PREHISTORIC SUBSISTENCE AT THE HELEN POINT SITE

by

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ABSTRACT

This thesis is concerned with the identification and interpretation of the faunal remains from the 5,000 year long sequence at the Helen Point site (DfRu 8) on Mayne Island, British Columbia, excavated in 1968.

A total sample of 22,652 animal bones were recovered from the excavations; 35 were unclassifiable, 14,021 were identified to class (land mammal, sea mammal, fish and bird), and 8,596 were identified to either family or species. Percentages for each class for each cultural phase were calculated from the total bone count in order to determine changes in the faunal composition through time. It was found that there was a substantial decrease in land mammal bones through time with an increase in fish bones. Sea mammal bones and bird bones also showed a decrease through time. Several explanations for these phenomena are considered: (1) a decline in the occurrence of mammals through time as a result of either environmental changes or disturbance by man; (2) an increase in the presence of fish as a result of shift in subsistence activities; (3) a change in hunting techniques, (4) food preferences.

Faunal works on other coastal archaeological sites are also examined in order to determine patterns of inter-site variability in animal utilization, and for comparison with

the Helen Point material. Two patterns of exploitation of fauna emerged: (1) a deep-sea oriented subsistence type, and (2) a riverine and littoral oriented subsistence type. In some sites, deep-sea exploitation seems to have been constant for the last 2,000 years, whereas at other sites, there has been a shift through time from land mammal exploitation towards the riverine-littoral pattern utilizing various combinations of sea mammal, fish, or shellfish resources of which the dominant class varies at different sites. The Mayne Island material clearly falls within the latter pattern.

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CHAPTER I

FAUNAL ANALYSIS

> Who--except possibly archaeologists--would dig for artifacts when there are bones to be salvaged (Reed 1963:205).

This thesis is concerned with the faunal analysis from the 5,000 year long sequence at the Helen Point site (DfRu 8) on Mayne Island, British Columbia, excavated in 1968. Faunal analysis, also designated as bioarchaeology or zooarchaeology, is the identification and interpretation of animal remains from archaeological sites. Several authors in the last decade and one half have stressed the role and/or importance of such a study: Higgs (1963), Reed (1963), Ziegler (1965), Daly (1969), Thomas (1969), Olsen (1971), Uerpmann (1973), and Stewart (1974).

As in archaeology, faunal analysis has possessed precocious thinkers (Wintemberg 1919); enthusiasts (Reed 1963); synthesizers (Olsen 1960, 1964, 1968, 1972; Chaplin 1971; Cornwall 1956); and meticulous persons (Flannery 1967). As early as 1919 Wintemberg commented:

> To the archaeologist...the saving of the bones and shells of animals found in the course of his excavations of the graves, mounds, shell heaps and village sites of prehistoric man, is important principally because it is by means of them that he learns something of the kinds of animals used for food, and what animal bones were used as material

> for artifacts, by prehistoric people. For a long time some archaeologists did not seem to see any further use for such findings, but all now realize how important it is for them to collect all bones of animals, not only for their own purposes, but for the zoologist's also... To the mere relic seeker, especially, animal bones are useless rubbish, and it is surprising that even those from whom better work could have been expected seldom collected these bones unless they showed evidence of workmanship (Wintemberg 1919:63).

Alas, there are still numerous "relic seekers", using Wintemberg's definition, and certainly not "all" realize the importance of collecting all animal bones. Many archaeologists are still collecting only small samples of faunal remains from excavated sites and merely include a "laundry list" of species recovered in the last appendix of their report. It seems that a major quality for a faunal analyst of today is to be an articulate advocate, constantly justifying why all bones should be saved and what can be done with them.

Why should all bones be saved? No one can deny that archaeological sites are collecting grounds for local flora and fauna, where they occur in a datable context. Although they do not represent a complete range of local species they nevertheless provide an important source of information for those interested in past natural conditions. Thorough environmental studies should be the major goal of every archaeologist. This point is emphasized by Cole (1963:93):

> ...knowledge in the development of vegetation and fauna in response to topographical and climatic agencies can be used by the archaeologist in two ways. First by establishing a sequence of climatic, floral and faunal stages, and by correlating these with prehistoric remains, a reliable dating method is gained, and in the majority of archaeological reports these scientific studies are pursued for this chronological purpose. Of equal importance is the interpretation of the same scientific reports into a reconstruction, as far as possible, of the former environment.

Of course, one should realize that a totally complete reconstruction can never be achieved due to the constant operation of natural destructive agents.

What can be done with bones? Bones found in a site are directly correlated with human activities. Butchering patterns and methods of cooking (from calcined or charred bones) can be analyzed; how food was prepared and eaten contributes to the depiction of the culture. Climatic information can be obtained from small mammals, reptiles and amphibians because they are so specialized that they are very sensitive to climatic fluctuations--much more so than birds and larger mammals. Quantitative analysis, done by counting, weighing or finding the minimum number of individuals, will show concentrations of faunal remains within specific areas thus helping to determine the various activity zones. The season of occupation determined by faunal analysis will indicate seasonal or permanent habitation areas. Clarke, at Star Carr (1954) concluded that there was a winter occupation at his site, from the remains of shed/unshed antlers of Red Deer (Cervus elaphus) and European Elk (Alces alces). "Peculiar" species recovered can be evidence of trade items from "visitors" or may reveal that an animal, now absent or extinct in the area under study, was present x number of years ago (see Joysey 1963:197-203). Pathological studies can also be undertaken.

Faunal analysis does have its limitations however. Several individuals have tried to estimate the amount of food available to various populations on the basis of the recovered bone fragments as an aid to paleodemography (e.g., Cook 1946; Cook and Treganza 1948, 1950; Clarke 1954; Reed 1963; Pearkins 1964; Daly 1969; Shawcross 1970; and Luxenberg 1972). Even Cook himself admits:

> Regardless of the success of White and some of the other investigations, it is probable that in most instances the total amount of animal bone, and hence quantity of meat, cannot be determined. Moreover, the turnover rate is highly capricious and dependent on a bewildering array of environmental factors that cannot be evaluated quantitatively (Cook 1972:8).

Several factors can indeed contribute to the absence of bones:

weathering agents, butchering and eating at other stations besides the main camp, using the bone material for artifacts, removing of bones by dogs or birds, disposing of remains in the water, distribution to other people as gifts or trade items, and the differential preservation of some species, (for example, some fish, and the epiphyses of frogs, toads, salamanders and other amphibians are cartilaginous and will thus disappear entirely).

The following example cited by Olsen (1971:29) shows how erroneous is the estimation of food supply available to one group. It was written by John Guilday and deals with a French and Indian war site in Pennsylvania. Guilday states:

> Fort Ligonier was garrisoned continuously from Sept. 3, 1758 until the spring of 1766, approximately 2,364 days. The size of the garrison varied from as many as 4,000 men for a brief time during Forbes campaign to a minimum of eight. Placing estimates of usable meat at 100 pounds per cow, 20 pounds per sheep, 75 pounds per deer, and 100 pounds per bear, the amount of meat represented by the minimum number of animals recovered archaeologically is about 4000 pounds. At standard field rations of one pound of meat per man per day, 4000 pounds would have sustained only two men for the length of time of the known occupancy--or the entire garrison at full strength for just one day! (John Guilday, "Animal Remains from Archaeological Excavations at Fort Ligonier", _Annals of Carnegie Museum_, 42: 177-186. 1970).

In addition to the limits of inference, the factors discussed below are practical limitations on the quality of faunal analysis which can be done. The lack of complete comparative collections in most centers where faunal analysis is done, is indeed a limiting factor. Fish collections are usually the poorest, and this situation restricts a thorough analysis of this very important and much exploited resource. At this present stage, it is very difficult to distinguish between dog, coyote or wolf. Some work has been done on distinctive traits in skulls between coyotes and dogs (Howard 1949; Krantz 1959; Olsen 1964). However, Olsen notes (1971:23) that dogs, coyotes, and wolves (genus *Canis*) can and do interbreed and consequently, when skeletal elements are compared, they may be indistinguishable. There will always be bone fragments to which not even a class can be assigned--this being usually due to erosion or fragmentation. Other bones can only be assigned to genus, such as *Canis*. Olsen (1961:538-40) discusses the relative value of fragmentary mammalian remains and lists them (with the exception of the hyoid and the baculum) in numerical order of decreasing importance: 1) teeth, 2) skull and jaws, 3) limb bones, 4) foot bones, 5) pectoral and pelvic girdles, 6) complete vertebrae other than caudals, 7) caudal vertebrae, and 8) ribs.

It is worth mentioning that not everything people caught was eaten. Every group had their food tabus, as revealed through the ethnographies. Also, sometimes, only the skin was retained and the meat discarded, or some animals might have been kept around a settlement to serve strictly as pets or for other utilitarian purposes. Thus one has to remember that she/he is faced with a "cultural filter" (Reed 1963:210), a very important aspect to consider in the final interpretation of subsistence systems.

The quantification of the faunal material, coupled with an established site chronology allows one to view subsistence patterns through time. For the Helen Point site, a total sample of 22,652 animal bones were recovered from the excavations; 35 were unclassifiable; 14,021 were identified to class (land mammal, sea mammal, fish and bird), and 8,596 were identified to either family or species. Percentages for each class for each cultural phase were calculated from the total bone count in order to determine changes in the faunal composition through time. It was found that there was a substantial decrease in the land mammal bones through time with an increase in fish bones. Sea mammal bones and bird bones also showed a decrease through time.

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Point material faunal works on other coastal archaeological sites were examined. Two patterns of exploitation of fauna emerged: (1) a deep-sea oriented subsistence type, and (2) a riverine and littoral oriented subsistence type. In some sites, deep-sea exploitation seems to have been constant for the last 2,000 years, whereas at other sites, there has been a shift through time from land mammal exploitation towards the riverine-littoral pattern utilizing various combinations of sea mammal, fish, or shellfish resources of which the dominant class varies at different sites. The Mayne Island material falls within the latter pattern.

CHAPTER 2

COAST SALISH ECOLOGY

This chapter establishes the location of Helen Point and the physiography, climate and biotic characteristics of the Gulf Islands. Ethnographic and ethnohistoric information is presented to provide interpretative analogies for subsistence patterns, and assist in the location of resource utilization areas. To further aid subsistence pattern interpretation, the last section of this chapter discusses animal habits and habitats of the southern coast of British Columbia.

The faunal remains under study were recovered from excavations at Helen Point on Mayne Island, British Columbia. Mayne Island is located near the southern end of the Strait of Georgia in the Gulf Islands. The Helen Point site (DfRu 8) is situated on the northwest corner of Mayne Island, on Active Pass (see Figures 1 and 2).

Physiographically, the Gulf Islands belong to the Georgia Depression area, part of the Coastal Trough province (Heusser 1960). Also part of this province are the San Juan and the Puget Sound Islands which belong to the Puget Trough area. The Georgia Depression extends as far north as Discovery Passage, south to Malaspina Peninsula, east to

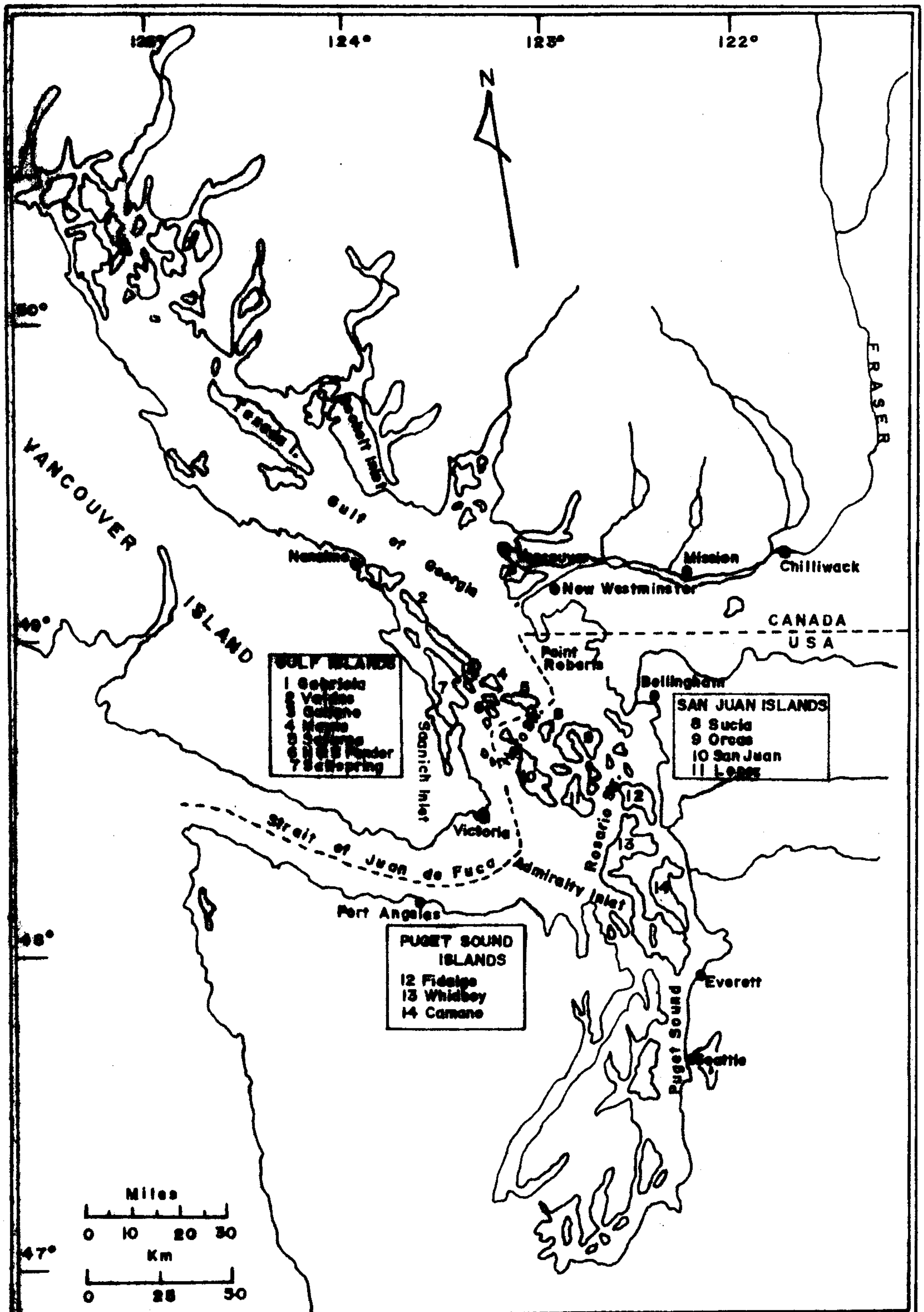


Figure 1 Location of the San Juan and the Gulf Islands, and the Surrounding Area

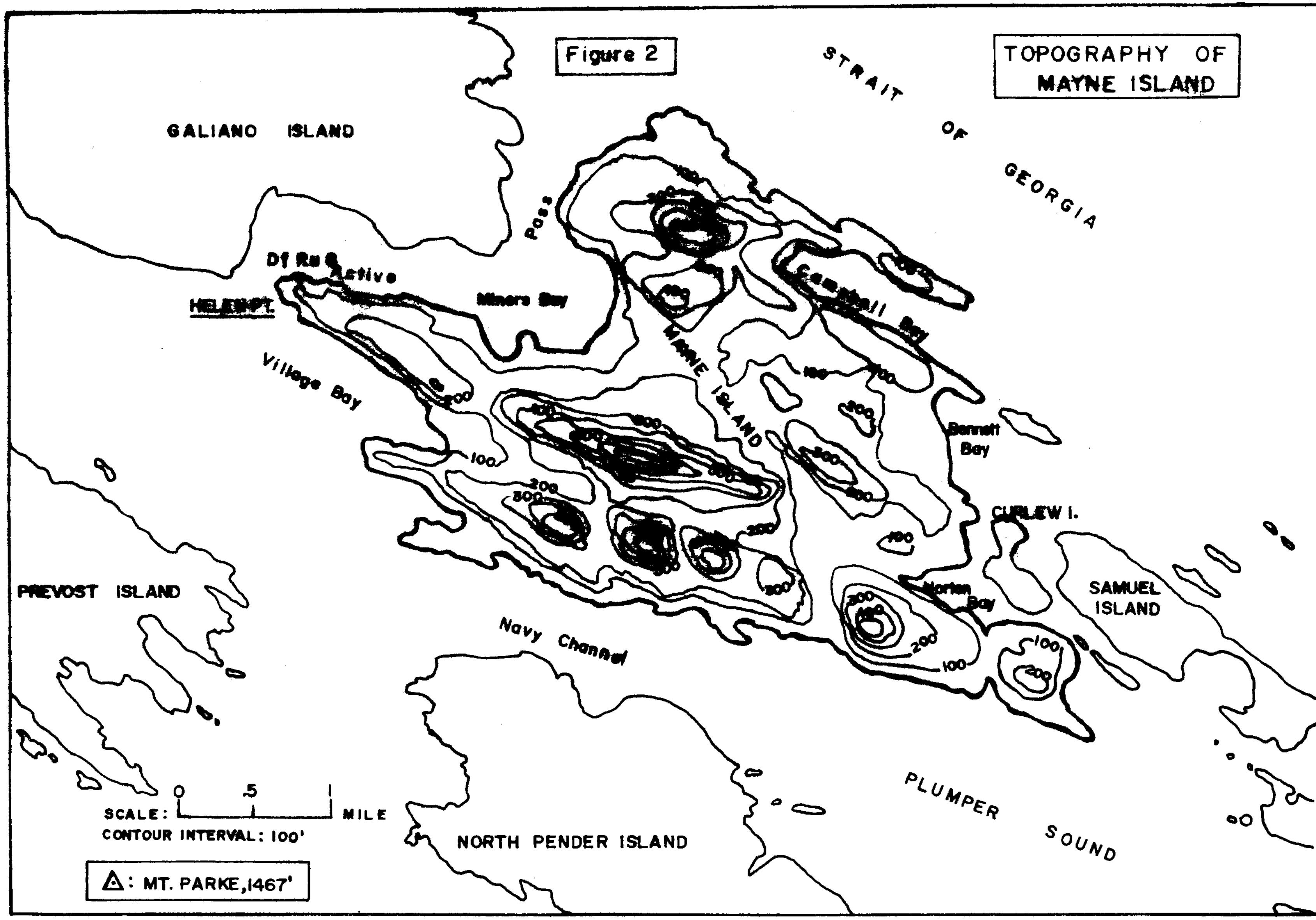


Figure 2
TOPOGRAPHY OF
MAYNE ISLAND
STRAIT OF GEORGIA
GALIANO ISLAND
Pass
Active
Miners Bay
Village Bay
Campbell Bay
MAYNE ISLAND
Bennett Bay
CURLEW I.
Navy Channel
SAMUEL ISLAND
PREVOST ISLAND
NORTH PENDER ISLAND
PLUMPER SOUND
SCALE: 0 .5 1 MILE
CONTOUR INTERVAL: 100'
△: MT. PARKE, 1467'

the lower Fraser Valley and west to eastern Vancouver Island. The highest elevations found in the Depression are around 300 to 600 meters, but as a whole, it averages around 150 meters. Mayne Island occupies an area of 24.4 km^2 and its highest elevation is 440 meters (Mt. Parke) (see Figure 2). Rough mountainous land covers the majority of the island; this is characterized by a very stony topography with variable drainage; only thin soil covers the bedrock (Day et al. 1959).

Day et al. (1959), Mitchell (1971) and Fladmark (1974) discuss the climate of the area under study. The Gulf Islands have a Transitional Climatic type with mean January temperatures of 1.7 to 3.9 degrees C and mean July temperatures of 15.5 to 17.7 degrees C, annual rainfalls of 72 to 125 cm and 200-250 plus of frost free days. In late fall, winter and spring the area gets southeast and southwest winds, whereas, in summer, northwest winds prevail (Mitchell 1971:11).

Data on glaciations, and past and present sea levels are found in Hansen (1947), Heusser (1960, 1965), Crandell (1965), and Fladmark (1974). The occupation of the Helen Point site is entirely post-glacial. The earliest C-14 date is 3,470 ± 230 B.C. (Gak 4938), and the youngest is within the historic period. A factor potentially disruptive of the local ecology during that time span would be sea level change. However, the most recent information (Fladmark 1974:144) indicates that from around 3,000 B.C. onwards sea levels in the southern inner coast region had become stabilized at their present position. Neither glaciations nor sea level change would appear to have had an immediate effect on site utilization.

The Gulf Islands constitute a distinct biotic area according to the three criteria of Munro and Cowan: the presence of, 1) distinctive plant species, 2) distinctive animal species and the absence of 3) plants and animals found in other biotic areas (Munro and Cowan 1947:13). Among the distinctive plant species of the Gulf Islands we find the Garry Oak *Quercus garryana* and the Arbutus *Arbutus menziesii*, and:

> A flowering dogwood, *Cornus Nuttallii*, cascara, *Rhamnus Purshiana*, and broad-leaf association is common, so are clear stands of red alder as a replacement of conifers on logged-off lands. Rocky Mountain junipers, *Juniperus scopulorum*, of tree size occupies suitable shore areas and reaches greatest development on some of the rocky islands (Munro and Cowan 1947:34).

They also comment on the absence of timber wolf, marten, weasel, wolverine, black bear, beaver and wapiti in the Gulf Island biotic area, but do not deny their possible presence during aboriginal time. (The Helen Point site yielded some few marten, beaver and wapiti bones. This point will be discussed further in Chapter 3). Animal distribution does in fact change. One mistake too commonly made however, is to correlate climatic change with animals (usually the larger ones) present at certain locations at a given time. Smith (1965) notes the adaptive tolerance of mammals to climate fluctuation, however they are less tolerant to human modification of the environment. Perhaps one should view a change in distribution as being one in abundance rather than range:

> In all animals, range adjustments depend on the availability of suitable habitats, vagility of the organism and size of the barrier to be crossed, and the reproductive potential of the species. Unless the range is bounded by insurmountable physiographic features, oscillations in its periphery are certain to be occurring. These small-scale contractions and expansions, not to be confused with cyclic fluctuations, are direct responses to local environmental factors (Smith 1965:638).

It is obvious that the international boundary between the Gulf Islands and the San Juan Islands does not make them two separate entities. Chapman and Turner (1956) include the San Juan Islands in the Gulf Island area when discussing the biotic zones.

The geological history of this region is significant in that it has created an area essentially unique to the

Northwest Coast. It has produced a gentle rolling country with low lying lands with sheltered inland waterways as opposed to a more rugged, mountainous and fjord-like topography for a great portion of the coast. Kroeber (1947:28) believes that Northwest Coast culture originated as a river or river-mouth culture, and subsequently changed into a beach culture and finally to a partly sea-going one. He adds that if this theory is correct, the Gulf of Georgia area would "logically" show the "first stages of its characterization" (1947:30).

Cultural ecology may be defined as the relationship and adaptation of man to his surroundings by means of his culture. The cultural ecological viewpoint has been, and will continue to be one of the most productive approaches in archaeology. An interesting and valuable attempt at the interpretation of the interaction between man and land has been formulated for the Northwest Coast by Fladmark (1974); no doubt, this is only a beginning. The cultural ecological approach is properly carried out on an interdisciplinary level, since marine and terrestrial botany and zoology, climate and geology all enter into the interpretation of the limits on, and possibilities open to, prehistoric cultures. The expertise of these other disciplines likewise aids in the identification of archaeological remains, but the archaeologist's interpretation of their cultural significance, on how the culture utilized these resources, depends upon ethnographic analogy.

Ethnographic analogy is essentially a general comparative approach, which can be used, for example, by the excavator to identify the function of unfamiliar artifacts. Cultural ecology requires interpretation of the subsistence systems of prehistoric culture; the archaeologist /faunal analyst, with no personal experience of the subsistence pattern which is under study, must turn to ethnohistoric and ethnographic evidence to provide interpretative analogies. The ethnohistoric and ethnographic information gathered from various sources is particularly valuable to the faunal analysis aspect of archaeology. Donald Abbott (1971:106) mentions a "...suspected alternation of certain sites between winter villages and mere seasonal resource camps...", a problem of significance to the interpretation of prehistoric development. A productive approach to this problem would be to analyze the individual depositional lenses in a site, considering them to represent the deposit of one season, or a number of seasons of sequential site usage. A detailed faunal analysis of the contents of the lenses would reveal whether individual lenses contained season-specific remains. In a problem such as this, the stratigraphic changes in the faunal assemblage could be a much more sensitive indicator of variation in site use than would any change in lithic assemblage and could therefore provide an answer to the seasonality problem (this approach is illustrated in Chapter 3).

The definition of the diverse land resources exploited by various groups should be useful to regional studies. Abbott (1971:103) has called for the excavation of all sites known to have been utilized by a single local group in order to obtain an assemblage which is truly representative of the whole culture. Since, for example, plant or fish spawning grounds occur in specific ecological conditions, an archaeologist should be able to combine a knowledge of the species known to have been utilized by a group during the contact period, with a knowledge of the conditions under which that species is likely to be most productive to assist in the location of the areas of specific resource utilization.

The following ethnographic information on subsistence patterns has been brought together to aid in the archaeological interpretation of the cultural ecology of prehistoric Coast Salish societies through faunal analysis. The land of the Coast Salish, according to Drucker (1963:17) includes:

> ...the circumference of the Gulf of Georgia, Puget Sound, a good portion of the Olympic Peninsula, and most of western Washington,

> down to Chinook territory at the mouth of the Columbia River. One Salishan group, the Tillamook, resided south of the Columbia on the Oregon coast.

The exploration of the Northwest Coast may have started as early as the 16th century (Juan de Fuca 1592) and certainly was under way by the 18th century, and was carried out both by sea and by land (see Sperlin 1916; Howay 1924; Goddard 1924; Quimby 1948; Gormly 1955; Hopwood 1971). The explorations were undertaken for seeking the northwest passage, extending commerce (especially for fur trading) and establishing trading communication between the Atlantic and the Pacific, for extending the knowledge of geography, and sometimes, simply for love of adventure. Contacts between Whites and Indians were numerous during the last years of the 18th century and the early years of the 19th century when the maritime fur trade reached its peak.

Information contained in the writings of the following explorers, fur traders, missionaries and early ethnographers are used as primary sources: Wagner (1933), Vancouver (1801), Menzies (1923), Fraser (1960), Swan (1972), Tolmie (1963), Wilson (1866), Eells (1887), Boas (1890, 1923), Hill-Tout (1900, 1905), Curtis (1913), and Reagan (1925). Some twentieth century ethnographers are considered as secondary sources: Gunther (1927, 1945), Haeberlin and

Gunther (1930), Barnett (1937, 1938, 1955), Hewes (1947, 1948), Suttles (1951), Singh (1966), Olsen (1967), Stern (1969), and Bennett (1973). It would be almost impossible to summarize and extract the significance from all of the data presented below. The observational powers and priorities of the various sources differ, and coupled with the fact that many of the earlier authors' observations covered only a period of a few days, the various sources cannot be directly compared for errors or omissions.

AUTHORS/DATE	GROUPS	SUBSISTENCE ACTIVITIES (season)
Vancouver (1792)	General (Admiralty Inlet)	Clam & mussel (May); wild onion (May).
Menzies (1792)	General (Gulf of Georgia)	Halibut & porpoise (June); barnacle; camas; raspberry shoots; arrow grass (May-June).
Fraser (1806)	General	"Fish oil"; salmon; wild onion; dried berries.
Swan (1852)	General	Flounder; turbot; seal; seal oil; clam; crab; oyster; shellfish ("not taken in winter"); camas (Sept.-Oct.); raspberry shoots, cow parsnip, wild celery, cattail, fern, skunk cabbage, (all in March); salmonberry; strawberry; huckleberry; blueberry; gooseberry; black currant; salalberry (Aug.-

		Dec.); crabapple; cranberry; raspberry; rush; shotberry.
Tolmie (1859-86)	General	Halibut, herring roe (April); clam (dried in June); cockle; elk; camas (June); salalberry.
Wilson (1865)	General (Gulf Islands region)	Herring (Oct.-Nov.); "Salmon" (esp. in Aug.-Sept.); deer; bear; eagle; magpie; camas; raspberry; wild celery; fern; wild parsnip; salmonberry; strawberry; red and black huckleberry; blackberry; gooseberry; salalberry; oregon grape; cranberry; raspberry shoots; rush; currant; dock; skunk cabbage; reed; angelica; kinnikinik or bearberry.
Eells (1887)	Twana, Chemakum, Klallam (Puget Sound area)	5 species of salmon; halibut; herring; smelt; "2 varieties" of cod; skate; trout; dogfish; shark oil; hair seal; sea otter; porpoise; whale; "4 varieties" of clam; "2 varieties" of crab; oyster; sea eggs & scallop; cuttlefish; deer; elk; black bear; beaver; racoon; wild cat; mallard; pintail; scoter; wood teal; canvas back; goose; sea gull; crane; grouse; loon; pheasant; mountain sheep; camas; wild onion; fern; skunk cabbage; hazel nut; salmonberry; elderberry; strawberry; black, red & blue huckleberry; blackberry; gooseberry; salalberry; crabapple;

		raspberry; cranberry; rush; currant; thimble-cap shoots.
Boas (1890)	Lkungen	Clam; salalberry.
Hill-Tout (1900)	Squamish	Salmon; "fish oil"; deer; mountain goat; duck; "fruit"; "root".
Curtis (1913)	Shoalwater Bay	Salmon; clam; oyster; "berries".
Curtis (1913)	Quinault	Chinook salmon (Sept.); sockeye (May-June); coho (Oct.-Nov.); steelhead trout (Dec.-mid June); smelt (end of June); rockcod (Aug.); sea otter (Aug.); sea lion (mid-winter); whale (Aug.); "berries".
Curtis (1913)	Cowichan	Chinook (May); sockeye (June); chum (Nov.-Dec.); herring (Feb.-March); steelhead (throughout winter); deer & elk (winter); wild onion (May); huckleberry (June-August).
Curtis (1913)	General	Chinook, sockeye, chum, coho, pink, salmon; herring; smelt; flounder; skate; salmon roe; sole; hair seal; sea otter; porpoise; whale; clam; mussel; crab; oyster; sea urchin; sea cucumber; cuttlefish; deer; elk; bear; wild cat; duck; goose; sea gull; grouse; pheasant; wolf; cougar; fox; brant; swan; camas; raspberry shoots; bracken;

		skunk cabbage; thimbleberry; salmonberry; huckleberry; elderberry; blackberry; salalberry; crabapple; cranberry; raspberry; roots of dog-tooth violet; sprouts of salmonberry and thimbleberry; tule.
Gunther (1924-25)	Klallam	Chinook (mid-April-July); chum (Oct.-Dec.); pink (Aug.-Oct.); herring (mid-Feb.-late March); steelhead trout (Dec.-Jan.); oolachan (Sept.-Oct.); smelt (Sept.); "fish eggs"; devilfish; blackfish; seal; porpoise; whale; clam (esp. June-July); mussel (best in winter); china slipper; deer; elk; duck; sea gull; eagle; camas (May); wild onion; fern; horsetail (April); tiger lilly (fall); wild carrot; blackcap (spring); acorn (Aug.); thimbleberry, salmonberry, salalberry, (all in June); elderberry, blackberry, gooseberry (all in August); strawberry (early summer); huckleberry (Aug.-Sept.); oregon grape (Sept.); red currant (Sept.); wild clover; western dock; mustard (Sept.).
Haeberlin/Gunther (1930)	Puget Sound (Snohomish, Snuqualmi, Nisqually)	Chinook, chum, coho, pink salmon; herring; steelhead trout; smelt; rockcod; flounder; skate; "fish eggs"; sturgeon; seal (winter/summer); clam (started gathering in May); barnacle; crab; oyster;

		deer; elk; bear; beaver; mountain goat; wild cat; duck (winter); pheasant; eggs of pheasant, lark, duck; groundhog; cougar; camas; cattail roots; fern; tiger lilly; wild carrot; blackcap; hazel nut; acorn; salmon-berry; strawberry; huckleberry; blackberry; salalberry; raspberry; roots of dandelion and sunflower; serviceberry.
Suttles (1951)	Haro and Rosario Straits	Chinook (spring and summer); sockeye (July-Aug.); chum (fall); coho (spring and summer); pink (July-Aug.); halibut (late spring-early summer); herring (winter and spring); steelhead trout (fall-beginning spring); oolachan (March-May); smelt (capelin: Sept.-Oct.; silver: June-Sept.; long-finned: Oct.-Dec.); ling-cod; flounder (fall-winter); eggs of sturgeon; white & green sturgeon; rockcod; black bass; red snapper; greenling; perch; sculpin; hair seal; porpoise; whale (stranded ones); sea elephant; horse, rock and butter clam; mussel, barnacle, crab, oyster, sea urchin (for all, greatest activity in summer); octopus; cockle; sea cucumber; china slipper; purple snail; bivalve; deer; elk; black bear; beaver; racoon; mountain goat;

		mallard; pintail; spoonbill; scoter; merganser; blue & ruffed grouse; loon; muskrat; grebe; cormorant; swan; brant; camas (May); wild onion; fern; horsetail (spring); tiger lilly; wild carrot; blackcap; salmonberry; blackberry; crabapple; sprouts and stems of thimbleberry and salmonberry (spring); clover; soapberry.
Barnett (1955)	Gulf of Georgia	Chinook (spring-July); sockeye (esp. in Aug.); chum (fall); coho (Sept.-Oct.); pink; halibut (May); herring (May); steelhead trout; oolachan; smelt; cultus, red and rock cod; flounder; skate; fish eggs; salmon and herring spawn; sturgeon (April); hair seal (May); sea lion; porpoise (May); clam; squid; deer; elk; bear; beaver, racoon, mountain goat (all in summer and late fall); duck; sea gull; grouse; eggs of loon, duck, gull, grouse and shag; cougar; eagle; camas (May); fern; wild parsnip (May); horsetail; acorn; rush; soapberry; salmonberry; seaweed.
Singh (1966)	Olympic Peninsula-General	Chinook; sockeye; chum (Sept.); coho (late summer and fall); pink; halibut (summer and spring); herring; steelhead trout (summer and early fall);

		oolachan (late winter and early spring); smelt (July-Aug.; Jan.-March); pacific cod (summer and spring); flounder; skate; cutthroat trout (summer and early fall); sea bass; red snapper; dog-fish; catfish; perch; shark; hair seal (fur seal sometimes); sea otter; sea lion; whale (esp. California Gray, Humpback, Finback, Blue-back); butter and razor clam, mussel, crab, rock oyster (for all, a principal harvest in summer); squid; sea cucumber; china slipper; deer; elk; beaver; bear; racoon; bird's eggs; land otter; marmot; "birds"; camas; wild onion; fern; tiger lilly; salmonberry; huckleberry; salalberry; sprouts of horsetail, salmonberry, thimbleberry (spring).
Olson (1967)	Quinault	Chinook (March-Aug.); sockeye (Dec.-June); chum (Sept.-mid-Nov.); coho (Sept.-mid-Nov.); pink Aug.-Sept.); halibut (June-Sept.); herring (esp. summer); steelhead trout (Nov.-May); oolachan (Jan.-April); smelt (Jan.-April); cod (June-Sept.); flounder, rockcod, sea bass, sole (all from June-Sept.); hair seal; fur seal (April-May); sea otter; sea lion; porpoise; whale; razor clam (May);

		mud clam (May); black mussel; crab; rock oyster; china slipper; sea anemone; deer (summer); elk (fall); bear (summer); beaver; racoon; wild cat; duck; sea gull; grouse; crane; loon; pheasant; marmot; land otter; sea pilot; pelican; pigeon; snipe; eagle; camas; fern; skunk cabbage; salmon-berry; elderberry; strawberry; black huckle-berry; gooseberry; salalberry; crabapple.
Stern (1969)	Lummi	Chinook (May); sockeye; halibut (late spring); herring (March-April); smelt; cod (Oct.); flounder; herring eggs (March-April); devilfish; bullhead; seal; sea lion; porpoise; butter, small, steaming, horse clam (Aug.-Oct.); cockle; crab; deer (Aug.-Oct.); duck (March or April, esp. mallard, then in Dec.); camas (May); salmonberry; and 25 varieties of berries and 16 varieties of roots.

Helen Point, the area under study in this thesis, is a Tsartlip band site, belonging to the Saanich ethnic group and the Straits Salish language group (Duff 1969:map 2). The culture type of this region is defined as Central and Southern Gulf River Fishermen (see Mitchell 1971:1926). Most of the Gulf Islands belong to this area; the rest and the San Juan Islands are part of the Cowichan, Lummi, Songhees, Chemakum, Klallam, Samish ethnic group, also referred to as the Straits Reef-Net Fishermen culture type by Mitchell (1971:19-26). The major sources for these two regions are thus: Menzies, Wilson, Eells, Curtis, Gunther, Suttles, Barnett, and Stern. From these authors, information will be extracted concerning the seasonal presence and distribution of species found in the excavation at Helen Point.

Salmon is well represented throughout the land occupied by the Coast Salish, chinook from mid-April to July, sockeye from June to August, chum from October to December and pink from July to October. Barnett and Suttles differ as to the coho season, the former mentioning September to October and the latter "spring to summer". The different types of cod taken included ling, cultus, red and rock. Also exploited were trout, dogfish, shark, sturgeon (white and green), rockfish, greenling, red snapper, sculpin, perch, and black bass. According to Barnett, sturgeon was taken in April. Hair seal was exploited in summer and winter (Gunther), and in May (Barnett), and all seem to agree that fur seal was not taken. Sea lion and whale are listed but no season is mentioned. Suttles reports that only one informant mentioned the exploitation of whales.

probably only stranded ones were used. Porpoises were caught in May and June (Menzies and Barnett). The only two variations in the listing of sea mammals are made by Suttles who mentions the use of sea elephant and Eells, of sea otter. Most authors say that mollusk, clam and mussel collecting was in summer but Gunther mentions that mussels are best in winter and never in March and April. Hunting of elk and deer occurred in winter (Curtis), late spring and June and December (Suttles) and August to October (Stern). Beaver and racoon were taken in summer and late fall (Barnett). Bear is mentioned by several authors, but mountain sheep only by Eells, muskrat by Suttles, and cougar and mountain goat by Barnett. Duck hunting was undertaken in March and April (especially for Mallard) and December, according to Stern. The most commonly exploited ducks were Mallard, Pintail, Scoter, Wood, Teal, Canvas-Back, Spoonbill and Merganser. Also used as food were Grouse (Blue and Ruffed), Sea Gull, Crane, Goose, Loon, Eagle, Magpie, Grebe, Cormorant, Swan, and Brant.

Suttles' work on the Coast Salish of Haro and Rosario Straits is an important source, not only for the subsistence patterns outlined, but also for the specific activities that went on at particular places. He gives a thorough description of the locations of various Straits Salish groups and their neighbours and describes their territories and villages, including the distribution of their winter villages and temporary camps, as well as available resources (see Suttles 1951:7-56). His information is summarized on the following map (see Figure 3). The Saanich territory included:

> ...both shores of the Saanich peninsula, the eastern shore of Saltspring Island, and the islands east of Saltspring and south of Active Pass perhaps as far as the northern shores of Orcas and San Juan Islands (Suttles 1951:21).

Their winter villages were on Saanich Inlet and Union (Patricia) Bays, Saanichton Bay, Sidney, Stuart, Saltspring, and Mayne Islands. Suttles (1951:21) also adds:

> The yearly round of the Saanich took them as far as East Sound, Orcas Island (really Lummi territory) for clams, and to Point Roberts (where Semiahmoo and Lummi also came) for reef-netting.

One important aspect of faunal analysis is the study of animal habits and habitats; it reveals food gathering patterns and zones of utilization. Moreover, data on the seasonal occupation of archaeological sites can be obtained from breeding patterns and movements or migrations. This section will deal with the distribution and seasonality of the specific animals of the southern coast of British Columbia which were recovered from DfRu 8. The amount of information presented about any species is partly a function

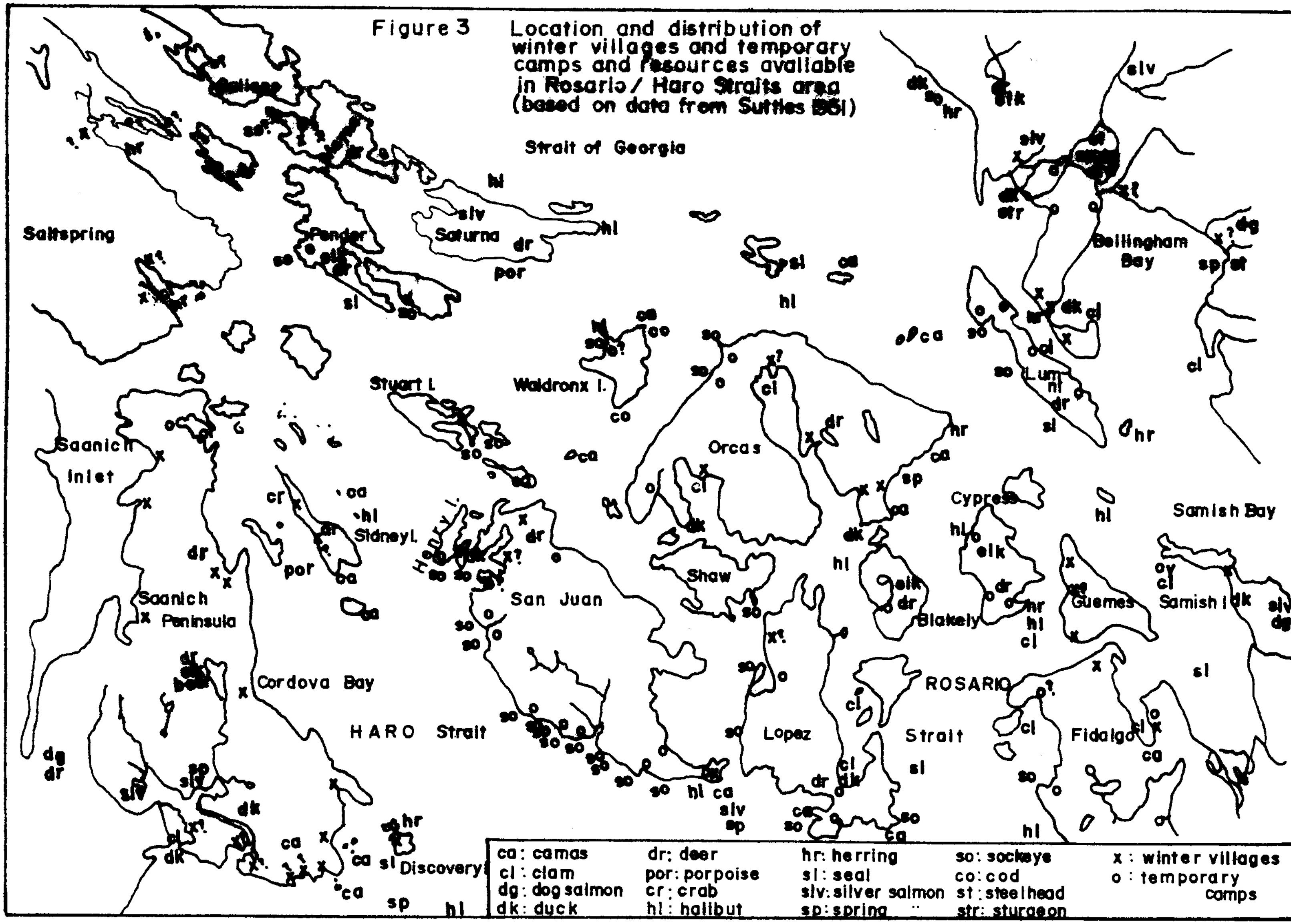


Figure 3 Location and distribution of winter villages and temporary camps and resources available in Rosario / Haro Straits area (based on data from Suttles 1951)

of the abundance of its remains in the site. Also, all species of the same family are often mentioned--but only those present at the site are discussed--in order to demonstrate that in some cases correct identification to species was impossible, or simply to show the problems one is faced with in faunal analysis.

Fish

Hart (1973:8) explains the reason why the Gulf of Georgia supports so many fish:

> Fresh turbid water from the Fraser mixes with sea water in the Strait of Georgia. In summer when runoff and insolation are at a peak, a great labile brackish lake, rich in nutrients, becomes strongly established in the southern strait, sometimes extending to Vancouver Island and Hornby Island. There is a general seaward movement of the discharged water through the passes among the San Juan Islands and the Canadian Gulf Islands, where strong tidal turbulence leads to thorough mixing. Beyond the mixing area, the diluted sea water moves on the surface through Juan de Fuca Strait entraining more saline water from below in its passage to the open ocean. The more saline water which is thus carried out of the Strait is replaced by the action of a deep counter current. The lake of mixed water in southern Strait of Georgia supports abundant plankton growth, which in turn supports a wide variety of fishes. In addition, the currents in and out of the Strait of Georgia provide passive transport for migrating species.

Fishes are divided into two main classes: 1) the cartilaginous fishes (Chondrichthyes) which includes sharks, rays (skates, dogfish) and ratfish and; 2) the bony fishes

(<u>Osteichthyes</u>).

The dogfish shark family (<u>Squalidae</u>) has two species: the Pacific sleeper shark and the spiny dogfish, the latter being the species recovered at DfRu 8. The fish's two long dorsal spines are the usual indication of its presence in archaeological sites. The Spiny Dogfish- <u>Squalus</u> <u>acanthias</u>, has 105 vertebrae, measures up to 160 cm and weighs up to 9.1 kg (Hart 1973:44-47 -- all subsequent statistics on fish will be from Hart, unless otherwise stated). Concentrations of them are seen at the mouth of the Fraser where they prey on oolachan and their eggs, from mid-March to mid-May, and among the islands of the Gulf of Georgia in the fall, where they prey on herring. Immature dogfish are available at all times in British Columbia coastal waters and even some of the adult population are available in winter. Recent tagging has shown an indigenous population in Puget Sound. Although dogfish livers are rich in vitamin A, the flesh was never favoured, according to early ethnographies and today's fishermen. In the past, the fish was boiled and the oil extracted from the flesh and the liver. Carl (1973:16) quotes Swan (1870) on this matter:

> In the fall of the year the flesh of the dogfish contains a considerable proportion of oil, which at other times it does not appear to possess; this is extracted in the following manner: when

> the livers are taken out, the head and back bone are also removed, the rest of the body being first slightly dried in the smoke, is steamed on hot stones till it is thoroughly cooked. It is then put in little baskets, made for the purpose, of soft cedar bark, and rolled and squeezed till all the liquid is extracted. This in colour resembles dirty milk. It is boiled and allowed to cool and settle, and the oil is then skimmed off...

The Ratfish (Hydrolagus colliei) is recognizable in a site by its very peculiar teeth, its long tail composed of a series of small rings, and its long dorsal spine. It may reach a length of 97 cm and is abundant throughout Canadian waters. It is also known as "fish with legs" and is often found in shallow water with muddy bottom, especially at night. Carl (1973:20) says that a recent study showed that the tissue around the spine secretes a poisonous substance which may be harmful and that the reproductive organs are also poisonous. There is no report of the ratfish in ethnographies.

The remains of rockfishes are very common in archaeological sites of the west coast. The rockfishes belong to the order of Scorpaeniformes which has 6 families: 1) Scorpionfishes (37 species), 2) sablefishes (2 species), 3) greenlings (7 species), 4) sculpins (42 species), 5) poachers (15 species), and 6) lumpfishes and snailfishes (16 species). The first family, Scorpionfishes (Scorpaenidae) has two genera:

1) Sebastolobus and 2) Sebastes. The latter commonly called "Rockfishes" contains 35 species; proper identification of rockfishes is thus very difficult! In general, rockfishes range from 15 cm to 97 cm, having between 25 and 26 vertebrae (1973:388-454). These fish are well distributed along the entire coast of British Columbia and are found around reefs and in both inside and outside waters at all times of the year. For this reason their differentiation is not as crucial as it would be for salmon, for example.

The Lingcod (Ephiodon elongatus) is a member of the greenling family (Hexagrammidae). It has an average of 56 vertebrae and measures up to 152 cm. Spawning usually occurs between December and March. Carl (1973:52) describes its habitat as being: "...near the bottom of the intertidal zone down to at least 60 fathoms, amongst the kelp beds, and reefs, especially where there are strong tidal movements".

The salmon and trout family (Salmonidae) comprises 3 genera: 1) the Salmo with 4 species (Atlantic Salmon, Brown Trout, Coastal Cutthroat Trout and Rainbow Trout), 2) the Onchorhynchus (with the 5 species of Pacific Salmon: Chum, Sockeye, Pink, Coho, Chinook), and 3) the Salvelinus malma or the Dolly Varden Trout. All species of the Pacific salmon are anadromous, that is, hatching in fresh water, going to salt water as young to live most of their lives, then returning to fresh water to lay their eggs and to then die.

The Pink Salmon (<u>Oncorhyncus gorbuscha</u>), also called the Humpback, is the smallest of the five, reaching a possible length of 76 cm and weight of 1.4-2.3 kg. It enters the spawning stream in September and October; the eggs hatch in late February and the young emerge in April and May, starting their migration downstream at night. Through their first summer they stay close to inshore and move into deeper water in September. During the second summer, the return migration starts. Hart (1973:110) says that odd-year runs in the Fraser River and southern British Columbia and even-year runs in northern British Columbia and the Queen Charlotte Islands is the predominant pattern. The Pink salmon with its two year life span is the most abundant species in B.C. and spawning occurs in all major rivers except in the southeast part of Vancouver Island.

The Chum Salmon (<u>Oncorhynchus keta</u>) may reach a size of 102 cm and 15 kg. The chum is seen along the shore in autumn and spawns at the end of the year, being the last of the Pacific salmon species to spawn. Hart (1973:113) says that the chums have also even been recorded to spawn as late as April at Deep Bay, Vancouver Island. The alevins (the newly-hatched) leave fresh water in the spring, and start moving offshore in September after spending the summer inshore. They stay at sea from 2 to 7 years (but usually 3-5 years). Then, according to Carl (1973:31), the "...adults enter Georgia Strait by way of Johnstone Strait as well as Juan de Fuca Strait". The best season for fishing the chum is after the coho run (see below), and into November. Hart adds that its flesh smokes very well and is favoured by coastal Indians.

The Coho Salmon (<u>Oncorhynchus kitsuch</u>) may measure up to 98 cm and weigh up to 14 kg; it has a lifespan of 3 years. The run begins in early fall and spawning occurs in October and November. Young emerge in April and stay in fresh water for about 1 year. The fish spend their second year in salt water and then return to freshwater. According to Carl (1973:27) the coho salmon "...provides fishing almost every month of the year and may be taken almost anywhere along the coast".

The Sockeye (<u>Oncorhynchus nerka</u>), also known as the red salmon, may reach a length of 84 cm and have a life span of 4 or 5 years. Carl (1973:33) says that spawning occurs in the fall; the young hatch in the spring and may spend between one and three years in freshwater before going to sea where they mature. Some sockeye never go to sea. There is a tendency for the sockeye population to move north during the marine summer and south in winter. For southern British Columbia the pattern of one year or more in freshwater and 2 years or more in sea seems to be the case.

The Chinook Salmon (Oncorhynchus tshawytscha), also called king or spring salmon, tyee and quinnat, is the largest of the Pacific salmons, reaching lengths of 147 cm and weights of over 14 kg (record weight: 57.27 kg). They may enter spawning waters at any time of the year and spawn very near the mouth or go upstream as much as 960 km. Some young chinook go to sea immediately after hatching while others remain in fresh water for about 1 year. Thus, from April on, young chinook are found at the mouth of the Fraser. The return to spawning streams occurs usually after 4 or 5 years, varying between 3 to 8 years.

Salmon was undoubtedly the most intensively exploited fish of the southern coast of British Columbia, as illustrated by the numbers of their vertebrae at DfRu 8, however, it is not presently possible to differentiate between species using the vertebrae. Research on this problem is imperative, for its solution would offer a very accurate way of estimating seasonality, coupled with age determination from annuli counts of vertebrae (Casteel 1972:404-405).

The Codfish family (Gadidae) includes 4 species: 1) Pacific Cod (Gadus macrocephalus), 2) Pacific Hake

(Merluccius productus), 3) Pacific Tomcod (Microgadus proximus), 4) Walleye Pollock (Theragra chaleogramma).

The Pacific cod, also called the "plain or gray cod" has an average of 52 vertebrae and measures up to 1 m. It spawns in winter, moves into deep water in autumn and returns to shallow water in spring. It is classified as a bottom fish but may be taken sometimes in shallow water. The Pacific hake is more of a southern fish and in Puget Sound and off the coast of California it spawns from January to June. Due to its soft flesh, it is not used as food. The Pacific tomcod, reaches a maximum length of 30.5 cm and is not abundant, but may be found all along the coast at depths of 27 to 92 meters. The walleye pollock, also called "Bigeye" measures up to 91 cm and has on the average 49 vertebrae. At the end of April and May the young are in the Strait of Georgia; they occur from the surface to below 386 m. The walleye pollock is common all along the British Columbia coast, but its flesh, being soft, is not preferred. Carl (1973:9-10) divides all of the fish species into 4 groups, according to habitat. Along the coast and in shallow waters with rocks, boulders, mud and sand are the sculpins, the seaperches and the rockfishes. Further away from the shore, where currents are stronger, eggs of cods are found, and third, in open water, are located herring, dogfish, salmon and cods. In the fourth habitat only "creatures which live on the bottom in the greatest depths at temperatures near freezing and under tremendous pressure" are found (Carl 1973:10). Such creatures are, for example, serpent stars, worms, and some "few types of fishes".

Birds

Another important class represented at DfRu 8 are birds or Aves. Thirty-six species of birds were recovered and their season of occurrence on the southern coast of British Columbia can be seen on the following charts (see Figures 4 and 5).

The Common Loon (Gavia immer) spends the winter on the coast and migrates back to freshwater lakes where it is found in spring, summer and fall. However, immature birds can be seen on the coast at all seasons (Godfrey 1966:9). The common loon comes ashore only to nest and is usually seen on open bodies of water (Guiguet 1971:7).

The Arctic Loon (Gavia arctica) nests in Alaska, Yukon, and Northwest Territories and is seen on the sea in large numbers during its spring and fall migrations and also in small numbers in winter (Guiguet 1971:13).

The Eared Grebe or the Black-Necked Grebe (Podiceps caspicus) breeds in central British Columbia and winters on

Figure 4 Season of Occurrence of Some Birds on the Southern Coast of British Columbia

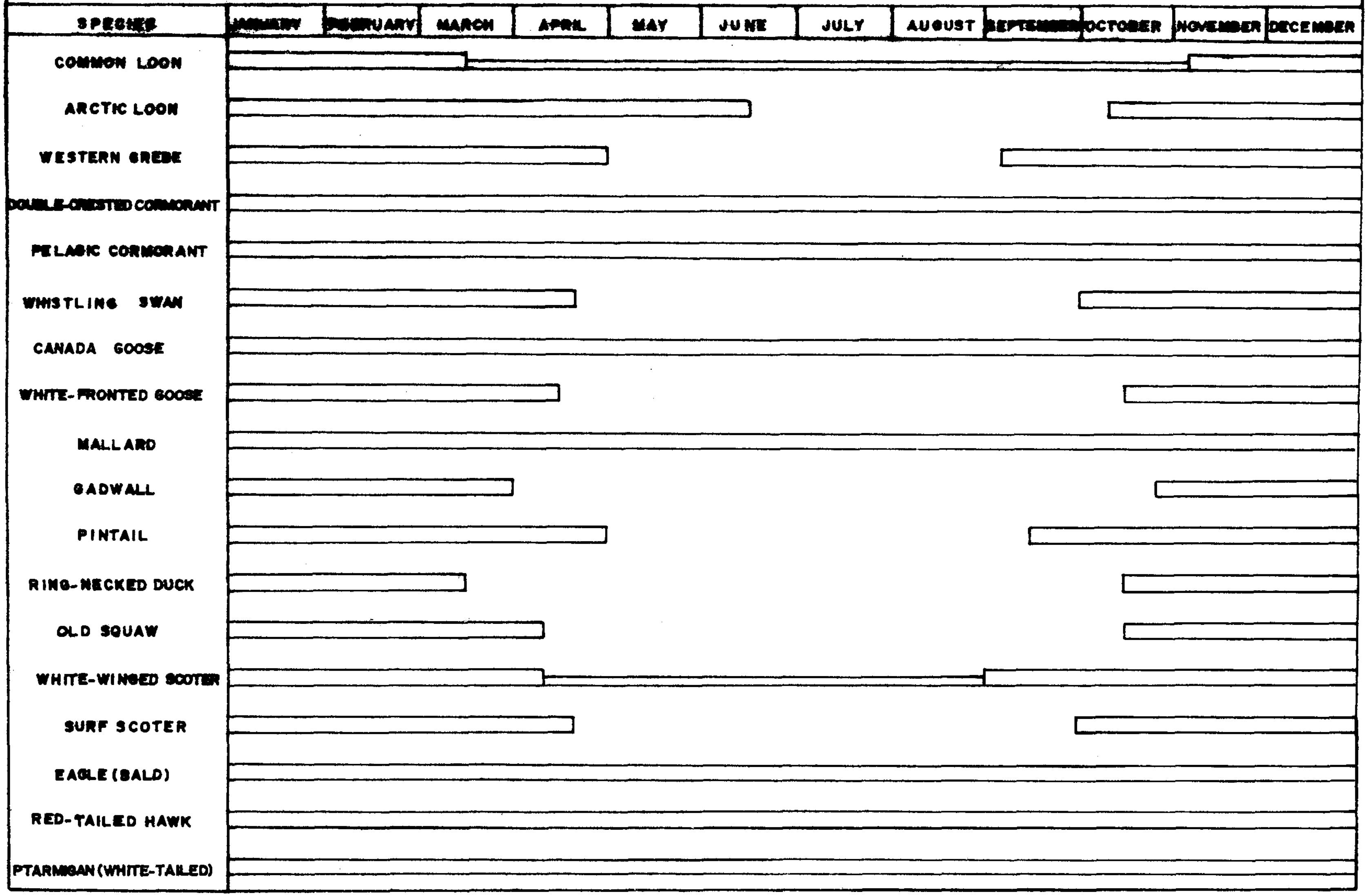
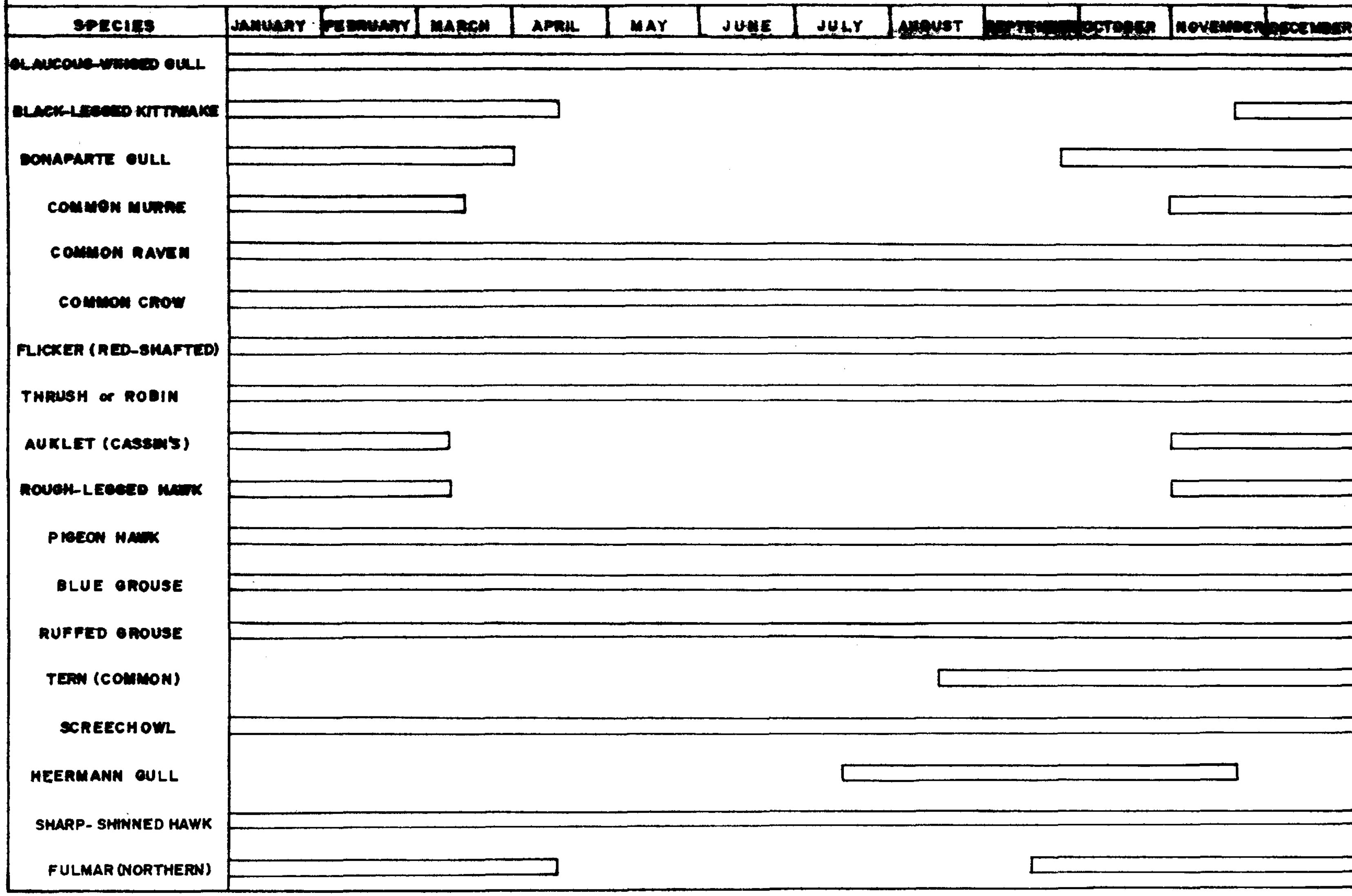


Figure 5 Season of Occurrence of Some Birds on the Southern Coast of British Columbia



the sea (Guiguet 1971:25).

The Western Grebe (Aechmophorus occidentalis) breeds in Saskatchewan and Alberta and is very common along the coastline and most inlets during fall, winter, and spring (Guiguet 1971:18-19).

The Double-Crested Cormorant (Phalocrocorax auritus) is a permanent resident of the coast. This bird can reach up to 90 cm in height. It feeds solely upon fish, especially herring, sandlance, sculpins and blennies (Guiguet 1971:71).

The Pelagic Cormorant (Phalocrocorax pelagicus) is also a permanent resident of the coast.

The Whistling Swan (Olor columbianus) usually winters south of British Columbia and nests north of the Arctic Circle. It is mainly seen on the coast during its fall migration, in September and October, and its spring migration, from March to May. Wintering records on the southern coast of British Columbia have been reported (Guiguet 1967:7).

The Canada Goose (Branta canadensis) can be divided into four subspecies according to Guiguet (1967:14):
1) the Westerner, 2) the Honker, 3) the Cackling, and 4) the Lesser. The Westerner is the only year-round species found along the coastal belt and islands. Nests are usually built on the ground close to the water.

The White-Fronted Goose (Anser albifrons) nests throughout the western Arctic and migrates to the coast for winter. It tends to inhabit freshwater ponds (Guiguet 1967:24).

The following information on ducks is taken from Guiguet 1967, unless otherwise stated. The Mallard (*Anas platyrhynchos*), the Gadwall (*Anas strepera*), and the Pintail (*Anas acuta*), are all pond ducks, feeding in shallow waters, wet fields or marshes and on land. The Mallard ranges from northern California to Central Alaska and nests on the ground, often far from the water. The Gadwall winters in small numbers only along the British Columbia coast; it frequents the central and western regions of Canada more than the coast. The Pintail is absent on the coast from May to late August, "...with large flocks passing southward in September and October, with relatively small numbers remaining to winter on the British Columbia coast" (1967:34).

The Ring-Necked Duck (*Aythya collaris*), the Oldsquaw (*Clangula hyemalis*), the White-Winged Scoter (*Melanitta deglandi*), and the Surf Scoter (*Melanitta perspicillata*) are known as diving ducks. They live on larger bodies of water, many of them living on the sea; they dive for their food. The Ring-Necked Duck nests in the interior and is seen in the Gulf Islands, in Puget Sound, on Vancouver Island and the Queen Charlotte Islands in winter. The Oldsquaw nests in Subarctic tundra and winters along the Pacific coast while the White-Winged Scoter breeds in the interior of the province of British Columbia. During the summer months, nonbreeding individuals of the latter species are seen on the coast and are joined by the rest from September to April. The Surf Scoter nests around the Mackenzie River and is seen on the coast from September to April.

The Bald Eagle (Haliaeetus leucocephalus), according to Beebe (1974:42) attains the highest population density on the coasts of British Columbia and Alaska.

> On the Pacific Coast, seasonal movements are coordinated with the spawning runs of the coho, dog, and pink salmon...The abrupt northward departure of Puget Sound eagles after the young can fly (in June) seems to be a response to the spawning runs of salmon (Beebe 1974:44).

The Red-tailed Hawk (Buteo jamaicensis) is a permanent resident to the coast and according to Beebe (1974:78) can adapt to all ecological regions in North America except the true Arctic. Ptarmigan remains were also recovered at DfRu 8 but due to a lack of a complete comparative collection for the three species of Ptarmigan: the Rock, the White-tailed, and the Willow, the osteological remains were simply classified as Ptarmigan. Because Guiguet (1970a) reports that only the

White-tailed Ptarmigan is present on the Southern coast of British Columbia, only its distribution will be given below.

The White-tailed Ptarmigan (Lagopus leucurus), the Blue Grouse (Dendragapus obscurus) and the Ruffed Grouse (Bonasa umbellus) are upland game birds, and are also known as gallinaceous or scratching birds. They are related to the chicken, and like it, spend most of their time on the ground and are excellent runners.

> The name 'ptarmigan' has been applied to those alpine and arctic species that change to white plumage in the winter months, but which are nevertheless grouse (Guiguet 1970a:4).

There are two subspecies of Blue Grouse, the Dusky Blue, found in the interior and the Sooty Blue which is a permanent resident of the mainland coast, the coastal islands and Vancouver Island. Guiguet (1970a:5-6) says that the Sooty Blue spends the winter on high ridges, in coniferous forests and comes down to clearings in March and April. The cock migrates back to higher altitudes in July, but the hens and the chicks remain for a while. The Ruffed Grouse is apparently a very difficult bird to hunt, but is often seen in evenings or early mornings in cleared areas and along roadways. It is a permanent resident of the southern coast, along with the White-tailed Ptarmigan. The latter species usually stays at higher altitudes during the summer, and descends in winter, to the wooded area

(Guiguet 1970a:22).

Guiguet (1967) says that there are thirteen species of gull occurring in British Columbia. Many species are very similar and accurate identification is very difficult. The Helen Point faunal remains yielded four species, two definite and two uncertain: 1) the Glaucous-Winged Gull (*Larus glaucescens*), 2) the Bonaparte Gull (*Larus philadelphia*) and possibly the 3) Black-Legged Kittiwake (*Rissa tridactyla*) and 4) the Heermann Gull (*Larus heermanni*). The Glaucous-Winged Gull is very abundant all along the British Columbia coast, where it is a permanent resident. It nests in rocky islets along the coast, where the young remain for some time. These gulls are also seen congregating on small islands to spend the night. The Bonaparte Gull nests in central and northern regions of British Columbia and often winters along the southern coast (Guiguet 1967:22). They are very numerous on the southern coast at the beginning of the fall migration, in August, until mid-October and can be seen until April.

The Black-Legged Kittiwake is described by Godfrey (1966:186) as being a transient and winter resident on the British Columbia coast. The Pacific Kittiwake has also been recorded around Victoria, at Discovery Island and Cadboro, in December and January (Guiguet 1967:28). The Heermann

Gull is reported for the Gulf Islands and the Victoria-Sooke areas, from July to October from where it migrates southward (Guiguet 1967:24). According to Godfrey (1966: 185), this gull breeds on islands off the Mexican coast from March to June and then moves northward to winter, as far as southwestern British Columbia. He adds that it is a "fairly common non-breeding summer and early autumn visitor to south coastal British Columbia (Vancouver Island north to Alert Bay) from late June to late October or early November" (1966:185).

Along with Auks and Puffins, Murres are purely sea-birds, only coming ashore to nest. Their main predators are mink and bear and Guiguet comments that breeding occurs on islands devoid of these predators (1971:76). The Common Murre (Uria aalge) breeds on Triangle Island (Scott Island Group), off the northern end of Vancouver Island, on Cleland Island, close to Tofino, and recently, Solander Island. They travel up and down the coast in winter, according to weather and feeding conditions, until they start breeding in March or April (Guiguet 1971:80). The Cassin's Auklet (Ptychoramphus aleuticus) appears on the east side of Vancouver Island, only in winter, and returns to its breeding colonies (West Coast of Vancouver Island and Washington State) for the summer.

In British Columbia, there are 7 species belonging to the Crow family (Corvidae): one Raven, two Crows, two Jays, and one Nutcracker. The Common Raven (Corvus corax) is non-migratory. Eggs are laid in April and May and by the beginning of June, young are ready to fly. The Ravens build their nests on cliffs and are often seen along the shores feeding on shellfish and other marine foods. The Crow, (called Northwestern Crow on the coast - Corvus caurinus as opposed to the American Crow of the interior - see Guiguet 1970b:46) a non-migratory bird, nests in April and May. It eats "everything going" and builds its nest on the ground, on fallen logs, on rocks, and up to 6-15 meters in deciduous trees.

Flickers are the most widely distributed of the Woodpeckers. Proper identification is complicated by the fact that there exists 2 subspecies of Red-Shafted Flickers and 2 subspecies of Yellow-Shafted Flickers in British Columbia, including a mixture of them, since they interbreed. All flickers are year-round residents and can be found from timberline to sea-level. Open woodlands and areas of slash and burn are preferred to thick coniferous areas (Guiguet 1970b:8).

There are 9 species of Thrush in British Columbia, 4 of them being found on the coast: 1) American Robin, 2) Varied Thrush, 3) Hermit Thrush, 4) Western Bluebird (Guiguet, 1964).

A lack of a complete comparative collection prevented the species identification of the Thrush remains from DfRu 8.

The Sharp-Shinned Hawk (Accipiter striatus) has two subspecies: the velox or the continental race and the perobscurus or the coastal race. The velox occasionally spends the winter on the southern coast of British Columbia and the perobscurus winters frequently but rarely breeds in the Puget Sound area:

> In Puget Sound, migrants of both subspecies of this hawk first appear in August and become slowly more numerous through September and October. Their numbers decline sharply by late November and remain low until mid-February, when they again re-appear, but far below the numbers seen in autumn (Beebe 1974:64).

The Sharp-Shinned Hawk prefers lightly treed areas of pine or aspen or areas of regenerating forest. The Rough-Legged Hawk (Buteo lagopus) is a species of the Arctic, circumpolar regions. It winters in small numbers along the southern coast of British Columbia, frequents open areas with sparse ground cover, but prefers the western plains and the desert states (Beebe 1974:84).

The Pigeon Hawk (Falco columbarius) winters on the southern coast and is also widely distributed in British Columbia during summer, but is not found in the Queen Charlotte Islands (Godfrey 1966:103).

Both the Arctic and the Common Terns (Sterna paradisea and Sterna hirundo) are seen on the coast while migrating south, from late August to the end of the year.

There are 15 species of Owls in British Columbia, but the Screech Owl (Otus asio)was the only one identified in the faunal remains of DfRu 8. It is a permanent resident of the coastal regions of British Columbia and also found in the wooded regions of the southern interior (Guiguet 1970c:11 and Godfrey 1966:212). The Screech Owl species now counts 18 subspecies!

Albatross, Shearwaters, Fulmars and Petrels form the "Tube-nosed swimmers" category, referring to their "tube-like external nostrils which are directed forward" (Guiguet 1971: 32). The waters along and off the British Columbia coast harbour 6 species of Shearwater, 3 of Petrel, 3 of Albatross, and 1 of Fulmar. The Shearwaters appear off the coast of British Columbia in summers while the Fulmar (Northern Fulmar - Fulmarus glacialis) is seen during fall, winter and early spring.

Sea Mammals

The three species of sea mammal found at DfRu 8 were: the hair seal, the northern sea lion and the harbour porpoise.

The *Pinnipedia* order ("feather footed", meaning that the limbs are modified for swimming) has 3 families: 1) *Otariidae* or eared seals, including the sea lions and the fur seals, 2) *Odobenidae*, earless or true seals, including the walruses and 3) *Phocidae*, also earless or true seals including the harbour and elephant seals.

Within the Northern Sea Lion species (*Eumetopias jubata*) sexual dimorphism is marked; males are distinctly larger than the females - the former weighing approximately 900 kg and the latter about 270 kg. Scammon (1968:128) says that they may reach a length of 4.8 m and yield 180 litres of oil. There are two breeding grounds for the northern sea lion, one in Alaska and the other in California. On the California coast, breeding occurs from May to August, and in Alaska from June to October (Scammon 1968:131). At the end of the summer there is a southward and northward migration bringing the animals to bays, estuaries and channels along the British Columbia coast. According to Gentry (1972:23) the length, duration and path of migration of sea lions is not known. Gentry also reports that feeding is nocturnal, in less than 180 meters, and probably not more than 24 km from shore. Cowan and Guiguet (1973:348) note that sea lions concentrate in river estuaries and forage only short distances up some of the larger systems during oolachan, herring and salmon runs.

There exists 9 species of Hair Seals (Phocidae) but only the Harbour Seal (Phoca vitulina) occurs along the entire coast of British Columbia. Two subspecies are known: one is found around Vancouver Island and is designated Phoca vitulina richardii. Anatomically they contrast with the sea lion in that their hind flippers cannot be turned forward to "walk"; they do not have external ears; and no great sexual dimorphism exists. Harbour seals have an average weight of approximately 112.5 kg and a length of about 1.5 to 1.8 m (Newby 1972: 25). According to Newby the harbour seal spends as much time on land as in the sea. It can be seen at low tides on sand bars and coastal rocks. It also frequents mouths of rivers, inland lakes, and shallow harbours. The harbour seal found on the Washington coast has three pupping seasons:

> State wide pupping begins in May on the outer coast, followed by a northern Puget Sound season in July and finally, in August, the season begins in southern Puget Sound (Newby 1972:26).

The Delphinidae family (porpoises, dolphins, blackfish) belong to the Cetecea order (whales) and the Odontoceti sub-order (toothed whales). The Delphinidae family includes two genuses: Phocaenoides or Dall porpoises and the Phocaena or common porpoises. The Dall Porpoise (Phocaenoides dalli) is rarely seen in the Strait of Georgia but is abundant north of Vancouver Island (Cowan and Guiguet 1973:261-262). The Harbour Porpoise (Phocaena vomerina) species belongs to the second genus and is widely distributed along the coastline throughout the year. It is seen in harbours, bays, inshore waters, and up to 38 km offshore (Cowan and Guiguet 1973:260). They may reach a length of about 1.8 m.

Land Mammals

There are no land mammals restricted to the Gulf Island biotic area, according to Cowan and Guiguet (1973: 27)

> ...but the wandering shrew (Sorex vagrans vancouverensis), white-footed mouse (Poromyscus maniculatus angustus), and Townsend vole (Microtus townsendi tetramerus) are more numerous there than elsewhere.

The eleven species of land mammals recovered at Helen Point were: blacktail deer, elk, canis, racoon, bear, marten, mink, beaver, and microtus, and two domesticates, cat and pig.

The Blacktail Deer (Odocoileus hemionus) belongs to the order Artiodactyla (Cloven-hoofed ungulates), under which is found the Cervidae family (deer), with one genus known as Odocoileus (American deer). There exists three subspecies of the blacktail deer: 1) the coast deer or Columbian deer (on south coast and adjacent islands), 2) the mule deer (interior), 3) the Sitka deer (north coast and adjacent islands).

The average male coast deer weighs 49.5 to 112.5 kg and the average female, 31.5 to 63 kg. Young are born in June and July and antlers are shed by males in January and February. According to Burt and Grossenheider (1964:230), the main periods of activity are mornings and evenings, and moonlit nights, and they are more gregarious in winter. About the biology of the Coast deer, Cowan and Guiguet (1973:368-69) comment:

> Coast deer are confined to the humid western slope of the Coast Range and to the islands off the coast. They are excellent swimmers and swim several miles from island to island. Their diet varies with the habitat, but the most palatable plants are Douglas fir, western cedar, Oregon yew, trailing blackberry, red huckleberry, and salal, supplemented in summer by a great variety of herbaceous plants. Many populations migrate to the mountaintops and high valleys during the summer and back to the lower ranges in the winter. In general the shelter of coniferous trees is essential for large-scale wintering.

The Elk or Wapiti (*Cervus canadensis*) belongs to the same order and family as the blacktail deer, but to the genus *Cervus* (true deer or tine-antlered deer). The male may weigh up to 360 kg and the female, 220 kg. The elk adapts easily to its environment; it prefers parkland communities, the conifers providing shelter and the deciduous trees along with the grassland providing food. At the end of the summer, it leaves the high elevations for the low ones where it will spend winter (Cowan and Guiguet 1973:358). The elk subspecies found on the coastal islands of British Columbia is called Roosevelt Elk (Cervus canadensis roosevelti). Males shed their antlers in February and March. The young are born in May and June and attain adult dentition at 2½-3 years (Burt and Grossenheider 1964:228).

The Carnivora order includes the Canidae family (dog-like flesh-eaters) of which the Canis (dog) is a genus. There exists 3 species of Canis: Coyote (Canis latrans with 2 subspecies), Wolf (Canis lupus with 3 subspecies) and Domestic dog (Canis familiaris). The Canis species are very difficult to differentiate osteologically; the fact that these species can and do interbreed enhances the problem of proper identification. Also, when dealing with southern northwest coast sites, one has to remember that a special breed of small dogs were raised by the Salish Indians at Contact for providing the wool used in weaving. I suspect that most of the Canis bones recovered from DfRu 8 came from these domesticated dogs due to their small sizes. Only 2 bones were identified as belonging to a large Canis.

Another family under the *Carnivora* order is the *Procyonidae*, which includes the racoons, the nasuas and the ringtail. The genus racoon (*Procyon*) includes the well-known species of Racoon or *Procyon lotor*. Its habitat consists of deciduous and coniferous forests, and areas covered with shrubs, including hollows of trees and burrows under roots. In a coastal environment, the racoon feeds itself almost solely on the beach (Cowan and Guiguet 1973:298). Burt and Grossenheider (1964:54) add that it is chiefly a nocturnal animal. Young are born in the spring (April and May) and are weaned by fall. *Procyon lotor vancouverensis* is the subspecies described by Cowan and Guiguet (1973:300) as occurring on Vancouver Island and the Gulf Islands. It may reach a length of 80 cm and a weight of about 5.4 kg.

The *Ursidae* (Bear) family also belongs to the *Carnivora* order; its genus *Ursus* includes the black and grizzly bears. The Black Bear (*Ursus americanus*) is usually found in wooded regions, around berry patches and spawning streams (Cowan and Guiguet 1973:290).

A fourth family of the *Carnivora* order is the *Mustelidae*. Its genus *Martes* includes martens and fishers. DfRu 8 yielded osteological remains of Marten (*Martes americana*). Young are born in April and May and attain sexual maturity by 2 years of age. The marten is mainly nocturnal, spending most of its time in trees; it also forages on the ground, and along sea beaches (Burt and Grossenheider 1964:57 and Cowan and Guiguet 1973:301).

The Mustelidae family also includes the genus Mustela (weasels and minks) with one species known as Mustela vison or Mink. Males are twice as large as the female, weighing up to 1.35 kg. Breeding occurs in March and females mature at one and males at one and one-half years. Minks are found in woodlands and marshes, near seashores and banks of rivers, lakes and streams. On the coast they live mainly on marine crustaceans especially crabs (Cowan and Guiguet 1973:321).

The Castoridae (beaver) is one of the families of the order Rodentia (rodent). Its genus, Castor (recent beaver) has only one species, the American Beaver or Castor canadensis. It is a common dweller of freshwater bodies in forested areas and it may be seen frequently along streams and lakes. The beaver also enters salt water and inhabits islands of coastal British Columbia (Cowan and Guiguet 1973:170). It is mainly nocturnal, usually appearing after sundown, but can also be seen by day. Young are born from late April to early June (Burt and Grossenheider 1964:157).

The family Cricetidae (New World rats and mice) also of the Rodentia order includes the Microtus genus - field mouse or vole. There were very few bones of Microtus recovered from the Helen Point site, but none could be identified to species. According to Cowan and Guiguet (1973:221) the one occurring in the Gulf Islands is the Townsend Vole - Microtus townsendi (subspecies: M.t. tetramerus). Microtus is not reported to be a food item used by Indians.

In the beginning of this section on the ecology of faunal species occurring on the southern coast of British Columbia, it was stated that studies of animal habits and habitats, as related to archaeology can reveal food gathering patterns and zones of utilization. The patterns which man must have adopted to exploit the various species described is in a large measure made evident by the species behaviour. For example, it is most probable that the Indians waited for fish such as dogfish, skate, ratfish, rockfish and pacific cod to come in shallower waters, at night, instead of going out on open water. It is also reported, in the ethnographies, that some birds were caught at night. Hunting waterfowl at night with fire in the canoe is described by Suttles (1951:74-75). Various zones on and around the island were utilized for animal exploitation: 1) the mudflats for clams, mussels and some ducks; 2) the eelgrass beds and shallow waters for dogfish, skates, and ratfish (at night); 3) rocky shores and reef areas for rockfishes, lingcods, some codfishes and salmon and pacific cod (the latter being found in shallow waters in the spring and deeper waters in the fall); 4) mouths of rivers for dogfish and salmon; 5) bays, estuaries, and channels for northern sea lions and porpoises; 6) sand bars and coastal rocks for harbour seals during pupping season; 7) harbours for seals and porpoises; 8) islands and rocky islets for gulls (breeding grounds); 9) marshes and shallow waters for pond ducks; 10) open waters and at sea for diving ducks; 11) open woodlands and areas of slash for flickers; 12) high valleys and mountainous terrains in summer, and lower ranges in winter, for deer and elk; 13) deciduous and coniferous forests and shrubby areas for racoons; and 14) valleys, around berry patches and salmon spawning streams for bears. The faunal remains at DfRu 8 show that the inhabitants of Helen Point engaged in fishing, fowling, sea hunting and land hunting. (Gathering was also practised, due to the presence of shellfish at the site). The following chapter describes the archaeology of this site and region with particular reference to paleoecology.

CHAPTER 3

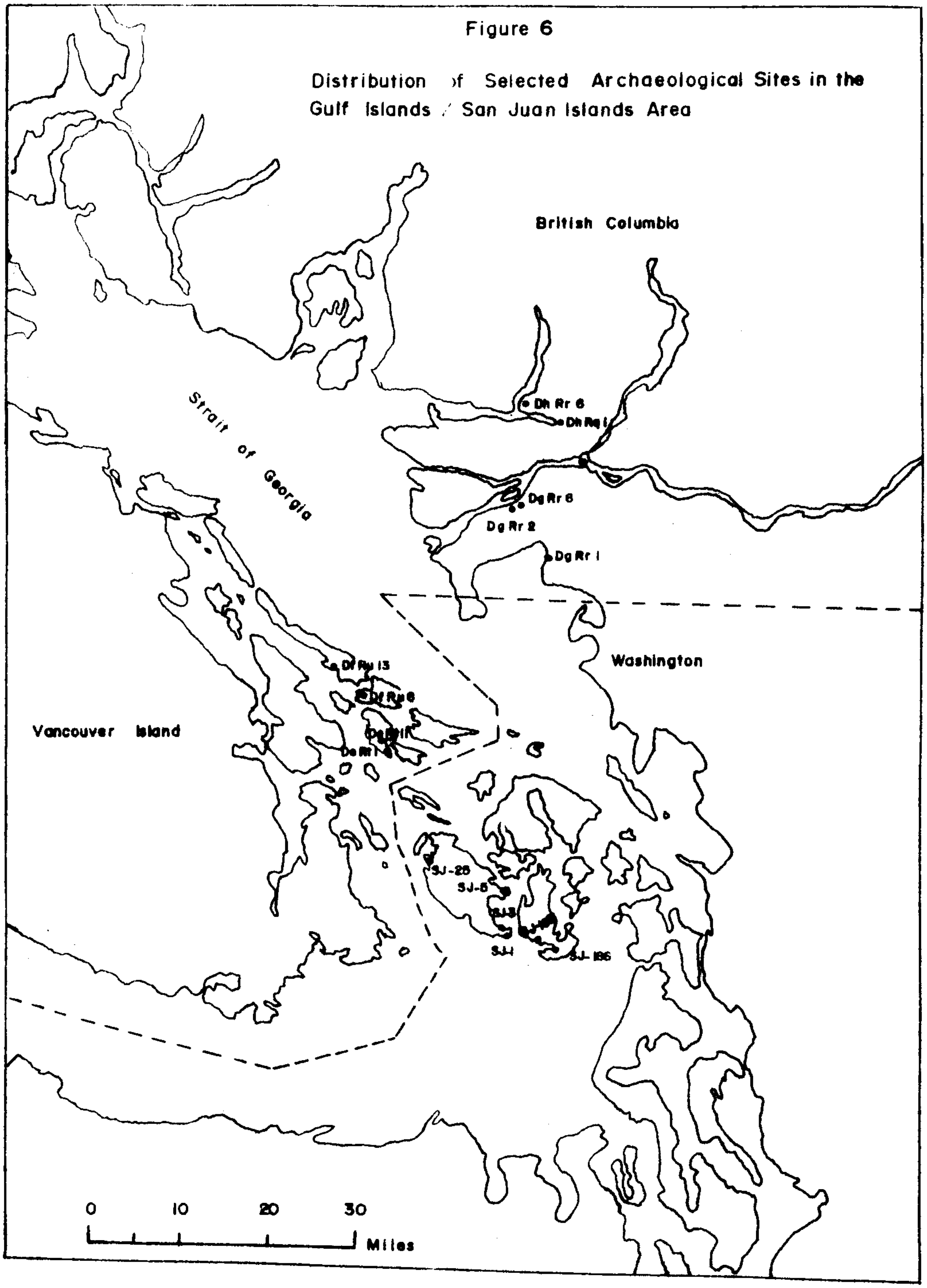
ARCHAEOLOGICAL INVESTIGATIONS

In this chapter archaeological investigations in the Gulf and San Juan Islands are summarized, and a detailed description of the paleo-ecological sequence at the Helen Point site (DfRu 8) is presented. These two groups of islands are essentially similar. They belong to the same biotic area --the oak-parkland (see Chapter 1 for description), enjoy warmer winters and drier summers and winters than the mainland from which they are isolated, have protected waterways and experience heavy fish runs. A small portion of the Fraser Delta belongs in the same biotic zone and data pertaining to it will also be included. For the purpose of this thesis, only archaeological sites where faunal material was reported in some chronological fashion will be considered (see Figure 6 for the distribution of sites discussed below).

Archaeological research in this zone began with the work of King (1950) at Cattle Point, on the south shore of San Juan Island. The strata in the three areas excavated, West Bluff, East Bluff and Old Beach, were correlated on the basis of their culture content and the following sequences of occupation were obtained: the Island phase (before 800 B.C.), the Developmental phase (between 800 B.C. and A.D. 500),

Figure 6

Distribution of Selected Archaeological Sites in the Gulf Islands / San Juan Islands Area



the Maritime phase (between A.D. 500 and 1,000), and the Late phase (A.D. 1,000 and after) (the suggested dating is from Mitchell 1971:42). According to King, the Island phase lacks shellfish and is better adapted to land rather than sea resources. The Developmental phase, with the initial presence of shellfish and the shift towards a sea adapted economy, sees an increase in the number of bone and antler artifacts. The next two phases, according to King, show a total adaptation towards the sea. However, as seen in the table below, deer and elk remains are more abundant at all times compared to harbour seal and whale. King's interpretation of "maritime adaptation" is unclear.

Mammalian Remains (based on no. of bones recovered)	Phases				Total
	Island	Developmental	Maritime	Late	
Columbian Blacktail deer	40	32	111	47	232
American Elk	8	2	20	14	44
Moose	3		7	9	19
Mountain Sheep			1		1
Mountain Goat			1		1
Cattle				1	1
Meadow Mouse	1	5	12	4	22
Western or Pacific mink	1		1		2
Harbour or Hair Seal	2	10	29	33	74
Whale		1	4	4	9
Domestic Dog	24	14	77	32	147
Puget Sound Wolf	1		7	5	13
Grey or Timber Wolf		1			1
Black Bear	4		5	2	11
Unid. Carnivore	1		5	2	8
Total	85	67	280	153	585

(King 1950:90)

The birds identified from this site were: Canada Goose, "duck", Sandhill Crane, and Bald Eagle; the greatest number were found in the Maritime phase. Fish remains were numerous in all strata.

In investigations at nine sites in the San Juan Islands, Carlson (1960:563) recognized two phases: the Marpole phase, dating between 1,000 B.C. and A.D. 1, and the San Juan phase, lasting from at least A.D. 1,300 to historic time. The San Juan phase was manifested in components of the following sites: Jekyll's Lagoon (SJ-3), Turn Point (SJ-4), Lime Kiln (SJ-99), Moore (SJ-5), Mackaye (SJ-186), and Cattle Point-Old Beach (SJ-1). Components from Garrison (SJ-25), and Richardson (SJ-185) showed Marpole phase characteristics. Components of early, unnamed phases were found at Argyle Lagoon and Cattle Point. Carlson's distribution of identified mammal bones is as follows:

Mammal form	Early, Unnamed Phase Components: Argyle Lagoon I	Early, Unnamed Phase Components: Argyle Lagoon II	Early, Unnamed Phase Components: Cattle Point East Bluff	Marpole Phase Components: Garrison	Marpole Phase Components: Richardson
Columbia Blacktailed Deer (*Odocoileus hemionus columbianus*)	56	175	11	145	52
Dog or wolf (*Canis* sp.)	8	23	8	21	16
Harbor or Hair Seal (*Phoca richardii richardii*)		2	4	9	
American elk (*Cervus canadensis*)	1	1	1	8	1
Sea Lion (*Eumetopias jubata*)	1?		1?	11	
Beaver (*Castor canadensis canadensis*)	1				
Total	67	201	25	194	69

Mammal form	San Juan Phase Components Jekyll's Lagoon	Moore	Mackaye	Cattle Point Old Beach
Columbia Blacktailed Deer (*Odocoileus hemionus columbianus*)	X*	13	62	119
Dog or wolf (*Canis* sp.)	X*	11	4	4
Harbor or Hair Seal (*Phoca richardii richardii*)	X*		9	26
American elk (*Cervus canadensis*)		8	16	2
Beaver (*Castor canadensis canadensis*)		2		
Total		34	91	151

* Present, but of undetermined frequency

(Carlson 1960:583)

Not all the fish bones were identified; of the identified fish bones, rockfish were the most common. Dogfish was recovered at all sites. Sculpin, lingcod, other cod-like fish, skate and salmon were also identified at various sites. Sea gull, puffin, murre, goose, cormorant, eagle, duck, and loon formed the bird fauna at specific sites. Shellfish made up the greatest bulk of the faunal remains in all components except Argyle Lagoon I, where shellfish remains were absent, Carlson suggests a dependence on land hunting for food during the Marpole and other early phases because of the presence of numerous chipped stone projectile points and the quantities of land mammal bones recovered from the Garrison and Argyle Lagoon sites (Carlson 1960:584). In the San Juan phase, however, the chipped stone industry was replaced by "a grinding and polishing industry utilizing bone and stone" and there was a simultaneous change towards marine exploitation:

> ...(it) is shown by increasing maritime adaptation through time and by the gradual replacement of the chipped stone industry by one using abrading and polishing techniques as the result of influence from the Old World (Carlson 1960:562).

There were three archaeological investigations undertaken at Helen Point, Mayne Island. The excavations under the Archaeological SitesAdvisory Board, in 1966 at the head of a cove on the northern side of Helen Point yielded three components: Helen Point I, Helen Point II, and Helen

Point III (Hall 1968). In 1968, the Simon Fraser University archaeological field school excavated on the eastern end of the site, under the direction of R. L. Carlson, who identified three components: the Mayne Phase (3,000 - 1,000 B.C.), the Marpole Phase (400 B.C. - A.D. 400), and the San Juan Phase (A.D. 1,200 - contact). The faunal analysis of this portion of the site is the subject of this thesis and will be discussed later in this chapter. Also in 1968, the British Columbia Provincial Museum worked in the central and western areas of the site. John McMurdo (1974) undertook the analysis of this cultural material and found three components: Helen Point Ib (1,300 - 800 B.C.), Helen Point II (100 B.C. - A.D. 300), and Helen Point III (A.D. 1,200 - 1,800). Helen Point Ib was found to contain some traits of both the Mayne and Locarno phases; Helen Point II contained traits of the Marpole phase; and Helen Point III was comparable to components of the Stselax and San Juan phases. The main artifact types from Helen Point I were microblades, contracting-stem chipped stone points, leaf-shaped chipped stone points, chipped slate knives and leaf-shaped ground slate projectile points. Helen Point II yielded triangular and leaf-triangular chipped stone projectile points and Helen Point III, antler wedges, bi-pointed bone objects and ground slate knives. From McMurdo's table of artifact classes by components, there is an indication of a gradual decrease through time in the chipped stone industry (from 63.3% to 10.7%) for a gradual increase in grinding industry using stone and bone (from 13.6% to 61.3%) (McMurdo 1974:22). McMurdo's qualitative analysis of the faunal remains at DfRu 8 can be seen below, where A=abundant, X=trait present, R=rare, and -=absent.

	Component I	Component II	Component III
Mammalia			
Columbian Blacktail Deer	A	A	A
Dog species	A	A	X
American elk	-	R	R
Marten	-	-	R
Short-tailed weasel	R	-	-
Canadian Beaver	X	R	X
Whale	R	-	-
Pinnipedia	R	R	R
Northern Sea Lion	-	R	-
Harbour Porpoise	R	-	-
Harbour Seal	-	R	-
Bird			
Anseriformes	X	X	X
Fish			
Salmon sp.	X	X	X
Rockfish sp.	X	R	X
Lingcod	X	X	X
Herring	-	-	X

(McMurdo 1974:135-136)

As a general pattern, he found that land mammal species (deer, elk, and dog) outnumbered the sea mammal species (harbour seal, northern sea lion and harbour porpoise) at all times. Fish remains occurred in greatest concentrations in the Helen Point II and III deposits, but McMurdo (1974:135) attributes this to differential preservation rather than to cultural variation. Bird remains seem to be consistently present through time. A representative sample of shells were collected and they proved to be present in all three components. They are listed in decreasing order of their relative numbers in Table 1 (McMurdo 1974:131-132).

The Montague Harbour site (DfRu 13) on the southwest shore of Galiano Island, was excavated by D. H. Mitchell in 1964-65, and three components were established for the site. Montague Harbour I has a carbon date of 1,210 B.C. and is of the Locarno Beach culture type. Montague Harbour II has no carbon date, but Mitchell (1971:221) says that it postdates 1,000 B.C. and precedes A.D. 1,000 and is of the Marpole culture type. Montague Harbour III dates around the 12th and 13th century A.D. up to pre-contact and belongs to the Gulf of Georgia culture type.

The chronological distribution of artifacts (see Mitchell 1971:89) shows a decrease in the chipped stone industry and an increase in the bone industry. The main artifacts for

TABLE 1

DISTRIBUTION OF SHELLFISH REMAINS AT DfRu 8

Helen Point Ib:

Thais lamellosa (Wrinkled Purple Whelk)
Saxidomus giganteus (Butter Clam)
Venerupis tenerrima (Thin-shelled Little-neck Clam)
Acmoea pelta (Shield Limpet)
Balanus sp. (Barnacle)
Clinocardium nuttalli (Basket Cockle)

Helen Point II:

Thais lamellosa (Wrinkled Purple Whelk)
Venerupis tenerrima (Thin-shelled Little-neck Clam)
Saxidomus giganteus (Butter Clam)
Balanus sp. (Barnacle)
Acmoea digitalis (Fingered Limpet)

Helen Point III:

Saxidomus giganteus (Butter Clam)
Thais lamellosa (Wrinkled Purple Whelk)
Venerupis tenerrima (Thin-shelled Little-neck Clam)
Homalopoma carpenteri (Carpenter Dwarf Turban)
Balanus sp. (Barnacle)
Clinocardium nuttalli (Basket Cockle)
Mytilus edulis (Blue Mussel)

(from McMurdo 1974)

Montague Harbour I were: leaf-shaped points of chipped stone, contracting-stem points of chipped stone, microblades, and chipped-slate and sandstone knives; for Montague Harbour II: small, triangular and stemmed projectile points of chipped-stone, microblades, unilaterally barbed harpoons; and for Montague Harbour III: triangular ground slate points, small single pointed and bipointed bone and composite toggling harpoon valves.

Concerning the faunal remains, Mitchell says:

> What was kept were samples of each species encountered, and where a species was particularly plentiful, more specimens were collected as a rough indication of the relative abundance (1971:149).

Very little shell was recovered from Montague Harbour I. The identified mammalian species consisted of: beaver, dog, wolf, black bear, wapiti, and coast deer, the last two being the most plentiful. Also present were: brant, "other anseriformes", salmon, lingcod and rockfish. In Montague Harbour II, the bulk of the faunal remains was composed of shell; also present were: harbour porpoise, racoon, mink, cougar, hair seal, wapiti, and coast deer, large waterfowl and salmon. Shellfish are still the dominant remains in Montague Harbour III, with deer and wapiti as the main mammal remains. Beaver, harbour porpoise, dog, black bear, racoon, hair seal, cougar, "branta", "anseriformes", sturgeon, salmon, lingcod, rockfish, and herring were also noted.

In 1968 and 1969 the St. Mungo Cannery site (DgRr 2), a Fraser Delta shell midden situated on the south shore of the South Arm of the Fraser River, was excavated by G. Boehm. The earliest cultural deposit has a carbon date of 2,360 $\pm$ 110 B.C.. Three components were established, the first crossdating with the Eayem Phase of the Fraser Canyon (3,500 - 1,500 B.C.), the second showing a transition from late Eayem to early Marpole (one carbon date obtained was A.D. 830), and the third, correlating with the Whalen II phase or a recent coast Salish occupation (A.D. 1,150 and A.D. 1,560 were two carbon dates obtained for the upper levels). Boehm offers the first thorough quantitative description of faunal remains in a chronological fashion. Site sampling by component yielded the following faunal types: the mammal bones recovered from component I consisted of wapiti, deer, dog, beaver, bear, racoon, mustelid, porcupine, muskrat, "small rodent", and hair seal; from Component II we find wapiti, deer, dog, beaver and hair seal, and from Component III, wapiti, deer, dog, beaver, racoon, "small rodent", and hair seal. Goose, duck, Bald Eagle, gull, Mallard, cormorant, "small bird", grouse, Canada Goose, White-Fronted Goose, swan, crow, loon, grebe, merganser, heron, murre/murrelet, raven and owl were recovered from component I; goose, duck (general), Mallard, cormorant, "small bird", and grouse, from component II; and goose, duck (general), Bald Eagle and gull from component III. Boehm then proceeded to group the fauna into classes in order to obtain the following percentages:

Faunal Class	Component		
	III N=33	II N=18	I N=512
Ungulates	21.2%	27.8%	25.8%
Fur-bearing land mammals	21.2	5.6	15.6
Other land mammals	27.3	16.7	8.2
Sea mammals	12.1	16.7	4.5
Waterfowl (duck, goose, swan)	9.1	16.7	25.8
Diving and shore birds	6.1	5.6	13.1
Grouse	0.0	5.6	2.1
Small birds	0.0	5.6	1.8
Larger land birds (crow, eagle, raven, owl)	3.0	0.0	3.1
Total	100%	100%	100%

(Boehm 1973:61)

It is to be noted in the above table that samples of vastly different sizes were used for the various components, which, undoubtedly, affects the faunal class distribution. Boehm herself concludes that:

> The effect of sample size on the number of types of artifacts or fauna found has been statistically demonstrated as a major error in small samples (Boehm 1973:99).

Due to a lack of comparative collection, fish bones were grouped and weighed. The following conclusions were obtained: relative to the other types of fish, salmon showed an increase through time, sturgeon a decrease from early to recent levels and "other fish" a steady decrease from unit 10 up (Boehm 1973:74). The major trends in fauna and artifact distribution were found to be: a decrease through time of pebble tools and large cores, a restriction in component I of bone awls, bone pendants, unbarbed bone point and pointed bird bone, an initial restriction followed by an increase in component III of ground slate knives, an initial high frequency followed by a decrease in component III of stone wedges, an initial high frequency followed by a decrease (but no subsequent change or decrease) through time of chipped points, and an initial high frequency (of bone fleshers), followed by an increase in component II, then a decrease in component III. Wapiti, deer, duck and grouse proved to be stable through time; dog, hair seal, beaver and cormorant increased, swan, all goose, and loon decreased, gull increased in mid-component I, salmon increased whereas the other fish decreased through time. Grebe distribution was too interrupted to offer any patterning (Boehm 1973:93).

The Glenrose Cannery site, located three tenths of a mile up-river from the St. Mungo site, was initially excavated by T. Loy and subsequently studied by R. G. Matson in order to obtain information about the development of the Northwest Coast subsistence pattern. From radiocarbon dates three components were established: 1) the Old Cordilleran (6,200 - 3,750 B.C.), 2) the St. Mungo (2,350 - 1,350 B.C.), and 3) the Marpole (350 B.C. - 50 B.C.). The main artifacts associated with the Old Cordilleran component are leaf-shaped projectile points, scrapers, pebble tools, retouched flakes, antler wedges, hammerstones, and one barbed antler point. The St. Mungo component yielded ground slate leaf-shaped points, incised decorative slates, bone pendants and wedges (fleshers), bone awls, leaf-shaped and contracting stemmed points, scrapers, pebble tools and fixed barbed points (no microblades, ground slate knives or stone celts). The artifacts recovered from the Marpole component included ground slate knives, ground slate heads, scrapers, and ground slate points, some microblades, chipped stone, bone and antler tools and possibly two harpoons. Faunal remains were recovered in all three components and analyzed by S. Imamoto (birds and mammals), L. Ham (shellfish), and R. Casteel (fish).

The major trend observed from the faunal analysis was the stability of mammalian exploitation throughout the site's occupation, based on the minimum number of individuals for each component. In general, the St. Mungo Component (II) yielded more faunal remains than the Marpole (I) or the Old Cordilleran (III) Components.

The mammalian species recovered were: elk, deer, bear (except for Component III), canis, beaver, racoon (except for III), mink (except for II), small rodent Peromyscus (except for I), and seal. Bird remains were common in the St. Mungo (II) and Marpole (I) Components. Goose and duck were recovered from Components I and II, merganser from I, and swan, Common Loon, Western Grebe and Bald Eagle from II. Matson found that avian remains were probably used more frequently during Marpole than St. Mungo. He attributes the above trends to the build-up of the Fraser Delta, and probably to changes in hunting patterns (Matson 1975:15-16).

As to fish remains, it was found that salmon and sturgeon were used throughout the site's occupation, with the former dominating at all time. The other fish recovered, such as herring, flounder, eulachon, stickleback, and peamouth showed some variation. For example, herring was found only in the Marpole Component, sticklebacks were more common in the lower portion of the site and both the eulachon and the stickleback were absent in the samples collected from the Marpole Component (Matson 1975:18-22).

Shellfish were found to be rare in the Old Cordilleran Component but frequent in the St. Mungo and Marpole Components. The most commonly reoccurring shell is the bay mussel (Mytilus edulis) followed by the barnacles. From the column samples the total amount of shellfish meat was estimated and then compared to the avian and mammalian weights previously obtained using the minimum number of individuals. Matson concludes that for both the St. Mungo and Marpole Components the amount of meat provided by the Mytilus edulis shellfish exceeded that of all mammals. Bay mussel of the Marpole Component yielded 2,050 kg of meat whereas the mammals yielded only 1,191 kg; likewise, the bay mussel of the St. Mungo Component yielded 6,078 kg and mammals only 3,509 kg (Matson 1975:23).

Seasonality was established on the basis of animal distribution. A summer occupation was attributed for the Old Cordilleran Component, a year round occupation for the St. Mungo Component and a fall to early spring occupation for the Marpole Component (Matson 1975:26-27).

The general subsistence pattern for the Old Cordilleran Component is a great dependence on mammals followed by fish and then shellfish. For the St. Mungo Component, there is an increase in shellfish and fish remains. After these two components there is a shift from land mammal hunting towards a riverine and foreshore oriented economy, with bay mussel as the most important resource, followed by salmon (Matson 1975:29). While the mammalian fauna of the Marpole Component is relatively similar to that of the older components, there seems to be a change in resource utilization judging by the presence of goose, duck, and merganser, by the diminution of sturgeon and flounder remains, and the absence of eulachon and sticklebacks; herring occurs only in this component. A shift to a winter occupation is also to be noted.

Matson observes that shellfish predominates in the diet starting 4,300 years ago and concludes that "Fladmark's suggestion that it occurred only after a winter village based on salmon was established does not seem to fit the Glenrose evidence" (1975:34).

Biruté Galdikas-Brindamour (1972) examined a total sample of the faunal material collected from 3 lower mainland sites, Glenrose (DgRr 6), Noon's Creek (DhRq 1) and Belcarra Park (DhRr 6) both in the Burrard Inlet Region, and from 2 Gulf Islands sites, Canal site (DeRt 1), and Hamilton Beach (DeRt 11) both on Pender Island. The latter four sites were excavated during salvage projects in 1971. McMurdo (1974:137) calculated the percentage distribution of the sea and the land mammals from Galdikas-Brindamour's analysis:

	Mainland			Gulf Islands	
	DgRr 6	DhRq 1	DhRr 6	DeRt 1	DeRt 11
Land Mammals	93.3%	100%	83%	75%	80%
Sea Mammals	6.7	0	17	25	20

In conclusion, there are archaeological remains present for at least the last 7,000 years in the zone under consideration. The earliest component, and one which stands alone is the Old Cordilleran component at Glenrose. Following this in time, and preceding the Marpole phase, are a great many somewhat varied components from a number of sites. There are differences in resource exploitation among these components, particularly in regard to evidence for shellfish utilization. The Marpole phase components which appear next, chronologically, are characterized by abundant evidence for shellfish utilization, and by a number of specific artifact types, particularly triangular chipped stone points of basalt, and unilaterally barbed antler harpoons. At St. Mungo the Marpole Component shows no evidence of change from the preceding component in terms of resource use, whereas at Glenrose, the Marpole component shows a greater abundance of avian remains and the diminution or absence of some fish species with shellfish remains still predominating.

The end of the prehistoric sequence as indicated by components of the San Juan and related phases is characterized artifactually by an abundance of bone artifacts, particularly barbs for composite fish hooks. Jekyll's Lagoon, Moore, Mackaye, late Cattle Point, McMurdo's Helen Point III and Mitchell's Montague Harbour III belong in this period between A.D. 1,200 and 1,800.

The following is a discussion of the Helen Point faunal material, analyzed in conjunction with the lithic assemblages devised by Carlson.

The Helen Point midden extends for approximately 450 meters along the shore of Active Pass, and stretches back about 50 meters from the beach. The 1968 excavations directed by Carlson were concentrated in the eastern end of the site. Excavation units consisted of 2 x 2 meter squares aligned along two bisecting trenches, and excavation proceeded in 10 cm levels. The depth of the midden varied between 10 and 150 cm (Carlson 1970:113-114).

In his preliminary report Carlson divided the midden into 3 stratigraphic units. Stratum I, within which Mayne Phase artifacts were found, varied between 10 and 90 cm deep. It contained charcoal, hearths, faunal material, burials, and fire cracked rocks, but minute amounts of shell. Stratum II, containing Marpole Phase artifacts, contained more shellfish remains than the previous stratum. Stratum III, with San Juan Phase artifacts, showed heavy concentrations of shell and fire cracked rocks. Carlson states that "there is an estimated 5,000 years of prehistory compressed into the 1.5 meter deep deposit" (Carlson 1970:115).

In the final report Carlson (manuscript) organized the total collection from the site into a series of 18 spatially defined assemblages. Some of these assemblages are from very short time spans, whereas others are from very long ones. Time estimates were assigned on the basis of 10 radiocarbon dates. These assemblages, which were used to divide the faunal collections, are as follows:

Assemblages	Time	Phase Assignment
1.	3,500-2,000 B.C.	Early Mayne Phase
2.	3,500-1,000 B.C.	Mayne Phase (Early & Late)
3.	2,000-1,000 B.C.	Late Mayne Phase
4.	3,500-1,000 B.C.	Mayne Phase (Early & Late)
5.	Ca 200 B.C.-1 A.D.	Marpole Phase
6.	Ca 1 A.D.-800 A.D.	Marpole Phase
7.	1,000 B.C.-800 A.D.	Several Phases
8.	3,500 B.C.-800 A.D.	Several Phases
9.	800 A.D.-1,850 A.D.	Several Phases
10.	1,000 B.C.-1,250 A.D.	Several Phases
11.	3,500 B.C.-1,250 A.D.	Several Phases
12.	800 A.D.-1,250 A.D.	Unnamed Phase
13.	800 A.D.-1,250 A.D.	Unnamed Phase
14.	1,250 A.D.-1,850 A.D.	San Juan Phase
15.	800 A.D.-1,850 A.D.	Several Phases
16.	800 A.D.-1,850 A.D.	Mixed
17.	3,500 B.C.-1,850 A.D.	Mixed
18.	3,500 B.C.-1,850 A.D.	Beach Collection, Mixed

A complete comparative collection is basic for a thorough analysis of the faunal remains from an archaeological site. At present, most institutions where reference material exists lack extensive fish collections; this situation made fish speciation impossible. For reasons stated previously, Canis and salmon remains could not be speciated. Skeletal, as opposed to sexual, maturity was used in aging various species, giving the following age groups: immature, young adult, and adult (based on epiphyseal union). Butchering marks, as well as charred/calcined bones were noted, but the data were not utilized for further study. The various standardizations used in this analysis, such as minimum number of individuals, determination of accidental/casual occurrences at sites and differences between "bone fragments" and "bone portions", were taken from Grayson (1973), Savage (1971), and Stewart (1974). The minimum number of individuals was determined by the most frequently reoccurring single element. Each element was separated into left and right sides as well as into age groups. This process was done for every species of every stratigraphic division.

Savage suggested that two basic criteria be used to determine which vertebrate fauna occurred naturally in the vicinity of archaeological sites. These were considered in the final analysis:

> Recovery by excavation of elements from various parts of the skeleton, from at least two individuals of a species, in two or more sites, located in the same broad geographical area and approximately contemporaneous in period of occupation.
>
> or
>
> Representation of the species in question by elements from various parts of the skeleton from at least two individuals in a site, AND supporting evidence of early historic records of the occurrence of the species in question in the geographic area of the site (1971:1).

Terms such as "bone portions" and "bone fragments", "large", "medium" and "small" mammals and birds, which are used in this analysis, are based on Stewart's definitions of these various qualitative designations: "portion" is applied when a bone is greater than 30 mm in length and "fragment" when it is equal to or smaller than 30 mm; "large mammals" consist of the ones equal to or larger than blacktail deer, "medium", smaller than or equal to an average-size dog, and "small", to marten-size animals; "large bird" is a term used to refer to eagle, cormorant, goose and loon, "medium" to duck, and "small" to flicker.

There are three different methods used to quantify the data in faunal analysis: 1) total bone counts of specimens, 2) total weight of specimens, 3) minimum number of individuals. The first and last methods were used below.

Of the 18 assemblages established by Carlson, some were qualified as being potentially pure--where there was no evidence of intrusion within levels, some as being potentially mixed--where the possibility of intrusion was found to exist. Thus, assemblages 1, 3, 5, 6, 12, and 14 were found to be potentially pure. The division of the faunal material for analysis was done according to these same assemblages.

A total of 22,652 animal bones were recovered from the 1968 excavations at Helen Point: 35 were unclassified, 14,021 were identified to class, and 8,596 were identified to either family or species (see Table 2 below). The following tables show the frequency of bones recovered within each class, per assemblage (Tables 3 to 11, where ca=calcined, ch=charred, bu=butchered, ya=young adult, and im=immature).

In order to determine if there were any changes in the faunal composition through time, I organized the site assemblages into three periods: Early (3,500-1,000 B.C.), Middle (1,000 B.C.-A.D. 800), and Late (A.D. 800-1,850). Then percentages for each class within each period were calculated (see Table 12).

The Early Period (3,500-1,000 B.C.) corresponds to the Mayne Phase and was further subdivided by Carlson as such:

Early Mayne phase = Assemblage 1
Late Mayne phase = Assemblage 3
Total Mayne phase = Assemblage 1, 2, 3, 4

Table 2 Total Animal Bone Count For Each Class Per Assemblage

	UNIDENTIFIABLE						IDENTIFIABLE						TOTALS
ASSEMBL.	LAND MAMMAL	SEA MAMMAL	BIRD	FISH	UNIDENT-IFIED	TOTAL	LAND MAMMAL	SEA MAMMAL	BIRD	FISH	TURTLE	TOTAL	
1	465	14	79	15	—	573	14	16	18	25	—	73	646
3	2715	55	549	542	19	3880	232	166	291	778	2	1469	5349
5	42	—	8	21	—	71	11	1	8	52	—	72	143
6	695	22	70	153	3	943	82	26	72	809	—	989	1932
12	195	3	47	155	—	400	45	2	71	370	—	488	888
14	831	1	102	1462	6	2402	135	10	119	1946	—	2210	4612
2	305	10	23	7	—	345	20	27	10	18	—	75	420
4	1520	40	213	186	1	1960	95	96	77	204	—	472	2432
7	311	3	51	88	—	453	39	12	50	464	—	565	1018
8	536	6	55	130	—	727	39	22	55	408	1	525	1252
9	379	8	82	218	1	688	95	8	77	387	—	567	1255
10	348	2	38	81	5	474	97	6	30	275	—	408	882
11	97	5	10	61	—	173	11	8	18	146	—	183	356
13	45	—	10	23	—	78	5	2	3	30	—	40	118
15	90	1	17	110	—	218	18	1	27	102	—	148	366
16	184	—	32	226	—	442	24	5	21	181	—	231	673
17	153	1	13	62	—	229	20	3	18	40	—	81	310
TOTALS	8911	171	1399	3540	35	14,056	982	411	965	6235	3	8596	22,652

ASSEMBLAGES	ELK	BLACKTAIL DEER	FAWN	CERVID metapodial part.	CANIS sp.	RACOON	BEAVER	MARTEN	OTHERS
1		9 2 ca	1		1	1	2		
3	2 1 bu	139 5 ca 2 ch 1 bu 5 ya 15 im	1 ca 2	4 ca 31 2 ch 1 bu	1 ca 40 1 ch 2 ya 4 im	7 1 ch 1 ya 1 im	9 1 im		2 Bear - im.
5		5 2 im		1	5 1 ya 1 im				
6	1	68 1 ca 1 bu 6 ya 4 im	1	6 1 bu	6 2 im				
12		36 2 ch 1 bu 4 ya 3 im	3	1	5 2 im				
14	12 1 im	1 ca 44	2	6 2 ch 1 bu	1 ca 28 6 im	27 23 im		1	3 Microtus sp. 1 Mink, 10 Cat - im 2 Bear
2		1 ca 11	1	1 ca 5	2 2 im			1	
4	1 1 im	62 3 ch 2 ya 8 im	1	1 ca 12 1 ch	11 1 ya 1 im	1 1 im	2 1 im	3	2 Bear
7		1 ca 28		5	6 1 ch 1 ya 3 im				
8		18 1 ch 1 ya 2 im	1	1 ca 3	15 4 im		1		1 Microtus sp.
9		34 2 im	30	4	19 5 ch 1 ya 8 im	2 2 im			1 Pig 5 Cat - 2 ya, 1 im
10	2 1 bu 1 im	1 ca 19 1 im	58	1 ca 3	14 2 im	1			
11	1	4 1 bu			4 2 ya 1 im	2			
13		5 1 ch 1 bu							
15		9	1		7 1 ch 1 ya 3 im				1 Bear
16		10 1 ch	1	3	10 1 ya 2 im				
17	4 1 im	6	5	1	2				2 Cat

Table 3 Frequency of Land Mammal Bones Per Assemblage

ASSEMBLAGES	ANTLER	Large mammal longbone port.	Large mammal longbone frag.	Longbone port.	Longbone frag.	Rib portion	Rib fragment	Bone portion	Bone fragment
1	2	2 1ch	1ca 8	3ca 53 5ch	5ca 51 4ch	1ca 2	2	1ca 47 1ch	15ca 300 10ch
3	3	1ca 2bu 52 3ch	35 3ch	9ca 8bu 370 47ch	54ca 2bu 327 38ch	1ca 1bu 58 1ch	1ca 1bu 33	21ca 436 25ch	27ca 4bu 1404 44ch
5		9 3ch	1ca 4 1ch	8	2			6 1ch	1ca 13 1ch
6	3	16 4ch	2ca 10 2ch	3ca 4bu 144 15ch	7ca 84 14ch	4	3	6ca 4bu 121 7ch	15ca 313 7ch
12		3 1ch	9 1ch	5ca 1bu 33 2ch	1ca 1bu 30 4ch	3	3	1ca 41 3ch	2ca 73 4ch
14	4	1ca 172 11ch	36 20bu	1ca 13bu 72 6ch	16ca 224 21ch	2	2ca 3	4ca 1bu 62 4ch	12ca 2bu 260 9ch
2	1	14 3ch		20	3ca 32 1ch	7	2 1bu	1ca 20	5ca 210 1ch
4		3ca 24	7	18ca 8bu 177 18ch	40ca 151 11ch	1ca 16	7	12ca 300 12ch	30ca 5bu 838 36ch
7	1	4		3ca 1bu 44 6ch	4ca 30 9ch	2	1	1ca 1bu 53 1ch	3ca 1bu 177 4ch
8	5	16		7ca 1bu 79 5ch	4ca 3bu 73 11ch	2ca 14	3	1ca 2bu 77 7ch	16ca 3bu 274 5ch
9		4	3	13ca 71 4ch	7ca 2bu 75 13ch	1ca 9	3	4ca 2bu 52 3ch	13ca 162 12ch
10	1	12 1ch	4	3ca 2bu 88 19ch	15ca 95 27ch	2		51	11ca 1bu 96 5ch
11		8		8bu 20 1ch	6 1ch		1	2ca 11 1ch	3ca 3bu 51
13		1	1ca 1	9 1ch	1bu 5		1	1ca 6	1ca 22
15	1	1	1	1ca 21 1ch	1ca 1bu 31	2	1	1ca 11	2ca 22 1ch
16	1	2ca 2bu 44 3ch	9	2ca 41 1ch	2ca 32 2ch	3		13	2ca 2bu 42
17		29 1ch	7	1ca 25	6ca 32	1ca 4		1ca 10	2ca 1bu 46 2ch

Table 4 Frequency of Land Mammal Bones Per Assemblage

ASSEMBL.	HARBOUR SEAL	NORTHERN SEA LION	HARBOUR PORPOISE	DELPHINIDAE sp. Vertebrae	OTHERS	Large sea mammal bone portion	Bone portion	Bone fragment
1	10 2ca	5 2ca 1bu	1			8	3	3
3	104 7ca 2bu 8ya 29im	32 2ca 4ch 19im	18 1ya 2im	11 1ya 4im	1 Whale?	25 1bu	21 3ch	9
5		1						
6	18 1ca 2ya 3im	4		3 2ca			11 1ca 2bu 1ch	12
12	1	1					2	1
14	10 1ca 1im						1 1bu	
2	21	2	1	3 2im		3 1ca	1	6
4	52 4ca 3ch 3ya 6im	15 2ch 1ya 2im	19 1im	9 2im	1 Sea Otter? - im.	5	17	18
7	8 1im		1	3 1ya		1	2 1ca	
8	16 2ca 4im	5 1ca 1im	1				5 1ca	1
9	7 1ca 2im	1				6		2
10	5	1						2 2ca
11	7 1ch 2im	1					2	3
13	1			1				
15	1					1		
16	2 1ca	3 1im						
17	1 1im		1 1im	1			1	

Table 5 Frequency of Sea Mammal Bones Per Assemblage

ASSEMBL.	COMMON LOON	ARCTIC LOON	WESTERN GREBE	DOUBLE-CRESTED CORMORANT	PELAGIC CORMORANT	WHISTLING SWAN	CANADA GOOSE	WHITE-FRONTED GOOSE
1	1	3		1	3			
3	13	40	17	15	20	3	7	2
5							2	
6	3	7		2	2		4	
12	3	5	5	1			4	1
14	3	1	15 1bu	1	1		1	1
2	1	1			1 1ca		2	
4	6	10	5	2	2	1	3	1
7	1	4	1 1ca	2	3		5	1
8	3	8	2 1ca	1	1		2	1
9	2	6	4		2		4	1
10			1		2		1	
11		4	1					
13								
15	1	1	11	1				
16		1	2		2		1 1ca	
17		2				1		

Table 6 Frequency of Bird Bones Per Assemblage

ASSEMBL.	MALLARD	GADWALL	PINTAIL	RING-NECKED DUCK	OLD SQUAW	WHITE-WINGED SCOTER	SURF SCOTER	EAGLE
1			4				5	
3	2	2	19	7	2	4	16	
5							1	
6		1	3	4 1ch		5	1	1
12	1	5	3	6	1	2	1	2
14		3	9	5	2	5	5	2
2			1					
4		1	3	2		1	4	
7	1	1	4	2		1	2	
8	1	1	2	1		1	6	
9	1	1	5	3	1	3	4	10
10		3	3		1		2	
11		2				1	1	
13			1					
15		2	1	1	1	2		
16	2	1	1	1		1	1	
17		1				1	2	

Table 7 Frequency of Bird Bones Per Assemblage

ASSEMBL.	RED-TAILED HAWK	PTARMIGAN	GLAUCOUS-WINGED GULL	BLACK-LEGGED KITTIWAKE	BONAPARTE GULL	COMMON MURRE	COMMON RAVEN	COMMON CROW
1						1		
3	4		39	4	4	54 1 bu		5
5			2 1 bu			2		
6	1	3	9	2	5	9		4
12		3	10 1 ch		5	5		1
14		7	16	●	5	16		4
2			1		2	1		
4		1	14			15		3
7		1	9	1	1	5	1	1
8		1	7	1	1	7	1	1
9		2	6	3	5	5		2
10		3	3	4	1	1		1
11			3			1		
13						2		
15		1	3	1				
16		1	1		2	2		
17		1	1	1	1 ca 6		1	

Table 8 Frequency of Bird Bones Per Assemblage

ASSEMBL.	BUCK	GOOSE	OTHERS	Vertebra	Phalanx	Longbone portion	Longbone fragment	Bone portion	Bone fragment
1				5		26	11ca 33 1ch	7	8 1ch
3	2	3	1 Thrush; 1 Auklet 2 Rough-Legged Hawk 2 Blue Grouse; 1 Grebe	45 3ca	15	4ca 210 7ch	3ca 174 13ch	1ca 53	3ca 51 1ch
5			1 Rough-Legged Hawk		1	4	1		2
6			1 Fulmar; 2 Shearwater 1 Blue Grouse 2 (Hermann) Gull		8	29 1ch	18	1ca 5	1ca 10
12	4	1	1 Ruffed Grouse 1 Grebe		7	13 2ch	2ca 23	1	3
14	4	1	2 Flicker; 1 Auklet 1 Hawk; 1 [illegible] Owl 1 [illegible] 1 [illegible]	2	5	2ca 1bu 40 3ch	2ca 2bu 37	8	1ca 10 1ch
2						5	1ca 11		7
4	2	1		10	1	8ca 91 3ch	8ca 87	12	1ca 11
7		1	1 Ruffed Grouse 1 (Hermann) Gull	1	1	1ca 21	17	2	9
8	1		4 Screech Owl 1 Shearwater	1	2	26	16 2ch	1ca 6	4
9	2		1 Tern; 2 Auklet 1 Thrush; 1 Shearwater	4	8 1ca	2ca 28	5ca 1bu 33 2ch	6	1ca 3
10	1		1 Grebe; 1 Pigeon Hawk 1 (Hermann) Gull	1	1	18	5ca 12 1ch	1ca 2	4
11	1		1 Shearwater		3	5	4	1	
13						4	6		
15	1				2	7	5	3	
16			1 Ruffed Grouse 1 Blue Grouse		2	1ca 15 1ch	2ca 10 2ch	4	1
17	1					7	2ca 3	1	2

Table 9 Frequency of Bird Bones Per Assemblage

ASSEMBL.	SALMONIDAE VERTEBRA	SCORPAENIDAE VERTEBRA	GADIDAE VERTEBRA	HEXAGRAMMIDAE VERTEBRA	DOGFISH SPINE	SCORPAENIDAE	GADIDAE	HEXAGRAMMIDAE
1	13	4		4		4		
3	17 ca 518 2 ch	107	11	2 ca 47 3 ch	5	1 ca 82	1	6
5	1 ca 37	5	2		1	7		
6	25 ca 697 6 ch	4 ca 50 1 ch	4	2 ca 35		22		1
12	37 ca 293 4 ch	2 ca 32	3	1 ca 15 1 ch	4 1 ch	18	3	1
14	89 ca 1493 19 ch	14 ca 217 9 ch	63 1 ch	1 ca 89 3 ch	15	1 ca 50	7	2
2	1 ca 15	3						
4	6 ca 108 3 ch	2 ca 54 2 ch	2	1 ca 23 1 ch	4	11		2
7	7 ca 390 1 ch	23	19	16	2	12		2
8	1 ca 335	2 ca 25	6	17	2	21	1	1
9	32 ca 289 6 ch	3 ca 47	2	20 2 ch	1	24	4	
10	7 ca 229 5 ch	1 ca 20	8	1 ca 9 2 ch	2	5		1
11	104	1 ca 10	1	1 ca 13	2	16		
13	1 ch 20	3	4	2		1		
15	8 ca 65	11	1 ca 12	5	1	6		2
16	52 ca 122 5 ch	14 ca 27	1	7 ca 14		13	1	1
17	30 1 ch	4 1 ch	1	3		1	1	

Table 10 Frequency of Fish Bones Per Assemblage

ASSEMBL.	OTHERS	Skull portion	Skull fragment	Vertebra fragment	Spine portion	Spine fragment	Bone portion	Bone fragment
1				7			5	3
3	1 Sturgeon	25 1ch	112	4ca 252 3ch	1ca 36	14	23	80 1ch
5				6	4	1	8	2
6		2	15	2ca 66	15	2	17	36
12				6ca 62	12	3	28	51
14	2 Sturgeon 3 Ratfish teeth	6	13	32ca 372 5ch	159 1ch	41	291	581 2ch
2				5		1		1
4		3	5	1ca 129	8	5	13	23
7			3	1ca 36 1ch	3 1ch	2 2ch	13	31
8			5	57	13	3	23	29
9		8	6	10ca 74 5ch	16	1	56	57 1ch
10		6	3	3ca 42 1ch	5	3	8	15
11				6ca 13	7	2	7 1ch	32
13		2	3	4	2	1	2	9
15			2	2ca 34	3	1ca 16	16	39
16	1 Sturgeon	8	9	22ca 56	30	19	13	92 1bu
17		7	14	16		1	12	12

Table II Frequency of Fish Bones Per Assemblage

Table 12 Percentages of Each Class of Animal Bones Per Period

		UNIDENTIFIABLE					IDENTIFIABLE					TOTALS
	ASSEMBL.	LAND MAMMAL	SEA MAMMAL	BIRD	FISH	TOTAL	LAND MAMMAL	SEA MAMMAL	BIRD	FISH	TOTAL	
3500-1,000 B.C.	1	465	14	79	15	573	14	16	18	25	73	646
	2	305	10	23	7	345	20	27	10	18	75	420
	3	2715	55	549	542	3861	232	166	291	778	1467	5328
	4	1520	40	213	186	1959	95	96	77	204	472	2431
	TOTALS	5005	119	864	750	6738	361	305	396	1025	2087	8825
	%	56.7	1.3	9.8	8.5		4.1	3.5	4.5	11.6		100
[illegible]	5	42	—	8	21	71	11	1	8	52	72	143
	6	695	22	70	153	940	82	26	72	809	989	1929
	7	311	3	51	88	453	39	12	50	464	565	1018
	TOTALS	1048	25	129	262	1464	132	39	130	1325	1626	3090
	%	33.9	.8	4.2	8.5		4.3	1.2	4.2	42.9		100
A.D. 800-1,850	9	379	8	82	218	687	95	8	77	387	567	1254
	12	195	3	47	155	400	45	2	71	370	488	888
	13	45	—	10	23	78	5	2	3	30	40	118
	14	831	1	102	1462	2396	135	10	119	1946	2210	4606
	15	90	1	17	110	218	18	1	27	102	148	366
	16	184	—	32	226	442	24	5	21	181	231	673
	TOTALS	1724	13	290	2194	4221	322	28	318	3016	3684	7905
	%	21.8	.1	3.7	27.8		4.1	.3	4.0	38.2		100
A.D. 800-1,250	12	195	3	47	155	400	45	2	71	370	488	888
	13	45	—	10	23	78	5	2	3	30	40	118
	TOTALS	240	3	57	178	478	50	4	74	400	528	1006
	%	23.8	.3	5.6	17.7		5.0	.4	7.4	39.8		100
A.D. 1250-1850	14	831	1	102	1462	2396	135	10	119	1946	2210	4606
	%	18	.02	2.3	31.7		2.9	.22	2.6	42.3		100

The Middle Period (1,000 B.C.-A.D. 800) contains the following: Marpole and Late Marpole = Assemblages 5 and 6 ca A.D. 1-800

The Late Period (A.D. 800-1,850) contains the following assemblages:

Unnamed component = Assemblages 12 and 13 ca A.D. 800-1,250

San Juan phase = Assemblage 14 A.D. 1,250-1,850

Bar graphs showing the percentage distribution of land mammal, sea mammal, bird and fish, identified and unidentified, were done for the following time periods: the Mayne Phase (3,500-1,000 B.C.), the Middle Period (1,000 B.C.-A.D. 800), the Unnamed Phase (A.D. 800-1,250), the San Juan Phase (A.D. 1,250-1,850), and the total Late Period (A.D. 800-1,850) (see Figures 7 to 11).

The combined percentages of identifiable and unidentifiable classes per period give the following results:

TABLE 13

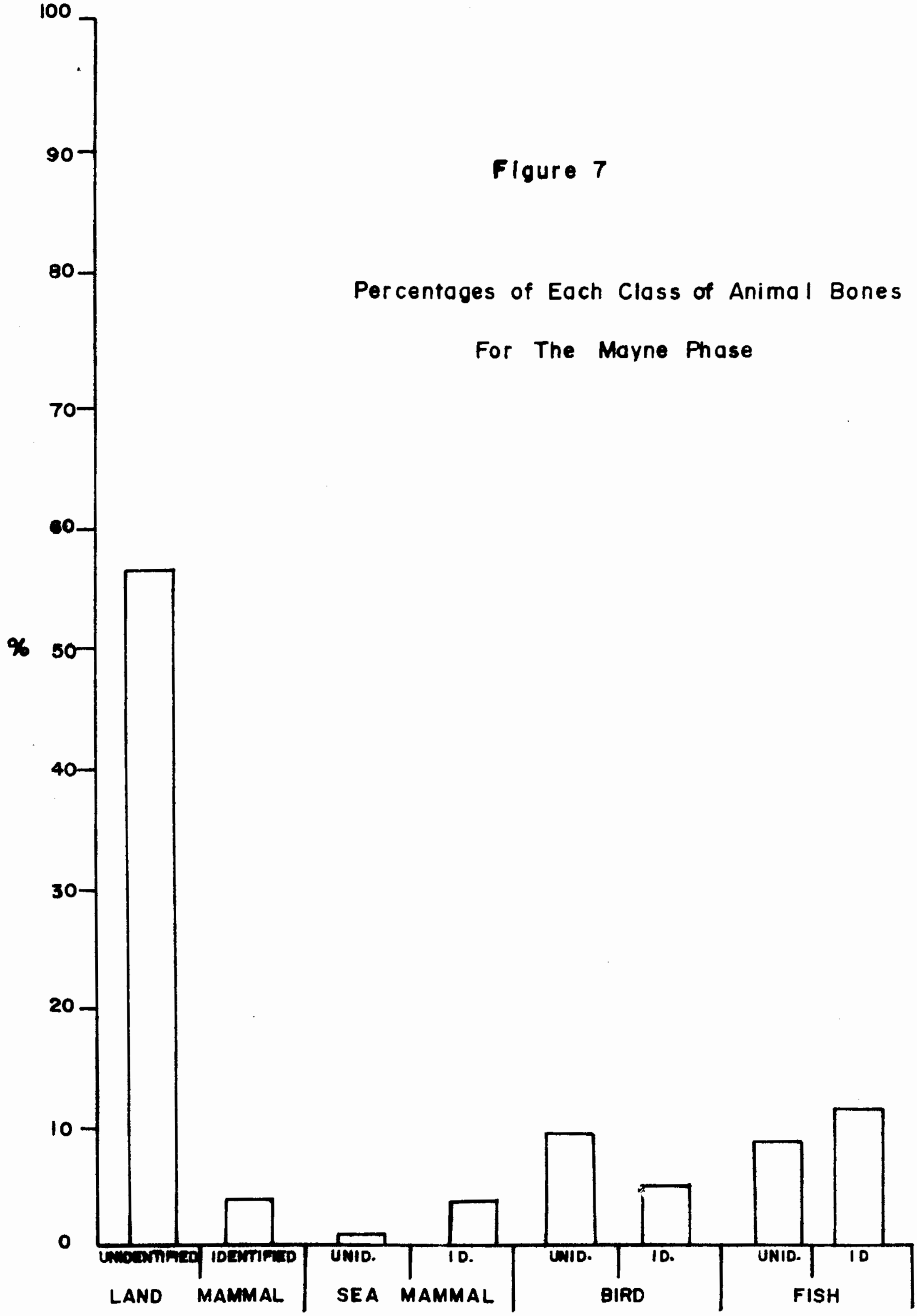
% of unid. and id. animal bones

Periods	Land Mammal	Sea Mammal	Bird	Fish	Totals
Mayne Phase	60.8%	4.8%	14.3%	20.1%	100%
Middle Period	38.2	2.0	8.4	51.4	100
Unnamed Period	28.8	.7	13.0	57.5	100
Late Period	25.9	.4	7.7	66.0	100
San Juan Phase	20.9	.2	4.9	74.0	100

Figure 7

Percentages of Each Class of Animal Bones

For The Mayne Phase



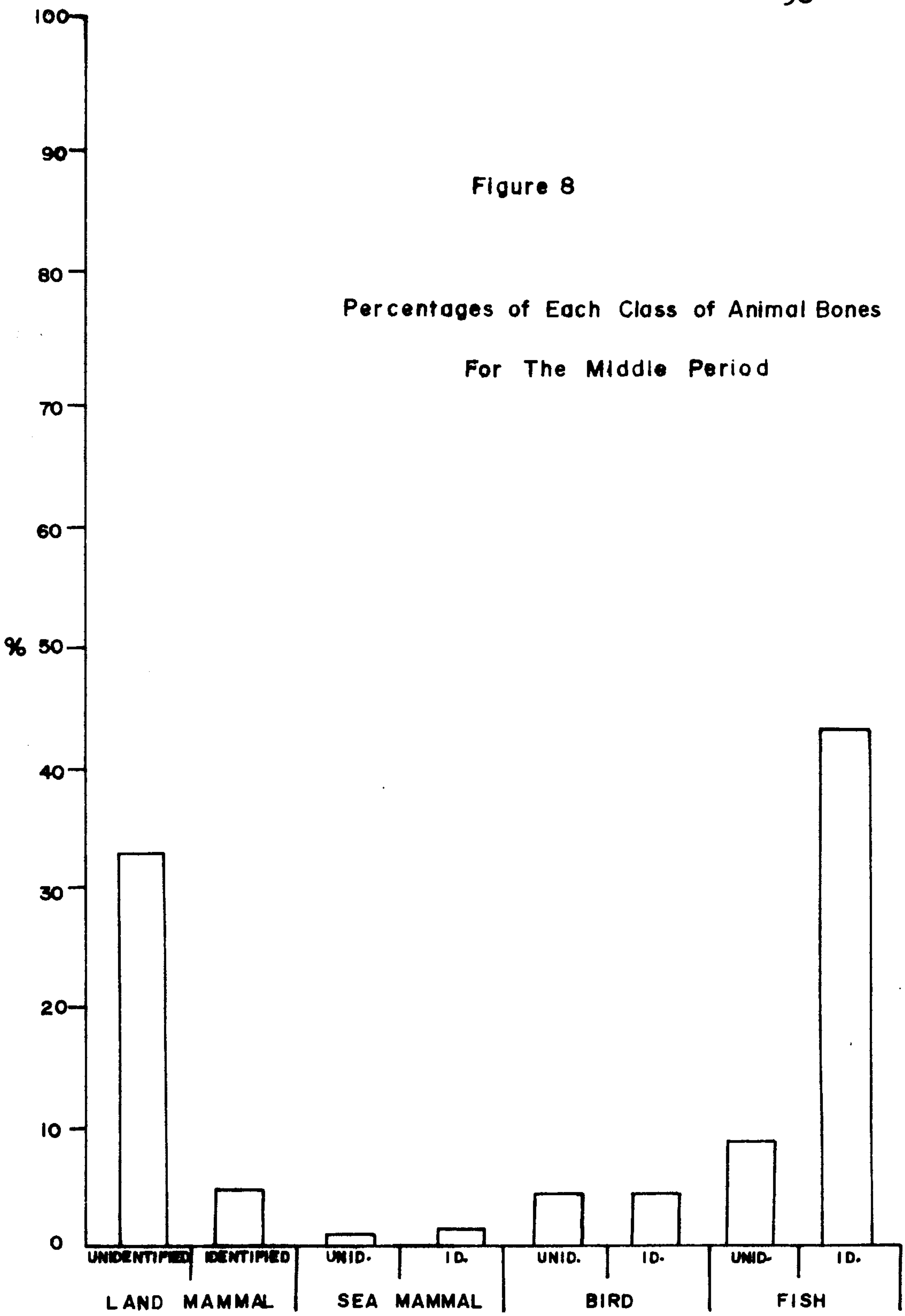
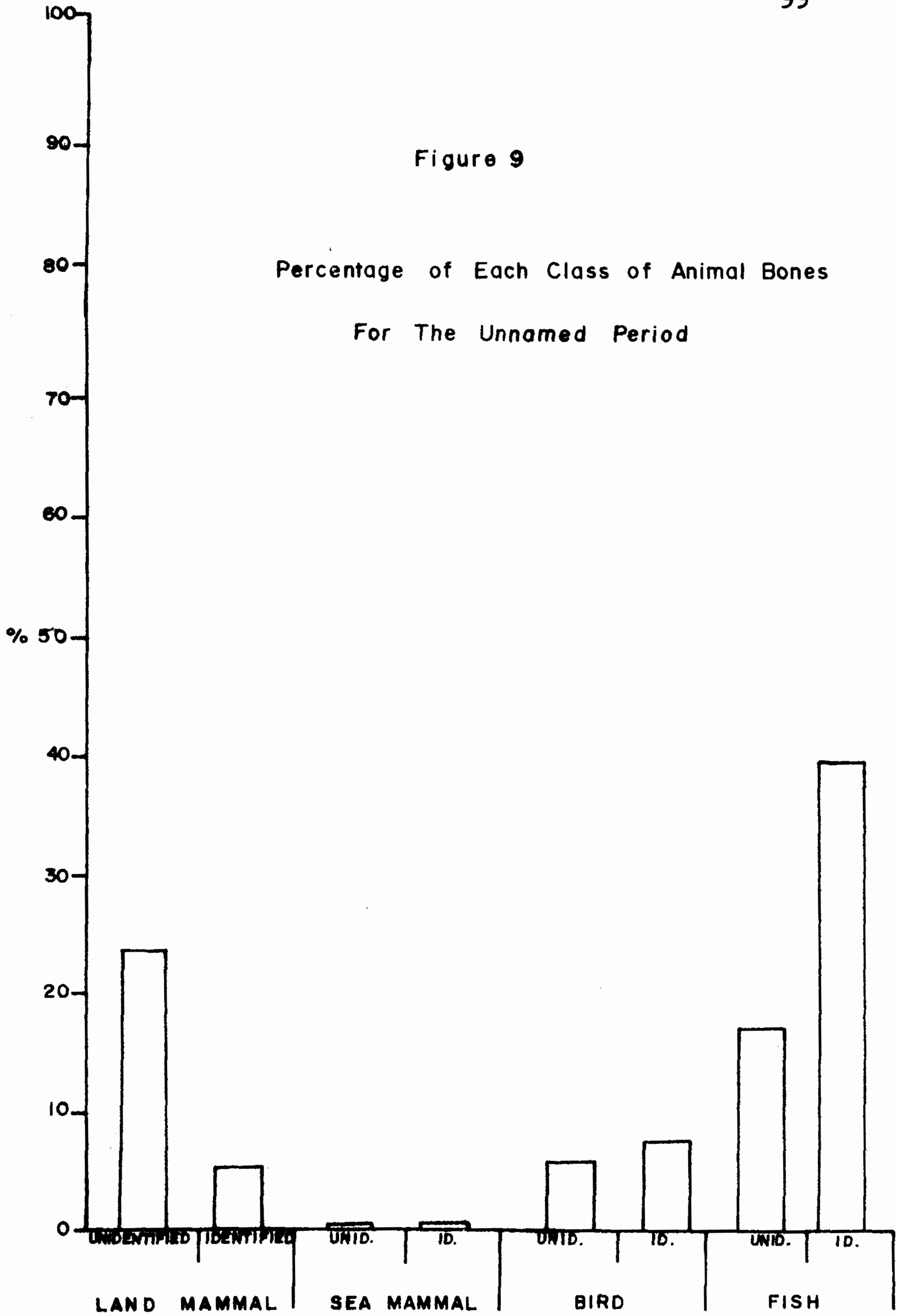


Figure 8
Percentages of Each Class of Animal Bones
For The Middle Period
%
100
90
80
70
60
50
40
30
20
10
0
UNIDENTIFIED
IDENTIFIED
UNID.
ID.
UNID.
ID.
UNID.
ID.
LAND MAMMAL
SEA MAMMAL
BIRD
FISH

Figure 9

Percentage of Each Class of Animal Bones

For The Unnamed Period



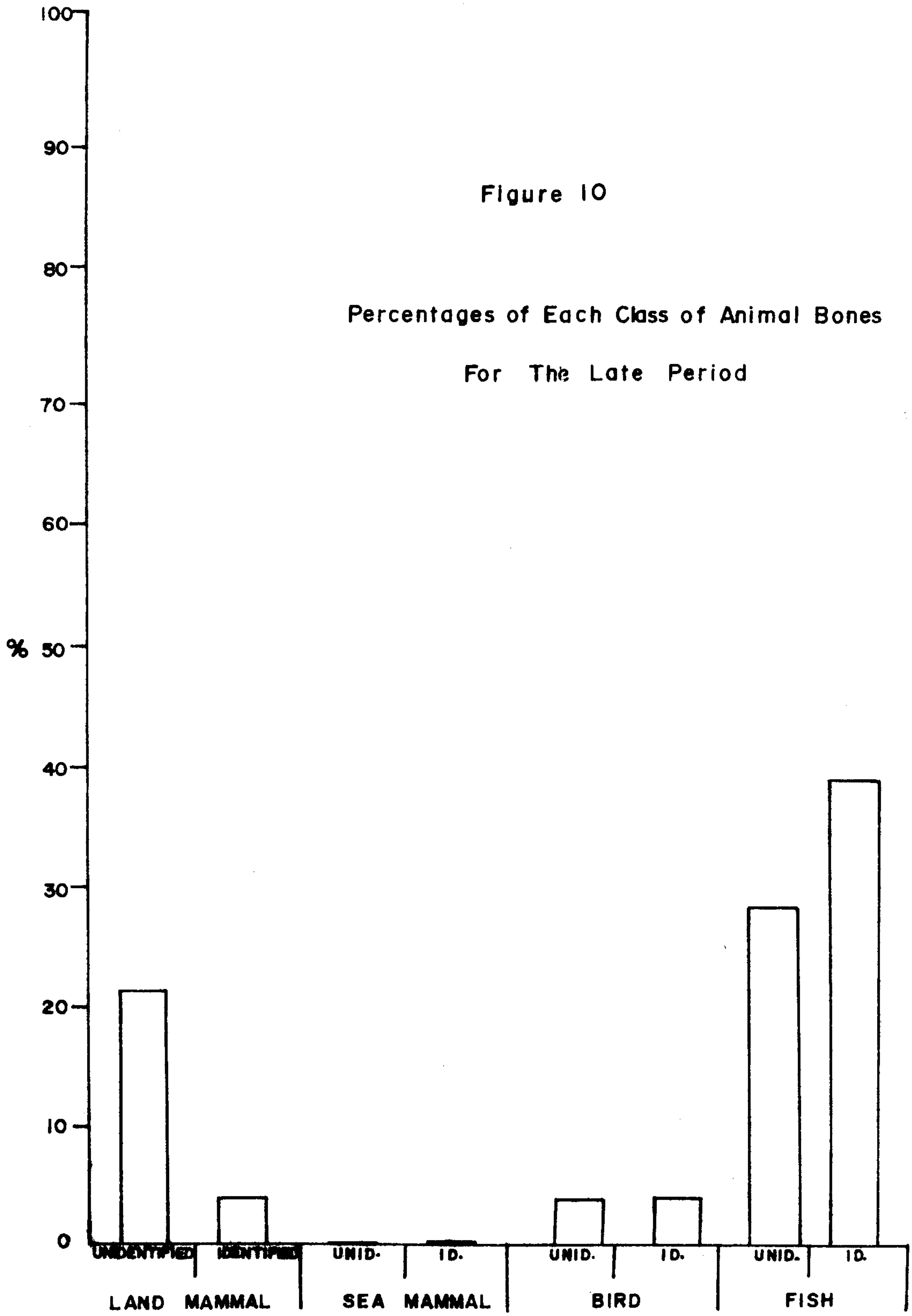


Figure 10

Percentages of Each Class of Animal Bones

For The Late Period

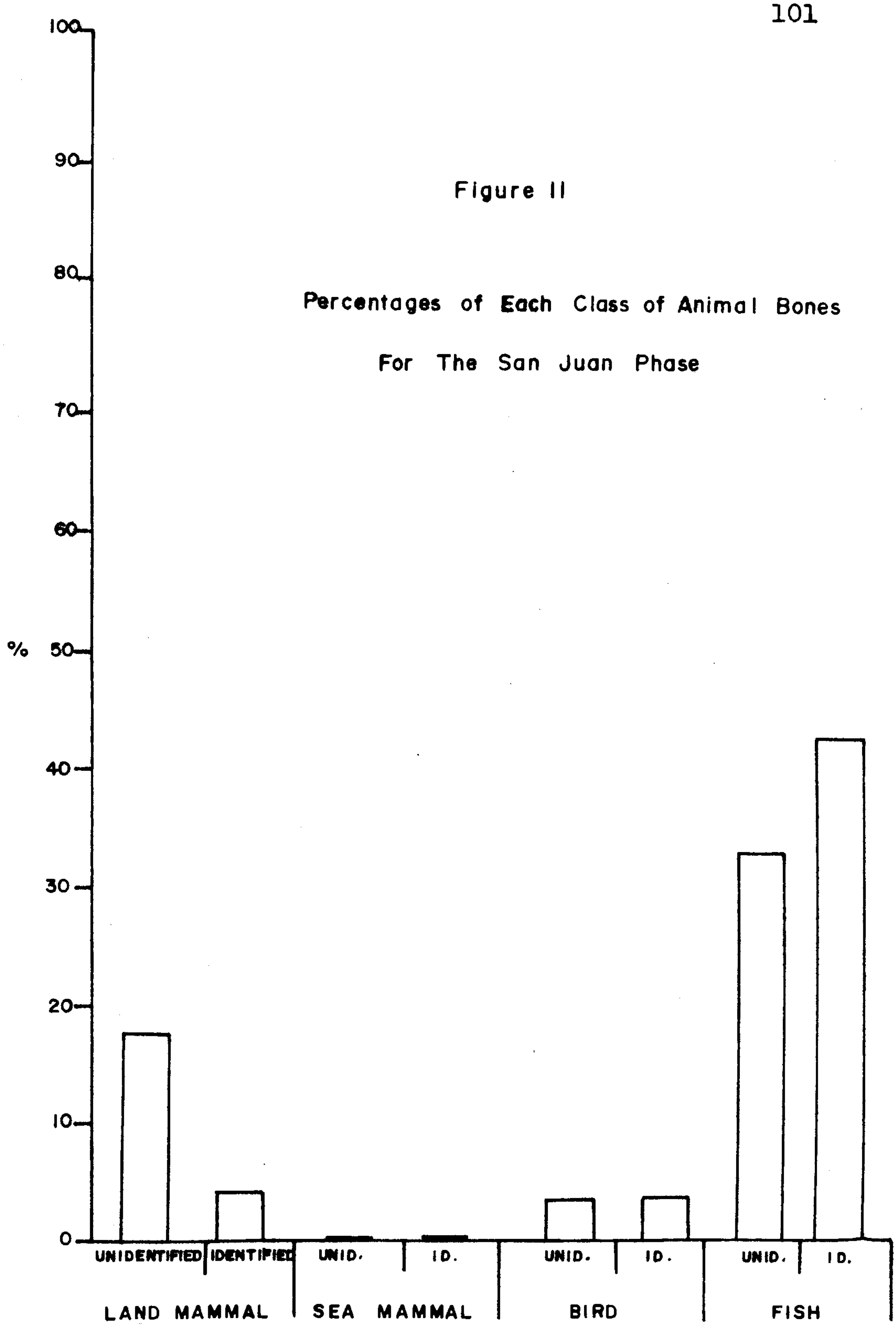


Figure II
Percentages of Each Class of Animal Bones
For The San Juan Phase
%
100
90
80
70
60
50
40
30
20
10
0
UNIDENTIFIED
IDENTIFIED
UNID.
ID.
UNID.
ID.
UNID.
ID.
LAND MAMMAL
SEA MAMMAL
BIRD
FISH

The minimum number of individuals was also calculated for each assemblage:

TABLE 14

Species	*Assemblages*																
	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17
LAND MAMMALS																	
Blacktail deer ad.	1	2	6	2	1	3	3	2	2	2	1	2	1	2	1	2	2
Blacktail deer ya.			1	1		2		1				1					
Blacktail deer im.			1	1	1	1		1	1	1		1					
Fawn	1	1	1	1		1		1	1	1		1		1	1	1	
Elk ad.			1	1		1				1	1			1			1
Elk im.			1							1							
Canis ad.	1	1	2	1	1	1	1	2	2	1	1	2		2	1	1	1
Canis ya.			1						1		1				1		
Canis im.			1	1	1	1	1		2	1	1	1		1	1	1	
Racoon ad.	1		1							1	1			1			
Racoon ya.			1														
Racoon im.			1	1					1					1			
Beaver ad.	1		1	1				1									
Beaver im.				1													
Marten		1		1													
Bear ad.			1											1	1		
Bear im.				1													
Microtus								1						1			
Mink														1			
Domestic Cat ad.									1								1
Domestic Cat ya.									1								
Domestic Cat im.									1					1			
Domestic Pig									1								
Total	5	5	20	13	4	10	5	9	14	9	6	8	1	13	6	5	4

TABLE 14
(continued)

	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17
<u>SEA MAMMALS</u>																	
Harbour Seal ad.	1	1	3	3		1	1	1	1	1	1	1	1	1	1	1	1
Harbour Seal ya.			2			1											
Harbour Seal im.			4	2		1	1	1	1		1			1			1
Northern Sea Lion ad.	1	1	1	1	1	1		1	1	1	1	1				1	
Northern Sea Lion ya.			1														
Northern Sea Lion im.			1	1				1								1	
Harbour Porpoise ad.	1	1	1	1			1	1									1
Harbour Porpoise ya..																	
Harbour Porpoise im.			1	1													1
<u>Delphinidae</u>						1							1				
Total	3	3	14	9	1	5	3	5	3	2	3	2	2	2	1	3	4

TABLE 14
(continued)

	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17
<u>BIRDS</u>																	
Common Loon	1	1	2	2		1	1		1			1		1	1		
Arctic Loon	1	1	7	2		2	1	2	1		1	1		1	1	1	1
Western Grebe				2			1	1	1	1	1	3		2	1	1	
Double-Crested Cormorant	1		3	2		1	1	1				1		1	1		
Pelagic Cormorant	1	1	6	1		1	1	1	1	2				1		1	
Whistling Swan			1	1													1
Canada Goose		1	2	2	1	1	2	1	2	1		1		1		1	
White-Fronted Goose			1	1			1	1	1			1		1			
Mallard			1				1	1	1			1				1	
Gadwall			1	1		1	1	1	1	1	1	2		3	1	1	1
Pintail	2	1	4	1		1	1	1	2			2	1	3	1	1	
Ring-Necked Duck			3	1		2	2	1	1	1		3		3	1	1	
Oldsquaw			1						1	1		1		1	1		
White-Winged Scoter			1	1		2	1	1	2		1	1		2	1	1	1
Surf Scoter			4	2	1	1	1	3	1	1	1	1		2		1	1
Bald Eagle						1			1			1		1			
Red-Tailed Hawk			1			1											
Ptarmigan				1		1	1	1	1	2		1		5	1	1	
Glaucous-Winged Gull		1	4	3	1	2	2		4	1	1	2		5	1	1	1
Black-Legged Kittiwake			3			1	1	1	1	3				1	1		1
Bonaparte Gull		1	1			1	1	1	1	1		2		1		1	2

TABLE 14
(continued)

	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17
Common Murre	1	1	7	3	1	2	2	2	2	1	1	2	1	2		1	
Common Raven							1	1									
Common Crow			2	1		1	1	1	1	1		1		1			
Thrush			1														
Auklet			1						1					1			
Rough-Legged Hawk			1		1												
Blue Grouse			1											1			
Fulmar						1?										1	
Shearwater						1?		1?	1?		1?						
Heermann Gull						1?	1?			1?				1?			
Ruffed Grouse							1					1		1		1	
Flicker														1			
Screech Owl								1						1			
Tern									1								
Pigeon Hawk										1							
Black-Necked Grebe			1							1		1					
Sharp-Shinned Eagle														1			
Total	7	8	60	27	5	26	26	24	30	20	8	30	2	45	12	16	10

REPTILE

	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17
Turtle			1					1									

All species discussed above are, in general, typical to the Gulf Islands, either as permanent residents or as "visitors". However, the presence of turtle (possibly Western Painted), as represented by 2 carapace portions in assemblage 3 and 1 femur in assemblage 8 is anomalous. Turtle has never been reported for the Gulf Islands, in the archaeological literature, ethnographies, or modern ecological studies. It is reported, however, for the mainland, at the Crescent Beach site (DgRr 1), Boundary Bay, where one piece of worked carapace was recovered in a level associated with the Marpole Phase (Percy 1974). The Western Painted Turtle is nowadays found in the Okanagan and Thompson valleys, from Osoyoos to Genier Lake, Shuswap Lake, from the International Border to Golden, at Pender Harbour (lower mainland), Texada Island (Priest Lake) and in Patterson Lake and other lakes near the Great Central Lake on Vancouver Island (Carl 1960:48). Carl believes that the turtles found at Patterson Lake and other lakes near the Great Central Lake are indigenous.
At DfRu 8 the percentage of turtle bones is so minimal that it is impossible to infer its natural presence on the island; they may be trade or gift items.

Seasonality was established on the basis of the "potentially pure assemblages" since they provided the necessary chronological control. For this, every level of every excavation unit within assemblages 1, 3, 5, 6, 12, and 14 was considered. Information on seasonality was then extracted from present-day ecological studies and ethnographies (details found in Chapter 2).

Determination of seasonality on the Pacific Coast is problematic because of the relatively long presence of animals which are normally present in other parts of the country for short seasons only. Most birds, except for the ones seen year-round, are found on the coast from fall to late winter-early spring (and sometimes even late spring). This is due to the coast's unique climatic position, offering the migrating birds the ideal setting for wintering. Sea lions also migrate from California or Alaska to the southern coast for winter, and are found there from September-October to the end of winter. The only two animals found at DfRu 8 specific to <u>one</u> season are the fawn and the seal pup, both occurring during the summer months.

In Assemblage 1, only one level of one excavation unit revealed a possible summer occupation with the left pubis of a fawn, while the rest of the season-specific species represent a fall, winter, to mid-spring occupation. The general trend in assemblage 3 is a fall, winter, early spring occupation with the exception of one excavation unit with 2 separate levels, one containing a distal portion of the left femur of a fawn, the other with a left and right tibia and a left and right fibula of a baby seal, and a second excavation unit with one level containing a right humerus of a baby seal. Assemblage 5 reveals a fall-winter occupation, with one species of duck found until mid-spring. Assemblage 6 offers very few exceptions to its fall, winter, early spring occupation; the possible presence of a shearwater in two levels of two separate excavation units might mean a summer occupation, but some nonbreeding individuals may be seen any time during the year. Also in 2 distinctive levels of two separate excavation units are found bones from the Heermann Gull which appears on the southern coast of British Columbia from mid-summer to late fall. In one of the same levels of the same excavation unit as the Heermann Gull is found a distal portion of the right tibia of a fawn. Assemblage 12 shows a general fall, winter, to possibly early spring occupation, except for the presence of 3 cervical vertebrae of a fawn in one level of one excavation unit. Assemblage 14 also demonstrates a general fall, winter up to possibly early-to-mid-spring occupation with the exception of one Heermann Gull bone and one fawn bone.

Ethnographically it is reported that birds were caught in fall and winter and possibly early spring (Stern 1969 and Suttles 1951). About their uses, Suttles reports:

> Waterfowl were used for flesh, fat and feathers. Since they were obtainable in the winter they were often served at feasts and taken as gifts. When a hunter got a good lot of ducks he gave two or three to every member of the community. They were usually eaten immediately but could be preserved by cooking (roasting?), then drying outside over a little fire to keep the flies away....Women...mixed the down with nettle fiber twine to make a textile used for shirts and robes (Suttles 1951:80).

Suttles also reports that the major hunting activity for deer was around June for their winter supply, and in December for immediate use (1951:82-83). The same rule is applicable to Elk.

The scanty but definite presence of fawn and/or seal pup bones in all assemblages except 5 indicates a summer occupation or at least a summer utilization of the Helen Point site. Admittedly, the number of summer-time indicators per assemblage is limited but this may be explained by two factors.

First, these are the only two definite summer indicators and consequently will always be in a minority in the total faunal list. Second, they may not have been exploited heavily because of the relatively small amount of meat they yield. Unfortunately, there is no ethnographic data on the exploitation of fawns and seal pups.

This chapter has provided a summary of the prehistory of the Gulf Islands, including Mayne Island. The stratigraphic and artifactual record of Helen Point serves as a framework for the analysis of the faunal collection; the six potentially pure assemblages are of particular use for the interpretation of subsistence patterns through time.

CHAPTER 4

PATTERNS AND TRENDS IN RESOURCE UTILIZATION

This chapter will explore the significance of the Mayne Island material when compared with faunal sequences from other coastal sites, and will attempt to define patterns and trends of resource utilization for the coast. Pattern implies a certain arrangement of things, or model, that can be seen in a number of instances. Trend implies a visible and relatively stable change through time in one direction; if like trends occur in a number of instances, they constitute a diachronic pattern.

At Helen Point, the Mayne Phase dating from 3,500 - 1,000 B.C. (or 5,450-2,950 B.P.), subdivisable into early and late phases, shows a subsistence based primarily on land resources, followed by fish, then bird, then finally sea mammals. Table 15 shows the percentage of occurrence of different classes of faunal remains in Mayne Phase deposits, where N=sample size, L.M.=land mammal, and S.M.=sea mammal.

TABLE 15

	L.M.	S.M.	BIRD	FISH	TOTAL N
Ass. 1: Early Mayne =3,500-2,000 BC	74% (N=479)	5% (N=30)	15% (N=97)	6% (N=40)	646
Ass. 3: Late Mayne =2,000-1,000 BC	55% (N=325)	5% (N=37)	15% (N=43)	25% (N=25)	420
Ass. 2&4: Early & Late Mayne=3,500-1,000 BC	68% (N=1940)	6% (N=173)	12% (N=323)	14% (N=415)	2851

(It is to be noted that for comparisons between assemblages to determine subsistence change through time, each assemblage is assumed to be an equally reliable representation, although the sample sizes are very different. This assumption is open to criticism, but no other course of action seems possible).

The Mayne Phase spans about one half of the occupation period of the site, and one would expect the trends shown by comparisons between phases to show up within the Mayne Phase itself. The substantial decrease in land mammal use, and an increase of fish use through time within the Mayne Phase bears out this expectation. The average Mayne Phase subsistence pattern, computed from Assemblages 2 and 4 does, as one would expect, fall between the extreme values of Assemblages 1 and 3, representing early and late subdivisions respectively.

A year-round utilization of the site was found to exist for the period of the Mayne Phase.

The Middle Period, dating from ca. 200 B.C. - A.D. 800 has, on the average, a subsistence based on fish resources, followed by land mammal, then bird and sea mammal. Assemblages 5 and 6 making up this period fall in the same time period between Mayne and San Juan phases, but are not continuous with what has been previously defined as the Marpole phase (Carlson 1975:Pers. Comm.). Assemblage 7, having a long time span, also covers the Middle Period in the site's history. Thus Assemblages 5 and 6 were combined and then compared to 7:

TABLE 16

	L.M.	S.M.	BIRD	FISH	TOTAL N
Ass. 5 & 6 = 200 BC - AD 800	40% (N=830)	2% (N=49)	8% (N=158)	50% (N=1035)	2072
Ass. 7 = 1,000 BC - AD 800	35% (N=350)	1% (N=151)	9% (N=101)	55% (N=552)	1018

Although the subsistence patterns indicated by assemblages 5 and 6 fall within the subsistence trends suggested by inter-phase analysis, assemblage 7 is anomalous. It has more early material than 5 and 6, but the land mammal percentage is lower than the trend pattern would suggest, and the fish percentage is higher. This difference is no more than 5%, and may be due to sampling error. A fall-winter-early spring site utilization was found to exist for the Middle Period (although 1 fawn bone in one level of one excavation unit suggests summer exploitation).

For the Late Period, dating from 800 - 1,850 A.D., the fish remains form the bulk of the fauna recovered, followed by the land mammal, then the bird and finally the sea mammal. For the percentage distribution of animal bones per class, see Table 12. It is to be noted that in Table 12, Assemblages 12, 13, and 14 appear twice. They are first used to create the overall Late Period estimates, but also represent shorter time periods and so are treated separately as well. Assemblages 12 and 13 are part of an unnamed phase between the Marpole and San Juan phases. Assemblage 14 is the only good sample which is actually coeval with the San Juan Phase (Carlson 1975:Pers. Comm.).

A possible year-round utilization seems to exist for the Late Period. Suttles notes only winter villages for Mayne Island (see Chapter 2). Even though Mayne Island might have been occupied continuously in winter only, it was certainly visited during other seasons as demonstrated by the faunal material recovered from Helen Point.

From the Mayne Island faunal material, there is a clear indication of a substantial decrease in the land mammal bones through time with an increase in fish. Sea mammal bones and bird bones also showed a decrease through time. These changes cannot be explained by one simple principle. There might have been a decline in the presence of mammals through time due to environmental change during the site's occupancy (but this has not been documented) or human disturbance of animal ranges. Also, a possible increase in the presence of fish, perhaps for the reasons stated by Fladmark (1974), would result in a shift in subsistence activities, with people following the path of minimum subsistence effort of surest reward. Fladmark states that efficient salmon runs depend upon 2 major factors: 1) the condition of the stream run-off and 2) the water temperature. Considering the Pleistocene glacial and drainage conditions, and the subsequent stabilization of stream gradients, Fladmark believes that climax productivity of most salmon populations was not achieved until at least 3,000 B.C.:

> ...peak sockeye and coho productivity could not have been achieved until major drainage systems developed stable run -off and sedimentation patterns...late glacial and early postglacial drainage systems would have been unsuitable for high salmon productivity (Fladmark 1974:198-99).

However, another point to consider is that a change in faunal deposits does not necessarily imply a change in faunal composition within the biological system; it might be due to a shift in hunting technique or simply food preference, settlement pattern, or differential sampling.

For comparison with the Helen Point material, and in order to determine patterns of inter-site variability in animal utilization, faunal works on other coastal archaeological sites are examined below.

Conover (1972) investigated five middens in the Bella Bella region (Kwakiutl territory): Namu Harbour, Kisameet Bay, Roscoe Inlet, Kwakume Inlet and Joassa Channel. All revealed a similar pattern: "...an intensive aboriginal interaction with the estuarine environment of the forest/ littoral interface at which they are located" (Conover 1972:10). Conover established three major periods of site utilization corresponding to stratified shell sequences: 1) <u>at 2,590 B.C. or before</u> - the initiation of shell deposition (all previous deposition, from 7,190 B.C., is non-shell), 2) <u>at 930 B.C.</u> - a peak in shell deposition, maintained until about A.D. 150, 3) <u>at A.D. 970</u> - a low shell content with thin strata.

The faunal remains of two middens, Namu and Kisameet, were analyzed: mammals by Dr. Charles Repenning, birds by Dr. Howard Savage, and fish by Dr. Charles Gruchy. In Conover's dissertation, only the mammals from Namu and part of Kisameet, and birds of Kisameet were included. The sample size was small for coastal middens. During the three seasons spent at Namu 1,800 specimens of all mammal bones were identified to at least family level; one excavation unit at Kisameet yielded 112 mammal specimens identified to family, genus or species. At Namu, land mammal remains outnumbered sea mammal remains five to one and at Kisameet, two to one. At Namu, cervids and phocids were represented throughout the site history, canids from the earliest deposits to about A.D. 1,270 and the delphinids from the earliest deposits to about A.D. 1,470. Sea otter and mink were also present for most of the site occupation. At Kisameet, cervids, phocids, sea otters and delphinids predominated, with only cervids present throughout the site history (that is, 3,000 years) (Conover 1971:154). The small collection recovered at Roscoe Inlet showed a predominance of cervids, followed by canids, whereas at Joassa Channel, a more "seaward midden", otariids dominated and at Kwakume Inlet sea otters outnumbered other species.

According to Conover (1971:283), the major trends shown from faunal remains are as follows: 1) at Namu, for the period 2,590 B.C. - Present, there is a "steady increase in predominance of beach dwelling clams (Saxidomus and Schizothaerus) over rock-dwellers Thais and barnacle" with the same trend seen at Kisameet over the 3,000 years of occupation; 2) at Namu there is a steady increase in the "predominance of marine fauna over forest fauna in terms of numbers of species exploited". However, the pattern suggested by her pie diagrams (Conover 1971:261-64) seems to be a gradual increase in coastal forest exploitation until the very last period where there is a decrease, and a gradual decrease in coast littoral exploitation, until again, the last period, where there is an increase, as shown below:

		Habitat Exploited (%)		
Time	Location	Coastal Forest	Coast Littoral	Mt. Range
7,190-2,590 BC	Namu	73	27	
2,590-930 BC		81	19	
930 BC-AD 970		89	11	
AD 970-Present		55	45	
50 BC-AD 90	Kisameet	65	29	5

The mammalian remains from the Boardwalk site (GbTo 31) on Digby Island, Prince Rupert Harbour and the Yuquot site on the west coast of Vancouver Island were analyzed by Dr. Howard Savage. The former site, in Tsimshian territory, was excavated by Dr. George Macdonald (1969-70) and dates back to 1,610 B.C.; the latter site, in Nootka territory, was excavated by Dr. William Folan and dates back to 2,280 B.C.

According to Dr. Savage (1973:2) the major land mammal used by the Tsimshians was the deer, and the major sea mammal was sea otter; seals, porpoises, and whales were also exploited but on a much smaller scale. At Yuquot, deer was also the predominant land mammal, but seals, porpoises, and larger whales were the main sea mammals exploited; sea otter were "uncommon". The main trend at Prince Rupert seems to be a predominance of land mammals in the lower levels as opposed to sea mammals for the upper levels. At Yuquot, there is an equal amount of sea and land mammals in the lower levels, giving way to an increase in sea mammals for the upper levels. The relative proportions of land and sea mammals bones by zones are given below:

Boardwalk Site

	% L.M.	% S.M.
Levels 1-4 (482 M. bones)	40%	60%
Levels 5-8 (638 M. bones)	44%	56%
Levels 9-14 (279 M. bones)	59%	41%

Yuquot Site

	% L.M.	% S.M.
Levels (1-8) (833 M. bones)	30%	70%
Levels (9-16) (791 M. bones)	41%	59%
Levels (17-28) (454 M. bones)	49%	51%

(see Savage 1973: Table II)

Savage offers three explanations for the increase in sea mammal exploitation through time (Savage 1973:3):
1) increase in number of people exploiting sea mammals, either due to an increase in the number of people or preference,
2) increase in the number of sea mammals around these villages in the later periods or a greater amount of land mammals during early occupation, and 3) better hunting methods or better equipment for the specific activity.

Edward I. Friedman and Carl E. Gustafson, in a paper given at the 1975 Canadian Archaeological Conference, describe the distribution and aboriginal use of Pinnipedia using the following sites: 1) Seal Rock, west coast of Oregon (Yaquina territory and dated between A.D. 950 and 1,450), 2) Netarts Bay, west coast of Oregon (dated from A.D. 1,350-1,600), 3) Martin site, Willapa Bay, west coast of Washington (Chinook territory and dated at around A.D. 1,080), 4) Minard site, Grays Harbour (Lower Chehalis territory and dated at about A.D. 870), 5) Toleak Point, west coast of Washington (Quileute territory and dated "protohistoric"), 6) Makah complex including sites such as Ozette, Sooes, Neah, Warmhouse, Archawat and Tatoosh, on the west coast of Washington (all in Makah territory and dated from 50 B.C. to historic time), 7) Yuquot, 8) Namu, and 9) Boardwalk site (the last three sites reported above).

Gustafson (1968) mentions that for the last 2,000 years, the exploitation of fur seals at Ozette has undergone very little change. Of the 80,000 mammal bones recovered from the 1966-67 excavations, 90% of them were from marine mammals, and almost 80% of them from one species: the Northern Fur Seal (Callorhinus ursinus). Friedman and Gustafson (1975:11) agree that through time, "the stability...recognized at Ozette is duplicated at other Makah sites excavated to date" and offer the following figures showing the "percent of pinniped bones in total sample of mammal bones from the Makah Complex sites":

	Ozette	Sooes	Archawat	Tatoosh
Fur Seal	79.6%	52.0%	65.2%	79.5%
Sea Lion	6.7	0.0	0.0	3.5
Harbour Seal	1.6	3.4	6.5	3.8
California Sea Lion	0.0	0.0	0.0	0.0
Elephant Seal	1.1	0.2	0.0	0.8
Land Mammals	11.0	44.4	28.3	12.4
Total	100.0%	100.0%	100.0%	100.0%

(see Friedman and Gustafson 1975:12 - Table 4)

Friedman and Gustafson conclude by suggesting that only the Makah Complex shows a continued exploitation of deep-sea economy, as exemplified by the fur seal remains. They add that even though sea mammal exploitation dates as far back as 9,000 years, as seen from Namu, it does not reveal an "ocean-going economy", since harbour seals and sea lions can be caught in harbours and inlets, and on rocks and land. The percentage of fur seal bones recovered at the Makah Complex sites was 80.0%, at Yuquot, 10.0%, at Namu, 2.7%, and at the Boardwalk site, 0.06%.

At Namu, using Conover's pie diagrams, we see that there is an increase in coastal forest exploitation through time, except for the last period, and a decrease in coastal littoral exploitation until the last period where there is an increase. As far as numbers of species exploited, Conover notes that there is an increase of marine fauna over forest fauna through time. For the Boardwalk site and the Yuquot site, Savage remarks that there is an increase in sea mammal use throughout the sites' occupation. For the Makah area, Friedman and Gustafson notice an early and continuous exploitation of sea mammals, as exemplified by the Northern Fur Seal and see that as a true representation of deep sea economy, as opposed to littoral exploitation for Namu and Prince Rupert. (At the time of migration, the Northern Fur Seal follows the 100 fathoms line--the continental slope--where food is more abundant). The inhabitants of the Yuquot, Prince Rupert and Namu sites did exploit the Northern Fur Seal, but on a smaller scale than the Makah Complex sites. Larger whales were also exploited at Yuquot (18% of the total mammal bones recovered). No data on fish remains are presented for the sites discussed above.

It is obvious that on one level, inter-site comparisons cannot be made since the specific ecological setting of one site will affect the kind of animals present and exploited by the autochthons. Thus variations in species present in the sites will be a function of both the species locally available for exploitation and of cultural factors. However, comparisons can be made between sites for the patterns of change which occur within each site's time span.

If one looks at the trends through time, two patterns of development emerge in fauna exploitation. In some sites, such as the ones from the Makah complex, deep-sea exploitation seems to be constant throughout the sites' relatively shallower occupation; that is, from about 50 B.C. to present, with no evidence of prior adaptation to that exploitation system within those sites. At the other sites, all having deeper time depths of up to 9,000 years, a pattern of shift through time from land mammal exploitation to riverine/ littoral exploitation, utilizing either sea mammal, or fish, or shell resources--or a combination of these--is evident. Mayne Island fits into this last developmental pattern.

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APPENDIX I

The shells recovered at DfRu 8 are as follows:

Butter Clam: Saxidomus giganteus

Native or Pacific Littleneck: Protothaca staminea

Horse Clam: Acmaea pelta

Basket Cockle: Clinocardium nuttallii

Edible Mussel: Mytilus edulis

Wrinkled Purple: Thais lamellosa

Short-Spired Purple: Thais emarginata

Leafy Hornmouth: Ceratostoma foliata

Shield Limpet: Acmaea pelta

Plate Limpet: Acmaea testudinalis scutum

Whitecap Limpet: Acmaea mitra

Barnacle: Balanus sp.

Rock Scallop: Hinnites giganteus

Black Katy: Katherina tunicata

Giant or Gumboot Chiton: Cryptochiton stelleri

Since only a small sample was collected from each level, no quantitative analysis was attempted. However, based on their provenience, the sample shells were assigned to specific assemblages. Field notes were consulted in order to obtain information on the relative abundance of shell in each excavation unit.

No shells were recovered from Assemblage 1 while only a few Littleneck clams were found in Assemblage 2. As a whole, the shell content in Assemblage 3 is low, even though there are lenses of highly compact and fragmented shell. The Assemblage 3 species recovered were: Edible Mussel, Wrinkled Purple, Native Littleneck, Butter Clam, Horse Clam, barnacle and Basket Cockle. In Assemblage 4, the shell content is still relatively low with some areas of burnt fragmented shells. The sample collected from this assemblage included: Horse Clam, Basket Cockle, Native Littleneck, barnacle, Wrinkled Purple, and Butter Clam; chiton and sea urchin were mentioned in the field notes. The shell content in Assemblage 5 is reported to be sparse with areas of concentrated crushed and fragmented shells. Wrinkled Purple, Native Littleneck, barnacle, Butter Clam, Basket Cockle, and Edible Mussel constituted the sample for this assemblage.

Assemblage 6 and 7 are made up of areas of little or no shell content, including patches of highly fragmented shells. Assemblage 6 yielded: Shield Limpet, Butter Clam, Native Littleneck, barnacle, Horse Clam, Basket Cockle, land snail, and Wrinkled Purple (mussel is reported in the field notes) while Assemblage 7 yielded only Butter Clam, Wrinkled Purple, Rock Scallop and Native Littleneck.

Wrinkled Purple, Horse Clam, Native Littleneck, Butter Clam, Basket Cockle, Short-Spired Purple, Shield Limpet, barnacle, and Mytilidae sp. were recovered from Assemblage 8. In general, the shell occurrence is very low with areas reported as being devoid of shell or as having only finely ground shell fragments.

Assemblage 9 has high and low shell deposits, but shells are reported for every level making up this assemblage. The Native Littleneck seems to form the bulk of this assemblage, followed by Butter Clam, Horse Clam, barnacle, Wrinkled Purple, Shield Limpet, Short-Spired Purple, Basket Cockle, Edible Mussel, land snail, Leafy Hornmouth, Whitecap Limpet, and sea urchin.

The shell content in Assemblage 10 is reported as being low, with the Native Littleneck as the most frequently re-occurring species. Also present were: Butter Clam, Shield Limpet, Horse Clam, Wrinkled Purple, Basket Cockle, barnacle, and Mytilidae sp.; snail was noted in the field.

Assemblages 11 and 12 display an identical pattern; shell deposits are very low, sparse and highly fragmented. Assemblage 11 yielded Horse Clam, Shield Limpet, Butter Clam, Native Littleneck, Basket Cockle, barnacle, Wrinkled Purple, sea urchin and mussel (the latter two being reported in the field notes only). In addition to these species, Assemblage 12 had Short-Spired Purple and land snail.

Only the field notes were used to obtain the following list of shells present in Assemblage 13: Horse Clam, cockle, Butter Clam, Native Littleneck, whelk, limpet, barnacle, mussel, scallop and "sea snail".

Shells are reported for all levels making up Assemblage 14, ranging in intensity from moderate to high. Some areas are described as being "solid shell" or showing "heavy concentrations of compressed shell fragments". There were also patches of calcined shells. The various species were: Wrinkled Purple, Butter Clam, Horse Clam, barnacle, Native Littleneck, Basket Cockle, Rock Scallop, Shield Limpet, Short-Spired Purple, Edible Mussel, land snail, and sea urchin; noted in the field were: chiton, gastropod, moon snail, and oyster drill.

Assemblage 15 yielded the same species as Assemblage 14, except for Rock Scallop, land snail, and moon snail. However, there is very little shell throughout the various levels and only small areas of concentrated fragmented shell are reported.

There is a mixture of whole and fragmented shells, including patches of highly fragmented burnt shells in Assemblage 16. Barnacle, Native Littleneck, Butter Clam, and Edible Mussel seem to form the bulk of this level, followed by Wrinkled Purple, Plate Limpet, Shield Limpet, Horse Clam, Basket Cockle, Black Katy, Giant or Gumboot Chiton, sea urchin, and land snail; oyster and razor clams are reported in the field notes.

Assemblage 17 is composed of large quantities of Littleneck Clams and Edible Mussel, plus Butter Clam, Horse Clam, barnacle, Wrinkled Purple, Basket Cockle, Shield Limpet, sea urchin and land snail.

The following table summarizes the species of shellfish present per assemblage for the Helen Point site.

TABLE 17

Species	Assemblages																
	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17
Butter Clam			X	X	X	X	X	X	X	X	X	X	X	X	X	X	X
Native Littleneck		X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X
Horse Clam			X	X		X		X	X	X	X	X	X	X	X	X	X
Basket Cockle			X	X	X	X		X	X	X	X	X	x	X	X	X	X
Edible Mussel			X		X	X			X					X	X	X	X
Wrinkled Purple			X	X	X	X	X	X	X	X	X	X		X	X	X	X
Short-Spired Purple								X	X			X		X	X		
Leafy Hornmouth									X								
Shield Limpet						X		X	X	X	X	X		X	X	X	X
Plate Limpet																X	
Whitecap Limpet									X								
Barnacle			X	X	X	X		X	X	X	X	X	X	X	X	X	X
Rock Scallop							X						x	X			
Black Katy																X	
Giant Chiton																X	
Chiton sp.				X										X	X		
Sea Urchin				X					X		X	X		X	X	X	X
Whelk sp.													X				
Land Snail						X			X	X		X		X		X	X
Mytilidae sp.								X		X	X	X	X				
Oyster Drill														X	X		
Moon Snail														X			
Limpet													X				

The paucity of shell remains in the Mayne Phase deposits is a significant archaeological problem. Although the shell remains might have been destroyed by soil condition, I think that it is more reasonable to assume that a true lack or paucity of shell did exist in deposits prior to 3,500 B.C.. It is possible that local shellfish beds were not well developed prior to that time, but if this is so, then an extra-cultural explanation is necessary for the beginning of abundant shell in archaeological sites. The possibility cannot be ignored, and research should be done on this problem. However, this thesis proceeds on the assumption that shellfish was present, and that cultural factors determined the beginning of its large-scale use. The presence of shell exploitation contemporaneous with the Mayne Phase at the Glenrose site (Matson 1975) tends to confirm this assumption.

Fladmark (1974) has suggested that it was the climax development of the salmon runs which allowed major winter concentrations of people, who exploited shellfish to supplement their diet, thus developing shell accumulations. But if there were a winter occupation of DfRu 8 prior to climax salmon runs, based on less productive land resources, why would not shellfish gathering have been used to supplement the diet? This requires no maritime technology at all.

Perhaps increase in shell is evidence of a shift in food preference, or the breakdown of a food taboo. Although we could see the effects of such value shifts archaeologically, we would not be in a position to explain them. More information on sites of the 7,000 - 3,500 B.C. period is needed.

APPENDIX II

To check the previous analysis by percentages, an analysis using the minimum number of individuals was done. However, the great variation in the volume of excavated material belonging to each period is a problem, for large excavated volumes may be expected to yield a higher absolute minimum number of individuals than low excavated volumes, subsistence changes aside. To surmount this problem, the total minimum number of individuals per class per period was divided by the total volume of excavated material representing each period, giving an average value per cubic meter which is directly comparable for the various time periods. As it was not possible to calculate the minimum number of individuals for the fish class, the values are expressed as the average number of bones per cubic meter per period, for comparison with the other animal classes. The results are presented below:

TABLE 18

Minimum Number of Individuals (Land Mammal, Sea Mammal, Bird) or Average Bone Density (Fish) Values per Cubic Meter by Animal Class and Period

Period	Land Mammal	Sea Mammal	Bird	Fish
Mayne	.86	.58	2.02	35.22
Middle	.57	.27	1.72	47.80
Unnamed	.50	.22	1.78	32.11
Late	.56	.15	1.60	61.73
San Juan	.47	.07	1.63	123.48

These figures can then be compared with the percentage analysis results, although the comparison of the figures can only be done on the basis of internal patterns, rather than absolute values. It can be seen that the general pattern of subsistence change shown by each type of calculation is the same, although there are minor discordances. In the Land Mammal class, the Minimum Number of Individuals analysis suggests slight Late Period increase in land exploitation over the Unnamed period, but the value drops again to an overall minimum in the San Juan period. The Sea Mammal pattern of decreasing through time is exactly the same in both tables. In the Bird class, similar fluctuating patterns are seen, except that the Minimum Number of Individuals analysis suggests a slight increase rather than a decrease in exploitation, in the San Juan period. In the Fish class, the Minimum Number of Individuals analysis suggests a reduction in exploitation during the Unnamed period, but the pattern of substantial increase from early to late is evident in both analyses. Thus, the general nature of subsistence change shown by the two modes of analysis is similar, but the minimum number of individuals analyses shows more frequent minor fluctuations. With the present data it is not possible to decide which of the two systems of analysis is the better. That the two types of analysis are broadly similar seems significant.