cal BP. It is believed that at some point the main village was moved west up the beach approximately 650 m to Hiikwis proper, which has been dated to at least 1290 cal BP. Both sites appear to have been occupied into the early twentieth century.

This thesis represents the first detailed faunal analysis of an inner Barkley Sound site older than 600 years. The faunal assemblage is unique among contemporaneous sites in the region, due in part to a large bird assemblage and the presence of salmon remains throughout all levels of the site complex. Hiikwis does not follow the pattern typically described for Barkley Sound sites, in which salmon was not a significant resource until around 800 cal BP. However, after 900 cal BP, the relative abundance of salmon within the Hiikwis fish assemblage does increase. These results support an established hypothesis that this time period in Barkley Sound was characterized by group amalgamations, increasing populations, shifting territorial boundaries, changes in subsistence practices, and increased defensive strategies and structures.

This faunal analysis shows that the Hiikwis site complex was occupied year-round for the majority of its occupation, with a shift to seasonal (winter/spring) occupation represented within the most recent levels of cultural deposits at Hiikwis proper.

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Acknowledgments

I wish to thank a number of people for their support, encouragement, and help throughout this journey; I am grateful to have had the opportunity to undertake this project and to connect with all of you. First and foremost, I would like to thank my co-supervisor, Dr. Yin Lam, for a seemingly unlimited supply of guidance, support, patience, and generosity, and for “encouraging” (AKA forcing) me to do so many things I previously would have shied away from. Heartfelt thanks also go to my co-supervisor Dr. Susan Crockford and committee member Becky Wigen for their generosity of time and willingness to share their immense knowledge; I truly feel I could not have completed this project without your help and support. Thank you for welcoming me into your lab. I would also like to acknowledge Dr. Gay Frederick, who introduced me to the wonderful world of faunal remains in the first place, and who I have viewed as a mentor of sorts since my first introductory Anthropology class at Vancouver Island University. I also wish to thank Dr. Jon Driver, for sharing a cafeteria table at the Bamfield Marine Sciences Centre and agreeing to serve as my external examiner.

Many thanks go to the Tseshaht First Nation, from whose traditional territory the faunal remains came; I have thoroughly enjoyed exploring your rich past. Denis St. Claire and Dr. Alan McMillan deserve profound thanks for entrusting me with this project and for always being available to answer questions and provide invaluable information and feedback.

I would also like to thank Randy Bouchard for providing translations of Nuu-chah-nulth animal names, and Lesley Kennes for her support and assistance with the identification of whale remains at the Royal BC Museum. Wholehearted thanks go to Matt Branagh, Nic Healey, and Alicia Walsh for volunteering their time to clean and sort dirt-encrusted bones for hours at a time; without your assistance, I might still be doing so!

This adventure would have been far less enjoyable without the Archaeology Lab gang: Jenny Cohen, Cecilia Porter, David Fargo, Darcy Mathews, and Aurora Skala, as well as our many visitors along the way. Thank you for the discussions and, most of all, the distractions. I would also like to thank my family and friends, especially my parents, Gord and Janice Monk, for the support and encouragement they have provided throughout my entire life.

Finally, I wish to thank my wonderful husband, Evan, for his love and support throughout the entire process. I am grateful we experienced this journey into academia together; here’s hoping it was all worth it!

Chapter 1: Introduction

1.1 Introduction

Barkley Sound, located on the west coast of Vancouver Island, has become one of the most-studied regions in Pacific Northwest Coast archaeology. Excavations in the area have provided archaeologists with a rich history of the traditional occupants of Barkley Sound. The Nuu-chah-nulth (formerly referred to as the Nootka) and the Ditidaht of the west coast of Vancouver Island, along with the Makah of Washington state, are renowned for their specialized whaling tradition. The nineteenth century territories of these groups are illustrated in Figure 1. The extensive shell middens built up over time at Barkley Sound village sites provide an excellent environment for the survival of artifacts and bones.

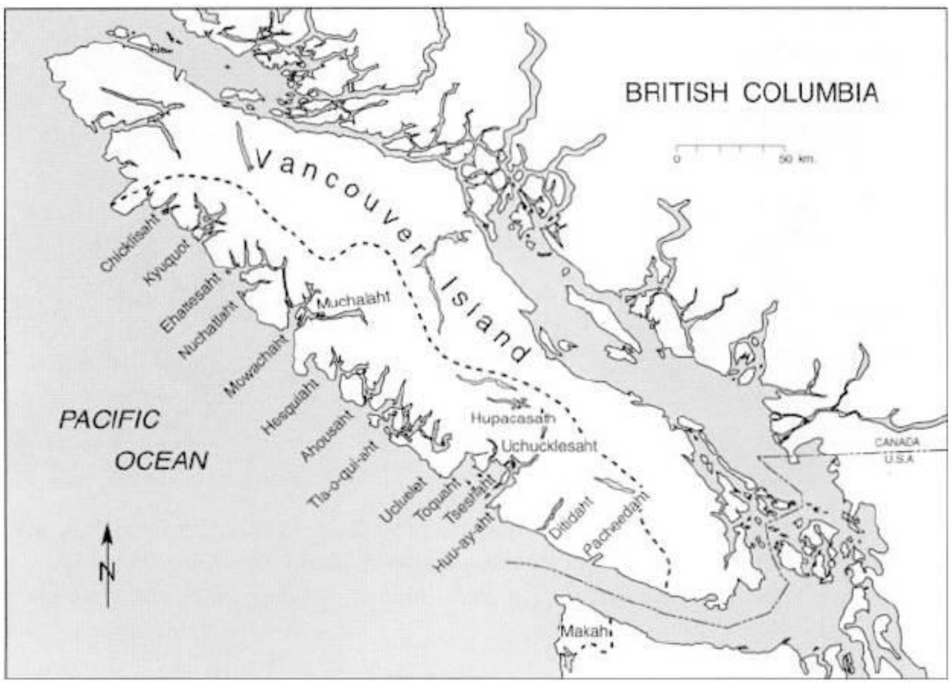

Figure 1. Nineteenth century territories of the Nuu-chah-nulth, Ditidaht, and Makah. McMillan 2000:7.

For my Master's thesis project, I have conducted a zooarchaeological analysis of the vertebrate faunal remains recovered from the Hiikwis site complex in Barkley Sound. Located in inner Barkley Sound, Hiikwis represents two distinct village sites: Uukwatis (DfSh-15), an older occupation dated to 2870 – 720 cal BP, and Hiikwis proper (DfSh-16), a more recent occupation dated to 1290 – 310 cal BP (McMillan pers. comm. 2012). At some point, the main village was moved from Uukwatis about 650 m west up the beach to Hiikwis proper. Both sites were occupied into the early twentieth century, and are located on the present day reserve of Equis.

A total of 26,619 vertebrate specimens were analyzed from the Hiikwis site complex, 14,186 from one unit at DfSh-16 and 12,433 from two units and one extension at DfSh-15. Excluding six fine-screened fish concentration features (discussed in Chapters 5 and 6), 24,413 bones/bone fragments were studied. Of those specimens, 13,888 were identifiable to species, genus, family, or size category (e.g., large bird). Of the identifiable remains, 10,687 were fish, 2478 were bird, and 723 were mammal.

1.2 Research Goals

In addition to a general identification of the species present, I focused on five areas of research, each guided by specific research questions. While I did not develop specific hypotheses for my first two research topics, I did so for the final three.

1. What changes occur within the faunal assemblage over time? Do any differences exist between Hiikwis proper and Uukwatis?
2. What differences exist between the typical level fauna (screened through 1/4" mesh) and the six recovered *in situ* fish concentration features (screened through 1/8" and 1/16" mesh)?
3. During which season(s) was the Hiikwis site complex occupied? Does the archaeological evidence of seasonality correspond with a written account of species taken at Hiikwis in the nineteenth century?
4. How does the faunal assemblage at Hiikwis compare to those from other Barkley Sound village sites?
5. Does salmon use at Hiikwis follow the typical Barkley Sound pattern recorded to date?

My first area of interest was in documenting any observable changes over time at the sites and any pronounced differences between the two sites. My second research question focused on differences within fish species present in the typical level fauna (screened through 1/4" mesh) and six recovered *in situ* fish concentration features (screened through 1/8" and 1/16" mesh) that were excavated at the site complex.

My third research question focused on determining seasonal markers among the faunal remains at Hiikwis. Ethnographic accounts and oral histories show that many amalgamations took place within Barkley Sound in the past, after which some sites were exploited seasonally rather than year-round (McMillan and St. Claire 2005). One such amalgamation is believed to have occurred when the traditional occupants of Hiikwis, the *Nash'as7ath*, became part of the Tseshaht, a larger Nuu-chah-nulth group that resided at Ts'ishaa on Benson Island in outer Barkley Sound. Post-amalgamation, the Tseshaht occupied Hiikwis during the winter and spring months, while Ts'ishaa was reduced to a summer camp. I hypothesized that year-round activity would be represented at the Hiikwis site complex for the majority of its occupation, with a clear shift to mainly winter and spring resources taking place within the most recent deposits. I compared my findings with a published historic account of the seasonal round of the Tseshaht, in which winter/early spring subsistence activities at Hiikwis are described (Sapir and Swadesh 1955).

My fourth objective was to compare my results to those of three other excavated Barkley Sound village sites: Ma'acoah (DfSi-5), Ts'ishaa (DfSi-16), and Huu7ii (DfSh-7). I hypothesized that the species present at Hiikwis and their relative abundances would be similar to that at the other sites. Of the three village sites previously studied, I hypothesized that the Hiikwis fauna would be most similar to that recovered from Ma'acoah, based upon the sites' similar geographic settings.

To answer my fifth research question, I examined salmon use at Hiikwis in comparison to these three sites and others along the Northwest Coast. The pattern observed at other Barkley Sound sites shows salmon use to be rare until around 800 years ago, after which it intensified significantly as other species, particularly rockfish, decreased (Frederick 2012; Frederick and Crockford 2005; Monks 2006). Using a variety of quantification methods, I tested whether an increase in salmon abundance occurred in the later periods at Hiikwis as well. Following the pattern observed for Ts'ishaa and Huu7ii, I hypothesized that salmon remains would be relatively rare within the earlier levels of the site, with rockfish favoured instead. Over time, I expected to see rockfish remains decrease in abundance and salmon remains increase significantly, beginning around 800 years ago.

1.3 Thesis Organization

Following this introductory chapter, Chapter 2 outlines previous archaeological work conducted within Barkley Sound, focusing on sites for which extensive faunal analysis has been completed. The West Coast culture type, a set of characteristics developed by Mitchell (1990) to define the groups along the west coast of Vancouver Island, and the Developed Northwest Coast pattern are discussed, including their applicability to Barkley Sound village sites.

Chapter 3 explores the ethnographic records of the Nuu-chah-nulth – in particular, the Tseshaht – and provides an overview of the past occupations and group amalgamations that took place at the Hiikwis site complex. Historic usage of the site is discussed, with a focus on ceremonial activities that took place at the site and the exploitation of seasonal resources during the winter months

Chapter 4 provides descriptions of Uukwatis and Hiikwis proper, including site chronology, and describes the methodology employed during excavation.

Chapter 5 outlines my sampling, identification, documentation, and quantification methodologies. It also includes a discussion of the benefits and problems associated with some common zooarchaeological quantification methods.

Chapter 6 provides a summary of my results, including general NISP counts. These results are then discussed in further detail, particularly in relation to the five research objectives outlined above. Additionally, this chapter details habitats that were exploited by the occupants of Hiikwis (as evidenced by the species recovered from the site complex). Limited results from aDNA analysis of Hiikwis whale bone specimens are also presented. Chapter 7 serves as a short summary of these results and an overall conclusion.

Appendix A summarizes the identifications I made within the sample assemblage, including taxa NISP and MNI counts for each Level/Layer combination. Appendix B contains four tables, one for each unit studied, outlining the number of seasonal markers present within each Level/Layer combination. Appendix C consists of a table comparing excavation methodologies and limited faunal analysis results from five Barkley Sound village sites: Uukwatis, Hiikwis proper, Ma’acoah, Ts’ishaa, and Huu7ii.

Chapter 2: Archaeological Context and History of Excavation in Barkley Sound

2.1 Introduction

As one of the most studied areas on the Pacific Northwest Coast, the west coast of Vancouver Island has provided a rich archaeological record. The first major excavation took place at Yuquot in Nootka Sound (northwest of Barkley Sound) in 1966 (McMillan 2000:3). After that, archaeological work in this area exploded. By 1995, 1,536 archaeological sites had been recorded within traditional Nuu-chah-nulth and Ditidaht territory, nearly half of which were shell middens (McMillan 2000:47). Other site types included fish traps, canoe skids, burial sites, surface lithic scatters, culturally modified trees, and rock art. However, fewer than 40 of these sites have been excavated beyond initial sampling.

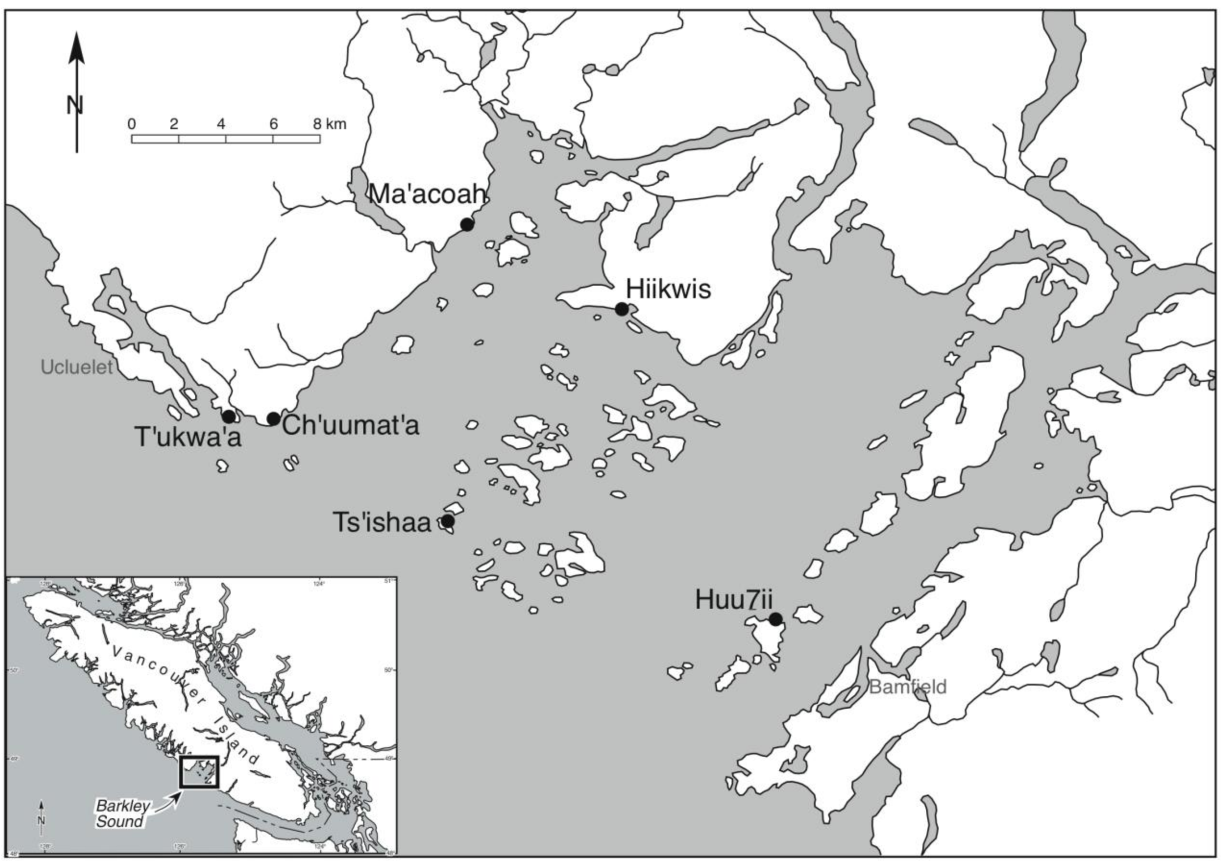

Figure 2. Major Barkley Sound excavations, including Hiikwis. McMillan and St. Claire 2012:1.

Several surveys and excavations have been conducted at sites within Barkley Sound. Sites located in the Broken Group Islands, near Bamfield, and along the western side of the sound have been surveyed, while excavations have taken place at Shoemaker Bay (at the head of Alberni Inlet), Hiikwis, Little Beach at Ucluelet, Huu7ii and Ts'ishaa in the outer islands, and five sites (including Ma'acoah) in Toquaht (a Nuu-chah-nulth group) territory on the western coast of Barkley Sound (McMillan 2000:62). Appendix C outlines the excavation methodologies and limited faunal analysis results for Ma'acoah, Ts'ishaa, Huu7ii, Uukwatis, and Hiikwis proper.

2.2 The Toquaht Project

In 1991, the Toquaht Project began, during which five Toquaht sites were excavated, including three large villages: Ma'acoah, T'ukw'aa, and Ch'uumat'a (McMillan 2000:63). Ma'acoah (or Macoah; DfSi-5) is a late Toquaht winter village site that was known and described in ethnographic accounts. It has been radiocarbon dated to 600 BP, although there is evidence that it may date up to 2000 BP (Monks 2006:217). Ma'acoah is located in the northern part of inner Barkley Sound. It is the closest excavated site to Hiikwis and represents a similar context (a major village site on the inner coast, with protection from strong winds and winter storms provided by the outer islands of Barkley Sound). The site was excavated in 1991 in five 1 m x 2 m units, from which approximately 18.2 m^3 of midden material was removed, representing about 0.22% of the total site (McMillan 2000:65; Monks 2006:220). Excavated material was screened through a 1/4" construction cloth screen, from which faunal remains were collected. Two litre matrix samples were taken, with one litre of each screened through both 1/8" and 1/16" screens to collect smaller remains. All recovered faunal remains from the 1/4" assemblage were analyzed, and were quantified using NSP (number of specimens), NISP (number of identified specimens) and MNE (minimum number of elements).

The vertebrate faunal assemblage (NSP = 12,198) was dominated by fish (74% of NSP), especially herring and salmon (McMillan et al. 2008:230). This was likely due to Ma'acoah's proximity to two salmon-bearing rivers. Other fish species present included rockfish, flatfish, perch, and sculpin. Salmon increased in relative abundance during occupancy, while rockfish declined. Birds made up about 15% of vertebrate NISP and mammals comprised around 11% (Monks 2006:222). Loons and gulls were the most frequently occurring birds. The bones of sea mammals, such as northern fur seal, harbour seal, dolphin, and whale, were much more abundant than those of land mammals, although dog and deer were well represented. Larger quantities of faunal remains occurred in the upper levels of the site and represent a wider range of taxa exploited, including those most often noted in ethnographies, such as deer, salmon, herring, and sea mammals (Monks 2006:236). Some remains (e.g., of salmon, bivalves, and mammals) were found in anomalously high quantities at certain areas of the site, suggesting that some families or groups had differential access to certain resources.

Because detailed faunal analyses have not been completed to date for T'ukw'aa (DfSj-23) and Ch'uumat'a (DfSi-4), these sites will not be discussed here.

2.3 Huu7ii

Huu7ii (DfSh-7) is located in the eastern sound on Diana Island, one of the Deer Group Islands. The site was excavated in 2004 and 2006, with 124.9 m^3 of deposit removed. House platforms are present, one of which was excavated and dated to between 1500 and 400 cal BP (McMillan et al. 2008:230). The site also has a mid-Holocene occupation located behind the main village, which has been dated to between 4800 and 3000 cal BP. This temporal gap between occupations is significant, and could likely be filled in by future archaeological work (McMillan and St. Claire 2012:99).

For the later village area, over 44,000 bones were identified to element, more than 95% of which were fish (McMillan et al. 2008:230). The site was excavated in 2 m x 2 m units in 5 cm arbitrary levels (Frederick 2012:115). Level fauna was handpicked from 1/8" screen during the 2004 season and from 1/4" screens in 2006. This disparity would have certainly increased the number of small species (e.g., Pacific herring) that were recovered during the first season, making direct comparison between units and between Huu7ii and contemporaneous sites problematic. The faunal remains were quantified using NSP and NISP. Column samples were fine-screened and showed a dominance of herring.

Interestingly, excavations at Huu7ii recovered a great number of remains identified as hake, a fish not generally found at Nuu-chah-nulth sites. Salmon, rockfish, greenling, and dogfish were also common. Over time there was a shift in fish species frequency, as lower midden levels were dominated by hake, rockfish, dogfish, and flatfish (with less than 1% of remains identified as salmon), while the house floor deposits in the upper levels were dominated by salmon (67% of NISP). The very top levels were dominated by salmon and herring. This shift in subsistence took place around 800 cal BP (Frederick 2012:152). As no salmon spawning stream is present on Diana Island, it is believed that this increase in salmon exploitation represents access to an area with a salmon stream, either through trade or an increase in group territory (Frederick 2012:140). If the salmon remains represent preserved fish, this increase could also represent a longer winter occupation at Huu7ii. Alternatively, the disproportion of species representation may be due to their contexts (house floor vs. midden).

Seasonality markers among the faunal remains recovered from Huu7ii included northern fur seal, albatross, turkey vulture, sharp-shinned hawk, white-fronted goose, snow goose, herring, hake, anchovy, Pacific sardine, and bluefin tuna (Frederick 2012:137-138). Nursing fur seal pup remains (younger than four months old) indicate summer exploitation, as these young animals are only available for capture at breeding rookeries during the summer before moving well off shore. Short-tailed albatross are only available during the summer, while turkey vultures are not present during the winter. White-fronted goose, snow goose, and sharp-shinned hawk are present in the area in the fall and spring during their migrations. Herring was available nearly year-round, but spring represents their peak availability for capture. Hake, anchovy, bluefin tuna, and Pacific sardine are available only during late spring and summer, making them excellent seasonal markers.

2.4 Ts’ishaa

Ts'ishaa (DfSi-16) is located on Benson Island within the Broken Group Islands in the center of Barkley Sound. It was excavated over three seasons from 1999 to 2001. Ts'ishaa has been described as a permanent base for a group of Tseshaht people, who exploited the resources of a small cluster of Broken Group islands (McMillan et al. 2008:217). Many whaling activities took place at this location. The earliest radiocarbon date from the site came back at 1870 – 1560 cal BP, although deposits further back from the shoreline have been dated to nearly 5000 BP (McMillan et al. 2008:218, 222). Excavation occurred in 35 2 m x 2 m units. About 174 m^3 of cultural deposit was excavated, including a large volume of faunal material, although only a portion has been examined (McMillan et al. 2008:222). Hand excavated material was screened through 1/4” mesh, while column samples were wet-screened through 1/8” and 1/16” mesh. For units where faunal remains were studied, typically every second level was analyzed. 48,962 vertebrate bones were examined, of which 23,881 were identified to a specific taxon (Frederick and Crockford 2005:177). Faunal remains were quantified using NSP, NISP, and MNI (Minimum Number of Individuals). Based on NISP, the faunal remains were dominated by fish (91-98%), except in the uppermost layers in one area of the site, where sea mammals and birds were more abundant (McMillan and St. Claire 2005:69). In the column samples, herring was the most frequently occurring fish (53% of NISP); anchovy, rockfish, and greenling were abundant, and salmon and perch were present (McKechnie 2005:212). Herring and other small fish were greatly underrepresented in the hand excavated material, where rockfish dominated, with lingcod and greenling also well represented. Mammal remains were dominated by northern fur seal, with whale, northern sea lion, harbour seal, porpoise, and dolphin occurring in much smaller numbers. There appears to be an interesting shift during the latest period (750 – 250 cal BP) to a greater focus on sea mammals, especially fur seals, and birds, while fish numbers declined. During this time, rockfish remains decreased in frequency while salmon and herring remains increased.

McMillan et al. (2008:227-229) suggest that the site became used seasonally (especially for hunting fur seal and whales, capturing highly valued salmon, and targeting the annual herring season in spring and summer) over time rather than year-round. Frederick and Crockford (2005:185) noted that summer was the most clearly marked season at Ts'ishaa, based on the presence of anchovy, albatross, young raccoon, juvenile river otter, and fur seal pup remains. The abundance of lingcod remains may point to late fall/early spring exploitation. As no salmon streams are present on Benson Island, salmon must have been procured elsewhere. The lack of salmon cranial remains suggests that the fish were prepared off-site and processed for storage, an activity that is often associated with winter occupation. However, the low quantity of salmon remains recovered may indicate that the village was not fully occupied throughout winter (Frederick and Crockford 2005:185). Ethnographic accounts describe Ts'ishaa as "a year-round community, the centre of Tseshaht political, economic and ceremonial life" where many high-status whaling chiefs resided (McMillan 2009:627).

2.5 Little Beach

The Little Beach site (DfSj-100) is located in a cove at the end of the Ucluth Peninsula, at the northeastern edge of Barkley Sound. Test excavations were undertaken in 1990 as a response to development plans, with further excavation in 1991. One hundred and eighty meters of trenching was produced through mechanical excavation, which revealed many burials. Four 1 m x 1 m units were hand excavated beside the trenches, from which 10 m^3 of deposit was removed (McMillan 2000:77). The site contained a shell midden up to 3 m deep, dating between 2500-4000 years ago. The site does not appear to have been occupied after 2500 BP, and there are no ethnographic references to the site. The most common faunal remains were fish, especially rockfish, lingcod, and greenling (McMillan 2000:78). Northern fur seal, harbour seal, canids, and cetaceans were the most common mammals recovered from the site. For this site, only a small sample of the faunal remains has been analyzed, although the low quantity of salmon remains compared to other species at this early site could be important for exploring the late rise of salmon utilization in Barkley Sound.

2.6 Shoemaker Bay

Shoemaker Bay (DhSe-2) is a site located at the end of the Alberni Inlet. Twenty-nine 2 m x 2 m units were excavated in 1973 and 17 2 m x 2 m units were excavated in 1974 (Calvert and Crockford 1982:181-2). Units were excavated in 10 cm arbitrary levels, with removed material screened through 1/4" mesh. In total, 132 m^3 of cultural deposit was removed, including 20,210 vertebrate faunal elements (McMillan 2000:75). Most of the faunal remains were recovered from the most recent component, Shoemaker Bay II, which consists of a layer of crushed shell, a matrix which enables good preservation of bone. The site appears to have first been occupied around 4000 years ago and abandoned sometime after 1000 years ago. There are several burials as well as evidence of a large house at the site.

Vertebrate fauna was quantified using NSP, NISP, MNI, and weight. The faunal remains suggest subsistence was based mainly on salmon, herring, deer, harbour seal, and waterfowl. Identified fish remains were dominated by salmon at 71% (earlier component, Shoemaker Bay I), and 48% (later component, Shoemaker Bay II) of NISP (Calvert and Crockford 1982:190-3). In the earlier component, dogfish (10%) and rockfish (9%) were present, and other species are rare (Calvert and Crockford 1982:190). In the later component, herring accounted for 39% of the identified fish, rockfish accounted for 6%, and other species were rare (Calvert and Crockford 1982:193). Fish remains in general increased from 35% in Component I to 55% in Component II, which suggests an increase in fish exploitation over time (Calvert and Crockford 1982:199). Based on the presence of many species available at different times of the year, Calvert and

Crockford (1982:195) suggested that the site was occupied at least from spring through fall, and likely year-round.

2.7 The West Coast Culture Type

A culture type for the west coast of Vancouver Island was described by Mitchell (1990), based on excavated data from Yuquot and Hesquiat Harbour (McMillan 2000:44). Mitchell (1990:357) stated that "the post-3000 B.C. period can be characterized as one of relatively little change in subsistence and other aspects of technology;" therefore, a single culture type was attributed to the west coast of Vancouver Island.

One of the defining characteristics of the West Coast culture type was "the near absence of any flaked stone artifacts or flaking detritus. Even ground stone items are comparatively infrequent. The only common stone artifacts are abraders, presumably used to produce the numerous categories of ground bone tools and objects" (Mitchell 1990:356). The other defining artifacts were

> ground stone celts; ground stone fishhook shanks; unilaterally and bilaterally barbed bone nontoggling harpoon heads; bone single points; bone bipoints; large and small composite toggling harpoon valves of bone or antler, small ones with two-piece "self-armed" variety with ancillary valve; sea mammal bone foreshafts; bone needles; bone splinter awls; ulna tools; whalebone bark beaters; whalebone bark shredders; perforated tooth and deer phalanx pendants; mussel shell celts; and mussel shell knives (Mitchell 1990:356).

This culture type has been challenged for several reasons (McMillan 2000:45). First, it does not acknowledge the changes and technological advancements that took place within west coast groups over time. Furthermore, it is problematic to define the wide-spread cultures of the west coast of Vancouver Island based on what was recovered from two sites.

It has been shown that Hiikwis is not consistent with this culture type, with its great number of flaked stone artifacts and debitage recovered – a feature anomalous among Barkley Sound sites in late contexts (post-2000 years BP) (MacLean 2012). However, many of the artifact types associated with the West Coast culture type, especially those made of bone and the perforated tooth pendants, were recovered from Hiikwis.

2.8 Salmon Exploitation on the Northwest Coast

2.8.1 The Developed Northwest Coast Pattern

Northwest Coast groups are known to have been complex hunter/gatherer societies. This complexity is often referred to as the Developed Northwest Coast Pattern, originally thought to have emerged as early as 3500 BP and to be fully in place by 1500 BP (Coupland 1998:37, 44). The processing and storage of fish (particularly salmon) for winter consumption allowed for population growth along the Northwest Coast. It has traditionally been argued that once salmon storage became common, Northwest Coast groups became more sedentary, allowing free time for specialization and the development of a complex social stratification system (McMillan 2000:123).

Salmon bone concentrations have been recovered from some of the older Northwest Coast villages, including the central B.C. coast site of Namu, dated to 6000 BP (Cannon 2001:182). This has led archaeologists to believe that salmon capture and storage techniques may have actually been in place on the Northwest Coast millennia earlier than previously anticipated.

2.8.2 Barkley Sound Pattern

While this hypothesis has been accepted for some regions along the Northwest Coast (Ames and Maschner 1999:115-6, 146; Coupland et al. 2010; Matson and Coupland 1995:154), excavations, and subsequent faunal analyses, at several Barkley Sound village sites have revealed that salmon did not become a substantial resource in the area until around 800 cal BP or later (Frederick 2012:152; McMillan et al. 2008). To date, these sites include Ts'ishaa, Huu7ii, and, to some degree, Ma'acoah.

At Ts'ishaa, salmon accounted for no more than 3% of NISP within the earlier deposits. However, within the more recent deposits, salmon NISP rose to 27% (Frederick and Crockford 2005:182). It was found that rockfish decreased in abundance over time. Salmon remains at the site are represented exclusively by postcranial elements. This suggests that they are river-caught fish prepared and stored for winter consumption. No salmon spawning streams are present on Benson Island; therefore, this intensification of salmon exploitation most likely indicates an increase in trade with nearby groups or an expansion of group territory (Frederick and Crockford 2005:184).

At Huu7ii, a major shift in fishing practices took place around 800 cal BP. While earlier levels showed an exploitation of a broad range of species, those more recent revealed a concentrated focus on salmon (Frederick 2012:152). Similar to what was observed at Ts'ishaa, vertebral elements greatly outnumbered cranial elements within the salmon remains recovered from Huu7ii, a site which also lacks access to a salmon spawning stream (Frederick 2012:140).

Occupation at Ma'acoah has been firmly dated only to about 600 BP, although use of the site may date back to 2000 BP. While Ma'acoah does not necessarily provide a direct comparison to Ts'ishaa, Huu7ii, and Hiikwis, salmon was also found to rise in abundance during the site's occupation, while rockfish decreased. The observed shift from rockfish to salmon at multiple Barkley Sound sites is most likely deliberate. Rockfish are found year-round in a variety of habitats, and could be taken alongside salmon using the same equipment. Salmon, however, are more restricted in their habitat and seasonal availability. The observed pattern could indicate an expansion of territory for many Nuu-chah-nulth groups to include productive salmon areas. Alternatively, a shift from rockfish to salmon could represent an environmental change favouring salmon populations after 800 BP.

Salmon streams are less common in Nuu-chah-nulth territory in comparison to other Northwest Coast regions (e.g., the land around the Fraser River). This is a common explanation for the lack of salmon remains recovered from Barkley Sound village sites. Monks (2006:239) noted that "salmon cannot exist in nearly the abundance in relatively small watersheds as they can in continental watersheds. Thus, reliance on salmon in these outer coast locations likely was not the same as it was on major mainland salmon rivers." Therefore, social complexity in these outer sites needed to be built upon other resources.

To summarize, the pattern observed at previously studied Barkley Sound village sites shows that salmon was rare at these sites prior to 800 BP, with rockfish identified as the most abundant fish taxa. Around 800 years ago, salmon remains increase in abundance, while other species, including rockfish, decrease (Frederick 2012:152; Frederick and Crockford 2005:182). The salmon remains that were recovered were post-cranial elements, suggesting that preserved salmon was consumed at the sites. These findings contradict an earlier belief that salmon was the most significant fish resource on the Northwest Coast for millennia.

2.8.3 Similar Patterns within the Northwest Coast

A pattern similar to that found in Barkley Sound has been observed within other regions of the Northwest Coast, including Hesquiat Harbour, southern Haida Gwaii, and Hoko River.

One of the Hesquiat Harbour sites, DiSo-9, displayed a clear shift in fishing patterns. Two distinct occupations were apparent, dating to around 1900 – 1600 cal BP and 1400 – 1100 cal BP (Calvert 1980:123). While the earlier occupation focused on herring and toadfishes (Batrachoididae), with salmon accounting for only 13% of identified fish remains, the later occupation displayed a greater focus on salmon (36%) and herring (Calvert 1980:171).

Sites in southern Haida Gwaii have displayed this pattern as well. A shift in fishing practices at several large village sites also took place around 800 BP; as salmon increased in abundance, a corresponding decrease in rockfish was observed (Acheson 1998:43; Orchard and Clark 2005:101; Wigen 1990:2-3). At five out of six village sites studied by Wigen (1990), rockfish was more abundant within the lower levels of the site than the upper levels, whereas salmon tended to increase in abundance over time. Four additional sites analyzed by Acheson (1998:48) in the area showed a similar trend. As with Barkley Sound, the same argument can be made for sites located in Haida Gwaii: major rivers on the islands supported fewer salmon in comparison to those located on the mainland (Monks 2006:239).

A similar trend has been documented at Hoko River in Washington state, although flatfish were the early dominant resource rather than rockfish. One site, dated to 3000 – 2200 BP, showed a predominance of flatfish and deer remains, whereas salmon dominated at a second site dated to 900-100 BP (Croes and Hackenberger 1988:19). However, the two sites were likely occupied during different seasons, which would affect the range of species present (Croes and Hackenberger 1988:21-2). For these sites, it has been hypothesized that

> the processing and air drying of summer-caught flatfish to supplement fresh winter supplies of deer and shellfish, allowed for population growth and resource depletion, which eventually culminated in the need to invest the time, labor, and new technologies necessary to intensively harvest, process, and store salmon (Cannon 2001:179).

2.8.4 Alternative Storage Foods

Monks (1987) coined the term “salmonopia” in reference to the overemphasis of the importance of salmon on the Northwest Coast. He believed that salmonopia causes the “inability to see all of the food resources because of the salmon, [which] has hindered the study of Northwest Coast subsistence systems in particular, and Northwest Coast cultural evolution in general" (Monks 1987:119). Years later, regarding the relationship between salmon storage and social stratification, he asked: "if salmon was intensively exploited only recently, is the elaborate social organization of the Nuu-chah-nulth as described in ethnography and ethnohistory also recent, or did it emerge at an earlier date on the basis of a different set of resources?" (Monks 2006:239). Numerous storable resources have been suggested for different regions along the Northwest Coast, including other fish species (e.g., flatfish, herring), shellfish (particularly clams), and plant material.

As discussed above, large flatfish (halibut and petrale sole in particular) likely formed the basis of fish storage at Hoko River, which would support the claim that, in some regions, "the intensification of the salmon fishery occurred only after the storage technology was already in place" (McMillan 2000:123). As lean fish species such as flatfish are easy to preserve and store, it is possible that flatfish provided the basis of winter diet at other sites with little or no access to salmon. Flatfish were not overly abundant within Barkley Sound sites in comparison to other species, although petrale sole was well represented within the faunal assemblages from both Ts'ishaa (NISP = 598) and Huu7ii (NISP = 1073) (Frederick 2012:125; Frederick and Crockford 2005:177; Monks 2006:225). The most common argument against this alternative resource being processed, stored, and consumed as the majority of one's diet during the winter months is the lack of fat content within preserved flatfish (Cannon 2001:181).

Clam gardens, which are prevalent across the Northwest Coast, were likely constructed and managed near Hiikwis. A ring of stones located in the bay at Uukwatis may represent a clam garden (Sellers 2013:37). Such gardens would have increased shellfish production, and in doing so may have attracted greater numbers of other animal species to these modified sections of the intertidal zone (Groesbeck et al. 2014). Species known to eat clams (and other mollusks) include raccoon, harbour seal, northern sea lion, river and sea otter, cabezon, ratfish, rock sole, scoters, gulls, and other shorebirds. While difficult to date, it is likely that clam gardens have been constructed on the coast and managed for millennia. Clams were likely harvested year-round, except during and after red tide events, which can render shellfish toxic (Moss 1993:640). Mariculture resulting in increased production of edible shellfish certainly could have played a role in the emergence of social complexity on the Northwest Coast.

The remains of shellfish are ubiquitous within excavated Northwest Coast village sites. These resources can also be preserved for winter storage, with species actively managed within anthropogenic clam beds. While salmon was an important resource for many groups, "a lack of rights on crucial salmon rivers, or a greater distance from their village to a spawning stream, forced some families to rely heavily on clams" (Williams 2006:48). Preserved clams could have fulfilled the role of salmon at those sites lacking a productive salmon stream; however, it has been argued that shellfish also do not contain a high enough fat content to maintain a healthy diet over the winter months (Cannon 2001:181). The use of sea mammal or eulachon oil as a condiment for dried foods would have provided essential fatty acids and would facilitate a reliance on shellfish (and/or flatfish) as alternative storage foods in lieu of salmon.

Some plant species found on the Northwest Coast were stored for future consumption, including a variety of berries, such as salal (Campbell and Butler 2010:185; Lepofsky and Lyons 2003:1365). Additionally, it is believed that naturally occurring habitats were extended and/or maintained to increase edible returns (Campbell and Butler 2010:188). By settling in one place and beginning to manage the land, rather than practicing nomadic foraging, greater returns could be produced, contributing to increased social complexity. Campbell and Butler (2010:190) also argue that "nearly all forms of plant management used to increase plant production … may have increased animal populations, or at least concentrated them in places easily accessed by people." As with managed shellfish beds, managed plant resources likely attracted a variety of animal species, which would be more vulnerable to human capture.

Many important food resources were owned by certain families, corresponding with the stratified structure of Northwest Coast society. Access to certain salmon streams, fish banks, berry patches, hunting grounds, and clam beds was regulated based on inherited privileges (McMillan 2000:16; Williams 2006:49). Differential access to certain resources has been presumed on the basis of the spatial distribution of faunal remains at several sites along the Northwest Coast, including Ma'acoah (Monks 2006:227) and Ozette (Gray 2008:123-34). This exemplifies one of the ways that faunal analysis aids in the understanding of past cultural behavior at an archaeological site. Unfortunately, the analyzed faunal sample at Hiikwis to date is too small to hypothesize differential status among the site's occupants.

2.9 Conclusion

Barkley Sound is one of the most extensively studied areas on the Northwest Coast, with many large-scale excavations conducted within a period of two decades. The village sites that have been excavated share some common characteristics, including earlier occupation atop a raised back terrace and a rise in salmon abundance around 800 years ago.

Ts'ishaa, Huu7ii, and Ch'uumat'a exhibit a more recent occupation close to the modern shoreline as well as an earlier occupation further back from the shoreline upon a raised terrace, corresponding with a time of higher sea level (3000-5000 years ago; McMillan 2009:627). A similar situation has been documented at Uukwatis.

Based on faunal remains, three sites (Ma'acoah, Ts'ishaa, and Huu7ii) show a shift in fishing practices in upper levels (see Table 1; discussed in greater detail in Chapter 7). Most notably, salmon increases in abundance during this later period, while some species that are numerous in earlier levels (e.g., rockfish, lingcod, and greenling) decrease in abundance. Neither Ts'ishaa nor Huu7ii is located beside a salmon stream; therefore, this increase in abundance around 800 years ago may indicate trade or an expansion of territory to include a salmon stream.

Table 1. Trends in faunal remains at major village sites excavated in Barkley Sound

Date (cal BP)	Ma'acoah	Ts'ishaa	Huu7ii
300 – 600	Site occupied. **Salmon** and **herring** dominate the fish assemblage. **Salmon** abundance increases over time. Flatfish, **rockfish**, perch, and sculpins also abundant.	**Salmon** more abundant and **rockfish** less abundant than in earlier levels. Sea mammals and birds are abundant.	**Salmon** and **herring** are most abundant fish. Sea mammals are less abundant than in earlier levels. Marine birds are abundant. Site abandoned ~400 BP.
700 – 800	May be occupied.	**Salmon** becomes more abundant; **rockfish** becomes rarer compared to earlier levels. Sea mammals and birds become more abundant and land mammals less abundant than in earlier levels. ** Shift to seasonal usage?*	**Salmon** increases in abundance greatly from earlier levels. **Herring** remains abundant. **Rockfish**, dogfish, hake, anchovy, and flatfish less abundant than in earlier levels. Overall decrease in sea mammals. Birds more dominant than in earlier levels; shift to marine species. ** Shift to a more seasonal usage?*
900 – 1400	May be occupied.	**Salmon** rare. **Rockfish** dominates. Dog less abundant than in earlier levels. Geese and ducks abundant. Marine birds less abundant.	Hake, **rockfish**, flatfish, dogfish, **herring**, anchovy, and **salmon** present. High quantity of bird remains.
1500 – 2000	May be occupied.	**Salmon** rare. **Rockfish** dominates.	Hake**, rockfish,** flatfish, and dogfish dominate. **Herring** and anchovy abundant. **Salmon** is present but not common. Sea mammals more abundant than in earlier layers.
2100 – 5000	Likely unoccupied.	**Rockfish**, greenling, and lingcod dominate. **Salmon** very rare. Dogs very abundant. Abundance of fur seals, dolphins, porpoises, and whales. Geese, shearwaters, northern fulmar, and ducks are most abundant birds.	**Herring**, **rockfish**, and greenling dominate; **salmon**, perch, and dogfish are present in lower numbers.

Chapter 3: Ethnographic Accounts of Hiikwis

3.1 The Nuu-chah-nulth in Barkley Sound

The Nuu-chah-nulth and the Ditidaht of the west coast of Vancouver Island, along with the Makah of Washington state, were unique among Northwest Coast groups as they specialized in whaling activities. The residents of Barkley Sound are Nuu-chah-nulth, a name translated as "along the mountains," in reference to the mountain range along the west coast of Vancouver Island. In the mid-nineteenth century, the Nuu-chah-nulth included the members of the Toquaht, Tseshaht, Huu-ay-aht (formerly Ohiaht), Ucluelet, and Uchucklesaht First Nations, each defending their own well-defined territory (see Figure 3). Spanish explorers in the late 1700s estimated the population of Barkley Sound to be around 8,500 (McMillan 2000:24). Over time, territory boundaries have shifted and many groups have become amalgamated. The former village sites of Uukwatis and Hiikwis are located on what is today the Tseshaht reserve of Equis.

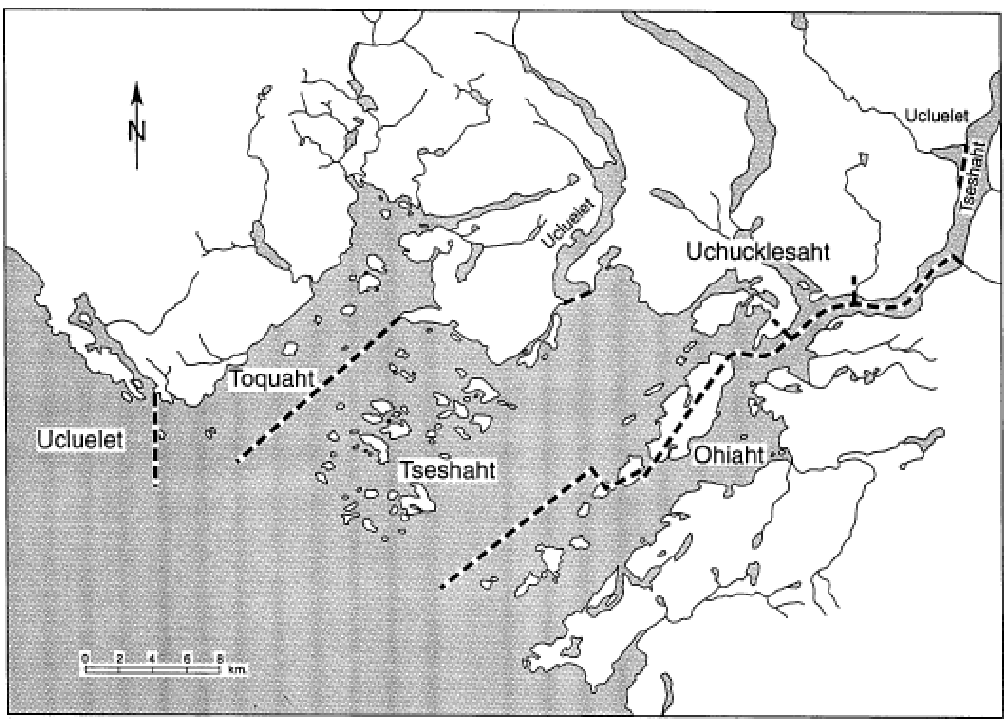

Figure 3. Barkley Sound, showing nineteenth-century Nuu-chah-nulth group territories.

3.2 Nuu-chah-nulth Social Structure

Nuu-chah-nulth culture was based around a political unit known as a local group, consisting of a family of chiefs typically named after the place in which they lived or for a particular chief (McMillan 2009:628; St. Claire 1991:22). Each local group was comprised of several subgroups, called *ushtak̲imilh,* representing a separate descent lineage led by a chief (*ha'wilh*) (McMillan 2009:628; St. Claire 1991:22). If groups became amalgamated, either by force or by choice, they often maintained their separate names and identity, but became ranked within the larger group population.

3.3 History of Occupation at Hiikwis

Hiikwis was historically occupied by the Tseshaht, a local group that originated at Ts'ishaa on Benson Island (within the Broken Group Islands) and expanded its territory over time. Occupation at the Hiikwis site complex has been radiocarbon dated to nearly 3000 cal BP and occupation lasted through the early twentieth century. It is believed that the village of Uukwatis was once occupied year-round by a local group called the *Nash'as7ath̲*, which means "people of thick bushes" (McMillan 2009:633; McMillan and St. Claire 2005:17; St. Claire 1991:42). Many amalgamations took place over time, as groups forcefully took over other areas in order to increase their territory, or when populations fell. The latter was especially common after European contact, when smaller groups that had been decimated by disease would willingly join forces and share resources. Near the end of the eighteenth century, the *Nash'as7ath̲* were amalgamated into the Tseshaht (McMillan and St. Claire 2005:19; St. Claire 1991:41-44).

Tseshaht informant Tom Saayach'apis (discussed below) stated that after the *Nash'as7ath̲* were absorbed by the Tseshaht, Hiikwis became a winter village site for the group as a whole (McMillan and St. Claire 2005:23; St. Claire 1991:134). The site's location in Barkley Sound, protected from the brunt of winter storms by the islands grouped within the sound, provided a good location for settling down during the winter months. Ts'ishaa, the site from which the Tseshaht originate, is located within the outer Broken Group Islands, with no protection from the strong winds and rains coming from the open ocean. Therefore, once the *Nash'as7ath̲* had been incorporated into the Tseshaht, Hiikwis began to be occupied by the large amalgamated group during the winter. Hiikwis changed hands between the Ucluelet and the Tseshaht multiple times around the 1840s and was used as a winter village by both groups, until the Tseshaht eventually defeated the Ucluelet (McMillan 2000:194; Sapir and Swadesh 1955:27, 412).

In the nineteenth century, the Tseshaht absorbed a group by the Somass River to gain access to its abundant salmon run, and subsequently moved their winter village location there, although they continued to utilize Hiikwis from February through April for its seasonal resources (McMillan and St. Claire 2005:23-24; St. Claire 1998:76). Tom Saayach'apis noted that former *Nash'as7ath* members often remained at Hiikwis during the summer months (McMillan and St. Claire 2005:24).

By this time, at least six formerly independent local groups had amalgamated with the Tseshaht to hold one of the largest territories in Barkley Sound, around which the group migrated throughout the year in order to take advantage of different resources. This territory included the Broken Group islands, the western Deer Group islands, the majority of the northern shore of Barkley Sound, a good portion of the Alberni Inlet, and the lower Somass River (McMillan 2009:632; St. Claire 1998:75-7).

3.4 Seasonal Resource Exploitation at Hiikwis

Hiikwis was described by reserve commissioner Peter O'Reilly as an area of salmon, dogfish, seal, and shellfish exploitation (McMillan and St. Claire 1982:20). The primary ethnographer and linguist who studied the Tseshaht in Barkley Sound was Edward Sapir, who conducted the majority of his work between 1910 and 1914 (McMillan 2000:63).

An interesting ethnographic account exists in Sapir and Morris Swadesh's joint publication *Native Accounts of Nootka Ethnography* (1955), which depicts the seasonal round of those occupying Hiikwis during historic times. In a chapter titled *The Yearly Round,* Sapir and Swadesh's (1955:27) primary Tseshaht informant, Tom Sayach'apis, describes the seasonal round that the "Tsishaa Tribe" undertook during his grandfather's time. He noted the various locations to which the tribe travelled throughout the year and the resources they exploited at each location. At Hiikwis during the winter, shellfish were gathered, sea lions, hair (harbour) seals, and porpoises were feasted upon, and salmon and herring began spawning and were consumed (Sapir and Swadesh 1955:27-30). Many of the fish caught were dried. Flocks of migratory birds, including geese and swans, came and were caught with scoop nets. Wild plants exploited during winter included fern roots, clover roots, and wild onion.

Tom stated that the tribe trapped flocks of *tsiinuu* birds on the sandy beach at Hiikwis, which "flew in flocks after the season of herring spawn" (Sapir and Swadesh 1955:39). *Tsiinuu* is the name given to sandpipers in many Nuu-chah-nulth languages (Powell 1991:33), and they were kept as pets by small children. Tom also recalled shooting an *iitu* bird, which he noted to be very tame, with an arrow as a boy. Here he is referring to a robin (Powell 1991:31).

When winter ended, the residents of Hiikwis moved to other locations in the Tseshaht territory to take advantage of seasonal resources. In the spring they caught cod. In the summer, Tom's ancestors would fish for halibut, canoeing away from the village at night to reach preferred fishing spots in the open ocean by dawn. During the summer months, they ate dried clams and mussels, coho salmon, tyee (chinook) salmon, thimbleberries, salal berries, and huckleberries. Big summer feasts were held. Much of the salmon caught during this season was dried. Once the salmon was dried, it was time to set up traps to catch sawbill ducks (mergansers). Other birds that were taken during this time include wigeon, geese, mallards, and other duck species. Hair seals were hunted during late summer and into fall. As the weather became colder, it was time to head back to Hiikwis for the winter.

3.5 Ceremonial Usage of Hiikwis

Hiikwis was an important location for many winter ceremonial and celebratory events, including potlatches and the Wolf Ritual (*Tl'ukwaana*) (McMillan and St. Claire 2005:24; St. Claire 1991:135; Sapir and Swadesh 1955:27, 43). Sapir and Swadesh (1955:43-4) describe potlatches held at Hiikwis during the winter months that were attended by at least seven distinct bands. During the Wolf Ritual, which also took place in the winter, children were captured by "wolves" for four days as part of an initiation rite (Arima and Hoover 2011:202; Sapir and Swadesh 1955:27-9). The ritual was "a re-enactment of a myth in which a young chief is carried off by wolves to their home in the forest" (Arima and Hoover 2011:202). The right to be "bitten away" by the wolves was inherited (Sapir and Swadesh 1939:129). The ritual was often followed by four additional days of singing and dancing, although among some Tseshaht, the event could last for up to 12 days (Arima and Hoover 2011:210).

3.6 European Contact and Trade

The first European to arrive in Barkley Sound was Captain Charles William Barkley in 1787, who named the sound after himself (McMillan and St. Claire 2005:34). Traders visited intermittently over the next century, with the first trading post established in Ucluelet in 1860. Reserve land began to be allocated by 1882 (McMillan and St. Claire 2005:35).

A number of local resources were sought by European and American traders, most importantly the soft fur of the sea otter. The fur trade was established in the sound from Captain Barkley's first contact in 1787 (McMillan 2000:188). As a result of this trade, sea otters were depleted in Barkley Sound by the 1820s (McMillan and St. Claire 2005:22). After the decimation of the sea otters, other animals were hunted for their coats, including fur seal, mink, marten, deer, and elk (Arima and Hoover 2011:183).

Oil from the spiny dogfish was also desired by the Europeans, for use in oil lamps and as a lubricant for lumber mill machinery. After 1850 dogfish oil became one of the top trading items between the Nuu-chah-nulth and European settlers (Arima and Hoover 2011:182-3; Crockford 1996:37). Crockford (1996:37) writes that "by 1874, Nuu-chah-nulth communities in Barkley Sound were producing 20,000 to 25,000 gallons of oil per year, which required the catching and processing of as many as 250,000 fish." This increase in dogfish exploitation may be visible within the faunal assemblages recovered from historic Nuu-chah-nulth sites.

3.7 Nuu-chah-nulth Whaling

The Nuu-chah-nulth were renowned for their whaling activities. Based on faunal remains from a number of Nuu-chah-nulth sites, whales were utilized from at least 4000 cal BP. Whales were actively hunted by at least 2500 cal BP, evidenced by mussel-shell harpoon heads embedded within recovered bones (Monks et al. 2001:60). Whaling was a spring activity, taking place during the annual grey whale (*Eschrichtius robustus*) migration north along the west coast of North America. When these whales migrate back south in the fall, they are further off coast and the weather is less accommodating. Humpback whales (*Megaptera novaeangliae*) were also hunted and may have been available in some areas of Barkley Sound year-round (Arima and Hoover 2011:59). Killer (*Orcinus orca*), blue (*Balaenoptera musculus*), right (*Balaena glacialis*), minke (*Balaenoptera acutorostrata*), and finback (*Balaenoptera physalus*) whale remains have also been identified at Nuu-chah-nulth sites, although very infrequently (McMillan 2000:135; Monks et al. 2001:74). Drift whales – dead whales encountered at sea or washed ashore – were also utilized, and typically belonged to the chief upon whose land the whale beached (Arima and Hoover 2011:64).

Whaling was a prestigious activity that required great training and ritual (Arima and Hoover 2011:59; McMillan 2000:139). The hereditary rights to whale, the knowledge of how to create whaling equipment and canoes, and the methods used to hunt whales were passed down from generation to generation, typically from father to son. Songs and rituals were performed to attract whales (including drift whales) and to ensure success during the hunt. Included was ritual bathing, in which the body was rubbed with hemlock branches, often drawing blood. The hunter bathed himself in certain bodies of water, imitating the actions of a whale. He was expected to abstain from certain foods and activities, including sexual activities (McMillan 2000:160). Wives of the whaling chiefs were also expected to participate in rituals and abstinence.

Six to twelve men would set out in a large dug-out cedar canoe in an attempt to catch a whale (Arima and Hoover 2011:61). While each man in the canoe played an important role, the chief was in charge of harpooning the whale, and held the rights to choice parts of it. All parts of the whale were used: oil, blubber, meat, bone, baleen, sinew, and gut. The blubber and meat were eaten fresh and dried, while whale oil was used as a condiment for dried food. Whale bone was used to make many types of tools, including war clubs (Arima and Hoover 2011:142). Surplus whale products were used as trade items (Monks et al. 2001:75).

Ethnographic accounts state that whales were disarticulated on the beach, with many of the bones hauled into the village sites to be made into tools or used as structural features (e.g., bank, house, or post supports; retaining walls; water trenches) (McMillan 2000:134; Monks et al. 2001:62, 64). Ethnographers were told that whales were sometimes butchered in the water; in such cases only choice pieces were canoed back to shore (Monks et al. 2001:64). These whales would not be represented within the archaeological record at all.

A commercial whaling station opened in Sechart Channel in 1905, closely followed by another in Kyuquat Sound to the north. In the 1908 season alone the two stations processed 569 whales (Monks et al. 2001:71). These commercial stations decimated humpback, blue, and finback whale populations in Barkley Sound and were closed within a couple of decades.

3.8 Conclusion

Oral history, ethnographic records, and archaeological work document Barkley Sound as rich in animal resources. This area supported a large population of Nuu-chah-nulth in many groups, which would amalgamate, break apart, or shift territories as needed. As a result of territory expansion in relatively recent times, Barkley Sound groups adopted a seasonal movement pattern to exploit different resources throughout the year. A historic account of one such seasonal round by the Tseshaht was recorded by Sapir and Swadesh (1955). The traditional residents of Barkley Sound were renowned for their extraordinary whaling culture. Animal resources, mainly dogfish oil and sea otter pelts, attracted non-indigenous traders to the area. This contact led to irrevocable changes to the traditional way of life for the natives of Barkley Sound, many of them devastating (e.g., the decimation of the sea otter population; indigenous population crashes).

Chapter 4: Site Description and Excavation Methodology

4.1 Site Location

The Hiikwis site complex is located in inner Barkley Sound along Sechart Channel on the west coast of Vancouver Island, British Columbia. Hiikwis is composed of two distinct Nuu-chah-nulth village sites at which large traditional plank houses once stood, now represented by large shell middens. The area first occupied was Uukwatis. Radiocarbon dates show this site to have been occupied from at least 2870 – 2750 cal BP to 920 – 720 cal BP (McMillan pers. comm. 2012). Hiikwis proper is located approximately 650 m west up the beach; it is believed to have been occupied by the same people who lived at Uukwatis. Hiikwis proper has been radiocarbon dated to 1290 – 1160 cal BP to 520 – 310 cal BP (McMillan pers. comm. 2012). Both sites were in use until the early twentieth century.

Figure 4. View coming into Uukwatis (DfSh-15) by boat. Note the mud flat in front of the site and the stream to the right side (shadowed area). Photo by author.

4.2 Sea Level History

During the Fraser Glaciation (approximately 30,000 to 11,000 cal BP), British Columbia was covered by the Cordilleran Ice Sheet (Dallimore et al. 2008:1346). Throughout this time, sea water was locked up in glaciers, resulting in eustatic sea level drop along the Northwest Coast. This drop was intensified by the isostatic pressure the weight of the glaciers placed upon the land. Near the end of glaciation (around 14,000 cal BP), sea levels along the Northwest Coast were up to 200 m higher than those of today (Clague et al. 1982:600). As the land rebounded as the glaciers receded, sea levels fell rapidly to several metres below modern levels.

Sea level history varies greatly along the Northwest Coast. Along the central western coast of Vancouver Island (where Barkley Sound is located), sea level was more than 21 m above modern prior to 14,000 cal BP, at which point it fell rapidly to 46 m below modern. Sea level remained quite stable for the next 2000 years, after which it rose rapidly to reach about 4 m above modern around 6000 cal BP and remained stable until about 4800 cal BP. Since then, it has slowly fallen to the modern level (Dallimore et al. 2008:1345; Mackie et al. 2011:58). Based on the presence of elevated cultural deposits (middens) located on platforms behind main village sites at Ch'uumat'a (DfSi-4), Huu7ii (DfSh-7), and Ts'ishaa (DfSi-16), it appears that sea level in Barkley Sound between 3000 – 5000 cal BP was higher than it is today (McMillan 2009:627). A similar situation occurs at Uukwatis, where both lower house platforms (close to the shoreline, representing a more recent occupation) and upper house platforms on a raised terrace (approximately 100 m back from and 4 m above the lower house platform) have been discerned. We can assume that artifacts and faunal remains recovered from these terrace features represent a distinct, older occupation, which has been confirmed through radiocarbon dating.

4.3 Site Description and Location of Excavation Units

4.3.1 Uukwatis (DfSh-15)

Uukwatis lies at the edge of an extensive mud flat (see Figures 4 and 5), which extends into a forested area. Within the forest are flat platforms upon which large traditional plank houses once stood, backed by a midden ridge. This ridge represents the “refuse” of the site (e.g., discarded shells and animal carcasses), which built up behind and between the houses during their occupation. As discussed above, archaeological deposits were also located on a raised terrace, believed to have been occupied during times of higher sea level.

Figure 5. Mud flat in front of Uukwatis (DfSh-15), looking west to DfSh-16. Photo by author.

Five 2 m x 2 m squares (Units 1-5) and two 1 m x 2 m extensions to Unit 4 were excavated at this site (Figure 6). Unit 1 was located closest to the beach. Early twentieth century houses once stood on pilings in this area. Units 2 and 5 were located on a platform where large traditional plank houses once stood. Unit 3 was located alongside the stream that runs in the eastern portion of the site. This unit was located further inland than Units 1, 2, and 5. Unit 4 was located much further inland, upon a back terrace approximately 6 m above modern sea level. Shell deposits were discovered on the terrace through soil probing.

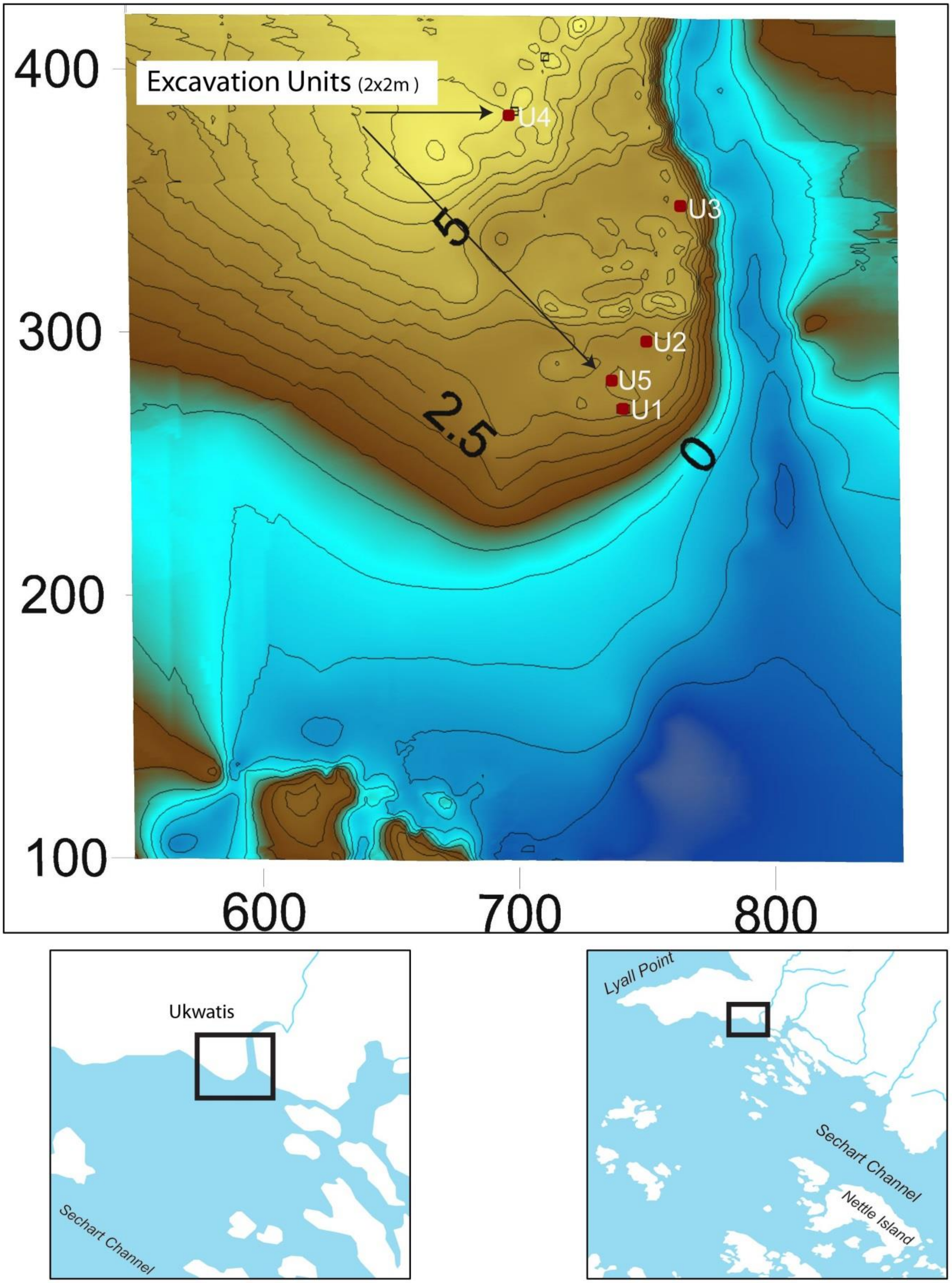

Figure 6. Location of Excavation Units at Uukwatis (DfSh-15), courtesy of Iain McKechnie. Labeled by author.

4.3.2 Hiikwis proper (DfSh-16)

Hiikwis proper consists of a rocky beach and forest. Five 2 m x 2 m units were excavated at this site (Figure 8). All five units were located on what are believed to be two house platforms upon which traditional plank houses once stood. Units N4-6 E0-2, N4-6 W4-6, and N6-8 W2-4 were placed on a lower house platform, while Units N12-14 E4-6 and N14-16 E4-6 were placed adjacent to one another on an upper house platform. A collapsed house beam lies on the surface of this platform; house post remnants were identified at this site as well. Excavation of two of the units, N6-8 W2-4 and N14-16 E4-6, was not completed.

Figure 7. Hiikwis proper (DfSh-16), looking east to DfSh-15. Photo courtesy of Alan McMillan.

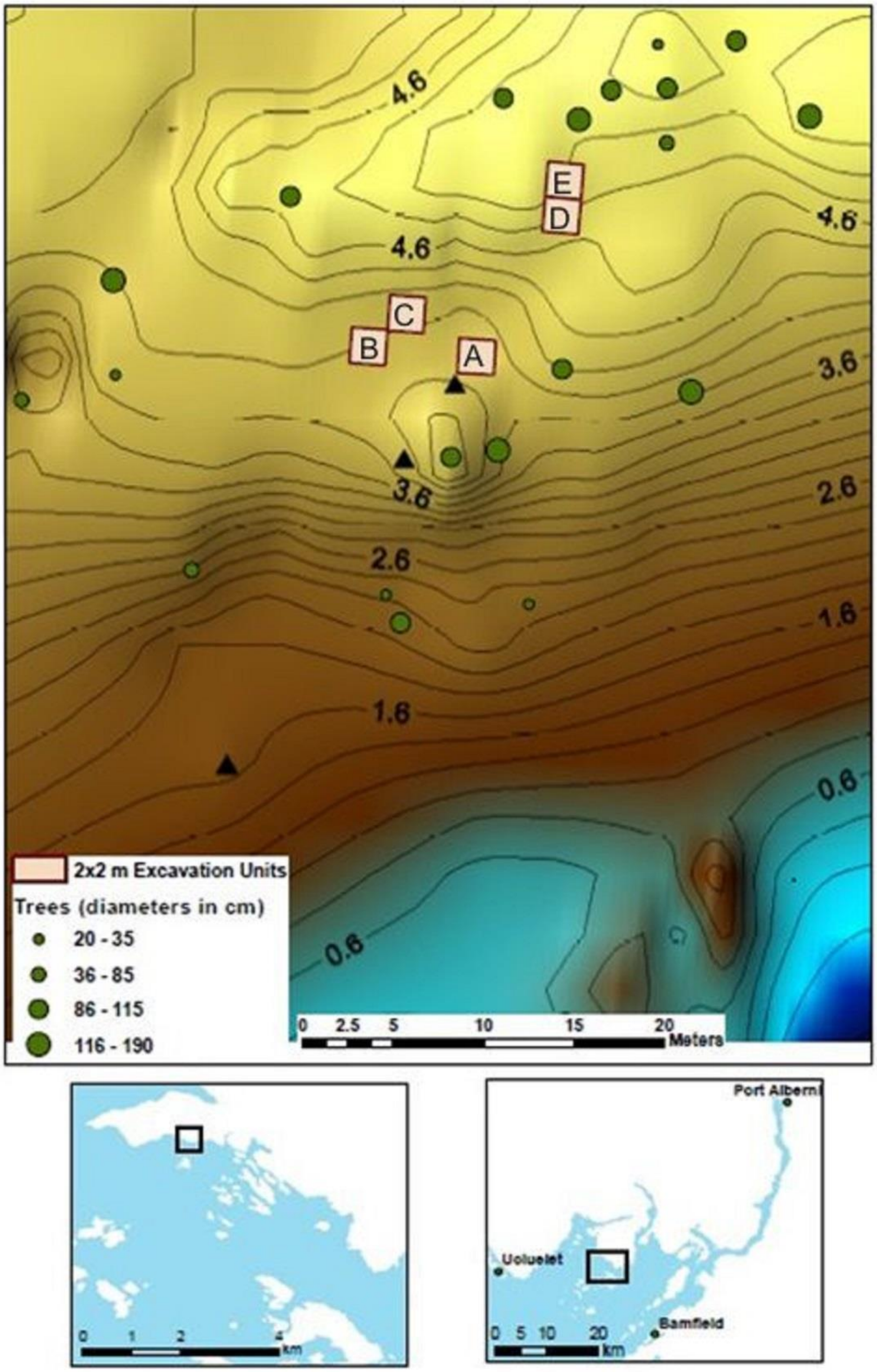

Figure 8. Location of excavation units at Hiikwis proper (DfSh-16), courtesy of Iain McKechnie.
Labeled by author:
A = Unit N4-6, E0-2; B = Unit N4-6, W4-6; C = Unit N6-8, W2-4;
D = Unit N12-14, E4-6; E = Unit N14-16, E4-6

4.4 Excavation Methodology

The archaeological project began with an excavation at Uukwatis in 2008, while Hiikwis proper was excavated in 2009. The excavation at Uukwatis was completed in 2010. The units were determined using judgmental sampling to ensure that specific areas of the site were examined (e.g., house platforms; the back terrace; the edge of a creek supporting a salmon run). The material recovered was dry-screened in the field through 1/4" mesh. Column samples were taken from each unit for future fine-screening in a laboratory setting.

4.4.1 Uukwatis (DfSh-15)

In total, 40.4 m^3 of material was removed from the five units and two extensions. The units follow a magnetic N-S orientation, with specific designations plotted in later using a total station. Excavation occurred in 10 cm arbitrary levels within stratigraphic layers. Levels are numbered and layers are labelled alphabetically. The units that I analyzed are described in further detail below:

<u>Unit 3</u>: This unit was located beside the creek that runs by the site. The creek supports a salmon run, which would have provided an important source of subsistence for the site's occupants. This unit is the farthest one up the creek. It is possible that sea level was slightly higher during this period of occupation. The amount of material excavated from this unit was 7.6 m^3. The average depth of the unit was 1.9 m.

<u>Unit 4</u>: This unit was excavated on the back terrace, representing the highest section of the site, and is located a significant distance from the shoreline. The terrace appears to be the earliest part of the site, radiocarbon dated to nearly 3000 cal BP, when sea levels were higher than today. The amount of material excavated from this unit was 19.5 m^3. The average depth of the unit was 2.7 m. Measuring 2 m x 2 m, the unit was originally excavated in 2008. In 2010, two 1 m x 2 m extensions along the eastern (4A) and southern (4B) walls were excavated alongside the original unit. I examined the faunal remains from the main unit (4) and from one of the extensions (4A).

4.4.2 Hiikwis proper (DfSh-16)

A total of 22.8 m³ of material was removed from the units at this site, which was excavated using a traditional N-S, E-W grid system. Excavation occurred in 10 cm arbitrary levels within stratigraphic layers. Levels are numbered and layers are labelled alphabetically. Two flat platforms were determined, both likely to be house platforms, one closer to the beach than the other. I analyzed one unit from this site:

<u>Unit N4-6 E0-2</u>: This unit is located on the lower house platform. During excavation, 5.4 m³ of material was removed. The average depth of the unit was 1.35 m.

Figure 9. Excavation units on the lower platform at DfSh-16. Photo courtesy of Alan McMillan.

4.5 Site Chronology

Based on radiocarbon dates obtained from Units 1 and 4, the original village site, Uukwatis was occupied from at least 2870 – 2750 cal BP until 920 – 720 cal BP or later (McMillan pers. comm. 2012). At some point, inhabitants moved west up the beach to Hiikwis proper, although Uukwatis was occupied into the early twentieth century. The oldest radiocarbon date from Hiikwis proper was 1290 – 1160 cal BP, with the site appearing to have been continuously occupied into the early 1900s (McMillan pers. comm. 2012; McMillan and St. Claire 2012:9).

4.5.1 Uukwatis (DfSh-15)

In Unit 3, historic materials were recovered until Level 2. At Level 10 (0.9 m depth), a charcoal sample from a hearth/fire-cracked rock concentration returned a radiocarbon date of 1749 – 1560 cal BP. A charcoal sample from Level 19, the bottom of the cultural material (1.8 m depth), was dated to 1870 – 1620 cal BP.

In Unit 4, a charcoal sample from Level 6 (0.7 m depth) returned a date of 2100 – 1880 cal BP). A sample from a hearth feature in Level 12 (1.2 m depth) returned a radiocarbon date of 2340 – 2120 cal BP. A charcoal sample from the second to last level, Level 23 (2.3 m depth), returned a date of 2870 – 2750 cal BP. As discussed above, this terrace represents occupation during a time of higher sea level in Barkley Sound, between 2000 – 5000 years ago.

A more recent occupation, located closer to the modern shoreline, has been radiocarbon dated to 920 – 720 cal BP using a charcoal sample from Unit 1 (1.4 m depth). The bottom of Unit 2 (1.0 m depth) was radiocarbon dated to 1390 – 1270 cal BP. Faunal remains from these two units were not included in my analysis.

4.5.2 Hiikwis proper (DfSh-16)

Historic materials were abundant in Unit N4-6 E0-2 in Levels 2 and 3, with one button recovered from Level 5 and one copper fragment from Level 7. A charcoal sample from the second lowest level, Level 13, near the bottom of the cultural material (1.3 m depth) was radiocarbon dated to 920 – 700 cal BP.

A charcoal sample from Level 16 (1.5 m depth) in Unit N14-16 E4-6 on the upper house platform returned a radiocarbon date of 1290 – 1160 cal BP. Fauna from this unit was not included in my analysis.

Chapter 5: Sampling, Identification, and Quantification Methodology

5.1 Sampling Methodology

Of the excavated units, I analyzed one from Hiikwis proper and two (plus one extension) from Uukwatis. As a large quantity of faunal material was recovered, I decided to sample each unit. Unit 4/4A at Uukwatis contained the most faunal material; therefore, I analyzed every third arbitrary level. For both Unit 3 at Uukwatis and Unit N4-6/E0-2 at Hiikwis proper, I analyzed every second arbitrary level.

The excavated sediment was screened in the field using 1/4" mesh. Vertebrate faunal remains were bagged according to arbitrary 10 cm horizontal level within each stratigraphic layer. *In situ* fish bone concentrations were removed and bagged with the surrounding matrix as a whole. These were screened through 1/4", 1/8", and 1/16" nested screens at the University of Victoria, providing an informative comparison to the 1/4" screened material.

5.2 Identification Methodology

My vertebrate identifications were made using the University of Victoria's comparative faunal collection. To begin, I separated the fauna into three categories: bird, fish, and mammal. From there, I attempted to identify each bone or bone fragment to species.

For many birds and fish, it is difficult to differentiate between species within a genus. This is particularly true for salmon and rockfish species; therefore, I identified all salmon remains as *Oncorhynchus* sp., and all rockfish remains as *Sebastes* sp. I also identified all greenling remains as *Hexagrammos* sp. Some bird species, particularly ducks and gulls, are also difficult to identify to species. In most cases I identified ducks as either small (e.g., bufflehead), medium (e.g., surf scoter), or large (e.g., mallard; white-winged scoter). Similarly, gull remains were identified as small (e.g., mew gull), medium (e.g., California gull), or large (e.g., glaucous-winged gull). Some sea mammal fragments could not be reliably distinguished as sea lion or fur seal; these were identified as "Otariidae," a family level designation. As the whale remains included in my sample were mainly small fragments, I did not attempt the identification of whale bones to size class.

In order to document as many specimens as possible, fragments which could not be identified to taxon were categorized by size classification (e.g., large bird, small land mammal). As a rough guideline, I considered a small land mammal as one smaller than a Northwest Coast dog, a medium-sized land mammal as one dog- to deer-sized, and a large land mammal to be one larger than a deer. I considered a small sea mammal as seal-sized or smaller, while a large sea mammal was sea lion-sized or larger. I considered a small bird to be robin-sized and smaller, a medium bird to be duck-sized, and a large bird to be loon-sized and up. It was necessary to classify some fragments to an intermediate size category (e.g., medium/large bird). No size classification system was used for unidentifiable fish, as the majority of these remains were not easily assignable to a size category (i.e., very fragmented), or were non-diagnostic spines or similar elements, which could greatly inflate the representation of medium-sized fish. Large fish spines are more easily identifiable to species or genus, while most small fish spines would pass through 1/4” screens.

I attempted to piece together any bone fragments that appeared to originate from one element. Fragments that fit together were quantified as a single element (i.e., given a NISP of 1) rather than counted individually. In the case of fragmented fish vertebrae, I noted whether more than half or less than half of the element was present, following Monks’ (2006:221) methodology, to avoid over-representing the actual number of vertebrae. Loose mammalian teeth were counted individually, while a mandible containing teeth was counted as one element. Unidentifiable mammal remains were designated as either land or sea mammal where possible.

5.3 Documentation Methodology

Initial documentation of the faunal assemblage was done in a spiral notebook. I recorded each bone/fragment that was successfully identified, along with which side of the body the bone came from, the completeness of the bone, and which part of the bone was present if incomplete.

I noted any observed indicators of sex and age of individuals. For mammals, I observed three age classes where possible: newborn (bones small, fragile, and not fully shaped; epiphyses absent), juvenile (epiphyses unattached or partially fused; deciduous teeth), and adult (epiphyses fully fused, with little to no appearance of fusion lines; permanent teeth). Many of the mammal specimens in the comparative faunal collection at the University of Victoria are of known ages, providing a useful age class designation for identified mammal fragments with epiphyseal portions preserved within the Hiikwis assemblage.

Possible indications of human modification on the bones, including burned or blackened bones and/or the presence of tool marks, were documented. The number of unidentified bones for each animal category (unidentified bird, fish, mammal, or unknown) was recorded as well. All observed information was entered into a Microsoft Access database from which I conducted my quantification.

5.4 Quantification Methodology

5.4.1 NSP and NISP

My results were quantified using a variety of methods. Basic counts were provided using Number of Specimens (NSP) and Number of Identified Specimens (NISP). NSP is the total of all bone fragments present in a sample assemblage, including fragments identified only as "bone." I counted an overall sum, as well as an NSP for each animal category (bird, fish, land mammal, and sea mammal), for each site, unit, level, layer, and level/layer combination. NISP includes only the bones/fragments that were identifiable to species, genus, or family. NISP is the most frequently employed method of quantification in zooarchaeological analysis and provides a general overview of the species present at a site.

To complement NISP, I also calculated %NISP for each species. This value provides a relative abundance for each species within its respective animal category (fish, bird, land mammal, or sea mammal). By accounting for sample size, this relative frequency provides a value that is easily comparable between levels, units, or sites.

The biggest problem with NISP is that it does not take into account bone fragmentation. To determine NISP, each bone fragment is counted individually, even if the fragments came from the same bone. Many of the faunal remains from Hiikwis were fragmented, particularly bird and mammal bones. In these cases, NISP likely over-represents abundance at the site. While NISP is subject to this and further limitations and biases (Lyman 2008; Reitz and Wing 2008), I chose to utilize it and %NISP as my main methods of quantification as they facilitate general comparisons within and among units and sites. %NISP was particularly useful for comparing the Hiikwis faunal assemblage to contemporaneous Barkley Sound village sites.

5.4.2 MNI

I also calculated the Minimum Number of Individuals (MNI) for each taxon represented in my sample. Although this quantification method did not play a large role in my analysis and interpretation, MNI values are provided in Appendix A. This method determines the lowest number of individual animals required to account for the bones present for each species. To determine MNI, I calculated MNE (Minimum Number of Elements) for each element of each species. The most frequently occurring element (i.e., the highest MNE) represents the minimum number of unique individuals recovered from the site (e.g., five left femora provide an MNI of 5). I took into account the portion of the element (if fragmented), side of body, size, age, and sex, where possible.

Perhaps the most difficult aspect of calculating MNI is deciding upon the *unit of aggregation*. This term represents how the site was divided and how the analyst decided to combine the faunal remains recovered to calculate MNI (Reitz and Wing 2008:208). For example, all of the bones found at a site could be combined as a whole, or they could be divided based on some combination of excavation unit, level, and layer. Different units of aggregation will result in differing MNIs.

I chose to calculate a separate MNI for each arbitrary level/natural layer combination in each excavation unit (i.e., a separate MNI for Level 9/Layer A and Level 9/Layer B, etc.). The units were located a significant distance away from one another; therefore, it did not make sense to aggregate the units and calculate MNIs based on each entire site. While it is possible that an individual may be represented in more than one level within an excavation unit, the unit of aggregation that I chose is simple and straightforward, and permits the observation of general trends in the fauna over time.

5.4.3. MAU

While MNI implies the presence of whole animals, Minimum number of Animal Units (MAU) focuses on individual elements. I chose to calculate MAU as it accounts for the fact that different numbers of elements occur in a skeleton (unlike NISP), and can therefore be employed to determine the relative abundance of elements within and between species. MAU is calculated by dividing MNE by the number of said element present in the skeleton (e.g., if five deer femora are present, 5 would be divided by 2, which is the number of times a femur occurs in a deer skeleton [Reitz and Wing 2008:226]). For some fish species, vertebrae were the most frequently occurring element (i.e., the highest MNE). In such cases, the number of identified vertebrae was divided by the average number of vertebrae documented for that particular species, following Wigen (2005).

I employed MAU to compare the frequency of cranial versus postcranial salmon bones in an attempt to determine whether fish were being consumed fresh (evidenced by a balanced representation of all body parts) or preserved (an overrepresentation of postcranial over cranial remains). The results and implications of this analysis are discussed in Chapter 6.17.

Chapter 6: Results and Discussion

6.1 Introduction

6.1.1 Chapter Overview

This chapter contains my results and subsequent discussion, particularly in relation to the five research questions outlined in Chapter 1. Here I present general quantification of the vertebrate faunal remains from the Hiikwis site complex, followed by a more in-depth discussion of the assemblage, including changes over time and differences between Uukwatis and Hiikwis proper. From there I examine the small assemblages of modified and burned specimens recovered from the sites. Six *in situ* fish concentration features were identified and quantified, confirming biases associated with screen size that can arise during archaeological excavation.

Based on the species identified within the analyzed assemblage, I describe the variety of habitats that were exploited by the residents of Hiikwis and the seasons during which the site complex was likely occupied.

Following this, I compare the faunal assemblage from Hiikwis to those of three contemporaneous Barkley Sound village sites: Ma'acoah (DfSi-5), Ts'ishaa (DfSi-16), and Huu7ii (DfSh-7). As part of this comparison, I explore whale exploitation at Ts'ishaa, Huu7ii, and Hiikwis, augmented by aDNA data. Finally, I discuss the role that salmon played at the Hiikwis site complex over time.

6.1.2 Introduction to the Hiikwis Faunal Assemblage

A total of 26,619 vertebrate specimens were analyzed from the Hiikwis site complex (DfSh-15 and DfSh-16). Of these, 14,186 were recovered from one unit at DfSh-16 and 12,433 were recovered from two units and one extension at DfSh-15. Excluding the six fine-screened fish concentration features (discussed below), 24,413 bones/bone fragments were studied. Of those specimens, 13,888 were identifiable to species, genus, family, or size category (e.g., large bird).

The analyzed assemblage was dominated by fish (NSP = 15,683), followed by bird (NSP = 5871), sea mammal (NSP = 729), and land mammal (NSP = 646). Indistinguishable mammal remains totaled 1283, and 195 bone fragments were identified as bird/mammal. Ten fragments were identified only as bone.

Evidence of human modification of bone at the Hiikwis site complex was few (specimens displaying distinct tool marks totalled 36, while blackened/calcined bone fragments totalled 68). However, based on their occurrence within midden deposits, the faunal remains are believed to represent animals exploited mainly for subsistence purposes. A probable exception is those species identified as commensal or invasive mammals: dogs, mice, and voles, following Crockford (1997b:104) and Frederick and Crockford (2005). Raw materials provided by the animals represented at the site were also exploited (e.g., bone and antler as evidenced through tool manufacture).

6.2 Overall Results – Number of Identified Specimens (NISP)

6.2.1 Fish Remains

Fish remains dominated the analyzed assemblage at the Hiikwis site complex, consisting of 64.2% of total NSP and 77.0% of total NISP. Fish remains were particularly abundant within Unit 3 at Uukwatis, comprising nearly 95% of the identifiable material. The salmon-spawning stream running near the unit may help explain the dominance of fish remains recovered from this unit. Table 2 outlines fish NSP, %NSP, NISP, and %NISP for each unit and the site complex in total.

Table 2. Fish NSP, NISP, and relative frequencies for sampled units at Hiikwis (DfSh-15 and DfSh-16), excluding fish concentration features.

Site	Unit	NSP	%NSP	NISP	%NISP
DfSh-15	3	5330	90.0%	3514	94.8%
DfSh-15	4	2459	67.5%	1672	79.6%
DfSh-15	4A	623	47.2%	421	68.2%
DfSh-16	N4-6 E0-2	7271	53.7%	5080	68.9%
TOTAL	**ALL UNITS**	**15,683**	**64.2%**	**10,687**	**77.0%**

Based on overall fish NISP, the most abundant fish species recovered from the Hiikwis site complex were salmon (NISP = 5942; 55.6% NISP), rockfish (NISP = 1479; 13.8%), Pacific herring (NISP = 947; 8.9%), and spiny dogfish (NISP = 548; 5.1%). These four taxa alone represent 83.4% of the identified fish remains in the assemblage. All other fish species contributed less than three percent to NISP. Table 3 lists the NISP of each fish species recovered from the analyzed units at the site complex.

Table 3. Total fish NISP counts for Hiikwis (DfSh-15 and DfSh-16, all studied units).

COMMON NAME	SCIENTIFIC NAME	SITE TOTAL	%NISP
Salmon	*Oncorhynchus* sp.	5942	55.6%
Rockfish	*Sebastes* sp.	1479	13.8%
Pacific Herring	*Clupea pallasi*	947	8.9%
Northern Anchovy	*Engraulis mordax*	42	<1%
Spiny Dogfish	*Squalus acanthias*	548	5.1%
Ratfish	*Hydrolagus colliei*	122	1.1%
Pile Perch	*Damalichthys vacca*	61	<1%
Shiner Perch	*Cymatogaster aggregata*	2	<1%
Perch	Embiotocidae	226	2.1%
Lingcod	*Ophiodon elongates*	307	2.9%
Greenling	*Hexagrammos* sp.	290	2.7%
Plainfin Midshipman	*Porichthys notatus*	261	2.4%
Cabezon	*Scorpaenichthys marmoratus*	44	<1%
Red Irish Lord	*Hemilepidotus hemilepidotus*	21	<1%
Great Sculpin	*Myoxocephalus polyacanthocephalus*	3	<1%
Sculpin	Cottidae	37	<1%
Pacific Hake	*Merluccius productus*	213	2.0%
Pacific Cod	*Gadus macrocephalus*	30	<1%
Pacific Cod/Pollock	Gadidae	7	<1%
Walleye Pollock	*Gadus chalcogrammus*	3	<1%
Pacific Halibut	*Hippoglossus stenolepis*	7	<1%
Starry Flounder	*Platichthys stellatus*	10	<1%
Pacific Sanddab	*Citharichthys sordidus*	4	<1%
Flatfish	Pleuronectiformes	50	<1%
Skate	*Raja* sp.	4	<1%
Bluefin Tuna	*Thunnus orientalis*	20	<1%
Wolf Eel	*Anarrhichthys ocellatus*	1	<1%
Eulachon	*Thaleichthys pacificus*	1	<1%
Pacific Sardine	*Sardinops sagax*	3	<1%
Sablefish	*Anoplopoma fimbria*	1	<1%
Thornyhead	*Sebastolobus* sp.	1	<1%
	TOTAL FISH NISP	**10,687**	**100%**

6.2.2. Bird Remains

In total, 5871 bird bones/fragments were present in the sample faunal assemblage recovered from the Hiikwis site complex. Of these, 2332 were identifiable to species, genus, or family. An additional 146 fragments were identifiable to bird size class (e.g., small, medium, large), as defined in Chapter 5. Table 4 outlines bird NSP, %NSP, NISP, and %NISP for each unit and the site complex in total. NISP totals include specimens identifiable only to size category

Table 4. Bird NSP, NISP, and relative frequencies for sampled units at Hiikwis (DfSh-15 and DfSh-16), including those identified only to size category (e.g., large bird; n=146).

Site	Unit	NSP	%NSP	NISP	%NISP
DfSh-15	3	328	5.5%	128	3.5%
DfSh-15	4	629	17.3%	298	14.2%
DfSh-15	4A	185	14.0%	80	13.0%
DfSh-16	N4-6 E0-2	4729	35.0%	1972	26.7%
TOTAL	**ALL UNITS**	**5871**	**24.0%**	**2478**	**17.8%**

Based on the overall bird NISP total for all units at both sites, the most abundant bird species recovered from the Hiikwis site complex were common murre (NISP = 683; 29.3% NISP), gulls (NISP = 367; 15.7%), loons (NISP = 296; 12.7%), albatross (NISP = 252; 10.8%), ducks (NISP = 220; 9.4%), geese (NISP = 174; 7.5%), and cormorants (NISP = 167; 7.2%). All other bird species contributed less than 2.5% each to NISP. Table 5 lists the NISP of each bird species recovered from the analyzed units at the site complex.

Table 5. Total bird NISP counts for Hiikwis (DfSh-15 and DfSh-16, all studied units).

COMMON NAME	SCIENTIFIC NAME	SITE TOTAL	%NISP
Common Murre	*Uria aalge*	683	29.3%
Murre	*Uria* sp.	1	<1%
Murrelet	Alcidae	3	<1%
Rhinoceros Auklet	*Cerorhinca monocerata*	1	<1%
Alcid	Alcidae	14	<1%
Common Loon	*Gavia immer*	80	3.4%
Pacific Loon	*Gavia pacifica*	186	8.0%
Loon	*Gavia* sp.	30	1.3%
Double-Crested Cormorant	*Phalacrocorax auritus*	93	4.0%
Pelagic Cormorant	*Phalacrocorax pelagicus*	19	<1%
Cormorant	*Phalacrocorax* sp.	55	2.4%
Albatross	*Phoebastria* sp.	252	10.8%
Shearwater	*Puffinus* sp.	12	<1%
Bald Eagle	*Haliaeetus leucocephalus*	43	1.8%
Red-Necked Grebe	*Podiceps grisegena*	2	<1%
Horned Grebe	*Podiceps auritus*	1	<1%
Western Grebe	*Aechmophorus occidentalis*	1	<1%
Grebe	*Podiceps/Aechmophorus*	41	1.8%
Canada Goose	*Branta canadensis*	37	1.6%
Small/Medium Goose	Anserinae	105	4.5%
Goose	Anserinae	32	1.4%
Goose/Duck	Anatidae	2	<1%
Northwestern Crow	*Corvus caurinus*	18	<1%
Common Raven	*Corvus corax*	3	<1%

Shorebird	Scolopacidae	10	<1%
Songbird	Fringillidae/Turdidae	11	<1%
Great Blue Heron	*Ardea herodias*	2	<1%
Great Horned Owl	*Bubo virginianus*	3	<1%
Mallard	*Anas platyrhynchus*	1	<1%
White-Winged Scoter	*Melanitta fusca*	10	<1%
Surf Scoter	*Melanitta perspicillata*	3	<1%
Scoter	*Melanitta* sp.	7	<1%
Common Merganser	*Mergus merganser*	1	<1%
Merganser	*Mergus* sp.	3	<1%
Duck	Anatidae	195	8.4%
Gull/Kittiwake	Laridae	5	<1%
Gull	*Larus* sp.	367	15.7%
	TOTAL BIRD NISP	**2332**	**100%**

6.2.3 Mammal Remains

In total, 2658 mammal bones/fragments were identified within the sample faunal assemblage recovered from the Hiikwis site complex. Of these, 561 were identifiable to species, genus, or family. An additional 162 fragments were identifiable to broader size categories, as defined in Chapter 5. Table 6 below outlines mammal NSP, %NSP, NISP, and %NISP for each unit and the site complex in total. NISP totals include specimens identifiable only to size category.

Table 6. Mammal NSP, NISP, and relative frequencies for sampled units at Hiikwis (DfSh-15 and DfSh-16), including those identified only to size category (e.g., small land mammal; n=162).

Site	Unit	NSP	%NSP	NISP	%NISP
DfSh-15	3	229	3.9%	65	1.8%
DfSh-15	4	535	14.7%	132	6.3%
DfSh-15	4A	499	37.8%	190	30.8%
DfSh-16	N4-6 E0-2	1395	10.3%	336	4.6%
TOTAL	**ALL UNITS**	**2658**	**10.9%**	**723**	**5.2%**

Commensal (dog) and intrusive (mouse and vole) mammals were separated from other land mammals, as they were less likely to be subsistence animals. While dog remains are abundant within Northwest Coast village sites, it is generally accepted that they were not consumed (Crockford 1997b:104). As the dog bones recovered from Hiikwis are unlikely to represent a food resource, I decided to separate them from the other land mammals to avoid skewing subsistence patterns. A similar methodology was followed for intrusive mammals.

Midden deposits and living floors of ancient First Nations groups were natural habitats for mice and voles (Frederick and Crockford 2005:195). Therefore, they are also unlikely to represent a subsistence resource and have been separated from those species whose presence within the units is better explained by human action.

Based on the overall commensal mammal NISP total for all units at both sites, domestic dog was ubiquitous at the site, found in every unit. Very few vole and mouse bones were recovered, likely due to their small size and the use of 1/4” screens. The most abundant land mammal species recovered from the Hiikwis site complex were mule deer (NISP = 69; 49.3% of land mammal NISP), mink (NISP = 28; 20.0%), and river otter (NISP = 16; 11.4%). Table 7 lists the NISP of each mammal species recovered from the analyzed units at the site complex.

Based on the overall sea mammal NISP total, the most abundant sea mammal species recovered from the Hiikwis site complex were northern fur seal (NISP = 148; 49.3% of sea mammal NISP), harbour seal (NISP = 49; 16.3%), and northern sea lion (NISP = 22; 7.3%). Whale (NISP = 20) and sea otter (NISP = 18) were also represented at the site complex.

Table 7. Total mammal NISP counts for Hiikwis (DfSh-15 and DfSh-16, all studied units).

COMMON NAME	SCIENTIFIC NAME	SITE TOTAL	%NISP
LAND MAMMALS			
Canid	Canidae	1	<1%
Mule Deer	*Odocoileus hemionus*	69	49.3%
Elk	*Cervus elaphus*	1	<1%
Large Cervid	Cervidae	12	8.6%
Raccoon	*Procyon lotor*	12	8.6%
Mink	*Mustela vison*	28	20.0%
River Otter	*Lontra canadensis*	16	11.4%
Marten	*Martes americana*	1	<1%
	TOTAL LAND MAMMAL NISP	**140**	**100%**
COMMENSAL AND INTRUSIVE MAMMALS			
Domestic Dog	*Canis familiaris*	114	94.2%
Deer Mouse	*Peromyscus sp.*	6	5.0%
Townsend’s Vole	*Microtus townsendii*	1	<1%
	TOTAL COMMENSAL MAMMAL NISP	**121**	**100%**
SEA MAMMALS			
Sea Otter	*Enhydra lutris*	18	6.0%
Northern Fur Seal	*Callorhinus ursinus*	148	49.3%
Harbour Seal	*Phoca vitulina*	49	16.3%
Seal	Pinnipedia	29	9.7%
Northern Sea Lion	*Eumetopias jubata*	22	7.3%
Sea Lion	*Zalophus/Eumetopias*	4	1.3%

Otariid	Otariidae	9	3.0%
Gray Whale	*Eschrichtius robustus*	2	<1%
Whale	Cetacea	18	6.0%
Porpoise	Phocoenidae	1	<1%
TOTAL SEA MAMMAL NISP		**300**	**100%**
TOTAL MAMMAL NISP		**561**	

6.3 Research Questions

There are five main research topics that I have explored through the analysis of the faunal material recovered from the Hiikwis site complex:

1. What changes occur within the faunal assemblage over time? Do any differences exist between Hiikwis proper and Uukwatis?
2. What differences exist between the typical level fauna (screened through 1/4" mesh) and the six recovered *in situ* fish concentration features (screened through 1/8" and 1/16" mesh)?
3. During which season(s) was the Hiikwis site complex occupied? Does the archaeological evidence of seasonality correspond with a written account of species taken at Hiikwis in the nineteenth century?
4. How does the faunal assemblage at Hiikwis compare to those from other Barkley Sound village sites?
5. Does salmon use at Hiikwis follow the typical Barkley Sound pattern recorded to date?

6.4 Differences between Uukwatis and Hiikwis proper and Changes over Time

My first research question was: What changes occur within the faunal assemblage over time? Do any differences exist between Hiikwis proper and Uukwatis? Below is a brief summary of observable differences within the recovered fish, bird, and mammal remains from the studied units. Notable changes over time are also discussed.

Charcoal samples from Unit 4/4A at Uukwatis have returned dates of 2870 – 1880 cal BP, while Unit 3 returned dates of 1870 – 1560 cal BP. Note that these samples do not come from the top and bottom levels of the units, and therefore do not accurately represent the full time range of cultural use at these parts of the site. Unit N4-6, E0-2 at Hiikwis proper returned only one date of 900 – 720 cal BP from near the bottom of the unit; the site was occupied until the early twentieth century.

6.4.1 Differences between Sites and Changes over Time for Fish Remains

6.4.1.1 Most Abundant Taxa

The most abundant fish taxa, based on NISP and %NISP of all fish remains, remained consistent throughout most of the units: salmon, rockfish, and Pacific herring. The one exception was Unit 4, for which the three most abundant species were salmon, perch, and rockfish, with herring fourth. While these types of fish require different procurement techniques, they are all readily available within the ecosystems present at the site complex. Rockfish are found in a variety of habitats, from deep offshore banks to rocky reef caves to kelp beds. They are available year-round and were caught with a hook or lured to the surface and speared (Suttles 1974:125-6).

Herring were collected in great numbers, especially while spawning in the intertidal zone during the winter and spring. They were impaled on sharpened bone or wooden teeth set into a long pole (known as a herring rake) drawn through schools of herring from a canoe. Herring spawning events attract many predators, including salmon, which could have been taken opportunistically at the same time as herring (discussed in section 6.8 below). Herring were eaten fresh, dried for winter storage, and used as bait for larger fish such as salmon, lingcod, and rockfish. Their presence at Hiikwis could reflect any of these three practices.

A number of methods were utilized for catching salmon along the Northwest Coast, including nets, weirs, traps, hooks, and harpoons (Suttles 1974:134). They were most accessible in streams while spawning, which takes place at various times throughout the year depending on species. Salmon seasonality is also discussed in greater detail below.

A number of perch species were identified at Hiikwis. These small fishes prefer rocky bottom habitats and kelp beds. They were likely taken at the same time as herring, while herring were spawning in kelp beds and eel grass within shallow waters.

Based on relative abundance, dogfish was the fourth most abundant fish species at the site overall. It was recovered in small numbers from the oldest unit studied, Unit 4/4A, but was much more prevalent within Unit 3 at Uukwatis and Unit N4-6, E0-2 at Hiikwis proper. Dogfish spines could be modified into tools, dried skin was used as sandpaper, and oil from their liver was utilized (Suttles 1974:130).

6.4.1.2 Hiikwis proper (DfSh-16)

The majority of fish species identified were present at both Uukwatis and Hiikwis proper, suggesting that fishing practices did not differ greatly between the two occupations. However, three fish species were more abundant in the sampled fauna from Hiikwis proper: Pacific hake (3.6% of fish NISP), plainfin midshipman (3.1% NISP), and lingcod (2.7% NISP).

Hake is an offshore species, and this abundance occurred in the earliest level studied at Hiikwis proper. It is attracted inshore by the presence of spawning herring and was likely taken alongside herring; therefore, this concentration could indicate usage of this part of the site during the spring. In the two units and one extension from Uukwatis combined, hake NISP was only 32. At Hiikwis proper, hake was a dominant species within Level 13 (NISP = 170; MNI = 14). The species is rarely seen in such abundance at Barkley Sound village sites, although one large concentration (NISP = 12,000+) was recovered from three levels of one unit at Huu7ii (Frederick 2012:136). Hake remains were not recovered in such high numbers from any other part of the site.

Lingcod are found at the bottom of the tidal zone, often among kelp beds and reefs. They feed on smaller fishes such as herring, rockfish, flounder, hake, and pollock; therefore, these species were likely taken at the same time and place. Lures were utilized to bring lingcod closer to the surface, where they could be speared; they could also be caught by hook and line. They were fished from canoes or rocks overlooking kelp beds. Greenling, which was present at both sites, was sometimes used as bait for lingcod (Suttles 1974:125).

Plainfin midshipman can be found in the intertidal zone, especially as they spawn during the spring. Female midshipman lay eggs under rocks, which the males guard until the young hatch. Males would have been particularly vulnerable to capture at this time; therefore, the presence of midshipman at Hiikwis proper may indicate spring occupation. Midshipman are prey for seals and sea lions, which were likely attracted to shallower waters by the spawning event and could be taken by hunters.

The greater abundance of hake, lingcod, and midshipman at Hiikwis proper points to a focus on winter and spring resources found within the intertidal zone among kelp beds. These three species are most common in the lower and middle levels of the unit, decreasing significantly over time in favour of other fish species, particularly salmon.

6.4.1.3 Uukwatis (DfSh-15)

Five fish taxa were more common within each unit at Uukwatis than at Hiikwis proper: perches, ratfish, northern anchovy, bluefin tuna, and greenling. Perch species, often found within kelp beds, were common within all units at Uukwatis, but were rare within Unit N4-6, E0-2 at Hiikwis proper (NISP = 7).

Ratfish were particularly common within Unit 3 (NISP = 88, 2.5% NISP) in comparison to the other units analyzed. The largest concentrations were recorded for Levels 7/B (5.7% NISP; MNI = 6) and 13/D (22.7% NISP; MNI = 10). Their liver is a source of high-quality oil which was likely exploited by the occupants of Hiikwis. Ratfish are found both offshore and close to shore. They lay their egg cases in intertidal waters during the late summer and early fall, which is when they were most likely captured. As predators of ratfish, dogfish and halibut may have been attracted by them to shallower waters and taken alongside them.

Despite its small size, northern anchovy was recovered from the Uukwatis units in greater numbers than from Hiikwis proper, where it was rare. This disparity is not due to sampling bias, as anchovy was abundant within the fine-screened fish concentration features at Uukwatis, and absent from those at Hiikwis proper (discussed below). These fish are most easily obtained as they spawn in the spring and summer months. Both dogfish and tuna prey upon anchovy, the presence of which may have attracted these two larger species to the waters of Uukwatis during the summer months. Many sea birds and marine mammals are attracted to schools of anchovy as well.

Bluefin tuna was identified only within Levels 16 and 19 in Units 4 and 4A (NISP = 20). This large, fast-swimming species was present nearshore in the past, and could be harpooned as it fed at the ocean’s surface at night (Crockford 1994; 1997a). Its presence at Uukwatis suggests a specialized fishing technology (they could be taken using whaling harpoons) and late summer exploitation.

Greenling species are present in the waters surrounding Hiikwis year-round, and would have been easily attainable close to shore within kelp beds and similar settings. They were likely taken alongside herring or caught with hook and line alongside rockfish. Based on %NISP, greenling was much more abundant at Uukwatis than at Hiikwis proper, suggesting its role diminished during the later occupation.

The ratfish, anchovy, and tuna remains recovered from Uukwatis indicate summer usage of the site. Perch, ratfish, anchovy, and greenling were taken in the intertidal zone around kelp beds, while tuna could have been caught in the nearshore pelagic zone or while hunting whales (Crockford 1997a).

6.4.1.4 Salmon

Salmon was the most abundant taxa identified within each examined unit at the Hiikwis site complex. However, its abundance may be exaggerated due to easier identification of fragmented salmon bones, particularly vertebrae, in comparison to other fish species. It is important to note that the identification of fragmented vertebrae may have inflated salmon NISP counts, affecting the interpretation of subsistence at Hiiwkis.

Although salmon was present throughout all levels at both sites, some noticeable patterns were revealed through %NISP calculations. Within Unit 3 at Uukwatis, salmon remains decreased over time. Within the lower levels analyzed (11 – 19), salmon remains accounted for between 28.1 and 75.8% of fish NISP. In the upper levels (1 – 9), salmon %NISP ranged from 0 to 43.3%.

Within Unit 4, salmon remains were most abundant in the middle of the unit, and were less abundant in the upper levels than in the lower, older levels. In the lowest levels studied (levels 19 (layer J), 22, and 25), salmon accounted for between 36.4 and 71.3% of fish NISP. In the middle levels (13, 16, and 19 (layers G and H)), salmon ranged from 27.6 to 83.7%. In the three uppermost levels studied (levels 4, 7, and 10), salmon remains contributed only 14.3 to 21.2% of fish NISP.

While salmon remains were relatively prominent in all of the levels studied in Unit N4-6, E0-2 at Hiikwis proper, relative frequency increased significantly over time. In the earliest levels (11 and 13), salmon remains accounted for 13.3 to 47.2% of fish NISP. In the upper levels (3, 5, 7, and 9), this range jumped to 61.2 to 91.6% NISP. Interestingly, this intensification takes place after 920 cal BP, when salmon remains were found to increase significantly at contemporaneous Barkley Sound village sites (McMillan et al. 2008; Monks 2006). This finding is discussed further below.

While salmon remains were relatively prominent in all of the levels studied in Unit N4-6, E0-2 at Hiikwis proper, the two largest concentrations occurred within the upper levels of the unit, and relative frequency increased significantly over time. In the earliest levels (11 and 13), salmon remains accounted for 13.3 to 47.2% of fish NISP. In the upper levels (3, 5, 7, and 9), this range jumped to 61.2 to 91.6% NISP. This intensification took place sometime after 920 cal BP, coinciding with the significant increase in salmon use observed at contemporaneous Barkley Sound village sites (McMillan et al. 2008; Monks 2006). This finding is discussed further in Chapter 2 and below.

As rockfish were one of the most abundant fish taxa recovered from Barkley Sound village sites, I was interested in the relationship between salmon and rockfish at Hiikwis. I observed that salmon increased and rockfish decreased over time within Unit N4-6, E0-2, based on both relative and absolute abundance. In levels 11 and 13, rockfish were abundant based on relative frequency, ranging from 18.4 to 66.7% of fish NISP, whereas in levels 3, 5, 7, and 9, rockfish ranged from 0.6 to 13.2% NISP. Rockfish NISP also decreased from the lower to the upper levels. The opposite pattern was observed within Unit 3 at Uukwatis, where salmon use appears to have decreased over time as rockfish increased. This was best observed through relative abundance. No clear pattern between the two species existed within Units 4/4A. Tables 8 through 10 below present the NISP and %NISP (relative frequency) values for both salmon and rockfish throughout each level within Units N4-6, E0-2, 3, and 4.

Rockfish are found in a wide variety of habitats and could be taken year-round. Spawning salmon were likely taken in quantity only in certain areas at particular times of the year, and were a preferred storage item, although some would have been available offshore year-round. Both rockfish and non-spawning salmon could be procured in the ocean using similar equipment. In an account of winter activities taking place at Hiikwis during historic times, a Ts'ishaa man informed ethnographers that "silver spring salmon" were fished (Sapir and Swadesh 1955:30). He is likely referring to Coho (silver) salmon, which spawn in small streams from November through January, and sometimes until March. At least some of the salmon remains from Hiikwis proper represent definitive spawning individuals, based on morphological features.

Table 8. Salmon and Rockfish NISP and relative frequencies within Unit N4-6, E0-2 at Hiikwis proper (DfSh-16).

Level	Layer	Salmon NISP	Salmon %NISP	Rockfish NISP	Rockfish %NISP
3	A	83	85.6%	7	7.2%
5	A	1054	91.6%	7	0.6%
7	A	398	84.7%	11	2.3%
9	A	196	63.2%	41	13.2%
9	B	170	61.2%	21	7.6%
11	A	196	33.8%	107	18.4%
11	B	263	44.1%	124	20.1%
13	A	77	47.2%	47	28.8%
13	A/B	73	20.7%	91	25.9%
13	B	320	39.8%	172	21.4%
13	C	106	39.8%	75	28.2%
13	C1	2	13.3%	10	66.7%

Table 9. Salmon and Rockfish NISP and relative frequencies within Unit 3 at Uukwatis (DfSh-15).

Level	Layer	Salmon NISP	Salmon %NISP	Rockfish NISP	Rockfish %NISP
1	A	0	0	0	0
3	A	0	0	0	0
5	A	29	43.3%	5	7.5%
5	B	7	4.9%	79	54.9%
7	A	13	25.0%	21	40.4%
7	B	151	36.0%	160	38.1%
9	B	0	0	0	0
9	C	41	38.7%	21	19.8%
11	C	886	69.1%	95	7.4%
13	C	9	28.1%	8	25.0%
13	D	72	41.9%	28	16.3%
13	E	47	75.8%	4	6.5%
15	F	336	72.6%	29	6.3%
15	G	37	35.9%	22	21.4%
17	G	325	59.2%	75	13.7%
19	G	36	65.5%	7	12.7%

Table 10. Salmon and Rockfish NISP and relative frequencies within Unit 4 at Uukwatis (DfSh-15).

Level	Layer	Salmon NISP	Salmon %NISP	Rockfish NISP	Rockfish %NISP
4	A	4	9.3%	2	4.7%
7	E	55	21.2%	31	11.9%
10	F	34	19.3%	28	15.9%
13	G	8	27.6%	5	17.2%
16	G	10	45.5%	8	36.4%
16	H	32	48.5%	9	13.6%
16	I	246	64.2%	34	8.9%
19	G	54	69.2%	3	3.8%
19	H	195	83.7%	9	3.9%
19	I	0	0	0	0
19	J	72	48.3%	10	6.7%
22	I	77	71.3%	4	3.7%
22	K	56	49.1%	9	7.9%
25	L	4	36.4%	2	18.2%
28	M	1	100%	0	0

The archaeological evidence suggests that subsistence at Hiikwis proper shifted away from the exploitation of a wide variety of fish species to focus on the procurement of salmon. Salmon and its role at Hiikwis are discussed in greater detail below.

6.4.2 Differences between Sites and Changes over Time for Bird Remains

Birds were clearly an important resource at the Hiikwis site complex. Ethnographies for groups along the Northwest Coast reveal a variety of techniques for catching birds, depending upon species and habitat (Sapir and Swadesh 1955; Suttles 1974:70-81). In addition to meat, birds provided resources such as feathers and bones.

There were many differences between the bird species identified at Uukwatis and Hiikwis proper. Foremost, the sheer number of bird remains at Hiikwis proper is notable. Bird NSP from one unit at Hiikwis proper totaled 4729, while 1142 specimens were recovered from two units and one extension at Uukwatis.

6.4.2.1 Most Abundant Taxa

The most commonly occurring taxa in each sampled unit differed. Common murre, which was the most abundant bird species for the site complex overall, was the top species only at Hiikwis proper. Large flocks of murres are attracted to herring spawning events and may have been taken in great numbers using bows, scoop nets, or raised nets at these times (Sapir and Swadesh 1955:31; Suttles 1974:70). Albatross was the most abundant taxon present in the Unit 3 fauna, but it was much less common in the other sampled units. The albatross remains recovered from the site are believed to be short-tailed albatross (*Phoebastria albatrus*), due to their large size. Ducks and gulls were the most prominent taxa in Units 4 and 4A.

Bones of albatross, duck, and gull, particularly those of the wing, were important raw materials for Northwest Coast peoples. These long, straight elements were selected to be made into items such as drinking tubes, awls, whistles, and bone points (Crockford et al. 1997:289).

6.4.2.2 Uukwatis (DfSh-15)

Some species were identified only within Units 4 and/or 4A, including great blue heron (NISP = 2), shearwater (NISP = 12), and shorebirds (NISP = 10)

Geese (including Canada goose and specimens identifiable only to family Anserinae) were abundant at Hiikwis proper (NISP = 165; 8.9% NISP), but were absent or rare within the units at Uukwatis. This same pattern occurs with pelagic cormorant (NISP = 18; 1.0% NISP). Alcids accounted for 33.2% of NISP at Hiikwis proper, but were relatively uncommon at Uukwatis. However, murrelet (an alcid) was present in all units at Uukwatis, but was not identified at Hiikwis proper.

Based on radiocarbon dates, Unit 4 at Uukwatis contains the oldest cultural material recovered from the site complex. Based on %NISP values, the bird species that were most abundant within the lowest levels of the unit included double-crested cormorant, common murre, grebes, white-winged scoter, and large/very large gulls. The species most abundant within the middle levels included loons, albatross, small/medium goose, northwestern crow, and common raven. Those most abundant in the top levels included murrelet, bald eagle, shearwater, and Canada goose, with a reappearance of double-crested cormorant and grebes.

The earliest period of occupation was represented by an abundance of many medium-sized marine bird species, including ducks, gulls, grebes, and murres, which would have been common within the coastal waters year-round and easily attainable with scoop or raised nets (Sapir and Swadesh 1955:31; Suttles 1974:70). The middle levels include the first appearance of albatross at the site. A pelagic species, short-tailed albatross was once common during the summer months within inshore coastal waters. Their large wingspan makes taking off from the water difficult, rendering them easy prey for hunters in canoes (Crockford 2003:3). Bird remains in general were rare within the upper levels of the unit; the most recent subsistence practices at this area of the site focused on fish.

Unit 3, which was located alongside a creek at Uukwatis, also showed changes in the abundance of several species over time. Based on relative frequency, species which were most abundant within the earliest (lowest) levels of the unit included white-winged scoter and albatross. In fact, for the lowest levels of the unit (15, 17, and 19), albatross was the only identifiable bird species present. Many fish and mammal remains were present in these levels, so preservational factors do not explain this anomaly.

Many species were only identified within the middle levels of the unit: common murre, murrelet, Pacific loon, bald eagle, raven, crow, songbird, western grebe, horned grebe, great horned owl, and small/medium gulls. Level 9/B contained a concentration of bald eagle bones (NISP = 24; 96% of bird NISP), representing a range of elements that could have belonged to one individual.

Species only present within the top levels of Unit 3 included common loon and pelagic cormorant. Those most abundant (based on %NISP) within the top levels of Unit 3 were Canada goose and large gulls.

While albatross was common throughout the unit, its greatest abundance was in the earliest levels. These early levels may represent a location where albatross carcasses were processed, although no tool marks were observed on albatross bones from these levels. There was a clear shift from a very narrow focus (albatross) to a wide range of bird species exploited within this area over time.

The elements represented in this unit included many limb bones, which were often used for creating a variety of objects. Albatross long bones in particular made good raw material, due to their exceptional length and straightness. The relative abundance of bald eagle bones recovered from this unit may reflect the ritual and spiritual significance of this particular bird. Eagle down and feathers were often utilized in ceremonial and other events, such as the Wolf Ritual, known to have taken place at Hiikwis at least during historic times (Arima and Hoover 2011:210; Sapir and Swadesh 1955:27).

6.4.2.3 Hiikwis proper (DfSh-16)

Within Unit N4-6, E0-2, bird species that were most abundant in the earliest levels (based on %NISP) included common murre, other alcids, and small/medium geese. Species most abundant in the middle levels within this unit included common murre, loons, albatross, Canada goose, and most gulls. Bald eagle is only present within the middle levels. Species that were most abundant in the upper levels of this unit included Pacific loon, cormorants, and large gulls. Common murre was much less abundant within the upper levels.

The species identified within the earliest levels could easily be found within the immediate area of the village site (coniferous forest and intertidal zone). These remains may represent the time period when Uukwatis served as the main village site, and Hiikwis proper would have been visited to exploit local resources. Similar to Unit 4, albatross was rare until the middle levels of the unit, where it became highly concentrated (NISP = 190 for Levels 9 and 11 combined; 20% of bird NISP). The upper levels showed a focus on birds commonly found near the shoreline such as ducks, gulls, and cormorants. During historic occupation at Hiikwis proper, large quantities of migratory birds (particularly ducks and geese) and cormorants were observed to be taken at once using arrows and scoop nets (Sapir and Swadesh 1955:31-2).

6.4.3 Differences between Sites and Changes over Time for Mammal Remains

The relative abundance of mammal species remained fairly consistent over time at both Uukwatis and Hiikwis. The small mammal sample size from the site complex likely contributes to this, as distinct patterns are difficult to observe (identified mammal specimens totalled only 723, representing 5.2% of site NISP). While no clear trends emerged, a number of observations can be noted.

6.4.3.1 Land Mammals

Mink was the most common mammal within Unit 3 (NISP = 20), but was rare or absent within the other studied units. Mink and other small mammals (including raccoon, marten, and river otter, all recovered in small numbers from the site complex) were likely captured for their pelts (Suttles 1974:96). Deer and elk were more likely to contribute to diet than these smaller mammals. For the site complex as a whole, deer NISP totalled 69, while elk/large cervid was represented by 12 specimens. Cervids also provided additional resources: bones (particularly metapodials) were made into tools, sinew was used in the manufacture of objects, and skins became cases for items such as arrows (Suttles 1974:83, 91).

6.4.3.2 Commensal Mammals

Dog remains were common across the site complex (NISP = 114). They were especially dominant within Unit 4A (NISP = 59), accounting for 69.4% of land mammal NISP. Dog bones were present throughout this entire unit, although the majority came from a concentration in Level 10/B (NISP = 51). A nearly complete spine was identified, along with over 50 rib fragments identified as "medium mammal." With an MNI of one juvenile, this concentration may represent a dog burial partially exposed by the excavation unit. A similar situation may have occurred within Unit 5 at Uukwatis (not analyzed for my project), in which an articulated dog forearm was documented *in situ* by excavators along one wall of the unit. While dogs were utilized for a variety of reasons, including hunting and wool, they were also kept as pets, and dog burials are commonly exposed at Northwest Coast village sites (Crellin 1994; Crockford 1997b). There was no evidence to suggest dogs were utilized as a food source at the Hiikwis site complex. Both large and small individuals were observed within the faunal assemblage, likely representing both larger village dogs and a smaller specialized breed kept for its wool, which was woven into blankets (Crockford 1997b).

Deer mouse (NISP = 6) and Townsend's vole (NISP = 1) occurred in very small numbers at the site.

6.4.3.3 Sea Mammals

Northern fur seal was the most abundant sea mammal species at Hiikwis proper (NISP = 114; 36.3% NISP). Based on %NISP, the species was much more abundant in the upper levels of the unit than the lower levels. Harbour seal, sea lion, and sea otter did not show clear patterns within Unit N4-6, E0-2, although whale (NISP = 7) was recovered only from Levels 9 and 11, near the middle of the unit, while porpoise (NISP = 1) was only present near the bottom. Seventeen sea otter elements were present at Hiikwis proper, but only one was identified among the Uukwatis material.

Harbour seal (NISP = 7) and northern sea lion (NISP = 3) occurred intermittently throughout Unit 4 at Uukwatis, while one identified whale element was recovered from Level

19/G. Fur seal (NISP = 29) was found only in the upper and lower levels of the unit; no identifiable seal remains were recovered from the middle levels. Level 10/F included a concentration of fur seal bones (NISP = 25), representing a minimum of 3 individuals, including a newborn. Newborn fur seals are indicative of summer exploitation of fur seal rookeries. There are presently no breeding grounds within Barkley Sound; the closest being the Pribilof Islands in Alaska. Archaeological evidence suggests that the central Northwest Coast once held a population of locally-breeding, non-migratory fur seals (Crockford et al. 2002:152).

Twenty whale bone fragments were confidently identified within the sampled fauna. The majority came from Unit 4A. Twelve fragments were recovered from the middle levels of this extension, including two vertebrae identified as subadult gray whale. One fragment was recovered from Unit 4, while seven came from Unit N4-6, E0-2 at Hiikwis proper. Those fragments that could be identified to element were from vertebrae or ribs. These elements may have been brought to the village attached to flesh and/or for oil extraction. Ribs, long and relatively straight, could be used to make a variety of artifacts, including clubs. No cranial or limb bones were identified; these may have been discarded on the beach.

While few sea mammal remains were recovered from Unit 3 in general (NISP = 12), a wide range of species were represented: sea otter, fur seal, harbour seal, and northern sea lion. All identifiable elements were limb bones or canine teeth. This could be because choice parts were connected to the limbs, or because these elements, along with teeth, were best for making tools and other items. For example, two drilled dog canines described as pendants were recovered from Unit 3. No whale remains were recovered from this unit. Its location at the edge of the village area alongside a stream may explain this absence, as whales would have been butchered on the beach, where the majority of bones would remain.

6.4.3.4 Land versus Sea Mammal Exploitation

There was a clear difference in the ratio of land to sea mammal remains between Uukwatis and Hiikwis proper. At Uukwatis, the mammal remains were dominated by land mammals (based on NSP and NISP). Within Unit 3, land mammal remains dominated throughout all levels. Of a total NISP of 3706 (all vertebrate fauna), only 12 elements were identified as sea mammal. The streamside location of Unit 3 may contribute to this lack of marine mammals. Land mammal NISP was also low within this unit (NISP = 52), suggesting that subsistence activity in this area of the site focused on fish (NISP = 3514).

Within Unit 4, most levels showed a higher abundance of land mammals. However, when commensal mammals are removed from the sample, land and sea mammal representation is more balanced. In Level 10/F, there was a single land mammal specimen, with 26 sea mammal specimens. This level held a concentration of nursing fur seal bones, identified as between four and eight weeks old. In Unit 4A, land mammal remains dominated in all but the top two levels (4 and 7), where sea mammal remains outnumbered land mammal remains (based on NISP). The abundance of land mammal bones at Uukwatis may be a result of the identification of numerous long bone fragments, which are more diagnostic to size category than those of sea mammals. These likely represent deer limb bones, which were broken for marrow (Suttles 1974:91). At Hiikwis proper, sea mammal remains dominated Unit N4-6, E0-2.

These results suggest that sea mammals became a more important resource after occupation shifted from Uukwatis to Hiikwis proper. Mammals in general played a very small role in the area of the site near the stream, but were more prevalent in the units located atop house platforms. It is possible that subsistence at the site complex may have focused less on mammals than fish and birds. Conversely, mammals may have provided a more substantial food source than is represented by NISP count alone, as mammal species in general can provide more edible material than most of the fish and bird species present at the site due to their larger sizes. Finally, these results may simply represent sampling bias or the slight difference in geographic settings of the two sites.

6.4.4 Differences and Changes – Summary

6.4.4.1 Unit 4/4A, Uukwatis

The analyzed faunal assemblage recovered from Unit 4/4A at Uukwatis was dominated by fish (NISP = 1672). The highest abundance of fish remains (96% of NISP) within Unit 4 occurred in Level 4 (the most recent deposits included in the sample for this unit). In the lower levels, birds and mammals were better represented. Within Unit 4A, there was a greater occurrence of land and commensal mammal remains (13.9% NISP) than seen in other units, although this number includes the potential dog burial discussed above. This extension also contained the greatest relative abundance of sea mammal remains (4.9% NISP) of the studied units, suggesting that subsistence practices at the site complex were more focused on mammal resources during earlier periods of occupation (as Unit 4 represents the oldest deposits examined). Albatross and shearwater remains appeared within the middle levels of the unit; along with tuna, they indicate summer use of Uukwatis. The presence of halibut remains within these levels suggests that offshore species began to be utilized at this time.

6.4.4.2 Unit 3, Uukwatis

Fish also dominated Unit 3 at Uukwatis (NISP = 3514), accounting for nearly 95% of the identifiable faunal remains analyzed. Fish remains totaled at least 87% in every level except 7/A and 9/B. Bird remains accounted for 80.6% of NISP in Level 9/B. This break in the general pattern of the unit results from a concentration of bald eagle bones (NISP =24). In Level 7/A, fish NISP dropped to 77.6% while land/commensal mammal NISP rose to 17.9% due in part to fragmented mink and dog skulls. Sea mammal remains were not present within the uppermost levels of Unit 3 and played a very small role in the lower levels, contributing a mere 0.3% to the total unit NISP. It is important to note that one sea mammal provides much more edible material than multiple fish, a fact not accounted for by simple quantification methods. Nevertheless, this area of the site was clearly dedicated to the utilization of fish. It may also have been a place of tool and other object manufacture. The bird and mammal remains recovered from the unit represent species and elements often selected for use as tools and other paraphernalia, including sea mammal, albatross and other bird long bones, canine teeth, and bald eagle remains. This may have been a place where people crafted objects while fishing in the stream.

6.4.4.3 Unit N4-6, E0-2, Hiikwis proper

While fish were clearly an important resource at Hiikwis proper (NISP = 5080), there was a greater focus on birds in comparison to Uukwatis, and a dominance of marine over terrestrial mammals. This pattern differed from the Uukwatis units, where land mammal remains tended to outnumber those of sea mammals. Within the upper levels of the unit, bird species decreased in relative abundance as fish and mammals rose, suggesting that, in more recent times, Hiikwis proper was utilized less for exploiting birds in favour of fish and mammals, especially salmon and fur seal.

6.5 Modified Bone

At least 36 bones/bone fragments recovered from the Hiikwis site complex displayed evidence of tool marks. Fifteen of these were mammal bones and 20 were bird bones. In addition, one dogfish dorsal spine may have been ground to be used as a tool.

The most common species exhibiting tool marks was deer (n=4). Cut marks were observed on two northern sea lion bones, two northern fur seal bones, and two large mammal bones, and one specimen each of large cervid, otariid, large sea mammal, unidentified land mammal, and unidentified mammal.

For the deer remains, one metacarpal fragment appeared to have been sawn at both ends. Cervid metapodials were commonly utilized for tool manufacture. They are long, straight, and symmetrical, with grooves running lengthways that enable the bones to be broken easily into sections. The other three deer specimens showed evidence of cut marks, likely made by a stone cutting tool. A piece of large cervid antler had been sawn and chopped. The unidentified mammal bone was ground and incised.

Two northern sea lion elements showed cut marks, one rib and one palatine (skull) bone. A rib fragment most likely belonging to northern sea lion, but possibly to whale, displayed evidence of being chopped. The two fur seal specimens displaying cut marks were a femur and a zygomatic bone.

Six of the bird bones with cut marks were unidentifiable to species. Three bones featuring cut marks belonged to common loon, while another three were identified as Pacific loon. Two bald eagle bones and two large gull bones displayed cut marks. Double-crested cormorant, albatross, Canada goose, and small/medium goose each had one bone featuring cut marks.

Very few specimens showed evidence of canine gnawing/chewing (n=5). These included two double-crested cormorant bones, one small/medium gull bone, one deer bone, and one small/medium mammal bone.

In total, very few faunal remains displayed tool marks; the majority of those identified (n=26) came from Hiikwis proper. Many additional worked bone pieces were collected from the excavation units and are currently being curated as artifacts. While cut marks are often considered evidence for the butchering and consumption of animals, a lack of cut marks observed within the Hiikwis fauna does not mean that the individuals represented at the site were not eaten. The faunal remains were recovered from shell middens, and at least two of the units (4 and N4-6, E0-2) were placed within what are believed to be house platforms. Based on these factors, I have assumed that the majority of the remains are representative of subsistence activities.

6.6 Burned Bone

Some bone fragments were blackened or calcined, indicating that they were exposed to fire. Of the three animal categories (bird, fish, and mammal), bird contained the highest number of blackened or calcined bone (n=31). Most of these specimens came from Hiikwis proper, which contained the majority of bird remains in the assemblage. Overall, 21 of the burned bones were fish, 15 were mammal, and one was identified only as bird/mammal.

For birds, most of the burned bones were fragments unidentifiable to species (n=24). Three were identified as common murre, with common loon, Pacific loon, albatross sp., and small/medium goose represented by one blackened or calcined bone each.

For fish, burned bones were identified as Pacific herring (n=8), salmon (n=5) and lingcod (n=4), while four were unidentifiable to taxon.

For mammals, six of the burned bones were identified only as unidentified mammal, five belonged to unidentified land mammal, and three belonged to unidentified sea mammal. One bone was identified as northern sea lion.

Several hearth and hearth depositional features (concentrations of fire-cracked rock, ash, and charcoal believed to represent hearth cleaning and subsequent dumping events) were identified within the excavated units; however, the blackened/calcined specimens were not associated with these features. Very few specimens in total displayed evidence of fire exposure, suggesting that animal carcasses were not typically discarded in hearths, or, if they were, such hearths were not uncovered within the excavated areas of the site complex.

6.7 Fish Concentration Features

My second research question was: What differences exist between the typical level fauna (screened through 1/4" mesh) and the six recovered *in situ* fish concentration features (screened through 1/8" and 1/16" mesh)? To answer this question, I examined which small fish species were present in the concentrations, and compared their abundance to that within the typical 1/4" screened level fauna.

Faunal reports from archaeological sites can often be biased as a result of the recovery methods used by excavators. This problem is important to address for sites on the Northwest Coast, where fish were an important food resource. Unfortunately, many species of small fish, including herring and anchovy, have been underrepresented at sites because their small bones are not recoverable by certain screen sizes. McKechnie (2005:221) addressed this problem in his analysis of the fish remains from Ts'ishaa, in which he showed that more than 85% of the fish specimens recovered through fine screening (using 1/8" and 1/16" screens) were absent from typical 1/4" recovery. For this reason, column samples are often taken from each excavated unit at a site and analyzed in a laboratory setting. Due to time constraints, I was not able to analyze the column samples associated with the units I studied. However, I was able to study six *in situ* "fish concentration" features (described in Chapter 5), which provide a comparison to the 1/4" screened level fauna.

Three fish concentrations were collected from Unit 4 at DfSh-15, in Levels 7/E, 16/G, and 22/I. Two fish concentrations were collected from Unit 4A, in Levels 4/A and 19/C. At DfSh-16, one fish concentration was collected from Level 9/B within Unit N4-6 E0-2. All were gathered in-field (along with the surrounding matrix) and bagged separately from the 1/4" screened faunal remains.

I screened these features through 1/4", 1/8", and 1/16" nested screens in the comparative faunal lab at the University of Victoria. These fish concentration features contained the remains of fish species that were rare or absent in the 1/4" screened assemblage. Tables 11 through 16 below outline the species identified within each examined feature. All identified taxa are provided for the 1/8" and 1/16" screened material, while NISP for herring and anchovy only is provided for the 1/4" screened material as a means of comparison. Appendix A displays the NISP and MNI of all fish species in the 1/4" screened fauna for each level/layer combination containing a fish concentration feature.

Table 11. NISP for fish concentration features in Unit 4 at DfSh-15 (Level 7, Layer E).

Screen Size	**Fish Species**	**NISP**
1/8"	Unidentified Fish	63
1/8"	Pacific Herring	90
1/8"	Northern Anchovy	40
1/8"	Greenling	2
1/8"	Perch	17
1/8"	**1/8" TOTAL**	**212**
1/16"	Unidentified Fish	19
1/16"	Pacific Herring	9
1/16"	Northern Anchovy	78
1/16"	Perch	4
1/16"	Perch OR Greenling	3
1/16"	**1/16" TOTAL**	**113**
	TOTAL	**325**
1/4"	Pacific Herring	19
1/4"	Northern Anchovy	2

Table 12. NISP for fish concentration features in Unit 4 at DfSh-15 (Level 16, Layer G).

Screen Size	**Fish Species**	**NISP**
1/8"	Northern Anchovy	21
1/8"	**1/8" TOTAL**	**21**
1/16"	Northern Anchovy	97
1/16"	**1/16" TOTAL**	**97**
	TOTAL	**118**
1/4"	Northern Anchovy	0

Table 13. NISP for fish concentration features in Unit 4 at DfSh-15 (Level 22, Layer I).

Screen Size	**Fish Species**	**NISP**
1/8"	Unidentified Fish	2
1/8"	Pacific Herring	38
1/8"	Northern Anchovy	6
1/8"	Salmon	4
1/8"	**1/8" TOTAL**	**50**
	TOTAL	**50**
1/4"	Pacific Herring	5
1/4"	Northern Anchovy	1

Table 14. NISP for fish concentration features in Unit 4A at DfSh-15 (Level 4, Layer A).

Screen Size	Fish Species		NISP
1/8"	Unidentified Fish		99
1/8"	Pacific Herring		868
1/8"	Rockfish		4
1/8"	Plainfin Midshipman		2
1/8"	Perch		2
1/8"	Greenling		2
1/8"	Northern Anchovy		1
1/8"	Spiny Dogfish		1
1/8"	Tuna?		1
1/8"	**1/8" TOTAL**		**980**
1/16"	Unidentified Fish		8
1/16"	Pacific Herring		3
1/16"	**1/16" TOTAL**		**11**
		TOTAL	**991**
1/4"	Pacific Herring		6
1/4"	Northern Anchovy		0

Table 15. NISP for fish concentration features in Unit 4A at DfSh-15 (Level 19, Layer C).

Screen Size	Fish Species		NISP
1/8"	Unidentified Fish		7
1/8"	Pacific Herring		60
1/8"	Perch		4
1/8"	Greenling		3
1/8"	Staghorn Sculpin		1
1/8"	**1/8" TOTAL**		**75**
		TOTAL	**75**
1/4"	Pacific Herring		6

Table 16. NISP for fish concentration features in Unit N4-6 E0-2 at DfSh-16 (Level 9, Layer B).

Screen Size	Fish Species		NISP
1/8"	Unidentified Fish		62
1/8"	Pacific Herring		584
1/8"	Rockfish		1
1/8"	**1/8" TOTAL**		**647**
1/16"	Unidentified Fish		1
1/16"	Pacific Herring		1
1/16"	**1/16" TOTAL**		**2**
		TOTAL	**649**
1/4"	Pacific Herring		46

While Pacific herring was only the third most abundant species in the 1/4” screened fauna (NISP = 947; 8.9% NISP), it dominated the fish concentration features overall (NISP = 1471; 66.6%). Northern anchovy, which was rare in the 1/4” screened fauna (NISP = 42; 0.4%), was abundant in the fish concentrations (NISP =243; 11.0%), and even accounts for 100% of the remains in the level 16/G concentration from Unit 4 at DfSh-15.

From the tables above, it is clear that the majority of herring and anchovy remains are not recovered when 1/4” screens are used. This was particularly evident for the fish concentration feature identified in Level 4/A from Unit 4A at Uukwatis (Table 14): 871 herring bones were identified within the 1/8” and 1/16” screened material. However, only six herring specimens were recovered from the 1/4” screened remains from this level.

Tables 11 and 12 show that both 1/4” and 1/8” screens failed to recover the majority of northern anchovy remains. The 1/16” screen proved best for recovering these small bones, which would be grossly underrepresented within typical 1/4” screened faunal assemblages.

There is clearly a bias against small fish species when traditional screening methods are used at archaeological sites. These results, along with those of other researchers, show that the analysis of fauna recovered using only 1/4” mesh may bias our interpretations regarding past use of animal resources (McKechnie 2005:221).

Greenling, rockfish, perch, dogfish, plainfin midshipman, salmon, and tuna were all present in the 1/8” and 1/16” fish concentration features, and appeared frequently in the 1/4” screened fauna. Staghorn sculpin was found only within the fish concentration fauna (NISP = 1).

6.8 Habitats Exploited

The faunal remains recovered from the Hiikwis site complex reveal that a number of habitats were visited during resource procurement. The habitat and seasonality information for the western coast of Vancouver Island presented in this and the following section was collected from Cannings et al. (2005), Crockford (1994; 1997a), Eder and Pattie (2001), Eschmeyer et al. (1983), Frederick (2012:137-8), Frederick and Crockford (2005), Goodson (1988), Hatler et al. (2008), Peterson (2005), and Shackleton (1999).

Animal-based subsistence was focused on marine rather than terrestrial resources. Sea mammals, particularly fur seal, are present in some of the earliest levels identified from the back terrace at Uukwatis, and persist throughout all units at the site complex. The presence of porpoise, albatross, shearwater, and bluefin tuna remains suggests that the occupants of Hiikwis exploited nearshore pelagic resources, while halibut remains represent further offshore resource exploitation.

The Nuu-chah-nulth were known to be active whalers, and the whale remains recovered from the site complex may represent whaling activity. To harpoon humpback and grey whales, high status Nuu-chah-nulth men paddled in cedar canoes into the open ocean (Arima and Hoover 2011:9). While the whale remains identified at Hiikwis may represent offshore whale hunting, drift whales occasionally end up on the shores of Barkley Sound. Such an occurrence is more common in the fall, when seas are rougher than in the spring. Drift whales were typically claimed by the chief on whose territory the whale became beached (Arima and Hoover 2011:64). It cannot be assumed that all whale remains represent active whaling, although the presence of embedded harpoon head fragments recovered from some Nuu-chah-nulth/Ditidaht/Makah sites certainly provides strong evidence for such. Unfortunately, no harpoon head fragments were found within any of the analyzed whale remains from Hiikwis.

Ethnographic information (Crockford 1994; 1997a) indicates that bluefin tuna were taken with whaling harpoons from canoes – evidence of using a single technology for several taxa. Porpoise may have also been taken with whaling gear.

The fish and bird remains identified indicate that the intertidal zone and shallow nearshore waters contributed greatly to subsistence. Bird species that would be available in these areas include mallard, surf scoter, white-winged scoter, bufflehead, red-throated loon, great blue heron, bald eagle, surfbird, mew gull, Bonaparte's gull, belted kingfisher, northwestern crow, and common raven. During summer months, short-tailed albatross and shearwaters would have been available in the nearshore pelagic zone.

Fish species commonly available in these habitats include rockfish, ratfish, pile perch, shiner perch, striped surfperch, cabezon, red Irish lord, great sculpin, various greenlings, lingcod, walleye pollock, Pacific cod, Pacific herring, Pacific hake, juvenile sablefish, arrowtooth flounder, starry flounder, juvenile English sole, Pacific sanddab and plainfin midshipman.

The fish species present within the faunal assemblage are found on both soft/sandy bottoms (e.g., rockfish, thornyhead, great sculpin, kelp and white-spotted greenlings, juvenile lingcod, sablefish, Pacific sanddab, plainfin midshipman, starry and arrowtooth flounders, and a number of soles) and rocky bottoms (e.g., rockfish, striped surfperch, pile perch, cabezon, red Irish lord, rock greenling, mature lingcod, and rock sole).

Many of the fish species identified at the site prefer a habitat of kelp beds and/or eelgrass, including rockfish, striped surfperch, pile perch, shiner perch, kelp greenling, white-spotted greenling, and Pacific herring.

Sea otters are also found in kelp bed/eelgrass environments. Many mammals forage in the intertidal zone as well, where they would have been vulnerable to human capture. These include mink, marten, raccoon, river otter, sea otter, and deer mouse, all of which are present in the Hiikwis faunal assemblage. Harbour seal and northern sea lion would have been available in shallow waters around the site.

The expansive mud flats present at Uukwatis would have attracted raccoons and many bird species, including Canada goose, great blue heron, bald eagle, and sandpipers.

The coniferous forest behind the village would have been home to a number of terrestrial mammal and bird species, including elk, deer, marten, mink, Townsend’s vole, common merganser, Bonaparte’s gull, marbled murrelet, bald eagle, great horned owl, common raven, and American robin.

In addition, the stream running alongside Uukwatis would have attracted or provided many animal resources. These include harbour seal, river otter, deer, raccoon, Townsend’s vole, bufflehead, common merganser, northwestern crow, Canada goose, mallard, bufflehead, mergansers, horned grebe, double-crested cormorant, great blue heron, bald eagle, a variety of gulls, great horned owl, shiner perch, juvenile starry flounder, eulachon, and salmon.

In the spring, Pacific herring spawn in shallow waters close to shore. The spawning event attracts a number of other animals to shallower waters, at which time such species would have been more vulnerable to predation by humans. These species include harbour seal, northern fur seal, sea lions, humpback whale, surf scoter, bufflehead, Pacific loon, pelagic cormorant, bald eagle, common murre, salmon, Pacific hake, lingcod, and petrale sole. Striped surf perch and various gulls are attracted to the eggs released by the spawning herring. Hiikwis was known as an area where herring was plentiful. A place named *Kiina7aa* at Uukwatis can be translated as “herring-guts-on-rocks,” as great numbers of herring were captured at Hiikwis and processed on the rocks at this particular spot, at least during historic times (St. Claire 1991:133). Other animals that eat herring include spiny dogfish, walleye pollock, Pacific cod, and red-throated loon.

As salmon spawn throughout the year, they also attract a number of animal species to the mouths of rivers, including harbour seal, black bear, and bald eagle. Northern sea lion is also known to consume salmon, and may have been attracted by spawning events as well.

6.9 Hiikwis Site Seasonality

The animal species recovered from an archaeological site may indicate the season(s) during which the site was occupied. While many species are available in an area year-round, some may occur only at certain times of the year.

My third research question was: During which season(s) was the Hiikwis site complex occupied? Does the archaeological evidence of seasonality correspond with a written account of species taken at Hiikwis in the nineteenth century? I hypothesized that year-round activity would be represented at the site for the majority of its occupation, with a clear switch to winter resources taking place within the more recent deposits. Seasonal occupation was determined through the identification of animal species present only at certain times of the year. I then compared my results to Tom Sayach'apis' account of animal use at Hiikwis during the winter (Sapir and Swadesh 1955).

Many of the species identified within the faunal remains are year-round residents of Barkley Sound, including marten, mink, river otter, sea otter, raccoon, Canada goose, mallard, Pacific loon, common loon, double-crested cormorant, pelagic cormorant, great blue heron, gulls, great horned owl, northwestern crow, common raven, spiny dogfish, ratfish, rockfish, greenlings, lingcod, and salmon.

Appendix B contains tables outlining the number of seasonal indicators present in each level/layer combination for each unit at the Hiikwis site complex.

6.9.1 Seasonal Indicators – Summer

Certain species identified within the faunal assemblage are only available in the Barkley Sound area during the summer months. These include albatross, shearwaters, rhinoceros auklet, bluefin tuna, Pacific sardine, and young fur seal (4-8 weeks old). Some species, including black-legged kittiwake, shiner perch, Pacific hake, and northern anchovy, occur at other times of the year, but are most abundant and/or closest to shore during the summer months.

6.9.2 Seasonal Indicators – Fall

In the fall, deer and elk move to lower elevations, increasing their abundance along the coast. Humpback and grey whales pass along the west coast of Vancouver Island during their migration south for the winter. Less accommodating waters would likely hinder whale hunting attempts, but drift whales may be more abundant at this time due to stormier seas. Loons, cormorants, geese, and scoters were especially abundant in the area during their migration south for the winter.

6.9.3 Seasonal Indicators – Winter

Winter occupation is often interpreted on the basis of preserved salmon remains. Ethnographic accounts observe that salmon were smoked or dried for winter storage. This process involved removing the heads of the salmon; therefore, a paucity of cranial elements relative to vertebral elements may indicate salmon storage at a village site (Frederick 2012:138). Pacific cod move into shallower waters during the late winter/early spring, at which time the species would be available in greater numbers. Pacific herring may already be spawning and therefore available in greater numbers than in the previous seasons. Lingcod and cabezon spawn in shallower waters during the winter, at which time they could be captured more easily. Grebes are also more abundant in the winter.

6.9.4 Seasonal Indicators – Spring

During the spring, humpback and grey whales could be hunted as they completed their migration north along western Vancouver Island. Loons, cormorants, geese, and scoters are again greatly abundant as they migrate north for the summer. Although they may be available year-round near Hiikwis, Pacific herring spawn in shallow waters, at which time they are available in great abundance. As discussed above, this abundance attracts many other animals to the shallow waters. Red Irish lord also spawn in intertidal waters in the spring, at which time they would have been more vulnerable to capture.

6.9.5 Seasonal Indicators – Salmon

While salmon are available in rivers, streams, and the ocean year-round, they are especially vulnerable to human predation during their spawning seasons, which range from late summer (sockeye, pink), to fall/winter (coho, chum), to anytime between spring and fall (chinook). Salmon spawning events also attract other animal species to the mouths of rivers and shallower waters, increasing their vulnerability to capture.

6.10 Site Seasonality

6.10.1 Unit 4/4A, Uukwatis

Based on a number of seasonal markers, spring and winter were best represented throughout time within Unit 4 and its extension. Summer was typically represented by at least one species, with multiple summer markers present in the levels above Level 19. Between Levels 7 and 16, each season was more uniformly represented. The nursing fur seal remains, indicating summer, came from Level 10, Layer F in Unit 4. These middle levels also included albatross and shearwater remains, two prominent summer markers. Within the most recent levels (above Level 7), winter and spring were the most clearly marked seasons of exploitation, while summer and fall were represented by one species or not at all.

6.10.2 Unit 3, Uukwatis

As with Unit 4/4A, winter and spring were the seasons best represented within the Unit 3 fauna. Summer exploitation was evident in many of the levels, mostly by albatross remains, which were present throughout most of the unit.

6.10.3 Unit N4-6, E0-2, Hiikwis proper

This unit provided the highest number of seasonal markers, due to the large quantity of seasonal bird remains recovered from the site. Spring and winter were strongly represented, as was fall, with remains of migrating bird species (especially loons, cormorants, geese, and scoters) abundant within the assemblage. Species available only or mostly in the summer were present in all studied levels except two: the uppermost (3/A) and the lowermost (13/C1).

The uppermost level of this unit (3/A) included seasonal markers for fall, winter, and spring; no specific summer markers were identified. This level coincides with a switch from year-round to seasonal (winter/spring) occupation at Hiikwis, discussed in Chapter 3. However, there is no radiocarbon date associated with this level. Historic materials were recovered through Level 7, and the switch is known to have taken place post-European contact. Therefore, the presence of non-aboriginal artifacts lends support to the argument that the faunal remains at Hiikwis proper reflect this switch.

6.10.4 Summary

In general, there was evidence for year-round occupation throughout the time periods represented by all of the analyzed units, with a strong focus on winter and spring species. The number of winter and spring seasonal markers could be even higher if the fish, bird, and mammal species attracted to the spawning events of certain fish – particularly salmon and herring – were included. At such times, the animals attracted to these events would have been more vulnerable to human capture.

Notable changes over time included a greater focus on summer species in the middle levels of Unit 4 at Uukwatis. A noticeable decrease and disappearance of summer markers occurred in the uppermost levels of Unit N4-6, E0-2 at Hiikwis proper, which could reflect the shift from year-round to winter/spring occupation.

6.11 Comparison to Tom's "Yearly Round"

As noted in Chapter 3, in 1921 Sapir and Swadesh (1955:27-46) recorded a story told by Tom Sayach'apis, their main Tseshaht informant. In it, Tom described the seasonal round that the "Tsishaa Tribe" undertook during his grandfather's time (around 1840/1850), which included spending the winter/early spring at Hiikwis. Many of the species identified within the Hiikwis faunal assemblage were mentioned in Tom's story.

The three most abundant sea mammal species present at Hiikwis were fur seal, harbour seal, and northern sea lion. Smaller numbers of whale and sea otter bones and one porpoise bone were also identified. Tom mentioned that, during the winter months, feasts were given when porpoises, sea lions, or hair seals (harbour seals) were caught.

The most abundant fish species were salmon, rockfish, and Pacific herring. Tom stated that while the Tseshaht were at Hiikwis, herring and salmon began to spawn. Many fish were caught; some were eaten fresh, while others were dried for future consumption. The residents also consumed and dried herring and salmon spawn. The abundance of salmon and herring bones recovered from the site complex lends support to Tom's story.

The abundance and wide variety of bird remains recovered from the site complex, particularly at Hiikwis proper, corresponds with the great number of species mentioned in Tom's "The Yearly Round." A great number of migratory bird species (including geese, cormorants, and loons) and ducks (including mallards, mergansers, and scoters) were present at the site complex, especially within the faunal remains from Hiikwis proper. Tom mentions that young men liked to shoot "shags" (cormorants) during the winter months at Hiikwis, and that "dummy shags" (constructed in the shape of a bird) were shot at with arrows as a boys' game (Sapir and Swadesh 1955:32-3). "Sawbill ducks" (mergansers) were trapped, with mallards and other ducks taken as well.

Tom continued his story, stating that "as soon as herring spawning ended, flocks of birds, (such as) swans and geese, came" (Sapir and Swadesh 1955:31). These large birds, along with ducks, were hunted and captured with scoop nets from canoes, often in the pitch-black of a moonless night as the birds rested on the water's surface. Hunters would paddle in quietly, and then start fires on board their canoes to frighten and confuse the birds. Some fires were blocked with mats, creating a dark space alongside the canoes to which the birds would flock. From there, groups of birds could be easily scooped up in nets. No swan remains were recorded among the Hiikwis fauna, but plenty of geese and ducks were.

Albatross was the third most abundant bird species at the site overall, with a small number of shearwater remains present. Both species are prominent markers of summer occupation. Tom mentioned two birds that were imitated in dances, *maatki* and *isin* birds (Sapir and Swadesh 1955:39). *Maatki* refers to the sooty shearwater (*Puffinus griseus*) (Ellis and Swan 1974:22). Twelve shearwater remains (*Puffinus* sp.) were identified within the Hiikwis assemblage. Tom recalled that "there were also two isin birds. They were big, long-limbed men with white paint along their arms to represent the wings. Their headdress was made out of isin bills, for isin were plentiful then" (Sapir and Swadesh 1955:39). The bird described here is the albatross, renowned for its massive wingspan (Bouchard and Kennedy 1990:65).

Even though Tom's story represents a very specific time during the nearly 3000-year occupation of Hiikwis, much of it coincides with the archaeological evidence. The variety of migratory birds and the prevalence of albatross, as well as the significance of seals and sea lions, corresponds with the faunal remains. The importance of both salmon and herring for subsistence is also clear from both Tom's "Yearly Round" and the archaeological remains. However, there are a number of taxa abundant within the Hiikwis fauna that would have been available during winter occupation, but were not mentioned in Tom's story. These include fur seal, deer, mink, common murre, gulls, rockfish, dogfish, lingcod, greenling, plainfin midshipman, and perch.

6.12 Comparison to Contemporaneous Sites within Barkley Sound

My fourth research question was: How does the faunal assemblage at Hiikwis compare to those at other Barkley Sound village sites? While many sites located within Barkley Sound have been surveyed, sampled, and/or excavated, only three have provided detailed faunal analyses to date: Ma'acoah, Ts'ishaa, and Huu7ii, all major village sites. These sites were occupied at least partially during the same period as Hiikwis, offering a direct comparison of Nuu-chah-nulth subsistence practices within Barkley Sound. I hypothesized that the species present at Hiikwis and their relative abundances would be similar to that at the other sites. Of the three village sites previously studied, I hypothesized that the Hiikwis fauna would be most similar to that recovered from Ma'acoah, based upon the sites' similar geographic settings. A detailed excavation methodology for each comparison site is provided in Chapter 2, as is a map of excavated site locations (Figure 1).

6.12.1 Ma'acoah

Ma'acoah (DfSi-5) is located in the northern part of inner Barkley Sound. Of the sites that have been sampled or excavated in Barkley Sound, it is located closest to the Hiikwis site complex. Like Hiikwis, Ma'acoah was once a large village site. The occupants had access to two salmon-bearing rivers.

The faunal assemblage at Ma'acoah shares many similarities with Hiikwis. Collected using a 1/4" screen, it is dominated by fish remains, particularly salmon, Pacific herring, and northern anchovy (Monks 2006:225). At Hiikwis, salmon constituted 55.6% of overall NISP, and herring 8.9%. Northern anchovy was present, but was not overly abundant within the 1/4" screened fauna. Other major fish species identified at Ma'acoah include rockfish, flatfish, perches, and sculpins, all of which were identified at Hiikwis. Salmon increased during the period of occupation at Ma'acoah, while rockfish decreased. This pattern was also observed for Hiikwis proper, although salmon remains decreased over time in Units 3 and 4 at Uukwatis.

At Ma’acoah, birds contributed 15% to the total NISP (Monks 2006:222). At Hiikwis, bird remains made up 17.8% of the total NISP. The most abundant bird species at Ma’acoah were loons and gulls. Gulls were the second most abundant type of birds at Hiikwis with 15.7% of bird NISP. Loons were also abundant at Hiikwis, making up 12.7% of the identified bird remains.

Mammal remains contributed 11.3% to the total NISP (Monks 2006:222). Land mammal remains were dominated by deer and dog, as at Hiikwis. Sea mammals outnumbered land mammal, with a focus on harbour seal, northern fur seal, whale, and dolphin. Seal and whale remains were present within the Hiikwis fauna, but dolphin was not identified within the analyzed units. Among the mammal remains, similarities existed between Ma’acoah and Hiikwis proper. At both sites, sea mammals outnumbered land mammals, whereas at Uukwatis, land mammal remains tended to be more abundant than those of marine mammals. River and sea otters were absent from Ma’acoah, and rare or absent in the Uukwatis units. However, both otter species were abundant within the Hiikwis proper fauna.

Birds made up a significant portion of the remains at both Ma’acoah and Hiikwis proper, with mammal exploitation focused on marine rather than terrestrial species. Salmon remains increased in abundance over time at both sites, a pattern discussed in greater detail below. Radiocarbon dates from Ma’acoah correspond with those from Hiikwis proper, while occupation at Uukwatis peaked much earlier (McMillan pers. comm. 2012; Monks 2006:237).

Some animal resources, such as salmon, herring, and mammals (excluding dogs), occurred in anomalously high numbers in certain areas of Ma’acoah (Monks 2006:227). It has been suggested that these areas indicate the presence of individuals or families with privileged access to particular resources (e.g., a particularly productive section of a salmon stream). No such patterns were observed for Hiikwis, although this may be due to small sample size.

Based on the species present within the faunal assemblage, all seasons are represented at Ma’acoah. There appears to be a focus on winter and spring resources, based on loon, goose, cormorant, grebe, herring, cod, lingcod, cabezon, hake, and anchovy remains. There is also a strong summer presence, represented by albatross, hake, anchovy, tuna, and whale. Many migrating bird species were present, including loons and geese, which can indicate spring or fall exploitation. The seasonal indicators present at Ma’acoah were similar to those found at Hiikwis.

6.12.2 Ts'ishaa

Another large village site, Ts'ishaa (DfSi-16) is located on Benson Island within the Broken Group Islands in the outer part of Barkley Sound. At least two distinct occupations have been recorded, represented by more recent deposits close to the shoreline (dated to 1870 – 1560 cal BP), and older deposits located further back from the beach on a raised terrace, dated to nearly 5000 cal BP (McMillan et al. 2008:218, 222). 48,962 vertebrate bones were examined, of which 23,881 were identified to taxon (Frederick and Crockford 2005:177). Based on NISP, fish were found to dominate the faunal remains in all but the uppermost levels, where sea mammals and birds were more abundant.

While the faunal remains at Hiikwis and Ts'ishaa were both dominated by fish, the species present and their relative abundance differ significantly. At Ts'ishaa, rockfish was the most common taxon within the sampled fauna, accounting for 65% of NISP (Frederick and Crockford 2005:179). Greenling and lingcod were the second and third most abundant species, with 8% and 7% of NISP, respectively. Salmon remains accounted for only 2% of total site NISP. At Hiikwis, the most abundant fish species within the 1/4" fauna were salmon (55.6% NISP), rockfish (13.8%), Pacific herring (8.9%), and spiny dogfish (5.1%). Ts'ishaa herring remains from the 1/4" screened fauna totalled only 2% of NISP.

At Ts'ishaa, salmon remains were much more abundant in the most recent deposits studied. While salmon made up 3% or less of NISP within the older midden and back terrace deposits, it accounted for 27% of NISP within the more recent material (Frederick and Crockford 2005:182). Salmon is prominent within all levels at Hiikwis, although the most recent deposits analyzed did show an increase in the relative abundance of salmon remains.

Bird remains accounted for only 1% of total site NISP at Ts'ishaa; at Hiikwis, bird NISP totalled 17.8% (Frederick and Crockford 2005:181). The most abundant birds identified at Ts'ishaa were geese (24% NISP), northern fulmar/shearwaters (16%), and ducks (13%). The most abundant bird species recovered from Hiikwis differed greatly: common murre, gulls, loons, albatross, and ducks.

It was noted that "the earlier deposits at [Ts'ishaa] display less focus on geese and ducks, and a slightly greater emphasis on the pelagic species such as albatross and shearwaters and the diving birds such as cormorants and alcids" (Frederick and Crockford 2005:181). However, the authors also note that the sample sizes are far too small to discern any strong patterns. At

Hiikwis, albatross and shearwater rose in abundance during the middle and late stages of occupation.

At Ts'ishaa, land mammals accounted for 2.7% of the total site NISP, while sea mammals totaled 3.7% (Frederick and Crockford 2005:179-80). While the relative abundance of mammal remains was similar to that at Hiikwis (2.2% of total site NISP was land mammal; 2.4% was sea mammal), the species utilized at each site differed.

Dog was the most abundant mammal species identified at Ts'ishaa (NISP = 294). The most common land mammals were river otter (53.3% of land mammal NISP), and mink (21.1%). Deer accounted for 12.8% of the land mammal remains identified at the site. Dog, deer, and mink were the three most abundant land/commensal mammal species identified at Hiikwis. Whale (29.1% of sea mammal NISP), fur seal (28.6%), porpoise/dolphin (8.8%), and white-sided dolphin (5.5%) were the top marine species identified at Ts'ishaa. The sea mammal assemblage at Hiikwis was very different, with fur seal, harbour seal, and northern sea lion as the most common species. Whales were represented by 20 fragments (3.6% of sea mammal NISP). Only one porpoise bone was identified within the sampled fauna at Hiikwis, and no dolphin elements were present. Other marine species present at Ts'ishaa but absent from Hiikwis were California sea lion and elephant seal. Northern sea lion remains were rare at Ts'ishaa, representing only 2.2% of overall sea mammal NISP.

The faunal assemblages recovered from Hiikwis and Ts'ishaa revealed significant differences, due to geographic location. The higher number of sea mammal remains and the wider variety of marine species taken at Ts'ishaa may be attributed to its location on Benson Island, in the open seas of outer Barkley Sound. The residents of Hiikwis, located within the protected waters of the inner sound, would have had lesser access to marine species. Location may also explain the differences observed within fish remains. The occupants of Hiikwis had access to salmon spawning areas; the residents of Ts'ishaa did not. One of the largest disparities between the two sites is the number of bird remains recovered: nearly 18% of NISP at Hiikwis, but only 1% at Ts'ishaa. This can be explained by the pronounced presence of migrating bird species at Hiikwis (e.g., loons, cormorants, geese, scoters), which would have been attracted to the calmer waters that front the site. The faunal remains from Ts'ishaa suggested a focus on summer resources, including anchovy, albatross, young raccoon, juvenile river otter, and fur seal pup remains.

6.12.3 Huu7ii

Located on Diana Island within the Deer Group Islands in outer Barkley Sound was another large village site called Huu7ii (DfSh-7). The site features lower house platforms, as well as a raised terrace further into the forest, upon which large houses also once stood. The upper platform on the terrace has been dated to between 4800 – 3000 cal BP, while the lower platform was dated to between 1500 – 400 cal BP (McMillan et al. 2008:230). Fauna was initially collected through 1/8" screens, with 1/4" mesh used during the second season of excavation.

The faunal assemblage from Huu7ii revealed a focus on summer/spring resources, including nursing fur seal pups, albatross, anchovy, bluefin tuna, sardine, herring, sharp-shinned hawk, snow goose, and white-fronted goose.

The fauna recovered from the more recent occupation was dominated by fish (95% NISP). The lower, earlier levels consisted mainly of rockfish, dogfish, flatfish, and hake remains; salmon accounted for less than 1% of NISP. However, the upper levels were dominated by salmon, which accounted for 67% of NISP (McMillan et al. 2008:231). Interestingly, this shift in fishing practices also takes place around 800 years ago, the same time as that at Ts'ishaa (Frederick 2012:152).

Because so few bird and mammal remains were recovered from the site, only these bones were looked at for six units; fish were excluded from identification from these levels (Frederick 2012:118). Even with an augmented sample, bird NISP for the site as a whole totaled only 859 (2% of NISP). Of these, the most abundant species were gulls (16.4% NISP), common murre (10.9%), and shearwater (8.6%). Various ducks, loons, cormorants, and geese were also present. While identified at Huu7ii, albatross remains were not as numerous as at Hiikwis (NISP = 33 (3.8% NISP) and 252 (10.8%), respectively). The Huu7ii bird assemblage, exclusive of size, is quite similar to that of Hiikwis, although shearwater remains were rare among the Hiikwis fauna (0.5% NISP).

Mammals accounted for 2828 of the identified faunal remains at Huu7ii (7% NISP). Dogs were abundant throughout the site (NISP = 773), while land mammal remains were dominated by mule deer (57.2% of land mammal NISP) and mink (20.1%). These were also the most common land mammal species identified at Hiikwis.

Sea mammal remains were more abundant than land mammal remains at Huu7ii, especially when dogs are excluded from the sample (as they were most likely brought to the island by humans and were less likely to have been consumed for food) (Frederick 2012:132-3). This pattern makes sense for a small island site, where marine mammals would have been diverse and plentiful while terrestrial species were limited. Huu7ii displays a pattern closer to that at Hiikwis proper, where sea mammal remains were more abundant than at Uukwatis. However, major differences exist between the sea mammal species present at Huu7ii and Hiikwis, likely due to differing geographic settings. The Huu7ii sea mammal assemblage (NISP = 1693) was dominated by whale and porpoise/dolphin remains (29.8% and 28.2% NISP, respectively). Northern fur seal was the third most abundant species (16.8%). Whale, while present at Hiikwis, occurred much less frequently, while dolphin was not identified at all. Only one porpoise bone was present in the sampled fauna, accounting for less than 1% of sea mammal NISP.

Only one of the occupations observed at Huu7ii overlaps temporally with Hiikwis: the more recent occupation located closest to the modern shoreline and dated to 400 – 1500 cal BP. The Huu7ii fauna share some similarities with Hiikwis, but also show many differences. The assemblage was dominated by fish remains (95% NISP), even though the sample was intentionally biased to increase the representation of bird and mammal remains. At Hiikwis, fish totaled 77% of NISP, with a greater focus on bird remains than at other Barkley Sound sites. Mammal remains at both sites were relatively low, accounting for 7% of NISP at Huu7ii and 5% at Hiikwis.

Table 17 updates the comparison of village sites in Barkley Sound in Table 1 by adding the trends observed at the Hiikwis site complex. The time periods outlined for Hiikwis and the trends observed within them are estimates based on limited radiocarbon dates.

Table 17. Trends in faunal remains at major village sites in Barkley Sound, including Hiikwis.

Date (cal BP)	Ma'acoah	Ts'ishaa	Huu7ii	Hiikwis
100 – 600	Site occupied. **Salmon** and **herring** dominate the fish assemblage. **Salmon** abundance increases over time. Flatfish, **rockfish**, perch, and sculpins also abundant.	**Salmon** more abundant and **rockfish** less abundant than in earlier levels. Sea mammals and birds are abundant.	**Salmon** and **herring** are most abundant fish. Sea mammals are less abundant than in earlier levels. Marine birds are abundant. Site abandoned ~400 BP.	**Salmon** dominant. **Rockfish** much more rare than in earlier levels. **Herring** decreases. **Dogfish** rare. Birds decrease. Sea mammals more abundant than land. **Fur seal** abundant. ** Shift to seasonal usage (~150 BP)*
700 – 800	May be occupied.	**Salmon** becomes more abundant; **rockfish** becomes rarer compared to earlier levels. Sea mammals and birds become more abundant and land mammals less abundant than in earlier levels. ** Shift to seasonal usage?*	**Salmon** increases in abundance greatly from earlier levels. **Herring** remains abundant. **Rockfish**, dogfish, hake, anchovy, and flatfish less abundant than in earlier levels. Overall decrease in sea mammals. Birds more dominant than in earlier levels; shift to marine. ** Shift to a more seasonal usage?*	**Salmon** increases in abundance, while **rockfish** decreases. **Herring** abundant. Birds in general greatly abundant. Sea mammals more abundant than land mammals.
900 – 1400	May be occupied.	**Salmon** rare. **Rockfish** dominates. Dog less abundant than in earlier levels. Geese and ducks abundant. Marine birds less abundant.	Hake, **rockfish**, flatfish, dogfish, **herring**, anchovy, and **salmon** present. High quantity of bird remains.	**Salmon** and **rockfish** most abundant fish species. **Herring** increases in abundance. **Dogfish** more abundant. Birds rise in abundance. Land mammals decrease.
1500 – 2000	May be occupied.	**Salmon** rare. **Rockfish** dominates.	**Hake, rockfish,** flatfish, and dogfish dominate. **Herring** and anchovy abundant. **Salmon** is present but not common. Sea mammals more abundant than in earlier layers.	**Salmon** increases in abundance. **Herring** present. **Dogfish** increases then decreases. Land mammals more abundant than sea mammals.
2100 – 5000	Likely unoccupied.	**Rockfish**, greenling, and lingcod dominate. **Salmon** very rare. Dogs very abundant. Focus on fur seals, dolphins, porpoises, and whales. Geese, shearwaters, northern fulmar, and ducks are most abundant birds.	**Herring**, **rockfish**, and greenling dominate; **salmon**, perch, and dogfish are present in lower numbers.	**Salmon** decreases in abundance, while **rockfish** increases. **Herring** very abundant. Dogfish rare. **Albatross** appears.

6.12.4 Summary

Of the three sites for which extensive faunal analyses have been conducted, the Hiikwis assemblage is most similar to that at Ma'acoah. This similarity can be largely attributed to similar geographic settings within inner Barkley Sound. Both sites showed a dominance of fish, although bird species were clearly an important food resource as well. Mammal remains accounted for approximately 11% of NISP at Ma'acoah and 5% at Hiikwis.

Access to salmon-bearing streams is responsible for the similarity between the Ma'acoah and Hiikwis fish assemblages. It has been shown that salmon did not increase in importance at the outer Barkley Sound sites until around 800 cal BP (see below; McMillan et al. 2008). Ts'ishaa and Huu7ii are located on islands which do not have salmon streams. Salmon featured prominently throughout all levels at both Ma'acoah and Hiikwis, although salmon remains did increase in abundance over time as rockfish remains decreased.

The protected waters of Hiikwis, located within inner Barkley Sound, would have been more attractive to flocks of migrating birds than the exposed shorelines of islands in the outer sound. This could explain the unusually high abundance of bird remains recovered from Hiikwis proper (17.8% of total site NISP). Ma'acoah, located in a similar position as Hiikwis, also had a higher abundance of bird remains (15% NISP) in comparison to the outer sound sites. Only 1% of the bones identified at Ts'ishaa were bird, and birds accounted for only 2% of the identified remains at Huu7ii, even with an intentionally inflated sample. Due in part to the presence of migrating bird species, Hiikwis and Ma'acoah demonstrated similar occupancy patterns. Both sites appear to have been occupied year-round, with a focus on winter and spring species and a strong presence of summer species.

Located on Vancouver Island, Ma'acoah and Hiikwis would have provided greater access to larger populations, and perhaps a wider variety, of terrestrial mammal species in comparison to the small island territories. On the other hand, their locations may have limited access to some marine mammal resources (e.g., whales, porpoises, and dolphins).

Of the Barkley Sound sites studied to date, the Hiikwis faunal assemblage is most similar to that recovered from Ma'acoah. In particular, the Ma'acoah fauna is more comparable to that from Hiikwis proper rather than Uukwatis. Radiocarbon dates from Hiikwis proper (occupied at least between 310 – 1290 cal BP) and Ma'acoah (occupied from at least 600 BP) have shown these two sites to be contemporaneous, while the main occupation at Uukwatis is older (720 to 2870 cal BP).

6.12.5 Whale Remains within Barkley Sound Village Sites

Excavations at Ma'acoah, Ts'ishaa, Huu7ii, and Hiikwis have all recovered whale remains. An ancient DNA analysis was conducted on 34 whale/large sea mammal bone fragments from eight units and both of the Unit 4 extensions at the Hiikwis site complex. These data provide accurate documentation of the whale species utilized at the site, as well as an interesting comparison to the identifications I made based on bone morphology. Furthermore, these results can be compared to contemporaneous Barkley Sound village sites.

Three samples were found to represent northern sea lion. Of the 31 remaining fragments, 28 yielded adequate DNA for whale species determination. Samples were selected from separate level/layer combinations in an effort to avoid taking multiple samples from the same individual. There was one exception, where two fragments were taken from the same level/layer and likely represent the same individual. Therefore, the 28 samples most likely represent 27 unique individuals.

Of the 28 samples that yielded DNA, humpback (*Megaptera novaeangliae*), grey (*Eschrichtius robustus*), and sperm whale (*Physeter macrocephalus*) specimens were identified (Rodrigues and Yang 2014). Humpback whale predominated, followed by grey whale, with only two verified sperm whale specimens. Eight of these specimens (four humpback and four grey whales) came from levels included in my sample. Three bones that I had previously identified as grey whale using comparative specimens were confirmed as such (an atlas, a cervical vertebra, and a caudal vertebra).

Grey, humpback, finback, right, killer, blue, and minke whales have been identified at excavated Barkley Sound village sites (Arndt 2011; McMillan 2000:135). Hiikwis is the first site in the region to produce verified sperm whale remains to date. At Ts'ishaa, 254 whale bone fragments within the analyzed units were identified, although not to species (Frederick and Crockford 2005:177). Analysis conducted on 163 samples from the site in general returned 138 specimens with adequate DNA (Arndt 2011:87). Of these, 105 were humpback, 18 were grey, nine were finback, three were right, two were blue, and one was orca (killer) whale (Arndt 2011:89). Humpback whale dominated the Ts'ishaa sample to a much greater extent than at

Hiikwis. No MNI was determined, although samples were selected in an effort to avoid resampling individuals (Arndt 2011:47). It is believed that a minimum of 75 individuals were represented by the 138 samples which returned adequate DNA (Arndt 2011:93).

Five hundred and five whale specimens were identified at Huu7ii, only three of which could be assigned to species – all humpback – on the basis of morphology (Frederick 2012:123). One hundred and one samples were submitted for aDNA analysis, 84 of which yielded adequate DNA (Arndt 2011:87). Of these, 70 were humpback, 11 were grey, two were finback, and one was right whale (Arndt and Yang 2012:188). Again, humpback whales had a greater relative abundance at Huu7ii than at Hiikwis. MNI was not determined, although at least 51 individuals were believed to be represented (Arndt 2011:93).

Whale remains were recovered from Ma'acoah, but were not identified to species. Whale identifications at the two other Toquaht project sites, Ch'uumat'a (DfSi-4) and T'ukw'aa (DfSj-23), showed a predominance of humpback whale as well. At Ch'uumat'a, humpback (NISP = 33), grey (NISP = 6), and minke (NISP = 1) whales were identified, as well as two tentatively identified right whale specimens (Monks et al. 2001:73). At T'ukw'aa, humpback (NISP = 37), grey (NISP = 5), and one possible right whale were present (Monks et al. 2001:73).

The Barkley Sound village sites studied to date show a clear predominance of humpback whale. The whale assemblage from Hiikwis follows this pattern as well. This preference likely exists because humpback whales are slower swimmers and less aggressive than other species, they swim closer to the shore, and they often enter Barkley Sound to feed on herring (Arndt 2011:97; Monks et al. 2001:70). This evidence contrasts the ethnographic view of Nuu-chah-nulth whaling, in which grey whales were described as the primary species hunted, with humpbacks considered secondary (Monks et al. 2001:70).

6.13 Salmon and the Developed Northwest Coast Pattern

My fifth research question was: Does salmon use at Hiikwis follow the typical Barkley Sound pattern recorded to date? To answer this question, I investigated whether or not salmon became a significant resource at Hiikwis only within the past 1000 years. Following the pattern observed for Ts'ishaa and Huu7ii, I hypothesized that salmon remains would be relatively rare within the earlier levels of the site, with rockfish favoured instead. Over time, I expected to see rockfish remains decrease and salmon remains increase significantly in relative abundance, beginning around 800 years ago.

As discussed in Chapter 2, the Barkley Sound village sites studied to date do not follow the Developed Northwest Coast Pattern. The traditional pattern describes salmon use as essential and consistent over time, for millennia. However, faunal analyses of Ts'ishaa and Huu7ii have shown that salmon did not become a significant resource in the outer sound until around 800 years ago (Frederick 2012:152; McMillan et al. 2008).

6.13.1 Salmon Usage at Hiikwis

Through faunal analysis, it was observed that the salmon remains recovered from Uukwatis *do not* follow the pattern documented at other Barkley Sound village sites. Salmon remains are present within the oldest deposited cultural material (Unit 4 on the back terrace, dated up to 2870 cal BP), and occur fairly consistently over time in both units studied (see Tables 8 through 10).

However, at Hiikwis proper, the relative percentage of salmon within all fish remains *does* increase over time. This increase in relative abundance occurs around Level 9. Material from Level 13 was radiocarbon dated to 920 – 700 cal BP. Therefore, this intensification occurs less than 920 years ago – a time frame which coincides with the rise of salmon in other locations.

Calculating MAU for salmon remains within each level bag revealed some interesting patterns at Hiikwis. Within Units 3, 4, and 4A at Uukwatis, salmon cranial remains were more abundant in older levels, relative to vertebrae. However, at Hiikwis proper, cranial elements were more abundant, relative to vertebrae, in the more recent levels.

A scarcity of cranial elements relative to non-cranial elements is often used to hypothesize the processing of fish for preservation (Cannon and Yang 2006:138). If accurate, it could be suggested that more fresh salmon was consumed in the earlier occupation at Uukwatis, with preserved salmon being consumed on a more regular basis as time passed. It would also suggest that the opposite occurred at Hiikwis proper; more preserved salmon was consumed during early occupation, with more fresh salmon consumed during later occupation. An alternative explanation could be that the unit analyzed at Hiikwis proper represents a site where salmon were processed for winter storage in more recent times, leaving mostly fish heads behind.

The only non-vertebral element that is present in any great abundance within the studied material is the basipterygium (pelvis). In some levels (at both sites), it was the most abundant element present (i.e., it had the highest MAU), surpassing vertebrae. Butler and Chatters (1994:417) determined that the basipterygium, a paired fin element, is a relatively low density element. Therefore, its abundance cannot be explained by its density. In fact, the basipterygium is less dense than many cranial elements that were rare or absent within the sampled assemblage, including the dentary, maxillary, and articular (Butler and Chatters 1994:417).

At Keatley Creek, a site in central British Columbia, the survivorship of low-density salmon elements, such as the basipterygium and coracoid, "likely reflects cultural processing behavior; the low correlation between density and element survivorship suggests that heads were rarely deposited at the site in the first place" (Butler and Chatters 1994:422). At this site, basipterygia outnumbered some vertebral elements, just as they did at Hiikwis, although cranial remains were low. The same pattern was recorded at the Alaskan site of Agayadan Village, where basipterygiums held the highest MAU (100%) and vertebrae were less abundant (78% MAU) (Hoffman et al. 2000:704).

Given that low-density skeletal elements survived at the Hiikwis site complex, while higher-density cranial bones were rare, the element representation appears to reflect human behavior rather than preservational bias. The heads of salmon were likely removed prior to being brought into the site. The pelvis may have been left in the body of the fish, which would account for its high occurrence within all excavated units at Uukwatis and Hiikwis proper. This idea is supported by Hoffman et al. (2000:701), who state that pelvic girdle elements would likely be present in stored fish, as fins were often left attached to the prepared fillets.

One final interesting observation was made concerning salmon remains at Hiikwis proper. Around 200 years ago, the Tseshaht gained access to the Somass River, which supports populations of chinook, sockeye, coho, chum, and pink salmon. The largest concentration of salmon remains (NISP = 1054; 91.6% of fish NISP) existed within Level 5/A at Hiikwis proper. Salmon also accounted for 85.6% of fish NISP within Level 3/A, one of the highest proportions of salmon noted within the studied levels. In this case, the archaeological material may clearly correspond with a known historic event, suggesting that newly gained access to a more productive salmon stream shifted subsistence at the Hiikwis site complex to an even greater focus on salmon. Unfortunately only one radiocarbon date was returned from near the bottom of the unit (920 – 700 cal BP) so this shift cannot be accurately dated, although historic artifacts were recovered through Level 5.

6.13.2 What was happening around 800 BP?

Subsistence practices appear to change in the last millennium of occupation at sites throughout Barkley Sound and elsewhere along the Northwest Coast (southern Haida Gwaii; Hesquiat Harbour; Hoko River). It has been suggested that these changes represent a period of amalgamations, territory expansions, and shifting settlement patterns, at least among the Nuu-chah-nulth (Frederick 2012:140; Monks 2006:237).

Along the west coast of Vancouver Island, a number of defensive sites appear to have emerged around 700 – 800 BP (McMillan 2000:69, 151). An increase in population size may be responsible for both the emergence of numerous defensive sites and the shift in subsistence practices. A larger population would have required more food resources; at the same time, those resources needed to be protected from nearby groups. Similarly, smaller groups may have amalgamated during this time period in order to expand territories and, as a result, resources available to them. Alternatively, a shift in subsistence practices could correspond with an expansion of trade routes among the Nuu-chah-nulth. It is also possible that the increase in salmon remains within Barkley Sound is the result of an environmental change favouring salmon, or a species salmon prey upon (e.g., Pacific herring). This is one area of Northwest Coast archaeology that would clearly benefit from further research.

Chapter 7: Conclusion

The Hiikwis site complex, located in inner Barkley Sound, represents two traditional Nuu-chah-nulth village sites occupied from at least 2800 years ago into the early twentieth century. Uukwatis (DfSh-15) is the older of the two sites, while Hiikwis proper (DfSh-16) is more recent. Excavated between 2008 and 2010, the site complex appears to be unique among other Barkley Sound sites. This is due to the presence of a late-context (post-2000 BP) flaked stone tradition (MacLean 2012) and also to the site's faunal assemblage. I analyzed selected levels from one unit at Hiikwis proper (N4-6, E0-2), and two units (3 and 4) plus one extension (4A) from Uukwatis. Total NISP, excluding six *in situ* fish concentration features, equaled 13,888. Of the identifiable remains, 10,687 belonged to fish, 2478 to birds, and 723 to mammals.

The fish assemblage was dominated by salmon (NISP = 5942), followed by smaller numbers of rockfish, Pacific herring, and spiny dogfish. While these were the most abundant taxa recovered from the site, many other species were identified in smaller numbers. At Uukwatis, salmon remains increased and then decreased in Unit 4 (dated between 2870 – 2090 cal BP), while they decreased in relative abundance over time in Unit 3 (dated between 1870 – 1560 cal BP). However, at Hiikwis proper, salmon increased in relative abundance, sometime after 920 cal years BP.

The analysis of six *in situ* fish bone concentration features showed that 1/4" mesh – most commonly utilized in Northwest Coast archaeological excavation – failed to recover the majority of small fish remains (e.g., Pacific herring, northern anchovy) present at the Hiikwis site complex. Similar recovery bias has been documented and discussed by McKechnie (2005:221). My results showed that 1/8" screens recover the majority of herring bones present at Hiikwis, while 1/16" screens are required to collect the majority of anchovy remains.

The bird assemblage for the site complex as a whole was dominated by common murre (29.3% NISP), although the great majority of these specimens came from Hiikwis proper. Gulls, loons, albatross, ducks, geese, and cormorants were also abundant, with a number of other taxa identified in smaller numbers. At Hiikwis proper, the most common bird species included common murre, gulls, albatross, and Pacific loon. At Uukwatis, albatross, bald eagle, ducks, and gulls were most abundant in Unit 3, while ducks and gulls were most abundant in Unit 4/4A.

Within Unit 4, which represented the oldest studied deposits, there was a shift from medium-sized birds present at the site year-round (e.g., ducks, gulls, and murres) to larger species such as loons, geese, and albatross, which were more limited in their seasonal availability. Bird remains in general were less abundant in the upper levels, where a greater focus on fish was apparent. Of the units analyzed, bird remains were least abundant within Unit 3. The species best represented were albatross and bald eagle, which may signify specialized use of this area of the site for tool and other object manufacture. Unit N4-6, E0-2 at Hiikwis proper (the youngest of the units) contained a great quantity of bird remains (NISP = 1856). However, the relative abundance of birds decreased over time, while those of fish and mammals, particularly salmon and fur seal, rose.

The mammal assemblage at the site complex was rather small, with only 723 identifiable specimens. However, mammals tend to be larger than bird and fish species. Each individual potentially contributes greater edible material than multiple fish or birds. Domestic dogs were ubiquitous across the sites (NISP = 114) and present throughout the entire occupation. The presence of a nearly complete juvenile dog spine within Unit 4A may suggest a deliberate burial, only part of which was revealed within the excavation unit borders. Deer and mink were the most common non-domesticates. The land mammal assemblage remained relatively consistent across the site complex and over time.

Among the sea mammals, northern fur seal was the most abundant species by far, with smaller numbers of harbour seal, northern sea lion, whale, and sea otter present. The greatest abundances of fur seal were found in the upper levels of Unit 4 at Uukwatis and Unit N4-6, E0-2 at Hiikwis proper. Whale remains were recovered from Units 4/4A and N4-6, E0-2. As the Nuu-chah-nulth were known whalers, the whale remains at the site may represent hunting activity. Whales were likely exploited for both subsistence (flesh, blubber, and oil) and tool manufacture (bone).

Based on NSP and NISP values, the mammal assemblages within the studied units at Uukwatis showed a focus on terrestrial species. This was especially true of Unit 3, which was located alongside a stream. The inverse occurred within the Hiikwis proper unit, where marine species dominated the mammal assemblage. As Hiikwis proper contained more recent deposits (based on radiocarbon dates), these results suggest that sea mammals played a larger economic role at the site complex in later periods of occupation. Alternatively, these data may simply reflect the slight geographic differences between the two sites (e.g., the presence of mudflats and a stream at Uukwatis; a rockier beach at Hiikwis proper).

All seasons were represented at both sites, with a greater focus on resources available during the winter and spring months. This was due to a consistent presence of salmon, herring, and migrating bird species. Summer was represented in most levels, typically by albatross, anchovy, hake, halibut, bluefin tuna, or nursing-age fur seal remains. Summer species wane and disappear within the most recent deposits at the site. This finding likely reflects a switch from year-round to seasonal (winter/spring) occupation at Hiikwis proper.

I compared the fauna from Hiikwis to that from two outer sound village sites (Ts'ishaa, DfSi-16, and Huu7ii, DfSh-7) and one inner sound site (Ma'acoah, DfSi-5). Not surprisingly, the Hiikwis fauna was most similar to that at Ma'acoah, due to their similar geographic settings. In particular, the Hiikwis proper fauna was most comparable to that from Ma'acoah, likely due to similar age ranges of occupation. Both sites had a very large bird assemblage (15% at Ma'acoah, 17.8% at Hiikwis), likely due to flocks of migrating birds taking refuge on the calmer waters surrounding these sites. Sea mammal assemblages were also similar, as marine species available to inner sites are more limited compared to the outer island sites. Both sites also demonstrate access to salmon streams, which contributed large quantities of salmon throughout all periods of occupation. The residents of Ts'ishaa and Huu7ii, located on smaller islands, lacked access to salmon streams for the majority of occupation; therefore, salmon only appears in significant abundance within the more recent deposits at each site (beginning around 800 years ago).

This late emergence of salmon use at Barkley Sound sites has challenged the traditional view that salmon was the most important subsistence resource on the Northwest Coast since time immemorial. Its preservation and storage for winter consumption was thought responsible for the emergence of complex society among coastal groups, known as the Developed Northwest Coast Pattern (Matson and Coupland 1995). Faunal analysis of the Hiikwis site complex showed consistent salmon exploitation beginning at least 2800 years ago and continuing into the twentieth century. Interestingly, salmon does increase in abundance compared to other fish species at Hiikwis proper sometime after 920 cal BP. The time period associated with this shift of fishing practices in Barkley Sound (approximately 1000 – 800 years ago) has been associated with group amalgamations, increasing populations, shifting territorial boundaries, changes in subsistence practices, and increased defensive strategies and structures (Frederick and Crockford 2005:184; Monks 2006:237).

Calculating MAU for the salmon remains recovered from Hiikwis showed that vertebral elements outnumbered cranial elements at Uukwatis. However, cranial elements were more abundant, relative to vertebrae, in the most recent deposits at Hiikwis proper. These results suggest that more stored salmon was eaten in the earlier periods of occupation at the site, while more fresh salmon was consumed during the later periods. This view conflicts with the shift from year-round to winter occupation at the site, as winter occupation is often associated with the consumption of stored salmon. Alternatively, this abundance of cranial bones at Hiikwis proper could represent a salmon processing spot. Their heads could have been removed and discarded in the same area where preserved fish were consumed and/or their backbones discarded.

Even with a small sample size, this analysis of faunal remains from the Hiikwis site complex contributes to the knowledge of subsistence practices among traditional Nuu-chah-nulth groups within Barkley Sound.

7.1 Future Work

Future faunal analysis of the units not included in my study would greatly benefit our understanding of Hiikwis. With a larger sample, patterns of animal use and distribution over the site complex would be much clearer. For example, it would be interesting to examine whether evidence of social structure illustrated by the faunal remains. This can be represented by anomalously high concentrations of certain species in specific areas of the site, suggesting differential access to choice resources, such as what was observed at Ma’acoah (Monks 2006).

If the evolution of complex society within Barkley Sound is to be fully understood, future archaeological work in the region is necessary. Faunal analyses of sites with similar contexts to Hiikwis (on mainland Vancouver Island rather than the smaller islands inside the sound) are required to better reveal the role of salmon in this area. To date, the only inner site for which a detailed faunal analysis has been completed is Ma’acoah. However, concrete evidence of occupation at this site goes back only 600 years, although it may have been used from 2000 cal BP. Sites occupied prior to 600 BP are needed for an accurate comparison of salmon use at Barkley Sound sites to be made.

Three regions along the Northwest Coast have also shown a predominance of other fish species over salmon during early periods of occupation: Hesquiat Harbour (Calvert 1980:123), southern Haida Gwaii (Acheson 1998:43; Orchard and Clark 2005:101; Wigen 1990:2-3), and Hoko River (Croes and Hackenberger 1988:19). Evidence for other preservable resources (e.g., flatfish; shellfish; plant material) proves that many groups along the Northwest Coast developed equally complex social systems even in the absence of abundant salmon. Greater research into alternative storage foods could provide the basis for an important study.

Additionally, it is necessary to research the role of small fish species (e.g., Pacific herring, northern anchovy) in subsistence for Northwest Coast groups. As previous studies have shown (McKechnie 2005), and as mine confirms, small fish are consistently underrepresented at archaeological village sites when 1/4" screens are primarily used for the recovery of faunal remains. It is clear that great numbers of these fishes were taken, and their role as significant subsistence resources for coastal groups requires further exploration.

References Cited

Acheson, S.
1998 *In the Wake of the ya'áats' xaatgáay [Iron People]: A Study of Changing Settlement Strategies among the Kunghit Haida*. British Archaeological Reports, International Series 711.

Ames, K.M. and H.D.G. Maschner
1999 *Peoples of the Northwest Coast: Their Archaeology and Prehistory*. Thames and Hudson, London.

Arima, E. and A. Hoover
2011 *The Whaling People of the West Coast of Vancouver Island and Cape Flattery*. Royal BC Museum, Victoria, B.C.

Arndt, U.
2011 *Ancient DNA Analysis of Northeast Humpback Whale (Megaptera novaeangliae*). PhD Dissertation, Department of Archaeology, Faculty of Environment, Simon Fraser University, Burnaby.

Arndt, U. and D. Yang
2012 Appendix C: Ancient DNA Analysis of Whale Bones from Huu7ii. In *Ts'ishaa: Archaeology and Ethnography of a Nuu-chah-nulth Origin Site in Barkley Sound*, by A.D. McMillan and D.E. St Claire, pp. 115-153. Archaeology Press, Simon Fraser University, Burnaby.

Bouchard, R. and D. Kennedy
1990 *Clayoquot Sound Indian Land Use.* Report prepared for MacMillan Bloedel Limited, Fletcher Challenge Canada, and the British Columbia Ministry of Forests.

Butler, V.L. and J.C. Chatters
1994 The Role of Bone Density in Structuring Prehistoric Salmon Bone Assemblages. *Journal of Archaeological Science* 21:413-424.

Calvert, S.G.
1980 *A Cultural Analysis of Faunal Remains from Three Archaeological Sites in Hesquiat Harbour, BC*. PhD Dissertation, Department of Anthropology and Sociology, University of British Columbia.

Calvert, G. and S. Crockford
1982 Analysis of Faunal Remains from the Shoemaker Bay Site (DhSe-2). In *Alberni Prehistory: Archaeological and Ethnographic Investigations on Western Vancouver Island*, by A.D McMillan and D.E. St. Claire, pp. 174-219. Theytus Books, Penticton, B.C.

Campbell, S.K. and V.L. Butler

2010 Fishes *and* Loaves? Explaining Sustainable, Long Term Animal Harvesting on the Northwest Coast using the "Plant Paradigm." In *The Archaeology of Anthropogenic Environments*, edited by R.M. Dean, pp.175-203. CAI Series, Carbondale, Illinois.

Cannings, R., R. Aversa and H. Opperman
2005 *Birds of Southwestern British Columbia*. Heritage House Publishing Company Ltd., Surrey, B.C.

Cannon, A.
2001 Was Salmon Important in Northwest Coast Prehistory? In *People and Wildlife in Northern North America: Essays in Honor of R. Dale Guthrie*, edited by S.C. Gerlach and M.S. Murray, pp. 178-187. BAR International Series 944. Archaeopress, Oxford.

Cannon, A. and D.Y. Yang
2006 Early Storage and Sedentism on the Pacific Northwest Coast: Ancient DNA Analysis of Salmon Remains from Namu, British Columbia. *American Antiquity* 71:123–140.

Clague, J., J.R. Harper, R.J. Hebda and D.E. Howes
1982 Late Quaternary Sea Levels and Crustal Movements, Coastal British Columbia. *Canadian Journal of Earth Sciences* 19(3):597-618.

Coupland, G.
1998 Maritime Adaptation and Evolution of the Developed Northwest Coast Pattern on the Central Northwest Coast. *Arctic Anthropology* 35(1):36-56.

Coupland, G., K. Stewart, and K. Patton
2010 Do you Never get Tired of Salmon? Evidence for Extreme Salmon Specialization at Prince Rupert Harbour, British Columbia. *Journal of Anthropological Archaeology* 29:189-207.

Crellin, D.F.
1994 *Is There a Dog in the House: The Cultural Significance of Prehistoric Domesticated Dogs in the Mid Fraser River Region of British Columbia*. Master's thesis, Department of Archaeology, Simon Fraser University, Burnaby.

Crockford, S.J.
1994 New Archaeological and Ethnographic Evidence of an Extinct Fishery for Giant Bluefin Tuna (*Thunnus thynnus orientalis*) on the Pacific Northwest Coast of North America. In *Fish Exploitation in the Past: Proceedings of the 7th Meeting of the ICAZ Fish Remains Working Group*, edited by W. Van Neer, pp. 163-168. Annales du Musée Royal d l'Afrique Centrale, Sciences Zoologiques, Tervuren.

1997a Archaeological Evidence of Large Northern Bluefin Tuna, *Thunnus thynnus*, in Coastal Waters of British Columbia and Northern Washington. *Fishery Bulletin* 95(1):11-24.

1997b Osteometry of Makah and Coast Salish Dogs. Simon Fraser University Archaeology Press, Burnaby.

2003 *The Archaeological History of Short-tailed Albatross in British Columbia: A review and summary of STAL skeletal remains, as compared to other avian species, identified from historic and prehistoric midden deposits*. Report submitted to Canadian Wildlife Services, Victoria.

Crockford, S., G. Frederick, and R. Wigen
1997 A Humerus Story: Albatross Element Distribution from Two Northwest Coast Sites, North America. *International Journal of Osteoarchaeology* 7(4):287-291.

2002 The Cape Flattery Fur Seal: An Extinct Species of *Callorhinus* in the Eastern North Pacific? *Canadian Journal of Archaeology* 26(2):152-174.

Croes, D.R and S. Hackenberger
1988 Hoko River Archaeological Complex: Modeling Prehistoric Northwest Coast Economic Evolution. In *Prehistoric Economies of the Pacific Northwest Coast*, Research in Economic Anthropology, Supplement 3, edited by B.L. Isaac, pp. 19-85. JAI Press, Greenwich, Connecticut.

Dallimore, A., R.J. Enkin, R. Peinitz, J.R. Southon, J. Baker, C.A. Wright, T.F. Pedersen, S.E. Calvert, and R.E. Thomson
2008 Post-glacial Evolution of a Pacific Coastal Fjord in British Columbia, Canada: Interaction of Sea-level Change, Crustal Response and Environmental Fluctuations – Results from MONA Core MD02-2494. *Canadian Journal of Earth Sciences* 45(11):1345-1362.

Eder, T. and D. Pattie
2001 *Mammals of British Columbia*. Lone Pine Publishing, Edmonton.

Ellis, D. and L. Swan
1974 *Fish, Low Tide Life, Animals, and Birds in the Manhousat Dialect of the Nootka (West Coast) Language*. Unpublished manuscript, in the possession of the BC Indian Language Project/Bouchard and Kennedy Research Consultants Archives, Victoria.

Eschmeyer, W.N., E.S. Herald and H. Hammann
1983 A Field Guide to Pacific Coast Fishes: North America. Houghton Mifflin Company, New York.

Frederick, G.
2012 Appendix A: Vertebrate Fauna from the Huu-ay-aht Archaeology Project: Results from the 2006 Huu7ii Village Excavations and Summary of 2004 and 2006 Data. In *Ts'ishaa: Archaeology and Ethnography of a Nuu-chah-nulth Origin Site in Barkley Sound*, by A.D. McMillan and D.E. St Claire, pp. 115-153. Archaeology Press, Simon Fraser University, Burnaby.

Frederick, G. and S. Crockford
2005 Appendix D: Analysis of the Vertebrate Fauna from Ts'ishaa Village, DfSi-16, Benson Island, B.C. *In* Ts'ishaa: Archaeology and Ethnography of a Nuu-chah-nulth Origin Site in

Barkley Sound, by A.D. McMillan and D.E. St Claire, pp. 173-205. Archaeology Press, Simon Fraser University, Burnaby.

Goodson, G.
1988 Fishes of the Pacific Coast: Alaska to Peru, Including the Gulf of California and the Galapagos Islands. Stanford University Press, Stanford, California.

Gray, B.
2008 *Sampling Methods in Northwest Coast Household Archaeology: A Simulation Approach Using Faunal Data from the Ozette Site.* Master's thesis, Department of Anthropology, University of Victoria.

Groesbeck, A.S., K. Rowell, D. Lepofsky, and A.K. Soloman
2014 Ancient Clam Gardens Increased Shellfish Production: Adaptive Strategies from the Past Can Inform Food Security Today. PLoS ONE 9(3):e91235.

Hatler, D.F., D.W. Nagorsen and A.M. Beal
2008 *Carnivores of British Columbia*. Royal BC Museum, Victoria, B.C.

Lam, Y.M and O.M. Pearson
2005 Bone Density Studies and the Interpretation of the Faunal Record. *Evolutionary Anthropology* 14:99-108.

Lepofsky, D. and N. Lyons
2003 Modeling Ancient Plant use on the Northwest Coast: Towards an Understanding of Mobility and Sedentism. *Journal of Archaeological Science* 30(11):1357–1371.

Lyman, R.L.
2008 *Quantitative Paleozoology*. Cambridge University Press, Cambridge.

Mackie, Q., D. Fedje, D. McLaren, N. Smith, and I. McKechnie
2011 Early Environments and Archaeology of Coastal British Columbia. In *Trekking the Shore: Changing Coastlines and the Antiquity of Coastal Settlement*, edited by N.F. Bicho, J.A. Haws, and L.G. Davis, pp. 51-103. Springer Science+Business Media, New York.

MacLean, K.
2012 *An Analysis of the Flaked Stone Assemblage from the Hiikwis Site Complex, Barkley Sound, British Columbia.* Master's thesis, Department of Anthropology, University of Victoria.

Matson, R.G. and G. Coupland
1995 *The Prehistory of the Northwest Coast*. Academic Press, San Diego

McKechnie, I.
2005 Column Sampling and the Archaeology of Small Fish at Ts'ishaa. In *Ts'ishaa: Archaeology and Ethnography of a Nuu-Chah-Nulth Origin Site in Barkley Sound*, edited by A.D. McMillan and D.E. St. Claire, pp. 206-233. Archaeology Press, Simon Fraser University, Burnaby.

McMillan, A.D.
2000 *Since the Time of the Transformers: The Ancient Heritage of the Nuu-Chah-Nulth, Ditidaht, and Makah*. UBC Press, Vancouver.

2009 A Tale of Two Ethnographies: The Contributions of Edward Sapir and Philip Drucker to Nuu-chah-nulth Archaeology. In *Painting the Past with a Broad Brush: Papers in Honour of James Valliere Wright*, edited by D.J. Keenlyside and J-L. Pilon, pp. 617-646. Mercury Series Archaeology Paper 170, Canadian Museum of Civilization, Gatineau, Quebec.

McMillan, A.D. and D.E. St. Claire
1982 *Alberni Prehistory: Archaeological and Ethnographic Investigations on Western Vancouver Island*. Theytus Books, Penticton, B.C.

2005 *Ts'ishaa: Archaeology and Ethnography of a Nuu-chah-nulth Origin Site in Barkley Sound.* Archaeology Press, Simon Fraser University, Burnaby.

2012 *Huu7ii: Household Archaeology at a Nuu-chah-nulth Village Site in Barkley Sound.* Archaeology Press, Simon Fraser University, Burnaby.

McMillan, A.D., I. McKechnie, D.E. St. Claire, and S.G. Frederick
2008 Exploring Variability in Maritime Resource Use on the Northwest Coast: A Case Study from Barkley Sound, Western Vancouver Island. *Canadian Journal of Archaeology* 32:214-238.

Mitchell, D.
1990 Prehistory of the Coasts of Southern British Columbia and Northern Washington. In *Handbook of North American Indians. Vol. 7, Northwest Coast*, edited by W. Suttles, pp. 340-358. Smithsonian Institution, Washington.

Monks, G.G.
1987 Prey as Bait: The Deep Bay Example. *Canadian Journal of Archaeology* 11:119-142.

2006 The Fauna from Ma'achoah (DfSi-5), Vancouver Island, British Columbia: An Interpretive Summary. *Canadian Journal of Archaeology* 30:215-244.

Moss, M.L.
1993 Shellfish, Gender, and Status on the Northwest Coast: Reconciling Archaeological, Ethnographic, and Ethnohistorical Records of the Tlingit. *American Anthropologist* 95(3):631-652.

Orchard, T.J. and T. Clark
2005 Multidimensional Scaling of Northwest Coast Faunal Assemblages: A Case Study from Southern Haida Gwaii, British Columbia. *Canadian Journal of Archaeology* 29(1):88-112.

Peterson, R.T.

2008 *Field Guide to Birds of North America*. Houghton Mifflin Harcourt Publishing Company, New York.

Powell, J. (editor)
1991 *Our World – Our Ways: T'aat'aaqsapa Cultural Dictionary*. Nuuchahnulth Tribal Council, Port Alberni.

Reitz, E.J. and E.S. Wing
2008 *Zooarchaeology*. 2nd ed. Cambridge University Press, Cambridge.

Rodrigues, A. and D. Yang
2014 *Ancient DNA Snalysis of Whale Remains from the Hiikwis Site Complex (DfSh-15 and DfSh-16) in Barkley Sound, British Columbia*. Report prepared for Alan McMillan, Department of Archaeology, Simon Fraser University.

Sapir, E. and M. Swadesh
1939 *Nootka Texts: Tales and Ethnological Narratives with Grammatical Notes and Lexical Materials*. Linguistic Society of America, Philadelphia.

1955 *Native Accounts of Nootka Ethnography*. International Journal of American Linguistics, vol. 21, no. 4, pt. 2.

Sellers, I.M.
2013 *A Historic Archaeology of Nuu-chah-nulth Barkley Sound: Material and Economic Change through the Nineteenth Century*. Master's thesis, Department of Archaeology, Simon Fraser University, Burnaby.

Shackleton, D.
1999 *Hoofed Mammals of British Columbia*. University of British Columbia Press, Vancouver.

St. Claire, D.E.
1991 Barkley Sound Tribal Territories. In *Between Ports Alberni and Renfrew: Notes of West Coast Peoples*, edited by Arima, E.Y., D. St. Claire, L. Clamhouse, J. Edgar, C. Jones, and J. Thomas, pp. 13-202. Canadian Ethnology Service, Mercury Series Paper 121, Canadian Museum of Civilization, Ottawa.

1998 *Niismakmatsukwukw Ts'ishaa7ath: Talking About Ts'ishaa7ath Land History*. Report prepared for the Tseshaht First Nation, Port Alberni, BC.

Suttles, W.P.
1974 *Coast Salish and Western Washington Indians Volume I: The Economic Life of the Coast Salish of Haro and Rosario Straits*. Garland Publishing Inc., New York.

Wigen, R.J.
1990 Identification and Analysis of Vertebrate Fauna from Eighteen Archaeological Sites on the Southern Queen Charlotte Islands. Report to British Columbia Heritage Trust. MS on file, Cultural Resource Library, Ministry of Sustainable Resource Management, Victoria, B.C.

2005 Vertebrate Fauna. In *The Hoko River Archaeological Complex*, edited by D.R. Croes, pp. 71-114. Washington State University Press, Pullman, Washington.

Wigen, R.J. and B.R. Stucki
1988 Taphonomy and Stratigraphy in the Interpretation of Economic Patterns at Hoko River Rockshelter. *Research in Economic Anthropology*, Supplement 3:87-146.

Williams, J.
2006 *Clam Gardens: Aboriginal Mariculture on Canada's West Coast*. New Star Books, Vancouver.

APPENDIX A: Taxa NISP and MNI for each sampled Level/Layer combination at the Hiikwis site complex (DfSh-15 and DfSh-16).

Site	Unit	Level	Layer	Species	NISP	MNI	Element Used	Side
DfSh-16	N4-6 E0-2	3	A	Rockfish	7	1		
DfSh-16	N4-6 E0-2	3	A	Salmon	83	2	Abdominal vertebrae	
DfSh-16	N4-6 E0-2	3	A	Lingcod	1	1		
DfSh-16	N4-6 E0-2	3	A	Greenling	1	1		
DfSh-16	N4-6 E0-2	3	A	Dogfish	5	1		
DfSh-16	N4-6 E0-2	3	A	Unidentifiable Fish	11	N/A		
DfSh-16	N4-6 E0-2	3	A	Deer	5	1		
DfSh-16	N4-6 E0-2	3	A	Dog [wool dog]	1	1	Molar 2	
DfSh-16	N4-6 E0-2	3	A	River Otter	1	1	Humerus	
DfSh-16	N4-6 E0-2	3	A	Harbour Seal	4	1		
DfSh-16	N4-6 E0-2	3	A	Northern Fur Seal	2	1		
DfSh-16	N4-6 E0-2	3	A	Northern Sea Lion	3	1		
DfSh-16	N4-6 E0-2	3	A	Unidentifiable Sea Mammal	3	N/A		
DfSh-16	N4-6 E0-2	3	A	Mink	1	1		
DfSh-16	N4-6 E0-2	3	A	Small Carnivore	1	1		
DfSh-16	N4-6 E0-2	3	A	Large Mammal	1	1		
DfSh-16	N4-6 E0-2	3	A	Unidentifiable Land Mammal	9	N/A		
DfSh-16	N4-6 E0-2	3	A	Unidentifiable Mammal	73	N/A		
DfSh-16	N4-6 E0-2	3	A	Unidentifiable Bird/Mammal	1	N/A		
DfSh-16	N4-6 E0-2	3	A	Common Loon	3	1		
DfSh-16	N4-6 E0-2	3	A	Pacific Loon	4	1		
DfSh-16	N4-6 E0-2	3	A	Double-Crested Cormorant	4	1		
DfSh-16	N4-6 E0-2	3	A	Cormorant sp.	2	1		
DfSh-16	N4-6 E0-2	3	A	Common Murre	3	1		
DfSh-16	N4-6 E0-2	3	A	Duck sp.	3	1		
DfSh-16	N4-6 E0-2	3	A	Large Gull sp.	3	1		
DfSh-16	N4-6 E0-2	3	A	Gull sp.	1	1		
DfSh-16	N4-6 E0-2	3	A	Unidentifiable Bird	37	N/A		
DfSh-16	N4-6 E0-2	5	A	Salmon sp.	1054	10	Caudal vertebrae	
DfSh-16	N4-6 E0-2	5	A	Pacific Herring	84	7	Ceratohyal	L
DfSh-16	N4-6 E0-2	5	A	Rockfish sp.	7	1		
DfSh-16	N4-6 E0-2	5	A	Greenling sp.	1	1		
DfSh-16	N4-6 E0-2	5	A	Cabezon	2	1		
DfSh-16	N4-6 E0-2	5	A	Lingcod	1	1		
DfSh-16	N4-6 E0-2	5	A	Lingcod or Rockfish	1	1		
DfSh-16	N4-6 E0-2	5	A	Starry Flounder	1	1		
DfSh-16	N4-6 E0-2	5	A	Unidentifiable Fish	284	N/A		
DfSh-16	N4-6 E0-2	5	A	Pacific Loon	27	1		
DfSh-16	N4-6 E0-2	5	A	Common Loon	4	1		
DfSh-16	N4-6 E0-2	5	A	Loon sp.	1	1		
DfSh-16	N4-6 E0-2	5	A	Double-Crested	12	2	Humerus	L

				Cormorant				
DfSh-16	N4-6 E0-2	5	A	Pelagic Cormorant	7	1		
DfSh-16	N4-6 E0-2	5	A	Cormorant sp.	13	1		
DfSh-16	N4-6 E0-2	5	A	Songbird	5	1		
DfSh-16	N4-6 E0-2	5	A	Common Murre	6	1		
DfSh-16	N4-6 E0-2	5	A	Common Merganser	1	1		
DfSh-16	N4-6 E0-2	5	A	Merganser sp.	2	1		
DfSh-16	N4-6 E0-2	5	A	Grebe sp.	4	1		
DfSh-16	N4-6 E0-2	5	A	White-Winged Scoter	1	1		
DfSh-16	N4-6 E0-2	5	A	Scoter sp.	3	1		
DfSh-16	N4-6 E0-2	5	A	Small Duck	2	1		
DfSh-16	N4-6 E0-2	5	A	Medium Duck	4	1		
DfSh-16	N4-6 E0-2	5	A	Medium/Large Duck	4	1		
DfSh-16	N4-6 E0-2	5	A	Large Duck	7	1		
DfSh-16	N4-6 E0-2	5	A	Duck sp.	2	1		
DfSh-16	N4-6 E0-2	5	A	Mallard	1	1		
DfSh-16	N4-6 E0-2	5	A	Albatross sp.	2	1		
DfSh-16	N4-6 E0-2	5	A	Small Gull	3	2	Coracoid	R
DfSh-16	N4-6 E0-2	5	A	Medium Gull	2	1		
DfSh-16	N4-6 E0-2	5	A	Medium/Large Gull	3	1		
DfSh-16	N4-6 E0-2	5	A	Large Gull	1	1		
DfSh-16	N4-6 E0-2	5	A	Gull sp.	3	1		
DfSh-16	N4-6 E0-2	5	A	Large Bird	1	1		
DfSh-16	N4-6 E0-2	5	A	Unidentifiable Bird	100	N/A		
DfSh-16	N4-6 E0-2	5	A	Northern Fur Seal	14	2		
DfSh-16	N4-6 E0-2	5	A	Seal sp.	3	1		
DfSh-16	N4-6 E0-2	5	A	Northern Sea Lion	2	1		
DfSh-16	N4-6 E0-2	5	A	Sea Lion OR Fur Seal	1	N/A		
DfSh-16	N4-6 E0-2	5	A	Sea Otter	2	1		
DfSh-16	N4-6 E0-2	5	A	Deer	3	2?		
DfSh-16	N4-6 E0-2	5	A	Mink	2	1		
DfSh-16	N4-6 E0-2	5	A	Large Cervid (Elk?)	12	1		
DfSh-16	N4-6 E0-2	5	A	Deer OR Fur Seal (Medium Mammal)	1	1		
DfSh-16	N4-6 E0-2	5	A	Antler OR Sea Mammal (Unidentifiable)	4	N/A		
DfSh-16	N4-6 E0-2	5	A	Large Land Mammal	8	N/A		
DfSh-16	N4-6 E0-2	5	A	Unidentifiable Land Mammal	20	N/A		
DfSh-16	N4-6 E0-2	5	A	Unidentifiable Sea Mammal	34	N/A		
DfSh-16	N4-6 E0-2	5	A	Unidentifiable Mammal	67	N/A		
DfSh-16	N4-6 E0-2	5	A	Unidentifiable Bird/Mammal	15	N/A		
DfSh-16	N4-6 E0-2	7	A	Unidentifiable Bird/Mammal	14	N/A		

DfSh-16	N4-6 E0-2	7	A	Unidentifiable Bird	121	N/A		
DfSh-16	N4-6 E0-2	7	A	Pacific Loon	8	1		
DfSh-16	N4-6 E0-2	7	A	Common Loon	7	1		
DfSh-16	N4-6 E0-2	7	A	Loon sp.	2	1		
DfSh-16	N4-6 E0-2	7	A	Double-Crested Cormorant	13	1		
DfSh-16	N4-6 E0-2	7	A	Pelagic Cormorant	4	1		
DfSh-16	N4-6 E0-2	7	A	Cormorant sp.	13	1		
DfSh-16	N4-6 E0-2	7	A	Common Murre	11	1		
DfSh-16	N4-6 E0-2	7	A	Canada Goose	4	1		
DfSh-16	N4-6 E0-2	7	A	Small/Medium Goose	1	1		
DfSh-16	N4-6 E0-2	7	A	Alabatross sp.	4	1		
DfSh-16	N4-6 E0-2	7	A	Grebe sp.	3	1		
DfSh-16	N4-6 E0-2	7	A	Small Gull	9	2	Coracoid	R
DfSh-16	N4-6 E0-2	7	A	Small/Medium Gull	5	2	Scapula	?
DfSh-16	N4-6 E0-2	7	A	Medium Gull	1	1		
DfSh-16	N4-6 E0-2	7	A	Large Gull	4	1		
DfSh-16	N4-6 E0-2	7	A	Medium Duck	3	1		
DfSh-16	N4-6 E0-2	7	A	Medium/Large Duck	2	1		
DfSh-16	N4-6 E0-2	7	A	Large Duck	1	1		
DfSh-16	N4-6 E0-2	7	A	Merganser sp.	1	1		
DfSh-16	N4-6 E0-2	7	A	Small Bird	3	1		
DfSh-16	N4-6 E0-2	7	A	Small/Medium Bird	5	3	Carpometacarpus	L
DfSh-16	N4-6 E0-2	7	A	Medium/Large Bird	1	1		
DfSh-16	N4-6 E0-2	7	A	Large Bird	1	1		
DfSh-16	N4-6 E0-2	7	A	Unidentifiable Fish	163	N/A		
DfSh-16	N4-6 E0-2	7	A	Salmon sp.	398	9	Caudal Vertebrae	
DfSh-16	N4-6 E0-2	7	A	Rockfish sp.	11	1		
DfSh-16	N4-6 E0-2	7	A	Pacific Herring	29	4	Articular	L
DfSh-16	N4-6 E0-2	7	A	Plainfin Midshipman	2	1		
DfSh-16	N4-6 E0-2	7	A	Greenling sp.	2	1		
DfSh-16	N4-6 E0-2	7	A	Pacific Hake	1	1		
DfSh-16	N4-6 E0-2	7	A	(Great?) Sculpin	3	1		
DfSh-16	N4-6 E0-2	7	A	Ratfish	1	1		
DfSh-16	N4-6 E0-2	7	A	Spiny Dogfish	17	1		
DfSh-16	N4-6 E0-2	7	A	Lingcod	3	1		
DfSh-16	N4-6 E0-2	7	A	Pacific Halibut	1	1		
DfSh-16	N4-6 E0-2	7	A	Flatfish sp.	2	1		
DfSh-16	N4-6 E0-2	7	A	Northern Fur Seal	42	2 or 3		
DfSh-16	N4-6 E0-2	7	A	Seal sp.	14	1		
DfSh-16	N4-6 E0-2	7	A	Sea Otter	1	1		
DfSh-16	N4-6 E0-2	7	A	Mink	3	1		
DfSh-16	N4-6 E0-2	7	A	Dog	3	1 or 2		
DfSh-16	N4-6 E0-2	7	A	Deer	6	1		
DfSh-16	N4-6 E0-2	7	A	Small Land Mammal	2	N/A		
DfSh-16	N4-6 E0-2	7	A	Antler OR Sea Mammal	3	N/A		
DfSh-16	N4-6 E0-2	7	A	Unidentifiable Mammal	139	N/A		
DfSh-16	N4-6 E0-2	7	A	Unidentifiable Land	24	N/A		

				Mammal				
DfSh-16	N4-6 E0-2	7	A	Unidentifiable Sea Mammal	32	N/A		
DfSh-16	N4-6 E0-2	7	A	Worked Mammal Bone	2	N/A		
DfSh-16	N4-6 E0-2	9	A	Unidentifiable Bird/Mammal	1	N/A		
DfSh-16	N4-6 E0-2	9	A	Unidentifiable Bird	82	N/A		
DfSh-16	N4-6 E0-2	9	A	Albatross sp.	16	1		
DfSh-16	N4-6 E0-2	9	A	Canada Goose	3	2	Coracoid	L
DfSh-16	N4-6 E0-2	9	A	Common Murre	1	1		
DfSh-16	N4-6 E0-2	9	A	Double-Creseted Cormorant	1	1		
DfSh-16	N4-6 E0-2	9	A	Cormorant sp.	2	1		
DfSh-16	N4-6 E0-2	9	A	Common Loon	3	1		
DfSh-16	N4-6 E0-2	9	A	Pacific Loon	7	1		
DfSh-16	N4-6 E0-2	9	A	Loon sp.	1	1		
DfSh-16	N4-6 E0-2	9	A	Small Gull sp.	1	1		
DfSh-16	N4-6 E0-2	9	A	Medium/Large Gull sp.	3	1		
DfSh-16	N4-6 E0-2	9	A	Large Gull sp.	9	2	Coracoid	R
DfSh-16	N4-6 E0-2	9	A	Medium/Large Duck sp.	2	1		
DfSh-16	N4-6 E0-2	9	A	Songbird	1	1		
DfSh-16	N4-6 E0-2	9	A	Medium Bird sp.	1	1		
DfSh-16	N4-6 E0-2	9	A	Medium/Large Bird sp.	1	1		
DfSh-16	N4-6 E0-2	9	A	Large Bird sp.	1	1		
DfSh-16	N4-6 E0-2	9	A	Unidentifiable Mammal	36	N/A		
DfSh-16	N4-6 E0-2	9	A	Unidentifiable Land Mammal	3	N/A		
DfSh-16	N4-6 E0-2	9	A	Unidentifiable Sea Mammal	2	N/A		
DfSh-16	N4-6 E0-2	9	A	Northern Fur Seal	1	1		
DfSh-16	N4-6 E0-2	9	A	Harbour Seal	4	1		
DfSh-16	N4-6 E0-2	9	A	Whale	1	1		
DfSh-16	N4-6 E0-2	9	A	Dog	1	1		
DfSh-16	N4-6 E0-2	9	A	Deer	2	1		
DfSh-16	N4-6 E0-2	9	A	River Otter	2	1		
DfSh-16	N4-6 E0-2	9	A	Unidentifiable Fish	74	N/A		
DfSh-16	N4-6 E0-2	9	A	Salmon sp.	196	3	Vertebrae	
DfSh-16	N4-6 E0-2	9	A	Rockfish sp.	41	4	Atlas	R
DfSh-16	N4-6 E0-2	9	A	Pacific Herring	49	9	Prootic/Pterotic	
DfSh-16	N4-6 E0-2	9	A	Lingcod	5	1		
DfSh-16	N4-6 E0-2	9	A	Spiny Dogfish	6	1		
DfSh-16	N4-6 E0-2	9	A	Plainfin Midshipman	6	1		
DfSh-16	N4-6 E0-2	9	A	Pacific Cod	1	1		
DfSh-16	N4-6 E0-2	9	A	Greenling sp.	3	1		
DfSh-16	N4-6 E0-2	9	A	Pacific Hake	1	1		
DfSh-16	N4-6 E0-2	9	A	Cabezon	2	1		

DfSh-16	N4-6 E0-2	9	B	Unidentifiable Bone	2	N/A		
DfSh-16	N4-6 E0-2	9	B	Unidentifiable Bird/Mammal	3	N/A		
DfSh-16	N4-6 E0-2	9	B	Unidentifiable Mammal	74	N/A		
DfSh-16	N4-6 E0-2	9	B	Unidentifiable Land Mammal	16	N/A		
DfSh-16	N4-6 E0-2	9	B	Unidentifiable Sea Mammal	1	N/A		
DfSh-16	N4-6 E0-2	9	B	Fur Seal	15	2 to 4	Different sizes (ages)	
DfSh-16	N4-6 E0-2	9	B	Harbour Seal	1	1		
DfSh-16	N4-6 E0-2	9	B	Seal sp.	2	1		
DfSh-16	N4-6 E0-2	9	B	Northern Sea Lion	3	1		
DfSh-16	N4-6 E0-2	9	B	Sea Lion sp.	1	1		
DfSh-16	N4-6 E0-2	9	B	Sea Otter	2	1		
DfSh-16	N4-6 E0-2	9	B	Marten	1	1		
DfSh-16	N4-6 E0-2	9	B	River Otter	5	1		
DfSh-16	N4-6 E0-2	9	B	Deer	1	1		
DfSh-16	N4-6 E0-2	9	B	Unidentifiable Bird	133	N/A		
DfSh-16	N4-6 E0-2	9	B	Pacific Loon	15	2	Femur	R
DfSh-16	N4-6 E0-2	9	B	Loon sp.	4	1		
DfSh-16	N4-6 E0-2	9	B	Double-Crested Cormorant	14	2	Femur	R
DfSh-16	N4-6 E0-2	9	B	Pelagic Cormorant	1	1		
DfSh-16	N4-6 E0-2	9	B	Cormorant sp.	9	2	Carpometacarpus	L
DfSh-16	N4-6 E0-2	9	B	Canada Goose	4	1		
DfSh-16	N4-6 E0-2	9	B	Large Bird	1	1		
DfSh-16	N4-6 E0-2	9	B	Albatross sp.	4	1		
DfSh-16	N4-6 E0-2	9	B	Small Goose sp.	3	2	Coracoid	L
DfSh-16	N4-6 E0-2	9	B	Common Murre	5	1		
DfSh-16	N4-6 E0-2	9	B	Grebe sp.	2	1		
DfSh-16	N4-6 E0-2	9	B	Small Gull sp.	6	1		
DfSh-16	N4-6 E0-2	9	B	Medium Gull sp.	2	1		
DfSh-16	N4-6 E0-2	9	B	Medium/Large Gull sp.	3	2	Furculum	Mid
DfSh-16	N4-6 E0-2	9	B	Large Gull sp.	13	3	Humerus	L
DfSh-16	N4-6 E0-2	9	B	Scoter sp.	1	1		
DfSh-16	N4-6 E0-2	9	B	Medium Duck sp.	5	1		
DfSh-16	N4-6 E0-2	9	B	Large Duck sp.	3	1		
DfSh-16	N4-6 E0-2	9	B	Small Bird sp.	1	1		
DfSh-16	N4-6 E0-2	9	B	Unidentifiable Fish	71	N/A		
DfSh-16	N4-6 E0-2	9	B	Large Fish	1	1		
DfSh-16	N4-6 E0-2	9	B	Salmon sp.	170	2 to 3	Vertebrae	
DfSh-16	N4-6 E0-2	9	B	Dogfish	21	1		
DfSh-16	N4-6 E0-2	9	B	Pacific Herring	46	5	Prootic/Pterotic	
DfSh-16	N4-6 E0-2	9	B	Rockfish sp.	21	2 to 3	Maxillary	L
DfSh-16	N4-6 E0-2	9	B	Greenling sp.	2	1		
DfSh-16	N4-6 E0-2	9	B	Lingcod	11	1		
DfSh-16	N4-6 E0-2	9	B	Pacific Cod	1	1		
DfSh-16	N4-6 E0-2	9	B	Pacific Halibut	1	1		
DfSh-16	N4-6 E0-2	9	B	Flatfish sp.	1	1		
DfSh-16	N4-6 E0-2	9	B	Pacific Hake	1	1		
DfSh-16	N4-6 E0-2	9	B	Pile Perch	1	1		

DfSh-16	N4-6 E0-2	9	B	Cabezon	1	1		
DfSh-16	*N4-6 E0-2*	*9*	*B*	***FISH CON-CENTRATION***				
				1/8"				
DfSh-16	*N4-6 E0-2*	*9*	*B*	*Unidentifiable Fish*	*62*	*N/A*		
DfSh-16	*N4-6 E0-2*	*9*	*B*	*Rockfish*	*1*	*1*		
DfSh-16	*N4-6 E0-2*	*9*	*B*	*Pacific Herring*	*584*	*36*	*Prootic/Pterotic*	
				1/16"				
DfSh-16	*N4-6 E0-2*	*9*	*B*	*Unidentifiable Fish*	*1*	*1*		
DfSh-16	*N4-6 E0-2*	*9*	*B*	*Pacific Herring*	*1*	*1*		
DfSh-16	N4-6 E0-2	11	A	Unidentifiable Bird/Mammal	26	N/A		
DfSh-16	N4-6 E0-2	11	A	Unidentifiable Mammal	75	N/A		
DfSh-16	N4-6 E0-2	11	A	Unidentifiable Land Mammal	11	N/A		
DfSh-16	N4-6 E0-2	11	A	Unidentifiable Sea Mammal	24	N/A		
DfSh-16	N4-6 E0-2	11	A	Sea Otter	1	1		
DfSh-16	N4-6 E0-2	11	A	Harbour Seal	4	1		
DfSh-16	N4-6 E0-2	11	A	Fur Seal	15	2	Based on size	
DfSh-16	N4-6 E0-2	11	A	Seal sp.	2	1		
DfSh-16	N4-6 E0-2	11	A	Northern Sea Lion	1	1		
DfSh-16	N4-6 E0-2	11	A	Sea Lion sp.	2	1		
DfSh-16	N4-6 E0-2	11	A	Otariid	3	1		
DfSh-16	N4-6 E0-2	11	A	Deer	2	1		
DfSh-16	N4-6 E0-2	11	A	Dog	1	1		
DfSh-16	N4-6 E0-2	11	A	Unidentifiable Bird	710	N/A		
DfSh-16	N4-6 E0-2	11	A	Small Bird	3	N/A		
DfSh-16	N4-6 E0-2	11	A	Large Bird	16	N/A		
DfSh-16	N4-6 E0-2	11	A	Bald Eagle	1	1		
DfSh-16	N4-6 E0-2	11	A	Pacific Loon	32	2	Humerus	L
DfSh-16	N4-6 E0-2	11	A	Common Loon	9	2	Quadrate	
DfSh-16	N4-6 E0-2	11	A	Loon sp.	11	1		
DfSh-16	N4-6 E0-2	11	A	Canada Goose	9	2	Humerus	L
DfSh-16	N4-6 E0-2	11	A	Small/Medium Goose sp.	4	2	Furculum	Mid
DfSh-16	N4-6 E0-2	11	A	Goose sp.	3	1		
DfSh-16	N4-6 E0-2	11	A	Albatross sp.	143	5	Humerus	
DfSh-16	N4-6 E0-2	11	A	Double-Crested Cormorant	7	1		
DfSh-16	N4-6 E0-2	11	A	Pelagic Cormorant	3	2	Carpometacarpus	R
DfSh-16	N4-6 E0-2	11	A	Cormorant sp.	3	1		
DfSh-16	N4-6 E0-2	11	A	Common Murre	119	7	Radius	L
DfSh-16	N4-6 E0-2	11	A	Large Alcid	2	1		
DfSh-16	N4-6 E0-2	11	A	Small Alcid	2	1		
DfSh-16	N4-6 E0-2	11	A	Grebe sp.	3	1		
DfSh-16	N4-6 E0-2	11	A	Small Gull sp.	22	4	Scapula	
DfSh-16	N4-6 E0-2	11	A	Small/Medium Gull sp.	8	3	Coracoid	R
DfSh-16	N4-6 E0-2	11	A	Medium Gull sp.	10	3	Humerus	R
DfSh-16	N4-6 E0-2	11	A	Medium/Large Gull	1	1		

				sp.				
DfSh-16	N4-6 E0-2	11	A	Large Gull sp.	11	2	Scapula & Manubrium	
DfSh-16	N4-6 E0-2	11	A	Very Large Gull sp.	1	1		
DfSh-16	N4-6 E0-2	11	A	Scoter sp.	1	1		
DfSh-16	N4-6 E0-2	11	A	Small/Medium Duck sp.	1	1		
DfSh-16	N4-6 E0-2	11	A	Medium Duck sp.	5	2	Humerus	L
DfSh-16	N4-6 E0-2	11	A	Large Duck sp.	7	1		
DfSh-16	N4-6 E0-2	11	A	Duck sp.	1	1		
DfSh-16	N4-6 E0-2	11	A	Unidentifiable Fish	211	N/A		
DfSh-16	N4-6 E0-2	11	A	Salmon sp.	196	3	Vertebrae	
DfSh-16	N4-6 E0-2	11	A	Pacific Herring	163	9	Prootic/Pterotic	
DfSh-16	N4-6 E0-2	11	A	Striped Surf Perch	1	1		
DfSh-16	N4-6 E0-2	11	A	Perch sp.	1	1		
DfSh-16	N4-6 E0-2	11	A	Pacific Hake	1	1		
DfSh-16	N4-6 E0-2	11	A	Ratfish	2	1		
DfSh-16	N4-6 E0-2	11	A	Pacific Cod	1	1		
DfSh-16	N4-6 E0-2	11	A	Dogfish	53	3	Dorsal Spine	
DfSh-16	N4-6 E0-2	11	A	Plainfin Midshipman	15	2	Articular	R
DfSh-16	N4-6 E0-2	11	A	Greenling sp.	4	1		
DfSh-16	N4-6 E0-2	11	A	Starry Flounder	4	1		
DfSh-16	N4-6 E0-2	11	A	Large Flatfish sp.	2	1		
DfSh-16	N4-6 E0-2	11	A	Cabezon	4	1		
DfSh-16	N4-6 E0-2	11	A	Lingcod	24	2	Based on size	
DfSh-16	N4-6 E0-2	11	A	Red Irish Lord	2	1		
DfSh-16	N4-6 E0-2	11	A	Rockfish sp.	107	4	Interhaemal Spine & Maxillary	R
DfSh-16	N4-6 E0-2	11	B	Unidentifiable Bird/Mammal	17	N/A		
DfSh-16	N4-6 E0-2	11	B	Unidentifiable Mammal	54	N/A		
DfSh-16	N4-6 E0-2	11	B	Unidentifiable Land Mammal	8	N/A		
DfSh-16	N4-6 E0-2	11	B	Unidentifiable Sea Mammal	16	N/A		
DfSh-16	N4-6 E0-2	11	B	Elk	1	1		
DfSh-16	N4-6 E0-2	11	B	Deer	4	1		
DfSh-16	N4-6 E0-2	11	B	Deer Mouse	3	1		
DfSh-16	N4-6 E0-2	11	B	River Otter	2	1		
DfSh-16	N4-6 E0-2	11	B	Harbour Seal	12	2?	Size differences	
DfSh-16	N4-6 E0-2	11	B	Fur Seal	6	1		
DfSh-16	N4-6 E0-2	11	B	Otariid	1	1		
DfSh-16	N4-6 E0-2	11	B	Whale	6	1		
DfSh-16	N4-6 E0-2	11	B	Unidentifiable Bird	523	N/A		
DfSh-16	N4-6 E0-2	11	B	Common Loon	19	1		
DfSh-16	N4-6 E0-2	11	B	Pacific Loon	19	2	Carpometacarpus	R
DfSh-16	N4-6 E0-2	11	B	Loon sp.	2	1		
DfSh-16	N4-6 E0-2	11	B	Common Murre	152	9	Coracoid	L
DfSh-16	N4-6 E0-2	11	B	Med/Large Bird	1	1		
DfSh-16	N4-6 E0-2	11	B	Small Alcid sp.	3	1		
DfSh-16	N4-6 E0-2	11	B	Albatross sp.	27	2	Coracoid	R

DfSh-16	N4-6 E0-2	11	B	Double-Crested Cormorant	10	2	Humerus	R
DfSh-16	N4-6 E0-2	11	B	Pelagic Cormorant	1	1		
DfSh-16	N4-6 E0-2	11	B	Canada Goose	4	1		
DfSh-16	N4-6 E0-2	11	B	Small/Medium Goose sp.	21	3	Tarsometatarsus	L
DfSh-16	N4-6 E0-2	11	B	Goose sp.	6	3	Furculum	Mid
DfSh-16	N4-6 E0-2	11	B	Large Grebe sp.	4	1		
DfSh-16	N4-6 E0-2	11	B	Small Gull sp.	31	3	Coracoid	R
DfSh-16	N4-6 E0-2	11	B	Small/Medium Gull sp.	1	1		
DfSh-16	N4-6 E0-2	11	B	Medium Gull sp.	2	1		
DfSh-16	N4-6 E0-2	11	B	Medium/Large Gull sp.	3	1		
DfSh-16	N4-6 E0-2	11	B	Large Gull sp.	14	2	Coracoid	L
DfSh-16	N4-6 E0-2	11	B	Gull sp.	1	1		
DfSh-16	N4-6 E0-2	11	B	White-Winged Scoter	1	1		
DfSh-16	N4-6 E0-2	11	B	Surf Scoter	1	1		
DfSh-16	N4-6 E0-2	11	B	Medium Duck sp.	5	2	Coracoid	L
DfSh-16	N4-6 E0-2	11	B	Large Duck sp.	7	1		
DfSh-16	N4-6 E0-2	11	B	Duck sp.	1	1		
DfSh-16	N4-6 E0-2	11	B	Songbird	2	1		
DfSh-16	N4-6 E0-2	11	B	Small Bird	5	2	Femur	R
DfSh-16	N4-6 E0-2	11	B	Large Bird	20	1		
DfSh-16	N4-6 E0-2	11	B	Unidentifiable Fish	332	N/A		
DfSh-16	N4-6 E0-2	11	B	Salmon sp.	263	6	Pelvis	R
DfSh-16	N4-6 E0-2	11	B	Dogfish	45	2	Dorsal Spine	
DfSh-16	N4-6 E0-2	11	B	Pacific Herring	59	8	Prootic/Pterotic	
DfSh-16	N4-6 E0-2	11	B	Plainfin Midshipman	44	7	Articular	L
DfSh-16	N4-6 E0-2	11	B	Rockfish sp.	124	6	Quadrate	L
DfSh-16	N4-6 E0-2	11	B	Lingcod	34	2	Dentary	R
DfSh-16	N4-6 E0-2	11	B	Greenling sp.	10	2	Parasphenoid	
DfSh-16	N4-6 E0-2	11	B	Sculpin sp.	3	1		
DfSh-16	N4-6 E0-2	11	B	Red Irish Lord	2	1		
DfSh-16	N4-6 E0-2	11	B	Cabezon	1	1		
DfSh-16	N4-6 E0-2	11	B	Starry Flounder	1	1		
DfSh-16	N4-6 E0-2	11	B	Large Flatfish sp.	1	1		
DfSh-16	N4-6 E0-2	11	B	Pacific Hake	7	1		
DfSh-16	N4-6 E0-2	11	B	Northern Anchovy	3	1		
DfSh-16	N4-6 E0-2	13	A	Unidentifiable Bird/Mammal	7	N/A		
DfSh-16	N4-6 E0-2	13	A	Unidentifiable Mammal	17	N/A		
DfSh-16	N4-6 E0-2	13	A	Unidentifiable Land Mammal	3	N/A		
DfSh-16	N4-6 E0-2	13	A	Unidentifiable Sea Mammal	7	N/A		
DfSh-16	N4-6 E0-2	13	A	Deer	3	1		
DfSh-16	N4-6 E0-2	13	A	Deer OR Fur Seal (Medium Mammal)	1	N/A		
DfSh-16	N4-6 E0-2	13	A	Fur Seal	3	1		

DfSh-16	N4-6 E0-2	13	A	Harbour Seal	1	1		
DfSh-16	N4-6 E0-2	13	A	Seal sp.	1	1		
DfSh-16	N4-6 E0-2	13	A	Sea Otter	1	1		
DfSh-16	N4-6 E0-2	13	A	Medium/Large Mammal	1	1		
DfSh-16	N4-6 E0-2	13	A	Unidentifiable Bird	178	N/A		
DfSh-16	N4-6 E0-2	13	A	Common Loon	3	1		
DfSh-16	N4-6 E0-2	13	A	Pacific Loon	4	1		
DfSh-16	N4-6 E0-2	13	A	Common Murre	55	3	Tibiotarsus	L & R
DfSh-16	N4-6 E0-2	13	A	Double-Crested Cormorant	5	1		
DfSh-16	N4-6 E0-2	13	A	Pelagic Cormorant	1	1		
DfSh-16	N4-6 E0-2	13	A	Cormorant sp.	2	1		
DfSh-16	N4-6 E0-2	13	A	Albatross sp.	3	1		
DfSh-16	N4-6 E0-2	13	A	Bald Eagle	1	1		
DfSh-16	N4-6 E0-2	13	A	Canada Goose	1	1		
DfSh-16	N4-6 E0-2	13	A	Small/Medium Goose sp.	8	2	Humerus	L
DfSh-16	N4-6 E0-2	13	A	Goose sp.	3	1		
DfSh-16	N4-6 E0-2	13	A	Small Gull sp.	3	1		
DfSh-16	N4-6 E0-2	13	A	Small/Medium Gull sp.	1	1		
DfSh-16	N4-6 E0-2	13	A	Medium Gull sp.	1	1		
DfSh-16	N4-6 E0-2	13	A	Large Gull sp.	3	1		
DfSh-16	N4-6 E0-2	13	A	White-Winged Scoter	1	1		
DfSh-16	N4-6 E0-2	13	A	Surf Scoter	1	1		
DfSh-16	N4-6 E0-2	13	A	Scoter sp.	2	1		
DfSh-16	N4-6 E0-2	13	A	Small/Medium Duck sp.	1	1		
DfSh-16	N4-6 E0-2	13	A	Medium Duck sp.	2	1		
DfSh-16	N4-6 E0-2	13	A	Medium/Large Duck sp.	1	1		
DfSh-16	N4-6 E0-2	13	A	Large Duck sp.	6	1		
DfSh-16	N4-6 E0-2	13	A	Large Bird	15	1		
DfSh-16	N4-6 E0-2	13	A	Unidentifiable Fish	116	N/A		
DfSh-16	N4-6 E0-2	13	A	Salmon sp.	77	2	Pelvis	R
DfSh-16	N4-6 E0-2	13	A	Dogfish	11	1		
DfSh-16	N4-6 E0-2	13	A	Pacific Herring	12	1		
DfSh-16	N4-6 E0-2	13	A	Plainfin Midshipman	4	2	Articular	L
DfSh-16	N4-6 E0-2	13	A	Lingcod	4	1		
DfSh-16	N4-6 E0-2	13	A	Lingcod OR Cabezon	1	1		
DfSh-16	N4-6 E0-2	13	A	Rockfish sp.	47	3	Dentary	L
DfSh-16	N4-6 E0-2	13	A	Pacific Hake	3	1		
DfSh-16	N4-6 E0-2	13	A	Greenling sp.	2	1		
DfSh-16	N4-6 E0-2	13	A	Red Irish Lord	2	1		
DfSh-16	N4-6 E0-2	13	A/B	Unidentifiable Bone	7	N/A		
DfSh-16	N4-6 E0-2	13	A/B	Unidentifiable Bird/Mammal	11	N/A		

DfSh-16	N4-6 E0-2	13	A/B	Unidentifiable Mammal	23	N/A		
DfSh-16	N4-6 E0-2	13	A/B	Unidentifiable Land Mammal	6	N/A		
DfSh-16	N4-6 E0-2	13	A/B	Unidentifiable Sea Mammal	48	N/A		
DfSh-16	N4-6 E0-2	13	A/B	Deer	1	1		
DfSh-16	N4-6 E0-2	13	A/B	Sea Otter	9	2	Mandible	
DfSh-16	N4-6 E0-2	13	A/B	Fur Seal	5	1		
DfSh-16	N4-6 E0-2	13	A/B	Otariid	3	1		
DfSh-16	N4-6 E0-2	13	A/B	Harbour Seal	5	1		
DfSh-16	N4-6 E0-2	13	A/B	Seal sp.	2	1		
DfSh-16	N4-6 E0-2	13	A/B	Northern Sea Lion	1	1		
DfSh-16	N4-6 E0-2	13	A/B	Sea Lion sp.	1	1		
DfSh-16	N4-6 E0-2	13	A/B	Medium/Large Mammal	1	1		
DfSh-16	N4-6 E0-2	13	A/B	Large Mammal	1	1		
DfSh-16	N4-6 E0-2	13	A/B	Unidentifiable Bird	184	N/A		
DfSh-16	N4-6 E0-2	13	A/B	Common Murre	37	2	Ulna	L
DfSh-16	N4-6 E0-2	13	A/B	Small Alcid sp.	1	1		
DfSh-16	N4-6 E0-2	13	A/B	Double-Crested Cormorant	4	1		
DfSh-16	N4-6 E0-2	13	A/B	Pelagic Cormorant	1	1		
DfSh-16	N4-6 E0-2	13	A/B	Cormorant sp.	2	1		
DfSh-16	N4-6 E0-2	13	A/B	Pacific Loon	10	1		
DfSh-16	N4-6 E0-2	13	A/B	Loon sp.	1	1		
DfSh-16	N4-6 E0-2	13	A/B	Canada Goose	2	1		
DfSh-16	N4-6 E0-2	13	A/B	Small/Medium Goose sp.	14	2	Scapula	L
DfSh-16	N4-6 E0-2	13	A/B	Goose sp.	7	2	Carpometacarpus	L
DfSh-16	N4-6 E0-2	13	A/B	Small Gull sp.	6	2	Radius	R
DfSh-16	N4-6 E0-2	13	A/B	Small/Medium Gull sp.	15	2	Ulna shaft fragments	
DfSh-16	N4-6 E0-2	13	A/B	Medium Gull sp.	1	1		
DfSh-16	N4-6 E0-2	13	A/B	Medium/Large Gull sp.	3	1		
DfSh-16	N4-6 E0-2	13	A/B	Large Gull sp.	3	1		
DfSh-16	N4-6 E0-2	13	A/B	Large Duck sp.	3	1		
DfSh-16	N4-6 E0-2	13	A/B	Large Bird	5	1		
DfSh-16	N4-6 E0-2	13	A/B	Unidentifiable Fish	192	N/A		
DfSh-16	N4-6 E0-2	13	A/B	Salmon sp.	73	1		
DfSh-16	N4-6 E0-2	13	A/B	Dogfish	15	1		
DfSh-16	N4-6 E0-2	13	A/B	Ratfish	1	1		
DfSh-16	N4-6 E0-2	13	A/B	Pacific Herring	23	2	Dentary	R
DfSh-16	N4-6 E0-2	13	A/B	Rockfish sp.	91	4	Dentary	R
DfSh-16	N4-6 E0-2	13	A/B	Greenling sp.	3	1		
DfSh-16	N4-6 E0-2	13	A/B	Plainfin Midshipman	26	4	Articular	L
DfSh-16	N4-6 E0-2	13	A/B	Pile Perch	1	1		
DfSh-16	N4-6 E0-2	13	A/B	Perch sp.	2	1		
DfSh-16	N4-6 E0-2	13	A/B	Pacific Hake	106	9	Dentary	L
DfSh-16	N4-6 E0-2	13	A/B	Sculpin sp.	1	1		
DfSh-16	N4-6 E0-2	13	A/B	Flatfish sp.	1	1		
DfSh-16	N4-6 E0-2	13	A/B	Cabezon	1	1		

DfSh-16	N4-6 E0-2	13	A/B	Lingcod	8	1		
DfSh-16	N4-6 E0-2	13	B	Unidentifiable Bird/Mammal	21	N/A		
DfSh-16	N4-6 E0-2	13	B	Unidentifiable Mammal	63	N/A		
DfSh-16	N4-6 E0-2	13	B	Unidentifiable Land Mammal	16	N/A		
DfSh-16	N4-6 E0-2	13	B	Unidentifiable Sea Mammal	50	N/A		
DfSh-16	N4-6 E0-2	13	B	Dog	1	1		
DfSh-16	N4-6 E0-2	13	B	Deer	4	1		
DfSh-16	N4-6 E0-2	13	B	Mink	1	1		
DfSh-16	N4-6 E0-2	13	B	Deer Mouse	1	1		
DfSh-16	N4-6 E0-2	13	B	Medium/Large Land Mammal	2	1		
DfSh-16	N4-6 E0-2	13	B	Fur Seal	5	2?	Size differences	
DfSh-16	N4-6 E0-2	13	B	Harbour Seal	4	1		
DfSh-16	N4-6 E0-2	13	B	Seal sp.	3	1		
DfSh-16	N4-6 E0-2	13	B	Northern Sea Lion	2	2	Size differences	
DfSh-16	N4-6 E0-2	13	B	Porpoise sp.	1	1		
DfSh-16	N4-6 E0-2	13	B	Unidentifiable Bird	549	N/A		
DfSh-16	N4-6 E0-2	13	B	Common Murre	177	11	Coracoid	R
DfSh-16	N4-6 E0-2	13	B	Murre sp.	1	1		
DfSh-16	N4-6 E0-2	13	B	Rhinoceros Auklet	1	1		
DfSh-16	N4-6 E0-2	13	B	Alcid sp.	1	1		
DfSh-16	N4-6 E0-2	13	B	Common Loon	15	2	Mandible	R
DfSh-16	N4-6 E0-2	13	B	Pacific Loon	22	2	Tarsometatarsus	R
DfSh-16	N4-6 E0-2	13	B	Loon sp.	4	1		
DfSh-16	N4-6 E0-2	13	B	Double-Crested Cormorant	1	1		
DfSh-16	N4-6 E0-2	13	B	Cormorant sp.	3	1		
DfSh-16	N4-6 E0-2	13	B	Albatross sp.	4	1		
DfSh-16	N4-6 E0-2	13	B	Large Grebe sp.	2	1		
DfSh-16	N4-6 E0-2	13	B	Grebe sp.	9	1		
DfSh-16	N4-6 E0-2	13	B	Canada Goose	5	1		
DfSh-16	N4-6 E0-2	13	B	Small/Medium Goose sp.	42	4	Coracoid	L & R
DfSh-16	N4-6 E0-2	13	B	Goose sp.	11	2	Humerus	L
DfSh-16	N4-6 E0-2	13	B	Small Gull sp.	22	4	Radius	L
DfSh-16	N4-6 E0-2	13	B	Medium Gull sp.	1	1		
DfSh-16	N4-6 E0-2	13	B	Large Gull sp.	13	2	Sternum - Manubrium	
DfSh-16	N4-6 E0-2	13	B	Gull sp.	13	2	Scapula	R
DfSh-16	N4-6 E0-2	13	B	Laridae	1	1		
DfSh-16	N4-6 E0-2	13	B	Medium Duck sp.	1	1		
DfSh-16	N4-6 E0-2	13	B	Medium/Large Duck sp.	1	1		
DfSh-16	N4-6 E0-2	13	B	Large Duck sp.	15	2	Tibiotarsus	R
DfSh-16	N4-6 E0-2	13	B	Anatidae	1	1		
DfSh-16	N4-6 E0-2	13	B	Small Bird	1	1		
DfSh-16	N4-6 E0-2	13	B	Large Bird	20	1		
DfSh-16	N4-6 E0-2	13	B	Unidentifiable Fish	515	N/A		
DfSh-16	N4-6 E0-2	13	B	Salmon sp.	320	4	Pelvis	L

DfSh-16	N4-6 E0-2	13	B	Dogfish	105	2	Dorsal Spine	
DfSh-16	N4-6 E0-2	13	B	Pacific Hake	48	4	Dentary	L & R
DfSh-16	N4-6 E0-2	13	B	Greenling sp.	9	4	Parasphenoid	
DfSh-16	N4-6 E0-2	13	B	Plainfin Midshipman	56	7	Ceratohyal	L
DfSh-16	N4-6 E0-2	13	B	Thornyhead	1	1		
DfSh-16	N4-6 E0-2	13	B	Rockfish sp.	172	10	Hyomandibular/Maxillary	L
DfSh-16	N4-6 E0-2	13	B	Lingcod	28	2	Supracleithrum	R
DfSh-16	N4-6 E0-2	13	B	Cabezon	8	1		
DfSh-16	N4-6 E0-2	13	B	Red Irish Lord	3	1		
DfSh-16	N4-6 E0-2	13	B	Perch sp.	1	1		
DfSh-16	N4-6 E0-2	13	B	Pacific Herring	45	4	Dentary	L
DfSh-16	N4-6 E0-2	13	B	Pacific Cod	2	1		
DfSh-16	N4-6 E0-2	13	B	Northern Anchovy	2	1		
DfSh-16	N4-6 E0-2	13	B	Pacific Halibut	1	1		
DfSh-16	N4-6 E0-2	13	B	Flatfish sp.	3	1		
DfSh-16	N4-6 E0-2	13	C	Unidentifiable Bird/Mammal	10	N/A		
DfSh-16	N4-6 E0-2	13	C	Unidentifiable Mammal	43	N/A		
DfSh-16	N4-6 E0-2	13	C	Unidentifiable Land Mammal	9	N/A		
DfSh-16	N4-6 E0-2	13	C	Unidentifiable Sea Mammal	15	N/A		
DfSh-16	N4-6 E0-2	13	C	Deer	2	1		
DfSh-16	N4-6 E0-2	13	C	Dog	3	1		
DfSh-16	N4-6 E0-2	13	C	Canid sp.	1	1		
DfSh-16	N4-6 E0-2	13	C	Raccoon	1	1		
DfSh-16	N4-6 E0-2	13	C	Townsend's Vole	1	1		
DfSh-16	N4-6 E0-2	13	C	Sea Otter	1	1		
DfSh-16	N4-6 E0-2	13	C	Fur Seal	6	2	Based on sizes	
DfSh-16	N4-6 E0-2	13	C	Harbour Seal	1	1		
DfSh-16	N4-6 E0-2	13	C	Northern Sea Lion	5	1		
DfSh-16	N4-6 E0-2	13	C	Small/Medium Mammal	2	1		
DfSh-16	N4-6 E0-2	13	C	Medium Mammal	1	1		
DfSh-16	N4-6 E0-2	13	C	Unidentifiable Bird	43	N/A		
DfSh-16	N4-6 E0-2	13	C	Common Murre	72	4	Humerus	L
DfSh-16	N4-6 E0-2	13	C	Small Alcid sp.	1	1		
DfSh-16	N4-6 E0-2	13	C	Alcid sp.	1	1		
DfSh-16	N4-6 E0-2	13	C	Double-Crested Cormorant	7	1		
DfSh-16	N4-6 E0-2	13	C	Cormorant sp.	2	1		
DfSh-16	N4-6 E0-2	13	C	Pacific Loon	8	2	Coracoid	L
DfSh-16	N4-6 E0-2	13	C	Common Loon	1	1		
DfSh-16	N4-6 E0-2	13	C	Loon sp.	2	1		
DfSh-16	N4-6 E0-2	13	C	Small/Medium Goose sp.	8	2	Furculum	Mid
DfSh-16	N4-6 E0-2	13	C	Goose sp.	1	1		
DfSh-16	N4-6 E0-2	13	C	Northwestern Crow	1	1		
DfSh-16	N4-6 E0-2	13	C	Small Gull sp.	11	2	Coracoid	R

DfSh-16	N4-6 E0-2	13	C	Large Gull sp.	1	1		
DfSh-16	N4-6 E0-2	13	C	Gull sp.	2	1		
DfSh-16	N4-6 E0-2	13	C	White-Winged Scoter	2	1		
DfSh-16	N4-6 E0-2	13	C	Medium/Large Duck sp.	4	1		
DfSh-16	N4-6 E0-2	13	C	Large Duck	2	1		
DfSh-16	N4-6 E0-2	13	C	Small Bird	1	1		
DfSh-16	N4-6 E0-2	13	C	Medium Bird	4	1		
DfSh-16	N4-6 E0-2	13	C	Medium/Large Bird	3	1		
DfSh-16	N4-6 E0-2	13	C	Large Bird	10	1		
DfSh-16	N4-6 E0-2	13	C	Unidentifiable Fish	191	N/A		
DfSh-16	N4-6 E0-2	13	C	Salmon sp.	106	2	Vertebrae	
DfSh-16	N4-6 E0-2	13	C	Spiny Dogfish	28	1		
DfSh-16	N4-6 E0-2	13	C	Ratfish	3	2	Tooth # 3	L
DfSh-16	N4-6 E0-2	13	C	Pacific Herring	8	4	Dentary	R
DfSh-16	N4-6 E0-2	13	C	Rockfish sp.	75	5	Vomer & Hyomandibular	L
DfSh-16	N4-6 E0-2	13	C	Greenling sp.	7	1		
DfSh-16	N4-6 E0-2	13	C	Lingcod	16	2	Maxillary	R
DfSh-16	N4-6 E0-2	13	C	Pacific Hake	13	1		
DfSh-16	N4-6 E0-2	13	C	Cabezon	3	1		
DfSh-16	N4-6 E0-2	13	C	Plainfin Midshipman	2	1		
DfSh-16	N4-6 E0-2	13	C	Flatfish sp.	2	1		
DfSh-16	N4-6 E0-2	13	C	Pacific Cod	2	1		
DfSh-16	N4-6 E0-2	13	C	Red Irish Lord	1	1		
DfSh-16	N4-6 E0-2	13	C1	Unidentifiable Mammal	4	N/A		
DfSh-16	N4-6 E0-2	13	C1	Harbour Seal	1	1		
DfSh-16	N4-6 E0-2	13	C1	Deer Mouse	1	1		
DfSh-16	N4-6 E0-2	13	C1	Unidentifiable Bird	16	N/A		
DfSh-16	N4-6 E0-2	13	C1	Common Murre	3	1		
DfSh-16	N4-6 E0-2	13	C1	Northwestern Crow	1	1		
DfSh-16	N4-6 E0-2	13	C1	Double-Crested Cormorant	2	1		
DfSh-16	N4-6 E0-2	13	C1	Unidentifiable Fish	18	N/A		
DfSh-16	N4-6 E0-2	13	C1	Salmon sp.	2	1		
DfSh-16	N4-6 E0-2	13	C1	Rockfish sp.	10	2	Based on size	
DfSh-16	N4-6 E0-2	13	C1	Ratfish	1	1		
DfSh-16	N4-6 E0-2	13	C1	Pacific Herring	1	1		
DfSh-16	N4-6 E0-2	13	C1	Lingcod	1	1		
DfSh-15	4	4	C	Unidentifiable Bird/Mammal	2	N/A		
DfSh-15	4	4	C	Large Sea Mammal	1	1		
DfSh-15	4	4	C	Unidentifiable Bird	1	N/A		
DfSh-15	4	4	C	Grebe sp.	1	1	Humerus	
DfSh-15	4	4	C	Unidentifiable Fish	10	N/A		
DfSh-15	4	4	C	Salmon sp.	4	1		
DfSh-15	4	4	C	Pacific Herring	21	1		
DfSh-15	4	4	C	Pile Perch	2	1		

DfSh-15	4	4	C	Perch sp.	9	1		
DfSh-15	4	4	C	Plainfin Midshipman	2	1		
DfSh-15	4	4	C	Rockfish sp.	2	1		
DfSh-15	4	4	C	Ratfish	1	1		
DfSh-15	4	4	C	Sculpin sp.	1	1		
DfSh-15	4	4	C	Pacific Hake	1	1		
DfSh-15	*4*	*6to8*	*D-F*	***HEARTH FEATURE***				
DfSh-15	*4*	*6to8*	*D-F*	*Unidentifiable Mammal*	*3*	*N/A*		
DfSh-15	*4*	*6to8*	*D-F*	*Unidentifiable Land Mammal*	*1*	*N/A*		
DfSh-15	*4*	*6to8*	*D-F*	*Unidentifiable Sea Mammal*	*0*	*N/A*		
DfSh-15	*4*	*6to8*	*D-F*	*Dog*	*1*	*1*		
DfSh-15	*4*	*6to8*	*D-F*					
DfSh-15	*4*	*6to8*	*D-F*	*Unidentifiable Bird*	*16*	*N/A*		
DfSh-15	*4*	*6to8*	*D-F*	*Bald Eagle*	*3*	*1*		
DfSh-15	*4*	*6to8*	*D-F*	*Common Loon*	*1*	*1*		
DfSh-15	*4*	*6to8*	*D-F*	*Shearwater sp.*	*1*	*1*		
DfSh-15	*4*	*6to8*	*D-F*	*Grebe sp.*	*1*	*1*		
DfSh-15	*4*	*6to8*	*D-F*	*Medium Duck sp.*	*2*	*1*		
DfSh-15	*4*	*6to8*	*D-F*	*Small Gull sp.*	*1*	*1*		
DfSh-15	*4*	*6to8*	*D-F*					
DfSh-15	*4*	*6to8*	*D-F*	*Unidentifiable Fish*	*22*	*N/A*		
DfSh-15	*4*	*6to8*	*D-F*	*Salmon sp.*	*4*	*1*		
DfSh-15	*4*	*6to8*	*D-F*	*Lingcod*	*4*	*1*		
DfSh-15	*4*	*6to8*	*D-F*	*Ratfish*	*1*	*1*		
DfSh-15	*4*	*6to8*	*D-F*	*Greenling sp.*	*9*	*3*	*Parasphenoid*	
DfSh-15	*4*	*6to8*	*D-F*	*Plainfin Midshipman*	*3*	*1*		
DfSh-15	*4*	*6to8*	*D-F*	*Pacific Cod/Pollock*	*1*	*1*		
DfSh-15	*4*	*6to8*	*D-F*	*Surf Perch sp.*	*1*	*1*		
DfSh-15	*4*	*6to8*	*D-F*	*Perch sp.*	*2*	*1*		
DfSh-15	*4*	*6to8*	*D-F*	*Rockfish sp.*	*3*	*1*		
DfSh-15	4	7	E	Unidentifiable Bird/Mammal	10	N/A		
DfSh-15	4	7	E	Unidentifiable Mammal	32	N/A		
DfSh-15	4	7	E	Unidentifiable Land Mammal	2	N/A		
DfSh-15	4	7	E	Dog	3	1		
DfSh-15	4	7	E	Deer	1	1		
DfSh-15	4	7	E	River Otter	2	1		
DfSh-15	4	7	E	Small Land Mammal	1	1		
DfSh-15	4	7	E	Fur Seal	1	1		
DfSh-15	4	7	E	Unidentifiable Bird	55	N/A		
DfSh-15	4	7	E	Bald Eagle	12	1		
DfSh-15	4	7	E	Double-Crested Cormorant	1	1		

DfSh-15	4	7	E	Pacific Loon	1	1		
DfSh-15	4	7	E	Common Loon	1	1		
DfSh-15	4	7	E	Grebe sp.	1	1		
DfSh-15	4	7	E	Canada Goose	1	1		
DfSh-15	4	7	E	Small Gull sp.	3	1		
DfSh-15	4	7	E	Small/Medium Gull sp.	1	1		
DfSh-15	4	7	E	Large Bird	11	N/A		
DfSh-15	4	7	E	Unidentifiable Fish	133	N/A		
DfSh-15	4	7	E	Salmon sp.	51	1		
DfSh-15	4	7	E	Dogfish	2	1		
DfSh-15	4	7	E	Ratfish	3	2	Tooth # 2	R
DfSh-15	4	7	E	Plainfin Midshipman	5	2	Ceratohyal	L
DfSh-15	4	7	E	Cabezon	1	1		
DfSh-15	4	7	E	Pacific Cod	2	1		
DfSh-15	4	7	E	Rockfish sp.	28	2	Premaxillary	L
DfSh-15	4	7	E	Pacific Herring	19	2	Prootic/Pterotic	
DfSh-15	4	7	E	Pile Perch	3	2	Inferior Pharyngeal Plate	
DfSh-15	4	7	E	Perch sp.	71	1		
DfSh-15	4	7	E	Greenling sp.	33	4	Articular	R
DfSh-15	4	7	E	Lingcod	9	1		
DfSh-15	4	7	E	Pacific Hake	1	1		
DfSh-15	4	7	E	Flatfish sp.	2	1		
DfSh-15	4	7	E	Northern Anchovy	2	1		
DfSh-15	*4*	*7*	*E*	***FISH CON-CENTRATION***				
				1/8"				
DfSh-15	*4*	*7*	*E*	*Unidentifiable Fish*	*63*	*N/A*		
DfSh-15	*4*	*7*	*E*	*Greenling sp.*	*2*	*1*		
DfSh-15	*4*	*7*	*E*	*Northern Anchovy*	*40*	*2*	*Atlas*	
DfSh-15	*4*	*7*	*E*	*Pacific Herring*	*90*	*2*	*Vertebrae*	
DfSh-15	*4*	*7*	*E*	*Perch sp.*	*17*	*1*		
				1/16"				
DfSh-15	*4*	*7*	*E*	*Unidentifiable Fish*	*19*	*N/A*		
DfSh-15	*4*	*7*	*E*	*Pacific Herring*	*9*	*1*		
DfSh-15	*4*	*7*	*E*	*Northern Anchovy*	*78*	*4*	*Atlas*	
DfSh-15	*4*	*7*	*E*	*Perch sp.*	*4*	*1*		
DfSh-15	*4*	*7*	*E*	*Perch sp. OR Greenling sp.*	*3*	*1*		
DfSh-15	4	10	F	Unidentifiable Mammal	61	N/A		
DfSh-15	4	10	F	Unidentifiable Land Mammal	1	N/A		
DfSh-15	4	10	F	Unidentifiable Sea Mammal	8	N/A		
DfSh-15	4	10	F	Dog	1	1		
DfSh-15	4	10	F	Fur Seal	25	3	Based on sizes	
DfSh-15	4	10	F	Northern Sea Lion	1	1		
DfSh-15	4	10	F	Small Mammal	2	1		
DfSh-15	4	10	F	Unidentifiable Bird	53	N/A		

DfSh-15	4	10	F	Common Murre	2	1		
DfSh-15	4	10	F	Murrelet sp.	1	1		
DfSh-15	4	10	F	Small Alcid sp.	1	1		
DfSh-15	4	10	F	Shearwater sp.	7	1		
DfSh-15	4	10	F	Grebe sp.	3	1		
DfSh-15	4	10	F	Common Loon	2	1		
DfSh-15	4	10	F	Pacific Loon	6	1		
DfSh-15	4	10	F	Albatross sp.	1	1		
DfSh-15	4	10	F	Canada Goose	1	1		
DfSh-15	4	10	F	Small Duck sp.	3	1		
DfSh-15	4	10	F	Medium Duck sp.	1	1		
DfSh-15	4	10	F	Large Duck sp.	2	1		
DfSh-15	4	10	F	Small Gull sp.	4	1		
DfSh-15	4	10	F	Small/Medium Gull sp.	1	1		
DfSh-15	4	10	F	Shorebird sp.	9	1		
DfSh-15	4	10	F	Very Small Bird	6	1		
DfSh-15	4	10	F	Unidentifiable Fish	136	N/A		
DfSh-15	4	10	F	Salmon sp.	34	1		
DfSh-15	4	10	F	Flatfish sp.	5	1		
DfSh-15	4	10	F	Dogfish	6	2	Dorsal Spine	
DfSh-15	4	10	F	Ratfish	4	1		
DfSh-15	4	10	F	Pile Perch	4	4	Inferior Pharyngeal Plate	
DfSh-15	4	10	F	Perch sp.	60	2	Parasphenoid	
DfSh-15	4	10	F	Plainfin Midshipman	3	1		
DfSh-15	4	10	F	Northern Anchovy	1	1		
DfSh-15	4	10	F	Rockfish sp.	28	2	1st Interhaemal Spine	
DfSh-15	4	10	F	Lingcod	7	2	Based on sizes	
DfSh-15	4	10	F	Greenling sp.	8	3	Parasphenoid	
DfSh-15	4	10	F	Pacific Cod	1	1		
DfSh-15	4	10	F	Pollock	1	1		
DfSh-15	4	10	F	Pacific Herring	14	2	Dentary	L
DfSh-15	4	13	G	Unidentifiable Mammal	85	N/A		
DfSh-15	4	13	G	Unidentifiable Land Mammal	14	N/A		
DfSh-15	4	13	G	Unidentifiable Sea Mammal	6	N/A		
DfSh-15	4	13	G	Dog	2	1		
DfSh-15	4	13	G	Deer	1	1		
DfSh-15	4	13	G	Medium/Large Land Mammal	11	N/A		
DfSh-15	4	13	G	Small Land Mammal	1	1		
DfSh-15	4	13	G	Northern Sea Lion	1	1		
DfSh-15	4	13	G	Large Sea Mammal	11	1		
DfSh-15	4	13	G	Harbour Seal	1	1		
DfSh-15	4	13	G					
DfSh-15	4	13	G	Unidentifiable Bird	22	N/A		
DfSh-15	4	13	G	Pacific Loon	1	1		
DfSh-15	4	13	G	Common Murre	1	1		

DfSh-15	4	13	G	Large Alcid sp.	1	1		
DfSh-15	4	13	G	Albatross sp.	3	1		
DfSh-15	4	13	G	Shearwater sp.	1	1		
DfSh-15	4	13	G	Double-Crested Cormorant	1	1		
DfSh-15	4	13	G	Goose sp.	1	1		
DfSh-15	4	13	G	Small Duck sp.	1	1		
DfSh-15	4	13	G	Small Gull sp.	1	1		
DfSh-15	4	13	G	Medium/Large Gull sp.	1	1		
DfSh-15	4	13	G	Large Gull sp.	1	1		
DfSh-15	4	13	G	Small Bird	1	1		
DfSh-15	4	13	G	Large Bird	1	1		
DfSh-15	4	13	G	Unidentifiable Fish	13	N/A		
DfSh-15	4	13	G	Salmon sp.	8	1		
DfSh-15	4	13	G	Rockfish sp.	5	1		
DfSh-15	4	13	G	Pacific Herring	8	1		
DfSh-15	4	13	G	Ratfish	1	1		
DfSh-15	4	13	G	Dogfish	2	1		
DfSh-15	4	13	G	Cod OR Pollock	1	1		
DfSh-15	4	13	G	Pacific Hake	1	1		
DfSh-15	4	13	G	Greenling sp.	1	1		
DfSh-15	4	13	G	Perch sp.	2	1		
DfSh-15	4	16	G	Unidentifiable Mammal	9	N/A		
DfSh-15	4	16	G	Unidentifiable Land Mammal	6	N/A		
DfSh-15	4	16	G	Unidentifiable Sea Mammal	4	N/A		
DfSh-15	4	16	G	Deer	1	1		
DfSh-15	4	16	G	River Otter	1	1		
DfSh-15	4	16	G	Large Sea Mammal	1	1		
DfSh-15	4	16	G	Unidentifiable Bird	9	N/A		
DfSh-15	4	16	G	Pacific Loon	1	1		
DfSh-15	4	16	G	Medium/Large Duck sp.	1	1		
DfSh-15	4	16	G	Small Alcid sp.	1	1		
DfSh-15	4	16	G					
DfSh-15	4	16	G	Unidentifiable Fish	9	N/A		
DfSh-15	4	16	G	Salmon sp.	10	1		
DfSh-15	4	16	G	Lingcod	1	1		
DfSh-15	4	16	G	Pile Perch	1	1		
DfSh-15	4	16	G	Rockfish sp.	8	2	Ceratohyal	R
DfSh-15	4	16	G	Flatfish sp.	1	1		
DfSh-15	4	16	G	Tuna sp. (Bluefin?)	1	1		
DfSh-15	*4*	*16*	*G*	***FISH CON-CENTRATION***				
				1/8”				
DfSh-15	*4*	*16*	*G*	*Northern Anchovy*	*21*	*1*		
				1/16”				
DfSh-15	*4*	*16*	*G*	*Northern Anchovy*	*97*	*2*		

DfSh-15	4	16	H	Unidentifiable Bird/Mammal	4	N/A		
DfSh-15	4	16	H	Unidentifiable Mammal	14	N/A		
DfSh-15	4	16	H	Unidentifiable Land Mammal	3	N/A		
DfSh-15	4	16	H	Unidentifiable Sea Mammal	2	N/A		
DfSh-15	4	16	H	Raccoon	3	1		
DfSh-15	4	16	H	Deer	1	1		
DfSh-15	4	16	H	Dog	1	1		
DfSh-15	4	16	H	Unidentifiable Bird	9	N/A		
DfSh-15	4	16	H	Pacific Loon	1	1		
DfSh-15	4	16	H	Common Loon	1	1		
DfSh-15	4	16	H	Loon sp.	2	1		
DfSh-15	4	16	H	Common Murre	1	1		
DfSh-15	4	16	H	Medium/Large Gull sp.	1	1		
DfSh-15	4	16	H	Medium Duck sp.	1	1		
DfSh-15	4	16	H	Medium/Large Duck sp.	2	1		
DfSh-15	4	16	H	Unidentifiable Fish	26	N/A		
DfSh-15	4	16	H	Salmon sp.	32	1		
DfSh-15	4	16	H	Dogfish	1	1		
DfSh-15	4	16	H	Pile Perch	3	2	Inferior Pharyngeal Plate	
DfSh-15	4	16	H	Perch sp.	2	1		
DfSh-15	4	16	H	Pacific Hake	1	1		
DfSh-15	4	16	H	Cabezon	1	1		
DfSh-15	4	16	H	Rockfish sp.	9	4	1st Interhaemal Spine	
DfSh-15	4	16	H	Greenling sp.	2	1		
DfSh-15	4	16	H	Plainfin Midshipman	5	1		
DfSh-15	4	16	H	Sablefish	1	1		
DfSh-15	4	16	H	Lingcod	2	1		
DfSh-15	4	16	H	Pacific Sardine	3	1		
DfSh-15	4	16	H	Pacific Herring	3	1		
DfSh-15	4	16	H	Flatfish sp.	1	1		
DfSh-15	4	16	I	Unidentifiable Mammal	30	N/A		
DfSh-15	4	16	I	Unidentifiable Land Mammal	11	N/A		
DfSh-15	4	16	I	Unidentifiable Sea Mammal	3	N/A		
DfSh-15	4	16	I	River Otter	2	1		
DfSh-15	4	16	I	Mink	1	1		
DfSh-15	4	16	I	Raccoon	1	1		
DfSh-15	4	16	I	Small Carnivore	1	1		
DfSh-15	4	16	I	Deer	2	1		
DfSh-15	4	16	I	Dog	5	1		
DfSh-15	4	16	I	Unidentifiable Bird	55	N/A		
DfSh-15	4	16	I	Common Loon	3	1		
DfSh-15	4	16	I	Pacific Loon	3	1		

DfSh-15	4	16	I	Cormorant sp.	1	1		
DfSh-15	4	16	I	Common Raven	1	1		
DfSh-15	4	16	I	Common Murre	1	1		
DfSh-15	4	16	I	Shearwater sp.	3	1		
DfSh-15	4	16	I	Small/Medium Goose sp.	2	1		
DfSh-15	4	16	I	Small Gull sp.	1	1		
DfSh-15	4	16	I	Large Gull sp.	2	1		
DfSh-15	4	16	I	Medium Duck sp.	2	1		
DfSh-15	4	16	I	Medium/Large Duck sp.	3	1		
DfSh-15	4	16	I	Large Duck sp.	2	1		
DfSh-15	4	16	I	Large Bird	1	1		
DfSh-15	4	16	I	Unidentifiable Fish	153	N/A		
DfSh-15	4	16	I	Salmon sp.	246	2	Pelvis/Vertebrae	R
DfSh-15	4	16	I	Dogfish	2	1		
DfSh-15	4	16	I	Ratfish	2	1		
DfSh-15	4	16	I	Pile Perch	8	3	Parasphenoid	
DfSh-15	4	16	I	Perch sp.	3	1		
DfSh-15	4	16	I	Pacific Herring	17	1		
DfSh-15	4	16	I	Rockfish sp.	34	2	Quadrate / Hyomandibular	L
DfSh-15	4	16	I	Plainfin Midshipman	20	3	Operculum / Ceratohyal	R/L
DfSh-15	4	16	I	Greenling sp.	34	5	Ceratohyal	R
DfSh-15	4	16	I	Red Irish Lord	4	1		
DfSh-15	4	16	I	Flatfish sp.	3	1		
DfSh-15	4	16	I	Pacific Hake	1	1		
DfSh-15	4	16	I	Lingcod	4	1		
DfSh-15	4	16	I	Pacific Cod OR Pollock	1	1		
DfSh-15	4	16	I	Northern Anchovy	1	1		
DfSh-15	4	16	I	Shiner Perch	2	1		
DfSh-15	4	16	I	Very Small Fish	1	1		
DfSh-15	4	19	G	Unidentifiable Bird/Mammal	2	N/A		
DfSh-15	4	19	G	Unidentifiable Mammal	6	N/A		
DfSh-15	4	19	G	Unidentifiable Land Mammal	2	N/A		
DfSh-15	4	19	G	Unidentifiable Sea Mammal	5	N/A		
DfSh-15	4	19	G	Dog	2	1		
DfSh-15	4	19	G	Raccoon	3	1		
DfSh-15	4	19	G	Northern Sea Lion	1	1		
DfSh-15	4	19	G	Whale	1	1		
DfSh-15	4	19	G	Unidentifiable Bird	7	N/A		
DfSh-15	4	19	G	Common Murre	1	1		
DfSh-15	4	19	G	Common Loon	2	1		
DfSh-15	4	19	G	Pacific Loon	3	1		
DfSh-15	4	19	G	Northwestern Crow	4	1		
DfSh-15	4	19	G	Common Raven	1	1		
DfSh-15	4	19	G	Albatross sp.	1	1		

DfSh-15	4	19	G	Large Gull sp.	2	1		
DfSh-15	4	19	G	Medium Duck sp.	6	1		
DfSh-15	4	19	G	Medium/Large Duck sp.	2	1		
DfSh-15	4	19	G	Large Duck sp.	1	1		
DfSh-15	4	19	G	Unidentifiable Fish	33	N/A		
DfSh-15	4	19	G	Bluefin Tuna	2	1		
DfSh-15	4	19	G	Salmon sp.	54	1		
DfSh-15	4	19	G	Dogfish	1	1		
DfSh-15	4	19	G	Lingcod	2	1		
DfSh-15	4	19	G	Pacific Herring	11	1		
DfSh-15	4	19	G	Greenling sp.	1	1		
DfSh-15	4	19	G	Rockfish sp.	3	1		
DfSh-15	4	19	G	Plainfin Midshipman	1	1		
DfSh-15	4	19	G	Flatfish sp.	2	1		
DfSh-15	4	19	G	Perch sp.	1	1		
DfSh-15	4	19	H	Unidentifiable Mammal	7	N/A		
DfSh-15	4	19	H	Unidentifiable Land Mammal	1	N/A		
DfSh-15	4	19	H	Unidentifiable Sea Mammal	0	0		
DfSh-15	4	19	H	Raccoon	1	1		
DfSh-15	4	19	H	Dog	4	1		
DfSh-15	4	19	H	Deer	1	1		
DfSh-15	4	19	H	Harbour Seal	4	1		
DfSh-15	4	19	H	Unidentifiable Bird	9	N/A		
DfSh-15	4	19	H	Albatross sp.	2	1		
DfSh-15	4	19	H	Common Loon	1	1		
DfSh-15	4	19	H	Pacific Loon	1	1		
DfSh-15	4	19	H	Northwestern Crow	3	1		
DfSh-15	4	19	H	Common Murre	1	1		
DfSh-15	4	19	H	Small Gull sp.	1	1		
DfSh-15	4	19	H	Small/Medium Gull sp.	2	1		
DfSh-15	4	19	H	Large Gull sp.	2	1		
DfSh-15	4	19	H	Gull sp.	1	1		
DfSh-15	4	19	H	Medium Duck sp.	9	2	Carpometacarpus	L
DfSh-15	4	19	H	Medium Bird	1	1		
DfSh-15	4	19	H	Unidentifiable Fish	28	N/A		
DfSh-15	4	19	H	Salmon sp.	195	2	Ultimate Vertebra/Vertebrae	
DfSh-15	4	19	H	Dogfish	2	1		
DfSh-15	4	19	H	Ratfish	1	1		
DfSh-15	4	19	H	Pile Perch	2	2	Inferior Pharyngeal Plate	
DfSh-15	4	19	H	Perch sp.	2	1		
DfSh-15	4	19	H	Pacific Herring	7	1		
DfSh-15	4	19	H	Plainfin Midshipman	3	1		
DfSh-15	4	19	H	Rockfish sp.	9	2	1st Interhaemal Spine	
DfSh-15	4	19	H	Greenling sp.	10	2	Parasphenoid	

DfSh-15	4	19	H	Cabezon	2	1		
DfSh-15	4	19	I	Unidentifiable Bird/Mammal	1	1		
DfSh-15	4	19	I	Seal sp.	1	1		
DfSh-15	4	19	I	Small Gull sp.	1	1		
DfSh-15	4	19	J	Unidentifiable Bird/Mammal	3	N/A		
DfSh-15	4	19	J	Unidentifiable Mammal	4	N/A		
DfSh-15	4	19	J	Unidentifiable Land Mammal	10	N/A		
DfSh-15	4	19	J	Unidentifiable Sea Mammal	4	N/A		
DfSh-15	4	19	J	Deer	1	1		
DfSh-15	4	19	J	Dog	1	1		
DfSh-15	4	19	J	Ungulate	2	1		
DfSh-15	4	19	J	Harbour Seal	2	1		
DfSh-15	4	19	J	Fur Seal	1	1		
DfSh-15	4	19	J	Unidentifiable Bird	14	N/A		
DfSh-15	4	19	J	Great Blue Heron	1	1		
DfSh-15	4	19	J	Shorebird	1	1		
DfSh-15	4	19	J	Common Murre	8	2	Tibiotarsus	L
DfSh-15	4	19	J	Double-Crested Cormorant	1	1		
DfSh-15	4	19	J	Grebe sp.	1	1		
DfSh-15	4	19	J	Small Gull sp.	1	1		
DfSh-15	4	19	J	Medium Gull sp.	1	1		
DfSh-15	4	19	J	Large Gull sp.	11	2	Ulna	R
DfSh-15	4	19	J	Large/Very Large Gull sp.	3	2	Humerus	R
DfSh-15	4	19	J	Very Large Gull sp.	4	2	Humerus	L
DfSh-15	4	19	J	Laridae	1	1		
DfSh-15	4	19	J	Medium Duck sp.	7	2	Ulna	R
DfSh-15	4	19	J	Medium/Large Duck sp.	1	1		
DfSh-15	4	19	J	Small Bird	1	1		
DfSh-15	4	19	J	Medium/Large Bird	4	1		
DfSh-15	4	19	J	Unidentifiable Fish	98	N/A		
DfSh-15	4	19	J	Salmon sp.	72	2	Pelvis	R&L
DfSh-15	4	19	J	Dogfish	2	1		
DfSh-15	4	19	J	Flatfish sp.	2	1		
DfSh-15	4	19	J	Pile Perch	3	3	Inferior Pharyngeal Plate	
DfSh-15	4	19	J	Perch sp.	5	1		
DfSh-15	4	19	J	Pacific Herring	10	1		
DfSh-15	4	19	J	Plainfin Midshipman	11	4	Ceratohyal	R
DfSh-15	4	19	J	Pacific Halibut	1	1		
DfSh-15	4	19	J	Rockfish sp.	10	2	Operculum	L
DfSh-15	4	19	J	Pacific Hake	2	1		
DfSh-15	4	19	J	Lingcod	4	1		
DfSh-15	4	19	J	Pacific Cod	2	1		

DfSh-15	4	19	J	Greenling sp.	25	6	Parasphenoid	
DfSh-15	4							
DfSh-15	4	22	I	Unidentifiable Bird/Mammal	1	N/A		
DfSh-15	4	22	I	Unidentifiable Mammal	1	N/A		
DfSh-15	4	22	I	Unidentifiable Land Mammal	5	N/A		
DfSh-15	4	22	I	Unidentifiable Sea Mammal	0	N/A		
DfSh-15	4	22	I	Dog	3	1		
DfSh-15	4	22	I	Fur Seal	1	1		
DfSh-15	4	22	I	Unidentifiable Bird	19	N/A		
DfSh-15	4	22	I	Common Murre	9	2	Coracoid	L
DfSh-15	4	22	I	Large Grebe sp.	1	1		
DfSh-15	4	22	I	Pacific Loon	4	1		
DfSh-15	4	22	I	Double-Crested Cormorant	3	1		
DfSh-15	4	22	I	Medium/Large Gull sp.	1	1		
DfSh-15	4	22	I	Large Gull sp.	7	1		
DfSh-15	4	22	I	Very Large Gull sp.	2	1		
DfSh-15	4	22	I	Laridae	1	1		
DfSh-15	4	22	I	Medium Duck sp.	3	1		
DfSh-15	4	22	I	Medium/Large Duck sp.	1	1		
DfSh-15	4	22	I	Large Duck sp.	2	1		
DfSh-15	4	22	I	Unidentifiable Fish	38	N/A		
DfSh-15	4	22	I	Salmon sp.	77	1		
DfSh-15	4	22	I	Pacific Cod	4	1		
DfSh-15	4	22	I	Greenling sp.	7	2	Maxillary	L
DfSh-15	4	22	I	Pacific Herring	5	1		
DfSh-15	4	22	I	Rockfish sp.	4	2	Parasphenoid	
DfSh-15	4	22	I	Perch sp.	4	1		
DfSh-15	4	22	I	Sculpin sp.	1	1		
DfSh-15	4	22	I	Plainfin Midshipman	4	1		
DfSh-15	4	22	I	Northern Anchovy	1	1		
DfSh-15	4	22	I	Lingcod	1	1		
DfSh-15	*4*	*22*	*I*	***FISH CON-CENTRATION***				
				1/8”				
DfSh-15	*4*	*22*	*I*	*Unidentifiable Fish*	*2*	*N/A*		
DfSh-15	*4*	*22*	*I*	*Salmon sp.*	*4*	*1*		
DfSh-15	*4*	*22*	*I*	*Pacific Herring*	*38*	*1*		
DfSh-15	*4*	*22*	*I*	*Northern Anchovy*	*6*	*1*		
DfSh-15	4	22	K	Unidentifiable Mammal	21	N/A		
DfSh-15	4	22	K	Unidentifiable Land Mammal	9	N/A		
DfSh-15	4	22	K	Unidentifiable Sea Mammal	0	N/A		

DfSh-15	4	22	K	Dog	4	1		
DfSh-15	4	22	K	Deer	2	1		
DfSh-15	4	22	K	Fur Seal	1	1		
DfSh-15	4	22	K	Seal sp.	1	1		
DfSh-15	4	22	K	Unidentifiable Bird	15	N/A		
DfSh-15	4	22	K	Common Murre	1	1		
DfSh-15	4	22	K	Cormorant sp.	1	1		
DfSh-15	4	22	K	Medium Grebe sp.	1	1		
DfSh-15	4	22	K	Large Grebe sp.	1	1		
DfSh-15	4	22	K	Large Gull sp.	3	1		
DfSh-15	4	22	K	Large/Very Large Gull sp.	1	1		
DfSh-15	4	22	K	White-Winged Scoter	1	1		
DfSh-15	4	22	K	Medium Duck sp.	13	3	Femur	R
DfSh-15	4	22	K	Large Duck sp.	3	1		
DfSh-15	4	22	K	Unidentifiable Fish	65	N/A		
DfSh-15	4	22	K	Salmon sp.	56	1		
DfSh-15	4	22	K	Ratfish	2	1		
DfSh-15	4	22	K	Pile Perch	1	1		
DfSh-15	4	22	K	Pacific Cod	1	1		
DfSh-15	4	22	K	Pacific Herring	25	2	Different Sizes	
DfSh-15	4	22	K	Greenling sp.	4	1		
DfSh-15	4	22	K	Rockfish sp.	9	2	Different sizes	
DfSh-15	4	22	K	Red Irish Lord	6	1		
DfSh-15	4	22	K	Cabezon	1	1		
DfSh-15	4	22	K	Sculpin sp.	3	2	Vertebrae	
DfSh-15	4	22	K	Flatfish sp.	5	1		
DfSh-15	4	22	K	Northern Anchovy	1	1		
DfSh-15	4	25	L	Unidentifiable Mammal	7	N/A		
DfSh-15	4	25	L	Unidentifiable Land Mammal	3	N/A		
DfSh-15	4	25	L	Unidentifiable Sea Mammal	0	N/A		
DfSh-15	4	25	L	Dog	7	2	Teeth	
DfSh-15	4	25	L	Otariid	1	1		
DfSh-15	4	25	L	Unidentifiable Bird	3	N/A		
DfSh-15	4	25	L	Medium Duck sp.	1	1		
DfSh-15	4	25	L					
DfSh-15	4	25	L	Unidentifiable Fish	9	N/A		
DfSh-15	4	25	L	Salmon sp.	4	1		
DfSh-15	4	25	L	Pacific Herring	5	1		
DfSh-15	4	25	L	Rockfish sp.	2	1		
DfSh-15	4	28	M	Unidentifiable Mammal	1	1		
DfSh-15	4	28	M	Salmon sp.	1	1		
DfSh-15	4A	4	A	Unidentifiable Mammal	10	N/A		
DfSh-15	4A	4	A	Unidentifiable Land	0	N/A		

				Mammal				
DfSh-15	4A	4	A	Unidentifiable Sea Mammal	52	N/A		
DfSh-15	4A	4	A	Dog	1	1		
DfSh-15	4A	4	A	Raccoon	1	1		
DfSh-15	4A	4	A	Large Sea Mammal	9	1		
DfSh-15	4A	4	A	Unidentifiable Bird	3	N/A		
DfSh-15	4A	4	A	Medium Gull sp.	1	1		
DfSh-15	4A	4	A	Small Goose sp.	1	1		
DfSh-15	4A	4	A	Unidentifiable Fish	14	N/A		
DfSh-15	4A	4	A	Salmon sp.	4	1		
DfSh-15	4A	4	A	Ratfish	1	1		
DfSh-15	4A	4	A	Pacific Herring	20	2	Prootic/Pterotic	
DfSh-15	4A	4	A	Pacific Cod	2	1		
DfSh-15	4A	4	A	Pile Perch	4	3	Parasphenoid	
DfSh-15	4A	4	A	Perch sp.	4	1		
DfSh-15	4A	4	A	Plainfin Midshipman	2	1		
DfSh-15	4A	4	A	Rockfish sp.	9	2	1st Interhaemal Spine	
DfSh-15	4A	4	A	Lingcod	1	1		
DfSh-15	4A	4	A	Greenling sp.	1	1		
DfSh-15	*4A*	*4*	*A*	***FISH CON-CENTRATION***				
				1/8”				
DfSh-15	*4A*	*4*	*A*	*Unidentifiable Fish*	*99*	*N/A*		
DfSh-15	*4A*	*4*	*A*	*Pacific Herring*	*868*	*15*	*Prootic/Pterotic*	
DfSh-15	*4A*	*4*	*A*	*Rockfish sp.*	*4*	*1*		
DfSh-15	*4A*	*4*	*A*	*Plainfin Midshipman*	*2*	*1*		
DfSh-15	*4A*	*4*	*A*	*Perch sp.*	*2*	*1*		
DfSh-15	*4A*	*4*	*A*	*Northern Anchovy*	*1*	*1*		
DfSh-15	*4A*	*4*	*A*	*Dogfish*	*1*	*1*		
DfSh-15	*4A*	*4*	*A*	*Greenling sp.*	*2*	*1*		
DfSh-15	*4A*	*4*	*A*	*Tuna?*	*1*	*1*		
DfSh-15	*4A*	*4*	*A*	*1/16”*				
DfSh-15	*4A*	*4*	*A*	*Unidentifiable Fish*	*8*	*N/A*		
DfSh-15	*4A*	*4*	*A*	*Pacific Herring*	*3*	*1*		
DfSh-15	4A	7	B	Unidentifiable Bird/Mammal	1	N/A		
DfSh-15	4A	7	B	Unidentifiable Mammal	11	N/A		
DfSh-15	4A	7	B	Unidentifiable Land Mammal	4	N/A		
DfSh-15	4A	7	B	Unidentifiable Sea Mammal	6	N/A		
DfSh-15	4A	7	B	Dog	1	1		
DfSh-15	4A	7	B	Fur Seal	1	1		
DfSh-15	4A	7	B	Large Sea Mammal	5	1		
DfSh-15	4A	7	B	Unidentifiable Bird	29	N/A		
DfSh-15	4A	7	B	Common Murre	1	1		
DfSh-15	4A	7	B	Northwestern Crow	1	1		
DfSh-15	4A	7	B	Grebe sp.	1	1		

DfSh-15	4A	7	B	Songbird	1	1		
DfSh-15	4A	7	B	Common Loon	2	1		
DfSh-15	4A	7	B	Pacific Loon	4	2	Ulna	R
DfSh-15	4A	7	B	Double-Crested Cormorant	3	1		
DfSh-15	4A	7	B	Albatross sp.	2	1		
DfSh-15	4A	7	B	Great Blue Heron	1	1		
DfSh-15	4A	7	B	Small Gull sp.	1	1		
DfSh-15	4A	7	B	Small/Medium Gull sp.	1	1		
DfSh-15	4A	7	B	Large Gull sp.	1	1		
DfSh-15	4A	7	B	Large Duck sp.	1	1		
DfSh-15	4A	7	B	Anatidae	1	1		
DfSh-15	4A	7	B	Unidentifiable Fish	40	N/A		
DfSh-15	4A	7	B	Salmon sp.	44	1		
DfSh-15	4A	7	B	Pacific Herring	2	2	Ceratohyal	R
DfSh-15	4A	7	B	Dogfish	3	1		
DfSh-15	4A	7	B	Ratfish	4	2	Tooth # 3	R
DfSh-15	4A	7	B	Pile Perch	1	1		
DfSh-15	4A	7	B	Perch sp.	1	1		
DfSh-15	4A	7	B	Pacific Cod	2	1		
DfSh-15	4A	7	B	Greenling sp.	2	1		
DfSh-15	4A	7	B	Lingcod	5	1		
DfSh-15	4A	7	B	Rockfish sp.	18	2	Ceratohyal	R
DfSh-15	4A	10	B	Unidentifiable Bird/Mammal	2	N/A		
DfSh-15	4A	10	B	Unidentifiable Mammal	55	N/A		
DfSh-15	4A	10	B	Unidentifiable Land Mammal	7	N/A		
DfSh-15	4A	10	B	Unidentifiable Sea Mammal	23	N/A		
DfSh-15	4A	10	B	Deer	1	1		
DfSh-15	4A	10	B	Dog	51	1		
DfSh-15	4A	10	B	Medium Mammal	74	N/A		
DfSh-15	4A	10	B	Fur Seal	1	1		
DfSh-15	4A	10	B	Whale sp.	2	1		
DfSh-15	4A	10	B	Gray Whale	2	1		
DfSh-15	4A	10	B	Unidentifiable Bird	18	N/A		
DfSh-15	4A	10	B	Albatross sp.	2	1		
DfSh-15	4A	10	B	Common Murre	3	1		
DfSh-15	4A	10	B	Murrelet sp.	1	1		
DfSh-15	4A	10	B	Red-Necked Grebe	2	1		
DfSh-15	4A	10	B	Grebe sp.	2	1		
DfSh-15	4A	10	B	Northwestern Crow	1	1		
DfSh-15	4A	10	B	Surf Scoter	1	1		
DfSh-15	4A	10	B	Medium/Large Duck sp.	1	1		
DfSh-15	4A	10	B	Small/Medium Bird	1	1		
DfSh-15	4A	10	B	Unidentifiable Fish	25	N/A		
DfSh-15	4A	10	B	Salmon sp.	9	1		
DfSh-15	4A	10	B	Dogfish	4	1		
DfSh-15	4A	10	B	Ratfish	2	2	Tooth # 2	R

DfSh-15	4A	10	B	Pile Perch	1	1		
DfSh-15	4A	10	B	Perch sp.	6	1		
DfSh-15	4A	10	B	Pacific Herring	15	1		
DfSh-15	4A	10	B	Pacific Hake	1	1		
DfSh-15	4A	10	B	Greenling sp.	2	1		
DfSh-15	4A	10	B	Rockfish sp.	3	1		
DfSh-15	4A	10	B	Lingcod	2	1		
DfSh-15	4A	10	B	Northern Anchovy	2	1		
DfSh-15	4A	10	B	Pacific Cod	9	1		
DfSh-15	4A	10	B	Plainfin Midshipman	1	1		
DfSh-15	4A	10	B	Pacific Halibut	1	1		
DfSh-15	4A	10	B	Large Flatfish sp.	1	1		
DfSh-15	4A	13	B	Unidentifiable Mammal	2	N/A		
DfSh-15	4A	13	B	Unidentifiable Land Mammal	2	N/A		
DfSh-15	4A	13	B	Unidentifiable Sea Mammal	0	N/A		
DfSh-15	4A	13	B	Unidentifiable Bird	11	N/A		
DfSh-15	4A	13	B	Common Murre	2	1		
DfSh-15	4A	13	B	Pacific Loon	1	1		
DfSh-15	4A	13	B	Albatross sp.	3	1		
DfSh-15	4A	13	B	Unidentifiable Fish	1	N/A		
DfSh-15	4A	13	B	Salmon sp.	2	1		
DfSh-15	4A	13	B	Ratfish	1	1		
DfSh-15	4A	13	B	Rockfish sp.	1	1		
DfSh-15	4A	16	B	Unidentifiable Bird/Mammal	9	N/A		
DfSh-15	4A	16	B	Unidentifiable Mammal	5	N/A		
DfSh-15	4A	16	B	Unidentifiable Land Mammal	8	N/A		
DfSh-15	4A	16	B	Unidentifiable Sea Mammal	16	N/A		
DfSh-15	4A	16	B	Dog	3	1		
DfSh-15	4A	16	B	Raccoon	1	1		
DfSh-15	4A	16	B	Deer	2	1		
DfSh-15	4A	16	B	Medium/Large Land Mammal	1	N/A		
DfSh-15	4A	16	B	Whale	7	1		
DfSh-15	4A	16	B	Unidentifiable Bird	6	N/A		
DfSh-15	4A	16	B	Common Loon	2	1		
DfSh-15	4A	16	B	Duck sp.	1	1		
DfSh-15	4A	16	B	Unidentifiable Fish	40	N/A		
DfSh-15	4A	16	B	Salmon sp.	5	1		
DfSh-15	4A	16	B	Ratfish	3	1		
DfSh-15	4A	16	B	Pile Perch	1	1		
DfSh-15	4A	16	B	Perch sp.	7	1		
DfSh-15	4A	16	B	Lingcod	1	1		
DfSh-15	4A	16	B	Cabezon	1	1		
DfSh-15	4A	16	B	Rockfish sp.	6	2	Quadrate	R

DfSh-15	4A	16	B	Plainfin Midshipman	2	1		
DfSh-15	4A	16	B	Greenling sp.	1	1		
DfSh-15	4A	16	B	Northern Anchovy	3	1		
DfSh-15	4A	16	B	Pacific Herring	7	1		
DfSh-15	4A	16	B	Wolf Eel	1	1		
DfSh-15	4A	16	B	Bluefin Tuna	2	1		
DfSh-15	4A	16	C	Unidentifiable Mammal	11	N/A		
DfSh-15	4A	16	C	Unidentifiable Land Mammal	11	N/A		
DfSh-15	4A	16	C	Unidentifiable Sea Mammal	16	N/A		
DfSh-15	4A	16	C	Dog	2	1		
DfSh-15	4A	16	C	Deer	2	1		
DfSh-15	4A	16	C	Ungulate	1	1		
DfSh-15	4A	16	C	River Otter	1	1		
DfSh-15	4A	16	C	Raccoon	1	1		
DfSh-15	4A	16	C	Large Land Mammal	14	N/A		
DfSh-15	4A	16	C	Whale	1	1		
DfSh-15	4A	16	C	Large Sea Mammal	2	1		
DfSh-15	4A	16	C	Unidentifiable Bird	14	N/A		
DfSh-15	4A	16	C	Pacific Loon	1	1		
DfSh-15	4A	16	C	Grebe sp.	1	1		
DfSh-15	4A	16	C	Northwestern Crow	6	1		
DfSh-15	4A	16	C	Unidentifiable Fish	59	N/A		
DfSh-15	4A	16	C	Bluefin Tuna	15	1		
DfSh-15	4A	16	C	Salmon sp.	9	1		
DfSh-15	4A	16	C	Dogfish	1	1		
DfSh-15	4A	16	C	Rockfish sp.	15	1		
DfSh-15	4A	16	C	Pile Perch	4	3	Inferior Pharyngeal Plate	
DfSh-15	4A	16	C	Perch sp.	2	1		
DfSh-15	4A	16	C	Greenling sp.	9	2	Articular	L
DfSh-15	4A	16	C	Lingcod	4	1		
DfSh-15	4A	16	C	Pacific Herring	8	1		
DfSh-15	4A	16	C	Sculpin sp.	1	1		
DfSh-15	4A	16	C	Northern Anchovy	2	1		
DfSh-15	4A	16	C	Eulachon	1	1		
DfSh-15	4A	19	C	Unidentifiable Mammal	40	N/A		
DfSh-15	4A	19	C	Unidentifiable Land Mammal	1	N/A		
DfSh-15	4A	19	C	Unidentifiable Sea Mammal	2	N/A		
DfSh-15	4A	19	C	Dog	1	1		
DfSh-15	4A	19	C	Deer	2	1		
DfSh-15	4A	19	C	Unidentifiable Bird	10	N/A		
DfSh-15	4A	19	C	Common Murre	2	1		
DfSh-15	4A	19	C	Pacific Loon	2	1		
DfSh-15	4A	19	C	Medium Duck sp.	3	1		

DfSh-15	4A	19	C	Medium/Large Duck sp.	2	1		
DfSh-15	4A	19	C	Large Duck sp.	1	1		
DfSh-15	4A	19	C	Small Gull/Kittiwake	1	1		
DfSh-15	4A	19	C	Medium Gull sp.	1	1		
DfSh-15	4A	19	C	Medium/Large Gull sp.	3	1		
DfSh-15	4A	19	C	Large Gull sp.	6	1		
DfSh-15	4A	19	C	Large/Very Large Gull sp.	3	1		
DfSh-15	4A	19	C	Very Large Gull sp.	2	1		
DfSh-15	4A	19	C	Unidentifiable Fish	18	N/A		
DfSh-15	4A	19	C	Salmon sp.	94	2	Abdominal vertebrae	
DfSh-15	4A	19	C	Dogfish	2	1		
DfSh-15	4A	19	C	Pile Perch	1	1		
DfSh-15	4A	19	C	Perch sp.	1	1		
DfSh-15	4A	19	C	Skate sp.	2	1		
DfSh-15	4A	19	C	Greenling sp.	4	2	Parasphenoid	
DfSh-15	4A	19	C	Pacific Herring	6	1		
DfSh-15	4A	19	C	Rockfish sp.	6	1		
DfSh-15	4A	19	C	Pacific Halibut	1	1		
DfSh-15	*4A*	*19*	*C*	***FISH CON-CENTRATION***				
				1/8”				
DfSh-15	*4A*	*19*	*C*	*Unidentifiable Fish*	*7*	*N/A*		
DfSh-15	*4A*	*19*	*C*	*Pacific Herring*	*60*	*2*	*Vertebrae*	
DfSh-15	*4A*	*19*	*C*	*Greenling sp.*	*3*	*1*		
DfSh-15	*4A*	*19*	*C*	*Perch sp.*	*4*	*1*		
DfSh-15	*4A*	*19*	*C*	*Staghorn Sculpin*	*1*	*1*		
DfSh-15	3	1	A	Common Loon	1	1		
DfSh-15	3	1	A	Albatross sp.	1	1		
DfSh-15	3	3	A	Unidentifiable Mammal	1	1		
DfSh-15	3	3	A	Deer	2	1		
DfSh-15	3	3	A	Unidentifiable Bird	1	1		
DfSh-15	3	5	A	Unidentifiable Mammal	11	N/A		
DfSh-15	3	5	A	Unidentifiable Land Mammal	7	N/A		
DfSh-15	3	5	A	Unidentifiable Sea Mammal	0	N/A		
DfSh-15	3	5	A	Unidentifiable Bird	3	N/A		
DfSh-15	3	5	A	Albatross sp.	2	1		
DfSh-15	3	5	A	Medium/Large Duck sp.	1	1		
DfSh-15	3	5	A	Large Gull sp.	1	1		
DfSh-15	3	5	A	Unidentifiable Fish	10	N/A		
DfSh-15	3	5	A	Salmon sp.	29	1		

DfSh-15	3	5	A	Dogfish	21	1		
DfSh-15	3	5	A	Pile Perch	1	1		
DfSh-15	3	5	A	Perch sp.	2	1		
DfSh-15	3	5	A	Lingcod	3	1		
DfSh-15	3	5	A	Rockfish sp.	5	1		
DfSh-15	3	5	A	Pacific Herring	1	1		
DfSh-15	3	5	A	Ratfish	2	2	Tooth # 3	L
DfSh-15	3	5	A	Plainfin Midshipman	1	1		
DfSh-15	3	5	A	Pollock/Pacific Cod	2	1		
DfSh-15	3	5	B	Unidentifiable Mammal	1	N/A		
DfSh-15	3	5	B	Unidentifiable Land Mammal	2	N/A		
DfSh-15	3	5	B	Unidentifiable Sea Mammal	0	N/A		
DfSh-15	3	5	B	Unidentifiable Bird	2	N/A		
DfSh-15	3	5	B	Albatross sp.	1	1		
DfSh-15	3	5	B	Pelagic Cormorant	1	1		
DfSh-15	3	5	B	Canada Goose	1	1		
DfSh-15	3	5	B	Medium Duck sp.	3	1		
DfSh-15	3	5	B	Medium/Large Duck sp.	1	1		
DfSh-15	3	5	B	Medium Bird	1	1		
DfSh-15	3	5	B	Unidentifiable Fish	89	N/A		
DfSh-15	3	5	B	Salmon sp.	7	1		
DfSh-15	3	5	B	Dogfish	37	1		
DfSh-15	3	5	B	Ratfish	5	2	Tooth # 3	L
DfSh-15	3	5	B	Pacific Herring	10	1		
DfSh-15	3	5	B	Plainfin Midshipman	2	1		
DfSh-15	3	5	B	Pacific Halibut	1	1		
DfSh-15	3	5	B	Skate sp.	1	1		
DfSh-15	3	5	B	Northern Anchovy	2	1		
DfSh-15	3	5	B	Rockfish sp.	79	5	Maxillary	R
DfSh-15	3	7	A	Unidentifiable Bird/Mammal	1	N/A		
DfSh-15	3	7	A	Unidentifiable Mammal	0	N/A		
DfSh-15	3	7	A	Unidentifiable Land Mammal	4	N/A		
DfSh-15	3	7	A	Unidentifiable Sea Mammal	0	N/A		
DfSh-15	3	7	A	Deer	3	1		
DfSh-15	3	7	A	Dog	3	1		
DfSh-15	3	7	A	Mink	6	1		
DfSh-15	3	7	A	Harbour Seal	1	1		
DfSh-15	3	7	A	Unidentifiable Bird	3	N/A		
DfSh-15	3	7	A	Albatross sp.	2	1		
DfSh-15	3	7	A	Unidentifiable Fish	42	N/A		
DfSh-15	3	7	A	Salmon sp.	13	1		
DfSh-15	3	7	A	Ratfish	1	1		

DfSh-15	3	7	A	Pacific Hake	1	1		
DfSh-15	3	7	A	Plainfin Midshipman	3	1		
DfSh-15	3	7	A	Lingcod	1	1		
DfSh-15	3	7	A	Pacific Herring	9	2	Operculum/Dentary	R
DfSh-15	3	7	A	Rockfish sp.	21	2	Operculum	L
DfSh-15	3	7	A	Sulpin sp.	2	1		
DfSh-15	3	7	A	Perch sp.	1	1		
DfSh-15	3	7	B	Unidentifiable Mammal	10	N/A		
DfSh-15	3	7	B	Unidentifiable Land Mammal	14	N/A		
DfSh-15	3	7	B	Unidentifiable Sea Mammal	2	N/A		
DfSh-15	3	7	B	Deer	6	1		
DfSh-15	3	7	B	Dog	4	1 or 2		
DfSh-15	3	7	B	Mink	12	1		
DfSh-15	3	7	B	Deer Mouse	1	1		
DfSh-15	3	7	B	Large Land Mammal	1	1		
DfSh-15	3	7	B	Harbour Seal	1	1		
DfSh-15	3	7	B	Northern Sea Lion	1	1		
DfSh-15	3	7	B	Unidentifiable Bird	21	N/A		
DfSh-15	3	7	B	Bald Eagle	1	1		
DfSh-15	3	7	B	Double-Crested Cormorant	1	1		
DfSh-15	3	7	B	Common Raven	1	1		
DfSh-15	3	7	B	Albatross sp.	4	1		
DfSh-15	3	7	B	Large Duck sp.	1	1		
DfSh-15	3	7	B	Small Gull sp.	1	1		
DfSh-15	3	7	B	Medium Gull sp.	1	1		
DfSh-15	3	7	B	Large Gull sp.	3	1		
DfSh-15	3	7	B	Unidentifiable Fish	305	N/A		
DfSh-15	3	7	B	Salmon sp.	151	2	Pelvis/Scapula	L/R
DfSh-15	3	7	B	Dogfish	4	1		
DfSh-15	3	7	B	Ratfish	24	6	Tooth # 2	R
DfSh-15	3	7	B	Plainfin Midshipman	7	2	Articular	R
DfSh-15	3	7	B	Pacific Herring	10	1		
DfSh-15	3	7	B	Pacific Hake	3	1		
DfSh-15	3	7	B	Lingcod	22	1		
DfSh-15	3	7	B	Rockfish sp.	160	5	Quadrate	L
DfSh-15	3	7	B	Pollock	2	1		
DfSh-15	3	7	B	Pacific Cod OR Pollock	1	1		
DfSh-15	3	7	B	Perch sp.	2	1		
DfSh-15	3	7	B	Sculpin sp.	24	1		
DfSh-15	3	7	B	Skate sp.	1	1		
DfSh-15	3	7	B	Greenling sp.	2	1		
DfSh-15	3	7	B	Pacific Sanddab	2	1		
DfSh-15	3	7	B	Starry Flounder	1	1		
DfSh-15	3	7	B	Flatfish sp.	4	2	Size differences	

DfSh-15	3	9	B	Lingcod	1	1		
DfSh-15	3	9	B	Northern Anchovy	4	1		
DfSh-15	3	9	B	Pacific Sanddab	1	1		
DfSh-15	3	9	B	Unidentifiable Bird	11	N/A		
DfSh-15	3	9	B	Large Bird	1	1		
DfSh-15	3	9	B	Bald Eagle	24	1		
DfSh-15	3	9	C	Unidentifiable Bone	1	N/A		
DfSh-15	3	9	C	Unidentifiable Bird/Mammal	5	N/A		
DfSh-15	3	9	C	Unidentifiable Mammal	0	N/A		
DfSh-15	3	9	C	Unidentifiable Land Mammal	0	N/A		
DfSh-15	3	9	C	Unidentifiable Sea Mammal	1	N/A		
DfSh-15	3	9	C	Mink	1	1		
DfSh-15	3	9	C	Dog	4	2 or 3	2 adult upper 2nd molars plus one deciduous tooth	
DfSh-15	3	9	C	Fur Seal	1	1		
DfSh-15	3	9	C	Unidentifiable Bird	6	N/A		
DfSh-15	3	9	C	Northwestern Crow	1	1		
DfSh-15	3	9	C	Songbird	1	1		
DfSh-15	3	9	C	Western Grebe	1	1		
DfSh-15	3	9	C	Horned Grebe	1	1		
DfSh-15	3	9	C	Large Gull sp.	1	1		
DfSh-15	3	9	C	Medium Duck sp.	2	1		
DfSh-15	3	9	C	Unidentifiable Fish	54	N/A		
DfSh-15	3	9	C	Salmon sp.	41	1		
DfSh-15	3	9	C	Dogfish	3	1		
DfSh-15	3	9	C	Ratfish	2	1		
DfSh-15	3	9	C	Greenling sp.	6	1		
DfSh-15	3	9	C	Pacific Herring	2	1		
DfSh-15	3	9	C	Pile Perch	13	2	Inferior Pharyngeal Plate	
DfSh-15	3	9	C	Perch sp.	7	1		
DfSh-15	3	9	C	Rockfish sp.	21	2	Dentary	L
DfSh-15	3	9	C	Starry Flounder	1	1		
DfSh-15	3	9	C	Small Flatfish sp.	5	N/A		
DfSh-15	3	9	C	(Red?) Irish Lord	1	1		
DfSh-15	3	9	C	Lingcod	1	1		
DfSh-15	3	9	C	Pacific Hake	1	1		
DfSh-15	3	9	C	Plainfin Midshipman	1	1		
DfSh-15	3	9	C	Northern Anchovy	1	1		
DfSh-15	3	11	C	Unidentifiable Bird/Mammal	3	N/A		
DfSh-15	3	11	C	Unidentifiable Mammal	1	N/A		
DfSh-15	3	11	C	Unidentifiable Land Mammal	3	N/A		

DfSh-15	3	11	C	Unidentifiable Sea Mammal	2	N/A		
DfSh-15	3	11	C	Mink	1	1		
DfSh-15	3	11	C	Fur Seal	2	1		
DfSh-15	3	11	C	Medium Mammal	1	1		
DfSh-15	3	11	C	Unidentifiable Bird	25	N/A		
DfSh-15	3	11	C	Albatross sp.	5	1		
DfSh-15	3	11	C	Great Horned Owl	3	1		
DfSh-15	3	11	C	Bald Eagle	1	1		
DfSh-15	3	11	C	Double-Crested Cormorant	1	1		
DfSh-15	3	11	C	Songbird	1	1		
DfSh-15	3	11	C	Common Murre	7	2	Tibiotarsus	L
DfSh-15	3	11	C	Murrelet sp.	1	1		
DfSh-15	3	11	C	Pacific Loon	1	1		
DfSh-15	3	11	C	Canada Goose	2	1		
DfSh-15	3	11	C	Medium Duck sp.	3	1		
DfSh-15	3	11	C	Small Gull sp.	1	1		
DfSh-15	3	11	C	Large Gull sp.	2	1		
DfSh-15	3	11	C	Unidentifiable Fish	538	N/A		
DfSh-15	3	11	C	Salmon sp.	886	12	Pelvis	R
DfSh-15	3	11	C	Dogfish	14	1		
DfSh-15	3	11	C	Ratfish	7	4	Tooth # 2	L
DfSh-15	3	11	C	Pile Perch	1	1		
DfSh-15	3	11	C	Perch sp.	10	1		
DfSh-15	3	11	C	Greenling sp.	16	2	Hyomandibular	L&R
DfSh-15	3	11	C	Pacific Hake	2	1		
DfSh-15	3	11	C	Lingcod	57	1 or 2		
DfSh-15	3	11	C	Plainfin Midshipman	18	3	Cleithrum	L
DfSh-15	3	11	C	Rockfish sp.	95	6	Interneural Spine	
DfSh-15	3	11	C	Pacific Herring	162	4	Prootic/Pterotic	
DfSh-15	3	11	C	Northern Anchovy	11	1		
DfSh-15	3	11	C	Flatfish sp.	4	1		
DfSh-15	3	13	C	Unidentifiable Mammal	2	N/A		
DfSh-15	3	13	C	Unidentifiable Land Mammal	0	N/A		
DfSh-15	3	13	C	Unidentifiable Sea Mammal	1	N/A		
DfSh-15	3	13	C	Unidentifiable Bird	4	N/A		
DfSh-15	3	13	C	Cormorant sp.	1	1		
DfSh-15	3	13	C	Common Murre	1	1		
DfSh-15	3	13	C	Small Gull or Kittiwake sp.	1	1		
DfSh-15	3	13	C	Unidentifiable Fish	80	N/A		
DfSh-15	3	13	C	Salmon sp.	9	1		
DfSh-15	3	13	C	Ratfish	5	2	Tooth # 3	R
DfSh-15	3	13	C	Rockfish sp.	8	2	Post-Clavicle B	?
DfSh-15	3	13	C	Pacific Herring	1	1		
DfSh-15	3	13	C	Northern Anchovy	1	1		
DfSh-15	3	13	C	Greenling sp.	3	1		
DfSh-15	3	13	C	Perch sp.	3	1		

DfSh-15	3	13	C	Pacific Sanddab	1	1		
DfSh-15	3	13	C	Cabezon	1	1		
DfSh-15	3	13	D	Unidentifiable Mammal	13	N/A		
DfSh-15	3	13	D	Unidentifiable Land Mammal	6	N/A		
DfSh-15	3	13	D	Unidentifiable Sea Mammal	3	N/A		
DfSh-15	3	13	D	Deer	1	1		
DfSh-15	3	13	D	Harbour Seal	1	1		
DfSh-15	3	13	D	Northern Sea Lion	1	1		
DfSh-15	3	13	D	Unidentifiable Bird	19	N/A		
DfSh-15	3	13	D	Double-Crested Cormorant	1	1		
DfSh-15	3	13	D	Cormorant sp.	1	1		
DfSh-15	3	13	D	Common Murre	1	1		
DfSh-15	3	13	D	Albatross sp.	4	1		
DfSh-15	3	13	D	Small Gull sp.	1	1		
DfSh-15	3	13	D	Small Duck sp.	1	1		
DfSh-15	3	13	D	Large Duck sp.	2	1		
DfSh-15	3	13	D	Unidentifiable Fish	163	N/A		
DfSh-15	3	13	D	Salmon sp.	72	1		
DfSh-15	3	13	D	Dogfish	2	1		
DfSh-15	3	13	D	Pile Perch	3	1		
DfSh-15	3	13	D	Perch sp.	1	1		
DfSh-15	3	13	D	Ratfish	39	10	Tooth # 3	R
DfSh-15	3	13	D	Greenling sp.	4	1		
DfSh-15	3	13	D	Plainfin Midshipman	1	1		
DfSh-15	3	13	D	Rockfish sp.	28	3	1st Interhaemal Spine	
DfSh-15	3	13	D	Lingcod	6	1		
DfSh-15	3	13	D	Pacific Herring	10	2		
DfSh-15	3	13	D	Northern Anchovy	5	1		
DfSh-15	3	13	D	Cabezon	1	1		
DfSh-15	3	13	E	Unidentifiable Mammal	2	N/A		
DfSh-15	3	13	E	Unidentifiable Land Mammal	1	N/A		
DfSh-15	3	13	E	Unidentifiable Sea Mammal	1	N/A		
DfSh-15	3	13	E	Deer	1	1		
DfSh-15	3	13	E	Small Sea Mammal	1	1		
DfSh-15	3	13	E	Unidentifiable Bird	8	N/A		
DfSh-15	3	13	E	White-Winged Scoter	4	1		
DfSh-15	3	13	E	Large Duck sp.	2	1		
DfSh-15	3	13	E	Medium/Large Gull sp.	1	1		
DfSh-15	3	13	E	Unidentifiable Fish	39	N/A		
DfSh-15	3	13	E	Salmon sp.	47	1		
DfSh-15	3	13	E	Dogfish	1	1		
DfSh-15	3	13	E	Pile Perch	1	1		

DfSh-15	3	13	E	Perch sp.	1	1		
DfSh-15	3	13	E	Ratfish	2	2	Tooth # 3	R
DfSh-15	3	13	E	Rockfish sp.	4	2	Size differences	
DfSh-15	3	13	E	Cabezon	1	1		
DfSh-15	3	13	E	Pacific Herring	2	1		
DfSh-15	3	13	E	Greenling sp.	2	1		
DfSh-15	3	13	E	Lingcod	1	1		
DfSh-15	3	13	E	Perch sp. OR Rockfish sp.	1	1		
DfSh-15	3	15	F	Unidentifiable Bird/Mammal	10	N/A		
DfSh-15	3	15	F	Unidentifiable Mammal	2	N/A		
DfSh-15	3	15	F	Unidentifiable Land Mammal	11	N/A		
DfSh-15	3	15	F	Unidentifiable Sea Mammal	2	N/A		
DfSh-15	3	15	F	Deer	3	1		
DfSh-15	3	15	F	Harbour Seal	1	1		
DfSh-15	3	15	F	Unidentifiable Bird	23	N/A		
DfSh-15	3	15	F	Albatross sp.	7	1		
DfSh-15	3	15	F	Double-Crested Cormorant	1	1		
DfSh-15	3	15	F	Unidentifiable Fish	163	N/A		
DfSh-15	3	15	F	Salmon sp.	336	4	Vertebrae	
DfSh-15	3	15	F	Dogfish	55	3	Dorsal Spine	
DfSh-15	3	15	F	Pacific Herring	6	1		
DfSh-15	3	15	F	Ratfish	1	1		
DfSh-15	3	15	F	Pile Perch	2	2	Inferior Pharyngeal Plate	
DfSh-15	3	15	F	Perch sp.	4	1		
DfSh-15	3	15	F	Cabezon	5	1		
DfSh-15	3	15	F	Pacific Hake	1	1		
DfSh-15	3	15	F	Lingcod	17	1		
DfSh-15	3	15	F	Starry Flounder	1	1		
DfSh-15	3	15	F	Greenling sp.	5	1		
DfSh-15	3	15	F	Plainfin Midshipman	1	1		
DfSh-15	3	15	F	Rockfish sp.	29	1?		
DfSh-15	3	15	G	Unidentifiable Mammal	1	N/A		
DfSh-15	3	15	G	Unidentifiable Land Mammal	4	N/A		
DfSh-15	3	15	G	Unidentifiable Sea Mammal	0	N/A		
DfSh-15	3	15	G	Unidentifiable Bird	17	N/A		
DfSh-15	3	15	G	Albatross sp.	5	1		
DfSh-15	3	15	G	Unidentifiable Fish	67	N/A		
DfSh-15	3	15	G	Salmon sp.	37	1		
DfSh-15	3	15	G	Dogfish	23	1		
DfSh-15	3	15	G	Rockfish sp.	22	2		
DfSh-15	3	15	G	Lingcod	4	1		

DfSh-15	3	15	G	Greenling sp.	10	1		
DfSh-15	3	15	G	Cabezon	4	1		
DfSh-15	3	15	G	Plainfin Midshipman	2	1		
DfSh-15	3	15	G	Large Sculpin sp.	1	1		
DfSh-15	3	17	G	Unidentifiable Bird/Mammal	15	N/A		
DfSh-15	3	17	G	Unidentifiable Mammal	26	N/A		
DfSh-15	3	17	G	Unidentifiable Land Mammal	5	N/A		
DfSh-15	3	17	G	Unidentifiable Sea Mammal	1	N/A		
DfSh-15	3	17	G	Deer	3	1		
DfSh-15	3	17	G	Sea Otter	1	1		
DfSh-15	3	17	G	Harbour Seal	1	1		
DfSh-15	3	17	G	Unidentifiable Bird	36	N/A		
DfSh-15	3	17	G	Albatross sp.	3	1		
DfSh-15	3	17	G	Unidentifiable Fish	238	N/A		
DfSh-15	3	17	G	Salmon sp.	325	6	Scapula	L
DfSh-15	3	17	G	Dogfish	46	3	Dorsal Spine	
DfSh-15	3	17	G	Pile Perch	4	1		
DfSh-15	3	17	G	Perch sp.	2	1		
DfSh-15	3	17	G	Pacific Herring	12	1		
DfSh-15	3	17	G	Plainfin Midshipman	8	1		
DfSh-15	3	17	G	Greenling sp.	42	2	Basioccipital / Ceratohyal	R
DfSh-15	3	17	G	Pacific Cod OR Pollock	1	1		
DfSh-15	3	17	G	Rockfish sp.	75	2	Quadrate	L
DfSh-15	3	17	G	Cabezon	4	1		
DfSh-15	3	17	G	Starry Flounder	1	1		
DfSh-15	3	17	G	Flatfish sp.	3	1		
DfSh-15	3	17	G	Lingcod	10	2	Vertebrae	
DfSh-15	3	17	G	Pacific Hake	16	1		
DfSh-15	3	19	G	Unidentifiable Mammal	1	1		
DfSh-15	3	19	G	Large Bird	1	1		
DfSh-15	3	19	G	Albatross sp.	1	1		
DfSh-15	3	19	G	Unidentifiable Fish	16	N/A		
DfSh-15	3	19	G	Salmon sp.	36	1		
DfSh-15	3	19	G	Spiny Dogfish	8	1		
DfSh-15	3	19	G	Rockfish sp.	7	2	Size differences	
DfSh-15	3	19	G	Greenling sp.	3	2	Size differences	
DfSh-15	3	19	G	Lingcod	1	1		

APPENDIX B: Presence of seasonal markers within each unit at the Hiikwis site complex

Unit 4, Uukwatis (DfSh-15)				
Level/Layer	**Spring**	**Summer**	**Fall**	**Winter**
4/C	xx	x		xxx
6-8/D-F	xx	x	x	xxx
7/E	xxxxxxx	xx	xxx	xxxxx
10/F	xxxxx	xxx	xx	xxxx
13/G	xxxxx	xxxx	xx	xx
16/G	xxx	xx	x	xx
16/H	xxxx	xx	x	xxxx
16/I	xxxxxxxx	xxxx	xxx	xxx
19/G	xxxx	xxx	xx	xxx
19/H	xx	x	x	xx
19/I				
19/J	xxxxxx	x	x	xxxxxx
22/I	xxxxxx	x	xx	xxxxx
22/K	xxxxx	x	xxx	xxxxxx
25/L	x			xx
28/M				

x = one seasonal species

Seasonal Species Identified within Unit 4:
Salmon: Presence of vertebrae with few to no cranial elements – Winter
Pacific hake: Spring and Summer
Pacific halibut – Spring and Summer
Northern anchovy – Spring and Summer
Cabezon: Winter
Pacific herring: Spring and Winter
Pacific cod: Spring and Winter
Lingcod: Winter
Red Irish lord: Spring
Bluefin tuna: Summer
White-winged scoter – Fall, Winter, and Spring
Cormorants: Spring and Fall
Geese: Spring and Fall
Scoters: Spring and Fall
Loons: Spring and Fall
Grebes: Winter
Albatross: Summer
Shearwater: Summer
Whale: Spring and Fall
Nursing fur seal: Summer

Unit 4A, Uukwatis (DfSh-15)				
Level/Layer	**Spring**	**Summer**	**Fall**	**Winter**
4/A	xxxx	x	x	xxxx
7/B	xxxx	x	xx	xxxxx
10/B	xxxxxxx	xxx	xx	xxxxx
13/B	x	x	x	x
16/B	xxxx	xxx	xx	xxxx
16/C	xxxx	xxx	xx	xxxx
19/C	xxx		x	x

x = one seasonal species

Seasonal Species Identified within Unit 4A:
Salmon: Presence of vertebrae with few to no cranial elements – Winter
Pacific hake: Spring and Summer
Pacific halibut – Spring and Summer
Northern anchovy – Spring and Summer
Cabezon: Winter
Pacific herring: Spring and Winter
Pacific cod: Spring and Winter
Lingcod: Winter
Red Irish lord: Spring
Bluefin tuna: Summer
White-winged scoter: Fall, Winter, and Spring
Cormorants: Spring and Fall
Geese: Spring and Fall
Loons: Spring and Fall
Grebe: Winter
Albatross: Summer
Shearwater: Summer
Whale: Spring and Fall

Unit 3, Uukwatis (DfSh-15)				
Level/Layer	**Spring**	**Summer**	**Fall**	**Winter**
1/A	x	x	x	
3/A				
5/A	x	x		xxx
5/B	xxxxx	xxx	xx	xx
7/A	xx	xx		xxx
7/B	xxx	xx	x	xxx
9/B	x	x		x
9/C	xxxx	xx		xxxx
11/C	xxxxxx	xxx	xxx	xx
13/C	xxx	x	x	xxx
13/D	xxx	xx	x	xxxx
13/E	xx		x	xxxxx
15/F	xxx	xx	x	xxxx
15/G		x		xxx
17/G	xx	xx		xxx
19/G		x		xx

x = one seasonal species

Seasonal Species Identified within Unit 3:
Salmon: Presence of vertebrae with few to no cranial elements – Winter
Pacific hake: Spring and Summer
Lingcod: Winter
Pacific herring: Spring and Winter
Pacific halibut – Spring and Summer
Northern anchovy – Spring and Summer
Red Irish lord: Spring
Cabezon: Winter
Albatross: Summer
Loons: Spring and Fall
Cormorants: Spring and Fall
Geese: Spring and Fall
White-winged scoter: Fall, Winter, and Spring

Unit N4-6, E0-2, Hiikwis proper (DfSh-16)				
Level/Layer	**Spring**	**Summer**	**Fall**	**Winter**
3/A	xx		xx	xx
5/A	xxxx	x	xxx	xxxxx
7/A	xxxxxx	xxx	xxx	xxxx
9/A	xxxxxxx	xx	xxxx	xxxxx
9/B	xxxxxxx	xx	xxxx	xxxxxx
11/A	xxxxxxxxx	xx	xxxx	xxxxxxxx
11/B	xxxxxxxxx	xxx	xxxxx	xxxxxx
13/A	xxxxxxx	xx	xxxx	xxxx
13 A/B	xxxxx	x	xxx	xxxx
13/B	xxxxxxxxxx	xxxxx	xxx	xxxxxx
13/C	xxxxxxxx	x	xxxx	xxxxxx
13/C1	xx		x	xxx

x = one seasonal species

Seasonal Species Identified within Unit N4-6, E0-2:
Salmon: Presence of vertebrae with few to no cranial elements – Winter
Lingcod: Winter
Pacific hake: Spring and Summer
Pacific halibut – Spring and Summer
Pacific herring: Spring and Winter
Pacific cod: Spring and Winter
Striped surf perch: Spring and Winter
Red Irish lord: Spring
Cabezon: Winter
Loons: Spring and Fall
Cormorants: Spring and Fall
Scoters: Spring and Fall
White-winged scoter: Spring, Fall, and Winter
Grebes: Winter
Rhinoceros auklet: Spring/summer
Whale: Spring and Fall

APPENDIX C: Inter-site comparison of Barkley Sound village sites – excavation methods and faunal analyses.

	Uukwatis	**Hiikwis proper**	**Ma'acoah**	**Ts'ishaa**	**Huu7ii**
Borden #	DfSh-15	DfSh-16	DfSi-5	DfSi-16	DfSh-7
Geographic Setting	Inner Barkley Sound on Vancouver Island (V.I.). Mud flats; streamside; Coniferous forest	Inner Barkley Sound on V.I. Rocky beach; Coniferous forest	Inner Barkley Sound on V.I.	Outer Barkley Sound on Benson Island.	Outer Barkley Sound on Diana Island.
Period of Occupation	Back Terrace: 2870-2750 cal BP to 2060-1880 BP Front: 1870-1620 cal BP to 920-720 BP; occupied until 20th century	1290-1160 cal BP to 520-310 cal BP; occupied until 20th century	From at least 600 cal BP; possibly up to 2000 cal BP	Back terrace: 5320-4870 cal BP to 3440-3000 BP. Possible date of 5920-5650 BP Front: 1870-1560 cal BP to 330-250 BP (core sample 2350-2130 cal BP)	Back terrace: 4800-3000 cal BP Front: 1500-400 cal BP
Year(s) Excavated	2008; 2010	2009	1991	1999-2001	2004; 2006
Screen size	1/4"	1/4"	1/4"	1/4"	2004: 1/8" 2006: 1/4"
Level size	10 cm	10 cm	10 cm	10 cm	5 cm
Total # of Units Excavated	5 2m x 2m; 2 1m x 2m extensions	5 2m x 2m	5 1m x 2m	35 2m x 2m	23 2m x 2m; 6 1m x 2m; 1 1m x 1m; 1 50cm x 8m trench
Volume Excavated	40.4 m³	22.8 m³	18.3 m³	163.0 m³	124.9 m³
# of Units Analyzed	2 plus 1 extension	1	5	5	3; plus the birds & mammals from 6 additional units. Also all fauna from one level only in 3 additional units
Overall NSP	12,433	14,186	12,198	48,962	80,308
Overall NISP	7735	7964	6741.5	23,877	43,833
Fish NISP	6919	5666	5750.5	22,100	40,146
Bird NISP	506	1972	494	256	859
Land	212	94	168	647	1135

Mammal NISP					
Sea Mammal NISP	98	232	329	874	1693
Seasonality	Year-round	Year-round; shift to winter	Year-round	Year-round; shift to spring/summer	Year-round
Salmon Use	Increases then decreases	Present throughout; increases around 800 BP	Present throughout; Increases over time	Rare in early levels; increases after 800 BP	Rare in early levels; increases after 800 BP
Whale Species Identified	Humpback & grey	Humpback, grey, & sperm	Present but not identified to species	Humpback, grey, finback, blue, & orca	Humpback, grey, finback, & right
References	MacLean 2013; McMillan pers. comm. 2012; Rodrigues & Yang 2014; Sellers 2013	MacLean 2013; McMillan pers. comm. 2012; Rodrigues & Yang 2014; Sellers 2013	Monks 2006	Arndt 2011; Frederick & Crockford 2005; McMillan & St. Claire 2005	Arndt 2011; Frederick 2012; McMillan & St. Claire 2012