A FAUNAL ANALYSIS OF TWO MIDDENS ON THE EAST COAST OF VANCOUVER ISLAND

by

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B.A., Washington State University, 1974

A THESIS SUBMITTED IN PARTIAL FULFILLMENT

OF THE REQUIREMENTS FOR THE DEGREE OF

MASTER OF ARTS

in the Department

of

Anthropology

We accept this thesis as conforming
to the required standard

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ABSTRACT

In this study the mammal, fish, and bird remains were analysed from two middens on either side of the Tsable River on the east coast of Vancouver Island. Both sites appear to be of the Locarno Beach culture type, with the Buckley Bay site (DjSf 13) consisting of a single component and the Tsable River Bridge site (DjSf 14) consisting of two components. The aims of the analysis were to determine what animals were collected at the sites, the contribution each animal made to the inhabitants' diet and the season of occupation of the sites. The results were compared between the two sites and with three other sites on the east coast of Vancouver Island: DkSg 2 in the Comox area, DiSe 7 at Deep Bay, and DiSc 1 at the mouth of the Little Qualicum River, and with the recent Coast Salish ethnographic data, paying particular attention to the Pentlatch. The data were analysed using the number of bone elements, weight of bone, the minimum number of individuals (MNI), and the live weight of each species multiplied by its MNI. The units compared were the whole components as no smaller units such as natural layers was determinable. The results indicate a general similarity between all of the three

components. Fish were caught in larger numbers than either mammals or birds. Herring was the most frequently caught fish in all three components. Other frequently caught fish were flatfishes, rockfish, salmon, and dogfish. The most variation between the components seems to lie in the proportion of salmon, herring, and the remaining fishes. DjSf 14II showed the highest amount of herring and DjSf 13 the highest amount of salmon. Despite the large numbers of fish caught, the mammals, particularly deer, probably provided the majority of the diet. The most frequently occurring mammal species in all components was *Canis* spp., probably mostly domestic dog. Deer was the next most numerous mammal species recovered in all components. Sea mammal elements were found in relatively small numbers and their position in the diet is debatable. Small mammals appear to have been hunted infrequently. As a whole birds seem to have been caught in the smallest numbers and supplied a small part of the overall diet. However, a large number of species were hunted. In all components the large gulls were the most frequently caught birds. Other frequently caught species were the dabbling ducks, scoters, and grouse, although the exact proportions vary considerably among the components. In comparison with the other sites in the area DjSf 13 and DjSf 14 show a wider range of species caught perhaps indicating a more lengthy seasonal occupation of these sites. The oldest component of DjSf 14 was occupied at least during the fall and spring, whether at two intervals or continuously is indeterminable. The most recent component of DjSf 14 and DjSf 13 seem to have been occupied during the entire year or at least during intervals during the entire year.

Examining Committee:

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ACKNOWLEDGEMENTS

My greatest thanks go to Dr. Donald Mitchell, my committee chairman, who suggested the topic of my thesis and who provided unending assistance. The other members of my committee, Dr. Nicolas Roland and Dr. Patrick Gregory assisted with advice in the final stages. Dr. Leland Donald was kind enough to assist me in determining the appropriate statistical measures to use.

This whole project would not have been possible without the use of the Provincial Museum's skeletal collections in the Vertebrate Biology and Archaeology Divisions. In both divisions space was always found for me to work, even though space was often at a premium. I deeply appreciate the great deal of assistance in the identifications I received from Gay Boehm and Susan Crockford of the Provincial Museum's Archaeology Division frequently when they were very busy.

All the maps in my thesis were drawn by Katherine Bernick. Without her very competent assistance I'm sure my maps and diagrams would have been only acceptable instead of the fine works that they are.

Many friends, my parents and particularly my husband are probably responsible for my never quite giving up. All of them have my gratitude.

I. INTRODUCTION

This study will examine intra-site and inter-site variability in the faunal remains from two locations in the Coast Salish region of the east coast of Vancouver Island. The data have been examined to determine, where possible, the season of collection of the animals, the season of site occupation and the relative proportion each species represents in the faunal assemblage and diet of the inhabitants. The sites providing the primary data are DjSf 13 at Buckley Bay and DjSf 14, the Tsable River Bridge site, on the south bank of the Tsable River. They are located within 400 metres of each other, on Baynes Sound, 24 kilometres south of Courtenay. Analysis of the seasonal pattern of shellfish collection in both sites has already been reported (Keen 1976). This analysis of the faunal remains will provide other seasonal data to complement Keen's report. The analysis of the artifactual material is in progress and when it is completed the three reports will provide a comprehensive analysis of these sites. Recently completed studies make it possible to compare the faunal assemblages of DjSf 13 and DjSf 14 with others in the immediate vicinity. The principle sites with which comparisons can be made are those at Deep Bay (DiSe 7)

(Monks 1977), and the Sandwick midden (DkSg 2) (Capes 1964) sites, respectively 8 kilometres south and 24 kilometres north of the Buckley Bay/Tsable River Bridge sites; and the Little Qualicum River site (DiSc 1) (Bernick 1976), about 48 kilometres south of the sites.

The ethnographic data on Coast Salish hunting, fishing, and food preparation techniques, particularly those of Vancouver Island Salish, offer another source of comparative data. These recent data could provide insights into the interpretation of the older Tsable River Bridge and Buckley Bay faunal assemblages and they can in turn give some indication of the time depth of the ethnographically known subsistence pattern.

II. DESCRIPTIONS OF SITES AND EXCAVATIONS

The Buckley Bay (DjSf 13) and Tsable River Bridge (DjSf 14) sites are located on the southeastern coast of Vancouver Island on Baynes Sound, opposite Denman Island. The Buckley Bay site is located to the north of Base Flat - a piece of land jutting into Baynes Sound and probably deltaic deposits of the Tsable River. The Tsable River runs through Base Flat, with the Tsable River Bridge site lying just off the southern portion of Base Flat (Fig. 1).

The Buckley Bay site (Fig. 2) once extended several hundred meters along the shore to the north of Base Flat but it has been partially destroyed by modern construction. An old road bed runs through the western portion of the site and during excavation evidence of further disturbance in the northeastern part of the site was uncovered. The site slopes to the shore quite steeply in some areas, and a small seasonal stream flows through the southern section. At present the northern portion of the site is clear of large trees and shrubs while the southern portion has a sparse covering of hemlock, Douglas fir and cedar with a few broadleafed maples, dogwood, and alders (Mitchell 1974a:2). The adjacent protected bay provides sand and mud flats which support a wide variety of bivalves and other invertebrates.

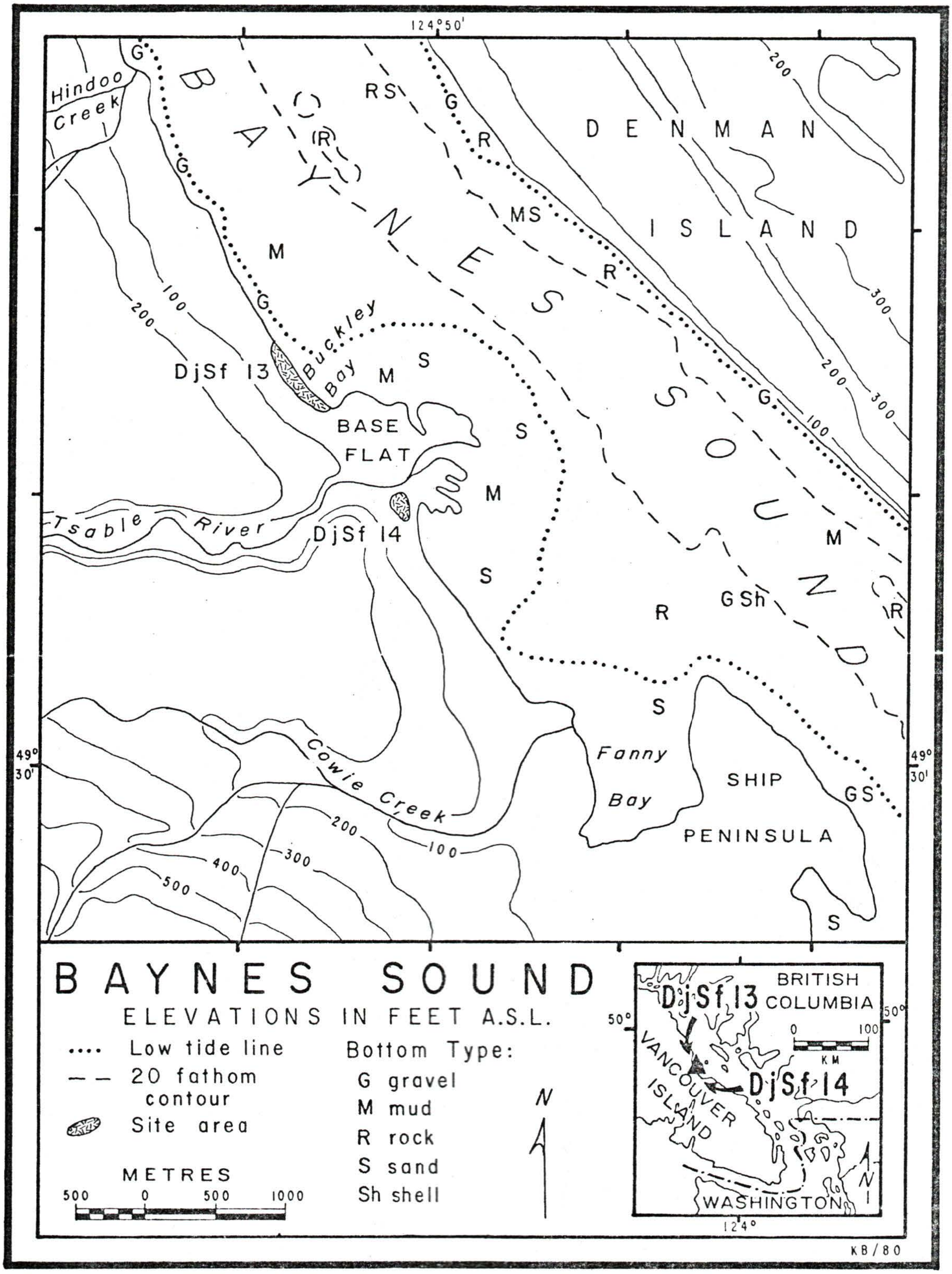

Figure 1. Map of the locations of the Buckley Bay (DjSf 13) and Tsable River Bridge (DjSf 14) sites.

A total of 28 excavation units was selected, of which 23 were excavated during the summers of 1973 and 1974. The remainder were located in areas impossible to excavate. The initial selection constituted a stratified random sample of a plot of two by two meter units that laid out on the surface to include all parts of the site. Test Cut (TC) 10 and the eastern portion of TC 4 were not selected randomly as they were designed to examine specific problems that had arisen during the excavations.

Trowels were used to excavate 10 cm, arbitrary levels and all material was screened through five strand to the inch hardware cloth. All bone and some of the shell were placed in the level bags and sorted in the laboratory some time later. Only articulated bones and a few special samples were given any closer provenience than the level designation. Column samples were selected randomly from the walls of each test cut.

The midden consisted in general of a sterile layer of top soil, followed by "alternating layers of crushed or whole shell and dark brown or grey soils with little or no shell" (Mitchell 1974b:3). A basal sterile layer of reddish to yellowish till with water-worn cobbles existed in all test cuts.

There are two radiocarbon date estimates for the site - both on shell samples. DjSf 13:R3 yielded an estimate

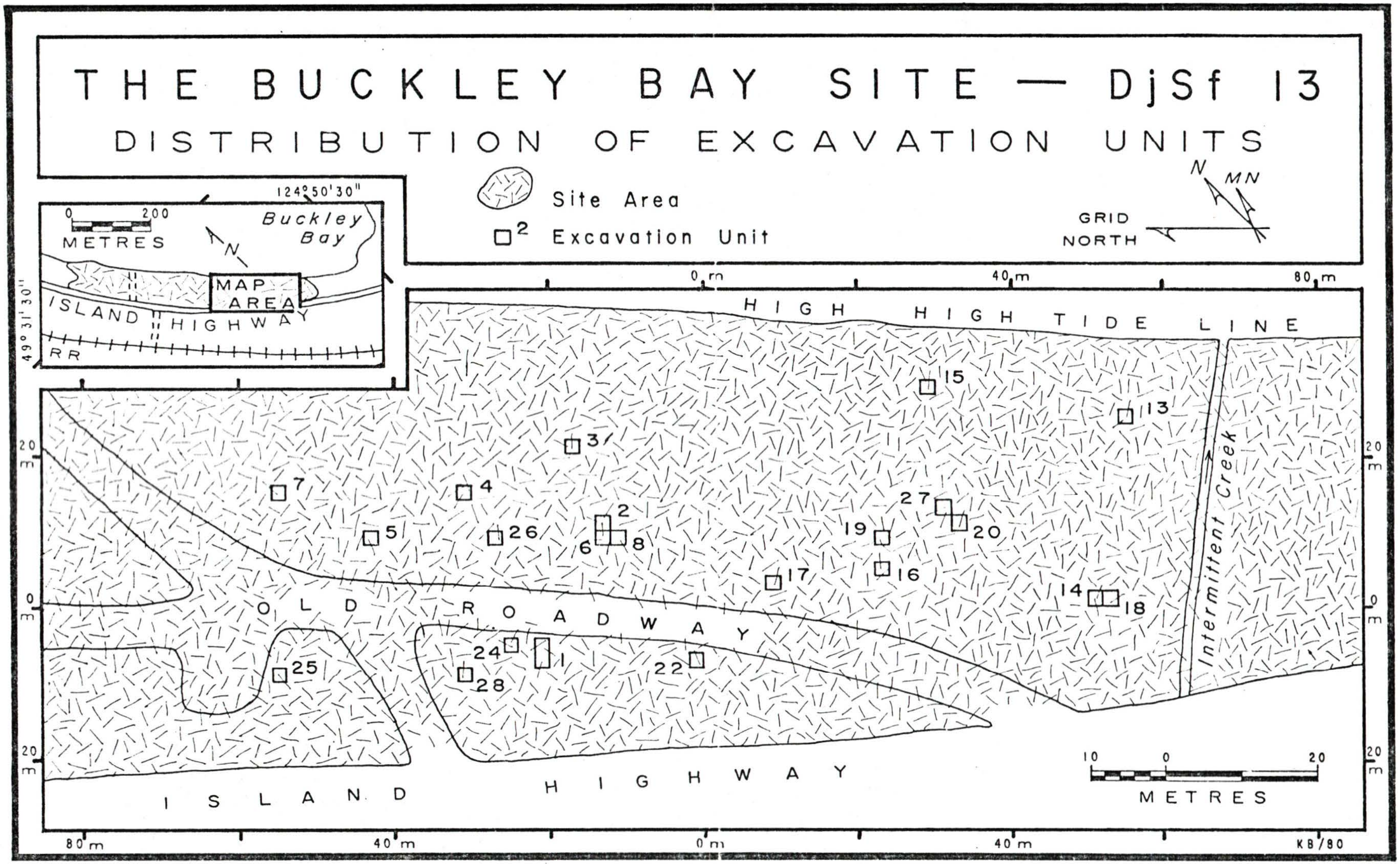

Figure 2. Map of the test cut locations of the Buckley Bay (DjSf 13) site.

of 2640 ± 90 years = 690 B.C. (GaK-7347), and sample DjSf 13:R1, an estimate of 2770 ± 90 years = 820 B.C. (GaK-7348).

Preliminary interpretation of the site indicates it consists of a single component (Mitchell 1974b:3). All of the artifacts fit into the Locarno Beach culture type, an interpretation which the radiocarbon estimates support.

Clam shells taken from the column sample of TC 4 were examined by Keen (1976) to determine if there was a seasonal pattern to clam collecting. Keen's analysis indicates that bivalves were collected all year, with an emphasis on the late spring and summer (1976:56). In addition, "there is no consistent pattern at all of butter clam or littleneck being exploited over the other either by season within a single natural matrix, or by season through time" (Keen 1976:58).

The Tsable River bridge site (Fig. 3) is bisected by the highway. It begins on the slopes of a small hill and extends to the high tide line, stretching about 400 metres along both sides of the highway. Between highest and lowest portions of the site there is a difference of about nine metres in elevation (Keen 1976:17). To the east and south of the site is a tidal slough connecting to Fanny Bay. The upper part of the site has few trees on it due to recent clearing. The lower part is thinly wooded with the same

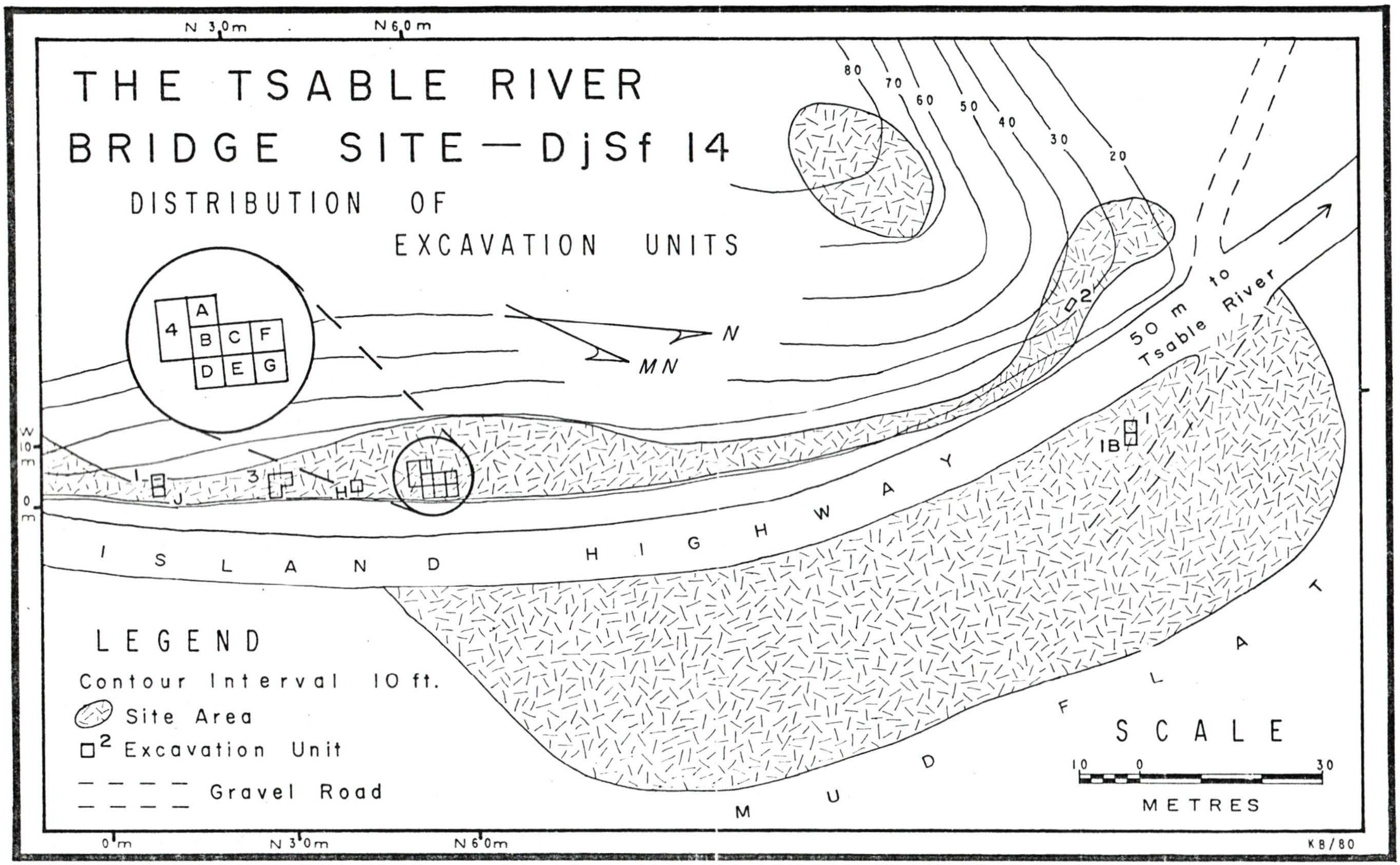

Figure 3. Map of the test cut locations of the Tsable River Bridge (DjSf 14) site.

type of vegetation found on the Buckley Bay site.

Fourteen units were excavated, four in the 1973 season and ten in the 1974 season. Test cuts 1, 2, and 4 were two by four metres. Test cut 3 consisted of three contiguous two by two metre units. All other units were two by two metres. Test cuts 1, 2, 3, and 4 were excavated in 20 cm, arbitrary levels. Test cuts A through J were excavated in 10 cm, arbitrary levels. The methods of excavation and collection were similar to those of DjSf 13. The units were placed in order to sample all obvious areas of the site, but none were selected randomly.

In general, the stratigraphy consisted of top soil followed by alternating layers of whole and broken shell or dark brown soil with little shell. In most, but not all, cases a layer of black pebbly soil with no shell followed. A sterile layer of orange-yellow glacial till with cobbles was found at the bottom of all units.

Four radiocarbon samples have been processed, two of shell and two of charcoal. Sample R5, charcoal from TC 1 at a depth of 1.80 below the surface, yielded an estimate of 3310 $\pm$ 180 years = 1360 B.C. (GaK-7349). A sample of shells, R7 from TC 3 at a depth of 1.40 metres from the surface, yielded an estimate of 3220 $\pm$ 140 years = 1270 B.C. (GaK-7350). Another sample from TC 3, R13, comprised shells from a depth of 3.20 metres below the surface, was dated at 3060 ± 110 years = 1110 B.C. (GaK-7351). Sample R15, charcoal from TC 4 at 4.40 metres below the surface, was estimated at 4090 ± 90 years = 2140 B.C. (GaK-7352).

Preliminary analysis of the Tsable River bridge site indicates the artifacts of at least the upper component conform best to the Locarno Beach Culture type (Mitchell, pers. comm.). Some of the artifacts leading to this interpretation are coal Gulf of Georgia complex objects, faceted ground slate points, and microblades. The radiocarbon estimates support this conclusion, although the basal date of 2140 B.C. ± 90 is old for the known Locarno Beach sites. Within the site, two components are definable based on the stratigraphy and the artifacts (Table 1). In some test cuts there is a definite stratigraphic break below which there is no shell and the dominant matrix is a black pebbly soil. The artifacts within this shell-free matrix are similar to those in the upper matrix, however there is a complete absence of ground slate. The two oldest dates, 1360 B.C. ± 130 from TC 1 and 2140 B.C. ± 90 from TC 4, come from the earliest component, Tsable River Bridge I. The more recent estimates, 1110 B.C. ± 110 and 1270 B.C. ± 140 both from TC 3, are associated with Tsable River Bridge II.

Analysis of the season of collection of bivalves for the Tsable River Bridge site indicates "the relative importance

TABLE I: DIVISION OF DjSf 14 INTO COMPONENTS I AND II BY TEST PIT.

Test Cut 1	
Surface A/1.40:	Component II
A/1.40-A/1.80 :	Mixed Components
A/1.80-A/2.30 :	Component I
Test Cut 1B	
Surface B/1.50:	Component II
B/1.50-B/1.80 :	Mixed Components
B/1.80-B/2.30 :	Component II
Test Cut 2	
Surface B/.50 :	Component II
B/.50-B/.80 :	Mixed Components
B/.80-B/1.20 :	Component I
Test Cut 3 (all sections)	
Surface C/3.20:	Component II
C/3.20-C/3.60 :	Mixed Components
C/3.20-C/4.40 :	Mixed Components in Section EO-2 N31-33
C/3.60-C/4.90 :	Component I
C/4.40-C/4.90 :	Component I in Section EO-2 N31-33
Test Cut 4	
Surface C/3.80:	Component II
C/3.80-C/4.20 :	Mixed Components
C/4.20-C/5.30 :	Component I
Test Cut A	
Surface C/3.70:	Component II
C/3.70-C/4.20 :	Mixed Components
C/4.20-C/4.60 :	Component I
Test Cut B	
Surface C/4.10:	Component II
C/4.10-C/4.50 :	Mixed Components
C/4.50-C/4.90 :	Component I
Test Cut C	
Surface C/4.30:	Component II
C/4.30-C/4.40 :	Mixed Components
C/4.40-C/4.70 :	Component I

TABLE I: (CONTINUED)

Test Cut D	
Surface C/4.40:	Component II
C/4.40-C/4.50 :	Mixed Components
C/4.50-C/5.30 :	Component I
Test Cut E	
Surface C/4.40:	Component II
C/4.40-C/4.60 :	Mixed Components
C/4.60-C/5.20 :	Component I
Test Cut F	
Surface C/4.10:	Component II
C/4.10-C/4.20 :	Mixed Components
C/4.20-C/4.30 :	Component I
Test Cut G	
Surface C/4.10:	Component II
Test Cut H	
Surface C/4.10:	Component II
Test Cut I	
Surface D/2.40:	Component II
Test Cut J	
Surface D/2.00:	Component II

of the seasons varies from strata to strata but often the most bivalves were gathered in the summer months and considerably fewer were taken in the spring and fall periods" (Keen 1976:50). No seasonal pattern of collecting a particular species of bivalve was apparent. This information is applicable only to Component II, as the matrix associated with Component I contained almost no shell.

Environmental Setting

The Tsable River Bridge and Buckley Bay sites are found within the Gulf Islands biotic area. As described by Munro and Cowan (1947:33-35), this biotic zone includes the Gulf Islands and a strip along the southeast coast of Vancouver Island extending from Victoria to the area of Comox. Its elevation is below 1000 feet. The temperature is moderate and the rainfall average is under 40 inches. Krajina (1965: 7) determines the rainfall average to be under 65 inches, which indicates the boundaries vary somewhat according to which source is used. Garry oak (*Quercus garryana*) and madrona (*Arbutus menziesii*) are the main species which identify this biotic area. This oak parkland has an abundance of flowering plants, particularly spring flowering bulbs (*Liliaceae*). Krajina's classification (1965:4-7) is essentially identical with some variation in details. He divides the coastal Douglas fir zone into two sub-zones based on soil types and annual precipitation. The Garry oak-Douglas fir association is found in drier areas than the madrona-Douglas fir zone.

To the west of the Gulf Islands biotic zone on Vancouver Island lies the Coast Forest biotic zone (Munro and Cowan 1947:32). It is characterized by mild weather and heavy rainfall (between 100 and 200 inches depending on the geographic area). The forest is dominated by Douglas fir (*Pseudotsuga menziesii*), broad-leafed maple (*Acer macrophyllum*), red alder (*Alnus rubra*), Sitka spruce (*Picea sitchensis*), hemlock (*Tsuga mertensia*), western red cedar (*Thuja plicata*) and others. The undergrowth is very thick and difficult to penetrate.

Although there are variations in the vegetation and climate between the Gulf Islands and Coast Forest biotic zones there are no significant differences in the mammalian fauna. The bird fauna in the Coast Forest is more limited than that of the Gulf Islands zone (Munro and Cowan 1947: 32). Relevant details of the habitats and life histories of the birds and mammal species in the sites will be discussed later in the Appendix.

The shoreline in the immediate vicinity of the Buckley Bay and Tsable River Bridge sites is a muddy, somewhat rocky tidal flat, which at low tide extends out a considerable distance around the mouth of the Tsable River (Fig. 1).

North of Buckley Bay is a fairly open beach with more rocks and gravel. Fanny Bay, immediately to the south of the Tsable River, is mainly muddy tidal flats with a small area of open water one metre deep at low tide. Baynes Sound is at its deepest next to Denman Island at 25 to 29 fathoms. The bottom of Baynes Sound is variable, from mud to muddy sand to areas of rock, particularly along the Denman Island shoreline. The Denman Island shoreline opposite Tsable River varies, with bluffs in some areas, and in others, large rock ledges and gravel or stone beaches.

The topography of the east coast of Vancouver Island is illustrated in Fig. 4. In Fig. 5 the major rivers are shown and those archaeological sites of importance to this study.

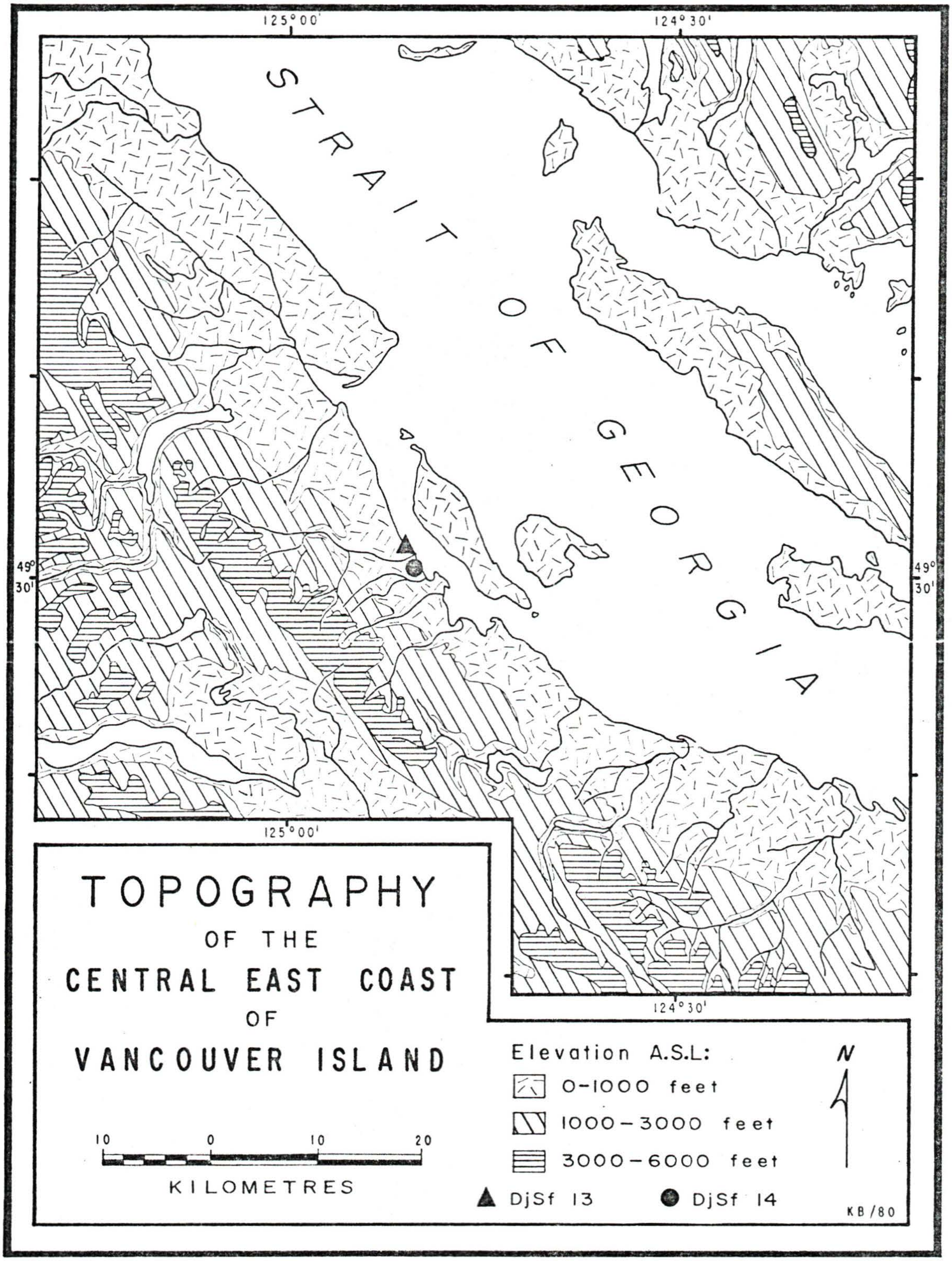

Figure 4. Topographical map of the central east coast of Vancouver Island.

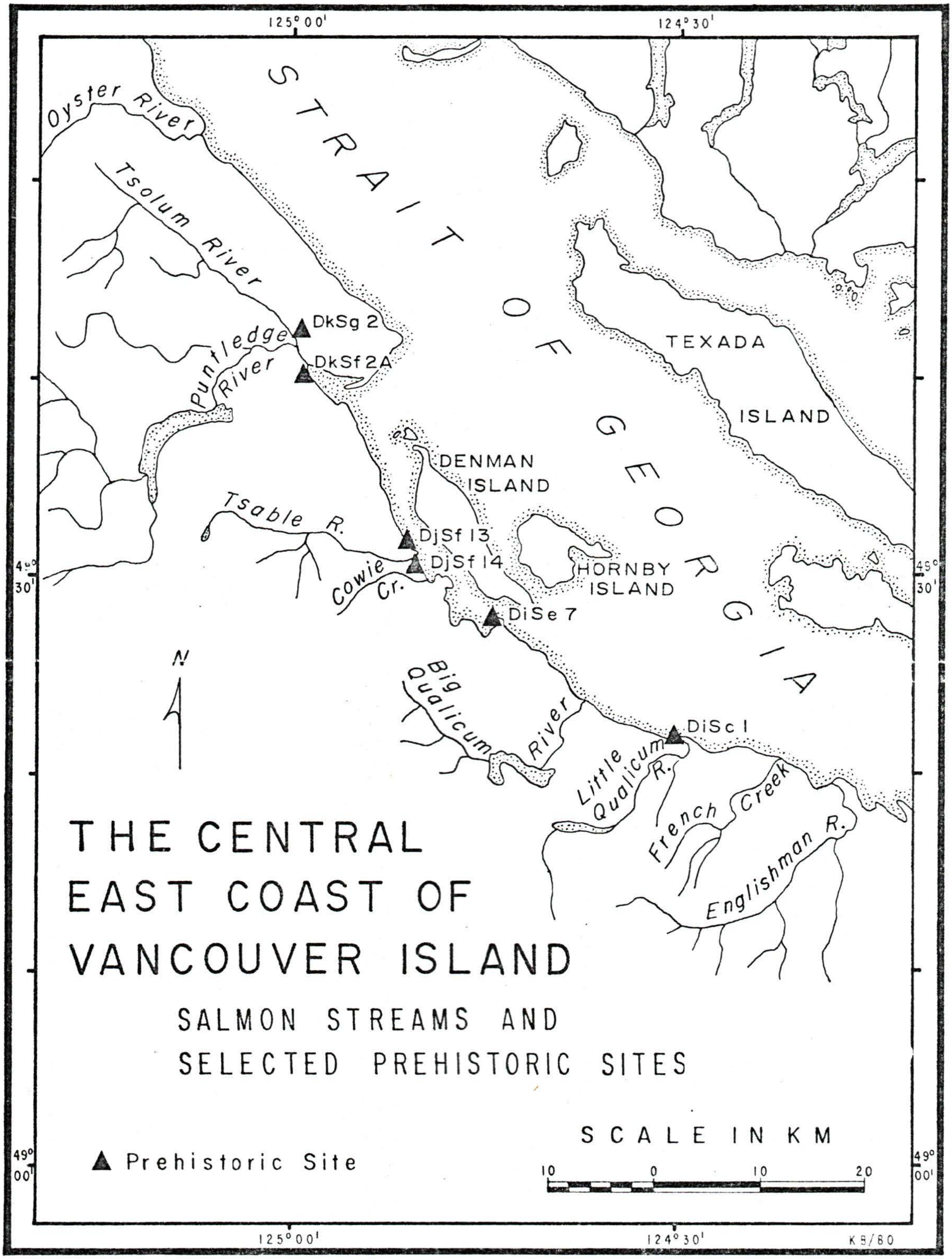

Figure 5. Major rivers and selected archaeological sites of the central east coast of Vancouver Island.

III. ETHNOGRAPHIC DATA

The Buckley Bay and Tsable River Bridge sites lie within the Coast Salish ethnographic area. Historically, a linguistic sub-group of the Coast Salish, the Pentlatch, included this area within their territory. Boas (1887:132) divides the Pentlatch into two groups based on linguistic criteria. The Pentlatch proper lived in the area from Comox, south to the Tsable River. The Saamen lived from the Tsable River south to the Horne Lake area, including Denman Island (Boas 1887:map). Barnett's informants indicated the "s:uckan", linguistic relatives of the Pentlatch lived in the Buckley Bay-Tsable River area. There were no occupants recorded at either site at contact. From analysis of his element list Barnett (1939:224) concluded "the Pentlatch as well as the Comox undoubtedly belong culturally with the Kwakiutl . . . the Comox and Pentlatch form a unit distinct from others of the same linguistic family. The division is sharpest on the island and most pronounced in the religious and ceremonial patterns." Although he does not include the Kwakiutl in his analysis, Jorgensen (1969:19,21) using linguistic data also groups the Pentlatch and Comox together, with the Sechelt being the next most similar.

Barnett (1939:224) had one Pentlatch informant when he gathered material for his element list study. Unfortunately the informant was not ideal. He was very old, spoke no English and was not interested in giving information. The translator was his wife, a Comox native from very near the Kwakiutl boundaries. Barnett feels the material from these informants is probably a confused mixture of Kwakiutl, Comox and Pentlatch practices. Both the general southern Gulf of Georgia Coast Salish and Pentlatch information (if there is any available) are given as a result of the uncertain status of the Pentlatch data and because there is no way of determining the length of time the Pentlatch have occupied the Tsable River area. The information available about the southern Gulf of Georgia Salish is particularly applicable as they occupy a region of similar environment to that of the northern Gulf of Georgia. The Tsable River area is most likely to have been in the Coast Salish territory for some time, but there is no method of determining which linguistic group within the Salish might have occupied it.

Coast Salish economic activities have been discussed at length elsewhere (Barnett 1979 and 1955; Duff 1952; Jenness n.d.; Suttles 1955 and 1974) and two pervasive common elements appear. One of these is a reliance on marine resources for the major portion of their diet, with salmon being the single most important component (Barnett

1955:15; Mitchell 1971:25). The other element is seasonal collection of resources, frequently involving movement of the people to various habitation sites for the collection of one or a few specific resources (Barnett 1955; Mitchell 1971:26-27). Within these broad outlines there is variation from group to group as a result of differential access to some resources through cultural or environmental restrictions.

There are no data available about Pentlatch seasonal movements, so the movements of other groups will be discussed to illustrate the patterning present.

In general the winter months (November to February or March) were spent in large villages and village clusters during which time a great deal of socializing, and some hunting and gathering took place. Jenness (n.d:7), speaking specifically of the West Saanich village of Tsartlip on Brentwood Bay, recounts from December to February "on fine days the men fished offshore for cod and grilse, or caught a few ducks, and the women gathered clams and a variety of seaweed . . . but for the most part the people subsisted on the dried fish and berries they had gathered during the summer." A similar pattern was found by Haeberlin and Gunther (1930:20) in the Puget Sound Salish who hunted seal and ducks during the winter in small groups. It is mentioned in several places that bears were hunted when in winter dormancy as well as other times of the year (e.g. Suttles 1955:25; Suttles 1974:148).

During the spring and summer months, the winter village aggregation broke up to exploit resources to which the families had access. Barnett (1955:29) states of the Slaiaman that "all of the food gathering places were named, owned, and occupied in the summer season by individual families." The West Saanich hunted seals and fished for spring salmon in March (Jenness n.d:7). In April and May "the men hunted deer and elk; at sea they fished for cod, grilse, spring salmon, halibut and particularly herring," while the women gathered camas and other plants (Jenness n.d:7). Some moved to San Juan Island for these activities. There is also mention by both Suttles (1974: 129) and Jenness (n.d:16) that diving ducks were caught with nets as the ducks were feeding on the herring spawn. Others contented themselves with capturing cod, spring salmon and grilse near the village" (Jenness n.d:8). Suttles (1974:138) states that the major deer hunting season for the Salish "was about June when hunters killed for winter supply."

Roughly from July to October, most of the Coast Salish economic activity centered around the salmon runs. The Nanaimo fished for salmon at the mouth of the Nanaimo River from August until December (Barnett 1955:22). The West

Saanich group moved to Point Roberts in July where they had fishing rights, returning to Brentwood Bay at the end of August (Jenness n.d:8-9). Some of the Cowichan moved to Mayne and Saltspring Islands while others stayed in the main village all year (Jenness n.d:8-9). The exact period when a Coast Salish group fished for salmon varied due to variations in the timing of the salmon run itself. For example, the West Saanich returned to their winter village in early September, catching dog salmon later in that month (Jenness n.d:9) while the Puget Sound Salish were not back to their winter villages until November (Haeberlin and Gunther 1930:20). These examples indicate that the Coast Salish annual routine was controlled by two factors: the seasonal availability of resources and access to collecting areas for these resources. It also should be understood the Coast Salish economic unit was highly variable, ranging from the whole winter village (which would be rare) to a single family unit.

Judging from the ethnographic data, most animals were collected at a particular time of the year. In addition many were collected by specific techniques and prepared for eating in particular ways. All of these methods could affect the remains found in an archaeological site. In the following pages I present the ethnographically known hunting techniques, season of collection and butchering methods for specific animals, concentrating mainly on the Coast Salish living in the vicinity of the Buckley Bay and Tsable River Bridge sites.

Deer

Barnett reports that "most hunting was done in the summer and late fall" (1955:95). Suttles (1974:138-139) informants were more specific about deer indicating that bucks were best in the late spring or early fall and does were best in the fall. Therefore they took bucks in the spring, and does in December for immediate use. Jenness (n.d:7-9) writes of deer being hunted in April, July, September and November with no mention of seasonal hunting of the sexes. The Pentlatch hunted deer in group drives and trapped them in pits (Barnett 1939:231-232). Jenness (n.d:11) states deer "were caught in three ways: in pits, in nets and by individual hunters with bows and arrows." Pits were dug along trails and were either just left for a passing deer to fall into or the deer might be driven into the pit by a group of men (Barnett 1955:97). Suttles (1974:145) says pits "were the most common device and perhaps the only one used by Vancouver Island groups." This statement is difficult to interpret as Barnett and Jenness describe several methods of hunting deer, neither author mentioning one method being favoured over others.

Nets strung along trails were used by several groups (Barnett 1955:103; Suttles 1974:143), but according to Barnett's Pentlatch informant they were not used by the Pentlatch (Barnett 1939:231). Reports vary as to whether dogs were used to assist in deer hunting. Barnett (1955: 96) writes "the use of hunting dogs was well established," and the Pentlatch informant said dogs were trained for hunting (1939:232). "A Saanich Indian said that his people never used dogs for driving the animals, having only the woolly-haired variety that was unsuitable for hunting; but a Westholme native said that in his district they did use the woolly-haired dog in deer drives" (Jenness n.d:12). Suttles' informants "disagree as to whether dogs were originally used in deer drives, but agree that they were in recent times" (1974:143). It seems probable that dogs were used for deer hunting, but it is no longer possible to say to what extent.

Some deer meat was eaten immediately and some dried for the winter. "The bones of deer killed in the late spring were cracked with rocks for the marrow, which was used as a cosmetic base. The lower leg-bones of bucks were sometimes saved for arrowheads and duck-spear points" (Suttles 1974:146-147). Barnett (1955:60) mentions that whole animals, including deer, were cooked in outdoor earth ovens. It appears that no one method of cooking was favoured over another for deer.

Elk

Suttles' informants reported elk were hunted in the same seasonal pattern as deer (1955:147). Barnett and Jenness mention no seasonal patterns. Both Suttles (1974: 147-148) and Jenness (n.d:11) record elk were hunted with the same methods as deer. Barnett (1955:103), however, writes elk were too large to be taken in deer nets, and this is confirmed by the Pentlatch informant (Barnett 1939:231). In direct conflict, Suttles Saanich informants caught elk in nets at Elk Lake, claiming elk were easier to catch than deer as they were heavier and clumsier (1974:147-148).

According to Suttles (1974:148) elk meat was also dried for winter use, otherwise there are no specific mentions of its use.

Bear

Barnett (1939:237) reports the Pentlatch hunted and ate bear. The only detailed information relating to bear hunting is recorded by Suttles (1974:148). As in the case of deer and elk, there were seasons when bear meat was felt to taste good, depending on what the bear had been eating. They were considered best in June when they had been eating fruit and in the fall when they fed on fish. In addition there is mention of bears being hunted while in winter dormancy (Suttles 1974:148; Barnett 1955:104).

> A few hunters hunted them with bow and arrows, trapped them with deadfalls, or smoked them out of hibernation (Suttles 1974:148).

> Bear meat was probably never eaten to the extent that venison or elk was, nor were bear skins used to the same extent. Bear grease was used as a cosmetic. It seems likely that bear hunting was stimulated by the market for skins offered by the Hudson's Bay Company (Suttles 1974:150).

Other Land Mammals

Information on the hunting and use of other land mammals is scarce. Barnett (1955:63) lists a group of mammals that were eaten, among which are cougars and raccoons, which were specifically denied by Barnett's Pentlatch informant (1939:237). Suttles (1974:96) mentions beaver, with some uncertainty as to whether it was eaten or not, raccoons, river otters, minks, fishers and martens as being trapped for their fur. Some of these animals may have been trapped mainly since the beginning of the commercial fur trade. In addition Suttles (1974:153) reports small rodents were not used and fox, bobcats, and cougars may not have been used before the fur trade. Barnett (1955:63) says minks and wolves were never eaten because of mythological associations. For these animals, most of which are quite small, the bow and arrow, and deadfall were used (Suttles 1974:96-97; Barnett 1955:97,100).

Seals and Porpoise

Both Barnett and Suttles feel that seal hunting was quite important to the Coast Salish. Barnett (1955:92) believes "economically, socially, and ritually, the primary animals hunted on the island were seals." Jenness (n.d:9) mentions after the West Saanich returned to their village in early September "often three or four canoes manned by men only went out among the islands to hunt seals, sea-lions and sea otters." "The Solachwan natives, however, occupied their village until about April, when they joined the others in moving out to False Narrows and Gabriola Island to fish . . . to hunt seals and sea-lions and to gather clams and camass" (Jenness n.d:10). It appears that sea mammals were hunted at a time convenient for the hunters, which could vary for each group, rather than at a time determined by the suitability of the sea mammals themselves. There is no mention of a season for porpoise hunting at all. Seals and sea lions were harpooned, clubbed, or netted (Barnett 1955:98-99, 102-103; Suttles 1974:106-109). The Pentlatch harpooned seal, sea lions and porpoise from a canoe and clubbed seals, but not sea lions, on the beach (Barnett, 1939:233).

Porpoise were harpooned with the same gear as used for seals.

Seal meat was cooked the same as any other meat. In addition, the fat was rendered and stored for later use (Barnett 1955:61; Suttles 1974:165).

Whales

The Klallam hunted whales (Gunther 1927:204) but it appears that the Salish of Vancouver Island and the Gulf Islands did little or no whaling, instead using the occasional whale that washed ashore. The Pentlatch informant denied either hunting of whales, or the use of stranded whales (Barnett 1939:233). Suttles (1974:167) reports one Saanichton man who killed one whale during historic times. In addition Jenness' Songish informants tell about whaling (n.d:19-20), but Suttles' Songish informants specifically deny whaling (1974:167-168). This conflict of reports is probably a good indication of the infrequence of whaling.

Birds

When discussing land and sea mammals there are few or no discrepancies between the Coast Salish and modern scientific nomenclatures. There are relatively few species of mammals in this area and all are quite distinctive in form and/or habitat. Unfortunately, this does not hold equally well when discussing birds, particularly the loon, grebe, sea bird and duck classes. It is quite possible, even likely, that the Coast Salish classification of birds only roughly parallels that of the modern scientific classification. Suttles is the only ethnographer of the Coast Salish to offer an example of a Coast Salish taxonomy of birds.

> The Semiahmoo informant JCh named 27 species taken. I am sure the list is not exhaustive. He classified them as "diving duck" (including mergansers, scoters, grebes, loons, cormorants, etc.), "larger marsh ducks" (swans, geese, brants), "smaller marsh ducks" (mallards, pintails, spoonbills, etc.) and snipes (Suttles 1974:126).

In addition to the difference in classification schemes, the ethnographers' reports are vague, using the name "duck" in most cases without more specific terminology. Therefore it is not possible to discuss each species of bird in terms of when, where, and how it was hunted, instead much broader categories have been used.

Waterfowl

There are only a few references to the season of waterfowl hunting. Jenness (n.d:7) says from December to February the West Saanich would go out and catch a few ducks on fine days. He also mentions setting underwater nets for ducks during the time of herring spawning in April (n.d:7). Suttles' Lummi informants said that they went duck hunting "in the fall or winter in the dark of the moon on rainy nights when the south wind was blowing" (1974:134). The Pentlatch hunted birds with the bow and arrow, slings, and snares (Barnett 1939:232, 245-247). The bow and arrow was apparently used during the daytime and at least occasionally from a canoe (Suttles 1974:135). Arrows were made specifically for birds (Jenness n.d:14; Barnett 1955: 102; Suttles 1974:135). Both Jenness and Suttles mention the swan as being hunted with bow and arrow (Jenness n.d:17; Suttles 1974:135). Spears appear to have been used mainly in connection with night hunting from a canoe using fire. Apparently, the ducks attempted to flee from the light of the fire (carried in an earth-filled box) into the shadow thrown by the hunters, the canoe and a mat screen and were speared as they came within reach (Barnett 1955:95-96; Suttles 1974:130-131). In a variation on this technique a net instead of a spear was used, being thrown over marsh ducks by the hunter. "The Lummi used the spear for diving ducks (Scoters and loons) and geese" (Suttles 1974:133). The use of a sling to throw rocks at ducks from the beach and snares to catch marsh ducks was mentioned by Suttles (1974:135). Standing permanent nets and submerged nets are mentioned for several groups (Barnett 1955:103;

Jenness n.d:16; Suttles 1974:128-129) but the Pentlatch or Comox informants denied using them (Barnett 1939:231).

Due to their availability, ducks were served at the winter feasts. They were usually eaten at once but were occasionally preserved by cooking and then drying (Suttles 1974:136). Waterfowl down was used in weaving (Suttles 1974:136).

Grouse

Both Suttles (1974:137) and Jenness (n.d:17) mention grouse being hunted. Both state grouse were not taken in very large numbers. Grouse were hunted using the bow and arrow, and Suttles had a Lummi informant who reported some type of snare being used to catch grouse also (Suttle 1974:137; Jenness n.d:17). The only method of cooking mentioned was burying the grouse whole in hot ashes (Suttles 1974:137).

Other Birds

Jenness (n.d:17) mentions eagles being hunted (presumably bald eagles, as golden eagles were uncommon on Vancouver Island). Barnett (1939:238; 1955:63) lists eagles and sea gulls as being eaten and owls as definitely not being eaten. "Snipes" (shorebirds) were killed by throwing a stick into a flock (Suttles 1974:136). In addition, "the eggs of the grouse, loon, shag [cormorant], duck, and sea gull were eaten" (Barnett 1955:63).

Fishes

As in the case of the birds, there are also nomenclature problems with the fishes. The common name cod covers the family Gadidae (Pacific cod, hake, tomcod and pollock), the family Hexagrammidae (greenlings and lingcod), and the genus *Sebastes* (rockcods or rockfishes). In the ethnographies it is very difficult, if not impossible in most cases, to sort out which fish is meant by the term "cod". Unfortunately, Suttles does not offer this time an example of a Coast Salish classification system. He says "informants gave native names which appear to be more or less equivalent to the English common names, suggesting that they too lump several species under a single name" (Suttles 1974:180). It should be mentioned that Suttles (1974:180) states "no true cod (Gadidae) were ordinarily taken by Straits fishermen." Therefore when Suttles talks of "cod," he apparently means only lingcod and rockfish. In the following discussion I will use the modern common names after Hart (1973) in cases where this does not cause further confusion and the term "cod" to refer to any case in which the exact fish is indeterminable.

Cod

Jenness is the only ethnographer who mentions any seasonal aspect to cod fishing. The Solachwan fished for cod in April in the area of False Narrows and Gabriola Island (Jenness n.d:10). The West Saanich fished for cod in the winter, December to February, on nice days, in April, May, June, and probably in the fall (Jenness n.d:7-9). Basically cod seems to have been fished for in those months when there wasn't some other more important activity. One of Suttles' Lummi informants reported there was no season for cod (1974:182).

Cod were taken using a spear and lure, and with a hook and line. A wooden lure was pushed deep into the water and released. Spinning to the surface, it attracted lingcod and some types of rockfish who were speared when within reach (Barnett 1955:84-85; Suttles 1974:108-181). Although he doesn't say specifically what type of fish were caught, Barnett's Pentlatch informant confirms the use of spears and wooden lures (1939:229,231). An alternative to the wooden lure was to catch a small greenling (Hexagrammidae) and use it as bait to draw the fish to the surface (Barnett 1955:85). Suttles (1974:181) feels this may have been used only for large lingcod. Jenness reports "the Saanich, and probably other groups, speared many cod by night" (n.d:22), but he doesn't offer any description of the exact technique. He also mentions spearing cod by day in shallow water during spawning, which would be in the early spring for the lingcod (n.d:22). Only Jenness and Barnett mention using a hook and line for catching cod. "More successful than the spear, perhaps, was the hook and line, the latter often made from kelp" (Jenness n.d:22). Barnett (1939: 230; 1955:84) reports the halibut hook was used for cod by the Pentlatch and others. Fishermen trolling for salmon sometimes caught lingcod and rockfish (Suttles 1974: 182).

No mention is made of any specific method of cooking cod. Cod could be dried for winter use (Barnett 1939: 236; 1955:62; Suttles 1974:182).

Flatfish

This category includes all flounders, sole, and halibut. Halibut was the most important of the flatfish for many of the Coast Salish. Perhaps as a result of this, the ethnographers recorded more specifics about fishing for halibut than for any other flatfish. The West Saanich fished halibut during April and some of the Cowichan fished off Mayne and Saltspring Islands during the mid-summer months (Jenness n.d:7,9). Suttles, referring to the Straits groups, says "men and sometimes women fished for halibut usually in the later spring and early summer, during the same period when fishermen trolled for salmon. Those who did not work on reef nets probably went right on trolling and fishing for halibut until late summer" (1974:170). The only mention of flounders is that they "were taken in fall and winter, probably because they were close at hand" (Suttles 1974:185).

Flatfish were taken by hook and line, with spears, nets, and in tidal traps. Halibut were taken only with a special U-shaped bentwood hook frequently baited with octopus (Jenness n.d:22; Suttles 1974:171-172; Barnett 1955:85-86). Barnett (1955:86) also mentions salmon eggs, cockles, and herring being used as bait but he doesn't specify for what fish or which type of hook and line. Other flatfish were taken with set lines consisting of small bone pins (Barnett 1955:85). Flatfish other than halibut were speared in shallow water, sometimes at night with fire (Jenness n.d:22; Suttles 1974:184-185). The Samish and Lummis used a flounder seine in a shallow bay, into which waders chased the fish (Suttles 1974:185). As Barnett does not mention this technique at all, it was possibly only of limited use. Tidal traps are only mentioned by Barnett, though he does not say exactly what fish were caught in them. In the paragraph preceding his discussion of tidal traps, he was writing about salmon.

However, from his description of tidal traps they should catch any shallow water fish, including flatfish.

> Rock and stake enclosures were built on the flats near the mouths of rivers . . . . They were of any shape, but low enough to be well covered at high tide. Fish and even seals passed over them, to be left aground or in shallow pools when the water subsided (Barnett 1955:82).

Barnett's informant reported the Pentlatch used stake enclosures, but he did not know about rock enclosures (1939:229). Flatfish other than halibut were eaten fresh, and sometimes smoked (Suttles 1974:185-186).

> Halibut were dried in the sun. The fish was cut parallel to the backbone into thin slices each the shape of the whole fish . . . . The backbone was cooked and eaten fresh (Suttles 1974:173).

It is interesting to note that the Puget Sound Salish stated they didn't dry flounder because it wouldn't keep (Haeberlin and Gunther 1930:22).

Dogfish

Dogfish were caught with a hook and line and speared. Jenness says they "were caught with the same tackle as halibut" (n.d:22). Both the Samish and Lummi speared dogfish when in shallow water (Suttles 1974:186). There is some confusion about the eating of dogfish. Barnett (1955: 63) says dogfish "were absolutely not eaten," only used for oil by the Pentlatch (1939:234; 1955:61) and as sandpaper (1939:245; 1955:111).

Herring

Herring appear to have been caught exclusively in the early spring during their spawning season because of the very heavy schooling activity at that time (Jenness n.d:23; Suttles 1974:126). Apparently the only method of catching herring was with a rake with sharp teeth set into the edge of a pole. The pole was swept through a concentration of herring, impaling them in the teeth (Barnett 1939:231;1955:86; Jenness n.d:23; Suttles 1974:182-183). In addition the herring roe was collected by putting cedar branches in the water where the herring could spawn on them (Barnett 1955:86; Suttles 1974:183).

Suttles reports "herring were eaten fresh, were dried, or were used for trolling bait" (1974:183).

Salmon

There are five species of salmon, each one with different seasons of availability, or areas of availability. For example, the spring salmon (*Oncorhynchus tshawytscha*) could be caught almost all year (Hart 1973:125; Suttles 1974:190). The sockeye (*O. nerka*) starts gathering for the spawning run in the summer (Hart 1973:119). The coho (*O. kisutch*) begins to gather in early fall for the spawning which takes place in October and November, while the young coho, or bluebacks, are available in the Strait of Georiga all year (Hart 1973:116). Chum salmon (*O. keta*) gather in autumn and spawn later in the year, perhaps into spring (Hart 1973:113). Pink salmon (*O. gorbuscha*) spawn during September and October on a two year cycle, but they are not present in the coastal area of southeastern Vancouver Island (Hart 1973:109-110). Ecological factors affect the distribution of the salmon themselves, and cultural factors influence where a Coast Salish group could fish. For example, Cowichan, West Saanich, and Nanaimo Indians all had access, through inherited rights, to fish for sockeye and pink salmon at Point Roberts in late summer and early fall (Barnett 1955:20-23). Many other Vancouver Island Salish did not have such rights and fished in their immediate vicinity.

There were many techniques for catching salmon - hook and line, several varieties of nets, spears, gaffs, and several types of traps. Probably no one group used all the techniques, as some were adapted for specific physical settings not available to everyone (Barnett 1955:78-79). Trolling with a hook and line was used to catch salmon particularly in non-spawning seasons. Suttles (1974:190) mentions springs being taken in the winter, spring, and summer by trolling. Jenness mentions several times that the West Saanich went out in the winter and spring to catch several types of fish, among them grilse (perhaps immature coho?) and spring salmon (n.d:7-8). It is probable they were trolling for these fish, although Jenness doesn't say. Gill nets were used during the spawning runs to catch any type of salmon and could be set out any place there were salmon. The only restriction on their use was due to the fact that the salmon would avoid the net if they could see it, so the net was used in muddy water or at night (Suttles 1974:192-194). There is some disagreement as to whether or not the gill net was used aboriginally or is a historic introduction. All but two of Barnett's informants declared it was not used aboriginally (1955:86). However, Suttles (1974:194) found two historical accounts of gill nets, both made of native materials, one in use on the Fraser River in 1864 and the other used by the Cowichan in 1862. As a result, Suttles believes the gill net was used before contact with Europeans. Two other kinds of nets were used by some Coast Salish, the reef net described in detail by Suttles as used by the Straits people (1974:208-217) and the dip net described by Barnett (1955:87). Barnett reports the East Saanich, Cowichan, Nanaimo, Pentlatch, and Squamish used the reef net (1939:230). Barnett (1955:87) says that the Saanich had the reef net, the Squamish used it and "it was also employed or at least known on the rest of the island" (1955:87). Because the reef net requires very particular geographical features for its use that are not found widely, Suttles believes that most of these groups did not use reef nets (1974:211, footnote). Instead he believes that the Cowichan and Nanaimo groups used a trawl or drift net, which is similar to a reef net but mobile instead of stationary, and that Barnett confused this with the reef net (1974: 211). The dip net was probably not used extensively by the Vancouver Island Salish (Barnett 1955:87; Suttles 1974:199) and was not recorded for the Pentlatch (Barnett 1939:230).

Harpoons were used in many situations. The harpoon looked very similar to the seal harpoon, only somewhat longer (Suttles 1974:196), and was used summer and fall in fresh or salt water. In the small streams on Vancouver Island the harpoon was used extensively. The harpoon was also used to take salmon at a weir. In addition to the harpoon, the gaff was also used in basically the same situations. Suttles states the gaff was the only method used by everyone (1974:198-199).

> The harpoon had greater range than the gaff since it was thrust out or thrown, but it also required good visibility. Hence it was used in salt water or upstream when the water was clear and was used at night only with a light. The gaff, on the other hand, provided its own signalling device

> and so was the instrument for fishing in the murky waters of stream mouths or at night (Suttles 1974:199).

Barnett offers the best description of various types of weirs and traps (1955:79-83). Possibly the Vancouver Island Salish used them more frequently than the Straits Salish Suttles was describing. Weirs were built in streams where the stream was "shallow, narrow and not too rapid" (Barnett 1955:79-83). Barnett's informant denied the Pentlatch used any type of weir (Barnett 1939:229). Permanent stakes were set into the stream and across this framework sections of latticework were laid. The salmon were unable to pass, while the latticework was in place, congregated on the downstream side, and were harpooned, gaffed, or netted. The easiest time to catch the salmon was at night or on dark rainy days when the salmon were unable to see the fishermen. Traps of basket with wings of stakes to divert the salmon into the basket were also set up in streams. These were emptied by day and the salmon clubbed. A common variation of this was a cage with the open end facing downstream. The salmon swam into it easily but their exit was blocked by a row of stakes pointing upstream just under the surface (Barnett 1955:81). The tidal traps described previously for flatfish could also be used to catch salmon.

Salmon were the major winter food, and therefore a large number were dried for easy storage. The salmon were cut into long thin strips for drying in the sun (Barnett 1955:62; Suttles 1974:230, 236-236). "The heads, tails, fins, and bones of the fish were removed and saved for roasting by the direct-fire method or stewing by the boiling method" (Barnett 1955:62). Suttles mentions no smoking of the fish, sun drying being sufficient (1975:238), however Barnett states the salmon were only partially dried in the sun and then smoked until fully cured (1955:62). Salmon could also be roasted over the fire (Barnett 1955:60).

Other Fish

Both Jenness (n.d:22) and Suttles (1974:187) record perch (surf perches?) as having been caught with a spear. Suttles (1974:187) also says the Lummi speared a large sculpin called by the common name of bullhead (*Leptocottus armatus?*). Both perch and sculpins were taken in this manner in bays at low tide in the winter. Steelhead (*Salmo gairdneri*) were caught with the same methods as salmon (Suttles 1974:190, 206). Small basket traps, the same type used for salmon, were used in creeks and sloughs to catch trout (Suttles 1974:207). Barnett (1955:63) mentions that skates were eaten, but that sharks were not.

Disposal of Bones

In Barnett's element list study he records the Pentlatch did not throw any bones into the water and that the dogs could have them (1939:237). However, Jenness makes the following statement about the disposal of bones.

> Custom demanded that the bones of all fish, whatever their species, should be thrown into the water, when it was believed they re-clothed themselves with flesh and became fish again. Animal bones also were generally thrown into the water, not, however, to re-store them to life, but to preserve them from molestation by dogs, which would annoy the animals' shades (Jenness n.d:21).

Barnett also records this practice, writing that "salmon bones had to be thrown back into the water, but there was no certain notion they would be revivified. Under no circumstances must dogs be allowed to have them" (1955:89). Suttles only mentions throwing salmon bones in the water during the first salmon ritual (1974:228-234).

IV. *PRE-HISTORY*

Glaciations

The most recent glaciation, the Vashon stade, covered the Strait of Georgia area, extending into the mountains of Vancouver Island to an elevation of between 4,000 to 5,000 feet (Heusser 1960:18-19; Mathews et al 1970:691). This advance peaked about 13050 B.C. and then began a rapid retreat about 11050 B.C. (Mathews et al 1970:691). There was a re-advance down the Fraser River valley by the Sumas stade as far as Sumas and Mission at about 9050 B.C. This ice, the last sizable glacial advance, had retreated again by 7550 B.C. (Mathews et al 1970:692).

Sea Level Fluctuations

As an immediate response to the withdrawal of the Vashon glaciers there was a rapid fall in sea level (Fig. 6). In the Courtenay area during the glacial period, the sea level at its maximum was about 500 feet above sea level today (Mathews et al 1970:693-694). The lowest sea level (lower than present) was reached in less than 2000 years, by about 10050 B.C. In conjunction with the Sumas stade advance there was a rise in sea level. "Marine fossils dated at 9550 B.C. (L-441B) are found in the matrix of the Denman

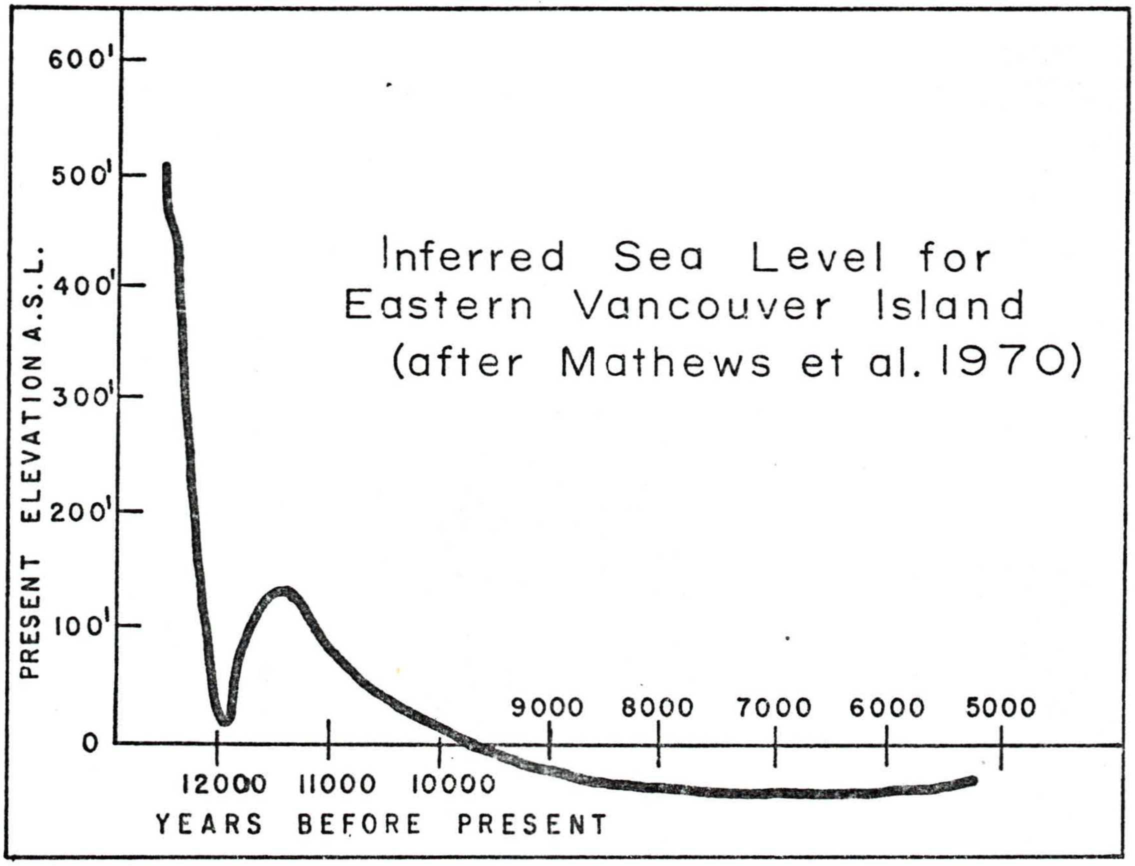

Figure 6. Inferred sea level fluctuations for eastern Vancouver Island. After Mathewes et al (1970).

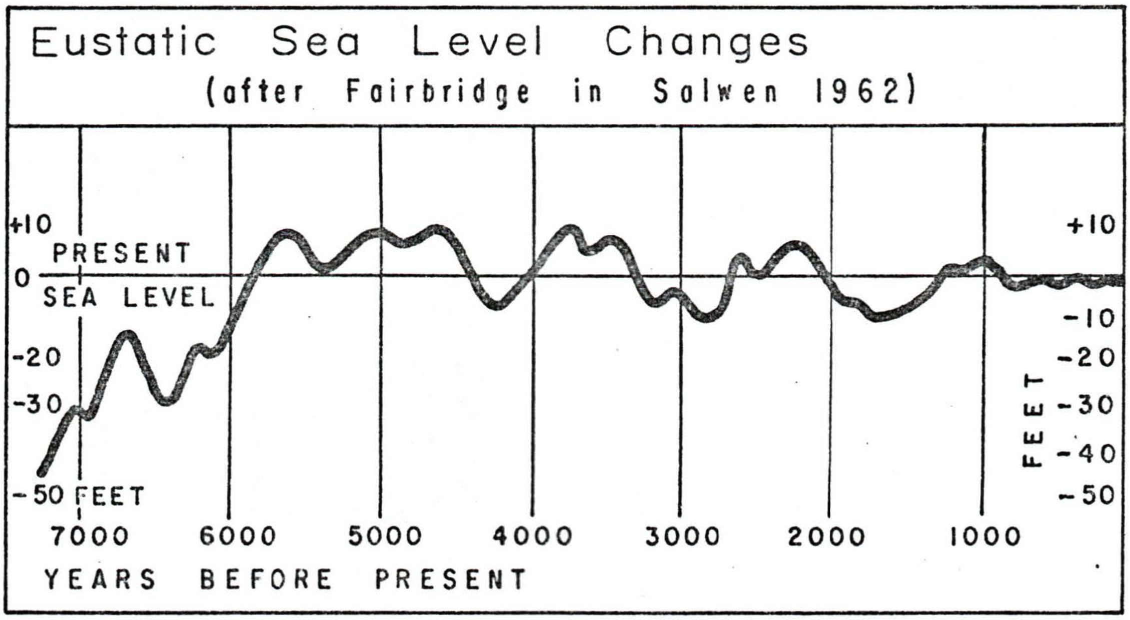

Figure 7. Worldwide eustatic sea level changes. After Fairbridge (1958:477) in Salwen (1962:47).

Island breccia indicating submergence to the present 120 ft. (36.6 m) contour at this same time" (Mathews et al 1970: 696). As in the case after the Vashon stade disappearance the sea level dropped very rapidly after the Sumas stade retreated, resulting in a lower sea level than present by 6750 B.C. At that time the sea level was at least 20 feet below present in the Comox area, and Denman Island was connected to Vancouver Island. At 3730 B.C. the sea level at Denman Island was slightly above that at present. This seems to be a local phenomenon; elsewhere on Vancouver Island and the adjacent mainland, the sea level seems to have been slightly lower than present (Mathews et al 1970:696-697).

More recent data specifically pertaining to the Baynes Sound area are not available. The applicability of data from other areas to the Baynes Sound area is questionable, particularly in view of the exceptionally localized nature of Mathews' data. Fairbridge (1958:477 in Salwen 1962:47) offers a synthesis in graph form of sea level fluctuations from about 5050 B.C. to the present (Fig. 7). His information is based on world-wide sea level fluctuations only; it does not take into account any land movements and would therefore have to be corrected for any unstable land areas. Certainly, considering Mathews' data, the east coast of Vancouver Island cannot be considered stable.

Even with that in mind, Fairbridge's data can still be used to indicate the general pattern.

Starting about 2550 B.C. there is a drop in sea level to a maximum of about 10 feet below present sea level, followed by a higher sea level of about 10 feet by 1750 to 1850 B.C. (Salwen 1962:Fig. 1). Heusser (1960:190) correlates this with pollen profiles taken from lakes on the Oregon shore showing sea incursions. Another period of raised sea level occurred between 850-150 B.C. not quite reaching 10 feet above present sea levels, followed by the last rise in sea level between 750 A.D. and 1950 A.D. of at the most five feet above present sea level. Two significant periods of lowered sea level have occurred since 2050 B.C., one between about 1350 and 750 B.C. and the other between about 50 B.C. and 750 A.D., both reaching a maximum of about 10 feet below present sea level. Since about 1050 B.C. the level has fluctuated to several feet below present sea level and back again, but not above it.

Climate and Vegetation

In southern coastal British Columbia what is called the early Post-glacial period lasted from 8550 to 6550 B.C. It is characterized by a cool moist climate which toward the end of the period was much like that of today (Heusser 1960:183). The major coniferous species was the lodgepole pine, with small numbers of spruce, hemlock, and fir present. Alder was the major deciduous tree present (Heusser 1960:183 and Figs. 36, 37).

The Hypsithermal lasted between 6550 and 1050 B.C. in southern British Columbia. The temperature fluctuated during the Hypsithermal: it "was warm and moist in the beginning, became drier later with an intervening episode during which humidity increased somewhat, and closed as strongly humid conditions coupled with cooling began to prevail" (Heusser 1960:185). Heusser characterizes the succession of plants in southern British Columbia as consisting of three stages: first a forest dominated by Sitka spruce and western hemlock; next a Douglas fir-alder forest with skunk cabbage; and finally, a mixture of western hemlock and Douglas fir with alder and skunk cabbage (Heusser 1960:184). Zirul (in Mitchell 1971:66) shows an oak maximum during this period from a pollen core taken from southern Vancouver Island. This period is also the first appearance of oak in a pollen column taken on the Malahat, southern Vancouver Island (Heusser 1960:Fig. 37).

The Late Postglacial started about 1050 B.C. in southern British Columbia, characterized by a climate generally colder and more humid than present (Heusser 1960: 186-187). The forests were dominated by western hemlock and spruce with fir, lodgepole, and western white pine also present. Examining the Malahat profile shows that sedges and *Myrica*, a bog plant, both increased considerably (Heusser 1960:Fig. 37). Zirul's pollen core showed a fir-oak dominance at about 950 A.D. (in Mitchell 1971:66).

Archaeological Background

People could have occupied the Gulf of Georgia area very soon after the disappearance of the Vashon glaciers about 13,500 B.P. At present there are no dated archaeological sites of that period in the Gulf of Georgia. The earliest date for the Gulf of Georiga is the basal component of the Glenrose site (DgRr 6), with a time range of approximately 6550 B.C. to 3550 B.C. (Matson 1976:17). The Millard Creek site (DkSf 2A) in the Comox valley has an estimated date of 6350 B.C. ± 200 (Capes 1964:60). Unfortunately, the quality of the date is suspect because of possible coal contamination (Mitchell, pers. comm.). The smallness of the artifact assemblage at this site offers little assistance in supporting the early date, although the only projectile point is described as "Lerma-like" (Capes 1964:60). Even if this date is accepted as valid there still remains a gap of several thousand years after de-glaciation in which no information is available. That people were in the general area is indicated by an occupation date of 7050 B.C. ± 150 at the Milliken site in the Fraser River canyon

(Borden 1961:6). Occupation of this site must have occurred right on the heels of the Sumas stade which retreated from the Fraser River canyon about 7550 B.C. (Mathews et al. 1970:692). The sea level was very high during the Sumas advance, 120 feet above present sea level. The following rapid fall in sea level (about one foot every four years) would have meant any site oriented to the coast could only have been occupied for a short period before it was moved to follow the receding coast line. Sites occupied for only a short period could tend to be archaeologically inconspicuous. Or it could be that people didn't inhabit Vancouver Island at an early date.

Where the earliest inhabitants of the British Columbia coast came from is a question about which there is much speculation, and for which there is as yet no definite answer. Probably the most accepted hypothesis is that people migrated north along the coast as the glaciers retreated. In support of this is the early site at the Dalles on the Columbia River (Mitchell 1971:70). Another speculation is the existence of refugia along the northern Pacific coastline from which people with boats trickled southward during the glaciation (Fladmark 1975:280-283; Heusser 1960:209-210). As yet this hypothesis has no archaeological support, but Fladmark (1975:282) points out that the most likely areas for refugia have not been surveyed extensively to date.

The early culture type represented by the Milliken site and perhaps the Millard Creek site, is called the Lithic culture type by Mitchell (1971:70). Matson (1976: 17) calls the basal component at Glenrose the Old Cordilleran. Both are described as a generalized hunting-fishing-gathering culture, possibly distinguished from the following culture types by a heavier reliance on hunting as compared to fishing (Mitchell 1971:70). Matson (1976:297) believes elk and deer were the most important food resources of the Old Cordilleran. Common artifacts include leaf-shaped medium to large-sized chipped stone points, cobble tools and there is a lack of ground stone artifacts (Matson 1976:282; Mitchell 1970:59-60). The beginning and ending dates for this culture type are not known.

At the St. Mungo Cannery (DgRr 2) (Boehm 1973:12) and Glenrose (DgRr 6) sites there is a phase called the St. Mungo, which seems to date between 2350 B.C. and 1350 B.C. (Matson 1976:285). Matson (1976:285) feels "the many similarities suggest that the St. Mungo developed out of the Old Cordilleran or something similar." Compared to the Old Cordilleran there is a reliance on "marine foreshore and riverine resources" (Matson, 1976:299) and the addition of birds to the list of resources used. The artifact assemblage is similar to the Old Cordilleran, but "includes two unique objects in some quantity: decorated slate and bone pendants" (Matson 1976:286).

The Locarno Beach culture type follows after a hiatus. This gap may be apparent rather than real simply because transitional sites have not been excavated, or perhaps the Locarno Beach culture is intrusive. The answer is not available from the sites excavated to date. Mitchell (1971:65; 1974:45) places the Locarno Beach culture type between at least 2000 B.C. and 400 B.C.

A few of the more distinctive artifacts associated with Locarno Beach are medium-sized chipped basalt points, microblades, large facetted ground slate knives and points, small well-made celts, Gulf Islands complex items, composite toggling harpoon heads and labrets and earspools (Mitchell 1974:26). The deposits tend to contain little shell, and when present the shell tends to be mussel. The subsistence base, which includes land mammals, sea mammals, birds, fish, and shellfish, appears at this time to be similar to the following cultures (Mitchell 1974:28). Within the Locarno Beach culture type there is variation in site assemblages, for example, in the number of Gulf Island complex items, the amount of slate and chipped stone and the presence of microblades. Mitchell (1974:30) states "it is not yet possible to determine whether the differences relate to time, space, or some other variable."

In the northern Gulf of Georgia, the Courtenay River site (DkSf 1) fits into this time period at 420 B.C. $\pm$ 70, but its cultural affiliation has not been established (Capes 1964:57-58). Component I at Deep Bay (DiSe 7) with two bracketing dates, 2910 B.C. $\pm$ 180 and 680 B.C. $\pm$ 100, is likely a Locarno Beach component, although Monks (1977:68-69) was somewhat hesitant about the reliability of the dates. The artifact assemblage is almost completely lithic. Monks (1977:236) argues "that Component I at Deep Bay contains a specialized assemblage from the Locarno Beach time period," specifically for land hunting. In support of this interpretation, "the predominant faunal remains from this component were unidentifiable land mammal and deer" (Monks 1977:238).

Between the Locarno Beach culture type and its successor, the Marpole culture type, there is no time gap. Mitchell (1974:45) places the Marpole culture type between 400 B.C. and 400 A.D. In some cases dates of Locarno Beach components overlap dates of Marpole components at different sites. This is not a major problem as the culture types could have been contemporaneous if the Marpole culture type is evolving from Locarno Beach. Mitchell (1974:45) also points out that overlapping dates could be a result of "sample unreliability." Some characteristic artifacts are large and medium sized chipped stone points, microblades, large ground slate points, large celts, disc heads, stone sculpture, non-toggling harpoon points, antler sleeve hafts, and native copper ornaments. Skull deformation was practised. Also there is evidence of large houses (Mitchell 1974:34). Sites are found along the Fraser River implying use of the salmon runs. In addition, small sea mammals, land mammals, birds and shellfish were used (Mitchell 1974:34). The regional differences in the amount of ground slate and the presence of microblades continue in the Marpole culture type from the Locarno Beach culture type, but in other ways the Marpole culture type appears to be consistent throughout time and space.

Deep Bay (DiSe 7) is the only site in the northern gulf area that has a component assigned to the Marpole culture type. Two dates are found within Component II: 40 A.D. ± 110 and 1050 A.D. ± 90. The oldest date comes from a reliable sample within the component (Monks 1977:66) and falls in the middle period of the Marpole cultural type. The younger date, 1050 A.D. ± 90, is from a possibly contaminated sample (Monks 1977:63-64) and overlaps into the period of the Gulf of Georgia culture type according to Mitchell's dates. Monks (1977:232) argues that "it is only reasonable to expect that considerable temporal overlap should exist between assemblages having Gulf of Georgia and Marpole characteristics, because there is no sharp distinction between the two culture types, and because one culture type is directly ancestral to the other." The artifact assemblage for Component II, while it is best described as Marpole, is anomalous in containing composite toggling harpoon valves, usually lacking in southern Gulf Marpole components (Monks 1977:214-215). This may be an indication of regional variation in the Marpole culture type, but more supportive evidence will be needed to decide.

The Gulf of Georgia culture type is found starting about 400 A.D. and existed until about 1800 A.D. (Mitchell 1974:45). The Gulf of Georgia type is most likely associated with the Coast Salish people. Both Mitchell (1974:46) and Monks (1977:232) feel that the Gulf of Georgia culture type evolved out of the Marpole culture type. Some of the artifacts commonly associated with the Gulf of Georgia culture type are small triangular, chipped basalt points, thin triangular ground slate points, large well-made celts, single and double pointed bone artifacts, composite toggling harpoon valves, decorated blanket pins and combs, antler wedges and triangular ground sea-mussel shell points. Skull deformation was practiced, and evidence of large houses exists in post moulds and house outlines (Mitchell 1974:36-37). "Site locations, artifacts, and faunal material all lead us to conclude the culture was built on fishing, hunting, and gathering, with a heavy reliance placed on fishing for salmon" (Mitchell 1974:37). There are regional and temporal variations with the Gulf of Georgia type which may correspond to seasonal differences in site use and/or may correspond to regional group distinctions such as were recorded by the ethnographers (Mitchell 1974:40).

Capes' (1964:40-43) excavations at the Sandwick Midden (DkSg 2) in the Comox area revealed what is most reasonably interpreted as a Gulf of Georgia component. A carbon sample from near the base of the midden gave a date of 1570 A.D. ± 70 and the lack of historic goods indicates that perhaps the site was abandoned before European contact (Capes 1964:25,40). The lack of chipped stone, presence of small triangular ground slate points and toggling harpoon valves fit the general Gulf of Georgia pattern.

Two dates from Deep Bay Component III fall within the Gulf of Georgia period. One at 1160 A.D. ± 80 Monks (1977: 63) considers to be a reliable date, however, the other, 1490 A.D. ± 90 is in a stratum with intrusive historic material and is not as reliable (Monks 1977:62). Monks (1977:215) had difficulty in establishing the boundary between Component II (Marpole) and Component III (Gulf of Georgia). The boundary is drawn more by the lack of some Marpole features, than the presence of any distinctive Gulf of Georgia features. For example, the amount of chipped stone artifacts decreases above the Component II boundary (Monks 1977:211-212). Some believe that absence of composite toggling harpoon valves in Marpole deposits serves to distinguish it from the Gulf of Georgia type, however at Deep Bay they are present in the Marpole component. The similarity of these two components at Deep Bay may be a northern Gulf regional variation or possibly an indication of an extremely stable pattern of site use at Deep Bay (Monks 1977:225). In support of this interpretation "the relative amounts of each bird, mammal, and fish species do not tend to increase or decrease in a pattern between components" (Monks 1977:221), however, considerably more work will have to be done to determine what pattern the northern Gulf of Georgia deposits follow.

Based on preliminary findings, the Little Qualicum River site (DiSc 1) appears to consist of a single Gulf of Georgia component. Six radiocarbon estimates from the site range between 280 A.D. $\pm$ 110 and 1220 A.D. $\pm$ 80. Bernick (pers. comm.) believes that the final interpretation of the dates will indicate the major occupation took place around 1000 A.D. and that the artifacts and faunal remains indicate in all likelihood the site was used seasonally as a salmon fishing camp. Chipped stone artifacts were almost totally lacking, and bone and antler artifacts comprised most of the assemblage, a finding consistent with other Gulf of Georgia components (Bernick 1976:8).

From the beginning of steady European contact in the 1800's the aboriginal patterns were rapidly replaced by European patterns. This very effectively brought to an end the Gulf of Georgia culture type.

V. *METHODS OF ANALYSIS*

The first step in the analysis was the identification of the faunal material. At this point the material was identified in the smallest possible units of analysis, the arbitrary levels within each pit. In addition it was decided to both count and weigh each one as the basic data to work from. After the identifications were complete it was necessary to choose the unit of analysis and methods of presenting the data most appropriate to the aims of this study.

Identification of the Faunal Materials

Identification of the faunal remains was made using the comparative skeletal collection of the Archaeology, and Vertebrate Zoology Divisions of the British Columbia Provincial Museum (BCPM). The quality of a faunal identification is dependent on the skill and experience of the analyst, and the completeness of the comparative faunal collection itself. I attempted to be conservative in my identifications by not placing a bone in a category unless I was certain of its identification.

The completeness of the comparative collections at the BCPM varies, although in all cases they are adequate for tentative identification to at least the class level. The mammal comparative collection has at least one skeleton of all mammals necessary with the exception of whales. The bird and fish collections are not complete. Problems that arose due to lack of some species' skeletons are discussed in the notes with the data section.

Knowledge of the composition of the skeletal comparative collection is very important for proper interpretation of the results. The unidentifiable category in most faunal reports contains bone of two types; that which cannot be identified due to its poor condition and that which cannot be identified due to lack of the necessary comparative skeletons. Particularly when comparing faunal assemblages between sites it becomes necessary to know what unidentified species might be found in the unidentifiable category. For example, Site A might contain a large percentage of Pacific cod bones, while Site B contains none. This absence in Site B might be real, or only apparent, because the comparative collection did not include a Pacific cod skeleton. The only method of controlling this possible source of confusion is to report gaps in the faunal collection being used.

Units of Analysis

The possible choices for units of analysis range from natural layers that can be correlated across the site, probably the most desirable, to arbitrary levels within each excavation unit. The aim of these units is to allow the archaeologist to compare one group of data with another in order to make statements about differences or the lack of them over time or space. In order for these statements to reflect the site's "reality" the units of analysis have to be real. In other words the goal is to create units of analysis that include all materials initially deposited in a related way.

Shell middens appear to consist of lensing deposits in a highly complex, confusing pattern. This pattern of deposition makes excavation in natural layers very difficult. In fact, shell middens may not have natural layers that can be correlated across the midden; their structure is not understood well enough for this to be determined yet. As a result, many middens are excavated in arbitrary levels as were the Buckley Bay and Tsable River Bridge sites. The structure of the two middens made stratigraphic correlation between excavation units very difficult, whether excavated in natural layers or arbitrary levels.

From the preliminary analysis of the artifacts and the carbon dates, it has been possible to define at least two cultural components within the Tsable River Bridge site and to determine that the Buckley Bay site probably consists of only one cultural component (see the site description for details). The units of analysis for the Tsable River Bridge site are Components I and II, excluding those arbitrary levels which contained more than one component, or which could not be easily assigned to either component (see Table 1). The excavated portion of the site is the unit of analysis for the Buckley Bay site.

The use of these cultural components as the units of analysis allows comparisons of the composition of the faunal assemblage over time and among the components of both sites. The seasonality of site occupation could be determined using the cultural component as the unit of analysis. However, the grossness of this unit of analysis will mask any shift of season of occupation within a cultural component. In order to overcome partially this problem, each arbitrary level within an excavation unit was examined in hopes that changes might be more apparent over a smaller span of time. As the natural layers in at least some of the excavation units were sloping, any pattern may still be obscured even in the individual arbitrary levels.

Presentation of the Data

There are several methods of presenting faunal data, but as yet no one has standardized which methods are to be used in any study, often making comparisons between studies very difficult. In this study I have used the number of elements of bone, the weight of bone and calculated the Minimum Number of Individuals (MNI) per species for each unit of analysis. In order to give some idea as to the relative amount of meat represented by the bones, I have multiplied the MNI by the weight of the live, whole animal.

The number of elements and weight of the bone provide the background from which other measures, the MNI in this study, are calculated. Until methods of presenting faunal material are standardized (if ever) both should be the minimum data provided in any report to facilitate comparison of faunal reports prepared by different persons. Using the number of elements alone to determine the relative abundance of a species is not adequate, as the number of elements of a single species found in a site can be affected by a number of cultural factors. Differential butchering techniques may mean that some portion of an animal's skeleton may never be brought to the site and the techniques may vary from animal to animal as well as within and between cultures

(Chaplin 1971:56-66). For example, discarding salmon bones into the water, a custom reported for the Coast Salish by Barnett (1955:89), if practised instead of discarding all bones similarly, could cause salmon to be severely underrepresented in relation to other fish for which this is not a practice. Breakage of bone is not necessarily equal for each species, being influenced by cultural practices such as marrow extraction (Yellen 1977: 292-293) and/or tool making and natural processes like weathering and scavenging. As a result of these factors, the number of bones found at a site may not be in the same proportion as the animals collected at the site originally. Chaplin (1971:67) concludes that it is impossible to use the number of elements as a measure of relative frequency of each species in the faunal assemblage. I might agree with his assessment if the number of elements are the only data offered, however including other measures allows some of the problems of using the number of elements to be overcome.

Using the weight of a species' bones has almost the same problems as using the number of elements method for calculating the relative frequency of one animal to another. Differential preservation and butchering practices will skew it in much the same direction. In addition the bone weight reflects the size of the animal species although the actual relationship of bone weight to meat weight is not known at this time. Bone weight has one major advantage when comparing faunal assemblages, in that a bone recovered in many pieces is equivalent to the same bone whole. The main advantage of including bone weight in the data recorded is to assist in the interpretation of the number of elements and so that it can be used to compare with studies that have used it.

The MNI is a widely used method of presenting faunal data. For this study it is the number of the most frequently occurring bone for each species within a unit of analysis, considering any age, sex or size differences noticeable (Uerpmann 1973; Payne 1972). (For a much more elaborate method, not in wide usage, see Chaplin 1971:70-75). The MNI indicates the smallest possible number of individuals represented by the identified bones. The method of calculating the MNI involves the assumption that an individual animal's bones are found completely within one unit of analysis, and that bones in another unit of analysis are from another individual. The less arbitrary the boundaries of a unit of analysis, the closer this assumption will approach the "reality" of the site. For example, using the boundaries of an arbitrary level or an excavation unit to calculate the MNI would be less desirable than a natural layer or cultural component, preferably ones that are visible across the site. When comparing MNI's between sites it becomes very important to know from which unit of analysis the MNI was calculated in order to ensure the sets of data are comparable (Grayson 1973).

The MNI presents each species in a form that is directly comparable to any other species. The problems of comparing animals with different numbers of skeletal elements or varying weights are eliminated. An effect of the MNI is to even out random fluctuation in the number of bones recovered. In contrast to the element method a bone in six fragments is equivalent to a whole bone. A complete skeleton is equivalent to a single bone. Chaplin (1971:70) seems to feel the use of the MNI eliminates bias due to butchering practices, because any bones brought to the site will represent an individual. However, the MNI is still affected by butchering, bone disposal, and preservation factors which reduce the number of bones recovered, or the identifiability of those bones recovered. There is no method available in faunal analysis at this time that will eliminate all recovery problems.

In order to give some indication of the relative amount each animal may have contributed to the diet, rather than only the numbers of each animal collected, the live weight represented by the MNI of each species has been calculated (Table 2). Live weight figures are used rather than meat weight figures because these are not available for all animals. Additionally there is no information on how much of the meat of any animal was used by the occupants of the sites.

Attempts have been made to determine a ratio between bone weight and meat weight for some animals (White 1953; Cook and Treganza 1956), but none of their methods has proved reliable (Chaplin 1971:68; Casteel 1978:77). Casteel (1978:77) calculated meat weight from bone weight using several different formulas offered by archaeologists and actual data on domestic pigs and concluded "that the constant utilized for estimating meat weight from bone weight may well be without foundation and that estimates derived from them are woefully inaccurate."

Determination of the season of collection of a species of animals is particularly important to Northwest Coast archaeologists because the Coast Salish had a definite seasonal pattern of resource collection involving movement of the people from one occupation site to another. At this point archaeologists would like to establish the time depth of this pattern and to determine what effects it might have on the tools used at a site. Establishing the season of collection of as many species as possible from a site will help infer its season of occupation.

The season of colletion of a species is established by considering any seasonal fluctuations in availability of the

TABLE II: AVERAGE LIVE WEIGHT OF THE SPECIES FOUND IN DjSf 13 AND DjSf 14 IN GRAMS

Species	Weight	No. of Species Weighed	Source of Data
Tamiasciurus hudsonicus	190.5	(7)	Banfield
<u>Mammals</u>			
Castor canadensis leucodontus Gray	8164.8	(4)	C+G 1978
Cetacea			
Ursus americanus	163296.		C+G 1978
Procyon lotor vancouverensis	5443.2	(6)	C+G 1978
Martes americana nesophila	1360.8	(4)	C+G 1978
Mustela vison evagor	1360.8	(2)	C+G 1978
Lutra canadensis pacifica	10432.8	(3)	C+G 1978
Eumetopias jubata	680400.0	(2)	C+G 1978
Phoca vitulina richardi	83916.	(5)	C+G 1978
Cervus canadensis roosevelti	234964.8	(4)	C+G 1978
Odocoileus hemionus columbianus	129276.	(4)	C+G 1978
<u>Birds</u>			
Gavia immer	3400.	?	P 1976
Gavia arctica pacifica	2000.	?	P 1976
Gavia stellata	1800.	?	P 1976
Podiceps grisegena holbollii	934.	(5)	P 1976
Podiceps auritus cornutus	446.	(6)	P 1976
Podiceps nigricollis	452.8	?	P 1976
Aechmophorus occidentalis	1472.2	(13)	P 1976
Podilymbus podiceps podiceps	135.	(8)	P 1976
Podiceps spp.	689.2	Avg. of avg. wgts for *Podiceps* and *Podilymbus*	

TABLE II: (CONTINUED)

Species	Weight	Number of Species Weighed	Source of Data
Phalacrocorax auritus auritus	1872.	(4)	P 1976
Phalacrocorax penicillatus	2426.	(1)	P 1976
Phalacrocorax pelagicus pelagicus	1868.	(14)	P 1976
Phalacrocorax spp.	2055.3	Avg. of 3 *Phalacrocorax* spp.	
Ardea herodias herodias	2948.4	?	P 1976
Anser albifrons frontalis	2680.8	(108)	B 1976
Anser caerulescens caerulescens	2621.8	(1017)	B 1976
Anser rossii	1714.6	(79)	B 1976
Anser spp.	2339.1	Avg. of all *Anser*	
Branta canadensis occidentalis	4127.8	(232)	B 1976
Branta bernicla nigricans	1360.8	(370)	B 1976
Anserinae	2609.2	Avg. of *Anser* and *Branta* spp.	
Anas platyrhynchos platyrhynchos	1170.4	(3226)	B 1976
Anas acuta acuta	952.6	(556)	B 1976
Anas creeca carolinensis	317.5	(192)	B 1976
Anas discors	408.2	(81)	B 1976
Anas cyanoptera septentrionalium	362.9	(24)	B 1976
Anas americana	816.5	(152)	B 1976
Anas clypeata	635.0	(41)	B 1976
Aythya collaris	725.8	(77)	B 1976
Aythya valisineria	1224.7	(245)	B 1976
Aythya marila mariloides	997.9	(67)	B 1976
Aythya affinis	771.1	(221)	B 1976
Clangula hyemalis	816.5	(76)	B 1976
Histrionicus histrionicus	589.7	(6)	B 1976
Melanitta fusca	1360.8	(22)	B 1976
Melanitta perspicillata	952.6	(17)	B 1976
Melanitta nigrla	1088.6	(9)	B 1976
Melanitta spp.	1134.0		
Anas spp.	667.4	Avg. of all *Anas*	

TABLE II: (CONTINUED)

Species	Weight	Number of Species Weighed	Source of Data
Aythya spp.	929.9	Avg. of *Aythya genus*	
Aythyinae	867.5	Avg. of *genus Aythya, Melanitta, Clangula*	
Mergus cucullatus	725.8	(5)	B 1976
Mergus merganser americanus	1451.5	(49)	B 1976
Mergus serrator	680.4	(9)	B 1976
Merginae	952.6	Avg. of *Mergus genus*	
Dendragopus obscurus	1276.	(1)	PM
Bonasa umbellus	541.7	(1)	PM
Tetraonidae	908.8	Avg. of *D. obscurus* and *B. umbellus*	
Aguila chrysaetes	2556.	(2)	PM
Haliaeetus leucocephalus	5296.6	(6)	PM
Larus glaucescens	870.8	(4)	PM
Larus heermanni	510.8	(3)	PM Used for *L. delawarensis*
Larus spp.	690.6	Avg. of *heermanni* and *glauceseens* for *argentatus* and *californicus*	
Uria aalge	934.3	(5)	PM
Corvus corax	866.	(1)	PM
Corvus caurinus	365.3	(3)	PM
<u>Fishes</u>			
Squalus acanthias	4536.	(3)	H 1973; J+E 1896
Raja rhina	5094.9	(3)	PM
Raja binoculata	12818.5	(2)	PM
Raja kincaidi	1571.	(2)	PM
Raja spp.	6494.6	Avg. of *Raja genera*	
Hydrolagus colliei	1221.	(3)	PM
Clupea harengus	141.6	(8)	PM
Oncorhynchus gorbuscha	1800.	?	H 1973
Oncorhynchus keta	5443.2	?	H 1973
Oncorhynchus kisutch	4000.	?	H 1973
Oncorhynchus nerka	2608.2	?	H 1973
Oncorhynchus tswytscha	9979.2	?	H 1973

TABLE II: (CONTINUED)

Species	Number of Species Weighed		Source of Data
Oncorhynchus spp.	4766.1	Avg. of all species	
Porichthys notatus	212.5	(2)	PM
Gadus macrocephalus	2268.	(5)	PM
Merluccius productus	1234.2	(3)	PM
Microgadus proximus	158.5	(2)	PM
Theragra chalcogramma	919.	(2)	PM
Gadidae	887.6	Avg. of 4 spp. above	
Embiotoca lateralis	599.2	(2)	PM
Rhacochilis vacca	433.	(1)	PM
Embiotocidae	516.1	Avg. of *E. lateralis* and *R vacca*	
Sebastes brevispinis	951.6	(3)	PM
Sebastes flavidis	1074.5	(2)	PM
Sebastes maliger	1212.8	(4)	PM
Sebastes minatus	937.	(1)	PM
Sebastes nebulosus	285.3	(1)	PM
Sebastes paucispinis	3176.	(5)	PM
Sebastes proriger	695.	(2)	PM
Sebastes ruberrimus	2369.4	(5)	PM
Sebastes spp.	1337.7	Avg of all above *Sebastes*	
Hexagrammos decagrammos	485.	(1)	PM
Ophiodon elongatus	4113.	(2)	PM
Scorpaenichthus marmoratus	5670.	max siz:	H 1973
Enophrys bison	403.5	(2)	PM
Leptocottus armatus	268.	(2)	PM
Myxocephalus polyacanthocephalus	560.	(2)	PM
Cottidae	410.5	Avg. of *E. bison, L. armatus, M. polyacanthocephalus*	
Platichthys stellatus	266.6	(2)	PM
Lepidopsetta bilineata	493.6	(5)	PM
Eopsetta jordani	1212.5	(2)	PM
Hippoglossoides elassodon	212.	(3)	PM
Psettichthys melanostictus	767.	(1)	PM
Parophrys vetulus	407.7	(3)	PM

TABLE II: (CONTINUED

Species	Weight	Number of Species Weighed	Source of Data
Lysopsetta exilis	134.7	(3)	PM
Microstomas pacificus	421.5	(2)	PM
Pleuronectiformes	489.4		

Number in parentheses is the number of individuals weighed to produce average where known.

C+G = Cowan and Guiget 1978

P = Palmer 1962, 1976

B = Bellrose 1976

PM = B.C. Provincial Museum comp. collections

H = Hart 1973

J+E = Jordan and Everman 1806

animal or any physical characteristics which might allow aging of a bone and therefore calculation of the time of the animal's death. Modern natural histories provide the information necessary to determine an animal's seasonal patterns, if any. It is most likely that modern data are applicable to animals of 4000 years ago as it does not appear that the climate varied enough to affect the species of animals important to the sites' inhabitants. However, it is possible that the known patterns of bird migration routes have been changed by hunting and/or habitat destruction. For example, the trumpeter swan range is severely restricted today due to a decimated population as a result of hunting pressure and its original range and migration patterns can only be hypothesized (Bellrose 1976:89). Conversely, animals which live in second growth forests, such as grouse, deer, and possibly black bear may have increased their original range areas and populations (Guiget 1970a:5-6). Seasonal variations for the fishes is in many cases a shift from deep to shallow water, a much more tentative indicator as there is no way of determining if the sites' inhabitants could collect those fish when they were "deep" or not (in most cases "deep" and "shallow" are not quantified by the ethologists). With a few exceptions,most of the mammals on Vancouver Island do not follow a seasonal migration. Therefore, information on their season of collection has to come from aging the bones or teeth. Bones are aged by considering the stage of epiphyseal union. Within a species of wild animal, young are usually born within a short span of time at a particular season allowing a bone to be assigned to an age category which usually spans no more than a few months (Gilbert 1973:44-57). Possible variations in bone maturation are not well understood, but it appears likely that the quality of the diet and the sex of the animal can affect epiphyseal union (Gilbert 1973:48). The pattern of eruption of teeth in mammals also allows aging, as does the wear of the tooth, although wear is affected considerably by the animal's diet (Gilbert 1973:44-45).

Ideally, a pattern would emerge showing definite animal collection for one season indicating occupation of that site for that season. However, many of the animals found in the site area are avilable for the whole year or for more than one season. For example, the birds that "winter" in Baynes Sound are actually present during the fall, winter and spring seasons. Many of the animals from the sites were available during more than one season. One possible interpretation is that the sites were occupied for more than one season. For example, it might be interpreted as a fall, winter and spring occupied village. However, this same type of pattern could also result if the season of occupation had been variable. A site occupied for a period of time only in the spring, later shifting to a fall occupation and then back again to a spring occupation could easily show a pattern of animal collection similar to that of a fall, winter and spring occupation. The possibility of a site's season of occupation shifting several times over a period of several thousand or even hundred years is unknown but seems probable. Environmental changes might affect the resources available at a particular site, such as a change in sea level harming the shellfish beds. If the Coast Salish pattern of access to resource areas through familial ties was followed at the time of the sites' occupation, this could create situations of shifting seasonal use of a site. Sites with a pattern of variable seasonal use will be extremely difficult to differentiate from year-around sites without very careful excavation and a better understanding of midden formation.

Knowledge of the animals collected allows discussion of the environmental zones used by the inhabitants of the sites. It is possible to give a minimum distance people would have to travel to procure the animal based on the animal's environmental requirements. This type of analysis obviously requires a thorough understanding of the animal's natural history and for many fish species the information is not yet available. Some animals by virtue of their physical capabilities and/or habitats require the hunter to use certain techniques in order to catch them (e.g. Wing and Hammond 1974). If these animals are present in a site certain hunting or catching techniques can be inferred. The combination of data on Coast Salish hunting techniques and zones in which the animals are found could theoretically be combined with the artifact analysis to produce as complete an understanding of hunting practices as possible for a site. This should also aid the search for evolutionary patterns in subsistence systems of the coastal inhabitants.

Calculation of population figures for a site, as have been attempted by Cook and Treganza (1956), are impractical at this time due to problems with converting the bone weight to meat weight to calories to number of people the calories could have supported. However, reaction to population pressure might be indicated by the number of animal species used by a people. A possibility exists that the evolutionary trend of using marine resources more and more heavily could be a response to a gradual increase in population pressure. Several assumptions are required but I feel they are not too implausible. First, within the range of resources available at a given site, I assume all people have foods which they prefer above others due to cultural preference and collection ease; if given a choice they will use these foods only. Second, if the population pressure on a site increases, either by increasing the length of time in a year the site is occupied, or by actual increase in the numbers of people using the site, or a scarcity in the preferred foods, a possible response by the people would be to increase the number of different species they collect. This response is likely to follow or be contemporaneous with increased use of the animals considered most desirable. In the site this might reveal itself as an overall increase in the density of the bone (determined by dividing the volume of the cultural deposits into the number of elements), or as an increase in some species with other species remaining at the same density. Comparisons with other sites will be necessary to determine what could be considered the normal range of species used from those available at a site.

After the establishment of the season (or seasons) of occupation of the sites and the proportion of the species present in terms of numbers and dietary value, these can be compared to results from other sites. Faunal assemblages from sites interpreted as being short-term seasonal occupat-ions can be compared to long-term permanent or semi-permanent villages in order to establish patterns of resource use which might then be useful to interpret future excavations. Short seasonal occupations may produce faunal assemblages dominated by one species with relatively few other species collected in small proportions. A more permanent occupation site might be expected to yield a wide variety of species with none being in much higher proportion than the others. The pattern of using some sites for the collection of one very seasonal species, as is known for the Coast Salish, may be a recent development, therefore consideration of the time depth of this pattern is worthwhile.

A suggested evolutionary pattern for the area inhabited by the Coast Salish is a shift from land resources to more and more reliance on marine resources, both fish and sea mammals. Consideration of the proportions and bone densities of land mammals to sea mammals and land mammals to fish in sites occupied for similar seasons but of different ages could be used to test this hypothesis. If the hypothesis is correct, the amount of land mammals represented in the diet could be expected to decrease in relation to the amount of sea mammals and fish.

Comparisons between sites are complicated if the sites are found in different environmental zones even if they are probably in the same cultural areas. It is very difficult to separate culturally created differences from environmentally created differences. For this reason this study has used sites from the east coast of Vancouver Island almost exclusively for the purposes of comparisons. With further work regional patterns may develop allowing better comparisons between regions.

VI. PRESENTATION OF THE DATA

The faunal species identified in DjSf 13 and DjSf 14 are listed in Tables 3, 4, and 5. In cases where identification to the species level was not possible, members of that genus or class known to be present in the sites vicinity are listed.

The distributions of the fauna from DjSf 13, DjSf 14I, and DjSf 14II are presented in Tables 6, 7, 8, 9, 10, and 11. The distribution of the combined faunal categories is presented in Tables 12, 13, 14 and 15. These tables are accompanied by notes which indicate any difficulties in identification of or pecularities about the bones that are important to the interpretation of the data.

TABLE III: MAMMALS IDENTIFIED FROM DjSf 13 AND DjSf 14

Red Squirrel	*Tamiasciurus hudsonicus* (Erxleber)
American Beaver	*Castor canadensis* Kuhl
White-footed Mouse	*Peromyscus maniculatus* (Wagner)
Old World Rat	*Rattus*
Whales	*Cetacea*
Dogs	*Canis* spp.
Domestic Dog	*Canis familiaris*
Wolf	*Canis lupus Linnaeus*
American Black Bear	*Ursus americanus* (Pallas)
Raccoon	*Procyon lotor* (Linnaeus)
Marten	*Martes americana* (Turton)
Mink	*Mustela vison* Schreber
Canadian River Otter	*Lutra canadensis* (Schreber)
Northern Sea-Lion	*Eumetopias jubata* (Schreber)
Hair Seal	*Phoca vitulina richardi* (Gray)
Elk	*Cervus canadensis* (Erxleben)
Blacktail Deer	*Odocoileus hemionus* (Rafinesque)

TABLE IV: BIRDS IDENTIFIED FROM DjSf 13 and DjSf 14 AND OTHER SELECTED SPECIES

✓	Common Loon	*Gavia immer* (Brunnich)
✓	Arctic Loon	*Gavia arctica* (Linnaeus)
✓	Red-throated Loon	*Gavia stellata* (Pontoppidan)
✓	Red-necked Grebe	*Podiceps grisegena* (Boddaert)
✓	Horned Grebe	*Podiceps auritus* Linnaeus
✓	Eared Grebe	*Podiceps nigricollis* Brehm (P. caspicus)
✓	Western Grebe	*Aechmophorus occidentalis* (Lawrence)
	Pied-billed Grebe	*Podilymbus podiceps* (Linnaeus)
	Double-crested Cormorant	*Phalacrocorax auritus* (Lesson)
✓	Brandt's Cormorant	*Phalacrocorax penicillatus* (Brandt)
	Pelagic Cormorant	*Phalacrocorax pelagicus* Pallas
✓	Great Blue Heron	*Ardea herodias* Chapman
	Canada Goose	*Branta canadensis* (Linnaeus)
✓	Black Brant	*Branta bernicla* (Linnaeus) (B. nigricans)
✓	White-fronted Goose	*Anser albifrons* (Scopoli)
✓	Snow Goose	*Anser caerulescens* (Linnaeus) (Chen hyperborea)
✓	Ross' Goose	*Anser rossii* (Chen rossii)
✓	Mallard	*Anas platyrhynchos* Linnaeus
✓	Pintail	*Anas acuta* Linnaeus
	Green-winged Teal	*Anas crecca* Linnaeus (A. carolinensis)
	Blue-winged Teal	*Anas discors* Linnaeus
	Cinnamon Teal	*Anas cyanaptera* Viellot
	American Wigeon	*Anas americana* (Gmelin) (Mareca americana)
✓	Shoveller	*Anas clypeata* (Linnaeus) (Spatula clypeata)
✓	Wood Duck	*Aix sponsa* (Linnaeus)
	Ring-necked Duck	*Aythya collaris* (Donovan)
	Canvasback	*Aythya valisineria* (Wilson)
✓	Greater Scaup	*Aythya marila* (Linnaeus)
	Lesser Scaup	*Aythya affinis* (Eyton)
✓	Oldsquaw	*Clangula hyemalis* (Linnaeus)
✓	Harlequin Duck	*Histronicus histrionicus* (Linnaeus)
✓	White-winged Scoter	*Melanitta fusca* (Linnaeus) (M. deglandi)
	Surf Scoter	*Melanitta perspicillata* (Linnaeus)
	Common Scoter	*melanitta nigra* (Linnaeus) (Oidemia nigra)
	Hooded Merganser	*Mergus cucullatus* (Linnaeus) (Laphodytes c.)
✓	Common Merganser	*Mergus merganser* Linnaeus
	Red-Breasted Merganser	*Mergus serrator* Linnaeus

TABLE IV: (CONTINUED)

✓ Blue Grouse	*Dendragopus obscurus* (Ridgway)
✓ Ruffed Grouse	*Bonasa umbellus* Conover
✓ Golden Eagle	*Aquila chrysaltes* (Linnaeus)
✓ Bald Eagle	*Haliaeetus levcocephalus* (Linnaeus)
Glaucous Gull?	*Larus hyperboreus*
✓ Glaucous-winged Gull	*Larus glavcescens* Naumann
✓ Western Gull	*Larus occidentalis* Audobon
✓ Herring Gull	*Larus argentatus* Pontoppidan
✓ Thayer's Gull	*Larus thayeri* Brooks (L. argentatus thayeri)
✓ California Gull	*Larus californicus* Lawrence
✓ Ring-billed Gull	*Larus delawarensis* Ord.
✓ Mew Gull	*Larus canus* Linnaeus
✓ Bonaparte's Gull	*Larus philadelphia* (Ord.)
Black-legged Kittiwake?	*Rissa tridactyla*
✓ Common Murre	*Uria aalge* (Pontoppidan)
✓ Common Raven	*Corvus corax* (Ridgway)
✓ Northwestern Crow	*Corvus caurinus* Baird

✓ Birds in comparative collection.

Species names in parentheses have been replaced by those in italics.

TABLE V: FISHES IDENTIFIED FROM DjSf 13 AND DjSf 14 AND OTHER SELECTED SPECIES

✓ Spiny Dogfish	*Squalus acanthias* Linnaeus 1758
✓ Big Skate	*Raja binoculata* Girard 1854
✓ Black Skate	*Raja kincaidi* Garman 1908
✓ Longnose Skate	*Raja rhina* Jordan and Gilbert 1880
Starry Skate	*Raja stellata* Jordan and Gilbert 1880
✓ Ratfish	*Hydrolagus colliei* (Lay and Bennett 1839)
✓ Pacific Herring	*Clupea harengus pallasi* Valenciennes
✓ Pink Salmon	*Oncorhynchus gorbuscha* (Walbaum 1792)
✓ Chum Salmon	*Oncorhynchus keta* (Walbaum 1792)
✓ Coho Salmon	*Oncorhynchus kisutch* (Walbaum 1792)
✓ Sockeye Salmon	*Oncorhynchus nerka* (Walbaum 1792)
✓ Chinook Salmon	*Oncorhynchus tshawytscha* (Walbaum 1792)
✓ Plainfin Midshipman	*Porichthys notatus* Girard 1854
✓ Pacific Cod	*Gadus macrocephalus* Tilesius 1810
✓ Pacific Tomcod	*Microgadus proximus* (Girard 1854)
✓ Walleye Pollock	*Theragra chalcogramma* (Pallas 1811)
True Cods	*Gadidae*
Surfperches	*Embiotocidae*
Shiner Perch	*Cymatogaster aggregata* Gibbons 1854
Striped Seaperch	*Embiotoca lateralis* Agassiz 1854
Pile Perch	*Rhacochilis vacca* (Girard 1855)
Rockfishes	*Sebastes* spp.
Brown Rockfish	*S. auriculatus* Girard 1854
✓ Silvergray Rockfish	*S. brevispinis* (Bean 1883)
✓ Copper Rockfish	*S. caurinus* Richardson 1845
✓ Splitnose Rockfish	*S. diploproa* (Gibert 1890)
✓ Greenstriped Rockfish	*S. elongatus* Ayres 1859
✓ Yellowtail Rockfish	*S. flavidus* (Ayres 1862)
✓ Quillback Rockfish	*S. maliger* (Jordan and Gilbert 1880)
✓ Black Rockfish	*S. melanops* Girard 1856
Vermilion Rockfish	*S. miniatus* (Jordan and Gilbert 1880)
China Rockfish	*S. nebulasus* Ayres 1854
Tiger Rockfish	*S. nigrocinctus* Ayres 1859
✓ Bocaccio	*S. paucispinis* Ayres 1854
✓ Redstripe Rockfish	*S. proriger* (Jordan and Gilbert)
✓ Yelloweye Rockfish	*S. ruberrimus* (Cramer 1895)
Stripetail Rockfish	*S. saxicola* (Gilbert 1890)

TABLE V: (CONTINUED)

	Greenlings	*Hexagrammos* spp.
√	Kelp Greenling	*Hexagrammos decagrammus* (Pallas 1810)
	Rock Greenling	*H. lagocephalus* (Pallas 1810)
	White spotted Greenling	*H. stelleri* Tilesius 1809
√	Lingcod	*Ophiodon elongatus* Girard 1854
	Sculpins	*Cottidae*
	Padded Sculpin	*Artedius fenestralis* Jordan and Gilbert 1882
	Silverspotted Sculpin	*Blepsias cirrhosus* (Pallas 1811)
	Roughback Sculpin	*Chitonatus pugetensis* (Steindachner 1877)
√	Spinyhead Sculpin	*Dasycottus setiger* Bean 1890
	Buffalo Sculpin	*Enophrys bison* (Girard 1854)
√	Red Irish Lord	*Hemilepidotus hemilepidotus* (Tilesius 1810)
	Threadfin Sculpin	*Icelinus filamentosus* Gilbert 1890
	Pacific Staghorn Sculpin	*Leptocattus armatus* Girard 1854
	Blackfin Sculpin	*Malacocottus kincaidi* Gilbert and Thompson 1905
	Great Sculpin	*Myoxocephalus polyacanthocephalus* (Pallas 1811)
	Sailfin Sculpin	*Navthichthys oculofasciatus* (Girard 1857)
	Slim Sculpin	*Radulinus asprellus* Gilbert 1890
√	Cabezon	*Scorpaenichthys marmoratus* (Ayres 1854)
	Flatfishes	*Pleuronectiformes*
√	Pacific Sanddab	*Citharichthys sordidus* (Girard 1854)
	Speckled Sanddab	*C. stigmaeus* Jordan and Gilbert 1882
√	Petrale Sole	*Eopsetta jordani* (Lockington 1879)
√	Flathead Sole	*Hippoglossoides elassadon* Jordan and Gilbert 1880
√	Pacific Halibut	*Hippoglossus stenolepis* Schmidt 1904
	(Hybrid) Sole	*Inopsetta ischyra* (Jordan and Gilbert 1881)
√	Rock Sole	*Lepidopsetta bilineata* (Ayres 1855)
√	Slender Sole	*Lyopsetta exilis* (Jordan and Gilbert)
√	Dover Sole	*Microstomus pacificus* (Lockington 1879)
√	English Sole	*Parophrys vetulus* Girard 1854
√	Starry Flounder	*Platichthys stellatus* (Pallas 1811)
	C-O Sole	*Pleuronichthys coenosus* Girard 1854
√	Sand Sole	*Psettichthys melanostictus* Girard 1854

√ Fishes in comparative collection.

TABLE VI: DISTRIBUTION OF THE FAUNA IN DjSf 13 BY NUMBER OF ELEMENTS, WEIGHT OF THE ELEMENTS, MNI, AND LIVE WEIGHT

Animal Species	No. of Elements	Weight in Grms.	MNI	Live Wgt. in Grms.	Notes
Mammals					
Tamiasciurus spp.	4	.4	1	190.5	1
Castor canadensis	2	20.2	2	16,329.6	
Rattus spp.	16	3.7	1		2
Canis spp.	239	359.2	8		3
Ursus americanus	2	23.9	1	163,296.0	4
Procyon lotor	1	.9	1	5,443.2	
Mustela vison	1	.4	1	1,360.8	
Eumetopias jubata	10	1208.1	2	1,360,800.0	
Phoca vitulina	4	49.5	1	83,916.0	
Cervus canadensis	5	119.5	1	234,964.8	5
Odocoileus hemionus	136	1048.0	4	517,104.0	
Totals	420	2883.8	23	2,383,404.9	
Birds					
Gavia immer	5	12.3	1	3,400.0	
Gavia stellata	1	.6	1	1,800.0	
Podiceps spp.	3	1.1	2	689.2	6
Podiceps grisegena	6	6.5	1	934.0	
Aechmophorus occidentalis	4	2.2	1	1,472.2	
Phalacrocorax spp.	2	.9	1	2,055.3	7
Ardea herodias	1	1.4	1	2,948.4	
Branta bernicla	8	8.6	2	2,721.6	
Anser spp.	29	42.9	3	7,017.3	8
Duck	16	11.1	3	2,295.0	9
Anas spp.	26	17.8	7	4,671.8	10
Aythya spp.	10	5.9	2	1,859.8	11
Clangula hyemalus	5	5.3	2	1,633.0	
Histrionicus histrionicus	1	.5	1	589.7	12
Melanitta spp.	62	60.5	10	11,340.0	13
Aythyinae	9	8.1	2	1,735.0	14
Merginae	19	15.4	4	3,810.4	15
Haliaeetus leucocephalus	9	13.8	2	10,587.2	
Tetraonidae	11	4.9	2	1,817.6	16
Larus spp., large	80	68.5	13	11,320.4	17
Larus spp., medium	8	3.0	3	2,071.8	17
Uria aalge	5	3.2	1	934.3	

TABLE VI: (CONTINUED)

Animal Species	No. of Elements	Weight in Grms.	MNI	Live Wgt. in Grms.	Notes
Corvus corax	12	12.8	3	2,598.0	
Corvus caurinus	2	.7	1	365.3	
Larus hyperboreus?	1	.4	1		18
Rissa spp.?	2	.7	1		
Totals	337	309.1	71	80,667.3	
Fishes					19
Squalus acanthias	61	6.9	3	13,608.0	20
Raja spp.	3	1.3	1	6,494.0	21
Hydrolagus colliei	1	.4	1	1,221.0	22
Clupea harengus	1076	9.3	112	15,859.2	23
Oncorhynchus spp.	471	101.6	6	28,596.6	24
Porichthys notatus	4	.2	1	212.5	
Gadus macrocephalus	39	15.0	1	1,238.6	
Microgadus proximus	2	.1	1	158.5	
Embiotocidae	4	2.0	3	1,548.3	25
Sebastes spp.	56	22.1	4	5,350.8	26
Ophiodon elongatus	2	1.0	1	4,113.0	
Cottidae	8	1.4	2	821.0	27
Scorpaenichthys marmoratus	12	7.2	1	5,670.0	
Pleuronectiformes	125	24.2	4	1,957.6	28
Totals	1864	192.7	141	86,849.7	
Unidentified Mammal		1567.5			
Unidentified Sea Mammal		345.4			
Antler fragments	70	321.1			
Unidentified Bird		61.5			
Unidentified Fish		32.9			

TABLE VII: DISTRIBUTION OF THE FAUNA IN DjSf 13 BY PER CENT OF THE TOTAL NUMBER OF ELEMENTS, WEIGHT OF THE ELEMENTS, MNI, & LIVE WEIGHT

Animal Species	% of Elements	Weight in Grms.	% of MNI	% of Total Live Wgt.	Notes
Mammals					
Tamiasciurus spp.	1.0	.01	4.3	.01	
Castor canadensis	.5	.7	8.7	.7	
Rattus spp.	3.8	.1	4.3	-	2
Canis spp.	56.9	12.5	34.8	-	3
Ursus americanus	.5	.8	4.3	6.9	
Procyon lotor	.2	.03	4.3	.2	
Mustela vison	.2	.01	4.3	.1	
Eumetopias jubata	2.4	41.9	8.7	57.1	
Phoca vitulina	1.0	1.7	4.3	9.9	
Cervus canadensis	1.2	4.1	4.3	9.9	
Odocoileus hemionus	32.4	36.3	17.4	21.7	
Totals	100.1	98.15	99.7	100.11	
Birds					
Gavia immer	1.5	4.0	1.4	4.2	
Gavia stellata	.3	.2	1.4	2.2	
Podiceps spp.	.9	.4	2.8	.9	
Podiceps grisegena	1.8	2.1	1.4	1.2	
Aechmophorus occidentalis	1.2	.7	1.4	1.8	
Phalacrocorax spp.	.6	.3	1.4	2.5	
Ardea herodias	.3	.4	1.4	3.7	
Branta bernicla	2.4	2.9	2.8	3.4	
Anser spp.	8.6	13.9	4.2	8.7	
Duck	4.7	3.6	4.2	5.8	
Anas spp.	7.7	5.8	9.9	2.8	
Aythya spp.	3.0	1.9	2.8	2.3	
Clangula hyemalis	1.5	1.7	2.8	2.0	
Histrionicus histrionicus	.3	.2	1.4	.7	
Melanitta spp.	18.4	19.6	14.1	14.1	
Aythyinae	2.7	2.6	2.8	2.2	
Merginae	5.6	5.0	5.6	4.7	
Haliaeetus leucocephalus	2.7	4.5	2.8	13.1	
Tetraonidae	3.3	1.6	2.8	2.3	
Larus spp., large	23.7	22.2	18.3	14.0	
Larus spp., medium	2.4	1.0	4.2	2.6	
Uria aalge	1.5	1.0	1.4	1.2	

TABLE VII: (CONTINUED)

Animal Species	% of Elements	Weight in Grms.	% of MNI	% of Total Live Wgt.	Notes
Corvus corax	3.6	4.1	4.2	3.2	
Corvus caurinus	.6	.2	1.4	.5	
Larus hyperboreus?	.3	.1	1.4	-	
Rissa spp.	.6	.2	1.4	-	
Totals	100.2	100.2	99.7	100.1	
Fishes					
Squalus acanthias	3.3	3.6	2.1	15.7	
Raja spp.	.2	.7	.7	7.5	
Hydrolagus colliei	.05	.2	.7	1.4	
Clupea harengus	57.8	4.8	79.4	18.3	
Oncorhynchus spp.	25.3	52.7	4.2	32.9	
Porichthys notatus	.2	.1	.7	.2	
Gadus macrocephalus	2.1	7.8	.7	1.4	
Microgadus proximus	.1	.05	.7	.2	
Embiotocidae	.2	1.0	2.1	1.8	
Sebastes spp.	3.0	11.5	2.8	6.2	
Ophiodon elongatus	.1	.5	.7	4.7	
Cottidae	.4	.7	1.4	.9	
Scorpaenichthys marmoratus	.6	3.7	.7	6.5	
Pleuronectiformes	6.7	12.6	2.8	2.3	
Totals	100.05	99.95	99.7	100.0	

TABLE VIII: DISTRIBUTION OF THE FAUNA IN DjSf 14I BY NUMBER OF ELEMENTS, WEIGHT OF ELEMENTS, MNI, AND LIVE WEIGHT

Animal Species	No. of Elements	Weight	MNI	Live Wgt in Grms.	Notes
Mammals					
Cetacea	2	49.6	1		29
Canis spp.	140	300.3	7		2
Ursus americanus	1	1.2	1	163,296	
Phoca vitulina	2	2.1	2	167,832	30
Odocoileus hemionus	62	455.0	3	387,828	
Totals	207	808.2	14	718,956	
Birds					
Gavia immer	1	1.1	1	3,400	
Gavia stellata	2	1.2	1	1,800	
Podiceps grisegena	2	1.1	1	934.0	
Phalacrocorax spp.	1	1.4	1	2,055.3	7
Anserinae	8	9.8	1(2?)	2,609.2	8
Anas spp.	6	2.4	1	667.4	10
Melanitta spp.	9	7.6	1	1,134	13
Tetraonidae	3	1.1	1	908.8	16
Larus spp., large	20	21.8	3	2,612.4	17
Larus spp., medium	3	.8	1	690.6	17
Corvus corax	2	1.5	1	866	
Totals	57	49.8	13	17,677.7	
Fishes					19
Squalus acanthias	26	2.5	3	13,608	20
Hydrolagus colliei	2	1.0	1	1,221	22
Clupea harengus	171	1.8	13	1,840.8	23
Oncorhynchus spp.	25	4.4	1	4,766.1	24
Gadidae	1	.2	1	887.6	31
Gadus macrocephalus	2	.5	1	1,238.6	
Microgadus proximus	5	.2	1	158.5	
Theragra chalcogramma	2	.1	1	919.0	
Embiotocidae	10	1.0	2	1,032.2	25&32
Sebastes spp.	18	3.8	2	675.4	26&33
Cottidae	9	1.7	3	1,231.5	

TABLE VIII: (CONTINUED)

Animal Species	No. of Elements	Weight	MNI	Live Wgt in Grms.	Notes
Scorpaenichthys marmoratus	1	.4	1	5,670	
Pleuronectiformes	39	4.4	2	978.8	28&35
Totals	311	22.0	32	36,227.5	
Unidentified Mammal		959.4			
Unidentified Sea Mammal		75.2			
Antler		9.4			
Unidentified Bird		24.0			
Unidentified Fish		11.8			

TABLE IX: DISTRIBUTION OF THE FAUNA IN DjSf 14I BY PER CENT OF THE TOTAL NUMBER OF ELEMENTS, WEIGHT OF THE ELEMENTS, MNI, AND LIVE WEIGHT

	% of Elements	% of Weight	% of MNI	% of Live Weight
Cetacea	1.0	6.1	7.1	-
Canis spp.	67.6	37.2	50.0	-
Ursus americanus	.5	.1	7.1	22.7
Phoca vitulina	1.0	.3	14.3	23.3
odocoileus hemionus	30.0	56.3	21.4	53.9
Totals	100.1	100.0	99.9	99.9
Birds				
Gavia immer	1.7	2.2	7.7	19.2
Gavia stellata	3.5	2.4	7.7	10.2
Podiceps grisegena	3.5	2.2	7.7	5.3
Phalacrocorax spp.	1.7	2.8	7.7	11.6
Anserinae	14.0	19.7	7.7	14.8
Anas spp.	10.5	4.8	7.7	3.8
Melanitta spp.	15.8	15.3	7.7	6.4
Tetraonidae	5.3	2.2	7.7	5.1
Larus spp., large	35.1	43.8	23.1	14.8
Larus spp., medium	5.3	1.6	7.7	3.9
Corvus corax	3.5	3.0	7.7	4.9
Totals	99.9	100.0	100.1	100.0
Fishes				
Squalus acanthias	8.4	11.4	9.4	37.6
Hydrolagus colliei	.6	4.5	3.1	3.4
Oncorhynchus spp.	8.0	20.0	3.1	13.2
Gadidae	.3	.9	3.1	2.5
Gadus macrocephalus	.6	2.3	3.1	3.4
Microgadus proximus	1.6	.9	3.1	.4
Theragra chalcogramma	.6	.4	3.1	2.5
Embiotocidae	3.2	4.5	6.2	2.8
Sebastes spp.	5.8	17.3	6.2	7.4
Cottidae	2.9	7.7	9.4	3.4
Scorpaenichthys maroratus	.3	1.8	3.1	15.7
Pleuronectiformes	12.5	20.0	6.2	2.7
Clupea harengus	55.0	8.2	40.6	5.1
Totals	99.8	99.9	99.7	100.1

TABLE X: DISTRIBUTION OF FAUNA IN DjSf 14II BY NUMBER OF ELEMENTS, WEIGHT OF ELEMENTS, MNI, AND LIVE WEIGHT

Animal Species	No. of Elements	Weight In Grms	MNI	Live Wgt By Grms	Notes
Tamiasciurus hudsonicus	1	.1	1	190.5	
Castor canadensis	17	2.8	1	8164.8	
Peromyscus maniculatus	2	.1	1	-	36
Canis spp.	1080	758.3	10	-	3
Ursus americanus	3	10.3	1	163,296.	4
Procyon lotor	1	2.1	1	5,443.2	
Martes americana	5	2.6	1	1,360.8	
Mustela vision	1	.8	1	1,360.8	
Lutra canadensis	3	12.1	1	10,428.8	
Eumetopias jubata	4	161.3	1	680,400.0	
Cervus canadensis	6	147.1	1	234,964.8	5
Odocoileus hemionus	96	612.2	4	517,104.	
Totals	1219	1709.8	24	1,622,713.7	
Gavia immer	4	8.7	1	3,400	
Gavia arctica	1	.8	1	2,000	
Gavia stellata	5	6.8	2	3,600	
Podiceps grisegena	5	2.6	1	934	
Podiceps spp.	1	.4	1	344.6	6
Aechmophorus occidentalis	3	2.1	2	2,944.4	
Phalacrocorax spp.	1	.3	1	2,055.3	7
Ardea herodias	2	2.1	1	2,948.4	
Anserinae	5	4.7	1	2,609.2	8
Branta bernicla	6	3.7	2	2,721.6	
Duck	7	2.4	2	1,530.	9
Anas spp.	34	19.7	5	3,337.	10
Aythya spp.	8	6.6	2	1,859.8	11
Clangula hyemalis	1	1.0	1	816.5	
Melanitta spp.	30	22.6	5	5,670.	13
Merginae	3	1.4	2	1,905.2	15
Tetraonidae	40	11.0	5	4,544	16
Aguila chrysaetes	1	14.0	1	2,556	37
Haliaeetus leucocephalus	6	6.1	1	5,293.6	
Larus spp., large	86	66.9	9	7,837.2	17
Larus spp., medium	28	16.3	9	6,215.4	17
Rissa tridactyla?	1	.1	1		
Corvus corax	5	7.5	1	866	
Corvus caurinus	3	.6	1	365.3	
Totals	286	208.4	58	66,353.5	

TABLE X: (CONTINUED)

Animal Species	No. of Elements	Weight in Grms	MNI	Live Wgt By Grms	Notes
Fishes					19
Squalus acanthias	357	28.2	12	54,432	20
Raja spp.	3	.6	1	6,494.6	21
Hydrolagus colliei	12	4.2	4	4,884.0	22
Clupea harengus	9,846	71.6	707	100,111.2	23
Oncorhynchus spp.	346	62.6	5	23,830.5	24&38
Porichthys notatus	73	5.1	5	1,062.5	
Gadus macrocephalus	131	36.4	3	3,715.8	
Merluccius productus	1	.1	1	1,234.2	
Microgadus proximus	251	8.4	5	792.5	
Theragra chalcogramma	5	.5	1	919.0	
Gadidae	34	7.3	2	1,775.2	
Embiotocidae	198	15.1	15	7,741.5	25
Sebastes spp.	377	89.8	10	13,377	26&39
Hexagrammos spp.	9	.6	2	970	
Ophiodon elongatus	39	21.6	3	12,339	
Cottidae	143	9.6	14	5,747	27
Scorpaenichthys marmoratus	53	16.9	2	11,340	
Pleuronectiformes	752	76.7	21	10,277.4	28&41
Totals	12,630	455.3	813	261,044.4	

Unidentified Mammal	1,411.2
Unidentified Sea Mammal	53.9
Antler	70.5
Unidentified Bird	100.8
Unidentified Fish	197.2
	1,833.6

TABLE XI: DISTRIBUTION OF THE FAUNA IN DjSf 14II BY PER CENT OF THE TOTAL NUMBER OF ELEMENTS, WEIGHT OF THE ELEMENTS, MNI, AND LIVE WEIGHT

Animal Species	No. of Elements	Weight in Grms	MNI	Live Wgt By Grams
Tamiasciurus hudsonicus	.1	.01	4.2	.01
Castor canadensis	1.4	.2	4.2	.05
Peromyscus maniculatus	.2	.01	4.2	
Canis spp.	88.6	44.4	41.7	
Ursus americanus	.2	.6	4.2	10.1
Procyon lotor	.1	.1	4.2	.3
Martes americana	.4	.2	4.2	.1
Mustela vison	.1	.05	4.2	.1
Lutra canadensis	.2	.7	4.2	.6
Eumetopias jubata	.3	9.4	4.2	41.9
Cervus canadensis	.5	8.6	4.2	14.5
Odocoileus hemionus	7.9	35.8	16.7	31.9
Totals	100.0	100.07	100.4	100.01
Birds				
Gavia immer	1.4	4.2	1.7	5.1
Gavia arctica	.3	.4	1.7	3.0
Gavia stellata	1.7	3.3	3.4	5.4
Podiceps grisegena	1.7	1.2	1.7	1.4
Podiceps spp.	.3	.2	1.7	.5
Aechmophorus occidentalis	1.0	1.0	3.4	4.4
Phalacrocorax spp.	.3	.1	1.7	3.1
Ardea herodias	.7	1.0	1.7	4.4
Anserinae	1.7	2.3	1.7	3.9
Branta bernicla	2.1	1.8	3.4	4.1
Duck	2.4	1.2	3.4	2.3
Anas spp.	11.9	9.5	8.6	5.0
Aythya spp.	2.8	3.2	3.4	2.8
Clangula hyemalis	.3	.5	1.7	1.2
Melanitta spp.	10.5	10.8	8.6	8.5
Merginae	1.0	.7	3.4	2.9
Tetraonidae	14.0	5.3	8.6	6.8
Aguila chrysaetes	.3	6.7	1.7	3.9
Haliaeetus leucocephalus	2.1	2.9	1.7	8.0
Larus spp., large	30.1	32.1	15.5	11.8
Larus spp., medium	9.7	7.8	15.5	9.4
Rissa tridactyla?	.3	.05	1.7	
Corvus corax	1.7	3.6	1.7	1.3
Corvus caurinus	1.0	.3	1.7	
Totals	99.3	100.15	99.3	99.8

TABLE XI: (CONTINUED)

Animal Species	No. of Elements	Weight in Grms	MNI	Live Wgt By Grms
Fishes				
Squalus acanthias	2.8	6.2	1.5	20.9
Raja spp.	.02	.1	.1	2.5
Hydrolagus colliei	.1	.9	.5	1.9
Clupea harengus	77.96	15.7	87.0	38.4
Oncorhynchus spp.	2.74	13.7	.6	9.1
Porichthys notatus	.58	1.1	.6	.4
Gadus macrocephalus	1.04	8.0	.4	1.4
Merluccius productus	.01	.02	.1	.5
Microgadus proximus	1.99	1.8	.6	.3
Theragra chalcogramma	.04	.1	.1	.4
Gadidae	.27	1.6	.2	.7
Embiotocidae	1.57	3.3	1.8	3.0
Sebastes spp.	2.98	19.7	1.2	5.1
Hexagrammas spp.	.07	.1	.2	.4
Ophiodon elongatus	.31	4.7	.4	4.7
Cottidae	1.13	2.1	1.7	2.2
Scorpaenichthys marmoratus	.42	3.7	.2	4.3
Pleuronectiformes	5.95	16.8	2.6	3.9
Totals	100.07	99.62	99.8	100.1

TABLE XII: DISTRIBUTION OF THE COMBINED FAUNAL CATEGORIES IN DjSf 13, DjSf 14I AND DjSf 14II BY NUMBER OF ELEMENTS, WEIGHT OF THE ELEMENTS, AND MNI.

	DjSf 13			DjSf 14:II			DjSf 14:I			
	Elements	Weight	MNI	Elements	Weight	MNI	Element	Weight	MNI	Notes
Mammals										
Artiodactyla	141	1167.5	5	102	759.3	5	62	455.0	3	42
Sea mammals	14	1257.6	3	7	173.4	2	4	51.7	3	
Other mammals	26	45.8	7	30	18.8	7	1	1.2	1	
Totals	181	2470.9	15	139	951.5	14	67	507.9	7	
Birds										
Geese	37	51.5	5	11	8.4	3	8	9.8	1	43
Dabbling Ducks	26	17.8	7	34	19.7	5	6	2.4	1	
Diving Birds	132	122.4	28	62	53.3	19	15	12.4	5	
Grouse	11	4.9	2	40	11.0	5	3	1.1	1	
Eagles	9	13.8	2	7	20.1	2	-	-	-	
Gulls	88	71.5	16	114	83.2	18	23	22.6	4	
Ravens and Crows	14	13.5	4	8	8.3	2	2	1.5	1	
Other Birds	20	13.6	6	10	4.6	4	-	-	-	
Totals	337	309.0	70	286	208.6	58	57	49.8	13	
Fishes										
Dogfish	61	6.9	3	357	28.2	12	26	2.5	3	44
Herring	1076	9.3	112	9846	71.6	707	171	1.8	13	
Salmon	471	101.6	6	346	62.6	5	25	4.4	1	
Cod	41	15.1	2	388	52.7	12	10	1.0	4	
Perches	4	2.0	3	198	15.1	15	10	1.0	2	
Greenlings	2	1.0	1	48	22.2	5	-	-	-	
Sculpins	20	8.6	3	196	26.5	16	10	2.1	4	
Rockfishes	56	22.1	4	377	89.8	10	18	3.8	2	
Flatfishes	125	24.2	4	752	76.7	21	39	4.4	2	
Other Fishes	8	1.9	3	88	9.9	10	2	1.0	1	
Totals	1864	192.7	141	12,596	455.3	813	311	22.0	32	

TABLE XIII: DISTRIBUTION OF THE LIVE WEIGHT OF THE COMBINED FAUNAL CATEGORIES OF DjSf 13, DjSf 14I, AND DjSf 14II

	DjSf 13	DjSf 14:II	DjSf 14:I
Artiodactyla	752,068.8	725,068.8	387,828
Sea Mammals	1,444,716.0	680,400.0	* 167,832
Other Mammals	186,620.1	190,054.4	163,292
	2,383,404.9	1,622,523.2	718,956
Geese	9,738.9	5,330.8	2,609.2
Dabbling Ducks	4,671.8	3,337.0	667.4
Diving Birds	32,252.9	25,529.8	9,323.3
Grouse	1,817.6	4,544.0	908.8
Eagles	10,587.2	7,849.6	-
Gulls	13,392.2	13,331.4	3,303.0
Ravens and Crows	2,963.3	1,231.3	866.0
Other Birds	5,243.4	4,478.4	-
	80,667.3	65,632.2	17,677.7
Dogfish	13,608.0	54,432.0	13,608.0
Herring	15,859.2	100,111.2	1,840.8
Salmon	28,596.6	23,830.5	4,766.1
Cod	1,397.1	8,436.7	3,203.7
Perches	1,548.3	7,741.5	1,032.2
Greenlings and Lingcod	4,113.0	13,309.0	-
Sculpins	6,491.0	17,087.0	6,901.5
Rockfishes	5,350.8	13,377.0	2,675.4
Flatfishes	1,957.6	10,277.4	978.8
Other Fishes	7,928.1	12,441.1	1,221.0
	86,849.7	261,044.4	36,227.5

* Without Cetacea

TABLE XIV: DISTRIBUTION OF THE COMBINED FAUNAL CATEGORIES IN DjSf 13, DjSf 14I, AND DjSf 14II BY PER CENT FOR THE NUMBER OF ELEMENTS, WEIGHT OF THE ELEMENTS, AND MNI

	DjSf 13			DjSf 14:II			DjSf 14:I			
	Percent Elements	Percent Weight	% MNI	Percent Elements	Percent Weight	% MNI	Percent Elements	Percent Weight	% MNI	Notes
Mammals										
Artiodactya	77.9	47.2	33.3	73.4	79.8	35.7	92.5	89.6	42.9	
Sea mammals	7.7	50.9	20.0	5.0	18.2	14.3	6.0	10.2	42.9	
Other mammals	14.4	1.9	46.7	21.6	2.0	50.0	1.5	.2	14.3	
Totals	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.1	
Birds										
Geese	11.0	16.7	7.1	3.8	4.0	5.2	14.0	19.7	7.7	
Dabbling Ducks	7.7	5.8	10.0	11.9	9.4	8.6	10.5	4.8	7.7	
Diving Birds	39.2	39.6	40.1	21.7	25.5	32.8	26.3	24.9	38.5	
Grouse	3.3	1.6	2.9	14.0	5.3	8.6	5.3	2.2	7.7	
Eagles	2.7	4.7	2.9	2.4	9.6	3.4	-	-	-	
Gulls	26.1	23.1	22.9	39.9	39.9	31.0	40.4	45.4	30.8	
Ravens and Crows	4.2	4.4	5.7	2.8	4.0	3.4	3.5	3.0	7.7	
Other Birds	5.9	4.4	8.6	3.5	2.2	6.9	-	-	-	
Totals	100.1	100.3	100.2	100.0	99.9	99.9	100.0	100.0	100.1	
Fishes										
Dogfish	3.3	3.6	2.1	2.8	6.2	1.5	8.3	11.4	9.4	
Herring	57.7	4.8	79.4	78.0	15.7	87.2	55.0	8.2	40.6	
Salmon	25.3	52.7	4.3	2.7	13.7	.6	8.0	20.0	3.1	
Cod	2.2	7.8	1.4	3.1	11.6	1.2	3.2	4.5	12.5	
Perches	.2	1.0	2.1	1.6	3.3	1.8	3.2	4.5	6.2	
Greenlings and Lingcod	.1	.5	.7	.4	4.9	.6	-	-	-	
Sculpins	1.1	4.5	2.1	1.6	5.8	2.0	3.2	9.5	12.5	
Flatfishes	6.7	12.6	2.8	5.6	16.8	2.6	12.5	20.0	6.2	
Rockfish	3.0	11.5	2.8	3.0	19.7	1.2	5.8	17.3	6.2	
Other Fishes	.4	1.0	2.1	.7	2.2	1.2	.6	4.5	3.1	
Totals	100.	100.0	99.8	99.5	99.9	99.9	99.8	99.9	99.8	

TABLE XV: DISTRIBUTION OF THE LIVE WEIGHT OF THE COMBINED FAUNAL CATEGORIES IN DjSf 13, DjSf 14I, AND DjSf 14II BY PER CENT

	DjSf 13 Percent	DjSf 14:II Percent	DjSf 14:I Percent
Mammals			
Artiodactyla	31.6	46.4	53.9
Sea mammals	60.6	41.9	23.3
Other mammals	7.8	11.7	22.7
Totals	100.0	100.0	99.9
Birds			
Geese	12.1	8.1	14.8
Dabbling Ducks	5.8	5.1	3.8
Diving Birds	40.0	38.9	52.7
Grouse	2.3	6.9	5.1
Eagles	13.1	12.0	-
Gulls	16.6	20.3	18.7
Ravens and Crows	3.7	1.9	4.9
Other Birds	6.5	6.8	-
Totals	100.1	100.0	100.0
Dogfish	15.7	20.9	37.6
Herring	18.3	38.4	5.1
Salmon	32.9	9.1	13.2
Cod	1.6	3.2	8.8
Perches	1.8	3.0	2.8
Rockfish	6.2	5.1	7.4
Greenlings and Lingcod	4.7	5.1	-
Sculpins	7.5	6.5	19.1
Flatfishes	2.3	3.9	2.7
Other Fishes	9.1	4.8	3.4
Totals	100.1	100.0	100.1

Notes to Tables

[1]In DjSf 13 and DjSf 14II the bones appeared more recent than others of the same levels and may have been the result of red squirrels dying in the burrows or being caught by dogs. There are few enough bones that they can be considered relatively unimportant in any case.

[2]One complete skeleton was found in DjSf 13, almost certainly having died in a burrow. As this animal is from historic times and intrusive in the site, data for it were found only in Tables 7 and 8, but not Tables 9, 10, 11 or 12.

[3]Distinguishing between dog and wolf skeletal remains is considered to be extremely difficult (Olsen 1973:17; Gilbert 1973:40). Most of the distinguishing features require measurements from complete or almost complete skulls, which in DjSf 13 and DjSf 14 are rare. Without whole skulls differentiation is based on the fact that wolves are usually larger than Indian dogs (Gilbert 1973:40). However, the possibility of size overlap between small wolves and large dogs exists. For example, in the BCPM's comparative skeletal collection there is a German shephard skeleton that is larger than any of their several wolf skeletons. For these reasons all bones identified as being from canids have been

placed in the category, *Canis* spp. The majority of the material is well under the wolf size range and can confidently be considered dog, while only a few bones are large enough possibly to be wolf.

Suttles (1974:161) states the Straits Indians did not eat dogs. Neither Barnett or Jenness mention dog eating although they do not specifically deny it. As a result, the *Canis* spp. category has been excluded from the live weight figures and the combined mammal figures.

[4]In DjSf 13, one of the bear elements found was the root of a canine tooth still enclosed in a fragment of mandible which had been deliberately smoothed on one side. In DjSf 14II, one of the elements was identified only tentatively as bear.

[5]One of the elk elements from DjSf 13 has been sawn through, probably with a modern bone saw. All of the elements from DjSf 13 come from near the surface, although they are from widely scattered excavation units. It is possible that the bones are of recent origin and should not be included in the discussion of the site inhabitants' diet. Lacking further information, elk has been included in all calculations and tables.

In DjSf 14II, as in the case of DjSf 13, all the elements were found close to the surface, either in the topsoil, or the next level. It is also possible that these bones are the result of recent hunting, although none of these elements was sawn.

[6]It was not possible to identify all the grebe elements to the species level. The western grebe could be easily distinguished from *Podiceps* spp. However while I could separate the red-necked grebe, *Podiceps grisegena*, from the others of the *Podiceps* genus on the basis of its larger size, I was unable to distinguish the horned grebe and the eared grebe from each other. In addition there was not a pied-billed grebe specimen in the comparative collection. As a result there is a category of *Podiceps* spp. which includes the horned grebe, eared grebe and possibly the pied-billed grebe.

[7]The BCPM's faunal collection contained only a Brandt's cormorant skeleton. As a result identification to species was not possible.

[8]In some cases it proved impossible to make identifications past the sub family, Anserinae, level. In addition I was unsure of my ability to identify elements of the genus *Anser* to the species level and ultimately decided to lump all *Anser* together.

[9]In most cases it was possible to distinguish the diving ducks from the dabbling ducks easily. However, in

cases where the element was heavily eroded, or only the shaft of a long bone remained, this was not always possible.

[10]The genus *Anas* contains seven species which are distinguished skeletally mainly by size. The species *Anas americana* and *A. clypeata* are somewhat more distinctive morphologically than the others of the genus. I made an attempt to identify the elements to the species level, but the majority of the elements could only be identified as *Anas* spp. As a result, for purposes of analyzing the quantity data all specific identifications are ignored and only the genus *Anas* is considered. The species identified will be presented when discussing possible seasons of collection.

[11]Only the greater scaup, *A. marila*, was present in the comparative collection, as a result no species identifications were possible.

[12]No harlequin duck elements were recovered in DjSf 14I or DjSf 14II. However, two harlequin duck elements were recovered from the mixed levels.

[13]Only *M. fusca*, the white-winged scoter was present in the faunal comparative collection, so species identification was impossible. Some of the elements were not white-winged scoter.

[14]It is usually possible, as mentioned above, to separate the diving ducks from the dabbling ducks. Within the diving ducks however, further identification was not always possible. The category Aythyinae includes the genera *Aythya*, *Clangula*, and *Melanitta*, excepting *Histrionicus histrionicus*, the harlequin duck, which is morphologically distinct from the other genera.

[15]Only *Mergus merganser*, the common merganser, was present in the comparative faunal collection. Most of the bones seemed to match the common merganser well in morphology and size, but I could not be certain of this identification without the other species to check against. Therefore, no species identifications are offered.

[16]It proved impossible to separate reliably the grouse and ptarmigan species morphologically. In addition to the blue and ruffed grouse which are present in the immediate area of the site, the white-tailed ptarmigan (*Lagopus leucurus*) is present on Vancouver Island at alpine elevations and could have been hunted by the sites' inhabitants.

[17]The gulls do not appear to be sufficiently distinct morphologically to distinguish their skeletons at the species level. There are major size distinctions, however, making it possible to create size categories containing a group of

similar sized species. The eight species of gulls present in the area today (Fitzpatrick n.d:52) can be divided into size categories as follows: the large category contains the glaucous-winged gull (*Larus glaucescens*) and the western gull (*L. occidentalis*); the medium category contains the herring gull (*L. argentatus*), Thayer's gull (*L. thayeri*), the California gull (*L. californicus*), and the ring-billed gull (*L. delawarensis*); the small category contains the mew gull (*L. canus*) and the very small category contains Bonaparte's gull (*L. philadelphia*).

[18]A single gull bone was found in DjSf 13, so much larger than the glaucous-winged gull skeleton that I tentatively identified it as the glaucous gull.

[19]Among the birds and mammals there is very little variation in the number of bones for each species. Comparing the number of elements between two bird species is intuitively understandable because they have the same number of skeletal elements to start with. However, among fishes the number of vertebrae is quite variable ranging from around 30 to over 70. In most cases vertebrae are found as commonly or more commonly than are other skeletal elements. As a result, the number of elements between two species of fish cannot be compared on the same level as the birds and mammals. One solution is to put considerable weight on the MNI when

comparing fish species.

[20]The spiny dogfish is a cartilaginous rather than a bony fish and as a result only vertebrae and two fin spines survive in an archaeological site.

[21]Skates are a cartilaginous fish and in most cases only their vertebrae survive in an archaeological deposit. It was not possible to separate the species morphologically.

[22]The ratfish is another cartilaginous fish, and only its single spine and the distinctive teeth normally survive in an archaeological deposit. As a result the ratfish will always be underrepresented by the number of elements and the MNI should be relied on most heavily.

[23]Herring bones are small, as a result most excavators probably do not see many of the herring bones present in a site. There is no method of determining definitely the ratio of herring bones lost to those recovered, but it is likely to be high. Therefore I assume that the herring are probably severely underrepresented in these sites.

[24]Some of the skeletal elements of salmon are identifiable to the species level, however at this time it appears that vertebrae are not. In both DjSf 13 and DjSf 14 the salmon elements were almost totally vertebrae. Therefore it was not possible to identify the salmon to the species level.

The preponderance of salmon vertebrae is so marked that it requires some attempt at explanation. The cranial skeleton of the salmon is more fragile than that of some fishes, such as the sculpins and rockfishes, so the possibility of differential preservation of the vertebrae and cranial skeleton exists. However, at both sites herring elements, both cranial and vertebral, were recovered in large numbers and they are very fragile. If differential preservation is eliminated as unlikely, then butchering practices should be considered. Barnett (1955:62) reports that the heads and bones of the salmon were removed before drying the meat, and these were roasted or stewed. Suttles (1974:237) reports that in some instances the backbone would be dried and stored with the rest of the flesh. As a result in areas where dried salmon are being consumed the only bones likely to be found, if any, are vertebrae. In areas where the salmon are being caught and processed, cranial elements and perhaps vertebrae would be expected. Therefore, I suggest that at DjSf 13 and DjSf 14, the majority of the salmon eaten was dried, and that at these sites at least some of the backbones were saved. This does not eliminate the possibility that the residents of the sites were fishing for salmon from the Tsable River. The salmon could have been processed at a site right on the river and the cranial bones and perhaps some of the vertebrae could have been discarded at that site. If this is actually the case then at both these sites the salmon are probably considerably underrepresented, and the MNI will not give an accurate representation of the salmon actually consumed at the sites.

[25] At the time I was identifying the fish bones, the BCMP's comparative collection did not include any of the surf perches. However, some exceptionally distinctive elements were known to be surf perch, and one particular bone was identifiable as *Rhacochilis vacca*, the pile perch. As a result, the surf perches are not identified to species and are undoubtedly significantly under-represented. In this case, the best indicator of the surf perches' quantity is the MNI.

[26] Some of the elements of the rockfishes are identifiable to the species level but not all. The species that were identified will be discussed separately rather than break the data for *Sebastes* spp. into small divisions on the tables. The rockfishes have one of the lowest average number of vertebrae of any of the species present, as a result the number of elements present is probably low in comparison with the other species. The relatively high rank of the MNI is probably the best indicator of the importance of the rockfish.

[27]At the time I was identifying the fish bones, the BCPM's comparative collection contained only the spinyhead and rough-spine sculpins, red Irish lord and cabezon. The buffalo and Pacific staghorn sculpins both have a few bones which are identifiable without a comparative skeleton. As a result, the number of species identifications is limited and the data are presented as Cottidae rather than as the few species identifiable, except for the cabezon which is presented separately. As a class, sculpins are fairly distinctive morphologically, so probably most of the sculpin bones were recognized as such; however, there is a possibility the sculpins are underrepresented due to recognition difficulties. In DjSf 13, a single element was identified as the Pacific staghorn sculpin.

[28]The flatfish are not morphologically distinct enough to distinguish species in all cases.

The only element identified to species in DjSf 13 came from a starry flounder. Starry flounders spawn in shallow water in February and March, and are found in relatively shallow water at all times (Hart 1973:632).

[29]Two fragments of a Cetacean vertebral epiphysis were found in DjSf 14I. Probably the fragments are from the same epiphysis, although they did not fit together. It was not possible to identify the epiphysis further, but

its large size indicated it is probably from a whale, such as the humpback, rather than from the smaller dolphins or killer whale. I did not include a live weight figure because of the lack of genus identification, the existence of only two fragments in all components and because the whale's live weight would overpower all other live weight figures. Cowan and Guiget (1978:269) give a weight of 32 tons for one humpback individual which equals 29,030,400 grams. For these reasons, Cetaceans are excluded from the live weight tables.

[30]In DjSf 14I, two hair seal elements were found, probably representing two individuals. Both elements were teeth of such disparate size that it is unlikely they came from the same individual.

[31]In DjSf 14I, one element was recovered so eroded as to make species identification within the Gadidae impossible.

[33]One element from DjSf 14I was positively identified as *Sebastes maliger*, the quillback rockfish. Hart (1973: 425) describes the quillback rockfish as "a fish of the inlets and shallow rockpiles." It can be assumed to be readily available in the Baynes Sound area.

[34]In DjSf 14I, two elements were definitely identified as from Pacific staghorn sculpin.

[35]A single element from DjSf 14I, was identified as *Hippoglossoides elassodon*, the flathead sole. Hart (1973: 613) reports "young are commonly taken at shallow depths in the Strait of Georgia."

[36]Two *Peromyscus* bones from a single individual were recovered from DjSf 14II. The condition of the bones is good compared to others from the same level. Probably, the mouse is of recent origin, having died in its burrow in the site.

[37]This bone comes from the first level in an excavation unit of DjSf 14II and may not be connected with the archaeological deposit. Its presence on the coast is surprising as these birds are more commonly found in mountainous areas, not near coastlines (Godfrey 1979:96).

[38]In DjSf 14, two elements were identified as *Oncorhynchus kisutch*, coho salmon. One was from a mixed level and the other from DjSf 14II. In addition, one premaxillary from a breeding male salmon was identified, but a species identification was not possible.

[39]Two species, *Sebastes brevispinis*, the silvergray rockfish, and *S. caurinus*, the copper rockfish were definitely identified from DjSf 14II. The silvergray rockfish has been taken from inside waters, but more specific information is not available (Hart 1973:405-406).

The copper rockfish "is commonly taken on rocky reefs in shallow waters of the Strait of Georgia" (Hart 1973:408).

Two other species, *S. maliger* (already discussed) and *S. ruberrimus*, the yelloweye rockfish or red snapper, were present in the mixed levels of DjSf 14. The yelloweye rockfish, one of the largest of the rockfishes, is "common throughout coastal British Columbia around reefs in both inside and outside waters" (Hart 1973:443).

[40]The BCPM's comparative collection contained only one species of greenling when I was using it. Therefore no species identifications are attempted.

[41]The most commonly identified species in DjSf 14II was the English sole, *Parophrys vetulus*, with a total of 14 elements identified. Nine elements were identified as halibut, *Hippoglossus stenolepis*, five as petrale sole, *Eopsetta jordani*, and three each of the flathead, *Hippoglossoides elassodon* and rock, *Lepidopsetta bilineata*, soles and the starry flounder, *Platichtys stellata*.

In addition, three species were identified only from the mixed levels; the Dover sole, *Microstomus pacifucus*, curlfin sole, *Pleuronichthys decurrens* and the sand sole, *Psettichthys melanostictus*.

[42]In an effort to see more clearly the relationships of the different groups of mammals in the assemblage of each component, I combined the deer and elk data into one

category of artiodactyla, the sea lion, hair seal, and river otter into a sea mammal category and all remaining mammals into the Other Mammal category, excluding *Canis* spp. entirely.

[43]The differences in percentage between the bird species and genera were frequently so small as to make comparisons very difficult. Combining the genera and species into more inclusive categories allows easier comparison of their relative quantities. The categories chosen (Table 13) follow the modern classification scheme to a large extent and are fairly self-explanatory, except for the "diving bird" and "other bird" categories. The diving bird category contains all diving ducks, the harlequin duck, mergansers, scoters, scaups, and the diving birds, cormorants, the common murre, and loons and grebes. This follows the diving duck category that Suttles (1974:126) reports for the Semiahmoo and represents a group of birds that may have been hunted by similar techniques. For DjSf 13, the other bird category contains great blue heron, duck, and the tentatively identified glaucous gull and kittiwake elements. In DjSf 14II, the other bird category contains duck, great blue heron and a questionable kittiwake element.

[44] As a result of the relatively few species identifications possible, only a few groups were combined. The true cods, the greenlings and lingocds, and the Cottidae and cabezon categories were combined to form three categories, and a category of other fish was formed.

VII. INTERPRETATION AND DISCUSSION OF THE DATA

The rank order for all the animals for all the components is presented in Table 16.

Mammals

None of the small mammals was represented by enough elements to warrant more detailed individual interpretation than that offered in the data section. They were discussed as a group (Other mammals) in the interpretation of the combined mammal categories.

Canis spp. Dogs and Wolves

Canis spp. rank highest of all the mammals in all components in number of elements and MNI (Table 16). *Canis* spp. comprise a higher percentage of all categories in DjSf 14II than in DjSf 13 and in number of elements and bone weight in DjSf 14I. In all components there was considerable size variation within the *Canis* spp. elements in all components, ranging from the size of a small dog to a wolf. The dog could have been small enough to match the ethnographic reports of the Coast Salish wool dog. It would be necessary to make measurements of the bones to be sure, but this may imply considerable time depth for the breeding of the wool dog.

TABLE XVI: RANK ORDER

Animals	No. of Elements			Bone Weight			MNI			Live Weight		
	DjSf 13	DjSf 14II	DjSf 14I	DjSf 13	DjSf 14II	DjSf 14I	DjSf 13	DjSf 14II	DjSf 14I	DjSf 13	DjSf 14II	DjSf 14I
Mammals												
Red Squirrel	5.5	11		9.5	11.5		7.5	7.5		9		
Beaver	7.5	3		7	7		3.5	7.5		6	6	
White-footed Mouse		9			11.5		7.5	7.5				
Black Bear	7.5	7.5	5	6	6	5	7.5	7.5	4.5	4	4	3
Raccoon	9.5	11		8	9		7.5	7.5		7	7	
Mink	9.5	11		9.5	10		7.5	7.5		8	8.5	
Marten		5			8			7.5			8.5	
River Otter		7.5			5			7.5			5	
Whales			3.5			3			4.5			
Canis spp.	1	1	1	3	1	2	1	1	1			
Northern Sea lion	3	6		1	3		3.5	7.5		1	1	
Hair Seal	5.5		3.5	5		4	7.5		2	5		2
Elk	4	4		4	4		7.5	7.5		3	3	
Coast Deer	2	2	2	2	4	1	2	2	2	2	2	1
Birds												
Common Loon	16	14	10.5	8	7	9	21	18	6.5	7	7	1
Arctic Loon		21.5			20			18			15	
Red-throated Loon	23.5	11.5	8	24	9	7	21	8.5	6.5	16	6	5
Podiceps spp.	19	21.5		20	22		12	18		22	23	
Red-necked Grebe	16		8	12	14	9	21	18	6.5	21	19	7
Western Grebe	18	16		18	16.5		21	8.5		19	10	
Cormorants	21	21.5	10.5	21	23	6	21	18	6.5	13	14	4
Great Blue Heron	23.5	18		19	16.5		21	18		8	9	
Geese		11.5	3		12	2		18	6.5		12	3
Anser spp.	3			3			6.5			4		
Brant	12.5	8.5		10	13		12	8.5		9	11	
Duck	6	7		9	15		6.5	8.5		11	18	
Anas spp.	4	3	4	4	3	4	3	4	6.5	5	8	11
Aythya spp.	9	6		13	10		12	8.5		14	17	

RANK XVI: (CONTINUED)

Animals	No. of Elements			Bone Weight			MNI			Live Weight		
	DjSf 13	DjSf 14II	DjSf 14I	DjSf 13	DjSf 14II	DjSf 14I	DjSf 13	DjSf 14II	DjSf 14I	DjSf 13	DjSf 14II	DjSf 14I
Old squaw	16	21.5		14	19		12	18		18	21	
Harlequin Duck	23.5			25			21			23		
Scoters	2	4	2	2	2	3	2	4	6.5	1	3	6
Diving Ducks	10.5			11			12			17		
Mergansers	5	16		5	18		4	8.5		6	16	
Grouse	8	2	5.5	15	6	9	12	4	6.5	15	5	8
Golden Eagle		21.5			5			18			13	
Bald Eagle	10.5	8.5		6	11		12	18		3	4	
Gulls, Large	1	1	1	1	1	1	1	1.5	1	2	1	2
Gulls, medium	12.5	5	5.5	17	4	11	6.5	1.5	6.5	12	2	10
Common Murre	16			16			21			20		
Raven	7	11.5	8	7	8	5	6.5	18	6.5	10	20	9
Northwestern Crow	21	16		22.5	21		21	18		24	22	
Glaucous Gull?	23.5			26			21					
Kittiwake?	21	21.5		22.5	24		21	18				
Fishes												
Spiny Dogfish	4	4	3	7	6	4	5.5	5	2.5	3	2	1
Skates	11	17		10	15.5		11	16		6	9	
Ratfish	14	14	10	12	14	7.5	11	9	10	11	11	7
Pacific Herring	1	1	1	5	3	5	1	1	1	2	1	4
Salmon	2	5	4	1	4	1.5	2	8	10	1	3	3
Midshipman	9.5	10		13	13		11	8		13	14	
Pacific Cod	6	9	10	4	5	9	11	10.5	10	10	12	5
Hake		18			18			16			13	
Tomcod	12.5	6	8	14	11	11.5	11	8	10	14	17	13
Walleye Pollock		16	10		17	13		16	10		16	10
True Cods		13	12.5		12	11.5		13	10		13	11
Surf perches	9.5	7	6	8	9	7.5	5.5	3	5	9	8	8
Greenlings		15			15.5			13			15	
Lingcod	12.5	12		11	7		11	10.5		7	5	
Rockfish	5	3	5	3	1	3	3.5	6	5	6	4	12
Sculpins	8	8	7	9	10	6	7	4	2.5	12	10	6
Cabezon	7	11	12.5	6	8	10	11	13	10	5	6	2
Flatfishes	3	2	2	2	2	1.5	3.5	2	5	8	7	9

No *Canis* spp. bones were found with butchering marks and several skeletons were found nearly complete. This indicates the inhabitants of the sites were probably not eating dogs, as was reported for the recent Coast Salish.

Ursus americanus Black Bear

Bear ranks fourth in live weight in DjSf 13 and DjSf 14II, and third in DjSf 14I. This high rank appears to be strictly as a result of the high weight of the live animal, with the low number of elements indicating it probably provided only a small proportion of the diet.

Cetacea Whales and Porpoises

The large possible live weight (see Note 29) indicates the huge contribution even one whale could make to a group of people. In this case, the two fragments of one epiphysis from DjSf 14I could as easily be the result of scavenging a dead whale carcass or acquiring a whale bone through trade (the bones were in such poor condition that it was impossible to determine if they had been modified in some fashion), as indicate deliberate whale hunting.

Lutra canadensis River Otter

The only river otter elements were found in DjSf 14II in TC H from adjacent levels. It is quite likely the elements are all from one individual. Only in the MNI category did the percentage rise above one. The bones were from a mature individual.

Eumetopias jubata Northern Sea Lion

In DjSf 13, ten sea lion elements were found. In number of elements it ranks third after deer (excluding the intrusive *Rattus*). In the bone weight category sea lion ranks first, making up 41.9 per cent. This high percentage results in part from the large size and great weight of sea lion bones. In addition the live weight of a sea lion is the highest of all the mammals in these sites (excluding the whales), an average of 680,400 grams. As a result, even with only two individuals present, the sea lion represents 57.1 per cent of the live weight category of the mammals. It is unlikely that sea lions actually provided over 50 per cent of the mammal meat eaten at the site as the number of elements does not seem large enough to support this idea. However, a sea lion would undoubtedly provide a large amount of edible meat and the hunting of sea lions may have been relatively important.

In DjSf 14II, four sea lion bones were found representing one individual. The proportion of sea lion is smaller than in DjSf 13 (Table 11). This lower proportion seems to indicate that sea lions were collected less in DjSf 14II than in DjSf 13. However, the relatively low number of elements would allow a considerable amount of chance variation. If the *Canis* spp. elements are left out of the percentage calculations in order to see the relations of the remaining elements more clearly, sea lion elements constitute 3.5 per cent in DjSf 13 and 2.9 per cent in DjSf 14II, not a large difference.

Phoca vitulina Hair or Harbour Seal

The highest number of hair seal elements are also found in DjSf 13. However, proportionately hair seals make up less than 5 per cent of any category (Table 7). Hair seals appear to have provided only a small part of the diet.

In DjSf 14I, two hair seal teeth were recovered which provided only a small portion of either the elements or bone weight categories. However, the MNI is two, giving hair seal a fairly high proportion of the total MNI and live weight categories. However, with only two elements and the low total number of elements in component interpretation is difficult.

No hair seal elements were found in DjSf 14II. This absence further supports the hypothesis of sea mammal hunting being most important in DjSf 13, which is of the most recent period. More support is provided by comparing the category of fragmentary sea mammal bone to the total unidentified bone (which includes mammal, antler, sea mammal, fish, and bird). In DjSf 13, 14.8 per cent of the unidentified bone by weight is sea mammal, dropping to 7.0 per cent in DjSf 14I and 2.0 per cent in DjSf 14II. It would appear that sea mammal was used the most heavily in DjSf 13, and the least in DjSf 14II, with DjSf 14I possibly filling an intermediary position.

Odocoileus hemionus Coast deer

In DjSf 13 deer elements are the second most numerous of the mammals, consisting of 136 bones. The third ranked species, sea lion, has only ten elements - an indication of the overwhelming importance of the deer in the diet. Deer ranks second after sea lion in live weight.

In DjSf 14I, deer also ranks second in elements after *Canis* spp. It ranks first in bone weight and live weight. The MNI is three, second only to *Canis* spp. As in DjSf 13, deer apparently constitutes a major portion of the diet, probably the most important mammal collected.

In DjSf 14II, coast deer also ranks second in number of elements, after *Canis* spp. The MNI for coast deer is four, compared with one for all other mammals except *Canis* spp. As in DjSf 13, coast deer ranks second in live weight after sea lion. Coast deer was the most important land mammal hunted representing a very significant portion of the diet of the site's inhabitants.

Combined Categories

In all components the artiodactyl category forms over 70 per cent of the elements. In addition I feel that a very high proportion of the unidentified fragments of mammal bone are also artiodactyla because of their size. In all components the sea mammal category forms less than 10 per cent of the elements with DjSf 13 highest at 7.7 per cent and DjSf 14II lowest at 5.0 per cent. The differences are slight, but the combined category still follows the pattern noted for the individual species. The per cent of other mammal elements fluctuates the most of all three groups, apparently in direct relationship to the number of species present in each component. The number of species recovered from the components probably reflects to a large degree the number of bones recovered. DjSf 14II with the highest number of species, has 21.6 per cent of the elements in the other mammal category while DjSf 14I with the lowest number of species has only 1.5 per cent in the other mammal category.

In contrast to its high percentage in the number of elements category, artiodactyla is much lower in the live weight category. In DjSf 13, artiodactyla only constitutes 31.6 per cent of the total live weight. In DjSf 14II and

DjSf 14I, artiodactyla constitutes 46.4 per cent and 53.9 per cent, respectively, of the total mammal live weight. This drop in percentage from the number of elements category to the live weight is the result of the heavy live weight of the sea mammals, particularly the sea lion. Sea mammals constitute 60.6 per cent of the live weight in DjSf 13, 41.9 per cent in DjSf 14II and 23.3 per cent of DjSf 14I. These figures illustrate well the fact that a few sea mammals could have provided a large amount of meat.

The conclusions from the data are that coast deer and sea mammals (particularly sea lion) were the most important mammals in the diet. More individuals of deer were caught than any other mammal, but if sea lions were hunted in any numbers they could have provided a large portion of the diet also. Smaller mammals were hunted, but they provided only a limited proportion of the diet in any of the components. The only difference over time seen in the components may be a gradual increase in the number of sea mammals used.

Birds

Gavia immer, G. arctica, G. stellata
Common, Arctic, Red-throated Loons

From DjSf 13, five elements were identified as common loon and one as red-throated loon. In no category does loon constitute more than 5 per cent. Despite being fairly large birds and the common loon being abundant, loons do not appear to have been hunted extensively.

In DjSf 14I, one common loon and two red-throated loon elements were recovered. Both species provide more than 5 per cent of the MNI category and more than 10 per cent of the live weight category. The relatively large proportion of loon in the live weight category is a result of most of the species having only one MNI, and the heavy live weight of the loons. In this component also, loons appear to have been hunted to only a limited extent.

In DjSf 14II, all three species of loon are found. Four common loon elements were found, representing one individual. A single Arctic loon element was recovered. There were five red-throated loon elements recovered, representing two individuals. The percentage of loon does not rise above five per cent except in the live weight category where 5.3 per cent of the total is red-throated loon. Although no species of loon contributes a very large proportion of the live weight, as a group loons make up 13.7 per cent of the total live weight. While loons were not apparently caught in large numbers, because they are large birds those caught could have supplied a significant portion of the diet.

With so few elements found for each species in any component, it is most reasonable to discuss the genus as a whole. There seems to be a decrease in the use of loons from the oldest component, DjSf 14I to the more recent DjSf 13. There seems to be no definite reason for this decline, but it perhaps represents a change or difference in dietary preferences.

Podiceps grisegena, Red-necked Grebe; *P. auritus*, Horned Grebe; *P. caspicus*, Earned Grebe; *Aechmophorus occidentalis*, Western Grebe; *Podilymbus podiceps*, Pied-billed Grebe

In all three components all categories of grebes were recovered in small numbers. This, coupled with the small size of the grebes (Table 2) seems to indicate the grebes provided only a small part of the diet.

In all components, *Podiceps* spp. is the smallest of the three groups of grebes recovered despite the fact that it represents two, perhaps three species. Differential recovery seems an unlikely explanation, so it appears that either these small grebes were not being hunted as much as the larger grebes, or they were not as easily available. They weigh the least of the birds except the teals (Table 2) and may not have been considered a worthwhile contribution to the diet.

Phalacrocorax auritus, Double-crested Cormorant; *P. penicillatus*, Brandt's Cormorant; *P. pelagicus*, Pelagic Cormorant

So few elements were recovered from these components that it appears the cormorants were little used. Cormorants are fairly numerous today and are quite large, so that their low number (only four elements) in the sites is somewhat surprising.

Anserinae Geese

Black brant elements were recovered in small numbers from DjSf 13 and DjSf 14II. They apparently provided only a small portion of the diet.

However, in DjSf 13 there were a fairly large number of *Anser* spp. elements recovered. *Anser* spp. rank third in number of elements and bone weight, but is considerably lower in MNI and live weight.

The placing of *Anser* spp. in third rank in elements and bone weight when it constitutes only a small percentage of either illustrates the generally even distribution of elements among the bird species. *Anser* spp. apparently provided a small to moderate proportion of the birds eaten at the site.

None of the three geese species included in the *Anser* genus is common today in the Comox-Baynes Sound area. The presence of such a relatively large number of them in the site is somewhat puzzling. Their presence could either indicate intensive hunting of the few birds present or that the geese were more common than at present.

No *Anser* spp. elements were recovered from DjSf 14I or DjSf 14II.

Eight elements identified as Anserinae were recovered from DjSf 14I, representing at least one and possibly, two, individuals. Anserinae ranks third in elements and ties for second in live weight. Geese appear to constitute a moderate proportion of the birds in the diet. The category of large gulls ranks first in number of elements by more than twice; however, geese are large enough in size to be nearly equal to live weight to the lighter large gulls, and if two individuals exist then geese would rank first in live weight.

In DjSf 13, 26 *Anas* spp. elements representing seven individuals were recovered. In number of elements *Anas* spp. ranks fourth, behind *Anser* spp. and ahead of Merginae. Despite very similar numbers of elements, the MNI for *Anas* spp. is twice that of *Anser* spp., illustrating how erratic the MNI can be. The genus *Anas* constitutes a relatively small proportion of the diet even though it ranks high in number of elements and MNI (third). Except for the first and second ranked species (yet to be discussed), no single bird species constitutes a very large proportion of the diet.

In DjSf 14I, six *Anas* spp. elements were recovered, representing one individual. *Anas* spp. ranks fourth in number of elements. As in DjSf 13, *Anas* spp. does not constitute a large portion of the diet, partly as a result of the low weight of the genus *Anas* (Table 2), but apparently was one of the more commonly wanted birds.

In DjSf 14II, 34 *Anas* spp. elements were found, representing five individuals. *Anas* spp. is third ranked in every category except live weight where it is fifth ranked. Again, *Anas* spp. does not constitute a very large proportion of the diet. However, it is among the group of species that seem to have been most commonly hunted in DjSf 14II. The lower MNI in DjSf 14II lowers the live weight figure somewhat, giving *Anas* spp. the appearance of providing less of the diet than in DjSf 13. I am inclined to feel that the amount of *Anas* spp. is probably close to equal in the sites.

Aythya spp. Scaups

Surprisingly, this genus makes up only a small portion of the bird assemblage in DjSf 13 and DjSf 14II despite the fact that the greater scaup is common and of reasonable size (see Table 2). None at all was recovered from DjSf 14I.

Melanitta spp. Scoters

In DjSf 13, 62 *Melanitta* spp. elements were recovered representing ten individuals. Scoters rank second in all categories except live weight in which they are tied for first rank with the large gulls. Without doubt, the scoters were one of the two most important groups collected at this site. The scoters and large-sized gulls, the most abundant bird, lead all the other bird species, generally by more than double in most categories. The scoters all weigh more than the large gulls (Table 2) resulting in both contributing the same proportion of the live weight category. As a result of this weight difference, it is possible the scoters may actually have contributed as much or more than the large gulls to the diet. In addition, the unspecified duck category probably contains some scoter elements.

In DjSf 14I, nine *Melanitta* spp. elements were found.

Scoters do not appear to be as highly ranked in this component as in DjSf 13. They comprise a much lower percentage of the birds than do the large gulls, which are first ranked in this component also. Geese outrank the scoters in bone weight and live weight categories. Rather than sharing the top ranking with the large gulls as in DjSf 13, scoters appear to share second and third rank with the geese, considerably below the large gulls.

In DjSf 14II, thirty scoter elements were recovered representing five individuals. The scoters rank fourth in number of elements, second in bone weight and meat weight, and are tied for second rank in total MNI with *Anas* spp. and grouse. The percentage of scoters present in DjSf 14II in general seems to be less than DjSf 13 and DjSf 14I. In DjSf 14II, although scoters are an important part of the assemblage, several other species have about equal importance, and the large gulls are considerably more important.

Mergus spp. Mergansers

In DjSf 13, nineteen *Mergus* spp. elements were recovered. The mergansers have an overall rank of about fifth. Mergansers do not comprise a very large proportion of the diet, but they would probably have been one of the more commonly hunted birds in this site.

Very few *Mergus* spp. elements were recovered from DjSf 14II and none at all from DjSf 14I. This low proportion is a considerable difference in comparison with DjSf 13. The implications are unclear. The merganser population would be lowest in the summer and highest in the winter when the red-breasted merganser migrates into the area. Perhaps this low number of merganser elements is a reflection of hunting during a period of low population, i.e. in the summer period. It could also be a change in dietary preference, or a shift in the population density of the mergansers. There are too many possible causes to give a definite explanation.

Uria aalge Common Murre

Five common murre elements representing one individual were recovered from DjSf 13. Common murres did not constitute a very large proportion of the diet at DjSf 13. As these birds are common, of moderate size (see Table 2) and other diving birds are used heavily, I would have expected them, and the other murres, to be more common in the site.

No common murre elements were recovered from DjSf 14I or DjSf 14II. However, one element was present in the site in a mixed level.

Tetraonidae Grouse and Ptarmigan

In DjSf 13, eleven elements were identified as Tetraonidae. Tetraonidae ranks eighth in the number of elements and considerably lower in all other categories. The grouse do not provide a large proportion of the diet; however, they are not the smallest group in the site, ranking above some of the sea birds.

In DjSf 14I, three Tetraonidae elements were recovered. Grouse represents a slightly larger portion of the bird assemblage in this site, however its numbers are still very low.

In DjSf 14II, forty Tetraonidae elements representing five individuals were recovered. Grouse ranks second in number of elements, fifth in bone weight, ties for third rank in MNI with *Melanitta* spp. and *Anas* spp. and fourth in live weight. In this component, grouse appears equally as important in terms of numbers as the duck species, a considerable difference from either DjSf 14I or DjSf 14II. One possible explanation would involve a greater emphasis on land hunting than in DjSf 13. Perhaps this emphasis on land hunting is also reflected in the lower number of sea mammal bones in DjSf 14II in comparison to DjSf 13. Another possibility is an environmental change allowing a high population of grouse, such as forest fires producing more clearings and second growth forests. Whatever the reasons, the high proportion of grouse in the bird assemblage in DjSf 14II is one of the major differences between it and the other two components.

Haliaeetus leucocephalus Bald Eagle

In DjSf 13, nine bald eagle elements were recovered representing two individuals. Bald eagle doesn't rank very high in any category except live weight, where with only a MNI of two, it ranks third. With its large size the bald eagle could provide a reasonable amount of the diet if hunted in any numbers; however, the low number of elements implies it was probably not hunted extensively.

Fewer bald eagle elements were found in DjSf 14II, implying it was even less important in the diet.

Larus spp. Gulls

In DjSf 13, eighty large gull elements were recovered, representing thirteen individuals. Large gulls are first rank in all categories except live weight, where they are second ranked just after *Melanitta* spp. More large gulls were caught than any other genus or species of bird at this site. Although large gulls had a greater MNI than *Melanitta* spp., each provided almost exactly the same proportion of the diet as a result of the greater live weight of the scoters (see Table 2). Considering that the western gull is only an occasional visitor, probably most elements are glaucous-winged gull.

Twenty large gull elements were recovered from DjSf 14I. The dominance of large gulls in all but live weight is even more pronounced than in DjSf 13. Again, the large gulls do not dominate the live weight category as definitely because of the heavier weight of birds such as the common loon and the geese. In DjSf 14I, the *Melanitta* spp. elements are less than half as numerous as the large gull elements in contrast to DjSf 13 where they were only about one third less.

In DjSf 14II, 86 large gull elements were recovered representing nine individuals. As in DjSf 14I, the large gulls dominate this site's bird assemblage, with more than twice as many elements as the next most numerous group, Tetraonidae. Although the number of large gull elements is higher in DjSf 14II than in DjSf 13, the MNI is lower which in turn lowers the total live weight. As a result, in DjSf 14II the large gulls provide a smaller proportion of the diet than in DjSf 13 even though they comprise a larger proportion of the elements in DjSf 14II than in DjSf 13.

In DjSf 13, eight medium gull elements were recovered, representing three individuals. The medium gulls do not appear to have provided a significant part in any category in this site. This is somewhat surprising considering these gulls should have been easily available during all the seasons. This may imply the glaucous-winged and western gills were being selected for over the smaller gulls, or the smaller gulls were not easily available. If the gulls were hunted by bow and arrow, it should be possible to select for the larger gulls, whereas the use of such things as permanent standing nets should have caught a more even distribution of the gulls.

In DjSf 14I, three elements of medium gulls were found, representing a single individual. This is not a very large proportion, but it is larger than in DjSf 13, perhaps indicating less of a bias against smaller gulls.

In DjSf 14II, twenty-eight elements were identified as medium gull. This represents a significant portion of the assemblage and more medium gulls than found in either DjSf 13 or DjSf 14I. The medium gulls rank fifth after *Melanitta* spp. in number of elements, tie for first rank in MNI with large gulls and rank second in live weight after large gulls.

The large gulls seem to decrease in use slightly from DjSf 14II to DjSf 13, even though the MNI and live weight percentages are highest for DjSf 13. I feel that either the MNI from DjSf 13 is slightly inflated or the MNI for DjSf 14II is slightly deflated as an effect of chance variation in the type of elements recovered. Without doubt, the number of medium gulls decreases from DjSf 14II to DjSf 13. It seems very unlikely that the local environment would change enough from the period of DjSf 14II to DjSf 13 to cause fewer of the medium gulls to appear in the Baynes Sound area. If an environmental change is unlikely then perhaps the hunting pattern changed. Less population pressure on the resources during the occupation of DjSf 13 might have allowed the hunters to ignore the medium gulls, their smaller size making them a less desirable resource than the larger gulls.

Corvus corax, Common Raven;
C. caurinus, Northwestern Crow

In DjSf 13, twelve raven elements were identified representing three individuals. There is no mention by any of the ethnographers of whether or not the raven was eaten by the recent Coast Salish. However, the number of elements implies deliberate hunting by the site's occupants if not in a large quantity. There is no indication from the elements found of any special treatment of the birds.

In addition, two crow elements were found in DjSf 13. Crow constitutes less than 1 per cent of any category except MNI where it makes up 1.4 per cent of the total. Crows represent only a very small proportion of the site's bird assemblage.

Two raven elements, representing a single individual were found in DjSf 14I.

In proportion, this is very similar to DjSf 13, but the low number of elements makes comparisons tenuous.

No crow elements were recovered from DjSf 14I.

In DjSf 14II, five raven elements were recovered. This is less than either of the other components and places the raven in a fairly low rank.

Three crow elements were recoverd from DjSf 14II, representing a single individual. Crows were hunted only to a minor extent in this component.

In all three components, the raven is found in greater numbers than the crow. The crow is a flocking bird found in great numbers along the coast today, while the raven is usually solitary or in small groups, and much less common than the crow. Possibly the crow population has risen recently due to a greater abundance of food resources found in farming areas and around garbage dumps. However, it seems possible that the predominance of ravens over crows in the site indicates deliberate selection of the raven for some purpose rather than random hunting of crows and ravens.

Combined Categories

In DjSf 13, diving ducks and gulls ranked first and second respectively in elements, dominating the bird assemblage (see Table 13). Geese and dabbling ducks are the next most numerous, ranking third and fourth but they constitute a considerably lower proportion of the elements than diving birds and gulls. In DjSf 14II, the gulls and diving birds are first and second ranked, their order reversed from that of DjSf 13, and they do not dominate the assemblage as much. In this component, grouse and dabbling ducks which rank third and fourth, comprise a larger portion of the elements than the third and fourth ranked birds in DjSf 13. The hunters of DjSf 13 seem to have been concentrating to a greater extent on the birds found at sea, the diving ducks, diving birds, and gulls, than were the hunters of DjSf 14II who used a wider variety of habitats to a greater extent.

When considering the live weight, this pattern is no longer as clear cut. In DjSf 13, the diving birds provide 40.1 per cent of the total live weight, well ahead of the second ranked gulls at 16.4 per cent. However, in this case only the diving birds stand out, as the eagles and geese follow right after the gulls with 13.2 per cent and 12.1 per cent respectively. In DjSf 14II, the diving ducks also rank first and provide almost the same proportion of the live weight, 38.9 per cent. Gulls comprise a slightly higher percentage, 20.3 per cent, than in DjSf 13. Eagles rank third, as in DjSf 13, with 12.0 per cent after which the proportions drop even further. There is little difference among the geese, grouse and other bird category, respectively fourth, fifth and sixth ranked. The major differences between DjSf 13 and DjSf 14II in live weight are the slightly higher proportion of gull and grouse and the slightly lower proportion of geese in DjSf 14II.

Comparisons with DjSf 14I are awkward because of a lack of either eagles or the other bird category. However, the same general pattern is followed with gull and diving bird ranking first and second in elements, respectively. This is reversed in live weight with diving birds ranking first by a considerable margin over the second ranked gulls.

Fishes

Squalus acanthias Spiny Dogfish

In DjSf 13, 61 dogfish elements were recovered, representing three individuals. Dogfish ranks fourth in number of elements, seventh in bone weight. Dogfish can be considered one of the important fish caught at this site, considering its fairly high ranking and the large percentage of the live weight it provides. It is possible that dogfish were not eaten (Barnett 1955:63; Suttles 1974: 186), but eating dogfish was reported for the Saanich (Jenness n.d:22).

In DjSf 14I, 26 dogfish elements representing three individuals were recovered. The dogfish ranks first in live weight, second in MNI, and third in both elements and bone weight. Considering its ranking and high percentages, this fish appears to have been one of the most numerous caught in this component. If the dogfish was eaten then it provided a large portion of the diet.

In DjSf 14II, 357 dogfish elements were recovered, which represent twelve individuals. In this component, the extremely large number of herring elements and individuals makes the percentages of all other fish look very low, as a result the rankings of the fish give a better indication of their relative importances. Dogfish ranks fourth in number of elements, fifth in MNI, sixth in bone weight and second in live weight. Again, as in the other components, the dogfish seems to have been a relatively important fish. If it was eaten it could have been a high percentage of the site inhabitants' diet.

Dogfish appears to have been used most heavily in DjSf 14I, where it ranks consistently higher than in either DjSf 13 or DjSf 14II.

Clupea harengus Pacific Herring

In DjSf 13, 1076 herring elements with an MNI of 112, were found. This gives herring first rank in elements and MNI, second rank in live weight and fifth rank in bone weight. With the possible exception of salmon (the second most numerous elements) herring was the most frequently caught fish at this site. Considering its small size, it contributes a surprisingly large proportion to the diet as well. It must also be assumed that herring is under-represented by a considerable amount.

In DjSf 14I, 171 herring elements were recovered, equalling 13 individuals. Herring is still the most numerous species by far, however the proportion of the live weight has dropped considerably from that in DjSf 13, into fourth rank. Nevertheless, herring still contributes a moderate proportion to the diet in this component.

In DjSf 14II, 9846 herring elements were recovered. These elements represented 707 individuals. Herring ranks third in bone weight and first in the other categories. The dominance of herring in this component is overwhelming. While the rank of herring among the three components is not greatly different, in DjSf 14II the proportion of herring is greater in all categories. Herring makes up almost 40 per cent of the live weight category. Dogfish is second ranked with 20.9 per cent, and in fact may not have been eaten. The third ranked fish is salmon at 9.1 per cent, much lower than the herring. Even if salmon is under-represented (see Note 24), herring must have provided a large portion of the fish diet. Although there are difficulties in comparing birds to fish, it may be significant that the live weight of all the birds in DjSf 14II is only 65,632 grams, while that of the herring alone is 100,111 grams.

Oncorhynchos spp. Salmon

In DjSf 13, 471 salmon elements were found representing six individuals. Salmon ranks second in number of elements and MNI, and first in bone weight and live weight. In this site salmon has less than half the number of elements as herring, but nearly twice the live weight. Considering the probability that salmon are underrepresented, they provide a larger proportion of the diet than any other fish group.

In DjSf 14I, 25 salmon elements were found, weighing 4.4 grams and representing a single individual. Salmon makes up 8.0 per cent of the elements, 12.0 per cent of the bone weight, 3.1 per cent of the MNI and 13.2 per cent of the live weight. It is first ranked in bone weight, third ranked in live weight, fourth in number of elements and with only one MNI is tied for last with several other species. Salmon does not seem to be a very important species in this component. Herring outnumbers it by about six times and several other species have a higher MNI. If it is under-represented as I suggested, then its importance could be raised, but it does not demonstrate the same kind of dominance as it showed in DjSf 13.

A total of 346 salmon elements were recovered from DjSf 14II, representing five individuals.

Salmon ranks third in live weight, fourth in bone weight, fifth in number of elements and eighth in MNI. When compared to DjSf 13 and DjSf 14I, salmon is least important in this component. It appears to share an overall third position with dogfish and rockfish. As salmon is a fairly large fish on the average, it shows up better in the live weight category, although still does not provide as high a proportion as in DjSf 13 or DjSf 14I.

Porichthys rotatus Plainfin Midshipman

Very few midshipman elements were found in DjSf 13, indicating they were not a major component in the diet. None at all was recovered from DjSf 14I.

In DjSf 14II, 73 midshipman elements representing five individuals were recovered. Although midshipman apparently did not constitute a major part of the diet in DjSf 14II, the number of elements is much higher in this component than in either of the others. It can be considered to have been more important in this site.

Gadus macrocephalus Pacific Cod

In DjSf 13, 39 Pacific cod elements were found, representing only a single individual. In rank, it is sixth in number of elements, fourth in bone weight, tied for last in MNI and tenth in live weight. With 39 elements, the Pacific cod is probably more important than the low MNI implies. However, it does not appear that it was caught in great frequency, or contributed a large part to the diet.

Two Pacific cod elements were found in DjSf 14I, representing a single individual. With so few elements, it is unlikely this fish was important in the diet of this component.

In DjSf 14II, 131 Pacific cod elements were recovered, representing three individuals. It is ranked ninth in elements, fifth in bone weight, eleventh in MNI and twelfth in live weight. As in the case of the midshipman, Pacific cod does not appear to have been a major part of the diet in this component. However, there are many more elements than in either of the other components, which implies the inhabitants were catching more Pacific cod than earlier or later.

Microgadus proximus Pacific Tomcod

Two tomcod elements were found in DjSf 13, representing a single individual. Tomcod comprises less than 1 per cent in all categories. It appears to have been a very minor part of the site's inhabitants' diet.

In DjSf 14I, five tomcod elements, representing a single individual were identified. The numbers are very small to draw conclusions; however tomcod may have played a slightly more important role in DjSf 14I than in DjSf 13. In any case, tomcod still contributed only a minor amount to the diet.

In DjSf 14II, there were 251 tomcod elements found. It ranks sixth in number of elements, twelfth in bone weight, eighth in MNI and eighteenth in live weight. The small size of the tomcod results in it contributing a small part of the total weight and probably not a very important part of the diet. However, it appears the number of tomcod caught has risen considerably in comparison with the other two components. The presence of this large number of tomcod elements is somewhat surprising considering that it is not abundant or large, and the other larger cod species were not caught in abundance.

Embiotocidae Surfperches

Only a few surf perch elements were recovered from either DjSf 13 or DjSf 14I. Surf perches did not contribute a large part to the diet of either of these components.

However, in DjSf 14II, 198 perch elements were recovered, representing fifteen individuals. Some of the elements were identified as pile perch. Perch ranks seventh in number of elements, ninth in bone weight, third in MNI and eighth in live weight. The rank in MNI gives the best indication of the probable importance of this fish in numbers. Its importance in the diet is not great however, because this fish itself is not very large.

Sebastes spp. Rockfishes

In DjSf 13, 56 rockfish elements were recovered, representing four individuals. They rank fifth in number of elements, third in bone weight, sixth in live weight and tie for third in MNI. The relatively high rank of the

MNI is probably a good indicator of the importance of the rockfish. They are tied in MNI with flatfish, but their size is greater than many flatfish so they may have provided a larger proportion of the diet. Probably rockfish, along with flatfish, dogfish (if eaten) and possibly perch were the staple fishes after salmon and herring in this site. No specific identifications were made from this site.

Eighteen rockfish elements were recovered from DjSf 14I, representing two individuals. It ranks fifth in elements, second in bone weight, fourth in live weight and ties for third in MNI. Rockfish appears to be somewhat more important in this component than in DjSf 13.

In DjSf 14II, 377 rockfish elements were identified, representing ten individuals. It ranks third in number of elements, first in bone weight, sixth in MNI and fourth in live weight. The percentages of rockfish in DjSf 14II are quite similar to those in DjSf 13, and a little lower than in DjSf 14I. Again, although it did not supply a large proportion of the live weight, rockfish seems to be among the group of fishes of secondary importance.

Cottidae Sculpins

Eight sculpin elements were recovered from DjSf 13, and representing two individuals. The sculpins comprise 1.4 per cent of the MNI and less than 1 per cent of all other categories. A single element was identified as the Pacific staghorn sculpin.

Twelve cabezon elements were found, weighing 7.2 grams, representing a single individual. The cabezon is the largest of the sculpins. As a result it makes up 6.5 per cent of the live weight and ranks fifth. The cabezon is in a similar position as the lingcod; relatively few elements, but a large live weight. This fish could contribute a fair amount to the diet if caught even in moderate numbers. The other sculpins appear to have contributed only a very minor part to the diet.

In DjSf 14I, nine sculpin bones were found, representing three individuals. The sculpins rank seventh in number of elements, fifth in bone weight, sixth in live weight and tie for second in MNI. Although the low number of fish elements from this component makes comparisons difficult, it appears that the sculpins are more important in DjSf 14I than DjSf 13. However, they are still not of great importance. Two elements were definitely identified as Pacific staghorn sculpin.

Only a single cabezon element was found. Even with only a single individual, the cabezon ranks second in live weight. The cabezon, with only a single element, is unlikely to have been the second most important fish in the diet, but as mentioned before, the cabezon can be large enough to provide a moderate part of the diet.

In DjSf 14II, 143 sculpin elements were recovered, representing fourteen individuals. In rank, sculpins are eighth in number of elements, tenth in bone weight, fourth in MNI and tenth in live weight. Considering the percentages sculpins seem to be of little importance, however their high rank in the MNI implies they were one of the most frequently caught fish. They are not overly large and probably did not make up a large part of the diet. In DjSf 14II, it appears that more sculpins may have been caught than in DjSf 13 although the contribution to the diet may have been about equal, as a larger variety of fish in DjSf 14II make the sculpins less noticeable. Two elements were identiifed as the buffalo sculpin and 27 as the Pacific staghorn sculpin.

Fifty-three cabezon elements were identifed, representing two individuals. Cabezon ranks sixth in live weight, considerably above the other sculpins even though its MNI and number of elements are much lower.

Sculpins appear to constitute the largest proportion of the fish assemblage in DjSf 14I, next largest in DjSf 14II and smallest in DjSf 13. The cabezon is the single most important species in numbers and in live weight among the sculpins. The Pacific staghorn sculpin is the second most numberous and would provide considerably less of the live weight.

Pleuronectiformes Flatfish

In DjSf 13, 125 flatfish elements, representing four individuals, were recovered. They rank third in number of elements, second in bone weight, eighth in live weight and are tied for third in MNI. Flatfish appear to have been the third most commonly caught fish and are more than twice as numerous as the next most common fish, the rockfish. They do not hold such a dominant position in the live weight category, partly due to a low MNI and partly to the relatively small size of the fish.

In DjSf 14I, 39 flatfish elements were identified, representing two individuals. The flatfishes rank second in number of elements, tenth in live weight, and are tied for first in bone weight and third in MNI. They contribute more to all the categories than in DjSf 13. However, dogfish and salmon, third and fourth ranked, are closer in number of elements to the flatfish than the third and fourth ranked fish in DjSf 13.

In DjSf 14II, 752 flatfish elements were recovered, representing 21 individuals. They rank second in number of elements, bone weight and MNI, and seventh in live weight. Flatfish have a dominant position in terms of number of elements in this component, being twice as numerous as the third ranked species, rockfishes. Other than herring and possibly salmon, flatfish were the most numerous fish caught. However, most of the flatfishes are not very large and their contribution to the diet is not as large as some of the bigger, less frequently caught fishes.

Combined Categories

In general the grouping of species among the fishes provides less of a change than in the birds and mammals.

Herring dominated the number of elements in all three components, being the most dominant in DjSf 14II by a considerable margin. Even in live weight, where herring might be expected to show up less, in DjSf 14II herring still comprises the major portion. This dominance of herring in the live weight of DjSf 14II is one of the major differences between it and the other components. In DjSf 13, herring is second rank in live weight, outweighed considerably by salmon and very closely followed by dogfish. In DjSf 14I, herring ranks sixth in live weight. In DjSf 14II, salmon is a low third rank, making up only 9.1 per cent of the live weight as compared to 32.9 per cent in DjSf 13. In DjSf 14I, dogfish is the dominant species in the live weight category, followed by salmon.

Other less dramatic differences can be seen in a larger proportion of true cod and perches in DjSf 14II than in DjSf 13. Flatfishes also provide a larger proportion of the live weight (although a smaller proportion of the elements) in DjSf 14II than in DjSf 13. The conclusion from this is that the inhabitants of DjSf 13 seem to have concentrated mainly on a few fish in their diet. Salmon, herring, and dogfish are the three most important fish, with salmon being dominant. Sculpins and rockfishes seem to form a second most common group and all other fishes are of much less importance. In DjSf 14II, herring and dogfish stand out as the most dominant species with herring considerably above dogfish. After salmon, the remaining fish species are quite similar in quantity. The inhabitants of DjSf 14II seem to have spread their diet more evenly over the range of fishes present, rather than concentrating as heavily on a few species. This pattern found in DjSf 14II of using a wider group of fish more heavily was also reflected in the pattern of bird use. In the birds it appears that a wider variety of habitats was being used for hunting. It is possible the people of DjSf 14II were fishing in a wider variety of habitats than those of DjSf 13, however this cannot be proved conclusively at this point. In any case, the heavier use of many fish species and the wider variety of habitats hunted could both be indicators of a heavier use of the resources in the area necessitated by more population pressure during the habitation of DjSf 14II.

Volume of the Components and the Bone Density

When comparing the quantity of bone between sites a major difficulty arises because the volume of the sites is likely to be different. If knowledge of the volume of the sites is available, the density of bone of a faunal species or group can be compared rather than the number of bones, and changes in the amount of a species used between sites can be considered more realistically. In addition comparisons of bone density can give an indication of the relative intensity of occupation at different sites or within a site.

A site is composed of material from natural and cultural sources. The amount of natural material in a site will affect the density of the cultural material. If the density of cultural materials in two sites is to be compared the amount of natural deposition would have to be similar to make the comparisons valid (this also holds true for divisions within a site). In the case of DjSf 13 and DjSf 14, the sites are close enough together in similar environments to assume similar natural deposition for the purposes of this analysis. The material from cultural sources will vary according to the intensity of use of a particular site. A site occupied for several seasons or a complete year should have a greater deposition of cultural material than a site occupied for a single season, as long as the number of people is held constant. But even this could be affected by a cultural activity that created a large amount of debris in a relatively short period, for example, intensive shellfish collection. Within a site some areas such as refuse heaps and perhaps living areas are going to be used in such a manner as to create particularly dense areas of debris. If the purpose of the analysis is to compare sites, a sample of all the site areas will be necessary. A large portion of DjSf 13 was destroyed prior to excavation and there is now no way of determining if the excavated portion is representative of the total site or only a peripheral area. The density of bone in DjSf 13 and DjSf 14 will be compared, but with the understanding that the comparison may be between areas of disparate functions.

The volume of the cultural deposits in each component was calculated using level notes and wall profiles. As these records were not taken with the intention of calculating the volume of the sites, the volume of each component is only the best approximation possible. Such factors as large tree trunks and roots, sloping land and sterile soil were considered in an attempt to make the volume figures as accurate an estimate as possible. The volume of DjSf 14I was 13.69 cubic metres, that of DjSf 14II was

TABLE XVII: NUMBER OF BONE ELEMENTS PER CUBIC METRE OF CULTURAL DEPOSITS FOR SELECTED FAUNAL CATEGORIES IN DjSf 13, DjSf 14I, AND DjSf 14II

Category of Animals	DjSf 13	DjSf 14I	DjSf 14II
Mammal	6.4	15.1	16.5
Mammal without *Canis* spp.	2.8	4.9	1.9
Canis spp.	3.6	10.2	14.6
Sea Mammal	.2	.3	.1
Birds	5.1	4.2	3.9
Fishes	28.4	22.7	170.8
Herring	16.4	12.5	133.2

73.93 cubic metres and the volume of DjSf 13 was 65.58 cubic metres. Table 17 lists the number of bone elements per cubic metre for selected groups of animals.

The density of all mammal bone is highest in DjSf 14II and lowest in DjSf 13. However, if the density of mammal bone without *Canis* spp. is calculated, DjSf 14II is lowest, and DjSf 14I is highest. In both DjSf 14II and DjSf 13, the mammal bone without *Canis* spp. is less dense than the bird or fish bone. DjSf 14II has the lowest density of bird bone and DjSf 13 the highest density. The differences in density among the components are not great for the bird and mammal bone, and could possibly be explained by random factors. However, in the case of the fish, the density in DjSf 14II is more than six times greater than in DjSf 14I or DjSf 13. Most of this difference in density is accounted for by the herring alone, but even with the herring removed, the density of fish bone is still three times that of the other components.

The interpretation suggested by the number of faunal remains and the meat weight data of more intensive occupation of DjSj 14II in comparison to the other components seems to be partially supported. Fish, in particular herring, was being most intensively collected in DjSf 14II. However, the low density of the mammals and birds as compared to the other components casts some doubt on the hypothesis.

If the site has been more intensively occupied than the others, I would have expected the density of the bird and mammal bones to at least have remained the same, instead they have dropped a small amount. This suggests the possibility that the people of DjSf 14II have shifted their collection emphasis to fish, away from birds and mammals, rather than that the population has risen.

Comparison of the Relative Contributions of Birds, Fish and Mammals

Ethnographic accounts of the Coast Salish invariably consider the most important resource to be fish. This could be interpreted as meaning that larger numbers of fish were caught than either birds or mammals, that fish provided more meat than either birds or mammals in the diet, and/or that fish were considered to be the most important resource by the Coast Salish. It has not yet been shown how old this pattern may be, although there is some indication of considerable age. At any given site the ratio of the fish, birds and mammals may vary depending upon which resources were collected the most heavily. With analysis of a group of sites it may become possible to determine the relative importance of the faunal resources to the diet of the Coast Salish and their predecessors.

In all components fish bones were more frequently found than either bird or mammal bones by an overwhelming amount; in DjSf 13, 86.1 per cent of the elements were fish, 71.5 per cent in DjSf 14I and 96.8 per cent in DjSf 14II. Similarly, in all cases the MNI was higher for fish than either birds or mammals. As fish bones are likely to be the most underrepresented of the three groups due to their small size and fragility, it appears without doubt that fish as a group were caught in greater numbers than either birds or mammals. DjSf 14II has the highest number and density of fish bones, both of which are lower in DjSf 13.

However, if live weight is accepted as a crude measure of dietary proportion, fish loses its dominance to mammals. In DjSf 13 and DjSf 14II, the mammal bones rank lowest in number of the three groups, but highest in live weight by a huge margin. Mammals provide 93.4 per cent of the live weight in DjSf 13, 93.0 per cent in DjSf 14I (without taking into account the single whale individual), and 83.1 per cent in DjSf 14II. These exceptionally high percentages create the possibility that mammals actually provided a larger part of the diet than the fishes at these sites. This may indicate that the Coast Salish pattern of reliance on fishes did not exist at this period at least at these sites. Conclusive proof will only appear when the relationship between edible meat and bone weight and/or live weight has been established for the fish, birds, and mammals.

The birds play an intermediary part in numbers of elements, being about twice as numerous as the mammal bones in DjSf 13 and DjSf 14II. In DjSf 14I, they are lower than mammals by a small amount. In live weight, birds are the smallest of the three groups. However, birds provide nearly the same amount of live weight as the fishes in DjSf 13. The density of bird bone is also highest in this site.

Comparing live weights among birds, fish, and mammals may be inappropriate. For example, equal weight birds, fishes or mammals may (probably do) have different ratios of edible meat to waste, therefore making the live weights non-comparable to a great extent. However, the difference between the fishes and mammals is so dramatic in these components that I feel there is a good possibility that mammals provided at least as much of the diet as the fish even though they were caught in smaller numbers.

Seasonal Interpretation From the Mammal Data

In DjSf 13, one of the beaver elements, a mandible, is from an animal less than six months old (Van Nostrand and Stephenson 1964), probably somewhere between one and five months old. This would place the time of its death between late May and November.

It was possible to age six of the *Canis* spp. elements from DjSf 13, but unfortunately for determining the season of death all but two of these are "less than" ages. For example, three of the elements are approximately less than eight months old which covers too wide a period to be useful. Two elements have more specific ages; one dog died at ten months, indicating the January to February or June to July period; and another was less than two and a half months old, indicating a period from March to early June or September to early December.

The sea lion remains from DjSf 13, give an indication of winter hunting since they winter in the area, but non-breeding individuals can be less predictable. Two of the bones were from immature individuals, but I have found no information on the timing of epiphyseal union in sea lions. It is most likely the animals were several years old, as epiphyses take several years to fuse in large animals. This might even be considered support for the data that non-breeding or immature individuals are found in the area at all times of the year.

From the coast deer elements in DjSf 13, twenty-three immature bones and teeth were recovered. Of the bones for which data on the time of epiphyseal union are available (Giles 1969), the ages ranged from less than one year three months old to less than two years eleven months with the majority less than two years five months old. The majority of the elements had fused epiphyses and therefore came from animals probably over five years of age and older. It is possible to age deer teeth by considering the eruption pattern and the amount of wear on the teeth (Giles 1969; Child 1970). Aging of the teeth from this site resulted in estimates of ages ranging from less than six months to between 2½ and 3½ years, with the majority at about 1½ years old. The aging of seven teeth gave a small enough span of time so as to allow calculation of the season of death. Five teeth came from deer which died around November and December. Two teeth came from deer that died approximately in June. This appears to indicate occupation of the site at least during those months; possibly continuously between November and June.

The deer teeth give the most definite indication of seasonality. All of the other animals could have been collected in either June or December, with no way of determining if the site was occupied continuously from December to June (or vice versa) or only during separate seasons, winter, and summer (Fig. 8).

It was possible to determine the age at death of fifteen *Canis* spp. bones in DjSf 14I, of which eleven were six months or younger, three were less than nine and a quarter months old and one was less than six and one quarter months old. Five elements were between two and four months old, placing the time of death between May and July or November

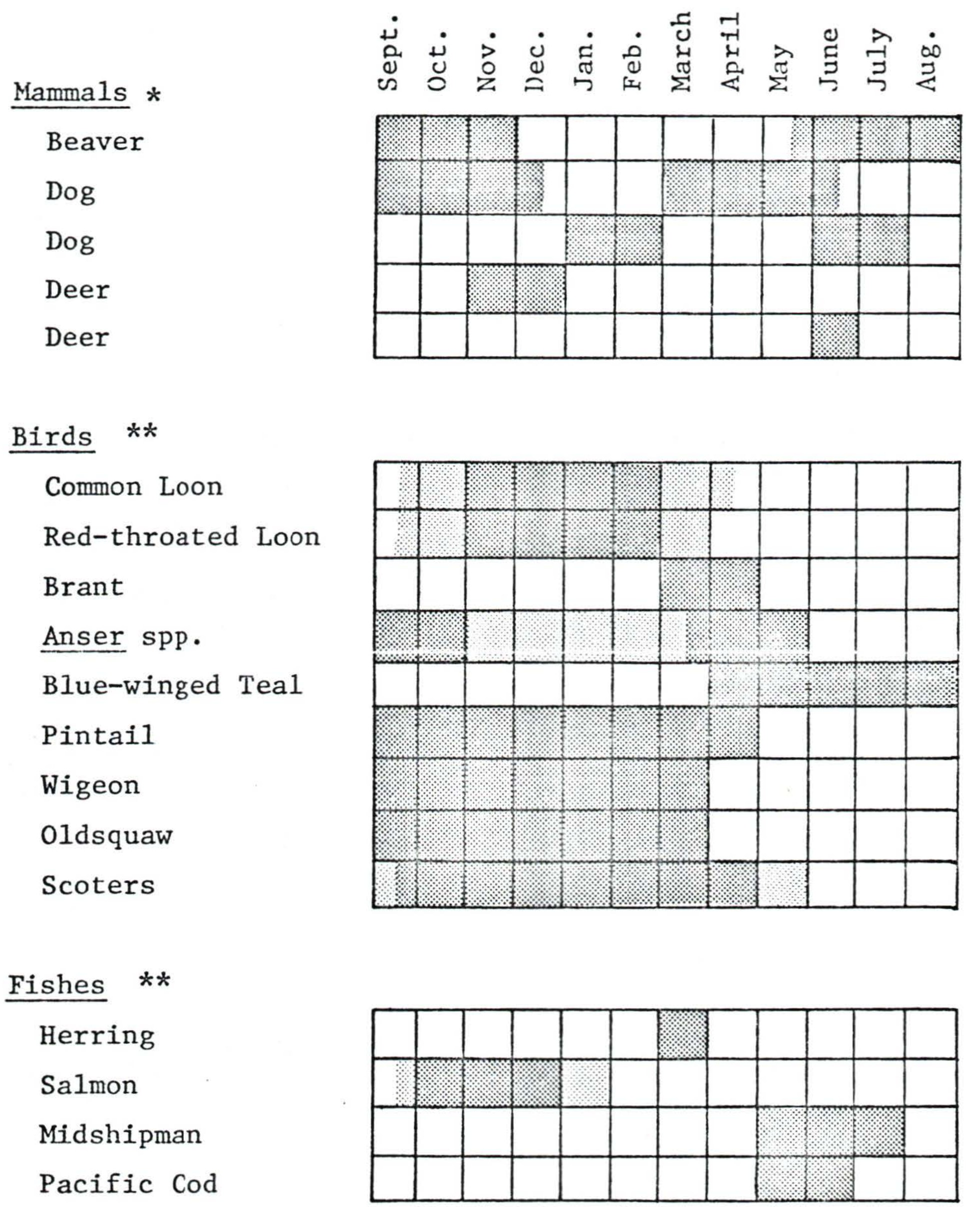

Figure 8. Season of collection of certain resources from DjSf 13.
* Probable season of death.
** Season of greastest availability.

Present in low numbers.

Present in large numbers.

and February. Three other bones fall generally within these periods; two to six months old, two to five months old and four to five months old. Three elements offer a narrower time period; one is aged one to two months, indicating the season of death as April to May or October to November; another is aged at three months, between June and July or November and December; and the last is six months old indicating the September to November, or March to April periods. All other bones were "less than" ages and not useful for seasonality determination.

If it is hypothesized that this component was occupied for only one season, then it would appear most likely it was the winter season beginning in November and probably including December. All of the *Canis* spp. bones could have come from dogs dying in this period. However, a change in the season of occupation during this component is possible or the site may have been occupied on a year around basis, either of which cases would also account for the data. The *Canis* spp. data can be used to support or oppose a hypothesis for a season of occupation, but it is too tenuous to be conclusive by itself.

The only other species which provided any seasonal data was the coast deer. In DjSf 14I, aging of six bones by epiphyseal union yielded ages at death ranging from less than two years three months to less than two years eleven months, with the majority being less than two years five months old.

Only five teeth could be aged; three were less than six months old and probably from the same individual; and two were more than fifteen years old, also probably from one individual. The deer less than six months old was probably killed between June and December, suggesting occupation of the site during that period.

The *Canis* spp. elements seem to indicate either a spring or winter occupation. If the site was occupied at only one season, winter seems to be indicated. Other possible interpretations are a winter and spring occupation or a winter through summer occupation (Fig. 9).

In DjSf 14II, it was possible to age only twelve *Canis* spp. elements. This is fewer in number than in DjSf 14I and a much smaller proportion of the *Canis* spp. bones. In DjSf 13, 2.5 per cent of the bones were aged, 10.7 per cent in DjSf 14I and only 1.1 per cent in DjSf 14II. For some reason, the proportion of young to mature bones has shifted. Fewer young dogs might die as a result of better care by the inhabitants or fewer young dogs might die on the site because the site was occupied at a time when the young dogs were less vulnerable to factors which cause death. Of the aged bones, six were less than 9¼ months old, and two were less than eight months old. One element

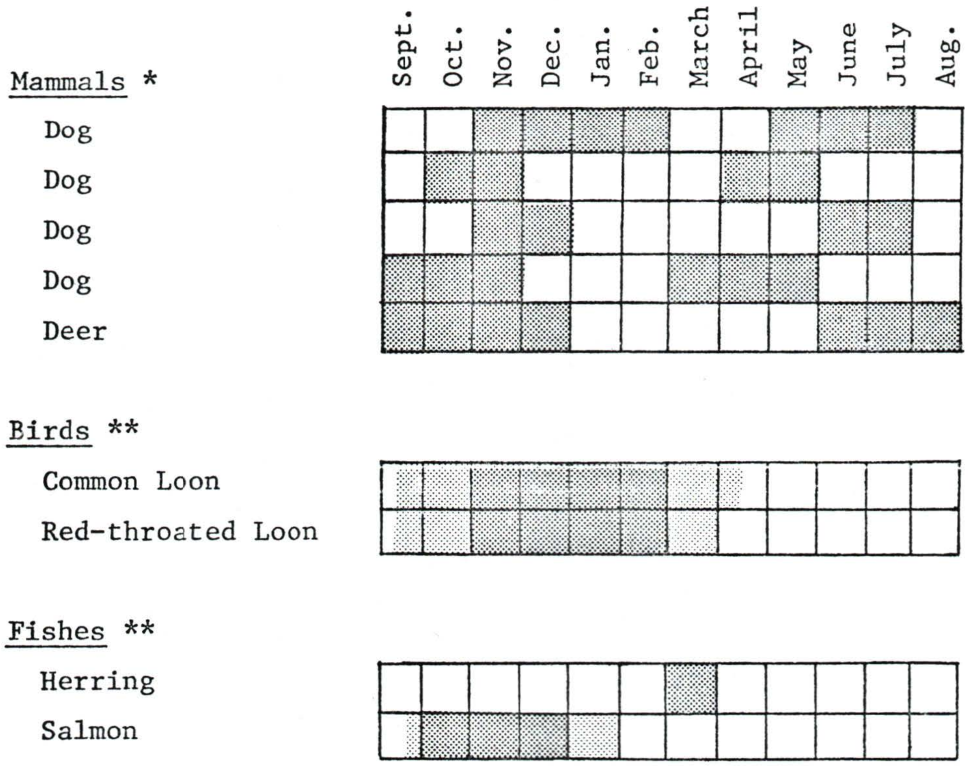

Figure 9. Season of collection of certain resources from DjSf 14I.

* Probable season of death.

** Season of greatest availability.

Present in low numbers.

Present in large numbers.

came from a dog between 8¼ to 9¼ months, the season of death most likely being the second week of October to the second week of December, or the second week of April to the second week of June. Three elements were from dogs of two to four months old, likely having died between May to July or November to February. From these data either a winter and/ or summer season of occupation could be indicated.

One of the marten bones in DjSf 14II was from an immature animal, but I was unable to age it due to lack of information on epiphyses fusions. Probably the animal was under one year in age, having died sometime in the fall or winter.

Twelve immature coast deer bones and teeth were recovered from DjSf 14II. This is the smallest number and percentage of any of the three components. Of those bones only five were ageable; three are less than two years and five months old and one is less than eight months old. The fifth bone is a skull fragment with the antler attached indicating a male deer killed between August and March. Two mandibles indicate a deer killed between July and March and a deer aged less than one year. Assuming the site was only occupied at one season, the period August to November seems indicated by the deer elements. The immature *Canis* spp. elements fell into the period of April to July or October to February. Combining the deer and *Canis* spp.

data implies an occupation between August and February (Fig. 10).

Seasonal Interpretation of the Bird Data

In DjSf 13, the presence of the common and red-throated loons implies winter or fall hunting as the red-throated loon is present only at that time and the common loon is most abundant then.

The few black brant elements found in DjSf 13 give a fairly short seasonal indication. Black brant are present in the Baynes Sound area for only a short span, from March to mid-May (Bellrose 1976:173-174). Their presence implies residence of some people at the site at this time. A large number of *Anser* spp. elements were recovered. All of the species of this genus found in the site area are present only during the fall and/or spring migrations.

The *Anas* species tentatively identified in DjSf 13 are *Anas platyrhynchos*, *A. discors*, *A. acuta* and *A. americanus*. Nine elements were tentatively identified as mallard, a common year around resident. One element was recovered and positively identified as *A. discors*, the blue-winged teal. The blue-winged teal is a spring-summer resident from April to August (Guiguet 1978:39). Two elements were found and identified as *A. acuta*, the pintail. Pintails are found in the Baynes Sound area commonly in the winter from

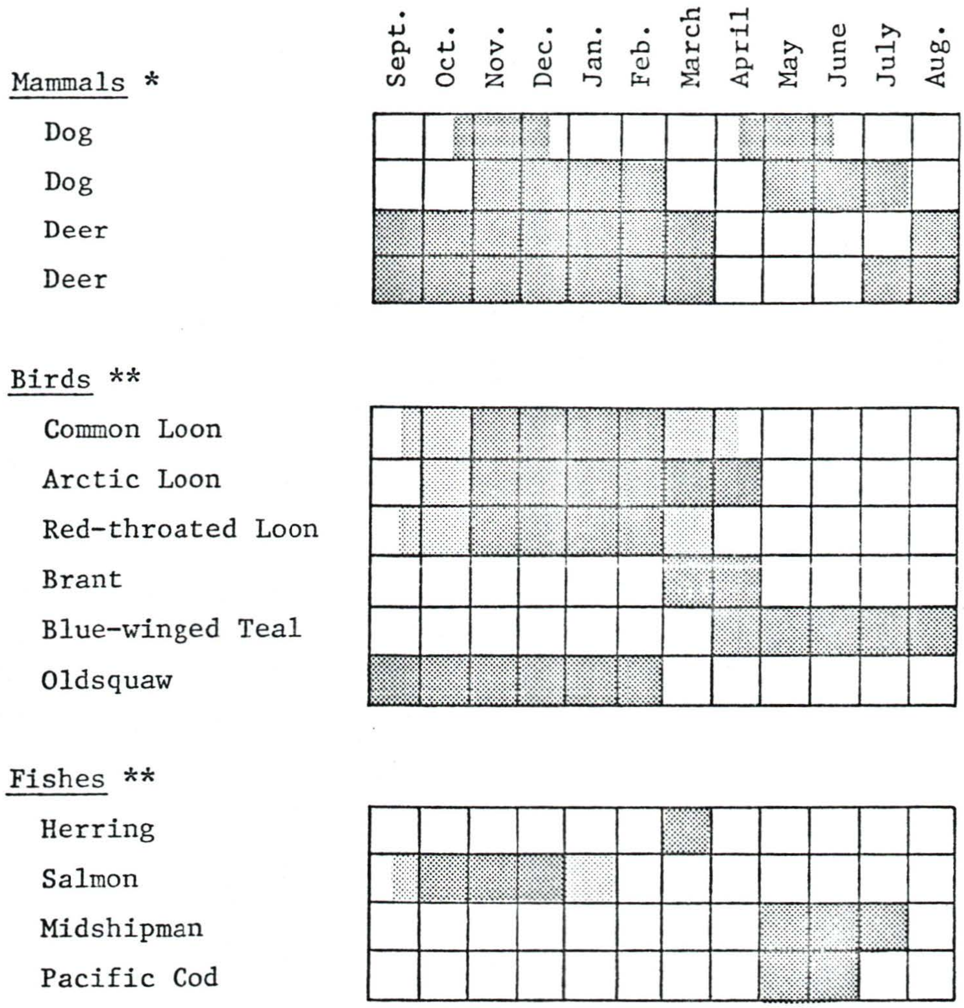

Figure 10. Season of collection of certain resources from DjSf 14II.
* Probable season of death.
** Season of greatest availability.

Present in low numbers.

Present in large numbers.

September to April, but may occasionally be present all year. Two *A. americana*, American wigeon, elements were recovered. The wigeon winters in Baynes Sound from September to March (Bellrose 1976:202). The presence of these ducks indicates occupation of the site at least during the fall or spring.

The two *Aythya* spp. elements are somewhat difficult to interpret because the presence of the greater scaup in Baynes Sound occasionally obscures the general pattern of winter residence shared by the rest of the species in the genus. However, it is most likely that the *Aythya* spp. were hunted in the winter when they were most abundant.

Five elements were found and identified as oldsquaw. The oldsquaw winters in the Baynes Sound area, therefore implying residence at the site sometime from fall to spring.

Scoters were recovered in large numbers implying hunting when they were most abundant. According to Guiguet (1976: 69-70, 72) scoters winter on the coast, arriving in September and October and leaving in March, April, and May.

The presence of the brants in the site area for such a short period in the spring requires that the site be occupied at least for that period. All of the other birds could have been present in the area during that March to mid-May period also, making that the minimum period of time the site had to have been occupied (Fig. 8). However, the site could have been occupied for a longer season, without the bird seasonality data being able to give any indication of this.

In DjSf 14I, the only birds that give any data on seasonal occupation are the loons. One common loon element was recovered which suggests residency from fall to spring when the birds are most numerous, however, a few non-breeding individuals are found on the coast in the summer also. Two red-throated loon elements were also found and this bird is only present from fall to spring. The only conclusion that can be drawn from this is that DjSf 14I was occupied some time during the fall to spring period, with no indication whether the occupation lasted the whole period, or only a portion of it (Fig. 9).

In DjSf 14II, all three species of loons are present. The Arctic loon implies hunting during the narrower period of May to June and/or October. This is compatible with the other loons, present during the fall and winter.

A few black brant elements were recovered. They imply hunting during the early spring, from March to mid-May.

The only *Anas* spp. identified in DjSf 14II is a single *A. discors*, blue-winged teal, element. This teal is present in the site area during the spring and summer, from April to August.

A single oldsquaw element was recovered. The oldsquaw is present only in the fall through spring seasons.

As in DjSf 13, there is a fairly large number of scoter elements recovered. Although some scoters are present in the area in the summer, this number is most likely the result of fall to spring hunting when the scoters are at their peak numbers.

Again, the presence of brants indicate occupation of the site at least during the March to mid-May period. All other birds could also have been collected in this period. Longer occupation of the site is possible, but cannot be inferred from the bird data (Fig. 10).

Seasonal Interpretation From the Fish Data

The large number of herring elements recovered from DjSf 13 and the ethnographic reports both indicated that it is almost certain these herring were being caught during the spawning period, probably in March. The only hesitation I have in stating this definitely is the ethnographic report (Suttles 1974:183) that some herring were dried. It is possible that the bones in this site could have resulted from the consumption of dried herring on the site, rather than catching herring there.

Salmon were probably the most important fish in the diet at DjSf 13. Although I have interpreted the salmon remains as being from processed fish, with the processing having been done elsewhere, it still seems likely that people lived at this site and exploited the salmon runs in the Tsable River. The chum and coho are the largest salmon runs in the Tsable River, with chum beginning to spawn in late September and the coho finishing in January. The peak number of salmon in the Tsable River is probably in early October, when both species are present. It seems most probable that DjSf 13 was occupied at least during this peak period, and perhaps during the whole spawning season.

Only a few midshipman bones were found in DjSf 13. The midshipmen spawn in the intertidal zone in late spring or summer and would be most available then. It is possible that the site was occupied at that time and the easily available fish were collected then. Their small size would make a large expenditure of effort in catching them uneconomical.

The moderate number of Pacific cod elements recovered from DjSf 13 may indicate fishing in the late spring or early summer when they are in shallow water. Unfortunately, I have no data on what is meant by deep water and cannot judge whether they would be too deep to be caught in the winter.

No other fish species provide any reliable seasonal information.

The fish indicate that the site was probably inhabited at least during the early spring, about March to fish for herring and during the fall to winter, around September to January, to fish for salmon. Some indication of a possible occupation of the site during late spring or summer is offered by the presence of the midshipman and Pacific cod, but these fish might have been available at other seasons (Fig. 8).

In DjSf 14I, the presence of the herring and salmon elements imply the same seasons of occupation as for DjSf 13; at least, the early spring and fall to winter. No other fish with a seasonal pattern were recovered in enough numbers to allow inference of any seasonal fishing (Fig. 9).

In DjSf 14II, the very high number of herring bones further supports the interpretation that the herring were being caught at that site.

Two salmon elements were identified as *Oncorhynchus kisutch*, coho salmon, and one element was identified from a breeding male salmon. If the coho was taken from the Tsable River, they were probably caught between early October and January, although young coho are available all year. The presence of a breeding male salmon indicates someone was catching salmon during the breeding season on the Tsable River.

A fair number of midshipman elements were recovered from DjSf 14II. In these larger numbers it seems more reasonable to suggest the midshipman were being caught during their breeding season in the late spring and summer.

In the same way, the larger number of Pacific cod also lends credence to the interpretation of fishing when they are most easily available. The Pacific cod are also available in shallow water during late spring and early summer.

The fish in DjSf 14II imply the same seasonal pattern as in DjSf 13. Possibly there is stronger evidence of spring and summer fishing and therefore occupation of the site at that time in the higher numbers of midshipman and Pacific cod (Fig. 10).

Comparisons With Other Sites

Few sites on the east coast of Vancouver Island have been excavated and analyzed. The Comox area sites excavated by Katherine Capes (1964) are the only ones from the Pentlatch area, however, the Little Qualicum River (DiSc 1) and the Deep Bay (DiSe 7) sites are close enough to provide reasonable comparative material (Fig. 5).

The Deep Bay site is interpreted on the basis of the faunal remains as

> . . . primarily occupied during the late winter and early spring for the purpose of taking advantage of the concentration of food resource species centered around spawning herring. The faunal and ethnographic evidence also suggests that deer hunting may have occurred in conjunction with herring fishing (Monks 1977:298-299).

The bird and mammal material from Deep Bay is represented by the MNI and usable meat weight based on White's method (1953). The MNI was calculated by natural level within each excavation unit which has the effect of creating a very high MNI (Monks 1977:179). Fish bones were only identified from samples taken and only the weight of the bone is presented. The less common species of bird, mammal and fish were recorded by bone weight alone. As a result none of the actual figures used in Monks' analysis can be compared with those of this analysis. Table 18 presents the data for the excavated areas at Deep Bay. The number of occurrences is the number of times a species was recorded to have been present in each natural layer within each excavation unit and therefore represents the least possible number of elements.

Canis spp. appears to be the most abundant mammal recovered, with deer as a close second, although deer occurs in more of the natural strata in the excavation units. This is very similar to DjSf 13 and DjSf 14. The sea mammals, northern sea lions and harbour seals are

TABLE XVIII: DEEP BAY FAUNAL ASSEMBLAGE - BIRDS AND MAMMALS (AFTER MONKS 1977)

Species in Order of Abundance	Lot 73		Lot 81		Combined Lots	
	MNI	No. of Occurrences	MNI	No. of Occurrences	MNI	No. of Occurrences
Mammals						
Canis spp.	61	37	20	10	81	47
Odocoileus hemionus	56	41	20	11	76	52
Eumetopias jubata	13	9	3	3	16	11
Phoca vitulina	14	11	2	2	16	13
Cervus canadensis		3	3	3	3	3
Castor canadensis		3		1		4
Procyon lotor		2		1		3
Delphinidae		1				1
Birds						
Unidentified duck	36	27	14	10	40	37
Larus spp.	15	13	5	5	20	18
Podiceps/Colymbus spp.	5	7	5	5	10	17
Haliaeetus leucocephalus	8	6		1	8	7
Branta spp.	6	6			6	6
Aythya marila	4	5	3	3	7	8
Melanitta spp.		2	3	3	3	5
Olor spp.			2	2	2	2
Gavia spp.		3				3
Bonasa umbellus		2				2
Anas spp.		1	3	3	3	4
Brachyramphus spp.		1				1
Corvus corax		1				1
Fulica spp.		1				1
Uria spp.		1				1
Dendragopus bosuvrus				1		1
Mareca americanus				1		1
Phalacrocorax spp.				1		1
Spatula clypeata				1		1

TABLE XVIII: (CONTINUED)

Species in Order of Abundance	Lot 73		Lot 81		Combined Lots	
	Wgt in Grams	No. of Occurrences	Wgt in Grams	No. of Occurrences	Wgt in Grams	No. of Occurrences
<u>Fish</u>						
Clupea harengus	12.08	22	4.30	10	16.38	32
Oncorhynchus	.17	5	.14	2	.31	7
Squalus acanthias	.43	6	.09	2	.52	8
Ophiodon elongatus	.89	2	.47	1	1.36	3
Hemilepidotus hemilepidotus	1.40	2			1.40	2
Pleuronectidae	.01	1			.01	1
Unidentified Fish			1.23	9	1.23	9

the next most numerous mammals recovered. In Lot 81 the sea mammals are found only in the upper strata, however in Lot 73, which was deeper, the sea mammal bones appear to be found throughout. It appears reasonable to conclude that sea mammals are more numerous in this site than in DjSf 13 or DjSf 14I or DjSf 14II. The Deep Bay site does not appear to show an overall increase in the use of the sea mammals from the early to late parts of the site, as is suggested for DjSf 13 and DjSf 14II. As in the case of DjSf 13 and DjSf 14, elk bones were only recovered in small numbers in the upper strata of the Deep Bay site.

Birds do not appear to have been recovered from the Deep Bay site in large numbers, judging from the number of occurrences. The unidentified duck category is largest, with *Larus* spp. the next most common. The grebes, bald eagles, *Branta* spp., and greater scaups are found in moderate numbers, while most of the remaining species are represented by few occurrences. The Deep Bay bird assemblage differs from that of DjSf 13 and DjSf 14 mainly in its small numbers. Birds appear not to have been hunted in as great numbers. The dominance of gulls found in DjSf 13 and particularly in DjSf 14I and DjSf 14II, is seen here also, although possibly not as strongly.

The number of fish species present is unexpectedly small: only six were identified. Although only the bone weight is used by Monks, it is fairly obvious herring was by far the most abundant species present. Herring outweighs all the other fish by more than ten times and herring bones are extremely light weight. Monks (1977:295) states "herring remains were very abundant in the deposits, sometimes appearing almost carpet-like." He further suggests that the fish-trap present near the site was used to catch the herring. Herring are very abundant at DjSf 13 and DjSf 14 also, however I have the impression from Monks' statements and the data presented that herring may have been more numerous at Deep Bay. Salmon and dogfish are the next most numerous fish, but in nowhere near the same quantity as herring. The other species of fish - lingcod, red Irish lord, and flatfish - are found only occasionally. The red Irish lord and flatfish could easily have been caught in the fish trap as well as the herring. Dogfish are reported to congregate to feed on herring (Hart 1973:45-46) and also could have been taken with the herring in the trap. It is even possible for lingcod to have been taken in the fish trap when they move into shallow water to spawn in the spring (Hart 1973:468). All of these species therefore could have been caught incidentally to the herring. This is in contrast to DjSf 13 and DjSf 14 where too many species of fish were caught in too large quantities to have been merely an incidental acquisition during the herring spawning, and there is no evidence today of a tidal trap in the area.

The most important contrasts between Deep Bay and DjSf 13 and DjSf 14 are the paucity of bird remains in general and the few fish species present. While herring were caught in large quantities at DjSf 13 and DjSf 14 many other species of fish and fair numbers of birds were taken also. At these sites no one species seems to dominate so totally the faunal assemblages, indicating a wider use of the sites' resources and perhaps a longer season of occupation than at Deep Bay.

The Little Qualicum River site (DiSc 1), comprised of both a waterlogged and a dry midden, appears to have been used primarily as a seasonal salmon fishing camp (Bernick pers. comm.). The waterlogged and dry middens are felt to be contemporaneous so that the marked differences in the faunal assemblage (Table 19) must be explained by depositional differences. It is possible that the river was used for the disposal of different refuse than the dry midden area, where presumably the people were living. Possibly the same garbage may have been discarded in both areas and differential preservation caused the differences in the

TABLE XIX: LITTLE QUALICUM RIVER SITE: FAUNAL ASSEMBLAGE (AFTER BERNICK 1980)

	Wet Site		Dry Midden		Both	
	No. of Elements	% of Total	No. of Elements	% of Total	No. of Elements	% of Total
Mammal						
Canis spp.	425	88.2	55	21.1	480	63.4
Odocoileus hemionus	34	7.1	201	77.0	235	31.0
Cervus canadensis	2	.4	2	.8	4	.5
Martes americana			1	.4	1	.1
Procyon lotor			1	.4	1	.1
Phoca vitulina	18	3.7			18	2.4
Eumetopias jubata	1	.2			1	.1
Delphinidae	1	.2			1	.1
Castor canadensis	1	.2	1	.4	2	.3
Total	482		261		757	
Bird						
Branta canadensis	1	14.3	1	1.9	2	3.4
Chen róssii?	1	14.3			1	1.7
Anas strepera	1	14.3			1	1.7
Aythya marila			1	1.9	1	1.7
Melanitta spp.			13	25.0	13	22.0
Mergus spp.	1	14.3			1	1.7
Duck	1	14.3	18	34.6	19	32.2
Podiceps podiceps			1	1.9	1	1.7
Podiceps nigricollis?			1	1.9	1	1.7
Aechmophorus occidentalis			3	5.8	3	5.1
Podiceps grisegena	1	14.3	1	1.9	2	3.4
Indeterminate Grebe			1	1.9	1	1.7
Gavia spp.			1	1.9	1	1.7
Haliaeetus leucocephalus			1	1.9	1	1.7
Accipiter spp.			1	1.9	1	1.7
Perisoreus canadensis			1	1.9	1	1.7
Corvus corax			4	7.7	4	6.8
Fringillidae			1	1.9	1	1.7
Larus glaucescens	1	14.3	4	7.7	5	8.5
Total	7		52			60.0

TABLE XIX: (CONTINUED)

	Wet Site		Dry Midden		Both	
	No. of Elements	% of Total	No. of Elements	% of Total	No. of Elements	% of Total
Fish						
Squalus acanthias	62	1.3	866	23.6	928	11.1
Hydrolagus colliei	1	.02	10	.3	11	.1
Clupea harengus	70	1.5	1202	32.7	1272	15.2
Oncorhynchus spp.	4511	96.6	869	23.6	5380	64.5
Gadus macrocephalus			7	.2	7	.1
Merluccius productus	1	.02	13	.4	14	.2
Microgadus proximus	1	.02			1	.01
Porichthys notatus			197	5.4	197	2.4
Embiotocidae	3	.1	21		24	.3
Scombridae			1	.03	1	.01
Ophiodon elongatus	4	.1	7	.2	11	.1
Hexagrammos spp.			63	1.7	63	.8
Sebastes spp.	4	.1	99	2.7	103	1.2
Pleuronectiformes	9	.2	200	5.4	209	2.5
Scorpaenichthys marmoratus			18	.5	18	.2
Other Cottidae	2	.04	103	2.8	105	1.3
Total	4668		3676		8344	

faunal assemblage. However, the presence of complete dog skeletons and the undamaged appearance of the fragile salmon cranial bones argues that the waterlogged midden, at least, is undisturbed.

Canis spp. and deer are dominant mammal species, dog being the most numerous in the waterlogged site and deer the most numerous in the dry midden. The exceptionally high number of *Canis* bones in the waterlogged site is partly due to the presence of several complete skeletons. Harbour seal is the next most numerous mammal, but is found only in the waterlogged site. Again, the sea mammals may be somewhat more common in this site than in DjSf 13 or DjSf 14I or DjSf 14II, and harbour seal seems to have been preferred to the northern sea lion.

Very few bird bones were recovered from the waterlogged site and only a moderate number from the dry midden. Scoters and ducks dominate the assemblage, with the glaucous-winged gull, grebes, and raven being in a secondary group. Although the numbers are low and spread among a large number of species (which could allow a large amount of chance variation) the gulls seem to have lost their dominance in this site to the scoters and ducks. In DjSf 13, the number of gulls had dropped and scoters had risen from the earlier component, DjSf 14II. Perhaps the trend continued and became more pronounced during the even more recent period of occupation of the Little Qualicum River site.

In the waterlogged midden, salmon is the dominant species. Dogfish and herring are the only other species to show up in any noticeable amount, but in much lower numbers than the salmon. In the dry midden, herring is dominant, with salmon and dogfish not too far behind. Flatfish and midshipman are the next most common species recovered. More species were recovered from the dry midden and the elements seem more evenly divided among them than in the waterlogged midden. The waterlogged midden contained more salmon cranial bones in relation to vertebrae than the dry midden, possibly the heads from freshly butchered salmon were disposed of primarily in the river rather than in the living area. If this was a common practice then it could account for the low proportion of salmon present in DjSf 13 and DjSf 14. Alternatively it is possible the relatively fragile salmon cranial bones do not survive well in a dry midden. In any case, even in the dry midden the salmon bones were in much greater number than in DjSf 14I or DsSf 14II. The proportion of salmon to herring is quite similar in the dry midden of the Little Qualicum River site and DjSf 13.

Both the Little Qualicum River and the Deep Bay sites are interpreted as seasonal fishing camps. Deep Bay exhibits a narrow range of bird and fish species which corresponds to the interpretation of use of the site for intensive collection of one resource. The Little Qualicum River site has relatively few bird elements, especially in the waterlogged site, but has a fairly wide selection of fish species in moderate numbers. The time of herring spawning is usually quite brief while the salmon run in the Little Qualicum River lasts several months. Perhaps the length of the salmon run necessitated that the Little Qualicum River site be occupied longer and created more opportunity or the necessity of collecting a wider group of resources to feed the inhabitants. In comparison, both DjSf 13 and DjSf 14 have a greater number of bird bones and the people may have concentrated less on a few species of fish, perhaps indicating a longer period of occupation than either Deep Bay or the Little Qualicum River.

The Sandwick midden (DkSg 2) is located 1.6 km north of Courtenay on the bank of the Tsolum River (Capes 1964: 22). Capes (1964:40) believes the midden was occupied relatively recently by the Pentlatch Salish.

No information was offered as to the method of collecting the faunal remains. The identified mammal and bird bones are presented in Table 20, partially consolidated from Capes (1974:Table 2). In this site deer and elk were the most numerous elements recovered, with dog in third place.

TABLE XX: SANDWICK MIDDEN (DkSg 2) FAUNAL ASSEMBLAGE
(AFTER CAPES 1964:TABLE 2)

	Layer 1	Layer 2	Layer 3	Layer 4	Layer 5	Total Elements	Total Per Cent
Microtus spp.				1		1	1.2
Castor canadensis			2	2	1	5	6.0
Phoecaena spp.				1		1	1.2
Canis spp.	3	2	2	4	1	12	14.5
Lutra canadensis		1		1	1	3	3.6
Phoca vitulina	1	1		1		3	3.6
Cervus canadensis	2	3	5	5		15	18.1
Odocoileus hemionus	2	8	14	19		43	51.8
Total	8	15	23	34	3	83	
Anas platyrhynchas			1			1	
Aythya affinis			1			1	
Bucephala spp.			2			2	
Haliaeetus leucocephalus			1			1	
Larus spp.			1			1	
Total			6			6	

Elk were specifically mentioned as living in the Comox area (Cowan and Guiguet 1978:362), which probably explains their importance in this site, in contrast to the Tsable River area where elk were not locally available. In the Sandwick Midden elk were found throughout the layers, not being restricted to the surface layers as they were in DjSf 13 and DjSf 14. A single porpoise bone was recovered, and the small river otter and harbour seal were the only other sea mammals found. The large sea lion was absent, perhaps related to the small number of mammals bones recovered, but it is possible the sea lion was not being hunted. Dog bones were not in great abundance compared with the deer, a major difference between this site and any of the others compared here.

Too few bird bones were recovered to make any comparisons of quantity, either within the Sandwick midden assemblage or with that of other sites. All the species found are commonly available. *Aythya affinis* and *Bucephala* spp. are present from fall through spring, implying occupation of the Sandwick midden at least at some time during that period.

Only three species of fish are noted, salmon, dogfish and herring, and no quantities are specified (Capes 1964: 26). Capes mentions that "masses of fish vertebrae were found in all layers" (Capes 1964:24), and "concentrations of very fine fish bones and scales, apparently the remains of whole fish, were frequently encountered in the bottoms of Layers 3 and 4" (1964:24). All these small fish bones may have been herring, but there are too many small species of fish to make this assumption without better data. At best it can be said that the fish found in this site may resemble the Tsable River Bridge and Buckley Bay sites' fish assemblages in having a high proportion of salmon, herring, and dogfish.

VIII. SUMMARY AND CONCLUSIONS

DjSf 14I is the oldest component with age estimates of 1360 B.C. ± 130 and 2140 B.C. ± 90. If Salwen's data (1962, Fig. 1) are applicable, the sea level was rising during the beginning of this occupation to a maximum of ten feet above the present sea level by about 1750 to 1850 B.C., and was then stable until the beginning of the next drop at about 1350 B.C. Climatically, this site was occupied during the late Hypsithermal which was characterized by relatively high humidity, and vegetation comprised of western hemlock, Douglas fir, and oak. DjSf 14I has the smallest number of elements recovered of the components and the least variety in species. As a result of the low numbers chance variation could be a major influence and all conclusions must be viewed as tentative.

In the mammals, *Canis* spp. is represented by the most elements, in fact of all the fauna recovered only herring are more numerous (Fig. 10). Deer are the only other mammal to have more than a few elements. Deer also have the highest MNI and live weight of the component with the exception of the live weight of the one whale (Figs. 11, 12).

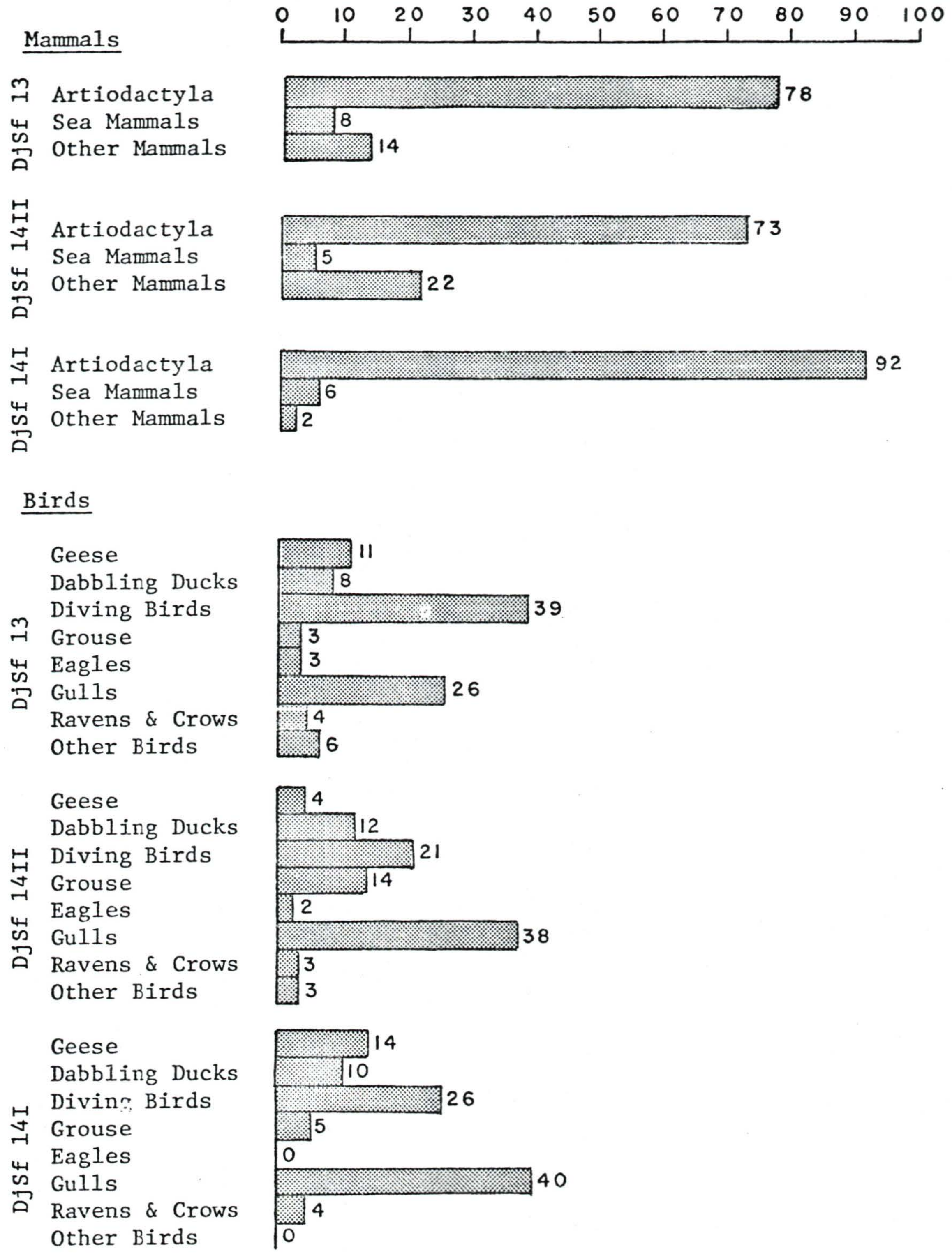

Figure 11. Histograms of the distribution of elements by percent for the combined categories in DjSf 13, DjSf 14I, and DjSf 14II.

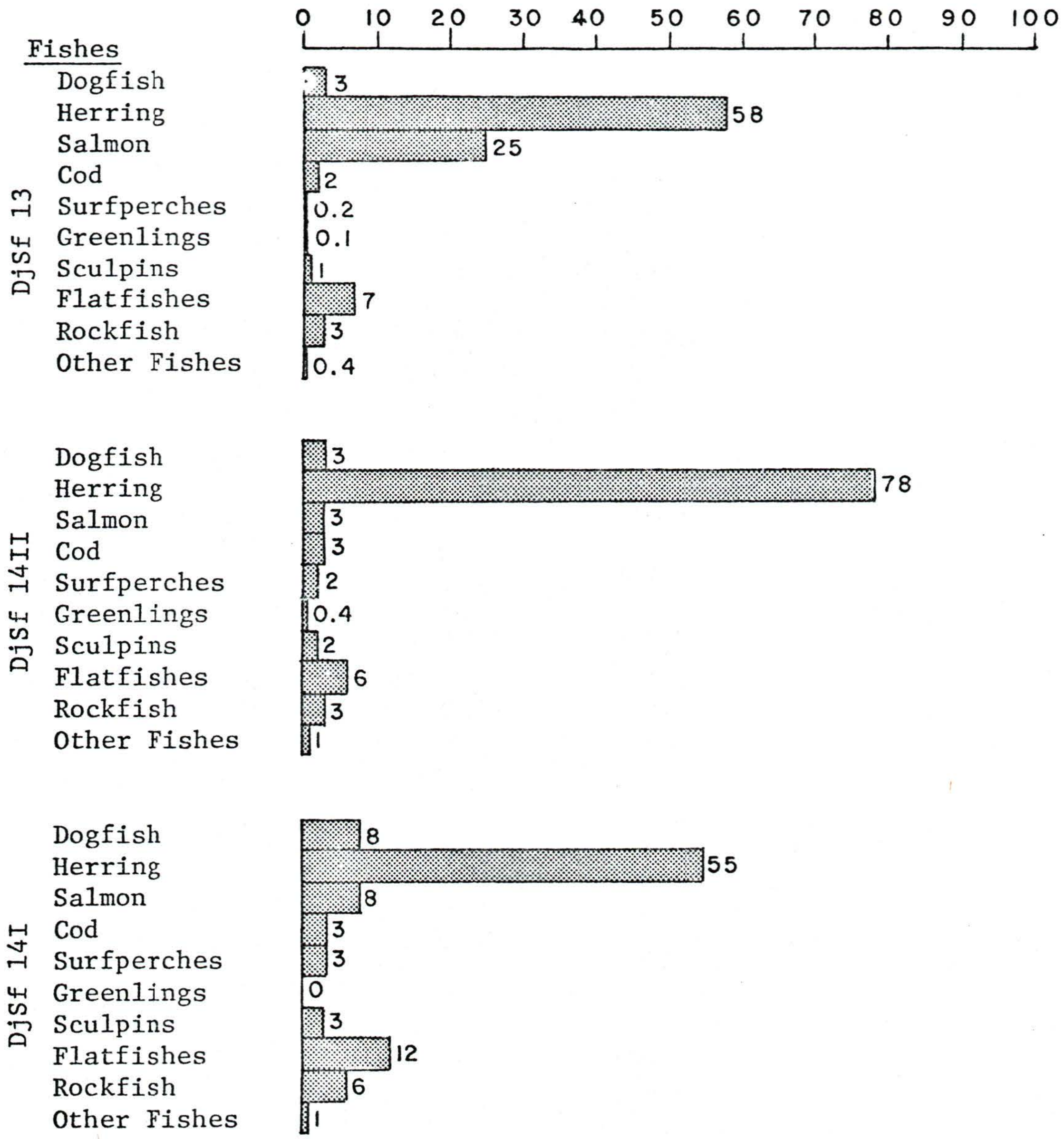

Figure 11. Continued.

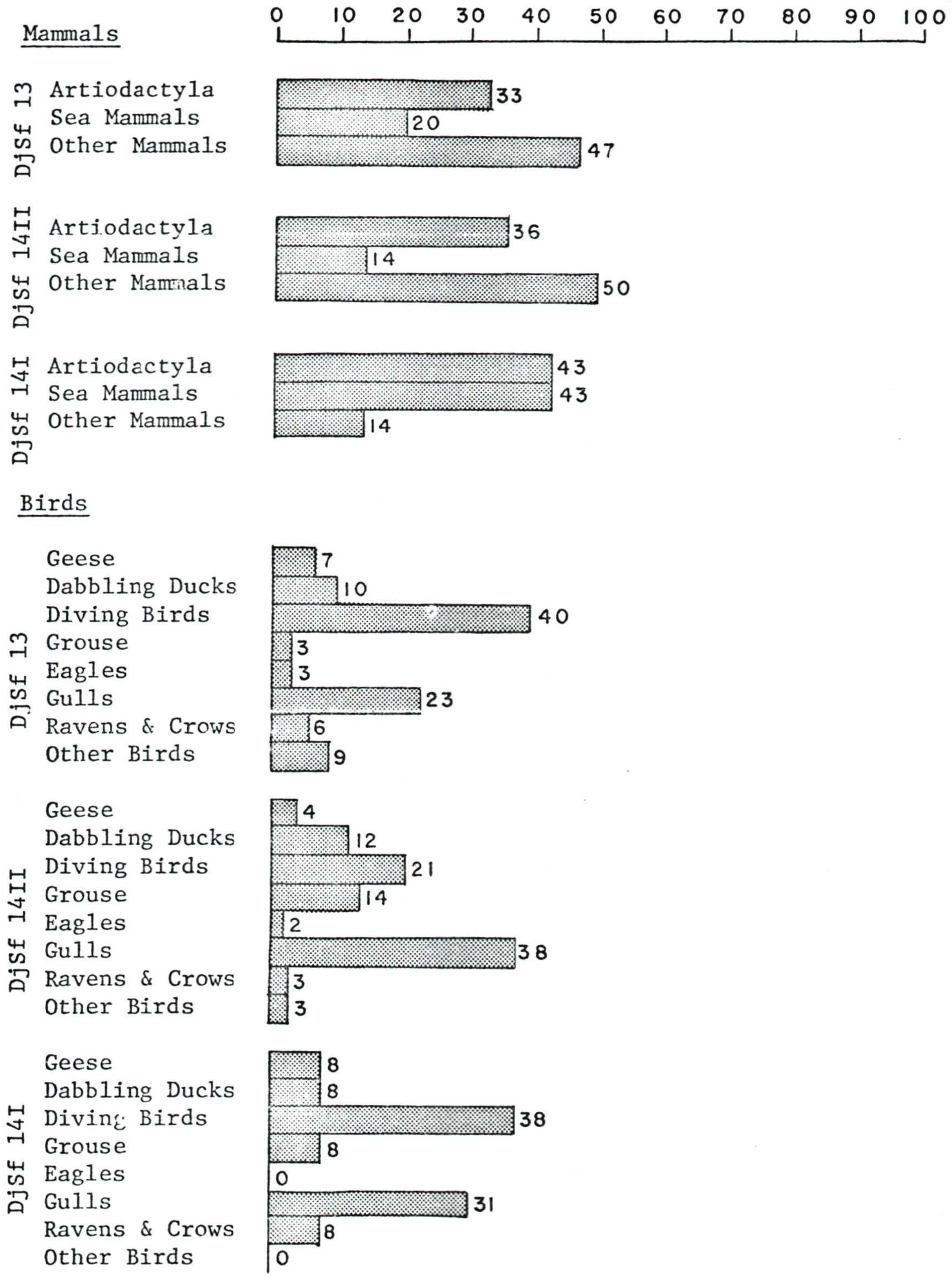

Figure 12. Histograms of the distribution of the MNI by percent for the combined categories in DjSf 13, DjSf 14I, and DjSf 14II.

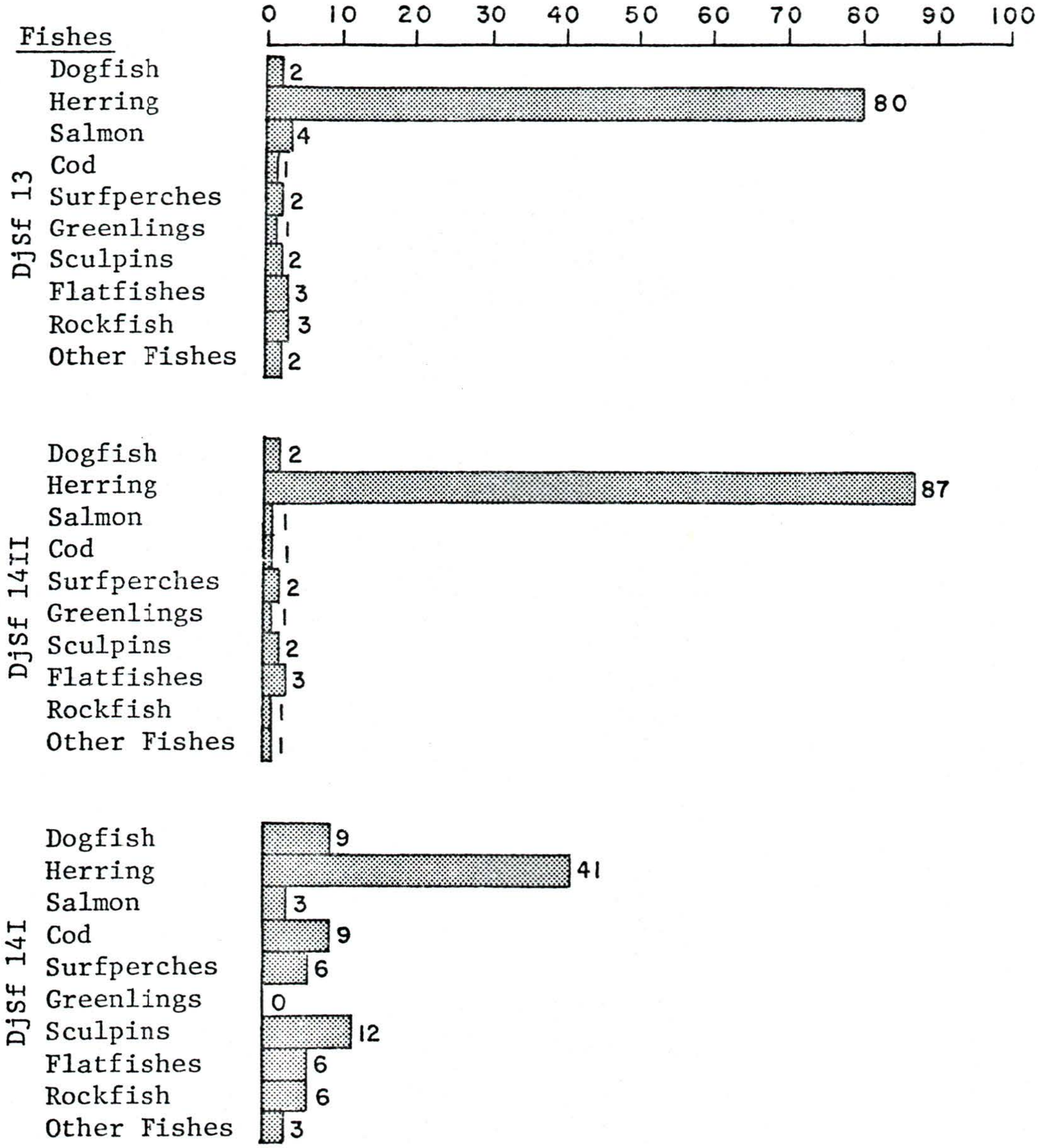

Figure 12. Continued

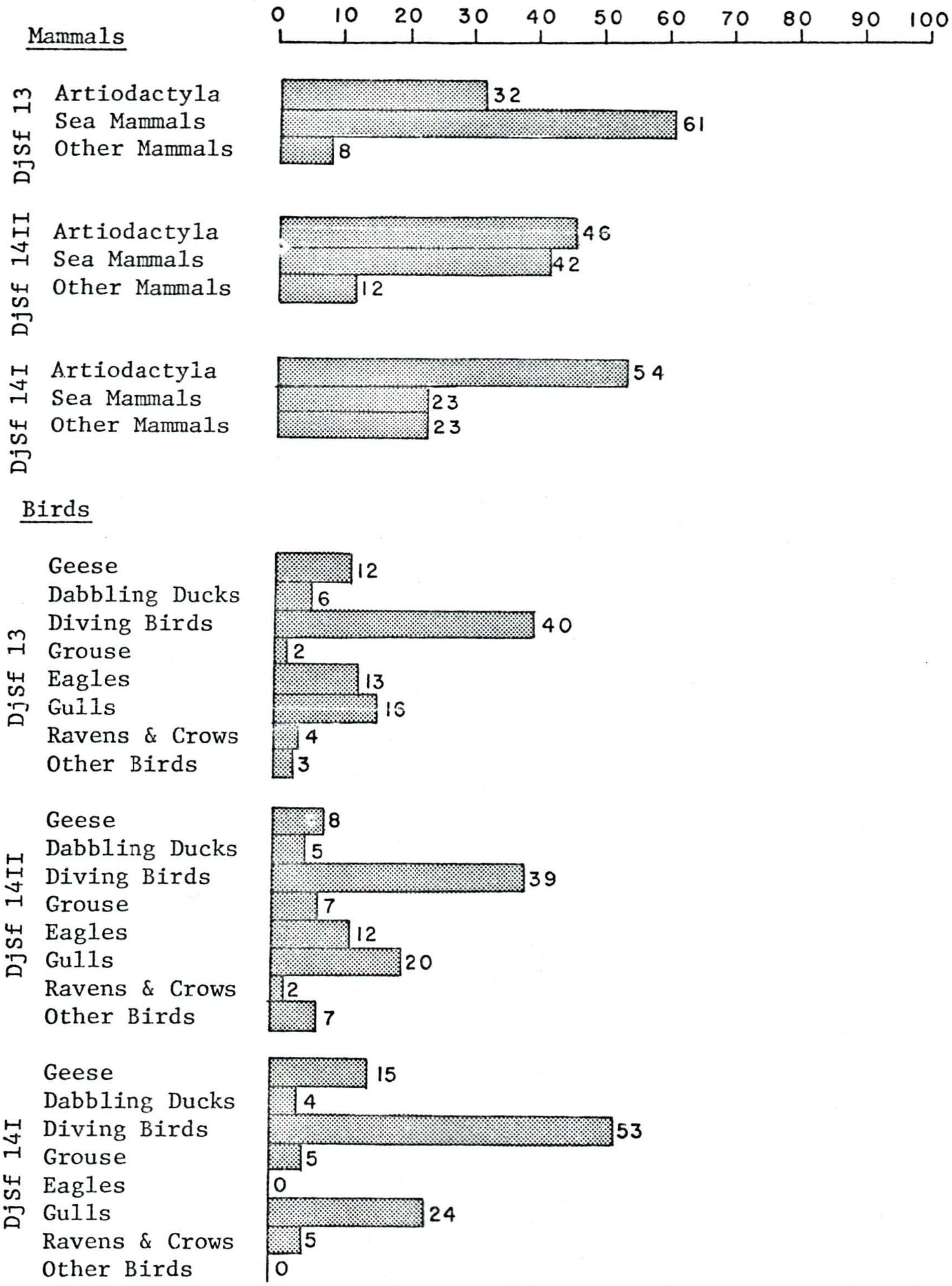

Figure 13. Histograms of the distribution of the live weight by percent for the combined categories in DjSf 13, DjSf 14I, and DjSf 14II.

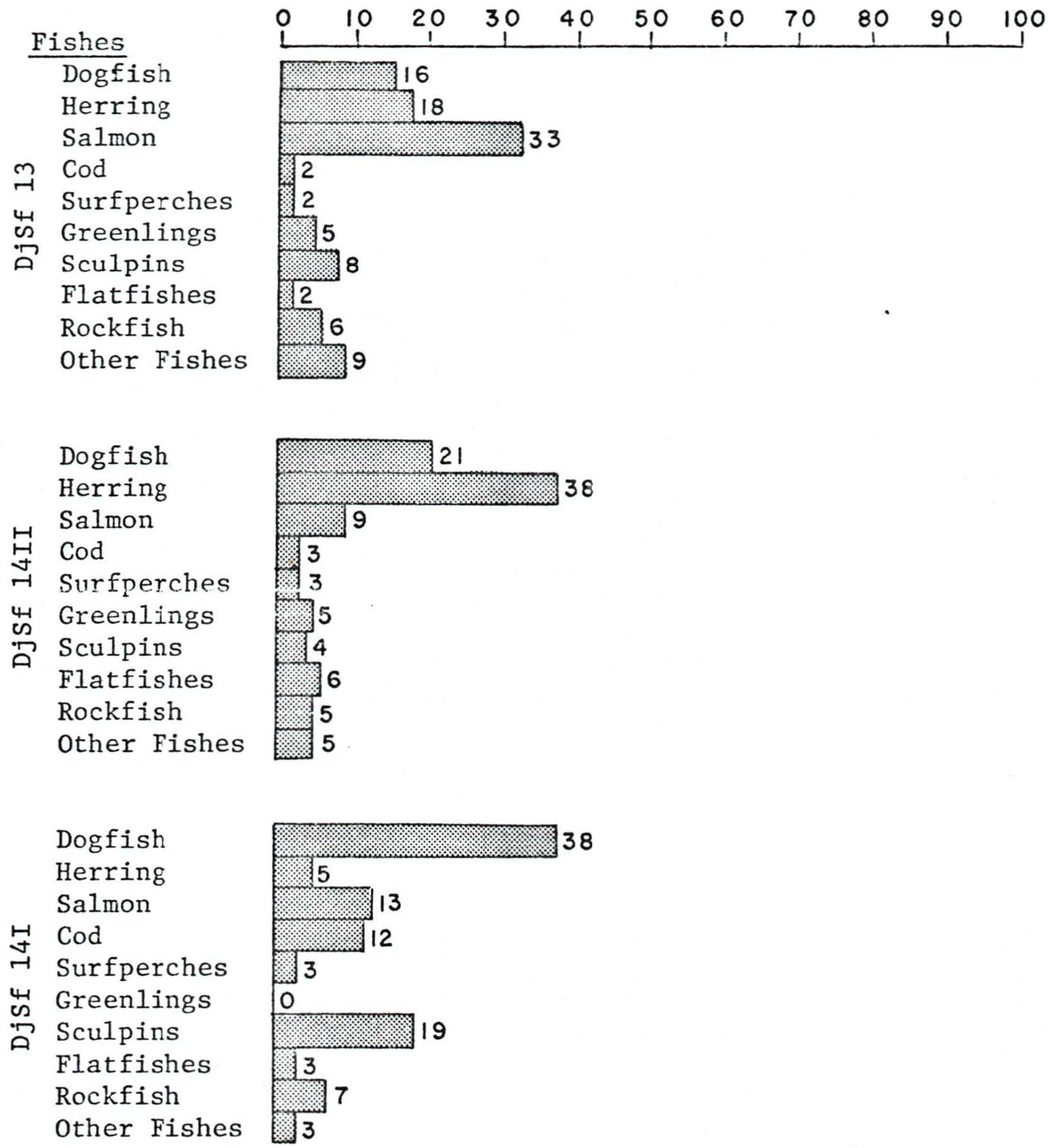

Figure 13. Continued.

Despite the low number of elements, DjSf 14I has the highest density of mammals, excluding dog, of any of the three components. It is possible that this indicates more concentration on mammal hunting, particularly of deer, than either of the more recent components. The sample is small however, and it would be best not to draw any definite conclusions based upon this component alone. Further excavations of sites from this period could be used to support or reject this conclusion.

The bird assemblage is quite small, both in sheer number of elements and in species, making interpretation difficult. The large gulls stand out with the highest number of elements and MNI (Fig. 10, 11). Other important birds appear to be scoters, *Anas* spp. and geese, but the numbers of elements are so low that the addition of a few elements to any one of the three species could shift the relationships. In the combined categories, gulls still dominate the number of elements, followed by diving birds, but the relationships of the other categories are tenuous at best. The density of bird bones is similar to, but slightly higher, than that of DjSf 14II and DjSf 13, so it seems that birds were probably collected in similar quantities.

The number of fish elements is higher than either the birds or mammals, providing a better sample. Herring make up more than half of the number of elements and have the largest MNI. The flatfishes are next highest in number of elements, followed by dogfish and salmon, and then the rockfishes. The sculpins have a low number of elements, but their MNI places them in with this group of frequently caught fishes. The fish assemblage of DjSf 14I seems most similar to that of DjSf 14II, particularly in the high ranking of herring and flatfish and the relatively low ranking of salmon (Fig. 10, 11, 12). Calculation of the Spearman rank correlation coefficient for the number of elements yielded a rho of .92 between DjSf 14II and DjSf 14I, and .79 between DjSf 14I and DjSf 13, both of which results are significant at the .05 level (Siegel 1956:202-213). This supports my subjective impression of DjSf 14I and DjSf 14II being the most similar, but indicated both DjSf 14II and DjSf 13 are very similar to DjSf 14I. The MNI of all fishes except herring are so low as to make the live weight calculations almost meaningless, as they are calculated on the basis of a single fish in most cases. Dogfish has the highest live weight which might be a true indication of its importance in the diet, and salmon ranks third, even with only a single MNI, but I think the live weight data are more likely to be misleading than useful in this component. DjSf 14I has the lowest density of fish bones, with or without herring, of the three components, which would correlate nicely with the greater density of mammal bones. The low rank of salmon might be interpreted as further evidence that the ethnographically reported pattern of dependence upon fish, particularly salmon, was not established at this time. However, as this is the oldest component, the low density of fish bones could be explained by poor preservation of these relatively fragile bones.

No shells were recovered from DjSf 14I so interpretation of the seasonality can only be based on the animals present. All of the animals could have been collected if the site was occupied during the fall and early winter with the exception of the herring which seem to require an early spring occupation for their collection. A summer indicator is lacking, although some of the dogs could have died during the summer. The seasonal patterns of the animals are not sufficient to determine whether the site was occupied at two intervals-- during the fall perhaps to use the salmon run and again during the early spring to catch herring -- or whether it could have been occupied continuously from fall to spring and perhaps into the summer.

DjSf 14II was occupied more recently than DjSf 14I, estimated between 1110 B.C. ± 110 and 1270 B.C. ± 140. This period correlates with a period of lowered sea level which lasted from about 3150 B.C. to about 750 B.C., reaching about ten feet below present levels. The climate was probably a little cooler than during the occupation of the earlier component for this would be the end of the Hypsithermal and the beginning of the cooler, more humid Late Postglacial (Heusser 1960:Fig. 37).

Canis spp. dominate the faunal assemblage of DjSf 14II as in DjSf 14I, but the dog bones are found in a much higher density. There are more species of mammals than in DjSf 14I (perhaps due to the larger sample size) and deer again occupies the dominant position numerically) (Fig. 10). Deer is the only mammal species with an MNI above one (except *Canis* spp.), but the northern sea lion leads in the live weight category (Fig. 11, 12). The total live weight of the mammals is very much larger than that of either the fish or the birds, supporting a suggestion that the mammals could have provided a major part of the diet. Despite this overwhelming dominance in live weight, the density of mammal bone has dropped considerably from DjSf 14I and is less than in DjSf 13. Although the mammals still provide a large part of the diet, the number seems to have dropped. If this trend continued in DjSf 13, it would be tempting to suggest this is the beginning of the change from use of land mammals to heavier dependence on fish. However, the density of mammal bones is higher in DjSf 13, making this drop in density of mammal bones possibly a transitory phenomenon, or the result of sampling error.

As with the mammals there are more species of birds identified in this component than in DjSf 14I. Despite this considerably larger number of elements, the density of bird bones has fallen slightly from DjSf 14I. The difference is small enough to be accounted for by chance variation and perhaps should only be used to indicate that the actual number of birds being caught does not seem to have risen. Large gulls are again the dominant single group with the highest number of elements, MNI, and meat weight, by a considerable margin in most cases. The next most numerous species is grouse, which was totally lacking in DjSf 14I. *Anas* spp., scoters, and medium-sized gulls are the next most numerous group of birds collected. The remainder of the species identified are represented by a relatively few elements. Consideration of the combined categories still leaves the gulls in the dominant position numerically, but the diving birds comprise twice the amount of the live weight as the gulls. The impression given by this assemblage is the birds were being collected in the proportions in which they might be found naturally. In a coastal area the gulls and diving birds could be expected to be the most numerous group present. The large number of gulls in the assemblage (and that of DjSf 14I and DjSf 13) is reasonable considering their availability and moderate size, but surprising as the ethnographers mention them only rarely (e.g. Barnett 1939:238; 1955:63). The grouse which appear in fairly large numbers in this site were reported by Suttles (1974:137) and Jenness (n.d:17) as being hunted in small numbers. Perhaps at contact a smaller range of bird species were being hunted.

The fish in DjSf 14II are found in greater number and much higher density than in either of the other components. The herring bones account for a large proportion of this density, but even with the herring excluded the remaining fish bones have a density more than three times that of DjSf 14I or DjSf 13. The extremely high number of herring bones might suggest interpretation of the site's use at this time as mainly a herring fishing site as was suggested for Deep Bay, but I feel the large numbers of other fishes precludes this idea. Instead it appears this site was used heavily as a fishing site for many species of fish. The flatfishes stand out as the next most numerous species caught after herring, with dogfish, salmon, and rockfish following not too closely behind. In this component, to further the impression of the immense number of herring, herring also dominates the live weight category. Dogfish and salmon are second and third ranked respectively. Whether or not dogfish were caught to be eaten is unknown, but it is obvious that in this component they were taken in large numbers. Perhaps the lack of eulachon runs in the area placed the dogfish in the position of being the major source of fish oil, and it was therefore taken in large numbers.

The shellfish present in this component were collected mainly in the summer, with some taken in the spring and fall (Keen 1976:50). All of the mammals that could be aged could have died during the late fall to early summer period. The majority of the birds are either year-around residents or winter on the coast from fall to spring. However, a few bird species indicate at least a spring and fall residence. The salmon runs last from late September to January, and are followed shortly thereafter by the herring spawning in the early spring, usually in February or March. Some of the fish would be most accessible during the spring and summer. These seasonal data seem to best support the interpretation of a year around site occupation by at least some people. The high density of fish bones indicates more intensive collection of fish resources than in DjSf 14I or DjSf 13, perhaps as a result of a longer season of occupation of the site.

DjSf 13 is more recently occupied than either DjSf 14I or DjSf 14II. Two carbon samples taken yielded date estimates of 820 B.C. ± 90 and 690 B.C. ± 90. Between 750 B.C.

and 850 B.C., the sea level was rising from a low level about ten feet below present levels to a height slightly less than ten feet above present. The Late Postglacial climatic period was well begun, characterized by conditions cooler and more humid than present. The forests were dominated by hemlock and spruce.

As in the other components, *Canis* spp. elements are the most numerous among the mammals. The density of the dog bones has fallen though, after its peak in DjSf 14II. The density of the remaining mammal bones has risen from DjSf 14II, with deer again being the most numerous after *Canis* spp. In the live weight category deer is eclipsed by the northern sea lion which is more numerous in this site than in any other (Fig. 12). The density of sea mammal bones has risen very sharply from DjSf 14II (0.09 bones/m^3 to 0.29 bones/m^3) but the number of elements is so low in both components as to make all interpretation very tenuous. However, this may indicate a rise in sea mammal hunting, particularly of the very large northern sea lion.

The bird bones are at their highest density in DjSf 13, having almost doubled from DjSf 14II. The most obvious shifts from DjSf 14I and DjSf 14II are a drop in the number of medium-sized gulls and grouse and a larger number of scoter elements. The very small number of grouse elements is puzzling. This might have suggested a shift away from land hunting in general, but the density of mammal bones has increased. As the overall density of birds has increased it cannot be explained by an attrition of some species due to fewer birds being caught. The drop in grouse, and also small gulls is at present inexplicable; perhaps it represents a shift or difference in cultural preferences. In live weight the scoters are also slightly ahead of the large gulls (Fig. 12). In the combined categories this is emphasized with the result that the diving birds outnumber and outweigh the gulls by a fair margin. While the amounts of the different bird species have shifted somewhat, the rank orders between DjSf 13 and DjSf 14II are still quite similar. Calculation of rho for the combined bird categories indicated that the hypothesis of non-association could be rejected at the .05 level, although rho was not very high for any group; .75 for the live weight, .66 for elements and .58 for MNI. The similarity exhibited in these sites may result from exploitation of the same environments and as a result, the same bird populations due to the close proximity of the sites. The shifts noted may be the result of shifts in dietary preferences or the season of occupation of the sites.

The density and absolute number of fish elements has dropped dramatically in DjSf 13. A large proportion of this drop is as a result of a much lower number of herring bones than in DjSf 14II, however the density of the remaining fish bones is still considerably below that of DjSf 14II. In contrast to the general trend, the density and number of the salmon bones has risen from DjSf 14II (4.68 bones/m^3 in DjSf 14II and 6.36 bones/m^3 in DjSf 13). The higher proportion of salmon and lower proportion of herring in this site seems to be one of the fundamental differences between it and the other two components. Calculation of chi-square to test the relationships of the herring, salmon and other fishes yielded the result that the null hypothesis of identical distributions can be rejected at least at the .05 level. Perhaps what is being seen here is the beginning of the dominance of salmon as a major part of the diet, hence the drop in density of the other species of fish. The other species of fish are found in much lower numbers than either salmon or herring, and provide slightly less of the diet than they did in DjSf 14II. There are also fewer species present in DjSf 13 than DjSf 14II. Overall this site gives a feeling that the inhabitants concentrated on a smaller variety of fish species, and more heavily on one or two species than did the people of DjSf 14II. This statement holds equally well in the case of the bird species.

The shells in DjSf 13 were interpreted as having been collected all year, particularly in the late spring and summer

(Keen 1976:56). The mammals indicated a winter and/or early summer occupation. The birds present in the assemblage require the site to have been occupied at least from March to mid-May and it could have been longer. The fish species present imply occupation in the early spring and fall to winter with a tentative indication of late spring to summer occupation. These data indicate DjSf 13 was most probably occupied continuously from fall to summer, at least by a small number of people. In the case of all the components, the population of the sites may have fluctuated throughout the year, with some people or families leaving temporarily to hunt, fish, or gather in other areas.

Analysis of the faunal assemblages from these sites has indicated that the three components show many basic similaritis to each other, as might have been expected for three Locarno Beach components. They also follow the general pattern recorded by the ethnographers for the Coast Salish. However, they do show differences among themselves which imply that the use of these sites was not static, changing particularly in the density of the bone and in the relationships between salmon, herring and other fishes. Their faunal assemblages may indicate the recent Coast Salish pattern of dependence on salmon and other fishes more than upon mammals had not appeared at the occupation of these sites. Additionally sea mammal hunting does not appear overly important. These questions and others mentioned before will only be answered with more research in faunal analysis.

Further research in several directions is needed to help fully establish the aboriginal economic patterns. Probably foremost is the need for more complete analyses of faunal assemblages from sites in the Coast Salish area. It would be particularly advantageous to excavate several recent sites, trying to cover the range of seasonal uses and ages available, in a small region of one environmental zone, historically inhabited by only one linguistic group of the Coast Salish. This would allow some control of environmental and cultural variables. Further excavations on the east coast of Vancouver Island and the adjacent smaller islands are needed to attempt to fully establish that region's pattern. This could subsequently be compared with other regional patterns in order to find out how much the regions vary and if an overall pattern can be recognized. In order to make these faunal data useful for comparisons between sites the basic data are going to have to be presented in some usable form. At the moment this probably means the number of elements for each species, at the very least, and possibly the MNI, should be presented for each site. Possibly a central depository for the raw faunal data should be established so that a researcher wanting specific data not available in the published report has a chance of getting it himself.

Other problems require basic research involving the animals themselves. If the question of the comparative contribution of mammals, birds, and fishes to the diet is to be resolved, then basic research on the amount of meat each can contribute to the diet needs to be established. Data on the time of epiphyseal fusion and tooth eruption of mammals need to be collected for many of the mammals (for example the sea mammals) for which they are not available. Also further ethological data for many of the fish species might allow better interpretation of seasonality and might allow suggestions to be made about necessary fishing techniques. Collection of this type of data has in the past been carried out by other professionals than archaeologists, but it is specifically needed by archaeological faunal analysts and will probably have to be gathered by them in the future.

REFERENCES CITED

American Ornithologists' Union
1957 *Checklist of North American birds.* Lord Baltimore Press, Inc., Baltimore.

1973 32nd supplement to the American Ornithologists' Union checklist of North American birds. *Auk* 90: 411-419.

Banfield, A.W.F.
1974 *Mammals of Canada.* National Museums of Canada, University of Toronto Press, Toronto.

Barnett, H.G.
1939 Culture element distributions, Vol. IX: Gulf of Georgia Salish. *Anthropological Records* 1 (5): 221-295.

Barnett, H.G.
1955 *The Coast Salish of British Columbia.* University of Oregon, Eugene.

Bellrose, F.C.
1976 *Ducks, geese and swans of North America.* Stackpole Books, Harrisburg.

Bernick, K.
1976 Preliminary report of 1976 salvage excavations at the Little Qualicum River site: DiSc 1. Ms. on file with the Archaeological Sites Advisory Board, Victoria.

Boas, Franz
1887 Zur Ethnologie Britsch-Kolumbiens. *Petermanns Geogr. Mitteilungen*, Heft V: 129-133.

Boehm, S.G.
1973 *Cultural and non-cultural variation in the artifact and faunal samples from the St. Mungo Cannery site, B.C., DgRr 2.* Masters Dissertation. Univ. of Victoria, Victoria.

Borden, C.E.
1961 Fraser River Archaeological Project. *Anthropol. Pap.*, 1. National Museum of Canada, Ottawa.

Brooks, A.C
N.D. Mammals of Comox-Strathcona Area, in *A Naturalist Guide to the Comox Valley and Adjacent Areas including Campbell River*. E.W. Bickle, Ltd., Courtenay.

Brooks, B.J.
N.D. Marine Life of Comox District, in *A Naturalist Guide to the Comox Valley and Adjacent Areas including Campbell River*, editors L. Henderson and P. Capes. E.W. Bickle, Ltd., Courtenay.

Brown, R.F., V.D. Chahley and D.G. Demontier
1977 Preliminary Catalogue of Salmon Streams and Spawning Escapements of Statistical Area 14 (Comox-Parksville). *Canada Fisheries and Marine Service (Pacific Region), Data Report Series* #77-12. Vancouver.

Canadian Hydrographic Service
1974 *Baynes Sound and Approaches, Chart 3532*. Department of the Environment, Ottawa.

Capes, K.H.
1964 Contributions to the Prehistory of Vancouver Island. *Occ. Papers of the Idaho State Univ. Museum*, No. 15, Pocatello.

Casteel, R.W.
1972 Some Biases in the Recovery of Archaeological Faunal Remains. *Proceedings of the Prehistoric Society*, 38: 382-398.

1976 Comparison of Column and Whole Unit Samples for Recovering Fish Remains. *World Arch.* 8(2): 192-196.

1978 Faunal Assemblages and the "Wiegemethode" or Weight Method. *Jour. of Field Arch.* 5(1): 71-77.

Chaplin, R.E.
1971 *The Study of Animal Bones from Archaeological Sites*. Seminar Press, London and New York.

Child, K.N.
1970 *Comparison and Evaluation of Some Methods Used to Age Culumbian Black-tailed Deer (Odocoileus hemionus hemionus) Collected in the Vicinity of Cowichan Lake, B.C.* Masters Dissertation. Univ. of Victoria, Victoria.

Cook, S.F. and A.E. Treganza
1956 The Quantitative Investigation of Indian Mounds. *Univ. Calif. Publ. Am. Arch. and Ethn.* 40: 223-261.

Cowan, I. Mct. and C.J. Guiguet
1978 The Mammals of British Columbia. *British Columbia Provincial Museum, Handbook 11.* Victoria.

Duff, W.
1952 The Upper State Indians of the Fraser valley, B.C. *Anthropology in British Columbia,* Memoir 1. Provincial Museum, Victoria.

Fairbridge, R.W.
1958 Dating the Latest Movements of the Quarternary Sea Level. *Trans., N.Y. Acad. Sci.,* 2, 20: 471-482.

Fitzpatrick, W.J.
N.D. Birds. In *A Naturalist Guide to the Comox Valley and Adjacent Areas Including Campbell River,* editors L. Henderson and P. Capes. E.W. Bickle, Ltd., Courtenay.

Fladmark, Knut
1975 A paleoecological model for northwest coast prehistory. *National Museums of Canada Mercury Series, Paper* 43.

Forrester, C.R.
1969 Life History Information on Some Groundfish Species. *Fisheries Research Board of Canada, Technical Report #105.* Ottawa.

Fox, M.W.
1978 *The Dog: Its Domestication and Behavior.* Garland STPM Press. New York and London.

Gilbert, B.M.
1973 "Mammalian Osteo-Archaeology: North America." *Special Publications, Missouri Archaeology Society.* Univ. of Missouri. Columbia.

Giles, R.H., editor
1969 *Wildlife Management Techniques.* Third edition, revised. Edward Brothers, Inc. Ann Arbor.

Godfrey, W.E.
1979 *The birds of Canada.* National Museums of Canada, Ottawa.

Grayson, D.K.
1973 "On the Methodology of Faunal Analysis." *Am. Antiq.*, 39(4): 432-439.

Guiguet, C.J.
1967 *The Birds of British Columbia. (5) Gulls, Terns and Skua.* British Columbia Provincial Museum. Victoria.

1970a *The Birds of British Columbia. (4) Upland Game Birds.* British Columbia Provincial Museum. Victoria.

1970b *The Birds of British Columbia. (9) Diving Birds and Tube-nosed Swimmers.* British Columbia Provincial Museum. Victoria.

1978 *The Birds of British Columbia. (6) Waterfowl.* British Columbia Provincial Museum. Victoria.

Gunther, Erna
1927 Klallam ethnography. *University of Washington Publications in Anthropology* 1 (5): 171-314.

Haeberlin, H. and E. Gunther
1930 "The Indians of Puget Sound." *University of Washington Publications in Anthropology*, 4 (1): 1-84.

Hart, J.L.
1973 "Pacific Fishes of Canada." *Fisheries Research Board of Canada Bulletin 180*. Ottawa.

Heusser, C.J.
1960 "Late-Pleistocene Environments of North Pacific North America." *Amer. Geog. Soc. Spec. Publ., 35*. New York.

Howay, F.W.
1918 "The Dog's Hair Blankets of the Coast Salish." *Wash. Hist. Quart.* 9(2): 83-92.

Jenness, D.
N.D. *The Saanitch Indians of Vancouver Island.* Ms. on file with the British Columbia Provincial Archives.

Jordan, D.S. and B.W. Evermann
1806 "The Fishes of North and Middle America." *U.S. Nat. Museum Bull. 47*: 1-4.

Jorgensen, J.G.
1969 "Salish Language and Culture, A Statistical Analysis of Internal Relationships, History and Evolution." *Lang. Sci. Mon.*, 3.

Keen, S.D.
1976 *The Growth Rings of Clam Shells from Two Pentlatch Middens as Indicators of Seasonal Gathering.* Masters Dissertation. Univ. of Victoria. Victoria.

Kirk, R.W.
1970 "Dogs." In *Reproduction and Breeding Techniques for Laboratory Animals.* E.S.E. Hafez, editor. Lea and Febiger. Philelphia.

Krajina, V.J.
1965 "Biogeoclimatic Zone and Classification of British Columbia." In *Ecology of Western North America, 1:* 1-17. Vancouver.

Krause, Aurel
1956 *The Tlingit Indians.* University of Washington Press. Seattle.

Lord, John Keast
1866 *The Naturalist in Vancouver Island and British Columbia. Volume II.* Richard Bentley. London.

Mathews, W.H., J.G. Fyles and H.W. Nasmith
1970 "Post-glacial Crustal Movements in South-western British Columbia and Adjacent Washington State." *Canadian Journal of Earth Sciences*, 7(2): 790-702.

Matson, R.G.
1976 "The Glenrose Cannery Site." *National Museum of Man, Mercury Series, Paper No. 52.* Ottawa.

Mitchell, D.H.
1971 "Archaeology of the Gulf of Georgia Area, A Natural Region and Its Culture Types." *Syesis*, 4, Supp. 1.

1974a *A Review of the Archaeology of the Gulf of Georgia Area.* Paper presented to the Anthropology 449 class.

1974b *Salvage Excavation at the Buckley Bay Site (DjSf 13), Baynes Sound, Vancouver Island, British Columbia.* Ms.

Monks, G.G.
1977 *An Examination of Relationships Between Artifact Classes and Food Resource Remains at Deep Bay, DiSe 7.* PhD. Dissertation. University of British Columbia. Vancouver.

Munro, J.A. and I. McT. Cowan
1947 "A Review of the Bird Fauna of British Columbia. *British Columbia Museum Special Publication #2.* Victoria.

Olsen, S.J.
1973 "Mammal Remains from Archaeological Sites. Part 1 - Southeastern and Southwestern United States." *Papers of the Peabody Museum of Archaeology and Ethology,* 56(1). Harvard Univ. Cambridge.

Palmer, R.S.
1962 *Handbook of North American Birds. Vol. I: Loons through Flamingos.* Yale University Press. New Haven and London.

1976 *Handbook of North American Birds. Vol. 3: Waterfowl.* Yale University Press. New Haven and London.

Payne, S.
1972 "On the Interpretation of Bone Samples from Archaeological Sites." In *Papers in Economic Prehistory.* Eds., E.S. Higgs. Cambridge.

Peterson, R.T.
1961 *A Field Guide to Western Birds.* Houghton Mifflin Co. Boston.

Robertson, R.A. and A.R. Shadle
1954 "Osteologic Criteria of Age in Beavers." *J. Mam.,* 35(2): 197-203.

Salwen, B.
1962 "Sea levels and Archaeology in the Long Island Sound Area." *Amer. Ant.*, 28: 46-55.

Siegel, Sidney
1956 *Nonparametric Statistics for the Behavioural Sciences.* McGraw-Hill Book Co., Inc., New York.

Suttles, Wayne
1955 "Katzie Ethnographic Notes." *Anthropology in British Columbia, Memoir No. 2.* British Columbia Provincial Museum. Victoria.

1974 "The Economic Life of the Coast Salish of Haro and Rosario Straits. *Coast Salish and Western Washington Indians, 1. Garland American Indian Ethnohistory Series: Indians of the Northwest.* Garland Publishing Inc. New York.

Thornton, B.M.
N.D. "Fresh-water Fish of East Central Vancouver Island." In *A Naturalist Guide to the Comox Valley and Adjacent Areas including Campbell River.* Eds. L. Henderson and P. Capes. The Comox Strathcona History Society. E.W. Bickle, Ltd. Courtenay.

Uerpmann, Hans-Peter
1973 "Animal Bone Finds and Economic Archaeology: A Critical Study of 'Osteo-archaeological Method'." *World Archaeology*, 4(3): 307-322.

Van Nostrand, F.C. and A.B. Stephenson
1964 "Age Determination for Beavers by Tooth Development." *Jour. of Wildlife Man.*, 28(3): 430-434.

White, T.E.
1953 A method of calculating the dietary percentage of various food animals utilized by aboriginal peoples. American Antiquity 18(4): 396-397.

Wilby, G.V.
1937 "The Ling Cod, *Ophiodon elongatus* Girard." *Biological Board of Canada, Bulletin 54.* Ottawa.

Wing, E.S. and N. Hammond
1974 "Fish Remains in Archaeology: A Comment on Casteel." *Am. Ant.*, 39(1): 133-134.

Yellen, J.E.
1977 "Cultural Patterning in Faunal Remains: Evidence from the !Kung Bushmen." In *Experimental Archaeology*, ed. D. Ingersoll, J.E. Yellen and W. Macdonald. Columbia University Press. New York.

APPENDIX I

Selected Notes on the Natural History of the Faunal Species Found in DjSf 13 and DjSf 14

Mammals

The mammals found in the sites are presented in their conventional order of classification, rather than in their order of abundance in the sites (Table 3). The natural history data are as specific to the sites' area as is possible to obtain from the literature. The data from the sites is compiled in Tables 6, 7, 8, 9, 10 and 11.

Tamiasciurus hudsonicus Red Squirrel

The red squirrel is the only squirrel species on Vancouver Island. It is found in forest communities, particularly those dominated by conifers. It is not found on Hornby Island although it is on Denman Island (A.C. Brooks n.d:59). The red squirrel nests in burrows, holes in trees or on sheltered branches. It hibernates only for short periods during extreme weather (Cowan and Guiguet 1978:149).

Castor canadensis Beaver

The beaver is an aquatic animal found along all sizes of streams and lakes in forested areas. They either construct a large lodge of sticks or burrow into a bank. The young are born from late April to early July. The two year old beavers leave their natal colony in mid-summer to establish new colonies, and may travel widely at this time (Cowan and Guiguet 1978:171-173). Beaver are found on Denman Island, but apparently not on Hornby Island (A.C. Brooks n.d:59).

Peromyscus maniculatus White-footed Mouse

The white-footed mouse is the only cricetid mouse species native to Vancouver Island. The habitat is variable but the particular sub-species of the Comox area is found at low elevations in forests and scrub areas. Nests are placed in any protected area (A.C. Brooks n.d:56; Cowan and Guiguet 1978:177).

Rattus spp. Old World Rat

There are two species of rat found on Vancouver Island, *Rattus rattus* and *Rattus norvegicus*, both introduced from Europe (Cowan and Guiguet 1978:232-236).

Cetacea Whales and Porpoises

The species presented below are those most likely to appear in the Strait of Georgia, but others may occur at times.

Lagenorhynchus obliquidens Pacific Striped Dolphin

The Pacific striped dolphin is found regularly in protected water around north and south Vancouver Island during the winter. In the summer it is found in the open ocean

(Cowan and Guiguet 1978:257).

Grampus rectipinna Pacific Killer Whale

The killer whale is found year around in shallow shore waters along the whole coast. It usually travels in groups of up to 100 (Cowan and Guiguet 1978:258).

Phocaena vomerina Harbour Propoise

Harbour porpoise are found in bays, harbours and inshore waters. They travel in small groups of two to four (Cowan and Guiguet 1978:260-261).

Megaptera novaeangliae Humpback Whale

The humpback whale can be found in partially enclosed straits and inlets. It is migratory and sometimes enters the Strait of Georgia during the summer (A.C. Brooks n.d:56; Cowan and Guiguet 1978:269-270).

Canis spp. Dogs and Wolves

Canis lupus Wolf

Wolves are found in a wide variety of habitats. They feed mainly on ungulates and so are found where there animals are available. The young are born in early spring, depending on the weather (Cowan and Guiguet 1978:280-282).

Canis familiaris Domestic Dog

From descriptions by explorers, early settlers and ethnographers, the Coast Salish appear to have kept two varieties of domestic dog. One type was bred specifically for wool production. Physical descriptions of this type of dog are scarce, one of the best coming from a Spanish exploration in 1792 (Howay 1918:87) of the Nanaimo area. "These animals are of moderate size, resembling those of English breed, with very thick coats, and usually white: among other things they differ from those of Europe in their manner of barking, which is simply a miserable howl." Vancouver mentioned this type of dog "much resembled those of Pomerania, though in general somewhat larger" (Howay 1918:85). All accounts agree that the dogs were mainly white, small to medium sized, and apparently numerous. By the late 1800's this type of dog no longer existed (Howay 1918:91).

Reports of another type of dog used for hunting, not for wool-bearing are contradictory. Barnett (1955:96) reports that dogs were used for hunting but that his informants were divided about equally about whether or not the hunting dog was a distinct breed from the wool dog. Suttles' (1974:158-159) Straits informants said they used their wool dog for hunting. In contradiction to this Krause (1956:58-59) says the Tlingit dogs "belong to the race of Eskimo dogs; they have no relationship to the Indian dogs of British Columbia and Puget Sound who could be confused in their appearance with coyotes." Lord (1866: 215), a naturalist who travelled with the Boundary Commission in the 1860's, notes two types of Indian dogs, the wool dog which was extinct by this time and another dog "hardly in any degree altered from the coyote" (Lord 1866:221). He gives a physical description of coyotes stating the dogs differed only in "the hair, which becomes softer, and more uniform in coloration" (Lord 1866:222-223). From these accounts it appears that at least some Coast Salish had a distinct breed of dog resembling a coyote, but whether this dog was found on Vancouver Island is uncertain.

The reproductive pattern of domestic dogs is highly variable. In most cases the female matures at six to nine months old and comes into heat twice a year, possibly three times a year (Fox 1978:Table I). In most cases "large numbers of bitches are in season during January to February and July to August" (Kirk 1970:226). The gestation period is 63 days, so puppies should be born during March to April and September to October.

Ursus americanus American Black Bear

The black bear is generally found in wooded areas, with seasonal use of berry patches and spawning streams.

Coastal black bears subsist mainly on berries, fish and marine invertebrates. The winter dormancy period varies with the climate with no definite information available for the Tsable River area. In northern areas they may den up in November, while on the south end of Vancouver Island bears may be active all winter. The young are born in January or February and stay with the mother for two years (Cowan and Guiguet 1978:289-291).

Procyon lotor Raccoon

Raccoons are found in forests and areas of shrubs. They eat almost anything, but those on the coast forage almost entirely on the beach. The young are born in the spring (Cowan and Guiguet 1978:298). Raccoons are not found on Denman Island (A.C. Broos n.d:59). There is no seasonal pattern of availability.

Martes americana Marten

The marten inhabits coniferous forests from sea level to the tree line. When on the coast it forages on the beach. There is some seasonal shift to higher elevation in the summer. The young are born in early spring (Cowan and Guiguet 1978:300-301). Marten are not found on either Denman or Hornby Islands (A.C. Brooks n.d:59).

Mustela vison Mink

The mink is semi-aquatic, living in woods and marshes bordering sea shores, lakes, and streams. Minks living on the coast eat marine crustaceans, in particular crabs. The young are born about May (Cowan and Guiguet 1978:320-321).

Lutra canadensis Canadian River Otter

The river otter is found near a fresh water pond, stream, or river but will forage along the marine shores. Along the salt-water beaches they eat crab mainly, along with fish. The young are born in March and April (Cowan and Guiguet 1978:330-332).

Eumetopias jubata Northern Sea Lion

During the summer the northern sea lions are found along the outside coast of Vancouver Island. They gather in groups on rocky islands to breed during June and July. In the winter, they can be found in littoral waters all along the coast of Vancouver Island (Cowan and Guiguet 1978: 347-349).

Phoca vitulina Hair or Harbour Seal

The hair seal is found in littoral waters along the whole coast of Vancouver Island. It stays close to shore and can be found in shallow bays and inlets. It regularly hauls out on sandbars and reefs. It can also be found up all the major rivers. The young are born in late May or June (Cowan and Guiguet 1978:352-353).

Cervus canadensis roosevelti Roosevelt Elk

The Roosevelt elk inhabits coastal rainforests. Generally the herds live in low elevation river valleys in the winter and move to higher elevations in the summer, although some herds might stay in the river valley all year. Calves are born in April and May. Antlers are shed by the males between March and May, depending on the age of the bull (Cowan and Guiguet 1978:358, 361-362).

Odocoileus hemionus columbianus Blacktail or Coast Deer

The blacktail is found throughout Vancouver Island and almost all of the islands in the Strait of Georgia. Many groups migrate to high valleys in the summer and winter in the lower elevations. Fawns are born in June. Antlers are mature about August and are dropped in March and April (Cowan and Guiguet 1978:367-369).

Birds

Identification of bird bones past the genus level is not always possible, as for example the goose genus, *Anser*. In these cases the life history of all the members of that genus present in the Baynes Sound area today are discussed. It is possible that members of these genera not known to exist in the area today might be found in the archaeological sites.

Gavia immer, G. arctica, G. stellata
Common, arctic, Red-throated Loons

Loons are large diving birds found in open water. Loons breed on fresh water at the water's edge, being very clumsy on land. In general, loons summer in lakes to the north and winter on the sea coast to the south. The common loon is abundant in the winter and a few non-breeding individuals are found on the British Columbia coast all summer. The arctic loon does not breed in British Columbia, but is common during the spring, (May and June) and the fall (October) migrations, with some birds wintering on the coast. The red-throated loon is present during the winter along the coast. Fitzpatrick (n.d:51) considers it uncommon and Guiguet (1970b:15) says it is common. As Fitzpatrick is dealing specifically with the Comox area rather than the whole province I accept his statement as better informed for the Baynes Sound area.

Podiceps grisegena, Red-necked Grebe;
P. auritus, Horned Grebe;
P. caspicus, Eared Grebe;
Aechmophorus occidentalis, Western Grebe;
Podilymbus podiceps, Pied-billed Grebe

Grebes are diving birds rarely seen on land. As in the case of the loons, grebes nest on lakes and winter on the sea coasts. Only two grebes, the red-necked and the pied-billed grebes, nest on Vancouver Island, neither in large numbers. The red-necked grebe, horned grebe, and western grebe are all common winter residents. The eared grebe occasionally winters in the Baynes Sound area. Unless forced out by freezing conditions, the pied-billed grebe prefers to winter on fresh water streams and ponds rather than sea water (Guiguet 1970b:16-31; Fitzpatrick n.d:51).

Phalacrocorax auritus, Double-crested Cormorant;
P. pencillatus, Brand's Cormorant;
P. pelagicus, Pelagic Cormorant

The cormorant is a diving sea bird nesting on rocky islets or cliffs. The double-crested and pelagic cormorants both nest in the Baynes Sound area and are resident at all times. Brandt's cormorant does not nest in the area, but a few may winter there (Guiguet 1970b:69-75). Munro and Cowan (1947:52) note a spring sighting at Nanoose Bay which indicates Brandt's cormorant possibly could be present in Baynes Sound in the spring.

Ardea herodias Great Blue Heron

The great blue heron feeds in shallow waters, fresh or salt and is a year around resident of the Baynes Sound area (Godfrey 1979:36-37).

Branta canadensis Canada Goose

The Canada goose population consists of at least six subspecies, possibly more (Bellrose 1976:142; Guiguet 1978: 13). Three of these subspecies are found on Vancouver Island, *Branta canadensis occidentalis*, *B.c. minima* and *B.c. canadensis* (Guiguet 1978:14-16). All subpsecies feed on vegetation, both aquatic plants and grasses (Guiguet 1978:16). The Canada goose would be found in the site area in small numbers during spring and fall migrations (Fitzpatrick n.d:51; Guiguet 1978:16).

Branta bernicla Black Brant

Eelgrass is the most important food of the black brant (Bellrose 1976:176; Guiguet 1978:20). Fitzpatrick (n.d.:51) lists black brants as common spring migrants. A very few are known to winter in British Columbia (Guiguet 1978:19) but are not recorded at the site area.

Anser rossii Ross' Goose

Ross' geese feed on vegetal material (Bellrose 1976:135). Guiguet (1978:28) mentions the Ross' goose being sighted at

Comox, but gives no season. This goose nests mainly in the Arctic, so presumably the sightings were either during the migrations or in the winter (Bellrose 1976:133). Fitzpatrick does not mention the Ross' goose at all so it can be presumed to be uncommon or rare in the Comox area.

Anser albifrons White-fronted Goose

The white-fronted goose feeds on vegetation, both aquatic and terrestrial (Guiguet 1978:24). It is encountered infrequently in the Comox area during the spring and fall migrations (Fitzpatrick n.d:51).

Anser caerulescens Lesser Snow Goose

The lesser snow goose feeds on aquatic plant roots in British Columbia (Guiguet 1978:27). The snow goose is an uncommon spring and winter transient in the Comox area (Fitzpatrick n.d:51).

Anas platyrhynchos Mallard

Mallards, dabbling ducks, eat a wide variety of vegetable food in both fresh and salt water (Guiguet 1978:30; Bellrose 1976:242-243). According to Fitzpatrick (n.d:51) they are common year around residents in the Comox area.

Anas acuta Pintail

Pintails feed on seeds and plants, mainly in fresh water although sometimes in salt bays (Bellrose 1976:274). They nest mainly in the far north, but are occasional year around residents in the Comox area (Fitzpatrick n.d:51). They are common winter residents in the Comox area.

Anas crecca, Green-winged Teal;
A. discors, Blue-winged Teal;
A. cyanoptera, Cinnamon Teal

All of these teals feed mainly on fresh water plants, particularly on mud flats (Guiguet 1978:36, 40; Bellrose 1976: 29., 285, 226). Both the blue-winged and cinnamon teals are uncommon summer birds in the Comox area (Fitzpatrick n.d:51). The green-winged teal winters commonly on the coast, including the Comox area and is an uncommon year around resident (Guiguet 1978:35; Fitzpatrick n.d:51).

Anas americana American Widgeon

The American widgeon eats vegetable matter particularly eelgrass, when feeding on the coast (Guiguet 1978:42). The American widgeon does not nest on the coast, but is a common winter resident (Guiguet 1978:42; Fitzpatrick n.d:51).

Anas clypeata Shoveller

The shoveller's diet consists of microscopic plants, insects and some larger plant material (Guiguet 1978:40; Bellrose 1976:300). Fitzpatrick (n.d:51) classifies the shoveller as an uncommon winter resident. In contrast, Guiguet (1978:41) says the shoveller is one of the most common ducks on the coast in the winter.

Aythya collaris, Ring-necked Duck;
A. valisineria, Canvasback;
A. marila, Greater Scaup;
A. affinis, Lesser Scaup

All of these are diving ducks with the ring-necked duck and canvasback frequenting shallower water than the greater and lesser scaups. In the same pattern, the ring-necked duck and canvasback inhabit mainly fresh water and the majority of their diet is plant material. The greater and lesser scaups are found more frequently on salt water and a larger portion of their diet is animal food, for example clams (Guiguet 1978:55-56, 53, 50-51; Bellrose 1976:312-313, 333-334, 341-342, 354). The greater scaup is a common winter and occasional summer resident, of the Comox area, while the ring-necked duck, canvasback and lesser scaup are found in the area only occasionally in the winter (Fitzpatrick n.d:51).

Clangula hyemalis Oldsquaw

Oldsquaws are diving ducks feeding mainly on crustaceans and mollusks (Bellrose 1976:393). They are common winter residents in the Comox area (Fitzpatrick n.d:51).

Histrionicus histrionicus Harlequin Duck

Harlequin ducks are diving ducks that nest along fast streams and winter along adjacent sea coasts (Bellrose 1976: 384). Their diet consists mainly of crustaceans and mollusks (Bellrose 1976:384). Harlequin ducks nest on Vancouver

Island, the females raising the young while the males move back to the coast in mid-June. The females and young join the males in September and October (Guiguet 1978:64-65). This pattern may explain why Fitzpatrick (n.d:51) classes the harlequin duck as an uncommon summer resident (males only), and a common winter resident (males, females and young).

Melanitta fusca, White-winged Scoter;
M. perspicillata, Surf Scoter;
M. nigra, Common Scoter

The three species of scoters are diving ducks feeding almost exclusively on animal food, particularly crustaceans (Guiguet 1976:70, 73). All three birds are common winter residents, in addition white-winged and surf scoters are present uncommonly in the summer (Fitzpatrick n.d:51).

Mergus cucullatus, Hooded Merganser;
M. merganser, Common Merganser;
M. serrator, Red-breasted Merganser

The mergansers are diving ducks, feeding mainly on small fish (Guiguet 1978:79, 81, 82). The common merganser and hooded merganser are both year around residents, with the hooded merganser being less common (Fitzpatrick n.d:51). The red-breasted merganser winters commonly in the Comox area (Fitzpatrick n.d:51).

Uria aalge Common Murre

The common murre is a diving bird, almost strictly marine, which feeds on small fishes (Guiguet 1970b:78-80). Fitzpatrick (n.d:47) mentions that common murres can be seen in Baynes Sound. They commonly winter in the area and are present in small numbers during the summer.

Dendragopus obscurus, Blue Grouse;
Bonasa umbellus, Ruffed Grouse

The blue grouse winters at high elevations in coniferous forests, moving downward in the spring to nest in natural clearings (Guiguet 1970a:5). Guiguet (1970a:5-6) also points out that logging has created more breeding area than found naturally, as a result the population of blue grouse is higher than before logging activities.

The ruffed grouse is found in deciduous or mixed forests. Guiguet (1970a:15-16) makes no mention of any seasonal movements by this grouse. Both birds are common year around residents in the Comox area (Fitzpatrick n.d:51).

Aguila chrysaetes, Golden Eagle;
Haliaeetus leucocephalus, Bald Eagle

Both eagles are birds of prey, with the golden eagle feeding mainly on small mammals and the bald eagle feeding mainly on dead or dying fish (Godfrey 1979:95-98; Peterson 1961:57). The golden eagle is an uncommon resident of the Comox region while the bald eagle is a common resident

(Fitzpatrick n.d:51). Fitzpatrick (n.d:47-48) mentions seeing large numbers of bald eagles gathered during salmon spawning slightly north of Deep Bay and that many bald eagles can be seen on Denman Island.

Corvus corax, Common Raven;
C. caurinus, Northwestern Crow

Both the raven and crow are omnivorous birds. Ravens are found in a wide variety of habitats including the coast. The northwestern crow lives along the shoreline specifically (Godfrey 1979:275, 276; Peterson 1961:165, 166). Both are common residents of the Comox area (Fitzpatrick n.d:51).

Larus glaucescens, Glaucous-winged Gull;
L. occidentalis, Western gull;
L. argentatus, Herring gull; *L. thayeri*, Thayer's gull;
L. californicus, California gull;
L. delawarensis, Ring-billed Gull;
L. canus, Mew gull; *L. philadelphia*, Bonaparte's Gull;
L. hyperboreus, Glaucous gull.

All gulls are voracious feeders on a wide variety of food such as small fish, crustaceans, mollusks, insects, birds' eggs, carrion, and anything else present (Guiguet 1967). The glaucous-winged gull is the only gull resident in the Comox area all year around (Fitzpatrick n.d:52; Guiguet 1967:6). The western, herring and Thayer's gulls are found in British Columbia only during the winter. The western only appears occasionally in the winter, while the herring and Thayer's gulls are usually present, but in small numbers (Fitzpatrick n.d:52). The California gull is a common summer bird and occasionally a fall transient, but it winters farther south (Fitzpatrick n.d:52; Guiguet 1967:15). The ring-billed gull appears only as an occasional spring or fall transient (Fitzpatrick n.d:52). The mew gull is common in the winter and an occasional year around resident (Fitzpatrick n.d:52). According to Fitzpatrick (n.d:52), Bonaparte's gull is a common summer resident and spring and fall transient. However, Guiguet (1967: 21-22) says the bird is on the coast from August until May at the latest. Glaucous gulls are considered rare, occasionally found off Vancouver Island waters in the fall and winter (Guiguet 1967:6).

Fishes

For many elements, identification to the genus was all that was possible. In these cases, I listed all members of the genus or class that may be found in the Baynes Sound area. The information on many of the fish is sparse so the list should not be considered definitive. I arbitrarily excluded species under 15 cm. in length and that do not form large groups or those found only at depths over 100 fathoms.

Squalus acanthias Spiny Dogfish

Spiny dogfish feed on small fish of all varieties, and many types of invertebrates. They will congregate in areas of spawning herring and capelin. It appears that the Strait of Georgia dogfish do not migrate in large numbers. They are found from the surface to 400 fathoms (Hart 1973:44-47).

Raja binoculata, Big Skate; *R, kincaidi,* Black Skate; *R. rhina,* Longnose Skate; *R. stellata,* Starry Skate

The four species of skate are all found commonly in the Strait of Georgia from the surface to moderate depths (Hart 1973:56-62).

Hydrolagus colliei Ratfish

Ratfish feed on clams and crustaceans. Eggs are laid in a case which is planted in mud in the intertidal zone, mainly in late summer and early autumn. It is considered to be abundant and can be found in shallow water (Hart 1973:66-67).

Clupea harengus Pacific Herring

Herring spawn in British Columbia "in late winter with heaviest concentrations in March, some in February and April, and occasionally as late as early June or July" (Hart 1973:97). Herring spawn at depths between high tide and 36 feet. "The annual inshore movement of herring preliminary to spawning is very variable in time, sometimes recognizable in October or September, and at other times immediately preceding active spawning on the beaches" (Hart 1973:98).

Oncorhynchus gorbuscha Pink Salmon

Pink salmon run in the Tsable River, both odd and even years, arriving in early October with the peak spawning in late November (Brown, *et al.* 1977:108). At its highest point in 1951, 750 fish were counted. At Cowie Creek, three kilometres south of Tsable River, pink salmon were recorded in 1951 and 1952, but not since then (Brown, Chahley, and Demontier 1977:22).

O. keta Chum Salmon

Chum salmon make up the largest run of salmon in the Tsable River, with a peak population of 21,000 in 1968 and a low of 200 in 1950 (Brown, *et al.* 1977:108). They arrive at the river in late September and spawning peaks and finishes in early October (Brown, *et al.* 1977:108). The chum salmon also comprise the largest run for Cowie Creek, with a peak of 7500 in 1951 and a low of 75 in 1975 (Brown *et al.* 1977:22). In Cowie Creek the chums arrive in late October and spawning ends sometime in December. Hart (1973:113) states that chum salmon have been recorded spawning as late as April at Deep Bay.

O. kisutch Coho Salmon

The coho form the second largest run of salmon in the Tsable River, although rivalled at times by the steelhead trout, with a peak of 3500 fish in 1947 (first year recorded) and 1952, and a low of 75 in 1959 and 1976 (Brown, *et al.* 1977:108). The coho arrive at the river in early October and spawning ends in January. In Cowie Creek, the coho are also the second largest run with a peak of 3500 in 1953 and a low of 75 in 1959 (Brown, *et al.* 1977:22). The coho arrive at Cowie Creek in middle October and the spawning ends sometime in December (Brown *et al.* 1977:22). Hart (1973:116) says "the coho salmon spawning run begins in early fall as a prelude for spawning in October and November." A significant number of young coho, called bluebacks, remain in the Strait of Georgia and supply a year around fishery (Hart 1973:116).

O. nerka Sockeye Salmon

Sockeye do not spawn in either Tsable River or Cowie Creek (Brown *et al.* 1977:22, 108). Sockeye spawn in rivers with lakes in their system (Hart 1973:119), the closest to the Baynes Sound area with runs being the Qualicum, Little Qualicum, and Englishman Rivers at about 19, 26, and 40 kilometres south of Tsable River respectively and the Puntledge and Tsolum Rivers, 24 km to the north (Brown, *et al.*

1977:32, 64, 84, 92, 114). Sockeye arrive at these rivers in early September.

O. tsawytscha Chinook Salmon

Chinooks are not found in the Tsable River or Cowie Creek (Brown *et al.* 1977:22, 108). Chinooks are found in the Qualicum, Little Qualicum, Englishman, Oyster and Puntledge Rivers, arriving at these rivers sometime in September (Brown *et al.* 1977:32, 64, 76, 84, 92). Hart (1973: 125) says they enter the spawning rivers most of the year, implying they may be available to fishermen most of the year.

Porichthys notatus Plainfin Midshipman

Midshipman are found from the intertidal zone to at least 45 fathoms (Hart 1973:209). They spawn in late spring or summer in the intertidal zone, which is the only season they are found in water that shallow (B.J. Brooks n.d:19; Hart 1973:208). Hart (1973:209) considers the midshipman common in the Strait of Georgia.

Gadus macrocephalus Pacific Cod

Pacific cod are found at depths between 20 and 300 fathoms (Forrester 1969:12; Hart 1973:223). They move into deep water in the winter, spawn there and move into the shallowest water in late spring and early summer (Forrester 1969:12). They feed on shrimp and all types of small fish (Forrester 1969:13; Hart 1973:223). They are common in the Strait of Georgia.

Merluccius productus Pacific Hake

Hake are found from the surface to depths of 491 fathoms. They feed on shrimp and small fish and are common along the British Columbia coast (Hart 1973:226).

Microgadus proximus Pacific Tomcod

Tomcod are found at depths between 15 to 50 fathoms all along the British Columbia coast, but are not considered abundant. The only food known is shrimp (Hart 1973:227).

Theragra chalcogramma Walleye Pollock

Pollock are found at depths from the surface to over 200 fathoms. They feed on shrimps and small fishes. They are found commonly in British Columbia waters.

Cymatogaster aggregata Shiner Perch

The shiner perch are common in British Columbia in shallow water during the summer and deeper water, to 40 fathoms, in the winter. They feed on mussels, barnacles, and algae (Hart 1973:305).

Embiotoca lateralis Striped Seaperch

The striped seaperch are not uncommon in British Columbia. They feed on small crustaceans, worms, mussels, and herring eggs (Hart 1973:307).

Rhacochilis vacca Pile Perch

The pile perch is common along the Vancouver Island shoreline in rocky areas. Its main source of food is mussels (Hart 1973:313).

Sebastes spp. Rockfishes

Rockfishes, as a group, are abundant in the Strait of Georgia, although individual species vary in availability. A few species are found in schools, for example the quillback and black rockfish, but most are solitary, living in rocky areas. They are found from shallow water to 800 fathoms. They eat a wide variety of small fish, jellyfish, and crustaceans (Hart 1973:398-454). The species probably found in the Strait of Georgia-Baynes Sound area are listed in Table 16.

Hexagrammos decagrammus, Kelp greenling;
H. lagocaphalus, Rock greenling;
H. stelleri, Whitespotted greenling;
Oxylebius pictus, Painted greenling;
Zaniolepis latipinnis, Longspine combfish

The greenlings are found throughout the British Columbia coastline in rocky areas in shallow waters (Hart 1973:461-472).

Ophiodon elongatus Lingcod

The lingcod is common in British Columbia at depths from 10 to 40 fathoms (Wilby 1937:3-4). Lingcod move into shallow water, at or near the low-tide level, to spawn from December to March (Wilby 1937:4; Hart 1973:468). They inhabit "rocky locations over which there is a considerable current" and a good supply of food fishes (Wilby 1937:4).

Cottidae Sculpins

Sculpins are a common bottom fish found from the intertidal zone to moderate depths. The padded, roughback, spinyhead, buffalo, red Irish lord, Pacific staghorn, great, and slim sculpins and the cabezon are common in the Strait of Georgia (for scientific names see Table 5). The red Irish lord and cabezon both spawn in the intertidal zone, the red Irish lord in March and the cabezon from January to March. The other sculpins may follow a similar pattern (Hart 1973:478-541).

Pleuronectiformes Flatfishes

The flatfish are all bottom fish. There appears to be a seasonal movement to shallow water in the spring and summer, and deeper water in the winter, actual depth depending on the individual species (Forrester 1969:2, 4, 6). All of the species listed in Table 5 can be found in shallow water (Hart 1973:596-637). The most common varieties in the Gulf of Georgia are the Pacific sanddab, speckled sanddab, the petrale, flathead, Dover, English and C-O soles and the starry flounder (Hart 1973:596-637).

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