DEPARTMENT OF ARCHAEOLOGY
SIMON FRASER UNIVERSITY
PUBLICATION NUMBER 3

CURRENT RESEARCH REPORTS

EDITED BY
ROY L. CARLSON

DEPARTMENT OF ARCHAEOLOGY
SIMON FRASER UNIVERSITY
BURNABY, BRITISH COLUMBIA, 1976

DEPARTMENT OF ARCHAEOLOGY

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PREFACE

This volume contains thirteen articles which reflect current research interests of faculty and graduate students in the Department of Archaeology, and an introductory guest article by Michael Stanislawski, Weatherford Fellow of the School of American Research in Santa Fe, New Mexico.

We are fortunate to have the article by Dr. Stanislawsky which emphasizes the importance of Ethno-archaeology. It has become increasingly clear that anthropologists generally do not collect the kinds and types of ethnographic information necessary for the inferences and analogies of modern archaeology, and that archaeologists themselves must design and undertake research problems directed toward satisfying this need. Dr. Stanislawsky is a pioneer in this newly developing field of Ethno-archaeology.

The majority of the other articles are concerned with archaeology in British Columbia, but reports on work in Quebec, New Brunswick, and Montana are also included. These contributions range from survey to excavation, from historic to pre-historic archaeology, and from culture history to method and theory. Some are preliminary, whereas others are final reports.

Archaeology in British Columbia is hopefully entering a new era, the era of publication. Far too much of the prehistory of the province has been compounded on the basis of published conclusions of field research which cannot be critically evaluated because the substantive data on which they are based remain unpublished. With the number of agencies now publishing preliminary and final reports, we may soon be able to discard outmoded concepts and ideas and with the presentation of new and more complete data, move forward to better understanding and explanation of the past.

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FIGURES

The Relationship of Ethno-archeology, Traditional, and Systems Archeology

MICHAEL B. STANISLAWSKI

Introduction

All archeologists use explanatory models in their work, and these are at least partially based on analogy. Many archeologists now think that the study of sounder methods of development of such models is the basic imperative of our field (e.g. Clarke 1973; Deetz 1970:121-2; Neustupny 1971; Tuggle et. al. 1972). In speaking of such explanatory models, the British archeologist D.L. Clarke believes that we do not yet have " . . . the appropriate procedures for judging and testing their accuracy, relevance, and logical adequacy . . . " (1973:15). Most important as regards our ethno-archeological emphasis in this paper, Clarke suggests that in any archeological theory model we must emphasize: a) the range of activities and social and environmental processes which once existed in a specific time and area; b) the way in which human and natural activities resulted in certain types of site deposition, re-use, erosion, and change; c) the survey sample and how it is recovered; d) the way the sample is analyzed; and e) the way that archeologists establish models or experiments by way of making analogies.

A start was made by Thompson in 1958 who discussed the nature of inference (Thompson 1958); and Ascher (1961), Binford (1967), Dozier (1970); Gould (1973) and Stanislawski (1973b) among others have also discussed some of the problems in forming analogy models and drawing inferences between present and past social systems, institutions of culture, and groups. The vital point is that in *all* stages of our work from description of the data to explanation we do use models, and often historical-functional models: "Describing the finds one already needs some understanding of their human function . . . One chooses the properties worth studying on the basis of one's previous knowledge of the subject. Those who reject the idea and cling to the fallacy of 'full objectivity' built an uncontrollable amount of subjectivity into the very foundations of their further theories" (Neustupny 1971: 36-7).

Theory

Such fields as ethnography and ethnohistory seem to me to give us the most complete and most non-ethnocentric sources of information for explanation of archeologically observed clusters of artifacts and their correlations with social structure units. Mathematical, scale model, or general systems models may also be used in some circumstances, but they too depend on factual data and analogy in the beginning (e.g. Williams 1971). If we can find all the information we need to reconstruct culture from the artifacts preserved for us in the ground, as modern systems archeologists often state (Binford 1968a), I believe we must still use data derived from the study of living peoples and their sites to suggest humanistic cultural explanations as to the meaning of the artifacts and their functions. This is as important a prob-

lem for social scientists as is the understanding of general systems.

In any case we must compare the fit of the explanatory model we select against the specific individual archeological situation. In the long run, we must all use some form of analogy in our explanatory models, and we will thus probably give some sort of general functional, or at least causal, explanation of the observed relationships (e.g. Hill 1970: 56 n.l; Johnson 1972: 370-1; Fritz and Plog 1970: 406-7; Longacre 1970: 3, 35; Watson et. al. 1971: 6). Most such explanations will have historical implications, too; for in the long run the explanation of a single site must include historical information as well as general cultural propositions. As Deetz, and Spaulding, and Trigger have said, there is really no important separation of history and archeology in the work of men in either the systems or traditional archeology schools (Deetz 1970: 115; Spaulding 1968; Trigger 1970). At the most it is a matter of different emphasis or different levels of goals at a particular moment in time for each scholar. We are all potentially working toward the same ends: " . . . (historians) seek to employ rules to gain an understanding of individual (i.e. unique and non-recurrent) situations . . . Because the aim is to explain a particular situation in all of its complexity, not only does the application of such rules serve as a test of theory but, because a variety of different bodies of theory may have to be applied in conjunction with one another, historical interpretation serves as an inter-disciplinary arena in which the explanatory power of different theoretical approaches may be ascertained" (Trigger 1970: 30-1). Thus Trigger (1970: 35), Deetz (1970: 121-2); Binford (1972: 19), Gould (1973), Neustupny (1971), and myself, among others, seem to agree that to understand cultural processes and the structure and function of pre-historic societies, the information is best derived from the study of living societies and not the archeological record *alone*.

Ethno-archeology

It is in this field of ethno-archeology (a term used as early as 1900 by J.W. Fewkes (1900: 579), that we may again see some of the most interesting work in archeology in the next decades. Early scholars, such as Jesse Walter Fewkes, were forced to do ethno-archeology as well as field archeology in order to try to put order and understanding into their striking and unique new data. In the present day, the new emphasis on explanation and the reconstruction of institutions of culture and cultural processes has brought back a new realization of the need for data concerning the relationships of man, tools, social groups and other aspects of the cultural system. An increasing number of archeologists are doing ethno-archeological field work in many world areas. Within the last decade, Lewis Binford, and others, were involved with work going on in the American Arctic (Campbell 1968); Canada (Bonnichsen 1973); the U.S. (Longacre and Ayers 1968; Stanislawski 1969a; 1969b; 1969c; 1973a; 1973b); Mesoamerica (Arnold 1971; Ascher 1962; 1968; Friedrich 1970; Lange and Rydberg 1972; Thompson 1958); South America (Arnold 1970; Donnan 1971); and in some quantity in Australia and New Guinea (Gould 1968a; 1968b; 1971; Petersen 1968; White 1967; Lauer 1971); and in Africa (David 1971; David and Hennig 1972; Yellen and Harpending 1972). This is but a sample of the published material available, and in the field of ceramic studies, in particular, there are many others (e.g. see Matson 1965; and Nicklin 1971; for reviews of books or articles on this subject.)

Major questions asked in such publications as these concern: 1) the manufacture, distribution, use, meaning and function of artifacts; 2) development of the archeological site and its stratigraphic problems; 3) house construction, re-building, and re-use; 4) cognition studies, including typology and its differential meaning to the native worker and the archeologist; 5) meaning of and possible correlations of artifacts, architecture and settlement patterns and social structural units such as those of descent, residence, sodality, age, sex, rank-status-class, etc.; 6) innovations and change in artifacts and the relationships of such technological change to the society and their culture. In short, a general consideration of the use, limits and meaning of archeological inference and analogy.

Field Work

In my own work, starting in 1968, I have attempted to study five or six such problems.

Sites

There are eight or more ways in which ceramic artifacts are used, re-used and become part of sites (Stanislawski 1969a). I have shown that the re-cycling of old and new potsherds from site to house, house to house, and wall to wall, in modern pueblos can produce great complexity of stratigraphy.

The Hopi Pottery Tradition and Ideas of Local Typology

In addition, evidence from 1969-1971 studies by my wife and I of Hopi and Hopi-Tewa potters has shown that decorative pottery types, as archeologists define them, are of little meaning to the Hopi. The Hopi instead emphasize vessel technology, form and function, size, ware, and schools of design (e.g. Smith 1971). Designs are sometimes individually "owned" or emphasized but are rarely if at all clan or lineage owned; they are frequently taught or "borrowed" across clan and family lines. Ceramic training, as a whole, freely occurs across clan lines and has done so at least since the 1870's among both the Hopi and the Hopi-Tewa of First Mesa. Historic documents indicate that Hopi ceramic production never ceased, but the tradition has strongly shifted in terms of village specialization since 1890. In the continuity of traditional designs, forms, and technology, the ceramic industry of the Mesas is still a native craft, little influenced by "western" influences.

Ceramic Training Models

Recent research of my own (Stanislawski 1969c; 1973a; 1973b) indicates that there are at least four common models of pottery teaching emphasized in modern Hopi and Hopi-Tewa villages; mother–daughter; mother-in-law–daughter-in-law; mother–niece of different clan-neighbor–neighbor; and also at least eight other teaching model situations. While many mothers *do* teach their daughters, it is also true that it may be the grandmother in another clan who will instruct, an aunt in another clan, a daughter-in-law, or even a male (for men do paint designs on pottery). All of these models may be involved in different stages in the life of one individual; and indeed, one should expect this, for many mothers do not make good pottery, are busy with young children, or are blind, divorced, or dead by the time of needed instruction. Analyzing one specific style of pottery (Hopi-Tewa Whiteware, developed since ca. 1920) I found that the style is now shared by women of at least 12 different Hopi and Hopi-Tewa clans, living in five villages and two settlements, and of two different linguistic or tribal groups. In fact, the most famous of the early Hopi-Tewa pottery makers, Nampeyo, was taught her craft by her Hopi grandmother (her father's mother) sometime before 1870 (thus before the reservation was established and before much Anglo influence). Thus not only do women learn a great deal from non-clan mates, but they continue to learn and change throughout their lifetimes, ultimately making several different types, wares or schools of design in pottery. Obviously a nearly blind old woman is going to paint in a different manner than when she was a young woman, or she may have her daughter or husband do her detailed work for her. Some pots are not even the result of a single individual's work, but are the result of a family or group: even a "potting bee" assembly line.

Settlement Archeology

Furthermore, clans could probably not be localized in one area of the village in any case. They were not so localized as long ago as the 1880's (Mindeleff 1900; Parsons 1940). All Hopi houses go through cycles of building, use, abandonment, trash fill, re-clearing, re-use, etc. They may be sold or traded or left vacant for a time (Stanislawski 1973b). Clans fluctuate in size through time. In the last 70 years at least two Hopi-Tewa clans have disappeared, and one more is perhaps about to die out. In any town, then, clans are developing, splitting and dying out. Their housing needs are constantly rising, falling or disappearing. Land or houses near relatives fluctuate in availability. New rooms for one clan might be needed when the remainder of the village was decreasing in population. At best, only lineages or phratries might be localized, and even that only for a few

years (Parsons 1940; Stanislawski 1973b).

It is my conclusion that any past localization of ceramic design clusters, elements, or types, more probably resulted from the localization of the typical pueblo ad hoc work group, including both kin and non-kin; rather than from the results of the utilization of such highly idealized ceramic teaching models, residence, and descent rules as those suggested by Longacre and others.

For such purposes, then, I will define ethno-archeology as "the direct observation field study of the form, manufacture, distribution, meaning and use of artifacts and their institutional setting and social unit correlates among living, non-industrial peoples for the purpose of constructing better explanatory models to aid archeological analogy and inference."

Archeologists will have to collect this data for themselves, for modern ethnographers have not emphasized such material culture studies. Also, if the tool and social unit typologies are to be equivalent and comparable, both must be done by a single scientist, or at least from the same frame of reference. Thus the work may have to be done by an archeologist also trained as an ethnographer, or in a combined field school project that takes this dual approach. Only in this way may we be sure that the questions asked are directly relevant to the archeological problems; that the categories of classification are comparable; that the observer can elicit or observe both the ideal and real patterns of behavior; and that the full range and context of the materials, as well as individual and group variations, are included in the study.

Ethno-archeological studies, then, should have as much to offer the workers in the systems archeology school as they do the traditional archeologist. Such studies will better allow us to escape from our own ethno-centricism as we develop additional and alternative explanatory models for archeological testing. Archeological data, we have been told (Binford 1968a) never speaks for itself. Obviously it is we, as archeologists, who do the explanation by appeal to logic (common knowledge), general social background information, general ethnographic, or specific direct historical analogy (see Stanislawski 1973b). Then through the context of the objects, the formal characteristics of the material, and perhaps by testing, we make inferences concerning their meaning and use (e.g. Thompson 1958). Or to briefly summarize and revise Neustupny (1971), we can obtain new knowledge from excavating specific sites, by applying the statistical models of natural sciences we can learn more about the artifacts and their co-variation and clustering; but it is mainly from fields such as history and ethnography (i.e. cultural and humanistic fields) that we can suggest realistic explanations in a human culture framework. In the long run, we are also testing the limitations of archeological inference; our own working limitations in actually reconstructing the ways of life of past societies now no longer functioning as a whole. We cannot always strictly apply analogies drawn from modern living peoples to explain the past. The criticism of some modern systems archeologists are probably correct when they say that such one-to-one relationships are neither possible nor adequate in most cases, for there must be some change from past to present. However, Binford and Binford also say "The expected relationships between material items and behavioral features of cultural systems are frequently most economically analyzed and tested with non-archeological data" (1968: 86); and, in the words of Lew Binford, "it may often be more impressive or scientifically more efficient in obtaining high levels of confidence to make such tests with ethnographic data" (1968b: 270). James Deetz clarifies this by noting that "more important perhaps are those analogues which exist in archeological and ethnographic data between material and behavior rather than between the artifacts — so many pots let's say, or so many projectile points — and the ethnographer's categories" (1970: 122). Ascher (1961) and Heider (1967) point out that there may well be more than one analogy model that may apply, for the archeological and ethnographic situation will often be highly complex and variable. Clearly people are just not as "reasonable" in real life as our anthropological models suggest that they are. The archeologist's and the native's cognitive systems and tool classifications thus often conflict, and native residence, descent, sex, and sodality systems may be far more variable than we, as scientists, like to admit (e.g. see Bonnichsen 1973; David 1971; Kehoe and Kehoe 1973; Heider 1967; Gould 1968b; 1971; Allen and Richardson 1971; Stanislawski 1969a; 1973a; 1973b).

Conclusions

Archeologists must seek out and test all analogy model possibilities, and then select that one, or ones, of best fit in his particular situation. If our explanations are to be more than armchair theories, our models and their premises must be based upon the real world, and must be verified and tested before their use in explanatory hypotheses in archeological situations. We must use the theory of "multiple working hypotheses" (Chamberlin 1965) and realize that scientific *proof* is often impossible, and that *dis*proving inadequate hypotheses is more reliable (Platt 1964; Salmon 1973). In particular, we must avoid the borrowing of scientific philosophies from other fields without very careful analysis and careful use (see: Clarke 1972; 1973; Johnson 1972; Tuggle et. al. 1972; Morgan 1973); and we must avoid the logical pitfall known in scientific philosophy as "the fallacy of affirming the consequent" (Morgan 1973; Salmon 1973), i.e. that mistake often seen in modern archeology of believing that a verified prediction of a hypothesis also proves the accuracy of the premises of that hypothesis. Rather, it is a rule of logic that we cannot move backwards; the conclusions do not prove the primary statements (see Morgan 1973; Stanislawski 1973b).

It appears to me that systems archeology field and laboratory methods and models may bring a better scientific approach to archeology, but it is in the merger of field archeology, natural science methods, and particularly ethno-archeology that archeology can best contribute to the understanding and explanation of culture, past and present.

ACKNOWLEDGEMENT

This paper was made possible by the cooperation and help of the staff of the Museum of Northern Arizona, Flagstaff, who have provided us with housing, secretarial aid, advice and encouragement during five summers of work. In particular, I would like to thank Dr. Edward B. Danson, Director, Dr. William D. Lipe, Assistant Director, and Dr. Alexander J. Lindsay, Jr., Curator of Anthropology, for their help in many ways; and Katherine Bartlett, Librarian, Barton Wright Curator of the Museum, Ann Hitchcock, Registrar of Collection, and Marc Gaede, Photographer, for their frequent help in providing access to collections. To the Hopi and Hopi-Tewa potters and friends who have so pleasantly suffered our questions, and who have taught us most of what we know about pottery making, we owe a particularly great debt of gratitude.

Archaeological Research in the Gaspé Peninsula, Preliminary Report

JOSEPH BENMOUYAL

Introduction

Interest in the prehistory of the Gaspé goes back only a few years and is concentrated on the north coast where most sites have been found (see Martijn 1973, for a synthetic history of archaeological research in Quebec). It started in 1968 with the discovery by Father Roland Provost, of abundant surface collections spread over six terraces on both sides of Rivière-à-la-Martre. The same year, T. Lee visited the sites and after a brief study of the material, proposed they should be included in a new culture: the Gaspé Archaic (Lee 1969:30). Preliminary excavations in 1969 by the Société d'Archéologie Préhistorique du Québec (S.A.P.Q.) and surface collecting yielded several thousand stone artifacts and tens of thousand flakes (S.A.P.Q. 1970). The only charcoal specimen recovered, from a low terrace however (10 m), was dated to 1360 ± 120 B.C. (Martijn, 1973:13). The particularity of the material, exclusively flaked tools, was again noticed and differentiated from the Boreal Archaic Tradition. Crête, Girouard and McKenzie tentatively suggested this new manifestation be called "Peri-boreal Archaic" (S.A.P.Q. 1970:87). In 1971, road renovations at Cap-Chat unearthed a new site 4 m above sea level. Salvage excavations were carried on by G. Barré. This stratified site of the Middle Woodland period gave a radiocarbon date of 620 ± 105 A.D. (Martijn 1973:11). In the meantime, Father Provost and members of his newly founded Société d'Archéologie de Gaspésie (S.A.G.), discovered several more sites among which are the three sites reported here (Provost and Ross 1972).

In 1972, due to extensive repairs of route 6, which encircles the Gaspè, I was responsible for surveying the areas affected by the renovations. The last three weeks of an eight weeks contract were spent testing and surface collecting at sites partly destroyed, with the help of members of the S.A.G. They were Ste-Anne-des-Monts (DgDo-4), Cap-au-Renard (DhDn-1), and St-Joachim-de-Tourelle (DgDo-6) sites. The total material recovered, 280 flaked stone tools and about 7500 flakes, was the subject of a preliminary report (Benmouyal 1973). One of the conclusions stated that these collections seemed to reflect a similar tradition, sufficiently distinct from anything else reported in the Northeast to be termed the Gaspé Archaic tradition. The artifact sample however consisted mainly of broken surface finds and more data were needed to establish and define this tradition. These three sites being in further danger of destruction, DgDo-4 and 6 are on top of gravel pits, I returned with a crew of seven in 1973 for nine weeks, to conduct salvage excavations. At the same time, a reconnaissance between Cap-Chat and St-Joachim-de-Tourelle added eight new sites (Fig. 1).

The material from 1973 has not yet been studied and the interpretations that follow must await further analysis and excavations to be supported. However, the new sample suggests a much wider range of variability then was first thought. In this report, I shall briefly describe the excavations conducted at these sites. In the light of the new data, some interpretations will be discussed.

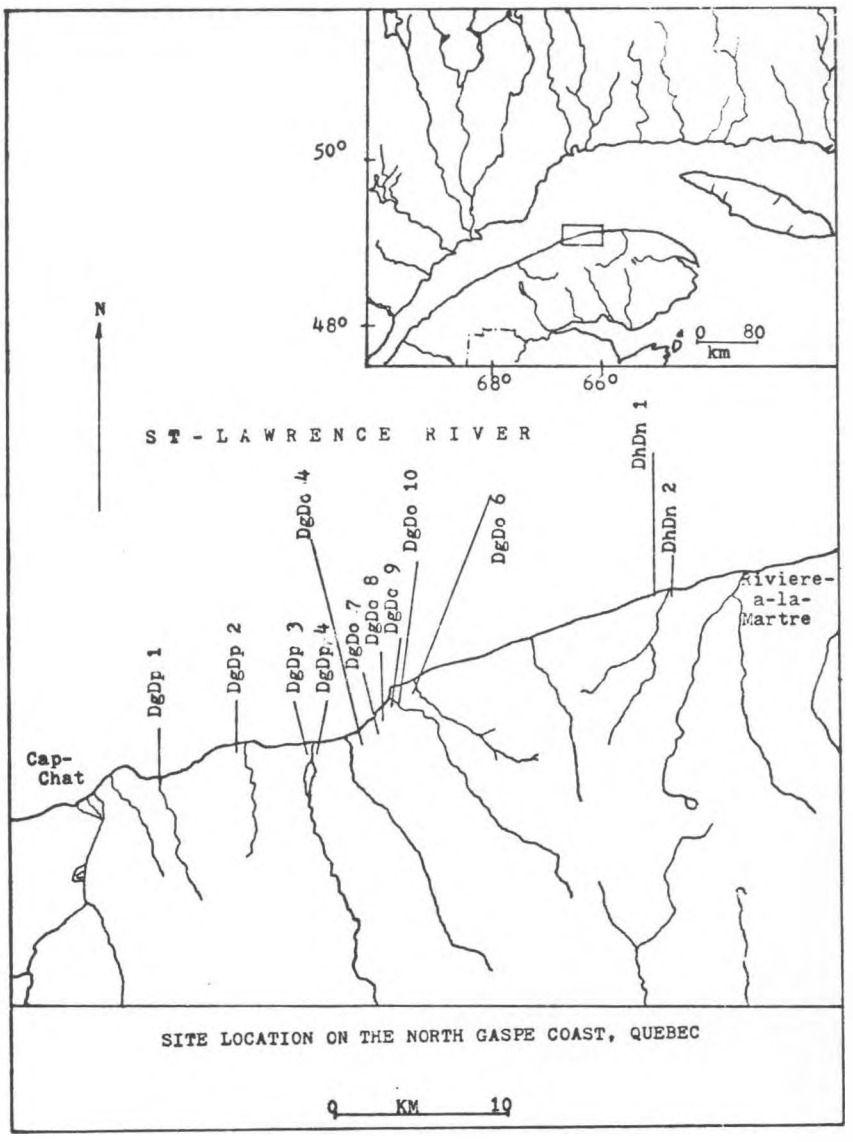

Fig. 1. Site locations on the north Gaspé Coast, Quebec.

Sainte Anne des Monts DgDo 4

The site (Fig. 2) is situated about 1 km inland, south of the village which gave it its name on the 40–45 m terrace (49 7'37'' N, 66 27'35'' W.). It is on top of once cultivated fields, converted into a giant gravel pit a few years ago. Because of intensive bulldozing and earth removal, the original surface of the site is difficult to estimate; however, systematic surface collecting and test-pitting revealed that cultural deposits must have extended for about 800 m along the terrace. South of the site, at the foot of the hill bordering the terrace, outcrops of bedrock showed slab formations of chert and other fine grained siliceous materials of various quality used in the manufacturing of most of the tools. The main excavations were concentrated

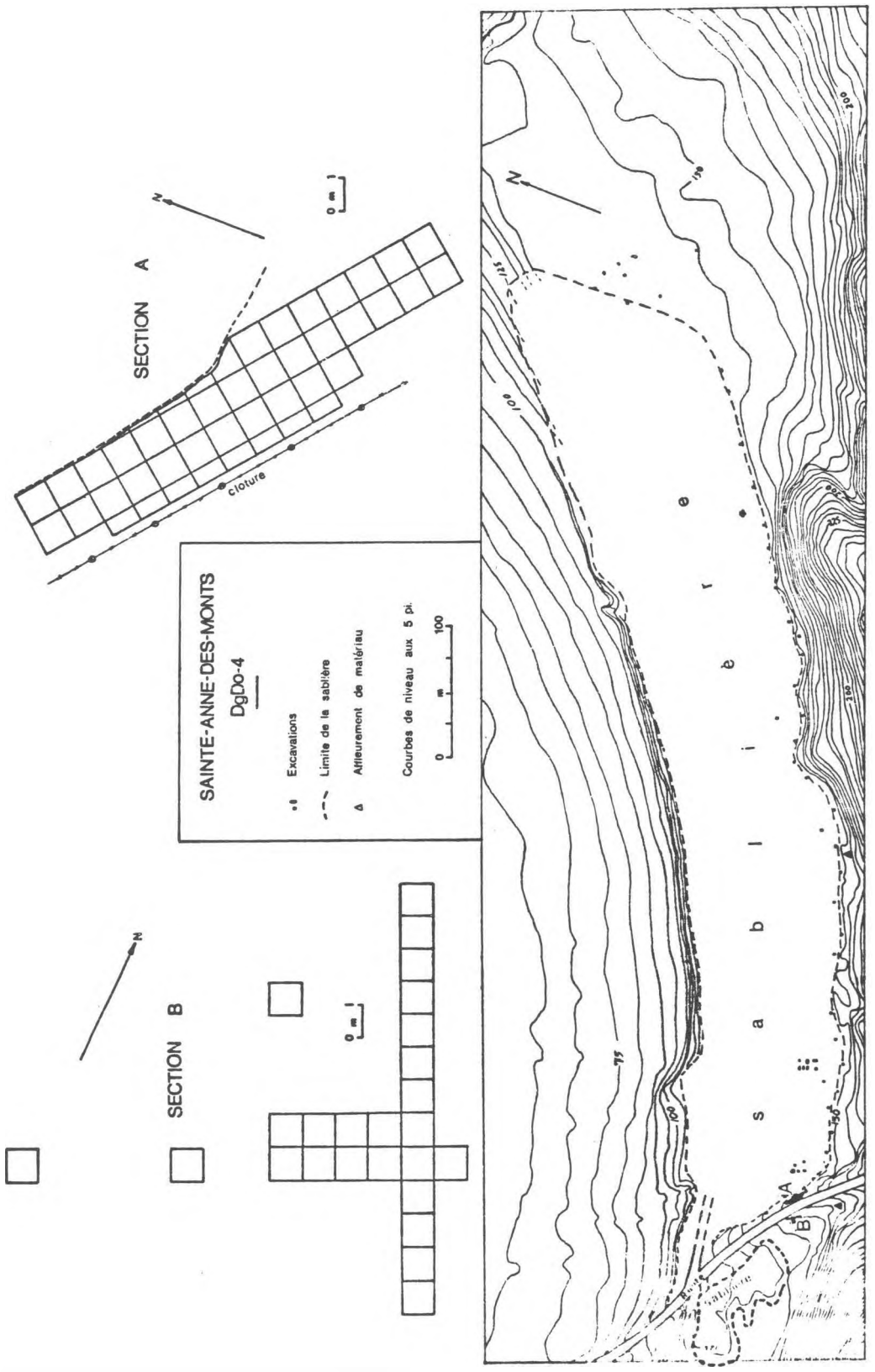

Fig. 2. *Plan of excavations at Sainte Anne des Monts.*

in two regions, sections A and B on either side of the road which gives access to the site.

Section A

Because of its situation immediately east of the road, this area was left untouched by the gravel exploitation. A previous test had shown a great concentration of cultural remains. For these reasons, extensive excavations were conducted in 1973. 38 square meters were excavated along the fence which borders the road; the area excavated was 15 m long and 2–3.5 m wide.

Stratigraphy

The stratigraphic units in this section from lowest to highest are as follow:

Unit 1 – Well stratified sand and gravel deposits from the Goldthwait Sea, 8 or more meters thick, on top of the Cambrian to Ordovician bedrock. No cultural remains were found in these sand and gravel strata deposited around 9000 B.C.

Unit 2 – A brown yellowish sand zone, 30–60 cm thick, sectioned by a thin (1–2 cm) oxidated irregular deposit. The top part of this sand zone (5–40 cm) contained most of the cultural remains.

Unit 3 – A bluish grey 5–10 cm thick layer of compact clay, the very bottom of which contained the remaining cultural deposits.

Unit 4 – Up to 70 cm of dark brown compact clay containing no artifacts. This layer and the previous one could be interpreted as deposits of a stream which had its bed where the road is presently. They could also have resulted from a small landslide.

Unit 5 – 10–20 cm of road-fill and top soil containing no cultural remains.

Cultural material

The stratification suggests a single cultural deposition in this area of the site. The material was very unevenly scattered horizontally over this section, generally a continuous deposition 10–15 cm thick in the upper part of unit 2. Two regions, totalling 8.5 m^2, yielded 70% of the chipping detritus and over 50% of the artifacts. One area contained over 2000 flakes and tools made from one particular type of black chert. Other clusters of remains were made of other types of materials.

The artifacts are exclusively composed of flaked stone tools, mostly fragments which occasionally fitted together. They included: 5 *projectile point fragments* (Fig. 3 *a, c, d*) which exhibit fine parallel pressure flaking

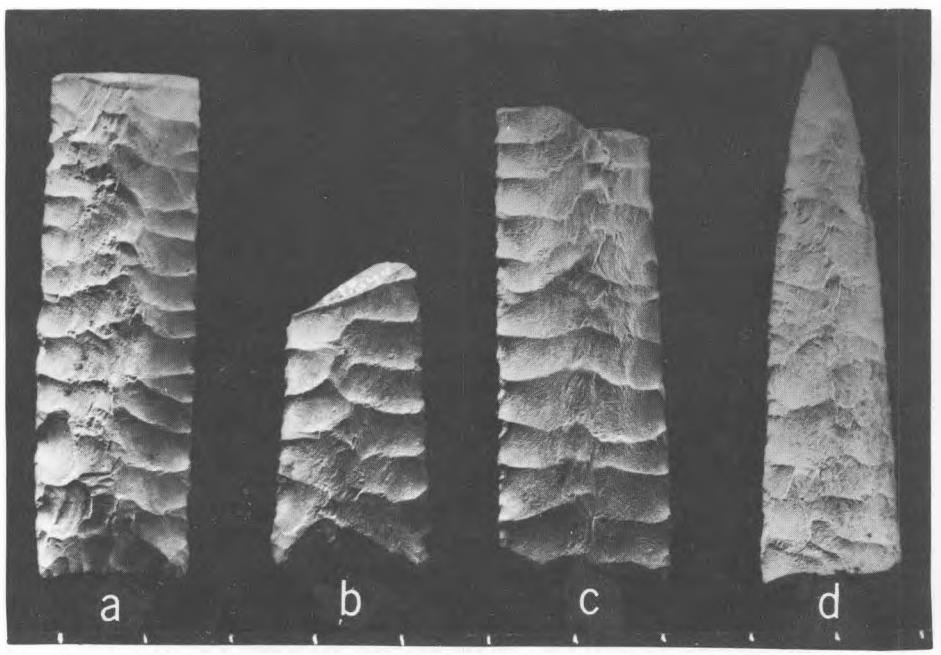

Fig. 3.
Plano projectile point fragments. a, c, d, from DgDo 4, section A. b, from DhDn 1. cm. scale.

usually associated with the Plano tradition; a wide variety of *bifaces* (158) of various shapes (oval, triangular, lanceolate, bipointed, asymmetrical, rectangular etc.) and sizes (8 to 30 cm in length) some of which are possibly preforms while others show fine edge retouch; 41 marginally *retouched flakes,* generally large and thin with one sharp or steep retouched edge (flake knives and side scrapers); some 8 *utilized flakes* showing wear patterns on one or more edges. Other tools included 1 drill fragment, 6 large quartzite used spalls, 1 hammerstone and 3 spherical nodules of iron pyrite, possibly used in fire making. About 10500 flakes, generally thin and large, obtained from the preparation of bifaces, complete the cultural remains from this section. No definite structure was encountered although the material distribution might reveal a pattern. Finally, two particularities should be noticed: with a few exceptions, most of the cutting edges seem fresh and do not show much, if any, use-wear; second, many artifact fragments seem to have been broken during their manufacturing.

Section B

In the hope of recovering similar material, 25 square meters arranged along two perpendicular trenches were excavated on the other side of the road from section A, in a small gently sloping plowed field south of an older gravel pit. The stratification and material content of this section proved to be markedly different.

Stratigraphy

A simplified stratigraphy, from oldest to youngest, is described here.

Unit 1 — The same strata of well sorted sand and gravel described for section A, underlay the cultural deposits. The upper part of this zone, mostly composed of grey beach sand contained no cultural remains.

Unit 2 — A stratum of reddish brown sand 20–50 cm thick contained most of the cultural material.

Units 3 and 4 — Two strata of mixed clay, sand and gravel from 10 to 50 cm thick, 80 cm in one pocket, contained the remaining cultural material. This mixture seems the result of recent land levelling and plowing.

Cultural remains

The stratification contained many lenses and at the moment, it is not possible to decide whether we are dealing with a one or multicomponent site. The distribution of the material was somewhat more regular than in the previous section but some deep pockets of material were observed in some areas.

The artifacts included one cluster of decorated *pottery* sherds, apparently from one vessel, somewhat similar to some of the Iroquois tradition of the upper St Lawrence valley; 3 *projectile points,* one complete small triangular stemmed (Fig. 4*d*) found at the same depth as the pottery and two fragments of lanceolate points; 47 *bifaces,* mostly fragments, generally triangular and thin of various dimensions; 13 *retouched flakes* similar to the previous ones; one utilized flake, a granite spall and about 2000 flakes complete the sample from this section. Features observed consisted of about 30 small possible post-holes and post-molds from 2–12 cm in diameter, some close to one meter in depth. Except for a few scattered pieces of charcoal, and five seeds, possibly hazelnut shells, no organic remain was found in this section or any other part of the site. Systematic surface collecting, test pits and excavation yielded more material which is included in Table 1.

Cap au Renard DhDn 1

The DhDn 1 site (Fig. 5) is situated in Cap-au-Renard, a small village 18 km east of the previous site and 5 km west of La Martre. The village is on the 45 m terrace, the top of a cliff that overlooks the St. Lawrence. The site itself is located about 60 m from the edge of the cliff, in the vicinity of Mr. J. Valée's house (49 11'44" N., 66 14'10" W.), and 120 m east of a small stream. In 1972, Mr. Vallée undertook to add a basement to his house and in the process unearthed cultural remains which were brought to my attention by members of the

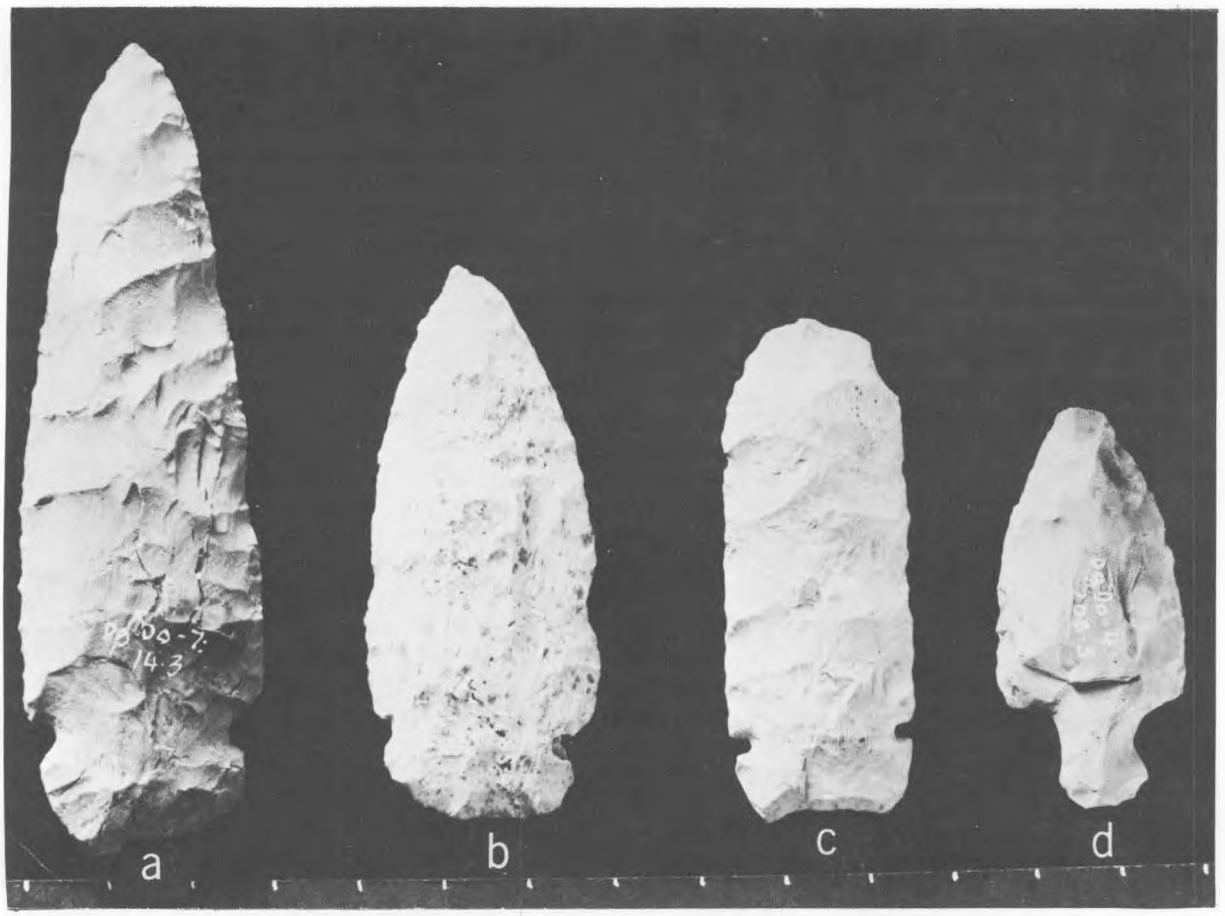

Fig. 4. *Notched projectile points. a, from DgDo 7. b, c, DhDn 1. d, DgDo 4. cm. scale.*

S.A.G. We then excavated 11 m^2 under the house and in 1973, we resumed excavations under and around the house; 80 m^2 were then open, concentrated in three areas. The ground around the site slopes gently toward the stream; a few decades ago, it was plowed and levelled before the house construction. These activities disturbed much of the cultural deposits which lay close to the surface. The site's area seems to cover about 2500 m^2 but the main concentration was found to be around the house.

Stratigraphy

The soil deposition at this site is typical of podsols and the following zones were observed from bottom to top:

Unit 1 – Stratified sand and gravel layers deposited by a higher sea level as described for the previous site. This unit occasionally contained rounded granite boulders, up to 80 cm in diameter, brought by floating ice of the continental glacier from the north shore of the St Lawrence. No cultural remains are associated with this zone.

Unit 2 – A layer up to 50 cm thick of yellowish or reddish brown sand, gravel and pebbles. This is the B_s horizon of podsols where aluminium and iron compounds have accumulated. Some material was found in the upper part of this

Table 1.
Artifact frequencies at the three Gaspe sites.

	DgDo-4			DhDn 1	DgDo 6
	Sect. A	Sect. B	Test surface		
Points	5	3	1	8	32
Bifaces	158	47	29	73	267
Retouched flakes	41	13	9	111	39
Utilized flakes	8	1	2	49	-
Drills	1	-	-	-	16
Pottery	-	1	-	-	-
Others	10	1	3	3	3
Artifact total	223	66	44	244	357
Flakes	10500	2000	2100	6500	10300
Excavated surface in m^2	38	25		80	75

horizon.
Unit 3 – An ash colour, light grey, thin (2–20 cm) stratum consisting of the A_e or eluviated horizon of podsols. In some areas, it is absent and mixed with the upper zone (or humus) as a result of plowing. Pockets of this horizon contained the majority of the cultural remains which were also bleached as a result of this proximity.
Unit 4 and 5 – Layers of decomposed wood and gravel noticed under the house as a result of land leveling and filling.
Unit 6 – The humus, 5–20 cm thick, includes the plowed zone and contained the remaining cultural material.

This stratification, especially units 4–6, manifests postoccupational disturbances; logging, plowing and leveling. However, what appears to have been the original deposition of this site, the next one and most sites in the Gaspé, was observed in another undisturbed closeby site: DhDn-2. The strata were as follow:
Unit 1 – Sand and gravel marine deposits.
Unit 2 – B_s horizon containing some material near the top.
Unit 3 – A_e horizon with more cultural material.
Unit 4 – The humus; most of the material was concentrated between units 3 and 4. It should be underlined that no "cultural layer" was noticed at this site or any other site; only artifacts, flakes and occasional structures made the cultural layer. The matrix seems to have been washed off from weathering and possibly eluviation.

Cultural remains

The stratification suggests a single component site but three distinct forms of projectile points might be interpreted as resulting from different occupations. Contacts, however, could also explain this diversity. Except in two areas, north and east of the house, totalling 7 m^2, the material was more or less evenly scattered. The two concentrations, however, gave about 35% of the total material. The concentration east of the house is associated with a possible hearth

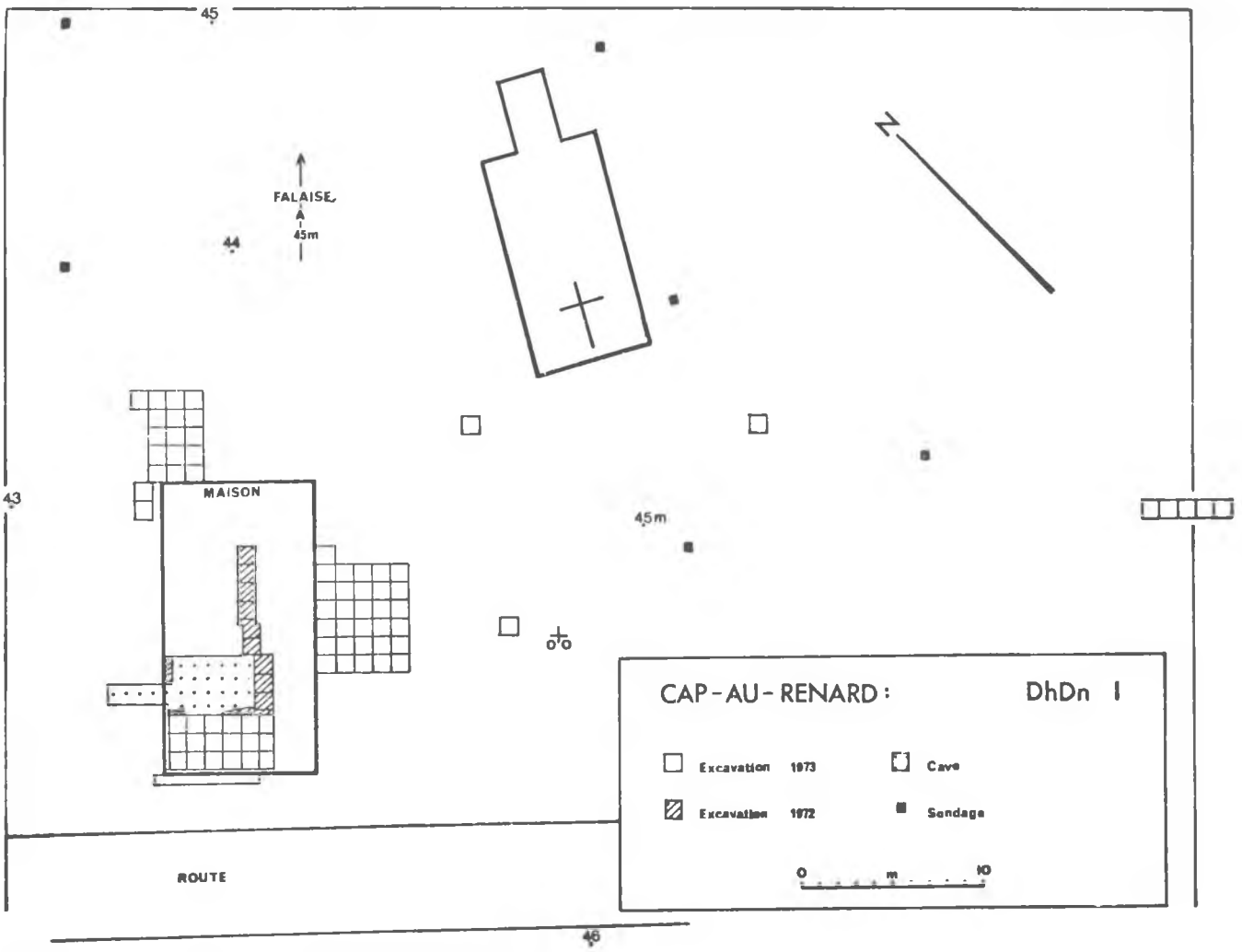

Fig. 5. Plan of excavations at Cap au Renard DhDn 1.

and other stone structures. No charcoal, except for a few dispersed pieces, or other organic material were found. Finally, about a third of the material comes from the upper disturbed levels.

Cap-au-Renard yielded only flaked stone tools and debitage flakes; again, most of these were fragmented and some displayed frost fractures. These included 8 *projectile points,* two side-notched (Fib. 4*b, c),* one fragment showing parallel pressure flaking (Fig. 3*b),* one small complete lanceolate and four fragments possibly lanceolate in shape; 73 *bifaces* generally triangular or oval, thin and small but large ones also were found (a complete specimen from the 1972 season was 38.5 cm long); many *retouched flakes* (111): flake knives, side scrapers and one end scraper; *utilized flakes* amounted to 49. The remaining tools included a pebble tool and two hammerstones of which one was pear-shaped. About 6500 flakes, generally large and thin, mostly debitage from biface manufacture, were recovered. Most of the artifacts are obviously finished tools and show ground (utilized?) edges.

Saint Joachim de Tourelle DgDo 6

Situated between the two previous sites, 4 km east of DgDo 4, St Joachim site (Fig. 6) is also partly destroyed by gravel exploitation. The site is located south of the village of the same name, also on the 45 m terrace, about 400 m inland (49 9'10'' N., 66 24'51'' W.). From surface collecting and test pitting, the estimated area of the site is about 60000 m². Being on top of a flat or gently sloping surface, it has also been intensively plowed for several generations. DgDo 6 extends from a small road which goes inland, into the fields south of the gravel pit and east to the edge of the deep V shaped Grande Tourelle stream valley. The main excavated area, east of the gravel pit, overlooks the stream and the St Lawrence seaway. It covered a surface of 65.5 m², mostly along two perpendicular trenches which were later enlarged. Test excavations along the gravel pit and around the main excavations brought this figure to 75 m². All the cultural remains from this site are included in Table 1.

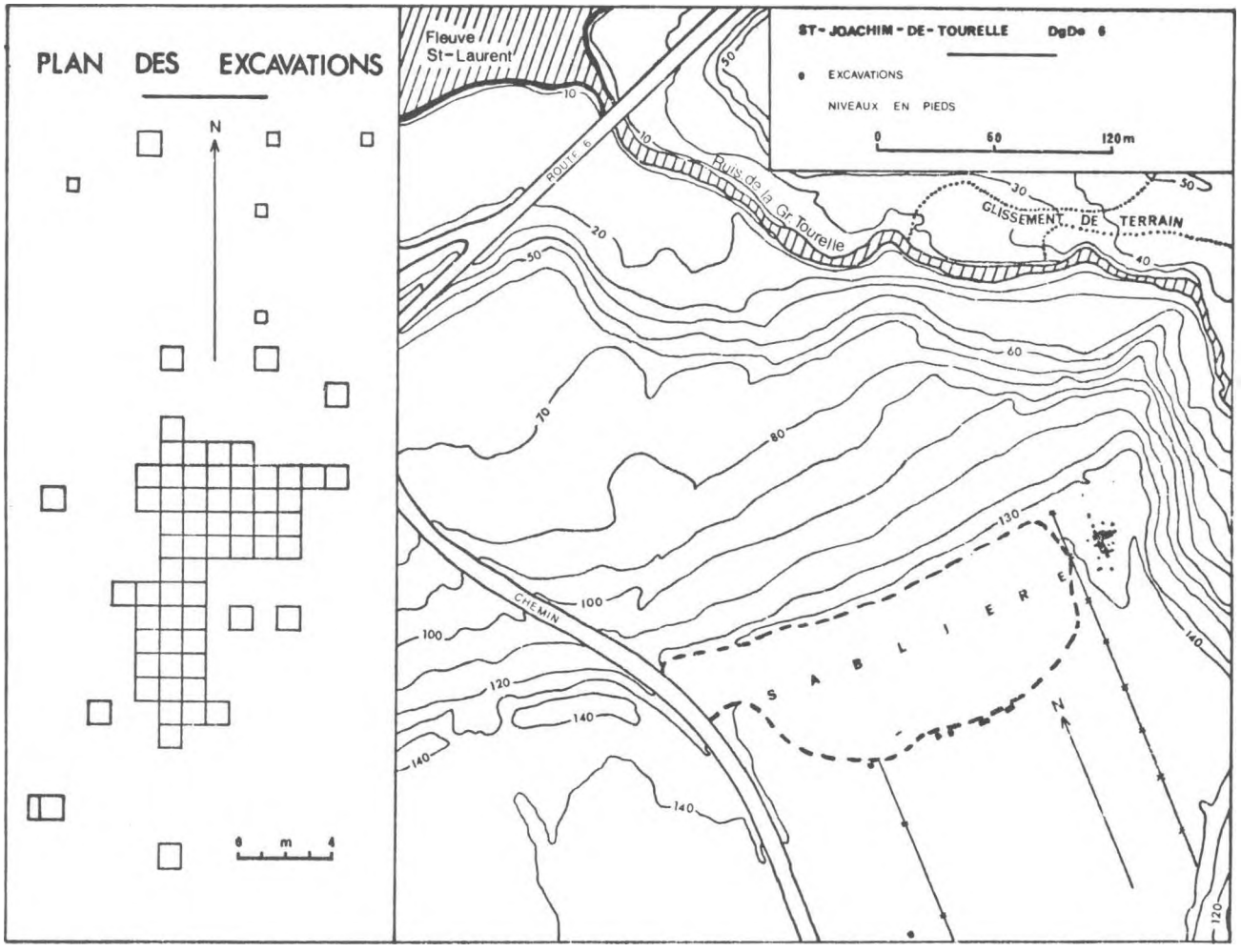

Fig. 6. Plan of excavations at St. Joachim de Tourelle DgDo 6.

Stratigraphy

The stratification was very similar to the previous site's; units 4 and 5, however, were absent. The A_e horizon, when still present, was directly under the plowed zone which was 20–25 cm thick.

Cultural material

The cultural remains appear to belong to one occupation of the site. The material was irregularly distributed, several concentrations, 10 m^2 in total, gave about 43% of the total remains. Almost 50% of these were found in the plowed zone, often close to the surface. The remains, composed entirely of flaked tools and chipping detritus, were, as in DhDn 1, bleached and often broken. No feature was encountered; a small lens of charcoal containing a few small flakes, was collected and is being dated.

The total artifact count from the 1973 season includes 359 tools and some 10300 flakes. The artifacts can be divided as follow: 31 small *projectile points* fragments possibly similar in shape as one complete small lanceolate point; 267 *bifaces;* mostly fragments, triangular and oval, some lanceolate, of various dimensions but often of medium size (10 – 15 cm in length); 39 *retouched flakes* similar to those from the previous sites; 16 *drills* and fragments; one large utilized spall, one tabular nucleus and a nodule of iron pyrite. Many of the bifaces are possibly preforms but some seem finished and exhibit rounded edges which appear to result from use.

Site Survey

During about eight weeks, A. Baulu, director of the survey, and one crew member chosen on a rotating basis, surveyed for sites between Cap-Chat and St-Joachim-de-Tourelle. This represents a distance of 22 km, along every terrace up to 65 m above sea level. The reconnaissance was however concentrated along the 45 and 35 m terraces, the lower ones being occupied by present villages. Eight sites were located, mapped, systematically surface collected and test pitted. All sites were in plowed and cultivated fields or around new housing developments. They were all situated on ancient beaches, except one above the maximum sea level line, ranging from 12 m to 70 m in altitude. All were close to a river or stream. Two sites represent individual finds or small clusters of material while others are spread on one or several terraces up to 600 m in length. From DgDo 4 to DgDo 6, a distance of 4 km, cultural remains were found almost continuously on different terraces.

The cultural remains from these eight sites total 224 artifacts and some 2000 flakes; two sites DgDo 7 and DgDo 8 gave the majority (85%) of the tools. As in the three excavated sites, tool forms include mostly bifaces, plus some retouched flakes and projectile points, and individual pieces (drill, hammerstone, nucleus). The survey revealed new data of particular interest for the prehistoric occupation of this part of the Gaspé Peninsula.

First, two pottery sherds were again found on an ancient terrace much higher than the present sea level (38 m). This is possibly related to the accessibility of raw material outcrops nearby.

Second, for the first time a polished stone artifact, a siltstone gorget (or pendant) fragment with a biconical perforation, was discovered in this part of the Gaspé. This surface find comes from the 15 m terrace.

Third, the two sites that yielded most artifacts (DgDo 7 and 8) gave more complete and finished tools than any other site in the Gaspé. This could suggest they were primarily habitation sites rather than workshop sites. These sites are situated east of DgDo 4 on the 30 to 60 m terraces. Among the finds are a complete long side-notched point (Fig. 4*a*) and several oval hand axes.

Finally, sites size and distribution suggest intensive occupations of this region in prehistoric times, contrary to ethnohistorical accounts which mention small scattered populations mainly east and south of the peninsula.

Discussion and Conclusion

As a result of the 1973 field season, it is evident that sites cannot be relatively dated on the basis of their elevation above sea level alone. Sections A and B at Ste-Anne-des-Monts were both situated on the same 45 m terrace, less than 20 m apart. The first area gave 5 projectile point fragments usually associated with the end of the Paleo-Indian tradition, while section B yielded pottery fragments of the end of the prehistoric period. More pottery sherds were discovered during the survey on the next lower terrace (38 m) further west. At La Martre, material interpreted as Archaic from the 10 m terrace was dated to around 1360 B.C., a reasonable date for the elevation of the site and its content.

It thus appears that other factors than sea level alone were important in the choice of site location. As pointed out above, the distribution of raw material might be one of these factors. So far, both sites which have given obviously late material (i.e. pottery) and are situated on ancient beach terraces, are close to raw material outcrops. This seems to corroborate the importance of this factor in the settlement pattern of this region. It remains to establish which sites were habitation or/and workshop sites. Phosphorous content in collected soil samples awaiting chemical analysis, should help to answer such questions. First observations revealed some sites gave more tools showing use-wear than others, but this remains to be supported by more exhaustive analysis. The presence of features usually associated with habitations and the flake/artifact ratio both indicate DhDn 1, section B of DgDo 4 and possibly DgDo 6 were habitation as well as workshop sites.

Nevertheless, on the basis of artifact types, the Gaspé seems to have been inhabited by Paleo-Indian, Archaic and Woodland populations. We shall now briefly discuss each of these manifestations.

Paleo-Indian

No fluted point has ever been found in Quebec although such finds are numerous in Ontario (Garrad 1971; Stork 1971) and in almost every other region of the Northeast (MacDonald 1971; Funk 1972). Part of Quebec was free of ice and inhabitable by 8000 B.C. and the absence of such finds must be partly due to the lack of archaeological research. Late Paleo-Indian projectile points showing characteristic collateral flaking associated with the Plano period, however, have been reported on the Richelieu River, near the New York state border, in the lakes Mistassini-Albanel region and possibly at La Martre (Martijn 1973:19; Martijn and Rogers 1969:318). This year, the first substantial evidences were found at the Ste-Anne-des-Monts (section A) and Cap-au-Renard sites. Both have yielded one or more point fragments exhibiting parallel ripple-flaking. Very similar specimens seem to have been discovered on Thompson's Island, Ontario and in New Brunswick by D. Sanger (MacDonald pers. comm.). Their cultural affinities in terms of adaptation is not known yet; neither is their origin or age. J. Wright (1972a:23, n.d.:3) proposes that the Plano hunters migrated eastward in the Northeast once Archaic populations were already present in this region. This hypothesis is supported by a number of sites in the Great Lakes area where Plano and early Archaic tools are found in direct association. A similar association is present at Cap-au-Renard, as was described above.

Archaic

Evidence of Archaic populations is well established at Riviere-à-la-Martre, Cap-au-Renard, St-Joachim-de-Tourelle, DgDo 7 and possibly some areas of Ste-Anne-des-Monts. All these sites have yielded lanceolate or side-notched projectile points associated with this tradition. The lithic industry however is very different from any archaic tradition defined in the Northeast. The complete lack of polished stone tools and differences in other cultural material make comparisons with the Laurentian Archaic described by Ritchie (1965:79–80) and

the Maritime Archaic (Tuck 1971), impossible. Tuck suggested the Maritime Archaic should be found along the St Lawrence as far as Quebec city, and thus in the Gaspé. Our research, so far does not support this hypothesis although the Gaspé does show similar environment and resources as Tuck's Maritime tradition (1971: 350–2). Possibly, less importance should be placed on environmental adaptation in defining the latter tradition.

As in the Shield Archaic, the artifact assemblage of the Gaspé Archaic contains no polished stone tools, but here the similarities end, although the interior of the Gaspé offers a similar environment as the Shield's. The lithic industry defined by Wright (1972b:11–12, 1968: 57) are markedly different in both technology and artifact types from the Gaspé's. As stated before (Benmouyal 1973:141–4), the Gaspé seems to exhibit a different type of cultural tradition; in the absence of similar manifestations in the Northeast, it is best identified as the *Gaspé Archaic Tradition.*

Woodland

Sites from the Woodland period have been found in the Gaspé. Cap-Chat is dated of the Middle Woodland on the basis of radiocarbon dating and pottery; section B of DgDo 4 and possibly DgDp 2, both gave pottery suggesting Late Woodland occupation. The relations between the Woodland and Archaic populations remain to be established.

In summary, the north shore of the Gaspé Peninsula has been inhabited for several thousand years, possibly since 5000 B.C., by late Paleo-Indian, Archaic and Woodland populations. The great number of sites of a local Archaic tradition, which I have named the Gaspé Archaic, suggest an adaptive climax during that period. So far, the first steps of the chronological sequence have tentatively been laid. Cultural interpretations must await further cultural remains analysis and field research.

Punchaw Village: A Preliminary Report Archaeology of a Prehistoric Settlement

K.R. FLADMARK

This is a preliminary report on archaeological research carried out by the Simon Fraser University field school, under my direction, between May 20 and July 20, 1973. Analysis is still largely incomplete and a full description of results is not yet possible.

The Setting

The 1973 field school was centered at the Punchaw Lake site (FiRs 1) 35 miles southwest of Prince George in the Blackwater district of north-central British Columbia. Punchaw Lake is about 1 mile in diameter and is drained by Tako Creek into the West Road (or Blackwater) River near its confluence with the Fraser. The surrounding region consists of forested rolling uplands incised by the West Road, Nechako, and Fraser Rivers, and dotted with innumerable small lakes and patches of muskeg. Vegetation is transitional between that of the Chilcotin Plateau and the Boreal forest, with dominant species including Douglas fir, lodgepole pine, and black spruce.

Present mammalian resources include mule deer, moose, black bear, bobcat, beaver, and hare, as well as numerous smaller species. This assemblage has undergone considerable modification since the beginning of the historical era, including the arrival of moose in the early 20th. century, replacing woodland caribou (Kew 1973:17), and the disappearance of grizzly bear and wolf. Although major sockeye runs ascend the Fraser River to Stuart Lake, this species is apparently rare to nonexistant in the West Road River system. However trout and several varieties of coarse fish are plentiful in all lakes and streams.

Ethnohistory

The Punchaw Lake site is within the traditional territory of the "Naskutin" band of the southern Carrier Indians, with their principle village near the confluence of the West Road and Blackwater Rivers (Morice 1904:21; Kew: pers. comm.). Alexander Mackenzie observed "an encampment of three families" on the eastern side of Punchaw Lake in 1793, but the site with which we are concerned was probably not occupied at that time.

An elderly member of the Nazco band, and apparently the last surviving Naskutin, recalled camping at the Punchaw Lake site about 1900 for spring fishing in the creek. This person also noted that there had been a burial ground somewhere in the southwestern part of the site which was in use up until about 1870. Despite considerable search we were unable to precisely pin-point the location of this graveyard, even though it was apparently marked by the ruins of a grave-house or other structure until fairly recently.

The ethnographic lifeway of the Carriers involved extensive seasonal mobility. Although references are somewhat inconsistent it seems that during winter small family groups hunted and trapped from campsites chosen for their shelter and proximity to firewood. In the spring the people moved to lakes to take trout and coarse fish, nucleating in larger groups later in the summer for the salmon fishery. This pattern involved seasonal transhumance over distances up to 250 miles (Kew 1973:18), necessitating well-developed communication mechanisms. Travel throughout the vast extent of Carrier territory was facilitated by a complex system of overland trails. Donahue (1974) has noted the value of these trails for explaining and predicting archaeological site distributions, but in general little attention has been paid to overland communication in the Interior of British Columbia despite the known significance of native trails to the initial Euro-Canadian explorations. FiRs 1 is located at the junction of major north-south and east-west elements of the Carrier trail network (Fig. 7) (Morice 1904) — a situation which may provide a partial explanation for the size and cultural richness of this site.

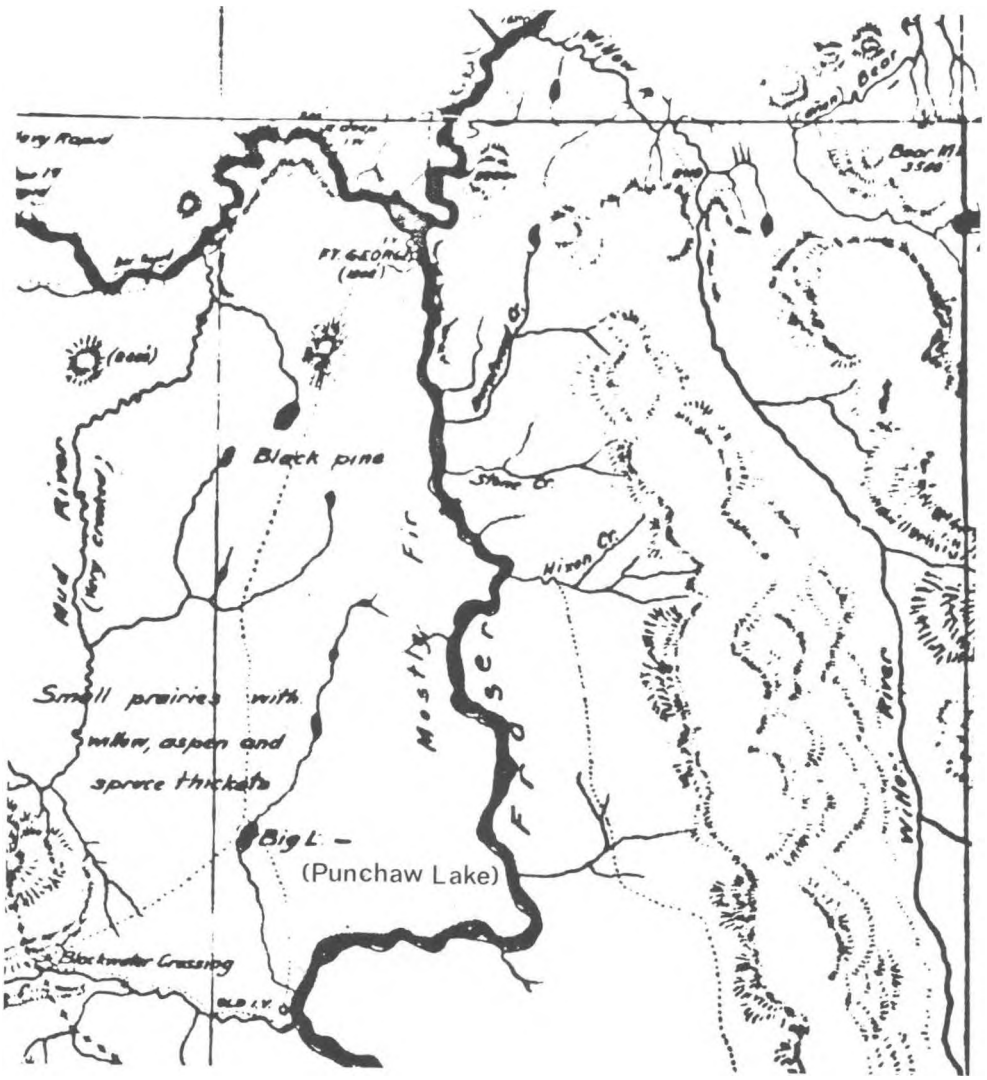

Fig. 7. *Section of map by A.G. Morice showing Punchaw Lake at the intersection of Indian trails.*

The Site

The Punchaw Lake site occupies over 54,000 sq. m. (about 14 acres) of the steep northwest bank of Tako Creek, at the outlet of the lake. The site was first reported in 1965 by the then district land-surveyor at Prince George, who had obtained a small artifact collection from the area. The limits of the site are defined by aspen-cottonwood parkland which stands in marked contrast to the surrounding dense coniferous forest (Fig. 8).

Surface cultural features include 43 house-platforms, 57 storage pits, and a 100 m. segment of a native trail running east-west across the center of the site. The house-platforms are level to slightly dished oblong areas averaging about 8x6 m. in size excavated into the slope, and are entirely different than southern Interior pit-houses. Excavations are shallow – although deepest on the up-hill side – and lack recognizable raised lips or rims. It must be noted that these features are only visible as minor breaks in the natural slope of the hill-side, and would not be easily detected in naturally level regions. Consequently it is entirely possible that other houses exist undetected along the flat terrace benches of the site.

The storage pits are circular depressions under 2 m. in diameter and of varying depth. Most occurred in distinct clusters around the margins of the site-clearing, although a number were also associated with the house-platforms. Ethnographic data indicate that most pits of this type were probably used in the storage of dried fish and other foodstuffs.

The section of native trail was re-located by the Naskutin informant who remembered it as part of an important route between the Fraser and West Road Rivers. Although heavily overgrown, the path was clearly defined as a deeply worn trough-shaped rut. There is no doubt that this is a true aboriginal feature of a type rarely noted today, but of considerable importance to the regional settlement pattern. There seems equally little doubt that Sir Alexander Mackenzie walked this same path on his overland journey to the Pacific in 1793, giving it considerable historic as well as prehistoric interest. The informant noted that the trail divided near the northeastern corner of the site, with one branch going north to the Prince George area and the other arm swinging southwest to the West Road River – both approximately paralleling the present route of the Blackwater road. A third less important trail followed the west bank of Tako Creek, eventually joining another path along the north side of the West Road River (Fig. 7).

Field Procedures

Specific field activities included the following:

1. Precise mapping of FiRs 1 to indicate the spatial relationships of cultural and natural features (Fig. 8).
2. Sampling and plotting of ancillary data potentially related to intra-site variations in cultural activities. This was accomplished by dividing the site into 65 30x30 m. main grid units designated by north-south and east-west co-ordinates. Within this main grid system we undertook:
   a. A total count of all trees, per species, for each 30x30 m. unit.
   b. Collection of a core, by 14" Swedish increment borer, from the largest conifer in each main grid square.
   c. Identification, counting, and plotting of up to 50 non-arboreal species from 3x3 m. units systematically selected within the main grid.
   d. Collection of soil samples from each of the main grid intersects for chemical analysis.
   e. Measurement of the depth of soil development and cultural deposition at each of the main grid intersects.
3. Recording of the physical attributes of the surficial cultural features. This included the completion of individual 5 cm. contour maps for most of the house-platforms, and measurement of the main dimensions and orientation of the storage pits.
4. Complete excavation of house-platform 1;

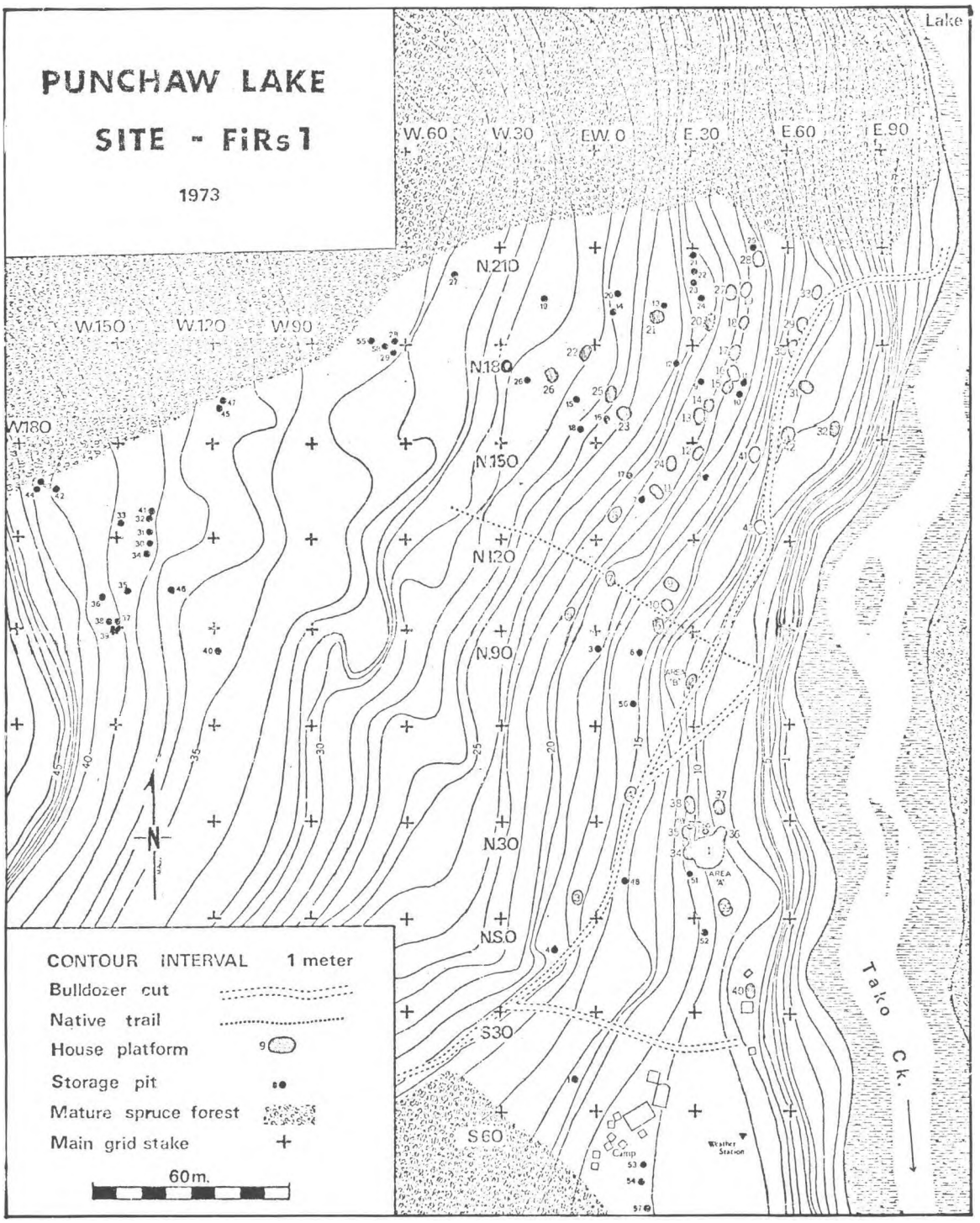

Fig. 8. *The Punchaw Lake Site, FiRs 1.*

complete excavation of the remainder of house-platform 2; and 1 or 2 2x2 m. test units in house-platforms 34, 36, and 43, and storage pit 50.

During excavation we aimed for precise *in situ* proveniences on all cultural materials, including modified tools, flakes over 1 cm. in maximum dimension, and potentially identifiable faunal remains. These were recorded three-dimensionally employing a field coding system designed for computerized sorting and plotting.

5. Recording the microclimatic characteristics of the site with a full range of meteorological instruments throughout the duration of the project.
6. Construction of a half-scale replica of a Carrier summer house, paying particular attention to labour expenditure, raw material requirements, and the effects on the site environment.
7. Collection of contemporary fauna from the site environs.
8. Intensive surveying of the area within a 20 mile radius of Punchaw Lake, including foot or boat reconnaissance of most adjacent or adjoining drainages.

Results

Floral Analysis and the Horizontal Limits of Cultural Activity

A problem common to the analysis of multi-dwelling archaeological sites is that of the identification of contemporaneous occupation units, i.e. which houses were lived in at the same time. Plotting the spatial proximity of the Punchaw Lake house platforms employing 5 m. isobars of separation produces a number of apparently significant clusters (Fig. 9). At greater than 40 m. separation all house-platforms fall into 2 major clusters, with a southern group of 10 houses centered around house-platform 1, and a northern group of 33 centered about 150N., 30 E. on the main grid. The northern group is divisible into a number of pronounced linear clusters paralleling the slope. Although no test of statistical significance has yet been applied, these clusters appear sufficiently distinct to provide some hypotheses about the spatial arrangement of past occupations. However, it should be noted that simple spatial proximity may be an indicator of cultural groupings only to a certain minimum level, whereafter some rule of optimum social distance may take precedence. Various floral and pedological sampling procedures conducted within the main grid framework were designed to provide a test of the cultural reality of the presumed house clusters, and to determine the total horizontal limits of past cultural activities.

In the Prince George region the climax stage of arboreal succession is marked by a dense coniferous forest with a species composition controlled by micro-environmental factors. Through time, an abandoned clearing will develop a climax forest by the successive replacement of initial floral communities (herbs-shrubs-deciduous trees) by encroaching conifers, barring any further significant disturbance. Thus total tree density per unit area, ratio of coniferous to deciduous species, and age distribution should directly reflect the state of arboreal succession as a function of time and the boundaries and extent of past clearings. This will only hold true given a relatively stable environment, in areas cleared recently enough that arboreal succession has not attained complete equilibrium with surrounding areas. Thus, on an archaeological site meeting these requirements, the present arboreal community should directly reflect the extent and intensity of aboriginal clearing activity.

Plots of tree density, percentage of conifers, and maximum conifer age were drawn up for each of the main sampling units across the Punchaw Lake site. These plots independently agree in showing two separated areas of minimum arboreal succession corresponding with the two main house-platform clusters. A tongue of older, more developed forest intrudes between these areas from the western margin of the site.

The plot of overall tree density (Fig. 10) reveals a number of lobate areas of low tree density radiating from the areas of minimum density, as well as a narrow strip of reduced tree occurence extending into the northwestern part of the site to the limits of the mapped area. These features probably reflect aboriginal harvesting of the forest for firewood and construction materials, with the narrow strip corresponding precisely to the projected extension of the

Fig. 9. *The distribution of cultural features (ovals — house-platforms; dots — storage pits; dotted line — native trail) at the Punchaw Lake site. Five meter isobars of spatial separation define two main groupings of house-platforms, with internal linear clusters in the main northern grouping.*

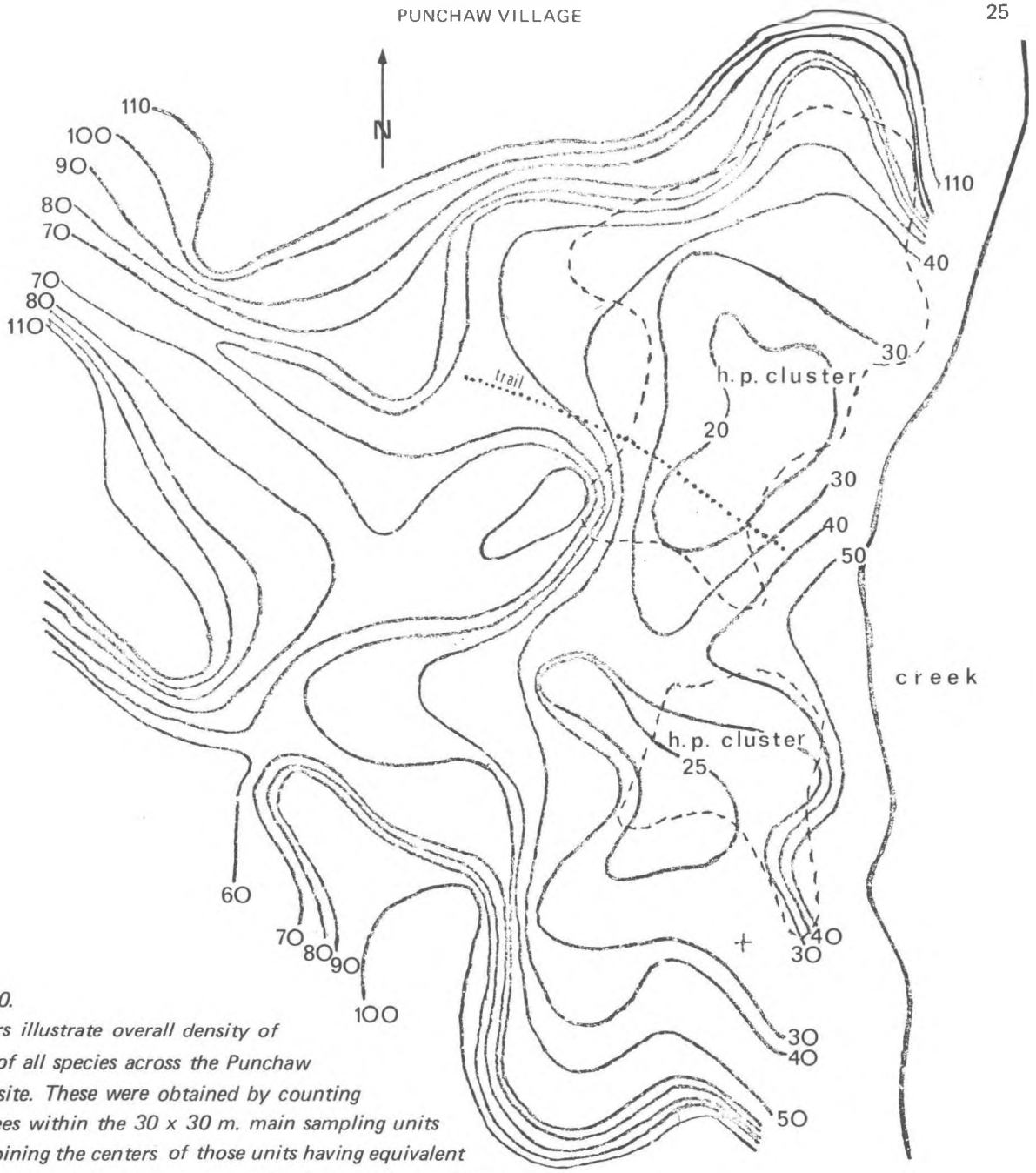

Fig. 10.
Isobars illustrate overall density of trees of all species across the Punchaw Lake site. These were obtained by counting all trees within the 30 x 30 m. main sampling units and joining the centers of those units having equivalent tree frequencies by the corresponding isobar. The resulting map of overall tree density points out the following distributional anomalies: (a) sharply increasing tree frequencies at the margins of the site apparently indicate the limits of the latest aboriginal clearing; (b) areas of minimum tree density closely correspond to the two main groupings of house-platforms; and (c) linear areas of relatively low tree density extending northwest and southwest from the main site correspond to the ethnographically reported extensions of the aboriginal trail system.

northwestern arm of the native trail system. It should be noted that the experimental replication of a half-scale Carrier house required the destruction of 80 young spruce trees, either cut for structural members or girdled for bark, and it is clear that construction of several full size houses would have resulted in significant forest clearing. The two areas of minimum tree density probably reflect those parts of the site most recently occupied – test excavation for histori-

cal artifacts in these areas would verify this hypothesis. Finally, the anomalous area of low tree density at the extreme southwest corner of the site map may provide a clue to the position and extent of the "lost" historic burial ground. Tree species ratios, and maximum conifer age provide supporting data for the density plot, showing that it is a function of natural succession, and not late disturbance or intra-site micro-environmental factors.

The value of close observance of the modern vegetation in the analysis of the spatial extent of late aboriginal occupations seems clear from this study. Not only do tree distributions provide precise limits for the maximum site-clearing – boundaries not accurately recognizable without systematic tree counts – but they allow the formulation of strong hypotheses concerning the location of cultural clusterings and specialized use areas such as wood harvesting zones and trails.

Arboreal species appear considerably more useful in these analyses than do herbs and shrubs, withthe non-arboreal forms exhibiting no significant spatial patterning across the site. Analysis of soil samples is at an early stage although results to date indicate variations in pH and some chemical elements along horizontal transects.

Stratigraphy

Cultural stratigraphy in the excavated areas was relatively shallow, averaging about 30-40 cm., with deposits up to 1 m. thickness in up-hill portions of house-platforms. Strata tended to be indistinct and discontinuous, characterized by lenses of dark soil intercalated with layers of wood ash and silt. Sterile subsoil varied between a compact yellow gravelly-silt in house platform 1 to loose sandy gravel in house-platform 2.

Excavated Features

The most common excavated feature were post molds, with over 220 occurring in house-platform 1 alone. Here they formed a loose pattern around an approximately 8x6 m. subrectangular area with long-axis orientated northeast-southwest. All post-molds were shallowly excavated into the subsoil around the periphery of the house-platform. There is no doubt that these posts result from more than one period of construction within house-platform 1, and possible alignments are illustrated in Fig. 11. Any late posts placed in the center of the platform would not have penetrated subsoil and hence would not have been detected during excavation, limiting evidence for multiple building to the peripheral areas. Even so there seems to be clear indications of different wall orientations and shapes, including what may have been an enclosed end entrance way during one phase of construction. Most post molds were under 20 cm. in diameter and less than 15 cm. deep, with angles varying considerably. Although styles may have changed through time, one gets an overall impression of light self-supporting A-frame structures, bark or skin covered, partially sunk into the slope with vertical or apsidal down-slope walls.

A large hearth area was situated near the center of the post-mold enclosure in house platform 1, continuing throughout the entire depth of cultural deposits. Upper layers of the hearth were characterized by small scattered fire-broken rocks, with ash and calcined bone concentrations. The lowest hearth stratum consisted of large rocks carefully piled in a restricted circular area, with less ash and fewer and larger bone fragments. As with the post-molds the hearth clearly results from successive occupations restricted within the limits of an original house-platform excavation.

Other features included flake and tool clusters and caches around the periphery of the post mold enclosure, as well as concentrations of butchered faunal material near the hearth. The more limited data from other excavation areas indicate a similar pattern of features to that in house-platform 1.

Burials

Four human burials were encountered during excavation; all were left *in situ* or re-buried to comply with the wishes of the Fort George native band.

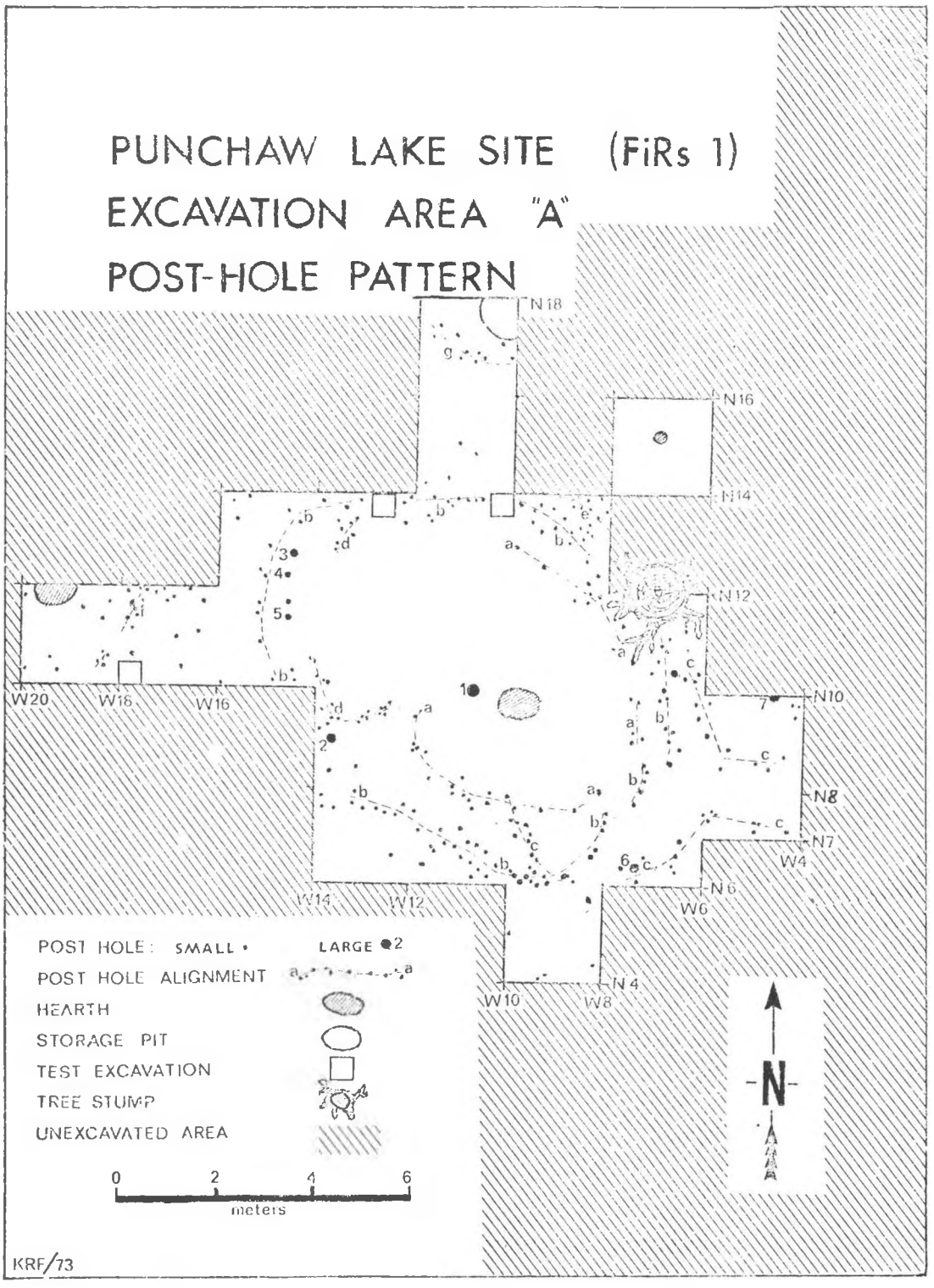

Fig. 11. *Post hole patterns in area A.*

Burial 1 was a young infant found on the main occupation floor of house-platform 2. The bones were slightly scattered and exhibited no evidence of deliberate placement or interment. Mingled with the bones were 3 basalt arrow-points: 1 multiple side notched, 1 stemmed, and 1 triangular.

Burial 2 consisted of a complete flexed adult interment in an ovate pit excavated into the subsoil directly beneath the lowest hearth stratum in house platform 1. The skeleton lay on its right side facing north or upstream towards the lake. The highly worn and incomplete dentition is that of an elderly individual; no grave goods were associated and sex is not known at the present time. A C-14 date of 3,980 ± 100 B.P. (Gak-4907) was obtained on a sample of carbonized organic material collected near the skull.

Burial 3 was found in a poorly defined pit excavated below the lowest occupation floor of house platform 36. The completely disintegrated skeleton was visible only by shadow-stains of the long-bones and preserved tooth crowns. However this was sufficient to identify a young robust adult or adolescent, lying on his (?) right side in a flexed position, facing south. Near the hands in front of the face was a cache of associated tools, including a large leaf-shaped basalt biface; several large unmodified basalt flakes; and traces of a bone or antler object which may have been a haft for one of the other tools. A small rock-ringed hearth was situated about 30 cm. above the burial in the grave-pit.

Burial 4 consisted of only a few partially charred cranial and long-bone mid-shaft fragments scattered among the stones of the lower portion of the main hearth in house-platform 1. These indicate an adult or sub-adult, but are too fragmentary for further identification.

The association of interments with hearths may indicate winter burials. Morice (1904:308) notes that during the small-pox epidemic of 1862 "corpses were hurridly buried in the fireplaces where the ground was free of snow and frost". The stratigraphic superpositioning of an apparent cremation (burial 4) over a full interment (burial 2) may suggest a change in burial practices through time, although the sample is obviously insufficient to clearly illustrate the mortuary norm at any given period.

Artifacts

A total of 6,200 items were recorded *in situ* from the 32½ 2x2 m. excavation units. Of these 40-50% are estimated to be modified tools; the rest consist of unmodified flakes and faunal remains. The vast majority of artifacts are flaked of vitreous basalt, with argillite-andesite, chert, chalcedoney, and ignimbrite-obsidian also well represented.

Projectile Points

Approximately 101 projectile points complete enough for classification were recovered from the excavations. These have been sorted into 8 provisional classes based on outline form:

Class	Total	Basalt	Chert	Chal	Obsid
Leaf shaped	11	9	2		
Square based	6	4	1	1	
Stemmed	10	10			
Fish tail	4	3	1		
Corner notched	22	16	5	1	
Large side notched	7	6	1		
Triangular	10	10			
Small side notched	31	27	1	1	2
Total	101	85	11	3	2

Leaf-shaped points have pointed or rounded bases, and one specimen carries pronounced basal edge-grinding. Length 9.4–3.6 cm.; width 2.9–1.5 cm.; thickness 1.0–0.4 cm.

The square based variety includes forms ranging from pentagonal to incipiently stemmed. Lower lateral edges tend to be parallel forming sharp right angles with a straight base. Several of these specimens are slightly reminiscent of Plano in their lanceolate outline form. However, a relatively small size, cruder workmanship, and lack of edge-grinding clearly distinguishes these Paleo-Indian point styles. Length 3.7–2.7 cm.; width 2.1–1.9 cm.; thickness 0.7–0.5 cm.

Stemmed points are characterized by straight to slightly-contracting stems with straight to excurvate basal edges. Shoulders are rounded and shallow. Length 5.0–2.4 cm.; width 2.2–1.6 cm.; thickness 0.8–0.4 cm.

The fish tailed points are distinguished by markedly concave bases – a characteristic almost totally lacking in the rest of the assemblage – and wide, shallow side notches. Basal "ears" tend to be sharply pointed. Length 4.5–3.3 cm.; width 2.1–1.8 cm.; thickness 0.7–0.4 cm.

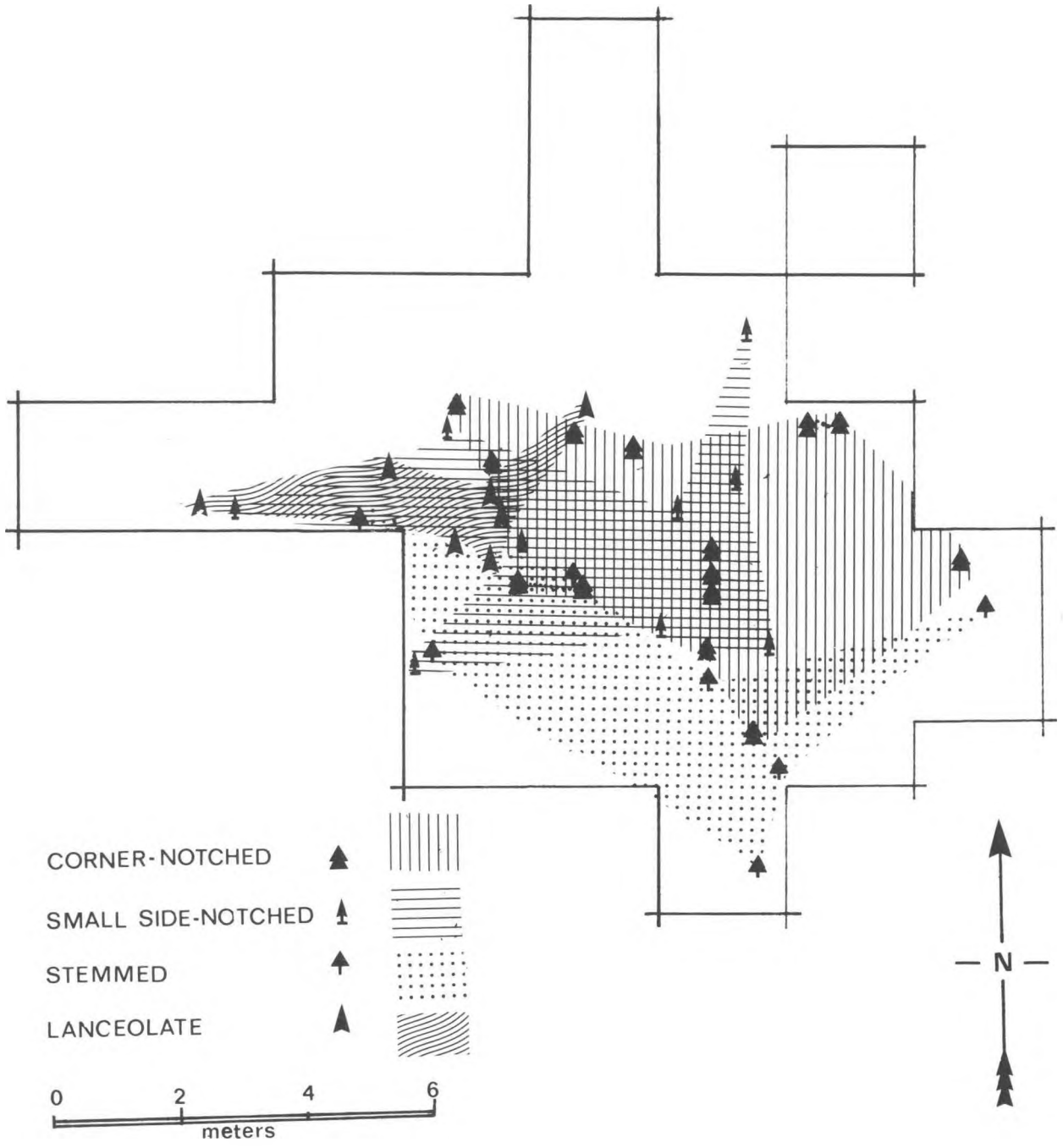

Fig. 12. *The horizontal distribution of projectile points in house-platform 1.*

The corner notched classification ranges from one basally notched specimen to others intermediate with large side notched and stemmed varieties. The majority are characterized by acute shoulder angles, with short, wide stems, and straight to excurvate basal edges. Length 7.3–3.1 cm.; width 3.3–1.6 cm.; thickness 0.6–0.4 cm.

The large side notched points may be variants of the corner notched continuum, but are for the moment described separately. With one exception these are crude stubby points with shallow side notches, wide necks, and straight bases. The exception is a long tapering point with small well defined side notches, wide neck, and a single basal thinning flake carrying half the length of one face. Length 4.4–1.8 cm.; width 2.4–1.4 cm.; thickness 0.5–0.3 cm.

The triangular points are probably preform stages for small side notched and corner notched varieties. These are short wide triangular forms with straight to excurvate edges. Length 3.9–1.9 cm.; width 3.3–1.1 cm.; thickness 0.5–0.2 cm.

The small side notched points are typical of late projectile point styles throughout the Interior of British Columbia. Bodies have straight to excurvate edges; notches are deep and necks narrow; and basal edges are uniformly straight to slightly excurvate. Two specimens are deeply serrated or multiply side notched on one edge, and two others are asymmetrically notched with a short trailing stem. Length 3.4–1.9; width 1.8–1.1; thickness 0.5–0.2 cm.

The stratigraphic relationships of these point styles have yet to be completely analyzed. However preliminary results for house platform 1 indicate that most small side notched points were found in the highest strata, with most leaf shaped and square based forms occurring in the lowest strata. A provisional horizontal plot indicates that these point styles have a remarkably exclusive distribution – unfortunately associations with other artifact classes are not yet determined.

Other Flaked Stone

The rest of the chipped stone assemblage is dominated by varieties of unifacially retouched flakes; side and end scrapers; awls and drills; amorphous bifaces; quartzite cortical spall tools; and small flake cores. A number of basalt and chert microblades and well made macroblades attest to a blade industry; however, no definite blade cores were found.

Ground Stone

All stone artifacts were chipped, with the exception of rare fragments of flaked and ground adze blades of fine grained green argillaceous rock; one carved fragment of soft grey-black argillite, decorated with an incised cross hatched design; two fragments of ground slate knives; and rare abrasive stones. No heavy pecked and ground stone implement were found.

Bone and Antler

Artifacts of non-lithic materials were very scarce despite generally excellent bone preservation. Examples include mid-fragments of two different bilaterally barbed bone points. Both are thin, narrow, and carry small closely spaced barbs. A number of simple ground bone point fragments were also found, as well as several fragments of bone decorated with dot-and-circle designs; a large antler wedge; and a shell-disc bead.

Euro-Canadian Artifacts

The total collection of non aboriginal artifacts consists of the blade of a Northwest Company trade hatchet found in house platform 34; a piece of beaten and rolled brass; and a small fragment of corroded iron from the uphill portion of house-platform 1.

Chronology

From a paleoenvironmental standpoint there seems to be no reason why the Punchaw Lake area could not have been occupied for at least the last 8–9,000 years. However there is no clear cut evidence from the 1973 project to indicate man's presence prior to about 4,000 B.P.

At the present time 5 radiocarbon dates are available from the excavations. The earliest is the sample associated with burial 2 which yielded a date of 3,980 ± 100 B.P. (Gak–4907). There is no apparent cause to dispute the validity of this date, although it is earlier than was expected for this well preserved burial, and it is assumed to provide an approximation of the age of the oldest occupation in house platform

1. A second carbon sample produced a date of 560 ± 75 B.P. (Gak–4905) in the upper zone of house platform 1. Storage pit 50, just outside house-platform 1 excavated through spoil from the last occupation of the house, yielded a wood charcoal date of 290 ± 70 B.P. (Gak–4906), although a provisional dendrochronological correlation had suggested a date of about 1830 A.D. for the wood in this feature. A date of 250 ± 70 (Gak–4908) was obtained just below ground surface in house platform 2; and house platform 43 yielded a date of 240 ± 70 B.P. (Gak–4909) on charcoal from the main occupation floor.

Maximum tree age in the site clearing is about 150 years. Allowing a number of years for the initiation of tree growth this correlates fairly well with the latest 3 radiocarbon dates to suggest that the last *major* occupation of the site occurred between 1700 and 1800 A.D.

Site Survey

A full description of the specific results of site surveying must await a later paper. In general, archaeological reconnaisance around Punchaw Lake revealed the following pattern:

1. Over 40 sites were located within a 20 mile radius of Punchaw Lake. Sites were found in greater frequency than expected, given the environmental and cultural relationships of the area.
2. No other site approached the size and cultural "intensity" of the Punchaw Lake site. Maximum number of house features found at any other site was 8.
3. Adjacent portions of the Fraser River possess relatively few sites in comparison to lesser drainage elements such as Tako Creek and the West Road River.
4. A significant number of sites were located on high terraces or considerable distances from water. Such sites are characterized by a surface scatter of flaking debitage in areas possessing commanding over-views of major river valleys.

Summary

From a cultural historical perspective the 1973 research at Punchaw Lake represents a further step in the gradual uncovery of the prehistory of north central British Columbia, adding to the pioneering investigations of Borden (1952a), Wilmeth (1971) and Donahue (1973). Of more direct significance, the village at Punchaw Lake represents an important fragment of the unwritten history of the Carrier people. In a province where the opulence of the coastal cultures has tended to overshadow the achievements of all other peoples, awareness of the size and contents of sites like Punchaw Lake may serve to focus archaeological and public attention on the almost forgotten cultural traditions of the northern Interior.

Finally, from the standpoint of academic archaeology, the principle contribution of the project may lie in some aspects of its methodology. Systematic floral analysis and systematic intrasite soil sampling have revealed preliminary results more than justifying the time-labour expenditure involved. Indeed, one can imagine future archaeology involving intensive analysis of the attributes of the total site – as though it were a macro-artifact – before full scale excavation is even considered. In addition, the information potential represented by full provenience records on all cultural materials – i.e. not merely modified "tools" – is clearly so significant that there should be no excuse for less rigorous field methods in anything but the most hurried of salvage projects. On a more general level, the complete excavation of cultural units, such as house areas, provides the only available means for the testing and critical evaluation of incomplete sampling procedures. The blanket application of any simple non-discriminating, unstratified, statistical sampling procedure must be considered unjustified until such tests are thoroughly conducted.

ACKNOWLEDGEMENT

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Investigations at the Maurer Site near Agassiz

RONALD LeCLAIR

The Maurer Site

DhRk8, located on the property of Fred Maurer, is a pithouse site situated in the upper Fraser Valley about seventy-five miles from the mouth of the Fraser River in Southwestern British Columbia (Fig. 13). The site is approximately two air miles southwest of the municipal hall in Agassiz and rests on a seventy-five foot promontory directly above the Fraser River, on the north side. Along the east side of the promontory is a slough which is almost dry in the winter and inundated annually by the rise of the Fraser River during the summer months. The promontory is a short southeastern extension of Hopyard Mountain which is about one-half mile wide by one and a half miles long, extending southwest to northeast. The mountain rises gradually from three hundred fifty feet in the south to seven hundred fifty feet in the north.

Ethnographically, there is no evidence of this site having been occupied by the Indian inhabitants of the upper Fraser Valley. The nearest sites to the Maurer site, as recorded by Duff (1952:35), are Siyita and Pilalq, both located in ethnographic Pilalt territory and each about three-quarter miles distant, west and north-east respectively. But, there is a site, not included in Duff, of which I was informed by Archie Charles, presently the chief of the Seabird Reserve in Agassiz. This site is located on the very southwestern tip of Hopyard Mountain, on the Fraser River, and was a fishing station called "Hook-nose". It is situated about one-quarter mile west by south-west of the Maurer site.

From the late Nineteenth century to the present day Hopyard Mountain and more specifically the Maurer property has been the scene of much human activity. Beginning in the late 1890's logging operations, lasting until ca. 1912, removed most of the larger flora: Douglas fir, hemlock and cedar. By 1912, limestone outcroppings were being mined on the south-east end of the mountain, on the perimeter of the site, and a grist mill was established to facilitate these operations. At the same time a crew-camp was set up on the alluvial floodplain about forty feet below the site on its west side. The mining continued off and on until 1945 when logging operations, including slash and burn techniques, were resumed on Hopyard Mountain.

The logging and mining operations terminated ca. 1950 and the mountain lay fallow until Fred Maurer purchased the property at the south-end of the mountain in 1960. He had been landscaping the property from 1960 until 1971 when archeological investigations were initiated at the Maurer site.

The archeological excavation of the Maurer property began on August 7, 1971 when Richard Percy, curator of the Simon Fraser Archeology Museum arrived at the site and with a volunteer crew from Agassiz excavated one three by six foot pit on the south-east side of Maurer's house (Percy 1972a:160–161). On the same day Percy discovered a large, deep depression on the north side of Maurer's house but did not test it. In the following summer, 1972, Thea de Vos, a graduate student in archeology at S.F.U., spent about six week-ends with a volunteer crew excavating in and around the deep depression on the north side of Maurer's house. Finally, in the summer of 1973, two summers of test excavation culminated in a major, systematic archeological investigation on the Maurer property.

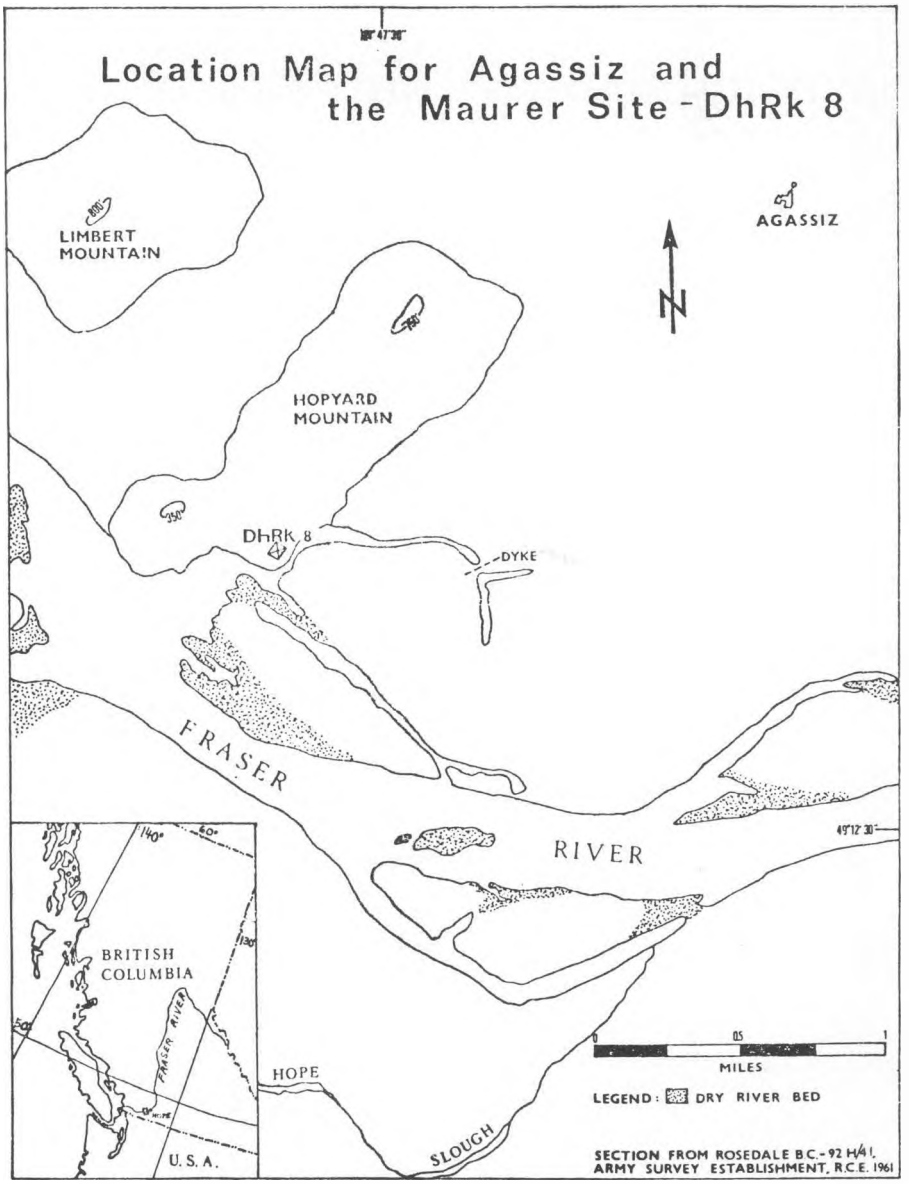

Fig. 13.
Location of the Mauer Site on the Fraser River near Agassiz.

Excavation

During the summer of 1973, from May 14 until September 3, excavations, funded by an Opportunity for Youth grant were conducted on the Maurer property. This was a major salvage excavation aimed at systematically solving the problems of the nature and prehistoric antiquity of the site. Therefore, with these problems in mind, Maurer's property was surveyed and some testing was done to determine the site universe and the feasibility of excavating in areas other than those where testing had already occurred (summers of 1971 and 1972). The results of the survey were negative. Combined with the topography of the property, the destruction caused by historic logging, mining and landscaping proved that excavation apart from the south

slope (R. Percy 1972a) and the pithouse depression would be fruitless. Some cultural material could be recovered but associations would be extremely skewed. Thus, the limits of excavation were defined as those areas already tested on the north (pithouse) and south sides of Maurer's house.

Excavations were horizontally controlled by a grid laid out in metric units mainly consisting of one by two metre pits. Vertical control was established by the use of arbitrary ten centimeter levels. The vertical measurements were taken from both the ground surface and a horizontal datum plane above the site. The actual excavation was conducted by discreetly using shovels and five inch trowels according to the nature of the matrix being excavated. Although the units of measure and the control employed were the same on each side of the site the cultural phenomena present dictated different restraints. For example, the pithouse on the north side of the site, being the only definite evidence of architectural remains was defined at the outset as of prime importance for site interpretation and would require total excavation in order to acquire knowledge of architecture and a good representative sample of artifacts associated with this feature. On the other hand, the south slope because of its size and the lack of any feature resembling architectural remains dictated that a random sampling technique would test adequately the utilization of this side of the site. Therefore, since the site was divided into two areas I shall discuss, in general, the work in each separately and then relate them as a single unit.

The Pithouse Excavation

Excavation of the pithouse (Fig. 14) was continuous from May 25 until August 24. The design of the depression, when I arrived at the site, indicated that it was probably a circular feature that had been moulded almost rectangular by natural forces occurring after the occupation. The pits excavated in 1972 were still open and considerable wall slumpage had occurred. The pits were cleaned up before excavation began. Since the field notes and artifacts were not available for the 1972 season, no information concerning the provenience of architectural features, the artifacts recovered and the possible number of components could be utilized. Therefore, except for orienting the grid system with the ten pits already excavated, I proceeded as if no work had been done.

The first two pits excavated were placed strategically around the rim of the depression and the third on the inside wall of the depression in order to determine the depth of the cultural deposits and their relationship to the natural stratigraphy. The results indicated that the cultural deposits ranged from one and a half to two meters in depth and were contained within a light yellow-brown deposit. Also, at this time there was an anomaly in the soil color within the light yellow-brown stratigraphic unit. The anomaly was a dark yellow-brown deposit about one meter deep which began below the humus and was apparent only in the interior of the depression. Near the perimeter of the depression this deposit merged into the light yellow-brown unit. There was also a charcoal lens a few centimeters thick below the dark yellow-brown deposit (about one meter deep) and sterile below this. This lens appeared continually during our excavation of the depression and has been interpreted as the remains of a burned superstructure covering the house floor. The house floor rested on what should have been the olive brown stratigraphic unit but was a grey-brown color. This color was only evident within the house itself as defined at the completion of excavation

During the summer, excavation revealed gradually that the house was not circular, oval or sub-rectangular but actually rectangular in shape. Architecturally, it had a central depression about seven and a half meters long by five and a half meters wide surrounded by a one meter bench raised thirty to forty centimeters, measuring eleven meters long by seven meters wide on its outer perimeter. The house was oriented in an almost magnetic north direction. Although a roof entrance might possibly be inferred for this feature, there is evidence on the east side for a ground entrance cut through the bench. The hearth was located at the south end of the central living depression. It was an elongate subterranean feature oriented east-west (with a slight convexity on the north side), three meters long and fifty centimeters wide. There were firecracked rocks at both ends and charcoal in the middle.

Twenty-five post moulds, all apparently associated with the house were recorded. There were six large upright posts on the perimeter of

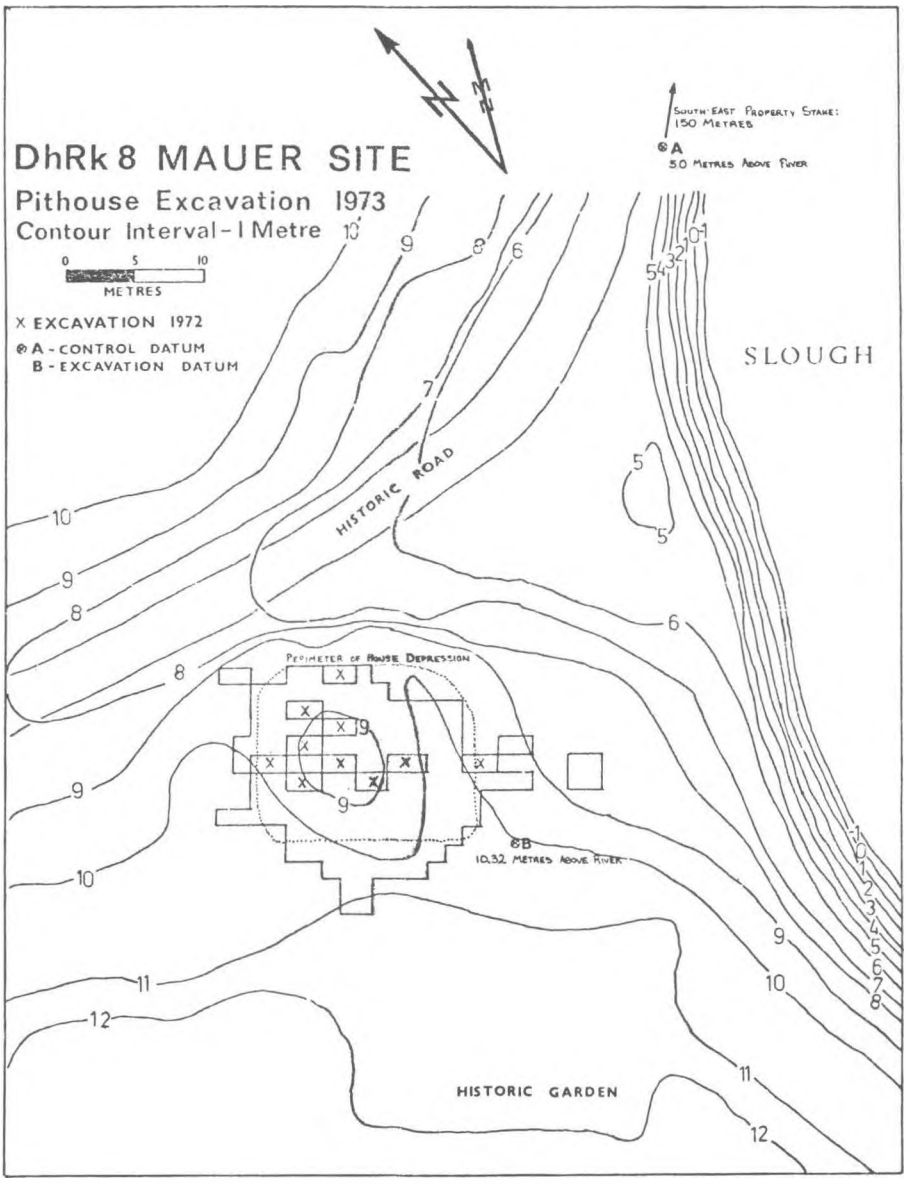

Fig. 14.
Plan of the pithouse excavation at the Mauer Site.

the central depression — one in each corner and one in the middle of each long side. The post mould pattern on the outside edge of the bench indicated gabled walls and the angle of declination suggests a height of six to seven feet for the roof. The roof itself was probably flat, supported by the six large interior posts. The cultural deposits above the house floor were uniform. There was no definitive break in the dark yellow-brown stratigraphy which could be interpreted as another living floor. Thus, it seems reasonable to assume that all the post moulds recorded were associated with this pithouse.

The artifacts recovered from the dark yellow-brown deposits above the house floor from the light yellow-brown deposits outside the house and from the house floor appear to represent a single component. The raw material and artifact types are consistent within the culture-bearing strata.

The depth of the cultural strata above the house floor (1 — 1.5 metres) can be attributed to slump from the earth on the roof and walls subsequent to occupation.

The South Slope Excavation

The excavation procedure on this side of the site (Fig. 15) was designed to sample as adequately as possible an area sixty meters in length by thirty meters in width. To do this three major trenches were gridded — one north-south, fifty five meters in length; and, two east-west, twelve meters in length. The trenches were not totally excavated. We excavated a pit every two or three meters along each trench. In all, twelve one by two meter pits and three two by two meter pits were excavated. There was one post mould, two burials and two large concentrations of charcoal — not defined as hearths — recorded on this side of the site. The natural stratigraphy consisted of two major stratigraphic units (from latest to earliest): a light yellow brown deposit and an olive-brown deposit resting on bedrock. The depth of these soils below the humus varied in thickness from a few centimeters resting on bedrock to two meters plus.

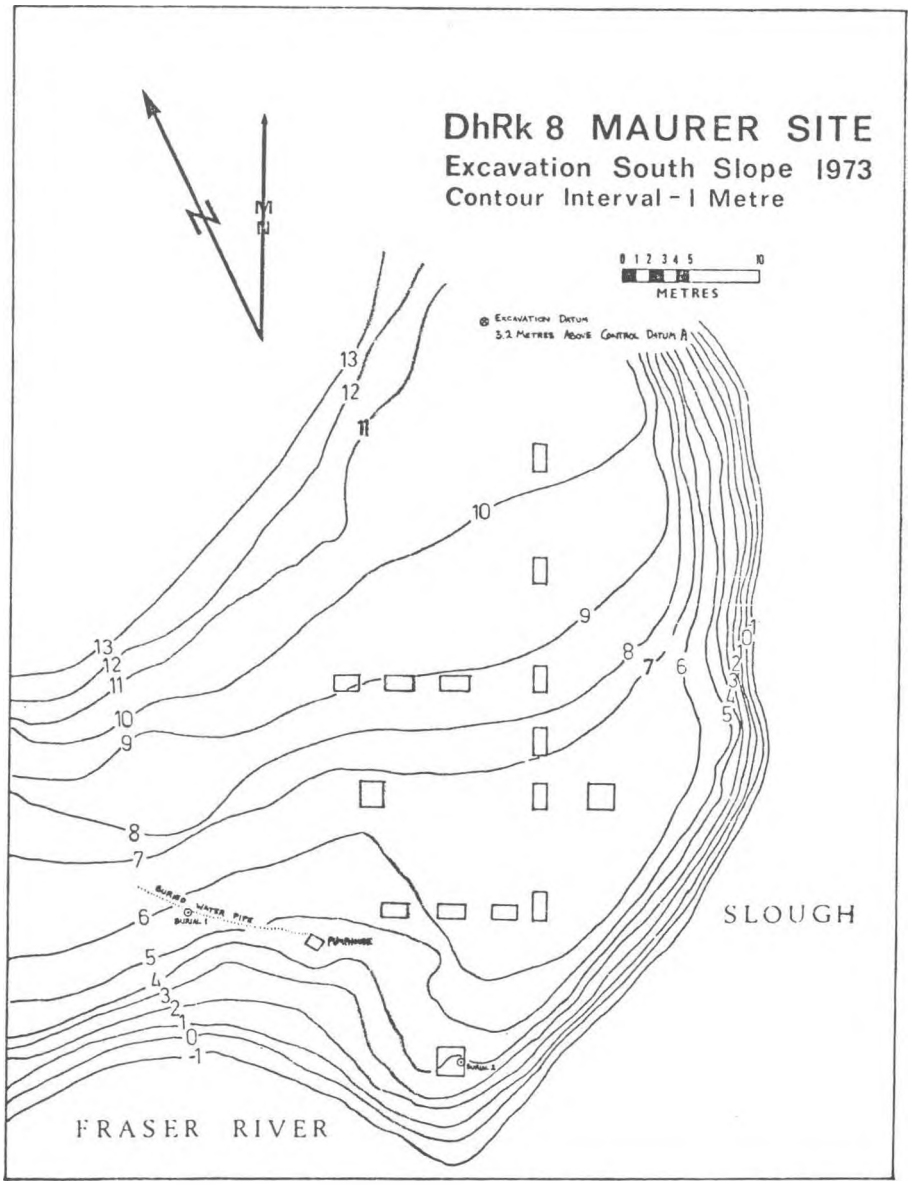

Fig. 15.
The south slope excavation at the Mauer Site.

This was because of the very irregular bedrock formation which tended to be close to the surface on the south east half of the slope. Again, as around the pithouse depression, the cultural deposits primarily coincided with the light yellow-brown stratigraphic unit and the artifacts had the same raw material range and types as those found in and around the pithouse. Therefore, on the basis of the natural stratigraphy, the cultural stratigraphy, the raw materials, and the artifact types recovered it appears that there is good evidence to suggest a synchronous occupation of both sides of the site either at one point in time or over a long period.

Two burials recovered from the south slope of the site definitely suggest a second, much later, component for three reasons. First, there was no bone (other than calcined fragments) recovered from anywhere else in the site below the humus, probably because of the acidic soil conditions. Second, Burial 1 was greatly disturbed by the excavation of an historic water pipe but preservation was still fairly good. Burial 2 did not display any historic disturbance, was flexed and in good condition. Thirdly, because of the homogeneity of the light yellow brown deposits in which both burials were found it would be possible to have burials without discernible intrusions in the stratigraphy. When the burials were placed here is not exactly certain. There were no discernible grave goods found with the burials; preservation of bone does not appear to have been good on the site, the site is not mentioned at all in Duff (1952); Burial 2 has occipital cranial deformation. Therefore, as a result of this evidence I suggest a conservative estimate of from 150 – 200 years for the length of interment.

Artifacts

Approximately six thousand prehistoric artifacts were recovered from the Maurer site in 1973. Except for a few charred wood fragments, some calcined bone fragments, and some burned shell fragments, the artifacts are all lithic. The lithic material used for the artifacts is vitreous basalt, crypto-crystalline grey chert, red jasper or obsidian. Of the lithic assemblage about fifteen hundred artifacts can be called tools. These tools have been further classified into four major groups: unifaces, bifaces, cobble tools and cores. Also, there are general types within these groups. Thus, for the purpose of this report only a brief description of each group and its types is presented.

Unifaces

The unifaces represent the largest group in the assemblage (ca. 72%). They are flakes of all shapes and sizes characterized by either primary or secondary retouch. Also, in this group, in almost every case, the flakes are fragments and exhibit flake scars on the ventral face.

Unifaces with primary retouch. These utilized flakes are the most common tool in this group. They appear to have been selected at random for their cutting or scraping edge or end. Flakes were multitudinous on the site and the fact that there are many with primary retouch is not surprising.

Unifaces with secondary retouch. These are unformed flakes with some secondary retouch usually on only one edge or end, caused by pressure flaking, and are not as common as those with primary retouch. They indicate a more enduring purpose. The selection of these flakes seems not as random as those previously mentioned since they have generally thicker working edges and probably some pre-meditated plan for use.

Bifaces

The bifaces are approximately 5% of the total collection and can be classified into three types: knives, projectile points, and drills (Figs. 16–17).

Knives. In general, the knives are characterized by crude pressure and percussion

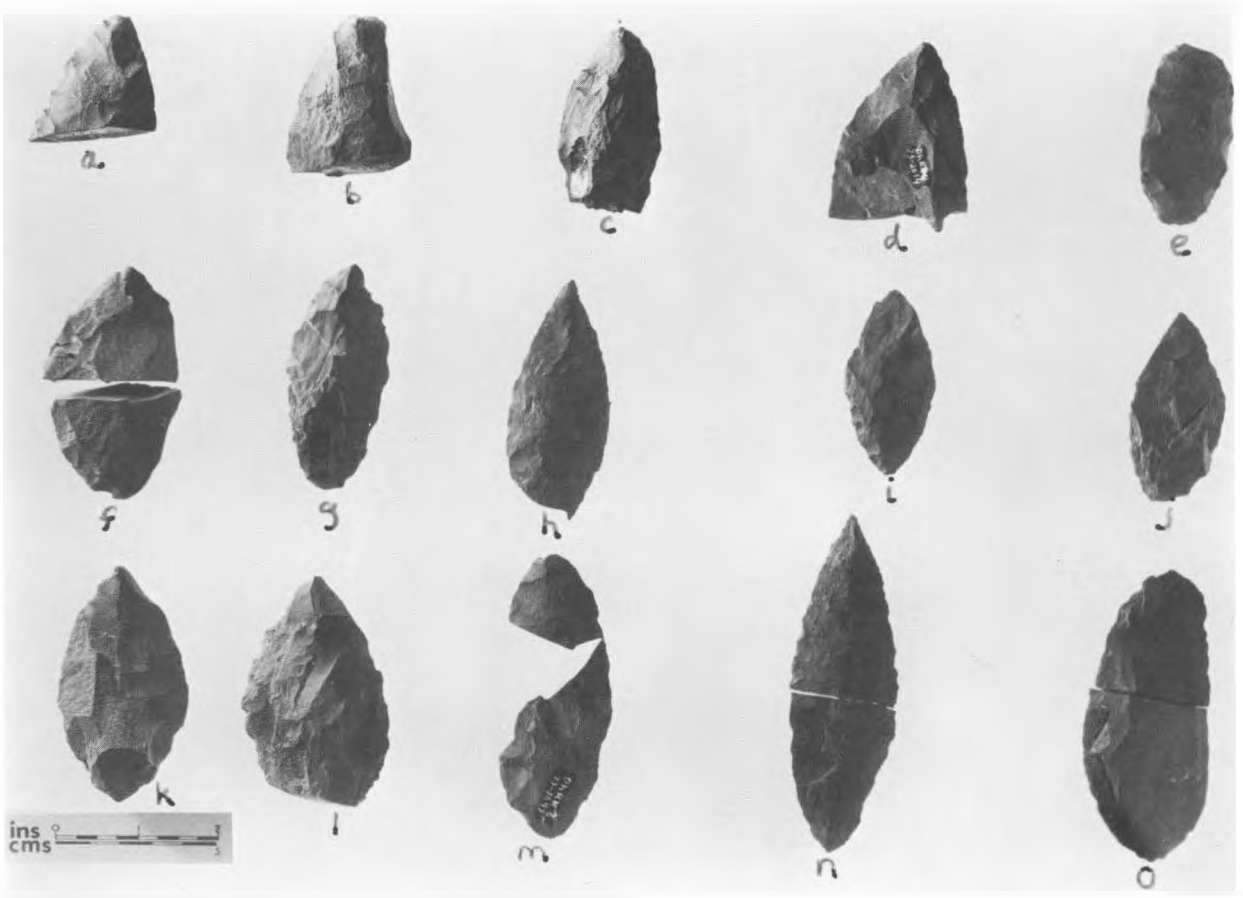

Fig. 16. *Bifacial knives from the excavations. a, b, e, f, k, l, m, n, o are basalt; the remainder are red jasper.*

flaking, a thick mid-section (compared to the points) and an asymmetrical form.

Projectile points. The points include four types: lanceolate, leaf shaped, leaf shaped with contracting base, and side-notched. They are characterized by fine parallel or oblique flake scars and thin midsections.

Drills. Only two drills were recovered and both exhibit a definite form created by fine parallel pressure-flaking on both faces.

Cobble Tools

There are three types included in this group: choppers, spall tools, and hammerstones. This group comprises about 8% of the assemblage.

Choppers. These are basalt river pebbles modified by percussion flaking and exhibiting flake scars from utilization on the retouched end Retouching is predominently unifacial and ranges from retouching at a steep angle on one end to the removal of flakes from three quarters of the retouched face. The working edge on these pebbles ranges from slightly convex to extremely convex or pointed (Fig. 18).

Spall tools. The spall tools are flakes,

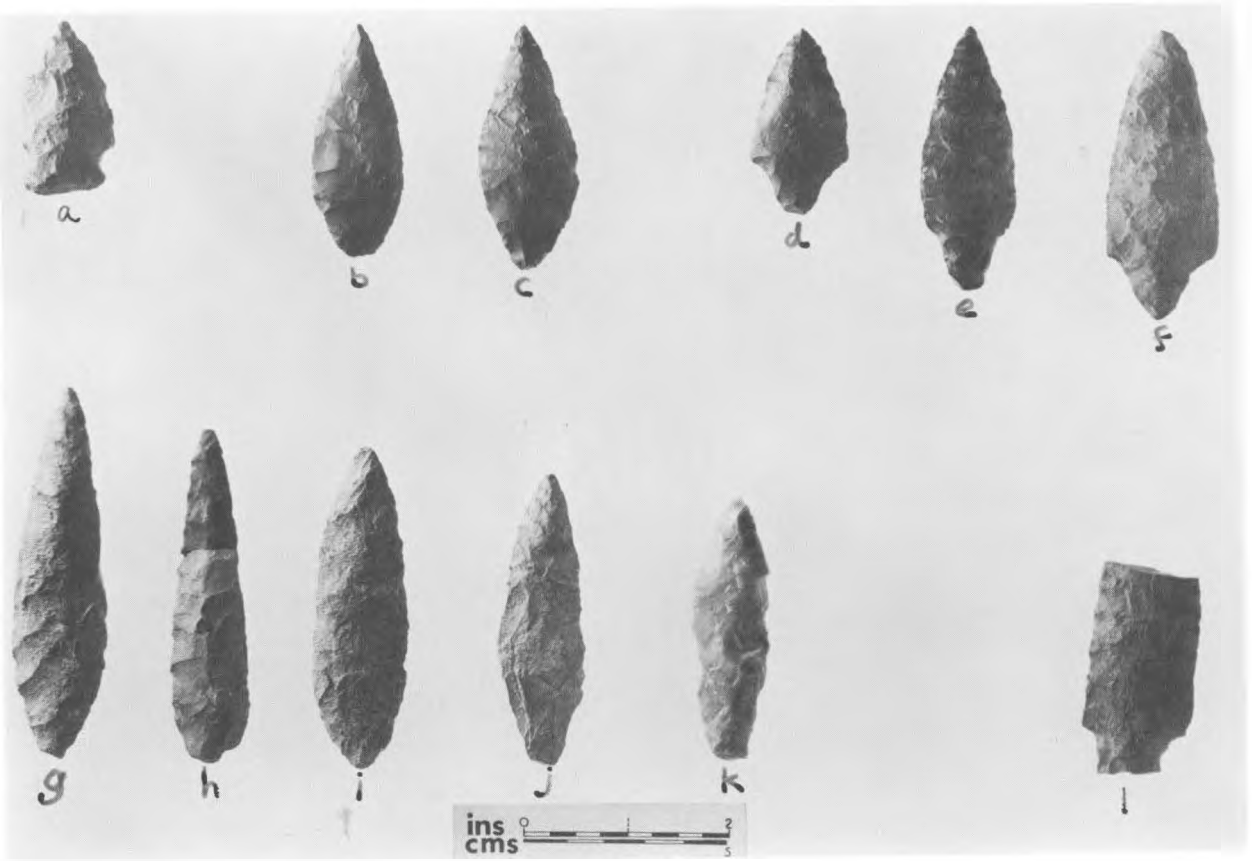

Fig. 17. *Bifacial projectile points from the excavations. b, c, are of red jasper and k is of a grey chert. The remainder are basalt.*

generally large, removed from river pebbles and usually retouched unifacially on the dorsal face at the distal end. Infrequently there is retouch on all edges of the dorsal face.

Hammerstones. These tools are not readily apparent in the assemblage and when they are discovered are usually broken. They have an elongate shape and exhibit some battering on one end.

Cores

This group is very common, representing about 15% of the collection. Disregarding the many core fragments there are two main types of cores: pyramidal and polyhedral.

Pyramidal cores. These cores range in size from one to five centimeters thick and are characterized by their pyramidal shape. The examples range from the small cores being extremely peaked on the top, with steep flake removal to the larger cores which are slightly convex on the top. In all cases there is cortex on the base. The reason for including the larger convex cores in the pyramidal type is that cores go through stages of development and the larger cores are probably an early stage in the process leading to the extremely peaked pyramidal core.

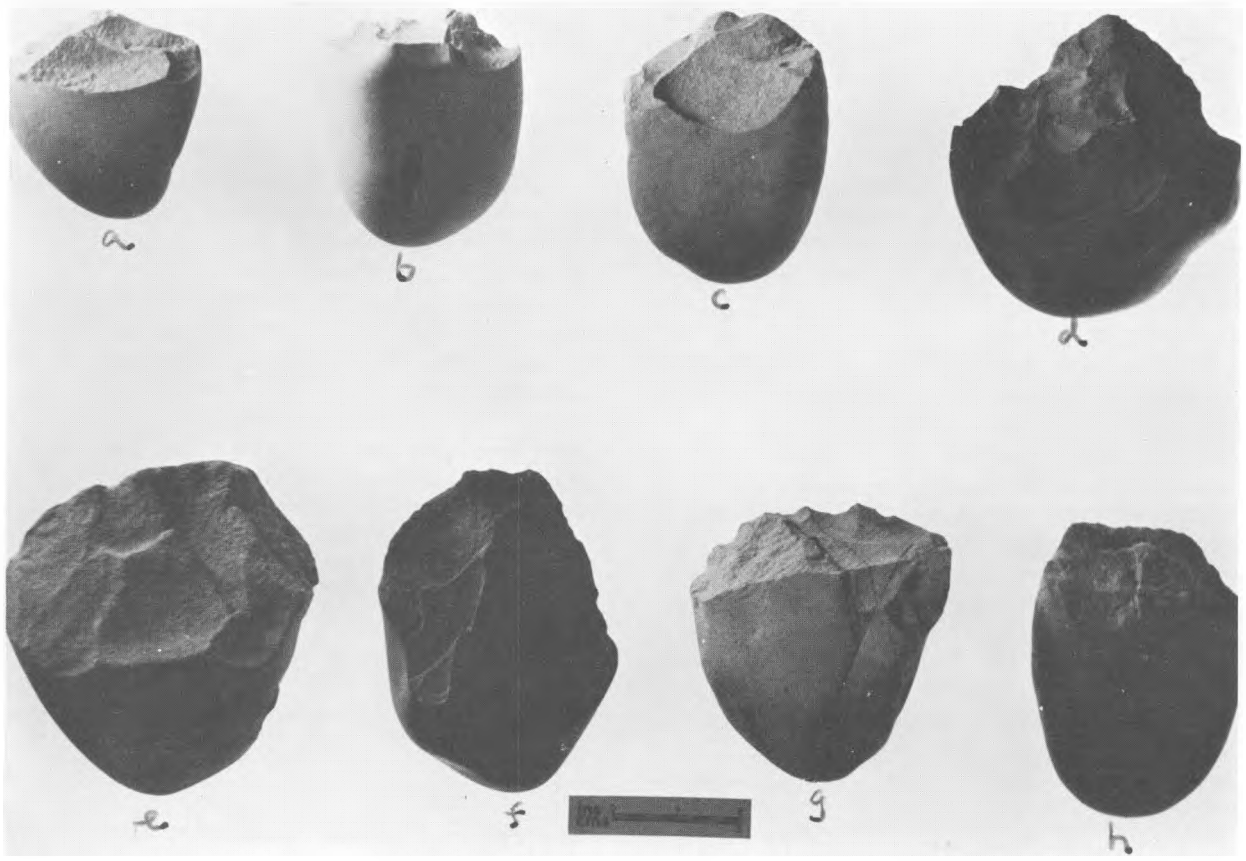

Fig. 18. *Cobble choppers from the excavations.*

Some are easily classifiable as microcores for the production of microblades.

Polyhedral cores. These cores are generally circular in shape and have flakes removed from all sides. In one case it appears that the core was almost a round pebble from which the cortex may have been removed before flakes were struck off.

Miscellaneous Artifacts

This category includes a very small percentage of the assemblage and contains blades, pièce esquillées, pigment and a palette. Some of the blades appear to have been struck deliberately from blade cores and are classifiable as microblades. It is possible that others are the result of using pièce esquillées of which there are at least two examples.

The pigment recovered from the site is red ochre and was found in association with the pithouse. A stone palette, not in association with red ochre, but having the ochre ground into the surface on one face was found at the northeast end of the pithouse. It is a flat, round river cobble about one centimeter thick and twelve centimeters in diameter.

Summary

The following discussion is directed at placing the Maurer site in the context of a chronology already defined for the Fraser Valley. This will be a relative relationship based on the tool typology as presented in this report. Since this is not a final report it should be realized that the context within which the site is placed is subject to change.

The tool types previously discussed in this report were all found in association with the pithouse. Notably, there was no ground or pecked stone recovered and no bone artifacts were present. This last item could have been destroyed when the house burned down but if bone artifacts were present in the house one might expect to recover large calcined fragments since small calcined bone fragments were recovered from the house floor. Nevertheless, the absence of a bone technology places greater emphasis on the lithic technology and this is apparent from the tool types recovered. For example, the projectile points range from lanceolate to contracting base to side-notched; each of these types was found in association with the pithouse. The same is true of the other tool groups; there is a broad range of types associated with the pithouse. Therefore, the problem is to find an assemblage with which that from the Maurer site can be compared.

The absence of ground and pecked stone from such a large tool assemblage as that recovered from the Maurer site indicates an age probably earlier than the first millinium B.C. Therefore, Dr. Borden's Fraser Canyon sequence was reviewed and it appears that there are a number of similarities with the Eayem Phase, dating between 1500 and 3500 B.C. Seven radiocarbon estimates were made by the Gakushuin laboratories in Japan (GaK 4919, 4920, 4921, 4922, 4923, 4926, 4927). Five of these estimates gave dates between 1910 and 2830 B.C. The other two estimates which gave ages of A.D. 540 ± 90 and A.D. 1340 ± 70 should be discounted as they do not reflect the true age of the site.

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Settlement Patterns in Southcentral Montana: A Speculative Approach

LYNN FREDLUND

Introduction

Much of southcentral Montana can be characterized as country interrupted by sandstone outcrops, hills covered with ponderosa pine, and expanses of short grass prairie broken by intermittent creeks and dry washes. It is an area of transition between the plains and the mountains and yet is not really part of either. This type of topography covers substantial areas of Montana, Wyoming, the Pine Hills of North and South Dakota, parts of Colorado, and Alberta. In some cases they represent scarp hills or remnant woodlands (Wells 1970) isolated from surrounding pine forests. Several archaeological surveys have been done south of the Yellowstone River and between the Bighorn and the Tongue Rivers, yet the actual area covered by these surveys represents a very small sample of the entire region (See Fig. 19). Funded by several coal companies as part of their reclamation programs, these surveys were confined to specific acreage and they received intensive coverage. Although numerous sites were recorded, few were much more than campsites for a small band or family group, a rock structure, or a small shipping station. Due to the slow rate of soil deposition common to the region, even the larger sites have little or no depth to them. Very few (12 of the 85) prehistoric sites recorded appeared to have been multi-component and the three sites excavated indicate little more than locations occupied occasionally during the past 5000 years by small groups for short periods of time.

The problem which haunts these surveys as it has many other surveys in the northern plains is that although many sites were located, few of them contain diagnostic artifacts or any datable remains to tie them into a chronology. Thus in an attempt to clothe the chipping debris and to infer past community life it is necessary to look at the overall non-human ecology and at the human settlement patterns. By plotting the distribution of sites within definable environmental zones it is possible to infer or at least hypothesize 1) the general patterns of utilization of the land and resources, 2) the community life within the immediate area for each time period, and 3) the macro-settlement pattern or total annual movement for the various populations through time.

Settlement patterns in southcentral Montana are primarily what Spaulding (1971:9) has called:

> extra-community archaeological sites — satellites sites — produced by extra-community activities of work groups: examples are the kill and butchering sites which are such an important component of our evidence for the early American Indians or the seasonally occupied small fishing camps of the Indians of western Canada. In some simple societies, the entire community is a set of specialized and spatially differentiated work team on a seasonal basis as it moves through its accustomed yearly round of subsistence activities; here, rather than speaking of the site of a community with its satellite sites, we must think in terms of a set of sites, each of which represents the total activity of a community at a given time in a repetitive sequence.

The simple societies to which Spaulding refers certainly applies to the pre-horse hunters and gatherers in southcentral Montana.

The "extra-community model" is used in this paper as if one looked at the entire survey area as being a single site and each area of human activity within the area is considered a unit of daily activity. Thus to make up the daily

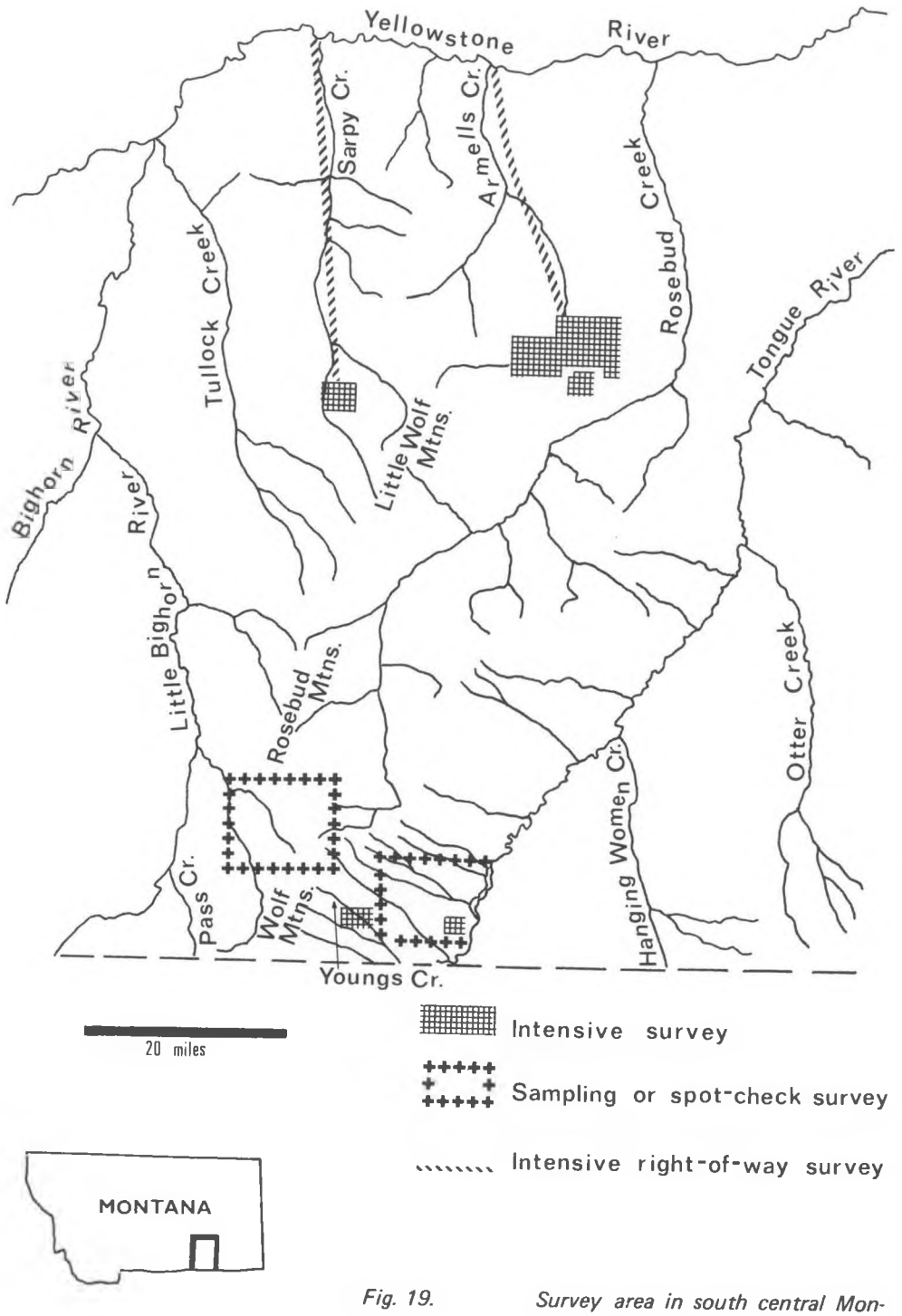


Fig. 19. *Survey area in south central Montana. The data in this paper are from the blocks of intensively surveyed areas only.*

routine or activities of the various populations inhabiting the region it is necessary to look at a set of daily activity sites and not just one particular site as representing the entire activities of that population at a particular point in time. Thomas (1973a: 167) emphasizes this when he says that

> . . . . the scope *must* be extended beyond cave sites, since kill sites, gathering stations and the like are of crucial importance in the seasonal round. Surface scatters are vital since they may be the only remnants of some prehistoric task activities.

In southcentral Montana this means that Pictograph Cave and, to a lesser extent, the small shelters in the Bighorn Canyon, are not indicative of the entire range of activities of the prehistoric populations. Although they have provided a typological and datable chronology they show only a small part of the overall activities of the inhabitants.

This extra-community approach does not exactly deal with the macro-settlement or total area covered by the annual movements of a population. Neither is it the micro-settlement pattern or spatially defined activity areas within a single site (see Trigger 1968:9). It is neither a macro- nor a micro- view but an extra-community outlook which falls somewhere between the two extremes. Similarly the focus in this paper is on a set of sites as they lie within four environmental zones that are felt to represent a portion of the annual movements of any one community, but reflect the pattern of living for the area.

According to Trigger (1968) there are two ways of approaching a study of settlement patterns; an ecological approach and a community patterning approach. The former "is primarily an investigation of how the settlement pattern reflects the adaptation of a society and its technology to its environment", whereas the second is "where settlement pattern data are used as a basis for making inferences about the social, political, and religious organization of prehistoric cultures" (Trigger 1968:54). Although Trigger sees the ecological and the community patterning approach as two separate positions from which to view settlement pattern studies, I see the first as a necessary step for the second, at least in the patterns of occupation of southcentral Montana. Consequently, this paper is first an ecologically orientated approach but will also attempt to take the second step and infer social and political changes.

After establishing 1) a pattern of site distribution within the four environmental zones, and 2) the assumed primary function(s) of each site, we must look at the times of year the area could have been occupied. So far, no hard data from faunal remains or other sources have been found archaeologically to infer occupation during a particular season. However, we are assuming that the region is part of a group's annual movement (macrosettlement) accomplished without question each year. This will be the assumption used throughout this paper but we must also realize that "scheduled", as opposed to seasonal, forays into this region could have been important.

> "Seasonality" was imposed on man by the nature of the wild resources themselves; "scheduling" was a cultural activity . . . . (Flannery 1972: 227)

Flannery views these "scheduled" activities as oriented toward the harvest of resources which perhaps were ready at the same time. The division of labor according to age or sex is, generally, unquestioned in explaining how decisions of scheduling are made: when the chokecherries are ready for harvest and a herd of bison is close enough to be hunted, both resources are exploited, for the women and children would pick chokecherries while the men and older boys would hunt buffalo. In the Great Basin, Flannery (1972) notes that when travelling relatives reported an abundance of a particular plant or animal in a certain area, the band would schedule a special trip to exploit this resource. During pre-horse times in southcentral Montana, mass bison killing, for instance was probably both a scheduled and a seasonal occurrence. Similarly, vision quest sites and eagle catching pits certainly reflect scheduled use of an area. Activities such as eagle catching and bison driving are generally viewed as specific seasonal activities which were based on actually finding a herd strategically located for a successful drive or upon actually spending a few days each fall catching eagles. However, these seasonal activities must also, of necessity have depended on the balance of other resources, particularly availability of food. Thus if there was leisure time and enough food, eagles would be hunted. Comparably, if food was scarce, would there have been the luxury of gathering a large enough group of people together, spending the time to locate the herd, and then following through with the bison drive? Consequently, although the seasonal use of the region will be stressed in this paper, the pos-

sibilities and probabilities of scheduled use will be suggested.

For many of the problems posed it is necessary to draw from ethnographic and ethnohistoric sources, however, there are some dangers in this method for the northern plains because many of the inhabitants who were known historically, like the Crow, were recent immigrants into the area and had the new technology of the horse. For the earlier populations in southcentral Montana, analogies are better drawn from non-horse hunters and gatherers such as the Great Basin Shoshone, as they *might* have existed in this environment.

Geographic Setting

Today this region is quite arid and receives anywhere from 9–17'' of precipitation per year. The summers are dry and hot with frequent storms that usually consist only of menacing clouds accompanied by high winds, thunder and lightning, and little if any rain. Winters, on the other hand, are cold with relatively little snow that generally blows off the grasslands and collects in the draws and lee sides of the low hills. Frequent chinook winds give the land and its inhabitants a break from the cold. Because of these factors the grasslands clear of snow and winter range is generally quite accessible to grazing animals. Even when the grasslands are dry the accumulation of snow in the draws and on the lee of hills remains until late spring, which is the time of most precipitation. Often disastrous storms bringing heavy wet snow come during the spring months.

What the climate for the past 5000 years has been is an all important factor but somewhat of an unknown. Our study that is applicable to southcentral Montana is from studies of macrobotanical remains of trees and debris from the Laramie Basin in southern Wyoming. While the Laramie Basin is slightly drier than southcentral Montana today, the climatic data from Wells' study (1970) is preferable to studies from Iowa and Wisconsin or from high mountain bogs in Yellowstone Park. Wells reports that large juniper trees were found that could by no means be supported by present amounts of precipitation, and that macroflora from several dry caves also support this assumption. This information, plus work from other areas on the plains, led Wells to conclude that the last few hundred years have been drier than the previous 5000 years. He also postulates that the scarp hills regions were very much similar to today but more precipitation would have extended the timber (ponderosa pine zone) if it were not checked by fire. Thus the following changes could have occurred through climatic change in southcentral Montana:

1) The ponderosa pine and sandstone zones could have been similar in distribution but the pine larger in size.
2) More springs could have been evident at times and consequently the creek-side zone could have been larger in area than today and could have included some draws which are filled now only during the spring runoff.
3) The grassland zone could have had different and possibly more lush grasses.

All of these factors would have bolstered the carrying capacity of the land, at least by degrees. However, the present land surface, vegetation, and soils are apparently normal with only minor variation in the past 5000 years.

Topographic-Ecologic Zones

The geography of any region can usually be broken into zones (ecologictopographic units) or microenvironments. These zones (see Fig. 20) are looked upon as a composite of a total ecological unit which realizes the association of the flora, soils, and topography, and are not based on just one factor such as vegetation.

Each of these zones is a subsystem within the overall model of the regional ecosystem. Within the southcentral Montana region, four major zones are easily distinguished and it becomes a simple matter to plot the distribution of archaeological sites throughout these zones. Through this distribution man becomes part of the complex system of intra- and interaction of the total ecological system. One

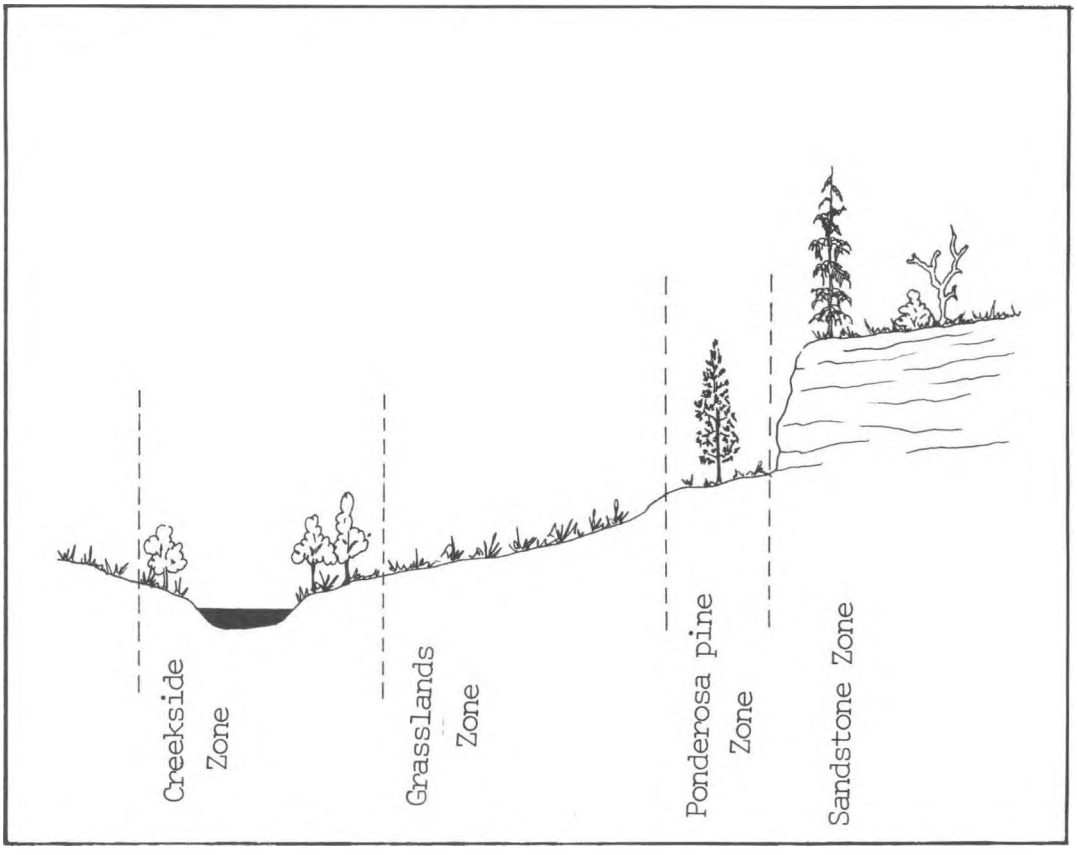


Fig. 20. *A model of the environmental zones in southcentral Montana. The creek-side zone shows deciduous trees and shrubs, the grassland has short grass prairie species for cover, the sandstone zone has practically no vegetative cover, and the ponderosa pine zone has ponderosa pine and juniper mixed with short grass prairie species in meadows.*

warning must be made; the researcher makes the choice and classifies the sites as to zone. Whenever a site was on a zone border, our criterion of choice was to place it in the zone which it was *mostly* within. Another factor is that the inhabitants might have chosen to be on zone borders and it is almost impossible to establish the location of a zone border even 100 years ago, much less several thousand.

Sandstone Zone

Sandstone outcrops dominate the topography of this zone. Since they are often capped with a hardened weather resistant shale or clinker (a result of coal seams burning underground), many have survived the years of erosion. These sandstone outcrops are erosional remnants of the Fort Union Formation composed of alternating layers of sandstone, shales, and coal. The shallow, sandy soil does not encourage thick vegetation and as a result a few scraggly ponderosa pine or juniper plus sparse grasses, sage, and cactus manage to grow.

The fauna of this zone are interesting as they are for the most part predators who use the sandstone zone for denning areas. Coyote, fox, bobcat, wolves, mountain lion, as well as the predatory birds such as eagles, hawks, and owls spend most of their lives in the sandstone zone. Certainly there is a resident population of packrats, mice, and other small rodents submissively co-existing with the primary inhabitants – the predators.

In the sandstone zone water is scarce except in the winter in the form of snow, and in the spring in the dry washes that collect and hold the snow and channel the run-off. Also, during and shortly after rains there are occasional natural catch basins in the sandstone that hold

limited amounts of water. Consequently the major attraction for the predators in the sandstone zone appears to be the protection and shelter which it offers and not for a water supply.

For man the sandstone offers protection and shelter, easy access to wood, an excellent view from the high sandstone remnants, stone for building structures, and flat walls for engraving or painting (petroglyphs and pictographs). The functions of sites within this zone are varied and include rock structures built for vision quests for eagle catching pits and for unknown purposes. There are also a number of rock shelters which were inhabited; some several times. Lookout sites are usually identified by a significant amount of chipping debris on the high cliff edges. Also, bison jumps are associated with, or at least directly related to this type of topography. On many of the sandstone outcrops, generally at the summit is found porcelanite, or as it has often been called in the literature, metamorphosed siltstone. Porcelanite was the main material utilized by the inhabitants who quarried it from within this sandstone zone. Because the wind and the sun tend to denude the high slopes of snow the material would have been easily obtainable during all seasons of the year.

Thus man has employed the sandstone areas over and above the concept of protection and lookout capacities as sought by co-existing predators by using the zone for bison jumping, eagle catching, inspiration, and communication. Basically it is a zone that is difficult to move, but is protected from wind and rain, and is an area where one can see and not be seen. Water is only seasonally available and thus the use of this zone, even by the predatory animals, must be seasonal or scheduled.

Ponderosa Pine Zone

This zone is sometimes difficult to distinguish from the sandstone zone and for this reason many of the attributes of the latter are equally applicable to this zone. It is an area that offers some protection and shelter and provides excellent concealment to the occupants. It shares, with the sandstone zone, a similar seasonal availability of water, without of course, the added possible convenience of the catch basins for intermittent rainfall, and it shares the attributes of available wood and available material for stone tools. Topographically it is not as broken and rugged as the sandstone zone but since the pine forest often grows on long north, west and southwest facing slopes it is easy to traverse and offers shelter along the way.

The predominant flora is ponderosa pine, some juniper and rhus with small grass meadows breaking up the open forest continuum. The fauna are mostly small game birds like the grouse that live in the pine and utilize the protected grasslands. Rabbits, squirrels, and many small birds live in this zone. Today the major ungulate is the mule deer and often their beds are found in the sandy soil under the pine and juniper.

The archaeological sites located within this zone are usually on relatively flat grassy areas surrounded by pine. Most of them also indicate more intensive use other than just a lookout site or a chipping station as in the sandstone zone. Yet, even here the area of chipping debris is usually not very extensive and would average about 900 square meters. Most of these sites are not adjacent to water sources or even a draw which might seasonally hold water so the primary drawing card for the prehistoric populations within the ponderosa pine zone must be shelter, wood, and concealment and a place to hunt larger ungulates. In the summer trees provide shade and a place to escape the hot sun.

Grassland Zone

The grasslands of the region are flat or slightly rolling with the flora being short grass prairie species characterized by blue grama, western and bluestem wheatgrass, and needle-and-thread grass. Sage is common and quite thick in some areas. The grasslands receive little precipitation since as mentioned above the snow is blown off generally by the winds during the winter and spring. Only a few species of plants on the grasslands were probably harvested by the prehistoric population; wild rye and ground cherry could have been two of them.

Today the grasslands are mostly used for cattle grazing but in some places large tracts have been plowed and planted in wheat or barley. In this area the ideal number of cattle is five or six head per acre; which gives some idea of the carrying capacity of the grasslands today. Historically these grasslands have supported horses, cattle and sheep.

Wild fauna living on the grasslands in the past were bison, antelope, mountain sheep, and probably elk (who actually probably spent more time in the creek-side zone). Only ante-

lope are left on the grasslands today feeding primarily off silver sage and consequently not competing with cattle for food. Bighorn sheep were observed in great numbers by Lewis and Clark and other early explorers along the Yellowstone and Bighorn Rivers. Sheep were not necessarily confined to the high mountain country where they are found today; "its feeding grounds were the grassy foothills and bluffs not far from the crags" (Seton 1953:531).

Bison, the major ungulate species on the grasslands and the adjacent plains is generally thought of as being the most important animal to the prehistoric populations, an assumption based on the ethnographic plains inhabitants and generalizing from the many bison jumps excavated. Bison were important in varying degrees through time to the human population but to the general ecology of the area bison probably had a tremendous effect. Certain plants moved into buffalo wallows, and grasses were trampled but the soil was also churned up and fertilized (Allen 1967). As well, bison aided the grasslands to maintain themselves from encroaching ponderosa pine by chewing on the young pine and rubbing on trees adjacent to the grasslands. Bison kill sites are found throughout the region and occasionally lone bison skeletons are found eroding out of cut banks. Various authors have discussed bison habits but there is disagreement as to whether bison move east and west, or north and south in their migrations. In the mountainous areas the most sensible solution seems to be that they move in a circle as suggested by Seton (1953). His map (see Fig. 21) shows one cyclical movement as going directly north of the survey region. Although the movement of bison through southcentral Montana is of importance in assessing the resources available to humans at certain times of the year, we have no direct evidence of what this movement was.

Another animal living on the grasslands was the elk, and its prevalence is attested by the ranchers' stories of the many elk antlers which they used to find scattered over the land. Today, the elk like the mountain sheep, have taken refuge in mountainous regions. Elk, however, were ethnographically not as important as a source of food as deer and bison or antelope because the meat could not be dried nor did it keep as well (Coues 1965:1170).

Other grassland fauna include the prairie dog, mice, ground squirrel, etc. and several species of game birds such as the sage grouse and sharp tail grouse. The communal gatherings

Fig. 21. Survey area relative to historic buffalo migrations (adapted from Seton 1953:652). Arrows indicate direction of movement of the Saskatchewan and Red River herds.

of these birds in the spring for the "drumming" and dancing preliminary to mating were in the same place year after year and could easily have been exploited by the inhabitants.

Evidence for man's use of the grassland zone is significant because of its absence from the archaeological record. Small chipping stations or miscellaneous artifacts are found occasionally which means nothing more than that someone walked across the grasslands sometime in the prehistoric past. Only one site of any significance was located in the grassland zone and that was a small bison kill site where the hunters had made use of a small (approximately 30 meters in diameter) swale into which bison had been driven, killed, and butchered (Ekland 1974). Only two other small prehistoric sites were recorded in this zone. This seems to indicate an avoidance of the grasslands as a living area by prehistoric and historic people.

Creek-side Zone

Composed of deciduous or broad leaf trees and numerous shrubs this zone is the most lush of the four zones. In the creek bottoms and even in the small draws leading to the creeks cottonwoods, box elder, wild rose, choke-

cherry, wild currants, wild plum, buffalo berry, and other plants grow. Moisture is constant in the creeks but in the draws is generally seasonal but sufficient enough to support many of the small shrubs.

The fauna living there are mainly small song birds and mammals such as the beaver, muskrat, mink, etc. White-tailed deer spend most of their time within the thick zone of trees and shrubs. Today, few beaver, muskrats, or fish are evident but numerous deer continue to inhabit this zone. In creeks that are barely muddy in the bottom today, local people remember catching fish or trapping muskrat in the Twenties. The clearing of the creeks of the large cottonwood and box elder for buildings and firewood by the homesteaders, the diversion of water for irrigation, combined with diseases which almost eliminated the beaver for instance plus the general trend toward slightly drier conditions has altered this zone and made it difficult to visualize as it was two hundred years ago. As the major source of water in the area we expected to find numerous human habitation sites along the creeks and were surprised to discover that most of the prehistoric sites were in the sandstone and ponderosa pine zones and not near the creek bottoms. Only the historic sites were consistently located near the creeks.

A Sketch of Human Life within the Four Zones

From the types of sites and their distribution within the four zones, the knowledge of the animals and plants that inhabit the zones and the assumed seasonal use we can describe 1) the general living pattern for man, as well as 2) a sketch of the community life which he might have had at each point in time. A cautionary word on the term "exploitation" which has often been used to describe man's interactions with his surrounding environment is as Flannery (1972:222) has stated "man was not simply extracting energy from his environment, but participating in it; and his use of each genus was part of a system which allowed the latter to survive, even flourish, in spite of heavy utilization." Thus rather than looking at means of procuring bison, deer, sheep, etc. we must first look at the various zones and movement within and between these zones and how man fits into the overall system.

Man seems to have moved within the ponderosa pine zone and watched the grasslands for game from lookout sites on high sandstone outcrops. In doing so he was using the topography so as to remove himself from the open grasslands (D. Fredlund 1973). This gained him a reasonable view over the adjacent areas. When game was spotted he could then plan his hunt by himself or in company with his immediate friends or family with which he was living and travelling. He also, from these high vantage points could watch several drainages at once. Once game was located, the hunt could be planned, and carried out in a manner as to disturb the animals as little as possible. This would be advantageous at all times of the year because when the herd is disturbed they would presumably flee to other areas thus alarming any other prey which might be nearby. When this occurred man would also be forced to move and this would utilize the groups' energies in a manner which would essentially be non-productive. Time would be spent in walking, and setting up another camp, rather than hunting or even making necessary tools.

When a band was forced to move, the question comes as to what type of shelter was constructed or carried and how was the labor divided. Dogs were presumably the major beast of burden along with humans. At most times of the year the dog travois could be used which would allow the animal to carry more than if he were carrying just a pack. Deep snow and mud would be the main hindrance for this type of movement.

When a group arrived at a small shelter or shallow overhang, it is presumed that dead timbers would have been laid against the shelter wall and skins and/or brush placed around these to ensure more warmth. In the Pryor Mountains (Loendorf 1969) there are several rock overhangs in which the remains of these types of shelter are evident. Wickiups or timbered lodges are another structure easily built in the ponderosa pine zone. These structures use logs and sometimes incorporate nearby rocks. Most of these were constructed previous to the 18th century and would presumably have weathered away but similar types of structures could have been built by the pre-horse populations. We have reported none of these structures on the survey areas but they are common in the general area and because of the zones in which they are found it seems feasible to suggest earlier use

Table 1. Number of site types by zone.*

	Sand Stone	Ponderosa Pine	Grasslands	Creek side	Total
Habitation Sites					
Open camp	4	22	1	14	41
Rock shelter	8	1			9
Tipi rings	1				1
Homesteads			2	9	11
Lookout Sites	8	3	1		12
Rock art	9				9
Rock structures	3	1	1		5
Kill sites	1		1		2
Quarries	1				1
Total	35	27	6	23	91

*The sites listed are from the units of intensive survey only, and multi-component sites are counted as one site for each occupation.

of similar structures.

During the fall of the year the creek-size zone would probably have been quite important because that is when the berries, plums, chokecherries, etc. would be ripe, and rose hips for instance would be ready for harvesting along the creeks. Women presumably would be the primary gatherers of these foods.

The focus of hunting does not seem to have been on bison totally. Yet, during late prehistoric times (600–1500 A.D.) as evident at the Kobold Jump, the BLM Bison kill, Glenrock and many others of this time period, bison hunting was developed into a successful activity. More manpower was needed than could be gathered from a small band without horses and considerable planning would have been necessary to carry out a mass bison kill. Ethnographically, the plains tribes who farmed the river bottoms of the Missouri River like the Mandan and Hidatsa, would move out in the fall to hunt bison. The Cheyenne and Crow who did not farm, hunted bison all year but emphasized the fall hunt and had the use of horses. Through scheduled hunting a small band without horses could often locate several other small bands of people to hunt bison at any season but the animals would have to be located and moved to a cliff, snow drift, or a surround built for the occasion. The amount of energy needed for this type of endeavor was more than could generally be mustered by the small pre-horse groups indicated by the archaeological evidence.

From the excavated sites we have faunal remains of bison, deer, antelope, one bone from a mountain sheep, but no elk. The percentage of bison bones from two shelters (4 different levels of occupation) does not indicate any heavy reliance on bison. There is more evidence that bison, deer, and antelope were brought

back equally as often. Thus, it seems that the few bison kills do not by any means indicate that those numbers of animals supported all of the inhabitants of the region! Because of the nature of bison kill sites, it is entirely probable that a good percentage of these have already been found and reported even if not fully recorded by professional archaeologists. This is not true of other sites. Thus in southcentral Montana bison hunting was probably scheduled and bison was one of several food resources for the prehorse inhabitants living in the area. It was however certainly the most dramatic acquisition of food which can be reconstructed from the archaeological record.

Changes in Settlement Patterns Through Time

Other than the four zones discussed above the inhabitants of this region had access to the various zones of the mountains and plains, plus the major river valleys. The Shoshone are reported to have lived in the mountains but also to have moved across the plains and into the Black Hills. The Crow certainly frequented the mountains surrounding their lands and there is abundant evidence of sites in the high mountain meadows in the Bighorn and Pryor Mountains of large groups living there. The sites along the Missouri River bottoms of farming communities who would seasonally move out onto the plains for bison are well-known. Figure 22 gives a very brief and simplified sketch of the various regions and zones available to inhabitants within these regions.

Although the prehistory of southcentral Montana begins at least as early as 11,000 years ago our surveys have recovered little evidence of life from this time period. Only a few isolated finds and very limited published data accounts for any activity before 5000 years ago.

Several sites from our surveys fit into the McKean complex or Early Middle Prehistoric Period (Mulloy 1958) based on typological comparisons of projectile points. This period roughly spans the time of 3000 B.C. to A.D. 1. Several sites excavated or located yielded points relating to this period but none produced any complete assemblages or datable material. However, the few middle period sites known are at favored locations and seem to have been selected for their closeness to creeks or springs rather than within the ponderosa pine or the sandstone zone as was the norm in later time periods. Sites from higher elevations in the Wolf Mountains from this time period are also adjacent to good springs. It seems that the early Middle Period people were utilizing the region seasonally different from those in the area later; perhaps during the summer since water seemed to be a major factor in the choice of site locations. It is also possible that enemies were not as great a problem as in later times and that it was not as necessary to live in areas which were more concealed. Thirdly, there were fewer people and there may have been no need to choose any but prime locations.

There are two hypotheses concerning the origins of the cultures during this time period proposed by Husted (1969) and Reeves (1969). According to Husted, people spread out from the mountains and into the plains during these 3000 years. Reeves believes the McKean complex arose and moved in from the eastern archaic. Unfortunately our evidence neither supports nor denies these speculations. During Late Middle Prehistoric Times, (A.D. 1–600) Husted sees a mountain adapted people similar to or ancestral to the modern day Shoshone who had remained in the area through early prehistoric times and continued to live in the Bighorn Canyon of southcentral Montana. Interestingly enough the point types from the shelters excavated in southcentral Montana are quite similar to the material from the Bighorn Canyon; and are more similar than to projectile point styles from the plains to the east and north.

For the late Middle Period Husted sees hunters who use the Avonlea style points moving into the area from the northern plains around A.D. 500 and influencing the mountain dwellers. Reeves, on the other hand, sees the Besant people moving in from the east with another style of corner-notched point and pottery and coexisting with the Avonlea or Tunaxa cultural tradition which he feels was an outgrowth of the McKean complex. Perhaps, if Reeves is correct the influx of Besant peoples forced some of the Avonlea hunters south and into the mountain areas. From the survey regions we have few samples of either the Avonlea or the Besant style point.

The corner-notched tradition is however quite apparent throughout the survey area and generally from sites in the pine and sandstone

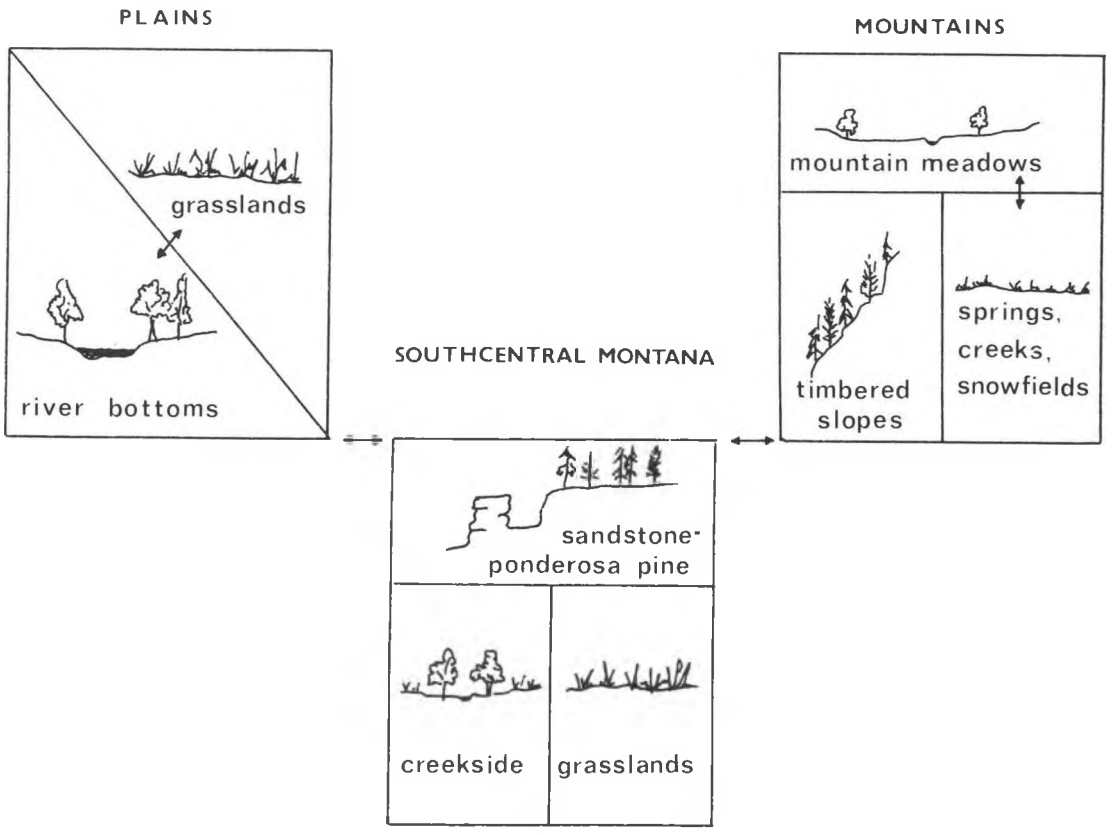


Fig. 22. Idealized model of environmental zones accessible to the populations of south central Montana.

zones. These sites are generally in similar locations with the Late Period small side-notched, or triangular points. Based on analogies of the use of the pinyon pine-juniper zones in the Great Basin (Steward 1938 and Thomas 1973a) and assuming that ponderosa pine-juniper zones have similar assets we can strongly suggest that the sites were occupied in the winter and spring. Two bison kill sites from the Colstrip area appear to be the results of driving the animals into snowdrifts, thus supporting a winter-spring season of inhabiting the area. In addition the rugged topography provides ideal winter refuge to which bison and other large ungulates would have concentrated.

Actually there are numerous bison kills from these later time periods but the sites themselves yield relatively few bison bones. Perhaps the mass kill sites are the result of peoples encroaching into the area at a certain season (fall?) and leaving immediately after the kill. The majority of sites in the region then would be the remains from people living there at other seasons of the year. There is no doubt that in Late Prehistoric Period times (600–1500 A.D.) the populations were larger and communal hunting of bison reached a peak (a factor which may also be the result of the increased number of bison). There is also evidence suggesting that there was a stabilization of climate which would enable this to occur. Yet, the community life, although undoubtedly more complex due to increased population, does not reflect any basic changes in the archaeological record for any time but the early middle period. Thus the sketch of life in the area, outlined above, holds true from late middle period times until the introduction of the horse.

With the introduction of the horse the mountain-plains adapted people (the Shoshone, Kiowa, and others) were displaced by the eastern tribes who were moving into the plains. The

Table 2. Number of prehistoric sites per zone per time period. *

	Sand stone	Ponderosa Pine	Grassland	Creek side	Total
Late prehistoric A.D. 600-1700 (Side notched and triangular points	3	2		3	8
Late middle prehistoric A.D. 1-600 (Corner-notched points)	3	4	1	3	11
Early Middle Prehistoric 3000-B.C.-1 A.D. (McKean Complex points)	1			3	4
Total	7	6	1	9	23

Table 3. Number of types of sites per time period.

	Early Middle	Late Middle	Late	Total
Open camp	4	5	3	12
Kill site		1	1	2
Lookout site		1	2	3
Rock shelter		2	3	5
Tipi ring			1	1
Total	4	9	10	23

*The chronology of sites is based on point typology and radio carbon dates were possible. However, because of the small samples point typology is not completely reliable but it is the only data on which to base a chronology.

surveys indicated only one site which would clearly be part of this historic period. Thus, with a new technology and way of life based on the horse another type of settlement pattern should appear. From ethnographic sources we know that the Crow, Cheyenne, and Sioux spent winters in this rough broken sandstone country, especially when being harassed by the cavalry. If we can assume that some of the tipi ring sites were associated with the post-horse period then we seem to be seeing a greater use of the grassland zone and closer ties to the creeks where more grass and constant water were available.

The next major change in settlement distribution came with the influx of homesteaders with their farming technology and domesticated animals. They settled primarily next to water sources and built their log cabins of either cottonwood or ponderosa pine. Some remains of cabins are to be found away from water but these were usually just constructed to legitimize the claim, i.e. to "prove up", and were not meant to live in, only to satisfy the law in order to gain another 160 acres of land. To the homesteaders, the sandstone zone was a problem and had no real value since it sheltered the animals which often preyed upontheir stock, it was difficult to cross, and it could not be used economically. The pine zone was a source of wood and a place of shelter for animals in the hot summers and probably during storms but the creeks and rivers were the key areas to life in the region.

Summary

This paper has attempted to examine the settlement patterns represented by the intensive archaeological surveys done in southcentral Montana through the summer of 1973. Four zones are singled out to be the focus of the distribution of living sites and the resulting pattern indicates some of the processes which may have been involved in changing living patterns throughout the last 5000 years.

During the early middle period times man is seen as living in choice locations near springs and creeks, thus emphasizing the water sources. In late middle period and late prehistoric times (A.D. 1–1700) man seems to have lived in the winter and spring seasons and moved – possibly into the higher altitudes – for the summers. It is also possible that peoples living on the plains most of the year used the southcentral Montana region for seasonal hunting trips or scheduled events rather than living in the area all the time, thus making use of the topography and the other resources. In general the daily pattern of land use based on the distribution of sites is that the grassland zone was watched and crossed only for purposes of hunting; the creek-side was for water, for gathering berries, and perhaps hunting white-tailed deer or trapping beaver or muskrat; the sandstone zone for vision quests, eagle catching, rock art, and shelter; and the ponderosa pine zone for living and moving within.

With the coming of the horse and new peoples a new, or altered settlement pattern is suggested. From ethnohistoric information these historic bison hunters located in this broken country in the winter where they had access to grass for grazing and creeks for water.

The next influx and change in living pattern was the homesteader. With a totally new culture and totally different technology and economy they attached themselves to the water sources and brought resources from other zones *to* their living areas rather than moving *to* the resource as others had done before.

Thus by using a zonal model of the environment and viewing the distribution of sites through an extra-community approach a greater perspective has been gained from the archaeological surveys of southcentral Montana.

ACKNOWLEDGEMENT

The following companies supported the field work which resulted in this paper: Peabody Coal, Western Energy Co., Shell Oil Co., Burlington Northern and Westmoreland Resources, Inc. Smaller tracts of land were surveyed for Decker Coal Co., and Ayrshire Coal Co. and two spot-check surveys were

sponsored by the Bureau of Land Management reported as of December 1973. Many of the ideas and contents of this paper have been used in part in reports to these contracting companies.

Random and Non-random Sampling of the Same Site

BRIAN SPURLING

Introduction

The need for probabilistic sampling strategies in archaeological research has been formally recognized since Vescelius (1960) proselytized the use of explicit sampling techniques. Binford (1964) and Rootenberg (1964) offered research designs deploying probabilistic sampling methods at the regional and site levels respectively four years later. By 1967 Ragir (1967) contributed a synopsis of sampling tactics largely influenced by Krumbein's (1965) work in paleontological sampling. Although all of these researchers proffer the rationale supportive of probabilistic sampling in archaeological research, none provide tests of efficiency between judgemental or intuitive sampling methods and probabilistically derived samples, or between alternative probabilistic sampling strategies conducted against a real population of archaeological data. This situation was rectified by Plog (1968), Matson (1970), Thomas (1969, 1973b), Judge, Ebert, and Hitchcock (1973), Matson and Lipe (1973), and Meuller (1974). These studies were generally concerned with statistically appraising the efficiency of differential sampling techniques employed against a universe of known site locations at the regional scale. Published accounts of such comparisons conducted through inter or intra-site excavational programs are scant. Only one case study, unfortunately of a parochial nature is known to the author, that of Michael Blake's excavation of a housepit at EeRk 9 and his subsequent comparison of the accuracy and precision of three probabilistic techniques, various sample sizes, and stratification designs against the recovered artifact population (Blake 1974). It is the intent of this paper to present the results of a similar investigation undertaken at a small coastal shell midden (DcRu 2) located near Victoria, British Columbia during the 1973 field season.

Study Area and Methods

DcRu 2 is situated near the southern entrance to Esquimalt harbour south and east of Victoria, British Columbia at the northern margin of Esquimalt Lagoon. It is separated from the terminus of Coburg Peninsula by a shallow tidal channel which drains and replenishes the lagoonal waters. The site is colloquially known as the Esquimalt Lagoon site for obvious reasons (Figs. 23, 24).

The surface area of DcRu 2 is approximately 4228 m^2. of which 3412 m^2. is amenable to sampling (a road runs through and covers a part of the southern section of the site). The site represents 6432 ± 130 m^3. in total volume of which 5118 ± 104 m^3. is accessible for excavation (80% limits).

DcRu 2 is within the historic-ethnographic tenure of the Straits Salish Songhee and, at present, under the tenure of the Historic Sites Branch of the Government of Canada.

The excavational history of the site spans the field seasons of 1972 and 1973. During the months May to September of 1972 Mr. Ernest K. Oliver directed five students in excavations at the site. This program was recommenced in October of 1972 for the purposes of a six-week field school course in

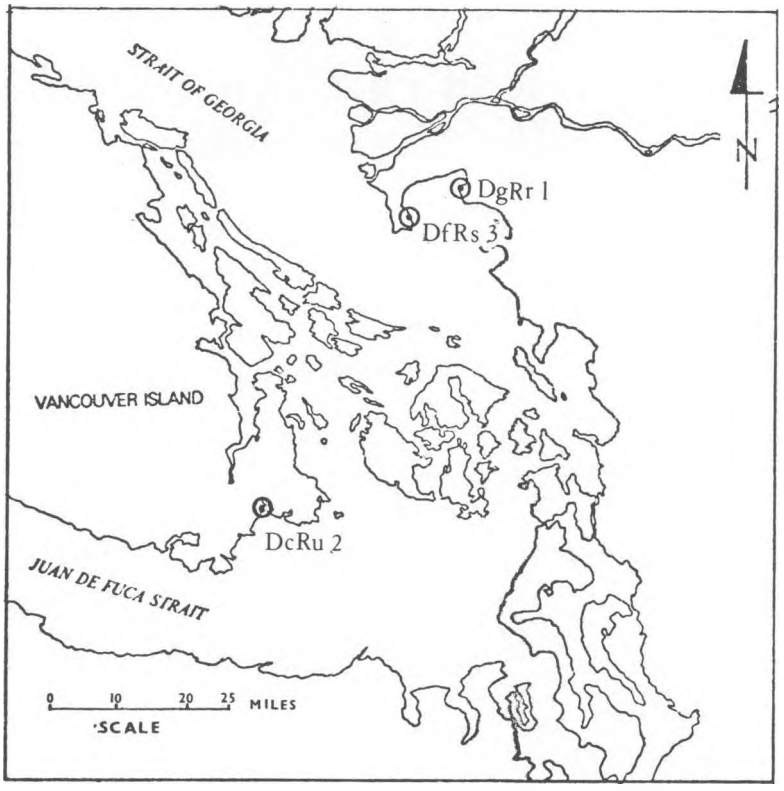


Fig. 23. *Location of the Esquimalt Lagoon site, DcRu 2. The locations of the Whalen site, DfRs 3, and the Crescent Beach site, DgRr 1, are also shown.*

archaeological methods offered by the University of Victoria again under the direction of Mr. Oliver. The author directed a crew of from five to seven members in further excavation during the months of May to August 1973.

The cumulative retrieved technological collection is grossly assignable, with some reservation, to the *San Juan phase* (Carlson 1970) or Mitchell's (1971b) *Montague Harbour III* taxon. "Diagnostic" of the *San Juan phase* are unspecified quantities of herring rake barbs, unilaterally barbed bone points, small unbarbed bone points, sandstone abraders, ground nephrite adze blades, valves, composite socketed harpoon heads, thin ground slate knives, thin triangular ground slate points, and antler wedges. Artifact classes occurring in quantity are composite fish hook barbs and items fashioned from split elk and deer long bones. Other artifact types present but in low frequencies are chipped stone items (Carlson 1970). Similarities are also adduceable to King's (1950) *Late ,Phase* at Cattle Point, Bryan's (1963) *Late period* components from northern Puget Sound, or Kidd's (1969) Late Component. The collection from DcRu2 cannot be assigned on a wholesale basis to the above taxon without the following qualifications. The presence of one specimen of a type assignable to an earlier regional taxon and the percentage that one class of cultural items represents in relation to the retrieved 1973 collection argue for 1) the presence of two components at the site and/or 2) recognition of an earlier date for the inception of the *San Juan phase.*

The *San Juan phase* here is used as a "catchall" temporal/spatial/cultural taxon inclusive of Mitchell's, Kidd's, and Bryan's complexes. The appropriateness of this lumping and, indeed, of the use of the concept of phase as applied to archaeological assemblages of the area in general will go unquestioned. It is beyond the scope of the present paper to undertake a justification of the above assignation of the use of the phase concept. With regard to the anomalous items present in the DcRu 2 collection of 1973 the proximal section of a bone harpoon fragment with bilateral line guards exhibiting posterior and anterior incisions

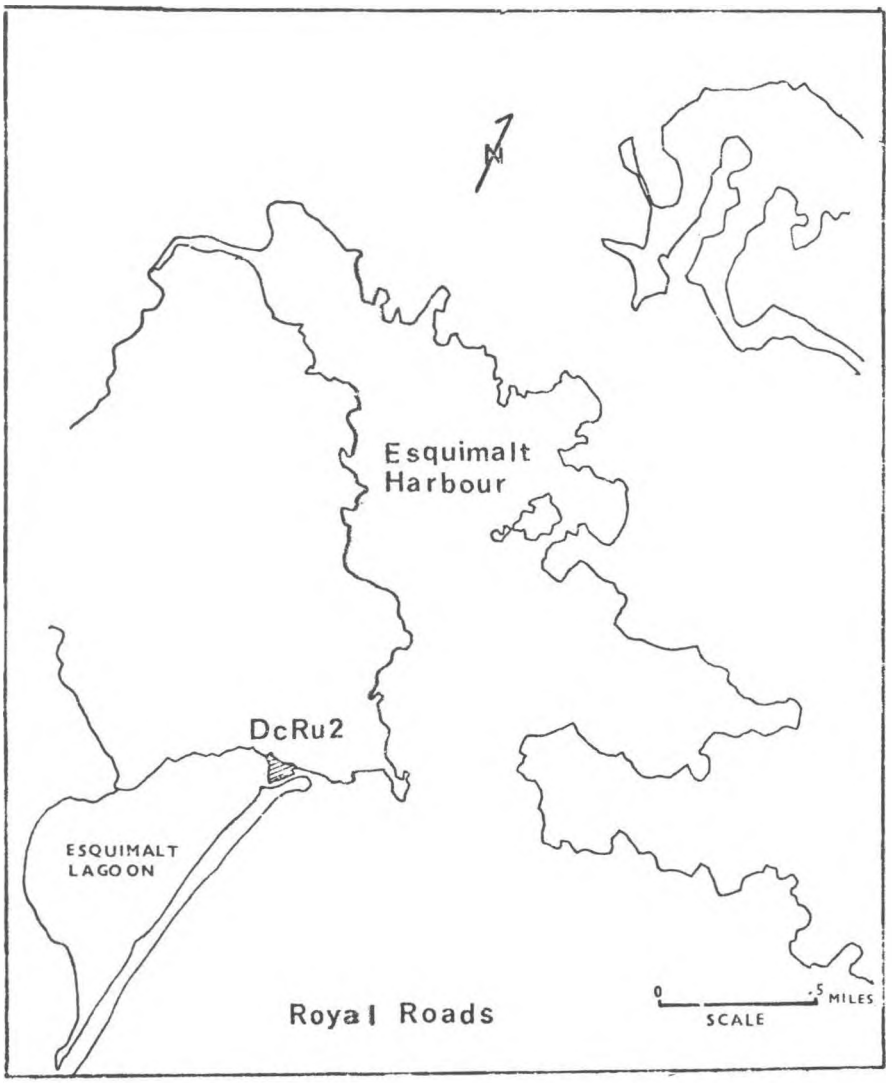


Fig. 24. *DcRu 2 at the northeast end of Esquimalt Lagoon.*

was recovered (McMurdo's Class i, Type I, sub type c 1972). Similar harpoons occurred at the Garrison site on San Juan Island and were assigned to the Marpole phase (Carlson 1960: 586–89). Items representative of a chipped stone industry, i.e., 2 cores, 3 points, 2 scrapers, and 2 flakes, constitute 6.1% of the 1973 collection, a frequency not comfortably consonant with the definition of the *San Juan phase.*

Chronologically the *San Juan phase* "dates from at least A.D. 1200 to the time of European contact . . . (and thus) . . . represents the protohistoric culture of the Straits Salish (Carlson 1970: 120). The *Marpole phase* (400 B.C. to 400 A.D.) precedes this. Thus, superficially, an 800 year lacunae exists between these two phases. However excavations at Fossil Bay undertaken by Kidd (1964) and at Dionisio Point by Mitchell (1971b) have produced San Juan type components dating to 436 A.D. and 550 A.D. respectively. The acceptance of these dates, although controversial at present, would indicate an earlier appearance than hitherto recognized of a culture comparable to that of the region's historic inhabitants. Thus the typologically early technic items of the 1973 DcRu 2 collection may suggest the assignment of the earlier depositional events at the Esquimalt Lagoon site to the above grey period in the chrono-

logy of the area. Whether two components are represented by the collection or whether the beginning of the *San Juan phase* should be temporally moved back on the basis of the recovered artifact sample of DcRu 2 are questions which must await the results of radiometric assay.

Having approximately positioned DcRu 2 in time and space we may now turn to the research design undertaken in 1973. A number of hypotheses were tested against the cultural and ecological residue present at the site. The one under concern here is the sufficiency of the sampling strategies deployed against such sites. As with other experiments in the social sciences, excavations of archaeological deposits are non-replicable. The act of recovery is simultaneously an act of destruction. The optimal sampling technique, in terms of retrieval, is thus complete excavation. This can rarely, if ever, be undertaken due to exigencies of time, funding, available trained personnel, and the desirability of leaving parts of sites unexcavated for future research. In lieu of complete sampling it was determined, in 1973, that since the site had been excavated the previous year the deployment of a sampling technique different than that utilized in 1972 would yield data which could be used to compare sampling strategies.

The senior investigator of the previous year had employed a judgemental sampling design based on a trench system. The design was judgemental in that no probabilistic criteria were employed in making the decision as to where excavation units were placed. The stated rationale behind the sampling strategy employed was that a salvage situation existed and that "because the east face of the midden was the most endangered by wave erosion, it was decided to concentrate the sampling in this area" (Oliver 1973). Other criteria likely entering into the choice of excavated area were, from my own observations, an absence of large vegetation and the presence of a large open area running on a north-south axis which would facilitate the taking of provenience data. However the ultimate factors behind judgemental sampling are psychological and, for our purposes, unknowable. Eleven 1 X 2 m. and three 1 X 3 m. excavation units were opened in this area near the eastern face of the midden. These units were staggered along and perpendicular to a north-south axis.

The strategy of sampling decided upon in the 1973 excavation program was an element sampling technique known as simple random sampling (Cochran 1963; Meuller 1974). This scheme was chosen in order to use statistical tests which assume a normal distribution, to reduce the complexity accruing to cluster samples due to the fact that ratio estimates are necessary in the computation of sample statistics, and because no site surface characteristics were available to stratify the site. In element sampling the quadrats are regarded as the elements and the cultural item frequencies, attributes of the elements which are amenable to the use of statistical tests dependent upon the assumption of normality (c.f. Thomas 1973b: 12–13).

In order to simple random sample (SRS) the site, its perimeter was first determined, the site was then mapped and gridded into 2 X 2 m. frames which were numbered. A table of random numbers was then consulted and the units drawn were excavated consecutively throughout the summer. The frame size was dictated by both safety and statistical considerations. In sampling ecological communities the rule of thumb for the selection of frame or quadrat size is to choose the smallest possible, "relative to the type of vegetation and to the practicability of the enumeration of such a quadrat size" (Kershaw 1973:32). Although the enumeration of cultural items should not prove, in a study of this nature, a constraint on size of the sampling frame, the encounter of problems analagous to the effect of vegetational patterning in ecological populations is common in archaeological sampling. As to what comprises a natural sampling unit or clump of cultural items in a shell midden has yet to be determined. While not denying that mosaic patterning exists in such archaeological deposits, we chose to ignore this possibility and opt for that frame size which represented the minimal dimensions in which crew members could work with the highest margin of safety. Independent 2 X 2 m. excavation units were selected as pits of this size when sunk into unconsolidated midden matrix that may achieve depths of up to 3 m. or more represent the minimal size that crew members work in with both comfort and security.

A 0.76% sample of the entire site by volume was achieved by SRS. If that portion of the site inaccessible to sampling is deleted the sample size is increased to 0.93% by volume. Thankfully none of the randomly selected units coincided with the roadway or shoulder.

The difference between the judgemental sample design's dispersion and that of the simple random sample design is illustrated in Figure 25. The computation of R values by Clark and Evans (1954) nearest-neighbour analysis produced a coefficient of .23 for the judgemental sample and 1.33 for the SRS. Dis-

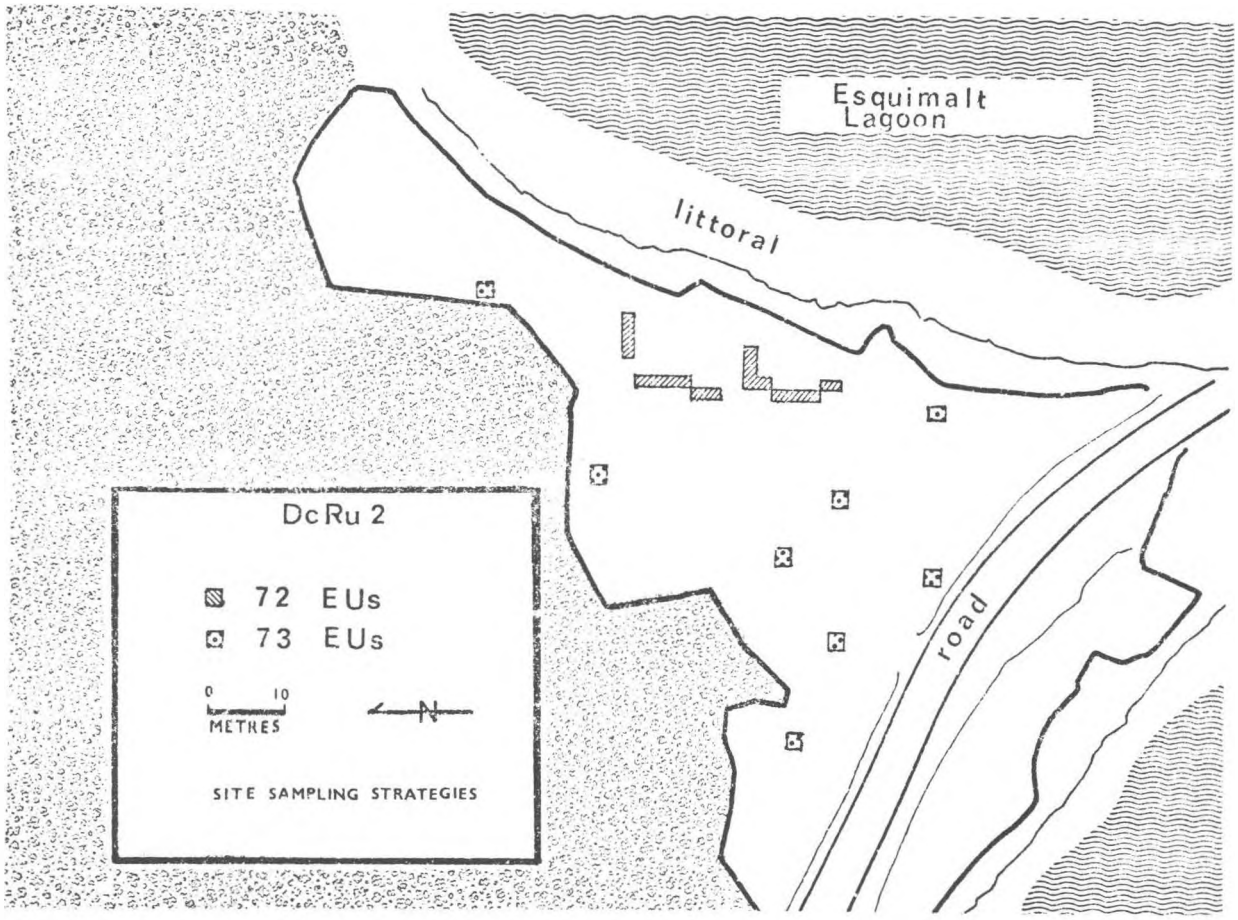


Fig. 25. *Site map of DcRu 2 showing random and non-random excavations.*

tance measurements were made from the centre of each excavation unit to its nearest neighbour. Thus what is intuitively apprehensible from the scrutiny of Fig. 25, i.e., that the judgemental sample is of a clustered pattern and the SRS is dispersed randomly with regard to quadrat placement on the horizontal dimension, is confirmed by nearest neighbour analysis.

As the research design of the 1973 investigation called for comparibility between the sample recovered judgementally the year before and the probabilistically obtained SRS care was taken that the two samples be equivalent in volume. The 1972 excavation program removed approximately 35.3 m^3. of matrix. The program undertaken in 1973 resulted in the removal and screening of approximately 48.0 m^3. of deposition. A Model II single classification anova with unqual sample sizes indicates a significant ($P < 0.05$) added variance component among derived samples for the volume of excavated units of each sampling strategy (Sokal and Rohlf 1969:208–9). This is obviously attributable to the difference in quadrat sizes between the sampling strategies deployed. When the 2 X 2 m. units were divided into two 1 X 2 m. excavation units and volumes obtained again compared an F value of 2.32 was computed. As $F_s < F_{.05(1.29)}$ ($F_{.05(1.29)}=4.18$) the null hypothesis is accepted, i.e., the means of the two series are not significantly different. This threshold is considered significant enough for comparing the derived samples.

A two-sample case of a one-way anova (Yeates 1974), a linear regression and two Q mode principal components analyses were used to compare the technic samples recovered by the two sampling strategies. The OTU's selected from between sample comparison are artifact type frequencies because, at the present stage of analysis, they are the most

tractable data set. The two inferential statistical methods and multi-variate technique mentioned above were utilized against this data. The precision of the estimates can be compared, if desired, by the use of the within-group MS of the table presented below (Cochran 1963:15; Sokal & Rohlf 1969:195–7).

The threshold data utilized in the 3 analyses described below are presented in Table 1.

One-way analysis of variance compares two different estimates of variation which cumulatively can be employed to calculate the variance of the presumed normally distributed population from which the samples were drawn. The null hypothesis is that the two samples were drawn from the same population with similar variance estimates for each sample which are also no different than the variance estimates for the population. The research hypothesis is that both the judgemental and probabilistic samples differ significantly (Yeates 1974:132–35). The accompanying anova table contains the results of this analysis.

Anova Table

Source of variation	df	SS	MS	Fs
$\overline{Y} - \overline{\overline{Y}}$ Between groups	1	2.65	2.65	.0863
$Y - \overline{Y}$ Within groups	72	2210.	30.69	
$Y - \overline{\overline{Y}}$ Total	73	2212.65		

$F_{.05(1,72)} = 4.0 > n > 3.92$

Since $Fs << F_{.05(1,72)}$, the null hypothesis is accepted. The means of the two series are not significantly different; that is the two samples do not differ in their technic composition (Sokal and Rohlf 1969:218–219).

The data in the Table were also subjected to simple correlation and regression. The derived Pearsonian product-moment correlation coefficient is $r = .84$ which, when squared, gives a coefficient of determination of 71% which allows the conclusion that 71% of the variation in the judgementally derived sample is associated with the variation in the probabilistically derived sample. Even though the sample size is quite small a test of the standard error of estimate of the regression coefficient produced a value of $8.90(t_{.99(35)} = 2.46 > n > 2.33)$. Thus the assumption of normality seems to hold (Yeates 1974:78–9). The best-fit straight-line relation between the two sampling strategies is presented in figure 26.

Principal components analysis is concerned with describing the underlying structure manifested by a group of variables with the assumption that all the variation in a given population is contained within the variables defining the population, i.e., the total matrix variance equals unity. In the analysis carried out against the DcRu 2 sampling programs two Q-mode analyses were employed utilizing the BMDO2M Regression on Principal Components program.

In the first analysis the two sampling strategies were treated as variables and compared across 37 cases comprised of the frequencies of technic items as presented in Table 1. The 2 eigenvalues or sum of the squares of correlation coefficients between each variable and the resolution vector accounting for the largest proportion of total variance were 1.84 and .1593 accounting for 92% and 8% of the total variance respectively. The eigenvector matrix presented below indicates that the variation contributed by each sample is equal and minimal:

Eigenvectors		1	1
judgemental sample	1	–0.7071	–0.7071
cluster sample	2	–0.7071	0.7071

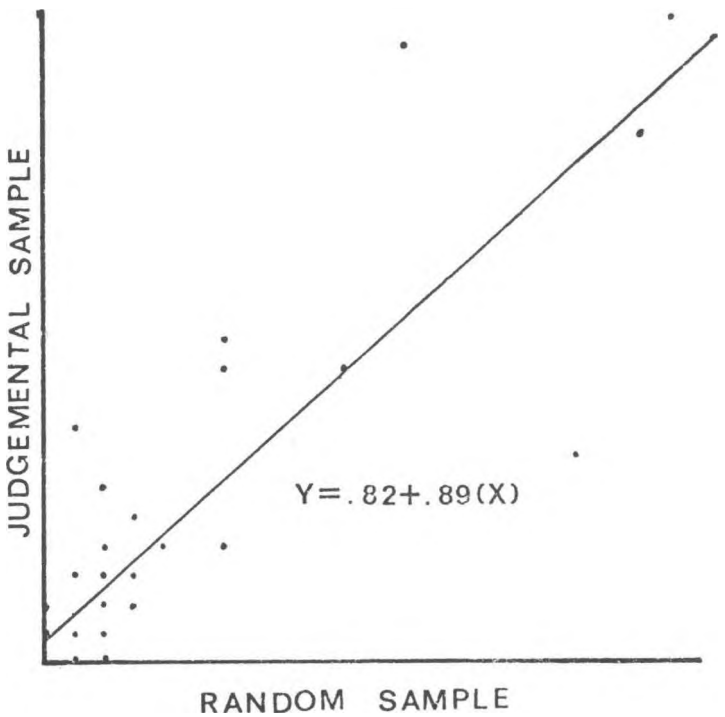
For the second principal components analysis the technic item frequencies were employed as variables and the sampling strategies as cases. In order to have the data conform to the limitations of the program the 37 technic item classes were reduced to 20 variables and the number of cases expanded by 3 by pooling the two samples to form the 3rd case. The new data matrix is presented in Table 2.

Two components were extracted with eigenvalues of 16.0211 and 3.9788 (where matrix variance = 20 = number of variables as matrix diagonals are 1.0's) accounting for 80% and 20% of the total variance respectively. A cumulative frequency graph of the eigenvalues for variables on the first two components are given in figure 27. No group of variables contributed more than 6% to the variance of the first component. This is a vector which apparently reflects homogeneity of samples. It is of interest however that 33% of the remaining 20% of population variance contained in the second component is accounted for by chipped stone items which, as has been suggested earlier, may argue for an earlier chronological placement of the early depositional events at the site. I conclude from this analysis that little variation in technic item recovery between the two sampling strategies exists.

TABLE 1
Data, Means, and Standard Deviations for a Two-Sample Case of a One-Way Analysis of Variance

Type	Threshold value	
	Judge	SRS
Dentalium	1	0
Worked Shell	6	2
Ochre	1	0
Incised Bird Bone	2	2
Ulna Awl	2	1
Long Bone Awl	1	3
Bird Bone Point	10	6
Bird Bone Bi-point	4	4
Bird Bone Fragment	4	2
Mammal Bone Bi-point	21	12
Mammal Bone Point (short)	22	21
Mammal Bone Point (long)	4	6
Curved Bone Object	1	1
Mammal Bone Chisel	1	2
Mammal Bone Fragment	18	20
Valve	8	1
Unilaterally Barbed Point	3	3
Bone Harpoon	0	1
Decorated Object	0	1
Antler Plug	2	0
Antler Point	1	1
Antler Wedge	10	10
Antler Tine	4	2
Antler Fragment	11	6
Core	0	2
Stone Point	2	3
Side Scraper	0	2
Flake	1	2
Slate Blade	2	3
Slate Point	3	1
Slate Fragment	5	3
Hammerstone/Grinder	0	1
Celt	1	1
Shist	1	1
Handmaul	1	1
Abrader	7	18
Mean	4.32	3.94
Standard Deviation	5.68	5.39

Fig. 26. The best-fit straight line relation between the two sampling strategies.



Discussion

Throughout this analysis the research hypothesis has been that differences between the sample obtained by judgemental and probability sampling strategies, other than sums and means, should exist and be detectable by statistical procedures. That the tests deployed convey that the samples are drawn from the same population is not intuitively offensive; however the insignificance between variations of the sampling strategies is disturbing theoretically. The implication of the null hypothesis is, at this admittedly preliminary stage of analysis, that, as far as the recovery of technic items from DcRu 2 is concerned, one would be served equally well by judgement sampling the Esquimalt Lagoon site as by using SRS.

There are obvious advantages to random sampling. Deployment of parametric statistics in inter- and intra-site comparisons is permitted by, indeed is contingent upon, the use of randomly drawn samples. Probability samples can be exploded to generate estimated parameters, within confidence limits, of site volume, artifact type densities, etc. Demographic determinations are similarly facilitated through probabilistically recovered samples of faunal remains (Shawcross 1972).

But there is a trade off. In terms of the present study the 1973 investigation lost some stratigraphic control as compared to that gained in the 1972 program. When the excavation of a shell midden with internally complex stratigraphy is undertaken this loss may prove considerable. The use of a trench

TABLE 2
Modified Data Matrix for Principal Components Analysis

Variable	Case		
	element	SRS	pooled
1. Shell	2	7	9
2. Decorated object	3	3	6
3. Antler	20	28	48
4. Awl	4	3	7
5. Bird bone point	10	14	24
6. Bird bone fragment	2	4	6
7. Mammal bone point	39	47	86
8. Mammal bone fragment	20	18	38
9. Curved bone object	1	1	2
10. Bone chisel	2	1	3
11. Barbed point	3	3	6
12. Toggling harpoon component	1	8	9
13. Ground schist	1	1	2
14. Ground stone (misc.)	2	1	3
15. Flake	5	1	6
16. Chipped stone point	3	2	5
17. Core	2	0	2
18. Ground slate	7	10	17
19. Celt	1	1	2
20. Abrader	18	7	25
Total	146	160	306

system does provide vertical control over a larger area than simple random sampling.

Both the 1972 and 1973 sampling strategies however are at a deficit when questions as to the horizontal patterning of cultural items in a shell midden such as DcRu 2 are addressed. As adumbrated above it is, at present, unclear as to what represents a natural sampling unit of middens of the ilk of DcRu 2. Logistically and ethnographically it is unlikely that DcRu 2 was occupied for a sufficient portion of the seasonal round of the Songhee to warrant the construction of permanent architecture. Determinations of social distances, activity areas, and other factors influencing the deposition of cultural items are lacking. Thus we are left with attempts at detecting redundant associations of cultural items. Although a routine for the recognition of such "toolkits" is under construction by the author, the results of this analysis are of too preliminary a nature to be presented. Even should such redundant associations be discovered their emic significance will be doubtful as their recovery is based upon a sampling frame of entirely arbitrary dimensions. Short of large-scale excavation with increased sample size of probabilistically selected areas of such sites as DcRu 2 the author has no immediate solution to this strategic dilemma.

Returning to the comparison at hand we must ask and answer the question as to why two totally

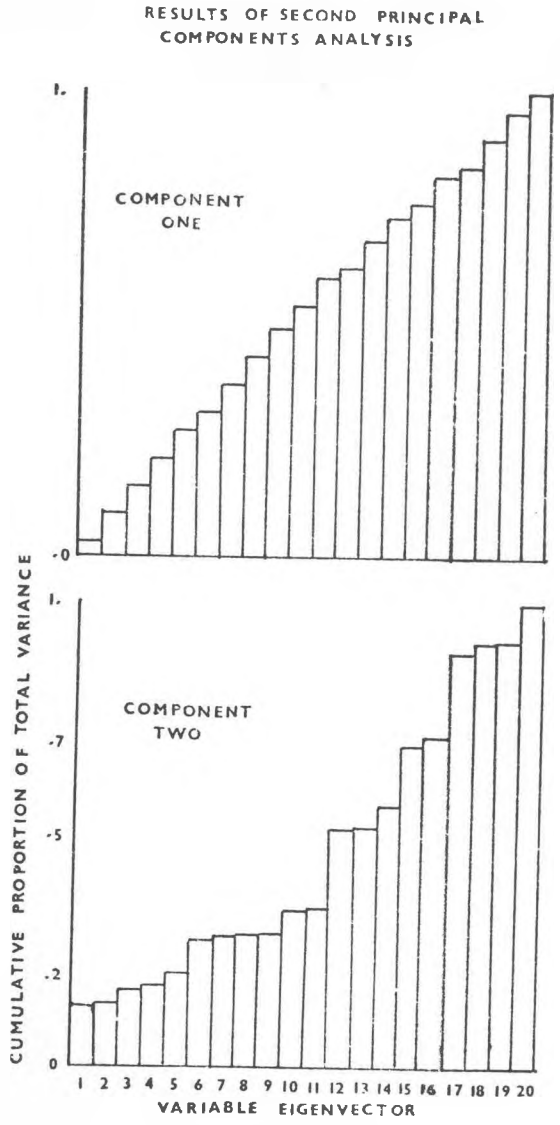


Fig. 27. *Cumulative frequency graph of eigenvector variance of the first two components of the second PCA.*

different sampling strategies should produce technic samples that are essentially similar. Two possibilities seem substantive. Given that the frequency distributions of the OTU's dealt with in this study can be described by a probability generating function (c.f. Neyman 1939, Warren 1971) the two sampling techniques may be encountering a spatially autocorrelated phenomena and essentially sampling the same positions on a cycle time. That is if there are periodicities in the data collected the sampling frames may be encountering the same positions on the oscillation of the dispersion pattern of the data.

A second and related possibility is that the dispersion of the technic items is between random and uniform. Systematic sampling procedures such as by transects (here trenching will be regarded as a special case of transect sampling) produce representative population estimates of very randomly distributed population; random sampling is representative when deployed against a normally distributed population. The technic item patterning of the simple random sample was tested, in a crude fashion, against a simple Poisson distribution. For a Poisson distribution the variance and the mean are equal. Contagious discrete distributions are defined by variances which exceed the mean. When the number of technic items per 10 cm. X 2 m. X 2 m. artifical excavation level are considered for the probabilistically recovered sample a variance: mean ratio of 2.74 is produced. When the index of dispersion (Pielou 1969:91) is calculated and compared to the X^2 distribution it is clear that the judgemental sample is contagiously patterned ($P < .005$). Unfortunately two drawbacks to the use of the variance: mean ratio do not allow me to adduce, with confidence, the empirical nature of the dispersal of the SRS. Jones (1955-56) has suggested that the interpretation of the ratio is unreliable should the mean density of individual items be extremely high or very low. Skellam (1952) has stated that the ratio is too dependent upon the size of the sampling frame or quadrat, a consideration discussed above. A resolution of the question as to the effect of the data distribution of the DcRu 2 technic item population upon the selection of an optimal sampling strategy must await further investigation employing distance-order statistics and attempts to fit the DcRu 2 data dispersion to a series of generalized distributions (Pielou 1969:83–86; Kershaw 1973:135–36).

In conclusion the proximate results of the comparison between judgemental and element sampling of DcRu 2 suggest that, on the basis of the respective technic item frequencies recovered, the probabilistic technique displayed no obivous increase in representativeness over that recovered by the judgemental implicit strategy. Ultimately however, the probabilistic sample is the only collection for which representativeness of the population of cultural items at the site can be claimed. This contention is substantiated on theoretical grounds as the probabilistic sample was obtained, by definition, with the allowance that every technic item of the population had an equal and known probability of selection and recovery. From the probabilistic sample a series of estimates, including those concerned with demography, can be derived. However the element sample derived during the 1973 excavation program at DcRu 2 is as insufficient as the judgemental sample in providing data sets upon

which hypotheses can be tested relating to the sociological factors responsible for the horizontal dispersal of cultural items. Until we investigate the theoretical distribution and empirical patterning of our data sets over a wide range of site types recommendations of optimal sampling strategies must necessarily be deferred.

ACKNOWLEDGEMENT

The field research was supported by grant 51340227 from the Opportunities for Youth program. I wish to thank the members of the 1973 excavation program, and J. Nance for assistance in the principal components interpretation, T.K. Peucker for comments concerning sampling in geographical studies, and Catherine Carlson.

The 1974 Katz Salvage Project

HENNING VON KROGH

Introduction

The Katz site (DiRj 1), a large pithouse village, is situated on the northern bank of the Fraser River, three miles west of Hope, British Columbia on the eastern portion of Indian Reserve Number 4 (Katz) of the Hope Band. Archaeological work began at DiRj 1 in 1970–71, as a salvage project, when it was revealed that the completion of the Agassiz-Haig link of the Highway 7 would cause the destruction of a major portion of the pithouse village. Preliminary testing of the site began in 1970 and a large scale salvage project was undertaken in 1971. The report on this work was written by Hanson (1973).

During February and March of 1974 salvage archaeology was again undertaken at the Katz site after it was reported to the Archaeological Sites Advisory Board that forthcoming Westcoast Transmission Co. Ltd. pipeline construction would disturb the eastern section of the site. Negotiations with Westcoast Transmission resulted in restricting construction to a 60 ft. wide right-of-way through the site area. This then left two areas in which salvage archaeology was to be undertaken: a 60' x 60' area south of the CPR tracks (Area I) and a 60' x 90' area to the north of the Highway 7, (Area II).

Excavation Procedure

Since the time for field work was quite limited, the primary objective was to adequately test the areas in question. Random sampling and other techniques of salvage archaeology were employed to recover a meaningful sample. In each of the three areas of excavation, a limited universe of the area to be disturbed was defined. Over this a grid was set up and each square of the grid was numbered, after which a 5% and 10% Random Sample was drawn for excavation. This sample was adhered to as closely as possible. If, for instance, a selected pit fell on a large stump, the number was returned to the sample and a new draw was made. When features were discovered, extension pits were put in to further expose them. The random sample for each area will be discussed in later sections.

Excavation was carried out at DiRj 1 in tenth's of feet to record data in a comparable way to previous work done at the site (Hanson 1973). All excavations were tied three-dimensionally to a fixed datum point. Westcoast Transmission provided the use of surveyors to pinpoint excavation areas and datums on our maps. Excavation was carried out by digging in 0.5 foot levels below datum. Soil was removed by careful shovel-shaving of the pits and then sieving through ¼" wire mesh screens. Artifacts, features and stratigraphic contacts were carefully exposed with trowels and other fine excavating equipment. Artifacts found in situ were recorded using three dimensional provenience and placed in separate artifact bags. Level material was collected and recorded on level bags.

The datum point for Areas I and II was the same fixed datum and elevation point used during the 1970–71 excavation. This point is the southeast corner of a concrete support block along the Westcoast Transmission pipeline main line (Fig. 29).

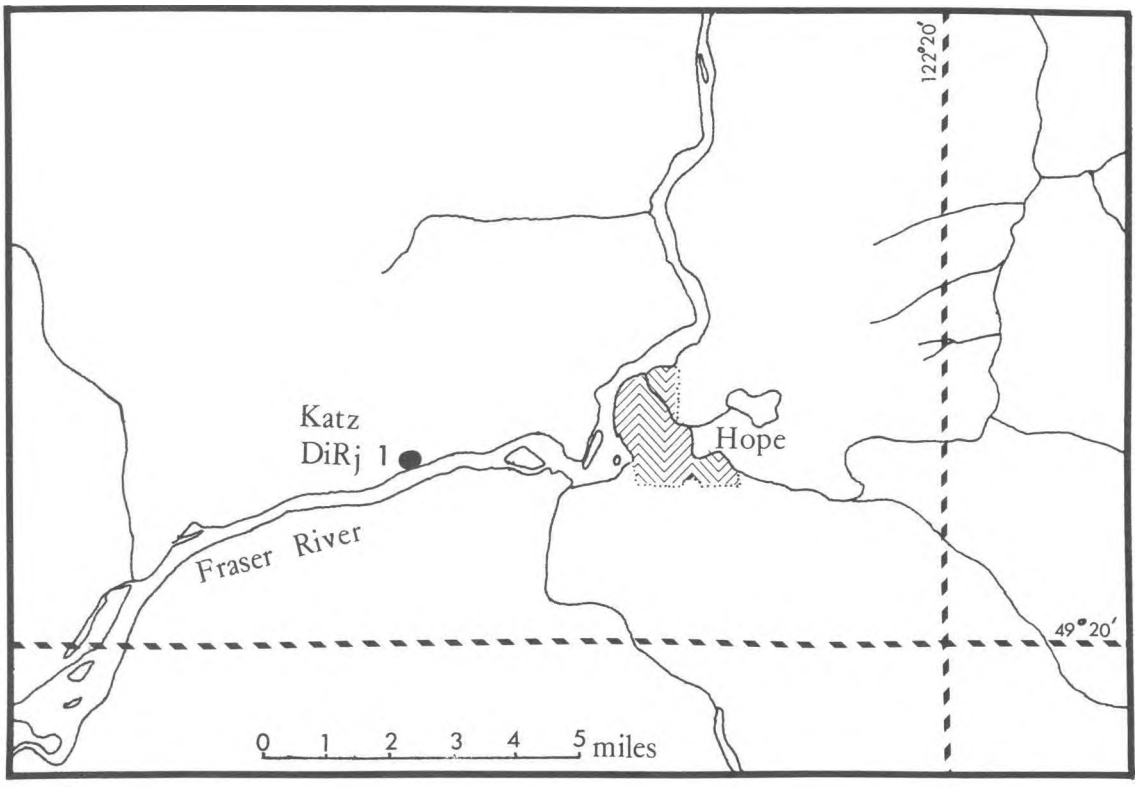


Fig. 28. The locations of DiRj 1 near Hope, B.C.

The Katz Site

Area I of DiRj 1 is bounded on the North side by the present day CPR Tracks and by the Fraser River on the South. The surface of this 60' x 60' area was relatively flat and featureless, with the river bank dropping steeply some 20 feet. Before excavating, it was divided into 144 (5' x 5') pits and a 5% and 10% random drawing was made to define the test sample (Fig. 30). Excavations were then begun on Pits 3,9,106,112 and 130 of the 5% sample. It soon became evident that all of these pits were sterile near the surface. Due to the time limitation the sample was abandoned in favor of testing the extremities of the area for cultural material. Pits 3,9 and 106 were continued and Pit 120 from the 10% sample was begun. All of these pits were then taken to the river cobble level. Pits 106 and 120 reached the cobble level at 13' below surface, revealing no cultural material at all. Pits 3 and 9 encountered the cobble level at 6' below surface. In these two pits considerable cultural material was found among the cobbles.

Pit 87 was excavated to test the possibility that a small depression between Pit 87 and 106 was a cache pit. Excavation did not verify this.

DiRj 1, Area II is situated between the proposed Highway scale site and the already existing Westcoast Transmission pipeline (Fig. 29). The area considered for excavation was a 90' x 60' rectangle running roughly N—S. The surface of the area was relatively flat with a few irregularities, but it was not possible to identify any surface features. The test area was then divided into 216 (5' x 5') pits. A 5% random sample was selected for testing (Fig. 31). Of the 5% sample, three alternative pits were selected when the sample pits had large stumps directly in them. Extension pits were excavated adjoining pits 211, 161, 149 and 115 to further expose features or possible features. To test the maximum possible depth of the cultural deposit, Pits 72 and 30 were taken to the river cobble level, encountered at 7' and 8' respectively. Figure 32 shows the vertical distribu-

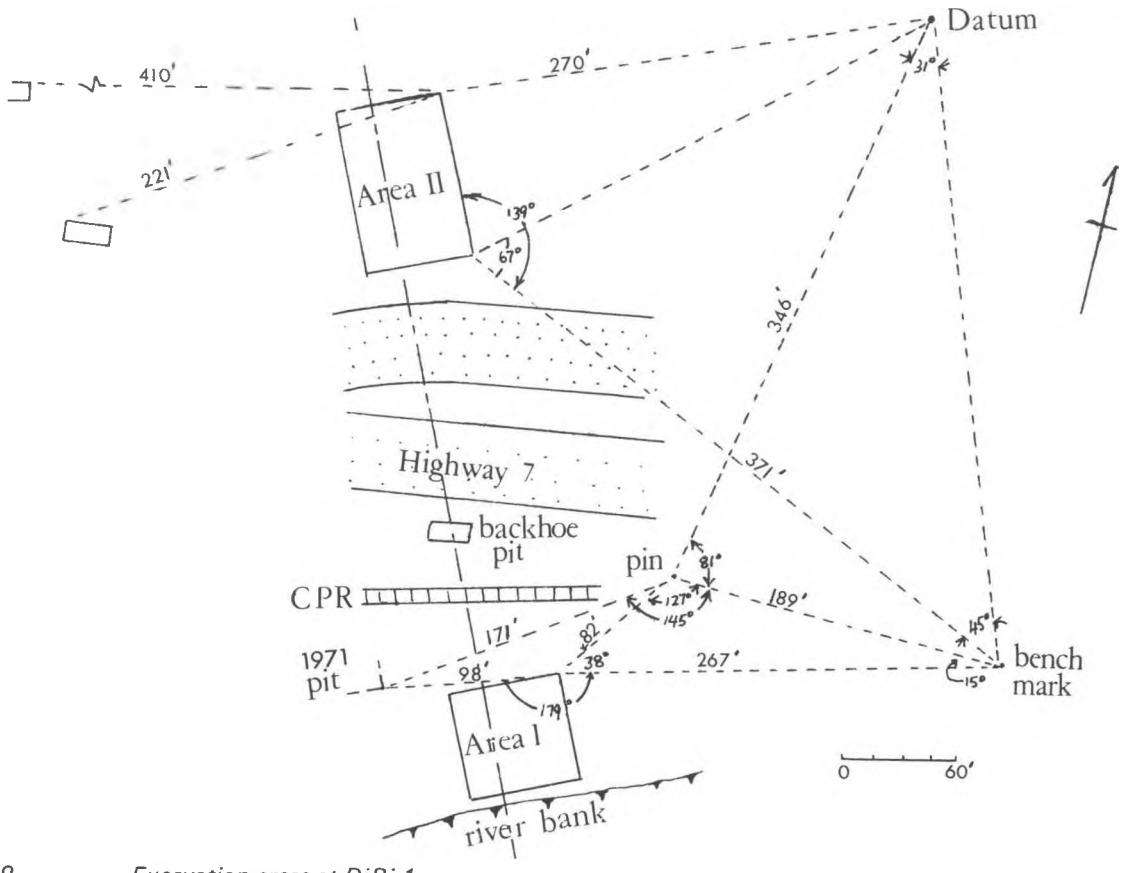


Fig. 29. Excavation areas at DiRj 1.

tion of the cultural material from Area II. Except for Pit 30, which included a very deep cache pit, and Pit 149, in which a burial was found, the maximum extent of the cultural deposits was consistantly between 2.5 and 4 feet below the surface. No cultural material was found in association with the river cobble deposit in Area II.

Stratigraphic zones were basically the same as those described by Hanson (1973:69–74):

Zone A: The Pithouse deposit – which includes all of the geological and cultural materials associated with the construction, occupation and disintegration of the pithouse. The majority of the cultural material recovered by Hanson was in association with the pithouse deposit. (Efforts were primarily concerned with pithouse excavation). A carbon –14 date from the floor ash from Pithouse 1 was 480 ± 90 BC (1–6191).

Zone B: The fluvial deposit – sediments laid down by the Fraser River during the development of the floodplain bank. Cultural material was found to a maximum depth of 2 feet above Zone C and persisted to 6 feet above Zone C. Carbon – 14 dates for the lowermost and uppermost Zone B cultural layers are given as 745 ± 90 (1–6189) and 525 ± 90 BC (1–6190) respectively. Zone B is characterized by hearth features, alignments of cobbles on end and stake mounds.

Zone C: Bottom of former river channel – this zone consists of water worn pebbles which represent the bottom of the old river channel. No cultural material was found in association with Zone C in 1970 – 71.

Although no Zone A was present, this was due to the fact that 1974 work did not involve Pithouse excavation. Zone A was therefore replaced by Zone A', which consists of topsoil and rootmat soil deposits above Zone B.

Artifact distributions with respect to stratigraphy, however, vary greatly between Hanson's (1973) excavation area and Areas I and II of the 1974 Salvage Project. Hanson (1973) found the majority of the artifacts recovered were from his Zone A. Zone B contained cultural materials down to a depth of 1.8 feet above Zone C. In Area I, no artifacts were recovered from Zone A', 2.6% of the artifacts were recovered from Zone B and 97.3% were recovered in direct association with Zone C, the

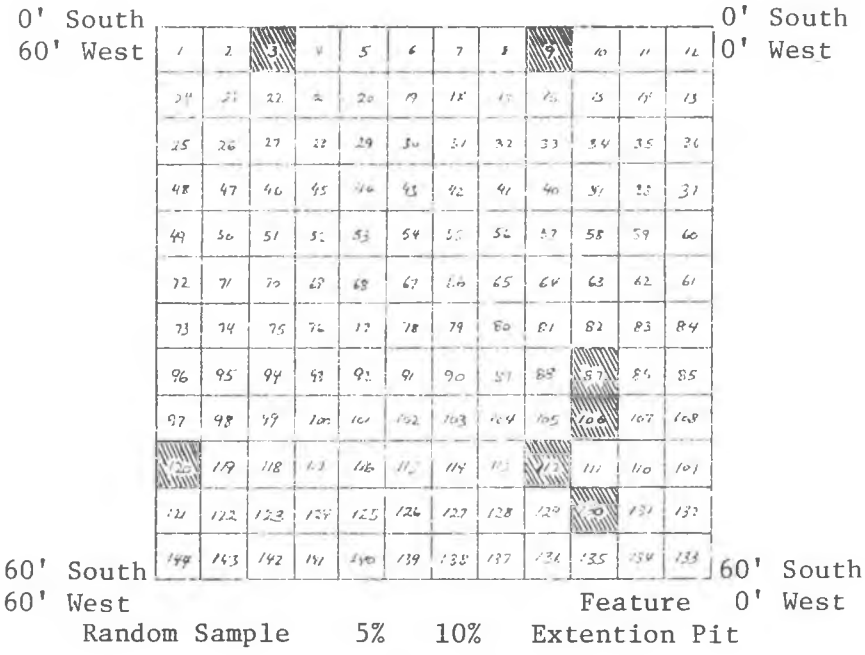


Fig. 30. Grid plan in Area I of site DiRj 1.

Random Sample	5%	10%	Extention Pit
1.	3*	105	85+
2.	112+	120*	
3.	45	26	
4.	9*	124	
5.	24	141	
6.	106*	68	
7.	130+	35	

* excavated to river cobbles
\+ excavation begun but not taken to river cobbles

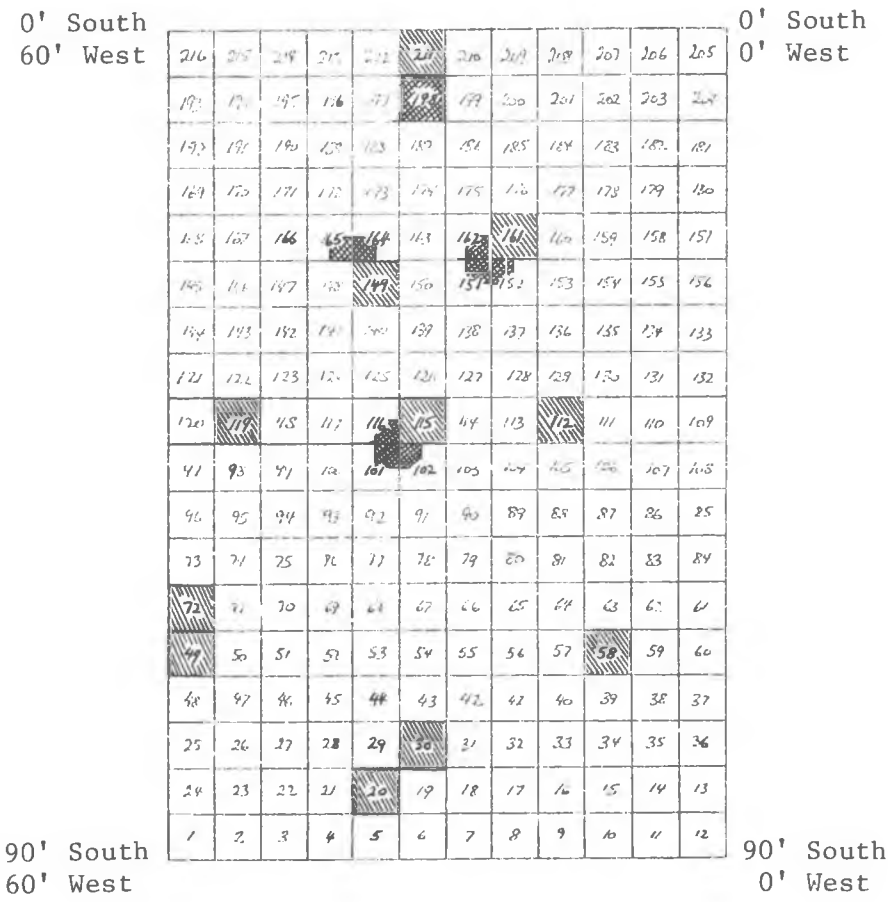
Excavated areas

river cobble level. In Area II artifacts were recovered from Zones A' and B to a maximum depth of 4 feet above the cobble level (Fig. 32). Deeper cultural intrusions were associated with features. No cultural deposits were found in association with Zone C. Representative profiles for Area I and II are shown in Figure 33.

In addition to the two test areas in 1974, observations were made on a Backhoe excavation done by Westcoast Transmission between the Highway and the CPR Tracks (Fig. 29). In this pit, a dark brown cultural deposit at least 4 feet thick could be clearly seen overlying the Zone B sand. This may likely have been a house depression filled in by past railroad and highway construction activities. Later construction activities in Area I removed all of Zones A' and B and extending well into Zone C confirmed the fact that cultural material from Area I was in direct association with river cobbles.

Artifacts and Features

The total sample of artifacts excavated from DiRj 1, Area I (221), and Area II (186), together with those collected from the Backhoe test hole, the beach and the surface in general (49) total 456, excluding utilized flakes. The collection by itself represents a small and comparatively undiagnositc group. It was



Excavated areas

Feature extention pits

Random Sample	5%	Alternative
1.	30*	6
2.	95 (stump)	112+
3.	20+	71
4.	58+	176
5.	161+	4
6.	119+	191
7.	211+	19
8.	15 (stump)	49+
9.	149+	107
10.	72*	175
11.	159 (stump)	115+

*excavated to cobbles
+excavated to sterile

Fig. 31. *Grid Plan in Area II of site DiRj 1.*

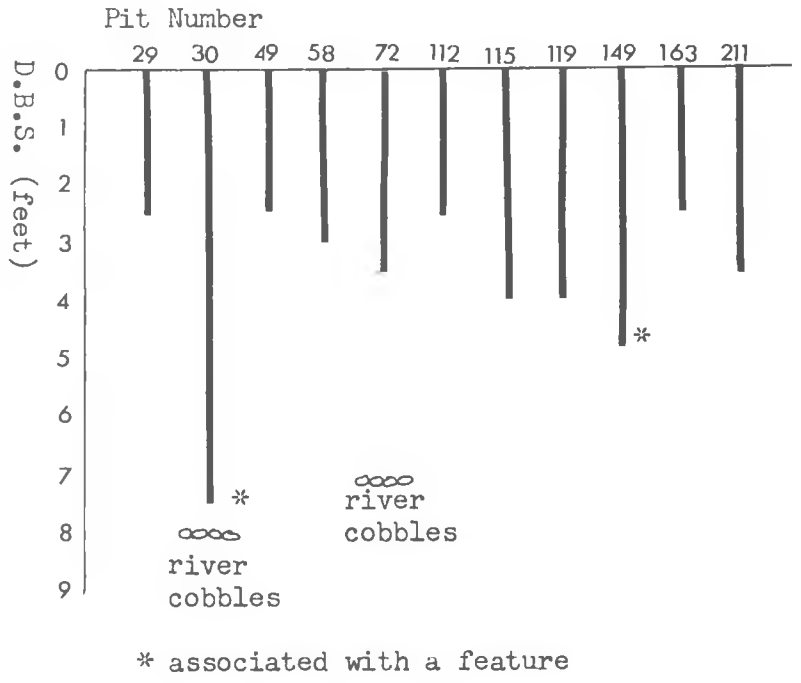


Fig. 32.
Vertical distribution of cultural remains in Area II at DiRj 1.

for this reason that preliminary artifact analysis was made in close correlation with Hanson's (1973) work at the site, based on 3184 systematically excavated artifacts. By grouping the artifacts similarly, direct comparisons could then be made between the 1970–71 excavations and the 1974 Salvage Project.

Hanson (1973:106–107) divided the artifacts into:

1) major categories (chipped stones, ground stone, bone etc.)
2) classes (bifaces, chipped stone points, etc.) and
3) groups (various types of chipped stone points etc.)

A similar system as used by Sanger (1970) in his description of artifacts from the Lochnore–Nesikep Location. For the purpose of this report, the artifacts were divided into the major categories and classes, with only a few of the classes being further subdivided into groups. The various descriptions and definitions for these categories, classes and groups are given by Hanson (1973:114–258) and need not be repeated here, the category and class names being largely self-explanatory.

The artifacts recovered from DiRj 1 in 1974 were catalogued by A.S.A.B. and then loaned to me for examination. I then went through the artifacts and catalogue, making amendments where necessary. The result of examining the artifacts is shown in Table 1, the artifact summary sheet. A selection of artifacts are shown in Figures 34–38. The features discovered in 1974 are described in Table 2.

Discussion

It is interesting to note the relationship between cultural deposits and the stratigraphy between the different areas of the Katz site which have now been examined. By examining the varying depths of the cobble level it becomes obvious that the level drops sharply as it nears the present day river bed. Hanson (1973:73) observed that:

> "The depth below surface [to the cobbles] increases in the direction of the river as the bar slopes downward, which indicates that the river has been degrading its bed."

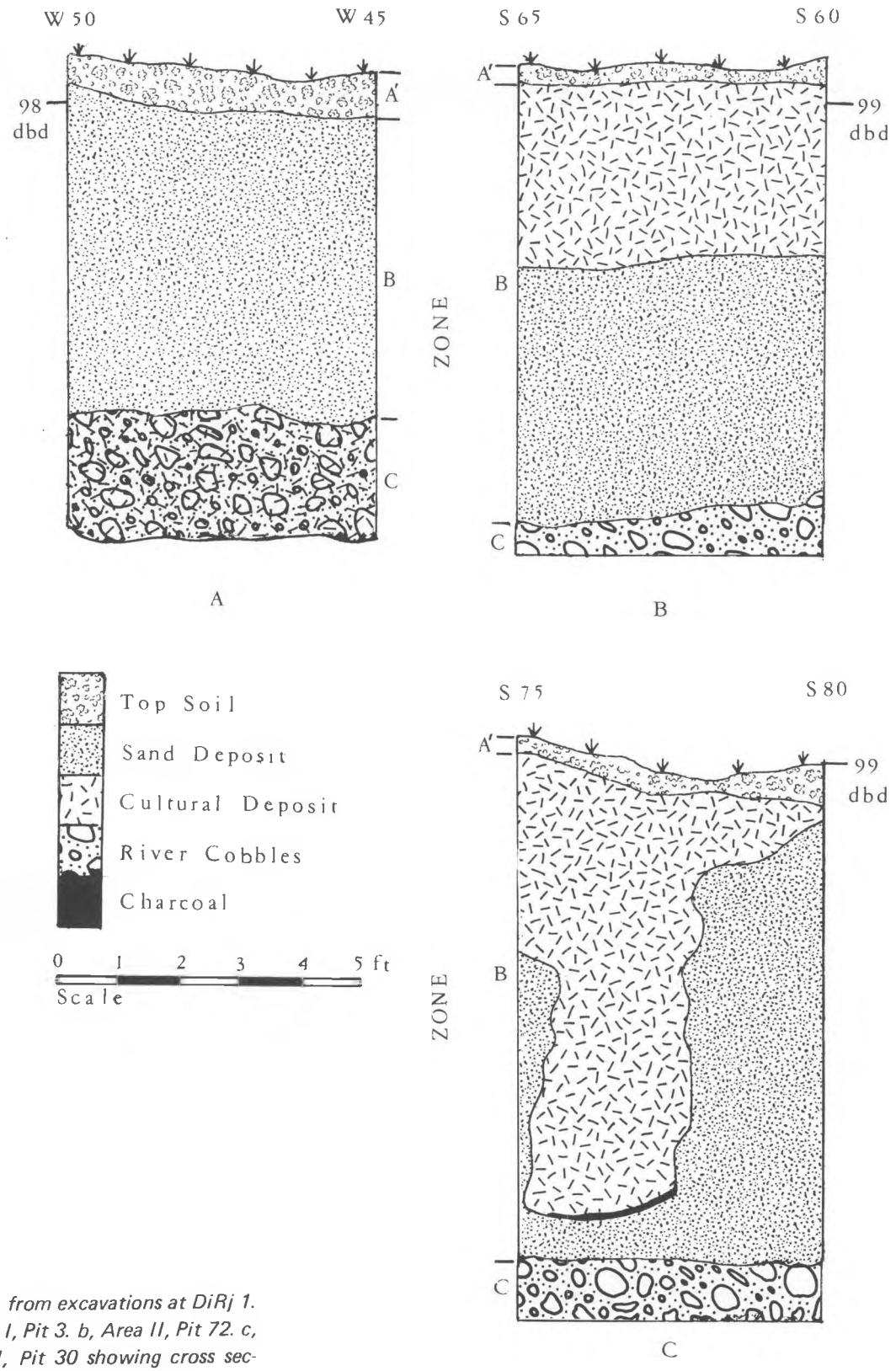


Fig. 33.
Profiles from excavations at DiRj 1. a, Area I, Pit 3. b, Area II, Pit 72. c, Area II, Pit 30 showing cross section of cache pit.

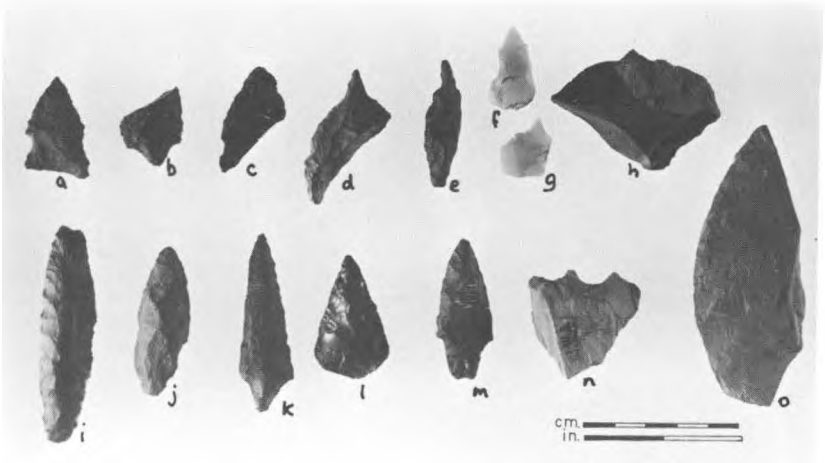


Fig. 34.
a, b, j - m, projectile points; c, i, o, other bifaces; d, e, drills; f — h, n, unifaces. Area I, Zone C: Pit 3, a — f, h. Surface: g, j, o. Area II, Zone A′ — B: Pit 211, i, m; Pit 149, k; Pit 119, l, n.

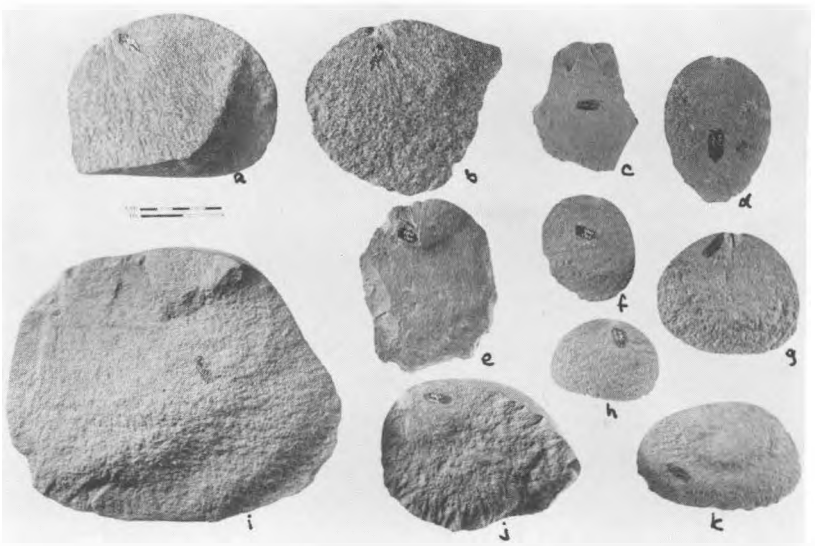


Fig. 35.
Spall tools. Area I, Zone C: Pit 3, a — c, e — f; Pit 9, g — h, j. Area II, Zone A′ — B: Pit 72, i; Pit 49, k. Surface: d.

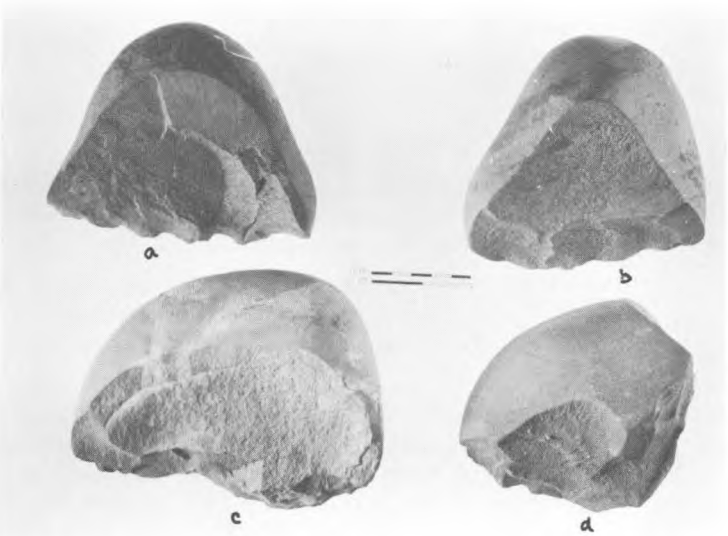


Fig. 36.
Pebble Tools. Surface: a — c. Area II, Zone A′ — B: Pit 149, d.

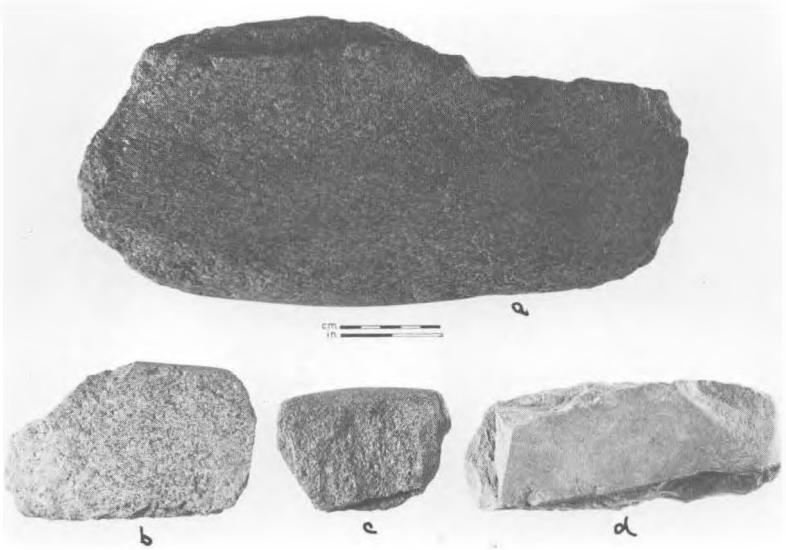


Fig. 37.
a — c, abrasive saws; d, abrasive block; e, sawn nephrite cobble. Area II, Zone A' — B: Pit 30, a — b; Pit 198, d. Surface: c, e.

On the basis of 6 points, where excavations were carried out down to the cobble level, Figure 39 was constructed. It shows the present day roads, railroad tracks and the excavation areas I and II in relation to the projected cobble level. The cobble level clearly takes a sharp drop as it nears the river in Area I, the remaining portion maintaining a relatively stable level. The fact that Pits 3 and 9 in Area I had a very productive cultural deposit in direct association with river cobbles presents an interesting situation. The following evidence suggests that these artifacts and features were laid down in situ:

1. the double hearth feature from Pit 3 found well within the cobble level was intact, complete with quantities of charcoal.
2. the artifacts recovered from Pits 3 and 9 are not water worn as would be expected if they were washed out of the deposit.
3. the location of the cobble depth is at a relatively high point in Pits 3 and 9 as compared to the cobble depth in nearby Pit 106.

To explain the occurrence of cultural material among the cobble level, one is left with several alternatives: 1. the deposit may have been laid down by Zone B "occupants" who visited the river beach and had campfires there. These hearth's were then

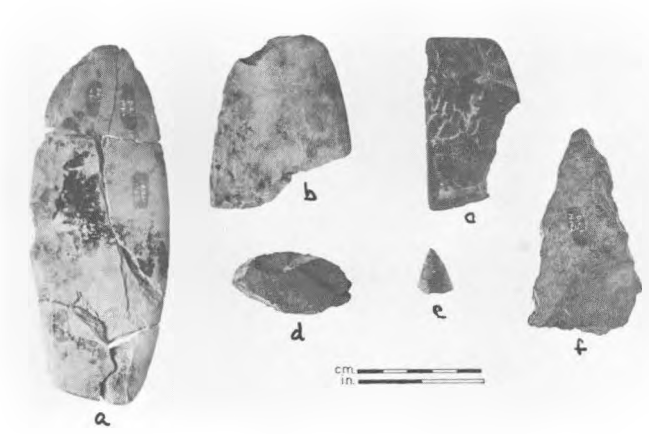


Fig. 38a. *a – c, ground slate knives. d, f, chipped slate objects. e, chipped and ground slate point fragment.*

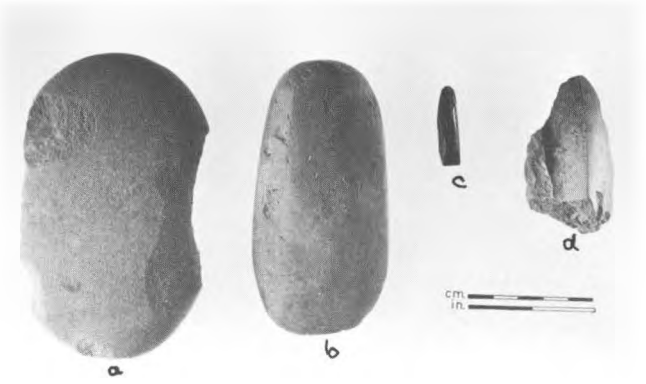


Fig.38b. *a, edge battered cobble. b, adze blade. c, chisel. d, sawn nephrite. Area II, Zone A′ – B: Pit 119, a – b; Pit 49, c; Pit 72, d.*

later covered by waterdeposited rock and sand. It is important to remember that Hanson (1973:260) found cultural material in Zone B to a depth of 1.8 feet above Zone C, not far from the actual cobble level. And 2. the Zone C river cobble deposit may have been laid down before the Zone B deposits. A charcoal sample from Hanson's (1973:260) lowermost cultural layer has been C^{14} dated at 745 ± 90 BC (1–6189). If the above mentioned suggestion were to hold, a C^{14} date for the Zone C hearth would have to yield a date earlier than this. Either of the above suggestions would appear to explain the occurrence of the Zone C cultural deposit. In any case, the artifacts from Zone C do not differ greatly from those of Zone B.

By comparing Area I, II and the Backhoe pit it is clear that site occupancy varied. I would suggest that the main habitation area, as demonstrated by the relative depths of cultural deposits, was in the vicinity of the Backhoe test. Here the Zone A deposit attained the thickness of 4.5 feet with underlying cultural material in Zone B to be observed. Towards Area I to the south and Area II to the north, concentrations of cultural deposits diminish. In Area II the cultural deposit is relatively thinly scattered horizontally and shallow vertically. Cultural material in Area II could relate either to Hanson's (1973) Zone A or B. Area I only had a concentrated deposit in Zone C. This hypothesis is supported by the 1970–71 pithouse excavation which fell to the east, but just north of Area I on a N–S axis.

Area II was interesting because of the various features found there. Pit 30 cut through approximately half of a very deep cache pit. In the cache pit were found various artifacts including 2 sandstone saws and an adze fragment. Other fill included fire broken rock, beach pebbles and flecks of charcoal. The bottom of the cache pit had a thin lining of charcoal. The exact function of the cache pit remains unknown (Fig.33*c*).

Two very badly disintegrated burials were found associated with rock concentrations and charcoal. Some bone fragments are calcined, indicating, together with the charcoal, possible cremations. Identifications of the human remains was made in the field by mem-

Table 1. Artifact frequencies, Katz Site, 1974.

Artifact categories	Area I		Area II	Surface
	Zone A'-B	Zone C	Zone A'-B	
Chipped stone points				
unstemmed			1	1
single shoulder			1	
bilaterally shouldered, contracting stem		2	3	
corner notched		1		1
Bifaces				
leaf shaped			1	
with retouched projections		1		
biface fragments		13	3	1
unformed and miscellaneous bifaces		3	8	1
Unifaces				
with retouched projections		4	1	
with marginal retouch		12	1	
notched		1	1	
unclassified			3	7
unformed		6	16	
Bipolar flaked tools		1	1	
Quartz crystals, tools		6	4	
Cortex spall tools	1	37	39	14
Cortex spall tool fragments	1	15	4	
Cortex spall cores		1	1	
Cores, core fragments and core tools	2	24	17	9
Split cobble tools		1	2	2
Pebble tools	2	1	7	3
Hammerstones		1	2	
Abrasive stones				
saws			2	1
blocks			1	
fragments		1		
Ground slate				
knife, complete or nearly so		3	6	
fragments		60	41	7
points and point fragments			1	
preforms		4	2	
chipped slate			6	
Ground nephrite				
adze, complete			2	
fragments		14	3	1
cut blocks			2	1
Miscellaneous				
ground fragments of other material		2	1	
obsidian		1		
ochre		1	1	
lignite (?) bead			1	
notched pebble net sinker			1	
TOTALS	6	215	186	49

Table 2. Summary of site features.

Feature Number	Type	Excavation Unit	Zone	Dimensions
Area I				
1.	2 hearths	Pit 9	C	3'x5' *
Description: A section of two well defined circular hearths, side by side, formed with large river cobbles set vertically with the tops of the cobbles sloping somewhat outward. Filled with dense charcoal, sand and small river cobbles. No charcoal appeared between the 2 hearths.				
2.	charcoal concentration	Pit 3	C	0.8'x1.4' *
Description: A concentration of charcoal in association with fire cracked rock and fragments of burnt bone.				
Area II				
1.	cache pit	Pit 30	B	see figure
Description: A deep cache pit clearly indicated by soil discoloration. Some artifacts, fire cracked rock, beach pebbles and charcoal flecks were found in the cache pit fill. The very bottom of the cache pit had a thin lining of charcoal. No surface feature indicated the presence of the cache pit. Exact function not determined.				
2.	burial	Pit 149	C	2.2x2.5 *
Description: Bone fragments were found on and among a concentration of rock. The bone was identified to be that of an adult human**. Identifiable fragments included teeth, skull, tibia and phalanges pieces. The bone was badly disintegrated, with the calcined fragments being best preserved. Charcoal and the calcine bone may indicate a cremation. Artifacts associated with the burial include a projectile point, ground slate fragments and a stone bead.				
3.	possible hearth	Pit 161	B	2'x2.5'
Description: A possible hearth feature consisting of charcoal and associated artifacts, detritus and fire cracked rock.				
4.	burial and concentration of rock	Pit 211	B	2.8'x3'
Description: Bone fragments overlying a large concentration of rock. The bone was identified as being that of an adult human**. Identifiable pieces were phalanges, patella and skull fragments. Bone was again badly disintegrated. Charcoal fragments and calcined bone may indicate cremation. The rock concentration consisted of some artifacts, fire cracked rock and beach pebbles in no apparent order. Among the artifacts found in association with the burial was a broken (but complete when pieced together) ground slate knife. A red jasper biface was found near the bottom of the rock concentration.				
5.	circular charcoal stained spot	Pit 119	B	0.2'x0.2'
Description: A small, circular charcoal stained spot with burnt bone fragments in the stained area. A calcined adult human mandibular incisor was among these burnt bone fragments**.				

*indicates the feature was not fully exposed.
**identification of human remains was made in the field by the participating crew members. Preliminary indentification was confirmed by O. Beattie (1974b).

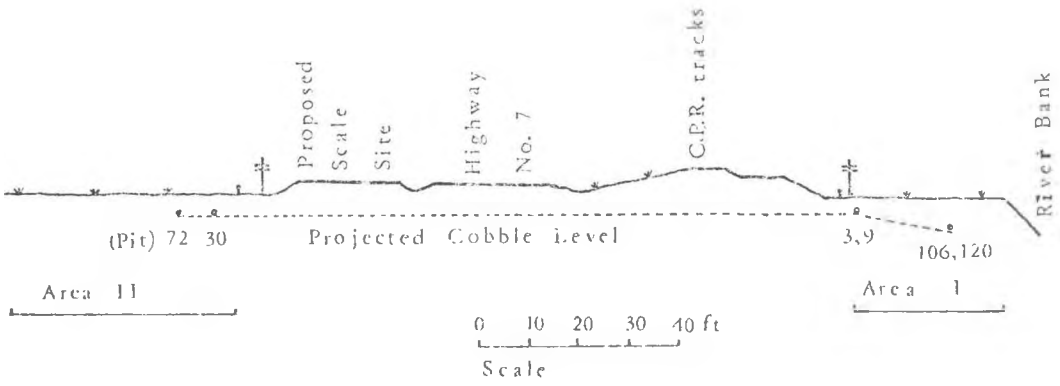


Fig. 39. *This projected river cobble level at DiRj 1 was drawn on the basis of the six points where 1974 excavations exposed the actual cobble level. Note the relatively stable level between Pits 72 and 30, Area II, and Pits 3 and 9, Area I. The cobble level then makes a sharp drop, between Pits 3 and 9 and Pits 106 and 120 in Area I, as it nears the present day river bed.*

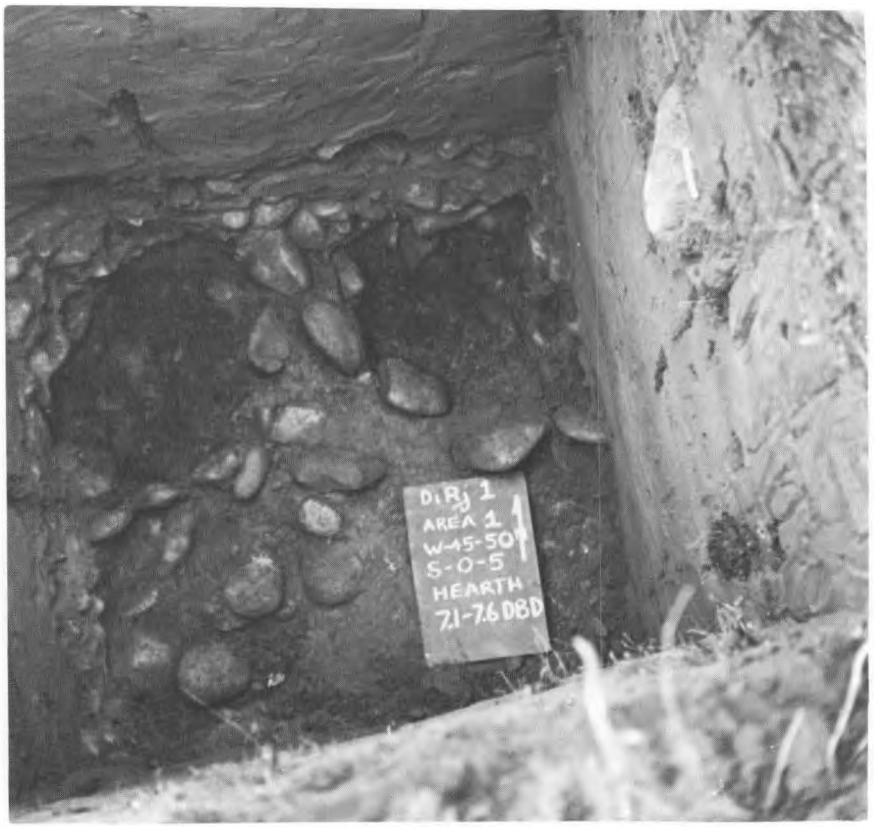


Fig. 40. *Two hearths in river cobble level, Zone C, Area I.*

bers of the salvage crew. This identification was confirmed by O. Beattie (1974b) of Simon Fraser University. Among the artifacts found in association with burial 2 were a chipped stone projectile point, a

lignite (?) bead, and ground slate fragments. The burial remains were found on and among the rock concentration. Among the artifacts in direct association with the burial (Feature 4) were a large, broken ground slate knife, and miscellaneous ground slate fragments. The burial remains were found directly, overlying the rock concentration, not far beneath the surface. At the bottom of this rock concentration a red jasper biface was found (Fig. 41).

All of the 456 artifacts recovered from DiRj 1 during the 1974 Salvage Project were made of stone. No bone was found during the excavation other than those from the burials. The total lack of organic artifacts is explained by Hanson (1973:259) as being due to a very high soil acidity. The condition of the in situ burial remains would tend to verify this. The survival of the bone here was largely due to the fact it was calcined. The non-calcined bone from the burials was observable in situ, but disintegrated entirely as it was removed. No new artifact types were found during the 1974 excavations. A percentage comparison is made in Table 3 between artifact categories from Area I, Area II and Zone A and B from the 1970 – 71 excavation (compiled from Hanson 1973:250–258) The Area I and Area II figures are of course based on a much smaller sample size than those from Zone A and Zone B (1970–71 excavations).

The figures on Table 3 show generally comparable assemblages. The consistently most frequent tool types in all areas are spall tool and spall tool fragments, ground slate fragments and cores, core tools and core fragments. Hanson (1973:276) noted that his Zone A artifact assemblage had a much broader range than did those of Zone B. This broader range also occurs in the Area II assemblage as compared to the Area I assemblage. (The "other catagories" percentage on Table 3 shows this.)

Whether this reflects a broader range of activities for Zone A (2,698 artifacts) than for Zone B (486 artifacts) as Hanson (1973:276) suggests, or is merely a result of the sampling procedure, is debatable. Insofar as Area I and Area II are concerned, 221 artifacts are recorded for Area I and 186 for Area II. The relatively equivalent numbers of artifacts from the two areas, with a correspondingly high figure for "other categories", would tend to suggest and support the broader activity range hypothesis for Area II (Zone A' – B) over Area I (Zone C).

Hanson (1973) suggests the Zone B cultural deposits (artifacts and features) indicate some regular utilization of the site. This utilization would have to be seasonal, perhaps summer and fall, as the thick deposit of fluvial sediments in Zone B would indicate regular flooding by the Fraser River. He suggests occupation may have coincided with the annual sockeye salmon run after July 1st and lasted until early fall. The Zone C deposit at Area I, as mentioned earlier, may have been contemporaneous to early Zone B or it may be somewhat earlier. The Zone A pithouse deposit represents a semipermanent habitation site with the earliest date from the bottom of Pithouse 1 set at 480 ± 90 BC (1–6196) (Hanson 1973:267, 276). From the relative stratigraphic position of the Area II deposit, the nature of the deposit and the profile of the cache pit feature extending far into Zone B, one can conclude that the Area II cultural deposit is probably contemporaneous to some timeperiod of DiRj 1 pithouse occupation, after 480 ± 90 BC.

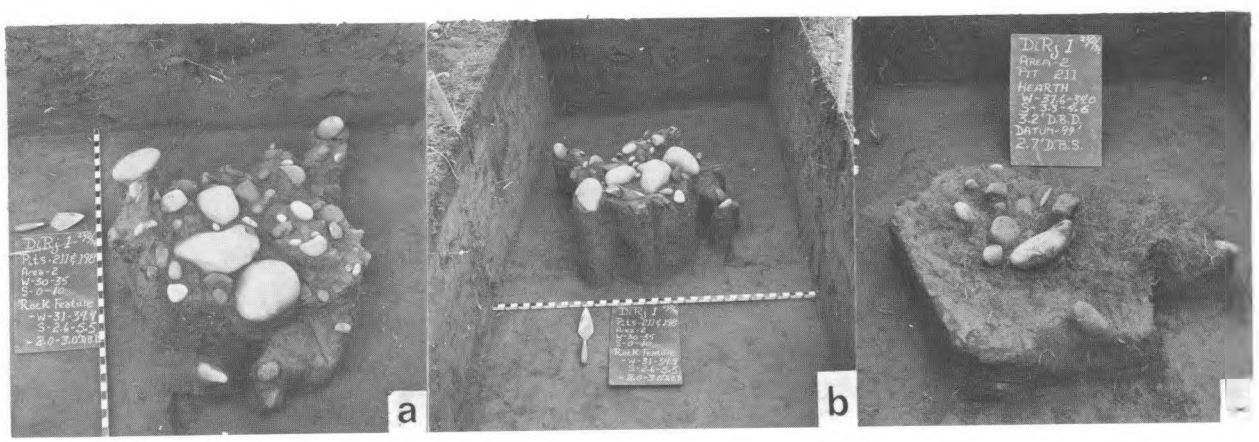


Fig. 41. *Feature 4, Area II, Pit 211. a, b, Two views of top of exposed rock concentration. c, Bottom of rock concentration with jasper biface in situ.*

Table 3. Artifact frequency comparisons.

	Percentage			
	1970-71 Excavations		1974 Excavations	
			Area I	Area II
	Zone A	Zone B	Zone C	Zone A'-B
spall tools + spall tool fragments	31	30	24	23.4
ground slate fragments	16	11	31	30
cores, core tools + core fragments	11.5	28	11	9
abrasives including saws	10	13	0.5	2
formed bifaces	1.9	3	8	6
formed unifaces	2.0	0.6	8.0	3
unformed unifaces	3.7	5	2.8	9
sawn nephrite detritus	4.8	3	6.5	3.7
chipped stone points	2.1	3	1.4	2
other categories	17.0	3.4	6.8	12

Conclusions

The recent Katz Salvage Project has shown that a much broader range of data can be recovered by excavating in the extensive area around known house pit features. While Hanson's (1973) excavations dealt with the recovery of data related to the construction and occupation of two pithouses, the work reported here concentrated on two areas not directly associated with any such features. In Area I, a previously unrecorded Zone C cultural deposit was exposed. Unfortunately, due to construction activities, excavation in this area had to be halted before the cultural deposit could be fully excavated. A more complete and wider exposure of Zone C may have yielded more information on the relative age of the cultural deposit as well as enabling us to possibly define and describe what specific activities were being undertaken. Also, the excavation of all four pits in this area to the cobble level, helped to establish the slope of the presently buried cobbles. In Area II, specific features not directly associated to a house pit, were recorded. Three of five recorded features had associated human remains. Another, a very deep cache pit, was of a type not recorded previously at DiRj 1. The occurrence of these features suggests that this portion of the site was being used for specific purposes. It is not possible at this time to state precisely how these may have related to the actual house pit occupations.

It is clear that much information still exists at DiRj 1. With the results of the pit house excavations by Hanson (1973) and the salvage work reported here, a more systematic and problem-oriented excavation with specific objectives can be outlined, should further work at DiRj 1 be undertaken.

ACKNOWLEDGEMENT

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1972 Salvage Excavations at DfRs3, the Whalen Farm Site

BRIAN SEYMOUR

Introduction

In the summer of 1972, Mr. D. Stock of Maple Beach, Point Roberts, informed the S.F.U. Archaeology Department of his intention to bull-doze a section of undisturbed midden deposit on his Maple Street property in order to make way for a house addition. This deposit was part of one of the few remaining undisturbed portions of DfRs 3. Mr. Stock invited the Department to undertake excavations on his premises. Subsequently, a volunteer salvage dig was organized by several students, including the author, in order to test the threatened deposits. Excavation continued intermittently from late August to the first of October, 1972.

The Site

DfRs 3 is a coastal shell midden located on the east shore of Point Roberts peninsula in Washington State. The site fronts the waters of Boundary Bay and traces of it are visible in and around the present subdivision of Maple Beach (Fig. 23). The surrounding area was historically occupied by the Semiahmoo group of the Coast Salish. Although now largely bull-dozed or otherwise altered by the construction of summer cottages, the site was once quite extensive, stretching parallel to the beach for perhaps 500 metres. Formerly there were two main midden mounds in the area, one located farther inland than the other.

The Excavations

As mentioned previously, testing was undertaken in the mound closest to the shore of Boundary Bay. The excavation locus is ca. 125 metres inland from the beach. The portion of undisturbed midden which was located in the southeast corner of the Stock property (Lot 15 on the South side of Maple Street) measured roughly 8 x 3.5 meters. (Fig. 42). After test excavations were completed, this mound was bull-dozed.

A datum point was established at the southeast corner of the house that stands in the centre of Lot 15. From this point, a North/South base-line was set up on the East side of which two 2 metre x 2 metre pits were laid out. The northern pit will be referred to as Pit A and the southern one as Pit B. The pits were separated by a 1 metre wide baulk. During the course of excavation two 1 x 2 metre extensions to Pits A and B were added onto their western sides. These will be referred to as Pits C and D. In addition a 1 x 1 metre test-pit was opened to the southwest of the main excavation locus. The stratigraphy of this unit, Pit E, confirmed the boundary between disturbed and undisturbed deposits which had previously been only assumed. The deposits of Pit E were extremely disturbed, apparently from landscaping activities. Excavation was terminated in Pit E at 70 cm.

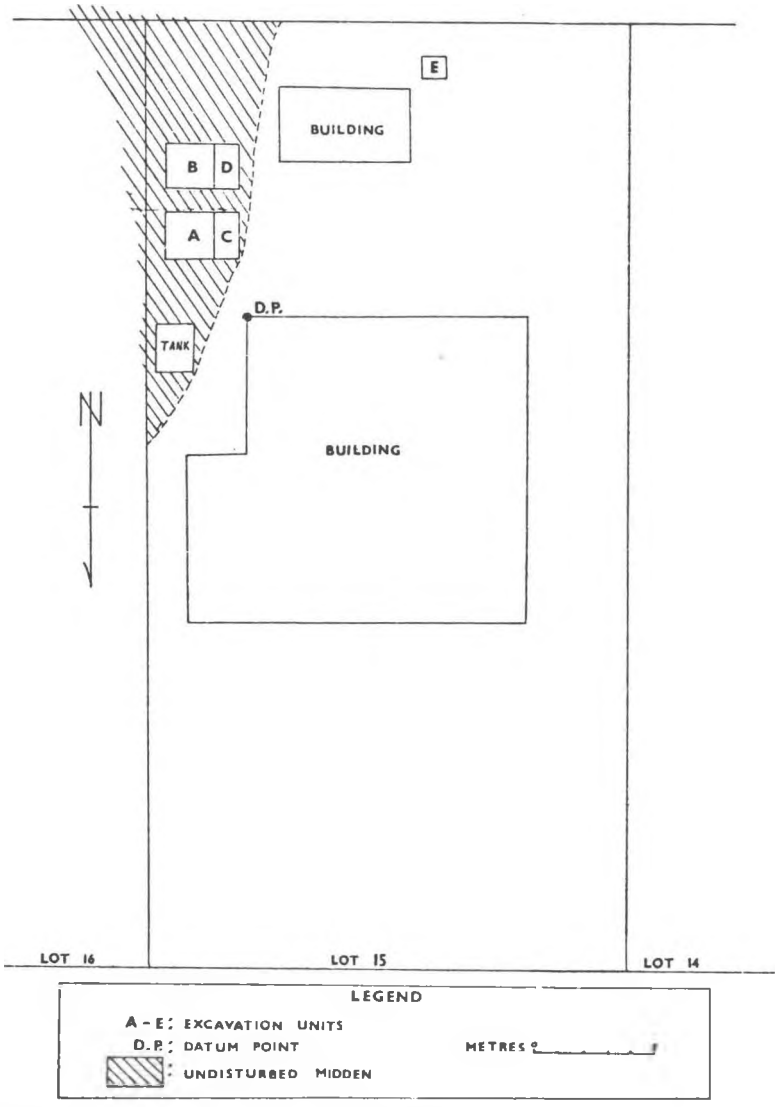

Fig. 42. Plan of excavations at the Whalen Farm site, DfRs 3.

below surface. Only one artifact, a fragment of ground bone, was recorded from this unit, at a depth of 60–70 cm. Digging was carried out largely by shovelling in arbitrary 10 and 20 cm. levels. Features were excavated with trowels and dust-pans and smaller tools when necessary. All excavated material was screened through 1/4 inch mesh.

Pits A and B were taken down to sterile beach sand and gravel at approximately 4.30 metres below the surface. Units C and D were not fully excavated because of time limitations, but were dug to depths of .80 metres and 1.40 metres respectively.

Stratigraphy

The stratigraphy of the portion of DfRs 3 that was test-pitted can be divided into four major zones

(Fig. 43). From oldest to youngest, they are identified as Zones I to IV.

Zone I: The cultural deposits at DfRs 3 rest upon this stratigraphic unit. It is composed of light brown sterile beach sand mixed with fine gravel. It continues from approximately 4.1 metres below surface to an unknown depth, since excavation was terminated at 4.3 metres below the surface. The upper portion of Zone I, where it came in contact with the cultural deposits was streaked with a few thin lenses of highly disintegrated mussel and clam shell.

Zone II: This zone is composed largely of great quantities of highly fragmented, compressed, mussel shell *(Mytilus edulis)* in addition to smaller amounts of decomposed cockle *(Clinocardium nuttalli),* horse clam *(Schizothaerus nuttallii)* and butter clam *(Saxidomus giganteus)* shell, in fairly well defined layers. Small cobbles, some of which were firecracked, were scattered throughout this unit. There was little soil in evidence. However, towards the bottom of this deposit, the crushed shell was mixed with thin lenses of bluish-gray clay and occasional light-brown sand layers. It extends from about 3.0 metres below the surface to the top of Zone I at approximately 4.1 metres.

Zone III: This zone extends from 2.4 metres to 3.0 metres below the surface. The deposit consists mainly of highly compacted, dark brown to black soil containing relatively few shell remains and comparatively large quantities of small cobbles, some of which were heat fractured. Mollusc shells were invariably highly fragmented. A few thin lenses of ash and fragmented shell mixed, were also located in this unit.

Zone IV: This is a comparatively loosely compacted deposit, extending from the surface to a depth of approximately 2.4 metres. It is composed of well-defined lenses of whole and partially fragmented clam and cockle shells and relatively unconsolidated grayish-brown soil in small quantities. A few mussel lenses are located in this stratigraphic unit, along with numerous cobbles. Whelk *(Thais* sp.) shells were recovered in small numbers throughout this zone and in the upper levels of Zone III. A thin surface humus layer, approximately 10 cm. thick and containing numerous shell remains caps Zone IV.

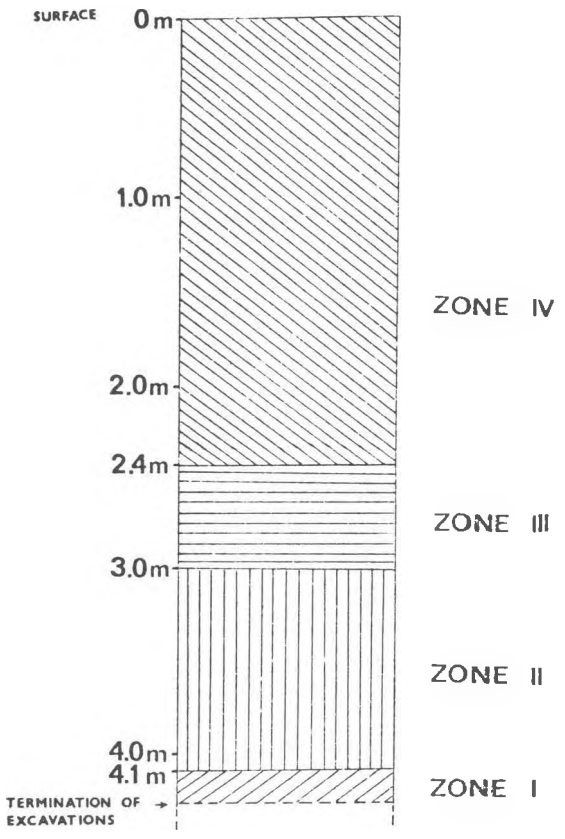

Fig. 43. Idealized strata at DfRs 3.

Faunal Remains

Molluscs: This food resource is represented in the excavations by profuse quantities of whole and fragmented shell. The most numerous species noted were cockle *(Clinocardium nuttallii),* butter clam *(Saxidomus giganteus),* horse clam *(Schizothaerus nuttallii)* and mussel *(Mytilus edulis).* Univalves such as whelks *(Thais* sp.) and limpets *(Acmaea* sp.) were also recovered in small numbers. A few small concentrations of sea-urchin *(Strongylocentrotus* sp.) spines were noted in the uppermost layers of the midden.

Fish: Most of the fish bones collected from this site have not been quantified or identified as to species. However *(Squalus* sp.) spines were present in small numbers. Fish bones (the majority of which were vertebrae) were more abundant in Zones II and III than in Zone IV.

Bird and Mammal Bones: An analysis of the bird and mammal remains from Pits A and B has been

carried out. Of the 1128 whole and fragmented bones recovered, 701 (62%) were from mammals and 427 (38%) were identified as bird bone. In the case of deer and elk, antler fragments were included in the bone category. This analysis also includes artifacts of bone and antler. Over 85% of the bird and mammal bones excavated were spread throughout stratigraphic Zone IV. The rest of the faunal material was distributed rather evenly throughout Zones II and III.

Mammal Bones: 160 mammal bone specimens could be positively identified. Figure 44 shows the species breakdown and relative percentages (out of a total of 160) demonstrated by each. On the basis of the great number of bones (75% of the 160 specimens identified) with at least one unfused epiphysis, it seems reasonable to infer that a large proportion of the animals represented were not fully mature. Dog, *(Canis familiaris)* is the best-represented species, followed by deer *(Odocoileus hemionus)*, elk *(Cervus canadensis)*, harbour seal *(Phoca vitulina richardii)* and porpoise *(Delphinus* sp.). There were two unidentifiable sea-mammal bone specimens. One possible marten *(Martes americanus)* ulna was also found.

Because of the size of the faunal sample and the relatively tiny horizontal extent of the part of the site tested, it is difficult to make any credible inferences regarding the respective abundance of the species identified. Perhaps land and sea-mammal hunting were only of marginal importance at this site, a factor possibly accounting for the lack of many game animal remains. Seasonal shellfish gathering or fishing may have been the primary occupations carried out. Ethnohistorically, various Coast Salish groups regularly occupied the southeastern corner of Point Roberts peninsula during the summer months in order to reef-net sockeye salmon, returning afterwards to winter villages on Vancouver Island and elsewhere (Suttles: 1951:152ff).

On the other hand, the differences between the amount of faunal material recovered per species may reflect a preference (or a lack of preference) on the part of the inhabitants for discarding certain types of bone in one particular area. The chance preservation or decomposition of bone specimens must also be considered in explaining the species breakdown. The great numbers of dog remains excavated are difficult to explain. The use of domestic dogs for hunting deer and elk as well as for the production of wool was well-established ethnographically among the Coast Salish (Barnett: 1955: 96–7). How far into prehistory

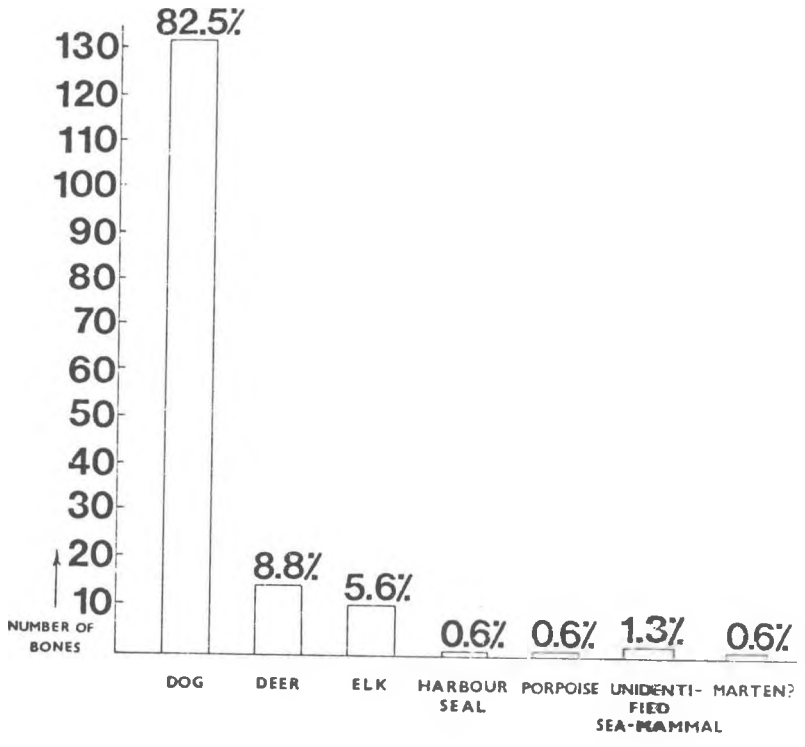

Fig. 44. Frequency of mammalian remains.

these practises extend is unknown, though the relative abundance of dog remains at DfRs 3 may indicate a considerable time-depth. Again, differential preservation and the small size of the sample should be taken into account.

Bird Bone: The 427 bird bones were not identified to the species or generic level. Of these bones, 296 could be identified as to specific skeletal elements such as humerii, tibiotarsii, etc. The most abundant types of skeletal elements proved to be wing and leg bones respectively. 284 wing bones and 10 leg bones were counted. Of the wing-bones, the carpometacarpus (the third bone from the distal end of the wing and which, in conjunction with the previous two elements makes up the distal segment of the limb) was the most abundant, with 209 specimens excavated. Only two non-wing/leg bones were found. Body bones were evidently not preserved or were discarded elsewhere. The great abundance of wing and leg bones cannot be satisfactorily explained at present, though it may be due to differential preservation between the more robust bones of the extremities (excluding the head and neck) and the delicate nature of the bones of the body proper.

Human Remains

Human skeletal remains from at least three individuals were encountered. During the excavation of Pit D, a human burial was exposed between 30 and 40 cm. below the surface (Fig. 45). The burial was in a tightly flexed position lying on its back with legs leaning toward the west. The vertebral column was aligned in a North/South manner with the head to the South. Most of the long-bones were reasonably well-preserved, though the innominates and others were fragmented. The skull was in many pieces, but the mandible was still intact. The individual was a male, approximately 12–14 years of age (O. Beattie, pers. comm., 1973).

This burial was located very near the South wall of the pit, and the darker profile of a well-defined pit coinciding with the horizontal and vertical provenience of the skeleton could be clearly seen in the stratigraphy. Three large rocks, one of them covering the upper portion of the burial, were found in a row beside it. Five additional boulders, (features that were virtually absent in the other pits), were found approximately 10 cms. above the burial surrounding its perimeter. They may, in conjunction with the three stones directly associated with the burial, represent a cairn. Similar cairns or small burial mounds have previously been reported from the Point Roberts peninsula by Smith (1901:61), as well as other areas of the Gulf of Georgia region. No artifacts were found in association with the skeletal material, even though the matrix around the burial was screened through fine mesh.

In Pit A at 1.1 metres below the surface, two fragmented human innominates were discovered. They were from an adult male individual. No boulders, pits or artifacts were found in association. Several cranial fragments and a femur shaft were recovered from the 70–80 cm. level of Pit B. Other, scattered, very fragmented human remains were found in the

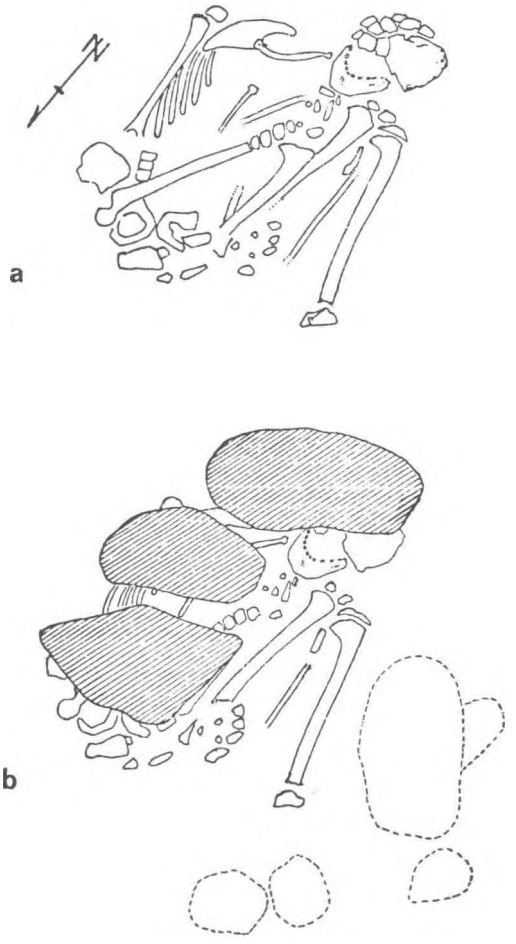

Fig. 45. Burial from Pit D with rock covering.

excavated pits down to a depth of 1.3 metres. A conclusive statement about the number of individuals represented by these latter finds is not justifiable.

The Artifacts

A total of 163 stone, bone and antler artifacts were excavated from DfRs 3. In addition, another 20 were retrieved from surface collection nearby or from subsequent landscaping of the test-pitted area. This report deals only with the 163 provenienced artifacts. The upper 10 cm. of the cultural deposit contained a considerable number of historic items such as rusted nails and broken glass which can be attributed with some certainty to activities since the turn of the century. The relative frequency of artifact types and their stratigraphic association by zone is shown in Table 1. Where not otherwise indicated, measurements given refer to the greatest length, width and thickness of the artifact under consideration.

Stone Artifacts

A total of 29 chipped stone artifacts were recovered. They are primarily made of the local coarse-grained basalt, though 2 specimens are of quartzite, one is of agate, and another is of slate There are 31 pecked, ground and incised stone tools made from a variety of lithic materials.

Chipped Points: Three basalt projectile points were excavated, having lengths of 4.0 cm., 4.4 cm and 5.2 cm. The largest is a rather slender, triangular, corner-notched specimen (Fig. 47*a*). The slightly smaller one shown in Fig. 47*b* is relatively thick leaf-shaped point with a concave base. The smallest point is fragmented and is triangular in shape (Fig. 47*c*). This last specimen is quite flat and shows evidence of unifacial reworking along one edge of the tip.

Bifaces: One complete biface and 3 biface fragments, all of basalt, are found in the sample. The complete artifact (Fig. 47*d*), probably functioned as a knife or scraping tool. It measures 6.1 cm. long. The thick bulb of percussion and striking platform of the flake that this tool was prepared from are located on the upper end of the artifact.

The smaller biface fragments measure 2.0 x 1.6 x 0.5 cm., 4.9 x 3.2 x 1.6 cm. and 5.8 x 2.1 x 1.3 cm.

Boulder-spall Tools: The two representatives of this category are relatively robust artifacts, the larger one measuring 13.0 x 8.6 x 2.1 cm. and the smaller one 11.2 x 6.3 x 1.9 cm.

The smaller of these artifacts was made from a flake retaining part of the cortical surface of the core from which it was removed (Fig. 47*f*). It is bifacially worked and made from a pinkish quartzite. The larger specimen is made of basalt and has been unifacially worked along one edge.

Cores: Two basalt cores were excavated in the 1972 work. One measures 9.5 x 4.4. x 3.4 cm. while the smaller of the two measures 5.0 x 4.7 x 3.3 cm. Basalt beach cobbles of a size similar to the cores described above are readily available on the beach in front of the site.

An agate core measuring 2.6 x 2.0 x 1.8 cm. was recovered from near the middle of Zone IV. It was fashioned from a small waterworn pebble.

Unifacially Worked Flakes: 15 of the 16 specimens in this category are of basalt, the 16th being of quartzite. The modification of the flakes ranges from the removal of a few random chips from a single edge to one specimen that has small flakes struck off in a patterned manner from two edges (Fig. 47*e*). However, only 7 of these flakes exhibit a well-defined retouch pattern. The bulk of the edge alteration on the flakes of this class probably come about as the result of their utilization as cutting and scraping tools.

Chipped Slate: There is one thin, chipped slate slab in the sample, measuring 8.7 x 4.5 x 0.5 cm. It shows evidence of rough, bifacial chipping all around its perimeter.

Stone Vessels: Two mortar or bowl fragments were excavated, one of which is decorated on the side with a carved anthropomorphic face (Fig. 46). This specimen measures 11.2 cm. long by 5.6 cm. wide and along its outside rim it is 4.3 cm. high. The unembellished bowl fragment is 9.4 cm. long by 5.4 cm. wide and is 5.4 cm. high (Fig. 48*a*). The process for creating the vessels appears to be a combination of pecking and grinding. The latter process has eliminated most of the pecking marks. The anthropomorphic bowl is made from a tough, igneous stone, while the other example is of a fine-grained vesicular stone, also igneous.

Maul Fragments: The single maul fragment found is ground very smooth and polished. Its cross-section resembles one half of a bisected circle with

Table 1. Artifact distributions by stratigraphic zone.

	Zone I	Zone II	Zone III	Zone IV
Bone Artifacts				
Split Cannon Bone Awls				2
Ulna Awls				3
Bone Points		1	2	1
Needle			1	
Composite Toggling Harpoon Valve			1	
Worked Rib		1		
Spatulate Tool			1	
Worked Bird Bone		2		1
Bone Beads				2
Perforated Bone Fragment		1		
Worked Bone Fragments		4	4	12
Antler Artifacts				
Unilaterally Barbed Points				3
Unbarbed Antler Points				2
Antler Wedges			1	7
Worked Antler Object			1	
Chopped Antler Tines		2		2
Chopped Antler Beam				1
Worked Antler Fragments		2	3	13
Artifacts of Other Materials				
Dogfish Spine "Awls"	1	3	2	20
Perforated Bird Claw			1	
Chipped Stone Artifacts				
Chipped Stone Points			1	2
Bifaces/Biface Fragments			1	3
Boulder-spall tools				2
Cores			1	2
Unifacially Worked Flakes				16
Chipped Slate Slab				1
Pecked, Ground and Incised Stone				
Stone Vessels		1		1
Maul Fragment				1
Pecked Pebble		1		
Hammerstones				2
Nephrite Adze-Blade				1
Ground Slate Point				1
Lignite Pendant				1
Abrasive Stones		1		12
Worked Siltstone		1		8
Totals	1	20	20	122

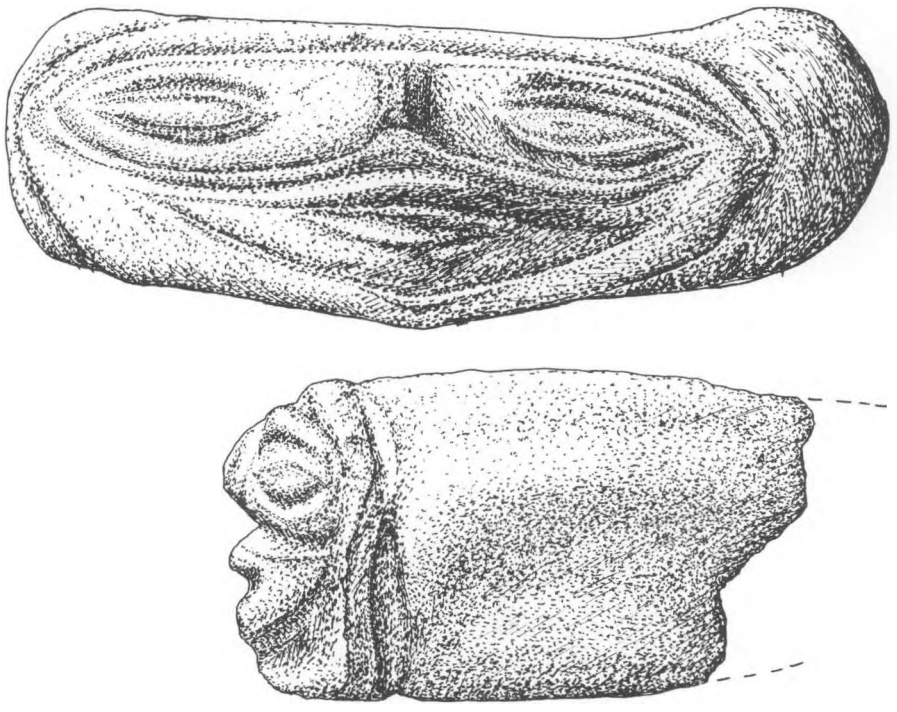

Fig. 46.
Carved stone bowl from Zone IV, at DfRs 3.

the worked portion of the stone being the convex side. It is 4.8 cm. long, 4.9 cm. wide and 2.2 cm. thick. It is made from a dense igneous stone (Fig. 48*c*).

Pecked Pebble: This artifact is an oval, flattened, waterworn pebble 6.0 cm. long, 4.5 cm. wide and 2.5 cm. thick. It has shallow depressions pecked into each of its opposing flat sides (Fig. 48*d*).

Hammerstones: Two hammerstones were discovered. One is an almost perfectly round, waterworn cobble, plano-convex in cross-section, 8.9 cm. across and 3.8 cm. thick. There are small hammering marks along its edges and on both of its faces. The second hammerstone, roughly rectangular in shape, is 9.8 cm. long, 6.5 cm. wide and has a maximum thickness of 1.6 cm. It is extensively pock-marked from repeated blows all along the edges of its long axis, and to a lesser degree at either end. Several small flakes have been removed from the edges, probably in the process of this pebble's use as a hammerstone.

Nephrite Adze Blade: A single, complete, nephrite adze blade was excavated which measures 7.7 cm. in length with a maximum thickness of 1.3 cm. (Fig. 49*a*). The slightly convex bit is 3.5 cm. wide while the poll measures 1.9 cm. across. This artifact is roughly rectangular in cross-section, with all faces being gently convex. There is evidence of wear on the bit in the form of several small chips that have been removed.

Ground Slate Point: The lone representative of this artifact type in the collection is leaf-shaped and 5.8 cm. in length, with a base 1.9 cm. wide (Fig. 49*b*). It has a maximum thickness in its midsection of 0.2 cm.

Pendant: This highly polished decorative piece measures 2.7 cm. long, 1.4 cm. wide and 0.9 cm. thick (Fig. 49*c*). The stone it is made from is deep reddish-brown in colour and is probably lignite. The perforation at the top is biconical in form.

Abrasive Stones: A total of 13 sandstone abraders were excavated. 8 of these have two separate abrasive surfaces on opposite faces, while the other five have been utilized on one side only. The specific abrasive surfaces themselves range from solitary very smooth sections on the stone to one or more shallow depressions to a deeply worn groove. The latter feature is shown in the specimen illustrated in Fig. 49*d*. The groove is 8.5 cms. long, 0.8 cms. deep at its deepest and has a maximum width of 2.6 cm. Another particularly interesting abrader exhibits 8

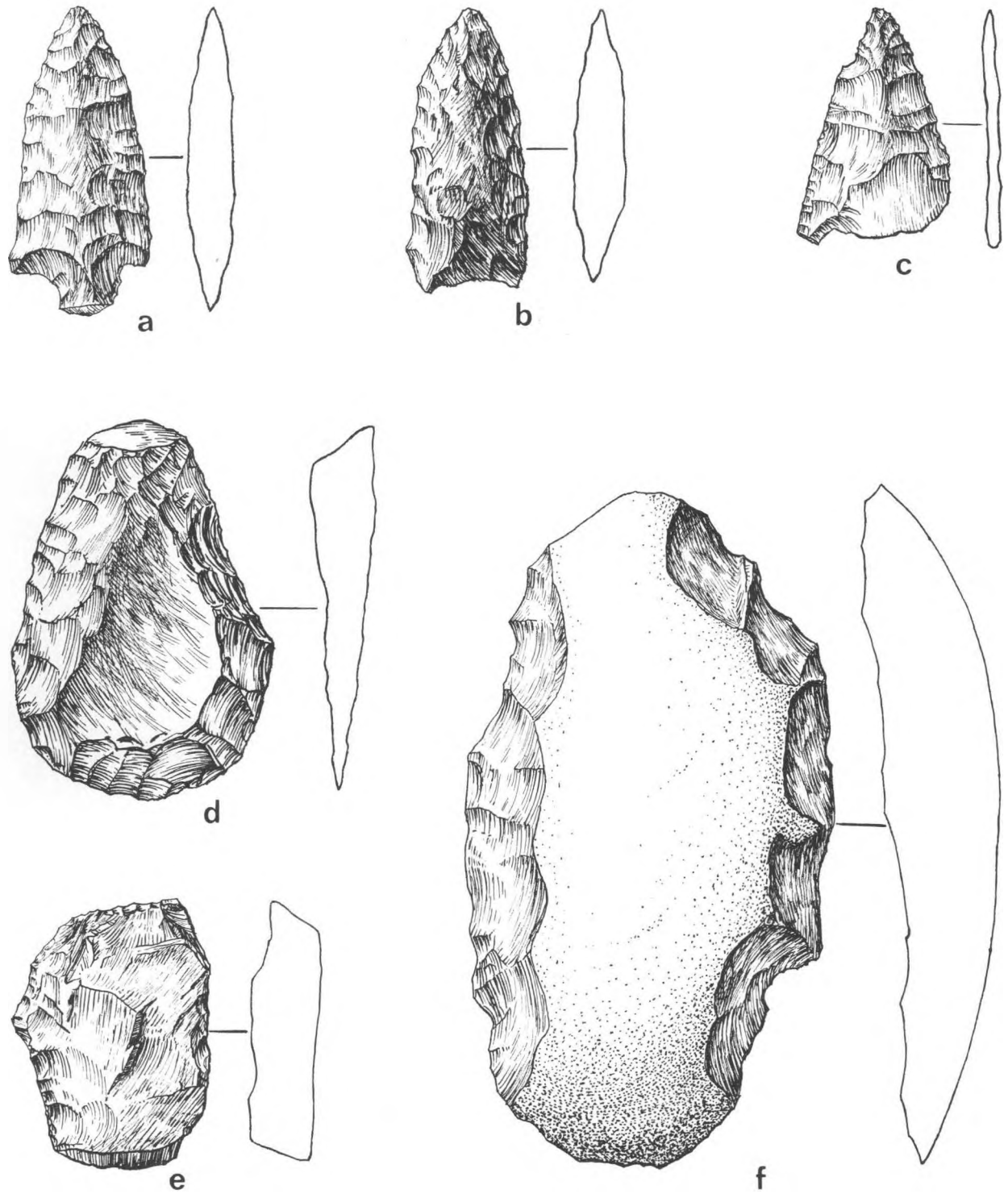

Fig. 47. *Chipped stone artifacts from DfRs 3. All are from Zone IV except c from Zone III.*

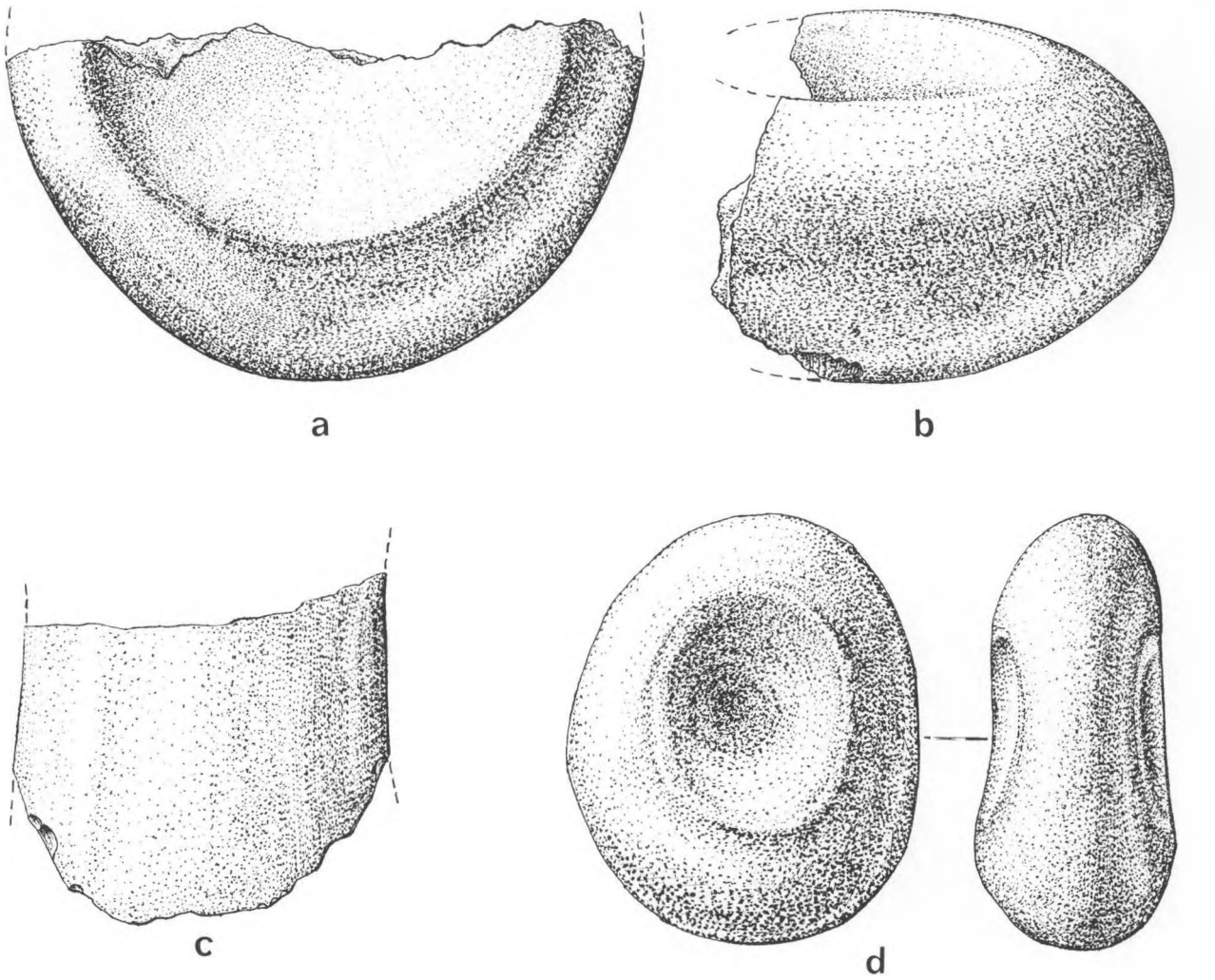

Fig. 48. *Pecked stone artifacts. a — b, top and side views of bowl from Zone II. c, maul fragment from Zone IV. d, bi-concave stone from Zone II.*

narrow grooves, each approximately 0.2 cm. wide and up to 4.1 cm. long (Fig. 49*e*).

Worked Siltstone: Nine pieces of ground, gouged, and incised siltstone were excavated. The most interesting of these artifacts are a small, abraded, siltstone pebble with a shallow, gouged-out depression (Fig. 49*f*), and a flattened piece with lines incised on its two opposing faces (Fig. 49*g*). The small gouged pebble is 5.0 cm. long, 2.7 cm. wide and 1.5 cm. thick. The gouged depression is approximately 0.5 cm. deep. The larger example is 7.3 cm. long, 5.1 cm. wide and 2.2 cm. thick. There are five roughly parallel lines incised approximately 1.5 mm. deep into each flat face of the pebble. The patterns on each face are almost identical.

Artifacts of Bone

Split Cannon-Bone Awls: Two split cannon-bone awls were recovered, one of which is illustrated in Fig. 50*a*. These tools were made from deer cannon bones that were split in half longitudinally before the proximal portions of each half were ground into shape. The butt-ends are unaltered. The specimens measure 11.4 cm. and 8.3 cm. in length.

Ulna Awls: There are two complete ulna awls

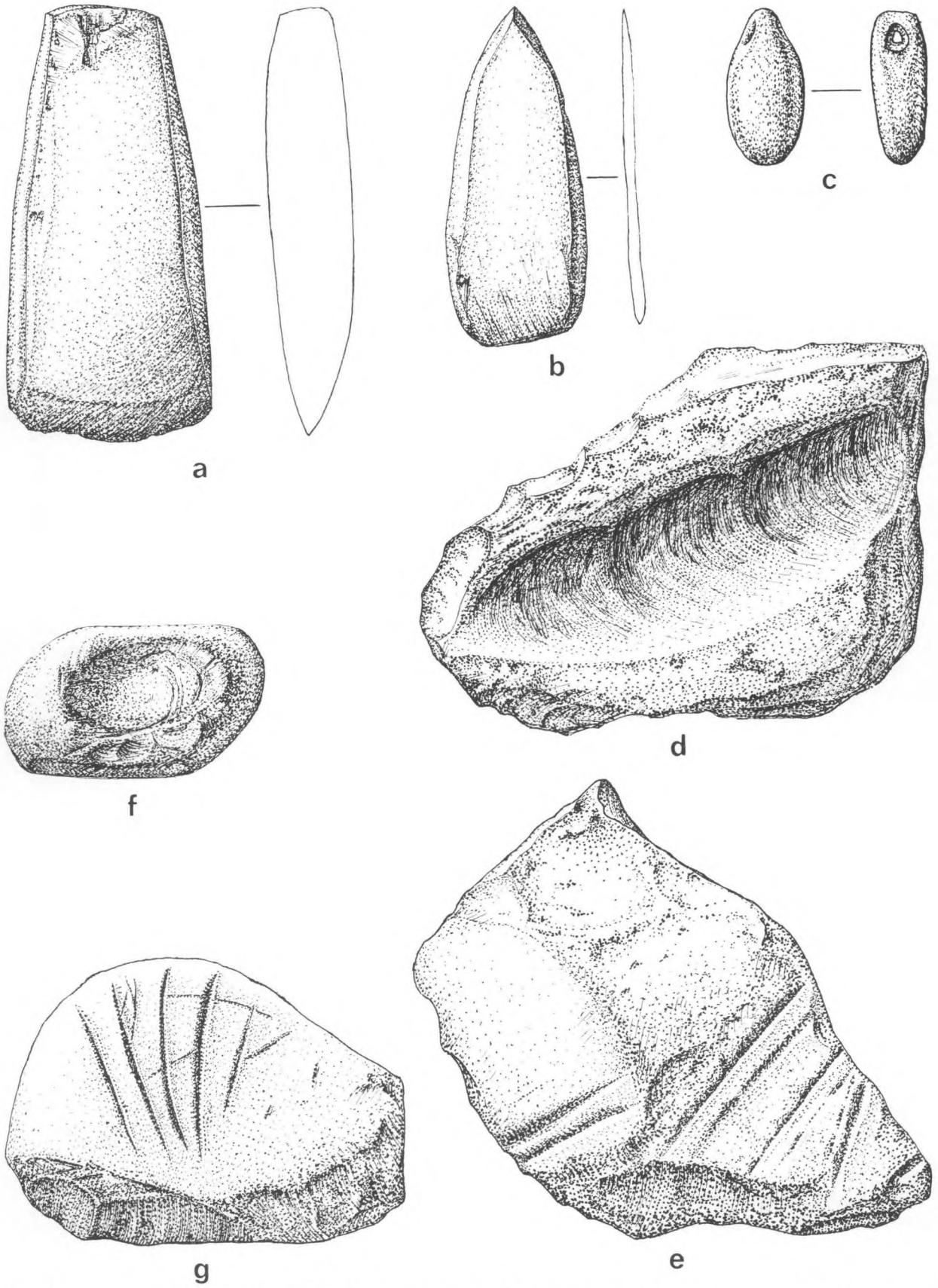

Fig. 49. *a, nephrite adze blade. b, slate point. c, lignite pendant. d, e, sandstone abraders. f, g, siltstone objects. All from Zone IV.*

and one tip fragment in the assemblage. The distal portions of all these tools are polished. The two incomplete awls are made from deer ulnae and measure 10.7 cm. and 9.7 cm. in length. The larger specimen is illustrated in Fig. 50*b*. The tip fragment is 3.1 cm. long and exhibits evidence of reworking on both edges.

Bone Points: Four bone points were recovered. The lengths of the two largest of these points are 4.5 cm. and 3.6 cm. The former is a well-polished specimen with a round cross-section and may represent the distal end of a needle, though no perforation is evident (Fig. 50*c*). The smaller tool is similar to a flattened rectangle in cross-section, its distal portion having been rather crudely worked to a point, (Fig. 50*d*). A thicker point-tip, 2.5 cm. long, with a rectangular cross-section (Fig. 50*e*), and a smaller, burnt point, (Fig. 50*f*) that is 1.8 cm. long and which has a rounded cross-section, complete this category.

Needle: One complete needle was recovered in the 1972 excavations. This specimen resembles a flattened rectangle in cross-section and is 15.7 cm. long (Fig. 50*g*). An oblong perforation is located 2.2 cm. from the distal end and is 0.3 cm. across at its widest point.

Composite Toggling Harpoon Valve: The single specimen excavated is 6.3 cm. in length and shows no evidence of a lashing groove or socket for a cutting blade or point (Fig. 50*h*). The blade-bed is ground flat, possibly for the insertion of a thin ground slate or bone cutting blade. The socket for the shaft is comprised of a section of the unmodified medullar cavity of the section of long bone used to make the valve.

Worked Rib: This broken tool, 11.1 cm. long, 1.5 cm. wide at its widest point and 0.3 cm. thick, is made from the midsection of a mammal rib. Both edges of the medial face of the rib show numerous striations and a high degree of polish (Fig. 50*i*). The lateral face and fragmented ends of rib show no signs of working or usage.

Spatulate Tool: This fragmented artifact is highly polished and has a shallow groove running the length of one face which widens toward the distal end (Fig. 50*j*). The tool is slightly curved with the groove being on the convex side. It is 11.3 cm. long, 1.3 cm. wide and 0.2 cm. thick at its midsection. It is fashioned from a piece of mammal long bone.

Bird Bone Artifacts: Three artifacts of bird bone were recovered. Two of these, having lengths of 3.8 cm. and 4.3 cm. have pointed ends which exhibit polish and wear patterns probably indicative of their use as piercing tools. The larger of these specimens is shown in Fig. 50*k*. The third example, which is 6.0 cm. long, has numerous shallow, apparently unpatterned incisions running at right angles to the long axis of one side of the bone.

Bone Beads: Two bone beads were recorded. The largest of these (Fig. 51*a*), is fashioned from a section of mammal long bone. This ring is ground and polished on all faces except for the inside walls. The second example (Fig. 51*b*) shows no signs of grinding or polishing. It too, is cut from a section of thin long bone, probably that of a bird.

Perforated Bone: This enigmatic artifact is 4.5 cm. long, and consists of a section of bone with a 0.4 cm. wide hole drilled completely through it (Fig. 51*c*). The concave face of this artifact has been ground and slightly polished.

Worked Bone Fragments: 20 amorphous cut, ground, or polished bone fragments were recovered, two of which have been burnt. 6 of these pieces exhibit traces of the "groove and split" boneworking technique, in the form of long, regular striations along one or more of their edges.

Antler Artifacts

Unilaterally Barbed Antler Points: Three incomplete specimens of this artifact type were found. Two of these are the butt-ends of fixed points while the third is the distal portion of a harpoon or fixed point. These specimens have respective lengths of 10.3 cm., 8.4 cm. and 6.3 cm. (Fig. 51*d, e, f.*).

Unbarbed Antler Points: The larger of these two incomplete points is 4.1 cm. long, while the smaller one is 2.3 cm. long. The former (Fig. 51*g*), has a flat, tear-drop shaped cross-section while the latter is rounded (Fig. 51*h*). These points are quite possibly tip or butt fragments from larger barbed antler points.

Antler Wedges: Wedges are the most numerous of the classifiable antler artifact types. All 8 of these tools were incomplete, ranging in length from 2.1 cm. to 16.3 cm. Four of them show signs of having been unifacially bevelled at the distal end while three others appear to have been worked bifacially. The distal end is missing from the eighth specimen. Five of these wedges were fashioned from antler tines while the remaining three were probably made from portions of the antler beam. Judging from the length and thickness of these tools, most of them appear to have been made from wapiti antler. Fig. 51*k* illustrates a wedge made from an antler beam while Fig. 51*i* shows an antler tine wedge.

Worked Antler Object: This enigmatic specimen is made from the distal portion of an antler tine (Fig. 51*l*). A series of four rounded grooves have been cut and ground around the circumference of the tine, giving it a pronounced ridged appearance.

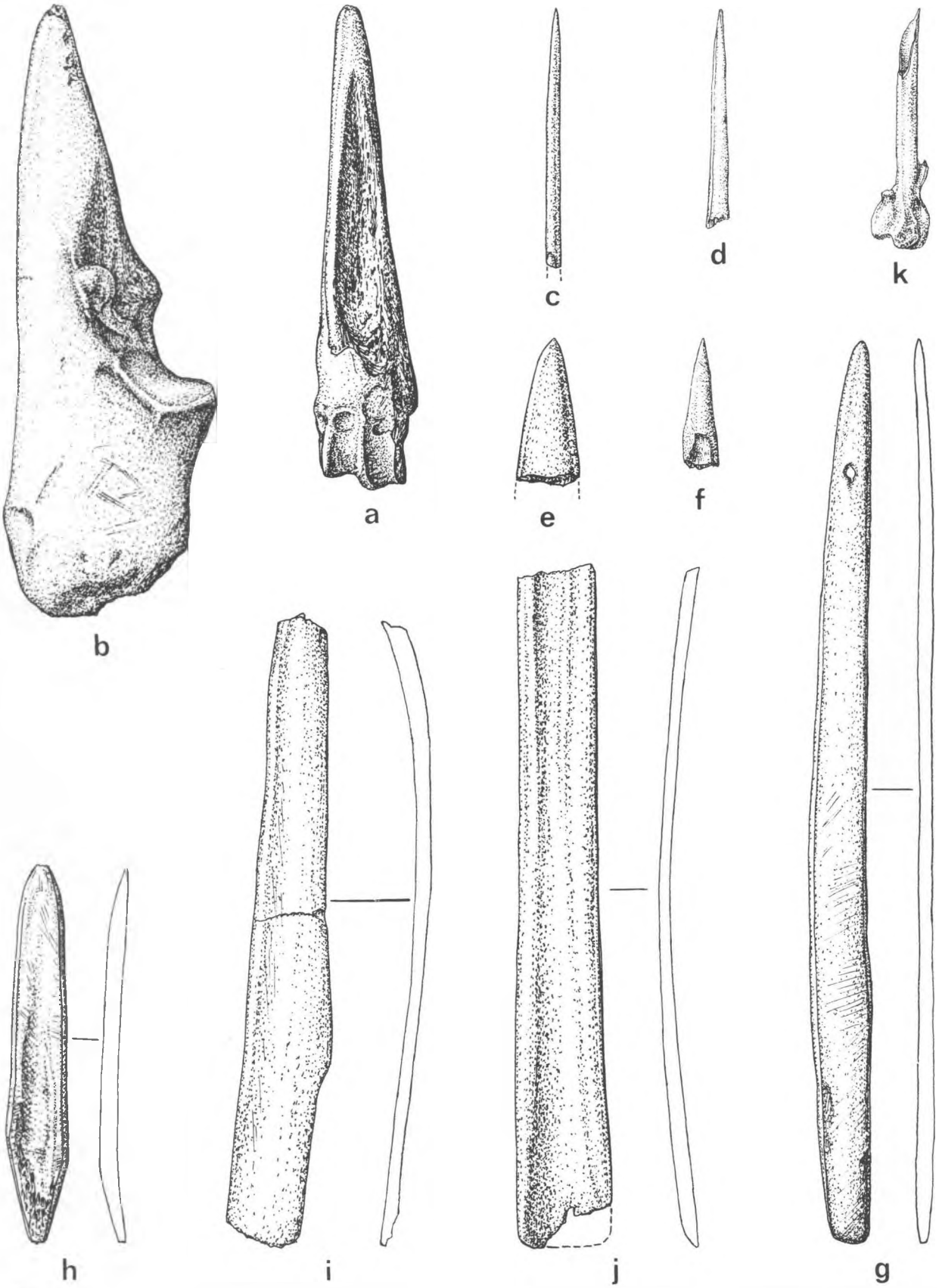

Fig. 50. *Bone artifacts. a, b, awls. c — f, point fragments. g, needle. h, harpoon valve. i — k, miscellaneous. a — c, Zone IV. d, i, k, Zone II. e — h, j, Zone III.*

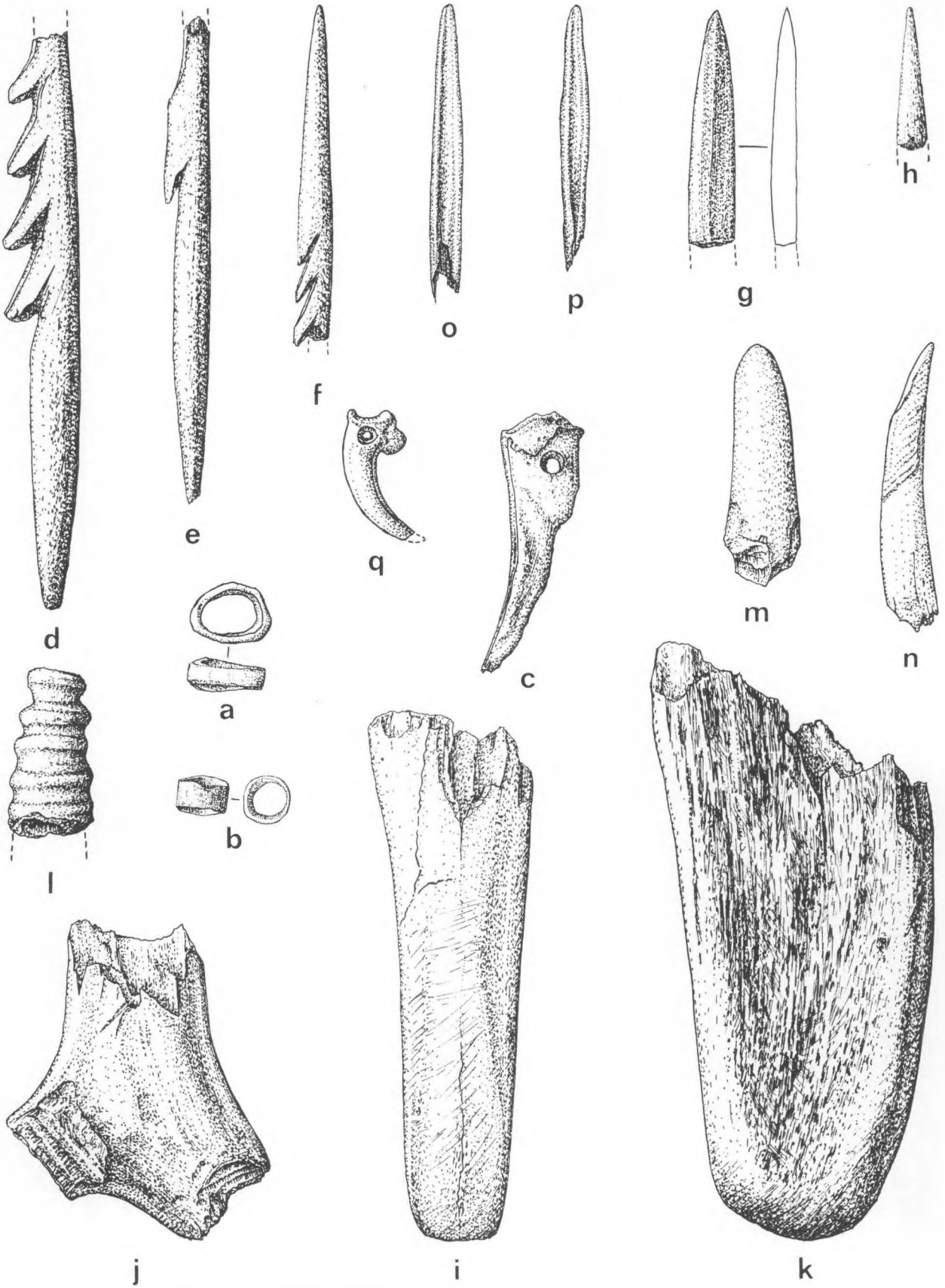

Fig. 51. *a, b, rings. c, perforated bone. d – f, barbed point fragments. g, h, point fragments. i, k, wedges. j, l, m, object fragments and beam ends. n – p, dog fish spines. q, perforated claw. a – c, bone. d – m, antler. a, b, d – k, m – p, Zone IV. c, Zone II. l, q, Zone III.*

The tine-tip has been removed and the top of the artifact ground smooth. The relatively wide base of the specimen has not been worked and it appears as though the artifact has been broken from the rest of the original tine at this point. It is 3.0 cm. long and 1.7 cm. wide at the base.

Chopped Antler Tines: Four chopped antler tines are included in the assemblage. They vary in length from 2.0 cm. to 4.2 cm. The tines were possibly removed during the process of working the antler beam. However, three show evidence of grinding, and one specimen shows polish as well as grinding marks (Fig. 51*m*).

Chopped Antler Beam: A single specimen, 5.8 cm. long, 4.0 cm. wide and 1.6 cm. thick is found in the collection (Fig. 51*j*). It is a part of the mid-section of the beam at a point where a smaller tine was formerly attached. Chopping marks are evident at the former confluence of the tine and beam as well as above and below it. Because of its small size, it is assumed that the antler fragment was that of a deer.

Worked Antler Fragments: 18 miscellaneous pieces of worked antler were catalogued, 8 of which showed possible signs of having been sectioned by the "groove and split" technique.

Artifacts of Other Materials

Dogfish Spine "Awls": 26 dogfish spines exhibiting use-wear and polish on their pointed distal ends were found (Fig. 51*n*). They range in length from 2.3 cm. to 5.2 cm. In most cases, the shiny outer coating of the spine has been worn down to the bony substructure, though in some instances, even the latter tough material has been eroded through use on the tip. Most of the wear seems to be concentrated on the dorsal side of the distal ends of spines. In 6 cases, the pointed end of the tip has been broken off. The tip of one specimen has been burnt. Varying amounts of polish and numerous, though apparently unpatterned striations usually accompany the wearing away of the chitinous outer covering.

The proximal ends of 10 specimens in the collection show clear signs of having been pinched. This constriction of the normally laterally flaring proximal end of the spines would be the expected result of holding the spine between forefinger and thumb while using it as an awl.

Fig. 51 *o* and *p* show ventral views of two utilized spines. The proximal end of the spine in Fig. 51*o* shows little evidence of having been pinched, while that in Fig. 51*p* shows very marked constriction.

Perforated Bird Claw: Fig. 51*q* illustrates a comparatively large bird claw core with a perforation completely through its proximal section. The perforation is biconical in form.

Conclusions

The artifact assemblage recovered in the 1972 excavations at DfRs 3 is for the most part indicative of a Marpole Phase occupation. This culture is clearly represented in stratigraphic Zones III and IV. So few artifacts of diagnostic value were retrieved from Zone II that it is impossible to apply the same phase designation with any certainty. However, no sterile layer or major stratigraphic break was noted in the lower reaches of the excavations other than the definition between Zone II and Zone III. This stratigraphic differentiation may well have been the result of altered shell-dumping activities or occupation-area re-alignments rather than culture change.

Artifacts excavated at DfRs 3 that are to a greater or lesser extent indicative of the Marpole Phase include unilaterally barbed, fixed antler points; small triangular, chipped basalt projectile points; a stone-bowl fragment with an anthropomorphic design; a nephrite adze-blade; a polished lignite pendant; and several incised siltstone fragments. The bone composite toggling harpoon valve (Fig. 50*h*), though not a common artifact type in assemblages from this culture has previously been found in Marpole Phase contexts at other Gulf of Georgia sites (Mitchell 1971a: 56). The phase designation I have applied to this assemblage is further supported (though weakly) by the absence of such traits as large, thick, ground slate points, heavy ground slate knives, and large bone points indicative of the Locarno Beach Phase. Artifacts or artifact combinations diagnostic of the later San Juan and Stselax Phase are also absent.

The assemblage described in this report appears to resemble quite closely Marpole Phase material recovered from other Gulf of Georgia area sites such as DgRs 1, Beach Grove; DfRu 8, Helen Point; and DhRs 1, the Marpole type-site.

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I would like to thank Mr. and Mrs. David Stock of Point Roberts for inviting salvage excavations to be undertaken on their property and for their kindness to us throughout the project. Thanks are also due to Dr. and Mrs. R.L. Carlson for aid in accommodation at Point Roberts as well as guidance and suggestions during and after the excavations. I am grateful to Maureen Carlson for cataloguing the artifact collection. Equipment for the dig was provided by the Simon Fraser University Archaeology Department.

The success of a volunteer excavation project largely depends upon the willingness of individuals to donate their time and energy. In this respect I am particularly grateful to Chuck and Dianne Arnold and Ron and Lane LeClair, who went out of their way to see that as much work as possible was completed in the limited time available.

The assistance in excavation given by the following people was greatly appreciated: Rick Arnold; Jean Bussey; Arne Carlson; Christopher Carlson; Daniel Carlson; Norman Cebula; Morley Eldridge; Dick Gilbert; Kathryn Goddard; Dave Hutchcroft; Rick Percy; Pauline Rafferty; Tom Walker; Jean Williams; Peter Wing; and Barbara Winter.

The 1974 Excavations at McNaughton Island

ROY L. CARLSON

At the northern end of the northernmost island of the McNaughton group is a large lagoon with a narrow opening to the sea (Fig. 52). A narrow channel extends from this lagoon to a second lagoon further inland so that there are in fact two lagoons, inner and outer. A domed conifer covered outcrop of rock forms the eastern edge of the channel connecting the two lagoons. When the tide is in, this outcrop becomes an island, but when the tide is out, this island is a peninsula connected on its eastern side. A shell midden (Fig. 53) covers both the domed outcrop, and the margins of the outer lagoon. The midden is deepest in the area to the east of this island-peninsula where erosion has exposed a midden face nearly four meters in height. This midden is known as the McNaughton Island site (ElTb 10). It was first surveyed and tested by J.A. Pomeroy in 1972 (Pomeroy and Spurling 1972).

We arrived at the site on May 21, and commenced excavations the following week. Pomeroy had previously excavated three 2 x 2 meter pits into the deepest part of the midden directly in back of the deepest exposed face. His permanent datum consisted of a metal pole set in concrete. We re-established his grid using the same permanent datum, and employed a mean sea level datum for our contours which we established using the tide tables. The base of the permanent datum, the steel rod, is 9.33 meters above mean sea level.

Excavations were undertaken in two portions of the site: on the central and southern parts of the island-peninsula, where no previous work had been done, and on the main midden immediately to the south and west of Pomeroy's excavations. Nine 2 x 2 meter squares were excavated to sterile in the island; and six such squares in the main midden. Excavation proceeded by 10 cm. levels. Features which were few, were recorded sequentially. Midden samples were obtained from the main stratigraphic units. Photographs and profile drawings were made as required. The field work began on May 21st, and terminated July 9th, 1974.

Stratification

The cultural deposits on the island varied in depth from 50 to 120 cm. This deposit consisted for the most part of lenses of ash, fragmented shell, and narrow bands of black midden soil. Thick lenses of whole shell also occurred. There is no major stratigraphic difference within this deposit which spans both the late prehistoric and historic periods. The top 40 cm. of deposit in the excavations of the southern end of the island-peninsula contained a few historic objects in addition to the prehistoric ones. Underlying the cultural deposit is a thick (20–30 cm.) layer of dark brown old humus which is permeated with small plant roots and has the consistency of wet peat. This deposit was sterile of cultural material except for two large chipped stone pieces.

The stratification of the main midden is much more complex than that of the island. In general, the stratigraphy consists of thick layers of mostly whole shell alternating with thin layers of old humus. Thinner bands of ash and black midden are associated with the layers of whole shell. Fire cracked rock occurs throughout. The stratigraphic picture seems clearly one of periods of occupation punctuated by periods of abandonment. The entire deposit rests on a weathered granite bedrock. It seems clear from our work at the site that Pomeroy's excavations centered in both the deepest and the oldest part of the midden, and that this deepest and oldest part is right at the front eroded edge of the main midden. Pomeroy's excavations reached sterile at a depth of four meters

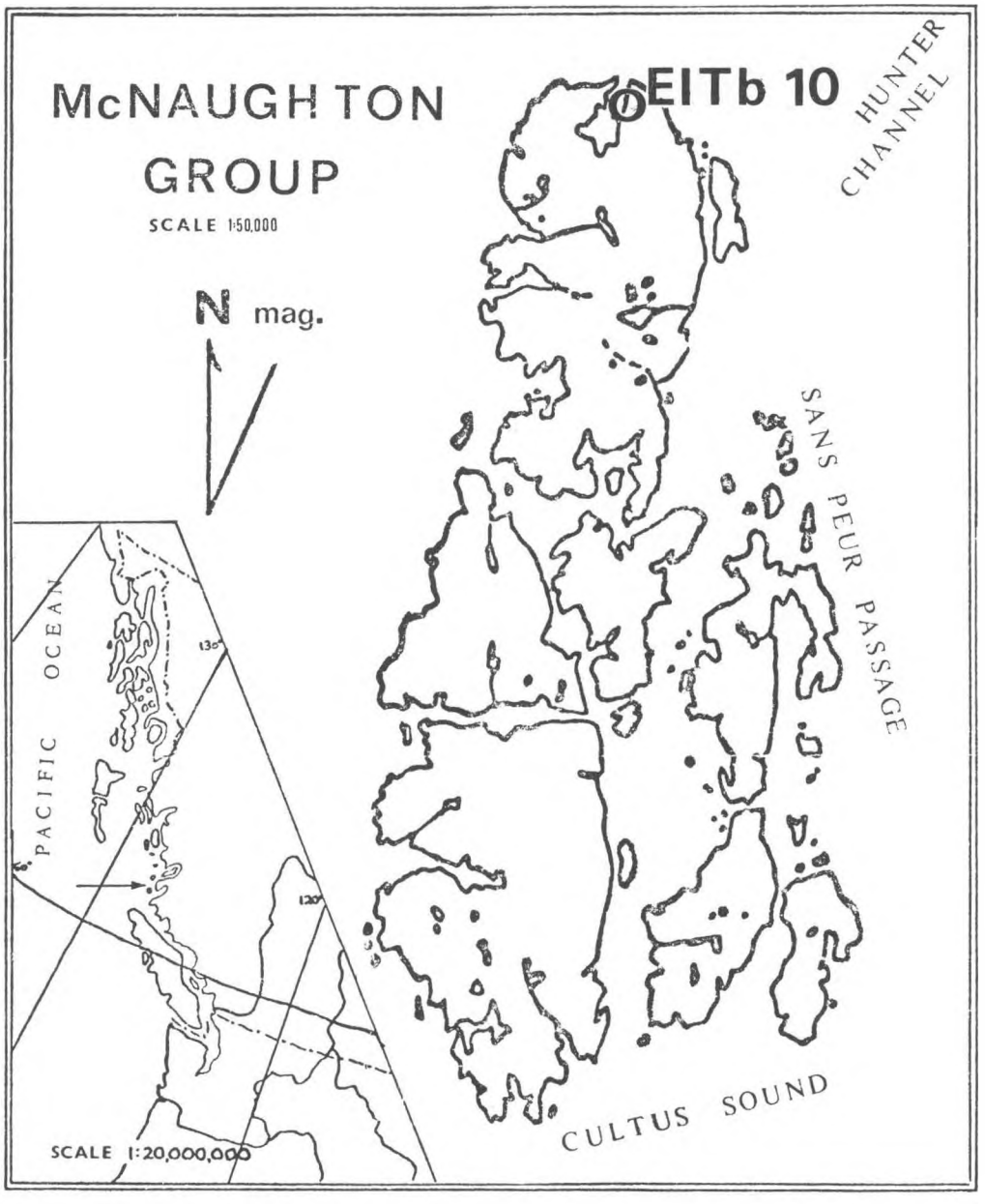


Fig. 52. Location of the McNaughton site, EITb 10.

below the surface. The radiocarbon dates he has received indicate a rapid build up of midden between 600 and 200 B.C.

Most of our excavations in the main midden fall within the same stratigraphic units as these dates; the exceptions are the two most westerly pits which contain a thicker overlying deposit analogous to the entire culture bearing unit on the island. It is clear that the youngest occupation is on the western part of the main midden, as well as on the island.

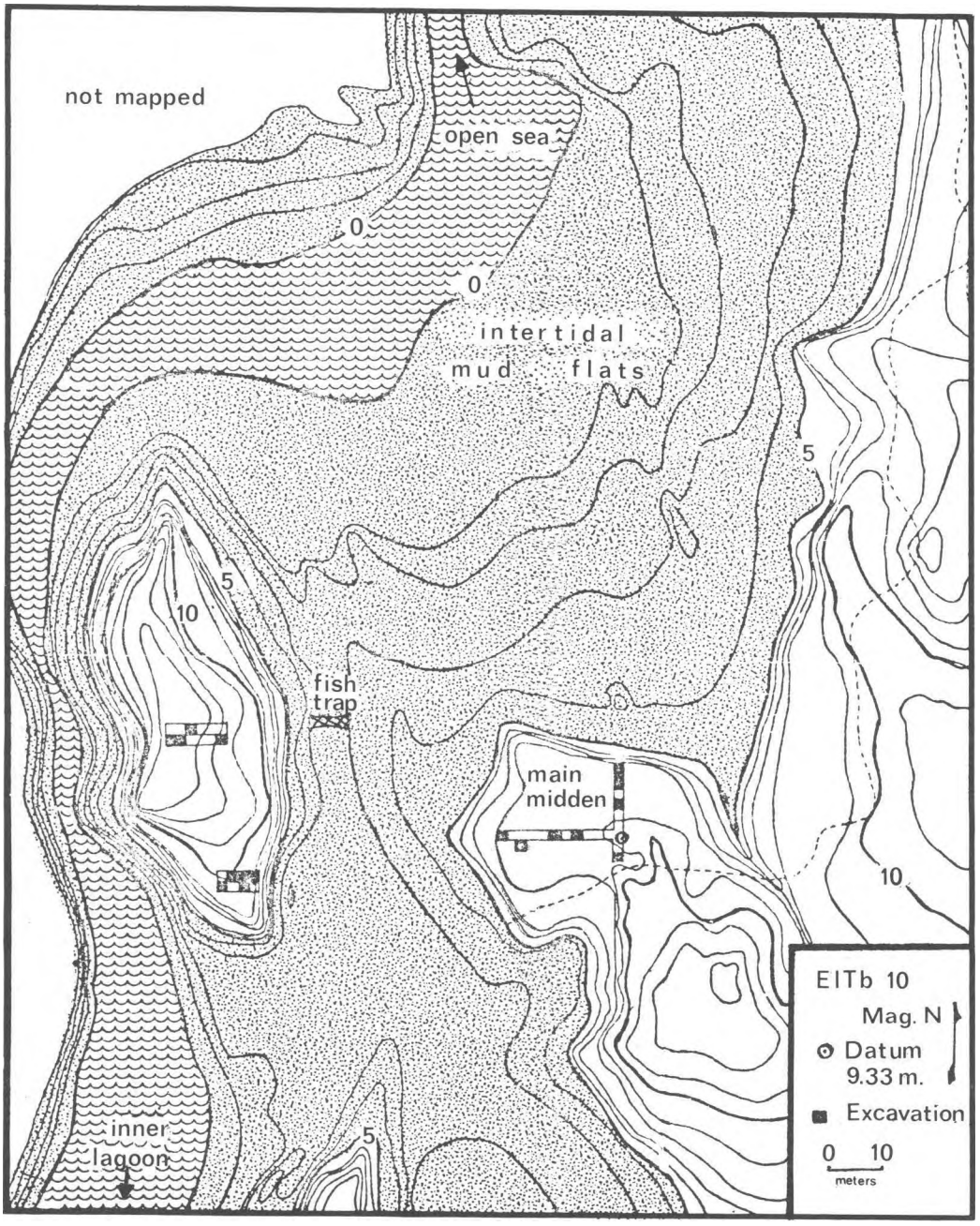


Fig. 53. *Contour map of EITb 10 showing location of excavations. Dashed line marks limit of main midden. Site mapped by S. Hercus and M. Wong.*

Assemblages

There are a series of stratigraphically defined artifact assemblages, and an assemblage found on the beach. These assemblages are listed below:

Assemblage 1

One stone core and one scraper were recovered from the old humus underlying the main cultural deposit on the island. Similar chipped stone items were also recovered from the beach where they had presumably eroded from the site. This assemblage can be considered as part of a component belonging to the Cathedral phase (Carlson 1972). Pomeroy and Spurling (1972) found chipped stone basalt and obsidian only in the lowermost portion of their excavation, and that material likely relates to this phase as well. Part of the beach assemblage also belongs to younger components.

Assemblage 2

This assemblage consist of those artifacts recovered from Stratigraphic Zone II (Fig. 54). No artifacts came from Zone I.

Assemblage 3

The artifacts in this assemblage come from a thick layer of dark brown humus (Zone III) which separates Zone II and Zone IV (Fig. 54). Artifacts from immediately adjoining levels of Zones II and IV are included, if it was impossible to ascertain which zone they actually came from.

Assemblage 4

This assemblage occurs in Zone IV, a thick shell layer (Fig. 54).

Assemblage 5

The artifacts in this assemblage were found in Stratigraphic Zones V and VI which consist of two layers of black humus with a shell and humus layer between. These layers are not separable from each other in all pits (Fig. 54).

Assemblage 6

This assemblage comes from the top humus layer in the pits in the main midden. It is the only assemblage from the main midden in which historic artifacts occur (Fig. 54).

Assemblage 7

This assemblage occurs in all layers below 40 cm. deep in all pits excavated on the southern end of the island.

Assemblage 8

This assemblage occurs in the top 40 cm. of the pits on the southern end of the island, and is separated from Assemblage 7 solely on the basis of the occurrence of trade goods.

Assemblage 9

This assemblage occurs in all pits in all levels from the pits on the center of the island.

Cultural Components

The degrees of similarity among the previously defined assemblages indicate that they can be grouped provisionally into the following cultural components.

Component 1

The core and core scraper from assemblage 1, plus the leaf-shaped points, core scrapers, crude bifaces and some of the obsidian from the beach can be tentatively assigned to the Cathedral phase (Carlson 1972).

Component 2

Assemblage 2 has only unilaterally barbed harpoon heads and lacks composite harpoon heads. It also has the highest frequency of large bone points and other simple (lacking stems and notches) bone points. All of the technically advanced pecked and ground stone implements (mauls, circular stones, hammerstone grinders) are lacking as well. Although there are only 57 artifacts from this assemblage, it appears desirable to identify it as a separate component.

Component 3

Assemblages 3 and 4 are little different in content, and can be grouped into a single component. Pomeroy's C—14 dates suggest that this component dates to about 200 B.C. Composite harpoon heads, green-stone adze blades, and pecked stone mauls make their appearance. The cultural content is in many ways identical to that of the Anutcix phase at Kwatna.

Component 4

Assemblages 5, 7 and 9 are very similar and can be grouped together into a single cultural component. There is a continuity of most artifact types from the preceding component Hammerstone-grinders and circular stones first appear in this component. This component is representative of precontact Heiltsuk culture. In many ways the content of this component is similar to that of the Kwatna phase at Kwatna.

Component 5

European trade goods appear only in assemblages 6 and 8. A few aboriginal artifact types continue from the preceding component, and indicate a general continuity of culture. The scarcity of European trade goods indicates the site was little used during the historic period. Pomeroy did obtain the name Hunlsuk from Fred Reid as the aboriginal name for this site, however.

The materials excavated by Pomeroy in 1972 belong stratigraphically with components 1, 2 and 3. He did not excavate in any part of the site where components 4 or 5 were present except possibly in the top 20 cm. of his excavations. Once the result of the 1972 and 1974 season's excavations are integrated, we will have a better picture of the culture history of the site.

Faunal Remains

Mammals

Samples of the faunal material from Components 2, 3, and 4 were analyzed by Alan Jacques. The sample from Component 2 was taken from 0—2 N, 12—14 W, 270—290 cm. below surface. This is toward the very bottom of the deposits containing Component 2. The sample from Component 3 came from 0—2 N, 8—10 W, 120—140 cm. below the surface. The sample from Component 4 came from 20—22 N, 76—78 W, 70—80 cm. below the surface. The results are shown in Table 2. The importance of this site for sea mammal hunting is rather clearly brought out by the bone frequencies. All identifiable bones from all levels were saved, and additional samples need to be analyzed.

Table 1. Artifact frequencies by type, assemblage, and component.

Components	1	2	3			4		5		mixed	total
Assemblages	1	2	3	4	5	7	9	6	8	beach	
Artifact Types											
CHIPPED STONE											
Cores	1									2	3
Core scrapers	1									2	3
Crude bifaces										2	2
Leaf-shaped points										3	3
Side notched points										1	1
Stemmed points										1	1
Biface fragments										1	1
Retouched flakes										1	1
Non-retouched flakes							1			3	4
Obsidian fragments				1						5	6
Flake chopper				1			1				2
PECKED & GROUNDSTONE											
Sandstone Abraders		2	1	1	3	1				2	10
Pebble Hammerstones		2		2	1	2				5	12
Cylindrical mauls				1	1	1			1	2	6
Flanged mauls								1			1
Hammerstone-grinders						1	3	1		3	8
Circular stones					1	2			1	1	5
Red Ochre						1					1
Graphite								1			1
Triangular slate points								2			2
Ground slate fragments								3			3
Quartz crystals					1	1					2
Greenstone adze/chisel blades			1	2	1	2				6	12
Greenstone adze blade fragments				1	1	7	6			18	33
Anvil stones							1				1
BONE and ANTLER											
Points and Harpoon Heads											
Harpoon valves Type I			2	3	1	6	8				20
Harpoon valves Type II				2	1	2	3			1	9
Harpoon valves Type III			1			1	3				5
Harpoon valves Type IV			1			1	1				3
Unfinished valves				2		1					3
Unilaterally barbed points		3				3	1				7
single line guard		1				1					2
line groove							2				2
Whalebone "foreshafts"		4		1		2	1				8
Large bone points		9	4		5	3	5		1		27
Birdbone fish hook barbs		1		1		2	1				5
Stemmed points						1	1				2
Side notched points							1				1
Harpoon arming points					1	1					2
Misc. points, barbs, fragments		17	4	6		7				3	37

Table 1 Continued

Components	1	2	3			4		5		mixed	total
Assemblages	1	2	3	4	5	7	9	6	8	beach	
BONE and ANTLER Continued											
Ornaments and worked animal teeth											
Ground beaver and porcupine incisors				4		3	2				9
Perforated tooth pendant				1		1					2
Grooved tooth pendant			1								1
Ivory hook or labret				1			1				2
Ground tooth			1	1		1	2				5
Bone ring				1							1
Notched bone pendant							1				1
Perforated bone pendant		1				1					2
Edge perforated vertebral disc			3								3
"Fish-like" bone object							1				1
Miscellaneous bone and antler											
Large perforated fish						2					2
Whalebone spindle vertebrae shuttle				1		3	3				7
Unperforated whalebone disc						1					1
Rectanguloid whalebone object						2					2
Curved bone pins						2					2
Worked antler tine							1				1
Antler wedge fragment						1					1
Ulna chisel				1							1
Ulna awls		1					1				2
Shouldered awls		1	2	4		6	3				16
Perforated awl							1				1
Misc. awls and fragments		6	3	8	1	4	3				25
Worked bone fragments		9	5	9		17	7	2			49
SHELL ARTIFACTS											
Olivella shell beads						2			1		3
Mussel shell adze blades						1					1
Mussel shell knife fragments			2								2
EUROPEAN TRADE GOODS											
Copper nose ring									1		1
Copper tinklers								1		1	2
Copper wedge										1	1
Iron fragments									5		5
Lead shot								1			1
Glass fragment								1			1
Copper fragments									2		2
TOTAL	2	57	31	55	18	96	65	13	12	64	413

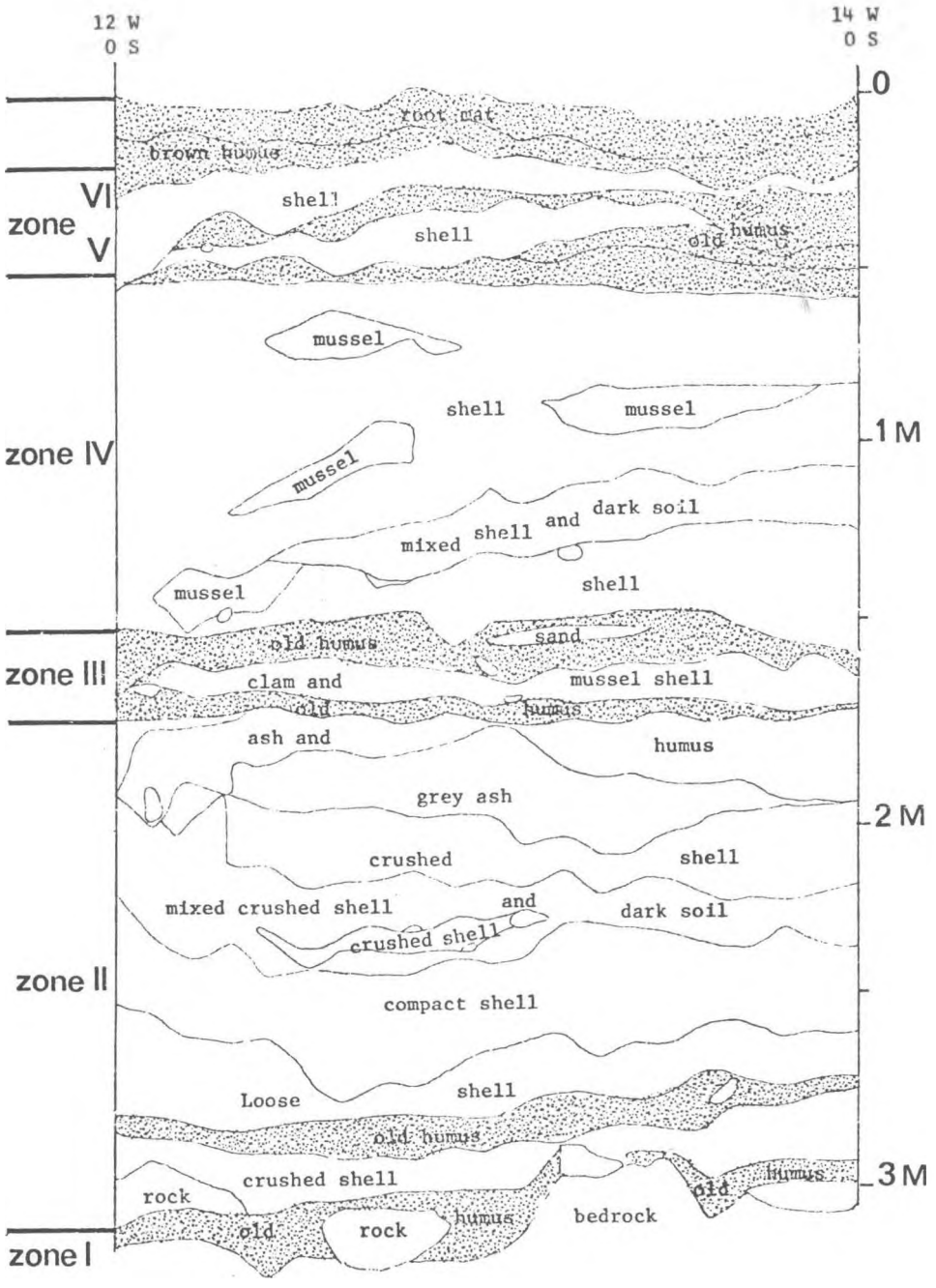


Fig. 54. *Stratigraphic profile of main midden.*

Table 2. Mammal bone samples from EITb 10.

Animal	Component 2		Component 3		Component 4	
	Number of bones	Minimum no. of Individuals	Number of bones	Minimum no. of Individuals	Number of bones	Minimum no. of Individuals
Canis Domestic dog?	2	1	2	2	1	1
Enhydra lutris Sea otter			3	2	3	3
Lutra canadensis River otter					1	1
MUSTELIDAE (family) mink?					1	1
Callorhinus ursinus northern fur-seal	1	1	10	7	2	2
Eumetopia jubata northern sea-lion			2	1	2	1
Zalophus californianus california sea-lion					2	1
OTARIIDAE (family) california sea-lion?			3	3	2	2
Phoca vitulina harbour or hair seal			3	3	4	2
Odocoileus hemionus blacktail deer	2	1	2	1	2	1
Oreamnos americanus Mountain goat			1	1		
Cetacea Corderl large whales	1	1	1	1		
DELAPHINIDAE (family) porpoises, dolphins			2	1	2	1
Totals	6	4	29	22	22	16

Fish

Samples of fish bones from the same squares and levels as the mammal bone were analyzed by Robert McLennan. The results are shown in Table 3. The samples from Components 2 and 3 are too small to generalize about, other than to note simply, presence of the various fish. The sample from component 4 clearly indicates the importance of salmon.

Table 3. Identified fish bones.

Fish	Number of bones			
	Component 2	Component 3	Component 4	Total
Red snapper	2	5	15	22
Pacific cod	1	3	11	15
Ling cod	3	13	33	49
Salmon	1	27	994	1022
Unidentified	33	421	137	591
Totals	40	469	1190	1699

Molluscs

Shellfish were an important resource for the inhabitants of the site, and much of the build-up in the main midden was the result of depositing large quantities of shell. The shores of the outer lagoon consist of intertidal sand flats which house a number of species of clams. Mussels, whelks, chitons, barnacles and limpets occur on the rocks near the entrance to the lagoon. Abalone and purple hinged rock scallops can be taken in the channel separating the inner and outer lagoons. A total of 47 species of molluscs excluding barnacles and chitons were observed in the lagoon and the immediately surrounding area.

Representative samples of each type of shell present were taken from each 10 cm. level during the course of excavation in order to obtain a presence-absence list level by level. In addition observations were made of exposed strata in profile, and samples were taken from shell bearing strata associated with Components 2, 3, and 4. Sandra Lucs and Shirley Casals analyzed these samples quantitatively by weight and their analyses are shown in Table 4 as percentages of the samples from which they came. The quantitative results reinforce the field observations: butterclam were the most frequent shellfish during all periods of occupation; barnacles were more frequent than one might expect, and that there is no evidence of significant variation in the patterns of shellfish exploitation during the periods of occupation of the site. Of these conclusions, the most interesting is why the high frequency of barnacle? Even taking into account the ratio of greater weight of the shell to the edible portions, cultural preference seems the logical answer.

Table 4. Shellfish frequency in the midden.

Shell	Percent of total shell		
	Component 2	Component 3	Component 4
Butterclam *Saxidomus giganteus*	55	39	49
Barnacle *Balanus sp.*	17	26	28
Horse clam *Schizothaerus nuttalli*	5	19	17
Native Little neck *Protothaca staminea*		6	
Blue mussel *Mytilus edulis*	1	3	
California Mussel *Mytilus californianus*	9	2	2
Wrinkled purple *Thais lamellosa*	1	2	
Cockle *Clinocardium nuttalli*	1	1	2
Other	10	2	2

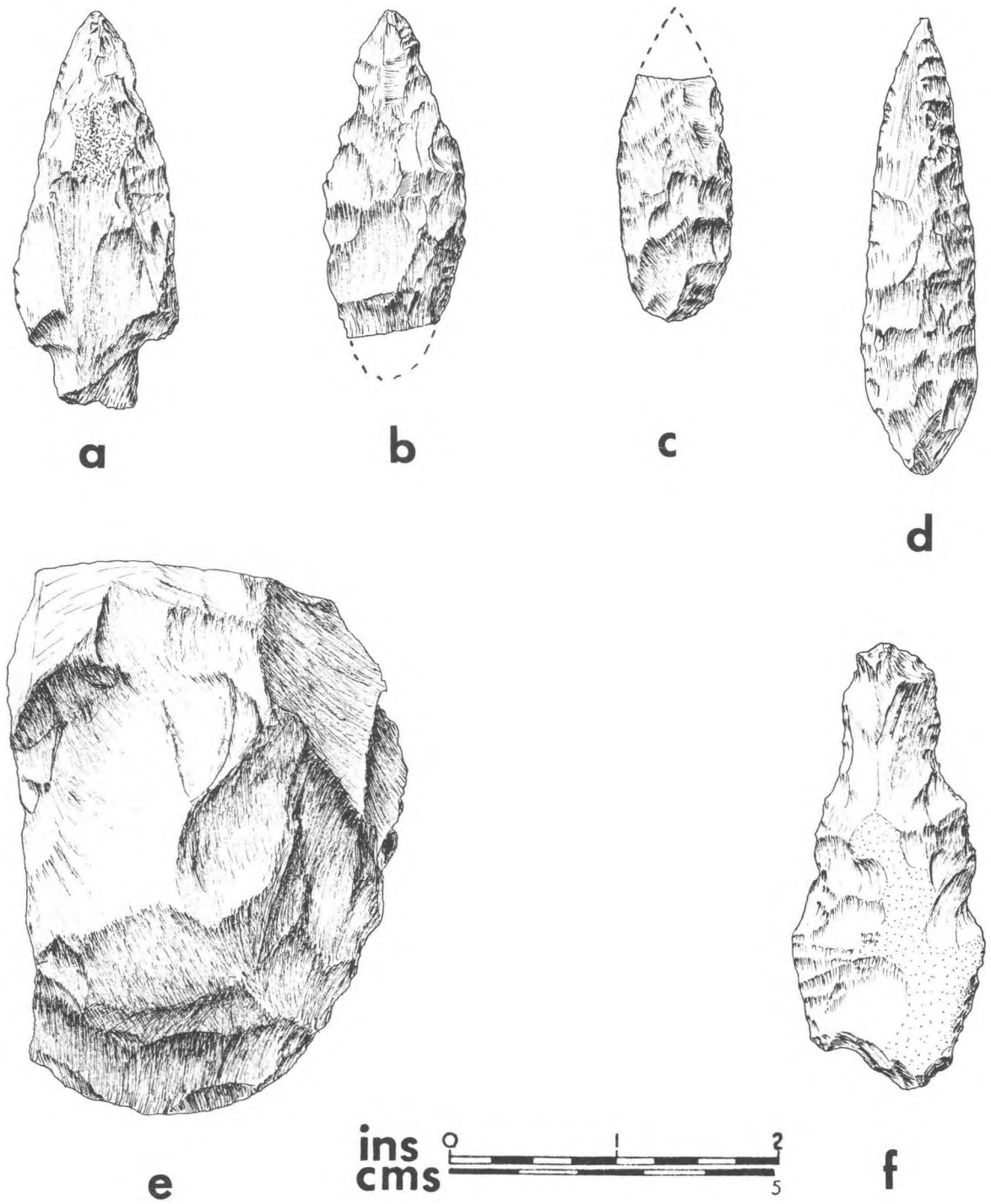


Fig. 55. *Chipped stone artifacts from Component 1 found on the beach. a, stemmed point. b, c, d, leaf shaped points. e, core scraper. f, crude biface.*

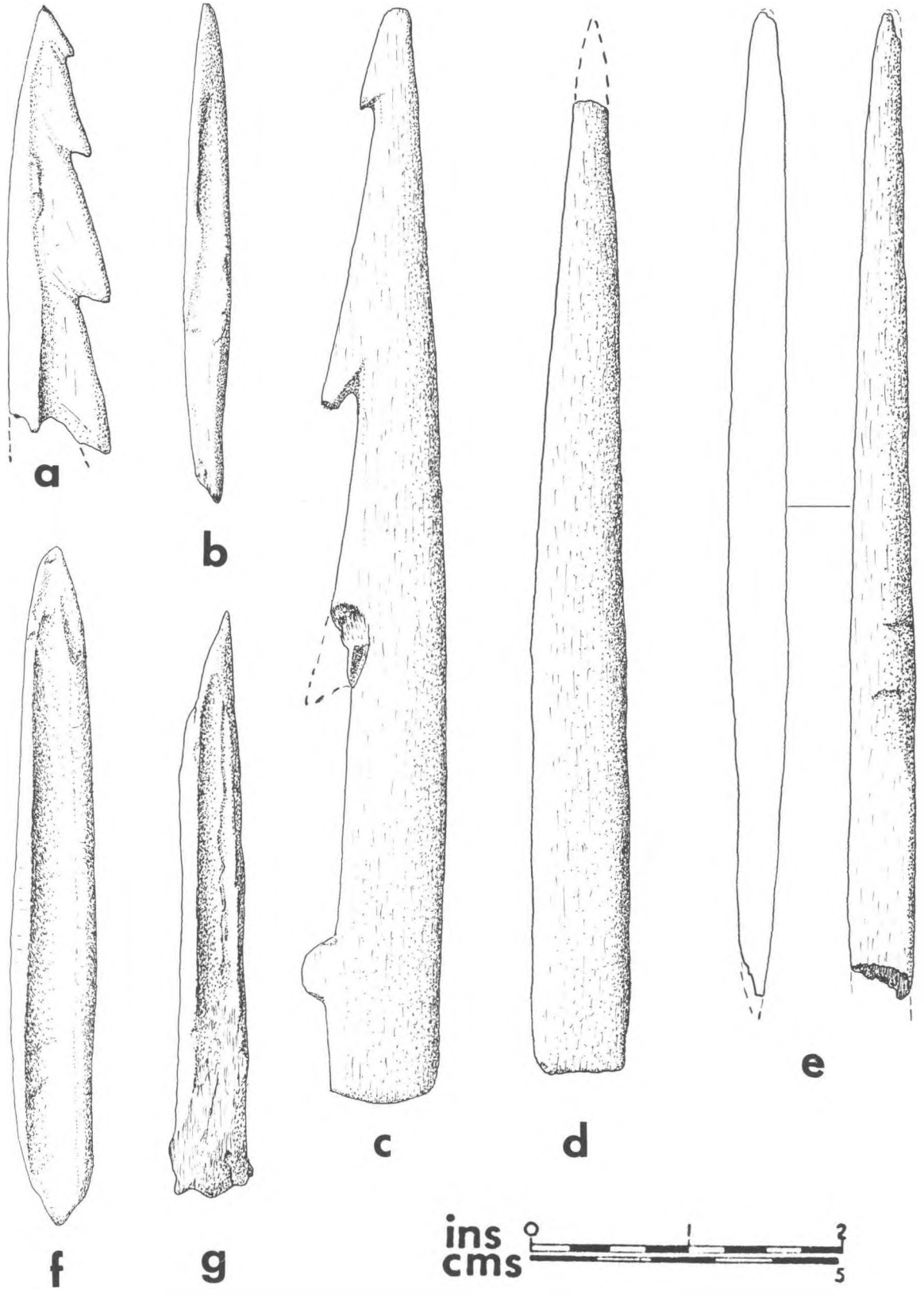


Fig. 56. *Bone artifacts from Component 2. a, fragmentary harpoon head. b, point. c, harpoon head with single line guard. d, e, possible foreshafts. f, point. g, awl.*

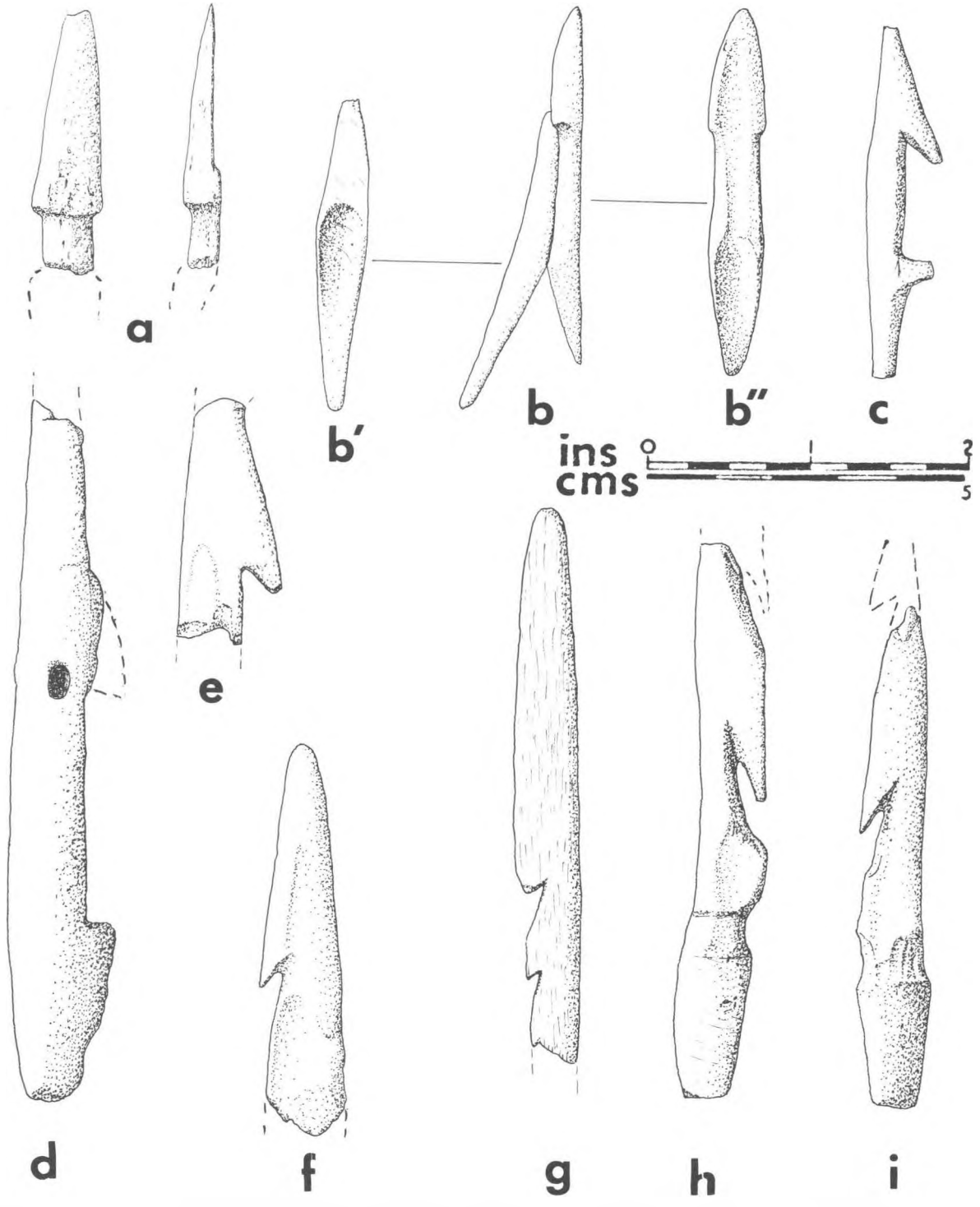


Fig. 57. *Artifacts from Component 4. a, fragmentary Type IV harpoon valve. b'. Type II harpoon valve found with b", Type I valve to form b, a complete harpoon head. c, small bone harpoon head with single line guard, possibly for a harpoon arrow. d, bone harpoon head with line shoulder. e, f, fragmentary harpoon heads. g, fragmentary barbed whalebone foreshaft. h, i, bone harpoon heads with line grooves.*

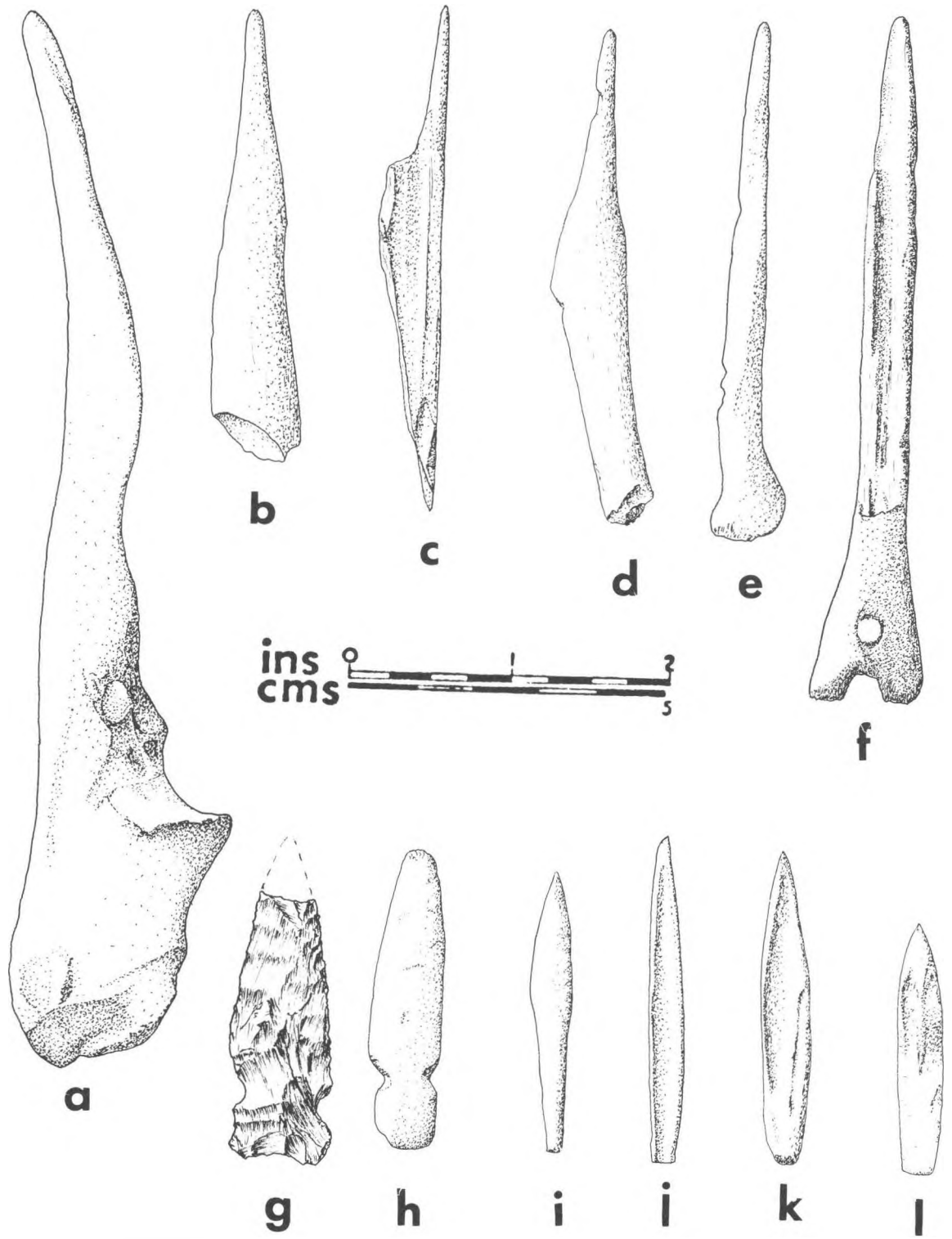


Fig. 58. *Awls and points from Component 4. a, ulna awl. b, bone awl. c, d, shouldered awls. e, awl or pin. f, perforated awl. g, chipped stone, side-notched point found on the beach. h, side-notched bone point. i, stemmed bone point. j, bird bone splinter barb. k, small bone point. l, bone arming tip for composite harpoon head.*

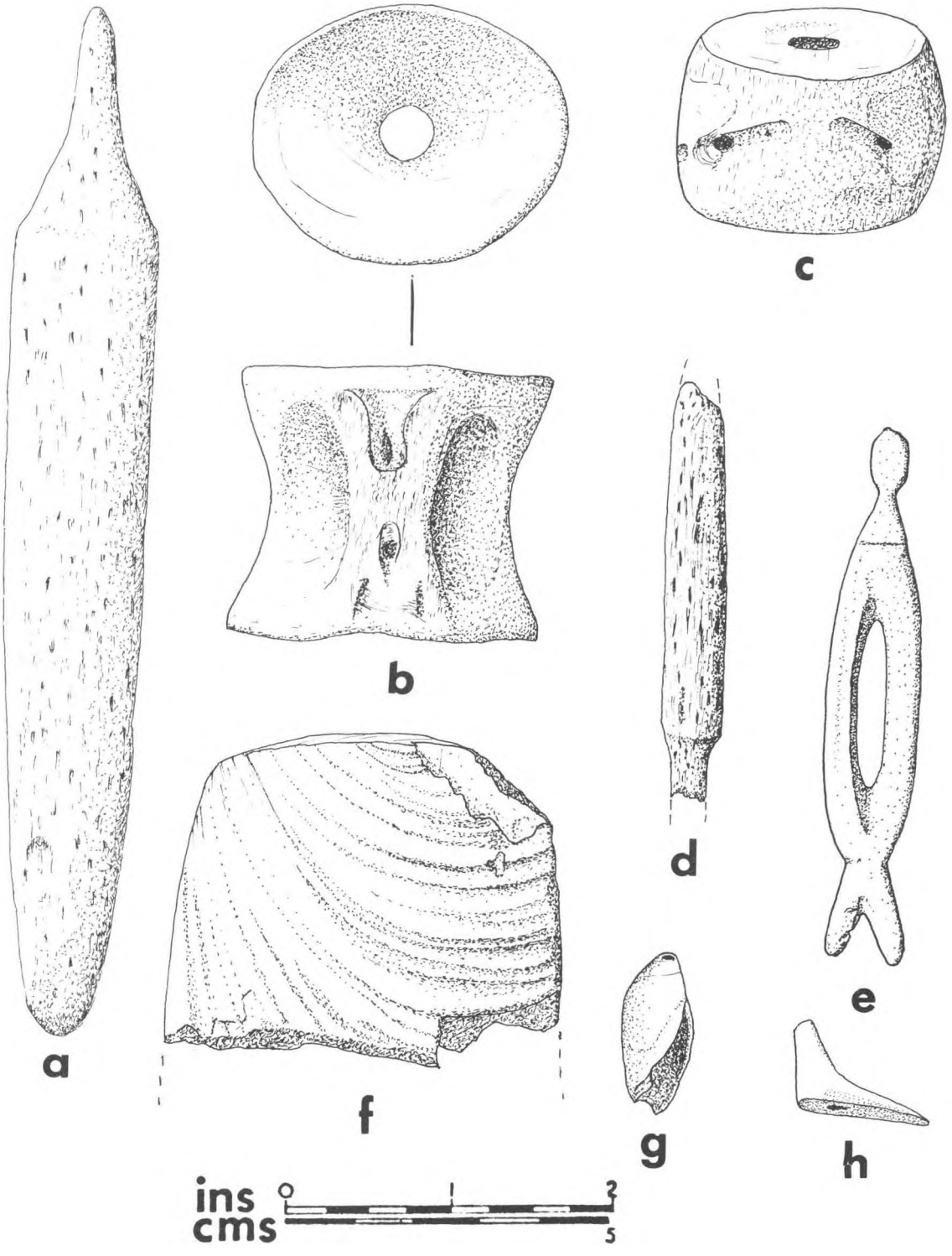


Fig. 59. *Miscellaneous artifacts from Component 4.a, whalebone spindle/shuttle. b, c, fish vertebra "spindle whorls". d, bone foreshaft. e, "fish-like" bone object. f, poll end of mussel shell adze blade. g, olivella shell bead. h, ivory hook or labret.*

Artifacts

A total of 366 artifacts were recovered this season: many of these are merely fragments. Table 1 gives a provisional listing by type, assemblage, and component. Detailed type descriptions must await a final report. The types of valves for socketed harpoons are as follows:

Type I A long self-pointed valve with a concavity in the lower ventral face; this type of valve joins to Type II to form a complete head.

Type II A short valve with a concavity in the lower ventral face and a flat upper ventral face for scarfing against the inner face of a Type I valve to form a complete head. (A flat bone point could be held between two such valves to form a complete head, but the only *in situ* pairs we uncovered consisted of a Type I joined to a Type II).

Type III A valve with a pointed tip, curved profile, and no basal depression. This may be a bone point rather than a harpoon valve.

Type IV A valve with an indentation in the ventral face of the tip end for insertion of an end blade. (The examples of this type are fragmentary).

All mauls found are fragmentary. Many artifact types are illustrated in the accompanying drawings.

Conclusions

The McNaughton Island midden belongs almost entirely within the Late Period of central coast prehistory. The culture content of the midden is very similar to that of sites of the same period at Kwatna. The generalized similarity in culture existing throughout this region during the last 3,000 years preceding European contact may be identified as prehistoric Heiltsuk culture. Within the pattern of this culture, the site seems to have been an important base for clam digging, fur sealing, and salmon fishing over a long period of time.

ACKNOWLEDGEMENT

This research was a joint project between the Department of Archaeology, Simon Fraser University and the Archaeological Sites Advisory Board. Bjorn Simonsen assisted greatly in launching the project. Philip Hobler and Tony Pomeroy helped with logistics. Cecil Reid, chief councillor of the Bella Bella band gave considerable encouragement. The following students assisted in this work: Steve Acheson, Brian Apland, Richard Brolly, Arne Carlson, Chris Carlson, Shirley Casals, Margaret Coulson, Stewart Hercus, Russ Hicks, Alan Jacques, Imogene Lim, Sandra and Arthur Lucs, Robert McLennan, Sharon and Tom McMath, James Morton, James Rolston, Michael Speer, George Will, Jean Williams, Mark Wong, and Joan Wood. Barbara Hodgson did the artifact drawings.

Archaeological Survey of Seymour Inlet, Quatsino Sound, and Adjacent Localities

ROY L. CARLSON and PHILIP M. HOBLER

Introduction

From May 25 to July 14, 1973, the authors carried out a site survey of Seymour Inlet, Quatsino Sound, and several adjacent localities. Brian Apland and Joyce May assisted us in this project. The project was sponsored jointly by the Archaeological Sites Advisory Board and the Department of Archaeology, Simon Fraser University, and the latter's research vessel, M.V. SISIUTL, was employed in the survey. The primary purpose of the survey was to locate and assess the scientific importance and archaeological resource significance of archaeological sites in the areas under consideration. The only previous work in the region was by Kenady in 1969.

A total of 63 sites were located; most of them had not been previously recorded. Artifacts in private collections from Quatsino Sound were examined and this proved a useful source of information. A few artifacts were picked up from the beaches in the course of the survey. While test pitting was not undertaken as part of the work, the nature of the sites and the artifacts observed do permit some general conclusions regarding the culture history of the region. The area covered by the survey is shown in Figures 60 and 61. The sites have been numbered according to the Borden (1952) system and the detailed descriptions and locations have been added to the provincial government's master site file.

The settlement pattern of the ethnographic period involved the following site functions: winter villages, fishing camps, shellfish gathering camps, burial sites, "forts", hunting camps, and probably other special purpose sites such as rock art sites. Some sites could have served at any one time in two or more of these capacities. Through time sites could shift from one type of use to another. Archaeological survey is generally not sufficiently sensitive to permit these distinctions, so we have adopted a primary classification of habitation sites, burial sites, rock art sites, and beach sites. The sites are listed by type in Tables 1, 2, and 3. Three localities — Seymour Inlet, northern Vancouver Island, and Quatsino Sound were surveyed — and the following section contains a description of sites found in each of these localities.

Seymour Inlet and Related Localities

Access to this system is from Queen Charlotte Strait through either Schooner or Slingsby Channel. These narrow channels join just below the Nakwaktok Rapids which open into Seymour Inlet. This inlet is the largest in the system which includes Nugent Sound, Frederick Sound, Salmon Arm, Belize Inlet, Mereworth Sound, Alison Sound, and all lesser bodies of water to which access by water can be gained only by passing through the Nakwaktok Narrows. The narrows themselves mark the transition from outer to inner coast, and the largest concentration of habitation sites is in the zone just above and below these rapids. Cougar Inlet, Slingsby and Schooner Channels, and Allison Harbour lie between the narrows and Queen Charlotte Strait. With the exception of Schwarzenberg Lagoon, these waterways were surveyed in their entirety. Small streams, some with salmon runs, exist at the heads of these long inlets. Clams, mussels, and prawns are plentiful in a number of localities, but there is an absence of shellfish at the heads of the long inlets where the water is less saline. The Japanese oyster has become established in one locality. Seals were seen almost every day.

The major characteristics of the shoreline are

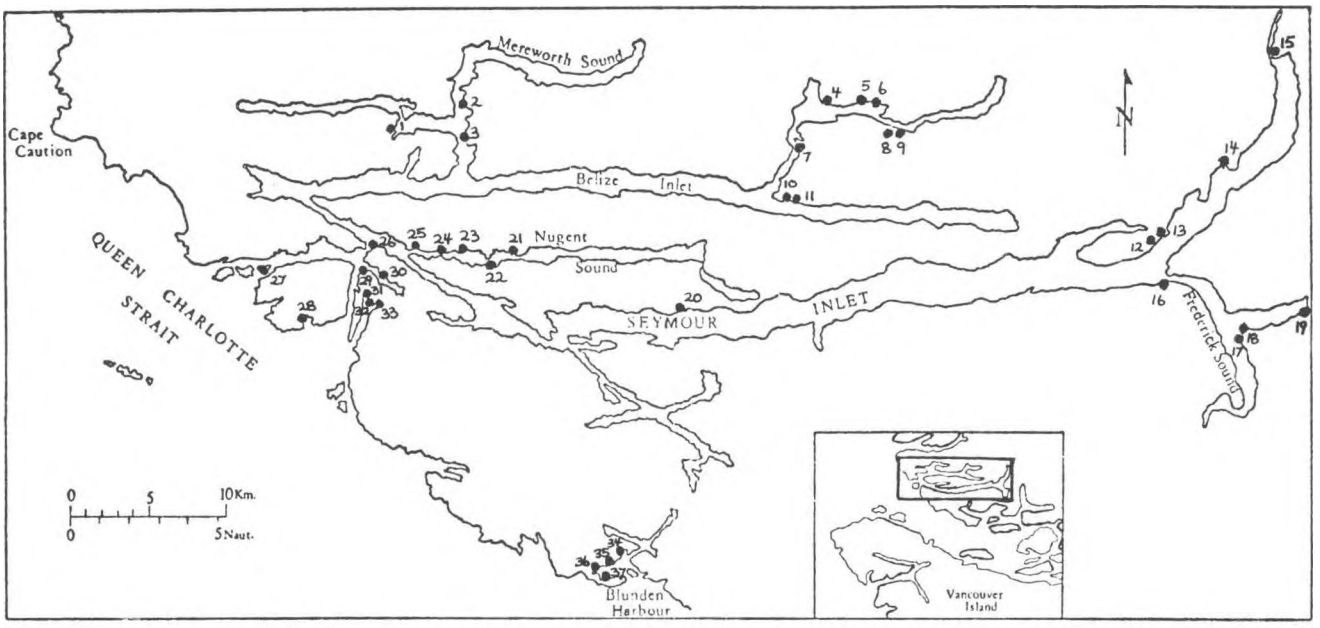


Fig. 60. Site locations in the Seymour Inlet system.

1. EgSu 5.
2. EhSu 7.
3. EgSu 4.
4. EhSs 3.
5. EhSs 1.
6. EhSs 4.
7. EgSs 2.
8. EgSs 3.
9. EgSs 4.
10. EgSs 1.
11. EgSs 5.
12. EgSu 1.
13. EgSq 2.
14. EgSq 3.
15. EhSq 1.
16. EgSq 4.
17. EgSq 5.
18. EgSq 6.
19. EgSp 1.
20. EgSt 1.
21. EgSu 9.
22. EgSu 8.
23. EgSu 10.
24. EgSu 7.
25. EgSu 6.
26. EgSv 5.
27. EgSv 4.
28. EgSv 3.
29. EgSv 2.
30. EgSu 1.
31. EgSv 1.
32. EgSu 2.
33. EgSu 3.
34. EfSt 5.
35. EfSt 1.
36. EfSt 2.
37. EfSt 3.

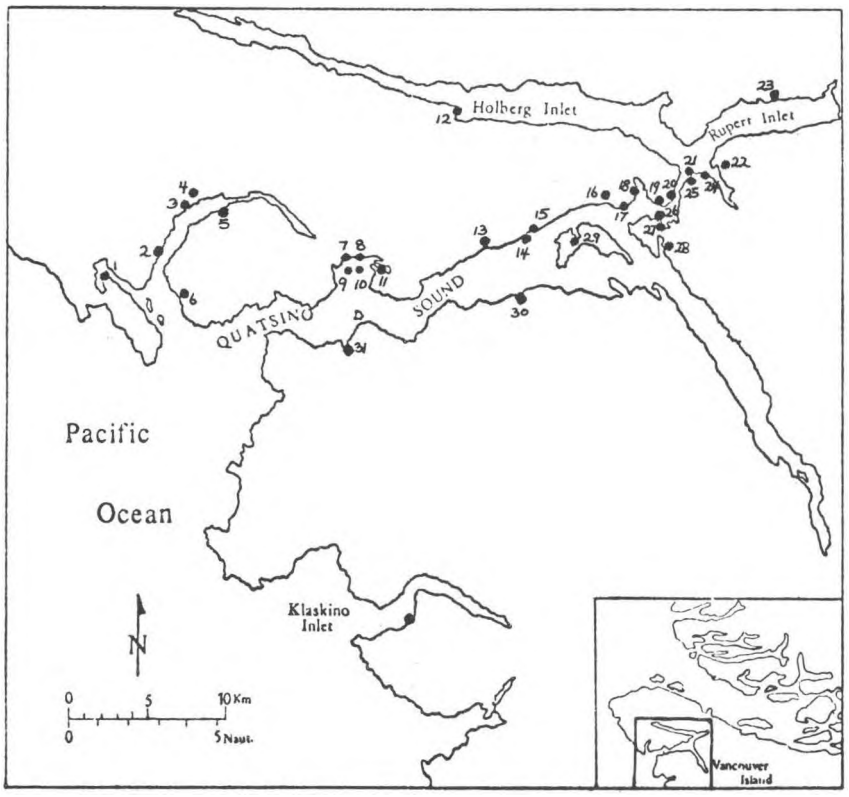


Fig. 61. Site locations in the Quatsino Sound system.

1. EdTa 2.
2. EdTa 3.
3. EdSx 2.
4. EdSx 1.
5. EdSx 4.
6. EcTa 1.
7. EdSx 8.
8. EdSx 7.
9. EcSx 4.
10. EdSx 5.
11. EcSx 1.
12. EdSw 4.
13. EdSw 3.
14. EdSw 2.
15. EdSw 1.
16. EdSv 10.
17. EdSv 2.
18. EdSv 1.
19. EdSv 4.
20. EdSv 6.
21. EdSv 12.
22. EcSv 1.
23. EdSu 1.
24. EdSv 8.
25. EdSv 7.
26. EdSv 5.
27. EdSv 11.
28. EdSv 13.
29. EdSv 3.
30. EcSw 1.
31. ExSx 2.

Table 1. Sites and features in the Seymour Inlet system.

Sites	EgSv1	EgSu2	EgSu3	EgSv2	EgSv3	EgSu1	EgSv4	EgSu4	EhSu7	EgSu5	EgSs1	EgSs2	EhSs3	EhSs1	EhSs4	EgSs3	EgSs4	EgSs5	EgSu6	EgSu7	EgSu8	EgSu9	EgSu10	EgSq1	EgSq2	EgSq3	EhSq1	EgSq4	EgSp1	EgSq5	EgSt1	EgSq7	EgSv5	EfSt1	EfSt5	EfSt3	EfSt2
HABITATION SITE	x	x	x	x	x		x		x	?		x							x		x					x	x	x?	x					x	x		
Post and beam house remains																																		x			
Milled lumber houses				x															x							x								x			
House with both milled lumber and post & beam									x																		x		x								
Rectangular house depression																			x																		
Ethnographic winter village				x															x															x			
Shallow midden	x	x	x		x		x		x			x							x																		
Medium depth midden				x																	x																
Deep midden																																		x	x		
Canoe runs									x	x																											
"Fort"				x	x		x												x																		
Totem pole or figure																			x																		
European goods present			x	x	x														x															x			
BURIAL SITE						x									x								x									x	x			x	x
Rock shelter						x									x								x														
Tree burials																																					x
Burial island																																x	x			x	
Burial shed																																x	x			x	
Bent wood boxes						x									x																						
Chinese chests																																					x
ROCK ART SITES								x			x		x	x		x	x	x		x		x		x	x					x	x						
Red pictographs								x			x		x	x		x	x	x		x		x		x	x					x	x						
Coppers																	x																				
Biomorphs											x		x				x			x					x					x	x						
Geometric figures																				x											x						
Canoes														x																							
Slashes																				x		x			x						x						
Dots								x																													

Table 2. Northern Vancouver Island sites.

	EfTa2	EfSx1	EfSx2	EfSx3	EfSx4
HABITATION SITES	x	x		x	
Post and beam house remains		x			
Milled lumber houses		x			
Ethnographic winter village		x			
Shallow midden	x			x	
Medium depth midden		x			
"Fort"	x			x	
BURIAL SITE			x		
Burial shed			x		
ROCK ART SITE					x
Red pictograph					x
Anthropomorphic face					x

its steepness and unbroken character punctuated here and there with bays and the mouths of shallow lagoons. Everywhere is the appearance of geologic recency with few well developed beaches, sparse habitation and no great depth or antiquity to sites. A decrease in sea level of only 5 – 10 meters would leave the area above the rapids as one vast inland lake.

The Nakwaktok, a Kwakiutl speaking band, were the known aboriginal inhabitants of the Seymour Inlet system. There are 15 reserves in the region; none are occupied at the present time. Two additional reserves, one in the Storm Islands and another at Blunden Harbour are also in Nakwaktok territory. We were unable to survey the Storm Islands where a large midden was reported, but did survey Blunden Harbour to the south and include the data from there in this section. Blunden Harbour was abandoned in 1963, and band headquarters are now on the Tsulquate Reserve at Port Hardy. The main published source of ethnographic information concerning site locations is by Boas (1934). The region had not been surveyed previously. We were unable because of time and weather to completely survey Nakwaktok territory. Twice we set out to survey the coastline between Blunden Harbour and Cape Caution, and both times were forced back by weather conditions. The coastline here remains to be surveyed as do the Storm Islands. The only internal waterway in this system not examined was Schwarzenberg Lagoon.

Very few aboriginal artifacts were observed in the course of the survey. The tip of an awl made of deer ulna at site EgSu 8, a basal fragment of a flanged maul from the beach at site EhSu 7, the fragment of a chiselshaped object of ground slate and the tip of a pointed bone object came from site EgSu 6. Locations which looked favourable for the occurrence of chipped stone on the beach were examined, but no such industries were found. Sites and features found in this locality are listed in Table 1, and site locations are shown in Figure 60.

Northern Vancouver Island

Several sites were recorded along the coast between Port Hardy and the mouth of Quatsino Sound, but a thorough and complete survey was not conducted. The old site of Xumtaspi (EfSx 1) was visited. A bulldozer had been run over the surface of the site since 1970, and the posts and beams of the longhouses extant a few years ago (Fig. 62) had been sawn up and pushed to one side. Five sites were noted and are listed in Table 2.

Quatsino Sound

Quatsino Sound with Holberg and Rupert Arms cuts two-thirds of the way across Vancouver Island.

Table 3. Sites in the Quatsino Sound system.

Site Types / Sites	HABITATION SITES	Post & beam house remains	Rectangular house depressions	Ethnographic winter village	Shallow shell midden	Medium depth shell midden	Deep shell midden	"Fort"	Historic artifacts	Milled lumber houses	Totem poles	BURIAL SITE	Cave	Burial island	Burial shed	Tree burial	BEACH SITE
EdTa2	x				x					x							
EdTa3	x				x					x		x					
EdSx2	x				x												
EdSx1	x					x						x		x			
EdSx4	x				x												
EcSx2	x		x	?			x		x	x							
EdSx5	x				x			x									
EcSx1	x		x	x		x			x								
EcSw1	x						x										
EdSw2	x				x							?	?				
EdSw1	x			x	x												x
EdSv3	x					x											x
EdSv2	x					x											
EdSv1						x											x
EdSv4	x			x						x	x						
EdSv6									x			x	x				
EdSv7	x					x		x									
EdSv8	x				x				x			?	?				
EdSv9	x				x												
EdSu1	x																
EdSv5					x							x		x			
EcTa1	x	x		x	x			x									
EdSx7					x												
EdSx8	x				x				x								
EcSx4													?	?			
EdSw3	x				x												x
EdSv10																	x
EdSw4	x				x												
EdSv11	x				x												
EdSv12												x	x				
EcSv1	x				x												
EdSv13	x				x												
EdSx9	x		x		x												x
Klaskino	x		x	x			x		x								

Fig. 62. The village of Xumtaspi (EfSx 1) on Hope Island in 1970. Photo by I. McGregor.

Aboriginally it was the home of the Quatsino, Giopino, and Koskimo bands. An earlier survey of this region by Kenady in 1969 resulted in the recording of 22 sites (Kenady 1970). We visited these sites and in addition recorded 12 new sites. A wide range of sites covering a long time span is present in the area. Site types and features are listed in Table 3.

Habitation Sites

We have placed all sites with either shell middens or house remains in this category. Some of these sites are distinctly winter village sites, others are clearly hunting or trapping sites, and others are less clearly one or the other.

Winter Village Sites

There are several types of winter village sites. The most recent type consists of a row of houses arranged along a crescentic sand or gravel beach. Five sites fall into this category: Xutes (EdSv 4) near Quatsino which was in the process of being abandoned in 1973; Ba-as (EfSt 1) at Blunden Harbour abandoned in 1963 (Fig. 63); Xumtaspi (EfSx 1) on Bates Pass abandoned since 1950; Clatux (EcSx 1) at Koprino in use seasonally at least as late as 1914 (Royal Commission, 1916, Vol. 2:382), and probably

Fig. 63. *The village of Ba-as (EfSt 1) at Blunden Harbour.*

as a winter village before that; and Tsowenochs at Klaskino abandoned before 1914. Deep shell middens are associated with all of these sites, even though tradition indicates that occupation began within the historic period at at least two of them. Curtis (1914) dates the settlement of Ba-as to 1884 when a chief's son became ill and died while on a hunting trip there. He begged to be buried there, so the chief remained and was joined by the rest of the Nakwaktok. The village from which they moved would logically have to be Kequesta (EgSu 6). Curtis (1914,5:306) similarly dates the settlement of Xutes by the Koskimo to about 1750–1800 following decimation of the Hoyalas, the aboriginal inhabitants, by an epidemic. The Quatsino moved there several generations later from their main village at Winter Harbour (EcTa 1?). The third site of this type, Xumtaspi, seems to lack specific traditions regarding its founding, but there are no indications that it is of any great age. Clatux and Tsowenachs both exhibit rectangular house depressions and deep middens, and suggest older occupations than the three other sites. Neither site shows surficial evidence of houses today other than the depressions. The original survey plan of Clatux shows five houses there in 1884.

A second type of winter village site is that at which either a steep-sided, midden-covered, peninsula or island is closely associated with a shell midden (Fig. 64*a*). The following five sites fall into this category: Sagumbala (EgSv 2) at the Nakwakto Narrows; Kequesta (EgSu 6) which is dominated by a high peninsular mound which merges with a midden containing four rectangular house depressions (Fig. 64*a*) a site at Cape Sutil identified as Nawitti (Fig. 64*b*) (EfTa 2) by Boas (1934, Map 3, #104); Oyakumla (EcTa 1) in Forward Inlet; and Ahwechaolte (EdSx 4) in Winter Harbour. Two standing houses of milled lumber at Sagumbala and some fallen shacks at Kequesta indicate re-use of these sites seasonally after their abandonment as winter villages. Posts for large post and beam houses are still extant at Oyakumla.

Fig. 64. *a, Kequesta (EgSu 6) on Seymour Inlet. b, Nawitti (EfTa 2) at Cape Sutil.*

Forts

Sites of this type are grassy, steep-sided, islands or peninsulas draped with a shell midden cover (Fig. 65). Some are associated with winter village sites; others show surficial evidence of occupation only on the mound itself. The designation "fort" comes from Boas whose name for sites which turned out to be of this type translates as fort (Boas, 1934, Map 18 #50, Map 3 #37, Map 4 #48). Whether or not all sites of this type actually had this function is conjectural. The sites classified as forts are listed in Tables 1–3.

Seasonally Occupied Sites

Some sites could well have evolved from seasonally occupied sites to winter village sites and back again to seasonally occupied sites. Such a site is possibly Mohtenicht (EcSx 2) on Mahatta Creek which has a very deep midden (Fig. 66*a*) and a number of fallen shacks dating to the historic period when it was a salmon fishing station (Royal Commission 1916, Vol. 11, 382). The depth of the midden (5–6 meters) and the location on a salmon stream suggest that it was a winter village site at one time. Grass Point (EdTa 3) in Winter Harbour listed as a principal village in 1916 (Royal Commission 1916, Vol. 2 382) is today a summer village with three houses; in fact, it and Quattische (Xutes) are the only occupied reserves in all of Quatsino Sound today. Kequesta (EgSu 6) and Sagumbala (EgSv 2) have already been mentioned in regard to seasonal occupation.

Other sites with either no middens in evidence or very shallow ones, and no more than two small post and beam houses seem clearly to be seasonal sites. Some of these such as EhSg 1 on the Seymour River and EhSu 7 on Mereworth Sound may well have been used as trappers cabins.

Fig. 65. "Fort" site (EfSx 3) at Bull Harbour.

Fig. 66. *a, Deep midden (EcSx 2) at the mouth of Mahatta Creek on Quatsino Sound. b, Deep midden (EcSw 1) on the Bland homestead on Johnson River on Quatsino Sound.*

Shell Middens

Middens have been referred to in the preceding paragraphs, and will only be touched upon here. We have classified middens of less than one meter in depth as shallow, one to two meters in depth as of medium depth, and more than two meters in depth as deep. Deep middens are rare within the surveyed area and other than those associated with late historic winter villages, the deepest are at Mahatta Creek (EcSx 2) (Fig. 66*a*) and on the Bland homestead (EcSw 1) (Fig. 66*b*) on Quatsino Sound. These middens are up to six meters deep.

Burial Sites

The burial pattern was to have a specialized burial site away from the main habitation area. No burials eroding from middens were observed as is the case in some other parts of the coast. Rock shelters and caves (Fig. 67) with bentwood burial boxes are clearly the older type of burial practice in the region. Such sites tend to be in close proximity to the second and older type of winter village site. Both boxes with painted designs and boxes with beaver tooth incised textured patterns as well as plain boxes were observed in sites of this type. All such sites had been considerably disturbed. A total absence of skulls at one such site with perhaps as many as 50 disturbed burials, was explained to us by an early settler in the region. He related that during the depression of the 1930's, dental schools were paying $10.00 for a skull complete with all its teeth; collecting and selling such objects was one of the ways he and his family survived

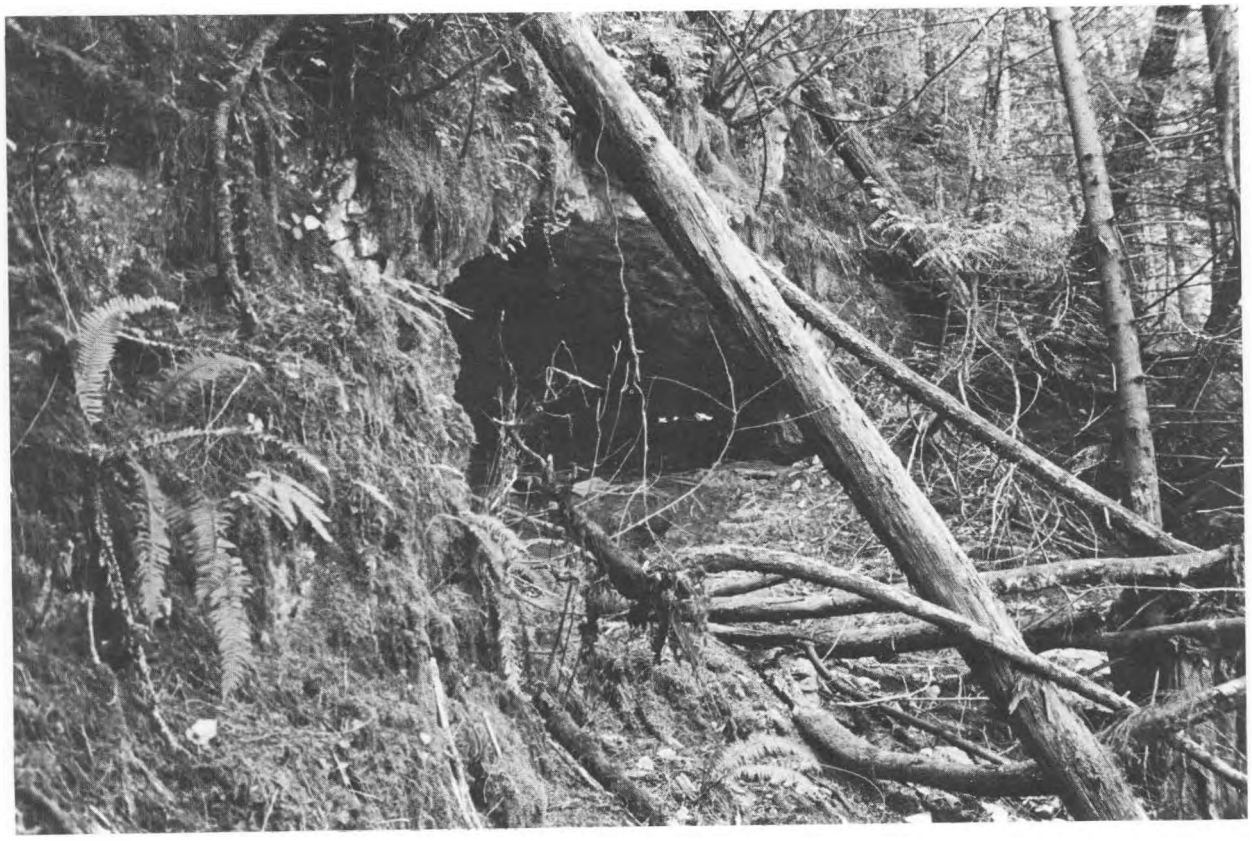


Fig. 67. *Burial cave (EdSv 6) in Quatsino Sound.*

the depression since at that time $10.00 was a considerable amount of money. Remains from these sites should be collected and reburied for protection from further vandalism.

Burial islands, burial houses (Fig. 68), and tree burials (Fig. 69) complete the complex of observed burial patterns. All such sites observed are clearly more recent in time than burial caves and shelters, but this may simply be a function of preservation. Camphor chests of Chinese origin were used for tree burials, as were rough boxes of cedar nailed together. The size of the boxes used for tree burials indicates that most were children. We were unable to visit several reported burial islands. Boas (1934) reports others.

One mortuary pole of very recent origin was reported to us at Xutes (EdSv 4), but we did not have the opportunity to see it. With the abandonment of this reserve, it would seem desirable to have the pole removed and preserved.

Beach Sites with Chipped Stone

Two such sites (EdSv 10, EdSv 1) exhibit no traces of midden on the shore and the only evidence of occupation comes from the beach (Fig. 70). Such sites are explicable as beach quarries or as old sites washed out as a result of changed sea levels. Testing of the landward edges of these sites might produce occupational evidence in a non-shell midden context. Four other sites have both shell middens and beach accumulations of crude flaked stone tools. The shell midden and the beach deposits do not necessarily belong to the same period of time. These sites are clearly the oldest so far found in the surveyed area.

Fig. 68. Burial house near Blunden Harbour (EfSt 3).

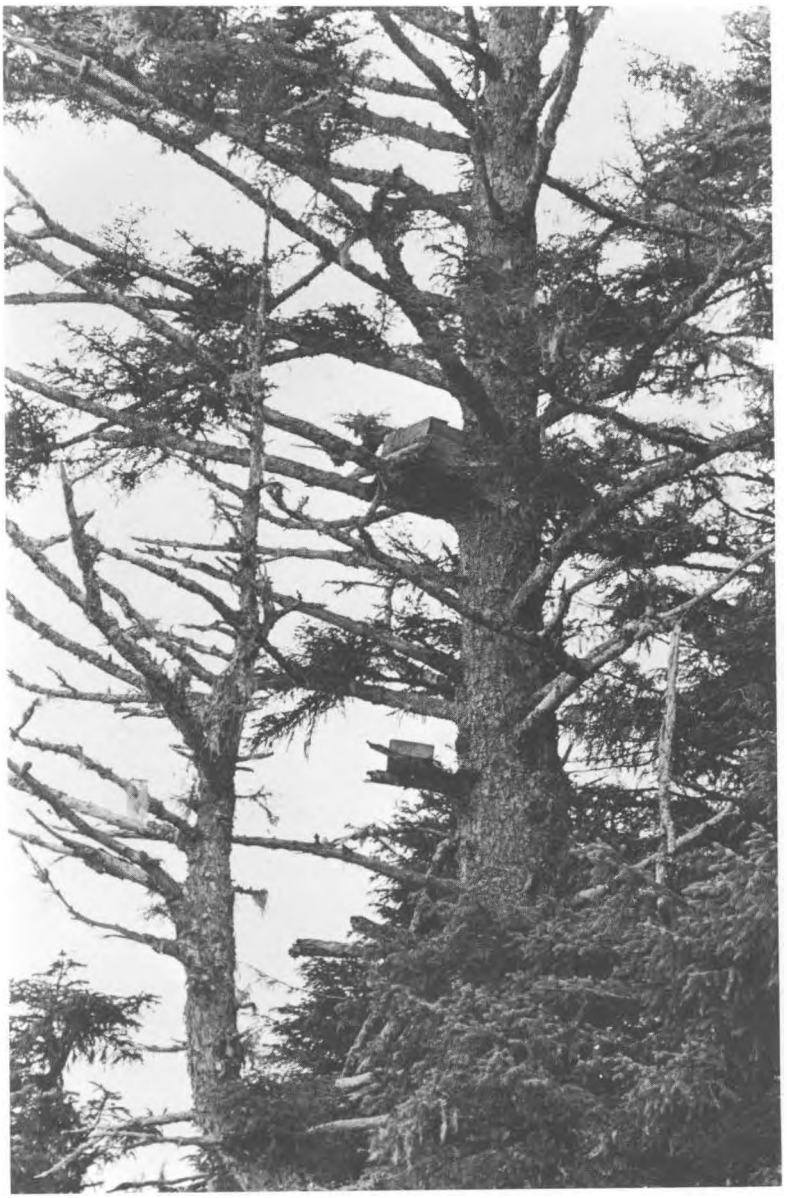


Fig. 69.
Tree burials near Blunden Harbour (EfSt 2).

Rock Art

All rock art sites have pictographs painted in red. No petroglyphs were discovered. No rock art sites were found in Quatsino Sound, and enquiries failed to produce any local knowledge of such sites. Thirteen of the rock art sites found are in the Seymour Inlet system, and one (EfSx 4), an anthropomorphic face with joined eyebrows is in Bull Harbour on Hope Island. The most common pictographic style is one of rather crude, simple life forms (Fig. 71), but one site does show a badly faded figure in classic Northwest Coast style. The best preserved panel in the entire region shows six dugout canoes confronting a large, northern style dugout (Fig. 72).

One pictograph panel (EgSg 1) we believe to be a contemporary non-Indian copy of true rock art. The figures are slightly different in style from those at other sites, and seem to have been painted with commercial paint of a slightly different hue. A brush

Fig. 70. *Beach site (EdSw 3) with chipped stone tools. Quatsino Sound.*

Fig. 71. *Red paint pictographs (EgSs 4) on Belize Inlet.*

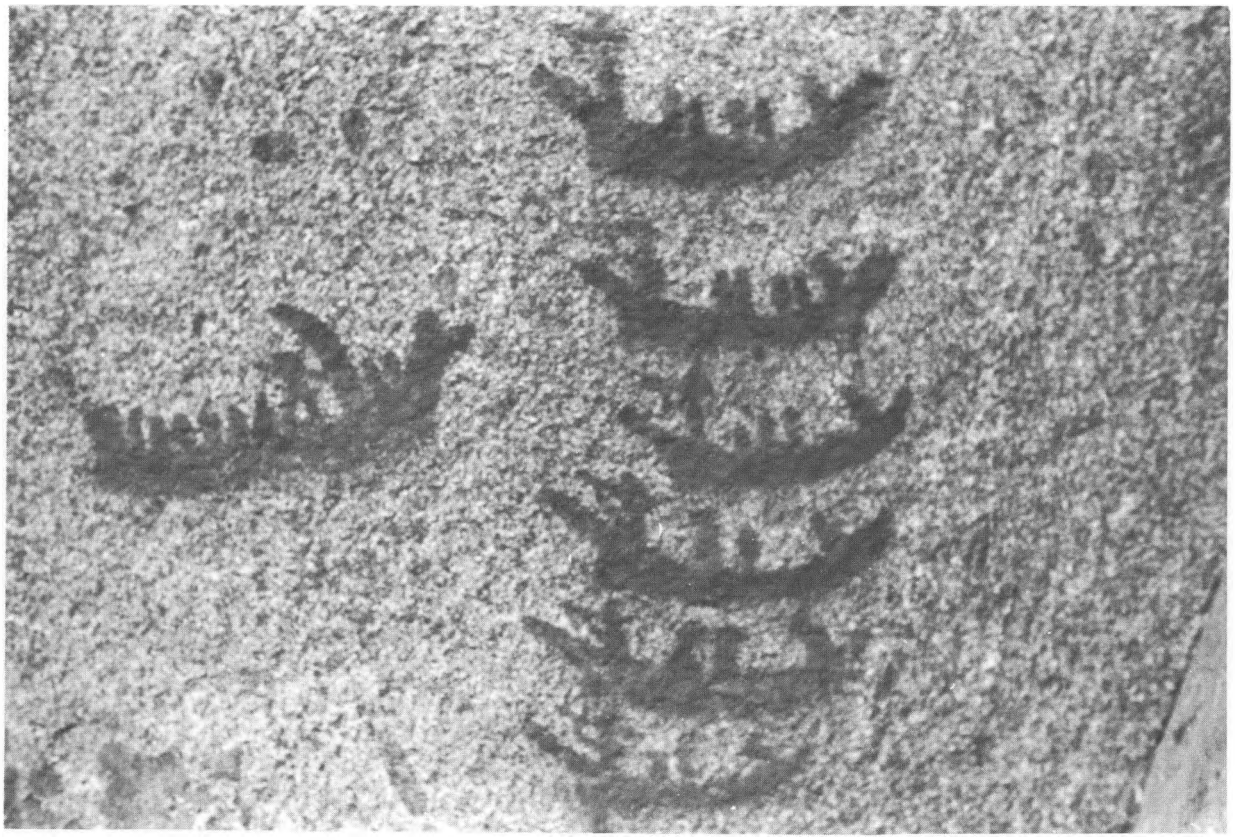


Fig. 72. *Red paint pictographs (EhSs 1) on Alison Sound. The canoists appear to be firing rifles.*

stained with the same red paint was found affixed to a long handle at a nearby abandoned logging camp.

Other Site Features

Canoe runs are beach areas cleared of rocks. Two such runs about 3 meters wide and 5 meters long were observed at Tsaikwiee (EhSu 7) on Mereworth Sound (Fig. 73). Another was noted at Strachen Bay and given a site designation (EgSu 5) even though no other site evidence was apparent. On the beach fronting site EdSw 4 at Hathaway Creek are a number of rock alignments. These, however, may relate to logging activities rather than aboriginal settlement.

Two sites have *totem poles.* A large wood figure of Tsonoqua, the cannibal woman, can still be found at Kequesta (EgSu 6) although it has fallen face forward and will not last much longer. This figure should be preserved. A pole marking a grave was reported at Quattische (EdSv 4), but we did not have the opportunity to observe it. A small wooden figure (Fig. 74) from the potlatch house at the same site is in a private collection.

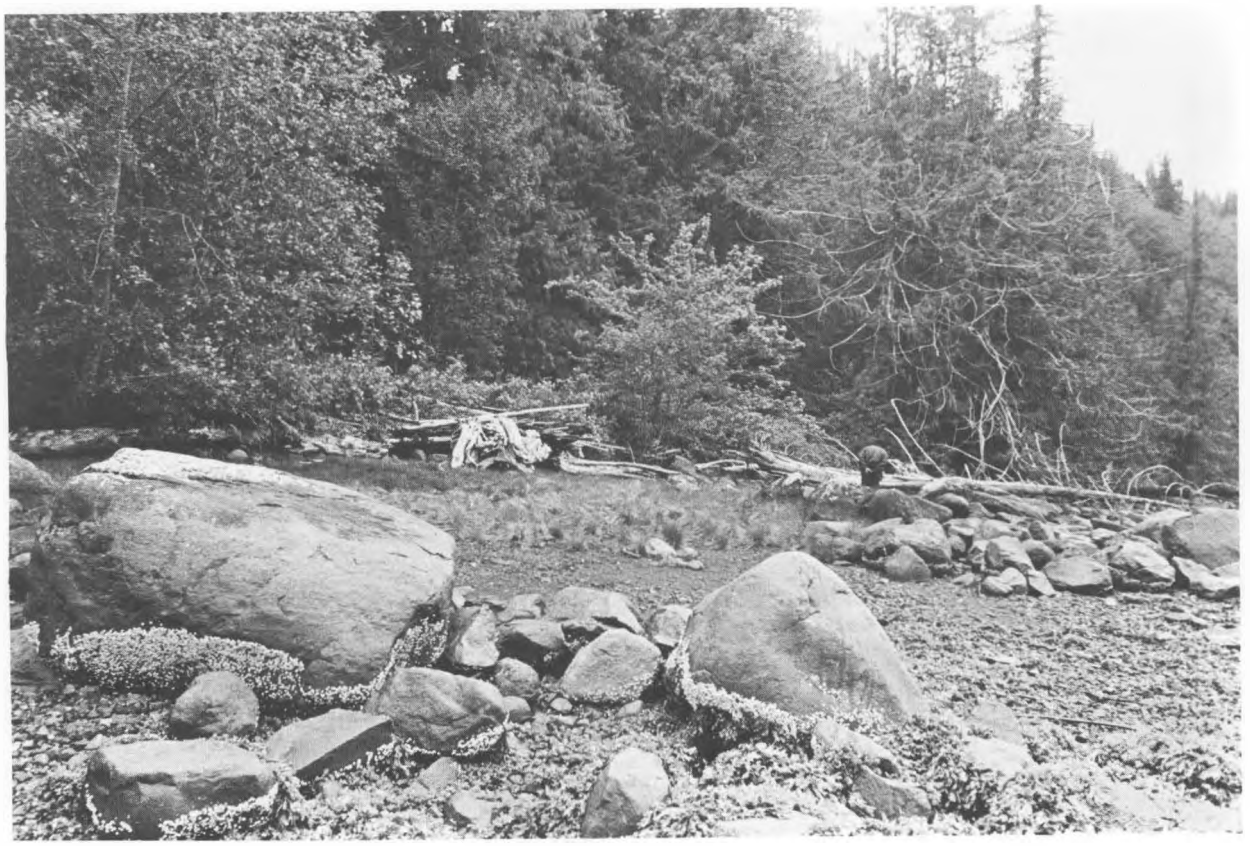


Fig. 73. Canoe run at EhSu 7 on Mereworth Sound.

Artifact Types

Artifacts observed during the course of the survey are listed in Table 4. With the exception of the crude, chipped stone forms, the great majority of these are in private collections. All the artifacts except five — a fragment of a flanged maul, a slate "chisel", the tip of an awl of deer ulna, a small bone point fragment, and an abrader fragment — are from sites in the Quatsino Sound system.

Chipped Stone Artifacts

Pebble tools: Unifacially flaked pebble tools with curved, straight, or denticulate edges (Fig. 75) are the most common tool type observed. The types intergrade with each other and with pebble cores. Pebble tools are generally early on the Northwest Coast and are known from sites dating between 7,000 B.C. and 500 B.C. Their site associations in the survey area suggest they are old here as well.

Pebble cores: Flaked pebbles which do not have as obvious use edge have been classified as cores (Fig. 76). They have much the same site distribution as pebble tools.

Large flakes: These large flakes (Fig. 77) with well developed bulbs of percussion could have functioned as cutting tools. All are beach worn and any evidence of use has been obliterated.

Bifacial points: Chipped stone bifaces are very rare here as is the case along most of the Northwest Coast except in Coast Salish territory. Of the five points observed, four are leaf-shaped. Kenady (1970)

reports finding an additional point of this shape, which *makes a total of only six for the entire surveyed area.* Four of these points are from one site, EdSv 1, at Hecate cove. Two of the points are very large (Fig. 78*c*), 13 and 20 cm. in length. One point is made of a white stone, and all the others of basalt. The point from Monkey Creek (Fig. 78*a*) is made on a thin basalt flake, and is corner notched. This style of point is considerably more recent than the simple leaf-shaped bifaces.

Fig. 74. *Wooden figure from the potlatch house at Quatsino (EdSv 4). In a local collection.*

Bone Artifacts

Nothing particularly surprising was observed in bone artifacts. These are listed in Table 4. To a certain extent the artifacts are indicative of cultural relationships. The unilaterally barbed bone points (Fig. 80) are distributed primarily to the south of this locality where they functioned as arrow points. The styles are relatively late rather than early. Whalebone clubs have a distribution from at least Prince Rupert to Puget Sound, but are generally considered to be Nootka in origin and traded widely. The decorate style of the one fragmentary club observed (Fig. 81) is somewhat unusual. The whalebone "shuttle", grooved bark beater, and scapula points have known distributions primarily to the north of Quatsino Sound. The gambling bone is clearly of an ethnographic style among west coast peoples, and could be duplicated in modern collections. The observed bone artifacts are not indicative of any great antiquity; they can be matched in style either to the north or south in comparatively late prehistoric sites.

Pecked Stone Artifacts

The various types of tools made by pecking are also listed in Table 4, and illustrated in figures 82 and 83. The end-grooved and end-perforated sinkers and the particular styles of clubhead are locally occurring types, whereas the other tools are distributed either to the north or south as well. Circular stones, cylindrical mauls, hammerstone-grinders, and the particular style of slave killer are found at Kwatna (Carlson 1972) and other sites to the north. The flanged mauls are, however, more of a southern feature.

Ground Stone Artifacts

Adze blades are the most common type of ground stone tool. Small pebbles with only the bit ground are probably the earlies type. Later types are either of nephrite traded in from the Gulf of Georgia, or of a light green shale traded in from somewhere to the north.

Table 4. Frequency distribution of artifacts from the surveyed area.

	Quatsino System																		Seymour System		
	EdSv1	EdSv8	EdSv10	EdSw1	EdSw3	EdSx9	EcSx1	EdSx5	EcSx2	EcSw1	EdSv7	EdSv4	EdSv3	Hathaway Peak	Goldberg Point	Monkey Creek	Forward Inlet	Winter Harbour	Inner-cott	EhSu7	EgSu6	EgSu8
CHIPPED STONE																						
Pebble tools																						
Bifacial			9		1																	
Unifacial, straight	4		20	1																		
Unifacial, curved	1		25		1	2							1									
Unifacial, denticulate			9		1																	
Pebble cores																						
Crude, cortex			26		5	1							3									
Disc, cortex backed			26																			
Globular			20			2							1									
Fragments			8																			
Large flakes	4		43	2	2	2							5									
Bifacial points																						
Large, leaf-shaped	1												1									
Medium, leaf-shaped	2																					
Small, notched																1						
Boulder spalls			11																			
PECKED STONE																						
Mauls, cylindrical					1					2									1			
Mauls, flanged																		1	2			
Flat top																						
Knob top																1						
Broken																				1		
Sinkers																						
End perforated		1																	1			
End grooved										1	1											
Central grooved									2													
Circular stones																						
Perforated							1															
Unperforated									1	11												
Hammerstone-grinders										2												
Zoomorphic "slave killer"										2												
Club head								1														
Edge ground cobble													1									
GROUND STONE																						
Abraders																				1		
Adze blades, chisels																						
Large												1		1								
Small	2									2		1							1			
Pebble adze blade	1																					
Slate "chisel"																					1	
BONE ARTIFACTS																						
Small points									1	2	3										I	
Toggle harpoon valves																						
Deer ulna awl																						1
Gambling bone									1													
Unilaterally barbed points											3											
Unilaterally barbed harpoon															1							
Whalebone club, incised										1												
Whalebone shuttle										1												
Whalebone bark-beater											1											
Curved whalebone object											1											
Scapula points																						
COPPER ARTIFACTS																						
Coppers												1				1		1				
Points		2																				

Fig. 75. *Pebble tools from a beach site on Quatsino Sound.*

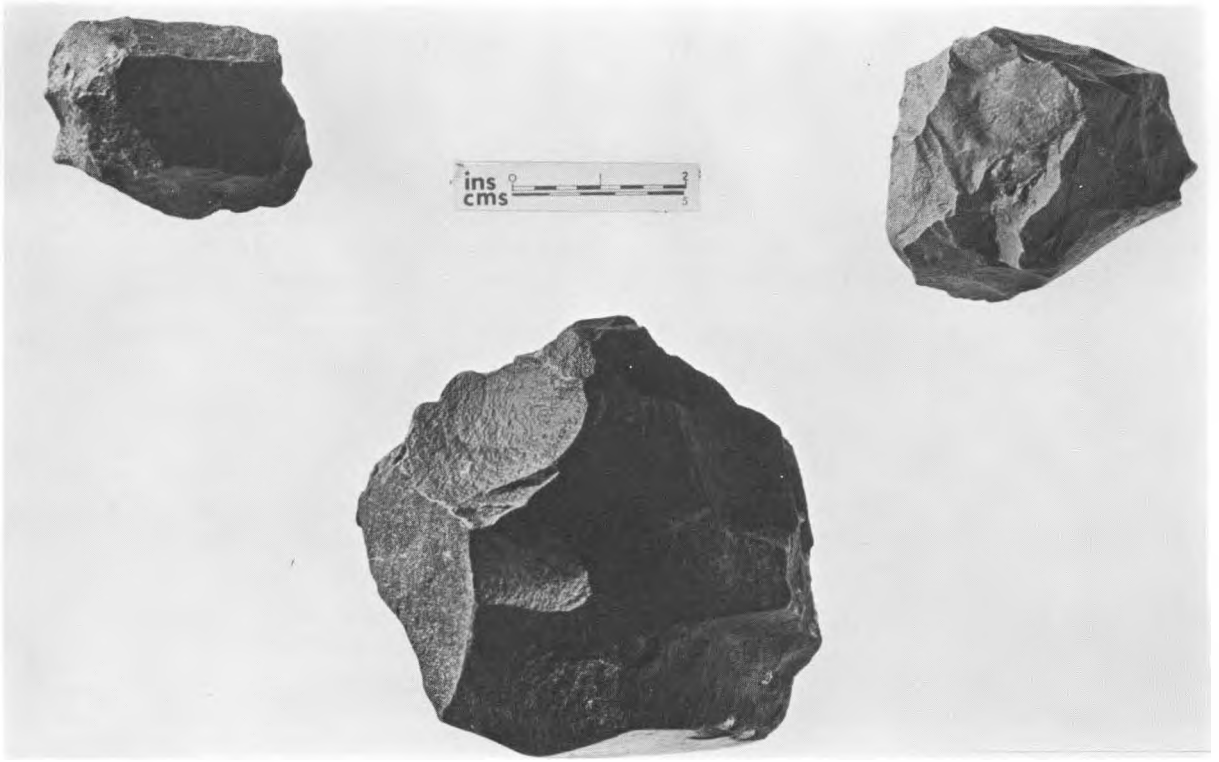


Fig. 76. *Pebble cores from a beach site on Quatsino Sound.*

Fig. 77. Large flakes from beach sites on Quatsino Sound.

Copper Artifacts

From nowhere else on the coast are there so many stories of the finding of copper on the beach. We did, however, actually see two of the coppers (Fig. 84) actually found at sites. Native copper may well be aboriginal in use, but none of the copper items we saw looked like native copper.

Site Chronology

The data from the survey suggest that the sites located fall within a long span of human occupation of the region. A tentative chronology can be developed at this time, but requires testing through excavation. Certain suggestions along these lines are given in the following paragraphs.

Early Period 7000 B.C. – 2000 B.C.

Early Period sites are those with pebble tools or other crude flaked stone artifacts of basalt. There are six such sites (EdSw 1, EdSw 3, EdSw 10, EdSv 1, EdSv 3, and EdSx 9). All are in Quatsino Sound. Elsewhere in British Columbia pebble tools are present before 7000 B.C. and persist until 500 B.C. or

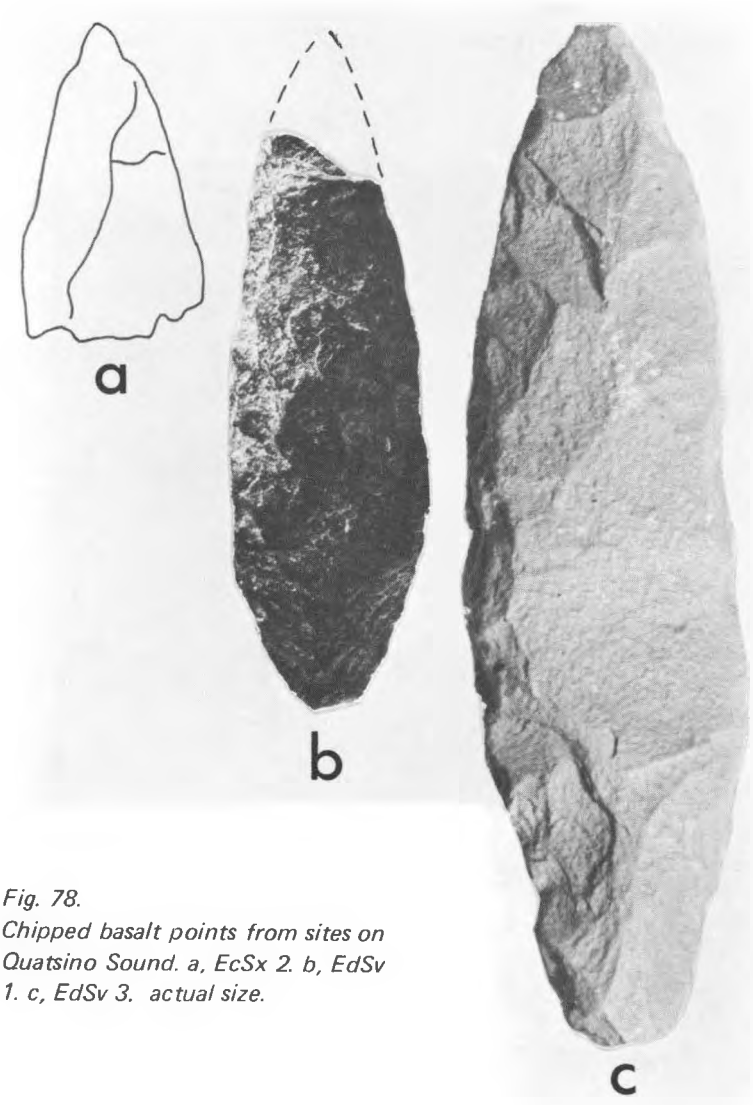


Fig. 78.
Chipped basalt points from sites on Quatsino Sound. a, EcSx 2. b, EdSv 1. c, EdSv 3. actual size.

Fig. 79. *Copper points from Quatsino Sound in a local collection. actual size.*

even later in some localities. The presence of leaf-shaped chipped stone points without more complex forms is also indicative of relative antiquity. Excavation at EdSw 3 and EdSx 9 is recommended in order to ascertain more about the cultures of this time period.

Middle Period 2000 B.C. – 1000 A.D.

Sites with components which likely fall within this period are those with deep shell middens. The large midden at Mahatta Creek (EcSx 2), and the other at Johnson River (EcSw 1) should both be tested for components of this period.

Late Period 1000 A.D. – 1900 A.D.

The greatest number of sites found belong within this time period. All the burial sites, and all the pictograph sites are late. The pictographs could well be studied in a systematic manner now that they have been located; many of the designs are badly faded and would require painstaking recording. Three village

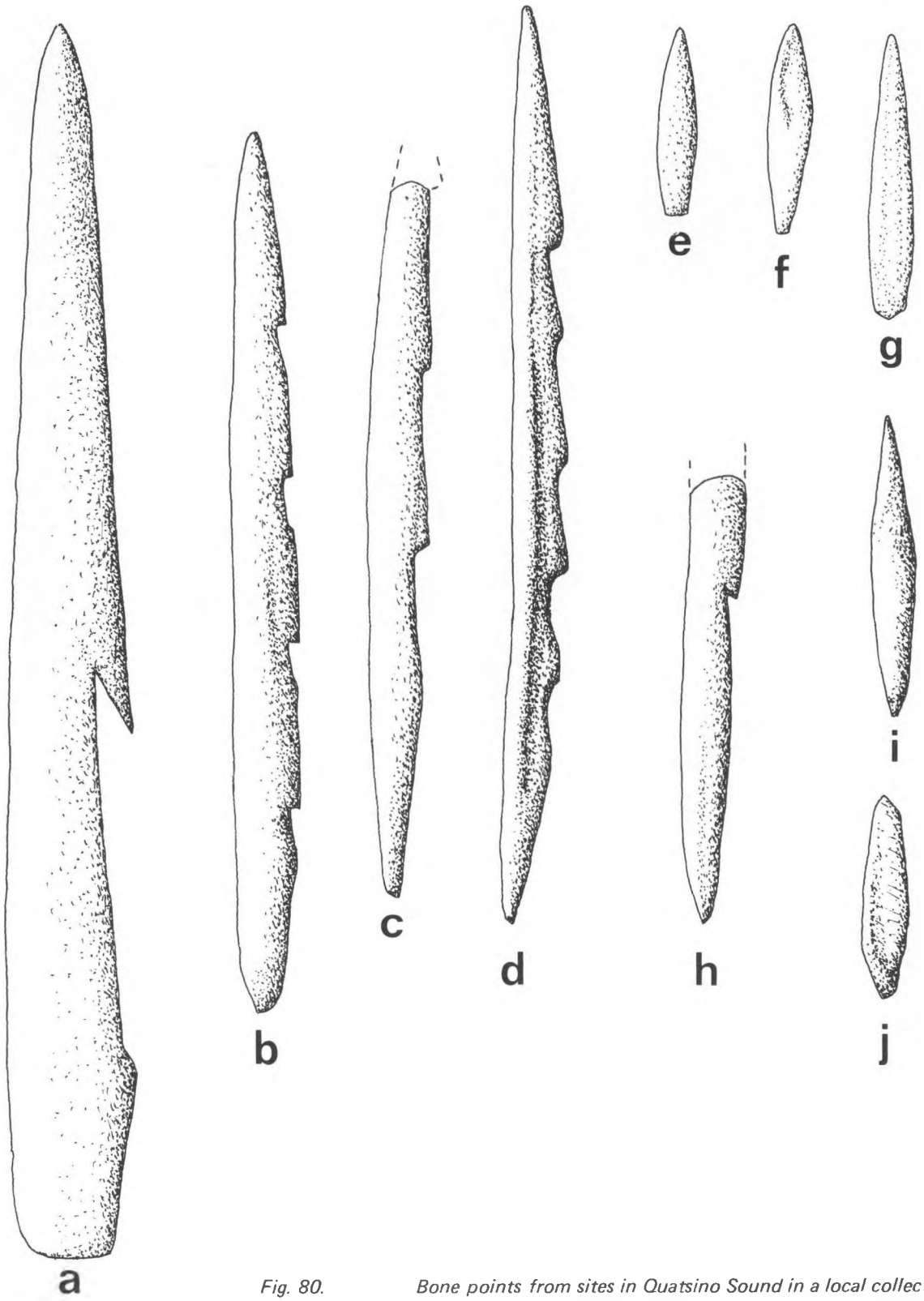


Fig. 80. *Bone points from sites in Quatsino Sound in a local collection. a, harpoon from Holberg Inlet. b – d, h, barbed points from EdSv 7. e – g, i, j, small bone points from EdSu 7 and EcSw 1. actual size.*

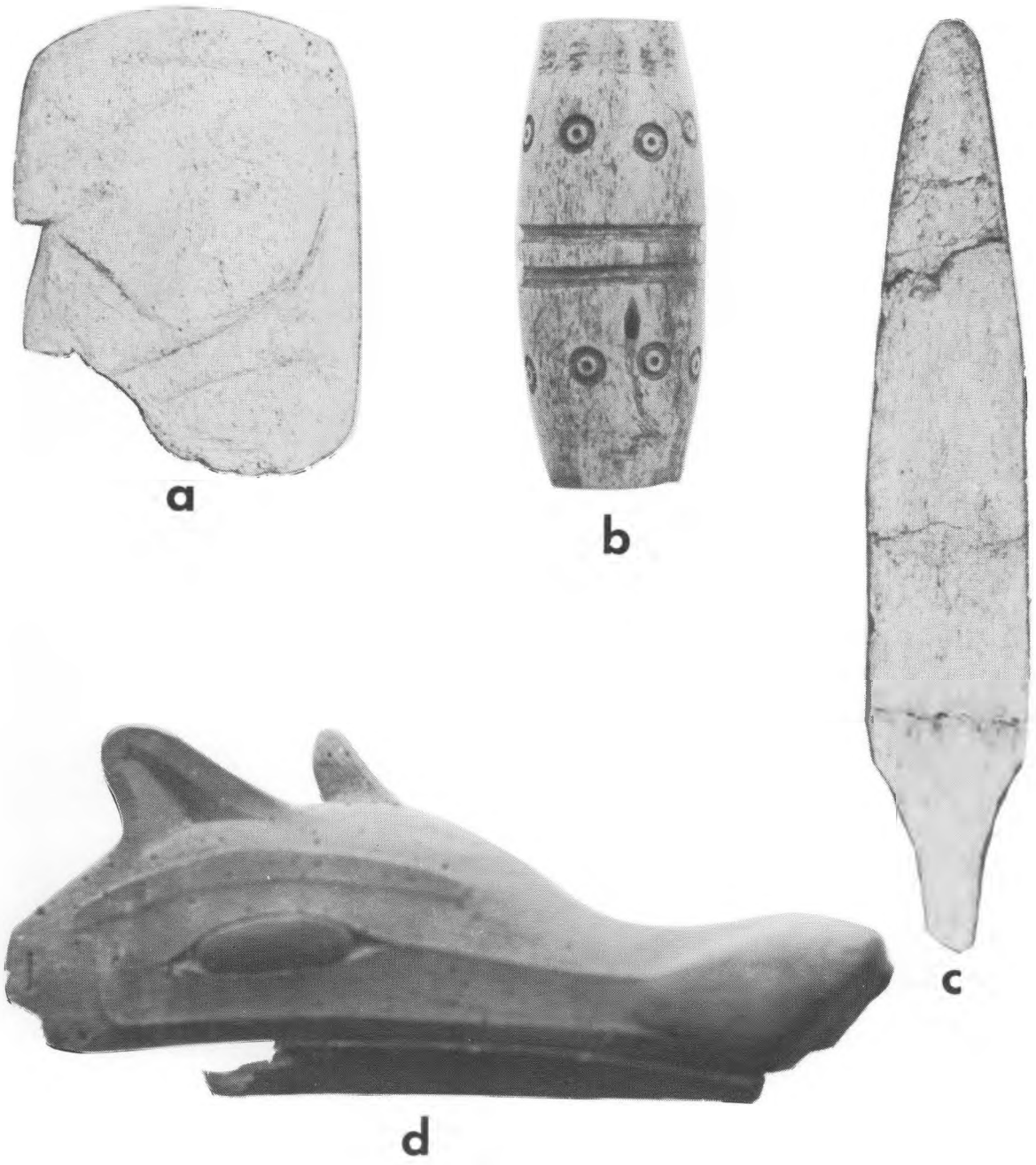
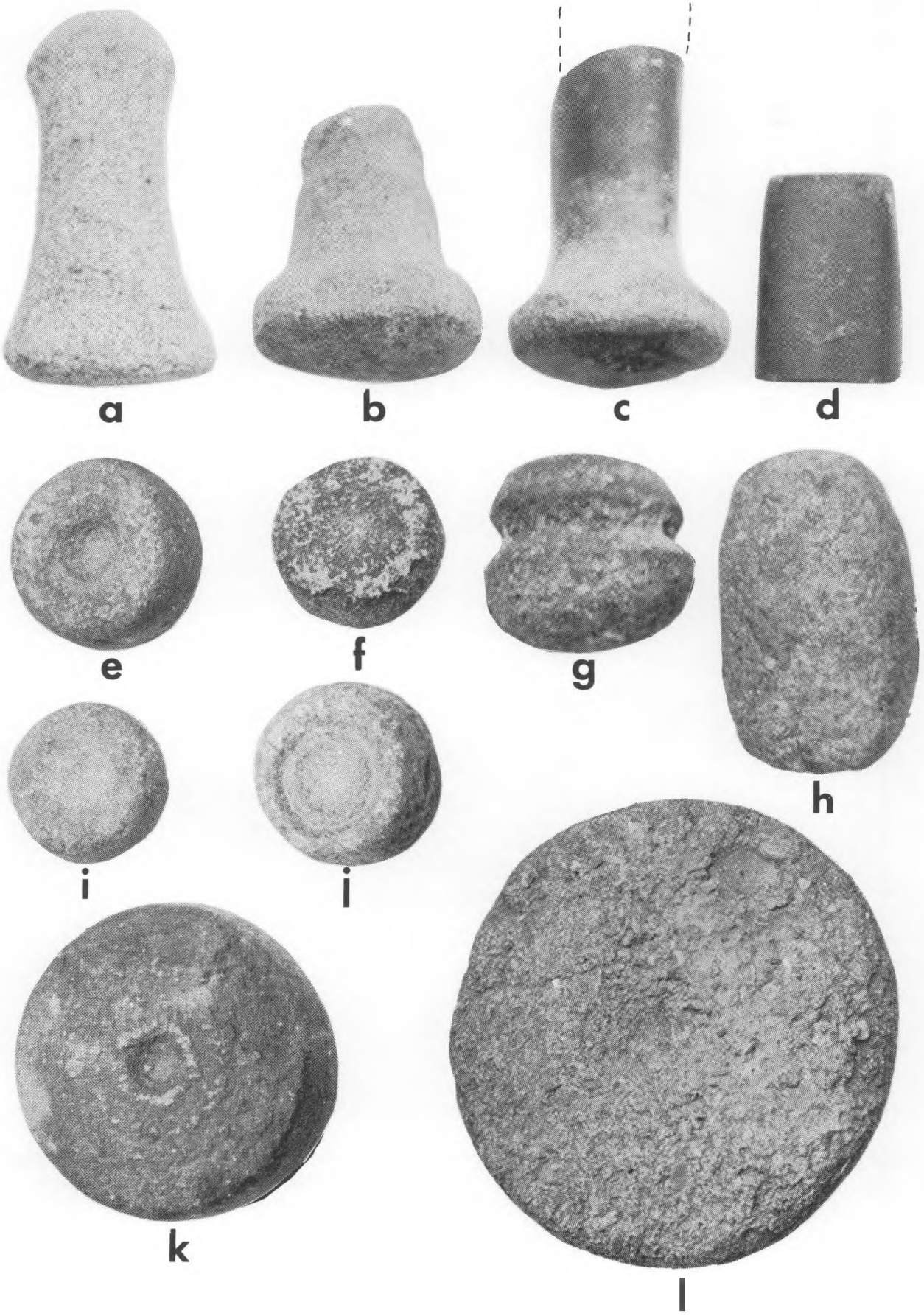


Fig. 81. *Bone artifacts and wooden mask from sites on Quatsino Sound, in local collections. a, portion of anthropomorphic whalebone club from EcSw 1. b, gambling bone, EcSx 2. c, whalebone shuttle, EcSw 1. d, wolf mask, EdSv 6. a–c, actual size. d, about 1/3 actual size.*


a
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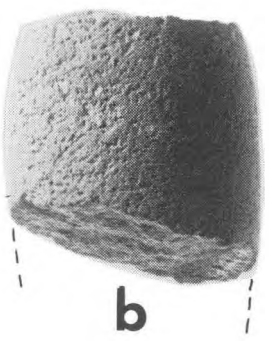

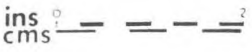

Fig. 82. left — *Pecked stone tools from EcTa 1 on Quatsino Sound in a local collection. a – c, flanged mauls. d, cylindrical maul. e, f, i – l, circular stones. g, grooved maul. h, hammerstone-grinder. About one-half actual size.*

Fig. 83. above — *Pecked stone tools from sites on Quatsino Sound. a, end-perforated sinker or anchor, EdSv 8. b, grinding stone fragment. c, club head, EdSx 5. d, cylindrical maul, EdSw 3.*

Fig. 84. *Coppers from Quatsino Sound sites in local collections.*

sites which might provide the most information about the cultures of this period are Kequesta (EqSu 6), Clatux (EcSx 1), and Klaskino.

Cultural Relationships

The artifacts which we observed in local collections are a guide to the relationships of the cultures of Quatsino Sound to those of the remainder of the Northwest Coast. There are similarities in artifact types and styles to both the Nootkan region to the south and to the Kwakiutl region to the north. Circular stones, cylindrical mauls, shale or greenstone adze blades, and grooved bark beaters have known distribu-

tions primarily to the Kwakiutl region to the north. The styles of unilaterally barbed bone points, flanged mauls, and whalebone clubs, are more common to the south. The extreme rarity of chipped stone projectile points suggests that Quatsino clearly belongs culturally in the Wakashan sub-area which has so far failed to yield evidence of chipped stone points in abundance at any period of time.

Conclusions

The survey resulted in the recording of 76 archaeological sites of which the majority are habitation rather than special purpose sites. The sites appear to cover a long time span, although no absolute dates have been obtained. The oldest remains are chipped stone industries found at several beach sites. These industries are similar to those in Pasika phase sites near the Fraser Canyon. Middle period components are likely present at several of the deep middens on Quatsino Sound. Late period sites exhibit complexes of bone and pecked stone artifacts similar to those found in other parts of the Wakashan region of the Northwest Coast.

A planned archaeological program for the survey area could well focus on both salvage and excavation of selected sites. Those sites which are most in need of salvage are the already vandalized burial caves. Recording and reburial of these remains should be done only if the Indians wish it. A detailed recording of the pictographs should also be undertaken. All 14 pictograph sites exhibited figures in red paint; many are very faint and it will not be too many years before they are no longer visible. A planned excavation program should sample several sites in each time period in order to test the cultural-historical perspective presented on the survey data alone. Suggestions as to which sites would likely provide the most information have been given in the text.

ACKNOWLEDGEMENT

This survey would not have been possible without the active cooperation of a great many individuals, and we wish to thank them for their assistance: Dora Bland and Mrs. Bland, Quatsino Sound; Tom Botel and Mr. and Mrs. Botel, Hecate Cove; Norman Charlie, Winter Harbour; Tricia Cotter, Kuprino; John Donaldson, Drake Island; John Eilertsen and Family, Coal Harbour; Harold Hole, Coal Harbour; Mrs. Howich, Hecate Cove; Mr. Ildstad, Winter Harbour; Dave O'Conner, Port Hardy; Patrick Schreiber and Family, Port Alice; Bjorn Simonsen, Archaeological Sites Advisory Board; John Stevenson, Hecate Cove; George Walkus, Tsulquate Band; Frank Wallas, Quatsino Band; Herbert Warren, Port Hardy; Gordon Zealand, Port Hardy; SFU Students Brian Apland and Joyce May, assisted us on the survey itself.

A Historic Site Survey within Pre-expulsion Acadian New Brunswick

DAVID V. BURLEY

Introduction

For a three week period in July, 1974, while under employment by the Historical Resources Administration Branch of the New Brunswick government, I undertook an historic site survey within the Shepody, Petticodiac and Memramcook regions of New Brunswick. The purpose of this project was to locate and assess as many pre-expulsion (before 1755) Acadian sites as time permitted. Ultimately, the data collected will be used in evaluating the feasability of further historic archaeological research in the area. This report, thus, represents a preliminary summary of the sites with a brief analysis of the various types. As well, a historical synthesis in which to view the components is provided.

The Region

In area, the region under investigation is immense. Bordered on the southwest by Fundy National Park, it includes all of the Shepody coastline as well as the drainage areas of the Petticodiac and Memramcook Rivers (Fig. 85). As a section of the Appalachian Acadian physiographic unit, it is underlain for the most part by Pennsylvanian sandstones, limestones and shales. Land forms, in general, can be characterized as a series of irregular hills and valleys. Within this rolling type of relief there are no true mountains although along the Fundy shore, sharp low cliffs are common.

The major forest cover of this district falls within Louck's (1962) Fundy Bay eco-region of the spruce-fir coast zone. Predominate stands are of red spruce, balsam fir and red maple with lesser amounts of white birch, yellow birch and white spruce. Soils tend to be poorly developed on a rocky till and, in most areas, are strongly podzolized. Contrasting this broad characterization, however, are certain estuary regions of the Bay of Fundy. Here extensive marine alluvial deposits have been built up and large salt water marshes prevail.

Clark (1968:35) argues that since the Bay of Fundy is an upper middle latitude east coast maritime region "it is situated in the heart of the area of favored storm track exit from the continent and, in consequence, has rapid day to day changes in temperature, humidity and cloudiness, and more than usual windiness." At Moncton on the Petticodiac River, the mean annual temperature is 41 degrees farenheit with high and low monthly means of 66 and 16 degrees respectively. A yearly average of 108 inches of snow, 41 inches of precipitation and 194 days with freezing temperatures does not make this region one of the most hospitable in the northeast for settlement (Clark 1968:32,33,35).

The early historical development of the Shepody/Petticodiac/Memramcook cannot be segregated from the general history of the Acadian people. Truely, it is impossible to even attempt an explanation of this region's sites without providing such a broad perspective. A brief synthesis of Acadian settlement, therefore, has been prepared.

Formerly, the territory of Acadia encompassed all three of the present Canadian Maritime Provinces New Brunswick, Nova Scotia and Prince Edward Island. This region was the site of the first real effort by the French to settle in the Americas and from that point in time has had an intriguing history marred by French/English conflict. In fact, by the year 1710 it had formally changed ownership seven times (cf. Ganong 1904: 30–35). Strategically, the importance of this province has been summed up by Griffeths. He appropriately characterized it as a "physical wedge" between New France (Quebec) and

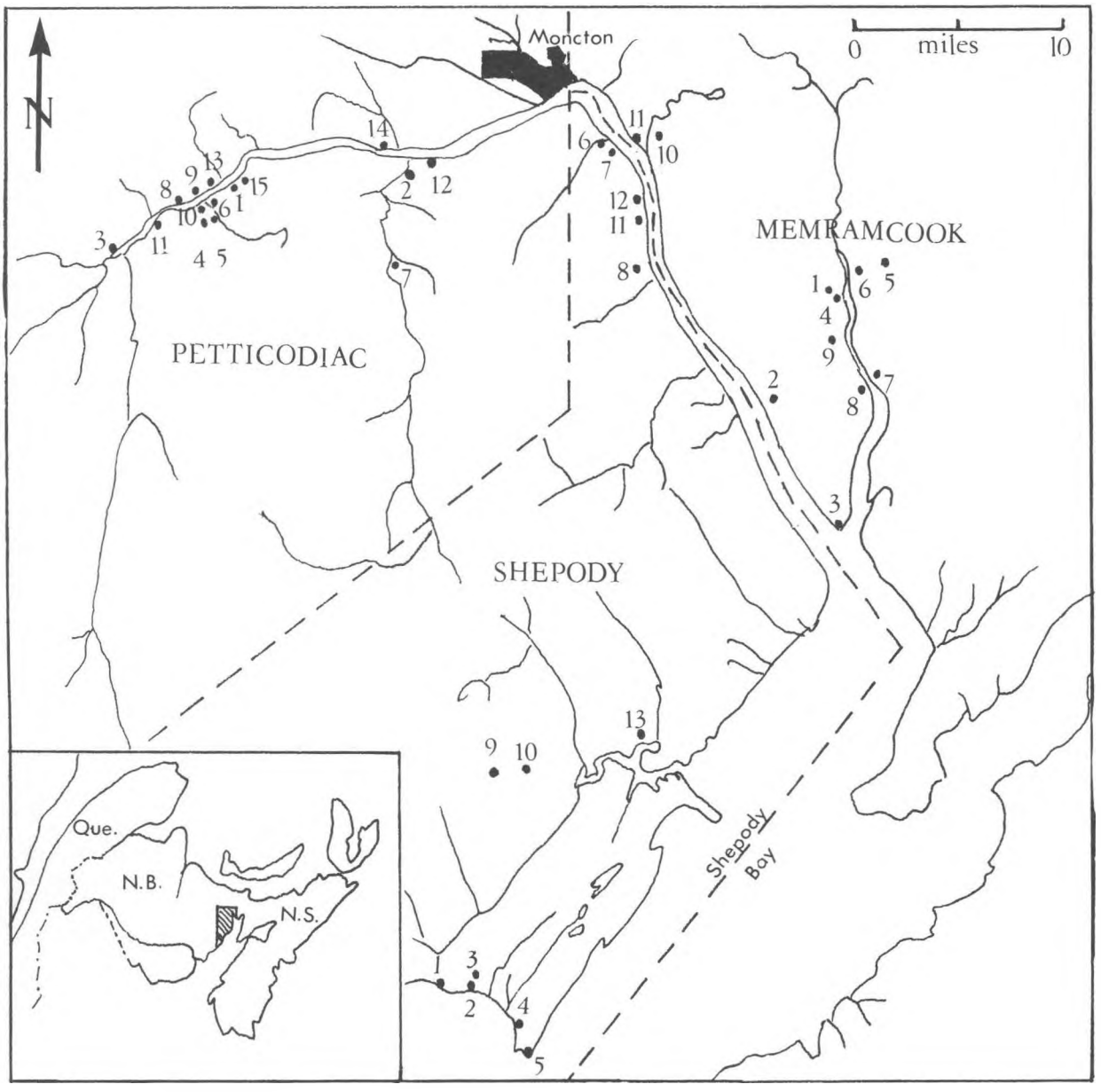

Fig. 85. *Historic site distribution by survey areas.*

New England (1969:2).

Originating from the west coast of France, the Acadians were first brought to the New World in 1633 by a French fur trading company (Hannay 1879: 251). Being peasant farmers, it would seem that they had little trouble adapting to their new environment. Indeed, between the years 1685 and 1714 their population grew from 885 to 2,500 without additional immigration (Griffeths 1969:2). Throughout this initial pioneer period almost all villages were established near the tidal marshes on the Bay of Fundy. These, through a communal diking system, were able to be reclaimed from the sea for agricultural purposes. The use of diked marshland was not a result of "old country" traditions but rather, was necessitated by the region's extremely poor soils. The few attempts

at clearing and farming nonmarsh areas met with limited success much to the dismay of the French officials (Clark 1968:54).

Although subject to a seigneur and protected by a military garrison, the Acadian settlements had little contact with the French regime centered in Quebec. Since the influence of the English was minimal as well (they made no attempts to populate the region until well into the 18th century), Acadia and its people developed almost as an independent entity. Abraham Brebner has aptly described this relationship He states:

> There were, in effect, two Acadies, each important in its own way. The one was the Acadie of the international conflict, the other, the land settled and developed by the Acadians (1927: 45)

After 1720, nevertheless, the English, who were given clear control of the territory within the Treaty of Utrecht (1713), made serious attempts to subjugate this rapidly growing population. All Acadians were required to take an oath of allegiance to the British monarchy. As might be expected, this period until 1760 was one of intense friction. This, as well, was a period of wholesale migrations from present-day Nova Scotia to New Brunswick; the ownership of the latter being in dispute until 1755. The climax came with the Acadian expulsion of 1755.

The expulsion can only be described as a massive deportation of all Acadians, I should say those that could be captured, to other British colonies where their numbers would be insignificant in the overall population. This dispersion with its many tales of woe, has become legendary through Longfellow's poem, *Evangeline.*

In Nova Scotia, from an English point of view, the expulsion was a total success. Throughout New Brunswick, a somewhat different situation resulted, Ganong states:

> It did indeed, practically obliterate the Acadian population from the peninsula of Nova Scotia, but at Beausejour and vicinity, as well as at Memramcook, Shepody and Petticodiac, the Acadians mostly escaped to the woods and the English had to be content with the destruction of all their buildings and crops (1904:36).

These fugitives now fled to New Brunswick's northeastern coast, an area at the time sparsely inhabited, as well as up the Petticodiac and Saint John rivers. Following a large British expedition in 1758, the Acadian populace was pushed still further inland beyond the head of tide and the reach of the naval forces (Ganong 1904:36). Finally in 1761, with the submission of almost all of the remaining exiles, these people were left to pursue their livelihoods once again without fear of attack or deportation. Few, however, returned to their original settlements along the Fundy shores.

On a more specific level, the details of Acadian development of the Shepody, Petticodiac and Memramcook areas are not well documented. We do know that they are a result of a general period of Acadian expansion lasting from 1670 to 1710 where new areas of dikable marsh were being sought. In 1698 Pierre Thibodeau, a miller from Port Royal, was the first recorded Acadian to attempt a settlement here. He, hoping to create his own seigneury (Wright 1945: 7), established himself on the Shepody coast near today's community of Hopewell Hill (Ganong 1899: 283). In addition, Thibodeau encouraged a comrad, Guillaume Blanchard, to undertake a similar effort on the Petticodiac River. These habitations, nevertheless, due to a series of land disputes with the adjacent seigneury of La Valliere, expanded at a somewhat slower pace than the rest of Acadia (Clark 1968:145–7). The settlement of Memramcook is still later than Shepody and Petticodiac with even less known of its first pioneers. Arsenault (1966:50) argues that its derivation was the result of natural outgrowth from the Thibodeau and Blanchard habitations in the seventeen-hundreds. Its proximity to the thriving settlement at Beaubassin and the major stronghold, Fort Beausejour, however, seems to be a more likely explanation. Whatever the case, by 1734 an ecclesiastical census attributes 65 families to the Shepody/Petticodiac/Memramcook, an area which had become renowned for its fertility and prosperity (Wright 1945:14). This figure rapidly increased to 165 families just prior to 1755 (Clark 1968:148).

During the expulsion, as earlier noted, the Acadian populace in these areas fled either up river beyond the head of tide or to inland refuge locales. The English, in turn, burned the major settlements and destroyed their crops. Only in the vicinity of Memramcook did the Acadian people return following 1760. The remaining lands, with rare exceptions, were taken over by English, Irish and German immigrants. Today's population of the Shepody coast, entire south bank of the Petticodiac River and the north bank of that tributary from Moncton upstream are largely descended from these later arrivals.

Survey Methodology

I have previously stated that the survey's goals were to locate and assess as many pre-expulsion Acadian sites as time permitted. Inherent in such an objective, obviously, is the problem of site identification. Without major excavations to obtain an artifact sample or investigate architectural styles, it is extremely difficult to distinguish pre 1755 Acadian components from those of late Acadian, British or German. As well, site verification through the historic literature proved to be almost fruitless due to the lack of early descriptions of habitation locales. The size of the survey region and the minute time allotment also were major drawbacks to the reconnaissance. It thus became necessary to rely heavily on oral tradition and local informants in the discovery and identification of sites. In conjunction, the provincial government's Department of Historical Resources kindly allowed their Acadian research historian, Rudolph Bourque, to join me in the field for a number of days. His knowledge of regional lore, site locations and area residents proved to be invaluable.

The majority of my time, therefore, was spent interviewing informants. Sites reported by them were then visited and catalogued with surface features noted. In addition, a separate three man crew tested a small number of these. There was no single criterion for excavation but rather, depended on individual circumstances.

Because of the large area being surveyed, base camp had to be shifted twice after commencing the project: one each being established in the districts of Shepody, Memramcook and Petticodiac. In turn, sites were given a catalogue number relating to these regions. Thirty-nine sites with a wide range of types were recorded (see Fig. 85).

The Sites

Although the greatest majority of the catalogued sites are of pre-expulsion Acadian derivation, a number of later components both Acadian and other were also recorded. Here, however, only the former are reviewed with full site summaries placed in Tables 1, 2, and 3. Sites have been classified into a number of functional categories for discussion. Included are the types habitation, fortification, mill, refuge and miscellaneous.

Habitation Sites

Twenty components have been assigned to the classification of pre-expulsion Acadian habitation (see Tables). Although many were referred to as "villages" by local informants and catalogued as such, I am skeptical of this terminology. Most would seem to be single family complexes while those few which might be representative of a clustering of several household units fall far short of the village conceptual framework.

Generally speaking, all habitation sites were found to have a single common denominator — the proximity of diked marshland. The diking of marsh, as already noted, was the primary means by which the Acadian prepared land for agriculture. Basically, dike building was a communal effort where the marsh was owned either by a number of men who shared the diking or by an individual who in turn provided services to his helpers for an equal number of days (Diereville 1933:94). Here I should point out that even though all habitation sites were near dikes, the presence of diked land does not necessarily imply a nearby Acadian site. This custom of marshland use was also adopted by later immigrants who maintained the former Acadian dikes as well as building many of their own. In fact, until the 1940's one informant reported that all of the men of the community had to undertake a specified number of days in the dike service or be fined. Our Acadian research historian, Rudolph Bourque, nevertheless argues that Acadian dikes are distinctive by their profile and *aboixdeau* (sluice gate) construction. Although unable to verify this proposition, on a number of presumably Acadian sites, dike cross sections were noted as being smaller.

Eight sites within this category had what I consider to be cellar features. These, primarily in the form of shallow depressions, varied in size with an approximate norm of 1 to 1.5 m. deep, 3.5 to 4.5 m. long and 2.5 to 3 m. wide. On a couple, foundation stones were visible.

There is a paucity of information on the archi-

Table 1. Shepody Site Information

Site No.	Site Name	Site Affiliation	Site Type	Surface Features	General Location	Verification Source
S–1	Fort la Poterie	Pre-expulsion Acadian	Fortification	A series of small mounds. Five unproductive test pits.	Waterside	Local informants
S–2	Cape Split Dry Dock	Questionable	Dock	Large bolted timbers on the beach.	Waterside	R. Bourque
S–3	Cape Split Mill	Pre-expulsion Acadian	Mill	Timbers eroding from the creek bank – part of early dam.	Waterside	R. Bourque
S–4	Anderson Farm Site	Pre-expulsion Acadian	Habitation	Extensive diking in the vicinity.	Long Marsh Creek	R. Bourque
S–5	Fort Enrage	Pre-expulsion Acadian	Fortification	Visible foundation walls. One test pit excavated locating S.E. corner.	Cape Enrage	R. Bourque
S–6	Mill Creek Site	Pre-expulsion Acadian	Mill	Shoreline mounds – probably part of early dam.	Lower Coverdale	R. Bourque
S–7	Blanchard Village	Pre-expulsion Acadian	Habitation	Dikes with aboixdeau construction.	Lower Coverdale	Ganong 1899 Local informants
S–8	Stoney Creek Site	Pre-expulsion Acadian	Habitation	Cellar depression with visible foundation.	Stoney Creek	R. Bourque
S–9	O'Donnel Farm Site	Questionable	Habitation	The remains of a fire-place, house foundation and stone fence.	New Ireland	Local informant
S–10	Anglican Church Site	Early British	Chapel	Overgrown with no detectable features.	New Ireland	Local informant
S–11	Jean de Colline Village	Pre-expulsion Acadian	Habitation	Under cultivation although Bourque suggests cellar features are present.	Lower Coverdale	R. Bourque
S–12	Duffy Farm Site	Pre-expulsion Acadian	Habitation	A basement feature with foundation stones visible.	Lower Coverdale	Local informant
S–13	Thibodeau Village	Pre-expulsion Acadian	Habitation	Extensive diking in the vicinity.	Hopewell Hill	Ganong 1899 Local informant

tecture of the pre-expulsion Acadian farmer in New Brunswick. Undoubtedly houses were simple and built out of the most available raw materials. At Nova Scotia's Port Royal in the 1650's, Rameau provides the following description:

> The houses were doubtless very rough; many were built of tree trunks piled one on the other without even being squared; some were based on heavy piles, driven in the ground which were interlaced with branches and then plastered with mud. The better built ones, and the manor house (d'Aulnay) itself, were made of great rough hewn beams laid, one on the other, in tiers. This construction is still called pièces sur pièces (Rameau 1889 as translated by Clark 1968:105).

There is little doubt that superstructures at the various habitation sites reported here were of a similar nature. At any rate, only future excavation will provide additional more specific details.

One pre-expulsion habitation component, the Jacques Village site (P–1) was tested and thus deserves further mention. On the south bank of the Petticodiac near Upper Coverdale, it consists of four cellar features stretched over approximately .75 kilometers of shoreline. As usual, extensive diking was found in the vicinity. The site has been subdivided into three areas A, B and C on the basis of feature separation. Both areas A and B have single cellar depressions while C has the remaining two.

As yet, I have been unable to document this component within the historic literature. Local informants suggest it to be a rather late pre-expulsion settlement even though none were able to provide a derivation of the name (pronounced by them as Jāk). Testing in areas A and B as well, did not help to

Table 2. Petticodiac Site Information

Site No.	Site Name	Site Affiliation	Site Type	Surface Features	General Location	Verification Source
P–1	Jacques Village Site	Pre-expulsion Acadian	Habitation	Four cellar features. Test excavations were productive	Upper Coverdale	Local informants
P–2	Turtle Creek Site	Pre-expulsion Acadian	Habitation	Two cellar features with extensive diking.	Coverdale	Ganong 1899 R. Bourque
P–4	Grub Road Cemetery	19th Century British	Cemetery	Variety of early grave markers are present.	Salisbury	Local informant
P–5	Indian Hill Site	Historic Micmac	Habitation	None which could be detected.	Salisbury	Local informant
P–6	Taylor Farm Site	Pre-expulsion Acadian/early British	Habitation	Large basement depression. Possible architectural remains in a nearby abandoned house.	Salisbury	Local informant
P–7	Forche a Crapaud	Expulsion Acadian	Habitation refuge	A cut stone floor in the creek bed – function (?).	Turtle Creek	Ganong 1899 R. Bourque
P–8	Highland Park Site	Pre-expulsion Acadian	Habitation	Four cellar depressions which are presently being filled in.	Salisbury	Local informant
P–9	Salisbury Shipyard	19th Century British	Dock	Hand hewn timbers eroding out of marsh cut.	Salisbury	Local informant
P–10	Colpits Farm Site	Pre-expulsion Acadian	Habitation	Extensive diking in the vicinity.	Salisbury	R. Bourque
P–11	Pollet River Battery	Expulsion Acadian	Fortification Refuge	Ridge with "diggings" of former owner visible.	Salisbury	R. Bourque Local informant
P–12	Aucoin Village	Pre-expulsion Acadian	Habitation	Under cultivation.	Coverdale	R. Bourque
P–13	Cherlegash	Pre-expulsion Acadian	Habitation	No detectable features.	Boundary Creek	R. Bourque Ganong 1899
P–14	Village du Boys	Pre-expulsion Acadian	Habitation	Unable to receive permission to visit the site.	Allison	R. Bourque
P–15	Burnham Farm Site	Pre-expulsion Acadian	Habitation	Cellar feature as well as extensive diking with an *aboixdeau.*	Coverdale	Local informant

clarify this problem of origins. Few cultural materials were uncovered while those that were (minute fragments of ceramics and glass and particles of calcined bone) gave no clues as to the time period involved. Bourque (1971) argues that such a trait, a lack of "worldly goods", was a dominant characteristic of Acadian life. Excavations at other pre-expulsion and post expulsion sites would seem to bear this out (Burley 1974, 1975).

A number of test pits did contain a charcoal strata which may have an association with the cellar features. The small area of excavation however, was insufficient to determine whether the houses had been destroyed by fire. If this was the case, it would not be overly presumptious to further suggest they had been burned in the British purge of 1758.

Overall, the Jacques Village site proves to be the best prospect for further archaeological research into the pre-expulsion Acadian habitation in the surveyed area.

Fortification

Three sites (S–1, S–5, M–3) are here categorized as fortifications. Although purported to have been military garrisons by informants, their function seems to have been more in the capacity of signal stations than protective strongholds. In this light, it is possible to suggest an affiliation with the nearby French fort at Beausejour. Historical verification is lacking for all three of these sites although this factor, because so little is known of Beausejour's outlying system of redoubts (Bourque, personal communication), does not seriously question their existance.

Of the three, Fort La Poterie is the only one not to have surface features. It nevertheless, is so

Table 3. Memramcook Site Information

Site No.	Site Name	Site Affiliation	Site Type	Surface Features	General Location	Verification Source
M–1	Memramcook Chapel	Pre-expulsion Acadian	Chapel and Cemetery	The site is marked by an iron cross erected in 1955.	St. Joseph	Local informant
M–2	Viecente Site	Pre-expulsion Acadian	Habitation	A well, basement feature and extensive diking mark this site.	Belliveau Village	R. Bourque
M–3	Fort Folly	Pre-expulsion Acadian	Fortification	None that are presently detectable.	Folly Point	Ganong 1899 Local informant
M–4	Butte a Petard	Pre-expulsion Acadian	Habitation	Site under cultivation although local informants report a number of cellars are visible.	St. Joseph	Local informant
M–5	Village des Ruisseau des Cabanes	Expulsion Acadian	Refuge Habitation	None that are presently detectable.	Memramcook East	R. Bourque Local informant
M–6	Landry Farm Site	Post-expulsion Acadian	Habitation	Three basement features.	Memramcook East	Local informant
M–7	Black House	Early British	Habitation	Basement feature. Testing proved to be unsuccessful.	Upper Dorchester	R. Bourque
M–8	Pointe aux Boulleaux	Pre-expulsion Acadian	Habitation	Under cultivation.	Taylor Village	Ganong 1899 R. Bourque
M–9	Village des Plattes	Pre-expulsion Acadian	Habitation	Under cultivation.	St. Joseph	Local informant
M–10	Amirault Village	Pre-expulsion Acadian	Habitation	Large stone walled basement feature.	Fox Creek	R. Bourque
M–11	Woods Point	Pre-expulsion Acadian	Dock	Remains of an early breakwater are visible.	St. Anselem	R. Bourque

rooted in local tradition that it could not go unrecorded. Situated on the Fundy shore at Waterside, informants claim this site was occupied by the French during the expulsion. On hearing of an English attack, supposedly, the defenders fled dumping their munitions into a nearby lake. The lake was examined but to no avail. Today the site is marked by a series of small mounds which, on testing, proved to be natural. In an adjacent gravel pit, a few artifacts were surface collected while the owner reported that he had found materials buried as much as "three feet deep". It is quite possible that La Poterie has been completely destroyed.

Both of the remaining fortification sites, Enrage and Folly, have identifiable remains and both have strikingly similar histories. Enrage, situated on a cliff edge at Cape Enrage, is in an excellent locale overlooking the Bay of Fundy. In fact, its view so commands the Bay that a later lighthouse was built within its foundations. This has since been replaced by a more modern structure on a higher elevation. Surface features at Fort Enrage include a rectangular dry-stone wall which, on its eastern exposure, is over 2.5 m. deep. Within the western half of this enclosure is an additional brick foundation that, according to the chief lighthouse keeper, served as a base for an early steam fog horn. It had been removed in the 1920's.

A single 1.5 by 1.5 m. test pit was excavated in a not fully exposed corner of the site. Aside from providing a large artifact yield, this pit also uncovered a brick floor. Its function has not been identified. The artifacts and heavy charcoal matrix from which they came appear to be related to the fog horn and not the French occupation. These consist of wrenches, spikes, bolts, junk metal as well as some window and bottle glass.

The final fortification site, Fort Folly, also was situated in an ideal position to view approaching shipping and it also had a lighthouse built on the spot. The basement of this structure is known to have sliced through the earlier foundation walls (Ganong 1899: 290, footnote 1, Bourque, personal communication). The existence of Fort Folly is well known by the local residents although, as with the other redoubts, has no historic confirmation. Ganong, also relying on local informants, describes this site:

> Between the Memramcook and Petticodiac River is a point known locally as Fort Folly Point (Folly Point on the map). I am told by local residents that there was a fort on the point on

> whose site the present lighthouse was built and that it was said to have been built by the Acadians during their troubles with the English. Locally it was said it was called Folly because there was really nothing there to defend. It is possible that both here and on St. Marys Point there were posts for observation of the approaching English and the giving of alarms to the settlers up the rivers (1899:290).

No surface materials were collected. Nonetheless, a number of informants including Bourque earlier had retrieved a variety of artifacts from this site.

Mill Sites

Two sites within the Shepody survey district, Cape Split and Mill Creek, have been identified as mills. In both, the remnants of former dams and their placement near the mouth of a creek well within the tidal range suggest they may have been tidewater based. Neither, however, had further surface features and it was impossible to relate them to a more specific function. Acadian mills, in general, do not seem to have significantly varied either in type or importance from those of peasant communities of the Old World. Port Royal, for instance, by 1700 had a minimum of two and possibly as many as four water powered grist mills, two saw mills and a wind mill. At Beaubassin La Valliere as early as 1680 had constructed a series of grist mills and a saw mill while at Minas, Villebon in 1698 reported seven or eight grist mills, a saw mill and a wind mill (Cf. Clark 1968:177–178). Unfortunately, for the Shepody/Petticodiac/Memramcook territory neither the numbers of nor locations for the Acadian mills are recorded. Nevertheless, I believe that two is hardly a representative sample and without a doubt many more did exist.

Refuge Sites

Within the introductory historical remarks, I had stated that the Acadians were pushed inland as well as beyond the Petticodiac's head of tide during the expulsion years. In regards to this Ganong states:

> It is said in Cockburn's Report on Immigration (1827) that the French formerly occupied the intervals at the Forks of Turtle Creek, calling the place Forche a Crapaud. It is very likely that they occupied locations on this, Coverdale and Pollet Rivers after the expulsion in order to be above the reach of the English ships, as they probably occupied the French Lakes and other places difficult of access on the Saint John for a similar reason (1899:282).

Through the use of informants, three refuge sites were located. These include two habitation locales, Forche a Crapaud and Ruisseau des Cabanes, and a refuge fortification, the Pollet River Battery. Only one, Forche a Crapaud, had visible features. Still such temporary occupations cannot be expected to have a wealth of surface markers. At Forche a Crapaud, a cut stone floor was found in the creek bed near the interval of Ganong's description (see quote).

The fortification site has a rather interesting background within the local lore. Here, at the Pollet River Battery, the Acadians are said to have withheld the British onslaught of 1758 for an entire winter. The site is situated on a high ridge overlooking the Pollet River and would seem to be an excellent command post. Although no surface features were noted, one informant reported that a number of artifacts had been unearthed by a previous owner. His test "holes" were discovered in two areas of the ridge.

Miscellaneous Sites

Two final pre-expulsion Acadian sites have been included within this miscellaneous category. These are the dock site at Wood's Point and the Chapel and cemetery complex at St. Joseph.

According to Bourque, a pre-expulsion dock was once located at Woods Point on the Petticodiac River. It, apparently, had a continued use into the nineteenth century. On inspecting the site, the remains of a former breakwater (a series of large stones jutting out from the shoreline) were noted. Additional surface features were lacking while much of the shoreline was undergoing erosion.

The Chapel and cemetery, on a hill near the modern village of St. Joseph, is well integrated into local tradition. In fact, in 1955 the area's present Acadian populace erected an iron cross on the site as a testiment of their ancestry. We did no testing at this locale however, the site owner stated that he had unearthed a variety of "relics" in a small adjacent garden plot.

Conclusions

New Brunswick's first European settlers, the Acadians, have been seriously neglected in terms of past archaeological research. As well, their history has been traditionally written as one small general section of the overall narrative on Acadia. Through an historic site survey of the New Brunswick region's of Shepody, Petticodiac and Memramcook, I have attempted to provide background material for a well needed future project.

In all, thirty-nine sites, of which thirty are affiliated with pre-expulsion or expulsion Acadian groups, were catalogued. Their location and verification, for the most part, was through the use of local informants. Although realizing the drawbacks of this type of reconnaissance, when weighed against the problems of time, area size and site identification, they are not quite so large. Only archaeological excavation, nevertheless, will provide the final identification of the majority of components reported here.

ACKNOWLEDGEMENT

As is apparent throughout the text, the completion of this project was dependent on the aid of a large number of individuals. Although only a few may be acknowledged here, I wish to thank all those who have made contributions. Specifically, I am deeply endebted to Mr. B. Eagles of Salisbury, Mr. and Mrs. Sutherland of Coverdale, Mr. R. Bourque of Fredericton and Dr. C. Turnbull, Provincial Archaeologist of New Brunswick. Finances were provided by the New Brunswick Government's Department of Historical Resources Administration.

Obsidian Sources in the Anahim Peak Area

D .E. NELSON and GEORGE WILL

Introduction

Obsidian artifacts are found in archaeological sites in most areas of British Columbia. Since there are only a few geological sources of obsidian in the province, the techniques that have been developed for distinguishing and identifying obsidian from the different flows can yield valuable information on the trade (or travel) routes by which this material was disseminated. In late 1973, a project to characterize the obsidian sources of the Pacific North-West Coast was begun at Simon Fraser University, such that a "library" of obsidian source types could be established. The technique employed is energy-dispersive X-ray fluorescence analysis. The details of this technique are published elsewhere (Nelson et al. 1975). To properly establish these characterizations, it was necessary to obtain a representative sampling of each obsidian flow to test for chemical homogeneity and, where possible, artifacts of known parentage were required to test the technique.

One such source of obsidian that was known to have provided obsidian for tool production is in the Anahim Peak area; this fact was officially noted as early as 1876 in the Geological Survey of Canada Report of Progress for 1876–77. A study by Evans and Wilmeth (1971) using neutron activation analysis on obsidian pebbles and artifacts from the Anahim area indicated that these materials could be characterized by their trace element concentrations. The results of an application of this technique to obsidian artifacts from various sites in British Columbia were subsequently reported by Wilmeth (1973). On the basis of these studies, two types of obsidian were defined from the Anahim Peak area. The first type was found as pebbles in the Dean River, and it was suggested that it derives from an eroded source on Tsitsutl Peak in the nearby Rainbow Mountains. The second type was thought to originate on Anahim Peak itself, as local Indian legend suggested that the Peak contained a source of obsidian.

While individual samples of these types of the Anahim area obsidian were kindly supplied by R. Wilmeth for the SFU study, a more representative sampling of these materials was required in order to test the flows for chemical homogeneity, and we undertook a field trip to try to locate these sources in September, 1973.

A photo of Anahim Peak is shown in Figure 86; a map of this area is given in Figure 87. The route taken to the Peak is shown by the dotted line on the map. Travel proceeded by Land Rover across a ford on the Dean River and then along a rugged bulldozed trail following an unnamed creek to a point about 2 miles almost due south of the Peak. Pebble-sized pieces of obsidian were taken from the Dean River at the ford. Following the creek upstream, larger and larger pieces were found, many of cobble-size, both in the creek and beside it. (This creek has been appropriately dubbed Obsidian Creek.) The obsidian was quite abundant, and it was relatively easy to find fist-sized pieces.

At a point about mid-way between the creek and trail and approximately half-way to the trail-end from the Dean River, a site was found. On the basis of a cursory examination and a brief surface collection, the site was designated a chipping station. The presence of obsidian cobbles in the nearby creek and the large amounts of obsidian flaking detritus on the surface make this conclusion likely. The absolute limits and other possible features of the site were not investigated due to lack of time. Apart from the unworked flakes, the surface collection included a partial projectile point and one core of obsidian.

Three cobble-sized samples of pitchstone were also found on the surface at this site. These cobbles may have been flaking cores, but as their surface features could conceivably have been caused by natural forces, it was impossible to determine with certainty whether they were artifacts. No other samples of this material were found on this trip.

From the end of the bull-dozed trail, the search for the sources continued on foot to the peak itself. This peak is a massive basalt monolith reaching an

Fig. 86. View of Anahim Peak from the north.

altitude of 6208 feet above sea level. It is heavily weathered and all its slopes are characterized by slides of scree below steep cliffs. One area on the south-east corner is characterized by several small and one massive slide. As local informants had suggested that the obsidian source was on the east side of the Peak in association with a major slide (Wilmeth, personal communication) this area was searched with some care. Apart from a very few mm-sized grains, no obsidian (or pitchstone) was found on the entire south or south-eastern portion of the Peak. As the northern section had been visited by a geologist who found no obsidian, it is not likely that the Peak itself is the rumored obsidian source.

Characterization Analysis

The large set of samples obtained from Obsidian Creek constituted an excellent sampling of this material. Since the obsidian was taken as worn pebbles from the creek, representative samples of the source were naturally obtained. Furthermore, the partial point and flaking detritus provided artifacts of known materials. Analysis of 18 randomly-selected creek pebbles and six or eight flakes has shown that this obsidian has a unique, easily-recognizable finger-print, and that the flow was homogeneous to within the uncertainty limits of the analysis technique (Nelson et al., 1975). This obsidian is identical with the pebbles found in the Dean River and with the 'Dean River' sample provided by Wilmeth. Further, artifacts recovered from FaSu 2, FbSu 1, EITb 10, EeRk 4 and the Chilcotin River have been analyzed using this technique and are unquestionably made of this material, indicating that it was widely used.

The three pitchstone samples were analyzed and also found to possess a very distinctive finger-print. This material was identical to the sample of material designated "Anahim Peak obsidian" provid-

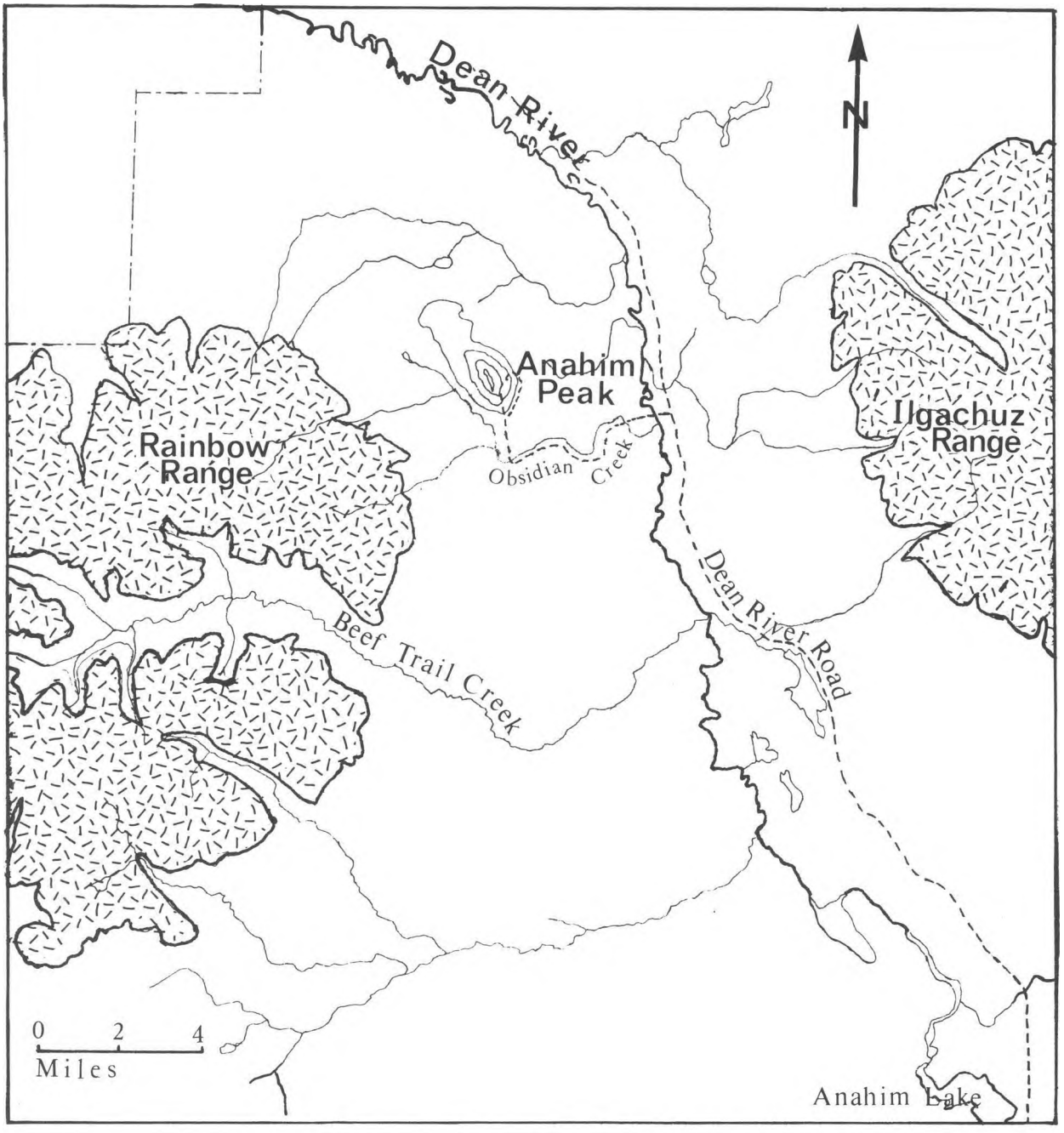

Fig. 87. *Map showing the Obsidian Creek obsidian source, and the trail followed to Anahim Peak.*

ed by Wilmeth. Since the number of samples is so small, it is premature to make any conclusions on the homogeneity of this pitchstone, but the variance in concentrations is remarkably small. An artifact from FaSu 2 proved to be made of this material, with the elemental concentrations fitting within the variances found for the three samples above. Wilmeth's study also indicates that this material was widely used locally.

A sample of obsidian reputedly taken from a

source in the Rainbow Mountains area was obtained from a gem collector by R. Carlson and provided for analysis. The results of the analysis show it to be similar, yet distinct from the 'Obsidian Creek' type. An artifact from FbSu 1 has an identical characterization, indicating that this source was known to ancient man.

Conclusions

Since the size and quantity of the obsidian found in Obsidian Creek seems to increase as one proceeded upstream, and since this material was very obviously used for tool-making, one may conclude, as Wilmeth has done, that the geological source lies upstream in the Rainbow Mountains and is being (or has been) eroded and washed downstream. The archaeological source is likely the creek itself.

The presence in coastal sites of artifacts made from this material indicates that the obsidian was either obtained in the Obsidian Creek area and transported down the Dean River to the coast, or that the obsidian flow in the Rainbows could be approached directly from the west. The very similar type of obsidian represented by the sample obtained from R. Carlson suggests that at least two eruptions took place in the Rainbow Mountains area.

The source of the pitchstone is something of a mystery. Only three samples were found on the field trip, and these were possibly artifacts; it is unlikely that the geological source is in the area surveyed. A source of "poor-quality obsidian" is reputed to exist on the high Eastern slopes of the neighbouring Ilgachuz Mountains (Sinkankas 1959). If this is the source of the pitchstone, why were the three samples taken to a plentiful supply of high-quality obsidian?

This area requires much more extensive archaeological survey.

ACKNOWLEDGEMENT

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Skeletal Pathology of Prehistoric Human Remains from Crescent Beach

OWEN B. BEATTIE

Introduction

Crescent Beach (DgRr 1) is an extensive midden site located on the eastern shore of Boundary Bay, fifteen miles south of Vancouver, B.C. (Fig. 88). During March of 1972 an extensive archaeological salvage project was conducted under the direction of R.C.W. Percy with a crew consisting of archaeology students and enthusiasts from Simon Fraser University, Douglas College, the Archaeological Society of British Columbia, and the B.C. Provincial Museum. Over 1300 artifacts and 18 human burials were recovered from the excavations, while at least 200 more artifacts and the remnants of an as yet undetermined number of individuals were collected from disturbed cultural deposits surrounding the excavations (Percy 1972b).

Analysis of the cultural material has recently been completed by Percy (1974), and a preliminary osteometric analysis of the human material is on file at the Simon Fraser University Museum of Archaeology and Ethnology (Beattie 1974a). The present report is concerned with concisely describing and diagnosing the skeletal pathology present in the 18 human burials recovered from the controlled excavations.

Twelve of the eighteen burials were either undisturbed or stratigraphically located immediately after discovery. This made it possible to accurately establish their cultural affiliations. Percy (1974: 271; Table VII) has described the deposits containing the burials as representing three cultural phases:

Crescent Beach I (Mayne Phase)
3400 B.C. – 1100 B.C.
containing burial numbers 12, 13, 15

Crescent Beach II (Locarno Phase)
1100 B.C. – 400 B.C.
containing burial numbers 1,3,4,5,6,7,8,10

Crescent Beach III (Marpole Phase)
400 B.C. – A.D. 400
containing burial number 16

Burials lacking definable stratigraphic context or too disturbed for accurate cultural placement include numbers 2,9,11,14,17,18.

Estimates of sex were made by the evaluation of specific morphological characteristics described by Krogman (1962) and Stewart (1957; 1973). Methods of age estimations varied with the conditions and completeness of the individual burials. Male and female pubic symphyseal age was determined using the standards and epoxy casts of McKern and Stewart (1957) and Gilbert and McKern (1973). Epiphyseal union of the post-cranial skeleton (McKern and Stewart 1957; Stewart 1973) and eruption of the permanent dentition were also used. Ectocranial suture closure has been shown to be very unreliable as an age indicator (Singer 1953; Brooks 1955; McKern and Stewart 1957), especially for females. Age estimates utilizing this method were made only in the absence of more reliable indicators. Table 1 contains the sex and age estimates for the material.

Skeletal Pathology

A number of pathological conditions occur in the material and these are described below.

Degenerative Arthritic Changes

Degenerative joint disease is the most common pathological form present in the sample. Out of the

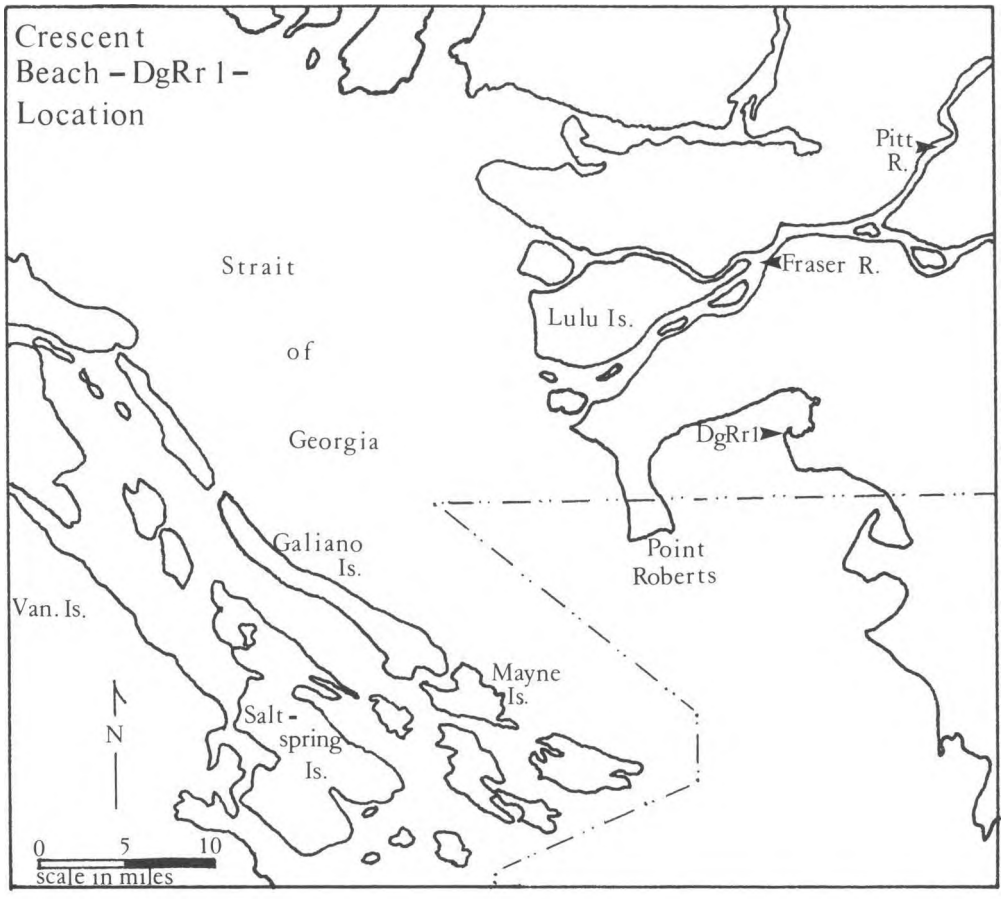


Fig. 88. Map showing location of DgRr 1.

18 recovered burials, 14 are complete enough to make relatively complete pathological evaluations (burial numbers 1–8,10,13,15–18), and 10 (71.4%) of these display varying degrees of degenerative changes involving the joint surfaces of the appendicular and axial skeleton.

Osteoarthritis: This is a degenerative disease that is primarily an expression of the aging process. In diarthrodial joints it is characterized by a bony lipping around the joint margin and is often accompanied by a roughening, pitting, and rarefaction of the articular bone surface. The presence of osteoarthritis in a majority of the DgRr 1 burials reflects their adult to old-adult status. Slight to moderate lipping and pitting of a majority of the appendicular articular surfaces were noted for burial numbers 1,2,5,10,13, and 16. Severe lipping and pitting occurs in burial 5. Apophyseal joint surfaces are degenerated in burial numbers 2 and 5, and the auricular surfaces of both innominates from burial 13 show nodular degenerative changes.

Rheumatoid Arthritis: This disease occurs primarily in women (3:1 over men) between the ages of twenty to forty, afflicting the cartilages of the small joints in the hands and feet as well as the larger joints during its more advanced stages (Bourke 1967). Burial 4 (a twenty-five year old female) is represented by a fairly complete skeleton. Degenerative arthritic changes are widespread and certain areas, such as the patellae, the lunates, left capitate, phalanges, and the apophyseal and costovertebral joints, show severe pitting, bone resorption, and localized sclerosis. Thoracic vertebrae 8 and 9 are ankylosed. Rheumatoid arthritis *may* be the pathological agent involved here.

Ankylosing Spondylitis: This condition (also referred to as Marie-Strümpell disease) is a chronic and progressive inflammatory joint disease of unknown etiology that affects males over females by a ratio of 9:1 (Huskisson and Hart 1973; Sissons 1966). Age at onset is usually early, though variable between 15 and

Table 1. Age and sex of Crescent Beach skeletons

Burial Number	Sex	Age	Cultural Affiliation at Crescent Beach
1	Male	Old Adult	II
2	Male	Old Adult	?
3	Male	Adult	II
4	Female	Adult	II
5	Male	Old Adult	II
6	Male	Adult	II
7	Female	Young Adult	II
8	Male	Old Adult	II
9	Female	Adult	?
10	Male	Old Adult	II
11	Female	Adult	?
12	?	Adult	I
13	Female	Adult	I
14	?	?	?
15	Female	Adult	I
16	Female	Adult	III
17	Male	Young Adult	?
18	Female	Adult	?

30 years of age. The sacro-iliac joints are first affected, almost always bilaterally, and involvement of the spine occurs from this region upward. The disease is distinguished by progressive ossification of the spinal ligaments and degeneration of the synovial joint spaces resulting ultimately in bony ankylosis. Inflammation and degeneration of the peripheral joints is a frequent occurrence, though not the rule. Advanced stages of the disease involve ossification of the annulus fibrosus and, less frequently, the nucleus pulposus (Sissons 1966; Boland 1966). Restriction of body movement in these advanced stages and the rigidity of the spine greatly increases susceptibility to vertebral fracture through trauma (Good 1967). Other features of the disease in modern populations include aortic valve lesions (4–5%), iritis (25%) often leading to blindness, and widespread generalized disuse osteoporosis (Boyd 1961; Jaffe 1972; Nordin 1973).

The fragmentary and very friable remains of burial 8 display massive degenerative changes that describe a classic case of advanced ankylosing spondylitis. In the vertebral column the atlas is fused to the skull by ossification of the apophyseal joints and the anterior and posterior atlanto-occipital membranes. The transverse ligament has also begun to ossify. Vertebral fusion is complete from the axis to the fifth cervical (Fig. 89), anteriorly by syndesmophyte formation and bridging, and posteriorly by the ossified posterior longitudinal ligament, the ligamenta flava, and the apophyseal joints. Cervicals 6 and 7, though separate, have very degenerated apophyseal joints with much bone resorption. The dens of the axis is expanded into a mushroom shape and is highly porous (Fig. 89). The cervical vertebrae still retain their secondary curvature. There are no osteophytes on the vertebrae and the anterior longitudinal ligament has not ossified.

The ninth thoracic down to the fourth lumbar vertebrae are all fused into a single unit by ossification of the ligamenta flava, apophyseal joints, and interspinous ligaments. All of the transverse processes have been broken away post-mortem, though some rib fragments show definite costovertebral fusion. In this fused spinal segment, only the body of thoracic 11 and parts of thoracic 12 and lumbars 1–3 are present. The bodies of lumbars 1–3 are compressed anteriorly, forming a severe lumbar kyphosis approaching 90^{o} (Fig. 90). The anterior and posterior longitudinal ligaments are not ossified. However, the annulus fibrosus and nucleus pulposis of a number of

Fig. 89.
Fused cervicals 2–5.

intervertebral discs have undergone ossification, forming nodular spicules of bone in the centre and around the periphery of the observable vertebral bodies. Some bodies are fused by these exostoses.

The thoracic column is noticeably rotated to the left and may well represent the only direction from which this individual could look upward. The column is broken post-mortem above thoracic 9 and below lumbar 4. The loss of the innominates through disintegration in the ground and the extremely fragmentary nature of the sacrum have made any observations of the sacro-iliac articulations impossible.

Other bones showing severe degenerative changes of the articular surfaces in burial 8 are the scapulae, right humerus, right clavicle (Fig. 91), carpals, metacarpals, ribs, right femur, tibiae, metatarsals, and phalanges. The lateral half of the left mandibular condyle is heavily pitted, though there is no involvement of the left mandibular fossa or articular tubercle, indicating inflammation only of the inferior compartment of the temporomandibular joint.

Disuse atrophy has greatly affected the constitution of the bone in this individual. The disabling effect of the disease has produced a severe osteoporosis in most or all of the skeleton (Fig. 92), probably contributing to the collapse of lumbars 1–3. The outer cortex of many bones, especially in those areas where there are no muscular, ligamentous, or tendinous attachments, has been resorbed leaving a trabecu-

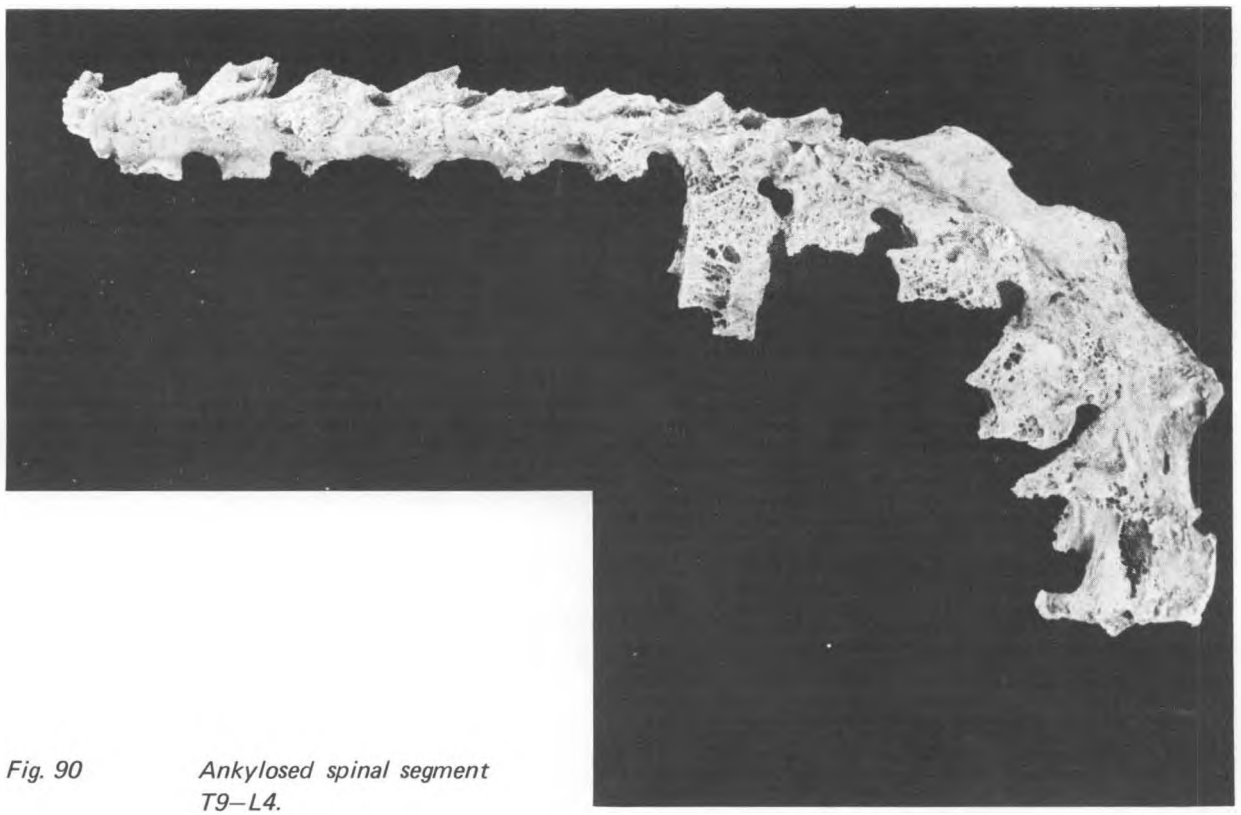


Fig. 90 *Ankylosed spinal segment T9–L4.*

Fig. 91. *Degenerated medial articular surface of the right clavicle.*

Fig. 92.
Vertebral plug showing osteoporosis.

lated network of bone as an outer surface. The cranium is also osteoporotic, though only in those areas where no connective tissue attaches.

Osteophytosis: The presence and degree of osteophyte formation (the bony lipping of the superior and inferior borders of the vertebral bodies immediately lateral to the anterior longitudinal ligament) was observed for each of the burials. Unfortunately, the present sample is too small to give accurate indications of which spinal segments in the population are more susceptible to osteophytosis. However, it *is* clear that vertebrae T10 — L5 have greater incidences of involvement than the rest of the vertebrae.

Infections

The material contains three instances of infectious agents causing modification of osseous tissue:

Burial 2: The radial tuberosity of the left radius has a suppurative scar in its centre, possibly the result of inflammation and infection of the bursa between the biceps tendon and the tuberosity.

Burial 10: A large rectangular osteitic scar with extensive new bone formation stretches from the posterior parts of the parietal bones near lambda, along the sagittal suture, through bregma, ending in two shallow elongated depressions on either side of the mid-frontal line near the frontal bosses (Fig. 93). The involved bone is very irregular in contour with an increased porosity interspersed with areas of bone sclerosis, especially along the sagittal suture. The scar measures 15.2 cms. anterior-posterior, by 5.7 cms. transversely throughout its length, and is raised 0.2 — 0.3 cms. above the surrounding normal bone. There is no corresponding involvement of the inner table.

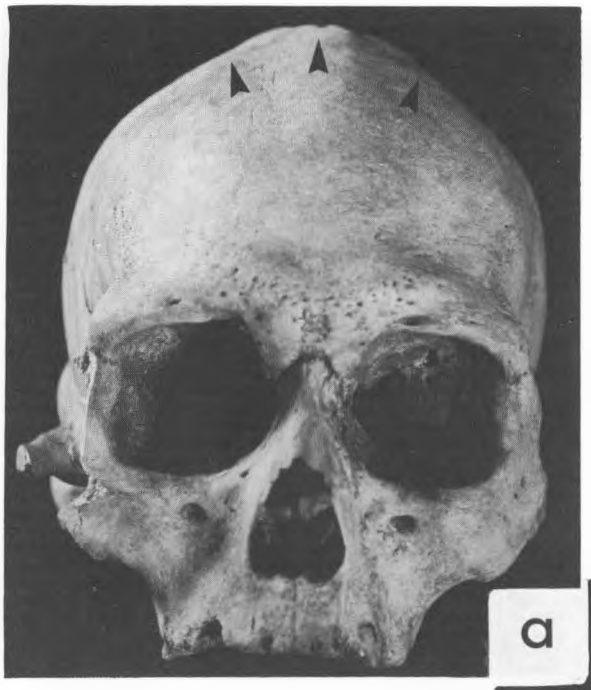
Burial 17: The bodies of lumbar vertebrae 3 and 4 have undergone massive osseous destruction:

L3—To the left of the body midline is a large aperture encroaching into the centrum. The lower vertebral border is involved by this hole and much of the central area of the inferior surface of this vertebra has been eaten away. This erosion expands backwards to finally take up the whole interpedicular surface of the body (except for the superior vertebral border).

L4—The pathologic agent of L3 is extended into L4. The central one-half of the body is completely eroded superiorly. The inferior surface is intact. Two large openings occur in the anterior surface of the body. The largest lay in the midline, the other to the left of this. The few portions remaining of the anterior superior border of the body have heavy syndesmophyte formation.

There is no involvement of the neural arch nor vertebral body collapse in either L3 or L4.

What seems to be the likely cause of the lesion is an advanced acute pyogenic staphylococcal infection of the intervertebral disc that has spread superiorly, inferiorly, and posteriorly into the adjacent vertebral bodies. The lesion is identical to that described by Kemp et al. (1973) in a clinical study of pyogenic infections of intervertebral discs. Figure 94



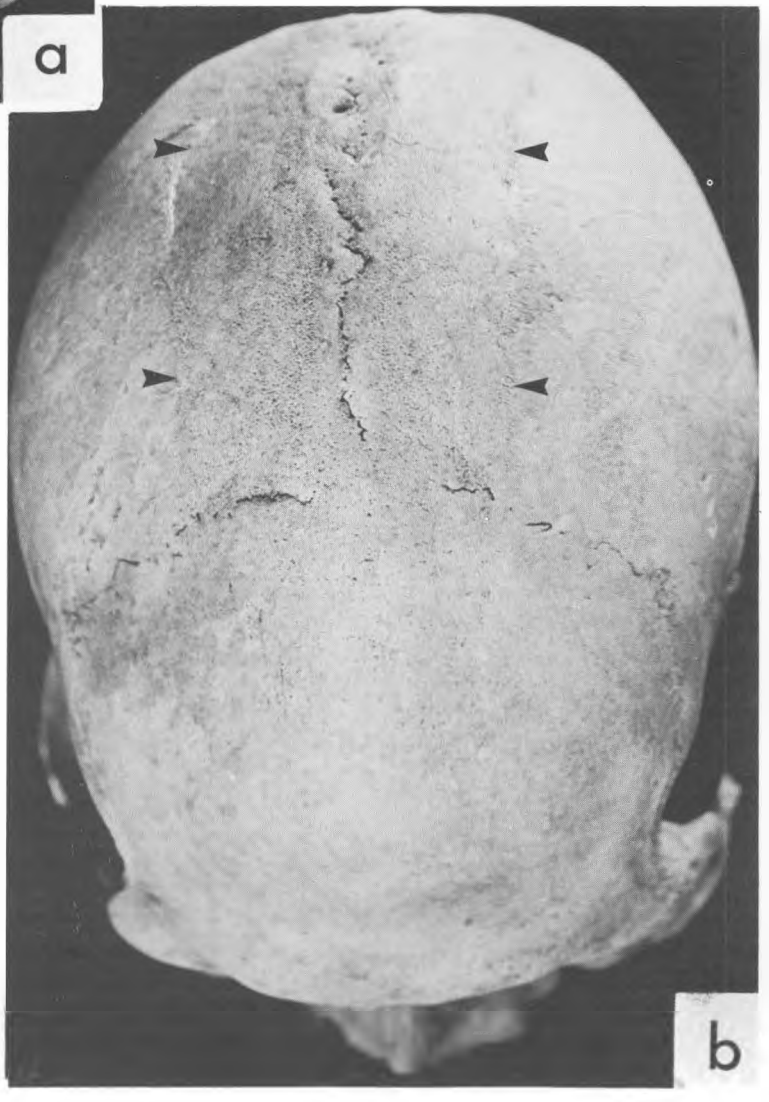


Fig. 93. *Arrows demarcate area of osteitic involvement in burial 10 from DgRr 1.*
a, Note the buildup of bone along the sagittal suture.
b, The extent of bone porosity and sclerosis can easily be seen in the involved area. The sclerosis is most evident along the sagittal suture.

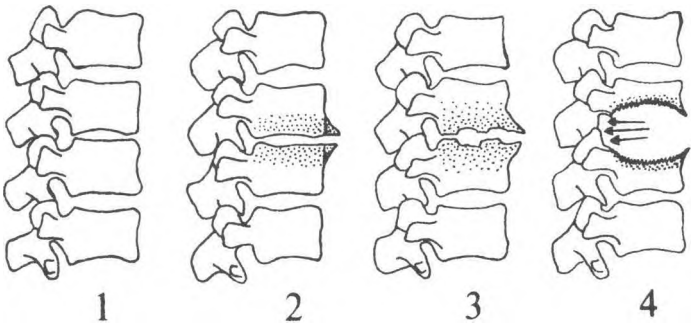


Fig. 94. *The features of pyogenic infection arising primarily in the intervertebral disc. 1. The earliest sign is narrowing of the intervertebral disc; 2. It is followed by an increase in the density of the adjacent areas of the proximal and distal vertebral bodies; 3. After a variable period, erosion of the vertebral plates occurs and is associated with reactive bone sclerosis; 4. Attempts at healing may occur by circumferential bone bridging. The remaining lesions show evidence of progression characterized by ballooning of the affected disc space and an extension of density to involve the vertebral body remnants. (adapted from Kemp et. al. 1973:701).*

shows and describes the various stages of osseous destruction. The fourth stage illustrated also represents the state of vertebrae L3 and L4 in Burial 17.

Pressure exerted backward onto the spinal cord as a result of a stage 4 infection frequently causes temporary paraplegia, and if the inflammatory process erodes the meninges and invades the spinal cord, irreversible paraplegia results (Kemp et. al. 1973: 707;709). It is conceivable that paraplegia and infection of the meninges occurred in Burial 17 from pressure on the cauda equina at the level of L3, and that this paraplegia along with the transport of the infectious agent within the meninges resulted ultimately in the death of the individual.

Tumours

There is a single instance of a possible benign bone tumour in burial 3. On the mid-lateral surface of the right tibia one-fifth of the way down the shaft is a nodule of bone, roughly circular in shape (1.2 cms. in diameter) and rising 0.3 cms. above the surrounding cortex. The central core of the nodule is more prominent and granular than the peripheral mounding of sclerotic bone. This description may indicate an osteoid osteoma, which is a highly distinctive benign bone tumour. It occurs mainly in young adults under 30 years of age, and it affects males over females by a ratio of 2:1 (Lichtenstein 1972; Robbins 1962). The tibia and femur account for at least one-half of osteoid-osteoma cases (Dahlin 1967). Radiographs of the Burial 3 tibia are to be taken, and if these reveal a central nidus surrounded by sclerotic bone formation, a diagnosis of osteoid osteoma may be justified.

Miscellaneous

The right scapula of Burial 2 has a small, hollow bony nodule (1 cm. by 1 cm.) located on the costal surface near the upper lateral border that may be a bone cyst.

Dental Disease

A majority of the maxillae from the sample are highly fragmented, and in a number of cases the mandibulae were not recovered during excavation. As a consequence of this situation only a brief description of the recognizable dental pathology follows here:

Burial 1: Six maxillary teeth have abscesses that were active at time of death, and two more healed abscesses are present with associated tooth loss. The mandible from this individual was not recovered.

Burial 2: Only three maxillary and eight mandibular teeth remain with this individual, the balance having been lost before death. Of these eleven remaining teeth, the maxillary right second molar and the

mandibular right and left first molars are carious and abscessed.

Burial 5: There are two abscesses present in the mandible: one active at the right first molar, and one healed with related tooth loss at the left first molar. The maxilla from this individual is too fragmented for dental observations.

Burial 10: All the maxillary teeth were lost before death, except the right third molar and left canine. The mandible was not recovered for Burial 10.

Burial 16: This is another burial lacking a mandible. In the maxilla there are three abscesses: at the right first premolar, the right lateral incisor, and the left first premolar.

Trauma

The incidence of trauma is quite high in the sample, occurring in 42.9% of the observed burials. The most common site of involvement is the vertebral bodies, though evidence of local trauma in the appendicular skeleton is also present.

Burial 1: On the superior surfaces of the vertebral bodies of T12, L1, and L2 are open lesions into the centre of the bodies. These lesions, averaging 1.1 cms. anterior-posterior by 2 cms. transversely, are probably the result of prolapse or herniation of the nucleus pulposus through the cartilaginous end plate of the intervertebral disc into the vertebral bodies. These herniations are referred to as Schmorl's nodes and they may occur as the result of injury or spontaneously (Bourke 1967). In this case, because the bodies of T12 and L1 have definite anterior compressions, a local trauma resulting in compression fractures is indicated.

Burial 2: The first lumbar vertebra is compressed anteriorly and is possibly a healed compression fracture. T11 is also compressed, though to a lesser degree than L1.

Burial 5: The superior left articular facet of the axis vertebra has been fractured, slightly separated, and healed, leaving an hourglass-shaped pitted depression in the middle of the facet. The anterior – posterior dimension of the facet has been correspondingly increased by 0.3 cms. The opposing facet of the atlas, although apparently not fractured, is similarly enlarged.

On the mid-right half of the frontal bone is a healed circular shallow lesion (1.2 cms. by 1.2 cms.) that exposes the diploë. It is possible that the lesion is the result of a heavy blow to the head, resulting in a small area of bone necrosis and regeneration. The inner table is not affected.

Burial 8: The posterior-medial one-third of the lateral condyle of the right tibia has been fractured, depressed 0.1 cms., and healed. The fracture site is marked by a ridge of porous bone.

Burial 13: A thoracic vertebral body (number ?) is compressed anteriorly and laterally to the left, and may represent a healed compression fracture. The pronounced lateral wedge-shape of the vertebra would probably have caused a moderate scoliosis.

Burial 15: The right lateral inferior border of the body of a mid-cervical vertebra shows rarefaction and upward compression, and may be the result of a compression fracture with intervertebral disc degeneration.

The anterior, medial one-half of the left tibial medial condyle is present. The posterior one-half of this fragment has a fracture line and associated nodular bone formation.

Trephination

A possible case of skull surgery is represented in Burial 8. In the right posterior quadrant of the frontal bone, near the midline, is a large oval healed perforation measuring 2.6 cms. anterior-posterior and 1.5 cms. transversely (Fig. 95). Slight bone regeneration is evident around the margin of this opening, which is surrounded by a ring of rarefied osteitic bone. This is in turn surrounded by a slightly mounded ring of sclerotic bone, making the total involved area 6.1 cms. anterior-posterior by 5.1 cms. transversely. The bevelling of the wound indicates that it was probably scraped open. The fact that the individual lived on for a relatively long period after the 'operation' is demonstrated by the osteitic changes and the amount of bone regeneration, a very slow process in cases of trephination (Lisowski 1967).

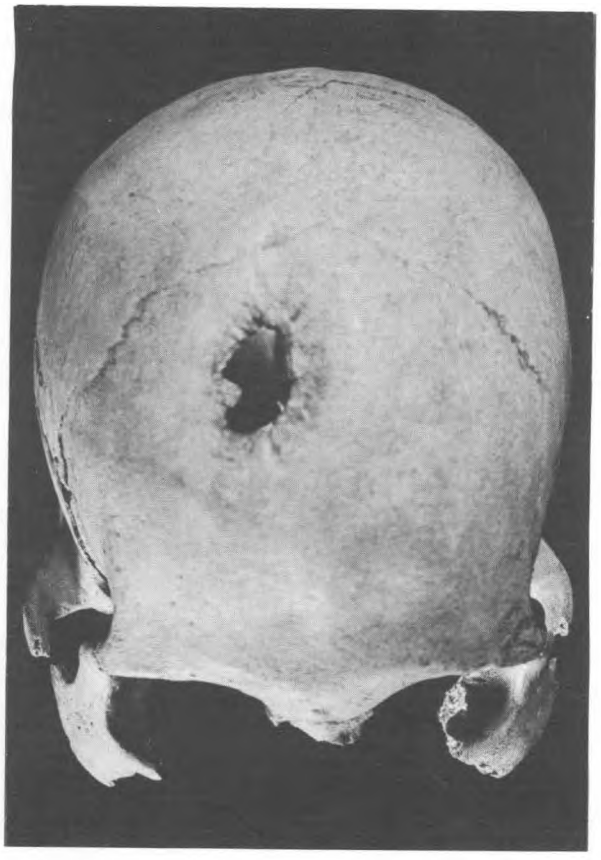


Fig. 95. Possibly an example of trephination.

Table 2. Pathologies

Burial Number	Degenerative Arthritis	Infections	Tumours	Bone Cysts	Dental Disease	Trauma	Trephination
1	X	X			X	X	
2	X			X	X	X	
3	X		X			X	
4	X						
5	X				X		
6	X						
7							
8	X					X	X
10	X	X			X		
13	X					X	
15						X	
16	X				X		
17		X					
18							

Discussion

Table 2 shows the distributions in the total observable sample of the pathologies previously described. Out of these fourteen individuals, 12 (85.7%) have at least one pathological condition. Ten (71.4%) individuals have pathologies other than degenerative arthritis. The relatively advanced ages of most of the burials generally account for the presence and degree of osteoarthritis, osteophytosis, and dental disease. There are no indications of any deficiency diseases in the sample.

Significant is the high incidence of trauma (42.9%) to the vertebral bodies and tibial condyles in both sexes. These types of fractures suggest a rigorous lifestyle consisting of activities resulting in substantial vertical compression on the major body-supporting skeletal structures.

It is also significant that the trephined skull belongs to the individual suffering from ankylosing spondylitis (Burial 8). The coincidental occurrence of two relatively rare conditions seems hard to believe. The skull surgery may have been a drastic form of treatment for what must have been a very painful malady.

The skeletal pathology of these prehistoric peoples gives us a hint of what some aspects of life must have been like on the Northwest Coast around 3000 years ago: Diet was sufficient to prevent detectable deficiency diseases; everyday activities were very strenuous, taking their toll on the skeleton through the years in the form of vertebral collapse and degenerative arthritic changes; there is evidence that trephination was practised during this period and a number of relatively uncommon pathologies occur in the sample, but the lack of further data prevents any comparisons to frequencies of the diseases in modern populations.

The diagnosis of pathological conditions solely from the bones of the skeleton is full of pitfalls — many different diseases can express themselves in nearly identical osseous lesions and alterations. Therefore, it is never wise to state absolutely the cause of a pathological state unless the information is very convincing (e.g. Burial 8). The diagnoses described in this paper are subject to revision after radiological and biochemical analyses have been carried out.

Stone Fish Traps of the Bella Bella Region

J.A. POMEROY

Introduction

Underhill states that (1945:9) ". . . the richest people in North America were the Indians of the Northwest Coast. Not rich in gold and silver! Even had they been able to dig those metals from the rocks the way the white man finds them now, the Indians would have thought of them only as another ornament like bear's claw and abalone shell. To them, wealth was more than ornament. Wealth was something a man could eat, wear or use to shelter him from the weather." Drucker adds (1963:35): "Fishing was the basis of Northwest Coast economy. The rivers and the sea provided an abundance of foods. There are five species of Pacific salmon, some of which 'run' annually in every river and stream along the coast." The subject of this paper is one of the methods of obtaining this extremely important food resource in the Bella Bella region of coastal British Columbia. This method was through the use of intertidal alignments of rock to trap fish.

Distribution of Stone Fish Traps

Linear arrangements of stone used to trap fish have a very widespread distribution. Intertidal stone-walled fish traps were widely used in Polynesia (Gifford 1929:177; Hiroa 1932:159; Beaglehole 1938:159; Handy 1932:91–7; Summers 1964). Dr. N. B. Tindale (pers. comm.) reports that there are rock alignment fish traps in the Bentick Island area of northern Australia. The main differences are that the rows of rocks have been cemented together by coral and that they are not at the mouths of streams (as they generally are on the Northwest Coast), as they are not intended to trap anadromous fish. He also informed me that the present method of utilizing these traps is that when the tide has receded the men go into the traps and spear the large fish, after which the women go in and catch the remaining fish.

Stone fish weirs *(saputit)* play an important role in the fishing activities of the Netsilik (Netsilingmiut) Eskimos of the northern Arctic coast (Balikci 1970). They are built across streams to catch seaward-bound salmon trout (arctic char). These traps are built near the sea in July and further upstream in August, the time of greatest usage.

An exhaustive survey of the world distributions of stone fish traps is not intended; the preceding statements are given to point out that such devices are not limited in distribution to the Northwest Coast.

On the British Columbia coast stone fish weirs or traps are quite broadly distributed along the entire coast, although the central portion appears to have the highest density. Drucker (1950:166–7) lists the use of tidewater salmon traps by the Nootka, Kwakiutl, Tsimshian, Haida and Tlingit and the use of stone salmon traps by the Owikeno and Chilkat. Drucker earlier (1943:109–10) mentions stone tidal fish weirs, describing them as both unelaborate structures and elaborate ones constructed of low walls of sizeable beach boulders. Hobler (1970:82–3) states that stone fish traps in the Bella Coola region are limited to the western edge of the territory which he has surveyed, a zone which overlaps the Bella Bella survey area. Stone fish traps are found on

Vancouver Island (Boas 1909:462) and at various places on the shores of Georgia Strait. Mitchell's survey of the Johnstone Strait region (1972:22) produced out of 687 sites only eight sites classified as 'miscellaneous' which included isolated canoe runs, fish traps and rock cairns.

Stone fish traps are found in the Queen Charlotte Islands (Hobler, pers. comm.). Alexander (pers. comm.) reports that during his survey of Princess Royal Island he found only two stone fish traps. Simonsen (1973:31–2) mentions that in his 1969 survey of the Hecate Strait-Milbanke Sound area 40 fish traps were found out of a total of 108 sites. Simonsen's survey area, in effect, overlaps the Bella Bella survey area; therefore the high concentration of this type of trap is not surprising. Simonsen refers to Barnett (1955:82), who briefly describes tidal traps on flats adjacent to the mouths of streams in Coast Salish areas. It is interesting to note that these traps were also used to catch seal and sturgeon as well as salmon. Simonsen also points out that de Laguna (1960:116) reports stone traps in the Tlingit territory. On the origin of semicircular stone tidal traps, Simonsen refers to Beynon (1948, vol. U.U.: 1): "Beynon has stated that the concept was originally used in the north by a Skeena River group and later adopted by groups farther south."

Bella Bella Fish Traps

In 1968 a project was inaugurated by the University of Colorado, under the leadership of James J. Hester, to investigate the prehistory of the Bella Bella (northern Kwakiutl) people. Site survey was started under this project and then continued during the field seasons of 1969, 1970, 1971 and 1974, by the author. 438 sites were recorded including middens, fish traps, art (pictograph, petroglyph) and a few miscellaneous types such as canoe skids and recent cabins. I have divided the 109 fish trap sites into two major types and four subtypes (see Fig. 96). These types are rock alignments set *in the mouths* of streams or rivers (Fig. 97), and tidal traps *at the sides* of mouths of streams or rivers (Fig. 98). In some cases, where they are found by extremely small streams, it seems hard to believe that any salmon would be going up these streams: therefore either other species or salmon milling about in the area when the tide went out could have been trapped in these rock catchments.

The types of fish trap range from extremely large ones, generally semicircular to small traps of simple alignments of rocks across streams. Some large traps are 300 to 400 metres long and 50 metres deep from shore to trap (Fig. 99). The range of height of fish traps also varies considerably: the highest one we've recorded is about two and one-half metres, and has been silted in behind so we don't know whether the trap originally was this height on both sides or was just a built-up rock face with a low trap around the rim.

In addition to fish traps a number of mounds of rocks have been recorded either associated with midden sites or on beaches; the meaning of these is rather obscure. Some of these are small heaps of rocks and some are complete circles of rocks. The mounds may very well be quite recent and be remnants of anchoring structures for wood pilings related to logging operations. The significance of the circular configurations is not known.

A number of rock alignments which are not at right angles to the stream, but are longitudinal (Fig. 97) probably served as foundations in which to place basket traps; that is, two or more lines of rocks parallel with the stream with a funnelling set of rocks at the upstream end. The fish would be caught in the baskets as they came down the stream, or at ebb tide. Boas (1909) and Drucker (1943) illustrate similar traps.

The largest number of traps is the single or simple variety, of which there are 65 surveyed for the Bella Bella region. The greatest density of this type is found in the survey units FbTb, FbTa and FaTb, and FaTa (Fig. 100). The present town of Bella Bella happens to fall almost in the centre of this concentration of sites. The highest density of multiple or complex fish traps (44) falls in the survey units ElTa, ElTb, FaTa, FcTa and FcSx.

One can predict fairly accurately where fish traps will be found. Almost every stream, small or large, has some type of stone fish trap associated with it. There are a number of situations where there is a combination of the various types of traps. There may be intricate semicircular traps on the sides of a stream as well as traps across the stream, and there may also be alignments of rocks parallel within the stream.

Where there is considerable beach area and it is quite flat, the larger and more complex traps are found. These traps are usually of the type consisting of a number of semicircular rock alignments (Fig. 99)

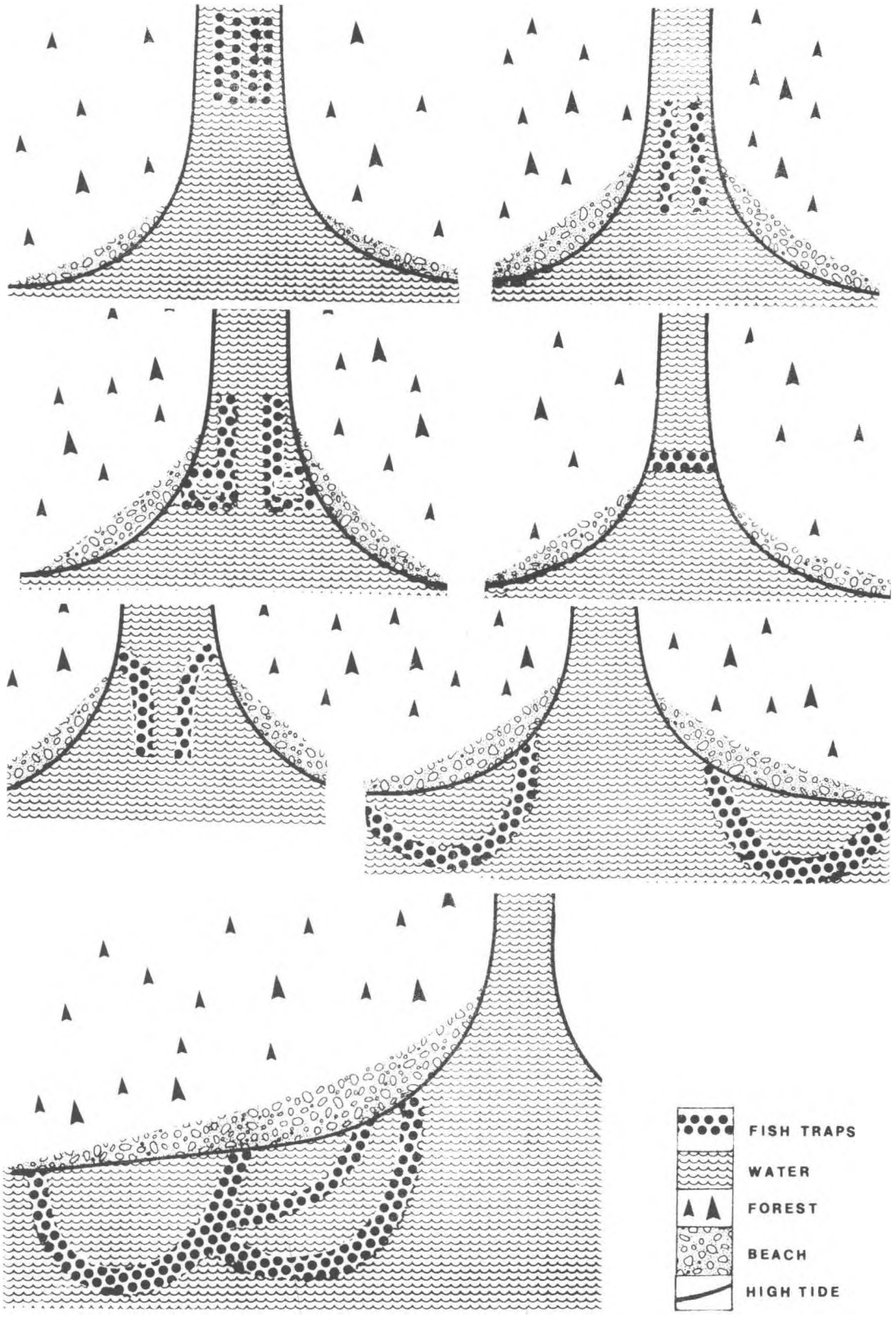


Fig. 96. *Schematic diagrams of stone fish traps.*

Fig. 97. Fish trap in Kildidt Lagoon (ElTa 21).

connected together to form one large trap on one or both sides of the stream. These large traps are often associated with midden sites and with other lines of rock radiating from the higher beach out towards the deeper water (these are assumed to be the remnants of canoe skids and not fish traps): an example of this is the site at Troup Passage (FbSx 2) (Fig. 101). Fish trap survey data indicates no relation with pictographs.

The occurrence of the simple type of trap generally is at the mouths of small streams or estuaries. Generally the smaller streams with rocky beaches on either side have small traps, usually the type which just crosses the stream. They often are found at great distances from midden sites and quite far up in lagoons which meander for considerable distances in among the coastal islands. It is assumed that the Indians spent a great deal of time travelling these distances to collect various types of fish from the traps. Ethnographic information, particularly from Willy Gladstone of Bella Bella, indicates that the rock fish traps were used for not only salmon but any species of fish which might be caught in them. One interesting lagoon is Kildidt Lagoon, on Hunter Island. This is a very long lagoon with meandering arms in the interior section. Wherever small streams enter it, small cross-stream traps are found. They usually, but not always, are just at the mouth of a stream, so that at ebb tide the trap is out of the water. The shape most often is slightly bowed, the concave side of the bowing towards the stream. Often these have fairly large piles of rocks at either end of the trap against the shore or are built utilizing large boulders which crop out at the shoreline. Natural topography is utilized to take advantage of large boulders or the narrower part of the stream bed. The amount of work involved in constructing these traps must have been considerable, as some of the stones in the traps often are quite large and would have had to be moved considerable distances. This indicates the importance of the traps to the people building them. I suspect that it would take more than a single individual to construct them — probably a family unit or perhaps a group of villagers. Ethno-

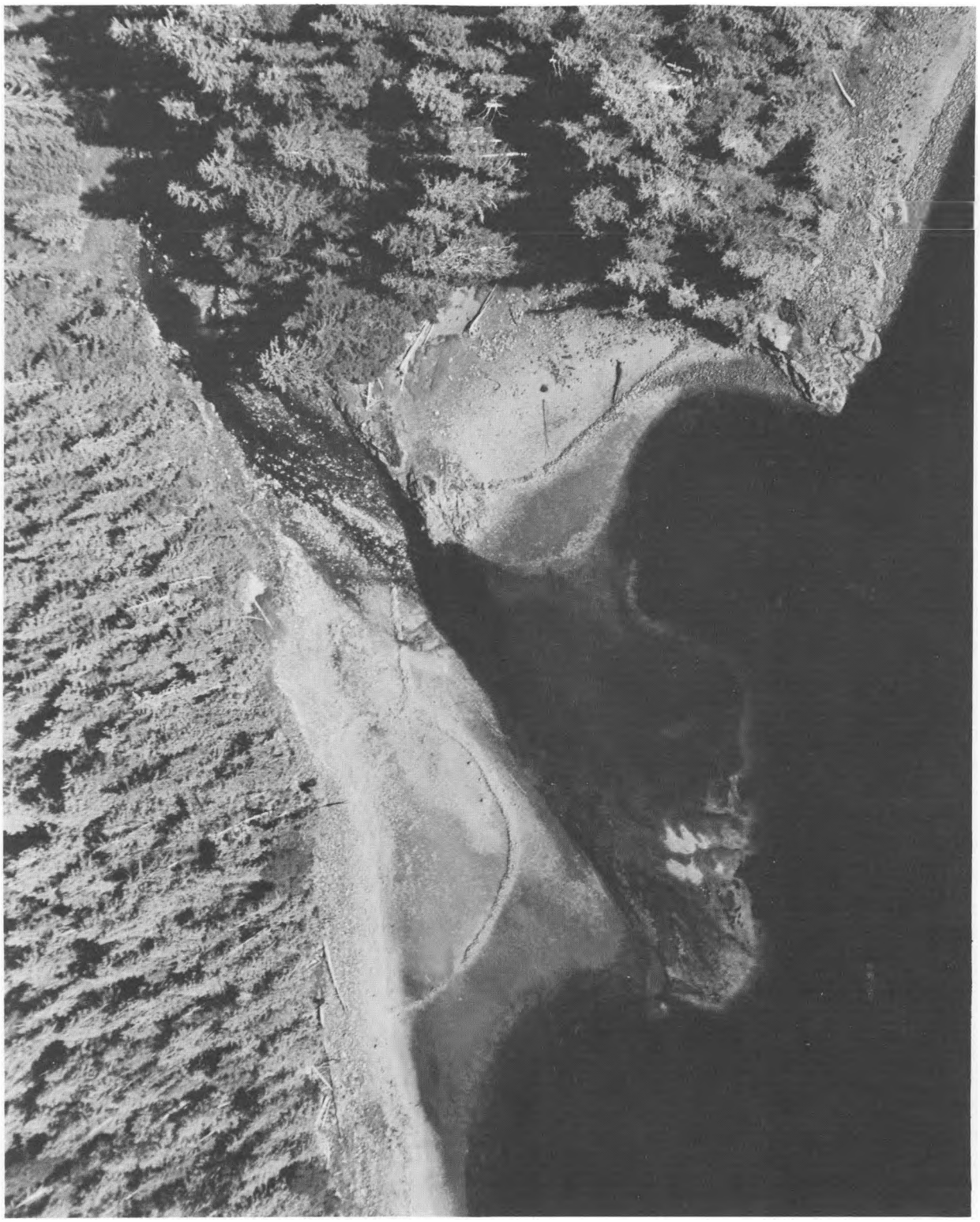


Fig. 98. *Complex intertidal trap flanking stream mouth at Yeo Bay (FbTb 13).*

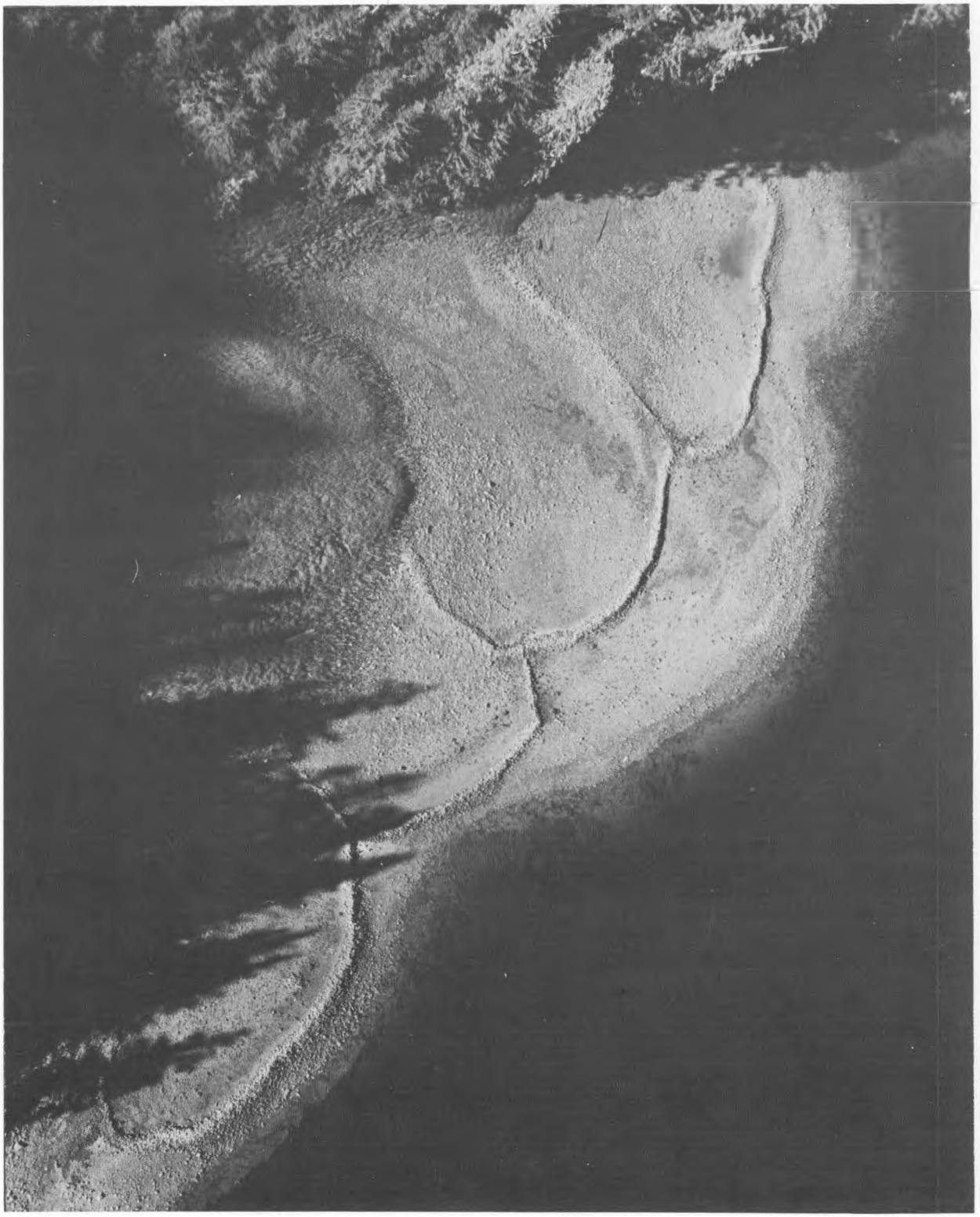


Fig. 99. *Complex intertidal trap at Evans Inlet (FaSw 3).*

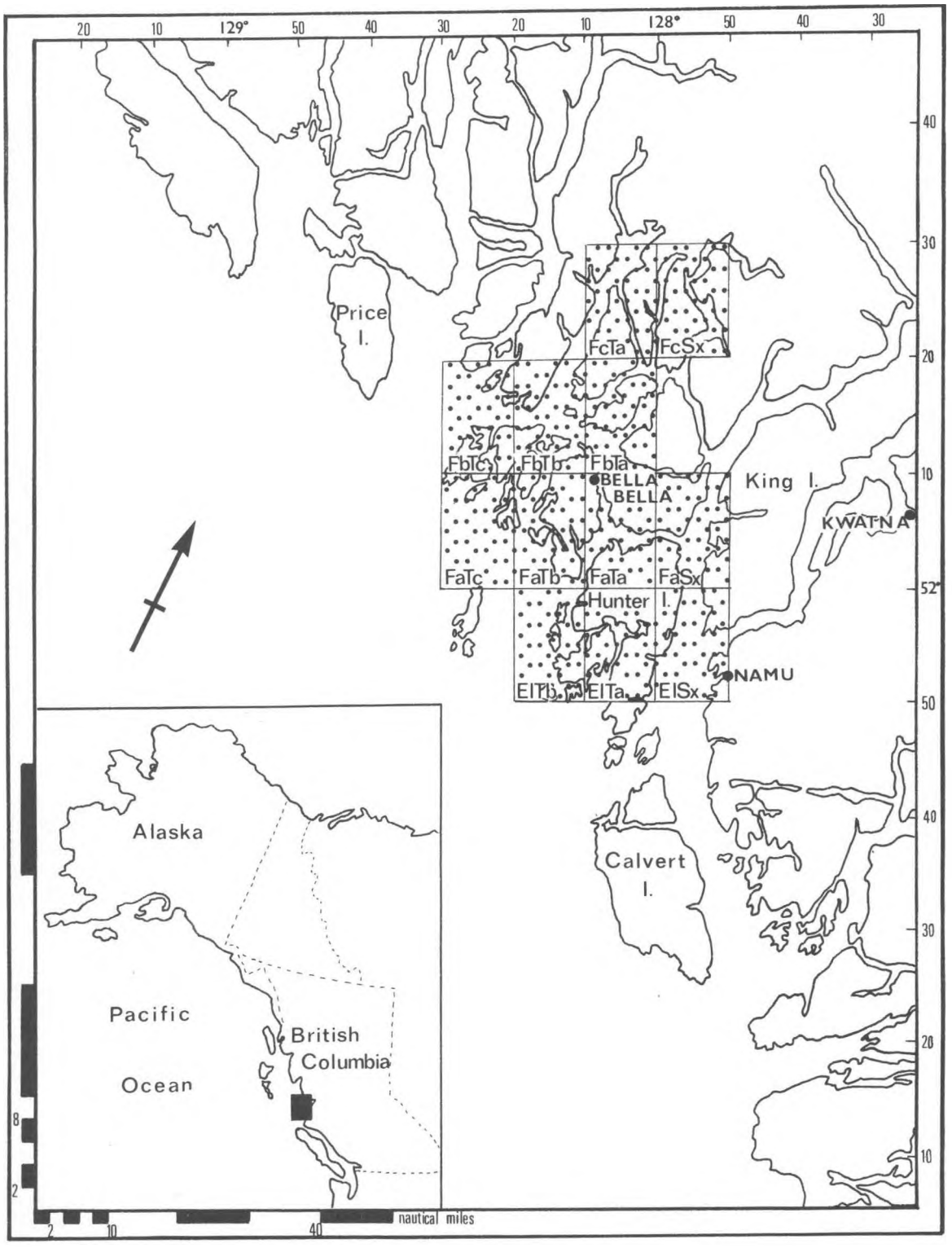


Fig. 100. *Map of the Bella Bella region. Fish traps are found in the shaded grid squares in the following frequency: FcTa, 5; FcSx 5; FbTc, 3; FbTb, 10; FbTa, 7; FaTc, 4; FaTb, 15; FaTa, 10; ElTb, 10; ElTa, 14; ElSx, 3.*

Fig. 101. *Two views of the fish trap on Troup Passage (FbSx 2).*

graphic data suggest that the traps were owned and used by specific village groups and the use of a set of traps was probably respected and exclusive to the owners.

The ethnographic information that we've been able to obtain indicates that stone fish traps were used up until quite recently: as a matter of fact, some of them look as though they've been repaired and are still being used. It is my feeling that these traps have probably been used as long as the middens, at least those which are associated with them. Salmon remains from Namu (dated about 9100 B.P.) were present in the lowest levels in a similar percentage as in the upper levels (Hester, pers. comm.). There are fish traps right below the Namu midden in the harbour and a good fish spawning stream going up to Namu Lake. These fish traps extend out into the harbour, though not directly in front of or beside the streams, suggesting that at low tide they caught fish milling about while waiting to go upstream. Sea levels have remained stable since 1000 B.C., according to current geomorphological information (Retherford 1970), and it is hypothetically possible that these traps are that old.

Summary and Conclusions

The present survey data of Northwest Coast sites indicate that the greatest density of stone fish traps is found in the northern Kwakiutl region. These traps can be roughly classified into two major types and four subtypes. Of the two major types, the large and complex variety is generally found in association with the larger salmon spawning streams found in the eastern portion of the area. No really large salmon streams are present in Bella Bella territory. The highest concentration of the other major type, the single or simple trap, is found in the western portion, particularly associated with quite small streams and lagoons of the outer islands. This device appears to have been essential to the successful adaptation of the Bella Bella peoples to this coastal habitat in which really large salmon streams are lacking.

REFERENCES

Allen, Durward Leon

1967 *The life of Prairies and Plains.* McGraw-Hill, New York.

Allen, W.L. and J.B. Richardson III

1971 The reconstruction of kinship from archaeological data: the concepts, the methods, and the feasibility. *American Antiquity* 36(1): 41–53.

Arnold, Dean

1970 The emics of pottery design from Quinua, Peru. Unpublished Ph.D. dissertation. Department of Anthropology, University of Illinois.

1971 Ethnomineralogy of Ticul, Yucatan potters: etics and emics. *American Antiquity* 36(1): 20–40.

Arsenault, Bona

1966 *History of the Acadians.* Le Conseil de la vie français en Amérique, Québec.

Ascher, Robert

1961 Analogy in archaeological interpretation. *Southwestern Journal of Anthropology* 17(4): 317–325.

1962 Ethnology for archaeology: a case from the Seri Indians. *Ethnology* 1(3): 360–369.

1968 Time's arrow and the archaeology of a contemporary community. In *Settlement archaeology,* edited by K.C. Chang, pp. 43–52. National Press Books, Palo Alto.

Balikci, Asen

1970 *The Netsilik Eskimo.* Natural History Press, Garden City.

Barnett, H.G.

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

Beaglehole, Ernest and Pearl Beaglehole

1938 Ethnology of Pukapuka. *Bernice P. Bishop Museum, Bulletin* 150.

Beattie, Owen

1973 Personal communication.

1974a A descriptive analysis of 18 human burials recovered during the 1972 salvage excavations at Crescent Beach (DgRr 1), British Columbia. Museum of Archaeology and Ethnology, Simon Fraser University. manuscript.

1974b Personal communication.

Benmouyal, J.

1973 Rapport préliminaire sur trois sites archaiques en Gaspésie. Department of Cultural Affairs, Quebec. manuscript.

Beynon, William

1948 Field notes. Folklore Division, National Museum of Canada, Ottawa.

Binford, Lewis R.

1964 A consideration of archaeological research design. *American Antiquity* 29(4): 425–441.

1967 Smudge pits and hide smoking: the use of analogy in archaeological reasoning. *American Antiquity* 32 (1): 1–12.

1968a Archaeological perspectives. In *New perspectives in archeology,* edited by S.R. and L.R. Binford, pp. 5–32. Aldine, Chicago.

1968b Methodological considerations of the archeological use of ethnographic data. In *Man the hunter,* edited by R.B. Lee and I. DeVore, pp. 268–273. Aldine, Chicago.

1972 *An archaeological perspective.* Seminar Press, New York.

Binford, S.R. and L.R. Binford (Editors.)

1968 *New perspectives in archeology.*

Aldine, Chicago.

Blake, M.
1974 A proposed sampling design for housepit excavation. Paper presented at the 7th annual meeting of the Canadian Archaeological Association, Whitehorse.

Boas, Franz
1909 The Kwakiutl of Vancouver Island. *American Museum of Natural History, Memoir* 8(2): 301–522.

1934 Geographical names of the Kwakiutl Indians. *Columbia University Contributions to Anthropology* 20: 1–83.

Boland, Edward W.
1966 Ankylosing spondylitis. In *Arthritis and allied conditions,* edited by Joseph L. Hollander, pp. 633–655. Lea and Febiger, Philadelphia.

Bonnichsen, Robson
1973 Millie's camp: an experiment in archaeology. *World Archaeology* 4 (3): 277–291.

Borden, Charles E.
1952a Results of archaeological investigations in central British Columbia. *Anthropology in British Columbia, Memoir* 3: 31–43.

1952b A uniform sites designation scheme for Canada. *Anthropology in British Columbia, Memoir* 3: 44–48.

Bourke, J.B.
1967 A review of the palaeopathology of the arthritic diseases. In *Diseases in antiquity,* edited by D.R. Brothwell and A.T. Sandison, pp. 352–370. C.C. Thomas, Springfield.

Bourque. J.R.
1971 Architectural and social life of the Acadians in New Brunswick. Unpublished M.A. thesis. Cooperstown University.

Boyd, William
1961 *Textbook of pathology.* Lea and Febiger, Philadelphia.

Brebner, J.B.
1927 *New England's outpost.* Columbia University Press, New York.

Brooks, Sheilagh T.
1955 Skeletal age at death: the reliability of cranial and public age indicators. *American Journal of Physical Anthropology* 13: 567–597.

Bryan, A.L.
1963 An archaeological survey of northern Puget Sound. *Occasional Papers of the Idaho State University Museum* 11.

Burley, D.V.
1974 Preliminary analysis of the structural features of the Laurant–Cyr house, St. Basil, New Brunswick. Historical Resources Administration of New Brunswick, Fredericton. manuscript.

1975 Acadian archaeology 1974: a final report. Acadian Village Museum, Caraquet, New Brunswick. manuscript.

Campbell, J.M.
1968 Territoriality among ancient hunters: interpretations from ethnography and nature. In *Anthropological archeology in the Americas,* edited by B.J. Meggers, pp. 1–21. Anthropologica Society of Washington, Washington.

Carlson, R.L.
1960 Chronology and culture change in the San Juan Islands, Washington. *American Antiquity* 25: 562–586.

1970 Excavations at Helen Point on Mayne Island. In Archaeology in British Columbia, new discoveries, edited by R.L. Carlson. *B.C. Studies* (Special Issue) 6–7: 113–125.

1972 Excavations at Kwatna. In Salvage '71, edited by R.L. Carslon. *Department of Archaeology Simon Fraser University Publication* 1: 41–58.

Chamberlin, T.C.
1965 The method of multiple working hypotheses. *Science* 148: 754–759. (Originally printed in *Science,* Old Series 15: 92, 1890).

Clark, A.H.
1968 *Acadia.* University of Wisconsin Press, Madison.

Clark, P.J. and F.C. Evans
1954 Distance to nearest neighbor as a measure of spatial relationships in populations. *Ecology* 35: 445–453.

Clarke, D.L.
1972 Review of "Explanation in archaeology: an explicitly scientific approach" by P.J. Watson, S.A. LeBlanc and C.L. Redman. *Antiquity* 46(183): 237–239.
1973 Archaeology: the loss of innocence. *Antiquity* 47(185): 6–18.

Cochran, W.G.
1963 *Sampling techniques.* John Wiley, New York.

Coues, Elliot (Editor.)
1965 *History of the expedition under the command of Lewis and Clark.* Dover Publications, Inc., New York.

Curtis, E.
1914 *The North American Indian,* Vol. 5. Johnson Reprint Corporation, New York.

Dahlin, David C.
1967 *Bone tumors.* C.C. Thomas, Springfield.

David, Nicholas
1971 The Fulani compound and the archaeologist. *World Archaeology* 3(2): 111–131.

David, Nicholas and Hilke Hennig
1972 The ethnography of pottery: a Fulani case seen in archaeological perspective. *Addison-Wesley Modular Publication* 21: 1–29.

Deetz, J.F.
1970 Archeology as a social science. In Current directions in anthropology, edited by Ann Fischer. *American Anthropological Association, Bulletin* 3(32): 115–125.

de Laguna, Frederica
1960 The story of a Tlingit community: a problem in the relationship between archaeological, ethnological, and historical methods. *Bureau of American Ethnology, Bulletin* 172.

Diereville, N.
1933 *Relation of the voyage to Port Royal in Acadia of New France,* translated by A.C. Webster. The Champlain Society, Toronto.

Donahue, Paul
1973 Ulkatcho: an archaeological outline. *Syesis* 6: 153–178.
1974 On applying geographical techniques to archaeological problems. Paper presented at the 7th annual meeting of the Canadian Archaeological Association, Whitehorse.

Donnan, Christopher B.
1971 Ancient Peruvian potter's marks and their interpretation through ethnographic analogy. *American Antiquity* 36(4): 460–466.

Dozier, E.P.
1970 The Pueblo Indians of North America. In *Case studies in cultural anthropology,* edited by George and Louise Spindler. Holt, Rinehart & Wilson, New York.

Drucker, Philip
1943 Archaeological survey on the northern Northwest Coast. *Bureau of American Ethnology, Bulletin* 133: 17–154.
1950 Culture element distributions: XX-VI Northwest Coast. *University of California Anthropological Records* 9(3): 157–294.
1963 *Indians of the Northwest Coast.* Natural History Press, Garden City.

Duff, W.
1952 The upper Stalo Indians. *Anthro-*

pology in British Columbia, Memoir 1: 1–136.

Ekland, Carolyn
1974 Salvage excavations at the BLM bison trap. Peabody Coal Company. report.

Evans, D.J.R. and R. Wilmeth
1971 Neutron activation analysis fingerprinting of obsidian artifacts. Atomic Energy of Canada, Ltd., Commercial Products Div. report no. CPSR–314.

Fewkes, Jesse W.
1900 Tusayan migration traditions. *Bureau of American Ethnology, Annual Report* 19: 577–633.

Flannery, Kent V.
1972 Archaeological systems theory and early Mesoamerica. In *Contemporary archaeology,* edited by Mark P. Leone, pp. 222–234. Southern Illinois University Press, Carbondale.

Fredlund, Dale E.
1973 1971 archaeological reconnaissance and salvage excavations on Peabody Coal Company lands, Rosebud County, Montana. In *Statewide archaeological survey, special report.* University of Montana, Missoula.

Friedrich, M.H.
1970 Design structure and social interaction: archaeological implications of an ethnographic analysis. *American Antiquity* 35(3): 332–343.

Fritz, J.M. and F.T. Plog
1970 The nature of archaeological explanation. *American Antiquity* 35 (4): 405–412.

Funk, R.E.
1972 Early man in the Northeast and the late-glacial environment. *Man in the Northeast* 4: 7–39.

Ganong, W.F.
1899 A monograph of historic sites in the province of New Brunswick. *Transactions of the Royal Society of Canada,* Series 2, 5:213–357.

1904 A monograph on the origins of settlements in the province of New Brunswick. *Transactions of the Royal Society of Canada,* Series 2, 10:3–185.

Garrad, C.
1971 Ontario fluted point survey. *Ontario Archaeology* 16: 3–18.

Gifford, Edward W.
1929 Tongan society. *Bernice P. Bishop Museum, Bulletin* 61.

Gilbert, B. Miles and Thomas W. McKern
1973 A method for aging the female *os pubis. American Journal of Physical Anthropology* 38: 31–38.

Good, Armin E.
1967 Nontraumatic fracture of the spine in ankylosing spondylitis. *Arthritis and Rheumatism* 10: 467–469.

Gould, Richard A.
1968a Chipping stones in the outback. *Natural History* 77(2): 42–49.

1968b Living archaeology: the Ngatatjara of western Australia. *Southwestern Journal of Anthropology* 24(2): 101–122.

1971 The archaeologist as ethnographer: a case from the western desert of Australia. *World Archaeology* 3(2): 143–177.

1973 Australian archaeology in ecological and ethnographic perspective. *Warner Modular Publication* 7: 1–33.

Griffeths, N.E.S.
1969 The Acadian deportation: deliberate perfidy or cruel necessity? In *Issues in Canadian history,* edited by J.L. Granatstein. Copp Clark, Toronto.

Handy, E.S. Craighill
1932 Houses, boats, and fishing in the Society Islands. *Bernice P. Bishop Museum, Bulletin* 90.

Hannay, J.
1879 *The history of Acadia.* MacMillan and Co., Saint John.

Hanson, G.W.
1973 The Katz site: a prehistoric pithouse settlement in the lower Fraser Valley, British Columbia. Unpublished M.A. thesis. Department of Anthropology, University of British Columbia.

Heider, Karl G.
1967 Archaeological assumptions and ethnographical facts: a cautionary tale from New Guinea. *Southwestern Journal of Anthropology* 23 (1): 52–64.

Hill, J.N.
1970 Prehistoric social organization in the American Southwest: theory and method. In *Reconstructing prehistoric Pueblo societies,* edited by W.A. Longacre, pp. 11–58. University of New Mexico Press, Albuquerque.

Hiroa, Te Rangi (Peter H. Buck)
1932 Ethnology of Manihiki and Rakahanga. *Bernice P. Bishop Museum, Bulletin* 99.

Hobler, Philip M.
1970 Archaeological survey and excavations in the vicinity of Bella Coola. In Archaeology in British Columbia, new discoveries, edited by R.L. Carlson. *B.C. Studies* (Special Issue) 6–7: 77–94.

Huskisson, E.C. and F. Dudley Hart
1973 *Joint disease: all the arthropathies.* John Wright and Sons Ltd., Bristol.

Husted, Wilfred M.
1969 Bighorn Canyon archaeology. *Smithsonian Institution River Basin Surveys, Publications in Salvage Archaeology* 12.

Jaffe, Henry L.
1972 *Metabolic, degenerative, and inflammatory diseases of bones and joints.* Lea and Febiger, Philadelphia.

Johnson, Leroy
1972 Problems in "avant-garde" archaeology. *American Anthropologist* 74: 366–377.

Jones, E.W.
1955–1956 Ecological studies on the rain forest of southern Nigeria, IV The plateau forest of the Okomu Forest Reserve. *Journal of Ecology* 43: 564–594; 44: 83–117.

Judge, J.W., J.I. Ebert and R.K. Hitchcock
1973 Transect sampling in regional archaeological survey. Paper presented at the 38th annual meeting of the Society for American Archaeology, San Francisco.

Kehoe, Alice B. and T.F. Kehoe
1973 Cognitive models for archaeological interpretation. *American Antiquity* 38(2): 150–154.

Kemp, H.B.S., J.W. Jackson, J.D. Jeremiah and A.J. Hall
1973 Pyogenic infections occurring primarily in intervertebral discs. *Journal of Bone and Joint Surgery* 55B: 698–714.

Kenady, S.
1970 An archaeological reconnaissance: the west coast of Vancouver Island. Archaeological Sites Advisory Board, Victoria. manuscript.

Kershaw, K.A.
1973 *Quantitative and dynamic plant ecology,* 2nd edition. William Clowes & Sons, London.

Kew, M.
1973 Notes on preliminary ethnographic fieldwork among the southern Carrier Indians, 1972. Department of Anthropology and Sociology, University of British Columbia. manuscript.

Kidd, R.S.
1964 A synthesis of western Washington prehistory from the perspective of three occupation sites. Unpublished M.A. thesis. Department of Anthro-

pology, University of Washington.

1969 The archaeology of the Fossil Bay site, Sucia Island, northwestern Washington state, in relation to the Fraser delta sequence. *National Museum of Canada, Bulletin* 232, *Contributions to Anthropology* VII: *Archaeology, Paper* 2.

King, A.R.
1950 Cattle Point, a stratified site in the southern Northwest coast region. *Society for American Archaeology, Memoir* 7.

Krogman, W.M.
1962 *The human skeleton in forensic medicine.* C.C. Thomas, Springfield.

Krumbein, W.C.
1965 Sampling in paleontology. In *Handbook of paleontological techniques,* edited by Bernhard Kummel and David Raup, pp. 137–150. W.H. Freeman, San Francisco.

Lange, F.W. and C.R. Rydberg
1972 Abandonment and post-abandonment behavior at a rural Central American house-site. *American Antiquity* 37(3): 419–434.

Lauer, P.K.
1971 Changing patterns of pottery trade to the Trobriand Islands. *World Archaeology* 3(2): 197–209.

Lee, T.E.
1969 Some remarkable archaeological sites in the Gaspé. *Anthropological Journal of Canada* 8(2): 28–30.

Lichtenstein, Louis
1972 *Bone tumors.* C.V. Mosby Co., Saint Louis.

Lisowski, F.P.
1967 Prehistoric and early historic trepanation. In *Diseases in antiquity,* edited by D.R. Brothwell and A.T. Sandison, pp. 651–672. C.C. Thomas, Springfield.

Loendorf, Lawrence L.
1969 The results of the archaeological survey in the Pryor Mountain-Bighorn Canyon recreation area – 1968. National Parks Service, Montana. manuscript.

Longacre, W.A. (Editor.)
1970 *Reconstructing prehistoric Pueblo societies.* University of New Mexico, Albuquerque.

Longacre, W.A. and James Ayers
1968 Archeological lessons from an Apache wickiup. In *New perspectives in archeology,* edited by S.R. Binford and L.R. Binford, pp. 151–160. Aldine, Chicago.

Loucks, D.
1962 A forest classification for the Maritime provinces. *Nova Scotia Institute of Science, Proceedings* 25.

MacDonald, G.F.
1971 A review of research on Paleo-Indian in eastern North America, 1960–1970. *Arctic Anthropology* VIII(2): 32–41.

Martijn, C.A.
1973 Etat de la recherche en préhistoire du Québec. Paper presented at the 2nd Colloque sur le Quaternaire du Québec, Université de Montréal.

Martijn, C.A. and E.S. Rogers
1969 Mistassini-Albanel: contributions to the prehistory of Quebec. *Centre d'Etudes Nordiques, Travaux Divers* 25.

Matson, Fred (Editor.)
1965 Ceramics and man. *Viking Fund Publication in Anthropology* 41.

Matson, R.G.
1970 A stratified survey in the Cerbat Mountains, Arizona. Paper presented at the Southwestern Anthropological Meetings, Asilomar.

Matson, R.G. and W.D. Lipe
1973 Regional sampling: a case study on Cedar Mesa, Utah. Paper presented at the 38th annual meet-

ing of the Society for American Archaeology, San Francisco.

McKern, Thomas W. and T. Dale Stewart
1957 *Skeletal age changes in young American males.* U.S. Army Quartermaster Research and Development Command, Natick.

McMurdo, A. de G.T.
1972 A typological analysis of barbed bone and antler projectile points from the Northwest coast. Unpublished M.A. thesis. Department of Archaeology, Simon Fraser University.

Mindeleff, Cosmos
1900 Localization of Tusayan clans. *Bureau of American Ethnology, Annual Report* 19: 639–653.

Mitchell, D.H.
1971a Archaeology of the Gulf of Georgia area, a natural region and its culture types. *Syesis* 4, Supplement 1.
1971b The Dionisio Point site and Gulf Island culture history. *Syesis* 4: 145–165.
1972 Artifacts from archaeological surveys in the Johnstone Strait area. *Syesis* 5: 21–42.

Morgan, C.G.
1973 Archaeology and explanation. *World Archaeology* 4(3): 259–276.

Morice, A.
1904 *The history of the northern Interior of British Columbia.* Ye Galleon Press, Farfield (1971).

Mueller, J.W.
1974 The use of sampling in archaeological survey. *Society for American Archaeology, Memoir* 28.

Mulloy, W.
1958 A preliminary historical outline for the northwestern Plains. *University of Wyoming Publication* 22: 1–235.

Nelson, D.E., J.M. D'Auria and R.B. Bennett
1975 Characterization of Pacific Northwest Coast obsidian by x-ray fluorescence analysis. *Archaeometry* 17(1): 85–97.

Neustupný, Evžen
1971 Whither archaeology? *Antiquity* 45 (177): 34–39.

Neyman, J.
1939 On a new class of "contagious" distributions. *Annals of Mathematical Statistics* 10: 35–57.

Nicklin, Keith
1971 Stability and innovation in pottery manufacture. *World Archaeology* 3 (1): 13–48.

Nordin, B.E.C.
1973 *Metabolic bone and stone disease.* Churchill Livingstone, London.

Oliver, E.K.
1973 Preliminary report to the Archaeological Sites Advisory Board of B.C. on the first summer of excavation (1972) at site DcRu 2, Esquimalt Lagoon. Archaeological Sites Advisory Board, Victoria. report.

Parsons, E.C.
1940 Relations between ethnology and archaeology in the Southwest. *American Antiquity* Old Series 3: 214–220.

Percy, Richard C.W.
1972a Miscellaneous archaeological work: 1971. In Salvage '71, edited by R.L. Carlson. *Department of Archaeology Simon Fraser University Publication* 1: 157–175.
1972b Salvage archaeology at Crescent Beach. Museum of Archaeology and Ethnology, Simon Fraser University. manuscript.
1974 The prehistoric cultural sequence at Crescent Beach, British Columbia. Unpublished M.A. thesis. Department of Archaeology, Simon Fraser University.

Petersen, Nicholas
1968 The pestle and mortar: an ethno-

graphic analogy for archaeology in Arnhem land. *Mankind* 6(11): 567–570.

Pielou, E.C.
1969 *An introduction to mathematical ecology.* John Wiley & Sons, New York.

Platt, John R.
1964 Strong inference. *Science* 146: 347–353.

Plog, F.
1968 Archaeological surveys: a new perspective. Unpublished M.A. thesis. Department of Archaeology, University of Chicago.

Pomeroy, J.A. and B. Spurling
1972 Test excavations at McNaughton Island, 1972. Department of Archaeology, Simon Fraser University. manuscript.

Provost, R. and J.Y. Ross
1972 Prospections archéologiques en Gaspésie. Department of Cultural Affairs, Quebec. manuscript.

Ragir, S.
1967 A review of techniques for archaeological sampling. In *A guide to field methods in archaeology: approaches to the anthropology of the dead,* edited by R.F. Heizer and J.A. Graham, pp. 181–197. National Press Books, Palo Alto.

Reeves, Brian O.K.
1969 The southern Alberta paleo-cultural paleo-environmental sequence. In *Post-Pleistocene man and his environment on the northern Plains,* edited by R.G. Forbis, L.B. Davis, O.A. Christensen and G. Fedirchuk, pp. 6–46. University of Calgary Students' Press, Calgary.

Retherford, R.M.
1970 Late quaternary geologic environments and their relation to archaeological studies in the Bella Bella – Bella Coola region of the British Columbia coast. Unpublished M.Sc. thesis. Department of Geological Sciences, University of Colorado.

Ritchie, W.A.
1965 *The archaeology of New York state.* The Natural History Press, Garden City.

Robbins, Stanley L.
1962 *Textbook of pathology.* W.B. Saunders, Philadelphia.

Rootenberg, S.
1964 Archaeological field sampling. *American Antiquity* 30: 181–188.

Royal Commission
1916 *Royal Commission on Indians Affairs for the Province of British Columbia, Report* 2.

Salmon, Wesley C.
1973 Confirmation. *Scientific American* May: 75–83.

Sanger, D.
1970 The archaeology of the Lochnore-Nesikep locality, British Columbia. *Syesis* 3(1): 1–146.

Seton, Ernest Thompson
1953 *Lives of game animals, hoofed animals,* Vol. III, Part II. Charles T. Branford Co., Boston.

Shawcross, W.
1972 Energy and ecology: thermodynamic models in archaeology. In *Models in archaeology,* edited by D.L. Clarke, pp. 577–622. Methuen & Co., London.

Simonsen, Bjorn
1973 Archaeological investigations in the Hecate Strait-Milbanke Sound area of British Columbia. *Archaeological Survey of Canada, Paper* 13.

Singer, R.
1953 Estimation of age from cranial suture closure. *Journal of Forensic Medicine* 1: 52–59.

Sinkankas, J.
1959 *Gemstones of North America.* D. Van Nostrand Co., Toronto.

Sissons, H.A.
1966 Diseases of joints, tendon sheaths, bursae, and fascia. In *Systemic pathology,* Vol. II, edited by G.P. Wright and W. St. Clair Symmers, pp. 1429–1448. Longmans, London.

Skellam, J.G.
1952 Studies in statistical ecology, I Spatial pattern. *Biometrica* 39: 346–362.

Smith, H.I. and G. Fowke
1901 Cairns of British Columbia and Washington. *American Museum of Natural History, Memoir* 4(2).

Smith, Watson
1971 Painted ceramics of the western mound at Awatovi. *Peabody Museum, Paper* 38.

Société d'Archéologie Préhistorique du Québec (S.A.P.Q.)
1970 *Activités de la S.A.P.Q. 1969: Pointe-aux-Buissons, La Martre, Mandeville.* Société d'Archéologie Préhistorique du Québec.

Sokal, R.R. and F.J. Rohlf
1969 *Biometry.* W.H. Freeman & Co., San Francisco.

Spaulding, Albert C.
1968 Explanation in archaeology. In *New perspectives in archeology,* edited by S.R. Binford and L.R. Binford, pp. 33–40. Aldine, Chicago.

1971 Some elements of quantitative archaeology. In *Mathematics in the archaeological and historical sciences,* edited by F.R. Hudson, D.G. Kendall and P. Tautu, pp. 3–16. Aldine-Atherton, Inc., Chicago.

Stanislawski, M.B.
1969a What good is a broken pot? An experiment in Hopi-Tewa ethno-archaeology. *Southwestern Lore* 35(1): 11–18.

1969a The ethno-archaeology of Hopi pottery making. *Plateau* 42(1).

1969c Hopi-Tewa pottery making: styles of learning. Paper presented at the 34th annual meeting of the Society for American Archaeology, Milwaukee.

1973a Review of "Archaeology as anthropology" by W.A. Longacre. *American Antiquity* 38(1): 117–122.

1973b Ethnoarchaeology and settlement archaeology. Paper presented at the 38th annual meeting of the Society for American Archaeology, San Francisco.

Steward, J.H.
1938 Basin-Plateau aboriginal socio-political groups. *Bureau of American Ethnology, Bulletin* 120: 1–346.

Stewart, T. Dale
1957 Distortion of the pubic symphyseal surface in females and its effect on age determination. *American Journal of Physical Anthropology* 15: 9–18.

1973 Recent improvements in estimating stature, sex, age and race from skeletal remains. In *Modern trends in forensic medicine – 3,* edited by A. Keith Mant, pp. 193–211. Butterworths, London.

Stork, P.
1971 The search for early man in Ontario. *Rotunda* 4(4): 18–27.

Summers, Catherine C.
1964 Hawaiian fishponds. *Bernice P. Bishop Museum, Special Publication* 52.

Suttles, W.P.
1951 Economic life of the Coast Salish of Haro and Rosario Straits. Unpublished Ph.D. dissertation. Department of Anthropology, University of Washington.

Thomas, D.H.
1969 Regional sampling in archaeology: a pilot Great Basin research design. *University of California Archaeological Survey Annual Report* 11: 87–100.

1973a An empirical test for Steward's model of Great Basin settlement patterns. *American Antiquity* 38 (2): 155–176.

1973b Up the creek without a site: nonsite sampling in archaeology. Paper presented at the 38th annual meeting of the Society for American Archaeology, San Francisco.

Thompson, R.H.
1958 Modern Yucatecan Maya pottery making. *Society for American Archaeology, Memoir* 15.

Trigger, Bruce G.
1968 The determinants of settlement patterns. In *Settlement archaeology,* edited by K.C. Chang, pp. 53–78. National Press Books, Palo Alto.

1970 Aims in prehistoric archaeology. *Antiquity* 44(176): 26–37.

Tuck, J.A.
1971 An Archaic cemetery at Port au Choix, Newfoundland. *American Antiquity* 36: 343–358.

Tuggle, H.D., A.H. Townsend and T.J. Riley
1972 Laws, systems, and research designs: a discussion of explanation in archaeology. *American Antiquity* 37(1); 3–12.

Underhill, Ruth
1945 Indians of the Pacific Northwest. *United States Department of Indian Affairs, Indian Life and Customs* 5.

Vescelius, G.S.
1960 Archaeological sampling: a problem of statistical inference. In *Essays in the science of culture in honor of Leslie A. White,* edited by Gertrude E. Dole and Robert L. Carneiro, pp. 457–470. Thomas Y. Crowell, New York.

Warren, W.G.
1971 The centre-satellite concept as a basis for ecological sampling. In *Statistical ecology,* Vol 2 *Sampling and modeling biological populations and population dynamics,* edited by G.P. Patil, E.C. Pielou and W.E. Waters, pp. 87–118. Pennsylvania State University Press, University Park.

Watson, Patty Jo, Steven A. LeBlanc and Charles L. Redman
1971 *Explanation in archaeology: an explicitly scientific approach.* Columbia University Press, New York.

Wells, Philip V.
1970 Vegetational history of the Great Plains: a post glacial record of coniferous woodland in southeastern Wyoming. In Pleistocene and Recent environments on the central Plains, edited by J. Wakefield Dort and J. Knox Jones, Jr. *Department of Geology University of Kansas Special Publication* 3: 185–202.

White, J.P.
1967 Ethno-archaeology in New Guinea: two examples. *Mankind* 6(9): 409–414.

Williams, C.I.
1971 Models for reconstructing the economy of early hunters and gatherers. Paper presented at the 36th annual meeting of the Society for American Archaeology, Norman, Oklahoma. To appear in "Late Pleisocene and Holocene climatic changes and their human ecological implication."

Wilmeth, R.
1971 Historic Chilcotin archaeology at Anahim Lake, British Columbia. In *Aboriginal man and environments on the Plateau of northwest America,* edited by A.H. Stryd and R.A. Smith, pp. 56–59. University of Calgary Students' Press, Calgary.

1973 Distribution of several types of obsidian from archaeological sites in British Columbia. *Canadian Archaeological Association Bulletin* 5.

Wright, E.C.
1945 *The Petticodiac.* The Tribune Press, Sackville.

Wright, J.V.
1968 Prehistory of the Hudson Bay: the boreal forest. In *Science, history and Hudson Bay,* edited by C.S. Beals and D.A. Shenston, pp. 55–68. Department of Energy, Mines and Resources, Ottawa.

1972a *Ontario prehistory: an eleven-thousand-year archaeological outline.* National Museums of Canada, Ottawa.

1972b Prehistory of the Shield. Archaeological Survey of Canada, Ottawa. manuscript.

n.d. La préhistoire de l'est du Canada. Archaeological Survey of Canada, Ottawa. manuscript.

Yeates, M.
1974 *An introduction to quantitative analysis in human geography.* McGraw-Hill, New York.

Yellen, John and Henry Harpending
1972 Hunter-gatherer populations and archaeological inference. *World Archaeology* 4(2): 244–253.

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