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PROJECTILE POINT SEQUENCES IN NORTHWESTERN NORTH AMERICA   CARLSON & MAGNE

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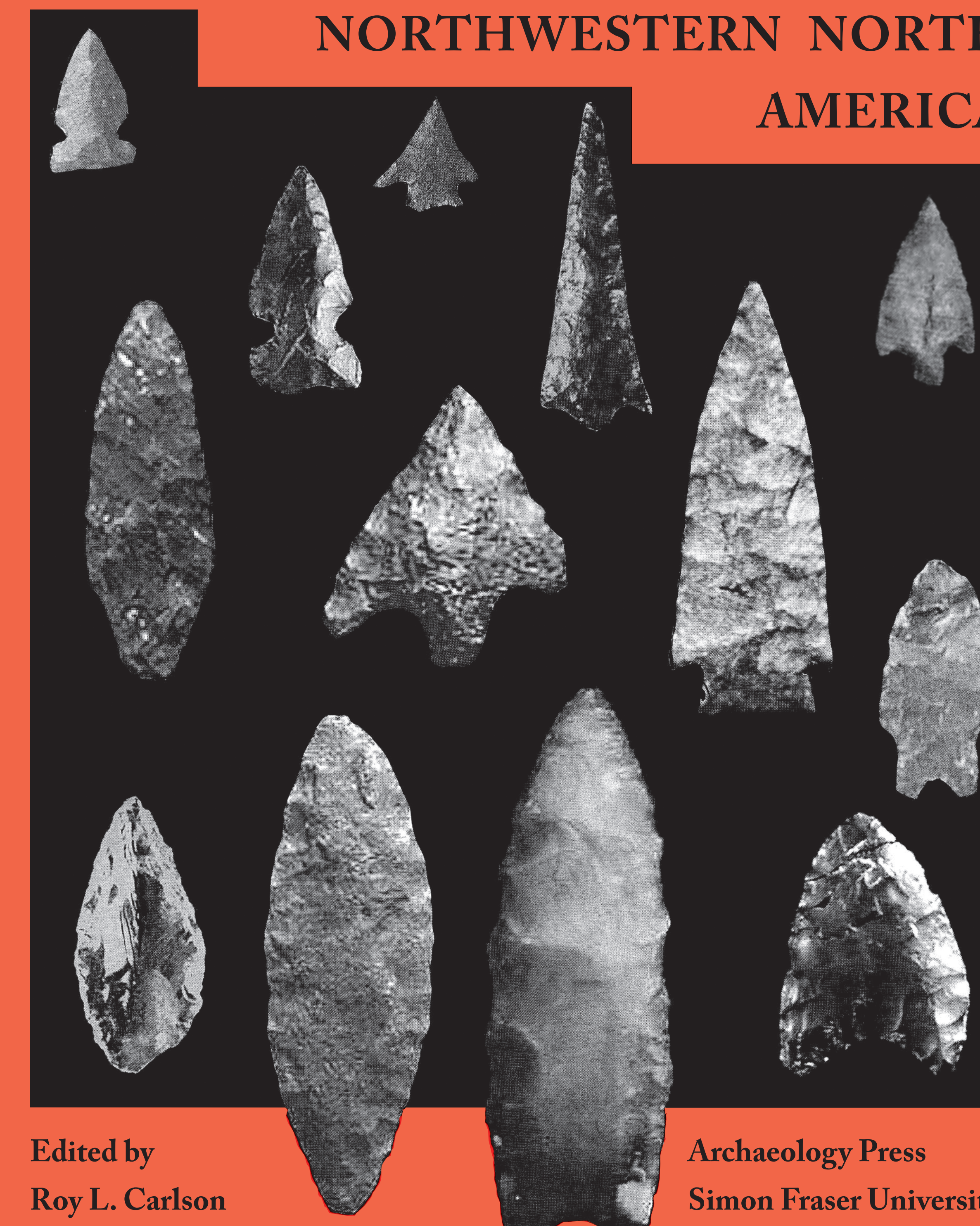

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Projectile Point Sequences in Northwestern North America

edited by

Roy L. Carlson & Martin P.R. Magne

This Volume is Dedicated to
the Dean of Northwest Archaeologists

Richard D. Daugherty

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Preface

As a volume this study of projectile points from the Northwest had its origins as a symposium at the annual meeting of the Canadian Archaeological Association in Nanaimo in 2005. Of course, actual study of the projectile points presented here goes much further back in time, to when the authors of the various chapters first became interested in points and began to compile data on the types, dates, and locations of the many finds. Projectile points have always been of particular interest to Northwest archaeologists where in the absence of potsherds, projectile points have seemed to be the most diagnostic artifacts available for defining particular societies or cultures and for inferring developmental relationships and culture contact. The extent to which this assumption has proven to be correct or not, can best be determined by reading the chapters, examining the illustrations, and evaluating the conclusions. Both new and old data are incorporated into the various chapters. We are very fortunate in being able to expand the coverage given at the Nanaimo meeting to include new discoveries and new analyses made since that time.

Those agencies and individuals that have provided particular assistance are listed in the Acknowledgements section of each chapter. Collections of projectile points from the institutions listed below have been employed in this study. We thank them and their staffs for making the collections in their care available and for their assistance. We also extend our particular thanks to Cheryl Takahashi of Takahashi Design (www.designtist.ca) for her patience with us and her skills in editing and providing the volume's layout and design.

Burke Museum, University of Washington
Denver Museum of Nature and Science
Laboratory of Anthropology, Washington State University
Laboratory of Archaeology, University of British Columbia
Laboratory of Anthropology, Langara College
Lower Similkameen Indian Band
Museum of Archaeology and Ethnology, Simon Fraser University
Parks Canada
Qay'llnagaay Museum, Haida Gwaii (Queen Charlotte Islands)
Royal British Columbia Museum
Squaxin Island Tribe Museum and Research Center, Kwuh-Deegs-Altxw
United States Forest Service, Alaska
Upper Similkameen Indian Band
Wenatchee Museum
Yukon College
Yukon Heritage Branch

The decision of the editors to dedicate this volume to Dick Daugherty is based on his exceptional contributions to Northwest archaeology. He has worked tirelessly on the archaeology of this region first as a student at the University of Washington under the direction of Douglas Osborne and Erna Gunther, then as a professor at Washington State University where he developed an outstanding research and graduate program in archaeology, and following his retirement, as an archaeological consultant involved in many mitigation projects. Although Dick is mostly associated with archaeology in Washington State, he also undertook archaeological survey in British Columbia in the early 1950s searching the Peace River District for the enigmatic route of early migrants to the New World. The Lind Coulee excavations, the multi-disciplinary Marmes Rockshelter project, and the excavation of the waterlogged village at Ozette, which all provided new and exciting information on the archaeology and prehistory of the Northwest, were major research projects for which Dick and his research teams can always be very proud. We are very pleased to honour him with this dedication.

Roy Carlson
Marty Magne

Notes on Radiocarbon Dates

Radiocarbon dates are not exactly equivalent with calendar dates. Radiocarbon dates can be corrected to more closely match calendar dates using the tree-ring and marine data sets developed by Reimer et al. (2004). In this volume some authors have used calibrated dates and some have used uncalibrated dates.

In order to understand the calibrated age of uncalibrated ^{14}C dates of 21,000 BP and younger, calibrated dates rounded off to the nearest century have been presented in the Table below. All dates are given in cal BP (calendar years before the present) meaning before AD 1950. There is no reliable calibration of ^{14}C dates older than about 21,400 BP, as published before the mid-2007.

Radiocarbon Age	**Calibrated Age**	**Radiocarbon Age**	**Calibrated Age**
1000 BP	900 cal BP	11,000 BP	12,900 cal BP
2000 BP	1900 cal BP	12,000 BP	13,800 cal BP
3000 BP	3200 cal BP	13,000 BP	15,400 cal BP
4000 BP	4400 cal BP	14,000 BP	16,700 cal BP
5000 BP	5700 cal BP	15,000 BP	18,300 cal BP
6000 BP	6800 cal BP	16,000 BP	19,200 cal BP
7000 BP	7900 cal BP	17,000 BP	20,100 cal BP
8000 BP	9000 cal BP	18,000 BP	21,300 cal BP
9000 BP	10,200 cal BP	19,000 BP	22,500 cal BP
10,000 BP	11,500 cal BP	20,000 BP	23,900 cal BP
		21,000 BP	25,400 cal BP

Calibrated ages based on Reimer, P.J., M.G.L. Baillie, E. Bard, A. Bayliss, J.W. Beck, C.J.H. Bertrand, P.G. Blackwell, C.E. Buck, G.S. Burr, K.B. Cutler, P.E. Damon, R.L. Edwards, R.G. Fairbanks, M. Friedrich, T.P. Guilderson, A.G. Hogg, K.A. Hughen, B. Kromer, G. McCormac, S. Manning, C. Bronk Ramsey, R.W. Reimer, S. Remmele, J.R. Southon, M. Stuiver, S. Talamo, F.W. Taylor, J. van der Plicht, C.E. Weyhenmeyer. 2004. IntCal04 Terrestrial Radiocarbon Age Calibration, 0–26 Cal Kyr BP. *Radiocarbon* 46:1029–1058.

Chapter 1

Projectile Points Past and Present

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Introduction

This volume is mostly about recognition of the various types and styles of chipped stone projectile points characteristic of particular regions and time periods in northwestern North America. It is intended as a source book bringing together as much information as possible with particular attention paid to points that have reliable chronological provenance. Projectile points are subject to the same rules of growth and change as other objects made by humans, and variations in these points in time and space are one of the tools used by archaeologists to predict the past. Such points are of particular value because they are of stone and survive in the archaeological record whereas artifacts of other materials frequently do not. This introductory chapter will point out the various emphases in the succeeding chapters and relate earlier studies of chipped points in the Northwest to the data presented here. Archaeology employs cultural theory and the comparative method in its attempt to work out the changes in cultures and societies that took place in the past. These attempts begin with the description and classification of those things found in archaeological sites, projectile points in this case, and end with a cultural-historical model of what happened in prehistory (Ch. 20), and this model is also what this volume is all about.

Dates

The majority of Northwest archaeologists still think in terms of uncalibrated radiocarbon dates BP (before 1950 AD) and these dates are used in all chapters, although in a few instances the authors have chosen to provide both calibrated and uncalibrated dates. A table prepared by Yaroslav Kuzmin giving the calibrated equivalents of the radiocarbon dates at 1000-year intervals follows the Preface.

Area Coverage

The geographic regions (Figure 1) covered in this volume are the coastal regions from the Alaska Panhandle south through coastal British Columbia to southern Puget Sound in Washington, and the interior regions west of the Rockies from central Washington north through the Fraser River drainage in British Columbia, and across the arctic divide into the Peace River drainage in northeastern B.C. and the Yukon. In culture area terms this area encompasses much of the Western Subarctic, almost all of the northern and central portions of the Northwest Coast, and the northern and central parts of the Columbia-Fraser Plateau. The Nuu-chah-nulth region on the west coast of Vancouver Island and the ocean shores of Washington are not covered because chipped stone points are nearly absent there.

At the time of first contact with Europeans the peoples inhabiting this area earned their living by fishing, hunting, and gathering, and the bow and arrow was in universal usage. The atlatl (spear thrower) that was once used widely survived only among the Tlingit of the Alaska Panhandle. Chipped stone points tipped arrows in the Plateau whereas bone, antler, ground slate, shell and sometimes wooden points more commonly tipped projectiles in the Yukon and Northwest Coast during the ethnohistoric period. For detailed coverage of the past and present lifeways of the native peoples of these regions see Helm (1981), Suttles (1990), and Walker (1998).

Organization and Content

The chapters in this volume are presented from north to south on the Coast and then south to north in the Interior. Content of the chapters varies from detailed descriptions of new finds of projectile points from specific sites (Chs. 2, 3, 4, 12, 16, and 19) to coverage of all or most the points from particular localities or sub-regions (Chs. 5, 6, 8, 9, 10, 11, 13, 14, 15, and 17). While the variable terminology used by different authors can impede comparisons, we hope that the abundant illustrations will make it reasonably clear what each author is writing about. Classification is emphasized in Chapters 11 and 18, and ethnicity is a focal point in Chapter 14. Although microblades are made by flaking stone and can be parts of composite projectile heads, they are not covered in detail in this volume although their significance is brought up in Chapters 3, 4, 14, and 15. Recent studies of microblade industries can be found in Kuzmin, Keates, and Shen (2007). Chipped stone crescents, that may have been used as transversely hafted projectile heads, are not actually covered either. There are only two crescents (Figure 2) known from our region, both from the Lind Coulee site, and their use is uncertain.

Authors of several chapters (Chs. 3, 6, and 18) have gone beyond the mandated coverage and included data on other kinds of projectile heads. The editors decided to retain this information, but no attempt has been made to provide complete coverage of other than chipped stone points. One reason for inclusion of some points of other materials is that while projectile heads of bone and antler typify the late period on the Coast (Ch. 6) and in the Yukon (Ch. 18), it is not generally known that the

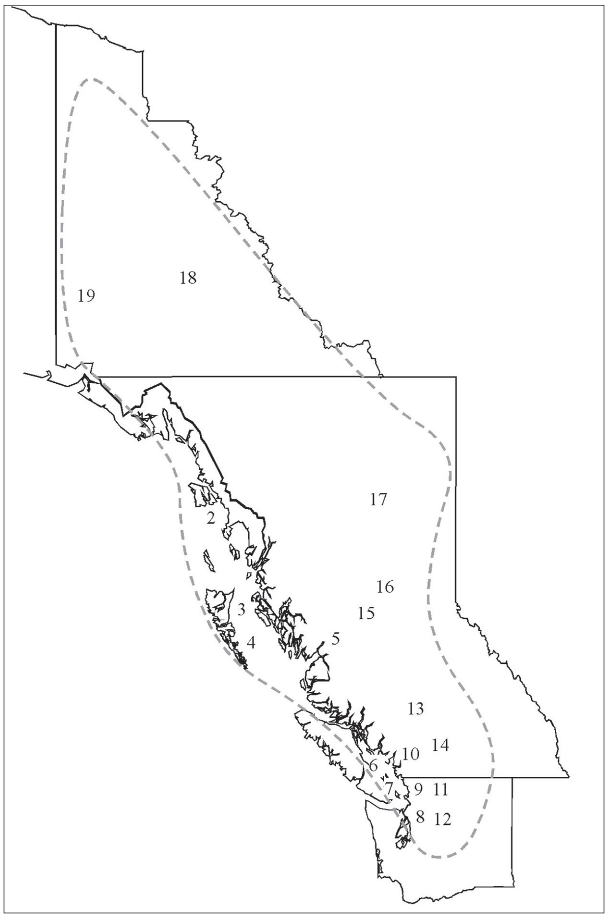

Figure 1. Map of the Yukon, British Columbia, and Washington with the regions covered enclosed by the dotted line. The numerals are the chapter numbers and are placed at the localities covered in the chapter indicated.

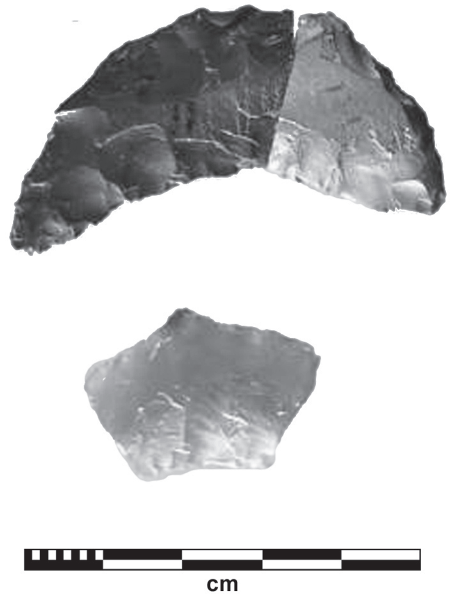

Figure 2. Crescents from the Lind Coulee site.

best provenienced early sample including the earliest bone harpoon head (Figure 3) is from the Lind Coulee site in the Plateau and dates about 9000 BP. Poor preservation is heavily involved with the scarcity of bone and antler implements, and the bone foreshafts found in Clovis components and at the Sentinel Gap site (Ch. 12) are probably only a few of the tools made of these perishable materials.

Classification and Typology

Projectile points have never been prominent in Northwest Coast archaeology, at least to the extent that archaeologists have relied on them on the Plains and other parts of North America. The nature of the coastal archaeological record is that chipped stone points decline substantially in use after 5000 BP except in the Puget-Sound-Gulf of Georgia-Lower Fraser region where this decline occurs after 1500 BP; bone and ground stone technology replaced chipped stone on the Coast.

Figure 3. Barbed bone point, harpoon point with line notch, and elongate bone tool from the Lind Coulee site.

On the Canadian Plateau the few projectile points from excavated sites and the absence of a deeply stratified site didn't lead to point classifications until Richards and Rousseau (1987) formulated the sequence of points for the pit house horizons, and Fladmark (1996) excavated the stratified sequence at Charlie Lake Cave that while containing only a modest point assemblage, covered a long period of time. Point typology developed mostly isolated from that of adjacent regions.

There has never been a standard typology of points for this entire region. The earliest typologies used on both the Plateau (Collier, Hudson, and Ford 1942:58; Strong, Schenck, and Steward 1930:78) and on the Coast (M. Smith 1950:19) were based on Thomas Wilson's (1897:757–988) scheme using upper and lower case letters and numbers to designate attributes and formalize types. The later attempt at systematization by Earl Swanson (1962) at the *First Conference of Western Archaeologists on Problems of Point Typology* has unfortunately gone largely unheeded. The most advanced typology and the direction in which classifications should be moving is that advanced by Lohse and Schou (Ch. 11) that will enable sound quantitative comparisons to be made. The evolving Yukon Projectile Point Database (Ch. 18) is another step in the right direction. Hopefully the data contained in this volume will eventually lead to a typology for the entire area that will facilitate comparisons without obscuring significant differences.

The different authors use varied terms for the same attributes, and employ various approaches to analysis. Our lack of insistence on a standard terminology for projectile point attributes may have been a mistake, although the variation used is a true reflection of the state of the art as it presently exists in this area. There is no standardized typology such as that used in the mid-continental and eastern United States (Justice 1987). Typologies vary from none, backed up with sufficient descriptions and illustrations for readers to judge degrees of similarity and difference, to numbered types (Chs. 5, 9, 14) to named types with nearly unpronounceable names (Chs. 3, 4), to highly quantitative multi-attribute modeling (Ch. 11) involving cluster analysis (Ch. 10), cladistics (Ch. 8), or multi-dimensional scaling (Ch. 15). Form or outline is the most common attribute used to differentiate types, and attributes of flake scars (Ch. 4) are used in several instances. Variations in hafting attributes—stemming and notching or their absences—are widely employed as diagnostic attributes in identifying types. The data from the dart and arrow shafts found with their points still attached in the Yukon ice patches (Ch. 18) suggest that these attributes may be purely stylistic or are at least unrelated to different types of hafts, although the nearly universal shift in North America from early points with either fluted, pointed, or convex bases, first to stemming and shouldering and then to notching suggests that the latter are more efficient (See Carlson 1983b, 1991; Musil 1988).

The Earliest Points

Clovis Fluted points lie at the bottom of the cultural sequence in the Columbia Plateau and the Puget Sound region of the Northwest Coast (Chs. 8, 11). Further north on the Coast the earliest points are laurel-leaf and willow-leaf foliates of which many exhibit collateral flaking and ground basal margins, and some have stems and slight shoulders (Chs. 2–5). There are some suggestions of fluted point derivatives in the Canadian portion of the Plateau (Ch. 13), and there is one re-worked multiple-fluted point (Ch. 17) from Charlie Lake Cave in the Peace River district of northeastern B.C. dated to 10,500 BP (Fladmark 1996) and other surface finds from there and the Rocky Mountain Trench (Ch. 17). Douglas Osborne (1956) documented the first fluted points recognized as Clovis from the Northwest, although Strong, Schenk, and Steward (1930, Pl. 12d) illustrated a point now recognizable as Clovis from the Dalles, Oregon. The only *in situ* Clovis fluted points from our region are those from the Ritchey-Roberts cache at East Wenatchee, Washington (Gramly 1996; Mehringer and Foit 1991), and although undated by ^{14}C, post-date the Glacier Peak ash fall, and must lie in the range of Clovis dated most recently elsewhere at 11,050 to 10,800 BP (Waters and Stafford 2007) although some researchers still place Clovis beginnings at 11,500 BP. These points are now in the Burke Museum at the University of Washington.

Northwest Coast Point Sequences

No fluted points have been found on the Northwest Coast north of Puget Sound. The early points there tend to be either lanceolate (long and narrow) with ground lower margins or tear-drop foliates resembling the Chindadn points found in the Nenana Complex of central Alaska. Charles Borden (1960, 1968, 1983) worked out the first long sequence in the coastal environmental zone from excavations in the Fraser Canyon. Although he never did fully publish the point types as a sequence, he maintained a series of showcases in his laboratory each containing one of the cultural components for use by students and researchers. It is from these cases that Carlson (1983a Fig. 1:7) extracted the phase sequence and included the points from Borden's three early phases in his chart for the lower Fraser and Gulf Islands. The full sequence is shown in Figure 4, and photogaphs of four of the early points including one found later are shown in Figure 5. The lower margins of at least one of these points is ground. Although there are major gaps in this sequence it does show the progression from foliate to stemmed to notched forms that typifies the Coast Salish region. The recent discoveries at Prince George (Ch. 16) look like a component of the Milliken phase. Roger Luebbers (Hester and Nelson 1978:35–56) presented the first point sequence for the central coast of British Columbia based on the excavations at Namu (See Ch. 5).

The problem of determining the temporal range of projectile points from complex multi-component coastal sites is brought out in Chapters 9 and 10. Coastal point sequences are expanded and brought up to date in Chapters 2–11 of which the early points from Haida Gwaii (Chs. 3, 4), the Alaska Panhandle (Ch. 2), and the Bella Coola Valley (Ch. 5) are new discoveries.

The Columbia-Fraser Plateau Point Sequences

Luther Cressman and his students (Cressman et al. 1960) formulated the first long sequence in the Columbia Plateau based on excavations at sites at Five Mile Rapids, but unfortunately the projectile point typology they employed has proven to be unusable. The small assemblage in the earliest component in their sequence lacked points, but the other lithics and the faunal remains indicated it is a Windust phase component (Cressman 1977:134;

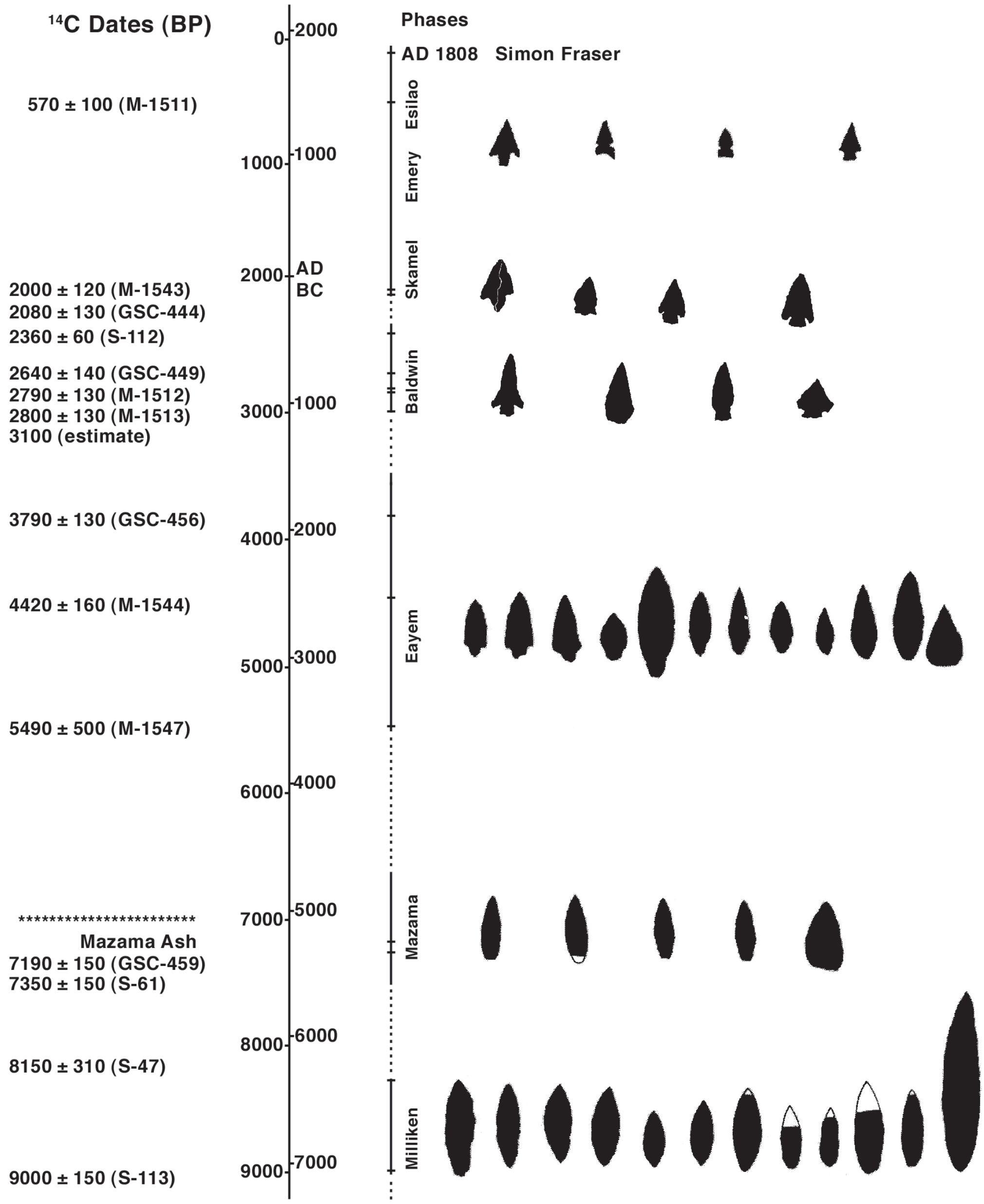

Figure 4. The sequence of projectile points at the Milliken site and Esilao Village in the Fraser Canyon based on Borden (1983), Carlson (1983a) and UBC collections.

Rice 1972:164) that is typified at other Windust sites by stemmed points. The absence of points is probably a consequence of small sample size. Foliate and single-shouldered points typify the next earliest component and place it in the Cascade phase.

The first early period site excavated in the Columbia Plateau was Lind Coulee excavated by Richard Daugherty in 1951–52 with a student crew from Washington State College (now University) and the University of Washington including Roy Carlson. We were puzzled when we excavated the first projectile point (Figure 6) that was stemmed and not at all what we expected from this buried site. Daugherty (1956, 1962) however noted the similarities to early points from Lake Mojave and playa sites far to the south in the Great Basin and subsequent research (Carlson 1983b:76) identified a continuous distribution of stemmed points between these two poles. Claude Warren (1968) developed a phase sequence based very much on projectile

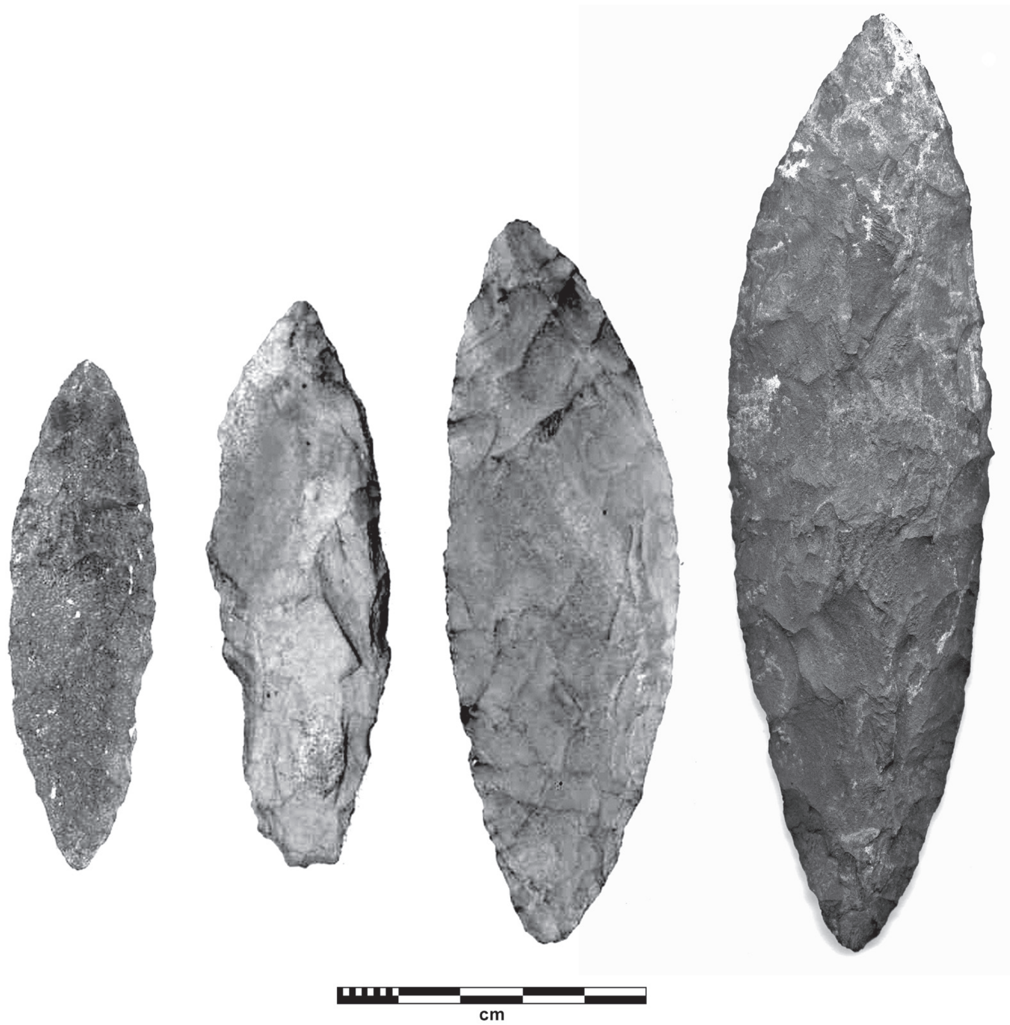

Figure 5. Bifaces from the Milliken phase at the Milliken site dating 9000-8000 BP.

Figure 6. Projectile points from the Lind Coulee site dating 9000–8500 BP.

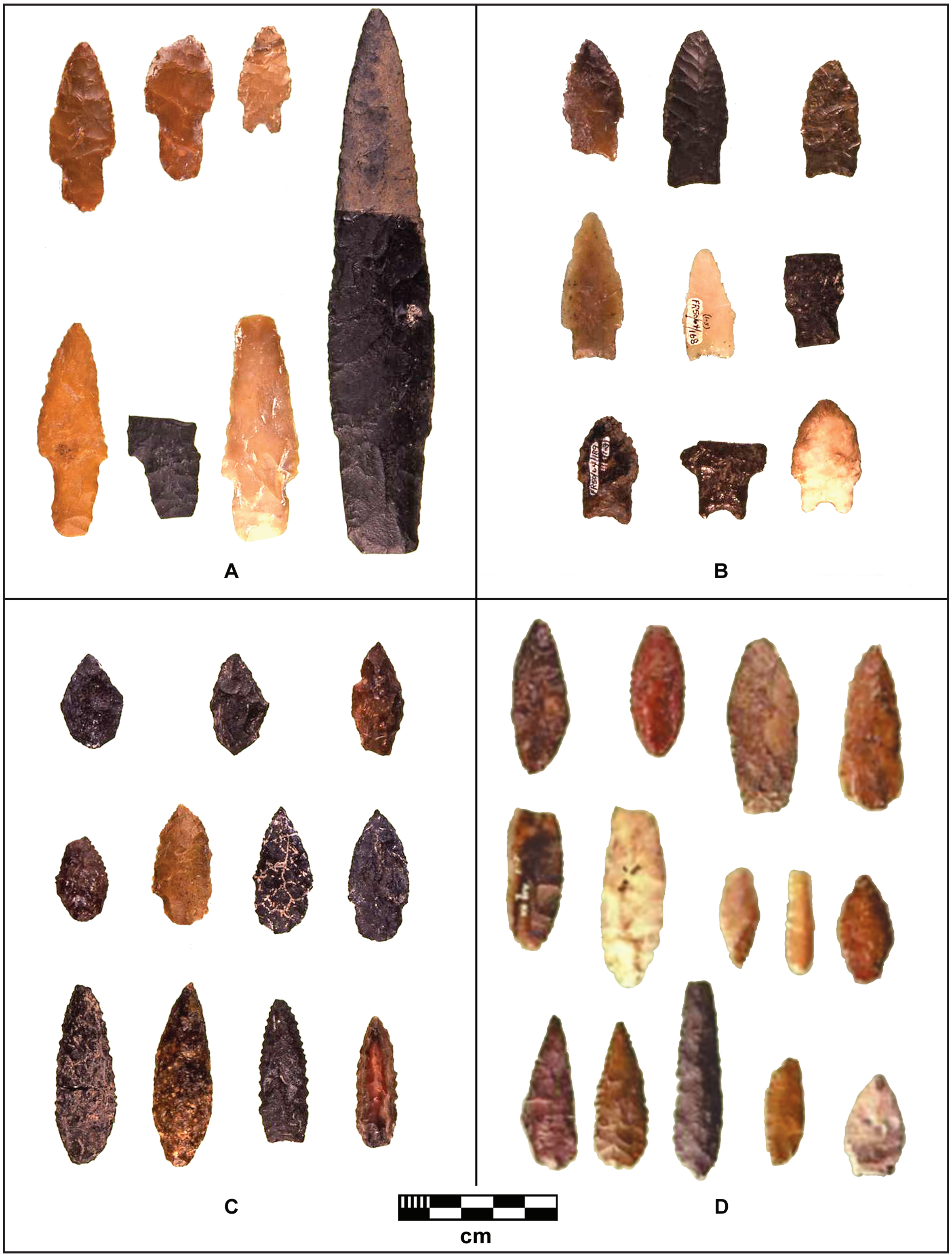

Figure 7. Projectile points from early components at the Marmes Rock Shelter. A, B, C Windust phase; D, Cascade phase. A, Marmes I dating ca. 10,000–9000 BP. B, Marmes II dating ca. 9000–8000 BP. C, Marmes III dating ca. 8000–7500 BP. D, Marmes IV dating ca. 7500–5000 BP.

points that was soon superceded by the sequence worked out at the Windust Caves, Marmes Rock Shelter and other sites (Bense 1972; Daugherty 1956; Leonhardy and Rice 1970; Rice 1972) of which the latter has been the most enduring. Projectile points from these excavations are shown in Figure 7. Further north on the upper Columbia Gar Grabert (1968) and David and Jennifer Chance (1978) published long sequences. Chapters 11 and 12 bring together the projectile point data from the Columbia Plateau.

On the Fraser Plateau in British Columbia David Sanger (1967) produced the first sequence for the middle Fraser and Thompson that was later revised (Richards and Rousseau 1987). Chapters 13–16 bring this projectile point sequence up-to-date.

Point Sequences in the Yukon and the North

While there was some early work in the Yukon by Scottie MacNeish (1964) the first enduring sequence was by Bill Workman (1978) which has been summarised and up-dated in Chapter 18. Knut Fladmark (1996) established the first sequence in the Peace River district from excavations at Charlie Lake Cave. This point sequence is repeated here in Chapter 17 and used as the basis for the point chronologies at other sites there and in the Rocky Mountain Trench (Ch. 17). Recent discoveries of Chindadn points in the Yukon are documented in Chapter 19.

This volume contains little about actual weapons systems of which stone points are merely the preservable parts. The earliest types of weaponry are thought to be the thrusting spear and the dart propelled by the atlatl. The debate as to whether Clovis knew and made use of the atlatl has been answered in the positive by Hutchings' (1999) study of impact fractures on fluted points. It is assumed Clovis also used the thrusting spear. On the Coast the earliest projectile heads found in the context of use (Ch. 3) are associated with bear dens and suggest thrusting spears used to impale bears as they were smoked out. As already mentioned, harpoons appear early and are differentiated from other types of projectiles by employing a detachable head or foreshaft with a line attached to the harpoon shaft. Harpoons were probably widely used from 9000 BP onward, but because of preservation are only found commonly in shell middens in later periods. The best information on weapons systems has recently been discovered in the melting ice patches of the Yukon (Ch. 18) where bone and wooden parts as well as stone have been preserved. The bow and arrow appeared in the different regions between 2000 and 1500 BP.

In the final chapter (20) the editors review the projectile point sequences by time period and culture area, point out similarities and differences, and make inferences regarding cultural and ethnic continuity and change. Our working hypothesis is the obvious one that the peoples encountered here by European explorers in the late 18th and early 19th centuries are the direct descendants of the peoples who left the pre-contact archaeological remains. As has been pointed out previously (Carlson 1996:215) in order to infer linkages between archaeological assemblages and known peoples it is useful to go back to the distribution of cultures during the period of early settlement before diffusion and acculturation leveled differences, and see how this distribution correlates with that of linguistically different peoples at the time of contact. We consider both persistence and gradual change in projectile point forms in a region to be indicators of cultural and ethnic continuity, and radical change as an indicator of an introduced technology, while recognizing that such differences are not always clear-cut. We also consider that in any given time period the greater the similarity in forms and manufacturing techniques of projectile points, and the closer the propinquity in time and space of the artifact assemblages containing similar points, the greater the probability of ethnic congruity of the people who occupied the sites and made the projectile points.

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Chapter 2

Bifaces from On Your Knees Cave, Southeast Alaska

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Introduction

On Your Knees Cave (OYKC) also known as 49-PET-408, is located on Protection Head, a peninsula at the northwest end of Prince of Wales Island in Southeast Alaska (Figure 1). The cave was used repeatedly by humans for more than 10,000 years and the oldest reliably dated human remains from Alaska and Canada have been found at the site. Bone, stone, and shell tools have been recovered from different chambers of the cave ranging between circa 12,050 (10,300 ± 50 ^{14}C yr BP) and 1470 (1760 ± 40 ^{14}C yr BP) calendar years ago that document at least four periods of use. The most extensive use of the cave occurred about 10,300 (9200 ^{14}C yr BP) calendar years ago and is chronologically associated with the partial remains of a young male who died approximately 10,300 calendar years ago. The assemblage of stone bifaces from OYKC consists of 12 complete, rearticulated, and fragmentary specimens. The points are derived from two localities: 1) eleven from the cave's main entrance and adjacent passage ways, and 2) two from the area in front of a smaller entrance called "Ed's Dilemma entrance" (Figure 2) (Dixon et al. 1997, Dixon 1999). Although the spatial analysis of the bifaces and other artifacts recovered from OYKC is not complete, this report provides preliminary morphological and chronological data.

Dating

Three AMS radiocarbon determinations on charcoal and two on human bone date the primary use of the cave's main entrance. They were run on charcoal identified as stem and/or branch wood of lodgepole pine (*Pinus contorta*) (Trieu and Newsom, 1997) collected from the cultural horizon (Unit 4) containing bifaces, irregular microblade cores, microblades, scrapers, flake cores, and lithic detritus. This period of occupation has been established by three ^{14}C AMS dates on charcoal: 8760 ± 50 BP (CAMS-43991), 9210 ± 50 BP (CAMS-43990) and 9150 ± 50 (CAMS-439899).

Two AMS radiocarbon dates run on human remains of an adult male dated to 9880 ± 50 BP (CAMS-32038, $\delta^{13}C = -12.1‰$) (pelvis) and 9730 ± 60 BP (CAMS-29873, $\delta^{13}C = -12.5$ ‰) (mandible) are associated with this stratigraphic level (Dixon et al., 1997). Delta ^{13}C values document the individual's diet was based largely on marine foods. This indicates that the ^{14}C determinations should be adjusted to c 9200 based on the regional marine carbon reservoir extrapolated from the Queen Charlotte Islands (Southon and Fedje 2003). These data suggest the human remains are roughly contemporaneous with the cultural occupation associated with Unit 4 at the main entrance of the cave.

One radiocarbon determination (CAMS-43991) is approximately 400 ^{14}C years younger than the others and may suggest later use of the cave's main entrance. However, the spatial distribution of the artifacts and the fact that it is possible to rearticulate artifacts and microblade fragments throughout level 4 suggests that most of the specimens recovered are

Figure 1. Regional map depicting the location of On Your Knees Cave (49-PET-408).

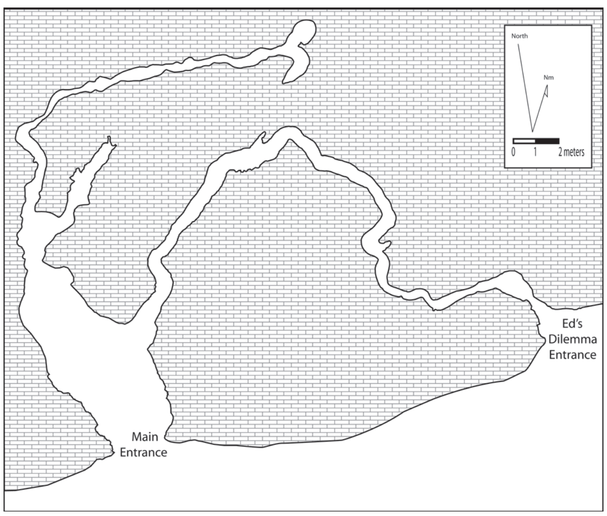

Figure 2. Site map illustrating the location of the two cave entrances.

contemporaneous. This analysis demonstrates that the most extensive use of the cave's main entrance occurred approximately 10,300 calendar (9200 ^{14}C) years ago.

The area adjacent to Ed's Dilemma entrance is smaller and fewer artifacts were recovered there. This locality is characterized by a high frequency of microblades struck from prepared cores, a single prepared microblade core, waste flakes, and three bifaces. Two radiocarbon determinations suggest the occupation at this locale occurred sometime between about 7900 (7140 ± 30 ^{14}C, CURL-7771) and 8150 (7405 ± 25 ^{14}C, CURL-7772) calendar years ago. Consequently the specimens from Ed's Dilemma entrance (Figure 6a and b) are probably about 1500 ^{14}C years younger than the projectile points from the main entrance.

Table 1. On Your Knees Cave (49-PET-408) complete, rearticulated, and fragmentary bifaces.

Figure	Artifact Catalog#	Length (cm)	Width (cm)	Thickness (cm)	Weight (g)	Length / Thickness Ratio	Width / Thickness Ratio
3a	1997-134.5, 1997-134.6, 2000-29.4	16.5	5.1	1.2	65.8	13.8	4.25
3b	2000-29.6	15.4	3.9	1.3	29.2	11.8	3.00
4a	2000-29.2	3.6	2.9	0.8	7.4	n/a	n/a
4b	1998-73.68	2.8	2.2	1.0	3.5	n/a	n/a
4c	2000-29.3, 2000-29.5	4.2	1.9	0.8	5.9	n/a	2.38
4d	1999-49.445	0.8	0.9	0.2	0.2	n/a	n/a
4e	1999-49.205	1.5	1.1	0.4	0.4	n/a	n/a
4f	1999-49.47	6.8	2.4	0.9	12.4	7.6	2.66
4g	2000-29.1	7.0	2.7	0.9	16.1	7.8	3.00
5a	2000-33.22, 1997-134.7	10.1	3.1	0.8	22.3	12.6	3.88
5b	1997-134.4	7.4	2.7	0.6	12.2	12.3	4.50
6a	2005-1.171	3.8	2.3	0.9	7.7	n/a	n/a
6b	2005-1.172	8.5	4.3	1.0	43.0	n/a	4.30

The Biface Assemblage

The biface assemblage consists of 13 complete and fragmentary specimens recovered from both the cave's main entrance and Ed's Dilemma entrance. Eleven complete, rearticulated, and fragmentary specimens were recovered from the area of the main entrance (Figures 3–5), while two fragmentary bifaces (Figure 6a and 6b) were found at Ed's Dilemma entrance. At both entrances, the bifaces were spatially and temporally associated with microblades and microblade cores.

The weight and morphology of all the complete and rearticulated specimens precludes their use as arrow points (Table 1). This suggests that they were used to tip thrusting spears or possibly to tip atlatl darts. Some of the smaller specimens were probably used as knife blades.

Specimens from the Main Entrance

The largest complete biface (Figure 3a) is manufactured from black-gray rhyolite. It is broken along two oblique bedding planes and has been rearticulated from three fragments. The extreme surface flattening that characterizes this specimen was produced by percussion flaking which could have been executed with an antler, or ivory, baton using an anvil for support. Sequential, and sometimes parallel, pressure flaking was used to create and maintain its acute edges.

A similar specimen (Figure 3b) has been rearticulated from seven fragments. Although the lithic material from which it was manufactured is difficult to determine because it is heavily weathered, it was made from light and dark gray banded metamorphosed siltstone. It is fractured along bedding planes of the parent siltstone. Although heavily eroded, it appears to have been a leaf-shaped (foliate) point similar in morphology and size to the specimen illustrated as Figure 3a.

A smaller example of this leaf-shaped type (Figure 5a) was manufactured from black cryptocrystaline silicate. The blade was found in the interior of the cave and the base was recovered outside the main entrance. This suggests that it may have been used and broken in the cave and the base was subsequently removed from its haft and discarded outside the cave.

Another base (Figure 4b) of a similar leaf-shaped point was also recovered from the area of the cave's main entrance. It is made from black rhyolite and, like the base of the rearticulated point (5a), it appears to have been brought to the area near the main entrance in its haft and subsequently discarded. Although the presence of edge grinding is impossible to determine on one specimen (Figure 3b), the bases of the remaining three foliate bifaces (Figures 4b, 5a and 3a) all exhibit light edge grinding or wear, probably the result of hafting in closed sockets.

Evidence of previous damage resulting from impact is preserved on the base of one specimen (4g).

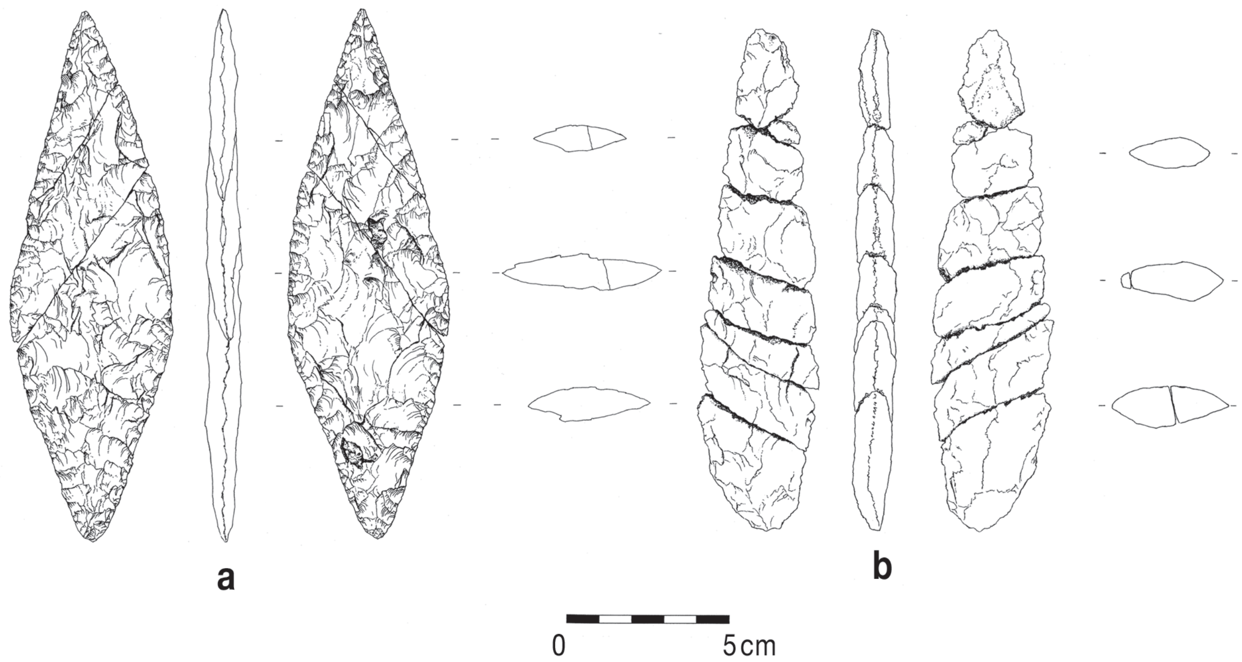

Figure 3. Line drawings of bifaces from the area of the main entrance of On Your Knees Cave (49-PET-408).

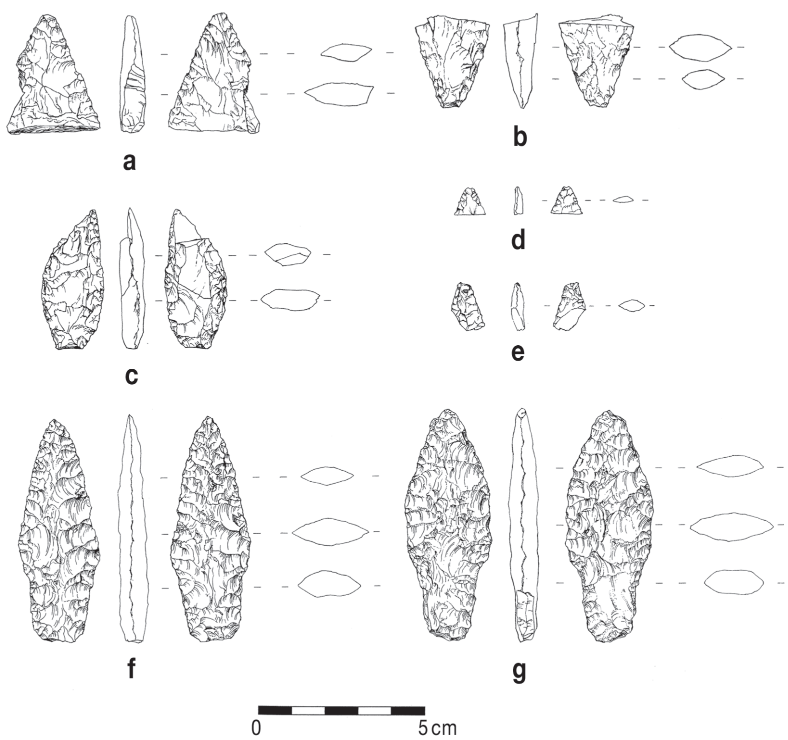

Figure 4. Line drawings of bifaces from the area of the main entrance of On Your Knees Cave (49-PET-408).

An "impact burin" facet extends from the base along the edge of the "stem" to the shoulder of this specimen. The "burin blow" probably results from shock to the base point exerted by the shaft upon impact, although it may have been done deliberately to facilitate hafting. The configuration and the distinctive length/thickness ratios (Table 1) for two stemmed specimens (Figures 4f and 4g) suggests that they may have been hafted as knives after having been broken and reworked. These two artifacts are made from obsidian from Suemez Island (Figure 1) and show considerable alteration probably representing several episodes of modification. They may have been manufactured initially to serve as leaf-shaped blades for thrusting or throwing spears and subsequently modified to function as stemmed knife blades.

The specimen illustrated in Figure 4c is the medial section of a leaf-shaped point. It is comprised of two rearticulating fragments and was manufactured from gray metamorphosed siltstone. The tip (or possible base) of another leaf-shaped specimen (Figure 4a) recovered from the area of the main entrance is made from gray cryptocrystaline silicate. This artifact has at least three burin-like blows terminating in hinge fractures along one edge, but it does not appear to have been used as a burin.

One specimen (Figure 5b) from the main entrance is unique. It is manufactured from a banded red brown chert. It is ovate in shape and exhibits distinctive edge grinding along one edge extending about one third of its length from the base toward the tip. This suggests that it was inserted in a slotted haft and ground to prevent damage to the lashing. It probably functioned as a knife blade secured in a slotted handle, rather than a projectile point. The remaining two specimens from the area of the main entrance are two small point tips. One (Figure 4d) is made of rhyolite and the other (Figure 4e) is black cryptocrystaline silicate.

Specimens from Ed's Dilemma Entrance

Two biface fragments (Figures 6a and 6b) were recovered from Ed's Dilemma entrance. The largest (6b) is ovate and made from lusterous black cryptocrystaline silicate. The tip, or extreme distal end, appears to be broken and there is slight edge grinding along the base, suggesting it was ground to protect lashing. Its spatulate shape suggests it may have functioned as a knife blade. The second specimen (Figure 6a) appears to be the medial section of a relatively small leaf-shaped biface. It is made from a coarser grained

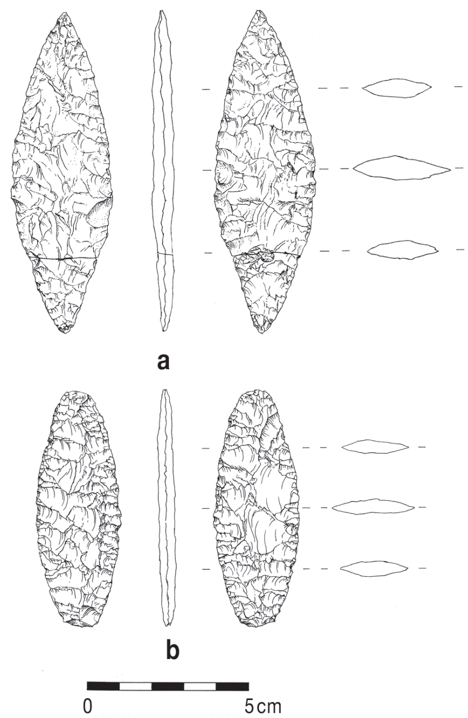

Figure 5. line drawings of bifaces from the area of the main entrance of On Your Knees Cave (49-PET-408).

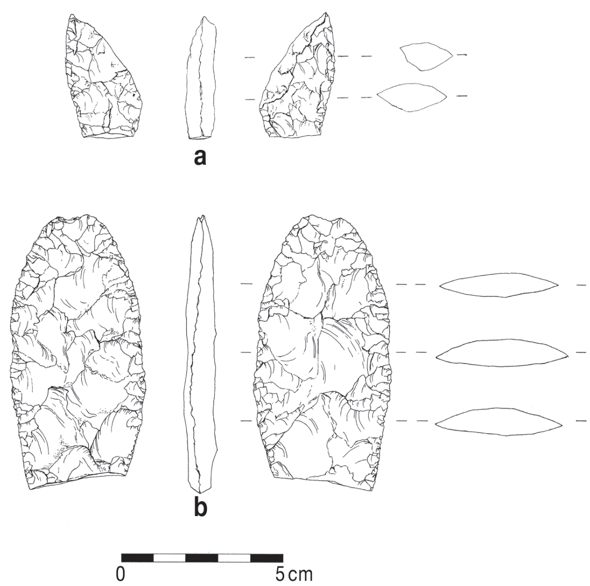

Figure 6. Line drawing of biface fragments from Ed's Dillema entrance On Your Knees Cave (49-PET-408).

black cryptocrystalline silicate that lacks the luster of the other specimen from this locale.

Interpretations

The relatively large number of projectile points recovered from OYKC compared to other sites in Southeast Alaska may be attributed to the age and function of the site. The faunal remains from OYKC indicate that the site was used by a variety of animals (Heaton 1996). It was likely a hibernaculum for both black and brown bear and the comparatively large number of bifaces from OYKC probably were used to tip weapons and knives for bear hunting and processing. There is a long tradition of subsistence hunting for bears at hibernacula, primarily because the danger associated with harvesting these powerful animals is greatly reduced if they can be taken during hibernation (McLaren et al. 2004). This was more often the case prior to the introduction of firearms. Although the site may have been used primarily for bear hunting, the presence of a wide array of other artifacts suggests that the cave may have been used for other activities as well.

The assemblage of bifacially flaked artifacts (knives and projectile points) represents a unified single lithic knapping tradition exhibiting various phases of biface rejuvenation and repair. The recovered projectile points and knives represent various stages in their life cycle as usable weapons and tools. Some specimens were first manufactured as large thin leaf-shaped projectile points that were subsequently reshaped into either smaller leaf-shaped projectile points or stemmed knives as their size and possible cultural needs required. The larger specimens were probably used to arm thrusting spears or javelins. When damaged or broken, they were reworked and recycled as smaller foliate and stemmed projectile points and knives. Both foliate and stemmed bifaces result from a continuous cultural process of manufacture, use, and retooling.

The OYKC bifaces are similar in flaking technique and morphology to fragments recovered from the lower component at Ground Hog Bay in Southeast Alaska (Ackerman 1968, 1996) and possibly examples from lowest components of the Namu (Carlson 1979, 1990) and Glenrose Cannery (Matson 1976) sites. They are clearly associated with other artifacts characteristic of the Northwest Coast Microblade tradition which is documented as early as circa 10,000 calendar years ago at several sites in northern British Columbia and Southeast Alaska (Ackerman 1992, Carlson 1990, Carlson and Dalla 1996, Davis 1989, Okada et al., 1992, Matson and Coupland 1995). Archeological sites ascribed to this tradition share the use of microblades, and exhibit a marine economy documented by limited faunal remains. The ecological setting of these archeological sites is generally on ancient beaches and other geographic features oriented to exploit marine resources, with the exception of OYKC which is not easily accessible from the shore and is located circa 0.5 kilometers from the ocean and about 135 meters above sea level. Northwest Coast Microblade tradition subsistence practices were adapted to an environment characterized by year round open water fresh and salt water fishing, collecting inter-tidal resources and shellfish, rugged coast with fjords, islands, rocky headlands, and calving glaciers.

Bifaces are rare in coastal sites along the Northwest Coast. This suggests that maritime subsistence activities probably required few bifaces and that these sophisticated lithic tools may have been more important for hunting large terrestrial mammals. The comparatively large number of bifaces found at OYKC is unusual for early archeological sites along the Northwest Coast. The bifaces recovered from On Your Knees Cave are associated with microblade technology and the oldest human remains known from Alaska or Canada. The $\delta^{13}C$ values from the human bone demonstrate the individual's diet was based on marine foods and that the ^{14}C age should be adjusted to circa 9200 (about 10,300 calendar years) based on the regional marine carbon reservoir.

The experimental character of the microblade technology at OYKC suggests it is in the formative stages of being adopted. It appears to be added to an extant and highly sophisticated bifacial technology. A similar technological transition appears to have taken place to the south in British Columbia between about 10,000–8800 calendar years ago (8900–8000 ^{14}C yr BP) in the southern Haida Gwaii (Fedje et al. 2005). These preliminary data suggest the widespread existence of an underlying bifacial technology predating a north to south diffusion of microblade technology along the Northwest Coast.

The assemblage from On Your Knees Cave also offers insights into the possible origins of very early lithic assemblages such as the Western Stemmed Point tradition and Cascade points commonly found throughout western North America. The radiocarbon dates from the main entrance of OYKC, and sites farther south in British Columbia, provide minimum limiting dates for these early leaf-shaped and stemmed bifaces along the Northwest Coast (Fedje et al. 2005, and this volume). These data suggest that these types of bifaces range in age between >12,650–8000 (>10,600–7500 ^{14}C yr BP) calendar years ago. By about 10,300 calendar years ago microblade technology appears to have been incorporated into preexisting bifacial technology.

The bifaces from OYKC may be used provisionally to help define a "Northwest Coast Biface tradition" typified by foliate and stemmed bifaces, and other artifact types. All these sites are located primarily on islands, and contain artifacts made from lithic sources located on the mainland and other islands. This suggests an economy primarily based on maritime resources and well developed coastal navigation using watercraft. Although these data are preliminary, the Northwest Coast Biface tradition appears to predate the introduction of microblade technology from the north and to be equivalent in age to Paleoindian complexes such as Cody, Folsom, and possibly Clovis in interior North America.

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Chapter 3

A Projectile Point Sequence for Haida Gwaii

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Introduction

In 1891 a chipped stone arrowhead was found by fur trader Alexander Mackenzie in Naden Harbour in the north of Haida Gwaii. When shown to local Haida they remarked that "they had never seen or heard of such a thing before" (Mackenzie and Dawson 1891). Subsequent investigations, including the intensive surveys (Fladmark 1970; Gessler 1972; Hobler 1976) and excavations (Fladmark 1986, 1990; Sutherland 1974) of the late 60s, 70s, and 80s led Fladmark (1989:216) to describe Haida Gwaii stone tool assemblages as "nearly single-mindedly unifacial local lithic traditions". For the period dating after 8000 BP[1] this still holds true with the only excavated bifaces being two obsidian specimens from the Blue Jackets Creek site dating to the late Holocene and suggested to have been traded in from the BC Mainland (Carlson 1994). Recent work, especially in the south of Haida Gwaii, has uncovered abundant evidence for a rich bifacial lithic tradition dating to the Pleistocene-Holocene transition. After 8000 BP, projectile points are manufactured using technologies other than bifacial knapping. Here we describe a projectile point sequence for Haida Gwaii, including late Pleistocene-early Holocene chipped stone points, early to mid-Holocene microblade-armed composite points and late Holocene ground slate and organic points.

Haida Gwaii (Figures 1 and 2) cultural history has been divided into three main cultural constructs based on technological characteristics including the Kinggi Complex, Moresby Tradition and Graham Tradition (Fedje and Christensen 1999; Fladmark 1989). The Kinggi Complex dates from ca. 10,600 to 8750 BP and is characterized by bifacial technology, simple core and flake tools, and an absence of microblades. The complex is derived from a small number of excavated sites in the south of Haida Gwaii and a scattering of surface finds across the archipelago. The Moresby Tradition dates from ca. 8750 to 5000 BP and is characterized by a focus on microblade technology and simple core and flake tools. During the early part (ca. 8750 to 8500 BP) this co-occurs with bifacial technology but after 8000 BP the latter is entirely absent. The Graham Tradition sees a shift from stone to organic tools and is further defined by an absence of microblade technology. In the early part (ca. 5000 to 2000 BP) stone tool technology is moderately abundant but by the later part (ca. 2000 to 200 BP) technology is almost entirely based on organic artifacts, with even ground stone being rare.

Late Pleistocene to Early Holocene—ca. 10,600 to 8700 BP

For the late Pleistocene to early Holocene (ca. 10,600 to 8500 BP) known-age projectile points are primarily bifacially worked foliate types.

[1] All dates are in uncalibrated radiocarbon years before present unless otherwise noted.

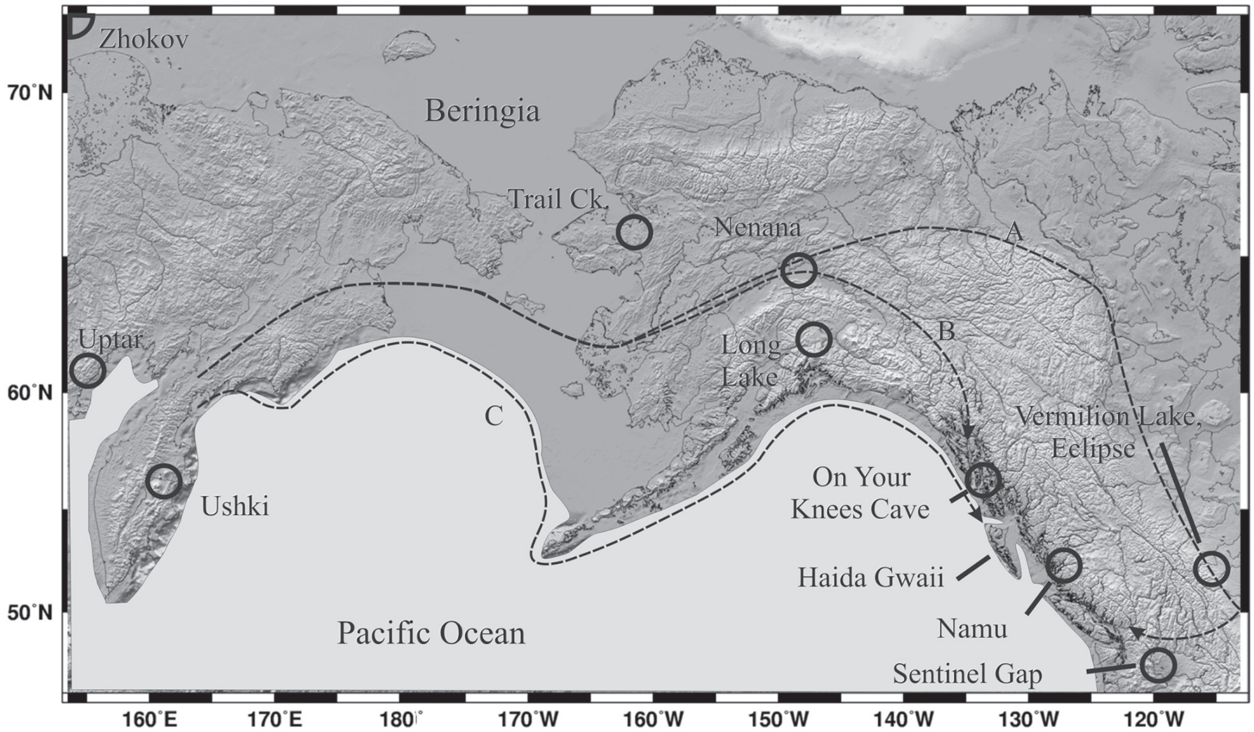

Figure 1. North Pacific and Beringia ('routes' – A: Ice-free Corridor via central Alaska; B: Northwest Coast via Central Alaska; C: Northwest Coast via Beringian coast). Adapted from Smith and Sandwell 1977.

Other specimens with good context include a small unifacial stemmed point and a few bone points or fragments. Overall, sample sizes are small for this time period with securely dated points coming from a handful of sites in the south of the archipelago.

Bifacial Projectile Points

Three styles of bifacially chipped stone projectile points have been identified from radiocarbon dated sites in Haida Gwaii. The following is a basic description of these point styles. Although they appear to follow sequentially in the archaeological record, some differences may simply relate to site function. The three styles, provisionally designated as Taan, Xil, and Xilju, are described below. A much larger sample from a variety of site types will be needed in order to provide secure interpretation.

Taan (Haida – bear)—large, broad-based spear point (ca. 10,200 BP). The bases of two large, foliate points (Figure 3b–c) were recovered from excavations at K1 Cave on the west coast of Moresby Island (Fedje, McLaren, and Wigen 2004; Fedje, Wigen et al. 2004). They exhibit broad bases (haft width >25 mm—Table 1), with moderate to heavy grinding along the entire basal and lower lateral margins. Lateral margins are convex. These spearpoints were manufactured from chert that has a creamy-white to yellowish-brown surface colour. This material is unusual and the source is not definitively known, however, massive chert beds occur within one kilometer of the site (Hesthammer et al. 1991). The cherts from these beds are described as green in colour, weathering to yellowish with brown patches. The K1 points were found in association with abundant bear bones and may derive from bear hunting activities (cf. McLaren et al. 2005). Both date to ca. 10,600 BP (Fedje, McLaren, and Wigen 2004). Specimen 3b was recovered from a level overlain by a date of 10,510 BP and underlain by a date of 10,960 BP while Specimen 3c was bracketed by dates of 10,525 and 10,660 BP. Stem width and evidence of heavy lateral and basal grinding suggest these points were likely set in an end-socketed haft (cf. Galm and Gough, this volume:Fig. 4; Musil 1988).

A complete spearpoint (Figure 3a) was recovered from Gaadu Din 2 cave. The point is similar to the

Figure 2. Haida Gwaii sites mentioned in text.

K1 specimens in that it is of a yellowish-brown chert, is heavily ground on the lateral stem margins and has a broad rounded (unground) base. The point is associated with a date of 10,220 BP.

Xil (Haida – leaf)—large, contracting-stemmed spearpoint (10,000-8900 BP). Relatively large foliate points, with contracting stems lacking significant edge grinding, have been recovered from a number of sites across Haida Gwaii (Figures 3 d–e, 4 a–m). Excavated specimens include 13 from the 9300 to 8900 BP levels at the Richardson Island site and two from Gaadu Din Cave dated to ca. 10,000 BP (Fedje, Magne, and Christensen 2005; Mackie and Fedje 2006). The Richardson points include two complete and 11 base fragments. Several point tips (broad, with pressure retouch forming a sharp tip) and a number of mid-sections were also recovered from excavations but are not illustrated here. Other examples of this foliate style have been collected from intertidal lithic sites dating to ca. 9400 BP based on association with the paleoshoreline (Fedje, Josenhans et al. 2005).

This style is generally willow leaf-shaped in outline (Figure 4). On the complete specimens the maximum width is closer to the tip than to the base although this may reflect curation as the nearly complete specimen from Gaadu Din cave exhibits a much longer blade element than the others. The complete Richardson Island specimens may be resharpened examples of originally much longer points. Support for reshaping broken points comes from refitting of three point bases (Figure 4d–f). In each case bifacial reworking of the broken blade end had begun before they broke again and were discarded. Bases range from pointed to narrow-rounded or squared. Most are 3 to 5 mm wide. The points characteristically exhibit acute stems (25–35°) with straight basal lateral margins and excurvate blade margins. The stems are thin, (Figure 6, 7), very similar in size and shape, and appear designed for a standardized side-socketed haft (cf. Dixon 1999; Grønnow 1994; Musil 1988). Overall size and stem breadth is 2.0–2.5 cm at 3 cm distal of the base and 2.3–2.9 cm at 4 cm distal (Figure 5, Table 1). For several of the Richardson Island specimens this is the juncture of very controlled bifacial thinning flakes defining the stem and the broader billet flaking of the blade. Although these might be classified as bipoints it is noteworthy that few are sharply pointed. Most exhibit straight to narrow-rounded bases (one or more abrupt flake scars) and several exhibit flat bases (primary flake platform remnants).

The points from Gaadu Din (Figure 3d, e) appear intermediate between the Taan and Xil styles. They exhibit some grinding, slightly convex basal lateral margins and a less acute base. These specimens exhibit lateral grinding 30 to 50 mm distal of the base and one exhibits a small amount of organic residue, possibly associated with hafting, 30 to 40 mm distal. Three of the Richardson specimens (Figure 4b, g, i) show light edge grinding or crushing 3–4 cm distal of the base and two (Figure 4c, k) exhibit notches in this same area. No basal grinding was noted although some marginal retouch has been used for final stem shaping. Several specimens exhibit one to three small abrupt flake scars resulting in a 2–3 mm wide 'flattened' base. This is the case for both of the (older) Gaadu Din specimens, possibly indicating a transition from broad, rounded to narrow and

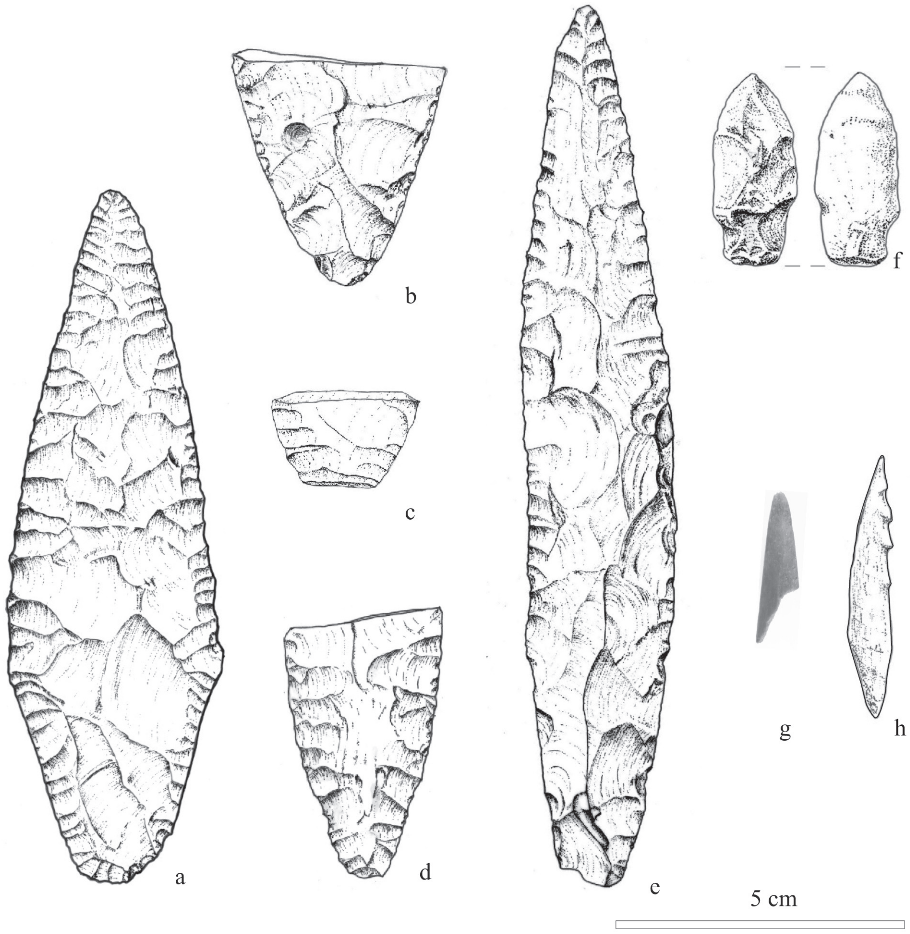

Figure 3. a: Points from Gaadu Din 2 Cave; b–c: K1 Cave; d–e, g: Gaadu Din 2 Cave; f, h: Kilgii Gwaay. Specimen 3a is associated with a date of 10,220 BP; 3b is stratigraphically bracketed by dates of 10,445 and 10,960 BP; 3c is bracketed by dates of 10,520 and 10,630 BP; 3d is undated; 3e dates to 9980 BP; 3f dates to 9450 BP; 3g dates to 10,150 BP; and 3h dates to 9450 BP. Drawings by J.B. McSporran.

pointed bases. Together, these attributes suggest a 3 to 4 cm long stem set into a 4 to 5 cm long bed (side socket) and a 2 to 3 cm wide shaft (cf. Figure 8, Grønnow 1994; Musil 1988).

The term 'contracting-stemmed' follows Bryan (1983), Dixon (1999), Galm and Gough (this volume), and Musil (1988), where a long, tapering base is suggested to have been hafted into a side-socketed (cf. Dixon 1999:Fig. 6.4c; Musil 1994:Fig. 21) or end-socketed (cf. Frison 1978:334; Galm and Gough, this volume:Fig. 4) organic haft. The Xil specimens were likely bound in a side-socketed haft where the sharp margins would not come in contact with the hafting cord. An archaeological analogue for this hafting method can be seen in the mid-Holocene maritime site of Qeqertasussuk in western Greenland where a number of spear-size organic foreshafts with carved side-socket beds have been recovered, including one with a leaf-shaped point still in place (Figure 8; Grønnow 1988, 1994).

Xilju (Haida – little leaf)—small, contracting-stemmed point (8800-8700 BP). This style is similar to Xil but much smaller (Figure 4n–q). It is only known from Richardson Island in a component dating from 8800 to 8700 BP. The assemblage is small (N=4) but distinctive. These points exhibit unground contracting stems. The stems are very acute (11–15°) with straight basal lateral margins and excurvate blade margins (Table 1). Stem margins are long with the shoulders of the only complete specimen being near the tip. As with the Xil specimens, this

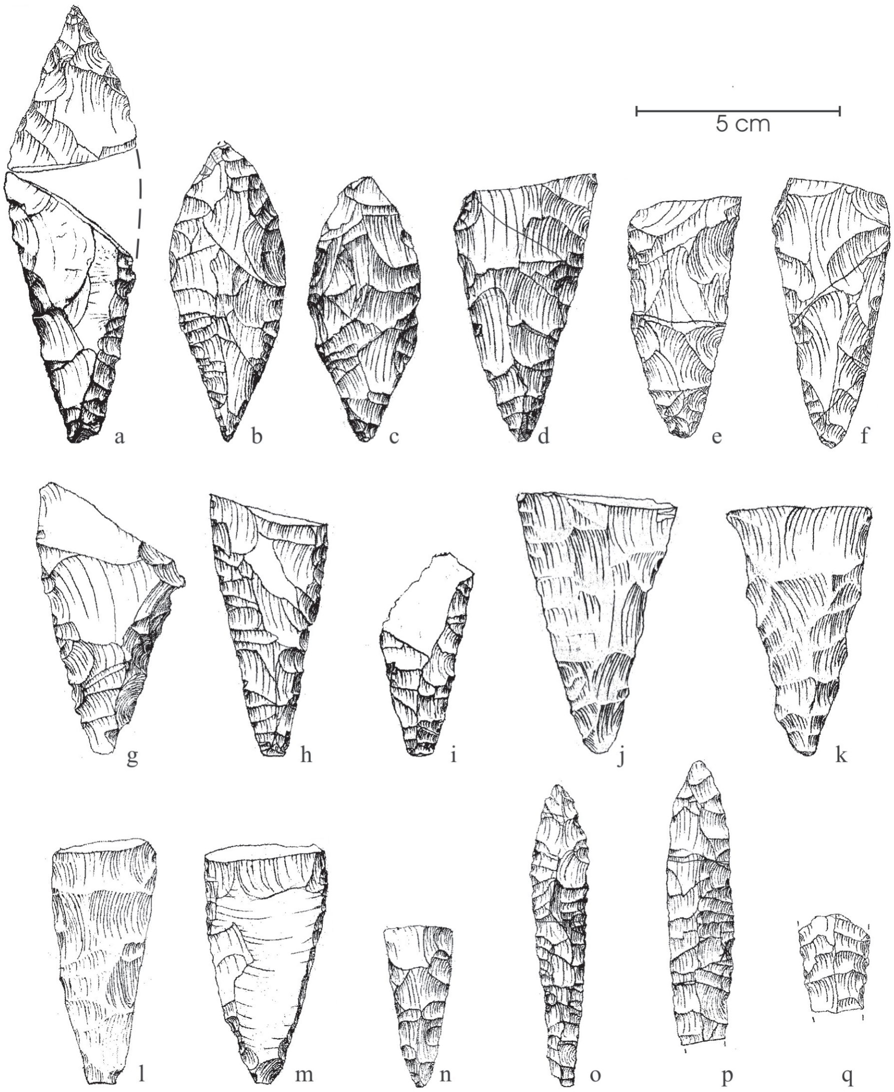

Figure 4. Bifacial points from Richardson Island (a–m: Xil, n–q: Xilju). Specimens a–m date 9300 to 8900 BP and n–q date 8800 to 8700 BP. Drawings by D. McLaren.

may result from resharpening. This is suggested by specimen 4p which, though missing its base, exhibits a long blade element. Stem breadth is 1.1–1.6 cm at 3 cm distal of the base and 1.3–1.8 cm at 4 cm distal suggesting these are likely atlatl points with a shaft/ foreshaft diameter of ca. 1–2 cm (cf. Musil 1988). As with Xil, these were likely set in a side-socketed haft and an analogue can be seen in the large suite of atlatl-size 'lance' foreshafts with carved 'blade beds' from the Qeqertasussuk site (Grønnow 1994).

Xilju points are associated with the earliest layers of the Early Moresby Tradition, which exhibits the first known evidence of microblade technology on Haida Gwaii. The small size and fine manufacturing, including a trend towards lamellar pressure flake scars, seems concordant with microblade technology (McLaren and Smith, this volume).

Discussion of Late Pleistocene to Early Holocene Bifacial Points

We distinguish three styles of foliate bifacially chipped stone projectile points for early post-glacial to early Holocene times in Haida Gwaii. Technologically these might be considered to fit to one general type, a foliate contracting-stem point that

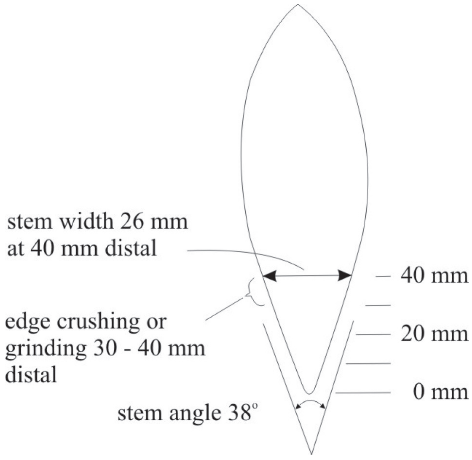

Figure 5. Leaf-shaped point stem measurement method (example).

was present from at least 10,600 BP to 8500 BP. The foliate points do exhibit stylistic differences, however, the degree to which these reflect functional versus temporal distinctions is uncertain.

The bipoint foliate biface is unique as both ends are pointed and either could be re-fashioned after breakage into a tip or a base with only moderate effort. Despite the bipointed form, we attempted to distinguish tips from basal portions using several criteria. Overall our observations are that basal portions have more controlled thinning, lateral smoothing, and consistent width morphology. In a possibly analogous technology from coastal Greenland, hafted bipointed spearpoints have bases thinner, in cross-section, than the blade so as to accommodate the bulk of the haft (Figure 8). This same pattern

Table 1. Stem characteristics for dated Haida Gwaii bifacial projectile points.

Specimen	Type	^{14}C ky BP	Stem			Width in mm at distance (5 to 40 mm) from base							
			side	edges	angle	5	10	15	20	25	30	35	40
Fig. 3a	Taan	10.2	convex	ground	41	15	20	24	27	32	36	38	
Fig. 3b	Taan	10.6	convex	ground[a]	42	13	19	23	28	30	33	35	37
Fig. 3c	Taan	10.6	convex	ground[a]	42	15	22	26	x	x	x	x	x
Fig. 3d	Xil	Est. 10	weakly convex	ground[b]	32	10	14	18	22	24	26	27	28
Fig. 3e	Xil	10.0	weakly convex	ground[b,c]	25	12	15	17	18	21	22	23	24
Fig. 4a	Xil	9.1	straight		30	11	12	14	17	20	23	25	27
Fig. 4b	Xil	9.3	straight	crushed[b]	36	7	11	14	18	22	25	28	29
Fig. 4c	Xil	9.1	straight	notched[b]	31	8	11	16	20	24	25	27	28
Fig. 4d	Xil	8.9	straight		30	8	12	15	18	20	23	26	28
Fig. 4e	Xil	9.1	straight		25	9	13	16	18	21	23	24	25
Fig. 4f	Xil	9.1	straight		26	9	11	13	15	17	19	22	25
Fig. 4g	Xil	9.0	straight	crushed[b]	30	8	12	16	19	21	25	27	29
Fig. 4h	Xil	9.3	straight		25	8	11	13	15	17	19	22	24
Fig. 4i	Xil	9.3	straight	ground[b]	29	9	11	13	15	17	x	x	x
Fig. 4j	Xil	9.1	straight		29	9	12	15	17	20	22	25	28
Fig. 4k	Xil	9.1	straight	notched[b]	27	8	12	14	17	19	21	23	28
Fig. 4l	Xil	8.9	straight		23	10	12	14	16	19	21	22	23
Fig. 4m	Xil	9.1	straight		29	10	12	16	18	22	24	26	28
Fig. 4n	Xilju	8.8	straight		15	6	8	10	12	14	16	17	18
Fig. 4o	Xilju	8.8	straight		11	6	7	8	9	10	11	12	13
Fig. 4p	Xilju	8.8	straight		12	x	x	x	x	x	x	x	x
Fig. 4q	Xilju	8.8	straight		15	x	x	x	x	x	x	x	x
Fig. 8	Greenland	4.0	straight	ground	30	7	10	12	15	18	20	23	25

[a] entire stem margin ground.
[b] stem margin ground, crushed or notched 3–4 cm distal of base.
[c] black organic residue in band 30–40 mm from base.

can be distinguished on the Haida Gwaii specimens (cf. Figures 6, 7). Well-defined shaping is also evident along the basal margins of the Greenland example so that there is a snug fit between the haft bed and the biface. This is also seen on bifaces from Haida Gwaii. Furthermore, Haida Gwaii artifacts have similar width morphology suggestive of shaping to fit a particular haft size (Table 1, Figure 7). With the aid of microscopic examination (10x–30x) light grinding and edge-crushing was found along the basal lateral margins of several of the Haida Gwaii artifacts. Transverse flake scars dulling the basal margins were also noted on a few of the implements. Lastly, Richardson Island, from which the majority of bifaces analyzed originate, is a base camp. Rehafting and a higher percentage of base elements would be expected at a campsite, discarded tips at a kill site. In consideration of these factors we distinguished base from tip portions. However, this is a bipointed industry, and, in a few instances (where there is no grinding, notching or basal flattening) identification as stems is less secure.

The suggested side-socketed hafting method is more shock absorbing than an end-slotted haft (cf. Sentinel Creek, Galm and Gough, this volume). It would be expected to limit spalling and breakage. As well, there would be no need for extensive grinding as the point is held firmly within a confining haft bed by pressure on the face of the stem.

The three styles of projectiles may be functionally different. The association of foliate points with abundant bear remains deep inside K1 and Gaadu Din caves suggests bear hunting activity (McLaren et al. 2005). Ethnographic data from many places in the northern hemisphere reveal that a preferred method of bear hunting was to roust the bear from its den or lair (using dogs or throwing in burning branches) and then have the animal impale itself upon a braced spear just outside the entrance (Hallowell 1926). The stem width of the Taan points suggests use with a large diameter spear shaft (Grønnow 1994; Musil 1988). The Xil stems are somewhat narrower, but

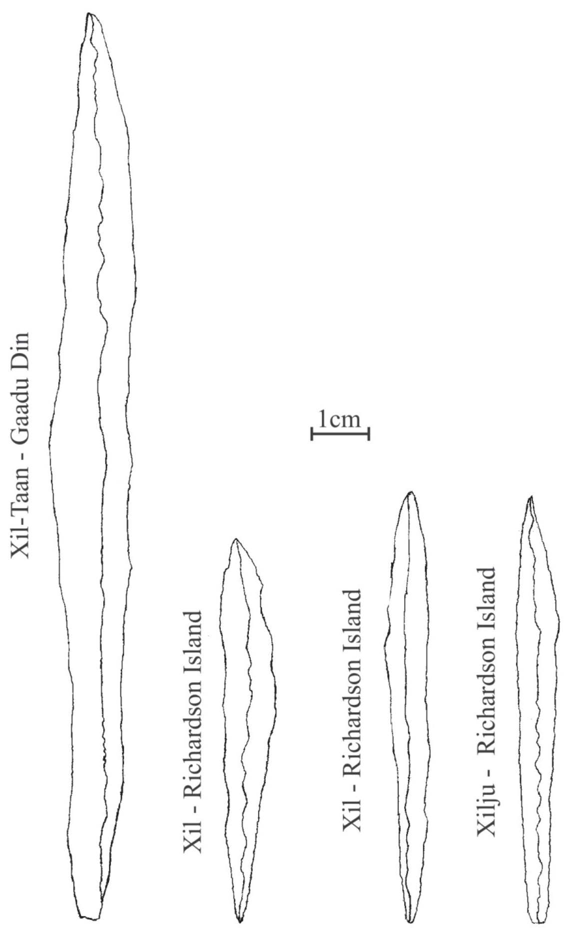

Figure 6. Longitudinal cross-sections of Gaadu Din and Richardson Island points. Drawings by D. McLaren.

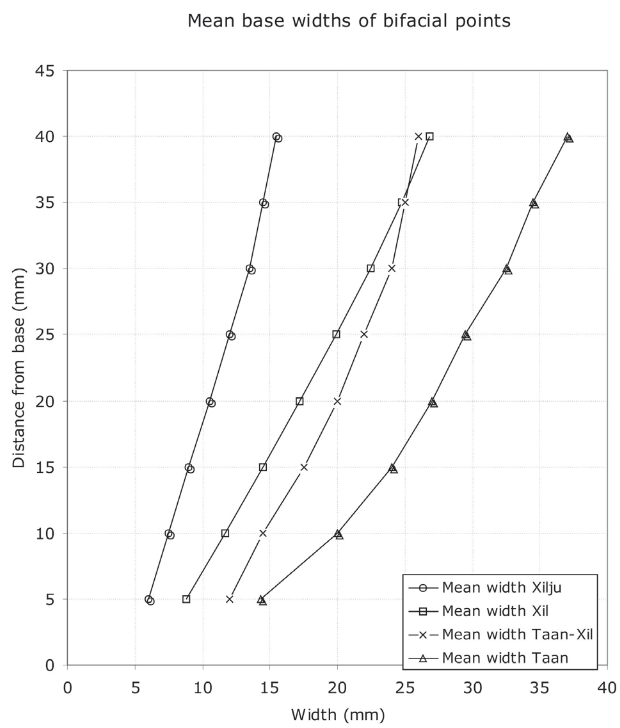

Figure 7. Stem widths for Haida Gwaii points: Taan (n = 3), Xil–Taan (n = 2), Xil (n = 13), Xilju (n = 2).

still of a size consistent with a spear rather than atlatl shaft. Xil and Xilju points show little or no evidence of basal grinding and are foliate with narrow to pointed bases. The distinction between these types is overall size and stem width, with the Xilju specimens being significantly smaller, having a much narrower stem and finished using pressure flaking. The stem width of the Xil type suggests use with a spear while that of Xilju points is consistent with atlatl dart dimensions (Grønnow 1994:220; Hare et al. 2004; Musil 1988; Shott 1993).

Sites with contracting-stemmed points dating to ca. 9000 BP or earlier are rare in the Northwest Coast area. The basal component at Namu produced a single specimen, ground on the stem portion (but less broad), associated with core tools, choppers and simple flake tools, and dated to ca. 9700 to 9000 BP (Carlson 1996). Points similar to the Xil style have been recovered from On Your Knees cave in southeast Alaska where they date from 9200 to 8500 BP (Dixon 2002) as well as from a number of undated sites on the southern BC coast (McLaren and Steffen this volume; McMillan 1996; Wright 1996). Component 3 at Ground Hog Bay 2 in southeast Alaska is of similar age (ca. 9200 BP) but produced only two biface fragments and a few flakes (Ackerman et al. 1979).

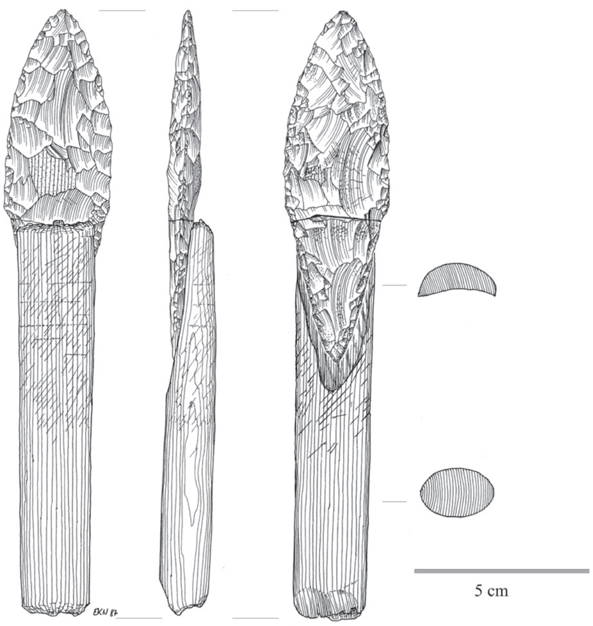

Figure 8. Hafted spear point from mid-Holocene Arctic Small Tool (AST) site of Qeqertasussuk, West Greenland (earliest AST site in eastern Arctic – 4200 BP). Drawing by Eva Koch, reproduced with permission of Bjarne Grønnow.

Farther afield, several contracting-stemmed points with basal grinding were excavated from 10,200 to 9700 BP components at the Vermilion Lakes and Eclipse sites in the Rocky Mountains of western Canada (Fedje 1996, Fedje et al. 1995) and from a ca. 10,200 BP component at Sentinel Gap (Galm and Gough, this volume). The Vermilion and Eclipse components also contained a tool set similar to those from early Haida Gwaii sites (Fedje, Magne, and Christensen 2005), including scraper-planes, choppers and simple flake tools. In interior Alaska foliate points are present as early as 11,200 BP but consensus has yet to be reached as to whether the various technologies documented (i.e., Nenana, Mesa/Sluiceway, Beringian Tradition, Denali, etc.) relate to site functionality or to 'ethnicity' (Dixon 1999; Goebel 1999; Rasic 2003; West 1996; Yesner 1996). At a geographic stretch, the Xil points are very similar to foliate points from the Ushki site in Kamchatka and from the Uptar site near Magadan on the Pacific coast of northeast Asia (Goebel and Slobodin 1999; Slobodin and King 1996). The Ushki points date from ca. 11,300 to 10,100 BP while the Uptar points underlie an 8500 BP tephra.

Points comparable to the Xilju style appear to be uncommon in northwestern North America. This may be an independent development integrating Northwest Coast Microblade Tradition techniques with the pre-existing biface technology. An assemblage with similarities to this style, and potentially of a similar age, seen at Long Lake, near Anchorage Alaska where bifaces with narrow rounded bases are associated with microblade technology (Reger and Bacon 1996). Some surface collected points from southwestern British Columbia are also similar, although the association of microblade technology is uncertain (McLaren and Steffen, this volume). The Xilju points are very similar to the narrow leaf-shaped 'arrow' points from the Uptar and Kheta sites near Magadan (Goebel and Slobodin 1999; Slobodin and King 1996). At both sites these points underlie an 8500 BP tephra. The Kheta specimen is associated with microblade technology. The Uptar specimens are associated with larger foliate points. The dimensions (stem width and overall size) of these points are consistent with those of atlatl points.

Other Projectile Points from the Late Pleistocene to early Holocene

Unifacial Stemmed Point. A small unifacially flaked stemmed point (Figure 3f) was recovered from a 9450 BP component at Kilgii Gwaay (Fedje, Mackie et al. 2005). This point has a relatively narrow (12 mm) squared stem with prominent, though slightly rounded, shoulders. There are no other comparable points known for Haida Gwaii and, as such, it cannot be considered a representative type. The stem width fits within the range of atlatl points. This unifacial point may be opportunistically made on a pointed flake. Beyond Haida Gwaii, some similarities can be seen to the small bifacial shouldered points from On Your Knees Cave (Dixon 2002).

Bone Points. Projectile points made from organic materials are uncommon during Kinggi Complex times, at least in part due to poor preservation at most sites. The tip of a bone point from Gaadu Din cave (Figure 3g) dates to 10,150±25 BP (UCIAMS 31729). A small unilaterally-barbed fixed bone point (Figure 3h) was found at the 9450 BP Kilgii Gwaay site, along with a well developed ground bone and wood industry (Fedje, Christensen et al. 2005). The function of these points is not certain but context (association with a mammalian fauna dominated by bear and sea mammals) implies that these may have been used to arm hunting spears or atlatls. The stem width of the Kilgii Gwaay specimen would suggest the latter. At Richardson Island, organic preservation is extremely poor, but the calcined tips of three bone artifacts have been found in hearth contexts dating to between 9100 BP and 9300 BP. Two of these most closely resemble barb elements, perhaps from a fishhook or a small barbed bone projectile point. The third is so fragmentary that reasonable inferences cannot be drawn.

Early to Mid-Holocene– ca. 8750 to 5000 BP

Artifact assemblages in Haida Gwaii dating to the Moresby Tradition (8750 to 5000 BP) include rare bone points, a few stone points in the earliest part (pre-8000 BP) and composite points as revealed from one slotted bone point and, an abundance of microblades. Radiocarbon dated microblade assemblages have been recovered from excavations at the Richardson Island, Lyell Bay, Arrow Creek, Kasta, Lawn Point and Cohoe Creek sites (Figure 9; Christensen and Stafford 2005; Fedje, Magne, and Christensen 2005; Fladmark 1986). The earliest securely dated evidence of microblade technology in Haida Gwaii is found at the Richardson Island site where microblades appear at 8,750 BP (Fedje, Magne, and Christensen 2005; Mackie and Fedje 2006). Many other sites in the Haida Gwaii archipelago contain microblades in a geological context inferring an early Holocene age (i.e., on raised beaches). Bifacial and microblade technology overlapped in Haida Gwaii from 8750 to 8400 BP. There is currently no evidence for biface technology in Haida Gwaii between 8000 and 3000 BP

Composite Points and Microblades

In early to mid-Holocene archaeological sites in northwestern North America the presence of microblades has been used to infer the use of composite slotted organic projectile points (Carlson 1983a:19). Slotted point technology is an additive approach to projectile point technology (cf. Dixon 1999:157; Giria and Pitul'ko 1994) where microblades are broken into small sections and inset into bilaterally and longitudinally slotted bone, antler, or ivory points.

The premise that some Haida Gwaii microblades were used to arm composite organic points is supported by the recovery of a fragmentary slotted organic point from a 5200 to 5000 BP component at the Cohoe Creek site in northern Haida Gwaii (Christensen and Stafford 2005) (see Figure 10d). The point exhibits a long groove, V-shaped in cross section, cut into both lateral sides of a piece of antler or bone likely to accommodate the insertion of microblade sections. Microblades were not found inset into the artifact but many were found in the same deposit. The point is very fragmented but when reconstructed measures approximately 25.0 cm long, 1.9 cm at its widest, and 0.8 cm at its thickest. The slot begins 4.3 cm from the base and continues the length of the refitted pieces. The distal section is missing.

Discussion of Slotted Point Technology

The slotted point from Cohoe Creek is similar to points recovered from Namu and Trail Creek (Alaska), and shares general technological characteristics with composite points recovered from a number of other sites in Alaska and Northeast Asia. The slotted bone point fragment from Namu is of similar age to the Cohoe Creek specimen (Carlson 1996:101 fig 18) while the Trail Creek specimens date considerably earlier. The slotted point fragments recovered at Trail Creek were associated with microblades, most of which were medial sections. The Namu specimen and those from Trail Creek Cave are oval in cross-section with the slot starting near the tip but differ somewhat in their narrowness.

The slotted points from the Lime Hills and Ilnuk sites (Ackerman 1996) in the Alaskan interior are morphologically different from the Cohoe example. The ~9500 BP points from Lime Hills are quite narrow (Ackerman 1996). At the early Holocene Zhokov site in the Siberian Arctic both unilateral and bilateral bone and antler points with inset medial microblade segments were recovered (Giria and Pitul'ko 1994; Pitul'ko and Kasparov 1996). These slotted points are quite large and commonly have triangular cross sections. The Cohoe Creek slotted point likely functioned as an atlatl dart. Although wider, the Cohoe point is of similar length to a Yukon ice patch example of a slotted composite atlatl point (Hare et al. 2004).

Many of the sites with slotted point technology appear to be associated with ungulate remains, especially caribou. At Trail Creek, Lime Hills, and Ilnuk caribou was the most common animal in the archaeological deposits while at Namu a variety of fauna, including deer, bear and sea-mammals were recovered from the component containing the slotted bone point fragment. The Zhokov fauna includes polar bear and caribou. Caribou was common in the deposits dating to between 5200 and 5000 at Cohoe Creek. It is likely that the slotted points were often used to hunt ungulates or that ungulate bone or antler was particularly suited for the manufacture of slotted points. Undoubtedly, in Haida Gwaii, these composite points were used for hunting a variety of terrestrial and marine mammals (see also Cassidy et al. 2004).

The absence of slotted bone points at microblade sites in Haida Gwaii other than Cohoe Creek is likely a function of preservation. These sites contain no organics other than charcoal, and, in a few cases, tiny fragments of calcined bone. It is interesting that, although we see the continuation of microblade technology into shell-bearing, bone-preserving post-5000 deposits in southern British Columbia and Washington State, slotted points have not been found in these assemblages. At these later sites microblades may have been used primarily for cutting rather than hunting purposes as were, for example, the end-hafted microlithic tools recovered from the Hoko River wet-site (Croes 1995).

Bone Points. A number of bone points including a unilaterally-barbed fixed bone point have been recovered at Cohoe Creek (Figure 10a–c), from deposits dating to ca. 4800 BP (Christensen and Stafford 2005). The absence of organic tools at most Early and Late Moresby Tradition sites is probably a result of preservation biases stemming from the rarity of shell bearing deposits.

Mid-to-Late Holocene– ca. 5000 to 200 BP

Projectile points from the Graham Tradition are predominantly organic. Stone points are rare. They include two lanceolate points, of presumed late Holocene age, and a small number of ground slate points. Two obsidian biface fragments from Bluejackets Creek sourced to Mt. Edziza (Carlson 1994) may be from projectile points.

Bifacial Points

Two undated lanceolate points, and a small number of biface fragments, some of which may be projectile points, have been recovered from surface contexts in Haida Gwaii (Figure 11). A bifacial projectile point found on the surface of Graham Tradition archaeological deposits at the Dead Tree Point site on eastern Graham Island has a lanceolate shape and fine parallel flake scars oriented collaterally (Figure 11a). It is basally thinned and the basal lateral margins are lightly ground. The point was manufactured from a translucent green chert apparently imported from the Mainland (Fladmark 1989:216). A lanceolate, bifacially worked point (Figure 11b) found on the surface at Clonard Bay on the west coast of Graham Island (Acheson 1995) may have been recycled in late prehistoric time. It is very finely worked and exhibits collateral flaking, parallel lateral edges and a straight base with slightly rounded corners. The point has an impact scar on the distal end. Subsequent to flaking the artifact has been ground on both faces.

The lanceolate points from Clonard Bay and Dead Tree Point are reminiscent of the late Paleoindian-like points of Alaskan Denali-age components (Ackerman 1996; Holmes 1996:316; Kunz and Reanier 1996). There are also similarities to 'Northern Archaic' (Donahue 1975) points from northern B.C. such as ca. 3500 BP lanceolate points from the Skeena River and southern Yukon areas (Allaire 1979; Hare et al. 2004:265). In reference to the Clonard Bay point, it is noteworthy that a large lanceolate biface from Prince Rupert dating to ca. 4500 BP is both flaked and ground (Ames 2005; Fladmark et al. 1990). For both specimens, their context as surface finds within a few metres elevation of the modern shore supports a late Holocene age.

Ground Slate Points

Ground slate points (Figure 11d, e) are rare in Haida Gwaii (Fladmark 1989; Fladmark et al. 1990). Slate points from Blue Jackets Creek (Severs 1974) are said to be thin and triangular with sharp lateral edges. A ground slate point from Zone II at Skoglund's Landing is basically foliate in plan with a diamond-shaped cross section (Fladmark 1989). A surface collected specimen from a site on the west coast of Graham Island is an elongate triangle with

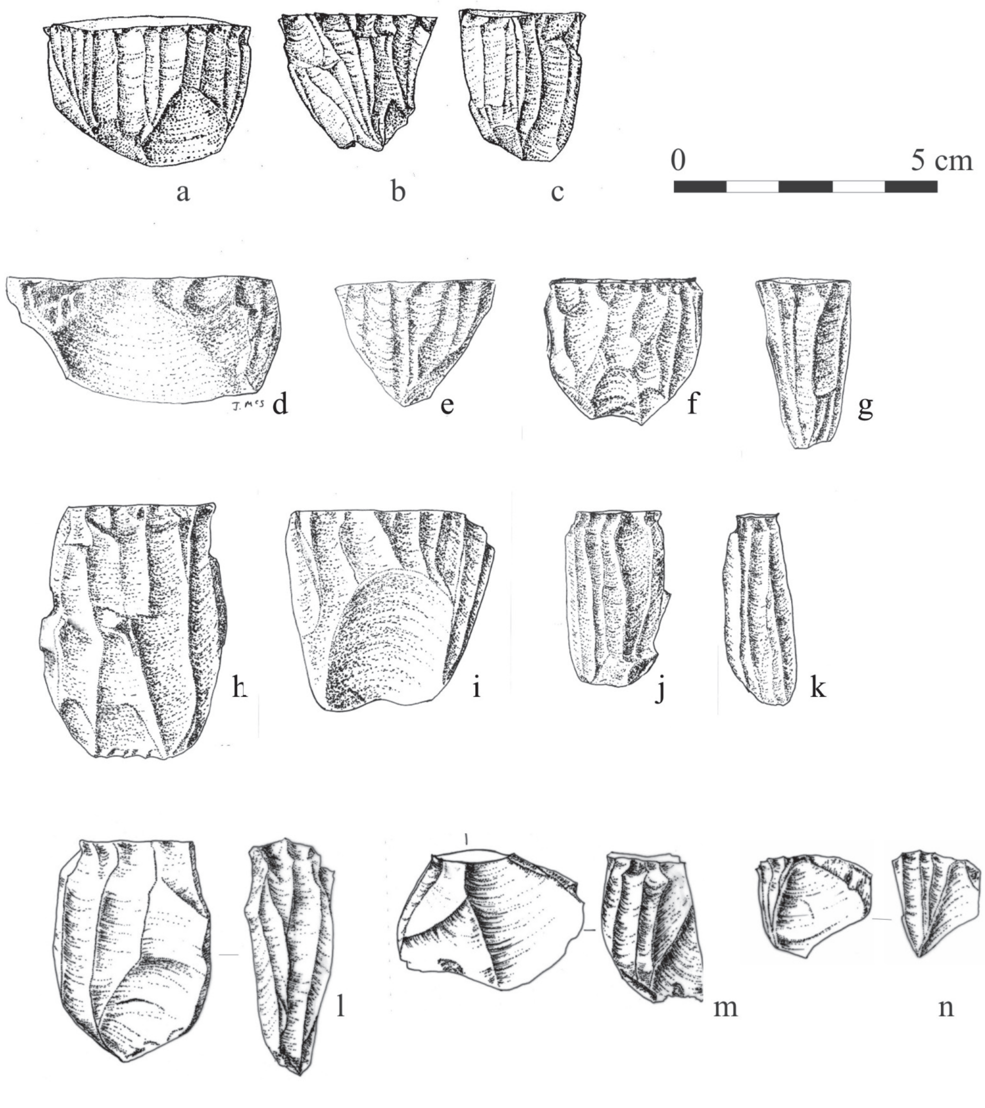

Figure 9. a–c: Microblade cores from Richardson Island—dating from 8750 to 8500 BP. d–k: Arrow Creek—dating from 8000 to 7000 BP; and l–n: Cohoe Creek—dating from 6000 to 5000 BP. Drawings by J.B. McSporran.

cleanly faceted, sharp lateral edges and a hexagonal cross-section

Organic Points

With the accumulation of large shell middens in the Graham Tradition preservation is favourable for bone, antler, shell and wood projectiles (Figure 11c, f–o). In the Early Graham tradition (5000 to 2000 BP), medium sized bilaterally-barbed harpoon heads with basal line guards are the most common type, known from Bluejackets Creek, Kiusta and Honna River. Less common are unilaterally barbed harpoons with line guards. The medial section of a bone point with a single, low, enclosed barb is known from Cohoe Creek (Christensen and Stafford 2005). Fixed points appear to be rare. Composite harpoon valves are reported from Blue Jackets Creek (Sutherland 1974) but are neither enumerated nor illustrated. The majority of known Early Graham specimens are made from land mammal bone or antler, and rarely on sea mammal bone.

In the Late Graham Tradition (2000 BP to contact), bilaterally barbed harpoons are absent,

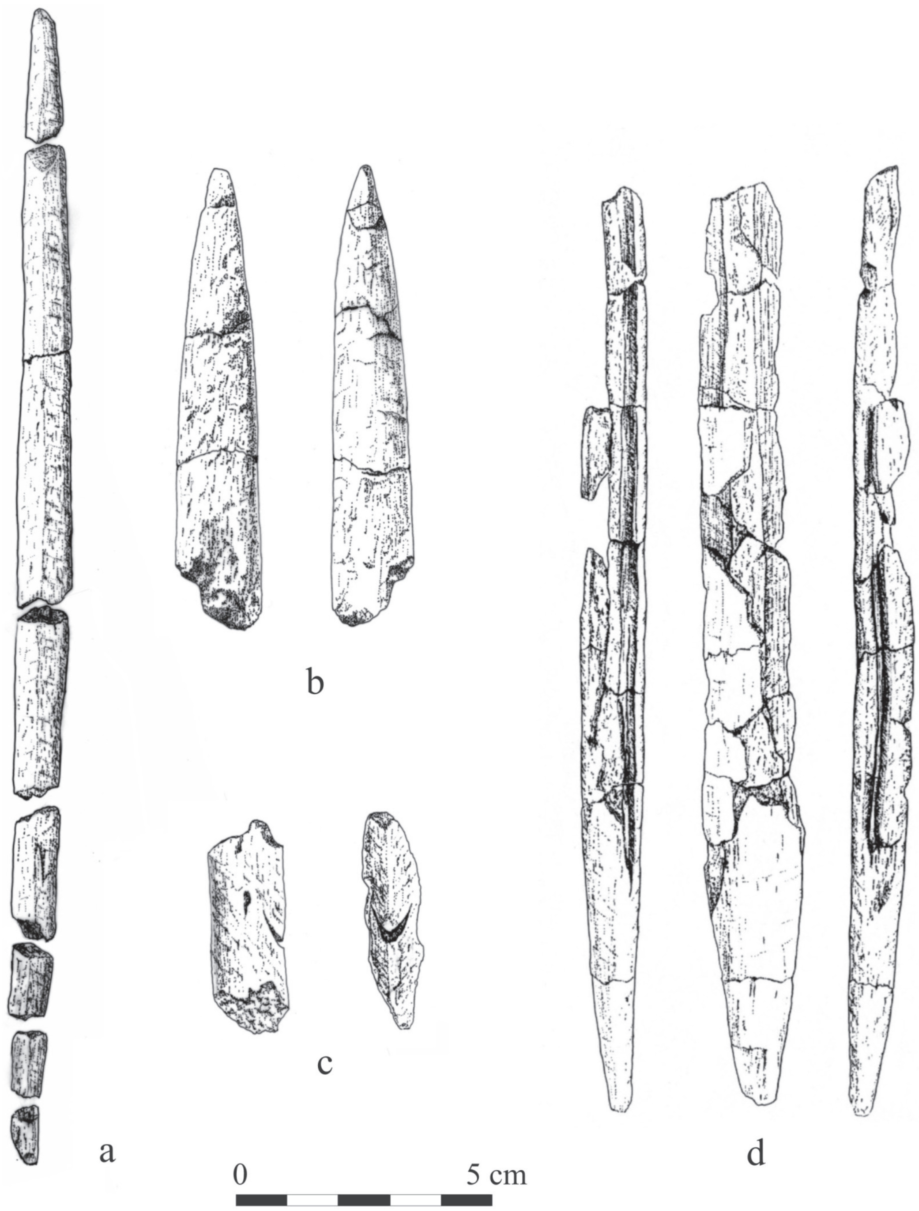

Figure 10. Bone points fragments (a–c) and slotted bone point (d) from Cohoe Creek. Drawings by J.B. McSporran.

replaced by unilateral ones. Also present are composite toggling harpoon valves (Acheson 1998; Orchard 2003). Specimens examined included the self-armed variety and valves with no obvious point bed, perhaps to be paired with their self armed counterparts (Figure 11m, n). One partial mussel shell point (Figure 11c) is known (Acheson 1998), probably the arming blade of a composite harpoon. Again, fixed bone projectile points are rare to absent, excepting points most readily explained as fishhook barbs. The majority of Late Graham points are made on sea mammal or land mammal bone. Ground stone points are rare in the Late Graham tradition and ground stone in general is an uncommon artifact type. Wooden points from Haida Gwaii are rarely preserved but include a unilateral harpoon from Bag Harbour in southeastern Moresby Island (Figure 11i) and a long atlatl point (Figure 11j) from Skidegate on southeastern Graham Island. Both were recovered from intertidal waterlogged components.

Temporal variation within the Graham Tradition is difficult to interpret because all the excavated Early Graham sites are towards the north of the archipelago, while the most significant Late Graham sites are near the southern end. Hence, regional variation could be masquerading as temporal variation. This highlights another difficulty: most of the excavated early Graham Tradition sites, such as Bluejackets Creek, Honna River and Kiusta, remain, at best, only partially reported (Gessler 1974, 1980; MacDonald and Inglis 1980; Severs 1974).

Haida Gwaii Projectile Points in a Regional Context

Bifacial projectile points are a common feature of sites in Haida Gwaii before about 8500 BP, but rare after about 8000 BP. Surrounding areas do not have as well-known an early Holocene record and so regional comparisons are difficult. Northern Northwest Coast well-dated early Holocene sites (10,000 to 8000 BP) with projectile points, outside of Haida Gwaii, include only On Your Knees Cave and Namu. After the early Holocene, biface technology is present outside of Haida Gwaii. Mid-Holocene (7000 to 4000 BP) components with bifacial technology are known from Prince Rupert Harbour and the lower Skeena (Allaire 1979; Ames 2005; Coupland 1988), the central coast of B.C. (e.g., Carlson 1996; Mitchel 1988) as well as on north and west Vancouver Island, (e.g., Arcas 1991; C. Carlson 1979, 2003; Maxwell 2005; McMillan 1998; McMillan and St. Claire 2005). In the late Holocene, bifacial technology generally declines in all areas though flaked stone technology continues to be present. Hobler (1990:304), in discussing trends in Central Coast archaeology, suggests that outer coast sites seem to lose flaked stone technology earlier than inner coast sites.

The absence of bifaces on Haida Gwaii, once thought to be total, and now known to be a case of "extirpation", requires explanation. One clue comes from the raw material being used. With very few exceptions, all lithic technology (bifacial, unifacial, and prepared core) on Haida Gwaii is made on locally available raw materials. A wide variety of argillites, siliceous argillites and rhyolites are available, at least in Gwaii Haanas. By contrast, the earliest components known in Southeast Alaska and at Namu prominently include exotic materials, principally obsidian, suggesting a very wide acquisition or distribution network was in place very early. For example, at On Your Knees Cave, obsidian from moderately distant (Suemez Island) and distant (Mt. Edziza) sources is present in the earliest deposits, ca. 9200 BP (Lee 2001). Similarly, at Namu, Mt. Edziza and Chilcotin obsidians appear on the coast by around 9000 BP (Carlson 1994; Hutchings 1996). Haida Gwaii appears to not be part of this interaction network. Although the evidence is limited, even the materials known from late Pleistocene sites—when lowered sea levels may have made interaction with the coast easier—are from apparently local sources.

At Kilgii Gwaay (9450 BP), exotic materials are absent. The assemblage (n>5000) is composed mostly of a siliceous argillite available 10 km away and small amounts of chalcedony (agate), widely available in Gwaii Haanas. At Richardson Island (9300–8500 BP), a detailed geochemical analysis (Smith 2004) showed considerable diversity in raw material types, but, again, despite this variety and the very large number of lithics recovered (n>50,000), there are no pieces that could not have been locally sourced. Indeed, based on both definitive sources and an assessment of the surficial geology, Smith (2004) suggests that the vast majority of the Richardson raw material would have been available within a 5 or 10 km radius of the site.

Figure 11. a, b: Bifaces from Deadtree Point and Clonard Bay; c: ground mussel shell point from Cape Freeman; d, e: ground slate points from Louscoone Inlet and Port Louis; f, h: bone toggling harpoons from Louscoone Point; g: bone toggling harpoons from Massett; i: wood harpoon from Bag Harbour; j: wood point from Skidegate; k–l: bone points; m, n: composite bone points from Louscoone Point; and o: toggling harpoon valve from Louscoone Point. Drawings by Joanne McSporran and Brian Seymour. Photos by Kim Martin and D. Fedje.

It appears that the insular nature of the Haida Gwaii archaeological record is established very early on. In fact, whereas on the mainland coast regional interaction appears to decline through time, Haida Gwaii appears quite isolated until the late Holocene, when influences from the mainland and, perhaps, Vancouver Island, are seen in the Late Graham tradition. Bifacial technology appears to disappear from Haida Gwaii around 8000 BP. As noted above, the only bifaces known to date after this time are two imported obsidian specimens from late Holocene Blue Jackets' Creek and surface finds, of probable late Holocene age, from Dead Tree Point and Clonard Bay (both also suggested to be imported from the Mainland).

This impression needs to be reconciled with the major technological innovation in projectile point technology: the introduction of microblade technology. The adoption of microblades is best documented at Richardson Island, where they first appear in a layer dated to 8730 ± 25 BP (UCIAMS 21979). Biface numbers decline, but continue through the rest of the excavated early Holocene sequence, i.e., for the next three centuries or so, as bone points are present very early and from the middle Holocene onwards, they can be considered evidence of continuity, rather than change.

The addition to, rather than replacement of, bifacial technology argues against simple explanations of ethnic replacement. Rather, it casts the problem into more adaptive terms. Both Magne (2004) and Smith (2004) agree that the introduction of microblades appears to be built upon existing technologies and raw materials. The former suggests that a distinctive unifacial core and scraper technology provides a pre-existing lithic reduction strategy—in essence a preadapted template—from which microblade technology is not so radical a development as it might otherwise seem. McLaren and Smith (this volume), note that a trend in the otherwise fairly unpatterned Richardson Island bifacial production is towards increasing lamellar flake scars. Being similar to microblades in both function (fairly standardized, small, long and narrow flakes) and reduction strategy (finely targetted pressure flaking) this is seen as further circumstantial evidence for *in situ* development of microblade technology (Smith 2004). Smith's analysis of the raw material concludes that microblades are first implemented on raw material types previously used for other reduction strategies, and that a period of wide raw material innovation ensues, followed by a focus on key raw materials previously absent in the Kinggi complex layers. She interprets this as a period of experimentation: a technological *idea* is fitted to local circumstances, in contrast to the sudden appearance of a well-developed techno-complex.

This gradual process is coincident with a major environmental change: after two millennia of unidirectional sea level change, sea level stops rising some time around 8800 BP. Soon after, microblades appear. These two events—the two major Holocene events in the environmental and technological domains, respectively—may be linked. With sea level stabilization came new adaptive challenges as a people accustomed to a dynamic environment were confronted with stability (Mackie and Fedje 2006; Magne 2004). One possibility is that with stable sea levels came a reduction in readily available lithic raw material as intertidal exposures stabilized, and the profligate days of the Kinggi complex came to an end. Microblade technology does have the advantage of conservation in lithic raw material, although many previously available raw material types at Richardson Island continue. Excavation of 8500 to 7500 BP layers would be very helpful, to trace the suggested decline of bifacial technology and, if stratigraphic resolution was high enough, to observe consolidation of raw material acquisition patterns. Such layers may exist at Richardson Island, areas of which were occupied in the middle Holocene. It may be significant that the link between changing sea levels and microblades is double-ended: when sea levels start to drop around 5000 BP, microblades appear to fall out of use, perhaps because raw materials become more abundant once again against a shifting shoreline.

Another factor that could have bearing upon shifts in hunting technology (i.e., from spear to atlatl) is change in the biological environment. Until 10,000 BP Haida Gwaii was characterized by relatively open landscapes, first tundra and then parklands (Lacourse and Mathewes 2005; Lacourse et al. 2003, 2005). After that time the forests began to close in and, with environmental warming between 10,000 and 9000 BP, migrate to high elevations. This would have significantly reduced bear and large ungulate habitat with the result that the need for heavy spears (cf. Hallowell 1926) may have dropped off and perhaps encouraged a greater reliance on atlatl technology (i.e., the shift from Xil spear points to Xilju and microblade-armed composite dart points). This is not to say that atlatls were not used prior to ca. 9000 BP—they could have been armed with bone points such as those found at Kilgii Gwaay and Gaadu Din cave—cf. Hare et al. 2004) or simply not yet be represented in the small sample of early points recovered to-date. The apparent absence of post-9500 BP bears at K1 and Gaadu Din caves may reflect a significantly reduced black bear population as well as the regional extirpation of brown bear (Fedje and Sumpter 2005). Alternatively, the absence of post-10,000 BP bears in the caves may reflect forest development and a commensurate shift to the modern practice of hibernating in excavated dens (e.g. under large trees).

In the later Holocene perhaps the most notable aspect of Haida Gwaii projectile technology is the relative lack of interest in ground stone. Slate and other suitable raw materials are abundant, however people appeared to focus on ground bone, antler and wood for their projectiles. This period is best documented for the extreme southern regions of the archipelago and so it is perhaps unsurprising that this preference closely echoes the West Coast Culture Type of Vancouver Island (McMillan 1998; Mitchell 1990), especially its most northerly known expressions at Yuquot (Dewhirst 1980) and Hesquiaht Harbour (Haggarty 1982). Better analysis of Graham Island late tradition deposits might show parallels with mainland North Coastal trends. On the other hand, the lack of abundant ground stone in the surface collected and, to the extent knowable, unreported excavation assemblages, suggests that ground stone was never an important projectile point technology on Haida Gwaii.

With regards to harpoons, the change from early bilaterally barbed styles to more recent unilateral styles echoes a coast-wide pattern identified by McMurdo (1972). Throughout the Graham Tradition, the barb style tends to be high and extended, and most points have only one or two barbs. Early examples tend to have line guards while later ones have line holes, or are composite, a trend which bears some similarity to those in Prince Rupert Harbour (McDonald and Inglis 1980). The self-armed composite toggling harpoons known from Gwaii Haanas may reflect Kunghit Haida interaction with the West Coast Culture Type of Vancouver Island, in which these are a typical artifact type, as discussed by Mackie and Acheson (2005). Since no sites are known from the West Coast of Vancouver Island that predate 5500 BP, it is difficult to comment on long-term pan-outer coast trends in bifacial technology. By 4500 BP at Yuquot bifacial technology is absent, and the later convergence upon a nearly-exclusively bone and wood tool-kit suggests some long term ties with Haida Gwaii which are perhaps greater than either area had with adjacent mainland areas. Such ties may have originated in the early Holocene but demonstration of this awaits discovery and excavation of relevant sites on northwestern Vancouver Island.

One point of interest is the low diversity of large land mammals on Haida Gwaii to serve as raw material for projectile technology. Rahemtulla (2003) suggests that land mammals are a crucial component of a maritime adaption because of the unique properties of their bone: hard, stiff, yet flexible and amenable to controlled shaping. With caribou limited to more northern environments, for much of the archipelago the only land mammal bone available was from black bear, which are not an abundant source of antler. The paucity of ground stone is, therefore, all the more remarkable considering the inherent difficulties in hunting black bears, and their relatively low population numbers as apex predators. Again, resolution of this important question will require more archaeological work, such as technological analysis of such important assemblages as Blue Jackets Creek and Kiusta, and excavation at southern early Graham tradition sites and northern late Graham tradition sites to resolve current geographic and temporal confounds. In the south, the early Graham Tradition sites may be on poorly developed terraces intermediate between modern and early Holocene sea levels. With sea level regression, these sites are likely smeared more thinly as people moved downslope and this may account for their lower visibility: shell preservation in a thinner site is likely to be much poorer than at sites associated with more stable or more recent sea levels. Despite visibility issues, due to the massive quantities of California mussel in Haida Gwaii middens, a greater attention to worked mussel shell could also enhance knowledge of worked shell projectile arming.

Conclusions

Data on projectile points for Haida Gwaii remain slim and, as such, present interpretations are preliminary and of only general utility. There are significant shifts in technology from bifacial to composite (ca. 8750 BP) to organic (ca. 5000 BP) but much of the associated tool kit shows little change until very late in this history. The ultimate source of the technology seen at early Haida Gwaii sites is likely western Beringia but it remains unclear whether this was directly via the paleo-Beringian coast (cf. Dixon 2001) or step-wise via inland Beringia and southeast Alaska (Carlson 1996, 2003). The oldest dated projectile points in Haida Gwaii are only 10,600 radiocarbon years old, about 1000 years younger than early Alaskan sites (Goebel 1999, Holmes 2001, Rasic 2003). Similarities between Nenana and early Haida Gwaii technologies (e.g., foliate points, large core tools and a focus on expedient flake tools) raise the possibility that both derive from the same ancient western Beringian technology. Similarly, the shift to microblade technology in Haida Gwaii appears to mirror that seen in northeast Asia and central Alaska although considerably later in time.

Overall, technological change in Haida Gwaii appears to be additive, with change being gradual rather than rapid. The shifts from foliate bifacial to microblade composite and to organic projectiles are significant but appear to occur over a period of centuries, thus suggesting diffusion or *in situ* development rather than significant demographic change. The high-resolution deposits at Richardson allow very detailed temporal distinctions to be made and so the process of technological innovation is better understood at this site than most (Fedje, Magne, and Christensen 2005; Magne 2004; Smith 2004). The changes in projectile point attributes during the early period are linear and relatively subtle and likely, at least in part, reflect differences in site function and raw material availability. For example, the Haida Gwaii spears may have been largely used for hunting bear at den entrances (cf. Hallowell 1926; McLaren et al. 2005) and the smaller Xilju and microblade composite darts for open-air hunting.

Site visibility remains a significant issue in obtaining representative samples of technology for early Haida Gwaii. Karst cave research shows that people were in the archipelago at a very early time but only hint at one aspect of adaptation. Survival of coastal archaeological sites on 12,000 to 11,000 BP ocean shorelines, except as reworked underwater lag deposits, is unlikely. Investigation of other inland landforms (lakes, river terraces, etc.), especially where ancient shorelines have not shifted large distances (cf. Davis et al. 2004; Rick et al. 2001, 2005), may ultimately lead to a more complete understanding of early adaptations, including time-diagnostic changes in projectile point form. Understanding later trends would involve investigation of the crucial 8500 to 7500 BP period, as well as a geographic gap-filling strategy for the Graham Tradition.

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Chapter 4

The Stratigraphy of Bifacial Implements at the Richardson Island Site, Haida Gwaii

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Introduction

The Richardson Island site is located on the Northern Northwest Coast of British Columbia, in the island archipelago of Haida Gwaii[1] (Figure 1). Dating between 9400 and 8400 BP[2], the archaeological deposits at the site span over four vertical meters with over fifty discrete depositional events. The site is associated with a raised marine terrace. Excavations have recovered a large number of lithic manufacturing debris and artifacts related stratigraphically throughout a one thousand year period. The cultural sequence at this site includes the transition at 8750 BP from the Kinggi Complex (dominated by large unifacial core tools and foliate bifaces) to the Early Moresby Tradition, which sees the introduction of microblades to the existing lithic toolkit. In this context of technological change, the following paper addresses the research question: does the bifacial manufacturing technology at the Richardson Site change significantly during the period of occupation? This question is explored through an analysis of bifacial attributes through time. Those attributes found to exhibit change through time are then compared to raw material type; a trait previously found to change throughout the Richardson sequence. We find that the bifacial manufacturing attributes and trends in bifacial raw material usage change minimally during occupation. These findings suggest that towards the end of their early Holocene existence on Haida Gwaii, bifaces remained a conservative technology little affected by the emergence of microblades.

Background

The Richardson Island site was first located in 1993 as a secondary deposit in the indertidal zone on the west side of Richardson Island (Mackie and Wilson 1994). The primary and *in situ* deposits were later identified to be associated with a raised marine terrace 15–16 meters above present day sea level (Fedje and Christensen 1999). Parks Canada and Haida Archaeologists undertook excavations at the site in 1995 and 1997. In 2001 and 2002, the University of Victoria conducted a larger scale excavation project at the site funded by SSHRC (Fedje 2003; Mackie et al. 2004; Smith 2004; Steffen 2006).

Deposition

The excavations at this site revealed a stratigraphic profile containing a minimum of 20 distinct depositional events with evidence of human occupation on their surface (Charcoal rich gravel layers in Figure 2). Debris-flow and gravel accumulation events are interspersed between charcoal rich cultural layers. The result is a four-meter plus profile of subsequent cultural occupations separated by gravel

1 Also known as the Queen Charlotte Islands.
2 All dates are given in radiocarbon years before present.

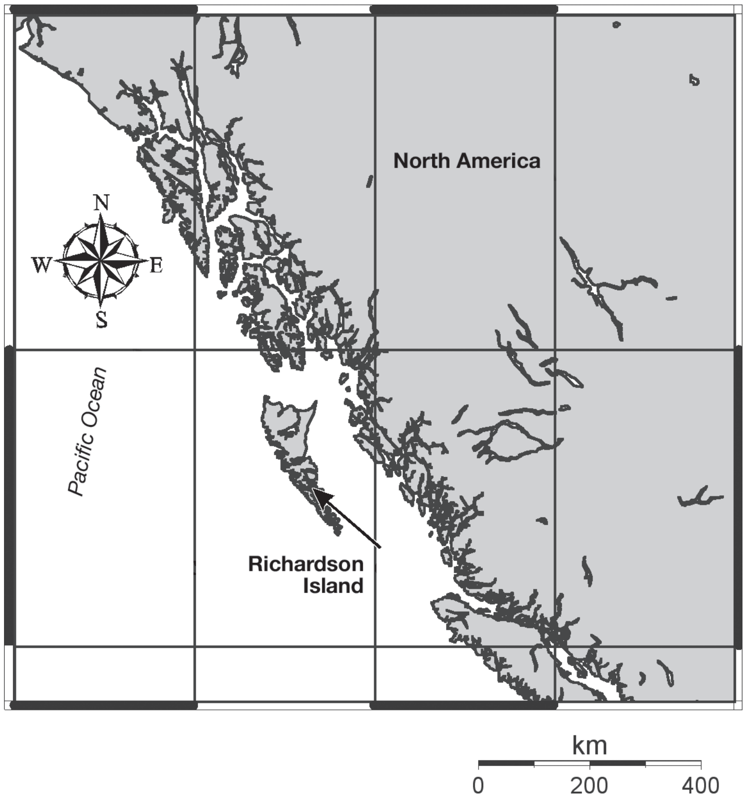


Figure 1. Location of the Richardson Island site.

washes and debris flows resulting in over 50 separable strata. Post-8000 BP alluvial gravels and debris-flow deposits cap the top 50 cm of the site, while archaeological deposits at the site are underlain by a diamicton (Fedje 2003).

Most cultural materials analyzed in this paper were recovered from depositional units represented by a 9400–8500 BP time span.

Dating

A total of 14 radiocarbon dates were obtained from the cultural deposits and one on the underlying diamicton (Fedje 2003). Throughout the sequence the dates are consistent at one-sigma with the exception of one date that is consistent at two-sigma. The dates reveal that the stratigraphy has accumulated without interruption over a 1000-year period. The stratigraphic separation provides a means of defining distinct chronological units. Based on the stratigraphy and associated radiocarbon dates, Fedje et al. (2005) separate stratigraphic units into 100-year intervals (Figure 2). This approach allows for detailed chronological analysis of the cultural material found at the site.

Cultural Occupation

Cultural remains from the site include hearth features, postholes, calcined faunal remains, and lithic artifacts (Fedje et al. 2005; Mackie et al. 2004, 2004; Magne 1996, 2004; Smith 2004, 2005; Steffen 2006; Steffen and Mackie 2005). Analyses undertaken on the lithic materials from the Richardson Island site reveal that there is a major shift in the technology between 8800 and 8700 BP (Fedje et al. 2005, Mackie et al. 2004; Magne 1996, 2004; Smith 2004). This coincides with a period of sea level stabilization after 4000 years of marine transgression. The earlier component of the site, the Kinggi Complex (>9400 to 8750 BP), is dominated by a bifacial industry and large unifacial core tools, named scraper-planes. After sea levels stabilize, these tools begin to decline and, following a period of coexistence with microblades, are eventually replaced by the microblade industry (Magne 2004). The introduction of micro-blades at 8750 BP to the existing

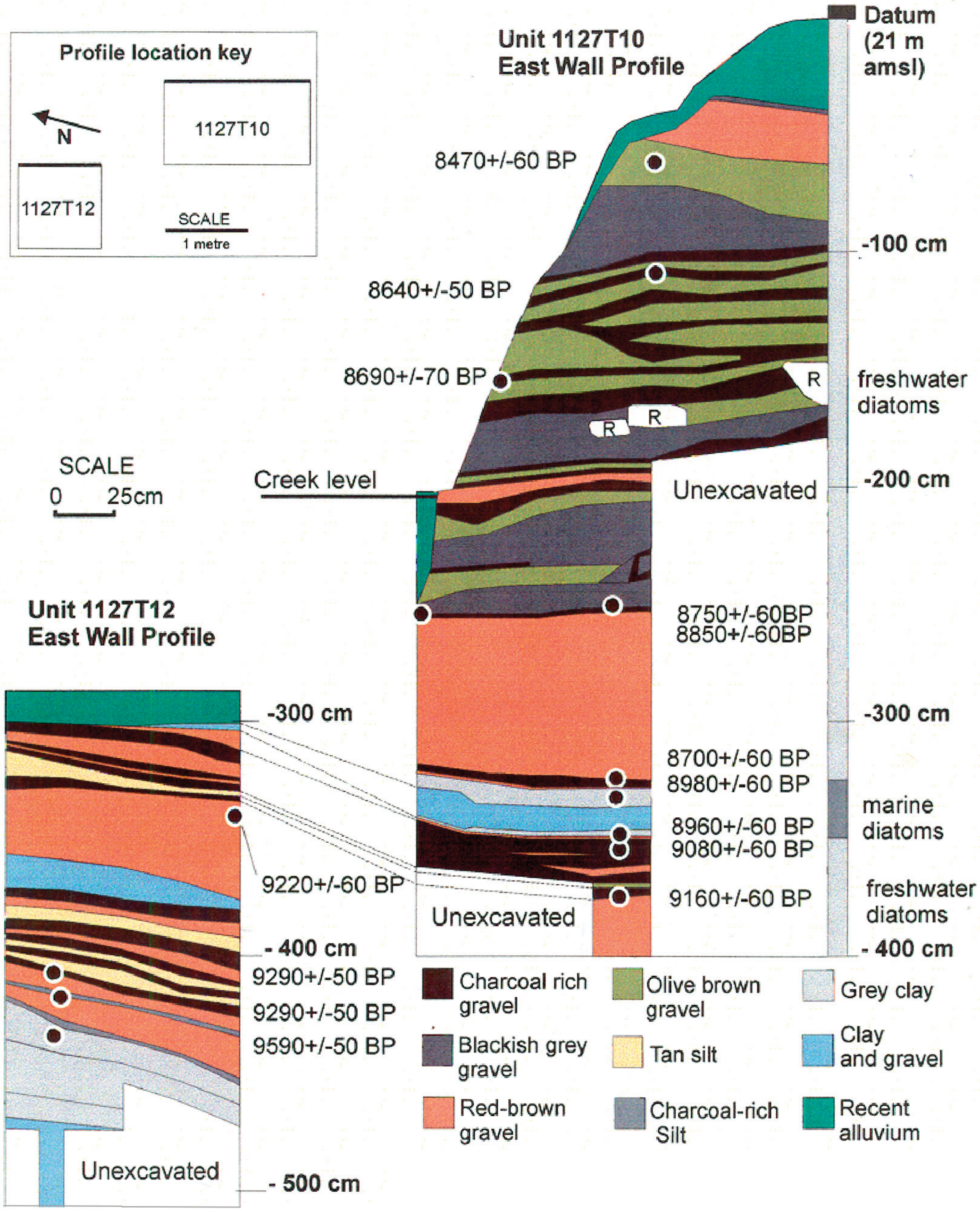


Figure 2. Profile and radiocarbon dates from the Richardson Island site (figure provided by Daryl Fedje).

bifacial toolkit marks the beginning of the Early Moresby Tradition (Fedje and Christensen 1999). Richardson Island is one of the few early-Holocene sites on the Northwest Coast to contain both bifaces and microblades in the same depositional context (Fedje and Mackie 2005; Fedje et al. 2005). Although reduced in frequency, bifaces are present in the microblade-bearing strata at Richardson Island. This analysis of Richardson bifaces presents a unique opportunity to examine tool-manufacturing patterns over a 1000-year chronology spanning two cultural complexes[3].

[3] The Late Moresby Tradition, distinguished by a lack in bifacial technology and presence of microblade technology (See Fedje et al. this volume), is represented at the Richardson Island site but has yet to be sufficiently identified and tested.

Richardson Island Biface Types

Fedje et al. (this volume) have proposed two classifications for the formed bifaces of Haida Gwaii dating to the early Holocene. The two proposed biface types, Xil and Xilju, are distinguished according to general morphology (see Fedje et al. this volume for a complete description of these types), but are also separated temporally with Xil occurring in the Kinggi component and Xilju co-occurring with the Early Moresby tradition. Xil are more characteristic of spear points and Xilju of atlatl darts, although without haft elements this is a conjectural assessment of function. Further excavation of early Holocene sites in Haida Gwaii and analysis of bifacial implements will help to refine the classifications of these bifacial types.

This paper provides a detailed look at different strategies and raw material used in the manufacturing of bifacial implements at the Richardson site through time. Our analysis was designed to distinguish differences in manufacturing strategies through time. Despite the apparent morphological and possible functional differences between the Xil and Xilju types, all bifaces from the Richardson site were studied together. The evidence from this paper reveals an underlying regularity in biface manufacture throughout the 1000-year occupation represented at Richardson.

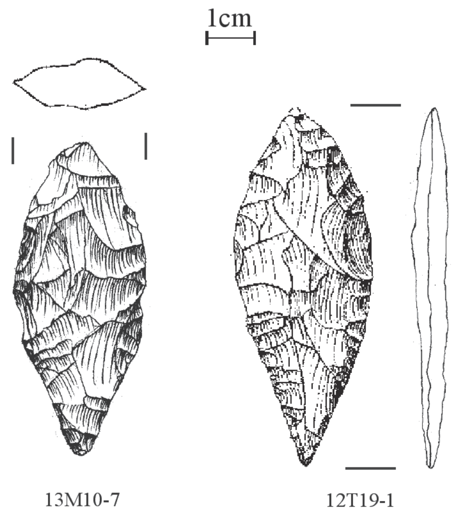


Figure 3. Xil bifaces from the Richardson Island site (9400–8800 BP). These objects were likely used to arm spears and have reworked and shortened tips. A longer variant from Gaadu Din Cave is illustrated in Fedje et al. (this volume).

Richardson Island Raw Materials

In a previous study, Smith (2004) identified the most commonly occurring raw material types at the Richardson Island site. Classification of these types was established using macroscopic visual assessment of the materials, major element compositions as determined through Electron Microprobe Analysis (EMPA), and trace element compositions as determined through Laser Ablation-Inductively Coupled Plasma-Mass Spectrometry (LA-ICP-MS) (Smith 2004). Twelve chemically distinct material types were identified (Figure 5). These include: siliceous argillite, shale/argillite[4], three chemically distinct types of rhyolite, varvite, dacite, wacke, tuff, chert, andesite, and basaltic andesite. One visually distinct mate-

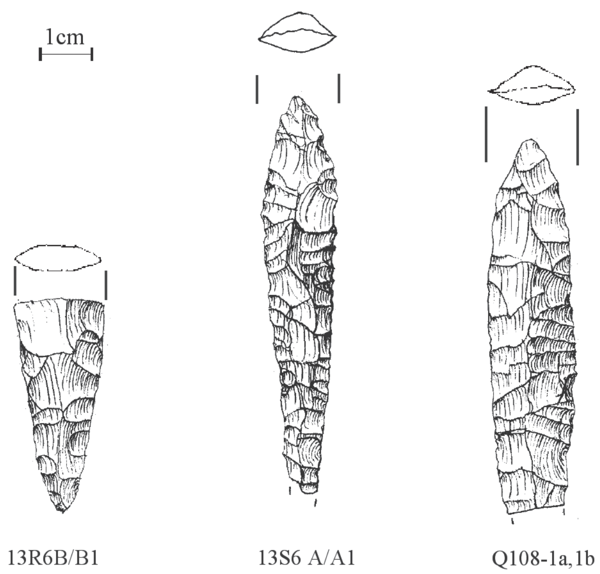


Figure 4. Examples of the Xilju type formed biface from Richardson Island (8800-8700 BP). These objects are stratigraphically separated from the lower Xil type and may have served to arm atlatl darts.

[4] Shale and argillite fall along a continuum of metamorphosed sediment. The Richardson material appears to fall within the transition between these materials.

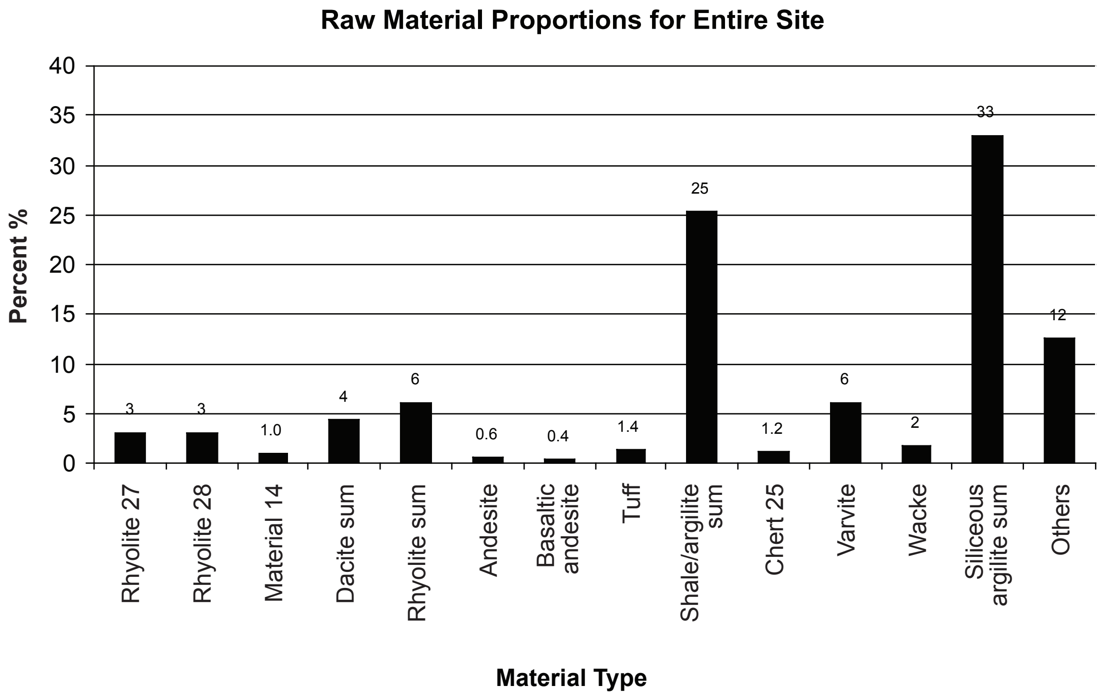


Figure 5. Total raw material proportions for the Richardson Island site (1127T) for all formed tool types.

rial (material 14) was contaminated during analysis and remains unidentified. Infrequently occurring material types were not tested chemically and were lumped into an 'others' category. These 'other' materials account for twelve percent of the raw material assemblage. The most commonly occurring material type at the site is siliceous argillite (Smith 2004).

Figure 5 shows the raw material proportions for the site as a whole. However, both Magne (2004) and Smith (2004) have demonstrated that the raw material proportions at Richardson are not consistently represented through time, and that these changing trends are statistically significant. Figure 6 provides a simple visual of how the proportions of raw material types differ between the Kinggi and Early Moresby components. Most notably there is a decreased dependence on siliceous argillite from Kinggi to Early Moresby, coupled with an increased use of shale/argillite.

The fine stratigraphic resolution at Richardson allows for a detailed look at raw material use through time. Smith (2004) finds that as one moves from the oldest depositional units to the most recent, siliceous argillite use declines steadily and is replaced by shale/argillite as the most commonly used material at 8850 BP. Shale/argillite had been increasing from 9300 BP until 8750 BP at which point it started to decrease in use. Soon thereafter, rhyolite becomes dominant material types. In these later years (8800–8400 BP), dacite use is enhanced and there is a brief occurrence of chert.

Smith attributes many of the raw material changes in the Early Moresby component to the introduction of microblades, a technology that appears to have developed *in situ* (Magne 2004; Smith 2004). The initial microblades at the site were made out of existing or known material types starting 8750 BP. For the next 100 years, however, there was a period of raw material experimentation in which microblades were manufactured out of numerous material types; many types which were not used at the site previously. By 8600 BP rhyolite 27 and rhyolite 28 dominate the microblade assemblage (Smith 2004). Despite the temporal changes in raw material at the site, bifaces remain quite static in raw material use.

Raw Material Use Among Bifaces

Preferred Material of Manufacture

The types of raw material chosen for biface manufacture were identified as part of a broader raw material study at the Richardson site (Smith 2004).

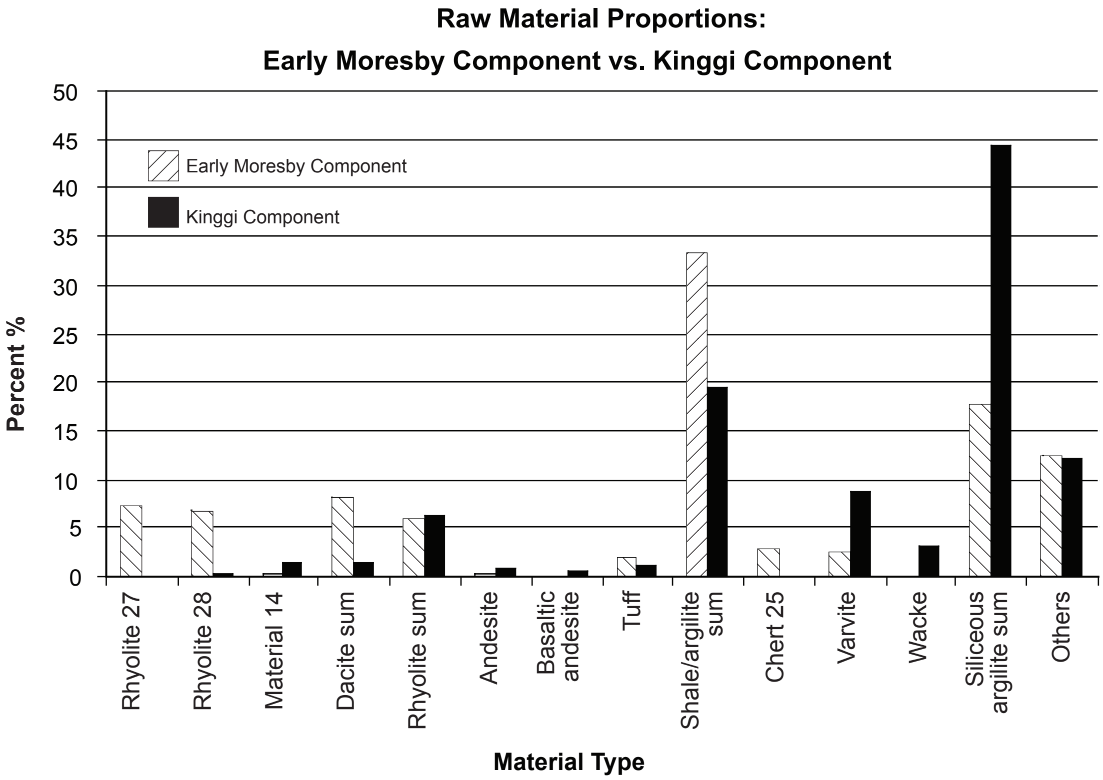


Figure 6. Raw material proportions: Early Moresby Component vs. Kinggi Component for all formed tool types.

Smith found that the most commonly used materials for biface manufacture were siliceous argillite, varvite, shale/argillite, and dacite. Figure 7 illustrates the raw material percentages within the bifacial tool class for the site as a whole, and compares these proportions to the raw material percents in all tools. Figure 7 also indicates that siliceous argillite and varvite occur at higher percentages in bifaces than they do among all the other tools. Smith found that 56% of bifaces were made from siliceous argillite while the same material accounts for 33% of all tools. Varvite accounts for 8% of bifaces and 6% of all tools. 2 x 2 chi-square analyses were run for each of these materials to see if the greater representation of these materials among bifaces was statistically significant, thus indicating a 'preference' for these material types. The results of the chi-square tests indicated that a greater use of siliceous argillite among bifaces was significant ($p = .000$) while varvite use was not significant ($p = .368$). Thus, Smith concluded that the Richardson inhabitants preferred siliceous argillite for biface manufacture (2004).

Bifacial Raw Material Use Through Time

Smith also explored raw material trends through time for individual tool types and found that in comparison to other tools, bifaces changed little in raw material use through time. Figure 8 illustrates the raw material proportions among bifaces in both the Kinggi and Early Moresby components.

Again 2 x 2 chi-square tests were run for each material to determine whether the changes in material proportions between the Kinggi and Early Moresby components were significant. The results[5] revealed that the only statistically significant change was among the shale/argillite group whose proportional use increased in the Early Moresby period.

Viewed alone, these data highlight a change in raw material use among bifaces between the Kinggi and Early Moresby components; an increase in shale/argillite use. Yet in similar raw material analy-

[5] The 'p' values for each material were as follows: siliceous argillite 0.126; varvite 0.735; shale/argillite 0.003; and dacite 0.284 (Smith 2004:146).

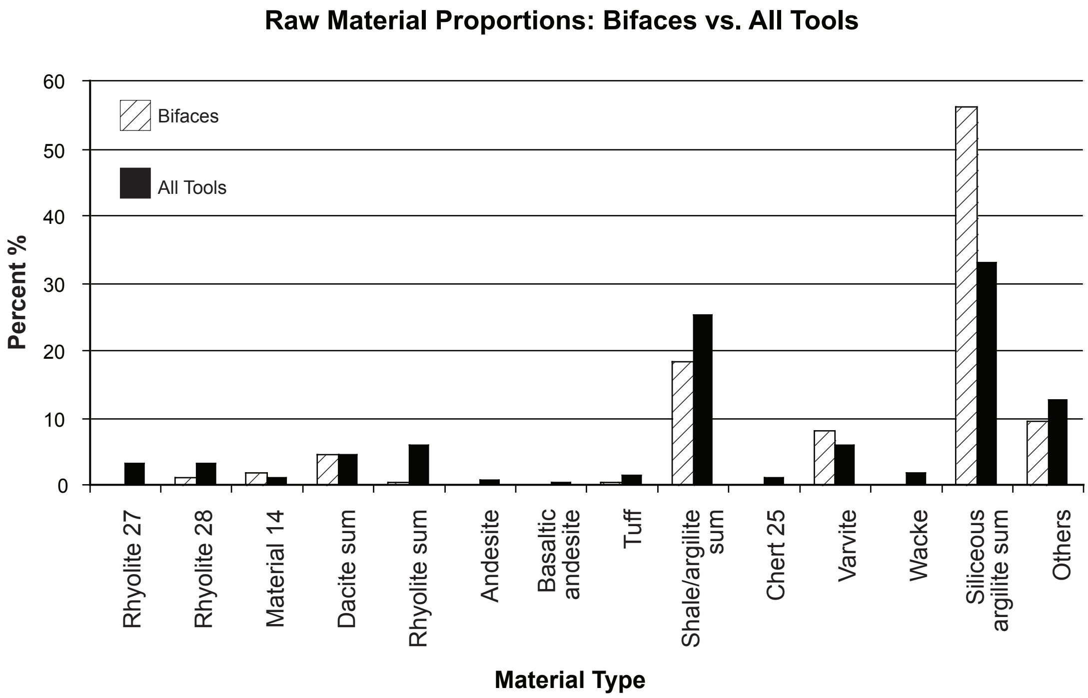


Figure 7. Raw material proportions: bifaces vs. all tools.

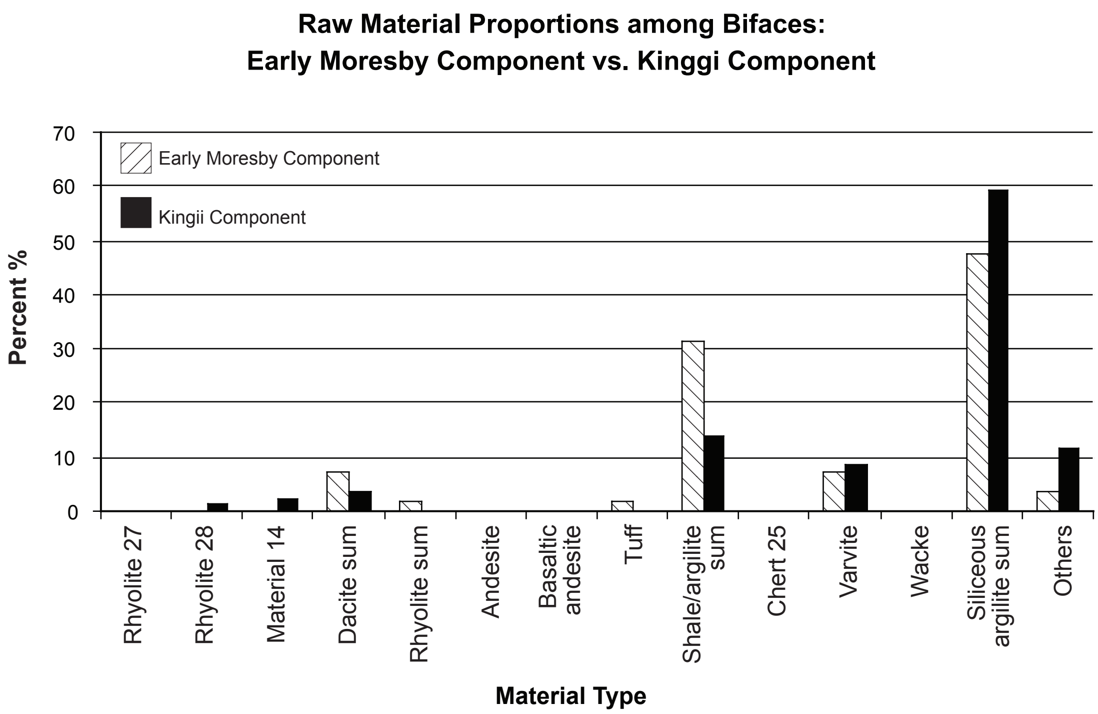


Figure 8. Raw material proportions among bifaces: Early Moresby Component vs. Kinggi Component.

ses for other major tool categories in the Richardson assemblage, bifaces change less than do other tool types. For example, scraperplanes, scrapers, and unimarginal tools show statistically significant decreases in siliceous argillite use between the Kinggi and Early Moresby components, and significant increases in other raw material categories such as rhyolite, dacite, shale/argillite, and tuff (Smith 2004). Thus, the degree to which raw material changes though time varies with tool type.

That the raw material trends are not consistent for each tool type suggests that bifaces had more stringent raw material requirements than other tools and were stable in their raw material patterning. While there was a significant increase in shale/argillite use for bifaces in the Early Moresby component, the proportional use of siliceous argillite, dacite, and varvite was unchanging; this despite an overall significant decrease in siliceous argillite and increase in dacite through time (Magne 2004; Smith 2004).

Table 1. Sample size temporal unit.

	Bifaces Used in Manufacturing Strategy Analysis			
100-Year Interval	**Formed Bifaces**	**Biface Blanks**	**Biface Preforms**	**Total**
8500	1	0	0	1
8600	0	0	0	0
8700	3	1	1	5
8800	10	0	3	13
8900	10	2	2	14
9000	6	2	4	12
9100	14	3	12	29
9200	15	5	4	24
9300	5	2	2	9
9400	4	3	3	10
Total	**68**	**18**	**31**	**117**

Methods and Results

This section is divided in two. For ease of readership both sections consider methods and results together. The first section examines binomial, qualitative, and quantitative manufacturing-based attributes of the Richardson bifaces. Eight bifacial attributes (described below) are assessed for the bifacial assemblage, and the occurrence of seven of these attributes through time is presented. The eighth attribute, completeness, is discussed qualitatively. The second section explores the relationship of raw materials and those attributes found to exhibit temporal variation in the Richardson sequence. Given that certain raw materials are time sensitive at Richardson, any apparent temporal trends among bifacial attributes must first be proven not to be influenced by raw material before they are proposed as indicators of purely stylistic or manufacturing change.

Bifacial Manufacturing Attributes

The study of bifaces is multifaceted and can include a number of different insights into past behaviors and relationships. Bifaces are formalized tools that require time and effort to produce as opposed to expedient tools that can be manufactured with little effort (Andrefsky 1998:30). The attributes used in this analysis were selected to distinguish bifacial objects based on manufacturing techniques. Attributes generally used in stylistic analysis, and based on the general outline of the biface, were not used as most of the Richardson examples are foliate bifaces, and lack distinguishing outline features such as notches, defined shoulders, and barbs. Furthermore, some of the bifacial artifacts were very fragmented and it was often difficult to distinguish the tip from the base of these typically bi-pointed artifacts. As the intended goal of this paper is to discern whether there is a change in the bifacial manufacturing practices through time, the chronological character of each biface attribute is presented.

A total of 223 tools classified as bifaces and biface fragments are present in the Richardson assemblage. Smith's (2004) analysis of raw material used in biface manufacture considered all 223 tools. For the purposes of attribute analysis, only 117 were complete enough to undertake the manufacturing practices analysis. The sample sizes from different time periods do vary and this results in some bias in the following results. Table 1 provides a summary of sample size for each temporal unit.

Manufacturing Stage Attributes

Two attributes were recorded for all of the 117 bifaces analyzed. These attributes are meant to distinguishing technological stages of manufacture within the assemblage.

Biface Manufacturing Stages. To produce a formalized tool such as a biface, a specific manufacturing sequence must be followed (Andrefsky 1998; Bradley 1975; Callahan 1979; Frison and Bradley 1980; Whittaker 1994; Young and Bonnichsen 1994). Based on Johnson's (1989) stages of manufacturing trajectory, the following categories were used (Figure 9):

- Blank: Flake, tabular piece, or spall with a bifacially worked but irregular edge;
- Preform: Biface has a regularized edge (wavy) but not straightened; and
- Formed: Edge straightened.

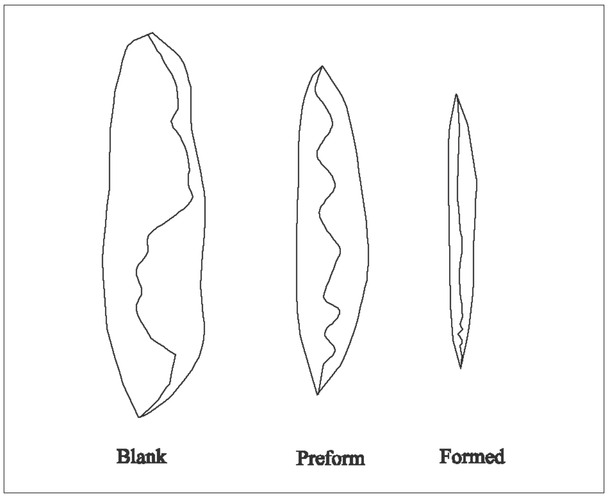
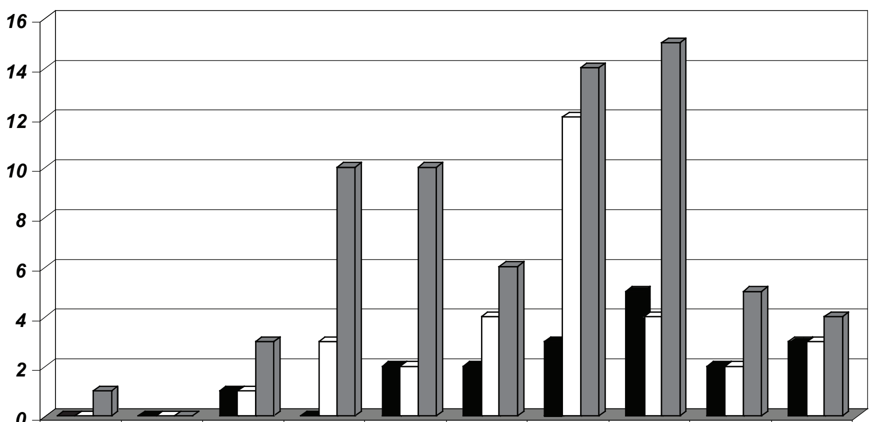


Figure 9. Biface manufacturing trajectory used to distinguish biface stage of manufacture.

Figure 10 demonstrates that the relative amounts of blanks, preforms, and formed bifaces remain fairly constant throughout the Richardson sequence, with formed bifaces dominating each 100-year interval.

Width/Thickness Ratio. The Width/Thickness Ratio of each biface and biface fragment was measured. This measurement was used by Callahan (1979) to distinguish biface manufacturing stages. In general, the ratio increases with each advanced stage of production. This attribute was measured for two reasons: 1) to evaluate whether a scheme for identifying biface manufacturing stage based on width/thickness ratios could be derived from the Richardson material, and 2) to evaluate if different width/thickness ratios were preferred for formed bifaces through time. Biface fragments lacking both lateral margins were excluded from this attribute as were small tip and base fragments.

The analysis of width/thickness ratios reveals that there is a consistent pattern of increasing value (comparatively thinner and wider) as the manufacturing trajectory progresses. Figure 11 reveals relative agreement between stage classification (blank, perform, and formed biface) and width/thickness ratios. This trend appears to be consistent throughout the Richardson sequence.



	8500	8600	8700	8800	8900	9000	9100	9200	9300	9400
■ *Blank*	*0*	*0*	*1*	*0*	*2*	*2*	*3*	*5*	*2*	*3*
□ *Preform*	*0*	*0*	*1*	*3*	*2*	*4*	*12*	*4*	*2*	*3*
■ *Formed Biface*	*1*	*0*	*3*	*10*	*10*	*6*	*14*	*15*	*5*	*4*

Figure 10. Percentages of biface types.

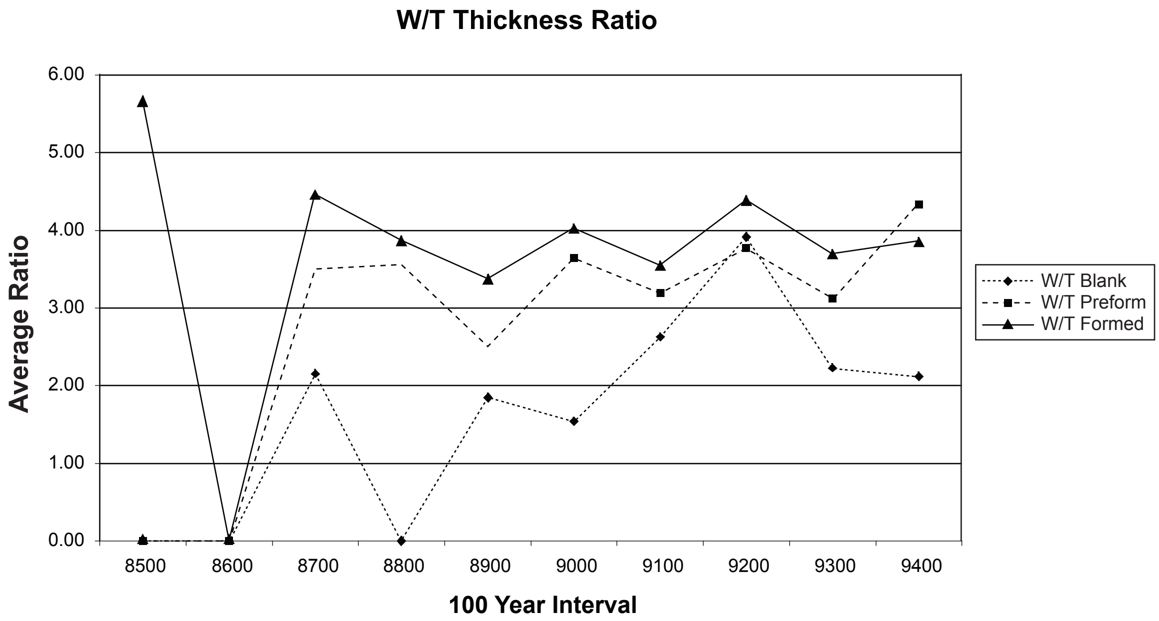


Figure 11. Sequence of identified biface stage and average biface width/thickness ratios for each temporal interval.

Formed Biface Attributes

Six additional attributes were recorded for those artifacts identified as formed bifaces (68 artifacts). These attributes were used to characterize distinct biface manufacturing strategies and are based primarily on steps taken to finish or refinish an artifact.

Flake Scars to Center. When a biface is thinned in its final stages, the flake scars can be knapped so as to travel to or past the medial axis of the object. These long thinning flakes are removed at the final stages of bifacial manufacture for either stylistic or functional reasons. This attribute can be decorative, particularly when flake scars are removed to produce a medial ridge or distinct pattern (Whittaker 1994). This attribute was recorded as present or absent for both sides of each biface.

The distribution of this attribute during the Richardson sequence is presented in Figure 13. This table demonstrates that throughout the historical sequence of biface manufacture at Richardson Island there is a greater tendency to complete biface manufacturing by flaking final flake scars to the center of the artifact on both faces. In the 8700 BP component all of the objects are flaked to the center of the artifact.

Flake Scar Outline. The types of finishing flake scars provide the biface with its final shape and stylistic

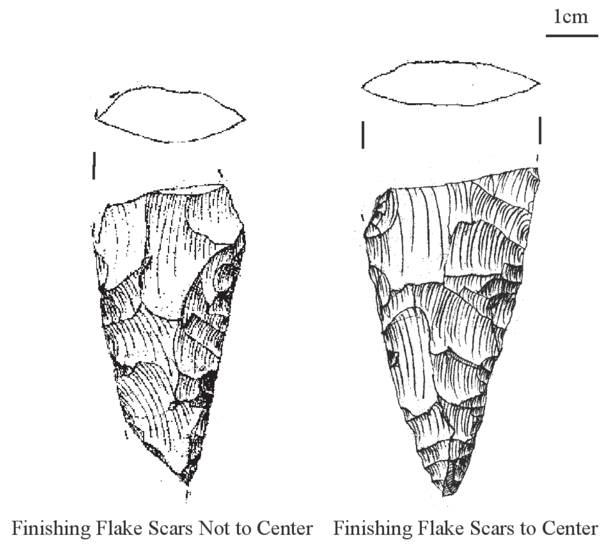
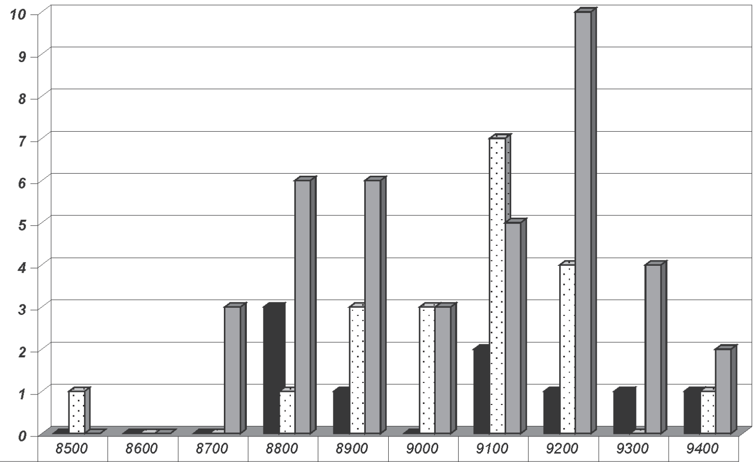


Figure 12. Examples of the finishing flake scars to center attribute.

patterning (Gotthardt 1990). The general flake scar outlines were recorded for the Richardson bifaces, as different manufacturing strategies can produce different flake scar outlines. For example, lamellar flake scars are often indicative of patterned pressure flaking and expanding flake scar are characteristic of soft-hammer thinning (Whittaker 1994). Four variants of this attribute, described below, were recorded during analysis and are pictured in Figure 14:



	8500	8600	8700	8800	8900	9000	9100	9200	9300	9400
Neither Side	0	0	0	3	1	0	2	1	1	1
One Side	1	0	0	1	3	3	7	4	0	1
Two Sides	0	0	3	6	6	3	5	10	4	2

Figure 13. Histogram demonstrating the occurrence of flake scar to center attribute on Richardson Island bifaces.

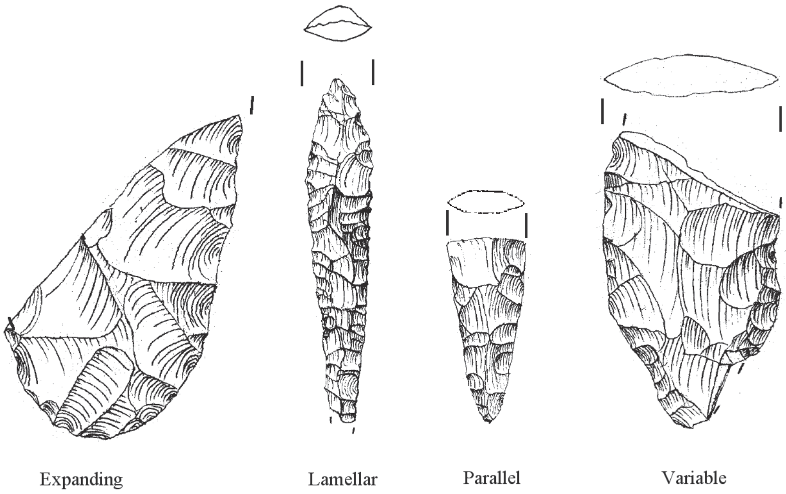


Figure 14. Examples of different bifacial flake scar outlines.

a) Expanding: Flake scars tend to expand towards the distal end of flake scar;
b) Lamellar: Flake scars are placed at regular intervals; platforms tend to be placed so as to allow the force of the flake removal to follow the later edge of the adjacent flake scar;
c) Parallel: Flake scars are placed at regular intervals along the margins of the tool, and are struck from a platform located above or below the margins of the adjacent flake scar; and
d) Variable: Flake scars are irregularly placed along the edge of the biface to straighten the edge and/or thin the biface at chosen locations.

In some instances, traces of two patterns were found on a single Richardson biface and it was necessary to record both variants for the object. Figure 15 reveals that there are some differences in the distribution of this attribute through time. In particular, bifaces with lamellar flake scar outlines appear in the latter part of the sequence. This pattern suggests that this strategy was adopted for bifacial finishing around the commencement of the Early Moresby tradition. The 9000 BP time interval is of interest as all the objects have the variable type of flake scar orientation. Overall the variable form of finishing flake scars is the most common.

Flake Scar Orientation. This attribute is associated with the final thinning of a biface. Carefully oriented final flake scars can produce a particular decorative pattern and are indicative of stylistic choices (Gotthardt 1990). The flake scar orientation variants are defined by the manner in which the finishing flake scars are oriented relative to the longitudinal axis of the tool. Four orientations were recorded for the Richardson bifaces (Figure 16):

a) Co-lateral: Flake scars regularly removed perpendicular to the medial axis;
b) Co-lateral/Oblique: Flake scars regularly removed diagonally to the longitudinal axis; and
c) Sub-radial: Flake scars regularly removed perpendicular to the margin of the tool;
d) Variable: Irregular orientation of final flake scars.

In some instances, it was necessary to record combinations of these manufacturing strategies for individual objects.

Figure 17 reveals that there are some changes in the distribution of this attribute through time. Colateral/oblique and subradial variables do not occur in the early part of the sequence, but are present with varying frequency through the middle sequence and the transition to the Early Moresby Tradition. The colateral variable is absent in the late part of the sequence.

Cross-Section. A variety of cross-sections can result from the flaking strategies, decorative elements, and morphological character of formed bifaces themselves. Six cross-section variants were recorded: flat, diamond, lenticular, plano-convex, plano-diamond, and irregular (Figure 18).

There is little variability in the occurrence of this attribute at Richardson. With the notable exception of the earliest 9400 BP interval (Figure 19), there is an overall tendency for bifaces to have a lenticular cross-section. The plano-convex form is present in the early part of the sequence but is not found in the latter part.

Retouch. This attribute records the presence or absence of retouch along the lateral margins of each formed biface. Retouch may result from reshaping, or from an attempt to regularize the edge of the biface prior to its initial use. The presence of retouch was recorded as present or absent. When present, retouch was classified as bifacial or unifacial.

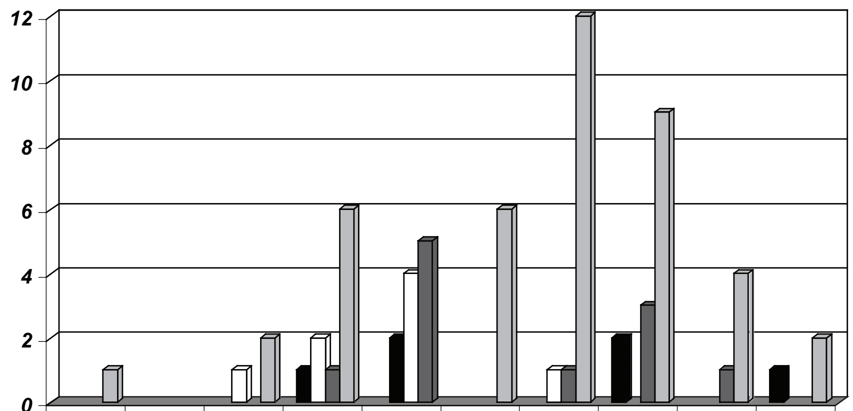
This attribute is relatively consistent through time with all variables represented to varying degrees through time (Figure 20). Overall, the majority of formed bifaces from the collection have been retouched. This pattern suggests that bifacial implements were being resharpened or reshaped for hafting with regularity.

Completeness. A tabulation of whether the formed bifaces analyzed were complete or fragmented was maintained. Only five of the 117 formed bifaces were found to be complete specimens. The remaining 112 objects are fragments the majority of which are basal fragments.

In the case of the Xil type (Figure 3), the end that served as the tip of the implement was at first difficult to determine with certainty. Indeed, some of these same artifacts have been illustrated in other volumes oriented with the elongated part upwards indicating it as the tip (e.g., Fedje 2004). However, it is clear from the later Xilju type (Figure 4) that the elongated part of these objects is indeed stem-like, the Xilju examples being too thin and narrow to withstand any substantial blow without the added buffering protection of a haft element. We argue below that based on the conservative approach to biface manufacturing during the 1000-year occupation at Richardson Island that Xilju technology is derived directly from Xil technology. For this reason, the elongated part of all of the formed bifaces may be considered to be the base or stem.

The following characteristics were considered in distinguishing the bases from the tips of these implements.

- To accommodate the bulk of the haft, the basal half of the biface will be thinner in longitudinal cross-section than the tip.
- There is a tendency for greater retouch and care through retouch to form the haft element so it can fit a specific haft.
- Implements identified as stems have a similar width morphology suggestive of shaping to fit a particular haft size (see Fedje et al. this volume).
- Through microscopic examination (10x–30x) some light grinding and rounding was noted on a few of the objects along the basal margins. In some cases slight indentations were noted along the basal lateral margins of the artifact.



	8500	8600	8700	8800	8900	9000	9100	9200	9300	9400
■ Expanding				1				2		1
□ Lammelar			1	2	2		1			
■ Parallel				1	4		1	3	1	
■ Variable	1		2	6	5	6	12	9	4	2

Figure 15. Histogram demonstrating the distribution of the flake scar outline attribute through time.

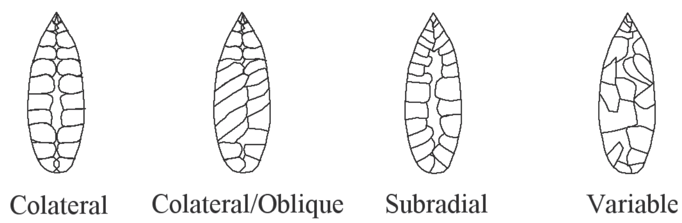
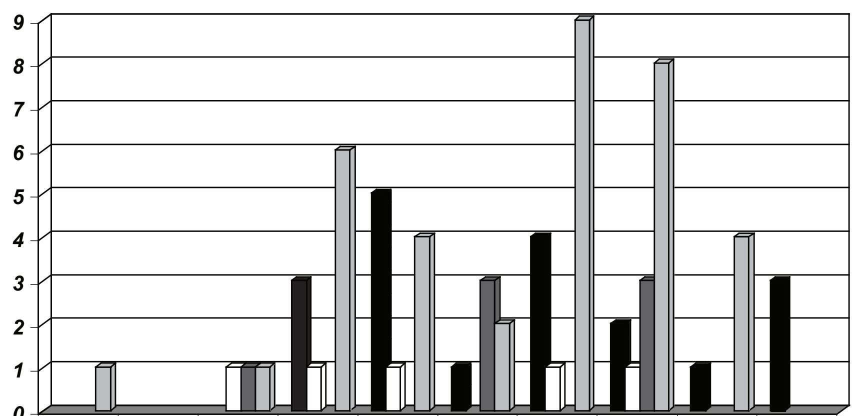


Figure 16. Idealized examples of the flake scar orientation attribute.



	8500	8600	8700	8800	8900	9000	9100	9200	9300	9400
■ Colateral				3	5	1	4	2	1	3
□ Colateral/Oblique			1	1	1		1	1		
■ Subradial			1			3		3		
■ Variable	1		1	6	4	2	9	8	4	

Figure 17. Histogram demonstrating biface flake scar orientation through time.

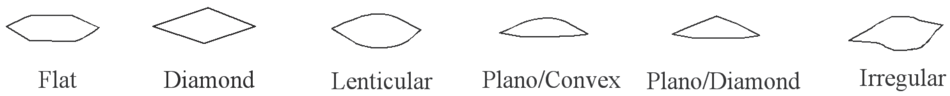
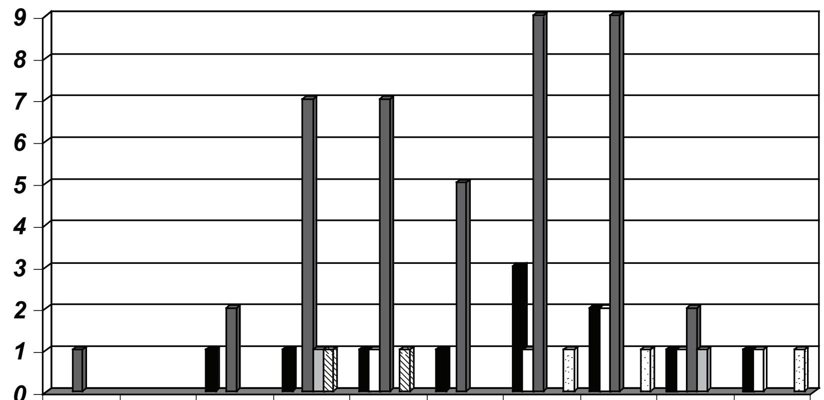
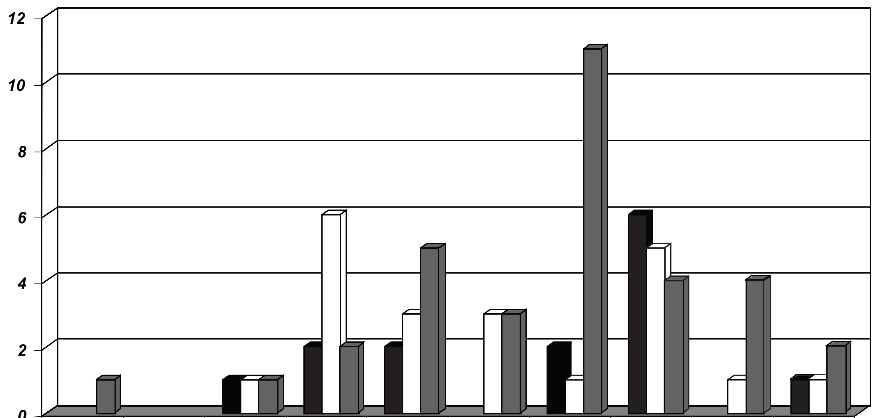


Figure 18. variables of the cross-section attribute recorded for formed bifaces at the Richardson Island site.



	8500	8600	8700	8800	8900	9000	9100	9200	9300	9400
■ Flat			1	1	1	1	3	2	1	1
□ Plano-Convex					1		1	2	1	1
■ Lenticular	1		2	7	7	5	9	9	2	
□ Diamond-Convex				1					1	
▨ Diamond				1	1					
□ Irregular							1	1		1

Figure 19. Histogram demonstrating frequencies of the cross-section attribute through time.



	8500	8600	8700	8800	8900	9000	9100	9200	9300	9400
■ No Retouch			1	2	2		2	6		1
□ Unifacial Retouch			1	6	3	3	1	5	1	1
■ Bifacial Retouch	1		1	2	5	3	11	4	4	2

Figure 20. The percentage of bifacial objects with retouch.

- A few of the objects have transverse flake scars dulling the basal margins.
- Based on the broad variety of tools, hearth and structural features, high debitage frequencies, and fauna, Richardson Island is considered a base camp as opposed to a kill site. Rehafting and a higher percentage of base elements would be expected at a campsite, discarded tips at a kill site.

In general, the classification of basal elements was formulated on the basis of more retouch, thinness, and edge smoothing. However, it is sometimes difficult to distinguish a base from a tip in this foliate bi-point technology. Indeed in re-sharpening and re-using the implements, the unique use-life history of bipointed bifaces is practiced. For as both ends are pointed, either can be re-fashioned after breakage into a tip or a base.

Most of the formed bifaces at Richardson Island were manufactured using siliceous argillite, varvite, and shale/argillite (Smith 2004). The sedimentary origins of these rocks have lent to tool fragmentation along shear bedding planes. Thus, several factors have resulted in the highly fragmented assemblage of bifaces found at Richardson Island: breakage along bedding planes during manufacture, breakage through use, and post-depositional damage.

Bifacial Attributes and Raw Material

Of the attributes examined above, two are suggestive of change in manufacturing behavior over time; flake scar outline and flake scar orientation. However, these are also the variables most likely to be influenced by the physical properties of raw material. Raw material constraints have been highlighted as a primary factor influencing tool use-life and assemblage variability (Rolland and Dibble 1990). Two features of raw material that have been shown to affect assemblage variability are: 1) the availability, or accessibility, of raw material (Andrefsky 1994; Bamforth 1986; Dibble 1987; Holdaway et al. 1996; Kuhn 1991; Rolland and Dibble 1990; Roth and Dibble 1998), and 2) the physical characteristics of the material itself (Dibble 1985; Jones 1978, 1984; Kuhn 1991, 1992; Moloney 1988; Moloney et al. 1988). For the analysis of bifacial attributes at Richardson we are most interested in the second point, as the most abundant raw materials have been found to be locally available in high quantities (Smith 2004).

The physical characteristics of stone which have been shown to affect the overall morphology of the tool are the shape and size of the raw material nodule or blank (Dibble 1985; Jones 1978, 1984; Kuhn 1991, 1992), and also the quality or texture of material (Jones 1978; Moloney 1988; Moloney et al. 1988). Different raw materials have been found to exhibit unique flaking characteristics which can limit the morphological outcomes of a tool and influence the degree to which a tool will be retouched (Jones 1978; Moloney 1988; Moloney et al. 1988). Given that the mechanical properties, quality of cutting edge, and number of usable flakes vary according to raw material type, there is a need to consider the role of raw material when analyzing the attributes of a tool assemblage. This is especially true when multiple material types are present at a site, as is the case at Richardson Island.

Thus, to what extent are the bifacial attributes at Richardson influenced by raw material? And how does this affect our understanding of apparent flaking changes in the Early Moresby component of the site? To address these questions, the two attributes (flake scar outline and flake scar orientation) were examined for raw material trends. Flake scar to center, a variable unaffected by time, was also tested for raw material associations. A series of 2 x 2 chi-square tests were used to compare the raw material proportions within each of the bifacial attribute categories. Due to small sample sizes only three material types were considered for each attribute: dacite, shale / argillite, and siliceous argillite.

Raw Material and Flake Scar to Center. The proportions of the material types (siliceous argillite, shale/argillite, and dacite) were examined for occurrences of flake scars approaching center for two sides of the biface, for one side, and for neither side. All chi square tests (again 2 x 2 tests) produced non-significant results, which suggest raw material does not affect whether a biface is flaked to the center.

Raw Material Choice and Flake Scar Orientation. The four types of flake scar orientation (colateral, colateral/oblique, subradial, and variable) were also examined for significant associations with the three raw material types. Only one significant chi-square result was found. This result appeared in the colateral category in which 35% of the shale/argillite bifaces exhibited colateral flake scar orientation, while only 14% of bifaces produced on other materials did. A 2 x 2 chi-square analysis revealed that this is a significant difference ($p = 0.019$), suggesting a relationship between colateral flake scar orientation and shale/argillite.

Raw Material and Flake Scar Outline. The four flake scar outlines described previously (lamellar, expanding, parallel, and variable) were also examined for significant associations with raw material. The expanding flake scar outline was the only category that did not have a significant relationship with a specific raw material type. The remaining three outlines, as summarized below, were each found to have a significant relationship with a distinct material type.

- Lamellar flake scar outline: Twenty five percent of the dacite bifaces possessed lamellar flake scars while only 4% of the other materials did. A 2 x 2 chi square analysis revealed that this was a significant difference ($p = 0.008$) suggesting a relationship between dacite and lamellar flake scars. Both shale/argillite and siliceous argillite produced non-significant results ($p = 0.387$ and 0.414 respectively) for similar tests suggesting that they do not have a relationship with lamellar flake scar outlines.
- Variable flake scar outline: Ninety percent of the bifaces made from siliceous argillite have variable flake scar outlines while 75% of bifaces made from the remaining material types have variable scars. This is a significant difference as revealed by a chi-square test ($p = 0.034$), which indicated a significant positive relationship between siliceous argillite and variable flake scar outlines. Sixty-one percent of bifaces made from shale/argillite have variable flake scar outlines while 87% of bifaces made from the remaining material types have variable scars. This is also a significant difference as revealed by a 2 x 2 chi square test ($p = 0.003$), which suggests that there is a negative relationship between shale/argillite and variable flake scars. Dacite produced a non-significant result ($p = 0.590$) for a similar test suggesting there is no relationship between it and variable flake scar outlines.
- Parallel flake scar outline: Twenty-six percent of bifaces made from shale/argillite were found to have parallel flake scar outlines in comparison to the four percent of bifaces made from other materials with parallel outlines. A 2 x 2 chi-square test revealed that this difference is significant ($p = 0.001$) which suggests that there is a relationship between shale/argillite and parallel flake scars. A similar test for siliceous argillite produced a non-significant result ($p = 0.195$) while the sample size was too small to warrant testing for dacite specimens with parallel flaking.

Discussion

One of the defining features of early components on the Northern Northwest Coast is the foliate biface (Carlson 1996; Matson and Coupland 1995; Fedje et al. this volume; Carlson this volume). This tradition is eventually replaced in Haida Gwaii by microblade technology (Fedje et al. 2005). In other areas of the Northwest Coast, microblade technology is introduced after the appearance of foliate bifaces, but the microblade tradition does not completely replace the bifacial tradition (Carlson 1996). Overall, the bifaces from the Richardson site are related to the early Holocene bifaces from other parts of the Northwest Coast being in general, foliate shaped. The general foliate shape of formed bifaces at Richardson Island remains very consistent throughout the sequence.

The sequence of manufactured bifaces is exemplified in Figure 21, which provides a visual representation of the stratigraphic relationship of select bifaces from the collection. For each 100-year time interval the earlier reduction and larger use stages are illustrated on the right, and the later reduction and smaller use stages on the left. The tips and bases of these bipointed bifaces were likely used interchangeably throughout the use-life history of the artifact. For this reason, it can be difficult to determine the tip of these tools from the base. While the transition from Xil to Xilju type bifaces emerges between 8800 and 8700 BP, there are unmistakable elements of continuity between the illustrated objects.

Over the 1000-year sequence, the general bifacial template remains fairly stable. In general this biface manufacturing tradition was oriented at producing a foliate shaped biface with elongated stem-like elements. Formed bifaces tended to have straightened lateral margins and an average width/thickness ratio between 3.5 and 5.5. The preferred manner of finishing these bifaces was to remove final flake scars to the center of the object forming a lenticular cross-section.

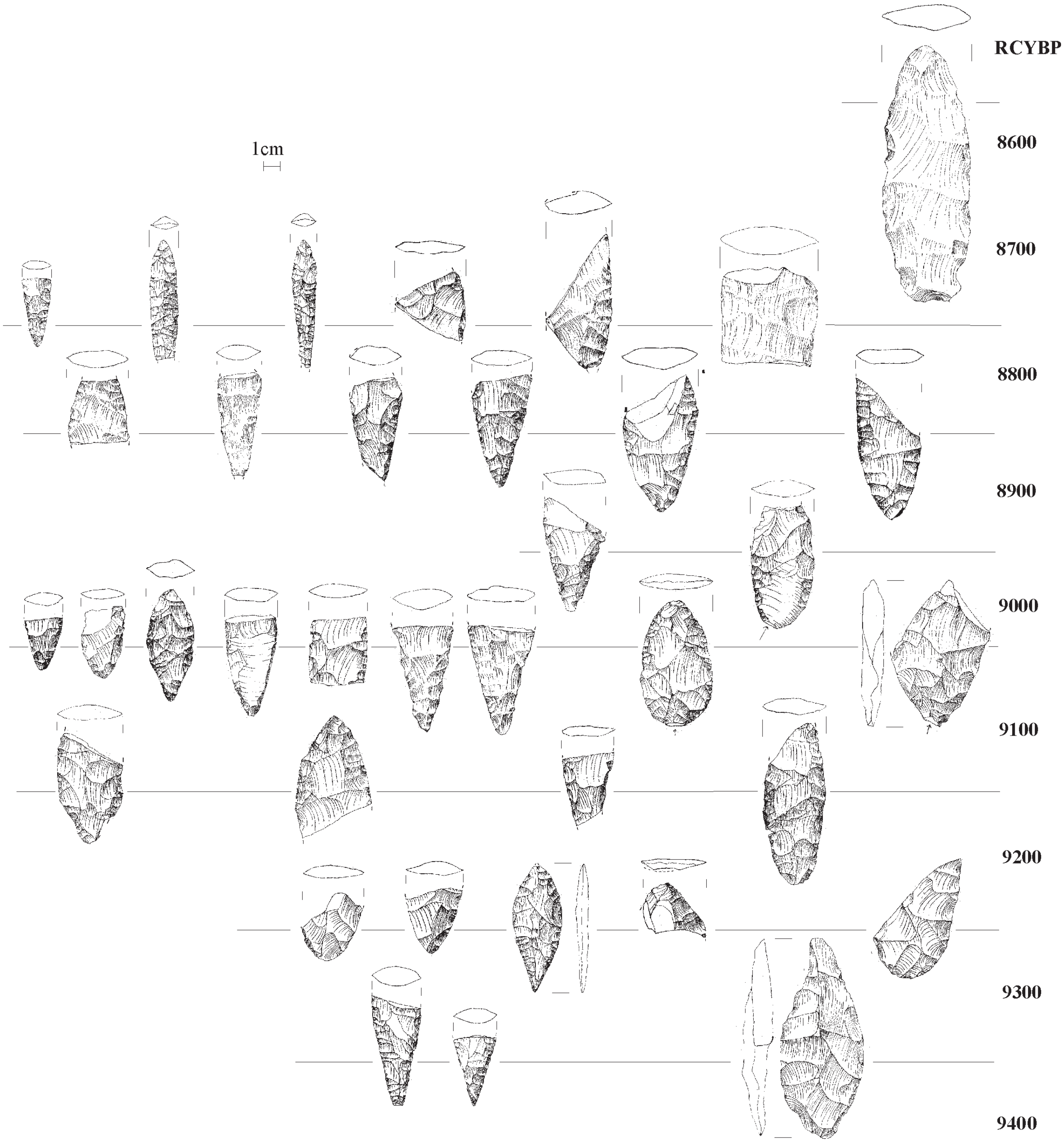


Figure 21. A stratigraphy of bifaces at the Richardson Island site. The transition from the Kinggi Complex to the Early Moresby Tradition occurs between 8800–8700 BP. This transition includes a shift from the earlier Xil type bifaces to the Xilju type. These illustrations demonstrate the continuity of bifacial technology throughout the period during which it was occupied. Large flakes are made into preforms (right side of diagram) and reduced along a use life trajectory. The bipointed style of these artifacts makes reshaping and reuse efficient. For this reason, it is often difficult to tell the tip from the base as they could be used interchangeably as a curation strategy.

Final alterations for hafting involved retouching the margins unifacially or bifacially. Despite this over all conservative approach to biface manufacture through time, there are some changes that can be emphasized, in particular: lamellar flake scar outlines and collateral/oblique flake scar orientations are more common in the latter part of the sequence.

Curiously, these changes occur around the same time as the Kinggi/Early Moresby transition. At first glance, this may be thought to reflect the application of indirect percussion or pressure flaking to biface manufacture. These manufacturing methods are also used in the production of microblades (Whittaker 1994). Significantly this implies that the difference between Xil and Xilju type points is the result of applying microblade type reduction strategies to the manufacturing of bifacial implements. However, when raw material types are taken into account, we found the following positive relationships between attributes and raw material: lamellar flake scar outline with dacite, parallel flake scar outline with shale/argillite, variable flake scar outline with siliceous argillite, and colateral flake scar orientation with shale/argillite. These results suggest flake scar orientation, and particularly flake scar outline, are influenced by raw material.

While all of the materials used for bifaces at Richardson are very fine grained, the different physical properties and homogeneity of the materials (such as bedding planes and fracture patterns), would appear to affect the shape of flake scar. The chi-square results indicate that materials with more homogenous textures such as dacite and shale/argillite offer more controlled flaking possibilities (i.e., lamellar and parallel flake scar outlines). Siliceous argillite, on the other hand, which has the highest silica content of all materials, is less controllable and has a tendency to fracture along bedding planes resulting in variable flake scar patterning. Siliceous argillite is the most commonly occurring material type in the oldest component of the site (Smith 2004), which explains the apparent lack of controlled finishing (i.e., lamellar and parallel flake scar outlines) in the oldest depositional units.

Thus, the increase in lamellar flake scars at the onset of the Early Moresby Tradition may not result from microblade flaking strategies being used on bifaces, but from the increased use of a specific dacite in the Early Moresby component. The increase in dacite use is likely attributable to the period of raw material experimentation associated with microblade production summarized earlier in this paper.

This association of raw material with flake scar outline and orientation is strengthened when one looks at bifaces from Haida Gwaii that pre-date those found at Richardson. Bifaces from K1 cave and Gaadu Din Cave (both caves pre-dating Richardson Island) also have lamellar flaking (see Fedje et al. this volume). The K1 artifacts are made on fine-grained, homogenous chert. The Gaadu Din examples are manufactured from a shale/argillite material. Indeed, lamellar flaking did not emerge in Haida Gwaii after 8800 BP with the introduction of microblades but had been around as a flaking technique for some time.

Interestingly, the 'flake scar to center' attribute has no apparent association with raw material. This suggests it, and other attributes found to have no association with raw material, may be the most reliable attributes for assessing intentional changes to bifacial manufacturing techniques over time. An examination of 'flake scar to center' over time with a larger sample size would make for an interesting follow up study to the results presented here.

Conclusion

This analysis has sought to characterize the bifaces from the Richardson Island site with the aim of identifying changes in manufacturing strategies. Overall, we find there is relative stability in the biface manufacturing tradition at the Richardson Island site. This stability in manufacturing seems to span the transition from the Kinggi Complex to the Early Moresby Tradition.

Superimposed on this stratigraphy of relative stability in bifacial manufacturing techniques are subtle attribute changes that have resulted in the characterization of formed bifaces into two distinct types: Xilju and Xil. The temporal shift from one type to the next occurs concurrently with the Kinggi/Early Moresby Tradition interface when microblade technology is introduced into the assemblage. While Fedje et al. (this volume) suggest that the morphological change may reflect a shift in biface function from spear to atlatl dart, our evidence suggests that the changes in bifacial attributes at Richardson Island are indirectly affected by the emergent microblade technology, which encouraged changes in the relative abundances of raw material types.

Ultimately it may have been the influence of multiple factors (introduction of microblade technology, different raw materials, stabilizing sea levels, and atlatl technology) that led to the morphological shift we see at Richardson These morphological changes, however, were constrained by the existing mental template for biface manufacture. Thus, the change from Xil to Xilju types represents the continuity of the tradition in a changing cultural context. We emphasize that overall, the Richardson bifacial attributes and raw material trends argue for a consistent and conservative bifacial tradition through time. The illustrations of the bifaces from Richardson Island, and their stratigraphic/temporal ordering, the analysis of typological of biface attributes, and the raw material types have been presented here to support to this supposition.

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Chapter 5

Projectile Points from the Central and Northern Mainland Coast of British Columbia

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Introduction

Until the mid-1960s very little was known about the archaeology of the central and northern coasts of British Columbia (Figure 1). Earlier site surveys by Harlan Smith (1909b, 1930) and Philip Drucker (1943) involved few excavations and those sites tested had only late components that lacked flaked stone tools. The ethnographic evidence indicated that the peoples of this coastal region did not make flaked stone artifacts, and the discovery of two large lanceolate chipped stone points near the mouth of the Bella Coola River was judged sufficiently unique by Harlan Smith (1909a) to write an article about them for the *American Anthropologist* in which he concluded that they were recent imports from the Interior. Another early find was a hafted side-notched arrow point (Figure 2) found in 1925 eroding from Tsitsutl glacier northeast of Bella Coola, that is now in the Royal British Columbia Museum (Keddie and Nelson 2005). Subsequent excavations beginning in the late 1960s did reveal that flaked stone points were part of the cultural inventory on both the North and Central coasts, particularly in the early period, and it is these points that form the database for this chapter. Figure 1 shows the locations of sites or localities where chipped stone points have been found. Particularly noticeable is the presence of chipped stone along the main routes to the Interior, the Skeena River on the north and the Dean and Burke channels and river systems on the south, and their absence in the intervening region. There have been some surveys and excavations in this intermediate region but the most likely reason for this absence is the lack of communication links between the Interior and the Coast.

The type of stone used for making chipped stone points in both these coastal regions is for the most part volcanic rock in the andesite/basalt/dacite range in which differentiation is difficult to determine visually as surfaces frequently weather to a medium grey colour. No detailed studies of the raw materials have been undertaken such as Smith (2004) has accomplished for Haida Gwaii. A few points of slate, chert, milky quartz, quartz crystal, quartzite, chalcedony, and obsidian have also been found.

The North Coast

On the north coast George MacDonald (1969) initiated research in 1966 as part of the North Coast Prehistory Project that saw the excavation or testing of 10 sites in Prince Rupert Harbour over the next several years and excavation at the site of Gitaus about 150 km up the Skeena River although still in the coastal zone. No sites earlier than 5000 BP were discovered. Louis Allaire (1979) analyzed the Gitaus collection, and Ken Ames (2005) has recently described the artifacts from the Prince Rupert Harbour excavations. Later work at Kitselas Canyon (Coupland 1996) recovered no classifiable projectile points. Donald Clark found two points at a cave site on the Nass River that are now in the Archaeological Survey collections in Gatineau. One large leaf-

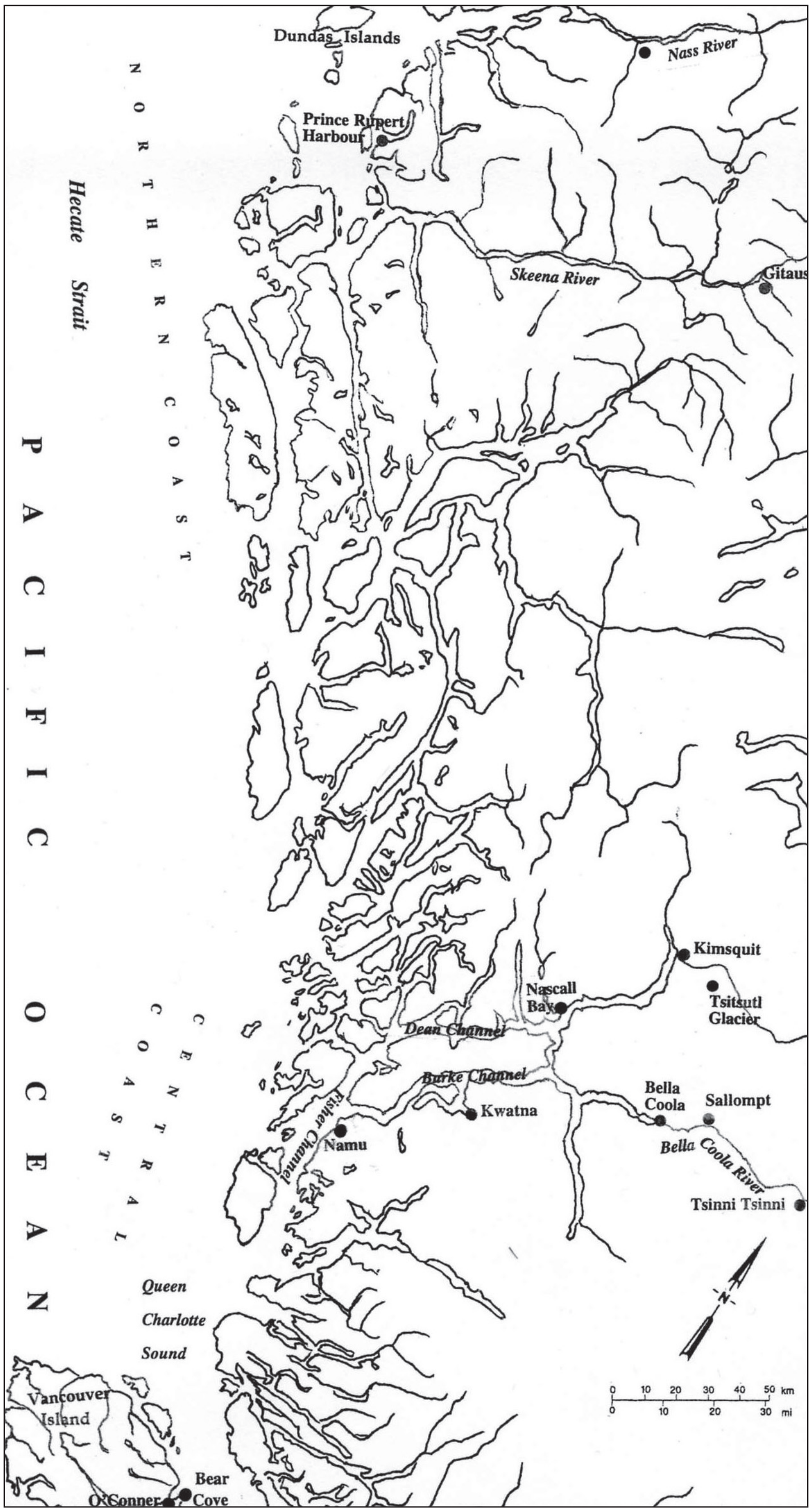

Figure 1. Map of the central and northern coasts of British Columbia showing locations of sites mentioned in the text.

shaped point (Figure 3) has recently been found on the beach on Kaien Island at Prince Rupert as a result of CRM work by Millennia Research.

Excavations at the sites in Prince Rupert Harbour produced only 11 chipped stone points, and Ames (2005:169) suggests that these were traded from up the Skeena River. Outlines of a sample of these bifaces that I made when I examined the collection in the mid-1970s are shown in the lower two rows in Figure 4. These points are made of basaltic stone and are large with convex sides and a rounded or slightly flattened base. Most are long and narrow and three of the 11 points have slightly indented margins at the proximal end forming weak shoulders and a long stem. Ames (2005:169) reports a mean length of 32 mm and mean width of 16 mm. The presence of only 11 flaked stone points contrasted with the presence of 242 points and fragments of points made of ground slate out of the approximately 9000 artifacts recovered is a strong indicator of the relative unimportance of flaked stone projectile heads during the last 5000 years of prehistory at Prince Rupert Harbour. MacDonald (1969:250–253) indicates that chipped stone in general was common at about 4500 BP, but had virtually disappeared by 1500 BP. These same types of points are found up the Skeena River at Gitaus (Allaire 1979) and Hagwilget (Ames 1979, Pl. 3) where they are dated by radiocarbon to between 5000 and 1500 BP. Ames (2005, Fig. 8.9) also reports a 200 mm long concave based ground stone point with edges sharpened by flaking from Prince Rupert. MacDonald (1983, Fig. 6:17) illustrates a large concave-based basalt "dagger" found as part of a cache of warrior weapons dated 2500 BP at the Boardwalk site at Prince Rupert.

Allaire (1979, Pls. 4, 5, 6, 8, 10, 11) recovered 27 classifiable projectile points and additional biface point fragments from his excavations at Gitaus (GdTc–2). All of these points are large and have foliate outlines. They vary in their width/length ratios

Figure 2. Hafted arrow point from Tsitsutl Glacier north of Bella Coola dated at 335±30 BP (Keddie and Nelson 2005:118). The flaked point is 4 cm long and appears to have been re-sharpened.

Figure 3. Foliate biface from Kaien Island, Prince Rupert. (Photo courtesy of Morley Eldridge.)

with about half lanceolate (<0.35 mm W/L ratio), and in the treatment of the base: expanding stem 6; contracting stem 1; flat to slightly rounded base 5; concave base 6; diamond shaped with rounded base 5; and foliate with rounded base 4. None have corner or side-notches for hafting although there is one in which the stem is missing and it could have been notched. They are dated by ^{14}C in the period between 4400 and 1500 BP. Outline drawings of a sample of these points are shown in the upper rows in Figure 4.

The Nass River cave on the lower Nass was investigated by Donald Clark and two small projectile points (Figure 5), one with a contracting stem like Kavik points, only larger, and one side-notched point broken at the notches, were recovered. These points are late and probably date within the last 1500 years.

The Central Coast

On the central coast Philip Hobler (1970) began archaeological investigations in 1968 with a site survey of the seaward reaches of Nuxalk (Bella Coola) territory, and in 1969 began excavations at several sites at Kwatna. That same year Jim Hester started the Bella Bella Prehistory Project including testing at Namu that continued for two years, and succeeded in establishing a 9000 year long cultural sequence at that site (Hester and Nelson 1978). In 1970–1972 Roy Carlson (1972) continued the excavations at Kwatna and in addition discovered a number of

Figure 4. Bifacially flaked points from sites in Prince Rupert Harbour (lower two rows) and Gitaus (upper rows). The latter re-drawn from Allaire (1979).

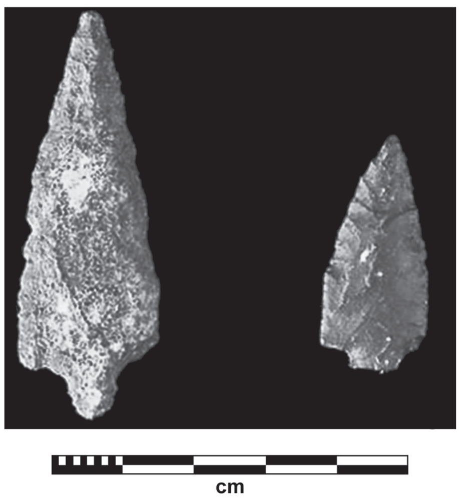

Figure 5. Points from the Nass River cave.

lithic scatters on the beaches that contained artifacts different from those found in the excavations at Kwatna, and were interpreted as lag deposits from early sites eroded by rising sea levels. In 1971 and 1972 Hobler shifted his excavations to Kimsquit and found one early site (FeSr–5) with both microblades and a bifacial point. In 1974 Brian Apland undertook a low tide survey of beaches in the islands of Heiltsuk territory west of Fisher Channel and discovered a number of lithic scatters that he analyzed (Apland 1982) along with those from Kwatna and from Quatsino Sound on northern Vancouver Island (Carlson and Hobler 1976). In 1977, 1978, and 1994 Carlson re-opened the Namu excavations and discovered pre-microblade levels with bifacial projectile points dating back to 9700 BP (Carlson 1996). In 1977 Hobler excavated the quarry site of Joashila (FaSu–19) at Kwatna with a component with bifaces dating to ca. 5000 BP, but no classifiable points were found. In 1994 and 1995 Hobler (1995, 1996) excavated at Tsinni Tsinni, an early site on two high terraces in the upper Bella Coola Valley (Hall 2003), and in 2001 excavated the Sallompt site (FcSp–017) on a lower terrace in the middle reaches of the Bella Coola Valley that produced about 30 mostly fragmentary bifaces (Hobler 2004). In 1995 Millenia Research (Maxwell, Eldridge, and Wilson 1995) undertook an impact assessment at Nascall Bay and found two flaked points at FcSt–3.

To the south in Southern Kwakiutl territory on the northern end of Vancouver Island three leaf-shaped points were recovered from the undated basal deposit at the O'Conner site (Chapman 1982), and at Bear Cove (C. Carlson 1979, 2003) one crude diamond-shaped and three leaf-shaped points were found in Component I dated between 8000 and 4500 BP as well as other point fragments. In Nuu-chah-nulth territory on the west coast of Vancouver Island no flaked stone points were found in the long sequence at Yuquot beginning 4200 years ago (Dewhirst 1980). Subsequent work in this region has uncovered crude leaf-shaped points at high elevations (McMillan 1996) and the occasional foliate biface in younger shell middens that may have been traded into the region (McMillan and St. Claire 2005).

Flaked stone projectile points are not common on the central coast although some are found throughout the 10,000 year cultural sequence. Eighty-four (58%) of the 145 classifiable points (Table 1) are from a single site, Namu (ElSx–1), and 65 (77%) of these pre-date 5000 BP. Nineteen points were found as parts of lithic scatters on eroded beaches (Apland 1982), and the others were found at various sites (Table 1). The first *in situ* points came from Phil Hobler's and my excavations at Kwatna (1969–73) and Jim Hester's (1969–71) at Namu. Additional points and the earliest ones were found in excavations at Namu that I directed in 1978 and 1994 (Carlson 1996) and at sites that Hobler (1995, 1996) excavated on the high terraces in the Bella Coola Valley.

Central Coast Projectile Point Types

The following types are based on form and are numbered from I to IX beginning with the earliest. **I.** Foliate, un-stemmed, un-barbed, rounded or pointed base; **II.** Small tear-drop "Chindadn" points; **III**. Trianguloid Chindadn variant; **IV.** Squared or concave base foliates; **V**. Diamond-shaped; **VI.** Contracting stem; **VII.** Expanding (fishtail) stem; **VIII.** Corner-notched; **IX.** Side-notched. The numbers of points of each type are shown in Table 1.

Type I Foliate Unstemmed Points with Rounded, Pointed, or Flattened Base. Figures 6–9. N = 97 (26 measured).

Length: 3.2 to 15.7 mm with 13 (50%) between 8.0 and 5.5 mm; **Width:** 3.5 to 1.2 mm with 13 (50%) between 2.4 and 1.8 mm; **W/L Ratio**: 0.18 to 0.60 mm with 13 (50%) between 0.37 and 0.27 mm.

Distribution. Eleven sites (See Table 1) with 68 including fragmentary examples (70%) from Namu.

Time Range. >9000 BP to contact and most common in the 9000–8000 period at Namu. The earliest dated point made of quartzite (Figure 6) is from the 9700–9000 BP level at Namu very close to the 9000 BP radiocarbon date. Neither the Tsinni Tsinni nor the Sallompt assemblages (Hall 2003; Hobler 1995, 2004) are radiocarbon dated, but their geological context—old terraces above the Bella Coola Valley—and their cultural inventories place them in the early period before 5000 BP with TsinniTsinni probably in the 10,000 to 8000 period, and Saloompt in the 8000 to 5000 BP range. Three of the large lanceolate points of this type (Figure 7), two of slate and one of basalt, were found with an adult male burial at

Table 1. Numbers of central coast projectile points by type and site. Types: I Foliate, unstemmed; II Chindadn; III Trianguloid; IV Lanceolate, unstemmed; V Diamond; VI Contracting stem; VII Expanding stem; VIII Corner-notched; IX Side-notched.

SITE / TYPE	I	II	III	IV	V	VI	VII	VIII	IX	TOTAL
Namu Periods BP										
Ia 10,000–9000	1									1
Ib 9000–8000	29	3	1							33
Ic 8000–6000	16					1				17
II 6000–5000	11	1				2				14
III 5000–4500	1									1
IV 4500–3500	7					1				8
V 3500–2000	1						1			2
VI 2000–200	2					1	1	2	2	8
Beach Scatters										
FbSu–1					1	2	1			4
EkTa–10	2							1		3
ElTb–10	4				2	1		1	1	9
FaSu–21					1		1			1
FaTc–7	1									1
EdSv–1										1
Kwatna										
FaSu–1									1	1
FaSu–2	1						1	3	2	7
FaSu–10								1		1
Kimsquit FeSr–5	1									1
TsinniTsinni FcSm–11	6	3								2
Tsitsi Glacier									1	1
Trumpter Mtn.				1						1
Nascall FcSt–3	1								1	2
Sallompt FcSp–17	7	1		1						9
Bella Coola						3				3
Bear Cove	3	1								4
O'Conner	3									3
TOTAL	**97**	**9**	**1**	**2**	**4**	**11**	**5**	**8**	**8**	**145**

Figure 6. Quartzite projectile point >9000 BP from the basal layer at Namu.

Figure 7. Lanceolate points associated with adult male burial at Namu dated 4390 ± 160 BP. Middle point is 14.3 cm long.

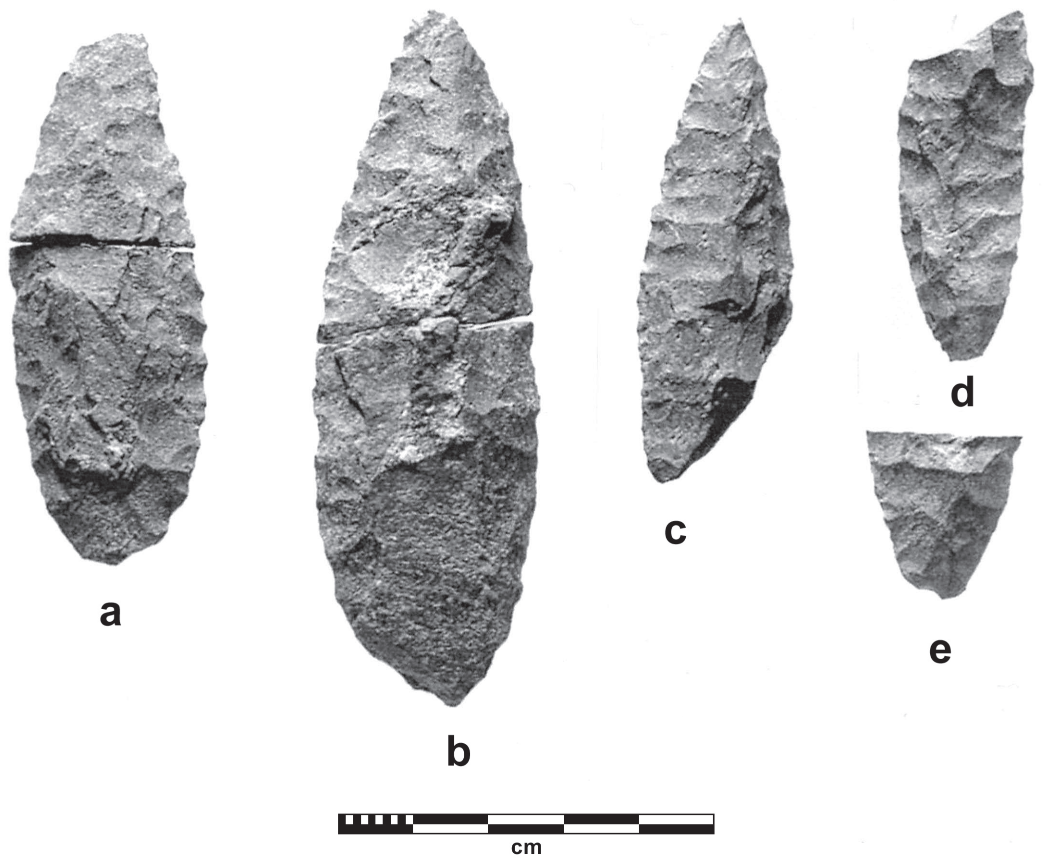

Figure 8. Early andesite bifaces from Namu showing patterning of flake scars. a, b, e: 9000–8000 BP levels; c: 6000–5000 BP levels; d: 8000–6000 BP levels.

Namu (Hester and Nelson 1978, Fig. 22) that was dated at 4390 ± 160 BP. Two unfinished points (Figure 8a, b) from Namu, apparently broken during manufacture, were found in levels dating 9000 to 8000 BP. Two points (Figure 9d, g) from Namu dated 2440 and 7800–4540 BP (Hester and Nelson 1978:50) may be re-sharpened examples of longer points.

Discussion. Namu has yielded 68 points of this type of which only nine are complete enough for measurement. All of these points have a pointed or rounded base except for one of the large lanceolate points mentioned above that has a rough flat base. They vary greatly in size. Twenty-five of the points from the 9000–8000 period at Namu are end fragments. One point from Tsinni Tsinni (Figure 9h) is made of quartz crystal and three are of basalt. The two basal fragments of lanceolate basalt points (Figure 9b, c) from Tsinni Tsinni both show grinding and smoothing on their basal margins as does the earliest point of quartzite (Figure 6) from Namu, and the undated point (Figure 9e from Kimsquit). At Tsinni Tsinni and at Namu there are fragments of other rather broad bifaces with rounded base that are probably parts of knives and have not been included in this count. A small lanceolate point with a single shoulder (Figure 9a) from the 7000 BP level at Namu is also made of quartzite.

Type II. Chindadn Points. Small thin Tear-drop Points with Marginal Retouch made on a Flake. N=9 (5 measured) Figure 10.

Length: 52 to 55 mm; **Width**: 2.3 to 2.6 mm; **W/L ratio**: 0.44 to 0.48 mm. **Th**: 5–6 mm.

Distribution. Namu, Tsinni Tsinni, and Sallompt

Time Range. Three of these points are from the 9000–8000 levels at Namu. The fourth point of andesite was found in the 6000–5000 level and

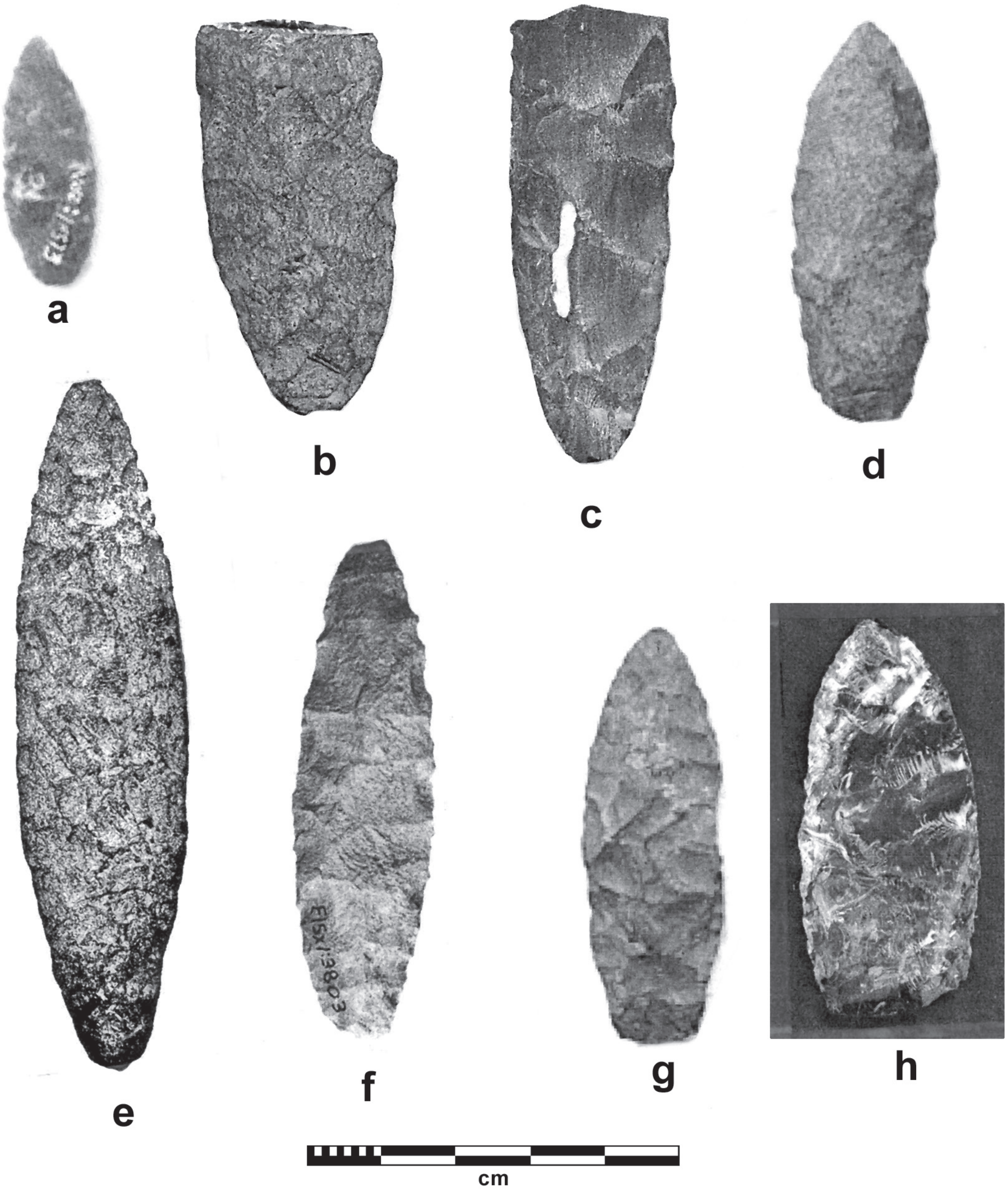

Figure 9. Early foliate points from various sites. a: quartzite point from 7000 BP level at Namu. b, c: bases of lanceolate points from Tsinni Tsinni that show grinding on basal lateral edges; d: basalt point from Namu with lateral grinding at base dating between 7800 and 4540 BP. e: point from FeSr–5 at Kimsquit; f: andesite point from Namu from the 7000 BP levels; g: slate Point from Namu dating to 2400 BP; h: quartz crystal point from Tsinni Tsinni.

could be intrusive from earlier levels. There are two fragments and one complete point from Tsinni Tsinni.

Discussion. These points (Figure 10) resemble the tear-drop Chindadn points from the Nenana Complex in Central Alaska (Cook 1996, Fig. 6–11) and are also found in the Yukon (Figure 10i; see Easton, this volume). Microblades are also present at Namu, Sallompt, and TsinniTsinni in the levels that contain these points as they are at Healey Lake although they are absent in the earlier Nenana Complex sites in Alaska. Two points from Namu are basalt/andesite and two are a light-coloured chert or rhyolite as are the three from Tsinni Tsinni. This type is also found in Haida Gwaii at this same time period (Fedje 2003, Fig. 3:6). The fact that other artifacts types—core scrapers/scraper planes, drills, and other scrapers—along with these points make up a lithic complex found in both Nenana and Northwest Coast sites indicates an historical connection (Carlson 1996, 2007).

Type III Trianguloid Point with Flat Base. N=1 Figure 10 d.

One trianguloid point (Figure 10d)) resembling those from the Nenana Complex of central Alaska

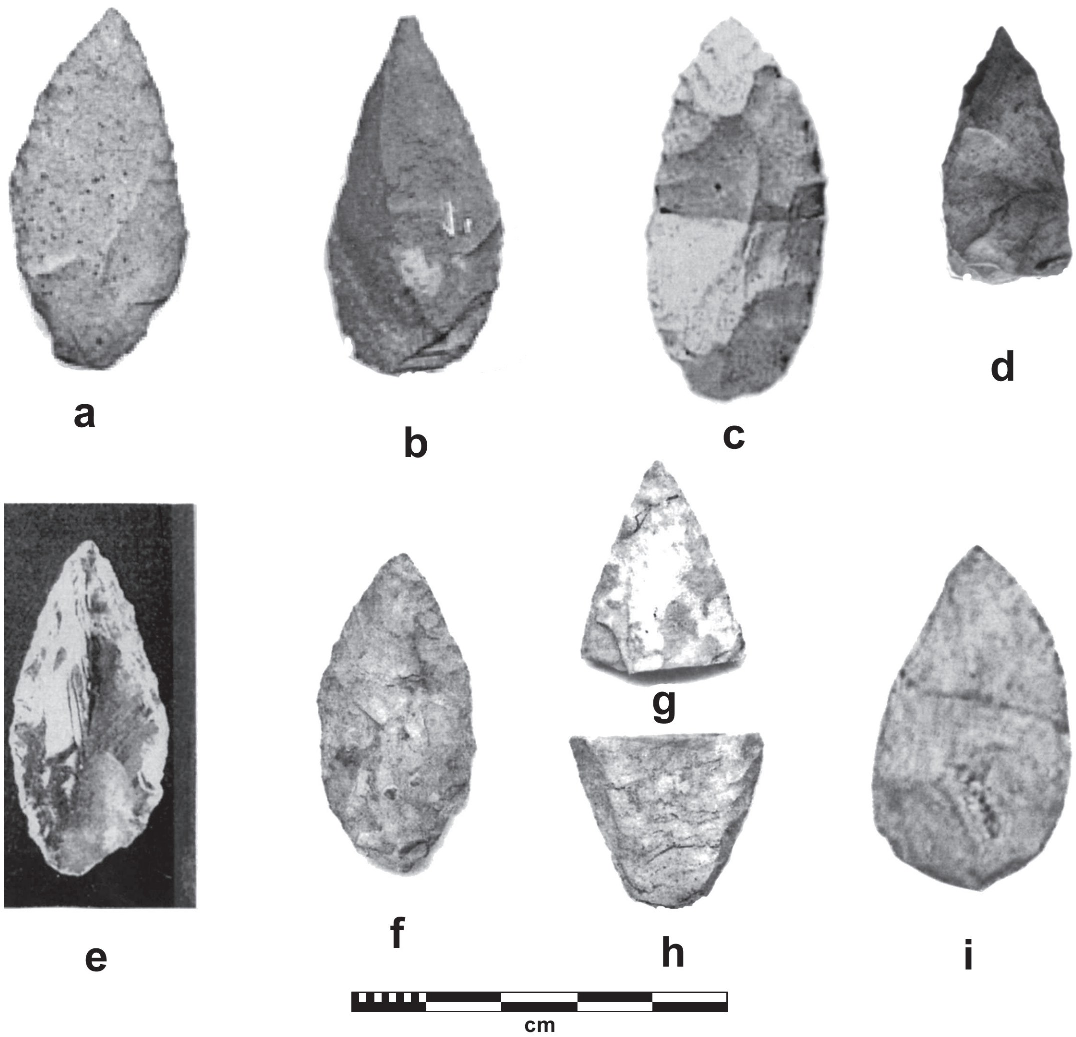

Figure 10. Chindadn and related points. a, c: Chindadn points from the 9000–8000 levels at Namu; b: possible Chindadn point from the 6000–5000 levels at Namu; d: trianguloid point from the 9000–8000 levels at Namu; e: quartz crystal point from Saloompt; f, g, h: Chindadn point and fragments from Tsinni Tsinni; i: Chindadn point from Walker Road site, Alaska.

was recovered from the 9000–8000 levels at Namu.

Length: 33 mm; **Width:** 18 mm; **W/L ratio:** 0.55 mm.

Distribution. Namu only.

Time Range. 9000–8000 BP.

Discussion. This point is unlike any others found except for one possible fragment and is similar to the small triangular points found in the Nenana Complex in Alaska (Hoffecker, Powers, and Bigelow 1996, Fig. 7–8d), and for this reason has been designated as a separate type.

Type IV Lanceolate Points with Squared or Concave Base. N=2 (one measured) Figure 11.

Length: 98 mm; **Width**: 25 mm; **W/L ratio**: 0.26 mm.

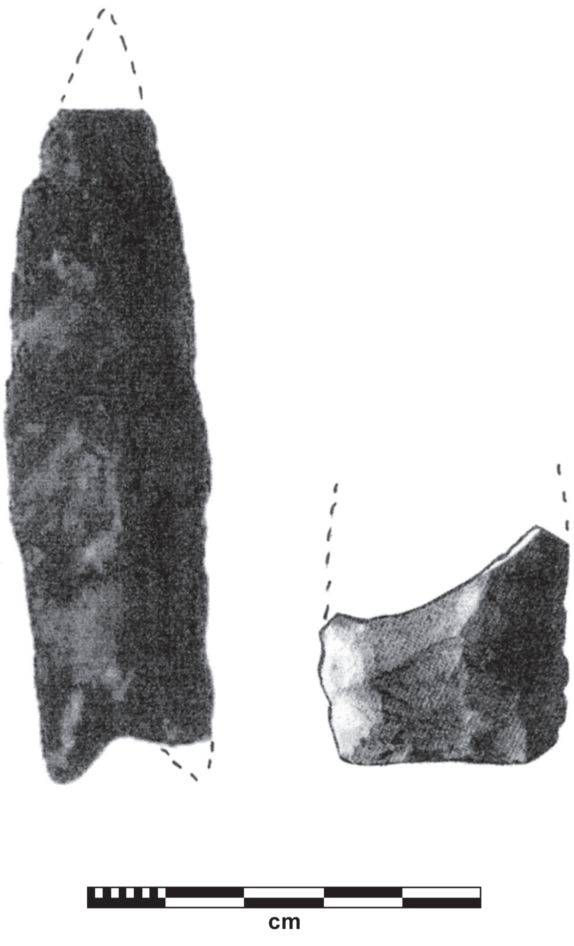

Figure 11. Lanceolate points from the Bella Coola valley. Left, point found by Jack Turner at the 5500' elevation on Trumpeter Mountain; right, point base from the Sallompt site.

Distribution. One point base from Sallompt and one point from the 5500 foot elevation on Trumpeter Mountain.

Time Range. Probably between 8000 and 5000 BP.

Discussion. The point of this type from Sallompt is a fragmentary base that shows grinding on both edges (Hobler 2004). This point resembles the "plainview-like" points from Hagwilget reported by Ames (1979, Pl. 3) that he dates about 5000–3500 BP. The second point was found by Jack Turner at the 5500 foot elevation on Trumpeter Mountain. Both points more closely resembles the Skeena River/Prince Rupert types (Figure 4) than those from the Central Coast.

Type V Diamond N=4 (4 measured) Figure 12.

Length: 47 to 110 mm; **Width**: 18 to 31 mm **W/L ratio**: 0.26 to 0.49 mm.

Distribution. Three beach scatters (see Table 1).

Time Range. This type was not found in the Namu sequence. To the south in the Gulf Islands it dates between 5000 and 1500 BP with most examples early in this period. Apland (1982:225) on the basis of indirect evidence suggests that the beach scatters from which all four of these points came date between 6000 and 3000 BP.

Discussion. One point is very well made whereas the others are crude.

Type VI Points with Contracting Stem N= 11 (8 measured) Figure 13.

Length: 115 to 40 mm; **Width**: 35 to 17 mm; **W/L ratio**: 0.30 to 0.50 mm

Distribution. 4 sites (See Table 1)

Time Range. The earliest point (Figure 13f) of this type is very small and made of mottled red chalcedony, and was found in the 7000 BP level at Namu. A small quartzite point (Figure 9a) from the same period with a single shoulder could be considered to have an incipient stem, as could the large undated point (Figure 9e) from Kimsquit, although both have been classified as Type I. Two points (Figure 13b, e) of andesite were found in the 6000 to 5000 year levels, and the base of a very large slate point in the 4000–3000 levels. The latter is very similar to a complete point (Figure 13a) found in the front trench at Namu dated at 1880–1600 BP

(Hester and Nelson 1978, Fig. 32a); however the surface of this point is very smooth as if it had been weathering on a sandy beach whereas its edges are sharp from recent retouch. It is probably an older point picked up on the beach and re-used, in which case 4000–3000 BP might be the more valid time period.

Discussion. The two large, lanceolate points reported by Smith (1909, Fig. 73) from Bella Coola have contracting stems and are probably made of slate. Two biface fragments from the Sallompt site that Hobler (2004) calls incipient stemmed have not been included as they are very crude and the stems are not well defined; they could be performs.

Type VII Points with Expanding Stems (corner removed). N=5 (5 measured) Figures 14, 15, 16g.

Length: 50 to 75 mm with three points between 60 and 63 mm; **Width**: 24 to 30 mm with three points between 24 and 26 mm; **W/L Ratio**: 0.49 to 0.31 mm.

Distribution. 4 sites (See Table 1).

Time Range. At Namu the three points occur in levels dated 3000 to 1500 BP. At FaSu–2 at Kwatna the deposits are younger than 2000 BP.

Discussion. The expanding stem on these points was made by notching the base at the corners. One corner is broken on each of the points from Namu. The raw materials of the two Namu points are light chert, and mottled red and tan chert. The point (Figure 15) from the beach at Cathedral Point (FbSu–1) is of Edziza obsidian and is more similar to points from the Skeena than those from the Central Coast. The point from FaSu–2 is of andesite. This type may be the youngest of the atlatl dart points.

Type VIII Corner-notched Points N= 8 (8 measured) Figure 16 d, e ,h, i.

Length: 64 to 34 mm; **Width**: 26 to 18 mm; **W/L Ratio**: 0.65 to 0.37 mm.

Distribution. 5 sites (See Table 1).

Time Range. All are probably younger than

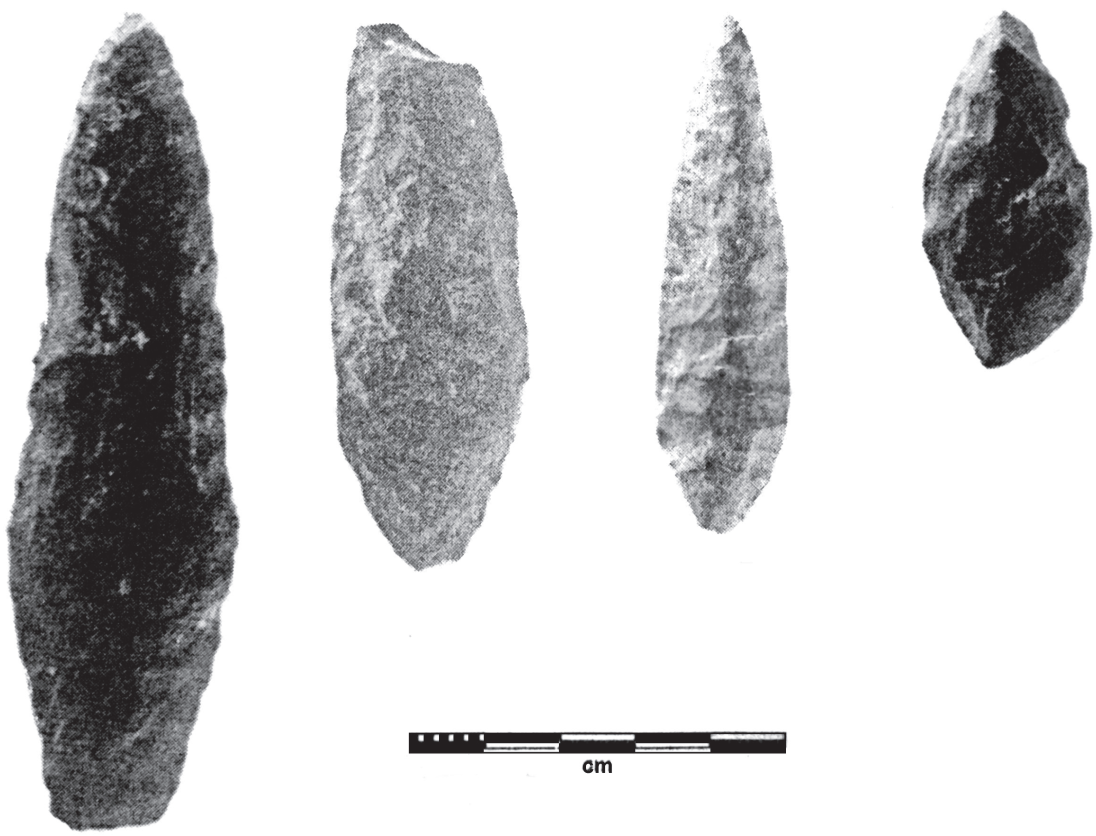

Figure 12. Diamond-shaped points from lithic scatters on beaches of the Central Coast.

2000 BP. At Namu (Hester and Nelson (1978 Fig. 32c) date one point at 1840 BP, and at Kwatna these points are all in deposits younger than 2000 BP. At FaSu–10 at Kwatna there is a single ^{14}C date of 1760 ± 90 BP (Gak 4333).

Discussion. This type seems to be transitional in form between the Type VII expanding stem points and the Type IX side-notched points.

Type IX Side-notched Points
N=8 (7 measured) Figures 2, 16a–c.

Length: 60 to 25 mm; **Width**: 25 to 15 mm; **W/L Ratio**: 0.72 to 0.29 mm.

Distribution. 6 sites

Time Range. The large crude obsidian point (Hester and Nelson 1978 Fig. 32f) from Namu is dated at 1470 BP. The two small points (Figure 16a, b) from Kwatna were found on the house floor at FaSu–2 dated at 330 ± 80 BP (Gak 3909). The hafted point from the Tsitsutl glacier (Figure 2) is of this type and appears to have been resharpened. The haft is dated at 335 ± 30 BP (Keddie and Nelson 2005:118).

Discussion. All points of this type may have been traded from the Interior.

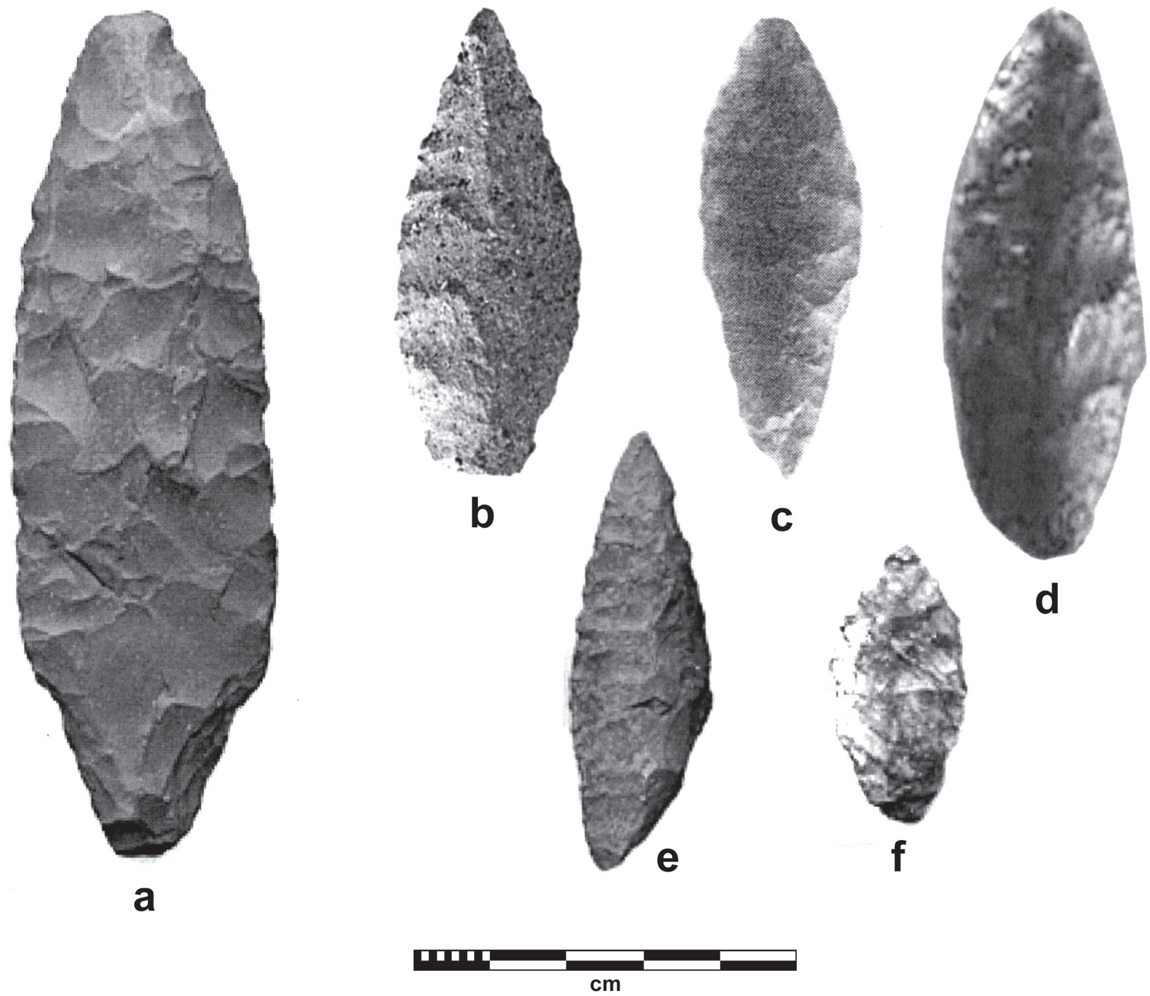

Figure 13. Contracting stem points from the Central Coast. a: slate point from Namu dating ca. 1880–1600 BP, but possibly earlier; b, e: andesite points from Namu dating 6000–5000 BP; c, d: beach finds; f: red and white chalcedony point from 7000 BP level at Namu.

Figure 14. Expanding stem point of red and white mottled chert from Namu dating 3000–2000 BP. The lower left side of the stem is broken and missing.

Figure 15. Expanding stem point of Edziza obsidian from the beach at Cathedral Point (FbSu–1).

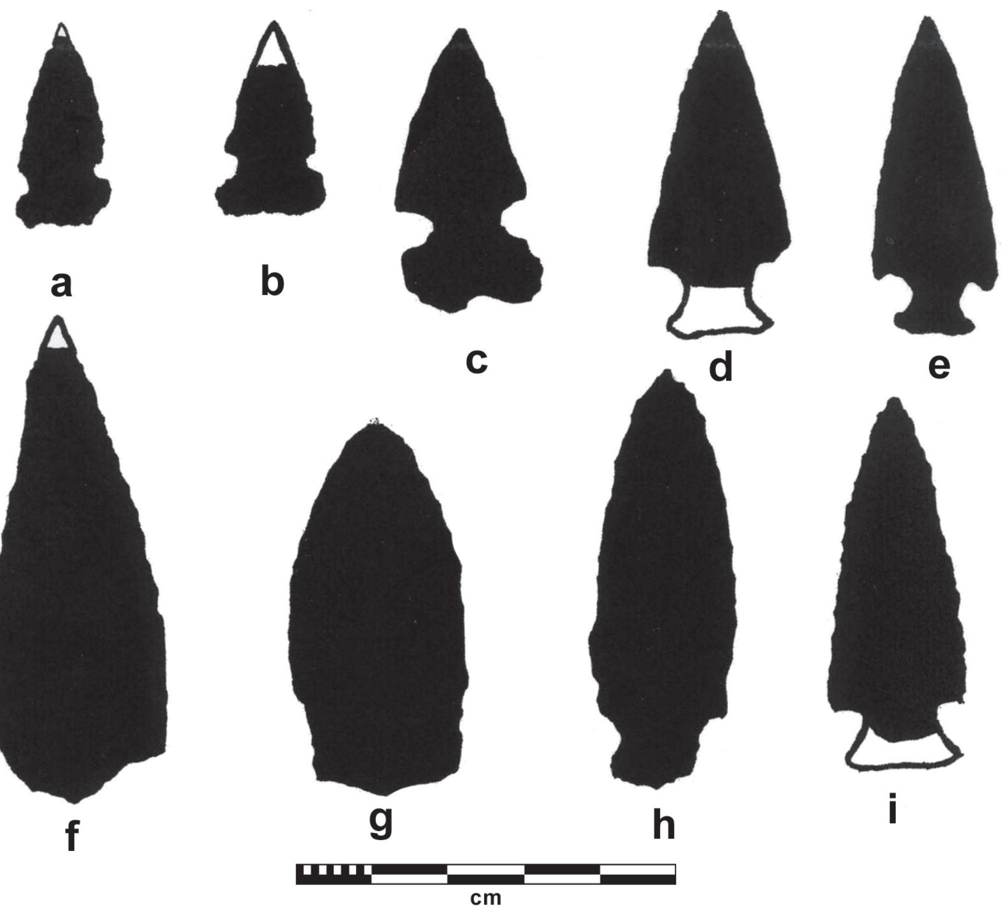

Figure 16. Late points from Kwatna and Namu. The two small side-notched points were found on the house floor at FaSu–2 dating 330 ± 80 BP. The earliest of the corner-notched points dates 1840 BP.

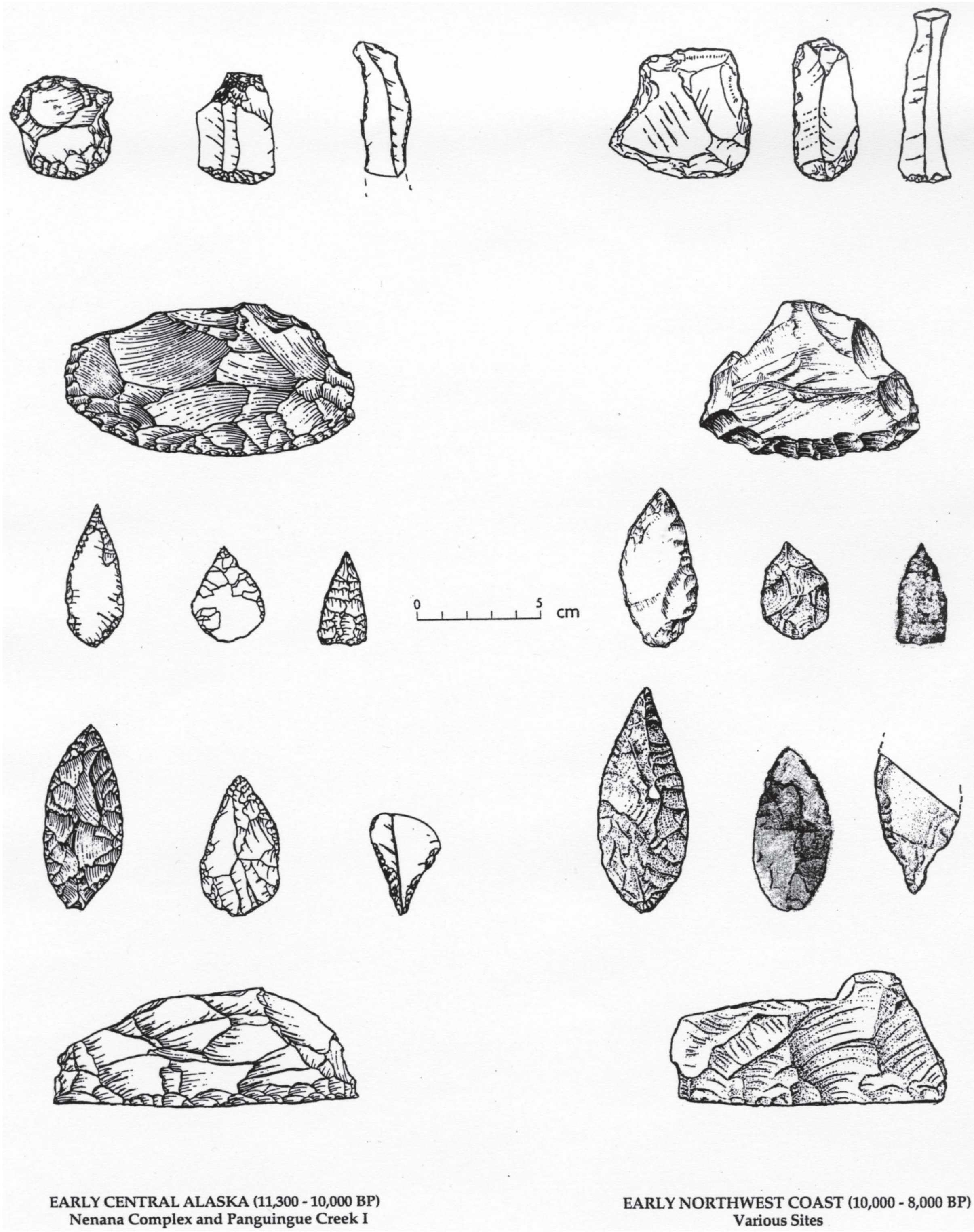

Figure 17. Types of flaked stone tools found in Nenana sites in Alaska and in early Northwest Coast sites. Top two rows: scrapers. Third row: triangular and Chindadn bifaces. Fourth row: foliate and Chindadn bifaces and drills. Bottom row: scraper planes. Artifacts re-drawn from Carlson (1996), Fedje (2003), Pearson (1999), West (1996).

Conclusions

Bifacially flaked stone projectile points were part of the cultural inventory brought to the Central Coast of British Columbia by the earliest known inhabitants about 10,000 years ago, and very probably to the North Coast as well although pre-5000 BP evidence of projectile points there is yet to be found. The earliest point at Namu and two early point bases from Tsinni Tsinni show grinding along the lateral margins of the base as do early points from Haida Gwaii. Some of the earliest points are similar to those of the Nenana Complex of central Alaska and the Yukon where they occur earlier, and it is probable that some of the early migrants to the Coast were derived from the same population. Other shared stone tool types shared with the Nenana Complex are scraper-planes, trianguloid points, perforators, and several forms of scrapers (Figure 17). Flaked points continued to be used throughout the 10,000 year sequence of occupation, but varied in form and in frequency throughout this period.

Both large and small bifacial points that probably served different uses are found throughout the Namu sequence (Figure 18). Foliate points (Type I) without stems or barbs are found between >9000 and 8000 years ago as are Chindadn (Type II) and one small trianguloid point (Type III). Lanceolate forms of Type I points continue into subsequent periods to as late as 1500 BP. The earliest stemmed and shouldered point (Type VI) is found about 7000 BP; others are found about 4000 BP and possibly later although the latter may be intrusive from earlier deposits. Points with the lower corners removed to form an expanding stem (Type VII) begin about 3000 BP and persist to perhaps 1500 BP when they are superceded by corner-notched (Type VIII) and side-notched (Type IX) forms. The frequency of flaked stone points at Namu (Table 1) peaked between 9000 and 6000 BP and drastically declined after 5000 BP. Abundant flaking detritus (Rahmetulla 2006) is present at Namu in pre-5000 BP deposits, but is much less common in younger assemblages. Similarities in the forms of later points are primarily to the Interior to the east and to the Skeena to the north rather than to the Gulf of Georgia to the south.

In the Bella Coola valley at TsinniTsinni the lithic assemblage including foliate and Chindadn points, scraper-planes, scrapers, and perforators, and in younger deposits, microblades, is very similar to that found in the 10,000 to 8000 year deposits at Namu. The similarity in projectile point forms is also present in the somewhat younger deposits at Sallompt where there is also a basal fragment of a different type more similar to points found to the north on the Skeena River.

On the North Coast all the known points post-date 5000 BP. These points are part of the coast-wise tradition of leaf-shaped points that in this region are usually lanceolate in form and are frequently slightly shouldered to form long stems for hafting. These same types are found at sites up the Skeena River. Very few of the types of small triangular notched or stemmed arrow points known to post-date 1500 BP in the Interior and on other parts of the Coast have been found on the North Coast.

The unavailability of choice raw materials for flaked stone tools on the Coast may have contributed to the decline of flaked stone points and to an increase in projectile heads made of bone and antler that are common in the post-5000 BP period. Examples of the latter are illustrated in R. Carlson (1996) and Hester and Nelson (1978).

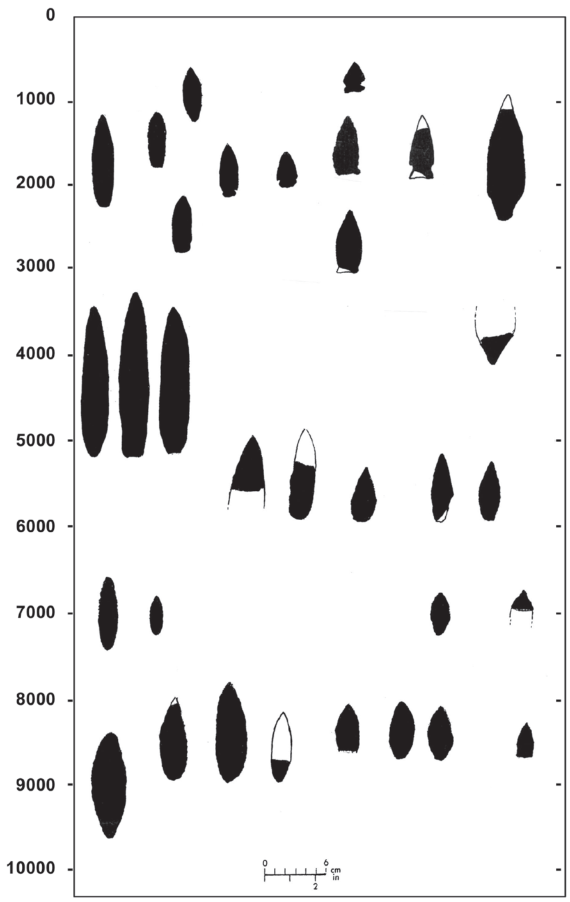

Figure 18. The sequence of projectile points at Namu based on ^{14}C dates BP.

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Chapter 6

Projectile Points from Southern Vancouver Island

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Introduction

Although projectile points can only be fully understood in the larger context of all forms of projectile heads, this chapter will focus on chipped stone points. Unfortunately the lack of enough detailed radiocarbon sequences that include sufficient samples of complete stone projectile points are lacking. Some of the information presented here must of necessity be based on before and after dates. Projectile points of a variety of types are found among the buried cultural debris in First Nations sites on southern Vancouver Island. These include the arming points for spears, harpoons and arrows. Spears with fixed point(s) include types that can be hand-throw, or spears that are thrown with the assistance of a throwing board (atlatl). Harpoons are a specialized kind of spear with barbed or toggle points that detach when the weapon is thrown or jabbed. The points may be made of wood, bone, antler, shell or stone. On a composite toggling harpoon the piercing point is usually set into antler or bone valves. Arrow points can be made of wood, stone, mussel shell and single or multiple bone points—usually with barbs (Figure 1). It is assumed that large barbed harpoons and the largest varieties of toggling harpoons would be primarily used for hunting larger sea mammals. Small barbed harpoons could be used for beaver and land otter, and the smallest toggling harpoons, especially those with round bone points—would be used for fish. Larger stone points may have been used mainly as fixed points on spears for hunting large land mammals or lances for finishing off harpooned sea mammals. Small stone points are generally assumed to have been arrow points. Several of the above types could also have been used in warfare.

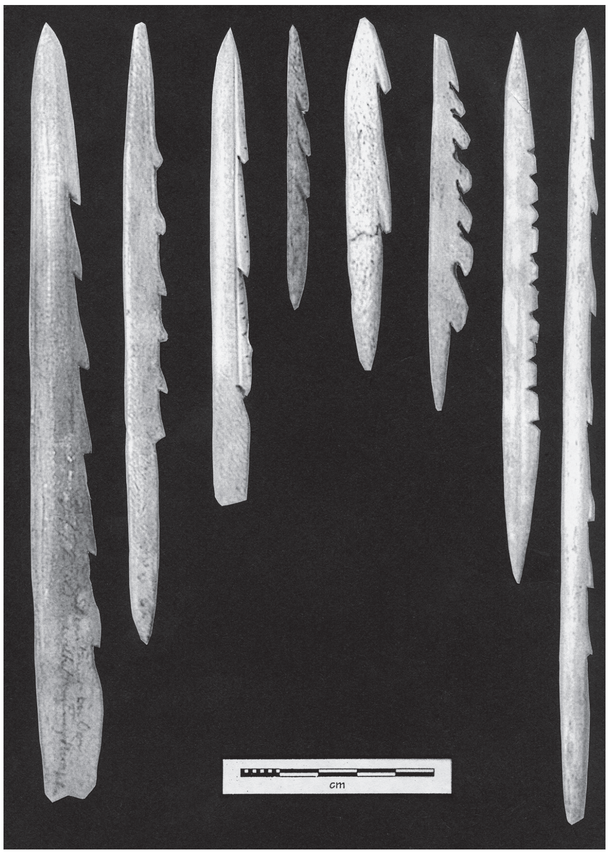

Figure 1. Bone projectile points. The large example at the left is similar to points used on the multi-pronged duck spear. The remainder have ethnographic analogs of either single or multi-pronged arrows. This general class of artifacts is found in sites dating within the last 2700 years, whereas some of the more specific types are known only from the late pre-contact period.

Form, Function and the Ethnographic Record

Assumptions are often made about the function of particular projectile point types without a sufficient database of research to backup the identifications. Telling the difference between stone points used for fixed spears, harpoons and knives can be difficult, as can distinguishing the difference between the small to medium size throwing spear dart heads and arrow points. There is more certainty in ascribing function to some later period projectile samples due to the know historic use of similar artifact types, but even so, detailed ethnographic comparisons—especially with well documented museum collections—are few. Real arrows or spears that have actually been used with points of traditional style materials are rare in museum collections. Most arrows in the Royal British Columbia Museum collection are late 19th and early 20th century examples with iron points; only one arrow with a stone point and a few with bone points are not models made for collectors or anthropologists. The models made by First Nation individuals usually have points that do not accurately match older traditional styles. I will present a sequence of types here that should be considered preliminary until further controlled excavations produce larger samples of points from well-dated contexts.

Raw Materials and Technology

Factors affecting the nature of pre-contact projectile points include both access to different types of raw materials and ease of manufacture. The quality and size of raw materials would limit the kinds of points that could be produced. Trade in both raw materials and finished points had a definite effect on point styles. The introduction of iron could have enhanced the role of bone and antler in the production of some types of projectile points and caused the elimination of other raw material types that were harder to obtain or work. Studies on the changes in proportions of ground slate and fine grained flaked stone point types to each other and to bone and antler point types have been lacking due to insufficient samples in similarly dated contexts. Fine grained flaked stone points and ground slate points seem to have been recovered in similar proportions from many sites dating within at least the last 3000 years on southern Vancouver Island. This is true of both coastal shoreline and inland sites. Most flaked stone points are made of igneous rocks in the andesite/basalt/dacite continuum, although chert seems to be increasingly more common in later time periods. My use of the term chert includes all sedimentary rocks composed primarily of microcrystalline quartz, and includes chalcedony, agate, and jasper. Although in many sites only small numbers of projectile points have been systematically excavated in a datable context, a number of these sites such as DcRt–9 and DcRt–15, have hundreds of points with a site context, thus allowing us to substantiate whether the types and proportions of stone points in the scientific sample are representative of what is found in the larger site.

Projectile Points 3000 to 5000 BP

Only a few projectile points have been recovered from archaeological sites on southern Vancouver Island radiocarbon dated to over 3000 years. In this period there are many flaked stone points that have straight to excurvate sides on leaf shaped bodies. The halting element is often a well made triangular shape with a pointed or rounded base and a slight inset shoulder.

There is often a fine line between a stemmed projectile point and an unstemmed biface. The base of the hafting area may be rounded or taper to a point. These points are of various sizes, but commonly range from 3 cm to 8 cm. Rhomboidal and irregular points are not uncommon. A small number of the tapering stem types have moderately (as opposed to deep) serrated edges. At inland sites the latter are usually associated with ground slate points of a similar size or larger. These earlier slate points have thick beveled edges or are long and hexagonal in shape.

Examples of flaked stone points of this period can be seen in Figure 2, which includes all the points from a single component site, DiSe–10, that dates to 3500 BP (Riddl-576). This site on Denman Island is known as the Blufftop site (Eldridge 1987). Similar points can be seen in the earliest component at Duke Point, DgRx–5, near Nanaimo (Murray 1982). Murray's marine calibrated shell dates were based on calculations that have now been superceded (see Deo et al. 2004). The actual age of the lower component I points shown in her figure 15, have a time more in the range of 4700 BP to 2700 BP

This re-dating was confirmed by a subsequent date of about 3500 BP (S-2350) obtained by Cybulski (1990). Murray's component II would also be older than the published sequence and date to around 2950 to 2250 BP. The latter component II has two leaf shaped, two tapering stemmed and two straight stemmed points.

Projectile Points 2900 to 2000 BP

Points found in the previous period are also found in this period but in very small numbers. There appear to be inter-regional differences in the percentage of stone point types found on southern Vancouver Island. The Maplebank site, DcRu–12, in Esquimalt harbour has two distinct portions of the midden separated by a 600 year hiatus (Keddie 1976). The upper Zone A may also have a temporal hiatus, but this is not as clearly defined as the separation between the upper Zones A–B with that of the lower Zone C. Zone A dates to a period from at least 600 BP (WSU 1583), to about 170 BP (WSU1539). Zone B, with six radiocarbon dates is concentrated in the period between 1460 BP (WSU 1586) and 1140 BP (WSU 1580). The distinct lower Zone covers the period from about 2900 BP (WAT 1616) to 2055 BP. (WSU 1584). All zones are dominated by triangular points in a range of sizes. The lower Zone C is dominated by triangular points with only a few leaf shaped bifaces, one diamond shaped stemmed point and one thin corner notched, chert point. Only a few of the 24 triangular points from Zone C are included in this image (Figure 3). What is significant at this site is the absence of assemblages from the time period from about 2000 BP to 1600 BP. This hiatus may account for the absence of stemmed and notched point types like those seen in large numbers at sites found only 6 to 7 km to the east. The small triangular points from DcRu–12 are of varying thickness and commonly range from 2 cm to 6 cm in length. They are the dominant type beginning around 2700 BP at the Maplebank site.

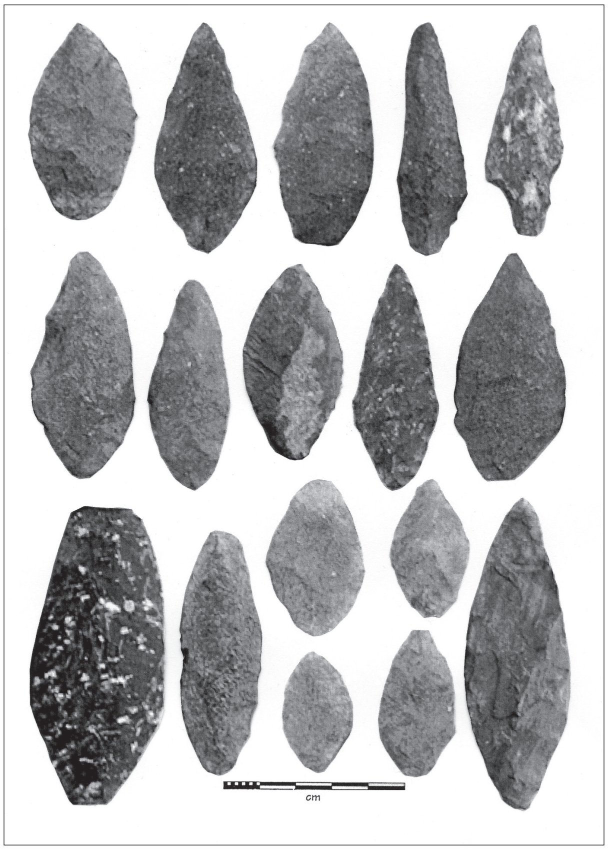

Figure 2. Points from a single component at DiSe–10, the Blufftop site on Denman Island dating to 3500 BP.

The Willows Beach site in Oak Bay, only 7 km to the east of the Maplebank site, also has distinct older and younger cultural components (Kenny 1974). The early Zone B is only found at the south end of the Willows Beach. The central and northern parts of the shell midden date to after about 1771 BP (SFU 792; shell date 2180 ± 70) and after 1483 BP (SFU 787, 1580 ± 70), (Keddie 1992).

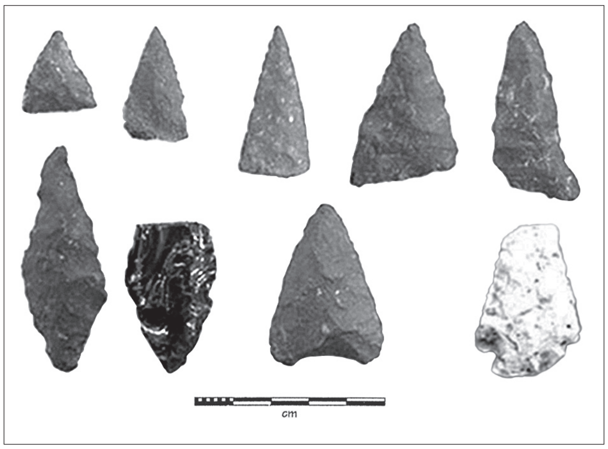

Figure 3. Points from the oldest layers at the Maplebank site, DcRu–12, dating between 2900 and 2055 BP. From bottom left are two tapering stemmed points of basalt and obsidian. At the right is a corner notched, burnt chert, point. There were 18 more triangular points like those in the upper left from this lower Zone that are not shown.

Kenny dated the lower deposits of the southern extreme of the site to a relatively short time period between 2630 ± 90 (Gak5102) and 2490 ± 85 BP (Gak5103). The lowest cultural unit II contained only one small leaf shaped and one small triangular point. Unit III above contained three corner indented points, a small triangular chert point, two leaf shaped bifaces and a unique excurvate edged obsidian point with a straight base (Figure 4). All upper Zone A points are triangular—although small stemmed unprovenienced points were found at the site.

The Bowker Creek site, DcRt–13, inland to the south of Willows Beach (Mitchell 1979), fits into a narrow time frame—dated by Mitchell to around 2910 ± 100 BP (Gak2760) to 2740 ± 100 BP (Gak2761). Mitchell gave a corrected average of the dates to 3018 ± 143 calendar years. However, these were shell dates, and new information (Deo et al. 2004) would suggest these shell dates should make the deposits about 400 years younger. A time frame of around 2510 BP to 2340 BP may be more accurate for these deposits. DcRt–13, has five different styles of flaked stone points (Figure 5). DcRt–13, like similar aged sites in the region, also has a range of slate points of which many are larger than the flaked stone points. Slate points are often reworked pieces of broken ones that were much larger in size. Fragmented pieces suggest that slate points in excess of 20 cm were not uncommon. A few complete examples have exceeded 40 cm in length (the size of a human forearm).

Small triangular points have not been found on the central part of Vancouver Island before about 1720 BP, the earlier possible date for the upper component III at the Duke Point site DgRx– 5, which contains four small triangular points, two small leaf shaped points, two small stemmed, one small corner notched and one small side notched points.

A different pattern occurs on the central east coast of Vancouver Island during the period from about 2050–1750 B.P., which is not well represented on the southern tip of the Island, the Departure Bay site, DhRx–16 near Nanaimo, is dominated by tapering stemmed points and a few side indented and corner notched points (Figure 6).

Figure 4. Projectile points from the Willows Beach site, DcRt–10, at Oak Bay. The top row of triangular points dates after 1500 BP. Points in the bottom two rows date between 2600 BP and 2400 BP with the oldest in the bottom row.

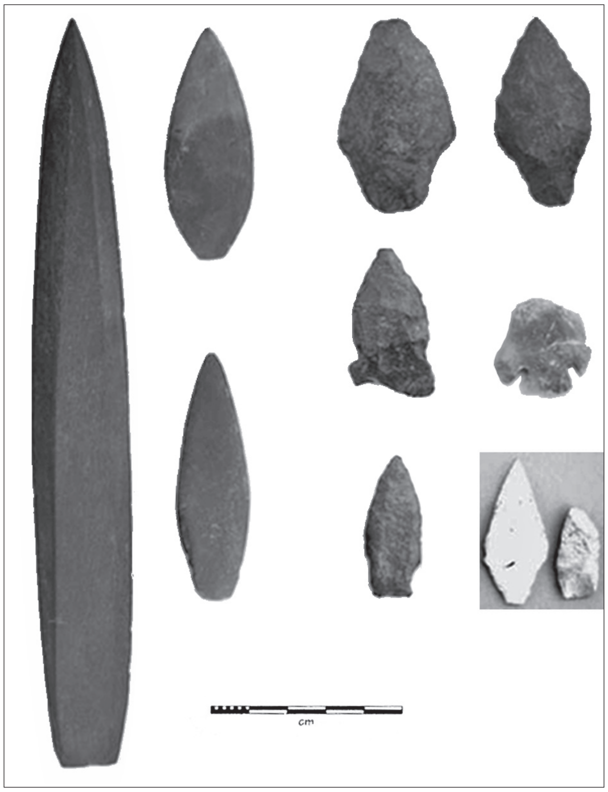

Figure 5. Projectile points from the Bowker Creek site, DcRt–13, at Oak Bay dating about 2500 to 2340 BP. A sample of the 24 ground slate points is shown at the left, and the complete sample (N = 7) of the flaked stone points at the right.

The small triangular stone points from Southern Vancouver Island appear to be arrow points and not harpoon points. If this is true, it would suggest that archery technology was introduced to this area by about 2700 BP—earlier than presently assumed. Evidence from other Pacific coast regions does not support or reject this idea. Similar triangular points are used in the arctic and south-eastern Siberia to Japan as cutting blades inset in harpoon points. Their use as harpoon points on Southern Vancouver Island may be ruled out because of the lack of slotted antler or bone points into which they would fit. Slotted wooden examples have not been found to date in waterlogged sites. These triangular points are consistently too thick to fit into the arming slot created by the two toggling valves of known harpoon points. These slots on the fitted valves found at this same time period are usually around 2 mm across, and only in the very large historic sea mammal harpoons is the rare one up to 5 mm thick, and even the slots on these are too narrow for most triangular flaked stone points.

Figure 6. Projectile points from Departure Bay near Nanaimo from a distinct component dating to 2050–1750 BP. These points are of different styles than those found in the Victoria region at the same time period.

On the Oregon coast researchers have correctly suggested that harpoon value lengths are crucial in determining species of prey hunted but have not recognized the importance of the width of the arming slot in determining the nature of the blade to be used. Clark (1991:201) suggests that triangular points 2 cm wide or greater are points used to arm large composite harpoons for sea mammal hunting. This width measurement cuts through the normal range for Vancouver Island triangular points and makes no difference in terms of point thickness.

In Japan, where triangular arrow points go back before 9000 years ago, most are much smaller than the triangular points of southern Vancouver Island. The majority of Japanese points weigh less than one gram and few are over 3 grams (see Ikawa Smith 1998). Victoria region triangular points are mostly over 3 grams in weight with less than 20% being between 3 grams and 1.8 grams. Small Japanese stemmed points that are assumed to be spear points overlap in range with Vancouver Island triangular points, but on the average are 30% larger (5 gm vs. 3.5 gm). Judging what is an arrowhead and spearhead is difficult without making comparisons with the size and weight of the arrow and spear shafts (see Keddie and Nelson 2005). We need to consider that most of the small triangular points were harpoon points used with perishable wooden shafts. Most arrows may have been armed with hardwood and bone points, with very few being made from stone.

Another variation in point styles occurs in specialized points dating to the period around 2200 to 1800 years ago. These flaked stone points are medium to large finely flaked points of exotic materials that are mostly, if not exclusively, associated with burials. The raw materials, such as white chalcedony, are usually of obvious northwestern United States origin. It may be that these unique points were seen as wealth objects and intended to be used primarily as burial goods.

Projectile Points 1800 BP to 1140 BP

This period shows an increasing diversity of point styles but with local differences in dominate types. Small triangular points dominate the deposits at

DcRu–12 in Esquimalt, but are found with large numbers of stemmed points at sites to the east, such as DcRt–8, DcRt–9 and DcRt–15 in Cadboro Bay. In addition to large numbers of triangular points, these sites have many small stemmed points and wide corner indented points (Figure 7). The latter point types are not associated with specific dates but seem to occur in a restricted time range. DcRt–7, a shallow midden at Telegraph Cove, only 2 km east of Cadboro Bay, has large numbers of undated corner indented and stemmed points, but unlike at the other sites they far outnumber the triangular types. A few dated examples from other local sites and their absence at similar missing time periods at other sites such as DcRu–12, would indicate that the examples shown in Figure 7 most likely occur in the time period from 1800 to 1600 BP.

Regional differences can clearly be seen at DcRv–1 in Pedder Bay to the west of Victoria (Figure 8). This site, occupied in 1790, dates to after about 1600 BP (Gak1484), and lacks the microblade technology sometimes associated with larger stemmed and corner indented points in Marpole period assemblages. Here the assemblage is dominated by thinner stemmed points and—like other sites in the Sooke area west of Victoria—smaller triangular points that tend to have more concave bases.

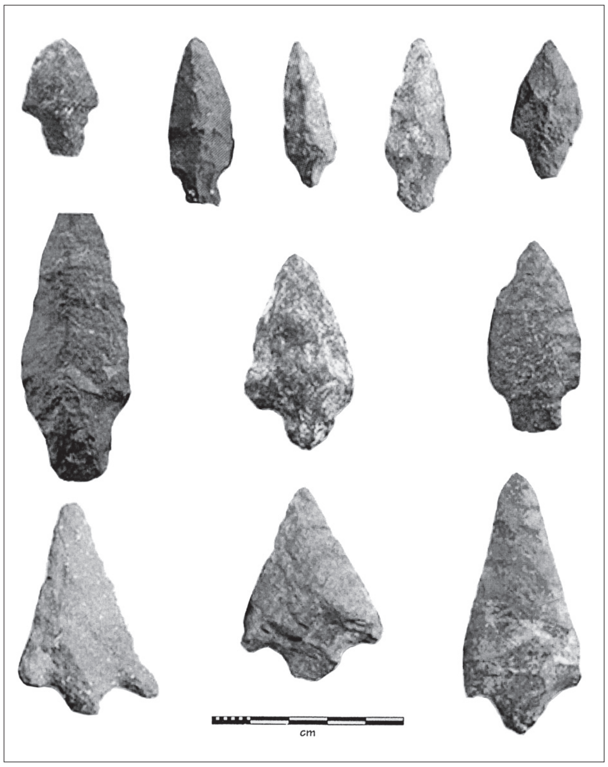

Figure 7. A representative sample of stemmed and wide corner indented points from DcRt–9 at Cadboro Bay to the east of Victoria that date about 1800 to 1600 BP. Although these styles are common, they are far outnumbered by triangular un-stemmed, un-notched points in the larger assemblage.

Projectile Points 900 BP to 600 BP

Triangular points dominate this time period at large sites such as DcRu–12 in Esquimalt harbour (Figure 9) and most other sites extending from the Oak Bay area and along the east coast of the Saanich Peninsula to the Basan Bay site, DdRu–4, south of Sidney. Some sites have proportionally smaller numbers with an increase in a range of projectile points made of exotic trade materials with basal, corner indented and corner and (rarely) side notching. Some of these are very small. There are similar points dating to the same time period in Washington and Oregon to the south. These point types tend not to be found in sites dating to the last 500 years. It may, therefore, be suggested that

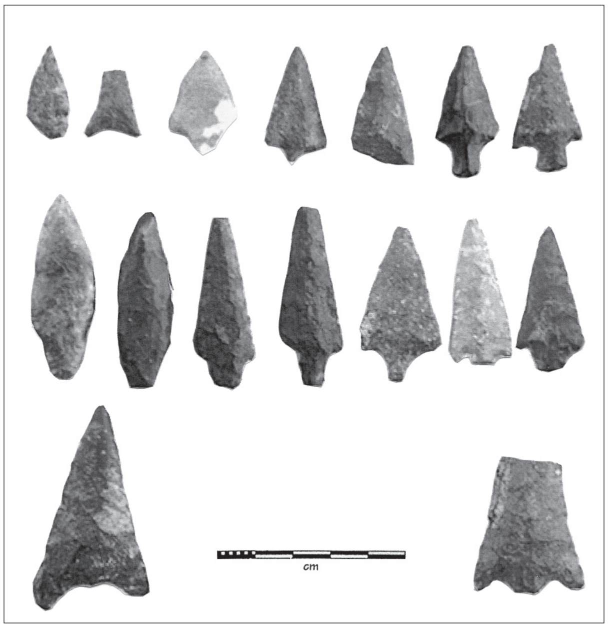

Figure 8. All of the flaked stone projectile points from the systematic excavations at the Pedder Bay site west of Victoria. They all date to after 1580 BP. The stemmed points are smaller and thinner than those usually associated with earlier time periods.

they are most common in the 900 BP to 600 BP time range.

Small thin triangular slate and thin flat shell and bone points are common at some post 1000 year old sites. Unlike the triangular flaked stone points, the flat slate, shell and bone points are mostly close to 2 mm thick and best suited for arming points placed in the slot formed by two antler or sea mammal bone toggling harpoon valves. A small number of these slate points with basal barbs may also have been used as arrow points.

In the last 500 years stone projectile points are rare. There are several archaeological sites in the Victoria area with basal dates around 500 years old in which every stone projectile point at the site is different from the others. These same deposits show evidence throughout the deposits of the extensive use of iron tools for working a wide variety of bone tools. I have observed numerous examples of cut marks on bone points that can only be made by iron burins and iron rasp files.

Conclusions

There is a general presence of leaf shaped, short diamond shaped, and medium size leaf shaped stone projectile points with slight inset tapering stems on southern Vancouver Island in the period from about 5000 to 3000 BP. Small numbers of stemmed types occur that have more pronounced but rounded shoulders. Local stylistic differences can be seen, but can not be well defined without further field research.

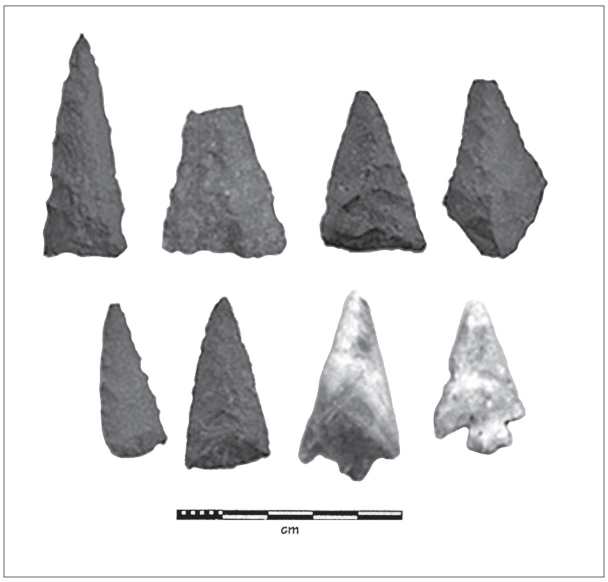

Figure 9. Two imported notched points and a sample of the numerous triangular points from the Upper Zone A at DcRu–12, in Esquimalt Harbour that date to about 600 BP.

The timing at which new types are introduced is different in parts of the region. Small numbers of triangular points appear by at least 2700 BP on the southern tip of the Island and dominate most assemblages after 1500 BP. They have not yet been shown to occur until after about 1700 BP further north on the Island and even then they only occur in small numbers. By 2700 BP small numbers of corner notched, corner indented and rare larger side notched points appear along the east coast of the Island.

Large exotic points were being imported and placed with burials on the east coast of the Island for at least a few hundred years centered on 2100 BP. The least known period is around 2000 to 1600 BP. Large numbers of poorly dated wide corner notched and corner indented points, as well as small to medium size stemmed points seem to occur mostly in part of this period from 1800 to 1600 BP. After about 1700 BP small triangular points made of local igneous materials replace these types for the most part. Proportional differences in point styles occurred within the larger region. Triangular points maintained a strong presence in some large sites around the Victoria area. After about 900 BP, a greater diversity of point styles occurred throughout the larger region. Many of these later points are made of exotic raw materials, and because of the lack of exotic waste material in local sites we must assume that these projectile points were traded as complete points from further south, although warfare cannot be ruled out as the cause of the appearance of some of them in this region.

Stone projectile points are rare by about 500 years ago. The use of iron gravers and rasp files for cutting and grinding bone, antler, hard wood and slate seems to have had a considerable impact on the nature of bone and antler projectile point production since at least the 16th century and probably much earlier. This iron was likely coming from long distant trade around the Pacific Rim as well as from shipwrecks, in the period before introduction by European traders.

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Chapter 7

Serrated Projectile Points from Inland Raised Elevation Sites in the Greater Victoria Area

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Introduction

There are no radiocarbon dates earlier than 3800 BP[1] from archaeological sites in the Greater Victoria area, though we must assume that people were occupying the area millennia before this. Local sea level history suggests that earlier occupation sites in the area are likely to be either drowned or stranded on raised beach terraces. Bifaces recovered from inland locations have some attributes that are rare in bifaces recovered from later period coastline sites. This paper examines the characteristics and typology of serrated and denticulate bifaces in the Victoria area and their geographic characteristics such as spatial distribution and elevation. A regional comparison examines the distribution and age of this trait. We introduce bifaces that have been found in association with serrated forms, and several additional apparently ancient artifacts from raised inland locations. No direct dating for the Victoria points is available, however, the arguments based on find locations, sea levels, and stylistic crossdating are, we believe, compelling.

During a recent archaeological assessment project, an unusual projectile point with denticulate blades was recovered while excavating a shovel test on a small, high-elevation bench near the summit of Skirt Mountain (Eldridge et al. 2006:25). Other archaeological investigation in the same locality had encountered several additional projectile points (e.g., Golder Associates 2006). Because a number of the points from the summit were similar, and appeared to be types missing or rare in local coastline excavated assemblages, the authors hypothesized that the points may date to an earlier time period than is currently recorded archaeologically in the Victoria area; a time period after which rising sea levels had inundated any associated coastal habitation sites. Furthermore, projectile points with denticulate blades are known to date to a moderately early period elsewhere in the Pacific Northwest.

Victoria Area Sea Level History

The sea level curve has been established for the Greater Victoria area. Sea levels at the close of the Pleistocene (13,000 BP) were very high, more than 75 metres above present day levels (Hutchinson 1992). Sea levels fell rapidly, however, and lowered to present day levels 11,700 radiocarbon years ago (Mosher and Hewitt 2004), after which sea level continued to fall below present day levels. The profile of the floor of Portage Inlet, below Skirt Mountain, shows subaerially weathered glacial tills, overlain by terrestrial peats, which are in turn capped by marine deposits (Foster 1972). The peats are as deep as –6.1 metres below present sea level. The weathered tills are found up to at least 10 meters depth at Royal Roads (Mathews et al. 1970), and core samples and unconformities in bedding as well as apparent wave-

[1] Uncalibrated radiocarbon date.

cut terraces off Esquimalt Harbour extend to over 50 metres below present mean sea level (Mosher and Hewitt 2004). Mosher and Hewitt suggest the lowest sea level was attained by 9919 ± 60 radiocarbon years ago. Sea levels around Victoria stabilized at their present position by about 5550 radiocarbon years ago (Mosher and Hewitt 2004), although this is based on a single date just above present sea level on a terrestrial sample. Despite the relatively large amount of archaeological work undertaken along the current shoreline in Victoria, no sites dating to before 3800 BP have ever been radiocarbon dated (Keddie 2006). The archaeological record is a good indication that sea levels may have reached present day elevations only about 3500–4000 BP (Bornhold 2007). Locations just east and west of the city also show a possibly small but sudden rise in sea levels about 2000 years ago (Clague 1989).

Human Occupation in the Victoria Area

We must assume that people were living in what is now the Victoria area during the middle and early Holocene, even though there has been no radiocarbon dated archaeological evidence of this. There is abundant proof that people were elsewhere on the Northwest Coast from the very early through middle Holocene (e.g., Carlson 1979; Carlson 1996a, b; Dixon et al. 1998; Fedje et al. 2004; Gallison 1994; Gustafson et al. 1979; Matson 1976b, 1996; McLaren 2006; Carlson 1990). The exclusive presence of late period archaeological evidence in the Victoria area probably results from an emphasis on archaeological research at or near the current shoreline. We suggest that several potentially early and middle Holocene point forms from the Victoria area have been retained within the Royal BC Museum (RBCM) archaeology collections. Specifically, in the following we define denticulation and serration as biface attributes that likely occur most frequently in periods earlier than 3800 BP.

Defining Denticulate and Serrated

In the following we use the terms "denticulate" and "serrated" to describe bifacial tools with tooth-like projections along the blade margin. The terms denticulate and serrated are often used interchangeably (Loy and Powell 1977). During examination of the denticulate bifaces in the RBCM collection we observed two different methods of manufacturing denticulate or serrated edge margins. The first is achieved through removal of small pressure flakes from alternate faces along the finished edge margin. This produces a slightly wavy edge. Generally, the alternating bifacial flake removal method seems to produce a slightly a less pronounced projection than the second method of manufacture, which is the removal of bifacial flakes along both faces originating from the same point along the edge margin, the depression between denticulate projections. Identification of the method of manufacture for serration or denticulate blades is not provided in the literature we reviewed. Subsequently, in the following we use the word denticulate, the second method of manufacture above, where it is present in the RBCM examples and to describe a very pronounced tooth edge in some cases within the literature. We use the term serration, as defined above, to describe the first method of manufacture in the RBCM examples and in cases were it was not possible for us to identify the specific manufacturing technique. Furthermore, this difference in manufacturing technique may have temporal implications.

Victoria Area Sites and Artifact Descriptions

The following sample was composed from the RBCM collections. Included are descriptions of each site from which denticulate or serrated, and several other potentially early-type points, were recovered (Figure 1). All the chipped-stone points from each site with denticulate or serrated points are considered. Site elevations are all relative to current sea level unless specified otherwise (Figure 2), and sites are discussed in order from highest elevation to lowest elevation. We have included some artifacts that are catalogued with "y" Borden number designations, which have more general locations than those with designated Borden numbers, although in some cases the location is actually quite precise, where a block number or a street address is known. Artifact metrics are provided in Table 1.

DcRv–154

This isolated find site is located near the summit of Skirt Mountain at 325 metres above current sea level. The biface recovered from the site has denticulate blades, rounded shoulders, contracting stem, and a convex base. The point appears to have been

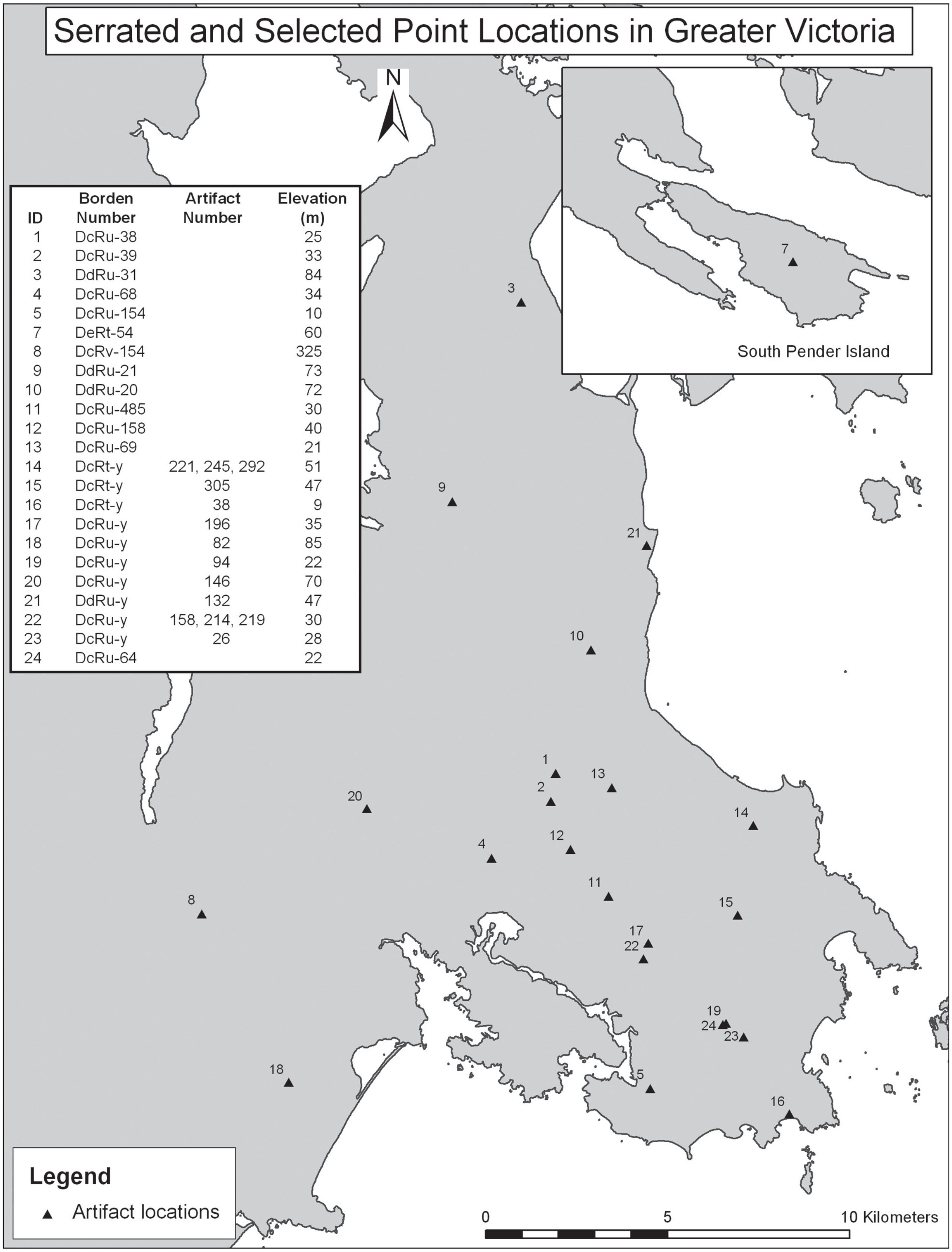

Figure 1. Map of the projectile point locations in the Victoria area referenced in the text.

Table 1. Descriptive statistics of serrated/denticulate points in the Victoria region. Dimensions in mm.

	Length	Width	Thickness	Wi/Th Ratio
Count (n=)	14	24	24	24
Mean	73	28	9	3.0
Standard Deviation	13	7	2	0.8
Median	71	27	10	2.9
Interquartile 1/4	65	23	8	2.5
Interquartile 3/4	78	32	11	3.9
Minimum	48	13	5	1.7
Maximum	105	47	13	4.3

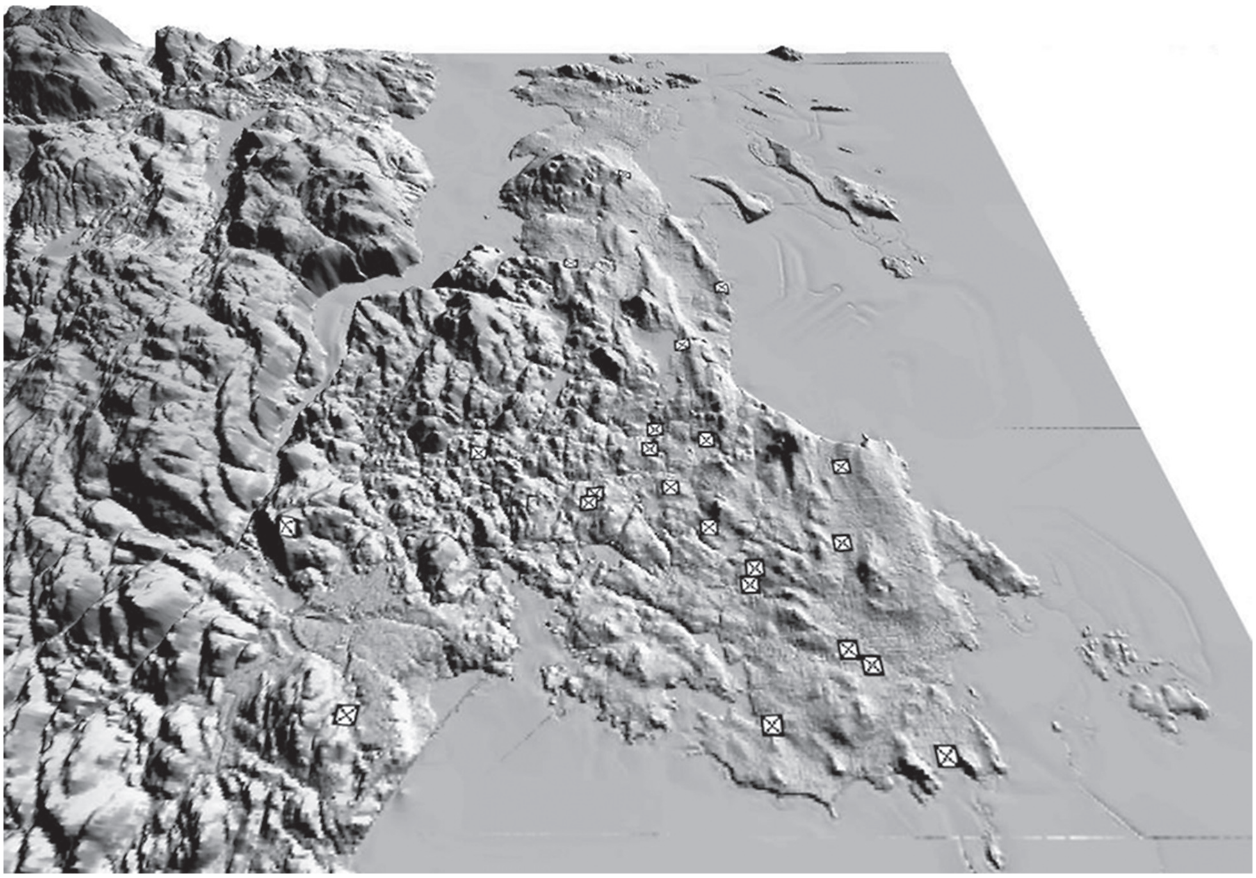

Figure 2. Three-dimensional map of the Victoria area with the locations of projectile points indicated.

reworked from an originally longer form (Figure 3a). Several additional serrated or denticulate bifaces from the mountain have been found during recent fieldwork, but have not yet been reported.

DcRu–y:82

This distal-medial segment has excurvate serrated blades (Figure 3e) and was collected near Triangle Mountain at an elevation of 85 metres.

DdRu–21

Artifacts from this Saanich site, which is located at the junction of West Saanich and Keating Cross Road at an elevation of 73 metres, include several bifaces (Figure 3b, c, d, g, i). Among them are four denticulate points: a small stemmed point with serrated excurvate blades, rounded shoulders, and a slightly broken base; a barbed or eared denticulate point with recurved blades, concave base; and the

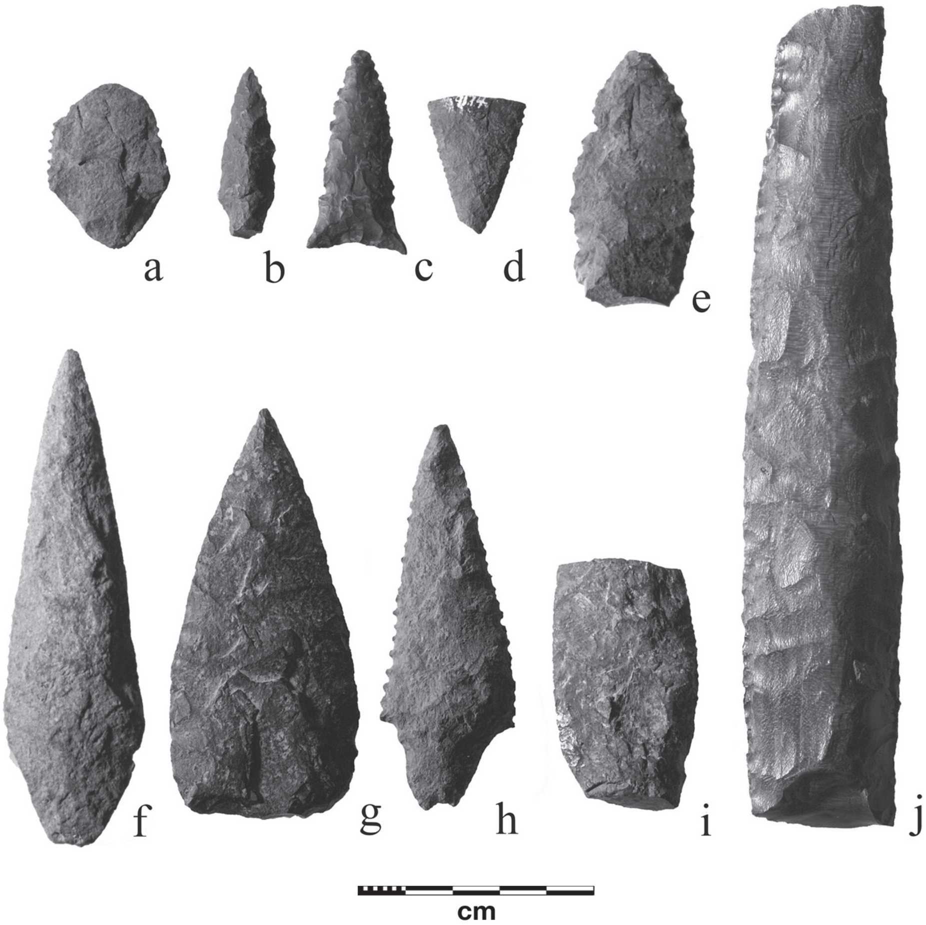

Figure 3. Projectile points recovered from elevations over 60 metres in the Victoria area. a: DcRv–154; b: DdRu–21:4; c: DdRu–21:5; d: DdRu–21:6; e: DcRu–y:82; f: DcRu–y:146; g: DdRu–21:1; h: DdRu–20:1; i: DdRu–21:3; j: DdRu–31:1.

end fragment of a denticulate point with subradial flaking and a thin and lenticular cross-section. Non-denticulate points from the site (Figure 3g, i) include two larger points: a medial fragment of a slightly contracting stemmed point with excurvate blades, and a complete biface with excurvate blades, irregular base, and subradial flake scars.

DdRu–20

This site is located along the 5000 block of the Pat Bay Highway in Saanich at an elevation of 72 metres and was defined by a single find from a residential garden (Figure 3h). The point is a thin denticulate biface with straight-excurvate blades, shoulders, contracting stem, and notched concave base. The small basal notch, created by bifacial tiny flake removal, is similar to the basal notches on several of the small, thin lanceolate points recovered from the Stave Watershed (McLaren 2003). The pronounced teeth along the biface blades were produced by the removal of two flakes bifacially from the same point at the center of the depression between denticulate projections.

DeRt–54

This site lies around a former wetland in the Spaulding Valley on South Pender Island at an elevation of 60 metres. This site has been included despite the fact that it is not directly within the Victoria area because RBCM accession records describe two contracting stem, several foliate points, but no later period point types from this location. Denticulate and serrated points include foliate form points with excurvate blades and a slightly contracting stems (Figure 4h) and a point that is thinner in cross-section, with excurvate blades, a more pronounced distal point, and convex base (Figure 4a). Non-denticulate points surface collected from the Spalding Valley include two shouldered bifaces with contracting stems (Figure 4f, g), and several foliate forms (Figure 4b, c, d, e). A notable example is DeRt–54:22, which is thin and lenticular in cross-section, and has fine subradial flake scars. The point has a white patina, perhaps as a result of taphonomic processes, as it is noted as having been recovered from peat.

DcRt–y:221, 245, 292

Serrated points from DcRt–y:221, 245 and 292 (Figure 4j, l, i) were recovered at an elevation of approximately 50 metres. Of these, two are stemmed forms, one of which has one wide angled and one rounded shoulder and a broken tip and base, the other with one irregular or recurved blade, a contracting stem, convex base, a wide rounded shoulder and a broken tip. All show slight serration along at least one blade margin. The third point is a foliate form. Additional points donated to the RBCM in the same collection include non-serrated and later period triangular point types. DcRt–y:305 (Figure 4n) is a foliate form with serrated blades and a slightly broken tip and base, which was collected at about 47 metres elevation.

DdRu–y:132

DdRu–y:132 (Figure 4m) is point fragment with denticulate excurvate blades. It was collected from a ploughed field north of Livesay Road about 175 metres back from a steep cliff, at an elevation of approximately 45 metres. The landform is glacially created and is continuing to be eroded by marine action. Interestingly, a 17,000 BP mammoth humerus was found at the base of the cliffs (Keddie 1979) and a mammoth tooth was later found at the same location (Keddie 1995).

DcRu–158

The site is located in Saanich on Leaside Avenue at 34 metres elevation on a knoll with good visibility to the south, west and north. A thin and finely flaked biface fragment with denticulate edges was surface collected from the site (Figure 5k).

DcRu–68

This site rests at a 34 metre elevation in Victoria. Artifacts surface collected at this site included hammerstones, an obsidian microblade, scrapers, a small foliate biface with slight serration and a biface with straight blades, shoulders, contracting stem, and convex base. Figure 5a and d are biface end fragments with entirely denticulate blades; the former is made of obsidian.

DcRu–39

The site is located in Victoria above Colquitz Creek at 33 metres elevation just south of where the creek crosses under Wilkinson Road. Numerous artifacts have been recovered including ground slate, and flaked basalt, obsidian, and chalcedony. Among a sample of artifacts donated to the RBCM in 1967 are several bifaces (Figure 5h, i, j, k), including four shouldered points with contracting stems, and convex or broken bases. One of these has denticulate excavate blades (Figure 5h). A small biface with contracting stem, and three triangular bifaces were also surface collected from the site. More than one period of occupation or site use is likely represented in this assemblage.

DcRu–485

Several bifaces were surface collected from this site, which is located at 30 metre elevation in Saanich southeast of the intersection of the Pat Bay Highway and McKenzie Avenue. Of the two bifaces donated to the RBCM one has denticulate blades and a slightly contracting stem (Figure 5c). The second biface has shoulders, a contracting stem, and excurvate blades.

DcRu–y:214, 219, 158

Biface DcRu–y:214 has denticulate excurvate blades, narrow angled shoulders a contracting stem and a broken base, 219 has very pronounced denticulate projections along the blades and a convex base, 158 has a wide and thin cross-section, slightly denticulate excurvate blades, and a broken base (Figure 5b, e, g). Cloverdale Street where they were found varies between about 20 and 55 metres elevation.

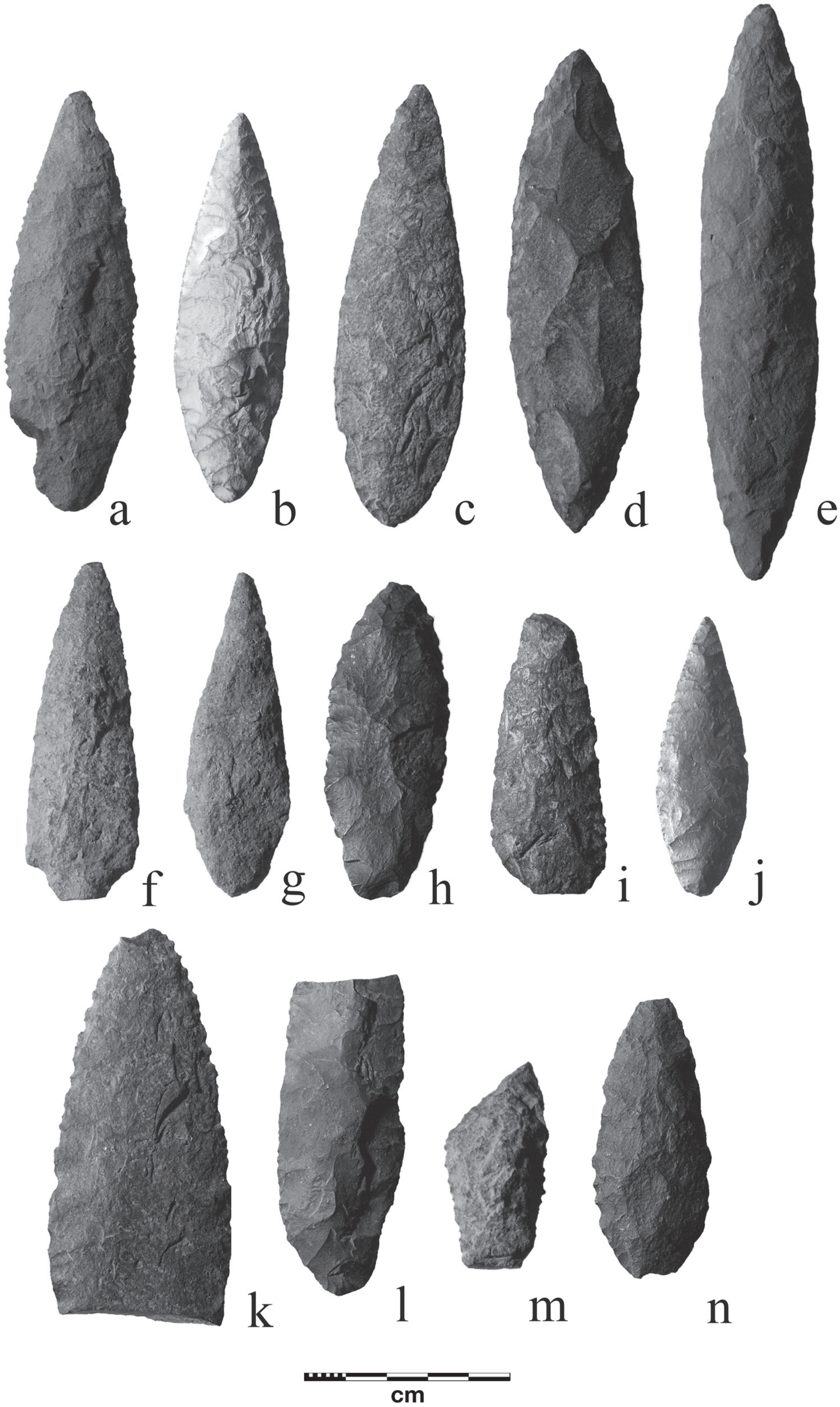

Figure 4. Projectile points recovered between 40 and 60 metres elevation in the Victoria area. a: DeRt–54:15; b: DeRt–y:22; c: DeRt–54:11; d: DeRt–54:12; e: DeRt–54:19; f: DeRt–54:17; g: DeRt–54:20; h: DeRt–54:16; i: DcRt–y:292; j: DcRt–y:221; k: DcRu–158:1; l: DcRt–y:245; m: DdRu–y:132; n: DcRt–y:305.

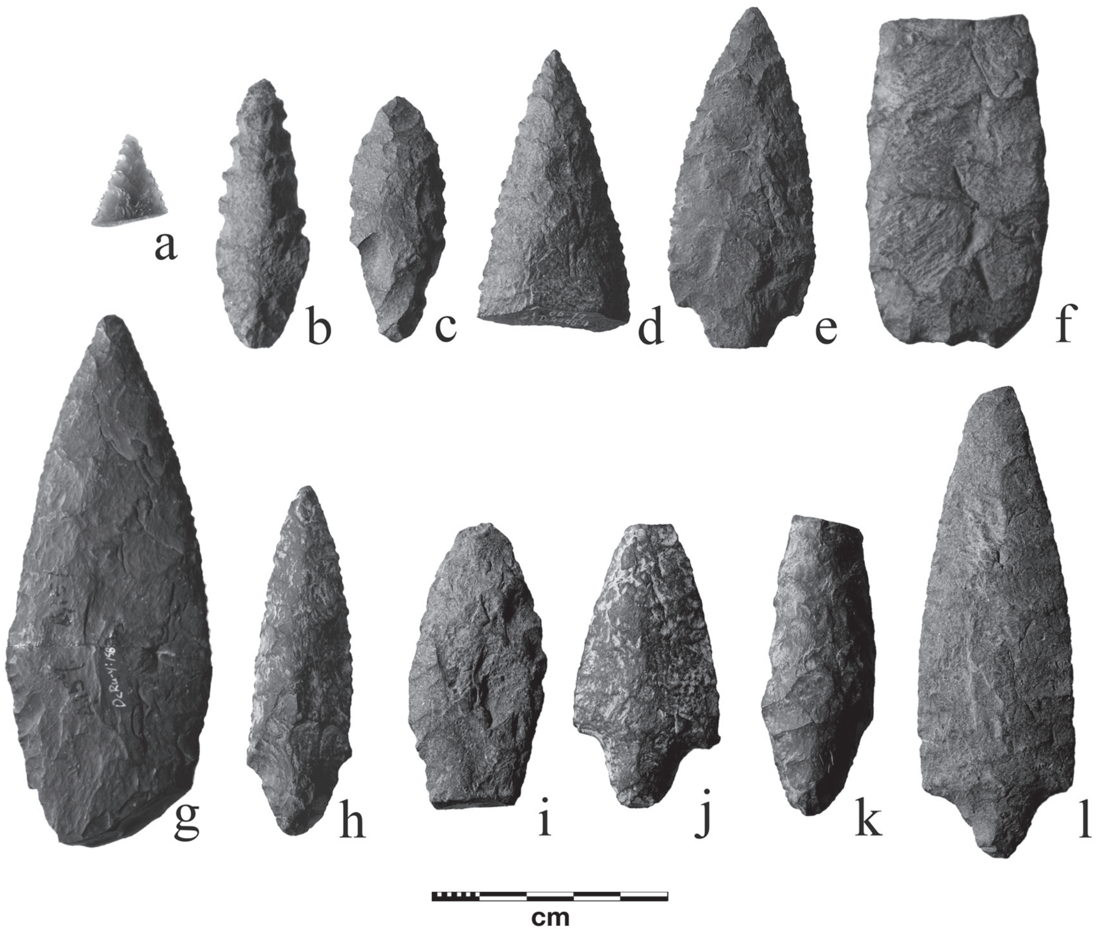

Figure 5. Projectile points recovered from between 30 and 39 metres in the Victoria area. a: DcRu–68:16; b: DcRu–y:219; c: DcRu–485:2; d: DcRu–68:13; e: DcRu–214:1; f: DcRu–y:196; g: DcRu–y:158; h: DcRu–39:7; i: DcRu–31:11; j: DcRu–39:8; k: DcRu–39:12; l: DcRu–39:6

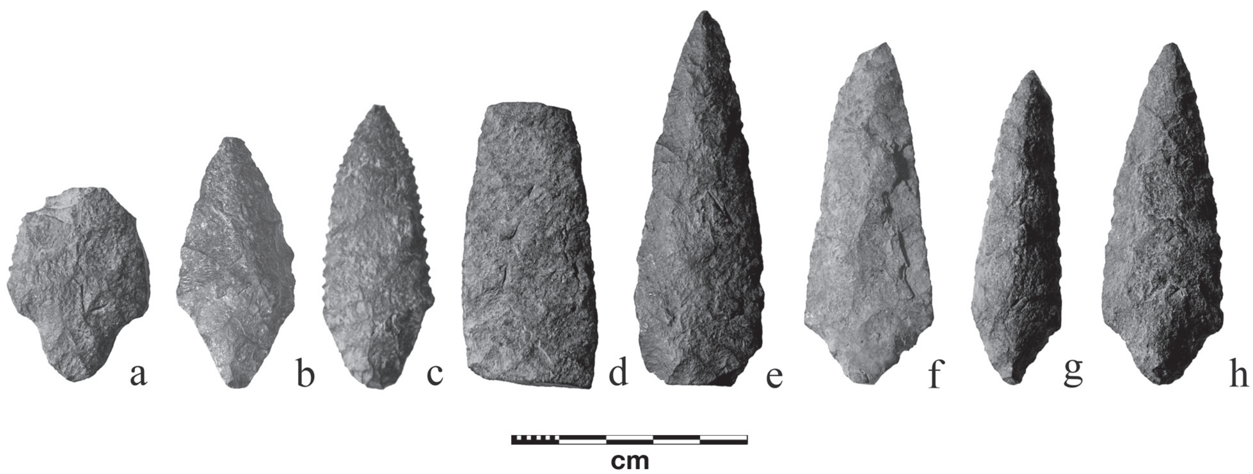

Figure 6. Projectile points recovered from between 20 and 29 metres in the Victoria area. a: DcRu–69:1; b: DcRu–64:1; c: DcRu–y:94; d: DcRu–38:83; e: DcRu–38:74; f: DcRu–38:158; g: DcRu–163; h: DcRu–38:159

DcRu–38

The Quicks Pond site is located at an elevation of 25 metres on both sides of a large wetland on Colquitz Creek. Surface collected artifacts from the site include part of a hand maul, a microblade, utilized flakes, choppers, ground stone points, abrasive stones, and bifaces. Mitchell (1971) characterizes the site as a possible Locarno Beach culture type, though other culture type phases may be represented. Two of the flaked stone bifaces from the site (Figure 6g, h) have serrated blades, wide angled shoulders, contracting stems, and a convex base. Additional stemmed points show similar attributes but the blades are not serrated (Figure 6e, f). The medial section of DcRu–38:83 (Figure 6d) is lenticular and thinner in cross section than the others and may be an older point type. Additional bifaces (not shown) include one acute shouldered point with excurvate blades made of chalcedony, a diamond shaped biface, two shouldered forms with excurvate blades, contracting stem and convex base and one with a straight base, as well as five small foliate bifaces or fragments.

DcRu–y:94

DcRu–y:94 (Figure 6c) was recovered from a residential garden at an elevation of 22 metres above current sea level. It has excurvate denticulate blades, wide rounded shoulders, contracting stem and convex base.

DcRu–64

This site is located at an elevation of 22 metres, close to the find location of biface DcRu–y:94. The point is an isolated find, although, humic and ashy soil as well as scattered shell have been noted at the site. This contracting stem point is roughly diamond shaped, has excurvate serrated blades, and rounded wide-angled shoulders (Figure 6b).

DcRu-69

This inland Victoria site is located at 21 metres elevation, east of the junction at Royal Oak Ave. and the Pat Bay Highway on the north side of Rithet swamp. Cultural material observed at the site includes fire cracked rock and scattered stone debitage, along with an abrasive stone, retouched flakes, and several bifaces. One biface is very similar in form to DcRv–154:1 from Skirt Mt., having a denticulate blade (the second is broken), contracting stem and convex base (Figure 6a). The medial section of a small foliate form was also recovered from the site.

DcRt–y

DcRt–y:141 (Figure 7d) has serrated blades, contracting stem, one wide angled shoulder, and straight-excurvate blades. DcRt–y:38 (Figure 7g) has slightly excurvate serrated blades, one slightly barbed narrow angled shoulder and broken shoulder, and a contracting stem and broken convex base. Collection provenience is more tentative for both DcRt–y:141 and 38, but they may have been collected in the vicinity of Cadboro Bay. St Patrick Street runs inland across low ground not higher than 20 metres.

A number of denticulate or serrated points have a general location but an unknown elevation, as follows.

DdRu–y

DdRu–y:98 (Figure 7e) has serrated excurvate blades and an irregular broken base. It was recovered from somewhere in the vicinity of Patricia Bay.

DdeRu-y

Bifaces from the area DdeRu–y (Figure 7a, b, c) have only a vague provenience and are noted in RBCM accession records as having been collected in "North Saanich" by J. Braden ca. 1890. All have excurvate denticulate blades. The blades of DdeRu–y:54 has angled shoulders, convex base, and may have been reworked as there is a slight contraction of blade form beginning in the medial portion of the blade. DdeRu–y:55 has a contracting stem and convex base, one excurvate and one straight blade, and wide-rounded shoulders. DdeRu–y:58 is a foliate form made of chert.

DcRu–y:33

DcRu–y:33 (Figure 7f) is a foliate form with serrated excurvate blades. It was collected at Beacon Hill Park.

DcRv–y:5

This point was collected in Metchosin west of Victoria, and deposited at the Royal BC Museum in 1921. The point has a lenticular cross-section, collateral and expanding flake scars, fine pressure-flaked denticulate excurvate blades, squared shoulders, contracting stem, and a convex base (Figure 7i).

Non-denticulate Points

The succeeding non-denticulate or serrated points are a sample of points that were collected from inland locations in the Victoria area that show attributes constant with relatively early antiquity.

DdRu-31 is located at approximately 80 metres elevation along Emard Terrace, south of the Experimental Farm in Saanich. The elevation of the site is just above the maximum height of post-glacial sea level rise and a prominent small terrace and wave-cut scarp lies immediately below the site. This beach was active for a relatively short period of time immediately following deglaciation 13,000 years BP, after which sea levels dropped rapidly (Clague et al. 1982; Clague 1981; Mosher and Hewitt 2004). The medial section of an extraordinary long lanceolate, collaterally flaked, spear point was recovered from the site in 1966 (Figure 3j). The point has a lenticular, almost diamond-shaped cross-section and shows fine pressure blade retouch following the main shaping of the artifact. It is made from a radial cross-section of petrified wood, an exotic material that is not known to be available in the Victoria area (Hebda 2006). Four additional bifaces from the site are in the RBCM collection and these are more typical of a middle period; one very large shouldered point with

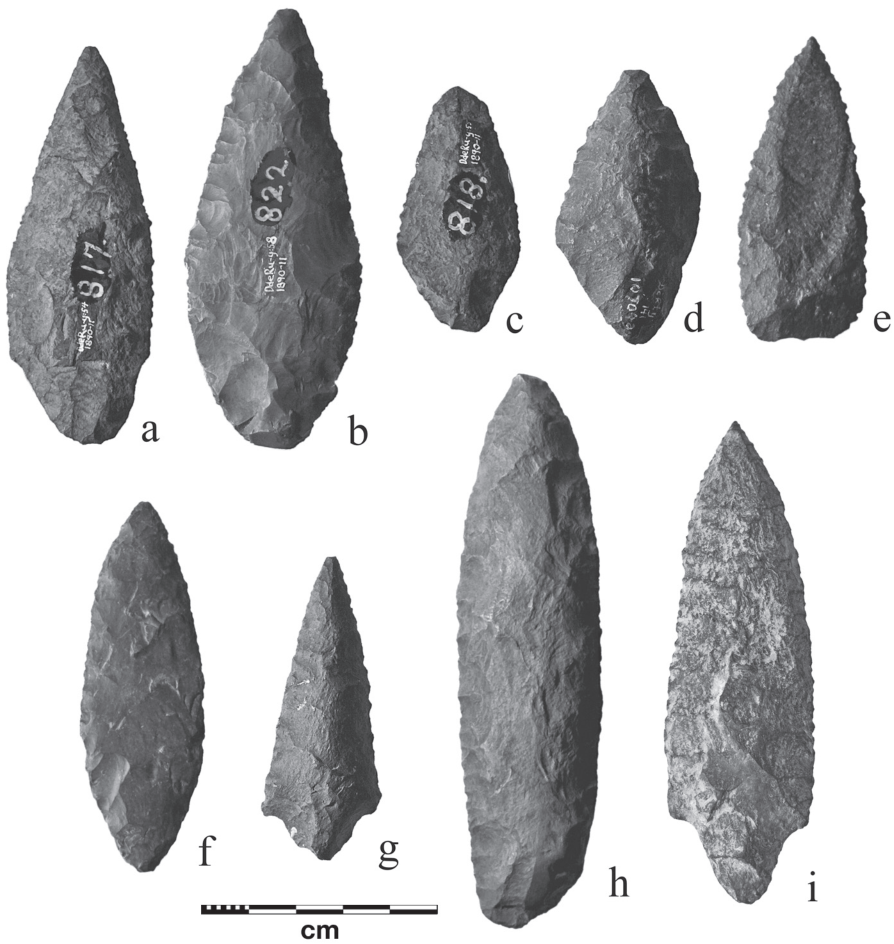

Figure 7. Projectile points recovered from an elevation of less than 20 metres or from unknown elevations. a: DdeRu–y:54; b: DdeRu–y:58; c: DdeRu–y:55; d: DcRt–y:141; e: DdRu–y:98; f: DcRu–y:33; g: DcRt–y:38; h: DcRu–y:88; i: DcRv–y:5

a contracting stem and a straight base, a diamond shape, and two foliate bifaces are present.

Four other points are isolated finds. The first, DcRu–y:88 (Figure 7h) is finely made, lenticular in cross-section, has fine subradial flaking and shows grinding on the face of the base, but not on the blades. The second, DcRu–y:146 (Figure 3f) was found at an elevation of about 70 metres near Pike Lake in Saanich in 1899. It is made of a coarse volcanic rock yet is finely manufactured, having a combination of subradial and collateral/oblique flake scars, contracting stem, wide rounded shoulders and parallel straight blades. The base of this point may show an original striking platform for the blank on which it was made. The third, DcRu–y:196 (Figure 5f) was collected in Saanich at 35 metres above current sea level. This biface fragment has straight parallel blades, a very thin and wide, flattened lenticular cross-section, and a base with two bifacial flake scar removals.

Regional Context

In the following, an examination of artifact assemblages containing denticulate or serrated bifaces from surrounding areas is presented in order to situate the Victoria area points within a regional context. The discussion begins by addressing assemblages to the south, and then continues first east, then north. Projectile point form is also discussed in relation to nearby assemblages.

In proximity to Victoria, the closest large and well-described assemblage that contains a significant number of denticulate or serrated bifaces is from 45–CA–426, Sequim on the Olympic Peninsula. This site, only 40 km SSE of the Victoria waterfront, had a major excavation in the late 1990s (Morgan 1999). Morgan (1999) dates the site to 4000 to 8000 BP based on cross-dating with regional assemblages. A total of 23 projectile points and 245 other bifaces were recovered and described (Walker et al. 1999). Ten of the 23 points are serrated. The assemblage is classified as Olcott, which Morgan and Hartmann (1999) summarize for western Washington. The western Washington counterpart to Olcott is the Cascade Phase (e.g., Bense 1972; Leonhardy and Rice 1970). As well, Olcott is part of Butler's (1961) Old Cordilleran Culture, and Carlson's (1970) Pebble Tool Tradition.

The Olcott period points from the Sequim site are categorized into four types (Walker et al. 1999:7.5–7.9). Type 1, shouldered lanceolate, have one or two small shoulders and contracting stems and one of the five is serrated. Type 2, large lanceolate, are over 60 mm long (max 76 mm). Three of the illustrated points appear to have small shoulders (Walker et al. 1999:7.5–7.7). Significantly, only three of the ten are *not* serrated and at least one is deeply denticulate. Type 3 are small lanceolate and are mostly reworked from larger points. One is highly serrated and three have striking platforms forming their base, a rare attribute shared by many of the Lehman Phase (6000–4500 BP) and Lochnore Phase (5500–3500 BP) points from the interior of B.C. (Stryd and Rousseau 1996). Type 4 are large contracting stemmed points of which there are only two examples, one of which is serrated. These large points have prominent shoulders, and contracting stems. Many of the points have marked similarity to the included Victoria area points.

Serrated blade points are also found around Puget Sound and mountains to the south. A large assemblage of 650 Olcott period formed tools was found at 45–MS–100, at Lake Cushman in the lower ranges of southeastern Olympic Mountains, 100 km south of Victoria (Wessen 1990). The assemblage includes 60 points and bifaces. Of the 30 bipointed lanceolate Cascade or Olcott points, eight are serrated (Wessen 1990:75, 81). Unipointed lanceolate points are often diamond shaped and usually have rounded to nearly straight bases, while three points have shoulders and contracting stems. One of these is deeply denticulated. A single Cold Springs side notched point (often co-occurring with serrated Cascade foliate points further south) had serrated blades. None of the Lake Cushman materials were directly dated. Based largely on the prevalence of serration, Wessen suggests much of the material dates to the mid rather than early Holocene, or about 4000–6000 BP.

Two montane sites just south of Puget Sound and about 250 km south of Victoria are well-dated, with radiocarbon assays combined with tephra layers of known ages. Layser Cave had 92 projectile points, most of which had been reworked (Daugherty et al. 1987b). All the denticulate points were in one layer. Layer X at Layser Cave had four denticulate and possibly another two serrated points dated to 6650 ± 120 BP. The complete denticulate points are foliate. There are also shouldered contracting stemmed points (one seemingly with a unilateral small barb) and a Cold Springs side notched point. In other layers, Cold Springs side notched type and contracting stemmed points dominate.

Judd Peak contained some 246 projectile points, which like Layser Cave were also reworked, and are dated by both radiocarbon and tephra layers (Daugherty et al. 1987a). Although the radiocarbon dates and tephras matched well, the projectile points morphology appeared very mixed. The earliest layers exhibited only early style points; and arrow points were confined to the upper layers, as expected. However, other point styles including Windust, Cascade, and Late Cascade were found throughout. It is possible that prehistoric pit digging may have mixed the assemblages. Heavily denticulate and serrated points are found in almost every level, but dominate in a layer directly dated at 5970 ± 120 and 5930 ± 120 BP. Morphologically much older Windust and long-stemmed points also occur in this layer.

Along the Snake River in southeast Washington, about 400 km to the southeast of Victoria, are many of the best-dated Cascade Phase sites. These include Marmes Rockshelter and Windust Caves. Bense (1972) produced a PhD dissertation that describes 13 of these assemblages, which date to between 5500 and 8000 years BP. Many of the components are capped by Mazama volcanic ash, assisting with the dating of these sites. The 367 points vary from willow leaf to lanceolate with rounded bases, to trapezoidal (diamond) with sharply contracting stems. In the early part of the phase, about 20% of the blades are serrated or denticulate; this rises to 42% in the later half of the phase. The lanceolate Cascade points often co-occur with the large side notched Cold Springs points. These last, and many of the other artifacts such as edge-ground cobbles and shaft smoothers, are extremely rare or do not occur in the assemblages to the northwest.

Serrated points are also found sporadically to the east and northeast of Victoria. At Helen Point, Mayne Island (aproximately 45 km NE of Victoria), serrated points occur in the Mayne Phase (Carlson 2006). Carlson also describes a large and heavily denticulate lanceolate biface, well over 200 mm long, from the Marpole component of the Helen Point site (Carlson 1996b:224, Fig. 7). Serrated points do occur occasionally in later periods (Carlson 1983:25). Burley (1980:19) suggests that large foliate-type points may be mainly in burial contexts during the Marpole period. Additionally, extremely large and well made lanceolate blades do occur across much of North America in burial contexts at about this time, according to Ames (2005:224–225).

Two of the contracting stem points from the Locarno component at Montague Harbour (Mitchell 1971) are serrated. Mitchell's observations regarding the similarity of these points to Olcott and Cascade points shows that we are not the first to note the links to points from the south. However, the presence of these points in Montague Harbour 1 is at least 2000 years later than the occurrence of similar artifacts to the south. Subsequent work at the site has shown that originally terrestrial parts of the site continue beneath the current intertidal beach (Eldridge 1989) and into the subtidal (Easton 1991, 1993). The potential for introduction of mid Holocene artifacts into rather later deposits would seem to be high at Montague Harbour.

The relatively small Old Cordilleran assemblage, from the Glenrose site at the mouth of the Fraser River, 75 km northwest of Victoria, has one serrated biface (Matson 1976a:Figure 8–3:t). The long lanceolate willow-leaf points and shouldered sharply contracting stemmed points are similar to others from the same time in the region, which are dated to between about 5000 and 8200 BP (Matson 1996). Glenrose and nearby St. Mungo sites also contain diamond-shaped, leaf, and shouldered contracting-stem points in the St. Mungo component (Calvert 1970; Matson 1976a). Pratt (1992) does not mention the serration trait in her discussion of the Charles Culture, within which she groups Mayne Phase and St. Mungo components.

Denticulation or serration occurs occasionally in assemblages in the Fraser River region. At least one of the presumed mid-Holocene aged points from Coquitlam Lake illustrated by Wright (Wright 1996 Fig. 3:c, second from right, top row) appears to be serrated. Coquitlam Lake is about 110 km from Victoria. Wilson and Clark (2001) also recovered a point with denticulate blades during their work at the Coquitlam Reservoirs.

Of 371 bifaces from the Fraser Valley Region analyzed by McLaren and Steffen (this volume), only eight were recorded as having denticulate blade margins. Five of the eight denticulates are from sites in the Stave Watershed. This reservoir is also north of the Fraser and about 120 km northeast of Victoria. Four of the five Stave points were recovered from sites that have been assigned relative date spans of between 5000–8000 BP, and one site that dates to between 5050 and 216 BP (McLaren and Steffen Table 2, this volume). In addition, one denticulate point was recorded from Scowlitz, dated to between 330 and 2940 BP (Lepofsky et al. 2000), and one from Silverhope Creek dating to between 310 and 2510 BP (Archer 1980). At the Maurer Site, dating to approximately 5000 BP, leaf and diamond shape and shouldered contracting stem points are found, but denticulate blades are not apparent (LeClair 1976; Schaepe 1998).

The Milliken, Mazama, and Gravel components from the Milliken site, near Yale on the Fraser River about 180 km northeast of Victoria have foliate and shouldered points with contracting stems, but no serration (Mitchell and Pokotylo 1996). Later at Yale, the Eayem Phase (grouped by researchers such as Pratt into the Charles culture type) also appears to lack serration (Borden 1968, 1975).

Across the southern Interior Plateau of BC, 300–500 km distant from Victoria, Early Nesikep points that date to 6000–7000 BP occasionally have serrated blades (Stryd and Rousseau 1996: 188), however, the points are particularly dissimilar in regard to other attributes. For example, most of the points have barbs, slightly expanding stems, concave bases, and many have recurved blades.

To the north, serrated points are uncommon. In the Alberni Valley, one point with slight shoulders and a contracting stem, appears to have serrated or denticulated blades (McMillan 1996: Figure 4d). This point was associated with microblades and microblade cores and is thought to date to the early to middle Holocene. At the Bear Cove site on north eastern Vancouver Island all the foliate points and the one contracting stem point lacked serration. They dated to between 5000 and 8000 years old (C. Carlson 1979). At Namu, serration appears to be absent on the foliate projectile points and other bifaces of Periods 1 and 2, which are dated from approximately 10,000 to 5000 BP (Carlson 1996a). A single serrated biface dating to 8750 BP has been found on Haida Gwaii at the Richardson Island site (Fedje et al. this volume).

At Denman Island, in the northern Strait of Georgia, a large assemblage of 60 foliate and diamond-shaped bifaces dated to 3500 BP, completely lacked serration (Eldridge 1987).

Points from the Victoria area that have been described here are most often from in inland, elevated locations and are forms that may predate the earliest radiocarbon date in Victoria. Taken together, the points share specific attributes with assemblages both to the north and to the south. Specifically, the outline form of many of these points are characteristic of Carlson's (1970:115–117) Mayne Phase, 5650–3850 BP (Carlson 1975; Percy 1974), which defines point traits including foliate and diamond forms as well as stemmed and shouldered points. The Mayne Phase was first identified northeast of Victoria on Mayne Island at the Helen Point site, and has not been identified previously in the Victoria area. Definitive identification of a Mayne Phase component is complicated here by the lack of excavated and radiocarbon dated assemblages in our sample. Also, similar point types are present within other archaeological culture types, and it is likely that multiple components are present at some of the sites mentioned, particularly for larger assemblages such as Quick's Pond, which may result from reuse of favoured areas over a long term.

Overall, serrated or denticulate blade margins are more common in projectile points found in inland, raised elevation locals than at sites situated on the current Victoria shoreline, which are dated to no earlier than 3800 BP in the area. On the whole, serration and denticulation are rare in sites to the north and east of Victoria. By contrast, the blade trait is relatively common in assemblages dating to between 4000 and 8000 BP to the south. This suggests that the trait may have been influenced more from areas to the south, exemplified through sites in the Olympic Mountains and Strait of Juan de Fuca, Puget Sound and further south, during the middle Holocene than regions to the north or east.

Discussion of the Geographical Distribution of Serrated and Denticulate Points in the Greater Victoria Area.

The serrated and denticulate blade point forms are predominately from elevated inland locations. Figures 1 and 2 show that the find locations are rarely near modern shorelines. These sites consist of both isolated finds and locations where numerous artifacts have been recovered. In most cases, sites containing numerous artifacts are situated in close proximity to wetlands that would have provided for occupants during periodic stays at hunting or gathering camps. Isolated find sites are characteristic of points lost or discarded during hunting. Many of the sites are on the rolling uplands of the Victoria area, a zone that would have been rich with deer and elk.

Notably, the elevation distribution of the serrated points reflects the elevation distribution of agricultural and residential development in the Greater Victoria area. Nearly all of these finds have been in farmer's fields or on residential lots. Only recently is development expanding to higher elevations, and points are being found, at least at low density, wherever archaeology is conducted in advance of such development.

It is clear that the serrated and denticulate points have a very different distribution than other point types. A frequency graph of elevations, in 20 metre bins, shows a unimodal distribution at 20–40 metre elevation (Figure 8). Interestingly, few have been found from 0 to 20 metre elevation. The graph decreases slowly to the right toward the highest elevation.

Although not demonstrated numerically here, it is evident that later point styles, such as triangular forms (Carlson 1983; Keddie, this volume), would have a very strong skew to the extreme left of the graph. The great majority of such points have been found on modern beaches or in excavated shell middens and other sites associated with the current sea level. Away from the modern shore, we know that later period point types are also occasionally present at higher elevation locations and represent terrestrial hunting activities in the later Holocene.

It is possible that the higher frequency of denticulate or serrated blade points at elevated locations is due to their suitability for inland hunting, but if this were the sole reason for their frequency distribution one might expect to find the points, or fragments, with some regularity at later period coastal sites as occupants produced and reworked the points. Likewise, the increased frequency of inland and elevated serrated and denticulate points is not necessarily indicative of an early distribution of people who emphasised inland locations over coastal areas. Throughout the Holocene it is likely that occupants of the area utilized both the coastal and terrestrial resources available to them. Furthermore, the presence of a maritime economic capacity has been demonstrated from the early Holocene both to the north (Fedje et al. 2004; Steffen 2006; McLaren 2006) and at the Channel Islands of California to the south (Rick et al. 2001). Thus, it would seem

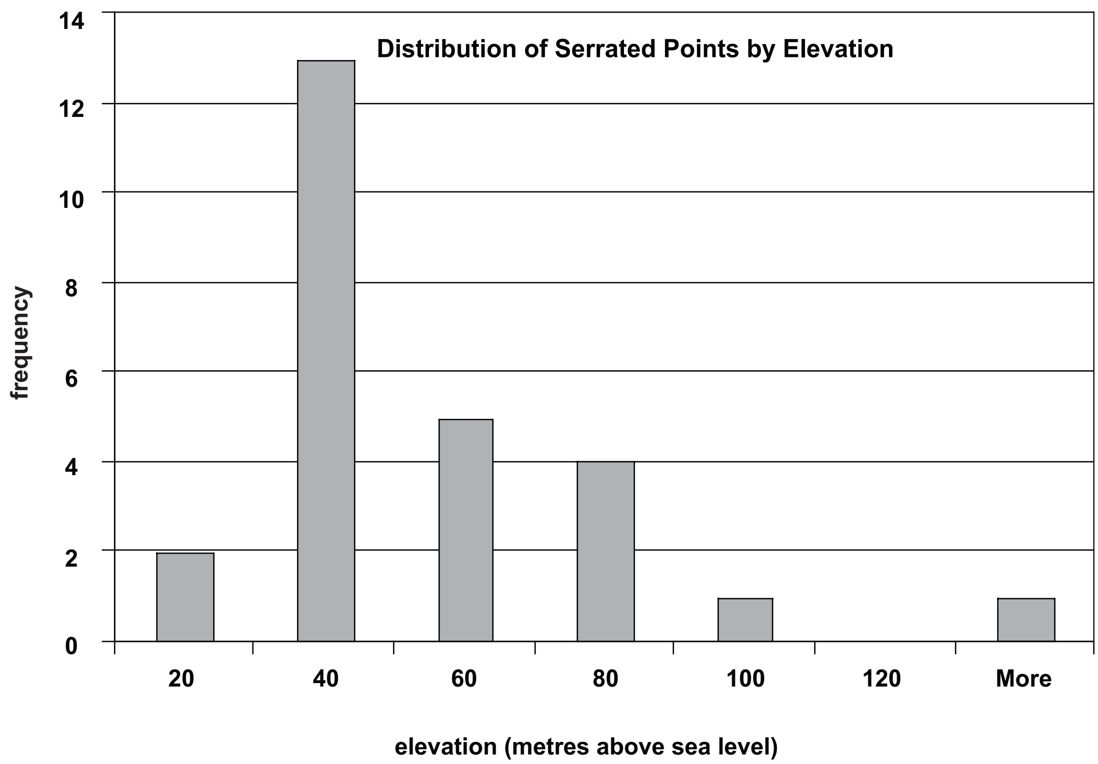

Figure 8. Histogram showing the elevations of serrated and denticulate points from the Victoria area.

unlikely that people situated in the Victoria area throughout the Holocene did not also have maritime proficiency. The inland distribution is better explained by rising sea levels. Probably serrated and denticulate points did occur with greater frequency along the shoreline at sites that are now drowned in up to 30 metres of water by a rise in sea levels.

The effects of changing sea levels on site distribution has been considered previously for the Victoria and southern Strait of Georgia region (e.g., Duff 1963), but researchers in Washington State have in the past neglected to consider sea level fluctuations in site distribution interpretations. For example, it had been suggested that an inland hunting economy characterized the Olcott period (e.g., Gallison 1994; Grabert 1977), without considering the possibility of an inundation of potential coastal sites. While not dismissing a maritime component Matson (1996:119) supports the stated emphasis on inland hunting and suggested that little sea level change had occurred in Puget Sound, which is arguable (e.g., Kelsey and Sherrod 2001). In considering sea level fluctuations absence of evidence can not be taken as evidence of absence, that is to say, if the sites that are directly related to early period maritime activities become drowned, then only the upland hunting sites might be visible archaeologically, potentially leading to a highly skewed view of culture and economy.

Denticulate or serrated points might well appear with considerable frequency within assemblages yet to be investigated from underwater contexts. It is likely that many drowned archaeological sites will have been damaged by wave and current erosion. Easton's (Easton 1991, 1992, 1993) excavation efforts in the shallow subtidal of Montague Harbour are a were a valuable demonstration, but produced an undated archaeological sample that was disturbed by marine bioturbation. In future, protected areas such as Portage Inlet, the Gorge, and parts of the Victoria Inner Harbour that have not been dredged might prove productive as places to target subtidal or underwater investigation. The very earliest sites in the Victoria area, however, may be associated with the post-glacial 75 metre elevation strandline.

Conclusion

There has been a considerable amount of archaeological research conducted in the Victoria area that has, for the most part, taken place along the current coastline and dates to no earlier than 3800 BP. Projectile points found at elevated, inland locations often show different attributes than those found at modern shoreline sites. Without the existence of firmly dated archaeological samples, this paper has taken a geographical and regional approach to consider this apparent variability in point attributes. We suggest that a number of the projectile points found at inland, elevated locations might represent earlier time periods of human occupation than have been radiocarbon dated in the area thus far. In particular, serrated or denticulate blade foliates, diamond, and shouldered contracting stemmed points may derive from the period 4000 to 8000 years BP in the Victoria area, as they do in assemblages to the south.

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Chapter 8

The Projectile Point Sequences in the Puget Sound Region

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Introduction

The research area discussed in this chapter encompasses what is considered to be the traditional territory of the Lushootseed speaking Coast Salish People, who are sometimes referred to as the Puget Sound Salish (e.g., Thompson and Kinkade 1990:38; Suttles and Lane 1990:485–502). This area begins at Samish Bay, east of the San Juan Islands, and extends southward to the head of Puget Sound, and includes the watersheds of numerous streams and rivers that drain from the Cascade Foothills into Puget Sound (Figure 1).

Comparatively speaking, few systematic archaeological investigations have occurred in this part of the Pacific Northwest, so this paper should be considered a preliminary but much needed synthesis of over 4500 square miles of sheltered "inside" areas between the Olympic and Cascade mountain ranges. The chipped stone projectile point sequence we will present covers the known sequence of lithic traditions in the study area, ranging from the Clovis period (approximately 11,000 BP) through to the time of European colonization.

Environmental Context

Puget Sound is approximately 145 kilometers long, north to south, and averages 140 meters in depth. Due to its large size, it has been likened to an inland sea. In reality, it is a glacially cut fjord where the ocean salt water from the Pacific mixes with freshwater draining from the surrounding watersheds. The Puget Sound environmental region represents approximately 3850 kilometers of shoreline—with an array of beaches, bluffs, deltas, mudflats and wetlands. Approximately 10,000 streams and rivers drain into this region, with at least 80% of the basin's annual surface water runoff coming from the watersheds of eight rivers—the Skagit, Snohomish, Stillaguamish, Cedar/Lake Washington Canal, Green/Duwamish, Puyallup, Nisqually, and Deschutes. To the Lushootseed Salish Peoples, these streams, creeks, rivers, and the Sound itself, as well as the nearby uplands, form the rich basis of their current and ancient livelihoods.

The Sound was formed into the north-south fjord it is today by glaciers that advanced from the

Figure 1. Locations of Puget Sound region sites referred to in this study. Gray shaded areas are considered the traditional territories of southern Coast Salish Peoples. (Base map adapted from Suttles, W. (editor) 1990 Handbook of the North American Indians. Volume 7: The Northwest Coast, Smithsonian Institution, Washington, DC: Southern Coast Salish, by Wayne Suttles and Barbara Lane: 486).

north at least four times (Waitt and Thorson 1983). The Vashon Stade of the Fraser Glaciation was the last major advance. It reached its maximum about 18,000 years ago, and covered everything between the Olympic Mountains and Cascade Mountains as far south as the Black Hills and the capital of Washington State, Olympia. As the Vashon retreated, its melting ice created glacial Lake Russell, a massive fresh water lake with a water level as much as 40 meters above the current level of Puget Sound. Lake Russell's overflow release is thought to have been through the Black Lake spillway in southern Puget Sound, and down the Black and Chehalis rivers to the Pacific Ocean. Interestingly, if people first colonized the Americas via the Pacific Coast, as Fladmark (1975, 1979, 1983) has suggested, the first drainage south of the southernmost extent of the Pacific ice flow they would have encountered would have been that of the Chehalis River.

Projectile Point Collections

We initiated our investigation of the Puget Sound region projectile points by first looking at the southern end of the Sound, with collections from the Qwu?gwes wet site (45–TN–240) and a surface collection from Hartstene Island (no site number assigned) (Figure 1). The excavations at Qwu?gwes are a joint initiative of the Squaxin Island Tribe and South Puget Sound Community College (Foster and Croes 2002, 2004). At the time of writing, seven summer seasons of excavations have provided one of the most controlled collections of stone, bone and shell artifacts in the Puget Sound region. They have also produced a range of basketry, cordage and wooden artifacts to compare alongside the projectile points from this region. Radiocarbon dating suggests that Qwu?gwes dates from 700–150 BP (Foster and Croes 2004).

The Hartstene Island assemblage is a large surface collection from a section of an active beach on the western shore of Hartstene Island that was accumulated over several years by Jack and Carleen Nickels. The Nickels attended an Archaeology Day public seminar at the University of Washington's Burke Museum in 1995 where they learned to label artifacts and to map the location of all future artifacts they found at the Hartstene Site. From that time forward, they meticulously did this with their finds. As a result, about half of the points in the collection are numbered and their locations plotted on a drawing of the shoreline, giving real provenance information for these projectile points. As noted above, however, the points were found in the active tidal zone of the beach, and their context within the site and the nature of the site deposit are unclear at this time. At the moment, the Hartstene Island collection is undated.

From these southern Puget Sound sites in Squaxin Island Tribe traditional territory we expanded our investigations northwards. Four projectile points are included from a two week public excavation at the Burton Acres Site (45–KI–437) on Vashon Island 50 kilometers north (Stein and Phillips 2002). Currently, the cultural materials recovered at the Burton Acres site are thought to have been deposited within the last 1000 years. Also included are projectile points from three sites in the vicinity of Seattle, about 80 kilometers to the north. The Seattle area sites are West Point (45–KI–428 & 429; Larson and Lewarch 1995) and Duwamish No. 1 (45–KI–23; Campbell 1981, Blukis-Onat 1987), both of which are in Seattle, and the Marymoor Site (45–KI–9; Greengo and Houston 1970), which is close to the northern end of Lake Sammamish (Figure 1). Dates from West Point and Marymoor fall into the period 2400 to 4400 BP, which is often referred to as the Locarno Beach Phase (Larson and Lewarch 1995; Greengo and Houston 1970). The dating of Duwamish No. 1 falls into two time periods, one early (approximately 1300 to 1400 BP) and one late (approximately 100 to 500 BP) (Campbell 1981, Blukis-Onat et al. 1987, Matson and Coupland 1995).

A number of sites with older, Olcott Period projectile point styles were also included in the study. These include the Tolt site (45-KI-464; Blukis–Onat et al. 2001) and sites exposed in the Chester Morse Lake drawdown (45–KI–25, 30-32, 299-300; Samuels 1993). The collections from these sites are thought to date from between 10,000 and 3000 BP. The Judd Peak Rockshelter site (45–LE–222) was also included in the study. Located slightly south of the Sound, it has yielded a well-dated, stratified collection spanning the period from 7000–200 years ago (Daugherty et al. 1987). Older styles are also represented by scattered occurrences of Clovis points, recorded as isolated and undated finds from eight locations around Puget Sound (Figure 1).

Though limited in scope, this analysis should at least set the stage for ongoing efforts to refine type chronologies and associate the projectile point styles in Puget Sound with other areas of the Pacific Northwest.

Pre-4,000 BP Projectile Point Styles in the Puget Sound Region

Fluted points from the Paleoindian period are rare in the Northwest (Carlson 1990), and only eight are known from our study region. None of the Puget Sound fluted points is from a dated context. These points are briefly described below and their locations are shown on Figure 1. Clovis points are assumed to represent some of the earliest occupation of the Puget Sound region, given their well-dated context elsewhere in North America. However, it is possible that earlier, non-fluted technologies were present prior to the appearance of the Clovis technology.

At the southern end of Puget Sound, one Clovis point was found "west of Olympia in the Chehalis River Valley" and another was found "in the Black Hills area west of Olympia" by a man who was grubbing stumps (Osborne 1956: 41–42). Avey has reported two fluted point bases, one from a private collection in Pierce County, which he believes was collected at either Hart's Lake or Anderson Island (Avey, 1992), and another from a survey of the Pierce College campus (Avey and Starwich 1985; Avey 1992).

In the mid region of the Sound, two Clovis points have been found with somewhat better provenience. A Clovis point was found in a bog in 1983, and the location (45–KI–215) was investigated by Meltzer and Dunnell (1987). Another Clovis point was found in a peat bog near Yukon Harbor, and the location (45–KP–139) was investigated by Julie Stein of the University of Washington (Figure 2). Additional remains were not found at either location.

In the northern portion of Puget Sound, two Clovis points have been found, one in a garden on Whidbey Island (45–IS–112), and one of unknown provenience in the collections of Western Washington University (Avey 1992:13–16). Another Clovis point known from just east of the Cascades was found on the south shore of Lake Cle Elum (Avey 1992: 14, citing Hollenbeck and Carter 1986; Figure 1).

The cultural traditions that succeeded Clovis in the Pacific Northwest are referred to by a variety of names depending on the researcher—the Old Cordilleran, Olcott, Cascade, Protowestern Tradition, Pebble Tool Tradition, and the Archaic Period (see Carlson 1990; Matson and Coupland 1995; Ames and Maschner 1999). Although each of these labels has, as originally proposed, specific characteristics (or lack of characteristics), over the years they have come to be used interchangeably in the Puget Sound region. Here, the term Olcott, which Carlson (1990:62) has noted is "conveniently vague", will be used for sites older than 4000 years.

Sites from the Olcott period with both large collections of projectile points and materials that can be directly dated are not common in our study area. Because of the widespread acidic soils of the region, it is much more common to find sites containing limited numbers of lithic artifacts but few, if any objects made from other materials. Such sites are often dated by means of tool types or their environmental context, such as on old river terraces. An example of this is a recent find near Olympia of a large, unusually notched biface (Figure 2). The find, designated 45–TN–333, consisted of a single large biface made of weathered igneous rock, found at a depth of one meter below the existing ground surface during landscaping work. Limited testing at the site revealed the deposit to be poorly sorted glacial till materials of the Alderwood series on the edge of the Pleistocene spillway of Lake Russell through the Black River. With its unusual notching style and large size, the artifact is unique to the area. Unfortunately, while its environmental context suggests it is old, its date of origin is uncertain.

The available evidence suggests that a wide variety of projectile point types were used in the Puget Sound area from the early Holocene to the contact period. Collections frequently contain a wide variety of stemmed, notched, and leaf-shaped points (Appendix G), which appear to reflect different functional classes (e.g., dart points, thrusting/dispatching points). The frequency of igneous raw material (primarily basalt) use appears higher in the early and mid Holocene periods than in the late Holocene (Figure 8). However, this conclusion is not certain and may in fact be influenced by sample size. The only definite change appears to be the addition of arrow points in the last 2000 years (Daugherty et al., 1987).

Establishing a Classification for Post-clovis Projectile Points from Puget Sound

The goals of our study were to (1) create a classification of the projectile points in the main collections

Figure 2. Yukon Harbor clovis point (left; 45–KP–139) and the Black Lake biface (right; 45–TN–333; see Figure 1 for locations).

using explicitly defined types, (2) place the types into a chronological sequence, and (3) compare this sequence with projectile point type sequences established further north on the Central Northwest Coast, especially in the Fraser River and Gulf of Georgia of British Columbia, Canada, and the San Juan Islands of the USA. We tried to make our definitions as explicit as possible to facilitate comparison with regions that are better known archaeologically.

Since the southern Puget Sound Qwu?gwes and the Hartstene Island collections are directly available to us (they are both owned by the Squaxin Island Tribe Cultural Resource Department and curated by the Tribe's Museum Library and Research Center) we initiated the projectile point descriptive recording and classification design with these two sizable collections. Twenty-five projectile points have been recovered *in situ* at Qwu?gwes. The Hartstene Island collection contains 249 points. The other collections included in this part of the study were those from Duwamish No. 1, West Point, Marymoor, Burton Acres and Chester Morse. The collections from West Point, Marymoor, Burton Acres, and Chester Morse contain 22, 54, 4, and 146 points, respectively. At the moment, the exact number of points recovered in the course of the excavations at Duwamish I is unclear. The projectile points from Duwamish No. 1, West Point, Marymoor, Burton Acres, and Chester Morse were not examined directly. Rather, data pertaining to their morphology were obtained from published photographs.

First, because the Qwu?gwes and Hartstene Island projectile point collections have not been analyzed before, we recorded the length, width, thickness, weight, and raw material type of each Qwu?gwes and labeled/numbered Hartstene Island projectile point (Tables 3 and 4). We then drew an outline of each point and photographed both of its sides. The quantitative data were entered into a spreadsheet, and the photographs were compiled for the record using Adobe Photoshop (Figure 3).

Next, we recorded the states of four qualitative characters on the projectile points from Qwu?gwes, Hartstene Island, Duwamish No. 1, West Point, Marymoor, Burton Acres, and Chester Morse. The characters in question are (a) body shape, (b) blade edge outline, (c) shoulder type, and (d) stem type. Details of these characters and their states are given in Figure 4. To standardize our labeling of the characters and states, we used Gumbus' (1999) lithic attribute designations.

Subsequently, the points from each collection were divided into types on the basis of the four characters. The types were created in such a way that each type within a collection has a unique combination of character states. Each type from a collection was given a code based on the site name (e.g., the types from Qwu?gwes are designated QW-A, QW-B, QW-C, QW-D, QW-E, QW-F, QW-G, QW-H, QW-I, QW-J and QW-K).

Lastly, we reviewed the types defined by site with a view to identifying types from collections that are the same.

Post-Clovis Puget Sound Projectile Point Types

The adequacy of the system of classification can be assessed in relation to the Hartstene Island collection. The Hartstene Island collection contains

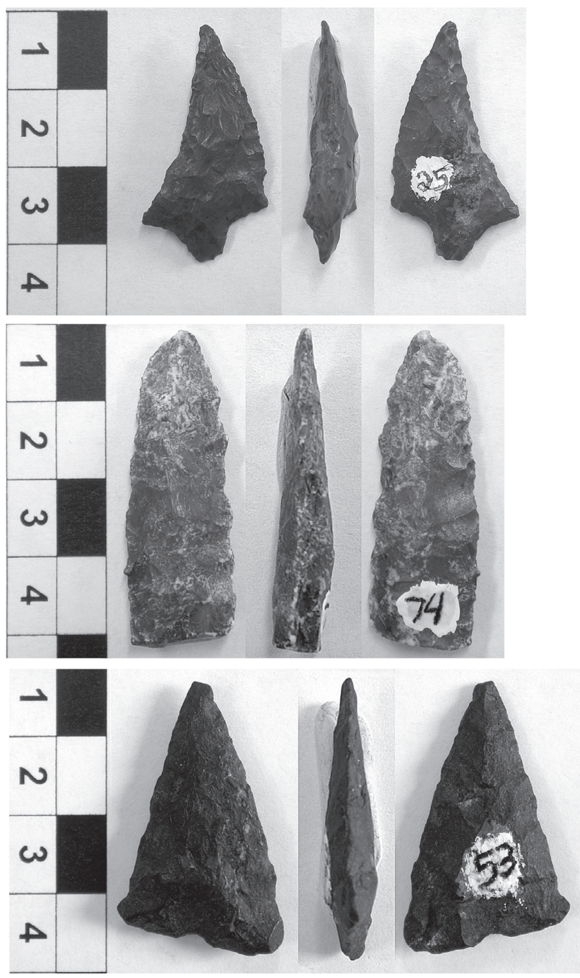

Figure 3. Three examples of photo records taken of each Qwu?gwes and Hartstene projectile points.

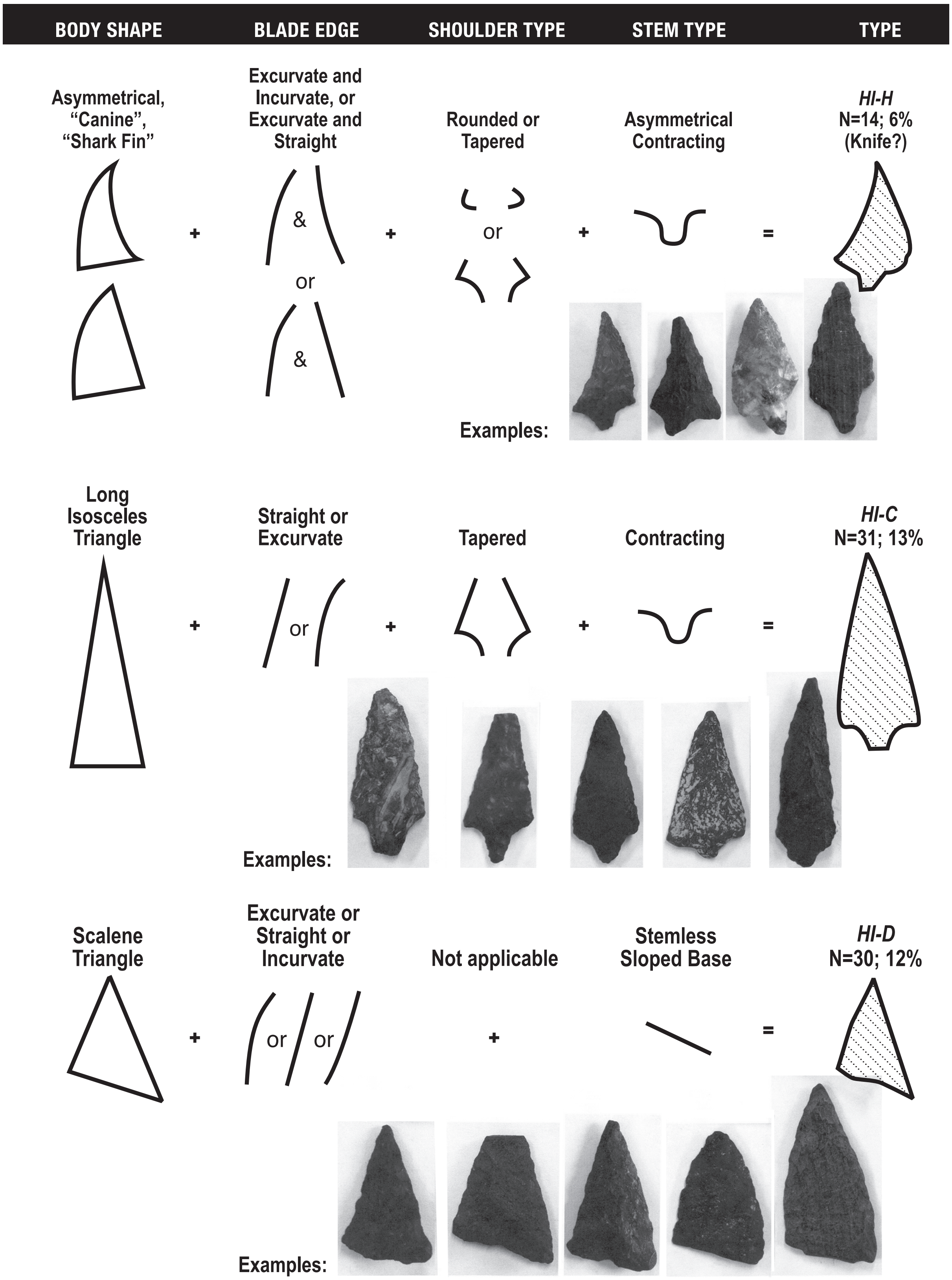

Figure 4. Three examples of how projectile point types were defined from Hartstene Island (HI) and all other sites considered here (see Appendix A–G).

124 mapped and numbered points and 125 points that were collected prior to the Nickels receiving advice from the Burke Museum staff with regard to labeling and mapping the locations of artifacts they collected. According to the system, the mapped and numbered points can be grouped into 13 types. When the unmapped, unnumbered points are classified on the basis of the four characters, 110 (88%) of them fit into the same 13 types as the mapped and numbered points. In addition, the frequency ratios of the types between the two groups of points are similar (Figure 5). These observations suggest that the classificatory system is capturing important qualitative and quantitative patterns of point morphology, and therefore support its use for comparative analysis.

The Qwuʔgwes points can be grouped into 11 types (Appendix A). The most numerous of these is QW-C. Nine of the points (35%) can be assigned to this type. QW-C has a body that is shaped like a long isosceles triangle, straight or excurvate blade edges, shoulders that are tapered, horizontal or slightly barbed, and a straight stem. The next most numerous type is QW-F. QW-F accounts for five points (19%). It has a body that is shaped like a short isosceles triangle, recurvate, straight or incurvate blade edges, shoulders that are tapered, horizontal or slightly barbed, and a contracting stem. None of the other types has more than two projectile points assigned to it.

Eighteen types were identified among the projectile points from Hartstene Island (Appendix B). Five of these types—HI-B, HI-C, HI-D, HI-I, and HI-L—are particularly well represented. Type HI-B has 41 points assigned to it (17%). These points have bodies that are shaped like short isosceles triangles, and blade edges that are excurvate, straight or incurvate. They lack shoulders and stems, and have bases that are convex, flat, or concave. Type HI-C has 31 points assigned to it (13%). The bodies of these points are shaped like long isosceles triangles, and their blade edges are either straight or excurvate. They have tapered shoulders and contracting stems. Thirty points are assigned to type HI-D (12%). These points are scalene triangular in shape. Their blade edges are of unequal length and their

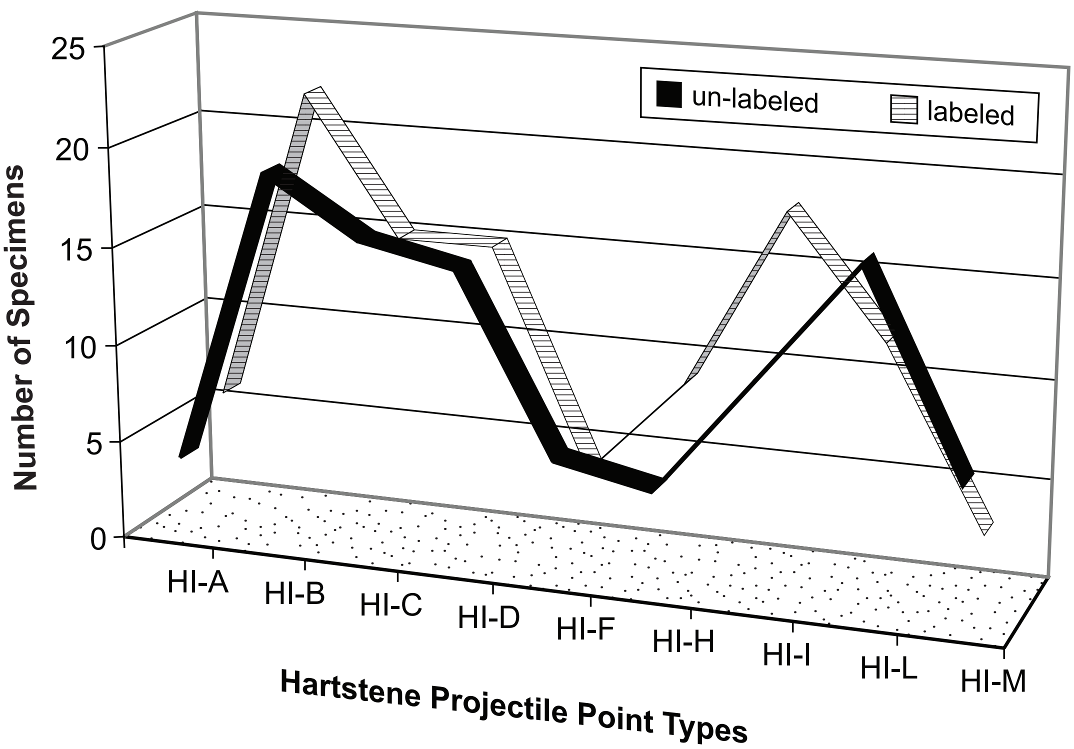

Figure 5. Hartstene Island projectile point types with over 10 examples, demonstrating the similar frequency ratios between the labeled examples (used to develop the original type classification, N=124, Appendix B) and un-labeled examples (N=125).

bases slope. They lack stems and shoulders. The blade edges of HI-D points are excurvate, straight, or incurvate. Type HI-I has 29 points assigned to it (12%). These points have bodies that are shaped like short isosceles triangles, and blade edges that are recurvate, straight, or incurvate. They have tapered, horizontal, or slightly barbed shoulders, and contracting stems. Type HI-L also has 29 points assigned to it (12%). The bodies of these points are lance-shaped, and their blade edges are excurvate. They may or may not have shoulders. If they are present they are weakly developed. HI-L points are stemless. Their bases are flat, sloped, or taper to a rounded point. None of the other types has more than 14 projectile points assigned to it.

The points from Duwamish No. 1 are assigned to eight types, according to our classificatory system. As noted earlier, the exact number of points recovered during the excavations at Duwamish I is unclear at the moment. Based on the published data, the most numerous types are DU-A, DU-B and DU-C. The points assigned to DU-A are shaped like short isosceles triangles. They lack shoulders and stems. Their blade edges are excurvate, straight, or incurvate, and their bases are convex, flat, or concave. The DU-B points have main bodies that are shaped like scalene triangles, and blade edges that are excurvate, straight, or incurvate. They points lack shoulders and stems, and their bases are sloped. The points assigned to DU-C have main bodies that are shaped like isosceles triangles, and blade edges that are incurvate, straight, excurvate, and/or serrated. The points either have weak shoulders or lack them entirely. They lack stems, and their bases are convex, flat, or concave.

The projectile points from West Point can be grouped into seven types (Appendix D). The most frequently occurring types are WP-A and WP-G, both of which have five points assigned to them (23% each). The points assigned to WP-A have bodies that are shaped like long isosceles triangles, and blade edges that are recurvate, straight, or excurvate. They also have tapered shoulders, and contracting stems. The points assigned to WP-G are lance-shaped. They lack shoulders and stems. Their blade edges are excurvate and their bases taper to a point. After WP-A and WP-G, the next most frequently occurring type is WP-D. Four of the points can be assigned to this type (18%). The WP-D points have bodies that are shaped like short isosceles triangles, and blade edges that are recurvate, straight, or incurvate. They also have shoulders are tapered, horizontal, or slightly barbed, and contracting stems. None of the other four types has more than three points assigned to it.

Eleven types were identified among the projectile points from Marymoor (Appendix E). The most frequently encountered of these is MA-F. Fifteen of the points (28%) can be assigned to this type. The MA-F points are lanceolate in shape. Their blade edges that are excurvate or serrated, and their bases are flat, pointed, or sloping. They are stemless, and either have weak shoulders or lack them altogether. The next most frequently encountered type is MA-I. Thirteen points are assigned to this type (24%). The MA-I points are triangular and side-notched. Their blade edges are excurvate or straight, and their shoulders are rounded. The other types have between six points and one point assigned to them.

The four points from Burton Acres can be assigned to three types on the basis of the characters employed in this analysis (Appendix F). Two of the points are shaped like scalene triangles. They both have asymmetrical shoulders and a stemless, concave base. They also both have a blade edge that is excurvate. The opposing blade edge is excurvate on one point and straight on the other. One of the other points is reminiscent of a short isosceles triangle. It has excurvate blade edges and a concave base. It lacks shoulders and a stem. The remaining point has a triangular main body and side-notches. One of its blade edges is straight; the other is excurvate. It has rounded shoulders and a convex pointed stem.

Thirteen types were identified among the projectile points from Chester Morse (Appendix G). The most numerous type, with 27 points assigned to it, is CM-L. CM-L points have bodies that are shaped like long isosceles triangles, and blade edges that are straight, slightly excurvate, or slightly incurvate. They also have tapered shoulders. Their stems contract, expand, or are diamond-shaped. The next most numerous type is CM-H, which has 23 points assigned to it. The CM-H points have bodies that are shaped like short isosceles triangles, blade edges that are recurvate, straight, or incurvate, and shoulders that are tapered, horizontal, or slightly barbed. They have stems, and these narrow proximally. None of the other types accounts for more than 14 points.

The inter-site review identified 29 distinct types among the Puget Sound projectile point collections (Table 1). Based on number of shared types, the collection that is most similar to the one from Qwu?gwes is Hartstene Island. These collections have seven types in common (I, II, IV, V, VI, VII, IX). The collection that is most similar to the one from Hartstene Island is Chester Morse. The Hartstene Island and Chester Morse collections have 12 types in common (I, II, IV, VI, XIII, XIV, XVI, XVII, XVIII, XIX, XX, XXI). The collection from Duwamish No. 1 shares the greatest number of types with those from Hartstene Island and Chester Morse. The types that Duwamish No. 1 shares with the Hartstene Island and Chester Morse collections are II, IV, XIV, XVI, XVIII and XIX. The collection that is most similar to the one from West Point is Marymoor. Six types are present in both collections (III, XVII, XVIII, XXIV, XXV, XXVI). The collection that is most similar to the one from Marymoor is West Point. The Burton Acres collection is most similar to the Hartstene Island collection. The latter contains all three of the types found at Burton Acres, whereas the other collections have at most one of them. The collection that shares the greatest number of types with the one from Chester Morse is Hartstene Island. To reiterate, these collections share types I, II, IV, VI, XIII, XIV, XVI, XVII, XVIII, XIX, XX, and XXI.

Post-Clovis Puget Sound Projectile Point Sequence

The geographically closest, published chipped projectile point sequence is from the lower Fraser River region and Gulf Islands in Canada, just north of our Puget Sound region (Carlson 1983). Since Carlson's (1983) chart is also based on the characteristics of projectile point outline morphology, we identified equivalent projectile point types in his sequence as defined by the four profile dimensions used in our classification above. We wanted to see whether or not the Puget Sound collections follow the established phase sequence patterns that have been well defined by half a century of professional investigations in the Fraser River and Gulf of Georgia (e.g., Carlson 1960). Given that the Hartstene Island collection is a large but undated surface collection, we also wanted to see if its projectile point types could be relatively dated by their styles based on Carlson's sequence.

First, we identified major types in Carlson's (1983) sequence chart that are found at the Qwu?gwes, Hartstene Island, Duwamish, West Point and Marymoor sites. We disregarded the Burton Acres collection on the grounds that it comprises just four points. We did not include the Chester Morse collection because it is derived from

Table 1. Codes for projectile point types found through equivalent site types in the Puget Sound region, with general chronological phase affiliations indicated. BA = Burton Acres. CM = Chester Morse. DU = Duwamish No. 1. HI = Hartstene Island. MA = Marymoor. QW = Qwu?gwes. WP = West Point.

Type Code	Equivalent Site Types	Type Code	Equivalent Site Types
I	CM-G, HI-N, QW-A	XVI	CM-D, DU-C, HI-F, MA-J
II	BA-B, CM-M, DU-A, HI-B, MA-H, QW-B	XVII	CM-K, HI-J, MA-E, WP-E
III	DU-G, MA-B, QW-C, WP-B	XVIII	CM-B, DU-E, HI-L, MA-F, WP-F
IV	CM-F, DU-D, HI-G, MA-I, QW-D	XIX	CM-C, DU-F, HI-M
V	HI-H, QW-E	XX	CM-G, HI-N
VI	CM-H, HI-I, QW-F, WP-D	XXI	CM-A, HI-O
VII	HI-K, QW-G	XXII	BA-A, HI-P
VIII	QW-H	XXIII	BA-C, HI-Q
IX	HI-R, QW-I	XXIV	MA-A, WP-A
X	DU-H, QW-J	XXV	MA-C, WP-C
XI	QW-K	XXVI	MA-G, WP-G
XII	HI-A	XXVII	CM-J, MA-K
XIII	CM-L, HI-C	XXVIII	MA-L
XIV	CM-N, DU-B, HI-D	XXIX	CM-E
XV	HI-E		

a number of sites that likely span several thousand years. We circled and labeled the similar types seen at each site on the chart developed for the Fraser River/Gulf Islands area. The results of this analysis are presented in Figure 6. As can be seen, the Puget Sound chipped projectile point types demonstrate a chronological and typological sequence that is similar to the Fraser River/Gulf of Georgia sites.

Subsequently, we used an approach called cladistics to examine the temporal sequencing of the sites based on the projectile point types. First presented coherently in the 1950s and 1960s (Hennig, 1950, 1966), cladistics is the dominant method of phylogenetic reconstruction used in zoology, botany, and paleontology (Kitching et al., 1998; Quicke, 1993; Smith, 1994). In recent years, it has also begun to be used by archaeologists and anthropologists to investigate cultural evolution (e.g., Collard and Shennan, 2000; O'Brien et al., 2001; Tehrani and Collard, 2002; Jordan and Shennan, 2003; Collard et al., 2006).

Based on a model of descent with modification in which new taxa arise from the bifurcation of existing ones, cladistics defines phylogenetic relationship in terms of relative recency of common ancestry. Two taxa are deemed to be more closely related to one another than either is to a third taxon if they share a common ancestor that is not also shared by the third taxon. The evidence for exclusive common ancestry is evolutionarily novel or "derived" character states. Two taxa are inferred to share a common ancestor to the exclusion of a third taxon if they exhibit derived character states that are not also exhibited by the third taxon.

In its simplest form, cladistic analysis proceeds via four steps. First, a character state data matrix is generated. This shows the states of the characters exhibited by each taxon. Next, the direction of evolutionary change among the states of each character is established. Several methods have been developed to facilitate this, including communality, ontogenetic analysis, and stratigraphic sequence analysis (Kitching et al., 1998; Quicke, 1993; Smith, 1994). Currently the favored method is outgroup analysis. This entails examining a close relative of the study group. When a character occurs in two states among the study group, but only one of the states is found in the outgroup, the principle of parsimony is invoked and the state found only in the study group is deemed to be evolutionarily novel with respect to the outgroup state. Having determined the probable direction of change for the character states, the next step in a cladistic analysis is to construct a branching diagram of relationships for each character. This is done by joining the two most derived taxa by two intersecting lines, and then successively connecting each of the other taxa according to how derived they are. Each group of taxa defined by a set of intersecting lines corresponds to a clade, and the diagram is referred to as a tree. The final step in a cladistic analysis is to compile an ensemble tree from the character trees. Ideally, the distribution of the character states among the taxa will be such that all the character trees imply relationships among the taxa that are congruent with one another. Normally, however, a number of the character trees will suggest relationships that are incompatible. This problem is overcome by generating an ensemble cladogram that is consistent with the largest number of characters and therefore requires the smallest number of *ad hoc* hypotheses of character change or "homoplasies" to account for the distribution of character states among the taxa.

We based our cladistic analysis on the presence and absence of the projectile point types at the various sites (Table 2, Figure 7). The analysis was run in the widely used phylogenetics program PAUP* 4 (Swofford, 1998). The collection of points from West Point was used as an outgroup on the grounds that West Point is the oldest of the sites studied and therefore its projectile points can be expected to retain the largest number ancestral character states.

The cladistic analysis returned a single most parsimonious cladogram (Figure 7). The fit between the cladogram and dataset can be assessed with the Consistency Index and the Retention Index. The Consistency Index assesses homoplasy as a fraction of character change in relation to a given cladogram. It ranges between 1.0 and 0.0, with values close to 1 indicating a good fit between the cladogram and the data set and values close to 0 indicating a poor fit. The Retention Index (measures the number of similarities in a data set that are retained as homologies in relation to a given cladogram. It also ranges between 1.0 and 0.0. As with the Consistency Index, values for the Retention Index that are close to 1 indicate a good fit between the cladogram and the data set, and values that are close to 0 indicate a poor fit. The Consistency Index for the Puget Sound projectile point cladogram is 0.82. Its Retention Index is 0.54. Thus, the fit between cladogram and the dataset is good.

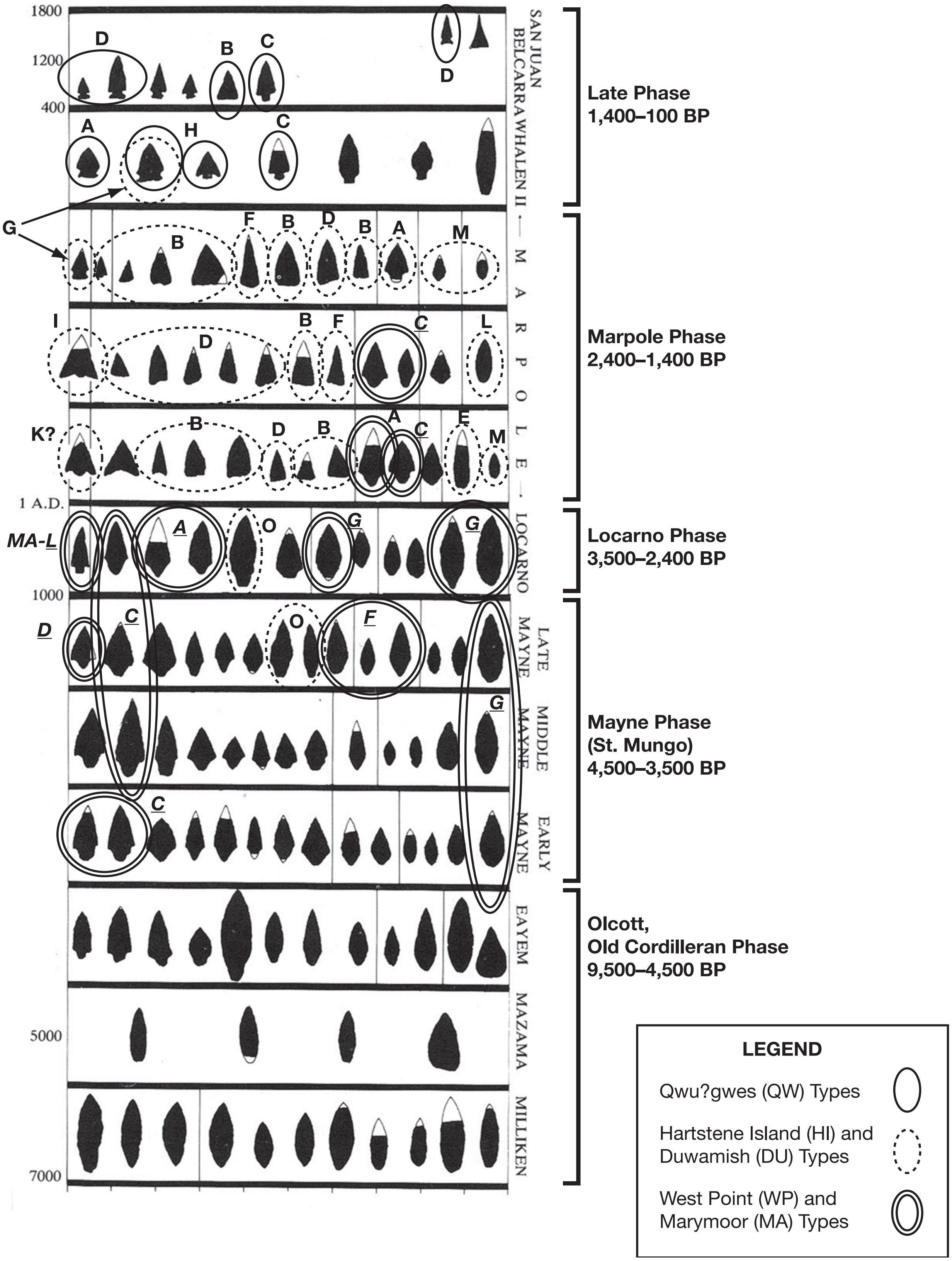

Figure 6. Central Northwest Coast projectile point chronology established for the Fraser River region (after Carlson 1983:27) and how the defined Puget Sound projectile points fit by site types and in corresponding phases.

Table 2. Presence/absence of defined projectile point types found at each of the five main Puget Sound sites in this study (0 = absence, 1 = presence).

Type / *Site*	I	II	III	IV	V	VI	VII	VIII	IX	X	XI	XII	XIII	XIV
Qwu?gwes	1	1	1	1	1	1	1	1	1	1	1	0	0	0
Hartstene	1	1	0	1	1	1	1	0	1	0	0	1	1	1
Duwamish 1	0	1	1	1	0	0	0	0	0	1	0	0	0	1
West Point	0	0	1	0	0	1	0	0	0	0	0	0	0	0
Marymoor	0	1	1	1	0	0	0	0	0	0	0	0	0	0

Type / *Site*	XV	XVI	XVII	XVIII	XIX	XX	XXI	XXII	XXIII	XXIV	XXV	XXVI	XXVII	XXVIII
Qwu?gwes	0	0	1	0	0	0	0	0	0	0	0	0	0	0
Hartstene	1	1	0	1	1	1	1	1	1	0	0	0	0	0
Duwamish 1	0	1	1	1	1	0	0	0	0	0	0	0	0	0
West Point	0	0	1	1	0	0	0	0	0	1	1	1	0	0
Marymoor	0	1		1	0	0	0	0	0	1	1	1	1	1

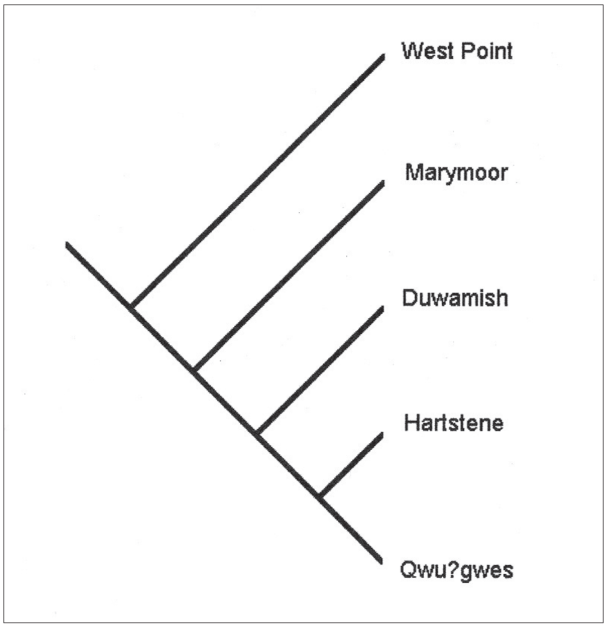

Figure 7. Cladogram derived from Puget Sound site projectile point types. Cladogram rooted on West Point.

Because West Point was used as the outgroup, the cladogram can only shed light on the relationships of the collections from Duwamish, Qwu?gwes, Hartstene and Marymoor. The cladogram suggests that the collections from Qwu?gwes and Hartstene are more closely related to one another than either of them is to the collections from Duwamish or Marymoor, and that the collection from Qwu?gwes, Hartstene and Duwamish are more closely related to each another than any of them is to the collection from Marymoor. This implies that the collections from Qwu?gwes and Hartstene share novel types that are not shared by Duwamish or Marymoor. It also implies that the collections from Qwu?gwes, Hartstene and Duwamish share novel types that are not shared by Marymoor.

In terms of relative recency of origin, the cladogram suggests that the collection from Marymoor is older than the collections from Duwamish, Qwu?gwes and Hartstene, and that the collection from Duwamish is older than the collections from Qwu?gwes and Hartstene. Significantly, this is consistent with the available dating evidence. To reiterate, West Point and Marymoor are dated to between 2400 to 4400 BP, while the dates from Duwamish fall into two time periods, 1300 to 1400 BP and 100 to 500 BP. Radiocarbon dates from Qwu?gwes suggest that it dates from 700–150 BP. Thus, the results of the cladistic analysis further support the notion that Carlson's ((1983) phase sequence is valid for the Puget Sound region.

With regard to the date of the Hartstene Island collection, its position on the cladogram suggests that it is either (a) older than Qwu?gwes but younger than Duwamish, (b) the same age as Qwu?gwes, or (c) younger than Qwu?gwes. Typologically, the Hartstene Island assemblage, like the one from Duwamish, fits well into the Fraser/Gulf Island Marpole Phase. Furthermore, it is most similar to the Duwamish assemblage in terms of type frequencies. Most of the Duwamish and Hartstene types are small triangular point types (HI-B and HI-D), lanceolate point types (HI-L and HI-O) and triangular drill-like types (HI-F). They occur in a surprisingly close percentage ratio at each site (Figures 7 and 8). In addition, when comparing the ratio of basalt to non-basalt projectile points at all the major sites considered, the Duwamish and Hartstene Island assemblages demonstrate a strong emphasis on basalt in contrast to sites considered later and earlier chronologically (Figure 9). As such, it seems reasonable to conclude that of the three dating options for the Hartstene Island collection suggested by the cladogram, the most plausible is the second one, namely that it is older than the Qwu?gwes collection but younger than the one from Duwamish. In view of the dates for Qwu?gwes and Duwamish, this suggests that the Hartstene island assemblage dates from between 1500 and 100 BP.

With the aid of a second phylogenetics program, MacClade 4.0 (Maddison and Maddison, 1998), we also investigated the unambiguous changes that delineate the clades of the cladogram. This analysis indicated that Marymoor is differentiated from West Point by the gain of two types, XXVII and XXVIII. The analysis also indicated that the clade comprising Duwamish No. 1, Hartstene Island and Qwu?gwes is differentiated from West Point and Marymoor by the loss of three types, XXIV, XXV and XXVI. Within the former clade, the Hartstene Island and Qwu?gwes assemblages are distinguished from the assemblage from Duwamish 1 by the gain of four types, I, V, VII and IX. The assemblage from Qwu?gwes uniquely lacks type XVIII and is unique in possessing types XVIII and XI. Qwu?gwes also exhibits a reversal to absence of type XVI, which is present in the Marymoor, Duwamish No. 1 and Hartstene Island assemblages but absent in the assemblage from West Point. The Hartstene Island assemblage has a large number of novel types compared to the other sites. These include types XII, XIII, XV, XX, XXI, XXII and XIII. It is also unique in lacking type III.

Processes of Cultural Evolution on the Northwest Coast

How do we explain the similarity in projectile point sequences between the Puget Sound region and the Fraser River/Gulf Islands region? There are three obvious possibilities:

1. **Population diffusion.** In this model, there was insignificant transmission of information pertaining to projectile point morphology between the populations in the two regions. In addition, the model holds that the resident populations

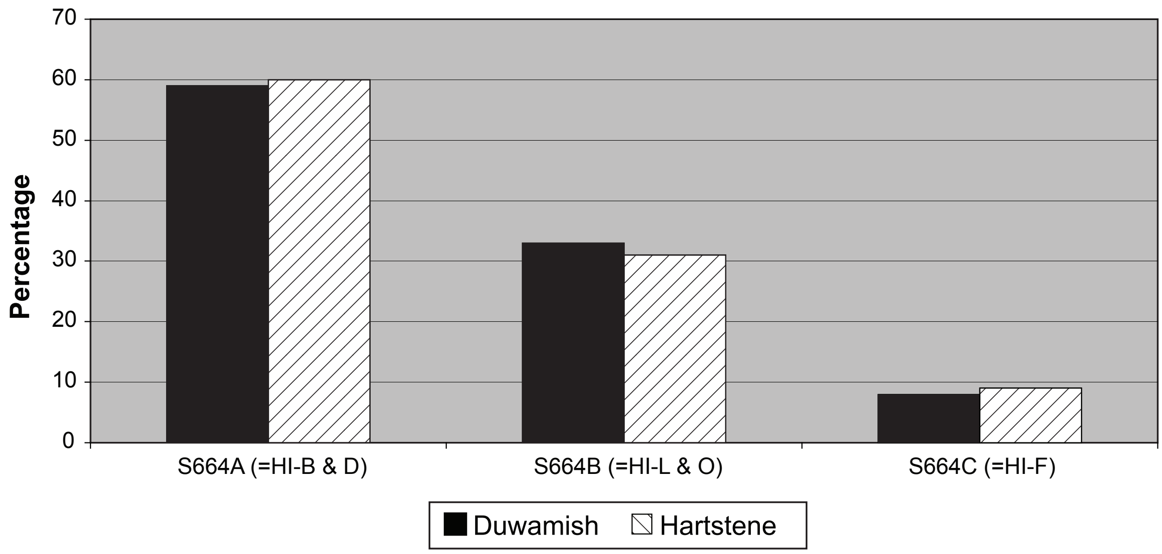

Figure 8. Duwamish No. 1 site and Hartstene Island site major projectile type percentages—note the very close percentage ratios. Since our type definitions included more attributes, the S664A types (Campbell 1981) included both our HI-B and HI-D (also referred to as "San Juan Triangular" in Carlson 1960:570) and Campbell's S664B types included both HI-L and HI-O types (see Appendix B).

in both regions were repeatedly replaced by migrating populations with different projectile point assemblages. Thus, according to this model, each phase of the phase-sequence represents the influx of a new population who either absorbed or displaced the preexisting populations.

2. **Cultural diffusion.** This model contends that there was long-term population persistence in both regions between 11,000 and 100 BP rather than repeated episodes of population replacement. It also contends that there was at least periodic transmission of projectile point morphology-related information between the populations in the two regions. Hence, in this model each phase of the phase-sequence represents the spread of novel ideas rather than the spread of people.
3. **Movement of individuals and information.** In this model the similarity between the projectile point sequence in the Sound and the Fraser River/Gulf Islands region is a consequence of a combination of population diffusion and cultural diffusion.

It is not possible to discriminate between these three models on the basis of the typological and cladistic analyses reported earlier. However, the results of a recent analysis of artifacts recovered from central Northwest Coast wet sites are suggestive in this regard. Croes et al. (2005) used cladistic techniques to investigate whether basketry artifacts cluster the sites in the same way as artifacts constructed from stone, bone, and shell. They found that the most parsimonious cladogram derived from the baskets differed from the one yielded by the stone, bone and shell artifacts. The stone, bone and shell artifact cladogram was consistent with the phase-sequence conventionally employed on the central Coast since the major clades comprised sites that are assigned to the same phase. In contrast, the major clades of the basketry cladogram consisted of sites that are geographically close but assigned to different phases. This was interpreted in terms of models of population history and cultural transmission. Specifically, Croes et al. (2005) argued that the basketry cladogram reflected vertical transmission of stylistic information in the context of long-term population persistence, while the cladogram derived from the stone, bone and shell artifacts reflected horizontal transmission among the populations of information about food-getting and manufacturing technology. Thus, Croes et al.'s (2005) study suggests that of the three possible explanations for

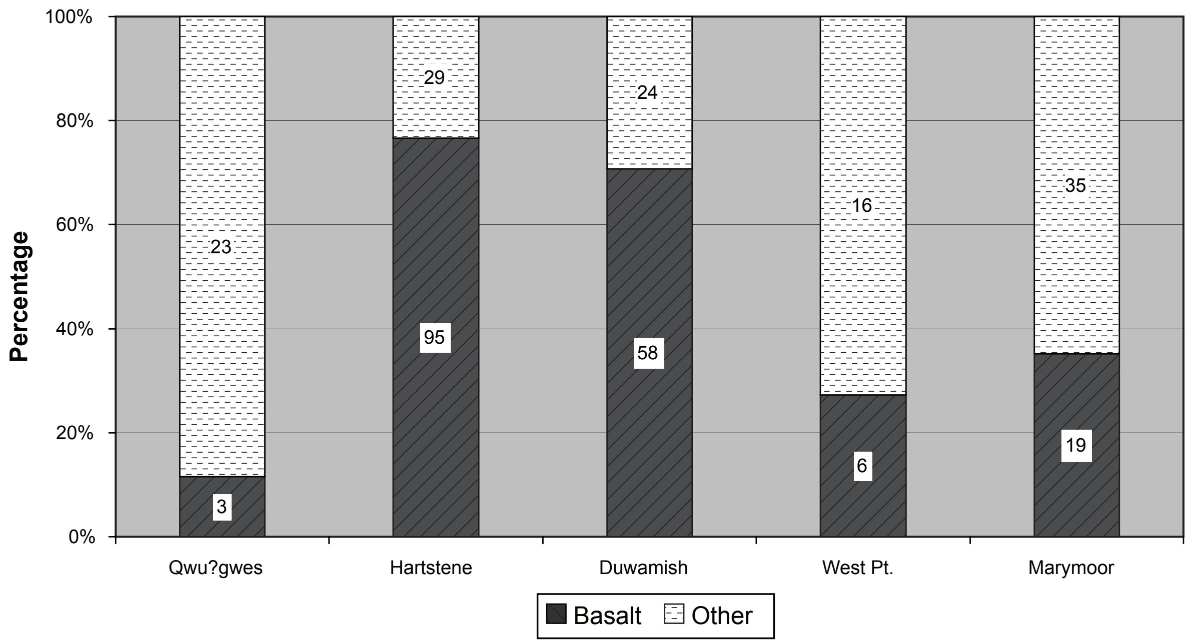

Figure 9. Ratio of projectile points of basalt and non-basalt at the major sites compared in this study. Note that the late Qwu?gwes site has the highest ratio of non-basalts (mostly chalcedonies), Hartstene and Duwamish No. 1 have similar high ratios of basalt points, and the earlier period West Point and Marymoor sites again have a higher and similar ratio of non-basalt projectile points, but not as high as in the late period.

the similarity between the projectile point sequences in the Puget Sound region and the Fraser River/Gulf of Georgia region, the most plausible is the second, namely that it is the result of cultural diffusion between the two regions in the context of long-term population persistence and cultural continuity within each region (see also, Croes 1995, 2005).

Concluding Remarks

In this chapter we have focused on projectile point assemblages from the Puget Sound region that date from approximately 11,000 to 100 BP. Through a combination of conventional typological analyses and novel cladistic analyses, we have shown that the pattern of projectile point evolution in the Sound is similar to that observed in the Fraser River/Gulf Islands region during the same period of time. We have also demonstrated that the important but hitherto undated collection of projectile points from Hartstene Island can be tentatively dated to between 1500 and 100 BP. Lastly, we have highlighted evidence that suggests that the similarity between the projectile point sequences in the Puget Sound region and the Fraser River/Gulf of Georgia region is likely a consequence of cultural diffusion rather than repeated episodes of population replacement.

With regard to future directions, it is likely that some of the types identified among the collections are invalid. This is because we did not attempt to differentiate true projectile points from points that might have been hafted but did not actually serve as projectile weapons. It is also possible that some of the types are the broken and rejuvenated fragments of other types. The characters used to define the types were selected, in part, with a view to avoiding this state of affairs. For example, serrated edges were given limited consideration in the type definitions, because in the collections examined it was obvious that points were serrated as a rejuvenation technique to provide a sharper edge on artifacts that had low width:thickness ratios. However, it remains possible that some of the types are reworked from other types. In light of these points, it seems likely that in future some of the types identified among the collections will be shown to be invalid. Possible examples of types in the first of these categories include QW-E from the Qwu?qwes collection and HI-H from the Hartstene collection (Figures 3 and 4, Appendices A and B), and MA-L (Appendix E) from the Marymoor collection. These artifacts are asymmetrically shaped and probably functioned as hafted knives rather than projectile points. Possible examples of types in the second category include QW-C, QW-D, and QW-F. These artifacts may represent a continuum of point use and rejuvenation, with QW-C being the early stage on the point life cycle and QW-D and QW-F representing progressively more reworked fragments of the once larger point (Figure 10). In the next phase of our work we will test these hypotheses with the aid of morphometric and microwear analyses.

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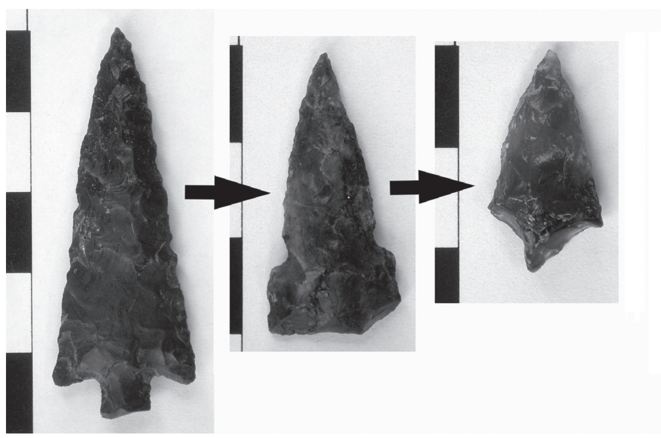

Figure 10. Example of proposed stages of rejuvenation of points at Qwu?gwes, from type QW-C to QW-D to QW-F (see Appendix A).

Table 3. Projectile point data from Qwu?gwes (45–TN–240). Types are defined in Appendices A and B. Level is in centimeters. Point measurements are in millimeters, and weights in grams. Measurements in brackets are estimates from incomplete examples.

Type	Square #	Level	Material	Length	Width	Thickness	Weight
QW–A	N25/E23	55-60	Chalcedony	31.49	25.80	7.80	4.90
QW–B	N26/E24	0-15	Basalt	20.31	17.57	3.47	1.00
QW–C	N08/E24	Surface	Chalcedony	30.22	17.02	5.63	1.80
QW–C	N15/E16	5-10	Jasper	27.96	15.40	4.68	1.50
QW–C	N21/E14	65-70	Chert	21.77	19.57	6.40	2.40
QW–C	N24/E22	50-55	Chert	48.13	17.59	4.08	3.40
QW–C	N29/E26	10-15	Chalcedony	33.26	14.25	4.02	1.60
QW–C	N30/E26	40-45	Basalt	28.55	17.14	3.17	1.40
QW–C	N34/E14	Surface	Chalcedony	28.66	17.50	4.35	1.80
QW–C	N52/E25	35-40	Chert	22.37	14.16	3.63	0.80
QW–C	N42.5/E19.1	Surface	Chert	37.91	19.47	5.28	2.70
QW–D	N24/E22	Slump	Chert	29.11	14.66	4.31	1.60
QW–E	N20/E13	0-5	Chert	31.06	15.08	3.59	1.60
QW–F	N18/E14	15-20	Jasper	21.86	11.38	4.96	1.00
QW–F	N18/E16	55-60	Chalcedony	25.39	15.82	6.02	2.00
QW–F	N19/E31	Surface	Chert	25.40	12.50	4.96	1.30
QW–F	N23.7/E9.7	Surface	Chalcedony	17.80	15.10	3.26	0.70
QW–F	N51/E26	25-30	Chert	33.06	19.90	5.41	2.50
QW–G	N29.02/E15.60	Surface	Chert	27.15	17.62	5.62	2.20
QW–H	N16/E17	Surface	Jasper	24.89	18.64	3.72	1.40
QW–H	N45/E15	Surface	Chert	28.16	21.63	5.04	2.00
QW–I	N16/E17	15-20	Chert	21.43	17.83	3.74	1.10
QW–I	N20/E15	50-60	Jasper	17.60	15.62	2.75	0.50
QW–J	N19/E14	10-15	Chert	30.68	20.25	6.57	3.20
QW–K	N30/E26	35-40	Basalt	28.81	18.09	2.75	1.40
QW–L	N23.3/E10	Surface	Chert	31.11	16.90	4.28	1.90

Table 4. Projectile point data from Hartstene Island. Types are defined in Appendices A and B. Measurement in brackets are broken, incomplete examples. All points were surface-collected.

Type	Number	Material	Length (mm)	Width (mm)	Thickness (mm)	Weight (g)
HI-A	HI-001	basalt	[35.21]	28.54	6.74	5.50
HI-A	HI-003	basalt	[22.47]	19.82	3.45	1.60
HI-A	HI-004	basalt	[29.37]	19.26	5.68	3.60
HI-A	HI-005	chert	38.02	23.26	6.37	4.40
HI-A	HI-009	chalcedony	50.07	17.35	5.71	5.30
HI-A	HI-016	petrified wood	37.80	16.89	4.25	2.00
HI-B	HI-017	basalt	18.47	15.68	2.99	0.70
HI-B	HI-021	chert	44.90	22.65	5.74	5.30
HI-B	HI-025	red jasper	30.42	15.06	5.08	1.70
HI-B	HI-026	red jasper	[18.13]	18.23	4.16	1.40
HI-B	HI-027	chalcedony	36.62	15.55	4.78	2.90
HI-B	HI-028	agate	42.83	17.74	9.27	6.40
HI-B	HI-029	chalcedony	24.29	14.96	4.96	1.70
HI-B	HI-031	basalt	[28.65]	24.76	4.88	2.70
HI-B	HI-034	basalt	[27.97]	18.6	4.17	1.50
HI-B	HI-035	basalt	[33.51]	24.65	4.48	3.00
HI-B	HI-037	white chalcedony	[28.42]	20.04	4.49	2.60
HI-B	HI-039	basalt	[29.74]	15.72	7.86	3.60
HI-B	HI-040	basalt	43.16	19.39	8.72	3.80
HI-B	HI-040b	basalt	[26.02]	21.65	5.57	—
HI-B	HI-041	basalt	29.25	14.29	4.74	1.80
HI-B	HI-044	basalt	26.55	26.6	4.07	2.80
HI-B	HI-045	basalt	27.76	19.48	4.45	2.70
HI-B	HI-046	basalt	43.16	19.39	8.72	7.70
HI-B	HI-052	basalt	[37.37]	16.27	4.97	2.70
HI-B	HI-053	basalt	31.71	20.99	6.25	3.30
HI-B	HI-054	basalt	[31.93]	22.28	6.45	3.40
HI-B	HI-055	basalt	39.43	14.63	7.49	3.40
HI-C	HI-056	basalt	25.78	18.29	5.04	2.10
HI-C	HI-057	basalt	26.04	19.31	5.93	2.00
HI-C	HI-058	basalt	20.36	16.57	3.50	1.50
HI-C	HI-063	red jasper	23.27	11.72	5.19	1.40
HI-C	HI-064	basalt	27.11	13.88	5.74	2.20
HI-C	HI-066	basalt	[40.21]	28.97	9.12	10.60
HI-C	HI-067	basalt	[23.52]	21.62	4.66	1.90
HI-C	HI-068	basalt	43.10	27.65	6.58	6.30
HI-C	HI-069	basalt	52.61	22.31	9.56	9.70
HI-C	HI-071	basalt	48.12	30.05	10.08	14.60
HI-C	HI-074	brown chalcedony	[40.36]	13.97	7.08	4.20
HI-C	HI-075	basalt	36.23	29.15	6.97	5.10
HI-C	HI-076	basalt	38.39	17.63	6.90	3.10
HI-C	HI-077	basalt	29.04	16.59	4.52	2.40
HI-C	HI-079	basalt	24.82	18.09	3.39	1.40
HI-D	HI-080	brown chalcedony	23.50	14.28	3.94	1.40
HI-D	HI-081	basalt	[40.18]	19.95	8.03	5.90
HI-D	HI-083	red jasper	23.22	14.15	4.92	1.60
HI-D	HI-084	purple chalcedony	31.08	13.84	4.92	2.00
HI-D	HI-085	basalt	[35.31]	13.74	6.71	4.10
HI-D	HI-086	basalt	26.48	15.58	2.74	1.30
HI-D	HI-087	chert	44.12	25.78	6.51	6.20
HI-D	HI-088	brown chalcedony	[30.50]	18.25	5.11	2.40
HI-D	HI-089	basalt	[32.62]	18.83	5.68	2.60
HI-D	HI-092	basalt	[39.16]	28.71	7.86	7.20
HI-D	HI-094	basalt	29.73	15.46	3.44	1.60
HI-D	HI-095	basalt	40.98	18.23	6.98	—
HI-D	HI-096	basalt	43.21	19.57	7.06	4.50
HI-D	HI-097	basalt	[32.25]	18.38	5.99	2.80
HI-D	HI-098	white chalcedony-agate?	[23.03]	11.72	5.06	1.20
HI-E	HI-099	red jasper	18.03	14.92	4.06	0.80
HI-E	HI-100	basalt	42.36	18.63	4.86	4.20
HI-E	HI-101	basalt	54.32	25.53	7.38	7.70
HI-E	HI-102	basalt	28.89	29.95	6.88	4.00
HI-E	HI-103	basalt	35.85	20.07	4.61	3.50

Table 4 continued.

Type	Number	Material	Length (mm)	Width (mm)	Thickness (mm)	Weight (g)
HI-E	HI-104	basalt	43.54	17.05	7.55	4.50
HI-F	HI-105	basalt	46.17	29.7	8.35	11.20
HI-F	HI-106	basalt	[39.83]	16.72	6.40	3.30
HI-F	HI-107	basalt	31.78	27.06	7.15	5.30
HI-F	HI-109	basalt	39.70	23.04	7.00	4.40
HI-G	HI-112	basalt	[25.34]	15.67	2.94	1.40
HI-G	HI-114	basalt	[39.23]	17.86	6.41	5.00
HI-G	HI-115	red jasper	[28.1]	18.23	6.98	4.30
HI-G	HI-119	basalt	40.20	24.24	7.57	4.90
HI-H	HI-120	basalt	35.09	14.61	4.08	2.10
HI-H	HI-121	basalt	[29.79]	27.77	9.34	8.40
HI-H	HI-123	chert	39.30	19.43	6.32	3.90
HI-H	HI-126	basalt	27.21	13.47	4.88	1.30
HI-H	HI-129	basalt	28.37	18.75	4.78	2.20
HI-H	HI-131	basalt	41.82	18.73	6.75	5.70
HI-H	HI-132	red jasper	[22.96]	14.24	4.34	1.50
HI-H	HI-133	basalt	33.13	19.88	7.69	4.30
HI-H	HI-135	basalt	38.69	22.49	7.45	5.40
HI-I	HI-135a	basalt	37.09	33.1	5.85	5.50
HI-I	HI-136	jadeite-metamorphic	[32.35]	27.08	3.91	3.10
HI-I	HI-137	basalt	16.68	17.46	3.18	0.90
HI-I	HI-139	red jasper	22.44	15.37	4.68	1.00
HI-I	HI-140	basalt	37.43	12.73	4.50	2.10
HI-I	HI-141	basalt	[34.73]	16.49	7.12	4.40
HI-I	HI-142	petrified wood	48.56	21.78	7.31	6.60
HI-I	HI-143	basalt	[34.16]	19.69	4.92	2.80
HI-I	HI-144	basalt	[44.13]	29.25	8.80	8.60
HI-I	HI-145	basalt	47.06	20.84	7.25	6.10
HI-I	HI-146	basalt	[37.37]	19.64	2.17	2.60
HI-I	HI-147	basalt	35.14	27.57	4.05	4.30
HI-I	HI-149	white chalcedony-agate?	22.94	12.16	5.3	1.70
HI-I	HI-150	chert	[23.05]	15.2	4.15	1.40
HI-I	HI-151	basalt	39.74	22.29	5.27	4.40
HI-I	HI-152	basalt	36.30	20.16	4.95	4.10
HI-I	HI-153	basalt	[28.63]	17.86	5.14	2.50
HI-I	HI-154	basalt	[39.38]	14.6	3.89	2.60
HI-J	HI-156	basalt	28.72	20.98	4.00	2.40
HI-J	HI-159	basalt	40.15	30.54	4.70	6.60
HI-J	HI-160	basalt	34.26	20.9	4.29	2.60
HI-K	HI-161	basalt	[24.04]	17.94	5.05	1.50
HI-K	HI-162	basalt	31.58	15.3	3.27	1.30
HI-K	HI-163	basalt	[34.73]	15.65	3.51	2.30
HI-K	HI-164	basalt	30.17	18.37	5.52	3.00
HI-K	HI-166	basalt	25.06	14.03	4.59	1.90
HI-K	HI-167	basalt	34.60	18.37	6.44	3.90
HI-L	HI-169	basalt	27.52	22.05	4.52	3.00
HI-L	HI-170	basalt	32.48	15.35	5.49	2.20
HI-L	HI-173	basalt	36.33	22.54	4.42	2.90
HI-L	HI-174	basalt	[34.60]	27.62	6.71	4.30
HI-L	HI-175	basalt	[32.42]	23.06	5.04	2.70
HI-L	HI-176	basalt	33.93	29.13	6.19	4.80
HI-L	HI-177	basalt	[30.15]	17.53	6.36	2.90
HI-L	HI-179	basalt	[31.30]	26.28	7.17	5.70
HI-L	HI-180	basalt	39.00	18.53	4.05	3.10
HI-L	HI-182	basalt	[22.63]	17.7	3.82	1.50
HI-L	HI-183	basalt	28.02	17.23	4.22	1.90
HI-L	HI-184	basalt	32.88	13.64	3.49	2.20
HI-M	HI-185	chert	34.50	17.47	5.45	3.40
HI-M	HI-185b	basalt	[33.51]	22.35	3.31	2.40
HI-M	HI-186	red jasper	[40.55]	19.12	7.43	4.60
—	HI-187	basalt	38.80	19.43	6.66	3.80
—	HI-189	basalt	[33.00]	12.31	4.56	2.00

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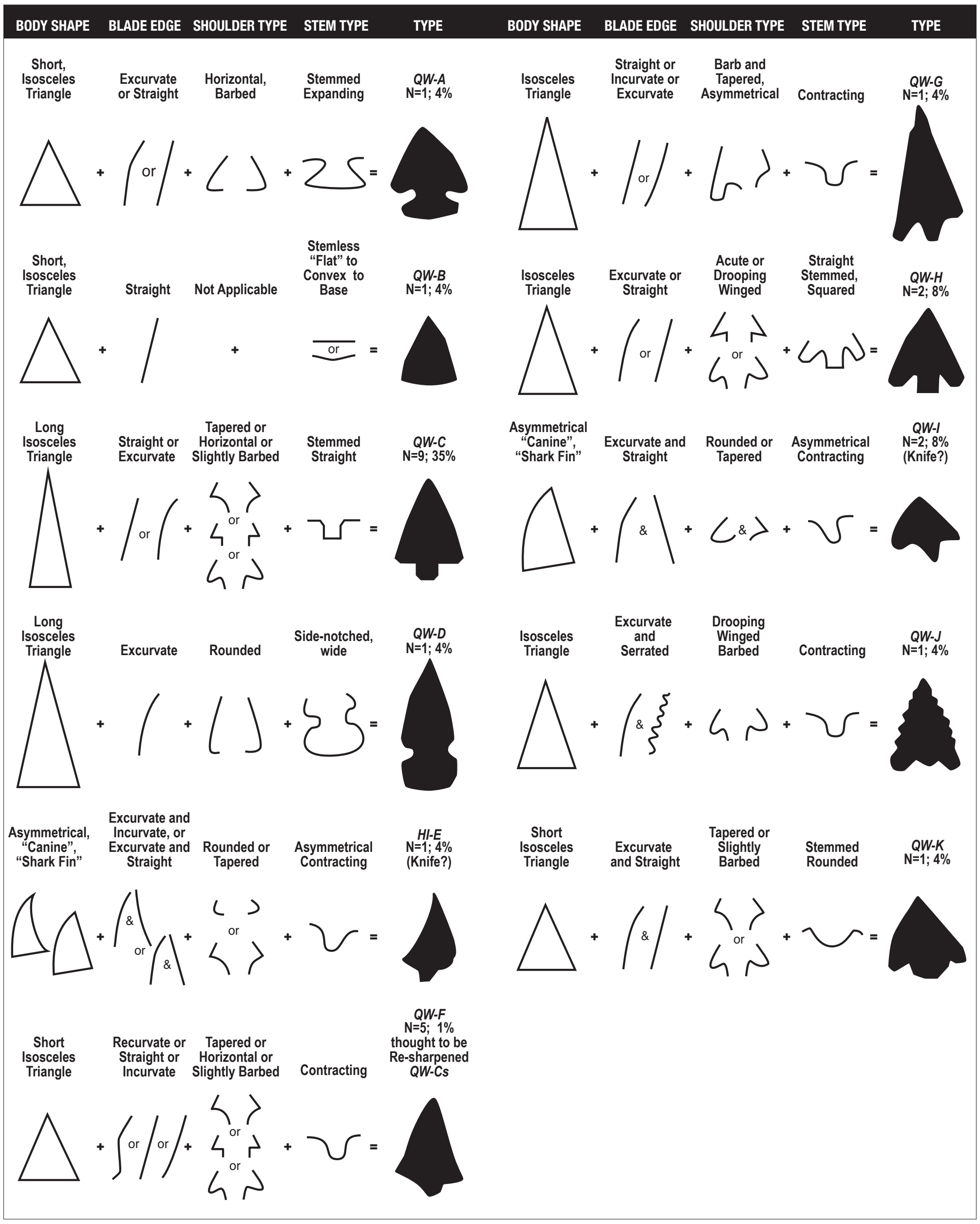
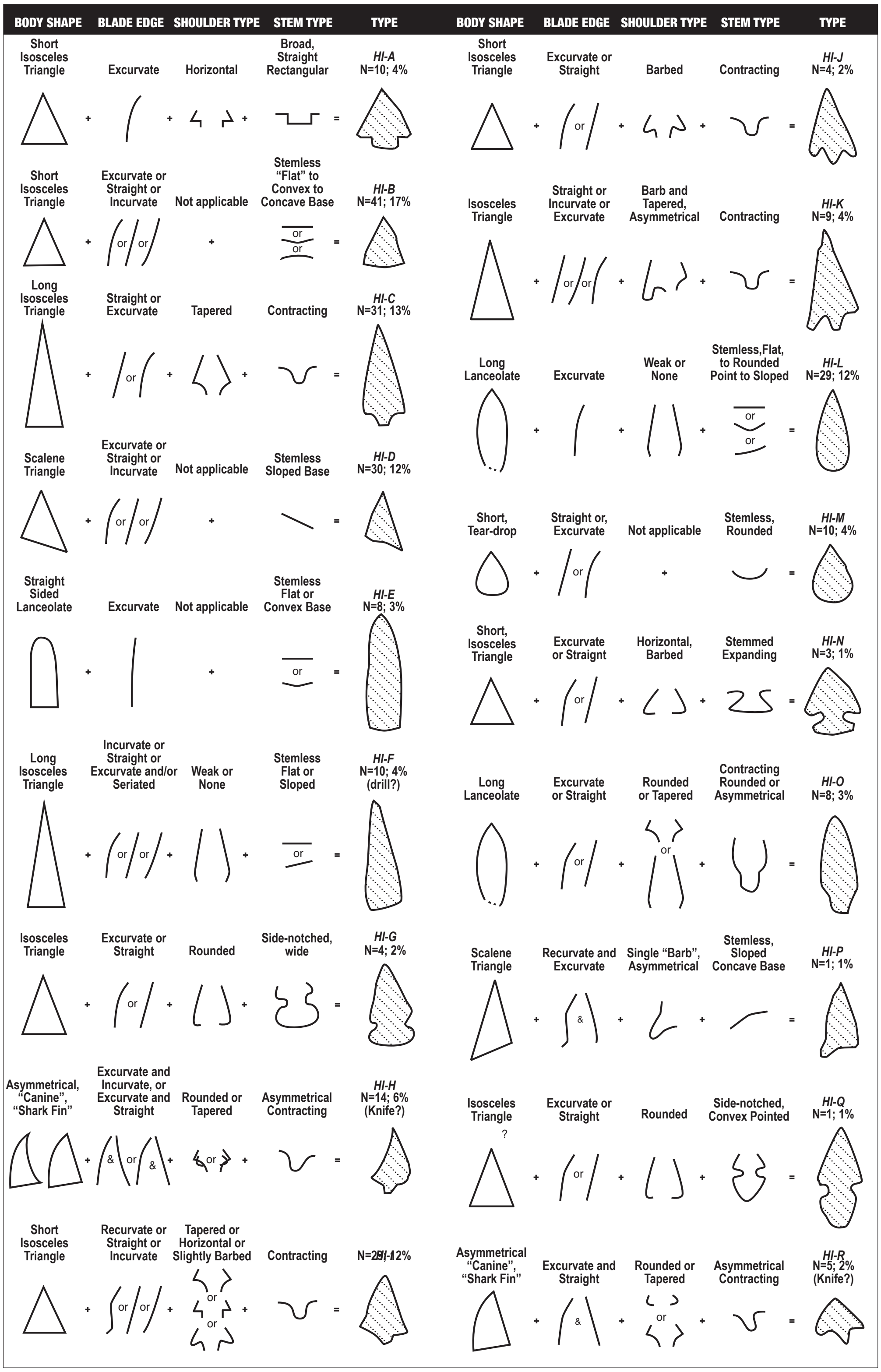
Appendix A. Definition and Frequencies of Qwu?gwes (QW) Site (45–TN–240) Projectile Point Types.

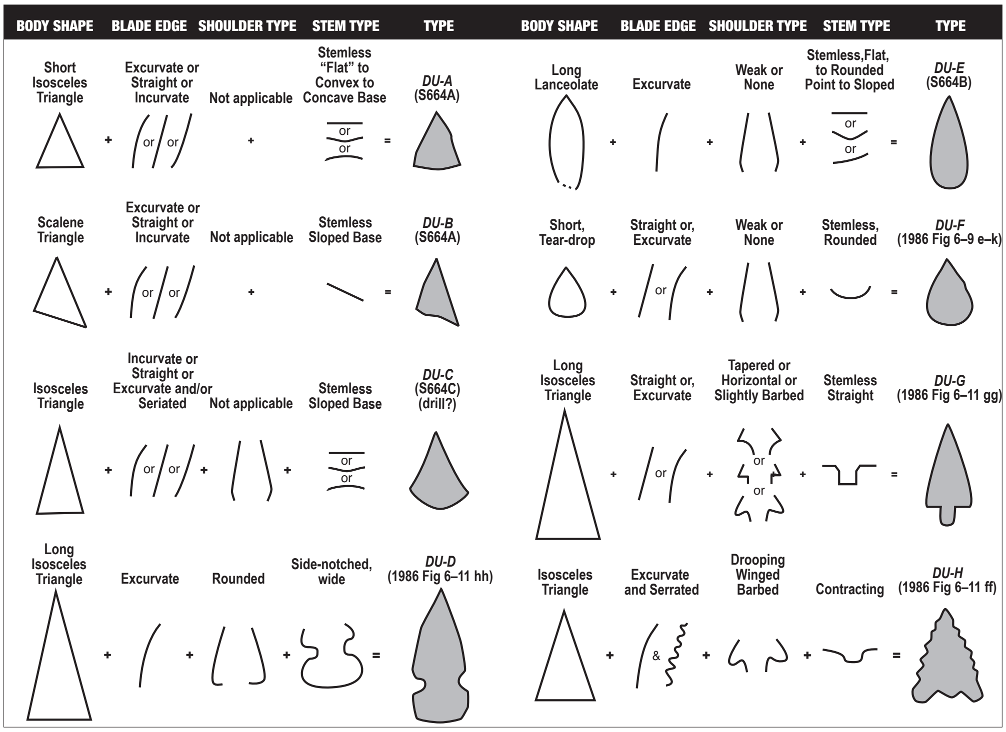


Appendix B. Definition and Frequencies of Hartstene Island (HI) Site Projectile Point Types.

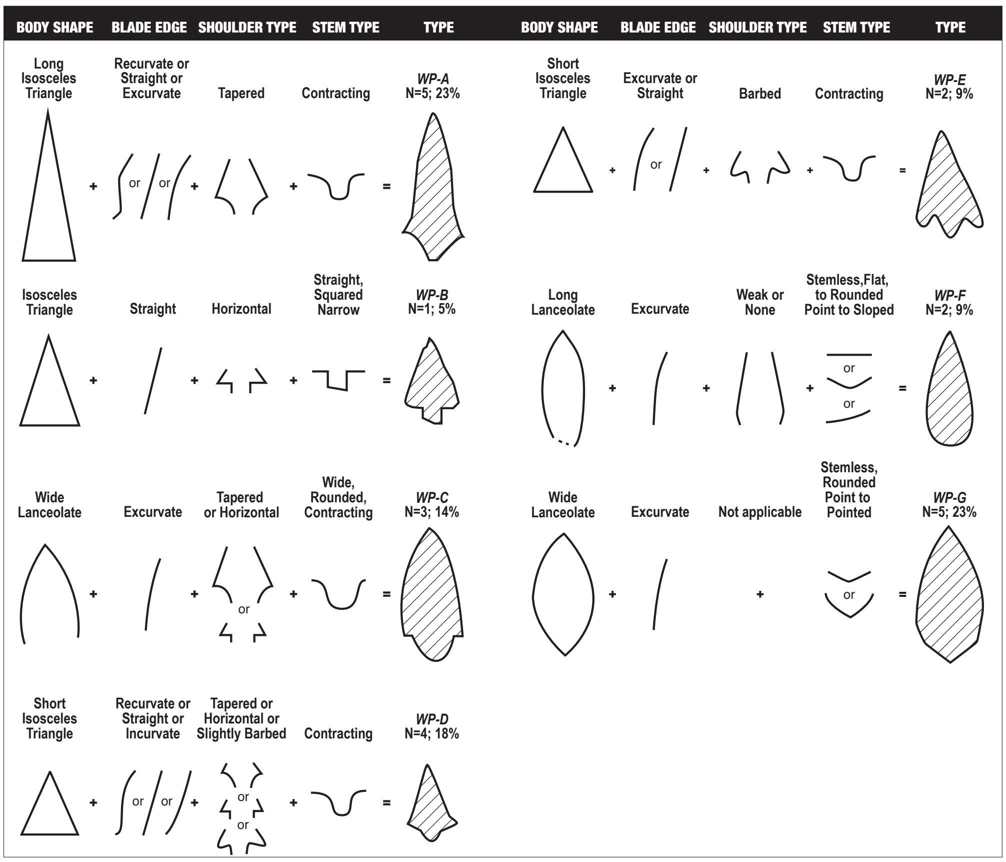


BODY SHAPE	BLADE EDGE	SHOULDER TYPE	STEM TYPE	TYPE
Short Isosceles Triangle	Excurvate	Horizontal	Broad, Straight Rectangular	*HI-A* N=10; 4%
Short Isosceles Triangle	Excurvate or Straight or Incurvate	Not applicable	Stemless “Flat” to Convex to Concave Base	*HI-B* N=41; 17%
Long Isosceles Triangle	Straight or Excurvate	Tapered	Contracting	*HI-C* N=31; 13%
Scalene Triangle	Excurvate or Straight or Incurvate	Not applicable	Stemless Sloped Base	*HI-D* N=30; 12%
Straight Sided Lanceolate	Excurvate	Not applicable	Stemless Flat or Convex Base	*HI-E* N=8; 3%
Long Isosceles Triangle	Incurvate or Straight or Excurvate and/or Seriated	Weak or None	Stemless Flat or Sloped	*HI-F* N=10; 4% (drill?)
Isosceles Triangle	Excurvate or Straight	Rounded	Side-notched, wide	*HI-G* N=4; 2%
Asymmetrical, “Canine”, “Shark Fin”	Excurvate and Incurvate, or Excurvate and Straight	Rounded or Tapered	Asymmetrical Contracting	*HI-H* N=14; 6% (Knife?)
Short Isosceles Triangle	Recurvate or Straight or Incurvate	Tapered or Horizontal or Slightly Barbed	Contracting	*HI-I* N=29; 12%
Short Isosceles Triangle	Excurvate or Straight	Barbed	Contracting	*HI-J* N=4; 2%
Isosceles Triangle	Straight or Incurvate or Excurvate	Barb and Tapered, Asymmetrical	Contracting	*HI-K* N=9; 4%
Long Lanceolate	Excurvate	Weak or None	Stemless,Flat, to Rounded Point to Sloped	*HI-L* N=29; 12%
Short, Tear-drop	Straight or, Excurvate	Not applicable	Stemless, Rounded	*HI-M* N=10; 4%
Short, Isosceles Triangle	Excurvate or Straight	Horizontal, Barbed	Stemmed Expanding	*HI-N* N=3; 1%
Long Lanceolate	Excurvate or Straight	Rounded or Tapered	Contracting Rounded or Asymmetrical	*HI-O* N=8; 3%
Scalene Triangle	Recurvate and Excurvate	Single “Barb”, Asymmetrical	Stemless, Sloped Concave Base	*HI-P* N=1; 1%
Isosceles Triangle ?	Excurvate or Straight	Rounded	Side-notched, Convex Pointed	*HI-Q* N=1; 1%
Asymmetrical “Canine”, “Shark Fin”	Excurvate and Straight	Rounded or Tapered	Asymmetrical Contracting	*HI-R* N=5; 2% (Knife?)

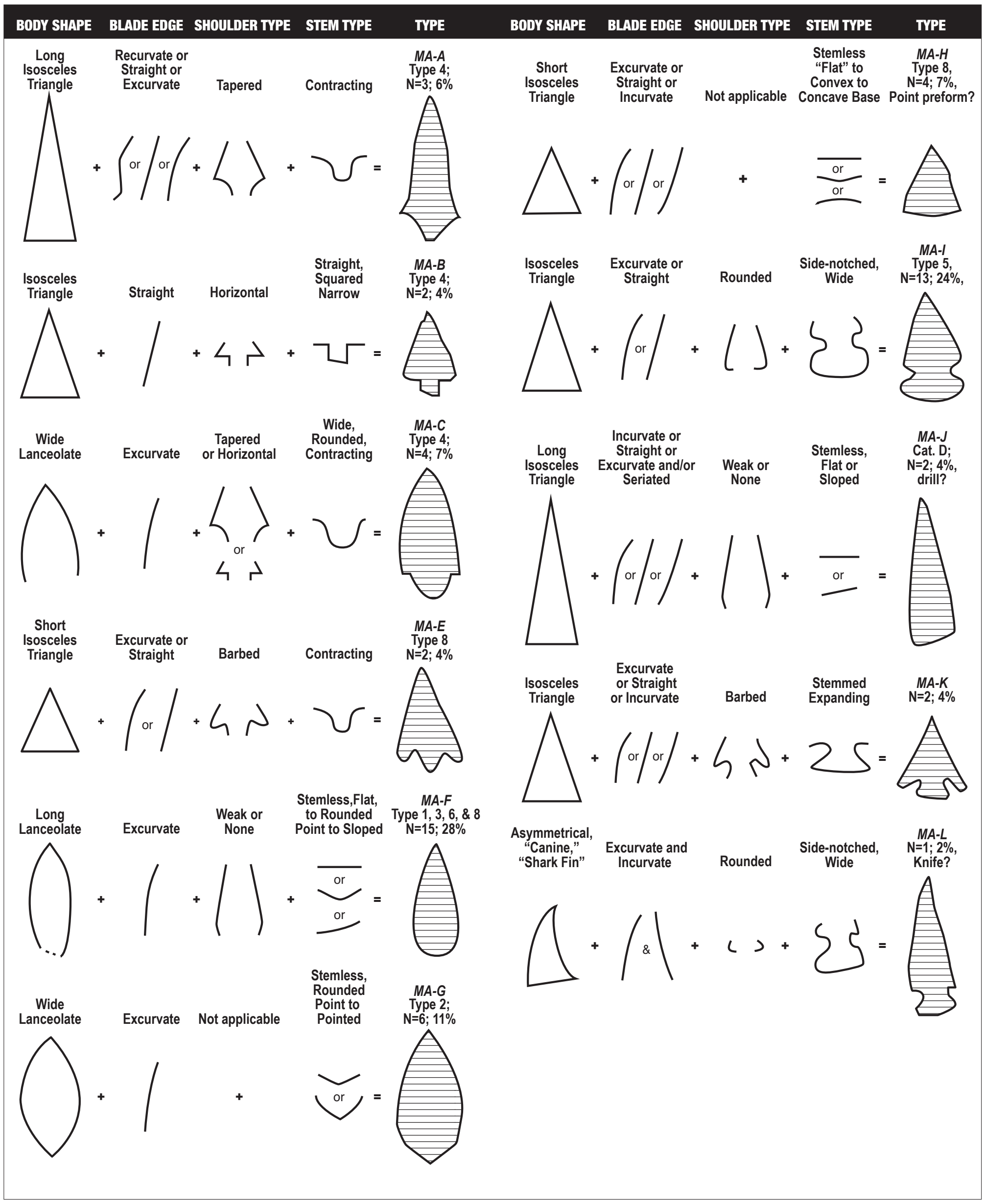
Appendix C. Definition of Duwamish No. 1 Site (DU) (45–KI–23) Projectile Point Types.



Appendix D. Definition and Frequencies of West Point (WP) Site (45–KI–428/429) Projectile Point Types.

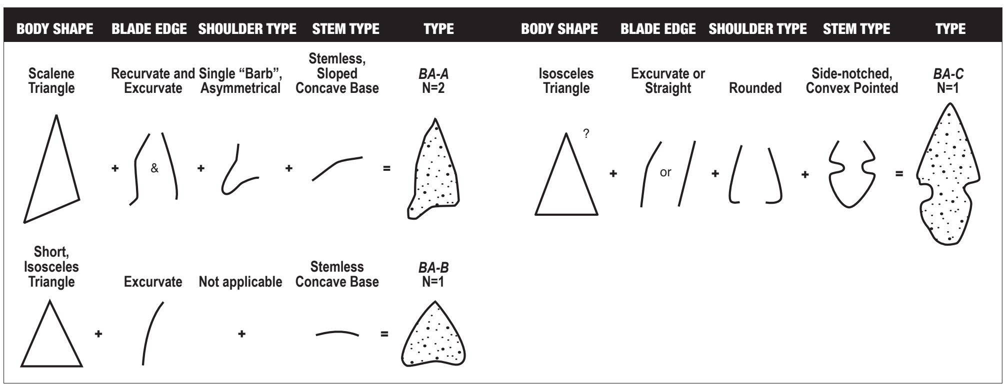


Appendix E. Definition and Frequencies of Marymoor (MA) Site (45–KI–9) Projectile Point Types.



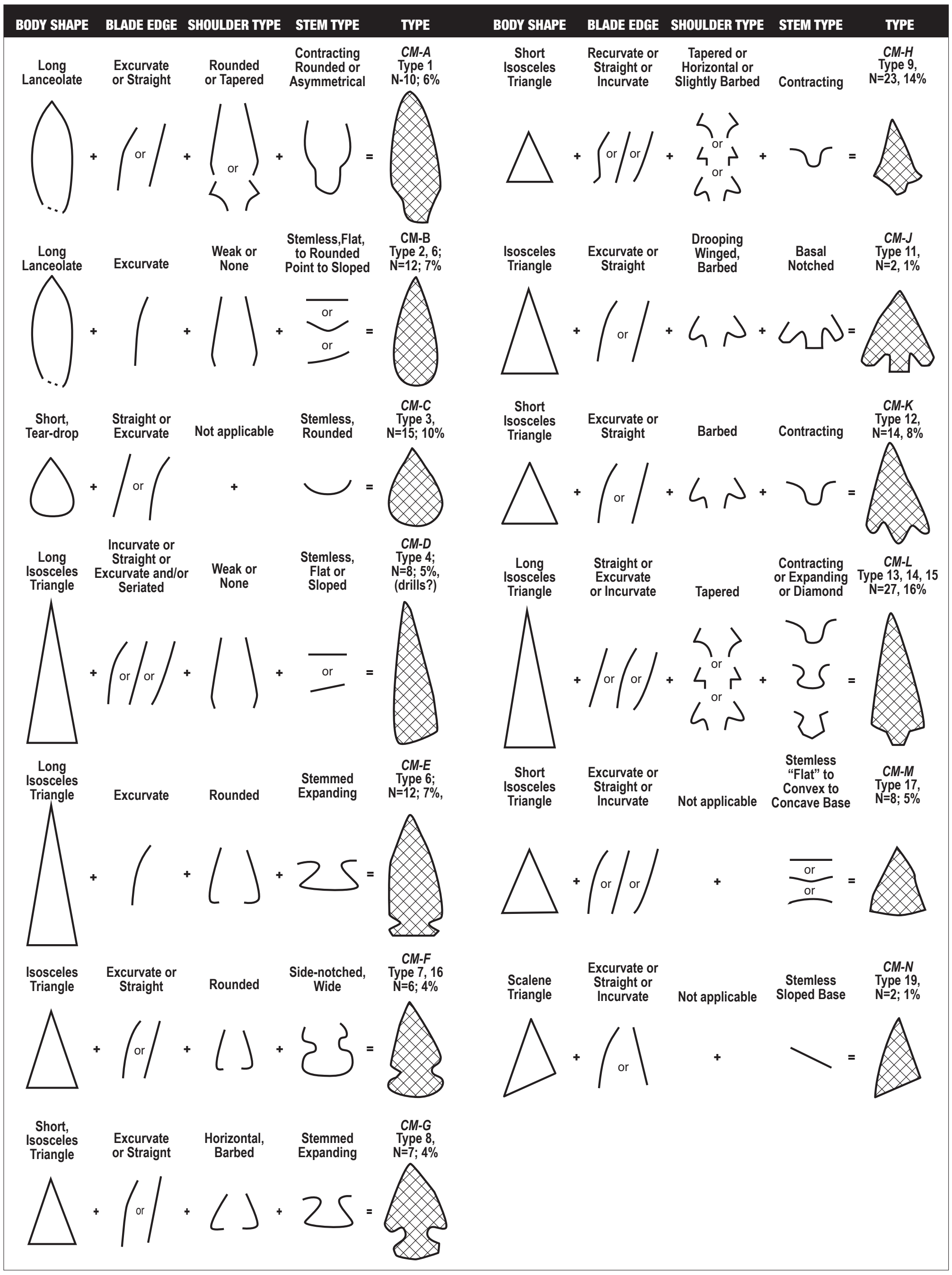
BODY SHAPE	BLADE EDGE	SHOULDER TYPE	STEM TYPE	TYPE
Long Isosceles Triangle	Recurvate or Straight or Excurvate	Tapered	Contracting	*MA-A* Type 4; N=3; 6%
Isosceles Triangle	Straight	Horizontal	Straight, Squared Narrow	*MA-B* Type 4; N=2; 4%
Wide Lanceolate	Excurvate	Tapered or Horizontal	Wide, Rounded, Contracting	*MA-C* Type 4; N=4; 7%
Short Isosceles Triangle	Excurvate or Straight	Barbed	Contracting	*MA-E* Type 8 N=2; 4%
Long Lanceolate	Excurvate	Weak or None	Stemless,Flat, to Rounded Point to Sloped	*MA-F* Type 1, 3, 6, & 8 N=15; 28%
Wide Lanceolate	Excurvate	Not applicable	Stemless, Rounded Point to Pointed	*MA-G* Type 2; N=6; 11%
Short Isosceles Triangle	Excurvate or Straight or Incurvate	Not applicable	Stemless "Flat" to Convex to Concave Base	*MA-H* Type 8, N=4; 7%, Point preform?
Isosceles Triangle	Excurvate or Straight	Rounded	Side-notched, Wide	*MA-I* Type 5, N=13; 24%,
Long Isosceles Triangle	Incurvate or Straight or Excurvate and/or Seriated	Weak or None	Stemless, Flat or Sloped	*MA-J* Cat. D; N=2; 4%, drill?
Isosceles Triangle	Excurvate or Straight or Incurvate	Barbed	Stemmed Expanding	*MA-K* N=2; 4%
Asymmetrical, "Canine," "Shark Fin"	Excurvate and Incurvate	Rounded	Side-notched, Wide	*MA-L* N=1; 2%, Knife?

Appendix F. Definitions and Frequencies of Burton Acres (BA) Site (45–KI–437) Projectile Point Types.



BODY SHAPE	BLADE EDGE	SHOULDER TYPE	STEM TYPE	TYPE
Scalene Triangle	Recurvate and Excurvate	Single "Barb", Asymmetrical	Stemless, Sloped Concave Base	*BA-A* N=2
Short, Isosceles Triangle	Excurvate	Not applicable	Stemless Concave Base	*BA-B* N=1
Isosceles Triangle	Excurvate or Straight	Rounded	Side-notched, Convex Pointed	*BA-C* N=1

Appendix G. Definitions and Frequencies of Chester Morse Lake (CM) Sites (45–KI–25, 30-32, 299-300) Projectile Point Types.



Chapter 9

Projectile Points from the Gulf and San Juan Islands

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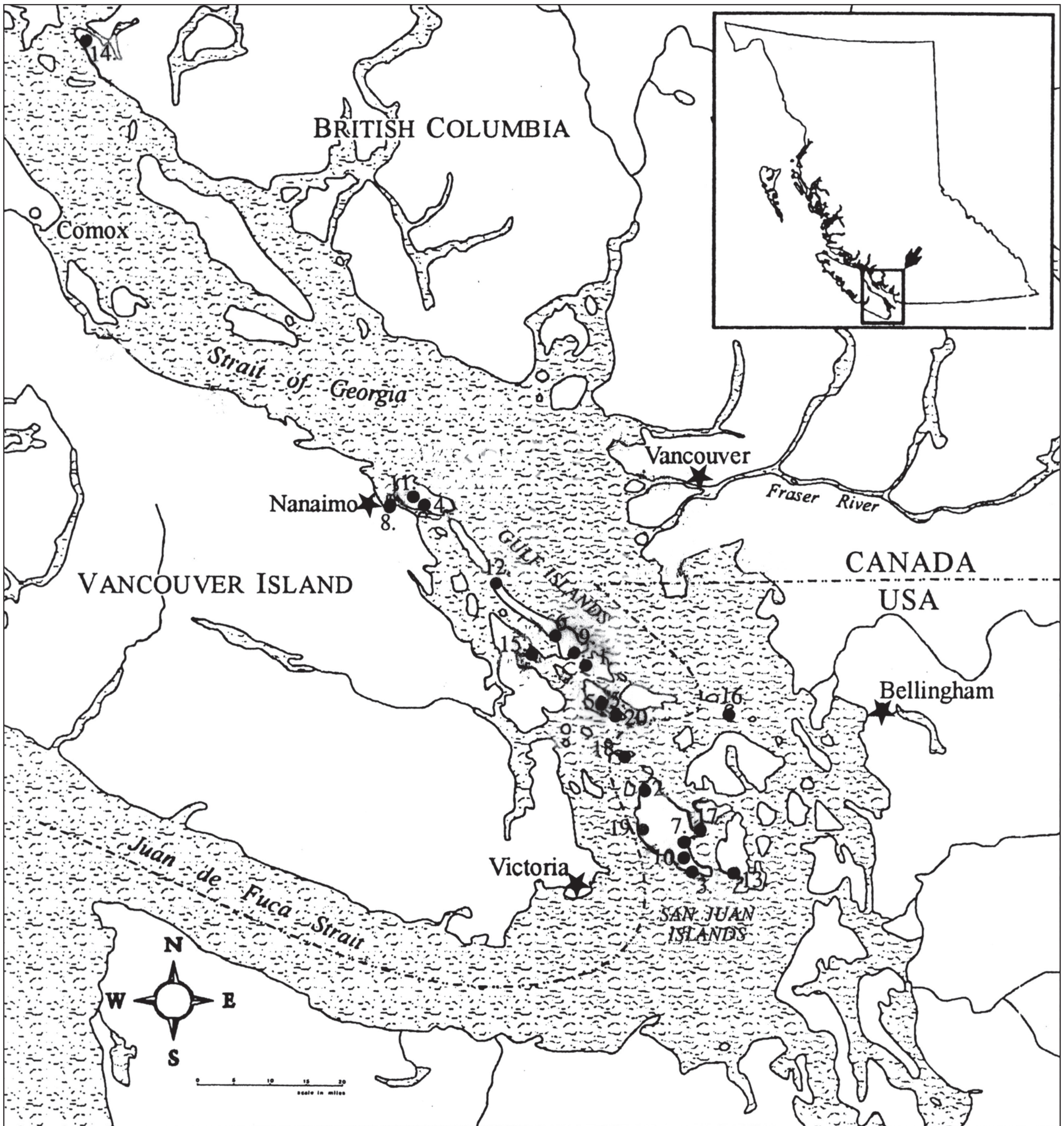
Nine hundred and thirty classifiable flaked stone points have been recovered from 22 excavated or tested sites in the Gulf and San Juan Islands and from two adjacent sites, Duke Point on Vancouver Island and Bliss Landing on the mainland (Figure 1). These sites have 147 radiocarbon dates that range from 5400 BP to the contact period. The absence of earlier sites may be the result of rapid sea level rise between 5800 and 4500 BP (Williams and Roberts 1988:1664) that would have eroded and drowned earlier shell middens and other shoreline features, although landward features at higher elevations would have been spared. The latter are difficult to discover because of forest growth and absence or scarcity of the shellfish remains that increase site visibility. Those parts of sites with the oldest dates, Helen Point and DeStaffany, are well above the present shoreline. The largest assemblage from a single site is from Helen Point (DfRu–8) on Active Pass in the Gulf Islands with 287 points (Table 1) that constitute 31% of entire sample. Several sites have yielded only one projectile point, and many sites have yielded intermediate frequencies. These variations in frequency can be attributed to culture change through time, differential sampling, and the different activities that took place in the particular parts of the sites excavated. These variables contribute to the difficulty of building a model of chronological change in projectile point types. Uncalibrated radiocarbon dates are used in this chapter.

Arden King (1950) developed the first typology for projectile points in this island region based on points recovered from the Cattle Point site. King was a splitter and classified the collection of 120 points into eleven major types with 36 sub-types. I'm more of a lumper and in 1954 I reclassified the Cattle Point points and the points from the other excavated San Juan Island sites into five major types and six sub-types (Carlson 1954). Later researchers have used similar types, although Kenady et al. (2002) have recently classified the points from the DeStaffany site into three categories they refer to as "series" following practices used in Plateau archaeology. In the present analysis I sort the points into six major types and ten sub-types (Figures 2, 3, Table 1). Large bifaces, those over 100 mm in length, are not considered to be projectile points and are placed in a class by themselves. Those attributes that have proven most useful in the formulation of types are the following: size—small or medium; shape of the blade—straight "triangular" or convex "leaf" or "foliate"; and treatment of the base—convex, straight, irregular, stemmed, notched or barbed. Examples of all the types are shown in Figure 3 at full size, and silhouettes illustrating the range of variation in form are in Figures 4–16 at half size.

The vast majority of the points are made of coarse gray-black volcanic rock that for years was called basalt or andesite. Bakewell and Irving (1994:30) have recently completed a chemical analysis of this rock and have identified this stone as dacite, a volcanic rock similar to basalt and andesite. Some examples have crystalline inclusions and are probably what King (1950) called porphyry. Other utilized geochemical varieties of local volcanic rocks may someday be identified, but the significant aspect of all of them is that they were difficult to flake and rarely produced artifacts of outstanding quality, although there are some exceptions (See Figure 19a). A few projectile points were flaked from obsidian, chal-



1. Helen Point DfRu 8
2. English Camp 45 SJ 24 & Garrison 45 SJ 25
3. Cattle Point 45 SJ 1
4. False Narrows DgRw–4
5. Pender Canal DeRt–1 & DeRt–2
6. Montague Harbour DfRt–2
7. Argyle Lagoon 45 SJ 2
8. Duke Point DgRx–5
9. Georgeson Bay DfRu–24
10. DeStaffany 45 SJ 414
11. Gablriola DgRw–199
12. Dionisio Point DgRv–3
13. Richardson 45 SJ 185
14. Bliss Landing EaSe–2
15. Long Harbour DfRu–44
16. Fossil Bay 45 SJ 105
17. Moore 45 SJ 5
18. Reid Harbor 45 SJ 84
19. Lime Kiln 45 SJ 99
20. Poets Cove DeRt–4

Figure 1. Map of the San Juan and Gulf Islands showing sites with chipped stone projectile points.

Table 1. Projectile point type distribution San Juan and Gulf Islands.

SITE \ TYPE	Ia	Ib	Ic	II	IIIa	IIIb	IVa	IVb	V	VIa	VIb	VIc	Total
Helen Point DfRu–8	26	34	25	23	110	4	9	1	4	35	13	3	287
English Camp 45–SJ–24	7	1	29		6	1	14	1	5	68	4	2	138
Cattle Point 45–SJ–1	19		15	3	27		5	4	10	33	4	4	124
Poets Cove DeRt–4	32		13	7	8	9	7	4	6	22	2		110
False Narrows DgRw–4	2		5		14		1		3	39	3	2	69
Pender DeRt–2	14		1	3	16	13	2			1	2	2	54
Montague Harbour DfRu–13	4		2	3	10					4	5		28
Argyle Lagoon 45–SJ–2	3	1	2		11		1		4				22
Garrison 45–SJ–25	2		1				1			9	6		19
Pender DeRt–1			3	2	3		4		1				13
Duke Point DgRx–5	3	1	1	2	5	2			2	3		2	21
Georgeson Bay DfRu–24	1		2				1		2	2			8
DeStaffany 45–SJ–414	3				2	1							6
Gabriola Island DgRw–199			1		1	1							3
DionisioPoint DgRv–3	3		3		3	1	4			1			15
Richardson 45–SJ–185	1	1							1				3
Bliss Landing EaSe–2	1		1	1									3
LongHarbour DfRu–44	2												2
Fossil Bay 45–SJ–105	2												2
Moore 45–SJ–5	1												1
Reid Harbor 45–SJ–84	1												1
Lime Kiln 45–SJ–99							1						1
Total Number	127	38	104	44	216	32	50	10	38	217	39	15	930
Percent	14	4	11	5	23	3	5	1	4	23	4	2	100

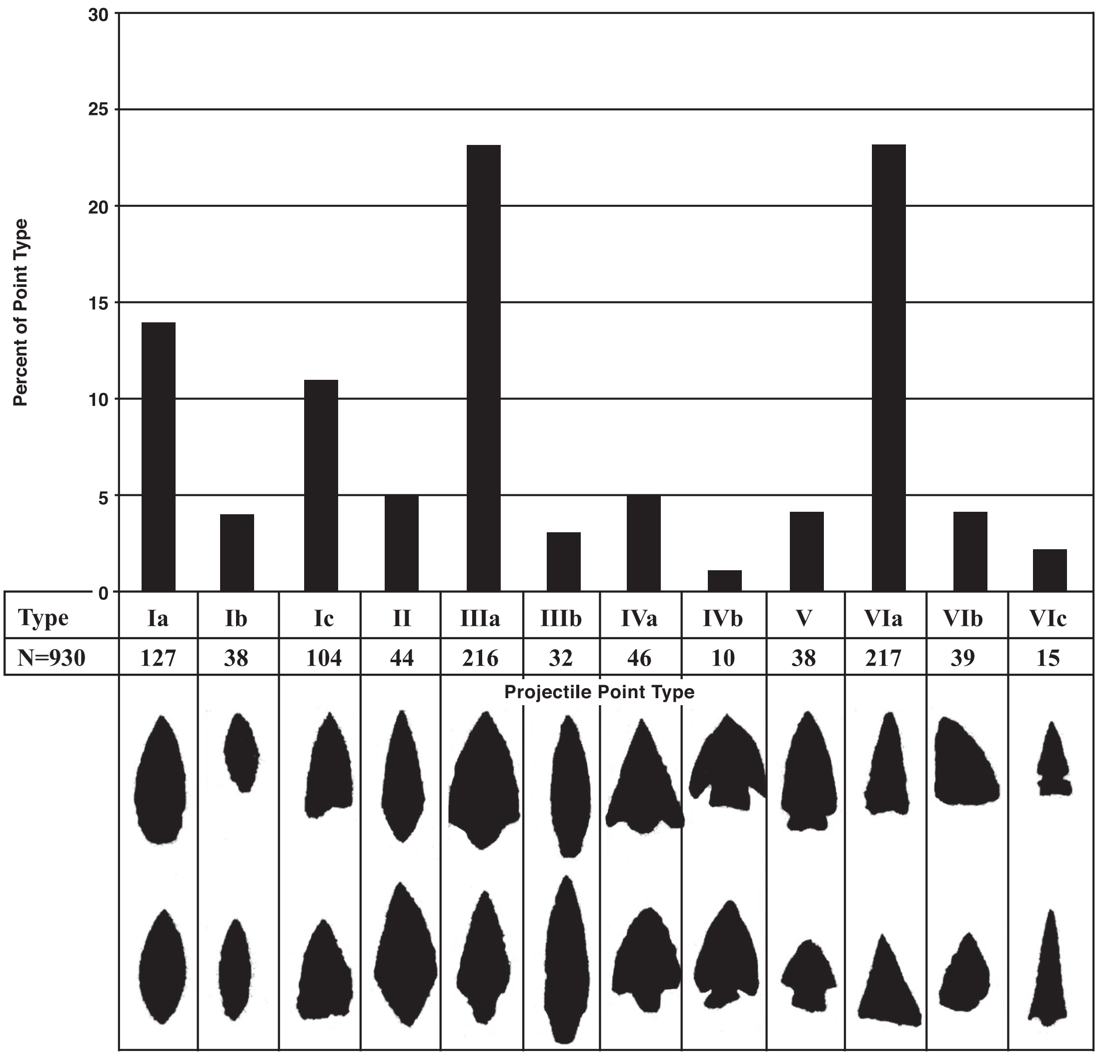


Figure 2. Graph showing percentages of projectile point types in the entire sample of 930 points.

cedony, chert, quartz crystal, and slate. Many of these were probably traded in as finished artifacts, although raw obsidian that came mostly from eastern Oregon with a small amount from Mt. Garibaldi just north of Vancouver was worked locally (Carlson 1994), and nodules of yellow chalcedony are present in the conglomerate that underlies the Helen Point site.

Projectile Point Types

In the discussion of the dating of the different types, the emphasis is on the time period when the type is most common rather than on the entire possible time range of the type since with the kind of settlement pattern and the nature of shell midden stratification some points from earlier or later periods can easily be intruded from earlier or later periods. The overall trends in projectile point form are from leaf-shaped and diamond unstemmed forms to leaf-shaped stemmed and shouldered forms to barbed foliate or triangular forms to foliate and triangular forms with a straight or irregular base accompanied by increased diminution in size and a decrease in frequency after 1100 BP.

Type I Foliate Bifaces without Stems or Barbs

This general type is demonstrably the oldest known type on the coast north of the Strait of Juan de Fuca, but is already accompanied by diamond and

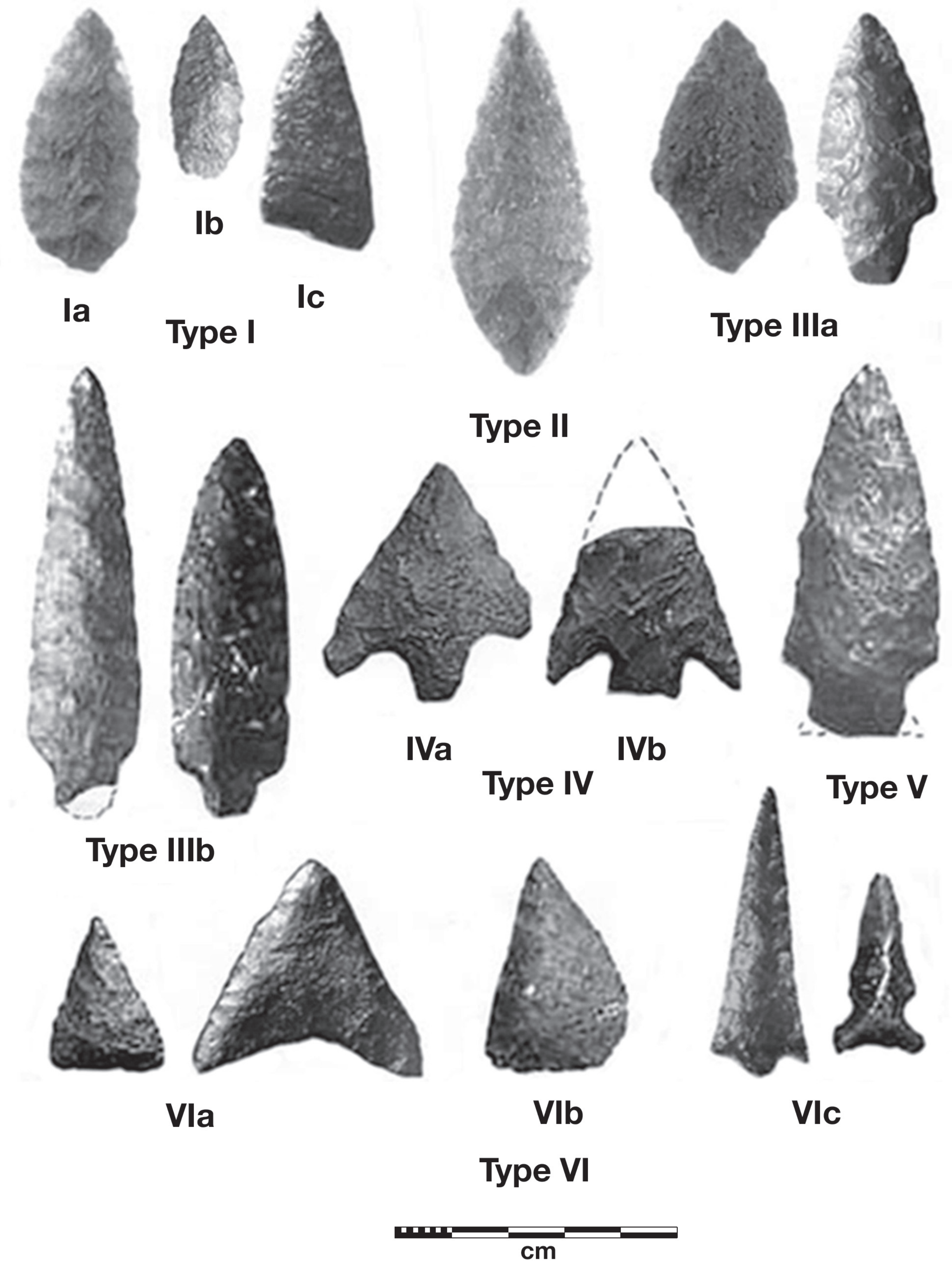


Figure 3. Examples of all the types of projectile points.

contracting stem types by the time of the earliest known components in the Gulf and San Juan Islands at 5400 BP. Some bifaces placed in this type may be stage II preforms for types with stems. Simple foliate points with rounded or pointed bases are the most common sub-type. They vary in size and in treatment of the base and these attributes are used as the basis for the three sub-types. In terms of use they could have functioned as arming tips for arrows, spears, or harpoon heads, or as knives. Types Ia and Ib are sometimes called "Cascade" points.

Type Ia Medium sized Foliate Points, Rounded to Pointed Base. N = 127 (57 measured) **Figure 4**. **Length**: 43 to 83 mm; 29 (51%) are 51 to 65 mm. **Width**: 12 to 40 mm with 33 (58%) from 21 to 27 mm. **W/L Ratio**: 0.23 to 0.67 mm range; 31 (54%) points are 0.36 to 0.46 mm.

Distribution. These points are the third most common type found in this region and occur at 19 sites (See Table 1).

Time Range. These points are found from the Mayne through the Marpole phases (>5000 to 1600 BP) but are not the most common type in these components. Thirteen (76%) of the 17 points of this type recovered in the 1968 SFU excavations at Helen Point are from levels that date between 3830 ± 60 and 3690 ± 70 BP. The two points from Long Harbour (Johnson 1991) are in Marpole phase deposits dated 2310 ± 60 and 2230 ± 50 BP. There is one point (Figure 4i) of this type with serrated edges from a San Juan phase component at the Moore site but this is the only reported occurrence in this late phase. In the Fraser valley (Schaepe 2003, Fig. 10:22) five points of this type are associated with the floor of the Mauer house dated between 4240 and 4220 BP. At the Saltery Bay site (DkSb–30) on the B.C. mainland northeast of the Gulf Islands a single point of this type was found directly associated with harbour porpoise bones in a hearth dated at 6050 ± 40 BP (Pegg et al. 2007:38).

Discussion. Some of these points are symmetrical and well-finished, but many are roughly finished and asymmetric. This simple leaf-shaped form is the prototype from which most later types on the entire Northwest Coast evolved. About 70% of the points from the Milliken phase in the Fraser Canyon (9000–8000 BP) are of this type and the other 30% are single-shouldered and probably represent a step in the later development of contracting stem points that begin in that locality with the Eayem phase (Carlson 1983:27). The direct association of a point

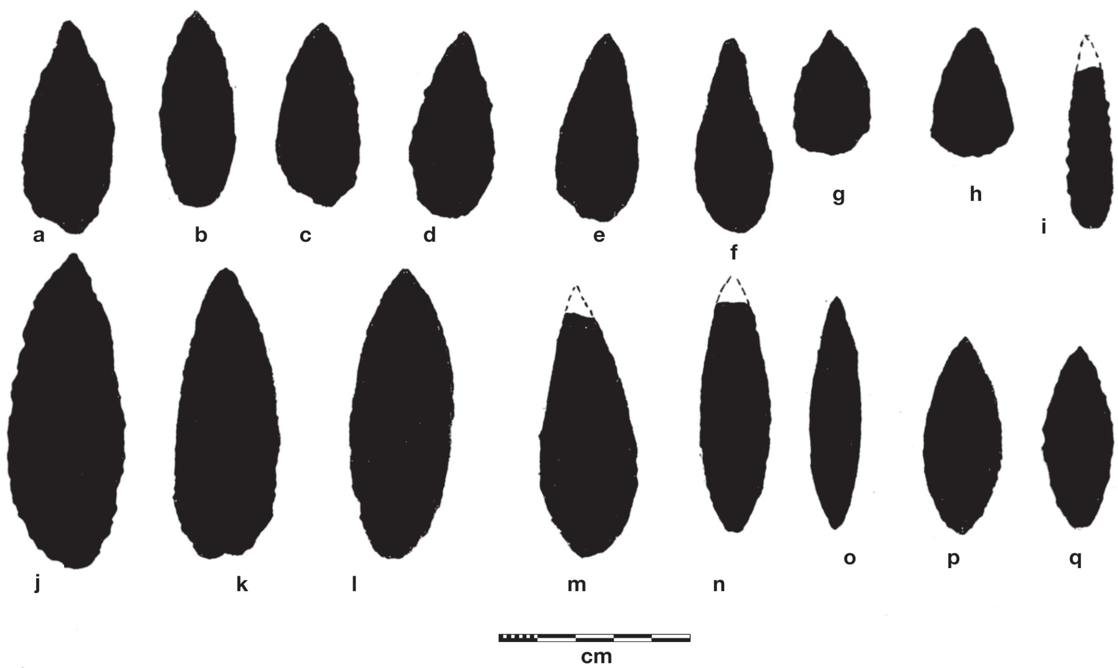


Figure 4. Type Ia points—Foliates with rounded or pointed base. a, b, j, m, p, q: Helen Point. c, d, e, f, k, n: Pender Canal DeRt– 2. g: Garrison. n, o: Cattle Point. i: Moore. l: Duke Point. Half size.

of this type with porpoise bones cited above suggests this type was used for sea hunting. A Type IIIa stemmed point was also found directly associated.

Type Ib Small Foliate Points, Rounded to Pointed Base. N = 38 (38 measured) **Figure 5**. **Length**: 28 to 42 mm.; 20 (53%) 34 to 39 mm; **Width**: 13 to 22 mm; 22 (58%) are 15-19 mm. **W/L Ratio**: 0.33 to 0.66 mm.

Distribution. Five sites with 34 (89%) points from the Helen Point site (See Table 1).

Time Range. At Helen Point one point of this type occurs in the earliest level dated at 5400 BP, and 21 (72%) of the 29 points from the 1968 SFU excavations come from Mayne phase levels that date between 5420 ± 230 and 3690 ± 70 BP. Single points are found in Marpole phase components at Garrison and Richardson. One point that is almost stemmed (Murray 1982, Fig. 29b) is from Component III at Duke Point that is post-Marpole in age.

Discussion. Many of these points are crudely flaked and some have incipient stems. The separation of this sub-type from Type Ia is justified by its overwhelming presence at Helen Point and because 90% of the points fall temporally in the Mayne phase. The size is small enough to suggest that these are arrow points although it is generally thought that the bow and arrow was not introduced until about 1600 BP when small triangular well-made notched points (Type VIc) made their appearance.

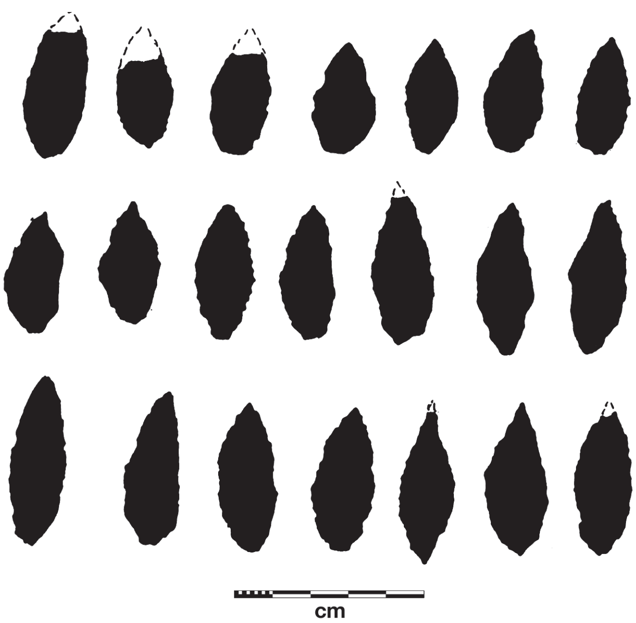


Figure 5. Type Ib points—small foliates with pointed, rounded, or irregular base. All are from Helen Point. Half size.

Type Ic Medium-sized Foliate Points with Straight/Irregular/Concave Base. N = 101 (52 measured) **Figure 6**. **Length**: 29 to 64 mm; 26 (50%) 38 to 49 mm; **Width**: 13 to 33 mm; 33 (63%) are between 21 and 27 mm. **W/L Ratio**: 0.30 to 0.84 mm; 24 (46%) are 0.48 to 0.65 mm.

Distribution. Fourteen sites (See Table 1).

Time Range. Unlike the other foliate types, this sub-type is probably restricted to the late Marpole phase. Three points were found in House 2 at Dionisio Point dated 1800–1500 BP (Grier 1999). At Helen Point sixteen(89%) of the eighteen points of this type from the 1968 SFU excavations were found in the top 40 cm of deposit above a date of 1370 ± 85 BP, in levels dated 1120 ± 100 and 1100 ± 90 BP. These dates are consistent with their occurrences at Cattle Point and English Camp.

Discussion. the short ranges in length, width, and proportions suggest that these points all served a similar purpose.

Type II Diamond

Diamond-shaped points are transitional in form between the simple leaf-shaped types and contracting stemmed types. Some of them are definitely finished points whereas others may be stage II preforms for contracting stem points.

N = 44 (35 measured) **Figure 7**. **Length**: 29 mm to 98 mm; 18 (51%) are 52 and 70 mm; **Width**: 13 to 43 mm; 19 (54%) are 23 to 30 mm. **W/L Ratio**: 0.31 to 0.77 mm.

Distribution. 23 of the points are from Helen Point and the remainder are from 7 other sites (Table 1).

Time Range. The earliest point (Figure 7p) of this type is a crude example from the lowermost levels at Helen Point with a ^{14}C date of 5420 BP. Of the 19 points of this type recovered from the 1968 SFU excavations 16 (84%) of them were found in levels dating between 3950 ± 250 and 3980 ± 130 BP. A quartz crystal point (Figure 7f) from Bliss Landing is from a component dated at 4000 BP. The three points from DeRt–2 date about 4000–3500 BP. The two crude examples from Duke Point may date to 4130 ± 100 BP (Murray

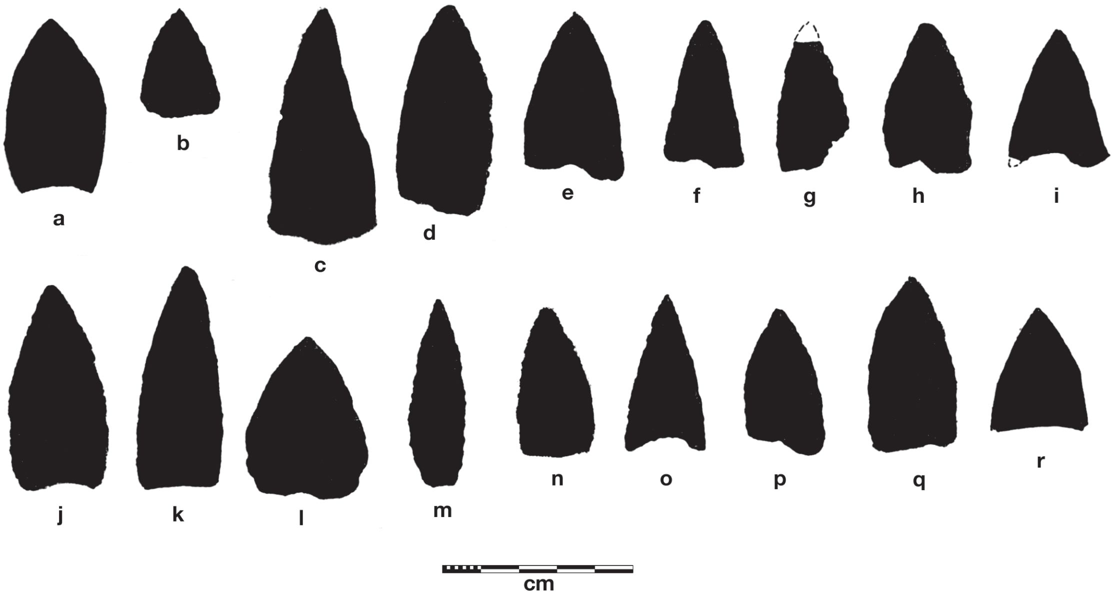


Figure 6. Type Ic points—foliates with straight, irregular, or concave base. a, e, i, r: Cattle Point. b, m, p: Garrison. c, q: False Narrows. d, j: Georgeson Bay. l, f, n: English Camp. g, o: Helen Point. h: Pender Canal DeRt–1. k: Pender Canal DeRt–2. Half size.

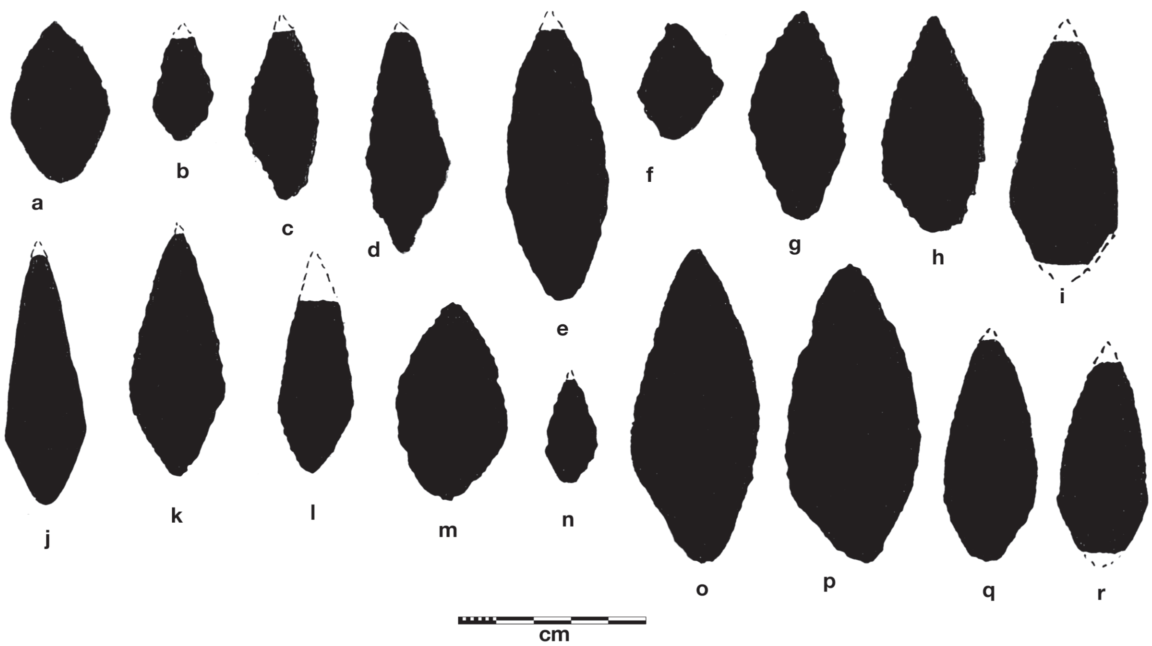


Figure 7. Type II points—diamond. a: Duke Point. b, e, g, h, k, l, m, n, p: Helen Point. f: Bliss Landing. i, o, r: Pender Canal DeRt–2. q: Pender Canal DeRt–2. Half size.

1982:130). Those from Montague Harbour are in the earliest component whose dates are uncertain although the lithic assemblage from that component (Mitchell 1970, Fig. 31) is Mayne phase in composition. Of the two points from DeRt–1, one was found on the beach and is undated and the other is a well-rolled specimen (Figure 7k) found in Marpole phase deposits that had obviously been picked up on the beach. At the Blufftop site on Denman Island Eldridge (1987) illustrates nine points of this type radiocarbon dated to 3500 BP. Overall the type is primarily if not entirely Mayne phase in age (>5000 to 3500 BP).

Discussion. One of the large diamond-shaped bifaces classified as a dagger (Figure 3g) is also from Mayne phase deposits at Helen Point.

Type III Foliate Points, Unbarbed, with a Contracting or Parallel-sided Stem.

Contracting stem points with sloping to straight shoulders and no barbs and generally convex sides are the most common type in the entire sample and have been subdivided into two sub-types. There are 230 examples of which just under half (114) came from the Helen Point site.

Type IIIa Medium-sized Foliate with Contracting/Parallel-sided Stem. **N = 216** (179 measured) **Figure 8**. **Length**: 34 to 90 mm; 94 (53%) are 45 to 63 mm; **Width**: 12 to 50 mm; 100 (56%) are 21 to 30 mm; **W/L Ratio**: 0.28 to 0.85 mm; 95 (52%) are 0.41 to 0.54 mm.

Distribution. Thirteen sites (See Table 1.)

Time Range. This type dates from the Mayne phase through the Marpole phase 5400 to 1500 BP with the highest frequency during the Mayne phase. The earliest point of this type is in the lowermost level of the 1968 SFU excavations at Helen Point with a radiocarbon date of 5400 BP. Highest frequency of this type is at Helen Point in levels dating between 5420 and 3690 BP in which 49 (83%) of the 59 points of this type were found. Four points of this type were associated with Burial 84–46 at Pender (DeRt–2) dated at 3570 ± 140 BP, and the type continues at that site to about 3000 cybp (Figure 18). In the Fraser Valley at the Mauer site (LeClair 1976) there are three points of this type associated with the Mauer House dated 4240–4220 BP (Schaepe 2003) although not directly with the floor level. At the Saltery Bay site (DkSb–30) on the B.C. mainland northeast of the Gulf Islands a single point of this type was found directly associated with porpoise bones in a hearth dated at 6050 ± 40 BP (Pegg et al. 2007:38) that makes this the earliest dated point of this type in the entire region.

Discussion. There is considerable variability in this type and it is possible that additional sub-types should have been recognized. The most common form is a large broad point with sloping shoulders and a tapering stem (Figure 8a–v). Smaller points with a rectanguloid stem, that is sometimes parallel sided (Figure 8w–dd), could be considered to be a different type but seem to occupy the same time range as the larger broader points. Some of the larger points also have a rectanguloid stem. The shape of the blade of the vast majority of points is excurvate (foliate) although the range actually goes to straight-edged to incurvate. A small number of points (Figure 8ii) are transitional in form between Types Ia and IIIa, and a larger number (Figure 8ff, gg) are transitional in form between the Type II diamond-shaped points and the Type IIIa contracting stem points. Points with incipient stems (Figure 8hh) may be unfinished second stage examples. Several points (Figure 8jj, kk) have incipient barbs and are transitional in form between Type IIIa and the stemmed and barbed forms of Type IV. The association with porpoise bones cited above suggests this type is part of sea hunting equipment.

Type IIIb Lanceolate with Contracting/Parallel-sided Stem. **N = 32** (21 measured) **Figure 9**. **Length**: 53 to 97 mm; 11 (52%) are 63 to 75mm; **Width**: 16 to 30 mm; 12 (57%) are 20 to 23 mm; **W/L Ratio**: 0.22 to 0.35 mm; 16 (76%) are 0.30 to 0.35 mm in width/length ratio and the remaining five (24%) are 0.22 to 0.27 .

Distribution. Seven sites (See Table 1) with the most (13 points) from DeRt–2.

Time Range. Three points of this type (Figure 9a, f, o) were associated with Burial 84–46 at Pender (DeRt–2) dated at 3570 ± 140 BP. The other 11 points from DeRt–2 are from the Main Midden deposit in close proximity to this burial and date between 4000 and 3500 BP. The four examples from Helen Point are in deposits dating between 5420 and 3690 BP. The two points from Duke Point (Murray 1982, Fig. 21a,b) are from Component II

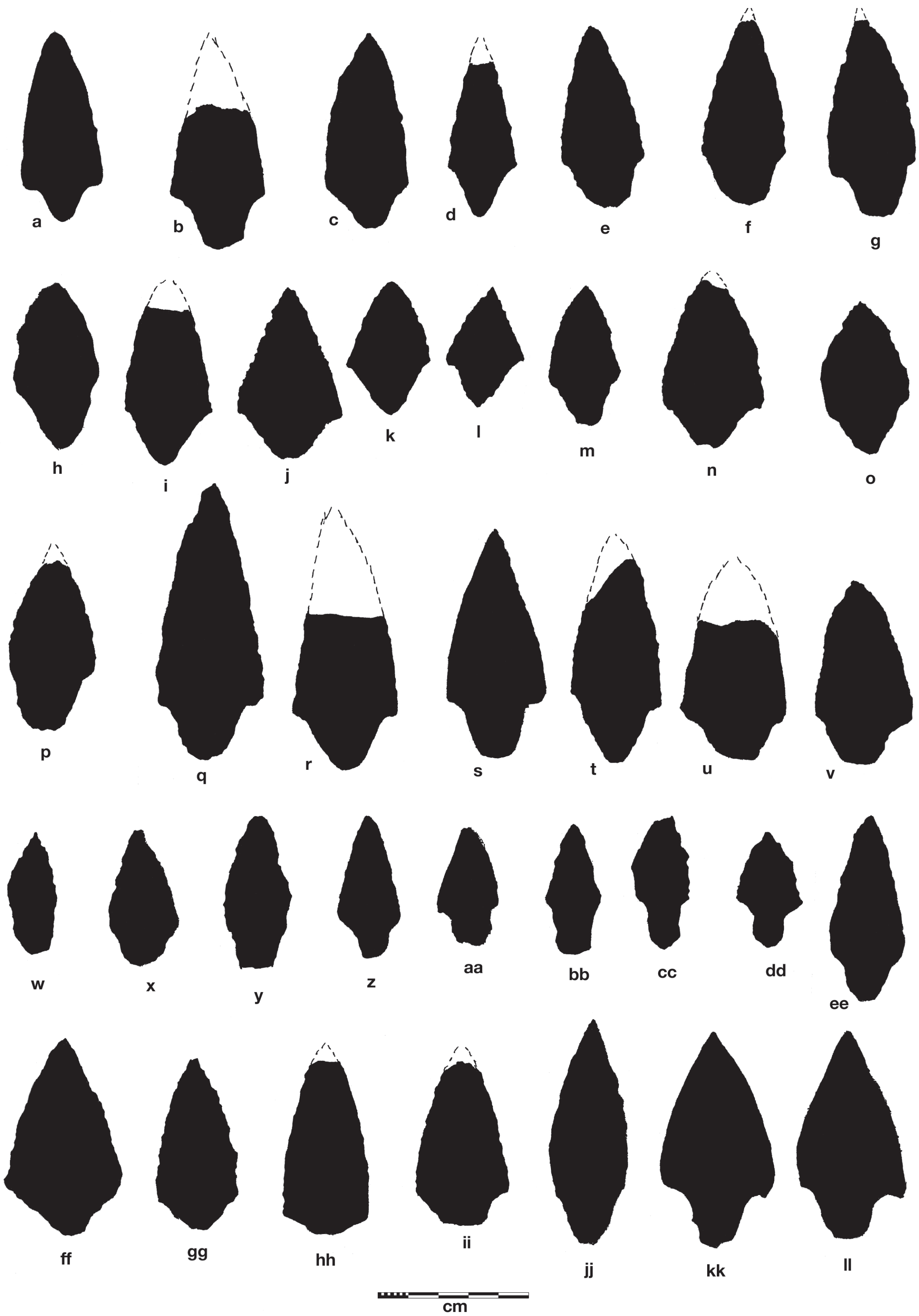


Figure 8. Type IIIa points—contracting stem. a, bb, dd, jj: Cattle Point. z: Argyle Lagoon. ee: Pender Canal DeRt–2. ii: Montague Harbour. Remainder are from Helen Point. Half size.

that recent redating places between 2950 and 2250 BP (Deo et al. 2004). The DeStaffany site dated at 3750 ± 50 and 4750 ± 50 BP yielded one point of this type (Kenady et al. 2002, Fig. 14) (Figure 8h). The one point from English Camp (Stein 2000:55) appears to be associated with the Marpole phase as is the one from Dionisio Point, although for the most part these points mark the transition from the Mayne to the Locarno Beach phase.

Discussion. These points are long and narrow. The ratio of width divided by length must be no larger than 0.35 mm to be classified as lanceolate. These points are distinguished by their lanceolate dimensions and the usual high quality of their manufacture.

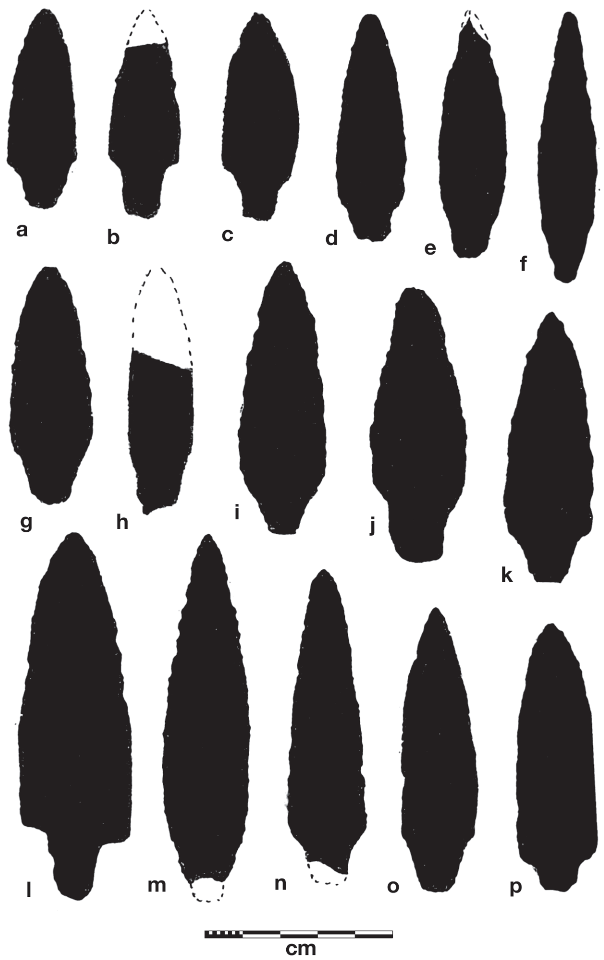


Figure 9. Type IIIb points—lanceolate with contracting to parallel-sided stem. a, d, f, g, i, k, l-p: Pender Canal DeRt–2. j: Duke Point. c: Garbiola. h: DeStaffany. e: Helen Point. Half size.

Type IV Stemmed and Barbed

In this type both sides of the base are indented to form a stem so that when hafted the widest part of the point at the base forms barbs. Two sub-types based on the shape of the stem are present.

Type IVa Barbed with Contracting Stem. N = 50 (29 measured) **Figure 10a–k; Figure 11. Length**: 30 to 77 mm; 16 (55%) are from 43 to 58 mm; **Width**: 21 to 50 mm; 16 (55%) are from 32 to 41 mm; **W/L Ratio**: 16 (55%) are 0.60 to 0.76

Distribution. Twelve sites (See Table 1)

Time Range. The points of this type are most common in the Marpole phase, but begin much earlier. The earliest point of this type (Figure 10j) from a dated context is from Pender DeRt–2 from a level dated at 3720 ± 240 BP. A nearly identical point (Figure 17i) is from a disturbed context at the same site. There is only one point of this type from a Locarno Beach phase context, and it is from Georgeson Bay I that has a ^{14}C date of 2820 ± 100 BP (Haggerty and Sendey 1976:66, Fig. 8d). At Helen Point these barbed points are late and occur in levels above 40 cm making them younger than 1370 BP and near two dates of 1100 and 1120 BP. The four points from Dionisio Point date 1800–1500 BP (Grier 1999).

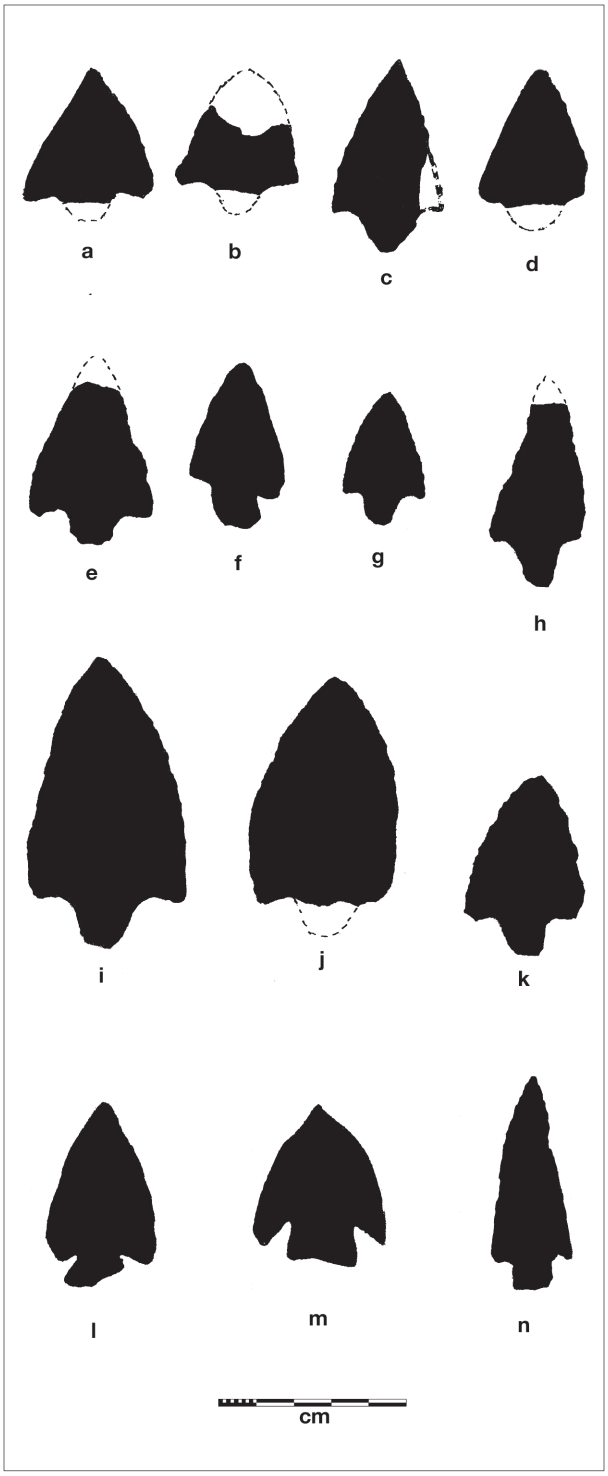
Discussion. The points with excurvate sides (Figure 10i–k) are the older variety and those with straight and incurvate sides (Figure 11) are more recent. The latter may be re-sharpened points. Flaring barbs is an attribute of Marpole phase harpoon points made of antler as well as an attribute of these flaked stone points from Marpole phase assemblages. Earlier bone and antler harpoon points usually have low enclosed barbs.

Type IVb Barbed with Straight to Expanding Stem. N = 10 (4 measured) **Figure 10l–n. Length**: 44 to 55 mm; **Width**: 22 to 44 mm. **W/L Ratio**: 0.44 to 0.88 mm.

Distribution. Cattle Point, English Camp, Poets Cove, and Helen Point.

Time Range. Marpole phase and probably Locarno Beach phase.

Discussion. Two of the points from Cattle Point (Figure 10m) are in all attributes except stem shape more similar to Type IVa and might have been better included in that sub-type. The expanding stem of three of the other points was formed



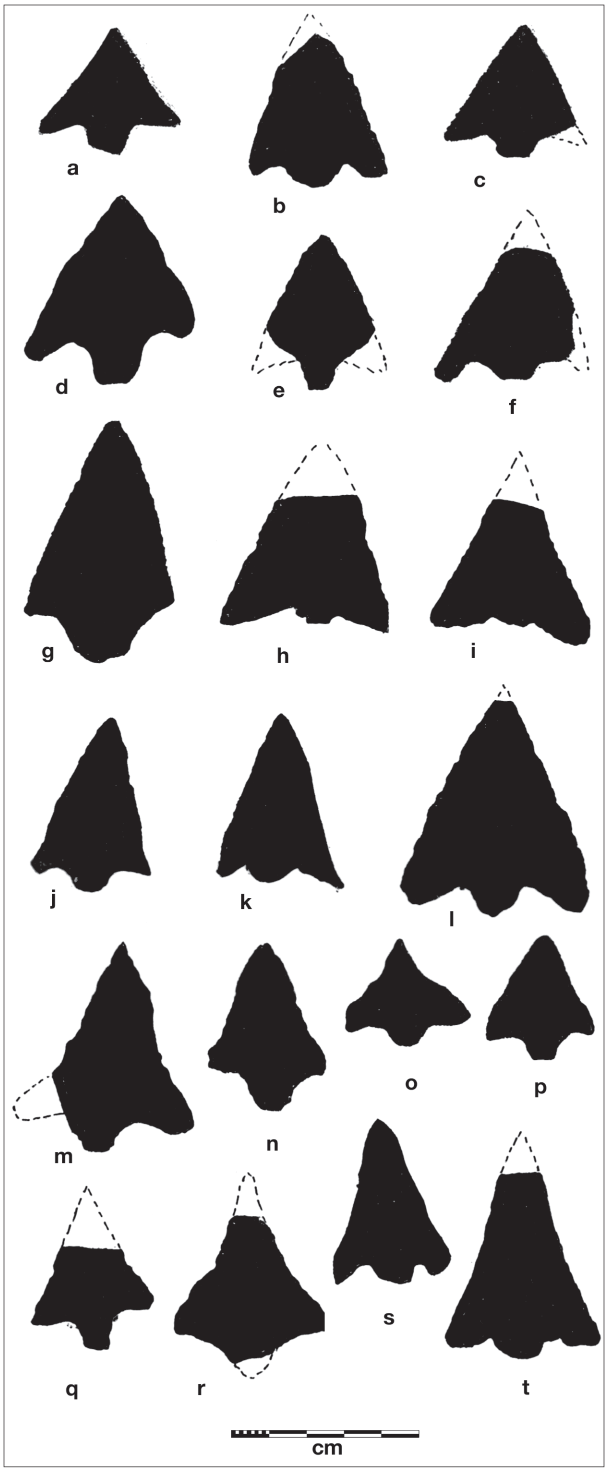


Figure 10. Type IVa points—stemmed and barbed with excurvate sides and contracting stem (a–k), and Type IVb—stemmed and barbed with straight to expanding stem (l–n). a, c, d, n: Helen Point. b: Georgeson Bay. e, g, l: English Camp. f, m: Cattle Point. h, k: Pender Canal DeRt–1. i, j: Pender Canal: DeRt–2. Half size.

Figure 11. Type IVa points—stemmed and barbed with straight (a–l) or incurving (m–t) sides and contracting stem. a, b, c, f, l, n, p: English Camp. d, m, s: Cattle Point. e, q: Pender Canal DeRt–1. g: Lime Kiln. n, i, e, t: Helen Point. j: Argyle lagoon. k: False Narrows. r: Garrison. Half size.

by corner-notching. The one from Helen Point (Figure 10n) is made of chert and the one from English Camp (Figure 10l) is also of an exotic material (Stein 2000:55). These points are probably trade items from outside the region.

Type V Expanding Stem Points, Not Barbed

There are 32 points of this unbarbed type from ten sites (Table 1). They date to the Marpole phase, but are never the most common type in Marpole assemblages. They are sometimes described as side-notched.

N = 38 (27 measured) **Figure 12**. **Length**: 27 to 74 mm; 15 (56%) 43 to 56 mm; **Width**: 17 to 31mm; 15 (56%) 22 to 25 mm; **W/L Ratio**: 0.32 to 0.78 mm; 16 (59%) 42 to 49 mm.

Distribution. Ten sites with ten of the 38 points from Cattle Point (See Table 1).

Time Range. These points are probably all Marpole phase, 2400 to 1600 BP, although the two points from Georgeson Bay I (Haggarty and Sendey 1976, Fig. 8a, b) indicate they may first appear in the Locarno Beach phase.

Discussion. Some examples of this type that appear to have been re-sharpened (Figure 12i–k) could be confused with younger side-notched arrow points, although they are of cruder manufacturer and thicker.

Type VI Triangular

Triangular points meaning those with straight rather than curved sides are most abundant late in the sequence. King (1950) first noted this trend in analyzing the Cattle Point material. Points (Type VIb) that are curved on one side and straight on the other seem to occupy much the same chronological position and have been grouped as a separate subtype. Small corner or side-notched arrow points also have straight sides and are grouped as a further sub-type.

Type VIa Triangular, Un-barbed , Un-notched with Variable Base. N = 217 (68 measured) **Figures 13, 14. Length**: 22 to 62 mm; 35 (51%) 34 to 42 mm; **Width**: 13 to 33 mm; 36 (52%) 19 to 23 mm; **W/L Ratio**: 0.32 to 0.88 mm; 38 (56%) 0.44 to 0.70 mm.

Distribution. Ten sites (See Table 1).

Time Range. Sixty-eight (31%) of the points of this type come from the English Camp site. In the 1950 excavations 46 (21%) of the 93 points are of this type (Carlson 1954:95). Sixteen came from the later excavations where Kornbacher (1992:171–175) reports eight (54.6%) of the projectile points in Ethnozone I, and four (66.7%) in Ethnozone II. These two ethnozones have very much the same range of dates that overlap from 1690 to 160 BP and suggest mixing of deposits of different time periods. The only other types present are contracting and expanding stem foliates (Types IIIa, V) present only in Ethnozone I (Kornbacher 1992, Table 3). At the Garrison site (Carlson 1954, 1960) nine (47%) of the 19 points are this type, and were found in all three stratigraphic units dating between 2100 and 1580 BP. At Helen Point 33 (89%) of the 37 points of this type from the 1968 SFU excavations occur in levels above 40 cm in deposits younger than 1370 BP with dates from 1120 to 649 BP. At Pender DeRt–2 this type is only found in the Late Midden deposit where the nearest radiocarbon date is 1450 ± 130 (RIDDL 270). At Dionisio Point one point dates 1800–1500 BP. Overall, this type dates to the Marpole phase and later.

Discussion. The use to which these bifaces were put is uncertain. A few of them are in the length and width range of arrow points and may have served that purpose, but most are broader than arrow points. Some are similar in size and shape to the ground slate points that served as end blades in composite harpoon heads, although none have been found in direct association with the hafting elements of such heads. Two (Figure 14n, o) may have been hafted as side-blades in a cutting or piercing implement.

Type VIb Leaf-triangular with one Straight and one Convex Side. N = 39 (28 measured) **Figure 15**. **Length**: 24 to 65 mm; 14 (50%) 36 to 46 mm; **Width**: 17 to 35 mm; 16 (58%) 22 to 27 mm; **W/L Ratio**: 0.43 to 0.80 mm; 14 (50%) 0.55 to 0.70 mm;

Distribution. Eight sites (See Table 1)

Time Range. Late Marpole. At Helen Point these points are all above 40 cm in depth and should date younger than 1370 BP. There are two dates on these late levels 700 ± 110 and 640 ± 90 BP.

Discussion. These bifaces may have been hafted as side blades.

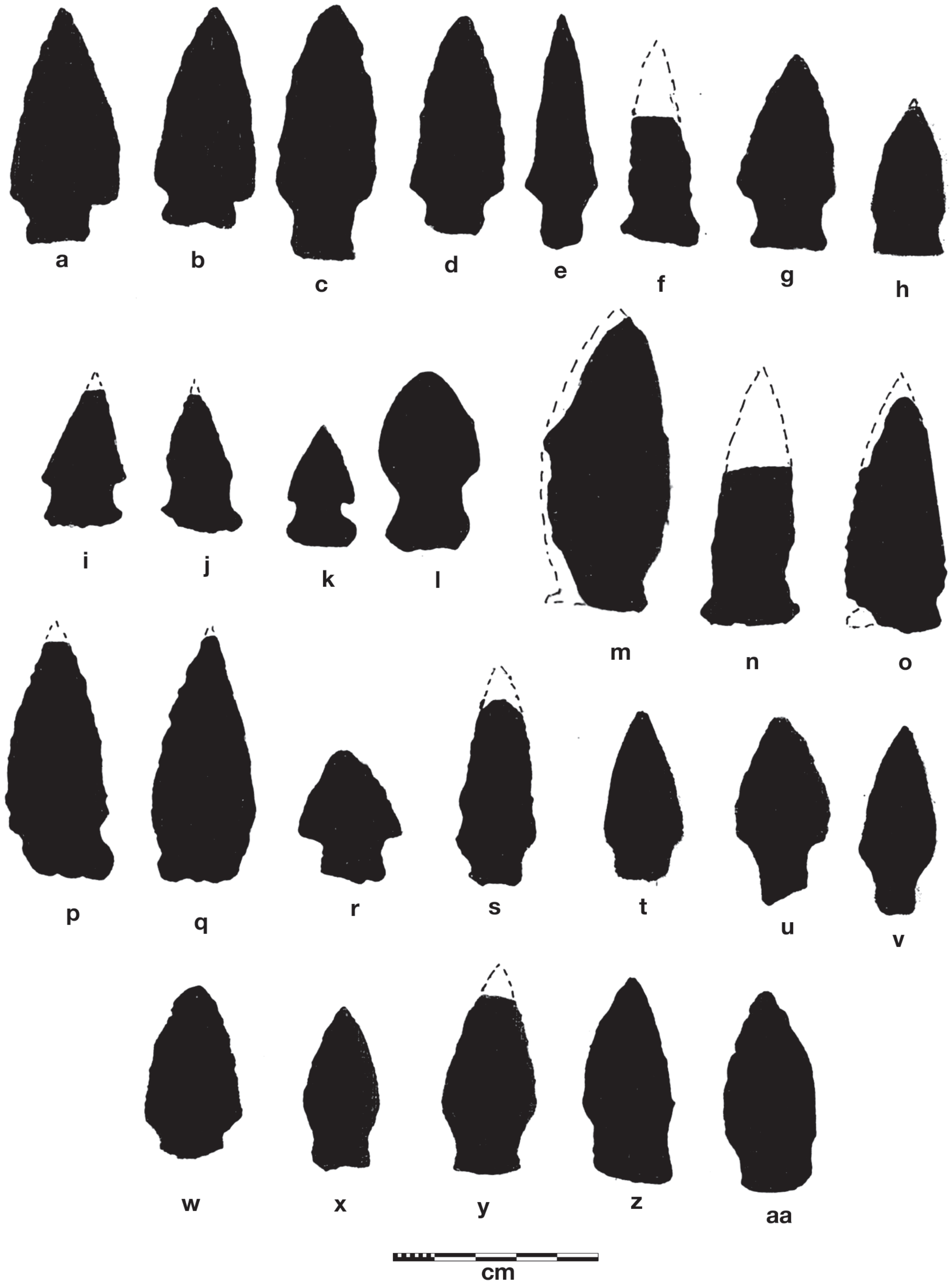


Figure 12. Type V points—straight to expanding stem points with foliate sides and occasional (re-sharpened?) incurvate or straight sides. a: Richardson. b, e, k, e, p, x, z: Cattle Point. c, d, g, j: Argyle Lagoon. f, i, n: Helen Point. h, o, t, u, v, y, aa: English Camp. m, r: Duke Point. q: Pender Canal DeRt 1. s, w: Georgeson Bay. Half size.

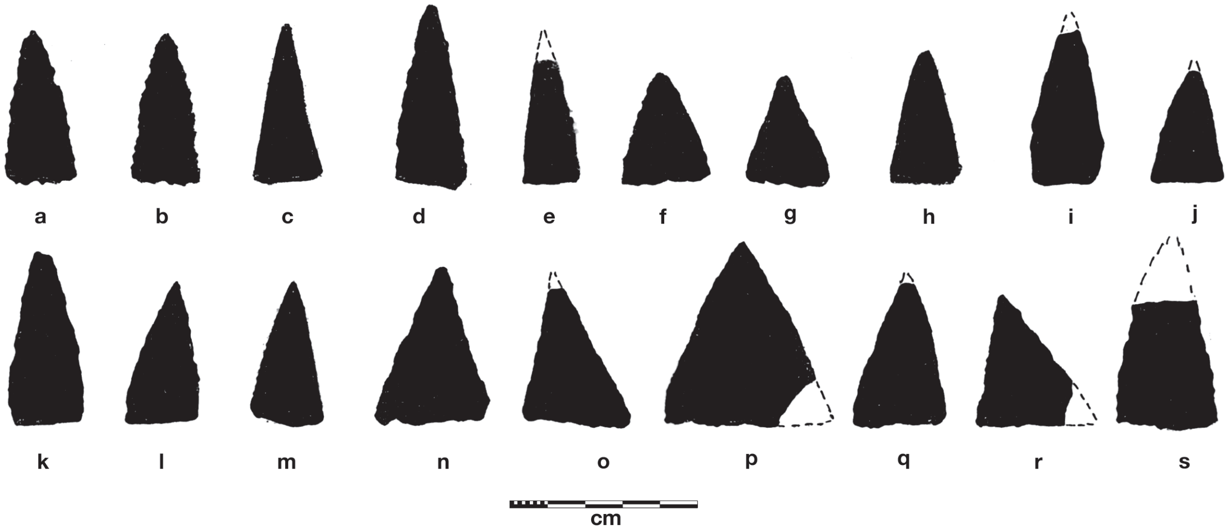


Figure 13. Type VIa points—plain triangular without stems, barbs, or notches, variable base. a, b, d, e, l, p, s: Helen Point. c, f, g, j, k, m, r: English Camp. h: False Narrows. i: Cattle Point. h, o, q: Garrison. Half size.

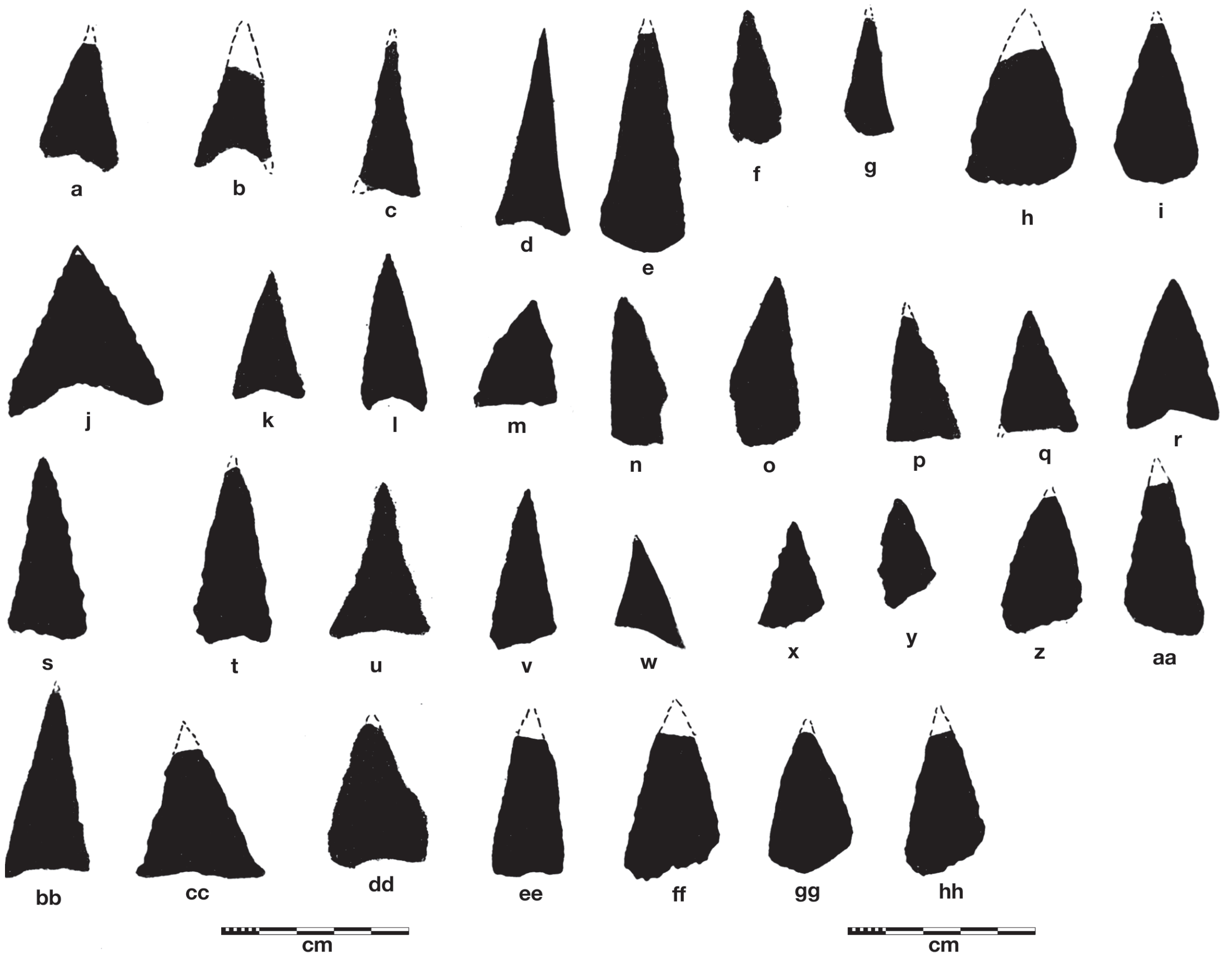


Figure 14. Type VIa points (cont'd). a, c, p: Montague Harbour. b, e, h, j, l, m, o, q, s, v, w, x, z, aa, ff, hh: Helen Point. d, g, k: False Narrows. f, y: Georgeson Bay. i, r: Garrison. n: Duke Point. t, cc: Cattle Point. u, bb, dd, ee, gg: English Camp. Half size.

Type VIc Small Notched Arrow Points. **N = 15** (14 measured) **Figure 16**. **Length**: 25 to 51 mm; seven (50%) 31 to 34 mm; **Width**: 11 to 22 mm; 12 (86%) 15 to 20 mm; **W/L Ratio**: 0.33 to 0.61 mm; seven (50%) 0.47 to 0.55 mm;

Distribution. Six sites with one to three points each (See Table 1).

Time Range. These points are post-Marpole in age and date after 1400 BP. The closest site where they are well dated is Belcarra on the lower Mainland with Belcarra II dated 1620 and 1070 BP (Charlton 1980) that may mark the time of the introduction of the bow and arrow. At Helen point the one example from the 1968 SFU excavations was found in the topmost level.

Discussion. One point (Figure 16a) lacking notches from the Old Beach at Cattle Point his shown with this type as it is probably an unfinished arrow point.

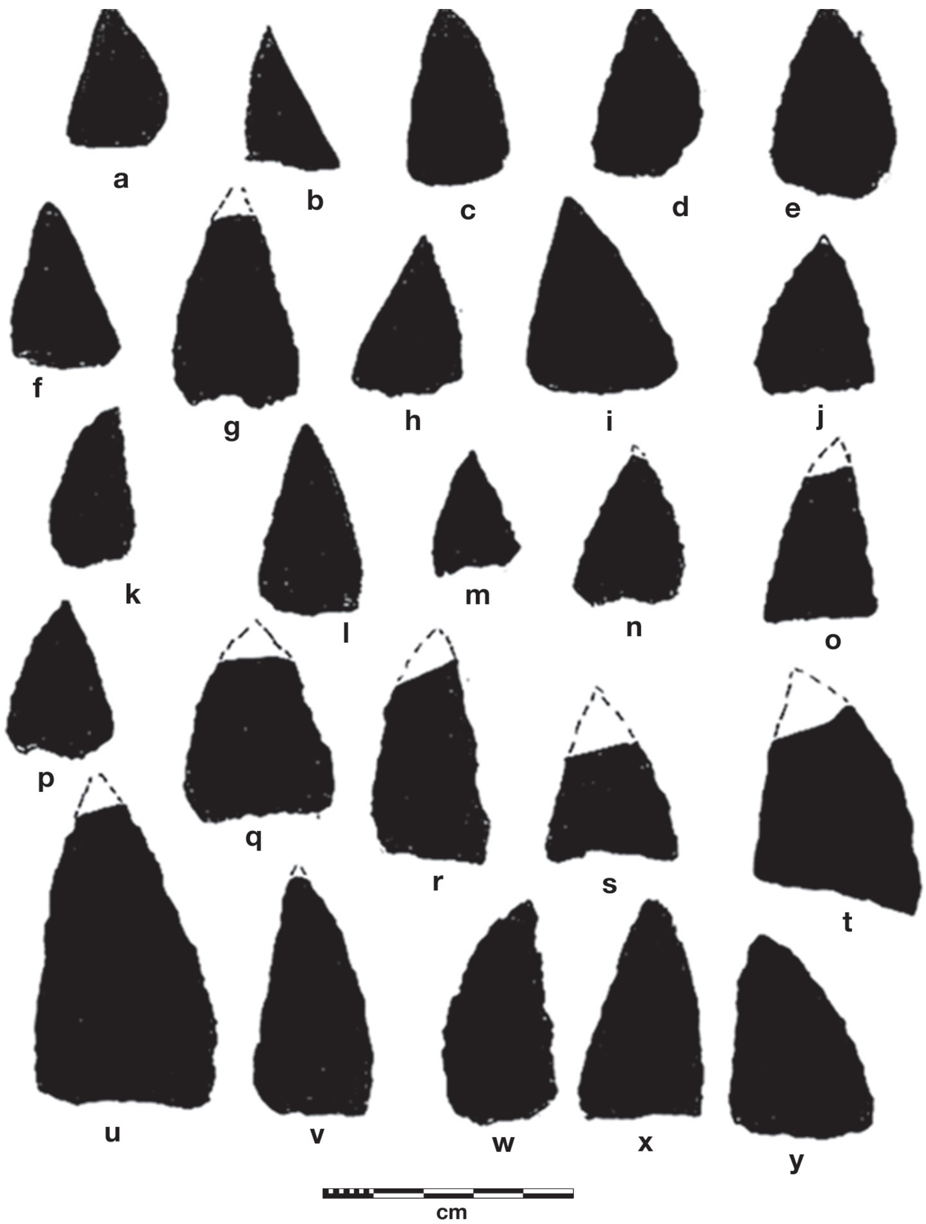


Figure 15. Type VIb—leaf-triangular without stems or notches. a, c, t, v: Garrison. b: False Narrows. d: Cattle Point. e, i, f, j, x, y: English Camp. g, h, m, q, r, u, w: Helen Point. k, l, n, p: Montague Harbour. g, o: Pender Canal DeRt–2. Half size.

Large Bifaces

Large bifaces (Figure 17) have been separated from other bifaces because their size indicates they were more likely used as daggers or knives than as tips for projectiles. Large bifaces are defined as those over 100 mm in length. They are few in number, but are known in southwest B.C. from as early as the Milliken phase (9000–8000 BP) in the Fraser Canyon where one large biface measures 175 mm in length (UBC collections). They occur in the same shapes as Type Ia (foliate with rounded base), Type II (diamond), and Type IIIa (foliate with contracting stem). Pronounced bilateral serration occurs on the edges of one large Marpole phase specimen. These large bifaces have not been included in the point counts.

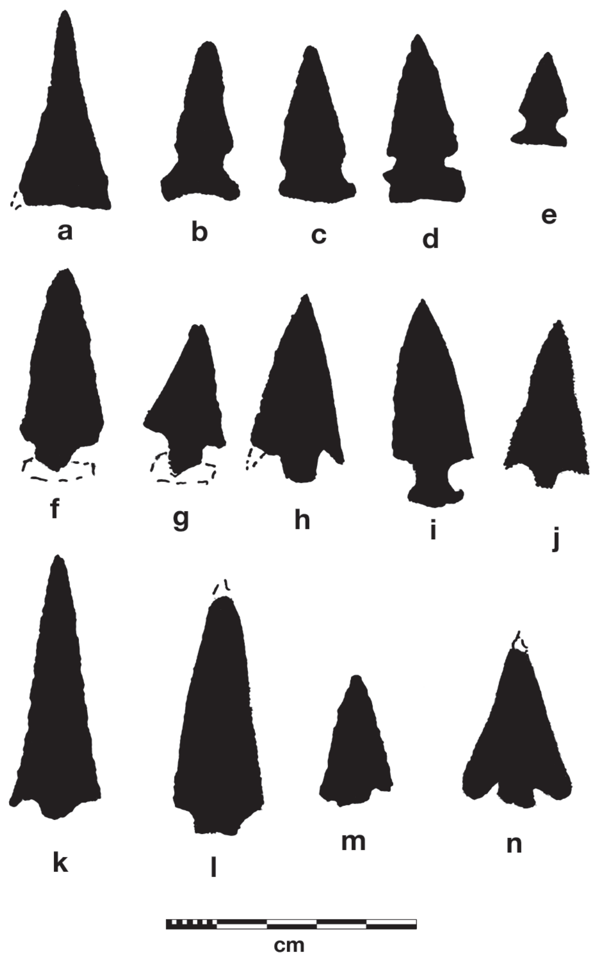


Figure 16. Type VIc points—notched arrow points. a, b, d: Cattle Point. c, g, m: Helen Point. e, f: Duke Point. h, i: False Narrows. j, n: English Camp. k, l: Pender Canal DeRt–2. Half size.

N = 12 Figure 17. Length: 109 to 228 mm. **Width**: 30 to 52 mm. **W/L Ratio**: 0.19 to 0.37 mm with six (67%) between 0.26 and 0.29 mm.

Distribution. Five sites: Pender (DeRt–2), Helen Point, False Narrows, DeStaffany, Montague Harbour (See Figure 1).

Time Range. Mayne through Marpole phases.

Site Summaries

The excavations from which this sample of 918 points was obtained are summarized in this section. Their locations are shown on the map in Figure 1, and the numbers of points from each site are listed in Table 1. Sites from which no chipped stone points were recovered have not been included. All of the sites except DeStaffany incorporate shell middens although four of the sites—the bluff areas of Cattle Point, Argyle Lagoon, Dionisio Point and Helen Point—have extensive basal cultural deposits that lack shell. The non-shell deposits in these sites are best understood as higher elevation landward remnants of sites that may once have had associated shell midden deposits at their beachward edges that were destroyed by rising sea levels. With the stabilization of sea levels and formation of new beaches, humans would then have deposited shell midden debris on top of the older site remnant.

Helen Point (DfRu–8)

This site fronting Active Pass on Mayne Island was first tested in 1966 by Jon Hall (1968) of the University of Victoria (UVic), then again in 1968 by John Sendey for the British Columbia Provincial Museum (BCPM) (McMurdo 1974), and also in 1968 by the Simon Fraser University (SFU) Archaeological Field School directed by Roy Carlson (1970). The points from the latter excavation were used in a chronological chart of point types of the Lower Fraser and Gulf Islands (Carlson 1983, Fig. 1:7). At 5420 ± 230 BP this site has the earliest beginning date of all the sites in the study area and the largest number of points. The Mayne phase deposits, that contain most of the points and thousands of pieces of cores and other debitage, are associated with the burial area of the site at this period, and it is probable that the makers of these points were buried there. It is also probable that these individuals were specialists in the manufacture of flaked stone artifacts and that this

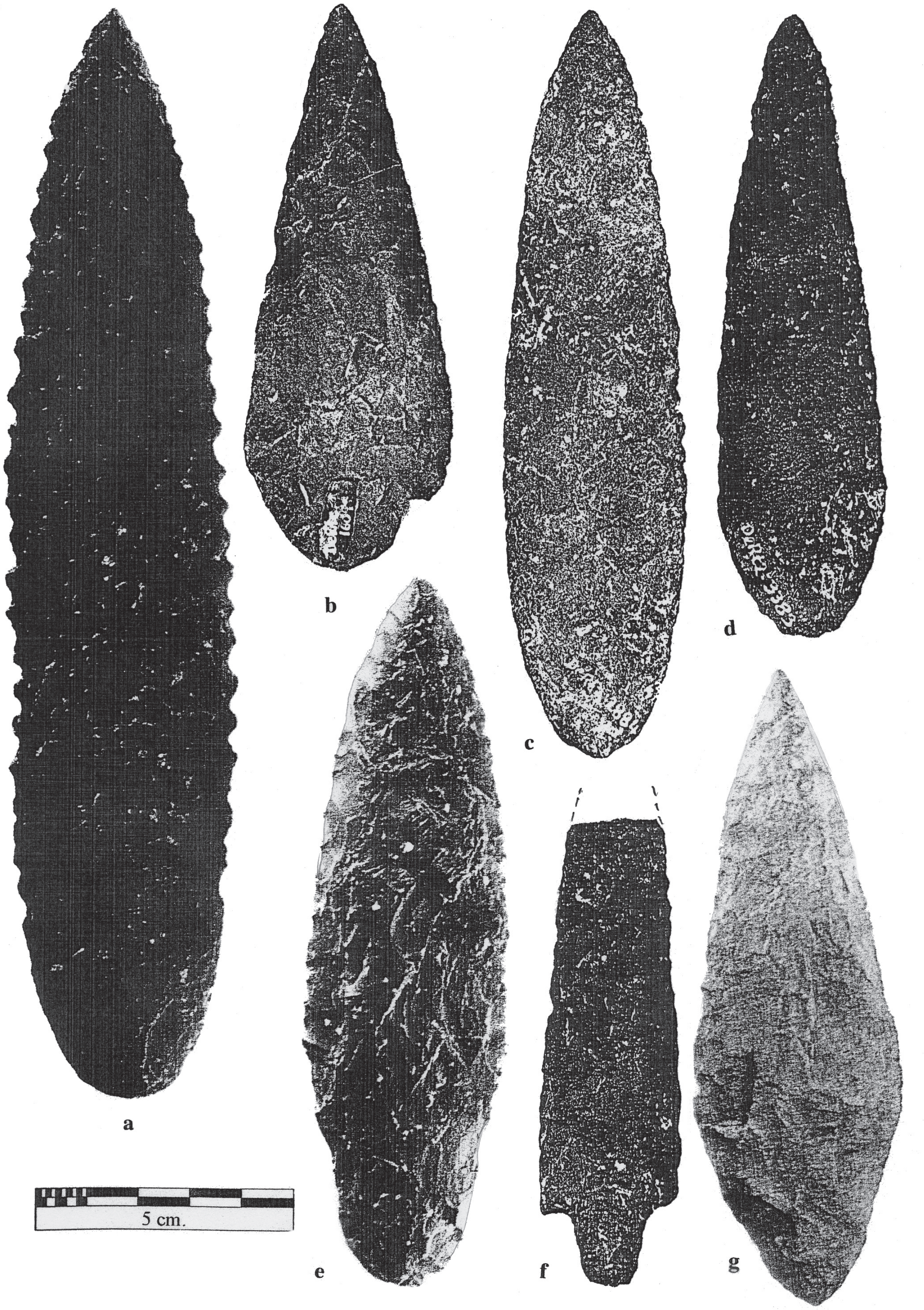


Figure 17. Large bifaces classified as daggers. a, e, f, g: Helen Point (DfRu–8). b, c, d: Pender Canal (DeRt–2). a, b, e: Marpole phase. c, d, f, g: Mayne phase.

site served as a distribution point from which these artifacts were traded to the surrounding region. The site has components of all four cultural phases found in this locality—Mayne, Locarno Beach, Marpole, and San Juan—although the Locarno Beach phase is barely represented in the 1968 SFU excavations that produced the vast majority of the chipped stone points from the site (Carlson 1970).

The stratification (Figure 18) at the SFU excavated part of the site is complex and consists of a lowermost black matrix lacking shell dating between 5420 and 3690 BP containing Mayne phase cultural material including five burials, succeeded by a Marpole phase deposit with varying amounts of shell, followed by a shallow San Juan phase deposit with abundant shell. One hundred and ninety-six projectile points came from this excavation. Whereas the lower half of the deposit, 90 to 150 cm below the surface, was relatively intact, the upper portion contained mixed assemblages of both older and younger materials caused by the excavation of pits and depressions in the older deposits by the aborginal inhabitants. The

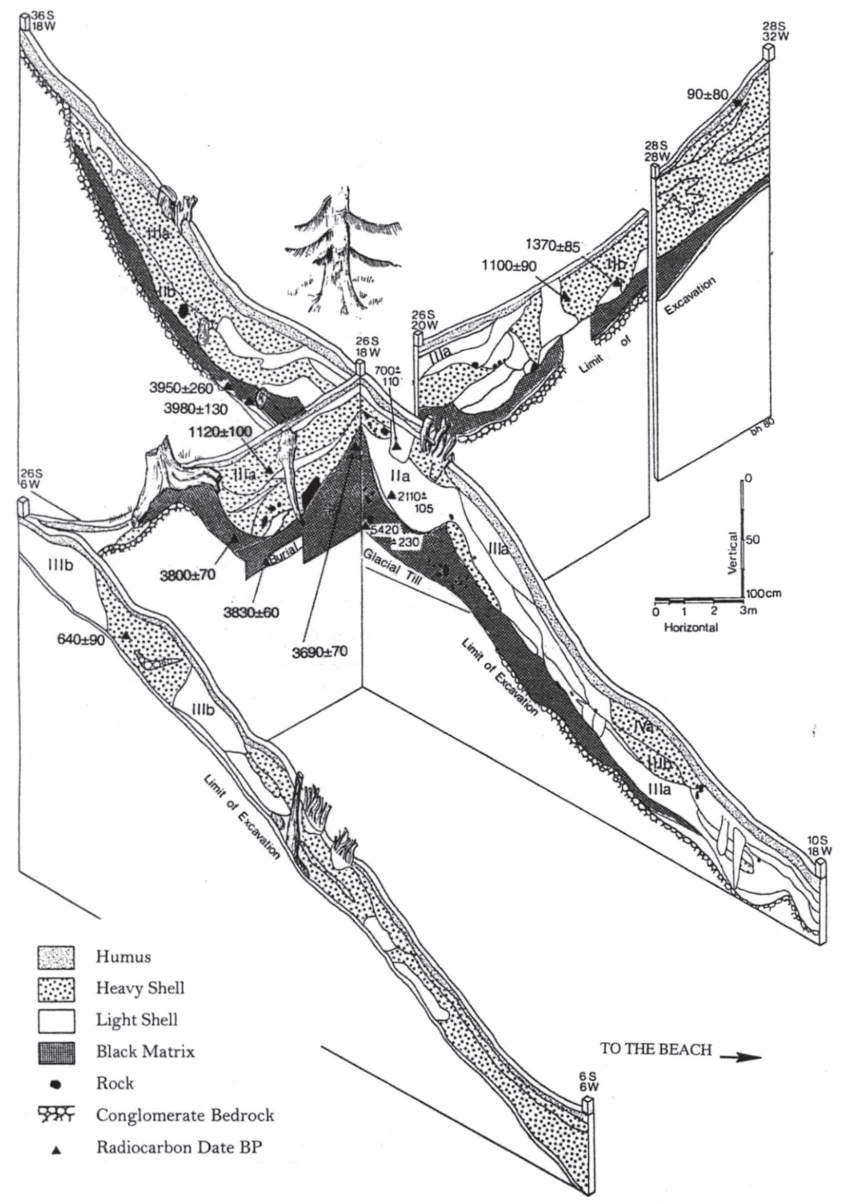


Figure 18. Stratigraphy at the Helen Point site (DfRu–8), the 1968 SFU excavations. Note that the vertical scale is double the horizontal scale.

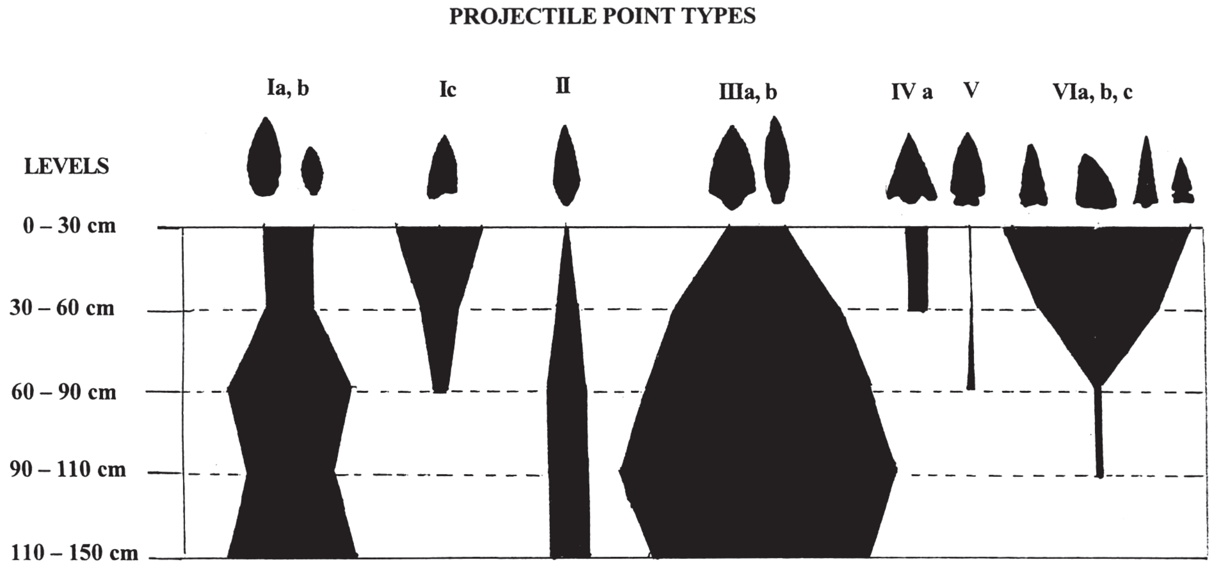


Figure 19. Battleship diagram of the 196 projectile points from the 1968 SFU excavations at Helen Point.

battleship diagram (Figure 19) showing the relative frequency of point types by depth without reference to stratification illustrates this mixing; the early types (Ia, Ib, II, III) continued to be found in upper levels although in diminished frequencies relative to the more recent types (Ic, IV, VI).

English Camp (45–SJ–24)

This site at the northern end of San Juan Island is sometimes known as British Camp and was initially tested by the University of Washington (UW) Field School in 1950 under the direction of A.E. Treganza. Although I participated in the excavation and wrote a description of the artifacts recovered (Carlson 1954), neither the site map and profiles, nor the field notes and catalog were available to me at that time. Further excavations were undertaken by the UW Field School from 1983 to 1989 directed by Julie Stein (1992) that produced 20 ^{14}C dates ranging from 1500 to 600 BP. Kornbacker (1992) analyzed the projectile points from this excavation. Stein (2000) mentions additional work at the site and illustrates additional projectile points. Both Marpole and post-Marpole components are present.

Cattle Point (45–SJ–1)

This site at the southern end of San Juan Island was excavated by the UW Field School directed by Arden King (1950) during 1946-47, and by Carroll Burroughs in 1948 (Carlson 1954, 1960). There are four horizontal divisions of this large site (King 1950, Fig. 1)—west bluff, east bluff, rock spur and old beach. Radiocarbon dates on the two bluff areas were obtained later (Robinson and Thompson 1981) on shell samples taken from level bags. These dates, corrected for the marine reservoir effect, plus the artifact types present indicate that the deposits date no earlier than the Locarno Beach phase. The east bluff has the oldest deposits and these overlap in time with those of the west bluff. The bluff and rock spur deposits in general cover the period from about 3000 to 1500 BP and are mostly Marpole phase. The deposits on the old beach are younger and probably cover the period from about 800 BP into the historic period.

Pender Canal (DeRt–1 and DeRt–2)

These two sites, sometimes referred to as the Canal Site, are situated at the south end of North Pender Island, and were partly destroyed by a ship canal dug between North and South Pender in 1911. DeRt–2 was first tested by Wilson Duff and Michael Kew in 1958 for the British Columbia Provincial Museum (BCPM), and DeRt–1 by John McMurdo for SFU in 1971. Later both sites were extensively excavated during 1984–86 by a joint salvage project between the provincial government Heritage Conservation

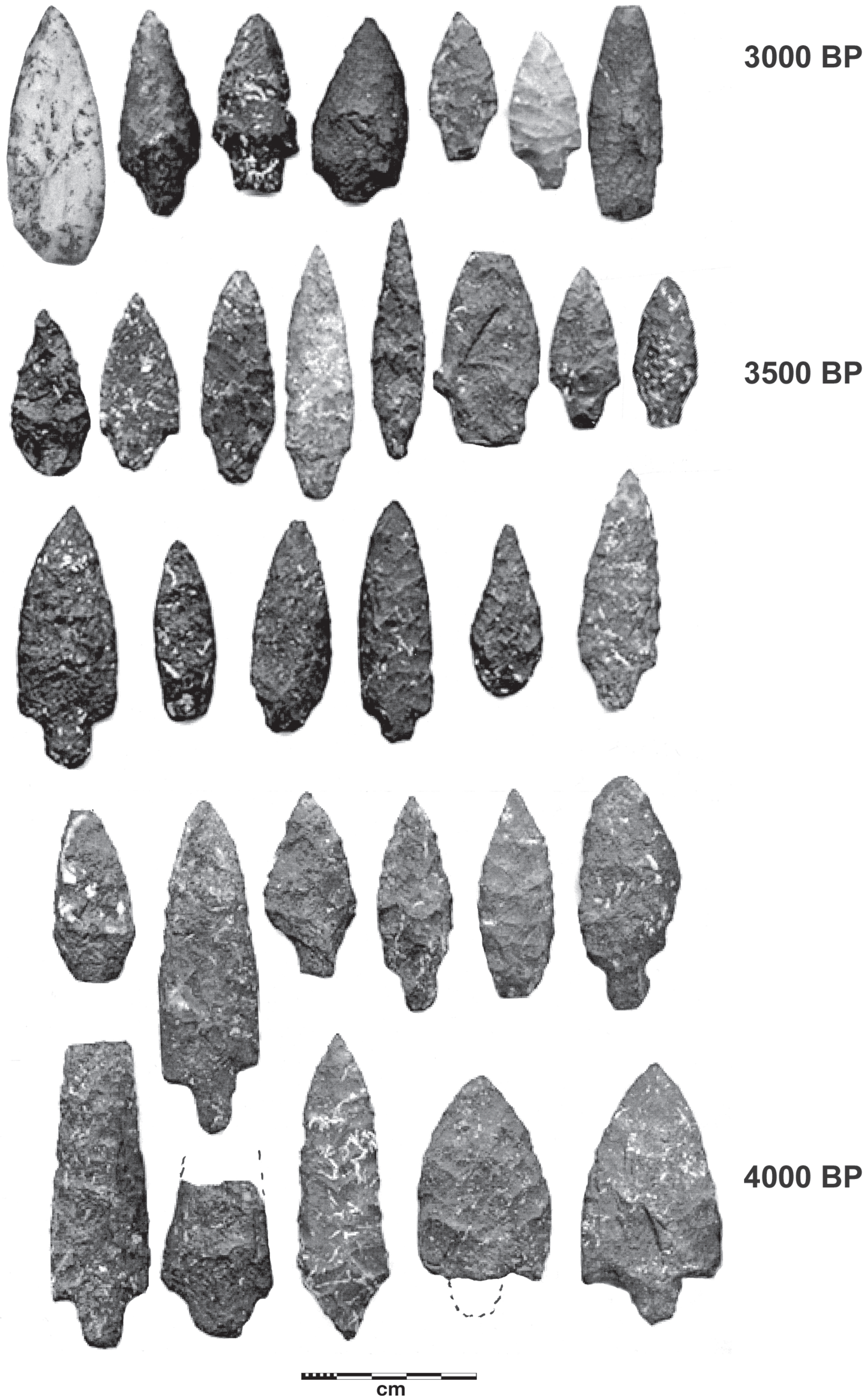


Figure 20. Sequence of projectile points from the main midden deposit at the Pender Canal site (DeRt–2) dated 4000 to 3000 BP. The eight points in the second row from the top were associated with Burial 84–46 radiocarbon dated at 3570 ± 140 BP. The point in the bottom row at the right end was found out of context but is nearly identical to the point next to it found *in situ* near the base of the deposit.

Branch and the SFU Department of Archaeology directed by Roy Carlson (Carlson and Hobler 1993). DeRt–2 is primarily a burial site, is the older of the two with Mayne and Locarno Beach components that date between 5200 and 2500 BP, and a smattering of younger remains sometimes mixed with the older material in the Late Midden deposit, whereas DeRt–1 is a camp site with occupation spanning the Locarno Beach, Marpole and San Juan phases from 2400 BP to late precontact. Some of the projectile points from Pender DeRt–2 are illustrated in Figure 20.

False Narrows (DgRw–4)

This site (Burley 1988) is situated on the southwest shore of Gabriola Island and was excavated in 1966–67 by a BCPM field crew under the direction of John Sendey. The site contains four components of which the earliest belongs to the Marpole phase and immediately predates the single radiocarbon date of 1710 ± 90 BP.

Poets Cove (DeRt–4)

This site is situated on Bedwell Harbour on South Pender Island, and was investigated by I.R. Wilson Consultants (2006) between 2002 and 2005. The objective was to salvage as much information as possible by screening about 2500 m^3 of cultural deposits that had already been completely disturbed and left as three large piles of midden debris. Radiocarbon dates range from 600 ± 80 BP to 2920 ± 15 to 4030 ± 70 BP.

Montague Harbour (DfRu–13)

The main excavation at this site on Galiano Island was undertaken by Donald Mitchell (1971), and later work in the underwater section by Norman Easton (1985) of the University of Victoria. The earliest component at the site is the Locarno Beach phase with the earliest date at 2360 ± 160 BP.

Duke Point (DgRx–5)

This site is on the east coast of Vancouver Island near the False Narrows site, and was excavated by a field crew under the direction of Neal Crozier in 1978 (Murray 1982). The site contains three components of which the earliest is probably Mayne phase. Recent redating gives an initial date of 4700 BP with later dates falling in the Marpole phase (Deo et al. 2004).

Argyle Lagoon (45–SJ–2)

This large site was tested by the UW Field School in 1951 under the direction of Carroll Burroughs (Carlson 1954, 1960). The excavation consisted of a series of disconnected test pits that revealed an upper shell midden and a lower cultural layer lacking shell. Smith (1907:383) noted that this site was 300 meters long by 60 meters wide. Gary Wessen (2005) conducted further excavations at what is probably another part of this same site although numbered 45–SJ–407. Wessen obtained three radiocarbon dates but these seem to date a later occupation since none of the artifact types from the previous excavations were found in his tests.

Georgeson Bay (DfRu–24)

This site is situated on the southern end of Galiano Island directly across Active Pass from the Helen Point site. It was excavated in 1968 by John Sendey (Haggarty and Sendey 1976) for the BCPM. Two components were identified, a Locarno Beach phase component dated at 2820 ± 100 BP and a late Marpole/Gulf of Georgia component dated at 750 ± 90 BP.

DeStaffany (45–SJ–414)

This site, situated on a rocky knoll well above the shoreline on the southwest side of San Juan Island, is a buried concentration of flaked stone debitage with a few formed tools including 45 mostly fragmentary bifaces, and was excavated by Stephen Kenady in 1972 (Kenady, Mierendorf, and Schalk 2002). There are two radiocarbon dates of 3750 ± 50 and 4750 ± 60 BP on soil residues scraped from artifacts (Kenady et al. 2002:9). This site is not a shell midden. Although the authors suggest that the assemblage may be early Holocene and these dates on humus too young, the lanceolate (IIIb), foliate (Ia), and stemmed (IIIa) points found are of types that date about 5000–3500 BP at Pender Canal and Helen Point that suggests that the dates are correct.

Bliss Landing (EaSe–2)

This site is not actually in the islands but on the mainland at the northern end of the Strait of Georgia. It was tested by Owen Beattie (1972) as part of the SFU Salvage '71 project and has two components—a Mayne phase component with one ^{14}C date of 4000 ± 60 BP (SFU 649) and a late component of the Gulf of Georgia pattern. Three classifiable projectile points including one of quartz crystal were associated with the Mayne phase component.

Long Harbour (DfRu–44)

This site was excavated by David Johnstone (1991) as part of thesis research at SFU. The site yielded only four points, two unclassifiable, and two from Marpole phase deposits.

Garrison (45–SJ–25), Lime Kiln (45–SJ–99), and Moore (45–SJ–5)

These sites are on San Juan Island, and were tested by the UW Field School under the direction of Carroll Burroughs in 1949 and 1951 (Carlson 1954, 1960). The Garrison site has three very similar assemblages and two radiocarbon dates, 1580 ± 60 and 2100 ± 100 BP, that place them in the Marpole phase. The other two sites yielded minimal amounts of chipped stone and belong in the post-1500 BP San Juan phase.

Richardson (45–SJ–185)

This site on Lopez Island was tested by two UW students, William Liston and Malcolm Forbes, in 1949 (Carlson 1954, 1960). The artifact inventory indicates that the site belongs in the Marpole phase.

Dionisio Point (DgRv–3)

This site on the north end of Galiano Island, tested by Donald Mitchell (1971), has an early undated component, that lacks shellfish remains, and two younger components. There are three crude points from Dionisio Point II that Mitchell dates at 1200–1400 BP. There are twelve points (Figure 21) from House 2 at Dionisio Point dated 1800–1500 BP (Grier 1999).

Gabriola Island (DgRw–199)

This site is one of several burial sites on Gabriola Island excavated by Joanne Curtin (2002) in the 1980s. It has only two projectile points and these belong to the Marpole phase component.

Fossil Bay (45–SJ–105)

This site was excavated by Robert Kidd (1969). A Marpole phase component and a San Juan phase component were identified with a ^{14}C date of 1514 ± 40 BP presumably dating the San Juan phase component, although it actually falls toward the end of the Marpole time range.

Reid Harbor (45–SJ–84)

Reid Harbor is on Stuart Island and was tested in 1977 by Jerry Bailey (1978). Although one foliate point and no diagnostic artifacts were recovered, nothing inconsistent with the time placement as indicated by the two ^{14}C dates of 2570 ± 140 and 2785 ± 128 BP was found.

Chronology and Conclusions

Arden King (1950) was the first to propose a cultural chronology for this sub-region based on his Cattle Point excavations. I published (Carlson 1960) an alternative scheme based on comparisons with Carl Borden's Fraser Delta sequence, and defined two phases, the Marpole phase and the succeeding San Juan phase while leaving some components such as the Argyle Lagoon assemblage floating in time without phase assignment. The reasons for not using King's phase sequence were that his model, based on the assumption that there was an evolution from a land hunting subsistence base to a fully maritime one, seemed unlikely during the time span indicated, and more importantly, I suspected that his cross-correlation of the different layers in his many disconnected excavation units on the basis of presence/absence and condition of the shellfish remains was highly questionable. The radiocarbon dates obtained much later (Robinson and Thompson 1980) confirmed my doubts.

In 1970 I proposed the Mayne phase as the antecedent to Locarno Beach based on the excavations at Helen Point (Carlson 1970). The term "Charles phase" or "Charles pattern" has sometimes been used since to group the local components of the Mayne, St. Mungo, and Eayem phases into a geographically wider cultural pattern. It is actually the similarity in the projectile points that is the main artifactual basis for this pattern. Some researchers refer to these phases as "culture types" when in fact that term is better reserved for cultures that are significantly different. In spite of some differences in technology and socio-cultural complexity all of these phases represent the same type of hunting/fishing/gathering culture that continued to exist here until the historic period. Significant socio-cultural complexity indicated by the use of masks and labrets is already present in the late Mayne phase and continues into the succeeding Locarno Beach and Marpole phases with some diminution in post-Marpole times (Carlson 2005, 2007).

Although I first introduced the Willey and Phillips (1958) phase system to the archaeology of this region (Carlson 1960), and Charles Borden agreed to use it for the Fraser Delta, there are problems with it. These problems stem from the nature of the settlement pattern. The ethnographic settlement pattern of small numbers of winter villages coupled with many hundreds of seasonal resource processing and extraction sites (Suttles 1951) produces varied artifact assemblages that belong to the same culture at the same time period and should not be construed as different cultural phases or complexes (Carlson 1954:10). Large village sites tend to have been oc-

Figure 21. Projectile points from Marpole phase House 2 at Dionisio Point dated 1800–1500 BP. Photo courtesy Colin Grier.

cupied for very long periods of time and discrete occupations are difficult to sort out. Another problem in making chronological sense is the amount of sampling at each site. Those sites with multi-year excavations that have the largest samples of data are Helen Point, Cattle Point, English Camp, and Pender Canal DeRt–1 and –2. Radiocarbon dating helps with the chronological problem, but by no means solves it. There are 147 radiocarbon dates from 16 sites in this region. These dates are graphed in Figures 22 and 23. What is clear from the radiocarbon chronology is that many of the same sites were used either continuously or sporadically over long periods of time.

With the preceding problems in mind it is still possible to construct a model of the sequential development of projectile points in this region (Figure 24). This sequence begins with a set of foliate, diamond, and contracting stem forms (Types Ia, Ib, II, IIIa, IIIb) that persists from about 5000 to 4000 BP to which are added barbed forms (Type IV) in the next 500 year period. At about 2500 BP points with a contracting stem begin to be replaced by unstemmed triangular (Type VIa) and foliate (Type Ic) forms with straight, irregular, or concave bases. Points with an expanding stem (Type V) appear about this same time possibly as a result of external influences. Triangular forms without stems increase in frequency from 2500 BP until about 1000 BP at which time flaked stone points almost disappear and are replaced by arrow points of bone. A few chipped stone arrow points with

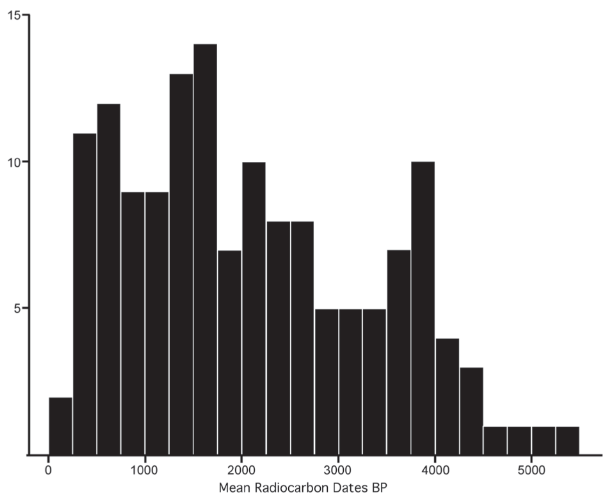


Figure 22. Frequency of radiocarbon dates for the Gulf and San Juan Islands graphed at 250 year intervals.

notches for hafting (Type VIc) are found, but many are of exotic raw materials and perhaps all of them originated outside this region. At the Sequim site on the Olympic Peninsula (Morgan 1999, Figs. 7:1 and 13:6) Component I, which is undated by ^{14}C, contains the same types of points as the 5000 to 4000 BP period in the islands, and Component II dated by ^{14}C at 2540 BP and later contains many stemmed and barbed forms as do Marpole phase assemblages of the same time period.

The time of the greatest variety in projectile point form is the period of the Marpole phase centered about 2000 years ago. This situation seems to be the same for the Lower Fraser at least at the Port Hammond site where Rousseau (2003, Figs. 8:3–8:5) with ^{14}C dates between 2000 and 1500 BP illustrates the same wide variety of point forms.

Although the typology is based on form, the more interesting question is what were these points used for? It might have been better to call all of them bifaces rather than points since some may well have served as knives or multi-purpose cutting implements, although the formal attributes of the vast majority do indicate their primary use as end blades for piercing implements—darts, spears, harpoons, or arrows—and as such are properly referred to as points. Other than the small side and corner notched points used for arrows, most other types of chipped bifaces had gone out of use in this region long before the historic period and as such have no local ethnographic analogs. These points were obviously used in subsistence pursuits, but what kind of subsistence? Faunal analyses (Hansen 1991, 1995) indicate that fish were the number one subsistence item in this watery region, and the isotopic analyses of human bones (Chisholm 1986) indicate that 80 to 100% of the protein in the human diet was obtained from marine resources as far back in time as there is evidence, about 5000 radiocarbon years. It is unlikely that any of the points were parts of fishing equipment.

The structure of the base and the average widths of these points (see type descriptions) give some clues to the size of the shaft or foreshaft to which they were hafted, but since no actual shafts or foreshafts have been recovered it is probable that the haft was made of wood. Many of these points were probably hafted as end blades in atlatl darts used for both sea and land mammal hunting and for warfare. A wooden atlatl dating to 1700 ± 100 BP (Fladmark et al. 1987) was found nearby at the mouth of

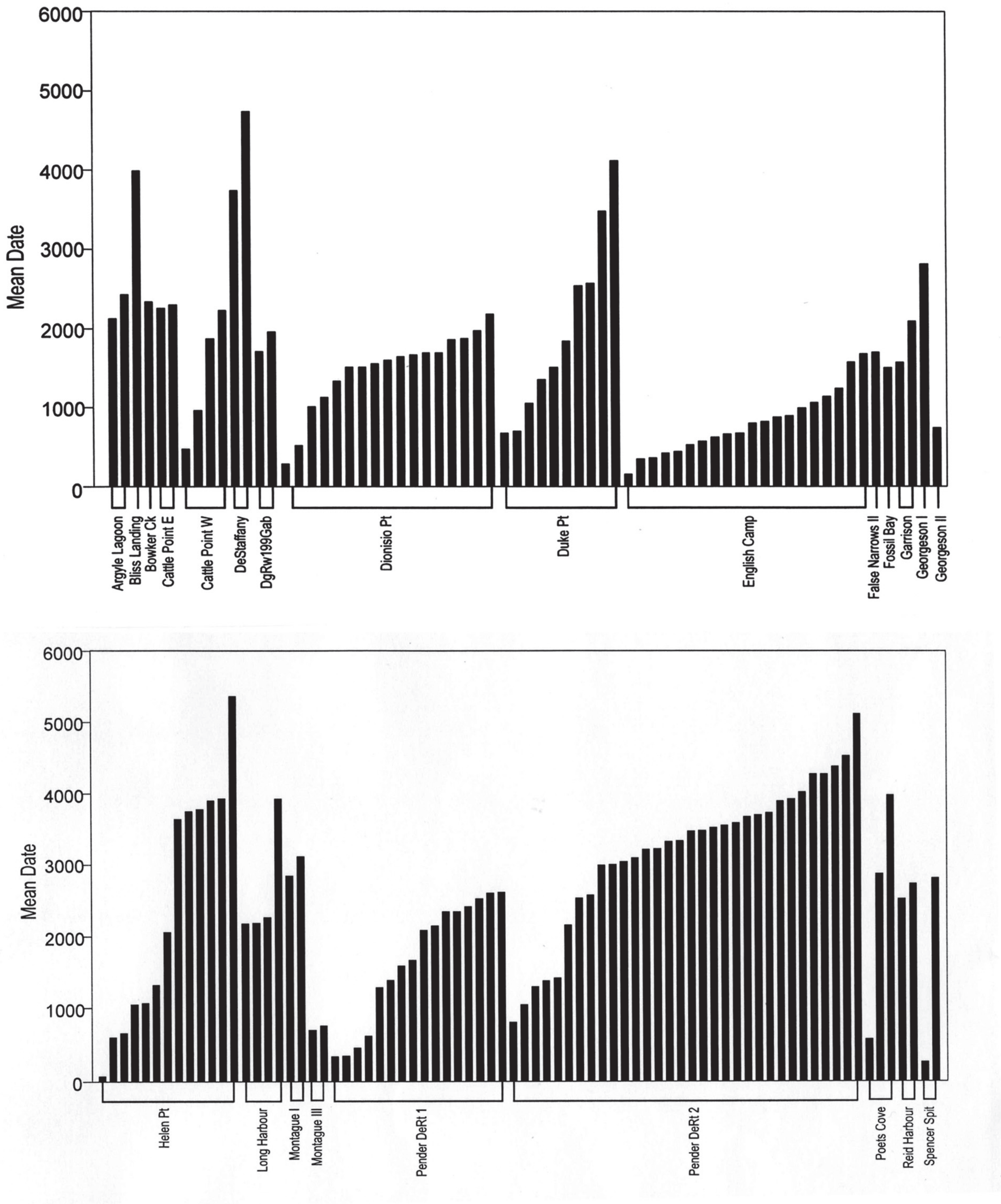


Figure 23. Radiocarbon dates for the Gulf and San Juan Islands by site.

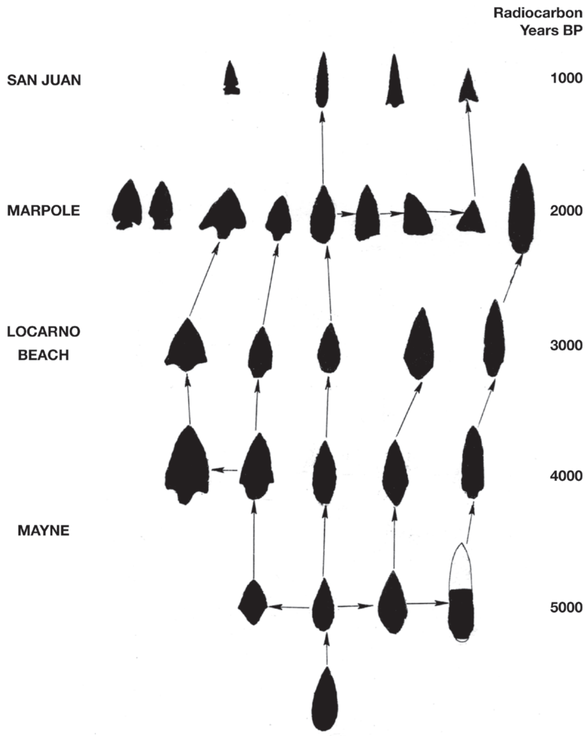


Figure 24. Diagram showing sequential development of projectile point types in the Gulf and San Juan Islands from 5000 BP.

the Skagit River, but evidence for the atlatl in the islands is limited to several bone atlatl hooks from Pender DeRt–2 dating 4000 to 3000 BP. In the Arctic the atlatl is an effective weapon for sea mammal hunting, and in a number of other environments such as the Australian desert for land hunting. Heavily forested coastal environments would not be ideal for effective use of this weapon so perhaps it was used mostly for sea mammals on the Northwest Coast, although there are tidelands and some open prairies. The direct association of porpoise bones with both a leaf-shaped point (Type Ia) and a large stemmed point (Type IIIa) in a hearth dated at 6050 ± 40 BP at the Saltery Bay site (Pegg et al. 2007:38) suggests these points were used for sea hunting, although other artifacts obviously not used for this purpose were also associated.

Changes in projectile point forms are theoretically linked to improvements in existing weapons systems, to the development of new weapons systems, and to changes in style. Such changes can be generated either internally or by external influences. It is reasonably clear that the early use of simple leaf-shaped points is followed by the development of points with stems and shoulders. This change to stemmed and shouldered forms is so widespread in North America that it clearly represents a more effective method of hafting. Diamond-shaped points, that are never the most common form at any time period, may be the transitional form in the Gulf-San Juan region. The next innovation to appear is barbing—extending the lower corners of the base downwards and indenting the base to form barbs. At some time during the Mayne phase barbs (Type IV) are added to the basal edges of points, but this attribute does not become common until the much later Marpole phase and is not the dominant type in any assemblage. With this attribute the projectile point has more holding power than earlier forms and is less easily dislodged by the prey animal. This innovation may well have been simply an internally generated improvement in an existing weapons system, although barbed points are widespread much earlier in the continental interior and influences from there cannot be ruled out. The shift to triangular blade forms and away from shoulders and stems seems to begin about 2500 BP with the shift from the Locarno Beach to the Marpole phase. New forms with expanding stems formed by either side notching or corner notching also make their appearance. These points lack local prototypes and may be either trade items from the mainland or inspired by such, or both. Two of these points are of chert or chalcedony and were probably not made locally. The final shift to small triangular points with corner or side notches is again so widespread in North America that it rather clearly represents either the introduction of the bow and arrow or a particular kind of bow and arrow.

The final change was the disappearance of flaked stone points altogether except for probable trade items, and their replacement by points of bone, shell, or ground slate that formed the arming tips of the weapons of the late prehistoric and ethnographic periods. Hayden (1989) attributes much of the world-wide shift from flaking to grinding as a response to the need to conserve raw materials, and this factor may have been operative here. Grinding and polishing of large projectile points of slate and antler are present at least as far back in time as the Mayne phase (Carlson 1970), but do not become the primary techniques for making projectile heads until the post-Marpole period. This shift away from a preponderance of tools made by flaking stone to a preponderance of tools made by grinding and polishing bone, shell, and in some localities slate, occurs throughout the Northwest Coast and takes place later in the Gulf and San Juan Islands than in regions to the north and west.

In general, the sequence of projectile point forms in the Gulf and San Juan Islands is more indicative of cultural and ethnic continuity than of anything else, at least from the earliest dates of about 5000 BP to the time of the appearance of small triangular arrow points about 1500 BP. The actual effect of the adoption of this new technology on warfare and subsistence has never been modeled for this region and awaits future research. In spite of this change there are other indicators of continuity, and the four phases—Mayne, Locarno Beach, Marpole, San Juan—are clearly a cultural tradition ancestral to the Coast Salish peoples who occupied this region at the time of European contact and whose descendants continue to reside here.

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Chapter 10

A Sequence of Formed Bifaces from the Fraser Valley Region of British Columbia

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Introduction

This paper presents the results of a temporally oriented analysis of formed bifaces from the lower Fraser Valley region of British Columbia. Formed biface is a term chosen to refer collectively to bifacially reduced projectile points and knives. The objective of this paper is to create a regional sequence of formed biface types for comparative purposes. The typology of bifaces was formulated based on assessments of specific artifact attributes that were evaluated statistically using cluster analysis. Since the majority of the artifacts analyzed in this study were from dated contexts, the types revealed through this analysis are associated with a given time span, which provides a chronological sequence of formed biface types from the region. Overall, we found that some of the types resulting from our analysis persist over long time periods, while others are present over shorter durations. After clustered types were established, the temporal sequence was used to cross-date surface collected artifacts from the Stave Watershed region. Our specific research goals were as follows:

1) To investigate how biface types vary temporally and spatially within the study area.
2) To identify temporal associations between undated, surface collected bifaces from the Stave Watershed and bifaces from dated contexts within the Fraser Valley region.

The study area lies between Hope to the east and the Surrey Highlands to the west (Figure 1), and is included in the territory of the Sto:lo Nation. The Fraser River is the primary watercourse flowing from east to west through the study area and bisecting the Coast and Cascade mountain ranges that rise to the north and the south of the river valley.

The study area is at the periphery of one of the most intensively investigated regions of the Northwest Coast of North America, the Gulf of Georgia (Fladmark 1982; Matson and Coupland 1995; Mitchell 1990). Excavated sites in the lower Fraser Valley have played a significant role in the development of the area's archaeological culture-history, in the western portion of our study area in particular. The canyon of the Fraser River lies to the northeast of the study area and is a region that has also been intensively investigated archaeologically (Archer 1980; Borden 1968; Mitchell 1990; Mitchell and Pokotylo 1996). The area from which materials were drawn from for this analysis lies in between these archaeologically renowned areas of the Fraser Canyon and Gulf of Georgia. Formed bifacial artifacts are found in all known chronological division of both regional culture historical sequences.

Specific sites from which artifacts were analyzed include St. Mungo, Glenrose Cannery, Pitt River, Telep, Hatzic Rock, Skowlitz, Katz, Silverhope Creek, and Hope Highway (Figure 1, Table 1). There are several other dated sites in the study area not included in the analysis for example Macallum (Lepofsky et al. 2004), Spirit Camp (Pokotylo n.d.), Port Hammond (Antiquus 2001), and Fort Langley (Steer and Porter 1984), or which did not have a sufficient number of radiocarbon dates for our purposes

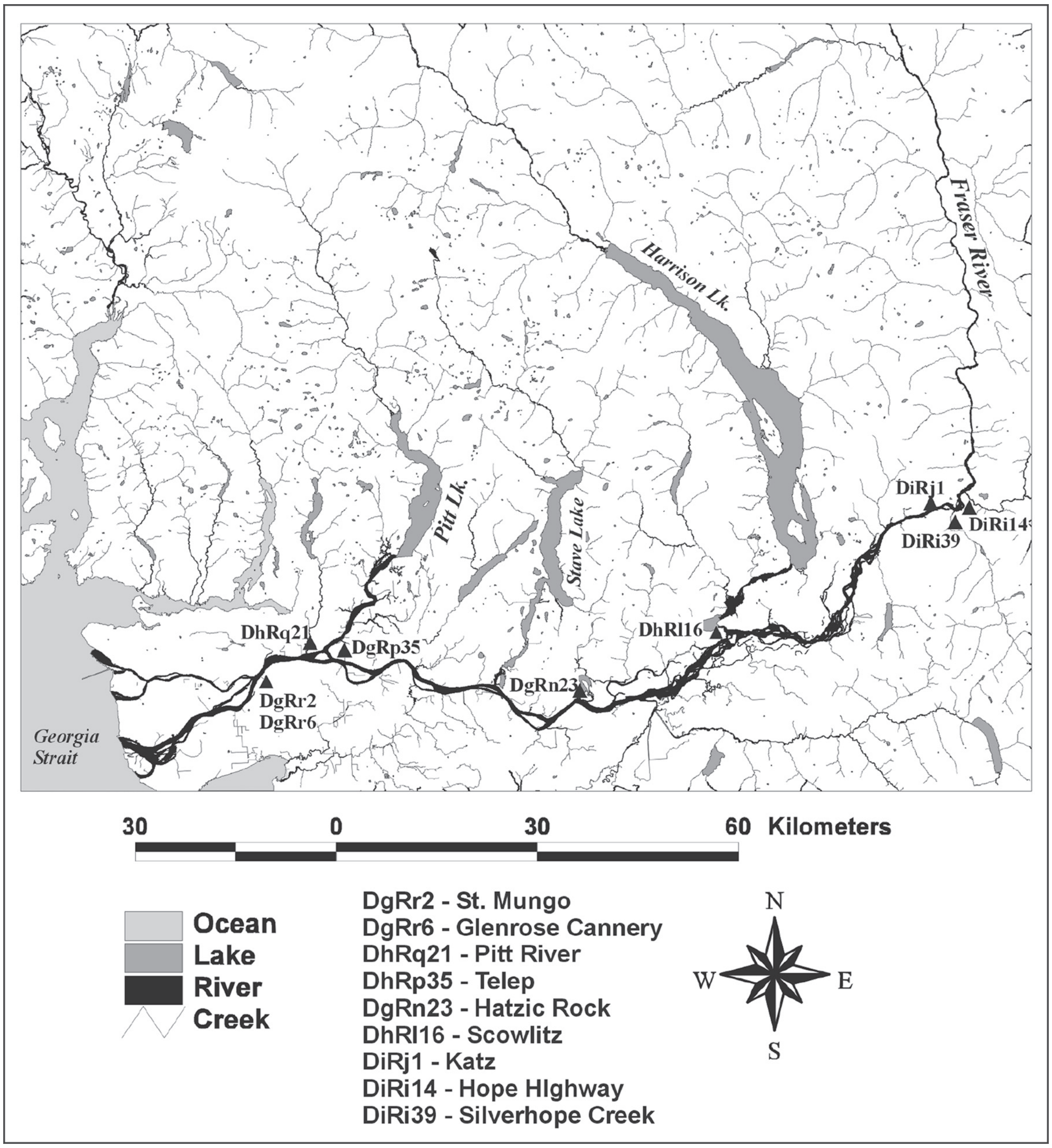

Figure 1. Study area is located in the lower Fraser River Valley east of the Fraser Canyon and west of the Fraser Delta.

(for example the Hope Site), or which have been dated but lack *in situ* bifacial tools (e.g., DhRo–28, DhRn–29 – McLaren 2005).

Several of the sites used in this analysis are of limited use for the creation a regional sequence of formed biface types. This is a result of the often very limited number of radiocarbon dates. For example, Telep, Katz, Silverhope Creek, and the Hope Highway site have very few radiocarbon dates considering the amount of area that was excavated. As a result of this, in some instances it was difficult to determine whether radiocarbon samples characterize the cultural matrices tested. For example, the cultural material from the Pitt River Site Gulf of Georgia culture type component is not typical of other assemblage dating to this time period. In particular, the presence of contracting stem points and labrets is uncharacteristic (Patenaude 1985). In an attempt to resolve this discrepancy, the authors reviewed the excavation profiles, field notes, pictures, and report

Table 1. Sites with analyzed bifaces from dated contexts.

Site Name	Borden Number	Uncalibrated Radiocarbon Date Range BP	Site Description	Source
St. Mungo	DgRr–2	3370 to 4480	Located on southern arm of the Fraser River, this site is the most western site in the study area.	Hamm et al. 1982; Calvert 1969
Glenrose Cannery	DgRr–6	2030 to 2340, 3280 to 4290 and 5730 to 8150	The site is located at the western end of the study area in Delta BC along the south bank of the south arm of the Fraser River.	Matson 1976
Pitt River	DhRq–21	216 to 1190, 2630 to 3300 and 3560 to 4390	This site is situated on the west bank of the Pitt River at its confluence with the Fraser River, in the western part of the study area.	Patenaude 1985
Telep	DhRp–35	2940 to 3180	The site is located at Maple Ridge north of the Fraser River and is situated within the western half of the study area.	Peacock 1982
Hatzic Rock	DgRn–23	4420 to 5050	The site is situated on the eastern bank of the Fraser River in Hatzic near mission, within the central-northern portion of the study area.	Mason 1984
Scowlitz	DhRl–16	330 to 2940	The site is located near the confluence of the Harrison and Fraser Rivers and is within the eastern portion of the study area.	Lepofsky et al. 2000
Katz	DiRj–1	2475 to 2695	The site is in the eastern portion of the study area west of Hope BC and is located on the north bank of the Fraser River.	Hanson 1970
Hope Highway	DiRi–14	2310 to 4080 and 6260	This site is located south of Hope BC and is the most eastern site within the study area.	Eldridge 1982
Silverhope Creek	DiRi–39	310 to 2510	The site is at the eastern end of the study area along the east bank of Silverhope Creek, southeast of Hope, BC.	Archer 1980

pertaining to the Gulf of Georgia component at the site. From these documents it could not be discerned with certainty that the contracting stem bifaces corresponded with features and deposits dated to Gulf of Georgia period. Specifically, the locations from which radiocarbon date samples were selected and the areas disturbed by plough action are not indicated on excavation profiles. Additionally, four of the six Gulf of Georgia radiocarbon dates were from pit hearth features, which were possibly intrusive into older deposits. For these reasons the artifacts are included in the following analysis but are not used to assign biface types to time periods. Unfortunately, this limits the scope of this analysis to the time frame spanning the Old Cordilleran through to the Marpole period in the western part of the study area.

The range of dates from excavated sites with formed bifaces spans 8100 to 250 BP (Figure 2) (all dates used in this article are radiocarbon years BP). Most of the sites in the study area date to the later half of the Holocene and as a result we examined a

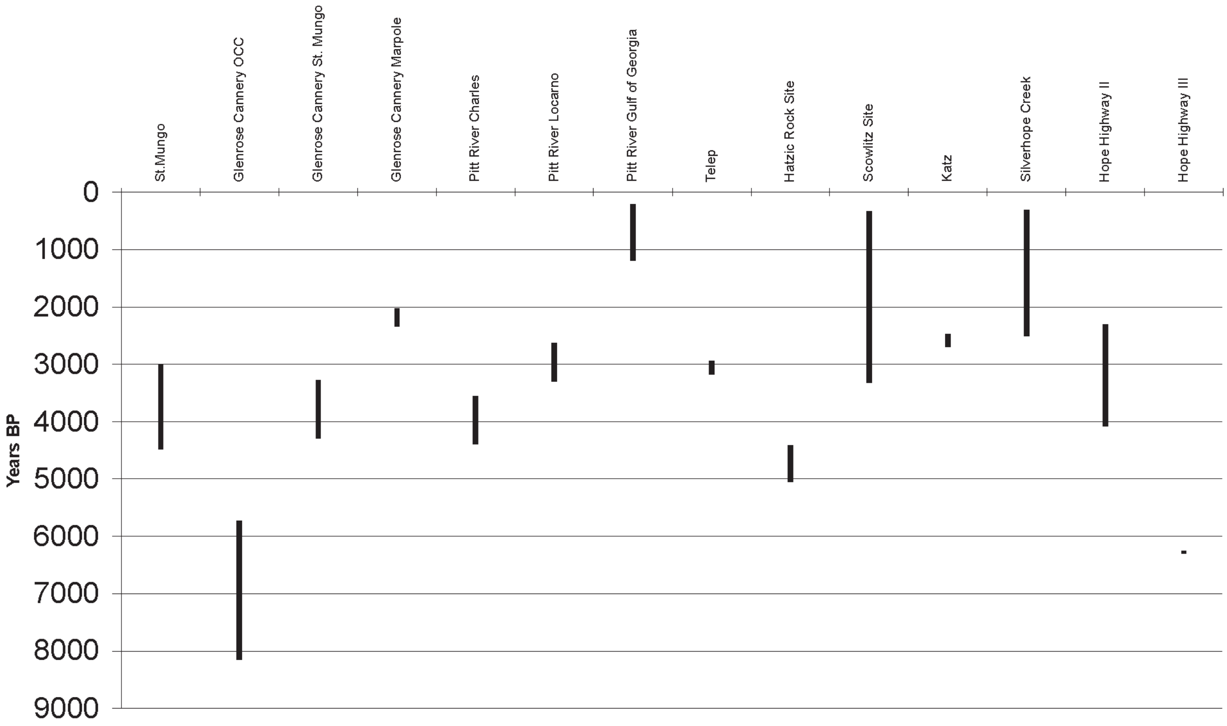

Figure 2. Date ranges for archaeological components from sites used in this analysis.

greater proportion of material that date to the later periods than to earlier phases.

One of the main objectives of this study was to compare undated surface collected material from the Stave Watershed with material from dated contexts in surrounding areas. The Stave River enters the Fraser River at the center of the study area (Figure 3). Archaeological work was initiated in the Stave Watershed by the Kwantlen First Nation and BC Hydro as archaeological inventory and impact assessment projects in the draw down zones of Stave and Hayward reservoirs (McLaren et al. 1997; McLaren and Maxwell 1998). This work resulted in the identification of over 70 archaeological sites. The majority of these are lithic scatters. Artifacts are regularly left in surface scatters as lag deposits while finer sediments are washed away by erosion related to reservoir operation (McLaren et al. 1997). In total, over 100 formed bifaces have been recovered from surface contexts in the Stave Watershed region of British Columbia (McLaren 2003). These lithics are not directly dateable as they are not in their primary depositional contexts. However, based on the general form of collected artifacts it was felt that there is a good possibility that styles from periods spanning the entire Holocene were represented in the collection (McLaren et al. 1997). In a previous study investigating the relative temporality of these objects, a seriation-based analysis was employed (Figure 4) (McLaren 2003). The sequence was cross-dated through a comparison with materials from the different components at the Glenrose Cannery site. The exercise was found to be significant in its ability to associate surface collected material stylistically related to the Glenrose Cannery Old Cordilleran bifaces (8150–5730 BP) and to differentiate these from other surface collected bifaces (presumably dating to other time periods). Surface collected bifaces more stylistically related to the St. Mungo (4290–3280 BP) and Marpole (2340–2030 BP) components could not be distinguished from one another as bifaces from these different temporal periods have many stylistic similarities.

Carlson (1983) undertook an earlier chronological study of bifaces from the surrounding area. This analysis of chipped points from the lower Fraser River and Gulf Islands region reveals a sequence characterized by leaf-shaped points in the

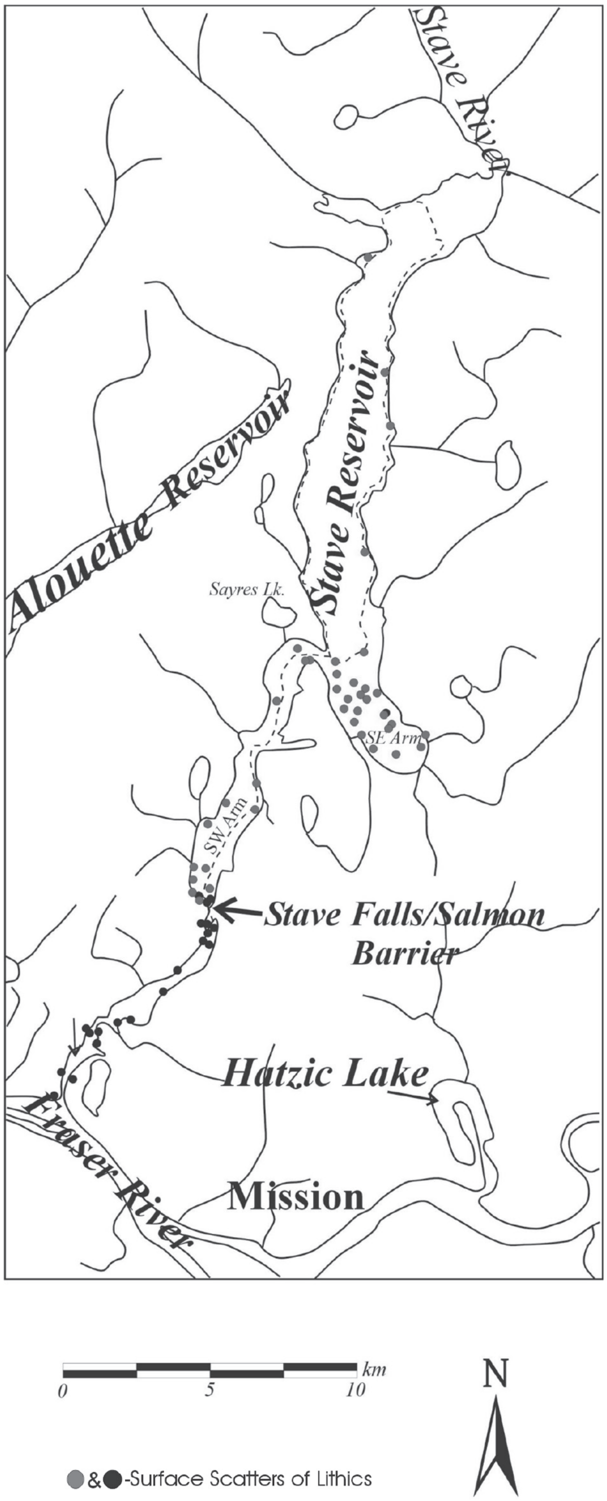

Figure 3. Map of the Stave Watershed where 116 surface scattered bifaces used in this analysis were collected in areas deflated by reservoir operations.

early Holocene, contracting stem forms in the mid-Holocene, and triangular and notched forms being restricted to later Holocene periods. The typology presented here differs in that a broader selection of biface attributes are used to characterize artifacts from various time periods.

The analysis presented in this study expands the comparative basis for cross-dating purposes by including formed bifaces from multiple dated contexts from the region surrounding the Stave area. Several different stages of analysis were undertaken, these include: the recording of the presence or absence of attributes for each bifacial tool, the creation of a typology by grouping bifaces with similar complements of attributes through cluster analysis, and the relating of types to chronological periods by direct association of types to their dated contexts. The surface collected materials from the Stave region were included in the formulation of the typology and so are related to bifacial artifacts from dated contexts by the presence of shared attributes.

Methodology

Biface preforms were distinguished from later stage bifaces following the classification suggested by Johnson (1989:124): formed bifaces were classified as such due to a lack of cortex and existence of straightened lateral margins, rather than markedly wavy or irregular margins that are often present on unfinished tools. For the purposes of this paper, "formed bifaces" include implements commonly identified as bifacially shaped knives and projectile points. Preforms were not analyzed.

For the most part, non-fragmented bifaces were selected for analysis from dated contexts, whereas both biface fragments and complete bifaces from surface scatters in the Stave Watershed were included. In total, attributes were assessed for 372 formed bifaces from the nine dated sites and 25 surface collected contexts. Of these, 116 artifacts were from surface contexts and 256 were from dated sites. From Katz and Skowlitz, only representative samples of the bifaces collected were used in the analysis presented here.

Attributes

The characteristics of all bifaces were assessed using 15 different attributes that were recorded for each

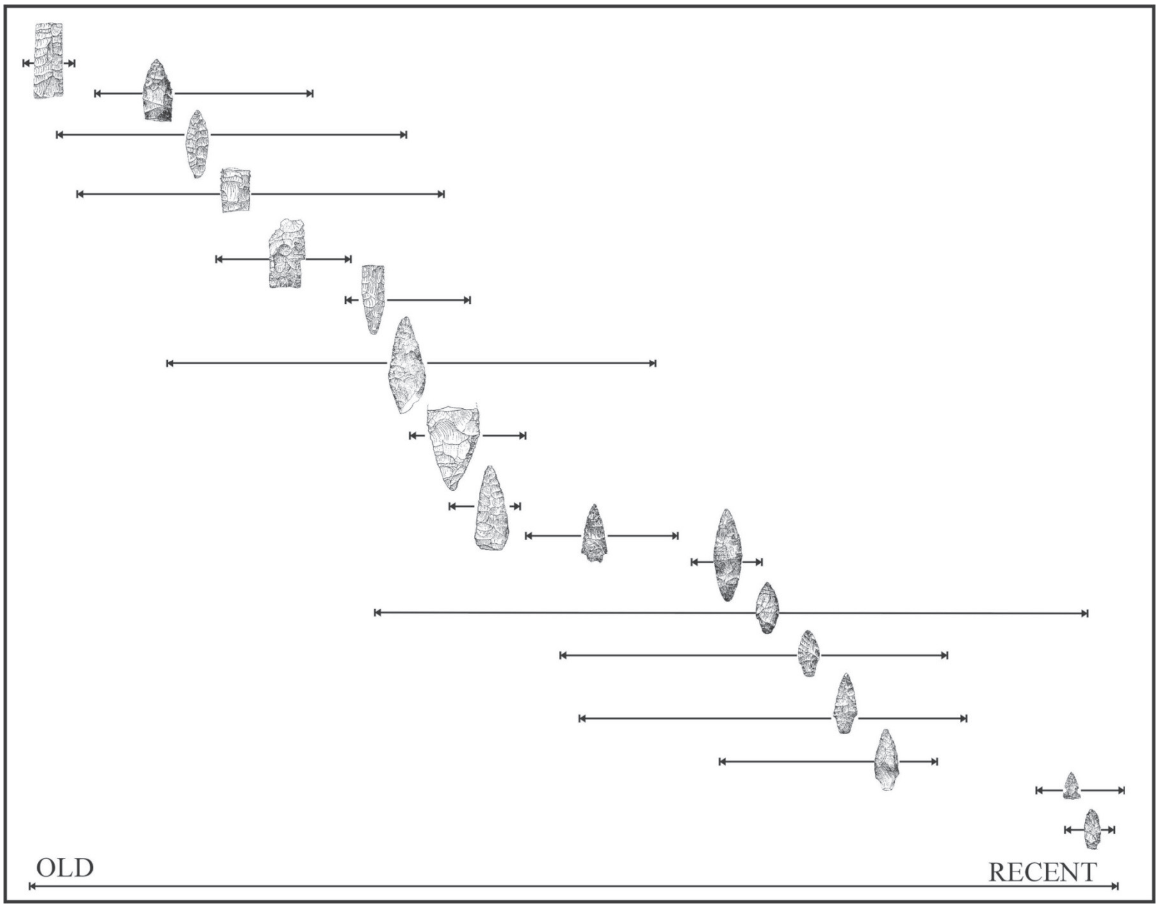

Figure 4. Results of a seriation analysis of surface collected artifacts from the Stave Watershed. Further details of this analysis are provided in McLaren (2003).

artifact. The attributes used for this analysis are derived from other studies of formed bifaces (Callahan 1979; Gotthardt 1990; McLaren 2003; McLaren and Smith this volume; Sanger 1970). Several of the chosen attributes, particularly those associated with flake scars, were selected because they allow the inclusion of formed biface fragments (Gotthardt 1990). The following attributes were recorded for each artifact.

Form. This attribute refers to the general outline of the tool. In most cases a complete or near complete artifact was needed in order to record this attribute. One of the following general forms was assigned in each case: foliate, lanceolate, notched, pentagonal, stemmed, and triangular (Figure 5).

Foliate and lanceolate points were distinguished from one another based on the position of the widest point. In foliate forms the widest point tended to be situated at the middle or closer to the base of the artifact, in lanceolate artifacts the widest point tended to be situated between the middle and the tip of the artifact or were characterized by long, parallel, and straight blade margins.

Flake scars to center. This attribute tracks the tendency of final biface thinning flake removal. Where finishing thinning flakes scars were found to extend to the medial axis of the tool, or beyond, the tool was recorded as possessing this attribute even if overlapping fine retouch was present along the lateral margins of the tools. This attribute was recorded as absent where the final flake scars did not penetrate to the medial axis.

Outline of Flake Scars. Variability in the final stages of flake scar removal can be attributed to different strategies of manufacture. Gotthardt (1990) distinguishes four variants (Figure 5):

a) Expanding: Flake scars are placed at regular intervals along the margins of the tool and tend to expand to the distal-most end of the flake scar.

b) Parallel: Flake scars are placed at regular intervals along the margins of the tool, do not expand and do not follow the ridge formed by the previous flake removed but are struck from a platform prepared below or above the margins of neighboring scars.

c) Lamellar: Flake scars are placed at regular intervals; platforms tend to be placed so as to allow the force of the flake removal to follow the lateral edge of an adjacent flake scar removal.

d) Variable: Flake scars are irregularly placed along the edge of the biface to straighten the edge and/or to thin the biface at chosen locations.

The presence of multiple scar patterns may be the result of manufacturing, re-sharpening, or curation after breakage. Expanding, parallel, and lamellar flake scar patterns are not always present independently. In some instances the presence of multiple flake scar patterns resulted in our recording the presence of more than one of these variants for a single artifact.

Orientation of Flake Scars. Gotthardt (1990) relates four variables of this attribute. These are described in terms of their orientations with respect to the longitudinal access of the tool (Figure 5). In some instances different flake scare attributes were noted on the same tool and were noted and recorded as such.

a) Colateral: Flake scars regularly removed perpendicular to the medial axis.

b) Sub-radial: Flake scars regularly removed perpendicular to the margin of the tool.

c) Oblique: Flake scars regularly removed diagonally to the longitudinal axis.

d) Random: Irregular placement of final flake scars.

Cross-Section. The cross-section of finished artifacts is related to the flaking strategies adopted by the maker and to the morphological characteristics of bifaces themselves. Several cross-sectional variants were recorded and are depicted in Figure 5.

End Thinning. This attribute was recorded as either present or absent on specimens with intact basal portions. In this context, end thinning refers to the removal of thinning flake scars from the basal margin and parallel to the medial axis of the tool.

Blade Form. The blade refers to the lateral margins of the bifacial tools from the shoulder or widest point to the tip. The general shape of the blade was characterized as excurvate, straight, recurved, or incurvate (Figure 5).

Denticulate. Blade margins with a denticulate (serrated) edge were recorded as having this attribute.

Stem Form. The stem shape attribute refers to artifacts that have been classified as stemmed. Stemmed artifacts tend to have narrower basal-lateral margins than the width between the blades, the two areas being distinctly separated from one another by a prominent shoulder. The stem variables recorded are illustrated in Figure 5.

Basal Margin. One of several different variables was recorded in order to describe the basal margin of analysed bifacial tools. The variables of this attribute that were recorded are illustrated in Figure 5.

Removals. Two types of removals were recorded: notching and indentation. Notching refers to the intentional removal of small notches in the margins of biface points for hafting purposes. Indentation refers to smaller intentional removals and was recorded only on the basal margin. The indentation and notch variables that were recorded are illustrated in Figure 5.

Shoulders. Shoulders refer to the intersection point between the blade margins and the basal lateral or stem margins of a biface. Shoulders are generally located at the widest place of the biface. Shoulder type was recorded for notched and stemmed biface forms. Shoulder variables that were recorded are listed in Figure 5.

Basal or Lateral Grinding. This attribute was recorded for any point base that displayed basal lateral grinding or basal margin grinding. It is generally thought that grinding was done to dull the sharp basal edges of bifaces in order to aid in handling and hafting.

Length of Complete Specimens. The length of all complete specimens was measured in millimetres. This attribute was not recorded in cases where the entire length of the biface was not present due to

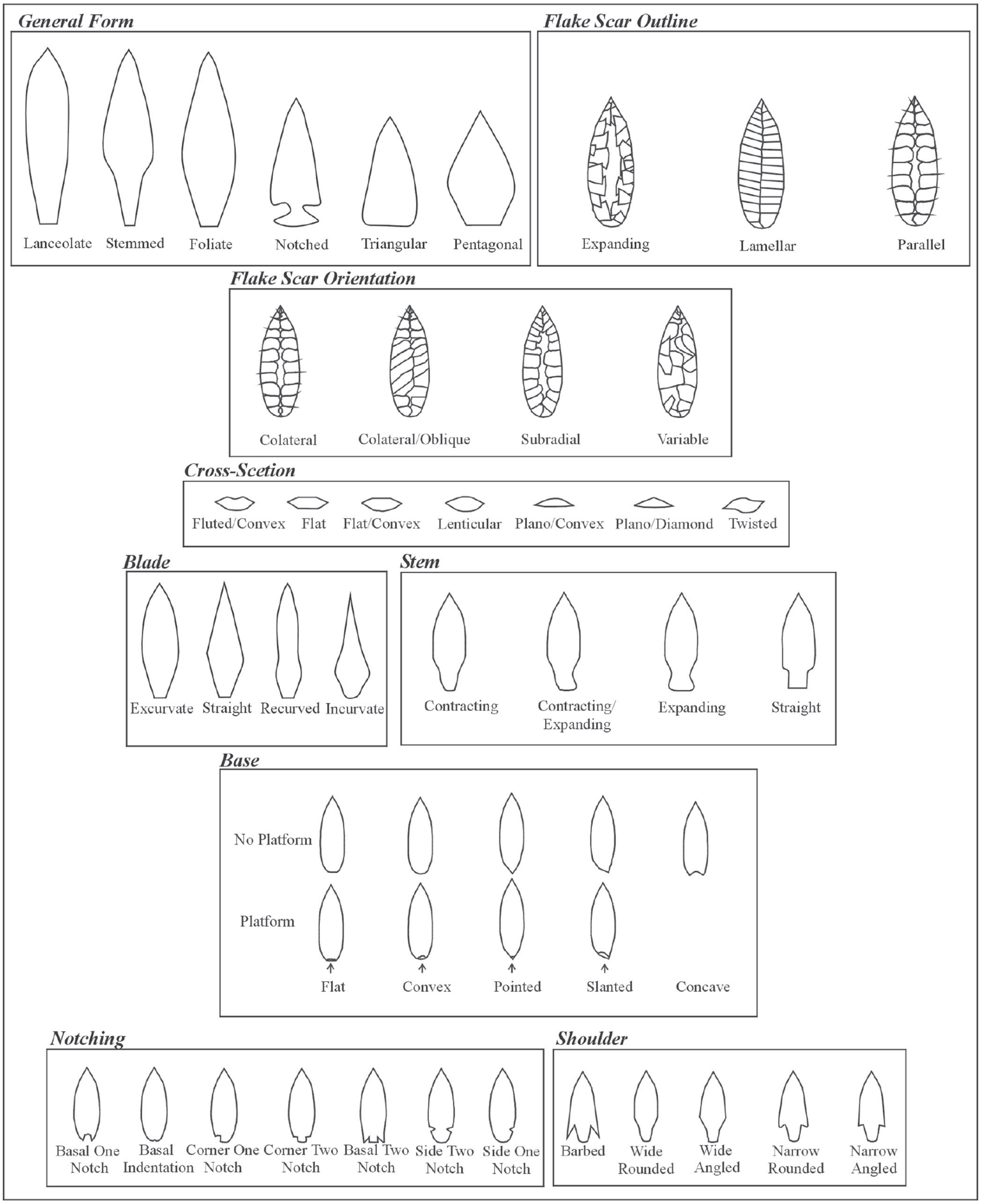

Figure 5. Illustrations used to exemplify variables of biface attributes used in this analysis. The attributes used for this analysis are derived from other studies of formed bifaces (Callahan 1979; Gotthardt 1990; McLaren 2003; McLaren and Smith this volume; Sanger 1970).

breakage. Four variables, each representing a range of lengths, were used to distinguish the relative length of complete specimens. One of the following categories was recorded as present for each biface:

Leng1: 0–29.9 mm
Leng2: 30–59.9 mm
Leng3: 60–89.9 mm
Leng4: 90+ mm

Width/Thickness Ratio. The maximum width and thickness of each formed biface was measured in millimetres and was then compared as a ratio. Callahan (1979) used width/thickness ratios to characterize the completeness of the artifact, with a high width to thickness ratio being considered closer to a complete projectile and those with lower width/thickness ratios being closer to preforms. The following variables were used to categorize the measurements:

W/T1: 0–1.99
W/T2: 2–2.499
W/T3: 2.5–2.99
W/T4: 3–3.499
W/T5: 3.5–3.99
W/T6: 4–4.499
W/T7: 4.5–4.99
W/T8: 5–5.499
W/T9: 5.5 +

Analysis

The variables of each attribute were recorded for the 372 bifaces examined according to the preceding criteria. Then, using the WINbasp statistical package for archaeologists, this data was tabulated as being present or absent for each artifact. A cluster analysis was then run in order to separate the formed bifaces into types based on similarities of attributes.

Cluster analysis is a technique used for ordering dataset characteristics to determine which entities are most similar (Kaufman and Rousseeuw 1990; Sokal and Sneath 1963). In this study, hierarchical cluster analysis was used to identify groups of similar bifaces.

Hierarchal clustering procedures consist of two main components. First, one must determine how to measure similarity between cases, which involves the selection of an appropriate method of calculating a matrix of resemblance. The Dice coefficient was chosen for this analysis and can be expressed as:

$$2a/2a+b+c$$

The Dice coefficient measures the frequency of co-occurring shared and unshared variables or attributes. This is expressed in the equation above, where category a represents the number of agreements or the joint presence variables within the cases being compared; b and c indicate the number of disagreements or mismatches. This coefficient is designed for binary datasets in which it is the presence of shared attributes that are of importance. The Dice method disregards paired negative matches and adds additional weight to cases of mutual agreement (Finch 2005). As a result, in cases where artifacts are fragmented (and for which particular attributes could not be recorded), the Dice coefficient does not count the missing attribute as an indication of similarity.

Second, having chosen a method for measuring similarity between cases one must select a method for grouping the individual cases together. This requires the choice of a clustering algorithm. Agglomerative clustering algorithms begin by grouping the two most similar cases together and then cases are added to groups at different levels of similarity until each case has been grouped. The average linkages algorithm was used for this study. This method defines similarity between cases based on the average of the similarity coefficients within successive clusters. This average is the basis for membership by new cases (Kaufman and Rousseeuw 1990). The average linkages algorithm is the most widely used method for archaeological clustering analyses (Shennan 1990).

The results of hierarchical cluster analysis are charted as a dendrogram. In order to attain separate clusters one must decide where to 'cut' the dendrogram so that the optimal number of groups is found. A heuristic approach is most common (Aldenderfer and Blachfield 1984) and was employed in this study.

Results

The cluster analysis was run and a dendrogram was produced (Figure 6). The dendrogram was cut and 17 clusters were identified, leaving 115 artifacts as unclustered residuals. For each cluster, or type, a summary sheet of attributes contributing to those types was generated. This enabled the following description of each type based on the most important attributes.

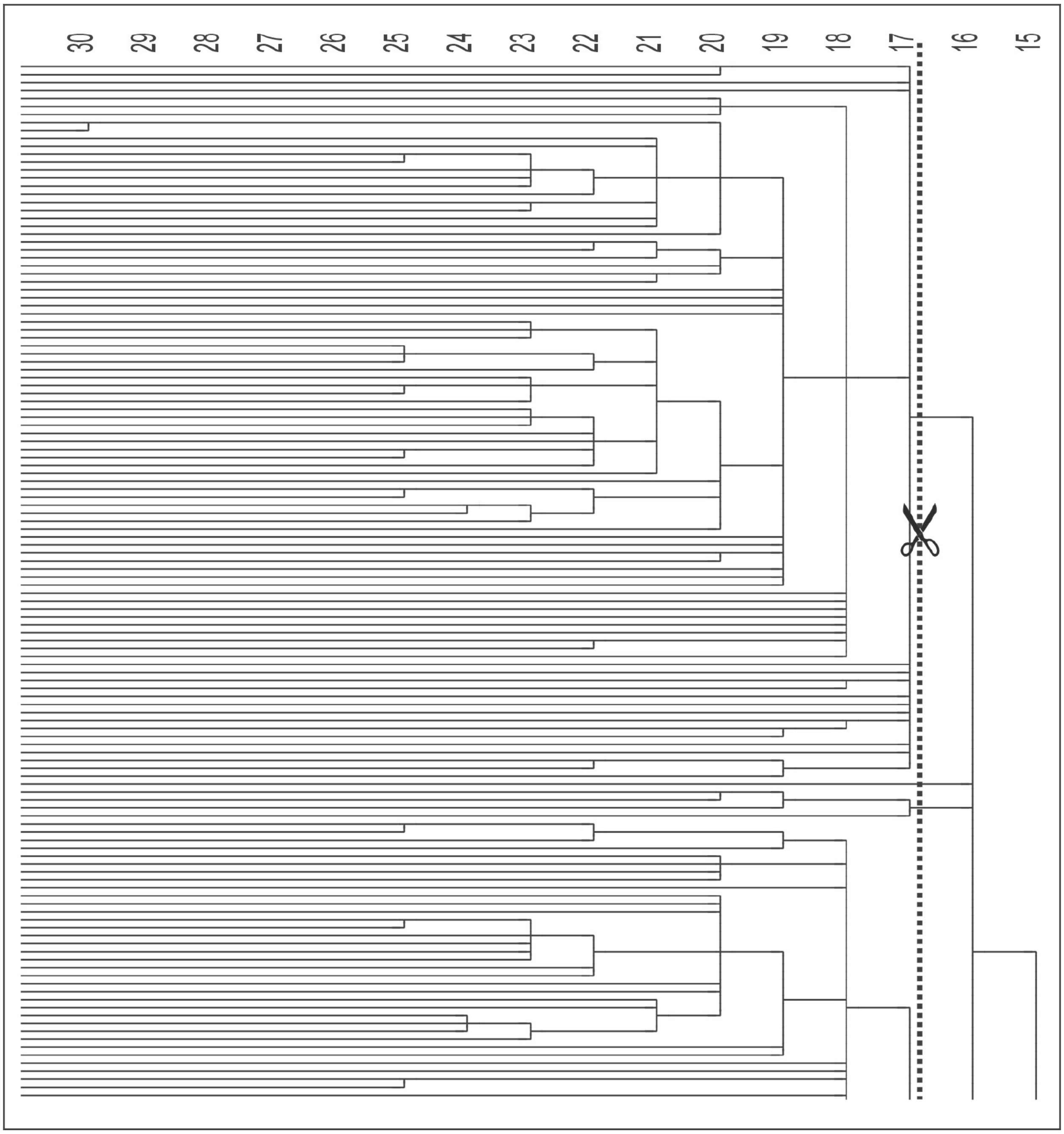

Figure 6. Detail of resulting dendrogram from the cluster analysis used to derive formed biface types based on commonalities in attributes. The dendrogram was cut at the 17th level, which allowed for the maximum number of cases to be included within a coherent number of groups.

The dendrogram was cut at the 17th level, which allowed for the maximum number of cases to be included within a coherent number of groups. We observed that cutting the dendrogram at a lower level would have excluded a very large number of cases from our analysis, conversely, cutting the dendrogram at a higher level would have produced fewer clusters with many members that are more dissimilar.

Cluster 1 (Foliate Type): This is the largest cluster and included 90 formed bifaces. In form, the artifacts comprising this cluster tend to be foliate shaped with lenticular cross-sections, excurvate blade margins, with pointed or convex basal margins. In size these objects are between 30–90 mm in length and tend to have width thickness ratios between 2 and 4. Finishing flake scars are in a subradial or random orientation with expanding or variable outlines, and lack end thinning. This type was recorded at all of the dated sites from which materials were analysed.

Cluster 2 (Basally Thinned Contracting Stem Type): Four artifacts are included in this group. These artifacts are contracting stemmed points with wide angled shoulders, and lenticular cross-sections. They have a width-thickness ratio between 4 and 5. Flake scars are variable in outline and tend to be random in orientation, with one example being colateral. Three of the objects are basally thinned. This type was recorded at one dated site, St. Mungo, which reveals a temporality between 4290 and 3280 BP.

Cluster 3 (Subradially Finished Contracting Stem Type I): Fifty-four artifacts are included in this cluster. These bifaces tend to have contracting stems, excurvate blade margins, wide rounded or angled shoulders, with convex or slanting basal margins. In size these objects are between 30–90 mm in length and tend to have width thickness ratios between 2 and 4. Finishing flake scars are subradial in orientation and end thinning is lacking, with flake scar outlines tending to be expanding or variable. Less than 50% of the objects have finishing flake scars to the center. Artifacts from Hatzic Rock, the St. Mungo component of Glenrose, Hope Highway, the Locarno component of Pitt River, the Marpole component of Glenrose, Silverhope Creek, and Scowlitz, are all present within this cluster suggesting a temporal span between 5050 and 310 BP. Twelve artifacts in this cluster were from surface collections in the Stave region.

Cluster 4 (Subradially Finished Contracting Stem Type II): Two artifacts are grouped into this cluster. These artifacts are similar to those found in Cluster 3 being contracting stemmed with excurvate blade margins. These objects also have subradial flake scar orientations and variable flake scar patterns. One of the objects is from the Marpole component the Glenrose Cannery site suggesting a temporality of between 2340 and 2030 BP. The other biface in this cluster is from a surface scatter context.

Cluster 5 (Colaterally Flaked Type): A total of 34 artifacts are included in this cluster. The artifacts are characterized by having flake scars to the center, colateral flake scar orientations, and lenticular cross sections. A number of the artifacts in this cluster are fragments that come from surface collected contexts in the Stave area. Those that are complete tend to be lanceolate in form with straight or concave basal margins and evidence of end thinning. Three of the objects in this cluster are from the Old Cordilleran component at the Glenrose Cannery site. This suggests a temporal affiliation of from 8150 to 5730 BP. A fourth object from this site is from the Hope Highway site. Unfortunately, a specific date cannot be assigned based on the site report (Eldridge 1982) or catalogue as no radiocarbon samples were taken from the vicinity of the excavation unit that this object was found in. Most of the material from the Hope Highway site dates between 4080 and 2310 BP, and there is one older date of 6260 BP from cultural matrices. We searched for soil samples from this project for the purpose of acquiring an AMS radiocarbon sample but were unable to find one associated with this biface. Due to uncertainty in the dating of this artifact, we have not used this diagnostic point from the Hope Highway site for cross-dating this cluster. The remainder of objects from this cluster are from surface scatter contexts in the Stave Watershed.

Cluster 6 (Variably Flaked Contracting Stem Type): There are 13 formed bifaces in this cluster. These are contracting stem in form and lack end thinning. These objects differ from the contracting stem points in Cluster 3 as they tend to have variable flake scar patterning and non-lenticular cross-sections. Objects in this cluster come from the Charles component of Pitt River, the St. Mungo component of Glenrose, the Locarno Component of Pitt River. The components span between 4390 and 2630 BP. These sites are spatially grouped at the western end of the study area. Four objects from this cluster were collected from surface scatter contexts in the Stave Watershed area.

Clusters 7 and 8 (Types lacking chronological reference): Two bifaces are included in each of Clusters 7 and 8. These consisted only of surface collected materials without dates. For this reason these clusters have been removed from the analysis.

Cluster 9 (Slanting Base Contracting Stem Type): Two objects are included in Cluster 9. These are contracting stemmed bifaces with variable flake scar outlines and slanted basal margins. One of these formed bifaces is from the St. Mungo component of the Glenrose Cannery suggesting a temporal affiliation between 4290 and 3280 BP. The other biface in this cluster is from a surface context in the Stave region.

Cluster 10 (Notched with Narrow Angled Shoulder Type): A total of 34 objects is included in cluster 10. All of these are notched forms with corner or side notching forming narrow angled shoulders. Flake scars are variable in orientation and variable in outline and lack end thinning. The objects in this cluster originate from Hope Highway, Pitt River Locarno component, Katz, Glenrose Marpole component, Silverhope Creek, and Scowlitz sites. These components span 4080 to 330 BP. The vast majority of these artifacts are from sites in the eastern end of the study area. Only three objects are from surface collected contexts in the Stave area.

Cluster 11 (Flattened Cross-Section Notched or Triangular Type): This cluster includes two formed bifaces, one notched and one triangular in form that have random flake scar orientations, variable flake scar outlines, flattened cross-section, end thinning, and a width thickness ratio between 3.5 and 3.99. One biface in this cluster is from the Locarno component of the Pitt River Locarno site suggesting a temporal span of 3300 to 2630 BP. The other object in this cluster is from a surface context in the Stave Watershed.

Cluster 12 (Type lacking chronological reference): Two objects are included in Cluster 12; there were no dated bifaces within this cluster as it was made up of only undated surface collected materials. For this reason this cluster has been discarded from this analysis.

Cluster 13 (Triangular Type): Three formed bifaces are included in Cluster 13. These objects are triangular in general form with excurvate blade margins. They have variable flake scar outlines, random flake scar orientations, and have been end thinned. Artifacts in this cluster are from the Glenrose St. Mungo component and from the Katz site suggesting a temporal interval for this type between 4290 and 2475 BP. No objects from the Stave watershed were included in this cluster.

Cluster 14 (Notched with Convex Basal Margin Type): Three formed bifaces are included in Cluster 14. These objects are notched in general form with narrow angle shoulders, convex basal margins, and excurvate blade margins. These objects have flake scars to center, a subradial flake scar orientation, and end thinning. Two of the bifaces have been corner notched and the third is basally notched. These objects are between 30 and 59.9 mm in length. Objects in this cluster are from Hope Highway, Katz, and Silverhope Creek. All of these sites occur in the eastern part of the study area and the combined temporal span is 4080 to 330 BP. No objects from the Stave watershed were included in this cluster.

Cluster 15 (Expanding Flake Scar Outline Corner Notched Type): Six artifacts are included in Cluster 15. The artifacts are corner notched. All of these objects have remnant characteristics demonstrating that they are reworked flakes, have expanding flake scar outlines, and random flake scar orientation. These objects are between 30 and 59.9 mm in length. Objects in this type are from the Pitt River Charles components, Glenrose Cannery St. Mungo Cannery, Silverhope Creek, and Scowlitz, suggesting a temporal span between 4390 and 330 BP. No objects from the Stave watershed were included in this cluster.

Cluster 16 (End Thinned Corner Notched Type): Two artifacts are included in this cluster. These are formed bifaces with a general notched form, corner notching, end-thinning, and irregular basal margins. These objects are between 30 and 59.9 mm in length. Objects from this site are associated with the Pitt River Charles component and Scowlitz site with a possible temporal span of 4390 and 330 BP. No objects from the Stave Watershed are included in this type.

Cluster 17 (Sub-Radially Flaked Straight or Expanding Stem Type): Two artifacts are included in this cluster. These are stemmed bifaces in form with one example having straight stem margins and the second having expanding stem margins. The artifacts have expanding flake scar outlines with a sub-radial pattern of flake scar removal and end thinning. These objects are between 30 and 59.9 mm in length. Both of the objects from this type come from the Scowlitz site suggesting a possible temporal range between 3320 and 320 BP.

Residual Artifacts: A total of 115 formed bifaces were not grouped into clusters. Included with these are 43 notched, 37 stemmed, seven foliate, and seven triangular formed bifaces. Twenty-six of these artifacts are from surface contexts in the Stave region, the remainder are from the sites with dated contexts.

Discussion

This analysis establishes broad time frames for groups of similar biface types from various archaeological sites within the Fraser Valley Region. The temporal range for these types was determined based on the presence of bifaces from dated contexts within each cluster. In addition to the human behavioural implications, which are discussed below, there is a methodological basis for our lack of ability in assigning concise time frames to particular artifact types. At the beginning of this study we found that it was often difficult separate the artifact assemblages from each site into different time ranges or components based on the site report or catalogue information. The temporal periods with which specific artifacts are associated could be derived more easily if archaeological cataloguing and reporting procedures routinely incorporated a cross-reference to the date or temporal component linked with each artifact. Regardless of these methodological issues, we were able to address the research questions laid out in our introduction at a broad temporal scale.

How do biface types vary temporally and spatially within the study area?

Examples of artifacts from each cluster and the temporal range associated with these artifacts are displayed in Figure 7. Additionally, the relative percentage of clusters from each dated site is given in Figure 8. We used a conservative approach when assigning temporal periods to the different clusters with the temporal span being defined using the oldest date from the oldest objects in the cluster and the youngest date from the youngest objects in the cluster. More often than not, site documentation did not provide enough specific radiocarbon dating to allow for more constrained time periods to be established.

In general, bifacial manufacturing technology appears to have been practiced conservatively by occupants of this region. In specific reference to the attribute of biface form, for example, the foliate form appears within an at least an 8000 year long period and occurs at all sites in the study area. Contracting stem forms span 5050–216 BP and are found more typically in more westerly sites, showing that the occurrence of these attributes is somewhat spatially constrained. Similarly, notched forms span 5050–310 BP and are found with greater frequency to in the eastern part of the study area. In addition, triangular forms span 4290–310 BP, and lanceolate forms have a more constrained time span of 8150–5730 BP.

The notched form bifaces assessed within this study were present within deposits ranging in age from approximately 5050 to 310 BP and show considerable variability (Figure 9). Unfortunately, the sequence of notched projectile points existing within this study area could not be further distinguished or defined within the current study as it has been for regions such as the interior plateau (Richards and Rousseau 1987; Rousseau this volume; and Stryd and Rousseau 1996). However, the concentration of notched forms in sites at the eastern end of our study area suggests that there was an interior influence on these forms. It is likely that the latter Holocene sequence of notched forms from the interior may be related to the lower Fraser valley region.

In general, triangular form bifaces tend to be found in greatest abundance in the coastal Georgia Strait region of British Columbia (Keddie, this volume) (Figure 10). The low frequency of triangular forms within the study area suggests that this type of point may have been better suited to activities at coastal sites; however, the presence of triangular bifaces at several sites in the study area does show that there were interactions between people within these two regions. Most notably, triangular points occur in contexts dating between 4290 and 310 BP from sites located in both the western and eastern parts of the study area.

Contracting stem forms are found at most sites in the study area but appear to have the greatest frequency within the more westerly situated sites (Figure 11). One contracting stem is catalogued as being from the Old Cordilleran component at the Glenrose Cannery site. A review of the of the catalogue reveals that this object may be more readily associated with the St. Mungo component. Excluding the Glenrose Old Cordilleran artifact and material from the Gulf of Georgia component at Pitt River, the time span for contracting stem points was found to occur between 5050 and 310 BP in both western and eastern parts of the study area.

Overall, this study shows that techniques and style in formed biface manufacturing were conservatively practiced over very long periods of time. Subtle changes in manufacturing do occur and new types

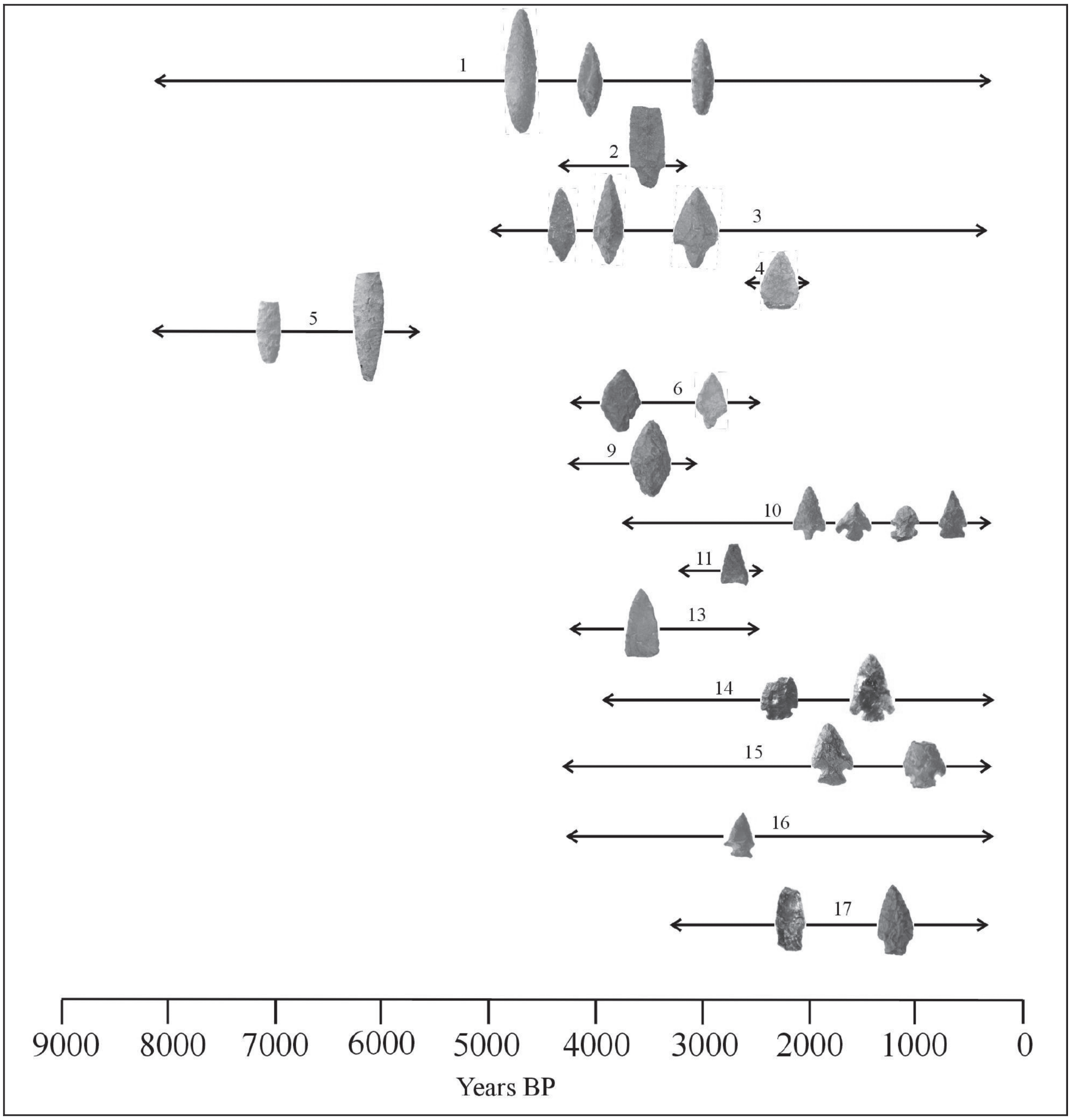

Figure 7. Chart demonstrating the formed biface cluster types and associated dates in radiocarbon years before present.

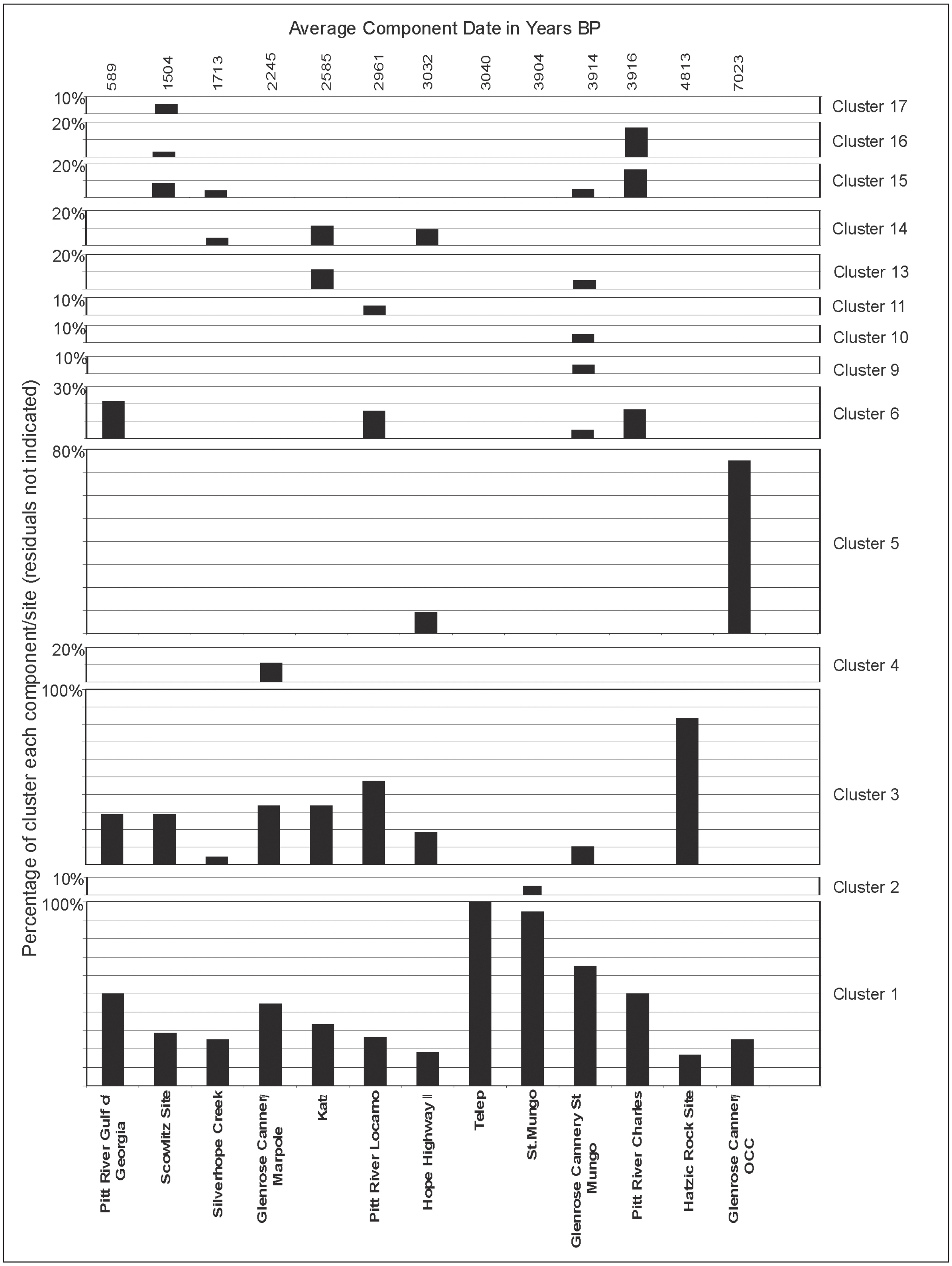

Figure 8. Chart demonstrating the relative percentage of clustered types for each site.

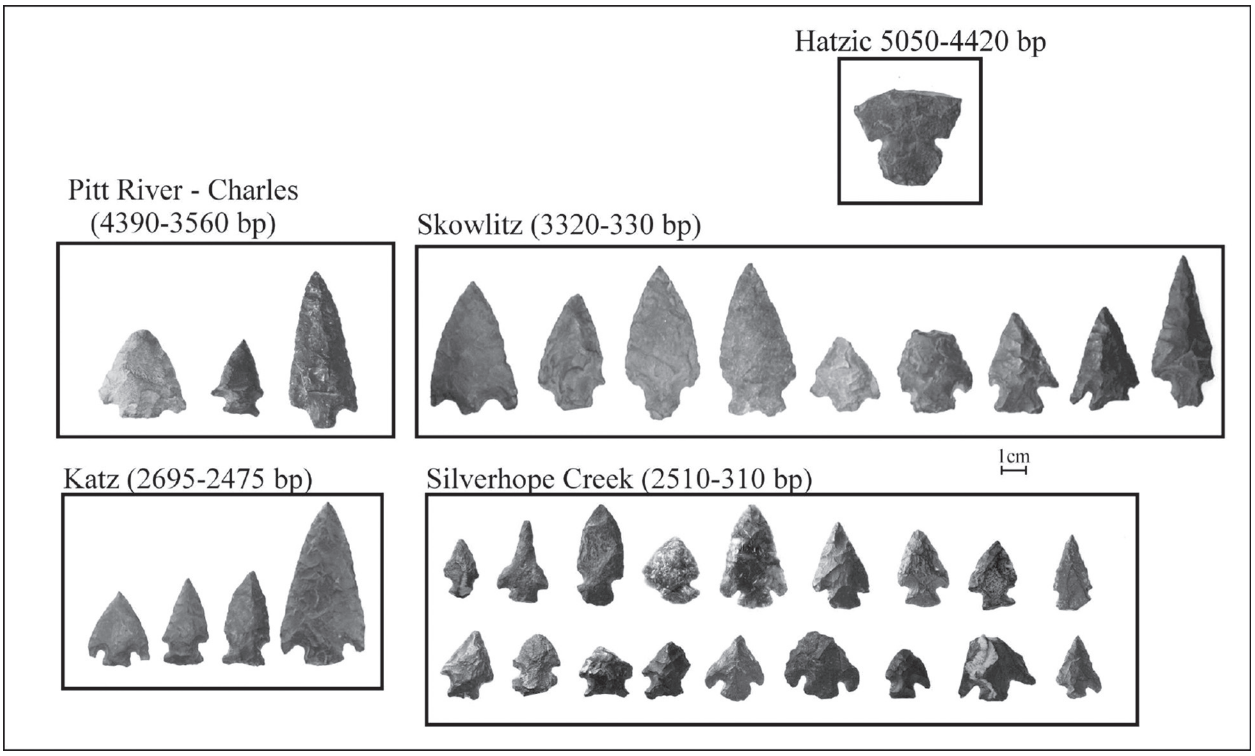

Figure 9. Notched bifaces from dated sites in the study area.

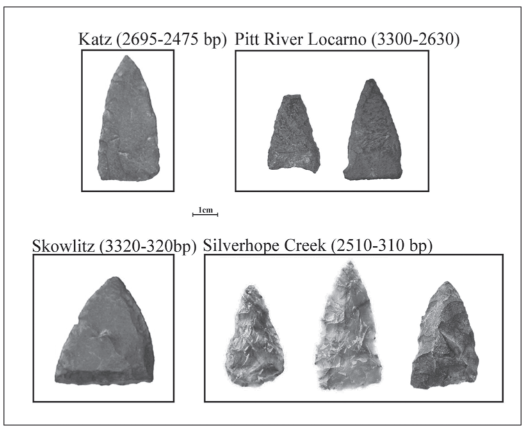

Figure 10. Triangular bifaces from dated sites in the study area.

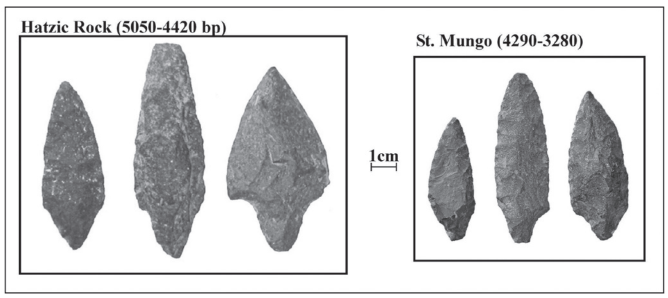

Figure 11. Contracting stem bifaces from dated sites in the study area.

are introduced. However, some types, particularly foliate, have very long durations in the archaeological record. This long-term practice of biface manufacturing tradition, in addition to our troubles encountered in attributing artifacts to specific site components, has made it difficult to separate biface types into smaller temporal frames than are presented here.

How does surface collected material from the Stave Watershed compare temporally to other bifaces within the Fraser Valley region?

One of the objectives of this study was to assess the relative temporality of undated, surface collected bifaces from the Stave Watershed by comparing them to dated types. Hence, by examining the occurrence of surface collected material within each type cluster some generalization regarding the relative age of sites in the Stave Watershed can be made. Table 2 shows the number of artifacts from surface contexts within each cluster.

As shown in Table 2, the type with the highest frequency of artifacts from the Stave region is Cluster 5. These objects tend to have colateral flake scar patterns and are most closely associated with materials from the Old Cordilleran component at the Glenrose Cannery site (8150–5730 BP).

In regards to finishing flake scar orientation, the early and mid Holocene objects tend to have colaterally oriented flake scars and finishing flake scars to the medial axis. Later Holocene formed bifaces have subradial or variable flake scar orientations. The illustration in Figure 12 highlights the unique flake scar patterning and narrowness of the Stave Watershed artifacts within Cluster 5. The fine workmanship and uniqueness of these artifact types differentiates them from later bifaces. Further, similar types to these are known from early Holocene contexts on the Columbia Plateau and Great Basin (Bryan 1980), Plains (Frison 1983), and northern Northwest Coast (Fedje et al., this volume). As has already been stated, elements of these styles are also present in some of the material from the Old Cordilleran component at the Glenrose Cannery site.

The illustrations presented in Figure 12 through Figure 15 present a sequence of formed bifaces from the Stave Watershed region as they were organized in the seriation analysis based on shared attributes (McLaren 2003). Each artifact includes a number at the bottom right corner that indicates the cluster into which that particular artifact was placed in the analysis described above. These artifacts follow a sequential order, with the oldest being depicted on the first page of illustrations and the latest being depicted on the last page. From this figure, it appears that there is relatively good agreement between the seriation results (the relative order of artifacts) and the cross-dating derived from the cluster analysis presented here.

Since undertaking this analysis, further fieldwork has been conducted in the Stave Watershed region. A selection of recently collected bifaces associated with cluster type 5 is presented in Figure 16.

Conclusion

This paper has presented a statistically based approach of comparing formed bifaces from dated contexts to bifaces from undated contexts, for the purposes of cross-dating. A total of 372 artifacts from the lower Fraser Valley region were analyzed from nine radiocarbon dated archaeological sites and 25 surface lithic scatters from the Stave Watershed. Specific attributes for each formed biface were recorded and then a typology was created by comparing objects using cluster analysis. This analysis resulted in the identification of 17 clusters, 14 of which contained artifacts from dated contexts. A temporal span was assigned to each cluster based on the material from dated contexts within each cluster. By extension, this temporal span was used to assess the relative temporality of the surface collected artifacts from the Stave Watershed.

We found that there are temporal and spatial differences between formed biface types in the region. Temporally diagnostic types can be distinguished at broad time scales. By relating common attributes between formed bifaces from dated components with formed bifaces from surface scatters we argue that it is possible to provide relative dates for the decontextualized materials.

This paper has presented a statistical method of evaluating the relatedness of formed bifaces through time and to formulate types based on complements of attributes. The very long duration of several of the formed biface types examined, particularly foliate forms, reveals that lithic tool manufacturing endured as a tradition throughout the Holocene period despite the environmental, social, and other technological shifts that occurred.

Table 2. Cross-dating results for archaeological sites in the Stave Watershed region of British Columbia.

Cluster	**1**	**2**	**3**	**4**	**5**	**6**	**9**	**10**	**11**	**13**	**14**	**15**	**16**	**17**	**Relative Date Span Excluding Cluster 1**
Oldest Associated Date (BP)	8150	4290	5050	2340	8150	3560	4290	4080	3300	2695	4080	4390	4390	3320	
Youngest Associated Date (BP)	216	3280	4813	2030	5730	216	3280	330	2630	2475	310	330	330	330	
DhRo–1	1														N/A
DhRo–10	8		3			3	1			1					5050-216
DhRo–11 (5920-3290 BP)*	1	1	1		6										8150-3280
DhRo–13					2										8150-5730
DhRo–14	1				1										8150-5730
DhRo–16			1		2			1							8150-330
DhRo–17	1				2										8150-5730
DhRo–18			1												5050-4813
DhRo–21									1						3300-2630
DhRo–26 (2530 BP)*	4		2		1	1									8150-216
DhRo–28 (316-287 BP)*								1							4080-330
DhRo–32		1	2	1	1										8150-2030
DhRo–36	2														N/A
DhRn–8					1										8150-5730
DhRn–11 (5570-4790 BP)*	1		1		4										8150-4813
DhRn–14	2	1			2										8150-3280
DhRn–15					1										8150-5730
DhRn–18	1				1										8150-5730
DhRn–25					1										8150-5730
DhRn–26								1							4080-330
DhRn–27					1										8150-5730
DhRn–29 (9270-8590 BP)*	1		1		1										8150-4813
DhRn–32					1										8150-5730
DhRn–33					1										8150-5730
DiRn–2	1														N/A
Total Surface	24	3	12	1	29	4	1	3	1	1	0	0	0	0	79
Total from Dated Contexts	66	1	42	1	4	9	1	31	1	2	3	6	2	2	171

*Dates are ranges based on preliminary testing at these site and does not necessarily apply to the surface collections

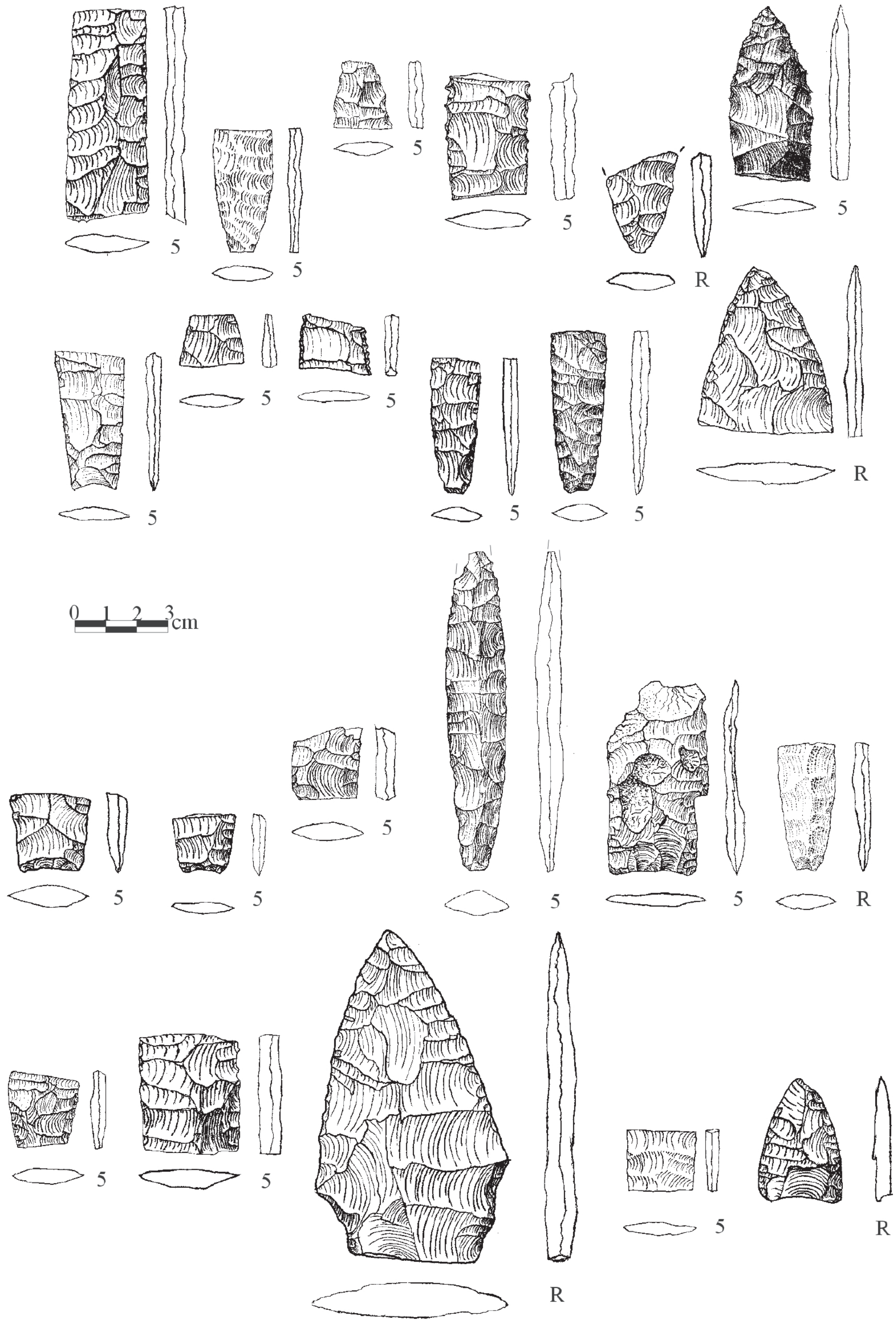

Figure 12. A sequence of bifaces from the Stave Watershed. The formed bifaces illustrated in Figures 12 to 15 have been ordered sequentially based on a seriation analysis presented in McLaren (2003). Cluster types are included as a number at the bottom right corner of each illustration ('R' = residual). The oldest object is at the top left hand corner and the youngest at the bottom right hand corner. This sequence is ordered in rows and continues in Figure 13. Cluster type 5 cross-dates between 8150–5730 BP.

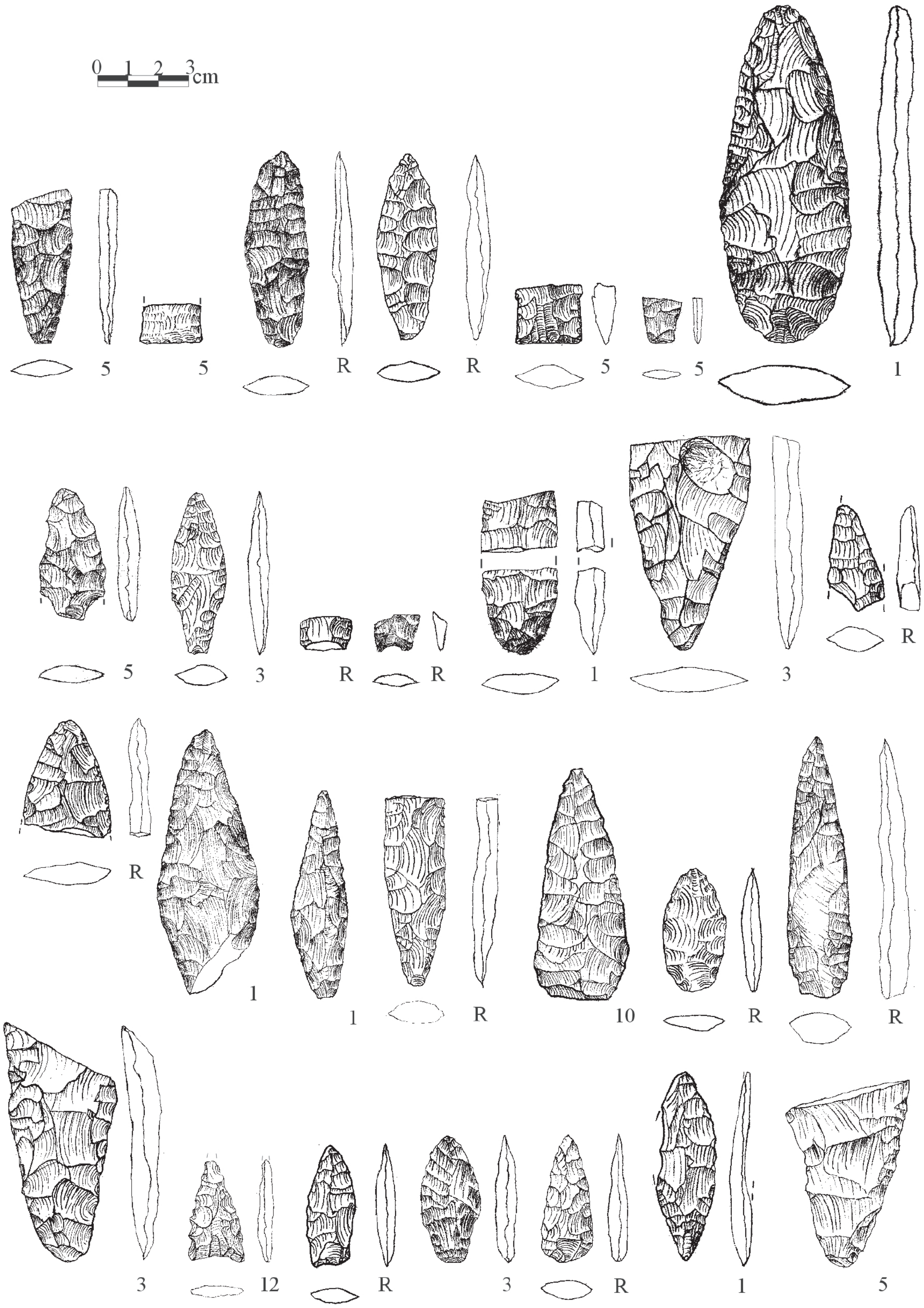

Figure 13. Continued sequence of bifaces from the Stave Watershed. This chronological ordering of formed bifaces continues from Figure 12. Cluster type cross-dates based on the analsyis presented here are as follows: 5: 8150–5730 BP; 3: 5050–310 BP; 1: 8150–310 BP; 10: 4080–310 BP; 12: N/A; and R: N/A.

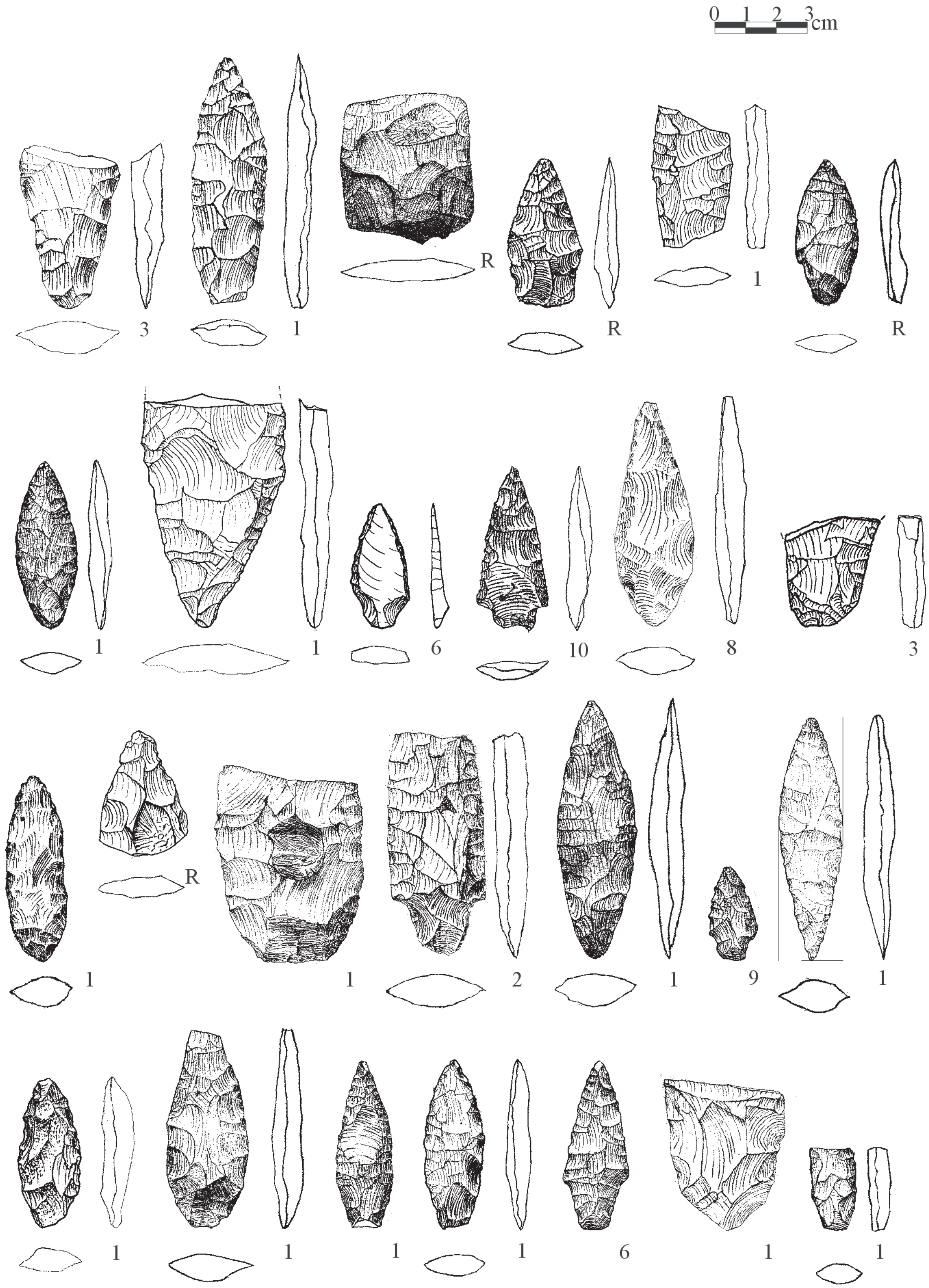

Figure 14. Continued sequence of bifaces from the Stave Watershed. This chronological ordering of formed bifaces continues from Figure 13. Cluster type cross-dates based on the analsyis presented here are as follows: 3: 5050–3 10 BP; 1: 8150–310 BP; 6: 4390–2630 BP; 10: 4080–310 BP; 8: N/A; 2: 4290–3280 BP; 9: 4290–3280 BP; and R: N/A.

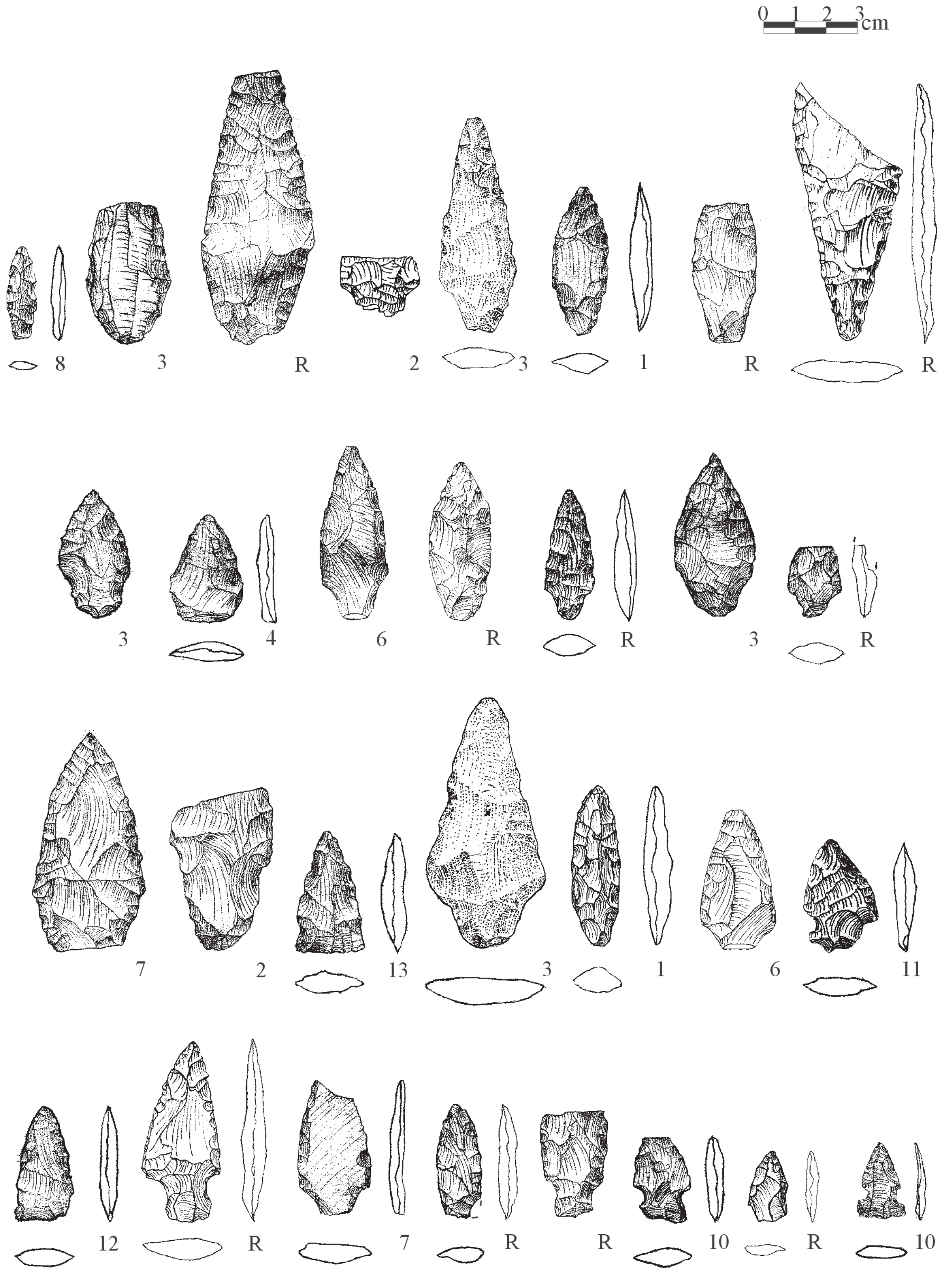

Figure 15. Continued Sequence of Bifaces from the Stave Watershed. This chronological ordering of formed bifaces continues from Figure 14. Cluster type cross–dates based on the analsyis presented here are as follows: 8: N/A; 3: 5050–310 BP; 2: 4290–3280 BP; 1: 8150–310 BP; 4: 2340–2030 BP; 6: 4390–2630 BP; 7: N/A; 13: 4290–2475 BP; 11: 3300–2630; 12: N/A; 10: 4080–310 BP.

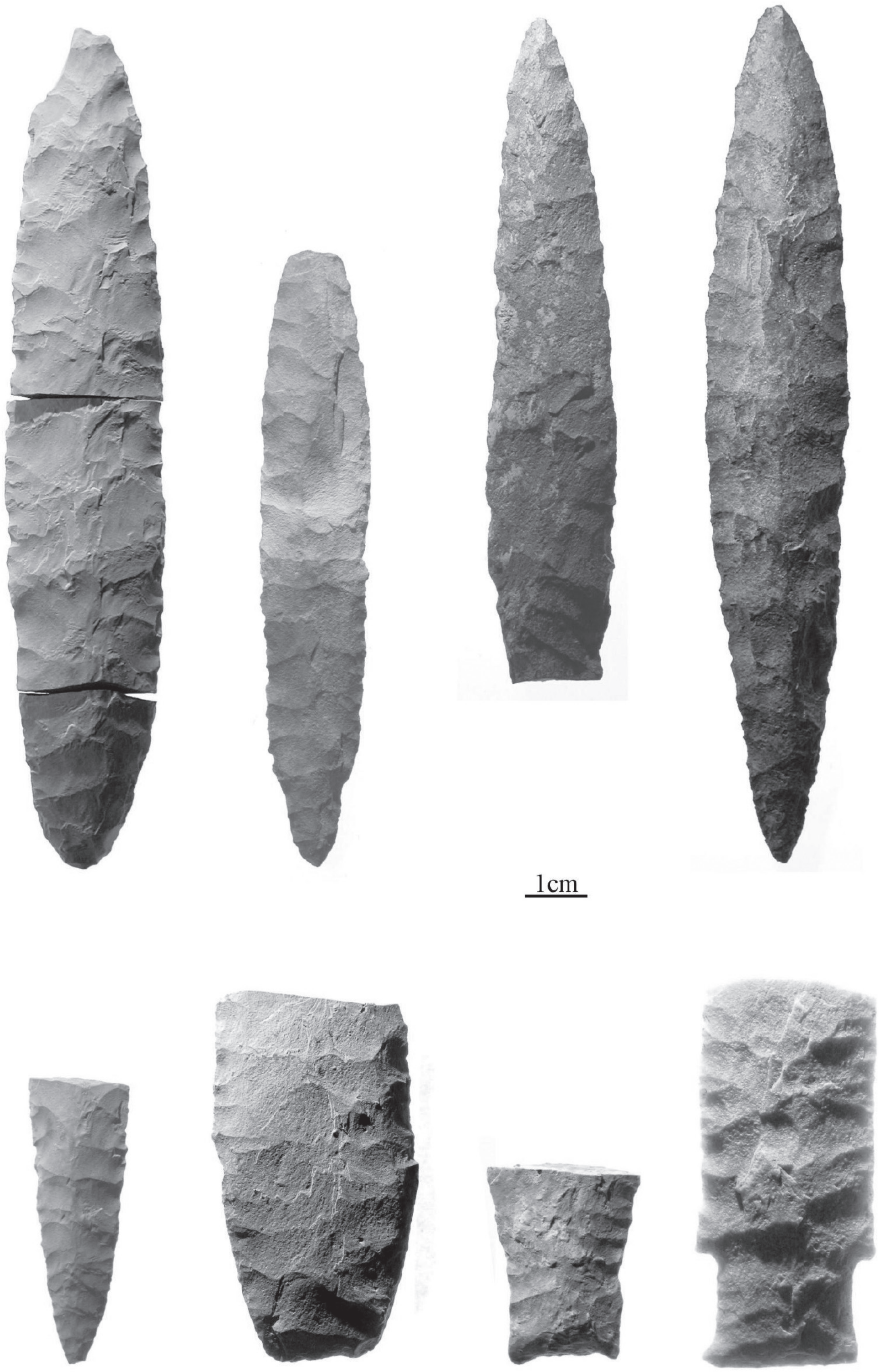

Figure 16. A selection of bifaces recently surface collected from Stave Reservoir after the analysis presented here was completed. These objects most closely relate to Cluster 5 type artifacts and cross-date between 8150 and 5730 BP. Top row from left to right: A: DhRn–16, B: DhRn–18, C: DhRn–23, D: DhRn–46; Bottom row: E: DhRo–52, F: DhRn–25, G: DhRn–25, H: DhRn–16.

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Chapter 11

The Southern Columbia Plateau Projectile Point Sequence: An Informatics-Based Approach

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Introduction

This paper defines a projectile point sequence for the Southern Columbia Plateau Cultural Area. Prior classifications are summarized but emphasis is placed on use of a neural network (SIGGI) to objectively classify projectile points within types and series proposed by Lohse (1985). Results are robust and possible new research directions for typology and sequence building are outlined.

The Southern Columbia Plateau Cultural Area lies within the physiographic region of the Columbia-Snake River Plateau (Hunt 1974). Prehistoric and ethnographic cultures occupying this area over the past 11,500 radiocarbon years BP had similar adaptive strategies focused on exploitation of large riverine systems that cut across a unique landscape encompassing lava flows, high desert plains and mountains (cf. definition of cultural area by Willey and Phillips 1958:20–21). These aboriginal societies certainly comprised different linguistic and ethnic groups, but exhibited comparable socioeconomic organizations and maintained a high degree of intense cultural interaction. Remarkable trends can be identified over time and space, with similar developments in similar physical settings at about the same periods of time.

Archaeological research on the Southern Columbia Plateau encompasses a number of accepted culture-historical syntheses that use artifact types with discrete temporal distributions to construct site sequences and local and regional sequences (e.g., Ames et al. 1998; Chatters 1995; Davis 2001; Leonhardy and Rice 1970; Lohse 1985; Warren 1968). Many researchers correlate changes in these cultural sequences with postulated macroshifts in prehistoric socioeconomic organization, often coincident with inferred environmental or climatic shifts. The cultural-historical sequence defined by Leonhardy and Rice (1970), although occasionally modified to match local conditions, remains a handy scheme for cultural-historical reconstructions.

Prior to 1985, projectile point types and type names overlapped, were redundant, or were contrary, with researchers having little success in identifying or naming common projectile point types. The recovery of hundreds of projectile points from securely dated, well-defined archaeological contexts by the Rufus Woods Lake Project, Upper Columbia River (see Campbell 1985 for a project summary), allowed Lohse (1985) to develop a statistically-based classification system of the points recovered at Rufus Woods Lake and other points from type sites across the Southern Columbia Plateau. Lohse's (1985) typology was the first explicit Plateau point classification system based on a large, documented, dated collection.

This paper briefly summarizes Lohse's 1985 typology and presents recent work by the authors to create an automated expert classification system. This neural network, nicknamed "SIGGI" after sigmoid curve, can classify Southern Columbia Plateau projectile points, having "learned" from Lohse's original work. It is important to note that the SIGGI classification does not force matches of specimens to established types, rather it serves as a smart user interface giving the expert operator information necessary to refine decision-making. This operational decision structure depends upon preferential vector scores that compare individual specimens to statistical populations along multiple dimensions.

The Lower Snake River Cultural Sequence

The Lower Snake River cultural sequence can be cited as a basic standard for comparison of archaeological assemblages (Leonhardy and Rice 1970). Six phases were identified as the basis for ordering "archaeological manifestations" on the lower Snake River: Windust Phase (10,000–9000 BP); Cascade Phase (8000–5000 BP); Tucannon Phase (5000–2500 BP); Harder Phase (2500–700 BP); Piqunin Phase (700–350 BP); Numipu Phase (350–50 BP). The Leonhardy and Rice sequence is summarized briefly below and phases, types, and traits are presented as idealizations.

Windust Phase (10,000–9000 BP)

The earliest archaeological components for the Lower Snake River region were found at Windust Caves (45-FR-46) (Rice 1965), Marmes Rockshelter (45-FR-50) (Hicks 2004; Rice 1969, 1972), and at Granite Point Locality 1 (Leonhardy 1970). Windust assemblages are marked by Windust point types, with short blades, weak shoulders, and straight to contracting squat stems. Other types include lanceolate and ovate knives, large end scrapers, burins, and numerous cobble implements. Tools were made on tabular flakes and from prismatic blades struck off polyhedral cores. Stone used is mostly cryptocrystallines, with some fine-grained basalt. Societies hunted elk, deer, antelope, and various smaller game. There is no evidence of plant processing. Burials were cremations.

Cascade Phase (8000–5000 BP)

Leonhardy and Rice (1970) originally defined the Cascade Phase based on ten site components. They used occurrence of the Cold Springs Side-notched projectile point type to demarcate an earlier and later subphase. Both subphases were identified at Windust Caves, Marmes Rockshelter, Granite Point, and Thorn Thicket. The hallmark artifact type is the Cascade point. Both subphases have comparable artifact assemblages, except for the distinctive point types. Characteristics include large, well-made lanceolate and triangular knives, tabular and keeled end scrapers, large utilized flakes, and cobble implements that include grinding stones. Lithic technology includes production of tabular flakes and prismatic blades, principally in fine-grained basalt. A distinctive hammerstone for the prepared blade industry is the edge-ground cobble defined by Crabtree and Swanson (1968). These societies hunted large and small game, gathered mussels from the rivers, and fished for salmon and steelhead. Burials include flexed and extended.

Tucannon Phase (5000–2500 BP)

This phase was defined based on components at the Tucannon site (Nelson 1966), Marmes Rockshelter, and Granite Point. The earmarks are a short, shouldered projectile point with a contracting stem, and barbed point with an expanding stem (Leonhardy and Rice suggest these are crude early versions of the later Snake River Corner-notched type). The artifact assemblage contains small side and end scrapers, cobble scrapers and utilized cobble spalls, and pounding stones. Sinkers, hopper-mortar bases and pestles are present. Lithic technology is geared to a generalized flake industry in basalt, which Leonhardy and Rice characterize as crude and impoverished (1970:14). Large and small game were hunted, mussel gathering was emphasized, and fishing for salmonids continued. A singled flexed burial was found at Marmes Rockshelter (Rice 1972).

Harder Phase (2500–700 BP)

Components from the Harder site (45-FR-40) (Kenaston 1966), Three Springs Bar (45-FR-39) (Daugherty et al. 1967), the Tucannon site (45-CO-1), Granite Point (45-WT-41), and Wawawai (45-WT-39) were used to define this phase. Leonhardy and Rice postulated two subphases, based on differences in settlement type and stratigraphy. The earlier subphase is marked by camp sites, and the later subphase by house pit villages. The early subphase artifact assemblage is characterized by large basal-notched and corner-notched projectile point types (Snake River Corner-notched). The points become smaller and more finely made in the later subphase.

The artifact assemblages for both are marked by small end scrapers, lanceolate and pentagonal knives, cobble implements, hopper mortar bases, and sinkers. Large and small game were hunted, and now bison and mountain sheep are well represented. Fishing may be more important than previously. Housepit settlements become well-established.

Piqunin Phase (700–350 BP)

This phase was defined based on a late component at Wexpusnime, an extensive housepit settlement. The cultural markers are variable forms of small basal-notched, corner-notched and side-notched projectile points (Leonhardy and Rice refer to Columbia Valley Corner-notched and Wallula Rectangular Stemmed types). The artifact assemblage includes small end scrapers, a distinctive scraper with a concave bit, lanceolate and pentagonal knives, cobble implements, pounding stones, pestles, hopper mortar stones, and sinkers. Large and small game were hunted, and salmon fishing was important. Burials appear to have been single flexed internments.

Numipu Phase (350–50 BP)

Leonhardy and Rice put this forward as a putative phase held to represent archaeological manifestations of ethnographic aboriginal culture from the time of horse introduction c. AD 1700 up to reservation confinement. At the time of their writing this phase designation was based entirely on historic period burials (Sprague 1965, 1967). "Numipu" is the Nez Perce word for their people, and Leonhardy and Rice acknowledge that both Nez Perce and Palus might be found in the archaeological record under this designation.

Ordering Data: Imposing Structure

Leonhardy and Rice's (1970) archaeological reconstructions are pockmarked with "data holes." While several troublesome topics persist (including questions as to the origins of sedentism, equating frequency of radiocarbon dates with numbers of people, and sample size variability), an overriding basic problem is that the archaeological record lacks consistent data structure. Excavation rationales and methods vary, data recovery and recording methods are not comparable, and reporting is often inadequate. Lack of a consistent conceptual scheme forces researchers to stretch interpretations to a general level to integrate pieces of the archaeological record. In order to ensure reliable data analysis and interpretation, it is imperative that researchers agree on rules of inclusion when considering which data to use to address certain problems. Culture history traits (e.g., Leonhardy and Rice's 1970 subjective projectile point type characterizations marking phase designations) cannot be effectively employed to answer questions of prehistoric socioeconomic organization but they can form significant stringers for organizing research.

We must attempt to standardize archaeological data sets as the primary foundation on which to build defensible archaeological interpretations. As Ames et al. (1998) acknowledge, there have been too few systematic analytical frameworks developed on the Columbia Plateau (cf. Bicchieri 1975; Davis 2001; Lohse and Sammons 1994).

Projectile point typologies are a primary key in building reliable chronological sequences. To date, the only attempt to statistically analyze a large, dated projectile point collection remains Lohse's (1985) projectile point typology developed as part of the Rufus Woods Lake archaeological project (Campbell 1985; Ames et al. 1998).

Southern Columbia Plateau Projectile Point Classification (1985)

Lohse (1985; various) produced a classification system from a study collection that included over 1500 projectile points, spanning the last 7000 years of the Archaic Period, and representing 60 separate cultural components indexed by 161 radiocarbon dates. This classification exercise had three explicit goals: (1) classify the Rufus Wood Lake projectile points within established Columbia Plateau types; (2) create a descriptive or morphological classificatory framework to drive further definition of distinctive styles; (3) assess the efficacy of established types by comparing identifications to radiocarbon dated components from excavated sites (Cowgill 1990; Read 1989; Read and Russell 1996).

An index collection was prepared by photographing and digitizing recognized projectile point type collections that formed the basis for established point types and cultural sequences on the Columbia Plateau (Lohse 1985). Collections selected were those that (a) constituted the originally defined type specimens or contained specimens clearly identified by authors as recognized types or type variants, (b) were reasonably well dated, and (c) were clearly illustrated to scale in published plates and figures. Large seminal collections, as at Marmes Rockshelter, the Fraser River drainage, and Rufus Woods Lake Reservoir, were handled, measured, photographed, paradigmatically encoded, and digitized for statistical analysis.

Figures 1 and 2 illustrate the historical projectile point types and type variants used in the Lohse (1985) analysis, cross-indexed with basic morphological divisions and series. Type assignments within the classification were made using discriminant analyses based on measurements derived from the two-dimensional outline of projectile point forms. These measurements were coded as distance, width, and angle measurements.

Discriminant analysis was used for two purposes: (1) to identify diagnostic elements of the recognized historical types by exploring how typologists could discriminate among groups on the basis of some set of characteristics; (2) to develop a consistent classification based on discriminant functions that would combine group characteristics to allow assignment of individual cases to defined groups. The goals were automating accepted typologies and revising these within an explicit, replicable, statistically based classification system.

Multivariate discriminant analysis was employed to classify the collection of Plateau projectile points. Discriminant rather than cluster analysis was chosen so that the specimens would be forced into recognized categories. An SPSS subprogram was used that employed a stepwise discrimination method to select the best discriminating variables by minimizing Wilke's lambda. The resulting classification tables provided the number of cases classified into each group and the percentage of correct classifications for the known cases. Statistics for each case included the discriminant score and classification, the

Morphological Division	Morphological Series	Type
Lanceolate	1. Lanceolate	1.1. Clovis
		1.2. Folsom
		1.3. Windust C
		1.4. Cascade A
		1.5. Cascade B
		1.6. Cascade C
	2. Shouldered Lanceolate	2.1. Lind Coulee
		2.2 Windust A
		2.3. Windust B
		2.4. Mahkin Shouldered
Triangular	3. Side-notched Triangular	3.1. Cold Springs Side-notched
		3.2. Plateau Side-notched
	4. Corner-removed Triangular	4.1. Nespelem Bar
		4.2. Rabbit Island Stemmed A
		4.3. Rabbit Island Stemmed B
	5. Corner-notched Triangular	5.1. Columbia Corner-notched A
		5.2. Columbia Corner-notched B
		5.3. Quilomene Bar Corner-notched A
		5.4. Quilomene Bar Corner-notched B
		5.5 Wallula Rectangular Stemmed
	6. Basal-notched Triangular	6.1. Quilomene Bar Basal-notched A
		6.2. Quilomene Bar Basal-notched B
		6.3. Columbia Stemmed A
		6.4. Columbia Stemmed B
		6.5. Columbia Stemmed C

Figure 1. Morphological divisions, series and historical types (after Lohse 1985).

probability of a case being that far from the group centroid, the probability of the case being in that group, and the probability of membership in the second closest group. Scatter plots were used to show locations of group centroids in n-dimensional space defined by the first two discriminant functions.

This indexing analysis resulted in identification of six distinct major type series. Plots identified group centroids and distributions of identified types within these series as scores plotted on coordinates within the n-dimensional space.

Success in separating out recognized types and type series allowed generation of classification functions to permit classification of new cases with unknown memberships. These were used to classify the Rufus Woods Lake specimens. Discriminant runs were made within the lanceolate and triangular divisions for simplicity. Results were robust, with 80% of lanceolate specimens correctly classified and 96% of triangular specimens correctly assigned. Types were then manually sorted into groups, errors checked, and anamolous forms dropped. Early types not well represented in the Rufus Woods Lake archaeological record were also removed. Discriminant runs were again performed, with improved type assignments as a result. At this stage, lack of resolution concentrated in lanceolate and triangular forms with slight to moderately well-defined shoulders (Mahkin Shouldered and Nespelem Bar types).

Figures 3 and 4 show lanceolate and triangular types as centroids arranged in n-dimensional space. These are illustrative of general relatedness and serve as concept maps for approaching classification of points on the Columbia Plateau.

Of interest for this study is that the discriminant functions revealed those variables with the greatest value for differentiating between recognized types. For lanceolate projectile points, the first two discriminant functions (F1 = haft length; F2 = neck width, blade width, shoulder angle and shoulder length) accounted for 91% of the variation observed. For triangular points, three functions accounted for 94%

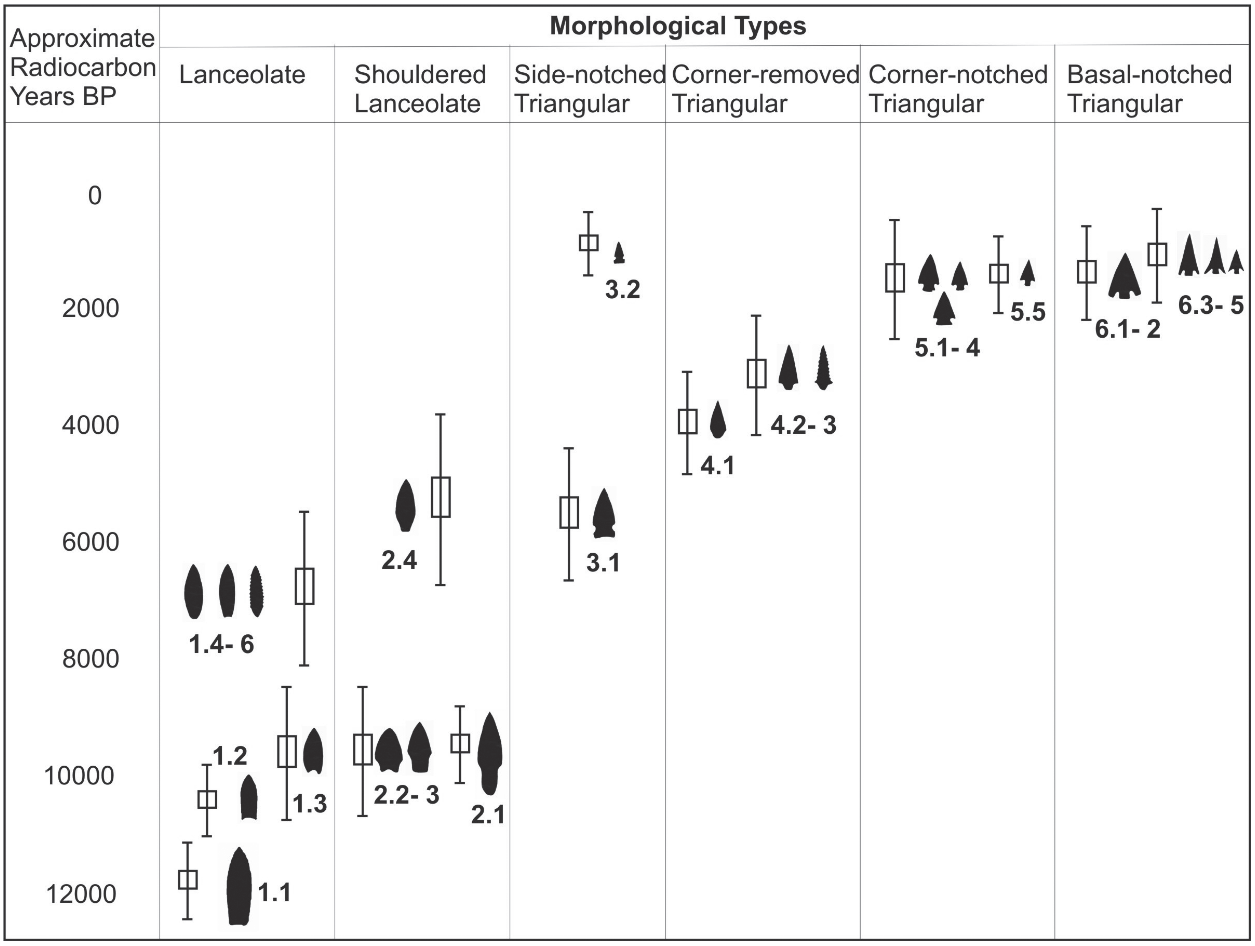


Figure 2. Projectile point type sequence for the Southern Columbia Plateau (after Lohse 1985).

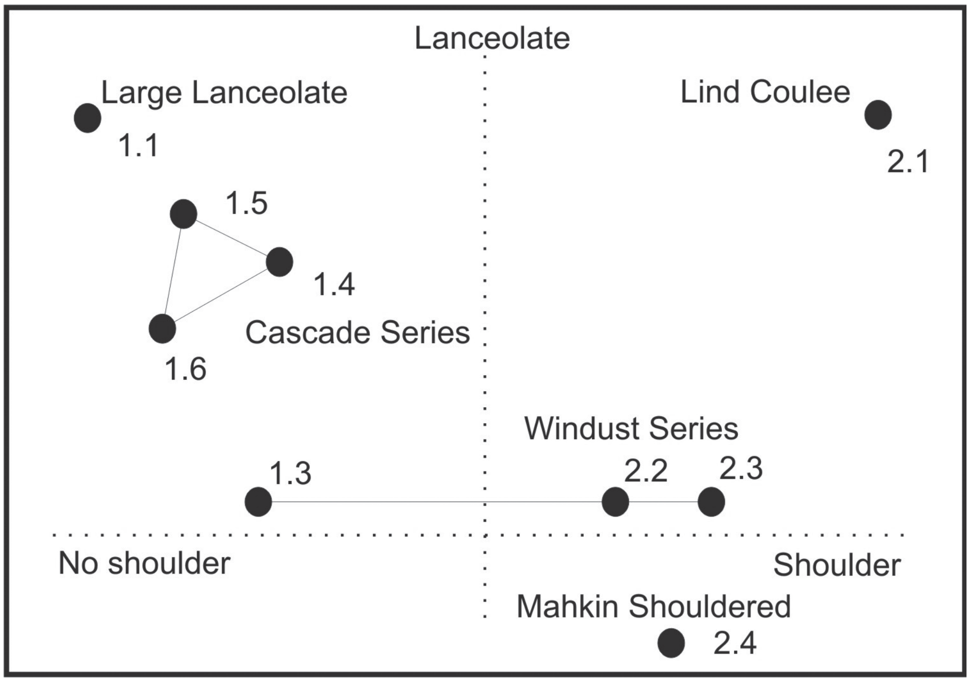


Figure 3. Lanceolate archetypes as group centroids in dimensional space. The nodes are arranged in space relative to the dimensions of shouldered and non-shouldered lanceolate forms. The nodes are placed conceptually along the dimensions, and lines connecting nodes indicate relationships within morphological series.

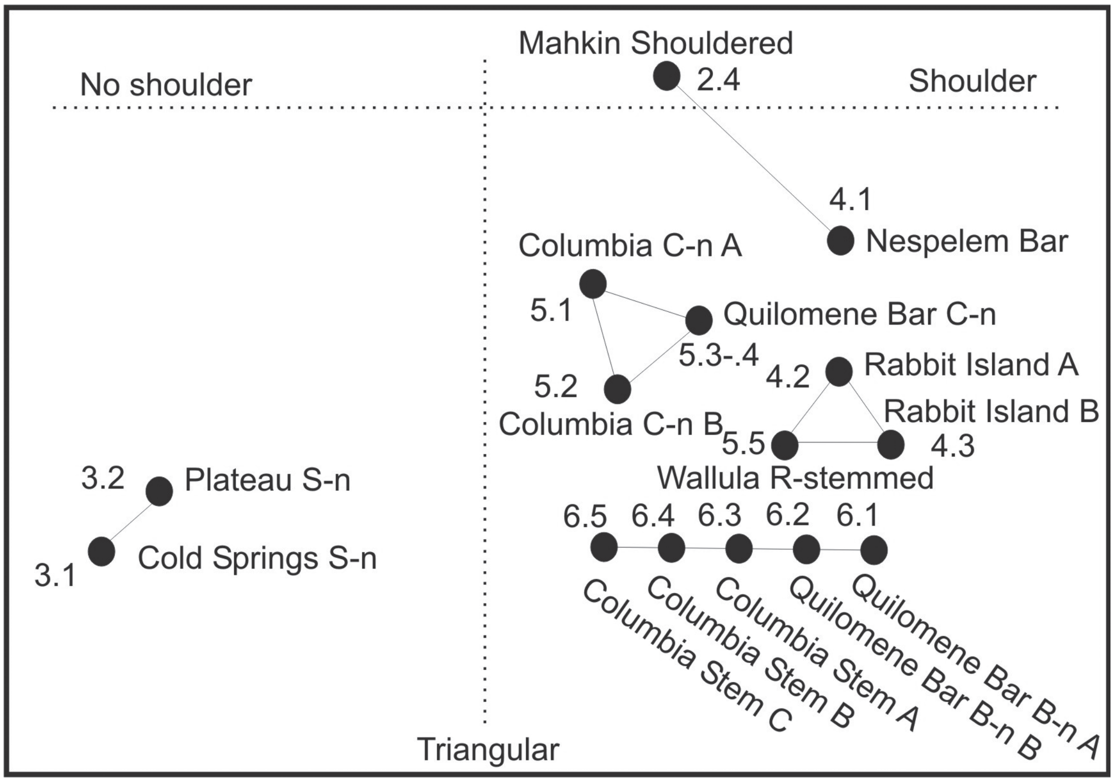


Figure 4. Triangular archetypes as group centroids in dimensional space. The nodes are arranged in space relative to the dimensions of shouldered and non-shouldered triangular forms. The nodes are placed conceptually along the dimensions, and lines connecting nodes indicate relationships within morphological series.

of the variation found (F1 = shoulder angle; F2 = basal margin angle; F3 = basal width, neck width/basal width ratio). Not surprisingly then, haft configuration, including stem and shoulder configurations and proportions, are the prime discriminating variables in defining the various accepted projectile point types. Distinctions remain relatively subtle in lanceolate forms and become more pronounced in triangular forms with diminishing size over time.

The resulting classification resulted in robust discrimination between recognized projectile point types and proved able to consistently separate recognized forms over the span of Columbia Plateau prehistory. The type series, type variants, and individual types identified proved effective in demarcating periods of time important for development of regional and areal cultural sequences. Readers should consult recent work by Baxter (1994a, 1994b) and Benfer and Benfer (1981) with regard to strengths and limitations of multivariate statistical and step-wise discriminant analyses in analysis of archaeological data (cf. Carr 1985).

The Rufus Woods Lake classification (Lohse 1985) has also become the basis for an expert automated classification system using a neural agent labeled SIGGI.

Southern Columbia Plateau Projectile Point Classification (2006)

The authors have attempted to refine projectile point typologies on the Columbia Plateau through use of a neural network to develop both an automated classification system and an authoritative online database (Lohse, Sammons et al. 2005; Lohse, Shou et al. 2004). Past experiments with artificial intelligence (AI) systems have largely been confined to rule-based forced classifications as in that developed by van den Dries (1998) for teaching use-wear analysts. Use of a sophisticated neural network that is trainable and capable of making novel intelligent decisions is an important approach to improving information sharing and exploring theoretical tenets of archaeological classification and data design.

Although the initial application of the SIGGI autoclassification system uses specimens drawn from Lohse (1985), the system is extensible. SIGGI functions as a virtual analyst which, given some basic rules and concepts derived from Lohse (1985), is continuously trained by introduction of new data sets. To improve its accuracy, SIGGI must be continually exposed to new and amplifying data fields. SIGGI is capable of accurately applying extant projectile point typologies; however, SIGGI can also identify outliers or unique data sets and suggest that these represent new types or that previous analysis identifying types needs modification within new explicit data ranges. As with any student, we must be certain that the data we ask SIGGI to analyze has been authenticated, and that we gather samples that are clearly representative of defined research populations. Because SIGGI learns by mimicking expert's decisions, behaviors, and explicit rules, and then creates new decision frameworks integral to the compilation of new data, SIGGI eventually may generate insights into decisions made by human analysts and by prehistoric makers.

The principal criterion for training SIGGI is to retrieve collections that have fine excavation and analytical context. A primary assumption in archaeological typologies is that the knappers of the stone points were operating within a very well defined cultural model that laid out clear expectations regarding what a particular projectile point form should look like. Essential for training this virtual analyst is retrieval of sample populations that as nearly as possible represent these real time actors in the past. For training, SIGGI needs projectile point samples found in large numbers from a single site, within a specific layer, in association with cultural features representing clear prehistoric human activity, and bracketed by reliable radiocarbon dates. These samples supply the virtual analyst with numerous points made to a prehistoric standard, and reveal expected ranges of statistical variation in basic variables of form. This allows SIGGI to make intelligent decisions on where to draw lines demarcating the distinctive types of projectile points. SIGGI's ability to explicitly handle multiple variables in a multidimensional statistical environment promises insights into clarification and refinement of chronologies of prehistoric projectile point types, a result of considerable interest to the practicing archaeologist (cf. Lohse et al. 2004).

SIGGI's AI engine evaluates shapes provided from .jpg image files against a series of stored training sets. The training set contains a spectrum of examples drawn from known collections. The technical specifications of how SIGGI works has been reported elsewhere (Lohse, Sammons et al. 2005; Lohse, Shou et al. 2004). In basic, SIGGI compares an individual image to a collection of images for which type assignments are known. It then compares the outline of the input image with outlines held in the established data set. In the case of the Southern Columbia Plateau projectile points, SIGGI learned from the same set of projectile points classified by Lohse (1985).

First the image file of a projectile point is uploaded into the system. To speed analysis, the expert user can suggest size, general shape, and other significant attributes. The user can also indicate that the point is "small" or "large", "lanceolate" or "triangular." Simple and complex shape attributions are used to identify shoulders and edge complexity. Identifying these values for SIGGI can speed the process, since entry without these values identified can triple analysis time.

The thresholding value, if needed, is used to refine contrast for detection of the specimen edge. An image editing tool may be used to remove stray image content. Once the image is prepared and the point's outlined clarified, the user can process the image through the SIGGI automated expert classification system.

Once the analysis is complete, SIGGI suggests three classification types as potentially correct. Each of the three proposed types is given a numeric score. This numeric value is functionally a vector length. The vector score can be conceived as a weighted score which the query places on the "space" between the point in question and its nearest neighbors. Match scores from the spaces are weighted to determine the overall match between each record and the query (Singitham et al. 2004). The higher the vector score, the "closer" a given projectile point is to a projectile point type.

For example, Figures 5 and 6 illustrate SIGGI's analysis of a point identified as Windust C by Lohse (1985). After SIGGI processed the point, it suggested three possible types: Cascade B, Windust C, and Cascade A. Nearly identical vector lengths indicate that SIGGI finds this point to be nearly equidistant from each of the three point types. SIGGI's suggestion of the Cascade varieties instead of Windust C is in keeping with the already established similarity between three point types.

A second example demonstrating vector length relationships, shown in Figure 6, is SIGGI's analysis of a Wallula Rectangular Stemmed point, which was processed as small, triangular and complex. This figure shows that the vector score for the Wallula Rectangular Stemmed classification is almost

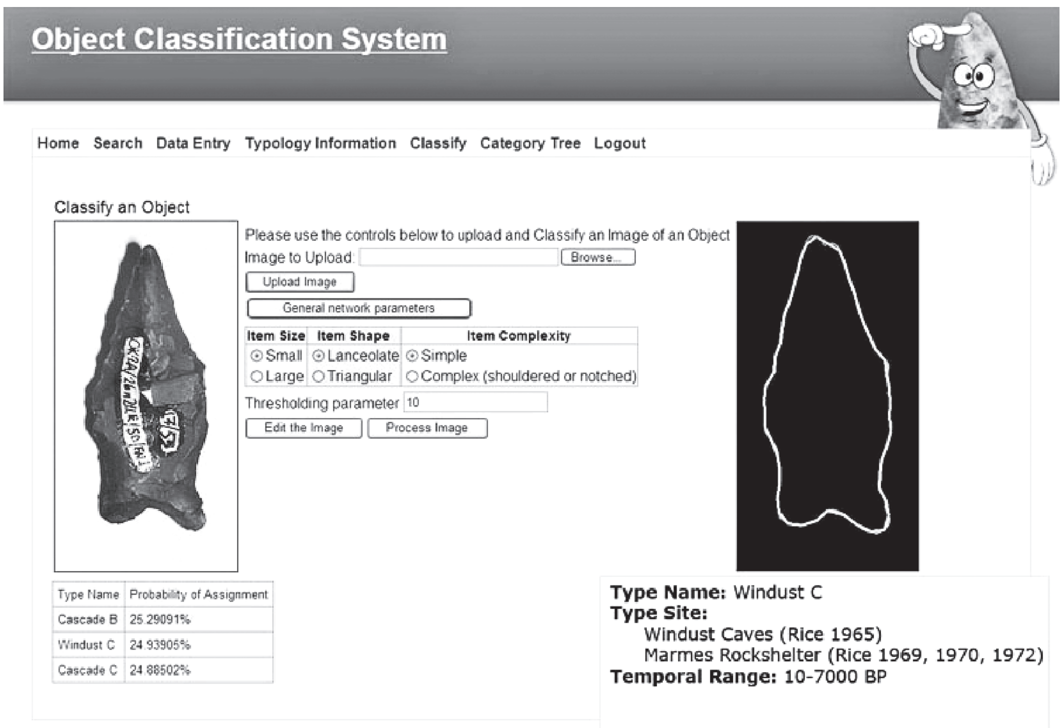


Figure 5. Screenshot of SIGGI interface showing classification of a Windust C specimen (after Lohse 1985).

three times as great as the vector scores for Rabbit Island Stemmed C and Columbia Stemmed A (28 vs. 10.3). So, SIGGI concludes that the specimen is much "closer" to the Wallula Rectangular Stemmed type than to either the Columbia Stemmed A or a Rabbit Island Stemmed C types. Previous analysis (Lohse 1985) had also identified this point as a Wallula Rectangular Stemmed.

In the discussion to follow, vector scores are reported for selected exemplar projectile point types (Figure 7).

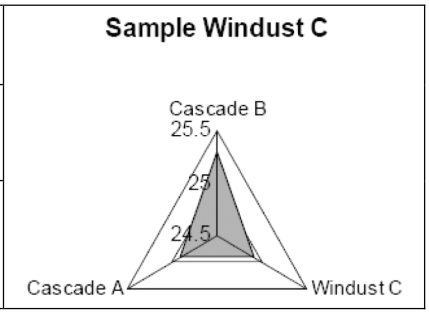
Recognized Columbia Plateau Types

In this next section, we will present type descriptions for the Southern Columbia Plateau Cultural area projectile point series, incorporating data both from Lohse (1985) and SIGGI's more recent classification of the same assemblages. Figure 8 presents a general overview of projectile point types and type series for the Southern Columbia Plateau. The chart spans the last twelve thousand years of the Holocene and presents recognized types series correlated with general morphological classes. Types and type series considered unique to the region are bolded. Projectile point type series, type variants, and individual types, prove effective in identifying these culture-historical divisions in time and space. Several type series and types in fact, probably represent robust horizon and tradition markers. Rules for inclusion of specimens, sites and assemblages in the construction of this typology are those outlined in Lohse (1994), wherein it was argued that only those diagnostic specimens from professionally excavated sites with known provenience, good dates, published results, and collections stored in professional repositories should be used.

Paleoindian Period

The earliest Paleoindian archaeological cultures in the Northern Intermountain West are identified as Clovis and Folsom, characterized by use of distinctive fluted lanceolate forms dated to c. 11,500–9000 BP. These are followed by Late Paleoindian cultures marked by various unfluted lanceolate projectile points: Midland, Firstview, San Jon, Agate Basin, Hell Gap, Alberta, Frederick-Firstview, Scottsbluff, Eden, and Jimmy Allen. This idealized cultural sequence has been found in excavated contexts on the adjoining Northwestern Plains (Frison 1991:Fig.2.2; Metcalf 1987; Mulloy 1958) but Paleoindian point types are typically only

Cascade B	25.3
Windust C	24.9
Cascade A	24.9



Wallula Rectangular Stemmed	28
Rabbit Island Stemmed C	10.3
Colombia Stemmed A	10.3

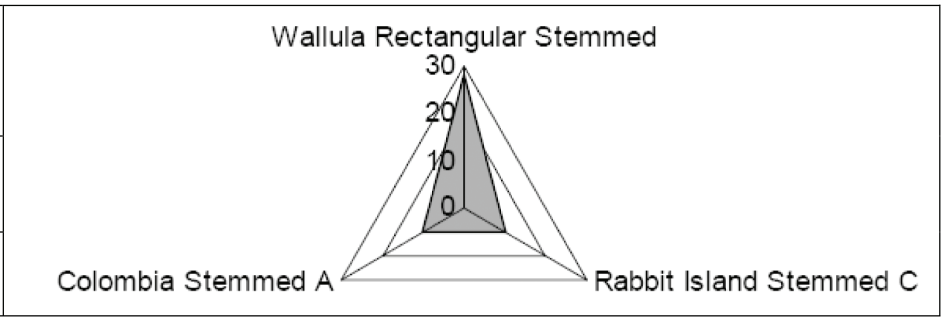


Figure 6. Vector scores generated in SIGGI classification of a Windust C specimen and a Wallula Rectangular Stemmed specimen (after Lohse 1985).

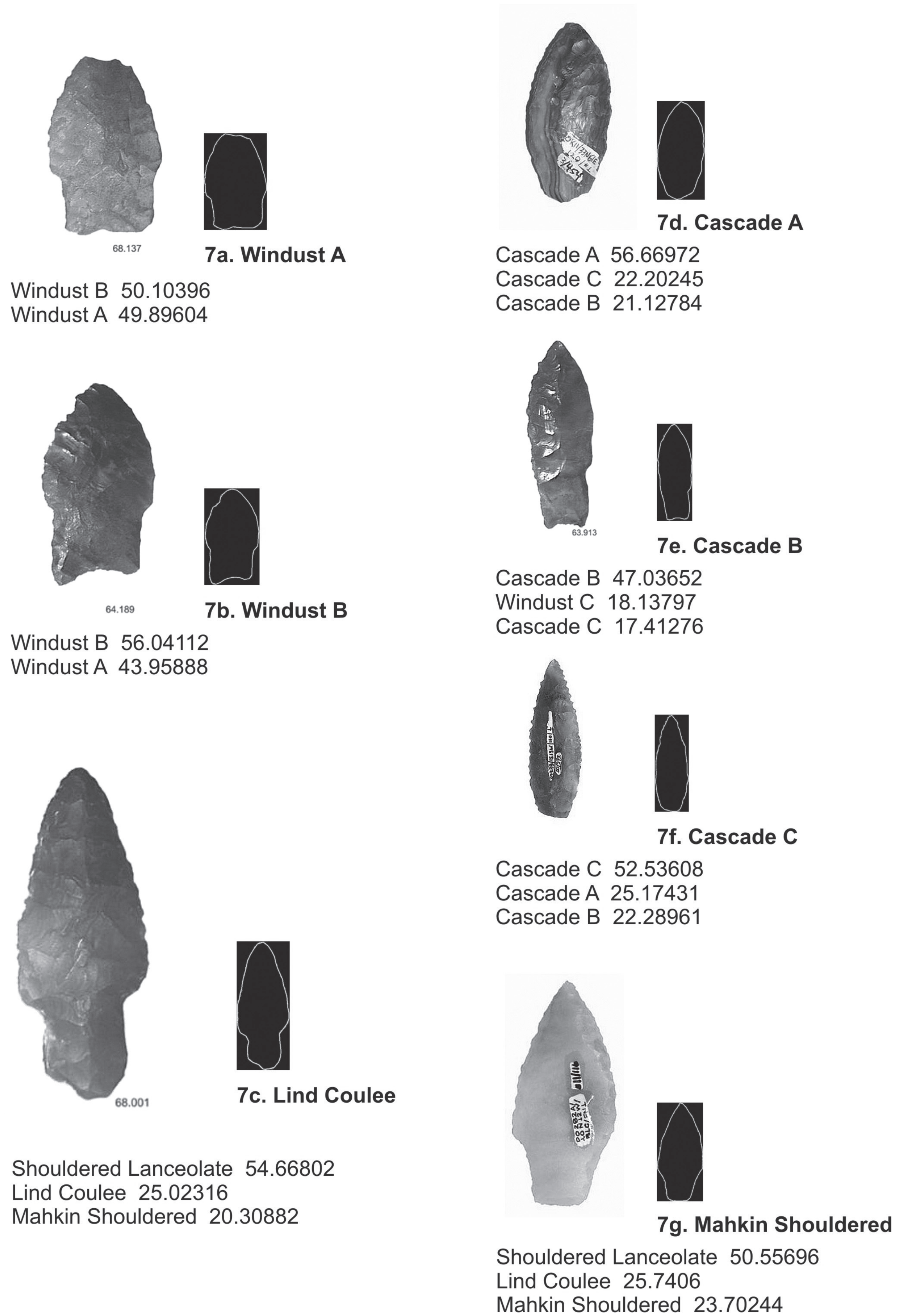
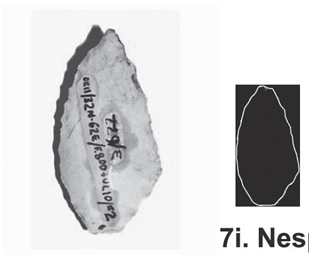


Figure 7. Examples of named projectile point types from the Southern Columbia Plateau.

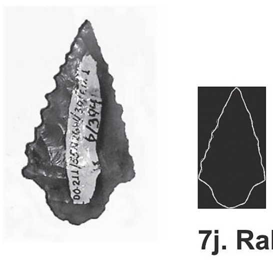
7h. Cold Springs S-n

Cold Springs Sn 33.27889
Columbia C-n A 16.85796
Nespelem Bar 12.90345



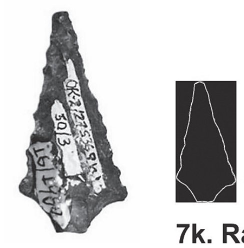
7i. Nespelem Bar

Nespelem Bar 27.40165
Rabbit Island Stem A 19.41543
Columbia C-n 10.69941



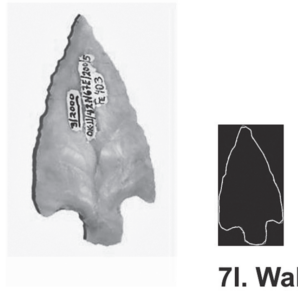
7j. Rabbit Island A

Rabbit Island A 31.15669
Nespelem Bar 11.52536
Cold Springs S-n 11.4694



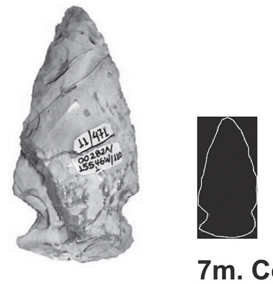
7k. Rabbit Island B

Rabbit Island Stem B 19.69573
Rabbit Island Stem C 11.47345
Wallula R-Stem 11.4718



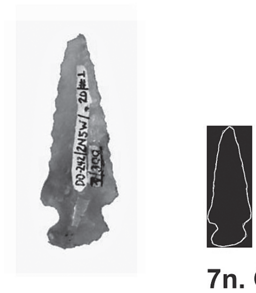
7l. Wallula Rect-Stem

Wallula R-Stem 27.86804
Rabbit Island C 10.30795
Rabbit Island B 10.30401



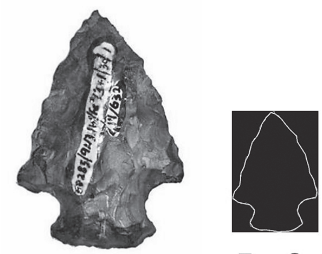
7m. Columbia C-n A

Columbia C-n A 14.60788
Cold Springs S-n 14.49156
Quilomene Bar C-n 14.22186



7n. Columbia C-n B

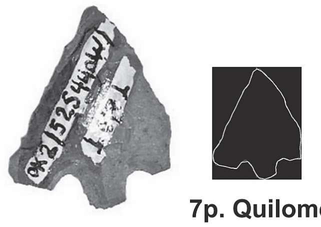
Columbia C-n B 21.84119
Wallula R-Stem 14.29629
Rabbit Island Stem B 12.9975



7o. Quilomene Bar C-n

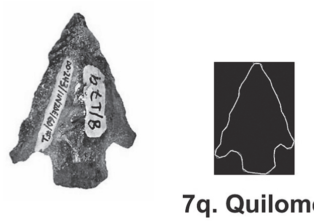
Quilomene Bar C-n 27.49496
Nespelem Bar 15.03861
Columbia C-n A 14.42634

Figure 7 continued.



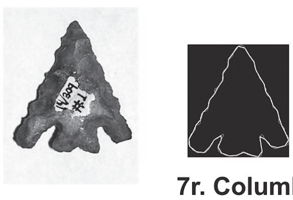
7p. Quilomene Bar B-n A

Quilomene Bar Basal-n A 29.99621
Nespelem Bar 11.9378
Quilomene Bar Bas-n B 11.61699



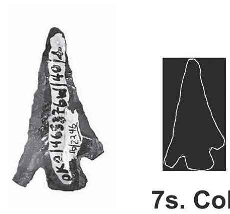
7q. Quilomene Bar B-n B

Quilomene Bar B-n B 14.3327
Nespelem Bar 14.31549
Cold Springs S-n 14.2755



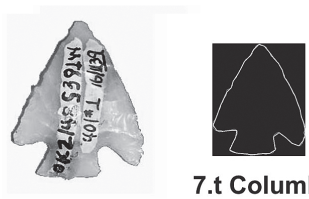
7r. Columbia Stemmed A

Columbia Stemmed A 27.96594
Columbia Stemmed C 10.29625
Columbia Stemmed B 10.29173



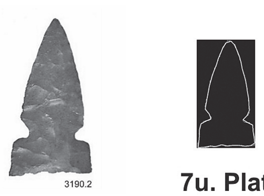
7s. Columbia Stemmed B

Columbia Stemmed B 28.21223
Columbia C-n B 14.3985
Wallula R-Stem 12.12958



7.t Columbia Stemmed

Columbia Stemmed C 27.96931
Columbia Stemmed A 10.29131
Columbia Stemmed B 10.2899



7u. Plateau Side-notched

Plateau Side-notched 20.05293
Rabbit Island Stem C 11.42102
Rabbit Island Stem B 11.42101

Figure 7 continued.

found as surface finds on the Columbia Plateau and the majority held in private collections. Unique find contexts have been preserved at the Richey-Roberts Clovis Cache near Wenatchee (Mehringer 1988; Mehringer and Voit 1990), at the Lind Coulee site in the Walla Walla Basin (Daugherty 1956a,b), at the Haskett Sentinel Gap site on the Middle Columbia River, and at the Haskett Locality sites on the Snake River Plain (Butler 1965a,b, 1967).

Ames et al. (1998) refer to this Paleoindian Period as Period I, dating c. 11,500–7000 BP. A Subperiod IA corresponds to Clovis and a Subperiod IB is described as "post-Clovis" (Ames et al. 1998). It is assumed that prehistoric populations in these periods lived at very low densities, emphasizing high mobility hunting and gathering strategies focused on a wide range of plant and animal species. These Paleoinidan cultures used large lanceolate and shouldered lanceolate projectile points. The end of Period I is marked by use of small, foliate Cascade projectile points. Butler dubbed this latter assemblage, including Cascade projectile points and edge-ground cobbles, the "Old Cordilleran Culture" (1961, 1962, 1965b). More recently, researchers applied the Old Cordilleran concept to a range of early assemblages with lanceolate projectile points and bifaces, bone tools, and a generalized hunter-gatherer economy. Daugherty (1962) referred to the Old Cordilleran Culture as an areal tradition within the "Intermontane Western Tradition."

Fluted lanceolate projectile points and Plano series projectile points are lightly represented in the Columbia Plateau region. Lind Coulee and Haskett types are clearly members of the larger Plano series.

More intriguing is the Windust type series, now dated in a broad range from c. 11,000–8500 BP (Davis and Sisson 1998; Green et al. 1998). A number of researchers have compared Windust point types to forms indicative of the broader "Western Pluvial Lake Tradition" or "Western Stemmed Tradition" (Ames 1988). On the Columbia Plateau, Clovis and Folsom are poorly represented in secure archaeological contexts and the Windust type series or Windust Phase is often the earliest assemblage present.

Clovis. Clovis projectile points are found as surface finds throughout the Northern Intermountain West (cf. Titmus and Woods 1991; Yohe and Woods 2002). Secure archaeological contexts for Clovis on the Southern Columbia Plateau include the Simon Cache on the Snake River Plain (Butler 1963) and the Richey-Roberts Cache in the Walla Walla Basin (Gramley 1993; Mehringer 1988; Mehringer and Voit 1990). For discussions of early occupations in British Columbia see Rousseau (1993) and Carlson (1991). Type Site: Blackwater Draw (Hester 1972); Naco-Lehner-Murray Springs, southeastern Arizona (Haury, Antevs and Lance 1953; Haury, Sayles and Wasley 1969; Haynes and Hemming 1968). Temporal Range: c. 12,000–11,000 BP.

Windust Series. Windust series projectile points include stemmed and unstemmed lanceolate forms with straight and indented bases. Lohse (1985, 1995) identified three variants: Windust A, shouldered with a straight base (Figure 7a); Windust B, shouldered with a concave base (Figure 7b); and Windust C, a lanceolate point with a markedly concave base. H. Rice (1965) referred to the Windust C variant as "Farrington Basal-notched." Type Site: Windust Caves (Rice 1965); Marmes Rockshelter (Rice 1972). Temporal Range: c. 13,000–9000 BP.

Lind Coulee. The Lind Coulee projectile point is a large shouldered lanceolate form with elongate stem and sloping to squared shoulders (Figure 7c). It is a distinctive Late Plano series point indicative of the Columbia Plateau. Type Site: Lind Coulee (Daugherty 1956). Temporal Range: c. 10,000–9000 BP.

Haskett. The Haskett type is a large, elongate lanceolate projectile point with a relatively thick cross-section and bulbous distal end. The Haskett point is very similar to other Late Paleoindian or Plano forms but appears distinctive of the lower Southern Columbia Plateau. Type Site: Haskett Locality (Butler 1964, 1967). Temporal Range: c. 8500–7000 BP.

Archaic Period

The shift from Late Paleoindian to the Early Archaic Period (c. 8000-5000 BP) is marked by continuation of the Shouldered Lanceolate morphological series as the Mahkin Shouldered type, and by introduction of the Cascade Series of small, finely made, lenticular, lanceolate projectile points. Lohse (1985, 1995) identified three principal variants. These are followed over the course of the Archaic Period by introduction four basic morphological series: side-notched triangular (Cold Springs Side-notched and Plateau Side-notched), corner-removed triangular (Nespelem Bar, Rabbit Island Springs Series, Wallula Rectangular-stemmed), corner-notched triangular (Columbia Corner-notched Series, Quilomene Bar Corner-notched), and basal-notched triangular (Quilomene Bar Series and Columbia Stemmed Series).

Cascade Series. Cascade Series projectile points include three variants: Cascade A, a broad lanceolate projectile point with a rounded to convex base (Figure 7d); Cascade B, a slender lanceolate projectile point with a concave base (Figure 7e); Cascade C, a slender, smaller lanceolate projectile point, often with serrated margins (Figure 7f) (Lohse 1985, 1995). Type Site: Indian Wells (Butler 1961); Marmes Rockshelter (Rice 1972). Temporal Range: c. 8000–5000 BP.

Mahkin Shouldered. This is a broad category of shouldered lanceolate projectile point with variable size, cross-section and flaking pattern, which spans a broad range of time (Figure 7g). Lohse (1985) defined this type to highlight a classification category that needs greater resolution as to type variants indicative of temporal period and also clarification of whether this a style of projectile point or a multi-purpose projectile point/biface. Type Site: Windust Caves (H. Rice1965); Marmes Rockshelter (D. Rice 1969, 1972); 45-OK-11 (Lohse 1984). Temporal Range: c. 8000–2500 BP.

Cold Springs Side-notched. These are large side-notched triangular projectile points with straight to concave bases (Figure 7h), first occurring in association with Cascade Series projectile points in Late Cascade assemblages (Leonhardy and Rice 1970) dating c. 6000-4000 BP. Type Site: Cold Springs (Shiner 1961). Temporal Range: c. 6000–4000 BP.

Nespelem Bar. The Nespelem Bar type was also named by Lohse (1985) as a classification category in need of clarification. This is a slightly shouldered triangular projectile point with variable basal morphology (Figure 7i). Researchers in the past included it with the Rabbit Island Series but it is distinctive and a clearly earlier triangular form. Type Site: 45-OK-11 (Lohse 1984); 45-OK-258 (Jaehnig 1985). Temporal Range: c. 5000–3000 BP.

Rabbit Island Stemmed Seies. This distinctive projectile point seems to be unique to the Columbia Plateau and clearly marks the Middle Archaic. Lohse (1985) identified two variants: Rabbit Island Stemmed A, a thin triangular projectile point with square shoulders and well defined straight to contracting stems, often with serrated blade margins (Figure 7j); Rabbit Island Stemmed B, a smaller, thinner triangular point with square shoulders, straight to incurvate lateral margins, sharply contracting stems, and often serrated blade margins (Figure 7k). Type Site: Shalkop Site (Swanson 1962); Sunset Creek Site (Nelson 1969) Temporal Range: Rabbit Island Stemmed A, c. 4000–2000 BP; Rabbit Island Stemmed B, c. 3000–1500 BP.

Wallula Rectangular Stemmed. This is a small, corner-notched triangular projectile point with square shoulders and straight, elongate stems (Figure 7l). The straight stem is distinctive and distinguishes this form from the Columbia Corner-notched series. It may represent a late development within the general Rabbit Island Stemmed series. Type Site: Sunset Creek (Nelson 1969), Wanapum Dam (Greengo 1982). Temporal Range: c. 2000–1500 BP.

Columbia Corner-notched Series. Columbia Corner-notched projectile points constitute a general series that can be broken into an earlier larger form (Columbia Corner-notched A) (Figure 7m) and a later smaller form (Columbia Corner-notched B) (Figure 7n) (Lohse 1985, 1995). Both have well developed corner notches, convex to straight lateral margins, and straight to expanding stems. This series resembles large corner-notched points of comparable age found across the Northern Intermountain West. Type Site: Marmes Rockshelter (Rice 1969, 1972), Granite Point Locality (Leonhardy and Rice 1970), Sunset Creek (Nelson 1969). Temporal Range: Columbia Corner-notched A (c. 5000–2500 BP), Columbia Corner-notched B (c. 2000–150 BP).

Quilomene Bar Series. Quilomene Bar series projectile points are large, thick corner-notched and basal-notched triangular forms, morphologically similar to Columbia Corner-notched specimens and later Columbia Stemmed Series specimens but much more massive in character. Lohse (1985, 1995) breaks these into three significant variants: Quilomene Bar Corner-notched (Figure 7o), Quilomene Bar Basal-notched A (Figure 7p), and Quilomene Bar Basal-notched B (Figure 7q). Type Site: Marmes Rockshelter (Rice 1969, 1972), Sunset Creek Site (Nelson 1969), Wanapum Dam (Greengo 1982). Temporal Range: Quilomene Bar Corner-notched (c. 3000–2000 BP), Quilomene Bar Basal-notched A (c. 2000–1500 BP), and Quilomene Bar Basal-notched B (c. 2500–1500 BP).

Columbia Stemmed Series. These are delicate triangular projectile points with long symmetrical barbs, thin, narrow, straight to expanding stems, and straight to incurvate blade margins. Lohse (1985, 1995) identifies three variants: Columbia Stemmed A Figure 7r), Columbia Stemmed B (Figure 7s), and Columbia Stemmed C (Figure 7t). Type Site: Sunset Creek (Nelson 1969), Wanapum Dam (Greengo 1982). Temporal Range: c. 2000–150 BP.

Plateau Side-notched. The Plateau Side-notched designates a large, highly variable series of small side-notched points with straight to concave bases, marking the late prehistoric period (Figure 7u). Type Site: Not identified. Temporal Range: c.1500-200 BP.

Conclusions

The current Southern Columbia Plateau projectile point sequence has focused on obtaining authenticated data in an effort to produce a "clean" set that reproduces exactly the classification published by Lohse (1985). Data collected are stored in an image database with attached descriptive fields. SIGGI is, in a sense, Lohse's virtual brain. SIGGI can "think" like Lohse, but as the project expands, SIGGI will also interact with other researchers, i.e., SIGGI will be educated by the larger community. This reflective activity is one of the more important aspects of the project. Obviously, certain kinds of things can be classified in proscribed ways, but our research focuses on identifying WHY things should be classified in certain ways. By watching SIGGI make classifications, researchers hope to gain a better understanding of why archaeologists make classifications and how these classifications might be continually improved as research methodology improves.

SIGGI has successfully incorporated the original database used by Lohse (1985) in development of the Rufus Woods Lake classification, and has been effective in producing results comparable to or exceeding those attained in the original analysis. The vast majority of specimens are assigned with high statistical probabilities of group membership, indicated as a vector length. Perhaps most interesting are instances where SIGGI has had difficulty in assigning specimens to one category or another. Difficulties in assignment may indicate where classifications need to be revised. The continuous addition of new data to the master database may well significantly alter or expand past classifications. This is the area where we will make gains in understanding how core types were distributed across regions temporally and spatially. Constant incorporation of new data in the AI system will inevitably result in increasingly refined classifications, and may allow us to approach research questions of ethnicity and cultural interactions over broader areas and regions. This is just the area archaeologists would like to push the data to understand behaviors of prehistoric cultures.

The SIGGI classification system aspires to create a heritage database of stone projectile point types using a trainable AI interface. It is expected that new authenticated data will be added continuously and that type assignments will be re-run as these data are entered. The result will be a master comparative data set that will allow incorporation of new finds and which will produce the possibility of typological refinement with each and every auto-classification run. Eventually, projectile point collections from surrounding regions will be added and the neural agent trained to emulate classification systems across the broader region. If successful, this may produce the data structure called for by so many researchers who attempt to construct detailed culture-historical sequences in synthesizing the vast archaeological data set to assess behavioral research questions (e.g., Ames et al. 1998; Chatters 1995).

Improved Resolution in Culture-Historical Sequences

Figures 2 and 8 suggest a strong directionality in projectile point design over time. As Lohse (1985, 1995) points out, the underlying design factor is probably the change in projectile propulsion over time, from throwing stick to bow and arrow, with a markedly corresponding decrease in projectile shaft diameter and mass (cf. Flenniken and Raymond 1986 for provisos in analysis; Hutchings 1997; Hutching and Bruchert 1997). This diminution in point size is accompanied by changes in basic projectile point morphology. Earlier simple lanceolate forms become shouldered, and then lanceolate evolve to triangular forms, which move from side-notched, to corner-removed, to corner-notched and basal-notched. There is no clear hard and fast functional correlate for these shifts in point morphology, and so, they are arguably best thought of as stylistic shifts reflecting conceptual templates of prehistoric artisans (cf. Close 1978; Conkey and Hastorf 1990; Dunnell 1978). Different types and type series are indicative of prehistoric idealizations or cultural templates that can be used to create a sound temporal and spatial structure to define and integrate local, regional and areal cultural chronologies (cf. Andrefsky 2004).

Prehistoric artisans produced projectile point types within closely constrained functional and stylistic templates. These master templates constitute core types. We depict these templates as concept maps (Figures 3 and 4), which date archaeological materials and reflect prehistoric design templates. To be able to classify projectile points we only need to understand the grammar of production and not the parameters of effective design and use. We can effectively employ this concept by use of schema theory.

Under schema theory, stone projectile points represent individual knappers' renditions of cultural idealizations concerning how these artifacts should be made as styles or templates shift over time. These knappers were building on standard templates reflecting cultural norms on how things should be done. The point types we view today were the result of these individuals performing accepted sets or scripts of actions to achieve their goal. So, these scripts represent collective norms or cultural schemata, which we can interpret as representing knapping traditions and cultural or ethnic idealizations in the past (cf. Boeda et al. 1990; Dobres and Hoffman 1994; Edmonds 1990).

These projectile point types, because they exist in groupings or associations clustered areally and temporally, can be classified statistically, and envisioned as centroids or norms within larger distributions of related forms. We can assume that variation will be found within these defined types, and that analysts may be able to identify ranges or production within these norms represent discrete social modes of expression in different areas and times. Figure 1 shows these distinctions semantically as six basic morphological types and twenty-five historical or cultural types. Figure 8 displays these cultural types as morphological clusters changing over time.

Our classifications will depend upon imposition of consistent, explicit rules for characterizing basic design. In this paper, following Lohse (1985, 1995), we have chosen to characterize these ranges in form based on simple description of outline. Part of this exercise is characterization of symmetry as reflecting the relative rigor of strict design parameters. We grasp the grammar of prehistoric makers by portraying past cultural templates as manipulating basic variables of two-dimensional shape, symmetry and surface reduction (cf. Chippindale 1992).

Six basic morphological classes of stone projectile point forms can be identified for the 11,500 radiocarbon year span of documented human occupation on the Columbia Plateau. This sequence shows a linear progression from large lanceolate to smaller, more elaborate triangular forms. Within these groupings, researchers have recognized distinctive types series, type variants and individual types demarcating more discrete areal and temporal distributions. It is assumed that enhanced sample sizes submitted to more analytical rigor as in use of refined multivariate statistical analysis as part of artificial intelligence applications or automated

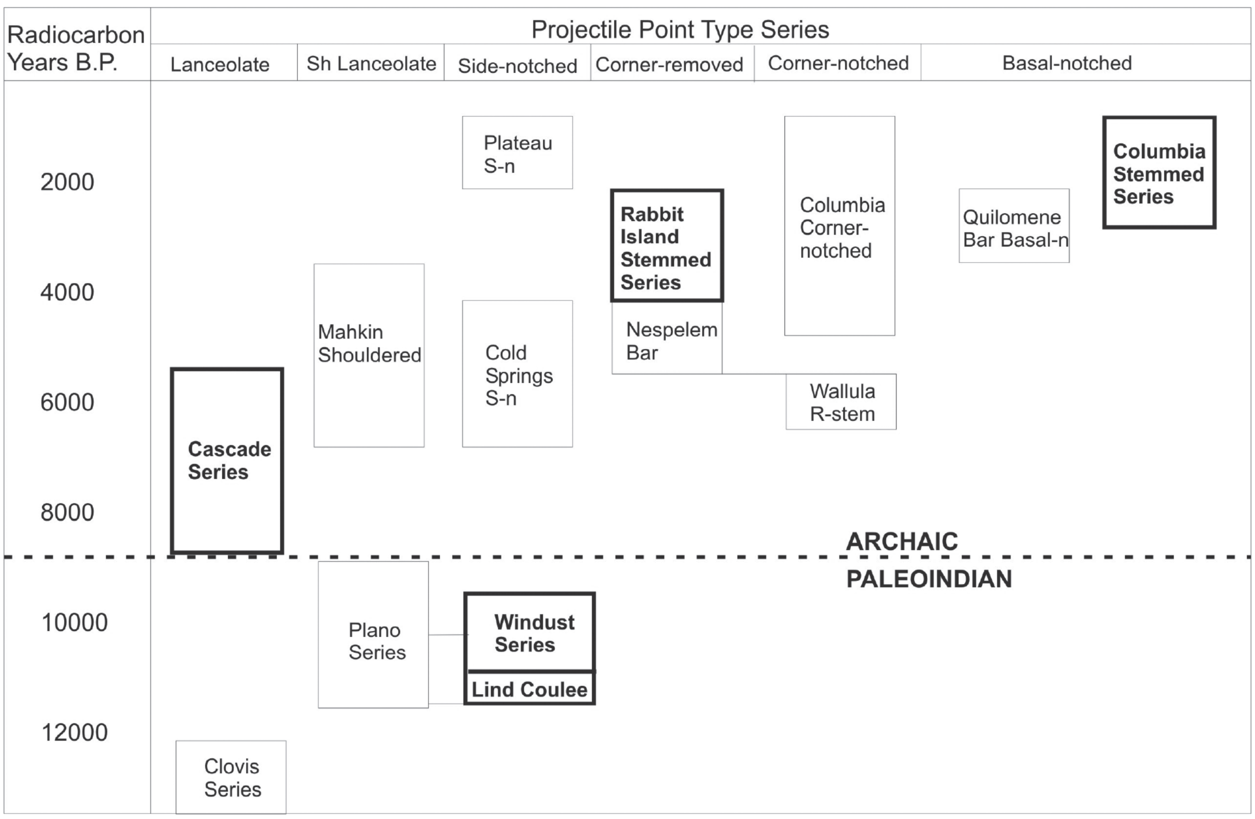


Figure 8. Projectile point type series. Series distinctive for the Southern Columbia Plateau are shown in bold.

classifications of tens of thousands of points from controlled collections from across archaeological regions will result in finer and finer discrimination of cultural styles or templates indicative of separate cultural traditions, ethnic groups, areal associations and finer periods of time (cf. Lohse 1994, 1995; Lohse, Sammons et al. 2005; Lohse, Shou et al. 2004).

Conceptual Spaces: The Geometry of Projectile Point Classification

Conceptual spaces serve as a framework for knowledge representation. These consist of quality dimensions derived from the perceptions of experts. Following Gardenfors (2004:10), representation of information can be based on simple geometrical structures, with similarities between structures modeled as conceptual forms (see also Gardenfors 2000). Measures of similarity between objects can be described as distances; the smaller the distance, the closer the representation values. Similarities can then be shown as the relative distances between object representations as points in space. The epistemological role of conceptual spaces is as a tool in sorting out these similarity relations. This model is shown in Figures 3 and 4, which depict known projectile point types as lanceolate and triangular forms in space defined based on the intersections of presence or absence of shoulders.

Quality dimensions represent various qualities of the stone projectile points. The dimensions form a framework used to assign properties to the points and to specify relations between the points. The coordinates of a particular measurement in the conceptual space represents the intersection of pertinent dimensions. Gardenfors (2004:11) argues that the dimensions are to be understood literally. It is assumed that each of the quality dimensions represents geometrical structures, and may represent topological orderings.

Some quality dimensions may have only a discrete structure that serves to divide objects into disjointed classes. Nodes may represent different types as in projectile points, and the space may be defined based on the intersection of defined dimensions. The distance between two nodes can be measured by the length of the path that connects them. This construction represents a geometric structure, and serves to depict the relationship of Type A to B as more closely related than Type B to D.

Construction of archaeological typologies represents two different uses of quality dimensions: phenomenal as allusion to the perceptions of archaeological experts and scientific as dimensions drawn from theory. The measurements are descriptions of data but the distinctions drawn and the associations made are products of implicit and explicit applied expertise.

The classifications performed by SIGGI follow explicit rules within a dynamic, thoughtful matching of shapes by a neural agent. Behind the type assignments is a comprehensive database containing relevant provenience information. SIGGI classifies in moments, defined as best fits within a specific data context. Adding more data will substantiate or revise prior assignments as group centroids move in n-dimensional space. That classificatory space can be depicted variably as conceptual spaces drawn abstractly within specified dimensions.

Implications

The SIGGI Southern Columbia Plateau project illustrates fundamentals of database design, user interface design, and relational database design. SIGGI operates on multiple levels, from development of an explicit, statistically based, online classification system with attached database, to use of a neural agent to augment archaeological training in classification, to observation of the artificial agent to study the character and effectiveness of archaeological thinking. Anthropologists and archaeologists are beginning to join cognitive psychologists and learning theorists in the use of artificial intelligence systems to explore human thought and behavior (e.g., Baylor 2002; Conte and Castelfranchi 1995; Cumming 1998; Doran 2000a,b; Gonzalez and DesJardins 2002; Russell and Norvig 1995; Woolridge and Jennings 1998; Woolridge, Muller and Tambe 1996), and the SIGGI Southern Columbia Plateau projectile point classification is part of this trend.

There are examples of successful neural networks applied to classifications in archaeology (e.g., van den Dries 1998). We need to expand on these prototypes and authenticate their potential. Obvious productive spinoffs from this research include: (1) training of an online neural classification system capable of accurately identifying archaeological artifacts (SIGGI in this sense constitutes a highly interactive user interface sitting atop a secure database); (2) creation of new theoretical and methodological frameworks to accelerate effective information design; (SIGGI offers advantages in teaching and insights into how we conceive of our study domains); and (3) further development of artificial intelligence systems linked to giant heritage databases that are constantly maintained and revised to ensure secure storage, organization and transfer of our archaeological heritage.

Construction of large databases supervised by intelligent agents is a completely attainable, realistic projection not just for archaeology but for all data rich disciplines (e.g., Egenhofer 2002). This is a major break from past practice in archaeology where laborious searches in libraries and archives for hard-to-find publications and "gray literature" are the norm; where tedious and time-consuming requests are made of overworked archive and collections managers to hand-relate various hard copy finder's guides in order to find and pull specimens from cabinet drawers and storage boxes (cf. Huggett 1995; Lock 1995; Lock and Brown 2000; Madsen 2001; Stewart 1996). The vision that information can be accessed through a central portal and seamlessly indexed and sorted, dependent upon researcher interest and creative motivation, constitutes a paradigm shift in archaeological information management and dissemination. An affirmation of technology has taken place and is driving significant changes in the infrastructure of scientific research (cf. Dreyfus 2001). Use of the Internet for delivery of scientific information not only speeds access but forces changes in the social organization of scholarship and the authentication of information (cf. Fulda 2000; Lamprell et al. 1995; van Leusen et al. 1996). SIGGI, like other new kinds of interfaces, will sit atop a large heritage database, ensuring that users have virtually seamless interaction with data.

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Chapter 12

The Projectile Point/Knife Sample from the Sentinel Gap Site

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Introduction

Recent archaeological investigations at the Sentinel Gap site (45–KT–1362) revealed an occupation surface containing a diverse and rich Paleoindian cultural assemblage (Galm and Gough 2001). Located in a small drainage basin immediately west of the Columbia River in central Washington (Figure 1), site materials were distributed over a ca. 82 m^2 area within an 8-cm-thick occupation surface. Exposed on this surface was a patterned distribution of artifacts and cultural features, most notably 13 discrete lithic waste flake "dumps" and two burned surface deposits possibly representing the remains of temporary brush structures. The approximately 283,000 artifacts recovered during investigations include a diversity of implement types ranging from projectile points/knives and bifaces to bone tools and ornaments (Galm and Gough 2001; Gough and Galm 2003). A large and diverse archaeofauna, incorporating bison (*Bison* sp.), elk (*Cervus canadensis*), mountain sheep (*Ovis canadensis*), badger (*Taxidea taxus*), and salmon (*Oncorhynchus* spp.), represents another important component of this assemblage. Five radiocarbon dates on charcoal derived from the occupation surface, including the two burned surface features, range between 10,680 and 10,010 radiocarbon years BP and provide an average age of ca. 10,200 BP (Galm and Gough 2001:31). Evidence compiled to date argues for use of the site by a small band of mobile foragers during a single occupation episode.

An examination of the projectile point/knife (hereafter "point") sample from the Sentinel Gap site is the subject of the present study. Presented herein are descriptions of the recovered specimens preliminary comparisons to other coeval regional point samples, and a discussion of the nature of relationships to foraging strategies and technological organization. Although the products and by-products of biface manufacture overwhelmingly dominate the sample of lithic artifacts from the site, the artifact assemblage does contain a small sample of point forms. However, the assemblage also provides examples of late stage bifaces and these items offer additional insights on stylistic attributes and production technology manifested in the point sample. Despite the low numbers of points recovered during the investigation, this sample represents an important new addition to the existing body of data on human use of the Columbia Plateau at the Pleistocene-Holocene boundary.

The Point Sample

Eleven points comprise the site sample. Of this number, only three are complete or nearly complete forms while the remaining specimens are, to varying degrees, fragmentary. As described below, most points are manufactured from exotic (or minimally, non-local) tool stone materials distinct from the local raw materials (cryptocrystalline silica or ccs) that characterize the bulk of the lithic sample. Differences in color, texture, and diaphaneity are the principal characteristics distinguishing exotic raw materials from local varieties of ccs.

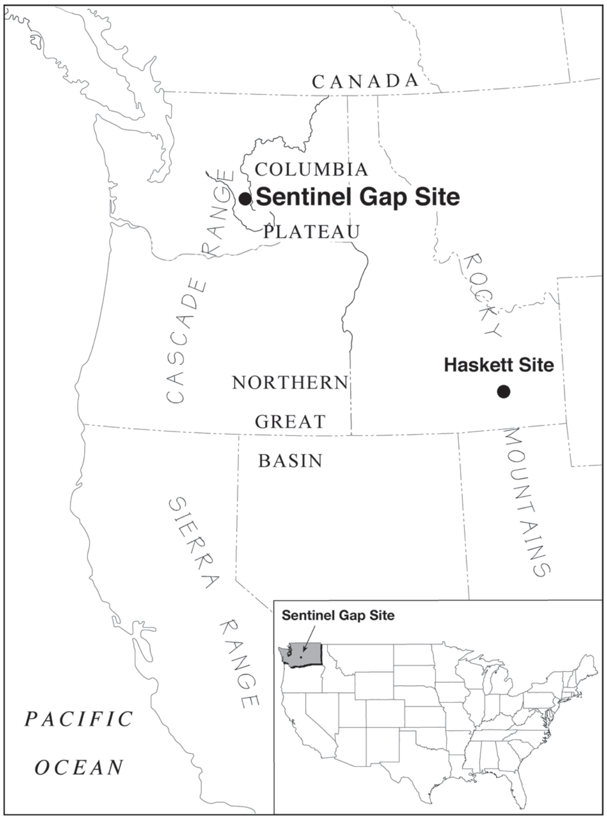

Figure 1. Sentinel Gap site in Eastern Washington and Haskett site type locality on the Snake River Plain, southeastern Idaho.

Following are descriptions of the eleven specimens in this sample. Metric data for the complete points are provided in Table 1; all points are illustrated in Figure 2.

Catalog Number 282: Defined as a small lanceolate form, this specimen has an extensively reworked blade element. The stem may also have been reworked (resized) in concert with the diminishing size of the blade. It is distinguished by a long tapering stem and a maximum width dimension that occurs above midline (distal segment). Stem margins are heavily ground except where reworking flakes have removed segments of lateral edges. Smoothing and polish are visible on some arrises of both faces and are probable indicators of "bag wear" (Huckell et al. 2002). Outline morphology is asymmetrical due to the reshaping of one entire margin with corresponding flake removals extending only down the blade margin of the opposing side. The tip is broken and has been reinforced but not reshaped during reworking. The base is irregular and roughly pointed in outline shape. The point is manufactured from a translucent tan-colored opaline or opalized wood not recognized in raw material samples from the immediate vicinity of the site. The cross section is plano convex and this specimen appears to be manufactured from a flake blank with a proximal flake blank orientation. The shape and edge grinding characteristics indicate the point was deeply seated in the haft with only the approximate distal ⅓ available for piercing and/or cutting uses.

Catalog Number 295: Number 295 is a small base section similar in form to other basal styles in this sample. Manufactured from what appears to be a locally derived translucent brown ccs material, the fragment retains a weathered (white) patch on the base that ends in a flat facet. This may be a remnant of the striking platform employed during flake removal or simply a broken section of stem margin. Both edges are ground. The cross section is biconvex. The distal break is relatively flat and has the appearance of lateral snap fracture. Breakage may have occurred as a result of uneven loading during reworking or manufacture. Flake ridges on both faces exhibit smoothing and polish suggestive of bag wear.

Catalog Number 328: This specimen is the broken proximal section of a contracting stemmed point. Approximately one half of the base consists of a flat facet while the remaining section is a friable and actively degrading brownish-white weathering rind. The rind extends distally into the center of this fragment. The raw material is a translucent off white gray ccs, possibly of local origin. A brown-colored vein is present along the weathering front and extents the full length of the fragment. Stem edges are ground and the basal facet is also very smooth, although it is

Table 1. Sentinel Gap Site projectile point/knife metric data.

Catalog No.	Length (mm)	Width (mm)	Thickness (mm)	Weight (g)
282	53.2	20.5	5.1	6.39
637	94.8	25.2	8.9	20.64
1254	89.2	23.3	7.0	15.26

not clear under low level magnification if this is the result of grinding. The base is straight and the juncture of base and stem is generally squared. Collateral flake removals do not typically meet at midline and thus form a symmetrical biconvex to slightly plano-convex cross section. The break surface is rolled possibly resulting from uneven loading of the piece during manufacture or reworking.

Catalog Number 556: This fragmentary section of a stem and base consists of two refitted pieces of a whitish ccs (opaline) raw material, presumably of non-local origin. The most recent breakage of this point is due to exposure to extreme heat as evidenced by crazing, numerous pot lid fractures, the presence of internal clouds and incipient fractures, and discoloration (reddish coloring on the base). In outline morphology, this is a medium-sized stemmed point with a slightly convex base and ground stem margin remnants in areas proximal to the base. Further evidence of edge grinding is obscured by the intense damage to this specimen caused by heat-induced fracture. The flake removal pattern, although largely obscured by heat damage, is a collateral style that crosses midline. This flaking pattern produced a biconvex cross section. The proximal break surface is gently "U" shaped across the width of the specimen and rolled in the opposing dimension.

Catalog Number 637: The single example in the Sentinel Gap point sample manufactured from basalt (or black fine-grained igneous stone) is a contracting stemmed style. Similar raw materials are common in the Lower Snake River Region, although other source locations cannot be ruled out. Stem and base margins are heavily ground with the exception of a ca. 2 cm long segment of one margin. This area was flaked in an apparent attempt to reshape this specimen. The convex base exhibits minor flake removals or breakage along one margin. The blade comprises approximately 60 percent of total specimen length and is extensively reworked. Reworking produced a narrowing of the blade beginning at the stem-blade juncture. Blade resharpening was apparently completed while the point remained in the haft. This resulted in the formation of an alternate bevel and the reshaping of the blade into a classic diamond-shaped configuration in cross section. By contrast, the stem has a biconvex cross section. Blade margins exhibit a moderate degree of sinuosity as a result of this late-stage reworking. A strongly asymmetrical tip is a by-product of this resharpening technique and the extreme distal end of the tip is broken, possibly in the course of reworking. Typically broad collateral flake removals produce the shaping and thinning of this specimen. The joining of these collateral removals produced a slight midline ridge, although arrises along this ridge and across most of both faces exhibit extreme rounding and polish. The extent of rounding and polish implies bag wear presumably associated with long distance transport of the specimen. The overall shape of this specimen in long-section and cross section suggests a proximal flake blank orientation and a flake to biface reduction trajectory. Although somewhat similar in outline morphology to defined Cascade point forms from this region (cf. Ames et al. 1998:104–105, Fig. 2; Leonhardy and Rice 1970), extensive reworking of the blade margins has altered this point from a style possessing a wider blade and more pronounced blade-stem configuration.

Catalog Number 728: This item is the fragmentary midsection and stem portion of a large contracting stemmed point. Manufactured from a non-local off-white to light brown ccs, this specimen is missing only the distal section of the blade and tip. Stem and basal margins are ground and arrises on both faces are rounded, especially near midline, in a pattern consistent with bag wear. Approximately half of the base was removed by breakage but the remaining segment reveals a rounded configuration. With stem grinding occurring over approximately half the total length of this fragment, this is another example of a point form that was deeply seated in the haft during use. Collateral flake removal series generally thinned this specimen across midline, although the blade section was more recently reworked, possibly after the loss of the tip section. Typically broad collateral flake removals on the blade section contrast with smaller collateral flake scars on the stem. This difference also produces a slight midline ridge on the stem that is completely removed on the reworked blade segment. The short blade segment is therefore thinner than the adjoining stem. This suggests blade section reshaping may have been underway immediately prior to curation. The cross section is biconvex when viewed from the base but is more noticeably plano-convex when examined from the perspective of the reworked distal end. Stem margins are straight and generally regular as compared to the sinuous configuration of blade edges. The break surface has a slight incline

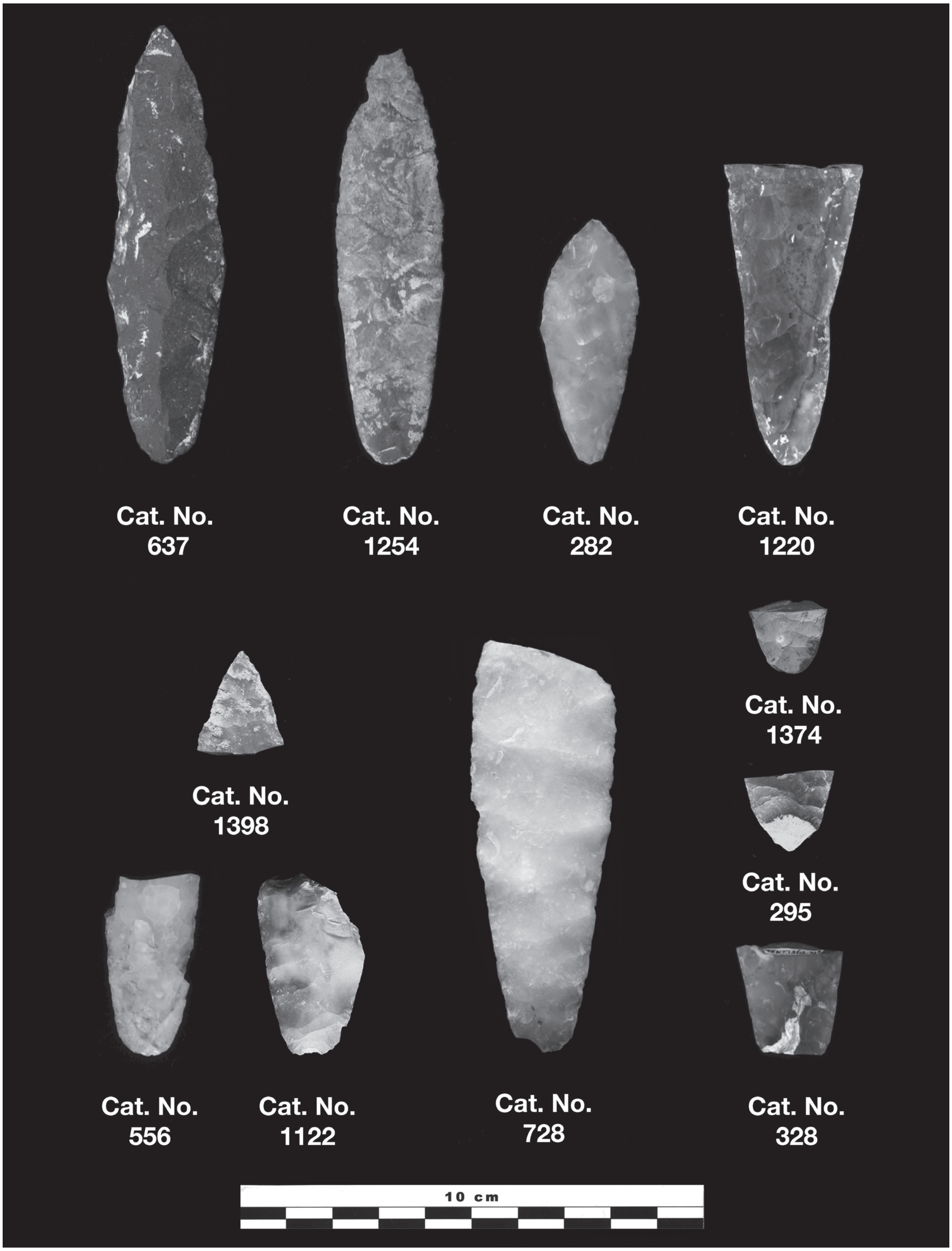

Figure 2. Sentinel Gap Site projectile points/knives and fragments. Note the morphological and technological similarities to Haskett Type 1 points (Butler 1965, 1967).

and roll on the high side of this configuration. A post-breakage attempt to reshape the tip section also is evident on one margin. It is noteworthy that the maximum width dimension of this form, taking into account the broken tip section, clearly occurred above (distal of) midline.

Catalog Number 1122: This appears to be the proximal segment (stem and base) of a contracting stemmed point. Reworking and breakage, especially on the base and distal end, obscure much of the original shape. The raw material is an exotic grayish-brown ccs with reddish colored clouds present along midline on both faces. The base is broken but was most likely rounded in outline. The distal end is reworked, possibly in an attempt to fashion a new functional edge. Unbroken segments of both margins are ground. If the shape of the remaining stem margins is an accurate reflection of the original configuration, this form was strongly contracting. Collateral flake removals generally pass across midline although a slight midline ridge is still present. The cross section is biconvex.

Catalog Number 1220: Catalog number 1220 is a fragmentary point consisting of contracting midsection and base sections. This specimen is manufactured from an exotic variegated brown ccs. This material is translucent only along the thin lateral margins. Stem margins converge to form a nearly pointed base. Apparent reworking of the base has removed the extreme end of this piece. A series of small flakes, possibly the result of unintentional fracture or scrubbing, produce a short, straight configuration at the proximal end. Stem margins are ground from the base to the midsection break. Collateral flake series extending beyond midline thinned this specimen and removed any evidence of a midline ridge. One stem margin is reworked, possibly representing an initial attempt to reshape this form. The edge on the reworked margin exhibits a series of micro-flake removals extending the full length of the fragment that are nearly continuous on both faces. The opposing stem margin is incurvate but regular. The asymmetry of the latter margin may have resulted from the reshaping of a broken section of the edge and/or the attempted reshaping of the entire piece prior to breakage at midsection. The break surface is only slightly rolled and a flaw in the material is visible near one edge of the break. It is highly likely that the structural weakness associated with this internal flaw is responsible for the resulting breakage in this position. The cross section is biconvex.

Catalog Number 1254: One of the few essentially complete forms in the Sentinel Gap assemblage, catalog number 1254 is manufactured from an exotic grayish-brown, opaque chert. The absence of the distal-most portion of the tip, probably as a result of impact fracture, is the only exception to an otherwise intact form. Typically broad collateral flake removals thinned the point across midline and produce a smoothed, symmetrical biconvex cross section. As noted on other specimens in this collection, flake removal patterns on the blade are at variance with those on the stem. Greater variability in removal patterns on the blade implies reworking/reshaping of this section of the point, presumably while the stem remained fixed in the haft. Blade reworking does not appear to have occurred more than once or, possibly, twice based on the resulting pattern and type of flake removals. There is no clear evidence of post-breakage attempts to re-establish the tip element. A prominent scar on one face near the tip appears to be a pot lid fracture suggesting exposure to extreme heat either late in its use history or coincidentally in the post-depositional environment. Stem margins are contracting and the base is rounded. Stem margins are ground, as are a few unretouched segments of the basal edge. Stem grinding extends distally to the approximate midsection of this specimen.

Catalog Number 1374: This small fragment appears to be the contracting proximal end of a larger lanceolate form, similar in size and outline to number 295. This is one of only two points recovered from a feature context (Feature 00.14B). The raw material is possibly a non-local opaque, brown ccs, although a yellowish patina masks most of one entire face of this fragment. The base is rounded and generally consistent in size with the basal dimensions of the lanceolate forms in this collection. Remaining stem margins and the basal edge are heavily ground. The surface of the broken end is rolled and sharply inclined to one face. The cross section is biconvex.

Catalog Number 1398: This tip segment is the second of two specimens (see catalog number 1374) found in the Feature 14 complex (Feature 00.14C). The specimen is manufactured from a translucent brown ccs material, probably of local origin. This tip fragment is reworked and very thin. Reworking flake series on both margins originate primarily from one surface (as opposed to alternating) but terminate before reaching the break. This results in an asymmetrical, inset edge configuration and may be an indication of edge modification following breakage. While the tip angle is acute, the extreme distal end is broken either from use or reworking. The break surface is uneven and intermittently "cupped" in a manner compatible with fracture due to exposure to high heat.

Discussion

Despite variation within this sample, enough consistency exists to offer several generalizations relating to the parameters of style and technology. Lanceolate forms, generally of large size, with acute tips, short blade elements, long tapering stems, and excurvate bases characterize points in this collection. The maximum width dimension typically occurs distal to point midline, thereby producing distinctive stem-blade configuration and outline morphology. Combined attributes suggest a strong stylistic affinity to Haskett point styles first reported from the eastern Snake River plain in Idaho (Butler 1965, 1967; Marler 2004:54–58; see also Galm and Gough 2001, 2002). Sentinel Gap points and late-stage bifaces most closely resemble the Type 1 form defined by Butler (1965) from points in the Haskett site assemblage. Following are other summary observations on the Sentinel Gap point sample.

Use-Wear

Sentinel Gap points were examined under a binocular microscope at low to moderate (10X–70X) magnification to define evidence and categories of use-wear. The few blade elements represented in the present collection are extensively reworked. In the case of catalog number 637, reworking occurred while the point remained in the haft, resulting in the removal of flakes from only one face of each lateral blade edge. This pattern of reworking produces a distinctive bevel and a diamond-shaped blade cross section (cf. Galm and Hofman 1984:51–53, Figure 6). Blade element reworking is also evident from a pattern of edge "blunting" indicative of light scrubbing of the margins in conjunction with platform preparation. Stem margins are moderately to heavily scrubbed along edge segments that can approximate up to ⅔ of total point lengths. The pattern of reworking and light scrubbing of blade margins, combined with the grinding of stem elements, therefore effectively removed the most obvious indicators of use-wear. Nevertheless, the apparent emphasis on the reworking/rejuvenation of blade margins, particularly when combined with the evidence for deep seating of these forms in the hafting element, strongly implies a companion use as knives. Deep seating in the haft can reduce lateral movement thus providing added protection of the point from uneven loading and resulting fracture-in-bending commonly associated with knife use. When seated in a foreshaft, resharpening of the tip/blade can be accomplished without removing the point when breakage does occur (Beck and Jones 1997:202; Galm and Hofman 1984; Marler 2004:55; Musil 1988:374). The point sample from Sentinel Gap is consistent with damage patterns observed on other Haskett points from southeastern Idaho (including the type site sample). The style of reworking Haskett points while still secured in the haft also serves to define a composite weapons system consisting of the point, a foreshaft, and spear socketed to accommodate the foreshaft.

Bag wear indicated by rounding and polish of flake ridges on both faces of Sentinel Gap specimens, was noted earlier. This form of wear is typically associated with friction occurring as a result of long distance transport in a bag (Huckell et al. 2002). Raw materials represented in this sample provide further support for the manufacture of at least some of these forms elsewhere with final curation at Sentinel Gap. As noted below, the site contains a wealth of information on the manufacture of objects from locally derived tool stones, an industry dominated by the production of bifaces.

Technology

Figure 3 illustrates the hypothesized production stages represented in point manufacture. Evidence for the manufacture of final point forms is limited but, equally important, is dwarfed by the number of bifaces in this assemblage. The mostly broken bifaces in this sample (n=63) indicate off-site completion of final forms and by extension, a design to manufacture late stage bifaces for later use or trade. Virtually all of the products and by-products in the biface production trajectory are manufactured from locally derived cryptocrystalline quartz tool stone.

The partial refitting of two cores documents the full sequence of biface production and the virtual absence of any significant concern for economy in technological approach. In this scheme, one core produced a single biface and at best, perhaps a few additional tools from ample numbers of large waste flakes. Most waste flakes were not employed in secondary lithic production as indicated by the multiple waste flake features that circumscribe the outer boundary of the occupation surface.

Large lanceolate points are the apparent end product of this production sequence. Late stage bifaces, final point forms, and debitage confirm an emphasis on the manufacture of point styles of considerable size that most closely resemble the Type 1 variant of Haskett points (Butler 1965). Broad collateral flake series were employed to thin and shape late stage forms. These series often terminate at midline, thus creating a smoothed to slight midline ridge and corresponding biconvex cross section. While some examples exhibit thinning flake scars that cross midline on blade elements, it is not clear if these flake removals are consistently associated with manufacture or instead reflect the reshaping of specimens following use and breakage.

Cross sections become more extreme if reworking is completed while the point remains in the haft as described earlier. Pronounced midline ridges present on a few Sentinel Gap specimens, as well as on the classic specimen (number H1) from the Haskett type-site, may simply represent a technological accommodation of brittle raw materials. Greater thickness along the longitudinal midline would have reinforced, and therefore compensated for, the brittleness inherent in certain tool stone materials. Some glassy volcanic raw materials for example, tend to exhibit this characteristic and a resulting susceptibility to stress fracture during use. The added thickness along the longitudinal midline would enhance use of forms manufactured from such materials as knives. Sentinel Gap points manufactured from ccs and basalt raw materials do not have pronounced midline ridges like those found on Haskett site obsidian specimens H1 and H3 (Butler 1965). However, Sentinel Gap points are consistent with other chert point examples from the type-site.

The recovery of a single clothespin-style bone/antler foreshaft fragment from the Sentinel Gap occupation surface offers important clues to the style of composite weapons system employed here and perhaps throughout the Haskett complex (Figure 4). The bone foreshaft blank was ground to produce the desired shape. This form of manufacture is evident from the exposure of interior bone cancellous structure on one side of the piece (see Figure 4a) and dense bone wall on the other (see Figure 4b). A notch cut into the distal foreshaft segment accommodates the point and produces the classic "clothespin" form. The total length of this object is unknown as the proximal segment of the foreshaft is broken. The depth of the foreshaft notch at 41.54 mm corresponds well with the stem length of 39.98 to 42.97 mm for point number 637. Although the maximum stem thickness of 8.72 mm for this point is too great for the maximum 7.73 mm foreshaft notch width, the size and shape of this foreshaft could accommodate most of the points in the Sentinel Gap sample. Also, a green bone foreshaft most likely was flexible enough to accept point 637 or styles of similar thickness. The foreshaft notch width is narrowest (3.48 mm) at the proximal end and widest at the distal end.

In cross section the foreshaft is a flattened oval. The stem is narrowest at the proximal end (14.03 mm) and widest at the distal stem-notch junction (15.64 mm). Stem dimensions also provide an indication of the corresponding spear socket diameter required to accommodate this foreshaft. In all likelihood, the depth of the socket exceeded the remaining truncated length of the foreshaft (61.32 mm). This combination of points and bone foreshaft in the Sentinel Gap assemblage provide a rare insight into the composite weapons system employed in this late Paleoindian timeframe. Foreshaft metric data also provide important new evidence for spear shaft dimensional relationships.

The composite weapon system outlined above not only readily accommodates use of the points as hafted knives, but also obviates the need for a separate, stylized knife form. In this regard, it is interesting to note the presence of a similar pattern of blade element reworking, and corresponding interpretation of knife use, on Haskett points from the type-site and other locations in eastern Idaho (Marler 2004:54–58).

Point Distributions

Figure 5 illustrates the distribution of points within the well-defined occupation surface at Sentinel Gap.

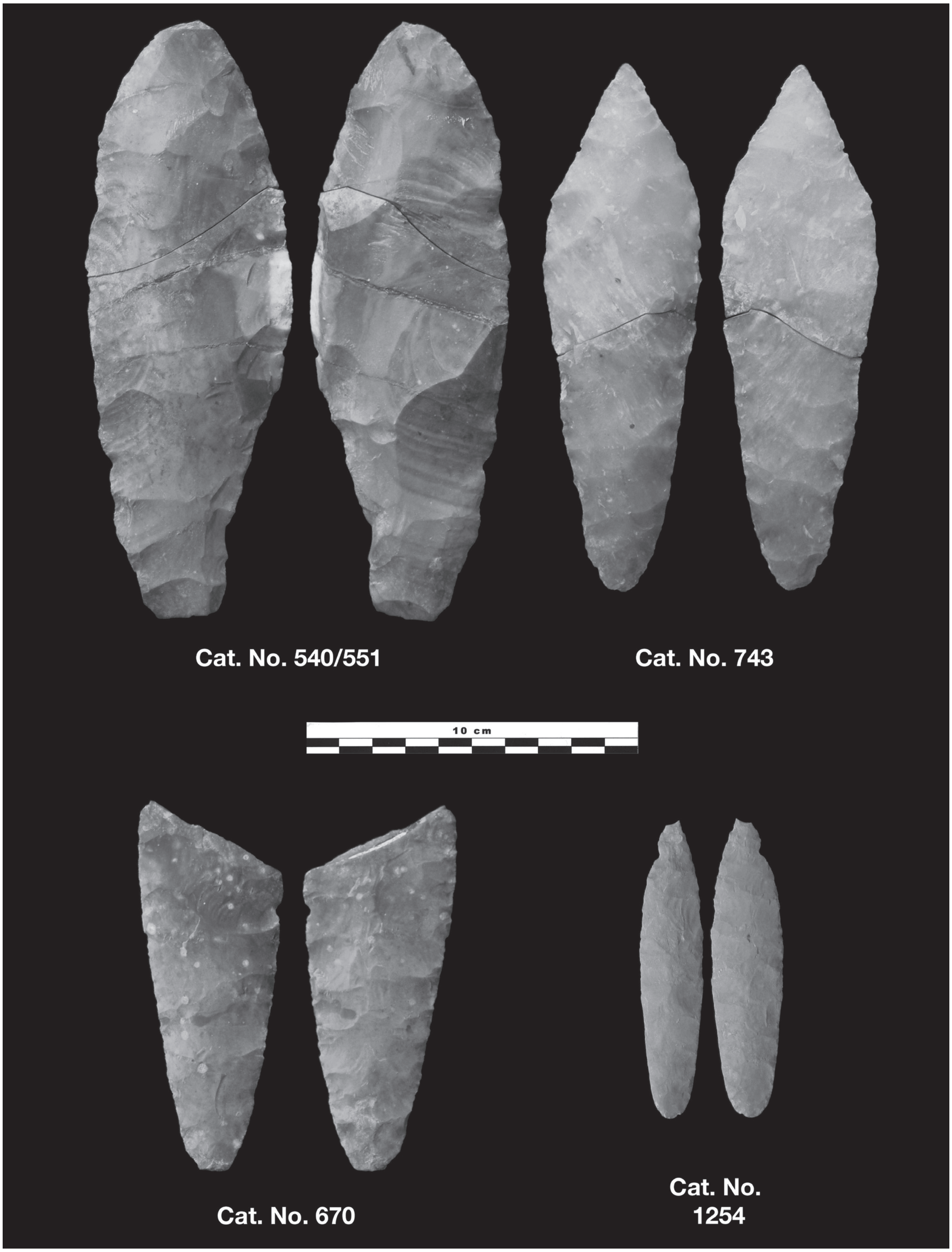

Figure 3. Major stages in the core to biface to projectile point/knife production system documented at the Sentinel Gap site.

The points on this surface are primarily distributed in an arc delimiting the outermost zone of the occupation surface and site. Within this zone are the 13 large lithic waste flake features (i.e., dumps) noted earlier, although many other smaller debris concentrations (i.e., flake, bone, fragmentary/complete implements) are present here as well. The concentration of debris in this outer ring, dominated by the products and by-products of biface production, defines a contrasting distribution of artifacts on the interior of the occupation surface. Here two burn features (Features 99.1 and 99.3) are focal points in a distribution of functional artifact forms oriented toward a range of domestic activities. Whether or not these features represent the burned remnants of simple brush dwellings, there is little doubt of their importance as activity foci in a rich and highly diverse functional artifact distribution characteristic of a residential camp.

Figure 4. Sentinel Gap site bone/antler clothespin-style foreshaft and point components of a composite weapon system. Note the cancellous interior bone structure (4a) and the dense exterior wall surface (4b) visible on the foreshaft. These characteristics indicate bone blank shaping to achieve the desired foreshaft form and dimensions.

The physical condition of the specimens included in the point sample, combined with their broad distribution within the waste management zone, strongly suggest these forms had reached the end of productive use and were discarded. For the more complete specimens in this sample, their projected use as multipurpose tools and specifically, the recognition of their reduced utility as knives, are important considerations in future evaluations of point life histories and technological organization in general.

Conclusions

The proposed assignment of the Sentinel Gap points and site to the Haskett complex is one of the more significant findings of this study. The style and technology of the points and late stage bifaces are consistent with specimens reported from the type-site (Butler 1965:1–21; 1967:25) and other finds from the eastern Snake River plain (Holmer 1995:4; Marler 2004) and Northern Great Basin in general (cf. Beck and Jones 1997; Russell 1993:79–85; Schroedl 1991:1–15). Possible relationships to Agate Basin-Hell Gap points and Western Stemmed/Great Basin Stemmed Series complexes of the northern Great Plains and Northern Great Basin, respectively, also have been noted (Beck and Jones 1997:189, 202; Butler 1965:7–9; Marler 2004:54–55). At approximately 10,200 B.P., the temporal placement of this sample is consistent with reported age estimates for the Haskett complex (Holmer 1995:4). Figure 6 relates the Sentinel Gap point sample to point sequences defined to date for the Northern Great Basin, Columbia Plateau, and Great Plains.

With the exception of a possible Haskett point from the Lind Coulee site (45GR97) in central Washington (Craven 2003:35–37), other Haskett points have not been reported from the Columbia Plateau. Craven (2003:35–37, figures 4.1–4.2) includes a point midsection and biface from Lind

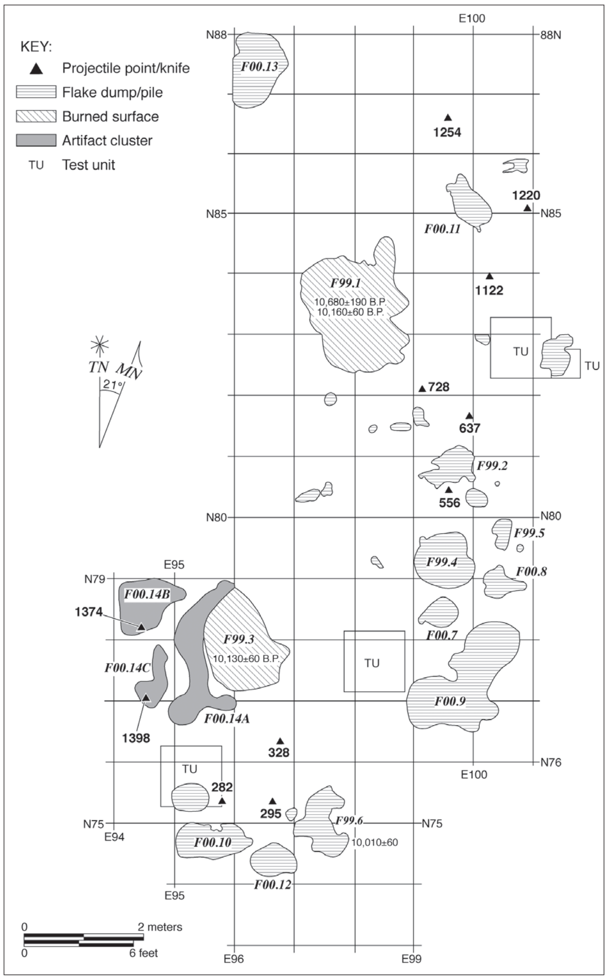

Figure 5. The majority of Sentinel Gap projectile points/knives were distributed in the Waste Management Zone Defined by Discrete Waste Flake Piles or Dumps. This zone bounds the site's central domestic activity areas surrounding burn Features 99.1 and 99.3.

Coulee as possible Haskett styles. However, neither example is a particularly good fit with the Type 1 Haskett variety. The point midsection is simply too fragmentary to assess with any certainty and the biface illustrated by Craven is stylistically similar to the Type 2 Haskett variety. The Type 2 variety was defined by Butler (1965:6) on the basis of two surface finds from the type-site. More recent finds of Haskett points typically do not include the Type 2 variant thereby casting doubt on the viability of this form as a diagnostic point style. In any case, no Type 1 Haskett points are reported from Windust sites in the Plateau to date.

Sentinel Gap then is the first site in the Plateau with compelling evidence of an association with the Haskett complex. This proposition raises intriguing new questions on the possible nature of relationships between the occupants of Sentinel Gap and coeval Windust Phase settlements in this region (Ames et al. 1998; Galm et al. 1981; Leonhardy and Rice 1970; Rice 1972). Preliminary comparison of these cultural complexes indicates a few significant differences, but also the need for further study of these cultural complexes.

One measure of the differences in lithic technological orientation represented by Sentinel Gap and Windust components is the respective emphasis on curated as opposed to expedient technological approaches. Following Amick, present use of the term "curation" is "simply descriptive and refers to complex tools which have relatively long use-lives and are frequently transported in anticipation of use at other locations" (1999:3). Expedient technology on the other hand is an expression of an unstandardized technology used to produce "convenience" flake tools. Expedient technologies are highly adaptable. The adaptability inherent in this approach provides ready accommodation of variations in resource access and availability, implement needs, and even sexual divisions of labor. But it also anticipates variability in tool stone availability, as well as size, geometry, and overall quality.

Sentinel Gap lithic technology is organized, first and foremost, around the abundance of lithic raw materials available in the immediate area. As refitting analysis has documented, this resulted in the repeated use of a large core to produce a single large biface followed by the discard of waste flakes, regardless of the numbers or sizes of these by-products (Galm and Gough 2002; Huckleberry et al. 2003). This approach is in agreement with MacDonald's (1971:34) assessment that Paleoindian groups were less concerned with economy in raw material use when sources were close. Technological approaches appear highly standardized resulting in the staged production of large bifaces and by extension, points. In fact, the paucity of evidence for an expedient technology, particularly in view of the abundance of large flakes available for use, is somewhat surprising. Finally, the manufacture of some points from exotic or non-local raw material indicates they were brought in from elsewhere and subsequently discarded. Replacement of points and bifaces thus comprises a major part of the retooling activity represented at Sentinel Gap.

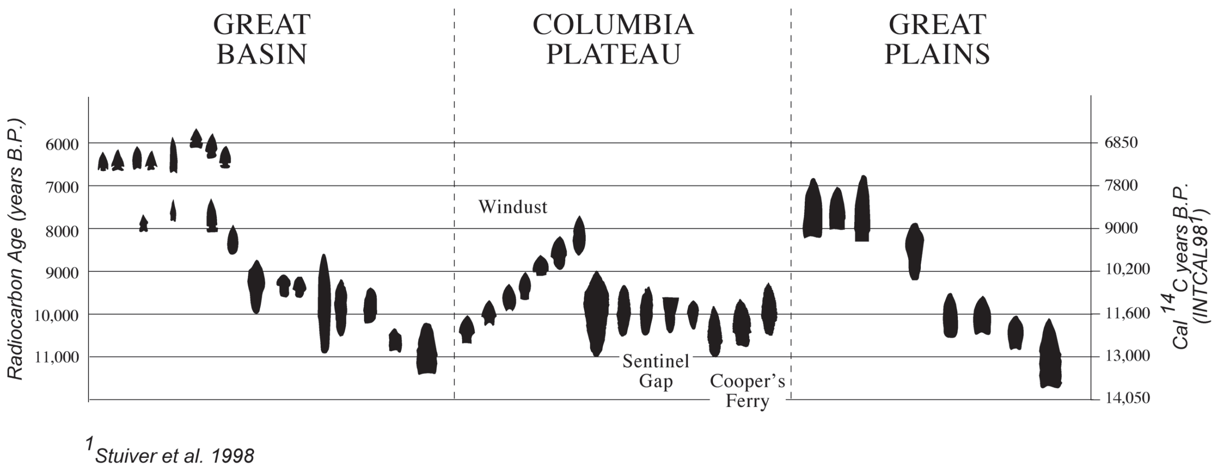

Figure 6. Sentinel Gap site projectile point/knife assemblage in comparison to regional point sequences.

By contrast, Windust lithic technological approaches are characterized by an economy of tool stone use, the production of smaller biface-point (and other tool) forms, and the presence of large numbers of expedient tools (Rice 1972). Manufacturing sequences for bifaces and points appear less standardized perhaps reflecting an accommodation of parent raw materials of smaller size, variable geometry and overall quality. In short, Windust lithic assemblages reveal marked differences in lithic technological strategies including the system of manufacture and stylistic attributes of points and bifaces. The emphasis on core-flake technology can be documented in the large number of "convenience" flake tools found in Windust assemblages from this region (Rice 1972). The fact that most of these unstandardized convenience tools are of small to moderate size contrasts sharply with the formalized implement styles of relatively large sizes found at Sentinel Gap and in most Haskett assemblages.

The siting of the Sentinel Gap habitation near a major source of raw materials of large size therefore reveals more than just an important site selection factor. The quest for large raw materials and the associated identification and exclusion of waste materials for secondary tool manufacture are possible parts of an established "mental template" for lithic technology present in the Haskett complex. It is also a likely indicator of high mobility. A rigid standardization of lithic technology and an attendant structured classification of products and by-products in this Haskett system also are most likely central to distinctions between regional manifestations of "Paleoindian" and "Archaic" adaptations. In this scenario, the appearance of a more generalized, less structured and standardized lithic technology in Windust phase components can be viewed as part of a wider constellation of cultural changes marking the transition into an Archaic cultural pose. The timing of these changes at the Pleistocene-Holocene boundary is not likely to be fortuitous but implies new coping strategies designed to accommodate a rapidly changing environment. The Sentinel Gap archaeological record provides the first compelling evidence of overlapping late Paleoindian and Archaic occupations of the Columbia Plateau at the Pleistocene-Holocene boundary. While beyond the scope of the present study, emerging data also intimate different patterns of land use and adaptive strategies in the archaeological records of Sentinel Gap and regional Windust Phase components. But regardless of the long-term implications of future research, Sentinel Gap introduces an extraordinary record of late Paleoindian settlement, including previously unreported point styles and lithic technology, into the record of Columbia Plateau archaeology.

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Chapter 13

Chipped Stone Bifaces as Cultural, Behavioural, and Temporal Indices on the Central Canadian Plateau

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Over the last three and a half decades, archaeological investigations on the Canadian Plateau have resulted in definition of several ubiquitous and distinctive chipped stone formed bifacial projectile point and knife types. Many have been successfully employed as temporal horizon markers for relative dating, others for interpreting and reconstructing past human behaviour, and a few have been used for developing models of cultural/ethnic group origins, identity, and inter-regional group interaction. This chapter provides general and detailed descriptions of recognized "diagnostic" biface types found on the central aspect of Canadian Plateau (Figure 1) over the last 11,000 years. It also summarizes what is currently known about initial appearance and termination dates for various bifacial implement forms and their persistence through time; suspected and/or demonstrated functions or activities related to specific biface types; and models put forth to explain and account for culture change, ethnic group origins and migrations, and participation in inter-regional interaction spheres.

The study area includes the central aspect of the Canadian Plateau, which is comprised of the Mid-Fraser, Thompson, North and South Thompson, Shuswap, North Okanagan, and South Chilcotin/Cariboo drainage regions (Figure 1). Here, a suspected 11,000 year-long succession of unique hunter-gatherer-fisher cultures introduced, invented, and/or adopted a myriad of successful technological, subsistence, and settlement strategies employed to successfully extract and utilize resources within a wide range of local environmental niches, and to cope with significant environmental and climatic changes spanning many millennia. Chipped stone bifaces were an important and integral aspect of these cultural and technological systems, and with the proper reconstruction and understanding of their role(s) and significance, a great deal of behavioral and ethnic information can be inferred from them.

The Early Prehistoric (pre-contact) Period from ca. 11,000 to 7000 BP is still very poorly understood, nevertheless, both solid and tenuous data have been gathered. Rousseau (1993) and Stryd and Rousseau (1996:179–185) have summarized what is currently known, and additional information is presented herein. Knowledge about the Middle Prehistoric Period (ca. 7000 to 3500 BP) is grounded and reconstructed from a more extensive and reliable sample of empirical data, but even so, much remains to be learned and clarified about this time as well. Most of what we can confidently reconstruct and extrapolate from Canadian Plateau biface technologies relates to the Late Prehistoric Period (ca. 3500 to 250 BP), as most investigated and recorded sites fall within this age range.

Early Period Bifaces (11,000 to 7500 BP)

Early Holocene peopling of South Central BC may have begun as early as 11,500 BP. This conjecture

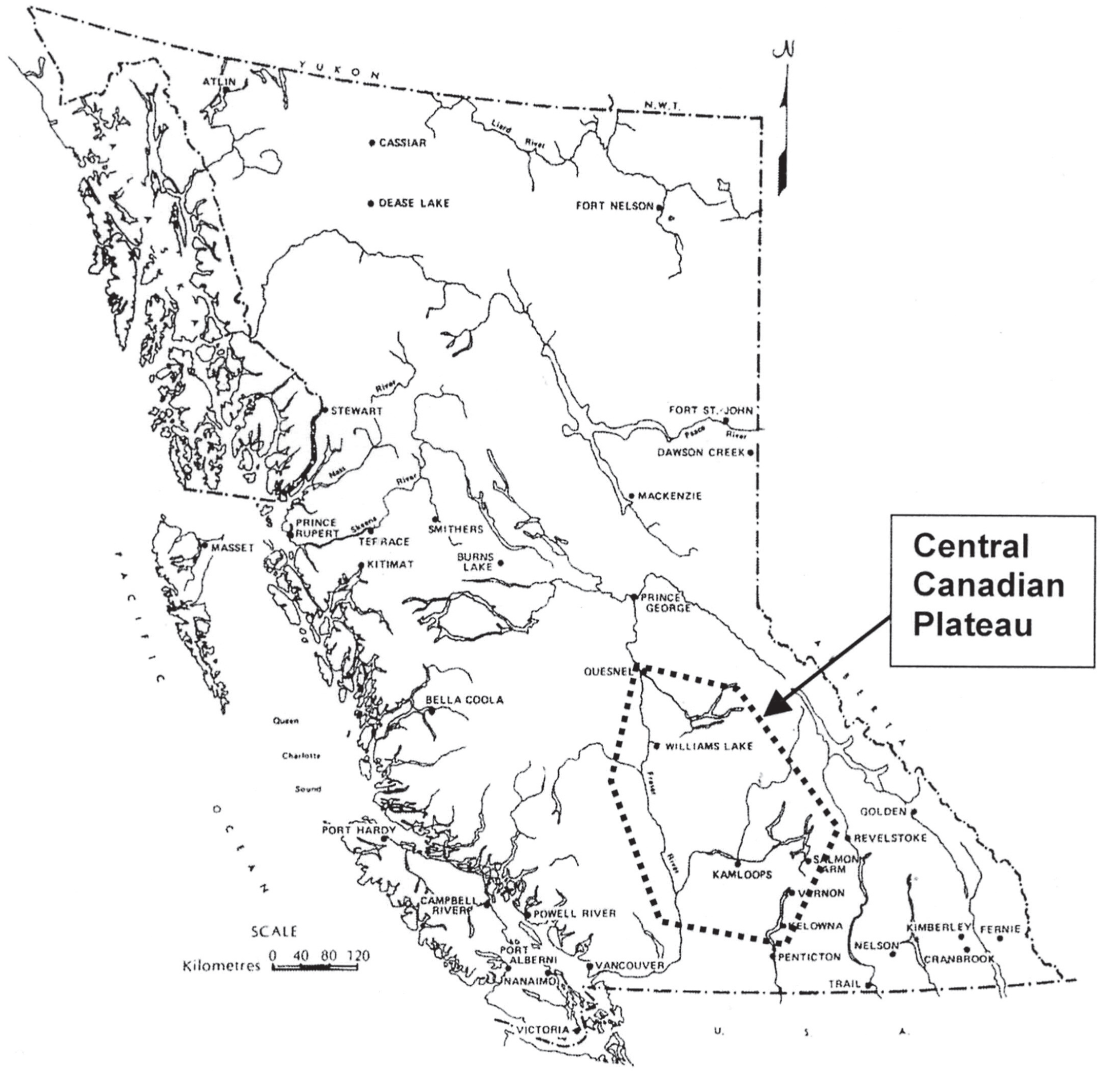

Figure 1. The Central Canadian Plateau in south-central British Columbia.

is based partly on paleoenvironmental studies that indicate flora and fauna were well established by this time and many local environments could have supported highly mobile big-game hunters (Clague 1981, Hebda 1982, Mathewes 1984, Mathewes and Rouse 1975). Several medium-size and large bifaces observed in several southern B.C. museums and private collections have marked striking resemblance with forms attributable to the Western Fluted Point, Intermontane Early Stemmed Point, Plano, and Early Pebble Tool technological traditions (Carlson and Dalla Bonna 1996). Some specimens I have encountered over the years are shown and discussed here, and undoubtedly there is a wealth of untapped additional evidence and information in private and museum collections throughout southern B.C.

Western Fluted Point/Post-Clovis Biface Tradition (10,700 to 9500 BP)

Components containing bifaces attributable to the "Western Post-Clovis" period dating from about 10,700 to 9500 BP have not been conclusively identified during any detailed archaeological excavations undertaken on the Canadian Plateau. What we currently know about it in the Pacific Northwest has been provided by data from Charlie Lake Cave in north-central B.C. (Fladmark et al. 1988; Fladmark 1996; Driver 1996), the Minnewanka Site in Banff National Park in the Canadian Rockies (Fedje 1996), Pink Mountain in northeast B.C. (Wilson 1996), Sibbald Creek in the Alberta foothills, (Gryba 1983, 1985; Vickers 1986) and the Ritchie Clovis cache on the northern Columbia Plateau near Wenatchee (Mehringer 1988; Gramly 2004). A summary overview and insightful discussion of Pacific Northwest fluted and basally thinned triangular points dating from 11,000 to 9500 years BP has also been presented by Carlson (1991). Despite the present absence of excavated data for this period on the Canadian Plateau, I believe it can be confidently expected that components belonging to this early tradition do indeed exist, since medium-size and large biface forms closely resembling other Post-Clovis "Western" variant basally thinned points have been identified in museum and private collections (Figure 2) (Copp, this volume).

In the Kamloops locality, two large, well-made, triangular chalcedony bifaces with V-shaped concave basal margins (Figures 2a,b) are presently being stored at the Kamloops Museum. The exact recovery provenience for these two bifaces is not known, but the remainder of the associated donated collection is comprised of common local artifact types and lithic raw materials, thus there is no reason to suspect that these items were acquired extra-locally. These two specimens bear similarity to some of the large fluted points found with the Richie Clovis cache (Gramly 2004). Both have been resharpened, and they were probably much longer originally. A unique feature is asymmetric basal-lateral "ears", and multiple sequential large thinning flakes initiated along the basal margins (Figure 2a, b). Slight to moderate edge grinding is also evident along basal and basal-lateral margins. The source of the high quality, semi-translucent, mottled white/brown chalcedony is not known, but it may have been quarried locally from the Arrowstone Hills northwest of Kamloops, or Ducks Range/Monte Lake area to the southeast, since similar high-quality siliceous lithic materials are found there in small quantities. It is also possible that the chalcedony was derived from more southerly and distant sources on the Columbia Plateau, since these high quality materials are known to be much more naturally common there, and it is not unusual to link fluted points with lithic sources that may be several hundred kilometers distant from their recovery location.

There are two more triangular bifaces from the Shuswap Lake locality that exhibit some "Classic Clovis"-like formal characteristics. The first specimen (Figure 2c) is from a private Shuswap Lake collection donated to the Kamloops Museum, but its exact recovery location on the lake is not known. It is a nearly complete specimen made from an exotic mottled and banded opaque orange/brown/yellow/white chalcedony. The source of this very distinctive material is not known to me, but again, a Columbia Plateau origin is possible. This specimen also exhibits bifacial sequential removal of multiple basal thinning flakes from along the slightly concave basal margin, but it lacks any obvious basal edge grinding. Formally, it is very similar to many of the bifacial blades associated with the Richie Clovis Cache, and with a Western Fluted Point specimen (Figure 2f) recovered from a gravel quarry in Grand Forks, B.C. (Copp, this volume).

The second Shuswap Lake specimen (Figure 2d) was recovered about 50 cm below ground surface immediately above glacial gravels during the hand-excavation of a deep pit at a site on Quaaout Indian Reserve No. 1 at the west end of Shuswap Lake (Equinox Research and Consulting Ltd. 2004:27–28). It is a medium-size, triangular biface made from a high quality semi-translucent orange/yellow chalcedony. The raw material is not locally familiar, and it may have an origin on the Columbia Plateau where similar orange and caramel chalcedonies are known to be abundant. Its lateral margins suggest that it was resharpened at least once, and that originally it was slightly longer. Multiple basal thinning flakes along an irregular basal margin are evident, but are not pronounced. Future detailed excavations at this site should be initiated to determine whether or not an intact Western Fluted Point tradition component exists there.

A small, triangular, semi-translucent, white speckled chert fluted point (Figure 2e) found on the east side of Ellison (Duck) Lake in the North Okanagan region is in a donated private collection at the Kelowna Museum. It is virtually identical to several of the small fluted/thinned points found at the Minnewanka site in Banff National Park (Fedje 1996:41). The site from which the point was collected is known, but no formal archaeological investigations have been conducted there. Multiple basal thinning flakes are present along a shallow concave margin. The raw material is not relatable to any

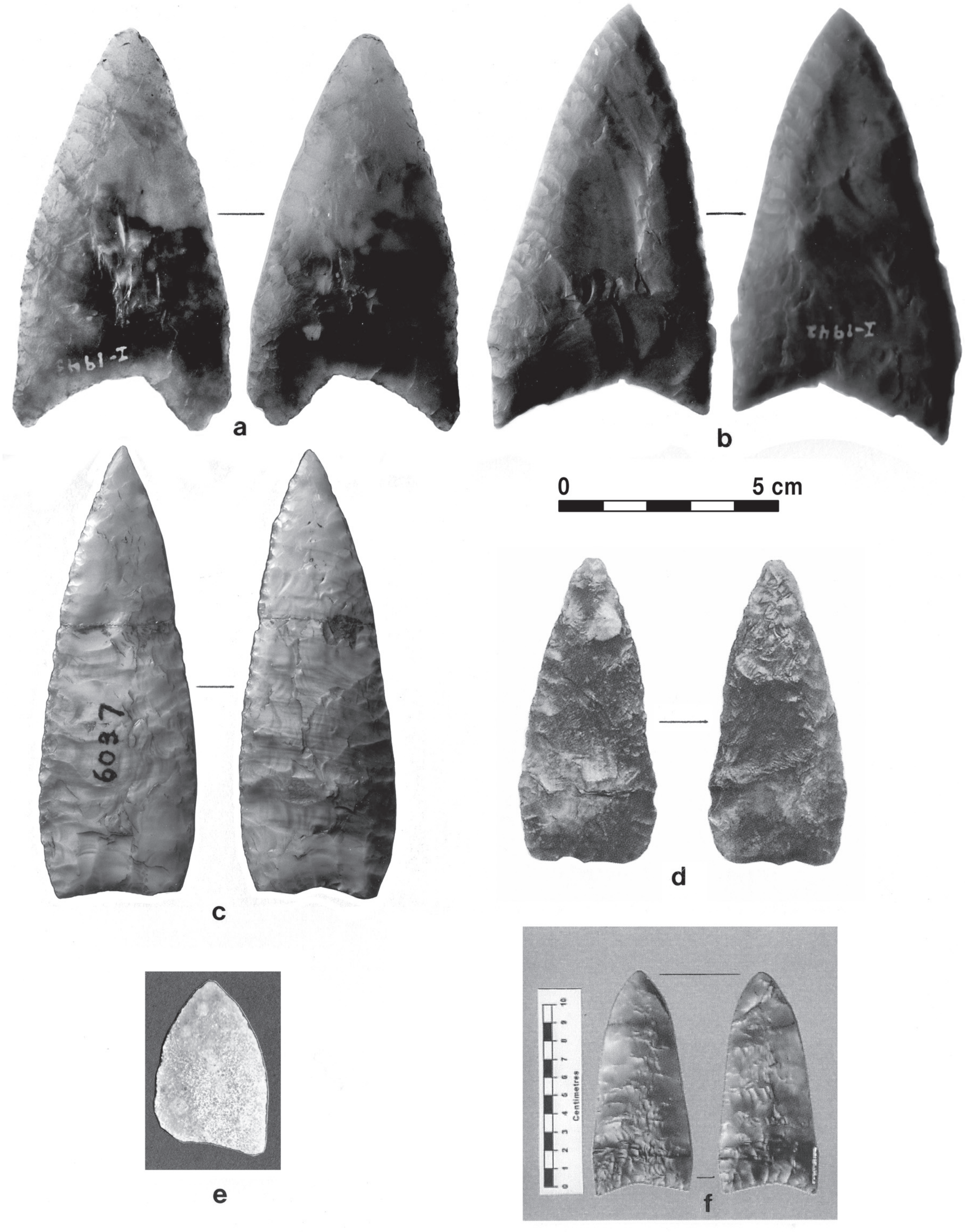

Figure 2. Canadian Plateau bifaces provisionally assigned to the post-Clovis Western Fluted Point Tradition (10,700–9500 BP). a, b: Kamloops locality (Kamloops Museum); c: Shuswap Lake area (RBCM collections); d: Quaaout Indian Reserve near the western end of Little Shuswap Lake (Little Shuswap Indian Band collections); e: Ellison (Duck) Lake near Winfield (Kelowna Museum collections); f: a very well-made specimen from Grand Forks (see Chapter 14).

known local lithic sources, but may have a northern B.C. origin (Fladmark, pers. comm. 2003).

Carlson (1991) has presented a good case for the presence and persistence of "Clovis-like" biface technology in the Pacific Northwest from about 10,500 to 9500 BP, and he surmises that regional expressions are direct "derivatives" of earlier Classic Clovis fluted point technology. Bifaces of this post-"Classic Clovis" period have been referred to as "basally-thinned triangular" (Vickers 1986), "basally-thinned broad" (Gryba 1987), "multiple-fluted/basally thinned" (Carlson 1991), and "Western Fluted" (Rousseau 1993, 1996). It is my opinion that these monikers are somewhat cumbersome, a bit misleading, and also overemphasize the significance of basal thinning. Perhaps "Western Post-Clovis" is a better and simpler term for these lanceolate and triangular basally-thinned point types.

It is clear that much remains to be learned about the post-Clovis "Western Fluted Point Tradition" on the Canadian Plateau. Nevertheless, the scant evidence coupled with solid excavated data from surrounding culture areas suggests that there may be a unique regional expression of this post-Clovis tradition in the Fraser, Thompson, and North Okanagan drainages. Future research may reveal that small to medium-sized lanceolate and triangular points with multiple bifacial basal thinning flakes are common in components in the Canadian Plateau and in central and northern B.C. between about 10,500 and 9500. Larger chalcedony forms with asymmetric basal "ears" such as those evident on the two large bifaces from the Kamloops locality (Figures 2a,b) may be slightly earlier (11,000 to 10,000 BP); and the "asymmetric ears" and V-shaped basal margin may represent trait variations that are exclusively unique to the Canadian Plateau at this time.

Early Intermontane Stemmed Point Tradition (10,500/10,000 to 8500 BP)

No intact components attributable to the Early Intermontane Stemmed Point Tradition have been identified or investigated in South-Central B.C. However, several private and museum collections contain large stemmed bifaces (Figure 3) with formal similarity to early stemmed points found in the Great Basin (Bryan 1980), the Columbia Plateau (Carlson 1983a; Leonhardy and Rice 1970; Lohse, this volume; Moody 1978; Rice 1972), Kootenay area (Choquette 1987, 1996), and in Banff National Park (Fedje 1996:41). Some (Figure 3a–g) are identical or very similar to "Windust" forms of the Lower Snake River and others are large lanceolate forms with contracting stems and incipient shoulders (Figure 3h,i). Many of the specimens shown in Figure 3 lack known site-specific provenience, but they are from private collections donated to local museums throughout southern B.C. Some general location information is available, but to my knowledge no professional efforts have been made to pursue these leads.

Complete specimens are typically large (>10 cm long), moderately to relatively thick (0.5 to 1.0 cm), with overall lanceolate forms (Figure 3) and lenticular cross-sections. Shouldering is slightly to moderately pronounced, and moderate to pronounced edge-grinding is present on lateral margins, and along straight, slightly concave, and convex basal margins. Some specimens are heavily patinated (e.g., Figure 3h) and/or weathered and worn by chemical and abrasive processes (e.g., Figure 3a, d, e, g), attesting to their appreciable age. These bifaces undoubtedly functioned as both thrusting spear tips and knives, and resharpening and/or refurbishing is indicated on some specimens (e.g., Figure 3b, d, f). Lithic raw materials types are variable, with some known local types (e.g., basalt/dacite) being represented. A specimen from the Lytton locality (Figure 3e) is made of jet black obsidian.

While there is still ongoing unresolved debate as to whether Early Stemmed Point tradition(s) of the Pacific Northwest pre-date or ante-date the Western Fluted Point Tradition, future research may confirm the rare presence of components belonging to the Early Stemmed Point tradition on the Canadian Plateau from 10,500/10,000 to 8500 years BP. I suspect that any such components will be best represented in the North Okanagan, Shuswap Lakes, and Thompson River regions, as they have direct geographic contiguity with the Columbia Plateau to the south where this early tradition is well known and documented.

Plano Tradition (9500 to 8000 BP)

In numerous southern B.C. museum and personal collections there are low numbers of well-made bifaces (Figure 4) displaying very prominent tech-

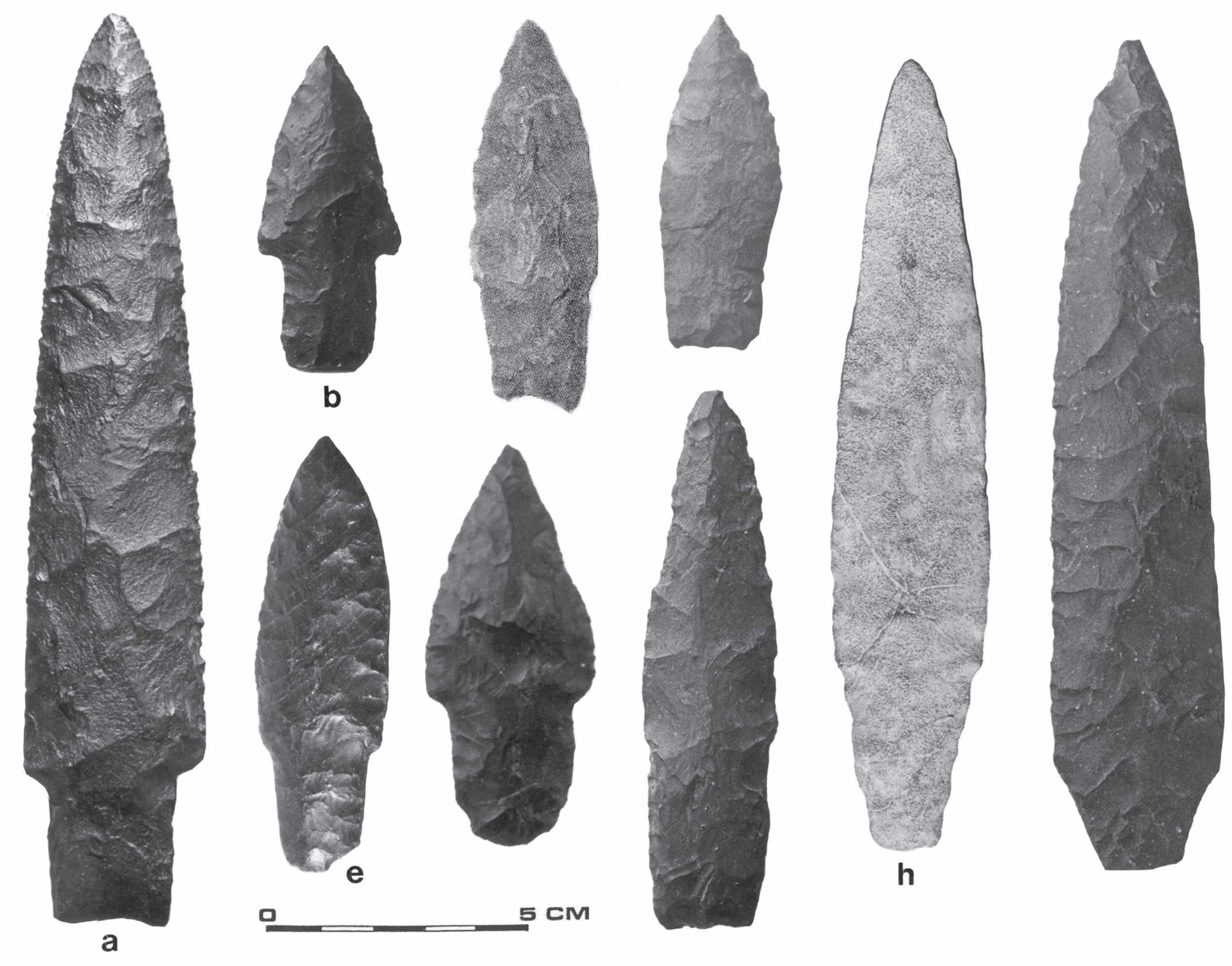

Figure 3. Bifaces assigned to the Early Stemmed Point Tradition (11,000/10,500–9000 BP). a: Chase locality (Chase Museum collections); b: site EdRa–1, South Thompson River; c: Shuswap Lake area; d: Bridge Lake locality; e: Lytton locality; f: Cache Creek locality; g: Lillooet locality; h: Skaha Lake locality; i: Kamloops locality.

nological and formal similarity to those defined for the Plano Tradition of the Northern Plains dating between ca. 10,000 to 9,000 BP (Wormington 1964, Wormington and Forbis 1965, Frison 1978, 1983). Components attributable to the Plano Tradition have yet to be identified and investigated in south-central B.C., but they are known from the northern half of the province (Howe and Brolly, this volume; Magne and Matson, this volume; Wilson 1996), and "Plano-esque" bifaces have also been recovered from sites in Banff National Park (Fedje 1996), and on the eastern slopes of the Rockies.

Most of the specimens shown in Figure 4 were selected from numerous collections originating from the Thompson River drainage area, and several can be linked with known sites. Many of them are identical to, or within the formal range of variability known for specific classic formal types such as Alberta/Scottsbluff (Figure 4a–e), Agate Basin/Eden/Lusk (Figure 4f, j) and Hell Gap (Figure g–i). Most specimens display well-controlled, successively initiated, parallel or collateral pressure flaking (Figure 4b, d, e–f); which is very characteristic of Plano biface technology. Edge-grinding is evident along the baso-lateral and basal margins of the majority of the specimens. Both local basalts/dacites and "exotic" cryptocrystalline silicate lithic raw material types are represented, and there is an obvious selective preference for chalcedonies and cherts.

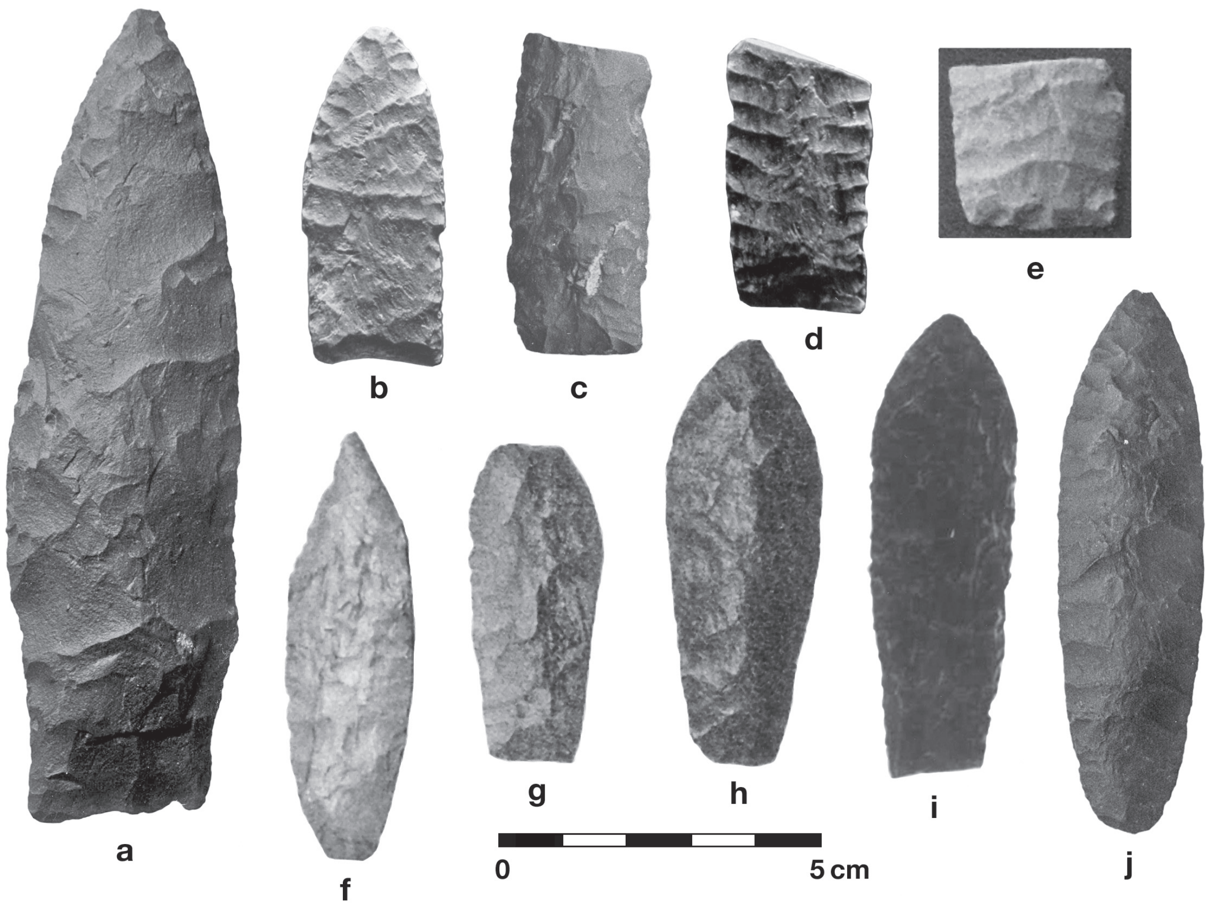

Figure 4. Bifaces of the Plano Tradition (9500–8000 BP). a: Lytton Locality; b: Chase locality; c: Clinton locality; d–f: Chase locality; g: Pavilion locality; h: site EdRk–8, Texas Creek locality; i: site EfRo–10, Dragon Lake; j: Kamloops locality.

Of interest is a biface (Figure 4i) recovered during a detailed excavation undertaken at site EfRo 10 located at the south end of Dragon Lake near Quesnel (Lawhead 1980:26). It is a large well-made lanceolate point with close formal resemblance to Hell Gap forms on the Northern Plains. Associated items include a triangular biface and several other large biface fragments that may also have considerable antiquity. Unfortunately this assemblage has not been analyzed in detail, and no radiocarbon dates are available. Lawhead (1980:65) remarks that several local collections from nearby sites contain "early" point styles, and microblade technology is represented.

While current evidence is scant for conclusive presence for "pure" Plano biface technology on the Canadian Plateau, I suspect one or two sites containing bifaces with Plano-like technological attributes will eventually be found and investigated within the next couple of decades. I offer that the Shuswap and North Okanagan regions hold the most promise for Plano components, which should date to the 9500 to 8000 BP range. Also, it has been noted by several researchers that the large well-made bifaces of the Early Nesikep Period (see below) have several attributes similar to Plano biface forms of the Northern Plains and elsewhere in the Pacific Northwest. It may be that some technological aspects of Early Nesikep Period biface technology were derived directly or indirectly from people participating in the Plano tradition prior to 8000 BP.

Old Cordilleran/Early Pebble Tool Tradition (9000 to 6000 BP)

Known by many names, this early cultural manifestation has been identified at a large number of sites on the Columbia Plateau, Lower Fraser River region, and along the southern and central Northwest Coast (Borden 1968, 1975; Butler 1961, 1965; Carlson 1983a, 1983b, 1996; Fladmark 1982; Haley 1996; Lohse, this volume; Matson 1976, 1996; McLaren and Steffen, this volume; Mitchell and Pokotylo 1996). Hallmark diagnostic implement forms belonging to this simple and limited lithic technological tradition includes cobble/pebble chopper/cores; medium-size and large flake tools and accompanying secondary lithic reduction waste; and large leaf-shaped, lozenge-shaped, and elongate tear-shaped knives with basal-lateral edge grinding (Figure 5).

The best-known and most extensively investigated component of this tradition was identified at the Milliken Site (DjRi 3) near Yale on the lower Fraser Canyon, where large foliate bifaces were recovered from components dating between 9000 and 8500 years BP (Borden 1968, 1969, 1975; Mitchell and Pokotylo 1996). The Milliken Site lies just outside the study area in the Lower Fraser Canyon, which is contiguous with the Mid-Fraser River region, where I believe this early technological tradition is well represented (see Chapter 1). Components belonging to the Early Pebble Tool Tradition have not been excavated on the Canadian Plateau, but it is important to note that with exception of the Lillooet and Lytton localities, vast portions of the relatively undeveloped Mid-Fraser River region remain to be subjected to archaeological investigations of any kind, and it is likely that occupations relating to this early technological tradition are deeply buried and difficult to identify.

Large, heavily patinated and weathered, leaf-shaped and elongate tear-shaped bifaces similar to those recovered from the Milliken Site and other Pebble Tool Tradition sites on the Lower Fraser River, have been observed by several researchers and myself at sites in early Holocene geologic contexts at disturbed and exposed sites in the Mid-Fraser and Thompson River regions (see Chapter 16). Many private and museum collections from these drainages also contain large bi-points that may be linked with this early technological tradition. Examples of selected random museum collection specimens, and bifaces from the Dutch Lake locality in the North Thompson River valley (Sanger 1970) are shown in Figure 5.

Many "Old Cordilleran" bifaces are moderately to fairly thick (0.5 to 1.0 cm), and were produced from large blade-like flake blanks using primarily

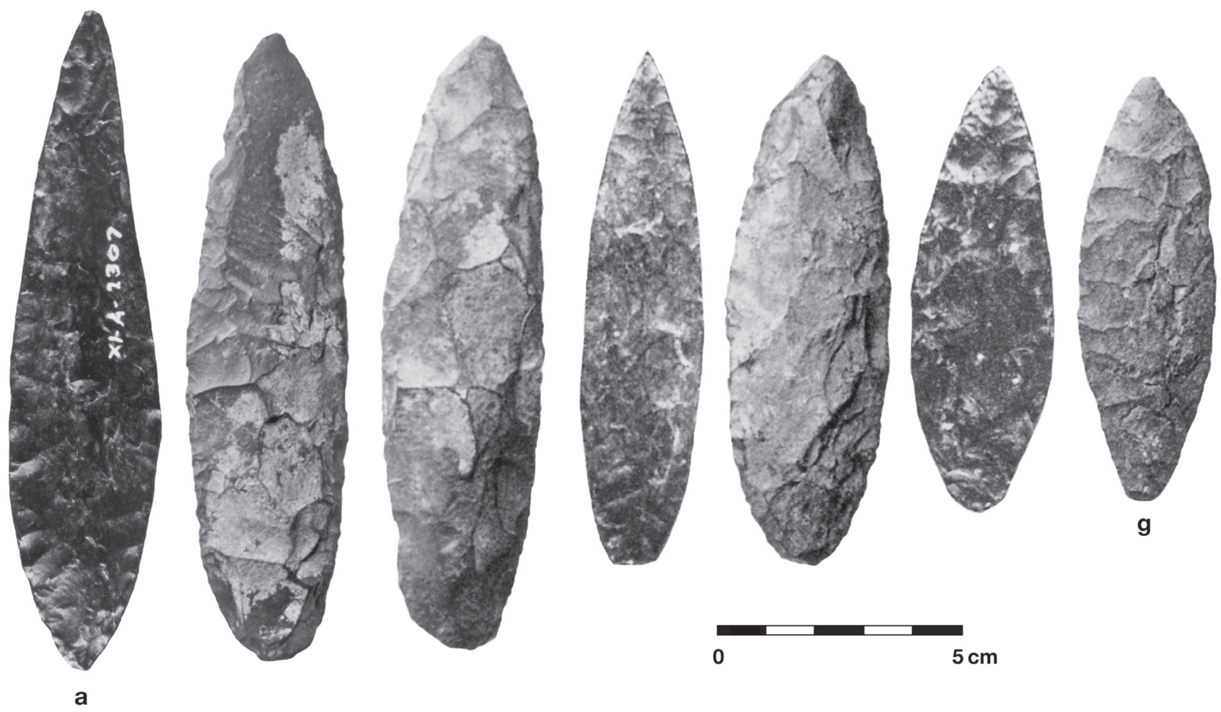

Figure 5. Large foliate bifaces of the Old Cordilleran/Early Pebble Tool Tradition (9000–6000 BP). a, d, f: Dutch Lake locality, North Thompson River; b: Lillooet locality; c, e, g: Lytton locality.

direct freehand hard-hammer percussion, with some pressure flaking being executed to finish and/or resharpen some specimens. Slight to pronounced basal and basal-lateral edge grinding is evident on many bifaces. A very slight or barely perceptible indent or "shouldering" is sometimes evident along one lateral edge about ⅓ the way up from the base. Patina development on some examples is moderate to advanced (Figure 5b, c, e), lending further (albeit somewhat contentious) support to the suspicion that some of these early foliate points have a respectable antiquity. Most of these large foliate bifaces were made from locally quarried, fair to good quality, metamorphosed siliceous siltstones and fine to medium grained basalts/dacites. Use of exotic silicates is very rare. Their overall form suggests primary use as knives; presumably to process primarily salmon and large game, but no doubt they were also used to execute a wide variety of everyday cutting-related tasks.

Nesikep Tradition Bifaces of the Middle Period (7500/7000 to 4500 BP)

The Nesikep tradition was first defined by Sanger (1969, 1970), who proposed a 7000 year-long cultural continuum culminating in ethnographic Interior Salish culture. This tradition has been shortened and redefined by Stryd and Rousseau (1996:187–191) and Rousseau (2004a:4–12). Excavated reliable data secured from Nesikep Tradition sites are sparse, but they allow a general reconstruction of subsistence and settlement (see Lawhead and Stryd 1985; Rousseau et al. 1991; Rousseau 2004a:3–12; Sanger 1970; Stryd 1972; Wilson 1991). The initial appearance, cultural origins, and duration of the Nesikep Tradition remains unknown, although it may have emerged in the Mid-Fraser and Thompson River drainages as early as 7500/8000 BP. However, this remains to be shown and supported by reliable excavated data and radiocarbon age determinations.

The mere handful of excavated Nesikep Tradition components, and data secured or observed at several sites during routine site surveys and inventories conducted in the Thompson and Mid-Fraser River drainages, permit a basic reconstruction of Nesikep Tradition technologies, adaptive strategies, and other aspects of their lifeways (see Gehr 1976; Lawhead and Stryd 1985; Lawhead et al. 1986; Rousseau 1991, 2004a; Rousseau and Richards 1988; Rousseau et al. 1991; Sanger 1970; Stryd 1972; Stryd and Rousseau 1996; and Wilson 1991). The Nesikep Tradition is further divided into the *Early Nesikep* period (7500/7000 to 6000 years BP), which is followed by the *Lehman Phase* (6000 to 4500 BP) (Rousseau 2004a:4–12; Stryd and Rousseau 1996:187–197). A culture history schematic for the Middle and Late Periods is presented in Figure 6.

Bifaces of the Early Nesikep Period (7500/7000 to 6000 BP)

For the Early Nesikep period (ca. 7500/7000 to 6000 BP) biface assemblages include very distinctive, medium-size to large, thin, finely flaked bifaces (Figure 7) that attest to superb technical skill and close adherence to a specific formal and functional theme that persisted for at least one millennium, and possibly considerably longer. Most complete bifaces are well-made, relatively thin, lanceolate in overall formal outline, have straight, slightly convex or recurved lateral margins, and thin lenticular cross-sections. A few specimens (~10%) have micro-serrated edges (e.g., Figure 7h, l, q, gg), presumably to enhance internal cutting and/or hemorrhaging efficiency. Distinctive attributes of Early Nesikep Period bifaces include: (1) V-shaped corner notches that create shoulders with slight to pronounced "hooked" lateral barbs; (2) parallel to slightly expanding basal-lateral margins; (3) straight or convex basal margins; and (4) slight to pronounced basal and basal-lateral edge grinding. Other bifaces associated with Early Nesikep occupations include un-notched triangular (Figure 7ll) and ovate forms that are likely point/knife performs or unhafted knives.

Intentional bifacial basal thinning by sequentially removing large pressure flakes from along straight or concave basal margins is readily evident on many of the examples shown in Figure 7. Moderate to pronounced basal edge grinding facilitated successful removal of these large pressured thinning flakes, and strengthened and dulled this margin for optimal hafting considerations. Viewed end-on, most bifaces have remarkably straight or slightly bowed lateral margins. Superb technical skill is also reflected in the flaking patterns and remarkable thinness of many items. Transversely snapped specimens often have impact damage along break margins, and many shorter examples suggest having

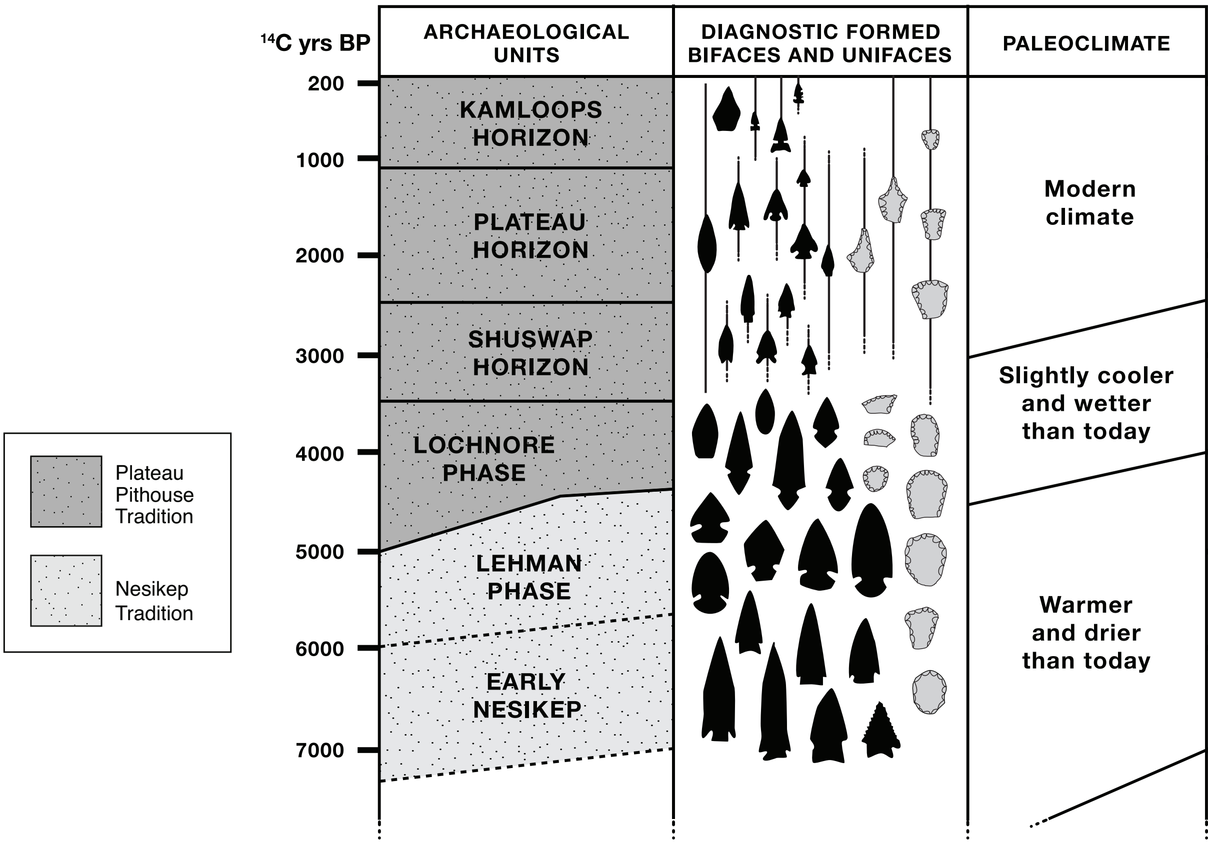

Figure 6. Schematic of archaeological units, common diagnostic biface and uniface forms through time, and paleoclimatic sequence for the last 7000 years on the Canadian Plateau.

been reworked (re-tipped) after distal portions had snapped off. Accidental breakage and/or successive resharpenings resulted in loss of overall blade length, and commonly resulting in reduction of basal-lateral barb size and prominence.

Some larger complete bifaces have recurved edge outlines (e.g., Figure 7a–d, g) suggesting that their initial form was designed to maximize mid-blade width so that successive resharpening episodes could be possible on breakage or edge dulling. This trait is more consistent with intended use as a knife rather than as a projectile tip. I submit that "complete" or "initial form" bifaces of the Early Nesikep period were designed with both projectile tip (i.e., spear and atlatl dart point) and cutting tool in mind. These dual purpose bifaces probably tipped short stout dart or spear shafts, and subsequent to dispatching a quarry, it could be then used as a knife by snapping the wooden projectile shaft to a manageable manipulative length. This weaponry and butchering tool system would have been a practical, efficient, and important technological strategy for people participating in the highly mobile big game hunting and foraging economy that characterized the Early Nesikep period (Rousseau 2004a; 2004b).

Medium and fine-grained basalt/dacite was the most commonly used lithic raw material during the Early Nesikep. Medium to high density natural concentrations of this excellent stone are available as float pebbles and cobbles in glacial till over large mid- and high altitude areas in the Maiden Creek Valley and Arrowstone Hills near Cache Creek, and in the Penask Lake and Sunset Lakes localities between Merritt and Kelowna. Exploitation of these sources indicates regular visitation and knowledge of mid-altitude and upland areas, and Early Nesikep bifaces are commonly found in all environments on the Canadian Plateau. The fine and medium-grained basalts/dacites from these sources have lamellar planar groundmasses that allowed successful pro-

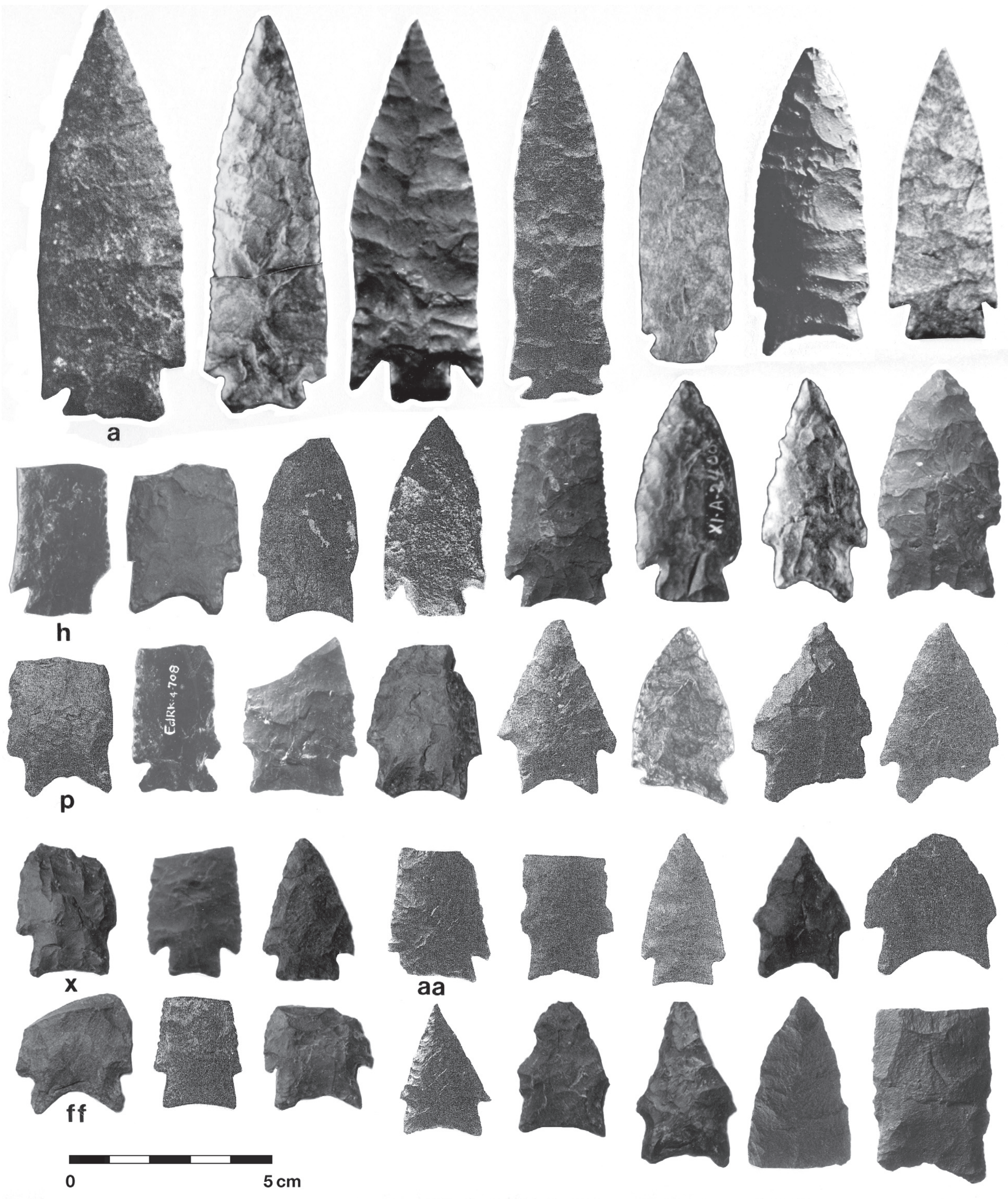

Figure 7. Selected examples of Early Nesikep Period (7500/7000–6000 BP) bifaces found during archaeological excavations and surveys, and in private collections. Most are from the Mid-Fraser and Thompson River regions, although these bifaces are found throughout the Canadian Plateau in all altitudes and environmental contexts.

duction of very large thin flake blanks with relative ease. People participating in the Early Nesikep took full advantage of this physical trait to consistently manufacture the well-made medium-size and large bifaces typical of this period.

Early Nesikep bifaces display a high level of chipped stone technological proficiency and other distinctive traits that Sanger (1970:122, 127) thought were somehow ultimately derived from early Plano traditions of the Northern Plains. While an apparent "lingering" of Plano Tradition technological traits is plausible, there is currently a perceived 1500 to 2000 year gap between these two archaeological constructs that challenges Sanger's argument for direct ancestral or sustained cultural continuity. It may be that similarities reflected in both Plano and Early Nesikep biface forms are simply coincidental, being the result of parallel technological innovation or functional necessity rather than from direct ethnic/cultural ancestry. It is interesting to note that on the Northern Plains, medium-sized, well-made corner-notched points are sometimes found in early Mummy Cave Complex components dating to between 7750 and 7000 (Reeves, pers. comm. 2005), and there may be a possible interactive link with people of the Northern Plains that needs to be considered and explored. Another curious observation is that the few Western Fluted Point tradition bifaces found in B.C. (Figure 2) have multiple basal thinning flakes and occasional edge grinding; traits that are shared with the Early Nesikep notched bifaces. While it is tempting to speculate that the lithic technological tradition of the Early Nesikep period may owe its origins to the Western Fluted Point Tradition, this scenario requires the acceptance that the early Nesikep Period commenced around 9000 BP, a hypothesis that seems improbable and is unsupported by any current reliable data.

As mentioned earlier, a commencement date for the Early Nesikep Period has not been determined, although I submit that it clearly represents an *in situ* development of a very unique cultural system with its own unique technological traditions and trait signatures resulting from, and involving, an interactive admixture of early Pacific Northwest cultural groups and material traits. This melding of several early technological and cultural traditions probably began sometime around 7500 years ago, with the unique "Early Nesikep" cultural pattern being fully developed and widespread over a vast area by at least 7000 years BP. A great deal remains to be learned about the Early Nesikep Period, and as a start, we desperately need radiocarbon dates and much more empirical data from several well-excavated components to disclose its approximate commencement and termination dates.

Bifaces of the Lehman Phase (6000 to 4500 BP)

The Lehman phase was initially identified and defined on the basis of excavations conducted at the Oregon Jack Creek and Rattlesnake Hill sites near Ashcroft, and several sites in the nearby Highland Valley (Lawhead and Stryd 1985, Lawhead et al. 1986; Rousseau and Richards 1988). Several other Lehman phase components have since been investigated and reported (see Rousseau 2004a; Stryd and Rousseau 1996:189–191, 201–204). Available radiocarbon dates from excavated sites suggest it began sometime around 6000 BP and ended by 4500 BP. There is little doubt that Lehman phase people were direct descendants of people participating in the Early Nesikep period, as indicated by clear continuities in technological traits, lithic tool type repertoires, subsistence practices, and consistent seriation and clustering of radiocarbon dates. Transition from the Early Nesikep to Lehman phase cultural patterns appears to have been gradual and relatively seamless, and there are many shared and persistent commonalities, especially with respect to biface production modes and general formal attributes.

Lehman phase chipped stone biface assemblages often include: (1) relatively high numbers of medium-size and large, relatively thin, pentagonal and tear-shaped knives/points with obliquely oriented, shallow to very deep V-shaped, U-shaped, corner or side notches (Figure 8); (2) occasional simple un-notched ovate and broad leaf-shaped forms with straight cortex-bearing bases; and (3) low numbers of simple triangular elliptical and leaf-shaped forms. Distinctive "*Lehman phase obliquely-notched*" bifaces (Figure 8) (Rousseau 2004a:7; Rousseau and Stryd 1996:189, 194) are considered solid diagnostic temporal horizon markers exclusive to Lehman phase occupations. Basal and baso-lateral margin edge grinding is moderate to pronounced on almost all bifaces, a trait also common to Early Nesikep Period and Lochnore phase biface technology.

Remarkably narrow and deep notching on large bifacial knives found in Lehman phase (ca. 6000

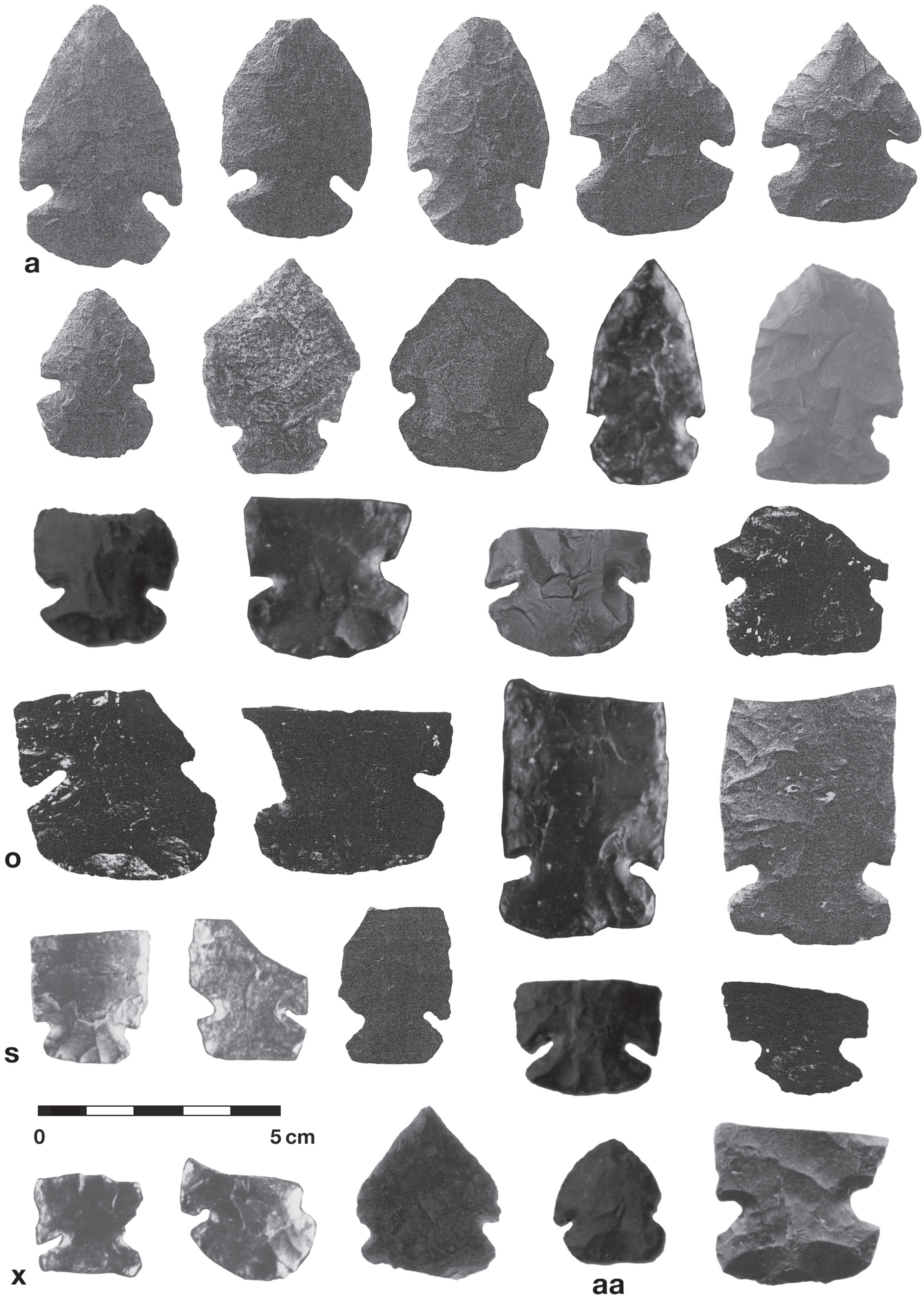

Figure 8. Bifaces of the Lehman Phase (6000–4500 BP) from excavated sites and surface collections in the mid-Fraser and Thompson drainage regions.

to 4500 BP) components (Figure 8) indicates that 3 to 4 mm-thick strips of hide or sinew binding were used to fix blade to haft. Notching on some specimens is often quite deep (0.5 to 1.0 cm), and was probably accomplished with a narrow awl-like indenters made from slivers of mammal longbone or antler. While notches up to 7 mm wide are present on some Lehman phase blades, fairly narrow widths (3 to 5 mm) seem to be the norm. The inter-notch width on most examples suggests these blade inserts were made to accommodate hafts varying from 1.5 to 2.2 cm in diameter.

The "Lehman phase obliquely-notched point" is a very unique bifacial tool form that I perceive to be most aptly suited for cutting rather than for tipping projectile darts or thrusting spears. I am not implying they were never used to dispatch game, but I suspect they were most often used as knife blade inserts for composite knives (Rousseau 2004b). This becomes logically evident when one considers that the degree of edge resharpening on some bifaces is extreme, creating very obtuse blunted distal ends that are clearly unsuited for effective projectile penetration of animal skin and flesh.

Common and consistent use of large quantities of vitreous, fine and medium-grained basalts/dacites quarried from the Arrowstone Hills area north of the lower Thompson River is abundantly evident, and this raw material was preferentially sought for the same technological and functional reasons outlined for the Early Nesikep period. At some sites, locally available, inferior quality, fine and medium-grained siliceous siltstones were used; presumably because better quality materials were unavailable.

It is worth noting that the typical "Lehman obliquely-notched" biface type has several technological and formal similarities with bifaces of the coeval Cold Springs horizon on the Columbia Plateau, where they are called "Cold Springs Side-Notched points" (Andrefsky 2004; Lohse, this volume; Womack 1977). It may be indicative that there was some level of direct physical interaction between peoples of the Canadian Plateau and Columbia Plateau groups from ca. 6000 to 4500 BP. Indeed, it is even possible that highly mobile groups of culturally and genetically related people could have used and frequented many resource-rich areas of the entire Interior Plateau Culture Area at that time. Alternately, the obvious close formal similarity in large side-notched bifaces from these two cultural sub-areas may actually be owing to simple inter-regional trait/tool diffusion that was driven by widespread acceptance of some important technological or subsistence advantage(s) afforded by use of large hafted bifaces.

Plateau Pithouse Tradition Bifaces of the Late Period (5000/4500 to 200 BP)

The Plateau Pithouse Tradition (PPT) of the Late Prehistoric Period spans at least five millennia, beginning with the Lochnore phase (5000 to 3500 years BP), followed by the Shuswap (3500 to 2400 BP), Plateau (2400 to 1200 BP), and Kamloops (1200 to 200 BP) cultural horizons (Figure 6) (Richards and Rousseau 1987:49–52; Rousseau 2004a:13–21; Rousseau and Richards 1985; Stryd and Rousseau 1996:197–198). Among many salient traits that persisted throughout its duration, this cultural tradition is hallmarked by the appearance of small seasonal (winter) pithouses sometime around 4500 BP (Golder Associates 2005; Wilson et al. 1992), broad-spectrum fishing, hunting and gathering economies, increased semi-sedentism and inter-regional cultural diversity, and an *in situ* development of adaptive practices, technological innovations, and subsistence and settlement patterns that are solely unique to the Canadian Plateau culture sub-area.

Formed Bifaces of the Lochnore Phase (5000 to 3500 BP)

The commencement date of the Lochnore phase is still shrouded in uncertainty and consternation, and there are a number of radiocarbon dates from excavated contexts suggesting it may have initially appeared in the Mid-Fraser and Thompson River drainages possibly as early as 5500 BP (Stryd and Rousseau 1996:204). Dates between 5000 and 4000 BP are most common for excavated components, and the data indicate it was clearly well-represented in these regions by 5000 BP. The presently perceived temporal overlap of the latter part of the Lehman phase and the early part of the Lochnore phase (5500 to 4500 BP) has been the recent focus of considerable speculation and debate (Prentiss and Kuijt 2004:49–63; Rousseau 2004a:8–13, and is discussed further in the final section of this chapter.

Distinctive Lochnore phase formed biface types and their associated technological traits include: (1) the commonly represented "Lochnore side-notched" or "Lochnore turkey-tail" bifaces, which are typically large and medium-sized, lanceolate, leaf-shaped, thin to moderately thick, lenticular cross-sectioned points/knives with wide, shallow to moderately deep, opposing U-shaped side notches, heavy basal edge grinding, and pointed or markedly convex basal margins (Figure 9a–o); (2) large and medium-size un-notched leaf-shaped bifaces with straight or slightly convex basal margins (Figure 9p–x); and (3) low numbers of elliptical, oval, and tear-shaped bifaces. Microdenticulation of lateral blade margins is evident on a few specimens. The size of opposing notches can vary considerably on Lochnore phase side-notched bifaces, ranging from very subtle (2 mm wide by 1 mm deep), to pronounced (up to 12 mm wide by 3 to 10 mm deep).

Lanceolate "Turkey Tail" bifaces with wide and moderately deep notches (Figure 9b–n) may have been most popular between 5000 and 4500 BP, and after that, smaller foliate versions with smaller notches prevail in assemblages. Un-notched foliate forms are more common during the latter half of the Lochnore phase, suggesting that by that time, secure notching may have been viewed as an optional feature that was dependent on personal preferences, the nature of the haft and means used to fix the blade securely in place, and/or the nature of tasks to be performed.

Lithic raw materials used to produce Lochnore phase bifaces in the Mid-Fraser River and Thompson River regions commonly included vitreous, fine-grained and medium-grained basalts/dacites derived from the Arrowstone Hills and Maiden Creek sources near the town of Cache Creek. Here, and in many other adjacent regions, poorer quality siliceous siltstones and cherts were also commonly obtained as randomly dispersed float cobbles from exposed glacial outwash deposits and river/stream beds on valley bottoms. Frequent use of inferior quality locally quarried lithic materials to produce bifaces, is another commonality shared between Lochnore phase people and their Coast Salish contemporaries in the Lower Fraser River.

It is significant to note that Coast Salish people occupying the Lower Fraser River region between 6000 and 3500 BP consistently produced small and medium-size foliate points that are virtually identical to those found in Lochnore phase components (McLaren and Steffen, this volume; Mitchell and Pokotylo 1996). The most salient difference is that many Lochnore phase bifaces are notched, but coeval points and knives from the Lower Fraser River region are not. It may be that notching was a trait that upstream penetrating riverine-adapted Coast Salish people borrowed directly from Lehman phase folks, who were very proficient at notching, and practiced it with great regularity. If so, it can be held as additional direct evidence supporting a suspected co-existence and technological information exchange between these cultural groups from 5000 to 4500 BP.

Lochnore phase assemblages in slow-moving riverine environmental contexts (i.e., the entire Thompson River drainage), sometime contain low numbers of small and medium-size (2.5 to 6.0 cm long), elongate, narrow (0.5 to 1.25 cm wide) formed bifaces with thick (0.5 to 1.0 cm) lenticular cross sections (Figure 10). Most of these distinctive items are best described as elongate "cigar" or "torpedo" shaped bipoints, others are awl-like or "pick-like", and a few resemble small crescents. While some of these bipoints may have tipped projectiles, I offer that most of them actually functioned as chipped stone fish gorges. The majority of identified fish gorges encountered in the archaeological record on the Canadian Plateau are made of mammal bone or antler, but it is perfectly logical to expect that chipped stone versions were made and used, since they sink to the river bottom where large fish lie. Long, thin, strong leader lines were attached to the middle of the bifacial bipoint (Figure 10f), and bait (e.g., fish roe and/or entrails, animal flesh) was secured on the biface so that the pointed distal ends protruded from the bait wad. A long line is set in deep, slow moving water, and when a large fish ingests the bait, the gorge becomes lodged in its gullet or stomach. It could then be retrieved. Several excavated assemblages suggest that occasional use of stone gorges may have also persisted into the following Shuswap horizon (Rousseau and Richards 1982), but they seem to be rare after about 2400 BP.

Formed Bifaces of the Shuswap Horizon (3500 to 2400 BP)

The Shuswap horizon corresponds with a period of cool and wet conditions that prevailed from

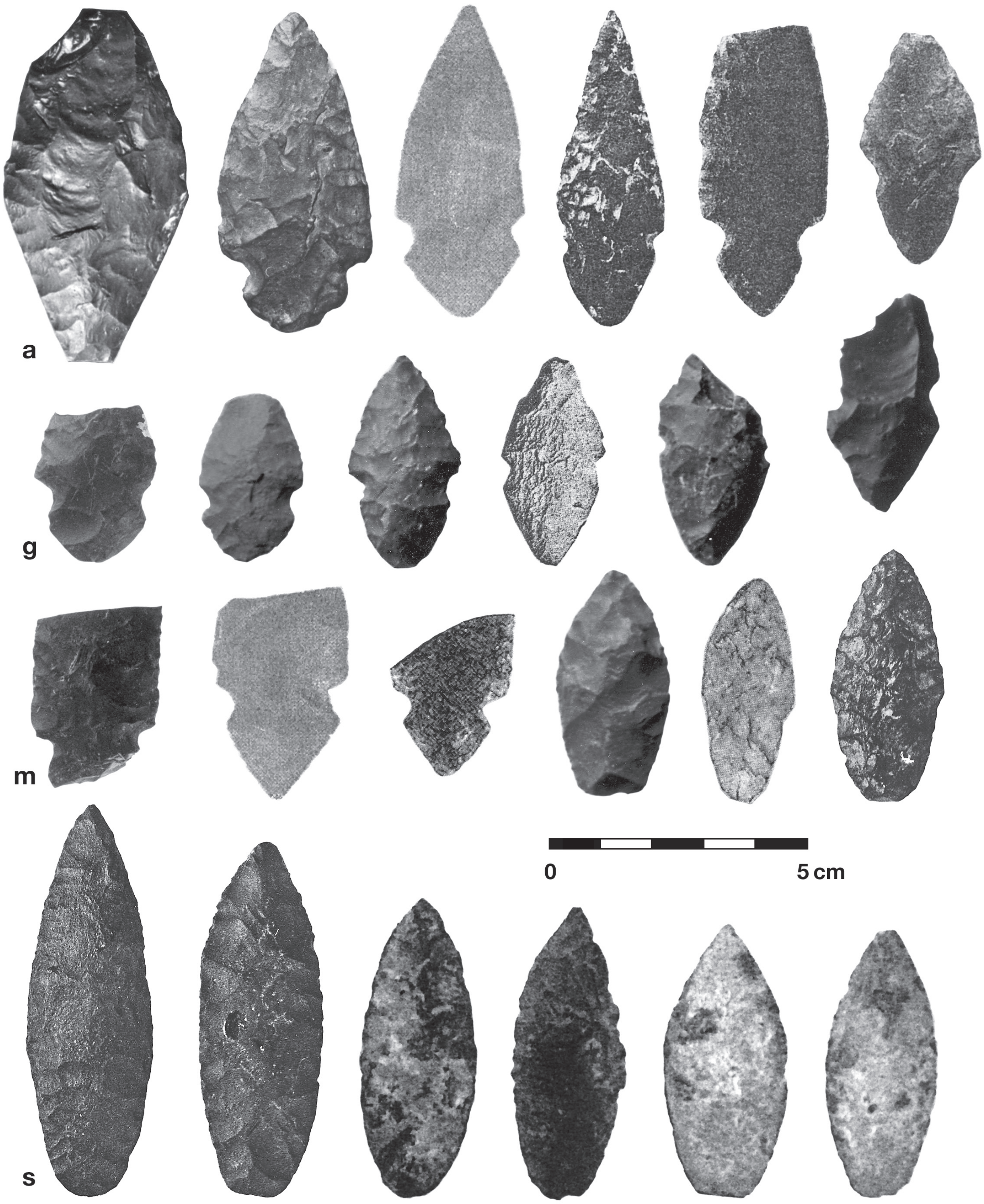

Figure 9. Lochnore Phase (5000–3500 BP) bifaces from excavated sites and surface collections in the mid-Fraser and Thompson drainage regions.

Figure 10. Chipped stone fish gorges associated with riverine sites in the lower Nicola Valley (a), and Ashcroft Locality (b–e). Item (f) shows typical line attachment.

about 4000 to 2500 BP. Highly productive forests expanded into valley bottoms, and sometime around 3500 BP, this very successful semi-sedentary cultural system emerged in the Shuswap Lakes and South Thompson regions (Richards and Rousseau 1987:22–31; Rousseau 2004a:15–16). Several Shuswap horizon pithouses have been excavated, and most of what we know about it has been derived from data secured from this site type.

Shuswap horizon formed bifaces include a variety of stemmed, basally-indented, shouldered, and corner-removed projectile points, and leaf-shaped knives (Figure 11) (see also Richards and Rousseau 1987:26; Rousseau 2004a:9). Many are lanceolate or triangular in general outline, and they range from small to quite large (2.5 to 10 cm long). Thickness varies, but for most bifaces it ranges from 0.4 to 1.0 cm. Basal and lateral edge-grinding has yet to be observed on any Shuswap horizon bifaces, and it seems that this common and persistent Middle Period technological trait was discontinued after 3500 BP. Medium size and large foliate, tear-shape and oval knives (Figure 11a–i) are also present in low to moderate numbers in assemblages, and in many respects these items are very formally similar to those of the preceding Lochnore phase.

A wide variety of lithic raw materials were employed for biface production, with extra-local exotic silicates (chalcedony and cherts) and basalt/dacite, and local poor to fair quality stone being represented in many assemblages. Technical proficiency of knappers ranges from fair to good. The suite of markedly varying point styles reflects a high degree of residential group mobility and contact with neighboring groups, personal point style preferences, and/or possibly experimentation with several types for different prey.

As mentioned above, many Shuswap horizon projectile point forms (Figure 11j–p, w, ee, ff) are strikingly similar to Oxbow and McKean-Hanna-Duncan complex atlatl points found during the Middle period the Northern Plains (Reeves 1969, 1983; Richards and Rousseau 1987:30–31; Vickers 1986). To me, this suggests direct or indirect interaction occurred with Plains groups to the immediate east, inciting adoption of basic Plains point styles and possibly other traits. Early housepit sites near Banff in the Rocky Mountains (Langemann 1998, 2002; Langemann and Perry 2002) contain projectile points attesting that Shuswap horizon groups occasionally visited and wintered on the western fringe of the Northern Plains. These same highly mobile Plains-influenced groups also resided in many other prime resource rich areas of the Canadian Plateau, as indicated by the ubiquity and inter-regional consistency in common use of

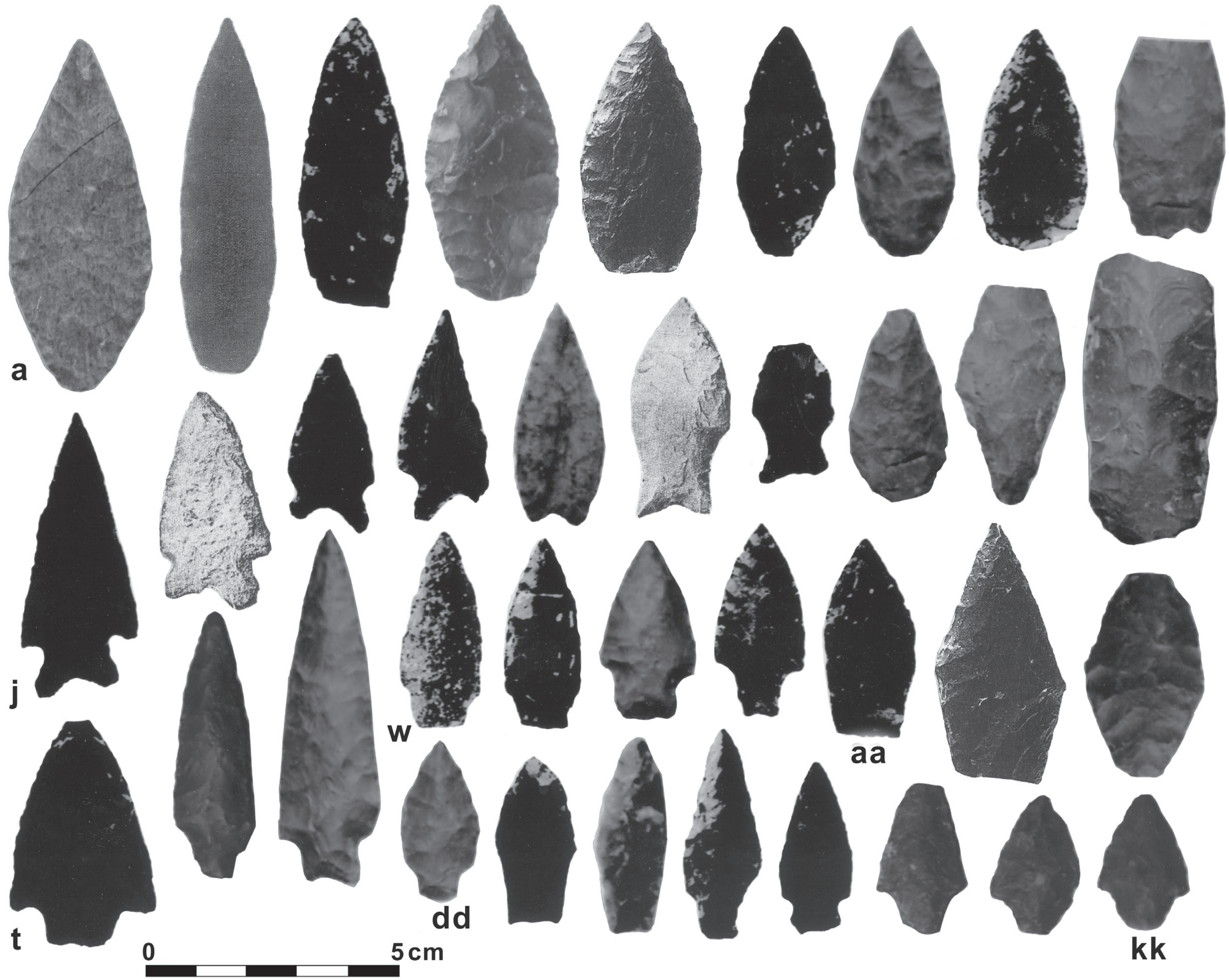

Figure 11. Selected bifaces of the Shuswap Horizon (3500–2400 BP) from excavated sites in the Kamloops, Shuswap Lake, Ashcroft, and Kelowna localities.

these Plains-like point forms at that time. Interestingly, there is a temporal discrepancy of about 1000 years between the initial appearance of Oxbow and Duncan/Hanna/McKean complex point styles on the Northern Plains compared to their debut on the Canadian Plateau. Later western adoption of these styles suggests a slow temporal cline originating from the Plains in the east, through the Rockies, and then west onto the Canadian Plateau by about 3500 BP. A similar temporal and distribution cline occurs for the ensuing Pelican Lake phase of the Northern Plains (Reeves, 1983) and the coeval Plateau horizon of the Canadian Plateau.

Contracting stemmed Shuswap horizon points (Figure 11r, t, u, z, dd, gg, ii–kk) are more common in assemblages after about 2800 BP, attesting to common use of stemmed point styles and other biface forms that were common on both the Columbia Plateau and South Coast at this time. This is particularly true in the North Okanagan and Shuswap Lakes regions which are contiguously linked to the Columbia drainage via the Okanagan River and Arrow Lakes Valleys. Low numbers of contracting stemmed points in the Mid-Fraser and Thompson regions may also reflect long-standing interaction with Lower Fraser River groups where stemmed points dominate assemblages dating between 3500 to 2500 BP (McLaren and Steffen, this volume).

Formed Bifaces of the Plateau Horizon (2400 to 1200 BP)

The Plateau horizon represents the climax of Canadian Plateau cultures, which is why it is so named (Richards and Rousseau 1987:32–41; Rousseau 2004a:16–19). It was a period of rapid human population growth, peaking around 2000 BP; declining steadily thereafter until 1200 BP. Components of this horizon are abundant in the archaeological record, and they are found in all environmental settings. Large permanent villages were established and occupied continuously for hundreds of years. Inter-regional exchange systems were highly organized and maintained, involving and providing ready access to large quantities of high quality basalt/dacite and cherts and chalcedonies from the Maiden Creek, Hat Creek, Arrowstone Hills, Ducks Meadow, Penask Lake and Salmon River (Falkland) sources. The high quality materials from these sources were used to produce well-made projectile points, knives, and bifacial drill bits. Very high levels of technical proficiency is evident on many bifaces, and in some communities there may have been specific lithic specialists that were regularly involved in acquisition of extra-local silicate materials, and/or in production of "commercially available" bifacial points and knives that were often exchanged with fellow village members for other commodities.

Plateau horizon projectile points are typically triangular in overall outline with convex and straight basal margins, and most have moderate to very pronounced lateral barbs created by deep corner or basally initiated notches (Figure 12). Unnotched triangular bifaces (Figure 12mm, nn) are also present in low numbers, but these are probably unfinished point preforms or knife blades. Basally-notched and corner-notched forms are both common from 2400 to 2000 BP, but corner-notched forms typically dominate assemblages from 2000 to 1200 BP. Rare leaf-shaped and stemmed points are also sometime found, and most of these probably functioned as knives or were scavenged from sites predating 2400 BP. Corner and basally-notched projectile points are found throughout the entire Pacific Northwest between about 2500 and 1000 BP. The predominant use and widespread adoption of this point style over such a large area is significant, and was probably due to greater hunting success that prominent barbs provide, and/or perhaps from development or adoption of an improved atlatl weaponry system.

A progressive reduction in point size is evident during the latter part of this horizon, particularly after 1600 BP when bow and arrow technology became the dominant hunting weapon system on the Canadian Plateau (Richards and Rousseau 1987:34; Rousseau 2004a:17). This very efficient weapon system was clearly present on the Northern Plains by about 1700 BP (Vickers 1986), spreading westward onto the Canadian Plateau sometime around 1600 BP, and into the Great Basin by 1350 BP (Bettinger and Eerkens 1999). Chatters (2004) argues for a 2000 BP introduction on the Columbia Plateau, but notes it was not commonly used until several centuries later. This technology is hallmarked by appearance of small (<3.0 cm long and <1.0 cm neck wide), triangular, corner-notched point forms (Figure 12y–l). Their progressively frequent appearance coincides with a concomitant steady decline in the relative frequency of larger atlatl dart points

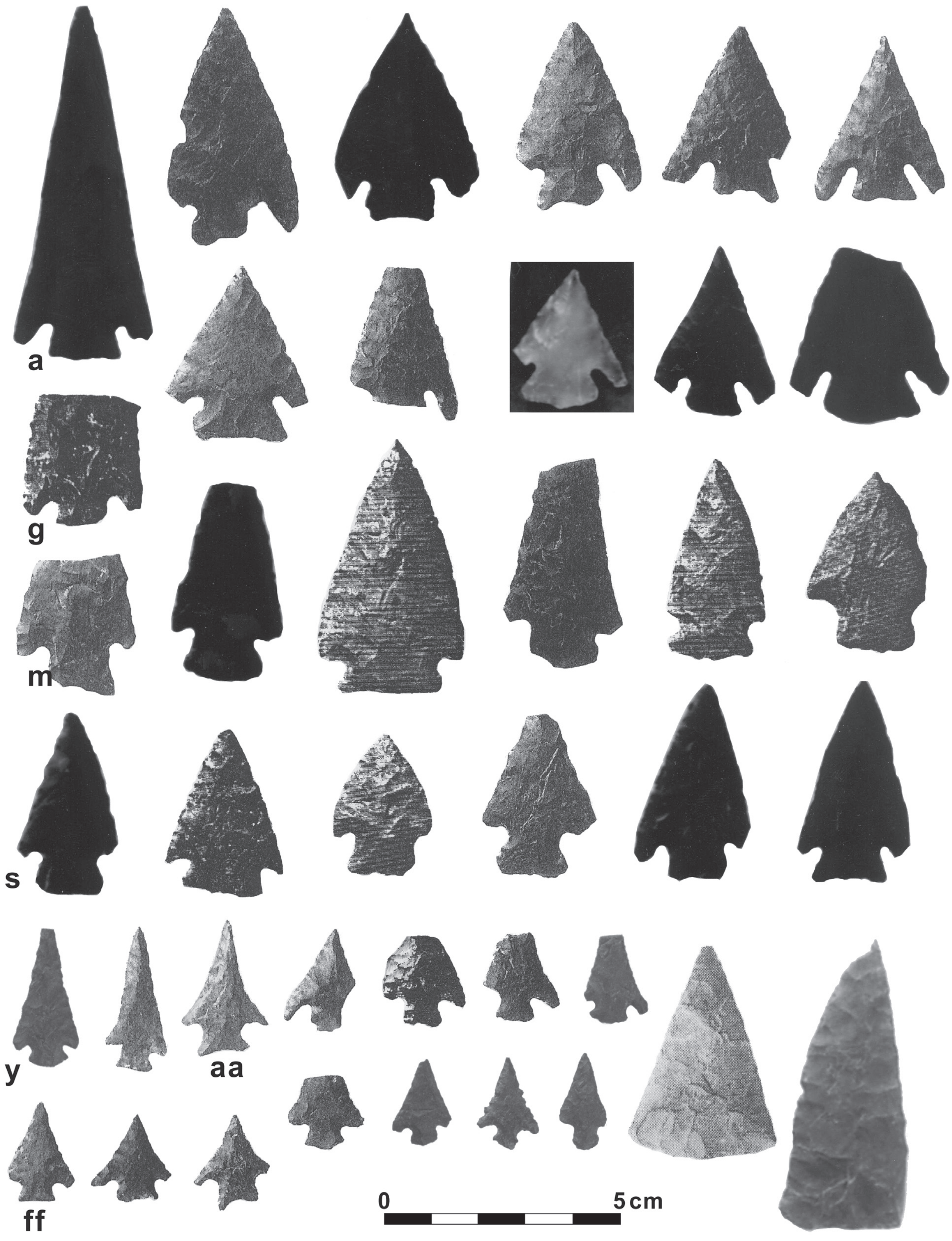

Figure 12. Selected bifaces of the Plateau Horizon (2400–1200 BP) from numerous excavated sites in the Thompson River and mid-Fraser drainage regions. y–ll: arrow points dating between 1600 and 1200 BP. mm, nn: typical un-notched projectile point preforms.

from 1500 to 1200 BP, suggesting the atlatl was used concurrently with the bow and arrow for several hundred years, but was phased out shortly after 1200 BP.

Occasionally, very large (>8 cm long), ovate, tear-shaped, pear-shaped, and sub-rectangular bifaces have been found associated with Plateau horizon earth-oven (roasting pit) depression sites where balsamroot and bitterroot shoots were processed. Examples are shown in Figure 13. These bifaces often display very pronounced rounding and unidirectional striations along the widest (usually basal) margin, indicating significant use of force involving hard contact materials. While many researchers would probably suggest they functioned as large knives, most are quite thick and have edges clearly unsuited for effective cutting. I offer that they were used as hoe blades that were fixed to hafts in a spatulate or adze-like fashion (Figure 13e, f), and they were used to harvest roots by hacking and/or prying them from the ground. This accounts for their overall formal attributes which are very well-suited for this activity, and for extreme use-wear evident on functional margins, since they were in regular forceful contact with silt, sand, pebbles, etc. while in use. These hoes are functionally compatible with root digging sticks, which also initially appeared at the commencement of the Plateau horizon (Richards and Rousseau 1987:39), and I suspect that both digging implement types were used concurrently during this horizon.

Formed Bifaces of the Kamloops Horizon (1200 to 200 BP)

The Kamloops horizon is well-represented in the archaeological record on the Canadian Plateau, and many sites have been subjected to detailed excavations (Richards and Rousseau 1987:41–49; Rousseau 2004:19–21). Regional populations were lower than the preceding Plateau horizon, but most regions and large established village sites continued to be occupied up to Euro-Canadian contact (200 BP). Biface technology during the Kamloops horizon was well-developed and well-represented, although many assemblages and bifaces reflect only mediocre to fair technical ability compared to the preceding Plateau horizon.

Of significant importance during the Kamloops horizon was the initial appearance and dominant persistence of "Kamloops side-notched" arrow points (Figure 14a–z). They are typically small (1.5 to 3.0 cm long), triangular in outline, relatively thin, and have small laterally-initiated opposing U-shaped notches of varying widths and depths. Larger (3.0 to 4.5 cm long) versions appear in assemblages during the last 400 years of this horizon, but they are present in small numbers. Most were produced from vitreous and fine-grained basalt/dacite, although exotic cherts and chalcedonies were sometimes used.

During the latter part of the Kamloops horizon, appearance of "multi-notched" variants with two or more notches along one lateral blade margin or micro-denticulated lateral blade margins (Figure 14aa–ii) are more than just curious, and deserve special future research attention. It may be that they were designed and primarily intended for use in situations involving serious interpersonal conflicts, since extra notches and micro-serrated edges promote greater damage to flesh during arrow penetration and subsequent attempted forceful removal. Also, thin points with multiple notches are more prone to break on impact and during extraction attempts, thereby causing the distal ends of these points to remain in the wound to promote infection and further physical damage. Most of these points are found in the Mid-Fraser and Thompson River regions associated with components dating between 400 and 200 BP, suggesting perhaps, that inter-regional group conflicts and tensions may have been common just prior to arrival of Euro Canadian settlers.

Medium-size and large bifacially flaked, unnotched, leaf-shaped, ovate, triangular, asymmetrical tear-shaped, incipiently stemmed, and "boat-shaped" bifacial knife blades also appear in Kamloops horizon components; many of which likely functioned as knives. Of particular interest are "Kamloops horizon pentagonal bifaces/knives" (Figure 15b–g) (Richards and Rousseau 1987:45; Rousseau 2004b:14–16). This tool form has been formally recognized as being a fairly reliable temporal horizon marker or index for the Kamloops horizon, and for some researchers it is considered to be on diagnostic par with the "Kamloops side-notched point". I submit that most Kamloops horizon pentagonal bifaces functioned primarily as knife blades, and that their initial "complete" forms were often fairly long (5 to 10 cm), with foliate and tear-shaped outlines and straight

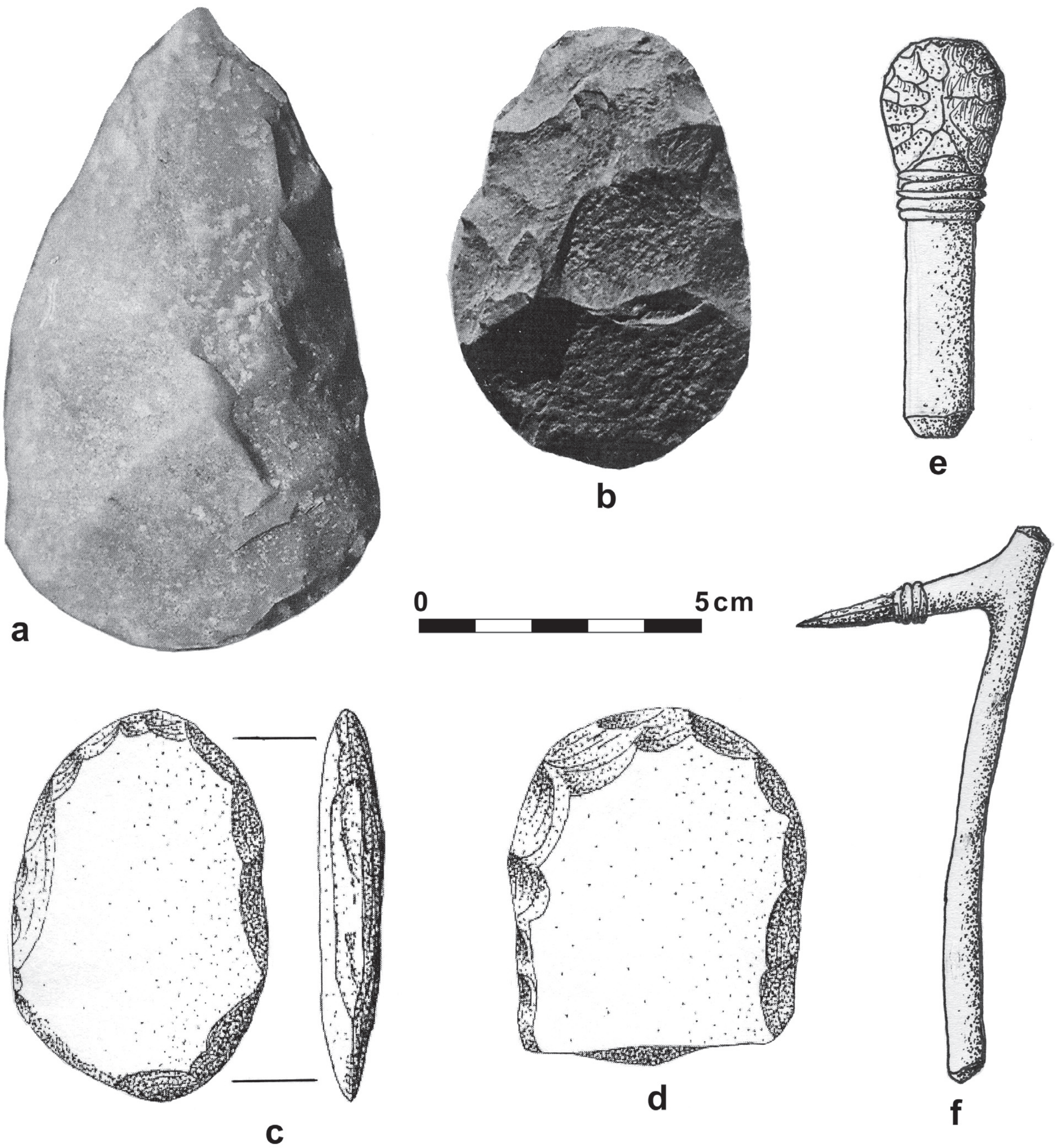

Figure 13. a–d: Examples of large bifaces associated with Plateau Horizon earth oven features from the north Okanagan (a, c, d), and Lytton Locality (b). Their recovery contexts, overall form, and use-wear patterns indicate they were blades for hoes used to harvest balsamroot and bitterroot. Suggested hafting configurations are indicated by (e) and (f).

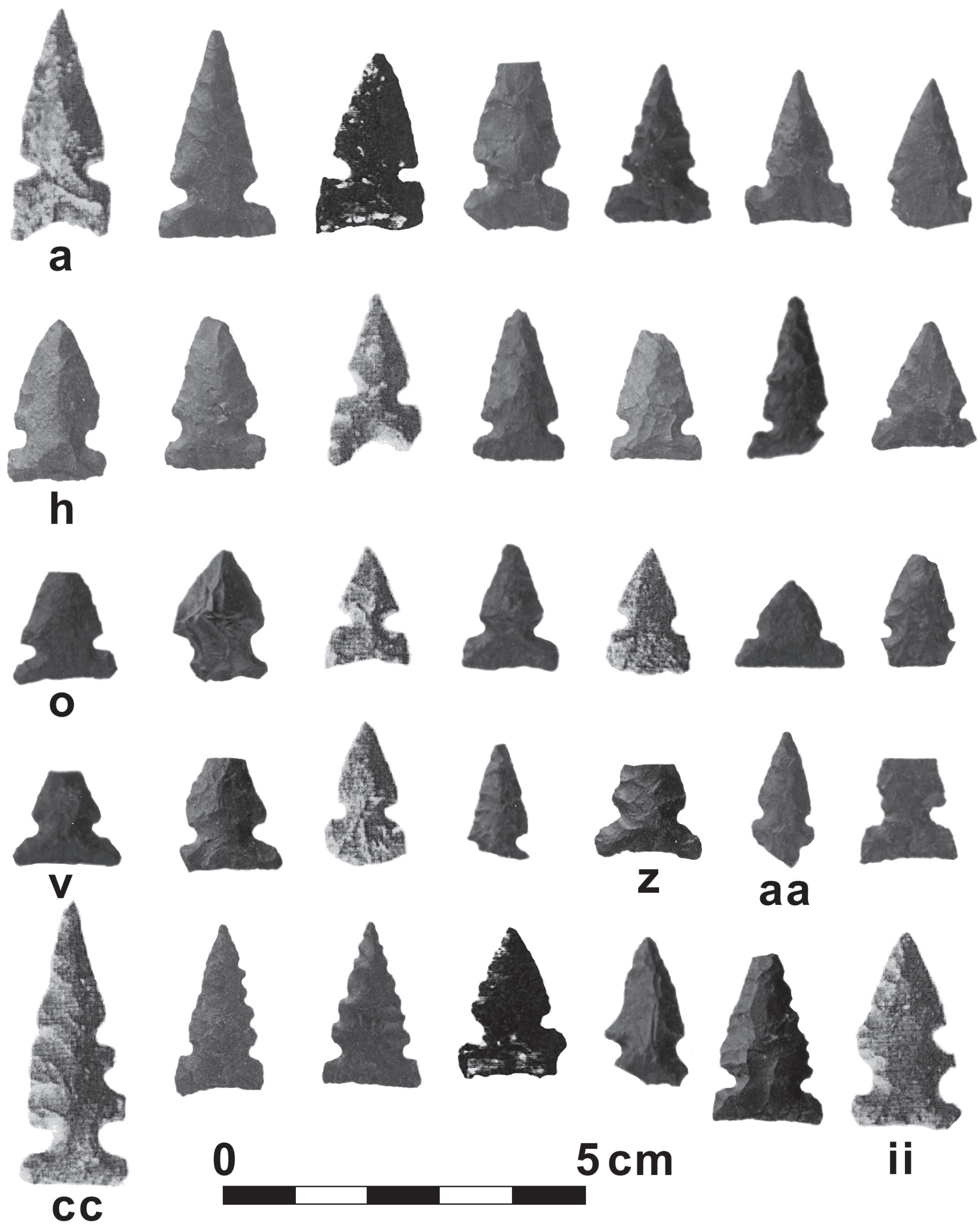

Figure 14. Arrow points of the Kamloops Horizon (1200–200 BP) from Canadian Plateau excavated sites.

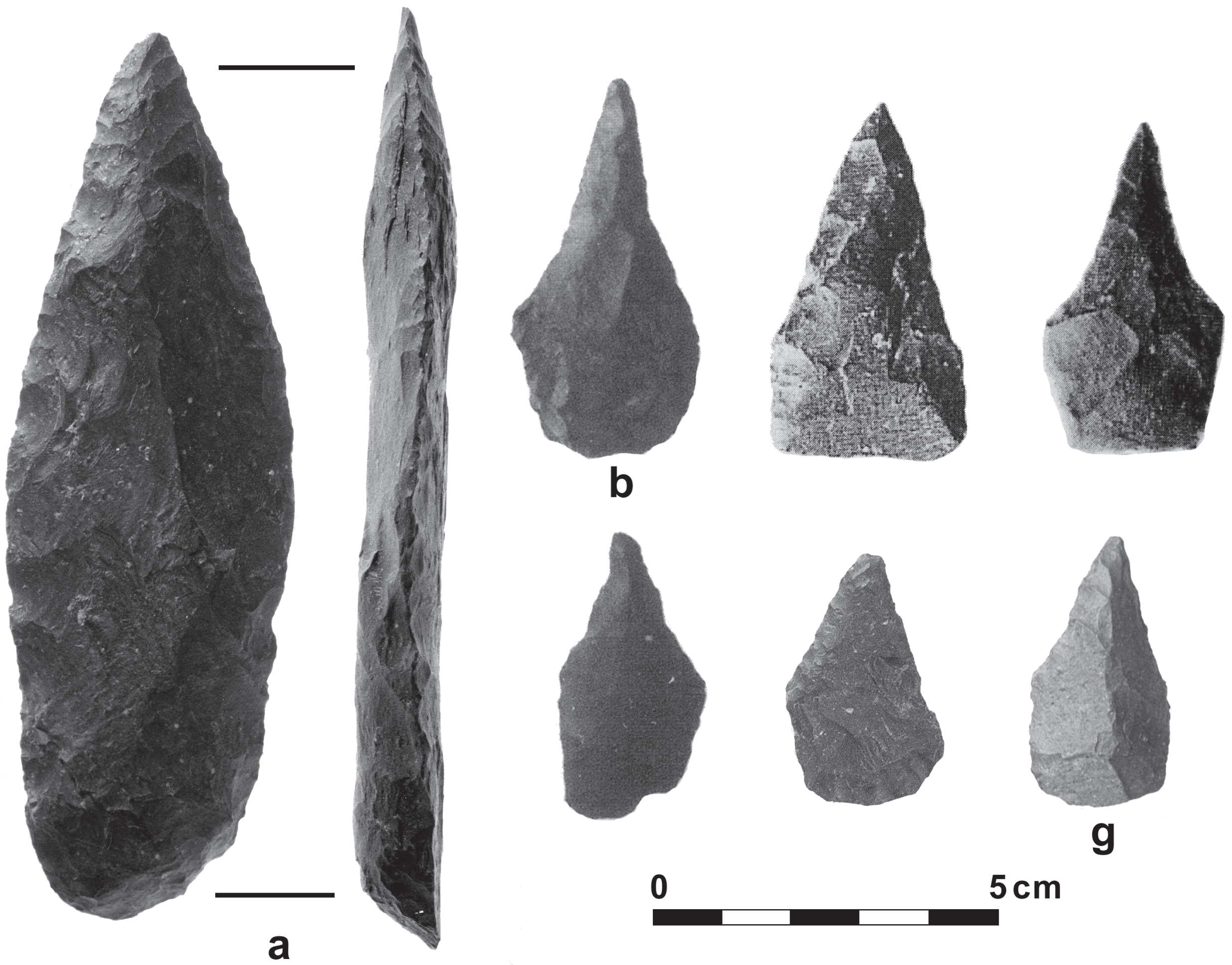

Figure 15. Examples of Kamloops Horizon "Pentagonal Knives" (b–g) from sites in the mid-Fraser and Thompson drainage regions. Item (a) is an example of a typical initial biface form before being resharpened.

or slightly convex basal margins (e.g., Figure 15a). Repeated resharpenings caused lateral margins to eventually converge in a progressively obtuse manner, thus creating the general pentagonal outline and reducing cutting efficiency and manipulability. Once functionally exhausted, pentagonal-shaped "slugs" were removed from hafts and discarded.

Summary Discussion and Suggestions for Future Research

Biface technologies have been an important and integral aspect of Canadian Plateau cultural systems for over 10,000 years, and consideration and definition of various biface types and traits have provided a wealth of information about initial peopling, cultural identities and group mobility, subsistence practices and their related resource extraction and processing activities and tasks, and as evidence for direct and indirect interaction between neighboring groups. Many biface forms, particularly projectile points, are reliable indices for relative dating of sites and their components, although for Early and Middle Prehistoric Periods, there are many issues relating to appearance and persistence of specific formal biface types that remain to be documented, studied, and resolved. Some of the more interesting and contentious aspects of Canadian Plateau archaeology relate specifically to inferences drawn from the appearance, persistence, and function of various biface formal types. Some of the more salient and topical issues are presented below.

For the Early Prehistoric Period, evidence for initial human occupation and use of the Canadian

Plateau is scant, and most of what we can reconstruct and conjecture is based solely on specimens in museum and private collections. Concerted efforts should be made to locate and excavate sites dating to this period, which are few and often concealed beneath several meters of Holocene colluvial, fluvial and aeolian sediments. At present, and into the foreseeable future, our best chance of finding Early Period sites rests with fortuitous encounters during heavy machinery land-altering activities associated with development projects. Funds necessary to launch and support a purely academic effort to locate and investigate sites belonging to the Early Period would be substantial, and consequently very difficult to secure. Also, it might be a risky and fruitless endeavor that may ultimately prove to be disappointing unless considerable forethought is invested in predicting locations with early site potential, and effective deep-probing site discovery methodologies are employed (see Rousseau 1993:175–177). Regardless, I am confident that over the next few decades, several Early Period sites will be identified and excavated, and bifaces will play a major role for inferring relative ages of the occupations, and for assigning ethnic/cultural origins of the people involved with initial occupation of the Canadian Plateau.

Over the last decade, Middle Period bifaces have been used to help decipher and explain temporal, technological and cultural/ethnic relationships between the Lehman and Lochnore phases. Radiocarbon dates for assemblages assigned to these two phases overlap from about 5500 to 4500 BP (Prentiss and Kuijt 2004:61, 62; Stryd and Rousseau 1996:203–204), suggesting a coeval but independent existence of these two markedly different cultural patterns during that time. The "Coast Salish incursion model", the up-river spread of the Salish from the Coast to the Interior rather than vice versa, was first proposed by Carlson (1983a:90, 1983b:19). There has been further expansion and discussion of the archaeological evidence for this model by Lawhead and Stryd (1985), Stryd and Rousseau (1996) and Rousseau (2004a) who maintain that sometime around 5500 BP, small, highly mobile, riverine adapted Coast Salish groups whose primary winter residency was in the Lower Fraser River and Fraser Canyon regions (and perhaps also from the Lower Columbia River region), began venturing upstream and inland along major drainages and their secondary tributaries on a fairly regular basis. They were adept fishers, and for several centuries they regularly launched progressively deeper penetrations into the interior river systems to claim and secure prime salmon fishing stations and nearby village sites that were being largely ignored or only occasionally used by the indigenous Lehman phase people, who were primarily opportunistic hunters and foragers.

The model maintains that direct physical interaction between Coast Salish and long-established non-Salish Lehman phase groups persisted and intensified between about 5000 and 4500 BP (Figure 6), resulting in mutually beneficial exchanges of technological systems and traits, knowledge of successful subsistence practices, language, and genes. The melding and mutual acculturation of these two "parent" groups was a relatively slow transitional process lasting several hundred years, and by 4500 BP, the basic Lochnore phase pattern proved to be the more dominant successful strategy for coping with onset of wetter and cooler environmental conditions at about that time. The eventual result was a "homogenous" and ubiquitous basic Lochnore phase adaptive pattern that prevailed on the Canadian Plateau from 4500 to 3500 BP. Overall, the Salish-incursion hypothesis is generally consistent with Elmendorf's (1965) model of Interior Salish origins and migrations based on linguistic considerations, and it provides an explanation of why Interior Salish dialects differ from those of their Coast Salish relatives.

Alternatively, Kuijt and Prentiss (2004), and Prentiss and Kuijt (2004), propose that a seamless direct cultural and ethnic continuity exists between the Lehman phase and the Lochnore phase (see below), with the later being directly ancestral to the former, and the late Lochnore phase being derived from groups originating from the Columbia Plateau (see also Wilson et al. 1992:189–190). They maintain that differences in material culture traits and patterns of adaptation between these two archaeological entities are not significant enough to infer existence of any cultural or ethnic disparity. I submit that differences between them are actually quite marked, particularly with regard to formal and technological aspects of biface manufacture and use, unifacial scraper forms, selection and employment of lithic materials, and exclusive presence of large edge-ground discoidal cobbles, cobble cores, fish gorges, and unilaterally barbed bone and antler harpoon points in Lochnore phase components (see below). I argue that upon close consideration of formed bifaces of the Lehman phase, it is readily evident that they are quite similar to those made by people participating in the preceding Early Nesikep period. However, Lochnore biface forms, which began appearing on the Canadian Plateau as early as 5500/5000 BP, are much more similar to those found on the South Coast, with the most obvious difference being the presence of side notches, a trait that Lochnore phase people likely borrowed from Lehman phase neighbors.

It could also be argued that these two distinctive assemblage patternings reflect two sets of different activities engaged by a single cultural group. This explanation has little merit, since both assemblages are too dissimilar in content, contain different lithic raw material types and relative frequencies, and are sometimes found together at the same site as discrete stratigraphically alternating occupation episodes (see Lawhead and Stryd 1985). Sorting out and reconstructing cultural and technological relationships between groups during the Middle Period should continue to be a primary focus of academic research on the Canadian Plateau. We require more excavated and dated components from all regions for the Lehman to Lochnore transition between 5500 to 4500 BP before the debate will be adequately and confidently resolved.

First-hand experience with many assemblages dating between 5000 and 2500 BP leads me to conclude that peoples participating in the Shuswap horizon were direct descendents of well-established resident Salish-speaking Lochnore phase groups. There are many salient trait and behavioral commonalities, although admittedly some important differences do indeed exist (Rousseau 2004a; Stryd and Rousseau 1996:191–197). In contrast, Prentiss and Kuijt (2004:49–63) have suggested that onset of the Shuswap horizon should more correctly be regarded as the initial significant Coast Salish incursion beginning around 3500 BP. However, to my knowledge, there are no projectile points from contemporaneous South Coast and Lower Fraser River regions that reflect any obvious similarity with Plains-like point forms, thus a clear direct cultural or technological link between South Coast and Northern Plains groups cannot be asserted on the basis of biface forms. It seems more logical and probable to me that ancestors of Shuswap horizon people must have already been permanent Canadian Plateau residents for at least several hundred years before the onset of the Shuswap horizon. They regularly interacted with highly mobile hunting groups living on the western fringe of the Northern Plains and Rocky Mountains, resulting in absorbance of some aspects of hunting weaponry systems, one of which was the adoption and use of a variety of Plains-like projectile point forms.

Adoption and use of projectile point styles during the Plateau and Kamloops horizons indicate participation in stylistic traditions that encompassed the entire Pacific Northwest, with basally-notched and corner-notched points being exclusively represented in the Plateau horizon occupations, and side-notched points being dominant during the Kamloops horizon. In this regard, they are of limited value for attempting to isolate and confidently identify cultural/ethnic movements and/or regional residency. However, some specific attributes of side-notched points have been used to infer southern movement of Athapaskan people during the last 1200 years (Copp, this volume; Magne and Matson, this volume).

The suspected debut of bow and arrow technology around 1600 BP during the Plateau horizon on the Canadian Plateau is an important technical and cultural milestone, as it signals the beginning of a new hunting technology that dramatically enhanced hunting efficiency, and subsequently triggered a number of important changes during the latter part of the Plateau horizon and ensuing Kamloops horizon (Rousseau 2004a). Chatters (2004) has suggested that bow and arrow technology was being used on the Columbia Plateau as early as 2000 BP, and if future research continues to support this observation, we will need to explore and determine why it does not show up before 1600 BP on the geographically contiguous Canadian Plateau. I believe that the latter commencement date is correct, as it conforms nicely to a temporal cline that began in southeastern North America sometime around 1700 BP, then spread into the Northern Plains and Canadian Plateau about 100 years later, and eventually to the South Coast by 1500 BP.

Chatters also discusses the bow and arrow's role in inter-personal conflict during the Late Period on the Columbia Plateau, and no doubt groups on the Canadian Plateau also had their fair share of intergroup skirmishes during that time. I submit that the appearance of Kamloops multi-notched points (Figure 14aa–ii) in the Mid-Fraser and Thompson drainages from 600 BP to Contact at 200 BP may be indicative of defensive or offensive readiness for warfare during unsettled acrimonious times. This is an interesting possibility that deserves future attention, and may be eventually linked to inter-regional and intra-regional resource stresses, maintenance and protection of territorial boundaries, or migratory movement of non-Salish people through the Canadian Plateau (Copp, this volume; Magne and Matson, this volume).

There are a number of important basic research questions that still need to be addressed for the Canadian Plateau, and I believe that successful interpretation of information provided by studying distinctive biface forms will be instrumental in helping to solve many of them. Specifically, we need to: (1) ascertain commencement and terminal dates for the Early Period and Middle Period archaeological constructs; (2) give more attention to examining and reconstructing the functional importance, stylistic variations, and cultural/ethnic implications of Nesikep Tradition bifaces; (3) improve our understanding of the "Lehman-Lochnore" transition through intensive detailed comparisons of biface forms and associated artifact assemblages; (4) further explore the nature, intensity, and duration of interaction and contact with groups on the Northern Plains, Columbia Plateau, Southern Coast, and central B.C.; and (5) continue to attempt to address problems related to group ethnicity, territoriality, migrations, dispersal and settlement.

It is hoped that future researchers will find this chapter helpful for identification of specific "diagnostic" biface forms in Canadian Plateau assemblages so that temporal and functional assignations or inferences can be made and/or argued with some degree of confidence. A great deal remains to be disclosed about the culture history of the Canadian Plateau, and I am confident that future detailed inquiries into biface technologies will greatly improve our understanding of British Columbia's past, and yield a few significant and unexpected surprises in the process.

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Chapter 14

Okanagan-Similkameen Projectile Points: Origins, Associations, and the Athapaskan Question

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The Okanagan-Similkameen Region

The Okanagan and Similkameen Valleys occupy a transition zone between the Columbia (or Southern) and Canadian (or Northern) Plateaus. Geo-politically, the region straddles the United States and Canadian borders (Figure 1). Although this boundary is meaningless with regard to the pre-contact First Nations of the area, it has been known to impede the free flow of archaeological information.

Geographically, the Okanagan-Similkameen consists of glacially-carved montane river valleys flowing through the Okanagan Highlands and Cascade Range. These valleys served as corridors for post-glacial movements of flora, fauna, and indigenous populations. The wider Okanagan corridor extends south to north from the Columbia River to the headwaters of Okanagan Lake. The narrower and more steeply-sloped northwest to eastward trending corridor is the Similkameen Valley, which flows east from an area near the headwaters of the Skagit River, north to the Princeton Basin, then south to its confluence with the Okanogan River in the United States. Okanogan is the accepted spelling in the United States.

The mid Fraser-Thompson and Nicola valleys lie to the north, the Kootenay valley to the east and the Skagit River-Puget Lowlands to the west across the Cascade Range. Evidence of contact and/or influences of these areas can be found in the archaeological record, primarily between the Canadian and Columbia Plateau cultures and secondarily from the Kootenay Valley and Skagit-Puget Lowlands (Copp 2006).

Okanagan-Similkameen Projectile Points

Table 1 lists projectile points by type observed in the Okanagan and Similkameen Valleys (Copp 2006; Grabert 1968, 1970; Vivian 1992). These points are compared with northwestern Columbian and southern Canadian (Fraser) Plateaus (Campbell 1985; Chatters 1984, 1986; Lohse 1985, 1995). Fine typological distinctions among Okanagan-Similkameen projectile point types are not attempted due to small sample sizes, although Lohse's (1985, 1995) analyses from the northern Columbia River area have increased identifiable diagnostic attributes, based on comparable materials.

Given that individual knappers differed in experience, vagaries of raw material quality, and personal idiosyncratic mental templates for any given point "style" being produced, it is not surprising that many defined types exhibit a wide range of morphological variation. Point size is most likely due to a function of the above variables, weapon systems (lance, atlatl, and/or bow and arrow), or time. As a result, the temporal position of non-radiometrically-dated materials cannot be determined solely upon typological traits, given the wide temporal span of similar point types across the Plateaus. Rather, associated artifacts and features must also be considered where possible—as well as proximity to areas with reported types.

Seventeen projectile point types, including sub-types, (Tables 1 and 2) are discussed in this study. Defined types are primarily in accord with criteria defined by Copp (2006), Grabert (1968, 1970), Lohse (1985, 1995), and Vivian (1989a, b;

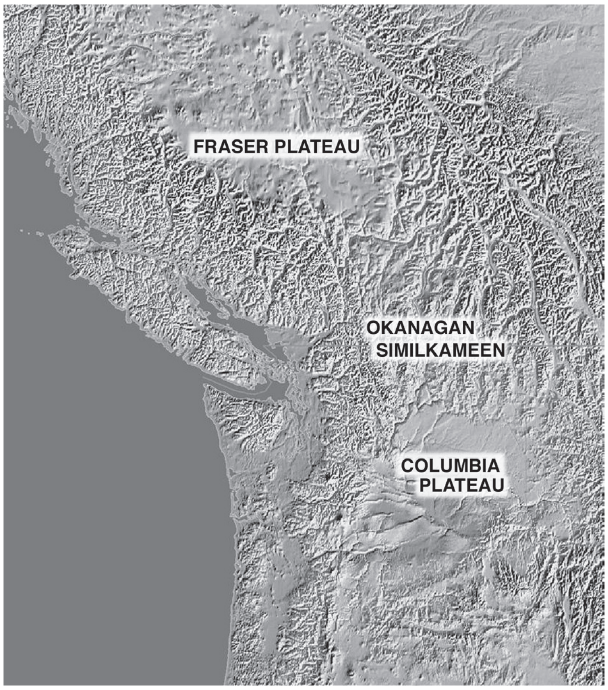

Figure 1. Inter-Plateau (Okangan-Similkameen) area.

1992). The Cold Springs Side-notched and Wallula Rectangular Stemmed are more commonly found south of the Canada-US border. Canadian Plateau types defined for the mid Fraser-Thompson—the Lehman Oblique-notched, Lochnore Side-notched, and Shuswap Types 1 through 8—occur in the north, but not south Okanagan and Similkameen Valleys. Shuswap Types 6 and 7 correspond to the Similkameen Stemmed Series and Nespelem Bar-Rabbit Island types. All other types are shared between the Columbia and Canadian Plateaus. Named types listed are the closest analogous projectile point categories from the Canadian and northern Columbia plateaus.

Table 3 illustrates the relative frequency of point types within the Okanagan-Similkameen. Numbers and frequencies are not currently available for the Okanagan Valley but are likely comparable. Exceptions are Lehman and Lochnore Phase specimens that are not known to occur in the Okanagan, but are rare in the Similkameen.

Discussion

Typological identification coupled with radiometric assays indicates a continuum of projectile point styles ranging from the early through late Holocene.

Terminal Pleistocene (>10,000 BP)

The terminal Pleistocene in the Pacific Northwest of North America is represented by the Fluted Point Tradition-Clovis. To date, no known sites of this tradition are known in the Okanagan-Similkameen. The nearest Fluted Point Tradition site is the East Wenatchee site (45–D0–486) located on the mid-Columbia River (Gramly 1996, Mierendorf 1997). Although radiometric assays on bone associated with Clovis points produced mid-Holocene age ranges, the site is assumed to date greater than 10,000 BP.

A possible unfluted Clovis variant in the Grand Forks, B.C. museum is similar in material and morphological traits to a fluted East Wenatchee site specimen (cat no. 1992.24.14) on display at the Burke Museum, Seattle. Photographed in the display case, the Grand Forks artifact appears to fall within the known range for Clovis (Figure 2), but information on artifact provenience is not currently available.

Early Holocene (10,000–6000 BP)

Early Holocene projectile points identified in the Okanagan-Similkameen are few and are characterized by the Western Stemmed Point Tradition. An exception is a heavily worn, basally edge-ground lanceolate point recovered at tree line on Crater Mountain by Lower Similkameen elder Robert Dennis in the early 1970s. The specimen (Figure 3), photographed by the author in 1974, resembles non-stemmed Plano varieties from the Columbia Plateau and Plains culture areas similar to the Goshen (Goshen-Plainview) Complex of Wyoming and Montana (Frison and Bonnichsen 1996; Irwin 1968), dating earlier than 10,000 BP.

At least two specimens of the Western (Intermontane) Stemmed Point Tradition characterized by the Windust Phase of 8000–1100 BP (Ames et al. 1981; Rice 1965, 1972; Rudolf 1995; Sappington 1994) have been identified in the Canadian portion of the Similkameen valley. Salo (1987) has also reported a Windust point in a private collection from the Palmer Lake area of Washington State, south of the current channel of the Similkameen River. Canadian sites referred to are indicated in Figure 4.

Canadian Windust specimens include a single point observed in a private collection and the other

Table 1. Okanagan-Similkameen projectile points (modified from Lohse 1985, 1995, Lohse and Schou this volume).

Type	Description	Age (BP)
Type 1: Windust C (CP), Plano (sFP)	Specimens are squat, shouldered lanceolate points with a broad to contracting stems conforming to the Windust C type (Lohse 1995:6). Flaking is variable, ranging from collateral to semi-collateral. Cross-sections are biconvex. Raw materials are cryptocrystalline silicates. Lateral edge-grinding is present as are two small lateral notches above the stem of a specimen recovered from site DiRc–67.	9000–13,000
Type 2: Cascade A,B,C (CP); Leaf-shaped Lanceolates (sFP)	**Cascade A**: These are points with broad to thick lanceolate bodies exhibiting rounded or pointed bases. Serrated blade margins occur in Columbia Plateau sites, and are rare in the Okanagan-Similkameen.	5000–8000
	Cascade B: These points are characterized by slender lanceolate bodies with slight concave bases. Cascade B points are rare in the Okanagan-Similkameen. Specimens with serrated blade margins have not been observed. Published illustrations resemble irregular Windust Phase points.	5000–8000
	Cascade C: Often referred to as "Classic" Cascade points, these points exhibit thin lanceolate bodies and contracting, rounded to pointed bases. Serrated margins occur frequently in Columbia Plateau assemblages, but are rare in the Okanagan-Similkameen.	5000–8000 (3000–8000 south Fraser Plateau).
Type 3: Cold Springs Side-notched (CP); Large Side-notched (sFP)	These points generally exhibit large atlatl-sized body morphologies characterized with side notches, convex blade margins and lateral contracting basal margins. Stem forms are straight to expanding with straight to convex bases.	4000–6000 (4000–9000 south Fraser Plateau)
Type 4: Mahkin Shouldered (CP); Shouldered Lanceolates (sFP)	The points are variable with shouldered, lanceolate body forms and convex blade margins. Stem forms are straight to contracting with rounded bases.	2500–8000
Type 5: Lehman Oblique notched (sFP)	This point type is currently known only from the Canadian Plateau. It exhibits thin, pentagonal body morphology with obliquely-oriented V-shaped corner to side notches. Base forms are generally expanding and exhibit edge grinding.	4000–6000 (?) (terminal date uncertain)
Type 6: Lochnore Side-notched (sFP)	The Lochnore Side-notched point has a leaf-shaped body form with wide side notches, heavy basal grinding and pointed to convex base morphologies. These distinctive points were originally defined based upon limited distribution within the mid Fraser-Thompson River region as per the Lehman Oblique Side-notched form (ARCAS 1986; Stryd and Rousseau 1996), but rare specimens have been found in the Similkameen valley (Copp 2006).	3500–5500 (?) (initial and terminal dates are uncertain)
Type 7: Shuswap Horizon Types 1, 2 and 8 (sFP)	These are points with roughly lanceolate body morphologies and shallow corner removals or side-notches forming rounded shoulders. Concave basal margins dominate and produce slight to pronounced "ears" (Richards and Rousseau 1987:25).	2500–4000 (Types 1 and 2: 2800–4000; Type 8: 2500–4000) on the southern Fraser Plateau only
Type 8: Shuswap Horizon Types 3 and 4 (sFP)	These are points exhibiting triangular body morphologies with distinctive concave basal margins and shallow side to corner-removed notches. Shoulders are pronounced and stems are generally expanding with concave bases. Type 4 is a smaller, with concave to indented bases.	2500–4000 on southern Fraser Plateau

Table 1 continued.

Type	Description	Age (BP)
Type 9: Shuswap Horizon Type 5 (sFP)	These are large triangular to lanceolate points with wide side to corner-removed notches with pronounced shoulders. Basal margins are generally concave with straight to slightly expanding stems.	2500–4000 on southern Fraser Plateau.
Type 10: Nespelem Bar (CP); Shuswap Horizon Type 7 (sFP)	These points vary in size but all exhibit elongate, triangular body morphologies with slight shoulders. Bases are generally convex with contracting stems.	3000–5000, (1500–3000 for Shuswap Horizon Type 7).
Type 11: Rabbit Island "A" and "B"; (CP)/Shuswap Horizon Types 6 and 7 (sFP), Var. Similkameen Stemmed (Vivian 1992)	These points exhibit narrow triangular body shapes with square shoulders ("corner-removed"). Bases vary from straight to contracting stems. Bases are straight to rounded base. These points have similar styles to northern Canadian Plateau Athapaskan Kavik points.	2000–4000 (A), 1500–3000 (B) and 1500–3000 for Shuswap Horizon Types 6 and 7.
Type 12: Columbia Corner-notched "A" (CP); Corner-notched variants (sFP)	These points vary in size, but generally exhibit large bodies with triangular shapes and straight to convex blade margins. Corner notches are wide and deep. Stems are expanding and barbs project downwards. Bases are generally straight.	2500–5000 (1200–2400 south Fraser Plateau variants).
Type 13: Quilomene Corner-notched (CP); Corner-notched variants (sFP)	These points are generally larger than Type 11. They exhibit thick bodies and t straight to convex lateral blade margins. Corner notches are wide and deep with slight downward projecting barbs. Stems are generally expanding with straight bases.	2000–3000 (1200–2400 south Fraser Plateau variants).
Type 14: Quilomene Bar Basal-notched "B" (CP), Basal-notched variants (sFP)	Quilomene Bar Basal-notched points are separated into two sub-types. Sub-type "B" is smaller, with shorter barbs than sub-type "A". Both are characterized by triangular body shape with straight to convex blade margins. Barbs are distinctive and result from deep basal notching. Stems are square to contracting with generally straight bases. Similar styles occur in the mid Fraser-Thompson and Okanagan valleys.	1500–2500 (300–2000 south Fraser Plateau variants).
Type 15: Wallulla Rectangular Stemmed (CP); Small stemmed variants (sFP)	These are small, triangular arrow-sized bodies with square shoulders formed by wide, low corner notches or corner removals. Stems are long, narrow and straight sided with a convex to straight basal margin. They represent a range of variants in mid Fraser-Thompson regions.	150–2000.
Type 16: Columbia Corner-notched "B" (CP); Corner-notched variants (sFP)	These points resemble Columbia Corner-notched "A" specimens, but are small in all aspects and most likely represent bow and arrow technologies.	150–2000.
Type 17a,b: Plateau Side-notched (CP); Plateau Small Side-notched (CP): Var. Kamloops Horizon small side-notched (sFP)	Plateau side-notched points are smaller than the Cold Springs type and manufactured from triangular preforms. They generally tend to be thin in cross-section with square to rectangular bases, although there is a great deal of variation in base form. Larger forms (type 17a) with thicker cross-sections appear to pre-date very small forms. These are referred to as Plateau side-notched following Lohse (1995). Plateau small side-notched points (type 17b) exhibit straight to concave bases. Rare forms exhibit a slight spur on one or both base edge margins. Small side-notched points in the Okanagan-Similkameen fall within the size ranges of the Kamloops type. The rare multiple-notched form is lacking.	(Type 17a): 1500–2000 (Plateau side-notched) (Type 17b): 150–1500 (Plateau small side-notched)

Table 2. Projectile point types.

	Columbia Plateau	^{14}C max	^{14}C min	Southern Fraser Plateau	^{14}C max	^{14}C min
Type 1	Windust C	13,000	9000	Plano	10,000	8000
Type 2	Cascade A,B,C	8000	5000	Leaf–shaped Lanceolates	8000	3000
Type 3	Cold Springs Side–notched	6000	4000			
Type 4	Mahkin Shouldered	8000	2500	Shouldered Lanceolates	9000	4000
Type 5				Lehman Oblique–notched	6000	4000
Type 6				Lochnore Side–notched	5500	3500
Type 7				Shuswap Horizon 1, 2 and 8	4000	2500
Type 8				Shuswap Horizon 3 and 4	4000	2500
Type 9				Shuswap Horizon 5	4000	2500
Type 10	Nespelem Bar	5000	3000	Shuswap Horizon 7	3000	1500
Type 11	Rabbit Island A	4000	2000	Shuswap Horizon 6 and 7	2800	2400
Type 12	Columbia Corner–notched A	5000	2500	Corner–notched variants	2000	1200
Type 13	Quilomene Bar Corner–notched	3000	2000	Corner–notched variants	2400	1200
Type 14	Quilomene Bar Basal–notched	2500	1500	Basal–notched variants	2000	300
Type 15	Wallulla Rectangular Stem	2000	200			
Type 16	Columbia Corner–notched B	2000	150	Corner–notched variants	2000	1200
Type 17a	Plateau Side–notched	2000	1500			
Type 17b	Plateau Small Side–notched	1500	150	Kamloops Horizon Side–notched	1200	150

is a surface find from the Copper Mountain Spring site (DiRc–67) near Princeton (Gould et al. 2001) (Figure 5). It was found as the result of an impact assessment project in proximity to a wetlands created by recent damming of a spring in the Interior Douglas Fir (IDF) zone southwest of the Princeton Basin (Gould et al. 2000). It is a large square-based, lanceolate stemmed point base manufactured of vitreous black chert and exhibits collateral flaking and slight basal-lateral edge grinding, a characteristic of 30% to 85% of Windust points (Ames 2000a, b; Rice 1972).

Site DiRc–67 is located in a southeastern flowing late Pleistocene meltwater channel that was in existence while the northern arm of the Similkameen was still choked with ice (Hills 1962) and may have been connected with the potential Cathedral Lakes refugium (Hebda 1999) across the highlands.

A small variant point form similar to one identified by Rice (1972:40, fig. 4e) has been observed in a private collection by the author, but permission to draw or photograph it has not been obtained (Figure 6). No image has been been published of the Windust point reported at site 45OK545 in Washington State (Salo 1987).

Windust points have a known distribution in the Canadian and northern Columbia Plateaus including the Kootenay valley (Choquette 1996), (American) Okanogan Highlands (Thoms 1987), and the Methow Valley (Fulkerson 1988). No Windust or Lind-Coulee variants were identified in the Chief Joseph reservoir (Campbell 1985) on the Upper Columbia River or Wells reservoir (Chatters 1986; Grabert 1968) at the confluence of the Okanogan and Columbia Rivers of Washington State. This may be a function of an emphasis on riverside sites in these areas. Early Holocene sites are most likely rare, deeply buried, or restricted to mid-to upper elevation sub-alpine ecozones.

The valley system between the Methow and Similkameen valleys via the Palmer Lake area may represent a plausible connecting area for the early movement north of people with this technology from the more xeric Columbia Plateau and southern Cascade foothills.

The earliest unequivocal evidence for human occupation in the Okanagan-Similkameen are surface finds and sites containing Cascade points, dating ca. 6000–8000 BP. Vivian (1992:149–153) recorded 26 instances of Cascade points in Similkameen Valley private collections. To this number can be added points associated with radiocarbon estimates of ca. 6900 and 7400 BP at Stirling Creek (DiRa–09) and one undated complete specimen from the Princeton Golf Club Springs site (DiRc–66) as well as

Table 3. Okanagan-Similkameen projectile points.

	Type	Okanagan-Similkameen	Columbia	Fraser Plateau
1	Windust C	rare	rare	rare
2	Cascade C	common	common	common
3	Cold Springs	rare	common	rare
4	Mahkin Shouldered	rare	common	absent
5	Lehman Oblique Notched	rare	absent	present
6	Lochnore Side–notched	rare	absent	present
7	Shuswap 1,2,8	rare	absent	present
8	Shuswap 3,4	rare	absent	present
9	Shuswap 5	rare	absent	present
10	Nespelem Bar	common	common	rare
11	Rabbit Island A, B (Shuswap 6 and 7)	common	common	present (variants)
12	Columbia Corner–notched A	rare	common	common variants
13	Quilomene Corner–notched	common	common	common variants
14	Quilomene Basal–notched	rare	common	present (variants)
15	Wallula Rectangular Stemmed	rare	common	absent
16	Columbia Corner–notched B	rare	common	rare
17	Plateau Side–notched	common	common	common

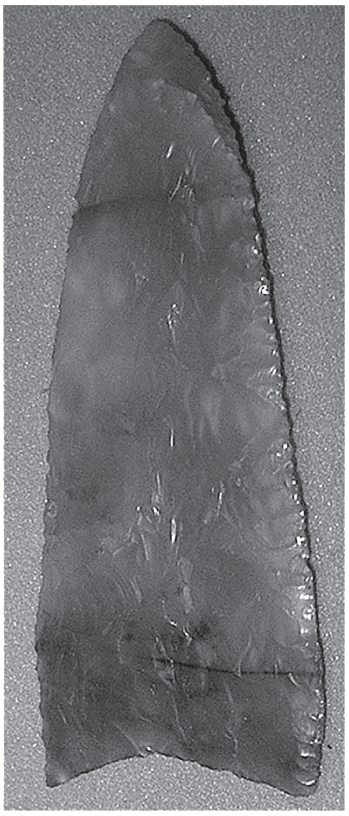

Figure 2. Grand Forks "Plateau Unfluted Lanceolate" specimen.

Figure 3. (b) Early Similkameen Lanceolate point (surface find).

those described by Grabert (1970) and more recent researchers in the Okanagan Valley. These are found in residential-logistical camps associated with big game hunting, primarily of ungulates such as elk, deer and bighorn sheep or mountain goat. Sites are generally located within catchment areas located on river or extinct lacustrine terraces with access to mid and high-elevation montane environments–exhibiting a range of floral and faunal resources attractive to seasonally mobile foragers.

Mid- Holocene (6000–2500 BP)

Mid-Holocene sites are characterized by continued use of leaf-shaped Cascade points, the introduction of the evolved Cascade "C" Mahkin Shouldered (Lohse 1995) and Cold Springs side-notched types (Figures 7, 8, and 9).

Cascade points of atlatl neck-width sizes (>7 mm, but <16 mm) recorded in the study area are assumed to date between 4500 to 7500 BP or earlier, although leaf-shaped variants continue through to the Late and Protohistoric periods albeit reduced in size (see Figure 7).

Mahkin Shouldered and Cold Springs side-notched points are rare to absent in the Okanagan-Similkameen. In the Similkameen, a single surface find of a Mahkin Shouldered preform was recorded at the Princeton Golf Club site (DiRc–66) and another from the surface of August Lake (DiRc–56) nearby. Cold Springs types are found in association with Cascade points in the Columbia Plateau and are more common in the (American) Okanogan than the north Okanagan (Grabert 1968). As with the north Okanagan they are rare in the Similkameen, known mostly from surface finds and only rarely in excavated sites.

Early weakly shouldered Cascade points are considered Mahkin Shouldered types in the Chief Joseph Dam locale (Lohse 1985), dating ca. 3500–8000 BP and as early as 5000–6600 BP in the Cascade Range (Lohse 1995, Mierendorf et al. 1998:498). Vivian (1989) reported a Windust, here re-classified as Mahkin Shouldered, point from August Lake (DiRc–56 site inventory form, 1989) south of Princeton (Figure 8).

The Lehman Phase (4000–6000 BP) includes the oblique-notched projectile point type. Research indicates that Lehman Phase peoples lacked the capacity to capitalize on anadromous salmon, although some were taken. The Plateau Microblade tradition appears to be lacking in this phase, although evidence

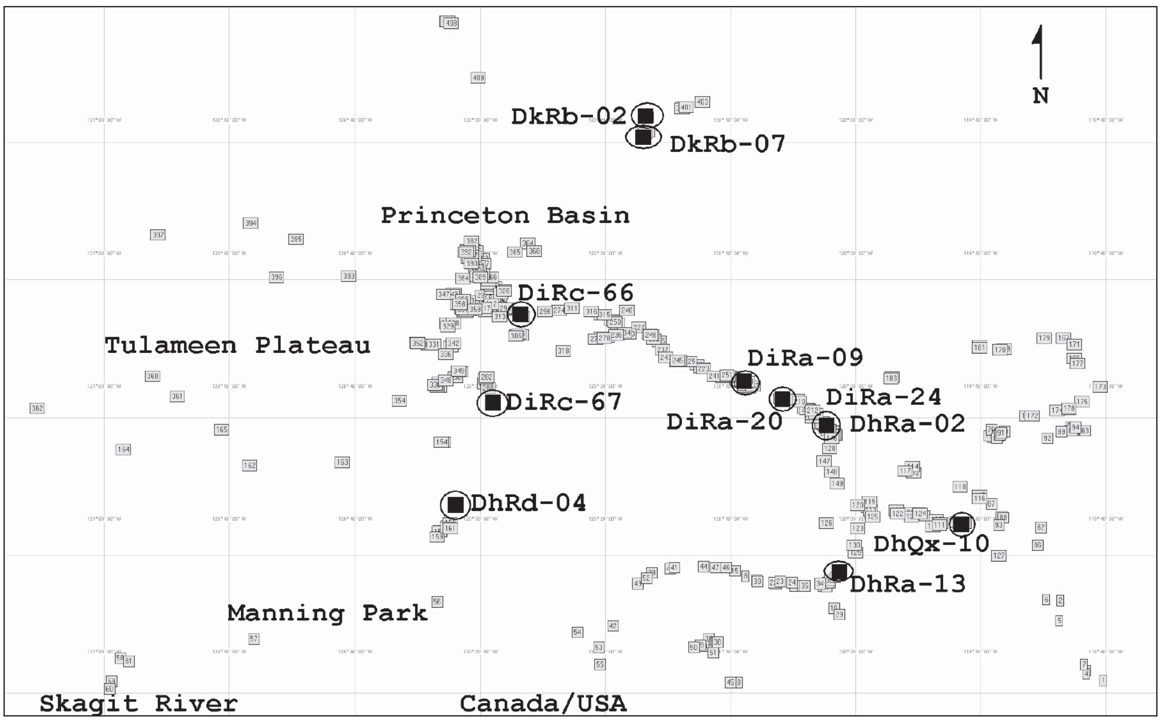

Figure 4. Archaeological site distribution illustrating sites discussed in text.

Figure 5. Windust point (DiRc–67).

Figure 6. Windust point variant similar to Canadian Similkameen specimen (after Rice 1972:63, fig. 14c).

compiled by Wilson et al. (1992) at the Baker site (EdQx–43) contradicts this. Consensus indicates that the Lehman Phase represents local development out of earlier Nesikep Tradition cultures.

Southern Fraser Plateau Lehman Oblique-notched projectile points are rare in the Similkameen, and non-existant in the Okanagan. Two recorded specimens were surface collected from DiRa–09 (Vivian 1992:140–153) and one recovered from a disturbed context from the same site (Copp 1995), (Figure 10a). This is the first recorded occurrence of this point style outside of the mid-Thompson-Fraser River region where it has been dated 3500–5500 BP (Copp 1997).

The Lochnore Phase (3500–5500 BP) exhibits distinctive side-notched projectile points exhibiting heavy basal grinding, as well as concave-edge sidescrapers and macroblades (Stryd and Rousseau 1996). Leaf-shaped projectile points (Cascade types), use of cyptocrystalline silicates over dacites, and a distinctive leaf-shaped knife exhibiting a prominent basal striking platform are considered typical traits. One of these leaf-shaped bifaces was recovered during sediment removal operations along with the single Lehman Oblique-notched specimen at DiRa–09 (Figure 10b).

Unlike the opportunistic Lehman Phase inhabitants of the mid-Fraser-Thompson, Lochnore Phase peoples have been characterized as a "mapping-on" forager strategy (cf. Binford 1980) focusing on a wider variety of fauna (Rousseau et al. 1991). Intensive use of salmon is uncertain, but some evidence of storage has been recorded (Pokotylo and Mitchell 1998; Stryd and Rousseau 1996). Small circular cultural depressions with mat-lodge configurations and interior storage pits have been found at the Baker site (EdQx–43) dating ca. 3950–4450 BP (Wilson et al. 1992), suggesting a shift towards a collection strategy by at least these times in the southern Fraser Plateau.

Of interest is the hypothesis advocated by Stryd and Rousseau (1996) that Lochnore Phase populations derived from earlier Old Cordilleran Tradition/Cascade Phase peoples of the Interior who in turn derive from Coastal Old Cordilleran (Pebble Tool)/Olcott Tradition populations migrating up major rivers to exploit salmon while adapting to xeric pine-sagebrush lowlands and more mesic Douglas Fir uplands. They believe that the more riverine-oriented Lochnore Phase peoples co-existed with upland-adapted Lehman Phase foragers, but eventually absorbed them through intermarriage and/or syncretic behaviour. Wilson et al. (1992) interpret these data as characteristic of a single Lehman-Lochnore culture complex *contra* Stryd and Rousseau (1996). The occurrence of both point types at DiRa–09, but in undated surface contexts, does little to resolve questions of ethnicity but ex-

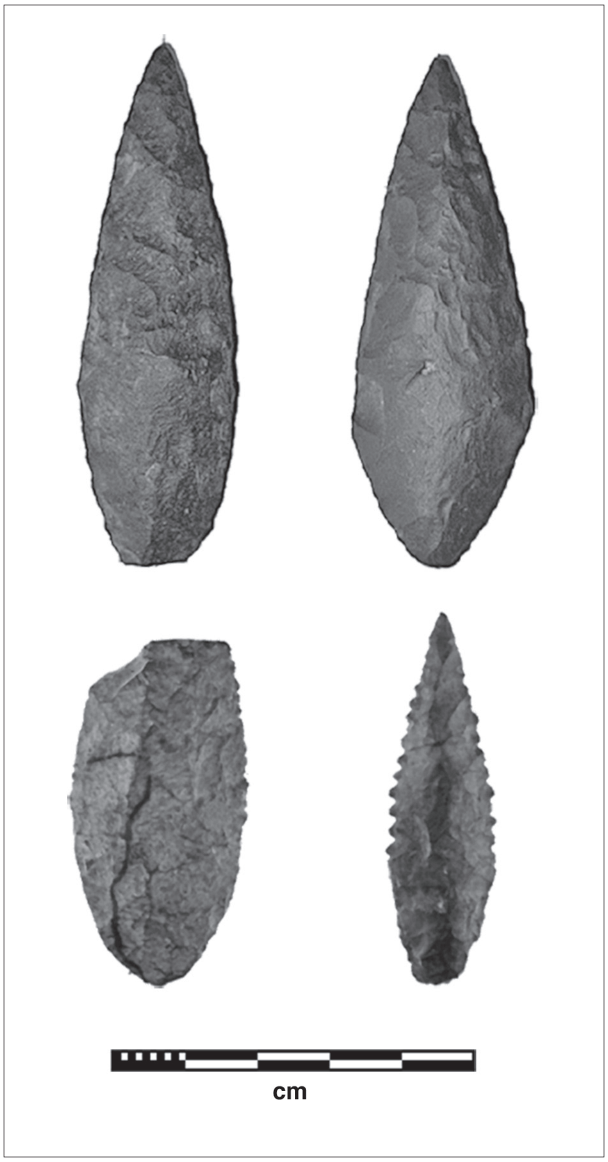

Figure 7. Cascade C points.

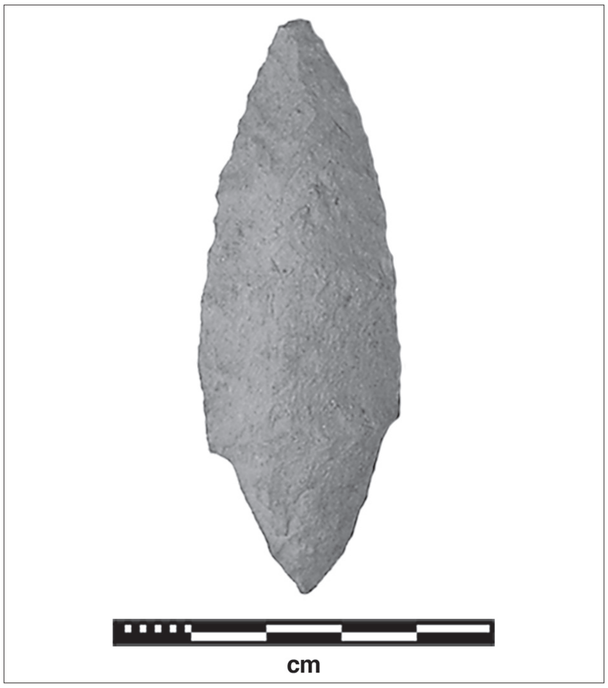

Figure 8. Mahkin Shouldered point.

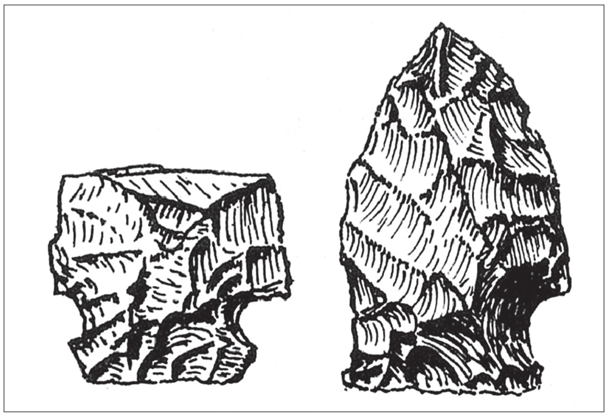

Figure 9. Cold Springs points.

pands the geographic range of this point style into the Similkameen Valley.

Coastal (Western Cascade Range slope) Olcott Tradition (ca. 5000–9000 BP) cultural materials include Cascade points and quartz crystal microblades (Onat et al. 2001). The Stuwe'yuq site (45K1464) on the western slopes of the Cascade Range at Tolt River exhibits these traits between 3500 and 5400 BP (Onat et al. 2001:9–58). Similar materials date 6800 to 7400 BP at the Stirling Creek site (DiRa–09) on the eastern Cascade slopes in the Similkameen Valley (Copp 1995), suggesting contact between the Coast and Interior at these times.

Although travel between the eastern and western Cascade slopes would have been possible by following major drainages (i.e., Similkameen-Pasayten, Similkameen-Skagit; Methow-Skagit), these routes would still have required arduous trekking through forests characterized by heavy downfall until subalpine and alpine zones were reached anytime during the last 7000 to 9000 years (cf. Luxenberg 1999 for 19th century accounts illustrating the difficulties of traveling over the Cascades Divide).

This pattern explains the lack of sites found in mid-elevation forests of the Similkameen, Cascade and Manning Parks in Canada and in north Cascades National Park in Washington State where sites generally have been found within major river valleys at lower elevations or at higher elevations near tree line (Copp 2006; Gould et al. 2001; Mierendorf et al. 1998).

The presence of Lehman-Lochnore complex artifacts in the salmon-free Similkameen valley requires explanation. Although undated and lacking stratrigraphic context, these cultural materials could represent separate excursions into that territory, or it could represent an early mixed Lochnore-Lehman group (Wilson et al. 1992) traveling together from their northern cultural base prior to the hypothesized cultural assimilation.

Southward expansion into the Similkameen Valley from the mid Fraser-Thompson may explain the change from leaf-shaped projectile point technology between 4500–7500 BP to a number of barbed and stemmed types by ca. 4500 BP. The shift to more mesic, forested conditions may also provide a partial explanation for such shifts in material culture occurring at approximately similar times in both the Fraser and Columbia Plateaus (cf. Lohse 1995).

Sites dating 4500–2500 BP are rare in the Okanagan-Similkameen. Represented by the Tcutcuwi'xa rock shelter (DhRa–02), Stirling Creek (DiRa–09) and Pinto Flats (IR2–01) in the Similkameen, sites of this age are the more frequent south of the border at Palmer Lake (Salo 1987). Projectile points dating to this time period include three series of stemmed and notched forms: Shuswap Horizon types 6 and 7; Rabbit Island and Nespelem Bar (Similkameen Stemmed), Columbia Corner-notched and the Quilomene Bar notched series (Figures 11 to 14).

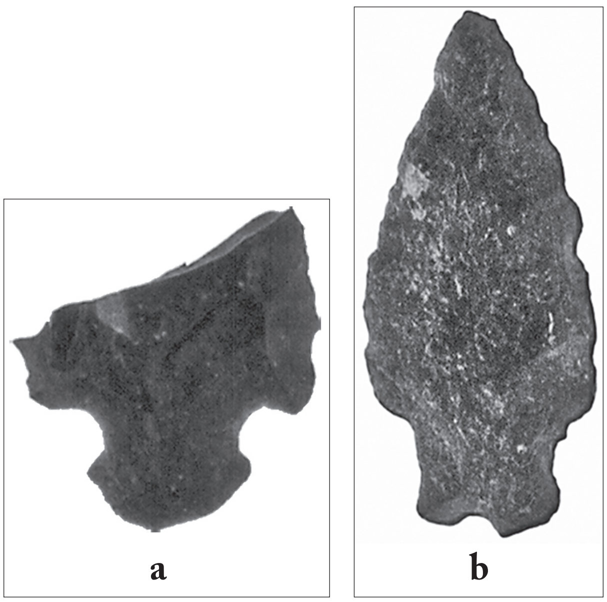

Figure 10. (a) Lehman Oblique–notched point; (b) Lochnore Side–notched point.

Late Holocene (2500–150 BP)

Later Holocene sites exhibit both sizes of Plateau side-notched projectile point types (Lohse 1995), with smaller variants predominating by the second half of this temporal distribution (Figure 15). Specimens have been recovered from excavations and observed in private collections. A Plateau side-notched point was located in the pithouse-mat lodge feature at the Snazaist Village site (DiRa–20). It is associated with several corner to basally-notched atlatl points from the same feature dated 1980 ± 60 BP. It provides evidence of an atlatl point type being adapted as bow and arrow technology.

Wallula rectangular types are common in the northern Columbia Plateau, as are Plateau small side-notched forms (Lohse 1985). One specimen from the Cool Creek site (DhQx–10) (Figure 16) in the Similkameen resembles an Athapaskan Kavik point type, as do Rabbit Island B specimens from other valley sites.

Plateau small side-notched points are similar to those defined as Kamloops small side-notched varieties characteristic of the mid Fraser-Thompson and Athapaskan variants from the Chilcotin (Magne 2001; Magne and Matson 1987). Examples have been found in excavated and surface collections (Figure 17). A radiometric assay of 710 ± 40 BP on ungulate bone fragments in association with a small side-notched point at the Snazaist Village site (DiRa–20) and an assay of 130 ± 40 BP from the Cool Creek site (DhQx–10) confirm a late age for this style.

Extra-areal Comparisons: The Plateau Mosaic

The Okanagan-Similkameen occupies an area intermediate between the south Fraser (or south "Canadian") and Columbia Plateaus. The nature of its riverine-montane topography and the fact that the Okanagan and Similkameen Rivers generally flow north to south suggests pre-contact cultural interactions would have naturally followed this direction (see Figure 1).

Terminal Pleistocene (>10,000 BP)

Current models of terminal Pleistocene glacial withdrawal indicate a northward retreat of ice lobes from northern Washington State. *In situ* downwasting of ice in the Canadian Okanagan and adjacent areas of northern Washington State is indicated by the presence of kettled outwash deposits. The emergence of higher peaks, particularly in the Cascade Range and Okanagan Highlands, is assumed to have supported in-migration of flora and fauna following the Okanagan River north.

Pellat's (1996) studies of fossil pollen recovered from small upland lakes on Mt. Stoyoma in the Cascade Range northwest of Merritt offers the most recent palaeo-environmental syntheses of southwestern B.C. His data, collected at elevations between 1800 and 2100 meters ASL, indicate that rapid warming heralded the end of the last glaciation about 10,000 BP. Heinrichs and Hebda (2001) summarized similar results for investigations at Mts. Kobau and Crater in the southern Okanagan and Similkameen Valleys.

From approximately 10,000 to 7500 BP climate remained warmer and dryer than recent (Xerothermic). Climax vegetation was non-analog Engelmann Spruce-Subalpine Fir parkland during the immediate post-glacial period. Hebda (1999) indicated the prevalence of grasses and sage biotic communities to elevations of ca. 1300 meters ASL, supplemented by Rocky Mountain Juniper *(Juniperus scopularum)*, soapberry *(Shepherdia canadensis)* and willows *(Salix spp.)* through most of the montane areas of interior British Columbia at about that time. Terminal Pleistocene upland areas were thus forest-steppe communities, within Pellatt's (1996) non-analog ESSF zone.

Heinrichs (1999) and Pellatt's (1996) data indicate a mosaic vegetation pattern from the earliest Holocene (9500–10,000 BP) ranging from sagebrush-steppe through open and closed canopy forests of Pine and Engelmann Spruce. Downwasting left highland areas ice-free before valley bottoms. It is likely a similar pattern developed within the Okanagan Valley, ameliorated by the relatively lower elevations of the Okanagan Highlands. Glacial Lake Pentiction was drained by ca. 8900 BP—providing a minimum early Holocene date for northern Okanagan bottomland occupations (Alley 1976).

As such, resources suitable for foragers were available in both valleys, but varied in abundance with latitude and elevation with dates for initial occupations ranging ca. 9000–10,000 BP—within the time range for the Intermontane Western Stemmed Point Tradition. A date of 10,000 BP could include an early Plateau Fluted Point Tradition. Interestingly, Hebda (1999) hypothesized that the Cathedral Lakes area may have been refugia for flora and fauna during the terminal Pleistocene—supported by the undated lanceolate point recovered from tree-line on Crater Mountain nearby (see Figure 3).

Future searches for terminal Pleistocene human activities in the study area should focus on higher elevations, at least in the Cascade Range, for cultural materials originating from the Columbia Plateau and Cascade Range.

Early Holocene (10,000–6000 BP)

The early Holocene is characterized by an initial occupation by Western Stemmed Point Tradition (Windust) peoples. Although known only from undated surface finds of distinctive Windust points, they indicate sporadic use of the Similkameen Valley probably between ca. 8000 and 10,000 BP. To date, no Western Stemmed Point Tradition sites are known for the Okanagan Valley, but this may be a function of sampling and research designs in this area.

Cascade (leaf-shaped) points are known to be coeval in time with Western Stemmed Point sites in the Cascade Range—specifically, at Newberry Crater on the border of the southern Columbia Plateau (Connolly 1999). Early Holocene dates range from ca. 9900 to 6500 BP (Connolly 1999:223) at Paulina Lake. Otherwise, Cascade points are diagnostic

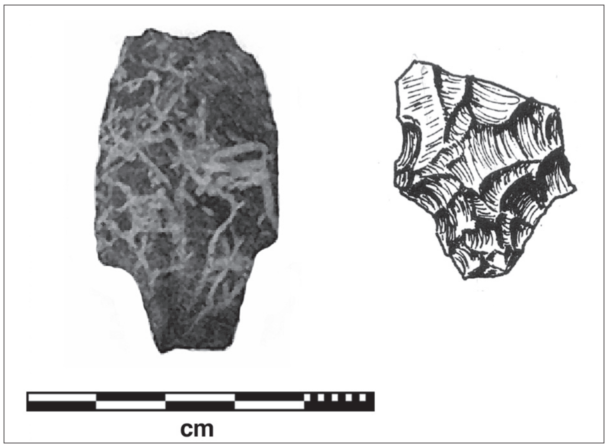

Figure 11. Nespelem Bar points.

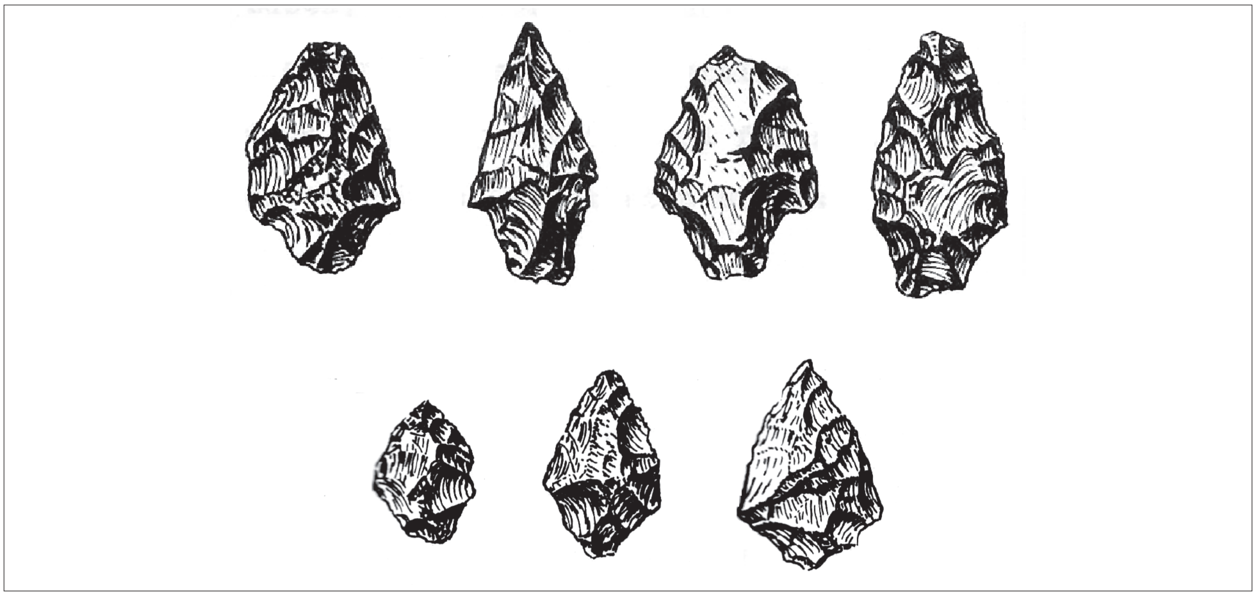

Figure 12. Rabbit Island A, B points (to scale).

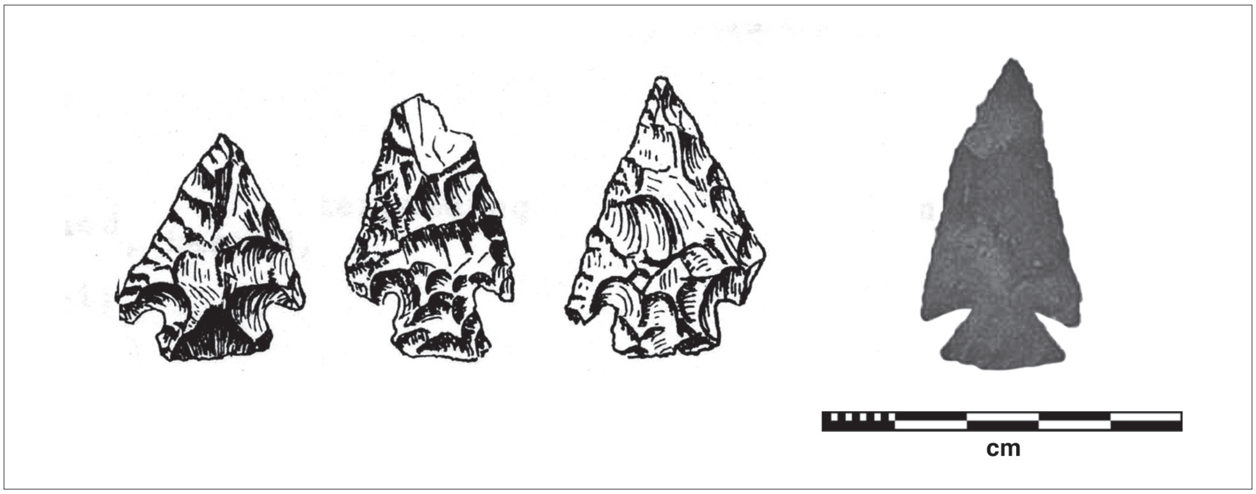

Figure 13. Columbia Corner–notched A, B points.

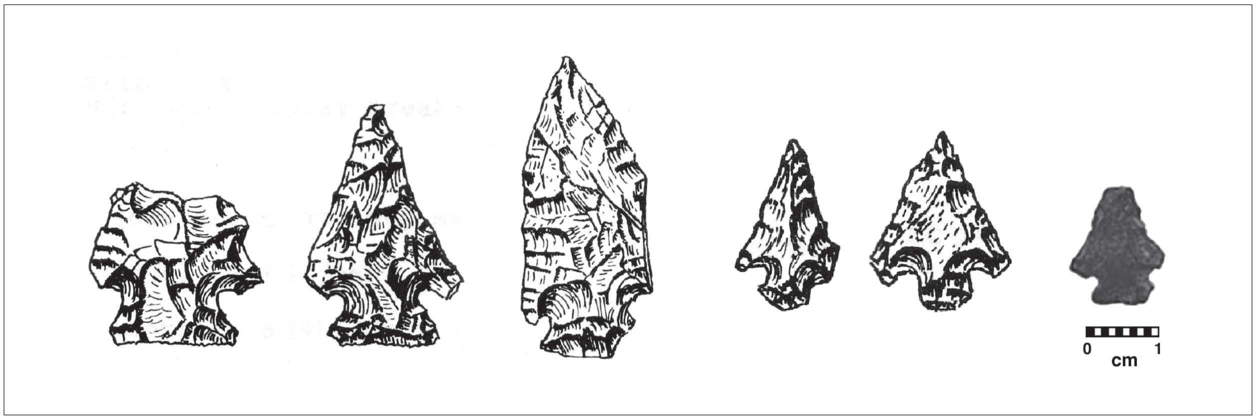

Figure 14. Quilomene Bar Basal–notched points.

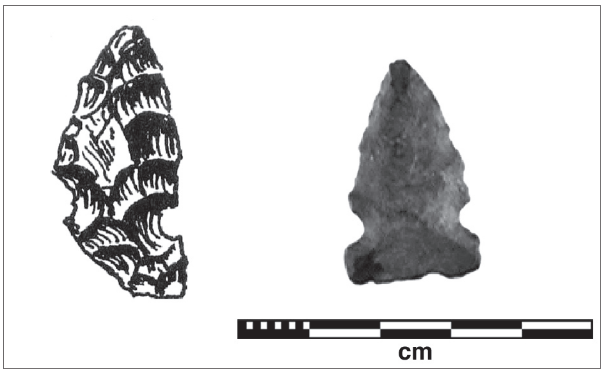

Figure 15. Plateau Side–notched points.

Figure 16. Wallula Rectangular Stemmed point.

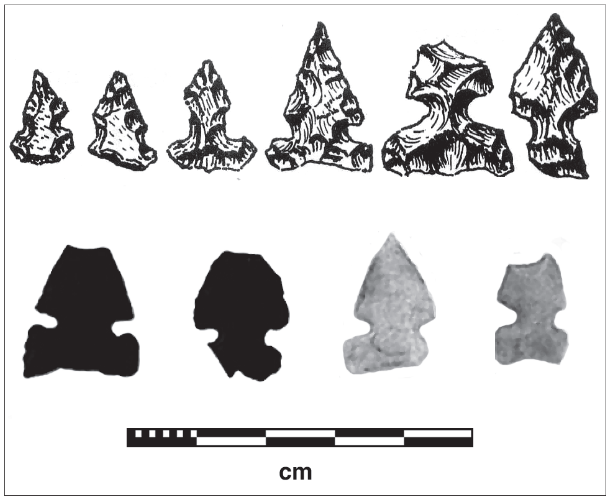

Figure 17. Plateau Small Side–notched points.

of the Olcott Tradition (5000–9000 BP) on both sides of the Cascade Range (Copp 2006, Onat et al. 2001). Mahkin Shouldered points are known principally from the northern Columbia Plateau. Defined by Losey (1985, 1995) they represent an evolved Cascade C type, albeit with stronger shouldered hafting elements. Cold Springs Side-notched points are more common in the Columbia Plateau than the inter-plateau region of the Okanagan-Similkameen, and post-date the main Mazama tephra fall (ca. 6800 BP). These points co-occur with Cascade and Mahkin Shouldered types.

This projectile point sequence indicates greater similarity during early Holocene times with the Columbia Plateau. The presence of the Plateau Microblade tradition (PMt) in the mid Fraser-Thompson and Okanagan-Similkameen areas dating from ca. 8000 to 1800 BP indicates ties to the northern Canadian Plateau and subarctic and/or west Coast through the Northwest Microblade Tradition. Microblade technologies, both coastal and interior, ultimately derive from northeast Asia at a time span greater than 12,000 BP. The appearance of microblade technology in the Okanagan-Similkameen by ca. 7400 BP (Copp 1995, 2006) indicates probable adoption through stimulus diffusion or population movements. The author takes the approach that the adoption of this highly expedient technology suitable to mobile foragers through diffusion to be a more parsimonious explanation than migrations, at least during the early Holocene.

Mid-Holocene (6000–2500 BP)

The mid-Holocene is a time of increasing cultural complexity on both Plateaus. There was a shift from foraging to foraging-collecting subsistence strategies marked by initial occurrence of pithouse structures. Early pithouses occur in isolated contexts or in small clusters of three or four, expanding to larger multi-house villages by the end of the period. Concurrent with a gradual shift to semi-permanent winter villages was the introduction at atlatl-sized corner and basally-notched, as well as corner-removed and contracting stemmed points.

The Okanagan Valley, with its seasonal runs of anadromous salmon, follows a pattern of increased use of piscean resources over time and documents increasing seasonal sedentism. The presence of larger aggregate clusters of pithouses south of the International Boundary in north-central Washington State is evident (Chatters 1986, 1989; Grabert 1968, 1970).

The Canadian Okanagan does exhibit pithouse villages, but these are restricted to larger lake locales (e.g., Osoyoos, Skaha and Okanagan Lakes) where populations would have been smaller than in the

American Okanogan. This may be a function of the fact that few salmon would have been able to surmount the natural falls at the south end of Skaha Lake—restricting northern Okanagan populations' access to this r-type species upon which larger aggregate populations were dependent.

There is no evidence for large winter villages in the Canadian Similkameen Valley. Salmon were restricted to the lower (US) portions of the river due to the height of Squantlen Falls upriver of the Similkameen and Okanogan confluence. Canadian Similkameen villages tend to be few in number and do not appear to have numbered more than four to six houses per village. Palmer Lake, on the American side of the valley, probably exhibited higher aggregate winter populations given its proximity to the fishing pools downstream of Squantlen Falls.

As such, the northern (Canadian) Okanagan and Similkameen valleys exhibit a continued reliance on earlier foraging and root collecting relative to a higher incidence of salmonid fishing on the American portions of the valleys. This is particularly noticeable in the Canadian Similkameen Valley where microblade and microcore technology is present by 7400 BP and continues to 1800 BP and possibly later, indicating the continuance of more mobile foraging subsistence strategies.

Late Holocene (2500–150 BP)

Late Holocene projectile points document a progressive reduction in size of all types, culminating in the eventual replacement of atlatl systems with the bow and arrow—although the late occurrence of points with neck-widths greater than 7 to 10 mm suggests the atlatl was never totally abandoned.

Grabert (1968, 1970) determined a clinal mode for pre-contact distributions of small, arrow-sized notched points in the Okanagan/Okanogan Valleys dating less than 1000 BP. His research indicated higher frequencies of smaller Columbia Corner-notched B variants in north-central Washington State than Plateau Small Side-notched forms, and ***vice versa*** for the Canadian valley. The situation for the Similkameen Valley appears to be identical, with Plateau Small Side-notched points predominating (Copp 2006; Vivian 1989a, b).

Again, the lack of salmon meant that Canadian Okanagan-Similkameen would have had to trade or travel some distance to acquire enough dried stock to carry them through the winter. The relative lack of winter villages in the Similkameen valley in particular, suggests that populations were smaller overall and that some portion of the indigenous population probably moved south and east during the Fall and Winter to areas closer to the salmon.

Ethnographic documents for the Similkameen (Allison 1892; Teit 1930) indicate that some people preferred to stay in the Canadian portion of the valley during the Fall and Winter seasons, subsisting on locally procured wild game, roots, freshwater fish and traded salmon.

The Athapaskan Question

The Ethnographic Record

There is general acceptance that, prior to ca. AD 1800, and possibly as early as 1200 BP, the area from Nicola Lake to the confluence of the Similkameen and Okanogan rivers was occupied by a population speaking an Athapaskan language (ARCAS Associates 1986, 1993; Boas 1895; Bouchard and kennedy 1984; Duff 1969; Hudson 1986, 1995, 1996; Hunn 2000; Kinkade et al. 1998; Magne 2001; Magne and Matson 1984, 1987; Teit 1895, 1900, 1930; Wilson et al. 1992, and Wyatt 1972).

Wyatt (1998) summarized linguistic information collected on the Nicola-Athapaskan language, primarily from the vocabulary list of MacKay (1895) as well as from work by Harrington (1943), who suggested a Chilcotin origin for Thompson Plateau and Pacific Coastal Athapaskan-speaking peoples. Wyatt cited Davis' (1975) and Krauss' (1973, 1979) linguistic research to be inconclusive as far as a Chilcotin-Nicola connection is concerned.

Workman (1977, 1979) indicated that a volcanic tephra eruption dating ca. AD 700 (Clague et al. 1995; West and Donaldson 2001) triggered an Athapaskan migration southward through the Interior of British Columbia and on to Washington and Oregon coastal areas. Cultures in the latter areas exhibited Athapaskan languages ethnohistorically (Harrington 1943; Hunn 2000) and linguistic studies (Krauss and Golla 1981:68) suggest a migration through the B.C. Interior and/or Cordillera prior to AD 500. There likely is a causal relationship between the Nicola and the Chilcotin documented by Bouchard and Kennedy (1984:13) who recorded Okanagan elders had maintained a distinction between groups in the Nicola and the Similkameen Valleys (Figure 18):

> Our research has shown us that elderly Thompson informants refer to the former Athapaskan inhabitants of the Nicola Valley as **stewix**, but they do not recognize that these are the same people who also used to live in the Similkameen Valley, nor do they recognize the term **smEllekamux** given by Teit (1898–1910) as the name of the former Athapaskan inhabitants of the Similkameen. Conversely, present-day elderly Okanagan informants refer to the former Similkameen Valley Athapaskan residents as **smlkamix** (the equivalent of Teit's term), but they do not recognize them as the same people who also lived in the Nicola Valley and they do not recognize the term **stewix** by which the Nicola Valley Athapaskan were known.

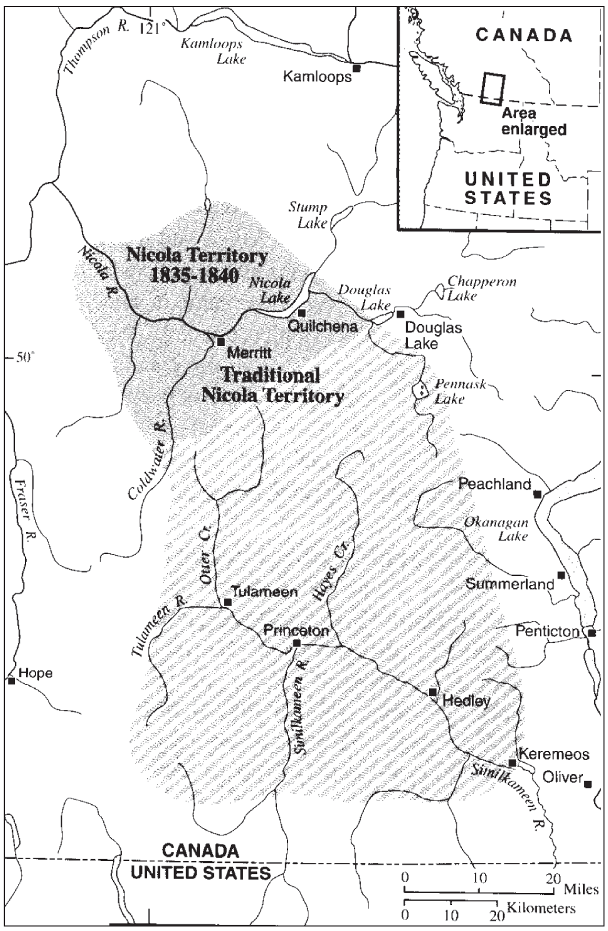

Figure 18. Ethnohistoric Nicola–Athapaskan distributions (after Wyatt 1998: 221, based on Teit 1900–1921).

Bouchard and Kennedy (1984) directly contradict Teit (1930:203–204, 213–216) who stressed the existence of **Stuw'ix** (var. **Stewix** above) throughout the Similkameen Valley as far south as the confluence of the Similkameen and Okanogan Rivers prior to the adoption of the horse in the early to mid 1700s. After the horse was adopted, Teit (1930:213–216) indicates that the Stuwi'x were either pushed out of the lower Similkameen Valley (i.e., Keremeos south to the confluence) or were assimilated by the Okanogan. Similarly, he cites increased trade and intermarriage for their assimilation by the Thompson in the upper Similkameen and Nicola Valleys.

Bouchard and Kennedy (1984:21) in a 1972 interview with Similkameen elder Harry Robinson, now deceased, underscore the point that the present Okanagan-Colville speaking population in the Similkameen Valley is an extension of the ancestral Nicola-Athapaskan Similkameen population:

> Both the Okanagans and the Similkameens were afraid of each other … They could not understand each other's languages, and so they used sign language … The Okanagans realized that the old Similkameen people were starving, so they cooked a lot of food for them...The Similkameen asked that Okanagans to stay there with them … After awhile, they became one band of people, because the old Similkameen people died, and the Similkameen children learned the Okanagan language … Old Terpasket said that our roots come from the Okanagan boy, **Gats'xwula⁷xw**, whose father had been the chief of the group of Okanagans who came over into the Ashnola area. When the father of Gats'xwula⁷xw died, it was the grown Gats'xwula⁷xw who was asked to be chief, by the Similkameen people.

In this account, the Okanagans had come to the Ashnola Valley over the mountains from the Methow river valley. A similar story was recounted by Harry Robinson who emphasized that the Methow were male hunters who stayed and married into the Ashnola groups (Hudson 1990, 1996).

The Methow river valley drains into the Columbia and provides an analogous physiographic setting to the Similkameen, as it extends northwest into the Cascade Range, for a riverine-montane lifestyle in pre-contact times. The Methow Valley provides an analog for pre-contact lifestyles as it too lacks anadromous salmon resources as well as being the eastern leg of a trans-Cascade contact path with the Coast, as indicated previously.

With regard to the Methow as a Salish-speaking people, Kinkade (1967) studied Salishan place names in that valley and determined that many had origins in the Okanagan-Colville language even though the historic population spoke Columbia Salish. He concluded that there had been a population displacement of Okanogan-Colville by Columbia Salish on the order of a few hundred years. This evidence parallels the Nicola-Similkameen Athapaskan situation, although data are scant in the latter case. Both indicate population displacement and/or acculturation in the late pre-contact to historic periods.

To summarize, these data indicate at least a late pre-contact and early historical Athapaskan-speaking population in the general area consisting of the **Stuwix** of the Nicola Valley, referred to by the Okanagan term **Smlkamix** by the Similkameen First Nations. By the time ethnographic research was carried out in the late 19th century by James Teit, the Similkameen Valley was Okanagan territory and entirely Salish-speaking. As such, Similkameen Athapaskan populations were effectively absorbed, culturally and linguistically, into the Salish populations of the time.

The Archaeological Record

Co-habitation or sharing of resource areas in prehistory and identification of ethnicity in the archaeological record has been attempted by many Plateau scholars, especially in attempts to define an Athapaskan presence. Stryd and Rousseau's (1996) synthesis of the Middle Period mid Fraser-Thompson cultures beginning ca. 5500 BP postulates that a riverine and Douglas fir forest adaptation deriving from earlier ungulate hunting Nesikep Tradition peoples, illustrates an expansion of Salish-speaking peoples migrating into the southern interior in order to exploit riverine (salmon), grassland (roots) and forest (ungulate) resources. A Salish identification of these Lochnore Phase peoples is specifically stated as being based upon "the continuity between this tradition and the historic Salish-speakers of the area. Furthermore, Elmendorf (1965) identifies the northwestern part of the present Interior Salish territory … as the most probable homeland of the proto-Interior Salish, an area more or less consistent with that of the Lochnore Phase" (Stryd and Rousseau 1996:199). A co-resident Lehman Phase population inhabiting upland areas presumed not to be capitalizing on riverine salmonid resources (an Athapaskan-style orientation) is interpreted as a distinctive and separate cultural, or ethnic, group.

Wilson et al. (1992), working in the same area, rejected the bi-ethnic model citing mixed Lochnore-Lehman assemblages in most sites as well as the co-occurrence of these materials at the Baker site (EdQx–43) as well as at nearby sites EdQx–41 and EdQx–42. Wilson et al. (1992) further stated that comparisons between Lochnore and Lehman Phase sites should more properly be made with Indian Dan/late Kartar Phase populations of the Okanogan and Upper Columbia River regions of Washington State based upon shared patterns observed in projectile points and house form. Wilson prefers to view differences in site assemblages as "different specialized activities" rather than attribute them to cultural differences between groups.

Stryd and Rousseau (1996:199) counter that, in their opinion, site assemblage differences do reflect cultural, or ethnic, differences; that components of Lochnore and Lehman Phase sites are not mixed, although they recognize that components could be the results of deflation or investigator error in assemblage recognition. Without access to the sites for re-excavation and examination of original field documentation it is difficult to objectively determine which view is more likely to be correct.

Could co-existence of two similar cultures, in this case foragers or forager-collectors, over long periods of time be possible, given stressors such as competition for resources? Salishan river-oriented mixed forager-fishers would still have needed access to upland root, berry and hunting areas supposedly occupied by Athapaskan foragers. It is unknown whether such a situation would remain in equilibrium for millennia.

Material culture that has been used to deduce or infer ethnicity or group identity in the archaeological record of past foragers tended to focus on relating artifact types (style) or broader technological traditions with defined groups. For example, Teit (1930:217–223) suggested that an absence of ground stone artifacts, specifically mortars and pestles, arrow smoothers and coiled baskets may have been indicators of the Athapaskan nature of Stuwi'x populations in the valley. Counter to this, Teit's (1930:219, 225–226) records indicate more common use of Columbia Plateau cultural traits involving the use of woven tule rush and sage textiles. As such, it is difficult to equate these material culture traits to retention of Athapaskan patterns (re: absence of ground stone) or syncretic adaptation of the more xeric resources of the valley.

Rousseau's (1992) analysis of key-shaped formed unifaces relatively commonly found in Columbia and Fraser Plateau sites dating between 4000/3000 to 1000 BP may be an indication of the relative uniqueness of the Similkameen archaeological record as they are absent in this area. Rousseau's experimental data using replica artefacts and microwear analysis indicates they were used primarily in processing stalks and branches, possibly as shaft smoothers and for other woodworking, as well as occasional shaving and smoothing of antler (Rousseau 1992:ii). As these distinctive artefacts occur in territories commonly associated with Interior Salish and Sahaptin-speaking Plateau peoples (Rousseau 1992:98), although they have also been found in two sites in the Chilcotin (Rousseau 1992:5), their absence in the Similkameen Valley may be indicative of Stuwi'x populations at a time depth of ca. 1000 to 3000 or 4000 years, assuming that the current archaeological database has not missed these tools due to sample bias.

Magne and Matson (1987:57–80) discriminated between Athapaskan and Salish projectile points through application of Multiple Discriminant and Multidimensional Scaling Analyses. Their sample consisted of 57 small side-notched projectile points from sites in north- to south-central British Columbia. Tables of quantitative and qualitative data derived from this sample were used to statistically validate their hypothesis that differences exist across a geographic area equated with historical ethno-linguistic territories of Salish or Athapaskan speaking peoples. They indicated that small side-notched projectile points could be readily identified according to presumed ethnically relevant morphological traits in a gradient ranging from north to south in the Plateau.

One of the most discriminating variables was the co-occurrence of concave based small side-notched projectile points with spurs projecting from one, or both, basal edges (Magne 2001). Whether such discrete artifact traits are a reflection of ethnicity between the two cultures (Salish and Athapaskan) or some other cultural or idiosyncratic pattern is debatable. However, they combined these specific artifact attributes with a statement that house form, size and depth could also be diagnostic of ethnicity (Magne and Matson 1987:67), expanding analysis beyond the level of artifact and house style to inferred socio-economic or political patterns. They were careful to state that these findings were *suggestive* of ethnic identification, not conclusive evidence.

In terms of the Similkameen artifact database, small side-notched projectile points with projecting basal spurs recovered from later pre-contact period deposits at Snazaist Village (DiRa–20) and Cool Creek (DhQx–10) could be inferred as Athapaskan. On the other hand, it is also likely that this point sub-type could be explained through the spread of sylistic variables through stimulus diffusion. The site otherwise does not exhibit other Athapaskan traits as the pithouse structures, or at least the single example tested, more closely resemble the shallow, saucer shaped types characteristic of the Columbia Plateau and Okanagan Valley.

Small side-notched projectile points appear ca. 1200 BP in the south-central Interior of British Columbia—the time of the White River tephra fall. This trait is highly suggestive of, if not an actual Athapaskan presence, then diffusion of a particular style into the Plateau. On the other hand, particularly since there is a continuum of side-notched projectile points throughout the pre-contact sequence from as early as 7000 BP, this could represent *in situ* progressive reduction of projectile point size associated with shifts from dart to arrow technologies.

Similarly, small, stemmed projectile points are also associated with Athapaskan sites in British Columbia (Magne 2001; Magne and Matson 1987). Referred to as Kavik or Klo-kut, they resemble smaller stemmed variants in the Similkameen (Rabbit Island series and some Wallula Stemmed variants). Small stemmed points associated with the Coquille Microblade Tradition are found in ethnohistoric Athapaskan territories in Oregon (Connolly 1986, 1991) but, as with side-notched points, stemmed variants also occur early in the Similkameen, becoming smaller over time.

The archaeological literature of British Columbia has suggested that microblade technology can be roughly equated with identification of linguistically differentiated pre-contact peoples—a type of proto-Athapaskan-speaking culture of microblade users (Carlson 1983, 1990). What is important is the assumption that microblade technologies arrived across the Bering Strait sometime less than 13,000 years ago and then spread south either are the result of migration and/or stimulus diffusion.

Borden (1968), Carlson (1983, 1990), and Dumond (1969) viewed microblade technologies as evidence of early Holocene populations of proto-Athapaskans into North America. By 7500–8000 BP microblade technologies are widespread throughout the Pacific Northwest where they may have continued in Plateau montane areas to at least 600 BP, possibly to 200 BP, long after they had been discontinued elsewhere. Sanger's (1970a) original work defining the Plateau Microblade tradition suggested the technology was extant from 7500–3500 BP, but also may have continued to proto-historic and/or early historic ("Christian Era") times.

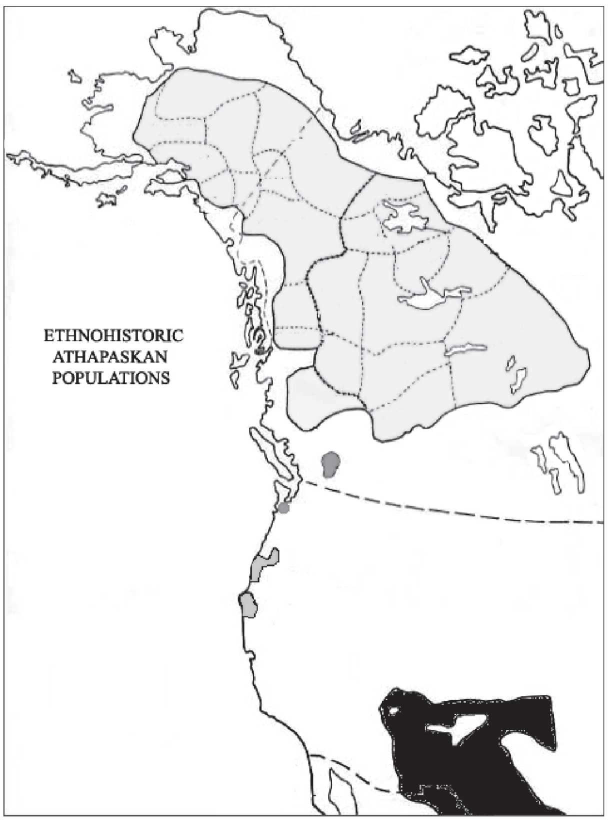

Figure 19. Ethnohistoric Athapaskan populations (after http://ehl.santafe.edu/maps/Na-Dene.gif).

Neither migration or stimulus diffusion hypotheses have been satisfactorily falsified, nor have they been verified at the time of writing. Both explanations remain plausible, so the identification of specific traits in the Similkameen (small side-notched and small stemmed projectile points, a microblade technology) and a hunting-gathering-fishing economy adapted to riverine and montane settings may yet indicate an Athapaskan presence, especially in components dating less than 1200 BP. This appears to be the case for the Coquille and Rogue River valley sites in Oregon—a much stronger case, given an ethnohistoric Athapaskan-speaking population there (Figure 19).

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Chapter 15

Projectile Points of Central and Northern Interior British Columbia

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Introduction

The west-central and northern area of British Columbia is the most under-studied archaeological region in the province. This entire area (Figure 1) is remarkable for not exhibiting even one excavated non-housepit stratified site extending to the middle prehistoric period (Grizzly Run at Mt. Edziza being a possible exception; Fladmark 1985). The relevant chapters in the two volumes of the Handbook of North American Indians, Subarctic (Clark 1981) and Plateau (Pokotylo and Mitchell 1998) map a total of only 30 sites worth discussing for an area that includes about one-half of the province. We extend this review from Mt. Edziza in the northwest corner of British Columbia (Fladmark 1985) to the south-central interior and include Matson's work at the Mouth of the Chilcotin (Matson et al. 1984) and our comparative analyses at Eagle Lake (Matson et al. 1980, Magne and Matson 1982, 1984, 1987, 2004, Matson and Magne 2004, 2007). Our comparisons of the Eagle Lake and Mouth of Chilcotin areas, including Anahim Lake, Punchaw Lake, and other northern plateau sites have revealed significant ethno-linguistic patterns in late prehistoric small side-notched point types and styles.

Overview of Research in the Area

The archaeological chronologies that have been presented for our region of interest are shown in Figure 2. General overviews of the prehistory of the parts of the Subarctic and Plateau that include this area can also be found in Clark (1981) and Pokotylo and Mitchell (1998). Borden (1952) initiated archaeology in this part of the province with his surveys of the proposed Kenney reservoir and his excavations at the Chinlac and Natalkuz Lake sites. During this project he made the acquaintance of John Sewell, who had collected various sites in the area. The Sewell collection was donated to the University of British Columbia where it has been used as a teaching collection for many years. We discuss the Sewell collection here since it contains several items of special interest. Readers should keep in mind that Jack Sewell was from Saskatchewan, indeed he was once the president of the Saskatchewan Archaeological Society. One could legitimately wonder if some of the points in the Sewell collection were in fact first found in Saskatchewan.

In the mid-1960s Mitchell (1970a, 1970b) undertook survey and excavations on the Chilcotin Plateau, focusing on three sites that in many ways are typical of that region, with shallow deposits, little dateable organic material, and a mixture of points and microblades. His excavations at Poplar Grove, Horn Lake, and Natsadalia Crossing produced nine lanceolates, six stemmed points, five corner-notched points, six side-notched points, and an assortment of fragments. Comparisons at the time were made

Figure 1. Major archaeological sites and surveys in the area considered.

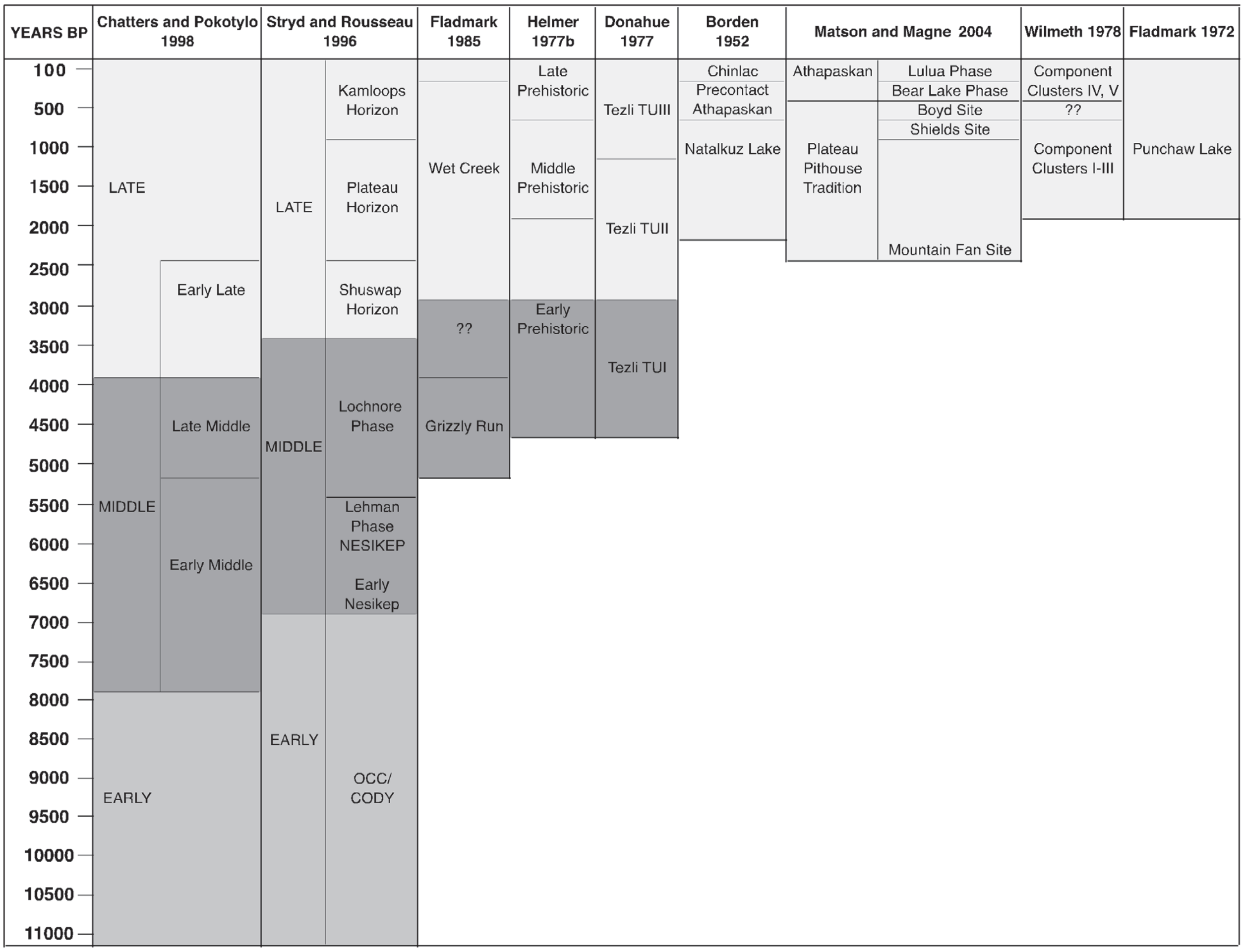


Figure 2. Culture history sequences that have been proposed for central and northern British Columbia.

to Borden's Carrier sites, and to Sanger's (1970) Lochnore-Nesikep work, with estimates that some of the material from Poplar Grove could be as old as 6000 to 3000 BC. These unsatisfactory Poplar Grove age estimates remain today, demonstrating that the early to mid-Holocene time period on the northern Plateau is still extremely poorly known.

Starting with survey work in 1970 along the Dean River and Anahim and Nimpo Lakes, Wilmeth's (1971, 1978, 1979) Plateau work was directed at outlining the history of Athapaskan occupations in the area of Anahim Lake, with the principal goal of understanding the movement of Athapaskan-speakers to the American southwest. This research set valuable groundwork that we expanded upon in later studies in an area further south, in which side-notched projectile point styles figure prominently, as discussed later in this paper (Magne and Matson 1982, 1984, 1987; Matson et al. 1980; Matson and Magne 2007). In his earlier papers, Wilmeth also relied heavily on Sanger's (1970) chronologies, with explicit due caution given the distances involved and the often small assemblages involved in making comparisons (Wilmeth 1971).

James Helmer offered a comprehensive culture history overview of the central portion of the area in which we are interested in 1977 (Helmer 1977a), based on surveys he did in the Blackwater River area, and with reference to excavations he did at Punchaw Lake with Susan Montgomery and Knut Fladmark (see Fladmark 1976, Helmer 1977b, Montgomery 1978). Helmer's (1977a, 1977b) descriptions of the culture history of the northern plateau area produced a chronology spanning only 5000 years, but his basic scheme would not be much altered today. His "Early Prehistoric" starts at 3000 BC to AD 1, with diagnostics including leaf-shaped points, corner-notched points, stemmed points, excurvate blade, concave base points, and microblades. Helmer's "Middle Prehistoric" spans AD 1 to AD 1300, and includes varieties of corner-notched and large side-notched points. His "Late Prehistoric" includes small side-notched points and varieties of corner-notched points. In this same region, Brandon and Irvine (1979) recovered a variety of points and microblades from disturbed contexts and test excavations at a salvage investigation at the Pantage Creek site (FhRs 35), southwest of Punchaw Lake, which adds to the data that were available to Helmer.

Donahue's (n.d.) examination of surface collections and his excavations at Tezli (Donahue 1977) and Ulgatcho (Donahue 1973) are important contributions to northern Plateau prehistory. Unfortunately Donahue's classificatory schemes are idiosyncratic and difficult to apply in a comparative manner without examination of photographs. Two of the earliest dates in our area are from Tezli, a pithouse site, and Punchaw Lake. The date of 3980 ± 100 BP (GaK 4907) from Punchaw Lake (Fladmark 1976) is associated with a burial underneath one of the "house platforms" found there, and the date of 3850 ± 140 BP (S–769) from Tezli is from a layer in the bench area of a house pit truncated by the pit (Donahue 1977:132). If either of these dates are actually coeval with house structures they would be among the oldest found on the Canadian Plateau, although older housepit dates occur on the Columbia Plateau (Ames 1998, Campbell 1985).

Fladmark's (1985) surveys and excavations in the Mount Edziza area are the most northern materials we examine. Extensive surveys of the Stikine River northwest of Mt. Edziza for a then-anticipated hydroelectric development uncovered a single stratified, late prehistoric site and a few other shallow sites but none of any apparent age (Aresco Ltd. 1982, Magne 1982). MacNeish's (1960) Callison site just south of the Yukon border is unfortunately undated and relates more closely to Yukon archaeology, so we do not discuss that assemblage here.

Work on the upper Skeena River, in the interior at Hagwilget Canyon (Ames 1979), and at Moricetown (Traces 2005), has yielded materials dating back to about 4700 BP. The sites here may be related more closely to sequences further down river, such as at Gitaus and Kitselas. We will look at the Moricetown-Hagwilget area but those important sites further west are definitely in the coastal B.C. culture area and as such do not fit here.

Interior Plateau settlement pattern research had its start with Matson's 1974 project at the Mouth of the Chilcotin (Ham 1975; Matson et al. 1984), which spawned the Eagle Lake Project and associated surveys in the western Chilcotin region from 1979 through 1985 (Alexander and Matson 1985, Alexander et al. 1987; Magne 1984, 1985; Magne and Matson 1984; Matson and Magne 2007; Matson et al. 1980).

Cultural chronologies that have been proposed for the Interior Plateau are shown in Figure 2. Chatters and Pokotylo (1998) and Stryd and Rousseau (1996) extend occupations to 11,000 BP, but in fact we have no well-dated archaeological sites before about 7000 BP, the Gore Creek skeleton at 8250 ± 115 BP (S–1737; Cybulski et al. 1981) being the exception. The Nesikep Creek and Lehman sites that Sanger (1970) reported are the best known examples of the well known "early" period, and represent pre-housepit settlement patterns. By other western North American standards, however, the points of the Early Nesikep are actually early Middle Period or Early Archaic types. Chatters and Pokotylo (1998) prefer a more generic style of chronology, one beginning with an Early Period from 11,000 to 8000 BP, a Middle Period from 8000 to 4000 BP that is subdivided into Early and Late Middle periods, then a Late Period from 4000 BP that has an Early Late division from 4000 to 2500 BP.

Fladmark's (1985) Mt. Edziza chronology extends to about 5000 BP, even though Smith (1971, 1974) had proposed occupations extending to about 10,000 BP based on obsidian hydration dates. Stryd and Rousseau's (1996) chronology begins at about 11,000 BP, with the Early Period extending to about 7000 BP, a Middle Period to 3500 BP, then a Late Period. Their Lochnore Phase at about 5500 BP to 3500 BP is the period in which housepit occupations begin and by the time of the Shuswap Horizon (*ca.* 3500 BP), many, perhaps, most, Plateau peoples appear to be living in housepit villages. To the north the cultures are not as well known. Borden's 1952 pioneering work in the northern interior identified the Natalkuz Lake site, which was occupied from about 2400 BP to late precontact times, followed by the Chinlac site's protohistoric occupation. Helmer's chronology (1977a) as discussed above begins at 5000 and extends to Late Prehistoric period, but dates for the early period are very few. In the Eagle Lake, Taseko Lakes, and nearby Potato Mountain regions, Matson and Magne (2007) and Alexander and Matson (1987) have identified a securely dated

Table 1. Frequencies of projectile points in collections and reports examined.

Point Type	Period	Donahue Survey	Tezli	Sewell	Chinlac	Natalkuz Lake	Mount Edziza	Potato Mtn	Punchaw Lake	Eagle Lake	Mouth of Chilcotin	Williams Lake	Hagwilget/ Moricetown	Pantage Creek	Total
Agate Basin	Early			3											3
Alberta	Early	1													1
Cascade	Early	9		7									6		22
Lochnore-Lehman	Early	2	3												5
Plainview	Early	2		1									2		5
Scottsbluff	Early	1													1
Skeena	Early	14	2	11		3	1		6				4		41
Corner-notched	Middle	11	8	13	2	1		3	19	4	12	8	2	2	85
McKean Complex	Middle	6	8	6					7						27
Medium/Large Side-notched	Middle	3	15	6			8		7		3		3		45
Plateau Corner-Notched	Middle	3	14	4				1			6				28
Stemmed	Middle?	13	10	9	54		2		10		1		8	1	108
Kavik	Late	3		1	16					4			1		25
Small Side-Notched	Late	4	5					10	30	31	33	3	5	1	122
Athapaskan Side-Notched	Late	1	18		14					8			6		47
Lanceolate	Unknown	16	1	8			6		11			2	26	19	89

Plateau Pithouse Tradition from about 2500 BP to about 600 BP, followed by the Athapaskan Tradition. Wilmeth's chronology at Anahim Lake characterizes his Component Clusters I, II and III as pre-Athapaskan Plateau Pithouse Traditions occupations, from 2000 BP to about 1000 BP, with a short gap, then Athapaskan occupations in Component Clusters IV and V beginning at about 600 BP.

To help organize the discussion, we have tabulated projectile point types for the principal sites and regional investigations within central and northwestern British Columbia (Table 1), and we have also summarized the types for the region as a whole (Table 2, Figure 3). We will use Stryd and Rousseau's (1996) general three-part outline, essentially a modification of Sanger's (1970) chronology, to organize the discussion as a whole. Table 1 and Figure 3 we take to be representative of the projectile points that have been found to

Table 2. Summary table of projectile points observed in collections and reports examined.

Point Type	Period	Total
Agate Basin	Early	3
Alberta	Early	1
Cascade	Early	22
Lochnore- Lehman	Early	5
Plainview	Early	5
Scottsbluff	Early	1
Corner-notched	Middle	85
McKean Complex	Middle	27
Medium/Large Side-notched	Middle	45
Plateau Corner-Notched	Middle	28
Skeena	Middle	41
Small Side-Notched	Late	122
Athapaskan Side-Notched	Late	47
Kavik	Late	25

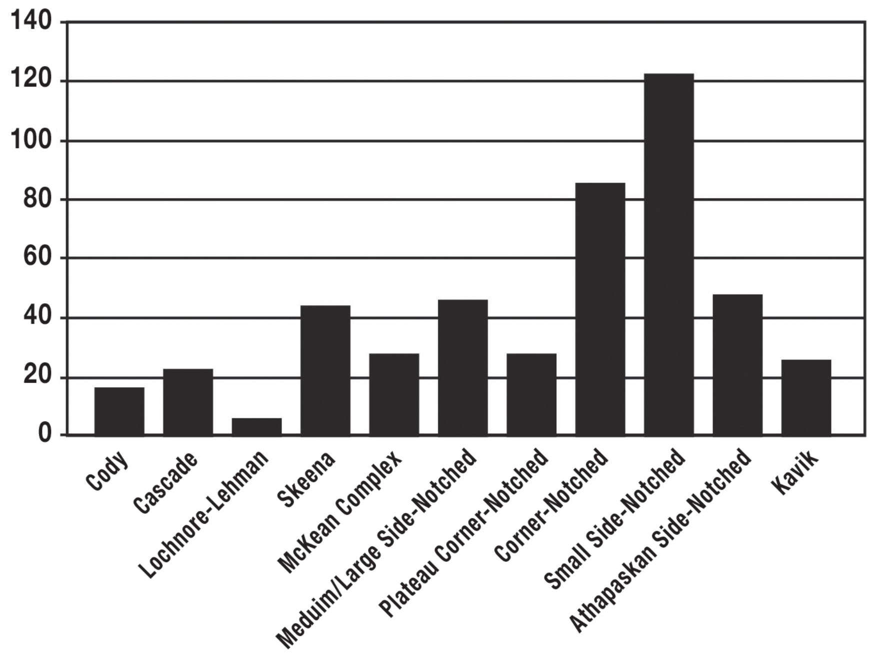


Figure 3. Projectile point frequencies for collections and reports examined.

date in this large area even though we know we have not exhausted the literature, particularly the many resource management reports produced in the more than 50 years since Borden surveyed the areas impounded by the Kemano dam. Even if double or triple this number of points are known, that is miniscule by most North American standards for the size of area under consideration, and it speaks to the vast amount of knowledge yet to be gained here.

Early Prehistoric Period (*ca.* 11,000 BP to *ca.* 7000 BP)

There are no excavated Early Period points from the area. The Sewell Collection (Figure 4) contains one possible Plainview and three possible Agate Basin points, while Donahue's (n.d.) examination of private collections documented two possible Plainview, one Scottsbluff, and one Alberta point. The possible Agate Basin items in the Sewell Collection are resharpened; a trait that seems common on the Plains as well, but they may also be resharpened McKean points. These Sewell Collection points are disputable given Sewell's Saskatchewan background as noted above. Wilmeth (1978:89) illustrates a concave-based point that he compares to the Pryor Stemmed type on the Plains, but in our view this rather crude point fragment is not similar to that type at all. Wilmeth (1978) also discusses a possible Agate Basin base that is not comparable because of breakage.

Lanceolate bifaces are common on the northern Plateau, and while many are similar to Cascade points, it is also true that lanceolate bifaces occur in all time periods and are thus difficult to attribute to any particular period when found in surface contexts. Inglis (1977:29) reports a beautiful lanceolate point in a private collection from South Hazelton that may be one of the lanceolate "Skeena" points found towards the coast that we discuss below. Faced with a find of a lanceolate point from an intertidal context on Haida Gwaii, Acheson (1995) offers a reasoned discussion that concludes that such points cannot be definitely temporally diagnostic in undated contexts, unless they truly dominate an assemblage. A sample of lanceolates from Sewell's collection is shown in Figure 5. In the absence of detailed analyses of actual specimens, the predominance of lanceolate bifaces in the published and unpublished literature for central and northern British Columbia confuses attempts to categorize assemblages that contain lanceolates. This is because lanceolate forms are seen to be characteristic of early and middle prehistoric cultures in areas to the north (Northern Cordilleran, Northern Plano, Taltheilei), to the south (Old Cordilleran), and to the west (Skeena Complex; Allaire 1979) of

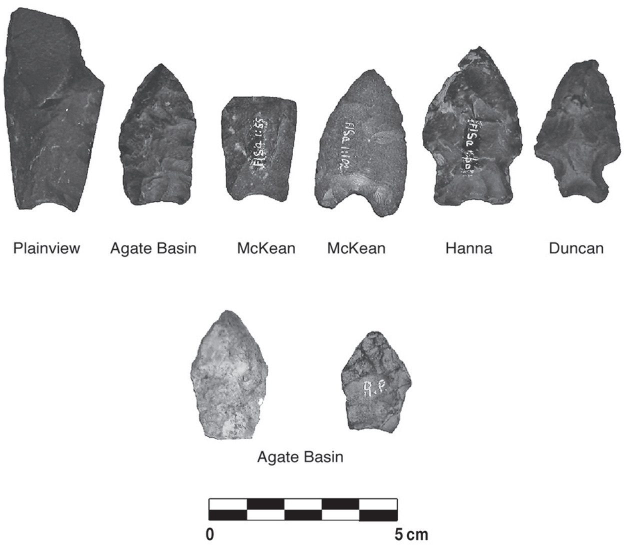


Figure 4. Early and Middle prehistoric points from the Sewell collection.

our area of study here. It may be that lanceolates are a hallmark of all cultures spanning a temporal range of about 9000 to 4000 BP in northwestern North America. As Fladmark (1982: 128) indicates, lanceolate points in the British Columbia interior may relate to Cascade Phase sites of the Old Cordilleran of the Columbia Plateau, but "classic" Cascade points may be rare. See also Roll and Hackenberger (1998:126) for a discussion of the same problem in the southeastern Plateau.

Similarly, stemmed points are difficult to assign temporally, although many are likely from late Early or early Middle periods. They occur in various forms, including some approaching Windust (concave stem), contracting stem (such as Lind Coulee points) and expanding stem. Windust and Lind Coulee points from the southern Plateau areas of Washington and Idaho are, however, very clearly Early period styles (including many from excavated and dated sites) and without very good examples (or excavations) in central British Columbia our preference is to not assign any of the surface collection materials to those categories. Furthermore, stemmed points are frequent on the Central Northwest Coast during 5000–3000 BP (Matson and Coupland 1995:97–198) so that they span a very long range in neighbouring areas. In Sanger's scheme, stemmed points (his Group 14) are found throughout most of the sequence although they are concentrated in the last 3000 years (Sanger 1970:47). Sewell's collection has nine stemmed points; Donahue's has quite a number of stemmed points (13), with another 10 from Tezli. The Punchaw Lake excavations produced 10 stemmed points.

The thin, extremely well made Early Nesikep points from the southern areas of the Canadian Plateau (Sanger 1970, Stryd and Rousseau 1996:192) appear to be absent from the northern Plateau. Documenting Early Nesikep Tradition or Windust Phase points in northern B.C. would be beneficial for understanding if the Early Nesikep Tradition with its microblades came in from the north or from the south.

Overall we are fairly confident of the Scottsbluff and Plainview points that have been found simply because those conform very closely to the type specimens from the Plains area (see Frison 1978, Hoffman and Graham 1998). Clovis and Folsom appear to be absent. The Agate Basin and Alberta points are marginal classifications and we have less confidence in those, simply because these do not appear to be not so well made (although they are equal to some on the Plains), and because of the wide range of lanceolate and stemmed point forms that are found throughout the area.

Middle Prehistoric Period (*ca.* 7000 BP to *ca.* 3500 BP)

Middle Period points are common from excavations and collections in the area. Many of the points have the general characteristics of the basally indented McKean-Duncan-Hanna series of the northern plains (Mulloy 1954; Wheeler 1954). Frison (1998) and others group these three point types into the McKean complex, dating from about 4900 to 3200 BP (Frison 1998:163). Richards and Rousseau (1987) and Rousseau (2004) report that points of this style are found in the Shuswap Horizon (3500–2400 BP) of the Plateau Pithouse Tradition. Thus there is some consistency in the dating, although this style may continue later on the Plateau.

Prentiss and Kuijt (2004:58) share this view that these similarities are in need further investigation, as do Ball and Magne (n.d.). Other Middle Period points are typical of the Nesikep tradition and the Lochnore Phase of more southern areas of the Plateau. Stemmed points and large to medium-sized, side-notched points are also common. Large side-notched points in forms that we see on the northern Plateau also appear on the northern plains

Figure 5. Lanceolate points from the Sewell collection.

during the late Early prehistoric and Middle prehistoric periods, in what is known as the Mummy Cave complex (Reeves 1969). Walker (1992) was able to use multivariate classification techniques to define five distinct types of these early side-notched points, ranging in age from about 8000 BP to about 5000 BP, from Colorado to Alberta and Saskatchewan (see also Dyck and Morlan 2001). Once more dated assemblages are available on the northern Plateau, an exercise to compare this area to the northern Plains would be worthwhile.

Some Lochnore Phase points (5000–3500 BP; Rousseau 2004) bear a strong resemblance to Acasta points from the western Northwest Territories or central District of Mackenzie (Noble 1981: p. 99, Fig. 2 c, e): lanceolate forms with wide, shallow side-notches and contracting stems. In the north, these are said to occur in association with Agate Basin-like points, as part of the Acasta Lake Complex (*ca.* 7000 BP) within the Northern Plano Tradition. Gotthardt (1990) cautiously extends the similarity of the Acasta Lake Complex to the Rock River area of northern Yukon.

Sewell's collection contains six McKean Complex points (Figure 4), four "Plateau" corner-notched points, 13 other corner-notched points, and six medium to large side-notched points. Many of these look similar to points found at Lochnore-Nesikep. Donahue's collection includes six McKean Complex points (Figure 6), 11 corner-notched (Figure 7), three Plateau corner-notched, and three medium to large side-notched points. Donahue wrote at the time (1977) that one of the latter with a wide, ovoid blade is similar to Archaic points from Ohio, and that a very large one is similar to middle prehistoric styles from the northern Plains; we see no reason to challenge his views on those at this time.

Many of the "Plateau" corner-notched styles are reminiscent of the Plains Pelican Lake style with its sharp corner-notches, often with shallow notches, although the Plateau styles have a wider, more curvate blade, and often have very long barbs ending parallel with the base. Furthermore, many of the remaining corner-notched points are very similar to Plains Besant styles (see Reeves 1983), a similarity noted by Donahue some time ago (1977:180). In Alberta the Besant phase dates to approximately 2000–1150 BP (Vickers 1986:81).

Donahue's Tezli site is the best-recorded site we have from the Middle Prehistoric period. Donahue grouped the Tezli dates into three temporal units to control for housepit mixing processes: TU I: 2400–800 BC, TU II: 800 BC–AD 750, TU III: AD 1200–Historic. Converting these into years BP using 1950 as the terminal date yields: TU I: 3950–2750 BP; TU II: 2750–1200 BP; TU III: 750–0 BP. This complex housepit site produced a large variety of points, dominated by small side-notched, large side-notched and corner-notched types. Overall at Tezli the small side-notched points are more common after 1500 BP, while corner-notched styles postdate 4000 BP. Donahue's Type 4, resembling Besant points, and Sanger's Group 7 (1970: 39) are most common in his Temporal Units 1 and 2, dating from

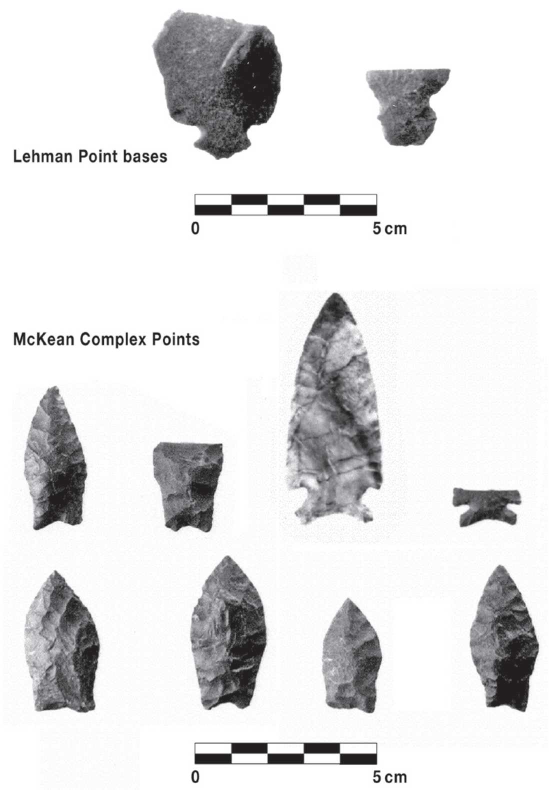


Figure 6. Lehman and McKean Complex points from Tezli. Photos courtesy of Paul Donahue.

3950–1200 BP, and since several appear in contexts older than what is seen on the Plains, he suggests a west to east "trajectory" for the style (Donahue 1977: 180). Three points resembling Lochnore points, Donahue's Group 40, occur at Tezli in TUs II and III but not in TU I. TUs II and III also contain the bulk of the corner-notched points, especially TU III, which he considers an anomalous situation (Donahue 1977: 191). One McKean-like point (Group 12) was found in the early levels of Tezli, dating to *ca.* 4450–3450 BP (Donahue 1977: 184).

Looking to the northwest portion of our area of interest, we find good evidence of two pre-arrow point types with possibilities of a third, all more closely connected with areas further north than to the Plateau tradition, and none of clear antiquity greater than 5000 years. The best case is for the straight base lanceolate type from Edziza (Figure 8: e); Fladmark 1985: Fig. 1: e, p, g), and another from Natalkuz Lake (Borden 1952: Fig. 1: 18). The general characteristics are clear in Fladmark's (1985) illustrations, with well-made points ranging from parallel sided to rounded sides, usually from 60 to 80 mm in length, and with straight, to slightly concave bases. This point style appears to be present from southwestern Yukon to Natalkuz Lake and along the Skeena River. Note that similar points are found in the Sewell Collection (Figure 5). Points much like these are also found in the earliest deposits in Prince Rupert harbour area. This point style is also found in only the lowest levels at Tezli, TU I (3950–2750 BP). Donahue (1977: 189–190) compared the style to those at Gitaus and Hagwilget, recognizing the earlier contexts at those sites.

Workman (1978) has this point style as being part of his Taye Lake culture, extending from about 4500 to 1300 BP, and he names the concave base variant, the "Whitehorse" point style. Fladmark found several of these at Edziza, including one (1985, Fig. 72, e) in the early component at Grizzly Run, which is the component without microblades and which has a radiocarbon date of 3910 ± 120 BP (SFU 127) associated with it. This point type is associated with the Skeena Culture on the upper reaches of the Skeena River, at the Gitaus site in Kitselas Canyon (Allaire 1979) and further upstream at Hagwilget Canyon (Ames 1979). The Skeena Culture is dated at circa 3600 to 3200 BP by Coupland (1988) on the basis of dates for preceding and later cultures. In none of these associations is this point type associated with

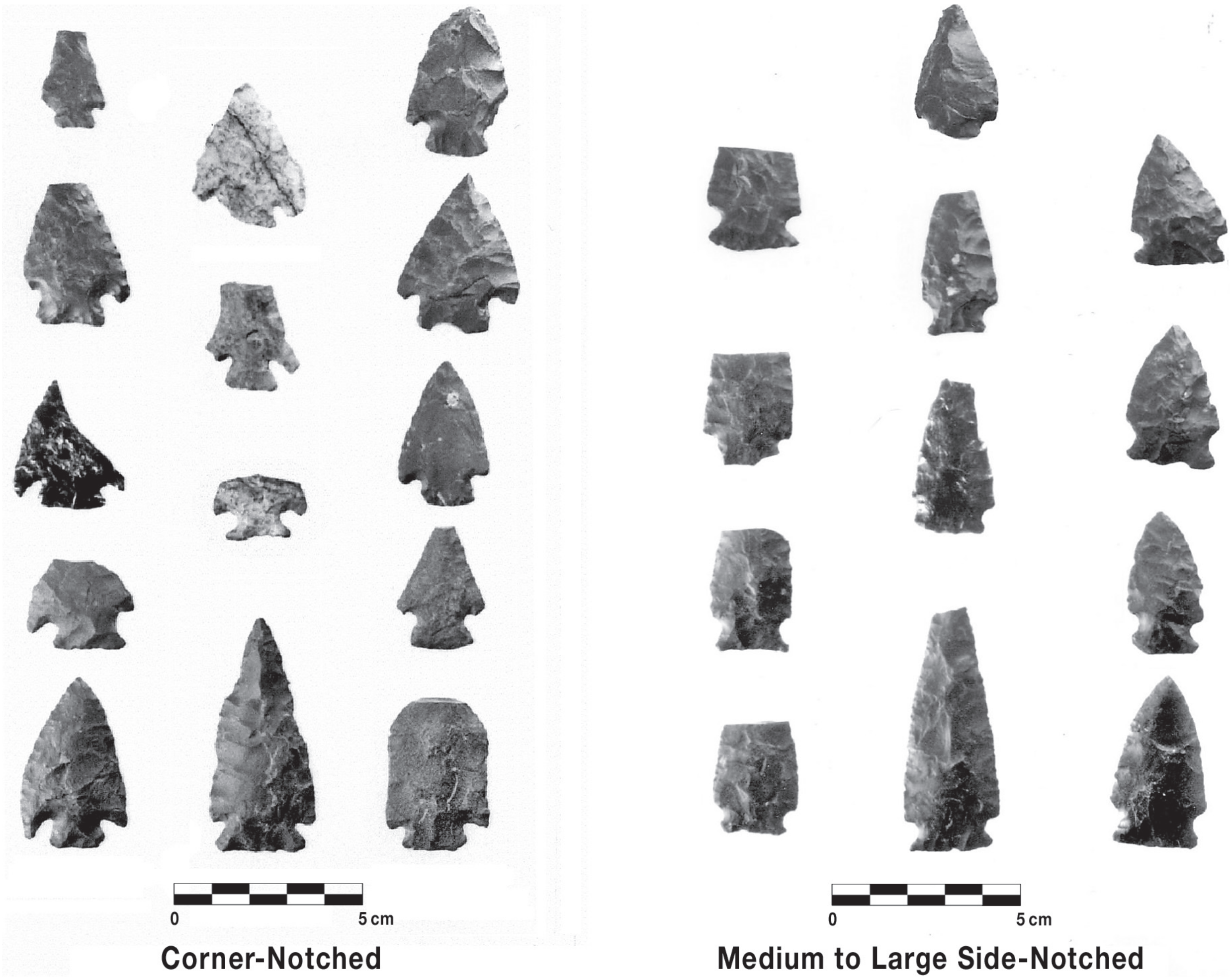


Figure 7. Corner-notched and medium to large side-notched points from Tezli. Photos courtesy of Paul Donahue.

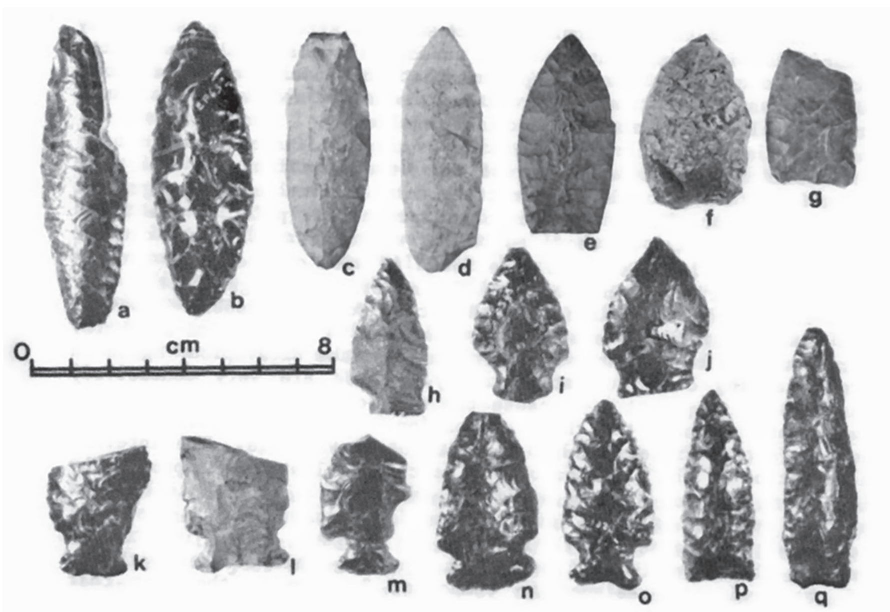


Figure 8. Points recovered from Mt. Edziza. Excavations at Grizzly Run site yielded item e. From Fladmark 1985: 152, Figure 72. Reproduced with permission.

microblades. Workman (1978) believes the Taye Lake culture is post-microblade, but admits that the situation may be that microblades sometimes occur. The Natalkuz Lake specimen may also be associated with microblades and is associated with a radiocarbon date of 2415 ± 160 BP (S-4) that is somewhat dubious as it was produced very early in the history of radiocarbon dating. Carlson (personal communication 2006) sees no reason to dispute this date, however, and he also obtained a second, unpublished date of 1950 ± 120 (SFU 71). The Natalkuz Lake site dates would therefore average out at about 2182 BP.

In summary this lanceolate point dates from more than 4000 years ago to perhaps around 2000 years ago, and has close ties to similar points to the north and not to the Plateau. Because it is similar to knives and other leaf shaped bifaces, it is not completely distinctive in shape and therefore may not be very useful as an index type. For future reference, however, it may yet prove to be an important type when found in the absence of other point types.

Also found in the Taye Lake culture are large, broad side-notched points, such as at Mount Edziza (Figure 8; Fladmark 1985, Fig. 72, k–o). The ones found by Fladmark range from 50 to 70 mm in length (although only one at 50 mm in length was complete.) Unfortunately, none of these were present in dated contexts at Mount Edziza, but Fladmark argues that they are probably associated with a post-microblade culture and therefore later than the 4800 BP date for the early microblade component at Grizzly Run. In short, the same general dates as for the first point type, and indeed, similar points are present in the Taye Lake culture, indicating a similar date range. These points are not found towards the coast (with one possible exception at Hagwilget Canyon), indicating a different distribution.

None of the points found by Fladmark had ground bases (one did, but the grinding also extended down the edge, indicating perhaps use wear), and they are not very well made, two characteristics shared by points of the Taye Lake culture and not with the earlier Lochnore-Nesikep assemblages. Furthermore, the other points associated with side- notched points in the early Lochnore-Nesikep culture have not yet been found in our region of interest, again showing a closer connection at this time with places further north. The medium to large side-notched points (Group 4; Figure 7) found at Tezli appear to overlap with this point type as do Group 7 at Lochnore-Nesikep (Sanger 1970) as neither has ground stems. There is also a general agreement about the dating of this general point style in all three areas.

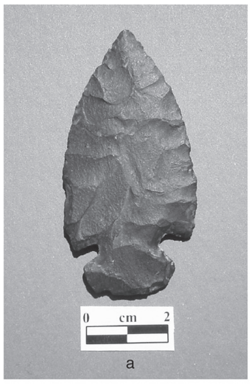
Large side-notched points in general have a very wide distribution in western North American ranging in dates from 8000 to 1200 BP and the full range of these dates may be possible for them in northwestern B.C. We agree with Fladmark, though, about the most likely dates being less than 5000 BP and (implicitly) with the ending dates less clear, although these are clearly not arrow points (although they could be hafted as knives.) If we put all the dating information together for these three areas, we get a range of 4000–1200 BP, with the ending date being more questionable. Unlike the lanceolate points, though, these are an easily recognized style, unlike the possible third style that we turn to next.

Associated with the lanceolate points, in the Taye Lake culture, at Mt. Edziza (Figure 8; Fladmark 1985: Fig. 72, a–d) and on the Skeena River, are large leaf-shaped bifaces. These do not appear to be very distinct and overlap with preforms, particularly on the Skeena River. These seem to be most abundant in the Skeena culture at Gitaus and Hagwilget Canyon. They appear to be next most abundant at Mt. Edziza and only marginally present in the Taye Lake culture. Is this also a useful culture-historic type? Given our earlier discussion about leaf-shaped or lanceolate points one wonders. Outside of the Skeena culture this remains to be demonstrated, but it certainly may turn out to be.

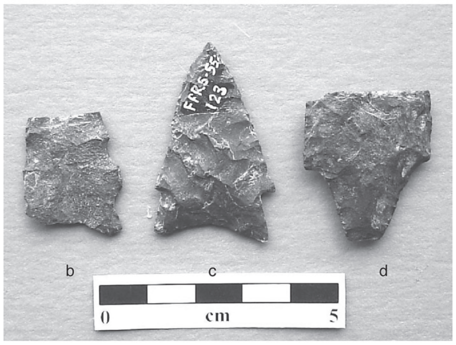
Borden's Natalkuz Lake site remains an enigma. It is an unusual house with a large central, depressed firepit, dated to about 2400–1900 BP, and the corner-notched point found there is unusual as is a large blade industry. This assemblage also contains microblades.

During a forest recreation area survey, a very nice Lehman Phase point was surface collected from site FdRr 1 (McNeney 2006). Shown here in Figure 9: a, this point is very similar to that pictured by Stryd and Rousseau (1996: 194, Figure 15: a). Stryd and Rousseau (1996: 189–191) propose that the Lehman Phase lasted from *ca.* 6000 BP to *ca.* 4500 BP, and that it was a direct development from the Early Nesikep Tradition of the mid-Fraser and Thompson Rivers area.

Site GgSt 2 at Moricetown is an important location that has been recently impacted by construction, yielding some 30 projectile points in addition to decorated bone and carved stone artifacts



Lehman Point from FdRr 1



Shuswap Phase points from FfRs 55

Figure 9. Early and Middle Period points recently recovered from central British Columbia. Photos courtesy of Ty Heffner.

(Budhwa 2005: 40; Traces 2005). Very few of these were professionally recovered, but previous work indicated that occupations extended back as far as 4700 to 5660 BP (Albright 1987, cited in Budwha 2005: 23). Among the points found there are a series of lanceolates, including four of the straight-based form, and some half-dozen small side-notched points of the Athapaskan type we discuss below.

The early Middle Prehistoric Period appears to be the first substantial occupation of this part of the province. Projectile points share stylistic similarities across a very broad area of the northwest, from the northern plains across the southern and northern interior plateau. A certain straight-based lanceolate form, which we call here the "Skeena" type, may be distinctive, and further finds in controlled situations would be of benefit.

Late Prehistoric Period (*ca.* 3500 BP to *ca.* 100 BP)

In recent excavations at housepit site FfRs 55 southwest of Prince George, Heffner (2005a) excavated three points thought to date on typological grounds to about 3500 BP. Heffner compares Item c in Figure 9 to Shuswap Point Type 3 of Richards and Rousseau (1987: 25), and it definitely compares well to Sanger's Group 3 projectile points (Sanger 1970: 40, Figure 20: l, m), occurring in Sanger's Middle Period, 5000 to 2000 BP. Item b in Figure 9 may be a preform of the same type, and Heffner compares item d in Figure 9 to Shuswap Point Type 7 (Richards and Rousseau 1987: 25), and we see a strong similarity there to Sanger's Type 14 projectile points (Sanger 1970: 43, Figure 22: n). At the same site, Heffner (2005: 57, Plate 4.9) found two corner-notched points that appear to be Plateau Horizon points, one from a housepit context but with no date, the other from a shovel test with a shallow stratigraphic context that he suggests would be on the order of 200–600 BP despite the appearance of the point.

Whitlam's (1976) mitigative excavations at ElRn 3 and FaRn 3 near Williams Lake seem to be typical of central Plateau housepit assemblages, with a "Kamloops" small multi-notched point, two other small side-notched points, and eight corner-notched points. These housepit assemblages yielded mean corrected ^{14}C dates ranging from 1762 ± 58 BP (Gak 4011) to 1180 ± 58 BP (GaK 4321). A small contracting stem point could be a Kavik type.

Donahue's surface collection report contains at least six Kavik points, Sewell's at least one, and Wilmeth's excavations at Anahim Lake produced a small number of small stemmed and corner-notched points, all from late prehistoric or protohistoric contexts. These include four Kavik points from the Potlatch site (Figure 11). Chinlac has between 16 and 70 Kavik points, depending on one's definition (Cranny 1986), Tezli has one or two Kavik points, and Ulgatcho (Donahue 1973) has at least five (Figure 11). The Bear Lake Athapaskan Lodge near Eagle Lake produced a Kavik point, and the Brittany Creek site further down the Chilko River yielded yet another (Figure 11; Matson and Magne 2007, Matson and Pokotylo 1998, see also Pokotylo and Mitchell 1998: 91, Figure 8).

At Tezli, small side-notched points only appear in TU III, after about 750 BP (Donahue 1977: 188). Tezli produced some 23 small side-notched points (Figure 10), 18 of which we would consider to be the "Athapaskan style" we discuss below.

The Eagle Lake Project (Matson et al. 1980, Magne and Matson 1984, Matson and Magne

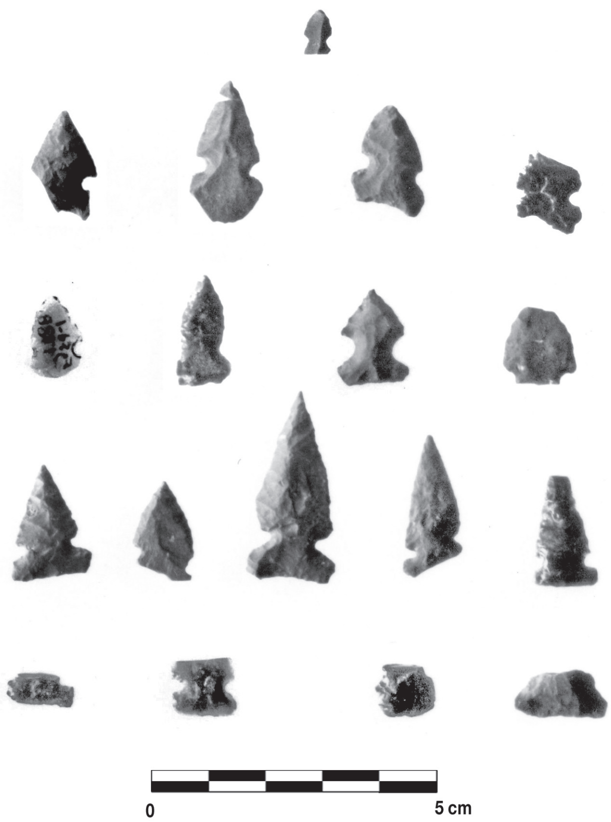


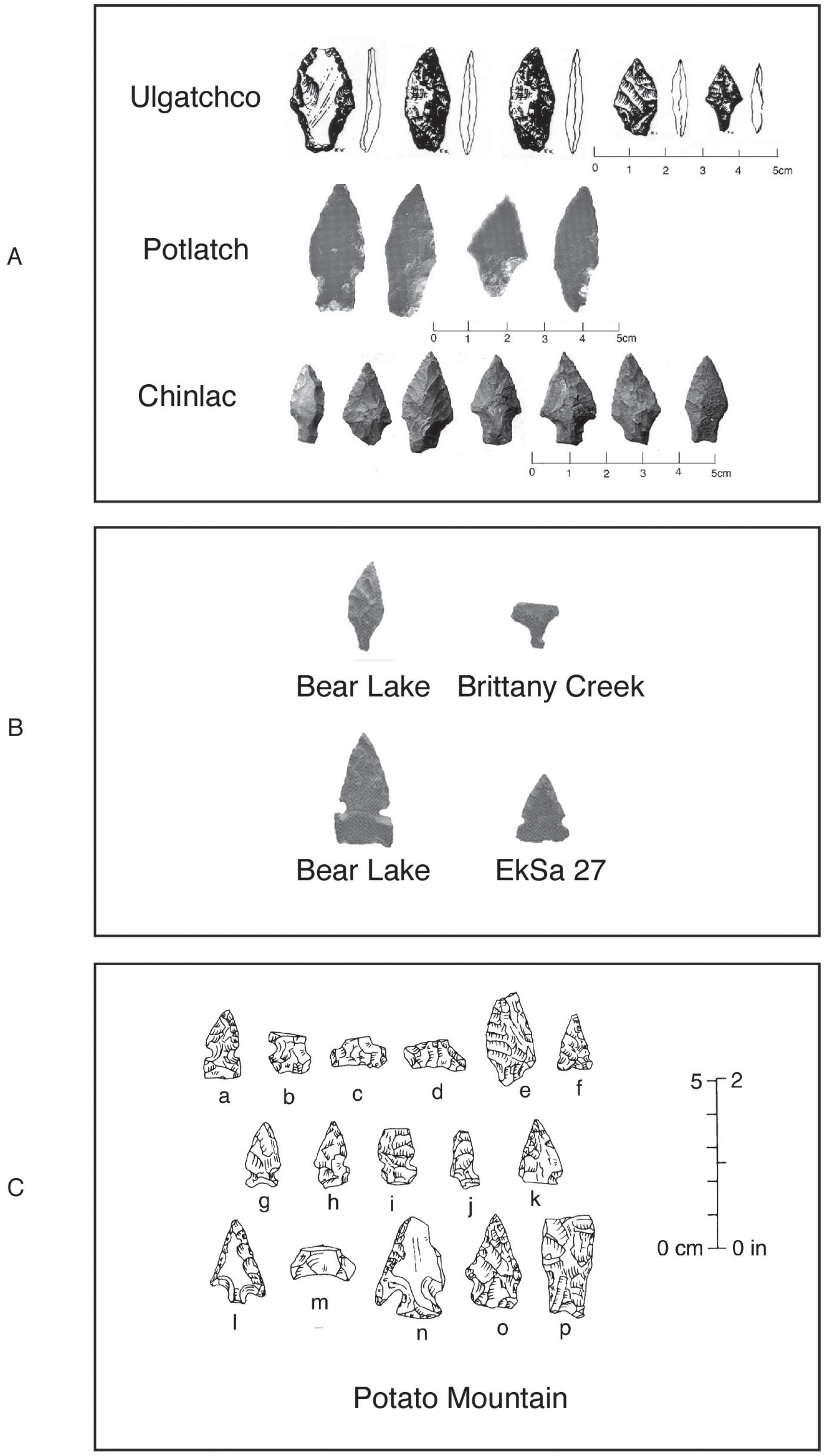
Figure 10. Small Side-notched points from Tezli. Photos courtesy of Paul Donahue.

2007), which had the Potato Mountain Project (Alexander and Matson 1987, Alexander et al. 1985) as an offshoot, was aimed at understanding Athapaskan movements in the central interior, south and east of where Wilmeth (1978) worked at Anahim Lake. Part of the Eagle Lake research was devoted to multivariate analyses of small side-notched projectile points to see if points from known Salishan areas were consistently different than those from known Athapaskan areas (Magne and Matson 1982, 1987, 2004; Matson and Magne 2007). Besides the association of the Kavik point with recent Athapaskan components, we were also able to demonstrate that multiple-side-notched points were associated with Plateau Pithouse Tradition (PPT) assemblages, but we did not use that attribute in our multivariate analyses. The multidimensional scaling diagram shown in Figure 12 was one of the most critical results, classifying "Athapaskan" and "Plateau Pithouse Tradition" points at 80% accuracy strictly on the basis of metric variables. Using multiple discriminant analysis, in which "known" groups are pre-assigned, then "unknown" samples are classified, we achieved accuracy rates of over 90%.

We characterize the Athapaskan side-notched point style (Figure 13) generally as follows, with the caveat that we strongly favour large sample multivariate analyses for discrimination purposes, and that a particular point in isolation may be incorrectly classified. The points have long blades, as opposed to those of the Salishan style (Figure 13), which tend toward blades with equilateral triangle shapes. The bases may be concave, as opposed to the Salishan style, which are straight. Sometimes the Athapaskan style bases may be longer than normal, with a contracting shape. The Athapaskan style's notches tend to be shallow and wide. The typical Athapaskan side-notched point would therefore be one that is fairly long, with an indented base and shallow notches.

The combined projectile points and entire lithic assemblage studies showed that different kinds of multivariate analyses on varying sets of standardized data will consistently yield patterns along the lines of PPT and Athapaskan ethnicity. One very important aspect of the study is that these differences have been shown to exist in areas that share quite similar environments, as well as in areas that do not. The projectile point study shows that subtle stylistic ("enculturated" in Clark's 2001 terms) variations in one class of material culture exist between the two ethnic groups and that these can be measured in a quantitative manner. The Athapaskan and Salishan points are well distinguished by the analyses. Indeed assemblages that were not included in the study, such as Tezli, can be seen to contain a large proportion of the Athapaskan side-notched style—in that case, we see at least 10 small side-notched points that would fit our notion of the Athapaskan style. The same is true when inspecting more southern side-notched photos—the Salishan style is far more dominant.

We were equally successful using entire assemblages, not just points, to distinguish Athapaskan or Salishan collections. The lithic assemblage analysis is encouraging in that it demonstrates that assignment of ethnicity to individual assemblages is very feasible, even using published descriptions, and also that traditional artifact classes used for such purposes by previous researchers, especially Wilmeth (1978, 1979) include some of the most useful items by which to make such distinctions. Among the most useful discriminating variables are Kavik points, easily picked out of the Ulgatcho, Chinlac, and Potlatch assem-



A Kavik points from Ulgatcho, Potlatch, Chinlac.
B Athapaskan points from the Eagle Lake region.
C Assorted points from Potato Mountain.

Figure 11. Points from Athapaskan sites and Eagle Lake region. Ulgatcho points reproduced with permission of Kris Foreyt.

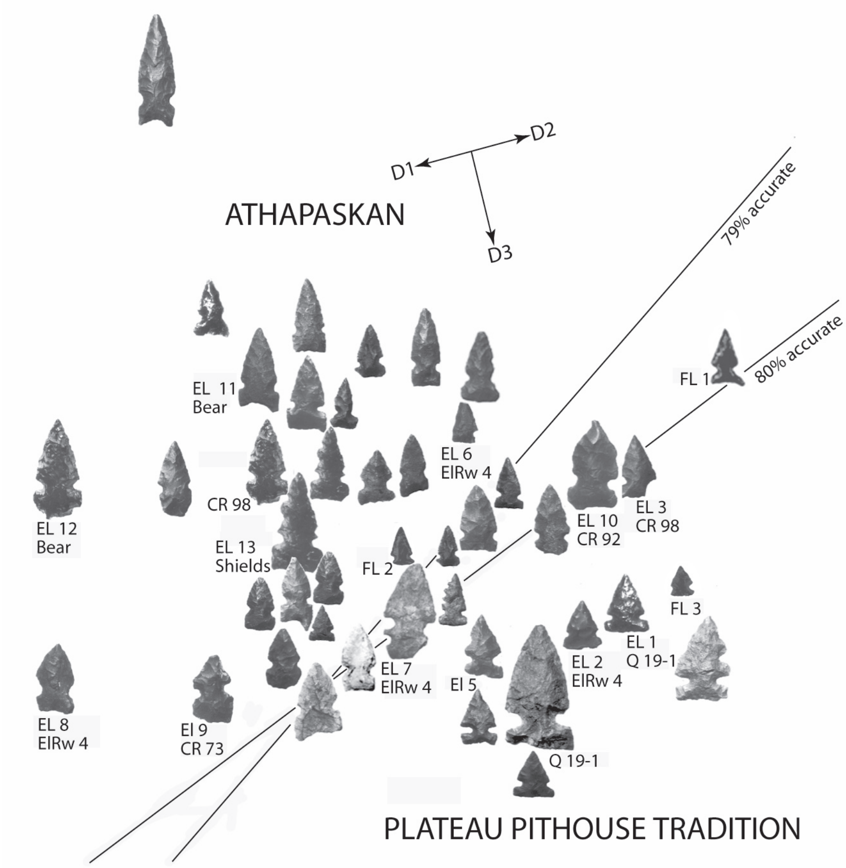


Figure 12. Multidimensional scaling of Athapaskan and Plateau Pithouse Tradition Small Side-notched points.

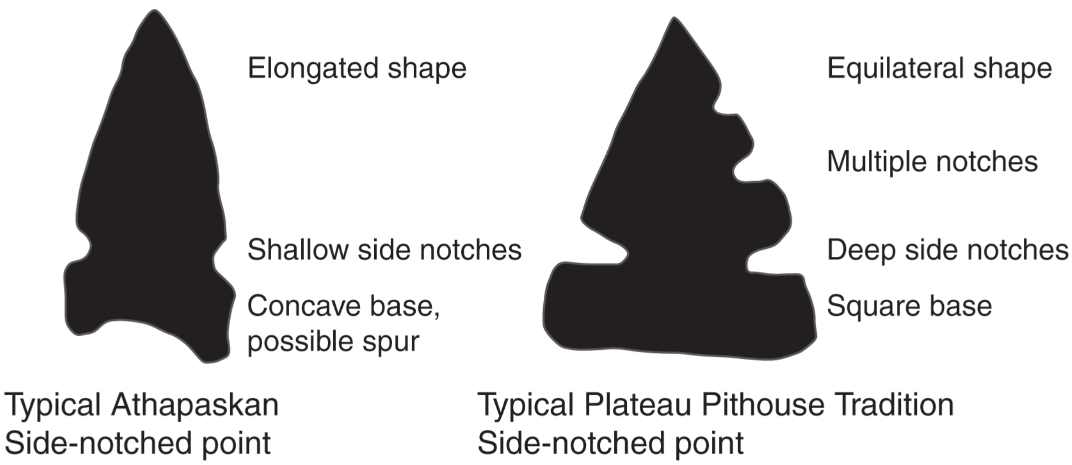


Figure 13. Diagram illustrating "typical" Athapaskan and Plateau Pithouse Tradition Side-notched points.

blages. This last procedure also identified some other flake tool types that appear to distinguish PPT from Athapaskan (sinuous edge unifaces, multiple edged utilised flakes, gravers, perforators) that have not been recognized before. These studies indicate that the Plateau Pithouse Tradition is easily differentiated from the central British Columbian Athapaskan tradition as long as site function is held constant.

Microblades

While we have no direct evidence for how microblades were used in interior British Columbia, microblades elsewhere appear to be made for use in composite projectile points, probably hafted longitudinally in bone, antler or wood shafts. Microblades occur throughout the northwest from northern Alaska to southern Alberta, from the coast to the foothills (Magne and Fedje 2002, 2007). Despite their proliferance, or perhaps because of it, their meaning is highly debated (and not least, between the authors of this paper) and the nature of their temporal occurrence and association with other types of tools is not understood equally well in all places they are found. The situation is certainly not clear for the western Northwest Territories and Yukon, and even less so for central and northern British Columbia.

Microblades and microblade cores are also useful in identifying old Athapaskan assemblages but remain problematic in the last 4000 years mainly because they are not present in all assemblages that we would call Athapaskan, and occasionally are found in assemblages we would call Salishan. Nonetheless, as shown by Magne and Fedje (2002, 2007), microblades are definitely a hallmark of older Athapaskan and Na-Dene assemblages. In addition, while microblades may occur through all prehistoric periods, they appear to peak in occurrence at 8000 and 2500 years ago throughout the Northwest. In our area of northern B.C., we can agree only that they occur prior to 5000 years ago with their presence in more recent assemblages likely, but not yet demonstrated to both of us. The presence of microblades in late prehistoric contexts is still an important issue that needs to be addressed.

Conclusions

Some general patterns for projectile point styles may be observed in the west-central and northern interior of British Columbia, although research programmes in the past 30 years have been sparse. Resource management projects are largely uninformative on this matter but this is how new knowledge is being gained in recent years. Examinations of private collections is crucial, and most of this was undertaken in the early 1970s. Although some points from the Nechako plateau and Upper Skeena region may be Paleo-Indian in age confirming dates are absent. A widespread complex of fairly large, corner-notched, and stemmed points is likely Middle Prehistoric in age but this period is very poorly understood in the area. The late period is very clearly different from the regions further south, where the ubiquitous small triangular side-notched arrow point is often the only point style present. Instead we find a subtly different triangular side-notched point along with small stemmed "Kavik" points.

General trends are apparent that have been apparent for over 30 years: the area of northwestern B.C., has a slight smattering of Paleo-Indian points, a strong presence of middle prehistoric side-notched, corner-notched, and stemmed points, and a high abundance of small side-notched points. Lanceolate forms are very common and one form with straight bases may be temporally diagnostic, occurring at about 4000–3000 BP. Site FlRq–13 reported by Burford et al. in this volume shows that the Old Cordilleran Complex of large lanceolate points was likely well-established in north-central British Columbia at about 8000 to 8700 BP. In this region, a non-housepit site of this age and complexity is extremely rare if not unique, but it implies that other substantial components are undiscovered, probably under similar geomorphological circumstances.

Recent research into small side-notched point styles shows that they can be reliably sorted into Athapaskan and PPT styles. Furthermore, Kavik points also appear to be good indicators of Athapaskan presence, as are multi-notched side-notched points for Salishan occupations. Microblades do occur prior to 5000 BP and may occur during all time periods. The archaeology of the area is greatly impeded by a lack of research on stratified non-housepit sites, something that will need to be corrected if the major patterns are to be clearly understood. Indications are that resource management projects can contribute new knowledge through intensive investigations. We find the situation disconcerting that a basic culture history as may be depicted through projectile points is so difficult to outline here. In 1952 Borden laid out the beginnings that were not much advanced in the next 20 years, although some progress was made in the mid-to-late 1970s. The time has come to apply rigorous modeling to learn where older and more deeply buried sites in this area may be found.

Endnote: We use 1950 as the terminal date to convert reported ages BC to ages BP for this paper.

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Chapter 16

An Early Cordilleran Assemblage from the Nechako-Fraser Basin

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Archer Cultural Resource Consultants

Introduction

The recent excavations at FlRq–013 produced unexpected results for an archaeological site in an urban setting on the central Interior Plateau of British Columbia. Prior to the identification of FlRq–013 and associated archaeological sites FlRq–009, FlRq–010, FlRq–011, and FlRq–012, it was believed that urban development and river erosion had destroyed most evidence of prehistoric occupation within the city of Prince George. To date, the majority of sites found on the north-central Interior Plateau are typically shallow, poorly stratified, and produce little diagnostic material. Few ^{14}C dates exist for sites within this region, and most have been dated through comparative tool morphology.

FlRq–013 is located 3.9 km southwest of the current confluence of the Fraser River and Nechako River. It is situated at the neck of a loop along a large palaeo-channel of the Nechako River. The site was originally recorded during a CRM project within an intact stand of mature forest near the off-ramp of the Simon Fraser Bridge on Highway 97. FlRq–013 covers an area of 11, 167 m^2. The site area includes 57 cultural depressions believed to represent food cache pits.

Upon initial investigation it was expected that this site was of similar function to other large sites with cultural depression in this region. However, as excavation progressed, a high density, deeply buried cultural deposit became evident in the west part of the site.

FlRq–013 is bisected by a palaeo-channel of the Fraser River. The lithic concentration is situated within a buried palaesol that overlies a relict gravel point-bar on the river. Two perceptible flooding events have buried this palaeosol.

At approximately 11,000 BP, the confluence of the Fraser and Nechako rivers and most of the surrounding area would have been covered with

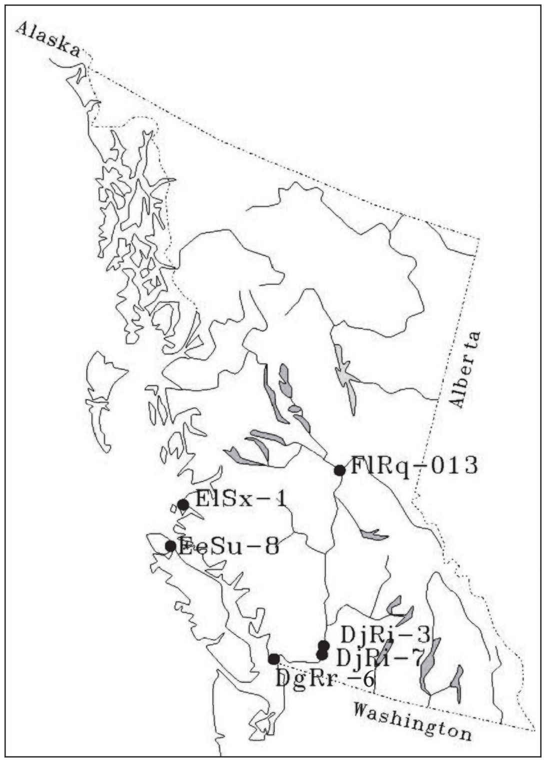

Figure 1. FlRq–013 and other sites with similar early artifact assemblages in British Columbia.

glacio-lacustrine sediments derived from the presence of Glacial Lake Prince George (Tipper 1971). Stratified varves are present in numerous road-cuts and river cut-banks in the surrounding area. When the dam forming this pro-glacial lake failed, a massive outburst flood scoured the glacial lake sediments. This event removed lake sediments from the area surrounding FlRq–013, and exposed the underlying glacial till. Subsequently, the till was remodelled by the action of the Fraser River, and formed the point-bar upon which FlRq–013 is located.

The early component of FlRq–013, referred to here as Component I, is associated with this palaeochannel of the Fraser River. The highest concentration of artifacts is situated along the terrace of this hydrological feature. It is estimated that Component I covers an area of 2658 m^2. Artifacts have been found as deep as 1.2 m below the surface, within the palaeo-channel itself. Component I cultural material is located in a 20–40 cm thick occupation layer. A total of 109.25 m^2 has currently been excavated within Component I, representing a 4% sample of this occupation of the site. The excavation has revealed localized concentrations of lithic material, some of which are focused around charred sediments. These burnt sediments are believed to represent hearth features, and also included calcine bone and red ochre. No diagnostic bone material has been recovered, and most specimens are fragments of large mammal long bones.

Two radiocarbon samples obtained from charcoal found in these hearth features give uncalibrated dates of 8770 ± 60 BP and 7970 ± 50 BP. The more recent date was collected from a hearth feature, located on the surface of the palaesol and may represent the final occupation of Component I, immediately before flooding made the site uninhabitable. The older date was collected from a hearth 15 cm above the gravel point-bar surface and represents early occupation of the site. However, it must be recognised that lithic material has been recovered from the surface of the gravel and consequently, the earliest occupation of the site likely pre-dates 8770 ± 60 BP.

The evidence examined to date from Component I of FlRq–013 indicates that the site was repeatedly occupied by associated groups of people. These groups were utilizing similar tool technology and cultural material for a period potentially as long as 1000 years.

The Assemblage

The subject of this study is an examination of the projectile point sample recovered during initial evaluation and excavation at FlRq–013 during the winter of 2006 to 2007. A summary of all tools and lithic debitage is also offered in order to present a more easily discernable comparison with other archaeological sites of the same age and technological affiliation.

The complete assemblage collected to date from FlRq–013 is comprised of 20,566 catalogued artifacts. This includes 18 uniface tools, 37 cores, 7 utilised cores, 7 cobble tools, 3 choppers, 1 unshaped sand stone abrader, 1 shaped sandstone abrader, 14 spall tools, 562 bone fragments, 19 pieces of red ochre, 304 decortication flakes, 466 primary flakes, 5605 secondary flakes, and 2930 tertiary retouch flakes. The assemblage also includes 41 examples of projectile points, including eight complete specimens.

Projectile Points

Forty-one examples of projectile points were recovered from FlRq–013. All specimens are of similar lanceolate form. Two of the points were recovered in sediments measuring above 40 cm below surface, which overlay the recorded extent of Component I.

Complete Projectile Points

Eight complete examples of projectile points were recovered from FlRq–013. One of these specimens is comprised of two uniting fragments, catalogue numbers 2469 and 2470, which were found within 20 cm of each other at the same depth. There appears to be three distinct variations of lanceolate point morphology represented. One style has an acutely pointed tip and a rounded base catalogue numbers 6357 and 2467 (Figure 2). Although this style has a thick cross section, collateral flaking along the margins has an obtuse angle creating thin margins. The second style is more narrow, has a much thicker cross section, and collateral flaking is at a much more acute angle to the plane of the point. An example of this is catalogue number 2459 (Figure 2). Both ends of this style are acutely pointed and the base is only identifiable by a slight roundedness. The third variant is a very rough lanceolate point that retains considerable preform characteristics (Figure 3).

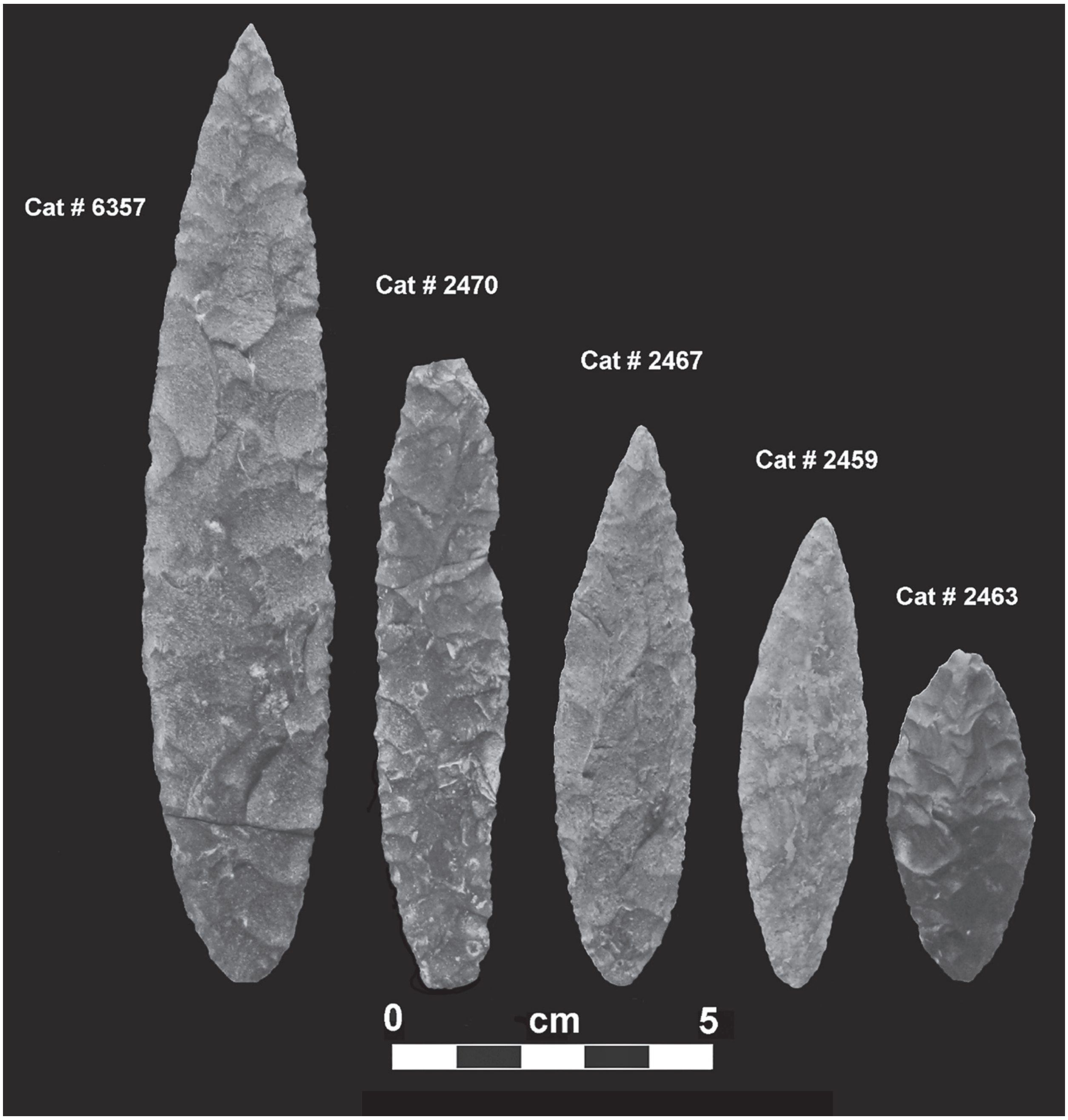

Figure 2. Lanceolate projectile points from FlRq–013 (8770 ± 60 BP, uncalibrated).

Catalogue Number 1847: This roughly-made item is a lanceolate projectile point manufactured from grey basalt. The distal end is tapered to a point while the proximal end is rounded. The profile is asymmetrical. The cross section is very thick and biconvex. The form is roughly shaped. On one side rough collateral flaking has produced a very high, well-pronounced medial ridge, and on the other longitudinal flake scars are present. It is more likely that this is an unfinished projectile point, or one expediently made to fulfill an immediate need.

Catalogue Number 2455: Number 2455 too is a roughly manufactured, lanceolate point made of grey dacite. It is difficult to distinguish the proximal from the distal end, as both are roughly pointed. The cross-section is very thick and of a right angled profile. Large irregular flakes have been removed along the margins to form a rough medial ridge. There is

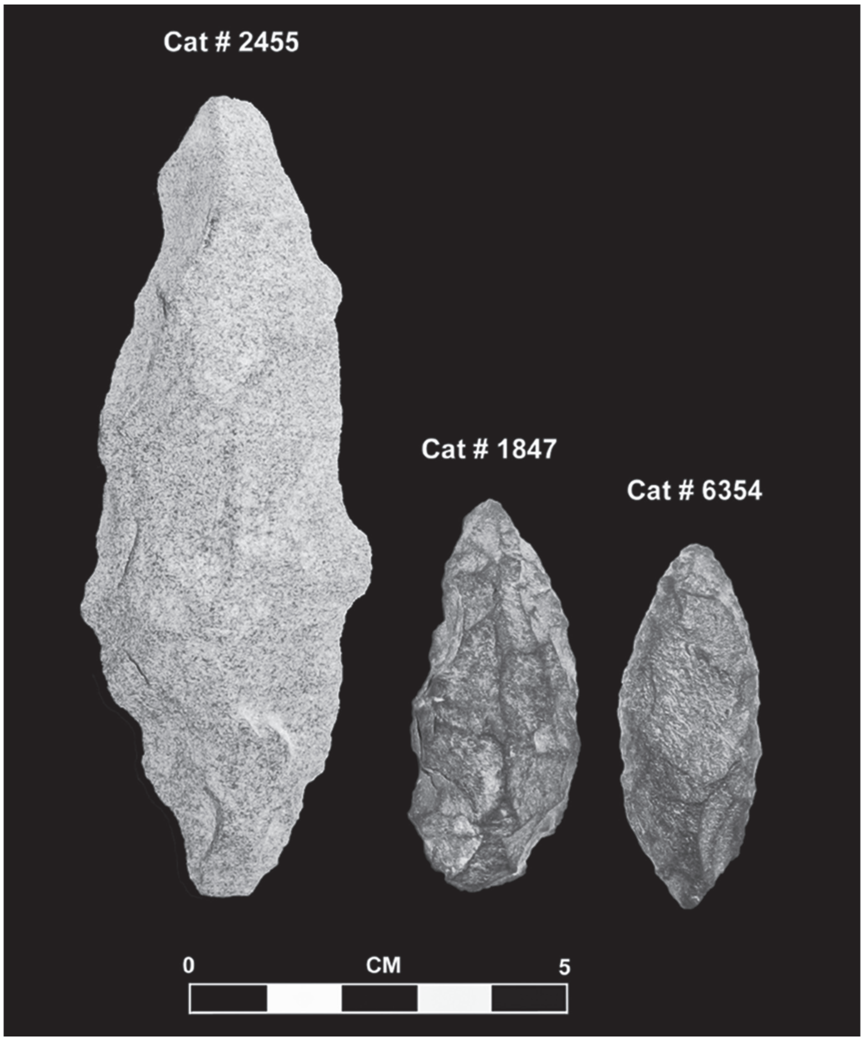

Figure 3. Rough lanceolate points from FlRq–013.

no reworking or retouching present. It is likely that this is an unfinished or expediently manufactured projectile point.

Catalogue Number 2459: This is a lanceolate projectile point manufactured from an unknown greyish green material obscured by a thick dark brown patina. Both the proximal and distal ends of this projectile point are acutely tapering, however the base is slightly rounded at the extremity. The cross section is very thick and biconvex. Flake scars are poorly defined, but are collateral and form an obvious medial ridge on both surfaces.

Catalogue Number 2463: This represents a complete lanceolate projectile point manufactured from black basalt. The distal end may have been acutely tapered but shows impact damage and evidence of repair. The proximal end is slightly rounded to converging. The cross section is thick and convex-plano. On the convex surface collateral flaking produces a marked medial ridge. On the Plano side large flake scars possibly relating to preform manufacture have removed any potential medial ridge. There is evidence of extensive marginal retouch

Catalogue Number 2467: Number 2467 is a lanceolate projectile point manufactured from black dacite. The distal end is acutely tapered to a sharp point and the proximal end is rounded. The cross section is thick and biconvex. Collateral flaking has produced a weakly defined medial ridge. Flake scars terminate well before the centre of the surfaces resulting in marginal thinning. Original preform flake scars are retained along the centre of the point.

Catalogue Numbers 2469 & 2470: These two fragments unite to form a complete lanceolate projectile point. The two fragments are broken along a hinge fracture. The specimen is manufactured from black basalt. The cross section is thick and biconvex. The sides are approximately converging but the edges are asymmetrical. Overall the point is narrow in form. The base is flat and extremely worn. Collateral flaking has formed a distinct medial ridge. However, towards the base flake scars do not meet and some preform surface is retained. Extensive retouch work is evident along the margins. The tip is missing and shows evidence of impact damage.

Catalogue Number 6354: Number 6354 is another example of a roughly made lanceolate point. This specimen is manufactured from black dacite. Both proximal and distal ends are converging and the cross section is thick and convex-plano. This point has retained preform characteristics and has not been extensively reworked.

Catalogue Number 6357: This 15 cm long point represents the largest complete lanceolate projectile point recovered. The tool is manufactured from black basalt, with a tapered to rounded base, and an acutely pointed tip. The cross section is thick and biconvex. Collateral flaking has produced an irregular medial ridge with some preform surface retained. The distal third has been extensively reworked, and the proximal third shows evidence of reworking. The proximal tip has been slightly thinned to facilitate hafting.

Projectile Point Fragments

Thirty-two projectile point fragments were recovered from the excavations at FlRq–013. Two of these specimens, Catalogue number 3369 and Catalogue number 1973, unite to form a large proximal fragment. It is also believed that Catalogue number 1946 and Catalogue number 2462 are the proximal and distal fragments of the same point, and a medial fragment is missing (Figure 4).

Catalogue Number 64: This specimen is a small fragment of a large lanceolate projectile point. This is manufactured from light grey basalt and appears to be a rounded proximal fragment. The fragment is well worn.

Catalogue Number 1750: A small fragment of a projectile point manufactured from light grey quartzite. It has converging edges with a straight base. The cross section is thick and bi-convex. The fragment is well worn and shows evidence of extensive Marginal grinding. A short longitudinal flake has been removed from the base. This is reminiscent to fluting or other forms of basal thinning such as that found in Plano style projectile points

Catalogue Number 1946: This example represents a narrow fragment of a lanceolate projectile point also manufactured from light grey dacite. It is a parallel sided to slightly rounded proximal fragment. The cross section is thick, almost as thick as it is wide, and biconvex. Uniform collateral flaking forms a well-defined medial ridge. The cross section size and style is very similar to Catalogue number 2462. These two fragments may be from the same projectile point.

Catalogue Number 1947: A small fragment of a larger projectile point manufactured from a darker grey dacite. Catalogue Number 1947 is a proximal fragment with converging sides and a level base. The cross section is thin and biconvex.

Catalogue Number 1953: A small fragment of a larger lanceolate projectile point, Catalogue number 1953 is manufactured from black dacite. It has converging edges, and the cross section is relatively thin and biconvex. Flake patterning is irregular with moderate retouch. The specimen shows evidence of medial grinding.

Catalogue Number 1960: This represents a fragment of a lanceolate point manufactured from black dacite. It is a proximal fragment with converging edges, and rough, irregular flaking. The cross section is thin and plano-convex.

Catalogue Number 1973: This example is a fragment of a lanceolate projectile point with converging edges. It is manufactured from black dacite. The cross section is thick, biconvex and slightly irregular. This fragment unites with Catalogue number 3369 and forms a large proximal fragment with tapering edges and slightly rounded base. Collateral flaking and retouch is evident, however some rough preform flake patterning is retained.

Catalogue Number 2065: This represents a small fragment of a larger lanceolate projectile point manufactured from dark grey basalt. It appears to be a proximal fragment with contracting margins and a rounded base. Basal margins show evidence of grinding.

Catalogue Number 2067: A large proximal fragment of a sizeable lanceolate projectile point with a rounded base. It is manufactured from dark grey basalt. The cross section is thick and plano-convex. Collateral flaking has produced a weak medial ridge

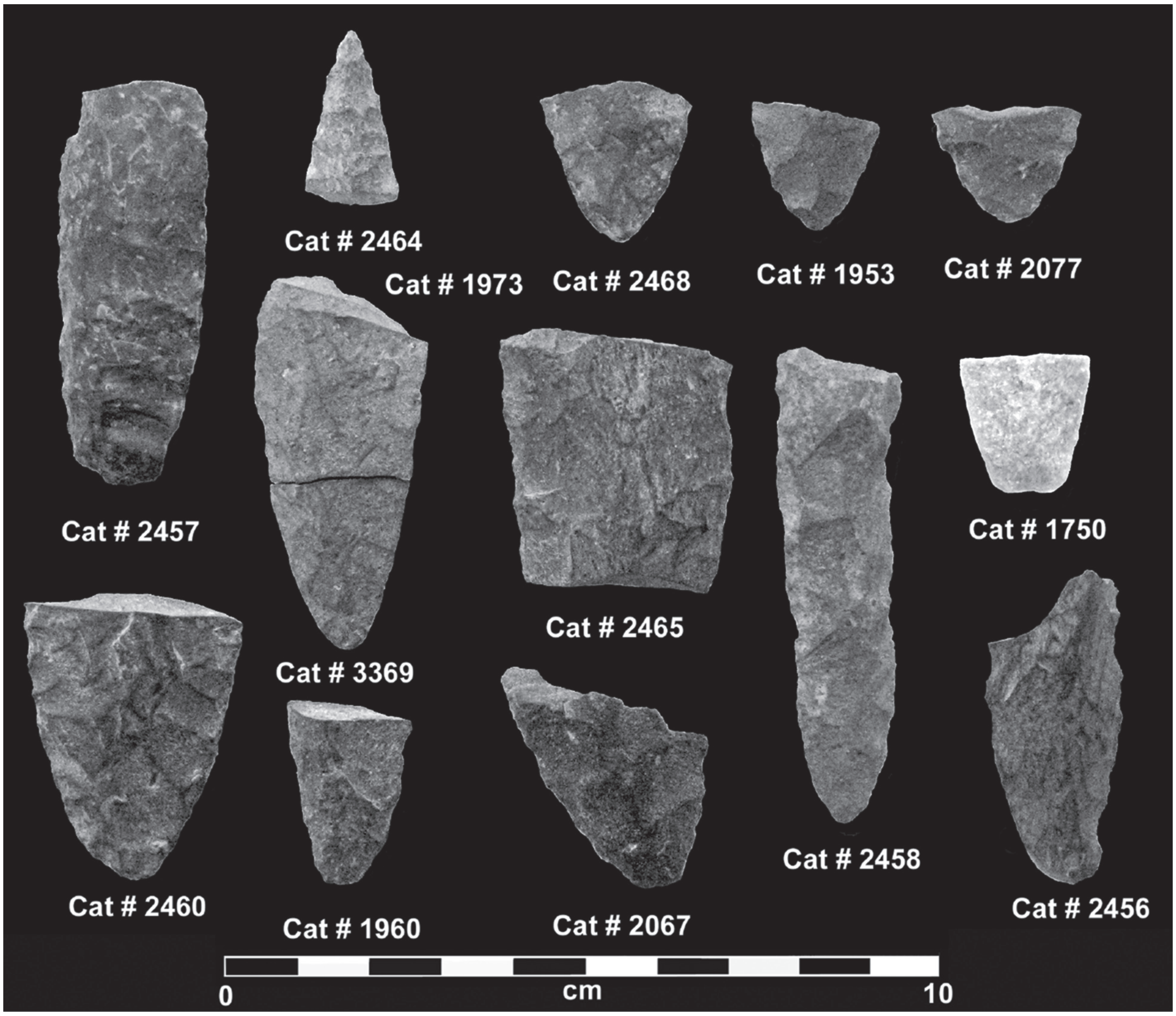

Figure 4. Selected projectile point fragments from FlRq–013.

on the convex side. Slight reworking and grinding is evident along the medial margins. The fragment terminates in a hinge fracture.

Catalogue Number 2077: This small proximal fragment of a larger lanceolate projectile point is manufactured from dark grey basalt. It represents a rounded base with collateral flaking, which overlaps and has removed any medial ridge. Basal margins show evidence of grinding. The fragment terminates in a hinge fragment.

Catalogue Number 2080: This specimen represents a large proximal fragment of a rough projectile point manufactured from dark grey basalt. The cross section is thick and plano-irregular. Rough flaking produces the irregular surface and a large preform flake scar produces the plano surface.

Catalogue Number 2365: This fragment is an example of a thick, narrow lanceolate projectile point. It is manufactured from dark grey basalt, and appears to be a distal fragment. The cross section is biconvex. Rough collateral flaking has produced an asymmetrical, weakly defined medial ridge. The tip is missing.

Catalogue Number 2368: A small fragment of a lanceolate projectile point manufactured from black dacite. It appears as an acutely tapered distal fragment. This example is well worn and only rough flaking can be identified.

Catalogue Number 2369: This projectile point fragment is manufactured from brown basalt. This is a proximal fragment with a rounded base. The cross section is thick and biconvex. Collateral flaking does not cross the midline and some of the original preform surface is retained.

Catalogue Number 2456: This proximal fragment is from a large lanceolate point manufactured from black dacite. It has tapering to rounded edges. The cross section is very thick and plano-right angled. The Plano surface is asymmetrically, collaterally flaked producing an offset ridge. The right-angled surface retains a large preform flake scar on one side. It is roughly flaked on the other surface producing a steep sided medial ridge. The proximal edge of the base retains a small portion of cortex.

Catalogue Number 2457: Catalogue number 2457 is the distal fragment of a large lanceolate projectile point manufactured from black basalt. The cross section is thick and bi-convex. Asymmetrical collateral flaking produces a weakly defined medial ridge. There is evidence of moderate reworking. A deep flake scar and the absence of a minute portion of the tip may be damage caused during thinning or reworking.

Catalogue Number 2458: This specimen represents a large fragment of an unfinished lanceolate projectile point. It is manufactured from dark brown dacite. It is unclear if this is a proximal or distal fragment. Collateral flaking has produced a weakly defined medial ridge and a thick biconvex cross section. The fragment displays a defined hinge fracture, at which the fragment is thick and retains preform morphology.

Catalogue Number 2460: Another fragment of a large lanceolate projectile point. Catalogue number 2460 is manufactured from black basalt. It is clearly a proximal fragment with a thick, biconvex cross section. The base is tapering to rounded. Collateral flaking does not cross the mid line and an irregular medial ridge of preform surface is retained. This example is very similar in shape to the complete example Catalogue number 6357, although this fragment is considerably larger.

Catalogue Number 2462: This is an acutely pointed distal fragment from a narrow lanceolate point. The specimen is manufactured from light grey dacite. In cross section it is very thick and biconvex. The fragment is almost as thick as it is wide. Collateral flaking is uniform, creating a well-defined medial ridge. The cross section, size and style are very similar to Catalogue number 1946. These two fragments may be from the same point.

Catalogue Number 2464: Catalogue number 2464 represents a small, distal fragment from a larger projectile point. It is manufactured from black basalt. The fragment that tapers acutely, and in cross section is thick and biconvex. Flaking is irregular and approximately collateral with a defined medial ridge.

Catalogue Number 2465: This specimen is a fragment of a large projectile point manufactured from black basalt. It is a medial fragment with slightly tapering edges. The cross section is thick and plano-convex. The convex surface is roughly flaked and has an irregular mid-line. The Plano surface has very little reworking. The main surface retains the original preform flake pattern.

Catalogue Number 2468: A small black basalt fragment of a larger lanceolate point. It appears to be the proximal end of a converging to rounded base. The cross section is thin and bi-convex. Collateral flaking does not cross the mid line and it has no pronounced medial ridge, or evidence of basal grinding.

Catalogue Number 2939: This small, proximal projectile point fragment is manufactured from black dacite. The cross section is thick and biconcave. Flaking is irregular.

Catalogue Number 2988: This small fragment is clearly from a large lanceolate projectile point. It is manufactured from greyish green basalt. Catalogue number 2988 appears to be a proximal fragment of a contracting base, and base margins show evidence of grinding.

Catalogue Number 3369: A small, black dacite fragment from a larger lanceolate projectile point. Collateral flake removal on this specimen has formed a weakly defined medial ridge. The fragment appears to be a contracting proximal end. Its stem margins show evidence of grinding, and overall the fragment is well worn. This fragment unites with a medial fragment, catalogued as number 1973

Catalogue Number 3375: Catalogue number 3375 represents a proximal fragment from a large lanceolate projectile point. This tool is manufactured from dark grey basalt and has a converging to rounded base. The cross section is thick and biconvex. Collateral flaking produces a weakly defined medial ridge. Cortex is retained on one side of the medial ridge.

Catalogue Number 3376: This specimen is a distal fragment of a projectile point, manufactured from dark grey basalt. The fragment has been produced by collateral flaking, resulting in a weakly defined medial ridge. The cross section is thick and biconvex. The tip is acutely pointed, however the extremity is absent and shows evidence of impact damage.

Catalogue Number 3379: A proximal fragment of a larger projectile point, manufactured from dark grey basalt. The sides are contracting and narrow to a slightly rounded point. The cross section is thick and biconcave to slightly irregular. Collateral flaking is present around the margins.

Catalogue Number 3386: A distal fragment of a projectile point manufactured from black basalt. The cross section is thick and biconvex. Collateral flaking forms a slightly offset medial ridge. The general morphology is slightly asymmetrical and acutely pointed.

Catalogue Number 5116: This specimen represents a very small, thin proximal fragment of a projectile point. It is manufactured from black dacite. The fragment measures 7 mm long and a rounded base is evident.

Catalogue Number 5450: This specimen is small fragment of a larger lanceolate projectile point. It manufactured from dark grey basalt, and appears to be the distal end of an acutely pointed tip. Moderate reworking is evident in the form of marginal removal of microflakes.

Catalogue Number 6512: Another small fragment of a larger projectile point. This specimen is manufactured from light grey quartzite, and it is unclear if this is a distal or proximal fragment. The sides tapers acutely but the end is slightly rounded. It is more likely that this is the base of a point similar to Catalogue number 2459. The cross section is thick and biconvex.

Discussion

The projectile points recovered in the stone tool assemblage from FlRq–013 are a characteristic representation of a tradition that has been found on the Coast and Lower Fraser Valley of British Columbia. This tradition is alternately named Southwestern Coastal Culture, Proto-Western, Old Cordilleran, or Pebble Tool Tradition. Its distribution is well documented throughout the Pacific coast of British Columbia and Washington. For simplicity sake the term Old Cordilleran/Pebble Tool will be used in reference to this tradition within this article. This tradition is typified by lanceolate or willow leaf shaped projectile points and bifaces, large cobble tools and a generally macro-lithic technology.

Lanceolate forms dominate the collection of complete points from FlRq–013. Fluting and stems are absent from all specimens. Some of these points may actually represent knives rather than projectile points. The point assemblage is typified by a style that is relatively thick in comparison to other point styles from the mid and late prehistoric in the central Interior. The points have a bi-convex cross section, an acutely tapering point and a rounded or tapered to rounded base. These have been produced by collateral flaking and have a weakly defined irregular medial ridge. However, rough flaking is also typical, and retention of preform features is commonplace especially when expedient.

Of the 41 examples of projectile points 22 (53.5%) are proximal fragments. This is similar to that noted by Rasic and Gal (2000). It is likely that most distal and medial sections became fragments during active use of the projectiles, and that proximal sections were retained in their hafting. These would have been subsequently removed from the hafting at camp. Distal fragments may have also been retained within prey brought back to camp.

In addition to the point collection, the assemblage includes numerous simple and expedient tools. Artifacts such as choppers, cobble tools, and cobble spall tools appear to be made from local materials. Large cores and core fragments show retouch and utilization, and scrapers appear large and simply reworked. These items required only minimal manufacturing to produce the desired tools. Numerous large retouched and utilized flakes are also present. Overall, the Component I assemblage of artifacts at FlRq–013 appears to represent a simple, macrolithic technology.

FlRq–013 (Figure 5) predates the previously known oldest site in the Central Plateau of British Columbia. The Landells site (EdRi–011), located within the Lower Thompson River drainage, dates from 8500 BP (Rousseau 1991). FlRq–013 is one of the few sites in this region to reveal intact deposits containing a diagnostic tool assemblage. Radiocarbon dates from FlRq–013 are approximately analogous to those from archaeological sites with similar components along coastal British Columbia and the lower Fraser Valley (Mitchell & Pokotylo 1996; Carlson 1996; Matson 1996). In fact, it appears that

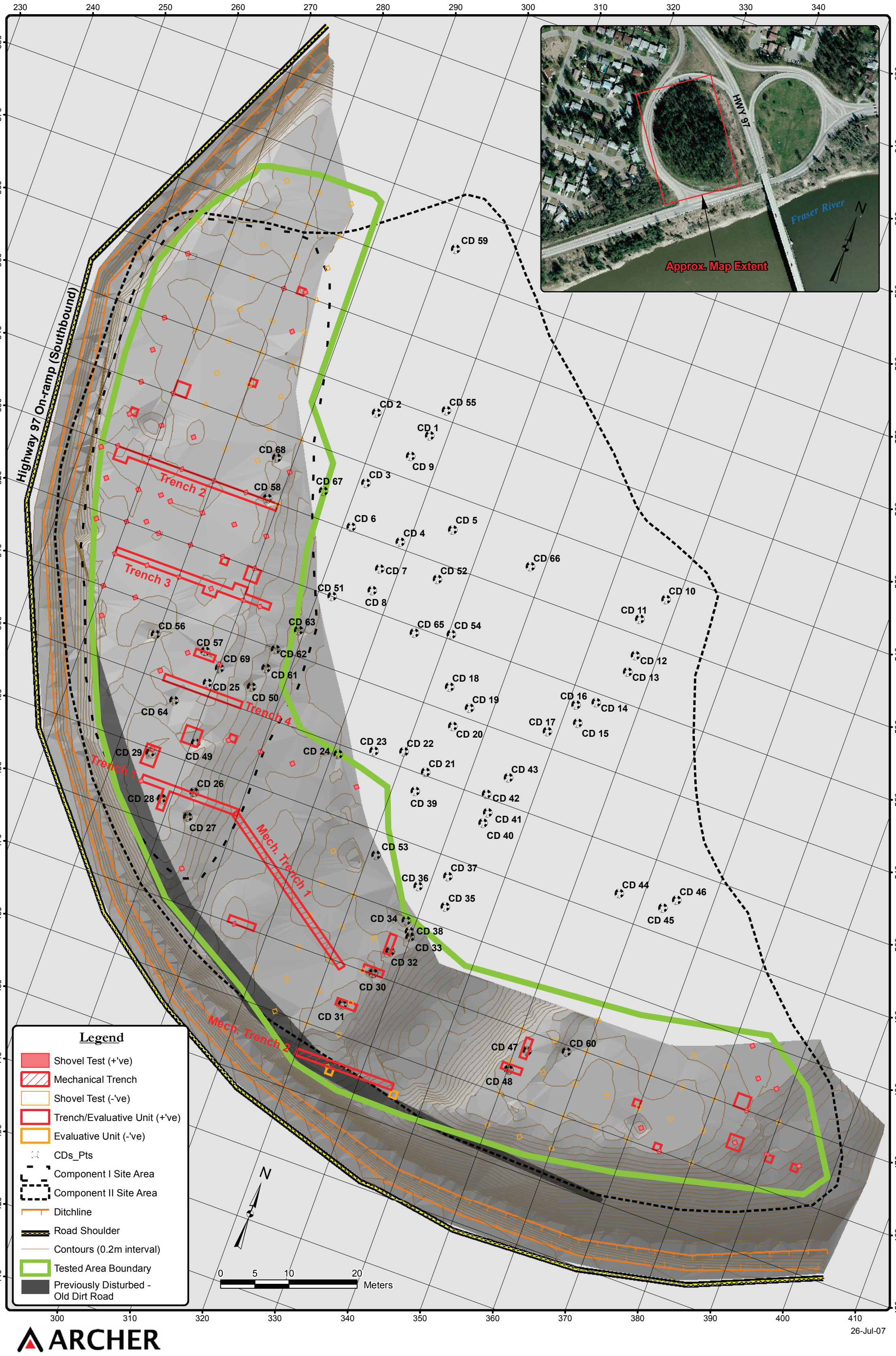

Figure 5. Archaeological site FlRq–013 at Simon Fraser Bridge, South Prince George, B.C.

Period 1 of the coastal site of Namu (Carlson 1996) and Component 1 of the interior site of FlRq–013 are contemporaneous. Four calibrated dates of 10,130 to 10,060 BP, 10,040 to 10,020 BP, 10,010 to 9990 BP and 9949 to 9550 BP are obtained from the conventional radiocarbon age of 8770 ± 60 BP.

The stratigraphic provenience of these artifacts at FlRq–013 is without question. Two thick layers of flood deposits seal the palaeosol in which the artifact assemblage was found. Outside of areas of anthropogenic activities the palaeosol is completely intact. The sediments immediately above are almost completely sterile of artifacts, and identified layers of sediments are continuous across the excavated area.

Conclusion

The point and biface collection of FlRq–013 discussed in this article provides us with one of the most comprehensive assemblages from the late-Pleistocene/early Holocene period on the Central Plateau to date. The size and antiquity of the assemblage, and integrity of Component I are unparalleled in the region.

FlRq–013 has brought forth new questions concerning the distribution and antiquity of the Old Cordilleran/Pebble Tool Tradition, which has been largely accepted as a coastal adaptation. The results of the excavations have also prompted a re-evaluation of previously accepted timelines for glacial retreat along the Fraser basin on the Interior Plateau.

A detailed account of the excavations at FlRq–013, as well as a comprehensive comparison with other Old Cordilleran/Pebble Tool sites is forthcoming. At a minimum, the results from these excavations will have significant implications regarding what we currently understand about the cultural material, subsistence, and migration of the earliest inhabitants of British Columbia.

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Chapter 17

Out of the Muskeg: Projectile Points from British Columbia's Northeast

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Introduction

In this chapter we propose a projectile point sequence for the Northeast of British Columbia by reviewing both previous research in the region and ongoing cultural resource management studies on behalf of hydroelectric and oil/gas developments. While the aboriginal use of projectile points in northeast British Columbia demonstrably spans the last 10,500 years of prehistory, a concise projectile point sequence for the region has proven to be elusive. As has been said, "stylistically distinctive artifacts are insufficient to allow one to make confident statements about the sequence of temporally diagnostic artifacts or comparisons with archaeological sequences from neighbouring regions" (Driver et al. 1996:276). Unfortunately, the paucity of investigated, stratified archaeological sites in this region forces researchers to compare assemblages with projectile point styles documented from neighbouring regions. Paleoindian projectile points have been recovered from Charlie Lake Cave, Pink Mountain, and a handful of other localities. Subsequent periods are defined by comparing projectile points to those found in neighbouring regional sequences including the southwestern Yukon Territory (Workman 1978; Hare 1995), southwestern Mackenzie Territory (Millar 1981; Morrison 1984, 1987), and the Northern Plains of Alberta (Vickers 1986). We recognize a three-fold temporal division of prehistory for this region: the Early Prehistoric (10,500 to 7500 BP) period, which begins with the earliest occupation of newly-deglaciated lands after the Pleistocene, the Middle Prehistoric (begins variably around 7500–7000 BP to 3500–2500 BP) and Late Prehistoric (3500–2500 BP to contact).

Geographic Focus

The study area is the northeastern portion of British Columbia, defined as those parts of the province within the Peace, Mackenzie, and Liard River drainage basins (Figure 1). The border between British Columbia and the Yukon and Northwest Territories defines the northern boundary, and its eastern boundary conforms to the British Columbia–Alberta border. The southern and western boundaries are defined by the Liard–Yukon, Liard–Pacific, and Peace–Fraser drainage divides. The study area includes the Rocky Mountains, the plains and plateaus of the Peace River District east of the Continental Divide, the Rocky Mountain Trench (or Omineca Trench), and the Omineca Mountains to the west.

Summary of Data Sources

The study area is situated within the Western Subarctic Culture Area (Clark 1981, 1991). Only a sketchy record of pre-contact settlement and occupancy has been reported by archaeologists. Site excavations with stratigraphic deposits associated with radiocarbon dates, are few in number, so the findings of the present study must be interpreted partly in the context of archaeological excavations that have taken

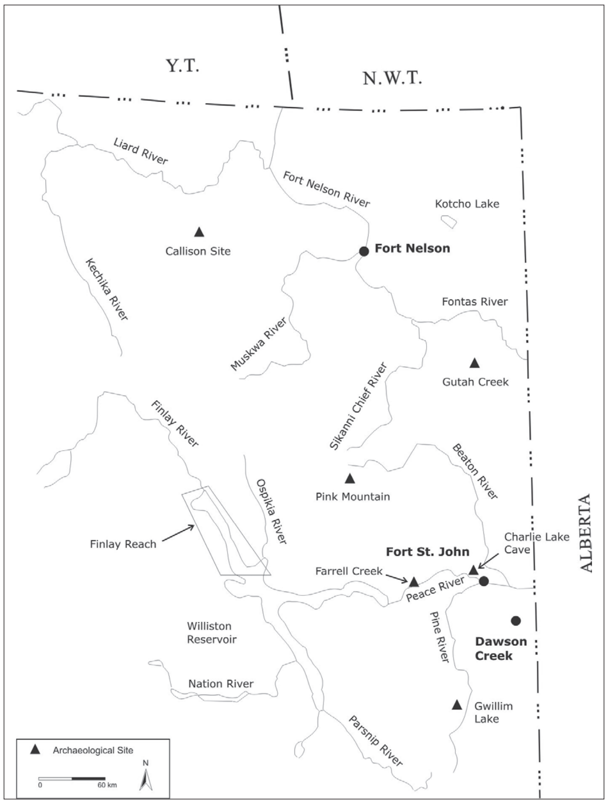

Figure 1. Study area showing selected archaeological sites and localities in northeast British Columbia.

place in neighbouring regions. Though some of the earliest scientific investigations in the northern interior of British Columbia were conducted within and adjacent to our study area (e.g., MacNeish 1960), the principle data sources for developing a chronological sequence of projectile points for the study area are the reports from seven investigated sites: the Callison Site (IeSh–1) (MacNeish 1960); the Pink Mountain Site (HhRr–1) (Wilson 1989, 1996); HkRo–2 (Heritage North Consulting 1994); Charlie Lake Cave (HbRf–39) (Fladmark et al. 1988; Driver et al. 1996); Farrell Creek (HaRk–1) (Fladmark 1975; Spurling 1980); Gutah Creek (HkRe–1) (Heritage North Consulting Limited 2004), and the Gwillim Lake Site (GiRi–4) (Ball 1978). Information summarizing the results of radiocarbon dates from some of these sites are displayed in Table 1. In addition to these sites, reports from a number of non-excavation and/or cultural resource management projects in the study area are also used to provide information about projectile point occurrences (e.g., Fladmark 1981; Arcas Consulting Archeologists 2004; Western Heritage Services 1996, 1997, 1998; Wilson 1996). Reports on archaeological investigations adjacent to northeastern B.C were used as sources of comparative data, among which Workman (1978), Millar (1981), Helmer (1977), Fladmark (1985), Gotthardt (1990), and Hare (1995) were the most important. Lastly, regional syntheses prepared by Clark (1991) and Vickers (1986) were used for wider comparisons to the Western Subarctic and northern Plains regions, respectively. Tables 2 and 3 summarize the projectile points and Figure 2 gives the cultural sequence for these regions.

Charlie Lake Cave (HbRf–39)

A detailed sequence of pre-Contact cultures has not been developed for northeastern British Columbia, but a partial cultural chronology for the Peace River District (i.e., Fort St. John and environs) is based on excavations at Charlie Lake Cave (Fladmark et al. 1984; Fladmark 1996; Handly 1993; Driver et al. 1996). Together with the later cultural sequence at Farrell Creek (Spurling 1980), these are the most thoroughly dated, stratified sites in the entire region. Charlie Lake Cave (HbRf–39) is situated at the southeast end of Charlie Lake approximately 9 km northwest of Fort St. John, overlooking the Stoddard Creek Valley. Though cultural materials are relatively sparse in the cave itself, most of the Charlie Lake Cave sequence was established by excavations of the 'platform' between the mouth of the cave and the parapet. The site was discovered by Knut Fladmark in 1974 and is the iconic archaeological site for northeastern British Columbia, with an occupation spanning approximately 10,500 years.

The Early Prehistoric Period

Driver et al. (1996) define the Early Period at Charlie Lake Cave from 10,500 to 9500 BP, delimited by a series of radiocarbon dates (Table 1). The site has yielded a diagnostic Paleoindian projectile point (Figure 2) and butchered bison bones in a stratigraphic zone radiocarbon-dated between 10,770 ± 120 and 9990 ± 150 BP (Driver et al. 1996; Fladmark et al. 1988). Charlie Lake Cave remains the only excavated, dated site in Canada with a clear association of a fluted point and faunal remains (Fladmark 1996; Fladmark et al. 1984; Driver et al. 1996). The complete basally-thinned—or fluted—projectile point (Figure 3) was recovered from Com-

Table 1. Radiocarbon dates for excavated sites in northeastern British Columbia (from Canadian Archaeological Radiocarbon Database).

Site Name Borden Number	Lab Number	Normalized Age	Sample Material
Gwillim Lake GiRi–1	WAT–341	Modern	Burned bone
	WAT–306	3430±110 BP	Charcoal
Farrell Creek HaRk–1	WSU–1950	1530±70 BP	Charcoal
	WSU–1951	1630±100 BP	Charcoal
	WSU–1952	2485±130 BP	Charcoal
	DAL–328	2790±95 BP	Charcoal
	WSU–1953	4365±100 BP	Charcoal
	GSC–2475	5830±80 BP	Charcoal
Charlie Lake Cave HbRf–39	SFU–453	1130±240 BP	Charcoal
	SFU–379	1400±400 BP	Charcoal
	RIDDL–59	1550±100 BP	Charcoal
	SFU–358	2900±400 BP	Charcoal
	SFU–382	4270±160 BP	Bison bone collagen
	SFU–385	4400±400 BP	Charcoal
	CAMS–3174	4400±80 BP	Ungulate bone collagen
	SFU–451	4800±640 BP	Charcoal
	SFU–356	6700±290 BP	Charcoal
	SFU–452	7100±350 BP	Charcoal
	RIDDL–10	7400±300 BP	Charcoal
	SFU–370	7800±800 BP	Charcoal
	SFU–357	8400±240 BP	Charcoal
	CAMS–2138	9490±140 BP	Raven bone collagen
	CAMS–2136	9670±150 BP	Bison bone collagen
	SFU–355	9760±160 BP	Bison bone collagen
	RIDDL–393	9990±150 BP	Bison bone collagen
	RIDDL–392	10,100±210 BP	Rodent bone collagen
	CAMS–2137	10,290±100 BP	Raven bone collagen
	SFU–378	10,380±160 BP	Bison bone collagen
	CAMS–2139	10,500±80 BP	Ungulate bone collagen
	SFU–300	10,450±150 BP	Bison bone collagen
	CAMS–2134	10,560±80 BP	Bison bone collagen
	SFU–454	10,770±120 BP	Bison bone collagen
	CAMS–2138	9490±140 BP	Raven bone collagen
	CAMS–2136	9670±150 BP	Bison bone collagen
	SFU–355	9760±160 BP	Bison bone collagen
	RIDDL–393	9990±150 BP	Bison bone collagen
	RIDDL–392	10,100±210 BP	Rodent bone collagen
	CAMS–2137	10,290±100 BP	Raven bone collagen
	SFU–378	10,380±160 BP	Bison bone collagen
	CAMS–2139	10,500±80 BP	Ungulate bone collagen
	SFU–300	10,450±150 BP	Bison bone collagen
	CAMS–2134	10,560±80 BP	Bison bone collagen
	SFU–454	10,770±120 BP	Bison bone collagen

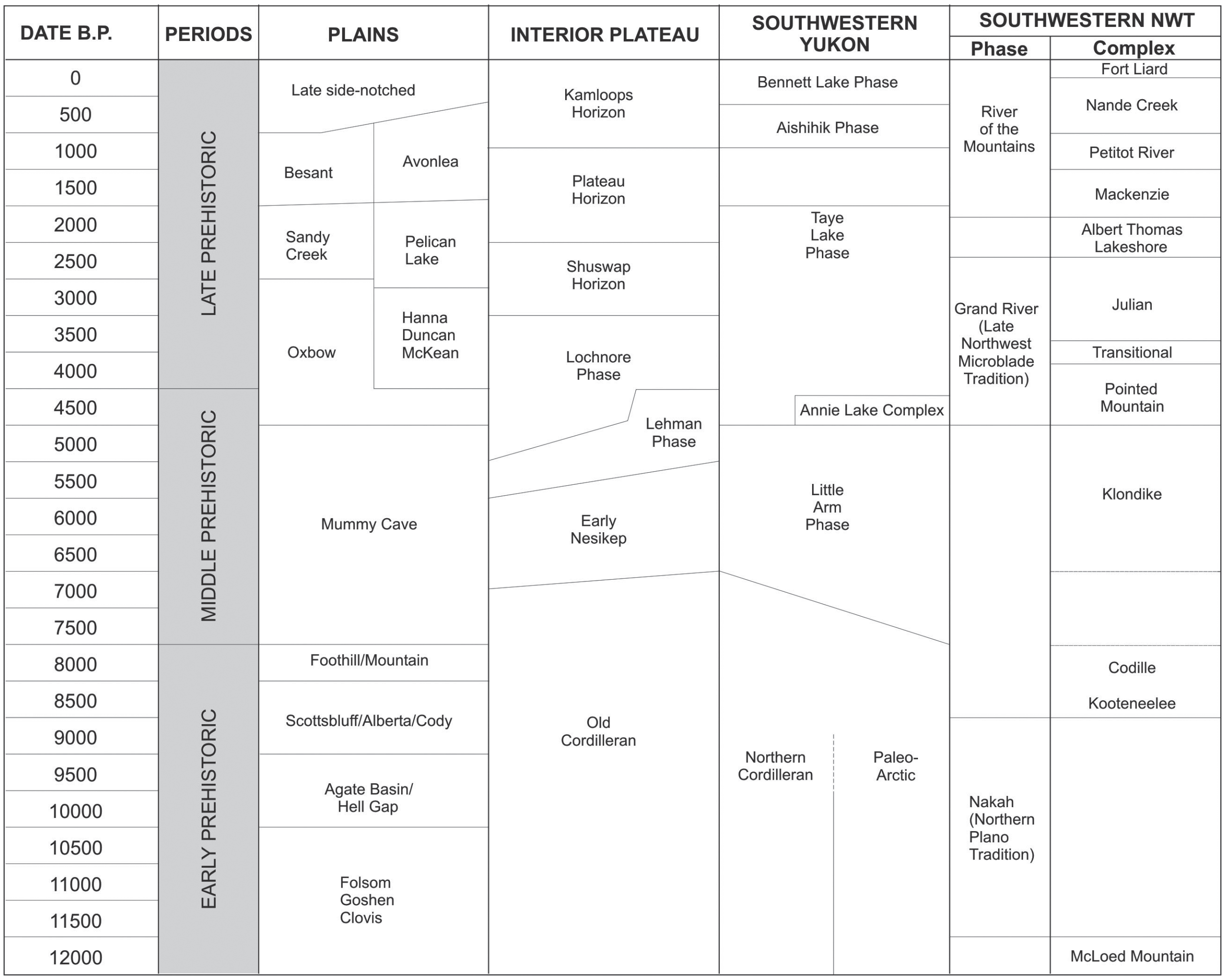

Figure 2. Cultural sequences for regions adjacent to northeastern British Columbia.

Figure 3. The Charlie Lake fluted point (center) and points from the Pink Mountain site (left and upper).

ponent 1 (Subzone IIb) of the site. It is described as "a stubby, lanceolate, extensively resharpened point of black chert measuring 39.3 mm in length" (Fladmark 1996:14). Hafting modification was observed, and as its overall shape was slightly asymmetrical, Fladmark et al. (1988) suggested that the point might have been reworked to function as a knife during its termination phase of use.

The Middle Prehistoric Period

Driver et al. (1996) establish the Middle Prehistoric Period at Charlie Lake Cave from 7000 BP to approximately 4300 BP, again delimited by radiocarbon dates and associated artifacts. The earliest Middle Prehistoric component (Component 4 – Subzone IIIf) dates to approximately 7000 BP (Driver et al. 1996). Handly (1993) attributed a

Table 2. Prehistoric cultural sequence for the Northern Plains (adapted from Vickers 1986).

Period	Time Span	Diagnostic Projectile Points
Prairie/Plains	500/300 BP–Contact	Small side-notched points with straight bases
Avonlea	1500–500/300 BP	Small side-notched points with concave bases
Besant	2000–1150 BP	Medium side-notched points
Pelican Lake	2600–1500 BP	Large corner-notched points
Hanna/Duncan/McKean	4000–2600 BP	Concave-based points Stemmed points with concave bases Corner-removed points
Oxbow	4500–2500 BP	Corner-notched points with concave bases
Mummy Cave	7500–4500 BP	Large side-notched points
Foothill/Mountain Complex	8000–7000 BP	Stemmed lanceolate points Shouldered lanceolate points
Scottsbluff-Alberta-Cody Complex	9000–8000 BP	Lanceolate points with straight-sided stems Lanceolate points with slightly-shouldered stems
Agate Basin–Hell Gap Complex	10,000–9000 BP	Tapering lanceolate points Lanceolate points with straight or convex bases
Foothill/Mountain Complex	8000–7000 BP	Stemmed lanceolate points Shouldered lanceolate points
Scottsbluff-Alberta-Cody Complex	9000–8000 BP	Lanceolate points with straight-sided stems Lanceolate points with slightly-shouldered stems
Agate Basin–Hell Gap Complex	10,000–9000 BP	Tapering lanceolate points Lanceolate points with straight or convex bases
Folsom Complex	11,500–10,000 BP	Small lanceolate points with very pronounced fluting
Goshen Complex		Large to medium lanceolate points with basal-thinning flakes
Clovis Complex		Large lanceolate points with small, distinct fluting

complete, notched point to the Taye Lake Phase of the southwestern Yukon (cf. Workman 1978). Component 5, with no associated radiocarbon dates, is inferred to date between 7000 and 5000 BP (Driver et al. 1996). One recovered projectile point is a side-notched type with shallow side notches and basal thinning. This projectile point is compared to a similar point recovered from the Farrell Creek Site (HaRk–1) (Driver et al. 1996:273). Component 6 (Subzone IIIh) at Charlie Lake Cave is dated to 4500 BP, and yielded a well-made side-notched projectile point—similar to specimens collected from HbRh–17 (Spurling 1980), and from the Karpinsky Site in northern Alberta (Bryan and Conaty 1975). The points are broadly leaf-shaped, with a shallow side-notches and a convex base.

Component 7 (Subzone IVa) yielded three side-notched, concave-based points, and a fragment of a small corner-notched point. This component dates to approximately 4300 BP (Driver et al. 1996:273). The larger points are similar to Oxbow types found on the northern plains and the parkland region. Spurling and Ball (1981) have hypothesized that Oxbow points found in the Peace River district date from 3000 to 2500 BP, while Driver et al. (1996) suggest that the Charlie Lake dates appear to refute this hypothesis. The latter authorities go on to point out that Oxbow-like points are found in the Shuswap Horizon, dating from 4000 to 3000 BP in south-central British Columbia (Richards and Rousseau 1987). Donahue (1977) has identified similar projectile points at Tezli at 1900 BP. and they also appear in Taye Lake Phase and Aishihik Phase components (MacNeish 1960; Workman 1978).

The Late Prehistoric Period

Components 8 to 10 at Charlie Lake Cave are in this period (Driver et al. 1996). Component 8 (Subzone IVb) dates to approximately 1500 BP. Two small projectile points with shallow side notches and

Table 3. Cultural sequences for the southwestern Yukon and southwestern Northwest Territory

Cultural sequence for southwestern Yukon Territory (adapted from Workman 1978; Hare 1995).

Period	Time Span[1]	Diagnostic Projectile Points
Bennett Lake Phase	AD 1800–1900	Small side-notched points Unstemmed points
Aishihik Phase	AD 400–1800	Small side-notched points Kavik-style small stemmed points Notched points (rare) Unstemmed points
Taye Lake Phase	3000/2500 BC–AD 400	Lanceolate points with straight or concave bases Convex-based stemmed points (rare) Notched points
Annie Lake Complex	5100–4800 BP	Deeply concave-based points
Little Arm Phase	8500/7500–3000/2500 BP	Leaf-shaped, concave-based points No notched points
Champagne Phase[2]	8500–7700 BP	Convex-based lanceolate points
Kluane Phase[2]	10,000–8500 BP	Agate Basin-like straight-based lanceolate points

Cultural sequence for southwestern Northwest Territory
(adapted from Stevenson 1981; Millar 1981; Morrison 1984, 1987).

Period	Complex	Time Span[1]	Diagnostic Projectile Points
River of the Mountains Phase	Nande Creek	AD 1000–1800	Small side-notched points Leaf-shaped points with straight bases Single-shouldered points Short straight-stemmed points
	Petitot River	AD 500–1000	
	McKenzie	AD 0–500	
		1000–200 BC	
Grand River Phase	Julian	1800–1000 BC	Wide/shallow side-notched points with straight or concave bases Corner-removed points Shouldered, tapering lanceolate points Round to convex-based lanceolate points
	Transitional	2200–1800 BC	
	Pointed Mountain	4000–1900 BC	
Nakah	Klondike	5000–4000 BC	Large leaf-shaped points Leaf-shaped points with tapered, straight bases Shouldered lanceolate points
		6000–5000 BC	
	Codille	7000–6000 BC	
	Kooteneelee		
		10,000–7000 BC	
	McLeod Mountain	>10,000 BC	No points identified

[1] Calendric dates from Workman (1978); RCYBP dates from Hare (1995).
[2] Hare (1995) combines these phases into his Northern Cordilleran Tradition.

convex bases were recovered from this component, both appearing to have been reworked. Similar specimens have been identified at the Karpinsky Site on the Peace River near Grand Prairie, and are dated to 1100 BP (Bryan and Conaty 1975). Components 9 and 10 at Charlie Lake Cave postdate 1500 BP and have yielded large projectile points with shallow side notches and flat bases. Spurling (1980) reports a similar point from Component 2 at Farrell Creek. Driver et al. (1996) indicate that these points are similar to Taltheilei complex projectile points dating from 1900 to 300 BP (e.g., Noble 1971; Gordon 1996). Three additional projectile points were recovered from Components 9 and 10; two are small side-notched points and one is a small corner-notched point.

Farrell Creek Site (HaRk–1)

Another reasonably well-documented site in northeastern British Columbia with deep, stratified cultural deposits is the Farrell Creek Site (HaRk–1), with a sequence dating to the Middle Prehistoric and Late Prehistoric periods. Originally identified by Richard Daugherty in 1952, the Farrell Creek Site is located at the confluence of Farrell Creek and the Peace River, approximately 57 km west-southwest of Fort St. John. In 1977 and 1978, Brian Spurling (1978, 1980) undertook excavations as part of the Simon Fraser University's heritage studies for the Site C Hydroelectric Project. HaRk–1 is distinguished by deeply stratified cultural deposits with at least four chronologically distinct occupations (Spurling 1980) and three types of projectile points. No diagnostic projectile points were recovered from Component 5 at the site.

Components 3 and 4 are considered to represent Middle Prehistoric Period occupations. One projectile point with a broken base was the only diagnostic artifact from Component 4, the earliest dated Farrell Creek component at 4365 ± 100 BP (WSU 1953) (Spurling 1980:211). Spurling assigned this point to Component 4, due to its lack of stylistic resemblance to the projectile points of Component 3. The Component 4 projectile point is said to resemble a Salmon River Side-notched point of the Mummy Cave Complex (Reeves 1983; Vickers 1986). The radiocarbon date obtained from Component 4 makes the provisional identification of the artifact as a Salmon River side-notched point at least temporally plausible (Spurling 1978:268). Component 3 is the third occupation at Farrell Creek, yielding two Oxbow-like projectile points (5000 to 2500 BP) (Spurling and Ball 1981) (Figure 4). A radiocarbon estimate of 2485 ± 130 (WSU 1952) was obtained from the Oxbow component at the Farrell Creek Site (Spurling 1978:267; Spurling and Ball 1981:89). The age estimate is slightly younger than typical dates for the Oxbow complex, but Spurling and Ball (1981:89; cf. Vickers 1986:68) hypothesize that this may reflect a later adoption of the Oxbow technology by northern residents. As noted previously, the occurrence of Oxbow-like projectile points from Charlie Lake Cave suggest this may not be correct.

Component 2 of the Farrell Creek Site yielded one complete and one relatively complete, side-notched projectile point with slightly concave bases, similar to the Besant style of the Plains, two basal point fragments, and another Besant-like point recovered from the foreshore-face of the site. Spurling reports that three of the Component 2 projectile points bear formal similarities to the Besant Phase, dating from 2000 to 1150 BP (Reeves 1983; Vickers 1986). Radiocarbon dates of 1530 70 (WSU 1950) and 1630 ± 100 (WSU 1951) were obtained from Component 2, which substantiate the Besant attribution. On the Northern Plains the Besant Phase is recognised as the final period of the Late Middle Prehistoric period (Reeves 1983, Vickers 1986). However, coeval projectile points with shallow side-notches and flat bases from Components 9 and 10 at Charlie Lake Cave are claimed to be Taltheilei points (Driver et al. 1996), and do not appear to resemble typical variants of Besant points.

Component 1 from the Farrell Creek Site (Spurling 1980) is based upon the presence of a fragmentary, small side-notched projectile point; suggesting that Component 1 dated between 500 and 1000 BP (Spurling 1980). A radiocarbon date of 2790 ± 95 (DAL 328) was obtained, but dismissed as being too early.

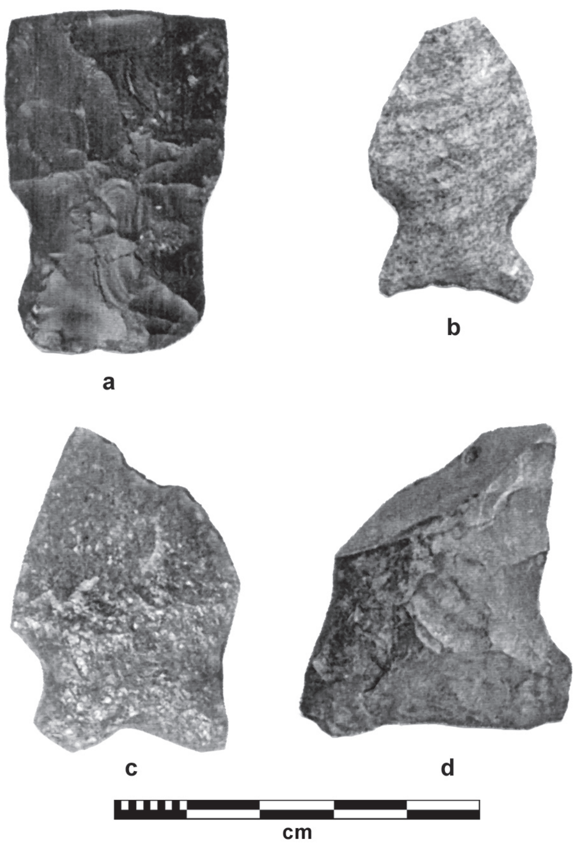

Figure 4. Selected projectile points recovered from HkRe-1 by the Gutah Research Project (courtesy Keary Walde, Heritage North Consulting Ltd.)

Pink Mountain Site (HhRr–1)

The Pink Mountain Site was identified during an archaeological assessment of a proposed pipeline, northwest of the community of Pink Mountain, along the Alaska Highway (Wilson 1986a). Minor test excavations and monitoring of construction (Wilson 1986b) identified several stone tools attributable to Paleoindian complexes. Located on a relatively narrow, high ridge, the Pink Mountain Site was distributed over an area more than 1000 m in length and 150 m in width, and consisted of two and possibly three artifact concentrations (Wilson 1996:29). The artifact assemblage comprises a total of 150 items, including debitage and a microblade core, though several Paleoindian projectile points were identified (Wilson 1990). Wilson (1996) describes two basally-thinned and/or fluted "Clovis" points from undated contexts at the Pink Mountain Site. The two points (Figure 3) are represented by distinctive basal portions only, and Wilson points out that they resemble the early point from Charlie Lake Cave. Wilson goes on to say that that such points may form a regional variant of the classic Clovis style, associated with the Northern Rocky Mountains (Wilson 1996:32). An undated Scottsbluff-like point (Figure 3) was also found at the site. Although this was the first Scottsbluff point recovered from an archaeological site in the region, others had been observed in private collections (e.g., Fladmark 1981).

Callison Site (IeSh-1)

Along the Alaska Highway near the northern border of British Columbia, another site has provided important insights into projectile point chronology for this region. The Callison Site (IeSh–1) is located near the settlement of Toad River, 145 km west of Fort Nelson, and was excavated in the summer of 1957 by Richard S. MacNeish (1960). Based upon the sediment matrix profile, MacNeish assigned the artifact-bearing components from 7000 to 2000 BP, but his artifact analysis places the site between 4000 and 2500 BP. One small, lanceolate projectile point, one side-notched convex-base, and one side-notched concave-base point were recovered, along with eight unclassifiable fragments. Comparing the Callison Site with 54 sites in the southern Yukon and southwestern Northwest Territory, MacNeish (1960:47) assigned the Callison projectile points to his Taye Lake Phase.

Gwillim Lake Site (GiRi–4)

The Gwillim Lake Site (GiRi–4) is another site dating to the Middle Prehistoric Period. The site was excavated by Bruce Ball (1978) during one of the archaeological assessments carried out for the Northeast Coal Development. The site is located between Tumbler Ridge and Chetwynd, on the tip of a small terrace overlooking Gwillim Lake. GiRi–4 is a single component, shallow-deposit site, interpreted by Ball (1978) as a camp for the production of stone tools and preparation of meat and hides. Few diagnostic artifacts were recovered from the Gwillim Lake Site, but two projectile point fragments were attributed to the Oxbox complex (Ball 1978:97). One radiocarbon date of 3427 ± 110 BP (WAT-306) was obtained from the cultural component. Based on this date and the projectile point fragments, Spurling and Ball (1981) assigned the site to the Oxbow complex.

Gutah Project (HkRe–1)

Most recently, the ongoing Gutah Research Project under the direction of Keary Walde and Tara Mather (Heritage North Consulting) has been investigating Holocene environments and human history from 12,000–10,000 years ago to the present. The Gutah Project is located approximately 164 km north of Fort St. John, with a primary focus on HkRe–1, a site identified during a post-development inspection of an oil/gas wellsite (Heritage North Consulting 2004).Excavations at HkRe–1 to date have yielded several projectile points (Figure 4), including a lanceolate point fragment with shallow side notches and slightly convex base, a small side-notched point with a concave base, a fragmentary corner-notched point with a concave base, and the base of two side-notched points. At the time this paper was presented, there were no radiocarbon dates available for these artifacts, but these points resemble Late Prehistoric styles from Fisherman Lake and/or the Taltheilei complex.

Surface Finds from Peace River District

During several years of archaeological research along the Peace River by Simon Fraser University, Knut Fladmark (1981) observed a number of diagnostic projectile points in private collections made around

Fort St. John. Charlie Lake Cave-style basally-thinned and/or fluted points have been collected from surface contexts in the Peace District, and Fladmark (1981) reports examples from the Gerret Site and the Bedier Site near Fort St. John. Fladmark describes three additional projectile points from private collections as "Plainview-like", that is, basally-thinned, concave-based points without distinctive evidence of fluting. Additional projectile points resembling typical Paleoindian styles (e.g., Scottsbluff, Alberta, Eden, and Lerma) have also been reported from Northeast B.C. Fladmark (1981) reported a complete Alberta-style point, recovered by a landowner from a surface exposure 7 km northeast of Fort St. John. Another artifact is the medial section of a Scottsbluff-style point, recovered 6 m below the surface during construction of a bridge over Stoddard Creek. Fladmark (1981) reports that the lithic material from which the latter point was manufactured resembles Knife River Flint, which has a wide distribution throughout the Northern Plains (Wormington and Forbis 1965, Irwin and Wormington 1970). Lastly, small side-notched or corner-notched projectile points are regularly encountered during cultural resource management programs undertaken for proposed oil and gas developments throughout the Peace River District (e.g., Arcas Consulting Archeologists 2002, 2005; Wilson 1986a, 1986b). These points are ubiquitous throughout Brtish Columbia and the Northern Plains in the later period.

Surface Finds from the Rocky Mountain Trench

Between 1996 and 2003, archaeological site surveys in the Rocky Mountain Trench resulted in the discovery of numerous projectile points and other artifacts in the drawdown zone of Finlay Reach, the northern arm of Williston Lake Reservoir impounded by the W.A.C. Bennett Dam. These studies were undertaken at the request of BC Hydro in response to Tsay Keh Dene First Nation concerns about archaeological sites being disturbed by ongoing reservoir operations (Western Heritage Services 1996; Arcas Consulting Archeologists 2004), or as part of a multi-year project to develop a predictive archaeological resource potential model for the Mackenzie Forest District (Western Heritage Services 1998, 2000). All of the investigations focused exclusively on the upper part of the drawdown zone, between 659 and 670 meters above sea level (the minimum pool elevation is 642 m). Thus, while the field surveys examined only the highest part of the pool, they were also concentrating on the oldest landforms in this environment.

The first post-inundation surveys of the Finlay Reach drawdown zone were undertaken by Charles Ramsay and Terry Gibson (Western Heritage Services 1996, 1997, 1998, 2000), and indicated the presence of distinctive Early Prehistoric artifacts. From 1996 to 2000, Western Heritage Services' archaeologists identified a total of 27 sites, all on the eastern side of the reservoir and most of them between Davis River and Shovel Creek (Western Heritage Services 1996, 2000). More recently, Arcas Consulting Archaeologists carried out the first stage of a research project for the Tsay Keh Dene First Nation and BC Hydro, to address several issues concerning archaeological site integrity in the Finlay Reach. During a reconnaissance survey of the drawdown zone in 2003, a total of 66 artifact locations were identified in eight of 10 survey localities (Figure 5) including diagnostic Early, Middle, and Late Prehistoric period projectile points. Point styles attributable to the Paleoindian sequences of the Northern Plains (Figure 6) were found, but others are more typical of Middle and Late Prehistoric styles from the Western Subarctic (Figure 7). At the Bruin Creek locality, a projectile point similar to the Charlie Lake fluted point was found amongst a small lithic surface scatter (Arcas Consulting Archeologists 2004). This specimen (BRUAR3) is a Goshen/Charlie Lake style projectile point (Figure 6a). The point is complete, 53 mm long x 25 mm wide x 6 mm thick, and is made from black chert with a basally-thinned, concave base.

Four potential Agate Basin-style projectile points were identified during the 2003 survey in Finlay Reach (Arcas Consulting Archeologists 2004). The medial section of a large, lanceolate point (Artifact-1) and a complete Agate Basin point with well-defined edge-grinding and a straight base (OSPAR4; Figure 6c) were found in the Ospika Arm locality. Another complete Agate Basin point (or perhaps Hell Gap) (SOMAR1; Figure 6d) was discovered at Van Somer Point in the northern part of Finlay Reach. The fourth specimen (ARBR36; Figure 6b) was identified amongst a high-density artifact scatter at the Bruin Creek locality. This point appears to have been broken during manufacture,

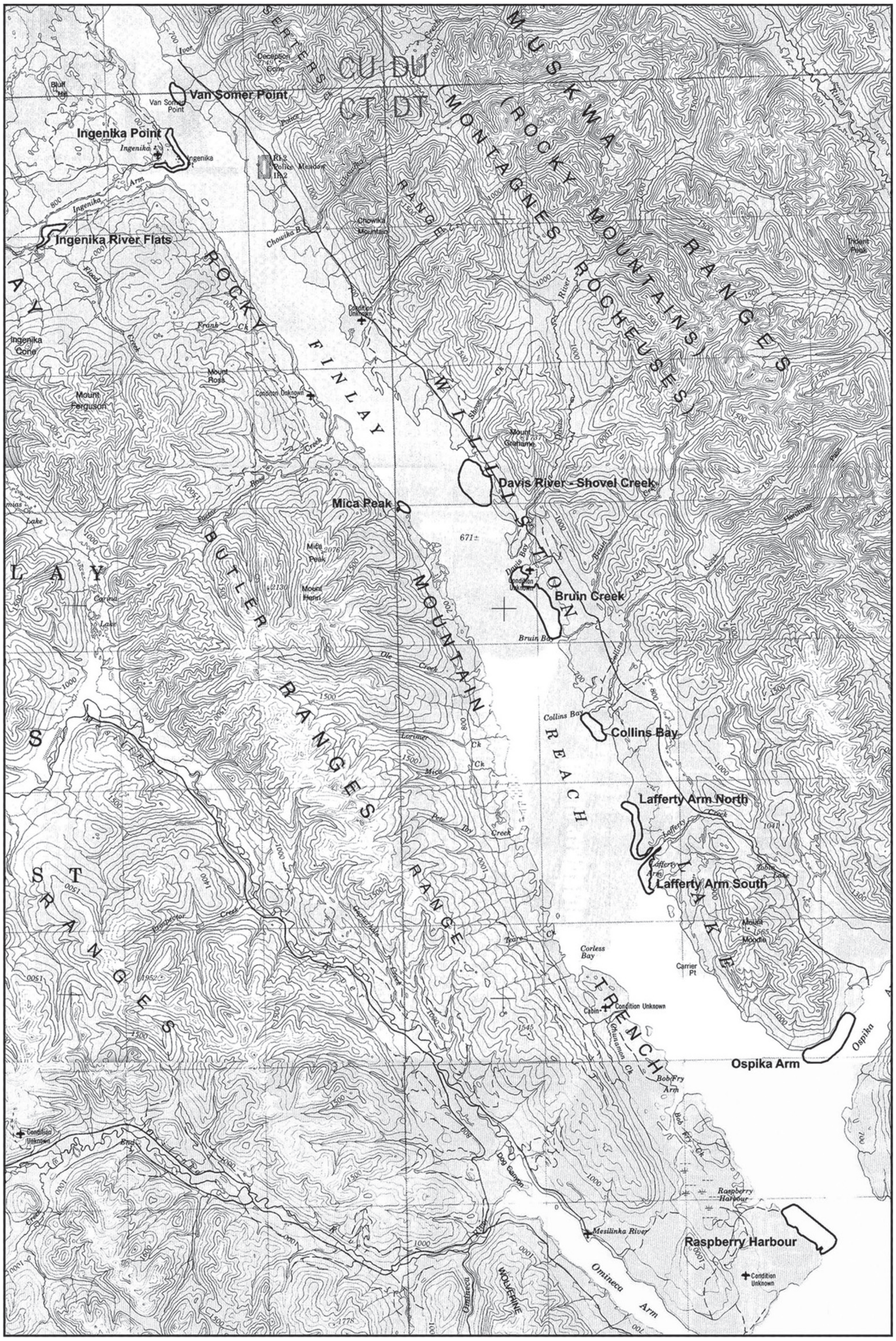

Figure 5. Finlay Reach of Williston showing 2003 Arcas survey localities (NTS 1:250,000).

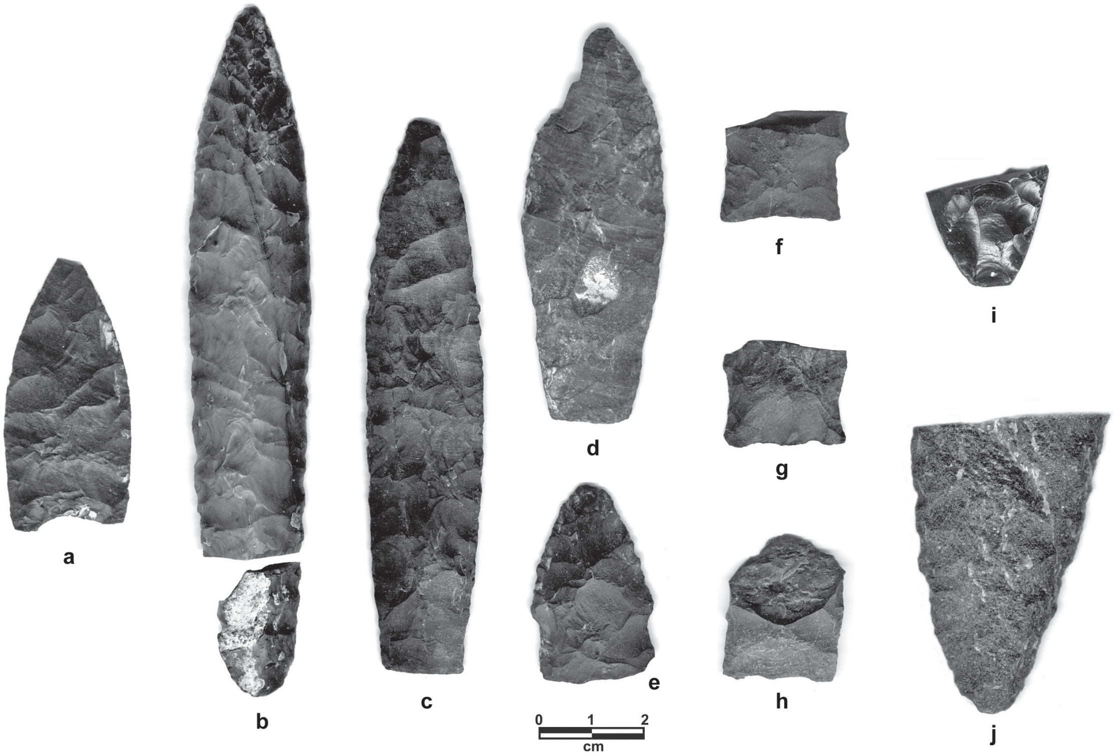

Figure 6. PaleoIndian and/or Northern Cordilleran Points from the Finlay Reach of Williston Reservoir. a: BRUAR3 (Bruin Creek locality); b: ARBR36 (Bruin Creek); c: OSPAR4 (Ospika Arm); d: SOMAR1 (Van Somer Point); e: COLA-1 (Collins Bay); f: LAFF-E (Lafferty South); g: ARLN04 (Lafferty North); h: DAA30 (Shovel Creek); i: MICA14 (Mica Peak); j: MICAR4 (Mica Peak).

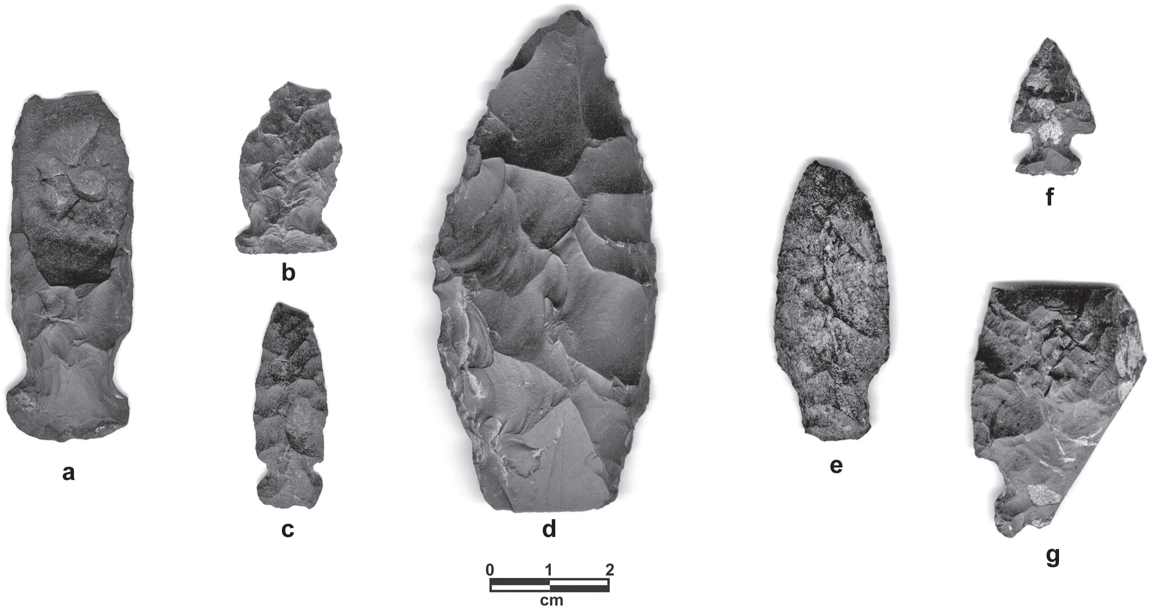

Figure 7. Stemmed and Notched projectile points from the Finlay Reach of Williston Reservoir. a: ARBRU30; b: ARBRU39; c: ARBRU28; d: ARBRU3; e: ARBRU2; f: DAA26; g: ARBRU40. All are from the Bruin Creek locality except for DAA26, from the Shovel Creek locality.

but the fragments were refitted and establish that it had a convex base. At least two additional Agate Basin-style projectile points were observed in private collections owned by members of the Tsay Keh Dene community. Agate Basin points are known to have been "mimicked" by Middle Prehistoric Period makers of lanceolate projectile points (cf. Clark 1983; Wright 1995). Further, Hare (1995) regards lanceolate, convex- or straight-based points to also be characteristic of the Northern Cordilleran Tradition.

Scottsbluff-like projectile point bases (LAFF-E, ARLN04, DAA30; Figure 6f, 6g, 6h) were found at the Lafferty South, Lafferty North, and Shovel Creek localities, and a stemmed projectile point (COLA-1; Figure 6e) from Collins Bay may be a resharpened/reworked Scottsbluff point (Arcas Consulting Archeologists 2004). A unique artifact (LAFF-E) from the Lafferty South locality was identified as a fragmentary Cody Knife (Michael Wilson, pers. comm. March 2005), though this has been disputed (Knut Fladmark and B.O.K. Reeves, pers. comms. May 2005). LAFF-E is 21 mm long x 26 mm wide x 6 mm thick, and has a concave, stemmed base with one pronounced shoulder. No Alberta or Foothills-Mountain-style points were discovered during the surveys by Western Heritage Services or Arcas Consulting Archeologists, but characteristic specimens are present in private collections from Finlay Reach at Tsay Keh Village (Arcas Consulting Archeologists 2004).

Leaf-shaped projectile points were encountered at three localities during the 2003 survey. MICAR14 and MICAR4 (Figure 6i, 6j) are foliate point bases, the latter manufactured from obsidian with an intensively-ground margin. Both were found at the Mica Peak locality on the western side of Finlay Reach, where two unclassifiable point tips were also observed. At the Bruin Creek locality on the eastern side of the reservoir, ARBRU6 (not collected) is the medial portion of a leaf-shaped point just missing its tip and base. Leaf-shaped points are not characteristic of typical PaleoIndian styles, but are frequently associated with Early Prehistoric Period (and later) assemblages from the Interior Plateau of the Pacific Northwest (e.g., Stryd and Rousseau 1996) and the Western Subarctic (e.g., Clark 1981). Large foliate bifaces observed at the Lafferty South and Bruin Creek localities, and seen in private collections, are more likely to be knives than points.

Although Alberta points and some late Paleoindian styles (e.g., Foothills-Mountain Complex) exhibit pronounced stems (Arcas Consulting Archeologists 2004:Figure 3–8), this attribute also distinguishes Middle Prehistoric Period projectile points, along with side- or corner-notching. The only stemmed points identified in Finlay Reach during the 2003 survey are ARBRU31 and ARBRU2 (Figure 6d, 6e) from the Bruin Creek locality. The former is a large, fairly thick artifact with a distinctive, wedge-shaped tapering stem that may be of Northern Cordilleran affinities. ARBRU2 is a somewhat nondescript point with a well-defined, straight-sided stem which could be attributable to some local equivalent of the Mackenzie Complex at Fisherman Lake (Millar 1981).

Notched points were most common at the Bruin Creek locality in Finlay Reach, where two side-notched, lanceolate points (ARBRU30, ARBRU28; Figure 7a, 7c), a broad side-notched point with a straight base (ARBRU39; Figure 7b), a fragmentary corner-notched point with a concave base (ARBRU40; Figure 7g), and a fragment of a small lanceolate point with a deeply-concave base (ARBR50/1; not collected) were observed amongst high-density artifact scatters associated with calcined bone fragments and patches of fire-reddened soil (Arcas Consulting Archeologists 2004). Of these, ARBRU28 is quite small and may be of Late Prehistoric attribution, though resembling no reported style known to us. ARBRU30 is the most interesting of this assemblage, exhibiting broad, shallow flaking, wide side-notches, and a pronounced lobate stem, closely resembling the Northern Archaic styles described by Gotthardt (1990:Plate 6.3), and sometimes referred to as "Kamut Points". ARBRU39 and ARBRU40 appear to represent typical examples of Pointed Mountain and/or Julian Complex points (Morrison 1987; Millar 1981). Lastly, ARBR50/1 is half of a longitudinally-fractured small point with a deeply-concave base, and may be equivalent to the Annie Lake Complex of the southern Yukon (Hare 1995).

One characteristic Late Prehistoric Period projectile point was observed during the 2003 survey in Finlay Reach. DAA26 (Figure 7f) was recovered from the Shovel Creek locality on the eastern side of the reservoir (Arcas Consulting Archeologists 2004). This artifact has a distinctly concave base, and the side-notches are quite pronounced with prominent tangs. No contemporary points from the Northern Plains (e.g., Pelican Lake) or the Interior Plateau (e.g., Kamloops) culture areas resemble this type, but the Julian Complex of Fisherman Lake (Morrison 1987) and the Aishihik and Bennett Lake Phases of southwestern Yukon (Workman 1978) have better matches.

A Proposed Projectile Point Sequence for Northeastern British Columbia

Figure 8 is a synoptic chart illustrating the proposed sequence of projectile points in the Peace River District and Rocky Mountain Trench. The paleoenvironmental data from northeastern British Columbia. indicates that a habitable environment had developed in this region by 11,600 BP (White 1983; Churcher and Wilson 1979). Human occupation probably followed herds of game animals (e.g., extinct species of bison) that entered the region from the Plains in search of new forage. These people represented the Paleoindian tradition, found throughout North America and marked by a number of distinctive traits, most notably a well-defined sequence of projectile point types (Table 2). Archaeologists have tended to stereotype Paleoindian people as exclusive hunters of big game, including giant species of bison, native horses, mammoths, and mastodons, all of which were contemporaries (e.g., Frison 1991). However, the classic Pleistocene mega-fauna were nearly all extinct by about 10,000 BP (Vickers 1986), so later Paleoindian hunters had to make do with smaller ungulate prey (e.g., bison, caribou, bighorn sheep) for at least several thousand years (Frison 1991).

Paleoindian points appear to be present throughout the Peace River drainage and Rocky Mountain Trench components of our study area. The Paleoindian points identified so far stylistically resemble those from the Great Plains and include points resembling Goshen, Agate Basin, Scottsbluff, and Alberta. These points suggest origins far to the south, presumably carried by early peoples following the retreating ice sheets into the Peace River drainage Charlie Lake/Goshen/Basally-Thinned triangular projectile points (11,000–10,000 BP) are felt to be late expressions of the Fluted Point Tradition (Carlson 1983). These are names used by different authorities (Gryba 2001; Frison 1991; Vickers 1986) to describe the same style of Paleoindian projectile point. This point type is intermediate in age between Clovis and Folsom, and appears to survive more recently in time than either of those point types (Frison 1991; 1996). The general shape of these points is reminiscent of a small Clovis point without a well-defined flute scar—instead, one or more small, basal-thinning scars are present on one or both faces of the artifact (Frison 1991, 1996). Most of these points that have been found in Canada are distinctly smaller than classic Clovis points. This point style is more abundant in western Canada than either Clovis or Folsom, with numerous specimens reported from Saskatchewan and Alberta, as well as the Peace River District of B.C. (Gryba 2001; Wilson 1989). Unlike either Folsom or Clovis point styles, Charlie Lake/Goshen points are clearly associated with late Pleistocene-early Holocene occupation of montane environments, including the "high plains" of western Wyoming (Frison 1991, 1996), the Rocky Mountain foothills (Gryba 1983) and the upper Bow River valley in Alberta (Fedje, et al. 1995; Fedje 1996). Furthermore, several points of this style have been found in central and northern Alaska (Clark and Clark 1983).

Northern Cordilleran points appear to be present in the Rocky Mountain Trench, based on the presence of leaf-shaped points at Mica Peak locality and elsewhere, as well as a putative, Denali-style microblade core (COLA-3) from the Collins Bay locality and microblades observed at the Shovel Creek locality and in a private collection from the Ospika Arm (Arcas Consulting Archeologists 2004). However, microblades are also a characteristic feature of the Middle Prehistoric Pointed Mountain Complex at Fisherman Lake and elsewhere (Millar 1981). Lastly, distinctive Northern Cordilleran projectile points so far do not appear to be present in the southern Peace River District.

Middle Prehistoric points in Peace River District appear to represent Plains types (Mummy Cave, Oxbow, Hanna). Middle Prehistoric points in the Rocky Mountain Trench more closely resemble Northern Archaic styles, such as the Kamut like point from Bruin Creek. However, Plains-style Middle Prehistoric points may also be present in the Trench, as a McKean point is reported from Davis River (Western Heritage Services 2000).

Late Prehistoric points in the Peace River District largely appear to parallel the Plains se-

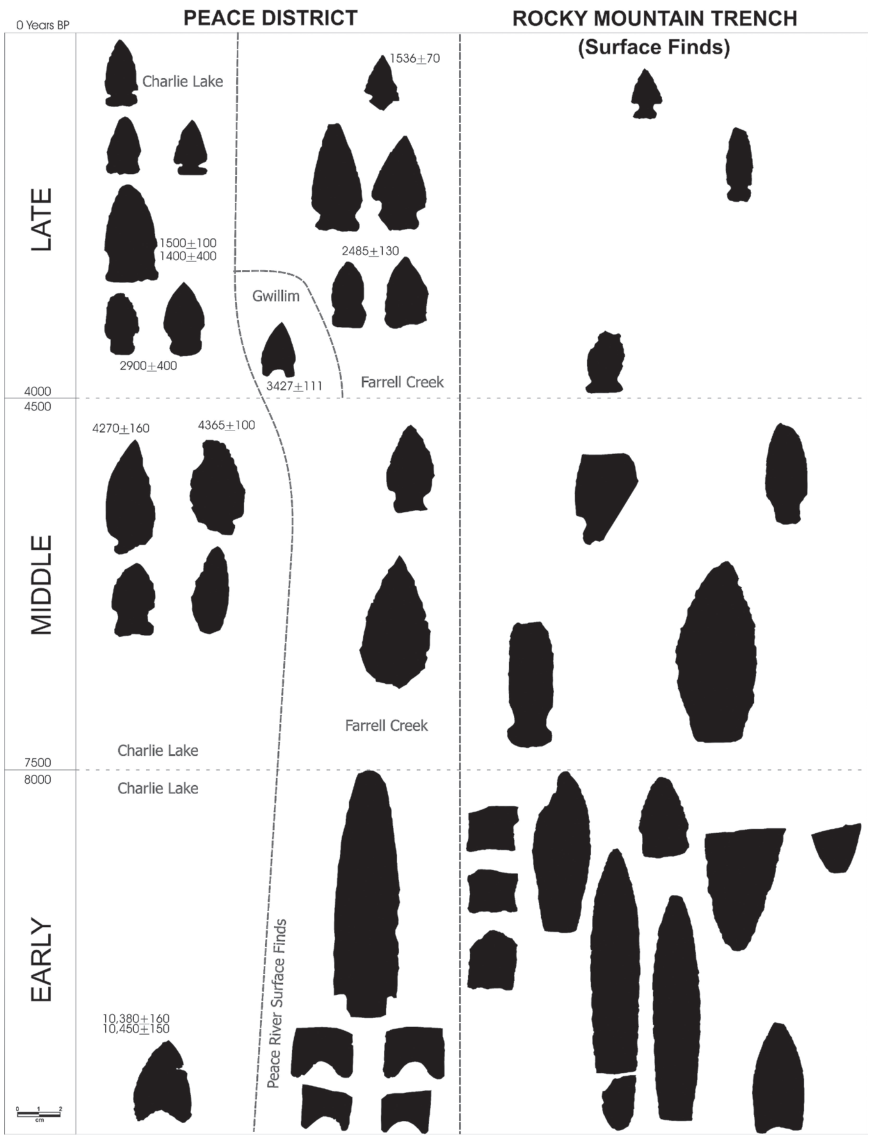

Figure 8. The proposed sequence of point types from surface sites in the Rocky Mountain Trench compared with the proposed Sequence of Points from the Peace River District.

quence, but it is suggested here that there may be a north–south split, with more Plains styles in the southern portion of the region and Fisherman Lake/Aishihik-Kluane or even Taltheilei artifacts in the northern portion of the Peace River District. Thus, the Gutah points illustrated in Figure 3 may have early and middle Taltheilei affinities (Heritage North Consulting 2004), while Charlie Lake Cave has one point also claimed to represent a Taltheilei style (Driver et al. 1996). Late Period points in the Rocky Mountain Trench do not appear to resemble either Plains or Plateau styles, but the sample is miniscule—one small side-notched point recovered from a surface context at Shovel Creek and another seen in a private collection at Tsey Key Village. These points more closely resemble specimens from the southern Yukon than neighbouring regions to the east and southwest.

The Rocky Mountain Trench affords direct, easily-traversed access to and from the southern Yukon. Furthermore, the Peace River is the only water-level route through the Northern Rocky Mountains. Paleoenvironments in the Trench appear to have been similar to Peace River parklands during the early Holocene. With the river providing direct access from the Northern Plains to the Rocky Mountain Trench for the earliest inhabitants of the region, it is reasonable to assume that typical PaleoIndian cultures would prevail in this part of the region as the ice retreated. In the later PaleoIndian period, different groups of early peoples ("Northern Cordilleran") may have migrated down the Rocky

Mountain Trench from the southern Yukon. By the Middle Prehistoric Period, distinctive northern and eastern influences appear within the Peace River drainage, and there may also have been influences from the north-central interior of B.C. As forests expanded in the Peace River District and Rocky Mountain Trench in the later Holocene, populations of grassland-dwelling animals diminished or scattered, forcing human populations from these lands to follow subsidiary drainages and expand more deeply into less-productive muskeg environments. The significance of the Rocky Mountain Trench in the prehistory of northeastern British Columbia is evidenced by the abundance of obsidian in Finlay Reach, where large worked obsidian cores were seen in private collections at Tsay Keh Village and artifacts made of the same material were observed at various localities (Arcas Consulting Archaeologists 2004). X-ray fluorescence analysis of two obsidian artifacts from the Mica Peak locality were determined to originate from the Mt. Edziza source in northwestern British Columbia (James 2003). These findings emphasize the importance of the Rocky Mountain Trench as a route for long-distance trading networks in the past. It is to be hoped that the current pattern of development-driven cultural resource management studies may yet result in the discovery of additional sites providing stratified cultural deposits, radiocarbon dates, and of course, diagnostic projectile points.

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The professional opinions expressed in this report are those of the authors, and not necessarily those of any individuals, groups, or institutions involved in the study. We are solely responsible for the content of this report, including any errors, omissions, or shortcomings.

Dedication. To the Pathfinders of NE British Columbia Archaeology: Charles Borden, Knut Fladmark, Robert McGhee, Richard S. MacNeish, Donald H. Mitchell, and Richard Daugherty

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Chapter 18

The Yukon Projectile Point Database

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Introduction

The Yukon Projectile Point Database Project was initiated in 2000 in an effort to make available for study information on all projectile points from the Yukon that are held in public repositories in Canada. The goal is to compile digital photographs of Yukon projectile points with information on point location, context, dates and associations into a database that would be available on the web. Nearly 500 points have been entered in the database, representing, the authors believe, the majority of Yukon projectile points collected to date.

The development of the Projectile Point database has brought about renewed reflection on questions of projectile point typology and chronology for the Yukon. In many Yukon contexts, efforts at chronological ordering of points are hampered by poor organic preservation, uncertain associations, and a lack of good stratigraphic context for excavated points. Progress in refining point typologies and chronologies has been exceedingly modest and Workman's point classification (1978) for Yukon remains the standard reference for central and southern Yukon.

However, in recent years a sample of projectile points still associated with their wooden spear shafts or foreshafts has been recovered from melting alpine ice patches in southwestern Yukon. The exceptional preservation of ancient weaponry permits the direct dating of a variety of point forms, and has provided some new insights into point types and chronology in the region.

The purpose of this paper is two-fold—to present a brief overview of the Yukon Projectile Point Database and to provide an update on point typologies in the Yukon. The data suggest that in many instances, the variation in projectile point types may relate to factors other than presumed cultural affiliation, time period or constraints of weapon design. Individual stylistic choice or skill and point breakage and reworking likely play a substantial role in the variation we see in point forms in the prehistoric record.

Construction of the Database

The Yukon Projectile Point Database arose from the desire to have a comprehensive digital image collection of projectile points from the Yukon available via the World Wide Web. This objective was judged readily achievable because the Yukon has seen a limited amount of archaeological research and the majority of archaeological collections are held in two principal repositories: the Canadian Museum of Civilization (Archaeological Survey of Canada) and the Yukon Government, Heritage Resources Unit. A small collection of archaeological materials from work by Parks Canada in the National Parks (Kluane, Vuntut and Ivvavik) is held by Cultural Resource Services, Parks Canada, Winnipeg.

At the time of writing, there are approximately 500 projectile point images in the Yukon Projectile Point Database, which is believed to represent the majority of points collected in the territory (although several large, private collections are known to exist). The records comprise both complete and fragmentary projectiles and where there is ambiguity as to the function of a biface, it is included in the dataset.

Thirteen fields were used to describe morphology, raw material, available dates, provenience, and published and unpublished references for each projectile (Figure 1).

The structure and content of the data fields is still evolving. The inclusion of separate fields for base morphology and blade morphology, for example, is being considered, similar to Workman's (1978) approach for some of his point types. It is anticipated that site location information will be a password protected field on the web version of the database.

In the course of populating the Yukon Projectile Points Database, the opportunity presented itself to review and potentially update Yukon point types and their chronologies. To this end, a subset of the database was created focusing on complete or near complete points. To narrow the focus further, arrow points, which occur only in the Late Prehistoric period in the Yukon archaeological record, were excluded from the present review (see Hare et al. 2004). In total the sample of Yukon dart or spear points forming the basis for the current typological exercise number about 216. Because the cultural historical sequence and projectile point typologies for the southwestern Yukon have been the subject of the greatest amount of study and investigation, this region will be the principal focus of the update of point typology, commencing with a review of the previous efforts of MacNeish (1964) and Workman (1978).

Southwest Yukon Projectile Point Typology—Historical Overview

Our grasp of the culture history of the Yukon is still fairly tentative. Dateable, stratified sites are rare and most sites contain few temporally diagnostic artifacts, requiring researchers to rely heavily on comparative typology of projectile points for the temporal placement of their sites (Greer 1993:26). The regional culture history developed for southwestern Yukon by Workman (1978) nearly 30 years ago, which built on the work of MacNeish (1964) a decade and a half before, remains the principal framework for interpreting much of the prehistoric record of southern and central Yukon.

MacNeish's Point Typology

MacNeish's (1964) pioneering efforts established the first projectile point typologies within a culture-historical sequence for southwestern Yukon spanning the Holocene.

MacNeish's projectile classification attracted some unfavourable comments due to the number of point types that he identified and their presumed, far-reaching and largely unsubstantiated cultural connections (Irving 1963). MacNeish developed his typology from points recovered from 50 sites located in southwestern and central Yukon and one from northern British Columbia. From 305 whole or fragmented points, MacNeish classified 196

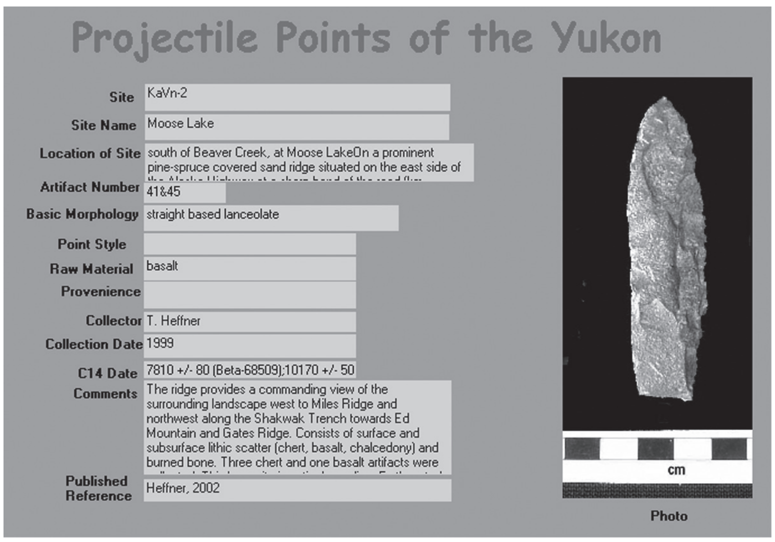

Figure 1. Representative entry from Yukon Projectile Point database.

points into a total of 19 chipped-stone projectile point types (MacNeish 1964:391). One hundred and twenty-eight points were from excavated context, comprising 28 components. Table 1 summarizes the 19 projectile point types, their descriptions and counts (excluding copper, bone and antler projectiles). MacNeish assigned names reflecting presumed southern connections for 11 of the 19 types developed on the basis of "similar attribute clusters and similar temporal significance". He admitted that this was somewhat reckless and suggested that the term "like" be used as a suffix for his northern Lerma, Agate Basin, Milnesand, Plainview, Morhriss, Refugio, Anderson, Besant, Catan, Prairie and Fresno points.

Within MacNeish's 19 point types, the Agate Basin-like point is the most abundant class with 51 specimens, followed by the Milnesand-like point with 19. The overall breakdown is shown in Table 1. This table reinforces the perception that there was a great variety of Yukon point types, with few types being very abundant. In fact some point "types" are represented only by a single specimen.

Table 1 shows that MacNeish's Agate Basin-like and Milnesand type (morphologically quite similar), are present through 6000 years of the Holocene. An even longer duration is evident for other concave based, lanceolate points, such as his Plainview point, which occurs from 8500 BP into the historic era. Notched point types date from the mid-Holocene and occur together with a variety of lanceolate forms and some stemmed points. After 1250 BP, arrow points, both tanged and notched, appear alongside larger notched and unnotched lanceolate points. Based on the observed chronology of the point styles, MacNeish (1964:391) concluded that in the prehistoric record in southwest Yukon, large unnotched points precede large notched and stemmed points, followed by small arrow points.

Workman's Point Typologies

Using many of MacNeish's collections along with his own excavated assemblages, Workman (1978) developed a point typology for the archaeological record of southwest Yukon based primarily on the

Table 1. Point types and frequency according to MacNeish's (1964) cultural phases.

	Phase								
	10,000 8500	**7500**	**6000**		**4000**	**1250**	**0 BP**		
Point Type	**Kluane**	**Champagne**	**Little Arm**	**Gladstone**	**Taye Lake**	**Aishihik**	**Bennett**	**Others**	**Total**
Lerma	2		1						3
Pelly		6							6
Agate Basin		24	13	4	5			5	51
Milnesand		6	7	2	2			2	19
Minto			1						1
Plainview		1	3		1		1		6
Morhiss				9	5				14
Refugio				2	11				13
Anderson				2	6	3			11
Besant				7	3	1			11
Destruction				1	1				2
Lockhart				3	4				7
Taye				1	1				2
Whitehorse					8	1			9
Aishihik						2			2
Stott							7		7
Catan						1	5		6
Prairie							4	1	5
Fresno							1		1
Total	**2**	**37**	**25**	**31**	**47**	**8**	**18**	**8**	**176**

type of haft element (stemmed, unstemmed [stemless] or notched) and secondarily overall shape and/or size, and/or features of the haft element, such as base morphology or the presence of multiple notches. Workman's total sample of complete and fragmentary projectile points numbered 97, derived from 35 distinct contexts or provenience units (1978:197). From the sample, Workman defined a total of 13 descriptive types, for which the distribution and chronology are summarized in Table 2.

In Workman's chronology, the P1 (and the cruder P2) convex-based lanceolates are associated with the earliest Little Arm occupations, possibly with Northern Plano or Cordilleran influences (1978:427). The thick biconvex, parallel-sided, straight-based P6 type occurs in pre-ash context but is of unknown antiquity (1978:210). Excluding the small arrows (P5, PN5, PS1, PS2) the remaining six types of stone projectiles date between 4500 BP and 1200 BP, associated with the Taye Lake phase of southwestern Yukon. Narrower temporal ranges are proposed for the PN3 type, which seems to be associated with the early Taye Lake phase, dating between 3000 and 4000 BP (1978:215) and PN4, which is dated to about 3000 BP at Chimi. P3, the Whitehorse point, P4, and possibly PN1, are all late Taye Lake phase, ca. 2000–1200 BP (1978:209).

Workman expressed the hope that his reconstruction of the prehistory of southwest Yukon would be improved with additional fieldwork, better chronologies and a greatly refined typology (1978:430). The following reviews some of the recent Yukon research, and particularly the research in the southwest Yukon ice patches, in the context of developing the Yukon Projectiles Point database and from this basis presents our tentative efforts to organize and interpret point types in the prehistoric record.

Yukon Projectile Point Database—A Cautionary Tale for Yukon Projectile Point Typologies

The sample of complete and/or diagnostic dart points in the Yukon Projectile Points database numbers 216. Many of the points studied by MacNeish and Workman to construct their typologies are included in the present database. Within the database is also a subset of stone spear points which derive from recent research in alpine ice patches. It is this sample which is felt to hold promise for providing valuable insights into the meaning of variability in projectile point styles.

Since 1997, approximately 185 fragmentary and occasionally complete hunting implements

Table 2. Point types and frequency according Workman's (1978) cultural phases.

Years BP	**7500+**	**4500**	**1200**		
Point Type	**Little Arm**	**Taye Lake**	**Aishihik/ Bennett**	**Other/ Unknown**	**Total**
P1: Thin convex-based points	2			2	4
P2: Crude, ground convex-based points	2?			1	3
P3: Whitehorse points—broad lanceolate points with subconvex base		5			5
P4: Straight-based lanceolate points		2			2
P5: Teardrop points		1?	5		6
P-6: Thick, biconvex, straight-edged points		2?			2
PN1: Large multi-notched points		2	1		3
PN2: Small, convex-bladed multi-notched points		2			2
PN3: Shallow-notched, weakly shouldered points		4			4
PN4: Notched barbed points		3			3
PN5: Diminutive side-notched points			3		3
PS1: Elongate-stem shouldered points			2		2
PS2: Kavik points			2		2
Total	**4**	**21**	**13**	**3**	**41**

have been recovered from 23 alpine ice patch sites in southwestern Yukon. The collection comprises principally whole or broken spear and arrow shafts, foreshafts, sinew and feathers, and projectile points, occasionally still hafted to the shafts. Current interpretations are that hunters were attracted to these alpine sites by the presence of caribou, which tend in summer to congregate on snow covered slopes at high elevations seeking relief from insects and high temperatures. Darts and arrows lost in the soft snow in the course of the hunt are today melting out of these alpine nivation basins (Hare et al. 2004).

Figure 2 shows the sample (N = 21) of stone projectile points recovered from alpine ice patches in southwest Yukon. Based on dates obtained on associated wooden dart shafts, the points probably range in age from about 3000 to 5500 years ago—within the early Taye Lake phase of the Northern Archaic tradition. All were recovered within a relatively delimited geographic area in southwest Yukon, broadly similar in size to the historic distribution of Southern Tutchone people. All of the dart points are presumed to have been used for hunting caribou. All dart points were used to arm throwing spears (spears propelled by a throwing board or atlatl). And finally, all dart points, regardless of base configuration (notched, stemmed or unstemmed), appear to have been hafted into "U" shaped slots on the spear shaft/foreshaft and secured with sinew and very likely some form of adhesive such as pitch. Figure 3 shows a selection of such "U" shaped slots. To date, 14 distal dart shafts/foreshafts have been recovered from Yukon ice patches, ranging in age from 1250 BP to 5000 BP (Hare et al. 2004). All of

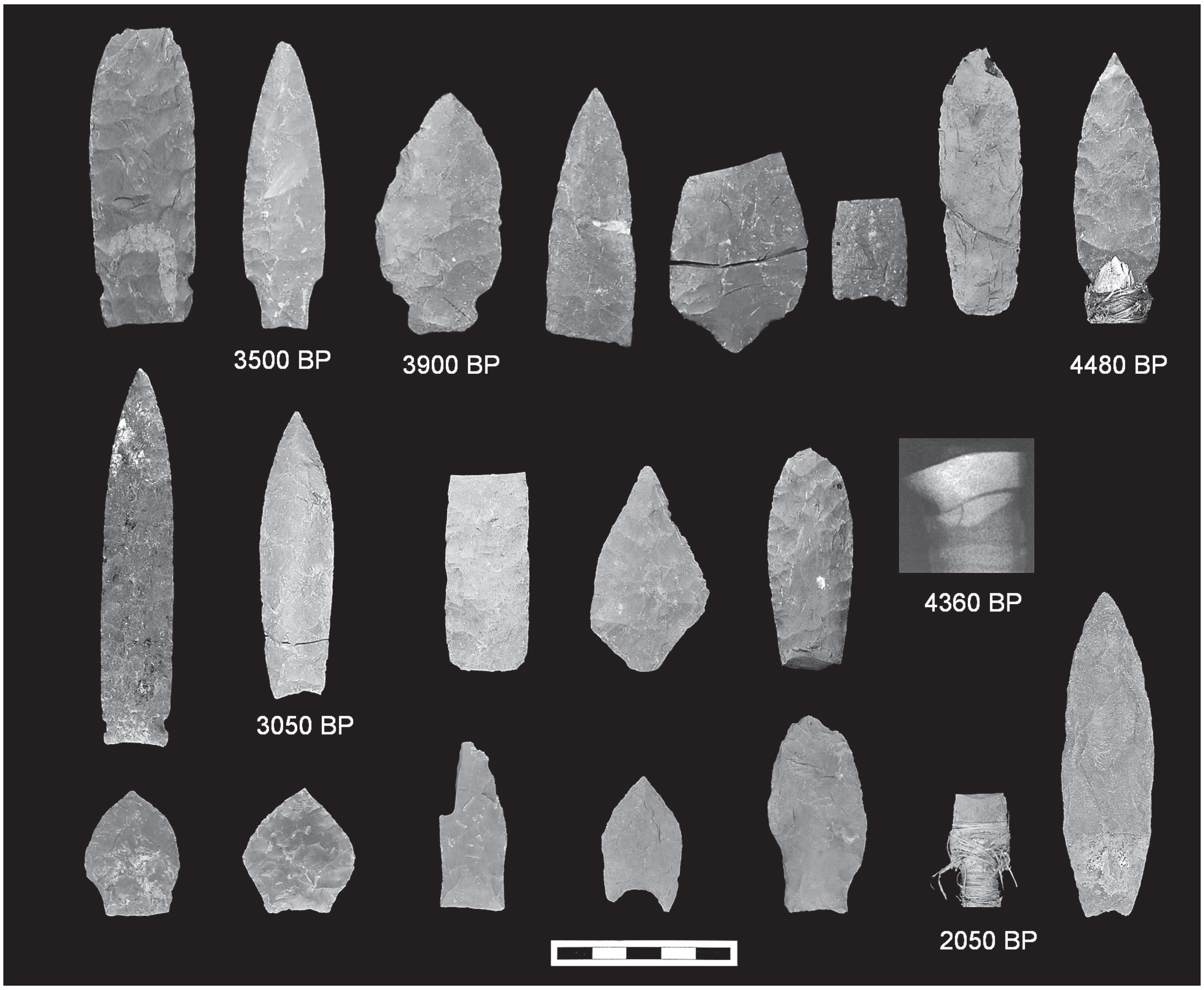

Figure 2. Sample of stone dart points recovered in southwest Yukon alpine ice patches. Dates are for points directly dated from associated shafts.

Figure 3. Haft elements of representative dart shafts and foreshafts from southwest Yukon ice patch sites dated from associated shafts.

these but the most recent were constructed with a "U" shaped slot.

Yet despite the common activity, common hafting technology and membership in the same cultural/technological tradition, at least eight morphological types can be identified in the sample of 20 projectile points from the southwest Yukon ice patches. A total of four point types can be classed with Workman's (1978) unstemmed and notched point types P3, P4; PN3 and PN4. Also represented in the sample are four seemingly distinct new type: a slightly stemmed pentagonal or cordiform type (N = 2); small tang points (N = 3); stemmed points (N = 2); and a reworked, highly convex-based lanceolate point which could be classed with the Annie Lake point type (Greer 1993). This subset of stone spear points from the Ice Patch collections indicates that a remarkable variety of point styles was being used by ancient hunters operating within similar spatial, chronological and technological spheres.

Furthermore, it should be noted that the variability seen in the stone spear point sample is mirrored in the sample of unilaterally barbed antler arrow points from Yukon ice patches (Figure 4). As with the stone spears, these all are part of a single culture-historic tradition, in this case Workman's Aishihik phase, all arrows result from the same harvest activity, the hafting technology is the same for all, and all antler arrows were recovered in the same geographic area. While broadly similar, each antler arrow point is, in fact, stylistically unique: variation is the rule rather than the exception.

In terms of further refining trait lists for Taye Lake Phase technology, the stone spear point sample from the southwest Yukon alpine ice patches suggests we should be recognizing at least four additional point types as diagnostics of Taye Lake (slightly stemmed pentagonal points; stemmed points, small tang points and Annie Lake points), bringing the total number of types within the phase to 13. With even better chronological control it may be possible to see a succession in point styles similar to that described by Anderson (1968) for Northern Archaic at Onion Portage, but with the evidence at hand, it is equally likely that the variation is due to factors such as individual stylistic preference, skill, or the life history of a point in terms of breakage, reworking and reuse.

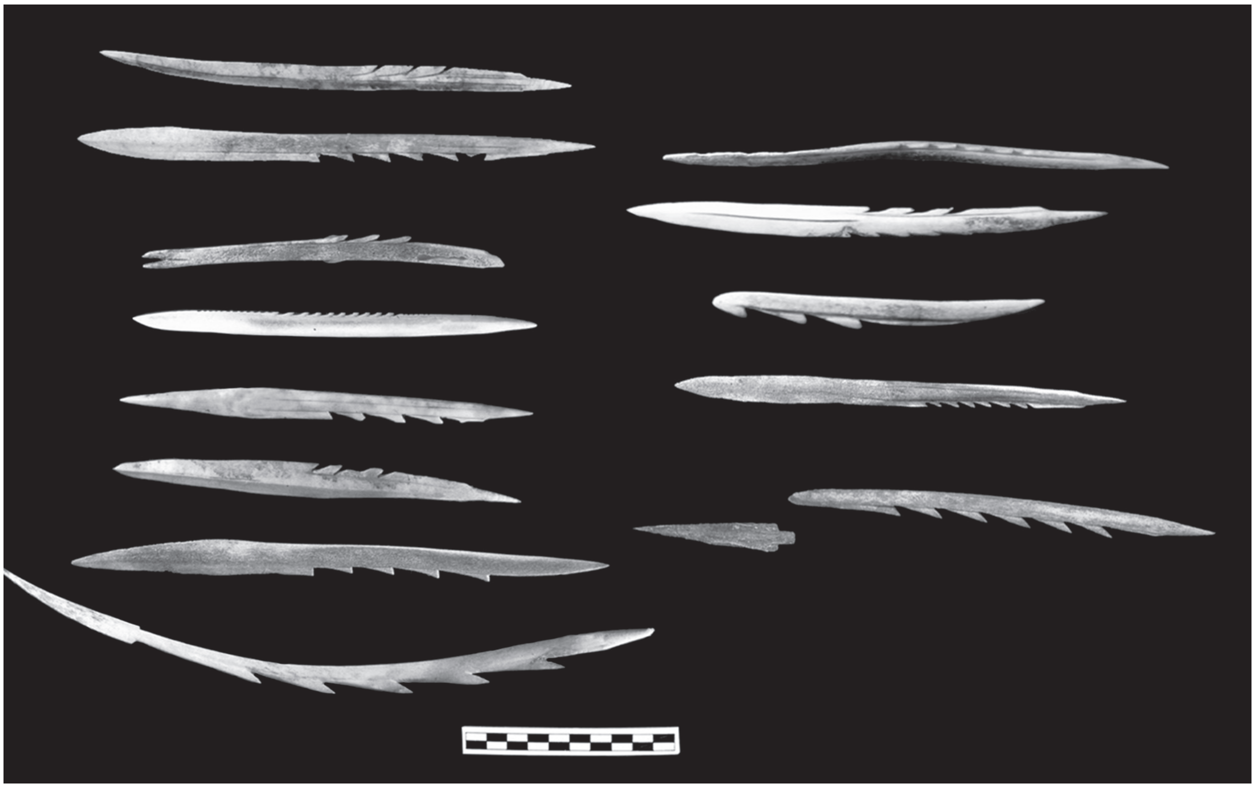

Figure 4. Sample of antler points from southwest Yukon alpine ice patches.

All this being said, in the course of establishing the Yukon Projectile Points database, a number of point types have been identified which may be proposed to have broader regional (cultural/ethnic) significance, or may be temporally sensitive. The following constitutes the very tentative update of Yukon projectile points typology, with all the aforementioned qualifications and conditions.

Some Provisional New "Types" for Yukon Culture History

Within the sample of points in the Yukon Projectile Points database, point "types" or classes were identified, based principally on hafting element or basal morphology, and shape of the blade element (point of maximum width: oblanceolate, lanceolate, leaf-shaped, parallel), as much as possible building from the typology developed by Workman (1978) (see Figure 5). During the process of identifying morphological variability within the Yukon database, it was evident that variability indeed is one of the primary characteristics of the collection. From the sample of 216 individual points it was possible to identify 29 morphological "types" by reference to base configuration and blade morphology alone. This number includes the nine stone spear point types defined by Workman (1978:Fig. 40). The average number of examples for each type numbers six. Some "types" were represented by a single artifact, but the most common "type" had nearly 20 examples (Table 3). Excluding Workman's nine types, out of the remaining 20 morphological types, we are proposing 10 types that merit further consideration. These are all provisional types for the Yukon, but may have potential to be reliable time/culture markers. The 10 new and/or provisional types are described in thumbnail fashion below.

Small Bipoint. This very provisional type is based on two specimens in the KaVn–2—Northern Cordilleran/Nenana Complex component dated ca. 10,000 BP (Heffner 2002:86). The bipoint pictured here (Figure 6) appears to be heavily reworked from a larger point.

Annie Lake Point. These distinctive points appear to be a good time marker for the period 3000 to

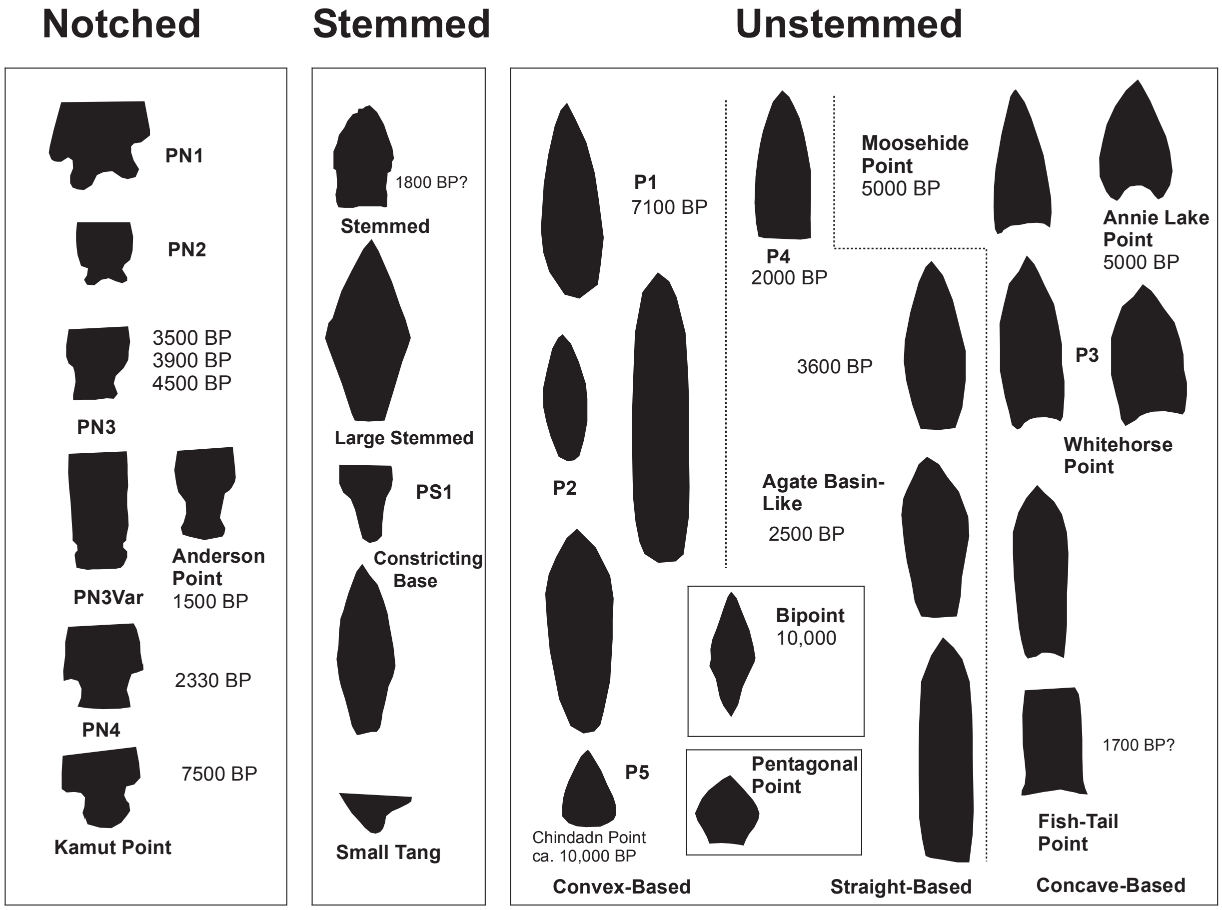

Figure 5. Morphological types in the Yukon Projectile Points database. Type names and Workman's type designations shown with available but not necessarily defining dates.

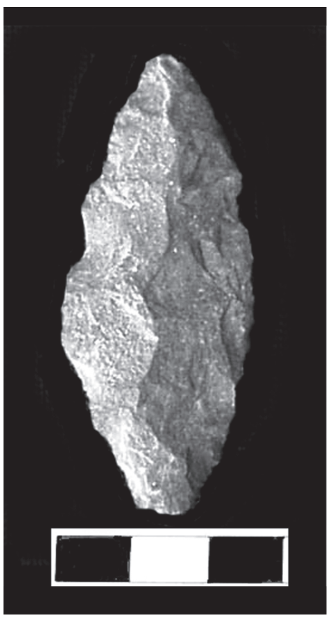

Figure 6. Small bipoint.

Figure 7. Annie Lake points.

5000 BP (Greer 1993; Hare 1995). Geographically, Annie Lake points tend to occur in southwest Yukon, although one apparent stray has been found in Seela Pass, north of Dawson City. Nineteen Annie Lake Points are identified in the Yukon collection (Figure 7).

Small Tang Point. This is a provisional type made up at present of three specimens, all from southwest Yukon ice patches (Figure 8a). One point has been dated to 2050 BP.

Anderson Point. Workman described the Anderson point as a variant of his P3 class. In resurrecting this as a distinct type, we use the name assigned by MacNeish to avoid a proliferation of type names in the literature, although no southern cultural connections are assumed for the Yukon type. Several examples of the Yukon Anderson Point have been recovered in dated context at the Annie Lake site and dated to about 1500 BP. We propose that this may be a distinct type within the Taye Lake Phase. Eight Anderson points are identified in the Yukon collection (Figure 8b).

Moosehide Point. This is a provisional type based on a sample of five specimens—two from the levels at the Moosehide site dated to about 5000–5600 BP (Hunston 1978). The points are finely flaked lanceolates with subconcave to straight bases. The point on the far left is thought to be a slightly reworked Moosehide point, although it may also be compared to Fishtail points (Figure 9a).

Fish Tail Points. This distinctive morphology is represented by two specimens in the Yukon collections (Figure 9b). The point recovered at KaVn–2 (Figure 9b, right) likely dates to about 1700 BP (Heffner 2002:78). The point on the right is from the Alligator Lake ice patch and is undated. The burinated tip may be a result of impact damage, but the tip appears utilized. This is a provisional type.

Stemmed Pentagonal Point. Slightly stemmed pentagonal points are identified in the southwest Yukon ice patch collections and likely date 2000–4500 BP (Figure 10a).

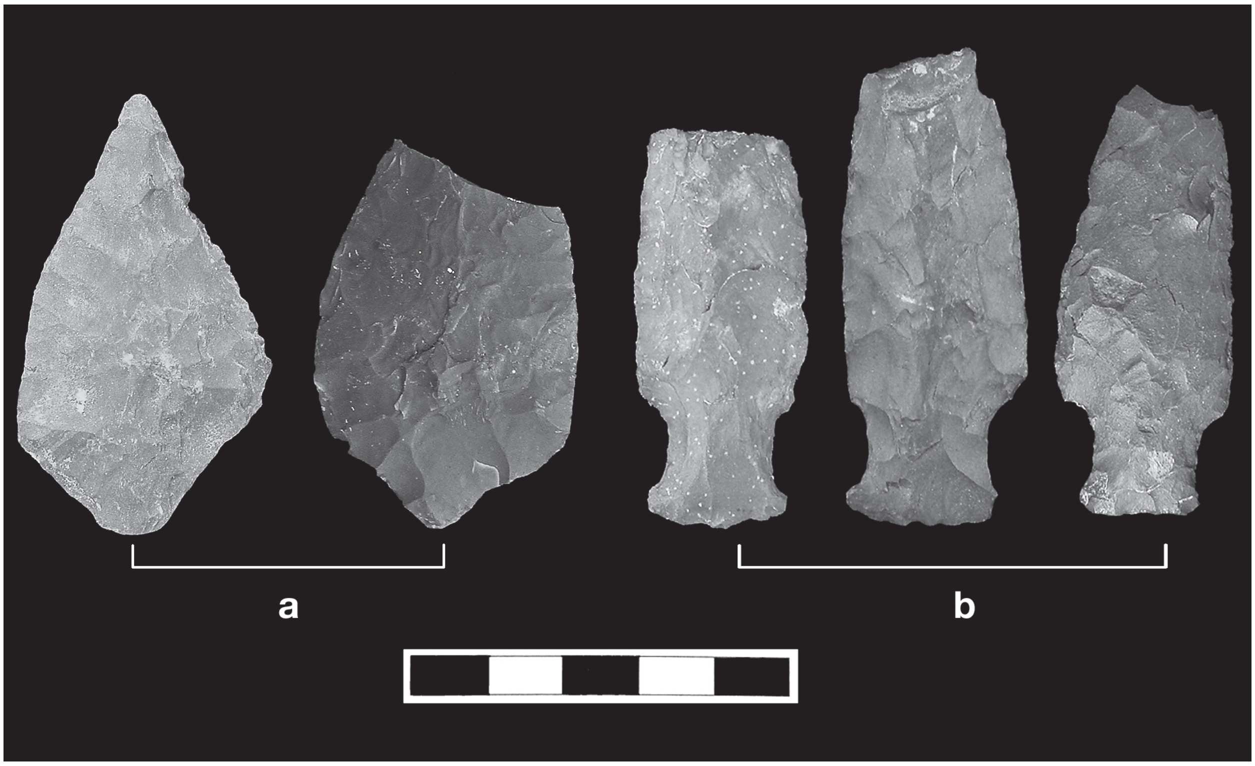

Figure 8. Small Tang points (a) and Anderson points (b).

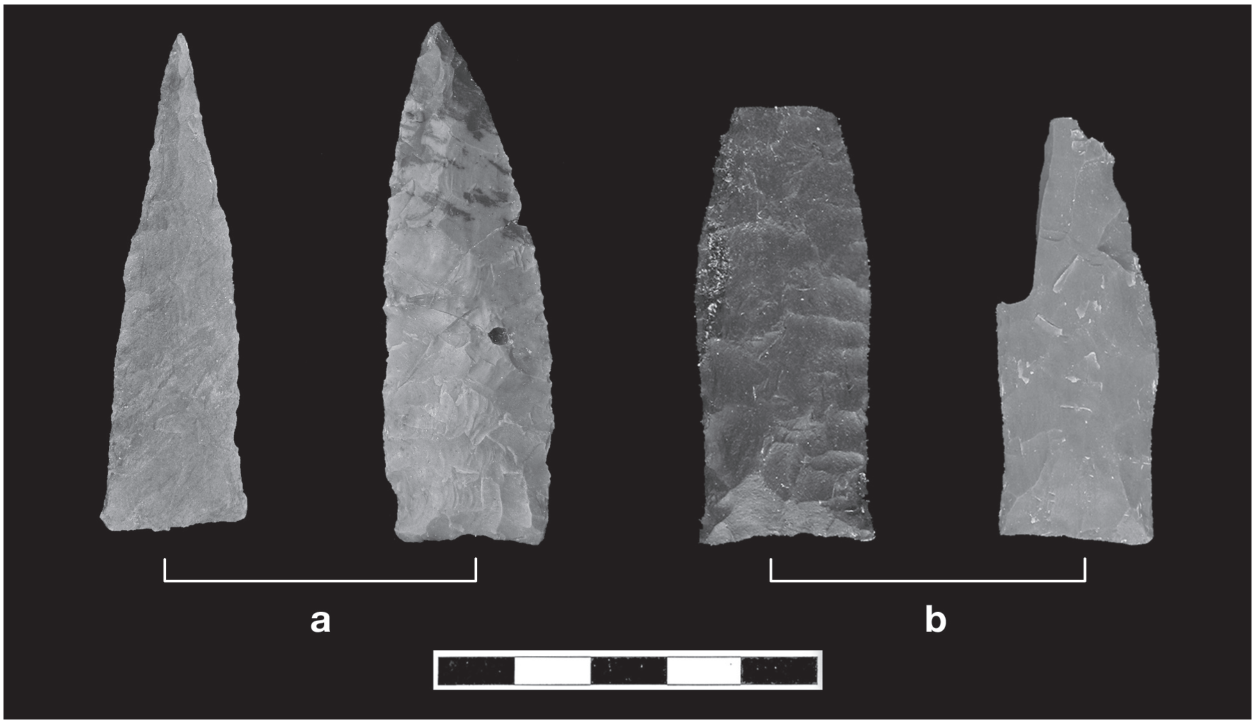

Figure 9. Moosehide points (a) and Fish Tail points (b).

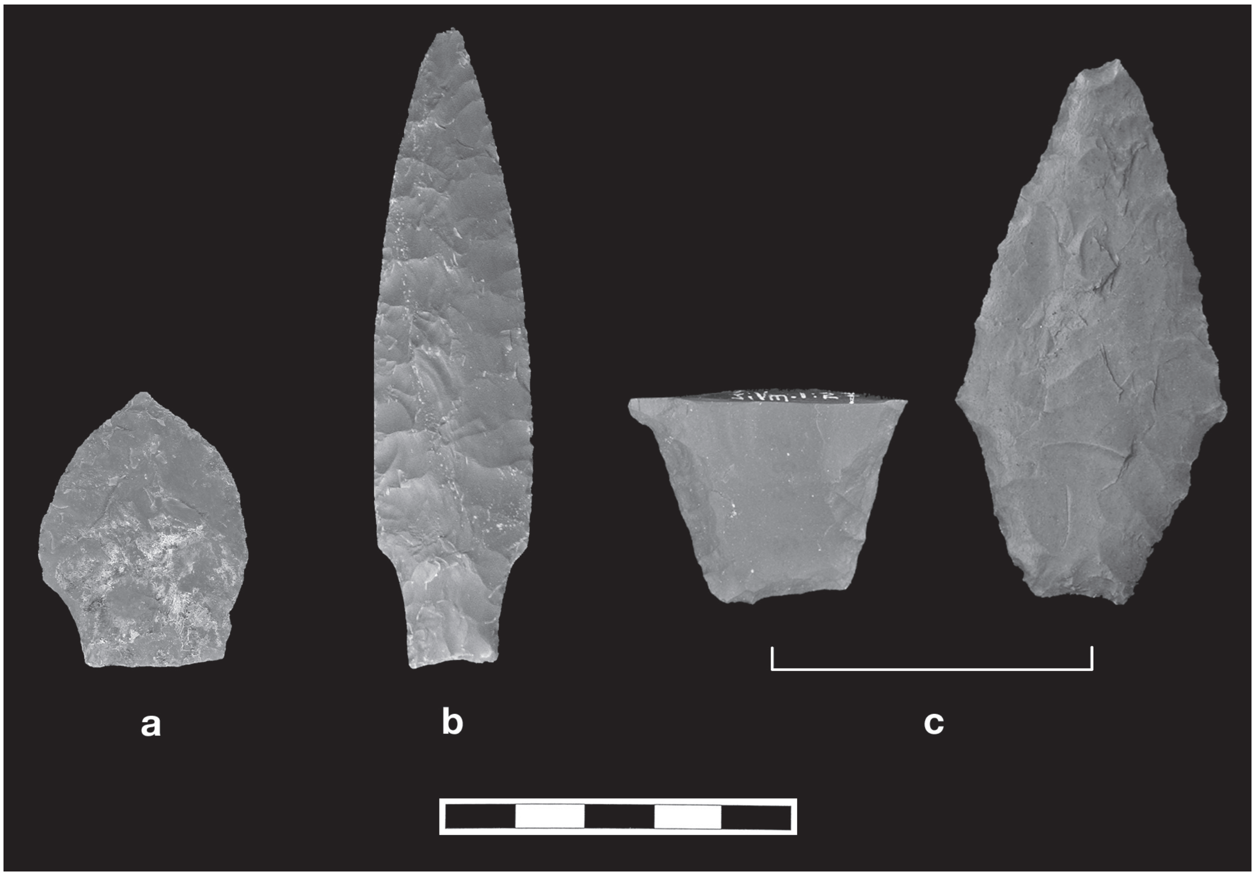

Figure 10. Stemmed Pentagonal point (a), Stemmed point (b), and Large Stemmed points (c).

Stemmed Point. This is a provisional type based on three (and possibly five) specimens in the Yukon collections (Figure 10b). One point of this type in the southwest Yukon ice patch collections dates to about 3500 BP.

Large Stemmed Points. A provisional and highly distinctive type based on two specimens in the Yukon collections—one from Gladstone Lake and one from Whitehorse. Workmanship on the points is so similar as to suggest they may have been produced by a single individual (Figure 10c).

Constricting Base Points. This provisional type numbers about five in the Yukon collections (Figure 11).

Summary and Conclusion

As a work-in-progress, the Yukon Projectile Points database currently contains basic information on provenience, available dates, description and images for just under 500 projectile points and point fragments recovered in archaeological context in the Yukon. In the future, the objective is to make this database accessible on the internet through the Yukon Government Heritage Resources web site. Future work on the database will include improved information on context and associations of the points and on other technological features such as flaking patterns. Further additions to the database will focus on acquiring information on the remainder of the northern Yukon points housed at the Canadian Museum of Civilization, and points in the Parks Canada collections.

The creation of the Yukon Projectile Points database prompted a review of point typologies that have been defined for the Yukon archaeological record. Workman's (1978) classification of point types for southwest Yukon has been a standard archaeological reference since its publication. Archaeological investigations in the intervening 30 years have generated new dates and new point types to be integrated into the reconstructions of the prehistoric record. In particular, new discoveries of hunting weaponry from alpine ice patches in southwest Yukon enabled the direct dating a variety of point forms, and has provided some new insights into the chronology of point types and the technology of spear manufacture.

Most significantly, it was enlightening to observe the considerable variation in point types in the ice patch collections, despite commonalities in temporal range, presumed cultural connections, technological constraints and activity. These observations suggest

Figure 15. Constricting Base points.

that when constructing point typologies factors such as individual style or skill or point reworking or recycling may be more important factors than generally assumed.

A second important observation arising from the ice patch collections concerns projectile points base configuration. Contrary to conventional wisdom, the shape of the point base apparently has no bearing on hafting techniques. All of the observed points forms, whether tanged, stemmed, unstemmed or notched were hafted in a similar "U"' shaped slot (Hare et al. 2004).

Finally, based on recent Yukon discoveries from both ice patch and non-ice patch sites, a total of 10 provisional new projectile point types has been proposed for the southwest Yukon archaeological record. The unconfirmed nature of the majority of proposed types should be born in mind in reading this paper. Given the wide variety of projectile points that seem to be in use at the same time, in the same place, and by the same people, the heuristic value of these new projectile point types (as well as the existing types) still remains to be determined.

It is hoped, however, that the increased accessibility of information on Yukon projectile points, when the database becomes web accessible, will facilitate other researchers making comparisons for newly discovered projectile points and enable further contributions to interpreting and refining our understanding of Yukon's archaeological past.

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Chapter 19

Early Bifaces from the Little John Site (KdVo–6), Yukon Territory, Canada

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Introduction

Borden site KdVo–6 was first tested in 2002 during a field survey associated with Easton's long-term Scottie Creek Culture History Project (begun in 1992), which involves archaeological and ethnographic documentation of the region about the Yukon-Alaska borderlands, in collaboration with the White River First Nation of Yukon and the Village Councils of Northway, Tetlin, and Tanacross, Alaska. Controlled area excavations were undertaken in 2003, 2004, and 2006 (Easton 2007). In the local Scottie Creek dialect of the Upper Tanana *Dineh* language this geographic location is known as *Haah Tu Taiy* (roughly "trail at the end of the hill"). After recognition of its significance and consultation with the White River First Nation, it was named the Little John site in 2006 after *Klaa Dii Cheeg*/his hand drops, called in English, "White River Johnny", and known affectionately as "Little John", a respected ancestor of many of the contemporary members of the White River First Nation. Like his ancestors before him, Little John often used the location as a hunting camp and lookout until his death in 1984, a practice continued by his descendents today.

This multi-component site contains evidence of use from the most recent past back to the Pleistocene Transition. The earliest identified component represents the first unequivocal identification of a Nenana complex assemblage within a stratified context to be found in Canada. A subsequent dated Late Glacial component, which we currently relate to the Denali complex, is also present at the site.[1] In this paper we present a description and discussion of the pointed bifaces recovered from these earliest levels of the Little John site.[2]

Site Context

The Little John site is located just off the Alaska Highway, twelve kilometers north of the village of Beaver Creek, Yukon, about two kilometers from the international border with Alaska (Figure 1). It occupies most of the higher surface of a knoll overlooking the upper reach of Mirror Creek, known as *Cheejil Niik*/Grayling Creek in the local Upper Tanana Athapaskan language. It overlooks the basin of the creek below from the north and lies within the most western extension of the Tanana River drainage.

Pleistocene glacial advances in the region were thin piedmont glaciers extending from the Nutzotin-Wrangel-St. Elias Mountain chain, which begin forty kilometers to the southwest of the site

[1] In this paper we present most dates as radiocarbon years before present (indicated by DATE BP); calibrated dates are indicated by cal BP.

[2] The use of the term "point" is advisable in this context. Both major biface forms described here (Chindadn and Foliate) have been described functionally by some as "knife" rather than "projectile" points.

Figure 1. Map locating archaeological sites mentioned in the text.

(Figure 2). However the Wisconsin advance of ice ended at McCauley Ridge, some fifty kilometers to the southeast, and began a rapid recession at about 13,500 BP; by 11,000 BP the region was ice-free to at least the White River, some 150 kilometers to the southeast (Rampton 1971).

Thus, the Little John Site lay within Beringia, a proposition further supported by the recovery of Pleistocene fauna *(Bison, Equus, Mammuthus, Rangifer,* and possibly *Saiga)* less than a kilometer from the site and elsewhere in the Mirror Creek and neighbouring Scottie Creek valleys. A local *Equus lambei* specimen has been radiocarbon dated to 20,660 ± 100 BP (MacIntosh 1997) and an ivory fragment recovered across the road from the Little John site dated to 38,160 ± 310 BP (Beta 231794).

In general terms the geological stratigraphy of the site consists of a basal regolith overlaid with sparse glacial till representing a glacial maximum known locally as the Mirror Creek glacial advance, variously dated to the Late Illinoian-MIS 6, c. 140,000 BP (Bostock, 1965; Krinsley, 1965) or the Early Wisconsin-MIS 4, c. 70,000 BP (Denton 1974; Hughes et al. 1989). Above this are found loess sediments varying in thickness from a few to over sixty centimeters, and then ten to twenty centimeters of Brunisols typical of the boreal forest in the region. In most areas this B horizon is intersected by a volcanic ash layer of several centimeters deposited by what we believe to be the second White River volcanic eruption, c. 1250 BP (West and Donaldson 2002; Lerbekmo and Westgate, 1975). A thin (1–2 cm) A/O horizon caps the sequence (Figures 3 and 4).

The discontinuous depth of these strata is accounted for by the undulating topography of the site, which ranges from over meter deep basins to eroding hillsides. The stratigraphy is also complicated by the action of both ancient and contemporary permafrost, solifluction, colluvial depositions,

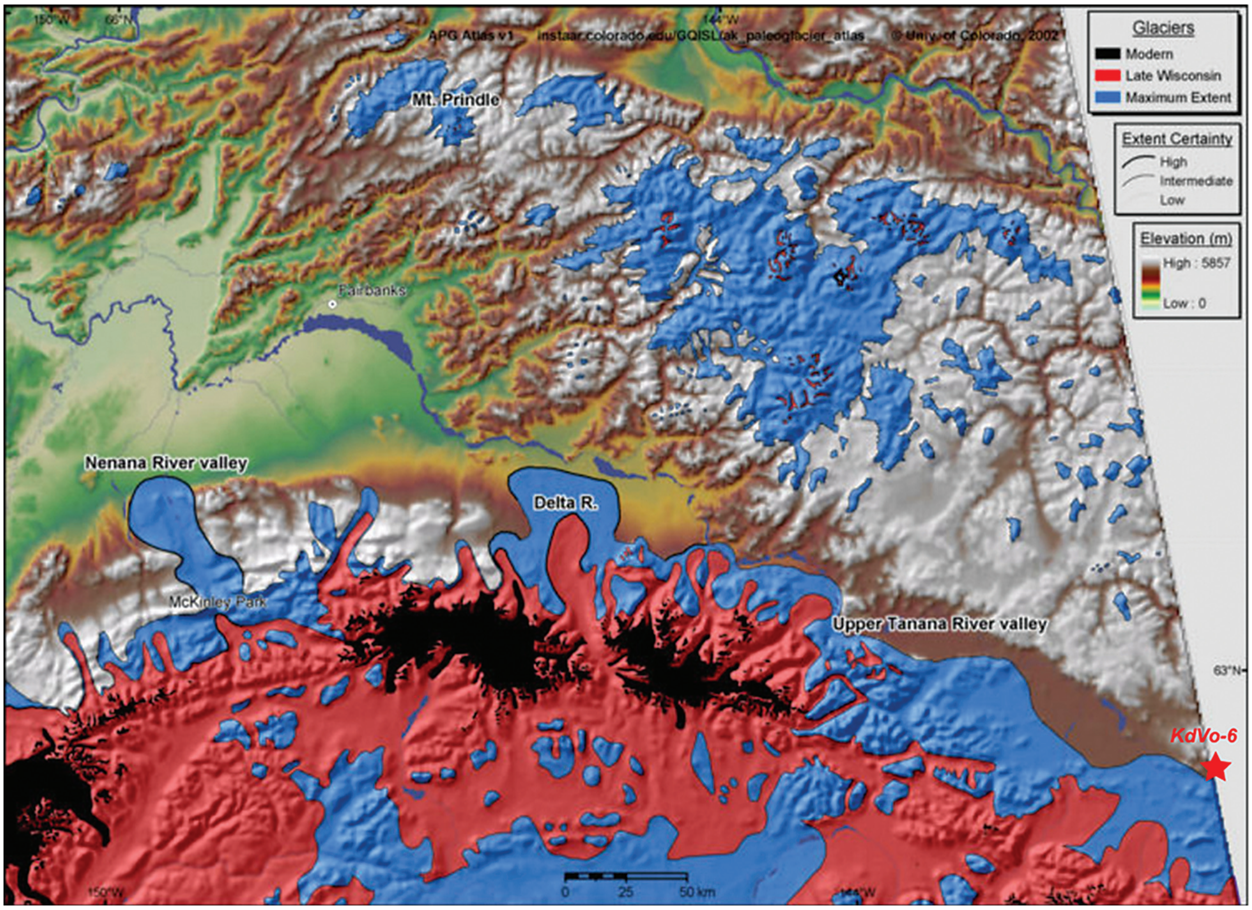

Figure 2. Extent of glaciation in the upper Tanana River basin. Blue represents maximum (Reid) extent; Red represents maximum late Wisconsin advance.

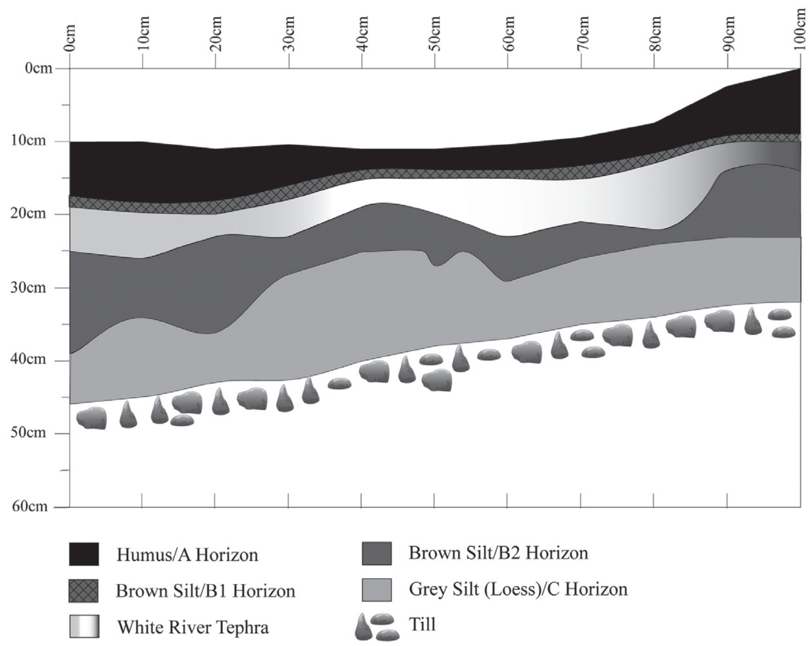

Figure 3. Stratigraphic differences between west and east lobes.

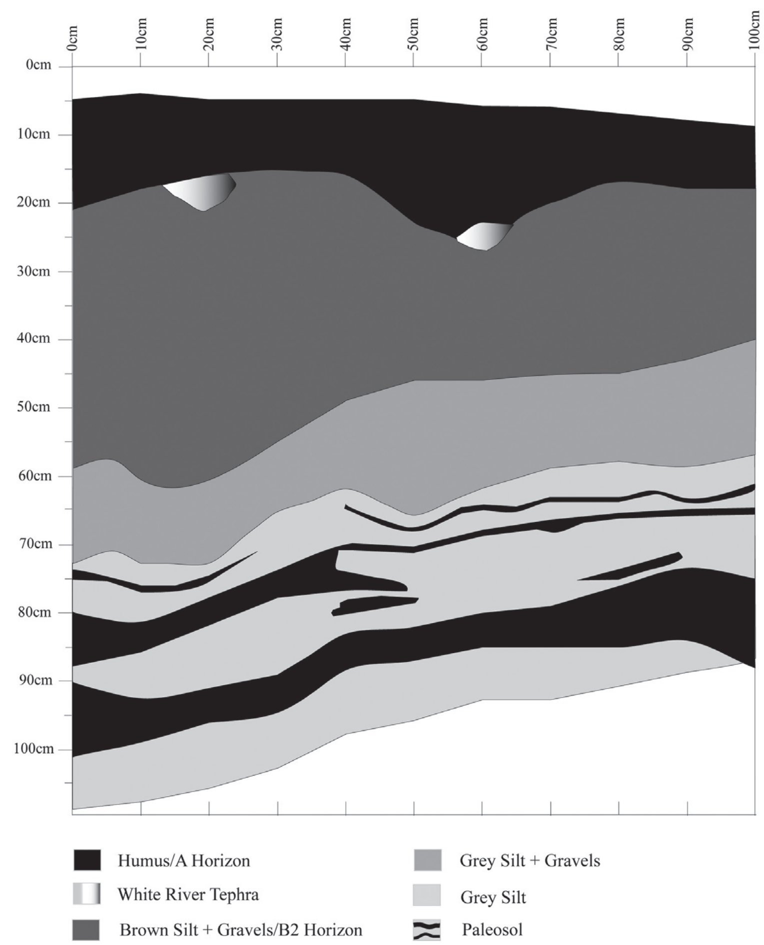

Figure 4. Stratigraphic differences between west and east lobes.

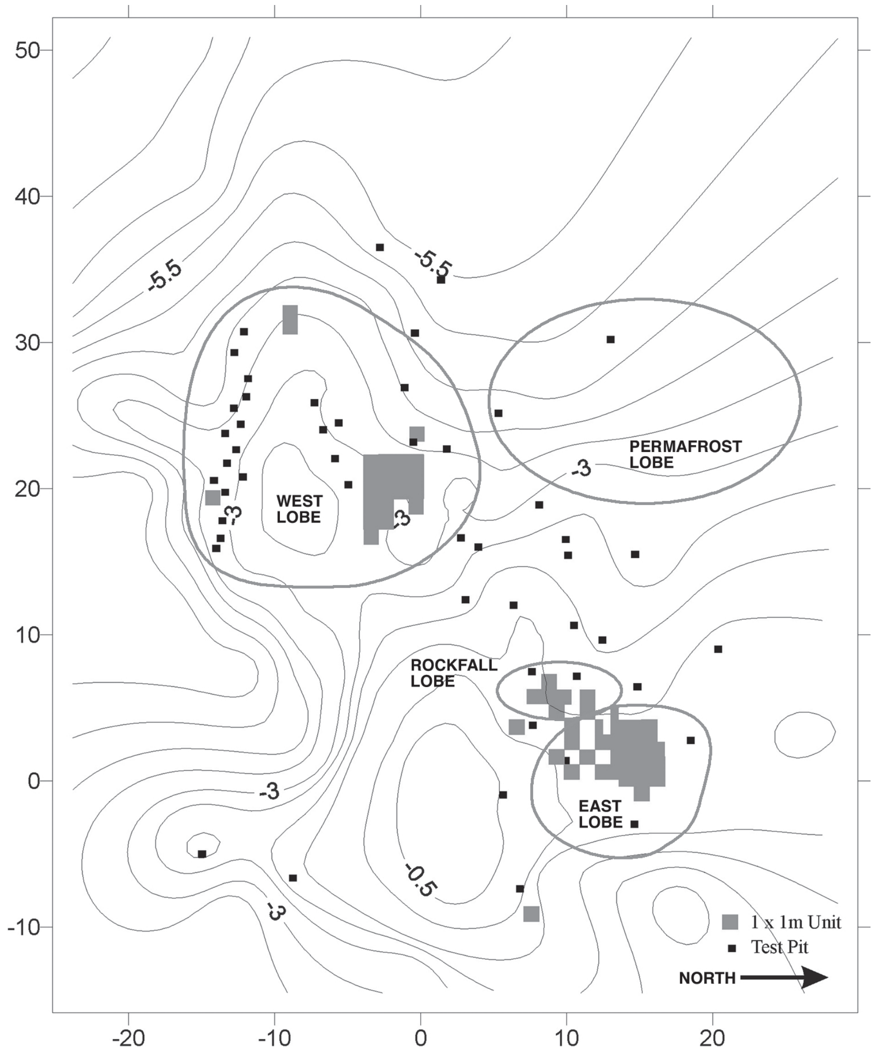

Figure 5. Zonal division of KdVo–6.

and what seems to be a mass wasting event over a portion of the site. Because of this differentiation in depth and nature of strata we have divided the site into four initial zones (Figure 5).

The West Lobe, where the strata are most shallow, occupies the southwestern hillside on which deposits range from five to thirty centimeters. The Permafrost Lobe, where frozen ground is encountered mere centimeters from the surface, occupies the north-facing slope of the knoll. The Rockfall lobe, where large boulders lie through the brunsol and loess deposits, runs roughly through the centre of the site on a north-south axis. The final area is the East Lobe, a large basin that troughs east from the site, and which contains the deep sedimentary deposits of one hundred centimeters and more and at least one, and perhaps two, paleosol strata near the bottom of the sequence. Capped by forty to sixty centimeters of loess below the B horizon, this paleosol complex contains a well preserved, culturally deposited faunal assemblage, in direct association with lithic artifacts.

Fauna and Radiocarbon Dates

Identified fauna from these paleosols include *Rangifer, Cervus, Bison,* possibly *Alces* (based on stable isotope data, Paul Matheus, pers. comm.), *Lepus*, *Cygnini* and other unidentified *Aves*, *Canis*, and *Rodentia*. Three AMS radiocarbon dates on bone from the paleosol complex have been processed. The first, on an unidentified large mammal fragment, was dated at 8890 ± 50 BP (Beta 182798; 2σ calibrated results range from 10,190 to 9865 cal BP). The second, on *Rangifer*, was dated at 9530 ± 40 BP (Beta 217279; 2σ calibrated results range from 11,090–10,930 and 10,880–10,690 cal BP). The third, on *Cygnini*, was dated at 9550 ± 50 BP (Beta 218235; 2σ calibrated results had two intercepts at 11,080–10,940 and 10,870–10,720 cal BP). All the bones from which these samples were drawn displayed cultural modification in the form of cut marks or fracture; the swan bone was directly associated with a microblade fragment. A fourth sample from a *Canis* spp. humerus, recovered from below the paleosol strata, was found to be lacking any collagen suitable for dating, suggesting greater antiquity than the upper paleosol fauna.

Overall, the faunal assemblage seems to represent a broad-spectrum subsistence strategy, similar to the few other late glacial sites in the Tanana Valley which have preserved fauna (see Holmes 2001; Yesner and Pearson 2002).

Archaeological Components

For the purposes of our analysis of the material remains recovered at the Little John site, we have divided the assemblage into seven archaeological components. Their identification is tentative to the extent that a full suite of radiocarbon dates and detailed artifact analysis is not yet complete. However, they do allow an initial chrono-stratigraphic organization of the assemblage.[3]

From earliest to youngest these components are the Nenana and Denali complexes of late glacial Beringia; the Little Arm Phase of post-glacial Yukon; the Northern Archaic Tradition (or Taye Lake phase) of mid-holocene age until the White River volcanic eruption, c. 1,900–1,200 years ago, the Late Prehistoric Period (or Aishihik phase) which post-dates this eruption, the Transitional Contact Period (Bennett Lake phase), and the Historic (20th century) Period, which includes occupation of the site by non-native builders of the Alaska Highway. An eighth component might be identified as the Contemporary, as the site is still used today by the local aboriginal *Dineh* as a hunting lookout and campsite.

In this paper we report on the lithic pointed bifaces from the earliest two components, provisionally assigned to the Nenana and Denali complexes. We use the term pointed bifaces in order to indicate that the forms we describe below include some artifacts which are clearly projectile points, some which are clearly knives, and some which are equivocal in their function.

Artifact Descriptions[4]

Chindadn Points of the Nenana Complex

The Nenana complex component present at the Little John site is currently undated, due to a lack of suitable organics. Formed tools include large bifaces, a variety of scraper forms, large blades and large blade core tablets, and tear-drop shaped Chindadn points, by which the complex is characteristically identified. Its distribution to date is within the loess deposits immediately above the regolith in the shallower Western lobe and extending east to the middle Rockfall lobe. Four clear Chindadn points have been recovered and are described below (see Figure 6). A pointed biface fragment (KdVo–6:716) may represent the distal end of a thin Chindadn or triangular point, but there is no certainty in this; it is described later along with the other biface fragments. Table 1 provides metric data for all of the artifacts described below; Table 2, provides comparative metric data for a selection

[3] For the late glacial components we use terminology developed and applied within southeastern Beringia, while for post-glacial components we use the southwest Yukon cultural chronology developed by Workman (1978) and refined by Hare (1995).

[4] With the exception of KdVo–6:95, all of the artifacts described here share the same hand-lens lithology of aphanitic volcanic origin; further classification would require thin-sectioning. For general descriptive purposes we identify the dark to black material as "basalt" (i.e., less quartz or maphic) and the light to tan material as "rhyolite" (i.e., more quartz or felsic). KdVo–6:121 is classified as rhyolite but differs from the others by having a very poorly developed lamination and the quartz and feldspar phenocrysts are much larger. Artifact KdVo–6:95 is a chert very similar to the Stanley Creek chert formation of the Shakwak Trench, a discontinuously exposed band found from the south end of Kluane Lake to the international border along its southwestern edge at the foot of the Kluane-Wrangell-St. Elias Mountain range (Grant Lowey pers. comm.).

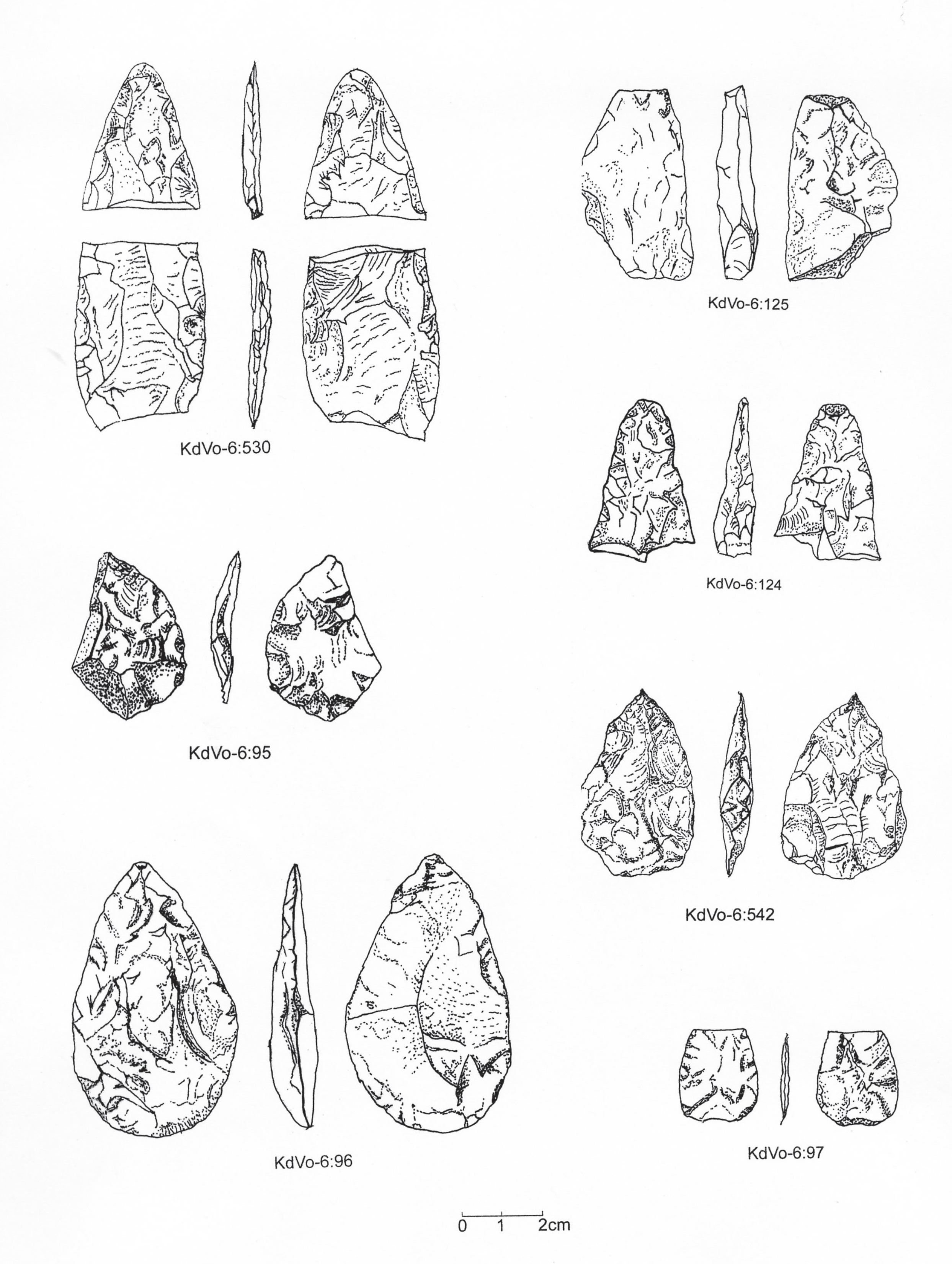

Figure 6. Bifaces of the Chindadn and Bipoint forms from KdVo–6 and KdVo–7.

Table 1. Metric attributes of KdVo–6 artifacts discussed in the text.

Artifact #	Length (mm)	Width (mm)	Thickness (mm)	Weight (g)	Material (cf Fn 3)	Stratum	Comment
KdVo–6:96	67	40	13	31.86	Basalt	Loess	Chindadn form, complete.
KdVo–6:542	45	30	09	10.90	Rhyolite	Loess	Chindadn form, complete.
KdVo–6:95	38	27	05	5.19	Chert	Loess	Chindadn form, incomplete.
KdVo–6:97	23 (30)	20	04	2.03	Basalt	Loess	Chindadn form, incomplete.
KdVo–6:530	80	33	05	20.15	Basalt	Paleosol	Bipoint form, two pieces.
KdVo–6:140/531	90	28	10	24.26	Basalt	Paleosol	Bipoint form, two pieces.
KdVo–7:1	70	32	09	22.61	Basalt	Loess	Projectile point, convex margins, straight ground base.
KdVo–6:123	38	31	07	10.84	Rhyolite	Loess	Projectile point base, convex margins, straight thinned base.
KdVo–6:122	49	25	12	19.30	Basalt	B2-L	Projectile point, medial fragment, thick, lenticular, straight margins.
KdVo–6:125	44	30	18	9.90	Basalt	B2-L	Projectile point, medial fragment, thick, lenticular, straight margins.
KdVo–6:124	40	27	19	8.60	Basalt	B2-L	Bipoint form fragment?
KdVo–6:716	25	24	04	4.42	Basalt	B2-L	Thinness suggests possible Chindadn or triangular point form; outline inconclusive.
KdVo–6:121	100	41	15	68.3	Rhyolite	Loess	Bipoint form but crudely flaked, – geofact?

Table 2. Comparative dimensions of Chindadn points.

Site	L	W	Source
Chugwater 1	1.4	2.0	Lively 1996, Fig. 6–4a
Healy Lake	3.1	2.2	Cook 1996, Fig. 6–11a
Healy Lake	4.8	1.9	Cook 1996, Fig. 6–11b
Walker Road	3.7	2.0	Goebel et al. 1996, Fig. 7–14a
Walker Road	4.0	2.7	Goebel et al. 1996, Fig.7–14b
Walker Road	4.4	2.5	Goebel et al. 1996, Fig. 7–14c
Moose Creek	3.3	2.5	Pearson 1999

of Chindadn points available in West (1996a) and Pearson (1999).

KdVo–6:96 is a complete Chindadn biface on a black basalt flake. It is from the West lobe of the site from the bottom of the loess deposit immediately above or on the till surface, 20 cm below surface. While its dimensions and mass make it the largest complete specimen of this form recovered that we are aware of (see Tables 1 and 2), KdVo–6:96 is similar to the general shape and dimensions of two of the Type 1 Chindadn fragments from Healy Lake (Holmes 2001:164 presents scaled photographs of these artifacts). Viewed proximal to distal it is highly symmetrical, but asymmetrical in plan view, with a relatively flat ventral surface and a high and rounded dorsal surface (i.e., plano-convex). While flake removal is visible on both surfaces, the ventral surface is much more heavily and consistently worked. As well, the proximal lateral edges are more heavily and finely retouched than the distal lateral edges, suggesting that the rounded proximal end may in fact be the working edge.

KdVo–6:542 is a complete Chindadn biface on a green-tan rhyolite flake. It was found in the West lobe from within loess sediment at 30 cm below surface. It has been worked into a roughly symmetrical form from both perspectives. The striking platform of the original flake is pronounced and present on the left lateral edge. It has finer retouch along the lateral edge opposite the striking platform, suggesting this is the working edge, consistent with its use as a knife.

KdVo–6:95 is a Chindadn biface on a grey-blue chert flake. Found in the middle Rockfall lobe of the site, it is from a cryoturbated loess strata, 30 cm below surface. Thin in plan view, relative to the two previous specimens, it seems to have much finer retouch along the right lateral edge, although certainty is precluded by the fact that much of the left distal lateral edge is missing; below this, on the ventral surface, is a strip of heavily patinated cortex.

KdVo–6:97 is a small Chindadn biface on a dark black basalt flake. It was recovered from the West lobe from the top of the loess at 30 cm below surface. It is broken perpendicular to its long axis, missing the distal end. Measuring 2.6 cm in length it is estimated that complete it would be about 3.0 cm. Both lateral edges hold fine bifacial retouch, while the proximal base has been thinned by flake removal on both sides, suggesting its use as a projectile point.

Foliate Bifaces of the Denali Complex

The Denali complex component is found over the entire extent of the site explored thus far. Formed tools are dominated by microblades. Several core tablets and irregular core fragments with microblade removal scars have been recovered but thus far no wedge-shaped core ubiquitous to this complex. Scrapers and burins are present, as well as two bifaces of a form alternatively categorized as "bifacial biconvex knives" (West 1967), "bipoints" (Hare 1995), "leaf-shaped" (Hefner 2002), and "foliate biface" (Carlson 1996a). Based on the radiocarbon dates and the presence of foliate bifaces, as well as a single proximal fragment of a microblade, we have provisionally assigned the buried fauna-rich paleosols present in the Eastern lobe to the Denali complex. The two foliate bifaces, described below, were recovered from this paleosol complex in direct association with culturally modified fauna dated to c. 9500–9000 BP (see Figure 6).

KdVo–6:140/531 are two pieces which refit to form a biface made on black basalt. It was found at the same level (approx. 64 cm below surface) in separate but contiguous units (FU 25 and 32). While this piece appears semi-lunate in outline, significant damage along one of the lateral margins indicates that its original shape tended more towards foliate. Like its counterpart (KdVo–6:530), this biface displays crude flaking, evidenced by random flaking on both faces, which likely relates to the low quality of the raw material. This artifact was broken by a transverse fracture.

KdVo–6:530 is an incomplete biface consisting of two re-fitting pieces made on black basalt separated on a transverse fracture. The pieces were found next to each other in the same unit at a depth of 64 cm below surface. While one end of this biface is missing, the convex curvature of the lateral margins towards the missing end suggests a foliate outline and thus indicates that this artifact was probably foliate in outline. Exhibiting randomly oriented flake scars on both faces and several step terminations, this artifact—though remarkably thin—appears crudely worked, likely owing to the low quality of the raw material.

Biface Point Fragments

In addition to the above, seven pointed biface fragments have been recovered at KdVo–6 and the nearby KdVo–7 site[5] which bear description and some discussion based on their recovery from early strata (see Figure 7).

Artifact KdVo–7:1 is a straight-based biface made on grey basalt. This artifact was recovered from a basal loess stratum similar to that of the sediment matrix of the Nenana assemblage at KdVo–6. It has slightly convex lateral margins and the distal end is snapped, though whether this is due to use or the result of an attempt to thin this end is unclear. The straight base has been heavily ground. Generally the larger flake pattern is random, but the artifact is finely retouched along both lateral margins.

KdVo–6:123 is a round-based thin bifacial fragment made from tan ryholite, recovered from the loess sediments in the Rockfall lobe, 45 cm below surface. It exhibits slightly convex lateral margins, and a random flake scar pattern. It is also basally thinned by the removal of several flakes on both sides of the proximal margin. The transverse break evident on this piece likely occurred during manufacture, which is suggested by the bifurcated pressure flake scar parallel to the break on the right lateral margin.

[5] KdVo–7, *Cheejil Niik Naakeeg*/Graying Creek hunting lookout in the Upper Tanana language, is located on a drumlin formation which overlooks the Mirror Creek plain, about two kilometers south of the Little John site. A well-established trail runs to this hunting lookout across the muskeg and atop the drumlin to the southeast prominence at which the site is located. Like many such sites in the region it remains in use to this day by local *Dineh*.

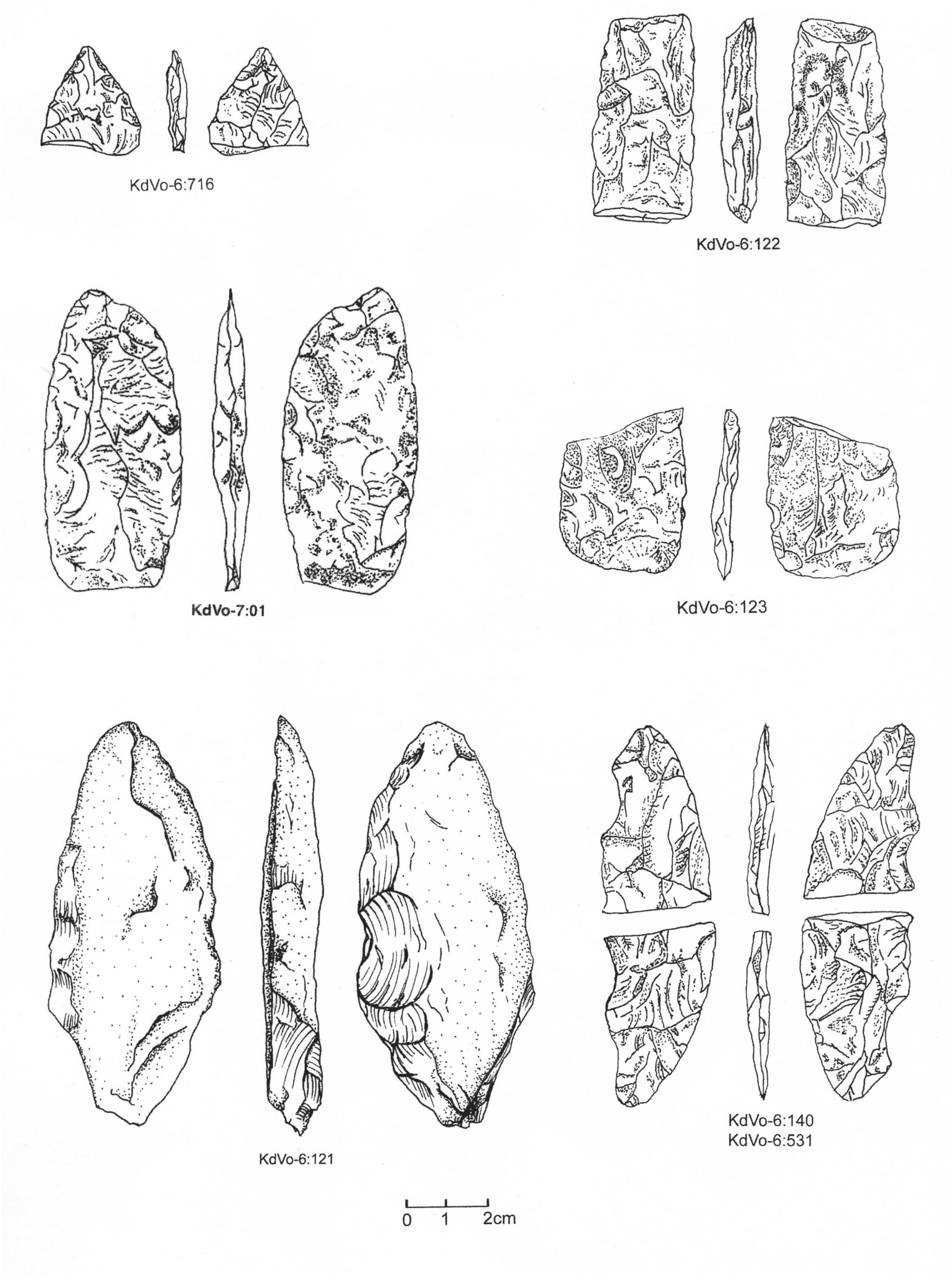

Figure 7. Biface point fragments from KdVo–6.

KdVo–6:122 is the medial fragment of a projectile point made from grey basalt, recovered from the interface between the Brunisol below vocanic ash (B2) and Loess stata (hereafter designated B2-Loess). This artifact is relatively narrow, with a thick lenticular cross-section and straight edges. The flake scar orientation is random and while the lateral margins have bifacial retouch, it is coarse and irregular. Numerous flake scars with step terminations reflect the low quality of the raw material. Transverse breaks are evident at both the distal and proximal ends on this point, and thus the base morphology is unknown.

KdVo–6:125 is the medial fragment of a biface made from grey basalt, recovered from the B2-Loess interface in the central Rockfall lobe. The flake scar orientation is random but there is fine bifacial retouch along both lateral edges. There are several step terminations evident on both surfaces, one of which snapped on a thinning flake removal, separating the proximal portion. The distal point is also missing, but the general form of the existing fragment is asymmetrical, and suggestive of an original foliate form.

KdVo–6:124 is the distal end of a bifacially worked projectile point, made from grey basalt, recovered from the B2-Loess interface in the Western lobe. Besides its expanding margins below the distal point, little can be said of its overall morphology. Although the general formal pattern of flaking is irregular, there does seem to be an attempt to achieve a parallel flaking pattern on the left lateral edge.

KdVo–6:716 is the tip of a distal fragment of a projectile point made from grey basalt, recovered from the B2-Loess interface in the Western lobe. There is a transverse break on a step fracture along its base. However, there is also slight damage to the tip suggesting some use. The flake scar orientation is random, and edge retouch is present but inconsistent. Its thinness alone suggests the possibility of its missing distal end to be tear-dropped or triangular, however besides this there is no other compelling reason not to imagine it as a foliate biface fragment or the business end of a projectile point.

Finally, we report on KdVo–6:121, which is a large edge modified piece, roughly foliate in outline, made from brown-grey rhyolite. While attempts at flaking are evident on both lateral margins, the manufacturer did not achieve flake removals that cover the faces of the artifact, and this was probably not even possible given the quality of the material. Given its state we imagine the piece to have been abandoned.

Frankly, we are not convinced that this is a human artifact. The raw material and crude workmanship suggests that it may be a geofact. However, it does hold numerous flake fractures along its circumference and it was recovered in close association with other indisputable human artifacts within the loess statum in the West lobe. Finally, we must consider the fact that some proportion of every assemblage likely contains material made by children or others of limited technological capacity. In this context we note that during a public tea, at which we displayed this and other finds of the season to our Upper Tanana *Dineh* hosts, this particular piece was picked up by an Elder who opined without encouragement, "You know what this is? It's a kid's piece. Practice." The ambiguity of this piece is increased when we note that, to our knowledge, this is the first apparent foliate biface found in direct association with Chindadn points, though we note it is exceedingly thick in comparison to other extant examples of this form.

Regional Comparisons

We can make the following unequivocal statements about the two principal lithic forms we have described from the early strata of the Little John site. Most of the bifacial fragments are equivocal, but based on their apparent morphology we can compare several of them to other regional expressions.

Chindadn Biface Form[6]

Over fifteen years ago, Goebel and Pontti (1992:2) asserted that, "Chindadn points occur exclusively in Late Glacial premicroblade contexts. Nowhere have

[6] Our literature review clearly revealed that some analysts categorize small, thin, triangular shaped bifaces of the Terminal Pleistocene as variants of the Chindadn form, sometimes to the extent of referring to them as such (e.g., Yesner, et al. 1992)—and they undoubtedly are right—but in the following discussion we restrict our comparisons to biface forms of the classic tear-drop shaped Chindadn point.

they been found in direct primary association with microblades. Repeated discoveries in both Alaska and Northeast Asia demonstrate their importance as the first 'type fossil' of the premicroblade Paleolithic of Beringia." Based on our literature review, their assertion holds true today. Chindadn biface forms are found in early levels associated with the Nenana complex west of the Little John site in the Tanana and Nenana valleys. There are also several reported from the Yukon and the Pacific coast. We note, but do not further discuss here, the occurrence of tear-drop biface forms in western Beringian components in Asia (c.f. West 1996a; Hoffecker and Elias 2007:109–110, 138–140).

The Chindadn form was first described by Cook (1969) based on their occurrence at the Healy Lake Village site, where they are found in the early levels (6 to 10). Cook (1996:325) notes that "some are definitely projectile points, while others are larger, and not so pointed, knives." Associated artifacts in these levels include small triangular points, a basally thinned concave-based point, a variety of endscraper forms, and gravers. And while "nearly 100 microblades and two cores" are found in levels 6–8 as well, Cook believes that these are separate from the Chindadn component. Others have suggested that "some post depositional mixing of artifacts may have occurred at the village site", in order to account for the microblades (Hamilton and Goebel 1999:169), which is supported by the steady decline in their occurrence at the lower levels, with none in levels 9 and 10 (see Table 6–7, Cook 1996:326). Dates obtained ranged from 11,410 to 8210 BP and averaged 9700 BP (Cook 1996:327).

At the Walker Road site four complete Chindadn bifaces and three performs, which "may represent Chindadn points in a preliminary stage of manufacture", were recovered from loess levels 1 and 2, dated to 11,300–11,010 BP. The 218 associated artifacts comprise the largest Nenana assemblage yet recovered, nearly fifty percent of which are retouched flakes and blades. Endscrapers (of seven distinct forms) and sidescrapers (of eight distinct forms) make up the next largest category (18.3% and 9.2% respectively). Cobble tools, the majority of which are plano-convex "planes", wedges/*pièces esquillées*, gravers, perforators, notches/spokeshaves, denticulates, and knives, complete the tool assemblage (Goebel, et al. 1996; see also Goebel, et al. 1991).

The Chugwater site contains at least one complete Chindadn biface in its Component I (Nenana) assemblage; a second basal biface fragment may also belong to this class (see Lively 1996:310, Fig. 6–4b). The remaining formed tools include a bifacial "knife" fragment and seven small endscrapers. There is no associated date for this component, but it predates Chugwater Component II (identified as Denali), dated to 9500–9000 BP.

Initial excavations at the Moose Creek site revealed two components dated to the terminal Pleistocene—earliest Holocene, circa 11,700–8000 BP, but lacked clear diagnostic artifacts; based on the dating alone, the lower component was provisionally assigned to the Nenana complex (Powers and Hoffecker 1989). Pearson's later excavations at this site clarified this ambiguity by confirming two components, a microblade-bearing stratum, dated to 10,500 BP, overlying a non-microblade stratum. This lower level, dated to 11,190 BP, also contained a single diminutive Chindadn point and a subtriangular point (Pearson 1999).

In the Yukon, MacNeish (1964:407, see Fig. 88-3, 4) identifies five tear-drop points from a site near Carcross, recovered from above the 1200 year old White River ashfall, and in association with diminutive side-notched points; he designated this form "Catan", a term no longer used in Yukon. Beyond this, we can say little more.[7]

Workman (1974:209–210) assigned "tear-dropped points" to his P5 category of projectile points of Yukon and identified six such points from the Chimi site (JjVi–7) near Aishihik village at the north end of Aishihik Lake and one from JhVf–5, a site at the south end of the lake. The Chimi specimens were recovered from below the 1200 year old White River ashfall. Examination of

[7] Our enquiry for more information on these materials revealed that "Both provenience and frequency data was partially lost during the original cataloguing of this collection. Frequencies in MacNeish's publication are inconsistent with one another, with the catalogue and with the existing collection.... Two projectile points (MacNeish 1964: Fig. 88, Nos. 3, 4) are missing. This is the history for a lot of the MacNeish sites." (G. Hare, pers. comm. Jan 2007). However, our query did identify a tear-dropped form from the JhVf–1 site near Otter Falls in the Aishihik valley (the falls once illustrated the Canadian 5 dollar bill), but there is no recorded provenience.

a photograph of one of the Chimi specimens shows it to be decidedly straight-based and thus more triangular in outline than the classic Chindadn form, which almost invariably have a much more rounded base. Greg Hare of the Yukon Archaeology Branch (pers. comm. 2007) notes that "regarding teardrop or P5 points, there are any number of short round based things that might be called tear drop shaped. Not sure how temporally sensitive they are and probably some of them are short because of reworking." Based on their form and late Holocene dating, we believe that these latter central-southwest Yukon points are neither technologically nor temporally related to the much earlier Chindadn form found in the Tanana River drainage, including those from the Little John site.

Finally, Cinq-Mars and Gotthardt (1998) have reported the recovery of a Chindadn point at the Poulton Station site (MbVn–1) in 1997 from the northwest Olgilvie Mountains of Yukon, near the Yukon-Alaskan border. The point was found on the surface "in a zone that was full of mixed workshop debris…. [and] other artifacts (large end scrapers made on blade-like supports) that also have a definite "Nenanoid" flavour" (J. Cinq-Mars pers. comm. Dec. 2005). No further information is readily available on this specimen.

Outside of the Beringia region, tear-drop shaped points are found in the early (c. 9000 BP) levels at Namu (Carlson 1996b), and perhaps in other early components from the northern Northwest Coast. We are not aware of their occurrence within a relevant time period outside of the distribution we have discussed above.

Based on these data it seems clear that there is a definite association between Chindadn points and occupations of eastern Beringia during the Terminal Pleistocene assigned to the Nenana complex. The discovery of this technological form at the Little John site, lying geographically at the southeastern extent of Beringia extends the geographic distribution of the Nenana complex eastward into Canada and supports a Late Glacial age for the lower component in the Western lobe.

Foliate Biface Form

The bipoint biface form has a much wider geographical distribution than the Chindadn form, being found in late Pleistocene and early Holocene components of sites in eastern Beringia (the Denali complex), as well as the early post-glacial northwest interior (the Northern Cordilleran Traditions), the coastal northwest (the Pebble Tool Tradition) and the Fraser Valley (Old Cordilleran). We also note, but do not further discuss here, the occurrence of the foliate biface form in western Beringian components in Asia (c.f. West 1996a; Hoffecker and Elias 2007).

West (1967:372) included "bifacial biconvex knives, randomly flaked and of variable size" in his original construction of the Denali complex. This is based on their association with microblade/wedge-shaped core technology at the Donnelly Ridge, Teklanika River (East and West), and Campus Sites (the latter was later determined to be late Holocene in age and should thus be removed from considerations of the Denali complex; see Moberly 1991).

At Donnelly Ridge "four specimens, of which only one is complete, were recovered. The proximal ends of two of the illustrated specimens are missing, and the assignment to this category is therefore a matter of probability only. None is perfectly symmetrical, and the term biconvex, like knife, is a matter of convenience" (West 1967:365).

Two biconvex bifaces are illustrated in West's (1967) paper for Teklanika West and two for Teklanika East. Later, West (1996b:335 and Fig. 7-2) notes that at Teklanika West "the dominant form [of biface] is the lenticular or biconvex (two segment) biface found in virtually all Denali assemblages." The accompanying illustrations make clear that what he is assigning to this category include both symmetrical and asymmetrical foliate forms.

Foliate bifaces of more symmetrical form are present in Component II of the Dry Creek site in the Nenana River valley (see Hoffecker et al. 1996:351, Fig. 7–10k). Found in association with wedge-shaped microblade cores, microblades, and polyfacetted (Donnelly) burins, Component II is assigned to the Denali complex; the component has associated dates ranging from 10,690 to 8915 BP (Powers and Hoffecker 1989; Bigelow and Powers 1994).

Component I of Panguingue Creek contains two "lenticular bifaces", which are in fact foliate bifaces of the form we discuss here, based on the illustrations accompanying the site description (see Goebel and Bigelow 1996:370, Fig. 7–18b, c). The site analysts note that the "small size of the assemblage precludes firm assignment to a defined complex, although it appears to fall within the time range (roughly 10,000 BP) generally prescribed for the Denali complex" (Goebel and Bigelow 1996:369). On the other hand, Yesner and Pearson (2002:139) suggest that Component I of Panguingue Creek "represents a late manifestation of the Nenana Complex, with dates and technologies similar to those from Component III at the Broken Mammoth site."

Finally, the lower component at KaVn–2, south of the Little John site just off the Alaska Highway and about 10 kilometers west of the White River, contains two complete foliate bifaces, and three biface fragments which may have also shared this form (see Hefner 2002:111, Fig. 4.19A, B, C, and E, F). They are stratigraphically between constraining dates of 10,670–10,130 BP, although neither date is on cultural material. Hefner draws a similarity between these bifaces and those of Dry Creek, Component II, linking them to the Denali complex. Hefner also draws a link between a lanceolate biface in the lower component at KaVn–2 with a similar biface base fragment in the lower (Nenana complex) component at the Moose Creek site, leading him to classify the lower component at KaVn–2 within West's (1996a) Eastern Beringian Tradition, which combines Nenana and Denali complex sites as seasonal or functional variants of a single population. On the other hand, Hare (1995:110) links the early KaVn–2 component to Clark's (1983) construct of a Northern Cordilleran Tradition based on the early date for the site and his view that the lanceolate biface has an affinity with "Agate-Basin like" points.

Outside of the Beringia region, foliate bifaces, seem ubiquitous to the earliest components of British Columbia, including the early period at Namu on the central coast, c. 9700 BP (Carlson 1996b), the pre-microblade levels at Richardson Island, Haida Gwaii, dating approximately 9300 to 8900 BP (Fedje et al. 2005), the Bear Cove site on northern Vancouver Island, c. 8000 BP (C. Carlson 1979), the Milliken component at the Milliken site in the Fraser River valley, c. 9000–8150 BP (Mitchell and Pokotylo 1996), and the Old Cordilleran component at the Glenrose Cannery site on the Fraser River delta, c. 8000 BP (Matson 1996); they are found widespread in the southern British Columbia interior, though few have early dated contexts (Stryd and Rousseau 1996).

Based on this review, it seems that the foliate biface form has, as Hefner (2002:87) notes, "been included in every major early cultural historical classification in northwestern North America …. [and] it would appear that this artifact originated in the north and diffused southward."

Biface Fragments

Of the biface fragments described below, two pieces (KdVo–6:123 and KdVo–7:1) were indisputably recovered from within basal loess sediments; 123 is from the West lobe of the Little John site, while KdVo–7:1 was recovered from similar sediments at a nearby hunting overlook. Based on this we include them within the Nenana complex assemblage. Morphologically they are similar: thin, nearly identical in width, randomly flaked, with a flat base gently curving upwards towards the lateral margins. The principal difference between them is that the base of KdVo–6:123 is bifacially thinned, while the base of KdVo–7:1 is ground.

These biface fragments appear to be unique to the Little John Nenana component. While they may bear some resemblance to several bifaces in the Dry Creek Component I assemblage (see Hoffecker et al. 1996:Fig. 7–8a–c), which are relatively broad and exhibit straight to round bases and convex margins, this identification is tenuous at best. Alternatively, KdVo–6:123 may be a preform or broken remains of the typically thin Chindadn points (though we note that the KdVo–6:96 Chindadn point is not thin by any imagination).

The points recovered from the B2-Loess interface are assigned to the Denali complex assemblage of the site based on their co-occurrence with numerous microblades in this stratum. Two (KdVo–6:125 and 716) may be tip fragments of foliate bifaces, but there is no certainty in this assumption. We note again that KdVo–6:716 is extremely thin and thus reminiscent of the small Chindadn form and that its outline does not preclude this possibility.

The medial fragment (KdVo–6:122) and remaining point tip (124) share a similar morphology in terms of thickness, lenticular cross-section, and maximum width, and on this basis seem to be the same technological form. We also note that the medial fragment (KdVo–6:122) seems to represent a lanceolate form, which is not foreign to Denali assemblages, such as Dry Creek Component II (Hoffecker et al. 1996).

Discussion

There are two opposing positions regarding the relationship between assemblages of the Nenana type and assemblages of the Denali type. The first, held by the original proponents of the Nenana Complex (Powers and Hoffecker 1989) and others (e.g., Goebel and Ponnti 1992; Pearson 1999), is that the Nenana complex represents the first inhabitants of the Nenana and Tanana Valley basin by a non-microblade producing people and that assemblages containing microblades and other assigned Denali assemblage material (including foliate bifaces) represent a subsequent migrant population or diffusion of this technology into the basin about one to two thousand years later. This position is based on the documented stratigraphic and temporal separation of most assemblages representing the two complexes, with Nenana material being consistently older and underlying the younger and stratigraphically higher Denali material at most sites in the region.

In opposition to this view, West (1996a) and others (e.g., Holmes 2001; Hefner 2002), maintain that the two complexes represent separate tool kits of the same over-arching techno-complex, known variously as Denali, the Eastern Beringian Tradition, or the Beringian Tradition. This position is based on some temporal overlap between the later occurrences of Nenana sites and the earlier occurrences of Denali sites, as well as the evidence from one site, Swan Point (Holmes et al. 1996), at which it is reported that a well-defined microblade assemblage *underlies* a non-microblade bearing "Nenana" stratum.

This view creates a distinction between short-term hunting camps with a limited range of hunting activities—thus lacking microblade technology for functional reasons—and longer-term village sites, where microblade technology was mobilized to perform a wider diversity of activities. Yet, as Yesner and Pearson (2002) aptly point out, the Broken Mammoth site (Holmes 1996), lacks microblade technology in its early components, but does contain evidence of a longer-term encampment, including "[T]ool manufacture and resharpening, caching behavior for both artifacts and meat sections, both primary and secondary butchering, and both hide preparation and skin sewing are reflected by the tools and fauna…"(Yesner and Pearson 2002:152, *sic*), which does not support explaining the difference between Nenana and Denali complex assemblages on the basis of functional distinctions created by short-term occupation.

Consistent with this argument, in his recent analysis of the radiocarbon chronology of late Pleistocene Alaska, Bever (2006) reaffirms the point that microblade technology and artifacts diagnostic of the Nenana complex, and in particular Chindadn points, have never been found in association. While he acknowledges that the Healy Lake site may be a possible exception, he notes that inextricable mixing of the lower levels of this site due to cryoturbation renders the apparent association between microblades and Chindadn points suspect. This prompts Bever (2006) to develop a third scenario for the relationship between the Nenana and Denali complexes. Contrary to Yesner and Pearson (2002), Bever argues that the basal components of the Broken Mammoth and Mead sites, which lack diagnostic lithic artifacts but are often placed in the Nenana complex based on dates comparable to the well-defined Nenana components in the Nenana Valley, are not necessarily Nenana components. Holmes (2001:165) had previously made the same point: "Despite the lack of any microblades from this time period at the Mead and Broken Mammoth sites, I would not assign these components to the Nenana complex on negative evidence alone." What Bever proposes is that these two components could be related to the microblade component at Swan Point:

> Like Swan Point, Broken Mammoth also contains an earlier occupation (Component IV, dated between 11,300 and 11,400 cal B.C.) underlying the Nenana component. The older basal component at Broken Mammoth produced a small assemblage that, while containing a large assemblage of organic tools, lacks known diagnostic types and cannot be assigned to a particular complex. However, it dates to the latter portion of the earliest Swan Point microblade component, and since it is located only about 20 km away, probably represents a related occupation. The nearby site of Mead also contains two occupations

> layers in sync with those at Swan Point and Broken Mammoth, but none contain diagnostic materials (Bever 2006:606).

Based on this interpretation, Bever goes on to describe a possible reversal in the archaeological record of late Pleistocene Alaska. While stratigraphic separation between the Nenana and Denali complexes is apparent in both the Nenana and Tanana Valleys, in the Tanana Valley the Denali complex underlies the Nenana complex; in the Nenana Valley the opposite is the case. Indeed, the Nenana complex of the Nenana Valley overlaps in time with the Denali complex of the Tanana Valley. This leads him to the general conclusion that:

> Clearly, there is no straightforward relationship between Nenana and Denali complexes when the evidence from both the Nenana and Tanana Valleys are considered together. The only clear pattern is that both coexisted side by side for at least two thousand years (Bever 2006:606–607).

All told, the culture-historical patterns evident in the Nenana and Tanana Valleys of interior Alaska, which provide the context for the interpretation of the Nenana and Denali components at the Little John Site, likely represent a complex suite of causes—perhaps relating to shifting economic adaptations, population movements and/or technological diffusion and expressions of cultural identity—yet to be fully unraveled. The influence of the accompanying Younger Dryas climatic event during the latter portion of this period in late glacial Beringia also needs to be taken more fully into consideration but we do no more than note this here (but see Hoffecker and Elias 2006, Carlson 2008).

Evidence from the Little John Site does not unequivocally resolve this debate, but the presence of a non-microblade assemblage bearing Chindadn points and other tools characteristic of the defined Nenana complex stratigraphically, and therefore temporally, separate from an overlying microblade bearing assemblage lends support to the notion that Nenana and Denali assemblages are separate techno-complexes, at least at this time in this place.

It remains unclear how the small assemblage recovered from the KaVn–2 site east of the Little John site near the White River, which possibly dates to between 10,670–10,130 BP, and which includes two foliate bifaces—diagnostic of the Denali complex in our analysis—but lacking in any evidence of microblades, relates to the Little John Site in the culture-historical framework of the region. A reasonable conclusion—in the absence of direct dating of the Nenana component at the Little John Site—is to state that microblades, foliate bifaces, and Chindadn points are present in the far southwest Yukon between 10,500 and 9000 BP. Viewed from the complex associations of techno-complexes in interior Alaska articulated by several generations of archaeologists, different manifestations of purported Nenana and Denali elements at different sites and times in the Yukon would not be surprising. Indeed, in the absence of clear stratigraphic or chronometric evidence otherwise, we have to at least entertain the possibility that the loess-level Chindadn-bearing assemblage from the West lobe of the Little John site *might* be the product of the same culture-bearers responsible for the deposition of the faunal remains and foliate bifaces found in the East lobe paleosols; in such an event the Little John case takes on an additional importance.

In this context, we must finally note the possible relationship of the Little John biface assemblage to areas outside of Beringia. Carlson (1996a, 2004, 2008) has suggested that the Nenana complex may be antecedent to the early pre-microblade occupations of the Northwest Coast of North America. This possibility is based on the presence of foliate and Chindadn-like teardrop bifaces in the earliest documented archaeological components on the coast, dated to c. 9500 at Namu. Carlson (2008:2) argues that bearers of the Nenana complex, adapted to caribou hunting, may have "spread to the northern Northwest Coast … from interior Alaska through the Yukon between 11,000 and 10,000 BP during the Younger Dryas", at a time at which the tundra environment may have extended from interior Alaska through the Yukon and onto the coast, a proposition supported by the presence of caribou on the coast during this period.

The presence of foliate or bipointed bifaces and Chindadn points in the Yukon at the Little John Site and KaVn–2 in the far southwest Yukon between 10,500 and 9000 BP provides support for Carlson's hypothesis. Interestingly, Bever (2006) notes that the Younger Dryas event might also be implicated in the disappearance of the Nenana complex from the Nenana Valley and its reappearance in the Tanana Valley. This may be supported by the presence of unequivocal Nenana components at Broken Mammoth-Component III and Swan Point-Component III, which taken together date to between 10,800 and 9700 BP, coincident with the Younger Dryas. If this movement from the Nenana valley into the Tanana valley continued eastward and onto the coast via the Yukon, the Little John Site and KaVn–2 are perfectly positioned geographically, and in the right range chronologically, to have been locations across which this migrant population would have passed. A detailed technological comparison between early coastal bifaces and those found in the far southwest Yukon, further excavation and dating of the Little John site, and excavation of new sites to more clearly delineate the early culture-historical framework of the southwest Yukon-Alaska borderlands will help to address these questions.

Conclusions

The Little John site presents us with the first recovery of an unequivocal Nenana complex assemblage from within a stratified context in Canada, overlaid by a microblade bearing assemblage we assign to the Denali complex. The site also contains a buried paleosol complex rich in culturally modified fauna, indicative of a broad spectrum subsistence strategy, and dated to c. 9500–9000 BP, in itself a rare occurrence in Yukon-Alaska and thus important in its own terms (Hutchinson et al. 2007). We have also assigned this paleosol complex to the Denali complex, based on its association with foliate bifaces and some evidence of microblade technology. Unfortunately, no material suitable for dating the Nenana complex component has been recovered but, if our separation of the site assemblage is correct, it would predate the fauna and date to c. 10,000+ BP, which would be in general accordance with similar Nenana complex assemblages in the nearby Tanana and Nenana river valleys.

On the other hand, as our regional comparisons and discussion shows, the apparent is no longer as straight forward as cultural-historians would like, and there are several possible ways to interpret the early assemblage of the Little John site at this time. Only further excavation may lead us to more definitive answers to the complexities of the culture history of the Late Glacial period in this region and its relationship to subsequent developments elsewhere. Fortunately, the Little John site is large, and we are also confident that additional related sites in the borderlands region will soon be revealed, which together will undoubtedly provide additional data on the Terminal Pleistocene occupation of Canada's far northwest in years to come, contribute to the resolution of some of the conflicting interpretations we raise here, and undoubtedly present us with important new questions to ponder.

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Chapter 20

Projectile Points and Prehistory in Northwestern North America

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Northwestern North America is of more than passing interest to all New World prehistorians because all three feasible routes by which early migrants could have come south from Beringia traverse parts of this area. The ice free corridor east of the Rocky Mountains was open by at least 10,500 BP since DNA analysis of bison remains from the earliest component at Charlie Lake Cave indicates that bison from both north and south of the glaciated regions were present at that time (Shapiro 2004). An alternative route, the Rocky Mountain Trench west of the Rockies, has so far only yielded artifacts belonging to the same time periods as Charlie Lake Cave, and nothing earlier (Ch. 17). On the Coast the earliest optimal time for movement south from Beringia would have been when the tundra-covered coastal plain was still above sea level during the interval between the melting of glacial ice on the outer coast and its later submergence, caused by the melting of glacial ice and isostatic rebound of the coastal mountains of the inner coast. DNA studies of the On-your-knees Cave skeleton (Kemp 2007) do suggest some coastal movement of early peoples. The earliest firmly dated coastal evidence is at K1 Cave in Haida Gwaii dated 10,800 to 10,500 BP (Ch. 3) and at On Your Knees Cave dated 10,300 BP (Ch. 2). None of these assemblages are early enough to be ancestral to Clovis or potential proto-Clovis assemblages found south of the glaciated regions. The debate on the most probable route of entry into sub-glacial North America will continue until such time as fully accepted archaeological evidence firmly dated to somewhat before 11,000 BP is discovered in the proposed corridors. Since the coastal route is now underwater, and people crossing glaciers, such as is known from accounts of eighteenth century Athapaskan movements (Cruikshank 2005:33–40), may leave no remains, archaeological evidence will be difficult to come by.

Period 1: >11,000–8000 BP (12,900–9000 cal BP)

Projectile points are few in number at the beginning of this period, but do indicate the presence between 11,000 and 10,000 BP of two regionally clustered traditions of making bifacial chipped stone projectile points: a Fluted Point tradition, and a Foliate Biface tradition. Points within these two traditions did not remain uniform throughout this period, but continued to evolve into different forms. In addition to these two early traditions and their derivatives, two additional projectile point traditions, the Microblade tradition and the tear-drop Chindadn point tradition, made their appearance between 10,000 and 9000 BP.

The Foliate Biface Tradition

North of the Strait of Juan de Fuca on the coasts of British Columbia and southeast Alaska the bases of the earliest known points are not fluted, but are either rounded, flattened, or pointed. Some are asymmetric, and while they have been treated as projectile points in this volume, many may have served primarily as knives, so naming this a biface tradition seems appropriate. These bifaces are mostly willow-leaf (narrow) with some laurel-leaf (broad) foliates with tapering lower margins forming a stem and many exhibit lateral grinding on the basal margins. The earliest points are present by 10,600 BP and are soon accompanied by weakly shouldered stemmed forms by at least 10,200 BP (Ch. 3). Shouldering, produced by off-sets on both edges of the lower margins of the point, logically developed from a foliate form with a lower margin tapering to a pointed or slightly rounded base. These early foliate points are found at On Your Knees Cave (Ch. 2), at several sites in Haida Gwaii (Chs. 3, 4), at Namu (Ch. 5) and in the earliest component at Ground Hog Bay (Ackerman 1968). They are also present at the Milliken site (Ch. 1) in the Fraser Canyon between 9000 and 8000 BP, and as part of Cluster 1 from the Stave River on the lower Fraser drainage with an estimated beginning date in excess of 8150 BP (Ch. 10).

Foliate bifaces are present on the Columbia Plateau at Sentinel Gap by 10,680–10,010 BP (Ch. 12) the same time as on the Coast, and somewhat later on the Fraser Plateau at the Prince George site (FlRq–013) (Ch. 16) by 8770 BP. Galm and Gough (Ch. 12) compare the Sentinel Gap points with Haskett points from Southeastern Idaho that have some of the same attributes, and date 10 ± 300 to 9860 ± 300 BP (Butler 1978:65), and are found in a number of other sites in eastern Oregon dating mostly between 10,500 and 9540 BP (Minor and Toepel 1984:33). It remains to be determined whether the Sentinel Gap points are closer in form to those from the northern Northwest Coast or to the Haskett points, or whether their similarities justify lumping them all together.

The Foliate Biface tradition, that is part of what is called the Old Cordilleran Culture by some researchers and the Pebble Tool Tradition by others, presumably has its immediate precursers to the north that are now underwater, and more distant origins in southeast Siberia or Kamchatka where foliate bifaces are common. Fedje et al. (Ch. 3) suggest relationships between the early Haida Gwaii assemblages and those from the Uptar and Kheta sites. More detailed comparisons of all these widely scattered early assemblages of similar, though not identical, bifacial points are necessary including comparisons with Northern Cordilleran (Clark 1983).

The Fluted Point Tradition

There are two types of fluted points in our area: Clovis fluted (Figure 1) and Peace River fluted (Figure 2). Clovis fluted points are found on both the Coast and Columbia Plateau in Washington (Chs. 8, 11), south into Oregon (Willig 1988) and California (Jones and Klar 2007), east through the prairies of Alberta and Saskatchewan, and south through the continental United States into Mexico and Central America (Bonnischen and Turnmire 1991). The East Wenatchee cache (Gramly 1996; Mehringer and Foit 1990), is the only excavated Clovis site on the

Figure 1. Clovis fluted point from the East Wenatchee cache.

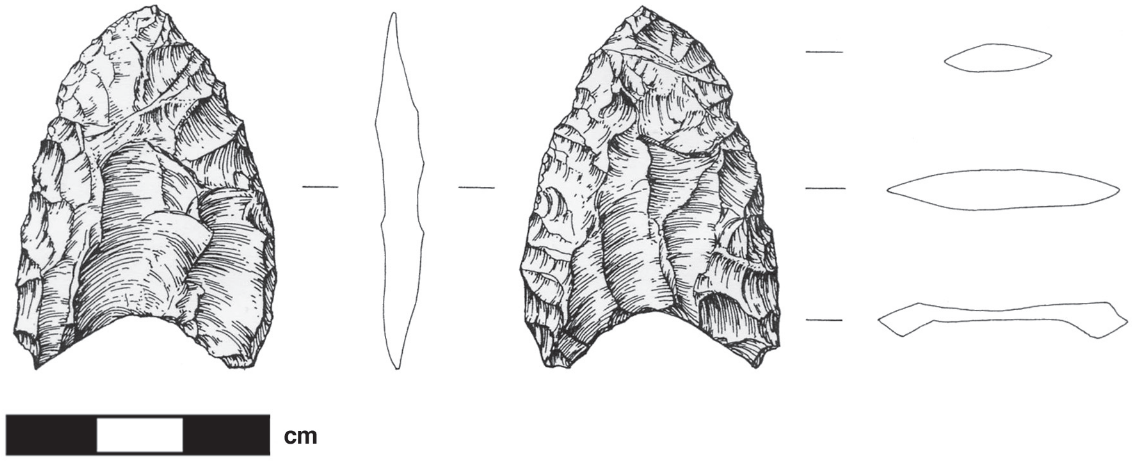

Figure 2. Peace River fluted point from Charlie Lake Cave dated 10,500 BP. Drawing by Brian Seymour courtesy of Jon Driver.

Columbia Plateau, but there are also isolated finds. The continuous distribution of Clovis fluted points, their rapid dissemination and chronological position at the bottom of the archaeological sequence in most of sub-glacial North America, and the specialized technical proficiency required to make such points indicate that Clovis points were products of a highly nomadic founding population in most of their area of distribution (see Bonnischen and Turnmire 1991:309 for other opinions). All of these factors suggest that Clovis points originated in the New World, probably in the eastern United States, and that their occurrence on the Northwest Coast at the outer margin of their distribution is slightly later than elsewhere. A time transgressive model of the spread of Clovis points cannot be validly demonstrated because of fluctuations in the levels of atmospheric carbon during the Younger Dryas that make precise radiocarbon dates during the Clovis period highly questionable (Bjork et al. 1996; Fiedel 1999) even though there have been valiant attempts (Buchanon and Collard 2007).

The overall distribution of Clovis fluted points indicates that their makers spread into the Northwest from the south and the east, and reached as far west and north as Puget Sound on the Coast and almost as far north as the Canada/U.S. border on the Plateau. As far as can be determined the makers of Clovis fluted points were the initial migrants to this area. Was there any reason for them or their descendants to leave? In the face of the changing environments of the late Pleistocene the choices were either to adapt to new conditions or to follow the retreating glacial environment. The projectile point data suggest that different Clovis bands followed different options. Clovis fluted points may be seen as evolving in two directions—one toward the Peace River fluted type (Figure 2) that probably originated on the southern Canadian prairies, spilled over onto the Fraser Plateau, and continued to spread north into Alaska, and the second evolving in the Great Basin toward the concave-based stemmed type (Figure 3) and related Windust phase types that constitute the Intermontane Stemmed Point tradition (Carlson 1996). The same process was at work to the east on the Plains as Clovis evolved into Folsom and even further east and south where there are numerous descendant types (Justice 1987).

The Peace River fluted type (Figure 2) on typological grounds appears to be a Clovis derivative made as fluting was going out of style, and is best represented in collections from east of the Rocky Mountains in Alberta and Saskatchewan (Carlson 1991; Ives 2006). This type is smaller, thinner, and has multiple thinning scars originating from a concave base. The type may be present on the Fraser Plateau (Ch. 13) as well as in the Peace River region (Ch. 17). The type should be viewed as intermediate in time and distribution between Clovis fluted and Arctic fluted points that have many of the same attributes (see Clark 1991). The only radiocarbon dated example is the one from Charlie Lake (Fladmark 2003).

The best current evidences for proto-Clovis, meaning the ancestral culture in which the custom

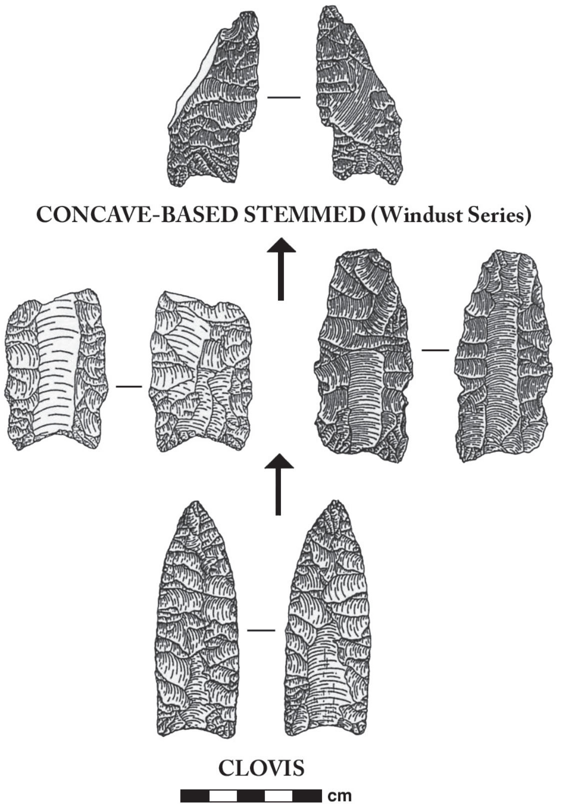

Figure 3. Points suggestive of development of the stemmed concave-based Windust point from the earlier Clovis fluted type. Adapted from Willig (1988).

of hafting points by fluting the base took place, are the early assemblages at Meadowcroft Rockshelter and related sites in Pennsylvania (Adavosio et al. 1983; Adavosio and Pedler 2004), and the Cactus Hill site in Virginia (McAvoy and McAvoy 1997). Both sites have genuine artifacts rather than geofacts, but the debate continues as to their pre-Clovis temporal position. However, both sites do have blade and biface technology that is the logical precurser of fluting (Carlson 1991), and both have radiocarbon dates that pre-date Clovis. Clovis fluted points did originate somewhere, and assemblages at these sites are at present the best candidates as progenitors. Proto-Clovis technology should include both bifaces and blades and when the two were combined to produce fluted points Clovis emerged as a recognizable cultural entity. Ultimate origins, before fluting was invented, are probably in northern Siberia from a culture like that of the much earlier Yana RHS Site (Pitulko et al. 2004) with its bifacial technology and Arctic hunting and survival skills dated about 25,000 BP. The questions as to how proto-Clovis peoples reached eastern North America and exactly when, remain unanswered.

The Intermontane Stemmed Point Tradition

There has been a tendency to treat Clovis as if it were separate from later North American cultures. In our opinion it is unreasonable to think that peoples bearing a culture as vigorous as Clovis simply disappeared and were totally replaced by later peoples. There should be transitional forms between Clovis fluted and later points. Makers of Clovis fluted points, sometimes referred to as western Clovis, occupied the Columbia Plateau and Great Basin, and it is probable that the tradition of concave-based stemmed and shouldered points in that area evolved from Clovis (Figure 3).

These stemmed and shouldered points of the Columbia-Fraser Plateau mark the northern extension of a post-Clovis tradition centered between the Rocky Mountains on the east and the Coast-Cascades-Cordilleran range on the west (Carlson 1983a, 1990:61). There are sites such as Smith Creek Cave in Nevada (Bryan 1979) and Fort Rock Cave in eastern Oregon (Bedwell 1970) that have yielded stemmed points in contexts with radiocarbon dates as early as or earlier than Clovis, but in the former case these dates are accompanied in the same stratum by younger dates within the range of the Stemmed Point Tradition at other sites, and in the latter the large standard deviation of the date makes it useless for precise chronological placement. Musil (1988) has pointed out the advantages of stemmed over fluted forms. It has been hypothesized that the stemmed, concave-based type found in Marmes I, Fort Rock Cave, and at the Dietz site in eastern Oregon (Willig 1988) is a transitional form (Carlson 1988:321) between Clovis fluted and the later stemmed points. Marmes I has two radiocarbon dates on charcoal, 9840 ± 300 BP and 10,130 ± 300 BP, and earlier dates on shell (CAA Radiocarbon Database). This provisional transitional type is also found in Component 1 dating 9920 ± 470 BP at the Paulina Lake site in eastern Oregon (Connolly 1999), and what appears to be the stem of a point of this type was found in the basal cultural deposit in the Connley Caves with radiocarbon dates of 9540–7530 BP and an obsidian date even earlier (Beck et al. 2004). Broken stems of this type appear to be common in eastern Oregon and have sometimes been classified as fluted points (Musil 2004), another indication of their transitional nature. There is one point base of this type from the South Thompson River on the Fraser Plateau (Figure 4) collected by Knut Fladmark. This tradition persisted to about 8000 BP on the Columbia Plateau when it was replaced by small foliates called Cascade points (Rice 1972), but continued later on the Fraser Plateau where the typical points of the Early Nesikep period (Ch. 13) look like derivative forms.

The Chindadn Tradition

Chindadn points are small, thin teardrop shaped bifaces usually made on flakes with marginal retouch (Cook 1996:325). They are known best from the Nenana Complex in central Alaska with an average date of 11,300 BP (Pearson 1999), but are also known from Siberia at the site of Berelekh (Mochanov and Fedoseeva 1996, Fig. 4–2l) and at later sites in Alaska dating 9500–8500 BP (Dixon 1993:86). In the Yukon (Ch. 19) these points are also present by 9500 BP. On the Coast they are found in Haida Gwaii (Fedje 2003, Fig. 3:6), at two sites in the Bella Coola Valley, and at Namu on the central B.C. coast (Ch. 5). Carlson (2008) suggests they were introduced to the northern Northwest Coast, when the coastal plain was still covered with tundra, by caribou hunters from the Yukon.

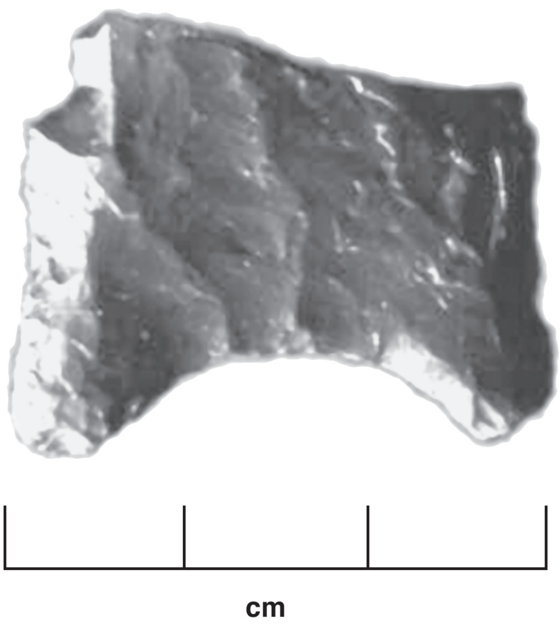

Figure 4. Base of the type of projectile point that can be confused with the Clovis fluted type. From the South Thompson River region in British Columbia. Courtesy Knut Fladmark.

The Microblade Tradition

Microblade technology in the Northwest includes the use of microblade segments as insets in organic hafts to make projectile points (Carlson 1983a, b). This technology is earliest in northeast Asia, later in Alaska, and still later in the Pacific Northwest. The earliest known microblades in Alaska are at the Swan Point site where they both precede and follow a component of the Nenana complex (Holmes 2007). Microblades are present by 9000 BP on the northern Northwest Coast and are found later further south into western Oregon. This technology is generally considered to have been introduced by ancestral NaDene (Tlingit, Haida, Athapaskan) speakers moving throughout this area (Magne and Fedje 2007; Matson and Magne 2007). Microblade types and distributions are covered in detail in Kuzmin, Keates, and Shen (2007). A serious issue yet to resolve is the temporal span of the Microblade Tradition since it does appear to occur well into late prehistoric times, particularly in the Interior.

Period 2: 8000–5000 BP (9000–5700 cal BP)

Both continuity and change are evident in the projectile points of this period. Foliate forms continue but new types of stemmed and notched forms make their appearance. Overall, this period is not well documented.

The Coast

Projectile point data are limited. In Haida Gwaii bone points with inset microblades replaced chipped stone points (Chs. 3, 4). At Namu (Ch. 5) this replacement was also the case, although a single contracting stem point and two foliate points date to this period. To the south on the Fraser River foliate and weakly stemmed forms continue from the earlier period. The best excavated example there is the earliest component from the Glenrose Cannery site near the mouth of the Fraser River (Matson 1976), but there are also a few points from the Milliken site in the Fraser Canyon (Ch. 1). Foliate points continue to dominate coastal asssemblages during this period but tend to be smaller in size than earlier and are accompanied by a few points with a contracting stem that become the dominant type in the next period. These points indicate continuity from the earlier period. Side notching is unknown on the Coast at this time. The only intrusive points from the Plateau are points with the corner removed to form a rectanguloid parallel-sided stem that are found in small numbers in the Stave River watershed off the lower Fraser River (Ch. 10, Fig. 12), and bear a striking resemblance to Scottsbluff points and to some Windust points (Ch. 13; Figure 3).

Columbia-Fraser Plateau and the North

On the Columbia Plateau this time period is marked by several changes in projectile points. The first was the shift about 8000 BP from the stemmed points of the earlier Windust phase to the small foliate bifaces of the Cascade phase (Rice 1972). This change in point form accompanied a shift in subsistence from land mammal hunting to anadromous salmon fishing, and it is possible that these small foliate points of which many have serrated edges served as end-blades on salmon spears. Small foliate Cascade points are found in earlier assemblages on the Columbia Plateau, but are scarce relative to stemmed forms. Various forms of notching appeared during this period. The Cold Springs side-notched type on the Columbia Plateau began about 6000 BP (Ch. 11).

On the middle Fraser River in the Early Nesikep phase (7500–6000 BP), notched forms made by either corner removal of the basal margins, which is probably a continuation of earlier Windust forms, side notching, diagonal corner notching, and rarely diagonal notching of the base near the corners are the common forms (Ch. 13). The northern part of the Fraser Plateau is essentially unknown at this time period except for points from private collections that resemble Plains types (Ch. 15). In the North (Chs. 17, 18) points with the corner removed and side-notched points are also found, and there are some simple foliate forms. Side-notched types are well known on the western Plains at this time period (Walker 1992) and this innovation may have spread to the Plateau and the North from there.

Period 3: 5000–2000 BP (5700–1900 cal BP)

This period is the best known period on both the Coast and Plateau. It is marked by seasonal sedentism with permanent villages in both areas, and by heavy reliance on preserved salmon.

The Coast

Foliate and contracting stem forms and large lanceolate points continue to be found on the central B.C. coast in small numbers. One corner-removed point, made of exotic material and probably traded from the Interior, was found at Namu (Ch. 5). The lanceolate points with faint shoulders and long stems from Prince Rupert Harbour and the Skeena River (Ch. 5) are of similar form to the earlier foliate bifaces found in Haida Gwaii, and could be derivatives although there is a considerable time gap between them. Suprisingly, microblade technology disappears from both the northern Coast and the central B.C. coast about 5000 BP, but continues later in southern coastal British Columbia.

The Coast Salish region (Chs. 6–10), centered on the Fraser River and off-shore islands, is the best know coastal region of this period, and becomes identifiable as a cultural entity recognizable by possession of a common set of projectile points. Simple foliate forms continue from earlier periods, but contracting stem types became dominant early, barbed and expanding stem forms appear as minor types, and triangular types become dominant toward the end of this period. The contracting stem form looks to be the same as the type called Mahkin shouldered (Chs. 11, 14) on the Columbia Plateau. It is also during this period, beginning by 3500 BP, that many of the sociocultural complexes of the ethnographic period are first known (Carlson 1996:Ch. 20).

The Columbia-Fraser Plateau and the North

Various forms of notching are common on points of this period. Corner-notched points producing barbs dominate the Plateau Horizon on the central Fraser Plateau (Ch. 13). On the Columbia Plateau corner-removed points became the norm, and were followed by corner-notched and basally-notched forms about 2000 BP (Ch. 11). On the central Fraser Plateau diagonally side-notched forms of the Lehman phase are common early and are followed by simple leaf-shaped forms that are then side-notched (Ch. 13). This change is suggestive of an up-river movement of people from the Coast related to salmon exploitation. In the Yukon lanceolate Agate Basin points are found as are concave-based, lanceolate corner-notched, and stemmed forms (Chs. 17, 18).

Period 4: 2000 BP to Contact (1900 cal BP to Contact)

This period is the period of the bow and arrow, and is marked first by a change in the size of chipped stone points and then by a change in form from corner notched to side notched. The atlatl is still found early in this period. Two prehistoric atlatls are known: one from the mouth of the Skagit River dated at 1700 ± 100 BP (Fladmark et al. 1987) and a second from Quiltanton Lake on the central Fraser Plateau dated 1950 ± 100 BP (The Midden 1988:8). This new weapons system impacted on not only projectile point size and hunting practices, but on warfare and settlement types (Maschner and Maschner 1998).

The Coast

Chipped stone points, usually triangular, continued in use in the Coast Salish region until 1500 BP or slightly later. We suspect that this type of triangular point is a harpoon end-blade, and was eventually replaced by triangular ground slate points. By the middle of this period the few chipped points found are either small diagonally corner-notched or side-notched forms with the latter seeming to be the later type as on the Plateau. The period between 2000 and 1600 BP in the lower Fraser-Gulf of Georgia region marked the end of the climactic Marpole phase. This event coincided with both the introduction of the bow and arrow and a climate change affecting the abundance of salmon on the Fraser River (Carlson 2008). It is possible that the bow and arrow was actually present in the earlier Marpole phase as there are barbed points made of antler that could have tipped arrows (Ch. 6), although we know the atlatl was still known as late as 1700 BP.

The Columbia-Fraser Plateau and the North

Small side-notched points dominate this period after about 1600 BP although barbed bone arrow points are common in the Yukon (Ch. 18). Also found in the northern Fraser Plateau are the small contracting stemmed Kavik points (Ch. 15) indicative of Athapaskan affiliation. Magne and Matson (Ch. 15) present a quantitative technique for differentiating small arrow points made by Athapaskans from those made by Salishan speakers. Barbed forms persist in the southern Columbia Plateau (Ch. 11) whereas side-notched points are typical further north.

Summary

Our simplified model of Northwest prehistory using projectile points as our main referent is that during the Younger Dryas between 11,000 and 10,000 BP two different peoples moved into the Northwest. At the present time the evidence is essentially equivocal as to who arrived first into what we now know as British Columbia—people making foliate bifaces arriving in the coastal northwest, or people making fluted points arriving in the intermontane northeast. Both date to about 10,500 BP. Between 10,000 and 9000 BP two additional projectile point technologies arrived from the north: tear drop Chindadn points, and microblades used as insets in bone points. Peoples bearing these technologies adapted to the changing environmental conditions of the late Pleistocene and Holocene, and projectile point forms evolved as a result of both adaptational and historical factors.

In the Interior Clovis fluted points evolved in two directions, one toward the Peace River/Charlie Lake type of point and the other toward the concave-based corner-removed stemmed point found in Windust and sites south into the Great Basin. Bifacial chipped stone projectile points became rare in coastal regions, first on the northern Northwest Coast, then on the central B.C. coast, and finally in both the Gulf of Georgia/Puget Sound/Fraser River region and in the Yukon, but continued to evolve in the Columbia-Fraser Plateau. On the Coast foliate forms of chipped stone points initially flourished and evolved first into contracting stem types, and then in those regions where bone points or microblade inserts didn't dominate until later, into expanding stem and notched forms. Influences from the Plains brought in side-notching and corner-notching first to the Plateau and then to the Coast. The arrival of the bow and arrow about 2000 BP saw a reduction in size of corner-notched types followed by development or introduction of small side-notched points.

After the population movements of the early period projectile point types and styles are generally indicative of cultural and ethnic continuity in the

Northwest, although there is a need for both more data from some time periods and more detailed comparative studies in order to better understand, for example, the nature of the time-space transgressive patterns that are apparent in the Early Period with respect to bifaces and microblades, and in the Middle Period with respect to points of the McKean-Duncan-Hanna forms. Many quantitative comparisons remain to be done. Additional detailed attribute and spatial analyses of the small arrow points of the late period could well lead to correlations of types with different ethnic groups.

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