Chapter 21: Chipped Stone Report

by

W. Finlayson and Carole McCartney

[Ed. *NB. Captions for the following items in Fig. 107 are incorrect and should have read: 107.2. KM 2464 retouched obsidian segment, general 1312, Period 4; 4. KM 1748 utilised obsidian bladelet, fill 987 of Building 994, Period 3B; 5. KM 2169 obsidian splintered piece, surface 1327, Period 4; 7. KM 982 obsidian bladelet segment, fill 626 of Building 206, Period 3B.*]

[Ed. *For additional bibliographic references, see p. 294.*]

Introduction (C.M.)

The following report documents the chipped stone assemblage of Kissonerga. The report concentrates on three areas: assemblage quantification, tool analysis and the investigation of chipped stone artefacts in relation to site context. The total assemblage and individual period compositions are considered first as well as fundamental aspects of the technology employed in the chipped stone industry. The second section covers the quantification of the formal and non-formal tool types within class groupings against which chronological comparisons and the consideration of a limited number of attributes have been made. A morphological tool typology provides the basis for the present analysis which will, no doubt, be refined by use-wear analysis, further attribute testing and inter-site analysis. The limited attribute analysis used in the present report provides an initial step towards isolating diagnostic elements in Cypriot chipped stone assemblages, particularly those belonging to the Chalcolithic period. Context analysis has been integrated within the discussions of major artefact classes. The consideration of context in the present analysis represents a generalised view of artefact proportions from six context classes: buildings, pits, general occupation deposits, external surfaces, other (including grave fills) and material from disturbed units. The aim of this simple analysis was to access the potential of the contextual variable in the study of chipped stone assemblages within complex multi-period sites like Kissonerga.

Knapping techniques and reduction strategies will not be dealt with in detail in the present report. The quantification of all debitage and core types and a discussion of assemblage category ratios document the basic reduction methods employed at the site. Debitage and core materials belonging to the Kissonerga assemblage were subjected to a detailed attribute analysis as part of the author's PhD research programme on the structure and variability found within later prehistoric simple core knapping techniques and reduction strategies in Cyprus and the Levant (McCartney 1996). Technological information can be obtained for the present from this thesis, but will also be discussed further within an intersite analysis of Lemba project sites in the future.

§ 21.1 Definitions (C.M.)

In order to avoid confusion, key terms utilised in this analysis are defined briefly below. Other more specific terms are defined within the relevant sections or, if not listed directly in the text, follow Inizan, Roche and Tixier 1992. Blanks are defined as any flake, blade or bladelet demonstrating no secondary retouch or patterned wear from utilisation. Blades are arbitrarily defined as any blank exhibiting a length at least two times its width, while bladelets represent smaller blades not greater than 40 mm long and 12 mm wide. Chips are defined as any blank less than or equal to 15 mm. Unmodified spalls (bladelets produced by the burin blow technique) are considered together with other blank types. While a regular practice of sieving was made during excavation, not all context types were sampled equally, suggesting that while such small elements of the assemblage seem to be relatively abundant, their total numbers may be somewhat under represented. All blank types were employed for the production of tools in the Kissonerga assemblage.

Blank fragments were quantified as proximal, medial, distal and non-orientable fragments for two (>15 mm and <15 mm) size ranges in an attempt to measure such debris more systematically in terms of the overall reduction strategy (e.g. Prentiss and Romanski 1989; Sullivan and Rosen 1985). Unlike the blanks and blank fragments, chunks (angular debris) and heat spalls represent true waste products rarely, if ever, utilised in tool production. The latter exhibiting extensive crazing and 'potlid' effects were produced by intense burning and fail to demonstrate the ventral features characteristic of true spalls.

Table 21.1. Assemblage category counts and percentages (Period samples based on OK or M status contexts only)

Period	*1A/1B*	*2*	*3A*	*3B*	*4*	*5*	*Surf.*	*Total*
Tools	1	43	529	140	843	0	714	3,270
%	5.56	3.92	11.05	4.50	8.59	0.00	22.16	8.93
C-1	0	2.	2	1	15	0	4	61
%	0.00	0.18	0.04	0.03	0.15	0.00	0.13	0.17
C-2	0	10	56	43	109	0	10	412
%	0.00	0.91	1.17	1.38	1.11	0.00	0.31	1.13
C-3	0	270	627	735	1,898	13	169	6,318
%	0.00	24.64	13.09	23.60	19.33	28.89	5.25	17.26
Proximal <15 mm	1	43	143	126	322	0	30	1,181
%	5.56	3.92	2.99	4.05	3.28	0.00	0.93	3.23
Medial <15 mm	0	68	204	197	645	3	73	2,101
%	0.00	6.20	4.26	6.33	6.57	6.67	2.27	5.74
Distal <15 mm	0	89	154	179	379	3	28	1,524
%	0.00	8.12	3.22	5.75	3.86	6.67	0.87	4.16
N.O. <15 mm	0	216	638	437	925	3	47	3,674
%	0.00	19.71	13.32	14.03	9.42	6.67	1.46	10.04
F-1	0	5	19	8	38	0	24	170
%	0.00	0.46	0.40	0.26	0.39	0.00	0.75	0.46
F-2	0	19	196	86	321	1	165	1,265
%	0.00	1.73	4.09	2.76	3.27	2.22	5.12	3.46
F-3	5	56	515	224	953	5	427	3,601
%	27.78	5.11	10.75	7.19	9.71	11.11	13.25	9.84
B-1	0	0	0	1	0	0	1	6
%	0.00	0.00	0.00	0.03	0.00	0.00	0.03	0.02
B-2	0	4	13	7	27	0	21	138
%	0.00	0.36	0.27	0.22	0.28	0.00	0.65	0.38
B-3	1	6	35	11	44	1	32	251
%	5.56	0.55	0.73	0.35	0.45	2.22	0.99	0.69
BL-1	0	0	0	0	1	0	1	3
%	0.00	0.00	0.00	0.00	0.01	0.00	0.03	0.01
BL-2	1	2	9	3	9	0	5	54
%	5.56	0.18	0.19	0.10	0.09	0.00	0.16	0.15
BL-3	0	4	30	27	62	0	13	226
%	0.00	0.36	0.63	0.87	0.63	0.00	0.40	0.62
Spall	0	35	38	45	115	0	12	440
%	0.00	3.19	0.79	1.45	1.17	0.00	0.37	1.20
Proximal >15 mm	2	17	201	114	365	1	218	1,492
%	11.11	1.55	4.20	3.66	3.72	2.22	6.77	4.08
Medial >15 mm	1	21	317	150	647	0	314	2,437
%	5.56	1.92	6.62	4.82	6.59	0.00	9.75	6.66
Distal >15 mm	1	23	209	103	383	2	187	1,513
%	5.56	2.10	4.36	3.31	3.90	4.44	5.80	4.13
N.O. >15 mm	2	10	175	69	257	2	116	1,013
%	11.11	0.91	3.65	2.22	2.62	4.44	3.60	2.77
Chunks	2	106	315	231	803	9	132	2,693
%	11.11	9.67	6.58	7.42	8.18	20.00	4.10	7.38
Heat spalls	0	5	1	5	10	0	1	38
%	0.00	0.46	0.02	0.16	0.10	0.00	0.03	0.10
Cores	0	13	184	70	265	0	251	1,154
%	0.00	1.19	3.84	2.25	2.70	0.00	7.79	3.15
Core frags.	0	5	33	13	76	1	62	310
%	0.00	0.46	0.69	0.42	0.77	2.22	1.92	0.85
Tested core	0	1	4	2	4	0	12	36
%	0.00	0.09	0.08	0.06	0.04	0.00	0.37	0.10
Split pebble	0	0	4	3	3	0	9	29
%	0.00	0.00	0.08	0.10	0.03	0.00	0.28	0.08
Crested piece	0	3	26	18	40	0	23	216
%	0.00	0.27	0.54	0.58	0.41	0.00	0.71	0.59
Battered crest	0	1	6	3	10	0	4	43
%	0.00	0.09	0.13	0.10	0.10	0.00	0.12	0.12
Core tablet	0	0	7	2	5	0	0	37
%	0.00	0.00	0.15	0.06	0.05	0.00	0.00	0.10
Plat. removal	0	18	85	57	231	1	103	824
%	0.00	1.64	1.77	1.83	2.35	2.22	3.20	2.25

Overshot	1	0	11	3	7	0	12	50
%	5.56	0.00	0.23	0.10	0.07	0.00	0.37	0.14
Hammerstone flake	0	1	3	1	5	0	2	18
%	0.00	0.09	0.06	0.03	0.05	0.00	0.06	0.05
Total	18	1,096	4,789	3,114	9,817	45	3,222	36,598
%	100	100	100	100	100	100	100	100

Table 21.2a. Assemblage category summary - counts and percentages (Period values based on OK and M status contexts only) (Ed. Note this is recorded as Table 21.2 in List of Tables, *LAP* II.1A, xxxix)

Period	*1A/1B*	*2*	*3A*	*3B*	*4*	*5*	*Surface*	*Total*
Tools	1	43	529	140	843	0	714	3,270
%	5.56	3.92	11.05	4.50	8.59	0.00	22.16	8.93
Chips	0	282	685	779	2,022	13	183	6,791
%	0.00	25.73	14.30	25.02	20.60	28.89	5.68	18.56
Flakes	5	80	730	318	1,312	6	616	5,036
%	27.78	7.30	15.24	10.21	13.36	13.33	19.12	13.76
Blade/Lets	2	16	87	49	143	1	73	678
%	11.11	1.46	1.82	1.57	1.46	2.22	2.27	1.85
Proximals	3	60	344	240	687	1	248	2,673
%	16.67	5.47	7.18	7.71	7.00	2.22	7.70	7.30
Medials	1	89	521	347	1,292	3	387	4,538
%	5.56	8.12	10.88	11.14	13.16	6.67	12.01	12.40
Distals	1	112	363	282	762	5	215	3,037
%	5.56	10.22	7.58	9.06	7.76	11.11	6.67	8.30
No-Orient	2	226	813	506	1,181	5	163	4,687
%	11.11	20.62	16.98	16.25	12.04	11.11	5.06	12.81
Spalls	0	35	38	45	115	0	12	440
%	0.00	3.19	0.79	1.45	1.17	0.00	0.38	1.20
Chunk/H.S.	2	111	316	236	813	9	133	2,731
%	11.11	10.13	6.60	7.58	8.28	20.00	4.13	7.46
Cores	0	19	225	88	348	1	334	1,529
%	0.00	1.73	4.70	2.83	3.54	2.22	10.37	4.18
C.T.E.	1	22	135	83	293	1	142	1,170
%	5.56	2.01	2.82	2.67	2.98	2.22	4.41	3.20
Hammerstone	0	1	3	1	5	0	2	18
%	0.00	0.09	0.06	0.03	0.05	0.00	0.06	0.05
Total	18	1,096	4,789	3,114	9,817	45	3,222	36,598
%	100	100	100	100	100	100	100	100

Cores are defined as any block of raw material from which blanks were removed. Flakes exhibiting subsequent blank removal scars, which cannot be characterised as secondary retouch are included within the core category. Cores (or nuclei) are considered broadly synonymous with other debitage materials in the present analysis as they document an element of reduction strategies employed in the chipped stone industry at the site. Core trimming elements represent both core preparation and platform rejuvenation events.

Tools are defined as any blank demonstrating signs of secondary retouch or wear generated for or from use. While the tools are grouped into classes and types which have in the past carried functional criteria, the specific categories in the present analysis are employed as morphological not functional terms. Conventional terms have been retained when they relate to basic morphologies understood and discussed by lithic analysts elsewhere. Functional (microwear) analysis of the assemblage has already begun to refine our understanding of tool types and classes and new research is discussed elsewhere in this volume (Finlayson 1987; see also § 21.10). Tool types employed in the present analysis are to provide a summary of the character of the assemblage as well as a means for generating new questions that can be addressed by more detailed attribute analysis in the future.

Samples selected for use-wear analysis were not available for the analysis of tool attributes quantified below. All use-wear samples were viewed briefly by the author in order to ensure that no obviously weighted samples had been drawn from any single class or type. These samples were counted within each period tool class totals since significant numbers were drawn from each category.

Before proceeding with the enumeration of the category counts representing each occupation period, sample size should be discussed briefly. Materials recovered from both ‘OK’ and ‘M’ samples belonging to the chronologically pure contexts (ie. ‘4’ not ‘4?’ or ‘3/4’) were counted for the assemblage category counts listed in Tables 21.1 and 21.2a. The consideration of artefacts from potentially mixed units was necessitated by the paucity of chipped stone from strictly *in situ* contexts, a familiar problem faced during any analysis of multi-period settlement. The presence of possibly residual material is not, however, considered to strongly effect the results presented for each of the periods of occupation at Kissonerga. The deficiency of strictly *in situ* materials is seen most vividly in the Periods 1 and 5 samples. Period 1A, in particular, was represented by only four *in situ* contexts. While the Period 1 tool counts presented in this report are typical of the Aceramic Neolithic, the low numbers of core and debitage materials from both Periods 1A and 1B were combined into a generalised 'Neolithic' sample. Similarly, Period 5 is largely represented by contaminated contexts limiting the interpretative value of materials assigned to this period. The large debitage and tool samples belonging to Periods 2, 3A, 3B and 4 ensure that the presence of potentially mixed material is nominal. All retouched and utilised artefacts were documented in the tool analysis. Formal tools found strictly *in situ* are discussed in each section and compared with the total tool class sample. Similarly, tools from all building units ('A', 'S*' and 'S') were listed in the tables relating to the six generalised context types. Numbers of examples attributed to occupation *deposits* and features in individual buildings are noted within the discussion and noted in the context tables for each tool class.

The problems associated with reliability in the Kissonerga assemblage are most severe when considering the transitions into and out of the Chalcolithic period at the site. The preceding Neolithic and succeeding Philia chipped stone samples show many interesting elements worthy of more detailed consideration, but cannot be regarded as definitive of such transitions. Perhaps the great value of the Kissonerga assemblage is the detailed view it provides of the Chalcolithic chipped stone industry in Cyprus.

§ 21.2 Assemblage total (C.M.)

Tables 21.1 shows comparative tool, core and debitage category totals for each occupation period, surface materials and the total assemblage. Table 21.2a gives a summary of generalised assemblage categories. As noted above, it is readily evident that Periods 1 and 5 are under represented, while Periods 2 through 4 possess large, strategraphically secure samples. The disparity between the combined period totals and the combined assemblage total illustrates the proportions of artefacts recovered from contexts suffering significant post-depositional effects.

A total of 36,598 artefacts constitute the chipped stone assemblage of Kissonerga. Of this total there were 12,945 unretouched blanks, 17,666 broken blank elements and debris, 1,529 cores, 1,188 core trimming elements and 3,270 retouched and utilised tools or tool fragments. In terms of the overall assemblage composition, tools represent just under 9% (8.93%) of the total assemblage in comparison to a total of 35% (35.37%) complete unretouched blanks. Cores represent just over 4% (4.18%) of the total assemblage and core trimming elements a further 3.25%. Waste products dominate the assemblage comprising 48.27% of the total. The characterisation of all broken blanks as 'waste' products, however, ignores their potential role as tool blanks, which the nature of many tool examples in the assemblage suggests (see below).

From the figures provided by Betts in a preliminary reporting of the assemblage, it is evident that only a small number of cores (n=55 or 1.28%) and core trimming (n=16 or 0.37%) materials had been recovered at that time colouring initial interpretations of the reduction strategy employed at the site (Betts 1987, 10, 12, Table 2). Both cores and core trimming elements are significantly more frequent in the total assemblage. Of the various core trimming listed in Table 21.1, platform rejuvenation pieces rather than core preparation elements dominate showing greater attention to core maintenance than core shaping procedures. Low numbers of completely cortical (core opening) flakes and significant numbers of partly-cortical blanks were recovered from all period samples demonstrating the introduction of unworked (though perhaps tested) raw materials to the site. Many core examples (within all periods) exhibit platforms which could be characterised as ventral scar surfaces of previously very large flakes. The great majority of these cores, however, represent heavily exhausted or late stage materials, which together with the presence of artefacts representing all stages of core reduction argues against the interpretation of off-site core reduction (e.g. Betts 1987, 10).

If the Kissonerga assemblage were based on a practice of core reduction taking place only off-site, the large numbers of chips belonging to each period (between 14.30 to 28.89%) could be seen to represent a dominance of tool production and rejuvenation activities. When combined, however, the total proportion of blanks and blank fragments exceeds the chip category in all periods. It seems unlikely that such large amounts of 'waste' material would have been carried to the site or that tool shaping activities alone would have resulting in such significant numbers of blanks and blank fragments. Instead, the strong role of blank production on site is readily apparent. The total combined proportion of blanks and debris 83.64% (though slightly decreased from the 85.76% reported by Betts) clearly illustrates a dominant production emphasis at the site. Similarly, while the numbers of cores and core trimming elements increased within the final excavation sample, the total proportion of tools has decreased from 12.58% in the preliminary report to 8.93%. This downward shift in the total proportion of tools reinforces the view of an assemblage representing a full spectrum of reduction activities, rather than tool manufacture and/or retooling alone. Changes in the total proportions of the major tool classes, discussed below, also provide contrasts with the preliminary reporting.

Lamellar (blade and bladelet) blanks never figured prominently in the Kissonerga assemblage with the exception of Period 1. The heavily flake based character of many Chalcolithic assemblages like Kissonerga distinguishes them from the long blades said to represent the Chalcolithic type site assemblage of Erimi (D'Annibale 1992, 22; Betts 1979a, 100; Seton-Williams 1962, 123). The more heavily blade based character reported for the Erimi assemblage may suggest a degree of continuity with the preceding Neolithic at this site or contextual differences associated with site location (e.g. D'Annibale 1992). There can be little doubt that Neolithic assemblages were more heavily blade based than Chalcolithic assemblages in Cyprus (e.g. Fox 1987; Hordynsky and Kingsnorth 1979; Seton-Williams 1962; Steklis 1962, 1961). The discussion of the relative importance of blades in Cypriot assemblages, however, seems over emphasised. As the Kissonerga assemblage suggests, the difference is one of degree rather than of kind. The samples belonging to Periods 1 and 2 in the Kissonerga assemblage illustrate the suggested decrease in blade production over time, but flakes do not completely replace blades within the Chalcolithic samples. Instead, differences in the proportions of blade blanks in the Chalcolithic samples at Kissonerga seem to relate to the relative importance of specific tool types. While the total proportions of lamellar blanks are quite small in the Chalcolithic period debitage samples from Kissonerga, blade, bladelet and spall blanks were regularly utilised for the production of specific tool types during all periods (see below).

§ 21.3 Artefact indices (C.M.)

The overall character of each period sample is best illustrated by consideration of several basic ratios: blank:core, tool:core, tool:blank, blank:blank fragments, core:core trimming elements, tool:chip, blank:chip, blank:spall, flake:blade and cortical:non-cortical blank. These ratios can be used to evaluate the underlying structure of the chipped stone industry belonging to each period. Individual ratios fail to demonstrate unique characteristics belonging to any one period or linear diachronic patterns, but the industry of each period can be understood to be more or less efficient with regard to production output by considering a combination of ratios. Production efficiency, sometimes considered indicative of skill, is generally assumed to be lacking in Cypriot assemblages and later prehistoric assemblages in general. The nature of the Kissonerga assemblage, however, shows a complex set of behaviours suggesting fluctuating degrees of reduction efficiency perhaps responsively employed to meet changing availability of raw materials, levels of craft specialisation, settlement stability or other factors which can be tested in the future against other contemporary assemblages.

Periods 1A and 1B - Neolithic

The lack of *in situ* cores within the Period 1 sample immediately suggests an absence of on-site blank production, but a single core trimming element (represented by an overshot) implies some limited on-site core reduction connected with the sample. The high proportion of proximal blank fragments and complete blanks is consistent with the description of the Period 1 sample as one dominated by tool production (e.g. Prentiss and Romanski 1989; Sullivan and Rosen 1985). The absence of chips from the Period 1 sample seems to preclude on-site production and/or retooling of formal tools, suggesting instead that both formal tools and unretouched blanks were carried to the site for utilisation. Obviously, however, the small sample size belonging to Period 1 demands that any interpretations remain speculative.

Period 2 - Early Chalcolithic

Consideration of the blank:core ratio (5.1:1) for the Period 2 sample demonstrates the highest blank production ratio within the Kissonerga assemblage. From this large number of blanks, however, somewhat less than half (blank:tool = 2.2:1) were subsequently retouched or utilised as tools indicating a high proportion of surplus blanks relative to tool production. The tool:core ratio (2.2:1) exaggerates the excessive number of blanks within the sample suggesting that large numbers of blanks were considered unsuitable for subsequent tool use. Uniquely in Period 2, the ratio of core trimming elements to cores (1.2:1) is also relatively high. Core trimming elements, dominated as in other periods by platform rejuvenation pieces, demonstrate a consistent degree of core maintenance through a series of platform re-adjustments rather than an attempt to conserve raw materials and control blank form through core preparation. The high proportion of blank fragments in comparison with complete blanks (5.1:1) illustrates the large number of blank failures within the Period 2 sample relative to other Kissonerga occupation periods. Despite the surplus of blanks, the very high number of chips relative to formal tools (6.6:1) demonstrates significant attention to the production and/or curration of formal tools during the EChal. The number of chips is similarly high relative to the blanks belonging to the sample (2.9:1). A low blank production efficiency is thus contrasted with an apparent attention paid to tool manufacture and/or curration (see discussion of the formal tools below).

Period 2 blanks show a predominantly non-lamellar pattern (flake:blade = 5:1), but one more heavily blade based than shown by later period samples. Thus a relatively gradual decrease in blade production spanning the EChal is suggested by the debitage figures of the Kissonerga assemblage. The tools belonging to Period 2, however, demonstrate a parallel utilisation of lamellar blanks for tool production like that belonging to that of other periods (see below). The lowest ratio of non-cortical blanks to cortical examples (2.1:1) belongs to the Period 2 sample suggesting the possibility of a distinct pattern of raw material acquisition during the EChal at Kissonerga. Explanations for the latter could involve a greater proportion of unworked raw materials being brought to the site during this period or the character of the materials exploited might have included a greater proportion of nodular materials (see raw material discussion below). The Period 2 sample also had a uniquely low ratio of spalls to other blank types (1:2.7), demonstrating a greater total proportion of spalls in comparison to other period samples. Like the larger concentrations of blade/bladelet blanks noted above, a sizeable proportion of spall blanks were not utilised for tool production, but remained as blank surplus.

Period 3A - Middle Chalcolithic

In direct contrast to the EChal (Period 2) sample outlined above, the Period 3A sample can be described as having the most efficient pattern of reduction. The blank:core ratio (3.6:1) represents the lowest proportion of blanks per core for any of the Kissonerga occupation periods. When considered in conjunction with the ratio of tools to blanks (1:1.5), it becomes more clear that the knappers of Period 3A were not involved in the production of a blank surplus. Instead, the majority of the blanks produced were subsequently utilised or retouched as formal tools. The high tool-to-core ratio (2.4:1), exceeding all other period samples but that of Period 4, supports the designation of the 3A sample as an efficient reduction system. A more expedient nature for the Period 3A blank production strategy is also suggested by the lower proportion of secondary tool modification according to the low (1:1.3) tool to chip ratio. The ratio of blanks to chips (1.2:1) is similarly low supporting the interpretation of a reduction in formal tool manufacture and/or rejuvenation during the first half of the MChal, an interpretation which is further supported by the 3A tool sample (see below).

A negative (1:1.7) core trimming element:core ratio (dominated by platform rejuvenation pieces) could suggest a more 'ad hoc' nature for the reduction strategy, but considering the lack of a blank surplus seems more likely to represent better core shaping techniques, reducing the need for frequent core maintenance events. The very low ratio of blanks to blank fragments (1:2.5) supports the view of a largely successful, efficient reduction strategy in Period 3A. In contrast to the preceding and succeeding period samples, the blanks produced during Period 3A were more exclusively flake based in type (8.4:1 flakes to blades). Similarly, the proportion of spalls produced during Period 3A was negligible in comparison with other period samples (21.5:1 in favour of other blank types). A greater proportion of the blanks produced were non-cortical (2.4:1) indicating an increase from the preceding Period 2 sample. While blank production was obviously carried out on-site judging from the significant number of cores belong to the Period 3A sample, preliminary raw material decortification may have been more frequently conducted at procurement sites, more tabular materials utilised, or more intensive reduction strategies employed.

Period 3B - Middle Chalcolithic

The tool, core and debitage ratios provided by the Period 3B sample exhibit significant contrasts with those of the preceding Period 3A confirming the distinction between the two MChal sub-periods at Kissonerga. Though some Period 4 ratios are similar, in many respects the general reduction strategy belonging to Period 3B exhibits a closer relationship to the EChal industry outlined above. Like the Period 2 sample, the blank:core ratio belonging to Period 3B was relatively high (4.2:1). The high blank production ratio when considered in conjunction with the tool:blank ratio (1:2.6) again demonstrates more selectivity of blanks employed for tools use. The number of unmodified, surplus blanks was greater during Period 3B than in any of the other occupation periods. An unusually low ratio of tools to cores (1.6:1) in the Period 3B sample again shows decreased tool productivity. A low tool production rate, in addition to the inefficient blank production ratios, illustrates a relatively wasteful reduction strategy in terms of the raw material utilised.

Consideration of other sample ratios provides further clarification of the 3B industry. The core trimming element:core ratio (1.1:1) demonstrates greater attention towards the maintenance of cores than evident in the previous 3A sub-period, while falling short of the high proportion of core trimming activity evidenced by the Period 2 sample. The ratio of blanks to blank fragments (1:3.7) more heavily favours the blank fragments being closer to the same ratio belonging to Period 2. A high level of blank 'waste' supports the designation of the Period 3B reduction strategy as relatively inefficient. Blades are again relatively more frequent (6.5:1 = flake:blade) and the blank:spall ratio (8.2:1) seems to confirm a renewed desire for a greater variety of blank types during Period 3B similar to that seen earlier in the Period 2 sample. The Period 3B sample is also closer to the EChal sample with consideration of the tool:chip (1:5.6) and blank:chip (1:2.1) ratios implying a high proportion of retouching and tool rejuvenation activity during the Period 3B occupation. In contrast, the amount of decortification represented by the ratio of cortical to non-cortical blanks (1:2.5) demonstrates the only direct parallel between the two MChal sub-periods, perhaps indicating similarities in raw material procurement strategy.

Period 4 - Late Chalcolithic

Overall, the Period 4 sample appears more similar to the Period 3A sample in terms of its underlying reduction strategy. Some category ratios do demonstrate parallels with the preceding 3B period, however, suggesting a middle range strategy combining elements of the preceding occupations into a system unique to Period 4. The Period 4 blank:core ratio (4.2:1) is equal to that of the preceding Period 3B occupation. In contrast, the high proportion of tools in the Period 4 sample suggests that more of these blanks produced (1:1.7 tool:blank) were subsequently utilised. The moderate tool:core ratio (2.4:1) also parallels that of Period 3A suggesting a similar lack of a blank production surplus.

A close ratio (1:1.2) for the core trimming elements and cores in Period 4 demonstrates somewhat more attention to core maintenance activities providing a parallel with the Period 3B sample. The ratios of the Period 4 reduction strategy imply an effective utilisation of cores aimed at maximum tool production with little blank waste. Low proportions of blank fragments relative to the number of blanks produced (2.7:1), like the tool:blank ratio, demonstrate an effective blank production strategy closely parallel that of Period 3A. Similarly, the Period 4 material exhibits a more exclusively flake based blank repertoire illustrated by both the flake:blade ratio (9.2:1) as well as a high blank:spall ratio (12.7:1). Lamellar blanks continued, however, to be used for tool production for some tool classes during Period 4. A decrease in the total numbers of blades, bladelets and spalls produced was not, therefore, matched by decreases in the numbers of lamellar blanks employed for tool use (see below). The proportion of non-cortical blanks to cortical blanks is somewhat higher in Period 4 (2.7:1), perhaps suggesting more unaltered raw material and/or more nodular material was brought to the site during Period 4 in contrast to the preceding E-MChal occupations.

A significant practice of tool curration in the Period 4 reduction strategy is indicated by consideration of the tool:chip (1:2.4) and blank:chip (1:1.4) ratios. While the first ratio closely parallels that of Period 3A, the higher number of chips relative to the blanks within Period 4 sample implies more frequent formal tool preparation and/or greater tool curration activity. Though specific tool types need to be considered in detail, the large total proportion of tools belonging to Period 3A and the corresponding paucity of chips in this same sample points to a potentially significant contrast with the later Period 4 sample.

Period 5 - Philia

Little can be reliably said of the poorly stratified sample of chipped stone provided for Period 5 from Kissonerga. The majority of the Period 5 material belongs to contaminated or disturbed contexts, many of which were very near to the surface. Retouched and utilised tools are, therefore, completely absent from the Period 5 sample illustrated in Table 21.1. The consideration of tool production efficiency by contrasting tool and debitage ratios is, therefore, impossible. Elements of the blank production strategy are better represented within well-stratified contexts. Features like a high blank:core ratio (7:1) and the relatively low (6:1) flake:blade ratio which are reminiscent of the Period 2 reduction strategy described above. The ratios of core trimming elements to cores (1:1), blanks to blank fragments (1:2) and blanks to chips (1:1.4), however, more closely parallel the low surplus reduction strategy of Period 4. The absence of spalls and the drastic increase in the proportion of non-cortical blanks (6:1) relative to cortical examples suggest differences of reduction strategy and raw material utilisation which need to be explored with an extended Philia period sample.

Obviously, the reduction strategies outlined above need to be tested against the detailed attribute analyses of both cores and blanks. The latter will provide a quantitative basis for evaluating the apparent changes in the reduction strategies and patterns of raw material procurement discussed above. What is clear from the above outline is the lack of any unilinear development in the chipped stone industries at Kissonerga. Instead, we see oscillating behaviours directed more or less exclusively at flake production as well as varying degrees of production efficiency over time. While the relationships of particular tool types (discussed below) need to be considered in comparison with the overall reduction strategies discussed above, proportions of tool production and/or curration seem to vary similarly through time. The relationships between chipped stone samples belonging to the five occupation periods at Kissonerga imply a more loosely structured and/or more affluent industry during Periods 2 and 3B. In contrast, a greater focus on efficiency is illustrated in varying degrees by the samples representing Periods 3A and 4. This contrast forms an hypothesis rather than a conclusion against which future chipped stone analysis, particularly of Chalcolithic assemblages, may be directed.

§ 21.4 Debitage and core context (C.M.)

In Period 1, debitage and core artefacts were distributed between pit and general contexts (Table 21.2b). Core trimming elements (50.0%) and especially cores (57.14%) show a greater emphasis of pit deposition than either the blanks (16.67%) or the blank fragments (21.92%). Instead, both blanks (83.33%) and blank fragments (73.92%) were more frequently incorporated within general occupation materials.

Table 21.2b. Core and debitage context counts and percentages – all contexts included [Building occupation 'A' and 'S*"] (Ed. Note this is an additional table to List of Tables, *LAP* II.1A, xxxix)

CATEGORY *Context type* *Percentage*	*1A/1B*	*2*	*3A*	*3B*	*4*	*5*
			Period			
CORE-ELEMENTS						
Buildings	0	0	13[13]	19[11]	73[73]	1
%	0.00	0.00	8.97	20.00	25.80	100
Pits	2	22	21	11	43	0
%	50.00	91.67	14.48	11.58	15.19	0.00
Surfaces	0	1	15	13	36	0
%	0.00	4.16	10.34	13.68	12.72	0.00
General	2	1	89	52	119	0
%	50.00	4.16	61.38	54.74	42.05	0.00
Other	0	0	7	0	12	0
%	0.00	0.00	4.83	0.00	4.24	0.00
CORES						
Buildings	0	0	26[19]	54[18]	80[70]	1
%	0.00	0.00	11.56	40.91	23.74	25.0
Pits	4	18	32	9	65	0
%	57.14	81.82	14.22	6.82	19.29	0.00
Surfaces	0	1	18	17	39	0
%	0.00	4.55	8.00	12.88	11.57	0.00
General	3	3	137	49	139	3
%	42.86	13.64	60.89	37.12	41.25	75.00
Other	0	0	12	3	14	0
%	0.00	0.00	5.33	2.27	4.15	0.00
BLANKS						
Buildings	0	24	307[93]	259[63]	1,367[439]	21
%	0.00	5.49	17.50	19.97	37.61	52.50
Pits	11	377	418	491	653	0
%	16.67	86.27	23.83	37.86	17.96	0.00
Surfaces	0	16	171	109	407	0
%	0.00	3.66	9.75	8.40	11.20	0.00
General	55	20	702	374	904	19
%	83.33	4.58	40.02	28.84	24.87	47.50
Other	0	0	156	64	304	0
%	0.00	0.00	8.89	4.93	8.36	0.00
BLANK FRAGS						
Buildings	0	0	464[305]	388[364]	2,253[1,446]	25
%	0.00	0.00	17.22	21.20	35.03	64.10
Pits	16	594	852	640	842	0
%	21.92	94.44	31.61	34.97	13.09	0.00
Surfaces	0	5	206	178	552	0
%	0.00	0.79	7.64	9.73	8.58	0.00
General	54	30	965	528	2358	14
%	73.92	4.77	35.81	28.85	36.66	35.90
Other	0	0	208	96	427	0
%	0.00	0.00	7.72	5.25	6.64	0.00

During Period 2 a wider distribution of debitage and core materials including possible fragmentary buildings, external surface areas as well as pit and general context types suggests a contrast with the Period 1 sample. In spite of the wider overall distribution of the materials, however, waste products associated with core reduction; core trimming pieces (91.67%), cores (81.82%), blanks (86.27%) and blank fragments (94.44%) were selectively deposited in pit contexts.

Period 3A production materials were found redeposited in grave fills in addition to the context types listed above. General occupation contexts are broadly dominant for the Period 3A sample more so for the core trimming elements (61.38%) and cores (60.89%) than for the unutilised blanks (40.02%) or blank fragments (35.81%). Period 3A blanks (23.83%) and blank fragments (31.61%) are well represented in pit contexts, suggesting differential treatment for these artefact types in comparison to the cores and related core materials. Smaller proportions 14.22% of the cores and 14.48% of the core trimming elements were recovered from pit contexts. Moderate proportions of blanks and blank fragments were recovered from building occupation and structural materials, with somewhat lower proportions of cores and core elements being recovered from the same contexts. More of the blanks, however, came from floor and feature occupation debris.

In Period 3B the contextual distribution becomes more diffuse. General occupation contexts account for more than half of the core trimming element localities (54.74%) representing the greatest concentration of reduction products from Period 3B. In contrast, cores were mainly recovered from building contexts (40.91% few of which were directly associated with floors) while both blanks and blank fragments were collected from pits (37.86% and 34.97% respectively). Almost as many cores (37.12%) were collected from general contexts, while 20.00% of the core trimming elements derive from building contexts, the majority of which came from strictly occupation *deposits*. Blanks and blank fragments both were recovered from general fill materials in virtually equal proportions (28.84% and 28.85%) following the moderate peak in pit deposition.

Period 4 debitage and core materials show a breadth of deposition similar to that of Period 3B. Artefacts recovered from general fill contexts dominate within the core trimming pieces (42.05%), cores (41.25%) and blank fragments (36.66%). Only the blanks (37.61%) were preferentially distributed in building *deposits* though most of these pieces came from building fill rather than occupation debris. Within other categories, 25.80% of core trimming elements, 23.74% of cores and 35.03% of blank fragments were recovered from building contexts, many from floor or associated occupation units.

The small numbers of Period 5 reduction materials were concentrated within two context varieties. Period 5 materials relating to building fill contexts account for 100% (n=1) of the core trimming elements, 25.0 % of the cores, 52.50% of the blanks and 64.10% of the blank fragments. Of the remaining production materials (75.00% cores, 47.50% blanks and 35.90% blank fragments) were recovered from general occupation contexts.

§ 21.5 Core types (C.M.)

The following discussion of the Kissonerga core technology is limited to the definition of types and the proportions in which these core types occur across Periods

1 to 5. Detailed discussion of core and blank attributes, core elements, knapping techniques and the structure of the reduction strategy form part of the author's PhD research (McCartney 1996). The numbers belonging to each core type and their relative proportions in each period are presented in Table 21.3. This table, like Tables 21.1 and 2a, shows that no cores were collected from secure contexts for Periods 1 and 5. Table 21.3, therefore, represents core type information relevant only for the Chalcolithic periods of occupation at the site. The core types utilised in the present analysis are defined below. The terms are based on dominant morphological characteristics including platform type and location as well as core shape and negative scar configuration, characteristics, which are not all of equal significance in each of the various core definitions.

Table 21.3. Core type counts and percentages (Period totals based on OK and M status contexts only)

Period	*2*	*3A*	*3B*	*4*	*Surface*	*Total*
single	0	5	1	10	8	33
%	0.00	2.72	1.43	3.77	3.19	2.86
opposed	0	2	3	10	8	34
%	0.00	1.09	4.29	3.77	3.19	2.95
discoidal	1	14	5	24	23	91
%	7.69	7.61	7.14	9.06	9.16	7.89
alternate	1	7	0	9	8	36
%	7.69	3.80	0.00	3.40	3.19	3.12
crossed	1	14	5	30	21	105
%	7.69	7.61	7.14	11.32	8.37	9.10
alt-cross	3	31	11	52	62	214
%	23.08	16.85	15.71	19.62	24.70	18.54
multi-plat	0	5	6	11	11	48
%	0.00	2.72	8.57	4.15	4.38	4.16
on-flake	3	66	18	67	81	339
%	23.08	35.87	25.71	25.28	32.27	29.38
splintered	4	40	21	52	29	254
%	30.77	21.74	30.00	19.62	11.55	22.01
Total	13	184	70	265	251	1154
%	100	100	100	100	100	100

Alternate platform core

Any core on which the platform was produced by alternate blank removals such that the platform represents a sinuous, bifacial edge. One or more discontinuous alternately flaked edges may be found on examples of this core type, though a single platform edge covering from 1/2 to 2/3 of the core circumference generally dominates.

Cores-on-flakes

Any flake or blade from which other blanks were removed. The negative scars on these pieces are not continuous and do not create a useful tool edge. The lack of any sign of tool edge wear is significant as well as the fact that the removals were larger than the retouch scars shown by the formal tools. Platforms were located predominantly on the ventral surfaces or as truncated-faceted platforms created along a lateral edge (e.g. Goren-Inbar, Naama 1988). Multiple concentric rings on the striking platform illustrates the direct percussion technique employed in shaping many of these pieces. Blank removal on the core-on-flake type may be either alternate or normal to the platform edge (for an extended discussion of this core type and of platform edge configuration see McCartney 1998 and 1996).

Crossed platform core

Any core with two or more individual platforms (and therefore core faces) oriented in 90 degree perpendicular planes.

Discoidal core

Any core with an alternating platform edge, which is continuous around the entire circumference of the core; the negative scars are thus oriented in a radial fashion. These bifacial cores often possess a flattened lenticular shape. Unifacial examples are related to other single platform cores, but were included with the bifacial examples of this core type on the basis of core shape and removal scar configuration.

Mixed platform core

Any core exhibiting elements of both alternate platform and crossed platform core types. These cores are distinguished from the multiple platform type defined below because they were not necessarily exhausted and the different striking platform configurations were easily distinguished (often at opposite ends of the core), suggesting that the core was worked sequentially in one method then the other. Like the Multiple platform core type, these hybrid cores may represent methodological failures or flexible responses to unexpected changes in raw material consistency during core reduction.

Multiple platform core

Any core on which multiple platforms and core faces were exploited such that the core is clearly exhausted and roughly spherical in shape.

Opposed platform core

Any core with two distinct platforms positioned at opposite ends of the core. Blank removals were directed towards the opposing platform leaving a bi-directional negative scar pattern on the core face(s).

Single platform core

Any core exhibiting only one striking platform. This platform may be either an unprepared cortical surface or one or more negative facets, indicating preparation of the striking platform.

Splintered pieces

Any chunk or blank with battered ends and bi-directional removal facets generated by the bipolar anvil technique (Crabtree 1972, 42; see McCartney 1998 for a more detailed discussion of splintered pieces).

Period 2 - Early Chalcolithic

Single platform, opposed platform and multiple platform core are absent from the Period 2 core repertoire. In terms of the percussion core types, mixed platform cores and cores-on-flakes represent equal proportions (23.08% each) while the alternate platform, discoidal and crossed platform cores were substantially less frequent (7.69% of each type). Splintered pieces representing a compressive rather than percussive reduction technique dominate the Period 2 core sample (30.77%) demonstrating the most concentrated use of this core type in the Kissonerga assemblage. It should be remembered, however, that the bipolar anvil technique produces excessive amounts of core debris, sometimes 2-3 cores per reduction (Knight 1991; Broadbent 1979; White 1968). Splintered piece proportions, therefore, are likely to be over represented relative to the occurrence of this element in the overall reduction strategy. The dominance of informal mixed platform, core-on-flake and splintered core varieties indicates that the large number and variety of blanks belonging to Period 2 was related to a strategy of intensive, yet non-standardised blank production.

Period 3A - Middle Chalcolithic

In contrast with Period 2, the Period 3A core sample exhibits an expanded core type diversity. The more methodologically structured single platform, opposed platform and discoidal core types are all present in low proportions (Table 21.3). Discoidal cores (7.61%) now exceed their alternate platform cousins (only 3.80%), while the crossed platform type (7.61) remains parallel to the proportion of these cores seen in Period 2. In general, the greater variety of less randomly worked core types supports the idea of a more efficient reduction strategy during Period 3A (Johnson and Morrow 1987). The Period 3A core sample is, however, dominated by a high proportion (35.87%) of the core-on-flake type, but a reduced proportion of splintered pieces (now only 21.74%). The relatively large number of cores-on-flakes corresponds well with the lower proportion of cortical blanks belonging to the Period 3A sample (noted above), suggesting the possibility of more early stage off-site core reduction. Greater control of core shape, considering the low core trimming index belonging to Period 3A, probably facilitated the efficient use of raw material and numbers of blanks produced.

Period 3B - Middle Chalcolithic

As indicated by the discussion of assemblage category ratios, Period 3B exhibits a surplus blank production and greater diversity in terms of the blank types produced. Considering these characteristics we should expect greater similarity with the Period 2 core sample including more informal reduction types as Table 21.3 clearly indicates is the case for the Period 3B core sample. The largest increases are found in the proportions of the splintered piece and multiple platform (highest during Period 3B) core types, suggesting intensive non-systematic raw material utilisation. Similarly, the proportion of mixed platform cores, though decreased, remained relatively high during Period 3B. The presence of more systematic core types: single platform, opposed platform and discoidal examples found in the Period 3B core sample, however, demonstrates continuity with the shift towards a wider range of reduction methods seen in the first half of the MChal. A peak in the proportion of opposed platform cores begins in Period 3B (4.29%) and continues into the succeeding Period 4. Conversely, the proportion of crossed platform cores demonstrates greater continuity with the preceding occupation periods.

Period 4 - Late Chalcolithic

The proportions of each core type in Period 4 show an overall increase in the importance of more systematic core types. Discoidal cores are dominant (9.06%) representing a peak in the utilisation of this core type in the Kissonerga assemblage. Single platform and opposed platform cores represent relatively high proportions of the Period 4 repertoire (3.77% in each case). The crossed platform core type also reached its peak proportion during Period 4, while alternate cores show a significant but low proportion of the Period 4 core sample, parallel in value to Period 3A. Cores-on-flakes, mixed platform and multiple platform core varieties are relatively frequent demonstrating an intensive, less structured element in the Period 4 core reduction system. Splintered pieces were less frequent in Period 4. The high numbers of blanks produced during Period 4, when considered in conjunction with the lower proportion of unsuccessful (broken) blank removals and the high ratio of blanks utilised for tool manufacture, correspond well with the use of more well prepared cores seen in the Period 4 core sample.

§ 21.6 Raw materials (C.M.)

The chipped stone assemblage from Kissonerga is characterised by variety in raw material type and colour. In addition to the dominant fine to medium grained cherts, obsidian (see below), jasper, silicified umber and a few attempts with poorer quality rocks like mudstone were utilised. Jaspers occur in small numbers in either red or yellow varieties. Silicified umbers more common to assemblages from eastern parts of the island are rare in the Kissonerga assemblage; assemblages from western Cyprus instead demonstrating more varied nodular and bedded chert materials (personal observation). Poorer quality materials are present in the assemblage primarily as tested cores, blanks, blank fragments or other debris and were very rarely utilised in tool production.

The raw materials utilised in the Kissonerga assemblage have been classified into four broad groups for the purposes of the present analysis.

Raw Material

Type 1 is represented by cryptocrystalline nodular cherts, which drive from the lower pillow lavas (C. Elliott-Xenophontos pers comm). These cherts generally exhibit superior fracture qualities and a very smooth surface texture being either translucent or semi-opaque. Less isotropic examples exhibit a somewhat rougher (frosted) surface texture. The variety of colours belonging to Type 1 is wide; red, orange, gold, brown and olive being dominant.

Type 2 is used to represent a particular sub-group of cherts which appear to have been selectively utilised within the Kissonerga assemblage (see below). This special group of materials includes a black opaque variety with a smooth surface texture as well as mottled or banded black, grey and brown examples some with a somewhat rougher (frosted) fracture surface. Materials of this type have been referred to as 'Moni' cherts elsewhere (e.g. Stewart 1992, 37 and references within text).

Type 3 was assigned to those materials exhibiting a clearly recognisable grain structure within an isotropic silica base. These materials are generally assigned to basal zones of the Lefkara formation (C. Elliott-Xenophontos pers comm; Stewart 1992, 37). Type 3 materials are dominated by pale red, brown, lime-green and white colours, representing materials of relatively high quality though generally more granular in texture.

Type 4 materials represent cherts generally translucent or somewhat opaque, which are distinguished by the presence of multiple small limestone inclusions. Materials of this type are attributed to the upper Lefkara formation (*ibid.*). Type 4 materials can be sub-divided into two categories within the Kissonerga assemblage. The first sub-type represents the mainly translucent materials, generally red, yellow, gold or orange in colour which exhibit a fine grain, but often brittle fracture quality. The second sub-group is more dense in fracture surface character, and is dominated by light and dark greys, grey-white and pale reddish-brown colours. Type 4 materials are sometimes of an inferior quality due to the presence of multiple fracture planes and the overly brittle character prevalent in the first sub-type, while the tough, quartz-like nature of the second sub-type can similarly inhibit successful fracture (personal observation). Translucent Lefkara materials of the first sub-type are more frequent in the Kissonerga assemblage.

Munsell colour designations for the four raw material types are as follows:

Type 1: Pale and light olive (2.5Y-6.4, 5Y-6.2), light grey (5YR-7.1, 2.5Y-7.2), olive-grey (5Y-5.2, 2.5Y-6.2, 2.5Y-4.2), olive (5Y-4.4, 2.5Y-5.4), dark olive (2.5Y-4.4), dark olive-grey (5Y-3.2), dark reddish-grey (5YR-4.2, 10R-4.1) dark reddish-brown (2.5YR-3.4, 5YR-3.3), dark red (10R-3.6), reddish-brown (5YR-4.4, 2.5YR-4.4), strong brown (7.5YR-4.6), weak red (10YR-4.3), light reddish-brown (5YR-6.3), yellowish-red (5YR-5.6, 5YR-4.6), and dark yellowish-brown (10YR-4.4)

Type 2: Grey (10YR-6.1, 10YR-5.1, 5YR-5.1), dark grey (2.5YR-4.0, 5YR-4.1, 5Y-4.1, 7.5YR-4.0, 10YR-4.1), very dark grey (2.5Y-3.2, 2.5YR-3.0, 7.5YR-3.0, 10YR-3.1), black (2.5Y-3.0), very dark to dark greyish-brown (10YR-3.2, 10YR-4.2), greyish-brown (10YR-5.2), dark brown (10YR-4.3, 7.5YR-3.2, 7.5YR-4.2).

Type 3: White (5YR-8.1, 10YR-8.2), pale yellow-white (2.5Y-8.2), pale yellow (5Y-7.3), very pale and pale olive (2.5Y-7.2, 5Y-6.4, light yellowish-brown (10YR-6.4), yellowish-red (5YR-5.6), light reddish-brown (5YR-6.3, 2.5YR-6.4), dark reddish-brown (2.5YR-3.3), brown and strong brown (7.5YR-5.2, 7.5YR-5.4, 7.5YR-5.6), very pale, pale and light brown (10YR-7.3, 10YR-6.3, 7.5YR-6.4), light grey (5Y-7.2, 2.5Y-7.0), greyish-brown (10YR-5.2), dark greyish-brown (10YR-4.2) and dark grey (7.5YR-4.0).

Type 4: Light grey (5YR-6.1, 7.5YR-7.0), pinkish-grey (5YR-6.2), light reddish-brown (5YR-6.3, 5YR-6.4), weak red (10R-5.3, 10R-4.3, 10R-5.4), red (2.5YR-4.6, 2.5YR-5.6, 10R-4.6), dark red (2.5YR-3.6), dusky-red (10R-3.4), dark reddish-brown (2.5YR-3.4), reddish-brown (5YR-5.3, 5YR-5.4, 5YR-4.3, 2.5YR-5.4), brown and strong brown (10YR-5.3, 7.5YR-4.6), light brown (7.5YR 6.4), light yellowish-brown (10YR-6.4), yellowish-brown (10YR-5.8), yellowish-red (5YR-4.6, 5YR-5.6), reddish-grey (10R-5.1), dark reddish-grey (10R-3.1, 10R-4.1) and dark grey (5YR-4.1).

Cortex when present on debitage, core or tool examples demonstrates that both primary and secondary raw material sources were utilised. Primary raw material sources appear to have been frequently utilised at Kissonerga as much of the cortex found on chipped stone artefacts in the assemblage had a relatively fresh white, chalky character. Cypriot cherts readily occur in primary sources as nodules or tabular bands of variable thickness. The tabular form of some raw materials may account, in part, for the paucity of cortical cover on artefacts in the Kissonerga assemblage (Hofman 1987, 102). Once the flat faces of chalky cortex and/or weathered chert are removed a substantial block of non-cortical material remains for reduction. Water worn cortex was also prevalent in the Kissonerga assemblage, demonstrating that secondary, riverine sources were also regularly exploited. Beach materials, while closest in proximity to the site, are deeply fractured and, therefore, of inferior knapping quality. Like other inferior materials, the latter were primarily represented in the form of tested cobbles and single flakes, but do not form a significant component of the raw materials utilised in the Kissonerga assemblage. The small river tributaries closest to the site failed to produce more than the rare transported nodule of Lefkara formation cherts and do not appear to represent significant local raw material sources. It is possible, however, that such sources were worked out in antiquity or that substantial modern terracing may have significantly altered the ancient landscape. The relatively frequent appearance of unaltered, 'fresh' cortex and the generally high quality of the cherts used in the assemblage, however, suggest that the Kissonerga knappers had access to materials from more substantial outcrops in the Troodos foothills or the larger river systems in the eastern part of the Paphos district (Betts 1987, 10). Examples of comparable outcrop materials have been located by the author near the village of Panayia, Type 4, Lefkara translucent. Type 2 cherts have been found near villages on the coastal plain just east of Paphos and the hills around Kholetria. Type 3 basal Lefkara materials are widely available from both primary and secondary sources in and around the Dharizos river. Significant sources of the relatively lustrous, fine quality Type 1 nodular cherts have not yet been located by the author, but have been recovered as isolated finds.

Heat treatment is evident in the Kissonerga assemblage, but does not appear to have been well controlled. Many chert artefacts exhibit the improved grain structure and lustrous (soapy) surface texture considered to be criteria for distinguishing heat-treated chert materials (Cotterell and Kamminga 1987, 678; Rick and Chappell 1983, 71). Coloration changes are difficult to document due to the paucity of contrasting exterior surfaces, beyond examples with blackened cortex which are not necessarily the result of intentional heat-treatment. In translucent Type 4 materials the effect seems to have consistently produced either dark red or mottled brownish-grey colours providing the most direct evidence of heat-treatment. Significantly, relatively successful heating of Type 4 materials was used in the production of some of the pressure flaked pieces, undoubtedly an attempt to improve the knapping quality of this brittle raw material prior to executing the pressure retouch (see below). In the majority of cases, however, the heat treatment applied was poorly executed causing potlid fractures, extensive crazing and excess brittleness to occur. Despite being most often poorly executed, the application of heat treatment was a part, if perhaps somewhat experimental, of the Kissonerga chipped stone industry.

§ 21.7 Obsidian (C.M.)

Fourteen pieces of obsidian were recovered during the excavations at Kissonerga. Due to rarity of this non-indigenous raw material, 0.04% of the total chipped stone assemblage, each find was registered individually. A catalogue is provided below of each artefact listed by registration and unit numbers. Category type, secondary treatment (if present) as well as measurements of length, width and thickness are given. All examples are non-cortical unless otherwise stated.

KM 208/Unit 157.4 - Splintered piece. A non-cortical chip or medial bladelet segment with bi-directional negative scarring covering the dorsal and part of the ventral surfaces. Both proximal and distal ends are battered and stepped. Length - 11.34 mm, width - 10.34 mm, thickness - 2.66 mm.

KM 982/Unit 626 - Medial bladelet segment with both proximal and distal ends snapped. Length - 17.25 mm (originally 31 mm), width - 9.17 mm, thickness - 2.47 mm. Fig. 107.7.

KM 994/Unit 819 - Proximal bladelet fragment with a punctiform platform. This piece exhibits heavy abrasion on both lateral edges extending from the snapped medial to just below the platform. Because the piece also shows an extensive 'frost' patina over both ventral and dorsal surfaces it is difficult, without closer examination, to say whether the edge abrasion is indicative of use or weathering processes. Length - 26.50 mm, width -10.44 mm, thickness - 4.26 mm.

KM 1748/Unit 987 - Proximal bladelet fragment with a punctiform platform. The right lateral edge shows fine utilisation edge damage extending from the medial snap break to *c.* 5 mm below the platform. Length - 18.06 mm, width - 11.80 mm, thickness - 2.82 mm. Fig. 107.4.

KM 1899/Unit 981 - Distal chip fragment. Length - 6.00 mm, width - 7.30 mm, thickness - 1.30 mm.

KM 1982/Unit 1147 - Complete chip with faceted platform. Gloss is present on the proximal end extending partly across the platform facets suggesting that this chip was created during the resharpening of a larger glossed element. Length - 10.96 mm, width - 6.52 mm, thickness - 1.06 mm.

KM 2110/Unit 1225 - Medial bladelet segment with both proximal and distal ends snapped. Length - 14.50 mm, width - 12.64 mm, thickness - 3.74 mm.

KM 2169/Unit 1327 - Splintered piece. A diminutive chunk with bi-directional negative scarring on all surfaces. Both proximal and distal ends are battered and stepped. Length - 14.70 mm, width - 7.30 mm, thickness - 3.50 mm. Fig. 107.5.

KM 2372/Unit 1331 - Chip shatter fragment. Length - 1.02 mm, width - 2.40 mm, thickness - 1.30 mm.

KM 2464/Unit 1312 - Retouched medial blade segment. This unique piece exhibits abrupt/semi-abrupt retouch on the left lateral edge extending the entire length of the edge. Fine, inverse edge damage lies adjacent to this retouch, while the opposing right lateral exhibits additional irregular utilisation or edge damage also on the ventral surface. The proximal and distal ends of the piece were both snapped and/or crudely shaped. A very light 'frost' patina has developed on both ventral and dorsal surfaces. Length - 19.12 mm, width - 21.20 mm, thickness - 5.38 mm. Fig. 107.2.

KM 3061/Unit 560 - Distal chip fragment. Length 4.88 mm, width - 3.12 mm, thickness - 0.50 mm.

KM 3062/Unit 1375 - Complete chip with punctiform platform. Length - 4.34 mm, width - 5.90 mm, thickness - 0.86 mm.

KM 5181/Unit 1623 - Medial bladelet segment, with both proximal and distal ends snapped. Length - 0.80 mm, width - 10.0 mm, thickness - 0.23 mm.

KM 5261/Unit 0 - Medial bladelet segment, with both proximal and distal ends snapped, exhibiting a highly developed gloss. Length - 29.01 mm, width - 8.45 mm, thickness - 2.32 mm.

In chronological terms the largest concentration of the obsidian sample (n=6 or 42.86%) was collected from contexts assigned to Period 3B: KM 982, 1899, 2110, 3061, 3062, and most notably 1748 the bladelet proximal with lateral utilisation damage. One of the six Period 3B pieces, a medial bladelet segment (KM 2110), comes from an *in situ* context belonging to the ceremonial area, pit 1225. KM 3062 was collected from a somewhat less secure unit also associated with the Ceremonial Area. Examples KM 982, 1748 and 1899 were collected from building materials; the first deriving from a disturbed fill in B 206 and the latter two examples from mixed structural occupation materials belonging to B 994. The remaining obsidian piece belonging to Period 3B was incorporated into a disturbed grave deposit. The contextually insecure obsidian pieces belonging to the Period 3B sample as well as the general assumption that obsidian is diagnostic of the Aceramic period in Cyprus demand that these artefacts be considered as derived. The area from which the 3B obsidian materials were recovered represents a discrete focus of Period 3B activity, but one cut down to bedrock possibly truncating earlier levels of Aceramic occupation (see § 3.1). Other potentially diagnostic tool types like the pressure retouched pieces are also somewhat more frequent in 3B contexts suggesting either a concentration exhibiting skill and 'wealth', or the effects of disturbance into Aceramic Neolithic occupation materials (Peltenburg 1993, 12-15; see also below). The obsidian present in the Chalcolithic assemblage of Kissonerga, however, represent extensively reduced items that could have been reused, perhaps as heirlooms, particularly during Period 3B (cf. Peltenburg 1979).

Three additional obsidian pieces were recovered from Period 4, two examples from mixed contexts and one further example from a contaminated context, KM 2169, 2372, 2464; the last example being the only retouched piece of obsidian in the sample. One more example came from a questionable Period 4 context, KM 994, completing the total proportion (28.57%) of obsidian artefacts assigned to Period 4. Only the last example was associated with a structure, B 375. The other Period 4 examples were recovered from an external surface (KM 2169) or general occupation contexts (KM 2372 and 2464).

Of the remaining four obsidian examples, one each was collected from a mixed 2/3A pit context (KM 1982) and one from a contaminated Period 3A pit (KM 5181). The final two obsidian pieces were collected from the surface, though notably, one of these KM 5261 was collected near B 2 of Period 3B.

The nature of the obsidian reduction strategy is impossible to describe in any detail considering the paucity of the sample. Chemical composition and provenience of the obsidian belonging to the Kissonerga assemblage are provided in § 9.3. In general, the category types represented by the obsidian sample would be at home in the larger Kissonerga assemblage. The diminutive splintered pieces, in particular, remind one of the numerous examples discussed in the core type section above, and, like the diminutive chips, suggest a desire to exploit obsidian materials to the fullest. Only two obsidian pieces demonstrated definite signs of utilisation, none showing the fine pressure retouch exhibited by the single tang example recently recovered from Khirokitia (Le Brun CARRI workshop 1994). The bladelet proximal showing extensive signs of abrasion and especially the probable resharpening chip from a larger obsidian glossed tool extend the functional possibilities shown by the sample. The method of production exhibited by the sample is distinguished from the larger chert assemblage by a strong lamellar (particularly bladelet) dominance (*c.* 50%), representing a contrast with the general paucity of blades and bladelets in the assemblage as a whole. Though cores and core trimming elements are absent, the obsidian blade and bladelet examples can be distinguished by their very regular, prismatic character (Crabtree 1968). Where platforms have survived they are predominantly punctiform identifying a specialised prepared core reduction strategy. While some of the finely retouched or utilised lamellar examples in the chert assemblage could also be considered prismatic, the majority of the chert blades and bladelets in the larger assemblage were less regular in character.

§ 21.8 Tools (C.M.)

The 3,270 retouched and utilised pieces belonging to the Kissonerga assemblage are described in the following section of the report. Eight tool classes were used to divide the total tool sample into generalised morphological groups. Individual tool types are defined within each particular class discussion. The attributes blank type, maximum tool length, tool edge thickness and raw material type were considered and are recorded in each tool class section. The total tool sample has been evaluated rather than considering only those pieces from clearly *in situ* contexts. Due to the paucity of absolutely *in situ* material and the wide variety of morphological types, excluding potentially mixed materials

Table 21.4. Burin types by period. (All contexts)

Period	*On-Brk*	*Simple*	*Dihed*	*Trunc*	*Mixed*	*Re-Use*	*Frag*	*Usewear*
Surface	13	2	4	5	2	14	6	0
%	32.50	5.00	10.00	12.50	5.00	35.00		
5	2	0	0	0	0	0	0	0
%	100.00	0.00	0.00	0.00	0.00	0.00		
5?	1	0	0	0	0	0	0	0
%	100.00	0.00	0.00	0.00	0.00	0.00		
4/5	2	0	0	0	0	0	0	0
%	100.00	0.00	0.00	0.00	0.00	0.00		
4	18	7	4	6	3	11	7	6
%	36.73	14.29	8.16	12.24	6.12	22.45		
4?	1	0	0	2	0	2	0	0
%	20.00	0.00	0.00	40.00	0.00	40.00		
3/4	1	0	0	2	0	1	0	3
%	25.00	0.00	0.00	50.00	0.00	25.00		
3B/4	2	0	0	0	1	0	0	0
%	66.67	0.00	0.00	0.00	33.33	0.00		
3A/4	3	0	0	0	0	1	0	1
%	75.00	0.00	0.00	0.00	0.00	25.00		
3	0	0	0	0	1	0	0	0
%	0.00	0.00	0.00	0.00	100.0	0.00		
3?	0	0	0	0	0	1	0	0
%	0.00	0.00	0.00	0.00	0.00	100.0		
3B	4	0	2	4	1	5	0	1
%	25.00	0.00	12.50	25.00	6.25	31.25		
3B?	0	0	0	0	0	1	0	0
%	0.00	0.00	0.00	0.00	0.00	100.00		
3A/B	1	1	0	1	1	3	0	0
%	14.29	14.29	0.00	14.29	14.29	42.86		
3A	13	7	2	13	9	17	4	4
%	21.31	11.48	3.28	21.31	14.75	27.87		
3A?	0	0	0	0	1	0	1	2
%	0.00	0.00	0.00	0.00	100.0	0.00		
2/3A	2	0	0	1	0	2	1	0
%	40.00	0.00	0.00	20.00	0.00	40.00		
2	1	0	2	2	0	1	1	0
%	16.67	0.00	33.33	33.33	0.00	16.67		
1A/1B?	0	1	0	0	0	0	0	0
%	0.00	100.00	0.00	0.00	0.00	0.00		
Total (N=247)	64	18	14	36	19	59	20	17
%	25.91	7.29	5.67	14.57	7.69	23.89	8.09	6.88

from the tool analysis would have provided an incomplete impression of the Kissonerga assemblage. Within each class, the clearly *in situ* items are noted and discussed in relation to the class sample as a whole. The number of items selected for use-wear analysis was included in the tabulations of all class totals. A brief assessment of the use-wear sample was conducted in order to ensure that the proportions for specific types in the main sample are indeed representative, but use-wear materials were not counted in the type distinctions nor considered in the attribute analysis. Items showing signs of re-use, a tool with secondary elements of another tool class, were documented separately within each class section where present. In assigning items to a particular class priority was given to the latest tool use as exhibited by overlapping retouches and the dominance of attributes belonging to any particular tool class. Though truly multiple tool exceptions do exist, the bulk of these items represent a curration behaviour in which tool blanks have been conserved.

Burins

The burin class is uniquely defined on the basis of technique. A burin is any piece on which the burin blow technique has been deliberately applied creating the negative burin facet(s) by which the class is generally known (Inizan, Roche and Tixier 1992, 70). Burin types are defined morphologically on the basis of the platform character. A total of 247 burins and burin fragments represent 7.55% of the total Kissonerga tool assemblage (Table 21.4). The manufacture of burins on previously retouched or utilised pieces represents a relatively high proportion of the sample demonstrating the greatest degree of tool re-use curration in the Kissonerga assemblage. Burin facets were most commonly struck on broken edges of previously retouched implements often employing earlier edge retouch as a backing opposite to the edge faceted by the burin blow technique (Fig. 103.12). It is equally possible, however, that the burin facet, itself, may have provided a backing to the retouched or utilised edge opposite; a possibility which can only be addressed through use-wear analysis (Finlayson 1989, 214). Within the fragment category a significant number of pieces represent deliberate re-sharpenings. A number of the latter are the platform end of concave truncation burins indicating that the intact examples of truncation burins represents a minimum number of a previously larger total sample. In addition to the sample selected for use-wear analysis, re-used examples and the fragmentary examples noted above, the five burin types employed in this analysis are defined below.

Burin-on-break

Any flake or blade segment on which one or more burin facets have been struck from a platform created by a simple, snapped, edge break. The break platform was most commonly located along a proximal or distal end thus establishing burin spall removals transversely along either or both lateral edges. That the burin blow technique was not always applied successfully is indicated by several examples with short, invasive or stepped multiple facet attempts. A small group of more successful examples exhibited multiple well struck negative burin facets on both lateral edges (previously referred to as 'multiple-burins' by Betts 1987, Fig. 3.8). The latter may provide evidence of deliberate burin spall production rather than the graving function traditionally associated with artefacts produced by the burin blow technique (Inizan, Roche and Tixier 1992, 78-79; Finlayson and Betts 1990; Finlayson 1989, 214). The later possibility must be seriously considered due to the number of drills made on burin spalls (see below). Fig. 103.9, 12, 13.

Simple burin

The term ' simple burin' was applied to any flake or blade which exhibited one or more burin facets struck from a non-modified edge. The edge selected for this unprepared platform was typically a broad, flat scar or natural back. Like the burin-on-break type described above, poorly struck facet attempts were not uncommon.

Dihedral burin

Any complete flake or blade or blank segment with intersecting burin facet scars creating a dihedral axis burin. In this case the platform for the second spall removal is the negative facet of a previously struck spall. A limited number of examples show burin facets intersecting at approximately 90 degree angles and would be more strictly assigned to a transverse category. The total number of the latter is, however, so low that they have been included along with the more classic dihedral examples. Fig. 103.8, 11.

Truncation burin

Any flake or blade segment on which one or more spalls were struck from a retouched truncation. The most common type of platform truncation was concave reaching a high standard of execution in several examples. Other truncated burins exhibited rectilinear platform edge faceting at times represented by little more than a series of crude chip removals. All examples included in this burin type, however, exhibit deliberate attempts to prepare the spall removal platform demonstrating a more complex methodology than that employed for other burin types described above. Fig. 103.7 and 10.

Mixed burin

Any burin on which two or more elements of the four basic types defined above were co-occurrent. Like those assigned to the re-use category, these examples probably represent the re-utilisation of individual implements within the burin class. Different burin type elements may have coexisted in cases where distinct edges of the same blank were modified separately.

A relatively high proportion (19% on average) of burins were produced on blades or bladelets compared to 81% using flake blanks (Table 21.5). The relatively high proportions of lamellar blanks, seen in all but the simple and re-used burin types, demonstrates a deliberate selection of elongated blanks similar to that exhibited by the glossed, perforator, retouched and utilised tool classes (see below). Only 6.25% of the simple burin type utilised blade and bladelet blanks. Burins made by the re-utilisation of other implements similarly exhibited a preference for flake blanks. Dihedral burins exhibited the highest blade/bladelet preference, nearly one third of the sample, while *c.* 20.00% of each of the on-break and truncation burins were produced on blades or bladelets. Burins produced on complete flakes or lamellar blanks are relatively rare. The preferred selection of medial blank segments is consistent across all types being almost exclusive within the blade and bladelet categories. Proximal and distal segments of flakes were more commonly employed, particularly for the burin-on-break type.

Table 21.5. Burin attributes

Blank type (based on a sample of 200 complete tools).	*On-brk*	*Simple*	*Dihed*	*Trunc*	*Mixed*	*Re-used*
Blade/Bladelet						
Complete	1	0	0	0	0	0
Proximal	3	0	0	0	0	0
Medial	7	0	4	7	4	3
Distal	2	1	1	0	0	3
% of type	20.63	6.25	31.35	21.88	22.22	10.91
Flake						
Complete	0	5	5	3	0	2
Proximal	12	1	1	0	3	7
Medial	31	5	3	21	9	17
Distal	7	4	2	1	2	23
% of type	79.37	93.75	68.75	78.13	77.78	89.09
Maximum tool length mm (based on a sample of 161 complete tools).	*On-brk*	*Simple*	*Dihed*	*Trunc*	*Mixed*	*Re-used*
Average	35.27	38.43	39.78	35.60	42.67	35.80
S-Std	0.88	1.19	1.08	1.57	1.38	0.98
S-Var	0.77	1.41	1.18	0.63	1.89	0.95
High	61.38	67.66	59.70	52.54	68.94	69.82
Low	23.12	26.58	28.70	22.18	24.34	19.92
Edge (breadth of burin facet) thickness mm (based on a sample of 161 complete tools)	*On-brk*	*Simple*	*Dihed*	*Trunc*	*Mixed*	*Re-used*
Average	6.18	5.41	6.52	6.72	9.07	5.93
S-Std	0.23	0.26	0.25	0.26	0.35	0.23
S-Var	0.23	0.07	0.06	0.63	0.12	0.05
High	11.44	11.36	11.64	11.82	17.84	12.02
Low	2.08	2.12	2.76	2.64	4.70	2.22
Angle of burin facet (based on a sample of 161 complete tools).	*On-brk*	*Simple*	*Dihed*	*Trunc*	*Mixed*	*Re-used*
Average angle	87	88	77	91	76	89

The burin class represents implements of a middle size range in the Kissonerga assemblage (Table 21.5). Average tool length rest between (35.25 and 42.67 mm) with moderately robust tool edge thicknesses of between (5.41 to 9.07 mm). The regular utilisation of both lamellar and flake blank segments for burin production is illustrated by the high standard deviations and variance levels demonstrated by the tool length statistics. Despite relatively high standard deviations and variance levels in the tool length attribute, burins as a class are more consistent in size than several of the other tool classes (see below). Maximal tool length does not exceed 70 mm (representing examples produced on blades) while the shortest examples are only *c.*10 mm smaller than the type averages. The dihedral and truncation types exhibit narrower tool length ranges followed closely by the burin-on-break type. The simple type as well as the mixed and re-use burin examples show more inconsistent manufacturing behaviours, which would be expected in cross tool reutilisation and/or more expedient tool use. Tool edge thickness (measured across the width of the latest burin facet) reconfirms the relative consistency with which burins were manufactured. In the four main burin types as well as examples made by tool re-use, high and low outliers vary within a *c.* 9 mm standard. Conversely, a wider range of variation in facet width *c.* 13 mm was exhibited by the mixed burin type, suggesting that a greater degree of error in the execution of these examples may have led to the mixing of burin type elements on the same individual implement.

Rather than measuring the edge angle attribute employed for other tool classes in the assemblage, the angle between the latest burin facet and the burin blow platform was considered. The average angles shown for each burin type help to demonstrate differences between the various types (Table 21.5). The higher angle values shown by both the dihedral and mixed burin type angles demonstrate the frequency with which artefacts assigned to the mixed type include elements of the dihedral type. If the juxtaposition of the facet edge to the platform is in any way functionally related, burins with intersecting facets may represent a different kind of implement than those with more nearly perpendicular angle arrangements.

Table 21.6. Burin raw materials (based on a sample of 163)

Material	*On-Brk*	*Simple*	*Dihed*	*Trunc*	*Mixed*	*Re-Use*	*Total*
Type 1	10	6	3	10	3	12	44
%	20.00	46.15	23.08	31.25	25.00	27.91	26.99
Type 2	17	3	3	4	2	12	41
%	34.00	23.08	23.08	12.50	16.67	27.91	25.15
Type 3	11	0	6	8	2	14	41
%	22.00	0.00	46.15	25.00	16.67	32.56	25.15
Type 4	12	4	1	10	5	5	37
%	24.00	30.77	7.69	31.25	41.67	11.63	22.70

			Colour			
Material	*Grey*	*Brown*	*Red*	*Yellow*	*Olive*	*White*
Type 1	15	1	8	6	13	1
%	34.09	2.27	18.18	13.64	29.55	2.27
Type 2	39	2	0	0	0	0
%	95.12	4.88	0.00	0.00	0.00	0.00
Type 3	9	11	5	7	4	5
%	21.95	26.83	12.20	17.07	9.76	12.20
Type 4	5	0	19	12	1	0
%	13.51	0.00	51.35	32.43	2.70	0.00

The distribution of raw material types is relatively consistent across all burin types and virtually equal for the class considered as a whole (Table 21.6). The simple burins exhibit an unusually high proportion of examples produced on the fine textured, cryptocrystalline Type 1 materials and a dearth of the often more grainy basal Lefkara (Type 3) materials. The simple production method of the latter burin type was probably fa-

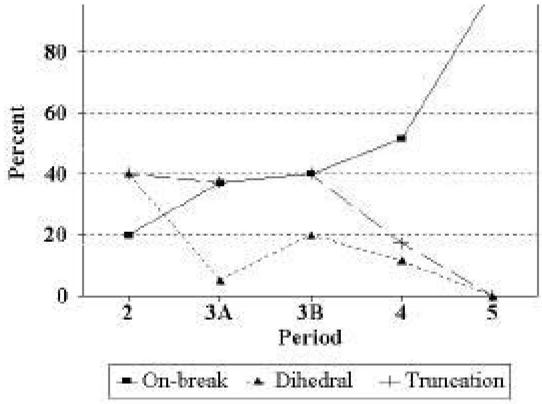

Fig. 117: Burin type percent

cilitated by the utilisation of high quality raw materials. Both dihedral and mixed burins demonstrate a frequent use of Lefkara raw materials; Type 3 for the former and translucent (Type 4) chert in the case of the latter. The tough quartz-like, nature of most Type 4 materials used at the site provides one possible explanation for the poor consistency of facet character in the mixed burin category. If burins can be considered as cores used for the production of spalls, the high proportion of basal Lefkara (Type 3) materials used for the manufacture of burins, dihedral examples in particular, may be signif i-cant considering the prominence of this raw material in the production of drills (see below).

Across the periods of occupation at the site, changes in type dominance are clearly represented by both the burin-on-break and truncation burin types (Table 21.4; Fig. 117). Changes in the proportions of both of these burin types over time demonstrate a trend away from the more methodologically complex truncation burins towards the simplified on-break type. Periods 2 and 4 show opposite proportions of these two burin categories with truncation burins representing a third of all Period 2 burins as opposed to just over a third of the Period 4 burins being represented by the burin-on-break type. Periods 3A and 3B demonstrate parallel proportions of these two burin types showing continuity with the EChal truncation examples and the gradual nature of the rise in the burin-on-break type. While the number of individual examples belonging to the burin class in Period 5 is small, this sample suggests that the burin-on-break had completely replaced other burin types by the close of the Chalcolithic at Kissonerga. Simple b u-rins, dihedral and mixed burins demonstrate relatively consistent low proportions of the total number of burins in each period (Table 21.4). As Fig. 117 shows, the dihedral type demonstrates an relative decline between Periods 2 to 5. The low proportion of mixed element burins during Period 4 seems consistent with the small proportion of dihedral burins also belonging to this period. The proportion of simple burins is consistent over time suggesting the expedient nature of this type.

Unfortunately, burin examples from purely *in situ* contexts are rare in all occupation periods. Examples from each of the main occupation periods broadly co n-firm the temporal shifts in burin type outlined above. In Period 2 *in situ* examples belong to the truncation and dihedral types (one example each). Three examples belong to Period 3A; one each from the truncation, b u-rin-on-break and simple types. Two examples of the truncation type were collected from Period 3B relative to a single burin-on-break example. From Period 4 the shift in burin type manufacture is represented by four burin-on-break examples relative to only two truncation examples. While the majority of the burins in the a s-semblage were recovered from potentially mixed co n-texts, the clear shift in the proportions of burin types from truncation and dihedral examples to the on-break burin type in the LChal is not contradicted by the e x-amples from *in situ* contexts.

Table 21.7. Burin context. (All contexts - [Building occupation 'A' and 'S*'])

Period	*Building*	*Pit*	*Surface*	*General*	*Other*	*Disturb*
5	0	0	0	2	0	0
%	0.00	0.00	0.00	100.0	0.00	0.00
5?	0	0	0	1	0	0
%	0.00	0.00	0.00	100.0	0.00	0.00
4/5	1	0	0	1	0	0
%	50.00	0.00	0.00	50.00	0.00	0.00
4	25 [21]	5	7	16	6	1
%	41.67	8.33	11.67	26.67	10.00	1.67
4?	0	5	0	2	0	0
%	0.00	71.43	0.00	28.57	0.00	0.00
3/4	0	0	0	7	0	0
%	0.00	0.00	0.00	100.0	0.00	0.00
3B/4	0	1	0	0	2	0
%	0.00	33.33	0.00	0.00	66.67	0.00
3A/4	0	3	0	0	2	0
%	0.00	60.00	0.00	0.00	40.00	0.00
3	0	0	0	0	1	0
%	0.00	0.00	0.00	0.00	100.0	0.00
3?	0	0	0	1	0	0
%	0.00	0.00	0.00	100.0	0.00	0.00
3B	10 [7]	3	0	1	2	0
%	62.50	18.75	0.00	6.25	12.50	0.00
3B?	0	0	0	1	0	0
%	0.00	0.00	0.00	100.0	0.00	0.00
3A/B	0	0	0	7	0	0
%	0.00	0.00	0.00	100.0	0.00	0.00
3A	22 [15]	5	0	42	0	0
%	31.88	7.25	0.00	60.87	0.00	0.00
3A?	0	3	0	0	1	0
%	0.00	75.00	0.00	0.00	25.00	0.00
2/3A	0	0	0	6	0	0
%	0.00	0.00	0.00	100.0	0.00	0.00
2	0	5	1	1	0	0
%	0.00	71.43	14.29	14.29	0.00	0.00
1A/1B?	0	1	0	0	0	0
%	0.00	100.0	0.00	0.00	0.00	0.00

The locations of burins in terms of six generalised context classes demonstrate a different spectrum for each of the main occupation periods (Table 21.7). B u-rins belonging to Period 1 were recovered only from pits. While Period 2 burins were recovered from exte r-nal surfaces and general occupation deposits, the vast majority had also been deposited in pits. During Periods 3A, 3B and 4 a more extensive range of discard behaviours was exhibited. In Period 3A, for example, a very high proportion of the burins were recovered from general occupation fills suggesting that burin use and discard both took place in the open informal areas beyond the structures. Evidence suggesting curative activity during Period 3A is evident by the relatively high (31.88%) proportion of burins found within building contexts, the majority from occupation deposits. From 4 to 7 burins were recovered in each of the buildings 1547, 1565 and especially 1016. The Period 3B sample, while small, showed a majority (62.50%) of burins belong to building contexts, with the remaining 37.50% scattered thinly between pit, miscellaneous and general contexts. All but 3 of the Period 3B burins recovered from structures were collected from occupation materials, but were distributed thinly across individual buildings: 2, 206, 855, 994 and 1000 in pairs or as single implements. The location of burins in Period 4 is again more widely distributed. The Period 4 sample shows a larger number of burins recovered from general occupation contexts. The majority of burins were mostly recovered from occupational building contexts in Period 4 and again distributed in low numbers throughout a long series of individual buildings: 3, 86, 200, 204, 493, 706, 834 and 866. Building 3 demonstrates the only significant concentration of burins (n=9) within a single structure.

Denticulates

Due to the irregular nature of much of the retouch in the Kissonerga assemblage, the term denticulate is used in this report to refer only to those chipped stone artefacts with a strongly denticulated edge delineation. With 192 examples, this class represents 5.87% of the total tool assemblage (Table 21.8). Denticulates (if they indeed represents a distinct tool class) were difficult to distinguish in the majority of cases from other tool classes, particularly scrapers, notches and some retouched examples. Nearly half (48.44%) represent a variety of resharpenings and fragmentary edges with deeply denticulated retouch. A further 9.90% are pieces with a denticulated edge delineation which appear to have resulted from scraper resharpening processes. The latter exhibit extremely similar retouch, edge convexity, raw material type and average edge angles with the scraper class as defined in the current report (see below). Similarly, pieces with fine edge denticulation made on less substantial edges may be shown to be nothing more than heavily damaged retouched flakes or blades exhibiting retouch irregular enough to appear ‘denticulated’ in some cases. The types used in this report designate two principle varieties of denticulated edge, the potentially resharpened scrapers, other examples that may be interpreted as either tool re-use or additional resharpening activities, fragments and a small use-wear sample.

Alternating denticulate

Any flake or blade or blank segment with a denticulated edge delineation created by alternating retouches along one or more edges. Fig. 107.13.

Direct denticulate

Any flake or blade or blank segment with direct retouch applied to create a strongly denticulated edge. Fig. 107.l2.

Scraper resharpening

Denticulated examples apparently recognisable as having derived from scraper retooling on the basis of other attributes. A distinct type was introduced in the present report in order to test the degree of correlation between these examples and the larger scraper class. Fig. 107.10.

Reused piece

Any piece with denticulated retouch in combination with or subsequent to other tool class elements.

Table 21.8. Denticulate type by period. (All contexts)

Period	*Alter-nating*	*Direct*	*Scr-Res*	*Re-used*	*Frag*	*Use-wear*
Surface	3	12	12	8	15	0
%	8.57	34.29	34.29	22.86		
5	0	1	0	2	4	0
%	0.00	33.33	0.00	66.67		
5?	0	1	1	0	1	0
%	0.00	50.00	50.00	0.00		
4/5	0	2	0	1	0	0
%	0.00	66.67	0.00	33.33		
4	4	12	3	5	40	4
%	16.67	50.00	12.50	20.83		
4?	0	1	0	0	1	0
%	0.00	100.0	0.00	0.00		
3/4	0	0	0	1	4	0
%	0.00	0.00	0.00	100.0		
3B/4	0	1	0	0	0	0
%	0.00	100.0	0.00	0.00		
3A/4	0	1	0	0	0	1
%	0.00	100.0	0.00	0.00		
3	1	1	0	0	0	0
%	50.00	50.00	0.00	0.00		
3?	0	0	0	0	2	0
%	0.00	0.00	0.00	0.00		
3B	0	2	1	1	5	0
%	0.00	50.00	25.00	25.00		
3B?	0	0	0	0	1	0
%	0.00	0.00	0.00	0.00		
3A/B	0	2	1	1	3	0
%	0.00	50.00	25.00	25.00		
3A/B?	0	0	0	0	0	0
%	0.00	0.00	0.00	0.00		
3A	0	8	1	1	15	1
%	0.00	80.00	10.00	10.00		
2/3A	0	0	0	1	2	0
%	0.00	0.00	0.00	100.0		
2	0	1	0	0	0	0
%	0.00	100.0	0.00	0.00		
Total (N=192)	8	45	19	21	93	6
%	4.17	23.44	9.90	10.94	48.44	3.13

Pieces with a denticulated edge delineation belonging to the Kissonerga assemblage were almost entirely produced on flakes (between 89 and 100%) in each of the four main types defined (Table 21.9). This dominant flake based blank selection closely reflects the character of the scraper class, though the use of blades and bladelets within the denticulate class (*c.* 6 to 10% for all but the alternate type) is demonstrably higher than that seen within the scraper class (see below). Of the small number of blade/bladelet blanks exhibiting denticulate retouch the majority are complete blanks. Conversely, the flake-based examples demonstrate the consistent use of medial and especially distal flake segments in addition to a large number of complete flake examples.

Table 21.9. Denticulate attributes

Blank type (based on 95 complete denticulates)	*Alternating*	*Direct*	*Scr-res*	*Reused*
Blade/Bladelet				
Complete	0	3	1	1
Proximal	0	0	0	0
Medial	0	0	1	0
Distal	0	1	0	1
% of type	0.00	10.26	6.45	10.53
Flake				
Complete	1	10	9	4
Proximal	0	1	2	4
Medial	3	11	5	4
Distal	2	13	13	5
% of type	100.0	89.74	93.55	89.47
Maximum tool length mm (based on a sample of 70 complete denticulates)	*Alternating*	*Direct*	*Scr-res*	*Reused*
Average	44.40	43.06	47.78	50.66
S-Std	1.24	1.61	1.65	1.94
S-Var	1.53	2.60	2.72	3.76
High	54.38	97.84	77.98	75.62
Low	23.28	18.34	26.68	19.90
Edge thickness mm (based on a sample of 70 complete denticulates)	*Alternating*	*Direct*	*Resharp*	*Multiple*
Average	10.18	8.07	8.91	7.58
S-Std	0.48	0.37	0.31	0.28
S-Var	0.23	0.14	0.10	0.08
High	16.40	20.10	15.52	10.94
Low	4.34	2.98	3.90	2.22

In terms of maximum tool length (between 43.06 mm and 50.66 mm) the denticulate class parallels the average tool length of the scraper class (between 43.60 mm and 54.87 mm) (Tables 21.9 and 21.29). The high and low outliers provided for maximum denticulate tool lengths are also comparable to those of the scraper class, but the standard deviation and variance statistics demonstrate the very wide degree of variation which characterises the denticulate class. Similarly, the direct, scraper-resharpening and re-use types demonstrate comparable edge thicknesses with the scraper class (between 7.58-8.91 mm for the denticulates relative to 7.81-9.55 mm for the scrapers, excluding the steep scraper type). The low degree of variation shown for the latter attribute provides a convincing parallel between the denticulate and scraper classes. Only the alternate denticulates stand apart demonstrating a greater average edge thickness of 10.18 mm. The lower degree of variability in the maximum tool length attribute of the alternate denticulate type also differs from the other denticulates.

Table 21.10. Denticulate raw materials (based on a sample of 114)

Material	*Alternating*	*Direct*	*Scr-resh*	*Re-use*	*Total*
Type 1	1	8 (1)	4	3	16
%	16.67	5.09	12.90	12.50	14.04
Type 2	3	22	17	10	52
%	50.00	41.51	54.84	41.67	45.61
Type 3	0	8	3	6	17
%	0.00	15.09	9.68	25.00	14.91
Type 4	2	13	6	5	26
%	33.33	24.53	19.35	20.83	22.81
Other	0	2	1	0	3
%	0.00	3.77	3.23	0.00	2.63

			Colour			
Material	*Grey*	*Brown*	*Red*	*Yellow*	*Olive*	*White*
Type 1	6	2	2	4	2	0
%	37.50	9.62	12.50	25.00	12.50	0.00
Type 2	47	5	0	0	0	0
%	90.39	9.62	0.00	0.00	0.00	0.00
Type 3	1	9	6	1	0	0
%	5.88	52.94	35.29	5.88	0.00	0.00
Type 4	7	2	5	5	0	7
%	26.92	7.69	19.23	19.23	0.00	26.92
Other	0	3	0	0	0	0
%	0.00	100.00	0.00	0.00	0.00	0.00

Raw material type, like the tool dimension attributes, suggests a strong link between the denticulate and scraper classes (Table 21.10 and 30). In proportions uniquely parallel to those of the scraper class, all denticulate types demonstrate a selective raw material bias in favour of Type 2 cherts. Between 41.51% to 54.84% of the denticulates were produced on Type 2 materials utilised in even greater proportions only in the scraper class. Significantly, the higher 54.84% value in the denticulate distribution belongs to the so-called scraper resharpening type. A secondary preference for the translucent Lefkara, Type 4, material also parallels the pattern found within the scraper class. The more uniform distribution of material types within the re-use examples demonstrates the multiple origins of the artefacts re-modified with denticulated retouch.

The poorly defined nature of the Kissonerga denticulates makes any discussion of chronological development difficult. The direct denticulate type accounts for the majority of examples in all periods (Table 21.8). Indeed, the only clear development occurs with the alternate denticulate type. The latter appears following Period 3B, being nearly isolated to Period 4 (Fig. 118). The specific character of the alternate denticulate type and the restricted nature of its distribution support the separate designation of these irregularly retouched implements. If the denticulate ever represented a discrete class of implements, it may have been during the earlier periods of occupation, 2 and 3A, as suggested by the paucity of items assigned to either the scraper re-

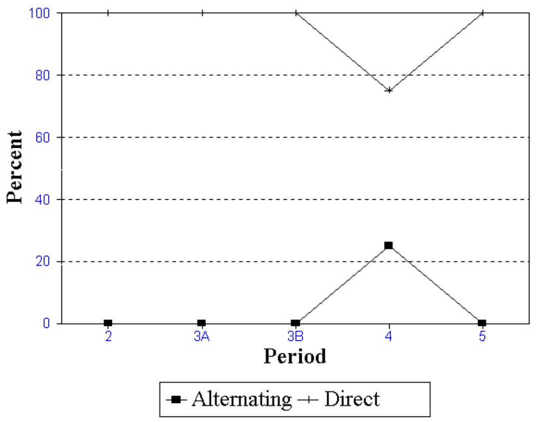

Fig. 118: Denticulate type percent

sharpening or re-use types. The direct and alternating denticulate types represent lower proportions of the total distribution of denticulates in post-3A period samples due to the rise in the number probable scraper re-sharpenings and ritualised examples.

Table 21.11. Denticulate context. (All contexts - [Building occupation 'A' and 'S*' contexts])

Period	*Building*	*Pit*	*Surface*	*General*	*Other*	*Disturb*
5	0	0	0	6	0	1
%	0.00	0.00	0.00	85.71	0.00	14.29
5?	0	0	0	3	0	0
%	0.00	0.00	0.00	100.00	0.00	0.00
4/5	0	1	0	1	1	0
%	0.00	33.33	0.00	33.33	33.33	0.00
4	23 [20]	19	3	19	5	0
%	33.33	27.54	4.35	27.54	7.25	0.00
4?	0	0	0	2	0	0
%	0.00	0.00	0.00	100.00	0.00	0.00
3/4	0	0	0	3	2	0
%	0.00	0.00	0.00	60.00	40.00	0.00
3B/4	1	0	0	0	0	0
%	100.0	0.00	0.00	0.00	0.00	0.00
3A/4	0	2	0	0	0	0
%	0.00	100.0	0.00	0.00	0.00	0.00
3	0	0	0	0	2	0
%	0.00	0.00	0.00	0.00	100	0.00
3?	0	1	0	0	1	0
%	0.00	50.00	0.00	0.00	50.00	0.00
3B	3 [2]	1	0	6	0	0
%	30.00	10.00	0.00	60.00	0.00	0.00
3B?	0	0	0	1	0	0
%	0.00	0.00	0.00	100.00	0.00	0.00
3A/B	0	6	1	4	0	0
%	0.00	54.55	9.09	36.36	0.00	0.00
3A	12 [11]	3	0	11	1	0
%	44.44	11.11	0.00	40.74	3.70	0.00
2/3A	0	1	0	2	0	0
%	0.00	33.33	0.00	66.67	0.00	0.00
2	0	1	0	0	0	0
%	0.00	100.0	0.00	0.00	0.00	0.00

During Period 3A, denticulates were recovered in nearly equal proportions from both the buildings and general occupation contexts (Table 21.11). The majority of the denticulates were recovered from occupation materials in Period 3A buildings; one each from B 1161 and 1565, with a more significant concentration of 6 denticulates collected from B 1016. Period 3B demonstrates an overwhelming preponderance of finds from general occupation contexts. A further 30% of the Period 3B denticulates were recovered from buildings, one each from B 206 and 994 came from occupation materials. In Period 4 the context distribution of denticulates is more varied. Relative to other occupation periods a greater number of denticulated implements were recovered from pit contexts (27.54%) in Period 4. A further small proportion (4.35%) of the Period 4 denticulates was recovered from external surface or floor areas. Exactly one third (n=23) of the Period 4 denticulates were collected in building contexts with only three of these deriving from structural units. B 3 (as expected) yielded the greatest concentration of examples from this tool class (n=9) with from 1 to 3 denticulates from each of B 86, 494, 706, 834, 1046 and 1052 occupation materials.

Table 21.12. Glossed element types by period. (All contexts)

Period	*Backed*	*Bac/Tru*	*Trunc*	*Unret*	*Frag*	*Usewear*
Surface	7	0	0	15	5	2
%	31.82	0.00	0.00	68.18		
5	0	0	0	0	1	0
5?	0	0	0	0	1	0
4/5	1	0	0	1	0	0
%	50.00	0.00	0.00	50.00		
4	6	2	2	20	10	9
%	20.00	6.67	6.67	66.67		
4?	0	0	0	0	2	0
3/4	0	0	0	1	3	1
%	0.00	0.00	0.00	100.00		
3/4?	0	0	0	0	1	1
3A/4	0	0	0	1	1	0
%	0.00	0.00	0.00	100.00		
3B	3	0	1	8	7	1
%	25.00	0.00	8.33	66.67		
3B?	0	0	1	0	2	0
%	0.00	0.00	100.00	0.00		
3A/B	1	0	0	1	3	0
%	50.00	0.00	0.00	50.00		
3A	3	2	1	12	9	6
%	16.67	11.11	5.56	66.67		
3A?	0	1	0	0	0	2
%	0.00	100.00	0.00	0.00		
2/3A	1	1	1	6	3	0
%	11.11	11.11	11.11	66.67		
2	0	1	0	0	0	0
%	0.00	100.00	0.00	0.00		
1A/1B?	0	1	0	1	0	0
%	0.00	50.00	0.00	50.00		
Total (N=172)	22	8	6	66	48	22
%	12.79	4.65	3.49	38.37	27.91	12.79

Glossed elements

The more general term 'glossed elements' is used in this analysis to include all examples of gloss replacing the functionally specific term 'sickle' (after Gebel, Kozlowski and Rollefson *et al.* 1994). A total of 172 glossed pieces (5.26% of the total tool sample) were either unretouched or exhibited gloss in association with retouched backing and/or end truncation(s) (Table 21.12). A number of examples with gloss were reused as other tool class implements, indicating that the low number glossed elements discussed below represents a minimum number of the total glossed elements once utilised at the site. The 172 examples assigned to the glossed element class were categorised into four main types: backed, backed and truncated, truncated and unretouched. Fragmentary glossed elements and examples selected for use-wear analysis were counted separately.

Backed glossed element
Any complete blade, bladelet, flake or blank segment exhibiting abrupt or semi-abrupt continuous retouch along one lateral edge opposite to the edge bearing gloss. Unidirectional retouch accounts for the majority of cases (n=9) of which two examples on thin bladelets show very fine abrupt retouch. One other example exhibits a crudely chipped back. Abrupt bi-directional retouch occurs in four cases as well as two additional pieces with steep alternating retouch. Natural backing was relatively frequent (n=7) of which two examples also demonstrated limited retouching along the cortical edge. Fig. 107.8, 9 and 11.

Backed and truncated glossed element
Any complete blank or blank segment on which abrupt or semi-abrupt backing retouch has been executed on one lateral edge as well as the distal and/or proximal end(s). The majority (n=5) are truncated on only one end. Two examples (one each from Periods 2 and 3A) have both proximal and distal end truncations representing the most well executed glossed pieces in the assemblage. Two other such finely backed and double end truncated glossed elements were included in the use-wear sample, one each from Periods 3A and 4. A further unique backed and truncated piece without gloss (from Period 3B) was assigned to the retouched class, but probably relates to this rare microlithic component of the glossed class. One further example of the backed and truncated type is distinguished by having more robust abrupt retouch along a naturally backed lateral edge. Fig. 107.3.

Truncated glossed element
Any blank or blank segment which exhibits one or two abrupt or semi-abrupt retouched truncation(s) on the distal and/or proximal ends, but exhibits no form of lateral backing. Within this glossed type there was a preference for distal end truncations (n=5). Only one example had both proximal and distal ends truncated.

Unretouched glossed element
Any blank or blank segment exhibiting gloss along one or both lateral edges (also including a single example with gloss on the distal end), but without any form of backing or end truncation. Fig. 107.1 and 6.

By definition, the backed type examples all exhibited unilateral gloss. The majority of the unretouched examples as well as the truncated examples, however, also demonstrated only a single glossed edge (Table 21.13). The dominant distribution of gloss on a single lateral edge suggests that the majority of the glossed elements may have once been hafted. Bilaterally glossed examples belonging to the unretouched type (n=12) were rare, but demonstrate possible rehafting of glossed elements or hafting methods focusing on the tool end. A few very large glossed elements made on irregular blades also suggest the possibility of some hand-held examples.

Table 21.13. Glossed element attributes

Blade/Bladelet	*Backed*	*Backed/ Truncated*	*Truncated*	*Unretouched*
Location of Gloss (based on a sample of 98)				
Right	10	5	4	31
Left	8	3	2	22
Bilat	0	0	0	12
Distal	0	0	0	1
Blank Type (based on sample of 100)				
Complete	4	0	0	6
Proximal	2	0	0	7
Medial	3	3	0	8
Distal	1	0	0	3
Total	10	3	0	24
% of type	50.00	37.50	0.00	36.36
Indeterminate: (blank segments with parallel lateral edges)				
? Proximal	0	0	0	1
? Medial	2	1	1	12
? Distal	1	1	2	3
Total	3	2	3	16
% of type	15.00	25.00	50.00	24.24
Flake				
Complete	0	1	0	4
Proximal	1	0	0	9
Medial	3	1	1	11
Distal	3	1	2	1
Total	7	3	3	25
% of type	35.00	37.50	50.00	37.88
Chip				
Total	0	0	0	1
% of type	0.00	0.00	0.00	1.52
Type Total	20	8	6	66
Maximum tool length mm (based on a sample of 78)				
Average	40.19	40.57	35.42	38.85
Sample Standard	1.74	1.08	0.28	1.92
Sample Varience	3.04	1.16	1.41	3.69
High	92.66	60.16	51.16	90.50
Low	23.54	29.32	23.42	14.32
Edge thickness mm (based on a sample of 78)				
Average	3.32	5.31	5.22	2.68
Sample Standard	0.20	0.32	0.28	0.19
Sample Varience	0.04	0.10	0.08	0.03
High	8.02	10.62	9.10	9.82
Low	0.96	2.66	2.80	0.24
Edge angle (based on a sample of 60)				
Average	40	45	59	40

A slight preference for utilisation of the right lateral edge was exhibited by all types (see Table 21.13). Backed examples show a nearly equal distribution (1.3:1) between right and left lateral glossed edges. Truncated glossed elements as well as backed and truncated pieces both demonstrated a nearly 2:1 relationship favouring the use of right lateral edges. Of the unretouched glossed pieces utilisation of the right lateral was again dominant (1.4:1) showing a ratio nearly parallel to the backed examples. One unretouched glossed piece exhibiting continuous gloss onto a proximal corner, while another example had gloss development that terminated abruptly half way down the lateral edge. A further unique example from the unretouched type showed gloss development isolated on the distal edge. The degree of variation in the location of gloss does support the possibility that at least some glossed pieces were composite elements within a single haft (but see Finlayson 1989, 215 for an alternative discussion).

Most of the glossed edges (as well as a few non-glossed edges) exhibited edge damage. In the majority of cases light damage scarring in the form of fine, discontinuous, angular chipping (possibly post-depositional) overlay the gloss. Gloss development was narrow and generally light (between 1-2 mm) in most cases, though examples with more extensive gloss do exist. Visibility of the gloss appears to be dependent, in part, on raw material type with coarser raw materials often not exhibiting clear gloss development (Finlayson 1989). Twelve examples in the sample demonstrated edge damage and/or resharpening scars both under and over the gloss clearly demonstrating the more extended use of these pieces. Despite the greater care taken in shaping backings and/or truncations, extensive re-sharpening of glossed pieces was not a frequent event at Kissonerga.

Within the total Kissonerga tool assemblage, the glossed elements represent the class most frequently produced on blade and bladelet blanks or blank segments (Table 21.13). A relatively large number of pieces (n=24) were indeterminate with regard to blank type. Judging from the parallel nature of their lateral edges and flat profiles, these snapped segments suggest an essentially 'prismatic' blade or bladelet character (Crabtree 1968). Consideration of the more complete blade/bladelet blank examples (n=37) together with the parallel sided indeterminate blank examples demonstrates a 1.6:1 preference for the production of glossed elements on lamellar blanks. Gloss development on complete blanks represent only 15% of the sample, the majority belong to the unretouched type. Proximal and distal ends were employed in relatively equal proportions, but medial segments dominate in the blade, bladelet and flake blank types. Due to the high proportion of clearly snapped ends on these blank segments, the ability to separate complete from broken glossed elements was often difficult. While the gloss in many cases ran up to but not over a broken edge; the consistent size and shape of many segments appears more than accidental. Considering the relatively variable nature of the Kissonerga glossed element sample, the utilisation of blank segments seems probable. Irregularly broken small fragments or deliberately struck re-sharpenings were clearly distinguishable from the segments mentioned above and included in the fragment category.

Average maximum tool length (between 35 and 40 mm) was fairly consistent across the four main glossed element types (Table 21.13). The high degree of variance in the statistics of all types can be accounted for in part by the possibility of broken pieces (noted above). Within both the backed and unretouched types, however, it is the presence of very large (greater than or equal to 90 mm), possibly hand-held, examples that have effected the standard deviation and variance statistics. The average tool edge thickness shows glossed pieces with end truncations to be thicker, *c.* 5 mm on average, than either the backed or unretouched examples, 3.32 mm and 2.68 mm respectively.

Table 21.14. Glossed element raw materials (based on a sample of 80)

Material	*Backed*	*Bac/Tru*	*Trunc*	*Unret*	*Total*
Type 1	6	2	1	11	20
%	27.27	50.00	16.67	22.92	25.00
Type 2	4	0	1	7	12
%	18.18	0.00	16.67	14.58	15.00
Type 3	4	1	3	19	27
%	18.18	25.00	50.00	39.58	33.75
Type 4	8	1	1	11	21
%	36.36	25.00	16.67	22.92	26.25

			Colour			
Material	*Grey*	*Red*	*Yellow*	*Brown*	*Olive*	*White*
Type 1	7	7	3	1	2	0
%	35.00	35.00	15.00	5.00	10.00	0.00
Type 2	12	0	0	0	0	0
%	100.00	0.00	0.00	0.00	0.00	0.00
Type 3	9	5	3	7	1	2
%	33.33	18.52	11.11	25.93	3.70	7.41
Type 4	5	9	7	0	0	0
%	23.81	42.86	33.33	0.00	0.00	0.00

A variety of raw materials was employed for the production of glossed pieces (Table 21.14). Across the total glossed sample material types 1 and 4 were employed in nearly parallel (*c.* 25%) proportions compared to a lower amount of Type 2 materials (15%) and a moderately high proportion (33.25%) of Type 3 materials. The backed as well as the backed and truncated examples were both dominated by fine quality material Types 1 and 4. Conversely, basal Lefkara cherts, Type 3, dominate the truncation and unretouched glossed varieties being represented by both fine grained and coarser examples. It should be noted that some pieces exhibited signs of intensive burning resulting in friable edges indicative of excessively heated chert. Gloss development on these examples may be related to burning activities and not derived from use (see § 9.2).

Table 21.15. Glossed element context. (All contexts - [Building occupation 'A' and 'S*' contexts])

Period	*Building*	*Pit*	*Surface*	*General*	*Other*	*Disturb*
5	0	0	0	0	0	1
%	0.00	0.00	0.00	0.00	0.00	100.00
5?	0	0	0	1	0	0
%	0.00	0.00	0.00	100.00	0.00	0.00
4/5	1	0	0	1	0	0
%	50.00	0.00	0.00	50.00	0.00	0.00
4	21 [16]	10	4	14	2	0
%	41.18	19.61	7.84	27.45	3.92	0.00
4?	0	0	0	2	0	0
%	0.00	0.00	0.00	100.00	0.00	0.00
3/4	0	0	0	4	0	0
%	0.00	0.00	0.00	100.00	0.00	0.00
3/4?	0	1	0	0	1	0
%	0.00	50.00	0.00	0.00	50.00	0.00
3A/4	0	2	0	0	0	0
%	0.00	100.00	0.00	0.00	0.00	0.00
3B	8 [7]	1	0	9	2	0
%	40.00	5.00	0.00	45.00	10.00	0.00
3B?	0	0	0	3	0	0
%	0.00	0.00	0.00	100.00	0.00	0.00
3A/B	0	2	0	3	1	0
%	0.00	33.33	0.00	50.00	16.67	0.00
3A	12 [8]	3	1	15	1	0
%	37.50	9.38	3.13	46.80	3.13	0.00
3A?	0	2	0	0	1	0
%	0.00	66.67	0.00	0.00	33.33	0.00
2/3A	0	0	0	11	0	0
%	0.00	0.00	0.00	100.00	0.00	0.00
2	0	1	0	0	0	0
%	0.00	100.00	0.00	0.00	0.00	0.00
1A/1B?	0	2	0	0	0	0
%	0.00	100.00	0.00	0.00	0.00	0.00

The greatest numbers of glossed pieces belong to Periods 3A, 3B and 4 (Table 21.12). A low number (n=29) of the glossed pieces were collected from *in situ* contexts; 6 from Period 3A, 3 from Period 3B and 16 belonging to Period 4. Of these clearly *in situ* examples the backed type is represented in Periods 3A (n=1) and 4 (n=2), while the backed and truncated type is represented only in Period 4 (n=2) with one other secure example from a temporally questionable 3A context. No truncated examples were collected from *in situ* contexts. The remainder of *in situ* examples was represented by unretouched tools or fragments belonging mainly to Period 4. A somewhat different picture is presented if the total proportions of the four glossed element types are considered (Fig. 119). Backed as well as the truncated glossed elements both peak proportionally during Period 3B. The backed and truncated type demonstrates a more erratic pattern showing low proportions during Periods 3A and 4 while being absent from Period 3B. The latter type provided the total number for the Period 2 glossed element sample, being represented by only a single example. All retouched glossed pieces, if combined, demonstrate parallel amounts of formal retouch across Periods 3A, 3B and 4 leaving (66.67%) of the glossed pieces unretouched in each of these three periods.

In terms of context, the majority of glossed pieces (46.80-45.00%) was recovered from general occupation contexts during Periods 3A and 3B (Table 21.15). Over

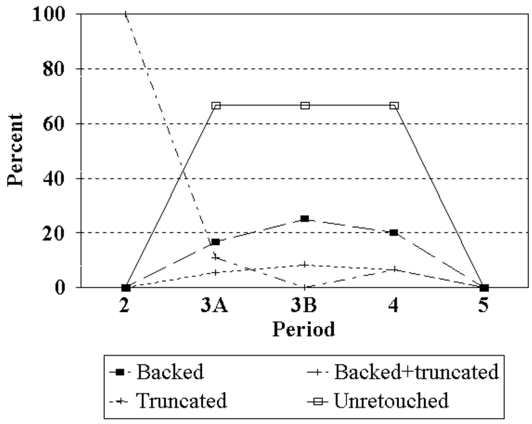

Fig. 119: Glossed element type percent

a third (37.50% in Period 3A to 41.18% in Period 4) were recovered from buildings, 31 of which derive from occupation debris. In Period 4, nine glossed pieces belonging to building 3 represent the greatest concentration of glossed pieces within a single structure on the site. Further concentrations of glossed elements belong to B 1016 (n=6) in Period 3A and B 2 (n=4) in Period 3B. The remaining building finds scattered more widely as single or paired examples during all periods: B 1161, 1295, 1547 and 1565 from Period 3A, B 855, 994 and 1161 belonging to Period 3B and B 375, 376, 834, 866 and 1052 in Period 4. A more moderate proportion of the glossed pieces were recovered from pit contexts (from 5.00% in Period 3B to 19.61% in Period 4), suggesting a less consistent pattern of deliberate disposal for this tool class. The single glossed piece from the EChal (Period 2) was also recovered from a pit similar to other tool classes in the Period 2 sample. Two examples were derived from the potential 'buildings' ascribed to Period 2, one each for Units 1651 and 1596. Only during Periods 3A and 4 were glossed pieces recovered from external floors and surfaces being somewhat more frequent during the latter period.

Notches

A total of 484 pieces representing 14.80% of the total tool assemblage were assigned to the notch class making this class one of the most numerous tool categories in the Kissonerga assemblage (Table 21.16). While many of the pieces belonging to the notch class were produced by regular abrupt or semi-abrupt retouch, a significant number were rather crude in manufacture, showing steep heavily stepped, irregular retouch. The variety demonstrated by this class suggests, that several functions were probably performed with these implements. It seems likely that some notches were introduced in order to facilitate hafting arrangements, a point which could be clarified by use-wear analysis in the future (Finlayson 1987, 14, pers observ). Six types in addition to those designating fragmentary examples and the sample removed for use-wear analysis have been introduced in order to illustrate the degree of variety found within this large class of artefacts, and to provide a basis for future analysis.

Table 21.16. Notch types by period. (All contexts included)

Period	Clact	Double	Single	W/Ret	Fine	Re-used	Frag	Use-wear
Surface	0	13	38	27	39	3	5	2
%	0.00	10.83	31.67	22.50	32.50	2.50		
5	0	0	3	0	7	0	0	0
%	0.00	0.00	30.00	0.00	70.00	0.00		
5?	0	2	1	0	5	0	0	0
%	0.00	25.00	12.50	0.00	62.50	0.00		
4/5	0	1	0	0	2	0	0	2
%	0.00	33.33	0.00	0.00	66.67	0.00		
4	6	11	39	13	51	2	10	9
%	4.92	9.02	31.97	10.66	41.80	1.64		
4?	0	0	1	1	2	0	1	1
%	0.00	0.00	25.00	25.00	50.00	0.00		
3/4	1	0	2	0	3	1	0	1
%	14.29	0.00	28.57	0.00	42.86	14.29		
3/4?	0	0	0	0	0	0	0	2
%	0.00	0.00	0.00	0.00	0.00	0.00		
3B/4	0	0	1	1	1	0	0	0
%	0.00	0.00	33.33	33.33	33.33	0.00		
3A/4	0	0	1	0	1	0	0	0
%	0.00	0.00	50.00	0.00	50.00	0.00		
3	0	1	0	0	2	0	0	0
%	0.00	33.33	0.00	0.00	66.67	0.00		
3B	1	1	11	3	12	0	1	2
%	3.57	3.57	39.29	10.71	42.86	0.00		
3B?	0	0	0	1	0	0	3	0
%	0.00	0.00	0.00	100.00	0.00	0.00		
3A/B	1	0	7	5	5	0	1	1
%	5.56	0.00	38.89	27.78	27.78	0.00		
3A	3	9	13	8	31	2	6	17
%	4.55	13.64	19.70	12.12	46.97	3.03		
3A?	0	0	1	1	1	0	0	4
%	0.00	0.00	33.33	33.33	33.33	0.00		
2/3A	0	1	3	1	2	0	0	1
%	0.00	14.29	42.86	14.29	28.57	0.00		
2	1	1	1	2	3	0	2	0
%	12.50	12.50	12.50	25.00	37.50	0.00		
Total (N=484)	13	40	122	63	167	8	29	42
%	2.69	8.26	25.21	13.02	34.50	1.65	5.99	8.68

Clactonian notch

Any flake, blade or blank segment exhibiting a notch produced by a single flake or chip removal. This type has been included since it has been regarded as a relevant tool type elsewhere (e.g. Inizan, Roche and Tixier 1992, 82). Considering the very high proportion of broken debitage in the total assemblage (see Tables 21.1 and 2) it is likely that so-called clactonian notches would represent little more than broken or trampled debitage. The examples included within the notch class have, therefore, been selected on the basis of an additional criteria: the presence of edge damage within the 'notch' area suggesting utilisation. Clactonian notches in the Kissonerga assemblage represent only a small proportion (2.69%) of the total notch class. Fig. 105.7.

Double notch

Any blank or blank segment with two discrete notches formed by abrupt or semi-abrupt retouch. Fig. 105.2 and 8.

Single notch

Any blank or blank segment with a single discrete notch formed by abrupt or semi-abrupt retouch, though rare examples made by relatively flat, invasive retouch do exist. Fig. 105.1, 3 and 9.

Notch with retouch

Any blank or blank fragment with abrupt or semi-abrupt retouch forming a discrete notch(es) as well as one or more segments of continuous retouch on any edge outside the area of the notch itself. With this notch type, in particular, the possibility of the notch representing a hafting point in support of or in correlation with the additional area of retouch seems most likely. In other cases, however, the additional retouch may have provided a backing for the notch itself. Fig. 105.5, 8 and 10.

Fine notch

Small flakes or bladelets or chips, generally complete, which exhibit continuous regular, fine abrupt or semi-abrupt retouch forming a 'notch' on either and end or lateral edge of the flake. These small finely worked notches closely resemble examples placed within the retouched class differing only in the rectilinear edge delineation belonging to the latter.

Reused piece

Any blank or blank segment showing one or more elements belonging to other tool classes which suggest that the piece was employed as a member of another tool category prior to having been remodified by the notch retouch. Fig. 105.4 and 6.

Flakes were the dominant blank type representing 82.61 to 100% of the notched class (Table 21.17). Complete flakes as well as medial segments were used most frequently, though proximal and distal fragments were not infrequent. Blades and bladelets with notches do occur, especially within the double notch category, being absent only from the limited clactonian category. A more unusual blank type occurrence, however, is the relatively high concentration of chips utilised in the fine notch type. These diminutive implements were, no doubt, used for different purposes than the large steeply retouched notches.

The tool length and edge thickness statistics illustrate the wide range of variety represented by the notch class (Table 21.17). Fine notches and the reused pieces are marked by their small (22.52 mm and 23.89 mm respectively) average size, illustrating the fragmentary nature of most pieces reused within the notch class. Single notches show the greatest average maximum length (42.09 mm). The full range of average notch lengths shows wide standard deviation and variance parameters in all but the fine and mixed notch types. The edge thickness measurement, however, goes some way toward unifying types within the notch class. The clactonian, single and double notches demonstrate very close average edge thickness values (between 6.43 mm and 6.66 mm). The mixed type too is not far from the above average edge thickness values at 7.05 mm, while both the fine and notch-with-retouch types differ more widely (3.65 mm and 8.54 mm respectively). These more widely separate edge thickness values suggest functional variations within the class, particularly regarding the fine type. While the standard deviation and variance values for the fine notch type show the consistent diminutive size of these notches, the notch-with-retouch type contains high and low outliers that are comparable with the rest of the notch class.

Table 21.17. Notch attributes

Blank Type (based on a sample of 394 complete Notches).

	Clact	Double	Single	W/Ret	Fine	Reused
Blade/Bladelet						
Complete	0	1	5	0	1	0
Proximal	0	0	0	0	1	0
Medial	0	3	1	0	4	1
Distal	0	0	2	1	2	0
Total	0	4	8	1	8	1
% Type	0.00	10.53	7.14	1.79	4.97	7.14
Flake						
Complete	5	4	24	11	90	4
Proximal	1	5	19	5	8	5
Medial	3	17	41	29	21	4
Distal	4	6	18	9	14	0
Total	13	32	102	54	133	13
% Type	100.0	84.21	91.07	96.43	82.61	92.86
Chip						
Complete	0	2	2	1	12	0
Proximal	0	0	0	0	0	0
Medial	0	0	0	0	5	0
Distal	0	0	0	0	3	0
Total	0	2	2	1	20	0
% Type	0.00	5.26	1.79	1.79	12.43	0.00
Total	13	38	112	56	161	14
Maximum Tool Length mm (based on a sample of 213 complete Notches).						
Average	37.10	34.50	42.09	31.94	22.52	23.89
Standard	1.62	1.15	1.64	1.38	0.60	0.66
Varience	2.63	1.33	2.77	1.90	0.36	0.43
High	72.02	61.02	81.92	62.88	39.86	30.44
Low	14.10	19.24	10.92	16.98	11.28	15.20
Edge Thickness (based on a sample of 213 complete Notches).						
Average	6.66	6.43	6.55	8.54	3.65	7.05
Standard	0.35	0.25	0.30	0.36	0.19	0.41
Varience	0.12	0.06	0.09	0.13	0.03	0.17
High	15.20	10.44	15.18	14.94	10.54	14.82
Low	2.32	2.56	1.38	3.16	0.94	3.34

The raw material characterisations for the notch class demonstrate variation only partly correlating with the basic divisions in the notched class shown in Table 21.18. Within each notch type, nearly half (41.18 to 54.55%) of the raw materials utilised belong to a single material category. The clactonian, fine and notch-with-retouch types were all produced with basal Lefkara cherts, Type 3, in the majority of examples. In contrast Type 2 raw materials are most well represented in the double notch and single type varieties. Only the mixed type notches show a predominance of the translucent Lefkara material, Type 4. Important to the raw material type distribution is the relative dominance of the coarser grained materials of Type 3 as well as those with greater surface roughness in the Types 2 and 4 varieties. Only the fine notch type demonstrates a significant utilisation (26.60%) of the highly cryptocrystalline Type 1 nodular cherts again demonstrating their more delicate character. Other notches show relatively low proportions (0 to 17.37%) of Type 1 materials, demonstrating the lowest overall utilisation of Type 1 materials of any tool class in the Kissonerga assemblage.

Table 21.18. Notch raw materials (based on a sample of 213 complete notches)

Attributes	Type 1	Type 2	Type 3	Type 4
Clactonian	0	4	6	4
%	0.00	28.57	42.86	28.57
Double	0	6	5	3
%	0.00	42.86	35.71	21.43
Single	10	28	26	4
%	14.71	41.18	38.24	5.88
Fine	25	17	44	8
%	26.60	18.09	46.81	8.51
W/ Retouch	0	1	6	4
%	0.00	9.09	54.55	36.36
Reused	2	3	2	5
%	16.67	25.00	16.67	41.67
Total	37	59	89	28
%	17.37	27.70	41.78	13.15

			Colour			
Material	Grey	Red	Yellow	Brown	Olive	White
Type 1	6	10	9	3	9	0
%	16.22	27.03	24.32	8.11	24.32	0.00
Type 2	52	0	0	7	0	0
%	88.14	0.00	0.00	11.86	0.00	0.00
Type 3	6	17	27	15	13	11
%	6.74	19.10	30.34	16.85	14.61	12.36
Type 4	6	10	8	1	1	2
%	21.45	35.71	28.57	3.57	3.57	7.14

Changes in the use of different notch types through the main occupation periods of the site is difficult to access due to the varying proportions shown by each type and the large number of pieces assigned to chronologically questionable contexts (Table 21.16; Fig. 120). Clactonian notches, if they are to be regarded as real type, appear to be a relatively insignificant in all periods except Period 2; a peak of 12.50%, however, is based on only one example. Double notches represent a low but significant proportion of the total notch sample in Periods 2, 3A and 4, decreasing temporarily during

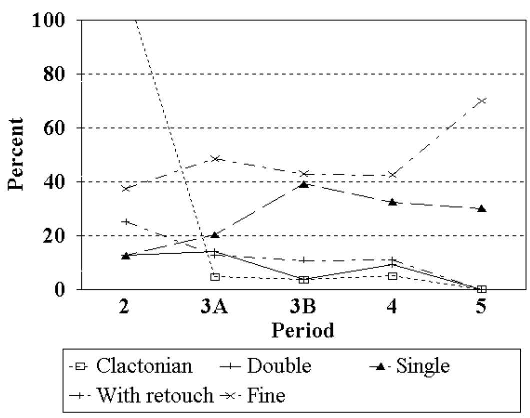

Fig. 120: Notch type percent

Period 3B. Fig. 120 shows a more gradual decrease in the double notch type despite the extreme low belonging to Period 3B. The single notch type depicts a relatively clear chronological development. Starting as a low proportion of the notches in samples belonging to Periods 2 and 3A, single notches increase in number to account for *c.* 1/3 of the total number of notches in Periods 3B (where the type reaches a high peak) 4 and 5. Examples of notches-with-retouch demonstrate an opposite trend decreasing from a peak during Period 2 to low proportions in Periods 3A through 4, disappearing finally in Period 5. The dominant type in all periods is the fine notch. Appearing first during Period 2 with 37.50%, this type of notch increases from a relatively consistent value (46.97 and 41.80% , respectively) between Periods 3A and 4 to a peak of 70% in the small Period 5 sample.

In general, both single and fine notches clearly increase during Period 3A to dominate the notch class in this and all remaining periods. The remaining notch types; clactonian, notches-with-retouch and double notches decrease and survive only as low proportions of the total notch distribution between Periods 3A to 4, disappearing finally in Period 5. The number of notches from *in situ* contexts generally reflects the distribution and development of notch types described above. Single notches from *in situ* contexts appear in Period 3A (n=2) and show an increase (5) during Period 4. Similarly, fine notches increase from Period 3A (4) to Period 3B (6), with a large number of *in situ* examples (10) belonging to Period 4. Of the less frequent notch types only notch-with-retouch examples were collected from *in situ* deposits during Periods 3A (n=2) and 3B (1), but confirm the decreasing trend suggested above. In the Period 4 sample examples of clactonian (2), double (5) and notch-with-retouch types (2) were collected from *in situ* deposits contradicting the pattern outlined above on the basis of the entire notch sample.

Periods 2 and 5 demonstrate the typical context priorities seen with other tool classes, being heavily dominated by pits during Period 2 (with four examples: Units 1651 (1), 1594 (1) and two examples in Unit 1594 from the ephemeral EChal structures), and consisting only of general occupation materials from Period 5 (Table 21.19). Periods 3A and 4 each show a significant number of notches collected from general occupation deposits, representing a peak in the Period 4 tool context distribution. Pit occurrences were relatively frequent for notches during Periods 3A and 4. The proportion of notches collected from external surfaces, reaching a peak during Period 2, is more moderate during Period 4 and virtually equal during Periods 3A and 3B. Relatively low proportions of notches from building contexts were recovered during Periods 3A and 4, while the comparable statistic from Period 3B is again high as seen with other tool distributions. A low number of tools was again collected from a number of different buildings in each period. Period 3A shows 1 notch from occupation deposits in each of the following buildings: 1161, 1295, 1565 and 1638. A further 4 notches were collected from B 1016 and a significant collection from building 1547 (7) were also retrieved from occupational materials. The 61.29% of notches found in Period 3B building contexts represent a heavy concentration of notches within buildings compared to either preceding (3A) or succeeding (4) periods. From 1 to 4 notches collected from each of following structures: 2, 4, 206, 855, 994, 1000 and 1103. Despite the low total proportion of notches from building contexts in Period 4, this period still shows the greatest variety of individual structures. Single notch examples from occupation deposits were recovered from the following structures: 1, 86, 96, 204, 376, 493, 736, 834, 1046 and 1165. Two more notches were collected in building 706 occupation levels, a further 3 from B1052 and the expected peak from B 3 (11). Of the notches listed under the 'other' label, the majority was re-deposited in grave fills.

Table 21.19. Notch context. (All contexts - [Building occupation 'A' and 'S*'])

Period	*Building*	*Pit*	*Surface*	*General*	*Other*	*Disturb*
5	0	0	0	6	0	4
%	0.00	0.00	0.00	60.00	0.00	40.00
5?	0	0	0	8	0	0
%	0.00	0.00	0.00	100.0	0.00	0.00
4/5	0	1	0	4	0	0
%	0.00	20.00	0.00	80.00	0.00	0.00
4	41 [26]	23	7	56	11	2
%	29.29	16.43	5.00	40.00	7.86	1.43
4?	0	1	1	2	2	0
%	0.00	16.67	16.67	33.33	33.33	0.00
3/4	0	0	0	8	0	0
%	0.00	0.00	0.00	100.0	0.00	0.00
3/4?	0	0	0	1	0	0
%	0.00	0.00	0.00	100.00	0.00	0.00
3B/4	2	1	0	0	0	0
%	66.67	33.33	0.00	0.00	0.00	0.00
3A/4	0	0	0	0	2	0
%	0.00	0.00	0.00	0.00	100.00	0.00
3	0	0	0	3	0	0
%	0.00	0.00	0.00	100.00	0.00	0.00
3B	19 [14]	2	1	6	3	0
%	61.29	6.45	3.23	19.35	9.68	0.00
3B?	0	0	0	5	0	0
%	0.00	0.00	0.00	100.00	0.00	0.00
3A/B	0	15	0	10	2	0
%	0.00	55.56	0.00	37.04	7.41	0.00
3A	21 [15]	12	3	51	1	1
%	23.60	13.48	3.37	57.30	1.12	1.12
3A?	0	4	0	0	3	0
%	0.00	57.14	0.00	0.00	42.86	0.00
2/3A	0	2	0	6	0	0
%	0.00	25.00	0.00	75.00	0.00	0.00
2	0	8	1	1	0	0
%	0.00	80.00	10.00	10.00	0.00	0.00

Perforators

The term perforator was applied to pieces exhibiting retouch or utilisation chipping along a distal tip or corner, either encircling this tip 360 degrees or showing paired half circles of 180 degrees about the tip. It is readily evident from consideration of other materials in the Kissonerga assemblage that perforating activities are associated with a number of artefact types. Though direct evidence of the perforation of many probable organic materials has not survived; perforated bone, ceramic materials and various stone types exist in large numbers (see § 8.2, 3, 5, 7; 20.2, 3, 5, 7). Within the perforator class the preservation of pigment on a series of examples provide the most direct evidence of a specific manufacturing activity pertaining to the chipped stone industry (see below). A total of 153 pieces have been assigned to the perforator class comprising a small proportion (4.68%) of the total tool assemblage. As with other class discussions, the fragmentary pieces as well as those items selected for use-wear analysis are listed as separate types (Table 21.20). Three further type distinctions have been made distinguishing borers, drills and mixed pieces.

Table 21.20. Perforator types by period. (All contexts)

Period	*Borer*	*Borer/ drill*	*Drill*	*Frags*	*Use-wear*
Surface	3	2	13	0	0
%	16.67	11.11	72.22		
5	0	0	1	0	0
%	0.00	0.00	100.0		
5?	0	0	2	0	0
%	0.00	0.00	100.0		
4	11	1	25	7	2
%	29.73	2.70	67.57		
4?	0	0	1	1	1
%	0.00	0.00	100.0		
3/4	1	1	0	0	0
%	50.00	50.00	0.00		
3A/4	0	1	1	0	0
%	0.00	50.00	50.00		
3	0	0	2	0	0
%	0.00	0.00	100.0		
3?	0	0	0	0	1
%	0.00	0.00	0.00		
3B	7	0	7	0	0
%	50.00	0.00	50.00		
3A/B	1	0	2	0	0
%	33.33	0.00	66.67		
3A	9	8	25	2	4
%	21.43	19.05	59.52		
3A?	0	0	3	0	1
%	0.00	0.00	100.0		
2/3A	1	0	3	0	0
%	25.00	0.00	75.00		
2	2	0	0	0	0
%	100.0	0.00	0.00		
1A/1B?	1	0	0	0	0
%	100.0	0.00	0.00		
Total (N=153)	36	85	13	10	9
%	23.53	55.56	8.50	6.54	5.88

Borer
Any blank or blank segment which exhibits retouch or utilisation encircling a distal tip, lateral corner or break corner. Borers were distinguished subjectively by their overall large size, particularly the more robust nature of the perforator tip, though no specific dimensional limit was set during analysis. It seems likely that this type of perforator was hand held in many cases. A few examples made on long blades or spalls show extensive retouch, but the majority were produced by (or were the result of) relatively crude chipping about the objective tip. Fig. 103.1, 4 and 5.

Drill
Any complete blank or blank segment with retouch or more often utilisation damage encircling a designated tip. These pieces are distinguished by their small overall size, but particularly by the diminutive nature of the delicate objective tip. Judging from their small size, a number of these pieces probably would have required the use of a hafting device, for example a bow drill (A. Betts pers comm). Fig. 103.2-3.

Mixed borer/drill
This category was used for pieces which could not easily be placed in either of the arbitrary borer or drill types. The majority of these pieces were made on irregular flakes or broken blank segments and often quite crudely shaped. Sometimes a relatively robust objective tip contradicted a diminutive overall size.

The perforator class demonstrates the widest variety of blank types employed in the production of any single class in the Kissonerga assemblage (Table 21.21). The diminutive nature of most perforators corresponds with the selection of a greater number of bladelet, spall and chip blanks. It should be noted that the numbers of spall and chip examples probably represent minimum values due to the lack of a total site sieving policy; the majority of these diminutive pieces were recovered from the flotation heavy fraction (see § 23.1). Flakes or more often flake segments provided 2/3 of all blanks used in both the borer and drill types. Drills made on flakes demonstrated a selection preference for thin examples. The drill type also utilised many proximal and distal blank segments, but demonstrates a preference for medial segments seen also in the manufacture of borers.

Consideration of the maximum tool lengths and tip diameters illustrate the main difference between perforator types (Table 21.21). Mixed perforator examples (36.78 mm long and 6.51 mm tip diameter on average) are shown to be more closely parallel to the borer type (37.01 mm long and 6.04 mm tip diameter). Drills are distinguished by a diminutive tool length (av. 26.36 mm) and tip diameter (av. 3.17 mm) representing the smallest working surface area of any tool type in the assemblage. The greater standard deviation and variance values of the former demonstrate the lack of standardisation introduced by the subjective parameters used to discuss the perforator types, particularly exaggerated in terms of the maximum tool lengths. The lower degree of variance, exhibited by the tip diameter values, however, does support the subjective size based distinctions used in the present analysis.

Table 21.21. Perforator attributes

Blank Type (based on a sample of 136 complete perforators)	*Borer*	*Borer/drill*	*Drill*
Blade/Bladelet			
Complete	5	0	3
Proximal	0	0	2
Medial	2	3	3
Distal	1	1	3
Total	8	4	11
% of type	23.53	30.77	12.36
Spall			
Complete	1	3	7
Proximal	0	0	1
Medial	1	1	2
Distal	1	1	7
Total	3	5	17
% of type	8.82	38.46	19.10
Flake			
Complete	1	2	12
Proximal	1	0	3
Medial	14	1	24
Distal	6	1	16
Total	22	4	55
% of type	64.71	30.77	61.80
Chip			
Complete	1	0	4
Proximal	0	0	0
Medial	0	0	1
Distal	0	0	1
Total	1	0	6
% of total	2.94	0.00	6.74
Type Total	34	13	89
Maximum Tool Length mm (based on a sample of 111 complete perforators)			
Average	37.01	36.78	26.36
Sample Standard	1.20	1.44	1.09
Sample Varience	1.43	2.07	1.19
High	66.44	64.12	54.26
Low	17.52	13.94	6.56
Perforator Tip Diameter mm (based on a sample of 111 complete perforators)			
Average	6.04	6.51	3.17
Sample Standard	0.24	0.42	0.16
Sample Varience	0.06	0.18	0.02
High	12.90	15.40	6.36
Low	2.32	2.64	1.68

As noted previously, burins belonging to the assemblage could have been employed, at least in part, for the production of spalls required for the manufacture of perforators. The degree of correlation in raw material type between the burins (discussed above) and the perforators provides one possibility of linking these tool classes into a single reduction trajectory. Proportions of different raw materials used in the production of perforators demonstrate a relatively equal preference for each of the four material types (Table 21.22). In general, utilisation of the most fine grained materials is evident by the somewhat higher proportions of Type 1 and Type 4 cherts employed for the production of the larger borer and mixed perforator types. Mixed type perforators also exhibit a significant amount of Type 2 materials. Drills demonstrate a slight preference for more coarse grained basal Lefkara materials (Type 3) a chert type which may have provided additional grip for perforating of some materials.

Table 21.22. Perforator raw materials (based on a sample of 117)

Material	*Borer*	*Borer /drill*	*Drill*	*Total*
Type 1	5	25	3	33
%	21.74	23.08	30.86	28.21
Type 2	2	10	4	16
%	8.70	30.77	12.35	13.68
Type 3	7	31	2	40
%	30.43	15.38	38.27	34.19
Type 4	9	15	4	28
%	39.13	30.77	18.52	23.93

			Colour			
Material	*Grey*	*Brown*	*Red*	*Yellow*	*Olive*	*White*
Type 1	11	7	3	6	6	0
%	33.33	21.21	9.09	18.18	18.18	0.00
Type 2	16	0	0	0	0	0
%	100.00	0.00	0.00	0.00	0.00	0.00
Type 3	10	4	2	14	3	7
%	25.00	10.00	5.00	35.00	7.50	17.50
Type 4	11	3	2	10	0	2
%	39.29	10.71	7.14	35.71	0.00	7.14

The only significant change over time within the perforator class is found between the borer and drill types. While the proportion of mixed perforators fluctuates over time, the borer and drill types each act in direct response to the other (Table 21.20; Fig. 121). During Periods 1A and 2 the borers dominate the perforator class. In Period 3A drills replace the larger perforators, a pattern reflected, after Period 3B during which the two types were equal, again in Period 4. The

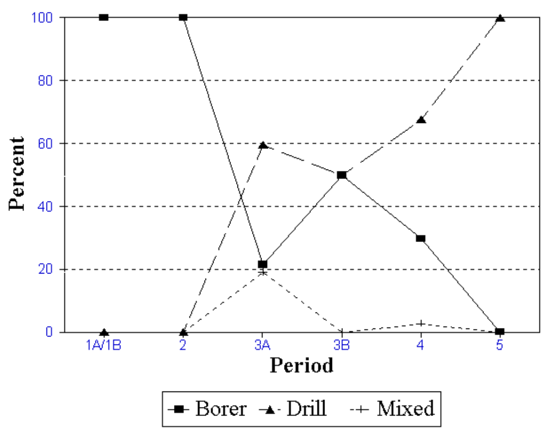

Fig. 121: Perforator type percent

broad increase of the drill type following Period 2 reaches its maximum in Period 5, though the latter sample like those from Periods 1 and 2 was extremely small. The distribution of perforators from *in situ* deposits generally agrees with the pattern illustrated by the total sample. The few borer examples belonging to Periods 1 and 2 were recovered from *in situ* contexts, one from each period. With the subsequent Period 3A, however, the peak of the drill type is not confirmed by *in situ* examples; instead, two borer examples and 5 mixed type pieces account for the *in situ* materials recovered from Period 3A. Equivalent type proportions demonstrated for Period 3B are confirmed by a single *in situ* example from each of the borer and drill types. Finally, *in situ* examples from Period 4 also support the total sample distribution showing 1 borer and four drill examples belonging to this period.

A number of perforators were recovered with traces of red pigment on the working end. A total of twenty-one perforators with pigment were counted, 3 assigned to the borer type, 3 to the mixed perforator type and the majority (n=15) to the drill type. The presence of examples with the same pigment in all perforator types suggests that no absolute functional division existed between types. Just over half of these pigment bearing perforators (n=11) belong to Period 3A and were recovered from general contexts: 993, 1539, 1543, 1568, 1571 and 1614. Five examples from Period 4 represent the only other concentration of these residue-covered implements (one each from Units 150, 217, 613, 738 and 746). It is likely that post-depositional processes and cleaning may have obliterated other similar traces. Only one example with pigment belongs to Period 3B also recovered from a general context (1018). The remaining examples were collected from mixed chronological contexts one from 3A/4 level (Unit 1012) and three from Unit 895 assigned to a disturbed 4/modern level.

A sample of these pigment-bearing perforators was submitted for X-ray florescence analysis. An analysis of the paint on several ceramic sherds determined the pigment to be non-crystalline iron-oxide that failed to generate any specific X-ray pattern (no physical alteration of the minerals) which is representative of sun-dried materials. Parallel testing of the pigment on several drill tips similarly failed to generate a crystalline pattern; an inconclusive result, but one which does not negate a correlation between drills and the perforation of pottery discs (A. Livingstone pers comm). The high frequency of perforated pottery discs in Period 3A corresponds well (context for context) with the large concentration of perforators with pigment in Period 3A. A similar correlation between perforator and pottery disc context was also evident for the single mixed 3A/4 example, but not with the Period 3B, 4 or surface pieces. While interior diameters of the pottery disc perforations were not consistently measured, the few available statistics show diameters between 5 to 10 mm with an average of 5-7 mm, correlating well with perforator tip

Table 21.23. Perforator context. (All contexts - [Building occupation 'A' and 'S*'])

Period	*Building*	*Pit*	*Surface*	*General*	*Other*
5	0	2	0	1	0
%	0.00	66.67	0.00	33.33	0.00
5?	0	0	0	2	0
%	0.00	0.00	0.00	100.00	0.00
4	18 [13]	10	3	11	3
%	40.00	22.22	6.67	24.44	6.67
4?	0	0	1	2	0
%	0.00	0.00	33.33	66.67	0.00
3/4	0	0	0	2	0
%	0.00	0.00	0.00	100.00	0.00
3A/4	0	1	0	0	1
%	0.00	50.00	0.00	0.00	50.00
3	0	1	0	1	0
%	0.00	50.00	0.00	50.00	0.00
3?	0	0	0	1	0
%	0.00	0.00	0.00	100.00	0.00
3B	5 [4]	2	1	6	0
%	35.71	14.29	7.14	42.86	0.00
3A/B	0	1	1	1	0
%	0.00	33.33	33.33	33.33	0.00
3A	13 [11]	5	1	29	0
%	27.08	10.42	2.08	60.42	0.00
3A?	0	2	0	0	2
%	0.00	50.00	0.00	0.00	50.00
2/3A	0	1	0	3	0
%	0.00	25.00	0.00	75.00	0.00
2	0	2	0	0	0
%	0.00	100.00	0.00	0.00	0.00
1A/1B?	0	1	0	0	0
%	0.00	100.00	0.00	0.00	0.00

diameters provided in Table 21.21 (C. Elliott-Xenophontos pers comm).

Consideration of the contextual distribution within the perforator class demonstrates variation in locality for each main occupation period (Table 21.23). As expected, Periods 1 and 2 show a discard pattern restricted to pit contexts while Period 5 perforators are recovered from both pit and general occupation materials. General occupation fills generated the greatest number (60.42%) of perforators during Period 3A, and account for the contexts from which the perforators with pigment were recovered. The same Period 3A structures, 1016 (5), 1547 (4) and 1565 (2) have significant perforator concentrations in occupation deposits. Period 3B shows relative increases in building, pit and surface discard behaviours with a concurrent decrease in the number perforators recovered from general occupation deposits. Only a few (n=4) perforators were recovered from Period 3B building occupation materials (B 206 (2), B 994 (1) and B 1103 (1)). Period 4 demonstrates a continued decrease in the numbers of perforators recovered from general occupation fills. A high proportion of perforators recovered from Period 4 belong to building contexts 13 of which derive from occupation materials (from 1-3 pieces in each of B 86, 493, 736, 866, 1046 and a relatively small concentration (5) for this class in B 3).

Retouched pieces

The term 'retouched piece' covering 666 implements has been used in the present analysis as a broad covering term for general retouched examples. The retouched class, therefore, represents an unusually large proportion (20.37%) of the total tool sample in the assemblage. The type series employed in the retouched class represents categories based on the edge delineation, retouch position and technique of retouch. These types provide a means for accessing the overly generalised retouched class in greater detail though the types used in this report should be viewed as preliminary. The class was dominated by a single type, rectilinear retouched pieces (Table 21.24). Other designations though less frequent illustrate specific retouches or edge configurations that were recurrent enough to warrant separate classifications. Several types represent more sophisticated tools such as the backed and truncated pieces, pieces with bilateral retouch and especially examples with pressure retouch demonstrating the high degree of skill which could be attained by the Kissonerga knappers. As elsewhere, the type series includes categories for fragmentary pieces and illustrates the number of examples sampled for use-wear analysis. Due to the special nature of the pressure-retouched pieces, fragmentary examples of this type were included within the specific pressure retouch type rather than being lost to the generalised fragment category. It should be noted that six *dhoukani* (threshing sledge) 'teeth', five from the surface collection and a single example from a mixed Period 3/4 chronological assignation, were separated from the rest of the retouched sample, and will not be discussed further (see McCartney 1993 for a detailed discussion of *dhoukani* chipped stone pieces).

Alternate retouch
Any blank or blank segment modified by continuous alternate retouch. This category unlike most other types in the retouched class was dominated by coarsely retouched examples. Fig. 104.3.

Backed and/or truncated retouch
Any blank or blank segment exhibiting abrupt or semi-abrupt retouch along a lateral edge (backed) or proximal or distal end (truncated). While truncated pieces were relatively rare, a large variety of the implements within the retouched class exhibited potential 'backing' retouched (see § 21.10). The limited number of examples specifically assigned to the backed type showed extremely abrupt retouch and were also required to exhibit clearly recognisable utilisation damage on the edge opposite the backing retouch. Fig. 104.4, 5 and 10.

Bilateral retouch
Any blank or blank segment with abrupt or semi-abrupt retouch on both lateral edges. This group is composed of two sorts of pieces; one exhibiting very finely retouched edges (both direct and inverse) while the other represents thicker steeply backed lateral edges similar to examples of the backed type . This type possesses several unique examples and is unified only by the presence of retouch on both lateral edges that might in some way limit or be related to their function. The most interesting group represent pointed implements produced on blades or blade segments exhibiting sections of direct and inverse retouch sometimes pointed at one or both ends. Fig. 103.6.

Convex retouch
Any blank or blank segment with abrupt or semi-abrupt retouch along one or more edges exhibiting a convex edge delineation. Both inverse and dorsal retouch examples are included within this category, though direct retouch examples dominate. Fig. 104.6.

Inverse-proximal retouch
Any blank or blank proximal with abrupt inverse retouch along one or both lateral edges located adjacent to the butt end. Examples with very steep, invasive, inverse lateral retouch similar in appearance to the true proximal end examples were included within this type. One unique example produced on a complete long blade exhibiting proximal end steep inverse retouch on one lateral and direct retouch on the opposite lateral is perhaps the most diagnostic tool belonging to the Aceramic Neolithic sample. The retouch on this unique implement suggests the manufacture of a broad tang for holding or hafting in support of the extensive unretouched portions of the blade below the retouched area. Fig. 104.11.

Pressure retouch
Any blank or blank segment, including fragments, with pressure retouch. This small group (n=8), represents a significant degree of manufacturing skill, possibly experimental or oriented towards the production of special status items. Despite contrary earlier reporting based on an incomplete sample, these pieces were all produced on native Cypriot raw materials (Betts 1987, 13). Heat treatment, though not fully successful, is exhibited by nearly all of these pieces (see the discussion of heat-treatment above and below). Both unifacial and bifacial examples are present in the sample. The overall morphology of several examples suggests an arrowhead designation, a tool type considered missing from Cypriot chipped stone assemblages. The presence of steeply backed edges on other examples as well as the variety of shape in the total sample, however, necessitates a multi-functional interpretation, at least for the present. Fig. 103.14-18.

Rectilinear retouch
Any blank or blank segment exhibiting abrupt or semi-abrupt retouch along one or more edges forming a straight or rectilinear edge delineation with both fine and coarse examples of retouch. The type is dominated by direct retouch, but a significant number of inverse examples also exist. A more infrequent number of examples exhibit discontinuous segments of rectilinear retouch along the same edge. Fig. 104.1-2, 7-9.

Consideration of the blank type, length, edge thickness and raw material attributes confirms the generalised nature of the retouched class (Tables 21.25 and 26). With the blank type attribute, two broad groups can been noted. Retouched types produced using a large proportion of blade/bladelet blanks and blank segments can be distinguished from flake based types. The backed and truncation pieces, bilaterally retouched pieces as well as the pressure retouched pieces all demonstrate a high reliance (between 46.43 and 71.43%) on lamellar blanks with medial and distal segments used more frequently than complete or proximal examples. Flakes may have dominated the blank production at Kissonerga, but the lamellar blanks produced were selectively used and often retouched to a relatively high standard. In contrast, the alternate, convex, inverse-proximal and rectilinear types were dominated (81.59 to 93.33%) by the selection of flake blanks. The use of complete blanks was much greater within the flake-based types, though a large number of medial and distal flake segments were also employed. Chips were used in small numbers within all types but the pressure retouched group. The rectilinear type exhibits the most significant use of chip blanks. The related fine notches were discussed above. Indeed, diminutive examples from the convex and rectilinear retouch types along

Table 21.24. Retouched piece types by period. (All contexts included)

Period	*Alternate*	*B/Tru*	*Conv*	*Inv-P*	*Rect*	*Press*	*Bilat*	*Frag*	*Use-Wear*
Surface	18	8	8	4	63	0	4	17	4
%	17.14	7.62	7.62	3.81	60.00	0.00	3.81		
5	1	0	4	0	11	1	1	1	4
%	5.56	0.00	22.22	0.00	61.11	5.56	5.56		
5?	0	0	0	0	4	0	0	3	1
%	0.00	0.00	0.00	0.00	100.00	0.00	0.00		
4/5	0	0	1	0	4	0	0	0	0
%	0.00	0.00	20.00	0.00	80.00	0.00	0.00		
4	18	8	14	5	95	1	6	43	23
%	12.24	5.44	9.52	3.40	64.63	0.68	4.08		
4?	0	0	3	0	3	1	0	3	0
%	0.00	0.00	42.86	0.00	42.86	14.29	0.00		
3/4	4	1	3	1	3	0	0	1	2
%	33.33	8.33	25.00	8.33	25.00	0.00	0.00		
3/4?	0	0	0	0	0	0	0	0	1
%	0.00	0.00	0.00	0.00	0.00	0.00	0.00		
3B/4	0	0	0	0	0	0	1	0	0
%	0.00	0.00	0.00	0.00	0.00	0.00	100.00		
3A/4	0	0	2	0	0	0	0	4	0
%	0.00	0.00	100.00	0.00	0.00	0.00	0.00		
3	1	1	0	0	1	0	0	2	0
%	33.33	33.33	0.00	0.00	33.33	0.00	0.00		
3?	0	0	0	0	1	0	0	1	0
%	0.00	0.00	0.00	0.00	100.00	0.00	0.00		
3B	4	7	3	2	21	3	3	22	2
%	9.30	16.28	6.98	4.45	48.84	6.98	6.98		
3B?	0	1	0	0	4	0	0	0	0
%	0.00	20.0	0.00	0.00	80.00	0.00	0.00		
3A/B	0	1	2	2	11	0	1	5	0
%	0.00	5.88	11.76	11.76	64.71	0.00	5.88		
3A/B?	0	1	0	0	0	0	0	0	0
%	0.00	100.0	0.00	0.00	0.00	0.00	0.00		
3A	6	10	16	6	51	2	1	17	19
%	6.52	10.87	17.39	6.52	55.43	2.17	1.09		
3A?	0	1	0	0	1	0	0	1	4
%	0.00	50.00	0.00	0.00	50.00	0.00	0.00		
2/3A	0	1	0	0	4	0	0	0	0
%	0.00	20.00	0.00	0.00	80.00	0.00	0.00		
2/3A?	0	0	0	0	1	0	0	0	0
%	0.00	0.00	0.00	0.00	100.00	0.00	0.00		
2	0	1	0	0	5	0	0	5	0
%	0.00	16.67	0.00	0.00	83.33	0.00	0.00		
1A/1B?	0	1	0	2	1	0	0	0	0
%	0.00	25.00	0.00	50.00	25.00	0.00	0.00		
Total (n=666)	52	42	56	22	284	8	17	125	60
%	7.81	6.31	8.41	3.30	42.64	1.20	2.55	18.77	9.01

with the fine type notches are paralleled not only in blank type, but also in raw material and retouch character, being distinguished only on the basis of edge delineation.

Average tool lengths do not directly reflect the blank type attribute (Table 21.25). The largest implements (between 43.44 mm and 46.23 mm) are shown to be the more coarsely retouched alternate and inverse-proximal types. The unique Neolithic inverse-proximal blade represents the longest artefact (201 mm) in the entire tool assemblage. A medium average tool length (between *c.* 33 mm and 37 mm) is demonstrated by the backed and truncated types, the pressure retouched and the bilaterally retouched pieces. Similarly, the convex and rectilinear types, due to the utilisation of chips and small flakes within these types, demonstrate parallel diminutive average tool lengths (27.92 mm and 28.56 mm respectively). The edge thickness attribute shows a fairly continuous distribution from the thin convex retouch type to the more robust alternate examples. While maximum and minimum measurements are widely separate, the standard deviations and variance levels are consistently low for the edge thickness attribute. Clearly extreme outliers, as well as high standard deviations and variance levels for the tool length attribute in each of the retouched types indicates a wide degree of variation for all but the pressure retouched group. Future analysis of the tool assemblage based on a wider range of attributes may generate more discrete types for these artefacts. Average edge angles demonstrate the abrupt nature of the edge retouch applied to all types.

Table 21.25. Retouched piece attributes

Blank types based on a sample of 420 complete retouched pieces	*Alt*	*Back/ Trunc*	*Conv*	*Inv-p*	*Rect*	*Press*	*Bilat*
Blade/Bladelet							
Complete	1	3	0	2	5	0	3
Proximal	0	1	0	0	1	0	0
Medial	0	6	3	0	7	2	3
Distal	2	3	0	0	1	3	1
% of type	6.67	46.43	5.56	6.06	5.86	71.43	50.00
Flake							
Complete	11	2	16	5	90	0	2
Proximal	10	0	6	8	19	0	1
Medial	17	10	13	5	54	2	2
Distal	4	2	11	11	32	0	1
% of type	93.33	50.00	85.19	87.88	81.59	28.57	42.86
Chip							
Complete	0	1	2	2	19	0	1
Proximal	0	0	0	0	3	0	0
Medial	0	0	2	0	3	0	0
Distal	0	0	1	0	5	0	0
% of type	0.00	3.57	9.26	6.06	12.55	0.00	7.14
Maximum tool dimension mm based on a sample of 252 complete retouched pieces							
Average	43.44	33.16	27.92	46.23	28.56	37.18	34.06
Standard	1.71	1.71	1.28	4.40	1.42	0.95	1.16
Varience	2.94	2.91	1.63	19.39	2.00	0.90	1.35
High	78.44	56.70	73.54	201.00	111.06	44.90	48.86
Low	15.50	19.32	12.26	11.76	9.10	23.35	14.58
Edge thickness mm based on a sample of 252 complete retouched pieces							
Average	7.59	6.72	3.00	4.95	3.48	5.81	3.85
Standard	0.30	0.38	0.21	0.27	0.23	0.12	0.21
Varience	0.09	0.15	0.04	0.08	0.06	0.01	0.04
High	14.96	10.54	11.80	10.48	12.26	6.82	7.33
Low	0.82	1.48	0.54	1.62	0.80	4.39	1.02
Average edge angle							
Average	n.d.	79	89	101	84	n.d.	93

Across the total range of retouched pieces the four raw material types show fairly even proportions (Table 21.26). Type 2 raw materials were used least frequently overall, dominant only in the alternate retouch type, being somewhat less frequent in the inverse-proximal type. The relatively fine character of the majority of the retouched pieces advocated the use of a greater number of smooth, cryptocrystalline Type 1 cherts as well as fine quality, Type 4 materials. The latter were favoured in the production of bilateral and pressure retouched examples. Heat treatment was used in several cases to alter the relatively tough nature of Type 4 cherts into a more isotropic material amenable to pressure retouch. Type 4 cherts with their numerous limestone inclusions appears to be an illogical choice for the practice of heat-treatment, and the overly brittle and broken edges betrays the poor control of most such heat-treatment attempts. Type 3 cherts were somewhat more significant in the alternate retouch type and represent between 20.00% to 27.27% across the entire retouch class. The latter were, however, absent from the pressure retouched group and account for only 7.69% in the bilateral examples.

Table 21.26. Retouched piece raw materials (based on a sample of 435)

Material	*Alt*	*B/Tru*	*Conv*	*Inv-P*	*Rect*	*Press*	*Bilat*	*Total*
Type 1	6	6	19	7	67	4	5	114
%	13.04	19.35	31.67	31.82	26.27	50.00	38.46	26.21
Type 2	15	7	14	2	45	1	2	85
%	32.61	19.35	23.33	9.09	17.65	12.50	15.38	19.54
Type 3	14	7	12	6	69	0	1	109
%	30.43	22.58	20.00	27.27	27.06	0.00	7.69	25.06
Type 4	9	12	14	7	69	3	5	119
%	19.57	38.71	23.33	31.82	27.06	37.50	38.46	27.36
Other	2	0	1	0	5	0	0	8
%	4.35	0.00	1.67	0.00	1.96	0.00	0.00	1.84

			Colour			
Material	*Grey*	*Red*	*Yellow*	*Brown*	*Olive*	*White*
Type 1	21	41	21	4	24	3
%	18.42	35.96	18.42	3.51	21.05	2.63
Type 2	75	3	0	6	0	1
%	88.24	3.53	0.00	7.06	0.00	1.18
Type 3	7	23	19	31	9	20
%	6.42	21.10	17.43	28.44	8.26	18.35
Type 4	36	51	26 1	1	0	5
%	30.25	42.86	21.85	0.84	0.00	4.20
Other	1	4	1	2	0	0
%	12.50	50.00	12.50	25.00	0.00	0.00

A variety of patterns document chronological shifts within the individual retouched types (Table 21.24; Figs. 122 and 123). The alternate type can be seen to increase after an introduction in Period 3A, rising to a peak presence during Period 4. The only *in situ* examples (n=11) belong to the latter period sample. Backed and truncated pieces show an uneven curve that decreases from Period 1 through Period 4, with a brief peak during Period 3B. The only *in situ* examples of the latter type were collected from Period 1 (n=1) and Period 3B (2). It should be noted, however, that a signifi-

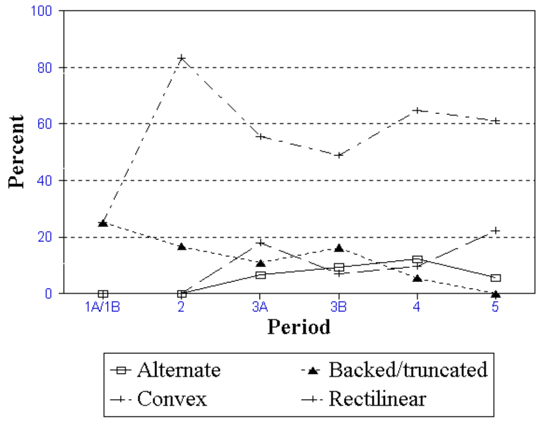

Fig. 122: Retouched piece percent - A

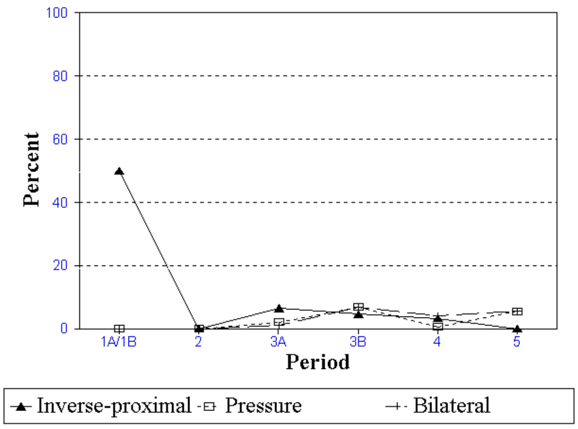

Fig. 123: Retouched piece percent - B

cant number of backed pieces belonging to Period 4 (6) were removed for use-wear analysis creating a higher proportion (9.52%) similar to that belonging to Period 3A and flattening the decreasing curve mentioned above. The convex type was not present in the initial two occupation periods appearing only during Period 3A (with one *in situ* example) and maintaining a low position in terms of the overall retouched type proportions. A further 4 *in situ* convex retouched pieces belong to Period 4. The rectilinear type climbs from a moderate initial proportion in Period 1 (1= *in situ*) to a clear dominance in the subsequent Period 2 (3 of 5 examples were from *in situ* contexts). Rectilinear examples decreased in importance again during Period 3A (with 7 *in situ* examples) and from that point broadly parallel the movement of the less frequent convex retouch type. Seven *in situ* rectilinear retouched examples from Period 3B and a large number of pieces (n=20) were collected from secure contexts belonging to Period 4. Inverse-proximal examples dominate the Aceramic sample with two examples, both *in situ*, including the unique long blade mentioned above. Later, this type represents a low curve between Periods 3A and 4, showing a peak during Period 3A (n=2 *in situ* examples). More *in situ* inverse-proximal examples (n=4) were collected from Period 4. The pressure retouched and bilateral types are also best described in terms of peak occurrences. The proportions of both types are quite small during all periods, showing a slight peak during Period 3B (see concluding remarks below). Indeed, the only *in situ* pressure retouched piece was recovered from a Period 3B context and the only reported parallel made of chert in Cyprus also comes from a Chalcolithic context at the site of Souskiou-Laona (D'Annibale 1992, 30). The presence of bilateral and pressure retouched examples (not forgetting the backed and truncated glossed pieces) in Periods 3A and 4 suggests, however, that the apparent peak in knapping skill did not begin or end with Period 3B, but may have always formed a limited part of the Kissonerga reduction methodology. The two *in situ* bilateral examples one each from Periods 3A and 4 are not inconsistent with the latter interpretation.

Table 21.27. Retouched piece context. (All contexts - [Building occupation 'A' and 'S*'])

Period		*Building*	*Pit*	*Surface*	*General*	*Other*	*Disturb*
5		0	0	0	17	0	6
	%	0.00	0.00	0.00	73.91	0.00	26.09
5?		0	0	0	8	0	0
	%	0.00	0.00	0.00	100.0	0.00	0.00
4/5		0	0	0	4	1	0
	%	0.00	0.00	0.00	80.00	20.00	0.00
4		70 [49]	42	12	67	19	3
	%	32.86	19.72	5.63	31.46	8.92	1.41
4?		0	0	0	8	1	1
	%	0.00	0.00	0.00	80.00	10.00	10.00
3/4		0	0	2	14	0	0
	%	0.00	0.00	12.50	87.50	0.00	0.00
3/4?		0	0	0	1	0	0
	%	0.00	0.00	0.00	100.0	0.00	0.00
3B/4		0	0	0	0	1	0
	%	0.00	0.00	0.00	0.00	100.0	0.00
3A/4		0	5	0	0	1	0
	%	0.00	83.33	0.00	0.00	16.67	0.00
3		0	1	0	3	1	0
	%	0.00	20.00	0.00	60.00	20.00	0.00
3?		0	1	0	0	1	0
	%	0.00	50.00	0.00	0.00	50.00	0.00
3B		39 [21]	5	2	18	2	0
	%	59.09	7.58	3.03	27.27	3.03	0.00
3B?		0	0	0	5	0	0
	%	0.00	0.00	0.00	100.0	0.00	0.00
3A/B		0	4	0	17	1	0
	%	0.00	18.18	0.00	77.27	4.55	0.00
3A/B?		0	0	0	1	0	0
	%	0.00	0.00	0.00	100.0	0.00	0.00
3A		47 [33]	11	2	65	1	2
	%	36.72	8.59	1.56	50.78	0.78	1.56
3A?		0	6	0	0	1	0
	%	0.00	85.71	0.00	0.00	14.29	0.00
2/3A		0	0	0	5	0	0
	%	0.00	0.00	0.00	100.0	0.00	0.00
2/3A?		0	0	0	1	0	0
	%	0.00	0.00	0.00	100.0	0.00	0.00
2		0	8	0	3	0	0
	%	0.00	72.73	0.00	27.27	0.00	0.00
1A/1B?		0	4	0	0	0	0
	%	0.00	100.0	0.00	0.00	0.00	0.00

A relatively large proportion of retouched pieces was recovered from general contexts representing half of the sample during Period 3A and somewhat less for Periods 2, 3B and 4 (Table 21.27). Pit contexts continue to dominate Periods 1 and 2, while Period 5, as expected, is represented only by examples from general occupation fills. A single retouched tool example was recovered from 'structure' or 'work-hollow' (1596) belonging to Period 2. Pit disposal was most infrequent during Periods 3A and 3B, but represents nearly 20% of the Period 4 retouched class sample. A slight increase in the numbers of retouched pieces recovered from external floors or surfaces can be seen between Periods 3A and 4. Building finds are well represented in Periods 3A, 3B and 4 forming relatively significant proportions of these retouched tool samples. A large

Table 21.28. Scraper types by period. (All contexts included)

Period	*End*	*Tri*	*Doub*	*Steep*	*Roun*	*Side*	*E+S*	*Inv*	*Reus*	*Frg*	*UW*
Surface	46	5	7	4	10	13	4	4	10	86	0
%	44.66	4.85	6.80	3.88	9.71	12.62	3.88	3.88	9.71		
5	1	0	0	0	0	5	0	0	0	8	1
%	16.67	0.00	0.00	0.00	0.00	83.33	0.00	0.00	0.00		
5?	5	0	0	0	1	3	0	0	1	6	4
%	50.00	0.00	0.00	0.00	10.00	30.00	0.00	0.00	10.00		
4/5	3	0	0	0	1	1	0	0	0	2	1
%	60.00	0.00	0.00	0.00	20.00	20.00	0.00	0.00	0.00		
4	33	0	4	2	7	9	0	7	1	78	8
%	52.38	0.00	6.35	3.17	11.11	14.39	0.00	11.11	1.59		
4?	0	0	0	0	0	0	0	0	0	2	0
3/4	3	0	0	0	0	1	0	0	0	6	1
%	75.00	0.00	0.00	0.00	0.00	25.00	0.00	0.00	0.00		
3/4?	0	0	0	0	0	0	0	0	0	0	1
3B/4	0	0	0	0	0	0	0	0	0	2	0
3A/4	0	0	0	0	0	0	0	0	0	2	0
3	1	0	0	0	0	0	0	0	0	6	0
%	100.0	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00		
3?	0	0	0	0	0	0	0	0	0	2	0
3B	5	0	1	0	1	0	0	0	1	21	0
%	62.50	0.00	12.50	0.00	12.50	0.00	0.00	0.00	12.50		
3B?0	0	0	0	0	2	0	1	0	2	0	
%	0.00	0.00	0.00	0.00	0.00	66.67	0.00	33.33	0.00		
3A/B	3	3	0	0	3	2	0	2	1	10	0
%	21.43	21.43	0.00	0.00	21.43	14.29	0.00	14.29	7.14		
3A	12	6	1	0	1	6	0	0	2	52	5
%	42.86	21.43	3.57	0.00	3.57	21.43	0.00	0.00	7.14		
3A?0	1	0	0	0	1	0	0	0	2	1	
%	0.00	50.00	0.00	0.00	0.00	50.00	0.00	0.00	0.00		
2/3A	1	0	0	1	1	1	0	0	0	6	1
%	25.00	0.00	0.00	25.00	25.00	25.00	0.00	0.00	0.00		
2	1	0	1	0	0	0	0	0	0	4	0
%	50.00	0.00	50.00	0.00	0.00	0.00	0.00	0.00	0.00		
1A/1B?	0	0	0	0	1	0	0	0	0	0	0
%	0.00	0.00	0.00	0.00	100.0	0.00	0.00	0.00	0.00		
Total (N=574)	114	15	14	7	26	44	4	14	16	297	23
%	19.86	2.61	2.44	1.22	4.53	7.67	0.70	2.44	2.79	51.74	4.01

number of retouched pieces were recovered from building occupation materials during Period 3A: from B 1638 (n=2), 1565 (4), 1295 (2), 1161 (1) and especially 1547 (10) and 1016 (14). Period 3B shows the familiar distribution of from 1 to 3 pieces in each of B 2, 4, 855, 994 and 1103 with relatively larger numbers (n=6) from each of B 206 and 1161. Similarly, Period 4 buildings are dominated by frequencies of 1 and 2 occurrences in the following structures; 1, 86, 200, 346, 375, 706, 1044 and 1046. More numerous occurrences of retouched pieces from occupation deposits (n=4) were collected from Period 4 B 493, 866 and 1052. B 834 shows a large concentration (n=9) of implements from this tool class, in addition to the expected peak occurrence (n=19) in B 3.

Scrapers

The term scraper is used in this report to refer specifically to abruptly retouched pieces which demonstrate a pronounced convex edge delineation. The convex retouched type, though directly related in terms of edge delineation to the scraper category, is distinguished from the latter in terms of the retouch applied. Even with the strict definition of the term scraper used in this analysis, the tool type generally considered to be diagnostic of Chalcolithic chipped stone in Cyprus still represents 17.55% of the total tool assemblage (D'Annibale 1992, 33; Betts 1987, 12; Hordynsky and Ritt 1978; see Table 21.28). The number of scraper fragments, however, represents over half (51.74%) of the total number of artefacts assigned to the scraper class. Without the mass of resharpening elements and scraper fragments the total proportion of the scraper class is reduced to only 8.47% of the total tool assemblage. The scraper class, therefore, is not the dominant tool in the Kissonerga assemblage, but one easily recognised and therefore formally diagnostic of the Chalcolithic period at the site.

As the very high proportion of fragmentary pieces indicates, this class more than any other appears to have been subjected to intensive retooling practices. It is possible that scraper resharpening elements are more readily distinguishable than those belonging to other examples of tool rejuvenation, but both archaeological and ethnographic research have demonstrated a high rate of tool rejuvenation with implements known as scrapers (e.g. Gallagher 1977). The presence of antler hafts in the Kissonerga assemblage represents a possible hafting device whose manufacture represents significant effort and is, therefore, more likely to have been curated than the easily produced stone element, especially considering the great abundance of chert on the island (Bamforth 1988; Keeley 1982; see § 20.7). Several of the scraper types distinguished in this analysis could be interpreted as stages of tool modification (whether hafted or unhafted) within a more generalised scraper category. In particular, cases of multiple or continuous edge retouch are likely to represent such stages of scraper rejuvenation (e.g. Dibble 1987).

Eleven types were used in the analysis of the Kissonerga scraper class. The dominant fragment type has been noted briefly above. A further 23 pieces representing 4.01% of the total scraper sample were selected for use-wear analysis and were not considered in greater detail. As seen with other tool class discussions, a number of the pieces assigned to the scraper class (n=16) represent examples of secondary re-utilisation exhibiting elements from one or more of the other tool classes. The remaining eight scraper types are defined below.

End scraper
Any blank or blank segment with abrupt or semi-abrupt scraper retouch exhibiting a convex edge delineation that is limited to either the distal (predominantly) or proximal end of the blank. Distinct sets of end scrapers were apparent within the sample. A significant number of the end scrapers were relatively massive being produced on very large thick flakes. This group was almost uniformly produced on Type 2 raw materials in contrast to other scrapers exhibiting greater variety in raw material type. The presence of a thick bulb and plain butt provide a convenient non-retouched 'backing' for these scrapers which appear to have been hand-held. A second group represents end scrapers made on incomplete blanks that exhibit deliberate snap breaks and/or negative scar facets establishing convenient holding positions opposite the retouched distal end. A very limited number of the end scrapers (n=3) were made on thick bulbar flakes showing a well-formed, extensively curved (crescentic) edge delineation. Fig. 106.2, 5-6, 9-10.

Triangular scrapers
A small series of scrapers made on medium size triangular shaped flakes with lateral edges flaring towards the distal end. The distal scraper retouch forms a less strongly curvilinear convex edge in comparison with other end scraper varieties. The exaggerated consistency with which this series of end scrapers was produced suggested the probability of a distinct variant worthy of investigation (see below). Fig. 106.7.

Double scrapers
Any blank with abrupt or semi-abrupt scraper retouch distributed on both distal and proximal ends or along both lateral edges.

Steep scrapers
A limited number of very thick flakes or flake segments with abrupt or semi-abrupt scalar retouch on one or two edges. The extreme average edge thickness and oblique edge angles of this type were unique within the scraper sample (see below). Fig. 106.4 and 8.

Round scrapers
Any flake or flake segment with abrupt or semi-abrupt scraper retouch extending around the entire circumference of the flake, though the butt was preserved in some cases. One uniquely small example collected during survey was made on a thick medial segment of coarse, white translucent Lefkara chert. The piece exhibited coarse, steep retouched around the entire edge circumference, being of a size and configuration parallel to the thumbnail scrapers described by Simmons for Site-E at Akrotiri (Simmons 1991, 860; Fig. 3). Fig. 106.1 and 3.

Side scraper
Any blank or blank segment with a convex edge delineation on which abrupt or semi-abrupt retouch is limited to either the left or right lateral edges. Side scrapers on complete flakes occur, but the majority were produced on flake segments showing deliberately snapped ends (often supplemented by negative facets) that provide convenient holding points suggesting that the majority of these pieces were hand-held. A small number of side scrapers were of a massive size comparable to the substantial end scrapers described above. Fig. 106.11 and 12.

End-side scrapers
Any flake or flake segment with abrupt or semi-abrupt retouch distributed in a continuous line along both the distal end either the left or right lateral edges. The limited number of such pieces (n=4) belonging to this type suggests an intermediate position within the kind of rejuvenation series postulated above.

Inverse scraper
Any blank or blank segment with abrupt or semi-abrupt inverse scraper retouch. Unlike the inverse-proximal type belonging to the retouched class, inverse scrapers possess the same convex edge delineation of other scrapers types. The practice of inverting the scraper retouches appears to simply to represent an infrequent stylistic variation. The presence of inverse retouch on flakes with convex bulbar surfaces noted by Betts (1987, 12) is a characteristic confirmed by this report.

The scraper class is the most heavily flake dominated of all the tool classes discussed in this analysis (Table 21.29). Only the end and side scraper varieties demonstrate any use of lamellar blanks; the side scraper type being represented by only a single example. End scrapers were produced on blades for 9.91% of the end scraper sample demonstrating a degree of continuity with more heavily blade based Neolithic assemblages (Fox 1987, Figs. 2.3 and 4.2-3; Steklis 1961, Pls. 117-8). The majority of all scraper types, except side scrapers, were made predominantly on complete flakes. The use of blank segments for the production of some end and most side scrapers represents a distinct pattern of truncation noted above and described in other Chalcolithic assemblages in Cyprus (Hordynsky and Ritt 1978). Broken examples undoubtedly exist in all cases and are sometimes difficult to distinguish from deliberately truncated pieces. The majority of the truncated pieces, however, exhibited a break and/or large negative facets aligned on the edge opposite the scraper retouch and could be fitted comfortably within the hand. It is equally possible that the truncated scrapers represent recycling processes not as readily apparent in other tool classes.

Table 21.29. Scraper attributes

	End	Tri	Doubl	Steep	Round	Side	Inv	Reuse
Blank type (based on a sample of 353 complete scrapers)								
Blade/Bladelet								
Comp	8	0	0	0	0	0	0	0
Prox	0	0	0	0	0	0	0	0
Med	1	0	0	0	0	0	0	0
Dist	2	0	0	0	0	1	0	0
%-Type	9.91	0.00	0.00	0.00	0.00	2.38	0.00	0.00
Flake								
Comp	56	15	8	3	18	9	6	7
Prox	1	0	0	0	0	11	2	1
Med	10	0	2	2	4	12	0	2
Dist	33	0	4	1	2	9	0	11
%-Type	90.09	100.0	100.0	100.0	100.0	97.62	100.0	100.0
Maximum tool length mm (based on a sample of 226 complete scrapers)								
Average	47.87	43.60	54.87	52.28	52.31	49.24	52.94	52.69
Standard	1.50	0.67	2.01	1.32	1.38	1.40	1.52	1.10
Varience	2.25	0.45	4.05	1.73	1.91	1.96	2.32	1.21
High	85.64	60.94	99.06	69.62	69.76	76.68	80.94	67.14
Low	23.20	34.90	32.30	38.10	21.18	26.58	41.28	39.12
Edge thickness mm (based on a sample of 226 complete scrapers)								
Average	8.52	8.74	9.21	19.28	9.55	8.35	7.81	9.44
Standard	0.34	0.22	0.36	0.38	0.33	0.35	0.39	2.42
Varience	0.11	0.05	0.13	0.15	0.11	0.13	0.15	0.56
High	19.26	11.90	18.18	23.24	15.85	18.54	12.06	24.26
Low	3.32	4.82	5.40	13.32	4.46	4.40	3.18	3.66
Edge angle (based on a sample of 226 complete scrapers)								
Average	70	73	73	82	70	70	107	97

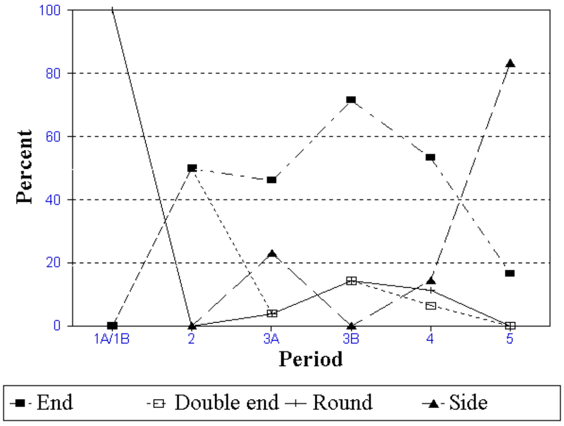

Fig. 124: Scraper type percent - A

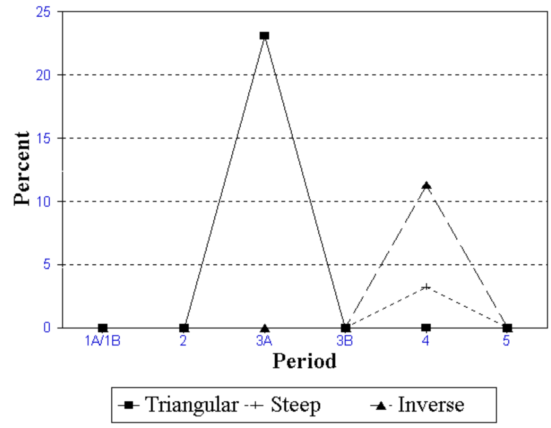

Fig. 125: Scraper type percent - B

Maximum tool length and edge thickness values for each scraper type demonstrate the large overall size of this tool class (Table 21.29). The scrapers range on average range between 43.60 mm for the more moderately sized triangular type, to 54.87 mm for the double scraper variety. The high and low parameters shown for each type illustrate the presence of the massive examples noted above in the end, double, side and inverse scraper types reaching as much as 99.06 mm in tool length. Smaller examples were similarly evident in all scraper types, particularly within the end, round and side scraper types. The 21.18 mm low representing the round scrapers is the length of the unique thumbscraper noted above. The variety in scraper size is confirmed by the standard deviation and variance statistics. Only the triangular type shows a significantly low standard deviation and variance values supporting the designation of this rare type.

Edge thickness values demonstrate the robust nature of the scraper retouch ranging from an average of between 7.81 mm to 9.55 mm to the extreme (19.28 mm) shown by the steep scraper type (Table 21.29). All of the edge thickness statistics, except for examples representing tool re-use from other classes, demonstrate a consistency not represented in the tool length attribute. High values belong to the massive examples described above as well as showing the use of very chunky blank segments. The oblique edge angle shown for the steep scraper type confirms the unique position of this limited type, paralleled only by the re-utilised pieces. Inverse scraper examples show an acute edge angle derived by the location of the retouch on the interior blank surface. All other scraper types show average edge angles of between 73 and 70 degrees demonstrating a broad consistency for the class.

As noted previously by Betts (1987, 12), the scraper class demonstrates the strongest selective behaviour with regard to raw material utilisation (Table 21.30). The Type 2 raw materials, particularly the opaque black cryptocrystalline and mottled dark grey-brown varieties were favoured for scraper production. While Type 2 raw materials occur in only 48.19% of the total scraper class, this material accounts for as much as 66.67% in the end, round and inverse scraper types. The remaining scraper types show lower, though still predominant, proportions of this distinctive dark coloured raw material. Type 3 materials with their granular consistency were perhaps not robust enough for most scraper production being represented in only the end and side scraper types. Following the Type 2 raw materials, Type 4 translucent Lefkara materials were most extensively utilised representing from 11.96 to 33.33% across the range of scraper types. The lower proportions of Type 2 materials demonstrated by fragmentary examples suggests that the deliberate selection of Type 2 raw materials may be linked to lower rates of breakage and resharpening when this raw material was employed. Type 1, 3 and 4 raw materials were, however, more commonly found representing small, thinner scraper examples which would be expected to break more readily than the massive examples dominated by material Type 2 flakes.

End scrapers were clearly dominant representing over 60% of the Kissonerga scraper sample (Table 21.28; Fig. 124). Absent from Period 1, end scrapers clearly dominate the distribution between Periods 2 to 4 showing a peak occurrence during Period 3B and decreasing once again to Period 5. Side scrapers, conversely, dominate the Period 5 sample and are clearly of secondary importance in the Periods 2, 3A and 4 samples. Double and round scraper variants demonstrate very similar distributions representing a low curve in the total scraper distribution that again peaked during Period 3B. A single round scraper represents the total proportion of scrapers assigned to Period 1. Similarly, the double scraper peak belonging to Period 2 is also possibly a reflection of sample size. The three remaining major scraper types; triangular, steep and inverse demonstrate restricted chronological occurrences in the assemblage (Fig. 125). The triangular scraper type clearly represents a distinct variety of end scraper produced during Period 3A. Surface examples and a single fragment (1 out of 78 examples) belonging to Period 4 do not diminish the restricted distribution of the triangular scraper type to Period 3A. All of the remaining examples from poor contexts belong to questionable 3A units (Table 21.28). The presence of a unique scraper type belonging to Period 3A is paralleled by the possibility of two other unique types belonging to Period 4. Inverse and steep scraper types were collected from chronologically mixed contexts preceding Period 4 as well as in the surface collection, but clearly dated examples belong only to Period 4. These more infrequent scraper varieties suggest a greater degree of stylistic variation in scraper production during Periods 3A and 4 than during other periods of occupation at Kissonerga.

Relatively few *in situ* examples exist for the scraper class only, partly confirming the temporal distinctions outlined above. The majority of end scrapers belong to Period 4 (n=12) with an additional example from a mixed 4/5 sample. The single triangular scraper example was recovered from a Period 3A context. Similarly, inverse scraper (n=2) were noted only within the Period 4 sample. Two round scraper examples were collected from Period 4 as well as a single example from Period 3B. Period 4 is also represented by a single example from each of the double and side scraper varieties with

Table 21.30. Scraper raw materials (based on a sample of 276)

Attribute	*Type 1*	*Type 2*	*Type 3*	*Type 4*	*Other*
End 10	56	14	11	1	
%	10.87	60.87	15.22	11.96	1.09
Triangular	4	6	0	5	0
%	26.67	40.00	0.00	33.33	0.00
Double	3	6	0	4	0
%	23.08	46.15	0.00	30.77	0.00
Steep	1	2	0	0	1
%	25.00	50.00	0.00	0.00	25.00
Round	2	12	0	4	0
%	11.11	66.67	0.00	22.22	0.00
Side	6	12	5	1	1
%	24.00	48.00	20.00	4.00	4.00
End/side	0	3	0	1	0
%	0.00	75.00	0.00	25.00	0.00
Inverse	1	8	0	2	1
%	8.33	66.67	0.00	16.67	8.33
Frags-end	16	22	9	17	0
%	25.00	34.38	14.06	26.56	0.00
Frags-side	4	6	7	11	1
%	13.79	20.69	24.14	37.93	3.45
Total	47	133	35	56	5
%	17.03	48.19	12.68	20.29	1.81

			Colour			
Material	*Grey*	*Red*	*Yellow*	*Brown*	*Olive*	*White*
Type 1	24	4	4	5	9	1
%	51.06	8.51	8.51	10.64	19.15	2.13
Type 2	84	0	0	49	0	0
%	63.16	0.00	0.00	36.84	0.00	0.00
Type 3	3	5	7	15	2	3
%	8.57	14.29	20.00	42.86	5.71	8.57
Type 4	13	18	19	2	1	3
%	23.21	32.14	33.93	3.57	1.79	5.36
Other	3	1	1	0	0	0
%	60.00	20.00	20.00	0.00	0.00	0.00

a single side scraper example from a 3B context completing the distribution of scrapers collected from the most secure contexts. Examples belonging to Period 3B deviate most strongly from the total scraper distribution, while Period 4 examples are over represented.

In contextual terms, the scraper class is dominated by general occupation occurrences during Period 3A while building contexts yielded the majority of scrapers during Periods 3B and 4 as well as a single example from the Period 2 'structures' (Unit 1596) (Table 21.31). The pit utilisation of Periods 1 and 2 as well as the general context dominance in Period 5 are typical of other tool classes discussed above. Consideration of the numbers of scrapers recovered from individual structures shows a pattern similar to that seen within other tool classes. Period 3A shows examples from four buildings: 1161, 1295, 1547 and 1638 (one scraper each), while B 1565 and 1016 had greater concentrations of 2 pieces and a large number (n=7) of scrapers respectively from occupation materials. In Period 3B scrapers were recovered in B 206, 855 and 1161, as single examples, while 4 of the 6 examples from B 2 were collected in occupation deposits. Period 4 typically

Table 21.31. Scraper context. (All contexts included - [Building occupation 'A' and 'S*'])

Period	*Building*	*Pit*	*Surface*	*General*	*Other*	*Disturb*
5	0	3	1	8	0	3
%	0.00	20.00	6.67	53.30	0.00	20.00
5?	0	1	0	16	0	0
%	0.00	5.88	0.00	94.12	0.00	0.00
4/5	0	1	0	3	0	0
%	0.00	25.00	0.00	75.00	0.00	0.00
4	54 [30]	14	11	25	10	1
%	46.96	12.17	9.57	21.74	8.70	0.87
4?	0	0	0	1	0	0
%	0.00	0.00	0.00	100.00	0.00	0.00
3/4	0	0	1	7	0	0
%	0.00	0.00	12.50	87.50	0.00	0.00
3/4?	0	0	0	1	0	0
%	0.00	0.00	0.00	100.00	0.00	0.00
3B/4	3	0	0	0	0	0
%	100.00	0.00	0.00	0.00	0.00	0.00
3A/4	0	1	0	0	0	0
%	0.00	100.00	0.00	0.00	0.00	0.00
3	0	1	0	0	1	0
%	0.00	50.00	0.00	0.00	50.00	0.00
3?	0	1	0	0	1	0
%	0.00	50.00	0.00	0.00	50.00	0.00
3B	10 [7]	0	0	5	1	1
%	58.82	0.00	0.00	29.41	5.88	5.88
3B?	0	1	0	3	0	0
%	0.00	25.00	0.00	75.00	0.00	0.00
3A/B	0	14	0	12	0	0
%	0.00	53.85	0.00	46.15	0.00	0.00
3A	17 [13]	5	1	37	2	0
%	27.42	8.06	1.61	59.68	3.23	0.00
3A?	0	2	0	0	2	0
%	0.00	50.00	0.00	0.00	50.00	0.00
2/3A	0	1	0	7	0	0
%	0.00	12.50	0.00	87.50	0.00	0.00
2	0	3	0	1	0	0
%	0.00	75.00	0.00	25.00	0.00	0.00
1A/1B?	0	1	0	0	0	0
%	0.00	100.00	0.00	0.00	0.00	0.00

shows examples from the greatest number of different structures, but (unusually) a significant number were collected from architectural contexts rather than occupation deposits. B 1, 86, 200, 494, 866, 1046 and 1052 all had from 1 to 3 scrapers in contexts relating to occupation. B 706 (n=7) and, typically, B 3 (13) possessed significant collections of scrapers. The concentration of scrapers from B 706, according to the excavator, represented the only recognisable 'cache' of chipped stone tools recorded at Kissonerga. The latter 'cache' is represented by seven massive scrapers; three inverse, three round and one end scraper. Significantly, the latter were examples produced with Type 2 raw materials, belonging perhaps to a single individual or craftsman.

Utilised pieces

The final class used to sub-divide the Kissonerga tool assemblage, the utilised pieces, is the only class defined exclusively on the basis of wear rather than secondary retouch. The pieces belonging to the utilised class exhibit various patterns of continuous edge damage. The expedient use of unretouched flakes and blades has recently been described as one of the hallmarks of the Chalcolithic in Cyprus (D'Annibale 1993, 14; see also Johnson and Morrow *et al.* 1987). The presence of utilised flakes and blades was noted earlier by Betts for the Kissonerga assemblage, but questioned by Finlayson through use-wear analysis as being derived largely from post-depositional effects (Betts 1987, 12; Finlayson 1987, 14). In a larger PhD research Finlayson subsequently showed that a significant proportion of artefacts from the Kissonerga assemblage belonging to a type labelled 'non-retouch utilisation' could be demonstrated to have been used (Finlayson 1989, 210). A small number of pieces described as waste flakes, however, also demonstrated signs of use according to Finlayson (*ibid.*). The difficulties of employing a utilised category in chipped stone analysis are, therefore, readily apparent. Within the Kissonerga assemblage significant numbers of artefacts demonstrated signs of utilisation, which warranted the continued use of this non-formal tool category. Due to the very large proportion of broken and damaged waste material in the assemblage, only those pieces with continuous edge damage patterns or a regular series of discontinuous edge damages were included in the utilised piece sample in the present analysis (Moss 1983; Tringham *et al.* 1974; see § 21.10). Using both 10x and 20x hand lenses, a total number of 782 utilised pieces were counted representing 23.91% of the total tool sample (Table 21.32). Three primary types of utilisation were noted and are described below. In addition to the usual fragmentary and use wear categories, a mixed type was added for pieces which exhibited elements of two or three of the primary type attributes. The latter contained a significant number of combinations, which included edges with abraded segments of wear.

General utilisation

Any blank or blank segment exhibiting continuous or regular discontinuous angular edge damage. The edge damage can be located on either end or lateral edge(s). Of the three main utilised types employed in this analysis, the general sample is most likely to include possible examples of post-depositional processes. Fig. 107.15.

Wedge

Any blank or blank segment exhibiting a series of angular edge damage scars either unifacially or most often bifacially along a single lateral edge, or distal or proximal end. On occasion, more than one edge exhibited this form of edge modification suggesting that a piece had been rotated during use or reuse. Flat plain butts and/or flat scars created by snapping the edge opposite to the modified edge provided probable convenient holding or hafting points. Fig. 107.14 and 16.

Abrasion

Any blank or blank segment with abrasion (grinding) edge damage rather than the angular edge damage scars belonging to the above two types described above. Fig. 107.17.

Table 21.32. Utilised pieces types by period. (All contexts included)

Period	*General*	*Wedge*	*Abras*	*Mixed*	*Frags*	*Use wear*
Surface	51	32	8	10	24	4
%	50.50	31.68	7.92	9.90		
5	4	0	0	0	7	1
%	100.00	0.00	0.00	0.00		
5?	6	3	5	0	2	1
%	42.86	21.43	35.71	0.00		
4/5	3	1	0	1	3	2
%	60.00	20.00	0.00	20.00		
4	66	45	15	10	80	28
%	48.53	33.09	11.03	7.35		
4?	6	1	1	0	2	3
%	75.00	12.50	12.50	0.00		
3/4	1	4	3	3	3	4
%	9.09	36.36	27.27	27.27		
3/4?	0	0	0	0	0	2
3B/4	1	0	0	0	1	0
%	100.00	0.00	0.00	0.00		
3A/4	2	2	1	0	5	2
%	40.00	40.00	20.00	0.00		
3	0	0	1	0	4	0
%	0.00	0.00	100.00	0.00		
3?	0	0	0	0	1	0
3B	22	10	3	3	25	5
%	57.89	26.32	7.89	7.89		
3B?	3	1	0	0	4	0
%	75.00	25.00	0.00	0.00		
3A/B	2	1	1	0	7	0
%	50.00	25.00	25.00	0.00		
3A	69	14	20	10	53	10
%	61.06	12.39	17.70	8.85		
3A?	5	1	1	0	3	3
%	71.43	14.29	14.29	0.00		
2/3A	11	2	0	1	8	0
%	78.57	14.29	0.00	7.14		
2/3A?	1	0	0	0	1	0
%	100.00	0.00	0.00	0.00		
2	5	2	0	0	5	0
%	71.43	28.57	0.00	0.00		
2?	2	0	0	0	1	0
%	100.00	0.00	0.00	0.00		
1A/1B?	1	0	0	0	1	0
%	100.00	0.00	0.00	0.00		
Total (n=782)	261	119	59	38	240	65
%	33.38	15.22	7.54	4.86	30.69	8.31

Table 21.33. Utilised piece attributes

Blank types based on a sample of 444	*General*	*Wedge*	*Abrasion*	*Mixed*
Blade/Bladelet				
Complete	15	1	6	1
Proximal	3	0	4	2
Medial	5	0	0	3
Distal	11	1	4	0
Total	34	2	14	6
% of type	13.99	1.84	24.07	15.79
Spall	3	0	0	0
% of type	1.23	0.00	0.00	0.00
Flake				
Complete	72	22	12	15
Proximal	34	13	8	3
Medial	37	36	9	11
Distal	53	33	12	3
Total	196	104	41	32
% of type	80.66	95.41	75.93	84.21
Chip				
Complete	9	1	0	0
Proximal	1	0	0	0
Medial	0	0	0	0
Distal	0	1	0	0
Total	10	2	0	0
% of type	4.12	1.84	0.00	0.00
Core	0	1	0	0
% of type	0.00	0.92	0.00	0.00
Total	243	109	55	38
Maximum tool length mm based on a sample of 183.				
Average	37.52	33.14	35.36	37.17
Std	1.43	1.21	1.32	1.82
Var	2.03	1.46	1.75	3.30
High	68.94	76.74	78.20	91.44
Low	4.90	15.98	13.70	13.02
Edge thickness mm based on a sample of 183.				
Average	2.50	6.72	1.64	2.55
Std	0.14	0.30	0.07	0.19
Var	0.02	0.09	0.01	0.04
High	7.12	17.54	4.56	8.64
Low	1.14	3.10	0.76	1.10

Expediently used blanks were predominantly flakes and flake segments though a significant proportion of lamellar blanks as well as some chips was employed (Table 21.33). Blades and bladelets with abrasion were the most common (24.07%) of the lamellar utilised pieces clearly demonstrating that expedient tool used need not be exclusively limited to flakes (e.g. Parry and Kelly 1987). A significant number of pieces with general edge damage chipping were also produced on lamellar blanks and blank segments. Very few spalls exhibited pattered edge damage belonging to the general type while the only core in the assemblage with clear signs of re-use as a tool belongs to the wedge utilised category. Complete blanks can be seen to dominate blank segment utilisation in both the general and abrasion types. Large numbers of blank segments were, however, employed expediently within the wedge type.

The utilised pieces belonging to the Kissonerga assemblage exhibit middle range maximum tool lengths (33.14 to 37.52 mm), but demonstrate the smallest average edge thicknesses (between 1.64 and 2.55 mm belonging to the general and abrasion types) (Table 21.33). The obvious exception of 6.72 mm belonging to the wedge type average edge-thickness distinguishes this substantially more robust type from other utilised pieces. High and low parameter values as well as the poor standard deviation and variance results of the maximum tool lengths reflect the unstandardised nature of blank types employed in the utilised class. Edge thickness values for the general and abrasion utilised types like that of the wedge type discussed above show low standard deviation and variance values despite the presence of rather extreme high outliers in all three cases.

Table 21.34. Utilised piece raw materials (based on a sample of 189)

Material	*General*	*Wedge*	*Abrasion*	*Mixed*	*Total*
Type 1	13	28	8	4	53
%	29.55	34.15	18.60	20.00	28.04
Type 2	7	8	2	4	21
%	15.91	9.76	4.65	20.00	11.11
Type 3	19	26	20	8	73
%	43.18	31.71	46.51	40.00	38.64
Type 4	4	20	13	4	41
%	9.09	24.39	30.23	20.00	21.69
Other	1	0	0	0	1
%	2.27	0.00	0.00	0.00	0.53

			Colour			
Material	*Grey*	*Red*	*Yellow*	*Brown*	*Olive*	*White*
Type 1	5	8	2	2	2	2
%	23.81	38.10	9.52	9.52	9.52	9.52
Type 2	41	0	0	12	0	0
%	77.36	0.00	0.00	22.64	0.00	0.00
Type 3	13	7	20	13	10	10
%	17.81	9.59	27.40	17.81	13.70	13.70
Type 4	10	15	10	2	0	4
%	24.39	36.59	24.39	4.88	0.00	9.76
Other	1	0	0	0	0	0
%	100.00	0.00	0.00	0.00	0.00	0.00

The sharp edges produced by most chert materials would have been well suited to expedient use (Table 21.34). The predominant use of materials belonging to Type 3 cherts within the utilised class would, therefore, seem to require some explanation. The low proportion of Type 2 materials (perhaps not readily available in large quantities) could represent the conservation of this material for its favoured application in scraper products rather than for expedient use (see above). Considering the nature of Type 4 raw materials (while being useful for strong, retouched edges), is often brittle and prone to splintering on very thin edges when freshly removed from a core (personal observation). The presence of sizeable quartz grains within the iso-tropic silica matrix of the Type 3 raw material, how-ever, is likely to have been useful in abrading activities as the dominance of this material within abrasion type (46.51%) implies. Raw material utilisation in the wedge type is more evenly distributed, excepting the expected paucity of examples made on Type 2 materi-als. Type 4 materials as well as materials belonging to Type 1 were apparently well suited for wedge type im-plements with their greater average edge thickness.

General utilised examples clearly dominate all chronological samples (Table 21.32; Fig. 126). From a

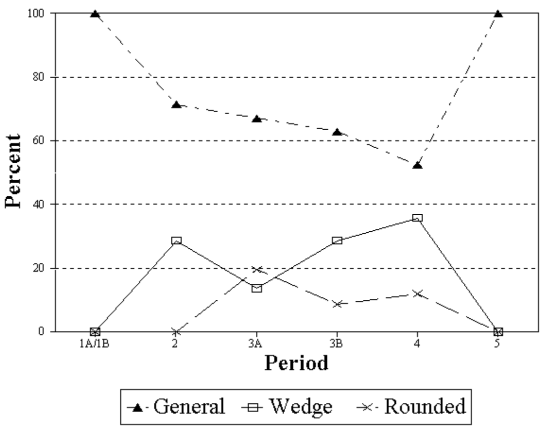

Fig. 126: Utilised type percent

peak during Period 1, the proportion of general utilised pieces decreases to a low of 48.53% in Period 4. The anomalous proportion of 100% representing Period 5 could well represent greater effects of post-depositional processes since most of this sample was collected at or near the surface. The decrease in the total proportion of general utilised pieces was met with increases in either the wedge or abrasion utilised types between Periods 2 and 4. Wedge pieces show two peaks, during each of Periods 2 and 4, while the abraded examples reached a separate peak during Period 3A when the proportions of wedge and abrasion pieces were most nearly parallel. In-situ examples show Period 4 dominant in all three categories. A large sample (n=20) of the *in situ* general utilised pieces belong to Period 4 relative to 13 exam-ples in Period 3A, 7 for Period 3B and 1 each for Peri-ods 1 and 2. Fifteen *in situ* wedge type pieces belong to Period 4 compared to 5 examples from 3B and one from Period 3A. Similarly, seven examples demonstrate the majority of *in situ* abraded pieces belonging to Pe-riod 4 while only one example was collected from each of Periods 3A and 3B.

In terms of recovery location utilised pieces demon-strate a similar distribution to the general patterns out-lined above (Table 21.35). Periods 1 and 2 show an invariable preference for pit disposal just as Period 5 utilised pieces were all recovered from general occupa-tion contexts. Three examples were recovered from the timber 'structures' belonging to Period 2 (Unit 1596 (n=1) and Unit 1651 (2)). Significant concentrations of utilised pieces were collected from individual general contexts in all Periods, especially Period 3A where the collections exceeded 20 examples in three cases. Exter-nal floor and surface occurrences were sparse in all periods. Within buildings, significant numbers of util-ised pieces were recovered during Periods 3A, and es-pecially 3B and 4. Building occurrences representing Period 3A contain the highest concentrations of tools assigned to building occupation materials belonging to this period; B 1016 (n=18), 1295 (3), 1547 (9) and

Table 21.35. Utilised piece context. (All contexts included - [Building occupation 'A' and 'S*'])

Period	*Building*	*Pit*	*Surface*	*General*	*Other*	*Disturb*
5	0	8	0	9	0	3
%	0.00	40.00	0.00	45.00	0.00	15.00
5?	0	0	0	17	0	0
%	0.00	0.00	0.00	100.00	0.00	0.00
4/5	2	1	0	6	1	0
%	20.00	10.00	0.00	60.00	10.00	0.00
4	84 [53]	52	17	71	19	2
%	34.29	21.22	6.94	28.98	7.76	0.82
4?	5	3	2	1	3	0
%	35.71	21.43	14.29	7.14	21.43	0.00
3/4	1	0	2	9	4	1
%	5.88	0.00	11.76	52.94	23.53	5.88
3/4?	0	1	0	1	0	0
%	0.00	50.00	0.00	50.00	0.00	0.00
3B/4	1	1	0	0	0	0
%	50.00	50.00	0.00	0.00	0.00	0.00
3A/4	0	9	0	0	3	0
%	0.00	75.00	0.00	0.00	25.00	0.00
3	3	0	0	3	0	0
%	50.00	0.00	0.00	50.00	0.00	0.00
3?	0	1	0	0	0	0
%	0.00	100.00	0.00	0.00	0.00	0.00
3B	37 [22]	4	1	19	4	0
%	56.92	6.15	1.54	29.23	6.15	0.00
3B?	0	0	0	8	0	0
%	0.00	0.00	0.00	100.00	0.00	0.00
3A/B	0	6	0	8	0	0
%	0.00	42.86	0.00	57.14	0.00	0.00
3A	46 [35]	15	6	101	3	2
%	26.59	8.67	3.47	58.38	1.73	1.16
3A?	0	3	0	2	5	0
%	0.00	30.00	0.00	20.00	50.00	0.00
2/3A	0	4	0	18	0	0
%	0.00	18.18	0.00	81.82	0.00	0.00
2/3A?	0	0	0	2	0	0
%	0.00	0.00	0.00	100.00	0.00	0.00
2	0	10	0	2	0	0
%	0.00	83.33	0.00	16.67	0.00	0.00
2?	0	3	0	0	0	0
%	0.00	100.00	0.00	0.00	0.00	0.00
1A/1B?	0	2	0	0	0	0
%	0.00	100.00	0.00	0.00	0.00	0.00

1565 (5). In Period 3B, utilised pieces from occupation materials were recovered in B 2, 4, 1000, 1103, and 1161, from 1 to 3 examples each. More substantial numbers were collected in buildings 206 (n=6) and 994 (7) during the same period. As shown above, the buildings of Period 4 most frequently contained numerous tool examples. B 1, 86, 98, 200, 493, 494, 936 and 1044 had between 1 and 3 examples each, while more numerous collections of utilised pieces from occupation contexts were recovered from B 706 (n=5), 834 (7), 866 (4), 1052 (6), 1165 (6), and the expected concentration of examples in B 3 (11).

§ 21.9 Conclusions (C.M.)

The review of assemblage categories and dominant tool types provides a basic picture of the development of the Kissonerga assemblage through time. The sample from Aceramic Neolithic contexts (Period 1A) at Kissonerga is, unfortunately, extremely impoverished. A characteristically Aceramic Period 1 sample appears to be unique within the Kissonerga assemblage in terms both of tool classes and perhaps debitage categories (remembering the combined debitage values were generated from Periods 1A and 1B values). High proportions of complete blanks and blank proximals comprise the majority of the Neolithic debitage. Lower numbers of other blank fragment types in addition to the absence of *in situ* cores or cortical blanks in the Period 1(A-B) sample suggest a greater focus on tool manufacture than core reduction. Only one tool, however, was collected from a secure Period 1A context limiting the value of such an interpretation. The most recognisably Neolithic feature of the Period 1 (A and B) sample from Kissonerga is the high proportion of blade and bladelet blanks. The small number of retouched and utilised implements assigned to Period 1 presents a patchy distribution across the major tool classes (Table 21.36). Period 1 examples of retouch are, in general, rather robust exhibiting abrupt sometimes invasive retouch used most frequently to establish steeply backed edges. The most diagnostic Aceramic implement in the sample, the extremely long blade showing inverse proximal retouch, is also the most unusual in terms of material type and especially size, suggesting that it was carried to Kissonerga after being produced in a more fully developed Aceramic industry elsewhere.

Table 21.36. Number and percentage of complete tools for each major tool type from chronologically secure contexts. (All contexts)

Tool type	*1A/1B*	*2*	*3A*	*3B*	*4*	*5*
Burin-on-break	0	1	13	4	18	2
%	0.00	3.13	3.33	2.61	3.11	4.76
Simple burin	1	0	7	0	7	0
%	10.00	0.00	1.79	0.00	1.21	0.00
Dihedral burin	0	2	2	2	4	0
%	0.00	6.25	0.51	1.31	0.69	0.00
Truncation burin	0	2	13	4	6	0
%	0.00	6.25	3.33	2.61	1.04	0.00
Mixed burin	0	0	9	1	3	0
%	0.00	0.00	2.31	0.65	0.52	0.00
Alternate denticulate	0	0	0	0	4	0
%	0.00	0.00	0.00	0.00	0.69	0.00
Direct denticulate	0	1	8	2	12	1
%	0.00	3.13	2.05	1.31	2.08	2.38
Scraper resharpening	0	0	1	1	3	0
%	0.00	0.00	0.26	0.65	0.52	0.00
Backed glossed piece	0	0	3	3	6	0
%	0.00	0.00	0.77	1.96	1.04	0.00
Backed/truncated gloss	1	1	2	0	2	0
%	10.00	3.13	0.51	0.00	0.35	0.00
Truncated gloss piece	0	0	1	1	2	0
%	0.00	0.00	0.26	0.65	0.35	0.00
Unretouched glossed	1	0	12	8	20	0
%	10.00	0.00	3.08	5.23	3.46	0.00
Clactonian notch	0	1	3	1	6	0
%	0.00	3.13	0.77	0.65	1.04	0.00
Double notch	0	1	9	1	11	0

%	0.00	3.13	2.31	0.65	1.90	0.00
Single notch	0	1	13	11	39	3
%	0.00	3.13	3.33	7.19	6.75	7.14
Notch with retouch	0	2	8	3	13	0
%	0.00	6.25	2.05	1.96	2.25	0.00
Fine notch	0	3	31	12	51	7
%	0.00	9.38	7.95	7.84	8.82	16.67
Borer perforator	1	2	9	7	11	0
%	10.00	6.25	2.31	4.58	1.90	0.00
Drill perforator	0	0	25	7	25	1
%	0.00	0.00	6.41	4.58	4.33	2.38
Alternate retouch	0	0	6	4	18	1
%	0.00	0.00	1.54	2.61	3.11	2.38
Backed and truncated	1	1	10	7	8	0
%	10.00	3.13	2.56	4.58	1.38	0.00
Convex retouch	0	0	16	3	14	4
%	0.00	0.00	4.10	1.96	2.42	9.52
Inverse proximal ret	2	0	6	2	5	0
%	20.00	0.00	1.54	1.31	0.87	0.00
Rectilinear retouch	1	5	51	21	95	11
%	10.00	15.63	13.08	13.73	16.44	26.19
Pressure retouch	0	0	2	3	1	1
%	0.00	0.00	0.51	1.96	0.17	2.38
Bilateral retouch	0	0	1	3	6	1
%	0.00	0.00	0.26	1.96	1.04	2.38
End scraper	0	1	12	5	33	1
%	0.00	3.13	3.08	3.27	5.71	2.38
Triangular scraper	0	0	6	0	0	0
%	0.00	0.00	1.54	0.00	0.00	0.00
Double scraper	0	1	1	1	4	0
%	0.00	3.13	0.26	0.65	0.69	0.00
Steep scraper	0	0	0	0	2	0
%	0.00	0.00	0.00	0.00	0.35	0.00
Round scraper	1	0	1	1	7	0
%	10.00	0.00	0.26	0.65	1.21	0.00
Side scraper	0	0	6	0	9	5
%	0.00	0.00	1.54	0.00	1.56	11.90
Inverse scraper	0	0	0	0	7	0
%	0.00	0.00	0.00	0.00	1.21	0.00
General utilised	1	5	69	22	66	4
%	10.00	15.63	17.69	14.38	11.42	9.52
Wedge utilised	0	2	14	10	45	0
%	0.00	6.25	3.59	6.54	7.79	0.00
Abrasion utilised	0	0	20	3	15	0
%	0.00	0.00	5.13	1.96	2.60	0.00

The spectrum of debitage and tool categories belonging to the EChal period (Period 2) at Kissonerga demonstrates a loosely structured industry relative to subsequent Chalcolithic period samples. The Period 2 reduction strategy shows an abundance of unutilised debitage with the greatest production rates of a variety of blank types. The tool type distribution is, however, impoverished. The notched class accounts for the widest variety of types and the largest proportion of implements in the Period 2 sample (Tables 21.36 and 37). Other tool classes demonstrate restricted type distributions, but show a significant number of tools particularly in the finely retouched tool variants, and the burin class. Unretouched utilised pieces also represent a high proportion of the Period 2 sample.

The Period 3A sample demonstrates the most effective reduction system in the Kissonerga assemblage. The high proportion of cores was efficiently utilised

Table 21.37. Percentages of each tool class within each period. (Chronologically secure contexts only)

Class	*1A/1B*	*2*	*3A*	*3B*	*4*	*5*
Burins	10.00	18.18	14.19	9.82	8.06	4.55
Denticulates	0.00	3.03	2.33	2.45	3.95	6.82
Perforators	10.00	6.06	9.77	8.59	6.09	2.27
Glossed	20.00	3.03	4.19	7.36	4.93	0.00
Notches	0.00	24.24	15.35	17.18	20.07	22.73
Retouched	40.00	18.18	21.40	26.38	24.18	40.91
Scrapers	10.00	6.06	6.51	4.91	10.36	13.64
Utilised	10.00	21.21	26.28	23.31	22.37	9.09

leaving a correspondingly low proportion of unutilised blanks. Variety in blank type was reduced within the Period 3A sample showing the most heavily flake based reduction strategy of the five Kissonerga periods. Tool production reached a peak in the Period 3A sample, but considering the uniquely low proportion of chips may indicate a decrease in the total amount of tool rejuvenation. The large proportion of tools in the Period 3A sample could be indicative of shorter tool use-lives relative to higher curration rates suggested for other periods of occupation. The dominant position of the utilised class of implements in the Period 3A sample agrees with the suggestion of a greater degree of expedient tool use. Other tools in the Period 3A sample are widely distributed across nearly all major tool types (Table 21.36). A small but significant number of perforators with pigment residues represents a concentration of implements probably used in craft activities related to the use of perforated ceramic artefacts (see above). The Period 3A tool distribution is also marked by the presence of the triangular scraper type, demonstrating a unique stylistic preference.

The Period 3B sample demonstrates a significant decrease in the total number of tools from the preceding first half of the MChal. The debitage sample is less heavily flake based, showing greater numbers of blades, bladelets and spall blanks. The proportions of cores and debitage materials are more comparable to those of the LChal sample than those of the preceding Period 3A. The Period 3B industry appears to be more wasteful than the preceding Period 3A or succeeding Period 4 samples, suggesting a shift in attitudes of blank production cost-effectiveness during the second half of the MChal. The very high proportion of chips in the sample, however, suggests a renewed emphasis on tool rejuvenation like that seen previously within the EChal sample. Though the total proportion of retouched and utilised implements decreased during Period 3B, the distribution of tool types is broadly parallel to that of the preceding Period 3A. The tool sample shows a number of finely retouched types, including the pressure retouched pieces, suggestive of a limited flowering of the chipped stone industry during Period 3B. Interestingly, the scraper class of Period 3B exhibits its lowest total proportion and type variety within the total Kissonerga assemblage.

The LChal, Period 4, sample demonstrates both changes and continuities in comparison with the preceding E-MChal periods. The distribution of major artefact categories demonstrates an industry lying between the extreme frugality shown by the first half of the MChal and the return to greater excesses seen in the Period 3B sample. A greater proportion of the blanks produced were subsequently manufactured into tools, while lower numbers of chips in the Period 4 sample seem to correspond to the less frequent tool rejuvenation seen in earlier Period 3A sample. The distribution of tool types is widest during the LChal with all major tool types being represented, excluding the chronologically limited triangular scrapers belonging to Period 3A. The latter was instead replaced by two new temporally unique scrapers; the steep and inverse types. A further unique Period 4 type, alternate denticulates, indicates a temporally limited preference for relatively coarse alternate retouch within the Period 4 distribution. The burin class demonstrates a greater number of more simply worked examples, while other more finely retouched tool types also show decreased proportions from the preceding second half of the MChal. Interestingly, while retouch quality may be somewhat less sophisticated in the LChal tool repertoire, the renewed increase in overall tool production is not accounted for by greater emphasis on expedient utilised pieces like that seen in the preceding Period 3A sample.

Summarising the Philia period industry at Kissonerga must remain speculative as the Period 5 sample like that from Period 1 is of poor quality. Relative proportions of the production categories suggest continuity with the M-LChal, particularly Periods 3A and 4. Tools, though absent from the well stratified contexts, are relatively frequent. A very high proportion of chips and the restricted distribution of tool types suggest a limited tool production repertoire maintained by significant amounts of tool rejuvenation. Continuing a trend indicated by the Period 4 sample, less formally retouched tool examples dominate a distribution heavily concentrated within the retouched class. The anomalous presence of pressure retouched and finely worked bilateral examples within the Period 5 sample can be attributed to intrusive material in this highly disturbed tool sample. A uniquely high proportion of side scrapers in the Period 5 sample may, however, demonstrate a significant concentrated effort in the production of this tool type during the Philia period at the site.

Keeping the limitations of the small Periods 1 and 5 samples in mind, the distribution of various tool classes is relatively consistent through time (Table 21.37). In general, the retouched, utilised and notched classes dominate the total tool class proportions. Burins, scrapers and perforators represent more moderate tool occurrences, while glossed pieces and denticulated pieces are relatively less common in the Kissonerga assemblage. The proportion of the burins belonging to each period demonstrates the most distinct temporal change of tool classes in the assemblage. Burins were most prominent in the Period 2 sample, showing a gradual decrease thereafter. A high proportion of burins has been noted in the EChal assemblage of Kalavassos-Ayious providing parallel data that appears to signal a diagnostic feature of the EChal in Cyprus (Betts n.d.1, 3). Denticulated pieces were most common within the Philia sample, but were relatively infrequent in the preceding Chalcolithic periods. During the MChal perforators were more significant, representing similar proportions only to the small Period 1 sample. Glossed pieces show a low, fluctuating proportion during all periods of the Chalcolithic. A low peak of this tool class during Period 3B is interesting in light of other peak occurrences within the retouched class and the problems of interpretation associated with the Period 1 sample (see below). A relatively low glossed element frequency in the EChal is also interesting considering the frequent occurrence of the large bell shaped pits at the site interpreted in terms of grain storage (see § 14.4 and 2). The high proportion of glossed pieces belonging to the Aceramic Neolithic sample (in light of the paucity of this tool class in other samples) may be more indicative of field rather than settlement activities, an interpretation which would help explain the incomplete, situational nature of the Period 1 sample. Glossed pieces are absent from the Philia tool class distribution. Notches represent one of the most significant tool components of the Kissonerga assemblage providing nearly a quarter of all implements from Periods 4, 5 while dominating the tool spectrum in Period 2. Notches decreased in relative importance during the MChal and were absent from the Neolithic sample at Kissonerga. Utilised pieces also represent one of the most common implement in the Kissonerga assemblage demonstrating a consistent use of expedient tools particularly in all Chalcolithic periods of occupation. Following the utilised pieces (particularly the peak in Period 3A), the generalised retouched class dominates the Kissonerga assemblage in all periods except the notch dominated Period 2. The diminutive Periods 1 and 5 samples show unusually high proportions of the retouched tool class. Assemblages from other Aceramic Neolithic assemblages in Cyprus, in particular, suggest that the Kissonerga Period 1 retouched proportion is representative (e.g. Steklis 1962, 1961). Scrapers may be a recognisable type fossil of the Chalcolithic in general, but represent only moderate tool proportions in the Neolithic, Chalcolithic and Philia samples at Kissonerga.

Final remarks on the assemblage chronology must consider the status of the obsidian, pressure retouched and fine bilateral retouched pieces belonging to the

Kissonerga assemblage. These artefact types are usually assumed to represent Aceramic Neolithic workmanship, but were recovered primarily in MChal contexts from Kissonerga. Conversely, the small Aceramic tool sample from Kissonerga is dominated by glossed elements and retouched pieces often exhibiting steep and relatively coarse retouch. The most formally diagnostic piece belonging to the Aceramic sample from Kissonerga is the extremely long blade (material Type 4) with very steep, bilateral inverse and direct retouch isolated at the proximal end (Fig. 104.11). Glossed elements and retouched blades also dominate other Neolithic chipped stone materials reported to date (e.g. Fox 1987; Coqueugniot 1984; Le Brun 1981; Stekelis 1962). The recently reported pressure retouched obsidian tang from Khirokitia provides a more distant link with the Kissonerga pressure retouched pieces than the chert example reported from the site of Souskiou-Laona. Though it seems possible that obsidian imports may have provided a model later copied by Cypriot knappers (see discussion of retouched pieces above). Aceramic Neolithic parallels of the finely retouched bilateral and pointed blades in the Kissonerga assemblage are found more easily, for example, in the assemblages belonging to Khirokitia, Kritou Marottou-Ais Yiorkis and Kholetria-Ortos (Fox 1987, Figs. 1.5 and 4.6; Stekelis 1962, Fig. 31.22). The difficulty of the Kissonerga assemblage lies in the possible disturbance of Neolithic deposits in the lower excavation area by Period 3B occupants at the site, precisely where the many of the obsidian, pressure retouched and bilateral artefacts were recovered. The presence of an Aceramic Neolithic occupation in this area of the excavation is not, however, well established and would not explain the recovery of obsidian, pressure retouched and bilateral artefacts from Periods 3A through Period 5. While the Period 5 examples, being recovered at or near the surface, are more likely to include derived materials (like the single thumbscraper belonging to the surface sample), pressure retouched and bilateral pieces were recovered from more well stratified or *in situ* contexts belonging to the M-LChal periods. The presence of blades and bladelets also fails to provide unequivocal evidence of Neolithic industries at Kissonerga (see below).

The status of the pressure retouch, fine bilaterally retouched blades and bladelets and obsidian belonging to the Kissonerga assemblage must remain inconclusive for the present. Parallels exist for these artefact types from Neolithic assemblages on the island, yet too few parallels exist to conclusively refute the contextual evidence from Kissonerga, and the fact that pressure retouched pieces have been collected from at least one other Chalcolithic site in Cyprus. The impoverished nature of the Aceramic tool sample from Kissonerga is at odds with the fine workmanship exhibited by the pressure retouched, bilateral and obsidian pieces recovered from the site. Conversely, elements like the technique of heat-treatment as well as other finely retouched implements belonging to the Chalcolithic contexts at Kissonerga demand that continuity and/or re-use of obsidian, bilateral points and pressure retouch during the Chalcolithic period be seriously considered until more substantial evidence to the contrary has been documented.

Table 21.38. Number and percentage of blades in each tool class by period. (Chronologically secure contexts only)

Class	*1A/1B*	*2*	*3A*	*3B*	*4*	*5*
Burins	0	2	9	3	6	1
%	0.00	33.33	18.75	10.00	11.11	50.00
Denticulates	0	0	1	0	3	0
%	0.00	0.00	2.08	0.00	5.56	0.00
Glossed	1	1	8	5	7	0
%	25.00	16.67	16.67	16.67	12.96	0.00
Notches	0	1	1	1	3	0
%	0.00	16.67	2.08	3.33	5.56	0.00
Perforators	1	0	8	4	3	0
%	25.00	0.00	16.67	13.33	5.56	0.00
Retouched	1	0	6	8	15	1
%	25.00	0.00	12.50	26.67	12.96	50.00
Scrapers	0	1	3	0	3	0
%	0.00	16.67	6.25	0.00	5.56	0.00
Utilised	1	1	12	9	14	0
%	25.00	16.67	25.00	30.00	25.93	0.00

Turning to summarise the main tool attributes considered in the present report, it is readily apparent the utilisation of blades and bladelets is not limited to Neolithic assemblages on the island. Table 21.38 demonstrates the persistent use of lamellar blanks through all periods of occupation at Kissonerga. The burin, glossed element, retouched and utilised tools, in particular, were regularly produced on lamellar blanks. Burins, however, not only became less frequently retouched through time, but were made more frequently on flakes during later periods of the Chalcolithic. Glossed elements, following a single example in the Period 1 sample, demonstrate a significant degree of continuity in the selection of lamellar blanks for the E-MChal. Perforators similarly exhibited a link between the Neolithic and Chalcolithic in terms of the proportions of blade and bladelet blanks utilised. If examples made on spalls are added to the values represented in Table 21.38, the MChal preference for long, narrow blanks for the manufacture of perforators is exaggerated both in Periods 3A (30.91%) and 3B (21.21%), with a more modest proportion in the Period 4 sample (11.48%). Interestingly, the most consistent utilisation of lamellar blanks is shown within the retouched and utilised tool classes varying little between the five occupation periods at the site. The distribution of lamellar blanks in other implement classes suggests a more occasional utilisation of blade and bladelet blanks. The shift to a more heavily flake based tool repertoire was, therefore, far from absolute in the Chalcolithic with lamellar blanks continuing to represent significant proportions of selected tool classes.

Table 21.39. Percentage of complete tools made on blank fragments by period. (Chronologically secure contexts only)

Blank type	*1A/1B*	*2*	*3A*	*3B*	*4*	*5*
Proximal	12.50	4.35	14.34	19.39	16.91	20.00
Medial	62.50	60.87	47.92	43.88	50.73	26.67
Distal	25.00	34.78	37.74	36.73	32.36	53.33

A final note regarding the types of blanks used for tool manufacture is documented in Table 21.39. The very high proportion of broken blanks in each period sample may not be linked entirely to failures in blank manufacture. Despite the difficulties of differentiating complete from broken tools in all cases, the deliberate selection of fragmentary blanks for tool manufacture is clearly represented in the Kissonerga assemblage. Interestingly, the selection medial blank segments for tool manufacture predominates in all samples but that belonging to Period 5. Medial fragments also dominated all debitage samples, but the unusual Period 1 sample. The apparent over production of medial blank fragments seems to suggest a deliberate reduction strategy aimed at the production of large numbers of blank segments particularly as many examples exhibited side-blow scars on one or more of the broken edges (Nishiaki 1992, 312-331; Knowles and Barnes 1937). Proximal and distal tool portions may be more likely to represent broken implements in such a reduction system, but the convenient backing provided by snapped, side-blow or faceted edges is suggestive of deliberate truncation in many cases, shown most explicitly by the scraper class (see also Hordynsky and Ritt 1978).

Raw material utilisation was relatively generalised in the Kissonerga assemblage as a whole and is marked by diversity. Type 1 materials representing very fine materials with a smooth surface fracture quality were more commonly used in the burin, glossed, perforator, retouched and utilised classes, being notably less frequent in the steep edged tool classes; denticulates, notches and scrapers for which a sharp edge was less important. Type 2 materials demonstrate the only clearly preferential material utilisation within the scraper and related denticulate classes, being relatively infrequent in other tool classes. Type 3 raw materials exhibited a lower peak occurrence in the glossed, notched, perforator and utilised classes. Limited preferential uses for the latter material type may be explained by its granular surface texture, perhaps beneficial to implements without substantial retouch on the working edge. Good quality Type 3 materials are also readily accessible in secondary river-bed sources, particularly in the large river beds of the Paphos district. Type 4 raw materials, probably collected from primary sources, represent more variable fracture and surface texture qualities. These materials were utilised consistently in all but the notched class, and their frequent appearance seems to indicate unimpeded access to material sources. The limited occurrence of other material types, notably jasper, in the Kissonerga assemblage demonstrates a willingness to experiment shown also by the limited heat-treatment practices exhibited in the assemblage.

Table 21.40. Percentages of raw material types for each tool class

Class	*Type 1*	*Type 2*	*Type 3*	*Type 4*	*Other*
Burins	26.99	25.15	25.15	22.70	0.00
Denticulates	14.04	45.61	14.91	22.81	2.63
Glossed pieces	25.00	15.00	33.75	26.25	0.00
Notches	17.37	27.70	41.78	13.15	0.00
Perforators	28.21	13.68	34.19	23.93	0.00
Retouched pieces	26.21	19.54	25.06	27.36	1.84
Scrapers	17.03	48.19	12.68	20.29	1.81
Utilised pieces	28.04	11.11	38.63	21.69	0.53

The distribution of each tool class across the site demonstrates variable patterns of deposition for each period of occupation. Periods 1 and 2 exhibit parallel tool discard patterns, showing a nearly absolute focus on pits. While pit utilisation of nearly all chipped stone is indicative of the EChal period, Neolithic period debitage was recovered primarily from general occupation contexts, demonstrating a clear distinction between implement and waste disposal patterns during Period 1). In Period 3A all tool classes except the denticulates (recovered more frequently in building contexts) were discarded haphazardly in general contexts like the core and debitage materials. The subsequent Period 3B sample illustrates a more complex distribution of chipped stone artefacts. Cores, burins, notches and retouched pieces represent an odd combination of elements recovered primarily from building contexts. Only blanks and blank fragments were more frequently deposited in pits, while a large majority of particularly Period 3B implements; core trimming elements, denticulates, glossed elements, perforators, scrapers and utilised pieces were simply left in general occupation deposits. During the MChal, the tidy habits of the EChal inhabitants were seriously eroded with most chipped stone being casually discarded, possibly where originally employed in various craft activities. With the succeeding Period 4 sample, blank debitage, and a large number of the tool classes: burins, denticulates, glossed elements, perforators, retouched pieces, scrapers and utilised pieces were stored more frequently within structures. Though the distribution of all debitage, core and tool types is more diffuse across the major context types in Period 4, most of the LChal debitage, cores and notches were deposited in general occupation fills. Period 5 materials like the Periods 1 and 2 samples were collected predominantly from a single context type, with the majority of implement classes, including burins, denticulates, notches, retouched pieces, scrapers and utilised pieces being collected from general occupation deposits.

During Periods 3A, 3B and 4 tools were frequently recovered from buildings. A large number of different structures are represented during each period of occupation. Retouched and utilised pieces, though frequently in low numbers, were most often found within buildings than all other tool classes in both M-LChal periods combined. Conversely, glossed elements were rarely recovered from building contexts and scrapers were frequently deposited in structures only during Period 4 as attested by the only real 'cache' of chipped stone artefacts belonging to B 706. Only the 'Pithos' B 3 and one other, B 1016 belonging to Period 3A, demonstrated the full compliment of eight tool class types, though the substantial B 2 in Period 3B had all classes but perforators. Other buildings in each of the M-LChal periods exhibited from 1 to 3 tool classes, most frequently including retouched, utilised pieces and one other implement class. This distribution was somewhat more diverse in the LChal building samples, demonstrating contextual distinctions, which need to be more fully considered with further analysis in the future.

§ 21.10 Use-wear analysis (W. F.)

Sample

A sample of 144 pieces of chipped stone has been examined. The sample incorporates a wide range of the types present. Given the apparent chronological and spatial variation present on-site, this sample does not allow an examination of tool function against spatial or chronological variation. Experimental work was conducted using the locally available cherts which appear to be the same material as used in the chalcolithic. The sample was selected by rapid sampling conducted by the author on a field visit to the site and subsequent sampling by Carole McCartney.

Method

The sample was studied following a method developed as part of a programme of postgraduate research (Finlayson 1989). The method of functional analysis employed in this study utilises a combination of high and low power microscopy, considering tool morphology, edge morphology, position of traces, edge damage, striations and polish distribution. It does not attempt to provide individual identifications of worked material, but sets out to provide a hierarchy of information starting with presence or absence of traces and going on to location of traces, direction of tool motion, hardness of contact material, and tool function. This hierarchy of information accords with the levels of accuracy repeatedly demonstrated by blind tests (Keeley and Newcomer 1977; Newcomer *et al.* 1986; Grace *et al.* 1988; Newcomer *et al.* 1988; Bamforth 1988; Grace 1989; Finlayson 1989).

Results

Only a very small number of pieces in the sample proved to be impossible to examine. These pieces had mostly had their surfaces altered by burning which had not been identified during initial sample selection.

Table 9.2 provides a basic summary of the use-wear analysis, showing the major categories of piece, the number examined, the number with no apparent wear traces and the number with identified wear traces. Most of the terms are self-explanatory, but it should be noted that "core" refers to items identified as core tools and splintered pieces. Dent refers to all types of denticulated tool. Scr (Scraper) includes all types of scraper. Retouched includes pieces classified as "modified".

A number of additional points can be made.

Within the core group, none of the splintered pieces examined had been used, suggesting that they are a waste product of bipolar knapping, rather than a modified tool type. A number of the other core tools appear to be platform rejuvenation flakes. This is confirmed by the absence of use-wear traces on them.

Within the scraper group, of the 8 used pieces, only two had had the scraper retouched part of the tool used. In the other examples, it appeared more likely that the retouch related to hafting or grasping the tool.

The sickle group included two distinct forms of wear, one of which has been interpreted as sickle use, the other as the result of intensive wood working. It is however possible that they represent two distinct reaping activities or seasons (cf. Unger-Hamilton 1983). The gloss on two of the sickles appeared not as the result of use, but as the result of heating or burning of the tool.

Of the various retouched and modified pieces, many pieces appear to be fragments of tools. It is possible that wear traces have been lost when tool has broken, especially if this happened during use.

Of the four utilised notches, only one shows wear traces associated with the notch, and, as with the scrapers, it appears likely that the notch part of the tool relates most commonly to hafting.

Conclusions

Retouch attributes in general appear to be a poor reflection on use rates and tasks in this assemblage. Retouch is often associated with hafting rather than with direct use. This causes a poor correlation between tool form and function. The often irregular form of retouched tools is perhaps a reflection of a low significance given to form.

There appears to be a relatively small number of sickle elements within the assemblage. The functional study exacerbates this scarcity as it suggests that some of the pieces identified as sickles were not used in such a manner. We must either assume loss of sickle blades in the field, combined with reworking and rehafting of tools on-site, rather than back in the village, or altern a-tive harvesting methods. If the former, then this is a useful reminder of how many activities will have been performed away from the “site”.

Where the hardness of contact material has been identified, it has generally been interpreted as being hard, or medium hard. A number of pieces, including some of the “sickles” have been interpreted as having been used for woodworking. This suggests that the heavy ground stone tools did not completely replace the chipped stone for heavy work.

Additional Bibliographic References

Goren-Inbar, Naama (1988) “Too Small to be True? Re-evaluation of Cores on Flakes in Levantine Mousterian Assemblages”, Lithic Technology, 17, no. 1: 37-44