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THE ARCHAEOLOGICAL SEQUENCE IN THE NORTHERN CORDILLERA: A CONSIDERATION OF TYPOLOGY AND TRADITIONS

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THE ARCHAEOLOGICAL SEQUENCE IN THE NORTHERN CORDILLERA:

A CONSIDERATION OF TYPOLOGY AND TRADITIONS

by

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ABSTRACT

This thesis reports on the results of investigations of 23 prehistoric sites in the Rock River headwaters, northern Yukon. The primary objective of the study was to construct a chronological and cultural framework of prehistoric occupation which could be integrated into the known culture-historic sequence for the interior Northwest.

The nature and context of the archaeological evidence in the Rock River headwaters present formidable challenges to the achievement of this objective. The majority of artefacts (c. 20,000) were recovered in surficial context in what are likely culturally mixed deposits. The collections themselves are typical of quarry/workshop sites: implements in various stages of production predominate, and finished or typologically distinctive artefacts are few. The virtual absence of chronological information or diagnostic artefact types required that alternative approaches to conventional artefact analysis and interpretation be developed.

The approach adopted here incorporates Rouse's concepts of 'modes' in artefact production to trace historical or technological relationships in lithic industries. Unlike conventional morphological typology, this approach can accommodate both unfinished tools and tools produced in an expedient or informal manner. Because so much of the prehistoric record of the interior Northwest is organized around the key technological subsets of edge retouched implements, biface, and blade and microblade production technology, these subsets were the focus of analysis for the Rock River collections.

Historically significant 'modes' were identified in the association of certain functional edges on multipurpose tools, which were otherwise expediently produced and morphologically non-standardized. Biface and blade core production sequences were identified also, which appear to reflect distinct technological traditions. The closest comparisons lie with the proposed northern Cordilleran tradition and Paleo-Arctic/Northwest Microblade tradition technologies. To a lesser degree, later Paleo-Eskimo and Athapaskan tradition material culture remains were represented as well.

The results of the investigation suggest that much of the uncertainty surrounding present interpretations of the culture-historic sequence in the interior Northwest may relate to a failure to recognize the limits of conventional typology in dealing with expedient or informal technology.

ACKNOWLEDGEMENTS

Many individuals and institutions have contributed to the realization of this dissertation, and have provided much valuable assistance in the completion of the research and analysis.

I would like to acknowledge the late Dr. W.N. Irving, who was my dissertation supervisor. Dr. Irving, together with Mr. Jacques Cinq-Mars, first gave me the opportunity to become involved in northern archaeology, with the Northern Yukon Research Programme. It was Dr. Irving's material assistance, tolerance and moral support over the years which enabled me to undertake and complete my dissertation research, most of which was carried out at the Northern Yukon Research Programme laboratory at the University of Toronto. The insights, challenges and direction provided by Dr. Irving have also contributed a great deal to the success of the work. Although I did not take his advice, to "ask only those questions that you can answer", his ability to see through to the one issue that lay at the bottom of the everything else enabled me to at least find the questions.

It was in discussions with Jacques Cinq-Mars that I made the decision to undertake investigations in the Rock River area for my dissertation research. I should add that Jacques made very clear to me at the time his reservations concerning this undertaking, and was very explicit concerning some of the problems that would be encountered. And he was right, of course. His willingness, nevertheless, to support my research, and his assistance in procuring for me financial support, in the form of a salvage contract with the National Museums of Canada, contributed a great deal to the success of the field work. I would also like to thank Jacques for his continued interest and advice concerning the Rock River collections and problems in the interpretation of the prehistory of the interior Northwest.

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I would like to express my particular appreciation to the people who worked with me in the field, sometimes under very difficult conditions; Bev Smith, and Patricia Hunking in 1980; and R. Jane Dale, in 1981. Their diligence and good spirits were invaluable. I would like also to thank the staff at the Eagle Plains Hotel, and the Department of Highways (Government of Yukon) crews for assisting our work in many ways, for keeping an eye out for us, and for lending us their dogs.

As is the case with most graduate research, discussions with fellow graduate students have been of considerable assistance throughout the course of the investigations. As a result of these discussions I was able to clarify certain ideas I had concerning my analytical approach, and I was obliged to rethink almost all the rest. I wish to particularly thank Peter Sheppard for his willingness to discuss my work at great length, and for his taking the time to get me started on the computer analysis. Discussions with Ingrid Kritsch improved my understanding of the special problems associated with the analysis of assemblages at quarry sites. I also would like to thank Jean-Luc Pilon, Sheila Greer, Terry K. Alldritt, Pat Julig, Max Friesen, and Margaret Newman who at various times all provided advice, encouragement and support.

The analysis of the pollen samples from the Rock River sites was kindly undertaken by Dr. James C. Ritchie and Ms. Kate Hadden (Department of Botany, University of Toronto). Jacques Cinq-Mars arranged for the processing of the radiocarbon dates by the Geological Survey of Canada.

Mr. Charlie Peter Charlie of Old Crow was kind enough to sit down with me for an afternoon to discuss traditional land use in the Rock River area and to speculate about past occupations. I wish to thank Charlie Peter for his time and his willingness to share his knowledge.

Carl Evers provided the necessary hardware for completion of the thesis here in Whitehorse, and his assistance is very much appreciated. Dave Harkness provided some eleventh hour photographic assistance, for which I am much obliged as well.

I would like to express my special gratitude to Ray Le Blanc and John Tomenchuck for taking the time to read the early drafts of my thesis. Their criticisms and suggestions considerably improved the work; they are not to be held responsible for its shortcomings, however. Ray was particularly exacting in his critical comments, and I am much obliged to him for this.

I also wish to thank the members of my supervisory committee: Maxine Kleindienst, Chuck Arnold and Bruce Schroeder. I am particularly grateful to Professor Kleindienst for assuming the role of thesis supervisor in Dr. Irving's place, and for her help in expediting the work in its final stages.

Finally, I wish to especially acknowledge the support of my family over the years that I have been in school and in the field, doing archaeology. Their belief in what I was doing helped me believe too. It is with much love and gratitude that I dedicate this thesis to my mother, Gisela Tervoort Gotthardt.

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CHAPTER 1

INTRODUCTION

> Material technological remains, especially lithics, are among the least diagnostic indicators of a particular human population, economic adaptation, and world region (Aigner 1978:39).

Introduction

The archaeological investigations in the Rock River headwaters, northern Yukon Territory, which comprise the core of this thesis, were undertaken with the objective of reconstructing the history of occupation in the area, and of integrating the archaeological sites and collections into the known culture historic sequence for the northwest Boreal Forest. The Porcupine drainage, of which the the Rock River headwaters represent the extreme eastern periphery, (Figure 1.1) has been a focus of intensive archaeological investigation in the past fifteen years (cf. Irving and Cinq-Mars 1974; Cinq-Mars 1979; Morlan 1980; Morlan and Cinq-Mars 1982, Le Blanc 1984). Although our understanding of the nature and antiquity of the archaeological record in northern Yukon is still in the developmental stage, there is evidence to suggest that human occupation of the region spans the Holocene and at least a portion of the late Pleistocene (cf. Jopling et al. 1981; Morlan and Cinq-Mars 1982, Greer and LeBlanc 1983).

Prior to the study outlined in this dissertation, and to two brief surveys made in connection with the construction of the Dempster Highway (Cinq-Mars 1975, 1976a) and the proposed Dempster lateral pipeline (Van Dyke 1979), the archaeological potential of the Rock River headwaters was virtually unknown. There are now approximately 35 prehistoric archaeological sites identified in this region of the northern Cordillera, the majority concentrated in the upper reaches of the middle branch of the Rock River, known as White Fox Creek (formerly Cornwall Creek) (Figure 1.2). All sites are located in what may be termed look-out situations, on gravel terraces and low ridge complexes in the western foothills of the Richardson Mountains. The location of these sites along a known caribou migration route suggests that at a minimum there was seasonal occupation of the area, centred around the interception of caribou herds during spring and/or fall migration. The sites

Fig. I.I Location of the Study Area

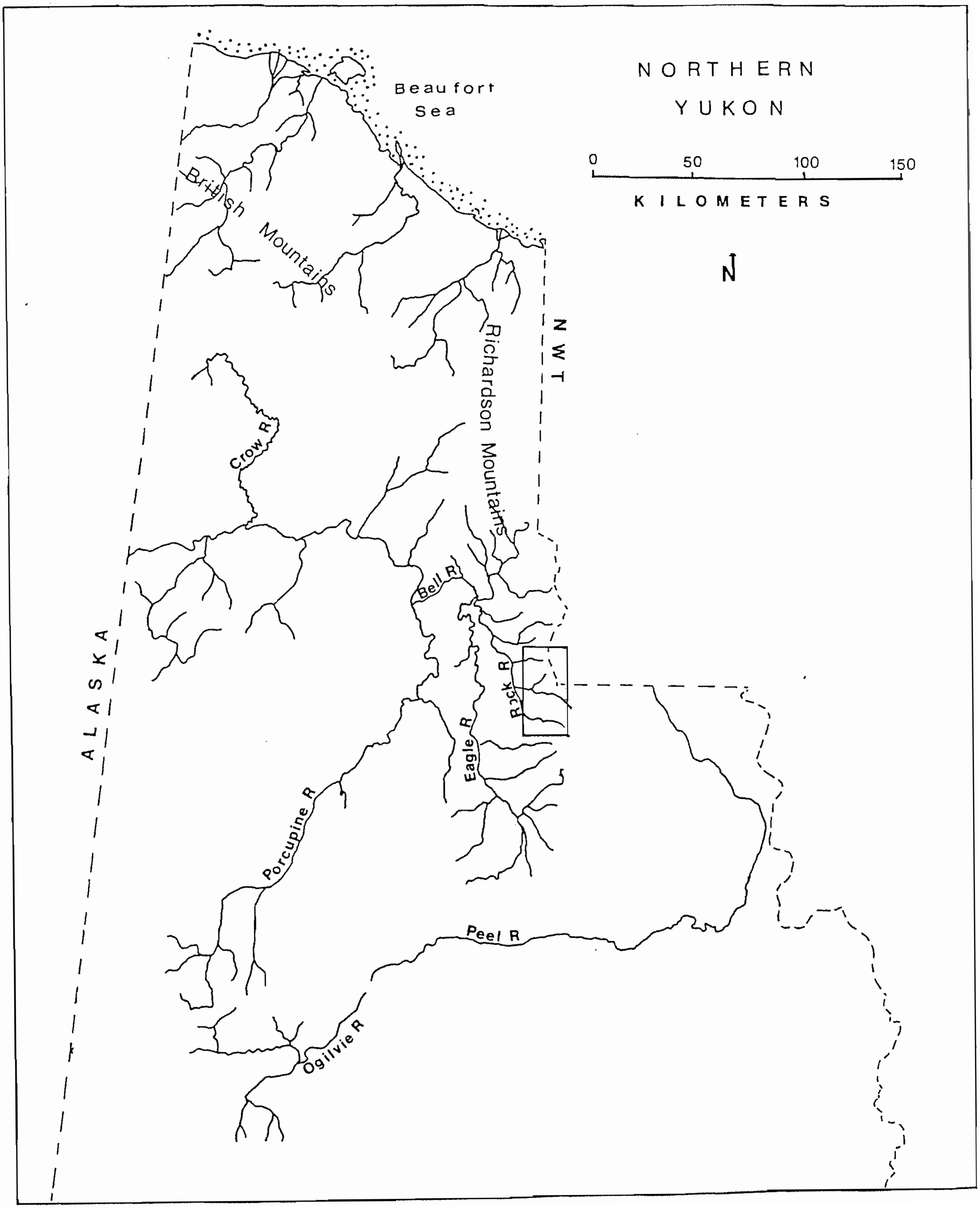
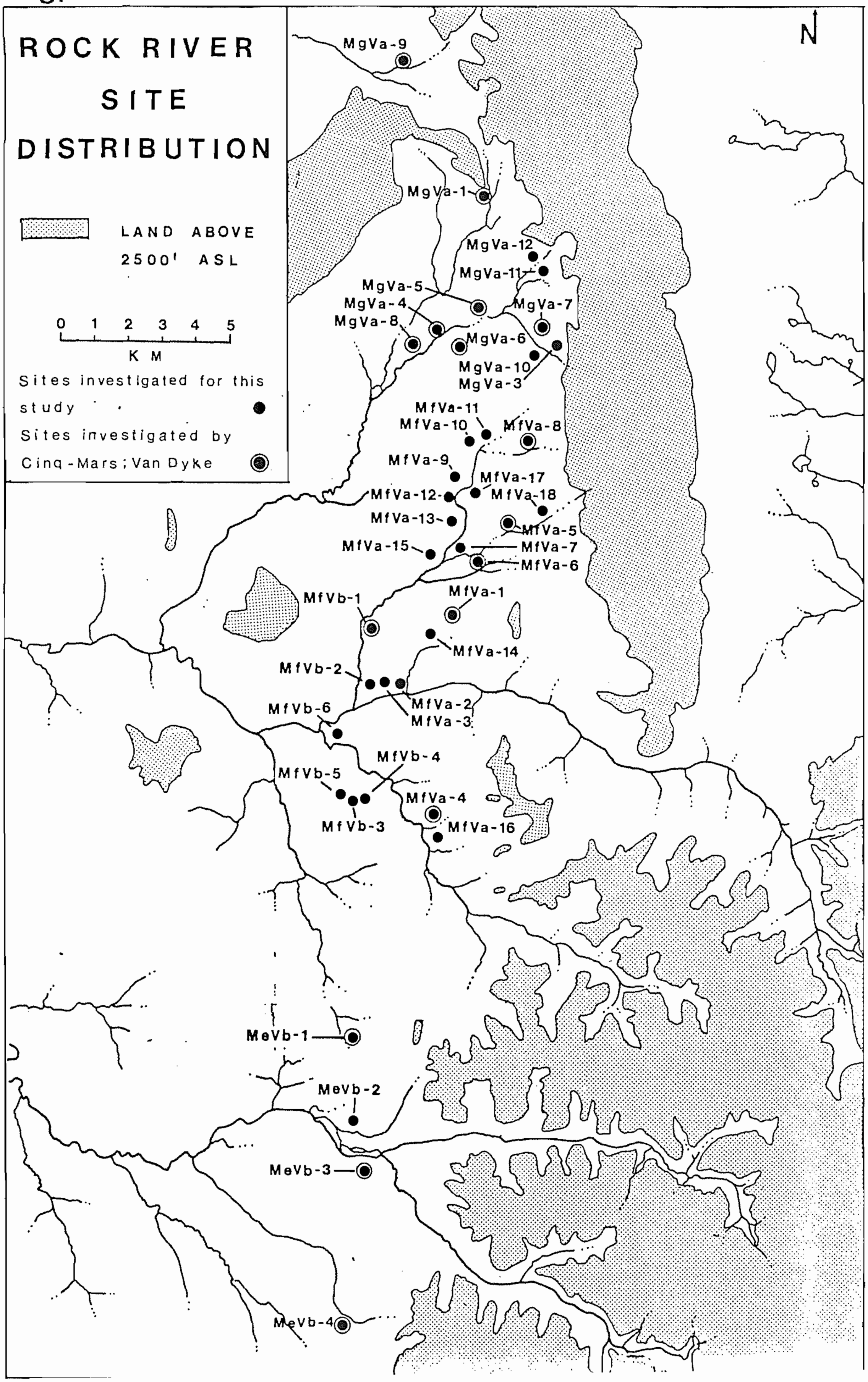


Fig. 1.2


ROCK RIVER
SITE
DISTRIBUTION
LAND ABOVE 2500' ASL
0 1 2 3 4 5
K M
Sites investigated for this study
Sites investigated by Cinq-Mars; Van Dyke
N
MgVa-9
MgVa-1
MgVa-12
MgVa-11
MgVa-5
MgVa-4
MgVa-8
MgVa-7
MgVa-6
MgVa-10
MgVa-3
MfVa-11
MfVa-10
MfVa-8
MfVa-9
MfVa-17
MfVa-12
MfVa-18
MfVa-13
MfVa-5
MfVa-15
MfVa-7
MfVa-6
MfVb-1
MfVa-1
MfVa-14
MfVb-2
MfVa-2
MfVa-3
MfVb-6
MfVb-4
MfVb-5
MfVa-4
MfVa-16
MfVb-3
MeVb-1
MeVb-2
MeVb-3
MeVb-4

are exposed directly on the surface, and thus organic remains are not preserved. The absence of faunal remains prevents a more direct interpretation of past subsistence adaptations.

One characteristic of the collections from the area is an almost exclusive reliance on locally available silicious argillite for the manufacture of implements. The collections are dominated by large flakes and bifaces, although a few edge retouched and burinized implements are also present.

On the basis of his brief reconnaissance, Cinq-Mars (1975:21) tentatively compared the Rock River materials with the collections from Engigstciak (MacNeish 1956) and the Trout Lake area in the Barn Mountains (Gordon 1970, 1973), which have been assigned by their respective investigators to the British Mountain tradition. British Mountain, however, is at best a poorly understood phenomenon in the culture history of the Northwest (cf. Clark 1976), and at this stage the comparison contributes little to our understanding of the archaeology of the Rock River area.

Isolated artefacts diagnostic of northern Cordilleran/ Northern Plano (Kamut), Paleo-Arctic, and Paleoeskimo traditions have since been recovered in the Rock River sites, and suggest that the prehistoric sequence consists of multiple occupations by diverse groups spanning most of the Holocene. The reconstruction of events in the prehistory of the Rock River area, and the placement of the materials in the culture-historic sequence presently defined for the northwest Boreal Forest is complicated, however, by two factors relating to the context of the sites and the nature of the collections.

Virtually all collections were recovered in surficial deposits, and at most sites the remains of several occupations are probably represented. In multicomponent surface sites the recognition of the products of diverse technologies, and their placement in the prehistoric sequence normally depends heavily on a typological approach, which seeks to identify variances in technological and stylistic attributes.

In the Rock River area, however, the majority of artefactual remains appear to relate to workshop/quarry activities, and finished artefacts are few. Moreover, the abundance of the silicious argillite raw material, and its ready availability in the form of frost spalls and shatter, apparently also promoted an expedient or opportunistic approach to tool manufacture and use. Furthermore, in the small sample of finished implements formalized or standardized tool types are not well represented.

Given the virtual absence of chronological information and diagnostic tool types, the problem of culture-historic reconstruction requires that alternative strategies for eliciting information from the lithic remains be employed, which do not depend on the presence of finished implements in the sample, or on ideas of morphologically distinctive or standardized tool types.

For the purposes of the present analysis, I have adapted the concepts of 'modes' in artefact production, as originally developed by Rouse (1939, 1960). According to Rouse (1960:313-14), a mode is a shared custom, standard or belief to which artisans conformed, and which may be distinguished by reconstructing decisions made at each level in the production of an implement. Rouse terms decisions relating to artefact manufacture and use 'procedural modes'; shared concepts of material, shape and decoration are labelled 'conceptual modes'. Rouse (1960:321) proposed that it is the distribution and associations of modes, rather than arbitrarily defined artefact types, which will prove most helpful in the identification of culture complexes and the recognition of processes of change in the archaeological record (1960:321). In analysing the Rock River collections, I anticipated that this approach would permit me to characterize the technologies represented, at least on the procedural level, even in the absence of finished artefact forms.

In most respects, attempts to reconstruct 'decision making' processes in implement manufacture (cf. Bonnichsen 1977), implement production 'styles' (cf. Close 1977, Conkey 1978), or designs (Kleindienst and Keller 1976, Kleindienst 1979), can be compared with Rouse's modal approach (see also Cross 1983). The recognition of style in the material culture record depends on the availability of choice in an activity or procedure (cf. Close 1977:5) The element of choice in the design and manufacture of artefacts is also central to the 'decision making' approaches (cf. Callahan 1979:3; Young and Bonnichsen 1984:136). The assumption that 'decision making' was 'normative' within a particular technological tradition, with respect to the production of specific artefact 'types', is implicit in most of these approaches, and in this respect, they are comparable to Rouse's concepts of 'ideal types' or 'templates'.

In the analysis of the collections from the Rock River area, I have chosen to focus specifically on three subsets of the lithic industries: the edge retouched and utilized implements, biface production technology, and blade and microblade production technology. The use of blades for the manufacture of tools and implements has obvious implications for ideas of formality or standardization contained in a lithic industry.

In view of the preponderance of bifaces in all stages of production, a modal approach seems appropriate to the problem of reconstructing and differentiating biface production strategies in the Rock River collections. Once defined, it may then be possible to suggest the association of these strategies with a particular technology or techno-complex defined elsewhere in the interior Northwest. This approach is also suggested by the success of a number of recent studies which have sought to characterize biface manufacturing traditions in time and space, also based on the reconstruction of decisions made in each stage of biface production (Muto 1971; Callahan 1979; Young and Bonnichsen 1984).

The subset of edge retouched and utilized implements is dominated by expediently produced forms. Most investigators would probably view these as relatively uninformative about the particular technology or social context in which they were produced. Commonly, the assumption is made that " ... the greater the number of transformation stages an item goes through, the greater its chances of bearing social information, because each stage provides an opportunity to add social expression" (Weissner 1983:259). Cahen et al. (1979:671-2) go so far as to caution against attempts to compare or characterize assemblages on the basis of a typological treatment of expedient technology as potentially misleading, and prefer instead to continue to trace cultural relationships on the basis of the distribution of fossiles directeurs in the prehistoric record. I would suggest that this judgement is somewhat premature, and heavily influenced by ideas of morphological standardization in the definition of tool types.

I noted in the Rock River collections that certain functional edges were consistently associated on implements, despite an otherwise expedient and morphologically non-standardized approach to tool production. The association of these edges represents, in my opinion, functional or 'conceptual' modes, important in the design of a particular tool type. The distribution and associations of these modes in the prehistoric sequence of the interior Northwest further suggests that, at least in some cases, these may also be considered 'historical' modes (Rouse 1960).

I suspect that much of the uncertainty surrounding our present understanding of the culture-historic sequence in the interior Northwest may relate to a failure to recognize the limits of conventional typology in dealing with expedient or informal technologies. In this regard, it is hoped that my work will also make some contribution to the development of alternative approaches for interpreting the archaeological record of the area.

The results of the investigations in the Rock River headwaters are presented in essentially two parts: background, including environment and interpretations of subsistence; and the analysis of the major technological subsets of edge retouched and utilized implements, bifaces, and blades. The analysis is prefaced with a review of current interpretations of the prehistoric sequence in the interior Northwest, to identify some of the problems associated with the defintion of technological traditions which are based essentially on these key traits.

A brief summary sketch of the environmental and physiographic setting of the Rock River sites is presented in Chapter Two, together with a discussion of available resources and the possible prehistoric subsistence base. The ethnographic record of land use patterns in the area is reviewed as this may contribute to the interpretation of earlier subsistence adaptations.

Chapter Three presents an overview of site context in the Rock River area and describes the excavations of two buried deposits. The context and associations of the radiocarbon samples are also discussed.

Current interpretations of the prehistoric sequence in the interior Northwest are reviewed in Chapter Four, with particular attention paid to the implement types and technologies which have been used to characterize various complexes and traditions. Some of the problems associated with the definition of technological traditions in the prehistoric record are also identified, particularly as these may benefit from alternative approaches that have been developed in the analysis of the Rock River collections.

Chapter Five presents the analysis of the edge retouched and utilized implements within a general framework of a review of concepts associated with expedient as opposed to curated tool production, and informal and formal technology. The subsets of implements manufactured on non-local cherts and on blades are given particular attention as these are assumed to represent examples of curated and formal technology respectively. Comparisons of the tool classes, and especially the functional modes represented in the sample of multipurpose tools, are made with collections described in the literature.

Chapter Six describes the modal analysis of the biface production technology, incorporating the results of similar studies by Muto (1971), Callahan (1979), and Young and Bonnichsen (1984). Initially, a test study was made on small samples of known provenience (the late Archaic Surma site and the Itivillik Lake collections, which contain Paleoeskimo and later historic Eskimo materials) to identify production features which consistently differentiated the two samples. The results of this study are then used to reconstruct manufacturing strategies in the Rock River biface sample. Bifaces and biface trimming flakes recovered in buried context in the Rock River area, and isolated examples of culturally distinctive projectile points permit some discussion of the association of the manufacturing strategies identified in the sample as a whole with cultural complexes already defined in the interior Northwest. Questions concerning degrees of formality evident in biface production are also addressed.

Chapter Seven describes blade and microblade technology in the Rock River area. Opportunism appears characteristic of core preparation in most cases, in response to the tabular form of the available raw material. The distribution of blade and microblade technologies in the interior Northwest are discussed, and the possibility of an early blade industry, not associated with microblade production, in a northern or Arctic Cordilleran complex (Morlan and Cinq-Mars 1982), is considered.

The final chapter undertakes to place the Rock River collections in the culture-historic sequence presently defined for the interior Northwest. Blade and microblade technologies, biface production technology, and multipurpose tools are considered specifically in the light of questions of expediency and curation; and of formality and informality in tool production, as these factors affect the utility of conventional typology for defining technological traditions in the prehistoric record of the interior Northwest. Recommendations concerning alternative typological approaches are presented here as well.

CHAPTER 2

ENVIRONMENTAL AND ETHNOHISTORICAL BACKGROUND

The Physical Setting

Bedrock Geology and Physiography

The area of the Rock River headwaters lies mainly on the border zone between the western Richardson Mountains and the Porcupine and Eagle Plain. Bostock (1948:37) describes the region as follows:

> On the west side, the Richardson Mountains rise from the Porcupine Plain as a belt of low foothills 5 to 10 miles wide. These hills mark the first upturned strata, and are followed by successively higher, steeper ridges as the mountains are entered.

The physiography of the study area proper is characterized by a series of southwest trending terraces at moderate to low elevations, paralleling the drainage of the various tributary streams of the middle and southern branches of the Rock River. Bedrock ridges, or 'whale backs', comprised of Devonian shales, sandstones and siltstones (Rampton 1981:28) parallel the mountain front in a north-south direction (Plate 2.1).

The middle branch of the Rock River (White Fox Creek) and its main tributary streams are deeply entrenched in the pediment of the foothills region. The minor tributary streams run in rather shallow, broad valleys. Erosional activity is restricted principally to the period of spring runoff.

The Richardson Mountains have been divided into northern and southern groups on the basis of variations in geotectonic development (Douglas *et al*. 1976). The region of the Rock River headwaters falls in the approximate geographic centre of the range. Orange weathering shale, noted in some areas in the Rock River headwaters, is characteristic of the northern Richardson Mountain bedrock province; various blue, grey and dark grey shales, sandstone, sandstone conglomerates, siltstone, limestone,

Plate 2.1: MfVa-13, Locality 1. General View to Northeast to Richardson Mountain Foothills

argillaceous limestone and red and green argillite are also found in the northern province. Bedrock types occurring in the southern bedrock province include argillite, argillaceous limestone, limestone, various dark grey and black shales, sandstone, siltstone, and some grey and black cherts of varying qualities (Douglas et al. 1976).

Surficial deposits in the Rock River headwaters are primarily colluvial. According to Rampton (1981:28), the depth of weathering and weathering products in colluvium vary significantly in this area, depending on the parent material. Overlying shale lithologies are silty clays with pebble-sized shale shards; silty sand with abundant angular pebbles and cobbles tends to overlie sandstone units. Silty clay with rounded pebbles generally develops over conglomeritic bedrock. Depth to bedrock ranges from less than 0.5 metres to as much as 3 metres. Poorly drained, depressed or level ground is generally characterized by an extensive cover of organic deposits (Hughes 1972). On the sheltered, lee sides of slopes, loess accumulations may be present, overlying bedrock or colluvium.

Illinoian or pre-Illinoian alluvial deposits are present along most major streams. These are typically high level terraces composed of 20 to 50 cm of peat overlying 5 m of alluvial gravels (Rampton 1981).

Exposed bedrock surfaces are common in the study area. Weathering ften produces a cover of shatter or rubble, depending on bedrock type. Extensive areas of felsenmeer tend to characterize exposed sandstone bedrock.

Although the western portion of the Richardson Mountains was largely ice-free during the last glaciation (Hughes 1972), there is evidence to suggest glacial outwash mantled the slopes nearer the mountain front. Rampton (1981:33) noted that during deglaciation " ... meltwater flowed across the divide and down the northern tributary of the Rock River (White Fox Creek), incising the river channel and forming low level terraces".

At present, a number of periglacial processes continue to modify the terrain. Solifluction and frost creep periodically cause the downslope movement of sediments on moderate and steep slopes and, on more level ground, evidence of cryoturbation in the form of non-sorted circles or rock polygons is visible. Locally, ice-wedge polygons and vegetation tussocks occur as well. In areas of high overland flow of water sediments are patterned into rill formations (Rampton 1981:33).

Soil Formation

Cryoturbation, deflation and general cold climate conditions have hindered normal soil development over much of the study area. Immature and mature Brunisols or Arctic Brown soils were noted on sheltered, well drained terraces where some tree or shrub cover was present. These soils are characterized by a thin, dark organic horizon (F-H), underlain by a thin reddish horizon (Bm), indicating the removal of some iron from the upper horizon, and finally, a C horizon, which is locally variable depending on the parent material (Hettinger *et al*. 1973:114).

In treed areas, along stream banks and on south-facing slopes south of the middle Rock River, soil profiles may also exhibit a thin greyish leached horizon (Ae or Ah) beneath the organic horizon, indicating slight removal of clays by acids (Hettinger *et al*. 1973:114).

Vegetation

The Rock River headwaters are in an elevation dependent treeline situation. Vegetation is a tundra type with gallery forest and isolated stands of black spruce (*Picea mariana*), white spruce (*P. glauca*), and tamarack (*Larix larcina*) occurring in sheltered areas, especially away from the mountain front and south of the middle branch of the Rock River (Plate 2.2, 2.3).

Vegetation on the terraces and ridges is controlled principally by bedrock type, drainage and aspect. Good drainage and southerly aspect are particularly important for the distribution of shrub species, especially alder (*Alnus crispa*; *A. incana*). In most areas, a cover of dwarf birch (*Betula glandulosa*) willow (*Salix phlebophylla*, *S. glauca*), heath (Ericaceae), low vascular plants (eg. *Vaccinium*, *Arctostaphylos*), moss and lichen, is common. In lowlying areas, vegetation is typically tussock tundra.

Fauna

The principal resident large game species in the Rock River headwaters are barren ground caribou (*Rangifer tarandus*) and Dall's sheep (*Ovis dalli*).

The caribou are members of the the Porcupine Caribou Herd. Of this herd, a few are known at present to winter in

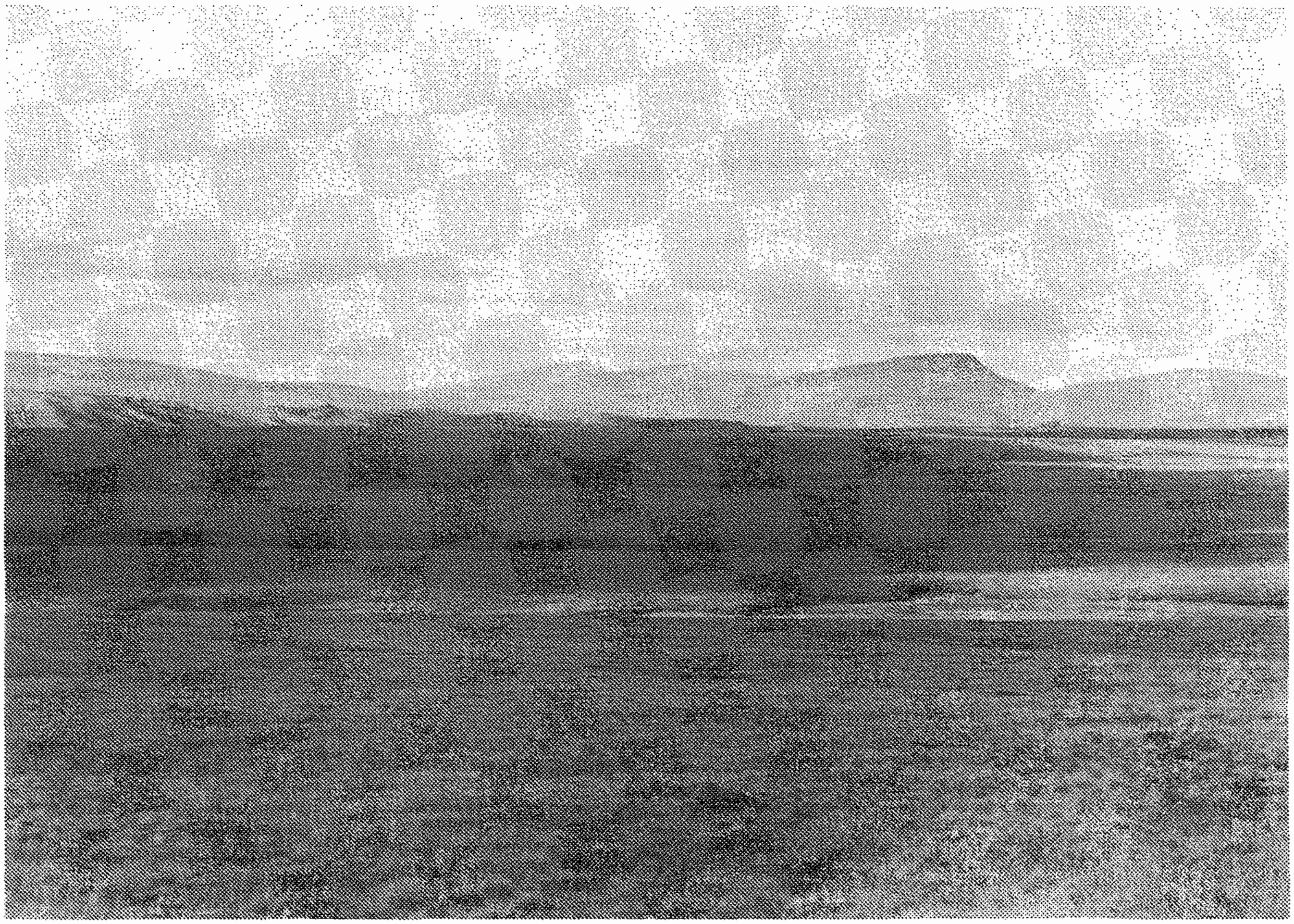


Plate 2.2: General View of Northern Portion of the Study Area. View Southwest from MfVa-15

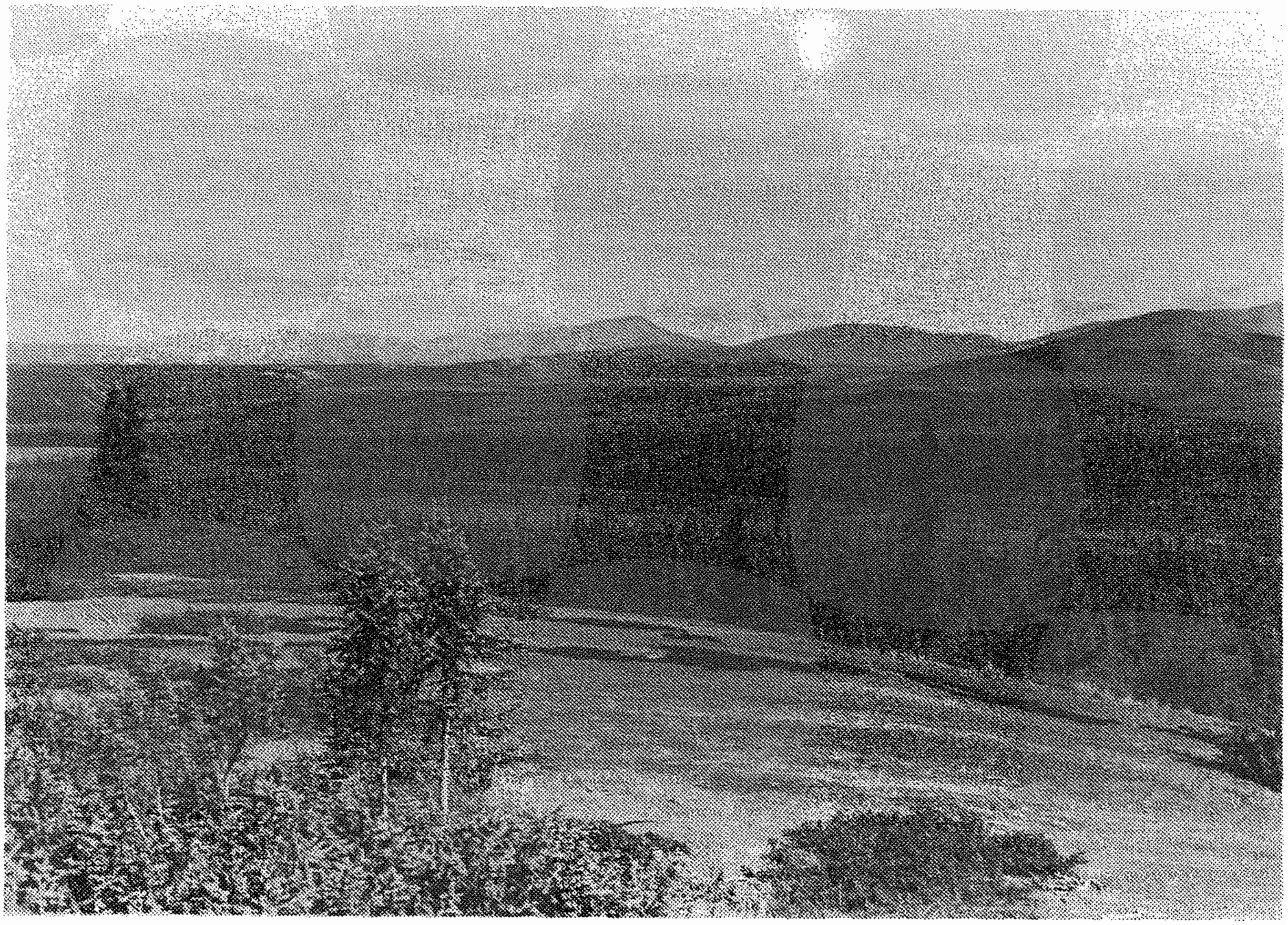


Plate 2.3: General View of Southern Portion of the Study Area. View North from MfVb-3

the Richardson Mountains in the general vicinity of the study area. Caribou are most abundant during spring and fall migrations between the main wintering grounds in the southern Richardsons and south of the Peel River in the Ogilvie Mountains, and their calving grounds on the coast. Environmental impact studies (Jakimchuk et al. 1974; Foothills Pipe Lines Environmental Impact Atlas, Vol 5; LeBlond 1979; Russell and Martell 1980) have shown that a portion of the Porcupine caribou herd regularly move along the western front of the Richardson Mountains and through the upper drainage of the Rock River during spring and fall migrations (Figure 2.1). Biologists who have monitored migrations during the last decade estimated as few as 4,202 (1978) and as many as 56,000 - 60,000 (1974) animals utilizing the Richardson Mountain route on an annual basis (Foothills Pipe Lines [Yukon] Ltd. 1978:53, Table 4).

The timing of the spring migration north appears to relate to factors of physiology of pregnant females, and to amount of snow cover, particularly for that portion of the herd south of the Peel River. Animals wintering in the southern Richardsons generally begin their northward movement in late March/early April; animals south of the Peel River begin moving north about one month later. Spring migration through the upper drainage of the Rock River occurs during late March and April, with the second wave, comprising the majority of the herd, moving through in late April and May (Foothills Pipe Lines [Yukon] Ltd. 1978: Table 2).

Although other factors probably enter in, fall migration appears to be initiated by the first major snowfall of the season (Jakimchuk 1974 et al.). Animals generally begin moving through the Rock River drainage in September and October (Foothills Pipe Lines [Yukon] Ltd. 1980).

The distribution of Dall's sheep in the Rock River headwaters has been documented by Russell and Hoefs (1979). The present winter range of the Mt. Cronin herd is in the headwaters of the lower and middle branches of the Rock River, east of the Dempster Highway. Sheep were also observed congregating in the area of the lower Rock River during lambing season and throughout the summer to take advantage of a mineral lick located 2.4 km east of the Dempster Highway (Figure 2.2). A second mineral lick is located about 26 km east of the Dempster Highway on Tetlit Creek, on the eastern flank of the Richardson Mountains. Regular use of the mineral licks by sheep was observed: the animals consistently used the same routes of travel to and from the lick at specific times of the day, arriving in late morning and departing in late afternoon. At present, the Mt. Cronin herd numbers just over 100 individuals.

Fig.2.1 Paths of Caribou Migration

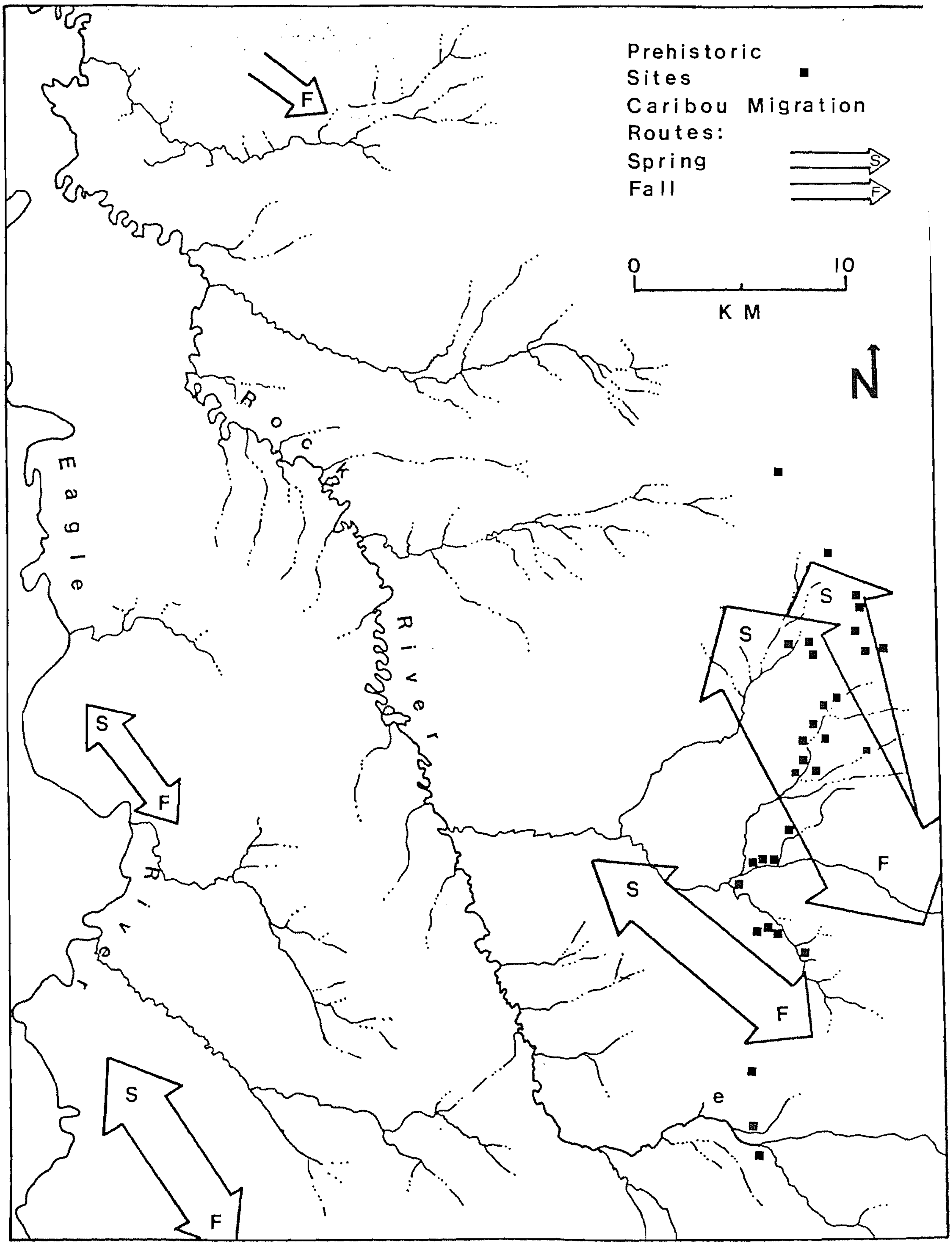
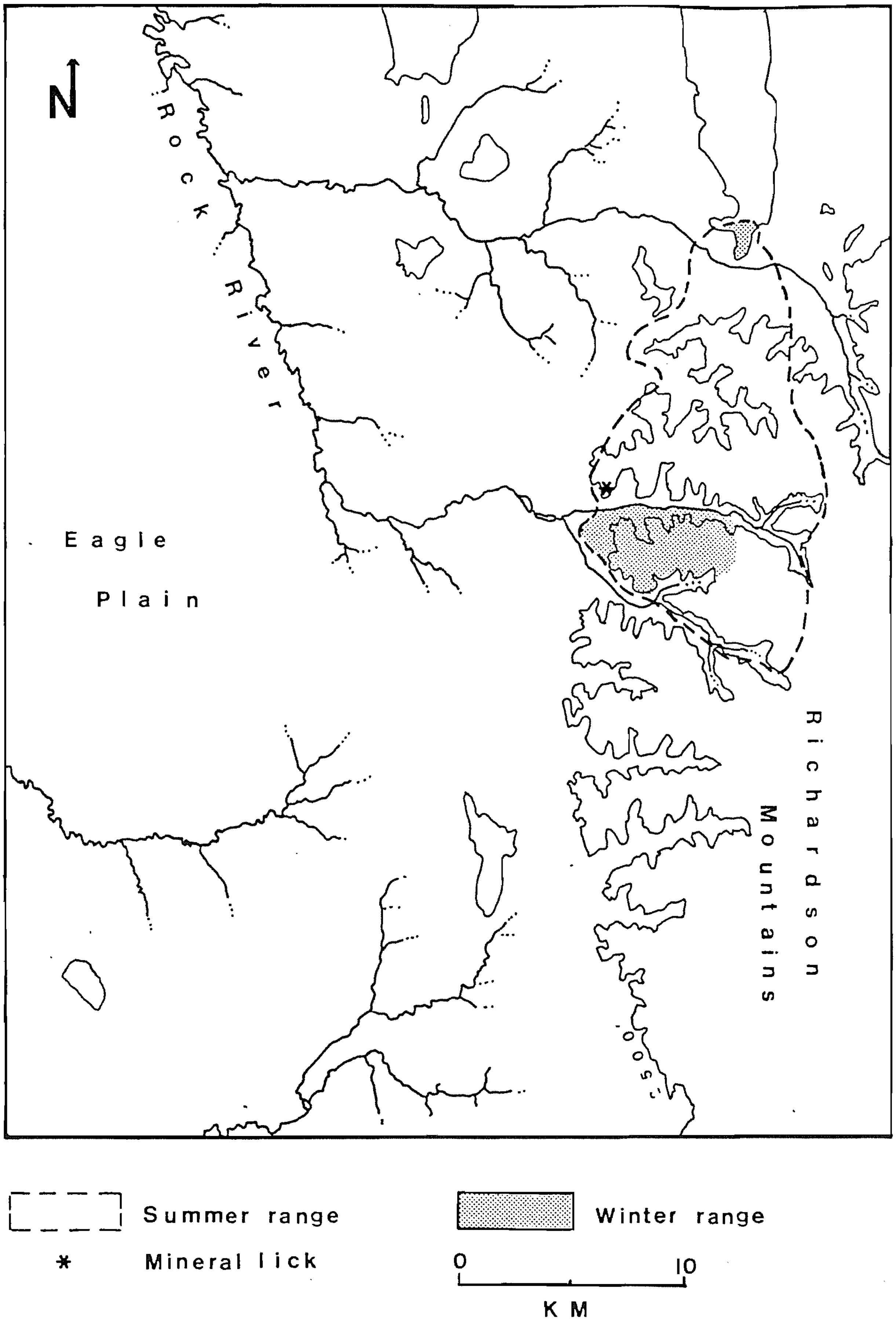


Fig. 2.2 Distribution of Dall Sheep



The upper drainage of the Rock River also supports a relatively dense population of grizzly bear (Ursus arctos), which are known to den in the area (Ruttan 1972). Other important resident fauna include wolf (Canis lupus), fox (Vulpes vulpes and Alopex lagopus), wolverine (Gulo gulo), snowshoe hare (Lepus americanus), and arctic ground squirrel (Spermophilus parryii) (Youngman 1975).

Environmental History of the Northern Cordillera

Our current understanding of the environmental history of the northern Cordillera stems primarily from the investigations of Cwynar (1980, 1982) and Ritchie (1984). The very long sediment cores obtained by Cwynar from Hanging Lake, just southwest of the Barn Mountains (68°23' N, 138°23' W), provide a continuous record of vegetational changes in upland portions of northern Yukon from about 33,000 B.P to the present.

Relevant for the reconstruction of environmental change in the Holocene period are Cwynar's Zones HL4 and HL5 from the Hanging Lake core, which date 11,000 - 8,900 B.P. and 8,900 B.P. to present, respectively (Cwynar 1980).

The early Holocene HL4 Zone is characterized by marked increases in both influx and percentage of pollen belonging to heath species (Ericaceae). Betula influx reaches its maximum in this zone, and increases in Picea, Populus, Alnus and Equisetum influx are noted as well. Cwynar interprets these changes to indicate the rapid development of 'wet mesic heath communities'. At the same time, dwarf birch and willow increase, resulting in the development of vegetation communities of low shrub heath tundra very similar to the modern flora of this region of northern Yukon.

Zone HL5 is marked by an increase in alder (Alnus crispa) up to its modern status. No significant changes are noted in species or percentage of pollen in the Hanging Lake sequence subsequent to the alder rise. On this basis, Cwynar has suggested that an essentially modern pattern of plant communities was established in upland regions of northern Yukon by about 8,000 B.P.

The meagre pollen sample collected from the buried organic horizons at site MfVa-9 in the headwaters of the middle branch of the Rock River, dated to 7580 ± 420 B.P. (S-2013), has been interpreted as representing an essentially modern flora (L. Ovenden 1981: personal communication; see also Appendix I). In the light of Cwynar's reconstructions of the vegetation of the northern

Yukon during the early to mid-Holocene, both the pollen record and the dates may be considered mutually acceptable.

The spread of forests in the interior Northwest appears in the early Holocene period to be a time transgressive phenomenon. Northern Yukon witnessed an early and rapid spread of white spruce in upland areas by at least about 9000 B.P. Cwynar has suggested in fact that parts of northern Yukon may have been a forest refugium (1980). According to Ager (1983:139), the colonization of southwest Yukon and the adjacent Tanana Valley of Alaska by white spruce also occurred at about 9000 B.P.; southeast Alaska, upper Cook Inlet and the Kenai Peninsula were forested by about 8000 B.P., while in southwest and northwest Alaska white spruce forests appeared only by about 5500 B.P. The implications of environmental diversity in the early/mid-Holocene for human adaptive patterns are probably significant.

The climatic implications of changes in plant communities during the Holocene must be interpreted with caution. On the basis of the Alaskan data, Ager tentatively recognizes an early-Holocene interval of warm moist summers; an interval of warmer, drier climate during the mid-Holocene (Hypsithermal), and by about 3500 B.P., a shift to cooler, moister conditions. Ager stresses, however, that these climatic changes are not represented by changes in vegetation in all localities in Alaska: "Most lowland sites in interior and western Alaska do not record significant changes in vegetation or climate during the past 6000 years or so ..." (Ager 1983:139).

The Ethnohistoric Record of the Northern Cordillera

The upper drainage of the Rock River lies within the lands traditionally occupied by the Upper Porcupine or Tukkuth Kutchin. In the accounts of the early Hudson's Bay Company traders, the Upper Porcupine people were named Rat Indians, after their homeland on the Bell (Rat) River (Murray 1910:26).

At the time of contact, Tukkuth Kutchin territories extended from the drainage of Berry Creek to the headwaters of the Porcupine River, including the Eagle River drainage, and across the divide to the foothills in the North (Osgood 1934:169).

In the historic period, Peel River or Tetlit Kutchin also hunted sheep and caribou in the western Richardson

Mountain foothills, and trapped in the area of the Eagle River drainage and the junction of the Eagle and Bell Rivers (Slobodin 1962:101, 45). Slobodin suggests, however, that this pattern may not have been traditional, but rather that it dates from about the time of the establishment of the Hudson's Bay post near the mouth of the Peel River (Fort McPherson, at that time known as the Peel's River Post) in 1840, and represents a northward extension of Tetlit Kutchin territories.

The traditional way of life of the Tukkuth Kutchin is not well documented. The Tukkuth Kutchin were decimated by an outbreak of smallpox at Rampart House in 1911 (Linklater n.d.). Most surviving members of the band moved to Old Crow. Balikci's (1963:55ff) account of the early Twentieth Century seasonal round of the Tukkuth Kutchin, which was described to him by descendants of Tukkuth living in Old Crow, suggests some alterations in the traditional subsistence pattern to accommodate trade with the Hudson's Bay Company at Fort McPherson and later at La Pierre House.

According to Balikci, in late fall the Tukkuth Kutchin followed migrating caribou to their wintering grounds in the wooded country south of the Porcupine River, principally in the area of the Whitestone River, the Miner River and the head of the Peel River. Winter hunting of caribou was accomplished by temporary surrounds or snares; or hunters would encircle small herds in valleys and dispatch the animals with bows and arrows. Sheep were also hunted in winter. These animals were either stalked or taken with snares. Trapping of marten and other fur bearers was undertaken in winter as well. The drainages of the Eagle River and the Whitestone River were considered prime country for marten.

In spring, before break up, groups from the Whitestone area descended the Porcupine River to Whitefish Lake near the Bell River. After break up, traps were constructed to capture spawning whitefish. Beaver and muskrat trapping were also undertaken in the spring. Traditionally, the section of the Bell River, between the mouths of the Rock and Eagle Rivers is considered prime beaver country, although with the introduction of the repeating rifle, beaver have become scarce in the country north of the Porcupine River.

From Whitefish Lake, people would cross the Richardsons (probably at McDougall Pass) and travel to Fort McPherson to await the arrival of the Mackenzie steamboat in late June. Trading would be carried on at this time. People returned to Whitefish Lake in July. By the end of August, groups began to move back along the Porcupine River to hunt caribou. People returned to their winter hunting grounds just after freeze up.

Prior to the establishment of Fort Yukon at the confluence of the Porcupine and Yukon Rivers in 1847, Tukkuth Kutchin, under their chief, Grand Blanc, were the principal middlemen in the very profitable trade between the Hudson's Bay Company post on the Peel River and the Kutchin groups of the northern Yukon (Murray 1910:27). Between about 1847 and 1891, Tukkuth Kutchin were involved in a limited amount of trade at La Pierre House; this post was primarily a supply depot for the Hudson's Bay Company, however, and no furs were traded here. Local groups of Tukkuth Kutchin did supply the post with meat; in 1887-88, a clerk at La Pierre House sent 1,300 caribou and moose tongues to other posts, estimating that 2,000 animals had been killed (Ogilvie 1898:63). During the height of gold mining activity in the Dawson area, between 1898 and 1901, some men went to Eagle in winter to trade caribou meat for supplies.

The subsistence adapatation of the Tetlit, Vunta and Tukkuth Kutchin in the protohistoric and contact period relied to a large extent on the use of caribou fences or surrounds for the interception of migrating caribou in the fall. In the largely treeless portion of the Richardson Mountain foothills north of the Bell River, the construction of willow fences has been described as well (Mr. Charlie Peter Charlie, personal communication, February 15, 1988). Osgood has documented these kinds of temporary surrounds as well for the Tetlit Kutchin, who used them both in autumn and winter (1936:25). In Osgood's description, the surrounds are circular in form, as opposed to the funnel shape documented in the territories of the Vunta Kutchin (cf. Morlan 1973a).

Spring hunting of caribou at crossing areas along the Porcupine River was a feature of Tukkuth Kutchin subsistence at least in the late prehistoric and contact period.

> The people, standing near their birch bark canoes, wait for the caribou at their habitual river crossing places. As soon as the animals show up, they are driven into the river, where they are quickly pursued by the fast moving canoes, and speared in the water with bone tipped lances (Balikci 1963:16).

Spring caribou hunting was largely abandoned in the early Twentieth Century, when muskrat hunting became an important economic activity (Morlan 1973a:89).

A noteworthy feature of Balikci's description of the traditional subsistence round is the apparent tendency of Tukkuth Kutchin to follow the migrating caribou, at least in fall, winter and spring. Possibly this relates to the Tukkuth role of supplying the posts with caribou meat in the early historic period. Alternatively, this pattern may well be an earlier adaptation, which relates to the accessibility of caribou in Tukkuth lands during most of the year.

Specific mention of hunting, or accounts of traditional occupation by Tukkuth in the Rock River headwaters is absent, however, in the ethnographic literature (Council for Yukon Indians Resource Atlas: Eagle River [116-I] and Bell River [116P] Map Sheets). This might be a post-contact development, in which groups moved closer to the trading posts; alternatively, this may be an indication of long term variation in patterns of caribou migration through the western Richardson Mountains, or adjustments in human adaptive and hunting strategies.

An apparent shift away from upland exploitation in the early/mid-Holocene, to a later combination of caribou fence surrounds and riverine hunting and fishing has been previously noted by Irving and Cinq-Mars (1974:79) for the the middle Porcupine drainage and regions north of the Old Crow Flats. A similar trend may be represented in the archaeological and ethnohistorical record in the eastern Richarson Mountain foothills as well.

CHAPTER THREE

SITE COMPOSITION, CONTEXT AND EXCAVATIONS

Introduction

Archaeological investigations along the Dempster Corridor in northern Yukon have been undertaken for the most part in connection with road or pipeline construction (Cinq-Mars 1975; Van Dyke 1979). The field work carried out in the 1980 season, which comprises a major part of the research reported in this dissertation, was essentially a site salvage exercise in the region of the Rock headwaters, in areas likely to be impacted by road maintenance or campground construction (Gotthardt 1981).

Within the framework of salvage activities, the principal objectives of my 1980 field season were: (1) systematic artefact collection from sites previously identified in the surveys of Cinq-Mars and Van Dyke, as well as the location of as yet unrecorded surface scatters, and (2) the location and testing of buried deposits in the study area with the potential for yielding artefacts in dateable context.

The principal objective of the brief 1981 field season was the controlled excavation of a relatively extensive buried deposit at MfVa-14. A secondary objective, limited by available time, was continued survey within the Dempster Highway corridor to locate additional sites.

Nineteen archaeological sites were identified by Cinq-Mars in his brief survey of the Dempster right-of-way in the area of the Rock River headwaters in 1974. Van Dyke's survey in the same region in 1978 located 6 additional sites. Thirteen new sites were found during the 1980 and 1981 field seasons, resulting in a total of 38 sites in the area of the Rock River headwaters. Because of possible imprecisions in recording site location information on the 1:250,000 map scale, however, this number is perhaps best treated as an estimate. The actual number of sites may be less because sites previously identified may have been treated as new sites if locations were not established exactly (a list of known sites in the Rock River headwaters is given in Appendix IV).

Twenty-one sites were examined in the 1980 field season, including 11 previously unrecorded sites. Where initial inspection revealed extensive artefact scatters (i.e., if more than about 50 artefacts in the site area), the attempt was made to keep artefacts found in proximity to each other together in numbered 'clusters'. Artefact clusters were mapped for five of the largest sites (MfVa-9, MfVa-13(5), MfVa-14, MfVa-18 and MfVb-2).

Only two sites were found to have buried deposits with the potential for yielding artefacts in dateable context: MfVa-9 and MfVa-14. The relatively small MfVa-9 deposit was initially located and tested by Cinq-Mars in 1977. During the 1980 field season, the MfVa-9 deposit was fully excavated and charcoal was recovered from a buried organic lens in association with artefacts. Only limited testing was carried out in the MfVa-14 deposit in the 1980 season.

Work in the 1981 field season focused primarily on the systematic excavation of the more extensive buried deposit at MfVa-14. A prolonged period of rain and snow hampered planned survey efforts; these were limited in the end to a brief reconnaissance in the area south of the middle branch of the Rock River.

Site Context

The limited and special orientation of most of the investigations in this region of northern Yukon prevents any proper assessment as to whether the concentration of archaeological sites in the middle branch of the Rock River and its tributaries is a true reflection of past settlement patterns. To some degree, site concentration may be an artefact of the survey strategies, inasmuch as the middle branch of the Rock River is also the area in which the Dempster Highway most closely approaches the mountain front. I suspect additional survey along the mountain front might uncover a general pattern of relatively intense prehistoric utilization. On the other hand, as was described more fully in the previous chapter, the Rock River and Eagle River do represent points at which a portion of the northward migrating Porcupine caribou herd begins to swing to the west toward the Porcupine River. It would be reasonable to assume that if this pattern of herd movement is an ancient one, the Rock River headwaters might have been a principal focus for herd interception by hunters in the past.

For the most part, sites in the Rock River headwaters are located in areas of alpine tundra vegetation. Only six sites occur in present taiga or gallery forest (MfVa-2, 3, MfVb-3, 4, 5, and 6): this pattern may be related, in part, to factors of site visibility (site context is described in more detail in Appendix IV).

The highest concentration of cultural remains within the site areas occurred on southern or eastern margins of terraces or ridges. Only three sites were on north facing slopes, and these were small scatters of artefacts. I hesitate to generalize from this observation, because the topography of the area, dominated by southwest trending terraces and ridges, is probably of more significance to site location that any presumed orientation of look-outs to the direction of caribou migration. On most sites, the view in all directions was good.

With the exception of MfVa-16, and MfVb-3, 4, and 5, all sites are situated near streams. The absence of cultural materials at potential game look-outs on elevated features such as whale backs, or on otherwise attractive ridges suggests that these areas were avoided as campsites primarily because of their distance from water. Ridges and terraces located near water, but without any appreciable view over the surrounding terrain, do not appear to have been occupied.

Site Collections

Most of the artefacts which form the basis for the present study were collected from 23 sites in the Rock River headwaters in the 1980 and 1981 field season. Virtually all are made on silicious argillite, which is a local bedrock. The composition of the site assemblages by artefact categories is presented in Table 3.1. The analytical categories represented here include bifaces, uniface tools, blade tools, cores, modified tabular pieces, blades and blade-like flakes, blade cores, microblades, microblade cores, flakes, plus miscellaneous artefact-related frost shatter and blocky fragments, and pebbles (included under the heading of 'other' in the table). A more detailed breakdown of the types of tools recovered in the Rock River sites is presented later, in Table 5.1. Additional materials from sites the Rock River area collected by Cinq-Mars and Van Dyke were added to the sample for analysis. These were exclusively bifaces and related debris, and tools (these collections are listed under the heading of 'other sites' on Table 3.1).

A small sample (n=13) of silicious argillite bifaces from the Trout Lake sites (specifically NeVi-4 and NeVi-8) (Gordon 1970, 1973), also made on , were analyzed as well because of the presumed relationships of those collections

Table 3.1: Assemblage Composition in the Rock River Sites, Yukon

SITE	BF	T	C	TB	BL	BC	MB	MBC	BT	FL	OTHER	TOTAL
MgVa-3	2									5		7
MgVa-10	1									22	5	28
MgVa-11										11		11
MgVa-12	3	8		1						7	11	30
MfVa-2	9	3								43	1	56
MfVa-3										10		10
MfVa-7	4			3						70	3	80
MfVa-9	45	14	2	17	18	1	9	2	4	3466	422	3400
MfVa-10	14	11		9	3			3	3	681	141	865
MfVa-11	5	3	1	1						144	17	171
MfVa-12	2	1			1				1	62	12	79
MfVa-13	99	32	5	34	2			1	3	4860	314	5350
MfVa-14	6	9	2	5			2		1	2069	37	2130
MfVa-15	7	1		3						227	18	256
MfVa-16	1									21	3	25
MfVa-17	30	14	1	25	1	4		3		1685	291	2054
MfVa-18	2	1	1	4		1				87	51	147
MfVb-2	8	1		13	2					2858	116	2998
MfVb-3	5			2	1	3				51	2	64
MfVb-4	5		1	6	2					596	34	644
MfVb-5	1		4	9		1				145	31	191
MfVb-6										1		1
MeVb-2	1									18	1	20
Other*	28	3										31
TOTAL	278	100	16	132	30	10	11	9	12	17,149	1,510	19,248

BF bifaces
T tools
C cores
TB bifacially-worked tablets, etc.
BL blades and blade-like flakes
BC blade cores
MB microblades (including possible)
MBC microblade cores (including possible)
BT tools on blades and blade-like flakes
FL flakes
Other frost shatter, pebbles and fragments

Other* Sites in the Rock River headwaters and adjacent areas investigated principally by Cinq-Mars (1975) and/or Van Dyke (1979)
Include MgVa-1, MgVa-6, MfVa-1, MfVb-1, MeVb-1, MeVb-3, MeVb-4.

to certain of the technologies represented in the Rock River area. The results of the Trout Lake biface analysis are presented separately.

Because most of the artefacts in the Rock River area were recovered in surficial context and probably represent multiple occupations over time, an analysis of assemblages by site was deemed of doubtful value (Plate 3.1). For the same reasons, statements concerning site function based on the classes of artefacts recovered are also of uncertain value (Table 3.2). Perhaps more meaningful are the discrepancies in the size of the collections recovered from the sites. The assemblages recovered in the MfVa-9, 10, 11 site area (3,996 artefacts), and the complex of localities in the MfVa-13 site area (5,345 artefacts) comprise almost half of the total collections recovered in the Rock River area (19,208). A combination of factors probably accounts for the differences in assemblage size, including site context (proximity to water, for example, and local elevation and aspect) and number of reoccupations. The high proportion of tools and tool fragments at these sites certainly also relates to the availability of suitable raw material for tool manufacture in the form of local silicious argillite bedrock exposures (a breakdown of assemblages by site is presented in Appendix IV).

Factors Affecting the Artefact Sample

In arctic and subarctic settings, a number of non-cultural agencies have the potential to affect the nature of the artefact sample recovered at archaeological sites and must be considered in the interpretation of the evidence from these sites. The effects of such processes as trampling, or movement in unconsolidated sediments in the course of freeze-thaw cycles are well documented in the literature (see for example Bowers et. al. 1983; Johnson and Hamsen 1974; Knudson 1977; Tringham et. al. 1974). The action of non-cultural agencies appears both to have affected the sampling of surface deposits in the Rock River area; and to varying degrees, to have produced edge damage on flakes and tabular fragments of silicious argillite (pseudo-tools) resembling various kinds of use damage or retouch on true implements.

Of particular relevance for the question of sampling is the action cryoturbation which, in certain contexts, results in the differential sorting of the sediment matrix on the basis of size. The tendency for smaller objects to become imbedded in subsurface deposits, for example, is a factor which may be used to explain the paucity of

Plate 3.1: MfVa-13, Locality 5. Artefacts in Surface Context

Table 3.2: Percentage of Functional Classes of Implements by Site, Rock River Area, Yukon

SITE	n	S	B	N	D	K	PE	BK	T
MgVa-12	8	0%	12%	0%	0%	0%	0%	0%	0%
MfVa-9 - 12	29	32%	43%	39%	0%	40%	12%	29%	11%
MfVa-13	32	28%	12%	28%	0%	40%	12%	43%	67%
MfVa-14	8	0%	0%	0%	25%	0%	12%	0%	0%
MfVa-17	14	13%	17%	0%	0%	20%	12%	0%	11%

S scraper
B burin
N notch
D denticulate
K knife
PE _piece esquillee_
BK beaked implement
T tabular implement

microblades recovered during surface collection of the Rock River sites (this is discussed again in Chapter 7).

The creation of pseudo-tools (including pseudo-burins, scrapers, notched tools, and beaked implements) by trampling or rolling merits special attention here by virtue of the very close resemblance of pseudo-tools to expedient tools, and in fact, the difficulty encountered at times in separating the two. In the sample of expedient tools in the Rock River collections, appropriate edges or projections were selected which could be used with little or no modification. Problems in the differentiation of tools and pseudo-tools arise precisely because it is these sharp edges and projections which are also most susceptible to damage by non-cultural agencies.

At the present level of analysis, edge damage was designated non-cultural on the basis of the following features or combinations of features:

1. Absence of microscopic rounding/polish/ striations on an edge. An irregular edge with minute, fragile projections was considered the product of non-cultural agencies, as normally these would be rounded off in the course of intentional use.

2. The presence of discontinuous or random edge damage on the margin or surface of a flake or tabular fragment, which suggests the object was subjected to substantial rolling or trampling.

3. Edge damage which penetrates the patina on an object, or exhibits different colouration as a result of differential degrees of weathering. (This feature should not be relied on exclusively in the identification of pseudo-tools as it prevents the recognition of artefact re-use by later occupants of a site.)

A final observation bearing on the discussion of pseudo-tools concerns the apparent differential frequency with which these objects occur in the Rock River sites (Table 3.3). Depositional conditions are known to vary in the Rock River area, primarily in response to factors of slope/drainage, vegetation, and the nature of the matrix (loess, gravelly sediments, bedrock shatter). The disparity in the number of pseudo-tools recovered at MfVa-9 and MfVa-13(5), for example, despite a comparably sized inventory of true implements, may be explained in terms of differences in the conditions of artefact deposition. At MfVa-9, the surface is relatively level and well drained, and over much of the site area, sediments are stabilized by

Table 3.3: Frequency of Pseudo-Tools in the Rock River Sites

SITE	N of Pseudo-Tools	N of Implements
MfVa-9	2	18
MfVa-10	1	16
MfVa-11	1	3
MfVa-13(N)	3	1
MfVa-13(5)	8	19
MfVa-13(5A)	1	7
MfVa-13(8)	1	0
MfVa-14	5	10
MfVb-3	1	0
MgVa-12	1	3
	24	77

ground vegetation. MfVa-13(5) is situated on a sparsely vegetated, slightly sloping terrace, and sediments are gravelly and unstable. Evidence of sediment sorting is present in the form of weakly developed stone circles. Artefacts occurring at MfVa-13(5) would be expected to undergo substantially more rolling during freeze-thaw cycles, with a concomitant production of higher frequencies of pseudo-tools. Factors such as the location of the site area on a frequently travelled game trail or migration route, will probably also affect the frequency of pseudo-tool production.

Excavations

MfVa-9 - Buried Deposit

MfVa-9 is located on a long north-south trending bedrock ridge, adjacent to a minor northern tributary of the middle branch of the Rock River (Figure 1.2). The buried deposit at MfVa-9 is a small bluff-head loess accumulation on the southern tip of the ridge. Approximately 4 m^2 were excavated in this area, accounting for the greater portion of the loess deposit on the slope edge (Plate 3.2).

The loess deposit was originally recognized and tested by Cinq-Mars in 1977. At that time, a side-notched point was recovered from a buried organic lens in the deposit. Subsequent excavation in 1980 uncovered what appear to be two organic lenses sealed in the loess deposit (Figure 3.1).

The general stratigraphic sequence of the loess deposit is:

1. A thin, or sometimes discontinuous humic horizon.

2. Brownish loess, stained by humic acids.

3. Organic lens. Near the top of the slope, there appear to be two lenses separated by a more or less sterile layer of yellow loess.

4. Yellow loess.

5. Dark brown colluvium/rubble overlying bedrock.

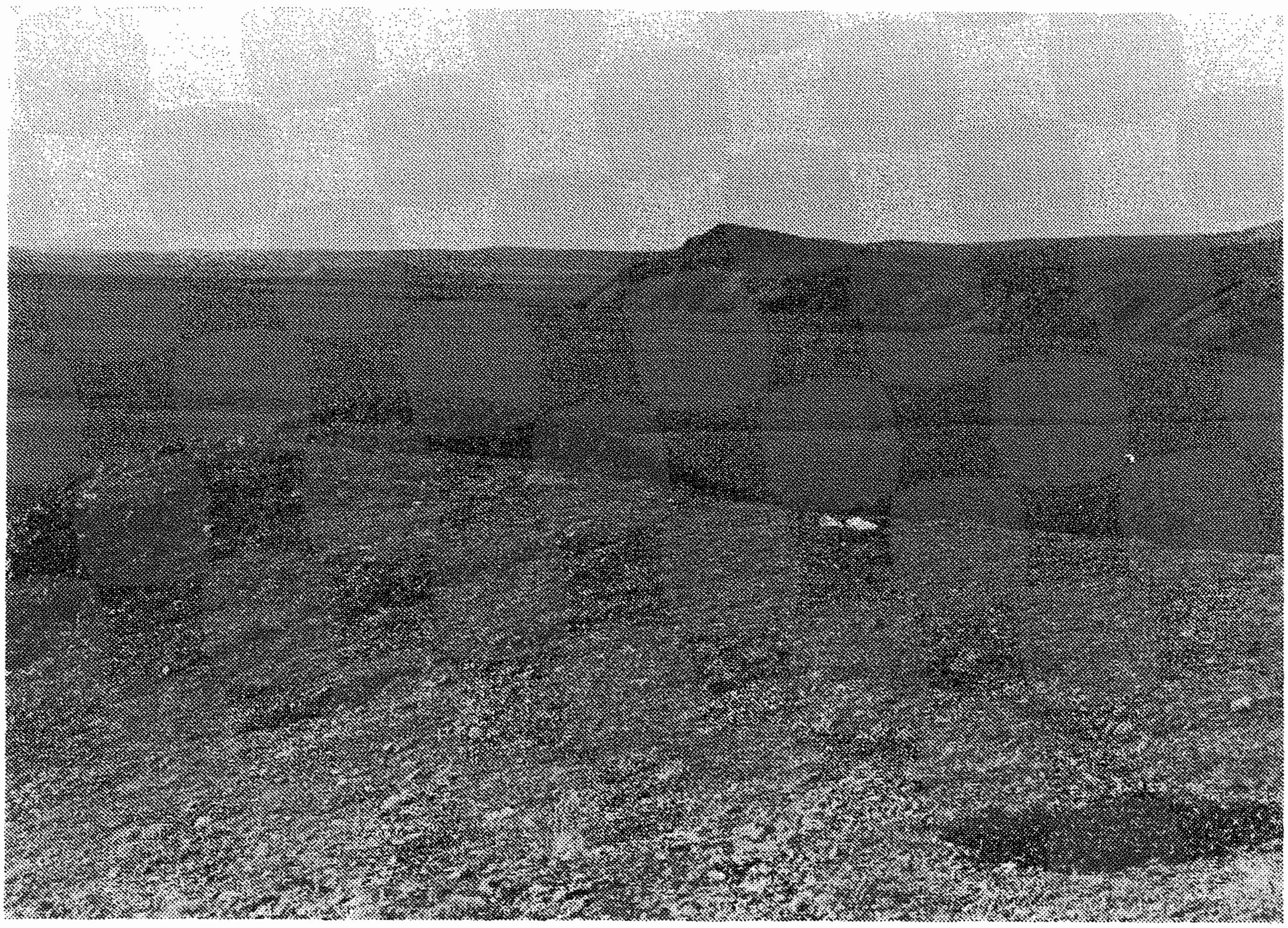
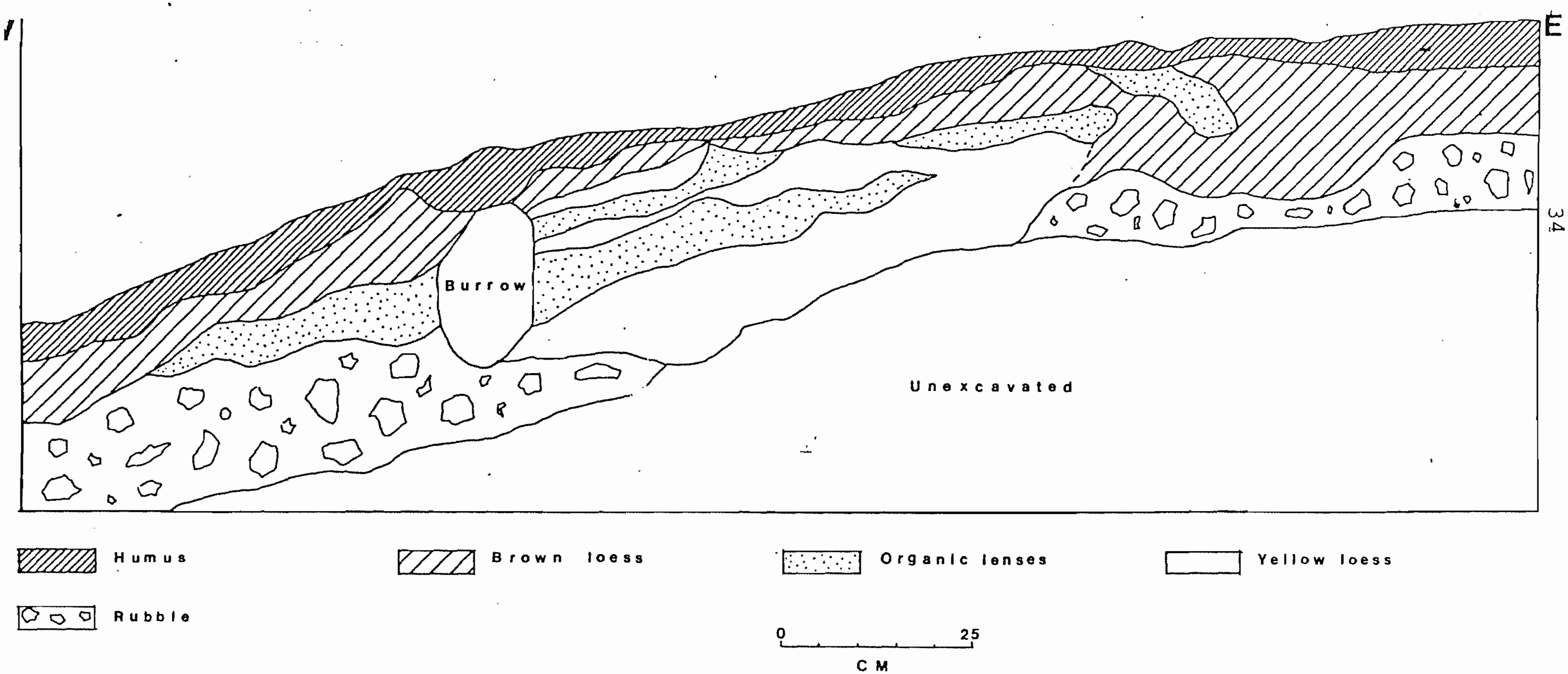


Plate 3.2: MfVa-9. View South from South End of Ridge. Area of Test Excavation is Located on the West Side of the Tip of the Ridge. Photograph Taken Prior to Excavation

Fig. 3.1 East-West Stratigraphic Profile
MfVa-9 Buried Deposit



There is little evidence of cryoturbation in the deposits, probably due to the very well drained condition of the ridge top. The organic lenses, which appear clearly separated at the top of the ridge, become discontinuous downslope, and towards the north and south margins of the deposit. Only one lens can be recognized near the lower end of the deposit. In the lower end of the deposit a recent ground squirrel burrow contributes to some degree of mixing in the deposit.

The bulk of the artefactual material excavated from the deposit at MfVa-9 was found in association with the organic lenses, which probably represent an hiatus in the loess accumulation, and the temporary establishment of a stable surface capable of supporting vegetation. A list of artefacts recovered in the buried deposit is provided in Table 3.4.

Age of the Deposit

Because only small amounts of charcoal were recovered from the upper and lower organic lenses, these samples had to be combined for conventional radiocarbon dating. The resultant date of 7580 $\pm$ 420 B.P. (S-2013; uncorrected) should therefore be considered an average age for the deposit and the artefacts within the deposit. Actual age of the upper and lower organic lenses in this deposit are likely to be younger and older than about 7580 B.P., respectively.

The analysis of pollen from the upper organic horizon showed concentrations of arboreal pollen slightly in excess of what can be expected under present patterns of vegetation in the site area (L. Ovenden 1981: personal communication). This could be interpreted to indicate the formation of the upper organic lens under more favourable conditions (hypsithermal?) than are presently extant in the site area (see Appendix I).

MfVa-14 - Buried Deposit

MfVa-14 is located on an ancient terrace overlooking a minor northern tributary of the middle Rock River (Figure 1.2). The buried deposit at MfVa-14 is also a bluff-head loess accumulation, which is somewhat more extensive than the MfVa-9 deposit. A total of 7 m^2 were excavated in this area, which removed about 2/3 of the total deposit. The maximum depth of the deposit, attained near the crest of the slope, is approximately 50 cm (Plate 3.3).

Table 3.4: Assemblage Composition in the MfVa-9 Buried Deposit

LEVEL	BF	TB	T	BT	C	BL	BC	MB	MBC	FL	OTHER	TOTAL
Upper Organic	3		1					2?		374	10	390
Lower Organic	4		2	1		3	8			840	55	913
Organic	2	1	1		2?	4	1	11?		197	25	244
	9	1	4	1	2?	7	9	13?		1411	90	1547

BF bifaces
TB tabular pieces (partial bifaces)
T tools
BT tools on blades/blade-like flakes
C cores
BL blades and blade-like flakes
BC blade cores (and related fragments)
MB microblades (including possible)
MBC microblade cores (including possible)
FL flakes
Other frost shatter, pebbles and fragments

Biface Sample:

Upper Organic Level: MfVa-9:396, MfVa-9:471; MfVa-9:419
Lower Organic Level: MfVa-9:1450; MfVa-9:503; MfVa-9:502; MfVa-9:509; MfVa-9:503 (bifacially worked blade)
Organic Level: MfVa-9:469; MfVa-9:3 (Tuktu-like or reworked Kamut point; shown in Plate 6.3a)

Tools:

Upper Organic Level: MfVa-9:397 (scraper/notch on blade)
Lower Organic Level: MfVa-9:439 (end scraper on blade); MfVa-9:431 (lateral burin on tablet); MfVa-9:464 (notch on blade-like flake).
Organic Level: MfVa-9:420 (burin/scraper/notch on blade)

Blades and Blade Cores:

Lower Organic: Core: MfVa-9:443; Core rejuvenation/ fragments: MfVa-9:424; MfVa-9:445; MfVa-9:440; MfVa-9:446; MfVa-9:9410; MfVa-9:8410; MfVa-9:7410; Blades or blade related: MfVa-9:421; MfVa-9:441; MfVa-9:416
Organic Level: Blades or blade related: MfVa-9:466; MfVa-9:468; MfVa-9:474; MfVa-9:464

Microblade Related (?)

Upper Organic Level: MfVa-9:394; MfVa-9:395
Organic Level: MfVa-9:475; MfVa-9:476; MfVa-9:477; MfVa-9:478; MfVa-9:481; MfVa-9:479 (core platform edge rejuvenation flake?); MfVa-9:4436; MfVa-9:5436; MfVa-9:6436; MfVa-9:7436; MfVa-9:8436

Plate 3.3: MfVa-14, Locality 1. View North of Area of Test Excavation. Photograph Taken Prior to Excavation

The relatively sheltered location of the deposit, in gallery forest on the south end of the terrace, has also contributed to a greater degree of soil development than occurred in the MfVa-9 loess pocket. A mature Brunisol or Arctic Brown soil has developed in much of the loess deposit. The general stratigraphy (Figure 3.2) is:

1. Level I - humus/organic horizon (F-H horizon), averaging about 5 cm in thickness.

2. Level II - brownish loess (Bm horizon), stained by the removal of humic acids and iron (?) from the upper levels. Variable thickness.

3. Level III - essentially unaltered yellow/beige loess (C horizon). Variable thickness.

4. Rubble/colluvium.

In portions of the excavation it appeared that some weak podzolization has occurred: a thin leached horizon (Ae) is present overlying the loess, which tends to appear more reddish in these areas (Bm horizon).

The stratigraphic profile in the area near the crest of the slope is somewhat more complex owing to a greater degree of mixing of the strata by cryoturbation and root action. The deposit here is also characterized in general by a higher organic content, including charcoal and pieces of burned and unburned wood in the upper levels. The yellow loess occurs in pockets, or is intermixed with reddish brown (Bm horizon) sediments.

A list of artefacts recovered in the MfVa-14 buried deposit is provided in Table 3.5.

Age of the Deposit

Probable hearth material in the form of ash, charcoal concentrations and what appear to be fire-reddened patches of soil, was noted throughout the excavation. A number of factors complicated the recognition and delimiting of these features, not the least of which is the possibility that ancient forest fire activity is also represented in the deposit. Mixing of the sediments by frost action and tree roots has already been noted. These problems notwithstanding, four charcoal samples from three likely heath concentrations were selected for dating.

Two samples were taken from the upper and lower levels of what appears to be a hearth (although somewhat disturbed)

Fig. 3.2 North-South Stratigraphic Profile
MfVa-14 Buried Deposit

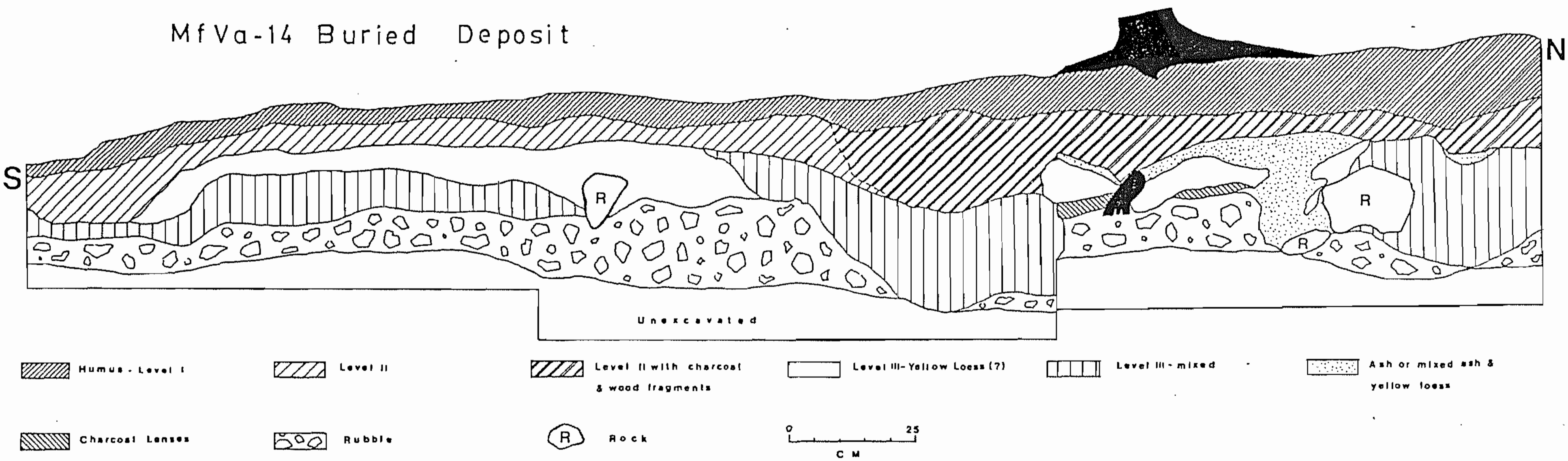


Table 3.5: Assemblage Composition in the MfVa-14 Buried Deposit

LEVEL	BF	TB	T	BT	C	BL	BC	MB	MBC	FL	OTHER	TOTAL
Humus										40		40
Level II	2		4							665	10	682
Level III								2		481	6	487
	2		4					2		1186	16	1209

BF bifaces
TB tabular pieces (partial bifaces)
T tools
BT tools on blades/blade-like flakes
C cores
BL blades and blade-like flakes
BC blade cores (and related fragments)
MB microblades (including possible)
MBC microblade cores (including possible)
FL flakes
Other frost shatter, pebbles and fragments

Biface Sample:

Level II: MfVa-14:84 (core?); MfVa-14:858 (core?)

Tools:

Level II: MfVa-14:115 (burin); MfVa-14:853 (*piéce esquillée*); MfVa-14:898 (burin/scraper); MfVa-14:946 (scraper)

Microblades:

Level III: MfVa-14:204; MfVa-14:1041

Note: Catalogue numbers (with the exception of MfVa-9:3) are provisional field numbers. Artefacts have been recatalogued by the Archaeological Survey of Canada.

near the crest of the slope (shown in section in Figure 3.2, beneath the tree stump). The upper portion of the feature corresponds to the lower Level II strata in the general profile. The area contained a rather dense concentration of charcoal in association with ash, or ash mixed with beige loess and a substantial amount of chipping debris.

The upper and lower portions of the feature were separated by a lens of largely sterile yellow loess. The lower hearth deposit, in upper Level III, yielded large pieces of charcoal, flakes (some appearing burned), small specks of possible calcined bone, and ash. The dates on the upper and lower hearth deposits are 780 ± 165 B.P. (S-2270; corrected age: 730 B.P.) and 1735 ± 215 B.P. (S-2271; corrected age: 1705 B.P.) respectively.

A second hearth feature, in the Level II strata, containing large pieces of charcoal, some fire-reddened bedrock shatter, ash, and flakes, was dated 905 ± 100 B.P. (S-2273; corrected age: 880 B.P.).

The third concentration of apparent hearth material occurred in the upper Level III strata. This feature yielded flake fragments and ash, associated with what appears to be burned soil, and was dated 1870 ± 180 B.P. (S-2272; corrected age: 1765 B.P.). A small blade-like flake (possibly a crude microblade) was recovered in this feature.

The stratigraphic consistency in the dates, with Level II at about 700 - 900 B.P. and Level III at 1700 - 1800 B.P. lends some measure of assurance to the interpretation of the features as hearth deposits. The resultant dates also suggest a rather slow rate of deposition in the MfVa-14 deposit. Even occasional reoccupation of the locality could be expected to result in the superimposition of hearths with little or no vertical separation. The problems encountered in attempting to delimit hearth boundaries probably relate to this aspect of site formation as well. In view of the slow rate of deposition in this area, and the likelihood of ancient forest fire activity, however, contamination of the samples cannot be entirely ruled out.

CHAPTER 4

TYPOLOGY AND TRADITIONS IN THE EARLY PREHISTORY OF THE INTERIOR NORTHWEST: SOME DEFINITIONAL PROBLEMS

Introduction

The prehistory of interior Northwest North America is described conventionally in three broad stages: (1) an early stage of which microblade technology is the hallmark; (2) an intermediate stage, characterized by the appearance of side-notched points and a generally 'archaic' trait complex; and (3) an Athapaskan stage, ultimately traceable to groups identified in the ethnographic record. A Northern Plano stage is considered to precede microblade complexes in the District of Mackenzie, N.W.T., and in some interpretations, southern portions of Yukon and Alaska as well. Recently, a number of investigators (Clark 1981; 1983a,b; 1984; Clark and Morlan 1982; Morlan and Cinq-Mars 1982) have argued for a northern or Arctic Cordilleran tradition, preceding the microblade complexes, and essentially superceding what is termed Northern Plano west of the Mackenzie River. In this scheme, Northern Plano, as a southern derived complex, is limited to eastern Mackenzie and Keewatin Districts.

While the ultimate Asian origin of the early blade and microblade complexes is recognized, the derivations of the Northern Plano, side-notched point, and late prehistoric Athapaskan technologies have been the subject of a certain amount of debate in the literature. In some interpretations the Paleo-Indian presence in the Northwest assumes derivation from the Paleo-Indian traditions of southern North America (cf. Millar 1981). Other investigators prefer to see Paleo-Indian as a late Pleistocene development out of very early blade and microblade technologies in Beringia (notably West 1981 and Guthrie 1983). A later return of Paleo-Indian technology, in the form of Northern Plano, to parts of the interior northwest can be accommodated in this scheme. Clark's northern Cordilleran concept (based on the Cordilleran tradition originally defined by MacNeish [1959a,b; 1963], and on the northern or arctic Cordilleran tradition introduced by Irving and Cinq-Mars [1974]), also posits a late Pleistocene Paleo-Indian presence in the Northwest; however, its origins lie not in the microblade complexes, but in an earlier, as yet poorly recognized bifacial technology. Haynes (1980) is in essential agreement with this reconstruction (but cf. Clark [1984] for an alternate interpretation similar to that of West). Further, while this technology gave rise to the Paleo-Indian cultures in the south, it also persisted in the Cordilleran regions of Yukon and in the District of Mackenzie into the Holocene, and as such was contemporaneous with the microblade complexes which subsequently occupied much of the interior Northwest.

The appearance of the 'archaic' complexes during the mid-Holocene has been interpreted as an introduction from the south of boreal forest adapted technology and/or populations (Anderson 1968a,b). The association of archaic traits and microblades, and of side-notched points with microblade complexes, are viewed by the majority of investigators as evidence of acculturation or trait diffusion in the context of population contact/replacement. More recently, Clark and Morlan (1982:36) proposed a reconstruction of events in terms of continuity with change, with Northern Archaic as a late phase of the Northwest Microblade tradition which, in certain localities, lacks microblades. Millar (1981) appears to be reasoning along the same lines.

The origins of the late prehistoric Athapaskan tradition are also a matter of controversy. A number of researchers see continuity from a Northern Archaic base (Anderson 1970a; Workman 1978). Linguistic evidence (Krauss and Golla 1981) and archaeological evidence, which fails to substantiate continuity of technology (Shinkwin 1979), suggest a local origin, possibly in south Alaska, and subsequent spread of Athapaskan populations over much of the interior Northwest.

In the following, some of the more recent attempts to synthesize the early to mid-Holocene prehistoric record in the interior Northwest will be reviewed in order to examine the kinds of evidence considered important by archaeologists in the definition of prehistoric traditions. While a percentage of the disagreements concerning the prehistoric record stem from the nature of the data base itself -- specifically, the lack of temporal context for assemblages, and problems of mixed assemblages -- it is also apparent that a more fundamental problem exists on the interpretive level. The observation can be made that the cultural-historical significance of certain artefact types or technologies is ill-defined, and that, as a result, the ways in which variation -- either within a type or within an assemblage -- are interpreted are inconsistent. As well, the inadequacy of the present descriptive nomenclature for the communication of potentially significant variation within a given 'type' or class of artefacts further impedes comparative exercises. And, as will be shown in the analysis of the Rock River collections, existing typologies do not adequately accommodate informal technology, or variation arising from situationally expedient tool production.

In making explicit the kinds of evidence which are used in reconstructing events in the prehistoric record, the models themselves may be more critically evaluated, and the place of the Rock River assemblages in the prehistoric sequence may be clarified.

The Paleo-Indian Complexes

The Northern Cordilleran Tradition

In recent articles, Clark (1983a, b) has advocated a resurrection of the northern, or Boreal (1984:78) Cordilleran tradition (originally defined by MacNeish 1959b, 1964) as a late Wisconsin occupation of northwest North America, predating the early microblade complexes. The northern Cordilleran tradition is presented as filling a gap in the current reconstructions of the prehistoric record with regard to the origins of fluted point complexes in North America. Because Clark's evidence for the tradition is not unequivocal, his arguments for the construct merit a detailed review here.

According to Clark, the northern Cordilleran tradition is represented in Alaska by three components: Chindadn, Dry Creek I and certain Batza Tėna collections (1983b). Both Chindadn and Dry Creek I have been found stratigraphically below microblade components. Based on these assemblages, Clark lists as elements of early Cordilleran complexes: bifaced projectile points; biface knives; thick bifaces; broad bifaces with shallow wide flaking; various leaf shaped, ovoid square based, quadrangular and irregular bifaces; rare end scrapers; scraper planes; beveled flakes (side scrapers or unformalized); choppers; transverse burins; spalled burins (dihedral); graver spurs; blade-like flakes; and _pieces esquillees_ (1983a:11). Of these, only blade-like flakes and bifaced projectile points of various forms in fact occur in all three assemblages.

Later and derivative northern Cordilleran tradition complexes exhibit considerable variation in response to regional diversification and contact/amalgamation with the American Paleo-Arctic or Paleo-Arctic tradition and possibly other technologies in the western Subarctic. Representing this later stage are: (1) assemblages previously called

British Mountain; (2) lower levels of the Canyon site; (3) the Acasta Lake assemblage; (4) various undated assemblages in central and northern Yukon containing implements undiagnostic of established complexes; (5) certain leaf-shaped and thick lanceolate point assemblages from North Alaska (1983b:14). Note: Clark does not include in this list the Stem Point or Nakah Plano tradition of Fisherman Lake, but a Cordilleran membership is argued subsequently in the paper. In Clark's estimation, the complexes listed above " ... all share ... one characteristic: as they are presently known they do not rest comfortably in other traditions" (1983b:15).

A Northern Plano affiliation has been attributed to some of these materials (Acasta Lake [Noble 1971, 1981]; the Canyon site [Workman 1974, 1978]; Stem Point Plano of Fisherman Lake [Millar 1981]). Clark, however, observes little resemblance between these assemblages and materials from the Plains. Irving and Cinq-Mars (1974) suggested an 'Arctic Cordilleran' affiliation for the materials from northern Yukon. This view is maintained by Morlan and Cinq-Mars in a later paper (1982:376) in which the northern Yukon assemblages, containing large core and flake tools, a wide range of bifaces, transverse, angle and dihedral burins, and occasional large blades, are described as possibly a distinctive regional development and technologically unrelated to the microblade complexes.

In Alaska, sites containing thick leafshaped lanceolate points, often with parallel flaking, and generally lacking microblades are considered by Clark (1983b:18) as possible candidates for a late expression of northern Cordilleran. These include Kayuk, Trail Creek Choris, possibly the Choris site, the Bedwell complex at Putu, the Mesa site, the Lisburne site, and elements of Minchumina Lake collections. Of these only the Mesa site has been dated, (ca. 7670 B.P.), and Clark (1983b:19) sees resemblances in the point forms at Mesa to Plano or fluted point derivations.

Clark's unwillingness to accept Northern Plano derivation for many of these complexes stems in part from his feeling that Northern Plano remains to be adequately defined for regions west of the Mackenzie River, inasmuch as assemblages attributed to this tradition exhibit substantial diversity and few parallels with Plains complexes. Further, Clark observes of the Northern Plano diagnostic, the Agate Basin point, that " ... in the north, most lanceolate projectile points, and especially those often called 'Agate Basin', have low taxonomic value" (Clark 1983b:20). The pervasiveness of various broad stemmed lanceolate and leafshaped points resembling Plano forms from the Plains throughout the Subarctic west of Hudson Bay, and the dating of many of these forms to relatively recent contexts would tend to support this assertion (Clark 1983b:22; Clark and Morlan 1982:83). While Plano connections appear valid for certain sites in the District of Keewatin, dated to ca. 7,000 to 8,000 B.P., in Clark's (1983b:23a) view, Plano derivation cannot be demonstrated on the basis of age or typological similarities for the majority of complexes termed Northern Plano in the District of Mackenzie, Yukon or Alaska.

Clark does appear willing to entertain the idea that some mixture of Cordilleran and Northern Plains elements occurred in the District of Mackenzie. In this line of reasoning, the idea of Plano as a diffusion sphere, adopted from Irving (1963:69), " ... allows for greater latitude for interpretation and can account for a broader spectrum of northern finds" (Clark 1983b:23a).

The Northern Plano Tradition

The Acasta Lake assemblage in the central District of Mackenzie, which Noble (1971, 1981) assigns to the Northern Plano tradition, is characterized principally by the following traits: Agate Basin Points; Acasta Points (essentially side-notched Agate Basin Points, in Noble's estimation); single and bipointed bifaces with thick plano-convex cross-section; hump-backed, spall and stemmed scrapers; scraper planes; semi-lunar bifaces; bifacial knives; multigravers; spokeshaves; notched transverse burins on flakes; rare wedges; and blade-like flakes. Counter to Clark's observations, Noble sees a relatively close relationship between the Northern Plano Grant Lake complex in Keewatin and the Acasta Lake materials.

Based on investigations in the Fisherman Lake area, Millar (1981) identifies large lanceolate points and gravers as hallmarks of the Northern Plano tradition. In this regard, Millar has adopted Frison's (1978:77-78) view that, as a whole, artefact assemblages in Paleo-Indian complexes are unreliable chronological indicators because few tool forms are distinctive, and those tools most frequently found have a wide temporal and geographic distribution. The most reliable means of recognizing cultural connections is the comparison of lanceolate point shapes. Millar essentially assigns Northern Plano affiliation to all collections in northern North America which have lanceolate points and which fall generally within the requisite time frame. Later complexes with lanceolate points (Taltheilei, Kayuk) are considered possible 'survivals' from earlier Northern Plano.

A somewhat different, but equally limited set of Northern Plano diagnostics is proposed by Clark and Morlan

(1982:83), including Agate Basin-like points, burinated projectile points, and in the Yukon, pentagonal Pelly Points (re-worked Agate Basin-like points).

While it is somewhat out of the scope of the present investigation, the place of northern fluted points in the prehistoric sequence requires brief mention, inasmuch as these points are associated with either an early Paleo-Indian presence in the interior Northwest, or a spread of Paleo-Indian technology into the region some time after the onset of deglaciation. Though the uncertain context, and the degree of variability in form and manufacture apparent in the known sample of these kinds of points complicates interpretive efforts, the view of fluted points in the north as representative of the spread of a hafting technology may be essentially correct. According to Morlan and Cinq-Mars (1982:376) fluting as a hafting technique is a time-transgressive phenomenon which both precedes and is contemporary with the appearance of microblade complexes in the interior Northwest.

The Microblade Complexes

The American Paleo-Arctic Tradition

In his 1980 overview of the prehistoric record from north Alaska, Anderson (1980:237-238) lists as characteristic of the American Paleo-Arctic tradition or Paleo-Arctic tradition the following traits:

1. narrow wedge-shaped microblade cores;

2. microblade core rejuvenation by removal of the platform by a heavy transverse blow, or removal of the faceted end with a longitudinal blow;

3. microblade midsections used as weapon insets. May be retouched or backed;

4. large core tools;

5. blade cores produced by an 'Epi-Levallois' technique (face-facetted cores);

6. large biface knife blades, usually oval and broad with convex bases;

7. longitudinally struck burins with the burin blow struck from a unifacially prepared edge;

8. large blades, made into a variety of scrapers and gouges.

In its expanded definition, the Paleo-Arctic tradition includes Dyuktai, Denali and Akmak and related assemblages.

The Siberian-American Paleo-Arctic Tradition

Dumond (1977:36ff; 1980) includes in the Siberian-American Paleo-Arctic tradition all assemblages which contain microblades, small wedge-shaped cores, generalized leaf-shaped or ellipsoidal bifaces, and burins made with careful longitudinal blows. Four variants of the tradition are defined as follows: (1) sites with specialized projectile points, represented by the Chindadn complex at Healy Lake (small subtriangular forms whose chipping technique is considered similar to that on the lanceolate bifaces at Akmak); (2) fluted point sites, represented by the Utukok River sites, Putu, and Batza Tėna; (3) unifacial complexes, in which the manufacture of blades from poorly formalized cores predominates in the technology, represented by Anangula and the Gallagher Flint Station; and (4) Northeast Asian variants, encompassing the Dyuktai and Sumnagin cultures. Also present in some assemblages and possibly representing local developments are large blades struck from polyhedral cores, and large, more or less discoidal bifaces used both as tools and flake cores.

The Beringian Tradition

West (1981:163) defines the Beringian tradition as comprising " ... all those Upper Paleolithic cultures which occupied (Beringia) between mid-Würm and early Holocene times. Assemblages belonging to the Beringian tradition are characterized by core and blade technology, in which the manufacture of microblades predominates; the tendency to use flakes as opposed to blades in the production of tools such as burins and end scrapers; burins used most frequently along the edges of the burin facet rather than at the juncture point; the use of burin spalls as engraving tools; often massive bifacial implements of simple lenticular form; three types of microblade cores (wedge-shaped, conical and tabular); and generalized forms of blade cores (West 1981:85ff). From this original base or "common Beringian matrix", West (1981:221) proposes that local cultural differentiation developed rapidly in eastern Beringia in response to new environmental conditions and the isolation of small groups.

The Northwest Microblade Tradition

As originally envisioned by MacNeish (1959a,b; 1963), the Northwest Microblade tradition represented a coalescence of Asian, Plano and Cordilleran traits: two variants of tongue-shaped polyhedral cores; microblades; microblade burins; spokeshaves; unifacial drills; and possibly asymetrical tanged, small triangular points were seen as Asian contributions. Conical polyhedral cores and blades; end of blade scrapers; pebble choppers; Ft. Liard burins; Flint Creek multiburins; and ovoid bifaces were acquired from contact with the Cordilleran tradition; and the Agate Basin point; flake end scraper; biface chopper; keeled end scraper; pebble hammer; artefact burin; and graver were acquired from the Plano tradition.

The Northwest Microblade tradition construct was widely criticized for its extreme variability and its diffuseness in the archaeological record (cf. Irving 1963). MacNeish (1964) subsequently redefined the tradition as a more localized entity.

Recently, however, Millar (1981) and Clark and Morlan (1982) revived the broader definition of the Northwest Microblade tradition to underline the essential continuity seen in the Yukon and the Mackenzie Basin between the early microblade complexes and later complexes characterized by the addition of various forms of projectile points.

According to Millar the early phase of the tradition is essentially equivalent to the American Paleo-Arctic tradition or early phases of the Denali complex, and is characterized by notched and transverse burins, a variety of bifaces, microblades, and wedge-shaped cores, with blades as a minor component. Anangula and the microblade complexes in British Columbia are not included in Millar's Northwest Microblade tradition. In the later phases of the tradition, variability increases, as does the geographic distribution of the tradition: lanceolate, stemmed and notched points are added to the complex of microblades, burins and bifaces. Lanceolate points are straight, round and convex based forms. The forms of side notched and stemmed points are also variable. The addition of lanceolate point types and gravers in the late phases of the Northwest Microblade tradition is attributed to contact with Northern Plano ca. 4000 - 6000 B.P. in southern Yukon and Mackenzie (1981:281). Notched points are postulated to derive from an as yet unidentified tradition which Millar seems to imply was the Northern Archaic tradition in Alaska. Alternatively, Millar (1981:283) proposes that the idea of notching may derive from the Northern Plano variant Acasta Lake, where notching as a hafting design occurs as early as 7000 B.P.

The nature of the association of side notched points and microblades in the interior Northwest is problematical. Clark (1981:128) notes that in some areas side notched points appear as an isolated trait added on to the inventory of an essentially Beringian-derived microblade culture and in other places side notched points accompany a distinctively 'Archaic' trait complex which occasionally may have microblades. Tuktu would be an example of the latter, although Anderson (1970b) ventures the opinion that the Tuktu collections represent a mixed deposit.

Within the framework of continuity with change, Clark and Morlan (1982:86) propose that the Northern Archaic tradition may be a late phase of the Northwest Microblade tradition (or Denali/Paleo-Arctic tradition), which in localized cases lacks microblades. This view, however, is difficult to reconcile with Anderson's (1968b:21; 1970b:6) observation of technological discontinuity between the American Paleo-Arctic tradition and the Northern Archaic tradition assemblages at Onion Portage. Microblade technologies notwithstanding, Anderson notes a " ... very different concept in the execution of flint knapping ... ", which in the Northern Archaic has been described as crude, minimal and haphazard. Multiple sources for the idea of side notching as a hafting technique, as suggested by Millar, may prove a viable course of inquiry for the resolution of this problem.

The Side Notched Point Complexes

The Northern Archaic Tradition

The Northern Archaic tradition was defined by Anderson (1968a,b) on the basis of materials excavated from bands 5, 6, and 7 at Onion Portage, and on collections from Palisades II. Anderson (1968b) viewed the tradition as a regional development, but wider relationships were also seen with elsewhere sites in Alaska and in Yukon. The appearance of the Northern Archaic tradition in northwest Alaska at approximately 6500 to 6000 B.P. coincided with the northward spread of the boreal forest at the beginning of the

Hypsithermal. This, combined with evidence of technological discontinuity between the Northern Archaic tradition and the preceding American Paleo-Arctic tradition complexes suggested to Anderson that the appearance of the tradition marked an actual movement of boreal forest adapted populations into northwest Alaska.

Two complexes - Palisades II and the Portage complex, comprise the Northern Archaic tradition at Onion Portage. In the Palisades II complex, asymetrical side notched points appear early in the sequence. Increasing variability in blade form, and depth and position of notches occurs in later phases, developing into quasi-stemmed forms. Notching disappears from the sequence at approximately 4700 B.P. The occurrence of true stemmed points overlaps temporally with the notched varieties, appearing at approximately 4900 B.P. Stemmed points had ceased to be manufactured with the development of the Portage complex at about 4600 B.P. At approximately 4700 B.P., oblanceolate points appear and persist to become the unique form in the Portage complex. Various biface forms also characterize the Northern Archaic tradition: large elongate biface knives are present throughout the sequence at Onion Portage, generally with one pointed and one rounded end. Over time, the form tended to become broader, approximating a semi-lunar shape. The large, semi-lunar bifaces are termed one of the hallmarks of the Northern Archaic tradition (Anderson 1968b:11). Small, elongate bifaces are present late in the sequence, and small, semi-lunar forms occur early in the Palisades II complex.

Over time, end scraper morphology in the Palisades II complex changed from large flake forms, with occasional single spurs near the working edge, to end scrapers on blade-like flakes, and finally, to variable forms, including mid-sized end scrapers " ... with multiple working edges, often at right or acute angles to each other and separated by small graver-like spurs" (Anderson 1968b:5). In the Portage complex, obsidian cortex flake end scrapers become the dominant form. Small discoidal end scrapers with retouch occurring on the entire margin also appear.

Boulder chip artefacts are present sporadically throughout the Northern Archaic sequence; slate artefacts are present but rare in the early phases, becoming increasingly common in the Portage complex. Large, straight-edged unifaces or unifacially retouched flakes occur throughout the Northern Archaic tradition, and persist into later complexes. Notched stones (net sinkers) are present throughout the sequence.

At Onion Portage, the Northern Archaic sequence terminates abruptly at around 4300 B.P. with the appearance of the Denbigh Flint complex. Continuity of the tradition elsewhere in Alaska and Yukon is assumed, however, with the Northern Archaic tradition eventually giving rise to the Late Prehistoric Athapaskan tradition (Anderson 1968b:28).

Discussion

It is evident from the above that there exist a number of disagreements concerning the interpretations of events in the prehistoric record of the interior Northwest, specifically with respect to the inclusiveness or exclusiveness of the various constructs defined to organize the data, and with respect to the kinds of traits considered significant for the definition of groupings.

For example, of the constructs used to group the early microblade complexes, Anderson's American Paleo-Arctic tradition is defined by eight traits, Dumond's Siberian-American Paleo-Arctic tradition is defined by four traits, and West's Beringian tradition is defined by five traits. Dumond's Paleo-Arctic tradition type assemblage differs from Anderson's American Paleo-Arctic tradition in the exclusion of blades as an historic index trait, although blades do occur in 'variant' complexes. West considers the production of the majority of tools on flakes a diagnostic of the Beringian tradition. Anderson includes as key traits in the definition of his Paleo-Arctic tradition certain techniques of blade and burin preparation. These features are not emphasized by Dumond or West in the constructs they have defined. A review of the 'variant' complexes defined by Dumond and West reveals another notable feature: the sole trait which occurs consistently in all complexes is microblade technology.

The ways in which variability in assemblages is interpreted also differs among these researchers. Anderson's decision to exclude Anangula and Gallagher from the Paleo-Arctic tradition reflects his view that the absence of bifacial technology is culture-historically significant to the degree that the membership of Anangula in a different 'diffusion sphere', centred around the North Pacific, is posited. Dumond and West, on the other hand, view the distinctive Anangula assemblage as a local development out of a Paleo-Arctic base and as the result of the isolation of peoples and shifts in their adaptive strategy.

At the risk of oversimplifying, much of the confusion concerning the early prehistory of the interior Northwest probably stems from two basic sources: (1) the definition of artefact types (and by extension, historical index types);

and (2) the definition, on this uncertain foundation, of traditions. A survey of the recent, and not so recent, literature shows that investigators are not unaware of these problems.

Irving's (1971:74) assessment of the problems associated with the recognition of a Northern Plano tradition as defined by MacNeish (1964), for example, was critical of the taxonomic confusion engendered by the equation of a type, defined solely on form or shape, with a particular stage or type of culture, subsistence or environment. The development of more precise definitions of types, based on additional attributes of style and technique of manufacture, was seen as a means to clarify some of the confusion in the prehistoric record.

Clark has been particularly outspoken with regard to the current state of investigation. In referring to the distribution of microblade complexes in the interior Northwest over time, Clark (1981:115) suggests " ... perhaps the microblade industry should not be given primacy as an index trait". Further, " ... a complex history is suggested and it is unwise to attempt to identify interior microblade technologies with a single cultural tradition" (Clark 1983a:11).

Morlan and Cinq-Mars (1982:373) echo these sentiments in a more specific reference to the uneven distribution of microblades at Dry Creek II: "Absence of the otherwise almost ubiquitous microblade in a few of the clusters raises questions as to the functional and historical significance of these distinctive artefacts."

In fact, reviewing the kinds of traits used in the organization of the archaeological record in the interior Northwest (wedge-shaped microblade cores, burins, large, lanceolate bifaces and various projectile point types), it becomes apparent that the usefulness of these forms as historical-index types has not been adequately demonstrated. As a consequence, 'traditions' based upon these 'types' may be invalid.

As will become evident in the analysis of the Rock River collections, a number of factors also mitigate against an exclusive reliance on conventional typological approaches, or more specifically, upon morphological typology. For example, the spread of ideas concerning hafting design or shapes of projectile points, independently of a people and their technology, could make these features unreliable indicators of groups or traditions in time and space (cf. Bryan 1980; Young and Bonnichsen 1984). In fact, much significant variability is masked in the current systems of nomenclature. As originally suggested by Kreiger, " ... basic relationships between specimens cannot be assumed to exist in any form, however close their superficial resemblances may be" (1944:283, emphasis in original). The degree of formality or standardization characteristic of a technology, or the degree of expediency evident in tool production, will also affect the success of conventional morphological typology for the interpretation and comparison of material culture remains.

Questions of expediency/curation and formality/informality in implement production are especially relevant for the Rock River collections. In the following, the attempt has been made to refine some of the existing artefact typologies to take these factors into consideration. Biface, and blade and microblade production are also examined in an attempt to better characterize these subsets of technology. The integration of the Rock River collections into the culture-historic sequence of the interior Northwest requires that alternative approaches be developed which may improve the current levels of understanding concerning these key traits around which so much of the prehistoric record is organized.

CHAPTER 5

EDGE RETOUCHED AND UTILIZED IMPLEMENTS

Introduction

In characterizing the production of implements from the Rock River collections, I have made use of terms such as 'expedient' or 'opportunistic' to convey the fact that the implements are very much "tools of the moment", often utilized with only a minimum of modification, or none at all, and discarded in most cases soon after use, with no attempt to rework or resharpen the tool. In the Rock River area, 'expediency' appears to relate to both the abundance of raw material (the local silicious argillite bedrock was used almost exclusively in tool production), and to its availability in the form of tabular fragments and frost spalls, which permitted the stoneworkers essentially to bypass the stage of blank production in tool manufacture.

In the literature, the distinction between 'curated' and 'expedient' technology generally revolves around the sometimes ill-defined feature of "effort investment" in tool production (cf. Weissner 1983:259). According to Binford (1973:251), curated implements will exhibit " ... higher degrees of stylistic and artisan investment ... " than will expedient tools, and will have " ... a greater tendency to range in patterned stylistic expression and formal diversity" (1973:243). Expedient tools " ... exhibit less investment from the individual standpoint and hence have less of the identity of the manufacturers expressed through individualized or group conscious stylistic character" (1973:243). By virtue of the greater stylistic and artisan investment in the production of curated implements, Binford argues that this class would be " ... the best material markers of ethnic identity" (1973:243). While I suspect that Binford lacks the empirical evidence to support these observations, he does make explicit certain assumptions commonly associated with ideas of curated and expedient technology.

In most discussions of curated technology, the operation of a tool-making style or tradition to produce certain morphologically recognizable tool types is assumed (cf. Conkey 1978:70). Implicit in this is the idea that these implement types will be standardized. 'Standardization' has been variously defined as a " ... high degree of attribute cohesion" (Isaac 1977b:105), or in terms of a " ... restricted range of variability ... " in continuous or metric attributes of an artefact, and " ... the regular and consistent patterning of discrete attributes of an artefact" (Stiles 1979:5). Most often, Lower and Middle Palaeolithic technologies are contrasted with European Upper Palaeolithic material culture, with the former seen as unstandardized or expedient industries, and the latter, as exhibiting increasing levels of standardization or curation (Conkey 1978; Isaac 1977a).

Minimally, however, curation can be said to occur when an implement or raw material is transported from one locus to another: "... easily replaceable, portable objects are probably not curated when the means of transportation is limited to human energy and the distance to the next site is great" (Schiffer 1976:167).[1]

In these contexts, curation is a situationally determined feature of technology, or a subset of technology, in opposition to an expedient or opportunistic approach to implement production. In the interests of clarity, therefore, the use of the term 'curated' will be restricted in the present discussion to activities related to raw material conservation (recognized, for example, by the transport of exotic raw materials or by apparent efforts to extend the use life of tools). Lithic industries characterized by greater or lesser degrees of standardization in implement production will be designated 'formal' and 'informal' respectively. Figure 5.1a illustrates the potential relationships of the factors of standardization and work effort (reflecting degrees of expediency and curation) in the production of implements.

In contrast to curated implements, expedient implements, according to Binford (1979:267), are produced for immediate use, using available materials. "In general, there is little investment in the tool production aspects -- edges are used if appropriate, minimal investment is made in modification, and replacement rates are very high if material is readily available." In the context of expedient tool production, it is generally assumed that the importance of overall form is often subordinated to the presence of suitable edge angles or edge configurations, or to flake (blank) size (White and Thomas 1972). It is this assumption, however, which needs to be examined further.

Ideas concerning 'expediency' and 'effort investment' as these bear on the production of certain types of implements can be clarified by reference to Pye's general discussion of design principles (1964). According to Pye,

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1 Undoubtedly some implements were transported, whether they were expediently produced or not; Schiffer's observation may stand as a general rule, however.

Figure 5.1a: Potential Interrelationship of Factors of Standardization and Work Effort in Tool Production

		WORK EFFORT	
		Expedient (-)	Non-Expedient (+)
STANDARDIZATION	Informal (-)	- -	- +
	Formal (+)	+ -	+ +

Figure 5.1b: Levels of Decision Making and the Assessment of Degrees of Expediency/Curation and Formality/Informality in Tool Production

1.	RAW MATERIAL	i	local
		ii	non-local
2.	BLANK	i	opportunistic
		ii	flake/blade (prepared core)
		iii	biface
		iv	tool
3.	MODIFICATION		
	Extent:	i	none (use only)
		ii	marginal
		iii	invasive
	Type:	i	irregular retouch
		ii	regular, controlled flaking
4.	NUMBER OF FUNCTIONAL EDGES	i	1
		ii	2
		ii	3+
5.	TOOL RE-USE/ RESHARPENING	i	absent
		ii	present
6.	HAFT	i	absent
		ii	minor edge modification
		iii	separate element

expediency in the manufacture of an object has to be balanced against economy and effectiveness of use. In economizing effort, the craftsman has several options open him (1964:58-59):

1) use of readily available material;

2) use of easily worked material;

3) use of less skill;

4) use of aids to standardization;

5) reduction in the number of techniques used in production;

6) reduction in the number of production stages.

Important for questions pertaining to the interpretive value of expedient stone tool industries, Pye has stated that, although the choice of certain economizing strategies may affect the design of the implement, " ... preconceptions concerning the ideal appearance of an object cannot be lost entirely" (1964:58; emphasis added). The implications of this observation will be given greater consideration in discussions to follow.

In assessing implements as curated or expedient, or implement production as formal or informal, features such as raw material, blank type, degree and type of modification, evidence of tool resharpening or re-use, and the presence or absence of a prehensile or haft element can be examined on the basis of the decisions involving economizing effort listed by Pye (see also Binford 1973:77, 79). For the majority of edge retouched implements in the Rock River collections, decisions concerning 'economizing effort' appear to relate to raw material selection and to the number of production stages used in artefact manufacture.

The systematic evaluation of degrees of curation/ expediency and formality/informality in tool production can be approached by taking into account the decisions the manufacturer faced at each stage of tool production. In addition, curation/expediency cannot be properly assessed apart from information concerning the context of tool production and/or discard (the obvious consideration here is access to raw material). And while an individual implement may be assessed as expedient or curated, the proper evaluation of degrees of standardization or non-standardization characteristic of tool production requires both that information concerning the context of production and discard is available and that a range of implement types produced within the context of that industry be examined.

A schematic breakdown of how degrees of curation and formality in tool production may be assessed is presented in Figure 5.1b. The initial judgment concerning expediency or curation is made on the basis of raw material type (local/exotic). Blank production or selection, the next level in the decision process, gives an indication as to whether tool production was being approached in an expedient manner, and may indicate as well whether the implements were being produced in the context of a formal technology. The opportunistic selection of frost spalls or random flakes, for example, represents expediency in tool production. Reworking of a tool fragment or biface fragment might be considered curation behaviour. The production of blades or specific flake types for use as blanks for a range of tools suggests that ideas concerning implement manufacture were more formalized. The systematic selection of blade-like flakes as tool blanks, rather than the production of blades, however, may be an indication of expediency within an industry which values standardization in implement manufacture.

The third level of decision making in tool production is modification of the blank to produce the required service edge(s) for a specific task. If modification is absent and edge was used as is, or if modification is limited to localized edge trimming to form the desired edge morphology, expediency in tool manufacture is suggested. More extensive retouching and possibly the placement of more than one functional edge on a tool made on exotic raw material may be interpreted to represent curation behaviour (i.e., efforts to extend the use-life of a tool made on a valued raw material). Extensive retouching or shaping of an edge, or the presence of more than one service edge on an otherwise expediently produced tool (made on local raw material, possibly using an opportunistically selected blank) suggests that ideas concerning ideal tool morphology are formalized within that lithic industry, regardless of an otherwise expedient approach to manufacture in certain circumstances (specifically, in situations of raw material abundance).

The presence of a haft element on an expediently produced tool may similarly indicate that ideas concerning the ideal form of that tool are formalized within a lithic industry. Or, the presence of a haft element on a curated tool may indicate efforts to extend the use-life of the tool. Evidence of resharpening or reworking of a tool may generally be taken to indicate curation behaviour.

Following this breakdown of levels of decision making in tool production, and taking into consideration any situational constraints, it becomes evident that implements may be both standardized and expedient; or alternatively, curated and non-standardized or informal. The ability to characterize a lithic industry in these terms should contribute significantly to the development of useful and valid typological comparisons. And while informal and/or expedient technologies necessitate our abandoning "normative ideas of technically and morphologically homogeneous industries", as Binford (1979:271) puts it, the products of these technologies should not be viewed as uninformative.

In an attempt to better understand the nature of variability in the sample of edge retouched and utilized implements, and in particular, features of expediency and curation, and formality and informality in tool production in the Rock River sample, decisions pertaining to raw material and type of blank selected for tool manufacture are given initial consideration. Modification associated with tool function or use in the sample (type of modification, number of functional edges, resharpening, haft or prehensile element) are described separately.

Special emphasis is given in the analysis to the subsets of tools made on blades, and tools made on non-local cherts. In the case of blade tools, the assumption is that these represent the products of a single technological tradition (in the interior Northwest, most investigators attribute large blade production to Paleo-Arctic tradition technology). In the case of implements produced on non-local cherts, these would normally be assumed to be 'curated tools', which will exhibit greater degrees of 'artisan investment' as compared with tools produced on locally abundant silicious argillite.

A comparison of the chert and blade implements with the sample produced on locally-available flakes and shatter will permit some assessment of the formality or standardization characteristic of the various tool production technologies represented in the Rock River sample in general. The question of 'tool types' may be considered in the light of the results of this analysis, and conventional ideas concerning typology, based principally on assumptions of morphological standardization, may require re-evaluation.

The Sample

In the Rock River assemblages, 112 edge-retouched and utilized implements have been identified. The number is in a sense an estimate, because in a number of cases non-cultural edge damage has obscured evidence of use or retouch, and in other cases, has mimicked use wear. Overall, however, tendencies in the kinds of tools being manufactured or used are readily apparent.

The basis for assigning functional labels should be made explicit before proceeding to the descriptive level. In general, the principal determining criteria are morphology and type of modification of the functional edge or edges, subdivided as follows:

Scraper - convex, straight or concave steep or beveled edge with primarily unifacial retouch or use damage.

Notched/Denticulated Implement - localized concavity or a series of concavities on the edge, formed by unifacial retouch or use damage.

Beaked Tool - projection or acutely angled juncture of two lateral margins.

Burin - burinated edge with evidence of use, or break margin or cleavage plane surface utilized as a burin facet.

Piece esquillee/Wedge - generalized edge crushing or battering, often on opposing margins.

Knife - straight edge with flat, bifacial or unifacial retouch or edge damage. Generally manufactured on tabular fragments.

Tabular Biface - convex edge with bifacial retouch.

Spall Scraper - convex edge with moderately steep unifacial retouch or use damage. Manufactured on a large flakes, frost spalls, or tabular fragments.

Within the framework of the present analysis, the degree to which these labels conform to the actual function of the implement is a moot point. For the purposes of this study, mechanical requirements of the edge for the execution of a task are assumed to be broadly reflected in the morphology of the edge.

In terms of the classification outlined above, the most frequently occurring classes of retouched implements in the Rock River sites are scrapers (n=31), and burins (n=27). Notched and denticulated implements (n=6), beaked implements (n=10), *pieces esquillees* (n=4), tabular bifaces (n=5), spall scrapers (n=4) and knives (n=4) comprise the remaining sample of implements (Table 5.1).

Table 5.1: Implement Types in the Rock River Sites

	S	B	N	D	K	T	SS	Bk	PE	BS	BSN	SN	BN	SPE	BPE	SDBK	KS	BD	SD	SPEBk	TOTAL
MgVa-12		2	1						2		1			1	1						8
MfVa-2	3																				3
MfVa-9	7	5	1					1		1	1		1	1							18
MfVa-10	3	6			1			2		1			3								16
MfVa-11		1				1	1														3
MfVa-12	1							1													2
MfVa-13(N)	1																				1
(5)	7	3	1			2	1	3	1			1									19
(5A)	1	1					2	1			1						1				7
(6)						1		1													2
(10)		2			2																4
MfVa-14	3	1	2					1	1	1								1			10
MfVa-15	1																				1
MfVa-17	2	6			1	1							1			1			1	1	14
MfVa-18	1																				1
MfVb-1													1								1
MfVb-2	1																				1
MeVb-4				1																	1
TOTAL	31	27	5	1	4	5	4	10	4	3	3	1	6	2	1	1	1	1	1	1	112

S	scraper	BSN	burin/scraper/notch
B	burin/snap burin	SN	scraper/notch
N	notch	BN	burin/notch
D	denticulate	SPE	scraper/*pièce esquillée*
K	knife	BPE	burin/*pièce esquillée*
T	tabular biface	SDBk	scraper/denticulate/beak
SS	spall scraper	KS	knife/scraper
Bk	beak	BD	burin/denticulate
PE	*pièce esquillée*	SD	scraper/denticulate
BS	burin scraper	SPEBk	scraper/*pièce esquillée*/beak

An important component of the collections, however, is the production of tools with multiple working edges, likely used in the execution of related tasks. These multipurpose implements (n=21, 19% of the sample of edge-retouched and utilized implements), exhibit the following functional combinations: burin/scraper (n=3), burin/notch (n=6), burin/scraper/notch (n=3), burin/denticulated implement (n=1), burin/*piece esquillee* (n=1), scraper/notch (n=1), scraper/knife (n=1), scraper/ denticulated implement (n=1), scraper/*piece esquillee* (n=2), scraper/denticulate/beaked implement (n=1), scraper/beaked implement/*piece esquillee* (n=1).

If the representation of functional edges, independent of their occurrence on implements with other working edges is considered, present in the sample (total number of working edges = 138) are: scrapers (n=44, 32%), burins (n=41, 30%), notched implements (n=14, 10%), denticulated implements (n=4, 3%), knives (n=5, 3.6%), tabular bifaces (n=5, 3.6%), spall scrapers (n=4, 3%), beaked implements (n=14, 9%) and *pieces esquillees* (n=8, 5.8%).

Before proceeding with a discussion of the implement sample, some explanation of the small sample size is required, particularly in view of the size of the collections from the Rock River area as a whole. To some degree, the small sample size may reflect reality, inasmuch as the workshop activities at many of the sites generate a misleading impression of density/duration of habitation. A preference for organic material (specifically bone and antler) for implement manufacture by the past occupants of the Rock River sites also may account for the observed paucity of lithic implements. Implements produced on these kinds of materials would not survive for any appreciable length of time in surficial contexts.

The expedient nature of the stone tool technology itself affects the recognition of tools in the sample as well. Evidence of use damage on unmodified flakes or tablets may have been obscured by subsequent non-cultural edge damage, caused by trampling or various forms of cryoturbation. It is also possible that the expedient selection and use of appropriate edges on flakes or tabular fragments of silicious argillite may not be visible, particularly if the task was short term and the tool was not re-used. Experimental use of a series of silicious argillite flakes in butchering activities, for example, did not result in any alteration of the edges visible either macroscopically or under moderate (40X) magnification.[2]

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2 Specially produced silicious argillite flakes were used in the butchering of a yak by several students of the Faunal Archaeo-Osteology course (1984-85), taught by Dr. Howard Savage at the University of Toronto.

Raw Material and Blank Production

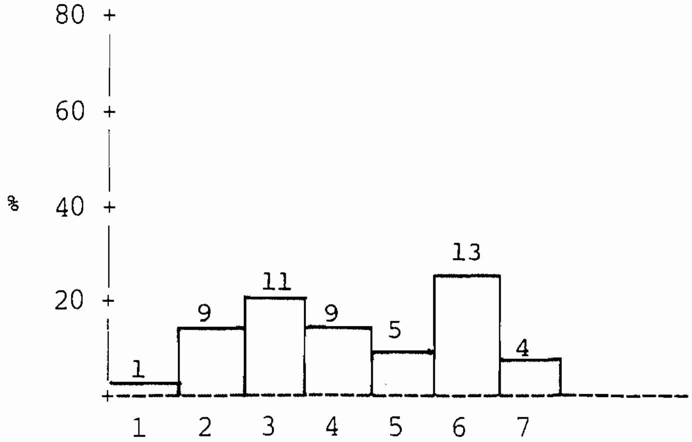
With the exception of a small sample of blades, the systematic production of blanks for the purposes of tool manufacture does not appear to have been a priority in the Rock River assemblages. Of the total sample (n=112), 45 implements are manufactured on various flake blanks, 12 are made on blades or blade-like flakes, and 55 implements are made on tabular or blocky fragments of the local silicious argillite, frost spalls, biface fragments and pebble fragments, which apparently fulfilled the basic requirements of size and edge morphology for the task at hand.

An examination of the production features of flakes which have been utilized or made into tools (Figure 5.2) serves to reinforce the impression of expediency in tool manufacture (attributes used in the analysis of the sample of edge retouched and utilized implements are described in detail in Appendix II). Approximately 66% (n=32) of the flakes in the sample exhibit some cortex or cleavage plane surface; 21% (n=12) have 50% or greater cortex cover. On almost one-third of the sample of complete flakes (n=11), platforms are unprepared, comprising cortex or cleavage plane. In the Rock River sample, multiple faceting on the platforms is probably attributable to the use of biface trimming flakes as blanks for tool production, rather than to a greater degree of preparation of the core for flake detachment.

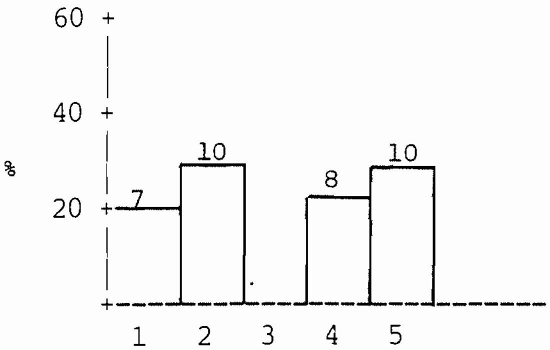
It is of interest to note that despite the fact that chert implements (n=10) represent a 'curated' subset of technology (in terms of the transport of implements made on exotic raw materials), there is little evidence to suggest (with the exception of chert blades [n=3]) that the blanks were being systematically produced for this purpose. A fair proportion of the blanks used for the production of chert implements appear to be biface trimming flakes (n=4). One thick, amorphous flake exhibits a highly irregular dorsal surface topography, which suggests removal in order to correct errors in the shaping of a biface or core. One chert implement is made on a frost spall. The blank type for a scraper fragment could not be identified.

The apparent tendency for expedient selection of blanks for tool production, even within the sample of 'curated' implements, suggests very strongly that implement production, at least on this level, was not generally 'formalized' among the technologies represented in the Rock

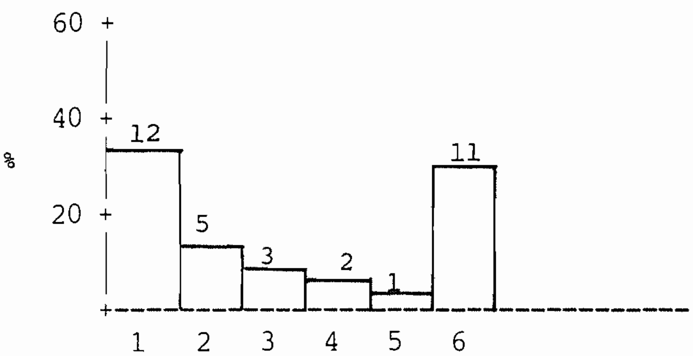
Figure 5.2: Edge Retouched and Utilized Flakes and Blades: Production Features of the Blank



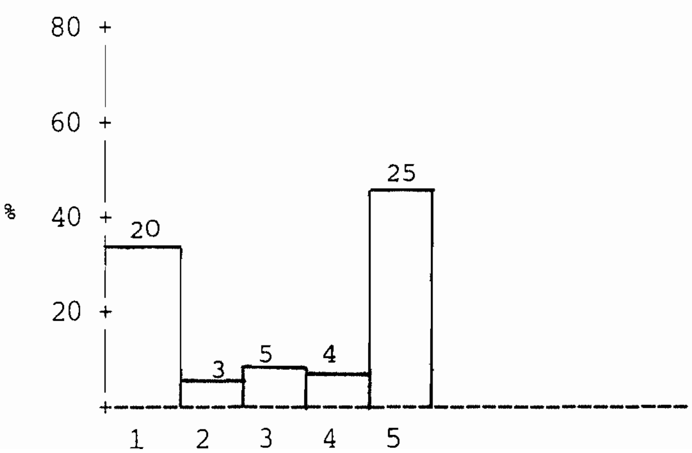
Number of Dorsal Flake Scars
1 - 1   5 - 5
2 - 2   6 - 6+
3 - 3   7 cortex
4 - 4



Platform Edge Preparation
1 grinding   4 grinding and chipping
2 chipping   5 none
3 battering



Platform Type
1 1 facet   4 4+ facets
2 2 facets 5 ridge
3 3 facets 6 cortex



Cortex Cover
1 <25%   4 <100%
2 <50%   5 none
3 <75%

River area. Degrees of formality or standardization in implement production will be examined further in the discussion of the modifications associated with tool function.

Types of Modification on Edge Retouched and Utilized Implements

Introduction

In apparent confirmation of the expediency observed at the level of blank selection, a relatively high proportion of the flakes and tabular fragments in the collections are utilized on appropriate edges or corners without modification (n=46, 33.3% of the total sample of functional edges, n=138). It is interesting to note that in the sample of 'curated' implements (i.e., those made on imported cherts), the use of unmodified edges also occurs with some frequency (n=7 or 37% or the total number of functional edges, n=19), which would seem to indicate that although the implements were 'curated' in the raw material sense, the actual production of the tool still proceeded expediently, or in a way that involved the least effort on the part of the artisan.

As noted earlier, the production of multipurpose tools is also an important feature of the Rock River technologies, where multipurpose tools comprise approximately 19% (n=21) of the total sample of edge-retouched and utilized implements (n=112). Commonly, multipurpose tools are viewed as a response to scarcity of good quality raw materials and reflect increasing levels of 'economizing behaviour' with respect to material utilization (cf. Vierra 1982:171; Binford 1979:263). In the Rock River assemblages, however, over half of the multipurpose tools are not manufactured on exotic raw materials but are made on flakes or tabular fragments of the abundant local raw material (Table 5.2). In this respect the association of edges does not represent efforts to 'curate' or extend the use-life of a valued raw material, but suggests an effort to conform to certain design requirements of a particular (multipurpose) tool type. With regard to the production of certain of the multipurpose tools in the Rock River collections, Pye's observation concerning the effect of economizing strategies on implement design is worth repeating here:

Table 5.2: Types of Blanks Used in the Production of Multipurpose Implements

TYPE	CHERT	ARGILLITE BLADE	CHERT BLADE	OTHER	TOTAL
BN	1	0	1	3	5
BS	0	1	1?	2	4
BSN	1	1	0	1	3
BD	0	0	0	1	1
BPE	0	0	0	1?	1?
SN	0	0	0	1	1
SD	0	0	0	1	1
SDBk	1	0	0	0	1
SK	0	0	0	1	1
SPE	0	0	0	2	2
SPEBk	0	0	0	1	1
	3	2	2	14	21

BN	burin/notch
BS	burin/scraper
BSN	burin/scraper/notch
BD	burin/dentiuclate
BPE	burin/<u>piece esquillee</u>
SN	scraper/notch
SD	scraper/denticulate
SDBk	scraper/denticulate/beaked implement
SK	scraper/knife
SPE	scraper/<u>piece esquillee</u>
SPEBk	scraper/<u>piece esquillee</u>/beaked implement

Other: Predominantly argillite flakes, tablets or frost spalls.

" ... preconceptions concerning the ideal appearance of an object cannot be lost entirely" (Pye 1964:58).

On this basis, I would propose that the combination of functional edges on implements, which are otherwise expediently produced and morphologically non-standardized, represents a procedural 'mode' or preference in tool design which was important within the context of a particular technological tradition.

In order to isolate and better define these 'modes', features of the tools, including type of modification and preparation, edge location, number of edges, prehensile or haft element, and the presence/absence of resharpening, will be examined in the sample as a whole. Again, special emphasis is placed on implements manufactured on blades and non-local cherts because it is generally assumed that the degree of formality and curation is higher in these subsets.

The chronology and distribution of both functional modes and tool types in the Rock River sample will also be considered to evaluate the suggestion that these were specific to a particular technological tradition in the northwest Boreal Forest. The surficial context of the sites requires that virtually the entire prehistoric sequence for this region be taken into consideration in making comparisons.

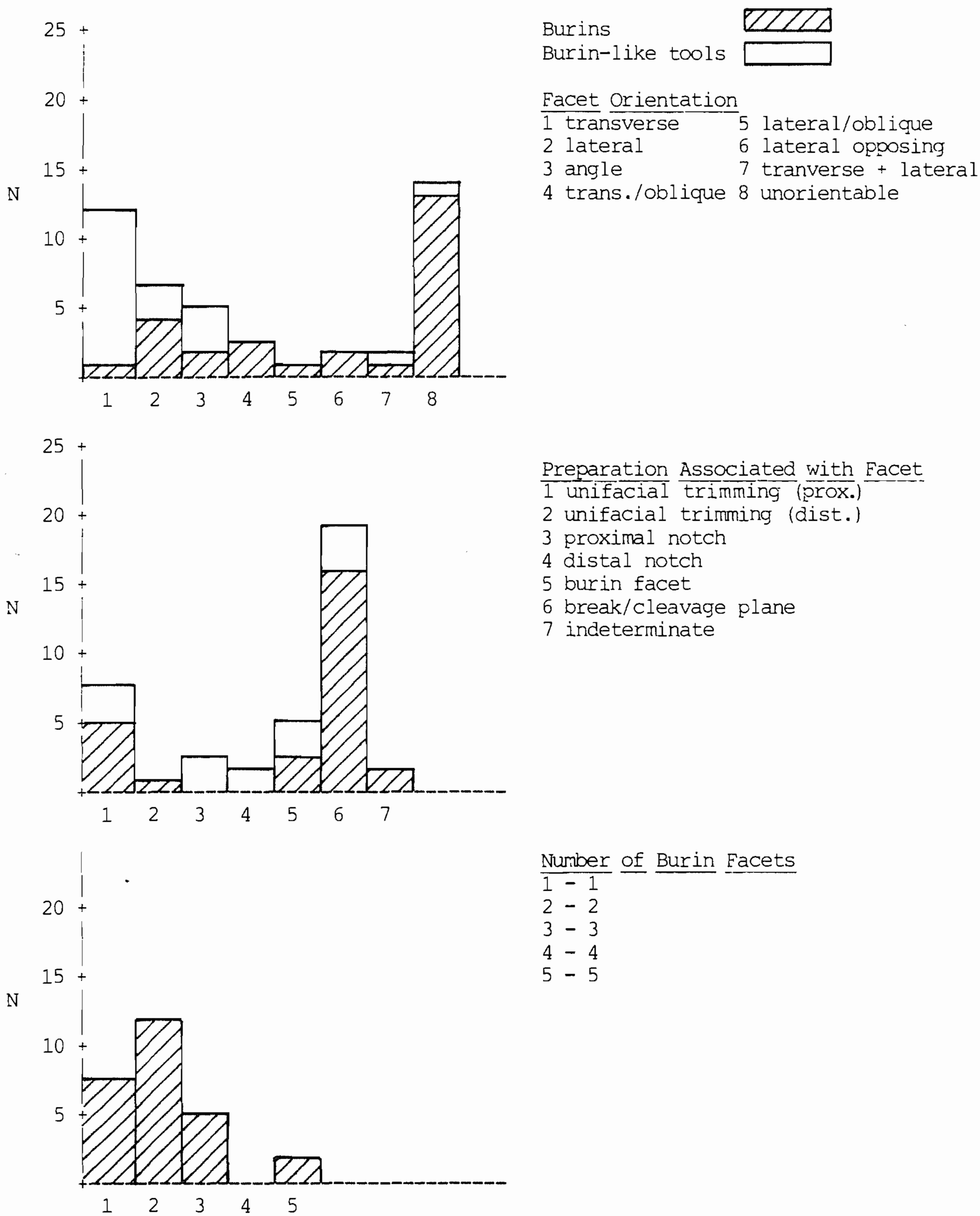
Burins and Snap Burins

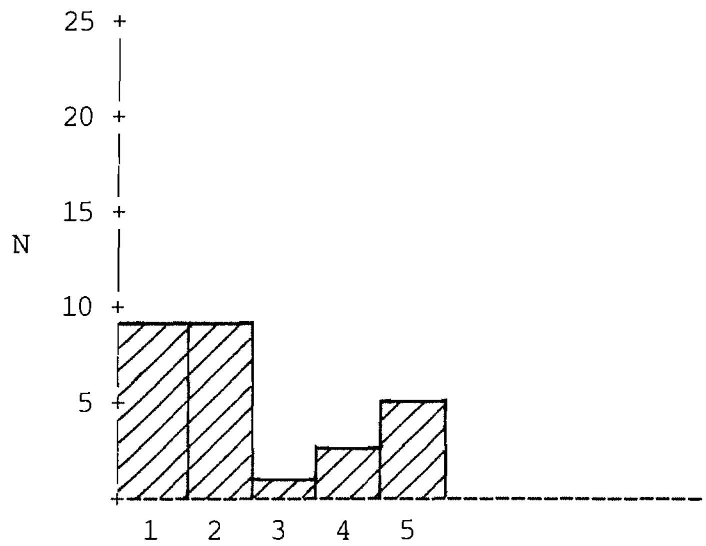
Burins, or tools which have been used in a manner similar to burins, comprise one of the most popular implement classes (n=41, 37%) in the collections. There are 27 specimens which can be called true burins; i.e., they exhibit the removal of a burin spall to create a functional edge or angle. Fourteen flakes, bifaces or tabular fragments of silicious argillite exhibit use on a break margin or cleavage plane, analogous to use damage observed on burin facets, and are here termed 'snap burins'.[3]

The expedient character of the burin sample is evident in the nature of preparation for the detachment of burin spalls (Figure 5.3). Of 34 burin facets, 17 (50%) have been produced without preparation, by detachment of the burin spall from a break margin or cleavage plane. Unifacial

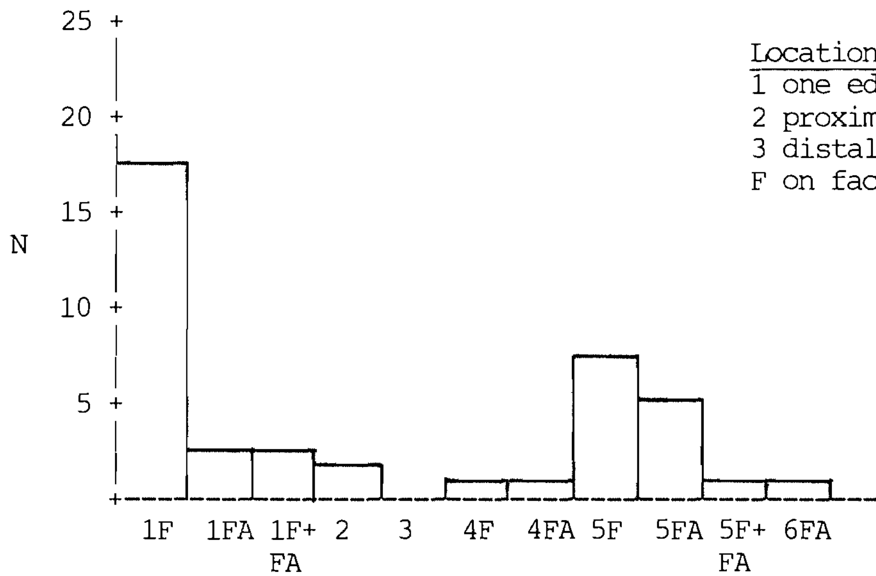
3 Aigner (1970:67), in her description of the Anangula assemblage, was the first to document snap tools or snap burins in the archaeological record of the far Northwest.

Figure 5.3: Burins and Snap Burins - Discrete Attributes





Facet Termination
1 feather
2 hinge
3 step
4 feather and hinge
5 feather and step



Location of Use Damage

1 one edge	4 two edges
2 proximal tip	5 1 edge + prox. tip
3 distal tip	6 2 edges + prox. tip
F on facet	FA on face of blank

trimming or retouch as preparation of an edge for burination occurs on 5 of the burin facets, of which 2 are chert. Unifacial trimming at the distal end of the facet was noted on 2 specimens. The use of a previous burin facet as the platform for detachment of a second burin spall occurs on 3 specimens. The presence of notches at the proximal and distal ends of burin facets was noted for 2 specimens (a chert flake and a chert blade). Much the same as unifacial trimming at the proximal or distal ends of burin facets, this feature is generally assumed in the literature to be preparation for detachment of a burin spall (i.e., the notch serving as a platform for spall detachment, or as a feature preventing wrap-around of the spall as it is detached; cf. Mauger 1970:31-32). In the Rock River collections, however, most of the notches appear to have been created primarily for use, and their location on burins near the facet may be fortuitous or, possibly, a matter of convenience. This impression is reinforced by the fact that notching on one true burin is not associated with the burin facet, and that notching is also present on 2 snap burins. Notching as preparation for hafting was also noted on one true burin and one snap burin. The nature of preparation for burin spall detachment could not be determined for 6 burin facets, whose proximal ends are truncated by subsequent burin blows or breaks.

A relatively large proportion of the true burins (n=8) exhibit only a single burin blow (Figure 5.3). This tends to support the argument for expediency, or at least a non-conservative attitude to raw material utilization, as a major characteristic of the sample: it may have proven more efficient to create a new burin than to resharpen the existing tool. A substantial number of burin facets terminate in hinge or step fractures (Figure 5.3), which would perhaps require more effort to overcome in subsequent burinations than would be involved in the manufacture of a new burin. With regard to the question of curation, it is noticeable that multiple spall detachment is characteristic of the sample of chert burins, and to a lesser extent, the blade burins as well. Raw material conservation, among the chert burins at least, is probably a factor in this pattern.

Some interesting trends occur in the sample with respect to the portion of the burin facet utilized (Figure 5.3). On over 50% of the sample (n=23) use damage occurs along one edge of the burin facet exclusively. Two burins (5% of the sample) exhibit use along both edges of the burin facet (dorsal and ventral). Of the total sample, only 2 burins exhibit use exclusively on the tip or juncture of the burin facet and margin of the blank. Thirty percent (n=13) of the burins are used both at the tip and along one edge of the burin facet. One burin exhibits use damage at the tip and on both edges of the burin facet.

In the sample of burins utilized on facet edges, some variation was observed as well with respect to the location of use damage on the facet. Use damage extending from the facet edge onto the facet proper was noted on 25 burins. Use damage from the facet edge onto the face of the blank occurred on 10 burins. Four burins exhibited a combination of these two types of use damage. It is possible that two different use modes are represented in these patterns of use: in the case of use damage on the facet (F), the burin was probably pulled toward the user in a manner similar to that inferred for scrapers; use damage on the face of the burin (FA) may have resulted from pushing the burin, in a shaving motion, across the work piece.

A slight correlation exists between these inferred use patterns and the portion of the burin facet being used. On burins exhibiting use along the edge of the facet only, use damage most frequently extends onto the facet proper (72% of the sample of burins with use damage on the facet). Burins which have been used on both the facet edge and the tip of the facet tend to exhibit use damage extending from the facet edge onto the face of tool (55% of the sample of burins with use damage on the face of the tool).

Both expediency and the range of potential uses inherent in the burin form probably contribute to the variability observed in the facet dimensions of the burin sample in general (Figure 5.4 - 5.5). The lengths of burin facets in the Rock River sample range broadly between 1.23 and 8.0 cm, with the majority (78%) between 1.5 and 4.0 cm. The widths of burin facets range between 0.26 and 1.43 cm with the majority (94%) between 0.4 and 1.0 cm. The angles of the utilized edge of the burin facet and the face of the blank range between 50^{o} and 132^{o}, with the majority (60%) between 70^{o} and 90^{o}. The utilized tips of the burin facet measure between 60^{o} and 110^{o}. Interestingly, this small sample (n=14) exhibits a bimodal distribution of angle measurements, peaking at 80^{o} and again at approximately 100^{o}; this may have some (presently unknown) functional implications (Figure 5.5).

In an attempt to discover if morphological requirements of the burin facet differed with respect to their manner of use, comparisons of facet length, width and angle were made (Figure 5.6) between the facet and face utilized burins. The range of facet lengths, width and angles is large in both samples, however, with considerable overlap, suggesting there was in fact no selection for certain sizes or angles or burin facets in response to the manner of use.

Figure 5.4: Morphology of Burin Facets

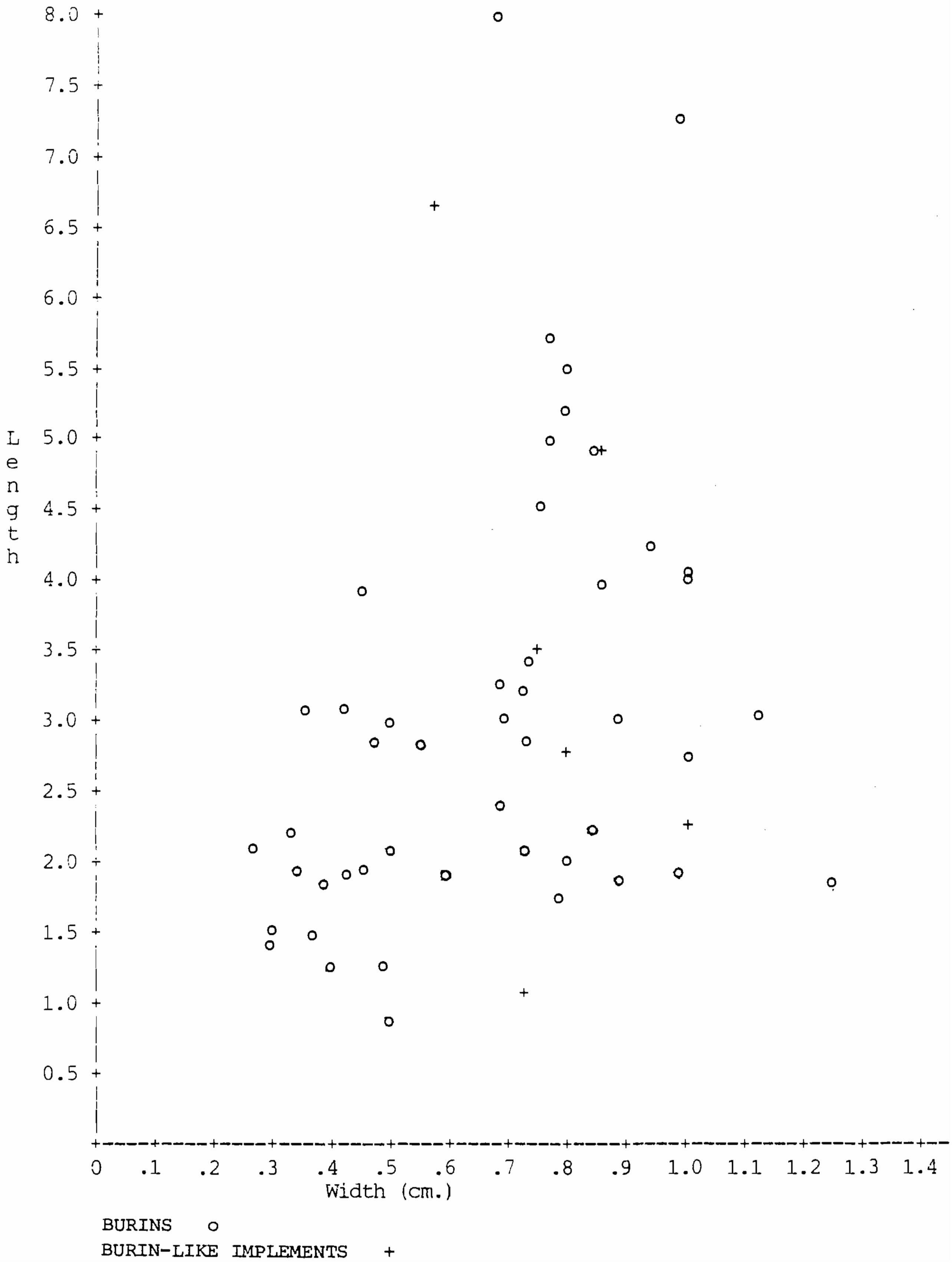
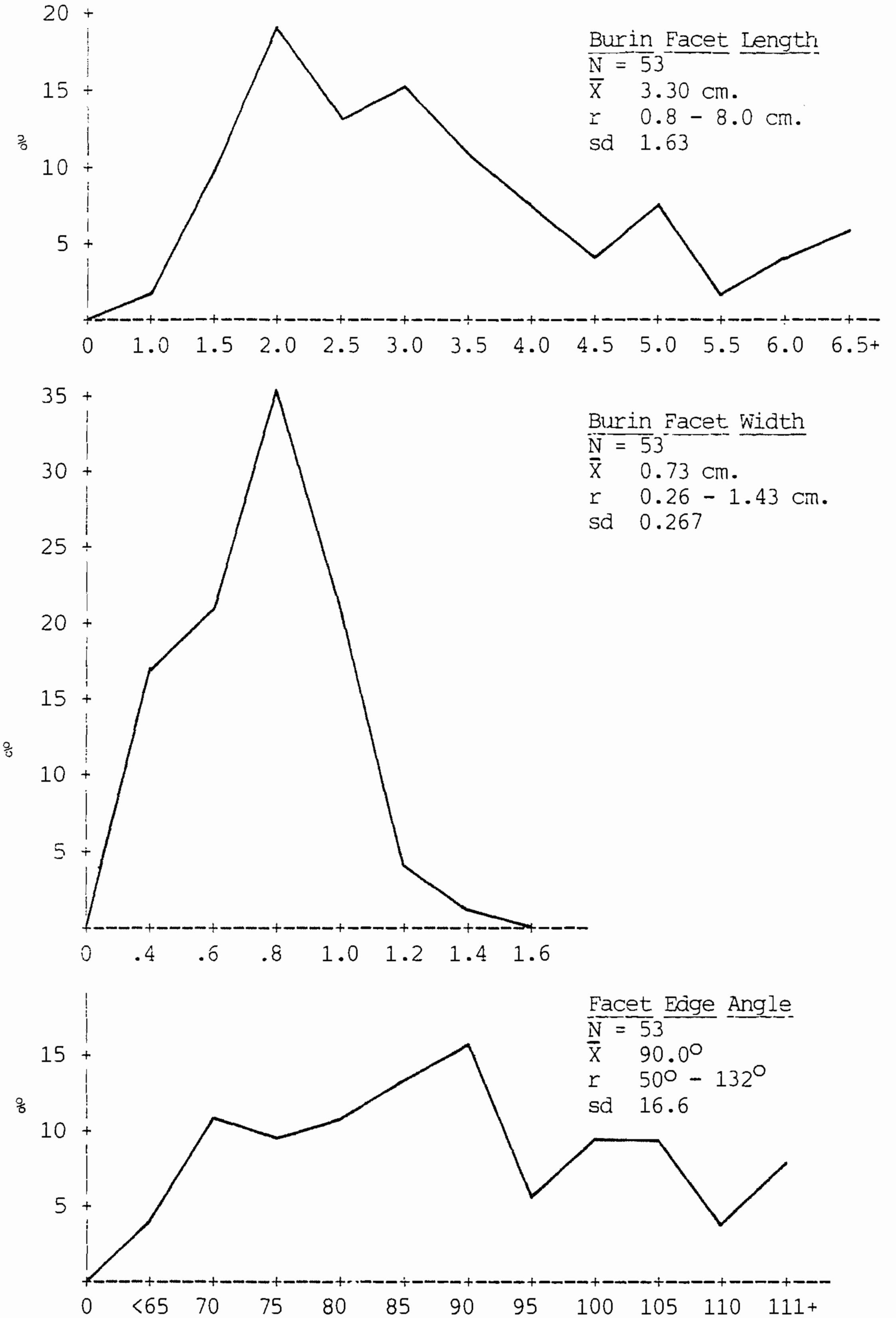


Figure 5.5: Burins and Snap Burins - Metric Attributes



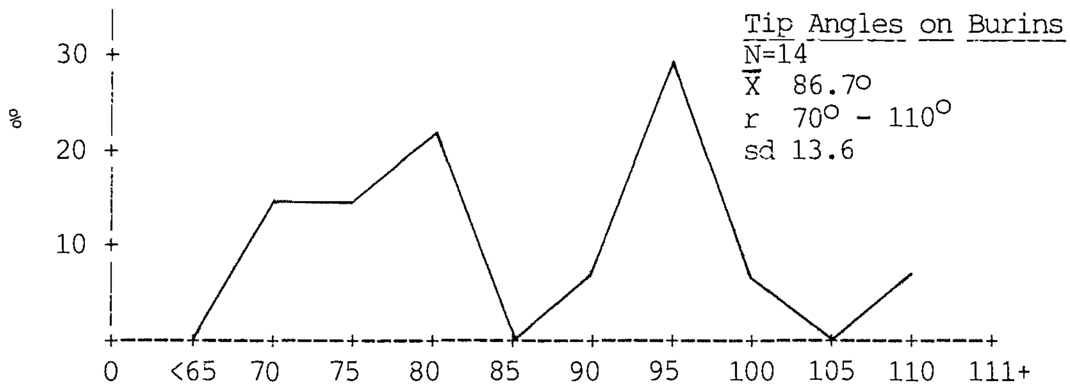
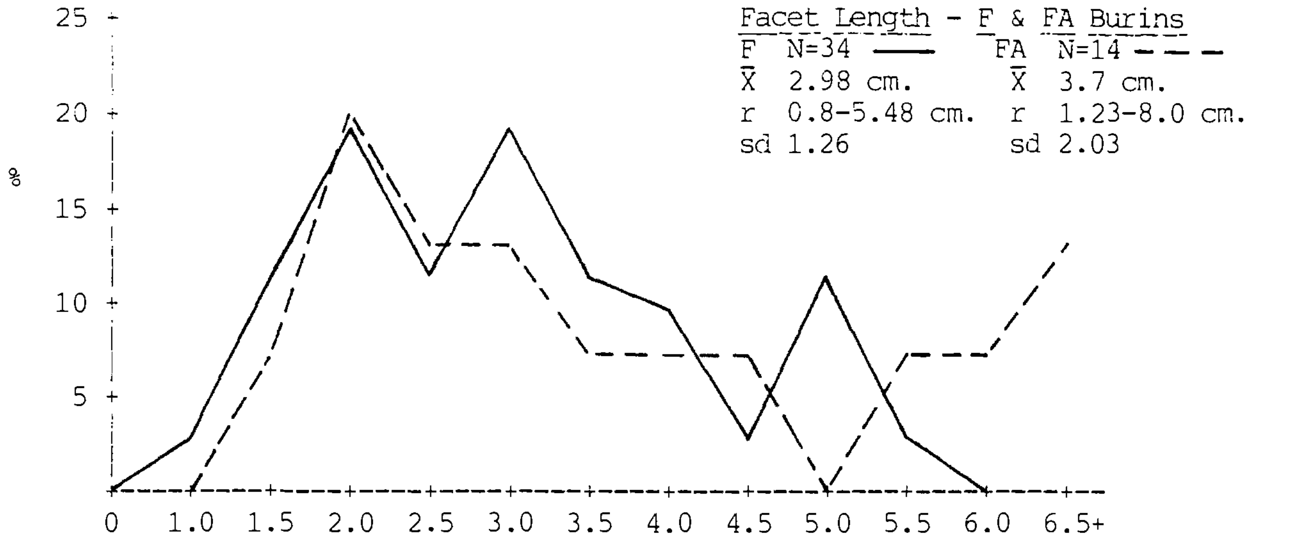
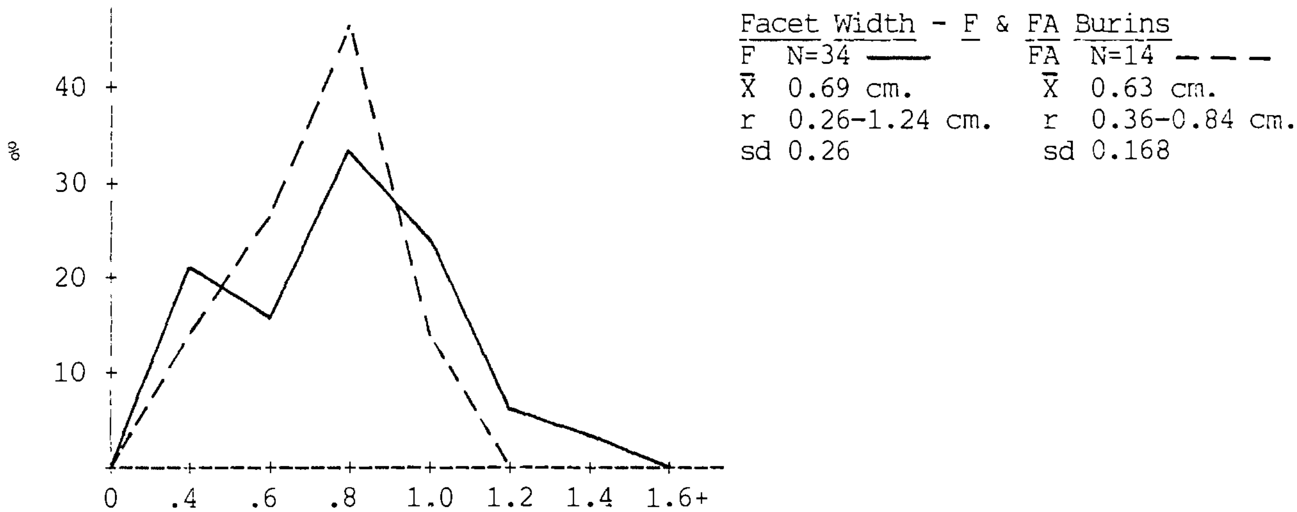
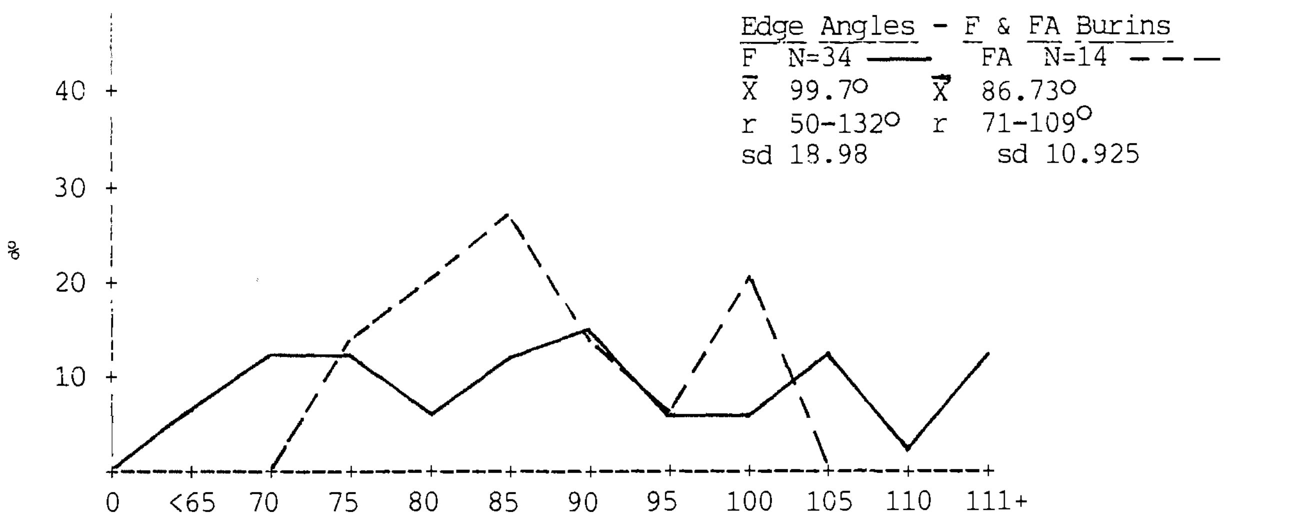

Tip Angles on Burins
N=14
X̄ 86.7°
r 70° - 110°
sd 13.6
%
30
20
10
0
<65
70
75
80
85
90
95
100
105
110
111+

Figure 5.6: Comparison of 'F' and 'FA' Burins







Typology of the Rock River Burins

In an effort to discover evidence for the systematic production of certain types of burins, patterns of co-variation of certain features of burin production and use were examined; specifically orientation of the burin facet, preparation for detachment of the burin spall, and location of use damage. Six classes were defined on the basis of these features:

Class I Transverse Burins (n=11). The facet is transverse to the longitudinal axis of the flake or blade and may be associated with a notch; use is generally on one edge of the facet, extending onto the facet proper. Edge angles tend to approach 90° (Plate 5.1).

Class IIA Lateral Burins (n=10). The facet is parallel to the longitudinal axis of the flake or blade, and occupies most of one lateral margin. Unifacial trimming may occur as the preparation for spall detachment. A notch may be present on the tool. Use damage is present either on the facet edge (commonly on the facet proper) or the facet and the tip of the facet. Edge angles average 75° (Plate 5.2).

Class IIB Partial Lateral Burins (n=10). The facet is parallel to the longitudinal axis of the flake or blade, and occupies only a portion of the lateral margin. Unifacial trimming may occur as the preparation for spall detachment. Use occurs most commonly on the facet and its tip, or on one edge of the facet. Damage may be on the facet or on the face of the blank. Edge angles average 75° (Plate 5.3, 5.4).

Class III Angle Burins (n=2). On these implements, burin facets occur more or less at right angles to each other with the first facet serving as the platform for the detachment of the second burin spall. Use damage is evident on both the facet edge and the tip or juncture of the two facets. Facet edge angles are relatively obtuse, between 80° and 100°.

Class IV Transverse/Oblique Burins (n=4). May be prepared as angle burins. Use damage occurs on the ventral edge of the transverse facet. A notch may be present. Edge angles are obtuse, averaging 120° - 130° (Plate 5.5).

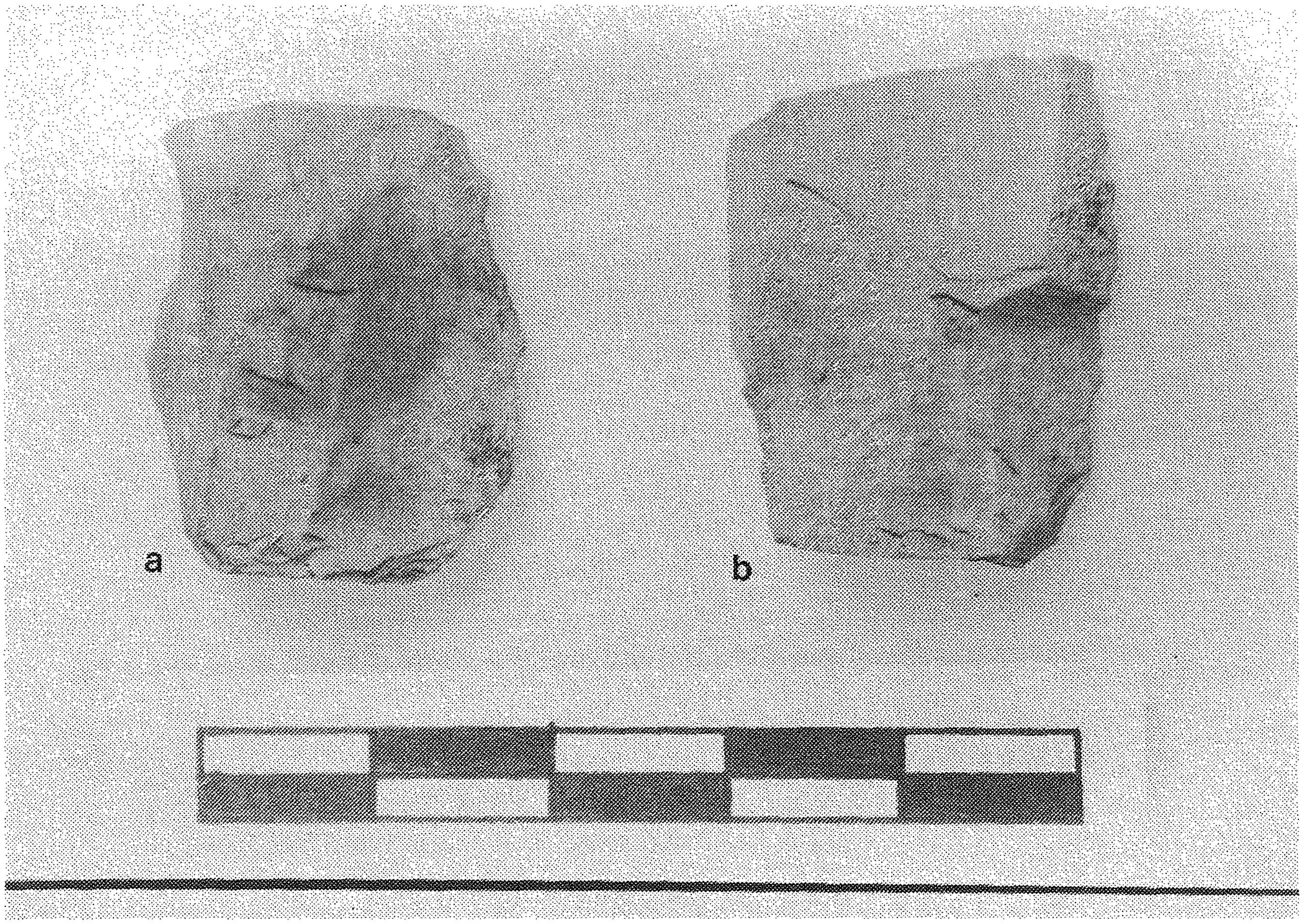


Plate 5.1: Transverse Burins on Blades. (a) Notch and Unifacial Retouch are Located on the Lateral Margins of the Tool; (b) Snap Burin with Unifacial (Scraper?) Retouch on the Lateral Margins of the Tool

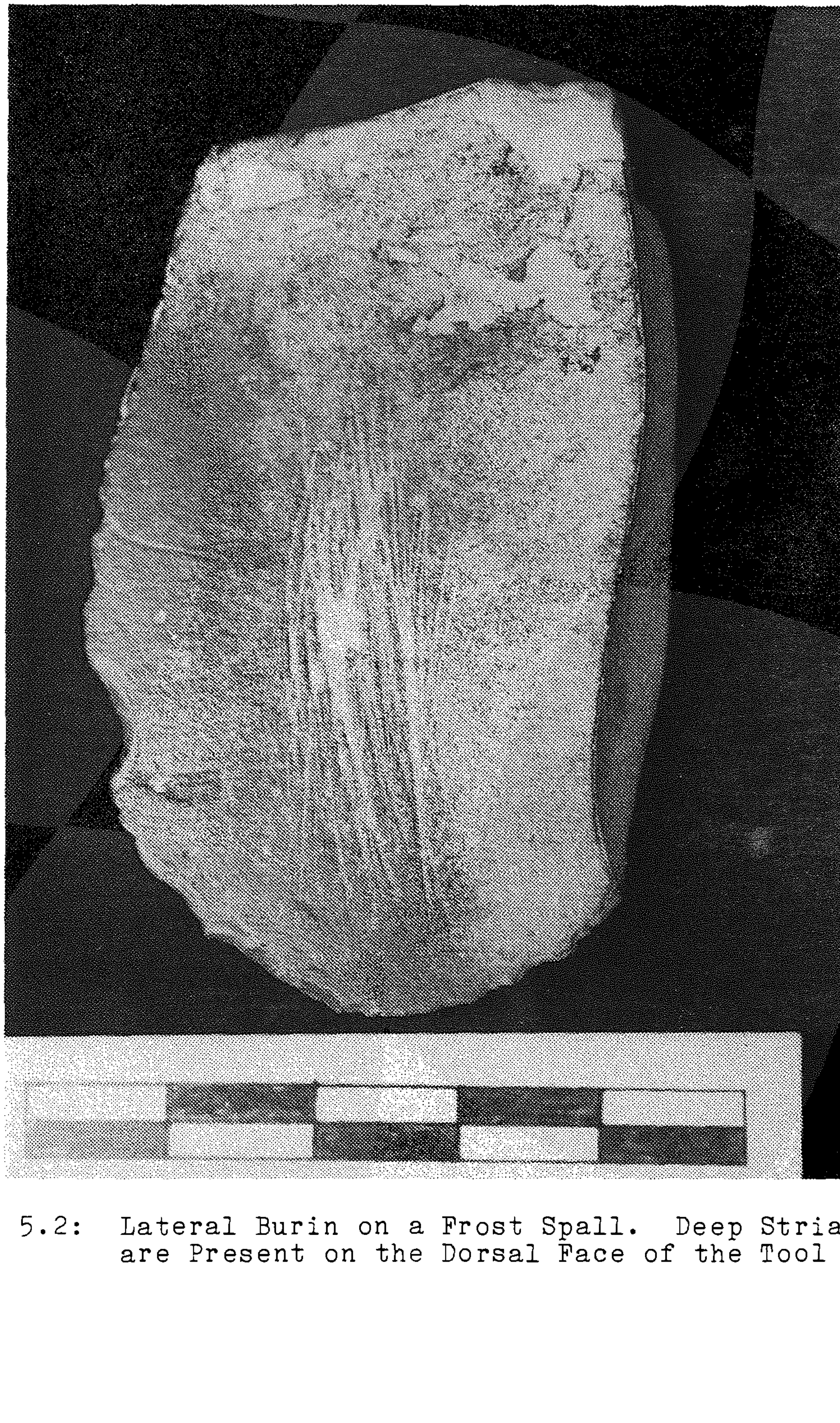


Plate 5.2: Lateral Burin on a Frost Spall. Deep Striations are Present on the Dorsal Face of the Tool

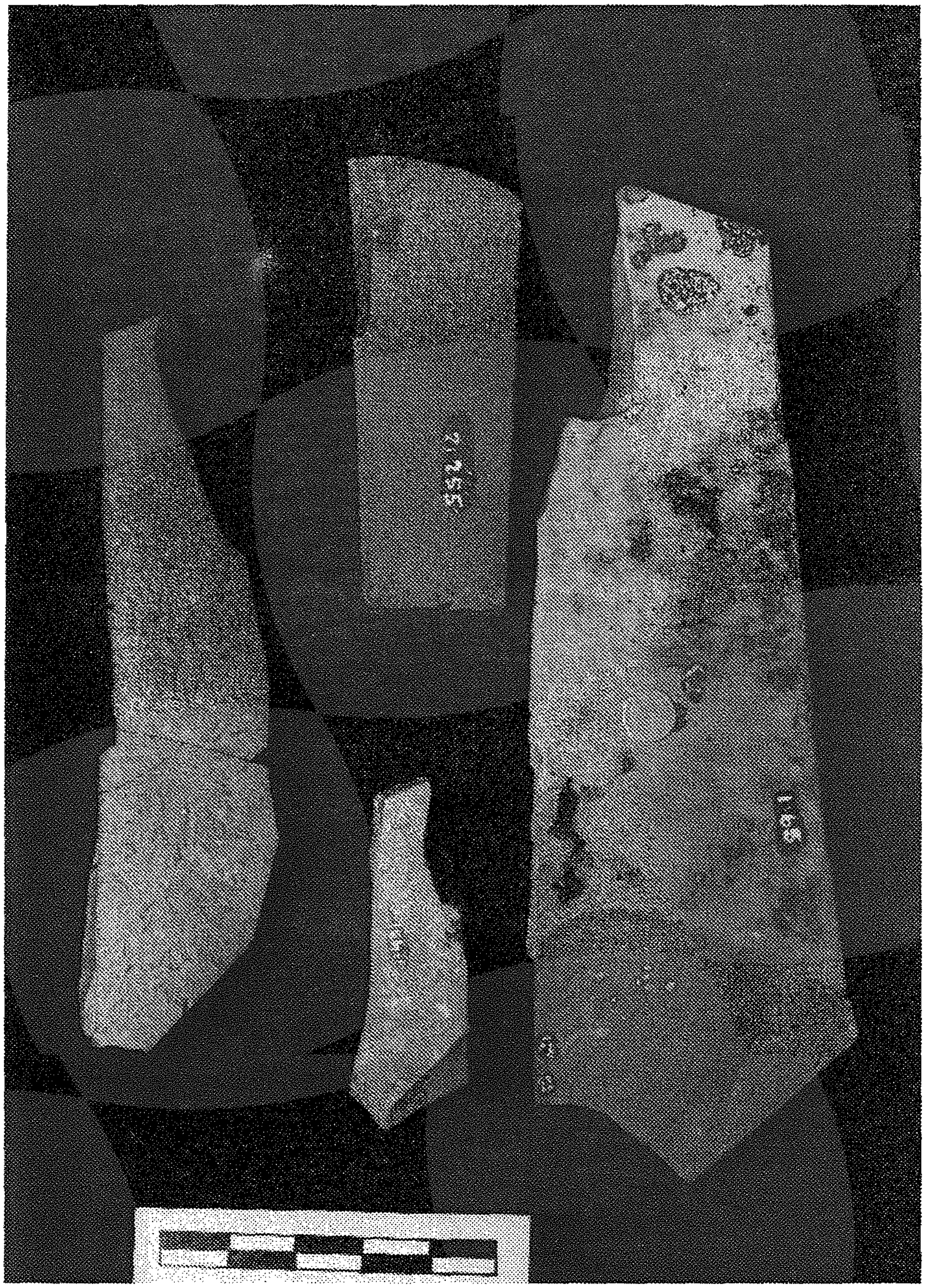


Plate 5.3: A Sample of Partial Lateral Burins Made on Tabular Fragments of Silicious Argillite. (Note: Dot markers on artefacts may be disregarded.)

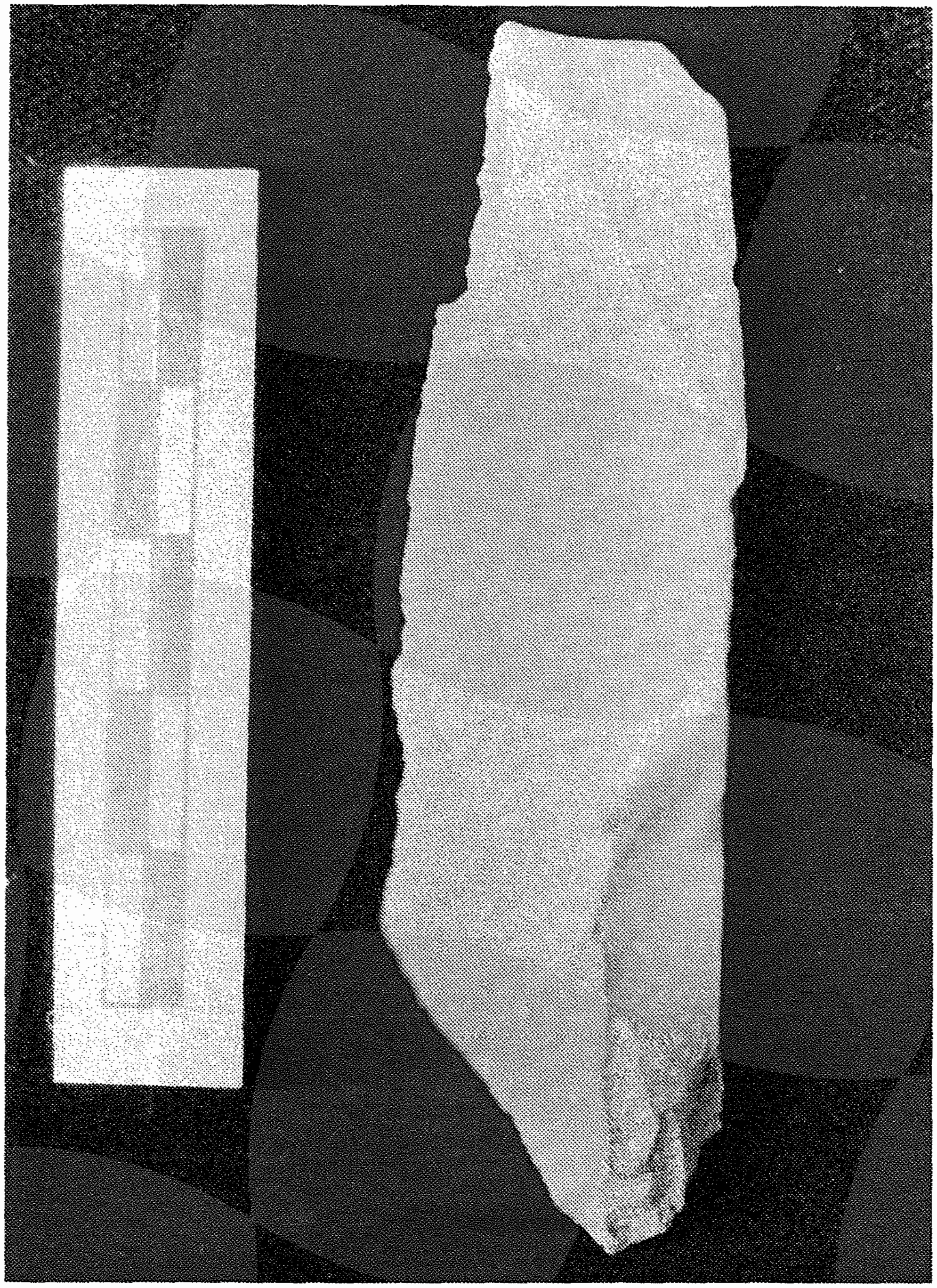


Plate 5.4: Partial Lateral 'Burin'. 'Burin' Portion of the Tool was Made by Controlled Unifacial Retouch

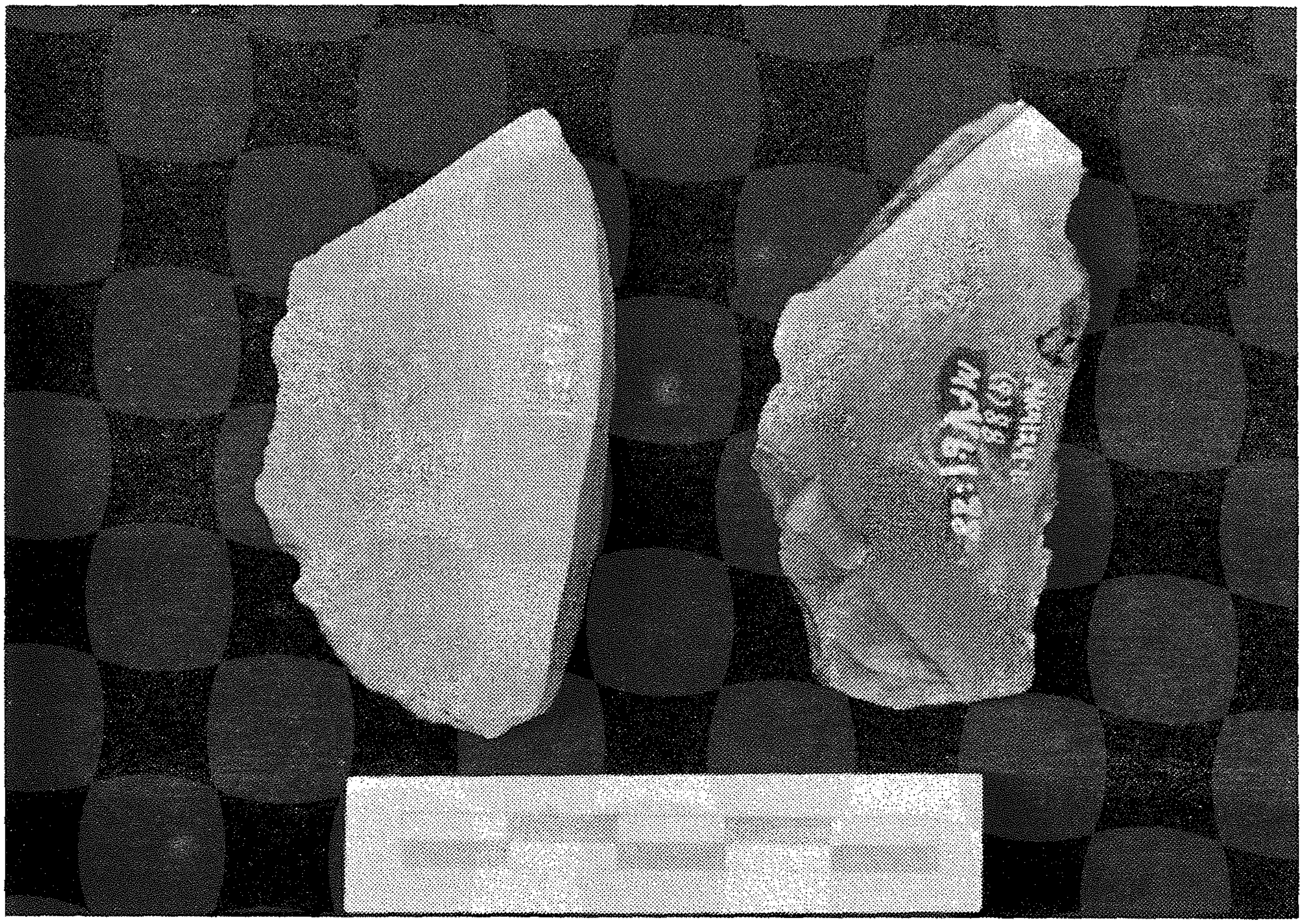


Plate 5.5: Transverse/Oblique Burins. The Burin on the Left is also Notched on the Left Margin, near the Burin Facet

Class V Lateral/Opposing Burins (n=2). One specimen, on a chert blade, is prepared by unifacial trimming. Burin facets occur on both lateral margins, struck from opposite ends of the blade. Use damage occurs on the edge of the facet and extends onto the face of the blank. Edge angles average approximately 90°. This class may be a variant of IIA (Plate 5.6).

Class VI Transverse and Lateral Burins (n=2). The two facets on these burins are separated by a notch. Facets are utilized on one edge, and facet angles average more than 90°. May be a variant of I.

The utility of these classes as historical-index types will be examined below; to some degree, however, what is represented here could be a mixture of functional and stylistic features, with some attempt by the maker to accommodate the morphology of the blank as well.

Burins Manufactured on Chert and Blade Blanks

Earlier, I suggested that the subsets of implements made on argillite blades and non-local cherts, as examples of formal and curated technology respectively, would assist in the identification of design conventions or modes in the production of a specific tool class. In the system of classification outlined above, blade burins fall into the following groups: transverse burins (n=4); lateral burins, including one opposing lateral burin (n=2); and partial lateral burins (n=2). In the latter grouping, one specimen is unusual in that the 'burin facet' has been produced by fine scalar retouch.

Exclusive of burins made on chert blades, chert burins may be classed as transverse (n=1); lateral (n=1); and transverse and lateral (n=1).

The sole feature which was found to be markedly different in the sample of burins made on chert blanks and argillite blades, and burins made on local raw material, is that of preparation associated with the burin facet (Figure 5.7 - 5.10). Unifacial trimming and notching are almost invariably associated with chert and blade burins, either as preparation for detachment of the burin spall or, in the case of notching, as a second functional edge. The virtual absence of unifacial trimming preparation in the non-chert burin sample probably relates to the nature of the raw material, rather than to any systematic cultural preference in the preparation of the tool. On silicious argillite burins, the presence of suitable cleavage plane surfaces on

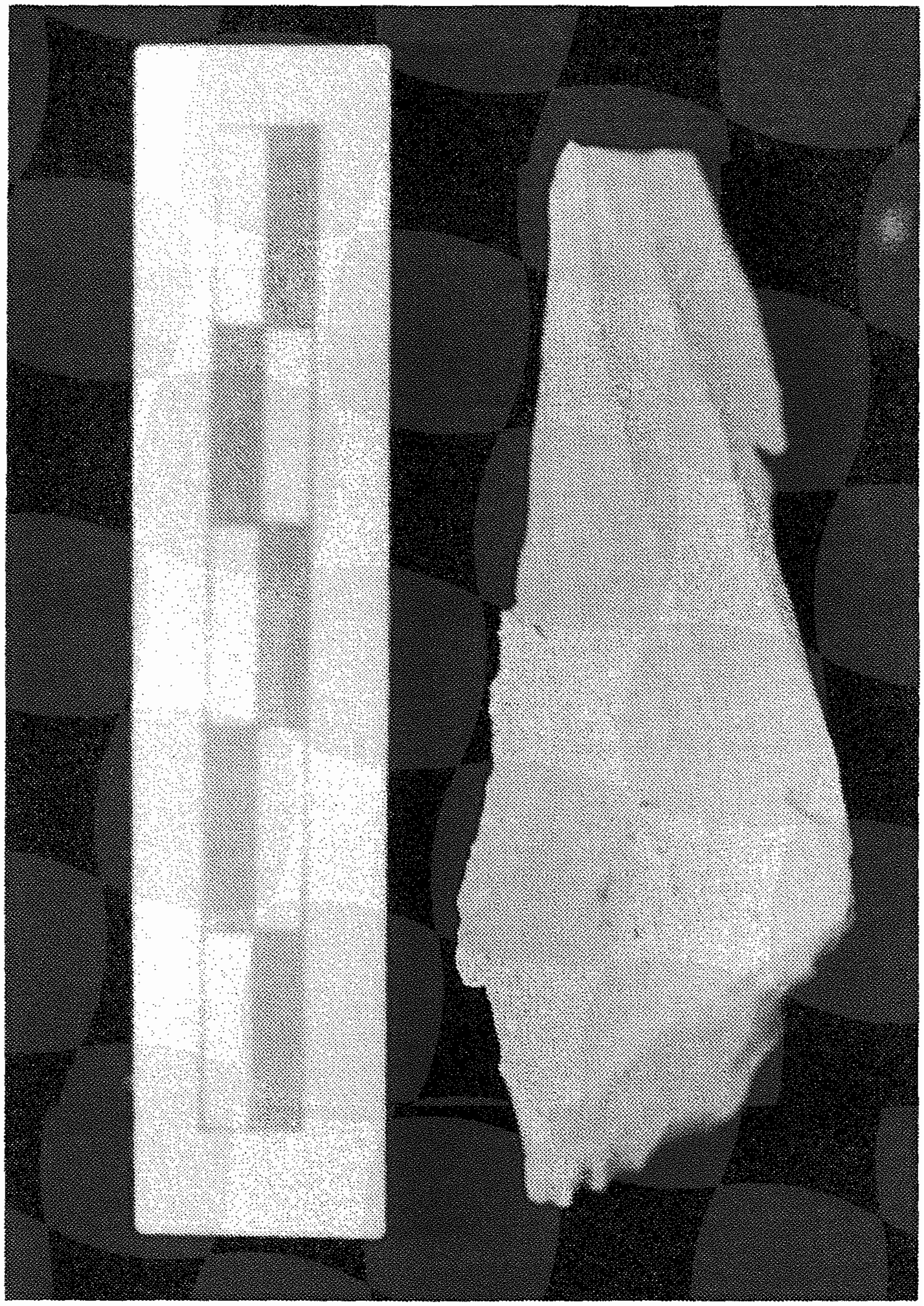
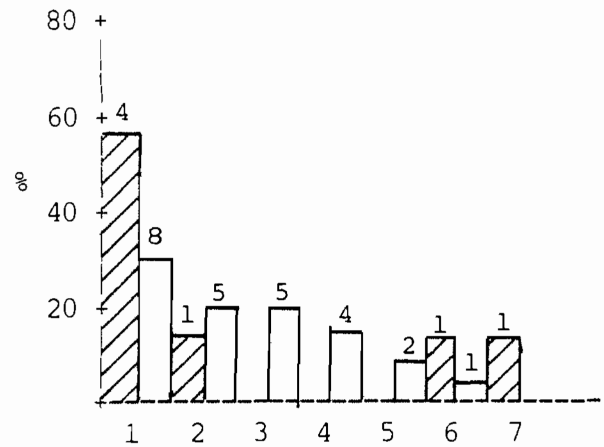


Plate 5.6: Lateral/Opposing Burin on a Chert Blade

Figure 5.7: Comparison of Discrete Attributes of Chert and Silicious Argillite Burins

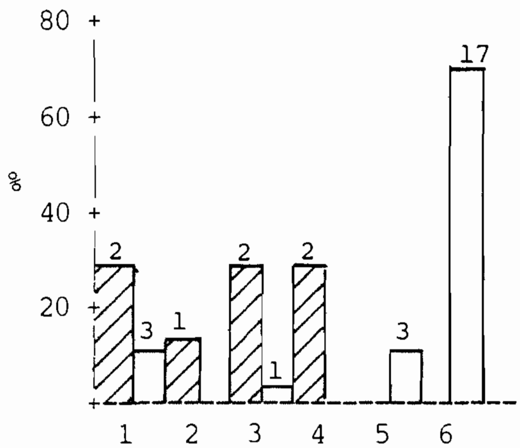
Chert (hatched)
Silicious Argillite (open)



Facet Orientation

1 transverse
2 lateral
3 angle
4 oblique/trans.
5 oblique/lateral
6 lateral/opposing
7 trans./lateral

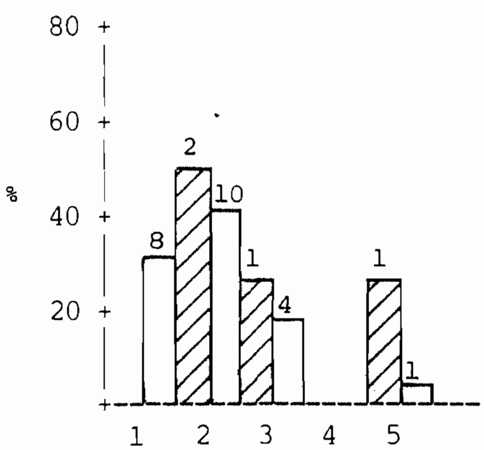
X^2 3.07 df 4 $p > .01$



Preparation for Spall Detachment

1 unifacial trimming (prox.)
2 unifacial trimming (dist.)
3 proximal notch
4 distal notch
5 burin facet
6 cortex

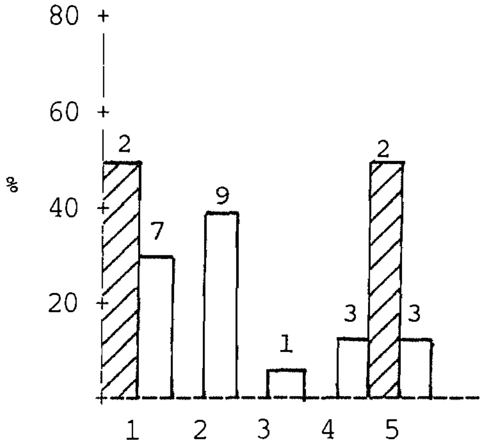
X^2 14.467 df 3 $p < .01$



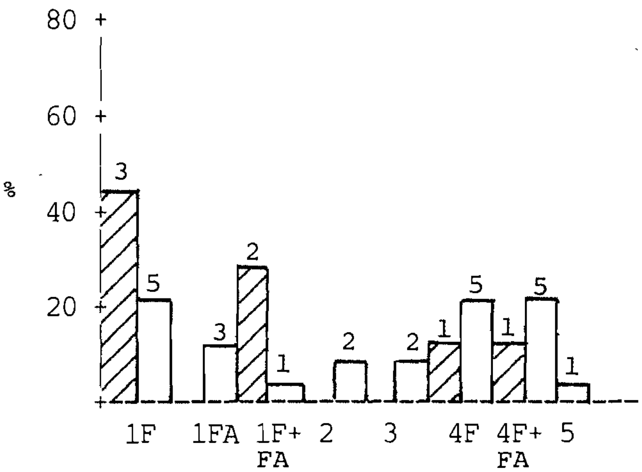
Number of Burin Facets

1 - 1
2 - 2
3 - 3
4 - 4
5 - 5

X^2 2.72 df 4 $p > .01$



Facet Termination
1 feather 4 feather + hinge
2 hinge 5 feather + step
3 step



Location of Use Damage on Facet
1 one edge 4 one edge + prox. tip
2 proximal tip 5 two edges + prox. tip
3 two edges
F on facet FA on face of blank
X^2 4.775 df 6 $p > .01$

Figure 5.8: Comparison of Metric Attributes of Chert and Silicious Argillite Burins

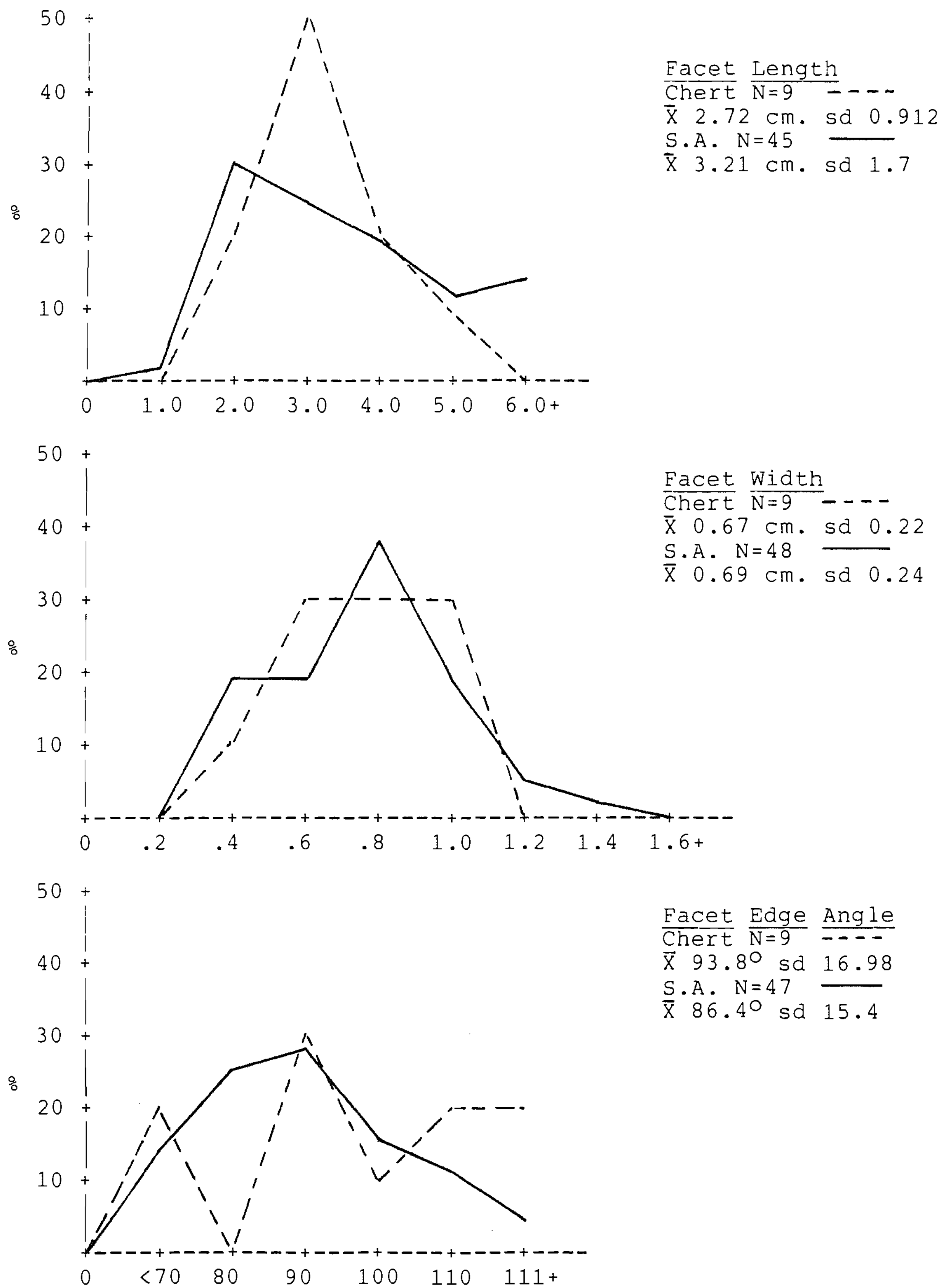
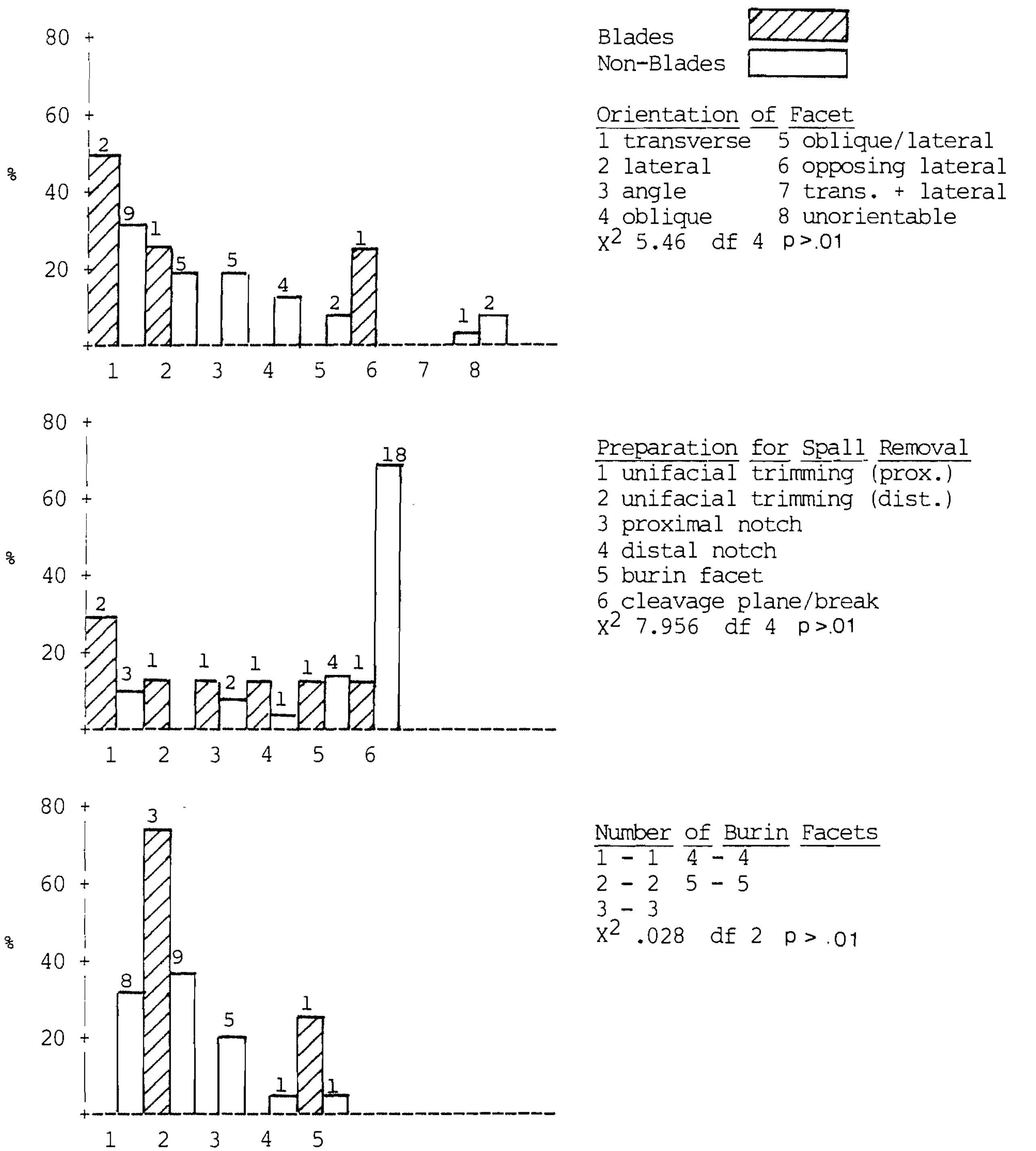
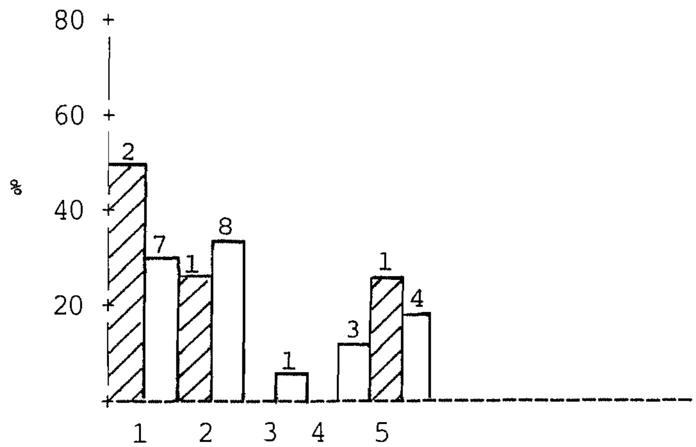
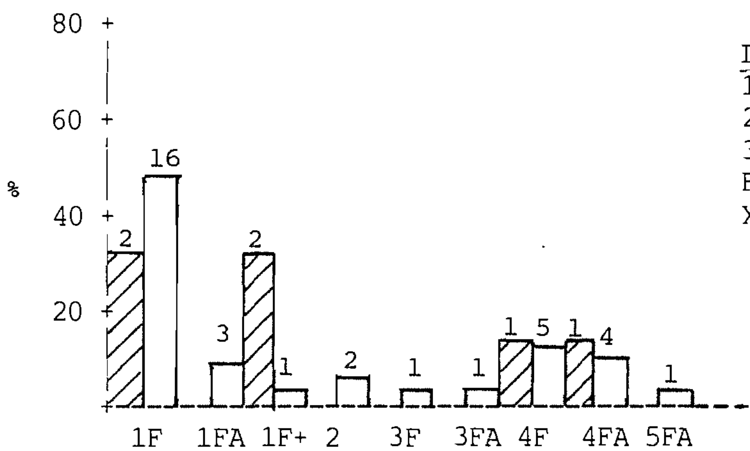


Figure 5.9: Comparison of Discrete Attributes of Blade and Non-Blade Burins



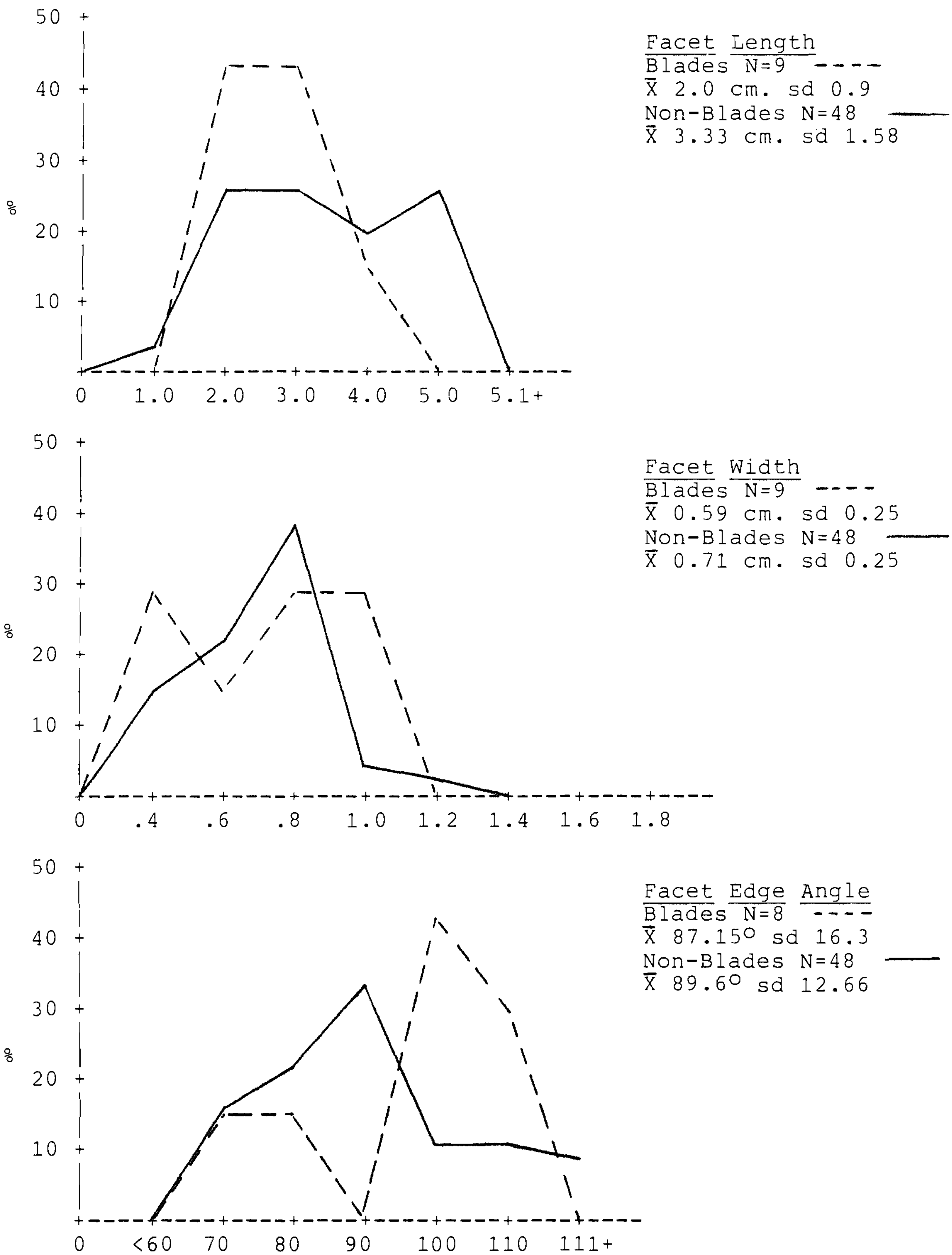


Termination of Burin Facets
1 feather
2 hinge
3 step
4 feather and hinge
5 feather and step



Location of Use Damage on Facet
1 one edge 4 one edge + prox. tip
2 proximal tip 5 two edges + prox. tip
3 two edges
F on facet FA on face of blank
X^2 6.3 df 5 $p > .01$

Figure 5.10: Comparison of Metric Attributes of Blade and Non-Blade Burins



most flakes or tabular fragments probably obviated the need for preparation of an edge for the detachment of the burin spall.

Possible evidence for the hafting of burins is limited to two transverse burins, made on a chert blades (Plate 5.1). On one specimen (5.1,a), repeated rejuvenation of the burin facet appears to have reduced the tool size to a point where hafting became necessary for continued use. On this implement, the hafting element comprises two shallow notches on the lateral margins of the blade, near the burin facet. On the second implement (5.1,b), minor, discontinuous unifacial retouch is present on the lateral margins of the blade, and appears to be related to attempts to regularize the edge for hafting, rather than to the use of the edge (as a scraping edge, for example).

Together with these features, an important trend in the sample of burins made on chert and blades is the production of multipurpose implements. Multipurpose burins on chert flakes include combinations of burin/notch (n=1), and burin/scraper/notch (n=1). On blades, combinations include burin/notch on a chert blade, burin/scraper (n=2; one is a chert blade), and burin/scraper/notch (n=1). The persistence of these associations of edges in the apparently expediently produced sample of burins made on local flakes and tabular fragments suggests that these are modes or conventions significant in the production of certain burin types.

Multipurpose Burins

The view that greater degrees of preparation of the implement are potentially more informative of conventions of implement design (cf. Binford 1976), is of particular relevance in the analysis and interpretation of the various multipurpose burins or snap burins (n=14) recognized in the Rock River sample. The tool combinations found in the sample as a whole are: burin and notch (n=6), burin and scraper (n=3), burin, notch and scraper (n=3), burin and denticulated implement (n=1), burin and *piece esquillee* (n=1).

Burin/Notch (N=6)

In the system of classification described above, notching occurs on the following types of burins: transverse (n=2) (Plate 5.1, b); partial lateral (n=1); transverse/oblique (n=1) (Plate 5.5, b); and the combination transverse and lateral burins on which the notch separates the two burin facets (n=2) (Plate 5.7, a). On the transverse burin, and the transverse and lateral burins, the notches are located directly adjacent to the burin facets or the utilized break margins. On the partial lateral and oblique burins, the notches are non-adjacent to the burin edge.

A number of factors may influence placement of the notch, including thickness and general configuration of the edge; convenience, inasmuch as the notches may represent a functional edge used in conjunction with the burin edge; and convention in the design of the tool.

From the standpoint of these tools as a 'functional type' it is of interest to note that damage is on the edge of the burin facet on all specimens, extending onto the facet proper (use mode analogous to scrapers). Edge angles, with the exception of the partial lateral burin, are 90° or greater. All burin/notch combinations, however, should probably not be treated as a uniform class of tools, since the notch may be preparation for spall detachment, a preparation for hafting, or an actual functional portion of the tool.

Burin/Scraper (N=4)

The implements in this class are highly variable in both form and manner of use. One is a partial lateral burin on a blade, where burination appears solely related to the production of a sharp corner on the proximal/left margin (Plate 5.7, b). Unifacial retouch is present distal to the burin facet, possibly to control the extent of burination. The scraper edge is produced by regular, scalar retouch on the slightly convex right margin of the blade. The remaining burin/scraper combination tools are all transverse snap burins. One specimen is a chert blade which may also have been hafted (Plate 5.1, b). The identification of scraper damage on this tool is tentative. Two flakes exhibit use on a transverse break and expedient use of a convex edge (proximal or distal) in a scraping fashion.

Burin/Scraper/Notch (N=3)

The combination of burin, scraper and notch edges was noted on two flakes (one chert) and a blade. On both flake tools (Plate 5.7, d and e) the burin portion of the tool comprises a transverse break. Edge damage is along the facet edge, extending onto the facet proper. Edge angles

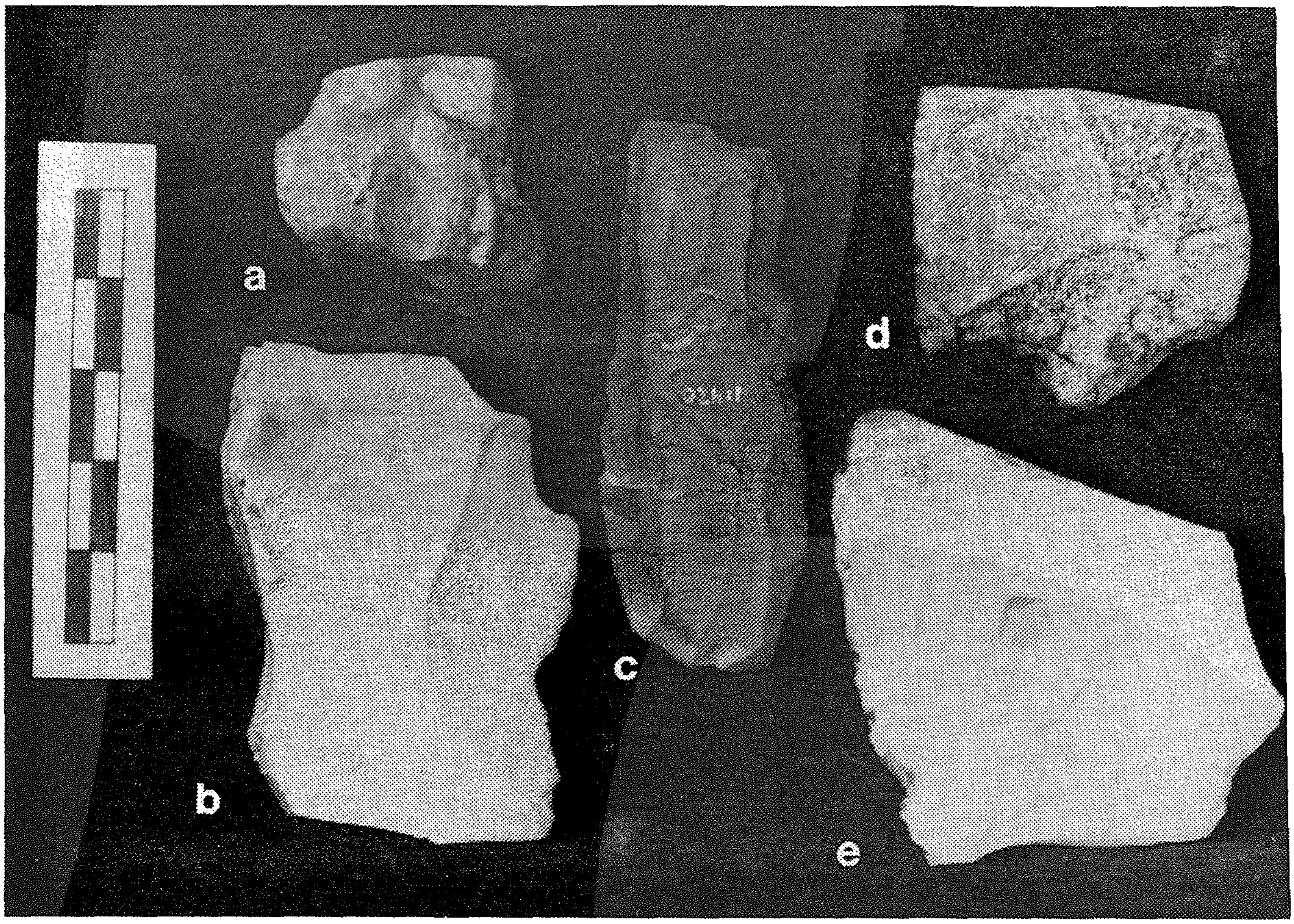


Plate 5.7: A Sample of Multipurpose Burins. (a) Burin/Notch Combination. Transverse and Lateral Burin Facets are Separated by a Notch; (b) Burin/Scraper Combination on a Light Grey Chert Frost Spall. Transverse Break is Used as a Burin Facet, with Scraper Edge Occuring on a Portion of the Adjacent Lateral Margin; (c) Burin/Scraper/Notch Combination on a Blade; (d) Burin/Scraper/Notch Combination on a Dark Grey Chert Flake; (e) Burin/Scraper/Notch Combination on a White Chert Flake

are approximately 90°. Notch location is adjacent to the burin facet on one specimen. Scraper edges are straight to slightly convex, formed by fine, scalar retouch. The scraper edge angle is approximately 60°.

The burin/scraper/notched implement on a blade (Plate 5.7, c) was recovered in buried context at MfVa-9, dated to about 7500 B.P. Burination is from the distal edge of the blade along the left lateral margin, with unifacial retouch on the distal margin comprising the preparation for the detachment of the burin spall. Use damage is along the facet edge, onto the facet proper. The edge angle is approximately 75°. The notch is located on the distal/right margin of the blade. The medial right margin exhibits steep irregular scraper retouch. The scraper edge angle is approximately 75°.

Burin/Denticulated Implement (N=1)

One combination burin and denticulated implement has been recognized in the Rock River sample (Plate 5.14, a). This artefact has been used as a burin along one edge of a transverse proximal break (edge angle: 80°). The removal of a flake obliquely from the right margin onto the ventral face has created a highly obtuse transverse/oblique facet at the distal end of the flake as well, which may also have been used. Three somewhat irregular notches occur on the right margin of the flake and comprise the denticulated portion of the tool.

Burin/Piece Esquillee (?) (N=1)

One possible combination transverse snap burin and piece esquillee, manufactured on a split chert pebble, has been recognized in the Rock River sample. The wedge function of the tool is represented by opposing marginal crushing on the lateral edges of the pebble. The burin edge is a transverse break with an edge angle of approximately 85°. Use damage occurs on the 'ventral' edge of the break margin and extends onto the ventral or split face of the implement.

Chronology and Distribution

A survey of the literature reveals that the classification of burins in the interior northwest, for the purposes of establishing historical index types, has met with little success. In part, this is due to the lack of a consistent basis for classification, but also, in large part, typological exercises are impeded by the minimal requirements of the form itself. As Dreiman (1979:5) observed of the European burin technology, " ... the preponderance of Upper Palaeolithic burins exhibit a surprising uniformity over several tens of thousands of years and a wide area."

In the interior Northwest various types of burins have been defined based on the orientation of the burin facet with respect to the longitudinal axis of the blank, including: lateral burins, transverse burins, angle burins, and dihedral or spalled burins. Burins categorized by their support piece or blank include burins on bifaces or projectile points, artefact burins (MacNeish 1964:423), core burins (Powers 1982:37), and flake burins (Workman 1978:263) or burinated flakes (Morlan 1973b:25).

West (1981:86) has implied that the manner in which the burin is used is of cultural-historical significance, differentiating between the use of the facet edges for scraping or cutting (Donnelly burins), and use of the juncture or acutely angled tip of the burin facet for grooving or gouging (Denbigh burins) (cf. Mauger 1970:41). This distinction does not, in fact, occur in reality. Irving's (1964:209ff) description of the Arctic Small Tool tradition burin sample from Punyuk Point indicates use damage exclusively on the tip is present on only about 25% of the sample. On 20% of the Punyuk Point burins, use damage is exclusively on the facet edge, while the majority of burins exhibit use damage on both the facet edge and the tip.

In his description of the Akmak burins, Anderson (1970a:42) observed that use damage, while present on the facet edge on the majority of specimens, extended only onto the face of the facet. The Donnelly burins illustrated by Mauger (1970: Plates) exhibit use wear predominantly on the facet, but in some cases, use damage extends onto the dorsal or ventral face of the flake blank. Combinations of these two types of use damage also occur. This has been noted in the Rock River burin sample as well.

A definitive study of the Donnelly burin type was undertaken by Mauger (1970:19ff), who defined these forms on the basis of the the following traits: one or more burin facets, manufacture on flakes, notching or unifacial retouch adjacent to one or both ends of the burin facet, and use of the facets along a lateral edge in a scraping function. Mauger (1970:39) considers the Donnelly burin potentially useful as a time-tradition marker, contrasting Donnelly burins with the transverse burins in the Anangula assemblage, and the Denbigh burin.

Mauger's definition of the Donnelly burin was subsequently modified by West (1981:124) to include essentially any flake exhibiting a burin facet. West describes these implements as highly variable in size and in the nature of the platform for spall removal, including other burin facets, fracture surfaces, truncatures, retouched flattened edges, and small notches. The utility of this expanded definition of the Donnelly burin as an historical-index type of the Denali Complex (West 1967) or the Beringian tradition (1981) may legitimately be questioned; the form could be produced by anyone familiar with the burin technique. Workman (1978:262) in fact observes that the Donnelly burin (following Mauger's definition) is widely distributed in time and space, occurring in the early microblade complexes of the Little Arm Phase as well as in the Northern Archaic Taye Lake Phase in southwest Yukon, and in relatively late context (1000 B.P.) in Lake Minchumina (Holmes 1973:5) and the Village site at Healy Lake (McKennan and Cook 1968:4).

At this stage of the review it is necessary to recognize the notched transverse burin as a type which certain investigators view as distinct from the Donnelly burin, although this distinction is not always consistently made in the literature. As a point of clarification, Mauger (1970) does not explicitly treat orientation of the burin facet as a critical feature of the Donnelly burin: an inspection of the plates accompanying his report reveals that burin facets may be parallel, transverse or oblique to the longitudinal axis of the flake. Mauger does, however, differentiate Donnelly and Anangula burins on the basis of the use of blades in Anangula, and burination by " ... a transverse blow delivered to one edge ... " (1970:42), which appears to imply that in this case, orientation of the the burin facet is an important criteria for defining this type.

Anderson (1970a:42ff) describes burins in Akmak as longitudinally struck along a lateral edge of a flake or blade, often with unifacial retouch or notching preparation for detachment of the burin spall, and compares these forms with the burins of the Denali complex (i.e., Donnelly burins). Cook and McKennan (1971:12,16), however, observe that Healy Lake burins resemble Donnelly burins, but not Akmak burins, and essentially equate the notched transverse burin with the Donnelly burin. Shinkwin (1979:162), in comparing the Donnelly Ridge assemblage and the lower level at Dixthada observed that: "The burins from Dixthada appear to be similar to the Donnelly burins since they are transverse and have a notch associated with the small platform used to detach the burin spall." Holmes (1977:11) also describes the notched transverse burins in the Lake Minchumina site as typical of the Donnelly type.

Irving and Cinq-Mars (1974:77) and Clark (1983a) include notched transverse burins as a trait of a northern Cordilleran tradition which, in Clark's definition (Clark 1983a; Clark and Morlan 1982), would incorporate early non-microblade assemblages in the interior northwest and assemblages in Yukon and the District of Mackenzie previously designated Northern Plano (Nakah Phase at Fisherman Lake [Millar 1981], Acasta Lake [Noble 1971], and basal Canyon [Workman 1974]). According to Clark (1983a:38), the notched transverse burin is:

> a very distinctive western trait found across Great Bear Lake, into the northern and southern Yukon and across interior Alaska to the Aleutian Islands. Although in Alaska these burins (not to be confused with the related Donnelly burin) endured over a span of several thousand years, they occur in early components, including Chindadn.

In a more recent publication, Clark (1987:38) defined the transverse notched burin more precisely as "select thick broad flakes which were notched, probably to form a striking platform, and burinated transversally to the longitudinal axis of the flake". The Great Bear Lake transverse burins, however, differ from most others of the type in that they may occasionally bear paired unfacial notches near the base, probably for hafting (Clark 1987:55). A number also exhibit retouch on the lateral edges, although Clark does not view this as evidence of the presence of multiple functional edges (burin/scraper combination).

The Donnelly burin, in Clark's view (1987:55 - 'flake perimeter burin'), is distinguished from the transverse notched burin by burination on the perimeters of the blank (although never truncating the distal margin), and the detachment of the burin spall from a notched or bevelled platform. Intergrades of the Donnelly and transverse notched burin types are acknowledged, however.

Irving (1985: personal communication) has suggested that a preference for blades as blanks in the production of burins may be a distinctive feature of the notched transverse type as well, especially in the earlier technologies in the interior Northwest.

Two burins in the Rock River collections conform to the Donnelly burin type as originally defined by Mauger (1970). If the definition is broadened to include blade as well as flake blanks, three additional burins may be added to this class. Five burins in the Rock River collections exhibit either notching independent of the burin facet, or notching associated with a break, which has been used in a manner analogous to a burin facet. Of this sample, one burin, manufactured on a blade, with paired notches at the proximal end of the blade, may be termed a 'classic' notched transverse burin following Clark's definition.

Clark (1987:56) also defines laterally-burinated flakes, or lateral burins in the Great Bear Lake collections. These are essentially the same forms as were defined for the Rock River sample, including classes IIA, IIB, and Class V (see above). Most of these specimens in Great Bear Lake are elongated, with burination occurring predominantly on the left margin of the flake, extending the whole length of the blank or only partway. Some are double lateral burins. Clark implies that this form is associated, at least in the Great Bear Lake area, with both northern Cordilleran/Acasta Lake complexes and Northwest Microblade tradition technologies.

A large proportion of the burin sample in the Rock River collections could be described also as flake burins (Workman 1978:263) or burinated flakes (Morlan 1973b:25), save that a number are made on tabular fragments of silicious argillite or frost spalls, rather than flakes. These implements occur with varying degrees of popularity throughout the prehistoric sequence in the interior Northwest (Workman 1978:263), and as such, are of little use in attempts to identify technological traditions in the archaeological record.

Workman (1978:263) has suggested that flake burins are a 'deteriorated' form of Donnelly burins, by which he may be implying they are more expediently produced. However, if the notches on the burins are interpreted as functional portions of the tool, as was suggested in the previous section (see also Anderson 1970a:44), their presence or absence may in fact indicate the use of the burin in different tasks. Although there appeared to be no morphological differences in burin facets or use patterns in the notched and non-notched burins in the Rock River sample, ideally a larger sample should be examined before any conclusive statements are made.

Three burinated bifaces are also present in the Rock River collections (Figure 5.8). Two (MfVa-9:213 and MfVa-13(10):1) exhibit no clear evidence of use; on these artefacts, burination may be related to the preparation of a squared edge for flaking. One rough biface, which resembles morphologically a projectile point blank, is obliquely burinated from the tip with heavy use damage on both the tip and the lateral edge of the facet. Workman (1978:265) reports burins on bifaces in southwest Yukon from the base of the Canyon site (dated to approximately 7100 B.P.), and

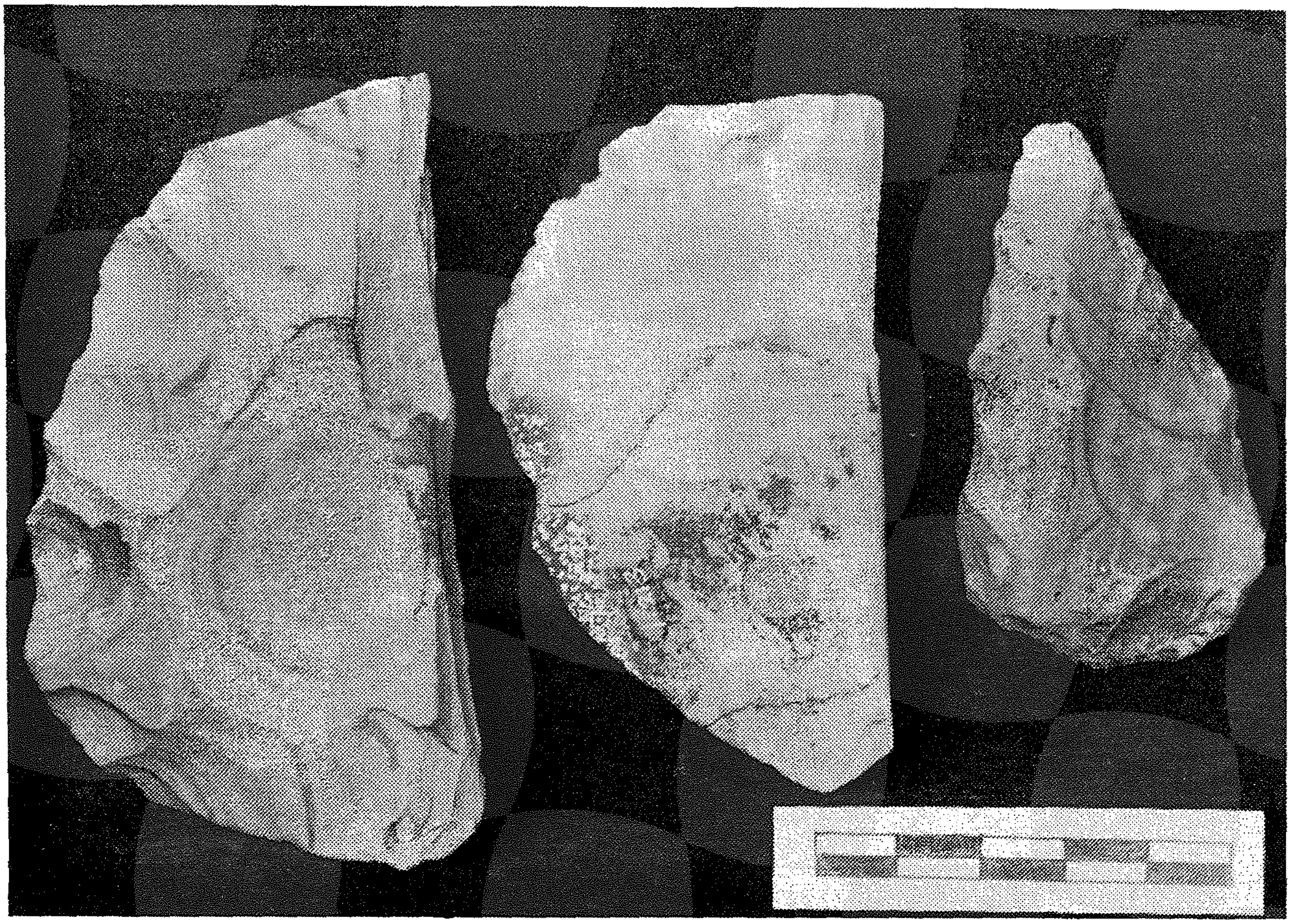


Plate 5.8: Burins Manufactured on Biface Blanks. The Tool on the Right Exhibits a Transverse/Oblique Burin Facet

from the Chimi site (dated 200 - 500 A.D.). According to Dixon (1985:53), burination of bifaces is a trait of Late Denali complex sites in central interior Alaska. Burination on projectile points is considered characteristic of late Paleo-Indian and Sheild Archaic in northeastern Canada (Wright 1972:77) and Northern Plano in western Canada (Noble 1971:105), although burinated points also occur in Northern Archaic components, and in Itkillik and Choris (Workman 1978:265). In some cases, the possibility that the burination of projectile points is not intentional, i.e., that burination is a result of impacts incurred by the point during use, should be considered (Anderson 1968b:22; Clark 1987:56).

Earlier, I suggested that the combination on a single tool of a burin edge with an additional functional edge, or edges was a potentially useful trait for comparative exercises. Discussion in the literature of multipurpose tools incorporating a burin edge, with the exception of the burin/notch combination, however, is fairly limited. Mauger (1970:12) describes 'secondary burins' in the Campus collection which " ... display evidence indicating they had an antecedent function." In Mauger's view, the burin edge was a later addition to the tool either due to breakage of the original tool or due to convenience. Apart from projectile points, Mauger does not, unfortunately, provide any information as to the kinds of tools being burinated. The creation of a small spur or tip between two adjacent notches is described for isolated burins in the Campus collection (Mauger 1970:21), although Mauger does not report whether use damage was observed on these projections. This type of modification was observed on one snap burin in the Rock River sample (MfVa-13(5A):37). The combination of burin, notch and scraper edges was observed on three implements in the Rock River collections. These forms may fall within the range of what Mauger terms Donnelly burins manufactured on secondary burins (Mauger 1970:13). It is of interest to note that the combination, on a blade, of burin, scraper and notch edges also occurs in Bluefish Cave II in deposits dated to the terminal Pleistocene (Morlan and Cinq-Mars 1982:368). Unifacial retouch truncating the distal end of the blade is present on both the Bluefish burin and one burin in the Rock River collections, which was recovered in buried context and dated to about 7500 B.P.

In the non-microblade Component I sample from Dry Creek, Powers (1982:10) reports a single burin/scraper combination tool. Scraper retouch occurs on a convex distal edge, with the removal of a burin spall along a lateral margin. Lateral breaks on the flake were also used in a manner similar to a burin. In Component II, a second combination burin and scraper was recovered. On this implement, burination occurs on one lateral edge with scraper retouch present on the opposite margin.

Some of MacNeish's (1964:423) artefact burins may represent multipurpose tools. He describes four scrapers exhibiting burin spall removal along a lateral edge " ... at an angle acute to transverse [sic] axis, by a blow struck from [the] lateral edge." This form is reported present in the North West Microblade tradition Little Arm and Gladstone complexes. Five burin/scraper combination implements are present in the Rock River sample.

In the Nakah Phase at Fisherman Lake, Millar (1981:262) notes that some burins are manufactured on broken artefacts, but provides no details. Possibly some are in fact multipurpose implements. In the Pointed Mountain Phase at Fisherman Lake (assigned membership in the Northwest Microblade tradition), both notched burins and burin and graver combinations occur (Millar 1981:280, Figure 12). One specimen in the Rock River collections resembles the burin/graver forms illustrated by Millar. A lateral burin/scraper combination tool, made on an elongated flake is present in the Acasta assemblage. Unifacial retouch appears on the tool, possibly as preparation for the detachment of the burin spall. The scraper edge occurs on the lateral margin opposite the burin facet and is slightly concave in outline.

Clark (1987:55) has noted the presence of 'retouch on lateral edges' or beveling of certain of the transverse notched burins from the Great Bear Lake area. He ascribes this to attempts to 'regularize' the tool margins, however, rather than as an additional functional edge.

Additional comparisons concerning the distribution and chronology of notched burins or other burin combination tools in the interior Northwest are limited by the apparently wide temporal and spatial distribution of the former, and the possibility that the latter, if present, have not been recognized in assemblages. Only general statements concerning the cultural affiliations represented by burin technology can be offered here on the basis of the comparative literature.

Burins, including the Donnelly burin, attained maximum popularity in the early microblade complexes of the interior Northwest. Transverse burins (or transverse/notched burins) are described as a trait of Northern Plano assemblages in the District of Mackenzie, or alternatively, the proposed northern Cordilleran tradition. The scraper/burin combination tool is present in the non-microblade Component I assemblage at Dry Creek, and at Acasta Lake, for which Clark suggests Cordilleran membership. Powers views the materials at Dry Creek as possibly ancestral to Paleo-Indian. Burin/scraper combination tools are also described by MacNeish for the Little Arm Phase in southwest Yukon.

Burin/graver combination tools occur in the Pointed Mountain Phase assemblage at Fisherman Lake.

Burins are poorly represented in Northern Archaic assemblages in Alaska, although they do persist in later phases of West's Denali complex in interior Alaska, and as a minor element in the Taye Lake Phase in southwest Yukon. In Yukon, burins are absent in prehistoric Athapaskan components in the Aishihik Phase and at Rat Indian Creek (Le Blanc 1984:413), although Morlan (1973a) reports burinated artefacts from Klo-kut. Le Blanc (1984:424) feels these are in fact fortuitous products of the bipolar technique, related to the use of pieces esquillees or the splitting of flakes from a supported core during detachment. One combination piece esquillee and snap burin was recognized in the Rock River collections (MgVa-12:120). On this implement, the edge of a break margin has been used as a burin facet or in a scraping fashion, and probably should not be assumed to represent the association of the burin technique and pieces esquillees (cf. Le Blanc 1984:413).

The single burin/scraper/notch combination on a blade, dated to about 7500 B.P., has already been compared to a similar form recovered in Bluefish Cave II, to which Cinq-Mars has attributed a late Pleistocene age (16,000 - 10,000 B.P.) (Morlan and Cinq-Mars 1982:371).

Scrapers

Scrapers, including multipurpose tools incorporating a scraper edge, comprise approximately 40% (n=44) of the sample of edge-retouched and utilized implements in the Rock River collections. Implements are grouped into this class on the basis of the presence of a generally steep, unifacially retouched or beveled edge on one or more margins. Fourteen utilized flakes are also included in the class of scrapers on the basis of edge morphology and the unifacial placement of use damage on the edge.

The majority of scrapers are made on flake blanks (n=32); 4 scrapers are made on blades. The remaining sample of scrapers is on tabular or blocky fragments of silicious argillite (n=7) or pebble fragments (n=3).

With respect to raw material, 7 (16%) of scrapers are made on non-local cherts, including 3 end scrapers or end scraper fragments (7% of the total sample), and one side scraper (2% of the sample) which is made on a mottled white/grey chert. Two utilized flakes, which on the basis of edge morphology fall within the class of scrapers, are also of chert (4.5% of the sample). Six (14%) of the scrapers are made on locally available quartzite, sandstone, or split chert pebbles. The remaining sample is made on locally available silicious argillite.

The manufacture of scrapers may be described, with isolated exceptions, as expedient or opportunistic. Normally, a flake or tablet was selected because it possessed the appropriate size and thickness, so that the appropriate edge configuration and angle could be produced with a minimum of modification. Chert scrapers, which generally exhibit a greater degree of preparation, are an exception to this trend. Because the chert is non-local, these implements probably represent examples of curated technology. These will be discussed in more detail below.

In terms of a conventional classification of scrapers based on the location of the working edge (Figure 5.11), 10 end scrapers and 10 side scrapers have been identified in the Rock River collections. In the end scraper sample, the scraper edge occurs on the relatively narrow distal (and more rarely proximal margin) of a flake or blade (Plate 5.9). Side scrapers exhibit a working edge along most of the lateral margin of a flake or blade (Plate 5.10).

The remaining sample of scrapers exhibits localized retouch on a portion of the margin of a tabular fragment or frost spall and cannot be accomodated in this kind of classification. Four heavy duty scrapers or scraper planes, defined by their large size and thickness, are also present in the collections (Plate 5.11).

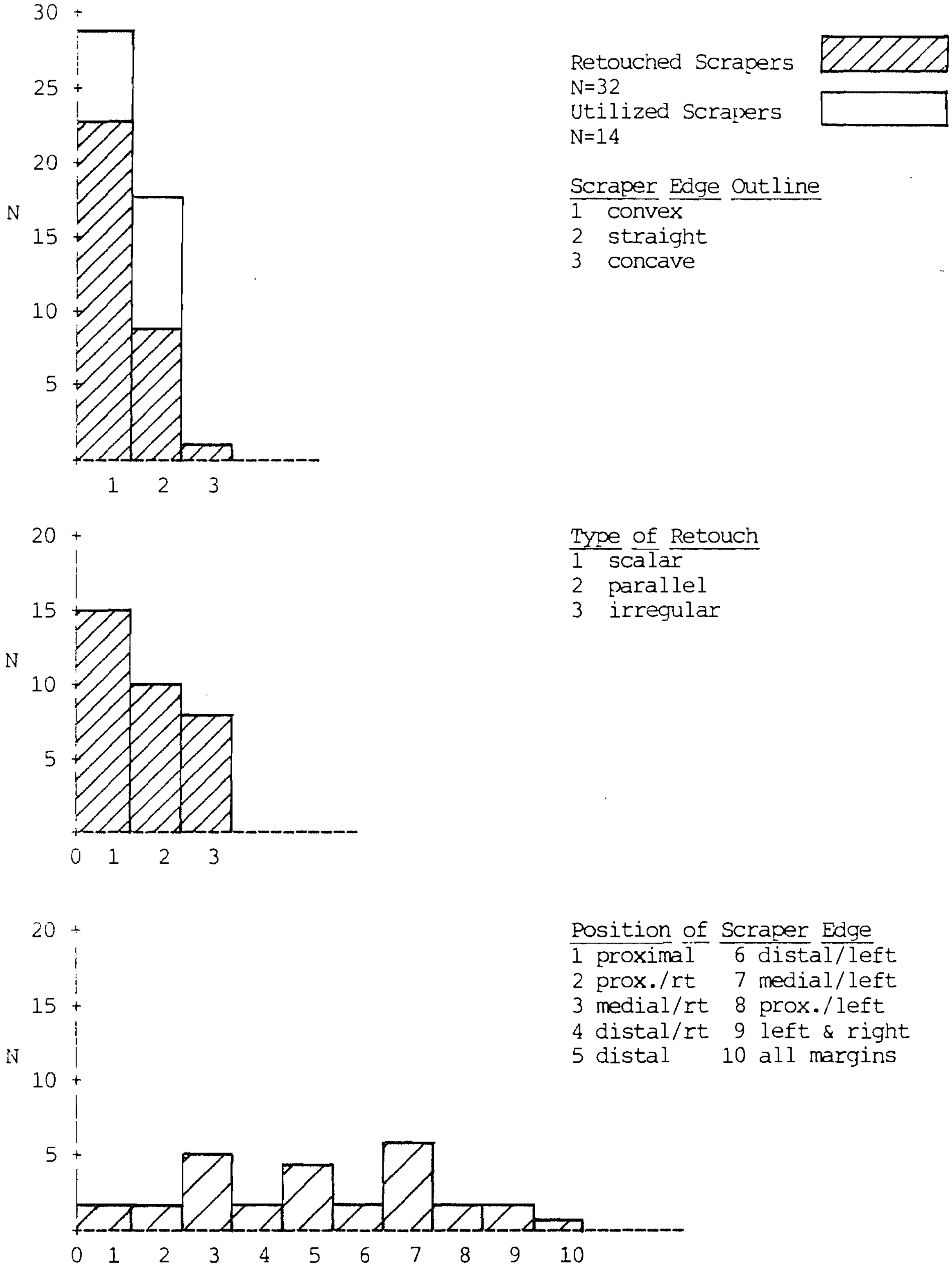
Given the apparent emphasis on expedient production of most scrapers, attempts to identify 'types' in the sample as a whole is uninformative. A mixture of functional requirements and constraints of blank morphology undoubtedly contribute to the high degree of variability evident in the sample. In general, however, scrapers in the Rock River collections may be characterized as follows (Figure 5.12 - 5.13):

1. Edge configuration may be straight (n=16), convex (n=24), or occasionally, concave (n=2).

2. Edge angles range between 50^{o} and $100+^{o}$ with the majority (65%, n=30) between 65^{o} and 80^{o}.

3. Thickness of the scraper edge is highly variable ranging between 0.2 and 2.0 cm. Thirty-seven percent of the sample ranges in thickness between 0.2 and 0.5 cm, with a second minor grouping around 0.9 cm (14% of the sample).

Figure 5.11: Discrete Attributes of Retouched and Utilized Scrapers



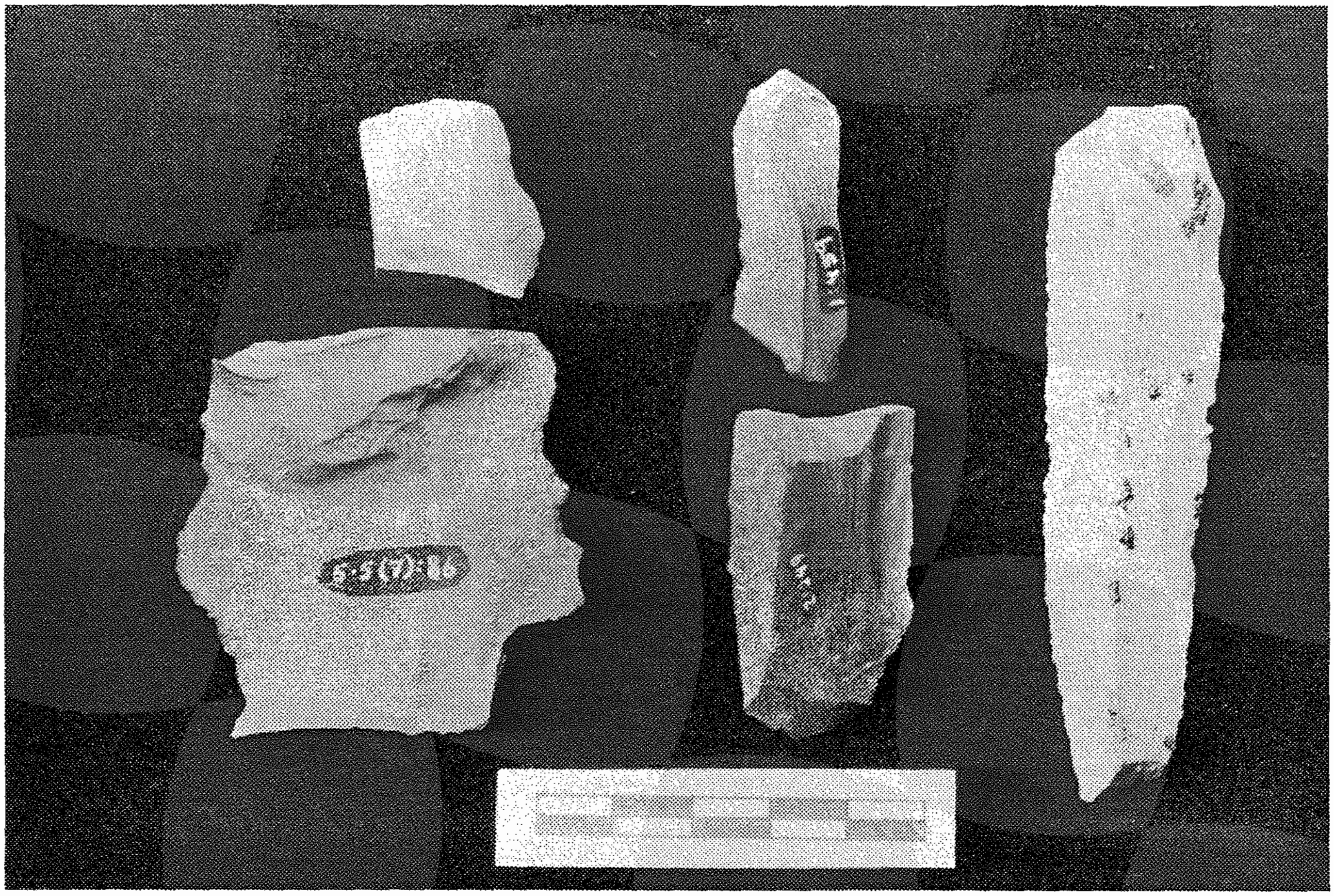


Plate 5.9: End Scrapers, Including Three Tools Made on Blade-Like Flakes

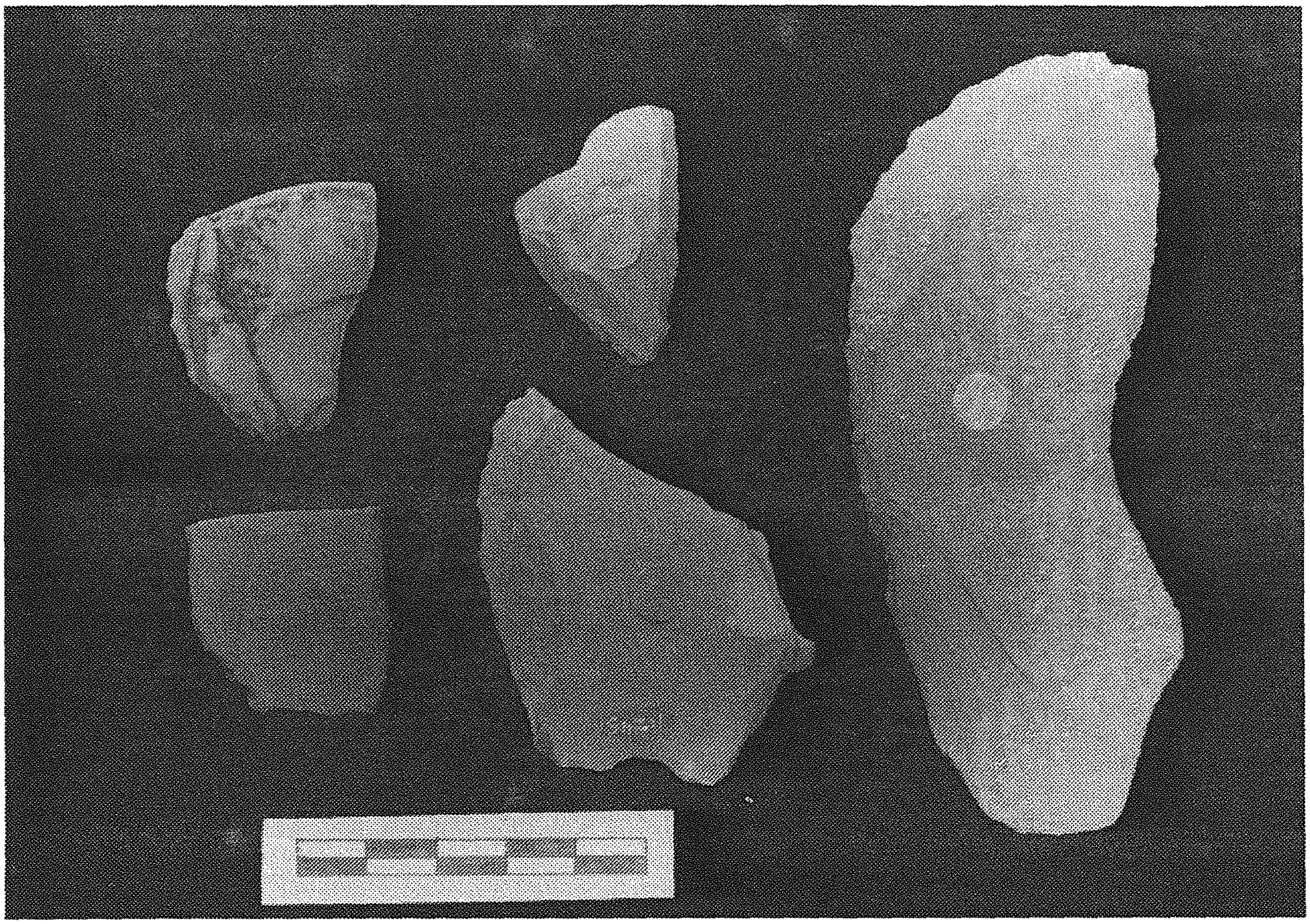


Plate 5.10: Side Scrapers, Including One Tool Made on a Blade Fragment

Plate 5.11: 'Scraper Planes'

Figure 5.12: Metric Attributes of Retouched and Utilized Scrapers

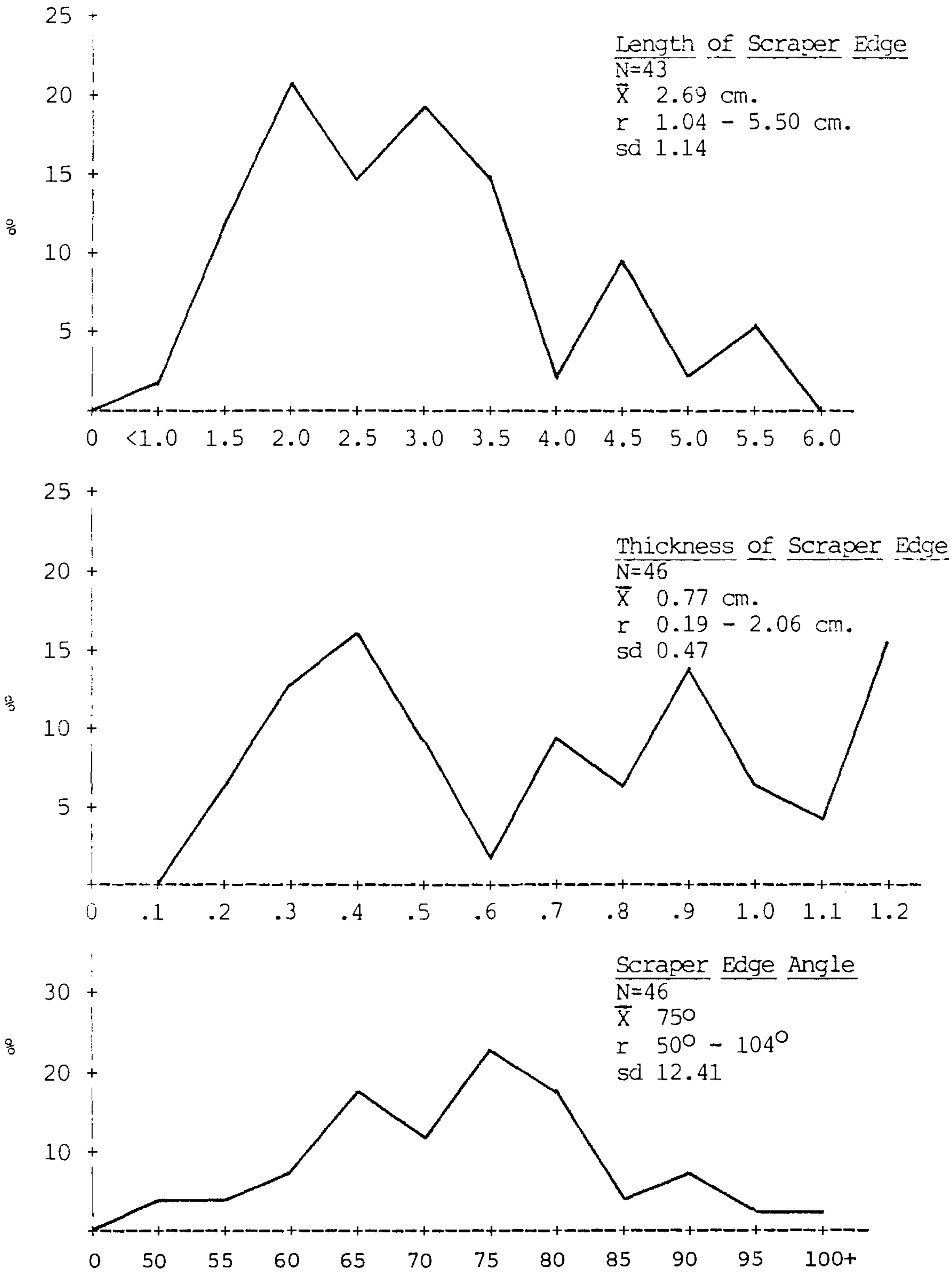
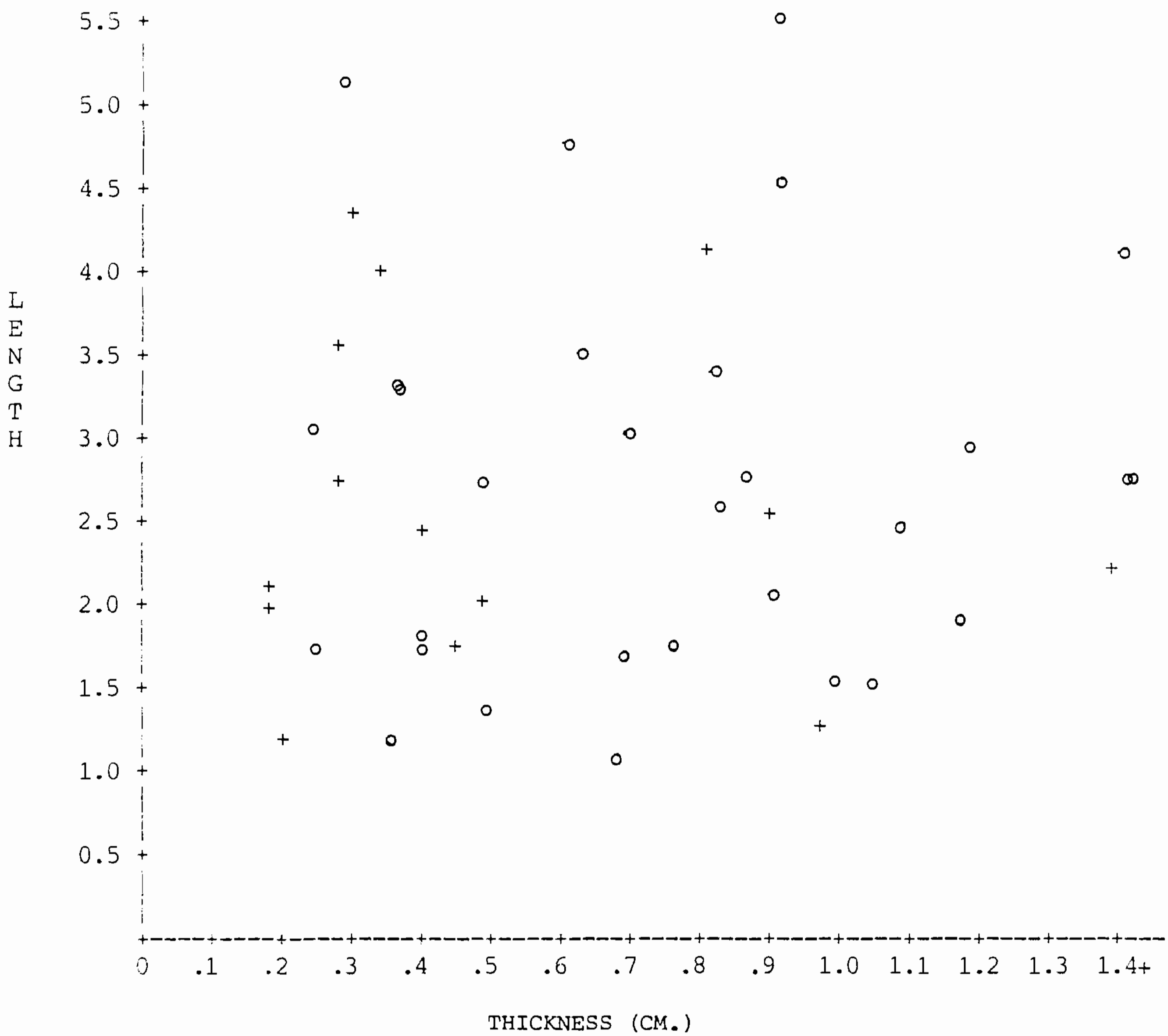


Figure 5.13: Scraper Edge Morphology



Retouched Scrapers o Utililized Scrapers +

4. Length of the working edge for the majority of scrapers (80%, n=34) is between 1.0 and 3.5 cm.

There is a slight tendency in the sample for straight-edged scrapers to exhibit more acutely angled edges; this association probably reflects certain functional requirements for the tools (Figure 5.14).

Scrapers Manufactured on Chert and Blade Blanks

If the subsets of scrapers made on blades and non-local cherts are considered separately, certain scraper 'types' may be suggested. It should be stressed again, however, that the majority of scrapers made on chert or blades do not exhibit a great deal of preparation of the edge; in some cases, edges are in fact simply utilized.[4]

In the sample of chert scrapers, one particularly well-made end scraper is noteworthy. Discontinuous marginal retouch along the lateral edges suggests some attempt was made to produce a uniform oval outline. Two chert end scraper fragments may relate to this specimen, in that they exhibit similar kinds of retouch, edge morphology and edge angles (approximately 70°). The fragments appear to represent a rather radical scraper edge rejuvenation technique, involving essentially a burin blow to the lateral edge of the scraper margin. The resultant angle would have closely approximated that on the original tool. Possibly this technique is characteristic of the production and maintenance of this type of end scraper (Plate 5.12). Interestingly, Wilmsen and Roberts (1978:98) have described a similar technique of edge rejuvenation by a "burin-like blow" on end scrapers from the Paleo-Indian Lindenmeier site.

The presence of multiple functional edges is again an important feature of the sample chert and blade scrapers. In the subset produced on blade blanks, burin/scraper (n=2) and burin/scraper/notch combinations are represented. On these implements, scraper edge configuration is straight, and edge angles average around 70°. These were described in greater detail in the previous section. Multipurpose tools made on chert flakes, and incorporating a scraper edge include combinations of burin/scraper/notch, and scraper/denticulate/beaked edges.

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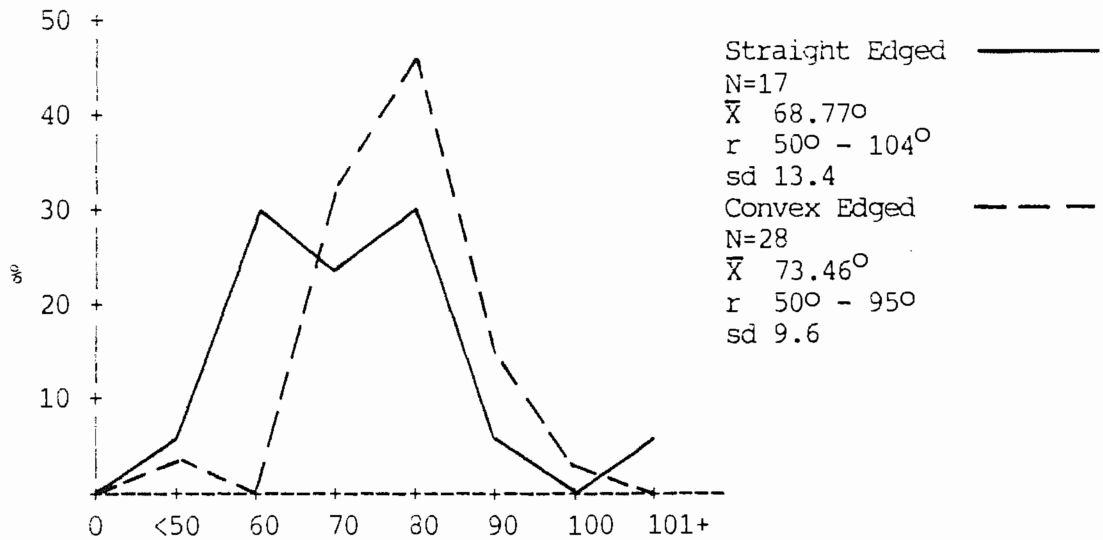
4 Although intentional retouch and use damage may at times be difficult to distinguish, the latter tends to exhibit a less regular appearance, or may comprise only rounding or polishing of the edge.

Figure 5.14: Comparison of Edge Angles of Straight and Convex Edged Scrapers



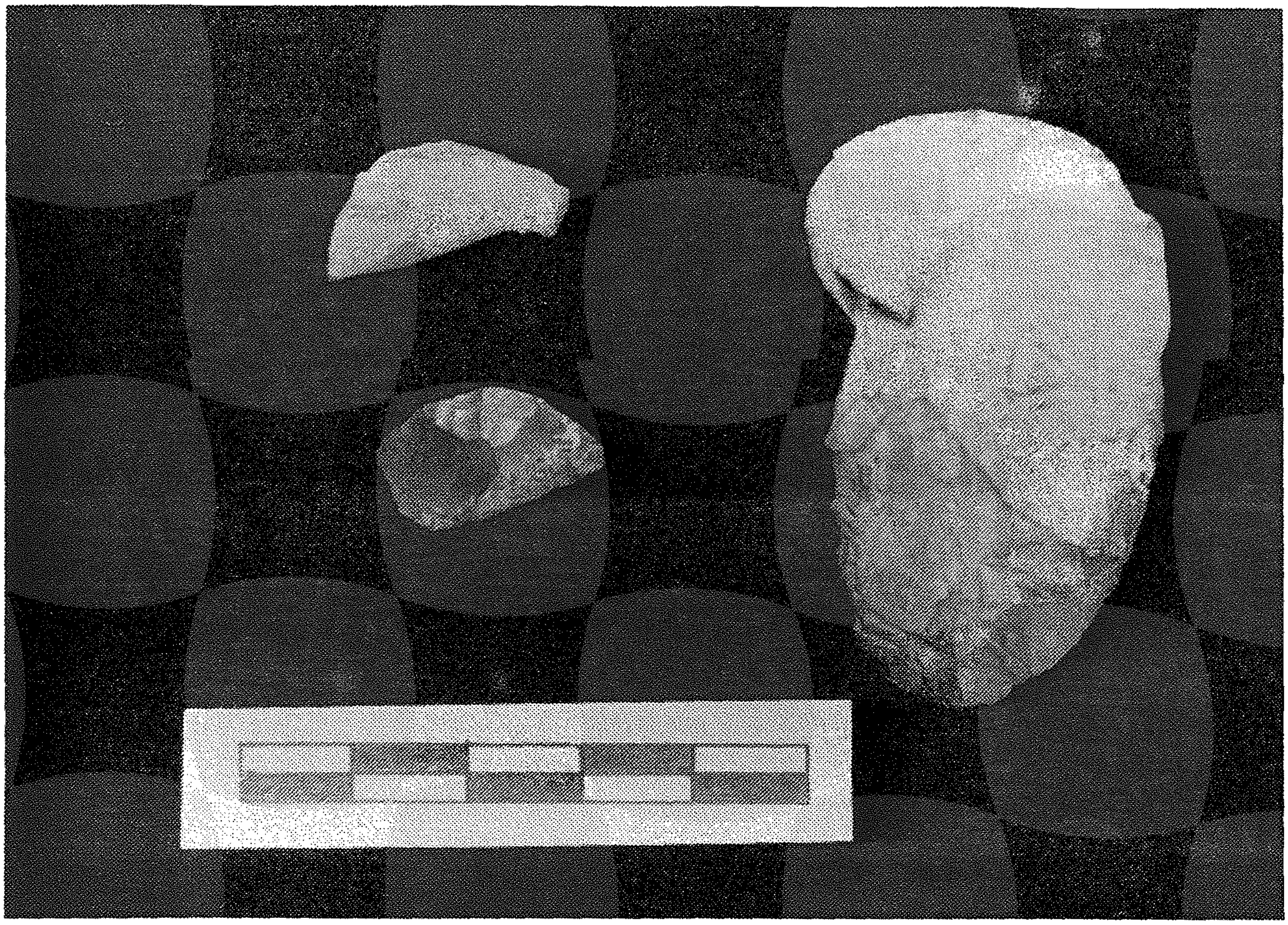


Plate 5.12: End Scraper and Two Distal Fragments of End Scrapers Made on Black Chert Flakes

A comparison of scrapers made on blade and chert blanks with the scrapers made on locally available silicious argillite (Figure 5.15 - 5.18) did not show any marked divergence between the samples that could not be explained by the nature or size of the blank. There is a preference for the distal or left margin of the blank for the location of the scraper edge on chert specimens, but the significance of this tendency is unknown.

Multipurpose Scrapers

Thirteen multipurpose scrapers have been recognized in the Rock River collections as a whole, including the following tool combinations: scraper/burin/notched implement (n=3), scraper/burin (n=3), scraper/denticulated implement (n=1), scraper/denticulated/beaked implement (n=1), scraper/notched implement (n=1), scraper/knife (n=1), scraper/*piece esquillee* (n=2), and scraper/*piece esquillee*/beaked implement (n=1). The various combinations of scraper and burin edges have been described in the previous section.

Scraper/Notch (N=1)

The single example of a scraper/notch tool combination is made on a large blade-like flake. The scraper portion of the tool is unmodified apart from use damage, which extends along most of the left lateral margin of the blade-like flake. The notch is located on the distal portion of the left margin. Scraper edge configuration is straight and edge angle approximately 64°.

Scraper/Denticulated Implement (N=1)

An implement, made on a large flake, is a combination of denticulated implement and side scraper (Plate 5.14, c). The scraper edge occurs on the proximal two-thirds of the left margin of the flake, formed by steep invasive, scalar to irregular retouch.

The edge outline is straight to slightly irregular, with an angle of approximately 80°. Two notches are present on the distal portion of the left margin. The right margin of the flake exhibits a series of notches which form a denticulated edge. The platform area of the flake appears modified, suggesting the tool was hafted.

Figure 5.15: Comparison of Discrete Attributes of Chert and Silicious Argillite Scrapers

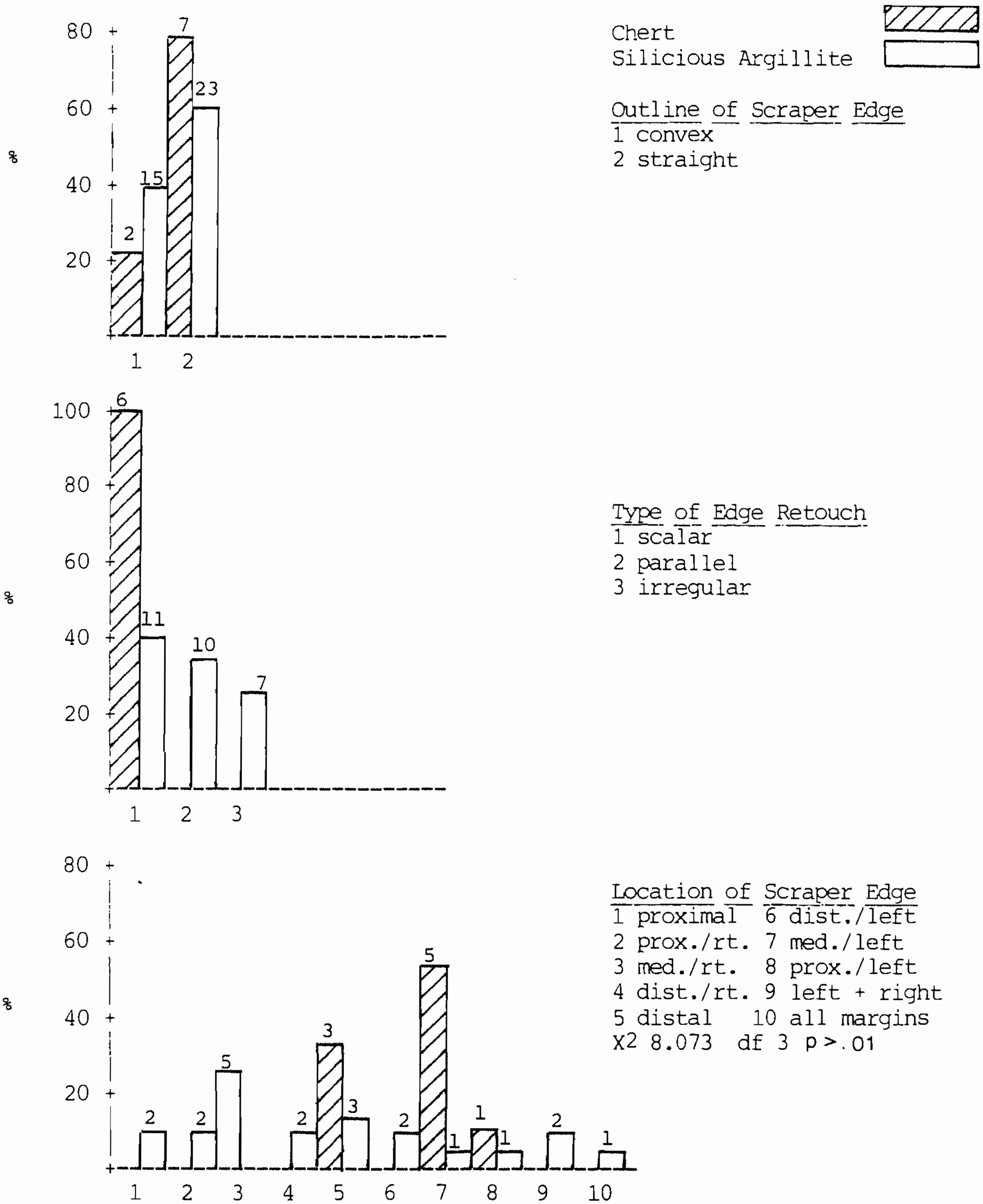


Figure 5.16: Comparison of Metric Attributes of Chert and Silicious Argillite Scrapers

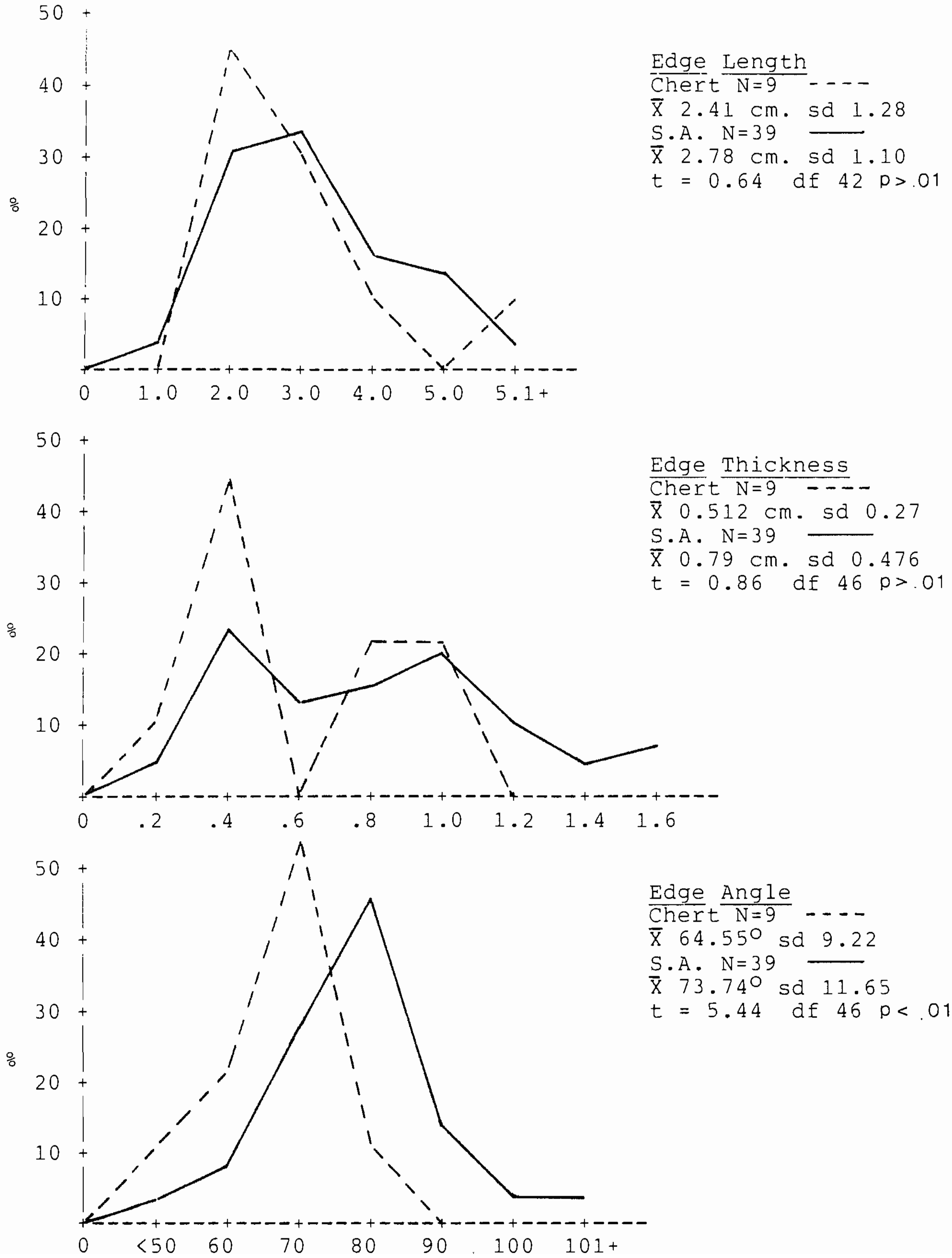
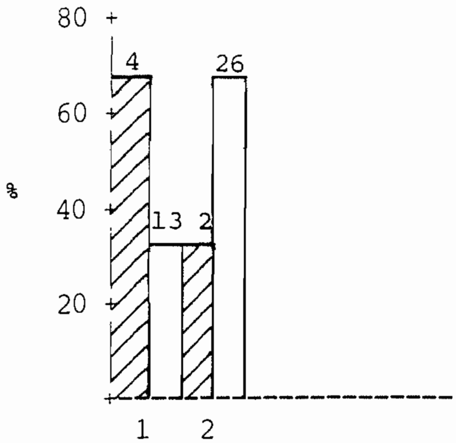
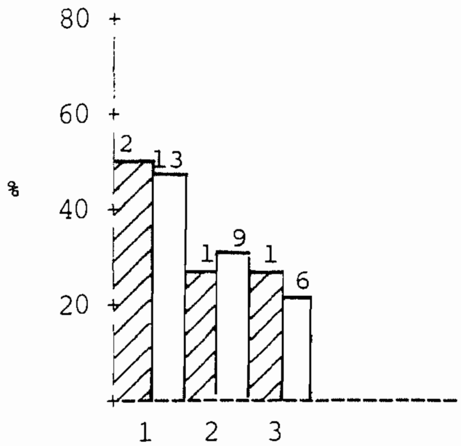


Figure 5.17: Comparison of Discrete Attributes of Blade and Non-Blade Scrapers

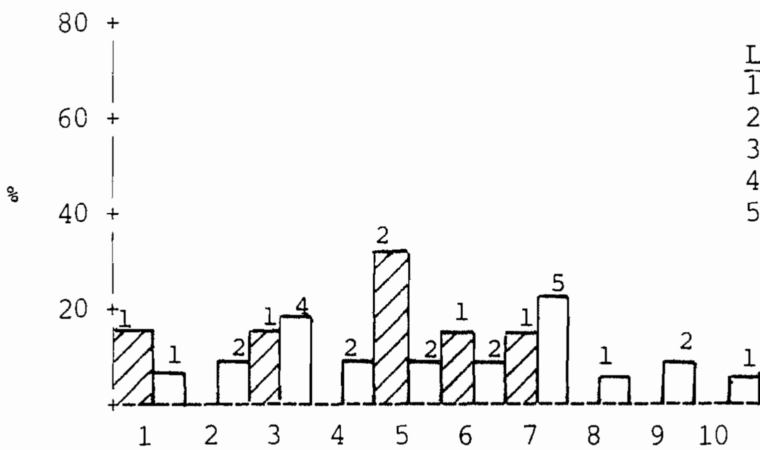
Blades (hatched)
Non-Blades (open)



Scraper Edge Outline
1 convex
2 straight
X^2 0.519 df 2 **p > .01**



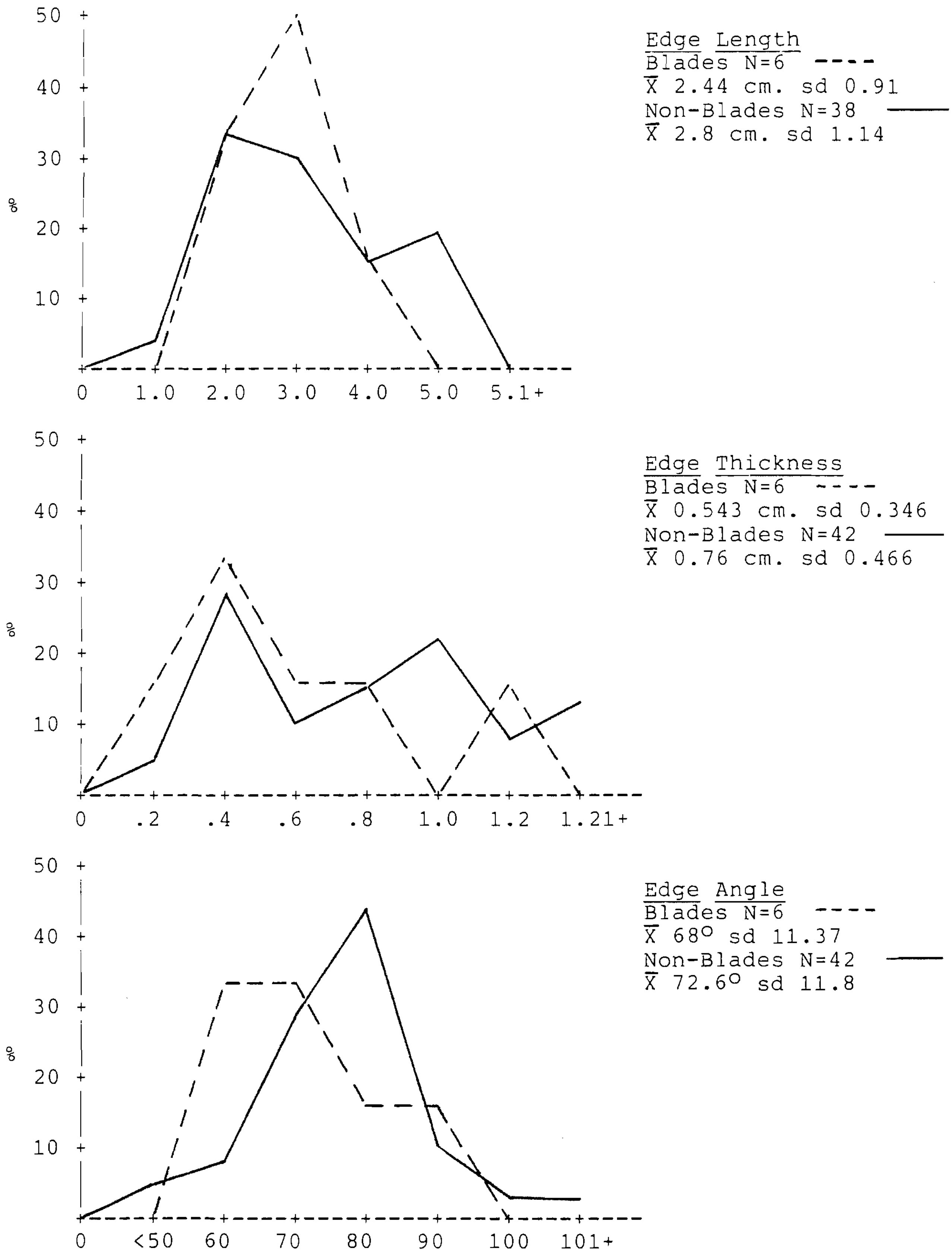
Type of Scraper Retouch
1 scalar
2 parallel
3 irregular



Location of Scraper Edge

1 proximal	6 distal/left
2 prox./rt.	7 medial/left
3 medial/rt.	8 prox./left
4 distal/rt.	9 left + right
5 distal	10 all margins

Figure 5.18: Comparison of Metric Attributes of Blade and Non-Blade Scrapers



Scraper/Denticulated/Beaked Implement (N=1)

The scraper/denticulated/beaked implement occurs on a small grey chert flake (Plate 5.16, b). Notching from both lateral edges at the proximal end of the flake has produced the beaked portion of the tool. Two additional notches, seemingly formed by crushing, occur on the right margin. The scraper portion of the tool is indicated by use damage along the convex left margin. The edge angle is approximately 60^{o}.

Scraper/Knife (N=1)

The scraper/knife implement is rectangular in outline and is made on a tabular fragment of silicious argillite (Plate 5.21, b). The knife edge is formed by invasive, lamellar, oblique retouch along the longest margin of the tablet. One end of the implement has been retouched to form a steep, convex scraper edge. This portion of the tool exhibits marked edge crushing and polish. The scraper edge angle measures approximately 75^{o}.

Scraper/<u>Piece Esquillee</u> (N=2)

One scraper/<u>piece esquillee</u> combination tool was excavated from the humic layer at MfVa-9 (Plate 5.22, a). This specimen is made on a small, relatively thick, dark grey chert flake, and exhibits two opposing crushed margins, and one crushed edge opposite a cleavage plane surface. The scraper portion of the tool has been formed by steep retouch on the juncture of the proximal and left crushed margins. Overall, the scraping edge is convex in outline, with an edge angle of approximately 85^{o}.

The second implement is a split chert pebble with a crushed margin located opposite a flat cortical surface (Plate 5.22, b). The scraper edge has been produced on one end of the pebble by the removal of several large flakes. Edge outline is convex with an edge angle of approximately 90^{o}. This implement differs from the majority of scrapers in the location of use damage on the 'ventral' face of the of the blank (similar to the use pattern observed for some burins in the Rock River sample) as opposed to the retouched scraper edge.

Scraper/Piece Esquillee/Beaked Implement (N=1)

The scraper/piece esquillee/beaked implement is made on a split pebble of grey chert which exhibits one crushed margin opposite an area of flat cortical surface (Plate 5.22, d). The scraper edge is indicated by irregular use damage/retouch on one end of the pebble, extending from the ventral face onto the cortical face of the pebble. Edge outline is convex. The angle of the scraper edge is approximately 78°. At the opposite end of the pebble is a beak or projection created by the juncture of the crushed edge and a lateral margin of the pebble. Shaping of the projection has been achieved by minor unifacial retouch.

Chronology and Distribution

In the analysis and interpretation of prehistoric lithic industries, scrapers are probably among the least useful classes of implement for attempting to trace chronological or technological relationships in prehistoric lithic assemblages. The production of scrapers requires only minimal modification of a blank, and very likely, a wide range of functions is represented in this class. Adding to all this the quality of expediency in manufacture, which is characteristic of the majority of scrapers in the Rock River sample, comparative typology becomes a singularly difficult task.

A survey of the literature on the prehistoric sequence in the northwest Boreal Forest indicates that there are few scraper types which cluster convincingly in time and space, or which are sufficiently distinctive in morphology or manufacture to be useful as historical-index types.

A number of investigators, however, have described types which, in their opinion, are characteristic of an assemblage or technology in the interior Northwest. Perhaps the best strategy at this stage is to focus on these for comparison with the scraper 'types', principally multipurpose scrapers, identified in the Rock River collections.

The oval end scraper on a chert flake in the Rock River sample appears to be widely distributed in early and mid-Holocene assemblages throughout Alaska, Yukon, and the District of Mackenzie. The closest morphological, if not technological, similarities are with the ridged end scrapers in Northern Archaic tradition sites (Anderson 1968b:15; cf. Campbell 1961: 77, Plate II); although the scrapers illustrated by Millar (1981: 277, Figure 9) in the Pointed Mountain complex at Fisherman Lake also resemble this form.

As noted above, the edge rejuvenation technique which appears associated with this scraper form is present in the Paleo-Indian Lindenmeier collections.

End scrapers on blade-like flakes are nearly ubiquitous in the interior Northwest. One end scraper in the Rock River collections appears to be made on a true blade, which suggests relationships with early blade-producing technologies.

The rather uncertain class of scraper planes, manufactured on split cobbles, is described by MacNeish (1964:428) from Kluane components in southwest Yukon. Noble (1971:104), apparently following MacNeish's typology, reports this form in the Acasta assemblage as well. Large scraper planes are reported in the British Mountain assemblage at Engigstciak, although, judging from the accompanying plates (MacNeish 1956: Plate I, no. 18), these measure only about 7.0 cm in length. Solecki (1973) describes these implements in the Katakturuk Lookout sites as well, which are assigned membership in the British Mountain tradition. Clark (1983a:34) describes scraper planes in the Batza Tėna assemblage, which he considers, at least in part, representative of the northern Cordilleran tradition.

Although apparently a trait of putatively early complexes in the interior Northwest (Northern Plano and northern Cordilleran), large scraper planes are probably also present under different labels in a number of later assemblages (unifacially retouched cobble spalls, heavy flaked implements [Workman 1978], some forms of adzes [?] [Clark 1987] and large core scrapers [Millar 1981]).

Exclusive of the burin/scraper combinations described in the previous section, multipurpose implements incorporating a scraper edge are not widely reported in the literature. The combination of a notch and scraper edge is described by Anderson (1970a:51-52) in the Akmak assemblage at Onion Portage. Workman (1978:281) reports notched side and/or end scrapers as localized spatially and temporally " ... between the Tanana Valley and the western Northwest Territories ... between three and one millennia ago". On these implements, however, notching is present primarily as a provision for hafting.

Combinations of scraper edges with bifacial knives or denticulated implements are not reported in the literature. Combination implements incorporating a piece esquillee and scraper edge are reported in prehistoric Athapaskan context at Rat Indian Creek and Klo-kut (Le Blanc 1984: 153), in northern Yukon. Morlan (1973:210ff) also reports scraper/notch, scraper/burin and scraper/graver combination tools in early and late prehistoric levels at Klo-kut.

It is of interest to note that the widely reported combination of scraper and graver spur is absent in the Rock River collection. This implement is considered a distinctive trait of the Beringian tradition (West 1981), the Northern Archaic tradition (Anderson 1968, Workman 1978), and the Northern Plano tradition (Millar 1981). Sampling should not be overlooked in explaining the absence of this tool in the Rock River area, however.

The low incidence of end scrapers in the Rock River assemblages may have some historical significance as well, particularly in view of the ubiquity of this tool type in northwest interior sites in general. Alexander's (1987:21) report of only one end scraper from the Putu site may suggest a degree of relationship between Putu and certain of the Rock River materials. Alternatively, site function or a predominately expedient approach to tool production (in which the use of a tablet or frost spall as the tool blank does not permit a conventional description of the location of scraper retouch) may account for the small sample of end scrapers in the Rock River sites.

Of possible relevance here as well is an observation made by Clark (1987:55) with regards to the absence of burinated end scrapers in the Great Bear Lake collections. Although he does not state this explicitly, Clark appears to implying that burins and end scrapers may be functionally equivallent tool forms in the context of certain prehistoric technologies.

Notched and Denticulated Implements

This section describes the sample of implements in the Rock River collections exhibiting a localized concavity or concavities on the margins that are produced by unifacial retouch or crushing. The grouping is subdivided into implements exhibiting an isolated notch or notches (notched implements), and those with a series of adjacent notches along one edge (denticulated implements). Included here as well are multipurpose tools which incorporate notching as a functional edge.

Notched Implements

In the literature, notched tools have been variously termed concave scrapers, spokeshaves or shaft smoothers, with an implied function of shaping or smoothing spear or arrow shafts (see for example Judge 1973:107). Fourteen notched implements have been recognized in the Rock River collections. Notches which are clearly related to the hafting of implements are not included in the present discussion. Of this sample, 9 are made on flakes (including 2 chert flakes), and 3 are made on blades or blade-like flakes (including 1 chert blade). One notched implement is manufactured on a broken biface, and another is made on a tabular fragment of silicious argillite.

In general, the size and morphology of notches on the notched implements are relatively uniform. Four implements, on which notches rather obviously exceed the general size range observed for the majority of the sample (notch width in excess of 2.0 cm), are the exception. Here, these implements are termed 'spokeshaves' (cf. Workman 1978:296) (Plate 5.13).

The width measurements on the notches (maximum distance between the two edges of the concavity) range between 0.38 and 1.67 cm, with the majority (n=7 or 58%) between 0.5 and 1.0 cm (Figure 5.19). The depths of notches range between 0.06 and 0.37 cm, with the majority (n=10 or 83%) between 0.1 and 0.2 cm in depth (Figure 5.19). Notch height, as a function of the thickness of the edge of the blank is more variable, ranging between 0.17 and 1.06 cm. Fifty-eight percent of the sample (n=7) is between 0.2 and 0.6 cm (Figure 5.19). Edge angles of the notches range between 60° and 95° with a tendency to cluster between 70° and 75° (n=8 or 67%) (Figure 5.19).

A comparative plot of the width and depth of notches (Figure 5.20) indicates that notch morphology is fairly standardized. Width/depth ratios were consistent at around 0.1 - 0.2 for most of the sample.

The spokeshaves, in comparison, are more variable in their size and shape. Widths range between 2.05 and 3.32 cm. Depths measurements tend to cluster around 0.4 cm. Edge angles range between 60° and 93°.

Chert and Blade Notched Implements

In the subsets of notched implements made on non-local chert and blades, all are multipurpose tools (burin/notch [n=2] and burin/scraper/notch [n=2]). On the chert implements, notch size tends to be uniform, and the notches are somewhat shallower than on implements made on silicious argillite flakes (Figure 5.21 -5.22).

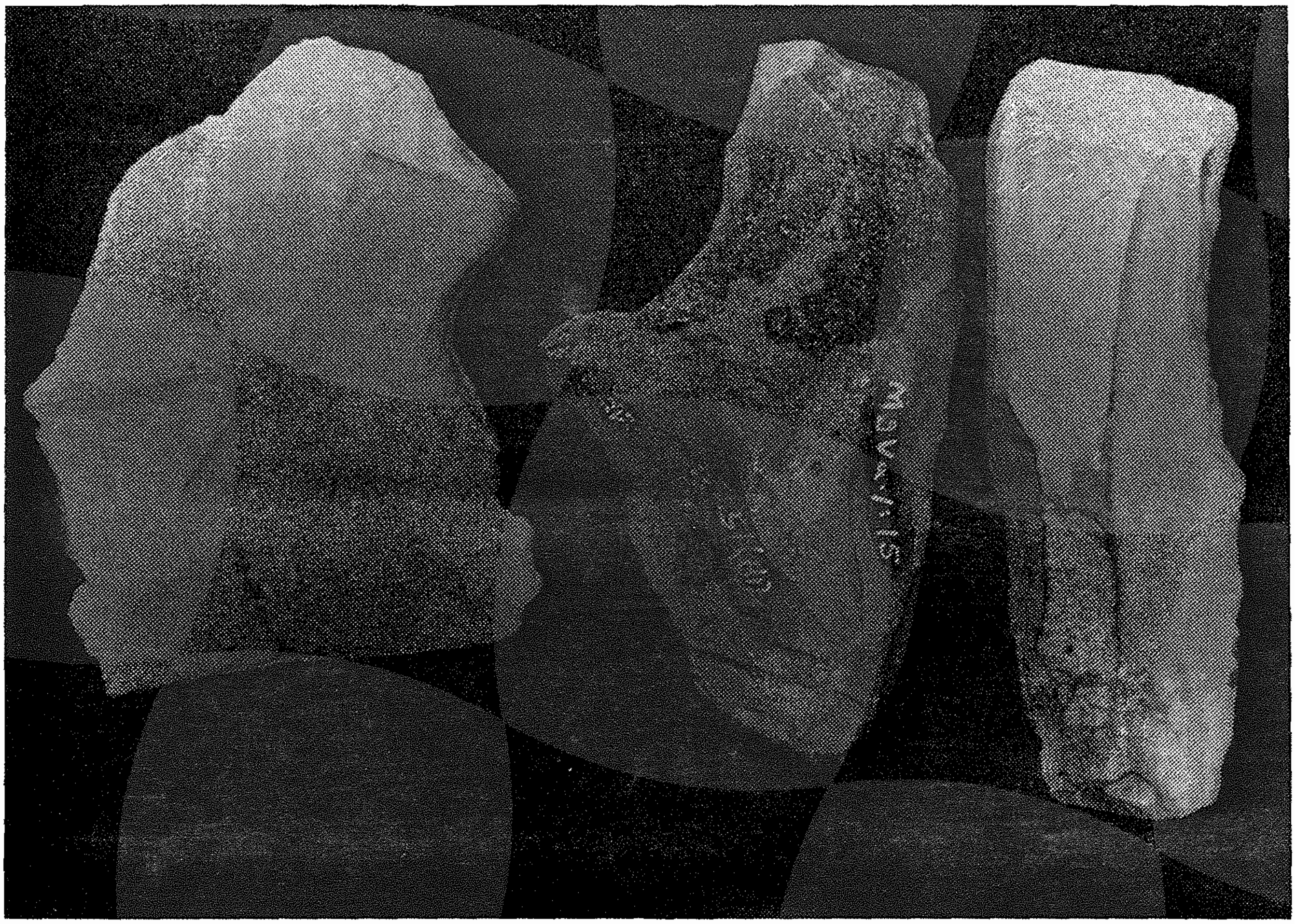
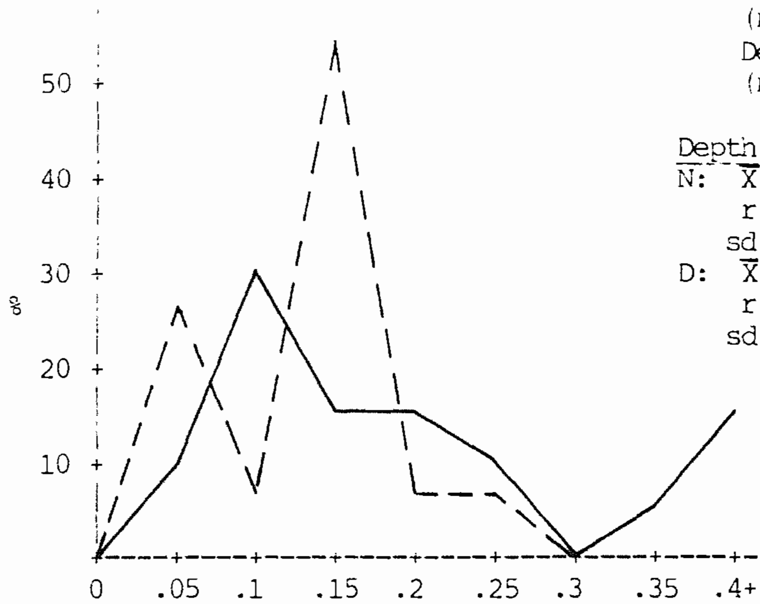


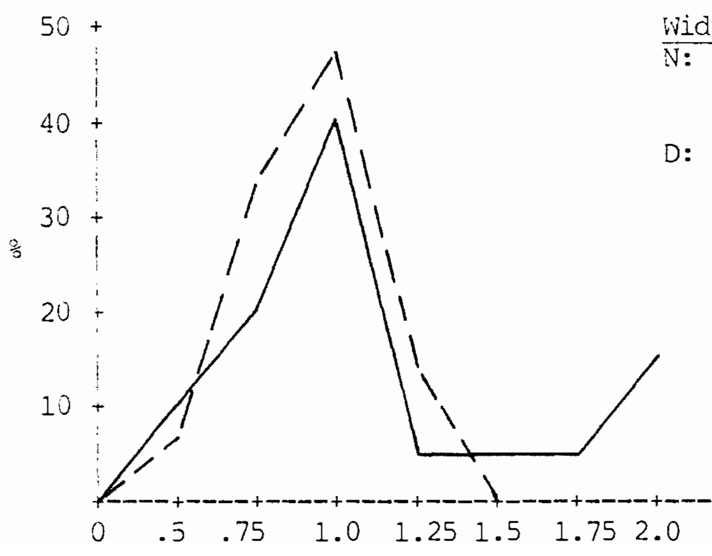
Plate 5.13: Spokeshaves

Figure 5.19: Comparison of Metric Attributes of Notched and Denticulated Implements

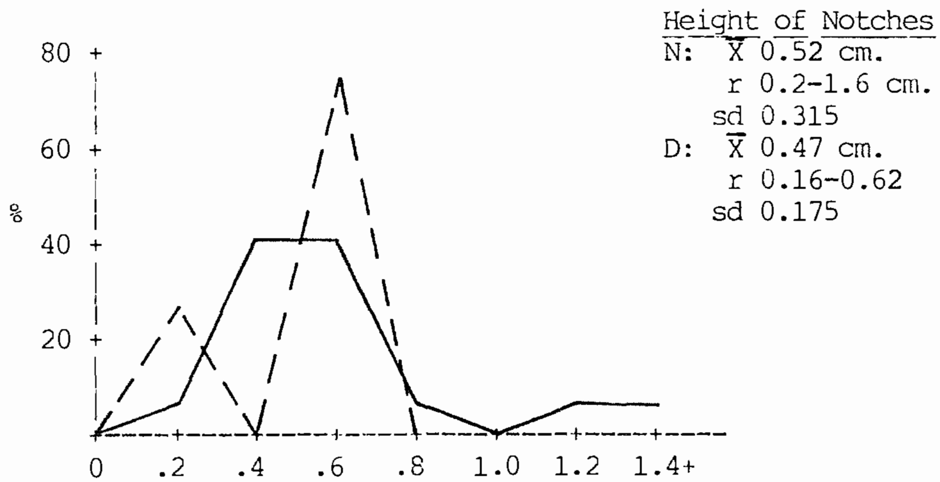
Notched ———
(n=20)
Denticulated — — —
(n=15)



Depth of Notches
N: X̄ 0.21 cm.
r 0.02-0.85 cm.
sd 0.205
D: X̄ 0.12 cm.
r 0.04-0.22 cm.
sd 0.05



Width of Notches
N: X̄ 1.24 cm.
r 0.38-3.45 cm.
sd 0.87
D: X̄ 0.78 cm.
r 0.48-1.12 cm.
sd 0.2 cm.


Height of Notches
N: X̄ 0.52 cm.
r 0.2-1.6 cm.
sd 0.315
D: X̄ 0.47 cm.
r 0.16-0.62
sd 0.175
%
80
60
40
20
0
.2
.4
.6
.8
1.0
1.2
1.4+

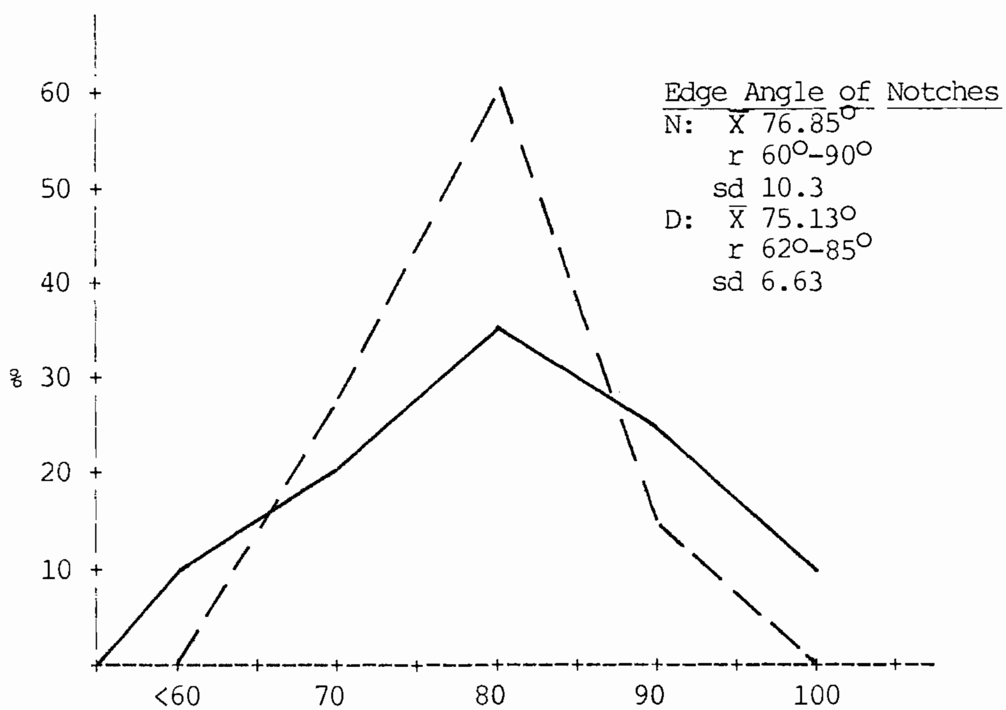

Edge Angle of Notches
N: X̄ 76.85°
r 60°-90°
sd 10.3
D: X̄ 75.13°
r 62°-85°
sd 6.63
%
60
50
40
30
20
10
<60
70
80
90
100

Figure 5.20: Range of Notch Sizes for Notched and Denticulate Implements

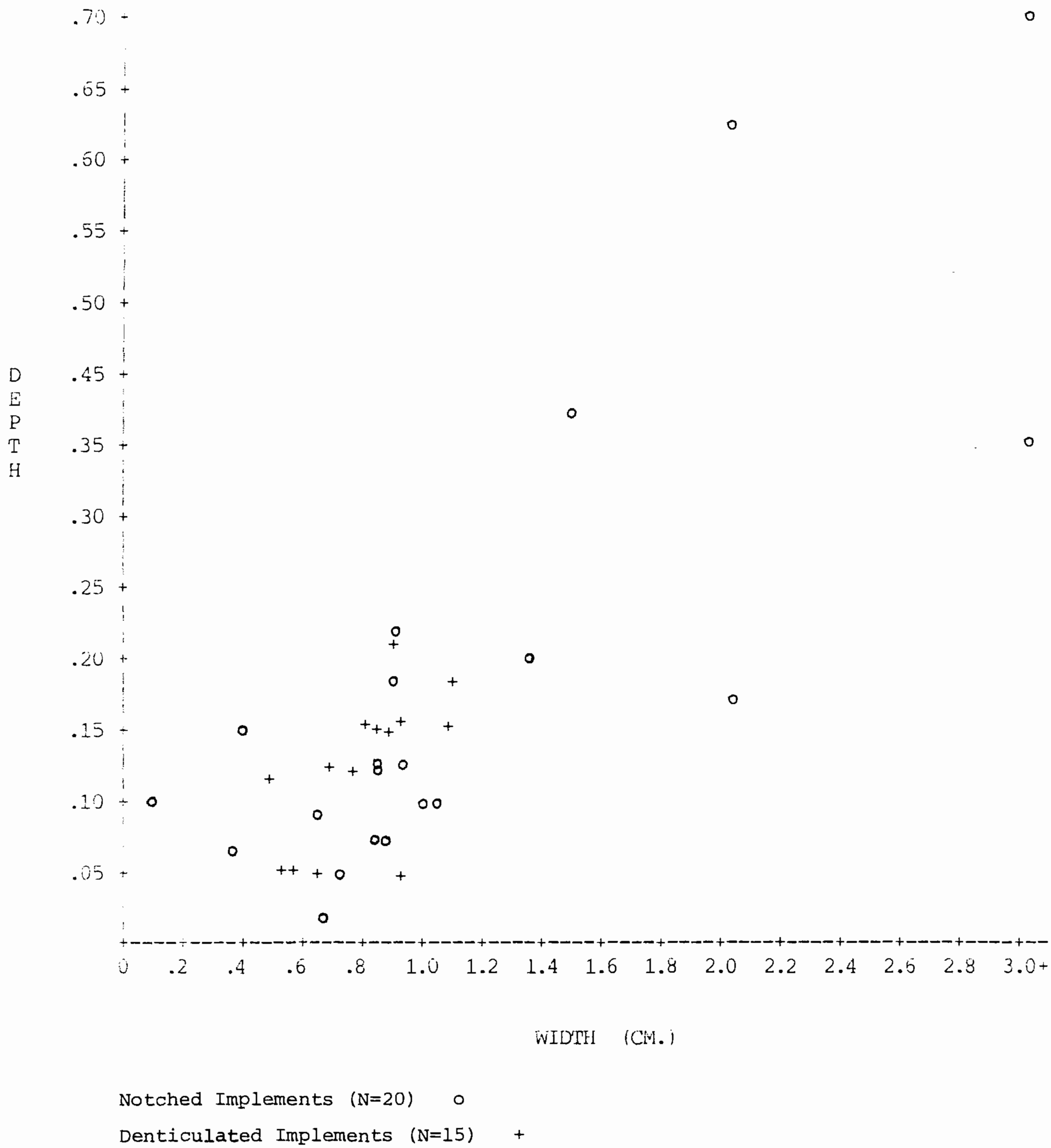
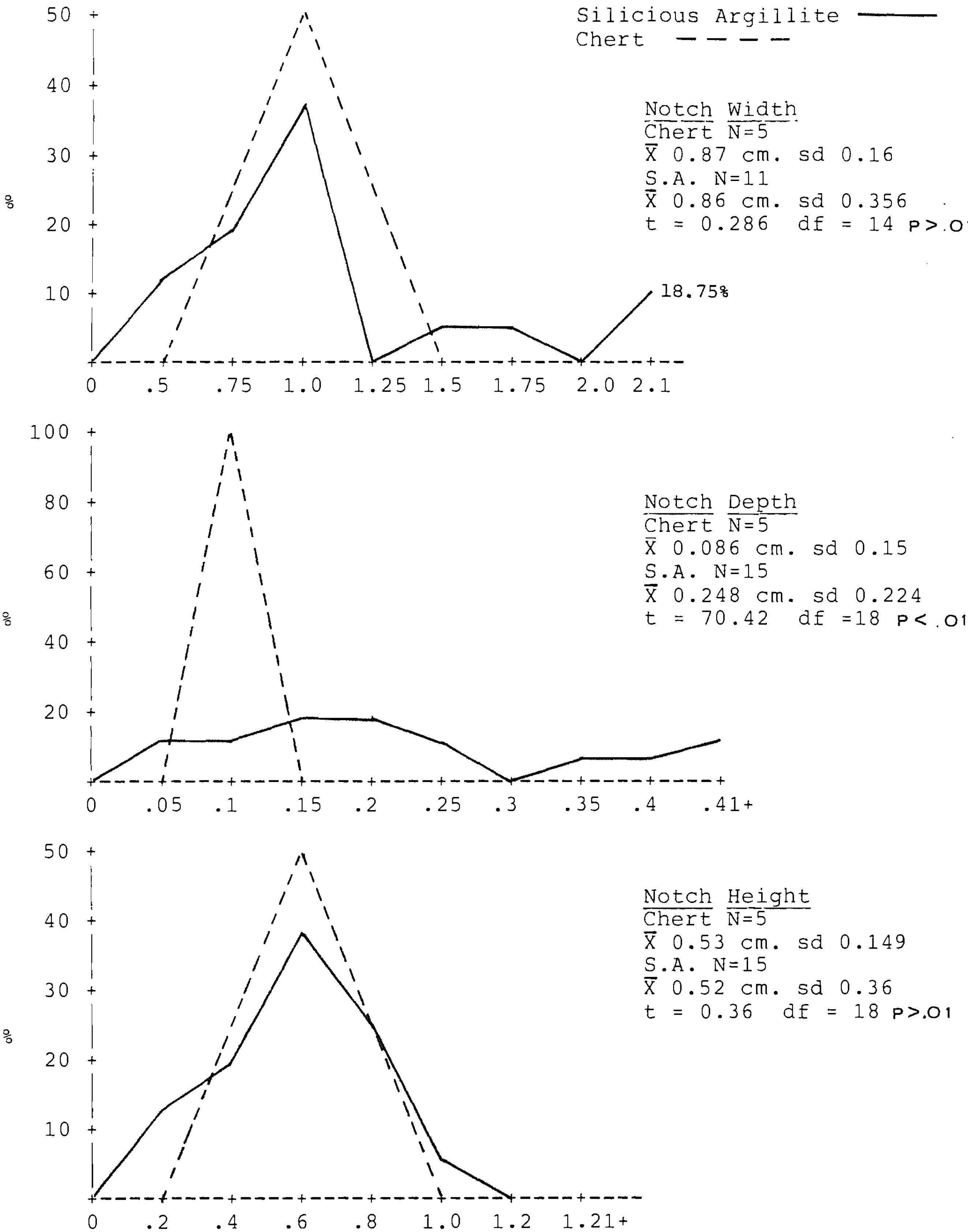
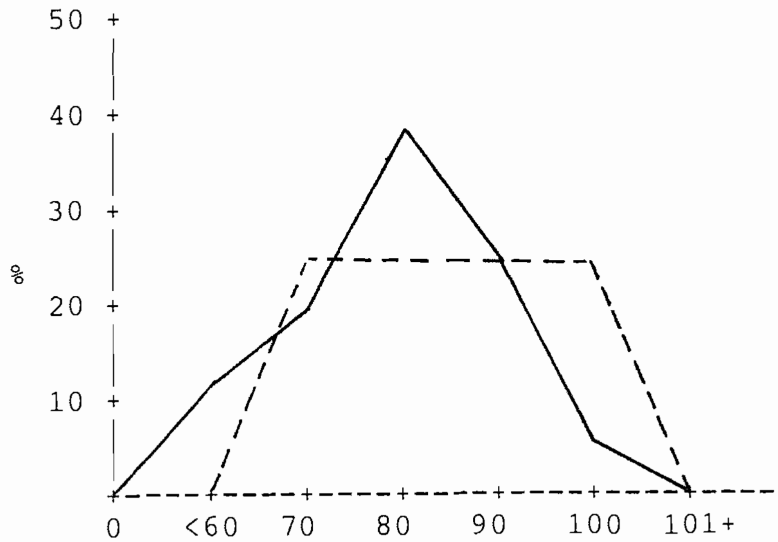


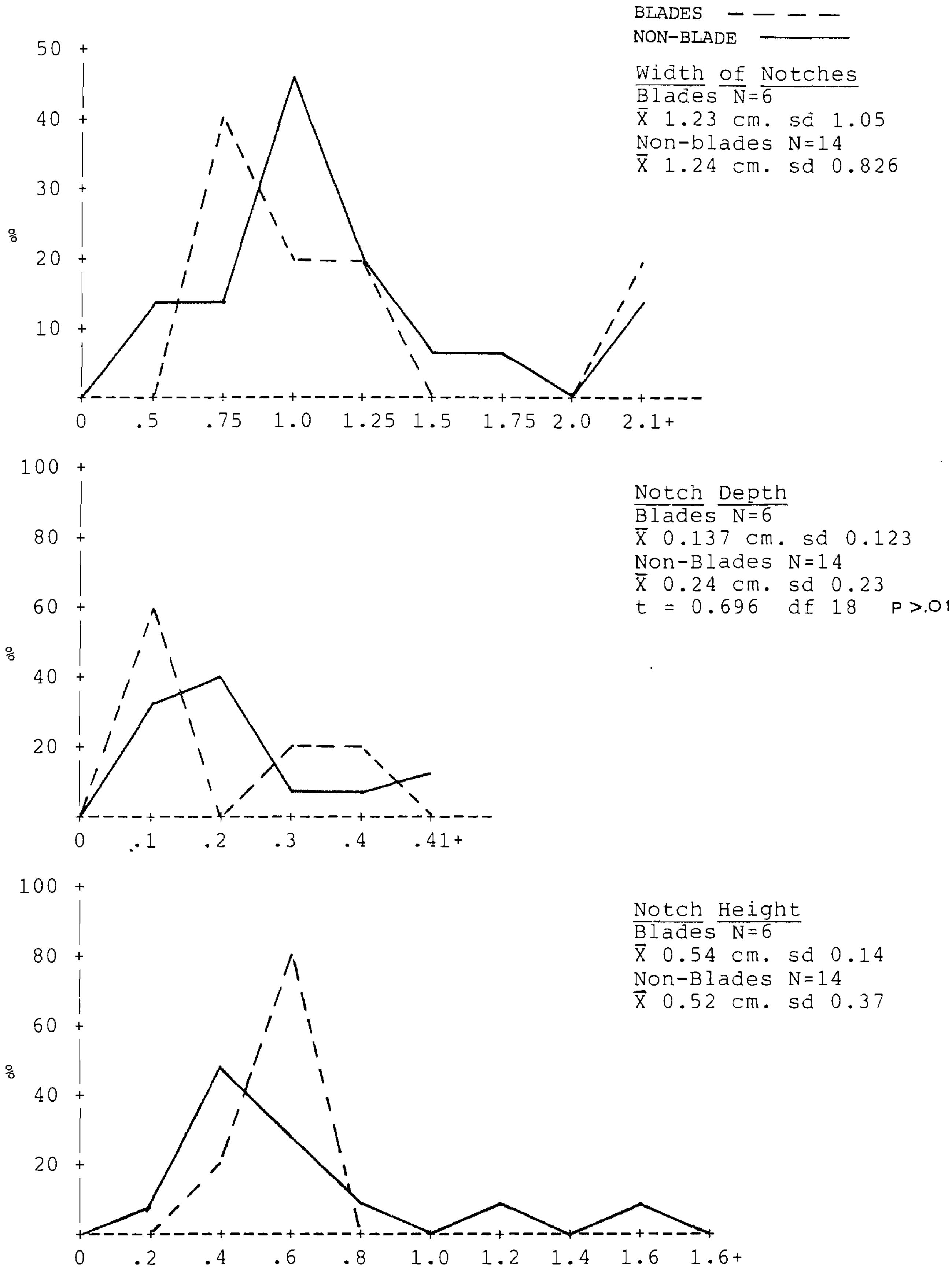
Figure 5.21: Comparison of Metric Attributes of Chert and Silicious Argillite Notched Implements

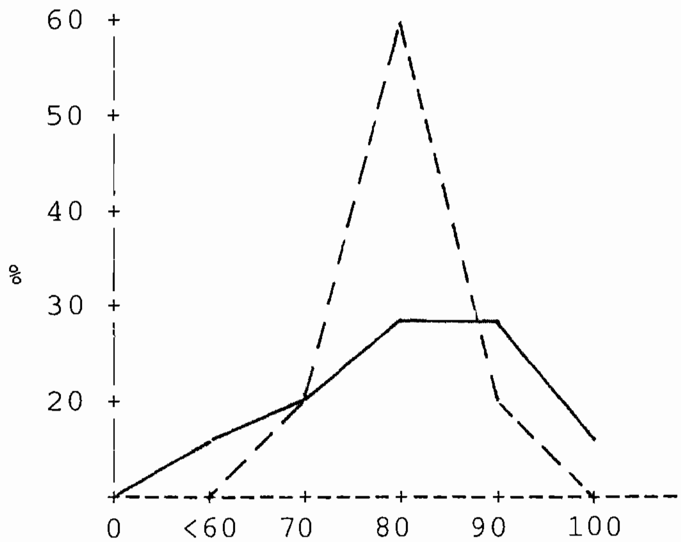




Notch Angle
Chert N=5 ———
$\overline{X}$ 79.6° sd 10.45
S.A. N=15 - - - - -
$\overline{X}$ 75.9° sd 10.43
t = 0.087 df = 18 P>.01

Figure 5.22: Comparison of Metric Attributes of Blade and Non-Blade Notched Implements





Notch Edge Angle
Blades N=6
$\bar{X}$ 78.8° sd 9.78
Non-Blades N=14
$\bar{X}$ 76° sd 10.73

Multipurpose Notched Implements

In the sample as a whole, multipurpose implements incorporating a notch include burin/scraper/notch (n=4) (Plate 5.7, c,d,e); burin notch (n=3) (Plate 5.7, a) and scraper/notch (n=1). (These implements have been described in detail above.)

The spokeshaves are predominately single purpose implements. On one specimen, however, the notch is associated with a burin facet. One spokeshave is made on a blade-like flake.

Denticulated Implements

Four denticulated implements have been identified on the basis of the presence of a series of small notches on a margin of the blank. In the literature, these kinds of implements have also been termed 'serrated scrapers' or 'scrapers with steep, irregular retouch' (MacNeish 1964: 455; cf. Isaac 1977a:154).

A comparison of notch dimensions and edge angles on the denticulated and notched implements (Figure 5.19 - 5.20) shows a strong similarity in the two tool classes (exclusive of the four large notched tools, or spokeshaves). On the functional level this may suggest use of the tools in the same task, or alternatively, that notches are in a sense general purpose, and can be employed for a variety of tasks.

Apart from the presence of an average of three to four small notches along one margin, the sample of denticulated implements is highly variable in form, blank and raw material, including silicious argillite flakes (n=2), a chert flake, and a chert biface. For the latter, I suspect the chert was obtained from a locally available cobble or pebble. With one exception, a denticulated biface, all denticulated implements are multipurpose tools.

Multipurpose Denticulated Implements

Multipurpose denticulated implements include the following tool combinations: burin/denticulated implement (n=1) (Plate 5.14, a), scraper/denticulate/beaked implement, made on a small chert flake (Plate 5.16, b), and scraper/denticulate (n=1) (Plate 5.14, c). These tools have been described in detail in previous sections.

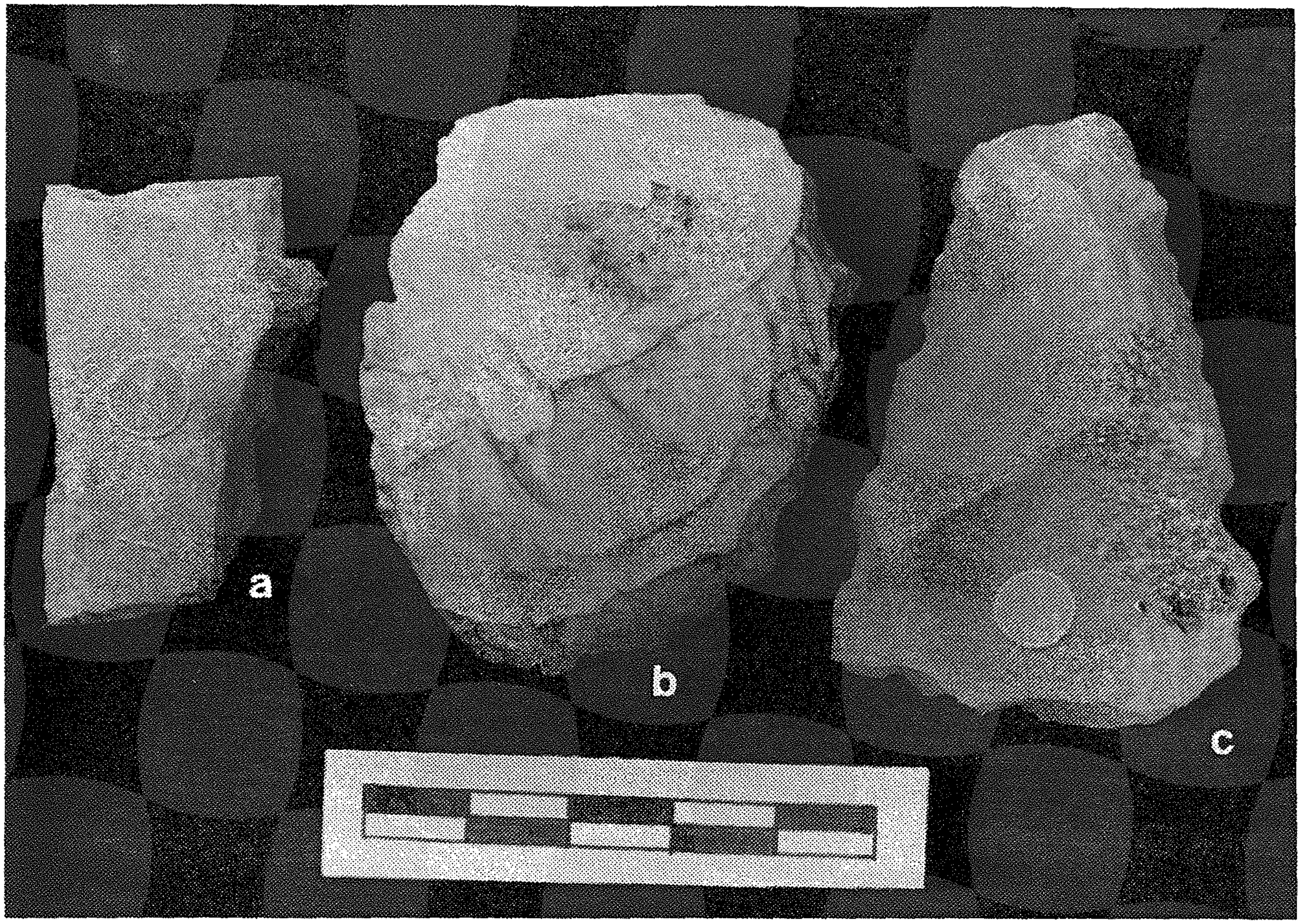


Plate 5.14: Denticulated Implements. (a) Burin/Denticulate Combination. The Burin Facet Occurs on the Distal End of the Flake; Three Notches are Present along the Right Margin of the Tool; (c) Scraper/Denticulate Combination. Scraper Retouch Occurs along a Portion of the Right Lateral Margin of the Tool

Chronology and Distribution

Notched implements appear widely distributed both temporally and spatially in the interior Northwest. Workman (1978:295) describes these implements as sporadic elements in all phases of the prehistoric sequence in the southwest Yukon. Anderson (1970a:58) reports notched implements in the American Paleo-Arctic Akmak and Kobuk (1970b:6) assemblages as well. The dimensions of the notched portions of the tools reported by both Workman and Anderson closely approximate those observed in the Rock River sample.

Large notched implements, or spokeshaves, are apparently limited to early and mid-Holocene complexes in the interior Northwest. Workman (1978:295) reports four spokeshaves in the Northern Archaic Taye Lake Phase in southwest Yukon; they are also characteristic of the Julian Complex at Fisherman Lake at approximately 4500 B.P. Millar (1981) includes spokeshaves as an element of the Northwest Microblade tradition Pointed Mountain complex at Fisherman Lake. Noble (1971:104) reports spokeshaves in the Acasta Lake assemblage, which he considers part of the Northern Plano tradition. In the American Paleo-Arctic tradition Akmak assemblage, Anderson (1970a:57) describes concave scrapers which he suggests were used as spokeshaves. Powers (1982:58) also describes spokeshaves in the Component II assemblage at Dry Creek. Dixon (1985:53) considers spokeshaves a diagnostic trait of American Paleo-Arctic tradition in central interior Alaska. Large notched implements are apparently absent in late prehistoric Athapaskan contexts.

The temporal and spatial distributions of multipurpose tools incorporating burin and/or scraper edge and notches have been described earlier.

Of denticulated implements, Workman (1978:295) observes that " ... (t)hese forms range throughout much of the prehistoric record in southwest Yukon without clustering convincingly in any one assemblage, invalidating MacNeish's earlier generalization that serrated flakes were confined to the Little Arm Phase components". Together with notched implements, Workman (1978:295, citing Millar 1968:322ff), describes denticulate pieces as " ... one of the hallmarks of the Julian technology which appeared in the western District of Mackenzie ca. 2500 B.C.".

Small denticulated implements made on flakes are illustrated in the American Paleo-Arctic Kobuk assemblage at Onion Portage (Anderson 1970b:6, Figure 3,4). MacNeish (1959a:44) described denticulates in the British Mountain collections at Engigstciak. A denticulated flake is illustrated for the Kogruk assemblage (Campbell 1962: Plate 1,g). Solecki (1973:32) also describes these forms in the

Katakturuk Lookout assemblages. Two combination beaked/ denticulated implements are reported in this assemblage as well.

Additional reference to denticulated implements in the literature is sparse. Possibly these implements are buried in the general class of unifacially retouched flakes in published descriptions of assemblages.

Beaked Implements

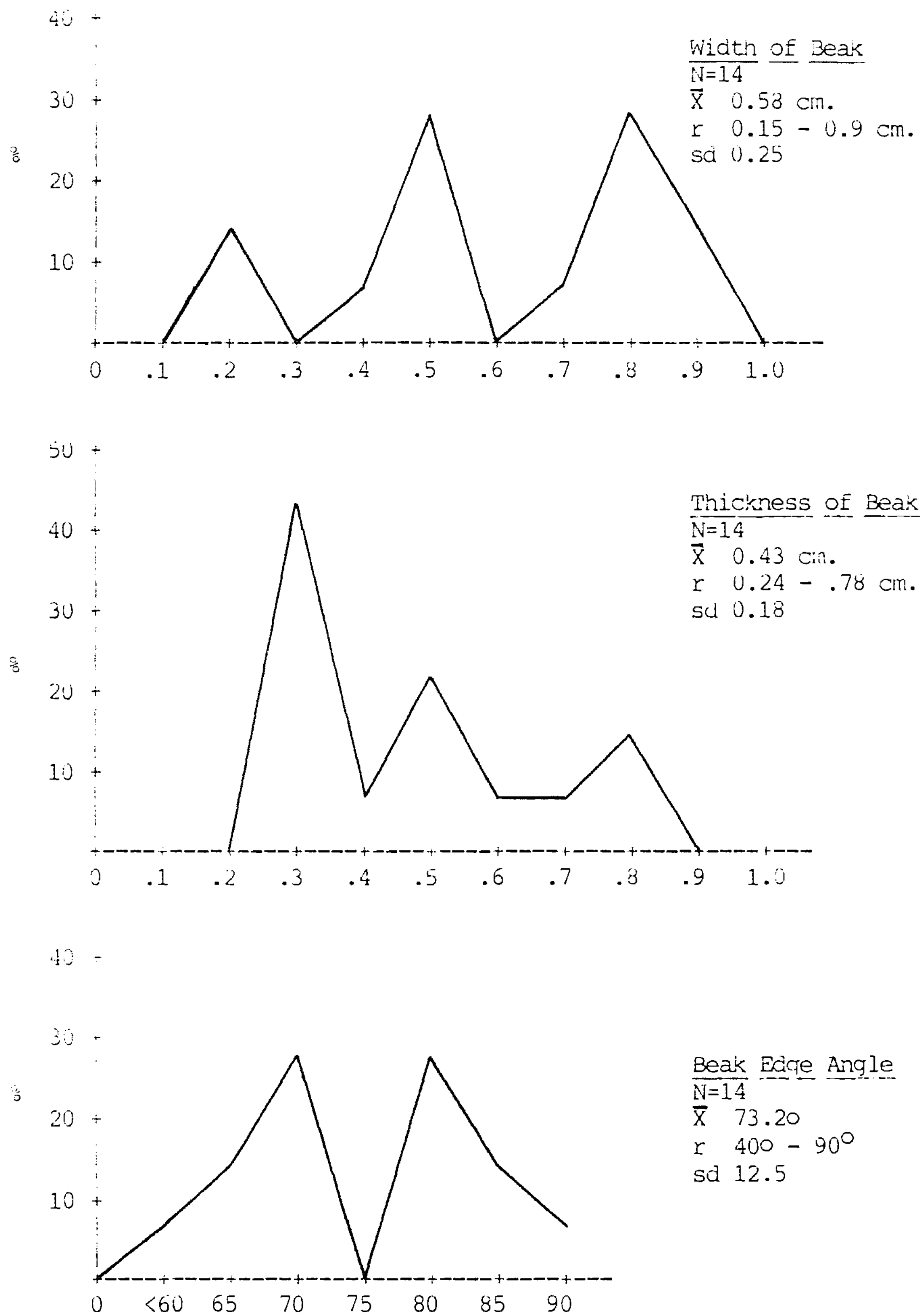
For the purposes of this analysis, beaked implements are tools, exclusive of burins, which exhibit use damage on a sharp corner or projection. Functional labels which could be assigned to the various implements in this rather heterogeneous class include, among others, 'gravers', 'gouges' and 'groovers'.

In the Rock River collections, beaked tools are characterized by a high degree of expediency: in most cases use damage is the sole indicator that these are in fact tools (see also Figure 5.1). As a result, some uncertainty exists in the identification of tools of this class, because it is projecting areas and corners of flakes or tablets which are also most susceptible to non-cultural damage. Generally, some evidence of heavy crushing, rounding or polish was interpreted to indicate intentional use as opposed to non-cultural alteration on edges. It is perhaps unavoidable that some beaked tools exhibiting less intensive use damage were not recognized in the collections, or not differentiated from pseudo-tools. However, general trends in this class of implements are felt to be represented in the present sample.

Thirteen beaked implements have been recognized in the collections. The majority of tools are on tabular fragments of silicious argillite (n=7). Isolated examples of the use of projections or corners on bifaces (n=2), and flakes (n=5) were also observed. In general, none of the beaked tools exhibits a working edge in excess of 1.0 cm in width or thickness. The majority are less than 0.6 cm in width and thickness. Edge angles range from 40° to 90°, with most implements exhibiting working angles of approximately 70° to 80° (Figure 5.23). No obvious association or clustering of certain width, thickness and angle measurements are apparent in the sample.

This lack of patterning also extends to certain edge morphologies. For example, there are: implements with the functional edge isolated in the form of a projection (P) (Plate 5.15); and implements exhibiting use on the sharp

Figure 5.23: Metric Attributes of Beaked Implements



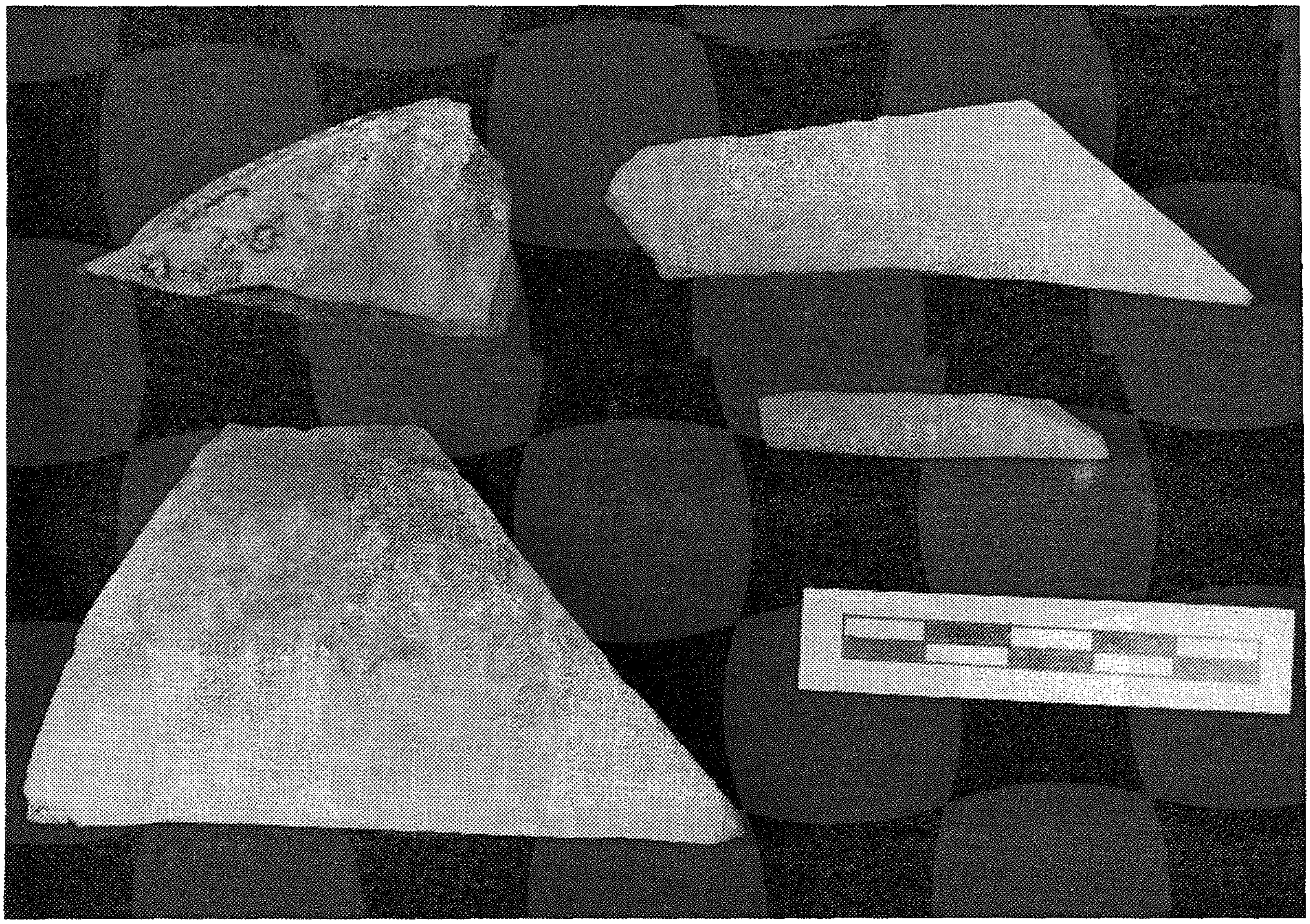


Plate 5.15: Beaked Implements

corner or juncture of two margins with use damage perpendicular to the margin (C), or parallel to the margin (B) (Plate 5.16) (Figure 5.24 - 5.25). This suggests either that these forms were more or less functionally equivalent, or that the range of tasks represented did not put severe limitations on the morphology of the functional edge.

In terms of the morphology and dimensions of the working edge, substantial overlap is evident between beaked tool and the utilized angles on burins (Figure 5.26). Although this requires substantiation, some functional overlap between these two tool classes may be suggested as well.

Five or six implements exhibit modification associated with the production of beaked portion of the tool. Projections on a chert flake and on a silicious argillite flake have been formed by notching adjacent to the projection. One projection on a local chert flake exhibits minor unifacial retouch to shape the tip area. Two tabular fragments, are modified in the area of the 'beak' by unifacial flaking, which is apparently associated with shaping or thinning of the beaked area. On one tablet, a broad concavity has been produced on the margin by the removal of a single flake to isolate the projection for use. A rather distinctive beaked implement has been produced by the thinning of the unmodified tip of a rough biface.

Beaked Tools Manufactured on Chert and Blade Blanks

Only one beaked implement, a combination scraper/denticulate/beaked tool, is made on a non-local chert flake. This implement has been described in earlier sections. No beaked tools have been produced on a blade blank, although one implement of this type is made on a blade-like flake.

Multipurpose Beaked Implements

In addition to the scraper/denticulate/beaked implement noted above, one scraper/*piece esquillee*/beaked implement is also present in the sample (Plate 5.16, b). A beak or projection has been tentatively identified on a burin/ scraper/notch implement as well. On the scraper/denticulate/beaked implement, the beaked portion of the tool has been produced by notching to isolate a projection; this also appears to be the case on the uncertain burin/scraper/notch/beaked implement. On the scraper/*piece esquillee* combination, the beaked portion of the tool is a natural projection.

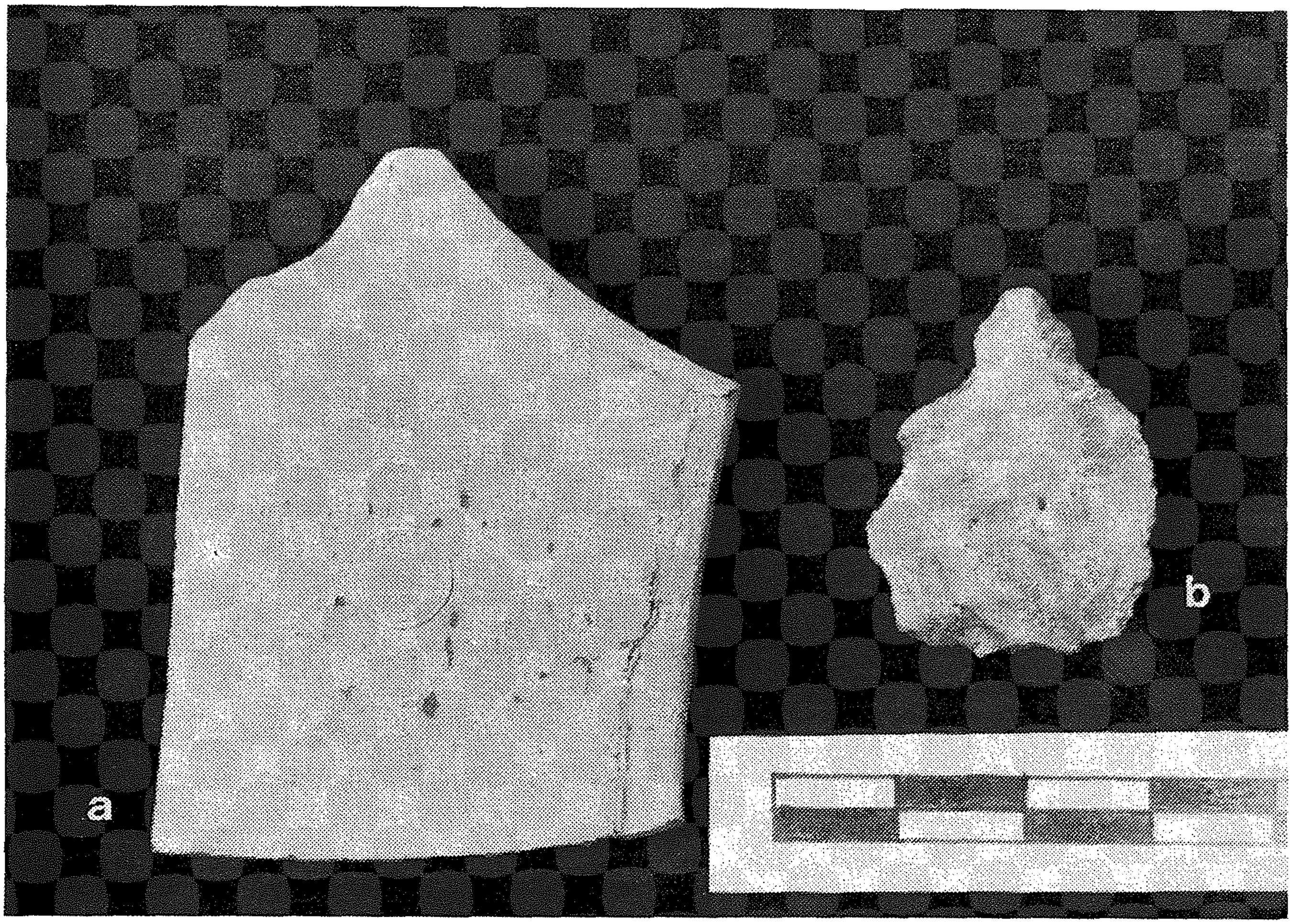
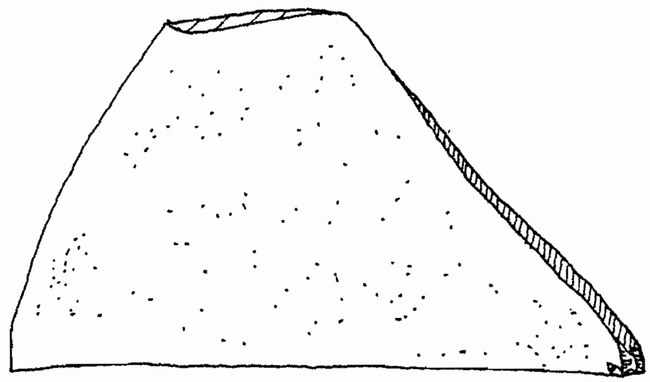
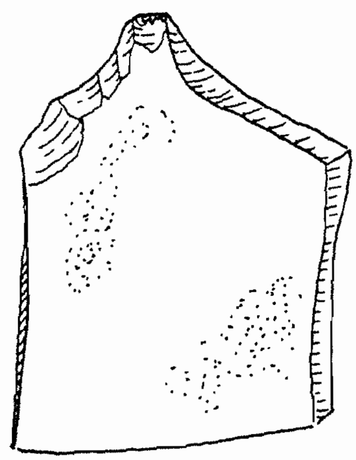


Plate 5.16: Implements Modified to Form Projections. (b) Scraper/Denticulate/Beaked Implement, Made on a Chert Flake. Denticulate Retouch Occurs on the Left Margin of the Flake; the Scraper Portion of the Tool is on the Right Lateral Edge

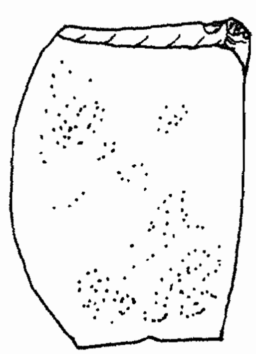
Figure 5.24: Types of Beaked Implements



BEAKED

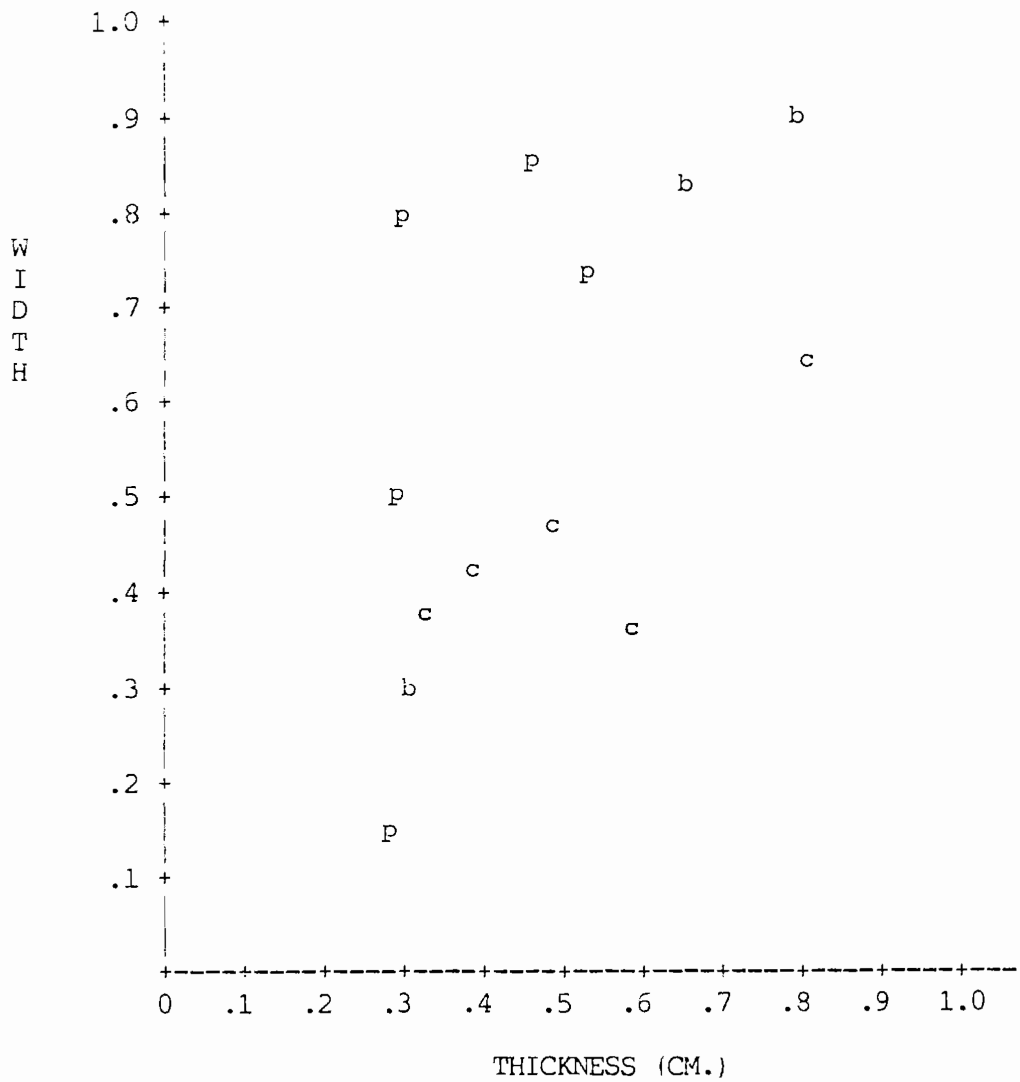


PROJECTION



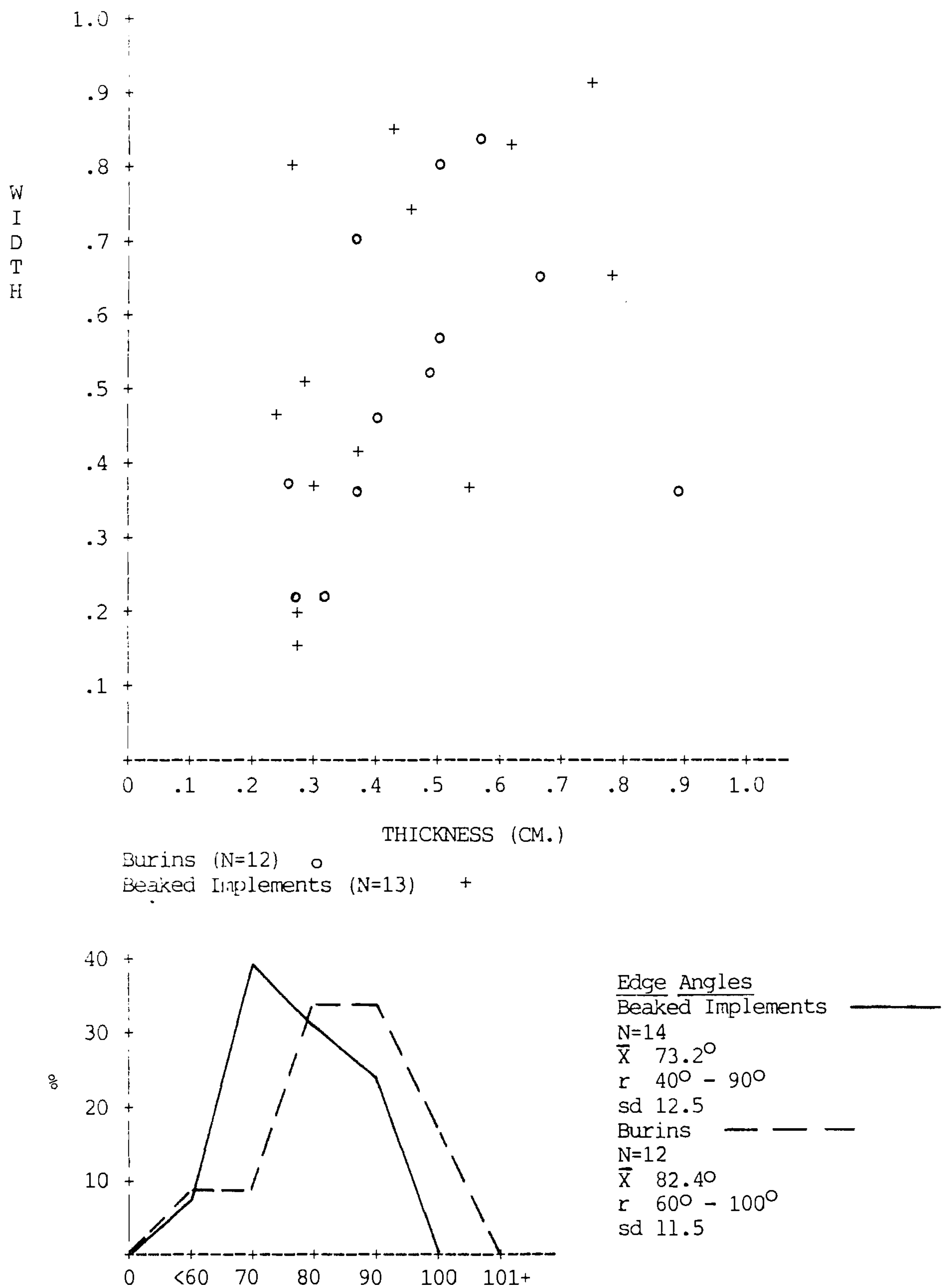
CORNER

Figure 5.25: Morphology of Beaked Element on Beaked Tools



Projections (N=5) p
Corners (N=5) c
Beaks (N=3) b

Figure 5.26: Comparison of Morphology of Functional Portions of Burins and Beaked Tools



Chronology and Distribution

The closest analogy to the beaked implements in the Rock River collections (excluding those used on projections or spurs) is found in the beaked implements described by Anderson (1970a:56) in the Akmak assemblage. In Akmak, these implements are made on thick, longitudinally curved flakes or blades; the beaked portion is formed by steep unifacial retouch on the distal end of the tool and tends to be V-shaped in outline. This kind of intentional retouch is largely absent on the Rock River implements, which may reflect the ready availability of suitable edges or corners on tablets rather than any significant difference in tool design or use. The measurements of edge thickness and angle provided by Anderson for the Akmak sample are within the upper range of measurements for the Rock River beaked implements.

Beaked implements resembling those in Akmak are also reported by Millar (1981:272) in the Northwest Microblade tradition Pointed Mountain Complex at Fisherman Lake.

MacNeish (1959:44) reports, but does not illustrate, "hooked crescentic-like graving tools" in the British Mountain component at Engigstciak. The term suggests the tools are somewhat more robust than gravers, and on this basis may be more like the beaked implements. Beaked gravers are reported by MacNeish in the Firth River complex, which he assigns membership in a Paleo-Eskimo continuum (1956:95, 100; see also Clark 1976). Two specimens illustrated in the report (Plate IV: 10, 17) appear made on bifaces of biface fragments which was also observed of two beaked implements in the Rock River collections.

The status of MacNeish's sample of beaked tools is uncertain, however. Anderson (1970a:56) does not see any evidence for beaked implements similar to the Akmak forms in Eskimo tool kits.

Beaked tools are not described by West in the Denali complex (1967) or by Anderson (1968b) in Northern Archaic assemblages, and are also apparently absent in early complexes in southwest Yukon (Workman 1978, MacNeish 1964). Neither Millar (1981) nor Noble (1971) describe these implements in Northern Plano context in the Northwest.

Gravers, which differ from beaked tools in being generally small projections or spurs on the margins of implements, are somewhat better represented in the interior Northwest. Certain of the implements in the Rock River collection which were used on projections may have served the same purpose, although in the Rock River sample the projections appear somewhat larger and more rounded than the graver spurs illustrated in the literature.

In Component II at Dry Creek, Powers (1982:58) describes a spokeshave or notched implement on a flake which exhibits a finely retouched projection or 'nose' adjacent to the notch, and a second projection at the opposite end of the tool. Powers does not designate these modifications graver spurs, which suggests they may compare with the 'projections' in the Rock River collections. In this regard, the association of a notch with the projections in both assemblages is of interest. Further comparisons cannot be made, however, on the basis of the information provided.

Gravers and multigravers are considered a characteristic trait of the Northern Plano tradition, represented in both the Nakah Phase at Fisherman Lake and at Acasta Lake (Millar 1981:262). At Fisherman Lake at least, graver spurs are present adjacent to the working edge of some end scrapers. As noted previously, this implement type is also reported by West (1981) in the Denali complex (or Beringian tradition), and by Anderson (1968b:14) in the Northern Archaic Palisades II complex. Morlan (1973a:210) notes the presence of two end scrapers with graver spurs in prehistoric Athapaskan context at Klo-kut.

Workman (1978:266ff) describes gravers and multiple gravers as relatively rare implements in southwest Yukon assemblages, which tend to be associated with microblade complexes but persist as isolated specimens to the end of the first millennium A.D. He suggests that the origins of this implement type may lie in early Paleo-Indian complexes (1978:267).

Large Tabular Implements

Fourteen large tabular implements exhibiting predominately marginal unifacial or bifacial edge trimming have been recognized in the Rock River collections. The sample is subdivided on the basis of shape and modification of the functional edge, into knives (straight-edged implements, which may exhibit bifacial or unifacial modification), tabular bifaces or <u>tci-thos</u> (convex-edged implements) (Morlan 1973a:259; 1973b:32), and spall scrapers (convex-edged, exhibiting unifacial retouch or use damage) (Morlan 1973a:251; 1973b:31). Note that tabular bifaces are distinguished from the general class of bifaces in that the former are finished implements characterized by bifacial retouch restricted to the margins of the tool.

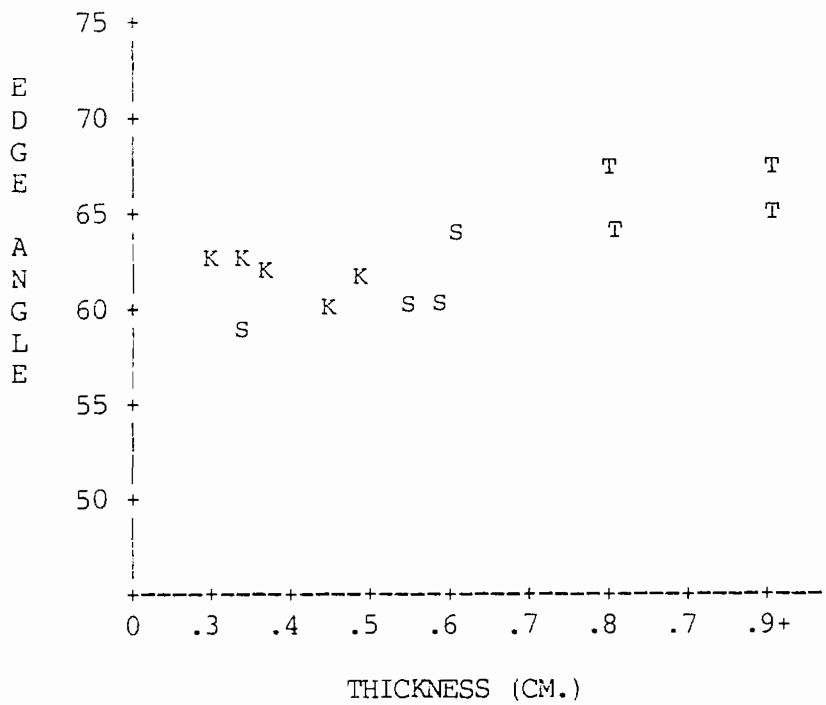
Both Workman (1978:237) and Le Blanc (1984:276) have noted that features of morphology and production are sufficiently dissimilar between tabular bifaces and spall implements as to suggest these implements functioned differently as well. Although a certain amount of caution must be exercised in generalizing from the very small samples in the Rock River collections, an apparently significant separation exists in the features of edge thickness, angle, cross-section and type of modification within the broad class of large tabular implements, suggesting that knives, tabular bifaces, and spall scrapers do in fact represent distinct functional types (Figure 5.27).

Le Blanc (1984:276) has suggested that the morphological differences between tabular bifaces and boulder spalls stems from the former being used in hide softening, while the latter may have functioned primarily as butchering tools, or in different stages of hide preparation, such as hair or fat removal. The less acute edge angles on the tabular bifaces, combined with what appears on some to be battering or attempts to blunt the working edge, tend to support these functional reconstructions. In hide softening activities, projections or sharp edges would result in undesirable lacerations and tears on the hide.

Knives, in general, exhibit thinner edges and less variation in edge thickness than do the other classes of large tabular implements, which may be interpreted to reflect the relatively narrow range of optimal edge thickness for this type of tool. The argument for grouping knives as a functional class separate from tabular bifaces in the context of the present analysis, rests essentially on the feature of expediency in manufacture. If the expedient production of a tool with a straight, thin, acutely angled edge is viewed as the goal of implement manufacture, a number of options are open to the craftsman, of which blank selection is the most critical. If either a flake or frost spall is chosen, generally unifacial retouch is sufficient to achieve the appropriate edge morphology. In the case of tabular fragments, which were often used in place of flakes in the Rock River technologies, the craftsman is presented with a squared edge, requiring more substantial bifacial reduction to produce the desired edge and cross-sectional morphology.

Given these constraints of raw material, it is open to question whether the distinction between bifacial and unifacial retouch is significant or even appropriate in the Rock River sample. Workman's (1978:235) observation concerning the rarity of intentionally bifacially retouched flakes in southwest Yukon, given the quantities of unifacially modified flakes may also be of relevance to the above argument.

Figure 5.27: Comparison of Edge Morphologies of Knives (K), Tabular Bifaces (T), and Spall Scrapers (S)



Knives

With the exception of one artefact, the sample of knives in the Rock River collections is characterized by expedient manufacture (Plate 5.17). Modification is absent or limited to minor, and at times discontinuous unifacial or bifacial edge trimming to form a straight edge. In general, knives in the collections are quite uniform with respect to the thickness of the working edge (averaging 0.4 cm) and the edge angle (approximately 50° to 60°) (Figure 5.28). Lengths of the working edges are somewhat variable, but average around 7.0 - 8.0 cm. Taken together, the uniformity of these features suggests the manufacture of a specific functional type.

The single example of a worked knife exhibits very regular invasive lamellar/oblique retouch extending from the edge onto both faces of the tool (Plate 5.21, b). The margin opposite the knife edge is either a break, or possibly has been burinated to square the edge. Unifacial retouch is also present at either end of the break facet as a form of backing. Both ends of the knife have also been utilized: steep scalar unifacial retouch is present on one convex end, associated with edge crushing and a substantial degree of polish, suggesting use as a scraper. The opposite end, which lacks evidence of intentional shaping, is straight thin edge exhibiting moderate use damage and polish. A cutting or wedging function may be proposed on the basis of edge morphology. Alternatively, use damage in this area may be a by-product of use of the knife portion of the tool in butchering activities. Polish is well developed on both faces of the tool, associated with the knife edge. Also present on one face of the tool are a series of sub-parallel, oblique striations, apparently relating to tool use.

Tabular Bifaces

Measures of edge thickness on tabular bifaces average approximately 0.9 cm, and edge angles cluster relatively closely around a mean of 65.5° (Figure 5.28). On the two complete specimens, the chord of the retouched edge measures over 12 cm in length. Modification of the functional edge takes the form of broad, scalar to irregular bifacial retouch. On 2 fragments recovered at one site, the retouch scars are shallow, invasive and highly uniform in appearance (Plate 5.18).

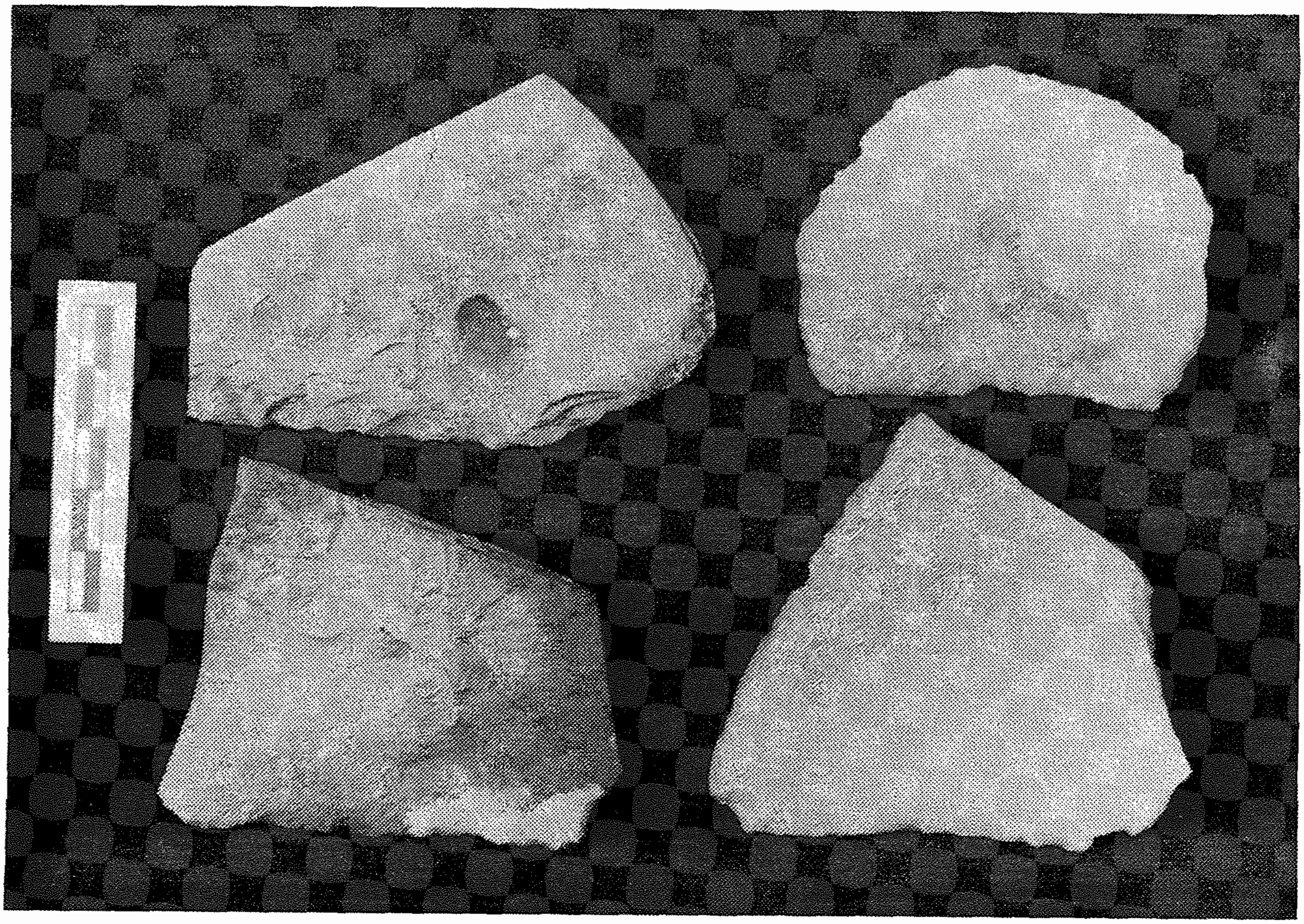
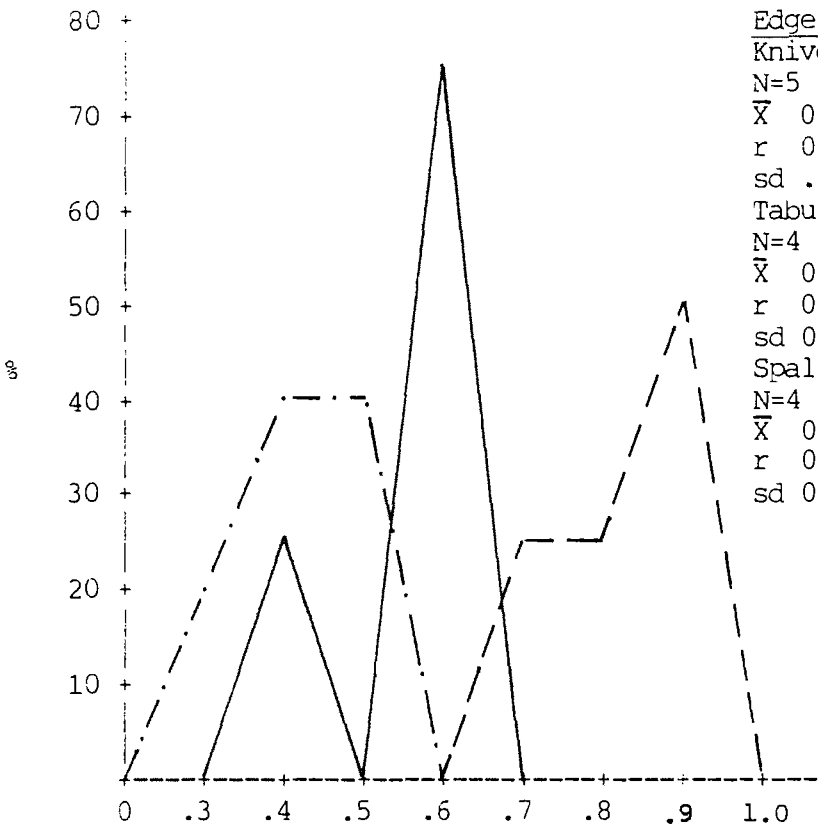
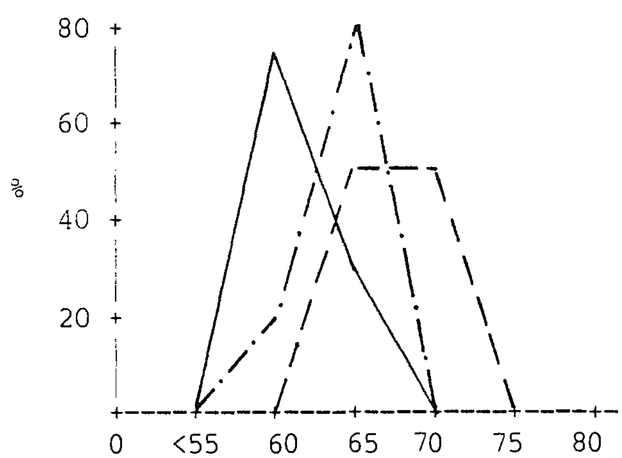


Plate 5.17: 'Knives' Manufactured on Tabular Fragments or Frost Spalls

Figure 5.28: Metric Attributes of Large Tabular Implements



Edge Thickness
Knives —·—·—
N=5
$\bar{X}$ 0.38 cm.
r 0.3 - 0.48 cm.
sd .08
Tabular Bifaces — — —
N=4
$\bar{X}$ 0.895 cm.
r 0.7 - 1.13 cm.
sd 0.19
Spall Scrapers ————
N=4
$\bar{X}$ 0.51 cm.
r 0.32 - 0.6 cm.
sd 0.18



Edge Angle
Knives N=5
$\bar{X}$ 62o r 60o-65o
sd 1.2
Tabular Bifaces N=4
$\bar{X}$ 65.5o r 64o-70^{o}
sd 1.3
Spall Scrapers N=4
$\bar{X}$ 60.5^{o} r 58^{o}-64^{o}
sd 2.5

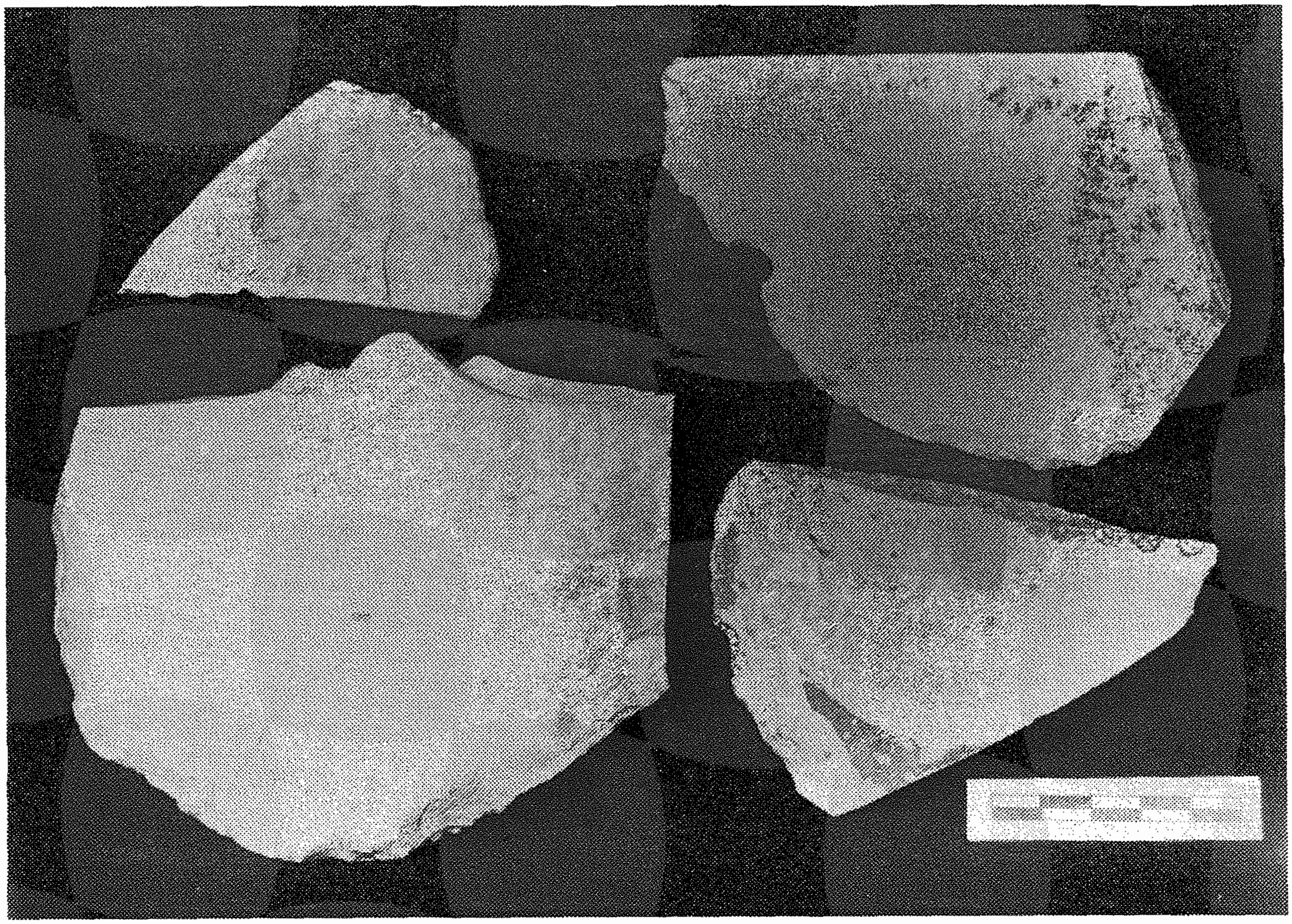


Plate 5.18: Tabular Bifaces

Spall Scrapers

Edge thickness of the spall scrapers averages approximately 0.5 cm, and edge angles cluster very closely around a mean of 60.5° (Figure 5.28).

One true boulder spall scraper also exhibits a steep scraper or scraper plane edge on the distal/left margin adjacent to the more acute angled utilized distal margin. The implement is made on a large, dark grey quartzite flake. Polish is present on both dorsal and ventral faces of the flake, associated with the acutely angled scraper edge.

The remaining spall scrapers (n=3) in the sample are made on a variety of frost spalls which exhibit a markedly plano-convex cross-section. Modification of the scraper edge appears generally limited to use damage. One very large spall scraper exhibits irregular to scalar edge retouch on the margin which may be a combination of intentional and use related modification. Bifacial retouch is also present on a portion of the opposite edge of the implement, probably as a form of backing (Plate 5.19, 5.20).

Ulu/Semilunar Knife

A single example of what appears to be a chipped ulu blade or semilunar knife was recovered in the Rock River area (Plate 5.21, a). The implement is manufactured on a frost spall of the locally available silicious argillite. The convex edge has been shaped by uniform lamellar to parallel, oblique bifacial retouch, which tends to be marginal to slightly invasive in extent. This type of retouch was also noted on the knife/scraper combination tool recovered at the same site. There is no obvious indication the ulu was hafted: natural backing is present in the form of cleavage plane surface.

Chronology and Distribution

Knives

The sample of knives in the Rock River collections may be compared either with the morpho-technological class of straight-edged unifaces (Anderson 1968b; Workman 1978; Millar 1981), or with certain straight-edged tabular bifaces (or bifacially retouched tablets). As noted above, the combination of expedient production and raw material

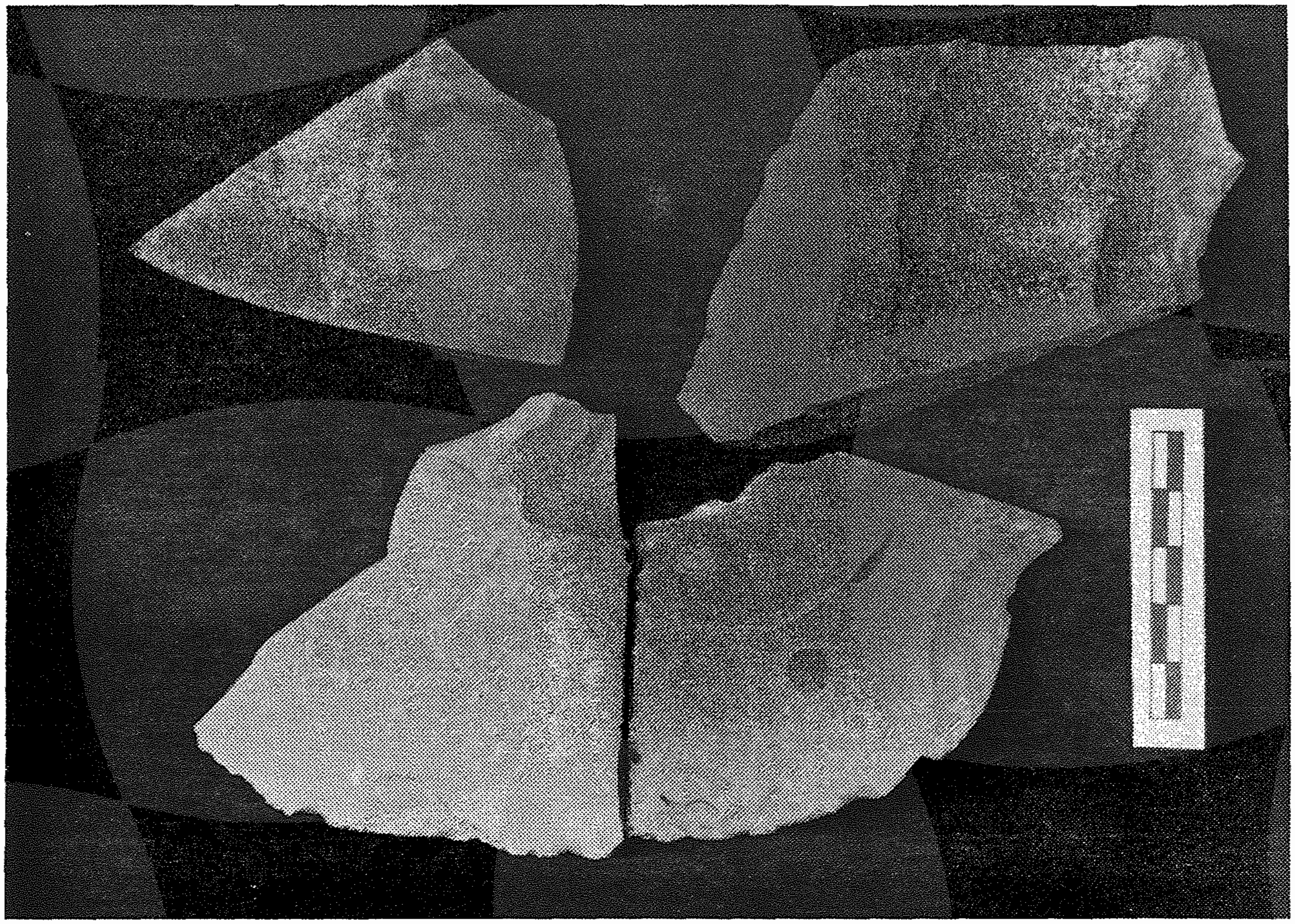


Plate 5.19: Spall Scrapers. Implement on the Lower Right also Exhibits Localized Steep Unifacial Retouch

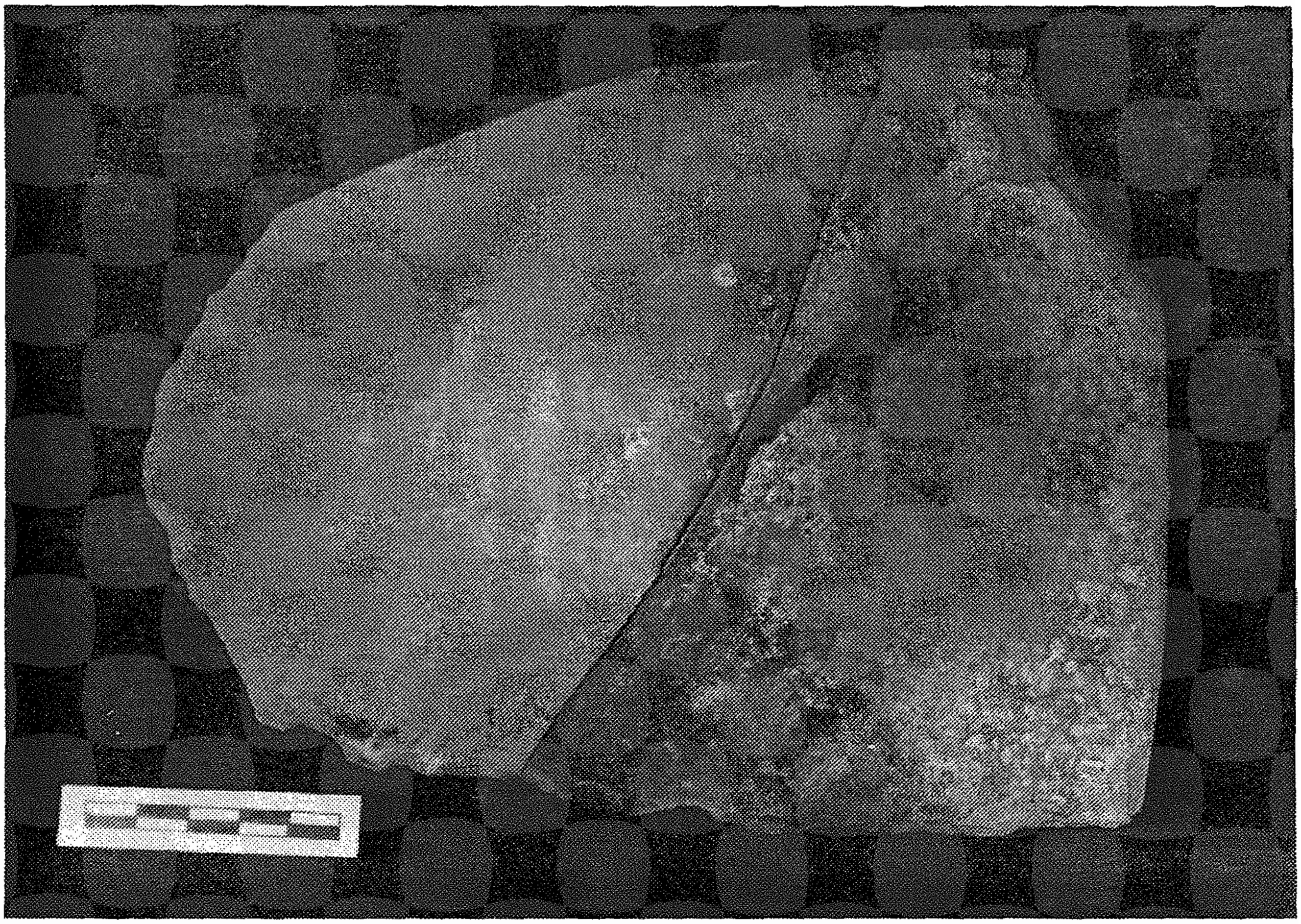


Plate 5.20: Large Spall Scraper

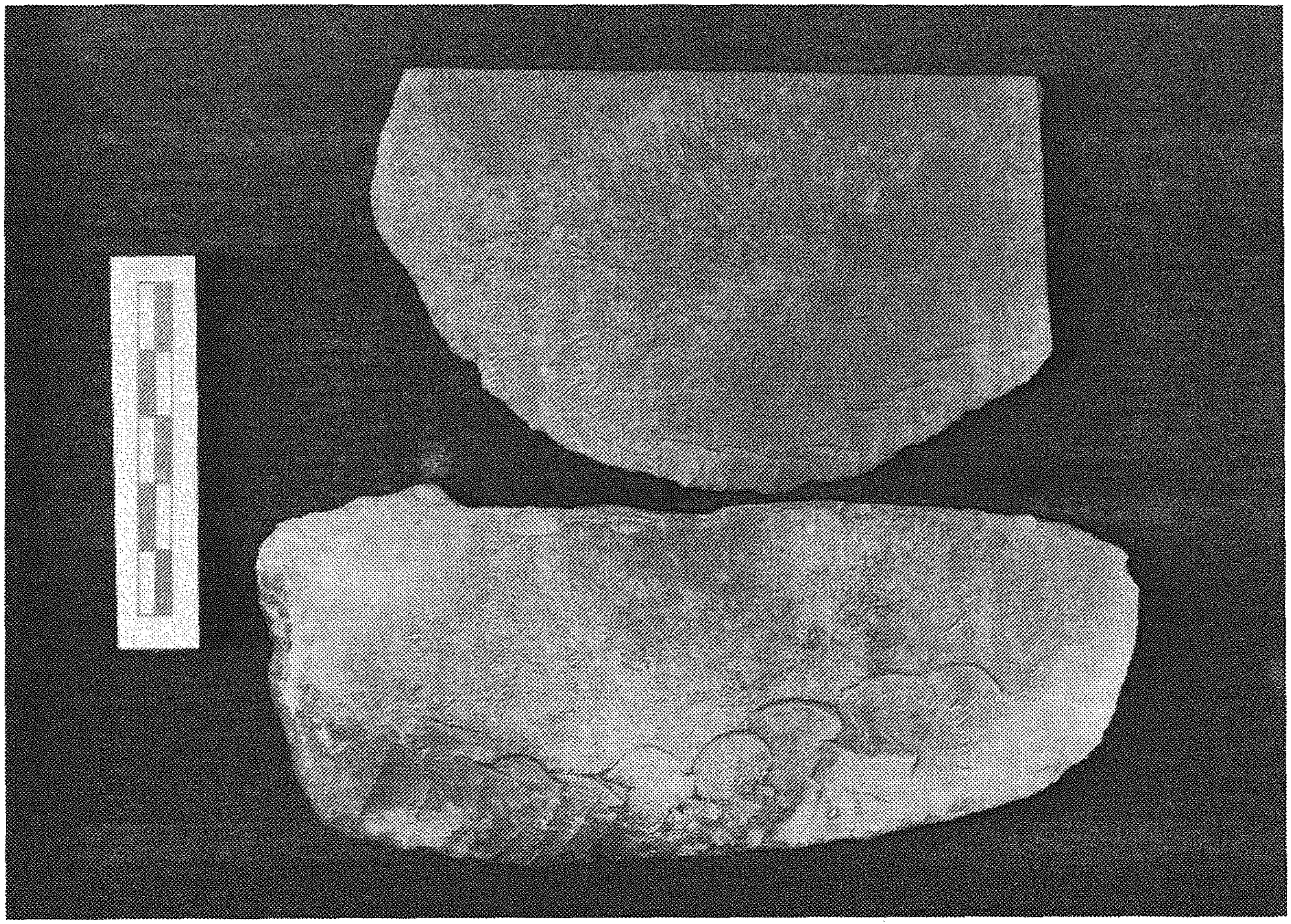


Plate 5.21: Ulu and Knife/Scraper Combination - Probable Examples of Paleo-Eskimo Technology

constraints in the manufacture of knives in the Rock River area suggests that the distinction between bifacial and unifacial retouch may not be locally significant, or even appropriate.

On the basis of the available information, straight-edge unifaces or unifacial flake knives appear to be widely distributed in the interior Northwest. In the Akmak assemblage at Onion Portage, Anderson (1970a:56-57) describes a sample blade and flake knives exhibiting primarily unifacial edge trimming or use damage in the form of irregular discontinuous flake scars. A high degree of variability is present in this functional class in terms of both size and type of blank selected.

West (1981:125) reports unifacial knives as a component of the Denali complex or Beringian tradition.

Utilized blade-like flakes, which may have functioned in cutting activities, are present in Dry Creek Component II (Powers 1982:60).

Unifacial knives made on flakes are present in the British Mountain component at Engigstciak (MacNeish 1959a:46) and in Trout Lake British Mountain components (Gordon 1970:77).

Large lateral unifaces, occasionally exhibiting straight edges, are noted by Millar (1981) in both the Northern Plano Nakah Phase and Northwest Microblade tradition Pointed Mountain Phase assemblages at Fisherman Lake. Millar (1981:271-272) at one point distinguishes between lateral unifaces and scrapers, and compares the former to certain flake unifaces in Akmak (Anderson's functional type 'knife'); judging from the specimens illustrated (Millar 1981: Figure 11), however, the majority of lateral unifaces, at least in the Pointed Mountain Phase, are steeply retouched, and in the present analysis would be described as scrapers.

Anderson (1968b:17) describes large unifaces with a single straight edge as a characteristic trait of all phases of the Northern Archaic tradition and derivative complexes in the interior Northwest. In this regard, Workman (1978:297) views as significant the presence of similar large, straight-edged unifaces in only pre-ash components in southwest Yukon. The functional status of the Northern Archaic straight-edged unifaces is, however, uncertain on the basis of the descriptions provided: Anderson (1968b:4,35) labels these as 'knives' at one point in his report on the materials in Phase I of the Palisades II complex at Onion Portage. In a later discussion, however, retouch on the tools is described as steep, and a woodworking or cutting function is suggested, which also appears borne out by the presence of heavy use crushing on the edges (1968:17). Workman (1978:297) also observed steep retouch on the southwest Yukon sample. Edge thicknesses in excess of 0.25 cm are reported by Workman (1978:297) for his southwest Yukon unifaces, which is within the range observed for some of the Rock River knives.

As noted above, straight-edged, bifacially retouched knives (made on tabular blanks, as opposed to flake blanks) are apparently not a common implement form in the interior Northwest. Le Blanc (1984:276) reports isolated examples of triangular and rectangular bifacially retouched tablets in the prehistoric Athapaskan assemblages at Rat Indian in northern Yukon. He also reports two examples in the general class of bifacially retouched tablets exhibiting sharp edges, as opposed to the conventionally blunted edges. Le Blanc, however, assigns a scraping function to all these forms.

The diagonal retouch present on the combination knife/scraper bears a strong resemblance to the type of retouch characteristic of Norton tradition technologies. Norton-like implements are well represented in the northern Yukon, at Engigstciak, and in the Firth River area (MacNeish 1956; Dumond 1977:105,112); in the Trout Lake area (Gordon 1970:74); and on the Mackenzie Delta, at Whirl Lake (Gordon and Savage 1974). In Alaska, the Norton tradition is dated approximately 3000 B.P. to 1000 B.P. (Dumond 1977:105ff).

Tabular Bifaces

Workman (1978:239) observed of the southwest Yukon sequence, that " ... (r)etouched tabular implements, although perhaps having deep roots in southwest Yukon technologies, reached their peak of popularity after the ashfall, in the first millennium A.D., and persisted well into this century". Workman has traced the distribution of these implements to the east, in Arctic Small Tool tradition context (ca. 4000 B.P.) in the central District of Mackenzie, where they also persisted into later traditions, and in the Barren Grounds, where this implement type is dated to approximately 5000 B.P. Tabular bifaces are also reported as present in the Pacific Eskimo area by about 3000 B.P.

The small sample of tabular bifaces in the Rock River collections does not differ significantly in any feature from the forms described by Workman in southwest Yukon, or by Morlan (1973a:259) at Klo-kut, or at Rat Indian Creek (Le Blanc (1984:276) in northern Yukon.

It is of interest for the general discussion of the prehistoric record in the Rock River area that Workman (1978:239) has observed an inverse temporal distribution of tabular bifaces and large bifaces.

Spall Scrapers

Spall scrapers, variously described as 'modified cobble spalls' (Le Blanc 1984:238), 'boulder spalls' (Morlan 1973a:251; Workman 1978:315), 'cobble scrapers' (Powers 1982:12), and 'boulder chip artefacts' (Anderson 1968b:13), have a long history in the interior Northwest. Workman (1978:316) has suggested that their absence in an assemblage is, in fact, more noteworthy than their presence.

Powers (1982:12) reports this implement type in the non-microblade Component I assemblage at Dry Creek. West (1967:372) included boulder chip scrapers (which he equates with <u>tci-thos</u>) as a possible diagnostic of the Denali complex, and later described these tools as an element of the wider Beringian tradition (West 1981:92).

Anderson (1968b:13) reports the sporadic occurrence of boulder chip artefacts throughout the Northern Archaic Palisades II sequence at Onion Portage, although they do not occur in the assemblages of the final phases. Spall scrapers are common in later interior components.

Spall scrapers are essentially expedient tools which may be unifacially retouched or unmodified, and are occasionally bifacially retouched (Workman 1978:316). They do not break down into any obvious typological categorization.

Ulu/Semilunar Knife

The single example of a chipped ulu blade in the Rock River collections exhibits the diagonal retouch characteristic of the Paleo-Eskimo technologies, and may be considered, together with the combination knife/scraper described above, as evidence of Paleo-Eskimo (possibly Norton tradition) occupation of the Rock River headwaters.

Pieces Esquillees

In the Rock River collections, _pieces esquillees_ are recognized by the presence of crushing or battering on opposed margins, or a crushed margin opposite a plane surface (cortex or cleavage plane). These implements probably were used as wedges in the working of hard organic materials (cf. MacDonald 1968, Le Blanc 1984).

Most of the _pieces esquillees_ in the Rock River sample are produced on small chert pebbles that have been broken using the bipolar technique. Hayden (1980) distinguished _pieces esquillees_ and bipolar cores principally on the basis of the use of flake/blade segments or tool fragments as blanks for the production of the former; and the use of pebbles for the latter. Excluding attributes which relate to the nature of the original blank or support piece, Hayden (1980:2-3) lists the criteria which characterize _pieces esquillees_ as:

- flakes removed from either end often extend down only a fraction of the dorsal or ventral face of the original flake or blade segment;

- such pieces are generally not very thick -- contrary to MacDonald's statement (1968) that _pieces esquillees_ are often made from thick flakes or blocky core fragments -- and they may even occur as very diminutive pieces.

In contrast, bipolar cores:

- are sometimes thick, and can even have thick flat bases;

- show evidence of primary flakes having been detached from one or more faces even though such primary flakes are often very small or even micro-chips;

- have flake scars often extending the full length of the core.

The majority of the Rock River _pieces esquillees_ show traits of both bipolar cores and true _pieces esquillees_. The initial production of the tool by the splitting of pebbles using the bipolar technique, and spalling and breakage in the course of tool use probably accounts for the appearance of attributes on the Rock River _pieces esquillees_ characteristic of bipolar cores. That these are tools, rather than cores, is supported the presence of a second functional edge on four of the specimens.

Eight pieces esquillees have been identified from the Rock River area. Two pieces esquillees recovered at MfVa-9 and MfVa-14, were excavated from the humus layer and from level II respectively (Plate 5.22).

The manufacture of pieces esquillees on locally available split chert pebbles appears to be a distinctive feature of the sample. (Six of the eight pieces esquillees in the sample are split chert pebbles.) Morlan (1973a:234) and Le Blanc (1984:183) both report the use of flakes as blanks in their respective samples, albeit flakes derived from the pebbles which are readily available on the Porcupine River gravel bars (Morlan 1973a:171; Le Blanc 1984:209). Possibly there is an optimum size range for pieces esquillees which, in the Rock River area, could only be attained, in most cases, by the use of the entire pebble. Pebbles in the Rock River area are characterized by the presence of numerous faults and inclusions and are generally small sized. The use of chert in the manufacture of pieces esquillees, is also unusual in the general context of the Rock River collections, where suitable flake and frost spall fragments abound. The preference for chert in the manufacture of pieces esquillees probably relates to the fact that chert is harder than silicious argillite and is of greater use for the function to which the tool was put.

Characteristic of the Rock River sample is the virtual absence of any preparation or rejuvenation of the working edges; in general, an appropriate margin was selected on a split pebble or flake and used without modification. Small chert pebbles are comparatively abundant in sites north of the middle branch of the Rock River, which probably contributed to the expediency observed in the manufacture of this implement type. Despite this expediency, however, the sample exhibits a relatively uniform range of edge length and thickness measures. This suggests either that the functional requirements for this tool class were fairly stringent, or that there was a limited range of sizes available in the pebble sample. Edge lengths range between 1.1 - 2.3 cm with an average of approximately 1.8 cm. Edge thicknesses cluster closely around a mean of 1.8 cm, and edge angles range between 60° and 85°, with the majority tightly clustered between 70° and 80° (Figure 5.29).

Location of the utilized edges on the pieces esquillees (on the long or short axis of the blank) appears fairly random, and is probably dependent on the availability of an appropriate edge.

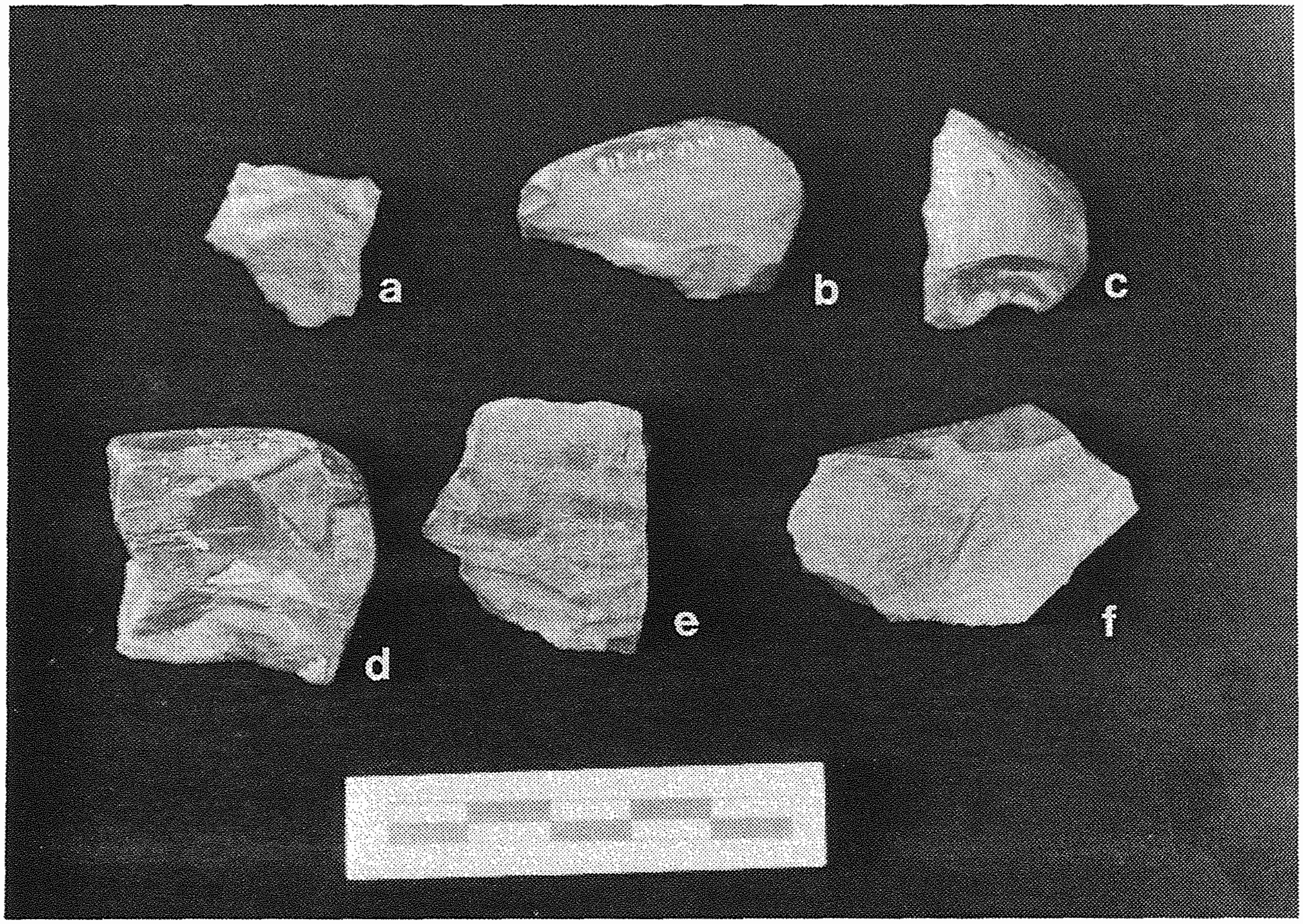
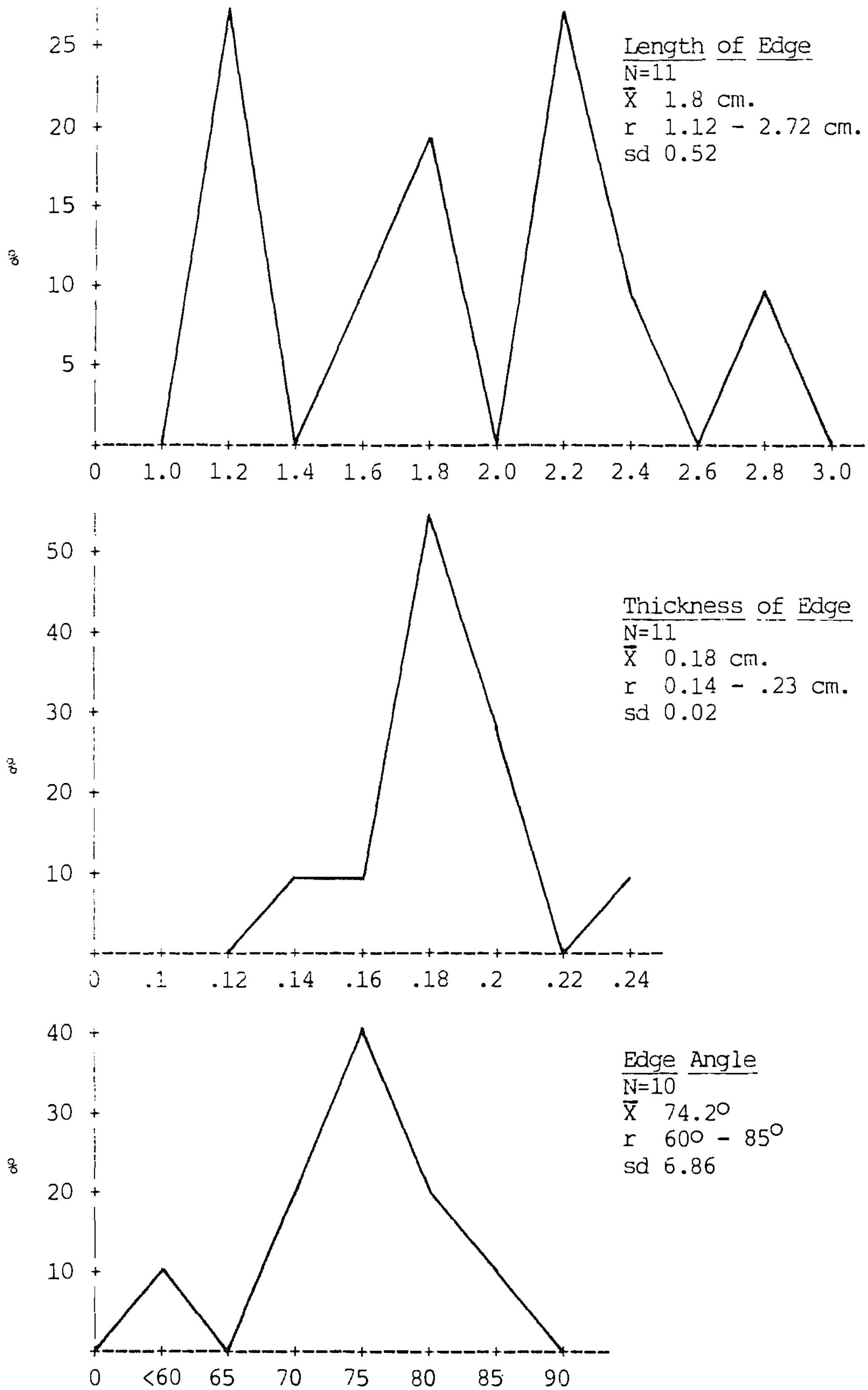


Plate 5.22: Pieces Esquillees (d) and (f) also Exhibit Use as Scrapers on One Margin. (b) Combination Scraper/Piece Esquillee/Beaked Implement

Figure 5.29: Metric Attributes of Pieces Esquillees



Multipurpose Pieces Esquillees

A significant feature of the Rock River *piece esquillee* sample is the presence of additional functional edges on the implements. Four *pieces esquillees* can be described as multipurpose tools, including combinations of *piece esquillee*/scraper (n=2) (Plate 5.22, a, d), *piece esquillee*/scraper/beaked implement (n=1) (Plate 5.22, d) and a possible *piece esquillee*/burin (n=1). The latter implement is used as a burin on a thick transverse break. Workman (1978:313), in observing the nearly complementary distribution of *pieces esquillees* and burins in the interior Northwest, has suggested that *pieces esquillees* and burins may be essentially functionally equivalent. The use of the break margin on this implement in a scraping fashion should not be assumed to indicate persistence of the burin technique.

Chronology and Distribution

In the interior Northwest, *pieces esquillees* or wedges are a characteristic implement of late prehistoric Athapaskan technologies from approximately the beginning of the first millennium A.D. (Workman 1978:313). *Pieces esquillees* are reported only sporadically from early, non-microblade context in the Chindadn complex at Healy Lake (Clark 1983:34), and at Acasta Lake (Noble 1971:104). Judging from the published descriptions, they are virtually absent in early microblade complexes and in Northern Archaic tradition assemblages (Anderson 1968b, Workman 1978:313, Millar 1981, West 1981).

The popularity of *pieces esquillees* in Athapaskan technology, particularly in northern Yukon, is attested to by the frequency with which they occur in the assemblages. Workman (1978:315) reports 39 *pieces esquillees* in the collections from southwest Yukon. At Klo-kut, Morlan (1973a:234) recovered 90 *pieces esquillees*, and at Rat Indian Creek, Le Blanc (1984:186) excavated a rather overwhelming sample of 386 *pieces esquillees*, primarily from the level 5 deposits.

The *piece esquillee* sample in the Rock River collection is numerically only a dim reflection of the Porcupine River sites. Proportionately, however, at MgVa-12, of the total sample of eight edge retouched and utilized implements, half were *pieces esquillees*.

The combination of *piece esquillee* with scraper edges noted on four implements in the Rock River sample, was also observed by Le Blanc (1984:186) on nine implements in the Rat Indian collections. Morlan (1973a) does not report scraper/piece esquillee combinations from Klo-kut. Two flake side scrapers are described in the collections, however, which exhibit crushing and some polish on both proximal and distal margins (Morlan 1973a:220), suggesting that these tools may have functioned as pieces esquillees as well.

The Technology of Edge Retouched and Edge Modified Tools: Summary and Discussion

In summarizing the results of the preceding analysis, two observations on the implement production technology of the Rock River area merit particular attention because these bear directly on the question of artefact typology.

The first observation concerns the degree of formality or standardization characteristic of the production of edge retouched and utilized implements. This problem was addressed primarily in the examination of the subsets of implements manufactured on blades, and on non-local cherts, which are commonly presumed to represent examples of formal and curated technology respectively. Although the small size of these samples does not allow any firm conclusions, it was apparent, particularly in the sample of chert tools, that curation and standardization with respect to the production of 'culturally' distinctive tool types (cf. Binford 1973) need not invariably be associated in a given technology.

With a few exceptions, most implements made on non-local chert in the Rock River collections were produced rather opportunistically or expediently, and most do not appear to represent morphologically formalized or standardized tool types. Expediency, with the intent to achieve least effort, may be manifest in the decision to use available frost spalls, for example, rather than to produce a flake or blade blank; effort can also be conserved in using a suitable edge or break margin on the blank rather than producing the desired functional edge.

Varying degrees of expediency or opportunism may, at least situationally, characterize an otherwise formal technology. In the sample of implements made on blades in the Rock River collections, the use of blade-like flakes may be an example of this kind of opportunism. Anderson (1970a) noted a similar trend in the American Paleo-Arctic Akmak technology. Expediency in the production of blades is discussed in more detail in Chapter 7.

These observations have major implications for conventional artefact typology, which depends on the assumption that implement production will be standardized within the context of a particular technology. Furthermore, if, as at Rock River, an informal approach to lithic tool production is essentially the norm in the interior Northwest (with the exception of the early blade technologies), attempts to trace cultural relationships among assemblages on the basis of conventional morphological typology will meet with little success.

Recently, Magne (1985:20) and Bamford (1986) have also attempted to draw attention to the effects of curation and expediency on the character of lithic industries, as a factor of raw material availability. Bamford (1986:49) states: "Depending on the ways in which lithic material is procured and distributed, recycling and maintenance may vary spatially within a single society as distance to raw material sources increases, resulting in differing assemblage composition in behaviourally and ethnically identical sites".

In the analysis of the Rock River tool assemblage, I attempted to develop an alternative approach to conventional typology, which essentially makes use of Rouse's (1960) ideas concerning 'functional modes'. This approach was suggested by the presence of a relatively large percentage of multipurpose tools in the sample. Multipurpose tools are generally viewed as an adaptive response to the problem of the scarcity of good raw materials (cf. Vierra 1982:171; Binford 1979:263). In the sample of implements made on non-local chert in the Rock River collections this appears to some extent to be confirmed, as 50% of the chert tools exhibit multiple functional edges. However, 16% (n=14) of the sample of implements produced on locally abundant raw materials are also multipurpose tools: contrary to Vierra and Binford, raw material conservation was not a consideration in the production of these implements. I have proposed, therefore, that the combinations of functional edges on tools probably represent 'functional modes' important in the design of tools in a particular technological tradition. It should be emphasized again, however, that despite the consistent association of certain edges, these implements are not formalized or morphologically standardized types.

Numerically, burin, scraper and notch edges are the most frequently combined on multipurpose tools. The proportions of multipurpose tools by functional class are as follows:

Multipurpose burins: 34% (n=14) of the total burin sample (n=41).

Multipurpose scrapers: 32% (n=14) of the total scraper sample (n=44).

Multipurpose notched: 64% (n=9) of the total notched sample (n=14).

Multipurpose denticulated: 75% (n=3) of the total denticulated sample (n=4).

Multipurpose beaked: 23% (n=3) of the total beaked sample (n=13).

Multipurpose piece esquillee: 50% (n=4) of the total piece esquillee sample (n=8).

Multipurpose knife: 20% (n=1) of the total knife sample (n=5).

In order to test the proposition that certain functional modes are associated with a particular technology, the distribution of multipurpose tools in the various prehistoric traditions and complexes defined in the interior Northwest was examined.

Most multipurpose burins reported in the literature occur in the early blade and microblade complexes, variously defined as American Paleo-Arctic tradition, Denali complex, and Northwest Microblade tradition. The virtual absence of evidence for microblade production in the Rock River is of interest in this regard; possibly, as has recently been suggested, the presence or absence of microblades in an assemblage should not invariably be assumed to have historical significance (Clark 1981; Clark and Morlan 1983; Morlan and Cinq-Mars 1982). Alternatively, the presence of multipurpose burins in certain microblade assemblages and not in others may be informative of differences in the material culture remains which may not be due solely to site function.

The transverse burin/notch combination on a blade has been proposed as a trait of the northern Cordilleran tradition, or in some interpretations, the northern Plano tradition (Morlan and Cinq-Mars 1982, Clark 1983; 1987). Burin/scraper combination tools are reported from MacNeish's Little Arm and Gladstone Phases and from Dry Creek I and II (Powers 1982). Powers compares Dry Creek I to certain Paleo-Indian complexes in the early Holocene. The combination of burin,scraper and notch edges on a blade is thus far reported only at Bluefish Cave II (tentatively included in the northern Cordilleran tradition by Morlan and Cinq-Mars [1982]) and one of the Rock River sites. The association of these types of multipurpose burins with certain early complexes in the interior Northwest (albeit poorly defined and understood) is of interest, because these are in all cases, non-microblade technologies.

Scraper/notch combinations are present in Akmak and in the late prehistoric Athapaskan assemblage at Klo-kut. The combination of piece esquillee with various edges is also reported in late prehistoric Athapaskan assemblages in northern Yukon.

Multipurpose denticulated implements are reported only from the British Mountain Katakturuk Lookout sites in the Brooks Range. Clark (1983) has proposed that much of what was previously termed British Mountain may be included in his northern Cordilleran tradition.

Caution must be exercised in interpreting these data because it is possible that some implements bearing more than one functional edge were not described as such in the literature; however, there is an apparent tendency for at least certain of the multipurpose tools to exhibit a limited distribution in time and space. With additional information, including information on raw material availability to control for 'curation' as a factor in the placement of multiple edges on a tool, it may prove possible to more narrowly define the 'functional modes' proposed here.

CHAPTER 6

BIFACE PRODUCTION TECHNOLOGY

Introduction

Bifaces in various stages of production (n=278), and bifacially-worked fragments (n=132) are numerically the best represented class of artefacts in the Rock River collections. Because the production of bifaces requires a relatively greater investment of effort, involving several successive stages of reduction and shaping, this class of artefacts perhaps more than any other, has the potential to reflect patterned behaviour or conventions of manufacture (Wilmsen and Roberts 1978:27; Voss 1977). Assuming that manufacturing conventions are learned and shared within the cultural context (Young and Bonnichsen 1984:136), modes of biface production should at some level serve to characterize the technology or cultural tradition(s) of which they are a part.

The primary objective of this analysis is the identification of the various strategies of biface production represented in the Rock River collections as an initial step to the recognition and characterization of the products of the different technological traditions which appear to comprise the archaeological record in this region.

Previous Research

The approach used in the present analysis to the problem of recognizing and differentiating the products of different biface manufacturing traditions is based in large part on earlier studies by Muto (1971), Callahan (1979), and Bonnichsen and Young (1977; Young and Bonnichsen 1984). These investigators have adopted what is essentially a 'decision making' approach to the study of biface manufacture, which interprets variability in certain aspects of the production sequence as representing, or potentially representing, traditional choices on the part of the craftsman within the context of a particular stoneworking technology. The recognition of a coherent and systematic series of choices in biface production is interpreted by these researchers to characterize a specific biface manufacturing tradition.

Both Muto and Callahan undertook detailed experimental replication of bifaces in order to define the purely "litho-mechanical" and design requirements for the successful production of the biface form. Optimal cross-sectional morphology and edge angles were recognized for successive stages of reduction (see especially Callahan 1979:36), and techniques of platform preparation and flaking were examined with respect to the immediate goals of a given reduction stage.

Muto applied the findings of his experimental work to three archaeological samples representing Clovis (Simon site) and Archaic (Spring Creek Cache and the Braden Burial site) technologies. In the respective biface technologies of these traditions, he was able to recognize systematic variation in the features of platform preparation, type of percussion, flaking patterns (including order of flake removal) and flaking sequence; in the finished bifaces, he noted differences in the degree of invasiveness of flaking, presence/absence of pressure finishing, preparation of the haft element, and shape (Muto 1971:86ff).

Callahan's (1979) research was intended to demonstrate the existence of distinct lithic subtraditions within the greater Clovis fluted point tradition in Virginia. While he did not attempt a systematic application of the results of his replicative studies to the archaeological record, he was able to identify the stages in the reduction sequence in which variation could be introduced. More precisely, variation in this context would reflect either individual choice or traditional behaviours on the part of the craftsman. Callahan (1979:165) observed that while variation may be introduced at any stage in the reduction sequence, (blank selection, for example, will affect decisions made in subsequent stages), it is primarily in later stages of biface reduction that cultural preference will become apparent, particularly in the flake removal sequence or patterning of flake scars.

Bonnichsen and Young (1977; Young and Bonnichsen 1984) adopted a "cognitive approach"[1] to the interpretation of variation in lithic technology in which the individual artefact is the basic unit of analysis as a record of decision making, behavioural processes and use (Bonnichsen and Young 1977:10). The main focus of their approach is the

1 The use of the term 'cognitive' by Bonnichsen and Young is misleading, as it implies a knowledge of purpose or intent in the mind of the craftsmen. In fact, only the results of the the stoneworker's actions and intentions are available for the analyst.

reconstruction of manufacturing procedures for a given artefact form, reasoning that

> ... (m)anufacturing technology is more conservative and less easily communicated than a shape gestalt [sic] because manufacturing technique is a dynamic process involving extremely complex knowledge and motor skills ... The conservative nature of the manufacturing technology ... makes it diagnostic and therefore of use to the archaeologist in attempting to associate tools with particular culture traditions or groups of people (1984:136; but cf. Rouse [1939:145], who states that attributes of technique are the least useful in some kinds of prehistoric interpretation because they are extremely conservative).

Like Callahan and Muto, Bonnichsen and Young (1977:11) made use of the results of experimental replication to identify " ... those aspects of the artefact production strategy in which the craftsman had many options open to him ... ", reasoning that " ... (a)ttributes indicative of technology and, to a lesser extent, shape choices are probably useful for isolating discrete cultural patterns ... ". The goal and general approach to analysis here is similar to that of Callahan and Muto, differing only to the extent that Bonnichsen and Young concentrate primarily on the finished artefact form. Technological features which Bonnichsen and Young (1977:75ff) assume reflect the action of cultural preference at the level of the finished biface include platform preparation, type of biface thinning flake, and orientation of thinning flakes.

Bonnichsen and Young applied their analysis to a small sample of Clovis points from geographically widely separated regions (the Moosehorn site in Manitoba [n=2], and the Anzick site in Maine [n=2]) in order to examine the hypothesis that the spread of fluted point technology in North America represents the spread of a hafting technique and possibly associated elements of technology, rather than the single migration of a people. If migration occurred, Bonnichsen and Young propose a uniform technology for the production of fluted points should be evident in all Clovis assemblages throughout North America.

The Moosehorn and Anzick points (1984:140ff) differed in the kinds of platform preparation techniques and flaking undertaken to produce the finished form. A degree of dissimilarity existed as well in the production of the haft element. On this basis, Bonnichsen and Young (1984:149) concluded that " ... (a)lthough the points have similar shape characteristics, the underlying production codes are remarkably different". This is presumed to support the argument against Clovis representing a single migration of people throughout North America.

The analyses of Muto, Callahan, and Bonnichsen and Young are in general agreement as to the kinds of attributes which are considered potentially informative of the operation of choice in biface manufacture. However, these kinds of analyses must still be viewed as preliminary in nature. Much of the work to date focuses on experimental replication, with only limited application to the archaeological record. As Cross (1983:96) aptly phrases it: "reconstruction is not explanation".

Cross (1983) recently presented a critical appraisal of the 'motor behaviour' and the 'mental template' approaches to the interpretation of material culture remains which includes specific reference to the studies outlined above. In his critique, Cross examined some of the inherent assumptions in these kinds of studies which, he argued, are not always appropriate to the data, and, in most cases, have yet to be empirically tested. These assumptions are most commonly (Cross 1983:91ff):

1. Stone tool technologies or traditions are associated with a given subsistence level or culture-historical tradition.

2. All individuals have equal access to technology and raw materials.

3. All individuals are proficient stone workers (i.e. equally capable of realizing the cultural norm for a given implement type).

4. Implement production is unaffected by raw material availability or other situational constraints.

5. The social valuation of a specific implement type is equal in all prehistoric cultures (with reference to implements which may also function in the symbolic subsystem of culture).

It is relevant to review in some detail Cross' discussion of the problems associated with these assumptions.

The first assumption is a fundamental premise of most archaeological interpretation, but it cannot hold without the remaining assumptions also being true. Further, the association of cultural complexes and technological traditions in the archaeological record may not be simple and direct. Analyses of microblade production technologies in the interior Northwest, for example, (Cook 1968; Morlan 1970; Sanger 1970; Smith 1975; Ackerman 1980) which sought to identify manufacturing subtraditions or types of microcores on the basis of their manner and sequence of production, showed a widespread distribution in space and time of the various forms.

The second assumption Cross lists essentially requires that we have some knowledge of the prehistoric social organization of the particular group whose technology we are studying. If, for example, the working of stone is the province of specialists, or if raw material distribution is in the form of blanks or preforms acquired through trade with other groups, then there are corresponding and obvious implications for implement standardization and for rates of change in technology and form (Cross 1983:97).

Assumption three is central to the normative or 'mental template' approach to technological analysis which depends on the measurement of central tendencies to establish the norms of production. This assumption does not, however, take into account the activities of novices or less proficient stoneworkers whose efforts may be disproportionately represented in an assemblage (Cross 1983:98).

Assumption four is challenged by Binford's (1979:20-21) observations concerning the 'situational flexibility' of technology (see also Bamford 1986), and how this is manifest in the archaeological record in terms of expedient or curated technologies, or the expedient or curated production of certain implement types. In expedient technologies, for example, selection of appropriate edge angles and configurations apparently dominates considerations of ideal tool form or morphology (Cross 1983:98).

The final assumption listed by Cross does not take into consideration the symbolic or 'information-carrying' content of material culture. If a certain implement type is also functioning in a messaging mode -- for instance, projectile points acting in the definition and maintenance of social boundaries between groups -- " ... we may expect a rather sudden standardization of form" (Cross 1983:100). However, this may or may not occur to an equal degree in all technologies, and it is probable that only a portion of the technology will be involved. Clearly, current interpretations of lithic remains have made only limited progress in testing these assumptions.

Cross also raises an important point with reference to 'scale' in archaeological interpretation, which has particular relevance to the work of Muto, Callahan, and Bonnichsen and Young. In these investigations, observed variability in biface manufacturing sequences is interpreted to represent varying degrees of 'cultural' difference. Using basically the same suite of production features, Muto differentiates Clovis and Archaic tradition technologies; Callahan seeks to identify different local subtraditions of Clovis; and Young and Bonnichsen claim to have distinguished regional variants of Clovis which are produced by very different 'cultural codes'. Flake scar patterning and platform preparation, which are considered in these analyses to result from traditional choice in biface manufacture, are also described by Gunn (1975, 1977) as features that are potentially informative of individual or idiosyncratic preference in biface production (Cross 1983:90).

While a number of the problems Cross has discussed with regard to the current state of lithic analysis are far beyond the ability of the present analysis to resolve, the Rock River assemblage does provide an opportunity to control for factors of raw material access and the 'situational flexibility' of technology. It is hoped that on this level at least, the results presented here will contribute to the interpretation and understanding of technological variability in the prehistoric record.

Analytical Strategy

The isolation of culture-historically significant variation in biface manufacturing strategies in the Rock River sample has essentially involved a two stage analysis. The first stage examines variability in biface samples for which the cultural relationships and temporal placement are known. In this study, biface samples from the late Archaic Surma site in Ontario (Emerson and Reid 1961) and the Itivilik Lake site in Alaska (Irving 1964) were compared, as these two technological traditions are assumed to be historically and culturally unrelated.

A note of explanation is required concerning the Itivilik Lake collections. In order to obtain a numerically adequate sample, all bifaces from Itivilik Lake were included in the analysis. According to Irving (1964), the collections comprise Arctic Small Tool tradition, later Paleo-Eskimo (Norton?) material culture remains, and historic Eskimo technology. These components, however, could be expected to emerge as units distinct from the Surma bifaces.

Patterns of attribute co-variation which associate with a specific technological tradition in this study may be interpreted to characterize the reduction strategy of the tradition. This exercise is expected to confirm, and possibly to add some resolution to the results of the earlier investigations by Muto, Callahan, and Bonnichsen and Young.

The second stage of the analysis involves the description of the production strategies recognized in the Rock River biface sample. Variation in individual production features, and co-associations of features are interpreted incorporating the results of the study of the Surma and Itivilik Lake bifaces. A measure of control over the cultural relationship of some of the Rock River materials is provided by the presence in the sample of isolated projectile point 'types' for which cultural affiliations are known, and by the recovery of a small sample of bifaces in the two buried deposits.

The analysis of a small sample of bifaces (n=13) from two sites in the nearby Trout Lake area (NeVi-4, NeVi-8) (Gordon 1970) also provides some basis for comparison with the Rock River materials (analytical results are presented in Table 6.6). Two components were identified by Gordon at the Trout Lake sites: Norton tradition technology and British Mountain tradition technology. Materials belonging to the latter technology were excavated in part from buried deposits dated to between 4640 $\pm$ 110 and 5540 $\pm$ 125 B.P. (Gordon 1973:82).

Critical to any comparative analysis of biface production strategies is the ability to differentiate variation arising from the production of bifaces within the context of different technological traditions from variability as a result of bifaces being in different stages of production. In the culturally mixed Rock River sample, precise control over the products of various reduction stages is lacking; fortunately, however, the successful production of the biface form is a far from random process. "There are definite stages that (a biface) must go through during the reduction continuum ... each stage must be approached somewhat differently from the preceding stages or the necessary modifications in width/thickness relation and other salient attributes may not be effected and failure or rejection may result" (Callahan 1979:33).

Both Callahan (1979) and Muto (1971) undertook the reconstruction of biface reduction strategies for their respective collections through experimental replication, and defined essentially similar stage or sequence parameters:

Stage 1 - Blank selection

Stage 2 - Initial edging with primary intent to produce edge angles of between 55° and 75°. Preparation for subsequent flaking, so that bifaces become thinner rather than narrower.

Stage 3 - Primary thinning. Production of the desired section and cross-section. Edge angles are between 40° and 60°.

Stage 4 - Secondary thinning. Achievement of a flattened cross-section. Edge angles are between 25° and 45°.

Stage 5 - Shape/outline are achieved.

Stage 6 - Production of the haft element and retouching.

For the purposes of the present analysis, bifaces and bifacially worked specimens are grouped into four classes on the basis of degree of bifacial working, regularity of the margins, symmetry, and the presence/absence of use damage:

Finished bifaces - implements exhibiting signs of use related to their primary function. Also, implements which are near completion, exhibiting a regular outline, and relatively straight edges. This class corresponds to Callahan's stages 5 and 6.

Rough bifaces - implements exhibiting bifacial retouch on all margins and complete facial flaking on at least one face. Margins are irregular or sinuous. This class corresponds to Callahan's stages 3 and 4.

Partial bifaces - some portions of the margin lack bifacial retouch. Bifacial flaking is localized and/or restricted primarily to one face of the blank. This class corresponds to Callahan's stage 3.

Bifacially worked tablets - tabular or blocky fragments exhibiting localized bifacial flake removal or edge preparation. It is assumed that these specimens represent initial stages of tablet edge preparation for subsequent bifacial trimming. This class corresponds to Callahan's stages 1 and 2.

Variability in reduction strategy due to constraints of raw material and blank type can be controlled in the present sample because of the almost exclusive use of tabular fragments of the local silicious argillite for biface production by all groups occupying the Rock River area.

Most of the attributes used in the analysis of the biface samples are conventional measures or descriptions; detailed definitions are given in Appendix II.

Throughout the analysis a great deal of emphasis is placed on the Tau-b statistic (or Goodman and Kruskal's tau [Blalock 1972:300-302]), and the chi-square statistic. Both are concerned with the associations between non-parametric variables: the chi-square is a measure of the significance of the association between two variables, or their independence; the tau-b is a measure of the strength of the association, or how well one variable predicts the occurrence of a second (see Appendix III). Tau-b values are most simply interpreted as a percentiles: for example, if the tau-b value of two variables is 0.5, this signifies that the knowledge of one variable reduces the amount of error in the prediction of a second by 50%. Unlike the chi-square statistic, the tau-b is not limited by small sample size.

The Surma and Itivilik Lake Biface Production Technology

The Nature of the Sample

The majority of bifaces selected from the Surma and Itivilik Lake collections represent generalized forms interpreted to be at the level of preforms in the production sequence (Itivilik Lake n=16; Surma n=32). The class of finished bifaces is represented by 2 specimens in Surma (6% of the Surma sample), and 13 specimens in Itivilik Lake (50% of the Itivilik Lake sample). Bifaces at the initial stages of reduction are absent in the Surma collections, and are represented by 3 specimens (19%) in the Itivilik Lake collections.

In both samples, chert was used exclusively in biface manufacture. The Surma bifaces are made on Onondaga chert, which is characterized by numerous faults or inclusions. The Itivilik Lake sample is made on a variety of cherts which appear to be comparatively homogeneous. The effects of raw material quality on various aspects of the production strategy remains to be determined for the present sample.

Comparison of the Production Features in the Surma and Itivilik Lake Biface Samples

A comparison of the Surma and Itivilik Lake biface samples (Table 6.1) showed differences in the following features (tau-b values indicate the strength of the relationship between site membership and the features of biface production and morphology):

1. outline of finished bifaces (tau-b = 1.00).

2. position of maximum width of finished bifaces (tau-b = 0.40).

3. outline of flake scars on finished bifaces (tau-b = 0.71).

4. orientation of flake scars on finished bifaces (tau-b = 1.0).

5. number of flake scars on finished bifaces (tau-b = 0.26) and rough bifaces (tau-b = 0.11 - 0.375).

6. size of flake scars on finished bifaces (tau-b = 0.20) and rough bifaces (tau-b = 0.27 - 0.47).

7. biconvexity of finished bifaces (tau-b = 0.36).

The order of flake removal, which was found useful in the analyses by Muto and Callahan, was recorded for the Itivilik Lake bifaces only. These exhibited almost exclusively unifacial (50%) or alternate (45.5%) patterns of flake removal.

Significant differences in dimensions of both finished and rough bifaces were also noted in the Surma and Itivilik Lake samples. Dimensions of flake scars were significantly different in the two samples as well.

Before these features can be assumed to be useful diagnostics of different biface manufacturing traditions, however, the nature of their relationship to certain morphological or design features of the biface production sequence must be determined (Table 6.2).

Table 6.1: Association of Production Attributes with Site in the Surma and Itivilik Lake Biface Samples

ATTRIBUTE	FINISHED BIFACES (Tau-b)	ROUGH BIFACES (Tau-b)
Outline	1.0	0.11
Position of maximum width	0.4	0.02
Flake scar outline	0.71	0.07
Flake scar orientation	1.0	0.05
Number of flake scars	n/a	0.11 - 0.38
Size of flake scars	n/a	0.27 - 0.47
Cross-section	0.1	0.19
Biconvexity	0.36	0.12

Table 6.2: Association of Morphological/Physical Attributes of Bifaces and Biface Production Features in the Surma, Itivilik Lake and Rock River Samples

ATTRIBUTE	ROCK RIVER	ITIVILIK	SURMA
	Stage of Production		
Number of flake scars	0.76	0.46	0.30
Size of flake scars	0.11	0.11	0.05
Flake scar outline	0.05	0.33	n/a
Flake scar orientation	0.05	0.20	n/a
Order of flake removal	0.03	0.02	n/a
	Length		
Number of flake scars	F 0.18	0.68	n/a
	R 0.15	0.37	0.47
	I 0.01	n/a	n/a
Size of flake scars	F 0.77	0.67	n/a
	R 0.18	0.42	0.33
	I 0.36	n/a	n/a
	Thickness		
Order of flake removal	0.00	0.14	n/a
Edging technique	0.12	n/a	n/a
	Initial Edge Angle		
Edging technique	0.07	n/a	n/a
	Cross-Section		
Order of flake removal	F 0.1	0.17	n/a
	R 0.06	0.004	n/a
	I 0.11	n/a	n/a

Table 6.2 (continued)

ATTRIBUTE	ROCK RIVER	ITIVILIK	SURMA
	Biconvexity		
Order of flake removal	F 0.06	0.0	n/a
	R 0.05	0.03	n/a
	I 0.09	n/a	n/a
	Blank		
Order of flake removal	0.003	n/a	n/a

F - finished bifaces R - rough bifaces I - partial bifaces

Association of Production Features with Morphological and Design Constraints of Bifaces

Stage of Production

Conventionally, differences in the shape of functionally equivalent implements are viewed as important diagnostics of stylistic tradition in the archaeological record. Given the difficulty of interpreting the intended function of bifacial preforms and rough bifaces, however, outline, and the related feature of position of maximum width are of only peripheral interest to the present study.

Features such as shape or outline of flake scars and orientation of flake scars with respect to the longitudinal axis of the biface are also potentially useful indicators of different stylistic traditions of manufacture. The analysis of the Surma and Itivilik Lake biface samples suggests, however, that these flaking patterns become distinctive only at the level of the finished biface. Flaking patterns on bifacial preforms show apparently no association with the particular cultural tradition which produced them (outline of flake scars: tau-b = 0.02; orientation of flake scars: tau-b = 0) which further suggests that on the basis of these features, preforms in Surma and Itivilik Lake are virtually indistinguishable.

Stage of production also appears to be a factor influencing the number of flake scars on a biface (tau-b = 0.46), and to a lesser extent, size of the flake scars (tau-b = 0.1). Not unexpectedly, flake scars tend to be smaller and more numerous on finished bifaces.

There is no apparent relationship between production stage and the order of flake removal (tau-b = 0.02) or biconvexity (tau-b = 0.01).

Size of the Biface

For finished bifaces in the Surma and Itivilik Lake samples, a moderate correlation of size and number of flake scars with cultural tradition was noted. The question arises, however, as to the degree to which these features may be a factor of the significant size differences observed in the two samples. Tau-b values in fact indicate that length of the biface correlates strongly with size and number of flake scars in both the Surma and Itivilik Lake samples (Itivilik Lake finished bifaces: tau-b = 0.68; preforms: tau-b = 0.37. Surma preforms: tau-b 0.33).

However, when bifaces of the same size and production stage from Surma and Itivilik Lake were compared, the relationship of cultural tradition and size and number of flake scars became on the average stronger (number of flake scars: tau-b = 0.11 to 0.47; size of flake scars: tau-b = 0.27 to 0.47), which suggests that these features have some potential as discriminators of cultural tradition. In the case of Itivilik Lake, the pattern is for smaller bifaces to exhibit smaller and more numerous flake scars; in Surma, the trend is reversed.

Cross-Sectional Morphology

The relationship between the order of flake removal (unifacial, alternate or alternating) on a biface, and such features as biface thickness, cross-section and biconvexity were examined in the Itivilik Lake sample to discover the extent to which morphological or physical constraints influence the decision to undertake one or another of these types of flake removal sequences. Tau-b values in fact indicate only very weak relationships between order of flake removal and cross-section (tau-b = 0.03) and thickness of the biface (tau-b = 0.17). If the isolated examples of plano-triangular, convex-triangular and concavo-convex cross-section are disregarded, no relationship is in evidence between cross-section (biconvex and plano-convex) and order of flake removal. No relationship apparently exists between biconvexity and order of flake removal (tau-b = 0.03).

Blank Type and Raw Material

The potential effect of blank type and raw material on reduction strategy could not be determined on the basis of the available sample of Surma and Itivilik Lake bifaces.

Discussion

The observed tendency for a number of production features to correlate with stage of biface production is not unexpected; in combination, these features contribute (at least intuitively) to the decision to classify bifaces as finished or incomplete. For the purposes of this study, therefore, comparative analysis will proceed 'within class' or among bifaces determined to be in the same state of completion.

The strong correlation of biface size, and dimensions and number of flake scars requires that comparisons involving these attributes are made only on bifaces which are roughly of the same size; or alternatively, that flake scar number be expressed as an index of length.

The lack of association between the order of flake removal and various constraints of cross-sectional morphology in the Itivilik Lake sample suggests strongly that this feature is free to vary in response to individual choice or cultural convention.

Within these limits, and within the limits of the available sample from Surma and Itivilik Lake, the production attributes which have been selected for the present analysis all appear to be essentially 'independent' of morphological or design constraints. It is a reasonable assumption then that patterned associations of these attributes, if present, may serve to characterize the biface manufacturing strategy of a particular technological tradition.

Co-Associations of Biface Production Features in Surma and Itivilik Lake Bifaces

In the first stage of the analysis, flake scar outline, flake scar orientation, and size and number of flake scars were observed, within certain limits, to distinguish the Surma and Itivilik Lake biface samples. Order of flake removal, which was recorded for the Itivilik Lake sample, may be an important discriminator of manufacturing traditions as well (cf. Muto 1971). The second stage of the analysis entails the identification of patterns of association among certain of these features which may be interpreted to represent systematic and culturally determined strategies of biface reduction (Table 6.3).

Finished Bifaces

In the sample of finished bifaces from Itivilik Lake, two reduction strategies were recognized.

Unifacial flaking - parallel or variable flake scar outline, associated with subradial orientation of flake scars..

Alternate flaking - lamellar flake scars associated primarily with oblique orientation of flake scars.

Table 6.3: Associations of Production Attributes in the Surma and Itivilik Lake Samples

ATTRIBUTE ASSOCIATIONS	ITIVILIK	SURMA
Flake scar orientation and flake scar outline	F 0.33 R 0.32	n/a 0.16
Site, flake scar orientation and flake scar outline	R 0.07	
Order of flake removal and flake scar outline	F 0.72 R 0.04	n/a n/a
Order of flake removal and flake scar orientation	F 0.38 R 0.30	n/a n/a
Size and number of flake scars	F 0.52 R 0.33	n/a 0.1
Site, size and number of flake scars	R 0.44 - 0.75	
Order of flake removal, flake scar outline and orientation	F 1.0 R n/a	n/a n/a

F - finished bifaces R - rough bifaces

(The tau-b value for the association of order of flake removal and flake scar morphology is 0.72; the association of order of flake removal and flake scar orientation have a tau-b value of 0.38).

Both manufacturing strategies were characterized by small flake scars (less than 1.0 cm in width), and an average number of flake scars on bifaces of approximately 60 - 80.

Recalling that the Itivilik Lake sample is mixed, this separation in the finished biface sample is of interest. Specimens identified as definite A.S.T.t bifaces (Irving: personal communication), are alternately flaked, with lamellar flake scars and oblique flake scar orientation. Norton tradition bifaces approach this pattern, but with some variation (see also Irving 1964). Historic Eskimo bifaces, on the other hand, are unifacially flaked with parallel/variable flake scar outline and subradial orientation of flake scars.

The small sample of finished bifaces from the Surma collection requires that the interpretation of reduction strategies be somewhat more tentative. On the basis of the available sample, parallel or contracting flake scars predominate, exhibiting exclusively a subradial orientation on the biface. On the average, flake scars range between 1.0 - 1.5 cm in width and number approximately 40 per biface.

Rough Bifaces and Biface Preforms

As noted in the first stage of the analysis, production features are less distinctive in earlier stages of biface manufacture. In an effort to discover whether, in combination, these features would prove more diagnostic of a technological tradition of biface manufacturing, the associations of flake scar outline and orientation, and flake scar size and number were compared for the Surma and Itivilik Lake preforms.

Associations of flake scar outline and orientation are, however, indistinguishable in the two samples (tau-b = 0.07). In both the Surma and Itivilik Lake preforms, flaking is predominately collateral or subradial, associated with flake scars which are expanding in outline.

Flake scar size and number (controlling for biface length) are on the other hand, more strongly correlated with technological tradition (tau-b values range between 0.44 and 0.75), exceeding the degree of association observed between cultural affiliation and these features taken individually.

The very strong correlation observed between order of flake removal, and flake scar outline on the Itivilik Lake finished bifaces does not occur in the sample of rough bifaces (tau-b = 0.04), which exhibit predominately expanding flake scar morphology. The associations of order of flake removal and flake scar orientation, observed in the sample of finished bifaces, however, persist on rough bifaces (tau-b = 0.3).

Discussion

In the Surma and Itivilik Lake samples, finished bifaces exhibited distinctive patterns of flaking, involving flake scar outline and orientation, and size and number of flake scars. In earlier production stages, however, flaking patterns are not as well characterized. Only flake scar size and number proved to be moderately useful in differentiating rough bifaces in the two collections. This is in apparent disagreement with Muto's observations concerning the distinctiveness of early stages of biface manufacture in Clovis and Archaic samples, discussed earlier. In part, the problem may lie in the more limited suite of attributes described for Surma and Itivilik Lake bifaces, and in the smaller sample size, as compared with Muto's sample (80+).

The mixed composition of the Itivilik Lake sample, which, as noted earlier, contains A.S.T.t., later Paleo-Eskimo and historic Eskimo materials, may also contribute to the paucity of any distinctive manufacturing trends emerging in the sample of bifaces in earlier stages of production. For the purposes of the present analysis, however, it is significant that certain features of production, specifically flake scar orientation and order of flake removal, apparently persist from earlier to later stages in the biface manufacturing sequence.

Within the limitations of this test study it has been possible to demonstrate that specific co-associations of biface production attributes do permit the characterization and differentiation of the biface manufacturing strategies of two geographically distant and historically unrelated assemblages. Proceeding upon this basis, the Rock River biface sample will be examined to attempt to recognize and differentiate the products of different manufacturing traditions.

Biface Production Technology in the Rock River Area

The Nature of the Sample

In keeping with the designation of the majority of the Rock River sites as, at least in part, workshop/quarry sites, 88% (n=244) of the total biface sample (n=278) represents rough or partially worked bifaces; only 12% (n=34) of the sample is comprised of finished forms. A separate study has been made of tablets which exhibit some bifacial working (n=132); although these artefacts are cannot be categorized as bifaces, they can be considered to represent initial stages in the production of a biface from tabular blanks.

In 97.5% of the biface sample, raw material is the locally abundant silicious argillite. Only isolated examples of bifaces made on non-local raw material (n=7) were noted in the collections. In the technologies represented in the Rock River area, tabular fragments and frost spalls were strongly favoured as blanks for the production of tools, comprising 86% (n=132) of the sample for which blank type could be determined (n=153). In a few cases, flakes, blades, cobbles and thick, blocky pieces of silicious argillite were also used as blanks for biface production.

Breakage is a common feature of the biface sample, occurring either in the course of manufacture, or subsequently, as a result of frost action or trampling. In the case of finsihed bifaces, breakage during use may be represented in the sample also. Complete, or nearly complete bifaces (lacking only the tip or base) comprise only approximately 26% of the sample (n=72).

Association of Production Features with Morphological and Design Constraints of Bifaces

The associations observed in the Surma and Itivilik Lake samples, between the production features selected for this study, and constraints of production stage, biface thickness, cross-section, and biconvexity were essentially confirmed in the Rock River sample. The size and nature of the Rock River sample, in which bifaces in all stages of manufacture are well represented, also permitted a consideration of the additional features of blank type and initial edge angle of bifacially worked tablets to discover the degree to which these constrain, or fail to constrain decisions in the strategy of biface production. The results of this analysis are presented in detail (see also Table 6.2).

Stage of Production

Production stage and number of flake scars proved to be moderately to strongly correlated in the Rock River sample, with the predictable tendency for finished bifaces to exhibit the greatest number of scars (tau-b = 0.76).

As in the Itivilik Lake sample, the order of flake removal is apparently unrelated to production stage (tau-b = 0.03).

By comparison with the Itivilik Lake sample, however, features of flake scar size, outline and orientation exhibit a weaker association with production stage (tau-b = 0.11, 0.05, 0.05). One interpretation might attribute this to the fact that the sample represents the products of a number of different technological traditions. Other factors may be involved as well, including variations in the skill of the craftspeople, and the choice to adopt a more 'expedient' approach to biface production in the face of raw material abundance in a quarry area.

Size of the Biface

As in the Itivilik Lake and Surma samples, biface length and dimensions of flake scars are strongly correlated in the Rock River collections (finished bifaces - tau-b = 0.77; rough bifaces - tau-b = 0.18; partial bifaces - tau-b = 0.36). The association of the number of flake scars on a biface and biface length, on the other hand, is relatively weak in the Rock River sample (finished bifaces - tau-b = 0.11; rough bifaces - tau-b = 0.18; partial bifaces - tau-b = 0.15). Again, the explanation may lie principally in the representation of more than one production technology in the collections.

Cross-Sectional Morphology

The very weak correlation of thickness with order of flake removal in both the Rock River (tau-b = 0.0) and Itivilik Lake biface samples suggests that the decision to adopt unifacial, alternate or alternating patterns of flake removal was independent of this feature of the biface.

Thickness of the original tablet and type of edging technique employed in the production of a bifacial edge on the tablet (unifacial beveling, bifacial beveling, burination or no preparation), are only weakly related in the Rock River sample (tau-b = 0.12), with a slight tendency for bifacial beveling to be associated with tablets which are less than 2 cm thick.

As with the Itivilik Lake sample, cross-section and the order of flake removal appear unrelated in the Rock River sample (finished bifaces - tau-b = 0.1; rough bifaces - tau-b = 0.06; partial bifaces - tau-b = 0.11).

The index of biconvexity[2], as an indicator of cross-sectional symmetry of bifaces, also appears unrelated to the decision to adopt unifacial, alternate or alternating patterns of flake removal (finished bifaces - tau-b = 0.06; rough bifaces - tau-b = 0.05; partial bifaces - tau-b = 0.09).

Initial Edge Angle

In the Rock River sample, the initial angle of the squared edge of tabular blanks appears to be essentially unrelated to the type of edging technique employed in the production of a bifacial edge (tau-b = 0.07). Approximately 41% of the sample of tabular pieces do not exhibit any preparation -- bifacial flaking of the tablet proceeds directly from the squared edge. On these specimens there is a tendency for the initial angle of the squared edge to diverge from the right angle.

It is also of interest to note that the edging technique employed to prepare the squared edge does not appear to produce any marked differences in the resultant edge angle.

2 The index of biconvexity is estimated by the formula:

$$1 - \frac{h - d}{h + d}$$

Where h = height from the medial plane of the biface in cross-section, and d = depth of the biface from the medial plane (Isaac 1977:119; Figure 39).

Blank

In the Rock River sample, the types of blanks used in biface production included tabular fragments, blocky fragments, frost spalls, flakes, blades and split cobbles. Tau-b values suggest that there is no correlation of blank type with the order of flake removal (tau-b = 0.003).

Discussion

As in the study of the more limited Surma and Itivilik Lake biface samples, production attributes of the Rock River bifaces were found to be largely independent of morphological constraints of the biface form. Taking into consideration the fact that the Rock River sample is culturally mixed, biface size and stage of production were the sole factors which appeared to affect the expression of certain production features. As in the Surma and Itivilik Lake samples, comparisons in the Rock River sample will therefore proceed controlling for these features.

Associations of Production Features: Reconstructing Biface Production Strategies in the Rock River Sample

Finished Bifaces (n=34)

In the small sample of culturally diagnostic projectile points from the Rock River area, certain attributes of production, specifically flake scar outline and orientation, order of flake removal, and size and number of flake scars proved, to varying degrees, to be useful in distinguishing the various types (Table 6.4).

The single specimen (MfVa-13[5]:227) attributed here to Paleo-Eskimo/Norton tradition technology is characterized by lamellar oblique flaking, alternate flake removal patterns, and flake scars averaging around 0.5 cm in width. On this artefact, measuring approximately 6.0 cm in length, the total number of flake scars is about 60 (flake scar number/length ratio - 1.00) (Plate 6.1). (Strategy I)

A small cordiform or subtriangular biface point, recovered in surficial context at MfVa-17 (artefact number 309) exhibited a similar strategy of manufacture: flake removal from the biface is alternate, with a high flake scar number/length ratio (1.15). Flake scars are of small size

Table 6.4: Production Features of the Sample of Diagnostic Projectile Points in the Rock River Collections

POINT	FLSCFORM	FLSCOR	FLOR	PLPREP	FLSCNO/L
Norton	lamellar	oblique	alternate	grinding	1.00
Tuktu-like	parallel	collat.	alternt'g & chipping	grinding	0.75
Kamut	parallel	collat.	alternt'g	grinding	0.53
Kamut	parallel	collat.	alternt'g	grinding	0.48
Lanceolate (N. Cordilleran)	expanding	subrad.	alternt'g	grinding	0.53
Lanceolate (N. Cordilleran)	expanding	collat.	alternt'g	grinding	0.31
Lanceolate	parallel & expanding	subrad.	alternate	grinding & chipping	1.10

Table 6.5: Production Features of the Finished Bifaces Recovered in Buried Context at MfVa-9

SITE	FLSCFORM	FLSCOR	FLOR	PLPREP	FLSCNO/L
MfVa-9	parallel	subrad.	alternate & chipping	grinding	1.50
MfVa-9	parallel	subrad.	alternate	grinding	1.10

FLSCFORM - outline of flake scars
FLSCOR - orientation of flake scars
FLOR - order of flake removal
PLPREP - platform preparation
FLSCNO/L - flake scar number/biface length ratio

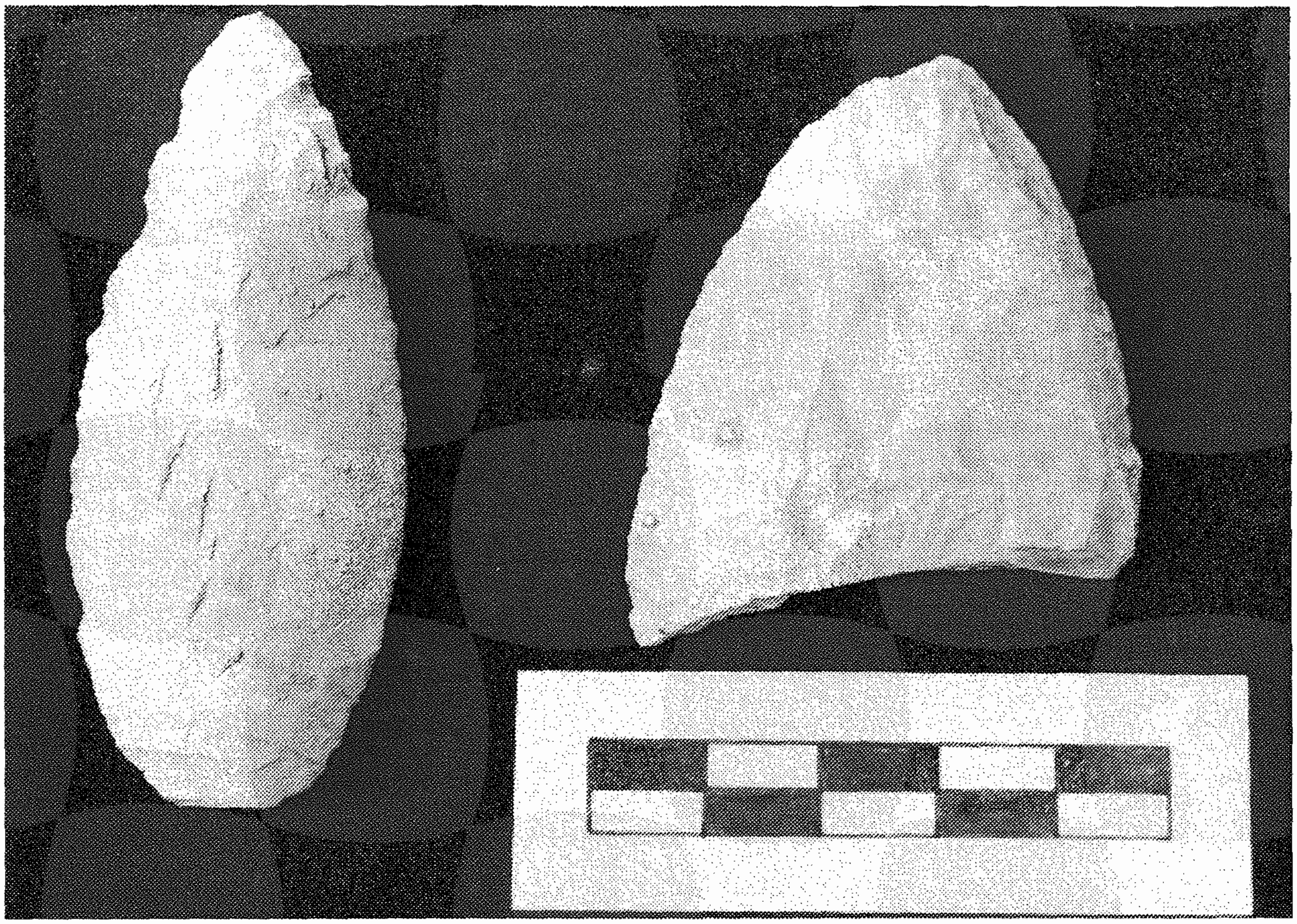


Plate 6.1: Finished Bifaces Exhibiting Alternate Flake Removal Pattern and High Flake Scar Number/Length Ratio (Strategy I). Paleo-Eskimo (Norton?) Point is Shown on the Left

(averaging 0.5 cm); unlike the Norton point, however, flake scars are generally expanding in form (Plate 6.2, a).

By comparison, two Norton points collected by Gordon (1970) in surface context in the Trout Lake area (NeVi-4: 207 and 27) exhibit lamellar oblique and parallel collateral flaking, unifacial flake removal patterns, and flake scars averaging about 0.46 - 0.56 cm in width. Flake scar number/length ratios are 1.47 and 1.57 for these points (see Table 6.6 for a description of the Trout Lake biface sample).

The two Kamut points (MfVa-17:18 and 220) and the Tuktu-like side-notched point (MfVa-9:3) (a reworked Kamut point), all exhibited parallel collateral flaking, alternating flake removal patterns, and an average flake scar width of approximately 1 cm. The ratios of flake scar number to length on the two Kamut points were approximately 0.50. The Tuktu-like point has a somewhat higher ratio of 0.75 which is probably attributable to some later reworking of the implement (Plate 6.3). (Strategy II)

Two examples of lanceolate points with highly convex or round bases (MfVa-17[5]:313 and MfVa-2:7) are present in the Rock River collections. Irving and Cinq-Mars have suggested that this type may relate to some form of "northern or Arctic Cordilleran complex or tradition" (1974:77). The production strategy characteristic of these implements was found to resemble very closely that observed on the Kamut points: flake scars are expanding in outline and predominately collateral in orientation. Flake scars are relatively large - averaging 1.5 cm in width. On both specimens, the order of flake removal is alternating. Flake scar number/length ratios are low to intermediate (0.31 and 0.53) (Plate 6.5).

In contrast, the manufacturing strategy observed to characterize a sample of more generalized, large lanceolate points (MfVa-2:4; MfVa-14:7; MfVa-17:103; MgVa-10:209; MfVb-2:209) differed markedly from the above: flake scars are predominately parallel to expanding in form; flake scar size is somewhat variable -- small parallel retouch scars along the margins are characteristic of these implements. Flake scar orientation is predominately collateral. The order of flake removal is in all cases alternate, and the flake scar number/length ratios are relatively high (averaging 0.9) (Plate 6.4). (Strategy III)

In addition to projectile points are a series of large bifaces which may have functioned as knives or scrapers. A number of asymetrical forms, exhibiting one straight and one excurvate margin (MfVa-7:2; MfVa-11:23; MfVa-13[5]:9 and 313; MfVa-14:64) were produced by alternate flaking and have a low to intermediate flake scar number/length ratio (0.4-

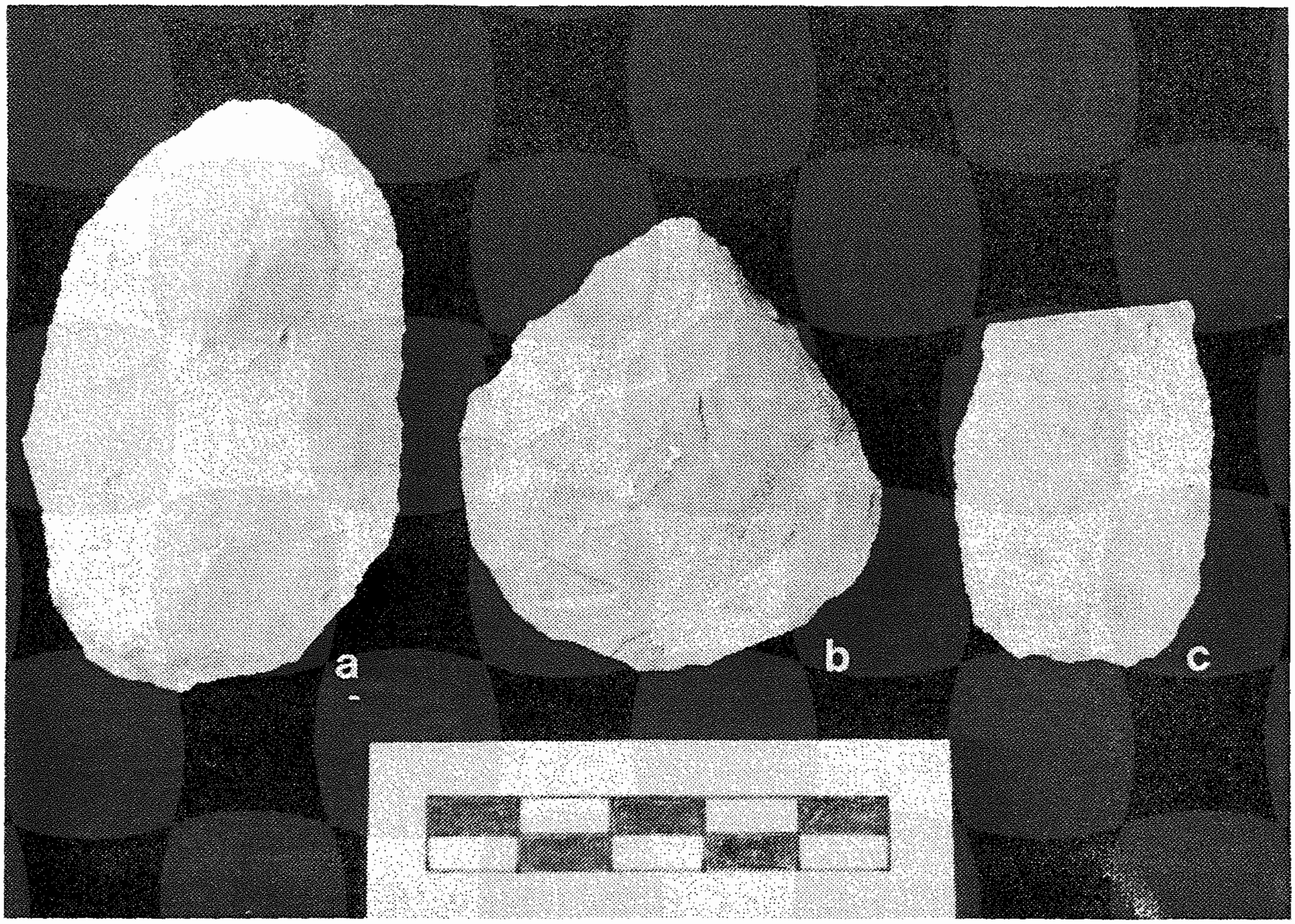


Plate 6.2: Finished Bifaces Exhibiting Alternate Flake Removal and High Flake Scar Number/Length Ratio (Strategy I). (a) and (c) were Recovered in Buried Context at MfVa-9

Table 6.6: Production Features of the Trout Lake Biface Sample

Finished Bifaces

SITE	FLSCFORM	FLSCOR	FLOR	PLPREP	FLSCNO/L
NeVi-4:147	expanding	subrad.	alternt'g	grinding & bev.	0.83
NeVi-4:25	expanding	subrad.	alternt'g	grinding (& bev.)	0.72
NeVi-4:29	expanding & parallel	collat. & subrad.	unifacial	beveling (& gr.)	0.83
NeVi-4:194	parallel	subrad.	alternt'g	grinding (& bev.)	1.10
NeVi-4:207	lammellar	oblique & collat.	unifacial	grinding	1.47*
NeVi-4:27	parallel & exp.	collat.	unifacial	grinding	1.57*
NeVi-8:9	variable	subrad.	alternate	beveling	1.00

Rough Bifaces

SITE	FLSCFORM	FLSCOR	FLOR	PLPREP	FLSCNO/L
NeVi-4:1	expanding	subrad.	alternt'g	grinding (& bev.)	0.57
NeVi-4:324	expanding	subrad.	unifacial	grinding & bev.	0.74
NeVi-4:185	expanding	subrad.	alternate	grinding & bev.	0.52
NeVi-4:23	expanding	collat. & subrad.	alternt'g	grinding & bev.	0.94
NeVi-4:211	variable	transv.	alternt'g	beveling & gr.	0.70
NeVi-4:111	expanding	subrad.	?	grinding	1.00

FLSCFORM - outline of flake scars
FLSCOR - orientation of flake scars
FLOR - order of flake removal
PLPREP - platform preparation
FLSCNO/L - flake scar number/biface length ratio

* Norton points

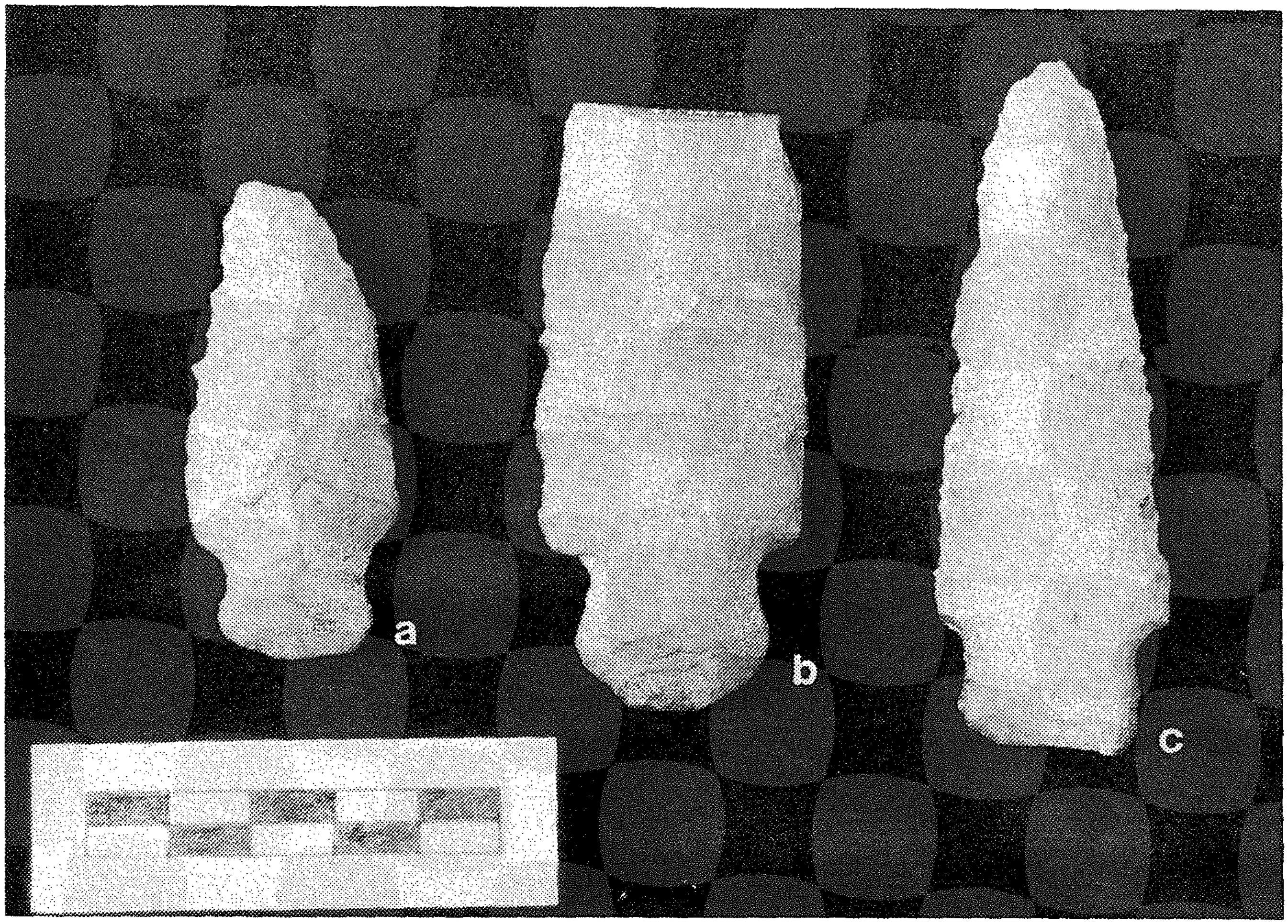


Plate 6.3: Finished Bifaces Exhibiting Alternating Flake Removal Pattern and Low Flake Scar Number/Length Ratios (Strategy II). (a) Re-worked Kamut Point; (b) Kamut Point; (c) Kamut Point

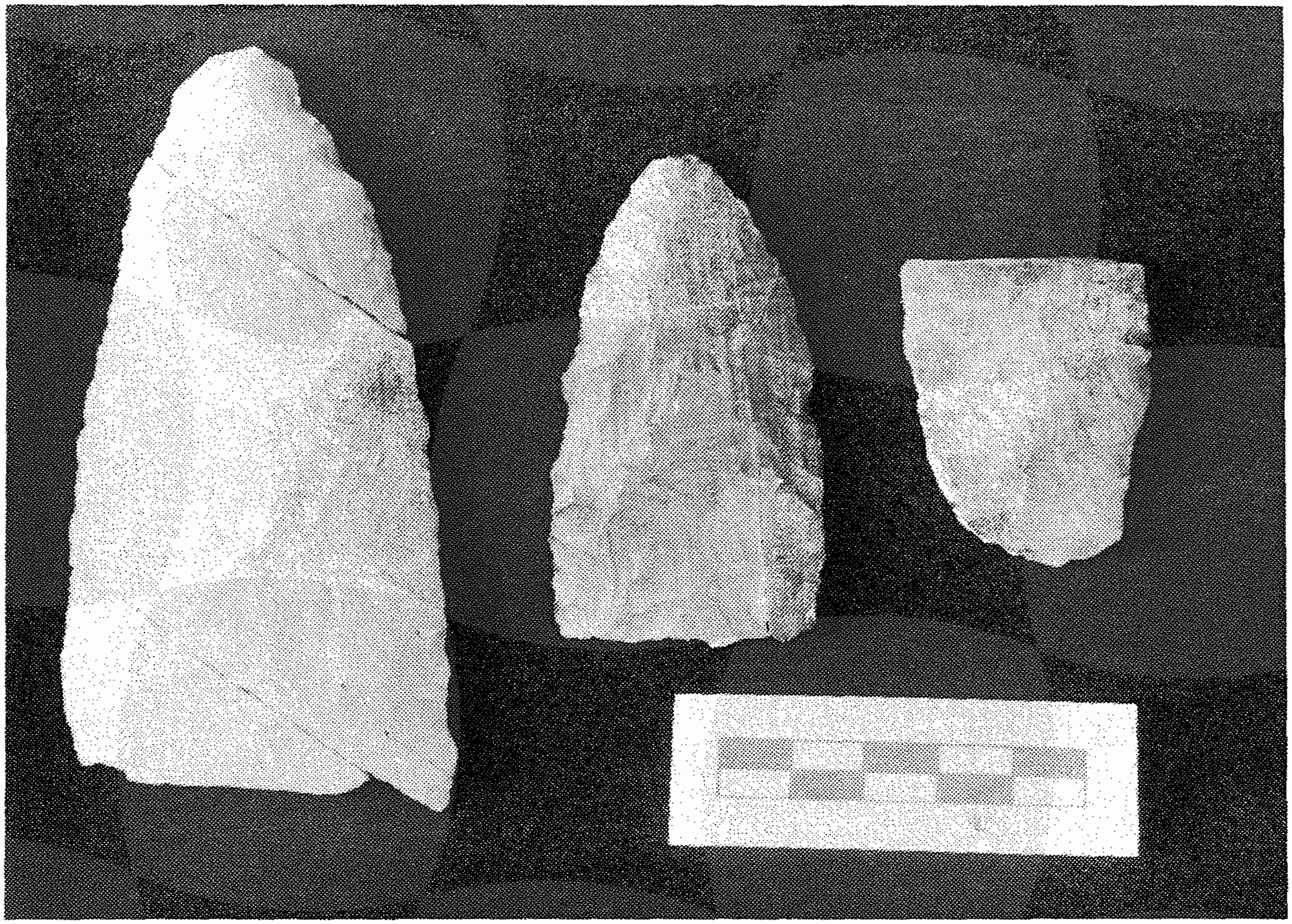


Plate 6.4: Lanceolate Bifaces Exhibiting Alternate Flake Removal Pattern and High Flake Scar Number/Length Ratio (Strategy III)

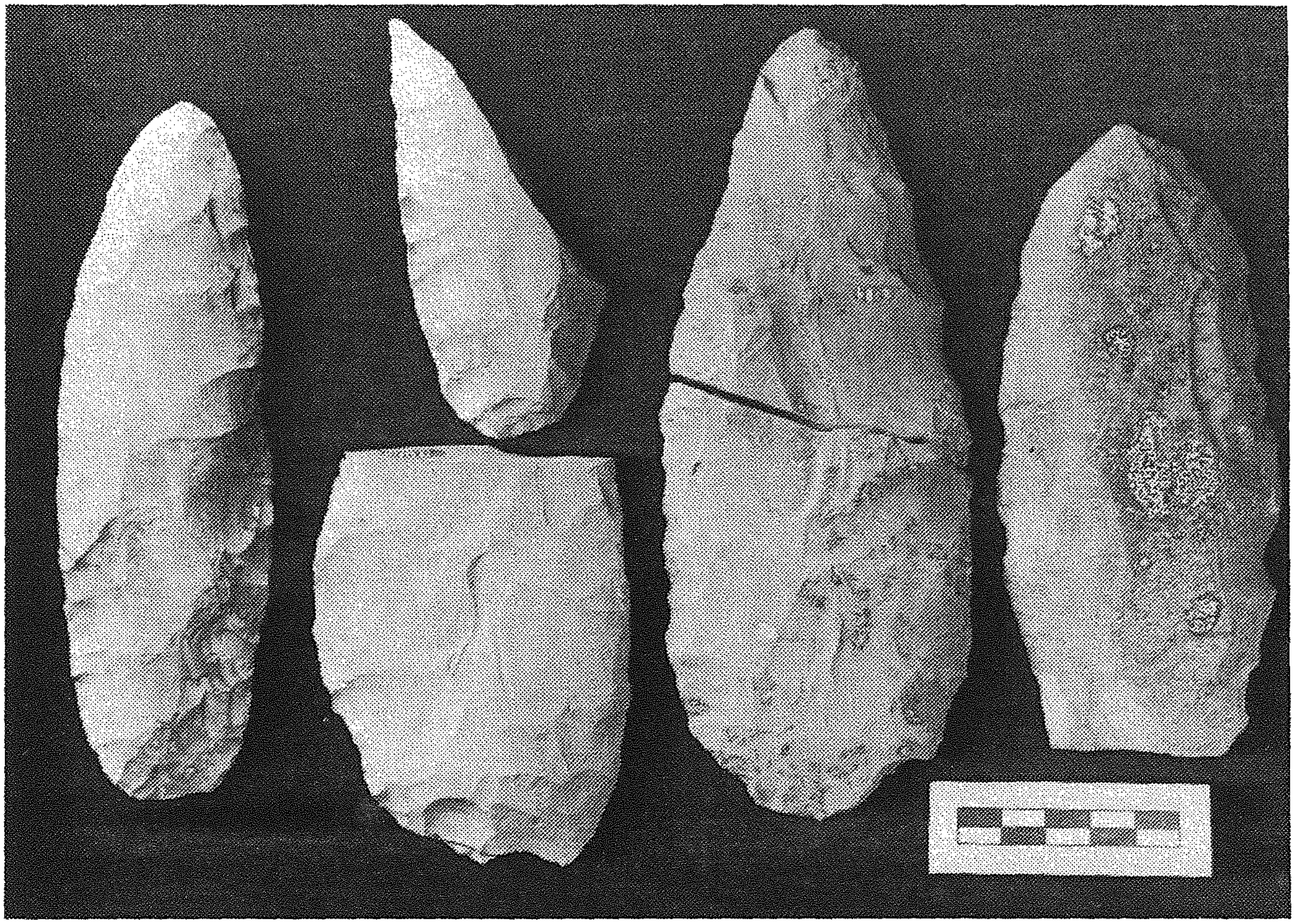


Plate 6.5: Lanceolate Bifaces - Proposed 'Northern Cordilleran' Technology. Alternating Flake Removal Pattern and Low Flake Scar Number/Length Ratio (Strategy II). Also shown are unfinished or rough bifaces

0.8). Flake scar morphology is expanding on all specimens and flake scar size averages 1.5 cm (Plate 6.6). (Strategy IV)

Two very broad leaf shaped bifaces (MfVa-1:4 and MfVa-13[5]:303) (represented by fragments only), have been produced by unifacial flaking and exhibit a low flake scar number/length ratio (0.27 and 0.5). Flake scar morphology is expanding on both implements and flake scars average 1.5 - 2 cm. in width (Plate 6.7). (Strategy V)

The remaining sample of finished bifaces in the Rock River collections comprises a less morphologically distinctive range of primarily ovoid to leaf shaped forms, or pieces which are too fragmentary to be assigned to a particular morphological class. On the basis of their manufacturing strategy, however, it is possible to group the majority with the classes described above (Figure 6.1).

Two finished bifaces, exhibiting a generalized ovoid form were recovered in buried context at MfVa-9, in association with the Tuktu-like, or reworked Kamut point (Plate 6.2, a and c). With regard to production strategy, however, both implements exhibit greater similarities to the biface technology represented in the Itivilik Lake Paleo-Eskimo sample (Table 6.5). The bifaces are small and thin; flake scars are parallel in form and subradial in orientation; flake removal sequence is alternate on both; and flake scar number/length ratios are approximately 1.00. The implications here are:

1. That the production techniques recognized in the Itivilik Lake Paleo-Eskimo sample and in the Kamut point sample represent essentially equivalent options within a single technological system.

2. That the buried deposit at MfVa-9 represents a culturally mixed assemblage.

This will be considered again in a later discussion.

The tendency noted in the sample of diagnostic projectile points, for certain flake scar number/length ratios to correlate with order of flake removal, can be seen to be present in the sample of finished bifaces as a whole (alternating flake removal sequences tend to be associated with low to moderate flake scar number/length ratios; and alternate flake removal sequences tend to be associated with moderate to high flake scar number/length ratios) (tau-b value for the association of order of flake removal and flake scar number/length ratio is 0.1) (Table 6.8).

Figure 6.1: Biface Production Strategies in the Sample of Finished Bifaces in the Rock River Collections

Strategy I:

Flake scar size: small; approximately 0.5 cm width
Flake scar outline: lamellar or expanding/parallel
Flake scar orientation: oblique or subradial
Order of flake removal; alternate and unifacial
Platform/edge preparation: grinding
Flake scar number/biface length ratio: high; approximately 1.00

N = 5

MfVa-13(5):227 (alternate flake removal); MfVa-9:419 (alternate flake removal); MfVa-9:469 (alternate flake removal); MfVa-13(5):284 (unifacial flake removal); MfVa-15:23 (unifacial flake removal)

Strategy II:

Flake scar size: large; 1 - 1.5 cm width
Flake scar outline: expanding or parallel
Flake scar orientation: collateral
Order of flake removal: alternating
Platform/edge preparation: grinding or minor chipping
Flake scar number/biface length ration: low; approximately 0.4 - 0.7

N = 8

MfVa-9:3; MfVa-9:172; MfVa-9:154; MfVa-9:2; MfVa-13(5):333; MfVa-17:18; MfVa-17:220; MfVa-2:7

Strategy III:

Flake scar size; variable; often smaller retouch scars are present on the edges of the biface;
Flake scar outline: predominantly parallel to expanding
Flake scar orientation: collateral/subradial
Order of flake removal: alternate
Flake scar number/biface length ratio: high; averaging 1.00

N = 6 (7?)

MfVa-17:103; MfVa-14:7; MfVa-2:4; MgVa-10:1; MfVb-2:209; MfVa-13(N):1; MfVa-2:2 (?)

Figure 6.1 (continued)

Strategy IV:

Flake scar size: large; averaging 1.5 cm
Flake scar outline: expanding
Flake scar orientation: transverse/subradial
Order of flake removal: alternate
Flake scar number/biface length ratio: low - intermediate; 04. - 0.8

N = 5

MfVa-7:2; MfVa-11: 23; MfVa-14:64; MfVa-13(5):9; MfVa-13(5):313

Strategy V:

Flake scar size: large; 1.5 - 2 cm
Flake scar outline: expanding
Flake scar orientation: collateral/subradial
Order of flake removal: unifacial
Flake scar number/biface length ration: low; 0.27 - 0.5

N = 8 (9?)

MgVa-4:348; MgVa-4:350; MfVa-1:4; MfVa-2:5; MfVa-2:6; MfVa-13(5):303; MfVa-13(5): 348; MfVa-13(5):317; MfVa-14:1040 (?)

Table 6.7: Associations of Production Attributes in the Rock River Sample

ATTRIBUTE		MfVa-9	MfVa-14	ROCK RIVER
Flake scar outline and flake scar orientation	F	n/a	n/a	0.09
	R	n/a	n/a	0.02
	I	n/a	n/a	0.07
Site, flake scar outline and orientation	R	0.64		n/a
Order of flake removal and flake scar outline	F	n/a	n/a	0.11
	R	n/a	n/a	0.03
	I	n/a	n/a	0.0
Order of flake removal & flake scar orientation	F	n/a	n/a	0.17
	R	n/a	n/a	0.02
	I	n/a	n/a	0.05
Size and number of	F	n/a	n/a	0.10
flake scars	R	n/a	n/a	0.17
	I	n/a	n/a	0.15
Order of flake removal and platform preparation	F	n/a	n/a	0.06
	R	n/a	n/a	0.3
	I	n/a	n/a	0.12
Site, order of flake removal, platform preparation	F	n/a		
	R	0.64		
	I	n/a		
Order of flake removal, flake scar outline, flake scar orientation	F	n/a	n/a	0.31
	R	n/a	n/a	0.11
	I	n/a	n/a	0.18
Order of flake removal, flake scar number/length	F	n/a	n/a	0.19
	R	n/a	n/a	0.05

F - finished bifaces R - rough bifaces I - partial bifaces

Table 6.8: Association of Features of Order of Flake Removal and Flake Scar Number/Length Ratio in the Rock River Biface Sample

Finished Bifaces

FLOR	FLSCNO/L RATIO	N	%
Unifacial	<0.4	3	33.3%
	<0.8	6	66.7%
	>0.8	0	0%
		9	
Alternate	<0.4	0	0%
	<0.8	6	37.5%
	>0.8	10	62.5%
		16	
Alternating	<0.4	2	22%
	<0.8	5	56%
	>0.8	2	22%
		9	

Rough Bifaces

FLOR	FLSCNO/L RATIO	N	%
Unifacial	<0.3	10	18%
	<0.6	37	66%
	>0.6	9	16%
		56	
Alternate	<0.3	4	14.3%
	<0.6	17	60.7%
	>0.6	7	25%
		28	
Alternating	<0.3	13	25.5%
	<0.6	24	47%
	>0.6	14	27.5%
		51	

FLOR - order of flake removal
FLSCNO/L - flake scar number/biface length ratio

Order of flake removal and flake scar number/length ratios do not alone comprise, of course, an adequate basis for characterizing a particular manufacturing strategy: in the small sample of diagnostic points in the Rock River collections, for example, alternate flake removal patterns and high flake scar number/length ratios characterized both the Paleo-Eskimo point and some of the large lanceolate forms, which may be attributed to the Northern Plano tradition (cf. Millar 1981). In our present understanding of the prehistoric sequence, these technologies are unrelated. However, unlike features of flake scar morphology or the general form of the implement, distinctive associations of flake scar number/length ratio and order of flake removal apparently also characterize, at least to some extent, bifaces in earlier stages of manufacture.

Rough Bifaces and Biface Preforms (n=141)

In the analysis of the Surma and Itivilik Lake bifaces, flaking patterns -- specifically flake scar outline and orientation -- were found to be relatively undiagnostic for distinguishing manufacturing tradition in the earlier stages of manufacture. Features of flake scar size and number, on the other hand, tended to remain moderately distinctive in the two samples, even in earlier stages of production. In the Itivilik Lake sample, the order of flake removal was found to be consistent throughout the production sequence. It was proposed that these features, rather than flake scar outline and orientation, would prove most useful for the identification of manufacturing preferences in the earlier stages of biface production.

The analysis of rough bifaces in the Rock River collections essentially confirmed these observations. On most specimens (n=91, 86.5%), flake scar outline is expanding. The few bifaces exhibiting parallel flake scars (n=14, 13.5%) could be interpreted to represent relatively late stages in preform production. Although proportions of collateral and subradial flake scar orientation on bifaces remains fairly constant on both rough and finished forms, oblique patterns are virtually absent in earlier stages of reduction. Furthermore, flake scar orientation fails to exhibit any marked correlation with order of flake removal or flake scar number/length ratios in the sample of rough bifaces (in both cases, tau-b values are 0).

However, the correlations of order of flake removal and flake scar number/length ratios observed among the rough bifaces in the Rock River collections do appear to be proportionately similar to those observed in the sample of finished bifaces (Table 6.8). In this sample, unifacially flaked bifaces tend to exhibit low to intermediate flake scar number/length ratios and alternately flaked bifaces exhibit predominately intermediate to high ratios. Bifaces with alternating flake removal also tend to exhibit low to intermediate flake scar number to length ratios, although the pattern here is less obvious.

The explanation for the relatively weak correlations of flake scar number/length ratios with order of flake removal observed in the rough biface sample may stem, in part, from the fact that this class represents several successive episodes of flake removal or thinning (cf. Muto 1971; Callahan 1979). A more precise definition of reduction stages in a culturally homogeneous sample possibly would result in a somewhat more distinctive patterning of these features, as was apparent in the Itivilik Lake and Surma biface samples.

A weak to moderate correlation of order of flake removal and type of platform preparation is also present in the sample of rough bifaces (tau-b = 0.2), which may further serve to characterize specific manufacturing strategies (Table 6.9). In most cases, flake removal is associated with grinding and/or minor chipping as edge preparation. Among those bifaces also characterized by unifacial or alternate flake removal, however, unifacial beveling is a common platform preparation technique as well. Unifacial beveling was not observed to associate with alternating flake removal patterns. This type of platform preparation was present on a unifacially flaked biface (core?) recovered in buried context at MfVa-14. One example of the 'burination' of a biface edge to create a suitable platform for flake removal was observed on a biface exhibiting alternate flake removal patterns.

Although the sample of rough bifaces recovered in buried context at MfVa-9 and MfVa-14 is small, these proved to be quite dissimilar with respect to production strategy at the two sites (Table 6.10).

Two rough bifaces were recovered in the buried deposit at MfVa-14 (Table 6.11). Both are relatively large, core-like specimens, made on cobbles or thick blocky pieces of silicious argillite. On both, flake scar orientation is subradial, and flake scars are expanding to parallel in outline. The order of flake removal is unifacial on one specimen and alternating on the second. In comparison to the rough bifaces recovered in the MfVa-9 deposit, flake scars are large, averaging in excess of 2.5 cm in width. Flake scar number to length ratios for the MfVa-14 bifaces are 0.40 and 0.55. The MfVa-14 bifaces are somewhat problematical in the present analysis in that one or both may be bifacial cores, and in this regard, they may not be comparable to forms which are intended as implements (Plate 6.8).

Table 6.9: Association of Order of Flake Removal and Platform Preparation in the Sample of Rough and Partial Bifaces

		Rough Bifaces		Partial Bifaces	
FLOR	PLPREP	N	%	N	%
unifacial	grinding	7	12.7	1	1.8
	chipping	5	9.1	4	7.3
	grinding & chipping	24	43.6	14	25.4
	burination	0		4	7.3
	unifacial beveling	16	29.1	31	56.4
	beveling & burination	3	5.5	1	1.8
		55		55	
alternate	grinding	3	11	1	9.1
	chipping	3	11	2	18.2
	grinding & chipping	13	46	1	9.1
	unifacial beveling	9	32	6	54.5
	burination	0		1	9.1
		28		11	
alternating	grinding	12	24.5	5	22
	chipping	1	2	4	17
	grinding & chipping	33	67.4	12	52.2
	unifacial beveling	2	4	1	4
	burination	1	2	1	4
		49		23	

Table 6.10: Association of Production Attributes with Site in the Rock River Buried Deposits

ATTRIBUTE	ROUGH BIFACES (tau-b values)
Flake scar outline	0.44
Flake scar orientation	1.00
Number of flake scars	n/a
Size of flake scars	1.00
Cross-section	1.00
Biconvexity	0.58
Platform preparation	0.38
Order of flake removal	0.40
Blank	1.00

Table 6.11: Production Features of Rough Bifaces in the Rock River Buried Deposits

SITE	FLSCFORM	FLSCOR	FLOR	PLPREP	FLSCNO/L
MfVa-9	parallel	subrad.	alternate	grinding & chipping	0.83
	parallel	subrad.	alternate	grinding	0.80
	parallel	collat.	alternt'g	grinding	0.54
	parallel	collat.	alternt'g	grinding	0.44
	variable	indet.	alternt'g	indet.	0.57
MfVa-14	parallel	subrad.	unifacial	unifacial beveling	0.39
	parallel	subrad.	alternt'g	grinding & chipping	0.55

FLSCFORM - flake scar outline
FLSCOR - flake scar orientation
FLOR - order of flake removal
PLPREP - platform preparation
FLSCNO/L - flake scar number to length ratio

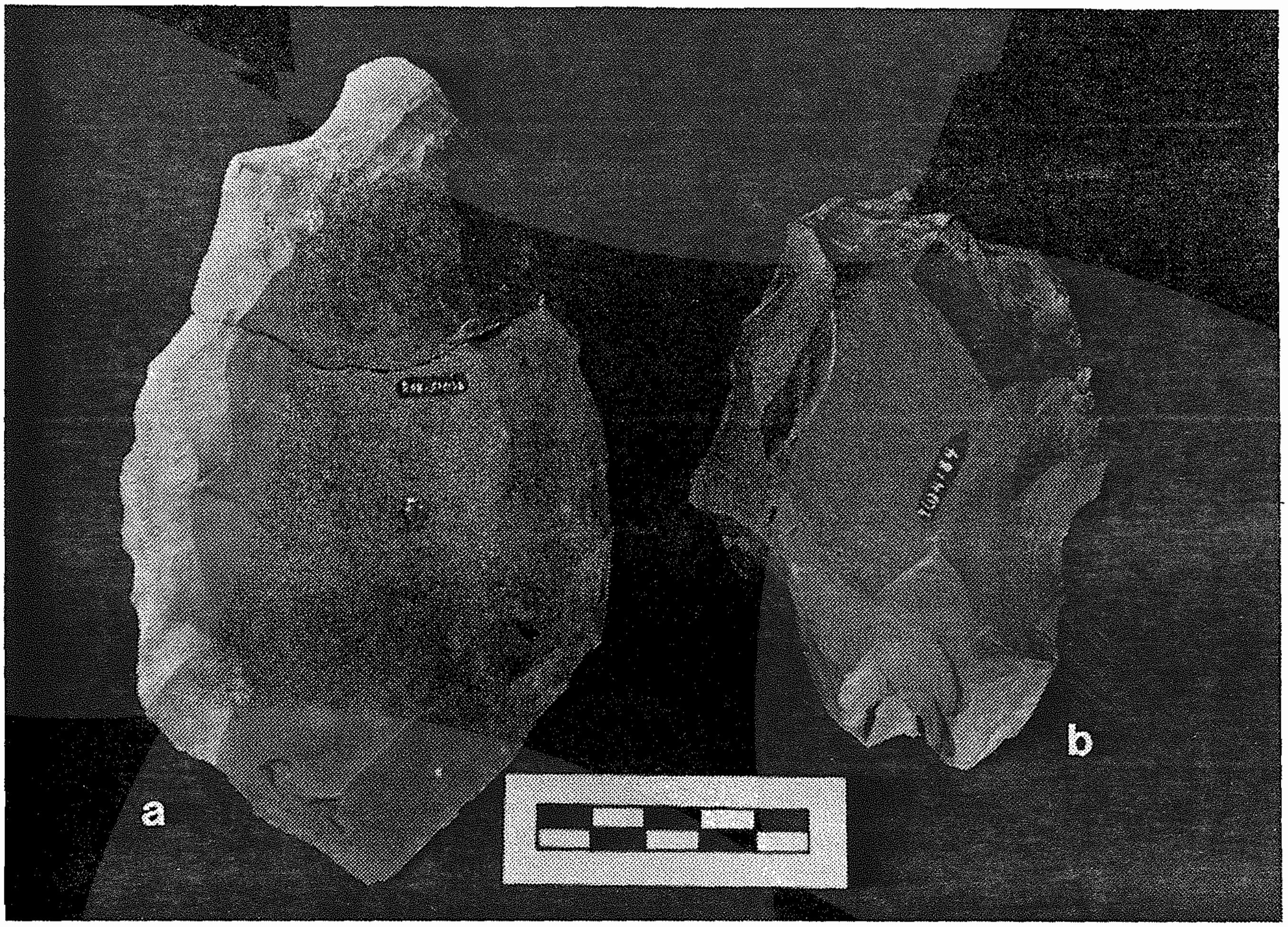


Plate 6.8: Rough Bifaces/Cores Recovered in Buried Context at MfVa-14. (a) Unifacial Flake Removal Pattern; (b) Alternating Flake Removal Pattern

The rough bifaces (n=5) recovered in buried context at MfVa-9 exhibit two fairly distinctive flaking patterns (Table 6.11). On two specimens, flake scar orientation is subradial, flake scars are parallel in form, flake removal is alternate, and flake scar number/length ratios are relatively high at approximately 0.80 (Plate 6.9). The remaining bifaces exhibit subradial, alternating flake removal patterns, parallel flake scars, and low flake scar number/length ratios of approximately 0.5. Essentially, the two flaking patterns observed in the sample of finished bifaces in the MfVa-9 buried deposit are duplicated in the sample of rough bifaces. Although the question of the deposit representing a culturally mixed assemblage remains, the consistency in manufacture evident in both rough and finished bifaces is encouraging with regards to efforts to characterize manufacturing traditions in time and space.

Partial Bifaces (n=103)

As was largely the case in the rough biface sample, patterned associations of flake scar orientation and outline are essentially absent in the sample of partially worked bifaces from the Rock River area (n=90). On most specimens, flake scars are expanding in outline and, when this can be determined, subradial flake scar orientation predominates.

Given that the class of partial bifaces probably represents the earlier stages in the production sequence, and lacks complete facial flaking, the features of flake scar number relative to length of the piece cannot be expected to be of utility as a sorting criteria, as proved to be the case among rough and finished forms.

Within the partial biface sample, however, some potentially significant, albeit relatively weak, associations of order of flake removal and platform preparation were noted (tau-b = 0.17, Table 6.9, Plate 6.10, 6.11). The correlation of unifacial and alternate flake removal patterns with large-scale unifacial beveling preparation is a strong, and is of interest here because this association is also observed in the sample of rough bifaces. Burination as a platform preparation technique occurs almost exclusively in association with unifacial flake removal in the present sample. Alternating flake removal, on the other hand, is almost exclusively associated with grinding and chipping platform preparation.

Three partial bifaces were recovered in buried context at MfVa-9 (Table 6.12). These specimens are somewhat atypical of the sample as a whole in that flakes, and in one case, a blade, comprise the blanks (Plate 6.9, a). Bearing in mind the very small size of the sample, there is

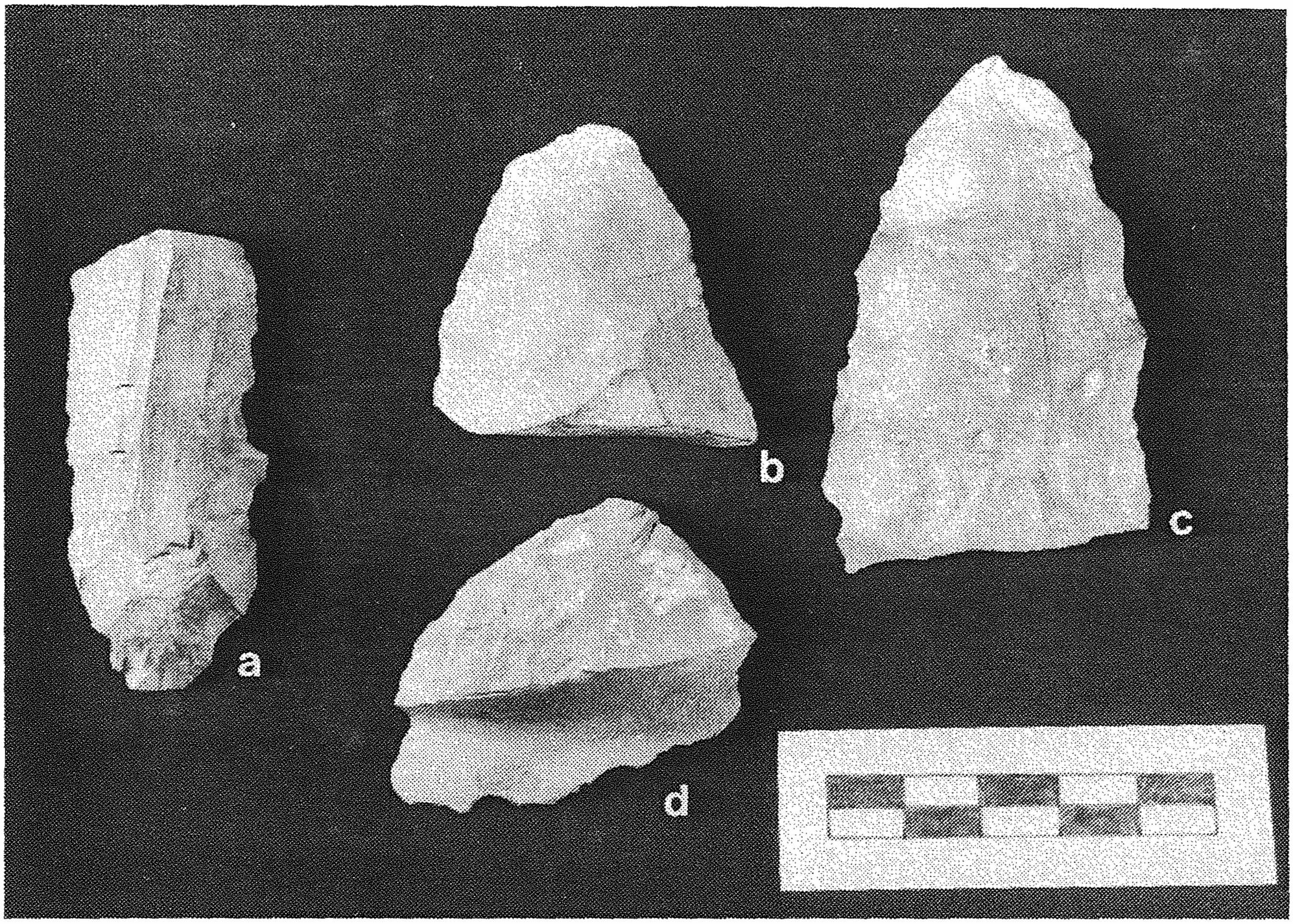


Plate 6.9: Bifaces in Various Stages of Reduction Recovered in Buried Context at MfVa-9. (b) and (c) Exhibit Alternating Flake Removal Patterns; (d) Exhibits Alternate Flake Removal Pattern; (a) Blade Showing Preliminary Bifacial Working

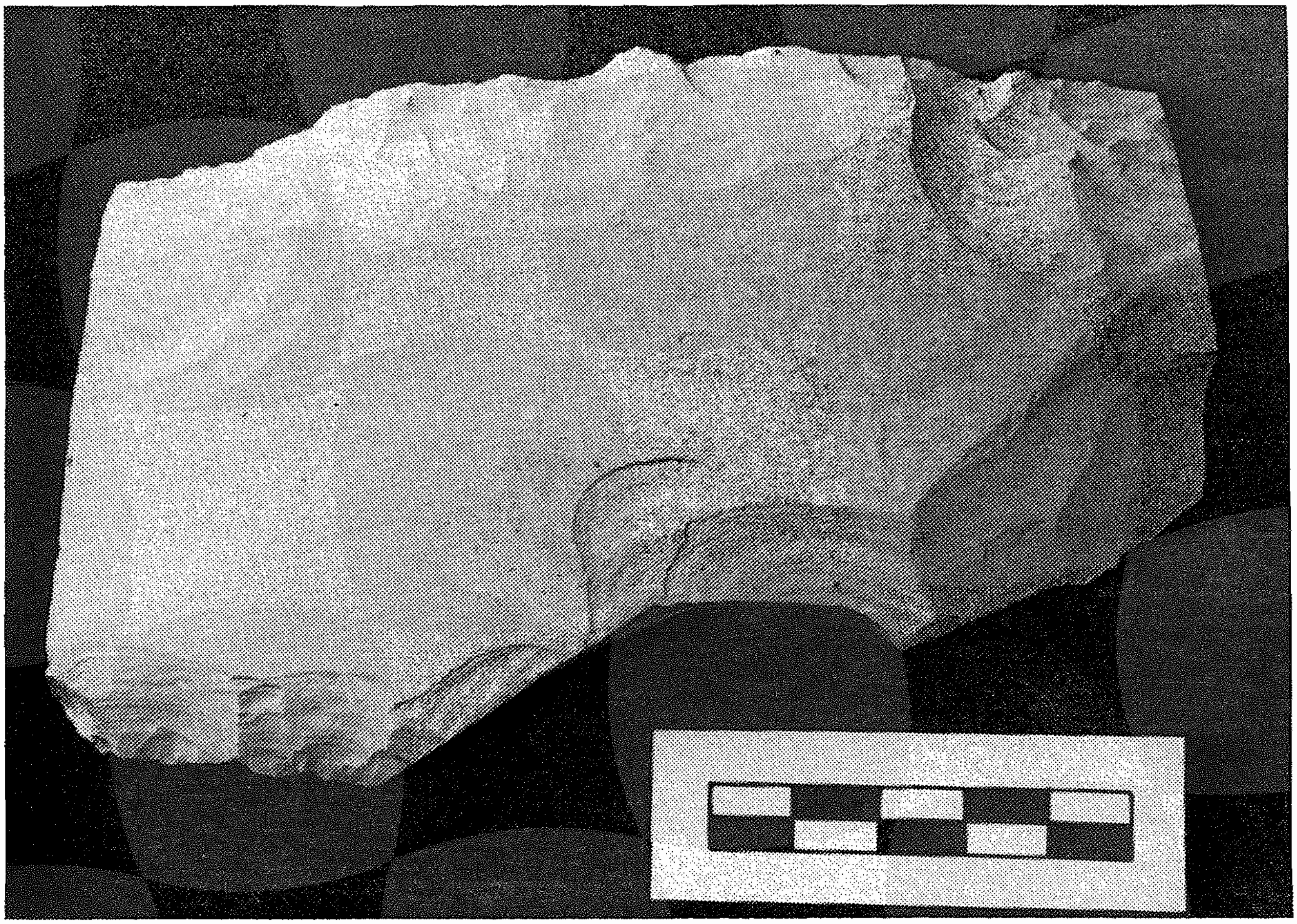


Plate 6.10: Partial Biface Showing Large-Scale Unifacial Beveling as Edge Preparation

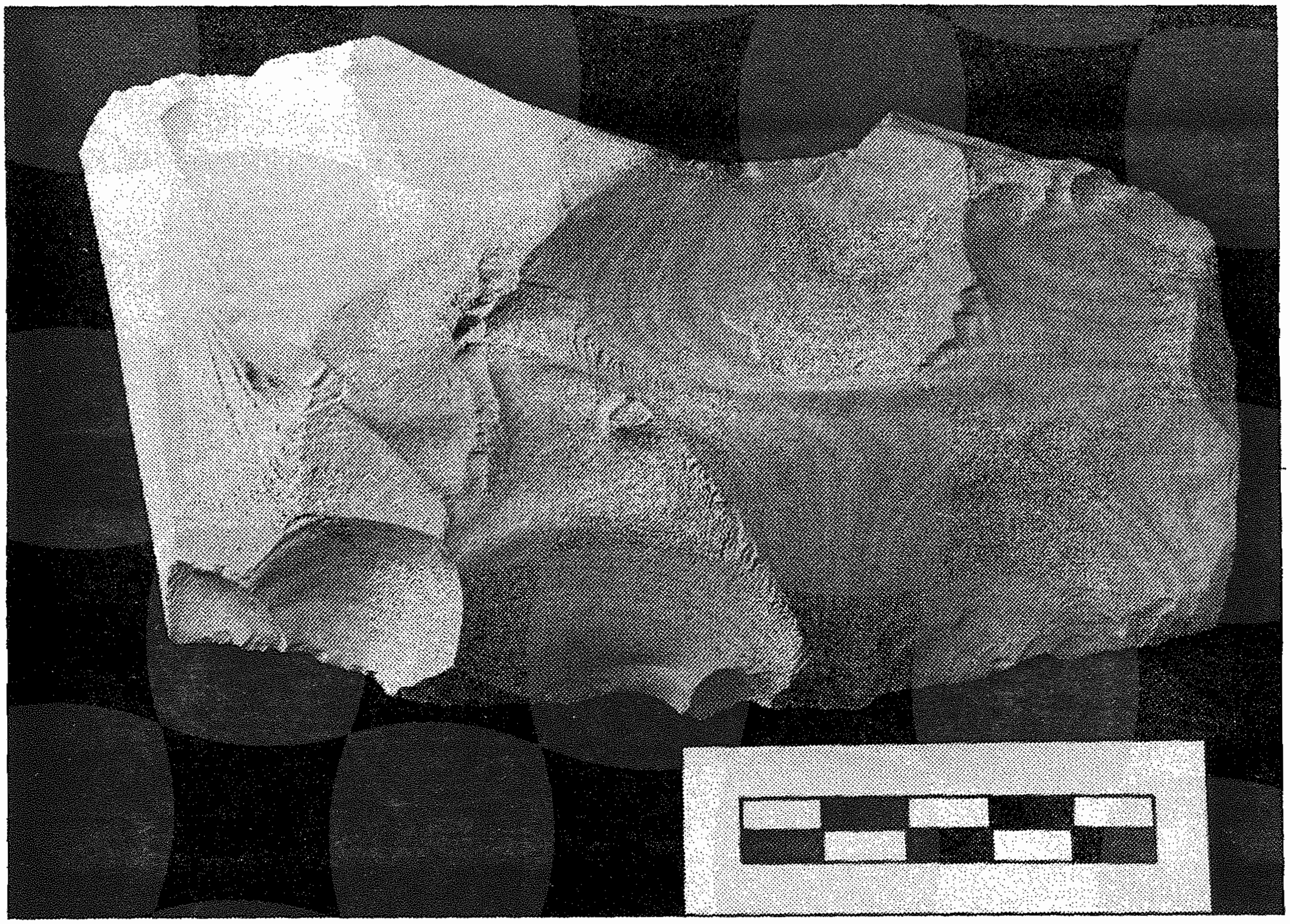


Plate 6.11: Reverse View of Plate 6.10

Table 6.12: Production Features of Partial Bifaces in the Rock River Buried Deposits

SITE	FLSCFORM	FLSCOR	FLOR	PLPREP	BLANK
MfVa-9	expanding	collat.	alternate	grinding & chipping	blade
	expanding	subrad.	indet.	grinding	flake
	parallel	collat.	alternate	grinding	flake

FLSCFORM - flake scar outline
FLSCOR - flake scar orientation
FLOR - order of flake removal
PLPREP - platform preparation

nevertheless, evidence for continuity in manufacturing strategies (in the form of alternate flake removal patterns) in the buried component, from the earliest stages of biface production to the finished forms.

Bifacially Worked Tablets

In the sample of bifacially worked tablets (n=132) in the Rock River collections, various edge preparation techniques on tablets with squared edges (n=92) were observed to occur in the following frequencies:

1. burination (n=29, 31.5%)
2. unifacial beveling (n=26, 28.3%)
3. bifacial beveling (n=26, 28.3%)
4. burination and unifacial beveling (n=10, 10.9%)
5. burination and bifacial beveling (n=1, 1.0%)

The relatively common association of burination and unifacial beveling on tablets could indicate that these two techniques are part of a single technological repertoire.

In later stages of biface production, unifacial beveling tends to associate with unifacial or alternate order of flake removal. From a simple mechanical standpoint, it could be proposed that bifacial beveling and alternating order of flake removal are associated as a production strategy as well.

Summary and Discussion

The study of biface production technology in the Rock River area has proceeded with the goal of identifying and characterizing the products of different technological traditions. The analysis rests on the pivotal assumption that consistent associations of certain production attributes at various stages in the manufacturing sequence represent strategies of biface manufacture which may be specific to a technological tradition.

The assumption was tested in a limited manner by the analysis of two small biface samples from the late Archaic tradition Surma site in Ontario, and the mixed Paleo-Eskimo and Historic Eskimo Itivilik Lake assemblage from Alaska. In this test study, associations of flake scar morphology and orientation, order of flake removal, and flake scar number and size were found to be useful in distinguishing bifaces in later stages of production in the two samples. Bifaces in earlier stages of production differed in the two samples principally with respect to features of flake scar size and number. In the Itivilik Lake biface sample, as well, order of flake removal was found to be consistent throughout the various stages of reduction and may be a feature which distinguishes Paleo-Eskimo tradition and later Eskimo biface technology (alternate and unifacial flake removal patterns were observed respectively).[3]

The analysis of the Rock River biface sample appears to confirm the results of the Itivilik Lake/Surma test study. Isolated, typologically distinctive examples of Norton, Kamut, and lanceolate ('Northern Plano' and 'northern Cordilleran') point types proved to be distinctive with regard to their manufacture, as well as in their morphology. The presence of similar associations of production features on morphologically generalized biface forms suggests these may be grouped with the diagnostic cultural-historical types.

In earlier stages of production, co-associations of features of platform preparation, flake scar number/length ratios, and order of flake removal were relatively weak overall, but did tend to suggest the operation of systematic reduction strategies. Recalling the fact that the Rock River collections represent in large part the products of quarry/workshop activities, the lack of very distinctive patterning in earlier production stages could be attributed, at least in part, to the endeavours of novice or inexperienced stoneworkers. Individuals lacking both skill and a complete enculturation in techniques of biface manufacture should probably not be expected to achieve the 'norm' for bifaces of the particular technological tradition (cf. Cross 1983). I suspect that not only are the efforts of novices disproportionately represented in these kinds of assemblages, but also that their efforts would probably account for a substantial proportion of the bifaces which failed in earlier stages of production.

Raw material abundance may contribute as well, albeit less directly, to the variability observed in bifaces in earlier stages of production. Ready access to stone could

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3 The use of unifacial flake removal in the production of the Norton points in the Trout Lake sample, however, (Table 6.6) suggests either that the preferrence for this strategy of biface reduction appeared fairly early in the continuum of Eskimo technology; or that unifacial and alternate flake removal were essentially equivalent strategies for biface reduction throughout the tradition of Paleo-Eskimo/Neo-Eskimo technologies.

have encouraged a more experimental approach to implement production, or a greater willingness to take risks in the course of manufacture. Possibly the fact that the stoneworkers were using silicious argillite tablets as blanks also promoted the use of non-standard approaches in the early stages of biface production. As a result, somewhat more unconventional or non-standard, or even expedient manufacturing techniques might be expected to appear in the material culture record in workshop/quarry situations as an additional source of variability (Plate 6.12).

The relationship of the biface manufacturing strategies identified in this study to a particular culture or tradition in the interior Northwest can only be suggested on the basis of the analysis of the culturally diagnostic implements (Figure 6.2).

Limited external comparisons are possible between the Paleo-Eskimo biface technology identified in the Rock River collections and the Arctic Small Tool/Norton tradition bifaces from Itivilik Lake. These indicate that the two samples are essentially identical in all aspects of production examined in this study (see above).

Without direct study of the production aspects of the Acasta Lake Kamut points, comparison of the Kamut points in the Rock River collections cannot proceed much beyond the level of morphological typology. It is of interest to note, however, that the Kamut points and convex-based or 'northern Cordilleran' lanceolate points in the Rock River collections exhibit a similar range of production attributes. The fact that these two point forms are also associated in the Acasta complex could be used to argue for relatively close relationships between Acasta Lake and the Rock River area.

The sample of large lanceolate bifaces in the Rock River collections which resemble certain 'Northern Plano' forms is not a large one (n=5), but it is worth noting with respect to the argument for relationships that these implements are produced by a different strategy from that observed on the Kamut points in the Rock River collections. The production of large lanceolate points within the context of later, and possibly unrelated technologies, has been noted in the interior Northwest (cf. Millar 1981). Alternatively, the ascription of a Northern Plano affiliation to the Acasta Lake materials may require reassessment. This will be discussed further in Chapter 8.

The complex of production features associated with unifacial flake removal patterns on bifaces did not occur on any culturally diagnostic implements in the Rock River collections. Unifacial flaking was observed, however, on a large core-like biface recovered in buried context at MfVa-

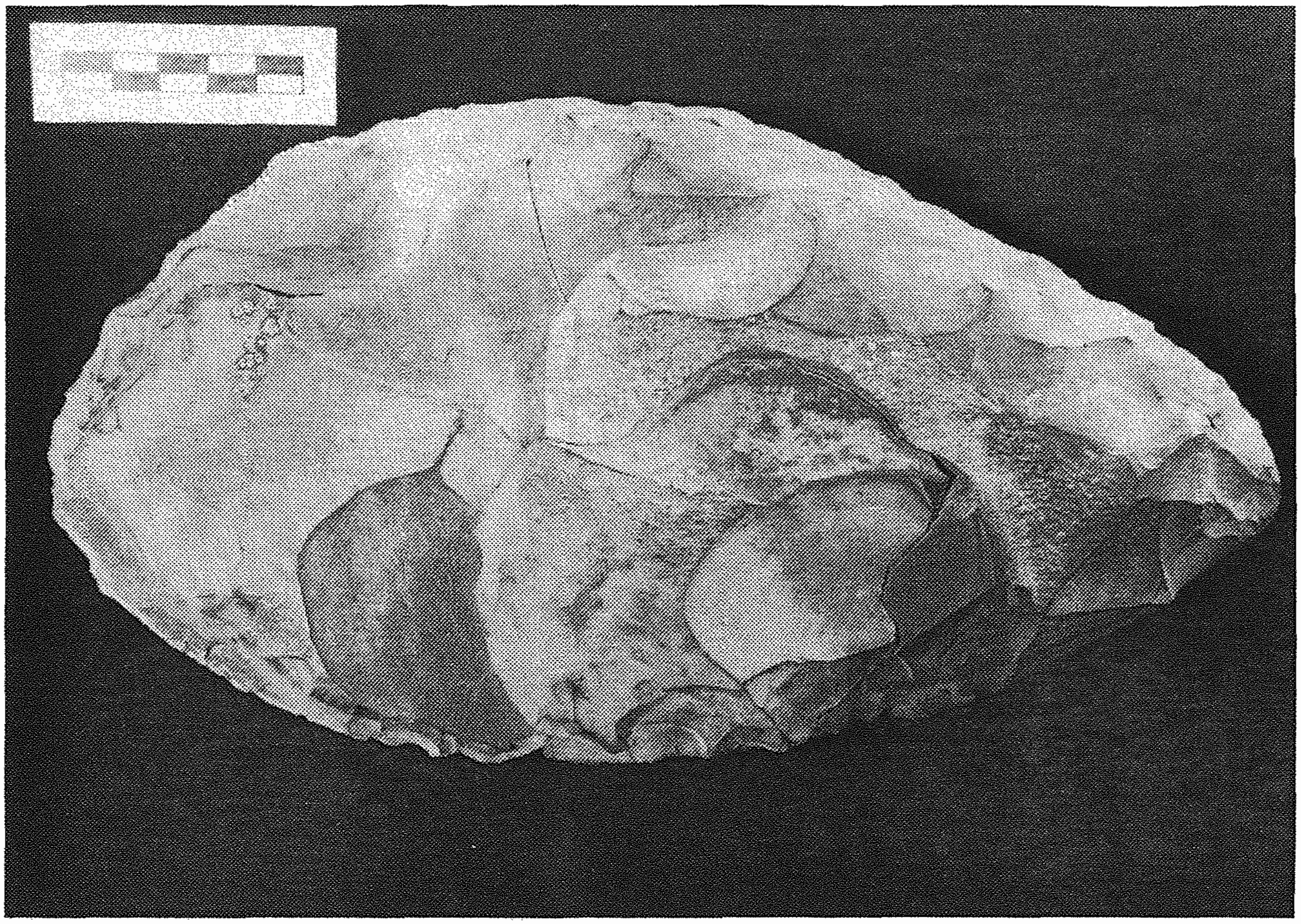


Plate 6.12: Very Large Biface. Possibly a Whimsical Response to the Availability of Numerous Large Tablular Fragments of Silicious Argillite in the Rock River Area

Figure 6.2: Proposed Reconstruction of Biface Production Strategies for Three Technological Traditions in the Rock River Sample

Northern Cordilleran:

Flake scar outline:	parallel/expanding
Flake scar orientation:	collateral
Order of flake removal:	alternating
Flake scar number/length:	intermediate
Platform preparation:	grinding & chipping
Initial Edging:	? bifacial beveling

'Northern Plano' or Paleo-Arctic:

Flake scar outline:	parallel & expanding
Flake scar orientation:	subradial
Order of flake removal:	alternate
Flake scar number/length:	high
Platform preparation:	unifacial beveling, grinding & chipping
Initial Edging:	? unifacial beveling burination

Paleo-Eskimo:

Flake scar outline:	lamellar/expanding
Flake scar orientation:	oblique/subradial
Order of flake removal:	alternate/unifacial
Flake scar number/length:	very high
Platform preparation:	unifacial beveling, grinding & chipping
Initial Edging:	? unifacial beveling burination

14. This deposit is dated to approximately 2000 B.P., and on this basis, the materials possibly relate to late prehistoric Athapaskan complexes in the interior Northwest.

Although single attribute comparisons are to be avoided, it is interesting to note that unifacial flake removal patterns also characterized a portion of the biface sample from Itivilik Lake, and certain points attributed to Norton technology in the Trout Lake collections.

In view of the variability in biface production strategies evident even in the small sample described here (Table 6.6), Gordon's (1970, 1973) identification of British Mountain as a principal component of the Trout Lake assemblages, in addition to Paleo- and Neo-Eskimo technology, may require reassessment. Greer's (1988) recent reexamination of the Trout Lake collections, and specifically the buried component at NfVi-10 (reported as NeVi-1 in Gordon [1970:77]), arrives at a similar conclusion. In Greer's opinion, the buried component at NfVi-10 is not a 'pure British Mountain component' as originally claimed by Gordon, but represents an association of the remains of Paleo-Eskimo technology, possibly in addition to one or more interior technologies. Greer echoes Clark's (1976) earlier view that the distinctive appearance of 'British Mountain' artefacts is due in large part to the nature of the raw material (silicious argillite or silicified shale), and to the preponderance of debris associated with biface production using this raw material in situations where it is locally abundant (silicified shale is readily available in the form of large river cobbles in the Trout Lake area). As was the case with the Rock River assemblages, the appearance of homogeneity in fact masks important variability which relates to the presence of what are likely several different technological traditions. Gordon's (1973:82) dates on the hearth material in the buried component at NfVi-10, between about 4500 and 5500 B.P. suggests, at least for this collection, that Northern Archaic/Northwest Microblade tradition technology is probably represented.

Biface Trimming Flakes

Introduction

In an ancillary analysis to the biface study, the sample of biface trimming flakes from the two buried deposits in the Rock River area was examined to discover the extent to which the debitage of biface production reflects differences observed in the associated small sample of bifaces. Biface trimming flakes are defined on the basis of the characteristic 'lipped' platform, which incorporates to varying degrees a portion of the edge of the original biface. This broad definition permits the inclusion in the study of flakes which are the byproducts of all but the initial stages of the reduction sequence.

A total of 266 biface trimming flakes were excavated from MfVa-9; the smaller MfVa-9 deposit yielded 40 flakes of this type. In both deposits, the recovery of flakes in stratigraphic context permits some discussion of possible changes over time in the technologies represented. This is especially important in the MfVa-9 sample, which, as noted earlier, is suspected of being culturally mixed.

Like the study of the biface sample, a major consideration in this study is the determination of the degree to which observed differences in the two biface trimming flake samples can be attributed to differences in biface production technology, or to what degree variation is a result of other factors, such as the differential representation of various reduction stages, or even blank type, in the two samples. Variation due to raw material type can be controlled in this study, as silicious argillite was used almost exclusively in the production of bifaces.

The problem of recognizing different stages in a biface reduction sequence from a sample of biface trimming flakes was addressed in a pilot study by Magne and Pokotylo (1981; see also Magne 1985). They found the features of cortex cover, flake size (measured by weight), flake scar number of the dorsal face of the flake, and number of platform facets to be particularly useful for this purpose. This exercise assumes, however, that a single technology is represented in the sample. While this is unlikely to be the case for the two buried samples in the Rock River area, given their widely disparate dates, it may still prove informative to attempt to characterize the samples using these attributes as a starting point.

Comparison of the MfVa-9 and MfVa-14 Samples

A comparison of the attributes of cortex cover and number of flake scars on the dorsal face of flakes showed only minor differences between the MfVa-9 and MfVa-14 samples. All stages in the reduction sequence appear to be represented in both samples, although in the MfVa-9 sample, flakes tend to exhibit relatively more cortex cover and relatively fewer dorsal scars and platform facets than in the MfVa-14 sample, suggesting that earlier stages of production are somewhat better represented in the former deposit. These differences, however, were not statistically significant. Nor is the average size of flakes (measured in this study as flake length and width) significantly different in the two samples (Table 6.13). This does not support the interpretation that earlier production stages are better represented in MfVa-9.

Statistically significant differences between the two samples were noted, however, in features of flake thickness and flaking angle. In MfVa-9, flaking angles tend to be more obtuse (average 68^{o}) than those on flakes recovered in MfVa-14 (average 60^{o}). Callahan (1979:36) views this attribute as an important indicator of stage of reduction of bifaces, citing an overall trend for edge angles to be more obtuse in earlier production stages. At odds with the suggestion that earlier stages of production are better represented in the MfVa-9 sample is the observation that the flakes from this deposits tend on the average to be thinner than flakes in MfVa-14. Although the differences in the two samples are relatively minor, the apparent lack of consistency in features diagnostic of reduction stage could be interpreted to indicate that different strategies of biface reduction are represented.

Important differences observed in features of flake scar outline and orientation of flake scars on the dorsal face of flakes would seem to support this interpretation. The majority (70%) of flakes in the MfVa-14 sample are expanding in outline. The MfVa-9 sample is more variable: parallel and lamellar flakes are better represented; there is also a tendency for more flakes in this deposit to exhibit an irregular outline. It may be recalled that in the biface sample from Itivilik Lake, flake scar morphology correlated rather strongly with stage of production. A similar, though less pronounced trend, was also observed in the Rock River sample, with bifaces in earlier stages of production exhibiting predominately expanding flake scars. In most other respects, however, the MfVa-14 sample appears to represent all stages in the production sequence. Consequently, the virtual absence of parallel-sided flakes in the MfVa-14 sample may reflect different manufacturing preferences.

The orientation of flake scars on the dorsal face of flakes was also found to be significantly different in the two buried samples. Flakes in MfVa-9 exhibit predominately parallel orientation of flake scars; in MfVa-14, flake scar orientation on the dorsal face of flakes tends to be more variable (parallel, converging or random). In the biface study, this feature was found to be less strongly related to production stage than the feature of flake scar outline,

Table 6.13: Comparison of Metric Attributes of MfVa-9 and MfVa-14 Biface Trimming Flakes

Attribute	MfVa-9 (X)	MfVa-14(X)	t	df	p
Length	1.98	2.35	1.93	304	>.05
Width	2.06	2.33	1.54	303	>.05
Thickness	0.21	0.26	3.18	300	<.05
Platf. Width	0.93	1.13	0.23	304	>.05
Flaking Angle	68.1°	59.6°	5.13	277	<.05

Table 6.14: Comparison of Metric Attributes of Biface Trimming Flakes from Levels II and III at MfVa-14

Attribute	L. II(X)	L. III(X)	t	df	p
Length	2.36	2.46	0.21	30	>.05
Width	2.45	2.35	0.38	30	>.05
Thickness	0.28	0.26	0.13	30	>.05
Platf. Width	1.18	1.15	0.14	30	>.05
Flaking Angle	62°	56°	1.40	30	>.05

Table 6.15: Comparison of Metric Attributes of Biface Trimming Flakes from the Upper and Lower Organic Lenses at MfVa-9

Attribute	Upper(X)	Lower(X)	t	df	p
Length	1.98	2.105	5.21	221	<.05
Width	2.04	2.19	6.90	226	<.05
Thickness	0.21	0.21	1.61	221	>.05
Platf. Width	0.92	0.96	3.75	221	<.05
Flaking Angle	68°	67.8°	1.30	204	>.05

which suggests again that the observed differences in the two samples may be attributed to manufacturing preferences. Unfortunately, the manner in which flake scar number and flake scar size were recorded did not permit the ratios of these features to be compared in the two flake samples.

Although the comparisons of biface trimming flakes are limited by assumptions concerning the equal representation of all production stages, a number of features suggest that different manufacturing strategies were in operation in the production of the two buried samples. While the same limitation applies to comparisons of flakes from different stratigraphic levels in the buried deposits, the question of the technological homogeneity of the deposits should be examined nonetheless.

Comparisons of Biface Trimming Flakes within the Buried Deposits

Within the MfVa-14 deposit, no significant differences were found in any aspects of manufacture between flakes from the level II and the level III flake sample (Table 6.13). This suggests that the flakes from the two levels represent both a similar range of reduction stages, and a technologically homogeneous sample.

By comparison, the flake sample from the upper and lower organic lenses in MfVa-9 differed significantly (at the .05 level) from each other in the features of flake length and width, and platform width (Table 6.14): flakes from the lower organic lens tended to be slightly larger on the average than those from the upper organic level. In all other aspects of production, however, no marked differences were observed in the samples.

If, on the basis of the latter observation, a similar range of reduction stages is assumed to be represented in the upper and lower organic samples, the differences in flake scar size become particularly significant in the light of the preceding analysis of the Rock River bifaces. It may be recalled that two biface manufacturing strategies were identified in the MfVa-9 buried deposit. One strategy was found to be associated with Kamut points, and round based lanceolate points in the Rock River collections. The second strategy is more tentatively associated with Paleo-Eskimo biface technology. Interestingly, one difference noted between these two production strategies relates to flake scar size (expressed in terms of the ratio of flake scar number to length of the biface). If this is considered together with the fact that the two debitage samples are stratigraphically separated (although, as discussed earlier, some mixing is possible), the argument for the buried deposit at MfVa-9 being culturally mixed, is strengthened.

CHAPTER 7

BLADE AND MICROBLADE PRODUCTION TECHNOLOGY

Introduction

The production of blades and microblades comprises an important, albeit minor component of the technologies represented in the Rock River area. Thirty-nine blades and related debitage, and fourteen blade cores, or core fragments, have been identified in the collections. Three cores and approximately five blades are provisionally designated microblades and microblade cores on the basis of size (less than 4.0 cm blade length). Five cores were tentatively identified as microblade cores in the collections.

Evidence for blade production occurs primarily in two sites or site areas in the headwaters of the Rock River: in the MfVa-3 - 5 areas, and in the buried deposit at MfVa-9. In the MfVa-9 deposit, dated to about 7500 B.P., the evidence of blade production is most clearly associated with the lower organic lens (see Table 3.4). It should be stressed again that the date on the deposit is an average based on charcoal samples from both the upper and lower organic lenses. Material recovered in the lower organic lens may in fact predate 7500 B.P.

Isolated fragments of blades or blade cores were also recovered at MfVa-12, MfVa-17, MfVa-18 and MfVb-2.

Microblade production is only tentatively identfied in buried context at MfVa-9. Two small blade-like flakes were recovered in the upper organic lens; the precise stratigraphic association of eleven small blade-like flakes could not be determined. One specimen (MfVa-9:479) appears to be a core platform edge rejuvenation flake. A wedge-shaped microblade core (MfVa-9:5) was recovered in surficial context at MfVa-9 as well.

Microblade cores and possible microblade cores were recovered also in surficial context at MfVa-10 and at MfVa-17, although no microblades were present in the collections from these sites. A possible microblade core occurs at MfVa-13, although, again, no microblades were recognized in the site collection. Two microblade fragments were recovered in buried context at MfVa-14, dated to approximately 1000 -

2000 B.P., and a third retouched or utilized specimen occurred in surficial context at this site.

Perhaps the best way to characterize the Rock River blade and microblade technology is as informal or opportunistic, inasmuch as the systematic production of specialized core forms for the manufacture of blades is not well represented. Initially, the question arose as to whether the production of blades from tabular or blocky pieces of silicious argillite was not in fact a fortuitous occurrence given the form and structure of the raw material, and the relative ease with which linear flakes could be removed along the edges of tablets.

The sample of blades and blade cores in the Rock River collections was identified on the relatively minimal criteria of general morphology, length/width ratio, and the presence of one or more parallel facets on the core face or the dorsal face of the blade (attributes used in the description of blade and microblade technology are defined in Appendix II). A series of discrete and metric attributes of the sample of blades and blade cores, and microblades and microblade cores were described in order to discover evidence of systematic blade production, with the assumption that this would be evidenced in consistent patterns of attribute clustering and co-variation. By the same token, patterning would tend to be less obvious if the sample represents the products of essentially fortuitous blade production.

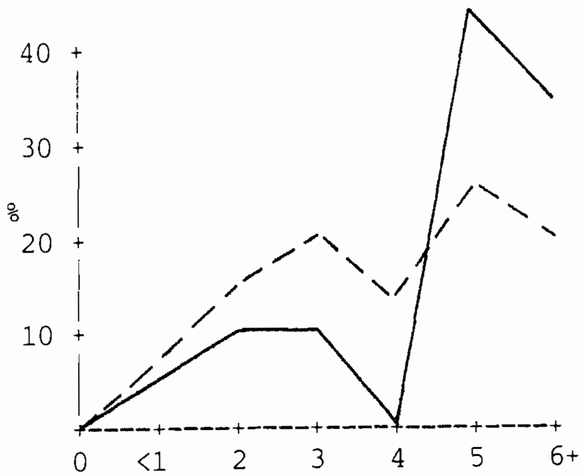
Figures 7.1 - 7.2 illustrate the results of this analysis. In general, consistent features of production do characterize the sample, suggesting a systematic strategy was in operation in the manufacture of blades and microblades.

General Features of Blade Production

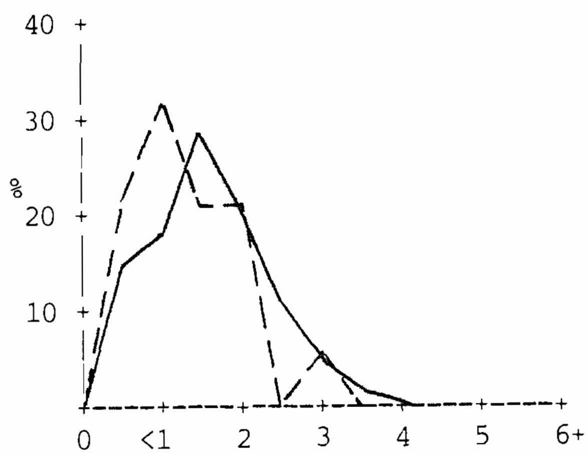
Although the lack of formality in blade technology largely precludes the description of 'types' of cores, some general trends in manufacture are evident in the sample.

All blade cores are manufactured on tabular or blocky fragments of silicious argillite. Probably as a result of the morphology and structure of the raw material, blade removal is, in most cases, along the edge of a tablet or block, in a direction parallel to the bedding planes on the material. In experimental replication using the local silicious argillite, it was found that the detachment of

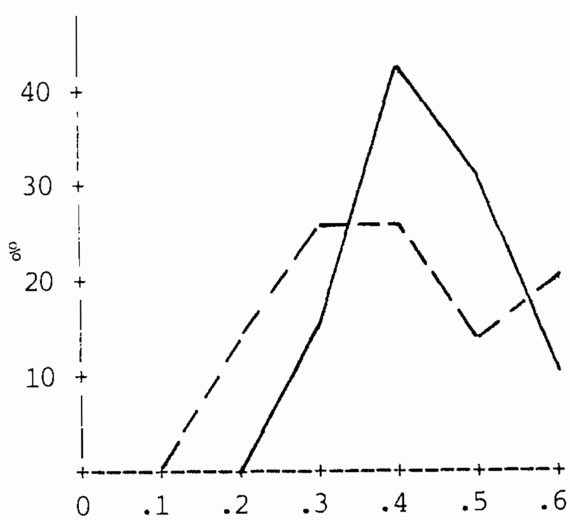
Figure 7.1: Comparison of Metric Attributes of Blade and Microblade Cores with the Sample of Blades and Microblades



Length
Blades N=20 ————
X̄ 4.23 cm.
r 0.78-9.22 cm.
sd 1.97
Blade Facets N=15 — — —
X̄ 3.63 cm.
r 1.14-6.53 cm.
sd 1.576
t=1.025 df=33 P >.01

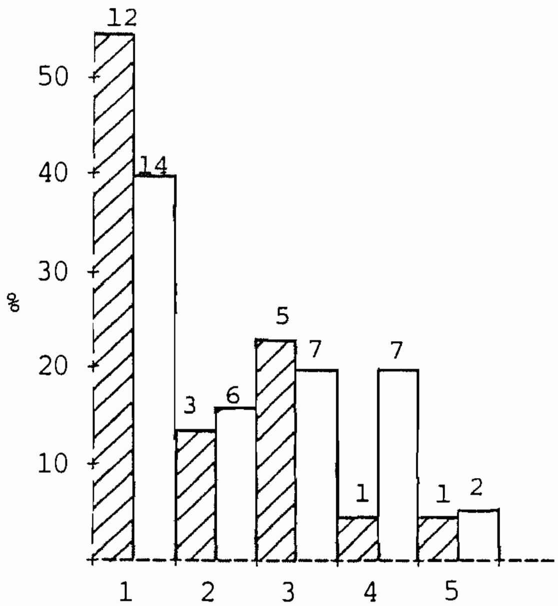


Width
Blades N=44
X̄ 1.59 cm.
r 0.47-3.38 cm.
sd 0.757
Blade Facets N=19
X̄ 1.286 cm.
r 0.41-2.70 cm.
sd 0.642
t=1.5 df=61 P >.01

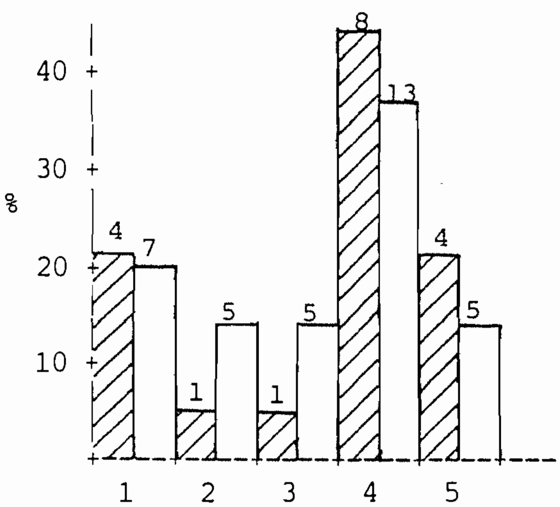


Length/Width Ratio
Blades N=19
Blade Facets N=15

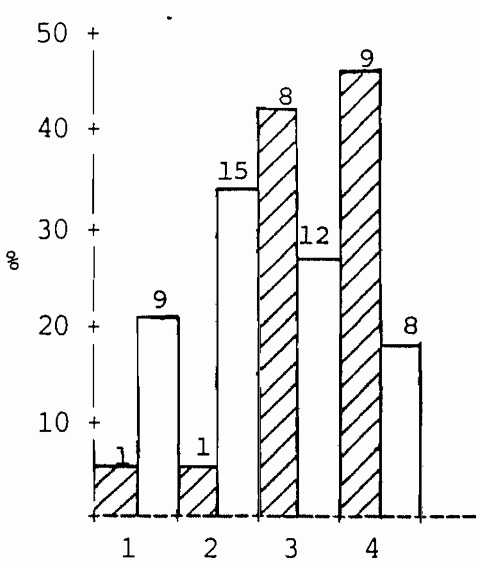
Figure 7.2: Comparison of Discrete Attributes of Blade and Microblade Cores with the Sample of Blades and Microblades



Platform Type
Cores N=22
Blades N=36
1 cortex
2 single facet
3 multiple facets
4 multiple facets from side
5 single facet and cortex
X2 0.45 df 2 P>.01



Platform Edge Preparation
Cores N=18
Blades N=35
1 grinding
2 chipping
3 battered
4 grinding and chipping
5 absent
X2 0.355 df 2 P>.01



Cortex Cover
Cores N=19
Blades N=44
1 absent
2 <25%
3 <50%
4 <75%
X2 11.36 df 3 P>.01

flakes parallel to the bedding plane also required less effort, and the resultant fracture surfaces tended to be smoother.

The majority of blade cores in the Rock River sample exhibit a large percentage of cortex cover. In approximately 54% (n=7) of the core sample (n=13), and 39% (n=15) of the blade sample (n=39), even platform preparation is absent. This suggests that there was a deliberate selection for tablets or blocky pieces which could be used in the production of blades with only a minimum of modification.

When present, platform preparation most often consists of the removal of a single large flake from the fluted or faceted end, along the length of the platform.

Techniques of core platform rejuvenation recognized in the sample include the removal of a core tablet by a blow struck from the lateral side of the fluted face (core tablet recovered at MfVa-10) and by a blow struck from the centre of the fluted face (technique described as burination by Anderson [1970a]). One core tablet, recovered at MfVa-11, was struck from the back of the core, or end opposite the fluted face. The attempt to rejuvinate the core platform failed in this case, however, as a portion of the fluted face of the core was removed as well. Judging from the morphology of the tablet, the resultant platform on the core would have been unusable without further modification (Plate 7.1).

Of the complete, or nearly complete blade cores (n=11), 45% (n=5) exhibit bidirectional blade removal. The average number of blade facets per platform is approximately two to three.

General Features of Microblade Technology

With the exception of a Campus type, or wedge-shaped microblade core, made on a grey chert flake, and a more amorphous form produced on a locally available black chert pebble, the microblade cores in the Rock River sample are made on fragments or flakes of silicious argillite. As in the sample of blade cores, a relatively informal and expedient approach to production is characteristic of these artefacts.

The majority of microblade cores exhibit 50% or greater cortex cover. On 50% (n=4) of the microblade cores,

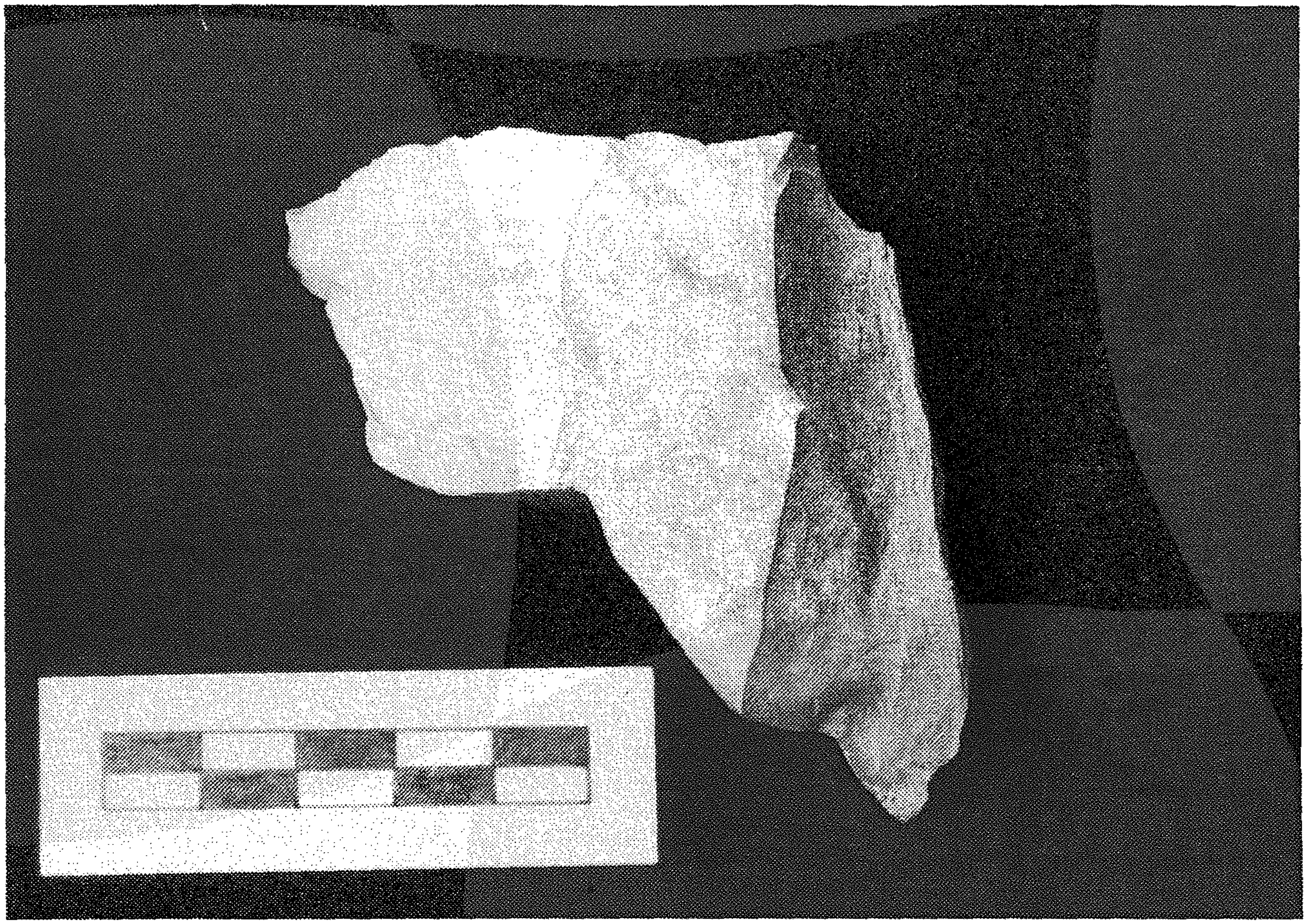


Plate 7.1: Blade Core Fragment Recovered at MfVb-3. Face-Faceted Variety

platforms for the detatchment of blades comprise natural cleavage plane or cortical surfaces; when present, preparation of the platform most often takes the form of multiple faceting from the fluted face onto the platform surface. The wedge-shaped core is again the exception here, in that platform preparation consists of multiple faceting from the lateral edge of the fluted face. A spall, recovered in buried context at MfVa-9 (artefact number 479), appears to represent an attempt to rejuvenate a microblade core platform edge by transverse burination. The resultant platform angle on the core would not have been usable, however, without further modification.

Virtually all microblade cores exhibit only a single platform. The average number of blade facets on the cores is three.

Comparison of Blade and Microblade Technology

Two questions may be raised with regard to the nature of blade and microblade production in the Rock River area:

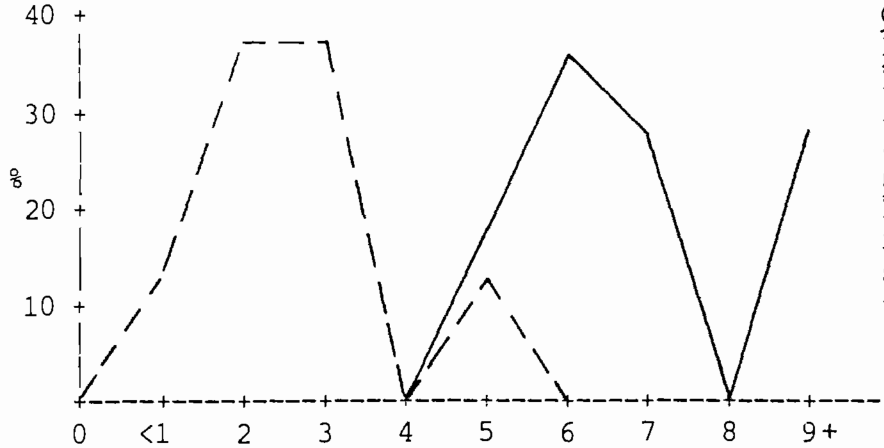
1. Are these distinct activities, or does the manufacture of large and small blades represent a continuum in production?

2. If the production of blades and microblades represent distinct activities, are they part of the same technology?

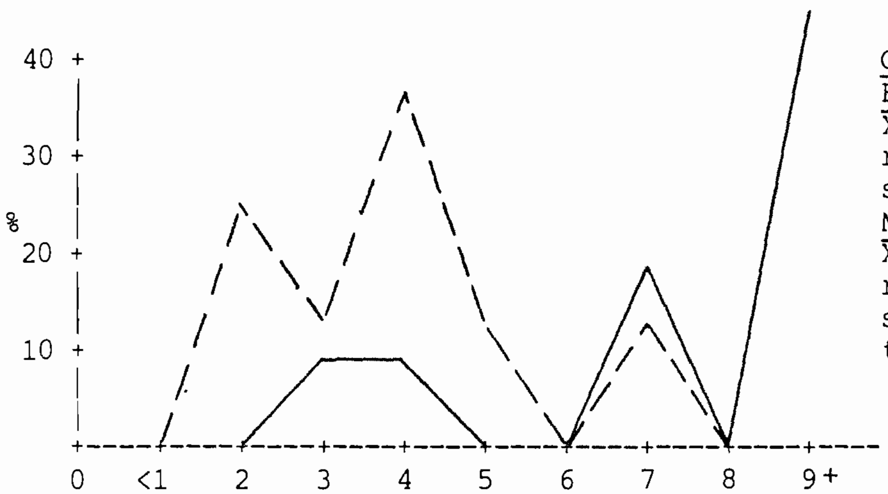
In the analysis of the Akmak assemblage from Onion Portage, Anderson (1970a) addressed the problem of a continuum in blade and microblade manufacture by the examination certain production attributes of the cores. The kinds of attributes Anderson found useful in demonstrating that these were in fact distinct activities within a single technology include angle of the striking platform (microblade cores exhibited less acute platform angles), a bimodal distribution of size attributes, a greater number of facets on microblade cores, and more regular facets on microblade cores (1970a:32).

To some degree, these patterns are duplicated in the Rock River sample (Figures 7.3 - 7.4), which suggests the production of blades and microblades were also distinct activities in the technologies represented here. Where overlap exists, this is probably attributable to the nature of the raw material, and the predominately expedient nature of both blade and microblade core production, in which the morphology of the original blank essentially predetermines

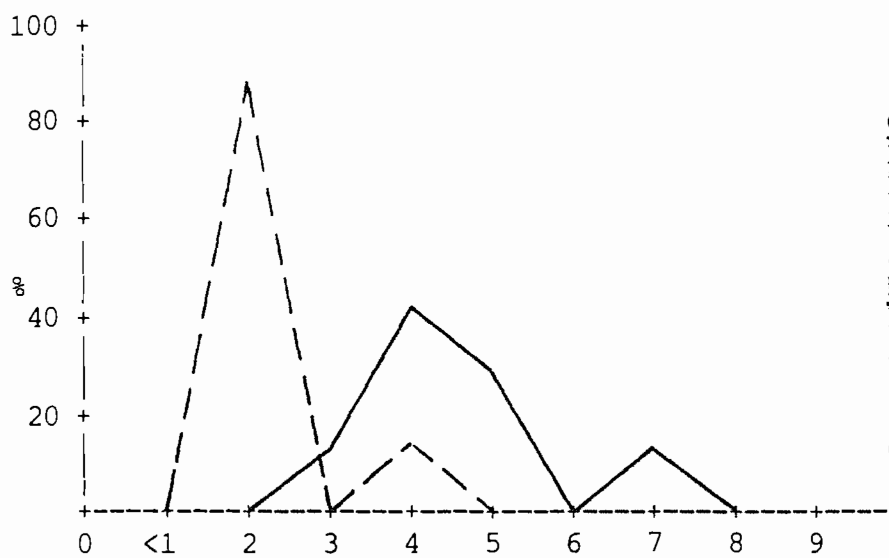
Figure 7.3: Comparison of Metric Attributes of Blade and Microblade Cores



Core Height
Blade Cores N=11 ———
X̄ 6.813 cm.
r 5.34-10.0+ cm.
sd 2.12
Microblade Cores N=8 — — —
X̄ 3.015 cm.
r 1.48-5.86 cm.
sd 1.38
t=4.164 df=17 $p < .01$

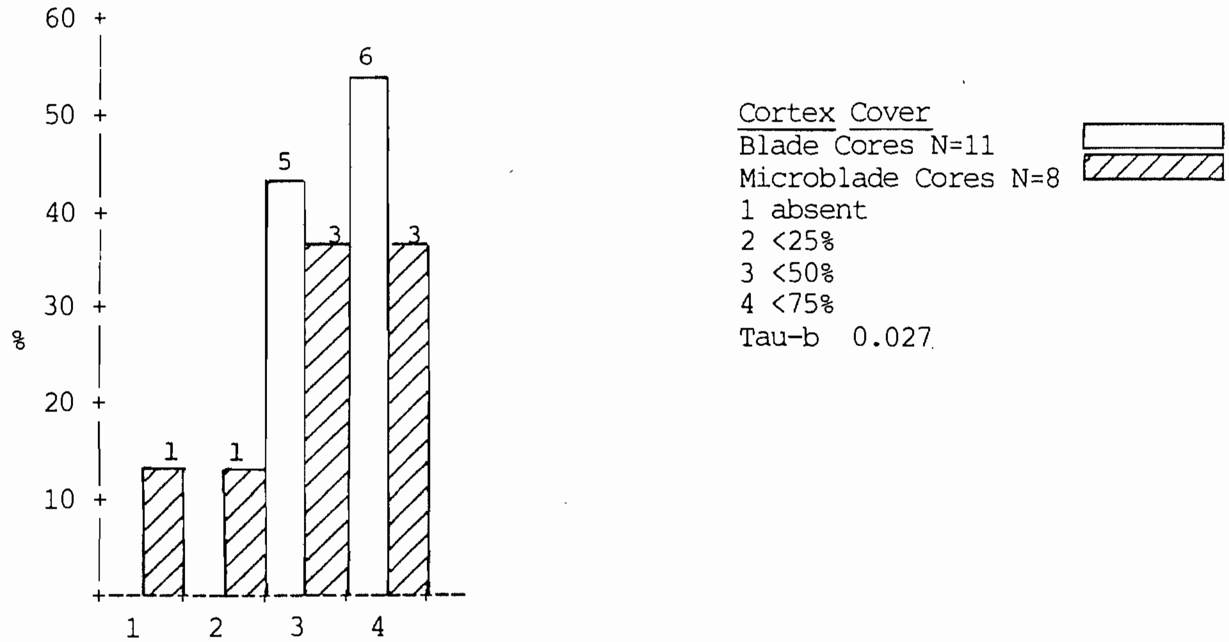


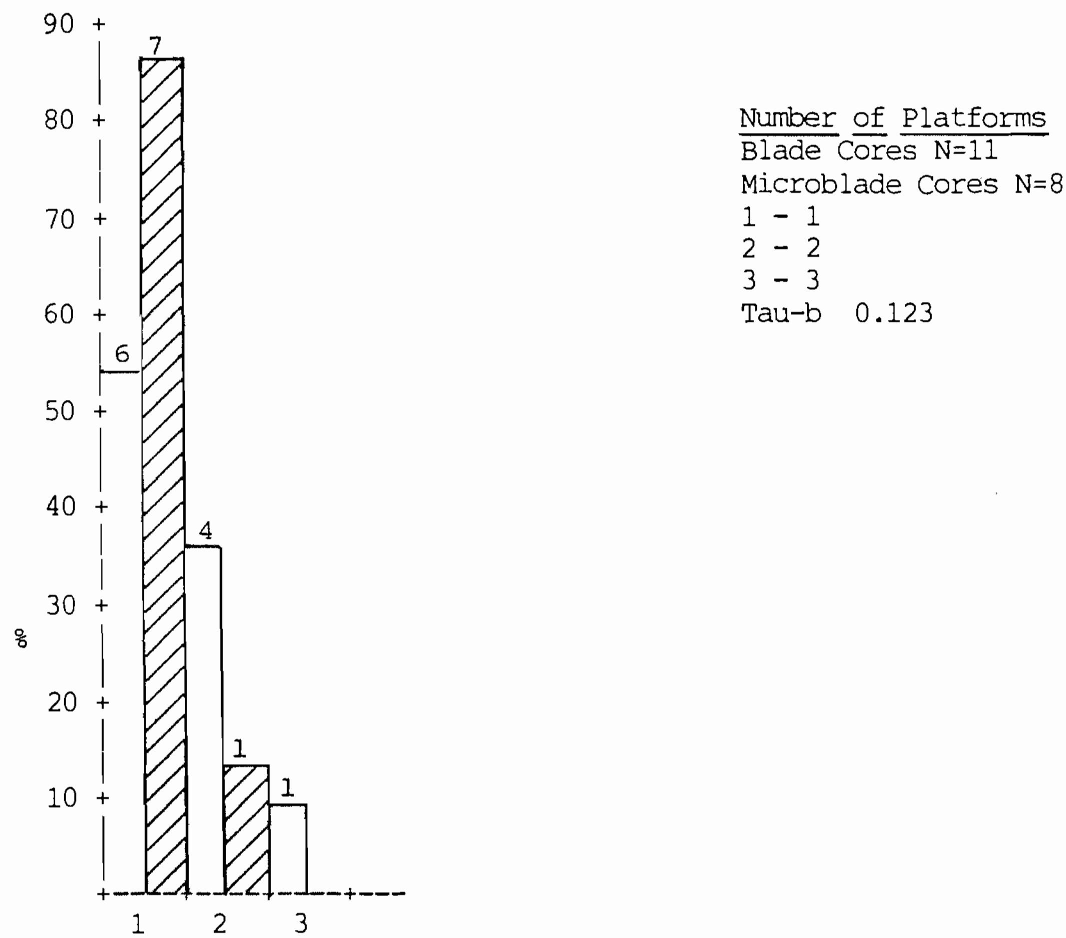
Core Length
Blade Cores N=11
X̄ 6.74 cm.
r 3.08-10.0+ cm.
sd 2.57
Microblade Cores N=8
X̄ 3.71 cm.
r 1.75-2.01 cm.
sd 1.81
t=2.546 df=17 $p > .01$



Core Width
Blade Cores N=7
X̄ 4.26 cm.
r 2.32-6.5 cm.
sd 1.515
Microblade Cores N=7
X̄ 1.47 cm.
r 1.10-1.40 cm.
sd 0.342
Samples do not exhibit common variance.

Figure 7.4: Comparison of Discrete Attributes of Blade and Microblade Cores





the form of the resultant core. (Tau-b values in fact indicate that the correlation of specific production features with either blade or microblade cores is relatively weak.)

With regard to raw material, Ackerman (1980) has observed in the Ground Hog Bay 2 site in southwest Alaska, that techniques of core manufacture and preparation appeared dependent on raw material form and type. Microblade cores made on argillite, which is harder to flake relative to obsidian or chert (i.e., requiring more force for the detachment of flakes), were, for example, more variable in form and production than the cores made on the crypto-crystalline raw materials. Microblades produced from argillite cores tended also to be larger than the chert or obsidian blades.

The question of whether the production of blades and microblades in the Rock River area occurred within the context of a single technology can be addressed only indirectly in the present analysis. Differences in platform preparation, and number of platforms on blade and microblade cores have already been noted in the samples as a whole. The expediency characteristic of both blade and microblade core production obviously limits comparisons of core morphology, but there is a tendency for microblade cores to exhibit blade removal from the face of a tablet or blocky piece, rather than the edge, as is characteristic on most of the blade core sample. In this regard, microblade cores more closely resemble the tabular core form in the interior northwest. The exceptions here are the wedge-shaped or Campus core, and the microblade core made on a chert pebble. Following Morlan's terminology (1970:31), the latter may be classified as a core of 'predetermined form'.

The differences in blade and microblade core production, although far from compelling, are noteworthy if compared with Anderson's (1970a:31) observations on the Akmak blade and microblade core technology, in which morphological similarities are very evident in the type IIB (blade) and IIC (microblade) cores.

Discussion

Although the foregoing analysis fails to adequately resolve the question of the relationship of blade and microblade technologies in the Rock River area, an examination of the distribution and associations of blades and microblades in the sites suggests that these technologies may not have been entirely contemporaneous.

The evidence for the production of large blades in surficial context at MfVb-3 (Plate 7.2) occurs without associated evidence of microblade production. Previous identification of a microblade component in the buried deposit at MfVa-9 (Gotthardt 1982) has been revised to a more tentative status: the majority of small blade-like flakes in this deposit may be either byproducts of large blade production, or burin spalls. Only one small blade or blade-like flake (MfVa-9:395), exhibiting discontinuous marginal retouch or use, together with relatively heavy crushing on the distal end, remains as a possible candidate for the presence of microblade technology. Where this could be determined, there appears to be a degree of stratigraphic separation of blade and tentatively identified microblade technology in the buried deposit: blade technology appears largely restricted to the lower organic lens; possible microblade technology occured most often in association with the upper organic lens (Table 3.4). As noted earlier, the date of 7500 B.P. on the buried deposit is an average date based on combined charcoal from both the upper and lower organic lenses. The actual age of the two organic lenses may be significantly younger and older than the 7500 B.P. average, respectively.

The wedge-shaped microblade core recovered in surficial context at MfVa-9, and the pebble microblade core at the nearby MfVa-10 site occurred without associated microblades.

Two microblade fragments were recovered at MfVa-14, in deposits dated to approximately 1800 B.P. Evidence of blade production was absent in this deposit. A utilized (?) microblade was also recognized in surficial context at MfVa-14, associated with a number of crude blades or blade-like flakes (Plate 7.3). This association cannot, however, be assumed to represent contemporaneity.

The fact that microblades are so poorly represented in the Rock River sites is of interest, but cannot of itself stand as evidence in arguing for the separation of microblade and blade technology in the Rock River area. Trampling, cryoturbation and the differential sorting of surficial deposits has been observed in the Rock River sites. Possibly these processes have caused smaller debris, including microblades, to become imbedded in subsurface deposits, resulting in their being unavailable for routine surface collection (cf. Gifford and Behrensmeyer 1977; Villa 1982; Bowers _et al_. 1983).

The significance of the presence/absence of microblade technology in various early and mid-Holocene assemblages has

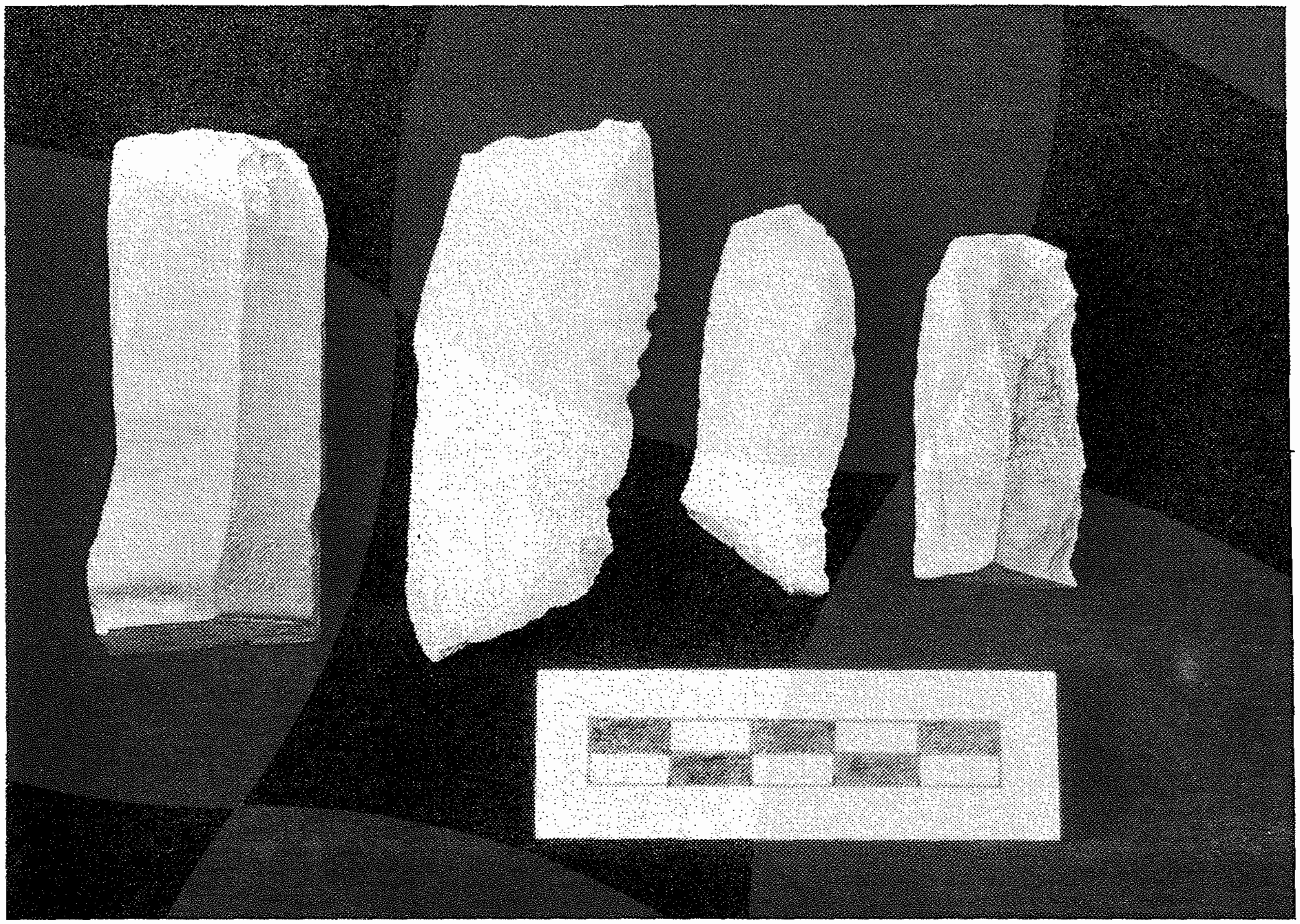


Plate 7.2: Large Blades Recovered in Surficial Context at MfVb-3

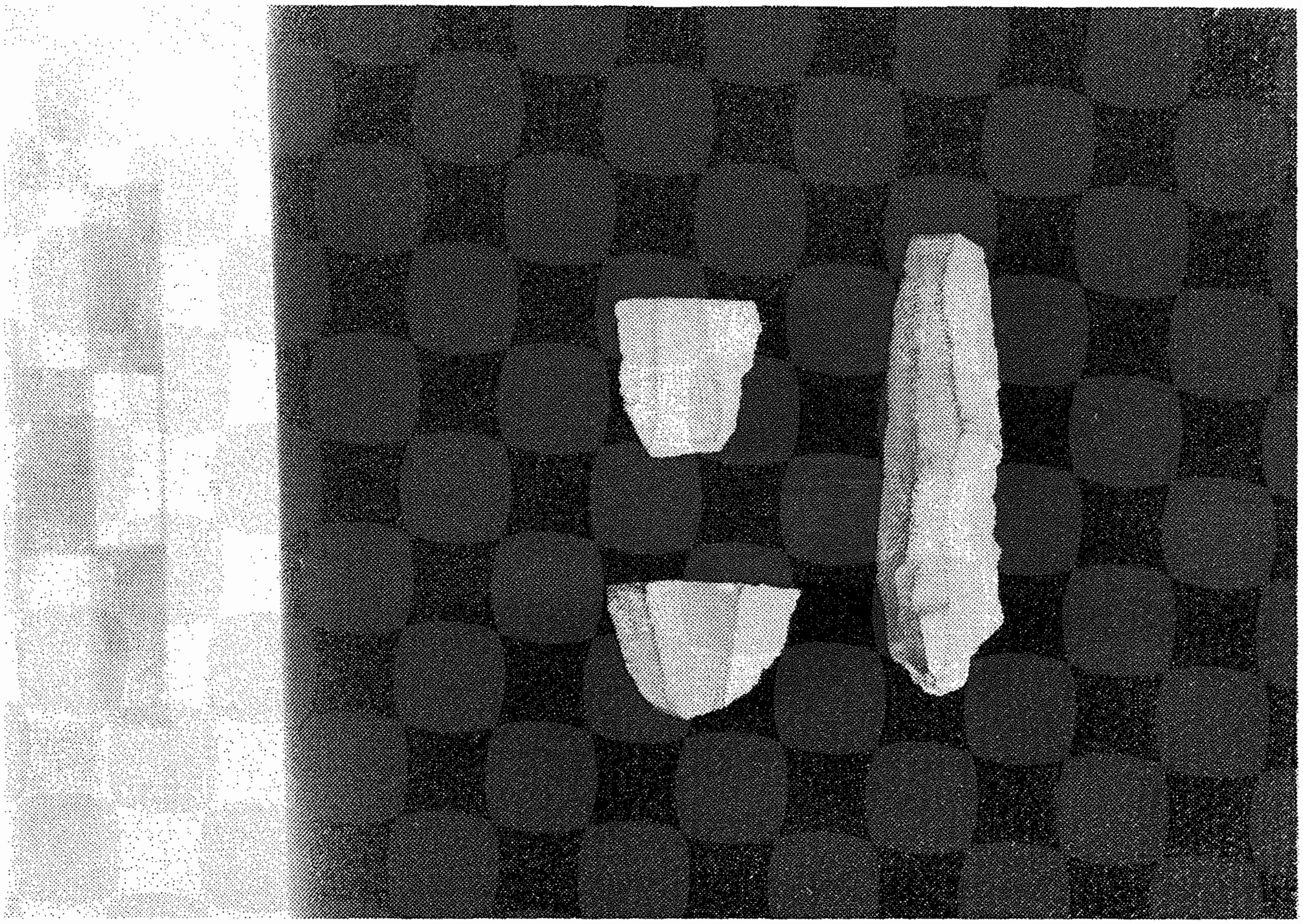


Plate 7.3: Microblade Recovered in Surficial Context at MfVa-14 (Left); Two Microblade Fragments Recovered in Buried Context at MfVa-14 (Right)

been the subject of some debate in the recent literature (see for example Dumond 1980:988; Clark 1981:115; Morlan and Cinq-Mars 1982:373). Concern is expressed as to our ability to interpret patterns of distribution without a firm understanding of the functional and historical role of the technology. This is considered more fully in the following discussions.

Blade and Microblade Technology in the Interior Northwest

In the interior Northwest, the production of large blades is associated with various and variously defined terminal Pleistocene/early Holocene techno-complexes including the American Paleo-Arctic tradition (Anderson 1968; 1970a,b), the Denali complex or Beringian tradition (West 1967, 1981), and the Northwest Microblade tradition (MacNeish 1964, Millar 1981). Blade technology has also been suggested as a trait of Northern Plano (MacNeish 1964) and the northern Cordilleran tradition (Morlan and Cinq-Mars 1982).

In those complexes also characterized by microblade technology, a close formal and technological relationship, if not a continuum, is generally seen in the production of large blades and microblades. Wedge-shaped, conical and tabular core varieties are apparently present in both blade and microblade samples (West 1981:85ff, Table 3.2). From the published descriptions, somewhat higher proportions of informal or opportunistic cores, however, characterize large blade technology; on the other hand, according to West (1981:87), microblade cores are the most distinctive and well characterized artefacts of the Beringian tradition.

West (1981:81) describes fortuitous or informal blade cores as follows: " ... the body may consist of an otherwise unaltered flake or block from which single or multiple blade removals have been made. Platforms often consist of accidental breaks or planes of bedding or cleavage". Informal or generalized blade cores comprise the majority of the core sample at both Anangula and the Gallagher Flint Station (Aigner 1970; Dixon 1975). Dixon (1975:69) notes for the Gallagher cores that over half are rotated, exhibiting two or more platforms, but no preferred orientation and no standardized techniques for core preparation are evident. Although Alexander's (1987:25; 33) description is not very detailed, the blade cores of the Putu complex can probably be characterized as informal or generalized as well.

An obvious explanation for the less formal or standardized production of large blades as opposed to microblades may be found in the uses inferred for these forms. Microblades are commonly assumed to have been produced as insets in composite bone and antler tools (see for example, Guthrie [1982]). This places fairly strict limits on the morphology of the microblades. Large blades, on the other hand, served as blanks in the production of a variety of implements, and as such are less subject to morphological constraints. In Akmak, Anderson reports that 10% of the artefact sample is made on blades, including end scrapers, beaked implements, side scrapers or knives and burins (1970a:32). The comparatively informal production and use of blades in Akmak extends as well to the use of blade-like flakes for tool manufacture:

> Although many of the implements in the Akmak assemblage are made on true blades, the same functional types are also made on blade-like flakes ... although blades are technologically distinct from flakes, blade implements are functionally indistinct from blade-like implements (Anderson 1970a:33).

Despite the predominately expedient approach to blade production in the Rock River area, some inter-assemblage comparisons are possible. Anderson's detailed treatment of blade manufacture in the American Paleo-Arctic tradition Akmak assemblage reveals a number of very close similarities, particularly of his Type IIB edge faceted core, with three (four?) cores in the Rock River sample (Plate 7.4, 7.5). Specific correspondences include:

1. Platform preparation by a single, or in some cases multiple blows, with flake removal from the fluted or faceted face of the core onto the platform).

2. Tabular blank or support piece. In the Rock River collections, these are unmodified, naturally occurring tablets; in Akmak, core bifaces or partially bifacially worked tabular pieces were used as blanks.

3. Outline of the core tends to be triangular or quadrilateral.

4. Blade facets are commonly relatively irregular.

5. Platform angles on the majority of Type IIB cores in Akmak range between 77° and 83°, as compared with 70° to 85° on the edge faceted cores in the Rock River sample.

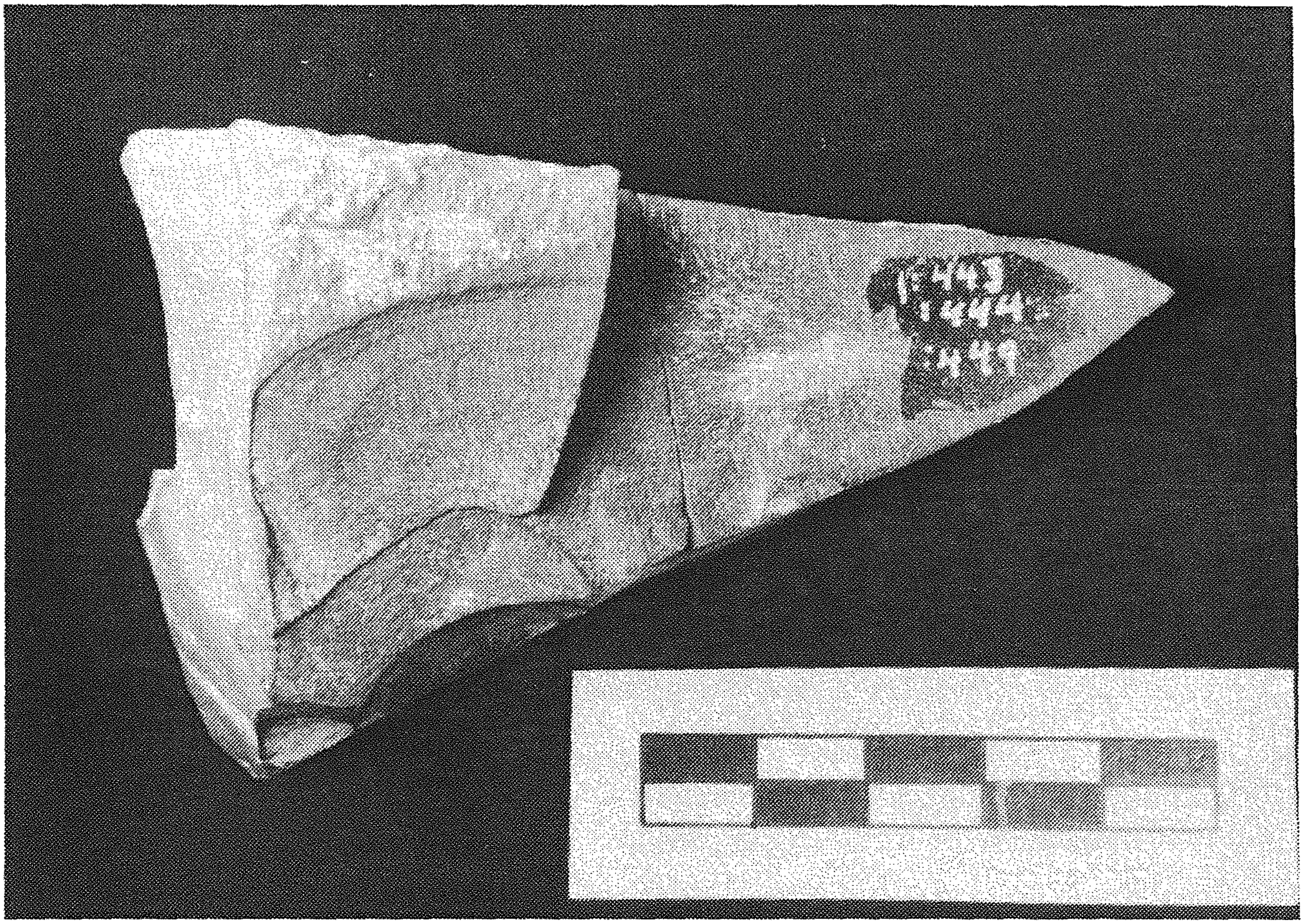


Plate 7.4: Lateral View of Informal Blade Core Recovered in Buried Context at MfVa-9. Edge-Faceted Variety

Plate 7.5: Lateral View of Informal Blade Core Fragments (Edge-Faceted Variety): Core Fragment on Left Recovered in Buried Context at MfVa-9; Core Fragment on Right Recovered in Surficial Context at MfVa-17

6. Blade dimensions correspond relatively closely in the Akmak and Rock River samples.

Differences in the Akmak and Rock River edge faceted blade core samples are relatively minor by comparison. Steep unifacial retouch, noted as a technique of platform preparation in Akmak, is absent in the Rock River sample (with the exception of a wedge-shaped microblade core). The absence of platform preparation on approximately half of the Rock River cores probably reflects differences in the nature of the available raw material, rather than technology.

A single fragmentary example of what would be a face faceted core in Anderson's classification (1970a:fig.22) has been recognized in the Rock River collections (Plate 7.1). As with the Akmak sample, the platform angle on this specimen appears relatively acute. Most of the platform is missing on the Rock River core, however, and this prevents more detailed comparisons of platform preparation. By comparison with the edge faceted cores, facets are relatively wide and shallow on the face faceted varieties in both the Rock River and Akmak collections.

Recently, Ackerman (1986) has reported on what he considers to be a variant of American Paleo-Arctic blade production technology in the Kagati Lake complex from southwest Alaska. The large blade cores in the sample are described as "large blocky to subprismatic to conical/ cylindrical" in form, with blade removal predominately from the lateral face of the cores, as opposed to the 'frontal' removal characteristic of the Akmak cores. Ackerman further distinguishes these cores from the Akmak cores on the basis of occasional rotation, or sometimes, bidirectional blade removal, and the presence of broad blade facets. Although Ackerman does not make the comparison himself, his description of the Kagati Lake cores resembles Anderson's description of the 'face-faceted' cores in the Akmak collections, which are also characterized by the removal of broad blades from the 'lateral' face of the core. Ackerman does, however, consider Anangula, Gallagher, Koggiung, Ugashik Narrows and Ugashik Knoll core forms comparable to the Kagati Lake cores.

There are four blade cores in the Rock River sample, however, (recovered at MfVb-3 [n=3] and MfVa-17 [n=1]) (Plate 7.6 and 7.7) for which comparisons are apparently lacking in the literature. All are expediently produced on blocky pieces of silicious argillite, with modification restricted to the platform and the fluted face. Platforms are prepared by the removal of a single large flake, as with the Akmak Type IIB cores; however, the platform angle for these specimens is highly acute (65° to 70°), and blade removals are very regular. Perhaps the most significant

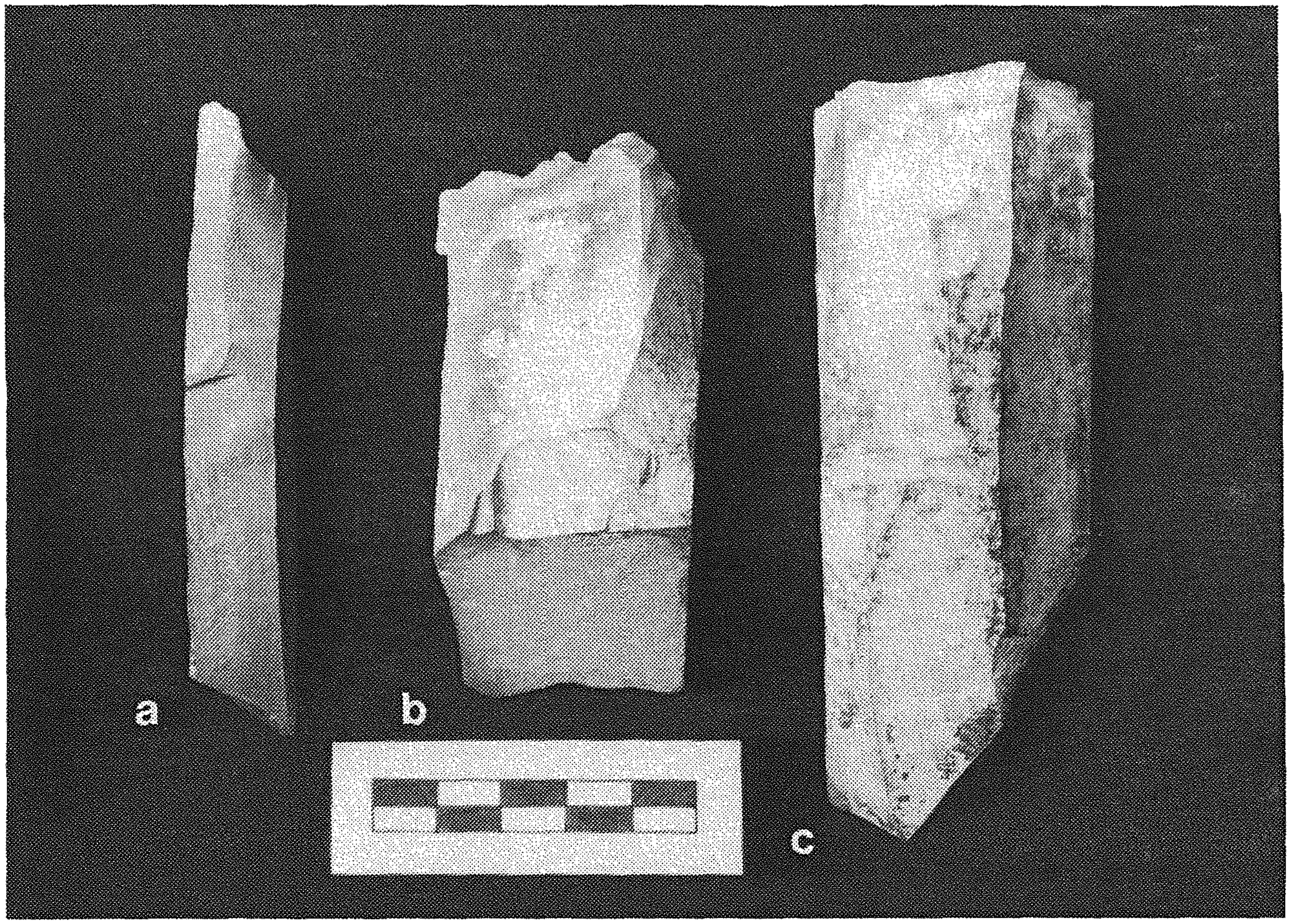


Plate 7.6: View of Faceted End of Three Blade Core Fragments. (a) MfVa-17; (b) and (c) MfVb-3

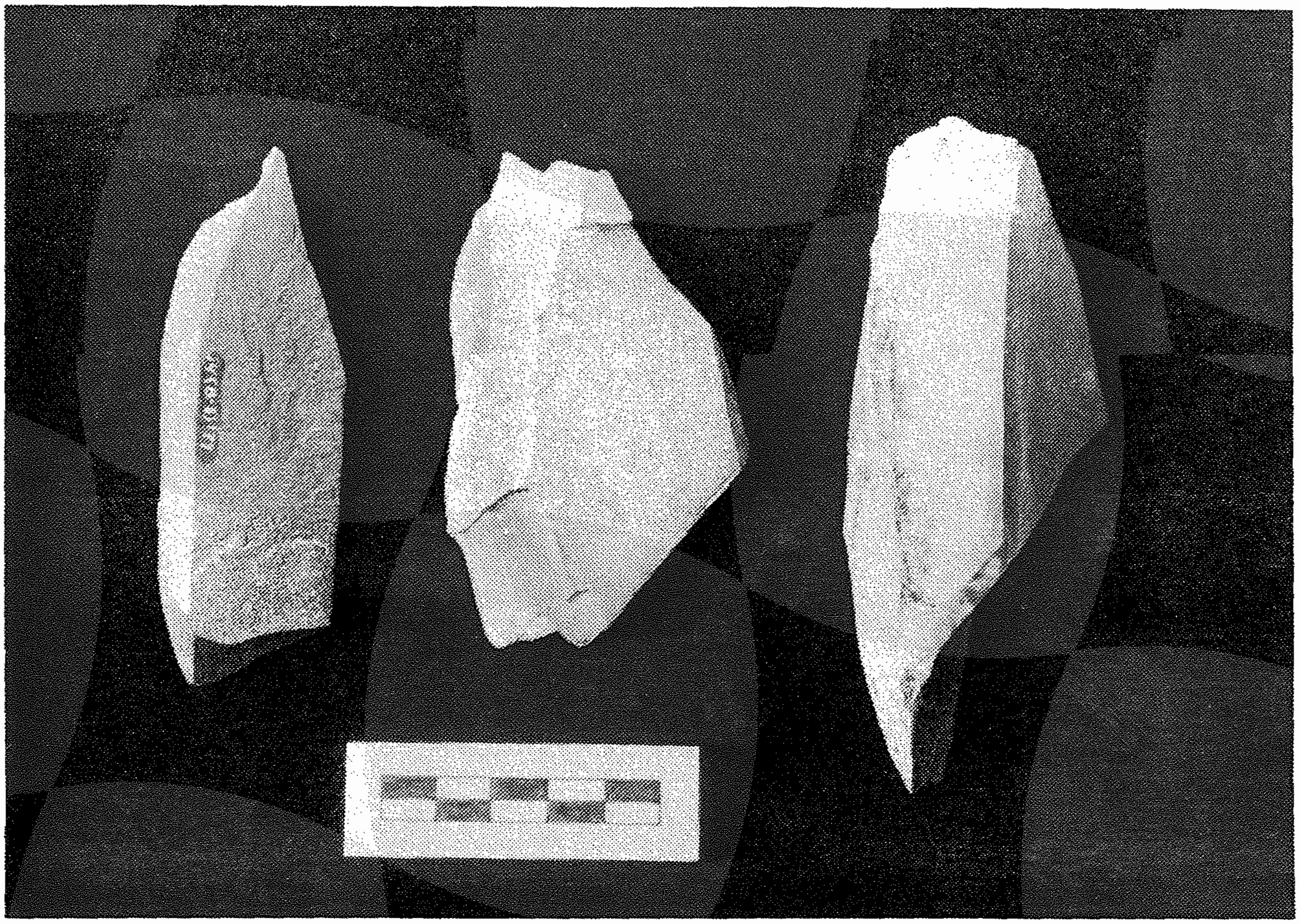


Plate 7.7: Lateral View of Core Fragments shown in Plate 7.6

feature of these cores is the removal of blades bidirectionally, from both ends of the fluted face. Possibly, these are a variant of the Akmak Type IIB cores. Alternatively, relations may lie with Gallagher and Anangula blade cores, which frequently tend to be rotated.

In a recent publication, Alexander (1987) illustrates a series of blade cores from the Putu site; one specimen (1987:31, Fig. 21, i) very closely resembles the Rock River cores from MfVb-3 and MfVa-17. Unfortunately, Alexander does not provide a detailed description of this core. The use of tablets or 'slabs' of raw material for blade core production is a feature the Putu complex shares with the Rock River sites. Most of the Putu cores (34 of a total of 43 cores) are also rotated; Alexander (1987:33) does not specifically mention bidirectional blade removal, however. Although the Putu complex, dated to 11,470 ± 500, is best known for the presence of fluted points in the assemblage, Alexander (1987:39-41) sees close relationships to sites and complexes of the Paleo-Arctic tradition, which he lists as the Akmak assemblage at Onion Portage; certain of the materials at the Batza Téna sites; the early occupation at Trail Creek; at least five of the Utukok sites (1, 3, 6, 12, 13), and the Chindadn occupation at Healy Lake.

The single wedge-shaped microblade core recovered in surficial context at MfVa-9 (Plate 7.8, b) compares well with types described in Akmak (Anderson's Type IIC [1970a]) and the Denali complex (West 1981:122). In and of itself, however, the comparison is not especially helpful for the interpretation of culture-historic relationships, as wedge-shaped or Campus cores are widely distributed both temporally and spatially in the interior northwest (see for example Clark 1981:110, Dixon 1985).

Three tentatively identified tabular or face faceted microblade cores, recovered in surficial context at MfVa-10, MfVa-13 and MfVa-17, may be compared to the Tuktu tabular cores on the minimal level of general design (Plate 7.9). Equally plausibly, these cores could be likened to 'face-faceted' macro-cores. The identification of the Rock River specimens as cores is not certain, however.

The pebble microblade core recovered at MfVa-10 was compared earlier to Morlan's (1970) PD type, or cores of predetermined form (Plate 7.8, a). Morlan's (1970) survey of microblade technology in the northwest describes these forms in Dorset/Arctic Small Tool tradition assemblages, and in low frequencies in interior assemblages in Alaska and Yukon. According to Morlan (1970:34), "The incidence of (PD cores) is much higher in the earlier collections of the interior".

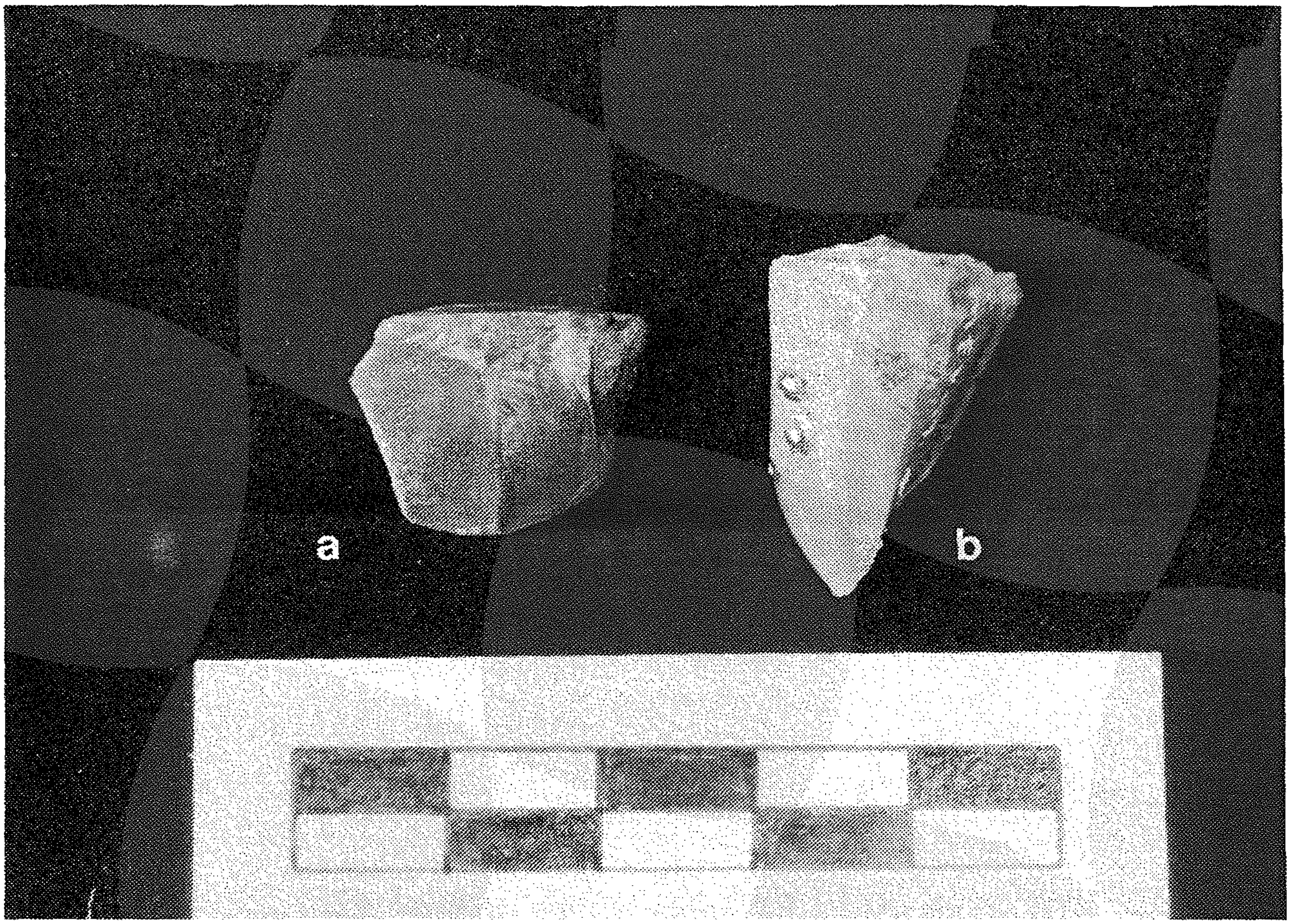


Plate 7.8: Possible Microblade Core on Chert Pebble (a); Wedge-Shaped Microblade Core (b)

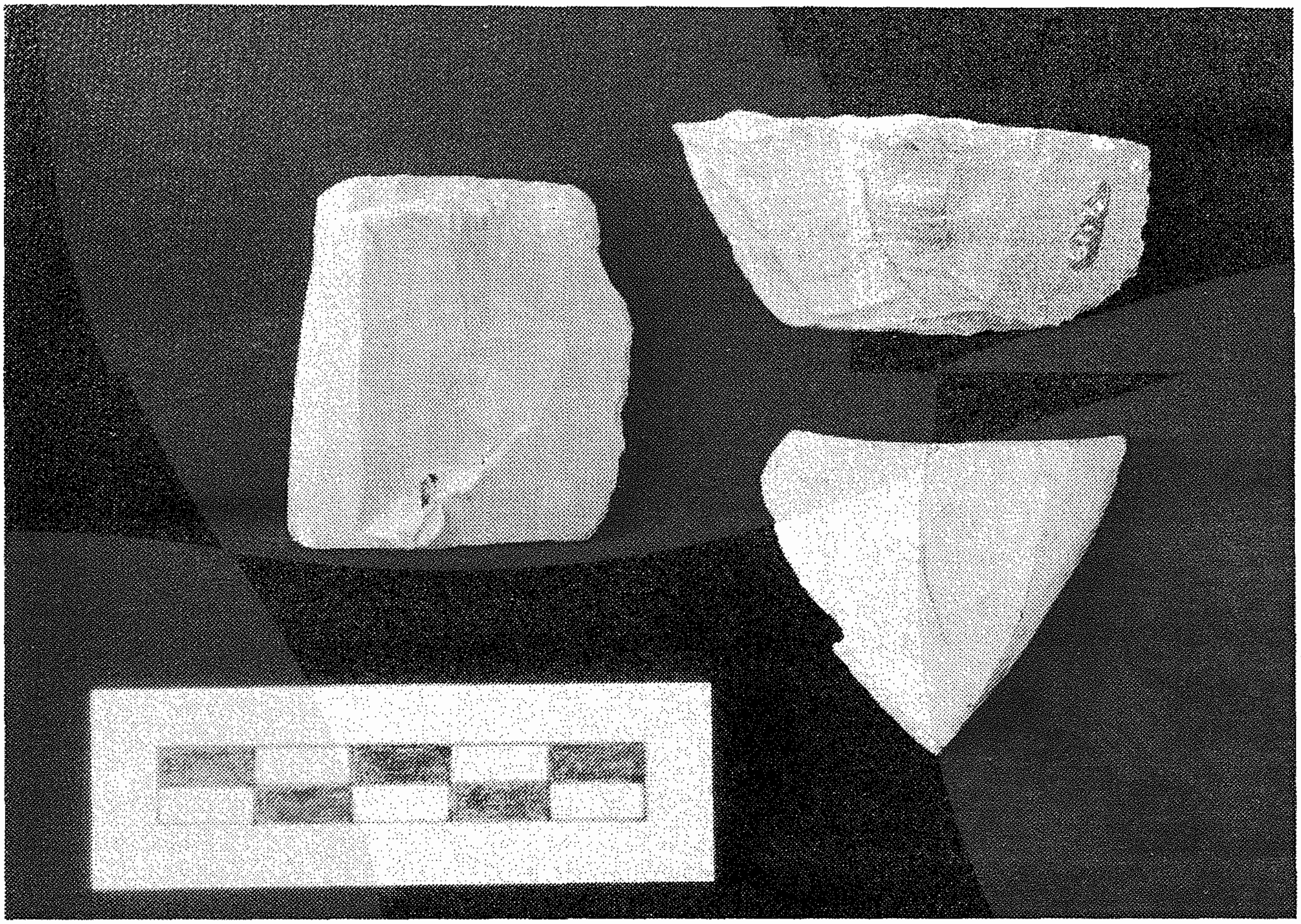


Plate 7.9: Tabular or Face-Faceted Microblade Cores

No immediately obvious comparisons for the remaining sample of microblade cores in the Rock River collections have been found in the literature (Plate 7.10). These are all relatively expedient cores, made on tabular or blocky fragments, and may well be subsumed under the class of predetermined forms, as defined by Morlan (1970). Comparisons with microblade cores in the Great Bear Lake area are possible (1987:42), however; this these will be considered in greater detail in the following.

Distribution and Chronology

Evidence of blade technology in proximity to the Rock River area has been recognized on the Yukon coast, in the upland regions surrounding the Old Crow basin, and in the western District of Mackenzie.

At NeVc-2, located on Rapid Creek on the Yukon coastal plain, Gordon (1973) has defined the Mackenzie blade component on the basis of two blade core fragments, manufactured on locally available grey chert cobbles or blocks, and several associated blades. One core has been rotated and exhibits two platforms. Preparation of the initial platform was achieved by the removal of a single large flake from the fluted face. The second platform utilizes an existing blade facet. The platform on the second core is prepared by the removal of several flakes from the fluted face and adjacent to the fluted face, onto the platform area. Dimensions of the cores and blades are somewhat smaller than observed in the Rock River collections, which may be a factor of the size of the available raw material. Blades at NeVc-2 are also relatively narrow, averaging 0.6 - 0.8 cm, as compared with a mean of approximately 1.0 - 2.0 cm for the blades in the Rock River collections.

Gordon compared the Mackenzie Blade materials to unpublished blades and blade cores recovered by Cinq-Mars at the Yellow Lake site (LdRq-2), west of Fort Norman. The Yellow Lake cores are made on nodules or cobbles of volcanic tuff, and like the cores at NeVc-2, are rotated, with platform preparation in the form of the removal of a single large flake from the platform. Previous blade facets were also used as platforms.

Blades are also present in the N.T. Docks/Franklin Tanks complex at Great Bear River (MacNeish 1955), but Gordon is less willing to see close relationships with the Mackenzie Blade component in view of the larger size of the

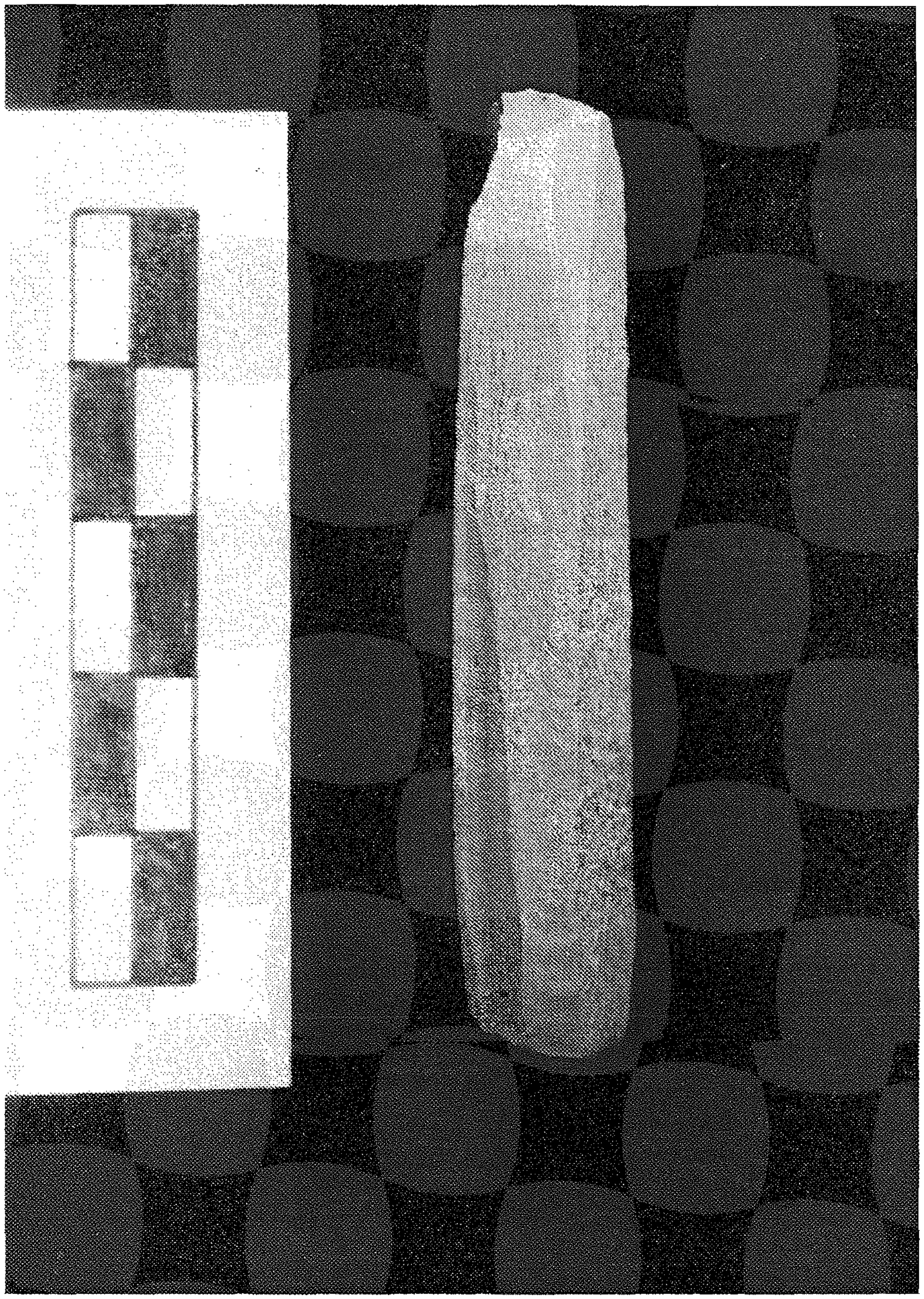


Plate 7.10: Microblade (?) Core Fragment

former, and their co-association with microblades. He notes, however, that blades, microblades and large triangular projectile points and possible gravers in N.T. Docks/Franklin Tanks probably do relate to the early component at Whirl Lake, in the southeast Mackenzie delta area (Gordon and Savage 1974).

Clark (1987), in his recent synthesis of the archaeological record in the Great Bear Lake area, including the N.T. Docks and Franklin Tanks complexes, is unprepared to identify a blade production technology in this area on the basis of the available evidence. "The few apparent blades (present in the Great Bear Lake collections) cannot support a definitive statement regarding a blade industry" (Clark 1987:44). Clark's description of the cores represented in the Great Bear Lake collection merits repetition here, in view of the 'informal' and 'expedient' approach recognized for the Rock River blade cores:

> There exist also, though not especially prominent in the Great Bear Lake collections, unformalized flake cores ... Such cores generally lack preshaping of the sides and base. Natural surfaces or unretouched fracture planes serve as striking platforms. However, after several flakes or bladelike flakes have been removed from a poorly formalized core it may take on a wedgeshaped or subconical form ... (1987:42, emphasis in original).

The principal difference between the Great Bear Lake cores and the blade cores in the Rock River collections, however, is that of size: on the whole, the Great Bear Lake specimens are small and were used in the production of small blade-like flakes or 'bladelets'.

Returning to the Yukon coast, evidence of blade production has been tentatively identified in assemblages attributed to the British Mountain complex. In the British Mountain component at Engigstciak, MacNeish (1959:46) has described three possible blades, one of which is modified as an end scraper. Gordon's (1970) survey of British Mountain-like assemblages in the Trout Lake area failed to provide for him any convincing evidence of associated blade technology. In the assemblage from one of these sites, however (NeVg-1, located southwest of Mount Fitton in the upper drainage of the Blow River), I suspect three specimens could fall within the range of informal blades cores (NeVg-1:lot no. 29), together with one blade (NeVg-1:6), and two blade-related flakes (NeVg-1:lot no. 29). The cores are relatively large, minimally prepared, and made on blocks of grey banded chert or silicious sedimentary material. Platform preparation occurs on only one core, in the form of the removal of a single large flake from the fluted face.

This core also differs from the other two in a somewhat more acutely angled platform. Multiple blade removals are evident on all cores. Two lamellar flakes were also identified in the sample as possibly relating to the initial flaking or preparation of the fluted face of the core. Both exhibit a single blade facet and cortex on the dorsal face. On one, platform edge angles are relatively acute. The second specimen exhibits a platform angle approaching 90^{o}.

To accommodate Gordon's view of British Mountain as a non-blade technology, the assemblages at NcVg-1 and Engigstciak could be viewed as mixed; that is the material culture remains of more than one prehistoric occupation may be represented.

On the northern peripheries of the Old Crow Basin, examples of large blade and microblade production have been identified in surveys conducted by Cinq-Mars and Irving (including wedge-shaped, conical and tabular microblade core varieties) (Irving and Cinq-Mars 1974; Cinq-Mars 1976b, 1977). In virtually all cases, these represent undated surface finds, and associations are probably mixed. Portions of the unpublished Dog Creek and Ahtrai assemblages in northern Yukon (Morlan and Cinq-Mars 1982:376) are considered by the investigator (Cinq-Mars) to date to the terminal Pleistocene/early Holocene period. Evidence of blade and microblade technology were noted in both sites. In Ahtrai, four crude or fragmentary blade cores were recovered, made on blocky pieces of chert or silicious sedimentary material. On two cores, platforms were prepared by the removal of a large flake from the faceted end. On the remaining two cores, platforms are cortical. Three of the four cores are rotated. A few relatively large thick blades are also present in the collections. Dog Creek has also produced evidence of fluted point technology; however, the assemblage represents primarily mixed surficial deposits and the significance of associations cannot be determined at this point.

South of the Old Crow Basin, excavations at Bluefish Cave II recovered a notched angle burin/scraper combination tool made on a blade, in deposits dated to the terminal Pleistocene (Morlan and Cinq-Mars 1982:368; Cinq-Mars 1979). Similarities to blade burins in the Rock River collections have already been noted.

It is worth emphasizing at this point that a number of the assemblages in northern Yukon and the western District of Mackenzie have yielded evidence of large blade production independent of microblade technology, specifically, the Mackenzie Blade component and Yellow Lake. In the Rock River area, evidence for the association of blade and microblade technologies, as noted earlier, is at best ambiguous. The explanation for the absence of microblade technology may relate to sampling, as most assemblages are relatively small and may represent limited activity sites. Alternatively, however, Morlan and Cinq-Mars (1982:376) have proposed on the basis of the evidence accumulating for the northern Yukon, including the Rock River sites, that some of these assemblages may represent distinctive regional developments, possibly dating from the late Pleistocene or earlier.

In Alaska, the presence of blade technology without an associated microblade technology is described for the Amphitheater Mountain complex in the Tangle Lakes region (West 1973). As with the Rock River assemblages, abundant large bifaces were recovered in sites of the Amphitheater Mountain complex. The status of the seven sites comprising the complex is, by West's own admission, tentative (see also West 1981:78, Table 3.1), but a date of pre-10,000 B.P. is suggested nonetheless. Reviewing the illustrated sample of blades (1973: Fig. 4f; 7c; 9a, e, f; 10d), a generous appraisal would term these artefacts examples of informal blade technology; I suspect the designation blade-like flake is, however, more appropriate. Mobley (1982) has suggested that the Amphitheater Mountain complex represents a functionally specialized series of sites, (i.e., workshop/quarry sites), and on the basis of similarities with the inventory at the Landmark Gap Trail site dated to approximately 4330 B.P., proposes relationships to late phases of the Denali complex. Mobley considers the blades in the Amphitheater Mountain complex to be fortuitous.

Putu and the Driftwood Creek Complex in northern Alaska (Alexander 1973, 1987; Humphrey 1970 in Alexander 1973) produced large blades and polyhedral blade cores associated with fluted points, various biface points and knives, and in the case of Putu, a microblade industry. Dumond (1980:990) has suggested, however, that the microblades in Putu could be considered to fall within the range of the blade industry. Although Alexander (1987:40) sees close technological ties to Akmak, Clark (1983:30) describes the blade/microblade industry at Putu, dated to approximately 11,500 B.P., as " ... not typical American Paleo-Arctic (Anderson's 1970a Akmak) format". Alexander also sees close relationships between Putu and the assemblages of the Chindadn complex, and certain of the Batza Téna materials. Both Chindadn and Batza Tena, however, have been included by Clark (1983) in his northern Cordilleran tradition; in this light, differences between Putu and Paleo-Arctic tradition technologies appear to be emphasized.

Alexander's interpretation of Putu as a fluted point complex implies closer relationships to the blade and burin technologies in Clovis, at the Clovis and Levi sites. Interestingly, burins in Clovis technology exhibit in some cases a concave platform (notch?) prepared by unifacial flaking for detachment of the burin spall, and in some cases a straight, unifacially prepared platform (Alexander 1973:23), which are types of modification described for the Donnelly burin in the interior Northwest as well.

The presence of blade technology in the Northern Plano tradition requires consideration here in view of the observed similarities between Acasta Lake (attributed membership in Northern Plano [Noble 1971]), and certain elements in the Rock River assemblages. In MacNeish's original definition of the Northern Plano tradition (1959a,b; 1964), crude blades were described as a characteristic trait of the tradition. Noble (1971) has described blade-like flakes in Acasta, some of which, upon inspection, could be described as true blades. Blades are, however, absent in Millar's (1981) Nakah Plano phase at Fisherman Lake, and in the small assemblage in the basal levels of the Canyon site, assigned by Workman (1974; 1978) to the Northern Plano tradition. Countering MacNeish's (1964) earlier reconstruction of the prehistoric sequence, Workman (1978:241) observed that in southwest Yukon there is no evidence for the existence of a large blade industry. To accommodate a view of Northern Plano with blades, the presence of a blade technology in some, presumably ancestral early Paleo-indian complexes south of the ice sheets, may be noted (Alexander 1973).

However, recalling that the evidence for the association of blades and microblades in the Rock River assemblages is ambiguous, a review of the distribution and characteristics of complexes in the interior Northwest in which both large and small blade production occurs is necessary; these may also bear on the interpretation of the cultural-historical sequence in the Rock River area.

Resemblances between Akmak blade and core technology and a number of blade cores in the Rock River collections have already been noted. The wedge-shaped microblade core recovered in surficial context at MfVa-9 is of the widespread Campus type, associated with American Paleo-Arctic and Denali complexes in interior Alaska, and also characteristic of Little Arm components in southwest Yukon (Workman 1978) and various Northwest Microblade tradition complexes in Yukon and the District of Mackenzie (Millar 1981; Morlan and Clark 1982). In northern Yukon, microblades and a wedge-shaped core were recovered in excavations at Old Chief Creek, on the Porcupine River. Although this component has not been dated directly, it underlies non-microblade early prehistoric Athapaskan levels dated at 2150 ± 120 B.P. and 1850 ± 165 B.P. (Cinq-Mars 1976b; Greer 1980). The sequence at Old Chief might call into question the very late dates on microblades at MfVa-14 in the Rock

River area (approximately 1800 B.P), given the relative proximity of these site areas.

If the association of a side-notched point and blade and microblade technology in buried context at MfVa-9 is valid, this assemblage would closely compare to that described by Campbell (1961) for the Tuktu complex. No blade cores were recovered in Tuktu, but 21 blades were present, ranging in length from 1 7/16" to 4 1/8" (approximately 3.75 - 10.25 cm), which is similar to the length distribution observed for the Rock River blades. Thirteen blades in Tuktu have been retouched to fashion single and double-sided scrapers. An additional seven exhibit lateral edge damage, which may relate to their use in cutting or scraping activities. The distinctive tabular microblade core in Tuktu may be compared to three possible face-faceted cores in the Rock River sample, although none of these occur in the MfVa-9 deposit. An important difference in the Tuktu and Rock River inventories is the absence of burins in the former.

Tuktu-related materials are also reported by Cinq-Mars (n.d.) in somewhat closer proximity to the Rock River sites, at Kikavichik Ridge and Dog Creek, in northern Yukon.

Tuktu, or the Tuktu-Naiyuk complex (Clark 1981:111) is dated to approximately 6500 B.P. (Anderson 1968b:2), and is considered by Anderson (1980:246) to represent, together with Palisades, the earliest phases of the Northern Archaic tradition. The presence of blades and microblades in Tuktu, which initially prevented its inclusion in the Northern Archaic tradition by Anderson (1968b), was evidently subsequently balanced against the presence of most of the Northern Archaic diagnostics in the complex. Presumably explanations could revolve around trait diffusion between the technologically distinct Northern Archaic technologies and earlier microblade complexes (in Anderson's view; see also West [1981]).

Arguing for continuity in the prehistoric record in the interior Northwest, Morlan and Clark (1982:85) place sites with associated microblade technology and side-notched points (including Tuktu and the buried component in the Rock River area) in a somewhat rehabilitated Northwest Microblade tradition.

East of the Cordillera, Millar (1981) reports a small number of sites or complexes (including Whirl Lake, Franklin Tanks/N.T. Docks, and the Pointed Mountain complex at Fisherman Lake) as typifying the local expression of the Northwest Microblade tradition (N.W.M.t.). The basic N.W.M.t. assemblage in the District of Mackenzie, as described by Millar (1981:271), includes burins, bifaces, lanceolate, stemmed and notched points, large lateral unifaces, a few blades or blade-like flakes, and core tools. As Millar (1981:272) rightly observes, this is also, with the addition of a few elements, the basic composition of the American Paleo-Arctic assemblages represented at Akmak.

Northwest Microblade tradition materials in the Great Bear Lake area, including N.T. Docks and Franklin Tanks, contain a high proportion of microblade cores which Clark (1987:42) describes as "rudimentary", and " ... lacking a high degree of characterization".

> Several microblade cores in the present collection are characterized by broad, nearly circular, retouched platforms, by evidence of platform rejuvenation, and by otherwise minimal shaping of the core blank.
>
> In many cases their identity, especially as microblade cores, might have been overlooked had they not been associated with particular industries (Clark 1987:42).

Clark's description of the N.W.M.t microblade cores in the Great Bear Lake collections presents the closest parallels to the informal microblade cores recovered in the Rock area.

Summary and Discussion

The strong similarities that have been noted between certain Rock River blade and microblade cores, and cores in the American Paleo-Arctic Akmak assemblage are suggestive of a degree of technological, if not cultural-historical continuity between the northern Cordillera and northern Alaska. The recovery of Akmak-like large blade cores in buried context in the Rock River area, in possible association with a side-notched point and microblade technology, has been interpreted by Morlan and Clark (1982) to represent continuity from the American Paleo-Arctic to the Northwest Microblade tradition. The informality characteristic of microblade core production in the Rock River collections is described elsewhere in the interior northwest only by Clark (1987) for the N.W.M.t. Great Bear Lake collections.

If the paucity of microblades in the Rock River assemblages relates to historical events rather than site function or other factors, then the presence of two early blade technologies in the region may be proposed: one with connections to the American Paleo-Arctic/Northwest

Microblade tradition continuum; and the second associated with the hypothesized northern Cordilleran tradition. As noted above, Morlan and Cinq-Mars (1982) have suggested the placement of some of the Rock River collections in this early non-microblade entity.

CHAPTER 8

THE PLACE OF THE ROCK RIVER SITES IN THE EARLY PREHISTORY OF THE INTERIOR NORTHWEST: A REVIEW OF ARTEFACT TYPOLOGY AND TECHNOLOGICAL TRADITIONS

Introduction

The following presents a review of the status and significance of the principal subsets of lithic technology (edge retouched and utilized implements [specifically multipurpose tools], biface technology and blade and microblade production technology), which serve as the basis for the organization and definition of the complexes and traditions in the prehistoric record of the interior Northwest. Approaches to the description of these key subsets of technology, developed in study of the Rock River collections, are incorporated into the review to provide possible alternatives or refinements to existing interpretations. The use of what is essentially a 'modal' approach for the characterization of the products of lithic technology, as was applied to the analysis of the Rock River collections, particularly allows for the consideration of factors of expediency and curation in tool production, which are not adequately accommodated in conventional morphological typology. The ability to recognize formal or informal approaches to tool production is facilitated as well by a modal analysis and will assist in the definition and characterization of the technologies present in the archaeological record of the interior Northwest.

Artefact Types and Technological Traditions in the Interior Northwest

Multipurpose Tools

In the review of the sample of edge retouched and utilized implements in the Rock River collections, I have proposed that certain features of their production, particularly the association of functional edges on otherwise expedient and informally produced tools, represent procedural or functional 'modes'. I have further suggested that these 'modes' in tool production have some potential for tracing historical relationships among the early technologies of the interior Northwest, and may in some cases be treated as fossiles directeurs, or index types in attempting to define technological traditions.

It was suggested that the manufacture of certain of the multipurpose tools on blades (transverse notched burin; burin/scraper; and burin/scraper/notch) identifies these tools with the early blade/microblade complexes in the interior Northwest; and possibly with the less well defined northern Cordilleran/Northern Plano traditions. The persistence of these associations of edges in expediently produced, non-blade burins serves to underline the persistence of the mode. The transverse notched burin in particular is associated with the proposed northern Cordilleran complexes in the interior Northwest (Clark 1987). The combination of burin/scraper/notch edges on a blade has been identified at Bluefish Cave II and in the buried deposit at MfVa-9, likely predating 7500 B.P. in the Rock River area. Associations again suggest a northern Cordilleran tradition or derivative affiliation, although this is more tentative.

Forms which are comparable to the Donnelly burin also occur in the Rock River sample, which may be used to strengthen the argument for the presence of Northwest Microblade tradition technologies in the Rock River headwaters.

Further comparisons are limited however, by the inadequacy of existing descriptions of the tools in the literature. The descriptions of 'secondary burins' are suggestive of multipurpose tools, but cannot be confirmed on the available information. Features such as use patterns also merit greater attention by investigators. Use of the burin facet in a scraping as opposed to shaving fashion (use wear present on the facet or on the adjacent face of the tool) are potentially important for refining existing typologies but are not consistently documented by investigators.

In the sample of multipurpose scrapers in the Rock River collections, certain associations of functional edges on otherwise expediently produced implements, in particular, scraper/notch combinations, also present in the Paleo-Arctic tradition Akmak collections; and with the scraper/piece esquillee combination tools in the late prehistoric Klo-kut and Rat Indian Creek sites. Comparisons of certain other multipurpose scrapers in the Rock River collections are hampered by the absence of descriptions of these forms in the literature.

End scraper rejuvenation by burination of the working edge observed in the Rock River sample may also be viewed as a 'procedural mode'. To the best of my knowledge, this technique is described elsewhere only in the Lindenmeier collections, and may point to connections with early technologies in the interior Northwest, ancestral to Paleo-Indian complexes south of the ice sheets. This needs to be substantiated, however.

The production of certain multipurpose denticulated implements on otherwise expedient and informally produced tool forms (including burin/denticulate; scraper/denticulate; and scraper/denticulate/beaked implements) has been used to suggest the operation of what may be historically significant tool manufacturing conventions. Few comparisons are available for these implements, however; what is available suggests connections to the early microblade complexes in the interior Northwest. The scraper/denticulate/beaked implement, made on a chert flake, may be an example of raw material curation.

The closest comparisons to the beaked implements (both [B] and [P] forms) in the Rock River collections also appear to be in the early microblade complexes in the interior Northwest (specifically Akmak, Fisherman Lake and Dry Creek II). This form of functional modification, however, is widespread in the prehistoric record of the interior Northwest.

The lone example of the combination of multiple functional edges in the sample of tabular implements occurs on the distinctive Paleo-Eskimo (Norton?) knife/scraper. The amount of preparation present on the tool suggests the operation of a formal tool making tradition.

Since <u>pieces esquillees</u> apparently attain their maximum popularity in the Late Prehistoric Athapaskan tradition technologies, and occur in significant concentrations in these assemblages, the production of the Rock River sample in the context of late Prehistoric Athapaskan tradition technology seems a relatively safe assumption. Multipurpose <u>pieces esquillees</u> appear to be a not uncommon feature of these assemblages as well.

It is important to note here that the review of the 'modes' represented in the sample of multipurpose implements confirms relationships to the early microblade technologies in the interior Northwest (Paleo-Arctic/Northwest Microblade tradition), and to the technology of the proposed northern Cordilleran tradition.

Biface Technology

Clark's succinct observation, that " ... extreme prudence must be exercised in employing the typological approach to point comparisons in the north" (1983a:22), appears to represent the consensus of opinion among researchers concerning the utility of this class of artefacts as historical-index types. Reviewing the literature, it is evident that the cultural-historical significance of large lanceolate points and notched points, which figure prominently in the interpretation of the prehistoric record in the Rock River area, is not adequately understood.

Large lanceolate points are widely distributed both temporally and spatially in the interior Northwest (Clark and Morlan 1982:83, Millar 1981); and Millar's claim, that these points represent Northern Plano technology and its derivatives, should be viewed with caution. In describing the occurrences of lanceolate point forms in the Mackenzie Basin, Millar (1981:262) himself stresses their extreme variability:

> While most of the points ... have the general appearance of Agate Basin, others are unilaterally-shouldered as Sandia, bilaterally-shouldered as Hellgap, concave-based as Plainview, or with shallow stems and straight bases, as Alberta or Scottsbluff. Flaking techniques vary widely from the delicate transverse and oblique ripple-flaking of many early-plains lanceolate-forms, to broad, shallow flaking.

Although Millar does not pursue these observations further, I suspect that a closer study of variability in the production and form of this class of artefacts in the interior Northwest, as originally suggested by Irving (1971:74), would contribute substantially to our understanding of the events in the prehistoric record.

I have attempted this for the limited sample of biface points from the Rock River area with some potentially significant results. Two manufacturing strategies were observed to be associated with the generalized lanceolate forms in the Rock River collections; of particular interest was the discovery that the round or convex-based lanceolate point form and the Kamut points were characterized by the same production strategy. Although further study of the distribution of manufacturing strategies in time and space is required, the fact that two production techniques are represented in the lanceolate point sample from the Rock River area suggests that this form might have been produced in the context of two technological traditions.

Irving and Cinq-Mars (1974) and Workman (1974:101) have posited that the large lanceolate points with rounded, or highly convex bases, are an early trait in the archaeological record of the interior Northwest. Irving and Cinq-Mars (1974:77) suggest a northern or Arctic Cordilleran affiliation for this type; Workman (1978:427) prefers to see this form as related to the early manifestations of the Little Arm Phase in southern Yukon, whose origins he thinks lie in a combination of Paleo-Arctic tradition and Paleo-Indian/Cordilleran complexes from the south. Convex or round-based lanceolate points, together with Kamut points, also occur in the Acasta Lake complex, which Noble (1971) and Millar (1981) consider a part of the Northern Plano tradition.

To be consistent with regard to the importance of the production attributes of bifacial points, it should be noted that the flaking patterns present on the Nakah Plano points (parallel and collateral) which Millar illustrates from Fisherman Lake (1981: 262-4; Figs. 2, 3, 4), are markedly different from those observed on the round-based lanceolate points and the Kamut points in the Rock River and Acasta Lake collections (essentially broad and shallow). Possibly, this can be explained in terms of Acasta Lake as a 'regional subtradition' or variant of Northern Plano (Millar 1981). Alternatively, relationships may be argued to be more remote.

The fact that the distinctive Kamut point type in the Rock River area may be somewhat earlier than the Acasta Lake forms might used to argue stronger connections for Acasta to the west than had been considered previously. The presence, in Acasta, of a transverse burin and possibly blades, (including the scraper/notch combination tool on a blade-like flake described in Chapter 5), may be viewed as additional evidence in support of these connections.

If Northern Plano relationships are brought into question, relations to Clark's proposed northern Cordilleran tradition, or an 'undiverged Paleo-Arctic/Paleo-Indian technology' (Clark 1984) could be considered a plausible alternative.

The lanceolate points in the Rock River sample which were not produced by the same technique as the Kamut point and round-based lanceolate forms cannot be placed in the prehistoric sequence with any degree of certainty at present. It is likely, however, that these may relate to regional manifestations of Northern Archaic/Northwest Microblade tradition, in which large lanceolate forms also occur.

The interpretive problems surrounding the appearance of side notched points in the interior Northwest can be compared with those discussed above for the lanceolate point types. The extreme variability in these forms suggests that a single migration or source (i.e., Northern Archaic tradition) does not adequately explain the distribution and associations observed for this hafting technique. In an earlier discussion, I noted Millar's (1981) suggestion that Acasta Lake might prove to be an early source for the idea of side notching, independent of the apparent movement of the Northern Archaic tradition into the interior Northwest (Anderson 1968b; Workman 1978). In the western District of Mackenzie and parts of Yukon, the nature of the evidence, in fact, suggests relationships to a different technological sphere. Clark and Morlan's (1983), and Millar's (1981) resurrection of the Northwest Microblade tradition reflects their view of the essential continuity in the prehistoric record of this region; in this reconstruction, certain Paleo-Arctic traits were apparently introduced into pre-existing technologies. In this regard, the prehistoric record of the western District of Mackenzie and portions of Yukon may only be indirectly related to the northern Alaska sequence (I am referring here to Anderson's observation [1968b] that stoneworking in Northern Archaic and Paleo-Arctic industries are markedly different).

I will note, however, that the Tuktu complex, which Anderson (1970b) considers a mixed deposit incorporating Northern Archaic and Paleo-Arctic tradition materials, could also be interpreted to be an example of trait diffusion. The superficial resemblances noted between the reworked Kamut point, recovered in buried context in the Rock River area, and a side notched point from Tuktu (Campbell 1961:76; Plate 1, no.3), taken together with the presence of blade and microblade technology in Tuktu, may suggest that side notching as a hafting technique may be an acquired trait in Tuktu. Clark's decision to place the Tuktu-Naiyuk complex in the Northwest Microblade tradition appears, in this light, to be appropriate (Clark 1981:111). This further suggests that the prehistoric sequence in northern Alaska may be somewhat more complex than Anderson originally proposed.

Blade Technology

I find it curious that in comparison to microblade technology, large blade production has received relatively little attention in efforts to organize and interpret the early archaeological record of the interior Northwest.

Dumond's ideas concerning blade technology in the early Holocene complexes in Alaska and Yukon probably represent the consensus of opinion on the matter:

> Considering specifically the evidence from the Akmak and Kobuk complexes, it seems possible that those assemblages in which a substantial proportion of the collection is formed by large blades, cores, and discoidal core-bifaces will turn out to be consistently somewhat earlier than those in which they are lacking (Dumond 1977:40).

I suggest, however, that for the understanding of the prehistoric record of the interior Northwest, the significance of large blade production goes beyond the purely temporal. In Chapter 5, I discussed briefly some interpretations concerning the significance of blade production technology in the Old World Upper Palaeolithic (cf. Conkey 1978; Isaac 1977a). In the Old World at least, the decision to manufacture tools using blade blanks as opposed to flake blanks is considered to have major implications for the characterization of a prehistoric industry, particularly concerning the level of the increasing importance of standardization in tool production and the development of ideas concerning formalized implement types. Assuming that these observations may be extended to the New World, I would suggest that the cultural-historical significance of large blade production in the archaeological record of the interior Northwest deserves much closer scrutiny. In this regard, Anderson's separation of the Anangula and Gallagher assemblages, which are dominated by blade manufacture, from the technological sphere of Akmak/Paleo-Arctic (1970, 1980) is probably more meaningful than Dumond's (1977) decision to label these complexes as variants of the Paleo-Arctic tradition.

Taking the perspective of blades as a critical index trait, I would like to indulge at this point in a certain amount of speculation concerning events in the late Pleistocene/early Holocene of the interior Northwest which have relevance for the interpretation of the archaeological record in the Rock River area. The question specifically concerns the relationship of certain Paleo-Indian complexes (including Clovis and the proposed northern Cordilleran tradition) and the early microblade technologies in the interior Northwest, both of which are characterized by varying degrees of emphasis on the production of large blades.

Haynes (1982:395) is very clear on the question of Clovis and Paleo-Arctic connections: " ... the Denali, Akmak and Gallagher assemblages are obviously derived from Dyuktai (if they are not, in fact, a part of it), but none bear [sic] much resemblance to Clovis assemblages." Clovis origins are seen in the Siberian Paleolithic, in the Mal'ta, Buret I, and Tomsk sites. These sites differ from the partially contemporary Dyuktai tradition sites (Afontova Gora II and Kokorevo II) in that the former are characterized by a flake industry, with large blades; while wedge shaped cores and microblades dominate in the latter. Bifacial foliate forms occur in both, however.

West (1981) has argued for the opposite interpretation -- that the Beringian tradition (Dyuktai/Paleo-Arctic) is ancestral to Clovis, or at least that they share a common technological antecedent. Elements occurring in both Clovis and Beringian technologies are blades, lenticular and straight-based bifaces, notched burins and certain scraper forms (West 1981:183ff). In a recent publication, Clark (1984) also appears willing to consider an "undiverged Paleo-Arctic/Paleo-Indian technology" to explain certain non-conformist assemblages (also designated boreal or northern Cordilleran) in the interior Northwest.

While it is not within the scope of the present work to attempt to resolve the issue of Clovis origins, it is of interest to note that Anderson (1970a:68-69), in seeking Siberian connections for the Akmak inventory, observed strong similarities between the Akmak core bifaces and the discoid cores at Mal'ta, Ust'Belaia, and Afontova Gora II. Mal'ta and Afontova Gora II also yielded face faceted blade cores which essentially duplicated Anderson's Type II-A face-faceted cores in Akmak. If Clovis and Beringian technologies are unrelated to the degree Haynes suggests, some contact or at least diffusion of traits should be considered to explain these observations. If I am to be consistent with regard to my own arguments for the importance of blades as an index trait, one interpretation would see a common ancestral technology for Paleo-Indian and Paleo-Arctic as suggested by West and Clark. Following from this, the northern Cordilleran tradition may represent one regional manifestation of this ancestral technology. With the addition of microblade technology and possibly a few other traits, something very close to Paleo-Arctic might result.

The alternative explanation, partly following the lines of argument presented by Haynes (1982), however, is suggested in the earlier discussion (Chapter 7) that two blade technologies may have been present in the early archaeological record of the Northwest. Anderson (1970a) has noted the obvious technological continuity between the Akmak Type II-B blade core and the Type II-C microblade core, which are both edge faceted or wedge-shaped forms. The Anangula and Gallagher assemblages, and also in certain Northwest Microblade tradition complexes in Yukon and the District of Mackenzie, on the other hand, are dominated by informal or generalized cores, which frequently are rotated as well. Possibly, the differences between morphologically formalized and non-formalized blade cores could be significant in postulating the existence of two blade technologies in the Northwest. Wedge shaped blade cores might be viewed as typical Paleo-Arctic, accompanying and closely related to microblade technology. More generalized forms, or rotated cores, may belong to a different technological sphere. Leaving aside for the moment Anangula and Gallagher, I will speculate that this latter blade technology may be a part of the proposed northern Cordilleran tradition or ancestral Paleo-Indian technology.

If speculation is extended again to the question of Clovis/Paleo-Indian technology, Müller-Beck's (1983) observations concerning Clovis blade cores are of interest:

> [Clovis blade cores] ... are quite independent in character (from Beringian cores) deriving to [sic] cores corresponding to the 'Aurignacian' form, but ones that are different again from the latter because they are strongly curved. In that regard they relate to a developed, flat retouching technique which, as is well known, is one of the criteria by which Paleo-Indian industries are recognized (1983:11).

Obviously, the question of blade technology in the Northwest requires further study. Fortuitous blade core production and blade-like flakes contribute to the uncertainty surrounding this issue. I would propose that one useful approach in future would be to focus on patterning in the types of tools made on blades, together with their spatial and temporal context and associations. I will consider this suggestion in more detail below.

Microblade Technology

With regard to the usefulness of microblade technology as an historical-index trait, there are essentially two observations that I would like to make. The first concerns the unresolved problem of how situational factors may affect the occurrence of this technology in a particular assemblage. Similar reservations on the part of other investigators have been noted above.

Conventionally, the production of microblades is explained as an adaptation to scarce raw materials, permitting the artisan to generate the maximum tool edge length from a particular core. The production of microblades represents, therefore, 'curation behaviour', in the sense of raw material conservation in response to limited access to suitable stone for tool production. Possibly the distribution of high quality raw materials could be mapped against the occurrence of microblade production to shed additional light on this interpretation.

To the degree that this can be reconstructed from site context and rare faunal remains, the role of site function in the distribution of microblades would undoubtedly be informative as well. The terminal Pleistocene/early Holocene period in the interior Northwest would have seen the establishment of essentially modern patterns of caribou migration and the disappearance of many species previously hunted (horse, mammoth). Possibly variation in hunting equipment and, indeed, the fluorescence of microblade technology, reflects available prey. Guthrie (1983) has proposed that microblade and composite tool manufacture are closely related to the exploitation of caribou, and that caribou antler is in fact the material best suited for the production of composite tools. It may also be relevant to note that bison persisted locally until quite late in the Holocene (Guthrie 1982), and if we assume that hunting equipment was specialized, a different technology -- large, bifacial lanceolate points, for example -- may have been used for hunting these animals.

Specialization in hunting weaponry is not unprecedented in the ethnographic, or even archaeological record (cf. Guthrie 1983). White (1974:16) observes in Archaic sites in the American mid-West, for example, that notched and stemmed point forms occur in varying proportions in a number of sites, and has suggested that the types of game hunted could be one explanation for this variability.

If the production of microblades can be demonstrated to be independent of considerations of raw material availability or site function, it may be possible to interpret the manufacture of composite tools using microblades as a technological tradition whose distribution will have implications for tracing historical relationships in the prehistoric record.

The second observation relates to some degree to the above, and concerns the general trend in the early-mid Holocene prehistory of North America for projectile point styles to diffuse rapidly. Fluted point occurrences are perhaps the best known example (although some would argue against trait diffusion in this case; cf. Haynes 1982; Martin 1982). Bryan (1980) has traced the rapid spread of side notching as a hafting technique across North America over a period of about 3000 years. Assuming that technology (sensu lato) accommodates changes in the environment and the available resources, variation and innovation in the sensitive area of hunting techniques and equipment are to be expected, particularly in high latitudes in the early Holocene. Bonnichsen (1978) for example, has suggested that fluting as a hafting technique and the use of the atlatl are associated as a complex of techniques for hunting. Following the same lines of reasoning, it could be suggested that the appearance of microblade technology and composite tools represent a similar development (Guthrie 1983). In other words, the spread of ideas concerning microblade production and composite tools occurred independently of any human migration, and these elements were essentially added to the technology of the groups already present in the interior Northwest.

Some support for the idea of microblades as a trait which diffused from Northeast Asia into Northwest North America is provided indirectly by Dixon (1985) in his suggestion that microblade technology in 'late Denali' complexes represents a re-introduction from Arctic Small Tool tradition, rather than the persistence of this technology over a period of approximately 8 - 10,000 years.

The Archaeological Sequence in the Northern Cordillera

The following is a speculative reconstruction of the prehistoric sequence for the Northern Cordillera based on the existing evidence reviewed above. Much of northern Yukon was ice free during the last Wisconsinan glacial period, and the earliest occupations of the Rock River may well have occurred during this period. Because the character of any lithic technology present in Yukon at this time is unknown, apart from traces recovered in the Bluefish Caves (Cinq-Mars 1979; Morlan and Cinq-Mars 1982), the evidence for this early occupation is difficult to recognize.

The sequence outlined here assumes, conservatively, that human presence in the western Richardson Mountain foothills is co-incidental with the early Holocene period and the presumed development of what are essentially modern patterns of caribou migration in the area.

Early Holocene

Occupations by groups using a technology Clark (1983a) has identified as northern Cordilleran. This technology is characterized by the production of large bifaces using the Strategy II biface production technique, blades from generalized or informal blade cores (often rotated), and tools made on blades, specifically transverse notched burins, and burins/scraper/notch tool combinations. Diagnostic point forms of the northern Cordilleran tradition include large convex-based lanceolate points and side-notched or lobate stemmed Kamut points.

Mid-Holocene

Paleo-Arctic or Northwest Microblade tradition technologies appear. Blade production is represented by certain cores which resemble formal types identified by Anderson in the Akmak collections. One classic 'Campus' or wedge-shaped microblade core was recovered in the Rock River collections. Comparisons may be made between certain of the generalized microblade cores in the Rock River area and the informal or 'rudimentary' microblade cores of Great Bear Lake (Clark 1987:42) as well. Donnelly burins and a small range of multipurpose tools seen in other microblade technologies of the interior Northwest also suggest Paleo-Arctic/N.W.M.t relations.

A number of large, more or less lanceolate bifaces in the Rock River collections, produced by what is termed here the Strategy III biface production technique, may be part of the technology of the Paleo-Arctic/Northwest Microblade tradition.

Late Holocene

Episodes of occupation in the western Richardson Mountain foothills by Paleo-Eskimo/Norton groups. At least three implements (point, knife, ulu) show highly distinctive workmanship attributable to this technology. As well, a number of bifaces of generalized form in the Rock River collections exhibit production attributes which have been identified as characteristic of Paleo-Eskimo biface manufacturing technology (Strategy I).

Occupations by Late Prehistoric Athapaskan tradition technologies are witnessed at one site by a relatively high incidence of pieces esquillees. The limited occurrence of pieces esquillees and the absence of diagnostic forms, such as the Klo-kut (Kavik) point, in the Rock River collections however, suggest Late Prehistoric Athapaskan tradition peoples did not utilize this area extensively. This apparent shift in land use patterns in the prehistoric period is similar to that interpreted by Irving and Cinq-Mars (1974) for the middle Porcupine basin. In this region, " ... sometime during the post-glacial period, a major change appears to have occurred in the pattern of land utilization ... (involving a) shift from the early northern lookout sites to the later combination of caribou surrounds and large riverine hunting camps " (1974:78-79). Irving and Cinq-Mars (1974:79) speculate that this shift away from an upland focus may have been in response to:

1. A change in the major prey species. If bison is assumed to have been the dominant prey species during the early and middle post-glacial times, it is likely that its extinction (or disappearance from the area) would have resulted in a shift to a different prey species (caribou), accompanied by changes in hunting patterns and preferred localities.

2. Extensive changes in the topography of the Old Crow Flats. It is likely that intermediate stages in the history of this complex lacustrine environment may have restricted game movements to a few corridors across and around the basin, that is, close to the northern lookout site areas. Subsequent increased drainage of the basin could very well have made these hunting stations obsolete.

3. Changes in hunting patterns and technology such as the invention or borrowing of the caribou fence and, possibly, the development of highly organized riverine-crossing caribou interception techniques.

The pattern of more limited exploitation of the western Richardson Mountain foothills characteristic of the late prehistoric period appears to have merged into the contact/historic period. As noted in Chapter 2, land use patterns documented for the Tukkuth Kutchin do not indicate intensive occupation of the western Richardson Mountain foothills in the historic period.

Summary and Conclusion

In the preceding discussion, I have attempted to review the current levels of understanding concerning certain key traits which are used to organize the prehistoric record in the interior Northwest.

With regard to the nature of these traits in the archaeological record, it is pertinent to review here Bryan's (1980:77) distinction between types and technological traditions: "A type is often presumed to have been made by a specific group for a limited temporal span, while a technological tradition may have been adopted by many cultural groups and may have persisted for prolonged periods of time." The majority of researchers would recognize that microblade technology, and lanceolate and side notched points in the interior Northwest most closely conform to Bryan's definition of technological tradition. As such, these artefact classes will have only limited utility for addressing more specific questions relating to local sequences and events in the prehistoric record. That these artefact classes continue to be the primary focus of efforts to reconstruct the prehistory of this region should not be attributed, however, to an unenlightened approach on the part of northern scholars. Frison's observation (1978:77-8, cited in Millar 1981:267), that in the Plains, " ... artefact assemblages are generally unreliable chronological indicators, as few tool forms are distinctive and those tools most frequently found have wide temporal and geographic distribution ... " appears to be have some basis in reality in the Northwest as well.

Questions of the degree of formality in prehistoric industries, or expediency and curation in tool production, which I have discussed in detail in Chapter 5, bear directly on the present state of investigations in the interior Northwest. I have noted that the majority of industries represented in this region are, in fact, characterized by relatively low levels of standardization. In the face of an informal or expedient approach to tool production, conventional typological approaches are severely constrained. In the analysis and description of collections, I would suggest that a great deal more attention also has to be given to questions of situational constraints on the character of the technology, (raw material availability and type, and site function, for example), before the descriptions will become truly useful for broader comparative purposes.

As an alternative approach to morphological typology, I have suggested the use of a modal approach (after Rouse), which focuses specifically on the kinds and associations of functional edges on tools. The presence of multipurpose tools in the predominantly expedient and informal technology of the Rock River area suggested to me that these associations of edges represented important functional modes which might be useful diagnostics of a particular technological tradition, and independent of situational constraints. As Pye (1964:58) has stated, although tool production may proceed in an expedient manner (using certain economizing strategies), preconceptions concerning the ideal appearance of the tool continue to affect how the tool is made or designed.

I have also suggested that blade technology in the interior Northwest deserves closer scrutiny as a means of characterizing industries. The level of formality routinely sought in the production of implements should be considered as distinctive or diagnostic of a technology as are the tool types themselves.

To the degree that this was feasible, given the somewhat limited descriptions in the literature, I attempted to trace both blade technology and multipurpose tools in the archaeological record of the interior Northwest. The majority of multipurpose tools present in the Rock River collections were found to occur in assemblages presently assigned to the Paleo-Arctic or Northwest Microblade tradition. Possibly relevant for Clark's arguments concerning the nature of pre-microblade occupations of the interior Northwest, multipurpose tools characterize early Paleo-Indian industries south of the ice sheets as well (cf. Wilmsen and Roberts 1978).

A modal approach was also undertaken in the attempt to differentiate various biface production strategies in the Rock River collections, on the basis of decisions relating to platform preparation, order of flake removal, and flaking patterns in general. Within certain limits, several strategies of manufacture could be reconstructed in the sample. Of particular interest was the observation that two of these were associated with lanceolate points in the Rock River collections, suggesting that the generalized lanceolate form was in fact produced in the context of two technological traditions. Further study may substantiate these observations. The potential of this kind of analysis for the understanding of the variability in the widely distributed lanceolate and side notched points in the interior Northwest remains to be fully explored.

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APPENDIX I

Pollen Record for the MfVa-9 Buried Deposit

Upper Organic Lens

Species	Count	%	Concentration
Picea	85	9.2	28356
Betula	551	59.4	183818
Populus	1		
Alnus crispa	172	18.6	57380
Alnus incana	17	1.8	5671
Salix	2		
Myrica	4		
Ericaceae	64	6.9	21350
Arctostaphylos	1		
Vaccinium	7	.75	
Cassiope	1		
Andromeda	2		
Gramineae	7	.75	
Tricuspidata	1		
Tubulif	1		
Lycopodium	1		
Annotinum	4		
Sibirica	4		
Filicales	2		
Sphagnum	6		

Sum of Concentration = 309,254/cm^3

Lower Organic Lens

Species	Count	%	Concentration
Picea	60	10.6	12774
Betula	264	46.5	56204
Alunus crispa	139	24.5	29592
Alnus incana	15	2.6	3193
Myrica	5		
Ericaceae	51	9.0	10858
Vaccinium	13	2.3	2768
Cassiope	2		
Cyperaceae	1		
Gramineae	8	1.4	1703
Lycopodium	4		
Annotinum	3		
Filicales	1		

Sum of concentration = 120,924/cm^3

(Pollen analysis by K. Hadden, Department of Botany, University of Toronto.)

APPENDIX II

Attribute System

Most of the attributes used in the analysis of the Rock River artefact sample are fairly conventional measures or descriptions which do not require lengthy explanation. Attributes used in a more specialized context are defined in greater detail. Attribute descriptions are presented in the order in which they appear in the main body of the text.

Edge Retouched and Utilized Implements

General Attributes

Standard Flake/Blade Orientation:

All implements produced on flake or blade blanks were described in terms of the standard orientation position of the blank. In this system, the dorsal or exterior face of the flake/blade is uppermost and the platform area (proximal end) is toward the observer. The margin opposite the proximal end is termed the distal end. The reverse face of the flake/blade is termed the ventral face. The right and left margins of the flake/blade correspond to the right and left of the observer.

Number of Dorsal Flake Scars on Flakes and Blades:

The count of flake scars on the dorsal face of the flake or blade blank represents flake or blade removals from the core prior to the detachment of the blank. The count excludes minor flaking associated with platform preparation, or modification associated with tool use.

Platform Edge Preparation on Flakes and Blades:

The attribute of platform edge preparation describes the kind of modification undertaken to strengthen and/or regularize the core platform edge, prior to the detachment of the flake or blade. Types of preparation observed on the platform remnants of flakes and blades in the sample include grinding and chipping, and combinations of these. Evidence of previous, unsuccessful attempts to remove the flake or blade may be preserved in the platform remnant area -- these platforms are described as 'battered'.

Platform Type on Flakes and Blades:

The type of platform remnant on a flake or blade reflects the nature of preparation of the core platform. Facets on the platform remnant represent truncated flake scars associated with preparation of the core platform; a ridge platform is narrow and generally exhibits grinding as a preparation for detachment of the flake. Platforms comprised of cortex (or cleavage plane) are unprepared.

Cortex Cover:

The percentage of cortex remaining on the dorsal face of the flake or blade was estimated subjectively and described in four categories: (1) 1 - 25%; (2) 25 - 50%; (3) 50 - 75%; (4) 75 - 100%; (5) none.

Burins

Facet Orientation:

Transverse: burin facet oriented transverse to the long axis of the tool blank.

Lateral: burin facet oriented parallel to the long axis of the tool blank.

Angle: two adjacent burin facets oriented transverse and parallel to the long axis of the tool blank.

Transverse/Oblique: burin facet is at an angle transverse and oblique to the long axis of the tool blank.

Lateral Opposing: burin facets are present on both lateral margins of the tool blank, with the burin spall struck from opposing ends of the blank.

Transverse and Lateral: a combination of transverse and lateral burins (above). Burin facets are non-adjacent; on certain artefacts, a notch is present between the two burin facets.

Preparation:

Three types of preparation were observed to be associated with the detachment of burin spalls: unifacial trimming (either at the proximal or distal end of the facet); notching (either at the proximal or distal end of the facet); and use of a previous burin facet as a platform for spall detachment. The detachment of burin spall from unprepared platforms, generally using a break or cleavage plane, was also observed.

Number of Burin Facets:

The count includes spall detachments from all burin facet areas on the tool; as well as the number of break facets on the tool used in a manner analogous to true burin facets.

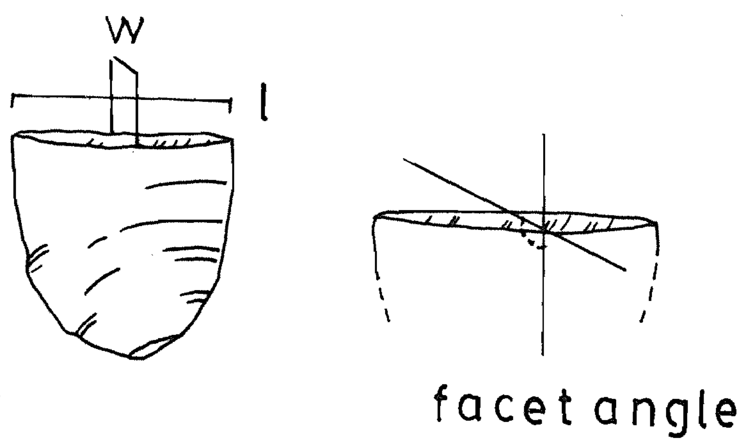
Facet Termination:

This attribute describes the termination of the facet created by the detachment of the burin spall. Includes: (1) feather: the distal termination of the burin spall is a thin, tapered margin (Crabtree 1972:64); (2) hinge: representing the termination of the burin spall in a rounded or blunt edge (Crabtree 1972:68); (3) step: abrupt termination of the burin spall in a squared or irregular edge (Crabtree 1972:93); (4) combination of feather and hinge termination; and (5) combination feather and step terminations.

Location of Use Damage:

Use damage, in the form of minor crushing or rounding, may occur on one or both lateral edges of the burin facet; or may also be present on the 'tip' of the facet, i.e., the angled portion of the tool created by the intersection of two burin facets, or by the intersection of the burin facet with an unmodified edge of the tool blank. Use damage occurring on the lateral edge of the burin facet may be further classified as it reflects the mode of use: use damage may occur on the facet proper, indicating use in a shaving fashion, drawing the tool toward the user; or damage may extend from the facet edge onto either the dorsal or ventral face of the tool, suggesting the use of the burin in a scraping fashion.

Measures of Burin Facet Length, Width and Angle:



Facet angle is measured as the angle between the facet and the face of the tool that is adjacent to the utilized portion of the facet.

Scrapers

Scraper Edge Outline:

The general outline of the scraper edge of the tool is described as convex (or excurvate); or straight. A single example of a scraper with a concave margin occurs in the Rock River sample; the curvature is very slight and does not qualify the tool for inclusion in the class of notched implements.

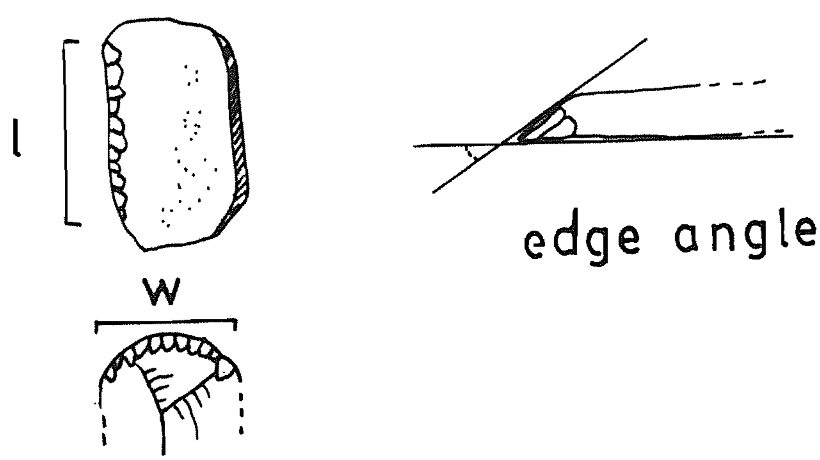
Type of Retouch:

This attribute describes the form or appearance of the retouch associated with the creation of the scraper edge. Retouch scars are classified as scalar in form, parallel, or irregular.

Position of Scraper Edge:

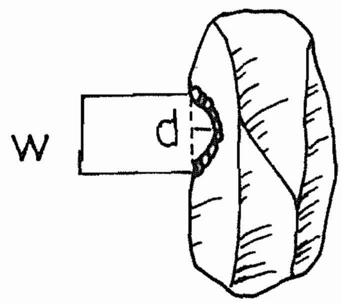
The location of the scraper edge on the flake or blade blank is described with reference to the standard orientation of the blank.

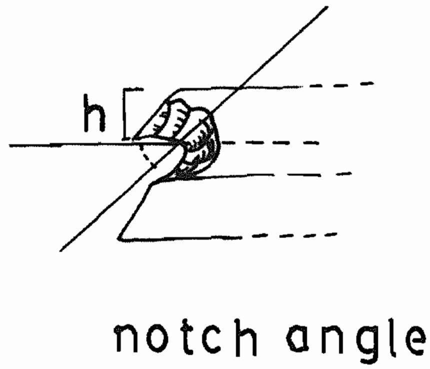
Measures of Scraper Edge Length, Thickness and Angle:



Notched and Denticulated Implements

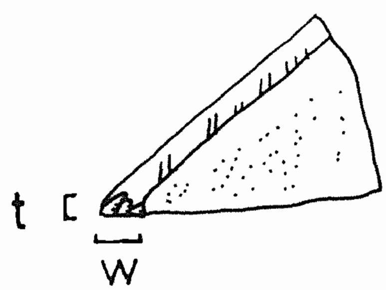
Measures of Depth, Width, Height and Edge Angle of Notches:

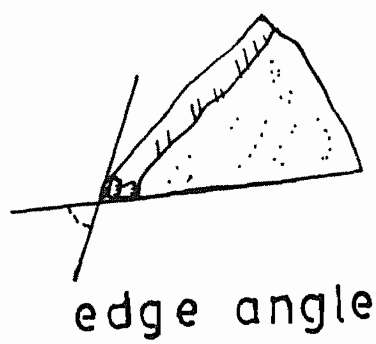




Beaked Implements

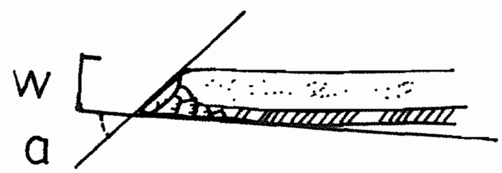
Measures Width, Thickness and Edge Angle of Beaked Portions of the Tool:





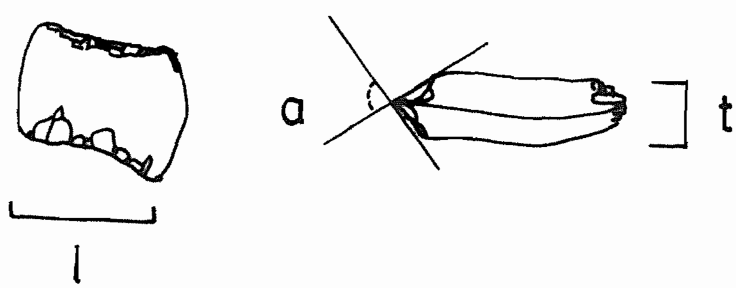
Large Tabular Implements:

Measures of Edge Thickness and Edge Angle:



Pieces Esquillees

Measures of Edge Length, Thickness, and Angle:



Biface Technology

Finished Bifaces and Preforms

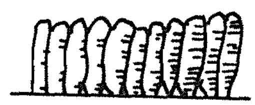
Outline:

The shape or outline of bifaces has been described using the following terms: discoidal; ovoid; lanceolate; quadrilateral or rectangular; cordiform; triangular; crescentic or semi-lunar.

Outline of Flake Scars:

expanding 

parallel 

lamellar 

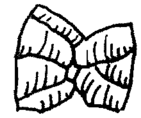
variable 

Orientation of Flake Scars:

Flake scar orientation is described with respect to the longitudinal axis of the biface (see also Crabtree 1972:87)).

collateral 

subradial



oblique

random

Size of Flake Scars on Bifaces:

'Size' was measured as the width of the flake scar. A sample of ten flake scars was measured on each face of the biface (total: 20), with selection for flake scars that were complete or nearly complete. The average size of the scars was calculated from this sample.

Biconvexity:

This measure was developed by Isaac (1977:119; Figure 39) to provide an index of the cross-sectional symmetry of bifaces. The index of biconvexity is estimated by the formula:

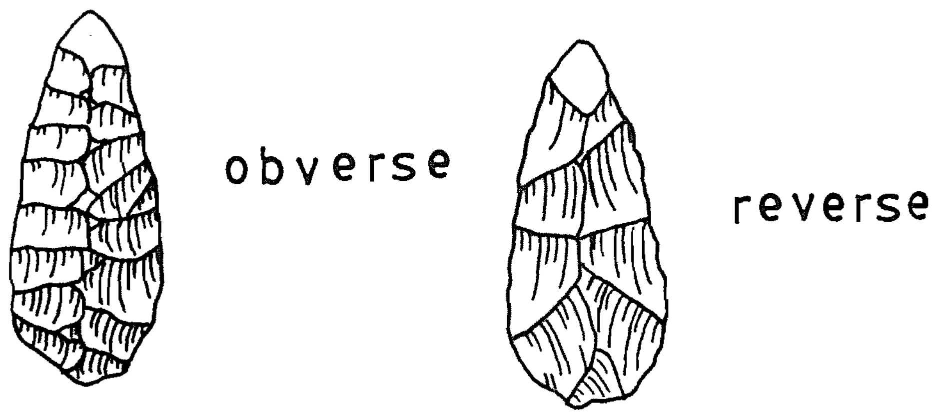
$$1 - \frac{h - d}{h + d}$$

Where h = height from the medial plane of the biface in cross-section, and d = depth of the biface from the medial plane.

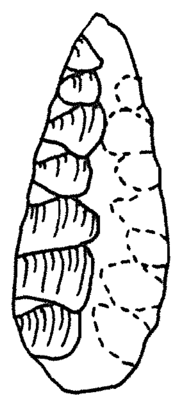
Order of Flake Removal:

This attribute has been modified and slightly expanded from Muto's usage (1971:66, 92; see also Crabtree 1972:33) as follows:

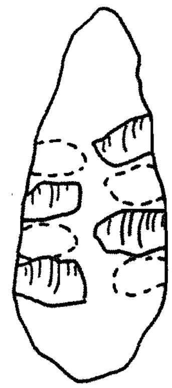
Unifacial Flake Removal: A technique of bifacial reduction which involves, for each reduction stage, the completion of flake removal (shaping/ thinning) on one face of the blank or preform before the opposite face is flaked. All margins are used.



Alternate Flake Removal: A variant of the above technique, in which one face of the biface is flaked from one margin; on the opposite face, flaking proceeds from the opposite margin.



Alternating Flake Removal: Flakes are removed on the blank or preform in an alternating fashion from both faces along the entire edge of the biface.



Flake Scar Number/Length Ratio:

This measure provides an expedient means to estimate the degree of bifacial working present on a biface. Broken as well as complete forms can be accommodated by the measure. The ratio of flake scar number/length is preferred over the measure of flake scar dimensions since the latter may be highly variable on a give specimen.

Platform preparation:

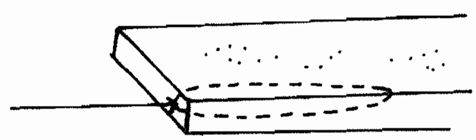
Preparation of the biface margins for the removal of flakes may take the form of grinding or chipping, or combinations of these techniques. Biface margins may also exhibit minor unifacial beveling along their entire length as preparation for flake removal.

Partial Bifaces

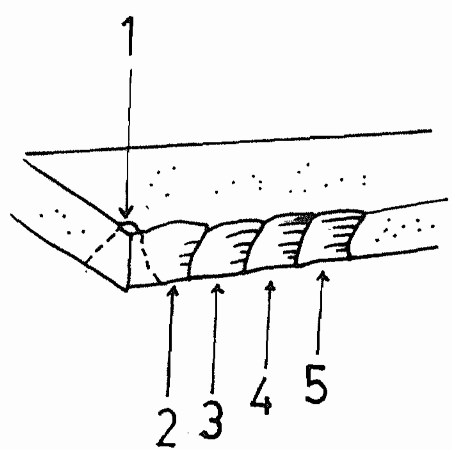
Initial Edging:

Callahan has defined three principal techniques for the preparation of a squared edge on a tabular piece of raw material (1979:34, Table 11):

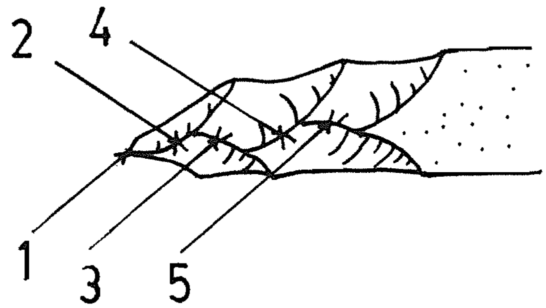
The removal of a blade, or the 'burination' of the edge of the tablet.



Unifacial beveling of the edge.



Bifacial beveling of the edge.



The objective of these techniques is the production of a suitable edge angle on the tablet for bifacial thinning. Tablet possessing a degree of natural beveling on the edge may not require preparation.

Blade and Microblade Technology

Core Attributes

Platform Type:

Platforms on blade and microblade cores may be prepared by flake removal from the faceted face of the core. The removal of a single large flake, or a series of flakes, to form the platform have been observed in the sample. Rarely, flake removals to form the platform were undertaken from the lateral edge of the core. Unprepared platforms are generally comprised of cleavage plane or a break facet.

Platform Edge Preparation:

Preparation of the core platform edge for blade detachment may take the form of grinding or chipping, or combinations of these. Grinding is associated with attempts to strengthen the platform edge to receive the impact of the percussor, by the removal of minor irregularities of the edge; chipping may be carried out to isolate a portion of the platform edge in order to facilitate blade removal. Evidence of previous, unsuccessful attempts to remove the blade may be preserved in the platform area -- these platforms are described as 'battered'.

Cortex Cover:

The percentage of cortex remaining on the blade or microblade core, exclusive of the faceted face of the core, was estimated subjectively and described in four categories: (1) none; (2) 1 - 25%; (2) 25 - 50%; (3) 50 - 75%; (4) 75 - 100%.

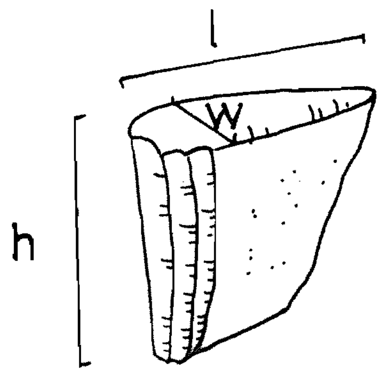
Number of Platforms:

Certain blade cores exhibit blade removal from more than one plane or platform area. A platform area which exhibits blade removal from more than one margin (i.e., on different faces of the core adjacent to the platform) is treated as a single platform area.

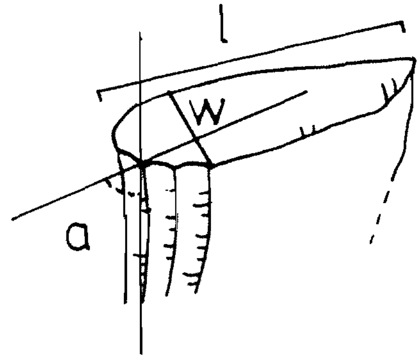
Blade/Microblade Facet Termination:

This attribute describes the termination of the facet on the core created by the detachment of blades or microblades. Includes: (1) feather: the distal termination of the blade/microblade is a thin, tapered margin (Crabtree 1972:64); (2) hinge: representing the termination of the blade/microblade in a rounded or blunt edge (Crabtree 1972:68); (3) step: abrupt termination of the blade/microblade in a squared or irregular edge (Crabtree 1972:93); (4) outre passé: the termination of the blade/microblade turns toward the centre part of the core and results in the removal of a portion of the base of the core (Tixier 1974:14); (5) combination of feather and hinge termination; (6) combination feather and step terminations.

Measures of Core Height, Length and Width:



Measures of Core Platform Length, Width and Angle:



APPENDIX III

Goodman and Kruskal's Tau

The Tau-b statistic or Goodman and Kruskal's Tau (1954, 1959, 1963) is a measure of association for nominal or discrete variables which provides a means of determining how well the knowledge of one variable predicts the occurrence of a second (Blalock 1972:300-302).

The Tau-b value itself is an estimate of the degree to which error in assigning an object to a particular class or category could be reduced if a second variable is introduced. As an example, the tau-b statistic could be used to approximate how well a knowledge of biface size (expressed as length) predicts the number of flake scars on the biface. Taking data from the sample of rough bifaces in the Rock River collections, the Tau-b value would be derived as follows:

		LENGTH (cm)					
		A_1	A_2	A_3	A_4	A_5	
		<3	3-3.9	4-4.9	5-5.9	≥ 6	
NO. OF FLAKE SCARS	B_1 <20	0	0	1	0	0	1
	B_2 20-39	1	1	2	3	3	10
	B_3 ≥ 40	0	2	3	0	4	9
		1	3	6	3	7	20

Tau-b =

$$\frac{\text{number of errors not knowing A - number of errors knowing A}}{\text{number of errors not knowing A}}$$

or

$$\frac{\text{error B - error A}}{\text{error B}}$$

Probability of error in assigning an object to B if A is unknown:

pB   Row total [(N-row total)/N]

pB_1 1[(20-1)/20] = 0.95

pB_2 10[(20-10)/20] = 5.0

pB_3 9[(20-9)/20 = 4.95

Total errors pB = 10.9

Probability of error in assigning an object to B if A is known:

pA   Oberved AB [(col. total A - observed AB)/col. total A]

pA_1B 0

pA_1B_2 1[(1-1)/1] = 0

.

.

.

pA_5B_3 4[(7-4)/7] = 1.7

Total errors pA = 8.4

$$\text{Tau-b} = \frac{10.9 - 8.4}{10.9}$$

$$= 0.23$$

Therefore, knowing A, or length of the biface, the amount of error in assigning a given biface to the correct category of number of flake scars is reduced 23%.

APPENDIX IV

List of Sites and Assemblages in the Rock River Area

Sites Investigated by Gotthardt

MeVb-2

CONTEXT: Located on a group of 3 - 4 low, exposed bedrock knobs, overlooking a northern tributary of the lower branch of the Rock River. The site area is in a trough between a series of whale-back features to the east, and a high bedrock ridge on the west. View to the north is good from the site area. Location of Geodetic Bench Mark #78Y137 (Ottawa).

Surface deposits are a shallow fine yellow loess/silt; much of the site area is comprised of exposed bedrock areas (silicious argillite or silicified shale). Vegetation is discontinuous; principally herbaceous with dwarf birch. Adjacent to the stream, vegetation is wet tundra with black spruce. Drainage is generally good in the site area.

ARCHAEOLOGICAL COLLECTIONS: Thin lithic scatter in surficial deposits.

Sample collected by Gotthardt:

Bifaces and fragments: 1
Flakes: 18
Frost spalls/shatter: 1

CHRONOLOGY: Unknown.

INVESTIGATOR: Cinq-Mars, 1975; Gotthardt, 1981 (Site 22).

MfVb-2

CONTEXT: Located on a low terrace north of White Fox Creek, just to the west of MfVa-3. View from the site is to the south and east up the creek valley.

The site is located in gallery forest. Extensive patches of exposed ground occur near the terrace edge. Sediments are gravelly; primarily bedrock (silicious argillite) shatter.

ARCHAEOLOGICAL COLLECTIONS: Surface collections made in 6 localities; locality 1 and 2 appear to be chipping stations. Lithics occurred both in surface and subsurface deposits.

Sample collected by Gotthardt:

Bifaces and fragments: 8 (including lanceolate point fragment [Strategy III])
Bifacially worked tabular pieces: 13
Tools: 1 scraper
Blades: 2
Flakes: 2858
Frost spalls/shatter: 116

CHRONOLOGY: Unknown.

INVESTIGATOR: Cinq-Mars, 1975; Gotthardt, 1981 (Site 8).

MfVb-3

CONTEXT: Located on a low, exposed north-south ridge complex, about 1 km south of a south tributary of White Fox Creek. The site is the central ridge of the complex. MfVb-4 is located to the southeast; MfVb-5 is located to the northwest.

Local vegetation is discontinuous low shrub; large areas of exposed ground, comprised of gravelly shale with occasional cobbles of quartzite occur in north area of site.

ARCHAEOLOGICAL COLLECTIONS: Two artefact concentrations noted on north end of ridge.

Sample collected by Gotthardt:

Bifaces and fragments: 5
Bifacially worked tabular pieces: 2
Blade cores: 3
Blades: 1
Flakes: 51
Frost spalls/shatter: 2

CHRONOLOGY: Unknown. The evidence of large blade production at the site suggests early Holocene occupations.

INVESTIGATOR: Van Dyke, 1979 (Site FNY-53); Gotthardt, 1981 (Site 12).

MfVb-4

CONTEXT: Located on a low, exposed north-south ridge complex, about 1 km south of a south tributary of White Fox Creek. The site is the eastern ridge of the complex.

Large areas of exposed ground occur along the length of the ridge, and particularly on the east slope, interspersed with shrub vegetation. Sediments are comprised of gravelly shale with occasional quartzite cobbles.

ARCHAEOLOGICAL COLLECTIONS: Moderate concentration of lithics on exposed north and central portions of the ridge.

Sample collected by Gotthardt:

Bifaces and fragments: 5
Bifacially worked tabular pieces: 5
Core fragments: 1
Blades: 2
Flakes: 596
Frost spalls/shatter: 34

CHRONOLOGY: Unknown. The presence of blades suggest early-Holocene occupation.

INVESTIGATOR: Van Dyke, 1979 (Site FNY-54); Gotthardt, 1981 (Site 13).

MfVb-5

CONTEXT: Located on a low, exposed north-south ridge complex, about 1 km south of a south tributary of White Fox Creek. The site is the westernmost ridge of the complex.

On northern portion of ridge, large areas of exposed ground are present; vegetation is discontinuous shrub. The southern portion of the ridge supports isolated stands of white spruce. Sediments are comprised of gravelly shale with occasional quartzite cobbles.

ARCHAEOLOGICAL COLLECTIONS: Lithics were recovered in surface context on the exposed northern end of the ridge. One flake cluster appears to have been a chipping station.

Bifaces and fragments: 1
Bifacially worked tabular pieces: 5
Core fragments: 4
Blade cores: 1
Flakes: 145
Frost spalls/shatter: 31

CHRONOLOGY: Unknown. The evidence of blade technology at the site suggests early Holocene occupation.

INVESTIGATOR: Gotthardt, 1981 (Site 21).

MfVb-6

CONTEXT: Located on the western edge of an old terrace of White Fox Creek -- terrace is a high, spit-like formation between north and south forks of creek. Excellent view from site area to north; view to south presently obscured by trees.

Local vegetation is predominately white spruce, with willow and alder understory. Ground vegetation is moss and heath. Sediments are silty; poorly developed Brunisol present over alluvial gravels. Approximately 15 shovel test made in site area.

ARCHAEOLOGICAL COLLECTIONS: Isolated silicious argillite flake found on caribou trail on crest of terrace.

CHRONOLOGY: Unknown.

INVESTIGATOR: Gotthardt, 1981 (Site 23).

MfVa-2

CONTEXT: Located on a low terrace north of White Fox Creek. The site is the easternmost of a series of hummocky areas of the terrace, separated from each other by stream gullies. View from the site is to the south and east up the creek valley.

The site is in an area of gallery forest; patches of exposed ground occur on the terrace edge. Sediments are gravelly: brown silty soil with silicious argillite; some quartzite and sandstone as well.

ARCHAEOLOGICAL COLLECTIONS: Thin lithic scatter in surficial deposits.

Sample collected by Gotthardt:

Bifaces and fragments: 9 (including lanceolate point fragment [Strategy III] and convex-based lanceolate point [Strategy II])
Tools: 3
Flakes: 43
Frost spalls/shatter: 1

CHRONOLOGY: Unknown.

INVESTIGATOR: Cinq-Mars, 1975; Gotthardt, 1981 (Site 6).

MfVa-3

CONTEXT: Located on a low terrace north of White Fox Creek, west of MfVa-2. View from the site is to the south and east up the creek valley.

Site is located in gallery forest; extensive areas of exposed ground occur on edge of terrace. Sediments are gravelly: brown silt with silicious argillite, and some quartzite and sandstone.

ARCHAEOLOGICAL COLLECTIONS: Thin scatter of flakes in surface deposits.

Sample collected by Gotthardt:

Flakes: 10

CHRONOLOGY: Unknown.

INVESTIGATOR: Cinq-Mars, 1975; Gotthardt, 1981 (Site 6).

MfVa-7

CONTEXT: Located on a low, southwest trending gravel terrace overlooking to the south a north tributary of White Fox Creek. Extensive areas of exposed ground occur along the south edge of the terrace.

Deposits are comprised of sandstone/quartzite gravels in brown silty sediment with some silicious argillite boulders and cobbles.

ARCHAEOLOGICAL COLLECTIONS: A single, highly localized cluster of artefacts was recovered about 20 - 40 m back of the terrace edge.

Bifaces and fragments: 4 (including asymmetrical biface [Strategy IV])
Bifacially worked tabular pieces: 1
Flakes: 70
Frost spalls/shatter: 3

CHRONOLOGY: Unknown.

INVESTIGATOR: Cinq-Mars, 1979; Van Dyke, 1979 (Site FNY 55 or 57?); Gotthardt, 1981 (Site 15).

MfVa-9

CONTEXT: Located on a high north-south ridge, the easternmost of an extensive ridge complex overlooking a major north tributary of White Fox Creek.

The site area is comprised primarily of large areas of exposed ground interspersed with shrub birch in lowlying areas and depressions. Deposits in the southern half of the the ridge are gravelly, comprised of sandstone, quartzite, limestone, shale and some small chert pebbles in brown silty sediment. In the northern portion of the ridge, an extensive 'felsenmeer' occurs, comprised of quartzite boulders. The extreme north area is entirely exposed gravelly shale/silicious argillite.

ARCHAEOLOGICAL COLLECTIONS: Dense concentration of lithics recovered in surface context over most of the site area. A small buried deposit on the southern tip of the ridge was excavated.

Sample collected by Gotthardt (with isolated specimens collected by Cinq-Mars [1975; 1979]):

Bifaces and fragments: 45 (including reworked Kamut point [Strategy II] and two small ovoid bifaces [Strategy I])
Bifacially worked tabular pieces: 15
Tools: 18 (7 scrapers, 5 burins, 1 notched tool, 1 beaked implement, 1 burin/scraper tool, 1 burin/scraper/notch tool on blade, 1 burin/notch implement, 1 scraper/*piece esquillee*)
Cores and fragments: 2
Blade cores: 1
Blades: 18
Microblade cores: 2 (including Campus core)
Microblades: 9
Flakes: 3466
Frost spalls/shatter: 422

CHRONOLOGY: The combined date from the two occupation levels in the buried deposit is approximately 7580 B.P. Northern Cordilleran tradition and Northwest Microblade/Paleo Arctic tradition technologies represented.

INVESTIGATOR: Cinq-Mars, 1975 (Site 9); Gotthardt, 1981 (Site 1).

MfVa-10

CONTEXT: A lower northeast extension of the MfVa-9 ridge, overlooking upper portion of the tributary stream. The ridge subsides in this area to about 7 m above the stream.

The site area is comprised entirely of exposed gravelly shale deposits.

ARCHAEOLOGICAL COLLECTIONS: A fairly dense scatter of artefacts occurred over the site area.

Bifaces and fragments: 14
Bifacially worked tabular pieces: 9
Tools: 16 (3 scrapers, 6 burins , 1 knife, 2 beaked implements, 1 burin/scraper implement, 3 burin/notch implements)
Blades: 3
Microblade cores: 3
Flakes: 681
Frost spalls and shatter: 141

CHRONOLOGY: Artefacts suggest northern Cordilleran and Northwest Microblade/Paleo Arctic tradition technologies are represented at the site.

INVESTIGATOR: Gotthardt, 1981 (Site 2).

MfVa-11

CONTEXT: Located on a small bedrock knoll about 200 m east of MfVa-10, overlooking the stream channel to the south. North White Fox Creek drainage.

The greater portion of the southern face of the knoll is exposed ground: a yellow/brown silty sediment with sandstone, argillite, and quartzite pebbles and cobbles. Low shrub vegetation occurs in sheltered areas adjacent to the knoll.

ARCHAEOLOGICAL COLLECTIONS: Artefacts are in surficial context, concentrated at the crest of the knoll.

Bifaces and fragments: 5 (including asymmetrical biface [Strategy IV])
Tools: 3 (1 burin, 1 tabular biface, 1 spall scraper)
Cores: 1
Flakes: 144
Frost spalls/shatter: 17

CHRONOLOGY: Unknown.

INVESTIGATOR: Gotthardt, 1981 (Site 3).

MfVa-12

CONTEXT: Located on a high east-west gravel ridge extending west from the MfVa-9. Overlooks a north tributary of White Fox Creek. With the exception of the east and west extremities, the ridge surface is exposed ground comprised of grey and red shale.

ARCHAEOLOGICAL COLLECTIONS: Artefacts are thinly scattered over the surface of the ridge, concentrating on the southern edge.

Bifaces and fragments: 2
Tools: 2 (scraper on blade and beaked implement)
Blades: 1
Flakes: 62
Frost spalls/shatter: 12

CHRONOLOGY: Unknown. Blades suggest early Holocene occupations.

INVESTIGATOR: Gotthardt, 1981 (Site 4).

MfVa-13

CONTEXT: Located to the west of MfVa-12 on a high, and extensive north-south ridge complex overlooking to the east a north tributary of White Fox Creek. Artefacts occurred on a series of knoll-like areas along the ridge -- a total to 11 localities were noted, over a distance of about 1 km.

Knoll areas characterized by large areas of exposed ground, comprising silicious argillite shatter. Shrub vegetation characteristic of lower ground along ridge.

ARCHAEOLOGICAL COLLECTIONS: The highest concentration of artefacts occurred on two adjacent knolls at about the centre of the ridge (Loc. 5 and 5A). Raw material is predominantly silicious argillite, with isolated pieces of various cherts, welded tuff (?), and quartzite.

Bifaces and fragments: 99 (including Paleo-Eskimo point type [Strategy I]; fragment of convex-based lanceolate point [Strategy II]; 2 asymmetrical bifaces [Strategy IV]; and a very broad leaf shaped biface [Strategy V]
Bifacially worked tabular pieces: 29
Tools: 33 (9 scrapers, 6 burins, 1 notched tool, 2 knives, 3 tabular bifaces [skin scrapers], 3 spall scrapers, 5 beaked

implements, 1 piece esquillee, 1 burin/scraper/notch tool, 1 scraper/notch tool, 1 knife/scraper [Paleo-Eskimo technology])
Cores and fragments: 5
Blades: 2
Microblade cores: 1
Flakes: 4860
Frost spalls/shatter: 314

CHRONOLOGY: A projectile point, and the knife/scraper implement recovered at Loc. 5 and 5A suggest connections with Paleo-Eskimo stone tool technology. Early and mid-Holocene occupations are probably represented as well.

INVESTIGATOR: Gotthardt, 1981 (Site 5).

MfVa-14

CONTEXT: Located on a moderately high north-south terrace overlooking a major north tributary of White Fox Creek. The terrace tends to become lower, less well defined to the north. Probably same site as MfVa-1.

Isolated stands of white spruce occur on the terrace; shrub birch widely distributed. The terrace subsides toward the north -- this area tends to be more forested. Extensive areas of exposed ground occur on the terrace edge and intermittently back of the terrace edge. Sediments are primarily argillite shatter or shatter and brown silty sediments mixed.

ARCHAEOLOGICAL COLLECTIONS: Artefacts are widely scattered in exposures on terrace edge and back of the edge. Major concentration occurs on the south end of the terrace. Buried deposits also located in this area.

Bifaces and fragments: 6 (including lanceolate point fragment [Strategy III] and asymmetrical biface [Strategy IV] and very broad leaf shaped biface [Strategy V]
Bifacially worked tabular pieces: 3
Tools: 10 (3 scrapers, 1 burin, 2 notched tools, 1 beaked implement, 1 piece esquillee, 1 combination burin/scraper tool, 1 beaked/denticulated implement)
Cores and fragments: 2
Microblades: 2
Flakes: 2069
Frost spalls/shatter: 37

CHRONOLOGY: Buried deposits were dated at about 730 B.P., 1705 B.P., and 1765 B.P. Possible microblade elements were associated with the sample yielding the last date. Likely

Late Prehistoric Athapaskan/late Northwest Microblade tradition occupations.

INVESTIGATOR: Cinq-Mars, 1975; Gotthardt, 1981 (Site 9).

MfVa-15

CONTEXT: The site is located on the southern half of a large southwest-trending terrace, overlooking to the east a small northern tributary of White Fox Creek. The terrace is about 20 - 30 m above the stream valley. Extensive patches of exposed ground occur on the eastern edge of the terrace, interspersed with low shrub vegetation. The terrace subsides to the southwest and isolated stands of spruce occur in this area. Deposits on the southern portion of the terrace are gravelly sandstone, quartzite and argillite in brown silty sediment.

ARCHAEOLOGICAL COLLECTIONS: Only a thin scatter of artefacts occurred at this site. Artefacts were collected at two localities, on the north end of the terrace and to the south on the terrace edge and on a lower bench adjacent to the terrace edge.

Bifaces and fragments: 7
Bifacially worked tabular fragments: 3
Tools: 1 (scraper)
Flakes: 227
Frost spalls/shatter: 18

CHRONOLOGY: Unknown.

INVESTIGATOR: Gotthardt, 1981 (Site 10).

MfVa-16

CONTEXT: Located on the southern portion of a fairly extensive north-south bedrock ridge complex about 1 - 2 km southwest of a south tributary of White Fox Creek.

Surface deposits are argillite and limestone shatter. Vegetation cover is sparse -- largely scattered shrub birch. May be the same site as MfVa-4 (Cinq-Mars 1975).

ARCHAEOLOGICAL COLLECTIONS: Isolated finds widely scattered over site area (northeast portion of a large knoll feature; and along the east side of a lower ridge to the north).

Bifaces and fragments: 1
Flakes: 21

Frost spalls and shatter: 3

CHRONOLOGY: Unknown.

INVESTIGATOR: Gotthardt, 1981 (Site 11).

MfVa-17

CONTEXT: Located on a long, southwest trending gravel terrace overlooking a small tributary stream to the south (north White Fox Creek drainage). The terrace has been bisected by construction of the Dempster Highway -- central portion of the site has been destroyed. (Note: MfVa-17 and MfVa-8 are probably the same site.)

Sediments comprise gravelly shale and sandstone, with quartzite pebbles and cobbles.

ARCHAEOLOGICAL COLLECTIONS: Dense concentration of lithics recovered on surface over most of the site area. To the east of the highway, most lithics associated with a bedrock spur on the extreme east end of the terrace. Lithics also concentrate to the east and west of the road cut. West of the highway, the highest concentration of artefacts was found on the western extremity of the terrace, where it begins to subside to the level of the valley floor.

Bifaces and fragments: 30 (including two Kamut points [Strategy II]; a lanceolate point fragment [Strategy III]; and a small cordiform biface [Strategy I])
Bifacially worked tabular pieces: 24
Tools: 14 (including 2 scrapers, 6 burins, 1 knife, 1 tabular biface, 1 burin/notch tool, 1 scraper/denticulate, 1 scraper/*piece esquillee*/beaked implement)
Cores and core fragments: 1
Blade cores and fragments: 4
Blades: 1
Microblade cores: 3
Flakes: 1685
Frost spalls/shatter: 291

CHRONOLOGY: Early and mid-Holocene occupations are probably represented at the site, including northern Cordilleran and Northwest Microblade traditions.

INVESTIGATOR: Van Dyke, 1979 (Site FNY-58); Gotthardt, 1981 (Site 14).

MfVa-18

CONTEXT: Located on an east-west bedrock ridge overlooking a small tributary stream (north White Fox Creek drainage). Extensive areas of exposed ground occur in the west, central and east portions of the ridge, comprised of gravelly sandstone, quartzite and argillite. Low shrub vegetation occurs in swales and adjacent to exposed ground.

ARCHAEOLOGICAL COLLECTIONS: A thin scatter of artefacts was recovered in surficial context; most concentrate on the western portion of the ridge.

Bifaces and fragments: 2
Bifacially worked tabular pieces: 3
Tools: 1 (scraper)
Core fragment: 1
Blade core fragment: 1
Flakes: 87
Frost spalls/shatter: 51

CHRONOLOGY: Unknown.

INVESTIGATOR: Gotthardt, 1981 (Site 16).

MgVa-3

CONTEXT: Located on a small northern spur of a whale-back formation just south of the Richardson Mountain divide. The site area is largely exposed ground comprised of gravelly argillite, sandstone and quartzite. Principal view to north. Probably a look out site.

ARCHAEOLOGICAL COLLECTIONS: A thin scatter of lithics were recovered in surface context.

Sample collected by Gotthardt:

Bifaces and fragments: 2
Flakes: 5

CHRONOLOGY: Unknown.

INVESTIGATOR: Cinq-Mars, 1975; Gotthardt, 1981 (Site 17).

MgVa-10

CONTEXT: Located in a broad, lowlying area of exposed ground on the south side of a small tributary stream (north White Fox Creek drainage). Surface deposits are gravelly, including sandstone, quartzite and low grade argillite/shale. View to the north and east.

ARCHAEOLOGICAL COLLECTIONS: Thin scatter of artefacts in surface context.

Bifaces and fragments: 1 (lanceolate point fragment [Strategy III])
Flakes: 22
Frost spalls/shatter: 5

CHRONOLOGY: Unknown.

INVESTIGATOR: Gotthardt, 1981 (Site 18).

MgVa-11

CONTEXT: Located on an east-west terrace which runs from the southern tip of the first large whale back formation south of the Richardson Mountain divide. The site area overlooks to the south a small north tributary of White Fox Creek. The terrace is higher to the east and gradually descends to about the level of the valley floor on the west end.

Large areas of exposed ground occur on the south edge of the terrace, with interspersed shrub vegetation. Sediments are primarily a dark brown silt or loess, with silicious argillite and quartzite cobbles and boulders.

ARCHAEOLOGICAL COLLECTIONS: Scattered flakes were recovered from the western and central portion of the ridge.

Flakes: 11

CHRONOLOGY: Unknown.

INVESTIGATOR: Gotthardt, 1981 (Site 19).

MgVa-12

CONTEXT: Located on a low north-south trending terrace about 200 - 300 m west of the west end of MgVa-11. Overlooks a small tributary stream originating north of the whale-back formation and running into the stream adjacent to MgVa-11.

Large areas of exposed ground occur on the eastern and northern portions of the terrace. Deposits comprise silicious argillite, quartzite/sandstone cobbles and boulders. Also high frequency of small chert pebbles (outwash?). Deposits in the southern portion of the terrace comprise primarily brown silty sediments.

ARCHAEOLOGICAL COLLECTIONS: Artefacts were widely scattered in surficial context over the terrace. Highest proportion of chert artefacts occur in the central and northern portion of the terrace; in the southern portions, artefacts are principally silicious argillite.

Bifaces and fragments: 3
Bifacially worked tabular pieces: 1
Tools: 8 (2 burin, 1 notched tool, 1 burin/scraper/notch tool, 2 *pieces esquillees*, 1 scraper/*piece esquillee*, 1 burin/*piece esquillee*)
Flakes: 7
Frost spalls/shatter: 11

CHRONOLOGY: Unknown. Possible Late Prehistoric Athapaskan occupation?

INVESTIGATOR: Gotthardt, 1981 (Site 20).

Sites Investigated by Cinq-Mars and Van Dyke

MeVb-1

CONTEXT: Located on a gravel ridge, in the headwaters of a southern tributary of White Fox Creek.

ARCHAEOLOGICAL COLLECTIONS: Thin lithic scatter in surficial deposits. Raw material is a dark grey silicious argillite.

CHRONOLOGY: Unknown.

INVESTIGATOR: Cinq-Mars, 1975.

MeVb-3

CONTEXT: Located on a gravel ridge, in the headwaters of the lower branch of the Rock River.

ARCHAEOLOGICAL COLLECTIONS: Thin lithic scatter in surficial deposits. Raw material is a dark grey silicious argillite.

CHRONOLOGY: Unknown.

INVESTIGATOR: Cinq-Mars, 1975.

MeVb-4

CONTEXT: Located on a gravel ridge, in the headwaters of the lower branch of the Rock River.

ARCHAEOLOGICAL COLLECTIONS: Thin lithic scatter in surficial deposits. Raw material is a dark grey silicious argillite.

CHRONOLOGY: Unknown.

INVESTIGATOR: Cinq-Mars, 1975.

MfVb-1

CONTEXT: Located on an exposed gravel terrace on the west side of a north tributary of White Fox Creek.

ARCHAEOLOGICAL COLLECTIONS: Scattered lithics in surface context, including evidence of biface production. Raw material is silicious argillite.

CHRONOLOGY: Unknown.

INVESTIGATOR: Cinq-Mars, 1975.

MfVa-1

Cinq-Mars, 1975. Probably the same site as MfVa-14.

MfVa-4

Cinq-Mars, 1975. Probably the same site as MfVa-16.

MfVa-5

CONTEXT: Located on a low southwest trending gravel terrace on the north side of an unnamed channel (north part of the White Fox Creek drainage). A second locality occurs slightly south and on the opposite bank of the channel to the west.

ARCHAEOLOGICAL COLLECTIONS: Isolated flakes and biface fragments. Raw material is silicious argillite.

CHRONOLOGY: Unknown.

INVESTIGATOR: Van Dyke, 1979.

MfVa-6

CONTEXT: Located on a gravel bench on the north side of a channel (north part of White Fox Creek drainage).

ARCHAEOLOGICAL COLLECTIONS: Isolated flakes recovered. Raw material is silicious argillite.

CHRONOLOGY: Unknown.

INVESTIGATOR: Van Dyke, 1979.

MfVa-8

Van Dyke, 1979. Probably the same site as MfVa-17.

MgVa-1

CONTEXT: Located on top of a bedrock ridge along a small northeastern tributary of White Fox Creek, just west of the Richardson Mountain divide.

ARCHAEOLOGICAL COLLECTIONS: Artefacts were recovered in surficial context, and are predominantly rough bifaces and related flakes and debitage. Raw material is silicious argillite. Workshop/temporary camp/look out site.

CHRONOLOGY: Unknown.

INVESTIGATOR: Cinq-Mars, 1975.

MgVa-2

Does not exist.

MgVa-4

CONTEXT: Located on top of a bedrock ridge along a small northeastern tributary of White Fox Creek, just west of the Richardson Mountain divide.

ARCHAEOLOGICAL COLLECTIONS: Artefacts were recovered in surficial context, and are predominantly rough bifaces and related flakes and debitage. Raw material is silicious argillite. Workshop/temporary camp/look out site.

CHRONOLOGY: Unknown.

INVESTIGATOR: Cinq-Mars, 1975.

MgVa-5

CONTEXT: Located on top of a bedrock ridge along a small northeastern tributary of White Fox Creek, just west of the Richardson Mountain divide.

ARCHAEOLOGICAL COLLECTIONS: Artefacts were recovered in surficial context, and are predominantly rough bifaces and related flakes and debitage. Raw material is silicious argillite. Workshop/temporary camp/look out site.

CHRONOLOGY: Unknown.

INVESTIGATOR: Cinq-Mars, 1975.

MgVa-6

CONTEXT: Located on top of a bedrock ridge along a small northeastern tributary of White Fox Creek, just west of the Richardson Mountain divide.

ARCHAEOLOGICAL COLLECTIONS: Artefacts were recovered in surficial context, and are predominantly rough bifaces and related flakes and debitage. Raw material is silicious argillite. Workshop/temporary camp/look out site.

CHRONOLOGY: Unknown.

INVESTIGATOR: Cinq-Mars, 1975.

MgVa-7

CONTEXT: Located in an open area of a broad valley, south of the Richardson Mountain divide, west of a prominent bedrock knob. Adjacent to a small tributary stream of the north White Fox Creek drainage.

ARCHAEOLOGICAL COLLECTIONS: Scattered flakes were recovered in surficial context. Raw material is silicious argillite.

CHRONOLOGY: Unknown.

INVESTIGATOR: Van Dyke, 1979 (Site FNY-59)

MgVa-8

CONTEXT: Located on top of a bedrock ridge along a small northeastern tributary of White Fox Creek, just west of the Richardson Mountain divide.

ARCHAEOLOGICAL COLLECTIONS: Artefacts were recovered in surficial context, and are predominantly rough bifaces and related flakes and debitage. Raw material is silicious argillite. Workshop/temporary camp/look out site.

CHRONOLOGY: Unknown.

INVESTIGATOR: Cinq-Mars, 1975.

MgVa-9

CONTEXT: Located on top of a bedrock ridge along a small northeastern tributary of Rock River, northwest of the Richardson Mountain divide.

ARCHAEOLOGICAL COLLECTIONS: Artefacts were recovered in surficial context, and are predominantly rough bifaces and related flakes and debitage. Raw material is silicious argillite. Workshop/temporary camp/look out site.

CHRONOLOGY: Unknown.

INVESTIGATOR: Cinq-Mars, 1975.