Chipped Stone Assemblages From the Beach Sites of the Central Coast

Brian Apland

INTRODUCTION

This report is concerned with the analysis and description of a series of chipped stone collections recovered from 38 sites in the Central Coast region of British Columbia. The recovery of these collections took place over a five year period from 1970 to 1974, as a result of the following three archaeological research projects:(1) Kwatna Inlet (Carlson 1970c, 1971, 1972; Hobler 1970); (2) Quatsino Sound (Carlson and Hobler 1974); and (3) the Bella Bella survey (Pomeroy 1971; Pomeroy and Spurling 1972; Apland 1974). To varying extents the author has had personal experience with each of those projects. The aims of the following analysis are: (1) to identify and outline the nature and extent of early chipped stone industries on the Central Coast, (2) to place these industries in time, and (3) to make cross-cultural comparisons of these chipped stone assemblages with similar material recorded from other areas of the Northwest Coast.

Ethnographic descriptions by Boas (1966:17) suggest that stone chipping was neither a well developed nor commonly practised form of tool manufacture among the Bella Coola and Kwakiutl speaking peoples of this region. Specific ethnographic accounts, such as those on the Bella Coola (MacIlwraith 1948), Owikeno and Bella Bella (Olsen 1954, 1955), make no mention of the use of chipped stone by those peoples. This absence could be construed as supportive negative evidence for the lack of such a trait. Early archaeological work (Smith 1907, 1909a; Drucker 1943) implied that this lack of chipped stone technology in the tool making industries of the Central Coast peoples extended far back into prehistory. Recent discoveries of chipped stone artifacts in virtually all parts of the Central Coast (the collections mentioned above are only a portion of the total evidence now known) necessitate a re-evaluation of the distributional patterns of these tools along the entire coast of British Columbia.

All of the material included in this report (consisting of 1841 specimens) has been collected from the active intertidal zone of various beaches, and as such has suffered severe surface attrition through natural weathering processes, particularly beach rolling. These effects have virtually precluded specific functional identifcations based on wear patterns, and have caused confusion in the use of edge angle studies for the establishment of generalized functional groupings. For functional inferences pertaining to the artifacts I have largely relied on morphological attributes which were also used as criteria for classification. Since the classification of this material itself was based solely on morphological attributes related to form it is strictly descriptive.

Due to an extreme amount of variation in survey conditions from one project to the next, the degree to which collected assemblages are representative of total site content is almost impossible to ascertain. Conclusions resulting from inter-site comparisons are therefore considered only tenuous at best. At least two and possibly three regional industries are suggested by this material and these will be outlined in the following pages. It will be up to future research in the area to more fully define them.

The ultimate value of this study is seen as four-fold. First, it offers raw data concerning archaeological material which until now has been only marginally reported in the literature. Second, it constitutes a re-evaluation of the presently accepted ideas of chipped stone distributions along the coast and will clarify some long standing misconceptions. Further, the report should alert the reader to some of the many existing problems in coastal archaeology, and offer suggestions for future research. Last, a tentative cultural-historical sequence based upon the slowly emerging regional data is offered.

THE STUDY AREA

The Central Coast as it will be referred to in this study is geographically defined as that area of coastal British Columbia which encompasses the numerous islands and waterways from Johnstone Strait in the south to Milbanke Sound in the north. These geographical boundaries are closely coincident with the territories ethnographically described as having been occupied by the Bella Coolan (Salish) and various Kwakiutl speaking peoples of coastal British Columbia

Post-Pleistocene Sea-levels

Within the last 13000 years the Northwest Coast has been subjected to high magnitude shifts in sea level (Fladmark 1975c:167).

These shifts are extremely significant to the understanding of past settlement patterns along the coast. Land-sea relationships through time are one of the major governing factors indicative of where and when suitable habitational localities were available to man.

Studies along the coast of British Columbia over the past two years have not produced enough information to significantly alter Fladmark's (1975c:143-171) synthesis of the data concerning post-glacial sea levels along the Northwest Coast. In this work Fladmark (1975c:167,293) concluded that the area north of Johnstone Strait experienced higher sea levels than at present between 3000 and 4000 B.C. It must be kept in mind, however, that Fladmark was synthesizing the sea level data for the entire Norhtwest Coast, and as he states:

> Sea level curves from different locales exhibit considerable variation (1975c:167).

Differential ice loading on a local scale can have dramatic effects upon local sea level changes since excessive ice in one valley will exert more pressure in the form of isostatic depression than in another where ice build-up had been less. The results are obvious, the valley with the more massive ice pack will exhibit much more pronounced shifts. There is no indication that ice build-up was uniform over the entire coast, so regional variations must be expected.

Retherford's (1972) report on the post-pleistocene environments of the Bella Bella-Bella Coola region offers a detailed description of the local history of sea level fluctuations in that region over the past 12000 years. After studying features being dissected by present tides including shell middens, glaciomarine sediments, raised deltas and fill terraces, Retherford developed a tentative sea level curve (Fig. 2.1) for the Bella Bella-Bella Coola region. This curve suggests that the relative sea level has fallen from a position approximately 10 m higher than at present to its present equivalent between 7500 and 4000 B.C. After 4000 B.C. the sea level fell slowly to a postion two or more metres below present by 1000 B.C., after which it rose gradually to its present postion.

Andrews and Retherford (1976) have recently presented a sea level curve for the Bella Bella area which is significantly different from Retherford's earlier one outlined above. This curve suggests a much more rapid submergence, immediately following glacial recession, with a relative sea level drop from +120 m ca. 10000 B.C. to the present equivalent by 5500 B.C. The period of below normal falling of sea levels therefore is pushed back 1000 years over Retherford's earlier work, and falls between 5500 and 2000 B.C. Andrews (pers. comm.) suggests that the inconsistencies which exist between the two curves are due to imprecision of the curve between 7000 and 1000 B.C.

At present there is no available data on post-pleistocene sea levels for any other areas of the Central Coast, although Heusser (1960:194) records evidence from Hope Island of two transgressions at around 100 ft. (30 m) and 15 ft. (5 m) with the lower stratigraphically pre-dating a peat formation. Using pollen stratigraphy Heusser placed a 1500 BP date on the lower section.

Considering the regional variability of sea level, statements made concerning areas of the Central Coast, outside the Bella Bella-Bella Coola region are speculative at best. However, since the majority of the sites are from this area, the sea level data should be a useful source of information on when these sites were occupied.

THE EVIDENCE

The chipped stone artifacts which form the primary data base for this report are by no means the only archaeological evidence for a relatively early and widespread use of chipped stone by the prehistoric inhabitants of the Central Coast region. This section outlines the presently available evidence concerning the overall distribution of chipped stone artifacts in the study area.

The first recorded evidence of chipped stone artifacts in the Central Coast were two leaf-shaped points from a site near the mouth of the Bella Coola river, described by Smith in 1909. Smith preferred to view those points as indicative of trade with the interior plateau rather than representative of an indig-

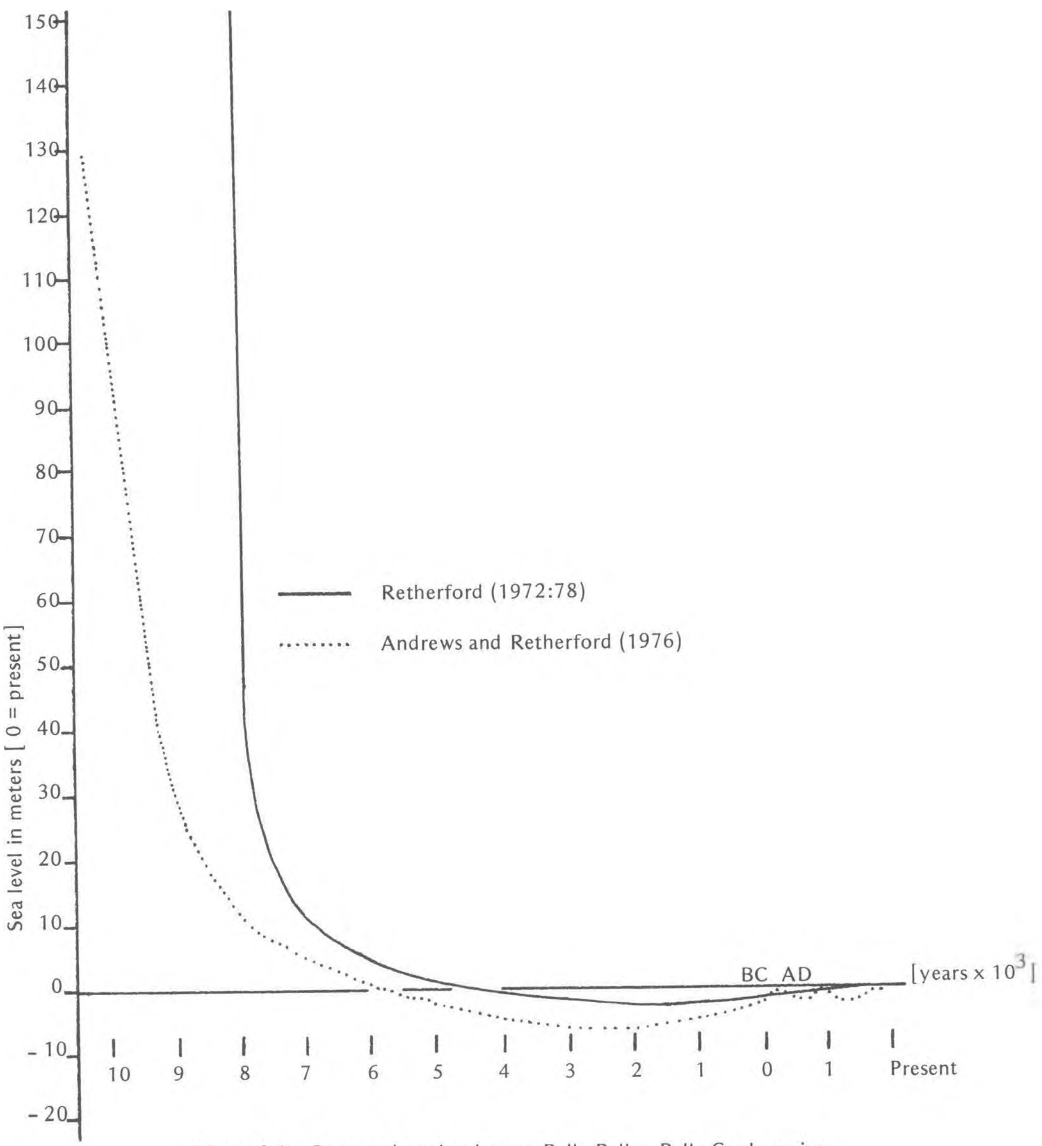


Figure 2.1. Proposed sea-level curve Bella Bella - Bella Coola region.

enous industry, and felt that the distribution of such artifacts along the coast of British Columbia did not extend north of the Comox area of eastern Vancouver Island (Smith 1909a:359).

The first major archaeological work done in the central coast, other than Smith's meagre recordings (Smith 1909a,b,), was a survey conducted by Drucker and Beardsley in 1938. The results of that survey, which extended from Prince Rupert to Rivers Inlet, appeared to substantiate Smith's beliefs concerning the distribution of chipped stone, and the presence of such a trait in the Central Coast area was described as "absent or rare" (Drucker 1943:124).

It is not surprising that Drucker observed a noticeable lack of chipped stone in the Central Coast. Drucker's

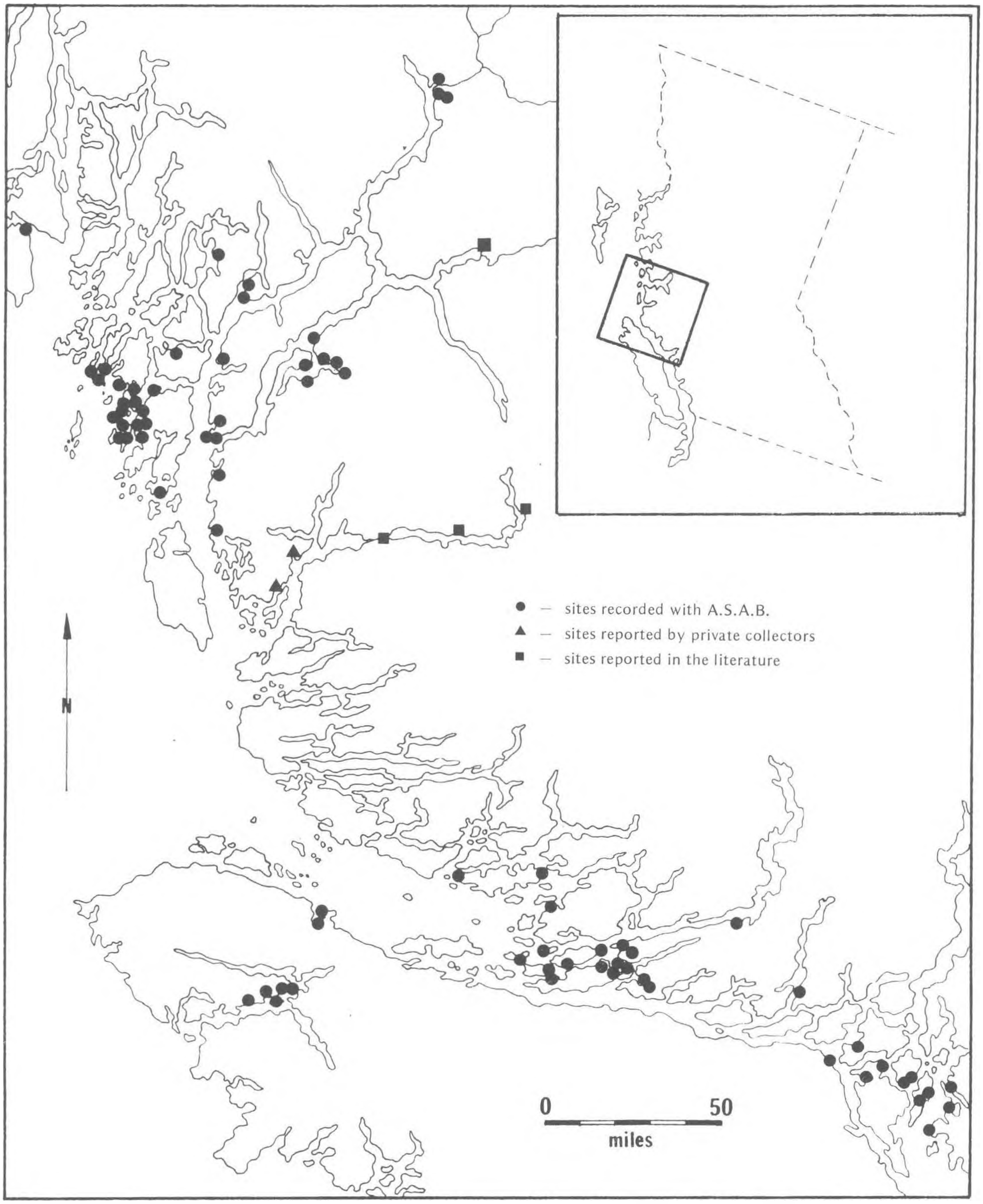


Figure 2.2. Distribution of all reported sites yielding chipped stone artifacts in the central coast.

data lacked appreciable time depth and only offered archaeological support to a pattern of tool technology which had already been described ethnographically.

Mitchell (1969) published a report on a series of intermittent surveys conducted in the Johnstone Strait-Queen Charlotte Strait area between 1966 and 1968. More than 400 sites were recorded in the course of those surveys, with some 37 of them yielding evidence of chipped stone (Mitchell 1969:206). The discovery of this material led Mitchell to conclude that, although the Kwakiutl did not employ stone chipping as a means of tool manufacture in ethnographic times

> at some earlier period relatively more emphasis had been placed on the production of chipped stone tools (Mitchell 1972:42).

The results of Mitchell's surveys contradicted Smith's beliefs and indicated that the distribution of chipped stone artifacts along the coast of British Columbia was not restricted to the areas south of Comox.

> However, we would have to modify Smith's conclusion that the Comox area marked the northern limit to the distribution of chipped-stone artifacts (Smith, 1907, p. 308; 1909, p.359). The boundary may lie further north near the mouth of the Knight Inlet, and it might more accurately be described as marking a relative difference in the use of stone-chipping technology rather than any absolute break in the distribution (Mitchell 1972:41).

Although Mitchell has suggested that there may be no absolute break in the distribution of chipped stone implements, his implied northern boundary (the mouth of Knight Inlet) is now known to be non-existent. Considering the geographical extent of archaeological research in the Central Coast at that time, it was predictable that Mitchell's boundary, like Smith's, would not stand the test of time. As Baker pointed out:

> As more work is done north of Knight Inlet, the possibility exists that the known distribution of chipped-stone will be increased (Baker 1973:59).

Chipped stone artifacts have now been found in virtually all areas of the coast north of Comox (MacDonald 1969; Hester 1968, 1969; Kenady 1969; Simonsen 1970, 1973; Carlson 1971, 1972; Pomeroy 1971; Hobler 1972a,b,; Pomeroy and Spurling 1972; Fladmark 1969, 1970a,b, 1971a,b,; Chapman 1973, 1974; Mitchell 1969,1971b, 1972; Apland 1974; Carlson and Hobler 1974; Hobler 1976a).

During the summer of 1970, Carlson discovered quantities of chipped stone artifacts in the intertidal zone of a beach fronting a small midden deposit (FbSu 1) at Cathedral Point in Burke Channel. Later that season similar material was recovered from the intertidal zone of two beaches in Kwatna Inlet (FaSu 18, 19). Although the artifact assemblages from all 3 sites were remarkably similar, the latter 2 differed from the first in that they were not associated with any additional evidence of human occupation, such as midden deposits. This observation prompted Carlson to conduct a series of low-tide investigations of the Kwatna Inlet region upon his return in 1971. The result of those investigations was that another intertidal "beach site" was discovered (FaSu 21) (Carlson, pers. comm.). Carlson considered the chipped stone assemblages recovered from the 4 sites in the Kwatna Inlet region to be indicative of an early phase of cultural activity in the region. He termed this early phase "Cathedral" and suggested that it dates to a period of reduced sea levels.

> The geological picture suggests that the sites of this phase belong in a period of time when sea level was lower than it is today, at least in the Kwatna locality (Carlson 1972:43).

In 1973 I assisted Carlson and Hobler on a site survey of the Seymour Inlet system, as well as the northwest coast of Vancouver Island. Low tide beach investigations were a standard procedure during that survey and as a result three additional intertidal beach sites represented solely by chipped stone were recorded in Quatsino Sound. One of these sites (EdSv 1) had been previously recorded by Kenady (1969) during his 1969 survey.

During the summer of 1974, Pomeroy and I conducted a survey of the Bella Bella region. In consideration of the increasing body of information suggesting a much wider distribution of chipped stone artifacts than previously known, one of the primary objectives of the survey was to obtain information concerning the overall distribution of chipped stone in the Bella Bella region (Apland 1974:1). Thus, low tide investigations were again a standard procedure of the survey and as a result, chipped stone artifacts were recovered from some 28 sites.

In summary, chipped stone artifacts are now known from all areas of the Central Coast assemblages from 38 sites have been analyzed here. Table 2.1 summarizes those sites with reference to the chipped stone artifacts recovered, and the locations of the sites are shown in Figure 2.3. Although no individual site descriptions are offered, there are sufficient shared characteristics to classify them into three main groups. (Table 2.1): (1) midden sites; (2) beach sites; and (3) fish trap sites.

Midden Sites

Shell middens are the most common type of site on the coast of British Columbia, and are characteristic of the majority of sites under discussion here (Table 2.1). Evidence for the use of chipped stone at these sites ranges from one retouched flake or core, to over 200 specimens, representing a variety of tool types. Only two of these sites have been test excavted, however, (FbSu 1; ElTb 10) and both produced indications that the chipped stone material from the beach fronting them, *might not* have been associated with the midden deposits.

It is not uncommon to find artifacts on beaches fronting midden deposits due to natural erosion from rain, wind and wave action. The first assumption one often makes when discovering such material is that it has been washed from the midden deposit. However, it is apparent that in some cases at least, these assumed relationships are not necessarily true.

Test excavtions in the midden at Cathedral Point (FbSu 1), the type site for the Cathedral phase (Carlson 1972), produced stone artifacts which differed markedly from the chipped stone assemblages from the beach. These excavated assemblages were more comparable typologically with the lithic components of two relatively late cultural phases from nearby sites.

Carlson describes the differences in these assemblages as follows:

> The chief difference lies in the basic tool manufacturing techniques. Tools of Cathedral phase were made by chipping or flaking stone whereas during the Anutcix and Kwatna phases stone tools were made primarily by grinding, polishing, and pecking (Carlson 1972:43).

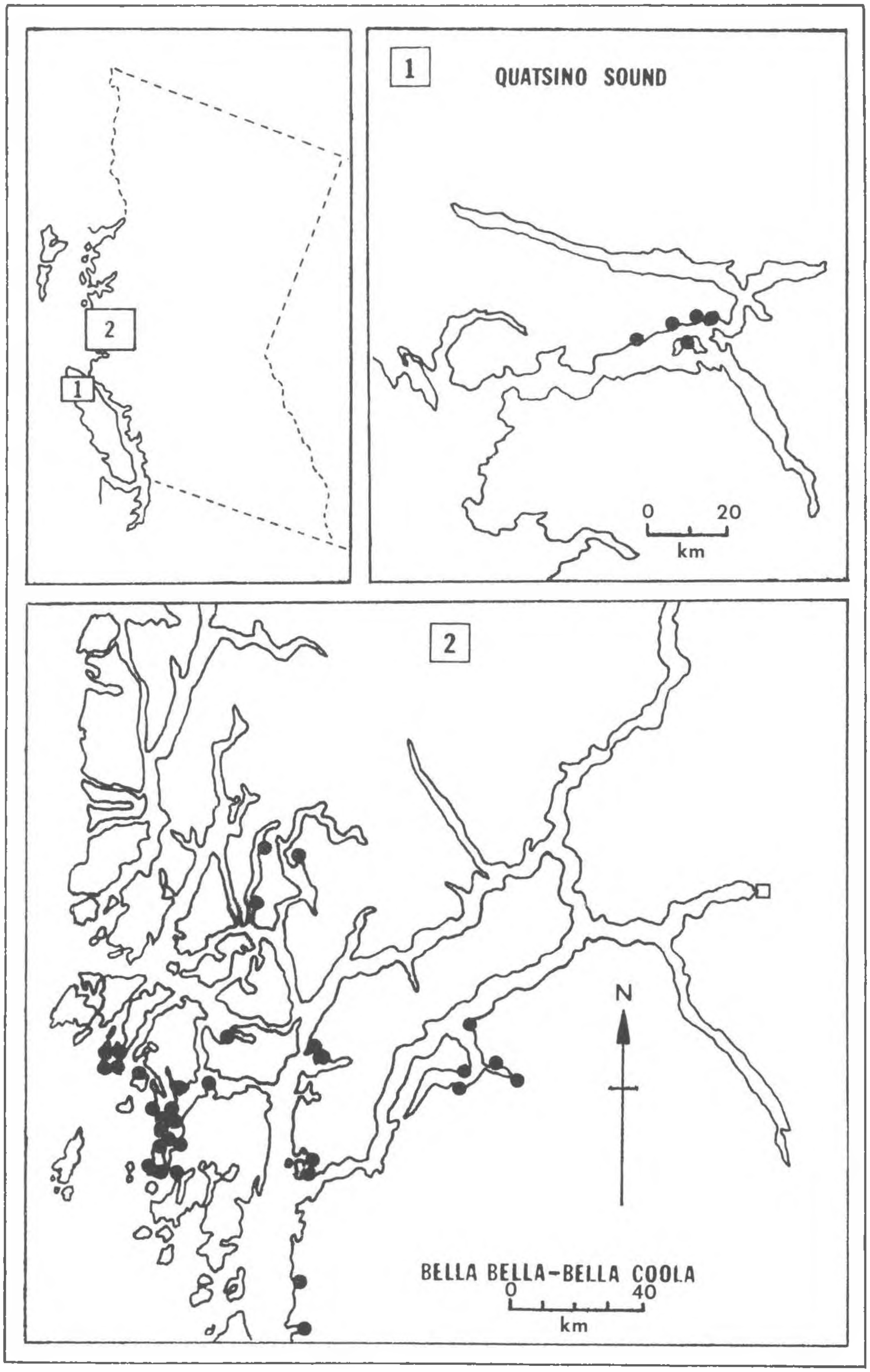


Figure 2.3. The distribution of archaeological sites included in this study.

This technological shift through time indicated in the above description has been evidenced in the north coast region as well. In his report on the Prince Rupert Harbour sequence, MacDonald (1969:250-253) describes chipped stone as the dominant lithic tool type in his "lower horizon" (ca. 2500 B.C.), but virtually absent from the "upper horizon" (ca. A.D. 500 - 1800). A similar transition also occurs in the Strait of Georgia, and Mitchell uses it as a major distinguishing characteristic of his early "Lithic Culture type":

> This type is characterized mainly by an absence of ground stone forms of any kind, except possibly those produced through food-grinding activity or used in the production of bone, antler, and possibly wood artifacts (Mitchell 1971a:59-60).

Excavations at ElTb 10 indicated a pattern remarkably similar to that at Cathedral Point. ElTb 10 is a large midden site on the north end of the northernmost island of the McNaughton group. Numerous chipped stone artifacts were recovered from the beach fronting this site and yet excavations found little evidence of such material within the midden deposits (Carlson 1975; Pomeroy, pers. comm.).

Pomeroy's excavation, a 2 m wide trench perpendicular to the beach front which cross-sectioned the midden, found that chipped stone occurred only infrequently in the bottom of the trench near the front of the midden (Pomeroy, pers. comm.; Pomeroy and Spurling 1972).

A lack of chipped stone material within the midden deposit was also observed by Carlson (1975) during his 1974 excavations, where only two specimens were recovered from beneath an old humus layer on the island. This paucity of chipped stone in the midden contrasted strongly with the relative abundance of such artifacts on the beach (116 specimens), and suggests that perhaps the chipped stone beach material has not washed out of the present midden, but is instead from an earlier, fully eroded site deposit.

Carlson identified a series of nine spatially defined artifact assemblages from the McNaughton Site. The first of these, mainly from the beach, he described as characterized by chipped stone which "can be considered as part of a component of the Cathedral Phase" (Carlson 1975:6). Carlson (1972:43) had earlier suggested that the Cathedral phase material from Kwatna Inlet may have been deposited during a period in which the sea level was lower than it is today. This may account for the peculiar distribution of chipped stone artifacts at the McNaughton Island Site (ElTb 10).

The midden at ElTb 10 surrounds the eastern and southern margins of a small lagoon, extending to cover a bedrock peninsula between the small lagoon and another larger lagoon situated farther inland. At high tide this peninsula becomes an island, yet at low tide the small lagoon fronting the midden becomes almost totally drained of water.

The relatively significant drop in sea level from its present equivalent ca. 5,000 B.C. to 5 or more metres below its present level by approximately 2,000 B.C. would have virtually eliminated the lagoon fronting ElTb 10, leaving only a dry beach area. It is this point which I would like to explore further with reference to the peculiar distribution of chipped stone at that site. If we consider the presence of the chipped stone material from ElTb 10 to be indictive of an early (relative to the non-chipped stone assemblages) occupation during a period of reduced sea level, that occupation in all likelihood was situated farther forward (toward the water) on the beach than the present midden. Subsequent rises in sea level would necessitate a backward shift of later occupational events in response to

TABLE 2.1

DISTRIBUTION OF CHIPPED STONE ARTIFACTS IN STUDY AREA

Artifacts	EdSv 1	EdSv 3	EdSv 10	EdSw 1	EdSw 3	EkTa 10	EkSx 1	ElSw 3	ElSx 3	ElTb 9	ElTb 10	ElTb 18	ElTb 19	ElTb 28	ElTb 30	FaSx 3	FaSx 11	FaSu 10a	FaSu 18	FaSu 19	FaSu 21	FaTa 35	FaTa 44	FaTb 3	FaTb 12
Bifacially flaked points	1					3					9										1				
Point fragments						1					5										4				
Large crude bifaces																			2		5				
Backed bifaces																					2				
Miscellaneous bifaces																					1	1			
Notched flakes											2								1	3	3				
Spurred flakes											1								1	2	6				
Microblades																			1						
Unifacial flakes						14	2	1	4	1	4		5						10	17	12	2		1	3
Unifacial spalls			26																		3				
Unifaces											1								8	3	11				
Unifacial core-tools						3			1		5		2			3			7	40	13	2			
Unifacial pebble-tools	1	6	55	1	8																				
Bifacial core-tools						4					3		3			7		2	5	24	6	1	1		
Bifacial pebble-tools			25																						
Multidirectional cores						11	2	1		4	1		2	1			3	1	36	81	43	7			1
Pebble cores	1	5	42																2		7				
Microblade cores																									
Miscellaneous flakes						8	6				19	2				9			17	30	48	3			
Waste flakes	3		37	2	2	72	17	1	4	2	54		33	3	3			6	86	41	126	8			12
Spalls			16																						
TOTALS	6	11	201	3	10	116	27	3	9	7	104	2	45	4	3	19	3	9	176	241	291	24	1	1	16
Site Types																									
Midden		xx		xx	xx	xx	xx	xx	xx	xx	xx		xx	xx	xx							xx	xx	xx	
Beach	xx		xx																xx	xx	xx				xx
Fish Trap												xx				xx	xx								
Undecided																		xx							

a rising shoreline.

The effect of this hypothetical progression of events would be to see the earlier cultural deposits become slowly submerged. Continual exposure to rising and falling tides would wash away such things as shell, bone, 'soil', charcoal, and ash, etc., leaving only the heavier, more durable elements of material culture such as those made from stone, exposed on the beach.

If land-sea relationships were stable, normal midden growth would tend to expand outward toward the water. Under these conditions the oldest deposits would normally be located near the bottom at the back of a midden. Under rising sea level conditions such as those described above, this handy 'rule of thumb' does not work, since the depositional sequence would be altered. This situation should always be kept in mind when planning midden excavations on

	FaTb 13	FaTb 14	FaTb 16	FaTb 17	FaTb 20	FaTb 24	FaTb 25	FaTc 7	FaTc 8	FaTc 11	FbSu 1	FcSx 11	FcSx 14b	TOTALS
								1			4			19
	1										3			14
											2			9
											1			3
											1			3
											3			12
											2			12
											1			2
	4	2	1		15						27		5	130
														29
											8			31
	11	1			4	1					11		1	105
														71
	10	1	1	2		2					4		2	78
														25
		3			2	1	1	3	1		36	6	5	252
														57
											1			1
	2				8	1					75	1		229
	31	10	1	1	70	7		1	2	9	83	1	13	741
													2	18
	59	17	3	3	99	12	1	5	3	9	262	8	28	1841
	xx	xx	xx	xx		xx			xx		xx	xx		23
					xx			xx		xx			xx	10
							xx							4
														1

the coast; it helps to explain why Pomeroy found chipped stone only at the very bottom near the front of the midden. If the early beach occupation hypothesis is true, then Pomeroy in all likelihood had managed to transect the remnants of an earlier deposit. The sequential stages of occupation hypothesized for the McNaughton Island Site are shown in Figure 2.4.

Beach Sites:

There are 10 sites among the 38 under consideration here which can be classified into this group (see Table 2.1). Beach sites have not yet gained full recognition in the archaeological literature, but are defined by artifacts on a beach, the presence of this material being the only recognizable evidence of past human activity. In the case of the 10 sites mentioned above, this artifactual material was comprised solely of chipped stone.

All of the beach sites included here share a number of characteristics other than those which have been used to define them. These sites are usually situated in small protected coves. In all cases they are located on relatively wide intertidal shelves which become exposed during periods of low tide and, characteristicaly, the terrain immediately behind the beaches slopes steeply upward leaving little, if any, land suitable for habitation above the high tide level.

Artifact assemblages from these sites are on the whole quite comparable to the assemblages from the midden sites discussed earlier. The only exceptions are the two beach sites EdSv 1 and EdSv 10 from Quatsino Sound where the artifact assemblages, although similar to each other, differ from all other beach sites. However, these two assemblages do compare well with chipped stone assemblages collected at three midden sites in the same area (EdSv 3, EdSw 1, EdSw 10). In total, these five sites represent a unique regional manifestation of a chipped stone industry distinct from that of the Bella Bella-Bella Coola region as we shall see later.

Beach Sites in general are considered to have depositional histories like those of the midden sites. Initial occupation would have occurred during a period of reduced sea-level when the

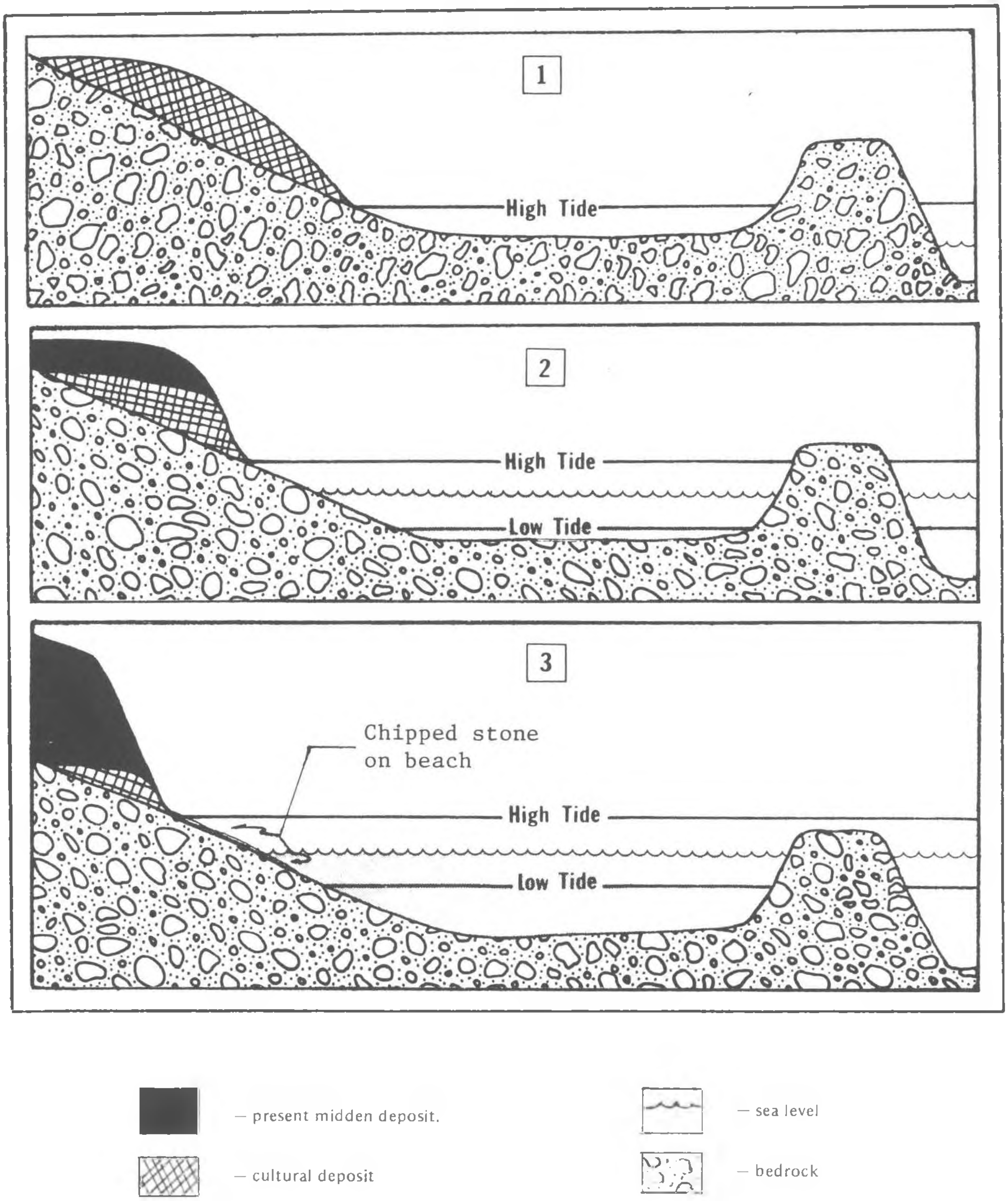


Figure 2.4. Schematic profile of McNaughton Island Site (ElTb 10) showing proposed occupational sequence with reference to past sea level fluctuations. 1.—cultural deposition during period reduced sea level, pre-1000 B.C. Chipped stone dominant; 2.—rise in sea level, shoreline encroaches upon cultural deposits, subsequent deposits developing further back. Older deposits being submerged and washed out; 3.—present position of the sea, midden deposit eroded by high tide. Older chipped stone bearing deposit only a remnant at bottom front of midden. Heavy artifacts (chipped stone mixed with later artifacts) on beach.

present intertidal shelf upon which they rest was exposed and formed an open beach area suitable for habitation. Subsequent sea-level rises submerged and eroded the early deposits and the relatively steep hinterland precluded later occupational events such as those which produced the midden sites.

Carlson and Hobler (1974:11) suggested that the beach sites with chipped stone were explicable as lithic quarries or as old habitation sites washed out by rising sea levels (as described above), or both. There is little doubt that raw materials for stone tool manufacturing were gathered at these sites, suggesting that either the first or last explanation would best describe them. However, upon closer inspection we find that the most extensively utilized raw material (andesite/basalt) is found in abundance among the natural cobbles existing on virtually all beaches in the area. This would suggest that the primary reason for site locations was not simply oriented towards quarrying. Furthermore, the variety of tool types found associated with these sites indicates a number of activities were in all likelihood carried out there and that site functions were somewhat complex.

One site has been recorded 'undecided' (FaSu 10a). It is represented by nine badly waterworn specimens of chipped stone recovered from a gravel bar in the Kwatna River near a large midden site, FaSu 10, excavated by Carlson in 1972. The overall appearance of this material is identical with the Cathedral phase material known from four sites in Kwatna Inlet. Although some chipped stone was found near the bottom of the deposit at FaSu 10, that material differs typologically from the pieces recovered from the river. At present it is difficult to place this material in any particular site group given the limitations of sample size, external wear through natural erosional processes, and lack of direct site association.

Fish Traps

Four sites have been included in this group (Table 2.1). Fish traps are a very common site group in the Bella Bella region and vary greatly in form and construction depending upon where they are located (Apland 1974:4-5; Pomeroy 1976). They consist of rows of rocks piled several courses high, positioned in the intertidal zone of beaches, at or near the mouths of large rivers and streams, across small shallow lagoons, across the heads of shallow coves, or simply along open shorelines.

These fish trap sites are in fact, on the beach. However, since a specific intertidal function (fishing) can be identified for them, they are classified separately from 'beach sites'. Chipped stone artifacts found at these sites may not be directly associated with the traps. It is difficult to establish the degree of association, if any, between the artifacts and subsistence features. These artifacts may represent old beach sites upon which later fish traps were constructed, or they may represent tools related to particular functions associated with the fish traps themselves, such as fish cutting implements.

DATING

There are no absolute dates yet available which can be directly associated with any of the collections. However, there is a fairly large body of indirect data which allows us to bracket this material into a relatively well defined time span ranging from ca. 4000 to 1000 B.C.

Carlson (1972:43) has suggested that chipped stone can be viewed as an horizon marker separating early cultures in which chipped stone is common from relatively late cultures in which chipped stone is rare.

The active intertidal zone of a beach is not noted for its preservational qualities and as such no organic matter suitable for radiocarbon dating found to be directly associated with the chipped stone assemblages under study here has been obtained. However, radiocarbon dates from a number of midden sites within the region are useful in estimating when stone chipping was in vogue throughout the Central Coast.

Mitchell received 14 radiocarbon dates from the sites in the Johnstone Strait region. Upon plotting site collection lists with radiocarbon estimates, he found that:

> An Arbitrary selection of 1550 B.C. (mid point of the range) as the boundary between "early" and "late" couples 80 per cent of the artifacts with early, and 11 per cent with late estimates. When we consider only chipped-stone items the proportions are 95 per cent early, 5 percent late (Mitchell 1972:42).

Two radiocarbon dates were obtained from the basal levels of the midden at FbSu 1, the type site for the Cathedral phase assemblages. One sample (Gak 3907-soil with plant roots) yielded a date of 260±130 B.C., and the other (Gak 3906 charcoal) was dated at A.D. 340±80 (Carlson and Hobler 1972:4). Test excavations of the midden deposit at this site revealed materials "typologically younger" than those from the beach (Carlson 1972:43), thus suggesting a pre-260 B.C. date for the Cathedral phase component (Carlson and Hobler 1972:4).

During his excavations at the McNaughton Island Site (ElTb 10) in 1972, Pomeroy found that the chipped stone artifacts which had been recovered in quantities from the beach were not similarly common throughout the midden deposit. Only one small scraper and a few unaltered flakes were found near the base of the midden close to the beach front (Pomeroy, pers. comm.). Two radiocarbon dates were obtained from the bottom of the deposit, both of which were on charcoal and dated to 570±90B.C. and 470±95 B.C.

At the O'Connor Site (EeSu5) near Port Hardy, Chapman found evidence of a chipped stone component in the basal deposits of the midden. Small obsidian flakes were found throughout the deposit but did not relate to the early chipped stone component which was marked by three leafshaped points and some unifacially retouched flakes. Three radiocarbon dates were obtained from this site, all taken from the mid-range of the deposit, stratigraphically well above the chipped stone bearing strata. These dates, two on charcoal, and one on fragmented shell and ash were found to centre around 760 B.C. (Gak 4917 1050±90 B.C.; Gak 4918,740±90 B.C.; Gak 3901, 590±120 B.C.) (Chapman this volume).

Excavations on the Central Coast have resulted in the testing of 27 sites to date, eight of which were major excavations (Drucker 1943; Capes 1960, 1964; Simonsen 1970; Hester 1968, 1969; Hobler 1969, 1970, 1972a,b; Carlson, 1970c, 1971, 1972, 1975, 1976; Chapman 1971, 1972, 1973, 1974, this volume; Pomeroy and Spurling 1972; Mitchell 1972; Cybulski 1975). Unfortunately the relative recency of excavation projects coupled with the inevitable time-lag in published accounts has resulted in very little information being available at this point concerning the results of those projects. If the apparent scarcity of chipped stone from excavated assemblages post-dating 1000 B.C. continues to prevail (and there are no indications that it will not) a terminal date for the prehistoric use of chipped stone *as a primary lithic tool manufacturing technique* in the Central Coast sometime prior to 1000 B.C. is strongly indicated. This is not to say that stone chipping was totally abandoned by the prehistoric peoples of the Central Coast but simply that there was a major shift in emphasis in stone tool technology. Plain and retouched flakes and cores along with other more formal chipped stone tools have been represented on a minor scale in excavated assemblages from the area post-dating 1000 B.C. (Luebbers 1971; Carlson 1972; Chapman 1971, 1974, this volume).

The only site which has yielded dated cultural deposits extending back over 3000 years in the Central Coast is Namu (ElSx 1). The Namu sequence as described by Luebbers (1971) supports the trends and dates offered in the above discussion. According to Luebbers' (1971:106) artifact description through time, chipped stone was the only artifact type present from 7000 to 3000 B.C. However, ground stone "celts" (adzes) began appearing between 2000 and 1000 B.C. and by the time of Christ chipped stone had virtually disappeared.

The lowest depositional phases at Kisameet Bay (ElSx 3), also described by Luebbers (1971:108), were dated between 410 B.C. and 90 A.D. These deposits were also devoid of chipped stone aritfacts. The Namu sequence appears to have chipped stone extending longer in time than is indicated by other sites in the area. It must be kept in mind, however, that the dates given are minimums, and that chipped stone had virtually disappeared from the sequence before the birth of Christ.

Sea Levels

As seen previously, the various assemblages under discussion probably date to a period of reduced sea level. This is essentially true in the case of beach sites. Since the relative sea-levels of at least the Bella Bella-Bella Coola region were much higher than present prior to 5,500 B.C. (Andrews and Retherford 1976) the occupation of all of the sites under discussion here must logically post-date that time period.

Sites occupied prior to 5,500 B.C. should be expected to be located on raised beaches, terraces or strand lines, as Retherford points out:

> ...because of these sea level shifts, the likelihood of finding midden sites much older than Namu is not good unless much higher elevations are surveyed (Retherford 1972:94).

If the 1,000 B.C. date can be accepted as the terminal date for the use of chipped stone as a primary method of lithic tool manufacture on the Central Coast, then the various assemblages to be described in the next section must date to 5,500 - 1,000 B.C., a period very close to that predicted by Carlson of 4,000 to 1,000 B.C. for the Cathedral phase (Carlson 1972:41).

THE ARTIFACTS

This section offers a description and discussion of 1841 flaked stone artifacts collected from the 38 sites previously discussed. This description is presented in the form of a loose system of classification, with the various artifact groups being solely defined on attributes of morphology. Specimens were classified according to two sets of criteria: (1) shared technological attributes of manufacture (e.g. bifacial and unifacial flaking) and (2) shared formal attributes (e.g. cross-sections, and outlines). This classificatory procedure was used to maintain consistency and descriptive continuity. Functional interpretations for the various artifact groupings are offered on a speculative level. These interpretations were not used as criteria for classification.

All of the specimens to be described herein have been collected from the surface of the intertidal zone of beaches and as such have been subjected to numerous erosional forces such as beach rolling, atmospheric weathering at low tide, and chemical alteration from sea water. The result of such erosional processes, however, is one of "rounding" on the sharp edges of angular particles. The process of rounding in a relatively high energy environment usually occurs relatively rapidly. It is interesting to note, however, that although all of the artifacts exhibit sufficient surface damage in the form of rounding to preclude wear pattern analysis, flake scars remain very distinct. This may suggest that these specimens have not been continuously exposed to the weathering agents associated with their beach environment for any significant periods of time. This may further suggest that they have emerged from the beach gravels relatively recently. Every specimen was observed under a low power microscope (20X) and, with the exception of two pieces, no function-specific wear patterns in the form of striations, polish, or micro-flaking could be confidently identified.

Ground stone. A number of ground stone specimens were also recovered from four of the sites included in this study (EkTa 10, ElTb 10, FaTb 13, FbSu 1). These specimens are in the form of ground greenstone adzes or adze fragments and the sites from which they came are all associated with midden deposits. Two of those sites (ElTb 10, FbSu 1) were test excavated and it was found that although comparable groundstone artifacts were present in the middens, chipped stone was absent or rare. Considering the lack of ground-stone implements in the assemblages from the majority of sites under consideration I felt that these implements where encountered were likely associated with a different and later cultural component than the chipped stone. For this reason these specimens have not been included in the analysis.

The initial analysis began with the separation of the material into two main categories: (1) tools and (2) waste (objects which did not exhibit evidence of use). The microscopic analysis at this point revealed that a large number of flakes exhibited edge damage which could not be positively identified as either intentional or 'use' retouch, or due to some form of post-depositional damage. The flakes mentioned above exhibited edge damage in the form of micro-flake scars representative of snap-fractures and step-fractures which did not conform to any apparent patterning. Several fresh-looking scars were also noted, suggesting damage during collection, shipment from the field, or storage. Although the latter damage was easily identified it did tend to obscure positive identification of previous wear patterns which may have existed on the specimens. Lack of positive identification for the origin of the edge damage on many of these specimens resulted in the inclusion of a third general artifact category, 'miscellaneous flakes'. Maximum length, width, and thickness measurements were recorded for all specimens, and weights were recorded for the heavy implements of the pebble-tool and core-tool groups. Edge angles were also taken with the aid of a pocket goniometer.

Raw Material

Obtaining raw materials for stone chipping was not a problem for prehistoric peoples in the Central Coast. The most common type of stone utilized is readily available among the natural pebbles and cobbles found on all beaches in the area. This material is a fine grained igneous rock of the basalt-andesite range (Crampton, pers. comm.). It would require a chemical and/or mineral analysis to distinguish between these two types, a procedure not performed since it was apparent that the material was chosen for its accessability and fine grained nature rather than its chemical composition.

A.J. Baer's (1968) geological study of the Bella Coola-Ocean Falls region, however, gives us some insight to the basic rock type common to that region:

> Volcanic rocks in the Bella Coola-Ocean Falls region are most commonly dark green with a purplish tint and appear black on weathered surfaces. Their composition is primarily andesitic and rarely basaltic (Baer 1968:1433).

This describes the majority of the material in the assemblages studied. It also resembles the type of rock observed among the chipped stone components included in the assemblages recovered from Namu and Grant Anchorage (pers. observ.). Mitchell's (1972) descriptions of the Johnstone Strait assemblages indicate that it dominates chipped stone components there as well. The material described above represents more than 95% of the rock type utilized. Other raw materials include obsidian (2.33%) and to a lesser extent milky quartz, grey vitreous basalt, and quartzite (less than 1% total). Of these materials, obsidian deserves special mention.

Obsidian is the only raw material represented which is not indigenous to the immediate area. Sources of obsidian are not as widespread as most other rock types and as such only a small number of geological sources are presently known in British Columbia (Nelson and Will 1976:151). Obsidian was recovered from six sites in the Bella Bella-Bella Coola region (ElTb 10, EkTa 10, EkSx 1, FaTb 13, FaSu 18, and FbSu 1), and the majority of it has been identified as having come from the Rainbow Mountain area east of Bella Coola. It has come from two sources in particular, Obsidian Creek and MacKenzie Pass. One specimen from FbSu 1 has come from the Ilgachuz Mountains on the Chilcotin plateau, and another from a source on Mount Edziza (Nelson 1976: pers. comm.).

The presence of obsidian at these sites can be explained in two ways: either it was traded in via the Dean and/or the Bella Coola valleys, or it was imported directly, which would require travel to the source areas. Information concerning early obsidian trade is presently being studied by Carlson and Nelson (pers. comm.), and should reveal important data concerning early cultural contacts between the coast and the interior plateau. The presence of this obsidian in the study material also has implications concerning site functions.

Tools

A total of 550 specimens were identified as tools on the basis of secondary flaking features. Retouch is indicative of either intentional tool shaping, resharpening, or conversely dulling an edge to perform a specific task. Any specimen exhibiting such a feature was considered a tool.

Twenty-nine of the sites yielded artifacts specifically identified as tools. Those artifacts have been subdivided into six major classes, the distribution of which is given in Table 2.2.

I. Bifaces No.=48

TABLE 2 . 2

DISTRIBUTION OF TOOLS BY SITE

	I. Bifaces A. Points 1. leaf-shaped	2. side notched	3. stemmed	4. fragments	B. Backed	C. Large Crude	D. Miscellaneous	II. Unifaces	III. Notches	IV. Spurs	V. Microblades	VI. Edge Modified A. Flakes 1. unifacial	B. Spalls 1. unifacial	C. Cores 1. unifacial	2. bifacial	D. Pebbles & Cobbles 1. unifacial	2. bifacial	TOTALS
EdSv	1															1		2
EdSv 3																6		6
EdSv 10													26			55	25	106
EdSw 1																1		1
EdSw 3																8	1	9
EkTa 10	2		1	1								14		3	4			25
EkSx 1												2						2
ElSw 3												1						1
ElSx 3												4		1				5
ElTb 9												1						1
ElTb 10	7	1	1	5				1	2	1		4		5	3			30
ElTb 19												5		2	2			9
FaSx 3														3	7			10
FaSu 18						2		8	1	1	1	10		7	5			35
FaSu 19								3	3	2		17		45	24			94
FaSu 21	1			4	2	5	1	11	3	6		12	3	12	6			66
FaTa 35							1					2		2	1			6
FaTa 44															1			1
FaTb 3												1						1
FaTb 12												3						3
FaTb 13				1								4		11	10			26
FaTb 14												2		1	1			4
FaTb 16												1			1			2
FaTb 17															2			2
FaTb 20												15		4				19
FaTb 24														1	2			3
FaTc 7	1																	1
FbSu 1	3		1	3	1	2	1	8	3	2	1	27		16	4			72
FcSx 14b												5		1	2			8
TOTALS	15	1	3	14	3	9	3	31	12	12	2	130	29	114	75	71	26	550

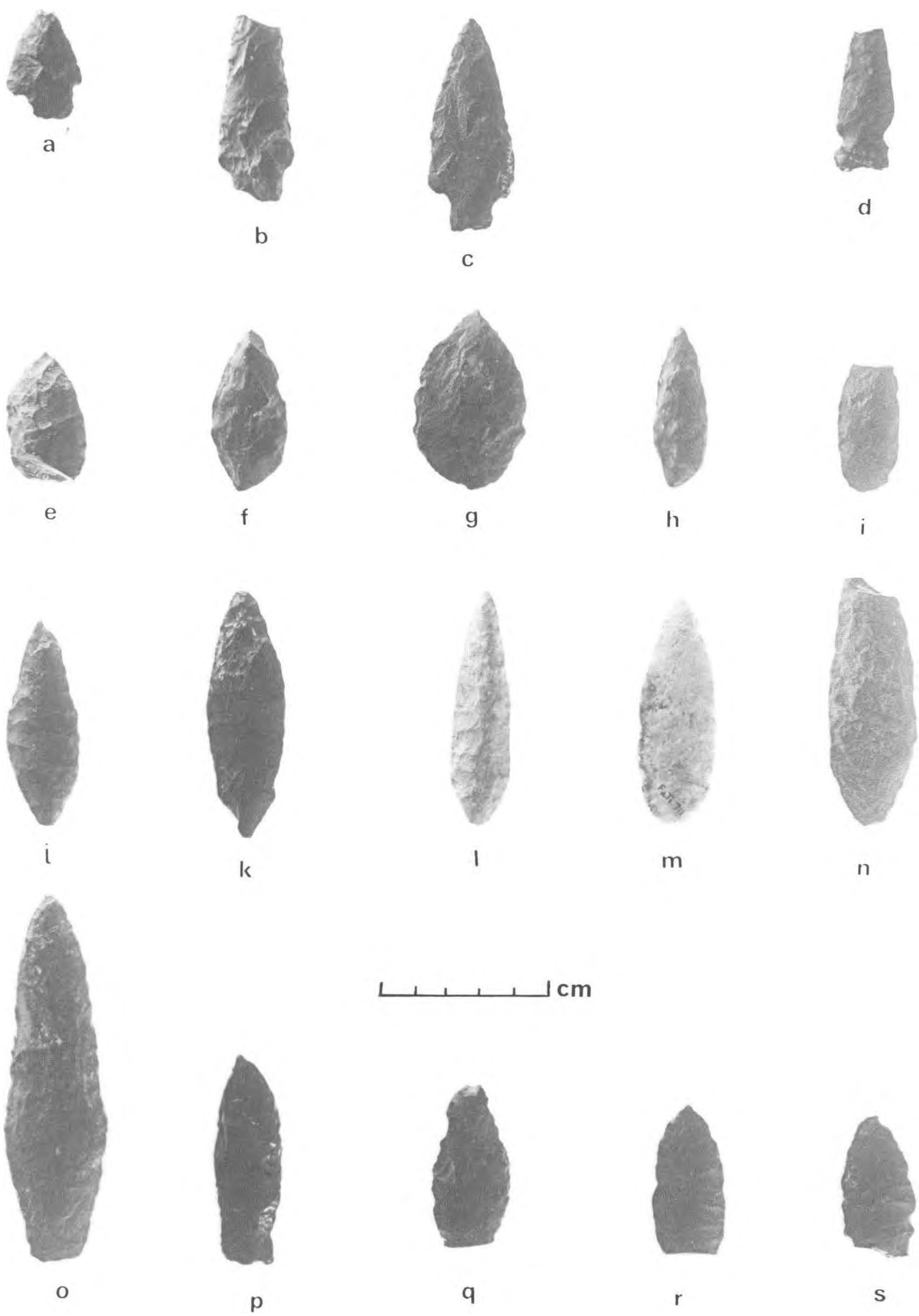


Figure 2.5. Bifacially flaked points. Type 1a—leaf-shaped convex base (e-l,m); 1b—leaf-shaped triangular base (j-l,n); 1c—leaf-shaped straight base (o-p); Type 2—side notched (d); Type 3a—rectangular stemmed (a-c).
Site provenience: a—EkTa 10; b—FbSu 1; c—ElTb 10; d—ElTb 10; e—ElTb 10; f—FbSu 1; g—ElTb 10; h—FbSu 1; i—ElTb 10; j—ElTb 10; k—FaSu 21; l—ElTb 10; m—FaTc 7; n—EdSv 1; o—ElTb 10; p—FbSu 1; q—ElTb 10; r—EkTa 10; s—EkTa 10.

Bifaces are those artifacts which exhibit extensive secondary flaking over two entire surfaces. The extensive flaking has resulted in forms apparently predetermined by the manufacturer, and as such they correspond to the "formed bifaces" described by Sanger (1970:71) and Von Krogh (1976:92). Four sub-classes of bifaces have been identified.

A. Points
No.= 33.
Sites: EdSu 1, EkTa 10, ElTb 10, FaSu 21, FaTc 7, FaTb 13, FbSu 1.

Bifacially flaked points are represented by 33 specimens of which only 19 are complete enough for formal classification (Fig. 2.5). The remaining 14 are fragments representative of point tips, mid-sections, and bases (Fig. 2.6). Points are characterized by relatively thin blade edges which converge to a point at one end while the other or basal end, normally exhibits some form of hafting element such as notches, stems, or basal thinning (Loy et. al. 1974b:25).

Points could have served a variety of functions; however, they most likely were used as arming tips for weaponry such as arrows or spears, and for this reason the common phrase "projectile point" is often used to describe artifacts of this sub-class (Sanger 1970:36; Stryd 1973:322; Ham 1975:124).

Three basic types and five sub-types of points have been identified.

Type 1: Leaf-shaped.
No.= 15
Sites: EdSv 1, EdTa 10, ElTb 10, FaSu 21, FaTc 7, FbSu 1.
Figure 2.5e-s.

These points are generally leaf-shaped in outline with little evidence of a basal hafting element. Blade edges are primarily excurvate and cross-sections bi-convex, although a few specimens exhibit an asymetrical cross-section which can be constructed as rhombic in form (Fig. 2.5, e,f,h). Flaking characteristics range from very crude, as indicated by broad, randomly oriented flake scars (Fig. 2.5, f-h) to very fine, exhibiting long narrow, almost parallel scars (Fig. 2.5, l,m).

Three sub-types of leaf-shaped points were identified using base form as a criterion for subdivision. The standard metric attributes of leaf-shaped points are as follows:

Attribute	range	mean	number
length	4.8-11.0	6.68	9
width	1.7- 3.0	2.33	15
thickness	0.6- 1.3	0.87	15

1a. Convex base: This sub-type is represented by six specimens (Fig. 2.5, e,i,m). Blade edges form a continuous arc at the base and the widest point on fragmented specimens (Fig. 2.6,i) may represent a basal section of a leaf-shaped point of this sub-type.

1b. Triangular base: The four specimens of this type (Fig. 2.5, j-l,n) have relatively straight basal edges which converge to a point. The maximum width of these specimens is in the lower third.

1c. Straight base: These specimens, of which only two are complete (Fig. 2.5, o,p), represent leaf-shaped points with the development of an incipient stem. The lateral edges below the widest point are straight, and form an angle of close to 85 degrees with the base, which is also straight. Three additional specimens (Fig. 2.5,p,q-s) of this sub-type exhibit a burin-like facet from the tip down one edge (Fig. 2.7). Mitchell (1972:28) illustrated a similar piece from a site in the Johnstone Strait region

(EaSh 23) which he described as a 'burin'. It is entirely possible that points such as these may have been burinated through use by striking a hard object such as bone or stone.

Type 2: Side-notched.
No.= 1.
Sites: ElTb 10.
Figure 2.5, d.

The characteristic feature of this point type was the presence of a well developed notch on each side near the base. The single specimen of this type exhibits straight blade edges forming a triangular blade and is thinly bi-convex in cross-section. The base is bifacially thinned, and convex in form. General flaking characteristics are very fine, suggestive of pressure flaking. The maximum width is 1.7 cm immediately above the notches and the maximum thickness was 0.6 cm. Points of this type are known from Kwatna Bay (FaSu 2) and have come from cultural deposits much younger than the majority of this chipped stone. It is probable that this point type relates to a later time period as well.

Type 3: Stemmed.
No. = 3(4).
Sites: EdTa 10, ElTb 10, FbSu 1.
Figure 2.5, a-c.

These points have a well developed stem to facilitate hafting to a shaft of some sort. Three specimens were manufactured out of fine grained basalt and flaking characteristics are suggestive of soft hammer percussion with very thin broad flakes removed. Flake orientation is random. A fourth specimen (Fig. 2.5, j), although fragmented, is considered to be representative of a stemmed point. This specimen is made of andesite. Two sub-types of stemmed points were identified.

3a. Rectangular stem: These specimens possess stems with straight edges that meet the base at right angles (Fig. 2.5, a-c). Only two specimens are complete enough for length measurements and these were found to range from 3.2 cm to 6.2 cm. The width and thickness of all three points are remarkably uniform, with the thickness of all three being 0.5 cm and the widths ranging from 2.1 to 2.2 cm.

3b. Contracting stem: This subtype is represented by only one basal fragment (Fig. 2.6 j). The edges of the stem converge to form a pointed or steeply convex base. The cross-section of this specimen is biconvex although somewhat skewed to one side and the thickness is 0.8 cm. The maximum width was assumed to be immediately above the shoulders of the stem and measures 3.6 cm.

B. Backed bifaces
No.= 3.
Sites: FaSu 21, FbSu 1.
Figures 2.8 and 2.9.

Backed bifaces are relatively large percussion flaked objects which have been longitudinally split. Well pronounced bulbs of percussion as well as negative bulbs occurring on the steep, flat, longitudinal and transverse edges in conjun-ction with localized impact crushing and suggest that these specimens were intentionally split (Fig. 2.9). It is presumed that this particular manner of splitting was done to form a backing for hand held use of the implement in cutting (heavy) or sawing functions. Overall flaking is fairly crude on two specimens (Fig. 2.8, b,c) and finely executed on the third (Fig. 2.8, a). Assuming symmetry in the original form before splitting, the cross-sections of all three specimens would have been bi-convex. The standard metric attributes of backed bi-faces are summarized as follows:

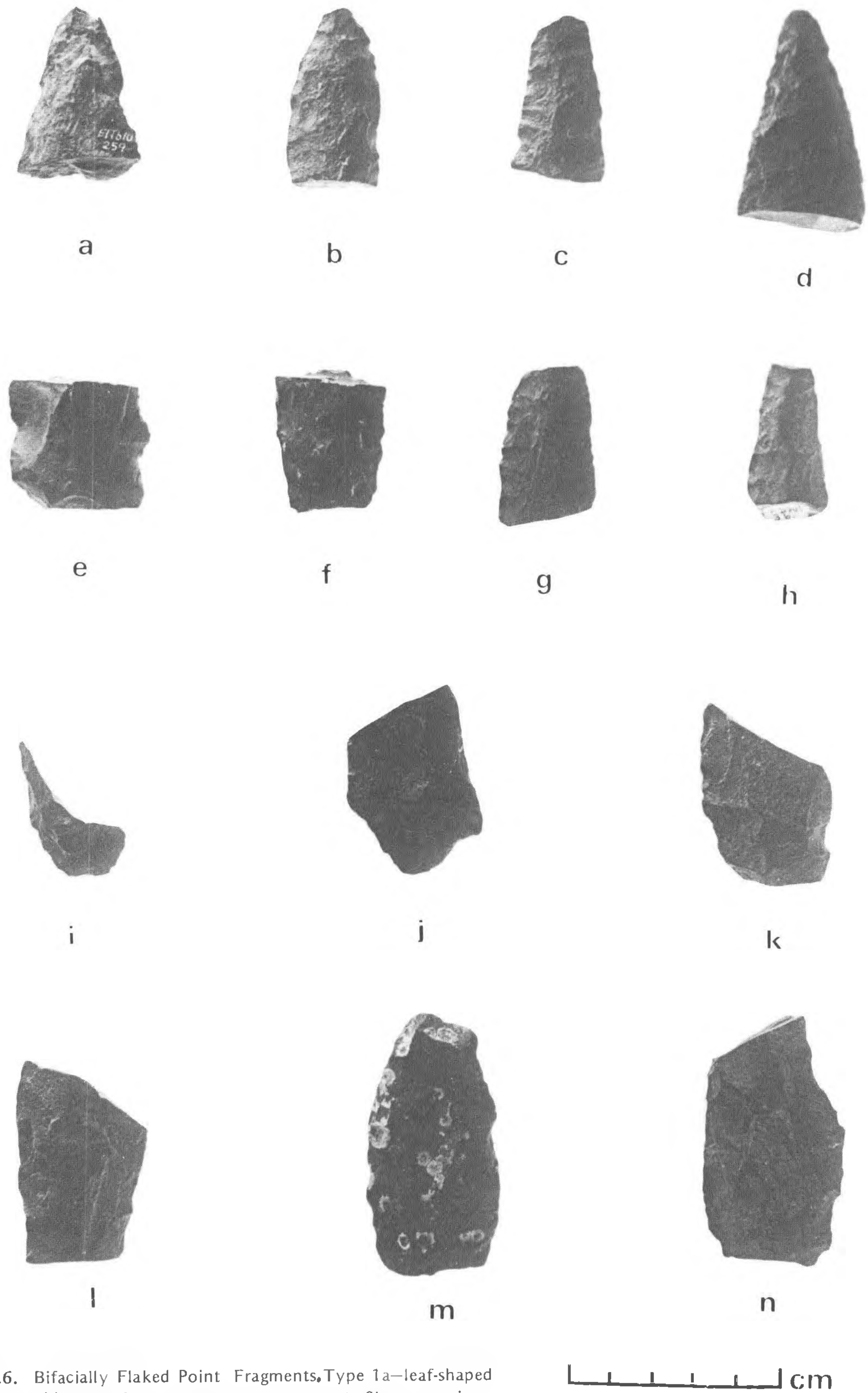


Figure 2.6. Bifacially Flaked Point Fragments. Type 1a—leaf-shaped convex base (i); Type 3b—con tracting stemmed (i). Site provenience: a—ElTb 10; b—FbSu 1; c—FaSu 21; d—ElTb 10; e—ElTb 10; f—FbSu 1; g—FaSu 21 h—FbSu 1; i—ElTb 10; j—EkTa 10; k—FaSu 21; l—FaSu 21; m—EkTa 10; n—FaTb 13.

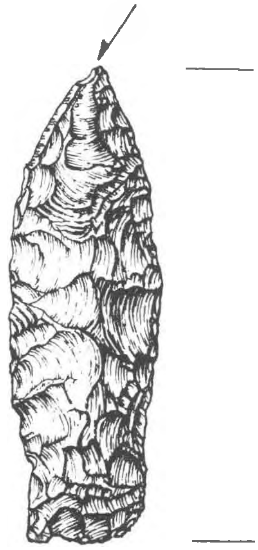


Figure 2.7. A burinated point from FbSu 1. Length is 6.3 cm.

Attribute	range	mean	number
length	3.1-8.7	5.63	3
width	2.5-4.1	3.1	3
thickness	1.0-2.1	1.37	3

C. Large crude bifaces.
No.= 9.
Sites: FaSu 18, FaSu 21, FbSu 1, ElTb 10.
Figure 2.10.

This class of artifacts consists of nine specimens, only one of which is complete (Fig. 2.10,f). These objects exhibit large, crude, and randomly oriented flake scars over both faces indicative of a heavy percussion technique of manufacture. They may conceivably have been used as cutting tools. However, there is some evidence that suggests that they were blanks for the production of either points or backed bifaces.

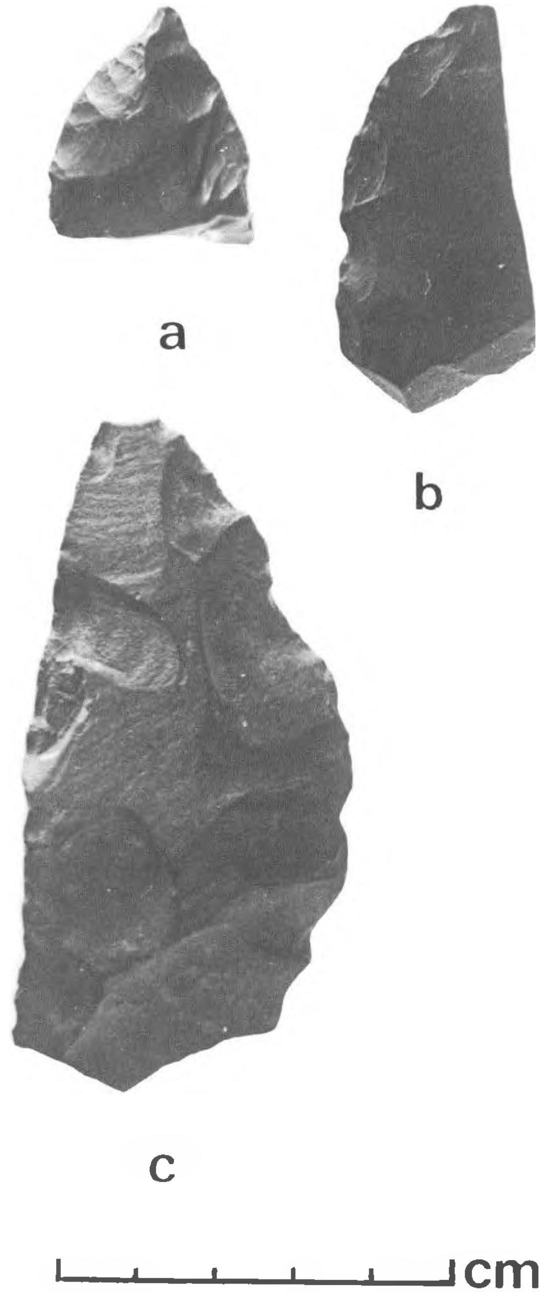


Figure 2.8. Backed bifaces. Site provenience: a—FaSu 21; b—FaSu 21; c—FbSu 1.

One specimen (Fig. 2.10, i) exhibits a snap fracture at the base. One face of that specimen shows relatively fine soft hammer flaking, commonly attributed to biface thinning, with a relatively even, slightly convex surface. The opposite face exhibits crude flaking near the fractured end and a small amount of very fine well directed flaking at the tip. This flaking pattern suggests that the object was broken during manufacture and thus represents an unfinished tool in the preform stage.

A second specimen (Fig. 2.10, g) exhibits a well developed cone of percussion in the center of the broken surface suggestive of intentional splitting or truncation. This may be indicative of one stage in the production of a backed biface. It would have required only a single blow on the truncated surface to produce a longitudinal fracture resulting in the formation of a backed biface similar to those described above (Fig. 2.11).

The standard metric attributes of large crude bifaces are as follows:

Attribute	range	mean	number
length	10.6	-	1
width	3.0-5.9	4.41	7
thickness	1.3-2.0	1.57	9

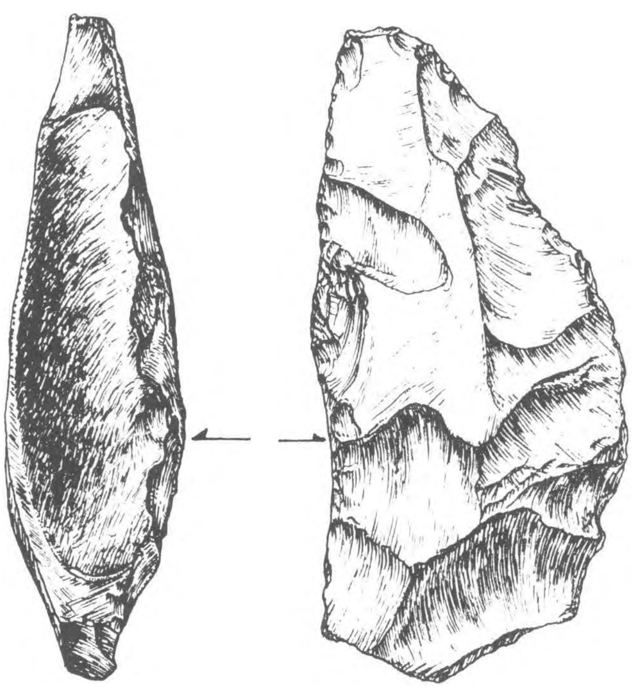


Figure 2.9. Backed biface (FbSu 1). Length is 8.8 cm.

D. Miscellaneous bifaces.
No.= 31.
Sites: FaSu 21, FaTa 35, FbSu 1.
Figure 2.12.

These specimens are unclassifiable as to form, and all exhibit extensive bifacial flaking. They also all appear to be broken, although severe wear from beach rolling and other natural agencies make it difficult to determine that for certain.

II. Unifaces
No.= 31.
Sites: ElTb 10, FaSu 18, 19, 21, FbSu 1.
Figure 2.12.

Unifaces are tools formed by unifacial secondary retouch over one entire face. These specimens are similar to those which Stryd (1973:360) refers to as "continuous scrapers" in that there is unbroken retouch around all edges of the tool making it difficult to isolate any particular edge as the primary working margin. The specimens range in form from ovate to rectanguloid, with cross-sections of basically two forms, biplano (4) and plano-convex (27).

Most of the specimens were manufactured from large flakes or split pebbles and cobbles with the initial bulbar surface having served as the platform for unifacial retouch around the periphery. There is a considerably wide size range with the standard metric attributes summarized as follows:

Attributes	range	mean	number
length	3.2-11.1	6.36	21
width	2.9-13.1	4.47	21
thickness	0.4- 6.4	2.01	31

According to Stryd

> unifacially retouched flake and core tools which exhibit an overall form suggesting deliberate shaping by the maker, are identifiable as scrapers (1973:352).

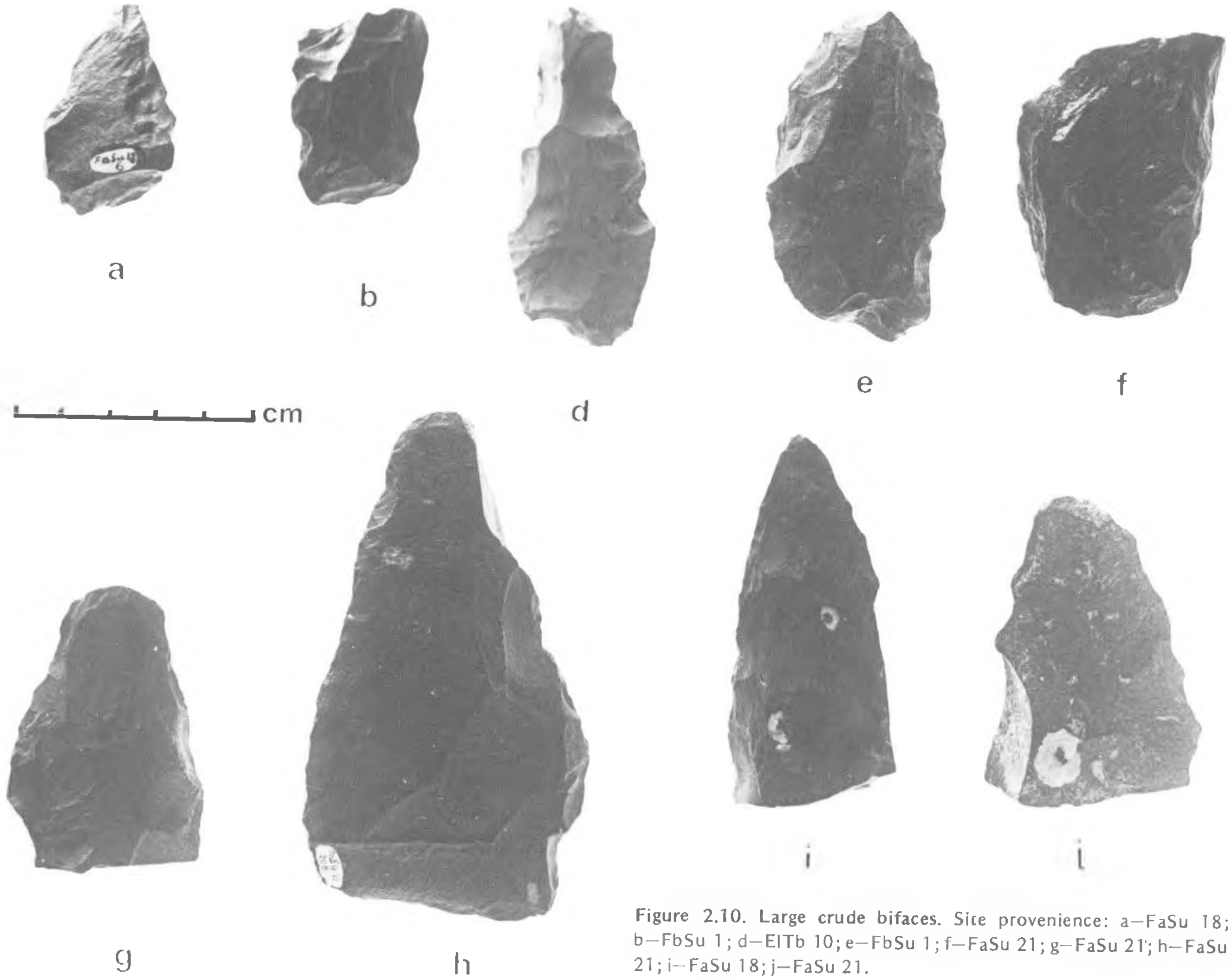


Figure 2.10. Large crude bifaces. Site provenience: a—FaSu 18; b—FbSu 1; d—ElTb 10; e—FbSu 1; f—FaSu 21; g—FaSu 21; h—FaSu 21; i—FaSu 18; j—FaSu 21.

Edge angle measurements tend to support the identification of scraping as the primary function of these tools. Edge angles taken on 29 of the specimens were found to fall into a range from 65 to 80 degrees, peaking in the 70 to 75 degree range (Fig. 2.13). Wilmsen (1968b:156) describes the general edge angle ranges from 66 to 75 degrees as best suited for woodworking, bone working, skin softening, and heavy shredding. Wylie (1975:4) found that edge angles ranging from 50 to 90 degrees with a mean of 75 degrees were most commonly associated with hard scraping functions, including the surface modification of fresh wood as well as bone material.

Wylie also found that tools used for

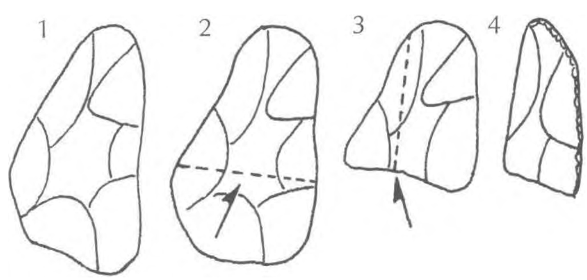


Figure 2.11. Stages in the production of backed bifaces.

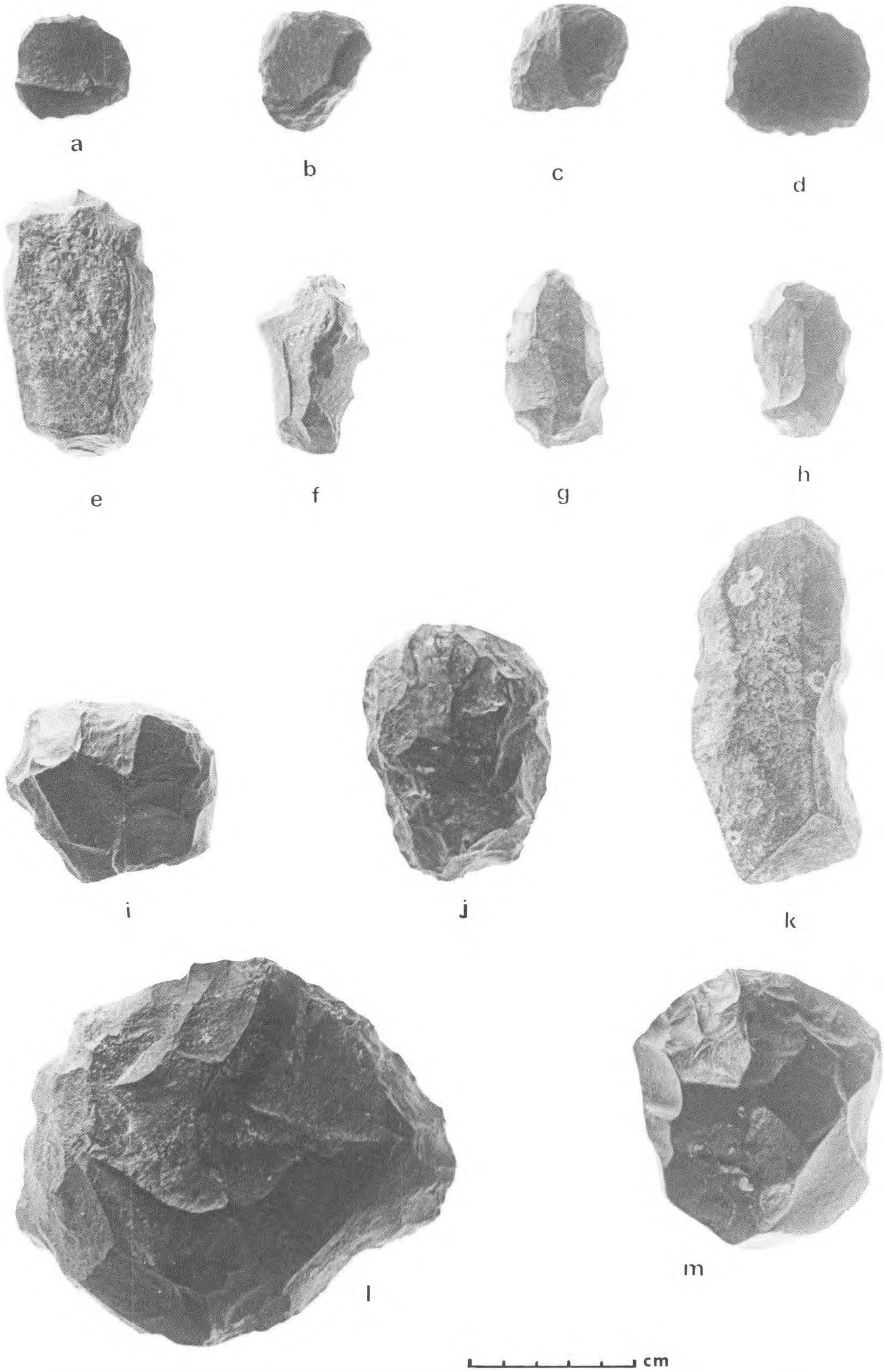
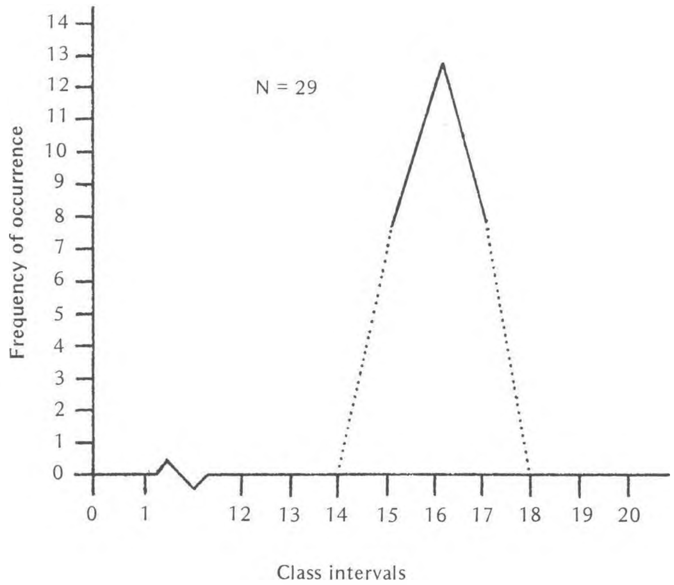


Figure 2.12. Unifaces. Site provenience: a-EkTa 10; b—FbSu 1; c—FaSu 21; d—FaSu 21; e—FaSu 19; f—FaSu 19; g—FaSu 18; h—FaSu 21; i—FaSu 18; j—FbSu 1; k—FaSu 18; l—FaSu 18; m—FaSu 18.



Class intervals

1– 0.0°– 4.9°	11–50.0°–54.9°
2– 5.0°– 9.9°	12–55.0°–59.9°
3–10.0°–14.9°	13–60.0°–64.9°
4–15.0°–19.9°	14–65.0°–69.9°
5–20.0°–24.9°	15–70.0°–74.9°
6–25.0°–29.9°	16–75.0°–79.9°
7–30.0°–34.9°	17–80.0°–84.9°
8–35.0°–39.9°	18–85.0°–89.9°
9–40.0°–44.9°	19–90.0°–94.9°
10–45.0°–49.9°	20–95.0°–99.9°

Figure 2.13. Edge angles, unifaces.

chopping and adzing functions exhibited edge angles between 70 to 80 degrees with a mean of 73 degrees. These tools were of three basic shapes according to Wylie:

> The three basic tool shapes were *thick plano convex forms ("domed scrapers") worked unifacially around most of their circumference*, thin unifacially retouched flakes, and bifacially flaked blades (italics by this writer) (Wylie 1975:22).

The first description compares closely to the unifaces described here and the last is suggestive of the large crude bifaces and backed bifaces described earlier.

A scraping function is still considered to be the primary use to which these unifaces were put. One reason for this is the notable lack of wear patterns, especially in the form of microflaking and crushing. If these tools were used for chopping and adzing purposes, a certain amount of step-fracturing and crushing should be expected along the edges. Such wear should be identifiable even in consideration of the extensive surface attrition displayed on these artifacts.

One of the two specimens which show some evidence of wear is in this group (Fig. 2.12,i). This specimen exhibits a high degree of polish on the planar surface immediately behind a slightly beveled rim. This attribute adds additional support to the identification of scraping as the function of these tools.

III. Notches

No.= 12.

Sites: ElTb 10, FaSu 18, 19, 21, FbSu 1.

Figure 2.14.

The characteristic feature of this class of tool, as the name implies, is a well-developed notch. All of the specimens identified were manufactured on irregular flakes. Notches were presumably used to scrape, smooth, and shape wood or bone implements such as projectile shafts, fore-shafts, etc., and as such are often referred to as spokeshaves (Wilmsen 1968b:159; Luebbers 1971:187; Stryd 1973:364; Loy et. al. 1974b:37). The standard metric attributes of notches are as follows:

Attribute	range	mean	number
length	3.5-8.7	4.65	12
width	1.2-4.5	3.11	12
thickness	0.5-1.5	0.96	12
notch mouth	0.9-1.3	1.05	12
notch depth	0.2-0.4	0.29	12

Assuming that these notches were indeed used for the shaping and smoothing of shafts (either wood or bone), the notch size would suggest that shaft diameters were no more than 1.3 cm. Many specimens exhibit extensive edge damage on the leading surface within the notch. This damage is in the form of step-fractures and crushing, again suggesting heavy use of these tools for scraping. Edge angles range from 70 degrees to 85 degrees peaking in the upper end of that range between 80 degrees to 85 degrees.

IV. Spurs.
No.= 12.
Sites: ElTb 10, FaSu 18, 19, 21, FbSu 1. Figure 2.15.

Spurs are defined as artifacts exhibiting pronounced projections in the form of a point or tip; all were manufactured on irregular flakes. These tools are presumed to have served general piercing or engraving functions on relatively soft materials such as hides, bone, wood, or even soft stone. In many cases parallels may be drawn with those tools referred to as gravers and perforators by others (Sanger 1970; Luebber 1971; Crabtree 1972; Carlson 1972; Loy et. al. 1974b). On many specimens minute microflake scars are noticeable on alternating faces of the projections, suggesting a twisting motion during use, since these scars occur most predominantly on the points as opposed to other areas of the flake, they are assumed to be use-related.

The standard metric measurements for spurs are as follows:

Attribute	range	mean	number
length	2.7-6.9	4.38	12
width	2.5-8.0	4.27	12
thickness	0.5-1.5	0.83	12

V. Microblades.
No.= 2.
Sites: FbSu 1, FaSu 18.

Only two microblade fragments were recovered from the sites. These specimens were manufactured from obsidian, a feature of all Hester's microblades from Namu (Luebbers 1971). They measure 1.5 cm and 0.9 cm in width by 0.7 and 0.9 cm in thickness. The sides of the fragments are parallel.

VI. Edge modified tools.
No.= 438.

Edge modified tools are defined as irregular, unformed cores and flakes exhibiting either unifacial or bifacial secondary flaking on one or more edges. This class of tools represents the largest single group of tools identified and is a major reason why these assemblages in general look quite crude. Subdivision within this class is based on (1) whether the tool was manufactured on a core or flake; and (2) whether edge modification is bifacial or unifacial.

A distinction was made on the subclass level between core and pebble tools, as well as flake and spall tools. Pebble and core tools are in all probability equatable in functional usage, the pebble-tool differing only in that there remained original cortex over most of the surface. Spall and flake tools are also in a sense the same; a spall is simply a large primary decortication flake. These distinctions were maintained primarily because of the predominance of simple pebble tools in many south coast sites, and because two regional patterns in tool technology are recognizable among the assemblages on the basis of these distinctions. These patterns will be discussed in more detail below.

A. Flakes
No.= 130.

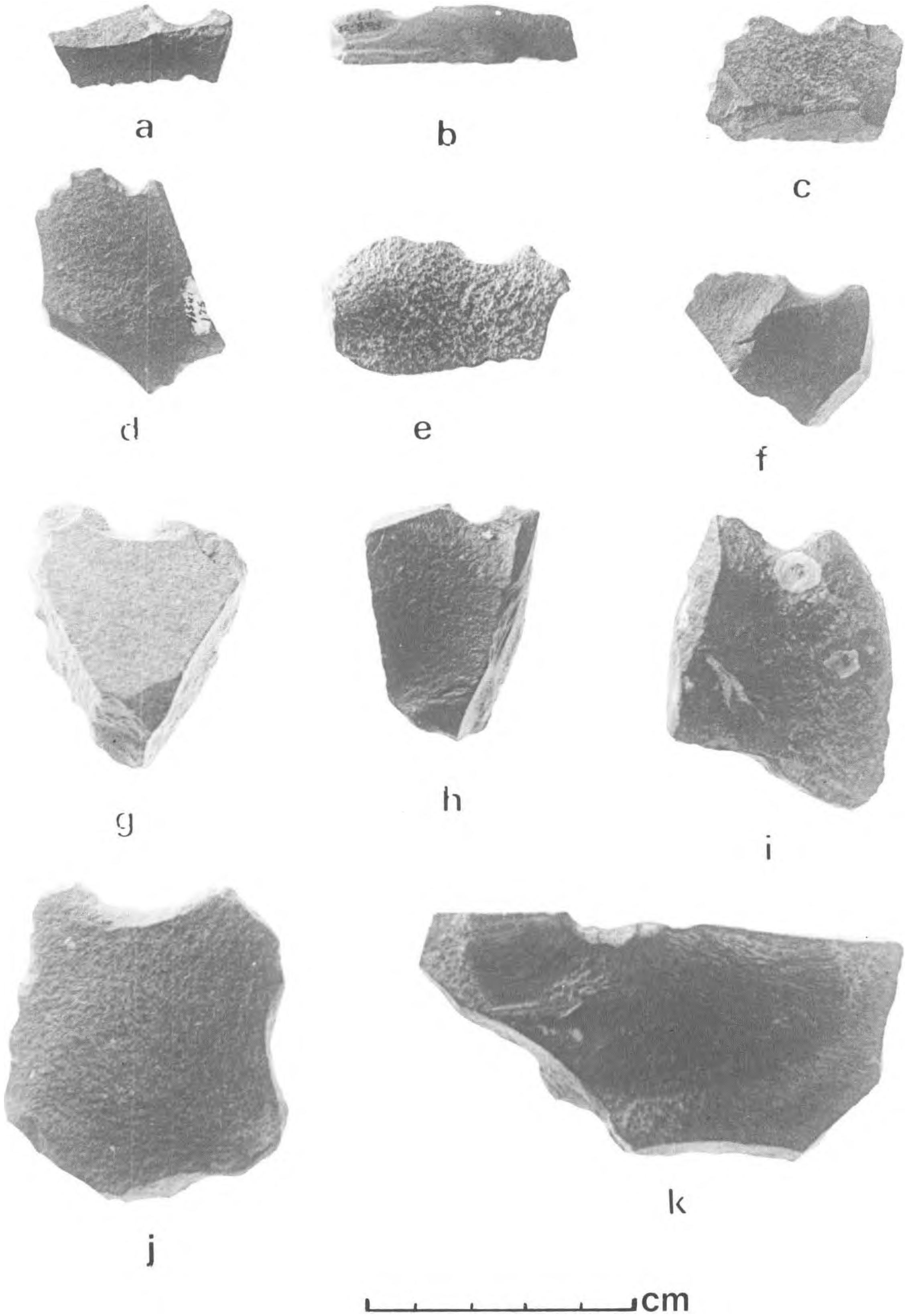


Figure 2.14. Notches. Site provenience: a–FaSu 19; b–FaSu 21; c–FbSu 1; d–FbSu 1; e–FaSu 21; f–FaSu 19; g–FaSu 19; h–FaSu 21; i–FaSu 18; j–FaSu 19; k–FbSu 1.

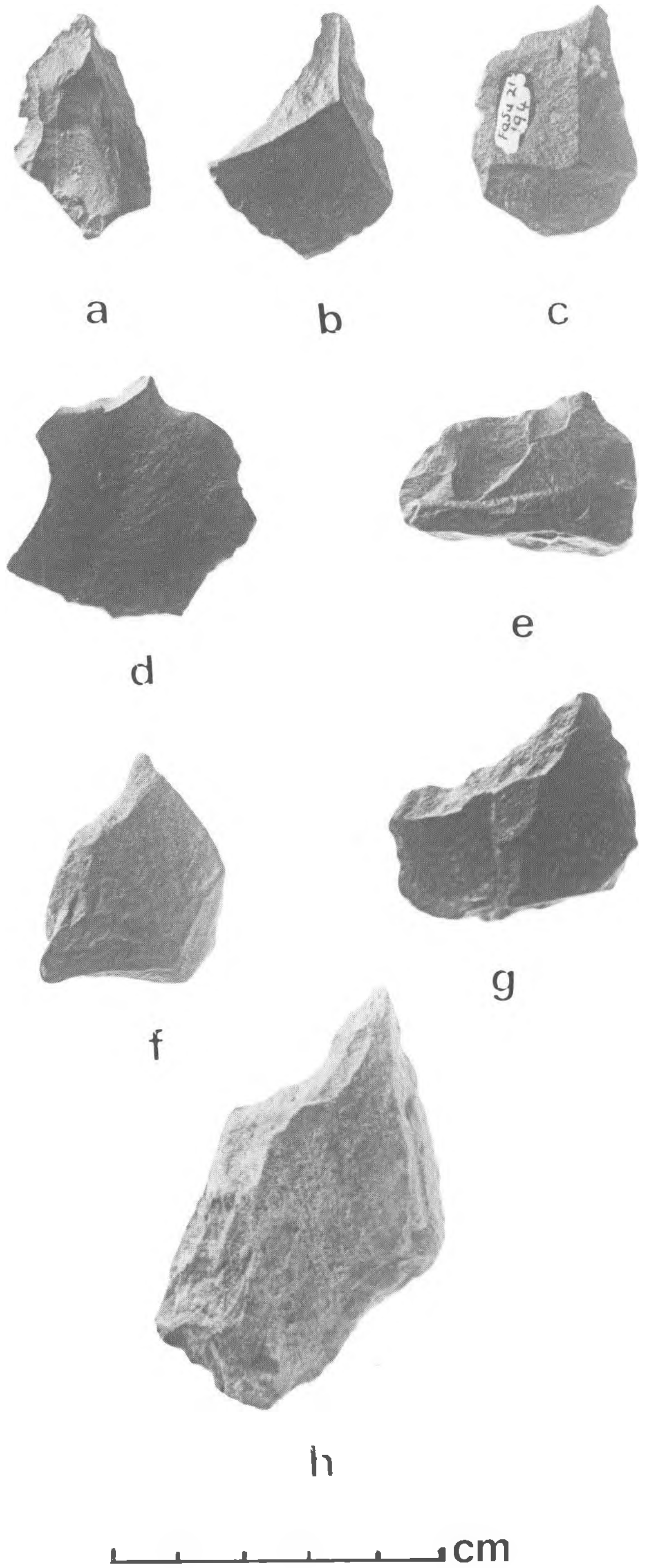


Figure 2.15. Spurs. Site provenience: a–ElTb 10; b–FbSu 1; c–FaSu 21; d–FaSu 21; e–FaSu 21; f–FaSu 21; g–FaSu 21; h–FaSu 18.

Edge modified flakes are perhaps one of the most common single groups found in any chipped stone assemblage and consist of irregularly formed flakes (usually primary percussion flakes) which exhibit some form of secondary retouch along one or more edges. Normally referred to as retouched flakes, these artifacts are "often assumed to have served as short use, all-purpose cutting and scraping implements" (Stryd 1973:365). Stryd describes three types of retouched flakes, "unifacial, bifacial, and alternate". Only unifacially retouched flakes were noted among the study material.

Type 1: Unifacially modified flakes.
No.= 130.
Sites: EdTa 10, EkSx 1, ElSw 3, ElSx 3, ElTb 9, 10, 19, FaSu 18, 19, 21, FaTa 35, FaTb 3, 12, 13, 14, 16, 20, FbSu 1, FcSx 14b.

The flaking characteristics exhibited by retouch on these specimens range from fairly thin short flakes to large and broad ones leaving a denticulated edge.

There are a number of terms used throughout the literature to describe artifacts of this type: "retouched flakes" (Stryd 1973:365), "Flake scrapers" (Simonsen 1970:107, 1973:36), "Flake unifaces" (Mitchell 1972:31), "Unformed unifaces" (Sanger 1970:80; Hanson 1973:169; Ham 1975:131, Von Krogh 1976:111), "Developed flakes" (Luebbers 1971:89), as well as "Unifacially modified flakes" (McMurdo 1974:45). A brief summary of attributes for these unifacially modified flakes is as follows:

Attribute	range	mean	number
length	2.2-11.4	5.28	121
width	1.75-10.9	4.28	126
thickness	0.33- 3.5	1.21	130

Edge angle measurements exhibit a bimodal distribution (Fig. 2.16) with an angle of 50 degrees representing a dividing line. Out of the 130 specimens studied, 36 (27.69%) exhibit angles clustering in a range from 20 to 49.9 degrees, while the remaining 94 (72.31%) cluster in a 50 to 89.9 degree range.

Wylie (1974:30) suggested that an angle of 60 degrees appears to be a rough dividing line between general cutting and scraping tools. Ham (1975:139) on the other hand found that the edge angles of his "unformed unifaces" exhibited a bimodal distribution similar to the one shown in Figure 2.16, with an "acute angle group" ranging from 15.6 to 47.5 degrees, and a "steep angle group" ranging from 47.6 to 79.5 degrees.

Although all three studies have resulted in similar bimodal distributions, Wylie's identification of 60 degrees as the probable transition point is somewhat higher than that noted in this study (+10) or Ham's (+13). A close correlation has been noted between Ham's study and this one; however, the significance of this pattern may only reflect differences in raw material. Ham was dealing primarily with basalt, which is extremely close in physical properties to the andesitic material studied here. Wylie, on the other hand dealt almost exclusively with chert, chalcedony, obsidian, and ignimbrite. All of these stones would produce slightly more friable edges than basalt and andesite and thus would require steeper edge angles for scraping tools, to give added strength to the working edge.

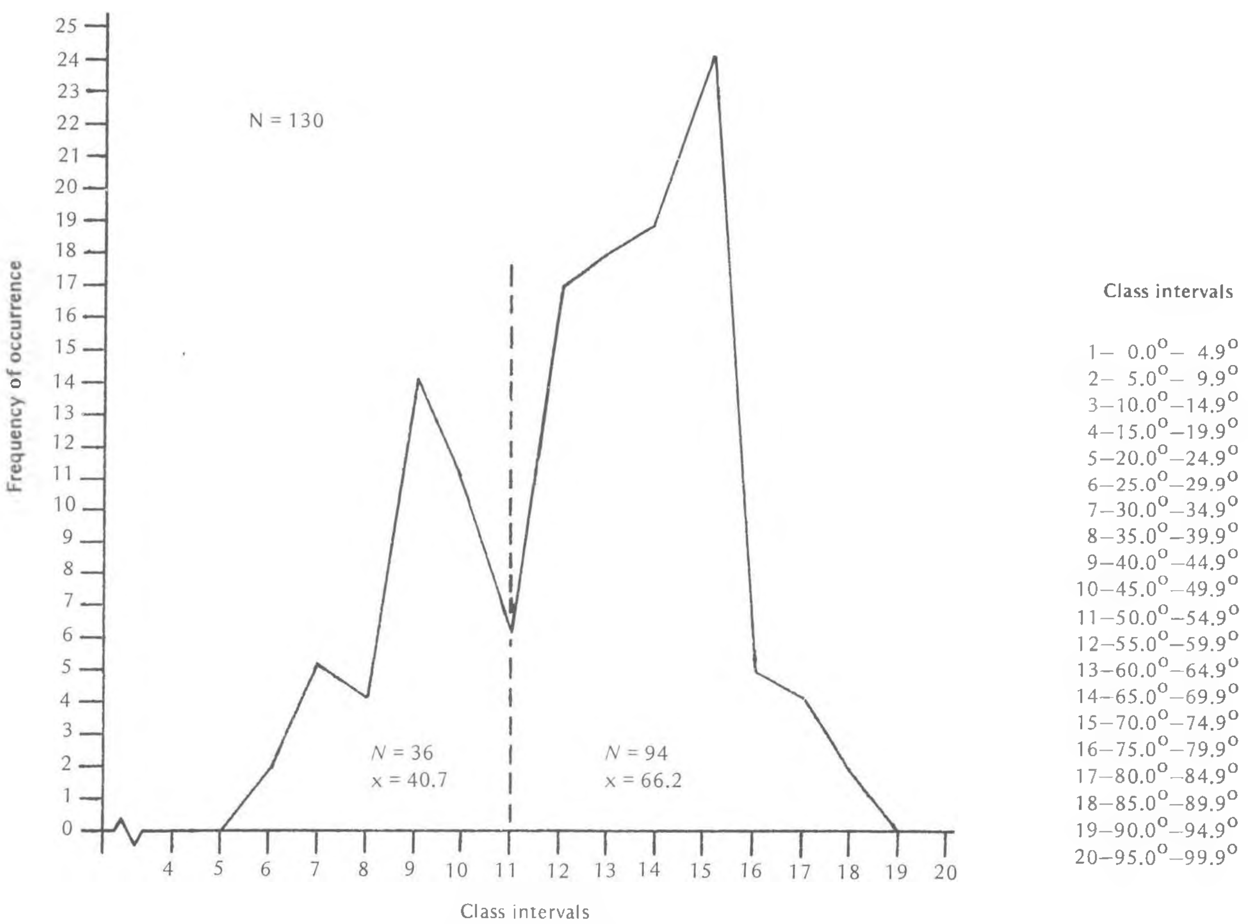


Figure 2.16. Edge angles on unifacially edge modified flakes.

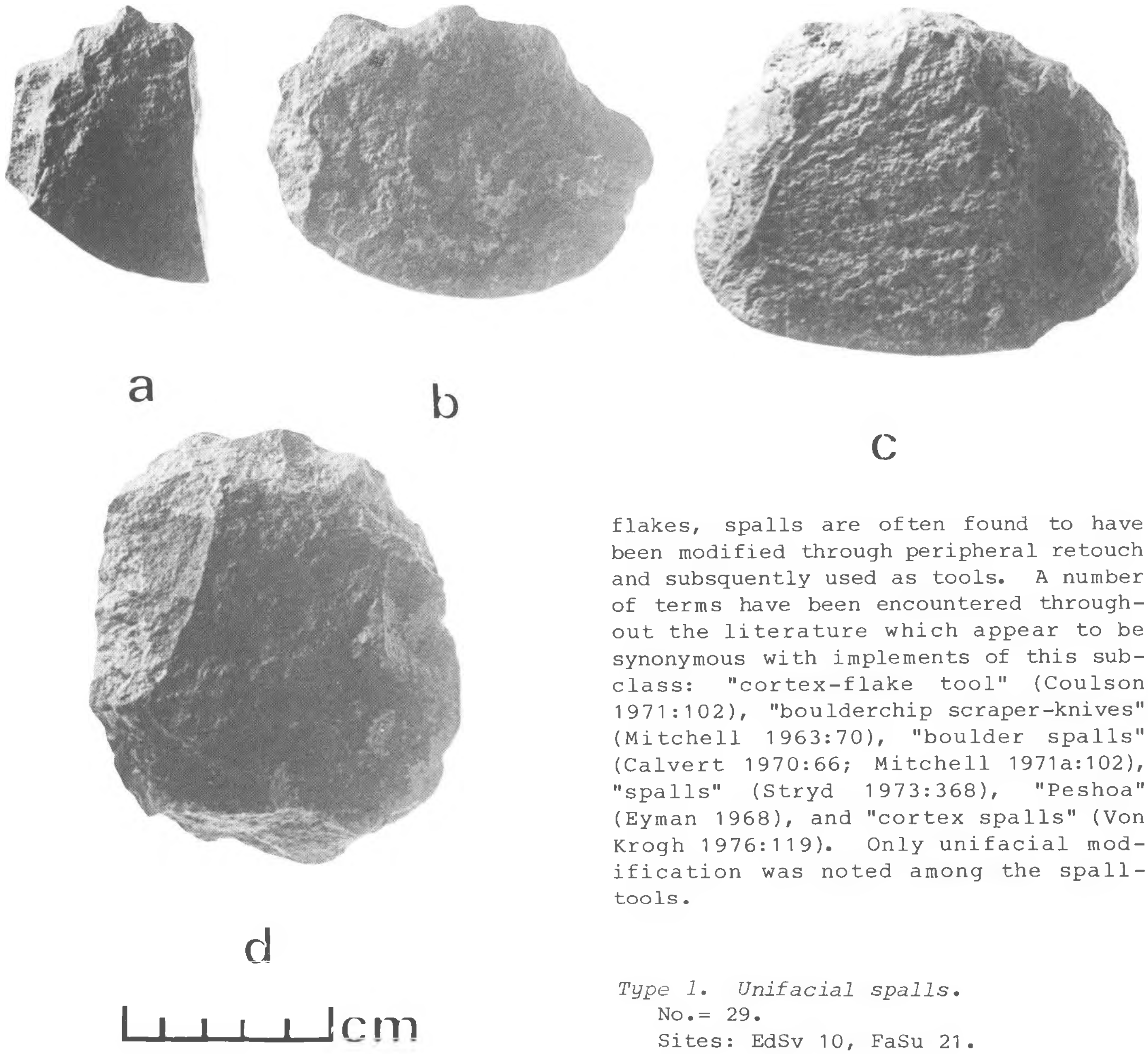


Figure 2.17. Unifacially edge modified spalls. Site provenience: a—EdSv 10; b—EdSv 10; c—EdSv 10; d—EdSv 10.

B. Spalls.
No.= 29.

Spalls are essentially primary decortication flakes struck from cobbles and pebbles, which retain their original cortex over most if not all of the dorsal surface. As with the edge modified flakes, spalls are often found to have been modified through peripheral retouch and subsquently used as tools. A number of terms have been encountered throughout the literature which appear to be synonymous with implements of this subclass: "cortex-flake tool" (Coulson 1971:102), "boulderchip scraper-knives" (Mitchell 1963:70), "boulder spalls" (Calvert 1970:66; Mitchell 1971a:102), "spalls" (Stryd 1973:368), "Peshoa" (Eyman 1968), and "cortex spalls" (Von Krogh 1976:119). Only unifacial modification was noted among the spall-tools.

Type 1. Unifacial spalls.
No.= 29.
Sites: EdSv 10, FaSu 21.
Figure 2.17.

Retouch on these specimens was initiated from the bulbar or ventral surface. Flaking appears to be primarily percussion induced, leaving relatively deeply indented or denticulated edges (Fig. 2.17). The standard metric measurements taken on these specimens are as follows:

Attribute	range	mean	number
length	5.2-10.8	7.04	26
width	4.0-10.8	6.81	26
thickness	1.2- 4.3	2.76	26
weight	144-473	255.38	29
edge angle	43-88	72.88	29

With the exception of one specimen all of the unifacial spall tools described here exhibit edge angles between 55 and 95 degrees (Fig. 2.18) with a mean of 72.88 degrees. Considering the coastal orientation, the rather large size, and the fairly heavy weight of these tools, it is most likely that they were used as chopping and adzing implements, for working both wood and bone.

C. Core tools.
No.= 189.

This sub-class is represented by multi-directional core specimens which exhibit intentional edge formation, either unifacial or bifacial, resulting in the creation of one or more working edges. These tools are assumed to have served a variety of heavy chopping, adzing, and scraping or shredding functions. A core, by definition, is simply "any object from which a flake has been removed" (Loy et al 1974b:9). The term core has been applied to this sub-class for want of a better descriptive term, but is recognized as somewhat ambiguous. As Crabtree (1972:56) points out, "Carried to its logical end, any stone tool which has had a flake removed could be justifiably termed a core tool". To clarify this ambiguity I shall herein follow Carlson's (pers. comm.) definition of his term, core: "a remainder of a nodule from some which flakes have been struck". It may be the primary objective in flake removal in which case the end product is a core-tool, or the flakes removed may be the primary goal in which case the core is merely a remainder of the original nodule, a by product of flake removal.

Type 1 Unifacial core tools.
No.= 114.
Sites: EdSw 3, ElSw 3, ElTb 10,19, FaSx 3, FaSu 18, 19, 21, FaTa 35, FaTb 13, 14, 20, 24, FbSu 1, FcSx 14b.
Figure 2.19.

Manufactured from cores or very large

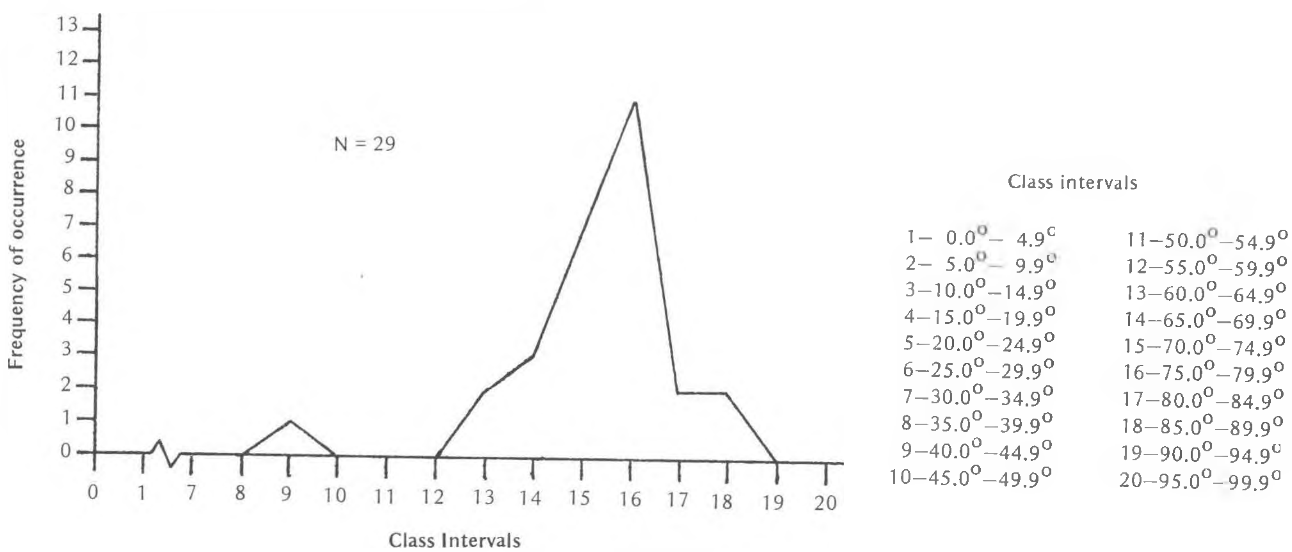


Figure 2.18. Edge angles on unifacial spalls.

heavy flakes, these specimens exhibit intentional edge formation through unifacial flaking along one or more edges. Flaking in all cases was percussion induced with no apparent orientation other than that dictated by the particular edge which was being flaked. The standard metric attributes of unifacial core tools have been summarized as follows:

Attribute	range	mean	number
length	2.8-12.9	7.85	114
width	2.3-13.0	5.84	114
thickness	0.9- 5.9	2.78	114
weight	7-928	193.70	114
edge angle	42-92 deg.	71.22 deg.	120

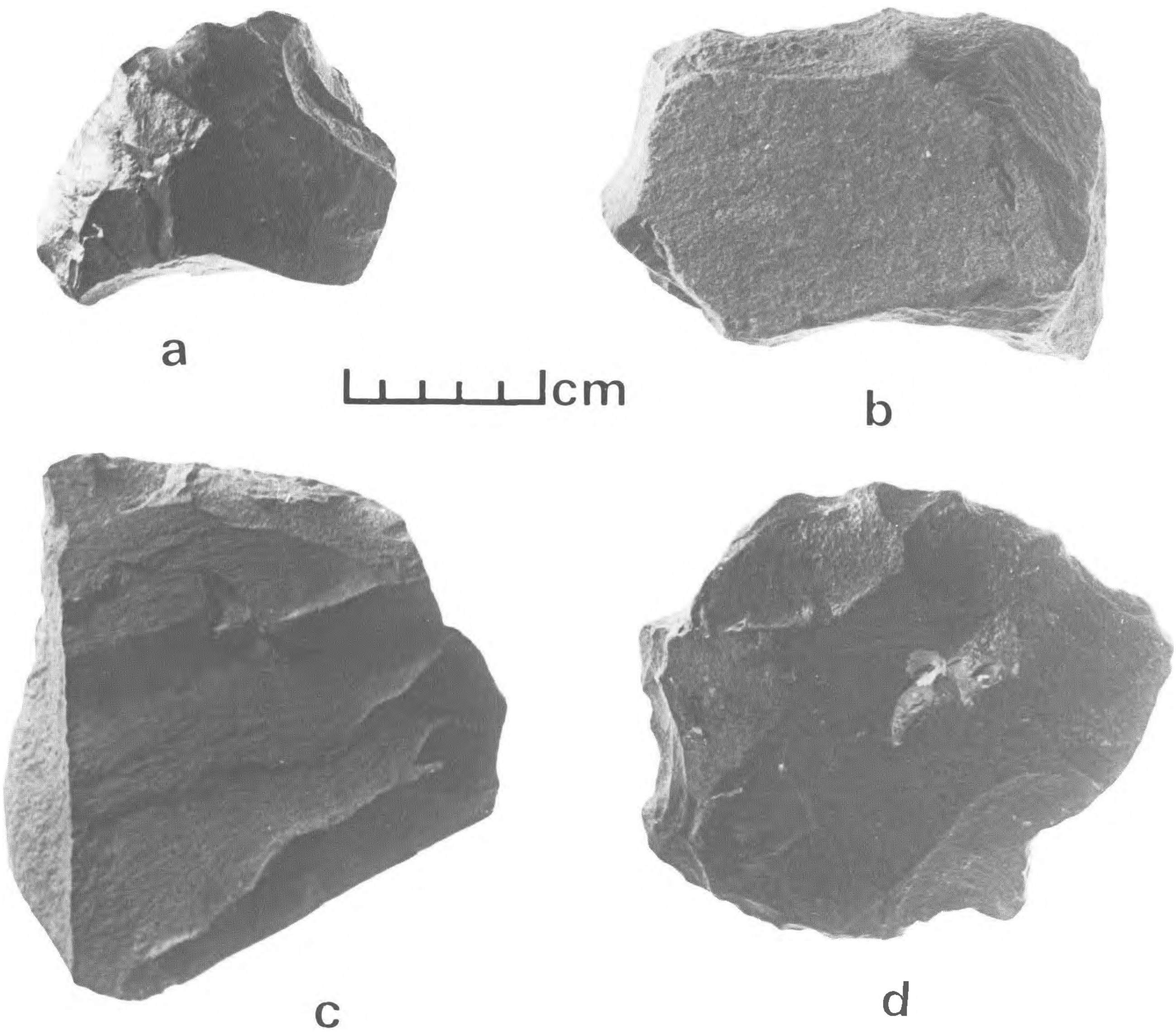


Figure 2.19. Unifacial Core Tools. Site provenience: a—FaSu 21; b—FaSu 19; c—FbSu 1; d—FaSu 19.

Type 2. Bifacial core tools.
No.= 75.
Sites: EkTa 10, ElTb 10,19, FaSx 3, FaSu 18,19,21, FaTa 35,44, FaTb 3,13,14,16,17,24, FbSu 1, FcSx 14c.
Figure 2.20.

Bifacially edge modified core-tools exhibit the same characteristics as the unifacial core tools, with the exception of the secondary edge modifications which are bifacial. On the average, these tools are somewhat heavier and are assumed to have served primarily as chopping and heavy cutting implements. All of the heavy chopping tools recovered at Namu were of this general sub-class (Luebbers 1971:88). The attributes for these implements have been summarized as follows:

Attribute	range	mean	number
length	4.0 -16.1	8.08	75
width	2.75-13.3	6.43	75
thickness	1.2 - 7.1	3.04	75
weight	40.5-1383.3	282.14	75
edge angle	62-86.6 deg.	73.58 deg.	75

D. Pebble-tools.
No.= 97.

These specimens are tools based on rounded beach cobbles and pebbles which exhibit crude percussion flaking on one or more edges and yet retain the original cortex over most of the surface. Since the rocks from which these tools have been manufactured span the cobble-pebble size range, the term "pebble tool" was applied in discussions of these implements, following Borden's definition of "pebble tools" (1969:9).

These pebble-tools are equivalent in many respects to what have been referred to as "Cobble-core tools" (Mitchell 1971a:106; Simonsen 1970:108, 1973:37; Percy 1974:64), or "Pebble-Choppers"

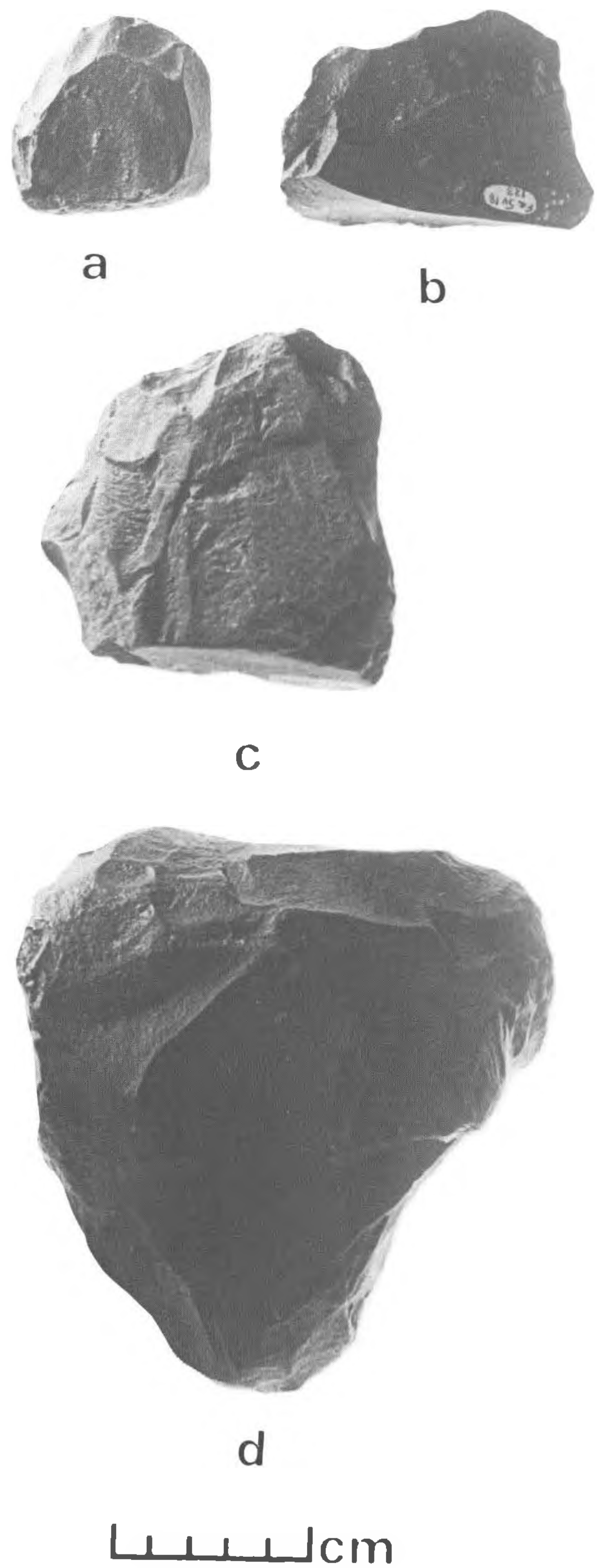


Figure 2.20. Bifacial core tools. Site provenience: a—FaSu 19; b—FaSu 18; c—FaSu 19; d—FaSu 19.

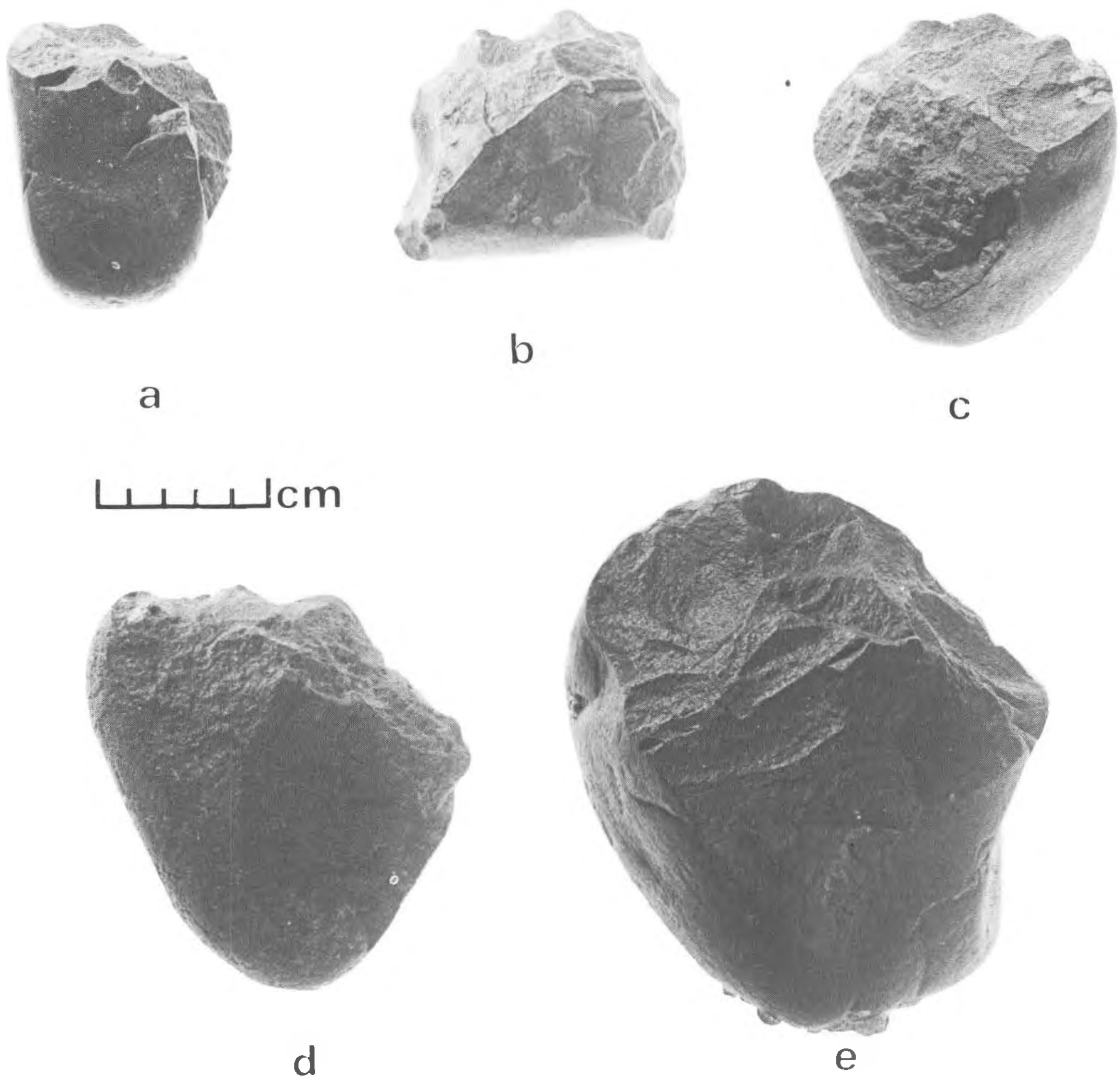


Figure 2.21. Unifacial pebble tools. Site provenience: a—EdSv 10; b—EdSv 10; c—EdSv 10; d—EdSv 10; e—EdSw 3

(McMurdo 1974:53). They are assumed to have performed heavy cutting, chopping, rasping, and shredding functions. As such they compare closely to the previously described core tools.

Type 1. Unifacial Pebble tools.
No.= 71.
Sites: EdSv 1,3,10, EdSw 1,3.
Figure 2.21.

Artifacts of this type are made from beach pebbles and cobbles through the removal of large, crude percussion flakes from one edge. The original cortex of the pebble/cobble is still present over the majority of the remaining surface. The standard metric attributes of unifacial pebble-tools have been summarized as follows:

Attribute	range	mean	number
length	3.8-19.1	8.26	71
width	3.1-12.9	8.13	71
thickness	2.2- 9.1	4.73	71
weight	67-1737.5	517.69	71
edge angle	67-94 deg.	80.36 deg.	63

Of the two types identified, the unifacial pebble tools are more functionally generalized than the bifacial, and could have performed all of the functions described above. Edge angles on these tools are fairly steep, with the majority exhibiting angles between 80 and 85 degrees. This distribution is somewhat higher than that exhibited by the unifacial core tools, the majority of which fall between 70 and 75 degrees (Fig. 2.22). The differences in edge angles between these two forms of tools may be primarily due to sample size (63 as opposed to 120), however, the differences may also be function-related. The pebble tools on the whole are much heavier than the core tools.

Type 2 Bifacial pebble tools.
No.= 26.
Sites: EdSv 10, EdSw 3.
Figure 2.23.

These implements differ from the unifacial pebble tools only in the bifacial flaking of the working edge. They were probably more limited in their functional usage. The standard metric attributes for the bifacial pebble tools are summarized as follows:

Attribute	range	mean	number
length	5.7-16.4	9.21	26
width	5.3-11.2	7.67	26
thickness	2.3- 7.3	4.83	26
weight	168-1891	540.56	26
edge angle	70-88.3 deg.	78.07 deg.	26

The overall edge angle measurements taken on the bifacial core- and pebble tools are very similar to the core tools but exhibit a slightly wider range, as would be expected considering the differences in sample size (Fig. 2.24).

Miscellaneous Flakes

A total of 229 flakes are subsumed under this general category. In all cases, these specimens consist of irregular primary flakes which exhibit edge damage to one or more edges. This damage, however, could not be confidently identified as to origin and was found most commonly in the form of small micro-flake scars, usually along the thinnest edge. This occurs in two basic types, either unifacial or alternating discontinuous. The presence of this damage, which in some cases was fairly localized, suggests use retouch.

Microscopic analysis indicated that no particular patterning was displayed by the flake-scars, arguing against identification as intentional retouch. In all case these scars led back from the edge and indicated either complete microflakes, or truncated step fractures. Considering the localized nature of much of the damage, it would also be rather presumptuous to cite beach-rolling as the casual factor. The standard metric attributes of these miscellaneous flakes are summarized as follows:

Attribute	range	mean	number
length	1.8-9.9	4.84	185
width	1.7-8.8	3.86	188
thickness	0.25-2.3	1.06	229

Edge angle measurements taken on several of the specimens (182) were found to range from 20 to 80 degrees with a mean angle measurement of 44.29 degrees (Fig. 2.26). Since use-damage as opposed to intentional-retouch was

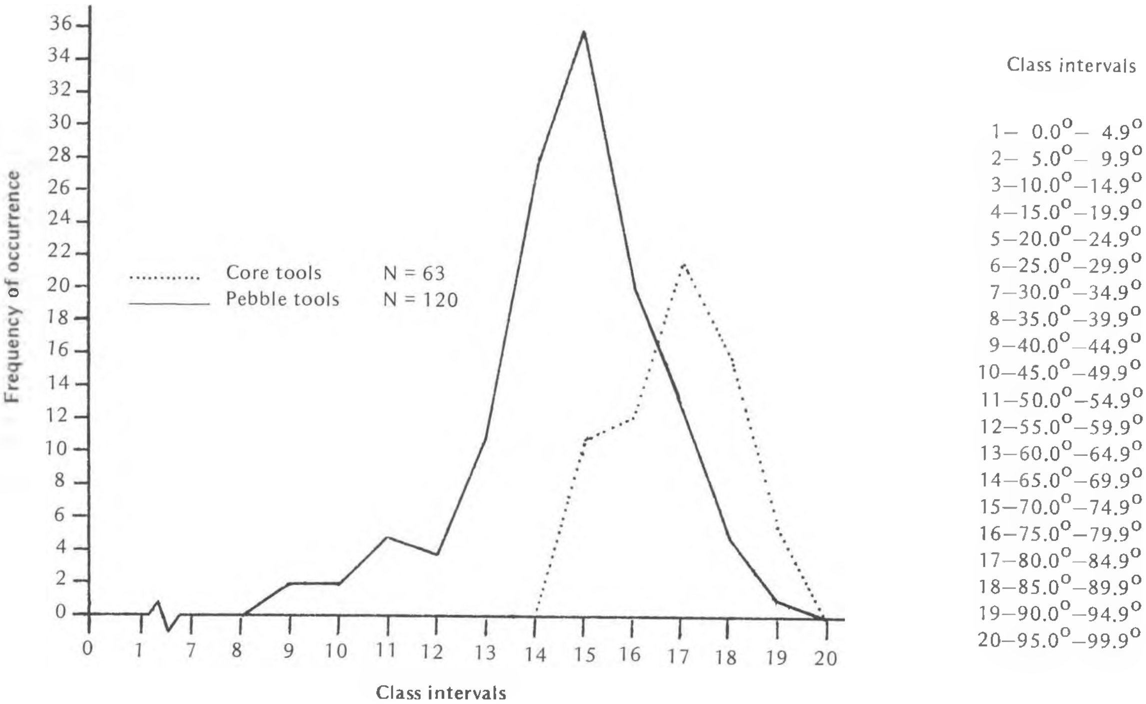


Figure 2.22. Edge angles, unifacial core and pebble tools.

considered, the angle measured was an extrapolation of the natural or spinal (Tringham et. al. 1974) angle of the flake estimated from the angle of convergence of the two faces (Fig. 2.25).

The majority of the specimens exhibit edge angles under 50 degrees (70.33%) with the highest concentration falling into the range between 35 and 50 degrees. If indeed these specimens represent utilized flakes, it is most likely that they served a variety of primary cutting functions, which may have included shaving and scraping, as well as sawing of materials such as bone or wood. Preliminary experimentation conducted by this writer using freshly produced flakes, and sawing, carving, and shaving relatively dry soft wood (pine) produced similar alternating discontinuous microflake scars (after sawing). It was also noted that very little evidence of wear was exhibited by the flakes (all andesite) other than small amounts of micro-flake damage to the edges.

Waste

As with most chipped stone assemblages, the majority of the material collected exhibits no evidence of utilization or secondary modification indicative of predetermined shaping. Such material in the form of plain flakes, spalls, and cores is normally considered representative of waste or debitage left over after tool manufacturing.

I. *Flakes*.
No.= 741.

Waste flakes comprise 40.08% of the total number of specimens collected and include all flakes which do not exhibit any form of modification other than the original detachment from a core. The standard metric attributes of these specimens are as follows:

Attribute	range	mean	number
length	1.2-10.3	4.26	532
width	1.1- 9.6	3.73	587
thickness	0.3- 3.9	1.11	741

The unifacially modified flakes on the average are slightly larger than the waste flakes which might indicate preferential selection. However, the differences are not great and most likely only reflect the fact that the very small flakes (<2 cm) were of little practical use and thus were not represented in the tool groups.

Carlson (1972) suggested that a number of prepared flake cores as well as flakes with prepared butts were contained in the Cathedral phase assemblages from the Kwatna locality. In anticipation of a prepared core-flake technique being represented all flakes which exhibited observable striking platforms were studied with the result that three types of platforms were noted: (1) plain, initiated on the original (cortex) surface of the rock,

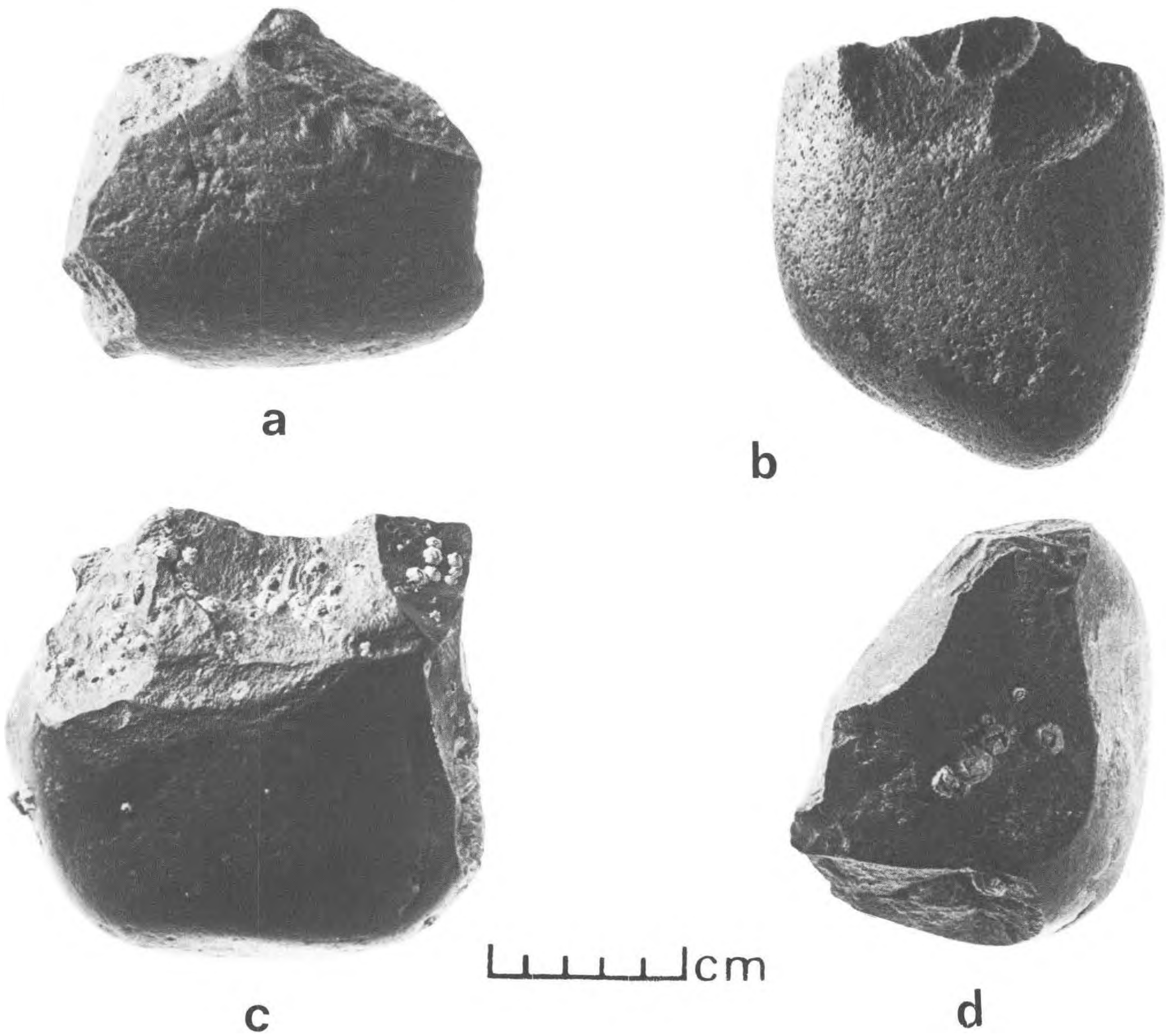


Figure 2.23. Bifacial pebble tools. Site provenience: a—EdSv 10; b—EdSv 10; c—EdSw 3; d—EdSv 10.

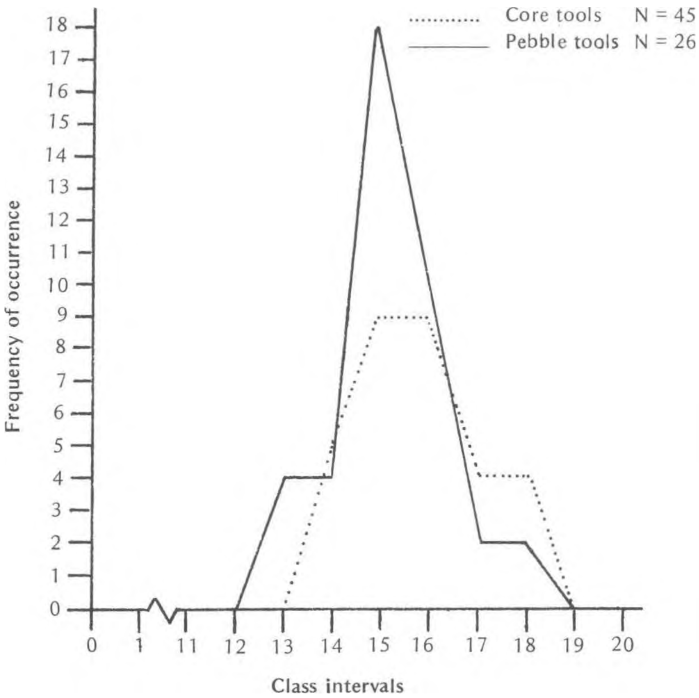


Figure 2.24. Edge angles, bifacial core and pebble tools.

Class intervals

1– 0.0°– 4.9°	11–50.0°–54.9°
2– 5.0°– 9.9°	12–55.0°–59.9°
3–10.0°–14.9°	13–60.0°–64.9°
4–15.0°–19.9°	14–65.0°–69.9°
5–20.0°–24.9°	15–70.0°–74.9°
6–25.0°–29.9°	16–75.0°–79.9°
7–30.0°–34.9°	17–80.0°–84.9°
8–35.0°–39.9°	18–85.0°–89.9°
9–40.0°–44.9°	19–90.0°–94.9°
10–45.0°–49.9°	20–95.0°–99.9°

(2) single faceted, initiated on flake scar surface, and (3) multifaceted, initiated on an area between two adjacent flake scars, thus exhibiting more than one previous flake scar facet. The latter two types of platforms could easily be considered as "prepared", and probably were, however, no identifiable preparation in the form of grinding, nibbling, or crushing was observed along the edges of the platforms. Only 319 flakes exhibit observable platforms of which 61 (19.12%) were plain, 168 (52.66%) were single faceted, and 90 (28.12%) were multifaceted, thus more than 80% could be considered prepared.

Aside from the platforms, a number of flakes (Fig. 2.27) exhibit characteristics suggestive of well controlled and predetermined detachment. Hobler (1976a) recovered similar material from several sites in the Queen Charlotte Islands. Although the present evidence is still quite scanty, there is some suggestion that an early prepared core-flake industry exhibiting some Levallois-like characteristics may have been present in the Pacific Northwest prior to 8,000 B.C. (Muto and Leonhardy 1975; Hobler 1976).

During the analysis all flakes were specifically examined for the presence of original cortex. Only 110 specimens exhibit such a characteristic. This would suggest that the primary decortication of the cores had been performed elsewhere. Again, such information might support the identification of a form of prepared core industry.

II. Spalls.
No.= 18.

Only two sites yielded spalls exhibiting no evidence of secondary modification (EdSv 10, FcSx 14b). The majority of these specimens (16) came from only one of those sites (EdSv 10). These specimens were large crude primary flakes removed from water worn pebbles and cobbles. The standard metric attributes of these spalls are summarized as follows:

Attribute	range	mean	number
length	5.2-10.8	7.17	18
width	5.4-10.5	7.24	18
thickness	2.7- 4.3	3.35	18

III. Cores.
No.= 312.

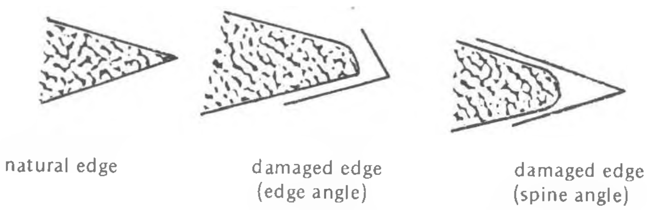


Figure 2.25. Types of edge angles measured.

The term core was defined earlier. This particular category represents those cores not used as tools. Three distinct core types have been identified.

A. Multidirectional cores.
No. =254.

Multidirectional cores are defined as cores which exhibit numerous flake scars oriented in several directions (Stryd 1973:370). A total of 254 cores and core remnants were observed; these range in size from very small (i.e. 3.2 x 1.3 x 1.1 cm) to very large (i.e. too large to remove from the beach) (Fig. 2.28).

A number of well prepared cores were also observed (Fig. 2.28, d-f), again supporting the identification of a prepared-core-flake industry.

B. Pebble cores.
No.= 57.

Pebble cores are large beach pebbles and cobbles from which a few flakes have been removed (Fig. 2.29). They differ from pebble tools only in that they exhibit no discernible evidence of intentional edge formation.

C. Microblade cores.
No.= 1.

A microblade core is defined as "the prepared nucleus from which microblades were removed" (Loy et. al. 1974a:20). As with the microblades, microblade cores are represented by a single specimen recovered from site FbSu 1 at Cathedral point (Fig. 2.30). This specimen was based on a thick flake, 2.2

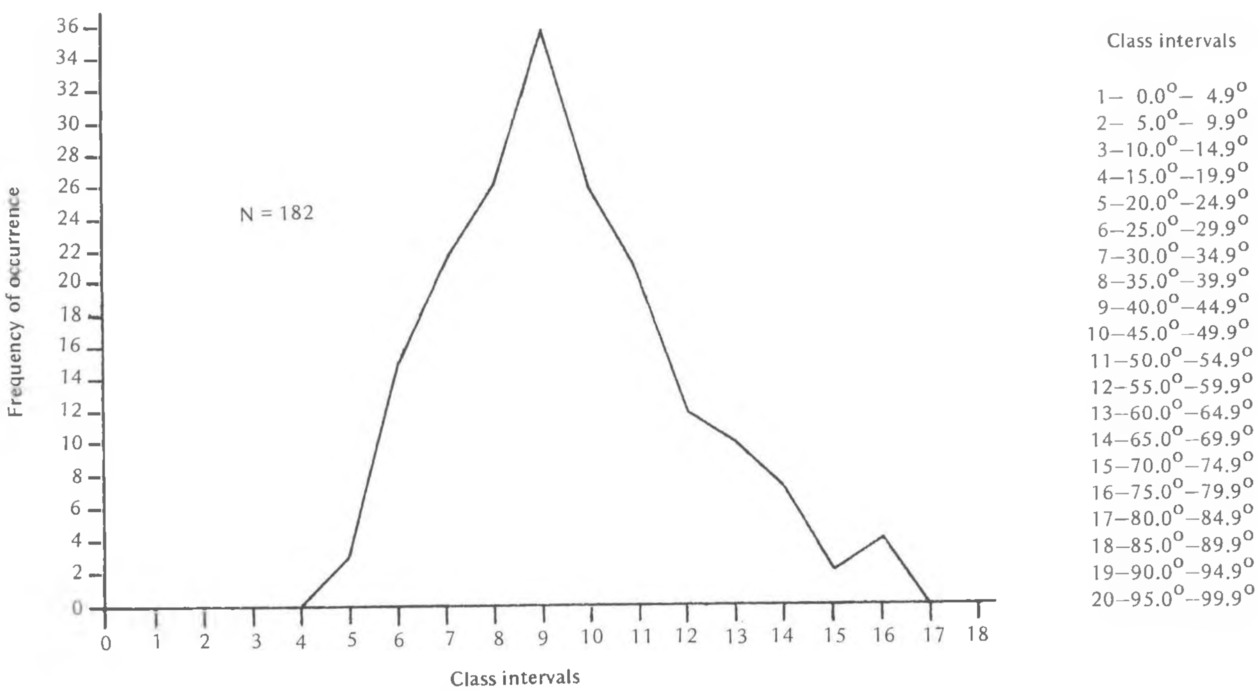


Figure 2.26. Edge angles, miscellaneous flakes.

x 4.5 x 1.9 cm, of fine grained andesite and exhibits seven parallel sided flake scars along one half of the perimeter. The flake scars measured 1.1 to 1.3 cm in length and 0.4 to 0.7 cm in width and were detached from the core at an angle of 80 degrees with the original bulbar surface of the flake having been used as the striking platform. The overall fluting pattern exhibited by this specimen is also reminiscent of that described by Fladmark (1970a:44, Table 1) for micro-cores from the Queen Charlotte Islands. The core itself is very similar to Sanger's (1970:58) group 2 microblade cores from the Lochnore-Nesikep locality.

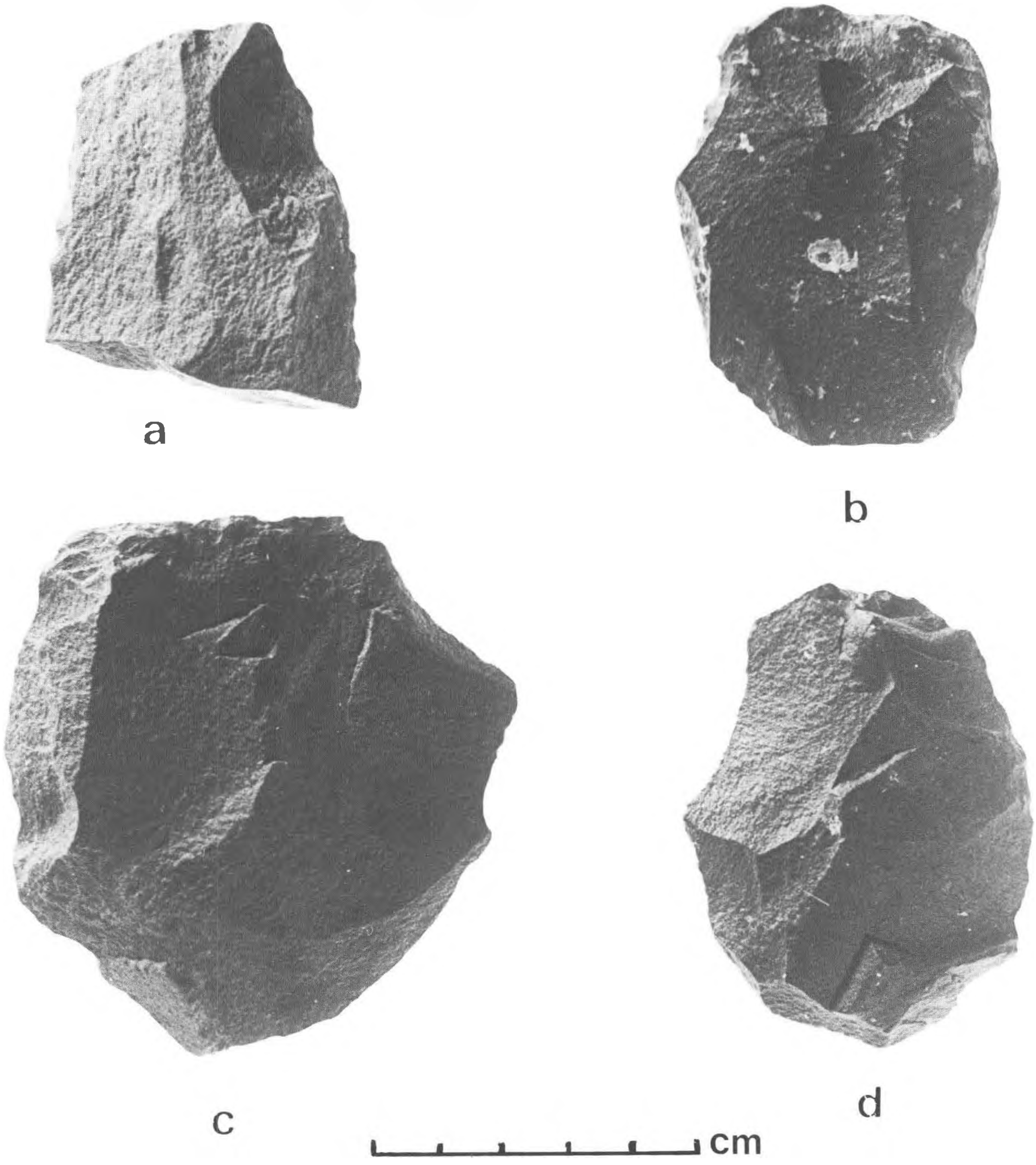


Figure 2.27. Prepared flakes. Site provenience: a—FaSu 21; b—FaSu 21; c—FaSu 18; d—FaSu 21.

RESULTS OF ANALYSIS

Attention must now turn to the correlation of the data in view of the stated aims of this study. Reiterated, these are (1) to identify the nature and extent of early chipped stone industries on the Central Coast, (2) to place those industries in time, and (3) to provide cross-cultural comparisons with similar material from other areas of the Pacific Northwest.

It is clear from the descriptive analysis that there are at least two basic technological patterns represented by the studied assemblages. These patterns appear to be fairly well defined geographically within the Central Coast area, and are best described in terms of technological traditions. The term tradition is taken here to mean a distinctive set of technological traits which persist through time and space. The two basic traditions identified are firstly a generalized pebble-spall tradition represented by the Quatsino Sound assemblages, and secondly a distinctively different prepared core-flake tradition evidenced by the various assemblages recovered from the Bella Bella-Kwatna Bay region. These traditions exhibit no detectable overlap in distribution as presently defined and appear to have fairly strong affiliations outside the Central Coast.

Pebble-spall tradition

The pebble-spall tradition, as indicated above, is known primarily from the Quatsino Sound assemblages. A total of 231 artifacts were collected from the five sites on Quatsino Sound (EdSv 1, EdSv 3, EdSv 10, EdSw 1, EdSw 3) and of those artifacts 186 (80.52%) were classified into the various pebble and spall categories. This contrasts remarkably with the artifact distributions from the assemblages in the Bella Bella-Kwatna Bay region where only 14 out of 1535 (.91%) specimens were classifiable into the pebble and/or spall groupings.

The Quatsino Sound material features a fairly homogeneous complex of traits which includes a predominance of large, crudely percussion-flaked pebble tools and cores, associated spalls and spall tools as well as a number of large crude flakes. Flaking is primarily unifacial with some bifacial flaking observed. Three large or medium sized leaf-shaped points were recorded from two of the sites. Only one of the points from EdSv 1 was described, but a similar point from the same site and one from EdSv 3 was observed in local private collections.

With the exception of the leaf-shaped points the above complex of artifacts mirrors the descriptions of the Pasika phase material described by Borden (1968a:6-12; 1975:56) from the South Yale locality in the Fraser Canyon. Borden considers the Pasika Material to date as early as 11,000 to 12,000 years. Such antiquity has recently been questioned by Matson (1976:283) who cites pollen evidence as suggesting that the pebble tools from the Yale area are somewhat less than 9,000 years old. Pebble tool complexes, however, do appear to have a very early and primarily southern distribution in the Pacific Northwest. Along the southern coast of British Columbia they are a characteristic feature of virtually every early cultural assemblage predating the time of Christ, particulary in the Fraser Valley and Gulf of Georgia regions (Borden 1968b; Calvert 1970; LeClair 1976; Mitchell 1971a; Percy 1974; Matson 1976; Von Krogh 1976). To the north however, such tools are not as predominant. Matson (1976;283) points out that a very different cultural complex is found in northern coastal sites of comparable age to those pebble tool producing sites on the south coast.

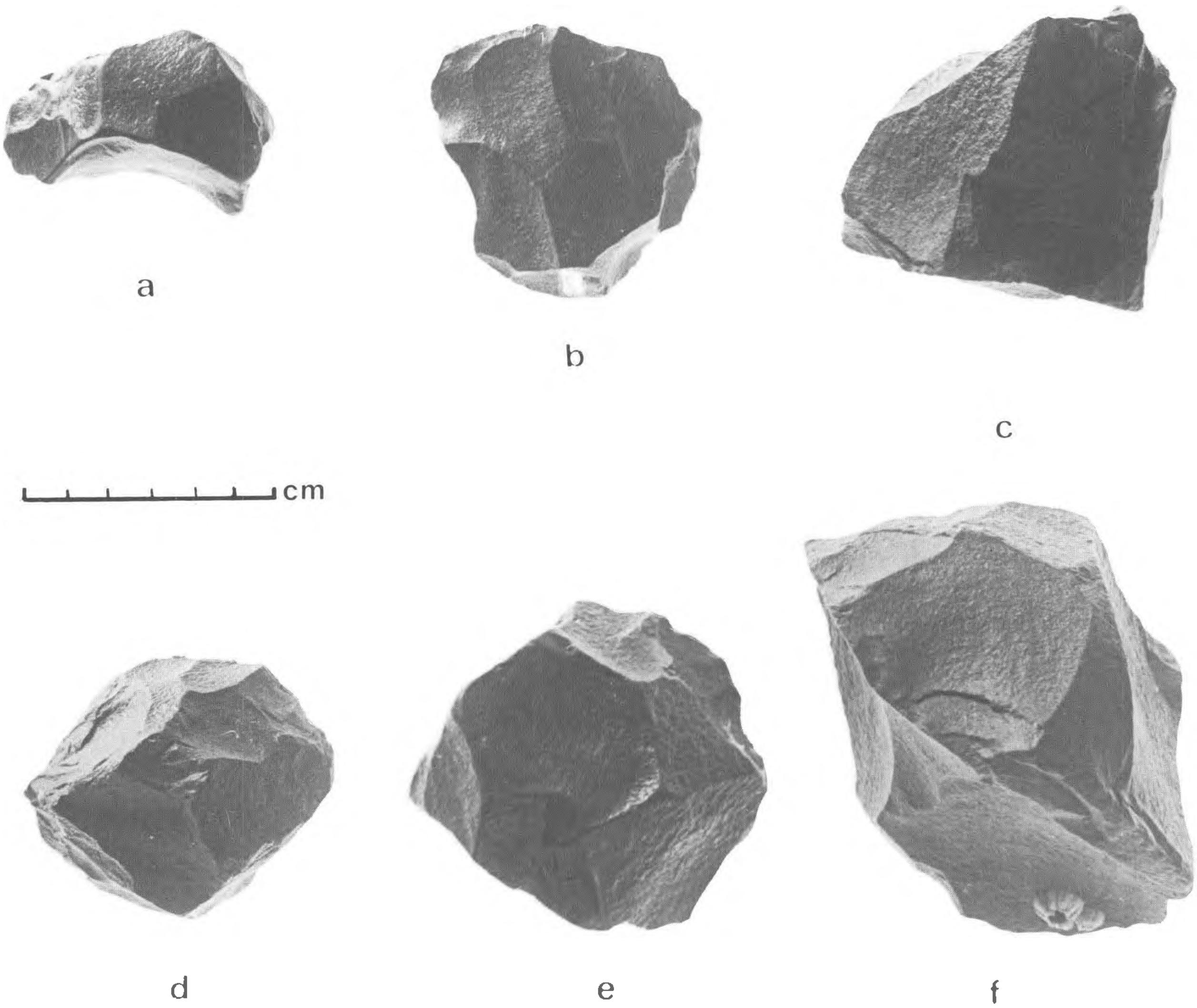


Figure 2.28. Multidirectional cores. Site provenience: a—FaSu 21; b—FaSu 21; c—FaSu 21; d—FaSu 21; e—FaSu 21; f—FaSu 21.

This is not to say that pebble tools do not exist in northern sites, as indeed they do (Ackerman 1968, 1974; Fladmark 1970b; MacDonald 1969b; Simonsen 1973), but rather it points out that they do not appear in as high a frequency as in southern coastal sites.

Pebble tool complexes have a very widespread and early distribution in many areas of the New World (Krieger 1964). They appear with leaf-shaped points and other more generalized tool forms such as retouched flakes and scrapers in many of the earliest cultural assemblages from the inter-montane areas of the Columbia Plateau (Cressman 1960; Butler 1961; Leonhardy and Rice 1970). Matson (1976) argues quite successfully that the basal component at the Glenrose site, which is dated between 8,500 and 5,500 B.P., represents a coastal variant of a generalized "Old Cordilleran" cultural pattern. In support of this suggestion he cites the predominance of pebble tools along with leaf-shaped points as distinguishing characteristics. Matson sees this early "Old Cordilleran pattern" as being fairly wide spread in the Pacific Northwest prior to 5,000 B.P. with influences extending throughout the Fraser delta and Gulf of Georgia area.

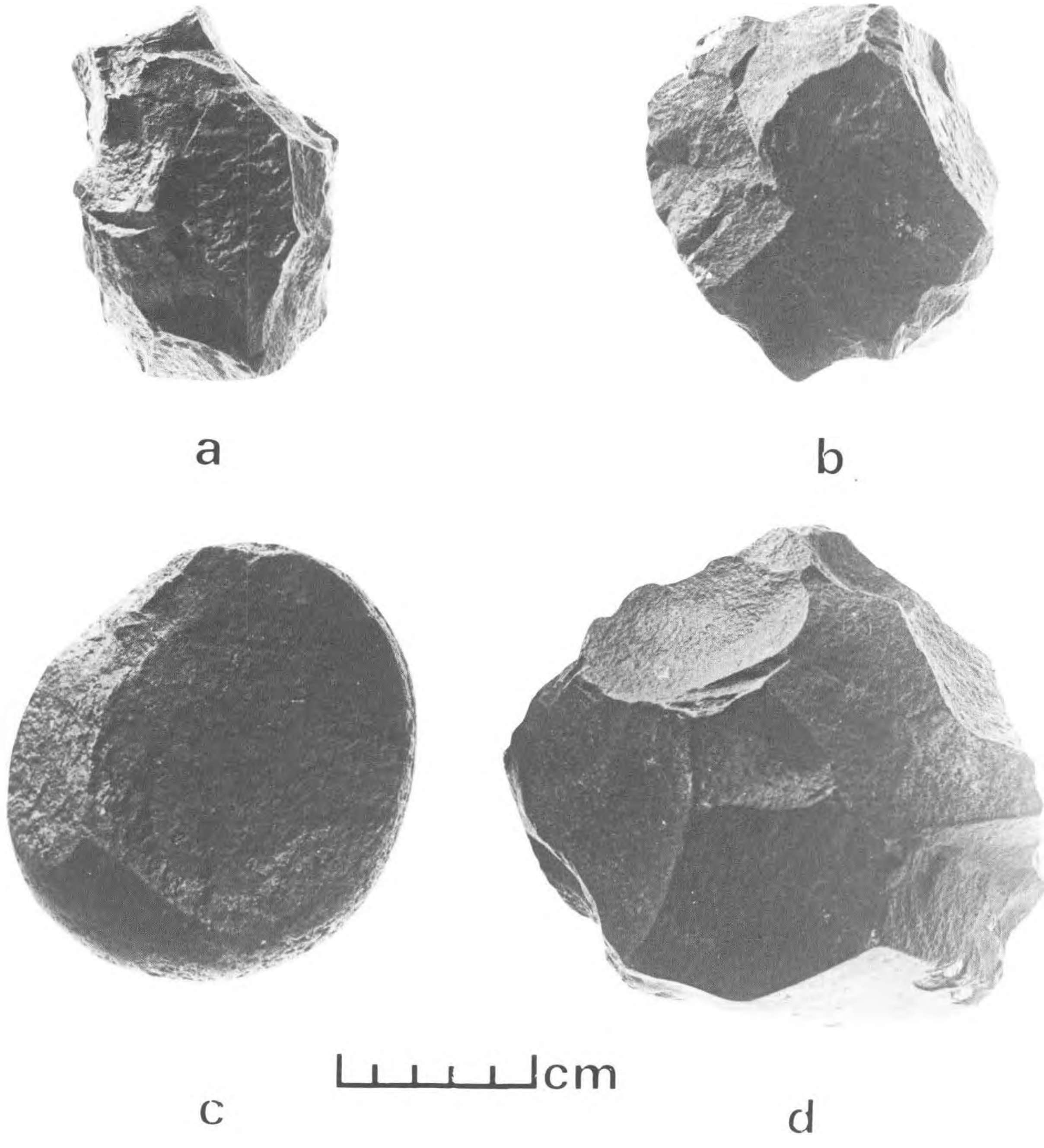


Figure 2.29. Pebble cores. Site provenience: a—EdSv 10; b—EdSv 10; c—EdSv 10; d—EdSv 3.

Mitchell's (1971a) synthesis of the prehistory of the Gulf of Georgia offered a similar suggestion. In that synthesis Mitchell identified an early "Lithic Culture Type" which he felt was indicative of the initial stages of cultural activity in the Gulf of Georgia prior to 5,000 B.P. The distinctive characteristics of that culture type were cited as medium to large chipped stone points (generally leaf-shaped) accompanied by a wide variety of ("cobble") pebble tools. After 5,000 B.P. pebble tools appear to drop in frequency throughout most of the southern inner coastal area. However, they do persist at least until the time of Christ and perhaps afterwards (Percy

1974; Von Krogh 1976).

In summary, it appears that the early chipped stone assemblages recovered from Quatsino Sound represent a regional industrial complex distinct from the rest of the assemblages studied, yet perhaps closely affiliated with the southern cultures of the inner coast. This complex is referred to as the pebble-spall tradition and is characterized by crude percussion-flaked pebble and spall tools as well as leaf-shaped points. Typologically this tradition appears to date prior to 5,000 years ago, and may extend back as far as 8,500 years or perhaps earlier. Until such time as there are controlled dates for archaeological data from the Quatsino Sound area, chronological positioning of the pebble-spall tradition will have to remain tentative.

Prepared Core-Flake Tradition

This tradition is known from the assemblages recovered in the Bella Bella-Kwatna Bay region. It appears to be distributed along the mainland and immediately adjacent islands of the north Central Coast. Judging from the descriptions of the chipped stone material from Johnstone Strait (Mitchell 1972) it may also extend into that area. Unfortunately there is no clear picture from the Northeast coast of Vancouver Island to indicate where that area stands with respect to these early traditions. Although Chapman's (this volume) excavations at the O'Connor Site yielded an early chipped stone component, it was evidenced by only three leaf-shaped points and a single uniface. Such traits could easily fit into either of the identified traditions.

The prepared core-flake tradition is characterized by a complex of specialized cutting and scraping tools based on well-developed or prepared cores and flakes. The majority of these implements exhibit little or no original cortex, a trait fairly diagnostic of the pebble-spall classes of artifacts. The production of usable flakes appears to have been the focal point of this tradition, with flakes and flake tools representing more than 87% of the total artifact inventory. This also contrasts with the previously described pebble-spall tradition assemblages where only 20% of the specimens were represented by flakes and spalls. A number of basic flake tools (notches, unifaces, spurs, and unifacially edge modified flakes) have been identified. Accompanying those tools are a variety of heavier chopping and scraping implements in the form of unifacial and bifacial core tools. These latter implements in all probability served the same funtions as pebble tools. They are, however, classified separately here because they are all based on well-developed cores as opposed to pebbles.

The above description omits the various artifacts classified under the general category of bifaces. Those implements, although present in the assemblages studied, are felt to be representative of a relatively late phase of the prepared core-flake tradition and perhaps indicative of southern or eastern influences. Carlson's (1972) initial "Cathedral Phase" designation is retained here for this late manifestation of the Central Coast prepared core-flake tradition. Bifacial flaking was at no time a major aspect of the prepared core-flake tradition and in fact less than 20% of the artifacts exhibited such a trait. The basic complement of artifacts described for the prepared core-flake tradition appear very early in the Central Coast and are associated with the basal component at

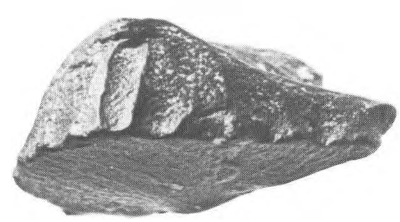


Figure 2.30. Microblade core from FbSu 1. Length is 4.5 cm.

Namu dated to between 7,000 and 3,000 B.C. (Luebbers 1971; pers. observations). Also associated with the early Namu component is a well-developed microblade industry, a feature only scarcely represented in the intertidal assemblages by two broken microblades and a possible core.

Fladmark (1975c) has recently indicated that an Early Coast Microblade Complex characterized by a paucity of bifacial flaking and near absence of bifacial projectile points was widespread throughout the northern coast north of Johnstone Strait prior to 3,000 B.C. Since the basic prepared core-flake tradition is considered to be present in the earliest component at Namu, a northern coast affiliation is inferred. The microblade industry on the north coast, however, appears to have faded sometime around 3,000 B.C. In the Namu sequence this decline was evidenced somewhat later around 2,000 to 2,500 B.C. (Luebbers 1971:109) and was succeeded by the appearance of bifacially flaked points in greater frequency. Although a few bifaces were recorded from the Prince Rupert Harbour area (Carlson 1973; MacDonald 1969), there does not appear to be a comparable increase in the frequency of such implements throughout the general northern coast area. This may suggest the possibility of interior or south coast influences in the later component of the prepared core-flake industry represented by the study assemblages. Such influences, however, are not considered to have overshadowed the basic northern affiliation of the prepared core-flake tradition.

During the course of intensive site surveying along the coast of Moresby Island in 1975 Hobler (1976a) discovered a few beach sites exhibiting similar characteristics to those of the Cathedral phase described above. Artifact assemblages from those sites essentially duplicated the Cathedral phase materials, with the exception that they lacked bifaces. The characteristic feature of those assemblages, according to Hobler (1976a:8), "is a prepared core and flake technology strongly reminiscent of the Levallois technique of the Old World". Hobler suggests a pre-8,000 B.P. time period based on local sea-level fluctuations. If that time estimate is correct the Queen Charlotte material would appreciably predate all of the prepared core-flake tradition material from the Central Coast and might suggest an early northern source. Whether or not Hobler's dating is validated will have to await future research. In any case, very close relationships between his material and the basic prepared core-flake tradition evidenced on the Central Coast are clear.

The prepared core-flake tradition therefore is seen as a basic tool complex, comprised of a predominance of unifacially edge-modified flakes accompanied by notches, spurs, unifaces as well as heavier unifacially flaked (and to a lesser extent, bifacially flaked) core tools. This tradition is represented by two fairly distinctive phases: (1) an early Namu phase dating from 7,000 to 4,000 B.C. which is characterized by the addition of a well-developed microblade industry to the basic tool complex, and (2) a later Cathedral phase dating from 4,000 to 1,000 B.C. in which the microblade industry characteristic of the earlier phase disappears andan increase in bifacial flaking is apparent.

In his recent discussion on the origins of Northwest Coast culture, Borden (1975) hypothesized that the early northern microblade complex is indicative of the initial settlement of the northern coast by people associated with an 'Early Boreal Tradition' of which the characteristic feature is the presence of a well developed microblade industry. Borden sees this tradition as having originated in Eurasia and Greater Beringia during the upper Paleolithic and early Mesolithic and having spread quic-

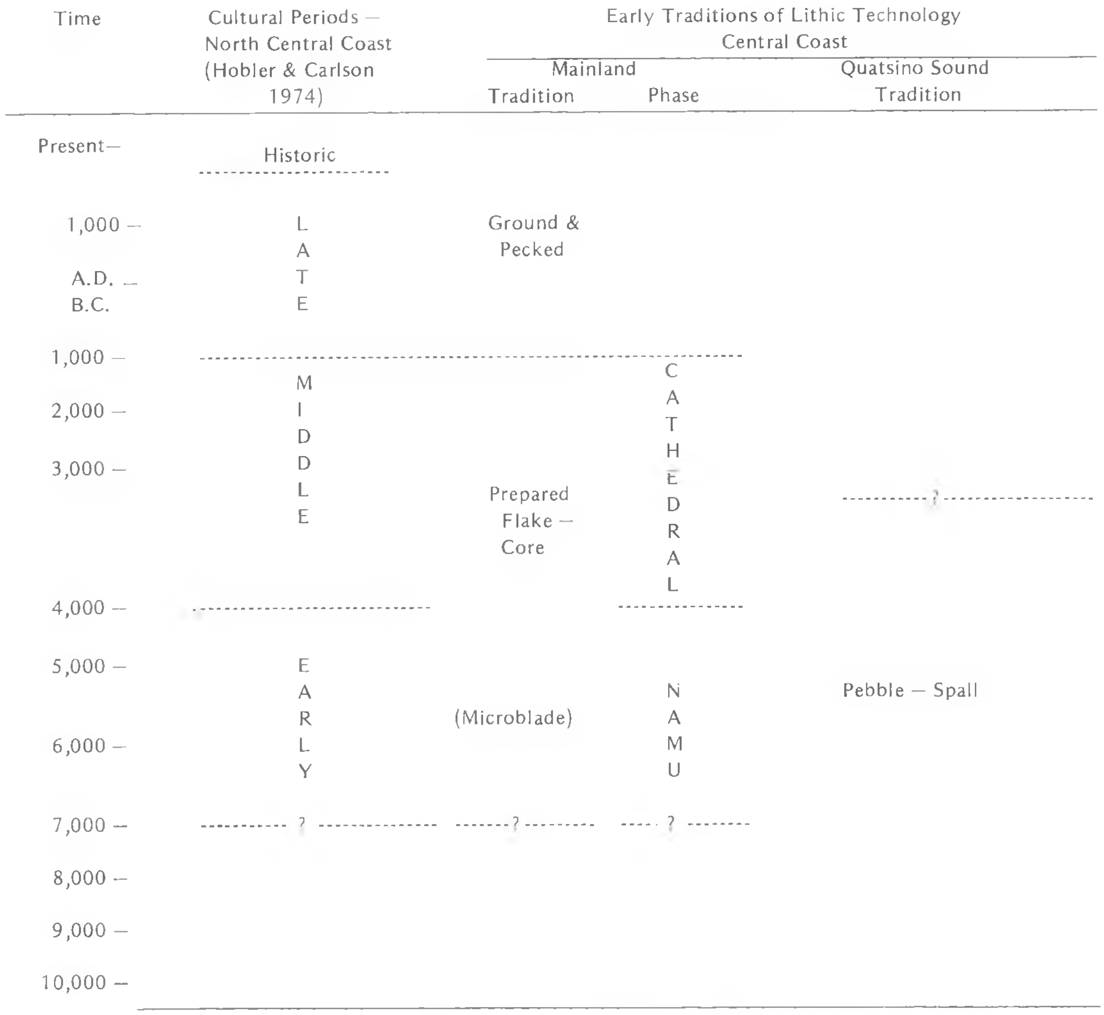


Figure 2.31. Early traditions of lithic technology on the central coast.

kly from there into northwestern North America immediately following deglaciation. Namu, according to Borden (1975:-101), presently represents "the most southern *known* outpost of Early Boreal expansion".

Borden further suggests that a separate early settlement occurred on the southern coast immediately following the retreat of the Fraser glacation. This settlement saw the expansion of a distinctive southeastern interior 'Proto Western Tradition' characterized by the presence of a crudely percussion-flaked pebble tool complex which included the distinctive leaf-shaped point, into the area from the Interior Plateau. That tradition can be seen as incorporating Matson's (1976) "Old Cordilleran Component", Mitchell's (1971a) "Early Lithic Culture Type" and the previously identified 'pebble-spall tradition'. Borden sees these "Proto Western" groups as having come into contact with the early Boreal peoples in the Johnstone Strait region sometime prior to 3,000 B.C. A mutual sharing of technological adaptations subsequently brought some specialized fishing practices to the south coast and several technological traits pertinent to the manufacture of terrestrial hunting implements (i.e. bifacial flaking) to the northern coast.

The northern microblade tradition

(included in the 'Early Boreal Tradition') has been discussed by many scholars (Akerman 1968, 1974; Borden 1968a, 1975; Fladmark 1971a, 1975c; Morlan 1970; Sanger 1968, 1970). This microblade tradition is clearly early in northwestern North America but its relationship to the Namu phase of the prepared core-flake tradition is not fully understood. The presence of a well-developed microblade industry in the Namu phase may indeed reflect a coastal manifestation of the northern microblade tra-dition, or it may also reflect a co-occurrence of two distinct traditions (i.e. prepared core-flake and northern microblade). At present it has not been established whether the northern microblade tradition is actually earlier than the prepared core-flake tradition. The early microblade industry of the Namu phase may also simply reflect a specialization within the overall prepared flake tradition, and as such may have an indigenous or at least coastal development which was independent of the interior northern microblade tradition.

Ackerman (1968) recorded a number of similarities between the material from the early component at Ground Hog Bay (ca. 8,000 B.C.) and artifacts recovered along the Pacific Coast of Asia, including much of the early material known from Australia. He also recorded the early appearance of microblades in Japan at 12,300 ± 700 B.C., (1968:76). Although not proposing direct ties between the early Alaskan material and that from the east Asiatic Coast, he does leave one with the impression that an ultimate Asian origin for the early microblade industry on the Northwest Coast is possible. During the meetings of the 13th Pacific Sciences Congress held in Vancouver, Rhys Jones (pers. comm.) noted that, without the bifaces, the Cathedral phase assemblages would "duplicate any lithic assemblage from the Western Desert in Australia prior to 8,000 B.C.". The early Australian material is seen as having ultimate links with the Chopper-Chopping Tool Tradition of Asia. Such a link is certainly not impossible for the early lithic cultures of the Northwest Coast as well. One must not rule out the possibility that "when more information becomes known...specific similarities between early cultures there and our own initial coastal occupation will be found" (Carlson and Hobler 1974:5).

Summary of Conclusions

It seems clear from the foregoing analysis that chipped stone industries in the Central Coast do represent a horizon marker segregating relatively early cultures with such a technology from later ones which employed pecking and grinding as the primary techniques in lithic tool manufacture. The shift from chipped to ground and pecked stone seems to have been virtually completed in the Central Coast by 1,000 B.C.

Two distinctive technological traditions were identified from the chipped stone assemblages studied. The pebble-spall tradition identified among the material from the Quatsino Sound area of northwestern Vancouver Island was characterized by crude percussion flaked pebble and spall tools and medium to large sized leaf-shaped points. No firm dating is available for that tradition, but fairly clear southern affiliations suggest a time period predating 3,000 B.C. and possibly extending back as far as 6,500 or even 9,000 B.C. The second tradition identified was a prepared core-flake tradition characterized by a wide variety of specialized cutting and scraping implements based on well-developed cores and flakes. Two phases of this tradition were noted: an early Namu phase characterized by the presence of a well-developed microblade industry accompanying the standard tool complex outlined above, and a later Cathedral phase, lacking the microblade industry and exhibiting a higher frequency of bifacially flaked points. The Namu phase, dating from about 7,000 B.C. to approximately 4,000 B.C. may ultimately have ties with the Pacific coast of Asia or may reflect a coastal manifestation of the northern microblade tradition of northwestern North America; it will require much more research in the area to establish cultural affiliations more clearly. The Cathedral phase, however, dates to a time period between 4,000 B.C. and 1,000 B.C. and is characterized by the disappearance of the earlier miroblade industry and an increase in the frequency of bifacially flaked implements, especially points. This latter trait strongly suggests either interior or south coast influences or perhaps both. Figure 2.31 illustrates the correlation of these early chipped stone traditions from the Central Coast with previously established cultural historical sequences outlined for the north Central Coast by Carlson and Hobler (1974).

Future Research

It is evident from the results of the foregoing analysis that much more research will be required in the Central Coast before any well defined cultural - historical sequence can be worked out for the area.

During the earlier discussion above of beach sites, I outlined three hypothetical explanations for those sites which had been proposed by Carlson and Hobler (1976); they represent (1) lithic quarries, (2) old habitational sites washed out by rising sea levels, and (3) both of the above. Given only those three alternatives, it was concluded that the last was perhaps the most acceptable, although such a decision is only arbitrary. Since the object of this discussion is to offer my own personal viewpoints, I would suggest that the ultimate functions of these sites were much more diversified than those outlined above. Some of these sites may represent brief stop-overs where emergency repairs on broken or leaky watercraft were carried out. There is also the possibility that some of these sites may represent types of procurement centers other than simply lithic quarries. Many of the sites, especially those from Quatsino Sound which are characterized by a high predominance of large heavy chopping and scraping tools, may simply represent wood-procurement centers analogous to modern day logging camps. The true nature of these sites therefore is clearly not well understood. I would like to offer a number of suggestions for future investigations:

(1) Intensive systematic collections should be made at some of these sites with good locational provenience on all artifacts.

(2) It would also be useful to sink a test-pit into the actual beach itself on some of these sites to test for undisturbed deposits beneath the beach gravels.

(3) It might also be useful to test the backing shoreline of several of these sites, especially those with no associated midden deposits. Since the proposed time span associated with these sites extends to the time when middens first appear these may be remnant cultural deposits presently undetected.

I would like to conclude by restating an observation which has been previously made by a number of coastal researchers, most notably Fladmark (1975c), Larsen (1971), and Retherford (1972): past sea level fluctuations have had extremely significant effects upon past settlement patterns along the coast. It is imperative, I feel, that future researchers gain an appreciation of this fact before any clear understanding of coastal archaeology in general can be attained. As we have seen, the archaeological evidence pertinent to a fairly lengthy period of Central Coast prehistory (i.e. 4,000 - ca. 1,000 B.C.) is presently in a state of partial submergence with respect to the present sea level. On the other hand, data relevant to even earlier cultural activity (pre-5,000 B.C.) will in all likelihood be found well above the present shore-line in association with raised beach terraces.

Sea-level fluctuations, however, have in no way been uniform along the Northwest Coast. Where a period of relatively lower sea-levels on the Central Coast has been in effect for much of the last 7,000 years, land-sea relationships in the Gulf of Georgia and Puget Sound regions have been relatively stable for the past 5,000 years. This southern region, however, experienced a comparable period of relatively reduced sea-levels somewhat earlier between 8,000 and 3,000 B.C. The importance of this major shift in sea-levels with respect to the local archaeology of the Gulf of Georgia and Puget Sound regions was pointed out as early as 1971 by Curtis Larsen in his thesis concerning the relationships of relative sea-level change to social change in the prehistory of Birch Bay.

While both the Central Coast and southern inner coastal areas have experienced major periods of reduced relative sea levels within the past 10,000 years, the North Coast region has not. In that region land-sea relationships have been characterized by continually higher sea levels relative to the present stand from late Pleistocene times until the present day. This brief overview has attempted to demonstrate some of the significant differences which exist between relatively broad regions of the coast with respect to past sea-level changes. It must be kept in mind that more localized differences may exist within each of the regions discussed, further complicating the archaeological picture. Future research along the Northwest Coast should attempt to include geological studies to help elucidate localized variations in past sea level fluctuations particular to specific areas of study.

Acknowledgements

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