

**Penetrating the 'transitional' category:
an *emic* approach to Lincombian Early
Upper Palaeolithic technology in Britain**

A thesis submitted to the University of Manchester for the degree of Doctor of
Philosophy in the Faculty of Humanities

2016

John Piprani

School of Arts, Languages and Cultures

Table of contents

List of figures	20
List of tables	25
Major abbreviations	29
Abstract	31
Declaration	32
Copyright statement	32
Dedication and acknowledgements	33
Chapters	
1. A predominant <i>etic</i> narrative	34
1.1 Introduction and research problem	34
1.1.1 An <i>emic</i> conceptual approach	35
1.1.2 Why an <i>emic</i> approach has been selected	36
1.1.3 How an <i>emic</i> approach is applied here	37
1.1.4 Chapter structure	38
1.1.5 Sites, type fossils and technology	39
1.1.6 A type fossil dominated corpus	42
1.1.7 A limited number of <i>debitage</i> collections	43
1.1.8 Little stratigraphic context	44
1.1.9 Introduction summary	45
1.1.10 Thesis structure	45
1.2 Theoretical and methodological review	48
1.2.1 Gabriel de Mortillet's type fossil method	49
1.2.2 Henri Breuil and the Middle to Upper Palaeolithic	52
1.2.3 The emergence of transitional industries	54

1.2.4	Penetrating the transitional category	56
1.2.5	Theoretical and methodological conclusions	58
1.3	Literature review	59
1.3.1	Dorothy Garrod and the proto-Solutrean	60
1.3.2	John Campbell and the Early Upper Palaeolithic	61
1.3.3	Damien Flas and the LRJ	63
1.3.4	Roger Jacobi and the British material	64
1.3.5	Literature review conclusions	66
1.4	Their time and space	68
1.4.1	Dating the Lincombian	68
1.4.2	Climate	71
1.4.3	Heinrich Event-4	71
1.4.4	Relating climate and dates	73
1.4.5	Climate summary	74
1.4.6	Weather	74
1.4.7	The British Isles	75
1.4.8	A summer upland landscape	77
1.4.9	Flora and fauna	78
1.4.10	The window we have	79
1.4.11	Chapter summary	81
2.	Strategies, methods and data	83
2.1	The <i>chaîne opératoire</i>	84
2.1.1	Experimental production	87
2.1.2	Comparative analysis (archaeological)	88
2.1.3	Comparative analysis (experimental)	89
2.1.4	Data collection	89

2.1.5	Type fossil recording	90
	a. Typology	91
	b. Material type	92
	c. Colour	92
	d. Patination	93
	e. Fragmentation	93
	f. Refits	95
	g. Break type	95
	h. Edge condition	96
	i. Dorsal ridge condition	96
	j. Metrics	97
	k. Dorsal scar pattern	97
	m. Retouch	98
	n. Cross section	98
2.1.6	<i>Debitage</i> recording	99
	a. Percussion type	100
	b. <i>Debitage</i> categories	100
	c. Degree of cortex	100
	d. Platform	100
	e. Ring crack	101
	f. Bulb type	101
	g. Radial fissures	101
2.3	An experiential approach to sites	102
	2.3.1 Experiential approaches	103
	2.3.2 The method used here	104
2.4	Research design	105

2.4.1	Identifying the available materials	106
2.4.2	Understanding the available materials	106
2.4.3	Organising experimental production	108
2.4.4	Selecting archaeological <i>debitage</i> collections	109
2.4.5	Chapter conclusion	110
3.	Experimental blade-point manufacture	111
3.1	Aims, methods and understandings	112
3.1.1	Methods	112
3.1.2	Five days experimental production	113
3.1.3	Material problems	114
3.1.4	Metrical problems	115
3.1.5	Typological problems	118
3.1.6	Laboratory based methods	120
3.1.7	Developments within my understanding	122
3.1.8	A six phase process	122
3.2	Transforming a nodule into blades	125
3.2.1	Nodule reduction patterns	126
3.2.2	Nodule size and form	128
3.2.3	Phase one 'testing'	129
3.2.4	Phase two 'de-cortication'	129
	a. Average flake size	130
	b. Degree of cortex	130
	c. Platform quantity and character	130
	d. Ring crack	130
	e. Platform size	130
	f. Bulb type	131

g. Radial fissures	131
3.2.5 Character of the de-cortication <i>debitage</i>	131
3.2.6 Phase three 'blade production'	131
a. Degree of cortex on all pieces	133
b. Degree of cortex on blades	133
c. Average blade	133
d. Blade platform type	133
e. Blade platform size	134
f. Ring crack	134
g. Bulb type	134
h. Radial fissures	134
i. Lipping	134
3.2.7 Blade characterisation	135
3.2.8 Phase three flakes	135
a. Degree of cortex	135
b. Size and weight	135
c. Platform type	136
d. Platform size	136
e. Ring crack	136
f. Bulb type	136
g. Lipping	136
3.2.9 Flake characterisation	137
3.2.10 Flake to phase metrics	137
3.2.11 Phase four 'longitudinal core maintenance'	137
a. Degree of cortex	138
b. Platform character	138

c. Platform size	139
d. Ring crack	139
e. Bulb type	139
f. Radial fissures	139
3.2.12 Longitudinal core maintenance <i>debitage</i> character	140
3.2.13 Longitudinal core maintenance flake metrics	140
a. Degree of cortex	140
b. Platform character	140
c. Platform size	140
d. Ring crack	141
e. Bulb type	141
f. Radial fissures	141
3.2.14 Longitudinal core maintenance flake summary	141
3.2.15 Core maintenance as problem removal	143
3.2.16 Longitudinal core maintenance summary	144
3.2.17 Phase five 'transverse core correction'	144
a. Complete flakes	144
b. Average size	144
c. Degree of cortex	145
d. Platform character	145
e. Platform size	145
f. Ring crack	145
g. Bulb type	145
h. Radial fissures	146
3.2.18 Transverse core correction summary	146
3.2.19 Flake width depth ratio	147

3.2.20	Phases one to five conclusions	147
3.3	Transforming blades into blade-points	149
3.3.1	Micro- <i>debitage</i>	149
3.3.2	Blade-point to <i>debitage</i> weight	149
3.3.3	Break down of micro- <i>debitage</i> by size	150
3.3.4	Broken or complete	152
3.3.5	Numbering and types	152
3.3.6	Average flake size	153
3.3.7	Refits present	153
3.3.8	Refits to blade-points	153
3.3.9	Refits to face	154
3.3.10	Refits to section	154
3.3.11	Blade-point micro- <i>debitage</i> summary	154
3.3.12	Characteristic blade-point <i>debitage</i>	155
3.3.13	Linear sequential reduction flakes	155
3.3.14	Vertical sequential reduction flakes	156
3.3.15	Ventral bulb avoiding flakes	157
3.3.16	Dorsal ridge following flakes	158
3.3.17	Summary	159
3.4	A blade-point production model	160
3.4.1	How these blade-points were made	160
3.4.2	Formal and metric characteristics	161
3.4.3	The value of phase six	162
3.4.4	Material quality	163
3.4.5	Opposed platform production	164
3.4.6	Facetted and plain platforms	164

3.4.7	Performance and audience satisfaction	166
3.4.8	Archaeological implications	167
3.4.9	Chapter conclusion	168
4.	Archaeological type fossil heterogeneity	169
4.1	Typological variation and leaf-points	170
4.1.1	Artefacts available	171
4.1.2	Derived average	172
4.1.3	Metric variation	173
a.	Cross Bank	174
b.	Kent's Cavern	175
c.	Bramford Rd leaf-point 1	179
d.	Bramford Rd leaf-point 3	180
e.	Bramford Rd pre-form 1	182
f.	Bramford Road pre-form 2	184
g.	Bramford Road pre-form 3	184
4.1.4	Interpretation	186
4.1.5	Flint and non-flint areas	186
4.1.6	Behavioural implications	190
4.1.7	Conclusions regarding leaf-points	190
4.2	Blade-point metric variability	192
4.2.1	Metric variability	192
4.2.2	Complete blade-points from Britain	193
4.2.3	Assumptions regarding blade-point proportions	195
4.2.4	The longest and shortest blade-points	195
4.2.5	Width outliers	199
4.2.6	Summary	202

4.2.7	Materials	203
4.2.8	Summary of complete pieces	203
4.3	Blade-point formal variability	205
4.3.1	Metrics	205
4.3.2	Kent's Cavern blade-point 2	207
4.3.3	Colby blade-point	210
4.3.4	Repair in relation to average size	214
4.3.5	Heterogeneous British corpus	214
4.3.6	Size and retouch	216
4.3.7	A different approach	217
	a. Town Pit	220
	b. Beedings 40	223
	c. Beedings 39	223
	d. Robin Hood's Cave 4	225
	e. Beedings 29	226
	f. Beedings 30	226
	g. Beedings 14	227
	h. Beedings 35	228
	i. Colby	229
	j. Beedings 10	229
	k. Beedings 32	230
4.3.8	Discussion of the largest pieces	231
4.3.9	Material economy signatures	233
	a. Robin Hood's cave 5	234
	b. Kent's Cavern 6	235
	c. Robin Hood's cave 6	236

d. Paviland 7	237
e. Robin Hood's cave 1	239
f. Badger Hole 1	240
g. Hyaena Den 1	242
h. Glaston	244
4.3.10 Discussion of below average size pieces	244
4.3.11 Conclusion	245
4.4 Explicating type fossil variability	246
4.4.1 The notion of a lifecycle	247
a. Kent's Cavern 5	248
b. Hainey Hill	249
c. Baldings Hill	250
4.4.2 Thickness as redundancy	252
4.4.3 Bi-pointed design	253
4.4.4 What constitutes a rounded base?	254
4.4.5 Damage through use	255
4.4.6 Rounded bases as proto-tips	255
4.4.7 Heterogeneity and interpretive potential	257
4.4.8 Adaptability, burins as planes	258
4.4.9 Adaptability, knives and scrapers	258
4.4.10 Chapter conclusion	260
5. Assemblages, patterns and behaviours	261
5.1 Badger Hole	262
5.1.1 The material available	263
5.1.2 Degrees of edge damage	265
5.1.3 A corpus dominated by blade products	266

5.1.4	Core maintenance activities	267
	a. BHD13	267
5.1.5	Large blade	268
5.1.6	Blade fragments	270
	a. BHD11	271
	b. BHD1	272
	c. BHD4	272
	d. BHD7	273
5.1.7	A modified blade fragment	274
5.1.8	Behaviour at Badger Hole	275
5.2	Glaston	276
5.2.1	Colour and condition	277
5.2.2	Cortex	277
5.2.3	Worn and damaged flakes	279
	a. GI4	279
	b. GI7	280
	c. GI8	280
5.2.4	A knapping sequence	281
	a. GI3	281
	b. GI5	282
	c. GI6	283
5.2.5	Macro- <i>debitage</i> summary	284
5.2.6	Micro- <i>debitage</i>	284
	a. GI15	284
	b. GI16	286
	c. GI24	286

d. GI25	287
e. GI26	287
5.2.7 Further significant pieces	288
a. GI11	288
b. GI14	289
c. GI23	290
d. GI27	291
5.2.8 Behaviours at Glaston	291
5.3 Beedings	293
5.3.1 The new material available	293
5.3.2 Differing technologies	294
5.3.3 Stratigraphic separation	295
5.3.4 Large blades	296
5.3.5 The use of blade fragments	297
5.3.6 Trench G	297
a. MP52	298
b. MP61	298
5.3.7 Trench F	300
a. MP97	300
b. MP147	301
5.3.8 Blade-point production	302
a. MP19a and MP22a	303
b. MP31 and MP37	305
5.3.9 Equifinality	305
5.3.10 Blade-point fragments	306
5.3.11 Exhausted cores	307

5.3.12 Cluster B from Trench A	308
a. MP38	308
5.3.13 Behaviours at Beedings	310
5.4 Technological and behavioural variability	311
5.4.1 Technology and temporality	311
5.4.2 Problems associated with blade-point use	312
5.4.3 Large blades	313
5.4.4 From technology to behaviour	313
5.4.5 Chapter conclusion	314
6. Landscapes and faunal contexts	316
6.1 Badger Hole	317
6.1.1 Millennial human use	318
6.1.2 Millennial faunal use	319
6.1.3 East-west valleys	320
6.1.4 Ungulate movement through valleys	320
6.1.5 Wookey Hole Ravine	321
6.1.6 The lithics	323
6.1.7 The affordances of plateaus	323
6.1.8 A seasonal context	324
6.1.9 Badger Hole summary	326
6.2 Glaston	327
6.2.1 A significant landscape feature	328
6.2.2 Humans preying on hyaena meat caches	329
6.2.3 Nunamiut summer hunting strategies	329
6.2.4 A sympatric relationship	330
6.2.5 Glaston conclusion	331

6.3	Beedings	332
	6.3.1 Landscape context	333
	6.3.2 The River Arun	335
	6.3.3 Watershed	335
	6.3.4 Viewshed	336
	6.3.5 A repeatedly used site	337
	6.3.6 Early phase production	337
	6.3.7 Intense recycling	338
	6.3.8 Small blade cores	339
	6.3.9 Transportability	339
	6.3.10 Multi-functionality	340
	6.3.11 Arrival, monitoring and return	340
	6.3.12 Seasonal indicators	341
	6.3.13 Beedings conclusion	342
6.4	Underlying themes	344
	6.4.1 Site variability	344
	6.4.2 Movement from east to west	345
	6.4.3 Movement from lowland to upland	346
	6.4.4 Importing hunting equipment	347
	6.4.5 Complete unbroken blade-points	347
	6.4.6 Unbroken at deposition	350
	6.4.7 Caves as sediment traps	352
	6.4.8 Cave sites or kill sites?	353
	6.4.9 <i>"Distant from the centre of social life"</i>	354
	6.4.10 Differing river valley systems	354
	6.4.11 Seasonality as a relational framework	355

6.4.12	A seasonality model for the EUP	356
6.4.13	Chapter conclusions	358
7.	An alternate <i>emic</i> narrative	361
7.1	Research answers	362
7.1.1	Blade-point production	362
7.1.2	Type-fossil heterogeneity	362
7.1.3	Material and behavioural patterns	363
7.1.4	An interpretive context	364
7.2	Exploring summer upland lives	366
7.2.1	An alternate <i>emic</i> narrative	366
7.2.2	A faunal migration cycle	366
7.2.3	Repeated use of sites	368
7.2.4	Artefact affordances	369
7.2.5	Cycles of human behaviour	370
7.2.6	An ending	371
7.2.7	Conclusion	373
7.3	Adding to our understanding	375
7.3.1	Penetrating the transitional category	375
7.3.2	Adding to our understanding	375
7.3.3	Moving beyond acculturation	376
7.3.4	Alternate <i>emic</i> narratives	377
7.4	A foundation for future research	378
7.4.1	A micro- <i>debitage</i> reference tool	378
7.4.2	Fissuring within upland plateaus	378
7.4.3	Excavating early spoil heaps	380
7.4.4	Field walking and museum collections	380

7.4.5 Experimental production	381
7.4.6 Thesis conclusion	383
Bibliography	385
Appendices	
A1 Sites, type fossils and assemblages	412
1.1 Single leaf-point finds	415
a. Beckford	415
b. Brighstone	416
c. Cross Bank	417
d. Eastall's Pit	419
e. Golden Cross	419
f. Ightham	420
g. Osney Lock	421
h. South Hams	422
i. Temple Mills	423
j. White Colne Pit	423
1.1.1 Single leaf-point summary	425
1.2 Single blade-point finds	426
a. Baldings Hill	426
b. Bapchild	428
c. Bench Quarry Tunnel	429
d. Colby	430
e. Conningbrook Manor Pit	431
f. Creffield Road	432
g. Drayton Wood Road	432
h. Earl of Dysart's Pit	433
i. Ffynnon Beuno	434
j. Goldcliff	435
k. Hainey Hill	437
m. King Arthur's Cave	438
n. Moordown	439
o. North Hinksey	439
p. Pin Hole Cave	439

r. Town Pit	441
s. Wallow Camp	442
t. Warren Hill	443
w. Windmill Hill Cave	443
1.2.1 Single blade-point summary	445
1.3 Artefact assemblages	447
a. Badger Hole	448
b. Beedings	449
(i) Raw material	450
(ii) EUP tools	452
(iii) <i>Micro-debitage</i>	453
c. Bramford Road	453
d. Glaston	455
e. Hyaena Den	456
f. Kent's Cavern	459
g. Paviland Cave	462
h. Robin Hood's Cave	464
i. Soldier's Hole	466
j. Sutton Courtnay	468
k. Uphill Cave 8	469
1.3.1 Artefact assemblage summary	470
A2: Definitions	472
A3: Blade-point refitting	474
3.1 Blade-point 4.2	474
a. Bladelet v2a	475
b. Flake v2d	476
c. Dorsal reduction sequence	477
d. Conjoined shatter d3c + d1	478
e. Flake v3	479
f. Flake v2c	480
g. Flake v1	480
3.2 Blade-point 5.19	481
a. Flake d2	482
b. Conjoin flake d6+d4	483
c. Flake v2	484

d. Flake v1	485
e. Bladelet v3	486
3.3 Blade-point 4.3	487
a. Flake d5	487
b. Flake v7	488
3.4 Link to key discussion points with knapper	489
A4: Badger Hole flakes	490
a. BHD5	490
b. BHD12	490
c. BHD10	491
A5: Beedings new collection	492
5.1 Analytical method and data	492
5.2 Identifying and recording EUP macro- <i>debitage</i>	493
a. Material colour and patina	493
b. Stratigraphic unit	494
c. Weathering and red colouring	495
5.3 Identifying and recording EUP micro- <i>debitage</i>	495
A6: Contributions to the content	497
Word count: 76616	

List of figures

1.1	<i>Distribution of Lincombian sites throughout Britain.</i>	39
1.2	<i>A bifacial leaf-point from Soldier's Hole in Somerset.</i>	40
1.3	<i>Relative percentages of blade and leaf-points from Britain.</i>	41
1.4	<i>A blade-point from the site of Beedings in Sussex.</i>	42
1.5	<i>Jacobi's developing categorisation system.</i>	65
1.6	<i>LRJ calibrated dates in relation to climatic events</i>	73
2.1	<i>Australian aboriginals 'drinking'.</i>	85
2.2	<i>Method for assessing degree of fragmentation.</i>	94
2.3	<i>Map showing Creswell Crags high-point.</i>	108
3.1	<i>Artefacts produced compared to pieces within size.</i>	116
3.2	<i>Labelling system for experimental materials.</i>	121
3.3	<i>Percentage weight of removals per phase of production</i>	126
3.4	<i>Percentage of >30mm pieces per phase of production.</i>	127
3.5	<i>Average flake metrics for the first three phases.</i>	137
3.6	<i>Average flake metrics for the first four phases.</i>	142
3.7	<i>Phase four flake E40</i>	143
3.8	<i>Average flake metrics for the first five phases.</i>	146
3.9	<i>Blade-point to debitage weight as percentage.</i>	151
3.10	<i>Excel spreadsheet numbering protocol.</i>	152
3.11	<i>Example of a linear sequential reduction flake.</i>	155
3.12	<i>Example of a vertical sequential reduction flake.</i>	156
3.13	<i>Example of a bulb avoiding flake.</i>	157
3.14	<i>Example of a dorsal ridge following flake.</i>	158
4.1	<i>Cross Bank leaf-point illustration.</i>	174
4.2	<i>Largest and smallest leaf-point length: width scatter plot.</i>	175
4.3	<i>Kent's Cavern leaf-point.</i>	176
4.4	<i>Robin Hood's Cave leaf-point.</i>	177
4.5	<i>Largest and smallest leaf-point width: depth scatter plot.</i>	178
4.6	<i>Bramford Road leaf-point 1.</i>	179
4.7	<i>>45% leaf-point width: depth scatter plot.</i>	180
4.8	<i>Bramford Road leaf-point 3.</i>	181
4.9	<i>Leaf-point 3 on >50% width: depth scatter plot.</i>	181
4.10	<i>Bramford Road pre-form 1.</i>	183
4.11	<i>Pre-form 1 on >50% width: depth scatter plot.</i>	183
4.12	<i>Bramford Road pre-form 2.</i>	184
4.13	<i>Bramford Road pre-form 3.</i>	185
4.14	<i>Bramford Road pieces on width: depth scatter plot.</i>	185
4.15	<i>Map of cretaceous chalk zones in Britain.</i>	187
4.16	<i>Map showing leaf-point site distribution across Britain</i>	188

4.17	<i>Complete blade-points size to geography.</i>	193
4.18	<i>Blade-point fragments size to geography.</i>	194
4.19	<i>Longest and shortest blade-points length:width scatter plot.</i>	196
4.20	<i>Longest and shortest blade-points width:depth scatter plot.</i>	197
4.21	<i>Complete blade-points length:width scatter plot.</i>	199
4.22	<i>Beedings blade-point 40.</i>	200
4.23	<i>Badger Hole blade-point 2.</i>	201
4.24	<i>Complete blade-points length:depth scatter plot.</i>	201
4.25	<i>Spy piece on complete pieces length:width scatter plot.</i>	206
4.26	<i>Spy piece on complete pieces length:depth scatter plot.</i>	206
4.27	<i>Kent's Cavern blade-point 2.</i>	207
4.28	<i>Contrasting the Spy and Kent's Cavern 2 length:width.</i>	208
4.29	<i>Contrasting the Spy and Kent's Cavern 2 width:depth.</i>	208
4.30	<i>Contrasting the Spy and Kent's Cavern 2 length:depth.</i>	209
4.31	<i>Colby blade-point (drawing).</i>	210
4.32	<i>Contrasting the Spy and Colby length:width.</i>	211
4.33	<i>Contrasting the Spy and Colby width:depth.</i>	211
4.34	<i>Contrasting the Spy and Colby length:depth.</i>	212
4.35	<i>Contrasting Beedings blade-point 29 and Colby metrics.</i>	213
4.36	<i>Blade-points above 35x12mm.</i>	219
4.37	<i>Town Pit blade-point fragment.</i>	220
4.38	<i>Using width to estimate Town Pit length.</i>	221
4.39	<i>Using depth to estimate Town Pit length.</i>	221
4.40	<i>Beedings blade-point 39.</i>	224
4.41	<i>Robin Hood's Cave 4 blade-point.</i>	225
4.42	<i>Beedings blade-point 30.</i>	226
4.43	<i>Beedings blade-point 14.</i>	227
4.44	<i>Beedings blade-point 35.</i>	228
4.45	<i>Beedings blade-point 10.</i>	229
4.46	<i>Beedings blade-point 32.</i>	230
4.47	<i>Below average complete pieces ranked by length.</i>	233
4.48	<i>Robin Hood's Cave blade-point 5.</i>	234
4.49	<i>Kent's Cavern blade-point 6.</i>	235
4.50	<i>Robin Hood's Cave blade-point 6.</i>	236
4.51	<i>Robin Hood's Cave 6 illustrating anomalous depth.</i>	236
4.52	<i>Paviland 7 dark green Carboniferous chert blade-point.</i>	237
4.53	<i>Paviland 7 illustrating anomalous depth.</i>	238
4.54	<i>Robin Hood's Cave blade-point 1.</i>	239
4.55	<i>Badger Hole blade-point 1.</i>	240
4.56	<i>Badger Hole blade point 1 below average length:width.</i>	241

4.57	<i>Badger Hole blade point 1 below average length: depth.</i>	241
4.58	<i>Hyaena Den blade-point 1.</i>	242
4.59	<i>Hyaena Den blade-point 1 illustrating anomalous depth.</i>	242
4.60	<i>Ergonomics and ridge wear of Hyaena Den blade-point 1.</i>	243
4.61	<i>The difficult to classify 'Spork'.</i>	246
4.62	<i>Kent's Cavern blade-point 5.</i>	248
4.63	<i>Hainey Hill proximal evidence boring.</i>	249
4.64	<i>Hainey Hill distal evidence of boring.</i>	249
4.65	<i>Dorsal retouch associated with uncharacteristic thickness.</i>	250
4.66	<i>Kent's Cavern blade-point 4.</i>	253
5.1	<i>Badger Hole Flake BHD5.</i>	264
5.2	<i>Jacobi's note within the Wells and Mendip Museum.</i>	265
5.3	<i>Badger Hole blade fragment BHD13 with evidence of cresting.</i>	267
5.4	<i>Badger Hole large blade BHD3.</i>	268
5.5	<i>Illustrating the anomalous size of blade BHD3.</i>	269
5.6	<i>RHC7 modified blade-point from Creswell Crags.</i>	270
5.7	<i>Badger Hole proximal blade fragment BHD11.</i>	271
5.8	<i>Badger Hole blade fragment BHD1.</i>	272
5.9	<i>Badger Hole blade fragment BHD4.</i>	272
5.10	<i>Badger Hole blade fragment BHD7.</i>	273
5.11	<i>Badger Hole blade fragment BHD2.</i>	274
5.12	<i>Glaston blade-point.</i>	277
5.13	<i>Glaston notched flake G14.</i>	279
5.14	<i>Glaston flake G17.</i>	280
5.15	<i>Glaston flake G18.</i>	280
5.16	<i>Glaston notched cortical flake G13.</i>	281
5.17	<i>Glaston cortical core fragment G15.</i>	282
5.18	<i>Glaston cortical blade G16.</i>	283
5.19	<i>Glaston cortical edge thinning flake G115.</i>	284
5.20	<i>Glaston edge thinning flake G116.</i>	286
5.21	<i>Glaston edge thinning flake G124.</i>	286
5.22	<i>Glaston edge thinning flake G125.</i>	287
5.23	<i>Glaston edge thinning flake G126.</i>	288
5.24	<i>Glaston dorsal ridge chasing flake G111.</i>	289
5.25	<i>Glaston heavily reduced thick flake G114.</i>	290
5.26	<i>Glaston vertical sequential removal G123.</i>	290
5.27	<i>Glaston small 'cherty' flake G127.</i>	291
5.28	<i>Published table of Beedings stratigraphy and technology.</i>	295
5.29	<i>Beedings early phase large blade removals.</i>	296
5.30	<i>Beedings proximal blade fragment MP52.</i>	298

5.31	<i>Beedings proximal blade fragment MP61.</i>	298
5.32	<i>Two pieces struck from the same core?</i>	299
5.33	<i>Beedings medial blade fragment MP97.</i>	300
5.34	<i>Beedings medial blade fragment MP147.</i>	301
5.35	<i>Artefact patination linking Trench A and Trench F.</i>	302
5.36	<i>Beedings MP19a and MP22a conjoining pieces.</i>	303
5.37	<i>Beedings MP19a with thick curtailed form.</i>	304
5.38	<i>Beedings MP31 and MP37 conjoining pieces.</i>	305
5.39	<i>Beedings LMP large blade technology.</i>	305
5.40	<i>Beedings 'Kostenki Knife'.</i>	306
5.41	<i>Beedings bulb avoiding flake MP38.</i>	308
5.42	<i>Beedings single platform blade core MP149.</i>	309
5.43	<i>Beedings worn core from the original collection.</i>	309
6.1	<i>Uphill Cave 8 in relation to the Wookey Hole Ravine</i>	317
6.2	<i>The vista looking west from above Uphill Cave 8.</i>	320
6.3	<i>A Nunamiut spring drying rack.</i>	325
6.4	<i>Glaston sits upon the highpoint of a west east ridge</i>	327
6.5	<i>Beedings sits upon the northern edge of a west east ridge</i>	333
6.6	<i>Beedings in its material and visual context</i>	334
6.7	<i>Beedings sits upon a watershed</i>	336
6.8	<i>'Unbroken at deposition' pieces from cave sites.</i>	350
6.9	<i>Blade-point from Ffynnon Beuno.</i>	351
7.1	<i>The predictable unpredictability of caribou.</i>	367
7.2	<i>The vista looking west from above Paviland Cave.</i>	368
7.3	<i>The Aurora Boreales as a geo-magnetic phenomena.</i>	372

Appendix figures

A1.1	<i>Brighstone leaf-point</i>	416
A1.2	<i>Cross Bank leaf-point</i>	418
A1.3	<i>Golden Cross leaf-point</i>	420
A1.4	<i>Osney Lock leaf-point</i>	421
A1.5	<i>South Hams leaf-point fragment</i>	422
A1.6	<i>White Colne Pit leaf-point</i>	424
A1.7	<i>Baldings Hill blade-point</i>	427
A1.8	<i>Bapchild blade-point</i>	428
A1.9	<i>Bench Quarry Tunnel blade-point</i>	429
A1.10	<i>View from above Bench Quarry Tunnel site</i>	430
A1.11	<i>Drayton Wood Road blade-point</i>	433
A1.12	<i>Earl of Dysart's Pit blade-point</i>	434
A1.13	<i>Goldcliff blade-point</i>	436
A1.14	<i>Hainey Hill blade-point</i>	437

A1.15	<i>Pin Hole Cave blade-point</i>	440
A1.16	<i>Town Pit blade-point</i>	441
A1.17	<i>Windmill Hill Cave blade-point</i>	444
A1.18	<i>Windmill Hill Cave possible second blade-point fragment</i>	445
A1.19	<i>Predominant materials from the Beedings collection</i>	450
A1.20	<i>Example of white dendritic patination</i>	451
A1.21	<i>Bramford Road blade-point 1</i>	454
A1.22	<i>Bramford Road blade-point 2</i>	455
A1.23	<i>Hyaena Den blade-points</i>	458
A1.24	<i>Kent's Cavern Cretaceous Upper Greensand chert blade-point</i>	460
A1.25	<i>Ogilvie's blade-point tip</i>	461
A1.26	<i>Fragments from Paviland Cave</i>	462
A1.27	<i>Robin Hood's Cave blade-point 2</i>	465
A1.28	<i>Soldier's Hole leaf-point</i>	467
A1.29	<i>Sutton Courtnay leaf-point</i>	468
A2.1.	<i>Flake topography and terminology.</i>	473
A3.1.	<i>Blade-point 4.2, bladelet v2a.</i>	475
A3.2.	<i>Blade-point 4.2, flake v2d.</i>	476
A3.3.	<i>Blade-point 4.2, broken flake D1+.</i>	477
A3.4.	<i>Two conjoining pieces of shatter d3c and d1.</i>	478
A3.5.	<i>Blade-point 4.2, flake v3.</i>	479
A3.6.	<i>Blade-point 4.2, flake v2c.</i>	480
A3.7.	<i>Blade-point 4.2, flake v1.</i>	481
A3.8.	<i>Blade-point 5.19, flake d2</i>	482
A3.9.	<i>Blade-point 5.19, flake d4 and d6.</i>	483
A3.10.	<i>Blade-point 5.19, flake v2.</i>	484
A3.11.	<i>Blade-point 5.19, flake v1.</i>	485
A3.12.	<i>Blade-point 5.19, bladelet v3.</i>	486
A3.13.	<i>Blade-point 4.5, flake d5.</i>	487
A3.14.	<i>Blade-point 4.5, flake v7.</i>	488
A4.1.	<i>Badger Hole core maintenance flake BHD12.</i>	490
A4.2.	<i>Badger Hole core maintenance flake BHD10.</i>	491

List of tables

1.1	<i>Calibrated dates for the LRJ materials.</i>	70
1.2	<i>LRJ dates bracketed by D/O-11 and H-E4.</i>	74
1.3	<i>The Pin Hole Mammal Assemblage Zone.</i>	79
2.1	<i>A horizontally organised reduction sequence.</i>	86
2.2	<i>The observation protocol used.</i>	90
2.3	<i>Type fossil recording characteristics.</i>	90
2.4	<i>Typology categories.</i>	92
2.5	<i>Material categories.</i>	92
2.6	<i>Provenance categories.</i>	92
2.7	<i>Patination categories.</i>	93
2.8	<i>Fragmentation assessment criteria.</i>	95
2.9	<i>Refit categories.</i>	95
2.10	<i>Break categories.</i>	96
2.11	<i>Edge damage categories.</i>	96
2.12	<i>Ridge-wear categories.</i>	97
2.13	<i>Metric categories.</i>	97
2.14	<i>Scar pattern categories.</i>	98
2.15	<i>Retouch categories.</i>	98
2.16	<i>Cross-section categories.</i>	98
2.17	<i>Debitage recording characteristics.</i>	99
2.18	<i>Debitage categories.</i>	100
2.19	<i>Cortication categories.</i>	100
2.20	<i>Platform categories.</i>	101
2.21	<i>Ring-crack categories.</i>	101
2.22	<i>Bulb categories.</i>	101
2.23	<i>Radial fissures categories.</i>	101
3.1	<i>Maximum and minimum blade-point criteria.</i>	116
3.2	<i>Comparative scar pattern analysis.</i>	119
3.3	<i>Archaeological scar pattern percentages.</i>	119
3.4	<i>Experimental scar pattern percentages.</i>	120
3.5	<i>Phase two debitage types by percent.</i>	130
3.6	<i>Phase two average flake size.</i>	130
3.7	<i>Phase two flake percentage cortex.</i>	130
3.8	<i>Phase two flake platforms quantity and type.</i>	130
3.9	<i>Phase two flake ring-crack percentages.</i>	130
3.10	<i>Phase two flake average platform size.</i>	131
3.11	<i>Phase two bulb types and percentages.</i>	131
3.12	<i>Phase two percentage radial fissures.</i>	131
3.13	<i>Phase three percentage debitage types.</i>	132

3.14	<i>Phase three artefact quantity to percentage of cortex.</i>	133
3.15	<i>Phase three blade quantity to percentage of cortex.</i>	133
3.16	<i>Phase three average blade size and weight.</i>	133
3.17	<i>Phase three platform type and percentage.</i>	133
3.18	<i>Phase three average blade platform size.</i>	134
3.19	<i>Phase three blades to ring-crack percentage.</i>	134
3.20	<i>Phase three blades to bulb type percentage.</i>	134
3.21	<i>Percentage of phase three blades with radial fissures.</i>	134
3.22	<i>Percentage of phase three blade platforms with lips.</i>	134
3.23	<i>Phase three flakes and fragments to percentage cortex.</i>	135
3.24	<i>Phase three flake average size and weight.</i>	135
3.25	<i>Phase three flakes platform type and percentage.</i>	136
3.26	<i>Phase three flakes average platform size.</i>	136
3.27	<i>Phase three percentage flake platforms with ring crack.</i>	136
3.28	<i>Phase three flakes bulb type and percentage.</i>	136
3.29	<i>Phase three flake platforms percentage with lipping.</i>	136
3.30	<i>Average flake size from the first three phases.</i>	137
3.31	<i>Phase four debitage type to percentage.</i>	138
3.32	<i>Phase four debitage to percentage of cortex.</i>	138
3.33	<i>Phase four percentage platform types.</i>	138
3.34	<i>Phase four average platform size.</i>	139
3.35	<i>Phase four percentage platforms with ring-crack.</i>	139
3.36	<i>Phase four debitage bulb type percentages.</i>	139
3.37	<i>Phase four percentage bulbs with radial fissures.</i>	139
3.38	<i>Phase four average flake size and weight.</i>	140
3.39	<i>Phase four flakes to percentage of cortex.</i>	140
3.40	<i>Phase four flakes percentage to platform type</i>	140
3.41	<i>Phase four average flake platform size.</i>	140
3.42	<i>Phase four flake platforms percentage with ring-crack.</i>	141
3.43	<i>Phase four flakes percentage bulb types.</i>	141
3.44	<i>Phase four flakes percentage with radial fissures.</i>	141
3.45	<i>Phase five debitage types and percentages.</i>	144
3.46	<i>Phase five complete to broken flakes.</i>	144
3.47	<i>Phase five average complete flake size and weight.</i>	144
3.48	<i>Phase five flake platform type to percentages.</i>	145
3.49	<i>Phase five flakes average platform size.</i>	145
3.50	<i>Phase five flake platforms percentage with ring-crack.</i>	145
3.51	<i>Phase five flakes percentage bulb type.</i>	145
3.52	<i>Phase five flake bulbs percentage with radial fissures.</i>	146
3.53	<i>Width depth ratio for each phase.</i>	147

3.54	<i>Percentage weight of blade, debitage and blade point.</i>	150
3.55	<i>Metrics for experimental blade point 4.2.</i>	150
3.56	<i>Metrics for experimental blade point 4.3.</i>	150
3.57	<i>Average experimental blade point metrics.</i>	151
3.58	<i>Broken and complete debitage summary.</i>	152
3.59	<i>Percentage of differing Micro-debitage types.</i>	153
3.60	<i>Average flake size generated by blade point production.</i>	153
3.61	<i>Phase six definite refits quantity and type.</i>	153
3.62	<i>Quantity of refits to individual blade points.</i>	153
3.63	<i>Quantity of refits per face.</i>	154
3.64	<i>Quantity of refits per section.</i>	154
3.65	<i>Refitted linear sequential removals.</i>	155
3.66	<i>Vertical sequential removals.</i>	156
3.67	<i>Bulb avoiding flakes.</i>	157
3.68	<i>Dorsal ridge following flakes.</i>	158
3.69	<i>Key types relating to each phase of production.</i>	161
4.1	<i>Source material used for recording leaf-points.</i>	171
4.2	<i>Summary of leaf-points degree of completeness.</i>	171
4.3	<i>Summary of leaf-points >50% complete.</i>	172
4.4	<i>Average size derived from British leaf-points.</i>	172
4.5	<i>Average size derived from continental leaf-points.</i>	172
4.6	<i>Leaf-points >90% complete ordered by length.</i>	173
4.7	<i>Leaf-points to counties, regions and cretaceous areas.</i>	188
4.8	<i>Leaf-point quantities to cretaceous and non-cretaceous areas.</i>	189
4.9	<i>Blade point average calculated from the British corpus.</i>	192
4.10	<i>Complete blade points from Britain.</i>	193
4.11	<i>Total of complete pieces and large (>50%) fragments.</i>	219
4.12	<i>Estimating length of the Town Pit fragment.</i>	222
4.13	<i>Production, maintenance and repair signatures.</i>	232
4.14	<i>Below average complete pieces ranked by length.</i>	233
4.15	<i>Degree of retouch within the sub-average size corpus.</i>	244
5.1	<i>Badger Hole materials summary.</i>	263
5.2	<i>Badger Hole artefact categories under discussion.</i>	263
5.3	<i>Metrics for Badger Hole flakes indicative of core maintenance.</i>	267
5.4	<i>Glaston material as broken down by the excavators.</i>	276
5.5	<i>Glaston material included and excluded.</i>	276
5.6	<i>Glaston >10mm material summary.</i>	278
5.7	<i>Glaston >10mm material as types and percentages.</i>	278
5.8	<i>Beddings new excavation, total materials received.</i>	294
5.9	<i>Beddings EUP material from Trench G.</i>	397

5.10	<i>Beedings EUP material from Trench F.</i>	300
5.11	<i>Beedings EUP material from Trench A.</i>	308
6.1	<i>Beedings arrival and return signatures</i>	341
6.2	<i>Artefacts, behaviours and interpretation at Beedings.</i>	342
6.3	<i>Unbroken at deposition blade-points</i>	349
6.4	<i>Unbroken at deposition blade-points and geography</i>	349
6.5	<i>Cave sites, blade-points and narrowing in the landscape</i>	353

Appendix tables

A1.1	<i>Sites and type fossil quantities</i>	412
A1.2	<i>Type fossil corpus break down</i>	414
A1.3	<i>Single leaf-point finds recorded</i>	415
A1.4	<i>Single blade-point finds recorded</i>	426
A1.5	<i>Sites and type fossils within collections</i>	447
A1.6	<i>Beedings EUP tool categories as per Jacobi (2007)</i>	452
A3.1.	<i>Blade-point 4.2 refits to face.</i>	474
A3.2.	<i>Blade-point 4.2 refits to section.</i>	474
A3.3.	<i>Blade-point 5.19 refits to face.</i>	481
A5.1.	<i>Beedings patina types based on the larger EUP artefacts.</i>	494

Major abbreviations used within the thesis

BH – Badger Hole cave

BHD – Badger Hole *debitage*

RHC – Robin Hood's Cave

CI - Campanian Ignimbrite volcanic eruption

D/O - Dansgaard-Oeschger climate event

D – Dorsal surface

E – Experimentally produced artefact

EPA – External Platform Angle

EUP - Early Upper Palaeolithic period

G – Glaston

HD – Hyaena Den cave

HE-4 - Heinrich 4 climate cooling event

LGE - Lanchamp Geomagnetic Excursion

LGM - Last Glacial Maximum

LMP – Late Middle Palaeolithic period

LOA – Local Operational Areas

LRJ - Lincombian-Ranisian-Jerzmaowician

MAZ - Mammal Assemblage Zone

MP - Matt Pope excavations

MIS3 - Marine Isotope Stage 3

PaMeLA – Palaeolithic and Mesolithic Lithic Artefacts database

V – Ventral surface

Abstract.

The Middle to Upper Palaeolithic transition is seen as an important research focus and key to understanding issues surrounding Neanderthal and modern human interactions. Because of this focus upon human type transitional industries without associated human fossil evidence have been marginalised within the debate. This perspective can be termed etic, looking at overall patterns and millennial timescales to answer 'big' questions. In contrast my research could be termed emic, using a small collection of 'transitional' stone tools to explore the perspective of the producers and users. Human type is not considered relevant here. This approach has allowed a shift in scale; from millennial and pan-European to seasonal and the uplands that now constitute Britain. To explore this emic perspective experimental production has been used to make material a manufacturing process. Metrical, formal and typological analysis has been applied to the archaeological type fossil corpus to more fully comprehend variability. Together these approaches have been used to construct a nuanced and comprehensive chaîne opératoire model for the industry. This model allowed comparative analysis to derive new understandings from old and new archaeological collections from three sites. Resultant material and behavioural patterns have been interpreted within their particular landscape and general faunal contexts. Emergent themes have been integrated into a seasonal structure to create the desired emic narrative. This process has revealed a maintainable, repairable and adaptable technology used to manage the predictable unpredictability associated with the hunting of migrating large fauna through a long summer season and in uplands of known and unknown stone resources.

DECLARATION

No portion of the work referred to in the thesis has been submitted in support of an application for another degree or qualification of this or any other university or other institute of learning.

COPYRIGHT STATEMENT

- i.** The author of this thesis (including any appendices and/or schedules to this thesis) owns certain copyright or related rights in it (the "Copyright") and s/he has given The University of Manchester certain rights to use such Copyright, including for administrative purposes.
- ii.** Copies of this thesis, either in full or in extracts and whether in hard or electronic copy, may be made only in accordance with the Copyright, Designs and Patents Act 1988 (as amended) and regulations issued under it or, where appropriate, in accordance with licensing agreements which the University has from time to time. This page must form part of any such copies made.
- iii.** The ownership of certain Copyright, patents, designs, trade-marks and other intellectual property (the "Intellectual Property") and any reproductions of copyright works in the thesis, for example graphs and tables ("Reproductions"), which may be described in this thesis, may not be owned by the author and may be owned by third parties. Such Intellectual Property and Reproductions cannot and must not be made available for use without the prior written permission of the owner(s) of the relevant Intellectual Property and/or Reproductions.
- iv.** Further information on the conditions under which disclosure, publication and commercialisation of this thesis, the Copyright and any Intellectual Property and/or Reproductions described in it may take place is available in the University IP Policy (see <http://documents.manchester.ac.uk/DocuInfo.aspx?DocID=487>), in any relevant Thesis restriction declarations deposited in the University Library, The University Library's regulations (see <http://www.manchester.ac.uk/library/aboutus/regulations>) and in The University's policy on Presentation of Theses.

Dedication

This thesis is dedicated to.

My mum Evelyn Piprani 24.7.35 - 11.2.13.

My dad Mohamed Piprani 11.1.32 - 24.9.13.

Karen Buckley and Roxanna Buckley Piprani.

Acknowledgements

Chantal Conneller introduced the idea of this thesis to me and skilfully guided me through the research, writing, and completion. Damien Flas sent me his thesis at the beginning of the process which was massively helpful. Debbie Buck at Franks House located and facilitated access to a large proportion of the artefacts discussed here. Karl Lee patiently helped me to work through and understand the technological process from a range of perspectives. Hazel Martingell generously gave me access to her archive of published and unpublished illustrations. Lynden Cooper facilitated access to the Glaston material and kindly put me up. Matt Pope sent me a significant proportion of the *debitage* recovered from Beedings to work on in Manchester. Throughout the process Elizabeth Healey has been very supportive of my work and generous with her time and sharing of technical knowledge. A cursory review of almost any chapter will highlight the fundamental role the work of Roger Jacobi has played within this research. Although I never met him, his rigour and foresight requires acknowledgement and here seems the appropriate place to do that. Finally, I would like to thank the University of Manchester for paying my fees. In relation to experimental production my thanks go to the Lithic Studies Society for awarding me the 2012 John Wymer Bursary. In respect to word count a more complete list of contributors is presented in appendix six.

Chapter One

A predominant *etic* narrative

1.1 Introduction and research problem

This thesis is a theoretical and material inquiry into what constitutes a Middle to Upper Palaeolithic 'transitional' industry. The industry in question is the Lincombian-Ranisian-Jerzmaowician (LRJ) and the transitional label links it to the story of the arrival of modern humans in Europe, and subsequent demise of an indigenous Neanderthal population. This human event was trans-continental and millennial in scale and perceived as an important research focus within Palaeolithic archaeology (e.g. van Andel and Davies 2003; Roebroeks 2008). Borrowing from Anthropology this focus is described here as *etic*, situating as it does a number of different cultural industries into an overarching and millennial temporal framework. However this *etic* approach has proved problematic for understandings of the LRJ. Because of a primary focus upon human type within the larger debate, a lack of stratigraphic, dating and human fossil evidence has meant that the LRJ has a history of being marginalised within discussions of the human transition (Jacobi 1990; Flas 2006). The hypothesis driving this research is that the transitional categorisation and its associated acculturation narrative have obfuscated another human story. The research aim of this thesis is to explore this hidden story, that of the humans who produced and used Lincombian stone tool technology within Britain for an apparently short temporal episode during Marine Isotope Stage 3 (MIS3). To achieve this research aim an *emic* conceptual approach has been adopted.

1.1.1 An *emic* conceptual approach

The anthropological terms *etic* and its correlate, *emic* were derived from linguistics in the 1950s. The label *etic* was taken from the linguistic term 'phonetic', and reflected a concern for the physical or acoustic properties of sounds themselves, independent, or *outside* of language systems. In contrast, the label *emic* was derived from the term 'phoneme', a unit of sound as used *within* a particular language system to define meaning. (Barnard and Spencer 2002: 180, 617). In anthropology these two terms were developed to differentiate between conceptual perspectives, one from within, and the other from outside a culture. As working definitions within anthropology, *emic* is used to indicate an internal and culturally specific model, whilst *etic* has been used to describe an external and overarching framework (Fontein 2010: 317; Barnard and Spencer 2002: 180).

Within archaeology an *emic* approach can be defined as one that uses recovered material culture to construct an internal understanding of a culturally specific past way of life (Gardin 1980 cited in Banning 2000: 2). However, it is important to be clear that an *emic* or internal model does not pretend to be the one consciously held by an indigenous thinker. To illustrate this point, a native English speaker may not be able to articulate the rules of grammar in spite intuitively using them (Hayden 1984: 85). However, an analyst can observe and may discern the internal rules and principles at work through an interrogation of repeated speech patterns. As Barnard and Spencer (2002: 181-2) put it: "*analysis, even emic analysis, is the job of the observer*". Like any model it is still an analyst's construct built upon a particular data-set.

1.1.2 Why an *emic* approach has been selected

Within this thesis an *emic* approach is used to discern the internal rules and principles at work within the Lincombian through an interrogation of potential material and landscape patterning. These internal rules and principles can be used to develop the story of the humans who produced and used this technology, the research aim of this thesis. There are a number of characteristics that make this industry ideal for interrogation from an *emic* perspective. Whilst the LRJ has been marginalised within *etic* discussions of the transition (Jacobi 1990), adopting an *emic* approach allows it to become the primary research focus. Flas (2011: 617) recognised 40 sites across Europe, 32 of which lie in Britain. Although the overall total of sites is small, the quantitative predominance in what now constitutes present day England and Wales would suggest that during this period of lowered sea levels these areas were a preferred upland environment for the humans who produced and used this technology (Jacobi 2007: 278). An *emic* focus upon the particular British Lincombian component of the LRJ facilitates a shift in geographical scale from trans-continental to the circumscribed zone of Britain. In practical terms it provides a bounded geography for research.

However, as well as having implications for space, the adoption of an *emic* perspective influences how we conceptualise time. As argued above, to develop an overarching understanding of the Middle to Upper Palaeolithic transition, archaeological evidence and interpretation has been used to account for longer-term processes of change (Banning 2000: 3). For the Lincombian we are only left with stone tools and sites. An *emic* approach allows a focus upon these artefacts and sites and in doing so can provide a shift from a millennial to a

human timescale, for example, relating to the number of minutes it takes to produce an artefact or to the particular season a site was in use. Whilst the LRJ can be considered *relatively* poor in dateable materials and stratigraphic context, due to this change in scale, the Lincombian component can be considered *relatively* rich in artefacts and sites. An *emic* approach is therefore valuable because it facilitates a focus not just upon the particular industry in question, but it can also accommodate the particular data-sets that are available for analysis. In doing so it promotes an understanding that is situated within a human timescale.

1.1.3 How an *emic* approach is applied here

As discussed above, for the Lincombian two extant data sets are available: a national corpus of stone tools; and the sites from which they were recovered. An *emic* approach is valuable because it can accommodate a behavioural understanding of lithics, along with an experiential exploration of sites. In order to provide a methodological linkage between stone tools and human behaviours a *chaîne opératoire* approach has been selected. In relation to sites, their predominance in Britain suggests particular factors made this a preferred environment for these particular humans. To comprehend these possible factors an experiential approach to site visits has been adopted. This has been used to integrate site affordances into the interpretive discussion.

Ultimately, this research provides a detailed consideration of the vast majority of currently available Lincombian materials and sites within the bounded geography of Britain. Behavioural and experiential interpretations derived from this research present a model of Lincombian seasonal and spatial activity for a short period during MIS3. Through this process repeated landscape, material and

behavioural patterning can be discerned and internal rules and principles recognised. These structuring rules and principles, considered in relation to faunal behaviours, are used to formulate the *emic* narrative that is the research aim of this thesis.

1.1.4 Chapter structure

The function of this first chapter is to provide an overall research context. To do so section 1.1 started by summarising the *etic* research problem and *emic* conceptual approach adopted. The next section will introduce the sites, type fossils and technology that constitute the primary research focus. Opportunities and problems associated with the evidence we have available are discussed, and a comprehensive site and artefact listing is presented within appendix one. This is followed by an explanation of how the research process navigates from problem to contribution, via the medium of lithic and site analysis and interpretation. Four research questions are established to direct the research process towards the research aim and outcome. Together, these components constitute the thesis introduction. Section 1.2 then presents a theoretical and methodological review of previous approaches to LRJ materials. This is used to develop an understanding of how the transitional label developed, and why we have been left predominantly with type fossils. Section 1.3 provides a focus on the British component of the LRJ, the Lincombian. A literature review highlights key research that frames current understandings, and briefly introduces more recent and important excavations into the discussion. Section 1.4 examines the scientific evidence used to understand the temporal and spatial context of the humans who produced and used these artefacts. Having summarised this

chapter structure, what follows next is an introduction to the sites, type fossils and technological aspects of the industry.

1.1.5 Sites, type fossils and technology

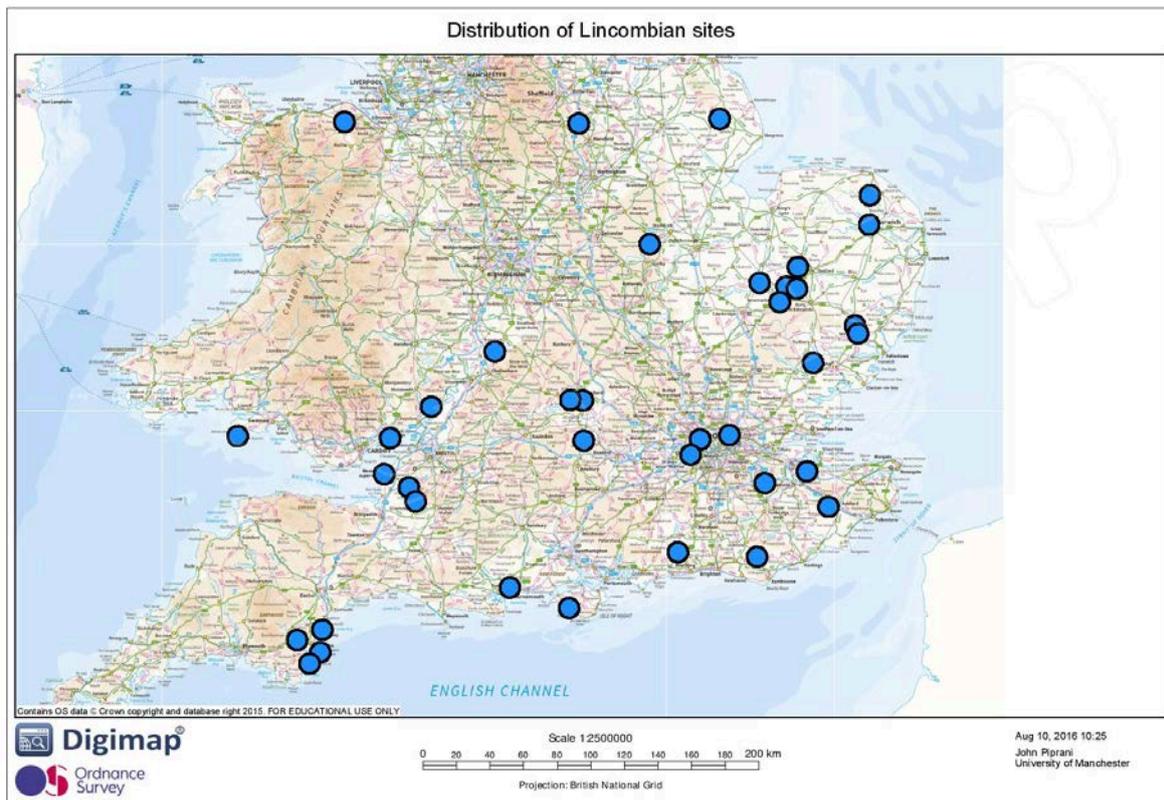


Fig. 1.1 Distribution of Lincombian sites throughout Britain © Crown Copyright and database rights 2015. Ordnance Survey (Digimap Licence).

The 'Lincombian' is the British component of the LRJ, a term developed by John Campbell (1986) to describe leaf shaped stone points (exemplified by those from Kent's Cavern, set in Lincombe Hill in Devonshire). Sites are distributed throughout England and Wales (Fig.1.1) and the industry itself is represented mainly by type fossils, sub-divided into leaf-points (Fig.1.2) and blade-points (Fig.1.4). Appendix one has been used to present a detailed summary of the sites, type fossils and assemblages reviewed within this thesis. The leaf-point / blade-point distinction is based upon differing methods of production, and it has

been argued that these reflect a strategic use of variable raw material packages. Bifacial leaf-points would therefore be produced by *façonnage* from flattened tablets of flint, whilst blade-points by *debitage* from blanks produced from cores made from irregular shaped nodules (Jacobi 2007: 247). Previous analysis of the British and continental materials (Flas 2006: 166-7) found an average blade-point size to be ~90-100x30x10mm. Bifacial leaf-points though fewer in quantity tend to be metrically larger with an average of 114x44x10mm (Flas 2006: 178).

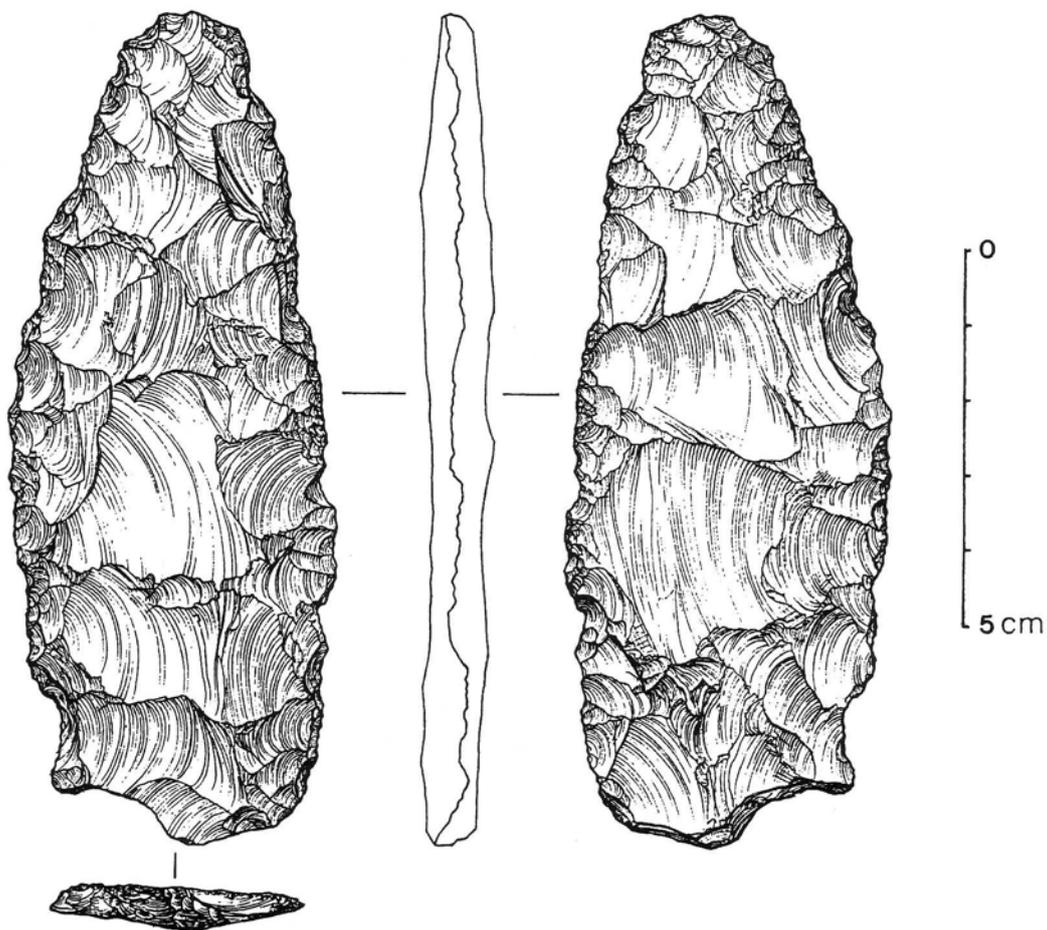


Fig.1.2 A bifacial leaf-point from Soldier's Hole in Somerset (Jacobi 2007: 287, Fig.47.1).

Both of these types have been found together at sites in Britain (e.g. Bramford Road; Kent's Cavern; Robin Hood's Cave; Paviland Cave). However, most

common are blade-points (Fig.1.3) with longitudinal dorsal scarring usually indicating production from opposed platform cores (Fig.1.4).

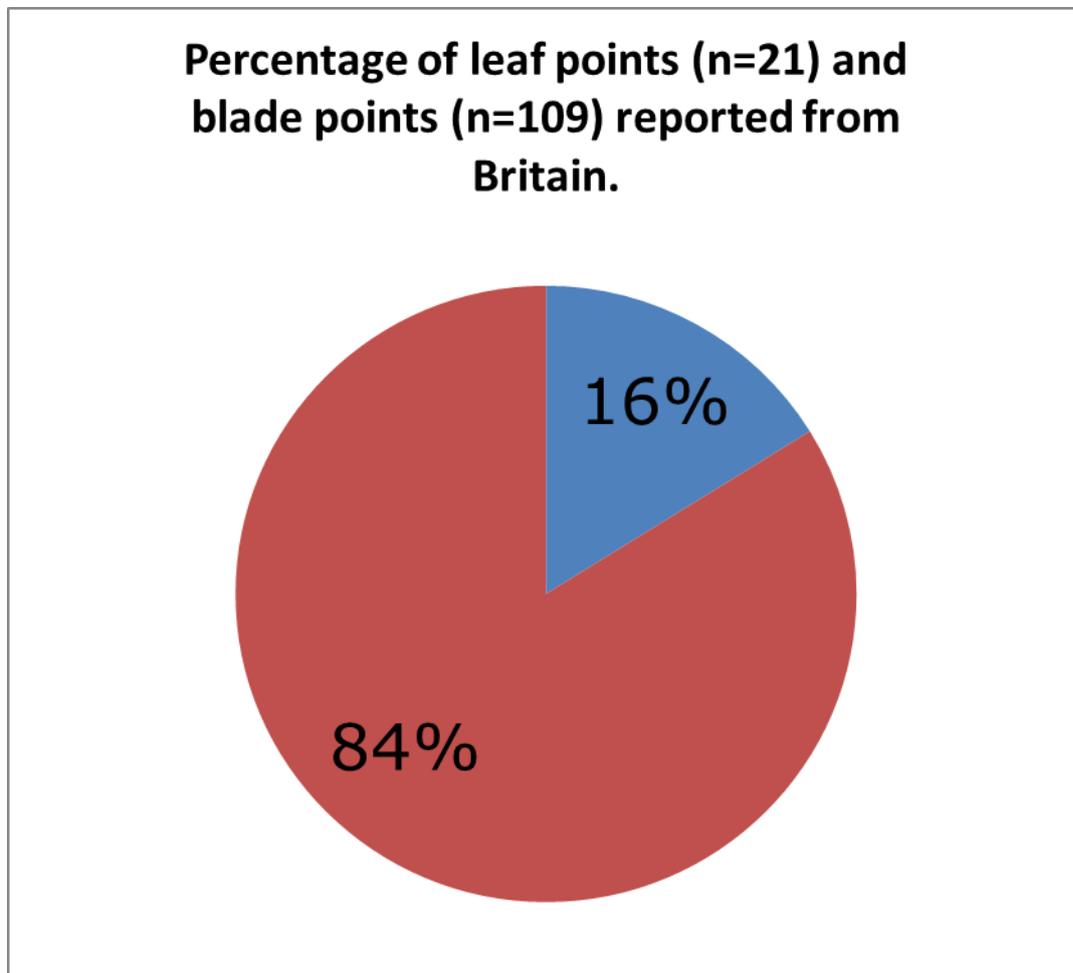


Fig. 1.3 Relative percentages of leaf-points (blue) and blade-points (red) from Britain (source: author).

While many assemblages consist just of type fossils, the product of past excavation, collection or retention strategies, core reduction *debitage* has been recovered in association with blade-points from a plateau at Beedings in Sussex around 1900 AD (Jacobi 2007). Blades had thin faceted platforms with lips, indicative of removal by soft hammer. These blades were both flat and straight and as such would provide an ideal support for transformation into blade-points. To do so, they would have been worked predominantly on the ventral surface at

the proximal end to remove the bulb of percussion. At the distal end, ventral retouch would have shaped the point (Flas 2013: 221).

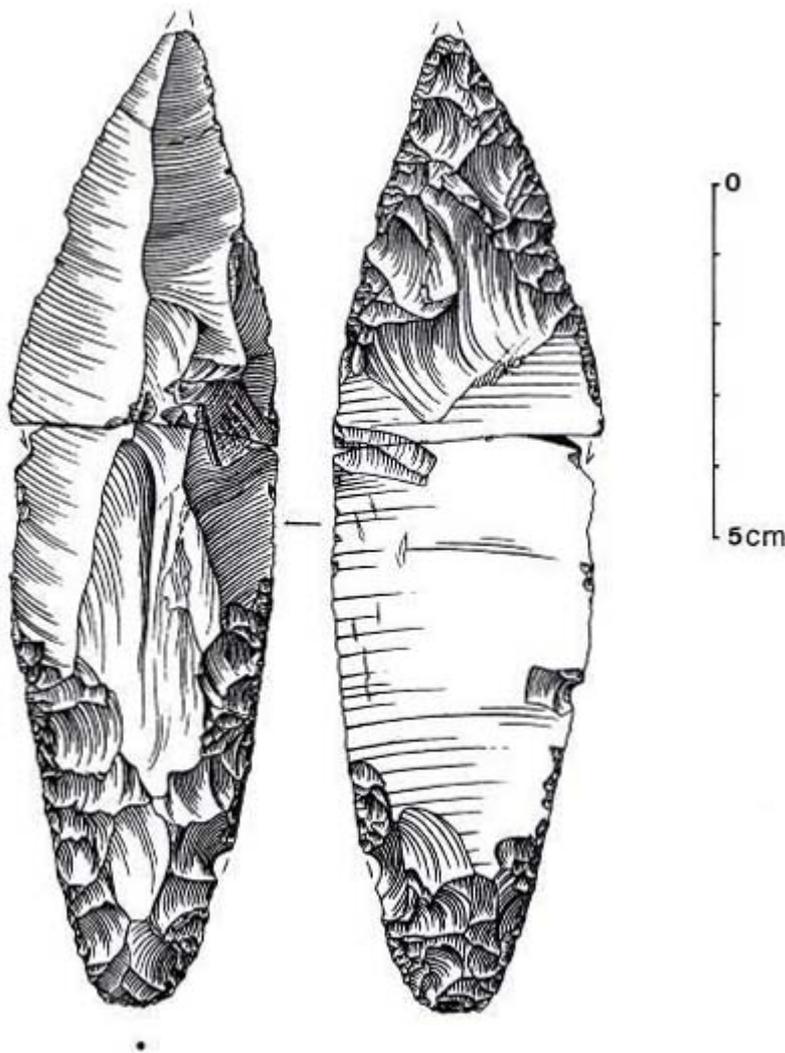


Fig. 1.4. A blade-point from the site of Beedings in Sussex (Jacobi 2007: 253 Fig.20.1).

1.1.6 A type fossil dominated corpus

A past research focus upon type fossils has affected the character of corpus available. The term 'available' is used cautiously as many of the artefacts listed within the literature have now been lost, leaving only illustrations or casts. Furthermore, around 80% of the extant type fossils are fragmented. What stands out within this small corpus is the metric and formal heterogeneity. The

thick (15mm) and burinated Drayton Wood Road blade-point (Appendix 1.2.g) and heavily thinned (7mm) Hainey Hill piece (Appendix 1.2.k) serve as examples that illustrate two differing aspects of formal variability. The Earl of Dysart's Pit fragment (123mm long, Appendix 1.2.h) and Town Pit fragment (45mm wide, Appendix 1.2.r) both signal the potentially large size of the original pieces. Size differential, along with evidence for repair and reworking into other tools are all facets of this particular type fossil dominated corpus. Understanding the production and use factors behind this variability is a major focus of this thesis. However a second significant characteristic is the limited number of *debitage* collections available.

1.1.7 A limited number of *debitage* collections

The term *debitage* used here refers to all the materials removed from a core (Banning 2000: 298). Un-retouched *debitage* can be useful for understanding how an artefact was made. In contrast, retouched *debitage* can be valuable for expanding our understanding of other tool outcomes the producers were interested in. Together, both unretouched and retouched *debitage* allows a more developed understanding of technological strategies, and their associated human behaviours. At a small number of sites *debitage* has been recovered in general association with Lincombian type fossils. However, because of the general lack of stratigraphic context it is difficult to confidently link the *debitage* to the type fossils, a problem if artefacts from more than one period are present within the collection. This means that although a *debitage* component may be present, it may not necessarily relate to the Lincombian material. Within this thesis *debitage* and contextual material from Badger Hole in Somerset, Glaston in the Midlands, Beedings in Sussex and Bramford Road in Suffolk is discussed. The

selection criterion used to target these useful *debitage* collections is presented within the next chapter (2.4.4). However, the final aspect I want to draw out from this review is related to the landscape contexts usually discussed. From an *emic* perspective it is important to explore how technological strategies, and their associated human behaviours, relate to their particular landscape locations. To do so it is necessary to return to stratigraphic context.

1.1.8 Little stratigraphic context

Many single finds collected within early phases of research have no evidence of context. However, due to the severe effects of the LGM, EUP material only survives within particular circumstances and fissuring would seem to have been one significant preservational mechanism. Climatic instability and deterioration leading up to the LGM led to the expansion of roof avens at many cave sites in Britain (e.g. Tratman et al. 1971: 254). EUP scatters lying above these caves have in many cases fallen through these widening roof avens to be preserved within the cave itself (Swainston 1999: 45). At open air sites such as Beedings in Sussex (Pope et al. 2013: 11) and Glaston in the Midlands (Cooper et al. 2012) a similar process has occurred. Both of these sites are on plateaus and fissuring on the plateau surface again captured and preserved EUP surface scatters through a process that has been termed the 'Sackung Hypothesis' (Collcutt 2001). The implication for this research is that in many cases for cave sites it was the areas above or outside that held significance within the Palaeolithic past. Clearly, an understanding of geomorphology is necessary if an experiential approach is to be used to relate sites of Palaeolithic activity to aspects of artefact, landscape and faunal evidence.

1.1.9 Introduction summary

The above discussion has explored the character of the available Lincombian type fossils, assemblages and associated contexts. Recognising the opportunities and problems presented by the materials available, to develop an *emic* perspective overall discussion will consider 130 type fossils from 28 open air and 12 cave sites. However to provide focus three case studies will be used to explore in more detail relationships between particular type fossils, *debitage* assemblages and their landscape contexts. With this in mind, the next section will outline the mechanics of how the research process relates to thesis structure.

1.1.10 Thesis structure

As discussed, the research aim of this thesis is to explore the story of the humans who produced and used this technology for a short temporal episode during MIS3. Consequently the thesis structure is built around a series of carefully selected methods designed to provide insight into an *emic* perspective. The first is the development of a *chaîne opératoire* approach to provide a linkage between collections of artefacts and patterns of human behaviour. The second is an experiential approach to site visits that can be used to develop interpretive contexts for these behavioural patterns. By bringing the results of these approaches together within a summer upland context repeated landscape, material and behavioural patterns can be discerned. These patterns can be used to explore underlying rules and principles from which an *emic* narrative can be developed. Based upon this approach a series of research questions have been

established to allow the research process to progress towards the stated research aim:

1. How was the technology produced and why was it produced in this way?
2. How and why do extant type fossils vary from each other?
3. What are the behavioural patterns that generated each assemblage?
4. How can these behaviours be interpreted in relation to their landscape and faunal contexts?

To address these questions the thesis is divided into seven chapters. Chapter one is used to provide a research context, whilst chapter two details the relevant strategies, methods and data collection protocols used. This is supported by a comprehensive review of the artefacts and sites presented within appendix one.

Chapters three and four are analytical and work together. Chapter three uses experimental production to develop and present a quantitative and qualitative model of a blade-point manufacturing process. By doing so it presents an answer to the first research question concerning how blade points were made, and why they were made in this way. Chapter four goes on to answer the second research question by explicating, quantifying and interpreting typological, metric and formal type fossil heterogeneity. Together the results of these two chapters provide a complete *chaîne opératoire* model, from material acquisition to artefact disposal, useful for linking artefacts from any stage of the process to associated behaviours. This model constitutes a reference tool for comparative analysis within subsequent chapters.

Chapter five contrasts the *chaîne opératoire* model to three lithic assemblages containing *debitage*. This comparative analysis is used to link artefact and behavioural patterns for each of the three case studies. In doing so it presents answers to the third research question by highlighting behavioural patterning on a site by site basis. Analysis within this chapter of the *debitage* (recovered 2007-8) from Beedings constitutes new research the detail of which is fully laid out within appendix five. Chapter six addresses the fourth research question using a review of landscape affordances and discussion of generalised faunal behaviours to interpret the human behavioural patterns recognised at each site. The final part of chapter six is summative, integrating outcomes from all previous analytical chapters into the course grained seasonal context presented by previous research. Doing so provides a new and original seasonal model for this particular period of the British Palaeolithic.

Within the final chapter 'internal' patterns and themes are discussed within the context of the overarching 'external' framework. This is used to structure the *emic* narrative that is the research aim of the thesis. The implications for how we approach the industry are then discussed, and the importance of moving beyond the transitional concept in order to contribute to our understanding of the industry. Finally, possible directions for future research are presented. Having summarised here the thesis structure, the following section will review theoretical and methodological issues associated with the subject.

1.2 Theoretical and methodological review

Three key research phases are used to comprehend how the corpus of materials under discussion has been shaped, and understandings of the materials developed and changed. This is needed because meanings associated with the term 'transitional' can be ambiguous. To provide clarity, it is necessary to penetrate the transitional label, and focus upon the industry and the artefacts. Consequently, this section explores the role different researchers have played in establishing conceptual frameworks within which differing understandings have been developed. Doing so explains why the materials under discussion are categorised as transitional, and why we are left with mainly type fossils and little in the way of associated human fossil, dateable or technological material. This deconstruction provides a basis for the theoretical and methodological choices made within this thesis research.

To begin this process, the context and work of Gabriel de Mortillet in France in the 1860s is discussed. De Mortillet's early contribution was a type fossil methodology developed to structure an understanding of the depth of human time. It is a model still in use today and has influenced which Lincombian artefacts were originally selected and subsequently curated. Secondly, the contribution of Henri Breuil in 1930s France is discussed, in particular his development of the Middle and Upper Palaeolithic temporal architecture. This is the architecture into which transitional materials do not easily fit. Thirdly, the evolution of meanings behind the term transitional are explored, and the elaboration by Paul Mellars, in late 1980s Britain, of the 'acculturation' hypothesis. This, and the continued affect this behavioural interpretation has on

current debate, forms the overarching research context for this thesis. Gabriel de Mortillet's work is discussed first.

1.2.1 Gabriel de Mortillet's type fossil method

To understand how de Mortillet's type fossil method affected Lincombian collections it is necessary to first summarise the history of artefact recovery in Britain. Whilst the Church had established a date for Creation of 4004 BC (O'Connor 2007: 1), it was excavations at Windmill Hill Cave in Devonshire between 1858-9 that signalled a shift in view. The careful excavation methods of William Pengelly located stone tools in association with extinct fauna. In so doing he convinced many influential observers of a greater human antiquity than previously acknowledged. This led William Boyd Dawkins to begin excavating in the Hyaena Den at the Wookey Hole Ravine in 1859 (Dawkins 1862: 117). He found stone tools sandwiched between trampled hyaena coprolites which "*proved the co-existence of man with...extinct mammalia*" (Dawkins 1862: 119; 1874: 295). Dawkins worked on the Hyaena Den up until ~1874, the same year he published his book 'Cave Hunting' (Tratman et al. 1971: 246, 247). This led the Reverend Magens Mello of Chesterfield to recognise the importance of the Creswell Caves in Derbyshire, and begin digging there in 1875 (Mello 1875: 679). Correspondingly, the work of Pengelly inspired Henry Hicks to excavate at Ffynnon Beuno in Denbighshire beginning in 1883 (Hicks 1885: 14). Materials now classed as Lincombian were recovered from all the above sites during this period.

As Dorothy Garrod (1926: 33) observed, the careful method William Pengelly developed at Windmill Hill Cave (and then at Kent's Cavern) allowed him to

explore the nature of geological and artefact patterning in only very broad terms (O'Connor 2007: xix). Pengelly's method provided a bench mark at the time; however, the result for artefacts collected within this period is that they have no real archaeological stratigraphic context (see McFarlane and Lundberg 2005 for a review of his method). Whilst the presence of human tools within geological strata allowed answers to fundamental questions, refining this broad understanding needed a systematic and agreed method for categorising tool types and time periods. The method that ultimately gained predominance was that of de Mortillet.

Working at the *Musée des Antiquités* near Paris, de Mortillet had two aims: the first was to take the narrative of the human past from the Church; the second was to fathom and illustrate the depth of human prehistory using scientific methods. The methods that influenced de Mortillet were those of geologists such as Georges Cuvier. Cuvier identified particular fossils that whilst geographically spread were characteristic of particular eras. As such these 'type fossils' were useful for helping to formulate a chronology for the differing eras of deep time. This geological method was adopted and adapted by de Mortillet to create an artefact based Palaeolithic chronology (Chazan 1995: 459; Hammond 1980: 119).

De Mortillet worked from the premise that particular stone tools could be understood as 'type fossils' from the deep human past. Consequently, he identified formal attributes of particular artefacts in order to define these type fossils (Monnier 2006: 711). Artefact variability was not useful for his purposes, and so de Mortillet separated type fossils from the chatter and noise of their associated materials. Contextual *debitage* and non-typical examples were

discarded to provide clarity and create order (Monnier 2006: 714). Like their geological counterparts, these type fossils were assumed to be sequential and to characterise differing epochs. In this respect de Mortillet treated human cultural products as the equivalent of fossilised biological species. De Mortillet had a progressive view of the past and stratigraphic context was seen as less important to him than the indicators of progress perceived within the stone tools themselves. Consequently, his de-contextualized museum collections became the ideal medium to develop and illustrate a sequential progression from one type fossil to another and from one characteristic period to another (Sackett 1981: 86, 92; Chazan 1995: 461). With this approach, he was able to refine the already established Scandinavian three age system organised around Stone, Bronze and Iron (de Mortillet 1883: 4). Although Edouard Lartet had excavated the type site of Le Moustier (and coined the term Aurignacian in 1863), it was de Mortillet in his work with Lartet that integrated both the Mousterian and Aurignacian into an artefact based evolutionary chronology (ibid). This chronology was promoted through the 1867 Universal Exposition in Paris (Chazan 1995: 459).

De Mortillet's system began to be accepted and utilised by British researchers towards the end of the nineteenth century (O'Conner 2007: 125), perhaps because his clearly defined links between epochs and artefacts seemed more useful than the equivocal and debated glacial, river and faunal sequences utilised in Britain (ibid.). This led to recovered lithic materials being subject to selection and culling with a priority placed upon clearly defined tools. For Lincombian materials within this thesis their early recovery and a focus upon humanly modified tools has resulted in a corpus dominated by type fossils with little in the

way of archaeological stratigraphic context. This has impacted upon the potential to confidently recognise technological and faunal associations when they may be present. However, by the early Twentieth Century another French archaeologist, Henri Breuil, was to develop de Mortillet's work with the formulation of the Middle and Upper Palaeolithic categories. These are the categories to which subsequently recognised transitional industries are contrasted and understood. It is therefore necessary to examine how and why they were developed.

1.2.2 Henri Breuil and the Middle to Upper Palaeolithic

As de Mortillet's career was coming to an end, Breuil entered the field of archaeology and arrived at a time when fieldwork had progressed. He became interested in reconciling de Mortillet's original type fossils with the emergent stratigraphic data (Monnier 2006: 717). By 1912, Breuil had taken John Lubbock's (1904) encompassing chipped stone Palaeolithic category and divided it into an Upper and a Lower. He did so to account for the differences between blade industries (as represented by the Aurignacian) and those containing flakes and handaxes. By the 1930s, he had also added a Middle Palaeolithic to differentiate a more recent flake based Mousterian from an earlier handaxe dominated Acheulean (Monnier 2006: 716). In this respect, Breuil reformulated understandings of Palaeolithic chronology and (by the 1930s) had created the Lower, Middle and Upper Palaeolithic categories used today. Although Breuil had usefully re-ordered de Mortillet's categories, he was using overarching flake and blade based definitions within a constrained geographical context which supported the impression of a clearly defined Middle and Upper Palaeolithic.

In creating this structure, Breuil had replaced de Mortillet's explicitly typological model of progressive epochs with a more nuanced blades and flakes schema better able to accommodate the newly emergent stratigraphic evidence.

Furthermore, Breuil's focus upon the technology of blade production allowed the recognition and quantification of more tool types. This was understood as technological development (Harrold 2000: 61) and Breuil had ideas about how this development occurred. Stone tools, sites and stratigraphies were believed by him to map out the movement and replacement of different human groups within space and time. Breuil (1912) perceived a technological shift from 'inferior' Middle Palaeolithic flake based, to 'superior' Upper Palaeolithic blade type industries within the same region of France. Whist de Mortillet had believed the transition from flakes to blades reflected the biological process of Neanderthals progressing into modern humans, the same evidence could now be understood as a modern human migration and a Neanderthal replacement and extinction event (Harrold 2000: 61). This explanation accommodated factors such as the close temporal and geographical association of Neanderthal artefacts and modern human fossils at sites such as Grimaldi in Italy (Hammond 1980: 119), as well as the Neanderthals' ultimate disappearance from the archaeological record. The Middle to Upper Palaeolithic temporal architecture developed by Breuil provided a structure that made sense of the range of evidence and data available at the time. However, as research progressed both inside and outside of France, it became clear that the division between a Mousterian Middle Palaeolithic and Aurignacian Upper Palaeolithic was too simple. For instance, one component of Breuil's composite Aurignacian is now termed the Chatelperronian, probably one of the best known 'transitional' industries (Riel-Salvatore 2009).

1.2.3 The emergence of transitional industries

Whilst Henry Breuil had seen the Middle to Upper Palaeolithic transition in terms of a biological replacement event, the human impact of the Second World War made this interpretation far less attractive (Proctor 2003: 221). Consequently, the earlier idea of Neanderthals becoming modern humans again gained prominence. Industries such as the Chatelperronian, although blade based, seemed to emerge from a Middle Palaeolithic substrate of the Mousterian of Acheulian Tradition (Bordes 1958). As such, the transition from flakes to blades was again seen to mirror the human transition from Neanderthals to modern humans (Mellars and Stringer 1989: 10). However, by 1990, the Chatelperronian was to play a central part in the British researcher, Paul Mellars, formulating the idea of a modern human colonisation of Europe with transitional industries being the result of Neanderthal acculturation by cognitively superior colonisers (e.g. Mellars 1989).

Mellars became involved in research on the Middle to Upper Palaeolithic Transition in the early 1970s (Mellars 1973) when he presented his initial ideas on the Middle to Upper Palaeolithic Transition at the *Explanation of Culture Change* conference at Sheffield. He saw Breuil's model of a Middle and Upper Palaeolithic, characterised by a division between flake and blade tools, as too simplistic (Mellars 1973: 256). For Mellars, the primary characteristic of the Upper Palaeolithic was the range of new tool shapes and the rapidity of their change through time. This was presented in contrast to a marked stability of Middle Palaeolithic tool forms through millennia (Mellars 1973: 270). The result was a characterisation of the culturally static Middle Palaeolithic in contrast to a dynamic Upper Palaeolithic. At this stage, Mellars believed it was the biological

emergence of modern humans that was being illustrated by the cultural transition from Middle to Upper Palaeolithic in Europe (Smith 2010: 24). Within this view, the Chatelperronian was one of the earliest Upper Palaeolithic manifestations (Mellars 1973: 258). This view held until ~1980 when new human fossil evidence was recovered.

In 1979, Lévêque and Vandermeersch recovered Neanderthal skeletal remains from a Chatelperronian layer at Saint Césaire in France (Lévêque and Vandermeersch 1980). The association of Neanderthal fossil evidence with Upper Palaeolithic material culture contradicted the previously assumed exclusive modern human association. It had been recognised for some time that at a number of sites Aurignacian materials were interstratified with Chatelperronian artefacts (see Klein 1973: 116). Importantly, this new association between Neanderthal human fossils and Chatelperronian artefacts supported the idea of some kind of coexistence followed by population replacement. These unfolding events created tremendous excitement and required a new explanatory narrative.

Consequently, research began to focus on Chatelperronian sites where interstratification with the Aurignacian was evident. Bone tools, personal ornaments and the use of red ochre had been found in association with Neanderthal teeth at the site of the Grotte du Renne in north central France (Leroi-Gourhan 1958). Aurignacian, and Chatelperronian material culture interstratification had been identified at two French and one Spanish site (summaries in Mellars 1989: 352; Zilhão 2011: 339). By 1989 these interstratifications were used by Mellars to argue that Neanderthals had developed an Upper Palaeolithic technology through a process of acculturation by incoming modern humans. He argued that the

Chatelperronian was geographically constrained, whilst the Aurignacian expansive. Furthermore bone working occurred only in the later Chatelperronian layers which were closer in time to the "*highly developed*" Aurignacian (Mellars 1989: 353). Importantly, within this new model the term 'transitional' changed its meaning (Mellars and Stringer 1989: 10). From originally indicating a biological transition from archaic to modern human, it was now employed to explain the acculturation of cognitively inferior Neanderthals by cognitively superior colonising moderns, an interpretation that held for the next decade.

However by 2001 those factors used to develop the idea of Neanderthal acculturation were being undermined. In particular, reviews of the interstratifications from the three Chatelperronian sites questioned their integrity. In 2001 Montes and Sanguino (Montes et al. 2005) showed that all levels of the slope deposit at the Spanish site of El Pendo contained a mixture of Middle and Upper Palaeolithic elements and the interpretation of integrity and interstratification was incorrect. Jean Guillaume Bordes (2002; 2003; 2006) used refitting of artefact components from differing levels to show that the illusion of interstratification was a result of post depositional disturbance at both the French sites. Consequently a number of important supports for the acculturation hypothesis were removed. It began to seem as though one of the earliest Upper Palaeolithic expressions in Europe had been produced by Neanderthals.

1.2.4 Penetrating the transitional category

Paul Mellars 'acculturation' narrative was consistent with the stratigraphic, cultural and human fossil evidence available before 2000 AD, however, since

then it has been systematically and stratigraphically undermined. More recent researchers have argued that this explanation's integration of both the human and cultural evidence into a simple narrative has retained an interpretive 'afterlife' (Zilhão 2011: 331). This afterlife perhaps has currency because current understandings are more complex and mosaic, and less succinct or summative in scope. As d'Errico and Banks (2015: 183) have recently argued, the explanation we are seeking is probably not a simple one. Rather than cognitive superiority and inferiority, it is more realistic to understand this period in terms of different human groups acting and interacting within a period of dramatic climatic instability. They advocate abandoning single cause explanations.

Developing this approach, Fedele (et al. 2008: 835) and colleagues have discussed how the term 'transition' has been absorbed into the *lingua franca* when discussing the period. However they emphasise the necessity of separating the cultural from the biological evidence if we want to recognise the potential and actual complexity of the period within Europe. It can therefore be argued that isolating transitional material culture is a useful analytical first step.

However, Zilhão (2011: 336) has emphasised that as a material culture category, the term transitional actually comprises "*a diverse array of lithic assemblage types that, in one way or another, fit at least some aspects of the definition of Upper Palaeolithic*". In other words, the industries termed transitional form a heterogeneous group. To penetrate this heterogeneity it is necessary to focus in, upon a particular industry. The LRJ is one such industry, and the Lincombian is one geographically bounded component of it. Following the above line of argument the Lincombian can be seen as 'un-encumbered' by human fossil evidence, and as such these artefacts cannot be expected to

address questions exploring human type. However this material does offer an interesting opportunity to explore the character of a human behavioural adaptation within its own spatial and temporal envelope. It is into this lacuna that my own research and contribution fits.

1.2.5 Theoretical and methodological conclusions

This discussion has been organised around three key research phases. All have implications for how the material under discussion within this thesis has been recovered, categorised, and interpreted. Early recovery has resulted in little archaeological stratigraphic context. The development and ultimate adoption of de Mortillet's method resulted in a British corpus focussed predominantly on type fossils. Breuil's Middle to Upper Palaeolithic architecture was built upon encompassing Mousterian and Aurignacian categories which failed to accommodate subsequently recognised 'transitional' Upper Palaeolithic industries. These industries were seen as reflecting the biological transition from Neanderthals into modern humans until 1980. However, by the 1990s the meaning associated with the term had changed and transitional industries were seen to reflect Neanderthal attempts to copy modern human Upper Palaeolithic technologies. Since 2000 research has undermined the evidence supporting this interpretation and a more complex biological and cultural picture is emerging. Consequently more recent approaches have emphasised the separation of biological and cultural lines of evidence, for a more rigorous approach to developing a nuanced understanding of the period. Within this thesis it is one material component of one particular transitional industry that is the focus. Having established the theoretical and methodological context, what follows is a literature review concerning the Lincombian component of the LRJ.

1.3 Literature review

Some of the artefacts discussed here were recovered at a very early stage in the history of research. For example, a blade-point from Kent's Cavern in Devon was recovered by John MacEnery in 1825 or 1826 (MacEnery 1859: Plate T:5). This longevity means that many researchers have discussed these materials to a greater or lesser degree. For this thesis the work of four archaeologists has been selected as primary. Dorothy Garrod and her publication *The Upper Palaeolithic Age in Britain* (1926) brought together much of the material under discussion for the first time. John Campbell's (1977) *The Upper Palaeolithic of Britain* built upon Garrod's work and integrated his own excavation data into the discussion. More recently Damien Flas (2006) within his doctoral thesis established the temporal and technological character and homogeneity of the pan-European LRJ. Finally, and most important for the British materials is the work of Roger Jacobi. Since the mid 1970s he systematically researched, collated and published on the Early Upper Palaeolithic (EUP) materials within British collections (e.g. Jacobi 1980; 1990; Jacobi and Higham 2011). Of particular relevance is Jacobi's work on the materials from the site of Beedings in Sussex (Jacobi 1986; 2007). However, as well as a research focus upon museum collections, newly excavated materials have come to light in Britain since 2000. Excavated using modern methods, quantities of *debitage* have been recovered from both the Midlands site of Glaston and the aforementioned plateau of Beedings. Both of these sites are introduced within this section and developed in depth within subsequent chapters (5+6). With this in mind this review begins with the work of Dorothy Garrod.

1.3.1 Dorothy Garrod and the proto-Solutrean

In *The Upper Palaeolithic Age in Britain* Garrod's stated aim was to make a general summary, and compare the Upper Palaeolithic industries of Britain with those on the continent (Garrod 1926: 10). She was a *protégé* of Breuil who, in the preface to her book, emphasised the importance of the Belgian cave site of Spy for relating British materials to the continent (Garrod 1926: 7). Spy was excavated by Marcel De Puydt and Max Lohest and published in 1887. Within the cave they found three bone layers: the lowest contained Mousterian materials along with two Neanderthal skeletons; the middle layer blade-points; and the upper layer Gravette and Font Robert points. The publication and materials were reviewed by Breuil in 1912 and he mistakenly conflated the blade-points with the Gravette and Font Robert points (Jacobi 1990: 281). Consequently he interpreted this conflated top layer as Upper Aurignacian with the blade-points showing a transition to Solutrean (Flas 2006: 5). Garrod, writing in 1926, followed Breuil and categorised the blade-points recovered from Kent's Cavern and Robin Hood's Cave as '*proto-Solutrean*' (Garrod 1926: 37, 128). Thus she understood the blade-points discussed within this thesis as evolutionary precursors to bifacially worked Solutrean points from France and Spain. Garrod's review was comprehensive and a valuable aspect of her work was to bring together the materials at an early stage of research. In doing so she was able to discuss and illustrate artefacts that have subsequently been destroyed (e.g. Uphill Cave 8). Whilst acknowledging the pioneering value, by 1965 John Campbell (1977: 4) had recognised the potential for updating Garrod's work.

1.3.2 John Campbell and the Early Upper Palaeolithic

It was within this context that Campbell took the opportunity to review the archaeological materials from Britain. Adopting a palaeo-ecological perspective he was particularly interested in the chronology, ecology and cultural material from the British Upper Palaeolithic (Campbell 1977: 199). Whilst primarily concerned with millennial change, a valuable aspect of Campbell's approach for this thesis was his linkage between sites, seasons and animal migration routes (e.g. Campbell 1977: 171). In doing so he was referencing work by a contemporary researcher at the University of Cambridge, Eric Higgs. Higgs was a primary mover within economic prehistory (Hickey 1974: 76) and emphasised the importance of animal studies for modelling human behaviours (Higgs 1976: 161). An underlying assumption within his economic approach was that optimal resource exploitation was a primary motivator for past peoples. If resources were unevenly distributed through space and time then optimal exploitation of the environment needed to be considered within a seasonal context (Higgs 1976: 159). Higgs worked with the geographer Claudio Vita-Finzi (1970) to develop the 'site catchment analysis' model that brought together seasonality, animal behaviour and technology as a way to situate a site within its territory. Grahame Clark published 'Star Carr: A Case Study in Bioarchaeology' in 1972 and adapted Vita-Finzi and Higgs site catchment analysis method. Within Britain he saw Red Deer as the primary source of calories with humans following the deer from winter lowlands, to summer uplands (Clark 1972: 31). Campbell, within his cultural ecology section explicitly used Vita-Finzi and Higgs' site catchment analysis method in an attempt to comprehend EUP territories within Britain. In doing so he emphasised how EUP sites were mainly found within the

contact zones between highland and lowlands. He explained this in economic terms as the "*exploitation of two or more viable ecological zones at the same time for greater economic yield and balance*" (Campbell 1977: 200). This mirrored Vita-Finzi and Higgs (1970) 'economic ecotone', providing access to a diversity of resources.

The result of Campbell's doctoral work was published in book form in 1977. A primary and long lasting outcome was to highlight a division in Britain with an Earlier Upper Palaeolithic preceding the Last Glacial Maximum (LGM), and a Later Upper Palaeolithic following it. Campbell broadly accepted Garrod's categories but integrated her Aurignacian variants together with the proto-Solutrean materials to form an encompassing EUP category (1977: 17). After reviewing Belgian materials in the 1980s Campbell (1986) went on to refine his EUP category and in the process termed the blade-points under discussion within this thesis 'Lincombe Points'.

Campbell's reflections on his own work are interesting. He expressed disappointment in the value of statistical approaches when applied to the small corpus of EUP materials available in Britain (Campbell 1977: 156). In contrast he perceived the potential value of experimental production as a strategy for making quantitative sense of the little understood EUP technologies (Campbell 1977: 26). Finally Campbell moved to Australia in 1975, and following first-hand experience of aboriginal adaptability, saw his previous conclusion regarding the abandonment of Britain during the LGM as likely to be incorrect (Campbell 1986: 7, 9). Subsequent to Campbell, more recent significant research was that produced by Damien Flis in 2006.

1.3.3 Damien Flas and the LRJ

To recognise the value of Flas's work it is necessary to understand the history of research as it relates to the continental materials. Waldemar Chmielewski (1961) excavated Nietoperzowa Cave situated near the Polish village of Jerzmanowcie. In doing so he found three layers (6, 5a and 4) that contained both leaf and blade-points. He termed the blade-points 'Jerzmanowice Points' and carbon dating indicated a surprisingly early age of 38,000 BP (uncalibrated) for these materials (Chmielewski 1961: 68). This early provenance for blade and leaf-points was reiterated in a posthumous 1977 publication of excavations from Ilsehöhle Cave at Ranis in Germany (Hülle 1977). There blade and leaf-point materials were found to overlay Mousterian and underlay Aurignacian artefacts (Flas 2014: 5501). Charles McBurney (1965: 27) had noted a relationship between British materials such as the blade-point from Ffynnon Beuno and those from Germany. Consequently by the 1980s many researchers had shifted from a 'proto-Solutrean' model, which associated blade-points with the French sequence, and accepted the formal similarity between the leaf and blade-point materials from Britain, Germany and Poland (e.g. Jacobi 1980: 17). As a consequence the term 'Lincombian-Ranisian-Jerzmanowician complex' was developed (Desbrosse and Kozłowski 1988) and along with it acknowledgement of an earlier chronology than previously thought. However, the linkage between British, German and Polish materials was not accepted by all researchers. Philip Allsworth-Jones (1986) saw 'Jerzmanowice Points' as being related to the central European Szeletian. Differences in form could be explained by the better quality Polish raw materials having allowed blade production to develop. Furthermore Campbell (1977) had established the idea that leaf and blade-points found at

some sites with characteristic Aurignacian artefacts formed an encompassing EUP category.

By 1980 Jacobi (1980, 1986) had recognised a number of just such Jerzmanowicie Points associated with technological material within a collection housed at the Museum of Sussex Archaeology. He discussed these artefacts with his friend and Belgian colleague Marcel Otte (2015: 249) and ultimately, Damien Flas, a student of Otte, used his doctoral thesis to present a careful analysis of technology, stratigraphy and chronology. In doing so he was able to convincingly separate the Lincombian-Ranisian-Jerzmanowician materials from those of the Szeletian and the Aurignacian (Flas 2006; 2008). A primary outcome of Flas's work was to establish the technological coherence of the industry showing it to be an independent complex. He also introduced the acronym LRJ which is used here. Whilst Flas's research engaged with the continental span of the LRJ, Roger Jacobi's analytical focus was upon those type fossils from early excavations that had been distributed widely throughout museum collections in Britain.

1.3.4 Roger Jacobi and the British material

From the outset Jacobi (1980: 15) had an explicit interest in refining the broad outline presented by Garrod, and developed by Campbell, of the Upper Palaeolithic sequence in Britain. Fittingly, this was also the theme of a paper co-written with Tom Higham and published after Jacobi's death in 2009 (Jacobi and Higham 2011). Within this paper the authors used artefact typology and carbon dating to discern possibly six Upper Palaeolithic "settlement events" with leaf and blade-point materials seen as representing the earliest of these (Jacobi and Higham 2011: 216). The term "settlement event" is important as it signals a

second theme of Jacobi's work, that of developing an understanding of past human behaviours, an approach exemplified by his interpretation of the site of Beedings.

It was probably during the mid-1970s whilst reviewing material for his PhD that Jacobi recognised the value of the Beedings collection. Charles McBurney was Jacobi's PhD supervisor and encouraged him to examine in detail the Jerzmanowice points he had found (Jacobi 1986: 67). Campbell had moved to Australia at around this time which explains why the Beedings materials remained un-discussed within his thesis (1972), book (1977) and early 1980s publications on the subject. Jacobi's first published reference to the materials was in 1980, with fuller and more comprehensive discussion and interpretation in 1986 and 2007. Because of extensive artefact fragmentation and recycling the collection proved problematic to categorise typologically. Jacobi (1986: 66) stated as much, and changes to his organising systems are apparent on stickers still adhering to actual artefacts (e.g. Fig.1.5).



Fig. 1.5 Jacobi's developing categorisation system as recorded on the Beedings artefacts (photograph: author).

However as well as typologically recognisable tools, the Beedings material included some *debitage*. This gave Jacobi a partial insight into the technology of blade-point manufacture, something that had been (largely) unavailable to both Garrod and Campbell. Furthermore damage patterns on blade-points provided evidence indicative of their use as spear heads (Jacobi 1986: 63) and a predominance of 'butts' was interpreted by Jacobi as a retooling signature (1986: 66, 67). The 'stunning' vistas associated with the site suggested to Jacobi that Beedings had been a 'field camp' and 'observation point' (ibid). Jacobi (1986: 63) also commented upon the relatively massive size of the Beedings blade-points in relation to those from caves in other parts of Britain, and was later to develop this observation (2007: 275) by contrasting the form of the blade-points from Beedings with those from other sites. In doing so he was able to comment upon and illustrate how different they were from each other. Jacobi was clearly pursuing this theme as a series of unpublished illustrations, commissioned by Jacobi and completed by Hazel Martingell, are of just such untypical pieces (see Appendix A1.2.g Drayton Wood Road burinated example).

Furthermore, two sites in England have been excavated since 2000 and contributed both macro and micro-*debitage* to the discussion. The first was at Glaston in the Midlands (Cooper et al. 2012) and the second comprised excavations on the Beedings plateau in 2007 and 2008 (Pope 2008). The new materials from each of these sites have been incorporated into the analysis within this thesis and each site is discussed in detail within the relevant subsequent chapters.

1.3.5 Literature review conclusions

A number of important aspects have emerged from this review. Flas (2006) recognised a temporal and technological homogeneity with artefacts from as far west as Wales, and as far east as Poland. In doing so he was able to establish the LRJ as an independent industry. Jacobi's (1986; 2007) work at Beedings provided a valuable but incomplete insight into the technological production process for the same industry. Campbell (Campbell 1977: 26) had already recognised the potential contribution experimental production could make to provide a quantitative understanding of EUP technology. Jacobi's difficulty in categorising the material from Beedings is significant in that it reflects the large degree of artefact recycling. As such Beedings provides an insight into the 'afterlife' of the original artefacts. However, once Jacobi had successfully categorised the artefacts (Jacobi 2007), heterogeneity throughout the British corpus became an emergent theme (Jacobi 2007: 275). Based upon subsequent publications, and unpublished illustrations, this was still under active investigation until his death. A valuable aspect of Campbell's approach for this thesis was his linkage between sites, seasons and animal migration routes (e.g. Campbell 1977: 171). The same is exemplified within Jacobi's interpretive approach at the site of Beedings. Finally, excavations since 2000 have unearthed *debitage* collections that have provided a potential opportunity to further develop understandings of this EUP technology in relation to particular landscape contexts. To follow this summary, the next section will review the understandings we have of the temporal and spatial context these humans were operating within.

1.4 Their time and space

Within this section a range of evidence available for dating the Lincombian is discussed, and a summary of climate and weather is presented. This is followed by an overview of the British landscape, flora and fauna of the period.

1.4.1 Dating the Lincombian

The primary radiocarbon evidence for LRJ EUP provenance came from Nietoperzowa Cave in Poland. The cave had three layers (levels 6, 5a and 4) that contained both leaf and blade-points unmixed with other industries (Flas 2006: 162). Wood charcoal from a hearth in the lowest layer six gave an un-calibrated date of $38,160 \pm 1250$ BP (lab. code GrN-2181) (Chmielewski 1961: 68; Flas 2008: 19, Table 3). Results from an unidentified bone from the same layer produced an un-calibrated date of $37,600 \pm 1300$ BP (lab. code Gd-10569). These early dates fitted with the stratigraphy and were supported by similar at the Ilsehöhle in Germany (Flas 2011: 608). However no British dates could be established until ~2000 AD.

This was because the amount of materials needed for carbon dating meant it was charcoal that was generally preferred, and none was confidently associated with Lincombian material. However, with the development of Accelerator Mass Spectrometry (AMS) smaller amounts of dateable carbon within bone collagen could be extracted and used (Jöris and Street 2008: 785). Initial problems with post depositional contamination of bone (Jöris and Street 2008: 786) were resolved with the development of ultrafiltration pre-treatment around 2000 AD. In the same year new dateable material was excavated from the EUP site of

Glaston in the Midlands. Of these two new developments ultrafiltration is discussed first.

Ultrafiltration pre-treatment allowed the purification of gelatine from bone collagen by the removal of contaminants (Higham et al. 2006: 176). This allowed Jacobi to submit for dating a number of faunal museum specimens from England that had been recovered in contact or close association with blade-points. These elements were from the sites of Badger Hole in Somerset, Bench Quarry Tunnel in Devon, and Pin Hole Cave in Derbyshire (Jacobi and Higham 2011: 188). At Badger Hole a wild horse (*Equus ferus*) right dentary was found in close association with blade-point and dated to $36,000 \pm 450$ BP (lab. code OxA-11963). From Bench Quarry Tunnel a hyaena (*Crocuta crocuta*) right dentary was found in contact with a broken blade-point. Two dates were taken from the same piece, using two differing methods (see Jacobi and Higham 2011: 188 for details) and resulted in dates of $37,500 \pm 900$ BP (lab. code OxA-13324) and $36,800 \pm 450$ BP (lab. code OxA-13512). Finally at Pin Hole Cave a hyaena (*Crocuta crocuta*) right pre-maxilla again found in close association with a blade-point was dated to $37,800 \pm 1600$ BP (lab. code OxA-11980) (Jacobi and Higham 2011: 188). These dates correlated with the chronology established at Nietoperzowa and corresponded with more organic material becoming available from the site of Glaston.

Glaston was excavated between April and October 2000 and spirally fractured horse bones were found associated with a blade-point. The fractures were seen as indicative of human marrow extraction and therefore offered a valuable dating opportunity (Cooper et al. 2012: 83). One *Equus ferus* first phalange was dated twice using the ultrafiltration method and resulted in a first date of 37,380

± 350 BP (lab. code OxA-21311), and a second of $38,610 \pm 400$ BP (lab. code OxA-21312). A calibration of all the above dates using OxCal 4.2 software and the IntCal13 curve has been summarised here (Table 1.1) to facilitate comparison with calendar year data obtained by other methods.

Site	Lab. Code	Reference	Un-calibrated date range	Calibrated Date Range	Probability	Notes
Nietoperzowa	GrN-2181	Chmielewski 1961	$38,160 \pm 1,250$	44,909 - 40,437 cal. BP	95.4%	Wood charcoal from layer six
Nietoperzowa	Gd-10569	Chmielewski 1961	$37,600 \pm 1,300$	44,572 - 39,761 cal. BP	95.4%	Unidentified bone from layer six
Badger Hole	OxA-11963	Jacobi et al. 2006	$36,000 \pm 450$	41,564 - 39,707 cal. BP	95.4%	Equus ferus right dentary
Bench Quarry Tunnel	OxA-13324	Jacobi et al. 2006	$37,500 \pm 900$	43,341 - 40,328 cal. BP	95.4%	Crocota crocuta right dentary
Bench Quarry Tunnel	OxA-13512	Jacobi et al. 2006	$36,800 \pm 450$	42,115 - 40,511 cal. BP	95.4%	Same Crocuta crocuta right dentary
Pin Hole Cave	OxA-11980	Jacobi et al. 1998	$37,800 \pm 1600$	45,661 - 39,351 cal. BP	95.4%	Crocota crocuta right pre-maxilla
Glaston	OxA-21311	Cooper et al. 2012	$37,380 \pm 350$	42,357 - 41,298 cal. BP	95.4%	Equus ferus first phalange
Glaston	OxA-21312	Cooper et al. 2012	$38,610 \pm 400$	43,372 - 42,079 cal. BP	95.4%	Same Equus ferus first phalange

Table 1.1 Calibrated dates for the LRJ materials.

An average taken from the above calibrated dates provides an approximate range of between $\sim 43,500$ - $40,500$ cal. BP to envelope the LRJ. The 95.4% certainty indicates that the Lincombian “settlement event” falls at some point within that date range. Zilhão (2006: 12) has drawn attention the Heinrich 4 event (HE-4) around $40,000$ cal BP that would have imposed dramatic cooling on what is now the British Isles. The correlation of HE-4 with the outlier end date for the LRJ indicates that climatic factors need to be considered more fully.

1.4.2 Climate

The Lincombian dates place it within the inter-glacial period termed Marine Isotope Stage 3 (MIS3) which spanned ~59,000-25,000 cal. BP (van Andel 2003: 9). MIS3 was climatically unstable and Greenland Ice Core data indicated a series of 'Dansgaard-Oeschger' (D/O) events during the period (Huntley et al. 2003: 195). D/O events have been generalised as having an initial rapid warming followed by a longer cooling off period (Pettitt and White 2012: 294). The Lincombian dates (~43,500 - 40,500 cal. BP) overlap a transitional middle phase of MIS3 (~44,000-37,000 cal. BP). This middle phase sat between an earlier warm phase and a subsequent cold phase that would ultimately lead to the LGM (Barron et al. 2003: 57). This middle phase was characterised by more intense instability and overall climatic deterioration (van Andel, Davies and Weniger 2003: 33). This was a result of the period being punctuated by four closely clustered D/O events (11, 10, 9 and 8). D/O-11 at around 43,000 cal. BP initiated the period, and the subsequent events went on to reach very low minimum temperatures (van Andel 2003: 11; Nowaczyk et al. 2012: 66).

Refining this understanding is difficult as there are problems associated with tying together the differing types of data associated with marine core, ice core, speleothem, and radio carbon results from differing parts of the globe. This means that only some dates and a relative chronology of climatic conditions can be posited when attempting to understand when the Lincombian emerged and subsequently disappeared (Weniger and Jöris 2008). This relative ordering is outlined here and begins with the final event in the sequence, HE-4.

1.4.3 Heinrich Event-4

Zilhão (2006: 11) highlighted how HE-4 occurred at around 40,000 cal. BP and towards the end of D/O 9 (cf. Fitzsimmons et al. 2013: 2). Recently researchers (Nowaczyk et al. 2012: 66) have developed software to link the data from the Greenland Ice Cores with those from the Black Sea. Doing so has allowed a correlation between D/O events within the Greenland Ice Core data, and evidence of the Laschamp Geomagnetic Excursion (LGE) and Campanian Ignimbrite (CI) volcanic eruption within the Black Sea sediment cores. From this they were able to produce a coherent sequential ordering of events to which carbon dates can tentatively be tied (e.g. Nowaczyk et al. 2012). Weniger and Jöris (2008: 779) have discussed how Mediterranean oxygen isotope records indicate that stratigraphically the HE-4 was immediately preceded by the CI volcanic eruption in Italy. This was one of the largest such events within the last 200,000 years and certainly affected the climate of a large portion of southern Europe (Fedele et al. 2003: 301). Zilhão (2006: 12) argued that glacial advance leading to dramatic cooling associated with HE-4 to the north, combined with the effects of a 'volcanic winter' to the south would have led to a significant reduction in the European landmass available to humans. Archaeologically the CI volcanic ash layer in turn post-dates evidence of the LGE (Weniger and Jöris 2008: 779) a short lived magnetic reversal that lasted around 440 years (Nowaczyk et al. 2012: 68). Evidence for this reversed polarity was first recognised within solidified lava flows at Laschamp, and then at Olby within the Auvergne region of central France. These lava flows are indicative of volcanic activity which prefigured the Italian eruption. It would seem that from a human perspective, the climate and environment in the period bracketing the LRJ presence was in step phases becoming increasingly unstable, un-predictable and apparently catastrophic. From an *etic* perspective however both the CI and LGE

are recognised as providing clearly recognisable horizons useful for absolute dating. This has allowed understanding of the relative dating and chronology discussed above, but also consideration of the early outlier dates for the LRJ.

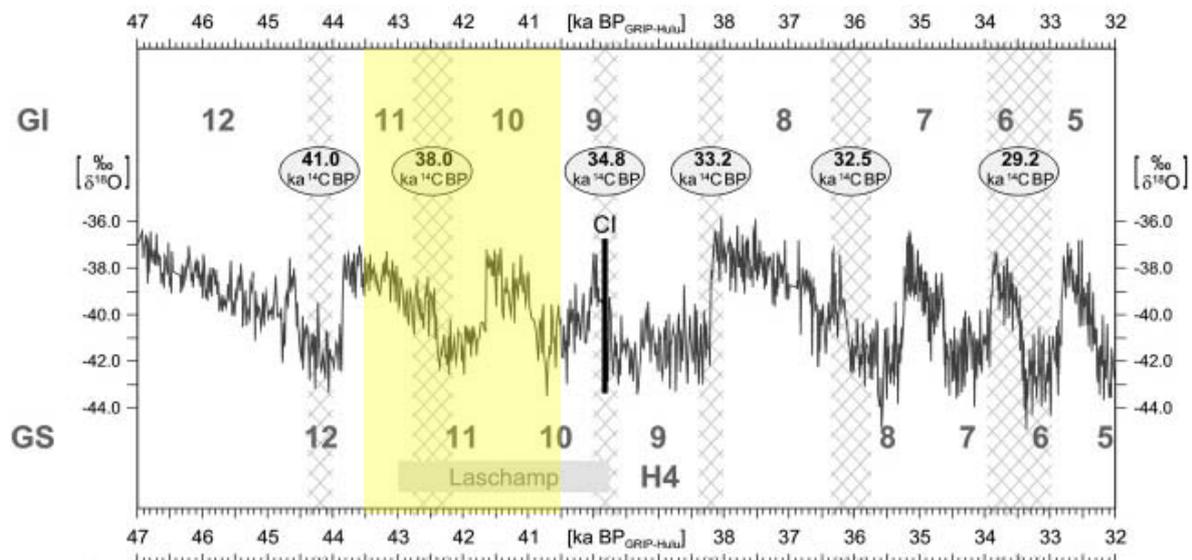


Fig. 1.6 Average for the LRJ calibrated dates (highlighted in yellow) in relation to Greenland Interstadials (GI), Greenland Stadials (GS), Laschamp Geomagnetic Excursion, Campanian Ignimbrite (CI) and Heinrich Event 4 (H4) (Adapted from Joris and Street 2007: 797 Fig. 9). The numbering of the interstadial warming events on this figure correspond with the D/O events referred to within the text.

1.4.4 Relating climate and dates

Jacobi and Higham (2011: 182) have pointed out the assumption that EUP occupation events within what is now Britain would have occurred within warmer interludes. At Nietoperzowa some attempt was made to link the radiocarbon dates from the blade and leaf-point levels to associated small mammal remains. Whilst imprecise in relation to the isotope record, the faunal evidence supports the idea that the assemblages are indeed related to one of the warmer episodes (Jacobi and Higham 2011: 189). The dates discussed for the less severe D/O-11 and very severe HE-4 fall approximately either side of the average range

established from the calibrated radio carbon determinations for the LRJ. The quantity of material from Britain is small and it would seem to relate to perhaps one of the warm phases bracketed by D/O-11 and HE4.

D/O-11	43,000 cal. BP
LRJ average dates	43,500 - 40,500 cal. BP
HE-4	40,000 cal. BP

Table 1.2 Average span for LRJ calibrated dates bracketed by D/O-11 and H-E4.

1.4.5 Climate summary

Based upon the dating evidence it would seem that the LRJ emerged after 43,500 cal. BP and recent work linking the Black Sea sediment core data, with that from the Greenland Ice Cores suggests this could correspond with one of the D/O warm phases (Nowaczyk et al. 2012: 66). The LRJ seems to have disappeared by 40,500 cal. BP, which marked the end of a sequence of major environmental events beginning with a 440 year geomagnetic excursion, followed by volcanic activity in central France and massive eruption in southern Italy. The final dates correspond with dramatic cooling associated with HE-4 (Nowaczyk et al. 2012: 66). This primary relative sequence of events, with some tentative dates, has allowed a more nuanced understanding of what is meant when MIS3 is described as 'unstable'. Furthermore, the period spanning D/O-11 and HE-4 can be legitimately described as 'dramatically unstable' throughout. This dramatically unstable climate provides a useful context for the following discussion of weather.

1.4.6 Weather

For a general understanding of MIS3 weather it is useful to discuss the work of Dale Guthrie. 'Mammoth steppe' has been used to describe the trans-continental

landscape associated with MIS3 and Guthrie (1982) is credited with developing the term. More recently Guthrie (2001) argued that this steppe landscape was primarily the result of skies free from cloud cover. According to Guthrie's model, clear skies allowed increased solar radiation that maximised summer evaporation and thus aridity. Furthermore the sun would be high in the sky providing an extended summer growing season (van Andel 2002: 2). Heat locked in the ground over the summer was lost to clear winter night skies thus decreasing overall yearly temperatures. Low moisture promoted the growth of xeric grasses and the sunlight made them nutrient rich. This facilitated the grazing and growth of the mega-fauna that populated the steppe. Consequently the term 'mammoth steppe' has been used to reflect both the landscape and faunal character of an environment that has been argued to have no current analogue (Guthrie 1982: 309). Guthrie's trans-continental and holistic overview presents a steppe weather context that was cold and dry but with high levels of sunlight throughout an extended summer.

1.4.7 The British Isles

The British Isles would have been a western upland periphery to this lowland mammoth steppe and aspects of this generalised weather pattern would most certainly have differed. More nuanced simulations for Britain were developed by the Stage 3 climate modelling project (van Andel and Davies 2003) when a number of specialists modelled a typical MIS3 warm period using evidence from the D/O 12 interstadial at 45,000 cal. BP (Barron et al. 2003: 58). This approach suggested mid-summer (June, July, August) temperatures of between 8 and 12°C (Barron et al. 2003: 65, Fig.5.7). Mid-autumn (October) temperatures were estimated at around 4°C (Barron et al. 2003: 70, Fig.5.11) accompanied

by heavy rainfall (Barron et al. 2003: 70) with mid-winter (January) temperatures at around minus 2°C. Then, as now, wind chill would have been a factor. Snow cover reached perhaps 15cm but was patchy (Barron et al. 2003: 73), and the spring thaw would have occurred very late in the season with snow still on the ground until late May (Barron et al. 2003: 70, 73).

Paul Pettit and Mark White (2012: 315) have argued that because MIS3 climate deteriorated over time, modelling based upon 45,000 cal BP may be seen as an ideal. Consequently, for the Lincombian period the weather would likely have been somewhat harsher. Based upon this recognition Pettitt and White (2012: 325) have therefore hypothesised that humans during MIS3 may have used the upland zone of what is now the British Isles as an exclusively summer hunting ground. Both Pettitt and White completed their PhD research under Paul Mellars at Cambridge. Mellars (1975: 52; 1976: 386-88) himself had built upon Grahame Clark's seasonal model for the Mesolithic site of Star Carr using modern studies of red deer to argue for faunal migration from constrained winter lowlands to expansive summer uplands. Within this model human seasonal migration was predicated upon this faunal movement. Mellars also presented a seasonal argument to explain the predominance of reindeer remains within the south-western French Upper Palaeolithic record (e.g. Mellars 2004). In this respect Pettitt and White were following in the footsteps of those previous Cambridge scholars Higgs (Higgs and Vita-Finzi 1970), Clark (1972), and Mellars (1975), as well as Campbell (1977) when situating this seasonal model into discussion of human activities in Britain during MIS3. Nevertheless, like Flas (2006) before them, Pettitt and White (2012) could find no significant patterning within the Lincombian materials with which to refine this seasonality hypothesis

for the British EUP. Returning to climate and weather, in contrast to Guthrie's interpretation of overall aridity, the Stage 3 observations indicated heavy autumnal rains within the British Isles. Acknowledging this autumnal ambiguity the next section will examine the evidence we have for understanding this summer upland landscape.

1.4.8 A summer upland landscape

Global sea levels between 43,500 – 40,500 cal. BP have been estimated to be between 70m to 80m below modern levels (Lambeck et al. 2002: 202).

Consequently the now submerged area to the east of Britain probably comprised a vast grassland plain with rivers and lakes that have been termed 'Doggerland' (Coles 1998). To the south of Britain lie a series of offshore palaeo-river valleys (e.g. palaeo-Arun; palaeo-Dart), relics of rivers that drained from the south of England into a substantial west flowing channel river that emptied into the Atlantic (Antoine et al. 2003: 238).

The EUP upland zone that now comprises the south of Britain is made up of two landscapes of differing character. The west can be generalised as being more rugged with steep sided limestone gorges and relatively short river valleys that would have ultimately emptied into the channel river system (Pettitt and White 2012: 300). From an archaeological perspective this western landscape, and also that of the more northerly Midlands, comprise limestone caves from which much MIS3 archaeology has been retrieved (Swainston 1999: 45). In contrast the east of this EUP upland zone was made up of rolling hills and long rivers which flowed eastwards into Doggerland (Pettitt and White 2012: 300). From a geological perspective, the east and south east of Britain is underlain by flint rich chalk.

Whilst the north of the Britain was probably ice-free during MIS3, subsequent events such as the Last Glacial Maximum (LGM) will have removed (through ice scouring) any evidence of Lincombian northern expansion (Swainston 1999: 45). Within this landscape context it is useful to return to Guthrie and his observations on flora.

1.4.9 Flora and fauna

Evidence of the xeric nature of the nutrient rich herbs, sedges and grasses is present within ice core data and has been explained by Guthrie. However, more contentious is whether or not of trees were present. Fossil coleopteran (beetle) evidence has been interpreted as indicative of an open treeless environment (Coope, 2002). However, MIS3 pollen recovered from cave speleothem from Lancaster Hole in Lancashire indicated a dominance of warm-loving tree species, in particular pine and oak, but also small quantities of alder, hazel and willow (Caseldine et al. 2008: 198, Table 3b). This suggests that sheltered landscapes such as limestone gorges may have acted as arboreal refugia within the more open and treeless Mammoth Steppe.

As discussed above, Guthrie characterised the 'mammoth steppe' as being populated by grazing megafauna. In relation to Britain, Andrew Currant and Roger Jacobi (2001: 1707) developed an approach using written records and museum collections to produce a biostratigraphy for each of the Marine Isotope Stages of the Late Pleistocene. The term biostratigraphy was therefore used to link distinctive and repeated mammal assemblages that characterised particular Marine Isotope Stages. This general patterning was linked to a series of individual British type site stratigraphies. For the overall period of MIS3 they

proposed the fauna from the Lower Cave Earth of Pin Hole Cave at Creswell Crags, and posited the term 'Pin Hole Mammal Assemblage Zone' (Pin Hole MAZ) (Currant and Jacobi 2001: 1711). Currant and Jacobi (2001: 1713, table 5) presented a summary of sixteen species including *Homo* (usually represented by tools) that seem to have re-populated Britain during MIS3.

Human (represented by artefacts)
Mountain hare
Red-cheeked suslick
Wolf
Red fox
Brown bear
Stoat
Polecat
Spotted hyaena
Lion
Woolly mammoth
Wild horse
Woolly rhinoceros
Giant deer
Reindeer
Bison

Table. 1.3 Pin Hole Mammal Assemblage Zone for Britain during MIS3 (adapted from Currant and Jacobi 2001: 1713).

MIS3 spanned a ~34,000 year period (van Andel 2003: 9) and recognising the period's climatic variability indicated from marine and ice core data the authors highlighted their generalising approach to the faunal record, and therefore its course-grained character (Currant and Jacobi 2001: 1712). However a series of dates on hyaena remains from the Creswell area indicate a probable ~30,000 year window for the Pin Hole MAZ that almost certainly overlaps the dates bracketing for the Lincombian.

1.4.10 The window we have

The above discussion has been used to provide an overarching context within which the research for this thesis can be situated and will be discussed. Whilst the LGM will have obliterated by ice scouring evidence of any Lincombian northern expansion in Britain, a blade-point from Ffynnon Beuno, in north Wales, points to some northern activity. Furthermore, evidence from the west, south and eastern lowlands surrounding Britain would now be submerged due to post LGM sea level rise. However, a blade-point recovered from underwater; close to the current coastline at Goldcliff in the Bristol Channel provides an indicator of the use of these lower areas. Consequently, the material we do have offers a limited window on the upland component of what would have been a much more expansive life-way. Any results are therefore obviously contingent.

Having said that, it does seem possible to provide some context to this upland human adaptation, and conclude that the Lincombian emerged after ~43,500 cal. BP probably in association with a D/O warm phase. Climate and weather reconstructions have been used to argue that the now British Isles would have probably only been used in the summer months as an upland hunting ground. During this long season the skies were clear, the climate dry and landscape open with only sheltered locations providing arboreal refugia. The fauna populating this landscape were grazing animals such as horse, mammoth, and woolly rhinoceros, and the quantitatively predominant co-predator to *Homo* was the hyaena. On a millennial scale it is clear that the climate and weather fluctuated dramatically, but generally deteriorated through the period bracketing the Lincombian. Because of the rapidity of the D/O events it is likely that aspects and consequences of climate fluctuation would have been recognised within human timescales.

1.4.11 Chapter summary

This chapter section has offered explanations as to why the predominant *etic* approach to this industry is problematic, dealing as it does, with large timescale and questions of human type. It then established why an *emic* perspective has been adopted, allowing an alternative focus upon artefacts and site affordances, to explore behaviour and interpret meaning. It also provided an overview of the main sites, type fossils and technology as currently understood within the literature. Four research questions were established in order to direct the research towards its aim of presenting an *emic* narrative. A theoretical review was used to unpick the complexities underlying the apparently simple 'transitional' label, in particular how it conflates both biological and material evidence within a temporal context. A methodological review explained why the analytical corpus we are left with is dominated by type fossils at the expense of contextual materials, an issue that has limited previous *etic* approaches. The literature review focussed upon the British Lincombian and the work of key researchers who have influenced current understandings. The recent excavations at Glaston (2000) and Beedings (2008) have been presented as making important contributions and thus providing an opportunity for this project. The final section focused upon the time and space occupied by the producers of the technology. This tied the lithics to somewhere within a climatically unstable period of ~3000 years between 43,500 - 40,500 cal. BP, and within a geography defined by the British Isles. The European landscape would have been generally open, the British Isles a peripheral upland used during the summer months. These summers were long and characterised by clear skies and high levels of sunlight. This is the context within which subsequent analysis can be integrated,

developed and understood. Within this context the next chapter will review the strategies, methods and data collection protocols adopted.

Chapter Two

Strategies, methods and data

As discussed within chapter one, an *emic* conceptual approach has been selected to explore the story of the humans who produced and used this stone tool technology within Britain for an apparently short temporal episode during Marine Isotope Stage 3 (MIS3). To achieve this research aim four key research questions were defined. Recognising the different characters of the datasets available, this chapter will focus upon the strategies and methods adopted to address these research questions. These strategies can be glossed as: a *chaîne opératoire* approach to lithics; and an experiential approach to sites. These strategies and their associated methods and data collection protocols are discussed within the first three sections of this chapter. The first section explores the *chaîne opératoire* as an overarching framework that can be used to situate a number of useful lithic analysis methods. The second section examines these methods, namely experimental production and comparative analysis. Associated data collection procedures are then outlined. The third section deals with an experiential approach to sites, providing a brief overview of relevant literature before outlining my own method. The final section of this chapter is reflective and examines the context within which this research project was formulated. In order to develop this discussion an explanation of the *chaîne opératoire* approach is presented first.

2.1 The *chaîne opératoire*

The term *chaîne opératoire* has been translated as 'operational sequence' (Lemonnier 1992), and is an approach that emphasises the human decisions and behaviours associated with the dynamics of an artefact life history from material acquisition to eventual discard (Banning 2000: 296). The methodology was developed from the work of the anthropologist and sociologist Marcel Mauss (e.g. *Les Techniques du Corps*, 1936). Mauss's contribution was to recognise how human movement and gesture varied in different peoples at different times and places. He interpreted this as reflecting how movement and gesture was socially structured, with tradition being the transfer mechanism. Mauss described it thus: "*The [body's] constant adaptation to a physical, mechanical or chemical aim (e.g. when we drink) is pursued in a series of assembled actions, and assembled for the individual not by himself alone but by all his education, by the whole society to which he belongs, in the place he occupies in it*" (Mauss 1936: 76). The accompanying photograph (Fig.2.1) illustrates well the differing levels of Mauss's explanation. Whilst adapting to and exploiting particular environmental affordances in order to achieve their chemical aim (drinking), the three males acting together and in the same physical manner, and perhaps in a relative order, illustrate the socially embedded nature of this particular behaviour.



Fig.2.1 Australian aboriginals from New South Wales 'drinking' (Mauss and Schlienger 2006: 154, Fig.8).

Mauss explained how individual gesture was integral to societal norms, and this observation was adapted by his student Andre Leroi-Gourhan who recognised a use value for archaeology (Soressi and Geneste 2011: 336). Leroi-Gourhan saw stone tools as an externalised manifestation of human gestures (Leroi-Gourhan 1971: 319; 1973: 333 cited in Audouze 2002: 287) and in doing so he was able to extend the linkage from artefact to gesture to society.

If stone tools were indeed the externalised manifestation of human gestures then Leroi-Gourhan understood how experimental production had the potential to reveal a relative order of removals and therefore gestures (Audoze 2002: 287). Furthermore the refitting of archaeologically recovered pieces allowed ancient removals and gestures to be mapped through both time and space. Consequently archaeological evidence reflecting material acquisition, artefact manufacture, use, recycling and discard could be mapped into meaningful sequences (ibid), thus providing insight into a socially embedded past behaviour.

This was Leroi-Gourhan's *chaîne opératoire* approach and it has been selected here to provide a linkage between artefacts, sites and behaviour.

There are three benefits in adopting a *chaîne opératoire* approach for this thesis. Firstly, it provides a research focus upon Lincombian stone tools as a route to comprehending human behaviour. This provides a corresponding shift away from human fossil evidence, reflecting a research preoccupation with human type. Secondly this approach allows the integration of experimental archaeology to make material a version of the complete manufacturing procedure. Doing so allows the analytical corpus of materials available to be expanded into areas not yet fully understood. Thirdly, this approach requires an analytical grid that is organised horizontally in order to accommodate the operational sequence or lifecycle of the artefact, but which also reflects the possibility of a spatial distribution within a landscape. This can allow the case studies within this thesis to be discussed in spatial relation to each other, rather than in isolation.

Raw Material Procurement	Technology of Production	Use	Discard
--------------------------	--------------------------	-----	---------

Table 2.1 A reduction sequence sits here within a horizontally organised analytical grid thus accommodating artefacts distributed within a landscape.

Within the simplified reduction sequence presented above, all components can be integrated and understood within a human timescale. Indeed this provides an important counter to the vertical structure of millennial time usually associated with the *etic* human transition narrative. And so, for all the reasons discussed above, a *chaîne opératoire* methodology has been adopted to facilitate the *emic* perspective desired within this thesis. However, within the *chaîne opératoire* approach used here a number of methods and data collection protocols are integrated. Experimental production will be discussed first.

2.1.1 Experimental production

The first method employed has been experimental production. This was undertaken by an experienced flint-knapper, Karl Lee, following instructions based upon published descriptions of LRJ technology and the author's own analysis of extant collections. Following a *chaîne opératoire* approach, experimental production has been used to allow a series of technical actions to be modelled and ordered sequentially. From an empirical perspective each sequence of technical action will generate material that can be interrogated for data. A range of data was chosen to record in order to construct and model this production process. Definitions of all the terms used here can be found in appendix two. An understanding of the different stages involved was made explicit via discussion with the knapper. Discussion and gesture associated with these sequences were recorded on (video) camera. Key discussion points discussed within this thesis have been edited into a short 20 minute film with a link provided in appendix three (A3.4). The empirical data recorded included:

1. Types of percussion.
2. Quantity, type and size of *debitage*.
3. Degree of cortex.
4. Platform remnant size and character.
5. Bulb type and character.

This allowed stages to be defined and metrics and observations from each stage to be analysed. Analysis was used to create average and abstract descriptions of the quantitatively predominant features from each stage of blade-point

production. A number of problems are generally associated with experimental production, and those particular to this project are discussed in detail in chapter four. However, this thesis has worked on the premise that a critical approach to experimental production (one closely constrained by archaeologically derived data) can be used to move forward our understandings of the EUP process of manufacture.

2.1.2 Comparative analysis (archaeological)

The second method adopted was a comparative analysis of archaeological type fossils in relation to each other. The aim was to make explicit and quantifiable type fossil variance within the archaeological record. In relation to the European corpus, Flas (2008: 30) examined heterogeneity and concluded that variance within production was the most likely cause. Within this thesis variation within the British materials was examined using typological, metric and formal analysis. Making variability explicit was designed to allow an understanding of the causes of these phenomena within the more constrained geographical area of Britain. Typological variation concerned the leaf shaped form and was divided into two sub-categories: leaf-points and blade-points. It was outlined in chapter one how both technology of production and patterning of retouch contribute to typological understanding of each. Consequently material type, and variability of retouch was recorded to better understand variance. Furthermore, it became important to systematically categorise fragmentation and the method used is outlined below. Metric variability simply related to axial length, greatest width and depth. Formal variation had two aspects: the first related to overall proportions and ratios derived from the metrics; the second focused upon obvious differences in shape within the same typological sub-categories. The differing analytical

methods and results obtained by Flas and this author are discussed in detail within chapter four. As already outlined, the approach within this thesis was multi-staged and together the results from chapters three and four formed a *chaîne opératoire* model useful for subsequent comparative analysis purposes.

2.1.3 Comparative analysis (experimental)

Three assemblages, Badger Hole, Glaston and Beedings, stood out as being relatively accessible and providing micro and macro-*debitage* for analysis. Comparative analysis was used recursively with the experimental process. Similar data recorded to comprehend the experimental production process was recorded for artefacts within each archaeological collection. Contrasting archaeological material with the *chaîne opératoire* model was used to reveal both inconsistency and consistency. Apparent inconsistency was explored to 'test' the validity of the model. Commonalities were used to comprehend the phases present within individual archaeological assemblages. To link archaeological components within assemblages, both colour and patination was recorded. Through this process related materials were recognised and collections characterised. These characterisations could then be related to their landscape and faunal contexts. As already made clear at least some materials entered cave sites through the roof (e.g. Pin Hole Cave). Artefact movement within the landscape can be reflected by the condition of edges and dorsal ridges as well as breakage patterns. Consequently these aspects of artefact condition were also recorded. Having outlined the lithic analysis methods adopted, the following section explains the data collection process.

2.1.4 Data collection

Data was needed from both type fossils and *debitage*, and from experimental and archaeological collections. Whilst differing in detail there was a large degree of overlap and so for explanatory purposes both experimentally generated and archaeologically recovered artefacts have been categorised as either type fossils or *debitage* and are dealt with in turn. Acknowledging this large degree of overlap, the *debitage* discussion covers only aspects additional to those already established as relevant within the type fossil section (Table 2.2).

Type fossils		<i>Debitage</i>	
Archaeological	Experimental	Archaeological	Experimental
Forms the first data list		Additions to the first data list	

Table 2.2 Structuring the observation protocol for experimental and archaeological material.

All pieces studied were both drawn and photographed to provide an overall context for the metric data recorded. Archaeological artefacts were usually recorded at the relevant holding institution whilst the experimental material was mainly recorded in the laboratory at the University of Manchester.

Type fossil characteristics
Typology
Material type
Colour
Patination
Fragmentation
Refits
Break type
Dorsal ridge condition
Edge condition
Metrics
Dorsal scarring
Retouch
Cross section

Table 2.3 Significant characteristics for the recording of type fossils.

2.1.5 Type fossil recording

Because of their bi-pointed form the orientation of some blade-points was equivocal, especially fragments. Whilst platforms had invariably been removed, both form and ventral rippling were used to orientate the blade-points with the proximal end assumed to be the basal section. This allowed length and maximum width to be measured in relation to the axis of the blade-point. Exceptions to this rule were one experimental blade-point, and a small number of archaeological examples that were pointed at the proximal end and more rounded at the distal, effectively reversing this logic.

a. Typology

Typology concerned whether the artefact was a blade or leaf point. The assessment criteria for each was laid out in chapter one however a number of blade-points had also been modified to form other tools, sometimes with more than one tool on the same support. This complicated recording and had implications for how artefacts have been categorised here. As the process of artefact recording at museums and institutions progressed, size variability seemed to have some regional patterning. In order to apprehend this apparent gross size variability in relation to sites and region, sub-dividing the corpus typologically was avoided until after metric averages were calculated. For example if a blade-point had been transformed into a burin its metrics were still included in the blade-point category in order to calculate overall averages. The burinated blade-point from Drayton Wood Rd provides a good example. Although reduced from a blade-point, it was still demonstrably large in width and depth compared to the majority of other blade-points within the corpus. This relative largeness would be disguised if it was typologically divided and removed from the blade-point corpus and categorised separately. The advantage of this

inclusive approach was that it optimised the quantity of blade-points available for analysis. This in turn allowed gross size relationships in relation to sites to emerge more clearly. Subsequent artefact modification such as burination was recorded under the retouch category.

Blade-point
Leaf point

Table 2.4 Typological categories.

b. Material type

Material type was ascertained via literature review and direct observation. The materials within the corpus were limited to:

Flint
Greensand chert
Carboniferous chert
Rhyolite
Unknown

Table 2.5 Material categories.

This was primarily important as it gave an indicator as to whether the material was local or non-local. Where it was possible to discern a tabular or nodular source material this was noted.

Local
Non-local
Unknown

Table 2.6 Provenance categories.

c. Colour

Material colour was sometimes difficult to ascertain because of high degrees of patination. Consequently colour was noted when possible but not used in any analytical way. The exception to this rule was with the newly recovered Beedings

materials. This was because the flint was generally well preserved and made available for a number of weeks. This allowed it to be laid out and artefact recording and grouping by colour to take place. Colour descriptions followed those laid down by previous researchers describing the same material (e.g. Pope et al. 2013) to facilitate clear comparison between results.

d. Patination

Patina was useful for understanding taphonomic history as well as providing an indication of possible age. Reviewing the newly recovered Beedings material indicated how the development of patination was not a simple progressive process but related to a number of ground related factors. This was useful within multi-period collections as materials with a similar taphonomic history were possibly of similar age (e.g. Badger Hole). A relative order was adopted for recording and artefacts were situated into one of six categories:

Un-patinated
Incipient clear glossing
Emergent white
Dendritic
Fully white patinated
Unknown

Table 2.7 Patination categories.

e. Fragmentation

A majority of the leaf and blade-points from Britain are fragments, and obviously differing degrees of completeness are of differing analytical value, especially so when attempting to derive an average size. Consequently, a systematic method to categorise fragments was developed. Based upon Flas's average length calculation of 100mm a blade-point was broken down graphically into six

sections (Fig.2.2, Table 2.8). The approximate length of each section was expressed as a percentage (e.g. 5mm = 5%). This proportional structure provided a series of percentage bands that could be added together and used to categorise fragments of any metric size. In this way each archaeological type fossil was compared with the model and an approximate total percentage of completeness systematically allocated. This was necessary in order to select relevant artefacts for differing aspects of analysis. For example pieces with over 90% present were classed as complete and useful for deriving length, width and depth. In contrast, pieces with over 50% present were useful only for width and depth measurements. This was based upon the assumption that these pieces would contain the widest part of the medial section.



Fig.2.2 Method used for assessing approximate degree of fragmentation (image: author).

Tip	5%
-----	----

Distal		20%
Upper Medial	Medial	25%
Lower Medial		25%
Proximal		20%
Tip		5%

Table 2.8 Method used for assessing approximate degree of fragmentation.

f. Refits

Artefact movement within a site was deemed significant, and breaks could be indicative of this kind of transport damage (Swainston 2000: 275), especially if refitting pieces were recovered. If so, it was then necessary to recognise whether the break in question was ancient or modern. Ancient breaks may indicate transport damage, whilst new breaks could pertain to damage through recovery (e.g. Glaston), or even from more recent handling or storage problems. If broken by movement in antiquity the individual pieces may then undergo individual damage trajectories. When refitted these different histories may be recognisable at the join. Similarly both pieces should bear equally patinated terminations, however as many refits had been glued this was not usually possible to ascertain. In contrast new breaks tended to be sharp and could reveal the original material colour within the patinated material.

None
Ancient break
Modern break
Unknown

Table 2.9 Refit categories.

g. Break type

The breaks themselves could be significant and were divided into two categories: bending breaks and impact breaks. This creates two discrete categories, whilst in fact there is some degree of overlap; however it has been useful to differentiate.

Bending breaks are created when a force is exerted at right angles to the length of the blade-point (Titmus and Woods 1986: 43). This results in a hinged termination possibly with a bulb and a lip. Impact breaks occur when the force travels directly along the length of the blade. The haft provides an opposing force which results in longitudinal burin-like removals and a termination that is perpendicular to both faces (Titmus and Woods 1986: 43). Transport damage is more likely to produce bending breaks.

None
Impact
Bending
Both
Unknown

Table 2.10 Break categories.

h. Edge condition

The edges of type fossils are thin and therefore vulnerable to damage if the artefact experiences movement within the landscape. Edge condition was ascertained by eye and related to one of five descriptors:

Clean
Edge chipping
Chipping and notching
Heavily notched
Unknown

Table 2.11 Edge damage categories.

i. Dorsal ridge condition

Worn dorsal ridges can also be indicative of transportation within abrasive sediment (Swainston 2000: 275). The relative width of the ridge was ascertained by eye and related to four descriptors:

New
Some abrading
Very abraded
Unknown

Table 2.12 Ridge wear categories.

Refits, breaks, edge condition and dorsal ridge condition can be seen as a constellation of factors brought together to ascertain likelihood and perhaps degree of artefact movement within the landscape. The unknown category relates primarily to illustrations and casts.

j. Metrics

Axial length, greatest width and depth for each type fossil were recorded. Non-digital callipers were used and measurements rounded up or down to the nearest millimetre. If the type fossil was above 90% complete it was weighed.

Length
Width
Depth
Weight

Table 2.13 Metric categories.

k. Dorsal scar pattern

One characteristic of blade-points is that they tend to be produced on opposed platform cores. Dorsal and ventral scarring was recorded via drawing and subsequently proved valuable for comparison between experimental and archaeological blade-points. Fragmentary pieces below 90% were not necessarily useful for this purpose and so, if only single direction removals were visible on a sub-90% fragment, they were recorded on the drawing but classed as 'unknown'.

Single
Opposed
Unknown

Table 2.14 Scar pattern categories.

m. Retouch

Many blade-points have undergone modification which produced problems of classification. Consequently rather than classify an ambiguous artefact typologically, the focus here was upon how artefacts and fragments were transformed by retouch. This was recorded by photograph and drawing of each artefact and the type of modification noted.

Burination
Steep scraper retouch
Notching
Flat invasive retouch

Table 2.15 Retouch categories.

n. Cross section

The published literature makes clear that blade-points tend to be approximately triangular or trapezoidal in transverse cross-section whilst leaf-points are more lenticular. Jacobi (1990: 278) highlighted the possibility of some leaf-points being made on blades rather than by the direct reduction of a tabular raw material (e.g. White Colne Pit, artefact now lost). For Jacobi, a leaf point with a plano-convex cross section may be indicative of the heavily worked ventral and dorsal surfaces of a blade. Consequently transverse cross-section was recorded on the drawing and classed as either:

Triangular
Lenticular
Plano-convex
Unknown

Table 2.16 Cross-section categories.

Additional aspects were needed when dealing with *debitage*, and these additional data categories are discussed next.

2.1.6 *Debitage* recording

<i>Debitage characteristics</i>
Percussion type
<i>Debitage</i> type
Degree of cortex
Platform type
Platform size
Ring crack
Lipping
Bulb type
Radial fissures

Table 2.17 Significant characteristics for the recording of *debitage*.

a. Percussion type

Within the experimental process the type of percussion used was observed and recorded directly. For the archaeological materials it was ascertained via analysis of platform type and size, presence or absence of ring crack and lipping, and bulb type and presence of bulbar scarring.

b. Debitage categories

When organising and quantifying *debitage* five categories were used:

Flakes
Flake fragments
Blades
Blade fragments
Shatter

Table 2.18 Debitage categories.

c. Degree of cortex

The degree of cortex present on the dorsal surface of an artefact was approximated as follows.

0%
1-25%
26-50%
51-75%
76-99%
100%

Table 2.19 Cortication categories.

d. Platform

Platforms were fitted into one of seven categories. If a platform was present, the width and depth were measured to the nearest mm.

Plain

Facetted
Linear
Punctiform
Dihedral
Crushed
Removed

Table 2.20 Platform categories.

e. Ring-crack

Present
Absent

Table 2.21 Ring-crack categories.

f. Bulb type

Prominent
Diffuse
Indefinite
Not present

Table 2.22 Bulb categories.

g. Radial fissures

Present
Absent

Table 2.23 Radial fissures categories.

This data was recorded in note form at the holding institution and subsequently input into an Excel spreadsheet for analysis.

2.3 An experiential approach to sites

As already discussed, the second main data set we are left with for the Lincombian is the sites themselves. Furthermore, within the literature review it was highlighted how Roger Jacobi presented a useful interpretive approach. The primary focus of his Beedings research, and the lion's share of his 'seminal' 2007 publication, was upon the results of his analysis of stone tools and *debitage*. From the predominance of basal blade-point pieces Jacobi recognised a re-tooling practice. Based upon his visits to the actual site he was struck by its northern outlook and 'stunning' vistas across the Wealden landscape. To make sense of these two phenomena he referred to contemporary ethnographic work by Lewis Binford (e.g. 1979 referenced in Jacobi 1986) and posited that Beedings had been used in the Palaeolithic past for retooling whilst monitoring game (Jacobi 1986: 66-7).

Whilst he may not have described it in phenomenological terms, Jacobi was using his own sensory experience of the landscape as a tool to think imaginatively about the implications of the site's overall setting (Hamilton et al. 2004: 33). In short, Jacobi integrated an elementary sensory experience with evidence derived from a more traditional lithic analysis, and to make sense of these two differing datasets he used ethnographic analogy. Whilst phenomenological approaches in general have been regarded as 'unscientific' and 'subjective' (Hamilton et al. 2004: 32) within British Palaeolithic research other specialists seem to have accepted Jacobi's interpretation (e.g. Pope 2009: 11; Pettitt and White 2012: 392). This is perhaps because since the mid 1990's

experiential approaches have become more common within British prehistoric research.

2.3.1 Experiential approaches

My own introduction to an experiential approach was Christopher Tilley's (1994) book *A Phenomenology of Landscape*. He used a series of case studies to explore how the qualitative aspects of a landscape are sensuously experienced by the human body (Tilley 1994: 11-14). In doing so he illustrated that how our bodies are situated and orientated within a landscape presents a particular perspective and context for understanding it (Tilley 2004: 10-12). It therefore follows that by using the site as a tool to situate and orientate our bodies it becomes possible to reproduce and explore past perspectives (Tilley 1994: 204). Within this approach it is the character of the situated body's engagement with the landscape that is used to develop an interpretive framework. Tilley's (1994: 27-33) approach emphasised the visual, and his movement through a landscape was used to structure a narrative with which to formulate understanding.

Subsequent research has built upon this approach by considering other sensorial approaches such as sound (Watson 2001) and touch (Cummings 2002).

However, phenomenological approaches have certainly not been universally embraced. Critiques have highlighted among other things a subjectivity to these approaches (Brück 2005: 59) and often a lack of explicit methodology (Hamilton et al. 2006: 32). Recognising the above opportunities and critiques, my own method is explicitly laid out here.

2.3.2 The method used here

The available excavation literature has been interrogated to identify the actual areas of a site that would have had significance within the Palaeolithic past. This was necessary because previous research had been organised to address other more *etic* research questions. Damien Flas (2006: 16, table 1) with his stratigraphic and dating focus categorised LRJ sites as either 'open air' or 'cave'. However, from an *emic* perspective this is less useful. It is clear from a close reading of the literature, that in a number of cases materials were simply preserved within the cave contexts having entered through the roof. As such the 'cave' sites are actually the preservational context (Swainston 1999: 45), but from a behavioural perspective it is the areas above the caves need to be considered. To explore these sites Ordnance Survey maps were used to comprehend key characteristics (height above sea level, orientation) and how the site overall would have been situated in relation to more fundamental aspects of a Palaeolithic landscape (valleys, plateaus, ridges). Differences between contemporary and past vegetation was considered and site visits made to record my own elementary sensory experience of affordances (views in relation to other landscape features, wind direction, exposure). My observations were recorded in note form at the site and with panoramic photographs. Finally, the results of my own lithic analysis were considered in relation to the site affordances, as well as ethological and ethnological research in order to build an interpretation. Having explained the approaches, methods and data collection used, the next section is more reflective, and is used to outline the logic and decision making that have influenced the content, approach and execution of this project.

2.4 Research design

Research began in 2010 and developed from an interest in the etymology of the label 'transitional'. It was unclear to me why a transitional industry should be understood not in its own right, but as a bridging concept between the Neanderthal Middle Palaeolithic and modern human Aurignacian. This situation seemed to provide an opportunity to explore how the history of archaeological research both structured and constrained present understandings of the period and industries in question.

However, if an answer to this initial question could be provided through a review and analysis of the history of research, a second question then emerged. How to understand a 'transitional industry' in its own right? Two recent publications had discussed predominantly British transitional materials and seemed to provide a basis for exploring this question. Damien Flas in 2006 had used his thesis to establish the 'reality' of the LRJ as a transitional industry in its own right. This was closely followed in 2007 by Jacobi's 'seminal' (Pope 2008: 33) analysis and account of the 'Lincombian' materials from Beedings. The Beedings collection seemed to provide a foundation from which an experimental project could fill the technological gaps in understanding. Furthermore, excavations at Glaston in 2000 (Cooper et al. 2012) and at Beedings in 2007 and 2008 (Pope 2008) had both recovered more EUP tools along with macro and micro-*debitage*.

Experimentally-generated materials could provide an ideal model for comparison with the recently recovered material from these two sites. Taken together these factors presented an opportunity to develop a new and more nuanced understanding of the relationships between this EUP technology and at least two of its landscape contexts. Roger Jacobi died in 2009 leaving a comprehensive

corpus of notes and publications on the British materials. All artefacts were apparently accessible within institutions in Britain and so experimental manufacture coupled with analysis of the majority of the type fossils and a number of *debitage* collections from Britain seemed manageable within the time and potential funding available. All the components were present to be able to explore a British transitional industry in its own right. These factors provided the context within which my research strategy was developed.

2.4.1 Identifying the available materials

As well as providing me with a detailed understanding of the history of research and current knowledge, an initial goal of the literature review was to identify the number of sites in Britain, quantities and types of materials available, and where they were housed. This allowed a ranking of the available materials in relation to accessibility and relative value to the project. Relative value was determined by factors such as the presence of production debris. Understanding how some holding institutions held artefacts from more than one site allowed me to organise my recording campaign expediently. Type fossil recording was prioritised, along with collections containing micro-*debitage*. The rationale for selecting collections is discussed in detail below. Ultimately the literature review provided a target of 130 type fossils and four archaeological collections with contextual material in one form or another. These were spread across 35 holding institutions.

2.4.2 Understanding the available materials

A second early goal of the literature review was to identify the archaeological evidence available from which to structure my own understanding of the EUP manufacturing process. This led to an initial review of the original Beedings collection in January 2011 to examine first-hand manufacturing debris. This,

along with a subsequent review and discussion with Damien Flas and Matt Pope allowed me to develop a practical directive for experimental production.

Typological, metrical, and formal recording of the available and accessible type fossil corpus developed with the aim of more fully understanding the character of the two main types. This recording began on materials held at the Manchester Museum in order to hone my protocol close to home. Many artefacts were held in museums local to the site of recovery. Because landscape contexts and affordances were of interest to me, site visits were integrated into artefact recording. This gave me first-hand experiential knowledge of all the key sites discussed within this thesis and time spent at Creswell, for example, proved this to be of value. It was clear from the literature review that the blade-point from Pin Hole Cave probably entered through the roof (Jenkinson 1984: 63; Jacobi 2007: 291-3). It is also clear from cycling up the 'new' road (B6042) in either direction that an extensive panorama unfolds as the crest is reached. Contours on the Ordnance Survey maps show how this highpoint sits above and to the east of Pin Hole and approximately above Robin Hood's Cave (Fig.2.3). Certainly for Pin Hole the area above the cave does seem to have significance.

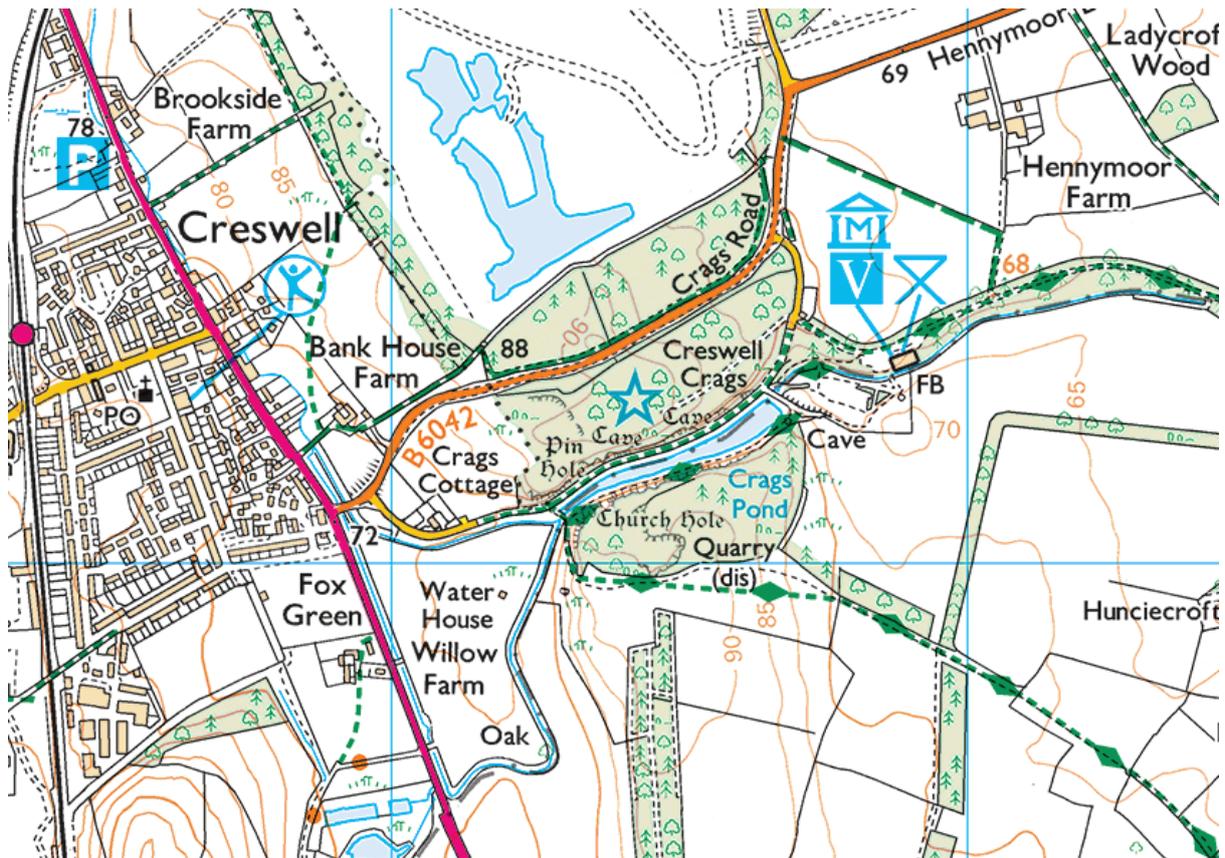


Fig.2.3 Map showing highpoint (95m contour) at the crest of the B6042 'new road' above both Robin Hood's Cave and Pin Hole © Crown Copyright and database rights 2015. Ordnance Survey (Digimap Licence).

2.4.3 Organising experimental production

Experimental work went ahead after I had developed a technological directive and funding was obtained. Experimental production was spread over four days in the summer of 2012 with the aim of generating and collecting material from one complete blade-point production sequence. Because of my interest in the human aspects of production I filmed the complete process. This was primarily used as a 'notebook' with which to capture process and discussion (see appendix 3.4 for hyperlink). Whilst not a primary part of my method, it proved invaluable as an aid when refitting sequences in the laboratory some months later. The experimental process is discussed in detail in chapter four. Only after analysis of

one complete reduction event was a sequential model of blade-point production established. This allowed comparative analysis of archaeological collections to begin.

2.4.4 Selecting archaeological *debitage* collections

It has been outlined above that only a small number of *debitage* collections were practically accessible for analysis. When assessing which collections to record for analysis a number of factors were considered, primary among which was the availability of micro-*debitage*. The value of the collections from Glaston and Beedings has already been discussed. Further collections containing contextual materials were potentially available for analysis, however a number of factors were considered before two more were selected. First was the quantity of contextual materials available. This may seem a straightforward measure of research value, however the presence of a range of archaeological periods and industries within a collection meant that a *debitage* component may not necessarily be relevant to the Lincombian. Paviland Cave can be used to illustrate this. Although 5000 pieces of *debitage* have been discussed within the literature (Flas 2006: 52), this could be related to potentially six, but probably three, periods and industries recovered from the site. Furthermore these 5000 pieces are spread between *at least* four holding institutions (Campbell 1977, Vol.2: 103) and possibly seven (Swainston 2000: 95). Together these factors made it complex and costly in time and funding to review and record the Paviland *debitage* as one sub-component within this project. These same factors applied to a greater or lesser degree to the contextual materials from Kent's Cavern and the Creswell Caves. However the material from Badger Hole in Somerset stood in contrast. A previous review by Jacobi (2000: 47) had isolated 21 pieces of probable Lincombian macro-*debitage* with the majority held within

one institution. Similarly a final collection that was targeted was that from Bramford Road in Suffolk. As well as a significant quantity of blade and leaf-points, a number of leaf point preforms were itemised within the literature (Jacobi 2007: 286). These pieces offered the potential to contribute an understanding of the leaf point production process. Furthermore for his review Flas (2006: 80) was unable to gain access to any of this material, meaning my research project could help fill that gap. Consequently four collections of contextual materials were targeted for recording and analysis.

2.4.5 Chapter conclusion

This chapter has been used to map out how the research has been conducted. The process begins with an exploration of blade-point production (chapter three) followed by an interrogation of type fossil heterogeneity (chapter four). Together these are used to establish a life cycle or *chaîne opératoire* model. This model is used as a bridge to link artefacts to behaviour. The *chaîne opératoire* model is compared to artefact collections from three key sites (chapter five) to establish patterns of behaviour associated with each collection. These behavioural patterns are considered in relation to their particular landscape, and general faunal contexts (chapter six). Ethnographic and ethological analogy is drawn upon to formulate a site interpretation. Situating these interpretations within a spatial (the uplands of Britain) and temporal (a long summer season) framework is used to develop our understanding of the seasonal model presented by previous research. Underlying themes are then drawn out to articulate the *emic* narrative that is the thesis' research aim (chapter seven). This outline of the mechanics of how the research has been conducted allows movement onto the first analytical stage, an exploration of type fossil production.

Chapter Three

Experimental blade-point manufacture

This chapter is designed to answer the first research question. It uses experimental archaeology to explore how archaeological blade-points were produced, and provide an understanding as to why were they produced in this way. Experimental production is used here to make material the patterning between blade-points and their production debris. Discussion with the knapper is used to understand his decision making process at each stage of production. Finally, insights are drawn from contrasts between the experimental and archaeological data to refine this model. The chapter has four main parts with the first discussing aims and methods as well as developments within my own understanding. The second presents the results obtained from the transformation of a derived flint nodule into a series of blades. Moving down in scale the third part discusses the results obtained by transforming blades into blade-points. The final section is discursive and uses the previous analytical sections to formulate an answer to the first research question.

3.1 Aims, methods and understanding

The aim of experimental production was to make explicit: the stages involved in the manufacture of a blade-point; the formal and metrical characteristics of each stage; comprehend the underlying motivations behind each stage. To achieve these goals both quantitative data in the form of material generated, and qualitative data in the form of the flint knapper's explanatory narrative was used.

3.1.1 Methods

To direct experimental production by an experienced flint knapper a technological model was constructed. This was based upon a review of the literature of Jacobi (1980; 1986; 1990; 2007) and Flas (2006; 2008). Building upon this foundation, I spent two days reviewing and recording key artefacts within the original (recovered ~1900 AD) Beedings collection at Franks House. Artefact recording at this stage focussed upon cortical flakes, cores, blades, and blade-points. My understanding could be described as a three stage model: from flint nodule to core; from core to blade; from blade to blade-point.

A number of points emerged from reviewing the literature and the artefacts. The scarring evident on both cores and blades indicated the use of an opposed platform technology (Jacobi 2007: 235). A number of flakes and blades had large platforms with faceting and clear lips, suggesting removal by soft hammer (Jacobi 2007: 234, 5). Some larger cortical blades bore transverse scarring appearing to be early removals (*ibid*). Jacobi recognised 36 un-recycled blade-points all worked upon the ventral and 19 also on the dorsal surface. Retouch was used to impose a symmetrical leaf shape on the dorsal, and to flatten the

ventral face by removing curvature (Jacobi 2007: 247). In an analysis of the flint it was recognised that a selection of blade-points appeared to be made from material of better internal consistency than other tools examined (ibid.). The above observations were discussed with the knapper before experimental work began.

Karl Lee is an experimental archaeologist with twenty years of knapping experience (Lee, pers. comm.) and produced blade-points for a Masters dissertation by Annameika Milks in 2010. Milks' dissertation used ballistic testing to compare the penetrative effectiveness of blade-points to Font Robert and Gravette points. Consequently Lee's prior experience made him the primary candidate for my own experimental work. To help him gain an understanding of size and form I organised a one hour visit for him to examine the Beedings collection at Franks House, and this visit took place in June 2012. I was unable to be present due to museum protocol; however Matt Pope facilitated the visit and discussed the blade-points with the knapper on my behalf.

3.1.2 Five days experimental production

Experimental production took place over five days. As well as the flakes, blades and shatter generated through the experimental production, the gestures and explanatory narrative of the knapper was recorded using a digital (video) camera. Key discussion points have been included within a short film with a hyperlink provided at the end of appendix three. These two differing sets of data are discussed in turn. In relation to the lithic material, debris was collected after each of three stages and bagged separately, thus providing a relative chronology

of removal. Gross weights of the nodule and large removals were recorded, and noted before further reduction took place.

In relation to the explanations, a dialogue was maintained throughout the process. I asked questions at relevant stages so that the logic behind behaviour was made explicit. Information was recorded in note form as well as captured on the digital recordings. It is from these records (spanning all five days) that an understanding of the knapper's rationale and decision making process was built. These were the data collection and recording methods used during the fieldwork. Working with the knapper highlighted some differing understandings between myself as 'subject specialist' and Lee as 'production specialist'. Although unplanned, it became important to examine these differences critically. Two significant points emerged and can be summarised:

1. Material, metrical and typological problems making blade-points.
2. Questioning the use of opposed platform production.

These points are addressed in turn.

3.1.3 Material problems

Lee's material difficulties related to the use of flint with inclusions, and this could be problematic at all stages. Even small inclusions could cause problems particularly at later stages, as on blades they contributed to end-shock, or unintended transverse breakage at the point of the inclusion. These production problems highlighted what Jacobi (2007: 234) had discussed in relation to blade-points being made from a flint with a 'better quality' or more homogenous

material than some cores and other tools. Interestingly, after three days of experiencing problems with end-shock the knapper changed his method.

With blade-points the proximal ventral surface received the most intense reduction in order to remove the bulb of percussion. Consequently, the knapper's new strategy involved addressing work on the proximal end of the blade first. This allowed him to leave any excess mass at the distal end until the bulb had been adequately thinned and any necessary dorsal fluting completed. The rationale behind this approach was that if the material was weakened by inclusions, then conversely it would be supported by leaving more mass in place whilst the most intense reduction process occurred. The knapper used this protocol for both days four and five. Because of the small quantities involved it is unclear if this made any difference. However it is an interesting and logical approach and, because it was systematic, was ultimately helpful when later ordering the blade-point *debitage* refits. However, this approach was developed directly as a response to problematic source materials. Presumably access to better source materials may not have required this development. However as well as unintentional breakage the knapper also experienced problems remaining within the size criteria established for the project.

3.1.4 Metrical problems

Metrically the majority of the knapper's blade-points were oversized in length, width or depth. Flas (2011: 610) in his study presented an average blade-point size of 90-100mm in length, 30mm wide and 10mm deep based on both British and continental materials, however the Beedings blade-points were generally larger than this average and it was these larger artefacts that the knapper had

viewed. Some blade-point fragments at Beedings suggest the maximum size may have been bigger than the largest complete artefact from the site. The same is true for the smallest sizes. Consequently, fragments from Beedings were used to provide maximum and minimum depth and width criteria, whilst complete pieces from Beedings and Glaston were used to define lengths (Table 3.1).

	Length	Width	Depth
Beedings maximum	N/A	41mm	14mm
Beedings complete	138mm	39mm	13mm
Flas (2011) average	90-100mm	30mm	10mm
Glaston complete	64mm	27mm	7mm
Beedings minimum	N/A	18mm	6mm

Table 3.1 Artefacts and data used to define the maximum and minimum blade-point criteria.

Over the five days 42 artefacts were produced of which 17 fell within the above size parameters and could therefore be classed as blade-points. On no one day did Lee achieve over a 50% success rate (Fig.3.1). This was almost exclusively because the majority of his experimentally produced pieces were metrically larger in one or more dimension than the largest museum pieces discussed here.

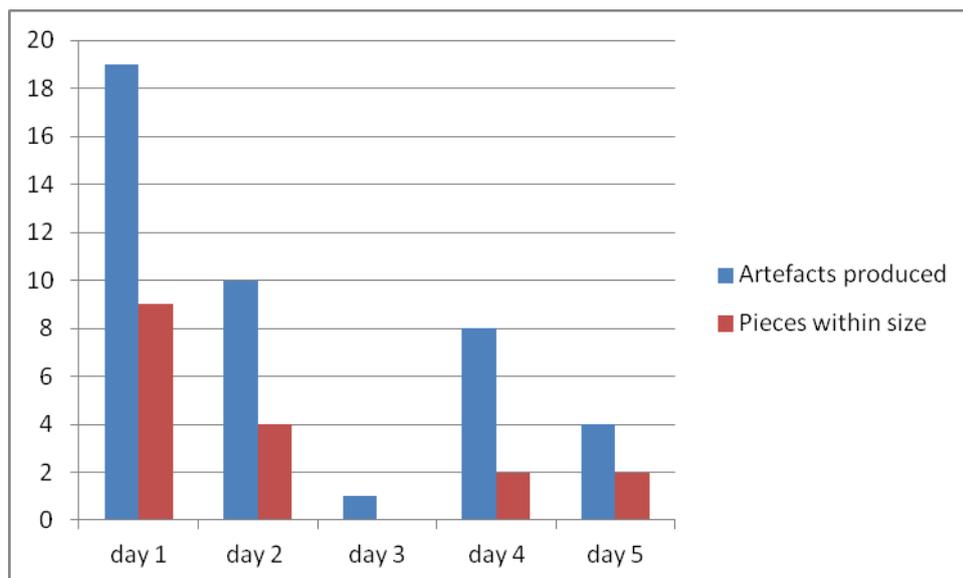


Fig.3.1 Total artefacts produced compared to pieces within the project's size parameters.

Whilst using the larger than average Beedings blade-points as a source material may be part of the explanation, another factor that led to the experimental production of oversized blade-points was debate regarding when blade-point production should take place.

Early on in the process it became clear that both the knapper and I had differing ideas on this issue. I was explicitly interested in core production and capturing the associated debris signature. However the knapper tended to recognise and exploit opportunities for blade-point manufacture early on in the nodule reduction process. When this occurred he shifted from producing a core to manufacturing a blade-point. This approach resulted in large, sometimes cortical blade-points. Furthermore it also disrupted the debris signature I was attempting to capture. Through discussion over three days we realised that I was approaching the issue from an assumption of mobility, whilst the knapper was working from the perspective of resource efficiency. I had assumed cores would be produced in one location and then transported elsewhere to produce blades. Consequently I had isolated core production as a discrete stage. The knapper argued that any removal that could be utilised to produce a blade-point would have been; regardless of at which theoretical stage it was produced. My three stage reduction process needed reviewing. We resolved the issue by producing blade-points both ways. Days four and five focused upon producing a core, and only after the core production debris had been collected did blade and blade-point manufacture go ahead, with blades removed directly from the prepared core. Days four and five provided clearly punctuated reduction sequences resulting in one complete debris collection. Having explored when to produce

blade-points it was then possible to focus upon the typology of the artefacts produced.

3.1.5 Typological problems

Relevant literature (Flas 2006; Jacobi 2007) and museum collection analysis (e.g. Beedings) made it clear that many (but not all) blade-points were produced from opposed platform cores. Consequently, an assumption of opposed platform production was used to direct experimental manufacture. Opposed platform production has been argued to be as a strategy to generate blades with a straight profile. This would produce strength within the longitudinal plane and thus be ideal for missile heads (Jacobi 2007: 271). However the experimental practitioner had a differing approach and rationale towards opposed platform production. From his perspective it took time to prepare a platform, and once prepared it made sense to fully exploit it. He saw the real problem as how to correct the core when a blade removal failed and produced a step or hinge fracture at its base. At this point he would invert the core and produce a second platform to manage the problem. The knapper believed this to be the reason why blade-points generally display opposing scar patterns, but sometimes have evidence of only single platform reduction (Flas 2014: 5505). From this perspective core maintenance from an opposing platform was a reactive and remedial process. The resulting experimentally produced blade-points that fell within the metric criteria were relatively straight and flat, and formally comparable to the models we were using. However a subsequent analysis of dorsal scar patterns on both experimental and archaeological materials has been used to clarify this issue.

Blade-point fragments cannot be used usefully for scar pattern comparison. A fragment may carry scarring from only one direction, but it is impossible to know if opposing scars were present on missing parts. However, a number of relatively complete blade-points do exist within collections and are discussed here. The blade-points selected at this stage were over 75% complete and therefore provided a good chance of indicating evidence of opposed platform production if present. Although small in sample size, 19 museum pieces were selected (Table 3.2) from seven sites and of these 18 had been viewed directly at the time of analysis. The blade-point from Paviland had not been seen directly and the scar pattern was taken from a technical drawing (Swainston 2000: 101). An interpretation of the pattern from a (difficult to read) chert blade-point from Kent's Cavern relied on an unpublished technical drawing by Hazel Martingell.

Site	Qty.
Badger Hole	3
Beedings	4
Ffynnon Beuno	1
Glaston	1
Kent's Cavern	5
Paviland	1
Robin Hood's Cave	4
Total	19

Table 3.2 Relatively complete blade-points used for comparative scar pattern analysis.

This compared equitably with 17 complete pieces produced by Lee that fell within the metrical parameters of this review. Of the 19 museum pieces 13 showed definite evidence of opposed platform production.

Archaeological examples		
Scar pattern	Qty.	%
Opposed	13	68%
Single	6	32%
Total	19	100%

Table 3.3 Scar pattern percentages for archaeological blade-points.

This equates to 68%, or approximately two thirds of the archaeological sample coming from opposed platform cores (Table 3.3). As discussed, over five days Lee produced 17 pieces that fell within the formal and metrical criteria for this project. Of these five showed evidence of opposed platform production whilst 12 indicated single platform manufacture (Table 3.4).

Experimental examples		
Scar pattern	Qty.	%
Opposed	5	30%
Single	12	70%
Total	17	100%

Table 3.4 Scar pattern percentages for experimental blade-points.

Opposed platform production therefore equated to around only 30% of the experimentally produced blade-points. The predominance of single platform experimental examples simply reflected the knapper's explicit and primary approach. This comparison would suggest that *contra* to Lee's rationale, 'true' or proactive opposed platform production was used to produce the museum pieces. The implications for this difference will be discussed in more detail in the last section of this chapter. Whilst this summary has discussed the issues related to production within the field. I will now summarise the data recording methods used within the laboratory based analysis, and how this process changed my understandings.

3.1.6 Laboratory based methods

Organisation, measurement and analysis of the experimental materials took place within a laboratory at the University of Manchester. A first stage involved reconstruction of the complete reduction sequence. Whilst initial bagging

provided an approximate order, the digital film record was used to identify a precise chronological position for each removal. This allowed all significant pieces to be laid out in order and refitting was used to confirm this ordering. 139 pieces all above 30mm in length were recognised and laid out. Material below this size remained bagged according to stage of production but was included when calculating total weights. With the reduction sequence established, each piece of *debitage* was identified and categorised as either: flake; blade, or shatter. All pieces were numbered chronologically with the letter E (for Experimental) prefacing each number, and the artefacts coded E1 to E139. This code along with the relevant video session, and point on the footage when removal took place, were noted on a label (Fig.3.2). Any refitting relationships were recorded directly on the artefact at the refitting point.



Fig.3.2 Labelling system for experimental materials: day of production; video number; minutes and seconds into the video when flake was removed; artefact number; size of hammer used.

Weights and measurements were recorded using digital scales and non-digital callipers. All data was input directly into an Excel spread sheet and measurements were rounded up or down to the nearest gram or mm. In relation to analysis, Pivot Tables were used to discern quantitative relationships between differing categories.

3.1.7 Developments within my understanding

A primary outcome of this organising process within the laboratory was a development of my own understanding of the knapper's method of production. My initial grasp conceptualised a series of three unfolding stages and this understanding structured my collection protocol. Stages give the impression of linear progression and in some ways this is correct. Initial testing of a nodule by removing a large flake invariably happens at the beginning of the process, whilst blade-point production occurs much later on. Having observed the production process over five days, and then seeing the complete chronological reduction sequence laid out, it became clear that the term 'phases' may be more appropriate. This is because the initially observed 'stages' actually subsumed a number of significant actions, which both overlapped and repeated within the stages. Rather than a linear process, it can be better understood as cycles of production, sandwiched between beginning and end stages. With this in mind I now understand the three stages to comprise six phases. Reviewing the footage and refitting the pieces allowed the detail and inter-relationships between each of these phases to be recognised.

3.18 A six phase process

These phases are heuristic, and used to organise an improved technological understanding of this particular knapper's approach. Based upon an explicit explanation provided by the knapper, each of the six phases can be seen to perform a different function:

1. Testing the nodule's flint quality;
2. De-corticating the nodule to form a blade core;

3. Removing blades from the core;
4. Longitudinal core maintenance and correction;
5. Transverse core maintenance and correction;
6. Blade-point production.

Whilst numbered for clarity, and in loosely chronological order, this obfuscates how phases one and two can segue into each other. It also disguises the repeated and cyclic nature of phases three, four and five (cf. Jacobi 2007: 271). With these factors in mind, each phase is discussed in detail and in turn. Whilst this model of phases provided an explanatory structure, metric and formal analysis was used to identify similarities and differences between the products from each phase. Through this process each phase was approximately characterised. Characterisation was structured via an observation protocol focussed upon:

6. Type of percussion used.
7. Overall quantities, types and sizes of *debitage* produced.
8. Degree of cortex in relation to phase and chronology.
9. Platform size and character.
10. Bulb type and character.
11. Chronologically early and late comparisons.

The metrics and observations from each phase were analysed, to create average and abstract descriptions of the quantitatively predominant features from each

phase. Through this process a textual, formal and metrical characterisation of the predominant element types from each phase of blade-point production was laid out. Having outlined the aims and methods the next section of this chapter will go on to discuss in detail the larger materials generated through the first five phases of production.

3.2 Transforming a nodule into blades

Some overall patterns emerged from this analysis. For example phases one to five produced 139 pieces of debris over 30mm in length, whilst blade-point shaping primarily generated materials below this size. The smaller materials produced during blade-point shaping have been termed here *micro-debitage*. Consequently, when attempting to understand overall nodule reduction patterns it is the first five phases that are primarily significant. In contrast the *micro-debitage* generated during the sixth phase allowed a more focused analysis and discussion of the reduction of blades to blade-points. Accordingly it is the overall nodule reduction patterns that are discussed first.

3.2.1 Nodule reduction patterns

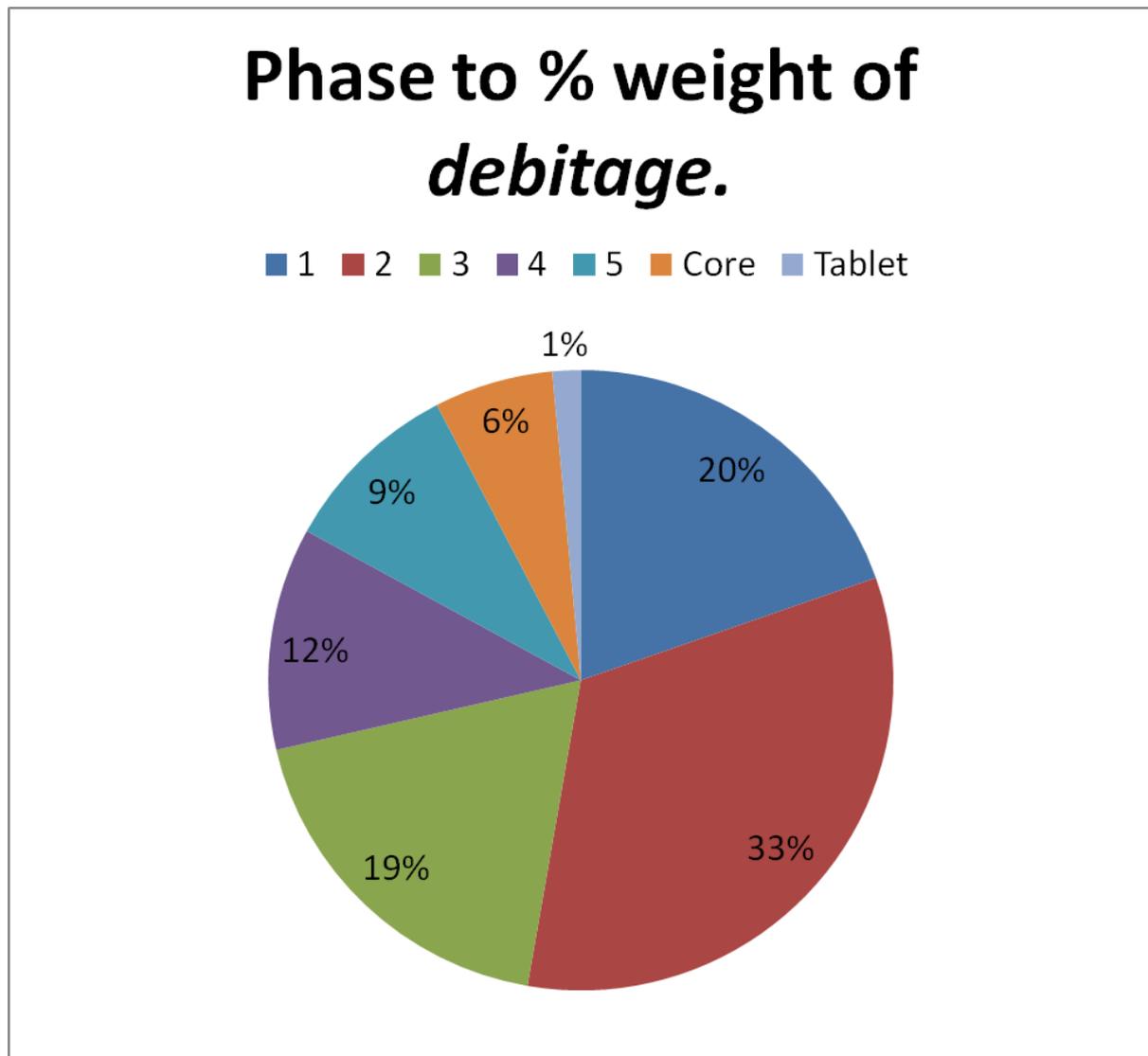


Fig.3.3 Percentage weight of material to phase of production. Core and core tablet included here.

From a 13kg damaged rounded nodule from a glacial till source more than half (53%) the weight was removed within the first two phases of reduction (Fig.3.3). In reality these two phases segued into each other and took less than seven minutes to complete. It can be observed from the overall experimental process that flakes and shatter are ubiquitous throughout, whilst blades tend to be manufactured only after these first two phases of reduction are complete. Phase three blade production segued with phase four and five core maintenance

and correction activities, and these combined phases account for less than half (40%) of the weight of the materials generated. However the picture changed dramatically when reviewing at the percentage of actual >30mm pieces produced during each phase.

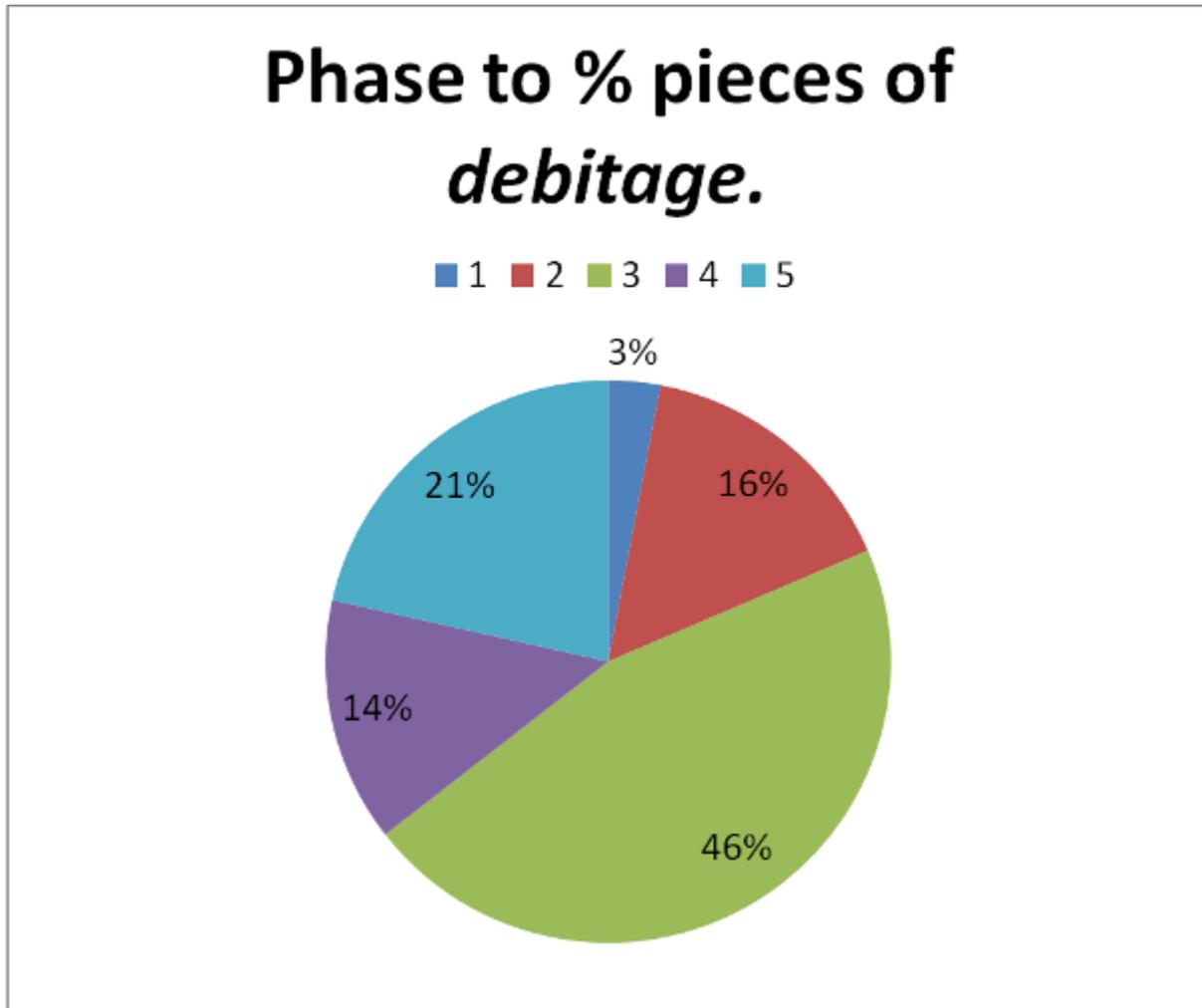


Fig.3.4 Percentage of >30mm pieces generated to phase. Core and core tablet not included.

More than three quarters (80%) of >30mm pieces were produced during phases three, four and five (Fig.3.4), which took around 27 minutes to complete. This reveals an inverse relationship. Early phases quickly removed over half the weight of the nodule with a relatively few large pieces. Later phases generated

many smaller pieces and only slowly reduced the remaining weight. Within these overall nodule reduction patterns, nodule size and form was considered next.

3.2.2 Nodule size and form

The stated aim of this early phase was to identify a flint nodule of necessary size, form and internal homogeneity capable of producing blade-points within the metric criteria of this project. Size and form were characteristics that could be assessed visually. Size was important for facilitating blade production of the required dimensions, whilst form was a factor that varied over the five days production. For example, on day two, a small 7.5kg derived cylindrical nodule was reduced. Because of the cylindrical form it was seen by the knapper as ideal and indeed it was possible to create two opposed platforms within the first two strikes. However it took correspondingly longer (around 11 minutes) to produce a small 2.5kg opposed platform core. Also a larger proportion (two thirds) of the weight was removed within the first two phases. Whilst the knapper saw cylindrical nodules as ideal, this piece took longer to reduce and generated proportionally more debris than the damaged and rounded glacial nodule used on day five. This may be because the smaller size of the nodule necessitated more care, and therefore time for core production. It may also be because it was worked on only the second day of the experiment. By day five the knapper was undoubtedly more conversant with the process, and perhaps able to reduce a more challenging nodule with efficiency. Size and form are undoubtedly significant factors that influence manufacturing time and the weight of debris produced, and I believe the knapper's observations regarding cylindrical nodules to be interesting; however no simple correlations could be derived from this experiment. Consequently, discussion of nodule form remains limited.

However homogeneity of material was a factor that could be explored more fully. Material of good quality allowed blades of length to be consistently produced with some degree of confidence. The homogeneity of cortical flint nodules was initially tested aurally by 'ringing', or striking with a stone and listening to the tone. A short dull sound was interpreted as indicating inclusions being present. However if the blow produced a loud ringing tone this was seen as signalling material homogeneity. This approach can be seen as an expedient and non-invasive way of initially screening nodules. If the nodule sounded good then invasive testing took place, using a 3.5kg quartzite hammer stone to remove a substantial flake. This large removal revealed the inner flint which was then assessed visually. If the flint was deemed free from inclusions then reduction proper began using the scar from the initial removal as a platform. It is within this behavioural context, observed and recorded over the first four days, that the first experimental removals were made on day five, from the 13kg damaged and rounded glacial nodule.

3.2.3 Phase one: 'testing'

This phase generated four pieces of debris and can be characterised succinctly. A large 3.5kg quartzite hammer-stone was used to produce a large cortical flake and three relatively large and mostly cortical pieces of shatter. The flake measured 200x200x90mm and weighed 2288g. This was by far the biggest flake produced throughout the complete process. The platform was plain with a ring crack and the bulb prominent with radial fissures. Of the three pieces with cortex all had between 51-75% present. The characteristics of this large sized cortical flake reflect the hard hammer production method used.

3.2.4 Phase two 'de-cortication'

For this process a 1kg quartzite hammer was used.

Type	Qty.	%
Flakes	13	62%
Broken flakes	2	10%
Shatter	6	28%
Total	21	100%

Table 3.5 Phase two debitage types percentage.

a. Average flake size

Length	Width	Depth	Weight
94mm	90mm	34mm	262g

Table 3.6 Phase two average (n=13) complete flake size and weight.

b. Degree of cortex

Cortex	0%	1-25%	26-50%	51-75%	76-99%	100%	Total
Flakes	0	3	3	1	4	2	13

Table 3.7 Phase two flakes percentage cortex.

c. Platform quantity and character

Flake platform	Qty.	%
Plain	7	64%
Facetted	3	27%
Crushed	1	9%
Total	11	100%

Table 3.8 Phase two platforms quantity and type.

d. Ring-crack

Ring crack	Qty.	%
Yes	6	55%
No	5	45%
Total	11	100%

Table 3.9 Phase two ring-crack percentages.

e. Platform size

Width	Depth
33mm	15mm

Table 3.10 Phase two flake mean average (n=11) platform size.

f. Bulb type

Bulb type	Qty.	%
Prominent	9	75%
Indefinite	3	25%
Total	12	100%

Table 3.11 Phase two bulb types and percentages.

g. Radial Fissures

Present	Qty.	%
Yes	9	75%
No	3	25%
Total	12	100%

Table 3.12 Phase two percentage radial fissures.

3.2.5 Character of the de-cortication *debitage*

This process was dominated (62%) by cortical flakes with mean average size of 94x90x34mm, and weight of 262g. In comparison to the initial 'testing' flake this average was less than half the size and has been termed 'Medium'. The average platform size was 33x15mm and it would be likely to have a ring crack, prominent bulb and radial fissures. This characterisation accurately reflects the 1kg hard hammer production method used.

3.2.6 Phase three 'blade production'

The explicit aim of this phase was to produce blades suitable for transformation into blade-points. The range of material created included blades, flakes and shatter. However there was some variation within the blades produced. For example some blades were broken during production whilst other complete

blades were either too large or small to be made into blade-points. Consequently within this phase there were three related blade categories:

1. 'Blade fragments' were broken blades usually too small to make into blade-points.
2. 'Outsize blades' were complete pieces either too large, but usually too small to make into blade-points.
3. 'Blades' were complete or broken pieces of a size that could be further modified into blade-points.

These categories were useful, as differentiation allowed an understanding of why for example some platforms and bulbs were not present. However, when attempting to grasp overall patterns these differing divisions have been conflated. Doing so allowed a clearer contrast to emerge between blade and flake products within phases.

Category	Qty.	%
Blades	20	32%
Blade pieces	15	24%
Outsize blades	9	15%
Flakes	16	26%
Shatter	2	3%
Total	62	100%

Table 3.13 Phase three percentage debitage types.

Within the following discussion, degree of cortex is reported for all materials. Blade products dominated the process making up over 70% of *debitage* whilst actual blades formed about one third of the total. As the process was aimed at producing blades these are discussed separately. A 1kg antler hammer was used throughout.

a. Degree of cortex on all pieces

0%	1-25%	Total
47	15	62

Table 3.14 Phase three artefact quantity to percentage of cortex.

b. Degree of cortex on blades

0%	16
1-25%	4
Total	20

Table 3.15 Phase three blade quantity to percentage of cortex.

c. Average blade

Length	Width	Depth	Weight
112mm	44mm	11mm	43g

Table 3.16 Phase three average (n=20) blade size and weight.

d. Blade platform type

Platform	Qty.	%
Plain	9	82%
Facetted	2	18%
Total	11	100%

Table 3.17 Phase three platform type and percentage.

e. Blade platform size

Width	Depth
19mm	7mm

Table 3.18 Phase three average (n=11) blade platform size.

f. Ring crack

Present	Qty.	%
No	9	82%
Yes	2	18%
Total	11	100%

Table 3.19 Phase three blades to ring-crack percentage.

g. Bulb type

Bulb type	Qty.	%
Diffuse	7	58%
Prominent	4	33%
Indefinite	1	9%
Total	12	100%

Table 3.20 Phase three blades to bulb type percentage.

h. Radial fissures

Presence	Qty.	%
No	7	58%
Yes	5	42%
Total	12	100%

Table 3.21 Percentage of blades with radial fissures.

i. Lipping

Present	Qty.	%
Yes	9	82%
No	2	18%
Total	11	100%

Table 3.22 Percentage of blade platforms with lips.

3.2.7 Blade characterisation

Using a 1kg antler hammer the knapper produced 62 pieces of debitage comprising blades, flakes and shatter, mostly without cortex. Blade products (71%) were in a majority with blades (32%) being the predominant type (20 pieces). The average blade size was 112x33x11mm and without cortex. Most platforms were plain, without a ring crack, and an average platform size was 19x7mm. When bulbs were present the majority were diffuse with lips and without radial fissures. These characteristics reflect soft hammer production. These blades differed from those at Beedings in that whilst these platforms were predominantly plain, those from Beedings were faceted. This difference will be discussed in detail within the final section of this chapter. As flakes were produced throughout all phases it was useful to characterise those from this phase, in order to differentiate them from both earlier and later examples.

3.2.8 Phase three flakes

Flakes and flake fragments formed approximately one quarter (26%) of the total *debitage* produced during blade production.

a. Degree of cortex

0%	14
1-25%	2
Total	16

Table 3.23 Phase three flakes and flake fragments to percentage cortex.

b. Size and weight

Length	Width	Depth	Weight
63mm	50mm	12mm	35g

Table 3.24 Phase three flake average (n=13) size and weight.

c. Platform type

Platform type	Qty.	%
Plain	7	87%
Facetted	1	13%
Total	8	100%

Table 3.25 Phase three flakes platform type and percentage.

d. Platform size

Width	Depth
23mm	8mm

Table 3.26 Phase three flakes average (n=8) platform size.

e. Ring crack

Present	Qty.	%
No	8	100%
Yes	0	0%
Total	8	100%

Table 3.27 Phase three percentage flake platforms with ring crack.

f. Bulb type

Type	Qty.	%
Prominent	5	63%
Diffuse	3	27%
Total	8	100%

Table 3.28 Phase three flakes bulb type and percentage.

g. Lipping

Present	Qty.	%
Yes	7	88%
No	1	12%
Total	8	100%

Table 3.29 Phase three flake platforms percentage with lipping.

3.2.9 Flake characterisation

These flakes are interesting when contrasted with those produced during previous phases. As well as being relatively small and free of cortex, phase three flakes bear a number of hallmarks of soft hammer production. The only potentially anomalous factor was the predominance of prominent bulbs. The mean average flake was 63x50x12mm and weighed 35g. This was significantly smaller than flake averages for previous phases and so are termed 'Small'.

3.2.10 Flake to phase metrics

	Length	Width	Depth	Weight	Size
Phase 1	200mm	200mm	90mm	2288g	Large
Phase 2	94mm	90mm	34mm	262g	Medium
Phase 3	63mm	50mm	12mm	35g	Small

Table 3.30 Average flake size and weight from the first three phases of production.

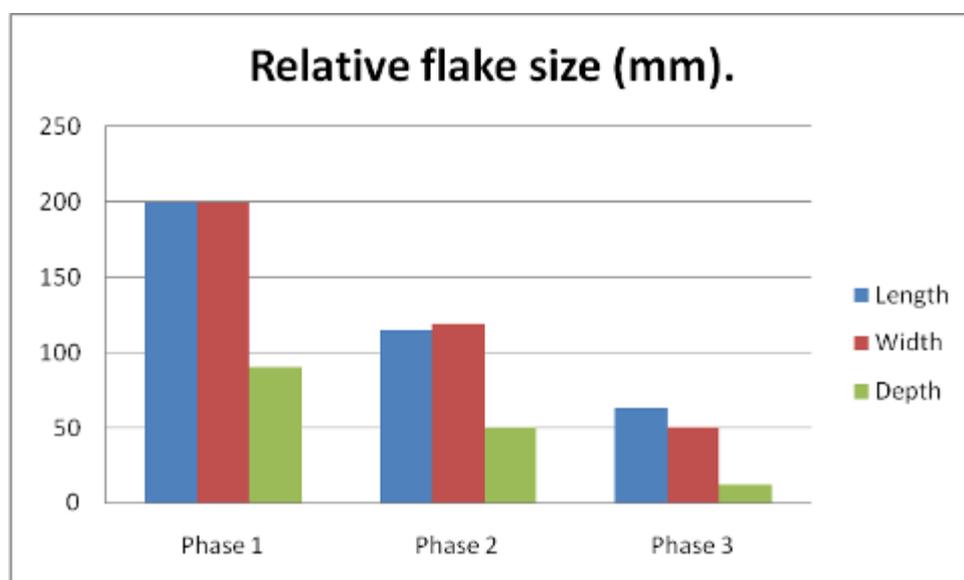


Fig.3.5 Average flake sizes from the first three phases.

3.2.11 Phase four 'longitudinal core maintenance'

As already discussed phases three, four and five overlapped. Phase four had some similarities to earlier blade production as it also involved taking

longitudinal removals from the core. However it differed in purpose, as the primary aim was to correct the core by removing problems. These problems may have been in the form of step fractures inhibiting further blade removal, or simply making a removal to expand the core face laterally, by eradicating a small amount of cresting or cortex. The primary characteristic of these removals was therefore their longitudinal orientation, and the presence of some kind of dorsal irregularity. This phase also differed from blade production in that the *debitage* was dominated by flakes. *Debitage* will be discussed as a whole followed by a focus upon flakes. A one kilogram quartzite hammer stone was used for this core correction process.

Type	Qty.	%
Flakes	10	52%
Flake pieces	2	11%
Outsize blades	3	16%
Blade pieces	2	11%
Blades	1	5%
Crested blade	1	5%
Total	19	100%

Table 3.31 Phase four *debitage* type to percentage.

a. Degree of cortex

0%	9
1-25%	8
26-50%	2
Total	19

Table 3.32 Phase four *debitage* to percentage of cortex.

b. Platform character

Type	Qty.	%
Plain	10	58%
Punctiform	3	18%
Facetted	2	12%

Crushed	1	6%
Linear	1	6%
Total	17	100%

Table 3.33 Phase four percentage platform types.

c. Platform size

Width	Depth
14mm	7mm

Table 3.34 Phase four average (n=17) platform size.

d. Ring crack

Presence	Qty.	%
No	10	59%
Yes	7	41%
Total	17	100%

Table 3.35 Phase four percentage platforms with ring-crack.

e. Bulb type

Type	Qty.	%
Prominent	9	56%
Diffuse	6	37%
Indefinite	1	7%
Total	16	100%

Table 3.36 Phase four debitage bulb type percentages.

f. Radial Fissures

Present	Qty.	%
Yes	10	62%
No	6	38%
Total	16	100%

Table 3.37 Phase four percentage bulbs with radial fissures.

3.2.12 Longitudinal core maintenance *debitage* character

This phase was dominated by flakes but some blade products were produced. More pieces had cortex than did not. The platforms were plain and without ring cracks, but with prominent bulbs and radial fissures. These features generally reflect the hard hammer production method. As flakes and flake fragments dominated (63%) they will be discussed next.

3.2.13 Longitudinal core maintenance flake metrics

Length	Width	Depth	Weight
64mm	52mm	15mm	59g

Table 3.38 Phase four average (n=10) flake size and weight.

a. Degree of cortex

0%	6
1-25%	4
Total	10

Table 3.39 Phase four flakes to percentage of cortex.

b. Platform character

Type	Qty.	%
Plain	5	50%
Facetted	2	20%
Crushed	1	10%
Linear	1	10%
Punctiform	1	10%
Total	10	100%

Table 3.40 Phase four flakes percentage to platform type.

c. Platform size

Width	Depth
15mm	5mm

Table 3.41 Phase four average (n=10) flake platform size.

d. Ring-crack

Present	Qty.	%
No	6	60%
Yes	4	40%
Total	10	100%

Table 3.42 Phase four flake platforms percentage with ring-crack.

e. Bulb type

Type	Qty.	%
Prominent	6	67%
Diffuse	3	33%
Total	9	100%

Table 3.43 Phase four flakes percentage bulb types.

f. Radial fissures

Present	Qty.	%
Yes	6	67%
No	3	33%
Total	9	100%

Table 3.44 Phase four flakes percentage with radial fissures.

3.2.14 Longitudinal core correction flake summary

This phase was dominated by 'Small' flakes. Measuring 64x52x15 mm and weighing around 57g, they are a similar size to flakes from the previous phase.

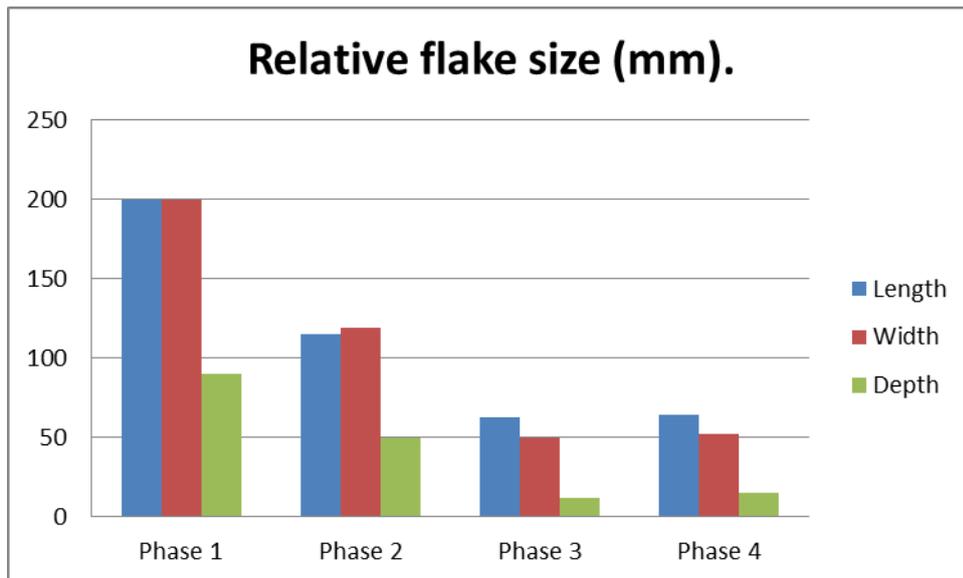


Fig. 3.6 Average flake sizes from first four phases.

The average platform was plain and measured 7x14mm. The prominent bulbs and radial fissures indicated hard hammer production, and therefore differentiated them from flakes produced via blade manufacture. Whilst 87% of phase three flakes had no cortex, only 60% of phase four flakes were without cortex. This difference is discussed further below in relation to problem removal.

3.2.15 Core maintenance as problem removal



Fig.3.7 Phase four flake E40.

E40 provides a useful example, illustrating how the knapper has used it to remove a cortical edge as well as a lower section bearing two large fractures. Together on a blade core these elements would present problems for blade removal, and this flake has been one part of a clearing process: firstly extending the core face by removing the cortical edge; secondly removing large fractures in an attempt to make the face suitable for further blade removals. This observation is important because although flake products dominate, it is the presence of 'problems' or irregularities on the dorsal surface of either flake or blade pieces that was indicative of this phase. It is therefore useful to summarise the problems and irregularities present within these 19 pieces of *debitage*: prominent dorsal ridges were reduced to flatten the blade producing face; cortex and step fractures were removed for the same purpose; edges were removed in order to extend the face of the core.

3.2.16 Longitudinal core maintenance summary

It can be summarised that whilst flake size is similar to the previous blade production mode, the knapper's use of a hard hammer to remove flake and blade products bearing problems and irregularities were indicative of this phase. The use of a hard hammer for this purpose will be interrogated further within chapter six. However, transverse core correction was in many instances used in conjunction with phase four longitudinal core correction and this is discussed next.

3.2.17 Phase five 'transverse core correction'

For transverse core correction, flakes and broken flakes dominated, and as such are discussed in detail. The same one kilogramme quartzite hammer-stone was used.

Type	Qty.	%
Flakes	19	65%
Shatter	6	21%
Blade pieces	2	7%
Outsize blades	2	7%
Total	29	100%

Table 3.45 Phase five debitage types and percentages.

a. Complete flakes

Type	Qty.	%
Complete	13	68%
Broken	6	32%
Total	19	100%

Table 3.46 Phase five complete to broken flakes.

b. Average size

Length	Width	Depth	Weight
--------	-------	-------	--------

66mm	63mm	15mm	53g
------	------	------	-----

Table 3.47 Phase five average (n=13) complete flake size and weight.

c. Degree of cortex

0%	10
1-25%	3
Total	13

Table 3.48 Phase five flakes degree of cortex.

d. Platform character

Type	Qty.	%
Plain	11	84%
Dihedral	1	8%
Linear	1	8%
Total	13	100%

Table 3.48 Phase five flake platform type to percentages.

e. Platform size

Width	Depth
17mm	7mm

Table 3.49 Phase five flakes average (n=13) platform size.

f. Ring-crack

Present	Qty.	%
Yes	7	54%
No	6	46%
Total	13	100%

Table 3.50 Phase five flake platforms percentage with ring-crack.

g. Bulb type

Type	Qty.	%
Prominent	10	77%
Diffuse	3	33%
Total	13	100%

Table 3.51 Phase five flakes percentage bulb type.

h. Radial fissures

Present	Qty.	%
Yes	10	77%
No	3	33%
Total	13	100%

Table 3.52 Phase five flake bulbs percentage with radial fissures.

3.2.18 'Transverse core correction' summary

Transverse core shaping produced flakes, shatter and blades. Flakes predominated with an average size of 66x63x15mm and weight of 53g. This average complete flake had no cortex, a plain platform measuring 17x7mm with a ring crack. The bulb was likely to be prominent with radial fissures, all characteristics reflecting the hard hammer mode of production used.

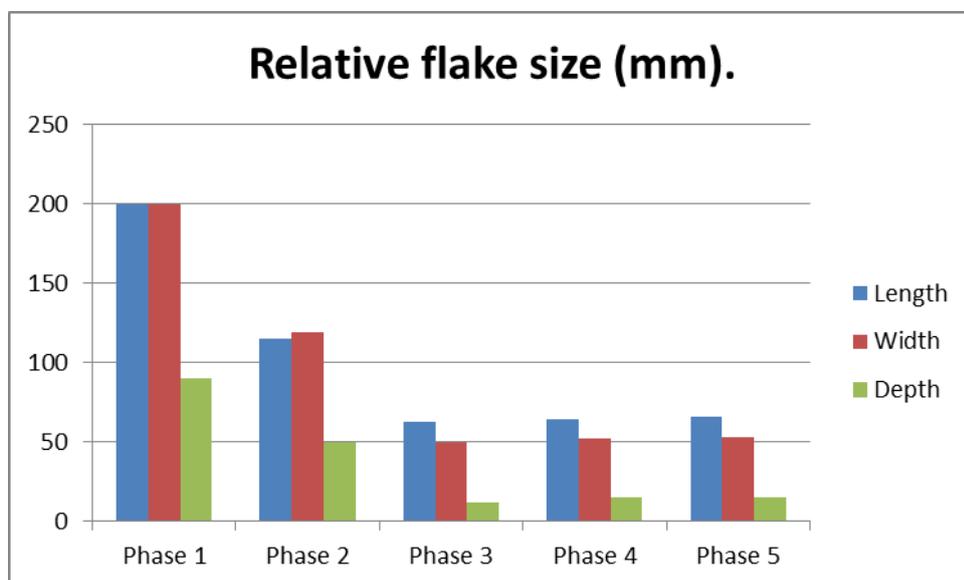


Fig. 3.8 Average flake sizes for first five production phases.

Whilst metrically there is a similarity between the flakes from phases three, four and five there is also an interesting approximate proportional relationship between (complete) flakes produced through all the above phases.

3.2.19 Flake width depth ratio

Phase 1	2.2	(n=1)
Phase 2	2.6	(n=13)
Phase 3	4.2	(n=13)
Phase 4	3.5	(n=9)
Phase 5	3.9	(n=16)

Table 3.53 Width depth ratio for each phase.

If width is divided by depth it can be seen that proportionally thicker flakes tend to be generated within phases one and two whilst flatter flakes seem to be associated with blade production but also correction phases. Contrasting the largest (4.2) and smallest (2.2) ratios indicates a difference of 20 units.

Therefore it can be generalised that flakes with a ratio of above 3.2 are likely to be from later phases of blade production and core correction. Those with a ratio of below 3.2 are likely to be related to earlier phases of testing, de-cortication and core production.

3.2.20 Phases one to five conclusions

This section has outlined the character of the materials generated through the production of blades from a large derived nodule of flint. These phases are useful for understanding the process, and in general terms reflect expectations. For example larger cortical material comes earlier in the process than smaller non-cortical material. The small quantities and large weight of early removals contrasts with the larger number of smaller removals from later phases.

Proportionally thicker flakes are produced during earlier phases whilst thinner

flakes result from later blade production, and associated core correction. Flakes and shatter are ubiquitous whilst blades are a later and more deliberate outcome. The characteristics reflecting percussion type on the experimental materials generally reflect the actual percussion type used. Finally the flakes and blades produced with 'problems' or irregularities on the dorsal surface can be seen here to correlate with core correction and maintenance activities. As such these first five phases introduce few surprises, and effectively present a quantitative model of *this particular knapper's* method of blade production. In other words, this is a quantitative model that can be used as a starting point to explore Palaeolithic practice. This is not argued to be indicative of Palaeolithic practice, but a useful model for comparison with archaeological evidence. Doing so shows how, for example, whilst consistent with the knapper's approach, the experimental plain platforms differed from the archaeological faceted platforms. The potential meanings underlying this anomaly are discussed in detail at the end of this chapter. However, the following phase six is argued here to be qualitatively different. This is because the metric and formal constraints used to select blade-points ties the selected examples much more closely to the archaeological models. This effectively constrains variability to within that reflected within the archaeological record.

3.3 Transforming blades into blade-points

This final phase of manufacture dealt with the process of transforming blades into blade-points. As the *debitage* was generally of small size (below 30mm) it has been treated separately to the material from the previous five phases, and is discussed in two parts: the first part outlines the particular approach and some general quantitative observations; the second part draws out and summarises key themes that can be recognised as tied to, and characteristic of the particular form of blade-points.

3.3.1 Micro-*debitage*

Micro-*debitage* associated with four separate blade-points was collected and analysed. The micro-*debitage* from two blade-points was bagged separately, the micro-*debitage* from two blade-points produced on day five was bagged together for reasons of time. The material produced when reducing blades to blade-points included flakes, shatter and bladelets as well as sand and dust created by abrasion. All this material was important when calculating relative weights. However the research focus was on materials above 4mm as these components can have some analytical value in relation to current collections (e.g. Beedings, Glaston). Consequently it was materials above 4mm that were used for refitting and metrical and formal analysis. With these caveats in mind, overall inclusive weights will be discussed first.

a. Blade-point to *debitage* weight

For the four blade-points under discussion overall weights were recorded before and after reduction. Consequently the weight of materials removed from each blade could be calculated. From this data averages were derived (Table 3.54).

Number	Blade	<i>Debitage</i>	Blade-point
4.2	31g (100%)	4g (13%)	27g (87%)
4.3	33g (100%)	3g (9%)	30g (91%)
5.14	41g (100%)	7g (17%)	34g (83%)
5.19	36g (100%)	9g (25%)	27g (75%)
Average	36g (100%)	6g (17%)	30g (83%)

Table 3.54 Summary of the relationship between original blades, weight and percentage of material removed in relation to the resultant blade-point produced.

Although slightly differing in metrics, blade-point 5.14 provided a proportionally good example of an average (n=4) experimental blade-point. Based upon this example it can be stated that on average the knapper had to remove 17% of *debitage* from a blade in order to produce a blade-point metrically (size), formally (shape and proportion) and typologically (zones of retouch) analogous with archaeological examples from the site of Beedings.

3.3.3 Break down of micro-*debitage* by size

The two blade-points manufactured on day four were useful in having provided data on the proportion and type of *debitage* produced, in particular materials above and below 4mm (Table 3.55, 3.56).

Blade-point 4.2	27g
Above 4mm	2.5g
Below 4mm	1.5g

Table 3.55 *Debitage* size range and relative weights produced from blade-point 4.2.

Blade-point 4.3	30g
Above 4mm	1g
Below 4mm	2g

Table 3.56 Debitage size range and relative weights produced from blade-point 4.3.

This allowed an approximate average (n=2) to be formulated (Table 3.57, Fig.3.9).

Blade-point	29g
Above 4mm	2g
Below 4mm	2g

Table 3.57 Average (n=2) debitage size range and relative weights generated from blade-point production.

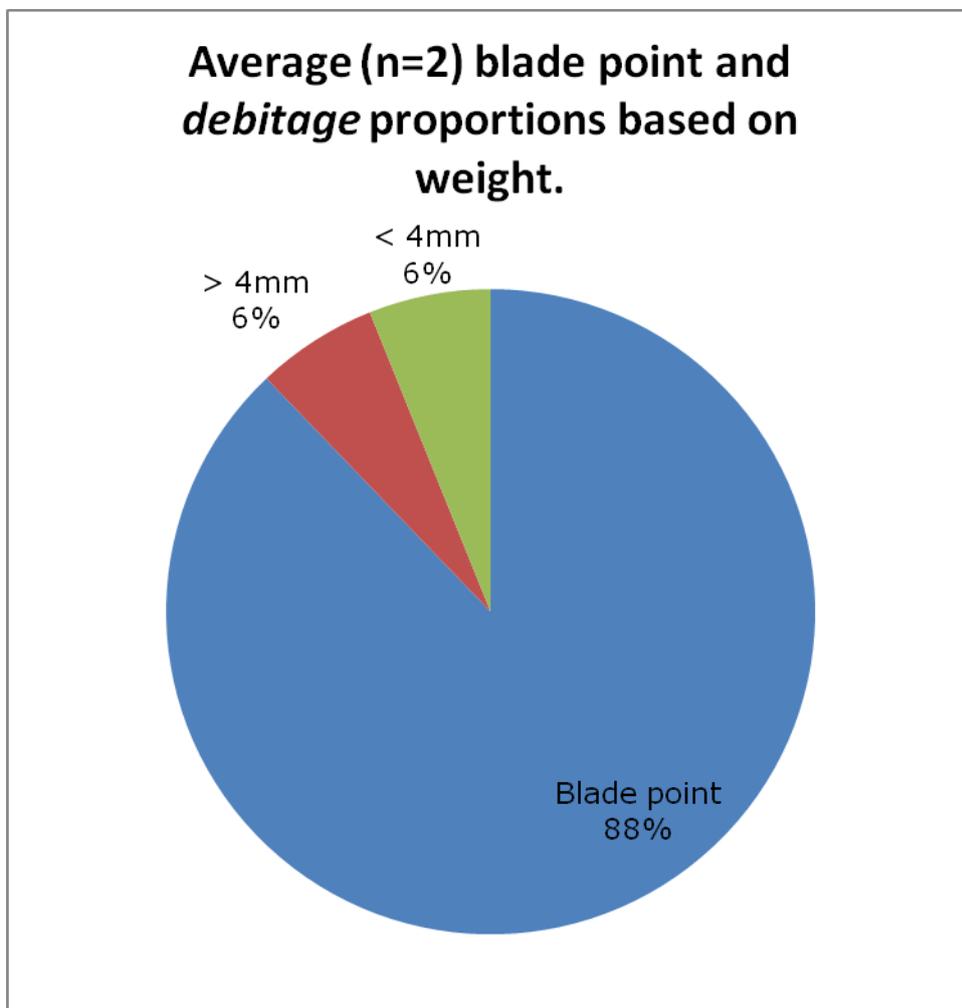


Fig. 3.9 Average weight of blade-point in relation to debitage as a percentage.

When micro-*debitage* was generated from blade-point production approximately half the weight of this material comprised pieces of a size likely to be of analytical value.

3.3.4 Broken or complete

The total micro-*debitage* available for analysis from these four blade-points comprised 40 pieces above 4mm. In order to calculate an average size it was necessary to distinguish between broken and complete pieces (Table 3.58).

Complete	23
Broken	17
Total	40

Table 3.58 Broken and complete pieces generated from blade-point production.

3.3.5 Numbering and types

Refitting was attempted for all micro-*debitage* associated with each blade-point. Six elements were found to conjoin (as snaps) and therefore treated as three pieces. This reduced the overall total to 37 units of micro-*debitage*. Based upon colour and patterning, pieces were located to blade-point faces and some probable, and 14 definite refits were found. All pieces were then numbered and recorded. The numbering system included information on the blade-point, removal face and its probable order of removal. Any notes or comments (such as 'conjoin') were added after the number. The face and number (e.g. v3) was recorded directly on the piece itself, whilst the complete code was input directly into an Excel spreadsheet (Fig.3.10).

5.19	v3 conjoin
------	------------

Fig.3.10 Excel spreadsheet numbering protocol.

Measurements were taken using non-digital callipers and rounded up or down to the nearest mm. The large majority of the pieces were classified as either flakes or shatter, however two pieces could be termed bladelets as they were twice as long as wide with approximately parallel sides. These pieces were classed as such (Table 3.59).

Flakes	29	78%
Shatter	6	16%
Bladelets	2	6%
Total	37	100%

Table 3.59 Micro-debitage types in relation to percentage.

The majority of micro-debitage produced comprised complete and broken flakes. Of the 29 flakes produced 22 were complete and used to calculate average flake size (Table 3.60).

3.3.6 Average flake size

Length	Width	Depth
11mm	10mm	1mm

Table 3.60 Average (n=22) flake size generated by blade-point production.

3.3.7 Refits present

Flakes	11
Bladelets	2
Shatter	1
Total	14

Table 3.61 Phase six definite refits quantity and type.

3.3.8 Refits to blade-points

Blade-point 4.2	7
Blade-point 5.19	5
Blade-point 4.3	2

Total	14
-------	----

Table 3.62 Quantity of refits to individual blade-points.

3.3.9 Refits to face.

Ventral	9
Dorsal	5
Total	14

Table 3.63 Quantity of refits per face.

3.3.10 Refits to section.

Proximal	11
Distal	3
Total	14

Table 3.64 Quantity of refits per section.

3.3.11 Blade-point micro-debitage summary

Relating four experimentally produced blade-points to their associated *debitage* a number of general observations can be made. To make a blade-point, approximately 17% of a blade's weight will be removed in the form of micro-*debitage*. Approximately half this weight will be made up of pieces above 4mm and therefore is likely to be of analytical value. A large majority of this above 4mm material will comprise mainly complete and broken flakes with an average complete flake measuring around 11x10x1mm. Refitting suggests that most material is removed from the proximal end and the ventral face. This quantitative summary fits comfortably with previous descriptions (Jacobi 2007), emphasising bulbar reduction and blade straightening. This is unsurprising as it was this same data that was used to structure experimental production. This comfortable fit then suggests that the quantitative data generated here should be a useful complement to these previous technological understandings derived

from museum collections. However, the experimentally produced *debitage* has further potential, in that it can be used to develop a more nuanced understanding of the relationships between micro-*debitage* quantities, form and the actual process of blade-point production.

3.3.12 Characteristic blade-point *debitage*

Analysis of the refitting process illustrated four key features, or tendencies associated with blade-point form and the process of production. To avoid repetition, detail of the complete analysis of the blade-points is found within appendix three. The features discussed are not differing types, as some pieces display more than one tendency at the same time and are thus included in more than one list. Examples of each of the tendencies are discussed in turn.

3.3.13 Linear sequential reduction flakes

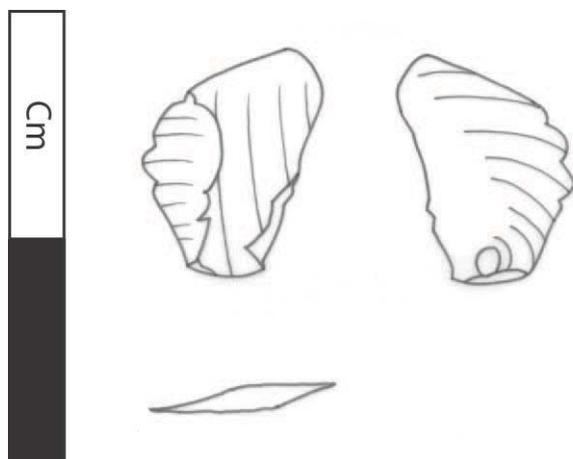


Fig.3.11 Flake 4.2 v1, a good example of a linear sequential reduction flake.

Blade	Removal
4.2	v1
5.19	v2
4.3	d5
4.3	v7

Table 3.65 Refitted linear sequential removals from three of the four blade-points.

Four refitting pieces have been categorised as linear sequential reduction flakes (Table 3.65, Fig.3.11). This term reflects their sequential removal from along a margin. They are defined by their perpendicular dorsal scar pattern, and refitting of this small sample indicated them to be associated with blade edges as opposed to ends. Three of the four came from the ventral face and three of the four had a low EPA. Refitting showed these flakes to be removed sequentially. For example flake 5.19 v3 (see Fig.3.13 below) has a dorsal scar pattern showing how it underlay a series of linear sequential reduction flakes struck from the dorsal right hand edge. So it can be summarised that these pieces occur in sequences, are associated with blade edges and are distinguished primarily by perpendicular scar patterning.

3.3.14 Vertical sequential reduction flakes

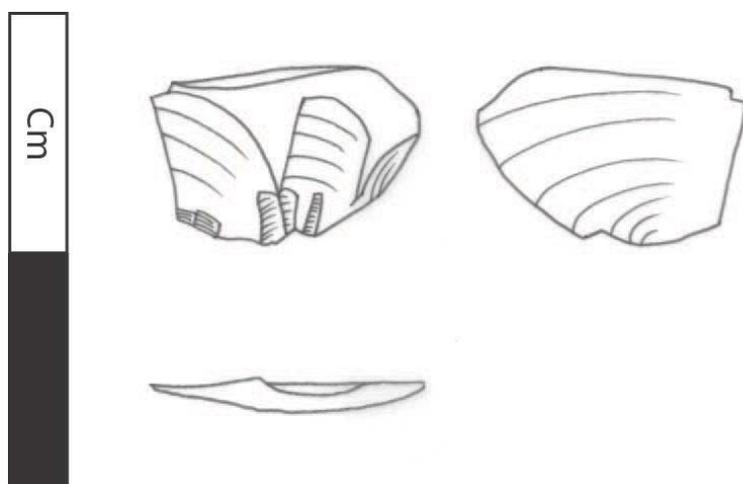


Fig.3.12 Flake d1+ illustrating the characteristics of a vertical sequential reduction flake.

Blade	Removal
4.2	v2[d]
4.2	d1+d3c
4.2	v2[c]

Table 3.66 Removals systematically taken from the same point on the blade.

Three flakes are classed as vertical sequential reduction flakes (Fig.3.12, Table 3.66). This removal type is distinguished by a dorsal scar pattern trending in the same direction as its own ventral rippling. This is indicative of sequential reduction at the same point on a blade. 4.2 v2d is useful to discuss as it bears the scar of an earlier refitting removal 4.2 v2a. Whilst this overlying flake was obviously also of the same type, it does not bear the same scar pattern as it has been used to initiate the process. Of the three pieces listed as vertical sequential removals all bear scarring along the longitudinal axis of the dorsal surface and all come from proximal ends. These flakes are distinguished by their longitudinal scar pattern and are associated with the proximal section of blades.

3.3.15 Ventral bulb avoiding flakes

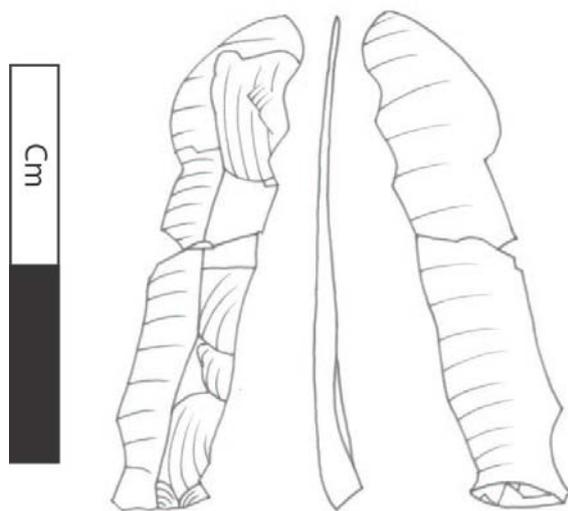


Fig.3.13 Bladelet 5.19 v3 illustrating the asymmetry associated with ventral, bulb avoiding removals.

Blade	Removal
4.2	v2[a]
4.2	v2[d]
4.2	v3

5.19	v3 conjoin
------	------------

Table 3.67 Flakes that have changed direction in order to avoid the bulbar prominence.

Inevitably these flakes (Table 3.67) derive from the proximal end and the ventral face. 5.19 v3 (Fig.3.13) is a good example of how these pieces circumvent the bulb. All are asymmetrical in plan and twisted in transverse profile, two dramatically so. These factors are the primary characteristics of this type.

3.3.16 Dorsal ridge following flakes

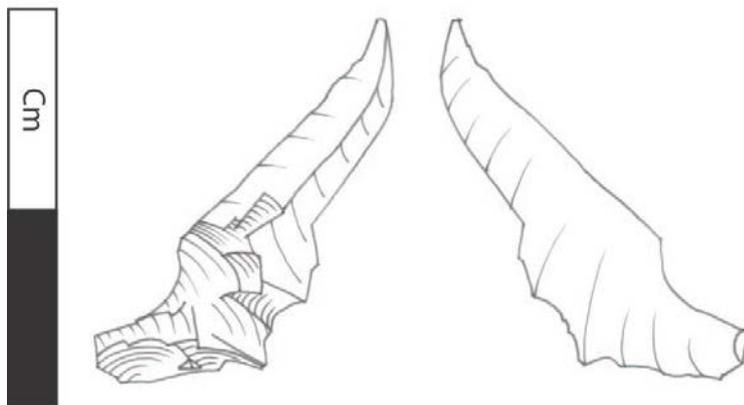


Fig.3.14 Flake 5.19 d2 illustrating direction of removal blow in relation to axis of the dorsal ridge of the blade.

Blade	Removal
4.2	d1 + d3 conjoin
5.19	d2
5.19	d6 + d4 conjoin

Table 3.68 Removals that change direction in order to follow the dorsal ridge.

Three pieces fell into this category (Table 3.68), and 5.19 d2 (Fig.3.14) illustrated the phenomena well. A blade's dorsal ridge can present an obstacle to a thinning flake's progress. Consequently a removal will tend to divert and follow the ridge. Examples show how this could occur when a flake was struck from the

left, right or centre of the proximal end. Obviously this was a solely a dorsal phenomenon. Elongated asymmetry seems to be the characteristic that defines this type of removal. However heavily worked proximal sections also seem to be indicative.

3.3.17 Summary

This section has reviewed the approach taken and the pieces that were able to be refitted. Doing so has allowed some key tendencies to emerge that seem to be tied to the particular form of blade-points. As such these tendencies should be valuable indicators of these same aspects of blade-point production if recovered within the archaeological record.

3.4 A blade-point production model

The aim of this chapter has been to answer the first research question. To do so it has explored how blade-points were made, and why they were made in the way they were. Within section 3.1 the phases involved in the experimental production of blade-points were outlined. In addition the knapper's explicit aim for each of the relative phases was discussed. Sections 3.2 and 3.3 developed this outline and detailed the formal and metric characteristics from each of the six phases presented. This final section will present a discussion of how blade-points were made and why they were made in this way. The experimental process has reflected one modern flint knapper's interpretation of the blade-point production process. To approach a Palaeolithic method this section will focus not just upon correspondences but also discrepancies between the archaeological record and the actualities of the experimental process. This is followed by an examination of the modern knapper's context to posit an explanation for why these differences occurred. This approach is then developed to explore the implications these differences can have for our understanding of the humans who produced the archaeological materials. The final section will introduce the issue of temporality, and its implications for the manufacturing process.

3.4.1 How these blade-points were made

The primary research question was concerned with using experimental production to outline the stages of blade-point production. Section 3.1 of this chapter posited a shift in perspective. This shift involved thinking about blade-point production in terms of phases that can sometimes overlap and repeat. To

answer the question directly: blade-point production has been glossed here as a six phase process.

3.4.2 Formal and metric characteristics

The second question was concerned with the formal and metric characteristics that can be usefully employed to identify each of these heuristic phases within the archaeological record. Again to answer the question directly: from the six phases ten key identifiers have been presented, six from the first five phases and four from the final phase. The details have been presented in sections 3.2 and 3.3 of this chapter and are summarised in Table 3.69.

Phase	Function	Debris	Characteristic
1	Testing the nodule's flint quality	Flakes and shatter	Large cortical hard hammer flakes
2	De-corticating the nodule to form a blade core	Flakes and shatter	Medium cortical hard hammer flakes
3	Removing blades from the core	Blades	Non-cortical soft hammer blades
		Flakes and shatter	Small non-cortical soft hammer flakes
4	Longitudinal core maintenance and correction	Flakes and shatter	Small hard hammer problem bearing flakes
		Blades	Non-cortical hard hammer blades
5	Transverse core maintenance and correction	Flakes and shatter	Small non-cortical hard hammer problem bearing flakes
6	Blade-point production	Linear sequential	Flakes with perpendicular dorsal scar patterns, probable low EPA
		Vertical sequential	Flakes with ventral and dorsal scar pattern trending in the same direction
		Bulb avoiders	Flakes and bladelets longitudinally asymmetrical and transversely twisted
		Ridge followers	Flakes and shatter longitudinally asymmetrical and heavily worked proximal

Table 3.69. Matrix linking phase, function, debris types and characteristics.

However, discrepancies between these results and the archaeological record (e.g. archaeological faceted platforms versus experimental plain platforms) suggest it would be unrealistic to accept these outcomes on face value. However I would argue that each component phase in fact offers differing opportunities and values.

3.4.3 The value of phase six

As discussed, there are clear differences between the experimental and archaeological blades. As such it can be argued that the experimental process described here is more indicative of a general blade manufacture and simply reflects the particular approach of this knapper. I would agree to a certain extent with this critique but add that the data is still generally valuable for fulfilling Campbell's aim of delivering overall quantitative data on an EUP production process. Aspects such as: flake size in relation to degree of cortex; flake width to depth ratio; the chronology of blade production can all be usefully integrated into an understanding of the particular process of EUP blade-point production. In addition the final phase of blade-point production has been more tightly constrained by metric, formal and typological criteria. As such the findings from this final phase are argued here to be more likely to be representative of blade-point production as found within the archaeological record. This is because the metric, typological and formal constraints have effectively reduced opportunities for variance. It can be argued that the first five phases and their associated variance can perhaps be of most value when attempting to comprehend possible meanings underlying the heuristic phases presented. The experimental knapper was explicit about his approach, and gave an explanation for each of his phases, and these have been outlined. However the discrepancies described between the

experimental and archaeological materials suggest some of these explanations are incorrect in relation to the archaeological process, and therefore need interrogation. The issues that will be interrogated are: material quality; opposed platform production; and the platform type on blades.

3.4.4 Material quality

Breakage within experimental production endorsed the notion that homogeneity of material was an important factor in allowing blades of length to be consistently produced with some degree of confidence. What was reflected within the five days of experimental production was that Karl Lee can experience difficulties accessing homogenous quality materials. What is perhaps less obvious is how this may have unconsciously influenced his methodological approach. I have worked with another flint knapper, John Lord who lives in Norfolk, an area rich in flint. With easy access to good quality flint Lord's explicit approach, when making a tool, was to address the most difficult aspects of production as early on as possible. If problems occurred he could abandon the piece and start again on a new nodule or flake, thus working in a time efficient manner (Lord, pers. comm.). When I discussed this approach with Lee he recognised an underlying logic, however did not accept the assumption that people in the past may necessarily have had good access to raw materials. Lee lives in Gloucestershire in the west of England, not a flint rich area, and his preferred approach was to persevere with pieces that went wrong, adopting a more resource efficient strategy. Obviously both knappers' preferred tactics are valid in different contexts (see Binford and O'Connell 1984). What is interesting however is how their personal style and method correspond to their respective abilities to access good quality flint. In relation to this project, Lee continued to

use large early stage removals over the first three days, even after we had discussed how they were not metrically suited for purpose, and doing so disrupted the debris signature I was attempting to capture. I believe difficulty in accessing good quality materials may have unconsciously contributed to the knapper's difficulty in moving away from a 'resource efficient' approach. This leads directly to the next issue for discussion, that of opposed platform production.

3.4.5 Opposed platform production

As discussed, one argument for using opposing platforms is that it produces relatively straight blades (Jacobi, 2007: 235). Lee, using predominantly single platform production created blade-points close in form to the museum pieces and relatively straight. However, his initial blades were variable and it was through subsequent retouch that straight blade-points were produced. This suggests that true or proactive opposed platform production may well produce straighter blades but was not a necessity in order to produce blade-points with a straight longitudinal profile. Jacobi (1990: 271) also argued that opposed platform production can also have been a pro-active core management tactic, as the regular use of both platforms allows problems to be corrected at an early stage. If this is the case then the archaeological materials bearing evidence of opposed platform production may be signalling a preoccupation with proactive core maintenance, and as such a strategy to ensure future blade core productivity. This notion may be related to a third and final discrepancy.

3.4.6 Faceted and plain platforms

As already discussed, the platforms on blades within the Beedings collection were clearly faceted (e.g. Jacobi 2007: 235 Fig. 3). This faceting was discussed with the knapper before production and in response core platform preparation in the form of abrasion and trimming did take place. However of the eleven experimentally produced blades, nine had plain platforms (Table 3.17). This indicated some technological variance between the experimental and archaeological methods of blade production. Faceting is a platform preparation method that takes removals from the core striking platform thus creating a desired micro-topography. It is generally argued that the aim of this micro-topography is to provide a contact surface that will enhance the predictability and accuracy of blade removal. Within later periods this process has been associated with the use of indirect percussion. Jacobi (2007: 270) had already drawn a link between pieces from Beedings with crushed platforms and their possible use to improve the positioning of blows when removing blades from cores. It may be useful to think about this technological variance in relation to the previous discussion on opposed platform production. Faceting could be argued to be a further tactic used to promote successful and accurate blade removal, providing precision and control. These actual differences in technology would suggest clear underlying differences between the experimental and archaeological knapping contexts of production, which in turn influenced choice of technological approach. It is therefore necessary to explore the modern knapper's context.

3.4.7 Performance and audience satisfaction

Knapping today has primarily an educational role, and a key component of the knapper's toolkit is the ability to engage with an audience, be it academic researcher, museum visitor or bush-craft enthusiast. A key skill is linking the production process with an explanatory dialogue, and importantly producing an end product provides conclusion to the dialogue, a happy ending. As discussed above, Lee was keen to produce blade-points from early stage removals and single platform cores. These choices allowed results to be achieved earlier in the prescribed process, and fitted well with how I have observed him work within a demonstration context. Furthermore his blades were variable in size as illustrated by the low proportion of within parameter pieces produced. It would seem that working through the prescribed technological process did not fit easily with this performative aspect. The fact that I was filming throughout may not have helped. It seems obvious that the social and 'economic' context of a modern flint knapper and Palaeolithic hunter are very different. Observation, discussion and reflection have helped me to understand the particularities of a modern knapper's 'economic' context and the import of engagement and performance within it. Through dialogue over a number of days we made a shift from a performance and type product emphasis (both mine and his), to more of a technological exploration with less focus upon *immediate* outcome. I believe that the knapper's drive for using primarily single platform production and manufacturing blade-points from very early removals, were both related to an underlying desire to produce results as part of this modern performative process. Consequently it is argued here that the differences between the experimental and archaeological artefacts discussed are in fact illustrating differences in the respective producer's underlying aims and approaches. If the

modern knapper's approach was designed to produce end products early on in the process, perhaps conversely the Palaeolithic knapper's method was designed to facilitate the production of end products at a later time and place. This idea of present and future orientation may in fact illustrate one fundamental difference between the economic context of a modern day knapper and Palaeolithic hunter. It is interesting then to integrate these observations with my own experience of how my own understanding developed.

3.4.8 Archaeological implications

As discussed my own understanding of the production process shifted from a linear three stage process to a more cyclical six phase model. Whilst Jacobi (2007: 271) had already observed that core correction was occurring throughout the process, this only became obvious to me through discussion with, and observation of the knapper. Consequently my understanding changed from 'production' to one of 'reproduction'. It is argued here that the selection of high quality materials, 'true' opposed platform production, and faceting of core striking platforms all point towards a 'future' orientation with an emphasis upon preparation to enhance predictability and control of the blade production process. These were factors not underlying the experimental work for the reasons outlined above. However the cyclical and repeated processes involved in core maintenance; correction and blade production was evident within the archaeological materials as well as the experimental process. Cores seemed to offer a punctuated productivity via repeated knapping cycles, and the tactics described seem to be inherently future orientated. This suggests that opposed platform blade cores under discussion may have temporal, spatial and behavioural implications and these issues will be discussed within chapter seven.

3.4.9 Chapter conclusion

The research question this chapter was designed to explore how blade-points were made, and why they were made in the way they were. In examining how they were made, it became apparent that the blade production process is cyclical and therefore the term 'phases' is more appropriate than 'stages' when discussing this technology. Within this cyclical framework, formal and metric characteristics for each of six heuristic phases have been outlined, thus presenting a complete experimental model of blade-point production. Within the final phase of transforming blades into blade-points, four significant micro-*debitage* characteristics were recognised. Because these characteristics are tightly tied to blade-point form, they should find correlates with *debitage* produced during EUP blade-point production. In relation to why blade-points were made in the way they were, comparative analysis between experimental and archaeological blade-points showed that opposed platform production was not necessary to produce flat blades. Therefore in the past it was probably a proactive core maintenance strategy. Consequently, the archaeological presence of opposed platform production, faceted platforms, and the use of good quality homogenous materials are all interpreted here as Palaeolithic strategies to predict successful blade production at some future point in time. In fact, the evidence discussed within this chapter suggests that archaeological blade-point production was an inherently future orientated process. To build upon this experimental model of production the next chapter will explore artefact 'afterlives' through an examination of typological, formal and metric variation within the corpus of type fossils from Britain.

Chapter Four

Archaeological type fossil

heterogeneity

This chapter addresses the second research question by examining how and why archaeological type fossils vary from each other: typologically, metrically, and formally. Typological variation divides a leaf-shaped form into two sub-categories: leaf-points and blade-points. Chapter one outlined how technology of production and patterning of retouch are both used to define type. In this chapter metric variability is explored via length, width and depth measurements. Formal variation has two aspects: overall ratios of differing metrics on an individual artefact, and obvious difference in shape within the same typological sub-categories. This chapter has a four part structure with the first part exploring ideas about typological variation and evidence of leaf-point manufacture. The second part discusses metric variability between blade-points. The third part examines blade-point formal heterogeneity and the final section is discursive, answering the research question with an alternative model to explain type fossil heterogeneity. This process begins by reviewing typological variation in relation to leaf-points.

4.1 Typological variation and leaf-points

Leaf-points and blade-points are seen as components belonging to the same technology having been found together within the same contexts at Ilsehöhle in Germany and Nietoperzowa Cave in Poland (Jacobi 2007: 278, 280). On stratigraphic grounds leaf-points and blade-points have been explained in evolutionary terms, with leaf-points being replaced by blade-points (Kozłowski 1990). This argument is based upon materials from Layer F of Weinberghöhlen, at Mauern in Germany which contained leaf-points associated with Middle Palaeolithic technology (Jacobi 2007: 280). Within this evolutionary schema Mauern is followed by a more balanced situation at the Ilsehöhle (Ranis 2, Layer X) where both variants were found together and leaf-points just outnumbered blade-points (*ibid*). At Nietoperzowa a large amount of blade-points and small number of leaf-points were recovered from layers 6 and 5a, with only a small number of blade-points recovered from the youngest layer 4 (Flas 2008: 149). In contrast to this evolutionary schema, both Jacobi and Flas have put forward a material explanation, arguing that tabular flint was ideal for the production of leaf-points whilst blade production was an efficient way of producing blanks from irregular shaped nodular flint (Jacobi 2007: 247; Flas 2011: 611).

In Britain only 21 EUP leaf-points have been recognised of which eight can be classed as complete. None have any real stratigraphic context which provides some challenges when attempting to understand meanings behind typological difference. Because of the small quantities involved it was artefacts not seen or much discussed by previous researchers that were targeted for review.

Consequently, the site of Bramford Road in Suffolk was important because exceptionally, it contained evidence of leaf-point production (Jacobi 2007: 286). Furthermore, Damien Flas was not able to gain access to, or include this collection within his analysis. Accordingly, the Bramford Road materials are used here to explore intra leaf-point variation. It is within this context that my analysis is situated.

4.1.1 Artefacts available

As well as being few in number, the leaf-points discussed here are dominated by proxy technical illustrations and in one case a scaled photograph (Table 4.1).

Illustrations	12
Artefacts	8
Not recorded	1
Total	21

Table 4.1 Sources used to record leaf-points form and metrics.

Whilst eight have been categorised as having over 90% present (Table 4.2) and therefore 'complete', a total of 15 fragmented examples had over 50% present and were useful for width and depth calculations. However, one illustration did not provide complete data and so 13 have been used to provide width and 12 depth measurements. Consequently, the derived average simply reflects what we are left with.

100%	4
95%	3
90%	1
70%	2
50%	5
45%	3
25%	3
Total	21

Table 4.2 Total leaf-points degree of completeness.

Leaf-points	Completeness
Bramford Road 3	100%
Kent's Cavern	100%
Sutton Courtnay	100%
White Colne Pit	100%
Brighstone	95%
Cross Bank	95%
Igtham	95%
Soldier's Hole 2	90%
Robin Hood's Cave	70%
Soldier's Hole 1	70%
Bramford Road 4	50%
Golden Cross	50%

Table 4.3 Leaf-points >50% complete useful for width:depth metrics.

4.1.2 Derived average

The above corpus was used to calculate an average size from the British materials, and whilst larger than previous researchers' figures (Flas 2006: 178), it illustrates the same phenomenon. Bifacial leaf-points are on average larger than blade-points.

British leaf-points average		
Length	119mm	(n=8)
Width	52mm	(n=13)
Depth	10mm	(n=12)

Table 4.4 Average derived from British leaf-points for this study.

Continental leaf-points average		
Length	114mm	(n=13)
Width	44mm	(n=25)
Depth	10mm	(n=28)

Table 4.5 Average derived from continental leaf-points by Flas (2006 178).

4.1.3 Metric variation

>90% complete leaf-points	Length	Width	Source
Cross Bank	215	77	Artefact
Sutton Courtney	160	88	Photograph
Bramford Road 3	139	58	Artefact
White Colne Pit	103	33	Illustration
Brighstone	92	31	Illustration
Ightham	83	49	Illustration
Soldier's Hole 2	82	49	Illustration
Kent's Cavern	74	46	Artefact

Table 4.6 Leaf-points >90% complete ordered by length.

However, this average disguises the fact that the largest complete piece from Cross Bank is almost three times longer than the smallest complete example from Kent's Cavern. Because of its lack of context Flas (2006: 77) categorised the Cross Bank piece as 'hypothetically' EUP. This was in contrast to John Wymer (1985: 381) and Jacobi (1990: 277) who both saw it as Palaeolithic because of its patina. Within this analysis it is classed as EUP because it mirrors the large size of some of the pre-forms recognised at Bramford Road, as well as some of the larger blade-point fragments such as that from Town Pit. To acknowledge and explore this size differential the approach taken needs to be made explicit. Within the first chapter, John Campbell's amalgamated EUP category included both Aurignacian and Gravettian material along with the Lincombian artefacts discussed here. However in spite of these inclusive totals he expressed disappointment in the value of statistical approaches because of the quantitatively small size of the corpus (Campbell 1977: 156). The research within this thesis deals with only a subset of Campbell's overall quantitative total and so a focus upon individual artefacts has been developed. Consequently when scatter plots and trendlines are used here it is to provide a general illustrative

context for individual artefacts. The small total quantities available limit any real analytical value. The leaf-point discussion starts with the largest artefact within the corpus from Mildenhall in Suffolk.

a. Cross Bank

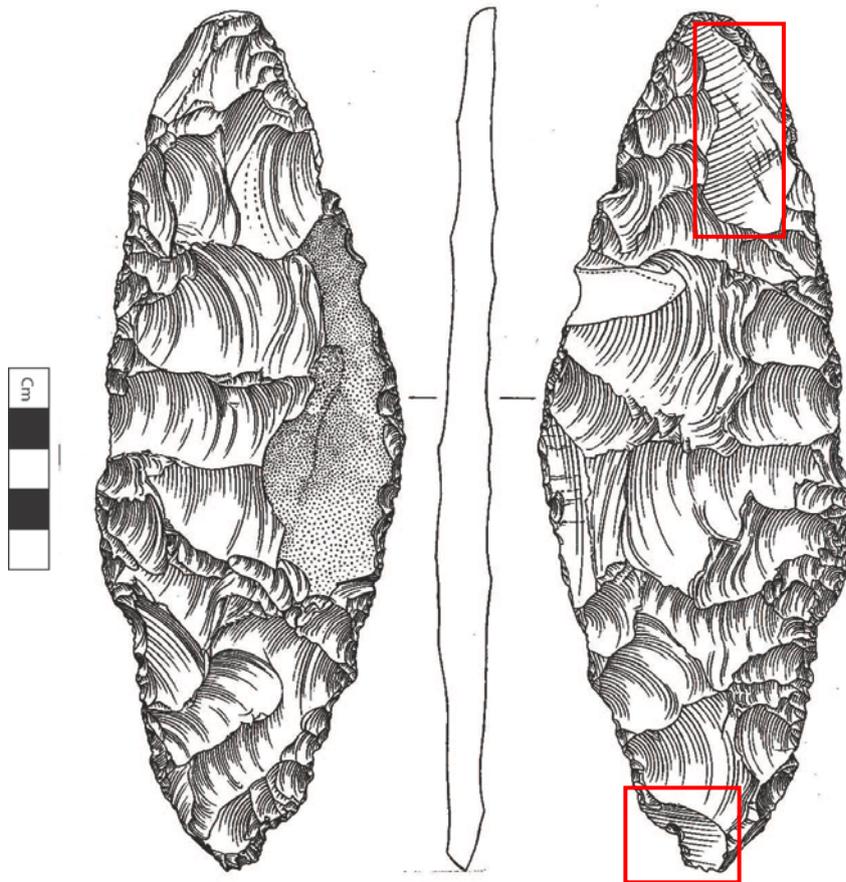


Fig. 4.1 Cross Bank leaf-point (215x77x14mm) (Jacobi and Higham 2011: 185, Fig. 11.2).

This piece is large, lenticular in cross section and bi-pointed (Fig.4.1). In relation to the length:width ratio it is narrow, with cortex on the dorsal surface and two sections of an original ventral face present (red boxes). Perhaps because of the size Jacobi suggested it was produced on a thermally detached blade (PaMeLA). However, invasive transverse removals on the medial section of the dorsal

surface seem to have been aimed at removing cortex and Flas (2006: 77) suggested the flint was tabular.

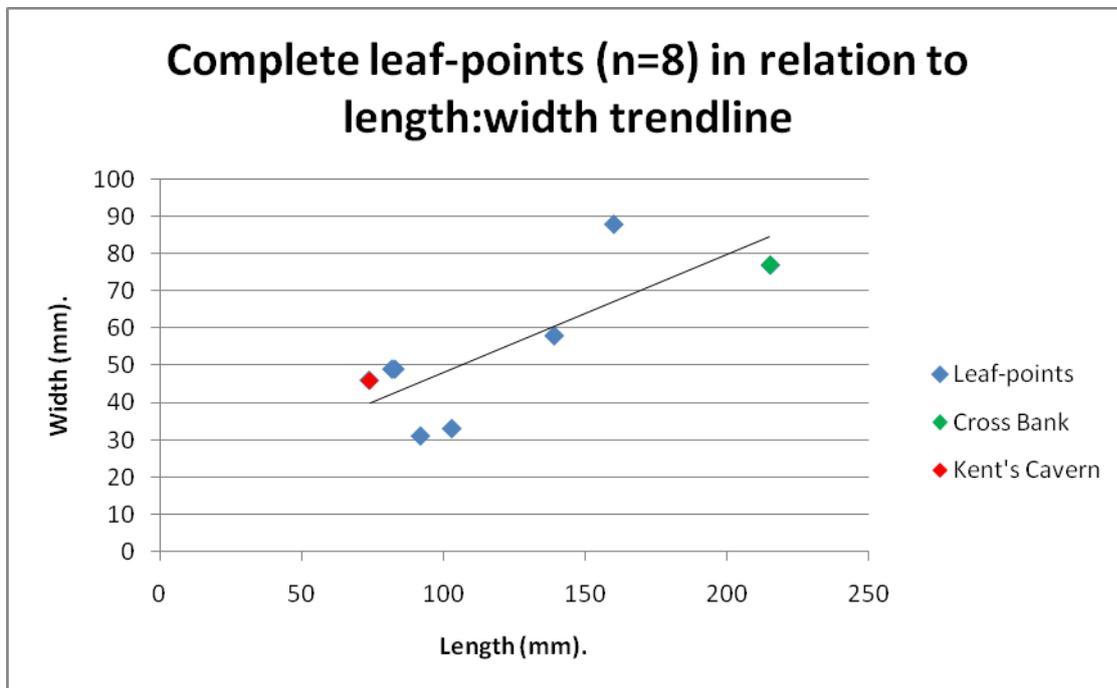


Fig.4.2 Illustrating the large degree of variance between the longest Cross Bank piece in green and shortest Kent's Cavern leaf-point in red.

b. Kent's Cavern

The shortest example was from Kent's Cavern in Devon (Fig.4.3). It measured 74x46x11mm and in contrast to the longest piece sits slightly above the trend line for width (Fig.4.2). Whilst the Cross Bank piece was long and narrow, this piece was short and wide.

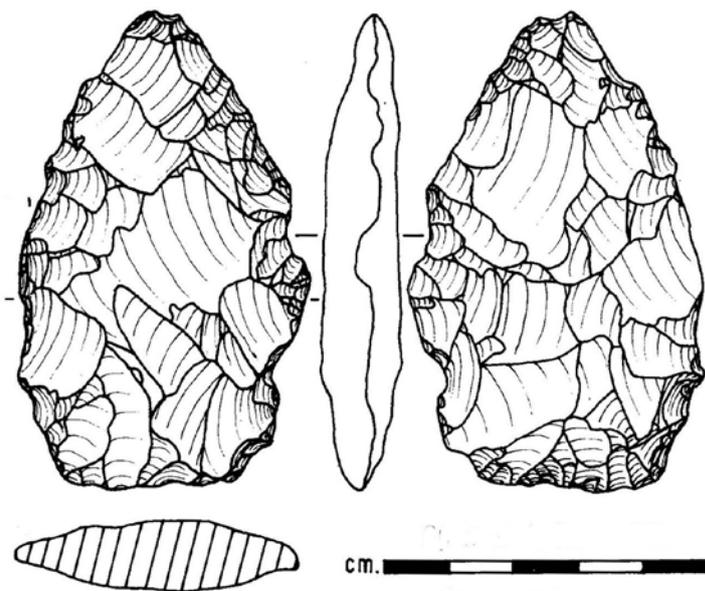


Fig.4.3 Kent's Cavern leaf-point (Campbell 1977, Vol.2: 236, Fig.86.2).

Jacobi (2007: 281) called this "a slightly unusual fully bifacial point", probably referring to the flattened base which is reminiscent of the break on a fragmented leaf-point from Robin Hood's Cave, Creswell Crags (Fig.4.4).

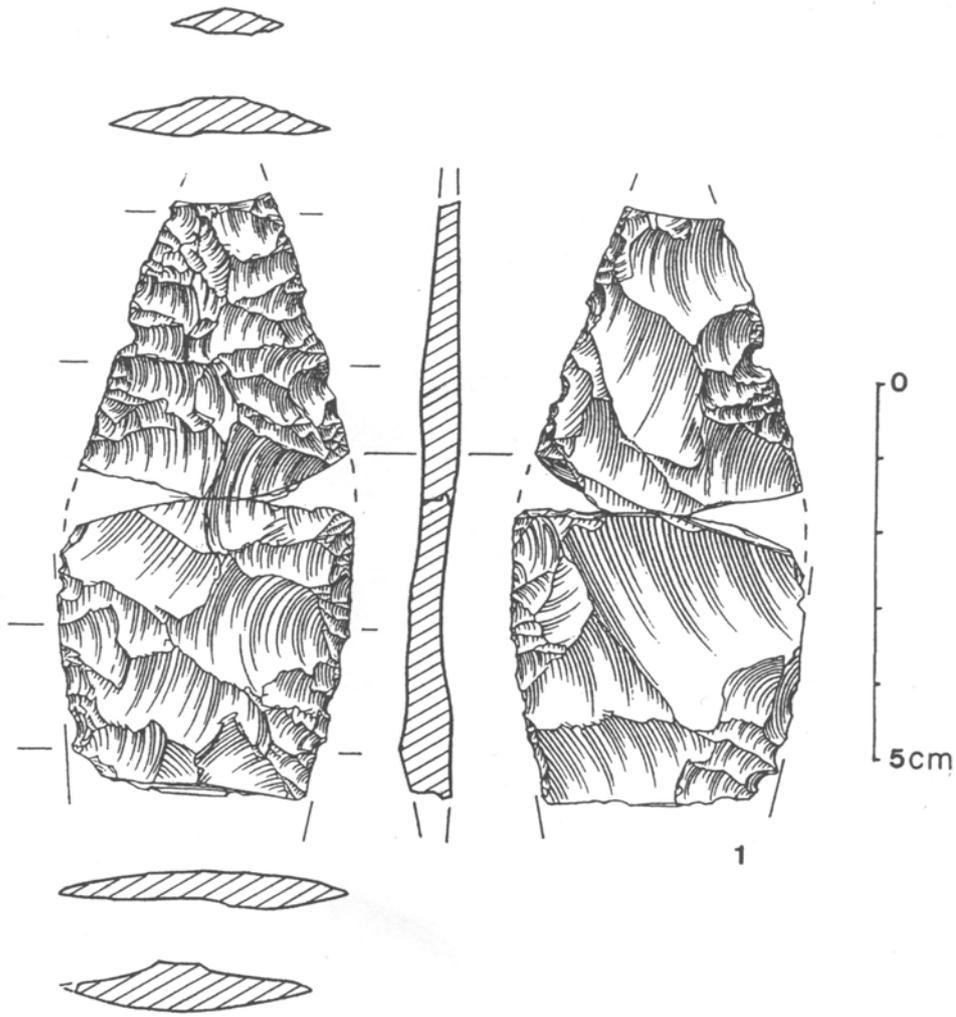


Fig.4.4 Robin Hood's Cave fragmented leaf-point (Jacobi 2007: 293, Fig.51.1).

This formal similarity suggests that the Kent's Cavern leaf-point may have been damaged and subsequently re-shaped. To explore this idea width and depth were analysed (Fig.4.5).

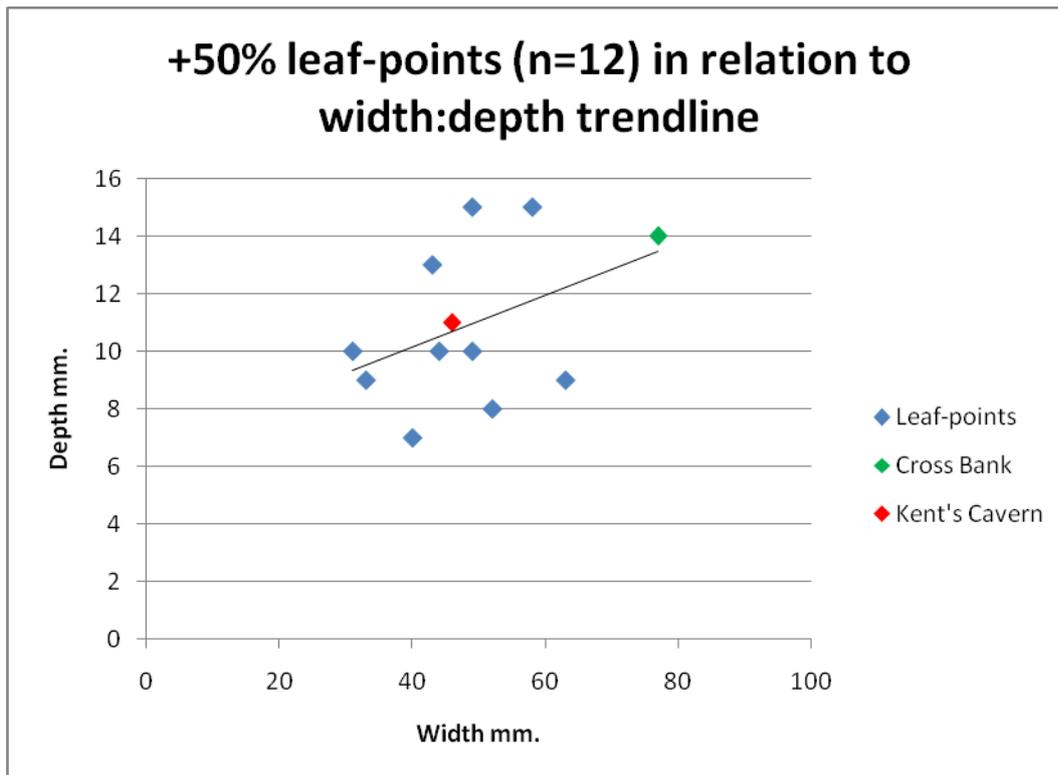


Fig. 4.5 Width:depth trendline with Kent's Cavern leaf-point in red.

Although shortest in length the Kent's Cavern piece sits towards the middle of the width grouping. Along with its shape, this reinforces the idea that the length is anomalous. Flas (2006: 25) has drawn attention to the formal similarity between the base on the Kent's Cavern piece and a proximal leaf-point fragment from Paviland Cave (not seen by this author). Seven of the eight leaf and blade-points recognised from Paviland were heavily fragmented and five were produced on local materials. Paviland is further west and like Kent's Cavern is in a flint poor area. Together these formal and geographical factors support the notion that the "*slightly unusual*" base on the Kent's Cavern piece is indicative of breakage and subsequent repair. The flintknapper Karl Lee (pers. comm.) commented upon the practical difficulties of hafting such a reduced piece, and saw the edge notching apparent on the illustration around the widest points as facilitating that function. Consequently, the Cross Bank and Kent's Cavern pieces

are seen here as representative of differing ends of a leaf-point production and repair spectrum. This notion of production and repair is developed by reference to the leaf-point materials from Bramford Road in Suffolk.

c. Bramford Road leaf-point 1



Fig.4.6 Bramford Road leaf-point 1 (Photograph: author; Moir 1931: 198 Fig.21).

This leaf-point was published by James Reid Moir (1931: 198) and following Garrod, he classed it as a great Solutrean blade. It is a distal section with perhaps 45% present (Fig.4.6). However, in spite of having no proximal or medial section including it illustrates its anomalous thickness in relation to other pieces. The fragment measured 104x77x22mm and the width:depth scatter-plot for >45% complete pieces shows it to be an outlier (Fig.4.7). The thickness and crude form suggest it is likely to be a pre-form damaged and discarded during manufacture.

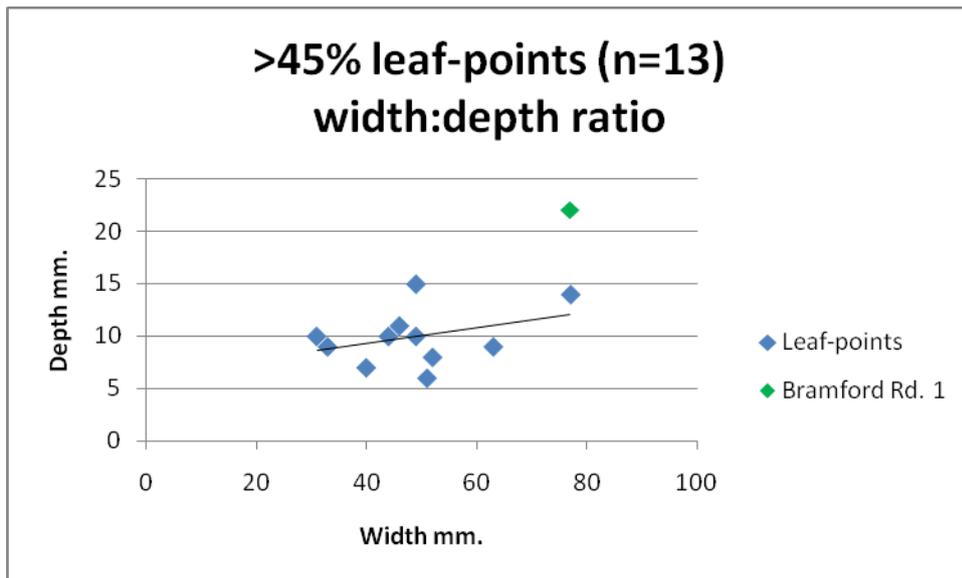


Fig.4.7 Illustrating the anomolous thickness of Bramford Road leaf-point 1.

d. Bramford Road leaf-point 3

This notion is supported by an examination of leaf-point 3, apparently complete and measuring 13x58x15mm.

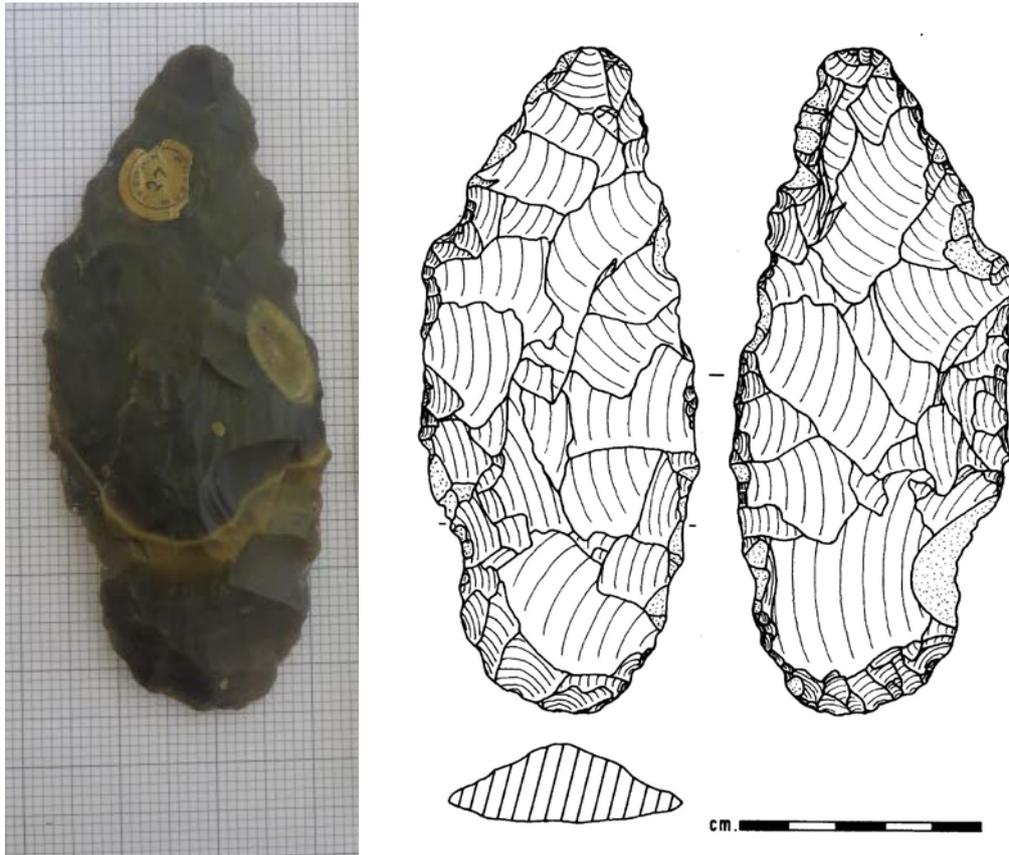


Fig. 4.8 Bramford Road leaf-point 3 (Photograph: author; Campbell 1977, Vol.2: 256, Fig.106).

When contrasted with the other >50% pieces, this leaf-point is one of the thickest examples (Fig.4.9).

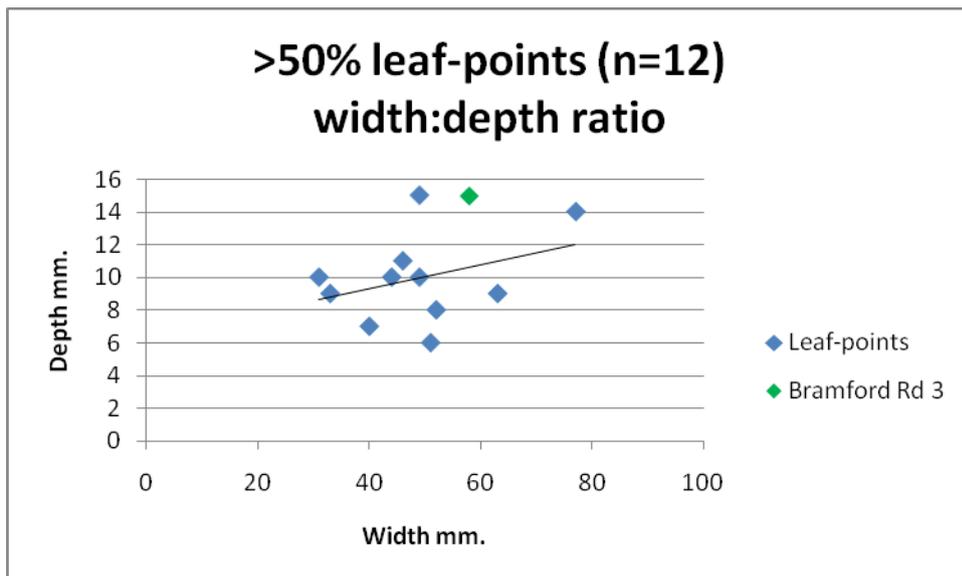


Fig. 4.9 Bramford Road leaf-point 3 contrasted with >50% elements.

Above average in all dimensions and crude in form, this example seems also to be unfinished. Jacobi observed a lack of edge retouch, but acknowledged that because it was heavily damaged, edge-retouch may have been destroyed. He also drew attention to a series of step fractures on the dorsal surface and suggested that it may have been discarded because of difficulty applying further thinning (Jacobi Archive: Bramford Road). Flint-knapper Robert Turner (2013: 32) has described how thinning bifacial tools is the most challenging aspect of their production. John Lord (pers. comm.) has emphasised, that for him, it is important to deal with the most difficult aspects of the tool's production first. If unsuccessful he can simply discard the piece and begin again with another nodule or flake. In other words, in a resource rich environment Lord works in a time efficient manner. This approach would leave a debris signature of incomplete pieces with 'problems'. This idea of discarded attempts at leaf-point manufacture is supported by two further pieces that have been interpreted by Jacobi as 'in progress', and discarded because of breakage (Jacobi Archive: Bramford Rd.).

e. Bramford Road pre-form 1

This piece was categorised by Jacobi as a pre-form (ibid). With over 50% present it measured 135x67x26mm and as such was again very thick.

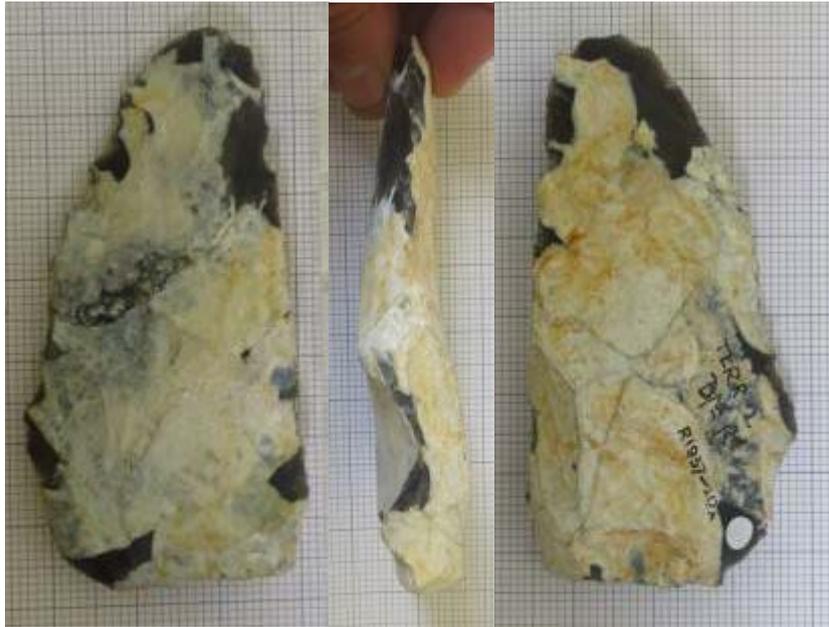


Fig. 4.10 Bramford Road pre-form 1 (Photograph: author).

The longitudinal profile shows how this has a hump on the dorsal surface that will need thinning in order to bring it into the required form (Fig.4.10). The patinated break indicates ancient damage and because of its coarse and unresolved form it is again probable that the break was due to production (Jacobi Archive: Bramford Road).

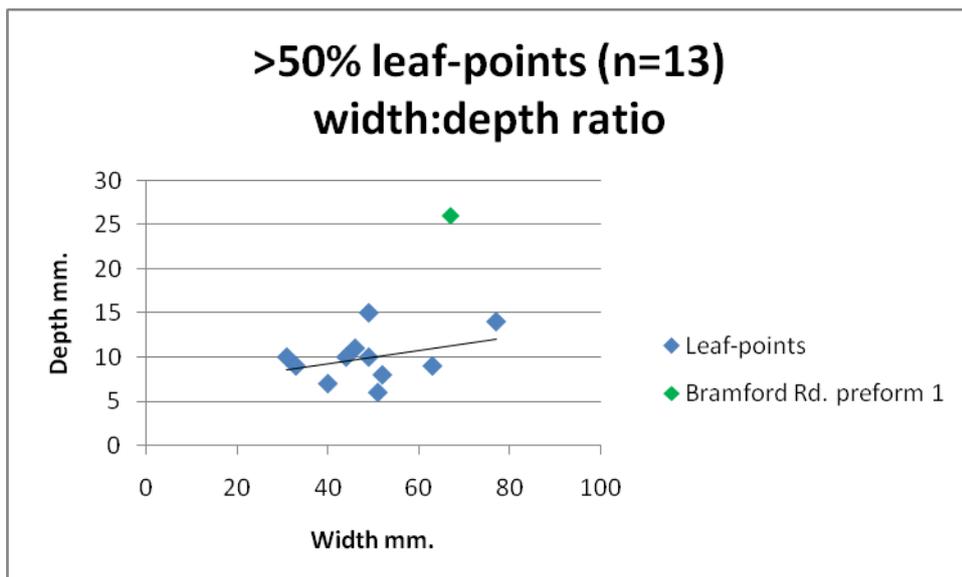


Fig.4.11 Scatter-plot illustrating the anomolous thickness of Bramford Road pre-form 1.

f. Bramford Road pre-form 2

A second example seems to be in an even more undeveloped state. Measuring approximately 180x74mm, the depth was difficult to gauge due to its undulating form (Fig.4.12).



Fig.4.12 Bramford Road pre-form 3 made upon tabular material (Photograph: author).

Jacobi called this a leaf-point pre-form made on tabular flint. He supported this assertion by drawing attention to the steep breaks along the left hand margin that would provide platforms for transverse thinning. He also thought the transverse break halted reduction (Jacobi Archive: Bramford Road). The character of this piece is similar to that of the Cross Bank example, and supports Flas' observation that the latter was also produced on tabular flint.

g. Bramford Road pre-form 3

The final example has again been categorised as a leaf-point pre-form.

Measuring 61x46x20mm, this apparent distal section is thick with a lenticular

profile (Fig.4.13). It is similar in shape and form to leaf-point 1 and as such classed as 45% present.



Fig.4.13 The final leaf-point pre-form from Bramford Road (Photograph: author).

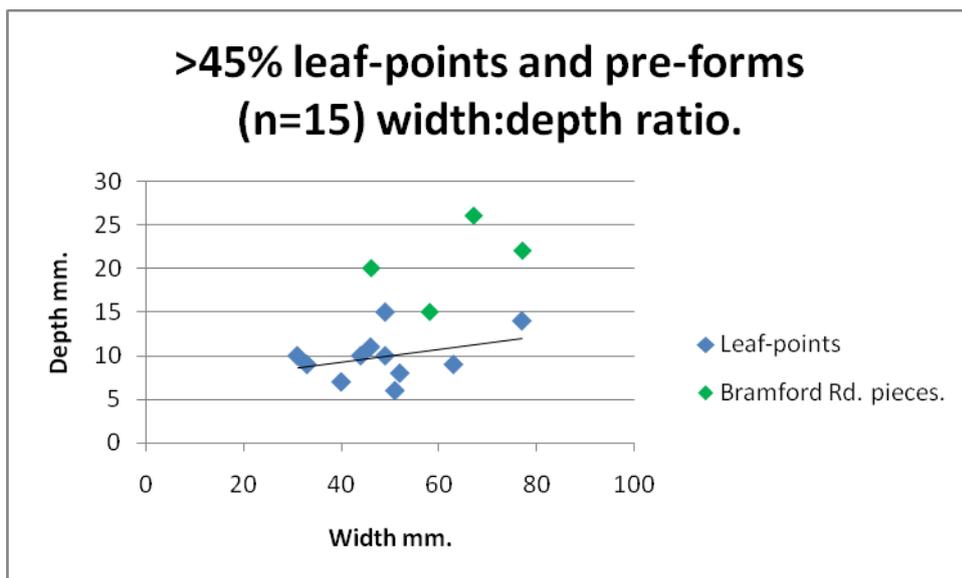


Fig.4.14 The anomolous thickness of these Bramford Road pieces.

If this piece is included in the scatter-plot along with the other three >45% Bramford Road artefacts (Fig.4.14), it is clear that all fall within the width criteria, but are disproportionally thick.

At least two of the purported rough-outs have step fractures on the dorsal surface indicative of problems related to thinning. All are crude in form and three have been broken and apparently discarded. All these factors are congruent with Jacobi's interpretation of leaf-point rough-outs broken during production.

4.1.4 Interpretation

The aim of this analysis has been to comprehend why leaf-points vary from each other typologically, formally and metrically. Typologically, the largest leaf-point and one of the pre-forms seem to have been produced on tabular flint. This endorses to some degree previous researchers ideas relating to a raw material package (Jacobi 2007: 247; Flas 2011: 611). Formally, the differing shapes of the largest and smallest pieces are indicative of production and repair respectively. In relation to metric variance these same two pieces introduce the idea that size may be related to a geographic area or location, and possibly availability of materials. However, geographically the overall distribution of leaf-points indicates there to be approximately equal quantities within flint and non-flint areas.

4.1.5 Flint and non-flint areas

Flint occurs within cretaceous chalk beds and in Britain these areas can be generalised as occurring within the south and east of the country (Fig.4.15).

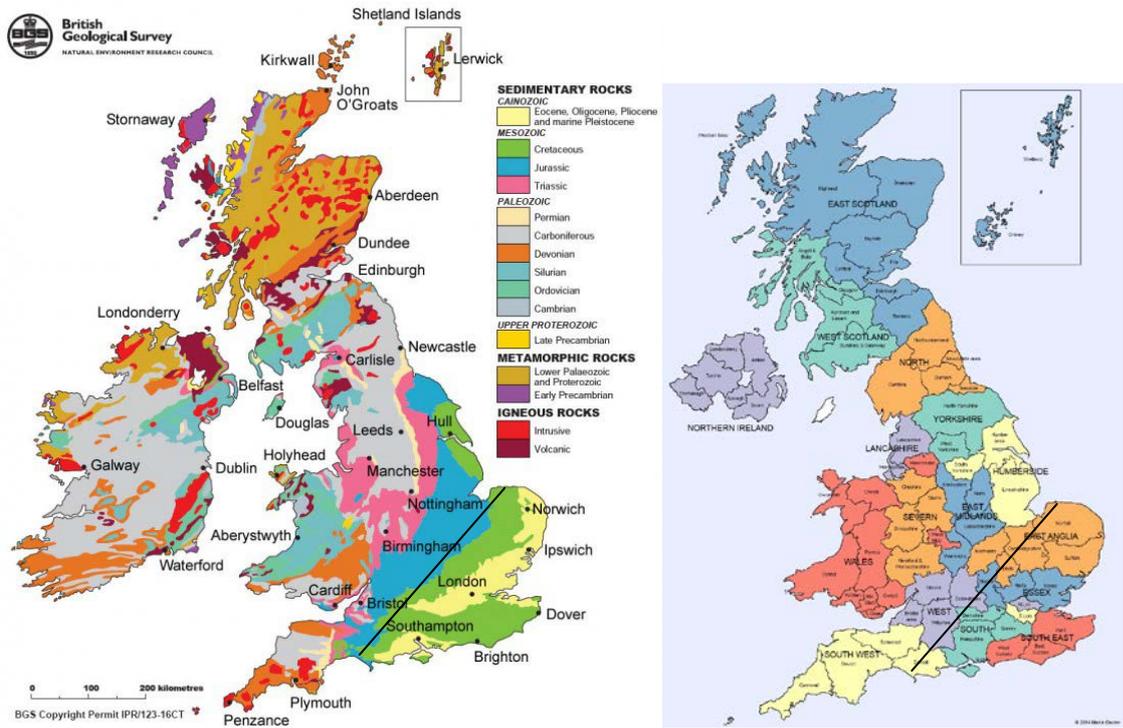


Fig. 4.15 Cretaceous chalk zones of the south and east related to areas and counties of Britain. Geological map of the UK and Ireland. IPR/123-16CT British Geological Survey © NERC. All rights reserved.

Flint does not occur in all chalk beds, and conversely, can be accessed in non-cretaceous zones in the form of glacially deposited nodules. Furthermore there is also a cretaceous zone along the Lincolnshire coast. However taking these caveats into consideration, it is still largely correct to say that the main cretaceous zones within Britain fall to the Southeast and East of the country. This generalisation is useful because it allows us to recognise how this basic geological division corresponds with the relative sizes of the largest and smallest leaf-points. However, as observed above, quantitatively leaf-points seem to be equally present in cretaceous and non-cretaceous areas.

Leaf-points	Area	Cretaceous
Beckford, Worcestershire	Severn	No
Bramford Rd 1, Suffolk	East Anglia	Yes
Bramford Rd 2, Suffolk	East Anglia	Yes

Bramford Road 3, Suffolk	East Anglia	Yes
Bramford Road 4, Suffolk	East Anglia	Yes
Brighstone, Isle of Wight	South East	Yes
Cross Bank, Suffolk	East Anglia	Yes
Eastall's Pit, Suffolk	East Anglia	Yes
Golden Cross, Sussex	South East	Yes
Igtham, Kent	South East	Yes
Kent's Cavern, Devon	South West	No
Osney Lock, Oxford	West	No
Paviland Cave, Swansea	South West Wales	No
Robin Hood's Cave, Derbyshire	East Midlands	No
Soldier's Hole 1, Somerset	South West	No
Soldier's Hole 2, Somerset	South West	No
Soldier's Hole 3, Somerset	South West	No
South Hams, Somerset	South West	No
Sutton Courtnay, Oxford	West	No
Temple Mills, Kent	South East	Yes
White Colne Pit, Essex	Essex	Yes

Table 4.7 Leaf-points to counties, regions and cretaceous areas.

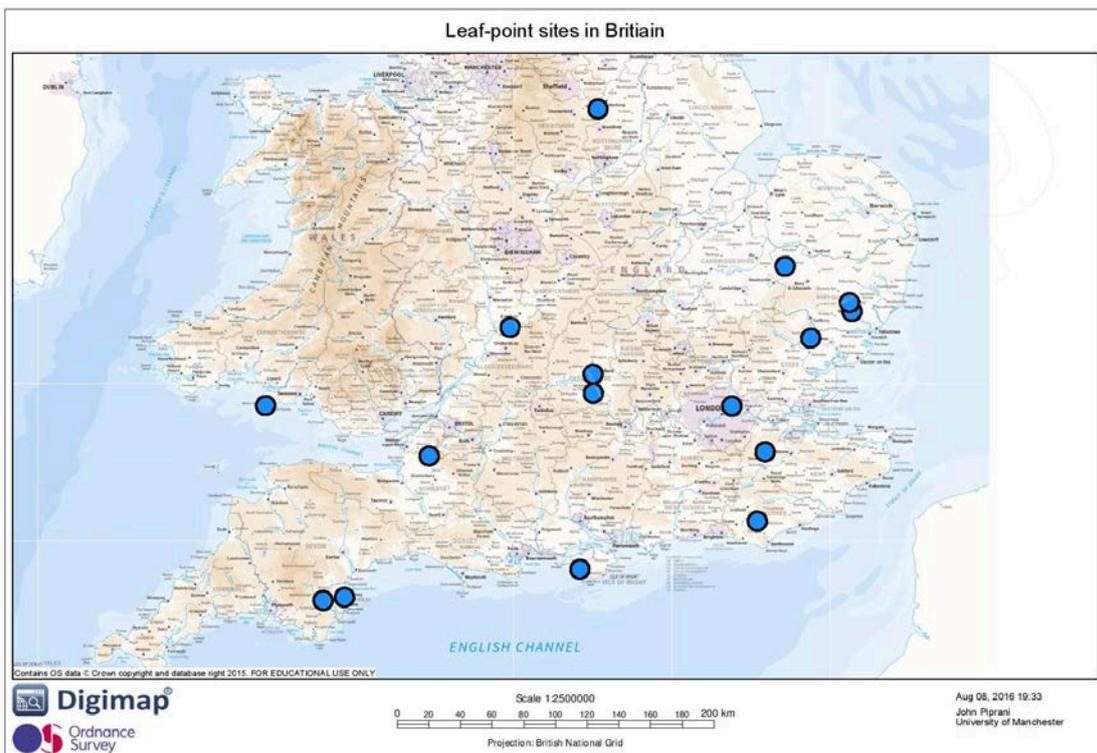


Fig. 4.16 Map showing leaf-point site distribution across Britain © Crown Copyright and database rights 2015. Ordnance Survey (Digimap Licence).

Cretaceous	11
Non-cretaceous	10
Total	21

Table 4.8 Total of leaf-points to cretaceous and non-cretaceous areas.

Of the 21 leaf-points under discussion, there are approximately equal numbers recovered from cretaceous and non-cretaceous areas (Fig.4.16; Table 4.8).

However if we accept the three pre-forms from Bramford Road this increases the total number of cretaceous examples to fourteen, and Bramford Road examples to seven. To explore this predominance it is necessary to discuss the area's geology.

Bramford Road is in Ipswich which itself sits within the Gipping Valley, an area important for geological research into relative chalk bed successions, along with the presence and types of flint. Ipswich is underlain by boulder clay which is the result of glacial deposit. Directly below this glacial material is up to 8.5m of soft, flint-rich chalk. This flint rich chalk sits on top of the more common and flint-less Blakenham Chalk Member. The flint-rich chalk is categorised as the Culver Chalk Formation linking it to that in Sussex and the south coast. This formation contains large flint nodules that are tabular in the upper sections (British Geological Survey 2016). The oldest and flint-less Blakenham chalk beds are exposed to the west and inland, whilst the Culver horizons increase towards the east and the present coastline (Woods et al. 2012). These two chalk horizons overlap and are thickest below Ipswich where the River Gipping has cut through the landscape and exposed a series of bedrocks. As the flint rich Culver chalk beds expand eastwards, the most relevant flint source during the Palaeolithic would probably have been an extension of the Gipping Valley now submerged

below the North Sea, perhaps what is referred to now as the Harwich deep water channel (Woods et al. 2007: 348, 350, 356; Woods et al. 2012). It would seem likely that tabular flint from the upper sections of the Culver Chalk Formation was probably exposed and available from the valley sides that are now submerged. If this lower area provided access to tabular flint, this may explain the predominance of leaf-point pre-forms recovered from the upper sections of the valley at Bramford Road.

4.1.6 Behavioural implications

If this archaeological and geological evidence is accepted, the leaf-points from Bramford Road can be seen as proxies for human movement from the lowland east to the upland west through the Gipping Valley. The largest Cross Bank leaf-point was recovered further inland at Mildenhall which is an area where tabular floorstone outcrops (Turner 2013: 132). That this leaf-point is relatively finished in relation to the Bramford Road pieces suggests that a large size was desirable when tablets of flint allowed leaf-points to be produced beyond the limitations imposed by blade cores. This fits well with the observation that on average leaf-points are metrically larger than blade-points, and also with Toby Morrow's insight (1996: 588) that larger artefacts have a longer use life because of a greater capacity for both re-sharpening and repair. Morrow's ethnographic observations seem to be reflected by the largest and smallest complete leaf-points discussed here.

4.1.7 Conclusions regarding leaf-points

In contrast to blade-points, leaf-points from Britain form a smaller corpus of generally larger artefacts. Following Jacobi and Flas, I would agree that in some

cases leaf-points represent an expedient use of tabular resources. I would add that tabular resources allowed larger size pieces to be produced (e.g. Cross Bank) which in turn facilitated tool longevity (e.g. Kent's Cavern). The Gipping Valley may well have been an important site, being flint rich. As discussed in the previous chapter, the flintknapper John Lord's explicit approach, when making a tool in a resource rich environment, was to address the most difficult aspects of production as early on as possible. If problems occurred he could abandon the piece and start again on a new nodule or flake, thus working in a time efficient manner (Lord, pers. comm.). Evidence suggests that in the resource rich Gipping Valley knapping occurred in a time-efficient manner, with mistakes leading to artefact abandonment (e.g. pre-forms 1,2,3). Following this examination of leaf-point variability the next section will focus upon the larger corpus of blade-points from Britain.

4.2 Blade-point metric variability

Damien Flas (2006: 166-7) found that the average blade-point size to be ~90-100x30x10mm, and similar to my own analysis, albeit using the smaller British dataset.

Length	101mm	N=24
Width	30mm	N=59
Depth	11mm	N=59

Table 4.9 Blade-point average calculated from the British corpus.

This similarity is unsurprising as there was a considerable overlap of artefacts recorded and methods used. However, my corpus comprised variously broken, transformed and possibly repaired pieces. This led me to question the actual meaning and value of any average size calculation and this is discussed in more detail below. However, because of the close similarity of results, larger dataset and conveniently round numbers, Flas' average is used to initiate discussion on metric variability.

4.2.1 Metric variability

Flas dealt with the issue of blade-point variability both within his thesis and more recently:

"Although these points show some diversity, particularly variability in size and in the extension of retouch such sub-typological variety cannot be correlated with geography...The variability...seems more likely related to the properties of the blades size, cortex, [and] straightness" (Flas 2014: 5503).

My conclusions differ from those of Flas.

4.2.2 Complete blade-points from Britain

Completeness	Qty.
100%	4
95%	4
90%	16
Total	24

Table 4.10 Complete blade-points from Britain.

Examining the 24 approximately complete (>90%) blade-points within my own corpus we can see that thirteen are above average in both length and width (Fig.4.16). It proved interesting to examine these pieces in relation to their geographical location. When looking at the length:width scatter-plot, those from the Southeast and East Anglia all fall into the above-average quadrant.

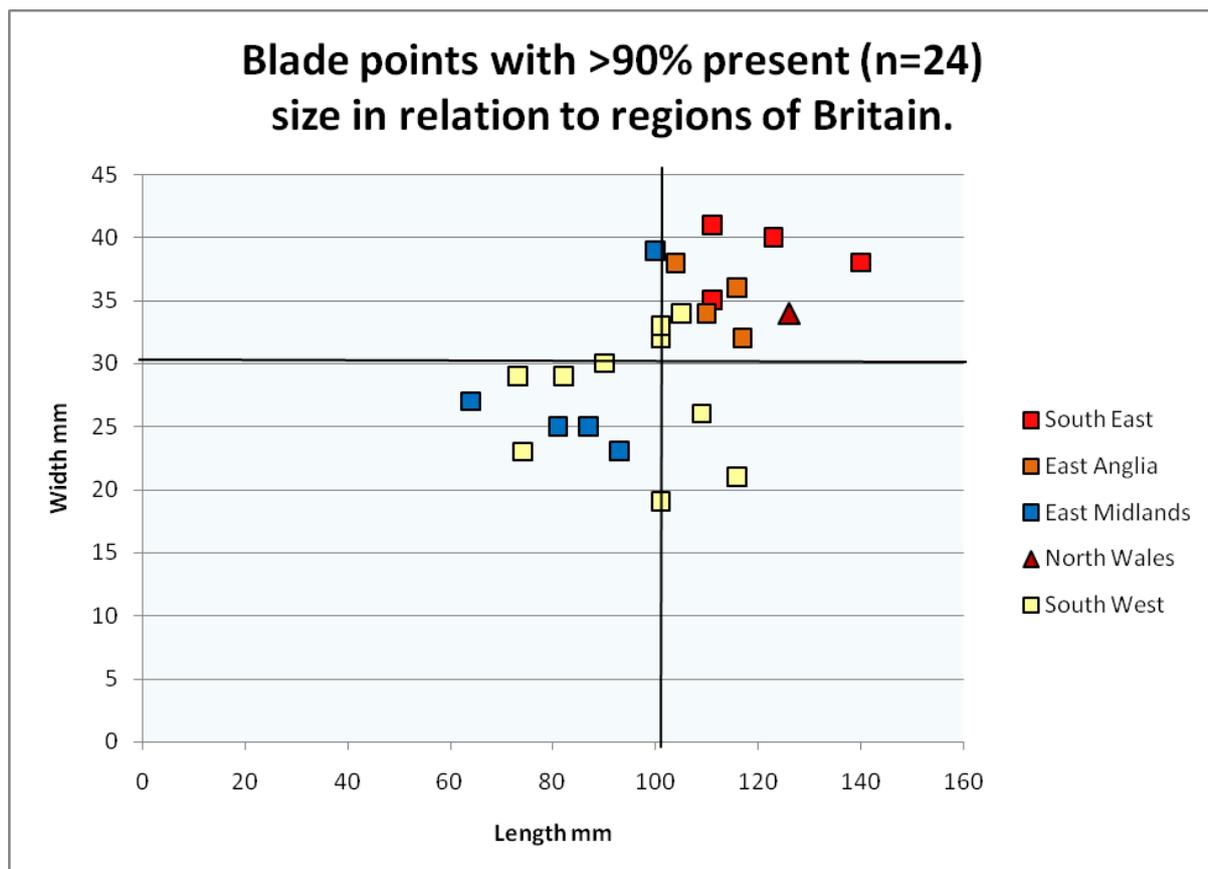


Fig. 4.17 Complete (>90%) blade-points in relation to average size and geography.

Length is a useful indicator because it is constrained by nodule size. The regions of the Southeast and East Anglia, as well as the adjacent and now submerged southern Channel Plain and Doggerland, could all have provided access to large flint nodules (Wragg Sykes 2009: 70). In contrast, those complete pieces that are below average in these dimensions are exclusively from the East Midlands and South-west. Expanding the analytical corpus by using the 59 pieces with maximum width and depth measurements illustrates the same tendency (Fig.4.17)

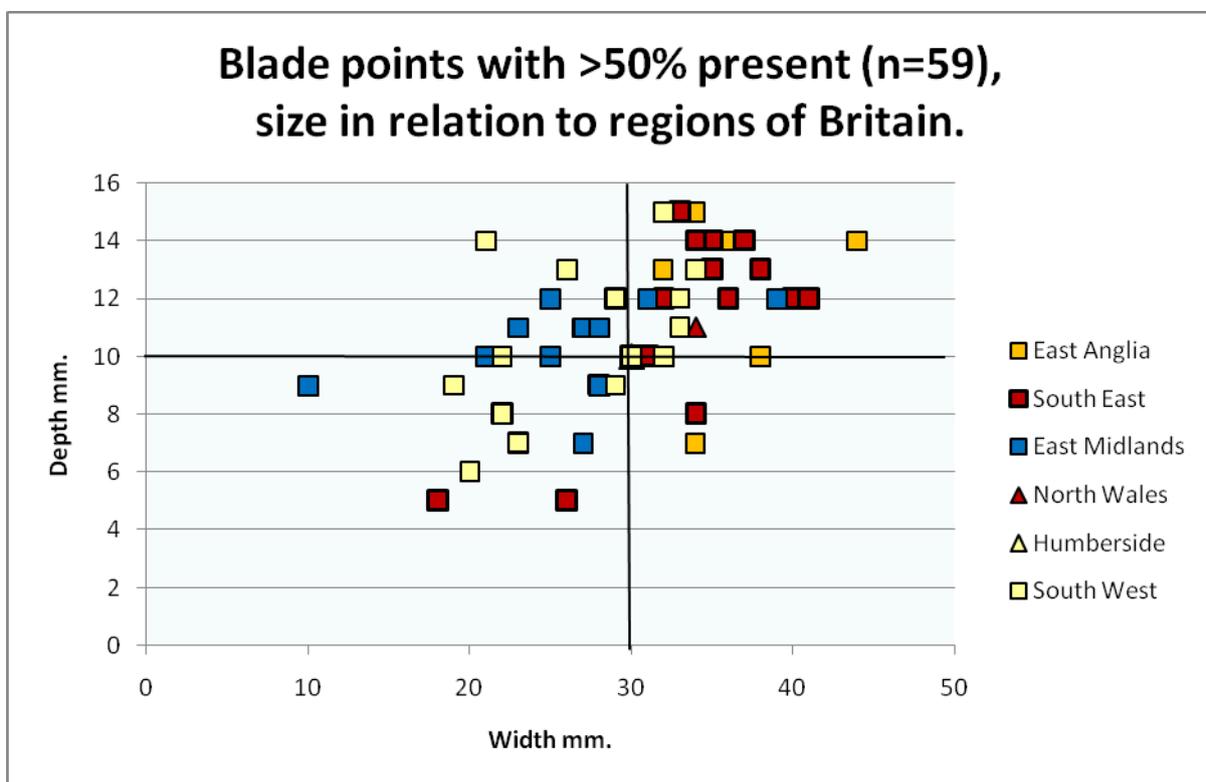


Fig. 4. 18 Blade-point fragments (>50%) in relation to average size and geography.

Artefacts above the metric average in both thickness and width are again mainly from East Anglia and the Southeast. This would suggest (contra to Flas' pan-European findings) that, within Britain variability in gross size seems to correlate with geography and, very probably material availability. This reflects intuitive observations by Jacobi (1986: 63), Swainston (1999: 53), and this author when

recording artefacts within collections. However the actualities of a relationship between size and material may be complex and various. To explore this spatial size trend it is useful to examine the largest and smallest complete pieces. However before doing so it is important to outline some assumptions made here.

4.2.3 Assumptions regarding blade-point proportions

Flas recognised from his analysis of size and degree of retouch that production would be an important determinant of final form. However, further criteria can be drawn into the discussion to explore the above geographical pattern. These supplementary criteria are based upon a number of assumptions related to blade-point proportion. Whilst it will be argued that the metric average derived from the complete artefacts is an under-estimate, a primary assumption is that derived trend-lines do have some value for indicating idealised proportional relationships. Recognising the high percentage of fragmented pieces and limited presence of tips it is assumed that artefact length reduced in relation to width and depth may be a sensitive indicator of damage. As invasive retouch is applied from the edges it is assumed that reduced width in relation to depth will be a sensitive indicator of maintenance. Finally, as depth is usually only affected after some significant degree of width reduction, this is seen as the least sensitive indicator of reduction, although conversely the strongest indicator of the blade-point's original size. Therefore length, width and depth in relation to trend-lines is utilised within this discussion of metric and formal variability. With these assumptions outlined, the longest and shortest blade-points will be discussed.

4.2.4 The longest and shortest blade-points

The longest complete blade-point was from Beedings in Sussex (Fig.4.18). Measuring 140x38x13mm it was found within 15km of accessible flint resources. In contrast the smallest complete artefact measured 64x27x7mm and was from Glaston, in the East Midlands. Whilst a local glacial till flint is available in the area, colour suggests this artefact was made from imported material (Cooper et al. 2012).

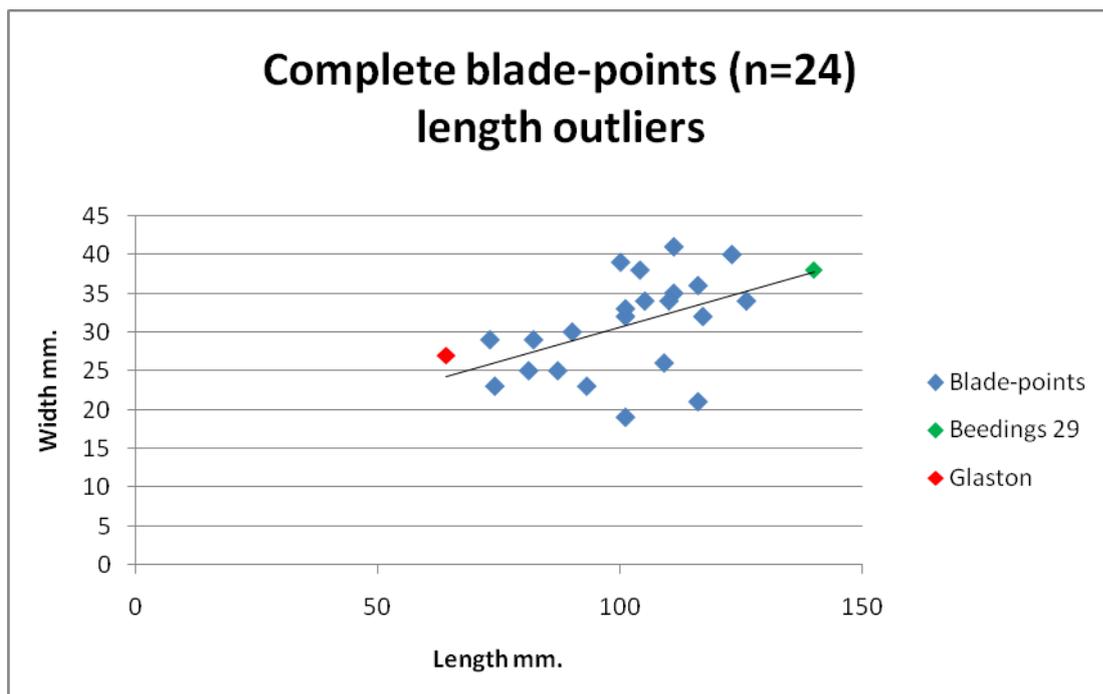


Fig.4.19 Complete blade-points with length outliers highlighted.

The Beedings blade-point was broken approximately in half, apparently anciently and probably through impact, as evidenced by small burin-like fractures at the break (Jacobi 2007: 252). In contrast the Glaston piece had a tip broken during excavation and would have been a complete bi-pointed example if undamaged. The excavators saw the broken end was likely to have been the more pointed (Cooper pers. comm.). If correct, the distal end of the blade-point was made on the bulbar end of the blade. In contrast, the Beedings piece has a slightly

rounded base which seems to have been part of the original bulb reduction process. This variation between pieces with rounded bases and bi-pointed examples will be discussed further below. Both pieces demonstrate what could be argued as an ideal in blade-point manufacture: a blade cleanly struck with minimal localised retouch applied mainly to the ventral surface and the proximal and distal tips (see Fig.1.3). In relation to width, the Glaston piece sits towards the centre of the grouping but below the trendline for depth (Fig.4.19).

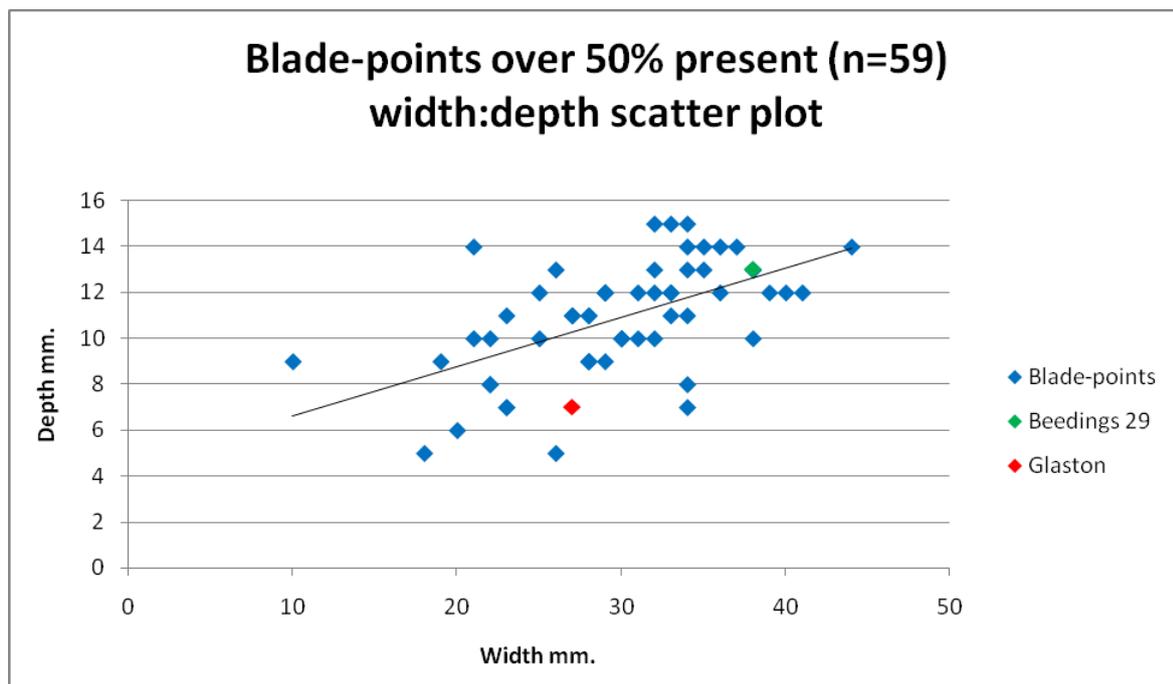


Fig.4.20 Length outliers compared in relation to width and depth.

In other words it is unusually thin. The cross-section is triangular and in this respect demonstrates the same qualities as an unretouched blade. The cross-sections of struck blades are usually triangular or trapezoidal. As the medial edges are retouched, the cross-section gradually changes to plano-convex (see Kuhn 1990: 585). The Glaston piece has minimally retouched edges. Whilst it is true that smaller blades can be struck from larger cores, experimental archaeology using large datasets has identified some general trends. For

example Morrow (1997: 63) conducted four separate reproduction experiments to produce four differing tool types. All debitage above one inch was subject to metric analysis. Morrow concluded that across all four reduction experiments: *"Quite simply, flakes tend to get shorter, narrower, and thinner...as reduction proceeds from rock to finished tool"* (Morrow 1997: 65). This would suggest that the Glaston blade-point was either a later phase product, or struck from a small core. My own experimental production provided a useful heuristic framework for recognising early and late phase flakes. Pieces with a width:depth ratio below 3.2 (thicker) tended to be early phase removals. Those with a ratio above 3.2 (thinner) tended to be later phase products. Using this as a guide would again suggest that the Glaston piece with a ratio of 3.9 was probably produced at a later phase of reduction, or from a small core. In contrast, the Beedings blade-point, with a width:depth ratio of 2.9, is indicative of an earlier phase of production from a large core. Having discussed length, now the width outliers will be examined.

4.2.5 Width outliers

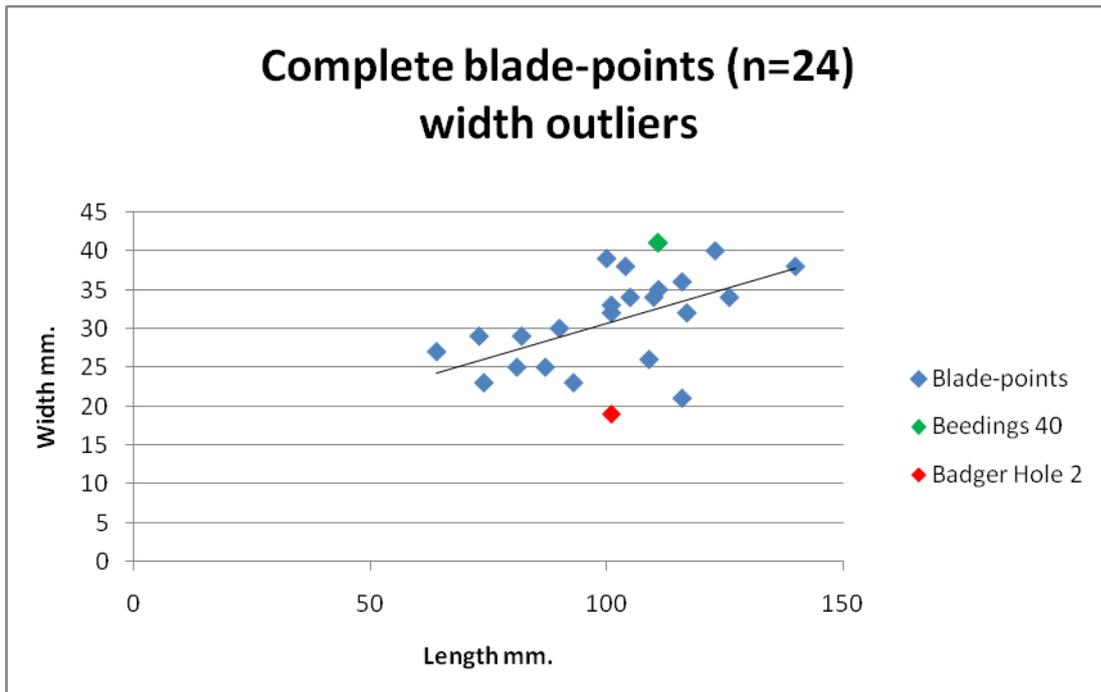


Fig. 4.20 Scatter-plot showing the widest and narrowest of the complete pieces.

The widest of the 24 complete pieces was again from Beedings (blade-point 40) and also broken (Fig.4.20; Fig.4.21).

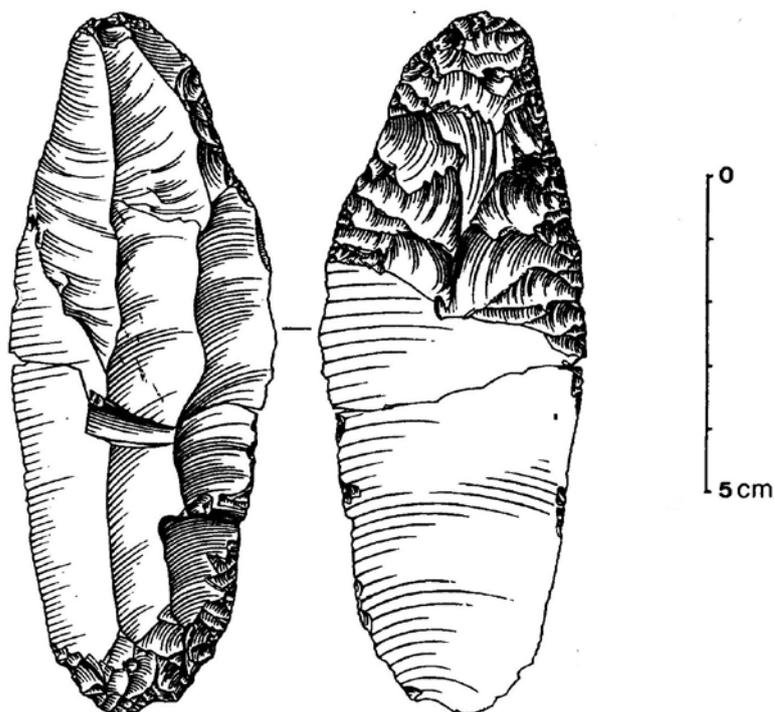


Fig.4.22 Beedings blade-point 40 (Jacobi 2007: 251, Fig.18.1).

It measured 111x41x12mm and had a bending break with a large piece removed from the dorsal section. It had been transformed by steep, proximal retouch to make a scraper, but despite this reduction was still above average in length. In contrast, the narrowest complete blade-point within the corpus came from Badger Hole (BH2) in Somerset in the south-east of England. It is a cleanly struck, long thin blade with retouch applied to the proximal and distal sections only. It measured 101x19x9mm and had a tip broken at the distal end. The arrow on the illustration (Fig.4.22) indicates a flake scar that may have been the result of impact.

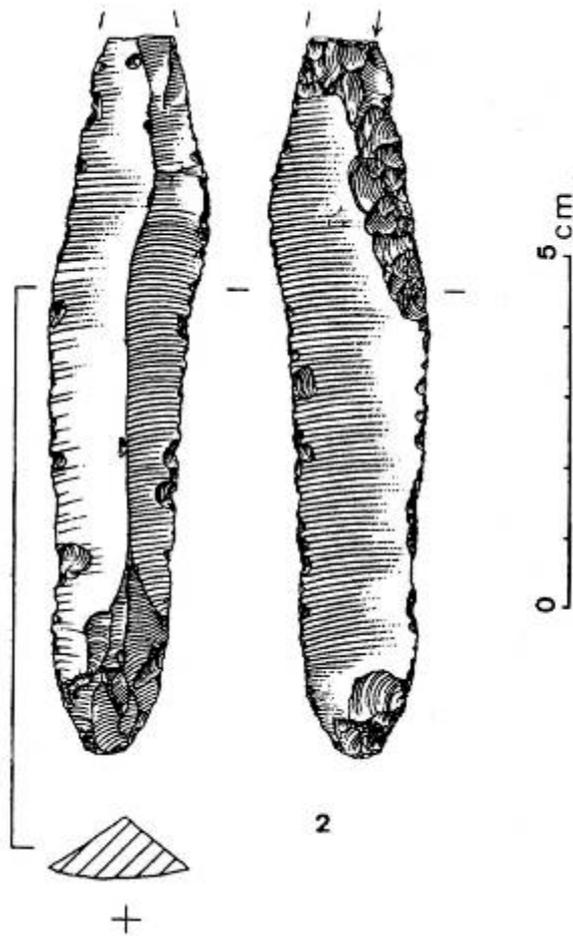


Fig. 4.23 Badger Hole blade-point 2 (Jacobi and Currant 2011: 57, Fig.2.4.2).

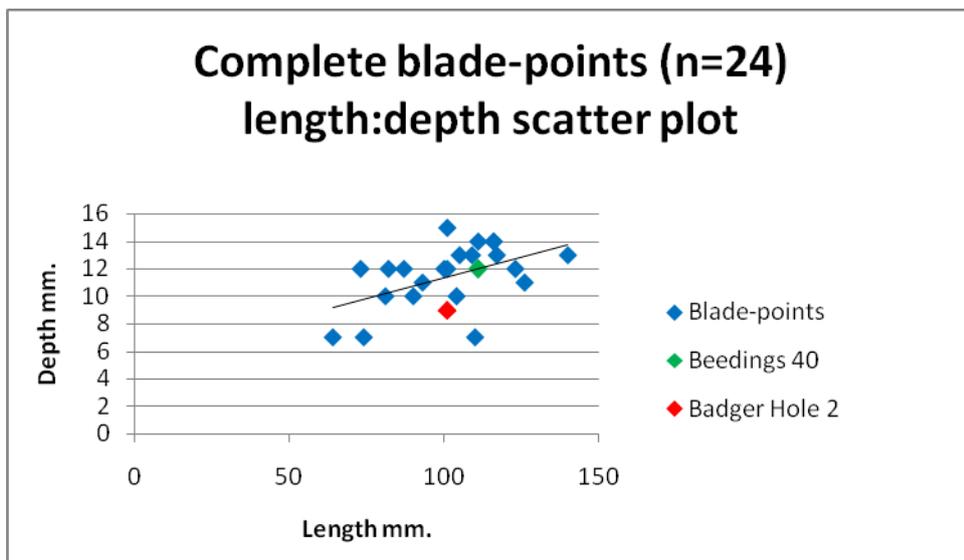


Fig. 4.24 Length:depth scatter-plot contrasting the widest and narrowest complete pieces.

As the length:depth scatter-plot shows the BH2 was also below the trendline for depth, demonstrating reduced metrics in two dimensions. Reduced depth indicates a later phase of removal whilst the narrow width and unretouched medial edges reflect removal from a narrow core. These two artefacts are indeed very different to each other.

4.2.6 Summary

This corpus of relatively complete pieces is bracketed by four outlying blade-points all with minimal localised retouch, with one transformed into an end-scraper. Such localised retouch supports Flas' argument that heterogeneity within the blade-point corpus is the result of managing the differing characteristics of the blade supports during production. However, whilst both are formally different from each other, the metrics from both the Badger Hole and Glaston blade-points suggest they have been struck at a later phase and from smaller cores. These cores may have been smaller because they were produced using local glacial nodules. The flint used at Glaston was imported but showed evidence of transport and thermal damage. However, glacial material is not easily available in the south-west of Britain and so the Badger Hole material is also likely to also have been imported, but perhaps as a curated core. If this is the case then although the Badger Hole blade-point does not indicate curation, the core from which it was struck probably does. This fits with conclusions from the previous chapter that cores seemed to offer a punctuated productivity via repeated knapping cycles. It is interesting to reflect on the idea of curation in relation to material.

4.2.7 Materials

A small proportion of the blade-point total (~6%, n=7) from only three sites are made from local non-flint materials. All three sites are in the south-west of Britain. These include one blade-point and four fragments from Paviland Cave, one proximal section from Windmill Hill Cave and one complete blade-point from Kent's Cavern. Both these latter sites are in Devon, in close proximity to each other and both blade-points are made on a local Greensand chert. Stephanie Swainston (2000: 100) observed how those from Paviland Cave in south Wales were also made on local materials, a Carboniferous chert and black un-speckled Rhyolite.

4.2.8 Summary of complete pieces

Within the sub-set of 24 complete pieces from Britain, a size trend in relation to geography and probably material availability can be observed. Above average size pieces generally come from the flint-rich areas of east and south-east England whilst the below average pieces generally come from the flint-poor areas of the midlands and south-west of Britain. The blade-point from Ffynnon Beuno in north-west Wales is one exception to this pattern, being large in size, but from an area not recognised for flint availability. Based upon their smaller size and minimal retouch, the blade-point examples from Glaston and Badger Hole may be related to the use of smaller imported glacial nodules or curated cores respectively. This interpretation of the size trend is strengthened when the use of non-flint materials is included in the discussion. Present at only three sites, it indicates the adaptive use of local stone resources in the south-west of Britain. If the size trend is reflecting material economy outside areas of

accessible flint, then the smaller materials from the Midlands and south-west would seem to be a useful starting point to look for evidence of maintained and repaired pieces. In order to identify maintained and repaired artefacts it is necessary to again review the work of Flas, in particular his method for recognising maintenance and repair signatures within the pan-European archaeological materials. This discussion will be integrated into the next section, which will examine formal heterogeneity.

4.3 Blade-point formal heterogeneity

Flas (2013: 221) argued that blade-point heterogeneity was almost exclusively related to variables within production. However, he presented an exception in a review of 25 blade-points and fragments from the site of Spy in Belgium (ibid). Within this material he recognised a correlation between smaller than average size, and intensive retouch, and interpreted this as raw material economy at the site. He supported this idea by drawing attention to a distance of around 50km between the site and good quality materials. Additionally he cited the presence of blade-points recycled to form burins, as well as one atypical point with a rounded base which he argued to be indicative of repair (see Flas 2013: 225, Fig.5.1). To understand the criteria used to recognise repair it is valuable to quote directly:

"Like the other [blade-points] from northern European sites, they are mostly bi-pointed. Only one has a rounded base but it appears that this is a distal fragment on which a new base was made, creating this rare sub-type. The retouch creating this new base includes longitudinal dorsal removals, [probably] some kind of fluting" (Flas 2013: 220).

The rounded base piece is illustrated and measures ~64x27x13mm. Both the metrics and the rounded base will be considered in turn.

4.3.1 Metrics

In relation to metrics, contrasting it with the complete pieces within my own corpus is informative. On the length:width scatter-plot the Spy piece sits directly on top of the Glaston blade-point (Fig.4.24).

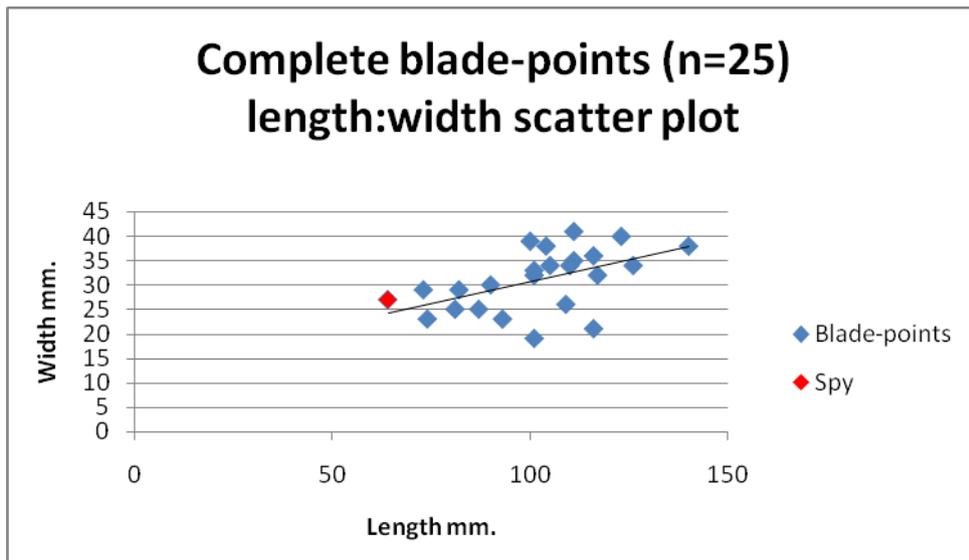


Fig.4.25 Length:width scatter-plot relating the Spy blade-point to complete British pieces.

However the difference between the Glaston and Spy pieces is made explicit on the length:depth scatter-plot. Whilst both measured just over 60mm in length the Spy piece is clearly above, and Glaston clearly below the trend-line for depth (Fig.4.25).

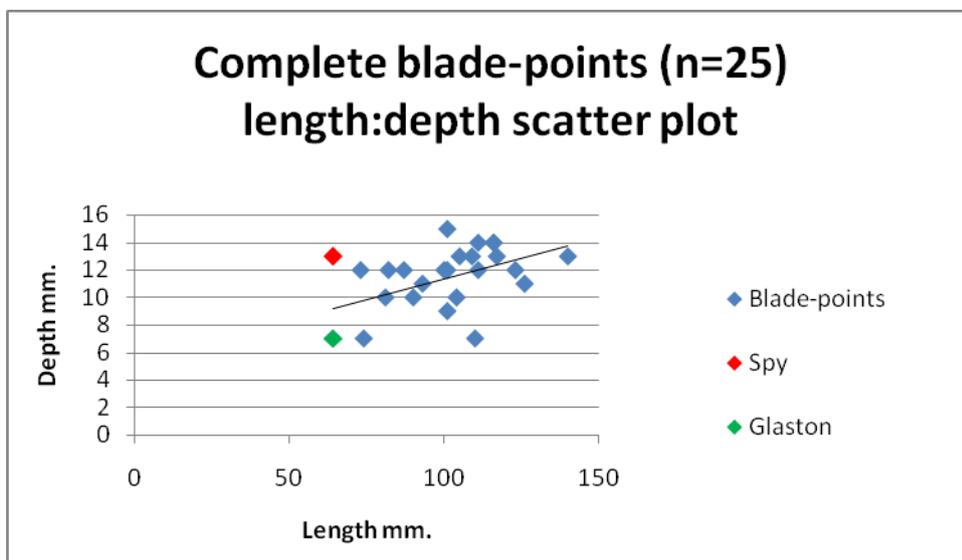


Fig.4.26 Length:depth scatter-plot relating the depth of the Spy blade-point to that of the Glaston example.

In other words the Spy piece is uncharacteristically thick. If the trendline has predictive value then based upon depth, the Spy piece could have been originally around 125mm in length with the repair reducing it to 64mm, effectively halving it. Using this blade-point as a model it would seem that a piece that sits at the lower end of the scale for length but above the trendline for depth may be seen as candidates for having been repaired. A second characteristic discussed by Flas as indicative of repair is the rounded base. Two pieces within the British corpus have similar rounded bases and therefore deserve attention.

4.3.2 Kent's Cavern blade-point 2

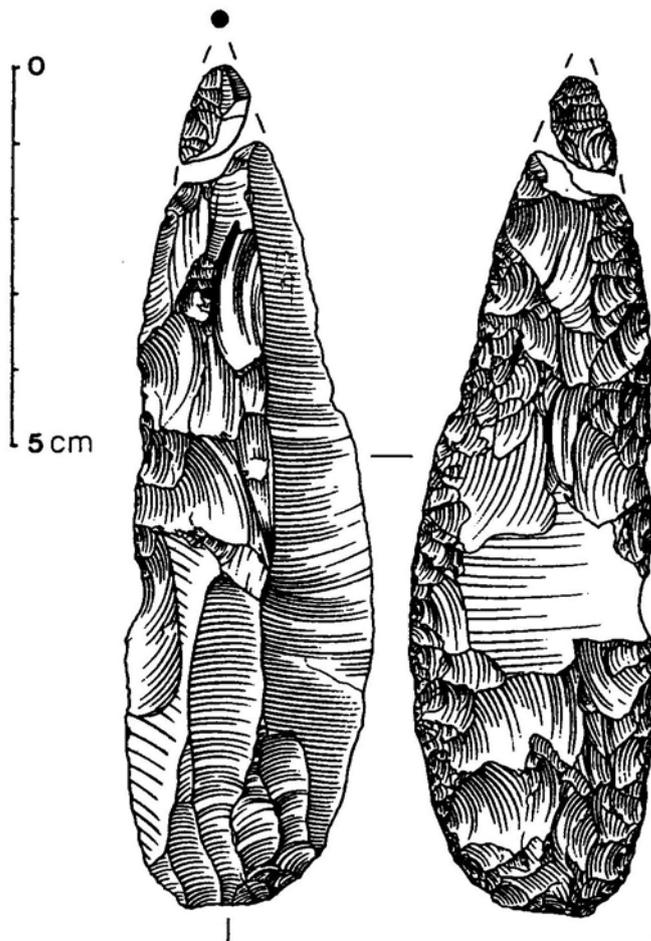


Fig. 4.27 Kent's Cavern blade-point 2 (Jacobi 2007: 282, Fig.43.2).

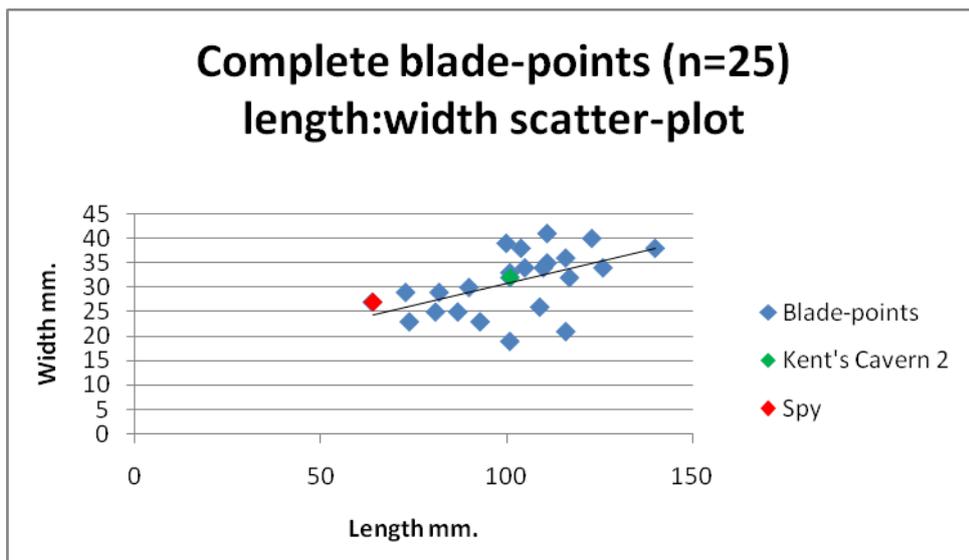


Fig.4.28 Proportional similarity between the Spy and Kent's Cavern 2 blade-points in length and width.

This blade-point measured 101x32x15mm. Like the point from Spy it is close to the length:width trend line, although unlike the point from Spy it is above average in all dimensions in spite of intense ventral retouch which indicates some reduction in both length and width (Fig.4.27).

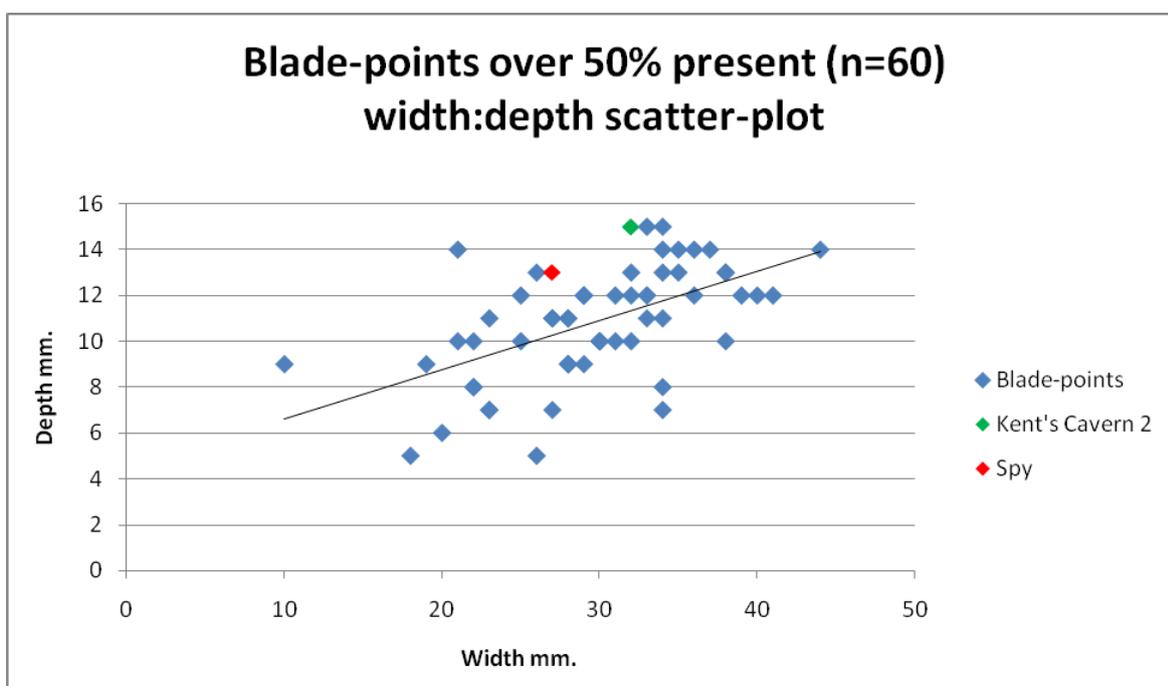


Fig.4.29 Proportional similarity between the Spy and Kent's Cavern 2 blade-points width and depth.

On the width:depth scatter this piece mirrors the Spy repair, being very deep in relation to width (Fig.4.28). As discussed this would seem to reflect the original depth being present on a piece maintained from the edges.

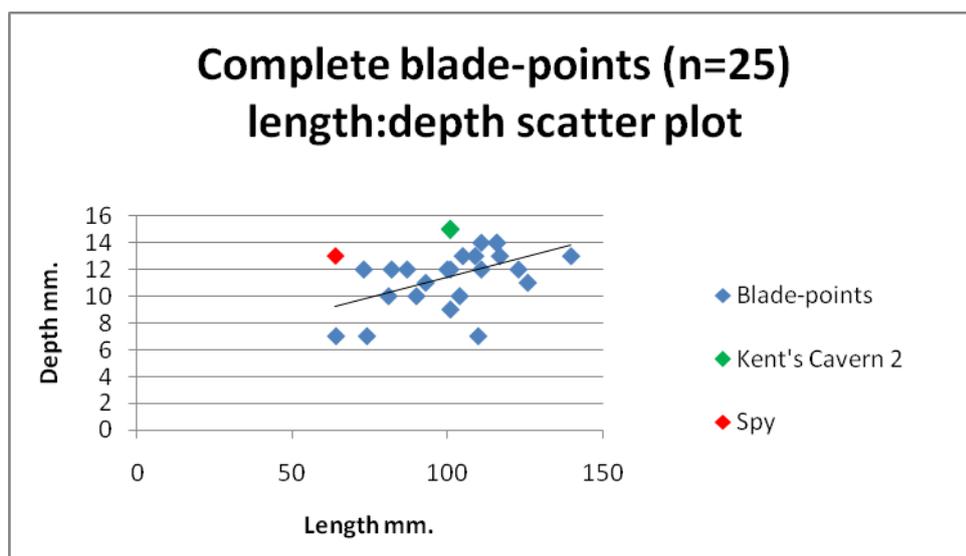


Fig.4.30 Proportional similarity between the Spy and Kent's Cavern 2 blade-points in length and depth.

On the length:depth scatter-plot, depth is again emphasised (Fig.4.29). Whilst being longer than the Spy piece this Kent's Cavern blade-point corresponds proportionally in all three dimensions. Formally the rounded base is only approaching the widest point on the blade and as such suggests that a smaller section missing than the Spy piece. This artefact's overall large size indicates a blade of different scale was being repaired here. Flas, in his thesis drew attention to the similarity between this and the Spy piece and in particular focussed upon the dorsal fluting, seeing it as a method of bladelet production similar to that of a 'Kostenki Knife' (Flas 2006: 41). This idea of bladelet production is supported by a number of pieces from Beedings and will be

discussed within the next section. However the dorsal proximal 'fluting' on this piece also seems to indicate an attempt to thin a prominent section as does the invasive retouch half way up the dorsal left hand edge. Both of these attempts have left a small dorsal 'hump' which accounts for the disproportionate depth in relation to length and width. Whilst noting the formal similarities between this and the Spy piece, Flas did not interpret this blade-point as being repaired, perhaps because of its above-average size. If the depth is extrapolated to the trend-line, this blade-point would have been perhaps 150mm long. Formally this piece is similar to the blade-point from Colby in Norfolk.

4.3.3 Colby blade-point

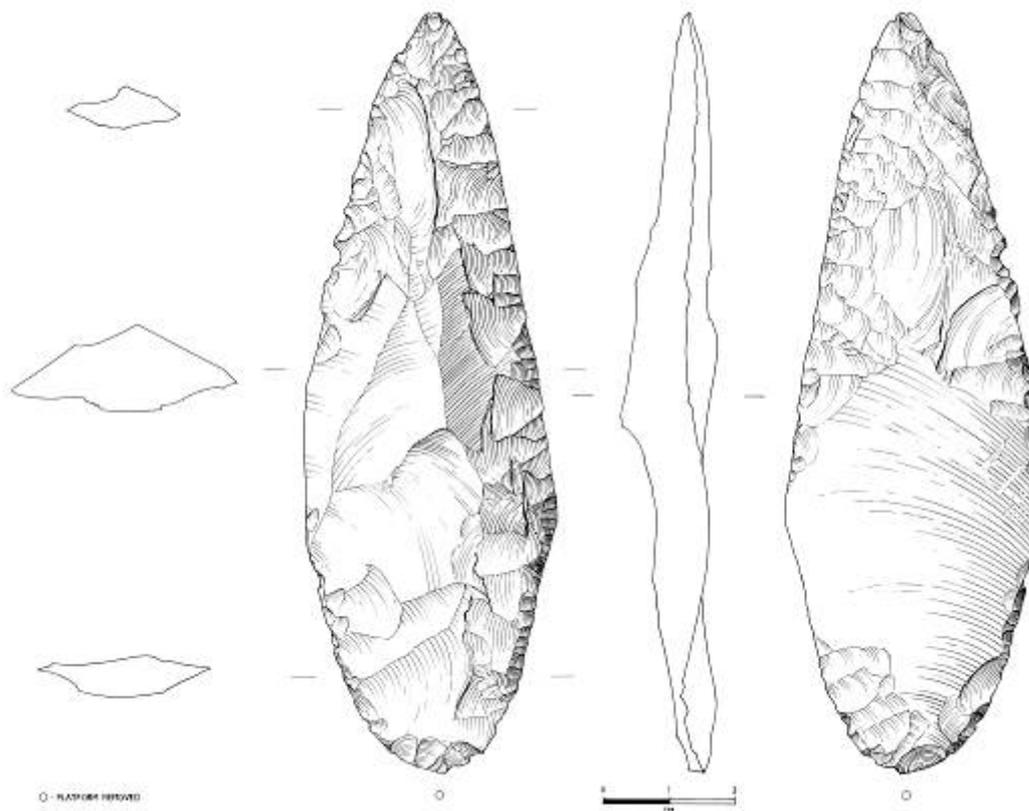


Fig. 4.31 Blade-point from Colby (Portable Antiquities Scheme n.d.).

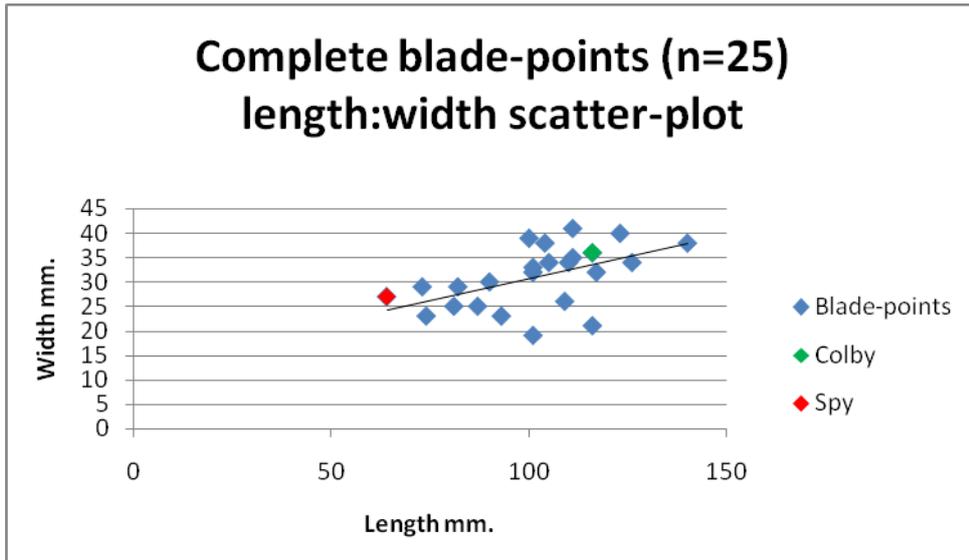


Fig. 4.32 Proportional similarity between the Spy and Colby blade-points in length and width.

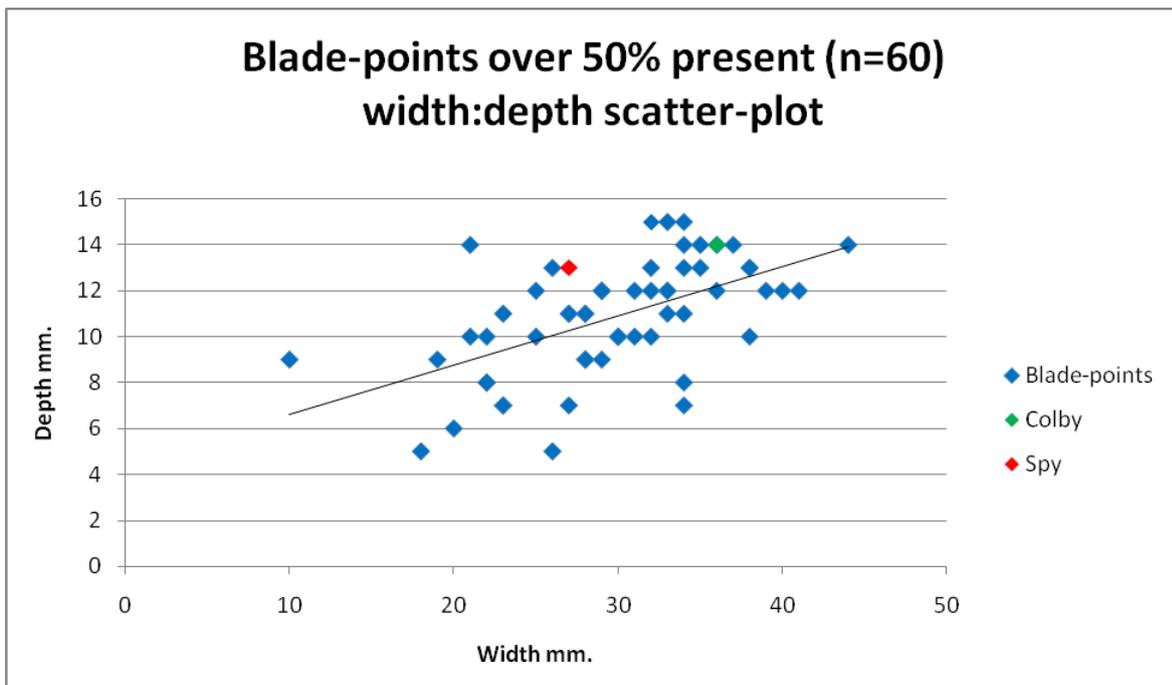


Fig. 4.33 Proportional similarity between the Spy and Colby blade-points in width and depth.

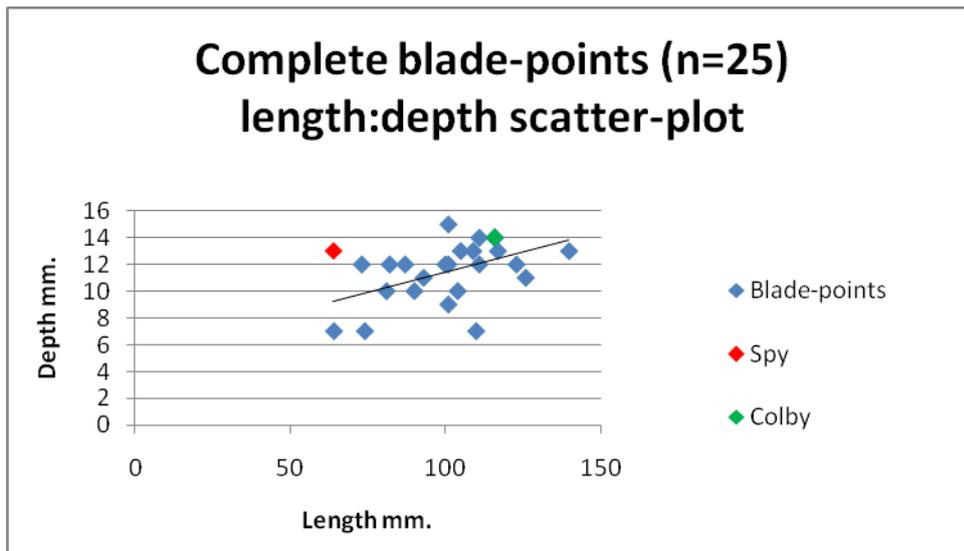


Fig.4.34 Proportional similarity between the Spy and Colby blade-points in length and depth.

This blade-point measured 116x36x14mm and was interesting on a number of levels. Whilst the base was rounded, it was not fluted, but thinned by a large dorsal removal emanating from the left-hand edge (Fig.4.30) It is above average in all dimensions and relatively deep whilst at the same time still having a heavily reduced dorsal surface. Its depth is due to the medial dorsal section being left in place and therefore maintaining the blade's original depth in spite of edge working. A similar deep invasive removal again from the dorsal left-hand edge, mirrors the Kent's Cavern example discussed previously, in that it reduces a dorsal prominence. A close examination of the retouch along the sides shows this piece to be asymmetrical. In dorsal plan, the left-hand edge could be described as gently curved, whilst the right-hand edge is more angular and formed by two approximately straight lines. The dorsal left hand edge is slightly notched whilst the right is un-notched and tightly worked with consistently sized retouch. It seems that the edges were produced in succession with the dorsal left-hand edge formed when the blade was initially struck, whilst the right has been re-shaped by a series of smaller controlled removals which have taken

away the original margin. These removals have effectively shifted the dorsal centre line over towards the right. This process has resulted in two step fractures that have undermined the dorsal ridge on the right-hand medial section. The ventral surface seems to tell the same story, with rippling indicating the bulbar area was further to the left and the upper section has been removed by the series of flat, invasive removals on the left-hand section of the rounded base. A small area of bulbar surface remains suggesting a small section of the proximal end was broken. The form of the Colby blade-point is exceptionally well preserved and as such interesting to contrast with that of Beedings blade-point 29 (Fig.4.34). With similar width and depth measurements, the differing lengths again correspond with the idea that the Colby piece sustained some damage with repair resulting in a rounded base.

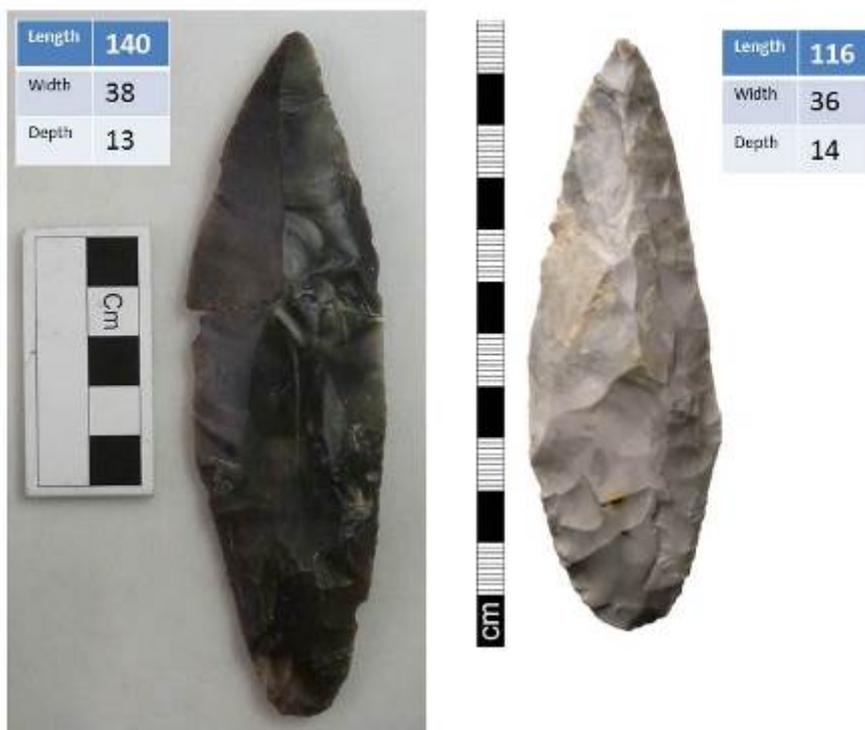


Fig. 4.35 Contrasting the metrics and form of Beedings blade-point 29 (Photograph: author) and the Colby piece (Portable Antiquities Scheme, n.d.).

If the depth measurement is extrapolated to the length:depth trend-line, the projected length for the Colby blade-point is about 140mm, mirroring the Beedings piece. If this is correct, the re-shaping and re-pointing was an asymmetrical process as indicated on the dorsal surfaces of both the Colby and Kent's Cavern examples. Because of the presence of a small section of bulbar prominence but an apparently reduced length, this re-pointing on the Colby piece may have been a strategy for dealing with damage at both ends.

4.3.4 Repair in relation to average size

That pieces like Colby and Kent's Cavern 2 are formally and proportionally similar to the repaired point from Spy seems to illustrate similar process. The key difference is in relation to length, with the Spy piece being well below average, whilst the two British examples are above. Being above average in size would seem to militate against a repair interpretation, however it is argued here that the average size derived from the extant and complete British pieces is too small and therefore unrepresentative. This is demonstrated by an examination of the heterogeneity within the British corpus.

4.3.5 Heterogeneous British corpus

Based upon my review it is clear that my British metric average was derived from a heterogeneous corpus and whilst Flas sees heterogeneity as related to production, my own analysis seems to contradict this view. In relation to length, for example, I have examined 24 examples that are mostly broken at the ends which indicated the measured length would be less than the original. Flas (2006:

166-7) has suggested this difference for his materials with tips missing would generally be a few millimetres. Because of the variability in blade-point size I have adopted a percentage system and allocated up to 10% of the total length as a working figure for pieces missing both tips. Flas' pan-European average size was calculated based upon 55 relatively complete pieces and 131 fragments with medial sections intact (ibid). As discussed, my own dataset for pieces with over 90% present numbered 24, of which at least three items were blade-points obviously transformed into other tools. In this respect my corpus differed in that Flas organised and analysed his material typologically and so these three transformed items would have been categorised as either scrapers or burins and separated from the blade-points. My approach was the opposite in that I included any artefact that either was, or had been, a blade-point within my overall total. Variation was then examined on a case by case basis. In order to increase my dataset and ascertain meaningful maximum sizes I included all pieces estimated to have above 90% present and categorised all these pieces as 'complete'. Complete could be a misleading term as it suggests the end of a process, but as the two possible repaired pieces illustrate, they would have been complete both before breakage, and again after repair. Use of the term complete here is tentative and acknowledges this probable temporal dimension. It would be imagined that including obviously transformed and therefore reduced pieces, such as an end-scrapers, into the complete corpus would decrease the overall metric average for length. However two of these three 'transformed' pieces (Beedings 39 and 40) were some of the longest within the collection and thus contributed to increasing average length. This should again alert us to idea that the current average length for the British materials is an under-representation. However, in spite of these differing categorising approaches, there was a large

degree of overlap in the corpus used, and my own and Flas' metric averages were almost identical. It is clear therefore that the derived average based on the metrics from Britain will not be representative of production. It is simply an average size for what we are left with after artefacts have been used and sometimes modified. To return to the original problem, deciding if a piece has been repaired by comparing it with an average length derived from only the remaining complete materials has little meaning. The form of the Kent's Cavern and Colby pieces is indicative of repair and illustrative of the interpretive limitations of using an unrepresentative average when attempting to understand this technology. However, as well as obfuscating our understanding and recognition of repaired pieces, this un-realistic average creates problems when attempting to understand materials in relation to their degree of retouch.

4.3.6 Size and retouch

The material economy category Flas posited for Spy was based upon pieces smaller than those from other sites and with comparatively more retouch. It is the coincidence of relative smallness with increased retouch that was used to support his material economy interpretation (Flas 2013: 221). Conversely, a production signature should be indicated by relatively larger pieces with comparatively little localised retouch. Whilst Flas could recognise a pattern with the below average size pieces from Spy, no significant relationship between size and retouch could be discerned within his remaining corpus. This led to the default position that no clear patterning was due to variability within 'production'. I will argue that a lack of clear patterning was due to larger pieces, actually indicative of production within Flas' criteria, not being available within the analytical corpus because they had *already* been reduced through

maintenance or they were fragmented and therefore perceived as of limited analytic utility within his method. If correct, this would blur any relationship between size and retouch. This is because these predominantly mid-range materials had probably received retouched already. Only smaller and more intensively retouched pieces approaching the end of their use life would present an obvious size-retouch correlation. To explore this hypothesis it is necessary to adopt a different approach to Flas when examining the available materials within the upper size band of the British corpus.

4.3.7 A different approach

As discussed, using the un-representative metric average based upon the extant corpus creates a methodological problem: how to separate out the two categories of 'production' and 'material economy' when there is invariably a degree of overlap and blurring with the signatures. I would argue that if we accept the average metric is too low then this methodological problem diminishes. I believe Flas' categories have value and factors such as overall size, blade thickness, degree and locality of retouch can all be used to indicate if an artefact is more likely to be at the 'production' or 'material economy' end of a technological continuum. It is simply necessary to extend the continuum beyond its current position. It is necessary for us to 'think outside of the box', that is the box formed by using only complete pieces that provide an under-representative average size.

To resolve this situation two things need to happen. Firstly fragments have to be integrated into the discussion and secondly it is necessary to shift attention to the pieces with the largest metrics to ascertain the character of pieces at the

upper end of the size spectrum. I will discuss the integration of fragmented pieces first. Flas pointed out two things, firstly it is no simple process to analyse in any metrically systematic way fragmented pieces, which is why he excluded them from his size-retouch analysis (Flas 2006: 173). However, he also observed that examination of the artefacts themselves was a useful qualitative way of ascertaining character in relation to degree of retouch (ibid).

Consequently, there is a value in including larger fragments, with over 50% of mass present, as this increases the quantity of materials available for qualitative analysis at the upper end of the scale. It is an assumption here that the character of retouch on fragments with over 50% of their mass present is *probably* indicative of the original piece as a whole. Accepting this assumption allows qualitative examination of the largest fragments to contribute to the discussion. To do so it is necessary to move on to the second point and identify an alternative to the current and misleading metric average. The approach adopted here is to use the width:depth scatter-plot as it can allow inclusion of larger complete and fragmented pieces. Whilst somewhat arbitrary in metric terms, I have focussed upon pieces that are above 35mm in width and 12mm in depth as this allows five fragmented and six complete pieces to be used to characterise the upper size range (Fig.4.35).

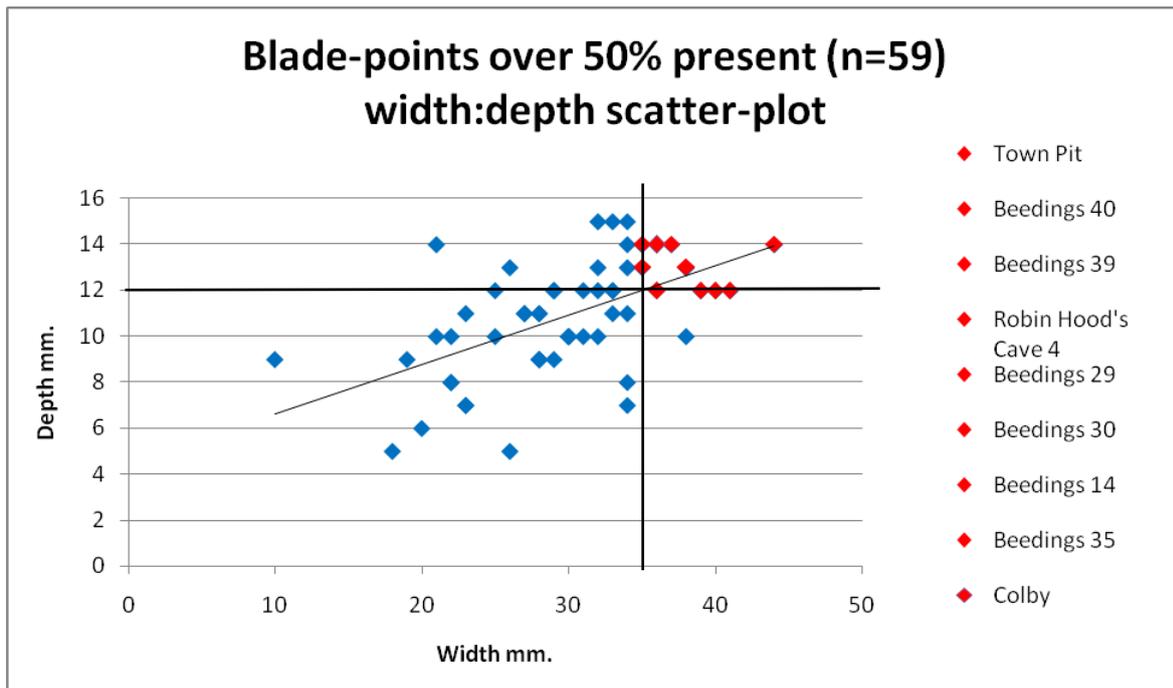


Fig. 4.36 Pieces above 35x12mm itemised and ranked by width, two of the eleven pieces occupy the same spot.

Complete blade-points	6
Large fragments	5
Total	11

Table 4.11 Total of complete pieces and large (>50%) fragments.

This grouping again reiterates the relationship between size and geography but mainly because Beedings materials predominate. What follows is a discussion of each of these pieces and beginning with the probable largest.

a. Town pit blade-point

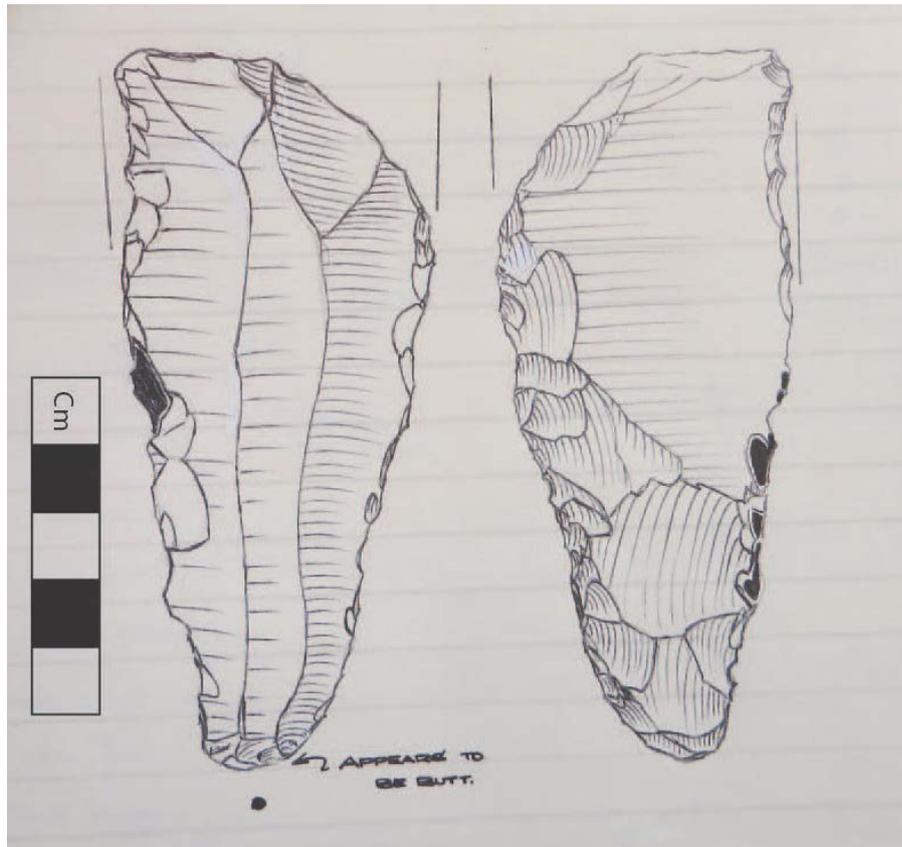


Fig. 4.37 Drawing by Roger Jacobi from the Jacobi Archive: Town Pit at Franks House.

The potentially largest piece within the corpus is from Town Pit, Icklingham in Suffolk. It is fragmented and a very loose approximation suggests that between 50 and 75% of its original mass is still present. However even in this fragmented state it is relatively massive compared to the rest of the corpus, measuring 101x44x14mm. Relating the actual width of the Town Pit fragment to the trend-line for complete pieces indicates it may have originally been up to 170mm in length.

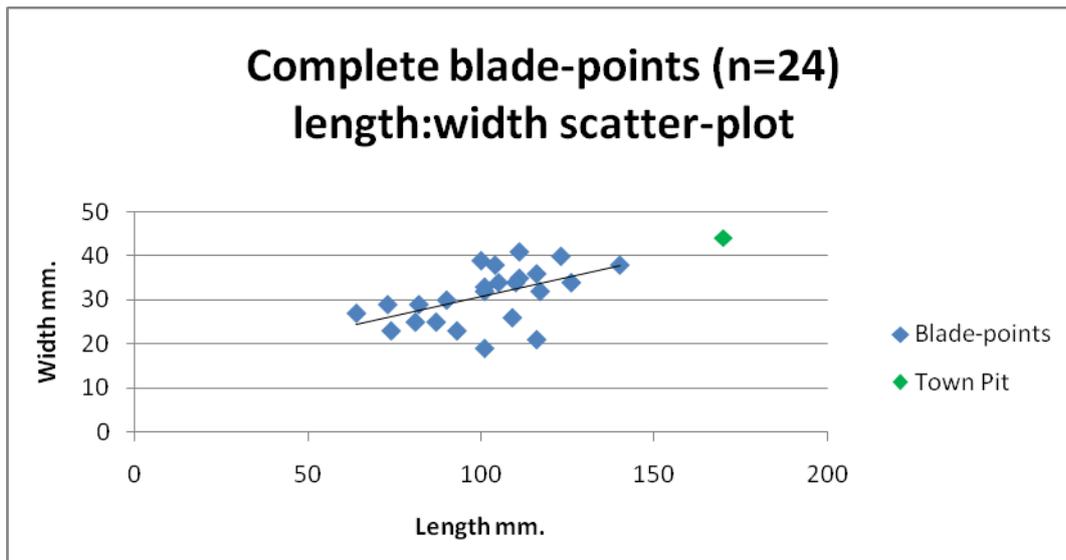


Fig. 4.38 Using actual width to estimate probable length of the Town Pit fragment.

However relating actual depth to the trend-line for complete pieces indicates a probable length of around 140mm (Fig.4.37).

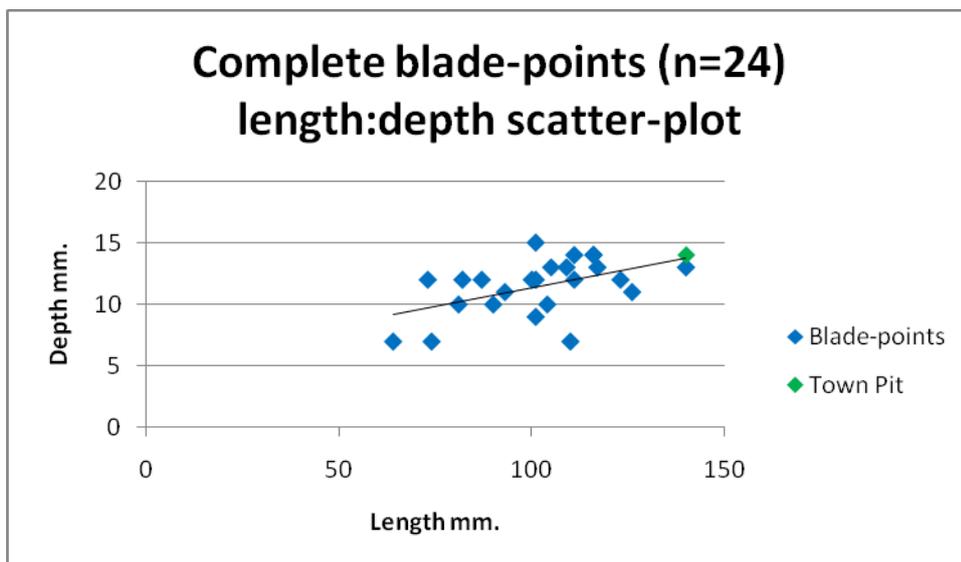


Fig. 4.39 Using actual depth to estimate probable length of the Town Pit fragment.

Jacobi used the proportions of the largest complete blade-point from Beedings to derive a formula for calculating the approximate original length from extant width. Taking Beedings blade-point 29 (Fig.1.3) as complete and ideal in form he

divided its length (140mm) by its width (38mm) and arrived at a figure of 3.68 (Jacobi archive notes on Beedings blade-point 39). It follows that if a broken blade-point had an intact medial section, multiplying its width by 3.68 would provide a prediction of original length. Applying this formula to the Town Pit fragment predicted an original length of around 160mm.

Length width trendline predicts	170mm
Jacobi formula width x 3.68 predicts	160mm
Length depth trendline predicts	140mm

Table.4.12 Using Jacobi's formula to estimate probable length of the Town Pit fragment.

Perhaps what these contrasting estimates illustrate is the difficulty of extrapolating from one dimension only. However these three differing approaches all provide an indication of the relatively large size of a blade-point at the upper end of the spectrum. They also provide a predictive matrix that integrates individual variation within width and depth with a projection based upon 'ideal' form. These three calculations can thus be used to derive a 'reasonable' prediction. Recognising the 30mm difference between the highest and lowest estimation suggests a figure of 15mm to be reasonable. Doing so indicates a length for the Town Pit fragment of around 155mm which is most similar to the figure produced by Jacobi's formula. This 'reasonable' estimation of length would suggest the current maximum length (140mm) derived from the largest extant complete piece (Beedings 29) and used to calculate the British metric average is around 15mm too low. Returning to the Town Pit fragment itself, whilst heavily edge damaged, some of which is recent, this piece has localised ancient retouch focussed upon the ventral proximal section and as such corresponds to the criteria deemed indicative of production.

b. Beedings 40

The widest complete blade-point (see Fig.4.2) was Beedings 40 and had been transformed into an end-scraper. The medial section is relatively complete and suggests that the flatness and width of this piece is related to the form of the original blade. This blade-point has been comprehensively thinned on the ventral distal section which would suggest removal of curvature on the blade. However this piece has no ventral, proximal, invasive thinning and instead is steeply retouched on the proximal dorsal end thus curtailing its length. Any previous proximal, ventral thinning aimed at bulbar reduction has been removed. Its transformation is informative, as one of the characteristics of an end-scraper is its formal capacity for re-sharpening which results in a reduction in support length (e.g. Gallagher 1977: 411). Placing the scraper at the end of a blade-point would therefore facilitate significant future re-sharpening potential. Jacobi (2007: 244) pointed out how it is unusual for Upper Palaeolithic scrapers to be produced upon the proximal ends of blades. This perhaps related to the necessity of removing a bulb of percussion. If this end-scraper has indeed been produced on a blade-point then the bulb would have already been removed, thus negating the problem. However this again highlights how significant amounts of reduction in length had already occurred on this artefact before transformation took place.

c. Beedings 39

This piece measured 123x40x12mm and it is one of the four artefacts to have retained its distal point whilst the proximal end has again been transformed into what appears to be a scraper (Fig.4.39).

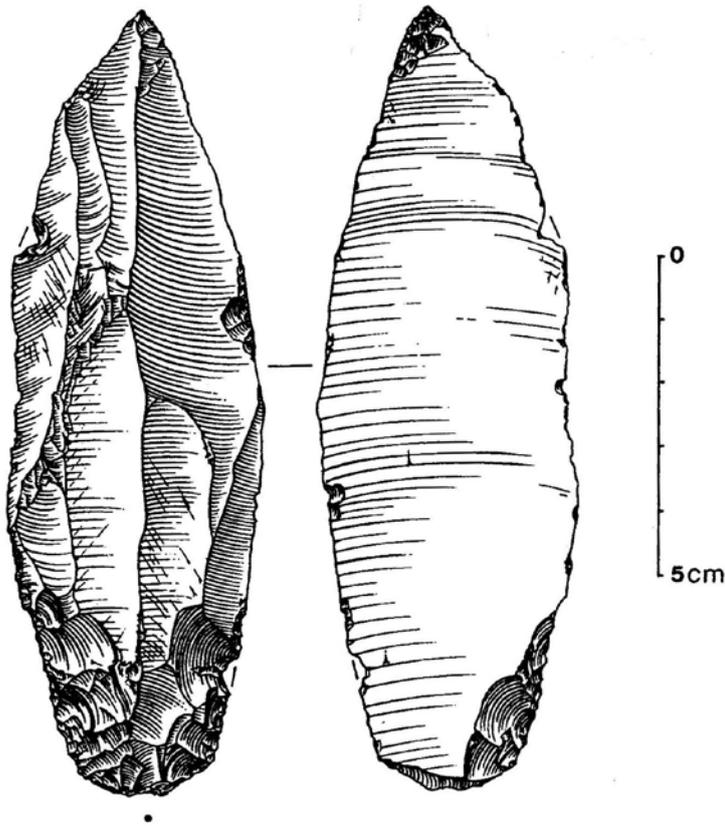


Fig. 4.40 Beedings blade-point 39 (Jacobi 2007: 250, Fig. 17.1).

Flas used the presence of blade-points transformed into burins at the site of Spy as support for his material economy argument (Flas 2013: 221). It follows logically that a blade-point that retains its distal tip in good order and has been apparently transformed at the proximal end into a scraper is also signalling a preoccupation with material economy, in spite of coming from an area of flint availability. Acknowledging the material availability observation, an alternative view could be that blade-point form was conducive to transformation, and therefore a more attractive option than 'starting again' with a new nodule or blade. This would explain why transformed blade-points are found within areas of flint availability, as well as in areas without. It has to be considered that

future transformation may have been an inherent design component of blade-point form.

Returning again to categorisation, this artefact is problematic on a number of levels. Calling this either a blade-point or scraper is awkward because each of these labels associates the artefact with a particular function whilst the combination of these two elements may be suggesting multi-functionality. The rounded base is reminiscent of the repaired pieces and could be seen as ergonomic, facilitating use of the point for piercing or the edges as a knife. Indeed the combination of piercing, cutting and scraping components within a tool would make sense within the context of processing a kill. This observation will be returned to in chapter seven.

d. Robin Hood's Cave 4

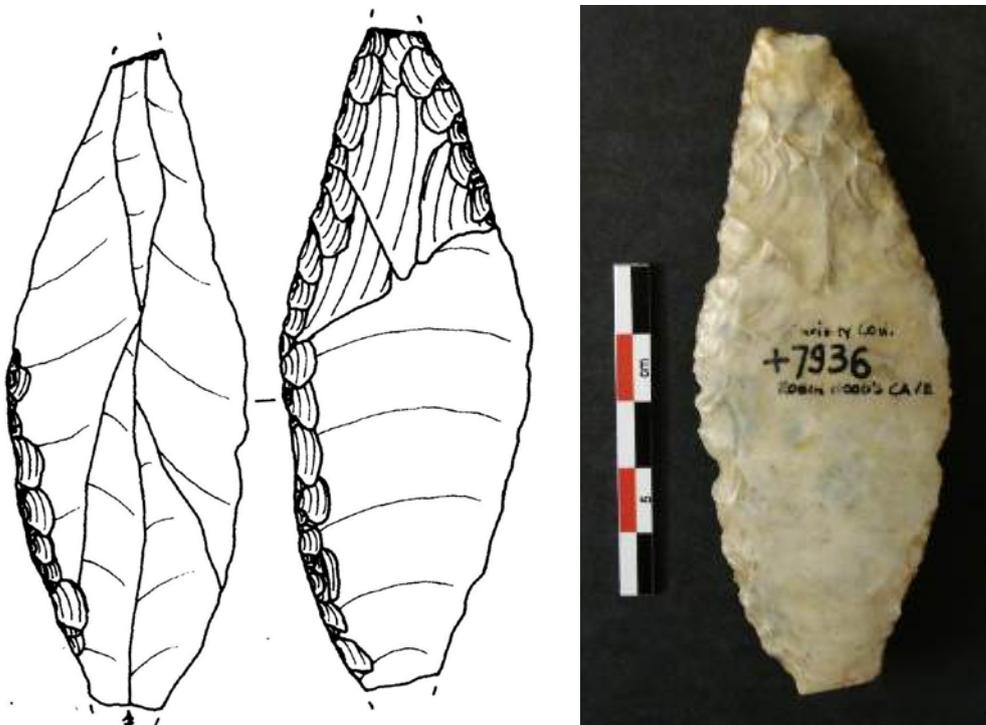


Fig. 4.41 Robin Hood's Cave 4 blade-point (Campbell 1977, Vol.2: 253: Fig.103.1; British Museum n.d.).

This piece is interesting as it is the only piece within this group that comes from the Midlands. It measures 100x39x12mm but has not been examined by me. Consequently my observations on the detail are limited. However this along with another artefact from Creswell were used by Flas (2006: 29) to show minimal retouch on large artefacts from a site that, like Spy, was some distance from good quality material sources. Flas used this contrast to highlight the individual nature of the Spy site. Indeed, if only the retouch is focussed upon, it could be argued to reflect production rather than repair or curation.

e. Beedings 29

This is the blade-point most often illustrated within discussions on the industry (see Fig.1.3). Cleanly struck, it also has transverse removals suggesting core maintenance. As already dicussed, the width:depth ratio suggests early removal whilst size and retouch indicate 'production'.

f. Beedings 30



Fig. 4.42 Beedings blade-point 30 (Photograph: author; Jacobi 2007: 256, Fig.23.3).

This proximal fragment measures 81x38x13mm and is the same width and depth as the previously discussed example. It seems to be fluted on the dorsal surface and shows minimal localised reduction on the ventral. The majority of the ventral face is un-worked and the margins largely sharp. In contrast the dorsal ridge immediately above the fluting seems worn. Viewed from the direction of the break, the cross section is triangular. This piece sits on the trend line showing 'ideal' form and with minimal localised retouch and fluting again fits the criteria for 'production'.

g. Beedings 14

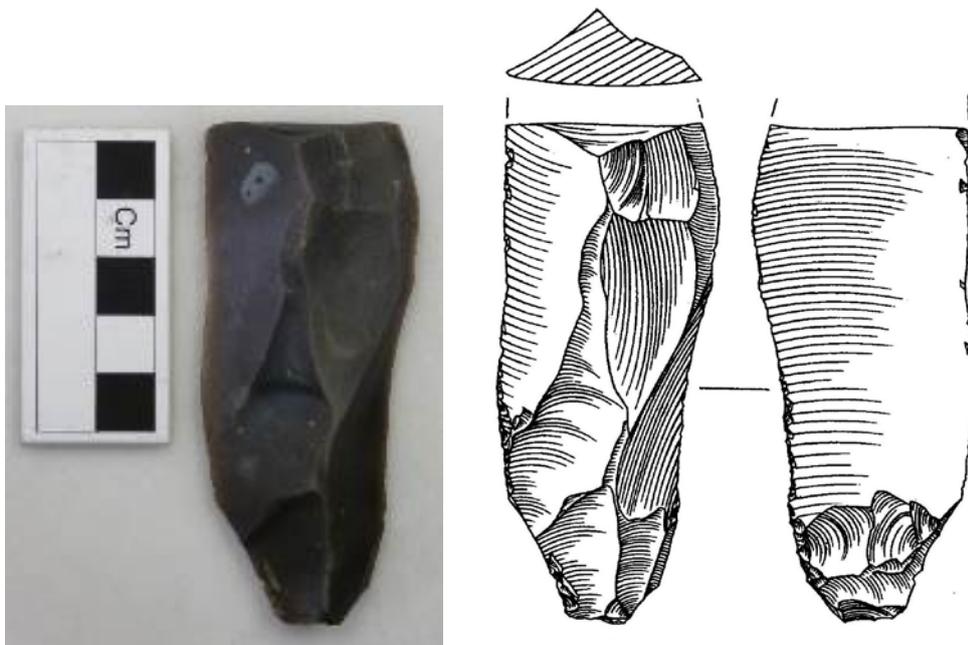


Fig. 4.43 Beedings blade-point 14 (Photograph: author; Jacobi 2007: 258, Fig.25.2).

This piece measured 86x37x14mm and was described by Jacobi (2007: 247; 258) as an 'unachieved' blade-point and, as such, indicative of production at Beedings. His diagnosis was based upon the edges not having been worked into symmetry. Only the proximal ventral section shows some minimal localised retouch, indicating it to be a blade-point (pre-form?). However whilst the edges

are clean and sharp the dorsal ridges have wear. This suggests the core from which this was struck was either curated or used in a way that wore down the ridges before the blade was struck. This piece is again indicative of 'production'.

h. Beedings 35

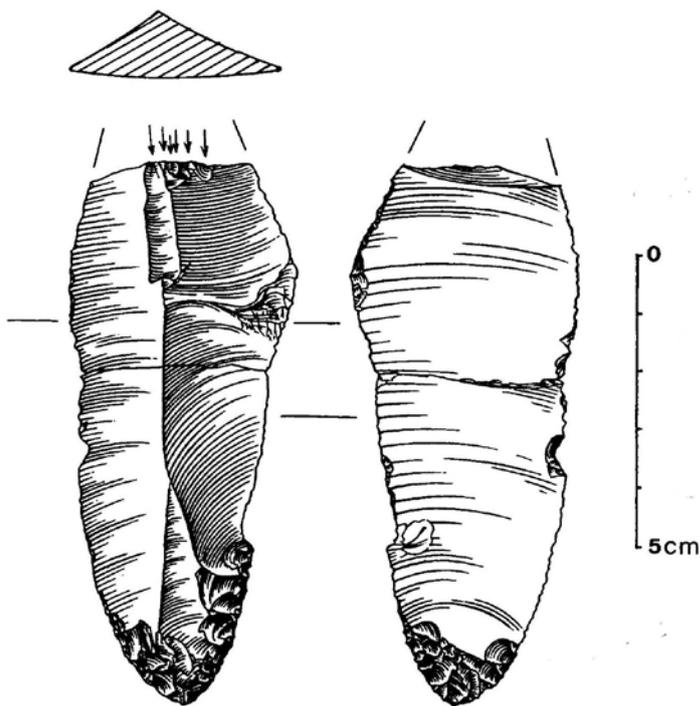


Fig. 4.44 Beedings blade-point 35 (Jacobi, 2007: 262, Fig.29.1).

This broken piece measured 92x36x12mm and for the purposes of this discussion follows Flas' dictum being indicative of 'production'.

i. Colby

This piece has already been discussed (see Fig.4.30) in detail and classed as a repair. However it again illustrates how repairs were occurring within flint areas and suggests again the form of a blade-point lent itself to renewal and was a preferential option to that of starting again even if further raw material was available in the area.

j. Beedings 10

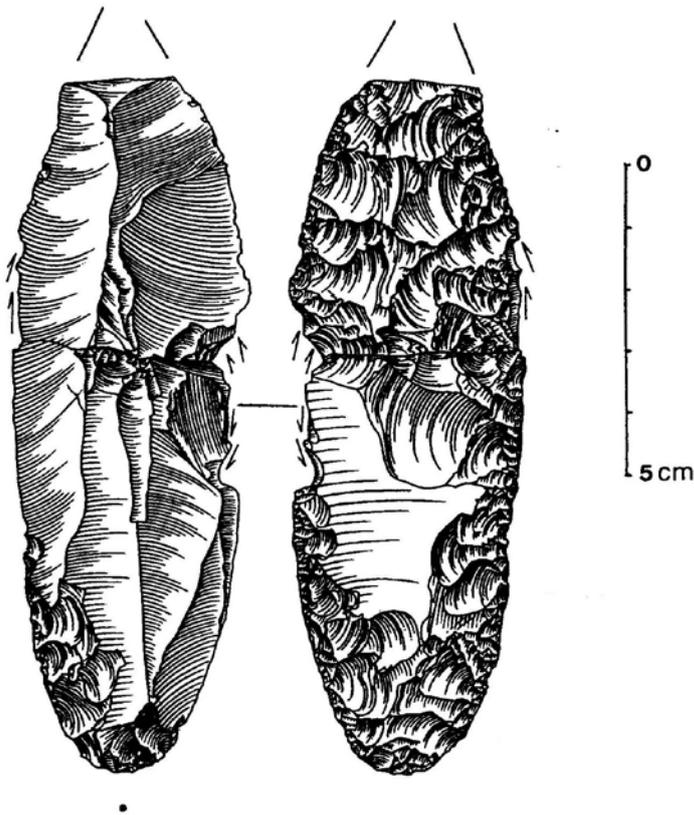


Fig.4.45 Beedings blade-point 10 (Jacobi, 2007: 254, Fig.21.1).

This piece is interesting in that the majority of its ventral surface has been worked and doing so has resulted in width reduction. As part of the 'original' ventral face is present, the depth reflects that of the original blade. Flas (2006: 27) has categorised pieces such as this with exhaustive ventral retouch as a

sub-type. It measures 111x35x14mm and has a width:depth ratio of 2.5 showing it to be disproportionately narrow, made so because of the invasive retouch process. All these aspects indicate a larger blade that had been curated.

k. Beedings 32



Fig. 4.46 Beedings blade-point 32 (Photograph: author; Jacobi 2007: 259, Fig.26.4).

This medial section is made from a good quality flint and like the previous example has complete ventral retouch. It is wide and relatively deep in spite of the retouch which would have reduced both dimensions. On the dorsal surface there is a transverse scar pattern suggestive of core shaping, indicating this to be perhaps an early removal. The presence of a small amount of cortex supports this notion. The edges are heavily worked indicating it has been used as a tool and one side has been burinated. Jacobi (2007: 270) has discussed this piece and suggested a linkage between its bruised edges and some pieces at Beedings with bruised butts. This linkage therefore suggests this piece was used in an

indirect-percussion process to accurately target impact. In contrast Nick Barton (1986 cited in Jacobi 2007: 270) has replicated this kind of bruising by wood chopping.

4.3.8 Discussion of the largest pieces

If we accept the assumption that pieces with above 50% present can be used as indicators of the original blade-point's character, an interesting pattern emerges. As discussed above, it is assumed that width is a sensitive indicator of retouch as it is applied from, and therefore reduces the edges in relation to depth. Because both fragmented and complete pieces are present these artefacts cannot meaningfully be ranked by length, and so are ranked by width. At the upper end of the width scale the majority of larger pieces (n=8) are characterised by localised and usually minimal retouch, a pattern posited by Flas (2006: 28) and accepted here as indicative of 'production'. In contrast, at the lower end of the scale a minority (n=3) have intense retouch covering the majority of at least one face. Following Flas' 'default' position, these three narrower pieces should also be interpreted as indicative of production. Within his model, increased retouch is explained as being the result of individual blade idiosyncrasies needing correction. However these three pieces group at the lower end of the width spectrum and there is 9mm difference between the widest and narrowest pieces presented here. Furthermore, one of these pieces demonstrates formal indicators of repair. Therefore it can equally be argued that these three pieces at the lower end of the scale are indicative of maintenance and repair behaviours. Based upon overall proportions, the Robin Hood's Cave blade-point could well be a larger blade-point maintained and reduced, however

it has not been seen directly and so it is categorised here based only degree of retouch.

>50% blade-points	Degree of retouch	Width
Town Pit	Indicative of production	44
Beedings 40	Indicative of production	41
Beedings 39	Indicative of production	40
Robin Hood's Cave 4	Indicative of production	39
Beedings 29	Indicative of production	38
Beedings 30	Indicative of production	38
Beedings 14	Indicative of production	37
Beedings 35	Indicative of production	36
Colby	Indicative of repair	36
Beedings 10	Indicative of maintenance	35
Beedings 32	Indicative of maintenance	35

Table 4.13 Production, maintenance and repair signatures.

This (by necessity) small sample looking at degree of retouch in relation to width supports the hypothesis that light and localised retouch on larger pieces is indeed indicative of production. However, if a typological and quantitative approach had been adopted, two of these pieces would be missing because they would be classed as scrapers, whilst a further five would not be included within the analytical corpus because of the methodological difficulties of including fragments in any quantitatively useful way. Typological and quantitative methods therefore obfuscate evidence of the largest and least retouched blade-points, and result in a metric average that is too low. An implication is that the majority of the material within the analytical corpus should be recognised as mid-range, and this material is at least as likely to be representative of material economy or maintenance as it is of production. With this implication in mind it is again necessary to focus upon Flas' criteria, but this time in relation to the smaller than average materials.

4.3.9 Material economy signatures

We have already seen how the very largest blade-points have minimal retouch and so it can be argued that if the smaller than average blade-points have relatively more retouch this would very probably be indicative of some kind of maintenance behaviour resulting in reduction. Whilst it was necessary to include fragments within the 'upper' corpus, complete pieces are available and can be used when interrogating below average blade-points. Flas' average is used here to identify the lower end pieces.

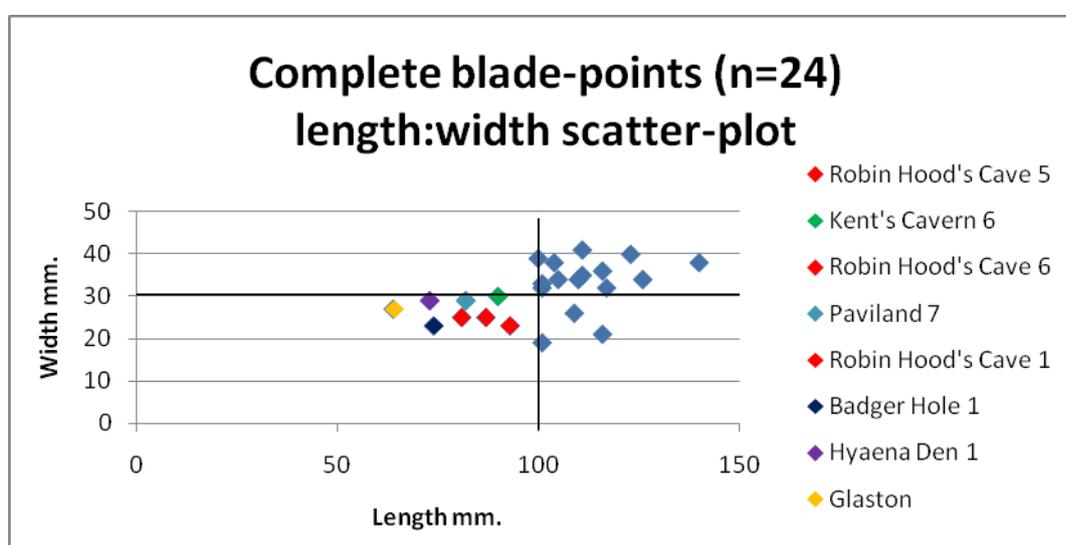


Fig. 4.47 Below average complete pieces ranked by length.

Blade-points	Length	Width	Depth
Robin Hood's Cave 5	93	23	11
Kent's Cavern 6	90	30	10
Robin Hood's Cave 6	87	25	12
Paviland 7	82	29	12
Robin Hood's Cave 1	81	25	10
Badger Hole 1	74	23	7
Hyaena Den 1	73	29	12
Glaston	64	27	7

Table 4.14 Below average complete pieces ranked by length.

Eight complete pieces that fell below Flas' average length and width measurements (Fig.4.46; Table 4.14) have been ranked in relation to length and are discussed in turn.

a. Robin Hood's Cave 5

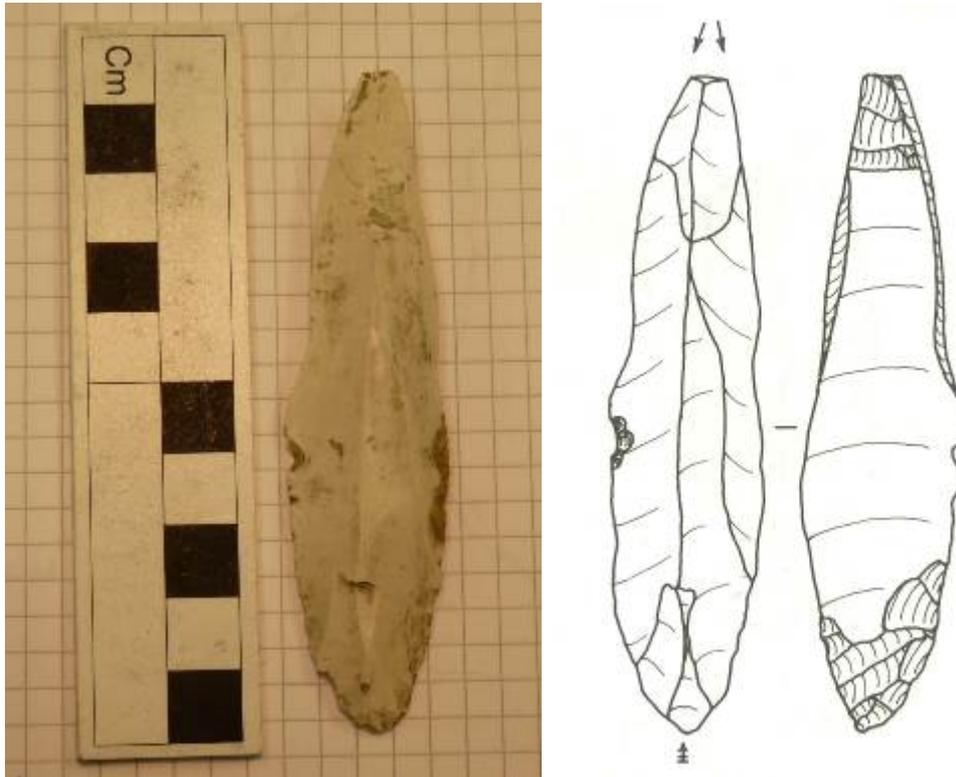


Fig.4.48 Robin Hood's Cave blade-point 5 (Photograph: author; Campbell 1977, Vol.2:252, Fig.103.2).

This piece measured 93x23x11mm and the important point to draw out is that retouch on the proximal ventral section indicates this once was a blade-point. This is supported by the proximal dorsal section indicative of possible fluting, in contrast to the burinated distal edges. This has a relative life history from first of all being a blade-point to subsequent transformation into a burin. This life history contradicts the 'variation due to production' argument and can be recognised as 'transformed'.

b. Kent's Cavern 6

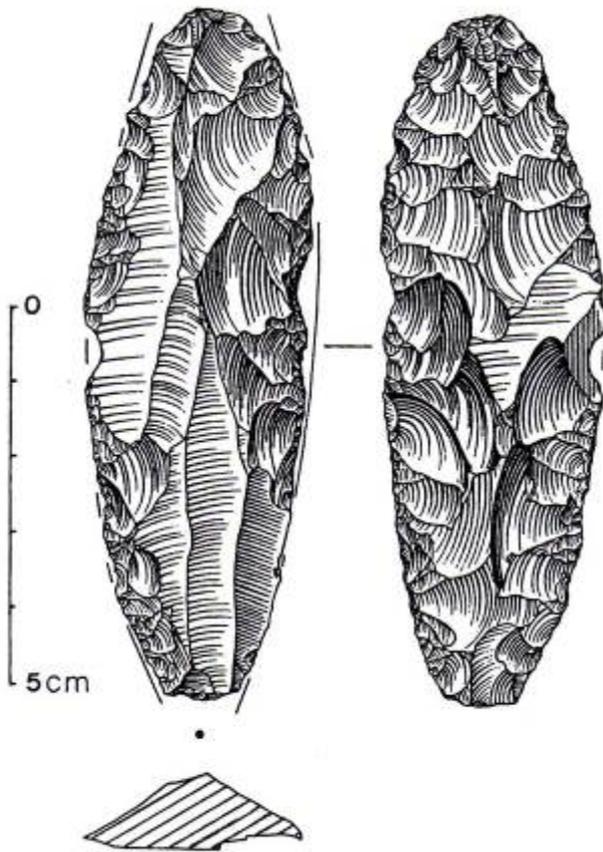


Fig.4.49 Kent's Cavern blade-point 6 (Jacobi 2007: 283, Fig.44.2).

This bi-point (Fig.4.48) measured 90x30x10mm and could be considered average in all dimensions. A relatively high degree of retouch on both the dorsal and ventral surfaces illustrates how both length and width have been reduced. In contrast some 'original' ventral surface was present and so the depth would reflect the original blade thickness. If the depth is considered 'authentic' but length and width clearly reduced, then the actual width:depth ratio would originally have been probably greater than 3.2. This would be indicative of later phase blade product struck from a smaller core. Although heavily worked,

proportion in relation to original thickness supports Flas' production explanation here.

c. Robin Hood's Cave 6

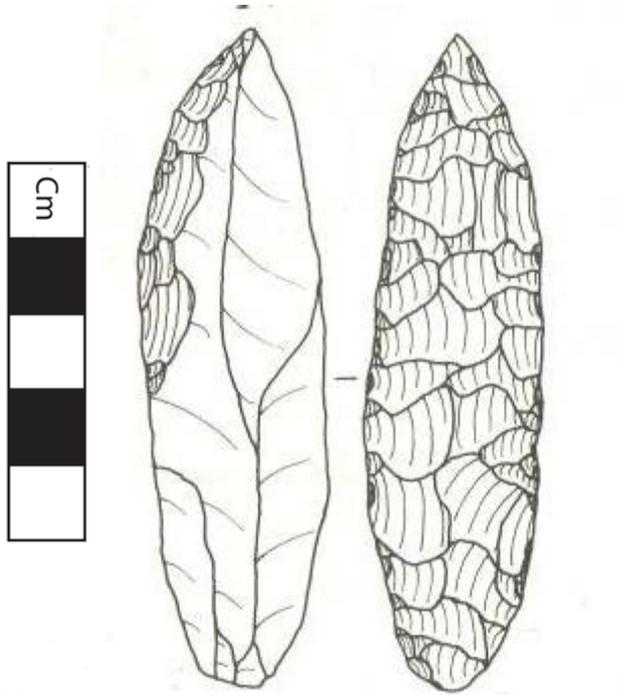


Fig. 4.50 Robin Hood's Cave blade-point 6 (Campbell 1977, Vol.2: 253, Fig.103.3).

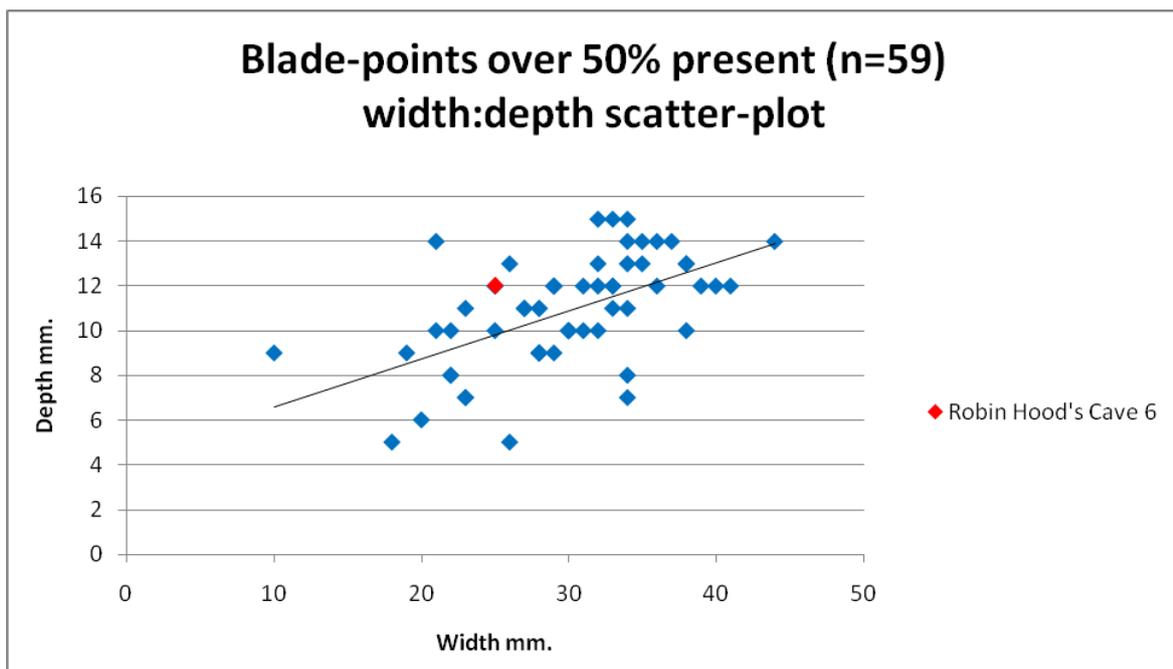


Fig.4.51 Scatter-plot illustrating Robin Hood's Cave 6 anomolous depth in relation to width.

In contrast, this piece measured 87x25x12mm and could be glossed as short, narrow and thick. Disproportionate thickness is in spite of complete ventral retouch, apparently aimed at thinning. Narrowness in relation to depth was perhaps a side effect of this process. Proportion and degree of retouch support the interpretation of maintenance.

d. Paviland 7

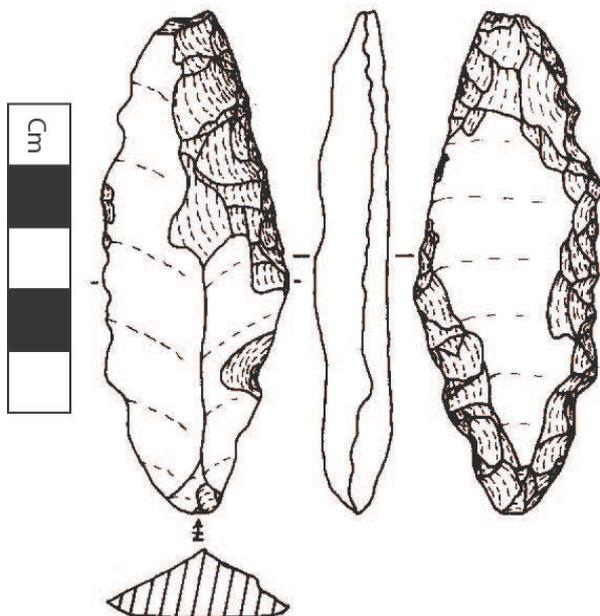


Fig.4.52 Paviland 7 dark green Carboniferous chert blade-point (Sollas 1913: 352), drawing from (Campbell 1977, Vol.2: 245, Fig. 95. 1).

Measurements of 82x29x12mm were taken from a cast and discussion is based upon the illustration. This piece can be summarised as being short, deep and heavily edge damaged. Whilst less heavily retouched than previous examples, the pattern cannot be described as localised. Depth and degree of retouch are consistent with the maintenance of a previously larger blade.

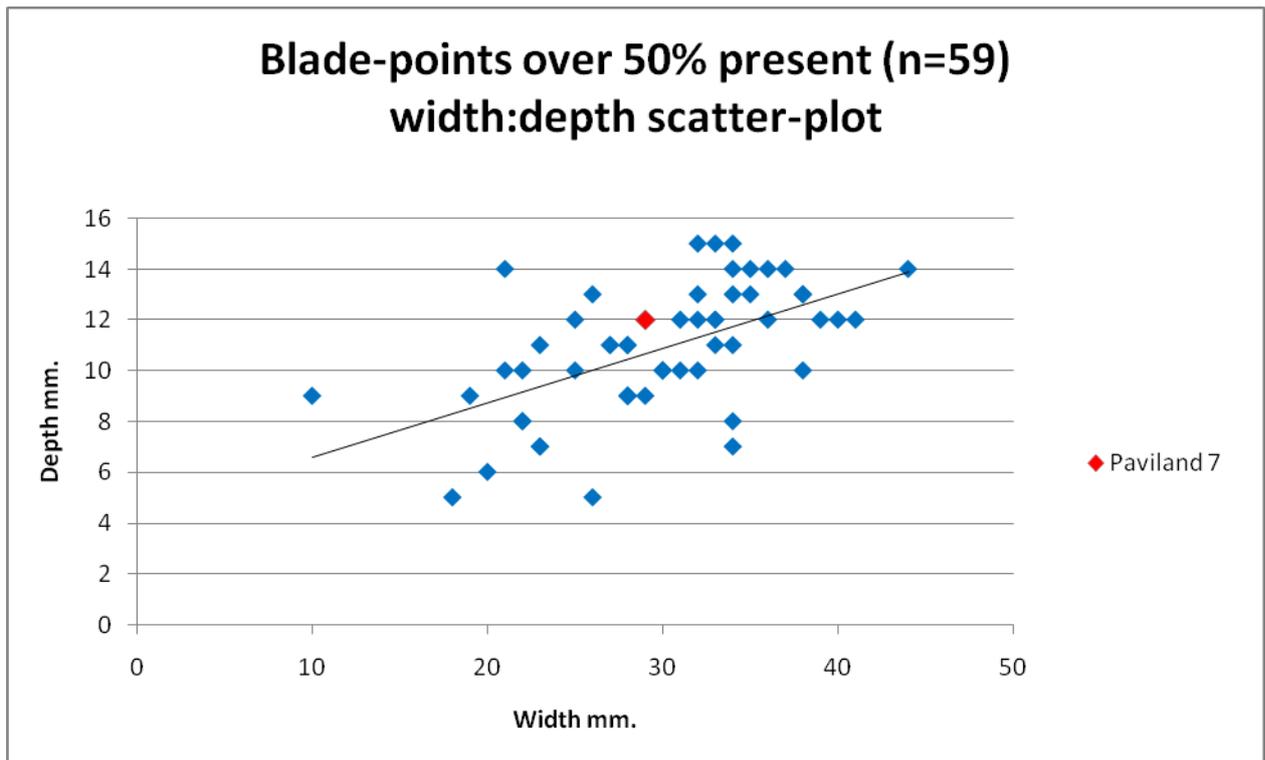


Fig. 4.53 Scatter-plot illustrating Paviland 7 anomolous depth in relation to width.

e. Robin Hood's Cave 1

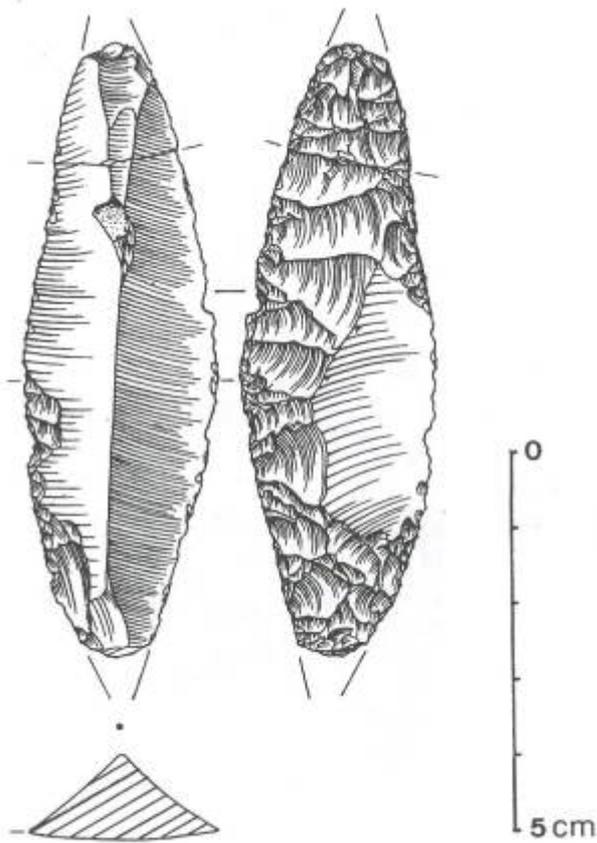


Fig.4.54 Robin Hood's Cave blade-point 1 (Jacobi 2007: 292 Fig.50.1).

This piece was small, broken and had about three quarters of the ventral surface retouched. Both pieces joined together measured 81x25x10mm and all relative proportions sat close to the trend-line, although length and width were below average. The remaining ventral blade surface and the small amount of cortex present on the dorsal face suggest this could have been reduced from an early blade struck from a small core. As such it perhaps fits well with Flas' argument for a small blade in need of work to bring it into form.

f. Badger Hole 1

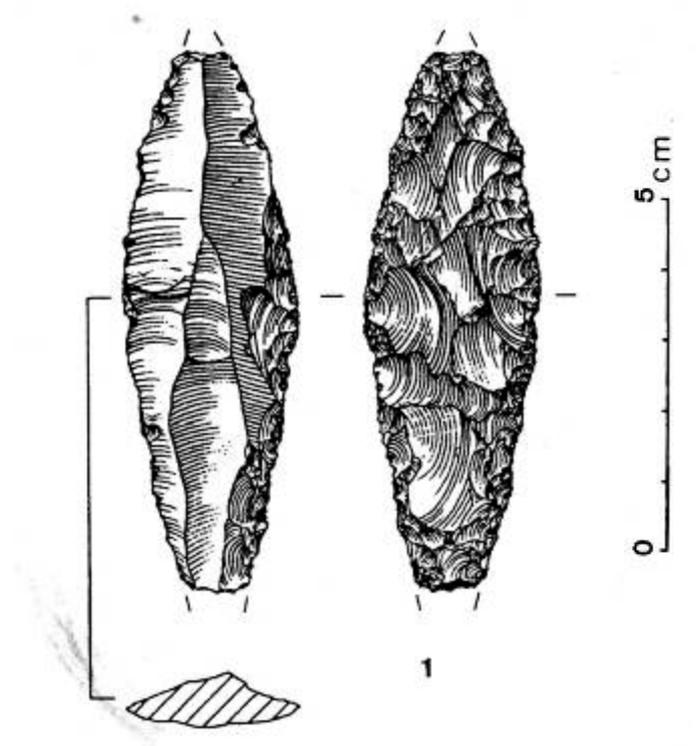


Fig. 4.55 Badger Hole blade-point 1 (Jacobi and Currant 2011: 57, Fig.2.4.1).

Badger Hole 1 is a small blade-point with complete ventral retouch and lenticular cross-section. It is a bi-point measuring 74x23x7mm which makes it below average size in all dimensions. In relation to the smallest complete piece that is from Glaston this artefact is both longer and narrower. This narrowness is largely due to the medial section of the ventral surface being reduced from the edges. Complete retouch has also reduced the depth, creating a blade-point that is both narrower and significantly less deep in relation to the trend-line.

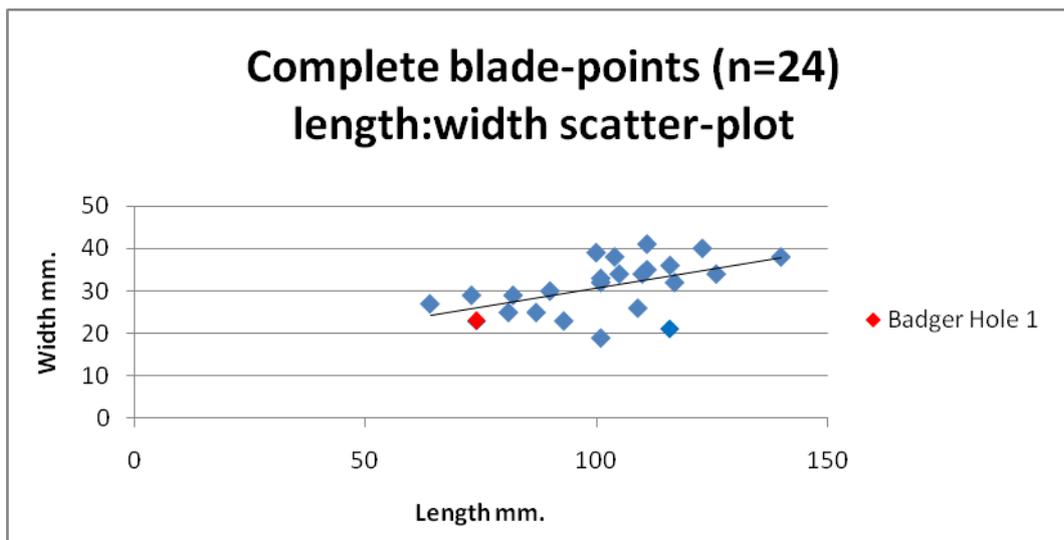


Fig.4.56 Badger Hole blade-point 1 below average in both length and width.

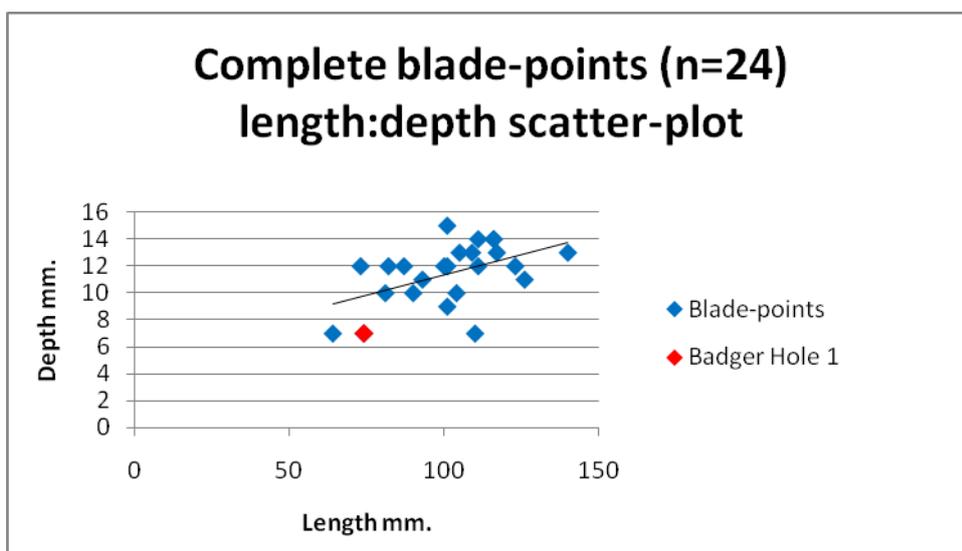


Fig.4.57 Badger Hole blade-point 1 below average in both length and depth.

According to Flas (2013: 221) this retouch would be aimed at addressing particular problem aspects of the blank. Proportionally, it can be argued as more indicative of a heavily maintained piece. Contrasting this with the blade-point from the closely related site of Hyaena Den further supports this view.

g. Hyaena Den 1

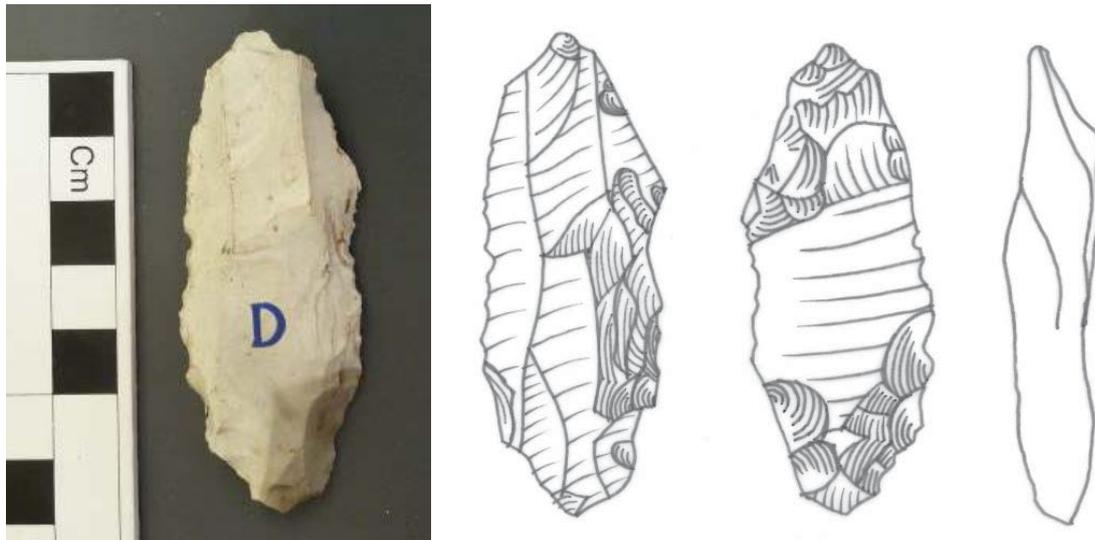


Fig.4.58 Hyaena Den 1 blade-point (Photograph and illustration: author).

This piece measured 73x29x12mm and was heavily edge damaged. It was relatively wide in relation to length, in spite of the edges having been reduced. It was also relatively deep in relation to width and the profile view highlighted an undulating section of the ventral surface and unsuccessful attempts to reduce it (Fig.4.57). It is this undulating section that accounts for the depth, a problem that was unable to be resolved.

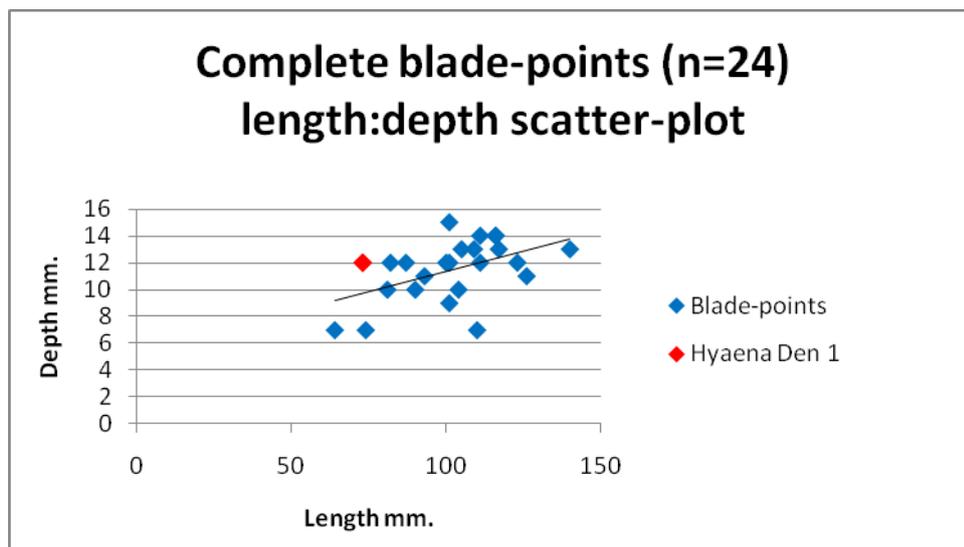


Fig.4.59 Scatter-plot illustrating anomolous depth in relation to length for Hyaena Den 1.

The relationship between depth and length shows the greatest variance and suggests length was reduced through damage (Fig.4.58). Perhaps the unsuccessful attempt to reduce the ventral prominence was part of a remedial strategy. I interpret this as a larger blade-point with damage primarily impacting upon length. Unsuccessful attempts were made to reduce the depth of the piece and ergonomics combined with differential ridge wear suggests could have been used as a cutting tool (Fig.4.59).



Fig.4.60 Ergonomics and ridge wear suggest a 'cutting' function before universal edge notching (Photograph: author).

At some point after apparent use, it sustained universal edge damage through movement, probably into the cave where it was preserved. The brutalised appearance of this blade-point provides a model of damage, whilst the previously discussed refinement of Badger Hole 1 can be seen as indicative of a similar sized example after maintenance and rejuvenation.

h. Glaston

This piece has been already been discussed and it is enough to reiterate that it was cleanly struck with minimal retouch and exemplifying a 'production' signature. Based upon depth I would argue that this is probably similar to Kent's Cavern 6 and the Robin Hood's Cave blade-point 1 examples, in that they all seem to have been struck from small cores.

4.3.10 Discussion of below average pieces

Blade-points	Degree of Retouch
Robin Hood's Cave 5	Minimal retouch but transformed
Kent's Cavern 6	High degree of retouch
Robin Hood's Cave 6	High degree of retouch
Goat's Hole 7	Medium degree of retouch
Robin Hood's Cave 1	High degree of retouch
Badger Hole 1	High degree of retouch
Hyaena Den 1	Medium degree of retouch
Glaston 1	Minimal retouch

Table 4.15 Summary of degree of retouch within the below average size corpus.

In contrast to the larger pieces, a majority (n=6) of these smaller artefacts have either a medium or high degree of retouch. In addition one was transformed from a blade-point into another artefact type. As such they support the notion that increased retouch does generally correlate with reduced size in the British corpus. However it would seem that reduced size was related to perhaps two differing factors. Firstly pieces like Glaston, possibly Kent's Cavern 6 and Robin Hood's Cave 1 illustrate how some of these blade-points were produced upon smaller blades struck from reduced or smaller cores. As such, in spite of a high degree of retouch, they could fall into Flas' 'production' category. However, the cores they were struck from could have been curated. The high degree of retouch present on the remainder of these smaller pieces, all from flint poor

areas, is argued to signal maintenance. This assertion is supported by the width:depth ratios discussed. This small and qualitative summary is presented in order to highlight some of the methodological complexity associated with categorising materials within small collections, but also to illustrate some opportunities created by a more qualitative and inclusive approach.

4.3.11 Conclusion

This section has illustrated a relationship between blade-point size and geography and possibly material availability. It then critiqued the notion that variability is always related to production problems, by recognising the low average size that has been posited for blade-points. Increasing the average size and inclusion of large fragments, showed how larger pieces tend to have proportionally less retouch, whilst the reverse is true for smaller pieces. This would suggest maintenance and repair were significant contributors to variability. The next section will develop this argument by an examination of blade-point formal variability.

4.4 Explicating type fossil variability

The blurring of form within the artefacts discussed is problematic for categorisation. It is therefore important to acknowledge and explore this difficulty (cf. Flas 2006: 167). Categorisation requires clear boundaries in order to make artefacts scientifically useful. However categories become problematic when materials transcend or blur conceptual borders. If we categorise and quantify artefacts as blade-points, they are therefore not included in burin or scraper totals, in spite of evidence that they may have also been used as such. Furthermore, depending upon how they are formulated, categories can also be problematic because they can 'fix' meanings to artefacts and disguise plurality. If we categorise blade-points as missile heads, they are therefore not conceptualised as knives although previous researchers have acknowledged the probability that they may have been used as such (Jacobi 1986: 63).



Fig. 4.61 The difficult to classify 'Spork' designed by Joachim Nordwall (Light my Fire n.d.).

A more recent example of this kind of blurring is the 'Spork', a hybrid form of cutlery. Whilst its use value is clear it would obviously present categorical problems similar to the examples discussed here. Like the Spork much of the Lincombian material seems to resist pre-existing typological models of

categorisation (cf. Jacobi 2007: 243). This resistance can be perceived as valuable for helping us to think about new approaches. It is argued that the value of inherent variability can be better understood within the notion of a life-cycle.

4.4.1 The notion of a life-cycle

An alternative way of conceptualising these artefacts can be as frozen moments within a 'life-cycle'. Developing this notion suggests that sites may simultaneously contain artefacts that can be understood as being at differing phases within the same life-cycle. This resolves the binary divide seeing sites as either signalling curation (e.g. Spy) or production (virtually all the rest). This may also provide an explanation for the heterogeneity of form and concomitant problems with categorisation. Furthermore if we think of this technology in life-cycle terms, a temporal dimension is added to static collections of artefacts. This temporal dimension can provide a better understanding of the materials conventionally classified as sub-types. One sub-type used by Flas (2006: 175) described blade-points that had complete dorsal retouch. Complete dorsal retouch was unusual within the corpus as a whole and was argued to be related to the removal of cortex within the process of production (ibid.). Kent's Cavern blade-point 5 supports this explanation.

a. Kent's Cavern 5

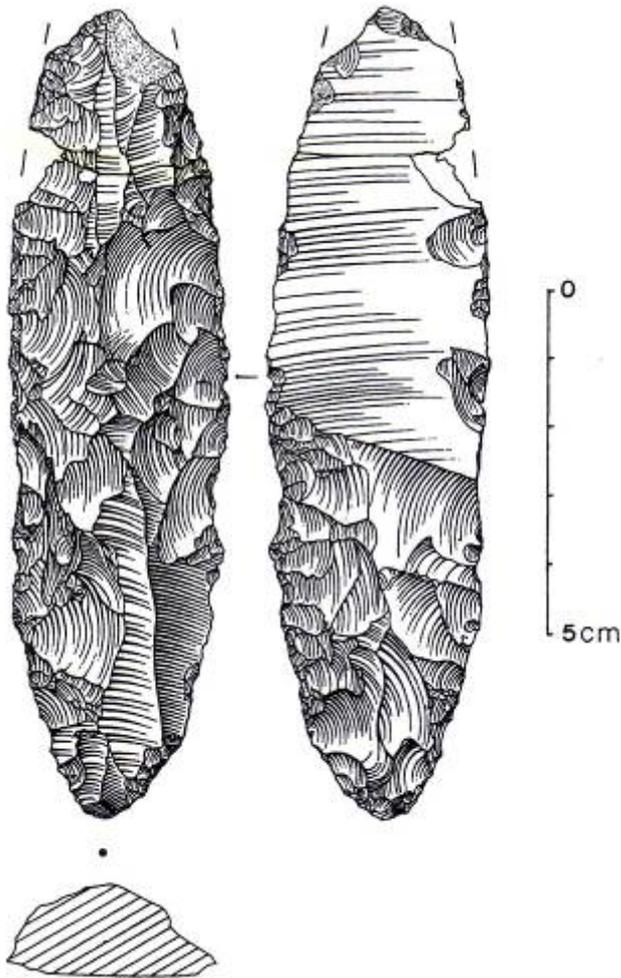


Fig. 4.62 Kent's Cavern blade-point 5 (Jacobi, 2007: 283, Fig.44: 1).

This bi-point measured 116x21 x14mm. Cortex showed it to have been an early removal and intense dorsal reduction focused on the medial margins resulted in a plano-convex cross-section. This made it proportionally very narrow in relation to depth. The high degree of retouch, covering what amounted to three-quarters of the whole surface may therefore have been aimed at reducing depth on what was originally a large and cortical blade. As such, it clearly supports Flas' explanation. However there are other complete dorsal reduction examples that do-not fit so easily this model.

b. Hainey Hill

Whilst also demonstrating complete dorsal reduction, this piece was very thin with metrics of 110x34x7mm. Jacobi (2007: 273) highlighted some uncertainty about this artefact being a blade-point and this is understandable. As well as being thin, it had an apparent tang at one end. However upon examination it appeared to be a blade-point transformed into a boring tool (Fig.4.62). The apparent tang seemed to be an end used for boring, and this same process, though less obvious, was also present at the opposite tip (Fig.4.63).



Fig.4.63 Note the steep retouch on the right hand side of both faces consistent with clockwise rotation of the 'tang' to widen a hole (Photograph: author).



Fig.4.64 Note the steep retouch on the right hand side of both faces consistent with clockwise rotation of the tip to create a hole (Photograph: author).

The uncharacteristic lack of depth suggests the whole piece has been deliberately thinned and the apparently systematic edge damage indicative of use. This edge damage has a parallel with a blade fragment recovered from Badger Hole that John Campbell categorised as a 'heavy saw'. In contrast, Karl Lee (pers. comm.) saw this as an ideal tool for planing wood. Further support to the argument that the Hainey Hill example is a blade-point is provided by a piece from Suffolk (now lost) discussed and illustrated by Jacobi (2007: 275) that has a similar intensive dorsal reduction resultant in overall thinning.

c. Baldings Hill

Taken from the illustration (Fig.A1.7) this blade-point measured 104x38x10mm and was again a bi-point and with total dorsal retouch. It proved useful to contrast the relative depths of the three dorsally worked pieces under discussion.

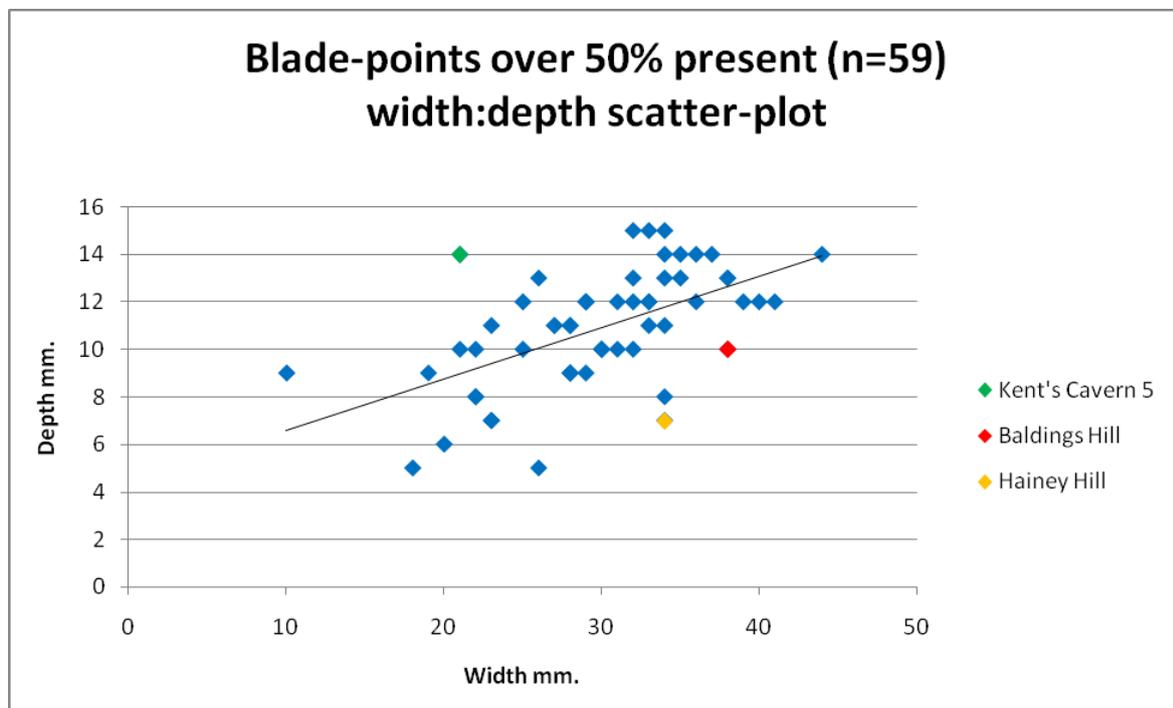


Fig. 4.65 Whilst all bearing intense dorsal retouch, two of these pieces are uncharacteristically thin whilst the other uncharacteristically thick.

Comparison makes it clear that the Kent's Cavern piece sits 5mm above the trend line for depth, whilst the two others sit between 3 and 4mm below (Fig. 4.64). Interestingly, the relatively thick piece was recovered in an area of poor flint availability. In contrast, both the heavily thinned pieces are from flint rich areas. This suggests that transformation of blade-points was not necessarily a response to a lack of material, but rather an artefact of the design. The two thinned pieces indicate that intensive dorsal reduction was sometimes aimed at reducing the artefacts' depth significantly, not simply the removal of cortex. In contrast, the artefact from Kent's Cavern seems indicative of an early stage blade removal, being heavily worked in order to bring it into only approximate blade-point form.

I agree with Flas that dorsal retouch seems to be indicative of a thinning process. However this was not solely to produce blade-points from awkward supports, but also to transform blade-points for other functions. Flas (2006: 174) acknowledged his was a default position simply based upon the results of his analytical approach. These examples suggest that complete dorsal retouch needs to be understood in relation to other formal variables. Rather than categorising pieces with complete dorsal retouch as a sub-type, they are better interpreted as representing differing moments within a life-cycle. The Kent's Cavern piece seems to be at an early production phase of the life-cycle whilst the Baldings and Hainey Hill pieces are a later transformation phase. Importantly this capacity for transformation was facilitated by the original thickness of the blade selected.

4.4.2 Thickness as redundancy

Thickness within this corpus is read here as a redundancy that facilitated continued functionality within future environments after damage and repair. As already highlighted, Morrow (1996: 588) has argued that, within many hunter-gatherer mobile technologies, bigger can be argued to be better because larger artefacts can have a greater capacity for rejuvenation. Flas (2011: 615) recognised that one characteristic of LRJ technology was the production and use of thick and robust blades, and Jacobi (1986: 63) observed how this made them ideal for recycling. It is argued here that the evidence in the form of repaired and transformed pieces shows how the selection of thick blades was related to their capacity for future re-sharpening (e.g. Beedings blade-point 10), repair (e.g. rounded base on Kent's Cavern blade-point 4) and transformation (e.g. Hainey Hill). The production of thick blades had an inherent future orientation. The use of an opposed platform core may have been designed to facilitate the production of thick blanks easily transformed into blade-points, with the capacity to be repaired if damaged (cf. Jacobi 1986: 63). However this was not only a maintainable technology, as blade-points could also be transformed into other tools. It has been demonstrated elsewhere that relative thickness may have had the capacity to produce large wounds (Milks 2010). It was also probable that robust form may have been useful for reducing possible breakage. However from the archaeological record we can see that these artefacts were also maintainable and recyclable. This argument is supported by another component quality that can be understood to serve a similar function.

4.4.3 Bi-pointed design

Flas recognised that the majority of blade-points were bi-pointed, and that those with a rounded base are a rare sub-type (Flas 2013: 220). From a design perspective, a bi-pointed format would again employ a degree of redundancy as each blade-point would have embodied two potential points. However, should one point break, then at the other end of the broken piece a second point could literally be brought to the fore. The blade-points Kent's Cavern 2 has been pointed on the proximal end of the blade and rounded at the distal.

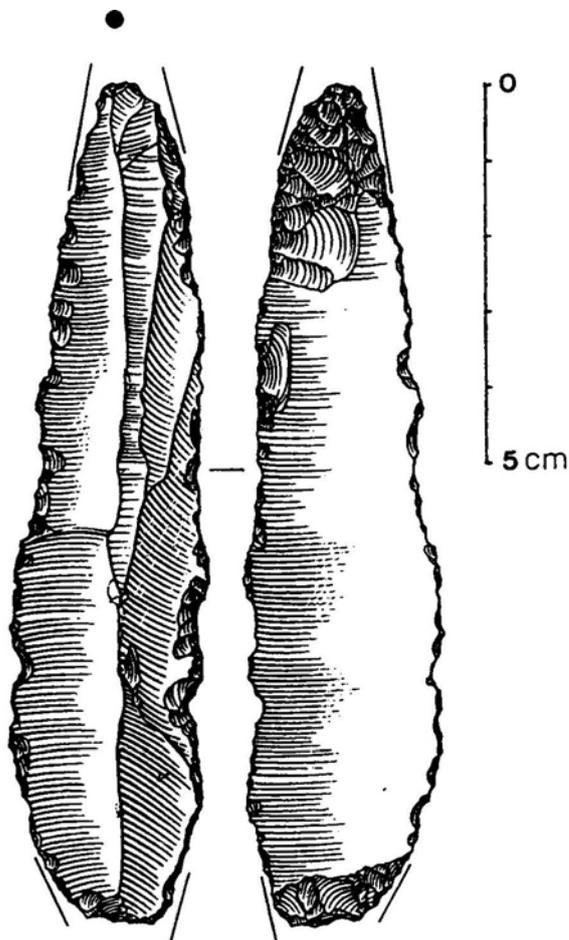


Fig.4.66 Kent's Cavern blade-point 4 (Jacobi 2007: 282, Fig.43.1). On this piece the rounded base seems to be at the distal end of the blade. Examples from Bapchild (Fig.2.9), Bench Quarry Tunnel

(Fig.2.10), Kent's Cavern 2 (Fig.4.26) and Robin Hood's Cave 2 (Fig.2.29) apparently illustrate the same.

This design could have released the user from the need to access further raw material should breakage occur. As such, it would be ideally suited for use within areas of unknown resource availability. It also suggests that the work put into producing a blade-point meant that they were not simply disposable items (the necessary implication of Flas' default argument that formal variability was related only to production). Thinking again about a life-cycle approach can be useful when examining pieces categorised as rounded base sub-types.

4.4.4 What constitutes a rounded base?

In reviewing my own corpus it became clear that there is a degree of subjectivity involved in differentiating bi-pointed examples from those with a rounded base.

The Glaston blade-point was the smallest piece and a bi-pointed example that was broken during excavation. The excavators believed the broken end to be the more pointed (Cooper pers. comm.). If correct it would have had a clearly penetrative point at each end and therefore be unequivocally bi-pointed.

However, what this blade-point also unequivocally illustrates is the vulnerability of blade-point tips to damage. Within the 24 complete pieces identified within the British corpus only four pieces had tips present. Two from Beedings in Sussex, 29 and 39 have kept their tips, along with the blade-points from Glaston in the Midlands and Colby in Norfolk. The effects of taphonomy would therefore suggest that because of a blade-point's particular form, their tips were vulnerable.

4.4.5 Damage through use

Following this model, blade-point 10 from Beedings (Fig.4.44) was classed as 95% complete, as one tip was obviously missing. However the material from Beedings was exceptionally well preserved and so it was not taphonomic processes that were responsible for this damage but apparently ancient impact. As well as a damaged tip it carried impact evidence in the form of burin-like breaks at the centre. This piece from Beedings is discussed to illustrate how impact damage could also be responsible for the removal of tips. If tips were vulnerable in the Palaeolithic past to damage from impact, then it can be argued that repair of the tips may also have been a necessary task in the past. If so then this process may be evidenced on some pieces.

To explore this idea it is useful to look again at the largest complete blade-point within the corpus (Fig.1.3). This piece is ambiguous when attempting to categorise it as either a bi-point or rounded base. Its symmetry suggests it could have been bi-pointed with true penetrative points at each end. However the intense retouch on the proximal surfaces has rounded off what could have been a point and it could be classified as a rounded base type. If we accept that tips were vulnerable to breakage in the Palaeolithic past then one strategy for repairing a broken tip could have been simply to round off the broken end.

4.4.6 Rounded bases as proto-tips

An alternative interpretation could be that rounded bases such as Fig.4.65 may have been deliberately created during production as 'proto-tips'. This would allow the proximal section to fit neatly into a haft, as well as rendering the artefact easier to handle un-hafted. This would allow use as a knife before (or

after) use as a missile head (cf. Evans 1872: 452). As discussed, Morrow has argued that the production of larger artefacts could negate the need to haft tools as they could have been hand held (Morrow 1996: 588) and in a largely treeless environment this would have been a valuable attribute. However these rounded ends could also be easily and quickly transformed into penetrative points should the need arise. In other words, rounding could be a way of preserving a section until a tip was needed and then it could be pointed. This is in contrast to pieces like the one from Spy with high depth and low length and a rounded base that lie much closer to the blade-point's maximum width. Following Flas these characteristics seem indicative of the repair of a more substantial missing section. If so this would explain why the categorising of a rounded base can be subjective and ambiguous. Rather than deciding when a piece 'becomes' an atypical rounded base sub-type it can perhaps be better understood within a process or continuum of production and repair. It also avoids 'fixing' the blade-point's identity as either a 'missile head' or a 'knife' as it encompasses both functions at differing times. From an interpretive perspective, this could be seen as *'running with the hare and hunting with the hounds'*. However, transformed pieces such as Beedings blade-point 39 (Fig.4.39) with two differing 'tool types' (scraper and piercer) formed on a previous 'weapon' (projectile-tip) supports exactly such an inclusive interpretation. Category boundaries can be useful but are considered even more valuable when a temporality is acknowledged that can accommodate non-typical artefacts.

4.4.7 Heterogeneity and interpretive potential

Andrew Myers (1989: 87) has observed that technology is produced and used to solve problems. This observation carries with it the correlate that technology can therefore be used to formulate an understanding of the problems the human producers and users were facing. Acknowledging and exploring within-corpus heterogeneity has laid out the breadth and variation of this technology. This variant technology and its associated temporality can therefore be seen as reflective of the problems these hunter-gatherers were engaged with. Following the design logic embodied within blade-point technology, these hunter-gatherers' problems could have been both foreseen and future orientated (killing) whilst at the same time proximate and present moment (adaptation, transformation and repair). Developing a typo-technological model that embodied predictability, regeneration and adaptability was one strategy with which they resolved the contradictory nature of the problems they were facing. Perhaps these problems were foreseen because of past experience, but also unpredictable because of the nature of the activities. Material and shape were combined through the technology of production to manufacture thick, symmetrical blade-points. Variable damage through use could warrant a range of responses including maintenance, repair, transformation or discard. Perhaps these symmetrical points produced on thick blades are better described as a predictable and adaptable technology.

4.4.8 Adaptability, burins as planes

As argued, an average size for blade-points is of limited use as heterogeneity within the British corpus is significant. If sequential blade-point reduction is at least a part contributor to the heterogeneity observed then it follows that the blade-points' wooden haft would also require remedial attention. Tools for working on the wooden haft seem to have been made from damaged and re-worked blade-points in order to manage and accommodate this dynamic heterogeneity of size. Jacobi (2007: 243), in his discussion of the Beedings collection, identified 19 probably deliberately produced burin edges. A thick and transformed blade-point from Drayton Wood Rd, Norfolk has been clearly burinated and, as Tomášková (2005: 97) has observed from EUP Pavlovian (Gravettian) sites in the Czech Republic and Austria, straight burin edges were used there for scraping and planing hard surfaces including wood. As well as burinated blade-points, other transformations deserve reiteration. The blade-point from Hainey Hill and that from Baldings Hill are outliers in depth, showing that the dorsal retouch in these instances has resulted in dramatic thinning. Edge damage on the Hainey Hill example was seen by Campbell as indicative of a saw, and by Karl Lee as a planing tool.

4.4.9 Adaptability, knives and scrapers

Our interrogation of the fixity problems associated with categorisation, as well as evidence in the form of blades comprising two tool types, suggest that artefact use was fluid, and that function could change or be added to. In effect an artefact's function was related to the context in which it was used. It is therefore important we think about object, function and context together. Blade-points

with ergonomically rounded bases made into scrapers, such as Beedings blade-point 39 (Fig.4.39), suggest un-hafted blade-points may also have had a processing function as knives without excluding a past or future function as projectile heads. The probable context for a tool of this type would be processing an animal body after a kill had taken place.

The problems associated with categorising these artefacts suggest that blade-point form may have been usefully adapted for tasks other than directly as hunting weapons. They may have simultaneously been tools as well as weapons. They seem to oscillate in and out of form, broken out and chipped back in. Killing may have been the meta-problem solved by this artefact, but maintaining this ability within areas where further materials were not guaranteed was resolved within the form of the object as well as the adoption of alternative stone sources, maintenance and repair via reduction. Reduction in size brought problems in relation to hafting and transformed pieces with burinated straight edges and thinned blade-points are interpreted here as 'haft management' equipment. However there were also the problems of managing the processes associated with having killed an animal, essentially, cutting, piercing and scraping tasks. Un-hafted blade-points with rounded bases would indeed make useful and ergonomic knives, and blade-points were also transformed into end-scrapers presumably for hide processing. In this respect it is clear that within-corpus heterogeneity tells us much about the problems faced by these humans and the technological strategies they employed to resolve them. Thinking about blade-points and leaf-points as type fossils is useful as an organisational strategy when differentiating materials from a range of industries (e.g. Flas

2006). However, exploring heterogeneity has revealed the maintainable, repairable and adaptable affordances of the blade-point form.

4.4.10 Chapter conclusion

The aim of this chapter has been to answer the second research question by exploring and explaining blade-point typological, metrical and formal heterogeneity. Typological analysis supported the previously established notion that tabular raw material was suitable for leaf-point production whilst flint nodules were better suited to blade production. Size differential within the overall corpus indicated material and human movement from east to west across Britain. Formal variability illustrated how blade-points were adapted to a number of tasks other than simply use as missile heads. Metric and formal analysis together showed how maintenance and repair via reduction was a significant feature of the blade-point corpus from Britain. The results of this and the previous chapter together provide a useful *chaîne opératoire* model linking artefacts to behaviours. The next chapter will use this model to develop an understanding of the behavioural characteristics associated with three collections that comprise type fossils and *debitage*.

Chapter five

Assemblages, patterns and behaviours

The aim of this chapter is to provide an answer to the third research question by making explicit the human behaviour at each of three selected sites with a *debitage* component. To do so the previously established *chaîne opératoire* model is used to recognise material patterns within each assemblage. These material patterns can then be related to human behaviours that generated these assemblages at each site. The chapter is divided into four parts, with the first part dealing with the quantitatively small collection of relatively large artefacts recovered from Badger Hole in Somerset between 1938 and 1956 (Ashworth 1971: 1). The second part deals with 83 large and small elements excavated at Glaston in the Midlands in 2000. The third section analyses some flints from the original Beedings collection of ~1900 AD in relation to new material excavated in 2008 and 2009 from gulls within the same plateau in Sussex. The fourth and final section is summative, presenting an answer to the research question by reviewing patterns of behaviour that generated the material patterning from each site.

5.1 Badger Hole

The blade-points and majority of *debitage* recovered from Badger Hole forms one component within the R.F. Parry Collection housed at the Wells and Mendip Museum in Somerset (Campbell 1977, Volume 2: 98). Parry's collection comprised material from differing sites, and Jacobi found artefacts from a range of periods including Lower Palaeolithic, Early Upper Palaeolithic, Late Glacial, Mesolithic and Neolithic (Jacobi's notes boxed with the artefacts). With recourse to Balch's excavation diaries, Jacobi isolated pieces from Badger Hole (Jacobi 2000: 47) with "*glossy grey-white surfaces - ancient mechanical damage to margins*" (Jacobi and Currant 2011: 57). Typologically this material included blade-points and the remainder largely comprised blade fragments (*ibid*). Publications cite 21 artefacts likely to be EUP (Jacobi 2000: 47), and records at the museum indicates that at least four blade-points, and twelve other pieces languish within the Parry Collection. However, two further artefacts were equivocal. One was a large double ended scraper and the other a triangular cortical flake. Both have patinated mechanical damage to the edges and the flake has staining that matches one of the EUP pieces. However these two flints are cream in colour. As a dense grey white was the primary EUP identifying factor these pieces have not been included within this discussion. Additionally, at least one and possibly five pieces may be housed at the University Museum of Archaeology and Anthropology at Cambridge. Jacobi and Currant (2011: 58) published illustrations of some associated blade fragments and this included one piece from Cambridge. This artefact has not been seen directly but the scaled illustration (Jacobi and Currant 2011: 58, Fig. 5) has been used as a proxy within this discussion.

5.1.1 The material available

As well as the four blade-points, this review will focus upon twelve pieces of *debitage* observed directly within the Parry Collection and one illustration of a piece housed at Cambridge making a total of seventeen pieces altogether (Table 5.1). This collection is a selection of larger materials and totally lacking any *micro-debitage*.

ID	Type	Section	Length	Width	Depth	Width Depth Ratio
BH1	Blade-point	Complete	74	23	7	3.3
BH2	Blade-point	Complete	101	19	9	2.1
BH3	Blade-point	Proximal	81	20	6	3.3
BH4	Blade-point	Medial	44	22	8	2.8
BHD1	Blade fragment	Proximal	38	15	5	3.0
BHD2	Blade fragment	Proximal	47	23	7	3.3
BHD3	Blade fragment	Distal	116	34	10	3.4
BHD4	Blade fragment	Distal	69	20	6	3.3
BHD5	Flake	Proximal	64	26	6	4.3
BHD6	Blade fragment	Proximal	52	17	7	2.4
BHD7	Blade fragment	Medial	45	17	5	3.4
BHD8	Flake	Proximal	22	21	8	2.6
BHD9	Flake	Proximal	17	25	8	3.1
BHD10	Flake	Medial	35	18	6	3.0
BHD11	Blade fragment	Proximal	36	21	8	2.6
BHD12	Flake	Complete	43	17	4	4.3
BHD13	Blade fragment	Distal	60	21	unknown	unknown

Table 5.1 Badger Hole *debitage* discussed within this case study.

Type	Qty.	%
Blade-points	4	24%
Blade fragments	8	47%
Flakes	5	29%
Total	17	100%

Table 5.2 Badger Hole percentages of artefact categories under discussion.

Of this material 71% can be described as blade-points or blade fragments (Table 5.2). Furthermore, no elements had any cortical surface present. The blades are largely un-retouched and almost all below Flas' blade-point average width of

30mm. Therefore, the small size, lack of cortex and retouch indicate these pieces were struck from a core at a later stage of reduction. As pointed out in a previous publication, a number of the blades have transverse scars on their dorsal surface. This indicates removal from the edge of a previously crested core as illustrated by the piece from Cambridge (Jacobi and Currant 2011: 57). Finally, all the pieces reviewed here were broken in antiquity and had some degree of edge damage and dorsal ridge wear. The variability of this damage was seen as significant and is discussed in more detail below. However, the first thing to clarify is how the categories of flakes and blades may be obfuscating an obvious feature of the collection.

A number of flakes, upon closer inspection, seem to be related to blade production. To give an example, BHD5 (Fig.5.1) is classed as a flake because its edges are not approximately parallel, however even in this incomplete state it is over twice as long as wide and its dorsal scar pattern illustrates the previous removal of blades. So whilst this artefact technically falls outside the blade category, it was related to blade production.



Fig.5.1 Flake BHD5 (64x24x6mm) (Photograph: author).

This corpus is dominated by blade-points and blade components, and the material classed as flakes could also be related to blade production. These flakes will be summarised below, along with a number of other significant aspects of the collection, the first of which relates to edge damage.

5.1.2 Degrees of edge damage

On a note written around 1991 (Fig.5.2) and included with the artefacts housed in the Wells and Mendip Museum, Jacobi identified the presence and degree of ancient patinated mechanical edge damage as a proxy indicator of overall geological age. Typology was used to ascertain archaeological period.

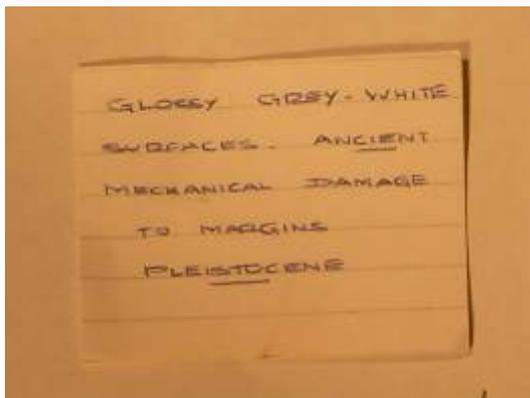


Fig.5.2 Jacobi's note within the Wells and Mendip Museum outlining Pleistocene characteristics (Photograph: author).

However in a later publication he was more nuanced stating that EUP pieces "*in some cases have ancient mechanical damage to their margins and break surfaces*" (Jacobi and Carrant 2011: 57). Having examined the artefacts it would seem to be an issue of degree of edge damage within the corpus. This variance is best illustrated by contrasting the margins of blade-point BH2 with those of blade BHD3. Both pieces came from apparently undisturbed contexts (Jacobi and

Currant 2011: 59) and, as can be seen on BH2, and from the illustration (Fig.5.22), the edges are indeed intact with only minimal notching. However there is ancient damage in the form of small chips removed from both the edges, on both the faces of the blade-point. In contrast, the blade BHD3 has almost continuous notching along its edges (see Fig.6.4). As such, these pieces can be seen as two ends of a damage spectrum within which all EUP pieces from this site fall. As both pieces are from apparently undisturbed contexts it would seem that the damage variance was related to differing movement histories before each artefact came to rest within the cave. Therefore, the degree of ancient mechanical damage and the location of recovery in the cave mouth do not rule out the possibility of blade-point entry from the plateau above. Furthermore, differing degrees of artefact movement over the plateau before entering the cave may be one factor responsible for the varying degrees of marginal damage. In addition, movement may have contributed to the high degree of ancient breakage observed on all pieces. A second aspect worth discussion is the predominance of blade products within the corpus.

5.1.3 A corpus dominated by blade products

It is clear that both the recovery process and subsequent selection criteria will have both contributed to the character of the extant collection. What follows therefore is an examination and discussion built upon an analysis of the artefacts we have been left with. With these caveats in mind, it has already been argued in chapter five that the overall metrics for the blade-points from Badger Hole are small when related to the complete corpus from Britain. This was interpreted as a material economy signature in an area where flint was not readily available. The absence of cortex supports the idea of curated materials being imported. It

is a question as to whether or not this curated material was brought to the site as blades or as cores.

5.1.4 Core maintenance activities

ID	Length	Width	Depth	Width:depth
BHD5	64mm	26mm	6mm	4.3
BHD10	35mm	18mm	6mm	3
BHD12	43mm	17mm	4mm	4.2
BHD13	60mm	21mm	Unknown	Unknown

Table 5.3 Metrics for flakes indicative of core maintenance.

Four pieces of *debitage* were indicative of core maintenance (Table 5.3), all being small in size with un-straightened margins and uneven dorsal topography. As discussed above, whilst three of the four are technically flakes, all seem related to blade production. The Cambridge broken blade fragment is identified here as BHD13 (Fig.5.3) and used to characterise the group. Details of the three others pieces are outlined in appendix four.

a. BHD13

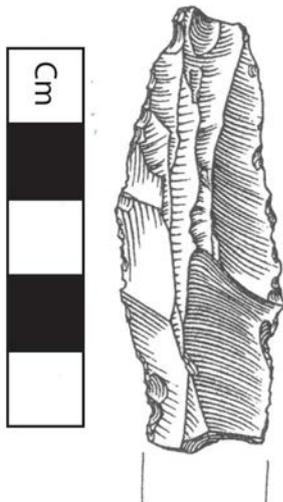


Fig.5.3 Blade fragment BHD13 (60x21mm) with evidence of cresting (Jacobi and Currant 2011: 58, fig.2.5.5).

The transverse removals along the dorsal left hand edge are indicative of cresting. Cresting is either used to initiate blade production, or to reshape the core after errors, a strategy to extend the life of a core. As such this piece, like the three others, seems to be indicative of some kind of blade production, core maintenance, or core preparation activity.

5.1.5 Large blade

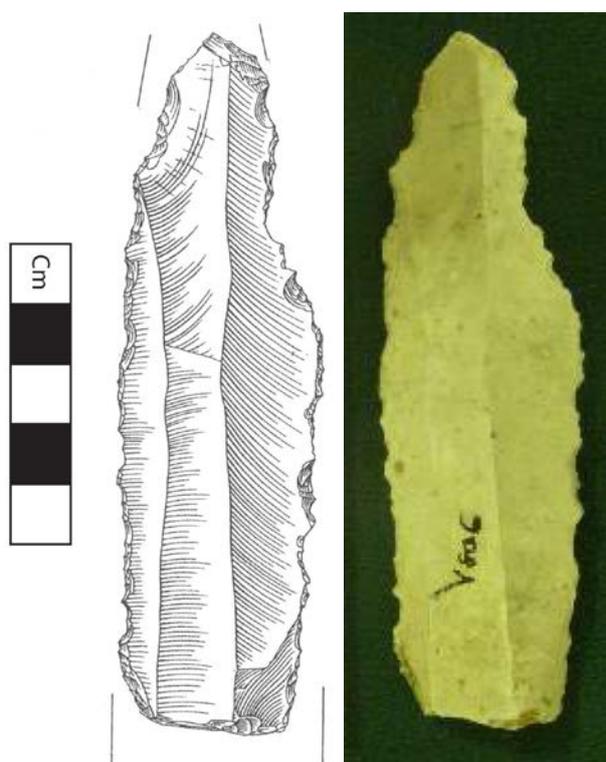


Fig.5.4 Large blade BHD3 (116x34x10mm) (Jacobi and Currant 2011: 58, fig.2.5.2, Photograph: author).

Within the collection almost all the blade fragments and blade-points fall below Flas' width average for blade-points. However one artefact seems to stand in contradiction to all other pieces. The largest artefact is a blade (BHD3, Fig.5.4) and even in its broken condition, it is significantly larger in all dimensions than

any of the other blade-points or blades (Fig.5.5). It is also bigger than Flas' blade-point average for length and width.

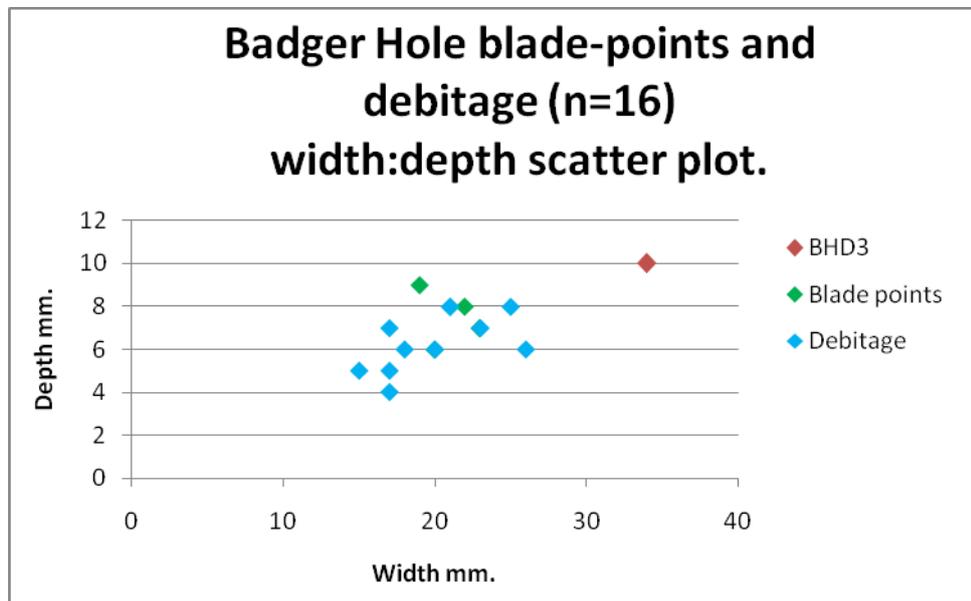


Fig.5.5 Scatter plot to illustrate the anomolous size of the large blade BHD3 in relation to all other material. Two of the blade-points and one piece of debitage are overlaid on the scatter plot by other pieces of the same size.

This obvious size difference indicates it was originally produced from a large core. However, because no other *debitage* recovered is of a similar proportion to this piece, it is without context. It would seem strange that smaller worked pieces were recovered by Balch but larger pieces missed. This raises the question as to whether or not this blade was actually produced at the site. Whilst accepting the selection processes that have obviously occurred, a lack of contextual material suggests this blade may have been imported along with the core as part of a toolkit. Interestingly, BHD3 has a parallel with RHC7 recovered from Creswell Crags on the Derbyshire-Nottinghamshire border (Fig.5.6).



Fig.5.6 Modified blade-point RHC7 (101x28x11mm) from Robin Hood's Cave (Photograph: author).

Classed as 70% complete the distal dorsal chipping suggests it had been transformed into a blade-point. Subsequent work resulted in a reduced width, however, even in this partial state this blade-point was still the largest recovered from the Creswell Caves. The presence at both locations of these relatively large blades supports the idea that they were imported into non-flint areas and in both cases used as tools. If interpreted correctly, the Badger Hole *debitage* indicates that both small cores and large blades were components within a toolkit that facilitated mobility into areas of unknown flint availability. Furthermore, that these large blades were recovered in their present form contrasts with smaller pieces that seem heavily worked and maintained (e.g. blade-point BH1, Fig.4.54). This presents the possibility that blades such as BHD3 may have been left within the landscape for reuse at some future point in time.

5.1.6 Blade fragments

This leads to a third aspect of interest, namely the blade fragments present. Like the above BHD3, some blades would seem to have made perfect blanks for blade-points. However none bear any patterned retouch to suggest they were ever made into blade-points. They were apparently struck, and their broken state may in some cases have been the result of use. The proximal section BHD11 is one such blade fragment (Fig.5.7).

a. BHD11



Fig.5.7 Proximal blade fragment BHD11 (36x21x8mm) (Photograph: author).

This bulbar fragment has a long thin platform. There are some small dorsal proximal removals but no ventral proximal retouch, as would be expected to reduce the bulb on a blade-point. As such it can be seen as a broken proximal fragment of a relatively unmodified blade. A second example is blade fragment BHD1 (Fig.5.8).

b. BHD1

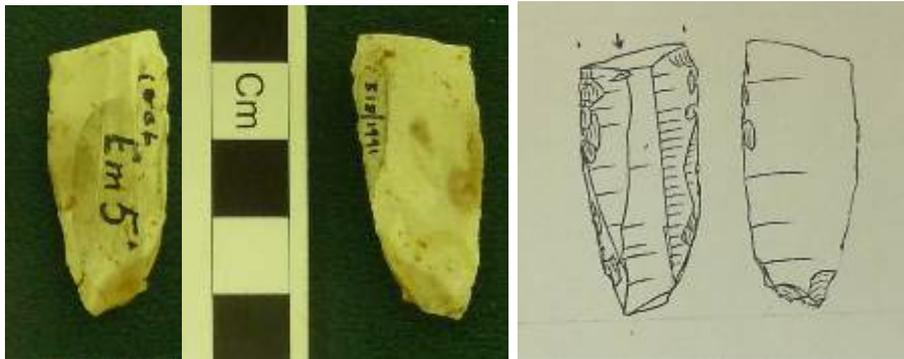


Fig.5.8 Blade fragment BHD1(38x15x5mm) (Photograph: author, drawing by Roger Jacobi from the Wells and Mendip Museum archive).

In his notes Jacobi initially classed this as a blade-point fragment, but ultimately did not include it within his overall totals. Whilst some edge straightening seems to have occurred along the dorsal left hand margin, it is equivocal as to whether the small amount of proximal ventral retouch represents bulbar thinning. This seems then to be a blade fragment with evidence of some edge straightening. A further example of a broken blade with straight edges is BHD4 (Fig.5.9).

c. BHD4



Fig.5.9 Blade fragment BHD4 (69x20x6mm) (Photograph: author, Jacobi and Currant 2011: 58, fig.2.5.3).

This blade has clearly parallel edges but in contrast to a blade-point no ventral retouch at the distal end in order to flatten and point it. As such it seems to be simply an un-retouched distal blade fragment. The recovered and refitted pieces suggest damage through movement. A final example of a broken, but un-retouched blade fragment is BHD7 (Fig.5.10).

d. BHD7

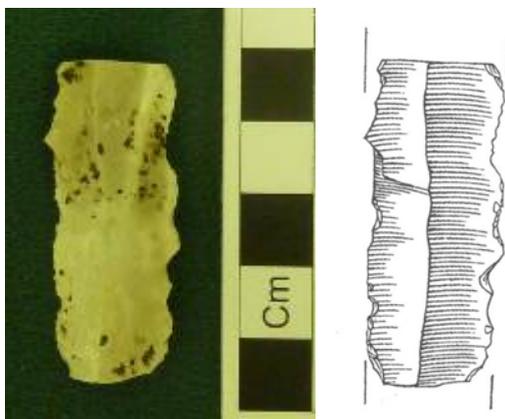


Fig.5.10 Blade fragment BHD7 (45x17x5mm) (Photograph: author, Jacobi and Currant 2011: 58, fig.2.5.4).

From a single platform core, heavily edge damaged and broken at both ends, the margins on this piece are impressively parallel. As a medial blade-point fragment it would be unlikely to bear any retouch unless needing correction, and so whether or not this piece was from a blade-point is moot. All that can really be said is that it is an un-retouched medial blade fragment.

These four examples indicate that blades were a significant component of the technology at this site, and that only some blades were transformed into blade-points. The fragmented presence of largely un-retouched blades presents the

possibility that at least some were broken through use, at or around the site. Furthermore there seems to be a number of blade-points and fragments with impressively parallel edges (BH2; BHD4; BHD7), and one piece that has had its edge straightened (BHD1). Three of these four have apparently been struck from a single platform core. Within the British corpus these strikingly parallel edges do seem individual to this site. Formally and proportionally these four artefacts could all have come from the same knapping event. However one blade fragment has a further significance.

5.1.7 A modified blade fragment

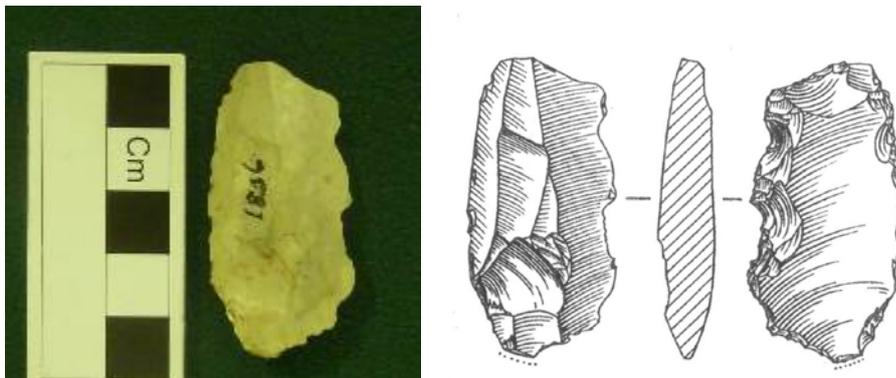


Fig.5.11 Blade fragment BHD2 (47x23x7mm) (photograph: author, Jacobi and Currant 2011: 58, fig.2.5.1).

Blade fragment BHD2 (Fig.5.11) seems to have been modified along one edge. It is not possible to say whether this occurred before or after breakage. However the modification mirrors retouch found on an equivocal blade-point from Hailey Hill in Cambridgeshire. On both pieces modification was targeted along one margin, and left each piece coarsely denticulated on one side. This similar treatment supports the notion that the equivocal artefact from Hailey Hill is also a reworked blade-point. Furthermore the denticulated edges on both pieces were probably used for similar functions. Jacobi and Currant (2011: 53) have argued

within a different context that "*flakes with notches and denticulation would seem ideally suited to pointing and shaping wooden spears*". This analysis of the material patterning from Badger Hole allows a discussion of behaviour at the site.

5.1.8 Behaviour at Badger Hole

It would seem that smaller well-used cores were maintained at the site. Within the experimental process, core maintenance segued with blade production and so it is plausible that a number of the blades were produced at the site. That one large blade had no *debitage* context is consistent with it being imported separately, and indicates that large blades were one component within this mobile toolkit. Other un-modified blades were perhaps fragmented through use, and this shifts emphasis away from blade-points as type fossils, and recognises them as simply one desired outcome of a blade production process. The denticulation on one edge of BHD2 is interesting as it has been argued in earlier chapters that such edges may be interpreted as the creation of a 'haft management' tool. This could be linked with the blade-point BH1 that had undergone intense ventral reduction, perhaps through maintenance. In other words the reduction of a blade-point would then require the modification of its wooden haft. The distinctly narrow width and parallel edges on some four elements, along with a similar width-depth ratio may indicate that at least these materials were related to one knapping event. This event perhaps occurred on a section of collapsed plateau above the cave. This provides a summary of the behavioural patterns associated with Badger Hole. The next section will discuss the collection from Glaston.

5.2 Glaston

The site of Glaston was excavated by the University of Leicester Archaeological Service (ULAS) in 2000. They recovered one complete blade-point and one bifacial proximal fragment in association with both macro and micro *debitage*. All of this material was housed at the University of Leicester, and the report (Cooper et al. 2012: 79) stated that 83 pieces of flint were recovered from the site, although I reviewed a collection of 84. Within the report this total was broken down into three categories: tools; *debitage* over 10mm; *debitage* below 10mm (Table 5.4).

Tools	4
<i>Debitage</i> over 10mm	17
<i>Debitage</i> below 10mm	62
Total	83

Table 5.4 Material as broken down by the excavators.

Tools comprised the almost complete blade-point, the bifacially worked fragment plus two notched flakes. A core fragment and 16 pieces of *debitage* made up a total of 21 pieces over 10mm. This left 63 below 10mm ‘chips’ (Lynden Cooper’s term). Of these 63 pieces 31 were below 4mm in at least two dimensions. The below 4mm materials were set aside and everything above 4mm was deemed large enough to have potential analytical value for this project (Table 5.5). This divided up the archaeological materials into the same size bands as my sieved experimental pieces.

Category	Included	Excluded
>10mm	21	0
>4mm <10mm	32	0
<4mm	0	31
Total	53	31

Table 5.5 Material included and excluded.

This provided 53 artefacts useful for comparative analysis of which 21 were above 10mm. Cortical pieces within both size bands suggested some materials may have been related to one knapping event.

5.2.1 Colour and condition

Much of the material had a deep white patination. The more or less complete blade-point was broken during excavation to reveal a light grey imported flint (Cooper et al. 2012). The artefact edges were well preserved suggesting little in the way of movement had occurred between the blade-point's production and burial (Fig.5.12). However, associated cortical *debitage* indicated the source nodules may have experienced some transport and thermal damage.

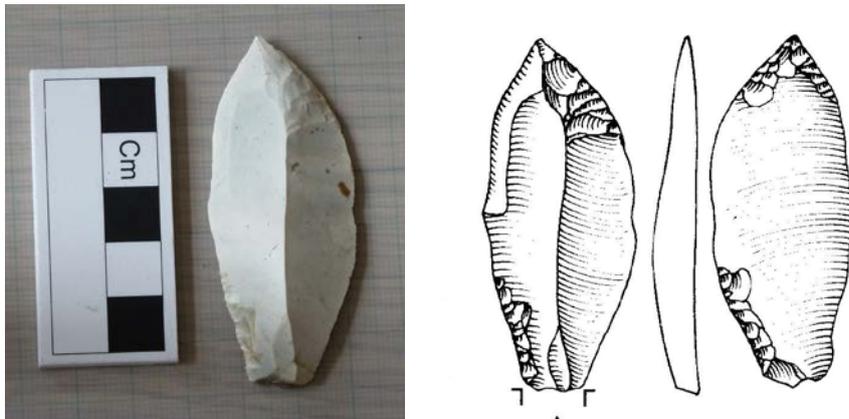


Fig.5.12 Glaston blade-point (Photograph: author, Flas 2008: 202, fig.15.1).

5.2.2 Cortex

11 of the 53 artefacts under discussion were cortical, equating to approximately 20%. The cortex on a number of pieces seemed worn, consistent with the use of glacially transported material or river cobbles. Of the cortical pieces present, nine of the eleven seemed to be related to the same knapping event. The 21

>10mm elements will form the bulk of this discussion, with a small number of formally significant <10mm pieces also included (Table 5.6). The >10mm material was dominated by flakes (Table 5.7).

ID	Type	Length	Width	Depth	Cortex
Gl1	Blade-point	64	27	7	0%
Gl2	Blade-point	24	17	7	0%
Gl3	Flake	54	36	19	1-25%
Gl4	Flake	35	35	15	26-50%
Gl5	Core	79	52	28	1-25%
Gl6	Blade	69	31	7	1-25%
Gl7	Flake	38	29	11	1-25%
Gl8	Flake	46	31	17	100%
Gl9	Shatter	28	24	8	1-25%
Gl10	Flake	19	19	3	1-25%
Gl11	Flake	22	13	4	0%
Gl12	Flake	22	13	4	0%
Gl13	Flake	18	13	4	1-25%
Gl14	Flake	14	16	4	0%
Gl15	Flake	14	13	2	26-50%
Gl16	Flake	12	14	3	0%
Gl17	Flake	12	12	3	0%
Gl18	Flake	9	10	3	0%
Gl19	Shatter	9	12	1	0%
Gl20	Shatter	10	11	2	0%
Gl21	Shatter	10	8	2	1-25%

Table 5.6 >10mm Glaston material discussed first.

> 10mm Glaston material		
Type	Qty.	%
Flakes	13	61%
Shatter	4	19%
Blade-point	2	10%
Blade	1	5%
Core	1	5%
Total	21	100%

Table 5.7 Glaston >10mm material categories.

This predominance of flakes stands in contrast to the material at Badger Hole, and demonstrates the difference between an excavated and collected

assemblage. It can be further differentiated by the quantity of pieces with cortex, as no Badger Hole pieces were cortical. Contrasting the Glaston material with the experimental model it would seem that some elements are from an early reduction phase. However, there are two aspects within the collection of larger materials I would like to draw out: the damaged nature of some of the artefacts, and the cortical indicators of a knapping sequence. The damage aspects are discussed first.

5.2.3 Worn and damaged flakes

Three issues are relevant here: the worn nature of some of the cortex; staining suggesting water penetration; ventral surfaces with no clear rippling direction, consistent with thermal removal.

a. G14

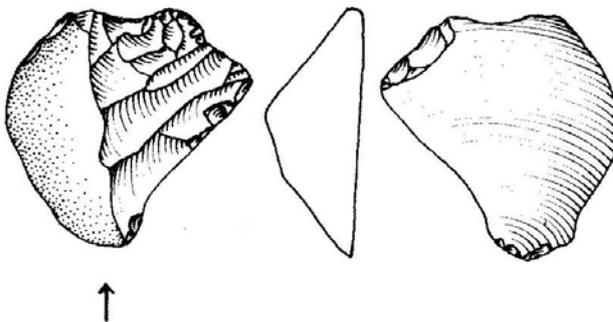


Fig.5.13 Notched flake G14 (35x35x15mm) (Flas 2008: 202, fig.15.4.).

This notched flake was classed as a tool, and although small in contrast to the experimental models, it was one of the larger archaeological pieces. The cortex on this flake differed to all other pieces and was worn suggesting the nodule had undergone some movement within the landscape before being utilised. A second cortical flake of similar size was G17 (Fig.5.14).

b. G17



Fig.5.14 Cortical flake G17 (38x29x11mm) (Photograph: author).

The dorsal surface has a small amount of cortex potentially linking this to other pieces within the collection. The condition of the remainder of the outer surface suggests a river cobble damaged through movement. The next flake to be discussed is G18 (Fig.5.15).

c. G18



Fig.5.15 Cortical flake G18 (46x31x17mm) (Photograph: author).

This was the largest unmodified piece of *debitage* within the corpus. It had a high degree of cortex but the ventral surface had no clear scar pattern suggesting it could have been a thermal removal. The cortex was different to all other cortical pieces within the collection and again it could have been from a river cobble. All these three pieces are consistent with the use of transport damaged and thermally fractured material at the site.

5.2.4 A knapping sequence

As discussed, a number of pieces seem to bear similar cortex and may be indicative of a knapping sequence. The first example is the notched cortical flake GI3 (Fig.5.16).

a. GI3

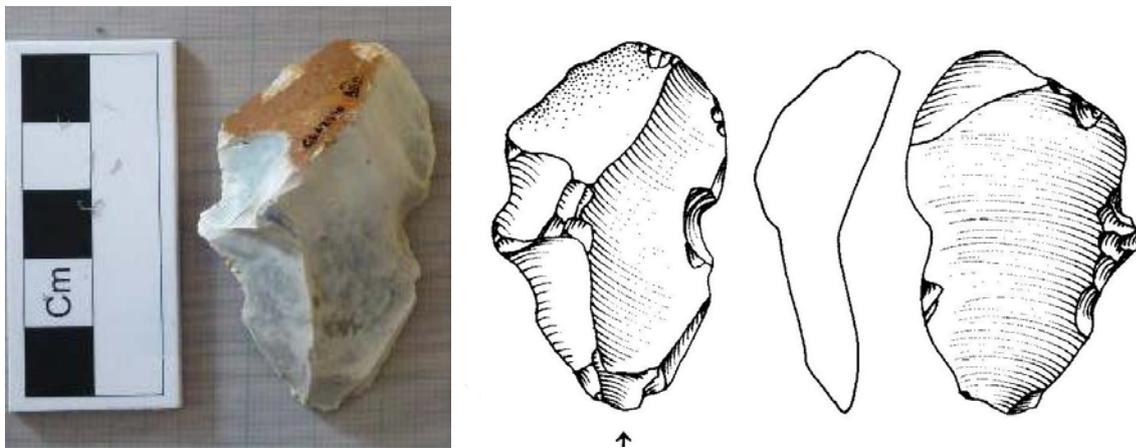


Fig. 5.16 Notched cortical flake GI3 (54x36x19mm), (Photograph: author, *Flas 2008: 202, fig. 15.3*).

The dorsal surface of this notched flake carried a number of problems. As such this was similar in character to experimental core correction flakes. After its removal this flake seems to have been notched, presumably for use as a tool. A second artefact with similar cortex is the core fragment GI5 (Fig.5.17).

b. GI5



Fig. 5.17 Cortical core fragment GI5 (79x52x28mm).

Again bearing similar cortex, this piece was classed by the excavators as a core fragment broken along a thermoclastic plane. The thermal damage links this piece to others within the collection and reiterates the use of thermally damaged material. The cortical blade GI6 (Fig.5.18) is discussed next.

c. GL6



Fig. 5.18 Cortical blade GL6 (Photograph: author).

This piece has been described as an irregular blade the purpose of which was to remove two hinge scars (Cooper, et al. 2012: 80). The cortex towards the top of the blade could also be understood as a problem to be removed. The problem bearing nature of this blade corresponds to the experimental core correction examples. An obvious difference to the experimental reference material, however, is in relation to the platform remnant that is present. It was summarised in chapter four that hard hammer flake and blade products bearing problems were indicative of core correction. However on this archaeological piece the narrow, faceted and lipped platform remnant is indicative of a soft organic hammer (Cooper, et al. 2012: 80). Within my experimental materials the flint knapper used a 1kg antler hammer for blade production and a 1kg quartzite hammer for all core maintenance and correction phases. He was however dealing with some much larger pieces, for example a crested blade (E36) removed during experimental production measured 190x75x43mm. This can be contrasted to the archaeological piece here which measured 69x31x7mm.

This artefact indicates that hammer type was probably related to the size of the material being reduced. The margins on this archaeological blade are undamaged, consistent with little movement between production and burial.

5.2.5 Macro-*debitage* summary

A number of characteristics emerge. In contrast to the experimentally generated examples the Glaston materials are generally of a small size. The cortex on a number of pieces suggests one knapping event. The dorsal surface of one of these cortical pieces indicates the use of transport damaged cobbles and a number of pieces may be the result of frost fracturing. On the single piece with a platform present soft hammer production was indicated, contrasting with the hard hammer used during experimental production. This differing use of hammer type was probably related to the metric size of the material being reduced.

5.2.6 Micro-*debitage*

One of the smaller flakes (GI15, Fig.5.19) also bears some cortex which links it to the archaeological knapping sequence. However it also formally corresponds with the experimental criteria for blade-point production.

a. GI15

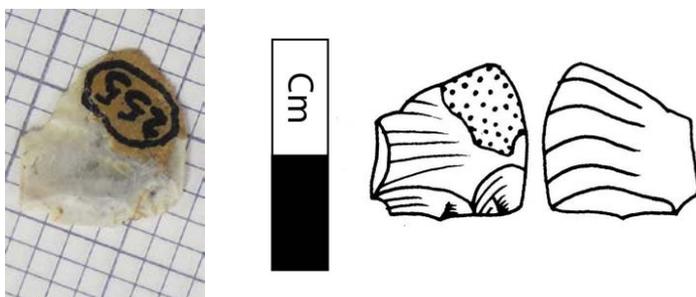


Fig.5.19 Cortical edge thinning flake GI15 (14x13x2mm) (Photograph and drawing: author).

Five pieces were described by previous researchers (Flas, 2006: 70; Cooper et al., 2012: 79) as thinning flakes and identified primarily by the presence of a platform remnant, a low exterior platform angle (EPA) and generally feathered edges. The presence and form of the platform indicated G15 to be one of those five pieces. This was above average size in relation to the experimentally generated thinning flakes (average 11x10x1mm) and the platform was relatively wide at ~10mm. The dorsal face appeared to have three relative surfaces, an original cortical one, the next which comprised the largest area of removal, and the third represented by the series of smaller and curtailed removals along the edge. This indicated repeated working at the same point and these removals all trend in the same direction as the ventral surface scar. This form corresponded to experimentally produced flakes removed in a vertical sequence and these were all (n=3) from the proximal end of the blade. Two were from the ventral surface and one from the dorsal. The presence of cortex indicated G15 was removed to thin a dorsal section. Within experimental production only four out of 20 blades produced were cortical. This flake was almost complete with only a small area of the dorsal left hand feathered edge snapped off. The above factors suggested this flake to be the result of repeated edge thinning on the proximal dorsal surface of a cortical blade or flake and the cortex was constant with it being from the same knapping sequence as the previously discussed pieces. A similar sized piece is G16 (Fig.5.20).

b. GI16



Fig.5.20 Edge thinning flake GI16 (12x14x2mm) (Photograph and drawing: author).

Again, the presence and form of a platform remnant indicated this flake was related to blade-point production or maintenance. It ended in a hinge fracture which may be why the report contained the caveat: *mostly feathered* terminations. This flake was again classed as complete and again above the experimental average. The dorsal surface was divided longitudinally by a ridge. The left hand section of this division was difficult to read but the right-hand side had scarring indicating at least one transverse removal. The platform was again wide at ~8mm and the low EPA again pointed to edge thinning. Whilst this piece does not fit easily into any of the experimental categories, the EPA does link it to edge working. The next piece to be discussed is GI24 (Fig.5.21).

c. GI24

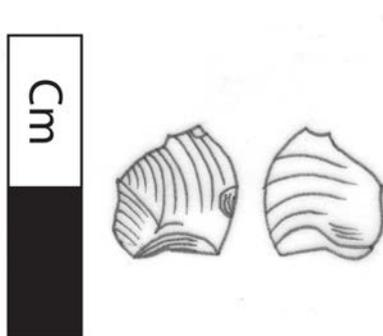


Fig.5.21 Edge thinning flake GI24 (9x8x2mm) (Drawing: author).

GI24 is also a thinning flake. It is smaller than the previous examples with a platform width of ~7mm. However the flake is incomplete, as a part of the distal section has snapped off. On the ventral surface there are a series of small parallel scars on the right-hand side of the bulb. The dorsal ripples are difficult to read, but suggest a series of short removals travelling from proximal left to distal right. The angle of these dorsal removals in relation to the ventral scar pattern suggests it may have been removed from a pointed end. This piece is also relatively flat. Again whilst not easily fitting into the experimental models discussed, the colour, overall flatness and the angle of the flake's dorsal scar pattern suggest this could be a thinning flake from one end of a blade. The next piece to be discussed is GI25 (Fig.5.22).

d. GI25

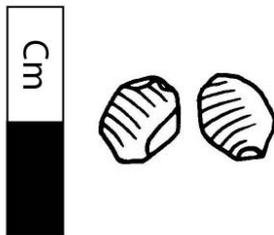


Fig.5.22 Edge thinning flake GI25 (7x6x1mm) (Drawing: author).

This is also likely to have been previously discussed as a thinning flake because of its ~3mm wide platform. The EPA looks higher than previous examples (~55°?). This flake has a series of snapped edges and the dorsal scar pattern has one removal dominating that moves across at the same angle of the flake asymmetry. The angle of a previous dorsal removal suggests it was flaked from a proximal or distal edge. The next piece to be discussed is GI26 (Fig.5.23).

e. GI26

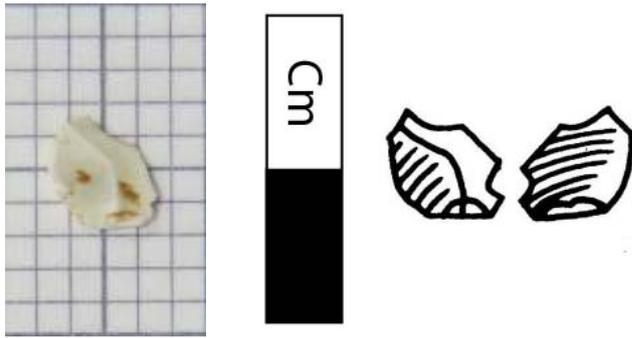


Fig.5.23 Edge thinning flake GI26 (8x7x1mm) (Photograph and drawing: author).

This thinning flake has a ~5mm platform remnant. The EPA seems high and it has snapped edges, marked asymmetry and a transverse twist. The asymmetry follows the line of the dorsal ridge and the twist illustrates how the previous dorsal removal has cut into the transverse profile. Consequently the right-hand side of the dorsal scar pattern may be part of the blades original surface. This flake corresponds to the experimental category of linear sequential removals, produced whilst working along the edge of a blade.

5.2.7 Further significant pieces

The primary features of the above pieces were the presence of a platform with a low EPA and usually feathered terminations and are likely to represent the five thinning flakes identified by other researchers. Some of these correspond to experimentally derived models however a number of other pieces also deserve discussion as they strongly correspond formally with the experimental material. The first is GI11 (Fig.5.24).

a. GI11

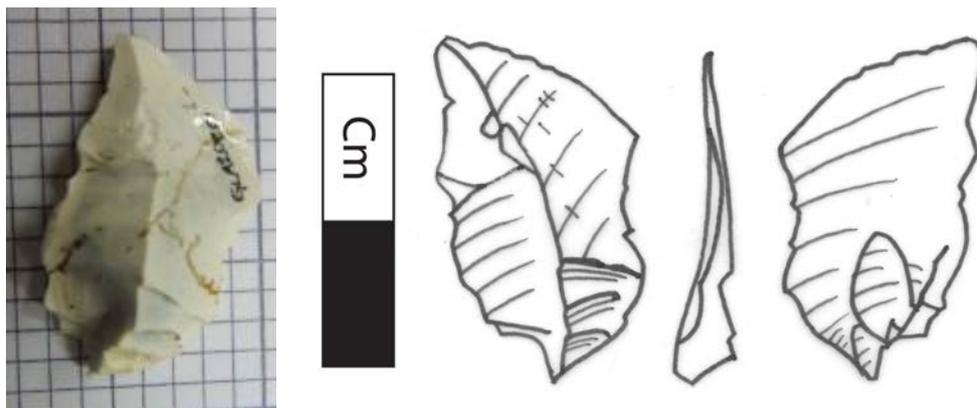


Fig.5.24 Dorsal ridge chasing flake G111 (22x13x4mm) (Photograph and drawing: author).

This is a large transversely twisted flake with the platform remnant broken off but bulbar section present. On the dorsal proximal right-hand side of this piece a series of 'steps' indicate previous unsuccessful attempted removals. This flake was the final successful removal within that process. The steep drop off on the dorsal left is the result of a scar from a successful invasive removal suggesting a left to right reduction sequence. The flake's longitudinal profile indicates how its primary function seems to be mass reduction as the proximal section is thick whilst the distal section is thin and feathered. The pronounced twist is perhaps partly due to the dorsal left hand invasive removal cutting into the transverse cross section. However the dorsal right-hand side seems to rise up as well. The differing dorsal ripple patterns indicate that the right-hand surface is earlier, with the left hand invasive removal being one of a series moving from left to right. The transverse twist indicates this piece was one in a series designed to thin a proximal end. Its asymmetric form and similarity to experimental pieces indicate it was following a dorsal ridge. The next piece to be discussed is G114 (Fig.5.25).

b. G114

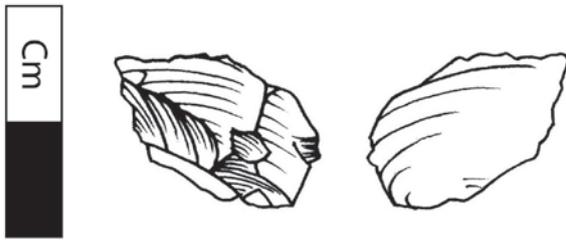


Fig.5.25 Heavily reduced thick flake G114 (14x16x4mm) (Drawing: author).

This piece was an asymmetrical, thick and complete flake. The dorsal surface was heavily reduced and combined with its relative thickness suggested it had been removed from a proximal section. The dorsal removals trend in the same direction as the flake itself indicating it was one in a series of attempts at thinning. Whilst not fitting clearly into any of the experimental models the intense reduction does correspond to vertical sequential pieces removed from a proximal section. The next piece to be discussed is G123 (Fig.5.26).

c. G123

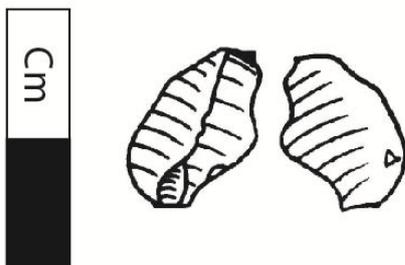


Fig.5.26 Vertical sequential removal G123 (13x11x1mm) (Drawing: author).

This thin removal was a little above the experimental average size. The platform had been removed although the bulbar area was present and the flake relatively complete. It was flat and asymmetrical, leaning over to the dorsal right. The dorsal scar pattern is split with the right-hand section having ripples at the distal

end suggesting a parallel removal. This would indicate a sequential removal from the same spot and most experimental pieces (n=3) like this were proximal. The final piece to be discussed is GI27 (Fig.5.27).

d. GI27

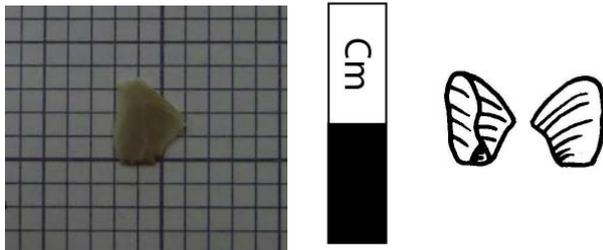


Fig.5.27 Small 'cherty' flake GI27 (7x6x1mm) (Photograph and drawing: author).

This small and almost complete flake had a colour that was unusual, not matching any other material. It looked and felt more 'cherty' although it was classed as flint by ULAS. The platform had been removed but the bulbar area was present. The dorsal scar pattern indicated two parallel removals before this piece was itself removed, and it therefore fitted the category of repeated removals from the same point. Experimentally these were all proximal (n=3). Whilst fitting the experimental description, its fabric makes it unlikely to be related to the other pieces. It may be indicative of more material being originally at the site and perhaps lost through quarrying.

5.2.8 Behaviours at Glaston

A number of behavioural aspects can be drawn from the above discussion. 20% of the total material recovered was cortical and the >10mm material dominated by flakes. From a behavioural perspective the quantity and artefact metrics are consistent with the preparation and reduction of a small core produced from a

glacial nodule or river cobble. The presence of other types of cortex may suggest other nodules were also worked. A number of the smaller flakes are formally consistent with the experimental evidence for blade-point manufacture and the small blade-point present could have been the result of this production process. However, there seems to be juxtaposition between the small and minimally worked blade-point and some larger size blade reduction flakes. It is also intriguing to consider why the complete blade-point was left at the site. One of the larger flakes has been notched after the knapping sequence was completed and may link with the broken bifacial piece found. This would be indicative of artefact repair and 'haft management' activities at Glaston. Finally one small 'cherty' piece seems to correspond in form to the experimental blade-point production models, but is made from a material dissimilar to any other artefacts present. This could indicate more artefacts were originally at the site but not recovered, or removed via quarrying. Having summarised the behavioural aspects of the collection from Glaston, material from Beedings is discussed next.

5.3 Beedings

The original (~1900 AD) Beedings collection, recovered from periglacial fissures (gulls) on the plateau, has helped to establish a typological and technological understanding for the Lincombian (Jacobi 2007). However, as well as an initial recovery bias towards large pieces, this collection was subsequently culled in the 1940s resulting in many flints being lost. Recent excavations on the plateau have provided a stratigraphic context for EUP materials trapped within one gull fissure. Furthermore, new tools and significant quantities of micro-*debitage* were also recovered (Pope et al. 2013). Considered together, these differing collections offer an opportunity to develop a more nuanced understanding of EUP behaviour on the plateau.

The new materials are the primary focus of this review and three main characteristics are drawn out. Firstly, the repeated utilisation of blade fragments is highlighted as significant. Secondly, refitting pieces of micro-*debitage* are used to illustrate blade-point production at the site. Thirdly, the apparent abandonment of an exhausted core is discussed. Each of these characteristics can be related to materials within the original (selectively collected and curated) collection. Consequently, individual artefacts from the original collection are drawn back into the overall discussion.

5.3.1 The new material available

Due to the site's importance, when proposals to plant a vineyard on the Beedings plateau were submitted, English Heritage funded the excavation of seven trenches in a field to the north of the original find-spot. Excavations in

2007 and 2008 targeted one fissure which proved to contain EUP artefacts (Pope 2009: 34). As well as providing a valuable stratigraphic context, both macro and micro-*debitage* was recovered. 348 elements were made available to me for analysis (Table 5.8). This was a component of the total 578 artefacts above 10mm that were found, along with an unspecified amount of sub-10mm material (Pope et al. 2013: 4). A full discussion of the analytical methods used on this newly recovered material is presented in appendix five.

Material received	Total elements	Total >4mm	Total <4mm
Trench A	91	68	23
Trench G	82	78	4
Trench F	58	54	4
Trench E	105	95	10
Trench D+	12	12	0
Totals	348	307	41

Table 5.8 Total materials received resulted in ~300 >4mm elements for analysis.

5.3.2 Differing technologies

The excavators identified at least three technologies, of which two were Palaeolithic. The EUP component was characterised by the presence of opposed platform blades, triangular or trapezoidal in cross section and with clean, sharp edges. The flint was generally very dark grey to black and the blade fragments all exceeded 6mm in thickness. Generally un-patinated, some material had a light blue-white dendritic patina, usually on one surface (Pope et al. 2013: 7). As such the flints corresponded in technology and condition with EUP artefacts from the original collection (see Fig.2.21). In contrast the Late Middle Palaeolithic material had thermal damage, a deep white patina and polished surfaces. However as well as differences in condition there seemed to be stratigraphic separation as well.

5.3.3 Stratigraphic separation

All the recovered material came from four stratigraphic units and presented some patterning. Based upon the results from all seven trenches the excavators presented a table relating technology to stratigraphy (Fig.5.28).

Table 1
Stratigraphy of the excavated gull features and artefact counts per unit including those clearly assigned to technological tradition on the basis of typology and technology.

Unit	Name	Description	Total finds (n)	Mesolithic/Late prehistoric (n)	Early Upper Palaeolithic (n)	Late Middle Palaeolithic (n)
[1]	Topsoil	Thin sandy humic layer	2	2	–	–
[2]	Subsoil	Fine sand with clasts of Hythe Beds geology. Extensive bioturbation.	348	346	2	–
[3a]	Upper Gull Fill (Upper Sandier Facies)	Fine sand with clay. Contains clast of Hythe Beds geology.	163	12	15	–
[3b]	Upper Gull Fill (Lower Clayier Facies)	Fine clay with sand. Rare clasts of Hythe Beds geology.	52	–	–	17
[4]	Lower Gull Fill	Stone free dayey sand	13	–	–	2

Fig.5.28 Published table of Beedings stratigraphy and technology (Pope et al. 2013: 5, Table.1).

Mesolithic material (with a possible later prehistoric component) was quantitatively dominant and almost exclusively found within a sub-soil termed Unit 2. Only a small quantity of Mesolithic material was found in the underlying Unit 3a and likewise two EUP artefacts were also recovered from Unit 2 suggesting some bioturbation. The remaining recognised EUP pieces were exclusively recovered from Unit 3a whilst LMP material was found only within Units 3b and a small quantity from Unit 4 (Pope et al. 2013: 5). As can be seen from the artefact totals within the Palaeolithic levels, the majority of finds have no technological allocation suggesting some further formal and material variety than accommodated within the above model. Having summarised the quantities and contexts for the new materials, the first aspect I want to discuss is the presence of large blades within the original collection.

5.3.4 Large blades



Fig.5.29 Early phase large blade removals (photograph: author).

Four conjoining pieces (the only technological refit within the original collection) comprised the medial section of a crested blade resting upon a cortical blade (Fig.5.29, Jacobi 2007: 233, 236). Together they measured 134mm in length and originally both blades would have been significantly longer. That the pieces have been recovered together suggests they may have been all broken within the same approximate area of the site. One of the conjoining blade components (136 in Fig.5.26) is differentially edge worn indicating a divergent use history subsequent to breakage. Whether produced on site through core reduction, or imported as complete blades or blade sections, these large pieces of production debris were clearly recognised as a resource, and at least one utilised as a tool

in its own right. The different patina observable on the dorsal face of two fragments (136 and 137 in Fig.5.26) is a characteristic generally seen on naturally fractured nodules eroding from slope deposits (Billington 2015, pers. comm.). However the point I want to draw out is the evidence of utilisation on one of the fragments.

5.3.5 The use of blade fragments

This utilisation of blade fragments is also reflected within the newly recovered materials. However, before further discussion it is important to reiterate that all the trenches targeted the same fissure, because there are indications of related materials being found within differing trenches. With this in mind, the first two blade fragments to be discussed came from Trench G.

5.3.6 Trench G

Trench	Unit	ID	Type
G	2	MP52	Proximal blade fragment
G	2	MP61	Proximal blade fragment

Table 5.9 EUP material from Trench G.

Two artefacts were identified by the excavators as EUP and both came from Unit 2. MP52 (Fig.5.30) is discussed first.

a. MP52



Fig.5.30 Proximal blade fragment MP52 (31x23x8mm) (Photograph and drawing: author).

This proximal blade fragment was different in colour to all other EUP pieces, being an un-patinated matt mottled light and dark grey. A transverse twist illustrated how it had been struck from the edge of a core with the length of the blade then moving down the cutting face. Whilst the dorsal left hand edge had some random chipping, the right had a short (~12mm) neat line of small chips that may constitute evidence of a scraping action (Fig.5.30). The platform remnant was thin, linear and lipped. MP61 (Fig.5.31) is discussed next.

b. MP61

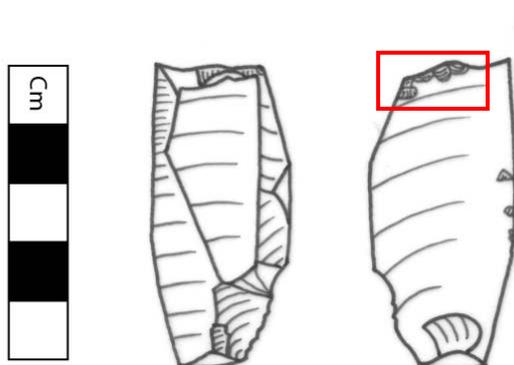


Fig.5.31 Proximal blade fragment MP61 (51x24x8mm) (Drawing: author).

The second blade fragment was relatively thick, from an opposed platform core and longitudinally curved. It had a large lipped platform remnant with a scarred bulb (Fig.5.31). Its emergent white patina was also present on many pieces within the original collection (e.g. Fig.A1.19). The overall form seemed designed to provide a series of straight edges, and the dorsal right-hand distal corner had a sequence of removals on the ventral face (Fig.5.31 red box) which may be indicative of use. The dorsal left-hand side was flat and would appear to be a remnant characteristic of the original core. Red colouring is most obvious on the dorsal face of this piece. A number of factors link this to fragment MP97 recovered from Trench F. Both from Unit 2, the flint colour and quality as well as the red colouration are similar if not the same. Furthermore the flat edge present on each (red lines in Fig.5.32) suggests they may have been struck from the same core, albeit from opposite directions.



Fig.5.32 The red line indicates the flat face on each piece.

The next fragments to be discussed are those from Trench F.

5.3.7 Trench F

Trench	Unit	ID	Type
F	2	MP97	Medial blade fragment
F	3	MP147	Medial blade fragment
F	3	MP149	Single platform blade core

Table 5.10 EUP material from Trench F.

Two blade fragments and a core were identified by the excavators from this trench (Table 5.10). The first of these was the blade fragment discussed above.

a. MP97

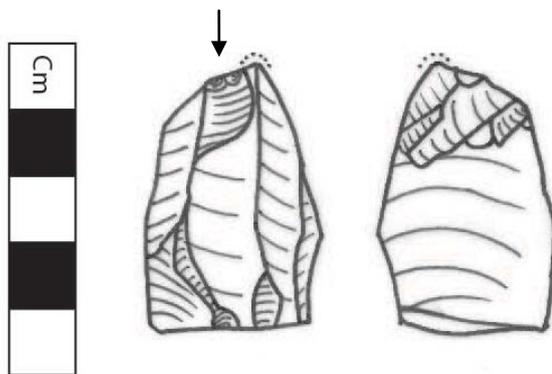


Fig.5.33 Medial blade fragment MP97 (39x24x8mm) (Drawing: author).

This medial blade fragment was made from good quality material and in excellent condition. From the proximal break, removals invade the dorsal surface as well as the right-hand edge. Where these removals approach the left hand dorsal ridge they seem worn. Interestingly, this piece has a clear glossing across the ventral face. Together, these factors are consistent with wear patterning on both surfaces. The distal dorsal section is dominated by one central, invasive removal that could have been the result of impact (see arrow in Fig.5.33). The ventral distal section, by contrast, has a series of invasive removals cutting across and into the face at $\sim 45^\circ$ travelling right to left. These removals isolated

a small 'gendarme' which appears worn. Finally a burin like removal runs down the right-hand side of the distal section. It seems that the removals along the longitudinal plane predate the diagonal removals. It could therefore be evidence of breakage and scarring through impact, followed by diagonal thinning. Wear patterning on both faces would support the idea that this piece was once hafted and the possibility of impact damage would indicate this may have been a blade-point. However all that really needs to be said is that this blade section has undergone significant retouch and modification after breakage.

b. MP147

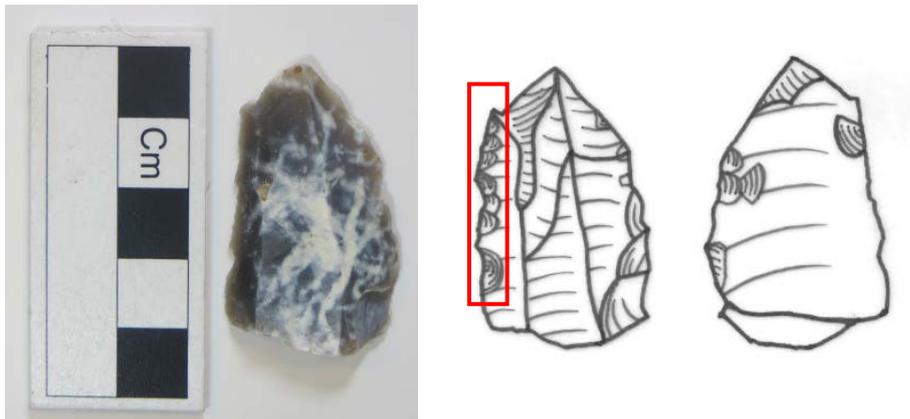


Fig.5.34 Medial blade fragment MP147 (41x25x6mm) (Photograph and drawing: author).

This fragment has a series of small flake scars along the dorsal left hand straight edge (Fig.5.34 red box). These appear to be the result of a scraping action with contact made by the ventral edge resulting in removals chipped off the dorsal surface. Both material and patina-wise this blade section is similar to other EUP pieces and also some of the smaller material within Trench A. This is most apparent if the flint colour and patina is compared with the small flake MP38 from Trench A and figure 5.35 shows the similarity in flint colour. Furthermore, it can be observed that MP147 has predominantly dendritic patina and a small

section on the proximal dorsal right shows a removal scar. The patina on this section differs from the rest of the artefact in that it is evenly spread, and similar to that of the smaller flake from Trench A. In other words whilst the majority of MP147 is dominated by dendritic patina, a more recently fractured section has patinated in a similar manner to the materials recovered from Trench A.

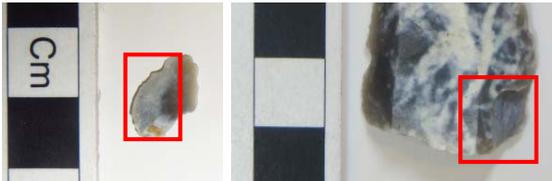


Fig. 5.35 Patination of the same colour and pattern is observable on sections of both the small flake MP38 from Trench A and MP147 from Trench F (Photograph: author).

These pieces provide a second example of how material and patina support a linkage between artefacts and *debitage* from differing trenches within the same gull fissure. However, the main point I want to draw out is the apparently repeated utilisation of blade fragments and possibly one blade-point fragment. The second aspect I want to discuss is the evidence for blade-point production.

5.3.8 Blade-point production

In reference to the original collection Jacobi suggested there was "*tenuous evidence that blade-points were made at the site*" (Jacobi 2007: 272 referring to his Figs. 23.4 and 25). In relation to the more recently recovered materials Matt Pope discussed

"12 soft hammer retouching spalls, recovered from a depth of 0.75m within the fissure at Trench A. In terms of patination and technology these are consistent with the rest of the late Middle Palaeolithic collection. The

stratigraphic position of this material was towards the more clay-rich base of the Upper Gull Fill [unit 3b]" (Pope et al. 2013: 6).

Weathering was seen as a key difference between the EUP and LMP materials (Pope et al. 2013: 8) with the earlier period being represented by more deeply patinated artefacts. The cluster of small fragments under discussion here are a grey colour, observed to be a result of colour change after they were excavated (Turner pers. comm. 2015). Such change is believed to be due to ultra violet light exposure (Glauberger and Thorson 2012: 25-26). Therefore, rather than being deeply patinated due to long surface exposure these small pieces seem to have experienced rapid colour change only after excavation. It would seem that rather than being consistent with the LMP material defined by heavy weathering, the patina on these flakes is inconsistent with both the LMP *and* EUP materials discussed so far. Furthermore, six flakes from this group corresponded with experimental expectations for blade-point production. Four of these pieces refitted and are discussed in detail below.

a. MP19a and MP22a



Fig.5.36 MP19a (12x19x4mm) and MP22a (12x11x3mm) conjoining pieces indicative of vertical sequential reduction of a bulbar section (Photograph and drawing: author).

The form of fragments MP19a and MP22a (Fig.5.36) is consistent with intensive work on the proximal bulbar section of a large blade, exactly the kind of

reduction necessary to produce a blade-point. As well as the evidence of previous and attempted removals on their dorsal surfaces, each of these fragments has the remnants of what appears to be the blades original ventral surface on the left and right dorsal margins respectively. MP19a is of particular interest, in that on its own it does not correspond directly with any experimentally produced landmark pieces, however it is similar in form to a piece from Glaston where only EUP material was recovered.



Fig.5.37 MP19a with thick curtailed form and dorsal scarring similar to a piece from Glaston (Photograph: author).

The Glaston piece (Fig.5.25) whilst angled differently is similar in all other respects to the Beedings example, being a short thick flake with intense dorsal reduction. Similarity of form and size supports the idea that the Glaston piece was also related to the proximal reduction of a blade. That only EUP material was recovered from Glaston supports the idea that MP19a is also of EUP provenance. Two further pieces refitted, however they were edge related.

b. MP31 and MP37



Fig. 5.38 MP31 (11x16x3mm) and MP37 (9x17x4mm) conjoining pieces indicative of the linear sequential reduction along a blade's edge (Photograph and drawing: author).

Both these pieces are similar in form (Fig.5.38) and correspond with experimental expectations for linear sequential removals, or edge trimming. The EPA is low and the dorsal surfaces have the remnants of previous removal attempts from what would have been the blade's ventral surface. That these two pieces refit illustrates a left to right sequence. Platform remnants on both are large and plain and the bulbs diffuse. Finally, they are significantly larger than the experimentally generated edge trimming flakes indicating that the blade being reduced in antiquity was large, perhaps of similar scale to the refitting blades from the original collection discussed at the beginning of the section.

5.3.9 Equifinality



Fig. 5.39 LMP large blade fragment (Photograph: author).

Fig.5.40 A broken blade-point fragment transformed into a 'Kostenki Knife' (Photograph: author) drawn by Roger Jacobi (Jacobi Archive: Beedings).

The presence of mainly proximal blade-point fragments at Beedings led Jacobi to his re-tooling hypothesis. He identified 36 broken blade-points along with six further pieces that were probably heavily modified fragments of the same. One piece was interpreted by Jacobi (Fig.5.40) as a medial blade-point fragment. At 13mm it was still relatively thick in spite of an inverse truncation and repeated bladelet removal from its dorsal surface. This inverse truncation and dorsal bladelet removal process defines a Kostenki Knife (Jacobi 2007: 262). In typological terms this blade-point fragment has been transformed into a Kostenki Knife, in practical terms it seems to have been used as a bladelet core. So it can be summarised that both thick (e.g. Jacobi number 136) and thin blade fragments (e.g. MP97) as well as thick blade-point fragments (e.g. Jacobi number 95) were all targeted for reuse at Beedings. However, as well as the reuse of blade-point fragments, I also want to highlight a pattern related to small cores.

5.3.11 Exhausted cores

As indicated above, a single platform blade core, MP149 (Fig.5.42) was recovered from Trench F. The patina on MP149 is lightly dendritic, slightly more so on the cortical face. This corresponds with the thin medial blade fragment MP147 recovered from the same unit in the same trench. As discussed, the material colour and a small field of patina on MP147 link both these artefacts to a small group (Cluster B) of materials from Trench A. Three small pieces corresponding to the experimental models were recognised within Cluster B (Table 5.11) and one is discussed in detail.

5.3.12 Cluster B from Trench A

Trench	Unit	ID	Description	Patina
A	3	MP42a	Vertical sequential	blue white
A	3	MP38	Bulb avoiding flake	blue white
A	3	MP48	Bulb avoiding flake	blue white

Table 5.11 Trench A Cluster B pieces that correspond with experimental blade point production pieces.

a. MP38



Fig.5.41 MP38 a bulb avoiding flake (13x9x3mm) (Photograph and drawing: author).

The longitudinal asymmetry and curve along with a transverse twist on this piece (Fig.5.41) are all characteristics that correspond with experimentally produced 'bulb avoiding' flakes. This piece is important because it provides a landmark for flint colour and patina type which links this piece with elements from Trench F. Again the platform remnant is plain and lipped. If we accept the argument that these pieces from Trenches A and F are connected materially as well as by patination there is an interesting correspondence between a small exhausted core, a later phase thin blade fragment, and three pieces of micro-*debitage* consistent with blade-point production all coming from a similar point on the plateau (Fig.5.42).



Fig.5.42 Single platform blade core (71x48x29mm) plus materially similar pieces.

However, the point I ultimately want to emphasise is the apparent abandonment of the core at the site. This is because the practice has clear parallels within the original collection.



Fig.5.43 From the original collection number 158 WC2 (68x29x24mm), drawn by Roger Jacobi (Jacobi Archive: Beedings).

No large cores capable of producing large blades have been found at any LRJ site (Flas 2006: 76). However five small cores originally found at Beedings were classed by Jacobi as EUP (Jacobi 2007: 237). Along with the newly recovered MP149 they seem to be illustrative of various end stages of a useful life.

However it is difficult to say if these are the remnants of large cores that have been heavily reduced, or simply exhausted blade cores originally produced on small supports. If we accept the relationship between core, blade fragment and bulb avoiding flake argued above, it is entirely possible that large cores were brought to the site of Beedings and reduced completely *in situ* with just these remnants recovered.

5.3.13 Behaviours at Beedings

The artefacts discussed here indicate a series of behaviours that can be glossed as 'production', 'reuse', and 'abandonment'. There is evidence of early phase production of blades as well as the trimming of large blades to make blade-points. There is also intensive reuse of blade and blade-point fragments, as well as the abandonment of a series of exhausted cores. This suggests two contradictory behavioural signatures. Firstly, evidence of access to good quality large packages of raw material. Secondly, evidence for raw material economy. This technological variability can be used to understand behavioural variability which is the subject of the following and final section.

5.4 Technological and behavioural variability

Two issues have emerged that help to characterise the behavioural variability under discussion. Firstly is the utilisation of early and later phase *debitage* materials, and secondly the presence of large blades. The utilisation of early and late phase materials is discussed first.

The experimental process focussed upon blade-point production and captured *debitage* from each phase for quantitative purposes. However this chapter has illustrated how within the archaeological material both early phase cortical flakes and end of life blade fragments bore evidence of utilisation. From a technological perspective this illustrates how, throughout production and use, a penumbra of useable materials were both generated and then utilised. It would seem that, for the producers and users of blade-points, the technological process itself provided a reservoir of behavioural opportunity, having value above and beyond simply the production of type fossils. Therefore, perhaps the primary *emic* value associated with this technology was in relation to its temporality.

5.4.1 Technology and temporality

It is unclear if the later phase utilised blade pieces discussed above were fragments (accidentally produced) or segments (deliberately produced).

However it is clear from their presence at both Badger Hole and Beedings that blade breakage was recognised as a source of useful materials. As such it can be assumed that probable future breakage, and therefore potential future use value, was recognised by the producers. The same argument can be made for the notched cortical flakes at Glaston. If technology is taken as a strategy for solving problems (Myers 1989: 79) then the generative nature of the technology and de-generative nature of an artefact's lifecycle seems to have allowed

problem solving to be projected temporally forward. This predicted need to solve future problems leads to a consideration of those possible problems.

5.4.2 Problems associated with blade-point use

It was argued within the previous chapter (based upon the patterning of type fossil size in relation to area) that repair and maintenance were apparently necessary tasks associated with blade-point use in non-flint areas. The story at Glaston is interesting as the presence of five small fragments (with low EPA) was interpreted as evidence of some kind of blade edge maintenance activity (Cooper et al. 2012). This small number of recognisable edge modification pieces was used by previous researchers to support an interpretation of maintenance whilst negating the idea of production (ibid). The experimental process within this thesis allowed recognition of a number of formal characteristics associated with proximal and distal, as well as edge modification. Just such characteristics were recognised within other elements of the Glaston collection. It was also necessary to emphasise how at Glaston further materials may have been lost to quarrying in the 1940s. Consequently I would argue, based upon the evidence available, for selecting an interpretation of either production, maintenance or repair is equivocal. However, what is interesting is that the evidence from Glaston does support the notion that maintenance and repair were significant activities associated within blade-points used within non-flint areas. At Glaston, the interpretation of proximal reduction is tentative, based simply upon a formal similarity to experimentally generated pieces (Fig.5.25). However it becomes more robust when related to the Beedings micro-*debitage*. In particular, the intensely worked re-fitting pieces from the proximal section of a blade at Beedings correspond strongly with experimental expectations, but also with the piece from Glaston (Fig.5.24) bearing evidence of intense reduction. It would

seem that at both sites blades were worked along edges and proximal sections. This evidence is consistent with the process of maintenance and repair as predicted within the previous chapter. However the large size of some of the flakes, particularly at Beedings, leads again to the notion that some large blades were being maintained.

5.4.3 Large blades

I want to draw attention to the large blade present at Badger Hole and link it to the oversized edge and proximal reduction flakes from Beedings. As already discussed, the utilisation of blade fragments indicates that blades were a significant feature of the technology in their own right with blade-points being simply one outcome. The large blade from Badger Hole, the large modified blade-point from Robin Hood's Cave, as well as the oversized blade reduction fragments present within the micro-*debitage* from Beedings all indicate that large blades were a component of the mobile toolkit being used, maintained and transformed by these groups.

5.4.4 From technology to behaviour

One outcome of this section has been to develop our understanding of the EUP *chaîne opératoire* model through critical analysis of *debitage* collections available. Doing so has allowed an exploration of behaviours associated with artefacts discussed. Brought together these case studies draw attention to the breadth of technological variability that comprises this industry. Correspondingly this also makes explicit the suite of behaviours associated with the technology. It was argued in chapter five that maintenance and repair via reduction was a significant feature of the blade-point corpus from Britain. It was also argued that reduction in size of the blade-points brought problems in relation to hafting. A review of the *debitage* collections available supports these conclusions and adds

to them. Primarily, at Glaston early phase removals were present and were utilised. This, along with the blade fragments discussed from Badger Hole and Beedings made apparent how a penumbra of useful materials was generated at both ends of the technological process. This means we have to consider how the technological process was consciously recognised and organised to provide a capacity to resolve future problems, in future places, as they arose. Small curated cores were transported and used to produce small blades. Some of these small blades were made into blade-points. Fragments from some of these blades were utilised for tasks, possibly in relation to haft management. However large blades were also a component of this mobile toolkit, with a potential for use as knives but also to be chipped down into blade-point form.

5.4.5 Chapter conclusion

The aim of this chapter has been to answer the third research question: what are the behavioural patterns that generated each assemblage? Analysis of the blade dominated assemblage from Badger Hole indicates the maintenance of at least one small and well-used cores of good quality imported material. Blade production is from at least one knapping event. One large blade with no *debitage* context is consistent with it being imported separately, whilst other un-modified blades were perhaps fragmented through use. Certainly the denticulation on one blade fragment is recognised as modification into a tool. Finally, the edge damage more or less present on all pieces suggests these behaviours may have occurred on a section of collapsed plateau above the cave.

At Glaston a small glacial and thermally damaged nodule was reduced to produce a small core. The differing types of cortex present within the assemblage suggest other nodules were also worked. One of the larger cortical flakes was notched after the knapping sequence was completed indicating tool

production. A number of the smaller flakes are formally consistent with the experimental evidence for blade-point manufacture and the small blade-point present could have been the result of this production process. However, there seems to be juxtaposition between the small and minimally worked blade-point and some larger size blade reduction flakes. This would be indicative of artefact repair and 'haft management' at Glaston.

The artefacts from both the earlier and later collections at Beedings were discussed. There is evidence of early phase blade production as well as the trimming of large blades to make blade-points. There is also intensive reuse of blade and blade-point fragments, and the abandonment of a series of small and exhausted cores. This suggests a complex behavioural signature of 'production', 'reuse', and 'abandonment' at Beedings, which stands in contrast to the small scale activity recognised at both Badger Hole and Glaston.

The suite of behavioural patterns developed here for each site can be better understood if situated within discussion of each site's landscape affordances and of general faunal behaviours. This can be used to provide an interpretive context for the behaviours at each site and is the focus of the next research question and the subject of the next chapter.

Chapter six

Landscapes and faunal contexts

This chapter is interpretive and designed to address the fourth and final research question, how the behaviours identified at these sites can be interpreted in relation to their landscape and faunal contexts. Particular landscape features recognised within the literature have been explored directly via site visits.

Through this process an understanding of site affordances has been ascertained.

Generalised faunal contexts have been developed from a review of the animal remains present and the use of ethological models. Brought together, these aspects provide a new and original interpretive context for the patterns found within the previous chapter. This approach has been applied to the three sites under discussion with the first part of this chapter examining Badger Hole, the second Glaston, and the third Beedings. An interpretation is presented for each site in turn and together they are used to answer the final research question.

The last chapter section is summative and draws upon the answers to all the previous research questions. Seasonality is recognised as an integrative framework that can hold together the patterns and interpretations that have been discussed. This integrative context for the interpretive findings within this thesis permits a new and developed seasonality model for this particular period of the British Palaeolithic.

6.1 Badger Hole

In order to understand the site of Badger Hole it is necessary to relate it to others within the area and a number of researchers have highlighted relationships between the Mendip sites of Uphill Cave 8, Soldier's Hole¹, Badger Hole and Hyaena Den (Fig.6.1).

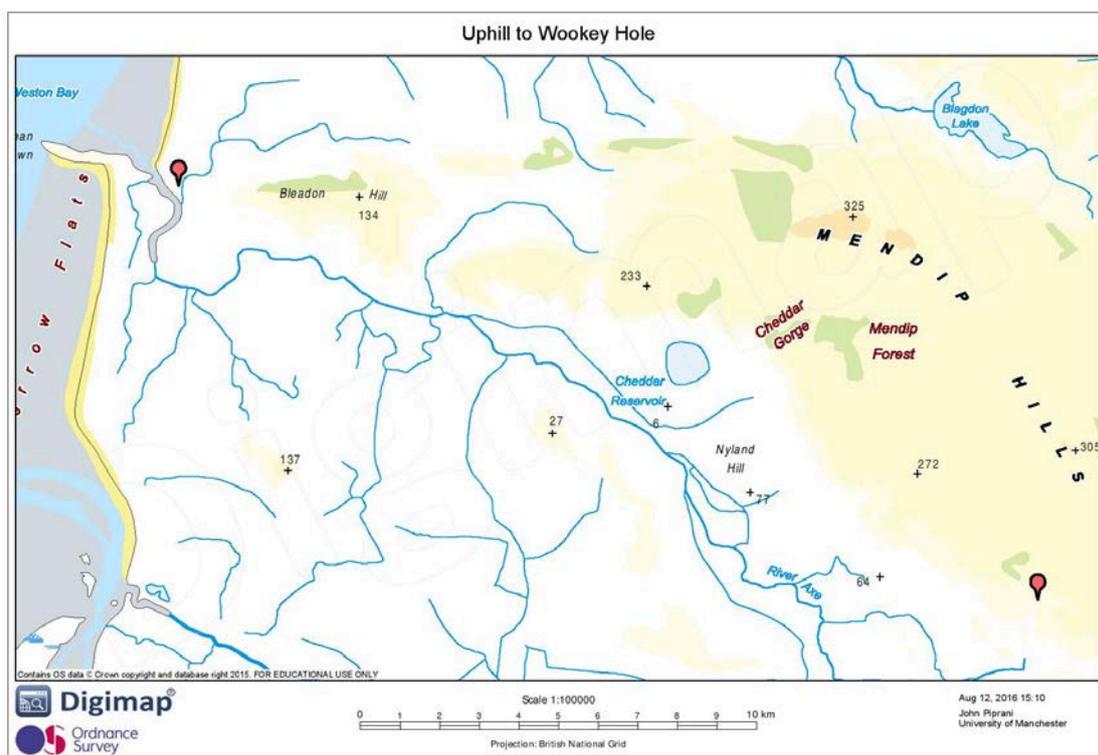


Fig.6.1 The Lincombian sites of Uphill Cave 8 to the west and Hyaena Den and Badger Hole further to the east in the Wookey Hole Ravine. These sites lie on an approximately west east axis at the interface between the Mendip uplands and the Axe Valley. © Crown Copyright and database rights 2015. Ordnance Survey (Digimap Licence).

John Campbell (1977: 31; 143) used total quantities of finds to interpret Badger Hole as an EUP base camp with Soldier's Hole being indicative of exploitation of a territory within a 10km radius. In the same year Ron Harrison (1977: 251)

¹ The material from Soldier's Hole has been lost and I have not visited the site. Consequently it is not included within this discussion.

drew attention to the similarity between material, technique and size of a Middle Palaeolithic handaxe from Uphill and those from Hyaena Den suggesting they may have been produced by the same Neanderthal group. More recently Pettitt and White (2012: 351) have developed this observation and integrated clusters of Neanderthal materials and related sites into what they term Local Operational Areas (LOAs). The Axe Valley LOA is discussed in detail (Pettitt and White 2012: 362) and it was hypothesised:

"Perhaps the Severn acted as a funnel, directing the herds out of the main floodplain of the Severn into the more steeply defined Axe Valley, where the movement of game could be monitored from afar and wherein the small box valleys at its sides could be used to disadvantage and trap game" (Pettitt and White 2012: 369).

This interpretation is astute and compliments earlier observations by Campbell (1977: 140). He argued the clustering of EUP sites around the Bristol Channel as due to the area being a *"contact zone between lowlands and highlands"*. As the differing periods discussed by these authors illustrate, the Axe Valley has seen human use on millennial scale.

6.1.1 Millennial human use

As well as the Neanderthal Middle Palaeolithic handaxes from Uphill and Hyaena Den, modern human Aurignacian antler or bone points have also been found at both sites (Jacobi and Carrant 2011: 61). At both ends of the Axe Valley signature artefacts provide insight into site use by differing human groups. However it may be useful to shift our anthropocentric gaze from type fossils, and follow Campbell by thinking about the landscape affordances and faunal behaviours that may be significant when attempting to understand the multi-

period, multi-technology focus on the Axe Valley. Faunal behaviour is discussed first.

6.1.2 Millennial faunal use

From two of the three sites, horse was apparently the dominant prey fauna (for Hyaena Den see Dawkins 1862: 117; for Uphill see Harrison 1977: 241) certainly for hyaena and also probably for human hunters (cf. Campbell 1977: 114). At Badger Hole it was a horse dentary used to ascertain a date for the blade-point (Jacobi and Higham 2011: 59). Shattered horse long bones found at Glaston have been accepted as evidence that horse was hunted by blade-point producers at least at that site (Cooper et al. 2012). In order to explore the possible interactions between human hunters and their likely prey it is useful to review some recent research into ungulate behaviour, in particular a paper addressing habitat fragmentation across mule deer migration routes in North America. Fragmentation was occurring because 2000 gas wells, associated pipelines and roads were planned. The study aimed to identify areas of conflict between the conservation of established migration routes, and the proposed wells, pipelines and roads. To do so they examined the how many animals used particular routes. The rationale behind developer decision making was based upon the observation that because some routes were utilised more than others *"proportional level of use may provide a reasonable metric by which routes can be prioritized for conservation"* (Sawyer et al. 2009: 2016). It is assumed here, that acquiring this same kind of faunal knowledge and understanding would have been fundamental for EUP hunters to inform their decision making when organising their own human animal interaction. The accumulation of faunal evidence within the 'Bone Caves' of the Axe Valley indicates that this was likely an established animal migration route, and the range of technologies present

highlights how it was repeatedly recognised as such by human hunters over many millennia. As originally argued by Eric Higgs, faunal behaviour can be a useful route to develop a context for understanding this past human technology.

6.1.3 East-west valleys

Campbell recognised the role of valleys linking lowlands to uplands, however the attraction of the Axe Valley may have also been related to its orientation. It runs approximately from upland east to a lowland west and ungulates generally migrate to maximise access to high quality forage as it becomes available. High quality forage equates to less mature, highly digestible plants. Sami reindeer herders look for east-west valleys, as in late winter-early spring the south facing slopes melt sooner, and offer forage earlier (Kitti et al. 2006: 152). These valleys make valuable pioneer routes for ungulates at the end of a hungry winter season and are important for facilitating the transition between winter lowland and summer upland pastures. Before, during and after the EUP, the south facing side of the Axe Valley may have been valuable to migrating ungulates in the late-winter early-spring because of its seasonally early provision of high quality forage. The west facing view from Uphill situated at the mouth of the Axe Valley provided a vista over what would have been just such a winter lowland landscape during the EUP (see Fig.6.1).



Fig.6.2 The vista looking west from above the now quarried away Uphill Cave 8 and looking out over the Severn Estuary (photograph: author).

6.1.4 Ungulate movement through valleys

When ungulates migrate through landscape corridors, they do so in pulses, from one area of accessible high quality forage to the next (Sawyer et al. 2009: 2016). Since ungulates such as horse are now domesticates, it is difficult to comprehend migration patterns. However, a small study of twelve Australian wild horses over 6.5 days showed they migrated between 8.1 and 28.3 km per day (Hampson et al. 2010). During the late winter–early spring migration these pulses would be from lowland to upland and cover large distances whilst moving through very different environments (Olsen 1989: 324). If Uphill did provide an entry point for migrating ungulates moving along the Axe Valley (Jacobi and Higham 2011: 195) the predominance of horse remains from the Wookey Hole ravine sites suggests it may have been one south facing stopover point.

6.1.5 Wookey Hole Ravine

As discussed, the ravine is a cul-de-sac with two Lincombian sites, Hyaena Den and Badger Hole. Although overwritten by hyaena gnawing, horse remains were the most recovered prey species from Hyaena Den numbering 401 elements (Balch 1914: 170). Jacobi recognised the "*box like form of Wookey Hole ravine makes it a natural trap for hunting*" (Jacobi 2000: 46), an observation supported by the behaviour of Sami reindeer herders who look for features such as box valleys to use as useful natural structures to marshal and control their herds (Kitti et al. 2006: 152).

It was outlined in chapter one how many blade-points from Beedings have breakage patterns indicative of use as missile heads. Steven Churchill examined the ethnographic record for peoples who hunt with missiles. He found a statistical correspondence between hand-thrust spears and landscape features that can be used to disadvantage large animals (Churchill 1993). This explanatory model links the affordances of the Wookey Hole Ravine, the horse

remains and blade-points recovered from the caves. However detailed analysis and discussion of the lithics from the ravine can provide a more nuanced context.

As discussed in chapter one, during the EUP sea levels would have been around 70m to 80m below modern levels (Lambeck et al. 2002: 202). The implication for sites under discussion here is that they would have all been occupying a relatively upland location. Consequently the seasonal migration process would have been somewhat underway by the time animals reached these upland sites. This may partly explain the small size and degree of curation evident on the majority of artefacts under discussion from Badger Hole. As established in chapter five, distance from main flint resources in the south and east of England was perhaps also a factor. Animal migration is dynamic by nature, and these hunters would have had to be also. This dynamism perhaps meant moving upland from one site of tactical advantage to the next along with, and perhaps slightly ahead of, the migrating game. Jacobi has pointed out "*the view from Uphill is quite extraordinary and extends in one direction as far as Exmoor*" (Jacobi and Carrant 2011: 54). Pettitt and White (2012: 369) have discussed how from Uphill one can see 30km eastwards along the valley. If we consider the plateau above Badger Hole what we find is "*a commanding view as far as Glastonbury Tor exists from a knoll above the cave*" (Jacobi and Carrant 2011: 53). Furthermore Jacobi has outlined how the "*the knolls above both the Hyaena Den and Uphill quarry offer wide panoramas for anyone monitoring game*" (Jacobi 2000: 46). If Uphill provided visual information allowing an understanding of when the late winter early spring migration would arrive, this would allow hunters to literally 'keep ahead of the game'. At the same time the views up the valley would facilitate planning, movement and rendezvous with

the prey further up at sites of tactical advantage (Pettitt and White 2012: 369). Perhaps we are analysing the context within which human hunters were able to take advantage of the repeated arrival of small herds of horse along a particular valley at a particular part of the season. The affordances offered by the Wookey Hole Ravine provide one example, within an open landscape, where these pulses of prey could be intercepted and disadvantaged. But what of the *debitage* and lithics examined for this project?

6.1.6 The lithics

As discussed, it would seem as though the material these blade-points were made from was probably imported and the artefacts themselves curated. Overall the EUP assemblage from the ravine is blade dominated and breakage observed may be related to use, although also perhaps movement through sediment. One blade-point from Hyaena Den (HD1) was heavily edge damaged, although differential ridge wear is consistent with the artefact having been used for cutting. The blade-points from Badger Hole are disparate, with one heavily retouched example (BH1), a long slim piece that may have evidence of impact damage (BH2), a piece broken possibly through movement (BH3) and a small notched piece (BH4). Within the *debitage* there is some evidence (BHD2) of potential 'haft management' activities. However the two points of significance I want to draw out are the dominance of broken blades and the likelihood that much of this material was from the plateau above.

6.1.7 The affordances of plateaus

If we consider the plateau above Badger Hole, the apparent importance of the views has already been discussed (e.g. Jacobi 2000: 46) in terms of observation

and interception of animals. Whilst this explanation is congruent with the landscape context, it is argued here that for the users of the site other affordances may also have been exploited. The production and breakage of blade material from above Badger Hole is intriguing, and some breakage may have been related to use. As well as the large blade interpreted by Balch as a knife, the blade-point HD1 from Hyaena Den had differential ridge wear consistent with its use for cutting. The use of blade materials on a site exposed to the elements might be related to the cutting and drying of meat.

6.1.8 A seasonal context

If we accept the seasonality of the hunter's world, and the future orientated qualities of the stone tool technology then this activity would make sense. Inuit from Baffin Island would cut raw meat into strips to eat it, a strategy to mitigate the lack of available fuel for cooking (Mears and Hunter 1997: 21). Cutting meat into strips also increases surface area and exposure to air flow facilitates drying. Evaporation of moisture inhibits bacterial activity thus preserving the meat, but it also considerably reduces the weight. As the season progressed prey would have become dispersed throughout the open and upland Mendip plateau. Prey dispersal would have made the human ability to make a kill much less predictable. A preserved and lightweight food source would provide a nutritional 'buffer' for operating within just such an environment. This interpretation fits both archaeological and ethnographic evidence. In relation to archaeological evidence for meat cutting, stone 'anvils' with repeated linear cut marks on the surface were identified at a Lower Palaeolithic horse butchery site (Thieme 2005: 130). In relation to ethnographic evidence for meat drying, Lewis Binford (1978: 94) in his discussion of the Nunamiut of Alaska explicated the necessity and

process in some detail. For the Nunamiut drying usually occurred in the spring before temperature rises. The orientation of Uphill is significant as it would have been useful for observing lowland to upland late winter–early spring migration in the past. If low temperatures are involved, air flow becomes a primary consideration for meat drying. One expedient procedure the Nunamiut adopt is ‘half drying’, where the outside of the meat is dried and forms a ‘skin’ but the inside remains moist. During MIS3 clear skies increased the amount of solar radiation, and the climate was arid, both factors that would have enhanced drying. Returning again to the Nunamiut, the equipment used for this drying process was termed by Binford (1978: 97) a ‘tripod-pole rack’, essentially a number of tripods linked by poles. As Figure 6.2 shows, this kind of structure could easily be fashioned by humans whose primary technology apparently comprised stone points attached to long wooden hafts.

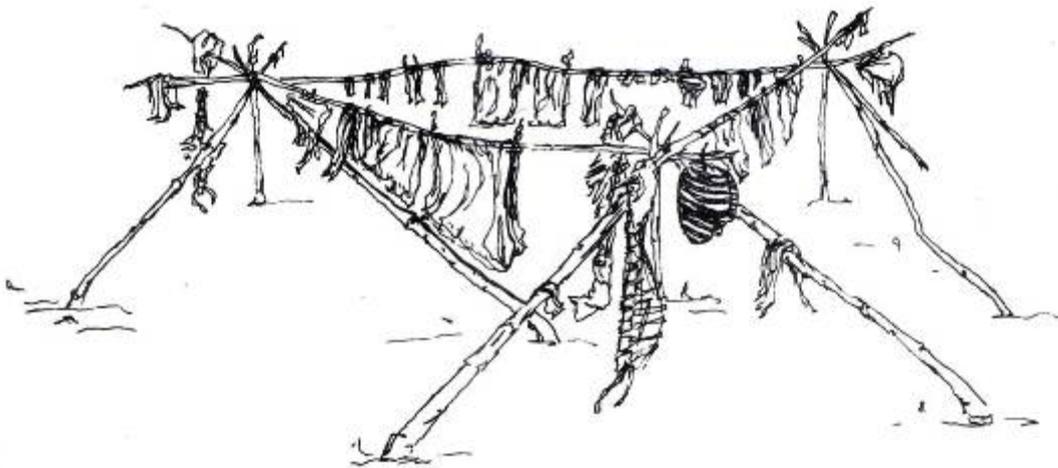


Fig.6.3 A Nunamiut spring drying rack (Binford 1978: 99, Fig.3.5).

An invisible element necessary within the drying process is time, and the presence of items such as the notched blade fragment BHD2, interpreted here as

'haft management' equipment, indicates that repair and modification activities could have been synchronous with landscape monitoring and meat drying.

6.1.9 Badger Hole summary

A type fossil approach has allowed recognition of the use of the Axe Valley over millennial time scales by differing groups of human hunters. However a focus upon the EUP *debitage* from Badger Hole is more usefully discussed within the temporal parameters that affected the humans using the technology. Integrating landscape and faunal evidence into a seasonal context highlights fundamental physical and temporal dynamics involved in the hunting and killing of large fauna. This allows recognition of the predictability of differential hunting success at different times within the season. The value of some kind of nutritional bridging system to ameliorate the effects of future and predicted hunting difficulty becomes apparent. As soon as we consider how these humans were able to function within this predictably fluctuating context, it would seem impossible without some such bridging strategy. The hunting process would have been complex and dynamic, and we need to explore this complexity and dynamism. As will be discussed, fractured horse limb bones and the targeting of hyaena meat caches at Glaston would seem to illustrate differing solutions to the same problem, perhaps at later points in the season. This meat drying interpretation is tentative but consistent with the evidence available currently. As such it may be a valuable starting point for further research.

6.2 Glaston

As discussed in chapter three the site of Glaston sits upon an east-west ridge approximately 122m ASL (Fig.6.4).

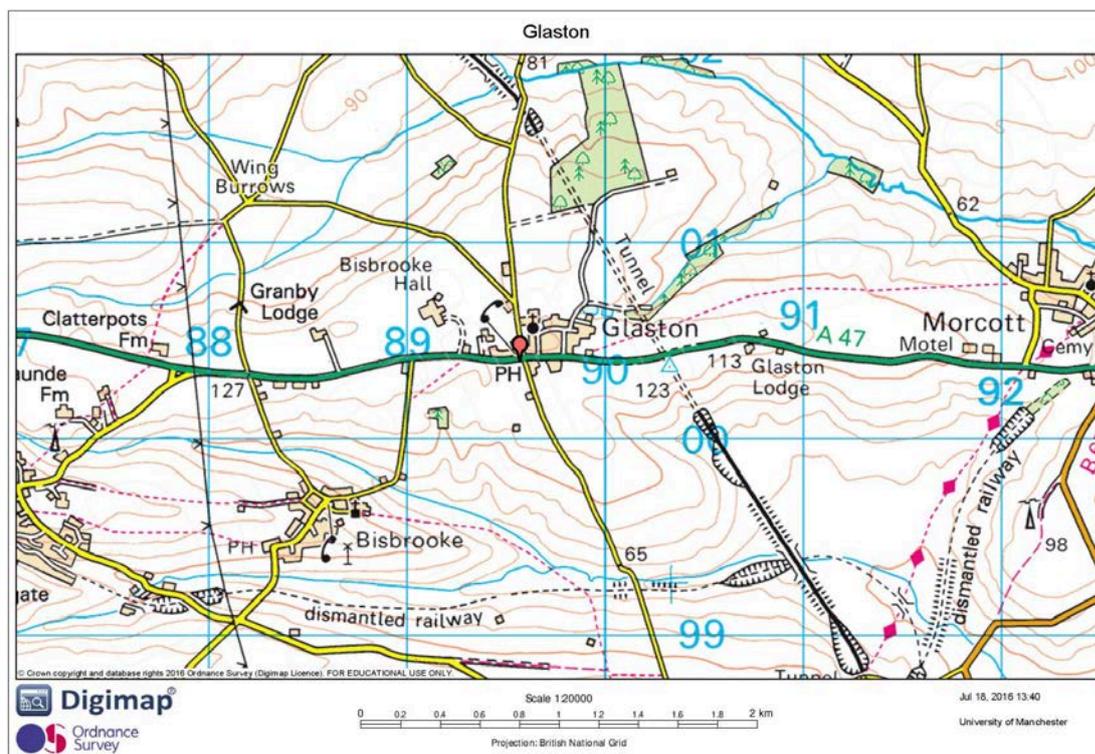


Fig.6.4 The Midlands site of Glaston sits close to a high point on a west to east running ridge and next to the current A47. © Crown Copyright and database rights 2015. Ordnance Survey (Digimap Licence).

At times of lowered sea-level Glaston would have been an upland site in relation to the EUP North Sea Plain. If hunters were following the seasonal movement of animals from the lowlands to uplands, then the location of Glaston indicates they were some way into the summer season. That they were targeting animals widely dispersed throughout an upland landscape may be supported by some of the faunal evidence present. Spiral fractures and lithic proximity has been seen as evidence of humans extracting marrow from horse long bones (Cooper et al.

2012: 82). Marrow extraction has some well-known ethnographic parallels and Binford's work with the Nunamiut is again valuable (Binford 1983: 101). He made observations on when and where marrow extraction occurred and recognised that one function was as a transportable back up food source for the times of year when hunting success could not be guaranteed. Summer hunting involved locating dispersed prey and the success of this process was unpredictable. This unpredictability was mediated by the carrying of transportable food in the form of caribou marrow bones. Outram and Rowley-Conwy (1998) highlighted the lesser nutritional value of horse limb bones in relation to caribou. However, this does not negate their value as a transportable marrow resource. The small size of the extant blade-point and the thermal and transport damaged cortical *debitage* supports the argument that these hunters were some way into their seasonal round perhaps carrying a somewhat improvised toolkit and a back up food source.

6.2.1 A significant landscape feature

The possible importance of view-shed was recognised by the excavators early on and analysis identified that whilst the adjacent valleys are not easily monitored, the location provided a good view of the surrounding plateaus. However, it can be argued that as well as a 'view-from', the site may also have had an important 'view-to' function. This is because the sandstone raft would have been a unique landscape feature during the Mid-Devensian. Indeed, as was discussed within the report: "*The upstanding remnants of the Collyweston sandstone acted as an attractor for both hyaenas and humans at various times, giving this particular point on the hilltop a specific identity as well as a little shelter*" (Cooper et al. 2012: 79). Marcy Rockman has discussed how native American Apache use

landscape names for tying socially valuable information to places that are in some way different (Rockman 2003: 7). Within an open environment, the sandstone raft may have formed a significant social 'place' for humans using the area. This social place could have been used within knowledge transfer, as well as facilitating navigation via dead reckoning (ibid). Indeed, as has already been argued "*Glaston is on a high east-west ridge top, which has potentially been an important route of communication for millennia and currently holds the main A47 road*" (Cooper et al. 2012: 76).

6.2.2 Humans preying upon hyaena meat caches

Finally, it is interesting to review the excavators' interpretation of humans preying upon hyaena meat caches. This idea is supported by the majority of bones showing evidence of hyaena gnawing, and the condition of preservation as well as stratigraphic and physical association between lithics and gnawed faunal remains (Cooper et al. 2012: 86). It is also true however, that the horse bones show no sign of hyaena gnawing, suggesting they may postdate the hyaena presence. What is perhaps more significant is Binford's observations of Nunamiut summer hunting strategies.

6.2.3 Nunamiut summer hunting strategies

Because the Nunamiut's main prey was dispersed during the summer months, one hunting strategy was to target salt licks (Binford 1978: 285). These were mineral exposures that ungulates and other animals used as a dietary supplement. In other words, human hunters targeted nodes within the landscape where it could be predicted that a wider range of prey animals would visit. In this respect the targeting of a hyaena den for meat caches could be understood

in a similar way, as a strategy to widen the range of food resources accessible at a time when a main prey species was dispersed. Thus, un-protected meat caches and smashed horse marrow bones could be interpreted in a similar way, as an expedient summer food supply.

6.2.4 A sympatric relationship

Pettitt and White (2012: 324) have argued for the possibility of a sympatric relationship between humans and hyaena sharing the same territories. This relationship perhaps involved humans hunting during the day and hyaena at night, thus sharing territorial space but using temporality to mediate competition. This notion is consistent with the behaviour of African hyaena that hunt at night. However, this night hunting has been understood as a strategy to mitigate high daytime temperatures (Cooper 1990: 131). This may not have been necessary for hyaena hunting during the cooler MIS3 temperatures.

However, a sympatric relationship may have been based on more fundamental differences between human and hyaena physiology. In an African environment modern hyaena are clan coursing hunters utilising open landscapes strategically (ibid). The open landscapes of MIS3 suggest this was probably also true then. However, the re-occurrence of Lincombian sites with associated vistas and gorges suggests human intercept strategies in an open and treeless landscape. A sympatric relationship may have existed between humans and hyaena within the same territory, but perhaps relating to different landscape use strategies. This would see hyaena having used open landscapes to practice a coursing behaviour. In contrast human hunters may have used upland viewpoints to gather information and intercept prey within closed environments: two

contemporary predators mediating direct competition by utilising the same landscapes differently.

6.2.5 Glaston conclusion

It is argued here that Glaston was utilised some way into a long summer season. The presence of a complete and unbroken blade-point suggests it was expected to be used at some point again in the future. Both the targeting of hyaena meat caches, as well as the use of horse marrow bones can be seen as strategic food resources, utilised during unpredictable upland summer hunting. These two differing strategies may have been used on differing occasions. It can be hypothesised that meat caches were targeted when hyaena young were present, and horse marrow bones utilised on a separate occasion after hyaena had abandoned the site.

6.3 Beedings

Integrating analysis of the lithics from Beedings into a landscape and faunal context is a continuation of the approach put forward by Roger Jacobi for the site. For Jacobi (2007: 273) fauna were inherent within his explanation when he related the predominance of broken spear heads to the site's associated vistas. Whilst accounting for the fractured state of at least 36 blade-points, there were a total of 80 EUP retouched tools identified from the site (Jacobi 2007: 245). Matt Pope has emphasised the high quantity of EUP lithics recovered and contrasted this to all other British find-spots. Because of this quantitative predominance he has asked if there is some characteristic of the site that we are perhaps not recognising (Pope et al. 2013: 12). Developing Pope's observation, the themes developed within chapter six of 'production', 'reuse' and 'abandonment' are reviewed in relation to a landscape and faunal context. This is used to comprehend the factors that seem to have made Beedings an exceptional EUP site.

6.3.1 Landscape context

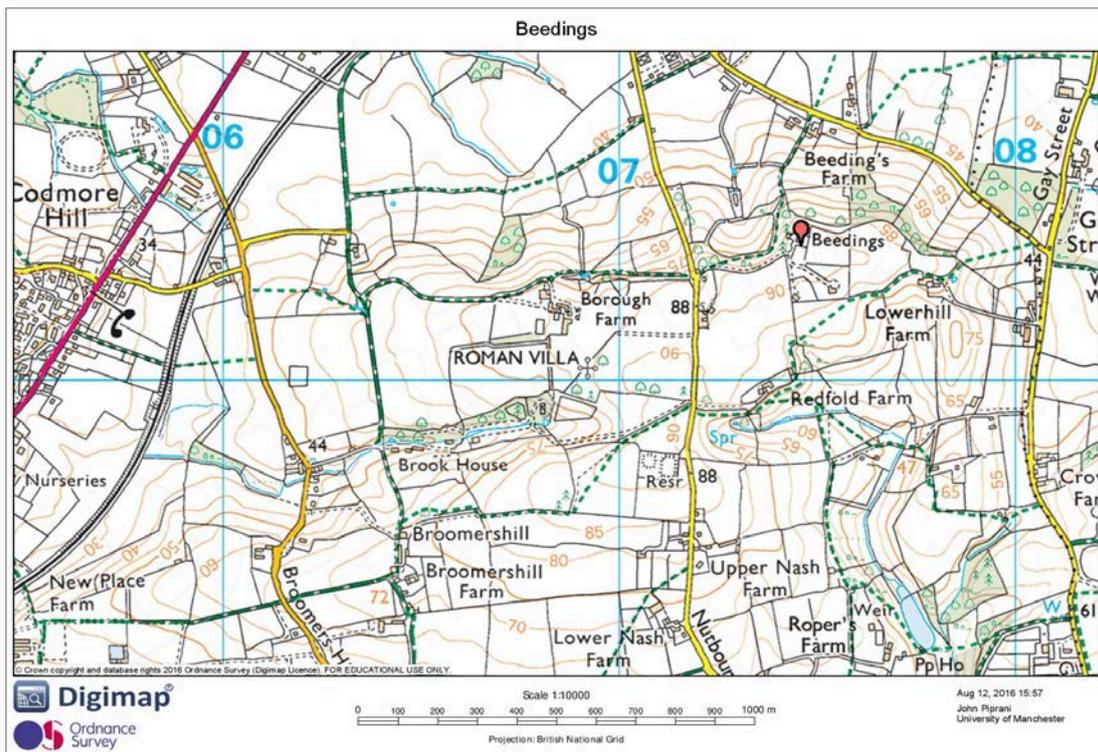


Fig. 6.5 The Sussex site of Beedings sitting on a west east orientated ridge and with a north facing orientation. © Crown Copyright and database rights 2015. Ordnance Survey (Digimap Licence).

As figure 6.5 illustrates, a good place to start is the site's north facing orientation (Jacobi 2007: 229). Whilst this does not preclude vistas in all directions from the plateau, the positioning of the original site, as well as the new excavations both provide a northern and 'inland' vista over a western section of the Weald (Jacobi 2007; Pope 2008: 34).



Fig.6.6 Beddings, marked in red, within a material and visual contexts. The Hog's Back ridge near Farnham is marked in green and visible from Beedings. Both Amberley (marked in yellow) and Warning Camp Quarry (blue) have exposed flint seams. © Crown Copyright and database rights 2015. Ordnance Survey (Digimap Licence).

The Weald is an upland area orientated west to east, some 60km wide and around 160km long (Wooldridge and Golding 1960: 1). The western section under discussion is termed the Low Weald in contrast to the central and eastern High Weald. Beedings is 90m ASL and in clear weather on the northern horizon the Hog's Back ridge some 35km distant at Farnham in Surrey can be seen (Jacobi 2007: 229, 273). Beedings sits upon an east-west Lower Greensand ridge and the River Arun runs approximately NNE-SSW, cutting the ridge some 5km to the west of the site (see Fig.6.6).

6.3.2 The River Arun

In the past the Arun would have differed to how it is now. The current broad valley floor is contained by sides that plunge steeply below it (Woolridge and Golding 1960: 75) and these steep edges contain a thick Holocene alluvial fill over 30m deep in places (Antoine et al. 2003: 235). This Holocene fill disguises that fact that, pre-Holocene, the river would have been contained within a steep gorge (Woolridge and Golding 1960: 75). To the south west of Beedings this steep gorge has cut through the Chalk Downs creating what has been termed the 'Arun-Gap'. Mortimore (1986: 39) has discussed how thick chalk beds are present at Amberley at the northern end of the Arun-Gap, and large flint seams within the Culver Chalk beds have been found at the Warning Camp quarry towards the southern end (see Fig.6.6). It would seem that the deeply incised river valley that produced the Arun-Gap would have cut through chalk beds containing large seams of flint (Jacobi 1986: 66) some 15km distance from Beedings.

6.3.3 Watershed

Viewed from the direction of Beedings, the western section of the Weald comprises a broad and flat ridge "*throwing off families of ghylls...southwards towards the Arun*" (Woolridge and Golding 1960: 89). A 'ghyll' is a deeply cut valley and the headstream of the Arun rises to the north east within just such a ghyll (Woolridge and Golding 1960: 88). Beedings however, sits upon a watershed that separates the waters feeding into both the River Arun to the north and west and the River Adur to the east (see Fig.6.7); cf. Woolridge and Golding 1960: 60. Fig.23). Therefore the viewshed from the site would have allowed, to the north and west, a 30km overview of a series of ghylls feeding

into the River Arun. Turning east the same would be true for the feeders to the River Adur.

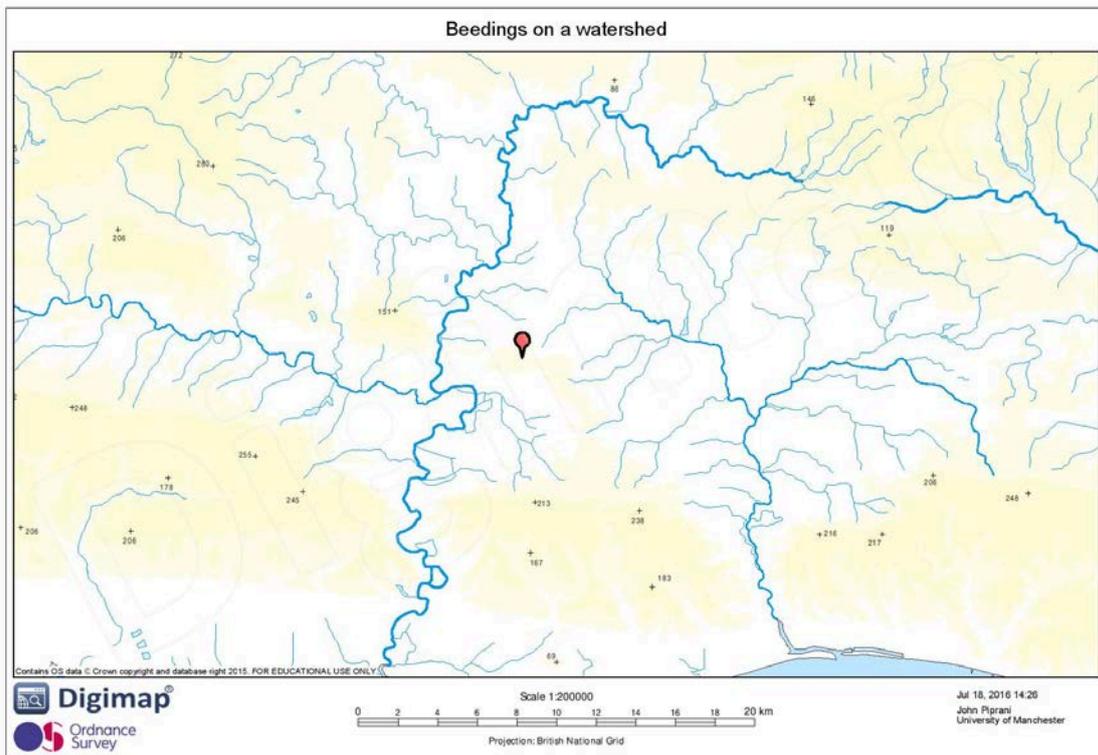


Fig. 6.7 The site of Beedings sits on a watershed between the rivers Arun to the west, and Adur to the east. © Crown Copyright and database rights 2015. Ordnance Survey (Digimap Licence).

6.3.4 Viewshed

This description of the pre-Holocene landscape is valuable as it allows a development of the oft cited characteristic, of Beedings being ideal for monitoring animal movement. The viewshed from Beedings seems to provide a linkage between animal movement and steep sided narrow valleys, a landform recognised by many other researchers (Churchill 1993: 17; Jacobi 2000: 46; Pettitt and White 2012: 369) as potentially useful for concentrating and disadvantaging large ungulates. In other words it would seem that the viewshed from Jacobi's monitoring and re-tooling site, was orientated towards a series of potential kill locations to the west, north and east. It may also be significant that

the River Arun cuts through the ridge upon which the site sits. Pettitt and White (2012: 369) have highlighted the navigational value of utilising rivers as 'hand-rail' features facilitating the location and return to repeatedly used sites.

6.3.5 A repeatedly used site

This brings to the fore the question as to whether quantity of material can be interpreted as an analogue for repeated use? 2300 elements were recovered in 1900 AD, and although all of these may not have been EUP, it does suggest that the component was originally larger (Jacobi 2007: 231). This needs consideration in relation to the fact that Beedings is currently the largest Lincombian site in Britain, and one of the largest LRJ sites overall. In order to interpret what this means I will outline key features of the assemblage, which sometimes seem to be contradictory. The first is the access to large size, high quality materials, imported at an early stage of reduction, and used to produce large blade-points. The second is evidence for extensive reuse and recycling, and finally the presence of exhausted and apparently abandoned materials. These features are interpreted here in terms of repeated occupation of the site and acts of arrival and return.

6.3.6 Early phase production

In chapter six it was shown how recent excavations have provided new evidence indicative of the production of blade-points at the site. The relatively large size of this micro-*debitage* in relation to experimental materials is coherent with an oversized blade being reduced. This supports the conclusion of chapter five that the blade-point average size derived from complete pieces is too low, and the above average size of the Beedings pieces may be related to flint availability within the locality. As discussed, some large Beedings elements have differently

patinated surfaces, indicative of naturally fractured flints eroding from slope deposits. Such deposits would have been accessible locally.

6.3.7 Intense recycling

In addition to the evidence for early stage reduction of large raw material, there was substantial evidence for recycling and raw material economies. This was illustrated within the previous chapter discussion on the Kostenki Knife / bladelet core. This intense recycling of discarded material supports the idea that the debris at Beedings was part of an active process designed to create a flint resource at a significant point in the landscape. Certainly the quantity and character of the material still extant fits well with what Paul Preston (2009) has described as a tertiary flint resource within the landscape. In simplified terms, whilst flint can be accessed directly from the chalk, it can also be found in secondary contexts as transported nodules. However the active human process of leaving flint debris at particular locales can be perceived as creating a third type of resource at a desired location within the landscape.

As discussed, Kostenki Knives appear to have been utilised as bladelet cores (Jacobi 2007: 266 citing Newcomer and Hivernel-Guerre 1974 and Dibble and McPherron 2006). The Kostenki Knife / bladelet core figured in chapter five (Fig.5.40) had a complex lifecycle. Produced initially as a blade-point, it was then fragmented, probably away from the site. Following Jacobi's model it seems then to have been brought to Beedings, ejected from the haft and presumably replaced (Jacobi 2007: 247, 252). Subsequent to this discard it was utilised as a bladelet core. Considering its history, as well as the fact that it was recovered from the site suggests it had an 'active' mobile life as a projectile tip, followed by a 'passive' static life after being broken, reused and then discarded at the site.

This shift from 'active' and mobile to 'passive' and static has been discussed by Binford in terms of 'change of state dynamics'. In other words how the use value of an artefact changes, and how this can be reflected within its recovery context. This explanation may also be relevant for the small blade cores recovered.

6.3.8 Small blade cores

Some of the material and patina relationships discussed within the previous chapter suggest cores were brought to Beedings and reduced *in situ*. However, this explanation does not acknowledge the probable dynamics of human and animal movement in relation to the site. Consequently I would like to develop this model. I will argue that from being active components of personal gear, the small cores were deposited at the site close to the end of their use life. This assertion is based upon three qualities inherent within the technology and the artefacts, namely: the transportability of small blade cores; the use of opposed platform production; the multi-functionality of small blade cores. Each will be discussed in turn.

6.3.9 Transportability

Binford explored the use of cores by the Nunamiut of North America and is worth quoting directly. "*Informants always spoke of carrying "cores" into the field; as they put it, you carry a piece that has been worked enough so that all the waste is removed, but that has not been worked so much that you cannot do different things with it*" (Binford 1979: 262). From the Nunamiut perspective small cores were seen as insurance and associated with movement in the field. The archaeological evidence from Beedings and Badger Hole of the use of small cores and utilisation of small blade fragments seems to reflect this ethnographic observation. In relation to personal gear Binford states: "*Personal gear was heavily curated. Recycling, reuse, and heavy maintenance investments were*

made in these items" (Binford 1977: 33). As such these small cores fit Binford's criteria for personal gear being characterised by repeated and controlled reduction and maintenance.

6.3.10 Multi-functionality

Jacobi coded the core discussed in chapter five as 'number 158 WC2' (Fig.5.43). WC stood for 'Worn Core' and highlighted how the core ridges may have been utilised. This wear suggests a multi-functionality of at least some of these small blade cores. The abandonment of cores towards the end of their use life at Beedings is consistent with the idea of replacement before they were fully exhausted. Their multi-functionality would be of value as personal gear but towards the end of their use life they would become a liability if relied upon within the field. However they could still function as an asset if left at the site as a tertiary flint resource. Acknowledging the above I would like to discuss the presence of 'production' elements in contrast to the 're-used' and end of life 'abandoned' pieces in terms of 'arrival', 'monitoring' and 'return'.

6.3.11 Arrival, monitoring and return

Patination on some pieces is consistent with the use of naturally fractured nodules obtained from slope deposits locally and to the south, and the large size and form of some pieces from Beedings is consistent with early stages of blade production. Consequently, it is argued here that an 'arrival' signature at the site is indicated by these large fragments reflecting import and early phases of production.

However this pattern finds a contrast with other pieces from the same collection. The majority of pieces at Beedings are broken and if we accept that Beedings was indeed overlooking a series of potential kill sites, then we are likely to also be seeing patterns indicative of return to the site for re-tooling, Jacobi's

explanation. This would probably be from the direction of the Weald, and as discussed the orientation of the River Arun would facilitate just such repeated journeys. That both production and broken materials have been recycled corresponds well with Jacobi's interpretation of re-tooling and monitoring. Monitoring takes time and whilst waiting pieces of debris could have been appropriated as improvised tools to facilitate the removal of broken blade-points and re-hafting of complete pieces, among other tasks (cf. Jacobi 1986: 66). At Beedings improvised reuse seems to be an activity that overwrites materials indicative of both arrival and return (see Table 6.1).

Arrival.	Large flint packages imported from chalk areas.	Production activities.	Larger debris	Intensively reused while monitoring
Return.	Curated and broken tools brought back from kill sites.	Maintenance and re-tooling activities.	Smaller fragmented debris	Intensively reused while monitoring

Table 6.1 Arrival and return signatures are overwritten by recycling whilst monitoring.

6.3.12 Seasonal indicators

One further point that may be relevant to this discussion is the presence of seven end-scrapers (Jacobi 2007: 245). Of the Lincombian find spots discussed within this thesis only Beedings and Robin Hood's Cave had scrapers associated with blade-points. That is not to say that there are not scrapers within other Lincombian collections, just that they have not been recognised by this or any other researcher to date. It is an assumption here that a smooth and rounded profile is indicative of a hide scraping function (Gallagher 1977: 411). From an ethnographic perspective hide scrapers are primarily useful in the late summer season. This is because animals have had the summer to replenish and their coats are in good condition (Binford 1978: 310, 312, 326). For this reason it is

the late summer that, ethnographically, hides are taken to make clothing. The presence of seven end-scrapers at the site of Beedings is taken here as an indicator that at least some of the material recovered was associated with late summer hunting.

6.3.13 Beedings conclusion

Jacobi (1986: 63, 66, 67) had early on recognised the predominance of proximal sections and the intense recycling of material at Beedings. He integrated these observations to produce his ‘observation and retooling’ interpretation. More recently Pope suggested the exceptional quantity of lithics present may mean we are missing some important characteristic of the site. The interpretation presented here builds upon both these researchers’ observations (see Table 6.2).

Artefacts	Large blades	Utilised fragments	Exhausted cores
Behaviour	Production	Reuse	Abandonment
Interpretation	Arrival	Monitoring	Return

Table 6.2 Artefacts, behaviours and interpretation at Beedings.

Discussing artefacts in relation to their landscape and faunal context is presented as a route to understanding the exceptional nature of the site. It is argued here that the accumulation of a tertiary flint resource demonstrates the site’s past use as well as an intention of future use. Combined with the exceptional quantity of lithics it is therefore likely that Beedings was repeatedly used. The presence within the collection of ‘production’ debris as well as broken and ‘exhausted’ artefacts has been interpreted here as indicative of arrival and return respectively. The size, form and patina of some ‘production’ material is consistent with it arriving from exposed local slope deposits. The improvised use of discarded material suggests a waiting function and as Jacobi originally

posited, observation from Beedings would have allowed a large area to be monitored (Jacobi 1986: 67). The site being situated on a watershed would have facilitated the overview of a series of ghylls feeding major river valleys to the west, north and east. The presence of potential kill sites within the buried Wealden landscape, as well as a 'handrail' feature such as the River Arun, add weight to the idea that hunting excursions to the north occurred from Beedings. The presence of scrapers, presumably for use on animal skins, would correlate ethnographically with harvesting towards the end of the migratory season. Whilst the exceptional nature of the lithics and the vista have previously been noted, a review of landscape affordances associated with the site go some way to developing our understanding of why, how and perhaps when Beedings may have been repeatedly used by EUP hunters.

Together these case studies have been used to answer the fourth research question. This was achieved by situating the artefacts from each site within their particular landscape and general faunal context in order to develop new and original interpretations. Whilst characterised by difference, they do however offer the opportunity to recognise underlying patterns and themes linking the sites, artefacts and behaviours discussed. That is the focus of the next section.

6.4 Underlying themes

Three underlying themes are discussed, behavioural adaptability, human directional mobility, and depositional practices. To do so this chapter section is divided into three parts. The first part begins by presenting the idea that collection variability reflects site function variability. This is used to develop the theme of behavioural adaptability. The second part will discuss the patterning of artefacts within the landscape to posit an explanation of human movement from east to west and lowland to upland. The third section will focus upon why complete and un-broken blade-points are predominantly recovered from cave sites and present the idea of artefact deposition. To begin this process human behavioural adaptability is dealt with first.

6.4.1 Site variability

Earlier chapters have illustrated how both type fossils and technology is characterised by variability. This focus upon collections and their contexts reflects the same. In relation to landscape, the material from Badger Hole was associated with an inter-face between a ravine and an upland plateau. Beedings sat upon a watershed overlooking two river systems with associated steep sided ghylls. In contrast Glaston sat upon an east-west running ridge close to an obvious landmark. The source materials used to produce the lithic artefacts were also variable, with good quality flint at two sites and a poor quality cobble used at the third. Experimental work highlighted the value of good quality flint for producing large size blade-points that could be maintained. Beedings showed some evidence for this kind of production whilst Badger Hole *debitage* indicated the use of a curated core. In contrast Glaston illustrated the application of the

same skilled reduction procedure but on poorer quality material. This was associated with the smallest blade-point within the overall corpus. An interpretation to explain this site variability has been posited for each case in turn. Together these explanations illustrate human behavioural adaptability. However the two most interesting aspects of variability I want to draw attention to are how these sites together provide evidence for human mobility and how the fragmented lithic signature from Beedings seems to stand in contrast to a patterning of complete pieces at cave sites. The implications these sites provide for comprehending human movement is discussed first.

6.4.2 Movement from east to west

Derek Roe² tentatively hypothesised that the overall patterning of leaf and blade-point find spots is perhaps indicative of humans moving across the British landscape. This movement would have been from the south and east to the north and west, facilitated by river valleys. In making this comment he was linking a leaf-point from Osney Lock, found in gravels from the Thames estuary, to materials from Poland and Germany to the east, as well as to those from Kent's Cavern, Paviland Cave and Creswell Crags to the South West and the East Midlands. This interpretation also fits the 'attrition' pattern I found for both leaf and blade-points, and so I agree that Roe was largely correct. However, if the individual site discussions are taken into consideration the situation becomes more complex.

² Comments taken from the Pitt Rivers Object Catalogue, Research Notes, email correspondence dated 2.10.13 between curator Jeremy Cootes and Professor Derek Roe.

6.4.3 Movement from lowland to upland

The pattern suggested by Roe does reflect an overall movement of flint resources from east to west. His comments on the Thames valley are bolstered by the single and sometimes water-worn finds from Creffield Road, Earl of Dysart's Pit, Temple Mills, and more recently North Hinksey. The materials recovered from Bramford Road within the east-west orientated Gipping Valley also support this observation. However Pettitt and White highlighted how the character of the southern landscape under discussion differs from the lowland east to a more rugged and upland north and west. The north and west comprised narrow limestone gorges with river valleys that would have emptied into the plains below (Pettitt and White 2012: 300). These same researchers have also drawn attention to the Axe Valley suggesting the Severn funnelled fauna into the Axe Valley (Pettitt and White 2012: 369). This compliments Campbell's observations on the clustering of EUP sites around the Bristol Channel being due to its value as a "*contact zone between lowlands and highlands*" (Campbell 1977: 140). These researchers have usefully drawn attention to the relationship between river valleys and lowland to upland interfaces. However lowland to upland movement along the Axe Valley would have occurred from west to east. At Beedings the Arun Valley would seem to have been used in a similar way. Both the rivers Arun and Adur have drowned palaeo-channels extending to what would have been the west flowing Channel River (Antoine et al. 2003: 237). Consequently any upland human movement along the Arun or Adur valleys would have occurred from south to north. Therefore I agree with Roe that the general pattern of movement was from east to west. I also agree that river valleys were being used to direct movement from lowland to upland. My evidence suggests that movement could occur from east

to west along ridges (Glaston) and river valleys (Gipping Valley and Bramford Road). However movement from lowland to upland also occurred along river valleys travelling from west to east (Axe Valley and Badger Hole) and probably south to north (Arun Valley and Beedings) also. As well as directing movement however, both Beedings and Bramford Road show how river valleys cutting through chalk landscapes could expose flint nodules. In contrast Badger Hole illustrates the use of curated cores and the killing potential of narrow valleys. Movement along river valleys therefore has implications how we comprehend not just the acquisition of resources but also the hunting of prey fauna.

6.4.4 Importing hunting equipment

As discussed, within the west of Britain, river valleys emanating from steep sided limestone gorges would have emptied into a series of now submerged channels running into what would have been the Bristol Channel or Channel River. These submerged valleys would presumably have been used as hunting venues in their own right earlier in the season. Fauna would have been followed upland along the valleys, as the season developed and temperatures increased. Marcy Rockman (2003: 18, 19) has argued that for humans entering and operating within an unknown environment, it is easier to import hunting tactics than it is to 'know' the stone resources. This notion of imported tactics may be illustrated by a quantitative predominance of complete, unbroken blade-points within non-cretaceous areas.

6.4.5 Complete unbroken blade-points

The previous chapter (5.3) focussed upon the deposition pattern of material at the site of Beedings. As Jacobi already pointed out, complete unbroken blade-points were missing, but broken fragments were present, hence his re-tooling

hypothesis. I would like to contrast this with a second patterning within the overall corpus that is perhaps less obvious. That is the predominance of complete and unbroken blade-points recovered from non-cretaceous areas. Analysis within an earlier chapter (1.1.5) was designed to understand average blade-point size. For length, 24 pieces were used that could be classed as >90% complete. To fulfil these criteria, artefacts may have been broken but could be classed as complete so long as both substantive parts were present.

Jacobi highlighted however, how breakage patterning on many pieces at Beedings showed that fragmentation occurred in antiquity and through impact. Following Jacobi's hypothesis these pieces were broken whilst in the haft, and then discarded at the re-tooling site to allow a new blade-point to be fitted. The archetypal Beedings blade-point 29 with its medial break and burin like impact fractures has been used to illustrate this explanation perfectly (see fig.1.3). These impact damaged 'broken in antiquity' pieces are in contrast to some other blade-points within the overall corpus that were also broken, but probably only after deposition. In these instances both pieces were recovered, the refit was clean and without impact fractures. It can be argued therefore that for these examples the break was more likely to have occurred *in situ* and perhaps through movement. At Glaston, the break at the tip of the blade-point was due to excavation damage (Cooper pers. comm.). This illustrates an important differentiation, as it can give an insight into the artefact's condition when it entered the preservational context. If we accept this distinction, then the 'broken but complete' corpus of 24 artefacts (used to ascertain average size) reduces to 21 'un-broken at deposition' pieces for discussion here (Table 6.3). This equates to just over 19% or around one fifth of the total 109 blade-points from Britain.

Broken but complete	24
Broken in antiquity	3
Unbroken at deposition	21

Table 6.3 Unbroken at deposition blade points.

Cretaceous	County	Blade-points
No	Somerset	Badger Hole 1
No	Somerset	Badger Hole 2
No	Denbighshire	Ffynnon Beuno
No	Leicestershire	Glaston
No	Somerset	Hyaena Den 1
No	Devon	Kent's Cavern 2
No	Devon	Kent's Cavern 4
No	Devon	Kent's Cavern 5
No	Devon	Kent's Cavern 6
No	Devon	Kent's Cavern 9
No	Devon	Kent's Cavern 11
No	Swansea	Paviland Cave 7
No	Derbyshire	Robin Hood's Cave 1
No	Derbyshire	Robin Hood's Cave 4
No	Derbyshire	Robin Hood's Cave 5
No	Derbyshire	Robin Hood's Cave 6
Yes	Suffolk	Baldings Hill
Yes	Sussex	Beedings 39
Yes	Suffolk	Bramford Rd 2
Yes	Norfolk	Colby
Yes	Cambridgeshire	Hainey Hill

Table 6.4 Twenty one artefacts >90% present and classed as 'un-broken at deposition'.

A cursory overview of Table 6.4 and Fig.6.4 highlights two things: firstly, the majority (76%) of these pieces are from non-cretaceous areas; secondly, the artefacts within this majority were almost all from cave contexts (71%).

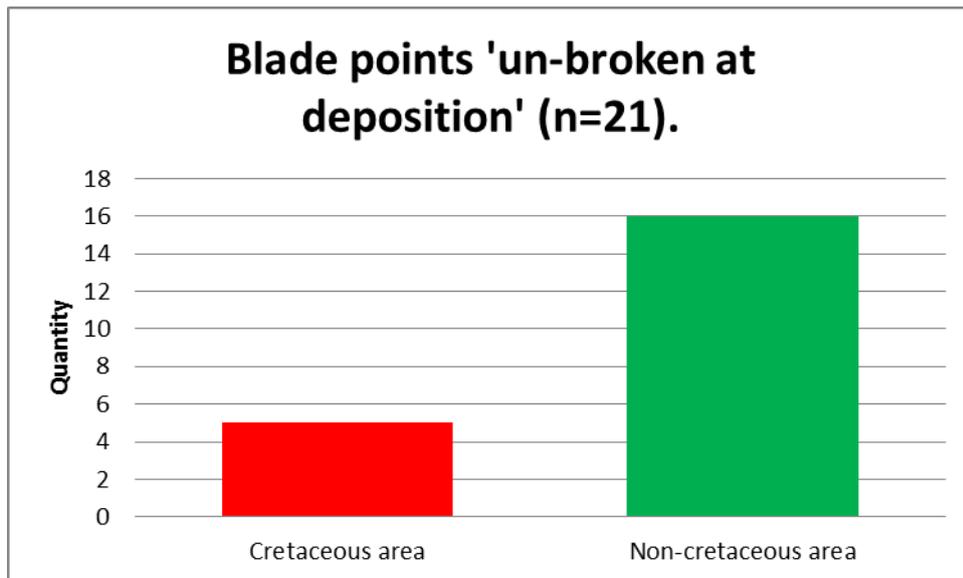


Fig.6.8 The majority (76%) of blade-points 'unbroken at deposition' were recovered from non-cretaceous areas and almost all of these were from cave sites (71%).

6.4.6 Unbroken at deposition

To strengthen the argument being presented, the blade-point from Ffynnon Beuno is used: firstly to characterise the type of materials under discussion; secondly to add detail to the evidence base supporting the argument.

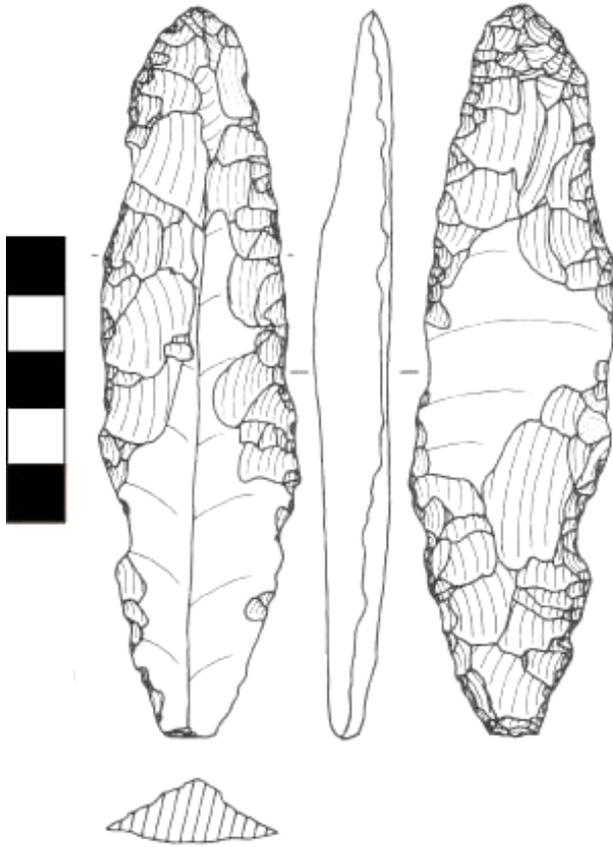


Fig.6.9 The blade-point from Ffynnon Beuno was 'un-broken at deposition' (Campbell 1977, Volume 2: 249, fig.99.2).

This blade-point (Fig.6.5) embodies a lot of the characteristics already discussed. The edge notching on this piece, as well as its recovery from below a fissure within the cave roof, indicate that this blade-point had experienced transport damage and probably entered from above. Furthermore, a close reading of the excavator's publications indicate this was probably not the only blade-point recovered (Hicks 1886: 10). Whilst not recorded on the illustration, one tip of this piece has been snapped. However the cleanness of the break and tight refit suggest it was recent. The main points I want to emphasise are that, like the other examples listed, it is relatively complete and relatively unbroken. However the most important factor I want to emphasise is self evident: it was

the complete and unbroken blade-point's presence at the site that has allowed its subsequent archaeological recovery.

6.4.7 Caves as sediment traps

Stephanie Swainston (1999: 45) made a cogent argument that any patterning of EUP material recovery will relate directly to increased preservation provided by cave sites to the west and north of Britain. As discussed it has been shown that at a number of cave sites at least some of the artefacts under discussion very likely entered through the roof (e.g. Badger Hole; Ffynnon Beuno; Hyaena Den; Pin Hole Cave; Robin Hood's Cave; Uphill Cave 8) or via sediment flow (Kent's Cavern; Windmill Hill). However the overall character of the materials preserved at these cave sites is different to that of Beedings. At Beedings the degree of fragmentation was high, whilst evidence of movement was minimal and preservation excellent. Only one Beedings complete piece could be included within the 'un-broken at deposition' category and this blade-point had been transformed into an end-scraper. It would seem that complete blade-points were removed from Beedings whilst at sites like Ffynnon Beuno they were left. In fact the above table indicates that complete but unbroken pieces exist in relatively high proportion at non-cretaceous cave sites. It is important to recognise how the sample size is small, totalling 13 complete 'unbroken at deposition' blade-points from cave sites. Furthermore, the veracity of Swainston's observations is acknowledged. However, the fragmented character of materials recovered from Beedings with exceptional preservation is still in contrast to the generally high proportion of transport damaged but unbroken blade-points recovered from the west and north. Undoubtedly caves acted as protective environments, but

preservation bias cannot be used to explain the differing character of the materials preserved.

6.4.8 Cave sites or kill sites?

I therefore want to follow previous researchers and suggest that a main attraction of sites such as Badger Hole was the opportunity they presented for aggregating prey fauna and killing them. This is because, as Campbell (1977: 140) recognised, many of these sites are situated at an interface between lowland and uplands, and some of these same sites are associated with narrow landscape features as outlined in Table 6.5.

Blade-points un-broken at deposition	Narrowing in the landscape
Badger Hole	Wookey Hole Ravine
Ffynnon Beuno	Un-named valley
Hyaena Den	Wookey Hole Ravine
Kent's Cavern	Ilsham Valley
Paviland Cave	Fox Hole Slade
Robin Hood's Cave	Creswell Ravine

Table 6.5 Cave sites with complete blade-points associated with a narrowing in the landscape, and usually also an interface between lowland and upland environments.

As already argued, these narrow landscape features would have offered human hunters the opportunity to intercept prey fauna at key points within the summer season and gateways within the landscape. With the exception of Glaston, all the non-cretaceous sites discussed here could be termed intercept or kill locations. Unbroken, complete pieces seem to have been preserved at intercept sites, where access to just such artefacts would be primarily of value. This is in opposition to where they were necessarily produced at sites such as Beedings, where all complete pieces were apparently removed.

6.4.9 "Distant from the centre of social life"

The predominance of complete unbroken pieces in non-cretaceous areas is interesting to think about in relation to a notion put forward by Terry Hopkinson, based upon his analysis of Late Middle Palaeolithic leaf-points from Germany. Hopkinson identified a pattern where leaf-points were associated with sites "*distant from the centre of social life*" (Hopkinson 2007: 112). For Hopkinson the small overall quantities of artefacts, predominance of leaf-points, and lack of hearths or waste flakes meant these sites could be understood as *caches*, locations where tools were deposited for use at some point in the future (Hopkinson 2007: 64; 110). At Robin Hood's Cave, Kent's Cavern, Badger Hole and probably Ffynnon Beuno more than one 'unbroken at deposition' blade-point was recovered. I will argue that these sites illustrate how imported hunting behaviours seem to have been applied along differing river valley systems.

6.4.10 Differing river valley systems

The viewshed at Badger Hole has already been discussed and its capacity to allow hunters to literally 'keep ahead of the game', moving from one site of tactical advantage to another along the Axe valley. However it is also useful to reflect upon the viewshed from Beedings, overlooking two differing river systems and presumably offering twice as many tactical advantage opportunities. If similar points in the landscape were being repeatedly targeted, with the aim of disadvantaging large fauna, then depositing blade-points at these sites would build a cache of preformed artefacts at the site of use. Andrew Myers (1989: 87) has discussed how within time critical activities such as the harvesting of mobile food resources, equipment needs to be formed in such a way as to reliably facilitate optimal harvesting. The availability of replacement points cached at a

site can be seen as one strategy to achieve this goal. However, as already discussed, the bi-pointed form of blade-points could also allow expedient repair and re-hafting by simply turning the damaged blade-point around within the haft. The form of these artefacts and the caching of these artefacts may be telling the same story. Part of this story might relate to the punctuated nature of the hunting and killing at these sites. It is interesting to think about this kind of punctuated re-tooling process and the punctuated behaviour of ungulates such as horse as discussed earlier in the chapter. Horse now, and probably in the Palaeolithic past, move in small herds and travel at speed when moving through landscape corridors (Sawyer et al. 2009: 2016). Perhaps the necessity to deal with the rapid and sequential arrival of small herds of prey fauna is reflected in the type fossils bi-pointed form and the caching behaviour. Both of these strategies would have allowed expedient re-tooling and so perhaps the technological process is reflecting characteristics of prey behaviour.

6.4.11 Seasonality as an integrative framework

More recent *etic* approaches discussed at the beginning of this thesis presented a course grained model of the summer season and the upland environment that these EUP humans would have encountered (Pettitt and White 2012: 325). Within this course grained context Damien Flas (2011: 610) could find no discernible geographical patterning within the British materials he examined. The earlier work of John Campbell (1977) has been seen as valuable within this thesis because he applied Eric Higgs' (1976: 159-161) original observations regarding seasonal faunal migratory movement to the EUP. However the results of his quantitative and statistical approaches were disappointing because of the small quantities of EUP materials available to work with (Campbell 1977: 156).

In recognition of these factors a *chaîne opératoire* approach to artefacts within this thesis has allowed a discussion of behaviour. Furthermore, an experiential approach to sites has provided a new interpretive context for these behaviours. Christopher Tilley (1994: 27-33) emphasised the visual, and used movement through a landscape to structure a narrative with which to formulate understanding. This discussion has been structured to move the reader through the case studies and an examination of site orientation used to explore a long summer season from the perspective of the humans who produced and used the technology (Tilley 1994: 204). Seasonality is therefore used here as an integrative framework within which the above analysis can be situated and understood.

6.4.12 A seasonality model for the EUP

Based upon the above approach it would seem that for the Lincombian hunters the summer season was long (van Andel 2002: 2). The case studies have illustrated how from an experiential perspective each site's setting differs from the next with variability seemingly the norm. It is therefore unsurprising that the artefacts themselves are characterised by just such variability. This variability is read here as reflecting human adaptability. As other researchers have observed, an overall east to west pattern seems to emerge from the continental distribution of sites. An east-west attrition pattern is reflected within my metric analysis of the artefact corpus. However, within this overall east-west pattern, the case studies seem to indicate lowland to upland movement orientated along river valleys. These valleys perhaps presented a predictable environment that allowed practiced hunting strategies to be moved inland and upland as conditions allowed. Artefact collections are found around landscape features that

offered some kind of tactical advantage, and viewsheds seem to have been used to manage the time and space variables associated with the interception of mobile prey. However, upon entering the western and northern uplands, stone availability would have become a limiting factor. One strategy to mitigate this was the repeated integration of materials within the landscape at sites where they would predictably be needed in the future. Technology was integrated into the landscape (Binford 1979: 257) as a logistic strategy to contribute to hunting episodes at the same sites in the immediate and perhaps future seasons.

However, the key recognition within this chapter is that the technology seems to be characterised by variability, and an experiential approach to the sites has been used to explore the variable problems the technology needed solve, often in areas without recourse to replacement stone. What we can see within the variability discussed, are the end results of adaptive processes. These adaptive processes involved the strategic use of predictability to mediate unpredictability within the material, landscape, faunal and seasonal dimensions.

The course grained and *etic* seasonality model discussed at the beginning of this thesis has been used as a relational framework for the interpretive findings from this research. Doing so has allowed a more detailed and original seasonal model for this period of the British Palaeolithic to be developed.

6.4.13 Chapter conclusions

The first three sections of this chapter have been used to answer the final research question, how the behaviours identified at these sites can be interpreted in relation to their landscape and faunal contexts, and the key points are summarised here. Particular landscape features identified through literature reviews have been explored directly via site visits. Generalised faunal behaviours have been posited based upon a review of the animal remains present and the use of ethological models. These have been used to provide an interpretive context for the human behaviours identified within each case study.

The outlook from the Mendips site of Uphill, and the east west orientation of the Axe Valley have been used as evidence to argue that Badger Hole and Hyaena Den would have been used early on in the faunal migration season. As Campbell pointed out, Badger Hole is situated at an interface between lowlands and uplands and associated with a box valley. However, the blade dominated corpus has been considered here from an experiential perspective. This new emphasis on the blade based nature of the assemblage along with the exposure of the plateau has allowed an original meat cutting, drying and preservation interpretation to be presented. This makes sense if we consider that the summer season would have been long, and prey would disperse once they reached the upland landscape.

In contrast, because of its Midlands and upland location it was posited that Glaston was visited some way into a long summer season. The possible targeting of hyaena meat caches, as well as the use of horse marrow bones have been interpreted here in the same way, as representing the use of strategic food

resources necessary because of the unpredictability associated with upland summer hunting. The presence of Glaston on a ridge and the 'view to' aspects of the site have been seen here as indicative of upland movement from east to west. The presence of a complete and unbroken blade-point suggests the site was expected to be used at some point again in the future.

At Beedings the size, form and patina of some 'production' material is consistent with derivation from exposed local slope deposits. The site being situated on a watershed would have facilitated the overview of a series of ghylls feeding major river valleys to the west, north and east. The presence of potential kill sites within the buried Wealden landscape, as well as a 'handrail' feature such as the River Arun, adds weight to the idea that hunting excursions to the north occurred from Beedings. The presence of scrapers, presumably for use on animal skins would correlate ethnographically with harvesting towards the end of a migratory season. Whilst the exceptional nature of the lithics and the vista have previously been noted, a review of landscape affordances associated with the site go some way to developing our understanding of why, how and perhaps when Beedings may have been repeatedly used by EUP hunters. These three case studies have been used to answer the fourth research question.

The final section of the chapter has explored the corpus of type fossils in relation to the case studies. By doing so, underlying themes of behavioural adaptability, human directional mobility and artefact deposition have been recognised. The course grained seasonality model presented within the first chapter has been used as a relational framework within which the detailed findings from the case studies and underlying themes derived from the complete corpus can be understood. Brought together within this relational context the interpretive

findings within this thesis have been used to make an original contribution to our understandings of the seasonality model for this particular period of the British Palaeolithic.

The final chapter within this thesis will use the results and findings from this research to present an alternative to the acculturation narrative critiqued within the first chapter. This alternative is the story of the humans who produced and used this technology within Britain for an apparently short temporal episode during MIS3. This is the *emic* narrative that has been the research aim of this thesis.

Chapter Seven

An alternate *emic* narrative

This final chapter presents the story of the humans who produced and used Lincombian stone tool technology for an apparently short temporal episode during MIS3. Answers to the research questions are reviewed and used as a foundation for my thesis to be discussed in the form of an *emic* narrative. This *emic* narrative moves discussion beyond the obfuscating transitional concept and counters the problematic acculturation model. The chapter is divided into four parts with the first reviewing the answers to my research questions. The second presents the *emic* narrative that has been the research aim of the thesis. The third examines how this approach has added to our understanding of the industry, and the broader implications for moving discussion beyond the transitional. The final section discusses the results of this thesis as a platform for future research to further develop our understandings of the Lincombian. As indicated, it is the answers to the four research questions that are summarised first.

7.1 Research Answers

7.1.1 Blade point production

The first research question was designed to identify how blade-points were made in the Palaeolithic past, and why they were made in the way they were. I was able to achieve a good grasp of how an experimental flint knapper in the present manufactured blade-points, and why he produced them in the way he did.

Subsequent laboratory based analysis allowed me to comprehend the ways in which these experimentally produced artefacts differed from the archaeological examples. From this I was able to develop some hypotheses as to why this may be the case. Through this process it became clear that in the past the technological process was cyclical and therefore the term 'phases' is more appropriate than 'stages'. In relation to why blade-points were made in the way they were, it was argued that the archaeological presence of opposed platform production; faceted platforms; and the use of good quality homogenous materials were all strategies designed to facilitate successful blade production at some future point in time.

7.1.2 Type fossil heterogeneity

The second research question was designed to quantify and explain blade-point typological, metrical and formal heterogeneity. Typological analysis supported the previously established notion that tabular raw material was suitable for leaf-point production whilst nodular material suited blade production. Size differential within the overall corpus was interpreted as indicating material and human movement from east to west across Britain. Formal variability showed how blade-points were adapted to a number of tasks other than simply use as missile

heads. Metric and formal analysis together illustrated how maintenance and repair via reduction was a significant feature of the blade-point corpus from Britain. The cyclical and future orientated production process, and the variability of the end products were brought together to form a *chaîne opératoire* model useful for subsequent collection analysis.

7.1.3 Material and behavioural patterns

The third research question focussed upon three Lincombian artefact collections with potential to provide behavioural information. The *chaîne opératoire* approach was used to recognise material patterns within each assemblage. Through this methodology these patterns were related to human behaviours that produced the assemblages at each site. At Badger Hole one large blade and a small curated core had been imported, and blade production and core maintenance occurred on the plateau above the cave site. At least one blade fragment was adapted for use as a tool. At Glaston a rolled and thermally damaged nodule of flint was imported to the site and worked. Some micro-*debitage* was consistent with blade-point production and this was in contrast to a small impact damaged proximal section of a blade-point also present. Two larger cortical flakes were transformed into notched tools and one small and complete blade point was left at the site. At Beedings large blades were produced and refitting micro-*debitage* was consistent with blade-point production. This was in contrast to the presence of only damaged or modified blade-points at the site. Both production debris and damaged blade-points indicated intense recycling had taken place and Beedings was almost unique in that scrapers were present. This summarises the key findings that were presented in answer to the third research question.

7.1.4 An interpretive context

The final research question was concerned with developing an interpretive context from the particular landscape affordances and generalised faunal behaviours relevant at each site. The relationship between Uphill, Badger Hole and Hyaena Den, and the orientation of the Axe Valley was seen as indicative of these sites being used early within a faunal migration season. The association between the Wookey Hole Ravine and six blade-points was interpreted as a kill site. Whilst the visual affordances were acknowledged the blade production and probable use associated with the exposed plateau above Badger Hole and Hyaena Den was interpreted in terms of a meat drying function. At the Midlands site of Glaston it was the 'view to' aspects that were emphasised in relation to the sandstone raft that was located at the highpoint on the east west running ridge. This was seen as a significant upland navigational landmark and the presence of a complete blade-point at the site supports the idea of an intention to re-visit. The small size of the blade-point and thermally damaged nature of the worked nodule indicated some material stress and the spirally smashed horse bones were interpreted as a mobile food source. Together with its Midlands location these aspects were taken to indicate a site used some way into the summer season when migrating prey would have been dispersed within the upland landscape and a kill not guaranteed. At the final site of Beedings its location upon a watershed between the rivers Arun and Adur was seen as significant. This would have provided vistas overlooking a series of narrow valleys to the west, north and east. The Arun cuts through the ridge around 5km from the site and as such would provide a 'handrail' facilitating navigation to and from the site. Around 15km to the south of Beedings the river valley has

exposed flint nodules within the chalk. The constellation of raw material availability and viewshed overlooking a series of potential kill sites to the east, north and west seems to explain the exceptional quantity of lithics recovered from this site. The presence of scrapers was taken as an indication of use towards the end of a migratory season.

These summaries bring together the key findings from the research questions. Within the next section the overarching seasonal framework discussed in chapter one is used to provide a relational framework to allow my thesis to be presented in the form of an *emic* narrative.

7.2 Exploring summer upland lives

7.2.1 An alternate emic narrative

As discussed, the uplands that now constitute Britain would have been used by EUP humans during summer seasons. Because of the climatic dynamism of MIS3 the term 'summer' may hide complexity on a number of levels. During D/O events rapid warming would have occurred over a period of perhaps 50 years. In human timescales it seems reasonable to argue that all of this upland zone may not have been available within an individual's lifetime. Areas to the south may have been visited more frequently, before more northern aspects became accessible. In other words, some of this upland zone may have been known whilst other areas not. Furthermore, because of overall climatic trends, an individual summer season one year may have had very different weather patterns to that of the previous or following summers. Some aspects of this climate and upland zone would have been predictable to EUP humans, other aspects would not. The above variability is glossed within this thesis as a 'predictable unpredictability'.

7.2.2 A faunal migration cycle

A further variable would have been the behaviour of prey fauna moving through season and landscape. Lewis Binford highlighted how, for the Nunamiut, seasonal migration of caribou was to a large degree predictable (Binford 1978: 169), however, timing of the movement could only be estimated. Consequently, active monitoring was used to recognise when and where migration would occur. This phenomenon was illustrated for Canadian archaeologists excavating a

caribou hunter site in the 1970s (see Fig.7.1). With the excavation taking place, a small caribou herd arrived to make the same river crossing as similar herds had done some 6500 years previously (Gordon 2003: 18).



Fig. 7.1 The predictable unpredictability of caribou. Whilst excavating a caribou hunter site archaeologists observed a caribou herd arrive at the same river crossing, some 6500 years after the site was originally used (Gordon 2003: 18, Fig.4).

As faunal migration would have been based upon seasonal change, climatic dynamics may have added complexity to the prediction of when it would occur. Dale Guthrie (2001) emphasised how clear skies and an open landscape were characteristic for the period. Visual affordances at a significant number of Lincombian sites emphasise the importance of viewsheds for these EUP humans. The tension between the predictability of migratory faunal movement, and the unpredictability of exactly when and where it would occur, perhaps created an emphasis on visual predictive solutions (see Fig.7.2).



Fig. 7.2 Looking down Fox Hole Slade from above the Lincombian site of Paviland Cave. The viewpoint's current distance ASL (~70m) effectively limits the line of sight to the horizon. However during a period of lowered sea levels the horizon would have been ~80m lower. This would have extended the line of sight to 'as far as the eye could see'. (Photograph: Eamonn Kirk).

If a function of the viewsheds discussed here was to manage the predictable unpredictability of prey faunal movement, the site of Beedings stands out. Sitting upon a watershed with vistas over two river valleys would have made the site doubly advantageous. It would seem that predictability was embraced, whilst unpredictability was managed, an approach reflected in the repeated use of sites.

7.2.3 Repeated use of sites

A number of lines of evidence are consistent with sites being used repeatedly, or indicating an intention to do so. The high point above the Creswell Caves would have provided vistas to the east overlooking lowland to upland migration routes. In the opposite direction, vistas to the upland west could be used to monitor subsequent return at the other end of the season. Regarding artefact quantities it is Beedings, along with its 'arrival' and 'return' signatures, that has provided the strongest indication for site re-use. However, the patterning of complete 'unbroken at deposition' blade-points at caves is behaviour consistent with an intention to return. This process of integrating technology into the landscape

allowed features within the emergent upland to become socially known (Rockman 2003: 13). Mapping out the landscape in this way developed the process of making the unpredictable predictable. Marcy Rockman (2003: 18, 19) explained how it is easier to bring established hunting methods into a new environment, than it is to 'know' the stone resources. The now submerged landscapes to the south and east of Britain comprised river valleys. Perhaps the hunting methods employed within these lowland river valleys were imported by hunters moving upland as the season progressed. Sites such as Beedings and Bramford Road indicated that flint was probably accessed from valley sides. However as movement continued to the west and to the north, the ability to access usable stone would have become unpredictable. Artefact attrition patterns (chapter four) along with the variant depositional protocols at the sites (chapter six) would seem to be a response to this limitation. Patterning would have built up as hunting progressed over a number of seasons, and faunal movement patterns began to emerge. To borrow from Clive Gamble, embedding these flint resources within the landscape allowed a 'release from proximity' (Gamble 1998) of embedded stone resources. This was achieved whilst simultaneously providing access to preformed stone points at locations where just such artefacts would predictably be needed. However this 'release from proximity' was primarily embodied by the form of the technological components under discussion.

7.2.4 Artefact affordances

To achieve material self-reliance the primary strategy adopted by these humans was to select, where possible, for good quality materials of large size. Both these qualities provided artefacts with the capacity for reduction through maintenance,

repair and transformation. Predictable fracturing afforded by material quality was embraced, as a counter to the unpredictability of attrition through use. Attrition was a factor to be managed, and it was also managed by the use of a bi-pointed form for the type fossils. This facilitated repair by allowing a penetrative point to be created on the bulbar end of a blade when necessary. Technologically, the proactive use of opposed platform cores allowed predictable blade production when needed. Furthermore, a penumbra of further useful components was generated by both the processes of manufacture and of breakage. Consistent re-use indicates these materials formed a predictably available resource. This technology was crafted to facilitate movement and killing within an upland environment rich in prey, but with variable access to stone resources. As seasons progressed, abandonment of materials at sites meant that the technology was integrated into the environment, and the environment became integrated into the technology. This upland zone became a human cultural landscape defined by how it was being used. However the most interesting aspects of this process are the implications this has for cycles of human behaviour.

7.2.5 Cycles of human behaviour

The repeated 'bringing back to form' of cores, bi-pointed leaf and blade-points (redundancy) was reproduced at different scales through the application of flat invasive retouch. Embodied, skilled, behavioural repetition was used as a strategy to deal with the predictable unpredictability of season, landscape, and the vagaries of hunting large fauna. Terry Hopkinson discussing LMP leaf-points argued that flat invasive retouch was 'un-economic' in simple time and energy terms (Hopkinson 2007: 124). Therefore he interpreted the practice of flat

invasive retouch in social terms as an 'intra-group' signifier of 'taskmates' (ibid). My results suggest that flat invasive retouch allowed precise and controlled maintenance, repair and transformation of broken and worn blade-points. The capacity to apply flat invasive retouch was also the capacity to extended type fossil functionality through time and space. Indeed, the ability to apply flat invasive retouch would have allowed an individual to signal a skilled self-reliance. This was a self-reliance that allowed freedom of movement within known and unknown, predictable and unpredictable environments and situations.

7.2.6 An ending

Our dates suggest the LRJ populated a warm phase somewhere within three millennia characterised by dramatic climatic instability. Punctuated by three volatile D/O events as well as a 440 year geomagnetic reversal, the latter was recorded in lava flows from volcanic activity in central France, which presaged a massive eruption in southern Europe. The finale would seem to have been the cooling associated with HE-4 (Zilhão 2006: 11). Aspects such as the geomagnetic excursion are primarily discussed within the *etic* context of providing a valuable absolute dating horizon for tying in relative dates. However, whilst the reversal lasted some hundreds of years, the magnetic field would have been weakened for many millennia (Valet et al. 2010: 3890). Little academic material seems to have explored the human experiential aspects of living through a period where the geomagnetic field would have been significantly weakened (although see Valet et al. 2010). As Jean-Pierre Valet and H el ene Valladas (2010: 3891) have observed "*One thus wonders whether this period of very low and complex [geomagnetic] field had consequences for life at the*

surface of the planet". Certainly, visual phenomena associated with increased solar activity, such as the northern and southern auroras (Fig.7.3) would have also migrated, moving across the hemispheres in concert with the wandering magnetic poles. One thus wonders about how these EUP humans experienced and understood such dramatic, dynamic and unpredictable phenomena occurring within their world.



Fig.7.3 Considering the northern and southern auroras as a geomagnetic phenomena (Aurora Borealis n.d.).

Furthermore, geomagnetic fields are one of a number of factors influencing migratory behaviour (Lohmann et al. 2007). Little is understood of the effects a geomagnetic excursion would have had upon the migratory behaviour of large ungulates, although it has been assumed that any effects cannot have been serious. This is because no link has been found between past species extinction events and evidence of geomagnetic excursions (British Geological Survey 2016). However, the LGE does seem to have been at least one factor that signalled the beginning of the end of the archaeological record for the humans who were producing and using Lincombian technology within the uplands of

Britain. Perhaps the LGE heralded a new phase for these humans: a dramatic phase of climatic and faunal 'unpredictable unpredictability'.

7.2.7 Conclusion

The aim of this section has been to present a framework to explain the results and patterning obtained through this research. To view how these humans were living their lives. It would seem that climatic amelioration allowed pioneer animal and human movement into a new and emergent landscape. Bringing in traditional faunal hunting strategies may have been relatively easy and allowed an element of predictability to these early hunting phases. However it was also necessary to deal with the potential unpredictability involved in hunting throughout a long summer season, and without good understanding of the landscape, or where replacement stone resources may be located. To manage this situation a technology was needed, and developed, that was adaptable for dealing with unpredictability. It was also maintainable and repairable because replacement stone resources were potentially unavailable. Use of chert (Kent's Cavern; Windmill Hill Cave) and rhyolite (Paviland Cave) as well as a thermally damaged flint nodule at Glaston indicates how an embodied repetitive skill-set was also applied to differing materials as an adaptive response to operating within non-flint areas. Developing Hopkinson's observation, it was the human ability to apply these behavioural solutions that was perhaps the intra-group signifier between taskmates. In relation to these artefacts, we can now recognise a maintainable repairable, adaptable technology designed to mediate predictable unpredictability. This was necessary to facilitate seasonal movement through known and unknown upland landscapes, and manage the processes associated with the killing of large fauna. This is the *emic* narrative that has

been the research aim, and as this thesis has demonstrated, use of the transitional label has unfortunately obfuscated any of this awareness. The next section will explain how this thesis has added to our understanding of this industry, and by doing so presents a useful model for moving beyond the outmoded transitional model.

7.3 Adding to our understanding

As argued within the introduction to this thesis the use of the transitional label has linked this material to the story of the arrival of modern humans in Europe, and subsequent demise of an indigenous Neanderthal population. However, because of the nature of the material evidence the LRJ has been marginalised within these discussions (Jacobi 1990; Flas 2006). At the same time the story of the humans who produced and used these stone tools has been obfuscated by the human and behavioural implications associated with the acculturation narrative. Although no longer widely accepted, the model has been argued to have an interpretive 'afterlife' (Zilhão 2011: 331) perhaps because more current models are complex and mosaic, and therefore less succinct or summative in scope.

7.3.1 Penetrating the transitional category

In order to penetrate the obfuscating transitional label one particular industry has been used as a research focus within this thesis and the majority of Lincombian material available from Britain has been brought together within a comprehensive corpus. A conceptual approach and appropriate methods have been adopted to interrogate in detailed and novel ways the lithic and landscape evidence we have left. Doing so has allowed new results and interpretations to be derived from the available evidence.

7.3.2 Adding to our understanding

For example a new geographical patterning has been recognised through metrical analysis of the extant British corpus. Whilst suspected by Jacobi (1986:

63) and Swainston (1999: 53) subsequent work by Flas (2006) examining both British and European materials found no patterning. He stated: "*Although these points show some diversity, particularly variability in size and in the extension of retouch, such sub-typological variety cannot be correlated with geography*" (Flas 2011: 610). However, the methods of analysis adopted within this thesis did illustrate a patterning within the more constrained landscape of upland Britain. This has been interpreted as very probably being related to material availability. However, as well as adding to our understanding this research has also allowed discussion to move beyond the problematic acculturation narrative.

7.3.3 Moving beyond acculturation

The results of the analysis within this thesis have been due to an alternate *emic* conceptual approach to the problem. This was necessary in order to penetrate the obfuscating transitional concept. Integrating the results and interpretations from this research into previously established *etic* frameworks has allowed a new and more comprehensive narrative to emerge. It has revealed a maintainable, repairable and adaptable technology crafted to manage the processes associated with the seasonal killing of large fauna within an emergent upland landscape. This provides a more coherent interpretive fit between evidence for climatic dynamism and the recognition of artefact heterogeneity. Consequently it provides a first step in moving overall discussions of the period beyond the problematic acculturation narrative.

7.3.4 Alternate *emic* narratives

It provides only a first step because as d'Errico and Banks (2015: 183) have already argued, the explanation we are seeking for the period is probably not simple. There is not one alternative narrative with which to overwrite the acculturation model. D'Errico and Banks (ibid) advocate understanding the period in terms of different human groups acting and interacting within the context of dramatic climatic instability. Furthermore Zilhão (2011: 336) has emphasised how the term transitional actually comprises "*a diverse array of lithic assemblage types that, in one way or another, fit at least some aspects of the definition of Upper Palaeolithic*". In other words the period in question is characterised by technological and climatic variability. The approach adopted within this thesis has interrogated one such human group's technological response to this climatic instability. Doing so within a bounded geography has allowed a more detailed review and alternate interpretations and narrative to be built. However all the industries categorised as transitional will have their particular story to tell. It is through an examination of these industries on their own terms and using appropriate conceptual approaches and methods that the potential and actual complexity of the period can begin to be revealed. This can facilitate a narrative shift, from general and summative to detailed and particular. It is through these new, detailed and particular narratives that we can encourage an engagement with the complexity and mosaic nature of this important Palaeolithic period. Having explained how this research helps to move beyond the transitional concept, the next section will present opportunities for future research into the Lincombian.

7.4 A foundation for future research

7.4.1 A micro-*debitage* reference tool

As Pettitt and White (2012: 399) have argued, more excavation would be of great potential value for developing our understanding of this EUP in Britain. This can be above and beyond a perceived primary need to recognise human type. Matt Pope's Beedings excavations and those of ULAS at Glaston have been valuable for recovering micro-*debitage*. Experimental work within this thesis has contributed a tool for the nuanced analysis of this kind of material. Experimental production has been developed within this thesis to characterise, map and comprehend the nature of micro-*debitage* associated with blade-point production. Strong correspondences have been found to the experimental data within both the Glaston and Beedings collections. This indicates the approach has validity and the capacity to contribute new and original knowledge to the period. Furthermore, it has provided a tool that can add value to any future excavations that do occur. A close reading of the literature has revealed opportunities for targeting future excavations within upland plateaus.

7.4.2 Fissuring within upland plateaus

The two most significant Lincombian sites in Britain, Beedings and Glaston, are both upland and open air. Based upon the work at Glaston, Simon Collcutt (2001) presented a hypothesis to explain the process by which EUP artefacts had been captured and preserved at these sites. He argued that during the later colder stages of the Pleistocene fluvial incision would have resulted in slope erosion. When this erosion occurred simultaneously on opposing sides of a ridge,

areas of the higher terrain would have been undermined on two sides. Collcutt used the German term 'Sackung', meaning sagging, to describe the cambering of a harder upland surface after parts of a softer base layer (including materials such as chalk) had slipped away (Collcutt 2001: 223). This cambering resulted in fissures (also termed gulls) within the hard upland surface which may have captured overlying Palaeolithic surface scatters. Jones (2002) has observed how similar fissuring may be common across uplands throughout the region, whilst Collcutt (2001: 229) emphasised the commonality of this hard-soft formation throughout Britain. Collcutt cited Jacobi's work at Beedings as an illustrative example of this process in the south of England. Consequently, when the opportunity arose, Matt Pope initiated new excavations (2007-8) to investigate directly fissuring on the Beedings plateau. In doing so he was able to confirm Collcutt's hypothesis and collected more Palaeolithic material in the process. Building upon this approach more recently Pope (et al. 2013: 25) presented a short literature review (anon. 1827; Abbott 1899; Harrison 1928) indicating more 'bone fissures' worthy of investigation in the south east of England. As Pope (et al. 2013: 25) has observed, all these sites need to be the focus of a systematic fieldwork campaign to recognise if they actually contain Palaeolithic materials. However, as well as the prospect of more Lincombian materials recovered from upland fissures, spoil heaps from earlier excavations may also have some potential for recovering micro-*debitage* material.

7.4.3 Excavating early spoil heaps

Recent excavations at Ffynnon Beuno by Chantal Conneller and Rob Dinnis explored both undisturbed cave sections as well as Henry Hicks's original spoil heap. To date this has resulted in the recovery of a small amount of *debitage* materials and larger quantities of MIS3 animal bone (pers. obs.). The approach was modelled on Dinnis's experience from excavations of the spoil heap outside Church Hole Cave at Creswell Crags between 2006 and 2008. These excavations demonstrated that slope deposits sitting below the Victorian spoil had been preserved intact (Wall n.d.: 32). A similar spoil heap (Campbell 1970), with potentially similar character is present on the opposite side of the gorge outside Robin Hood's Cave from which both leaf and blade-points have been recovered. The second Lincombian find site within the Creswell Gorge is Pin Hole Cave. Excavated by Leslie Armstrong between 1924 and 1936, he was followed by Collcutt in 1974 and then Rogan Jenkinson between 1984 and 1989. In spite of these incursions more material still remains at the back of the cave providing a valuable resource and future excavation opportunity (Jenkinson 1984: 67; Wall n.d.: 19). Finally, in his discussion of the caves at Uphill near Weston-super-Mare Ron Harrison (1977) identified the potential of more buried and unexcavated caverns in the area immediately adjacent to the Quarry.

7.4.4 Field walking and museum collections

However, as well as micro-*debitage* recovered from new excavations, more type fossils may also be forthcoming. I have focused upon type fossil heterogeneity and presented a lifecycle explanation to accommodate the variability observed. Adding further type fossils to the corpus can only help to develop this model.

Recent field-walking recovered the complete blade-point from Colby in Norfolk, and a leaf-point fragment from South Hams in Devon. As discussed in chapter one, sometime in the mid 1970s Roger Jacobi began actively searching for EUP artefacts within museum collections and in doing so added considerably to the published corpus (e.g. Beedings - 43 new blade-points). Museum collections may still be of value in this respect, as demonstrated by the blade-point from North Hinksey found within the collection at the Ashmolean Museum in 2008.

Quantitatively the missing *debitage* materials from Beedings discussed by Jacobi (2007) have the potential to make a massive contribution to the extant EUP corpus, and they have attracted significant research attention. Following discussion with Matt Pope, my conclusion is that if this material is to be traced, a study of 1940s curatorial disposal practices in relation to the professional network of Elliot Curwen would be the way forward. Sites such as the Creswell Caves very probably have associated *debitage* materials; however the corpus has been widely dispersed throughout a series of local and national museums. Collating and analysing Creswell EUP material would therefore be a research intensive endeavour. Much the same is true of the materials from Paviland and Kent's Cavern and perhaps these sites should be seen as presenting demarcated research opportunities in their own right. In this respect all additions to the corpus of EUP materials available have the potential to contribute to, and develop the boundaries of our understanding of EUP technology and the behaviour of the humans who produced it. However I would argue that the most exciting opportunities lie within the area of experimental production. To explore this notion I want to reiterate two themes.

7.4.5 Experimental production

The first is the repetitive and cyclical nature of the technology. The second is the adoption of a more broadly inquisitive attitude, and flexible conceptual and methodological approaches. I would like to apply these themes to the repetitive human action of applying flint retouch to bring back to form a damaged blade-point. Having established the large size of some of the blade and leaf-points, an opportunity emerges for experimental production to explore in quantitative terms the changing character of the artefact as the maintenance process unfolds. For example, how many times can a blade-point the size of the Town Pit example be reduced? And what are the formal implications in terms of cross section, width to depth ratio, and micro-*debitage* signatures at each incarnation?

However, the second theme relates to the value of adopting a more broadly inquisitive attitude and flexible conceptual and methodological approach. Doing so allows this same maintenance process to move analytically beyond the artefact. Digital film recording of the process would allow the capture of the gestures, sounds and rhythms associated with these maintenance activities. Digitally captured gesture and sound can be understood as independent data sources opening up a new field of analytical engagement with the technology. Patterning within these new data sources can be compared and contrasted directly with patterning observed and recorded from the artefact using more traditional methods.

To go further, these digital media, along with the haptic qualities of the artefact at its differing stages of incarnation, would also allow a more experiential and bodily comprehension of the technology. A visual, auditory and kinaesthetic exploration opens up new trajectories of engagement beyond academia, allowing

a more public interaction with components of the *emic* narrative that has been presented within this thesis. Acknowledging d'Errico and Bank's observation, that the explanations for the period are not likely to be simple, I would argue that a critical approach to experimental production (one closely constrained by archaeologically derived data) can play a valuable role in allowing people in the present to engage with the complexity that is inherent within the story of these people of the EUP past.

7.4.6 Thesis conclusion

It was argued at the beginning of this thesis that the transitional category and its associated explanatory narrative had hidden another story within plain sight. This thesis has penetrated the transitional category and explored that other story. Previous approaches have largely ignored the inherent qualities embodied within the artefacts (Jacobi being an exception). It is argued here that size, form, material and production methods, as well as the artefacts variant landscape contexts, all indicate this to be a maintainable, repairable and adaptable technology designed for managing predictable unpredictability. Whilst crafted and imported for the predictable meta-purpose of killing large fauna, both size and material quality allowed for the future maintenance, repair and transformations necessary for dealing with accompanying unpredictability. These future orientated qualities allowed killing and its associated processes to be repeatedly extended through seasonal time and an upland space of known and unknown stone resources.

In contrast to previous approaches, temporality has been considered here on a human scale. Deposition of useable materials at sites is used as evidence for a

potential future re-use. By integrating components of their technology into the landscape, the landscape as it became known and used, was integrated into the technology. Through this process these humans extended their world. Site and artefact re-use has been linked to seasonal and cyclical faunal movement and the cyclical production and maintenance of components within the technology. Maintenance was facilitated through material redundancy embodied within the form of large thick blades. This corresponded with a cyclical behavioural repetition embodied by the humans producing and using the technology. The cyclical aspects of season, fauna and technology stand in contrast to the vertical and horizontal temporal models usually applied to the period and materials. Whilst previous research has presented an overarching framework characterised by dramatic climatic instability, this thesis has focussed upon the human technological and behavioural responses. Brought together these approaches present a model of what these long summer seasons actually meant to the humans who produced and used these tools within their upland world. The *emic* approach advocated within this research. The results of this thesis suggest that all the industries categorised as transitional will have their own particular story to tell. It is by exploring these stories in their own right that a narrative shift can occur. Doing so will encourage a recognition and engagement with the complexity and mosaic nature of this important Palaeolithic period.

Bibliography

Abbott, W.J. 1899. The Ossiferrous fissures in the valley of the Shode, near Igtham, Kent. *Quarterly Journal of the Geological Society* 50(1-4): 171-187.

Abingdon Area Archaeological and Historical Society (n.d.). Photograph viewed 31 December 2013 <<http://www.aaahs.org.uk/arch/leafpoint.html>>

Allsworth-Jones, P. 1986. *The Szeletian*. Oxford. Oxford University Press.

Anon. 1827. Discovery of fossil hyaenas in Kent. *The Philosophical Magazine and Annals of Philosophy New Series* 2(7): 73-74.

Anon. 1903. Albert Jean Gaudry I.—Eminent Living Geologists. *Geological Magazine* (Decade IV), 10(02): 49-51.

Antoine, P., Coutard, J.P., Gibbard, P., Hallegouet, B., Lautridou, J.P., & Ozouf, J.C. 2003. The Pleistocene rivers of the English Channel region. *Journal of Quaternary Science*, 18(3-4): 227-243.

ApSimon, A.M., Smart, P.L., Macphail, R., Scott, K., & Taylor, H. 1992. King Arthurs Cave, Whitchurch, Herefordshire: reassessment of a Middle and Upper Palaeolithic, Mesolithic and beaker site. *Proceedings of the University of Bristol Spelaeological Society*, 19(2): 183-249.

Ashworth, H.W.W. 1971. *Fourteen years at Badger Hole. From the diaries of H.E. Balch, M.A, F.S.A., (1938-1952)*. Wells. Wells Natural History & Archaeology Society.

Audouze, F. 2002. Leroi-Gourhan, a philosopher of technique and evolution. *Journal of Archaeological Research*, 10(4): 277-306.

Aurora Borealis n.d. photograph viewed 31 December 2013

<<https://upload.wikimedia.org/wikipedia/commons/b/b3/AuroreAurores-bor%C3%A9ales-7octobre2015-3-1024x657.jpg?uselang=en-gb>>.

Balch, H.E. 1914. *Wookey Hole: Its caves and cave dwellers*. Oxford. H. Milford.

Banning, E.B. 2000. *The archaeologist's laboratory: the analysis of archaeological data*. New York. Culver Academic / Plenum Publishers.

Barnard, A. & Spencer, J. (eds.). 2002. *Encyclopaedia of Social and Cultural Anthropology*. London. Routledge.

Barron, E., van Andel, T. H., & Pollard, D. 2003. Glacial environments II: Reconstructing the climate of Europe in the last glaciation. *Neanderthals and modern humans in the European landscape during the last glaciations: archaeological results of the Stage 3 project*. McDonald Institute for archaeological research monographs: 57-78.

Barton, R. N. E., & Barton, D. E. 1992. *Hengistbury Head, Dorset*. Oxford University Committee for Archaeology, Institute of Archaeology.

Bell, M. 2007 *Prehistoric coastal communities: the Mesolithic in western Britain* (No.149). Council for British Archaeology.

Bernaldo de Quirós, F.B. 1982. *Los inicios del Paleolítico superior cantábrico*. (s.n.) Ministerio de Cultura.

Berridge, P., & Roberts, A. 1990. Windmill Hill Cave, Brixham: setting the record straight. *Lithics* 11: 24-30.

Binford, L.R. 1977. Forty-seven trips: a case study in the character of archaeological formation processes. In Wright, R.V.S. *Stone tools as cultural markers: change, evolution and complexity*. Canberra. Australian Institute of Aboriginal Studies: 24-36.

Binford, L.R. 1978. *Nunamiut ethnoarchaeology*. New York. Academic Press.

Binford, L.R. 1979. Organization and formation processes: looking at curated technologies. *Journal of Anthropological Research* 35: 255-273.

Binford, L.R. 1983. *In pursuit of the past: decoding the archaeological record*. London. Thames & Hudson.

Binford, L.R. and O'Connell, J.F. 1984. 'An Alyawara day: the stone quarry.' *Journal of Anthropological Research and Southwestern Journal of Anthropology Albuquerque, NM* 40.3: 406-432.

Bordes, F. 1958. Le passage du Paléolithique moyen au Paléolithique supérieur. In von Königswald G.H.R. *Neandertal centenary, Hundert Jahre neanderthaler 1856-1956*. Utrecht: Kemink en Zoon: 175-181.

Bordes, F., & Labrot, J. 1967. La stratigraphie du gisement de Roc de Combe (Lot) et ses implications. *Bulletin de la Société préhistorique française*. 64: 15-28.

Bordes, J.G. 2000. La séquence aurignacienne de Caminade revisitée: l'apport des raccords d'intérêt stratigraphique. *Paléo* 12: 387–408.

Bordes, J.G. 2002. Les interstratifications Châtelperronien/Aurignacien du Roc de Combe et du Piage (Lot, France). Analyse taphonomique des industries lithiques: Conséquences archéologiques. *PhD. dissertation*, University of Bordeaux I.

Bordes, J.G. 2003. Lithic taphonomy of the Châtelperronian/Aurignacian interstratifications in Roc de Combe and Le Piage (Lot, France). In Zilhão, J and d'Errico, F. (eds.), *The chronology of the Aurignacian and of the transitional technocomplexes: dating, stratigraphies, cultural implications*. Trabalhos de Arqueologia 33: Instituto Português de Arqueologia, Lisboa: 223-244.

Bordes, J.G. 2006. News from the West: a re-evaluation of the classical Aurignacian sequence of the Périgord. In Bar-Yosef O. & Zilhão J. (eds.), *Towards a definition of the Aurignacian*. Lisbon. American School of Prehistoric Research/Instituto Português de Arqueologia: 147-171.

Breuil, H. 1912. Les Subdivisions du Palolithique Supérieur et Leur Signification. *Compte rendu de Congrès international d'anthropologie et d'archéologie Préhistorique*, Geneva: 165-328.

British Geological Survey website. Accessed 8 August 2016.

<<http://www.bgs.ac.uk/lexicon.cfm?pub=CUCK>>

British Geological Survey website. Accessed 20 August 2016.

<<http://www.geomag.bgs.ac.uk/education/reversals.html>>

British Museum website. Accessed 8 August 2016.

http://www.britishmuseum.org/research/collection_online/collection_object_details.aspx?objectId=3174298&partId=1&object=8130&museumno=7936&page=1

Brück, J. 2005. Experiencing the past? The development of a phenomenological archaeology in British prehistory. *Archaeological Dialogues* 12: 45-72.

Burleigh, R. 1976. Excavations at Creffield Road, Acton in 1974 and 1975. *London Archaeology* 2: 379-83.

Campbell, J.B. 1977. *The Upper Palaeolithic of Britain: a study of man and nature in the Late Ice Age*. Oxford. Oxford University Press.

Campbell, J.B. 1986. Hiatus and continuity in the British Upper Palaeolithic: a view from the Antipodes, in Roe D. A. (ed.) *Studies in the Upper Palaeolithic of Britain and Northwest Europe*, Oxford: BAR International Series 296: 7–42.

Caseldine, C.J., McGarry, S.F., Baker, A., Hawkesworth, C., & Smart, P.L. 2008. Late Quaternary speleothem pollen in the British Isles. *Journal of Quaternary Science*, 23(2): 193-200.

Champagne, F., Espitalié, R., Beckouche, S., Champagne, C., Laville, H., Marquet, J.C., & Delporte, H. 1981. *Le Plage, site préhistorique du Lot*. Paris. Mémoires de la Société Préhistorique Française.

Chazan, M. 1995. Conceptions of time and the development of Paleolithic chronology. *American anthropologist*, 97(3): 457-467.

Chmielewski, W. 1961. *Civilisation de Jerzmanowice*. Wrocław-Warszawa-Kraków. Instytut Historii Kultury Materialnej Polskiej Akademii Nauk.

Churchill, S.E. 1993. Weapon technology, prey size selection, and hunting methods in modern hunter-gatherers: implications for hunting in the Palaeolithic and Mesolithic. *Archeological Papers of the American Anthropological Association*, 4(1): 11-24.

Coles, B. 1998. Doggerland: a speculative survey. *Proceedings of the Prehistoric Society* 64: 45–81.

Collcutt, S. 2001. The Sackung Hypothesis: a challenge for Palaeolithic prospection. In Milliken, S. & Cook, J. (eds.) *A very remote period indeed: papers on the Palaeolithic presented to Derek Roe*. Oxford: Oxbow books: 223–233.

Conard, N. J., Grootes, P. M., & Smith, F. H. 2004. Unexpectedly recent dates for human remains from Vogelherd. *Nature*, 430(6996): 198-201.

Coope, G.R. 2002. Changes in the thermal climate in Northwestern Europe during Marine Oxygen Isotope Stage 3, estimated from fossil insect assemblages. *Quaternary Research*, 57(3): 401-408.

Cooper, L.P., Thomas, J.S., Beamish, M.G., Gouldwell, A., Collcutt, S.N., Williams, J., Jacobi, R.M., Carrant, A. & Higham, T.F.G. 2012. An Early Upper Palaeolithic open air station and Mid Devensian Hyaena Den at Grange Farm, Glaston, Rutland, UK. *Proceedings of the Prehistoric Society* 78: 73–78.

Cooper, S.M. 1990. The hunting behaviour of spotted hyaenas (*Crocuta crocuta*) in a region containing both sedentary and migratory populations of herbivores. *African Journal of Ecology* 28: 131-141.

Cummings, V. 2002. Experiencing texture and transformation in the British Neolithic. *Oxford Journal of Archaeology* 21: 249-61.

Currant, A., & Jacobi, R. 2001. A formal mammalian biostratigraphy for the Late Pleistocene of Britain. *Quaternary Science Reviews*, 20(16): 1707-1716.

Curwen, E. 1949. A flint dagger factory near Pulborough, Sussex. *The Antiquaries Journal*, 29(3-4): 192-193.

Dawkins, W.B. 1862. On a hyaena-den at Wookey-Hole, near Wells. *Quarterly Journal of the Geological Society*, 18(1-2): 115-126.

Dawkins, W.B. 1874. *Cave hunting: researches on the evidence of caves respecting the early inhabitants of Europe*. Macmillan and Company (s.n.).

Dawkins, W.B. 1876. On the mammalia and traces of man found in the Robin Hood Cave. *Quarterly Journal of the Geological Society of London* 32(3): 245-58.

Dawkins, W.B. 1877. On the mammal-fauna of the caves of Creswell Crags. *Quarterly Journal of the Geological Society of London* 33(3): 589-612.

D'Errico, F., & Banks, W. E. 2015. Tephra studies and the reconstruction of Middle-to-Upper Paleolithic cultural trajectories. *Quaternary Science Reviews*, 118: 182-193.

De Mortillet, G. 1883. *Le préhistorique antiquité de l'homme*. Paris. Reinwald.

De Puydt, M. & Lohest, M. 1886. L'homme contemporain du mammoth à Spy. *Annales de la Fédération Archéologique et Historique de Belgique*, 2: 207-40.

Desbrosse, R. & Kozłowski, J.K. 1988. *Hommes et climats à l'âge du mammouth: Le Paléolithique supérieur d'Eurasie central*. Paris. Masson.

Dibble, H., & McPherron, S. 2006. The missing Mousterian. *Current Anthropology*, 47(5): 777-803.

Dines, H.G. 1929. The flint industries of Bapchild. *Proceedings of the Prehistoric Society of East Anglia*, 6(01): 12-26.

Ellaby, R. 1987. The Upper Palaeolithic and Mesolithic in Surrey. In Bird, J. & Bird, D.G. (eds.) *The archaeology of Surrey Guildford* (s.n.): 53-69.

Fedele, F. G., Giaccio, B., Isaia, R., & Orsi, G. 2003. The Campanian Ignimbrite eruption, Heinrich Event 4, and Paleolithic change in Europe: A high-resolution investigation. *Geophysical Monograph-American Geophysical Union*, 139: 301-328.

Fedele, F. G., Giaccio, B., & Hajdas, I. 2008. Timescales and cultural process at 40,000 BP in the light of the Campanian Ignimbrite eruption, Western Eurasia. *Journal of Human Evolution*, 55(5): 834-857.

Fitzsimmons, K. E., Hambach, U., Veres, D., & Iovita, R. 2013. The Campanian Ignimbrite eruption: new data on volcanic ash dispersal and its potential impact on human evolution. *PLoS One* 8, e65839.

Flas, D. 2006. *La transition du Paléolithique moyen au supérieur dans la plaine septentrionale de l'Europe. Les problématiques du Lincombien-Ranisien-Jerzmanowicien*. PhD. University of Liege.

- Flas, D. 2008. La transition du Paléolithique moyen au supérieur dans la plaine septentrionale de l'Europe. Brussels. *Anthropologica et Præhistorica* 119.
- Flas, D. 2011. The Middle to Upper Paleolithic transition in Northern Europe: the Lincombian-Ranisian-Jerzmanowician and the issue of acculturation of the last Neanderthals. *World Archaeology*, 43(4): 605-627.
- Flas, D. 2013. Jerzmanowicie points from Spy and the issue of the Lincombian-Ranisian-Jerzmanowician. In Rougier, H., & Semal, P. (eds.), *Spy Cave: 125 years of multidisciplinary research at the Betche aux Rotches*: 217-230.
- Flas, D. 2014. Northern Europe: Middle to Upper Palaeolithic transition. In: Fisher, C. (ed.), *Encyclopaedia of Global Archaeology*. New York. Springer: 5499-5514.
- Fontein, J. 2010. Commentary: The Efficiency of "Emic" and "Etic" in Archaeology and Heritage. In Lydon, J. & Rizvi, U.Z. (eds.) *Handbook of Postcolonial Archaeology*. California. Left Coast Press: 311-322.
- Gallagher, J.P. 1977. Contemporary stone tools in Ethiopia: implications for archaeology. *Journal of Field Archaeology*, 4(4): 407-414.
- Gallie, W.B. 1964. *Philosophy and historical understanding*. London. Chatto and Windus.
- Gamble, C. 1998. Palaeolithic society and the release from proximity: a network approach to intimate relations. *World Archaeology*, 29(3): 426-449.

Gardin, J.C. 1980. *Archaeological constructs: an aspect of theoretical archaeology*. Cambridge. Cambridge University Press.

Garrod, D.A.E. 1926. *The Upper Palaeolithic Age in Britain*. Oxford. AMS Press.

Geosuffolk website PDF for Eastall's Pit. Accessed 17 December 2015.

<<http://www.geosuffolk.co.uk/leaflets/GG11.pdf>>.

Gordon, B. 2003. Rangifer and man: an ancient relationship. *Rangifer*, 23(5): 15-28.

Guthrie, R.D. 1982. Mammals of the mammoth steppe as paleoenvironmental indicators. In Hopkins, D.M, J. Matthews, C.E. Schweger & S.B. Young (eds.) *Paleoecology of Beringia*. New York. Academic Press: 307-326.

Guthrie, R.D. 2001. Origin and causes of the mammoth steppe: a story of cloud cover, woolly mammal tooth pits, buckles, and inside-out Beringia. *Quaternary Science Reviews*, 20(1): 549-574.

Hamilton, S., Whitehouse, R., Brown, K., Combes, P., Herring, E. & Thomas M.S., 2006. Phenomenology in Practice: Towards a Methodology for a Subjective Approach. *European Journal of Archaeology*. 9(1): 31-71

Hammond, M. 1980. Anthropology as a weapon of social combat in late-nineteenth-century France. *Journal of the History of the Behavioral Sciences*. 16(2): 118-132.

Hampson, B. A., de Laat, M. A., Mills, P. C., & Pollitt, C. C. 2010. Distances travelled by feral horses in 'outback' Australia. *Equine Veterinary Journal*, 42(s38): 582-586.

Harrison, E.R. 1928. *Harrison of Ightham: a book about Benjamin Harrison, of Ightham, Kent, made up principally of extracts from his notebooks and correspondence*. Oxford University Press. Oxford.

Harrison, R.A. 1977. The Uphill Quarry caves, Weston-Super-Mare: A reappraisal. *Proceedings of the University of Bristol Spelaeological Society*, 14(3): 233-54.

Harrold, F.B. 2000. The Chatelperronian in historical context. *Journal of anthropological research* 56: 59-75.

Hayden, B. 1984. Are Emic Types Relevant to Archaeology? *Ethnohistory*. April: 79-92.

Hewer, T.F. 1926. King Arthur's Cave. *Proceedings of the University of Bristol Spelaeological Society* 2: 221-28.

Hey, G. & Roberts, A. 2008. Oxfordshire in the Mesolithic and Upper Palaeolithic. *Solent Thames Research Framework. Oxfordshire*.

Hickey, C.G. 1974. Archaeology: Papers in Economic Prehistory: Studies by members and associates of the British Academy Major Research Project in the Early History of Agriculture. E.S. Higgs. *American Anthropologist* 76(4): 970-971.

Hicks, H. 1885. On some researches in bone-caves in Wales. *Proceedings of the Geologists' Association*, 9(1): 1-20.

Hicks, H. 1886. Results of recent researches in some Bone-caves in North Wales (Ffynnon Beuno and Cae Gwyn). *Quarterly Journal of the Geological Society* 42: 3-19.

Higham, T.F.G. 2010. Obituary: Roger, M Jacobi. *Mitteilungen der Gesellschaft für Urgeschichte* 19: 217-220.

Higham, T.F.G., Jacobi, R.M., & Ramsey, C.B. 2006. AMS radiocarbon dating of ancient bone using ultrafiltration. *Radiocarbon*, 48(2): 179-195.

Hopkinson, T. 2007. *The Middle Palaeolithic Leaf Points of Europe: Ecology, knowledge and scale*. Oxford. John and Erica Hedges.

Hülle, W. M. 1977. *Die Ilsenhöhle unter Burg Ranis, Thüringen*. Stuttgart. Gustav Fischer.

Huntley, B., Alfano, M.J., Allen, R.M., Pollard, D. Tzedakis, C., de Beaulieu, J.L. Grüger, E., & Watts, B. 2003. European vegetation during marine oxygen isotope stage-3. *Quaternary Research* 59: 195-212.

Jacobi, R.M. (n.d.) *Baldings Hill* [artefact sheet and correspondence]. Jacobi Archive. Franks House, British Museum.

Jacobi, R.M. (n.d.) *Bapchild* [artefact sheet]. Jacobi Archive. Franks House, British Museum.

Jacobi, R.M. (n.d.) *Beedings* [artefact sheets and correspondence]. Jacobi Archive. Franks House, British Museum.

Jacobi, R.M. (n.d.) *Bramford Road* [artefact sheets]. Jacobi Archive. Franks House, British Museum.

Jacobi, R.M. (n.d.) *Conningbrook Manor Pit* [artefact sheet]. Jacobi Archive. Franks House, British Museum.

Jacobi, R.M. (n.d.) *Drayton Wood Road* [artefact sheet and correspondence]. Jacobi Archive. Franks House, British Museum.

Jacobi, R.M. (n.d.) *Eastall's Pit* [artefact sheet]. Jacobi Archive. Franks House, British Museum.

Jacobi, R.M. (n.d.) *Golden Cross* [artefact sheet]. Jacobi Archive. Franks House, British Museum.

Jacobi, R.M. (n.d.) *Ightham* [artefact sheet]. Jacobi Archive. Franks House, British Museum.

Jacobi, R.M. 1980. The Upper Palaeolithic of Britain with special reference to Wales. In Taylor. J.A. (ed.) *Culture and Environment in Prehistoric Wales*. Oxford. BAR British Series 76: 15–100.

Jacobi, R.M. 1986. The contents of Dr. Harley's Showcase. In Colclutt S.N (ed.) *The Palaeolithic of Britain and its Nearest Neighbours: Recent Studies*. Sheffield. University of Sheffield: 62-8.

Jacobi, R.M. 1990. Leaf-points and the British Early Upper Palaeolithic. In Kozłowski, J.K. (ed.) *Feuilles de pierre*. Liege. ERAUL 42: 271–89.

Jacobi, R.M. 1999. Some observations on the British Earlier Palaeolithic. In Davies, W & Charles, R. (eds.) *Dorothy Garrod and the Progress of the Palaeolithic: Studies in the Prehistoric Archaeology of the Near East and Europe* Oxford: Oxbow Books: 35-40.

Jacobi, R.M. 2000. The late Pleistocene archaeology of Somerset. In Webster, C.J. (ed.), *Somerset Archaeology: Papers to mark 150 years of the Somerset Archaeological and Natural History Society*. Somerset County Council, Taunton: 45-52.

Jacobi, R.M., Debenham, N., & Catt, J. 2007. A collection of Early Upper Palaeolithic artefacts from Beedings, near Pulborough, West Sussex, and the context of similar finds from the British Isles. *Proceedings of the Prehistoric Society* 73: 229-325.

Jacobi, R.M., & Hawkes, C.J. 1993. Archaeological notes: Work at the Hyæna Den, Wookey Hole. *Proceedings of the University of Bristol Spelæological Society*, 19(3): 369-371.

Jacobi, R.M., & Higham, T.F.G. 2011. The British earlier Upper Palaeolithic: settlement and chronology. In Ashton, N., Lewis, S., Stringer, C. (eds.) *The ancient human occupation of Britain*. Oxford. Elsevier: 181-222.

Jenkinson, R.D. 1984. *Creswell Crags: Late Pleistocene Sites in the East Midlands*. Oxford. BAR British Series 122.

- Jones, C. 2002. Late camber-induced ridge crest grabens in Rutland. *Jurassic Times* 26: 1-2.
- Jöris, O., & Street, M. 2008. At the end of the 14 C time scale—the Middle to Upper Paleolithic record of western Eurasia. *Journal of Human Evolution*, 55(5): 782-802.
- Kitti H., Gunslay N. & Forbes B.C. 2006. Defining the quality of reindeer pastures: the perspectives of Sámi reindeer herders. In Forbes, B.C, Bölter, M., Müller-Willie, L., Hukkinen, J., Müller, F., Gunslay, N., & Konstantinov, Y. (eds.), *Reindeer management in northernmost Europe: linking practical and scientific knowledge in social–ecological systems*. Berlin. Springer: 141–165.
- Klein, R.G. 1973. Ice-Age Hunters of the Ukraine. *Chicago: University of Chicago Press*.
- Kozłowski, J.K. 1990. Certains aspects techno-morphologiques des pointes foliacées de la fin du Paléolithique moyen et du début du Paléolithique supérieur en Europe central. In C. Farizy (ed.), *Paléolithique moyen récent et Paléolithique supérieur ancien en Europe. Ruptures et transitions: examen critique des documents archéologiques*. Actes du Colloque international de Nemours (9-11 Mai 1988). Mémoires du Musée de Préhistoire d'Île-de-France 3: 125-133.
- Kuhn, S.L. 1990. A geometric index of reduction for unifacial stone tools. *Journal of Archaeological Science* 17(5): 583-593.
- Lambeck, K., Esat, T.M., & Potter, E.K. 2002. Links between climate and sea levels for the past three million years. *Nature*, 419(6903):199-206.

Layard, N.F. 1927. A Late Palaeolithic Settlement in the Colne Valley, Essex. *The Antiquaries Journal*, 7(04): 500-514.

Lemonnier, P. 1992. *Elements for an Anthropology of Technology*. University of Michigan, Museum of Anthropology Anthropological Paper 88.

Leroi-Gourhan, A. 1958. Étude des vestiges humains fossiles provenant des grottes d'Arcy-sur-Cure. *Ann Paleontol* 44: 87-148.

Leroi-Gourhan, A. 1971. *Evolution et techniques, Vol.1 - L'Homme et la matière*. Paris. Albin Michel.

Leveque, F., & Vandermeersch, B. 1980. Les découvertes de restes humains dans un horizon castelperronien de Saint-Césaire (Charente-Maritime). *Comptes Rendus de l'Académie des Sciences de Paris* 291: 187-189.

Leyland, J., & Darby, S.E. 2008. An empirical–conceptual gully evolution model for channelled sea cliffs. *Geomorphology* 102: 3419-434.

Light my Fire website. Accessed 9 August 2016.

<<http://www.lightmyfire.com/products/products/spork/spork-original.aspx>>

Lohmann, K. J., Lohmann, C. M., & Putman, N. F. 2007. Magnetic maps in animals: nature's GPS. *Journal of Experimental Biology*, 210(21): 3697-3705.

Lubbock, J. 1904. *Pre-historic times: as illustrated by ancient remains and the manners and customs of modern savages* (Vol. 8). London. JA Hilliard Company.

Martingell, H. (n.d.) *Brighstone* [illustration titled 'Isle of Wight']. Martingell Archive, 27 Sandwich Close, Braintree, Essex, CM7 5RZ.

Martingell, H. (n.d.) *Golden Cross* [illustration titled 'Hailsham']. Martingell Archive, 27 Sandwich Close, Braintree, Essex, CM7 5RZ.

Martingell, H. (n.d.) *Temple Mills* [illustration titled 'Temple Mills']. Martingell Archive, 27 Sandwich Close, Braintree, Essex, CM7 5RZ.

Martingell, H. (n.d.) *White Colne Pit* [illustration titled 'White Colne']. Martingell Archive, 27 Sandwich Close, Braintree, Essex, CM7 5RZ.

Martingell, H. (n.d.) *Drayton Wood Rd* [illustration titled 'Hellesden']. Martingell Archive, 27 Sandwich Close, Braintree, Essex, CM7 5RZ.

Martingell, H. (n.d.) *Kent's Cavern chert blade-point* [illustration titled 'Bolton']. Martingell Archive, 27 Sandwich Close, Braintree, Essex, CM7 5RZ.

MacEnery, J. & Vivian E. 1859. *Cavern Researches, or, discoveries of organic remains, and of British and Roman reliques, in the caves of Kent's Hole, Anstis Cove, Chudleigh, and Berry Head*. London. Simpkin, Marshall & Co.

Mauss, M. 1936. Les techniques du corps. *Journal de psychologie*, 32(3-4): 365-86.

Mauss, M., & Schlanger, N. 2006. *Techniques, technology and civilization*. Oxford. Berghahn Books.

McBurney, C.B.M. 1959. Report on the First Season's Fieldwork on British Upper Palaeolithic Cave Deposits. *Proceedings of the Prehistoric Society (New Series)*, 25: 260-269.

McBurney, C.B.M. 1965. The Old Stone Age in Wales. In Daniel, G. and Foster, I.L. (eds.), *Prehistoric and Early Wales*, London, Routledge: 17-34.

McFarlane, D.A., & Lundberg, J. 2005. The 19th century excavation of Kent's Cavern, England. *Journal of Cave and Karst Studies* 67: 39-47.

Mears, R., & Hunter, J. 1997. *Ray Mears' world of survival*. London. Harper Collins.

Mellars, P.A. 1973. The character of the Middle-Upper Palaeolithic transition in south-west France. In Renfrew, C. (ed.), *The explanation of cultural change*. London. Duckworth: 255-276.

Mellars, P.A. 1989. Major issues in the emergence of modern humans. *Current anthropology*, 30(3): 349-385.

Mellars, P.A., & Stringer, C. (eds.) 1989. *The human revolution*. Edinburgh. Edinburgh University Press.

Mello, J. M. 1875. On some bone-caves in Creswell Crags. *Quarterly Journal of the Geological Society*, 31(1-4): 679-683.

Milks, A. 2010. *Spear throwing in the European Early Upper Palaeolithic*. Unpublished Master of Science dissertation, University College London, Institute of Archaeology.

Moir, J.R. 1931. Ancient man in the Gipping-Orwell Valley, Suffolk. *Proceedings of the Prehistoric Society of East Anglia* 6: 182-221

- Monnier, G. 2006. The Lower / Middle Paleolithic periodization in Western Europe. *Current Anthropology*, 47(5): 709-744.
- Montes, R., Sanguino, J., Martín, P., Gómez, A.J., & Morcillo, C. 2005. La secuencia estratigráfica de la cueva de El Pendo (Escobedo de Camargo, Cantabria): problemas geoarqueológicos de un referente cronocultural. In Santonja, M., Pérez-Gonzalez, A., & Machado, M. (eds.), *Geoarqueología y patrimonio en la Península Ibérica y el entorno mediterráneo*. ADEMA, Almazán (Soria): 127-138.
- Morrow, T.A. 1996. Bigger is better: comments on Kuhn's formal approach to mobile tool kits. *American Antiquity* 61: 581-590.
- Morrow, T.A. 1997. A chip off the old block: alternative approaches to debitage analysis. *Lithic Technology* 22: 51-69.
- Mortimore, R.N. 1986. Stratigraphy of the Upper Cretaceous White Chalk of Sussex. *Proceedings of the Geologists' Association*, 97(2): 97-139.
- Myers, A. 1989. Reliable and maintainable technological strategies in the Mesolithic of mainland Britain. In Torrence, R., *Time, energy and stone tools*. Cambridge. Cambridge University Press: 78-91.
- National Trust website. Accessed 17 December 2015.
<<https://nationaltrust.org.uk/oldbury-hill/features/oldbury-hill-kent--an-iron-age-hillfort>>.
- Newcomer, M.H., & Hivernel-Guerre, F. 1974. Nucléus sur éclat: technologie et utilisation par différentes cultures préhistoriques. *Bulletin de la Société préhistorique française* 71(4): 119-128.

Nowaczyk, N.R., Arz, H. W., Frank, U., Kind, J., & Plessen, B. 2012. Dynamics of the Laschamp geomagnetic excursion from Black Sea sediments. *Earth and Planetary Science Letters*, 351: 54-69.

O'Connor, A. 2007. *Finding Time for the Old Stone Age: A History of Palaeolithic Archaeology and Quaternary Geology in Britain, 1860-1960: A History of Palaeolithic Archaeology and Quaternary Geology in Britain, 1860-1960*. Oxford. Oxford University Press.

Olsen, S.L. 1989. Solutré: a theoretical approach to the reconstruction of Upper Palaeolithic hunting strategies. *Journal of Human Evolution*, 18(4): 295-327.

Otte, M. 2015. Roger Jacobi and the Belgians! In Ashton, N. & Harris, C. (eds.), *No stone unturned: papers in honour of Roger Jacobi*. Oxford. Oxbow: 249-251.

Outram, A. & Rowley-Conwy, P., 1998. Meat and marrow utility indices for horse (Equus). *Journal of Archaeological Science*, 25(9): 839-849.

Palaeolithic and Mesolithic Lithic Artefacts (PaMeLA) electronic archive of Jacobi's notes. Accessed 17 December 2015. <<http://www.wessexarch.co.uk/48666/colonisation-britain-project>>.

Pelegriin, J. 2000. Les techniques de débitage laminaire au Tardiglaciaire: critères de diagnose et quelques réflexions. *Arkeotek Journal*, 4: 73-86.

Pengelly, W. 1861. On a second new bone cavern recently discovered at Brixham, Devonshire. *The Geologist* 4(46): 456-460.

Pengelly, W. 1867. Second report of the committee for exploring Kent's cavern, Devonshire. The committee consisting of Sir Charles Lyell, Bart., Professor Philips, Sir John Lubbock, Bart., Bart., Mr John Evans, Mr Edward Vivian, and Mr William Pengelly (Reporter). *Report of the 36th meeting of the British Association for the Advancement of Science (Nottingham, 1866)*: 1-11.

Pengelly, W. 1888. Recent researches in Bench Cavern, Brixham, Devon. *Transactions of the Edinburgh Geological Society*, 5(4): 507-512.

Pengelly, W., Busk, G., Evans, J., Prestwich, J., Falconer, H., & Ramsay, A. 1873. Report on the Exploration of Brixham Cave, conducted by a Committee of the Geological Society, and under the Superintendence of Wm. Pengelly, Esq., F.R.S., aided by a local committee; with descriptions of the animal remains by George Busk, Esq., F.R.S., and of the Flint Implements by John Evans, Esq., F.R.S. Joseph Prestwich, F.R.S., F.G.S., &c., Reporter. *Philosophical Transactions of the Royal Society of London*, v163: 471-572.

Pettitt, P. and White, M. 2012. *The British Palaeolithic: human societies at the edge of the Pleistocene World*. London, Routledge.

Pluciennik, M. 1999. Archaeological narratives and other ways of telling. *Current Anthropology*, 40(5): 653-678.

Poole, H.F. 1928. Natural history and archaeological notes: Upper Palaeolithic implement from Grange Chine. *Proceedings of the Isle Wight Natural History and Archaeology Society*.

Poole, H.F. 1929. Natural history and archaeological notes: A laurel-leaf point

from Brighstone. *Proceedings of the Isle Wight Natural History and Archaeology Society*.

Pope, M. 2008. Early Upper Palaeolithic archaeology at Beedings, West Sussex: new contexts for Pleistocene archaeology. *Archaeology International* 11: 33-36.

Pope, M., Dinnis, R., Milks, A., Toms, P., & Wells, C. 2013. A Middle Palaeolithic to Early Upper Palaeolithic succession from an open air site at Beedings, West Sussex. *Quaternary International*, 316: 14-26.

Portable Antiquities Scheme (n.d.), Database search results, Record ID DEV-1F2FC7. Accessed 13 December 2013.

<<https://finds.org.uk/database/artefacts/record/id/495891>>.

Portable Antiquities Scheme (n.d.), Database search results, Record ID DEV-1F2FC7. Accessed 13 December 2013.

<<https://finds.org.uk/database/artefacts/record/id/570024>>.

Preston, P.R. 2009. Cache and Carry: lithic technology and Mesolithic mobility. Accessed 17 December 2015. <<http://intarch.ac.uk/journal/issue26/25/index.html>>.

Proctor, R. 2003. Three roots of human recency. *Current Anthropology*, 44(2): 213-239.

Proctor, C.J., Berridge, P.J., Bishop, M.J., Richards, D.A., & Smart, P.L. 2005. Age of middle Pleistocene fauna and lower Palaeolithic industries from Kent's cavern, Devon. *Quaternary Science Reviews*, 24(10): 1243-1252.

Riel-Salvatore, J. 2009. What is a 'transitional' industry? The Uluzzian of southern Italy as a case study. In Camps, M. & Chauhan, P. (eds.), *Sourcebook of Paleolithic transitions*. New York: Springer: 377-396.

Robinson, D. 2000. Geomorphology of the Lincolnshire Wolds: an excursion guide. *Mercian Geologist*, 15(1): 41-48.

Rockman, M. 2003. Knowledge and learning in the archaeology of colonization. In Rockman, M. & Steele, J. (eds.), *Colonization of Unfamiliar Landscapes: the archaeology of adaptation*. London. Routledge: 3-24.

Roebroeks, W. 2008. Time for the Middle to Upper Paleolithic transition in Europe. *Journal of Human Evolution*, 55(5): 918-926.

Sackett, J.R. 1981. From de Mortillet to Bordes: A century of French Paleolithic research. In: Daniel, G. (ed.). *Towards a history of archaeology*. London. Thames & Hudson: 85-99.

Sawyer, H., Kauffman, M.J., Nielson, R.M., & Horne, J.S. 2009. Identifying and prioritizing ungulate migration routes for landscape-level conservation. *Ecological Applications*, 19(8): 2016-2025.

Smith, P.J. 2010. Paul Anthony Mellars, from Swallownest to Cambridge: the Early Years. In: Boyle, K.V., Gamble, C., Bar-Yosef, O. (eds.), *The Upper Palaeolithic Revolution in Global Perspective: Essays in Honour of Paul Mellars*. McDonald Institute for Archaeological Research University of Cambridge, Cambridge: 9-34.

Smith, R.A. 1931. *The Sturge Collection. An Illustrated Selection of Flints from Britain Bequeathed in 1919 by William Allen Sturge*. London. The British Museum.

Sollas, W.J. 1913. Paviland Cave: An Aurignacian Station in Wales. *Journal of the Royal Anthropological Institute of Great Britain and Ireland* 43: 325-374.

Soressi, M., & Geneste, J.M. 2011. The history and efficacy of the chaîne opératoire approach to lithic analysis: studying techniques to reveal past societies in an evolutionary perspective. *PaleoAnthropology* 2011: 334-350.

Swainston, S. 1999. Unlocking the inhospitable. In Davies, W. & Charles, R., (eds.), *Dorothy Garrod and the Progress of the Palaeolithic: Studies in the Prehistoric Archaeology of the Near East and Europe*, Oxford. Oxbow: 41-56.

Swainston, S. 2000. The lithic artefacts from Paviland. In Aldhouse-Green, S. (ed.). *Paviland Cave and the 'Red Lady': a definitive report*. Bristol, Western Academic & Specialist Press Limited: 95-113.

Thieme, H. 2005. The Lower Palaeolithic art of hunting. In Gamble, C., & Porr, M. (eds.), *The hominid individual in context: archaeological investigations of Lower and Middle Palaeolithic landscapes, locales and artefacts*. Abingdon. Routledge: 115-132.

Tilley, C. 1994. *A Phenomenology of Landscape: places, paths, monuments*. Oxford. Berg.

Titmus, G.L., & Woods, J.C. 1986. An experimental study of projectile point fracture patterns. *Journal of California and Great Basin Anthropology* 8(1): 37-49.

Tratman, E.K., Donovan, D.T., & Campbell, J.B. 1971. *The Hyaena Den (Wookey Hole), Mendip Hills, Somerset*. University of Bristol Spelaeological Society 12: 245-279.

Turner, R. 2013. *Flint knapping: a guide to making your own stone age tool kit*. The History Press. (s.n.).

Valet, J.P., & Valladas, H. 2010. The Laschamp-Mono lake geomagnetic events and the extinction of Neanderthal: a causal link or a coincidence? *Quaternary Science Reviews*, 29(27): 3887-3893.

Van Andel, T.H. 2002. The climate and landscape of the middle part of the Weichselian glaciation in Europe: the stage 3 project. *Quaternary Research*, 57(1): 2-8.

Van Andel, T.H. 2003. Glacial environments I: the Weichselian climate in Europe between the end of the OIS-5 interglacial and the Last Glacial Maximum. In van Andel, T.H., & Davies, W. (eds). *Neanderthals and modern humans in the European landscape during the last glaciation: archaeological results of the Stage 3 Project*. McDonald Institute for Archaeological Research monographs: 9-19.

Van Andel, T.H., & Davies, W. (eds.) 2003. *Neanderthals and modern humans in the European landscape during the last glaciation: archaeological results of the Stage 3 Project*. McDonald Institute for Archaeological Research monographs.

Van Andel, T.H., Davies, W. & Weniger, B. 2003. The human presence in Europe during the last glacial period I: human migrations and the changing climate. In

Van Andel, T.H., & Davies, W. (eds.), *Neanderthals and modern humans in the European landscape during the last glaciation: archaeological results of the Stage 3 Project*. McDonald Institute for Archaeological Research monographs: 31-56.

Watson, A. 2001. Composing Avebury. *World Archaeology* 33: 296-314.

Weninger, B., & Jöris, O. 2008. A 14C age calibration curve for the last 60 ka: the Greenland-Hulu U/Th timescale and its impact on understanding the Middle to Upper Paleolithic transition in Western Eurasia. *Journal of Human Evolution* 55(5): 772-781.

West, I. 2013 (1). Brighstone Bay and Compton Bay, Isle of Wight: Geology of the Wessex Coast. University of Southampton. Accessed 13 December 2013. <<http://www.southampton.ac.uk/~imw/wight.htm>>.

West, I. 2013 (2). Introduction to the geology of the Isle of Wight. University of Southampton. Accessed 13 December 2013. <<http://www.southampton.ac.uk/~imw/Wight-Brighstone-Bay.htm>>.

Whittaker, J.C. 2007. *Flintknapping: making and understanding stone tools*. Texas. University of Texas Press.

Woodridge, S. W. and Golding, F. 1960. *The Weald*. London, Collins.

Woods, M.A., & Chacksfield, B.C. 2012. Revealing deep structural influences on the Upper Cretaceous Chalk of East Anglia (UK) through inter-regional geophysical log correlations. *Proceedings of the Geologists' Association* 123: 486-499.

Woods, M.A., Wood C.J., Wilkinson, I.P., & Wright, T.N. 2007. The stratigraphy of the Chalk Group (Upper Cretaceous) of the Gipping Valley, near Ipswich, Suffolk, UK. *Proceedings of the Geologists' Association* 118: 347-363.

Wragg Sykes, R.M. 2009. The British Mousterian: Late Neanderthal Archaeology in Landscape Context. *Unpublished PhD thesis, University of Sheffield*.

Wymer, J.J. 1985. *The Palaeolithic sites of East Anglia*. Norwich. Geo Books.

Wymer, J.J. 1999. *The Lower Palaeolithic Occupation of Britain*. Wessex Archaeology & English Heritage, Salisbury.

Zilhão, J. 2006. Genes, fossils, and culture: an overview of the evidence for Neandertal–Modern Human interaction and admixture. *Proceedings of the Prehistoric Society* 72: 1-20.

Zilhão, J. 2011. Aliens from Outer Time? Why the “Human Revolution” is wrong, and where do we go from Here? In Condemi, S. Weniger, G.-C (eds.), *Continuity and discontinuity in the peopling of Europe*. New York. Springer Dordrecht: 331-366.

Appendices

A1: Sites, type fossils, assemblages

This appendix is used to illustrate the character of the materials available for analysis. 130 archaeological type fossils from 40 sites (Table A1.1) are contextualised by a discussion of the recovery history, associated materials and landscape features.

Type fossil sites	Not recorded	Recorded	Total
Beckford	0	1	1
Badger Hole	0	4	4
Baldings Hill	0	1	1
Bapchild	0	1	1
Beedings	1	42	43
Bench Quarry Tunnel	0	1	1
Bramford Road	0	7	7(+)
Brighstone	0	1	1
Colby	0	1	1
Conningbrook Manor Pit	0	1	1
Creffield Rd	1	0	1
Cross Bank	0	1	1
Drayton	0	1	1
Earl of Dysart's Pit	0	1	1
Eastall's Pit	0	1	1
Ffynnon Beuno	0	1	1
Goldcliff	1	0	1
Golden Cross	0	1	1
Glaston	0	2	2
Hailey Hill	0	1	1
Hyaena Den	0	2	2
Ightham	0	1	1
Kent's Cavern	1	10	11(?)
King Arthur's Cave	0	1	1
Moordown	1	0	1
North Hinksey	1	0	1
Osney Lock	1	0	1
Paviland Cave	0	9	9
Pin Hole Cave	0	1	1

Robin Hood's Cave	3	11	14
Soldier's Hole	0	3	3
South Hams	0	1	1
Sutton Courtney	1	1	2
Temple Mills	0	1	1
Town Pit	0	1	1
Uphill Cave 8	0	4	4
Wallow Camp	0	1	1
Warren Hill	0	1	1
White Colne Pit	0	1	1
Windmill Hill	0	1	1
Totals	11	119	130

Table A1.1. Sites, type fossils and numbers recorded. (+) means there are probably more artefacts present than recognised and recorded. (?) indicates possible duplication within the literature.

It became clear from recording aspects such as the degree of fragmentation that differing elements within the corpus would have differing analytical value. Of the 130 type fossils listed it was possible to record the metrics and form for 119 in total. When artefacts were not available extant illustrations have been used as a proxy. However, the majority of the analytical corpus comprised artefacts which allowed consideration of material and condition. Collections were perhaps most useful as they contributed to an understanding of the breadth of the technology, as well as an impression of a site's character. These differing values are reflected within the chapter structure and analytical process. Consequently, this summary has three parts (Table A1.2), with the first part bringing together the small number of single leaf-point finds (Table A1.3) documented. With little in the way of archaeological context these are mainly represented by illustrations. The second section reviews a larger proportion of single blade-point finds (Table A1.4). Whilst still limited in context, these are mainly represented by artefacts. The third section deals with sites comprising collections of both leaf-point and

blade-points, and in some cases *debitage* (Table A1.5). A number of these sites emerge as key to offering some stratigraphic understanding and a technological context to the corpus as a whole.

Type fossil summary	Not recorded	Recorded	Total
Single leaf-points	1	9	10
Single blade-points	4	15	19
Artefacts in collections	6	95	101
Totals	11	119	130

Table A1.2 Type fossil corpus as broken down within this chapter.

Single find leaf-points are presented first.

1.1 Single leaf-point finds

Single leaf-points	Not recorded	Recorded	Total
Beckford	0	1	1
Brighstone	0	1	1
Cross Bank	0	1	1
Eastalls Pit	0	1	1
Golden Cross	0	1	1
Ightham	0	1	1
Osney Lock	1	0	1
South Hams	0	1	1
Temple Mills	0	1	1
White Colne Pit	0	1	1
Totals	1	9	10

Table A1.3 Total single leaf-point finds recorded.

a. Beckford

Carrant Brook, Worcestershire (SO 975355).

Holding institution
Franks House
P.F (R?) Whitehead Collection P1993 12.1 62-76

This distal fragment of thin leaf-point is from the main terrace of Carrant Brook within a narrowing of the Carrant Valley between Bredon Hill to the north, and two smaller hills to the south. The brook flows westwards and Bredon Hill at nearly 300m is the highest point in the area. The artefact was recovered by P.R. Whitehead (date unknown) and the museum record states 'not in situ'. Its recovery was possibly the result of gravel extraction and the fragment margins have both ancient and modern damage revealing a light grey flint. The patina has been stained with one face yellow orange and the other more orange yellow. Based on the rippling a central section of the orange yellow face seems to be the

remnant of an original blade surface. The ridges are worn and the cross section lenticular.

b. Brighstone

Isle of Wight (SZ 417179).

Holding institution
Carisbrooke Castle Museum
SMR number 268 – MIW267

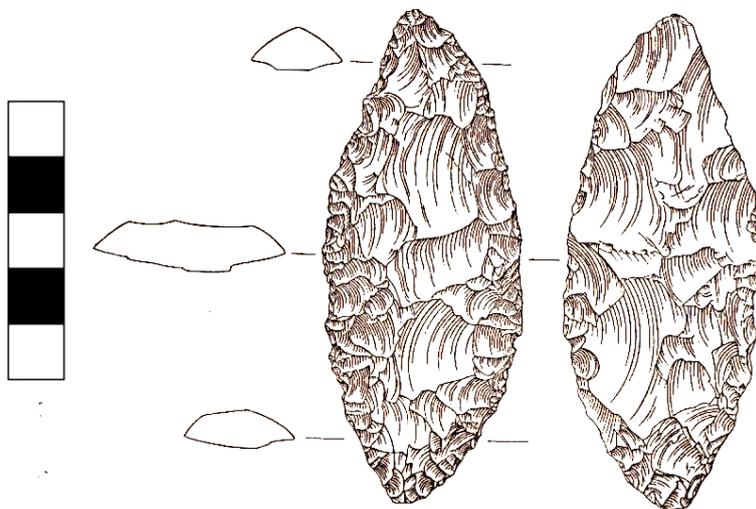


Fig.A1.1 Un-published drawing of the Brighstone leaf-point (Martingell n.d. 'Isle of Wight').

This small complete leaf-point (Fig.A1.1) has not been seen directly. It was found in the 1920s in Brighstone Bay on what is now the Isle of Wight (Poole, 1929). The bay is 9km long and sits on the south coast between the Hanover and Atherfield points (West 2013 (1)). According to the HER the piece was found on the lower slopes of a sea cliff, some 2-300 yards from Grange Chine. A chine is the local name for a steep-sided river valley and Grange Chine lies approximately in the middle of the bay and drains water from the southern slopes of Brighstone Down. In doing so it has eroded through the cliff face and in

the process caused cliff retreat (Leyland and Darby 2008). Mammoth remains have been found in the old river gravels (West 2013 (2)) and Jacobi noted that the artefact "*probably originated from the gravel*" (PaMeLA). Poole (1928: 691) described the leaf-point material as "*yellow-stained flint with a dully lustrous surface*". In his archival notes Jacobi commented: "*One face is comparatively flat the other flatly convex, both being water-worn*" (PaMeLA).

c. Cross Bank

Mildenhall, Suffolk, (TL 710750).

Holding institution
Franks House
Sturge 159



Fig.A1.2 Cross Bank leaf-point with a glazed ventral surface (photograph: author).

This complete leaf-point (Fig.A1.2) had no contextual information (Smith 1931: 32-33) and had probably lain for some time on a land-surface, based upon the glazed ventral face (Flas 2006: 78). It was first listed by Jacobi in his 1990 paper, however because of its large size and lack of context Flas (ibid) considered this only hypothetically EUP. Its equivocal EUP status is discussed in chapter five.

d. Eastall's Pit

Barham, Suffolk (TM 121513).

Holding institution
Ipswich Museum
964 123.1

This leaf-point distal fragment was listed by Campbell (1977 Vol.2: 107) as housed at the Ipswich Museum, however it was not locatable on my visit.

Eastall's Pit was a result of river terrace gravel extraction by A.H. Eastall and Company Ltd between the 1950s and 1970s. The probable open air site was situated upon the floodplain of the River Gipping, upstream of the larger site of Bramford Road. It was found by local collector Claude Garrod in 1964 (Campbell, 1977 Vol.2: 107). Fauna from the same pit included lion, wolf, hyaena, woolly mammoth, auroch. Reindeer, horse and woolly rhinoceros were the most common (Eastall's Pit PDF, 2010) but none could be associated with the leaf-point. Jacobi described the fragment as being stained bright orange, with a definite plano-convex cross section and edge damage. More recent chipping revealed a semi translucent grey flint (Jacobi Archive: Eastall's Pit).

e. Golden Cross

Hailsham, East Sussex (TQ 536124).

Holding institution
Referenced to Dr A.G. Woodcock

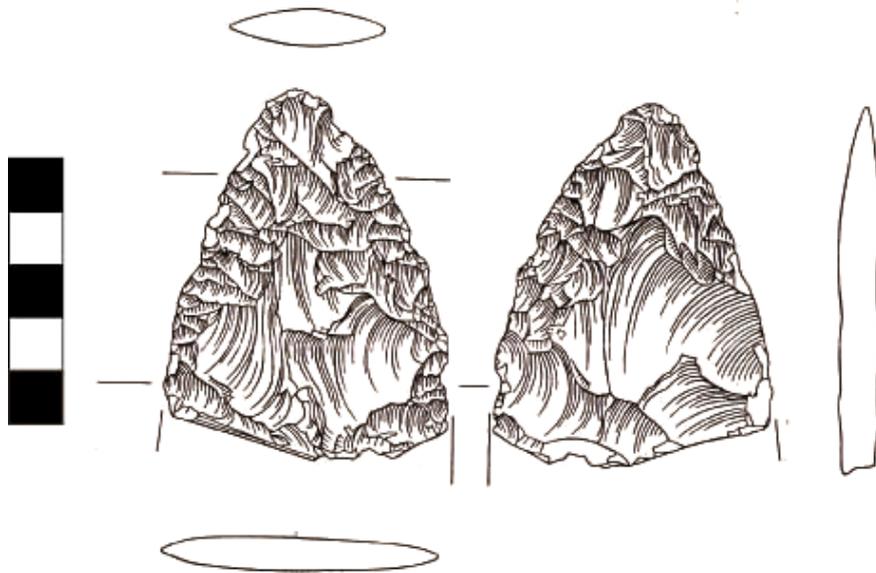


Fig.A1.3 An un-published drawing of the Golden Cross leaf-point (Martingell n.d. 'Hailsham').

Golden Cross is a village sitting on the northern edge of the Pevensey Levels. This piece (Fig.A1.3) has not been seen directly, however Jacobi's notes state that the speckled yellow blue surfaces of this distal fragment is similar to that found on other Palaeolithic surface finds. He described it as being thin and lenticular in cross section with both recent and ancient edge damage (Jacobi Archive: Golden Cross).

f. Ightham

Kent (TQ 585565).

Holding institution

Maidstone Museum

Box P58

Oldbury Hill sits ~180m ASL on a Greensand ridge which runs from the east coast to the north of the Weald. Like Beedings, this site can also be described as having commanding views across the Weald (National Trust website), albeit from

the opposite direction. Mousterian artefacts including handaxes were found in the 1890s by Benjamin Harrison below a rock-shelter on the eastern side of the hill. The find location suggests they were probably not in primary context (Wragg Sykes 2009: 43). Regarding the blade-point, no contextual information was available, and the artefact has not been seen directly. However in his archive Jacobi described its complete surface as "*very glossed*" suggesting a surface find (Jacobi Archive: Ightham).

g. Osney Lock

Oxford, Oxfordshire (SP 502060).

Holding institution
Pitt Rivers Museum
1911.41.2



Fig.A1.4 Osney Lock leaf-point (Pitt Rivers Museum Object Catalogue, n.d.).

This piece (Fig.A1.4) has not been seen or recorded, however it has been included here because of the interesting commentary by Derek Roe. A water-worn medial fragment was found in river ballast in 1911 by Henry Balfour at Osney Lock on the River Thames in the Upper Thames Valley, Oxford. Derek Roe

(1986) recognised the leaf-point and tentatively suggested it may have been dredged up from a buried Devensian channel. Relating it to others found at sites such as Kent's Cavern in the west and Robin Hood's Cave further north Roe suggested it could be illustrative of Early Upper Palaeolithic hunters following routes like the Thames Valley across the south and east of England. Roe introduced the piece to Jacobi who included it in his 1980 map of Early Upper Palaeolithic leaf-point find spots (Pitt Rivers Object Catalogue).

h. South Hams (aka Hill Park)

Dartington, Devon (SX 803626).

Holding institution

Private collection of Tom Gloyns



Fig.A1.5 South Hams leaf-point fragment (Portable Antiquities Scheme, n.d.).

This leaf-point medial fragment (Fig.A1.5) was a recent surface find from the western bank of the River Dart. Campbell (1977: 161) argued that both the Rivers Teign and Dart would have provided potential lowland to upland animal migration routes during the EUP. This was identified as a leaf-point by Bruce Bradley on the 27th of March 2012.

i. Temple Mills

Greater London (TQ 380854).

Holding institution
Liverpool City Museum
A.W. Collection 44.27.277

The site of Temple Mills lies close to Hackney Marsh, less than 5km to the north of the current River Thames. The grid reference places the site close to the path of the River Lea and this medial leaf-point fragment is described in the museum object catalogue as a '*Bifacially flaked flint knife trimmed all around the edges, very water-worn*'. This artefact has not been seen and measurements have been taken from an illustration within the Martingell archive.

j. White Colne Pit

Essex (TL 875286).

Holding institution
Ipswich Museum
935-170E



Fig.A1.6 White Colne Pit leaf-point (Martingell, n.d. 'White Colne').

Campbell (1977, Vol.2: 108) referenced this complete leaf-point (Fig.A1.6) to Ipswich Museum but it was not locatable on my visit. It was excavated by Nina Layard between 1924 and 1927 from a gravel terrace on the River Colne, found at a depth of 8ft and associated with a mammoth tusk and horse, ibex and bovid teeth. Layard described the artefact as sand polished and made from a rich chocolate flint with no signs of rolling (Layard 1927: 512). Breuil viewed this piece and highlighted how the ventral surface had been worked before the dorsal (ibid). The overall form and retouch indicated to Jacobi (1990: 278) that this

artefact may have been made on a blade thus falling between the two categories of leaf and blade-point. Measurements have been taken from the illustration.

1.1.1 Single leaf-point summary

None of the above examples have any real archaeological context. Of the ten leaf-points discussed, six are fragments and four complete. Of the nine recorded for this project metrics for seven were taken from illustrations or archives whilst only two artefacts were recorded directly. That two of the artefacts have now been lost emphasises the analytical constraints presented by these materials. If we accept their categorisation as leaf-points, their primary value is their metric and formal data, and within their broader landscape context, an association with river valleys. They also highlight an apparently high degree of fragmentation needing consideration. The situation for single blade-point finds is however slightly better.

A1.2 Single blade-point finds

Single blade-points	Not recorded	Recorded	Total
Baldings Hill	0	1	1
Bapchild	0	1	1
Bench Quarry Tunnel	0	1	1
Colby	0	1	1
Conningbrook Manor Pit	0	1	1
Creffield Road	1	0	1
Drayton	0	1	1
Earl of Dysart's Pit	0	1	1
Ffynnon Beuno	0	1	1
Goldcliff	1	0	1
Hailey Hill	0	1	1
King Arthur's Cave	0	1	1
Moordown	1	0	1
North Hinksey	1	0	1
Pin Hole Cave	0	1	1
Town Pit	0	1	1
Wallow Camp	0	1	1
Warren Hill	0	1	1
Windmill Hill	0	1	1
Totals	4	15	19

Table A1.4 Total of single blade-point finds recorded.

a. Baldings Hill

Brandon, Suffolk (TL 792863).

Holding institution
Moyses Hall Museum
1981.31

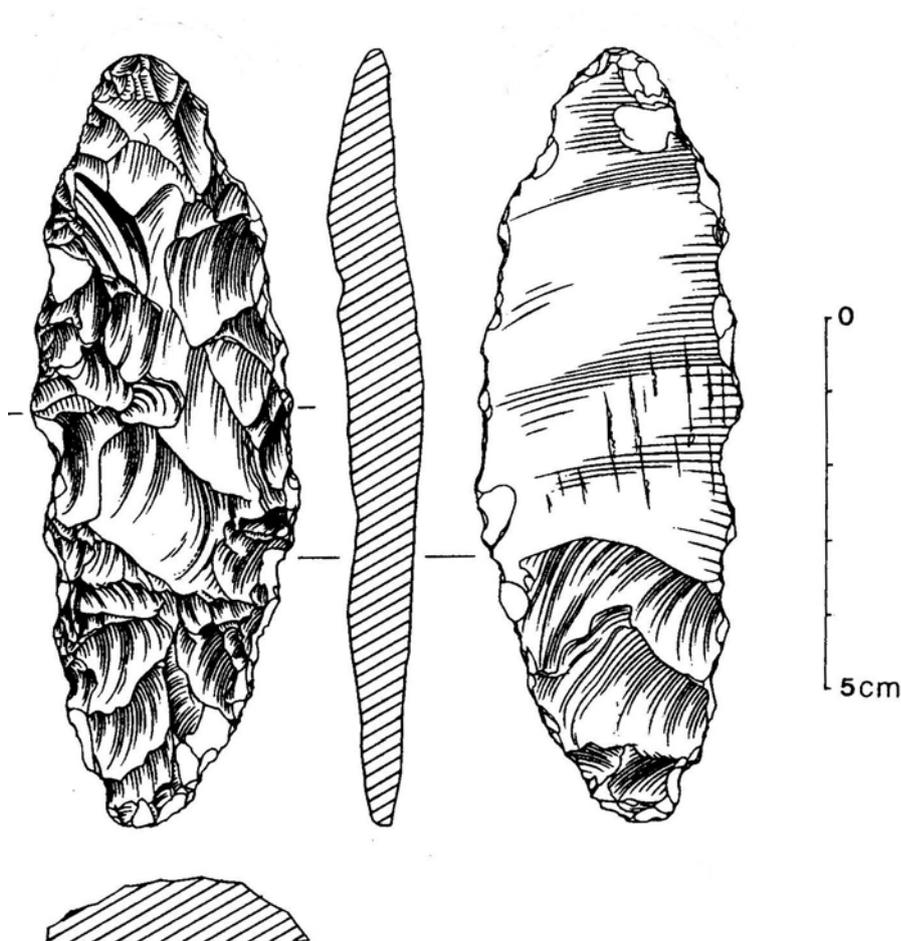


Fig.A1.7 Baldings Hill blade-point (Jacobi 2007: 275, Fig.40.1).

This was a surface find recovered by George Eagle whilst ploughing fields to the south of Brandon. It is now lost. The find spot was approximately 35m ASL on the north side of a small hill overlooking the west-flowing Little Ouse River. This artefact (Fig.A1.7) is unusual having retouch covering the whole of the dorsal surface. Jacobi described it as water-worn with mechanical damage along the edges. It was donated to the Moyses Hall Museum in 1980 by the land owner Basil W. Rought-Rought (Jacobi Archive: Baldings Hill). Chris Mycock from the museum carried out a search for the piece firstly in June, and then again in September 2012 and concluded that it was certainly missing (Mycock, pers. comm.). Whilst there was no corroborative paperwork, Mycock noted that Roger

Jacobi paid the museum a number of visits in the 1980s and possibly borrowed the piece at that time with the permission of the then curator Elizabeth Owles. The artefact was first listed in Jacobi's 1990 paper and Hazel Martingell's illustration was published in Jacobi's 2007 paper.

b. Bapchild

Kent (TQ 935625).

Holding institution
Franks House
1947.5-2.67

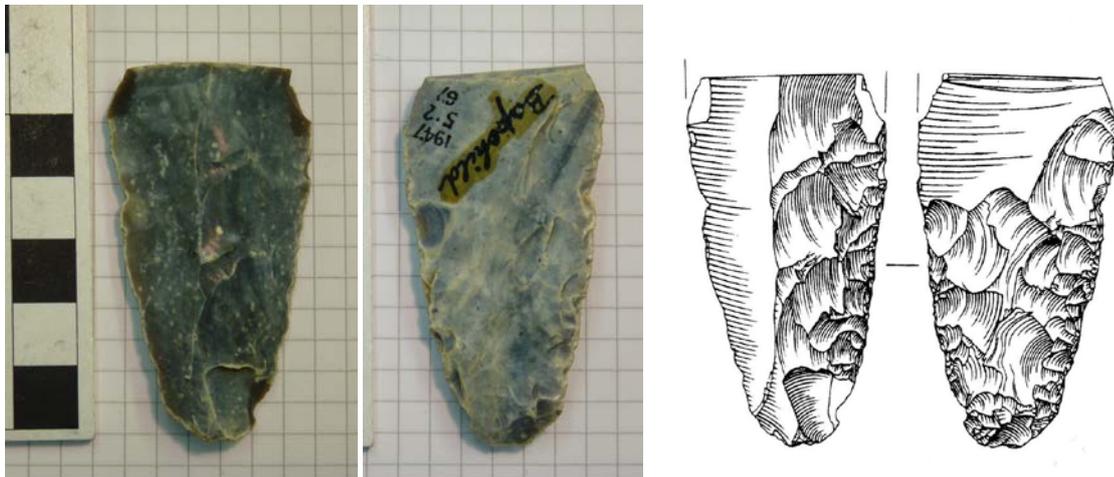


Fig.A1.8 Bapchild blade-point (photograph: author; Jacobi 2007: 276, Fig.41.3).

Bapchild sits ~20m ASL and is 3km to the south of the Swale which empties into the North Sea some 15km to the east. In a note from Roger Jacobi to Damien Flas it was stated that this blade-point (Fig.A1.8) was found by Major J.P.T Burchell at the same site as that described by Dines. In his discussion of LUP materials Jacobi (1982: 12) described artefacts (categorised by Dines (1929: 16) as Aurignacian) being patinated blue and coming from the 'brown loam' of the Heywood brick-pit at Bapchild. The blade-point is unevenly patinated with the ventral surface and the break being a blue white. The dorsal surface had only

incipient patination. The edges and dorsal ridges are in good condition however some recent chips have revealed a green black flint. The dorsal right hand margin looks original whilst the dorsal left has been worked on both faces. The overall shape suggests it was the proximal section of a blade-point and that is how it has been orientated by Jacobi (2007: 276). Furthermore, Flas (2006: 81) saw the small dorsal flute as similar to the proximal section of some Beedings pieces. However the ventral rippling if correctly interpreted indicates it was made on the distal section of the blade (Jacobi Archive: Bapchild).

c. Bench Quarry Tunnel

Torquay, Devonshire (SX 923568).

Holding institution

Torquay Museum

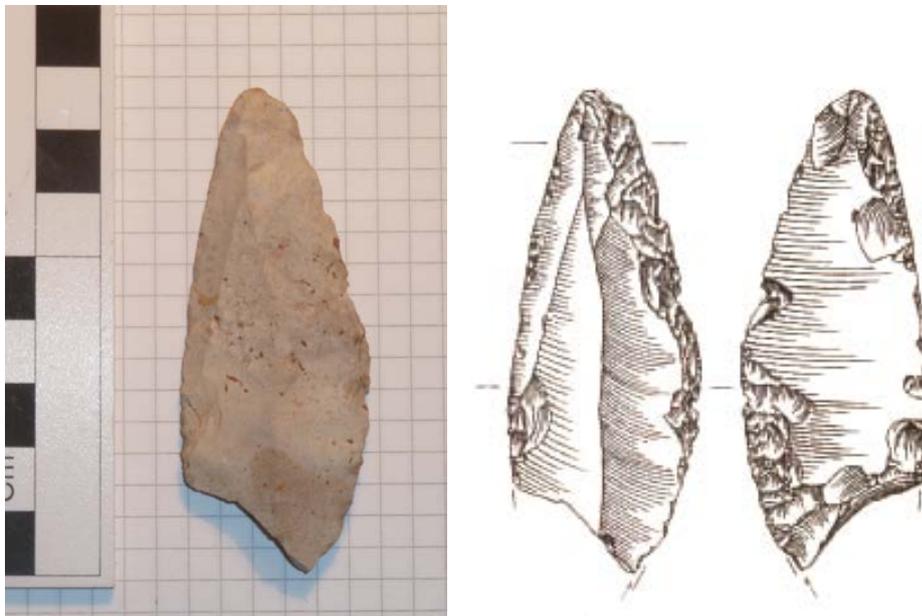


Fig.A1.9 Bench Quarry Tunnel blade-point (photograph: author; Jacobi 2007: 295, Fig.53.1).

Bench Quarry sits in close association with two other Torquay sites, Kent's Cavern and Windmill Hill Cave. The quarry is located on the limestone Furzeham

Hill on the northern side of the valley that divides the town of Brixham. As such it faces Windmill Hill on the opposite valley side (Pengelly 1861) and looks to the north east over what would have been a coastal plain.



Fig.A1.10 View from above the site of Bench Quarry Tunnel looking over what would have been the English Channel Plain (photograph: author).

Coastal quarrying work (Fig.A1.10) in 1839 revealed a fissure filled with bone remains. Further work in 1861 exposed both the fissure and a tunnel. The curator of the Museum of Torquay Natural History Society, William Else, obtained permission to excavate both the fissure and the tunnel in 1885. Only one artefact was found and that was from the cave earth some 3-4ft inside the tunnel (Pengelly 1888: 511-2). This was a blade-point in association with the right mandible of a spotted hyaena (Jacobi 2007: 293-4). Jacobi (2007: 296-7) presented two photographs of the mandible and blade-point in association. Script on the reverse of one of the photographs indicated that William Else was convinced that the blade-point had killed the hyaena (Jacobi 2007: 294). The artefact is asymmetrical and patinated white. The edges are intact and the break has a clear lip. There is a small burin like removal on the dorsal right hand edge of the break and although made from flint (Campbell 1977 Vol.2: 97) the material seems more 'cherty', making the ripples difficult to read. However, if read correctly the point has been made on the proximal end of the blade.

d. Colby

Norfolk (TG 214287).

Holding institution
Private collection
SMR number 58489

This complete blade-point was a relatively recent (2012) surface find on an arable field in Norfolk (Andrew Rogerson pers. comm.). It was identified as a blade-point by Jason Gibbons and is discussed in detail within chapter five.

e. Conningbrook Manor Pit

Kennington, Kent.

Holding institution
Private collection
J.D Clayden

Little context is available for this artefact although the site is ~35m ASL in the Stour Valley near Ashford. J.D. Clayden was a local fossil collector publishing in the 1980s and 90s, and the site was a gravel quarry. In a note to Damien Flas, Jacobi described LMP artefacts and Devensian fauna as coming from the quarry. However, the blade-point is now lost and the quarry now a lake. This medial blade-point fragment was described by Jacobi as being made from un-patinated black flint and edge damaged (Jacobi Archive: Conningbrook Manor Pit).

f. Creffield Road

Acton, London (TQ 935625).

Holding institution
Merchant Taylor's School
Artefact now lost

Roger Jacobi, in a note to Damien Flas described a blade-point from the museum at the Merchant Taylor's School "*but now lost*" (Flas 2008: 142). He also stated in the note that there was no reason to associate it with the rich Levallois finds from the same part of London. This refers to the materials exposed by gravel digging and recovered by John Allen Brown around 1885 (Burleigh 1976: 379). Allen Brown's site was ~30m ASL and four km to the north of the River Thames. Jacobi stated on his note that the blade-point was found at a depth of 6ft (1.8m) and possibly under late Devensian loess.

g. Drayton Wood Rd

Hellesdon, Norfolk (TG 199126).

Holding institution
Norwich Castle Museum
L.W Burroughs Collection 2001.227

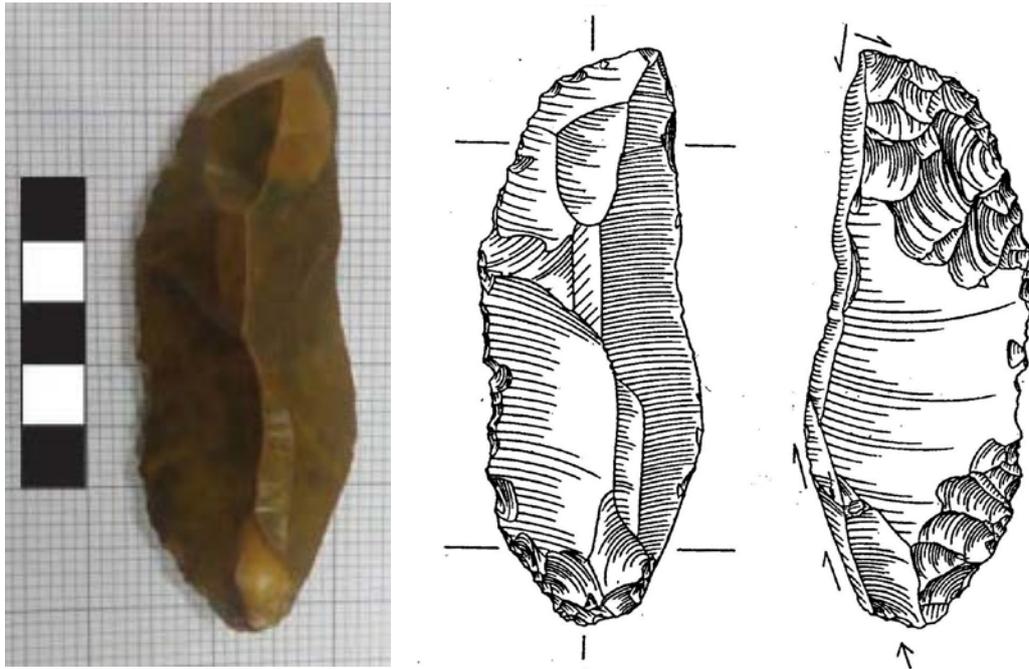


Fig.A1.11 Drayton Wood Road blade-point un-published drawing (photograph: author; illustration: Martingell, n.d. 'Hellesden')

A stained blade-point transformed into a dihedral burin (Fig.A1.11) was found by local collector L.W. Burroughs, apparently in his garden at the above address (Jacobi Archive: Drayton Wood). The find site is around 30m ASL on a plateau overlooking, and within two km of the river Wensum. This is a tributary to the larger river Yare which discharges into the North Sea further east at Great Yarmouth. Burroughs died in 2000 and his artefacts were gifted to the Norwich Castle Museum. This artefact is discussed in detail in chapter five.

h. Earl of Dysart's Pit

Ham, London (TQ 165724).

Holding institution
Museum of London
A18989



Fig.A1.12 Earl of Dysart's Pit blade-point, photograph courtesy of the Museum of London.

This large fragment (Fig.A1.12, 123x33x15mm) is on display at the Museum of London and has not been recorded directly. It was recovered from a gravel pit at Ham (Ellaby 1987: 53-4) adjacent to the River Thames in an area that is now a nature reserve. Jacobi described the blade-point as made from a glossy grey flint with notched margins (PaMeLA). Measurements have been taken from the museum record.

i. Ffynnon Beuno

Denbighshire, North Wales (SJ 080720).

Holding institution
Natural History Museum
E.194

The cave of Ffynnon Beuno is located in a Carboniferous limestone escarpment near Tremerchion in North Wales (Hicks 1886:3). The escarpment is on the north face of a west-east valley and the cave sits ~13m above the current west-flowing stream and is ~116m ASL. The artefact was recovered by Henry Hicks in 1886 from a fissure adjoining the main cave. The fissure was situated below a hole in the roof and excavating the fissure Hicks found up to 6ft of disturbed material overlying an undisturbed cave earth. The blade-point was found within the cave earth and associated with a mammoth tooth (Hicks 1886: 8). In discussing the piece Hicks (1886: 10) stated "*Another seems to be of a similar type*" indicating a second blade-point may have been recovered but since lost. The extant blade-point is complete, heavily patinated with rounded and chipped edges. The condition and location of the artefact suggest it sustained damage through movement and entered the cavern through the roof (see Fig.7.5).

j. Goldcliff

Newport, Monmouthshire (ST 372819).

Holding institution
University of Reading?
E 7000

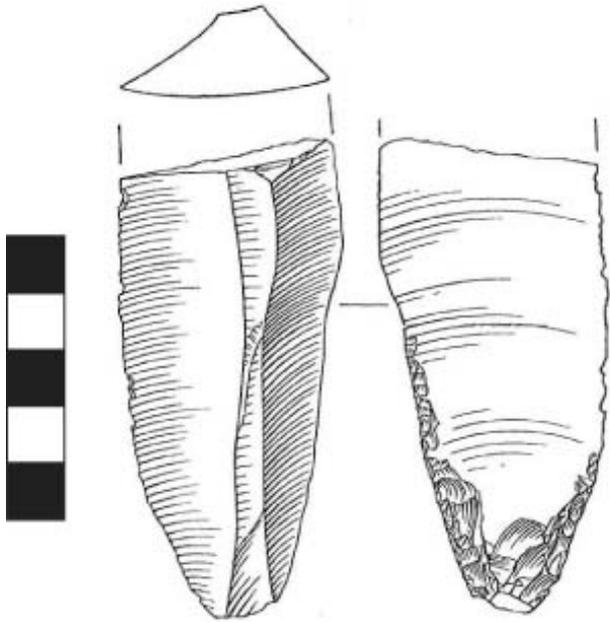


Fig.A1.13 Goldcliff blade-point (Barton 2007: 116, Fig.9.9).

This artefact was an un-stratified find from modern gravels at Goldcliff East (Fig A1.13). It was illustrated by Hazel Martingell and discussed by Nick Barton in Martin Bell's publication on the Mesolithic of Western Britain (2007). It was first listed by Jacobi in 2007 and Nick Barton (2007: 113-5) described it as being patinated with a large plain platform remnant at the proximal, and a bending break at the distal. Overall it is large, measuring 80x38x16mm and is thicker than any other blade-point recorded. The large size is interesting in relation to comments made by Stephaine Swainston (2000: 95) regarding imported flint used at Paviland. She posited that the flint may have come from chalk deposits within the now submerged Bristol Channel plain. These chalk deposits lie at 51°25' N and 5°25' W are some 30km to the West of Lundy in the mouth of the Bristol Channel. This artefact illustrates activity within what were EUP lowlands surrounding Britain. In form and size it is reminiscent of the Beedings blade-

points. Unfortunately, this illustration and the metrics were located only after my own metric analysis was complete.

k. Hainey Hill

Barway, Cambridgeshire (TL 555755).

Holding institution
Ely Museum
EM.2010.56



Fig.A1.14 Hainey Hill blade-point (photograph and illustration: author).

Hainey Hill sits ~14m ASL within the low-lying landscape of the Bedford Levels.

The site is close to two other Lincombian find-spots being ~16km from

Mildenhall and ~22km from Icklingham. The artefact (Fig.A1.14) is on display at

the Ely Museum, gifted by local collector A. Palmer sometime before 2004.

Jacobi stated some uncertainty "*stemming from whether an isolated surface find from Hainey Hill, Barway, south of Ely (Cambridgeshire) is truly Palaeolithic*"

(Jacobi, 2007: 273). It is made from a well preserved black green flint and

heavily worked. The issue of its authenticity is discussed more fully in chapter five (see Figs.5.62 and 5.63).

m. King Arthur's Cave

Whitchurch, Herefordshire (SO 547157).

Holding institution
University of Bristol Speleological Society Museum

King Arthur's Cave lies at the north western corner of Lord's Wood within the winding Upper Wye Gorge. It is ~90m above the east-west flowing river and formed within a Carboniferous Limestone cliff (Campbell 1977: 43). The cave is made up of a broad entrance and two main chambers and was initially excavated by W.S Symonds in 1871. He found the contents to be largely disturbed with abundant remains of horse and hyaena (Garrod 1926: 76, 77). A blade-point fragment was recovered in the 1920s by T.F. Hewer and H. Taylor of the Bristol Speleological Society (Garrod 1926: 79; Campbell 1977, Vol.2: 105) from 'the passage' leading from the entrance to the second chamber (Hewer 1926: 223). The blade-point was found at a depth of eighteen inches within an 'upper cave earth' and the excavators believed the passage to be undisturbed (Hewer 1926: 222). Fauna from the same level was dominated by hyaena, woolly rhinoceros and horse (Hewer 1926: 224, 227). Arthur ApSimon (et al. 1992) made a comprehensive reassessment of the site, fauna and artefacts and saw the blade-point as being associated with hyaena denning. Furthermore, Mesolithic, LUP flints and Roman pottery seemed to have infiltrated the same layer indicating disturbance (ApSimon et al. 1992: 226-7). Consequently, when Flas reviewed the excavation history and the artefact for his thesis (2006: 58) he described

this blade-point as a short proximal fragment with damaged margins found in a disturbed context.

n. Moordown

Bournemouth, Dorset (SZ 095945).

This first appeared in Jacobi's 1990 publication and on a note to Damien Flas he described it as in private possession, excavated in 1907 and recovered from a depth of 5ft (Flas 2006: 81).

o. North Hinksey

Oxfordshire (SP 494055).

Holding institution
Ashmolean Museum

This was located within the collections of the Ashmolean Museum by Gill Hey and Alison Roberts in 2008. The blade-point was labelled as "*Dredged up in North Hinksey backwater: 1904*". Evidence, they argue for the possibility of more material emerging from the Thames floodplain gravels (Hey and Roberts 2008: 2). This artefact has not been seen.

p. Pin Hole Cave

Creswell Crags, Derbyshire (SK 553742).

Holding institution
Manchester Museum
33848

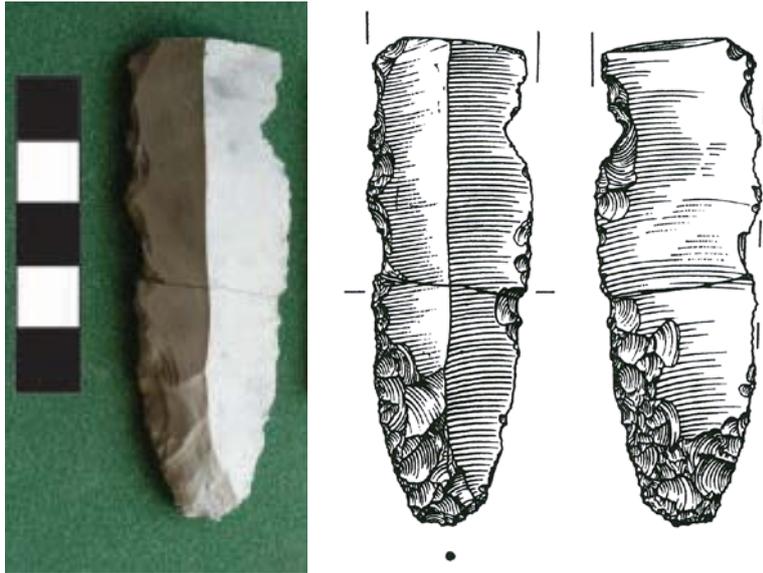


Fig.A1.15 Pin Hole blade-point (photograph: author; Jacobi 2007: 294, Fig.52.1).

Pin Hole Cave is one of twenty four caves and small shelters located within a ravine of Lower Permian Limestone known as Creswell Crags. The ravine is situated north of Mansfield and south of Worksop and forms part of the Derbyshire-Nottinghamshire border. It is approximately one kilometre long and orientated from west to east separating lowlands to the east from the Peak District uplands to the west (Garrod 1926: 122; Campbell 1977: 171). The terrain directly above the cave provides a natural high point with vistas to both the west and the east.

Lying at the western end of the ravine, Pin Hole Cave penetrates 50m into the north face of the cliff. The fissure is between one and two metres wide, and twenty metres into the cliff opens up into a large chamber with high roof and avens onto the plateau above (Jacobi 2007: 291). Off this large chamber a passage opens to the east and it is here that the broken blade-point (Fig.A1.15) was found by Leslie Armstrong between 1924 and 1936 (ibid). The stratigraphy of Pin Hole is complex and Jacobi has argued that the materials filling this

eastern passage may have migrated down a gradient from the main chamber (Jacobi 2007: 293). The blade-point itself is patinated white and anciently broken with edge chipping and notching supporting the idea of movement. Rogan Jenkinson (1984: 63) observed that "*Today, considerable sediment from the top of the northern limestone outcrop washes into the cave from the areas where solution extends to the surface. This is presumably the same process which caused the build up of internal sediments within the cave during the Devensian*". If correct this is consistent with the blade-point entering the main chamber through the roof and migrating into the eastern chamber.

r. Town Pit

Icklingham, Suffolk (TL 790715).

Holding institution
Franks House
P1975 3-6.20



Fig.A1.16 The large Town Pit blade-point fragment (photograph: author).

Icklingham sits on the main A1101 and the straddles the River Lark. It is approximately four miles to the south east of Mildenhall and connected by both the river and the road. This large blade-point fragment (Fig.A1.16) was recovered in 1865 from a gravel pit (Flas 2008: 146) and first listed by Jacobi in 1990. It has been differentially patinated with a gloss consistent with the ventral surface having been exposed for some time. The edges are heavily notched and the dorsal ridges worn. Recent damage has revealed a translucent black flint and the proximal section has the remnants of a plain platform. This artefact is discussed in detail within chapter five.

s. Wallow Camp

Salmonby, Lincolnshire (TF 320747).

Holding institution
Possibly Lincoln Museum
HER 42966

This broken blade-point was found by Geoffrey V. Taylor in a field to the north west of the village of Salmonby, Lincolnshire. Much of Lincolnshire's Palaeolithic archaeology was obliterated by the ice sheets of the Last Glacial Maximum. However some areas of the High Wolds stood above the grinding ice and so some Palaeolithic archaeology has been protected. Salmonby stands at the head of the Lymn Valley and the River Lymn flows down the valley in a south easterly direction to join the Steeping River which empties out into the Wash further to the south east. (Robinson 2000: 41). The blade-point was first listed by Jacobi in 1980. His archival notes are dated 1987 and in them he commented upon the bright orange staining of the grey flint and the ancient break at the proximal end. Joanna Richards produced a scale drawing of the artefact for Jacobi in

1993, and after Taylor's death in 1997 some of his materials went to 'The Collection' at Lincoln Museum (Richards 2012 pers. comm.) however I have been unable to confirm this. Measurements have been taken from the Jacobi Archive.

t. Warren Hill (aka Three Hills)

Mildenhall, Suffolk (TL 740740).

Holding institution
Franks House
1928 1-17.7

Within the relatively flat Bedford Levels, Warren Hill sits ~30m ASL on the north bank of the River Lark. In the late 1800s the site was used for gravel extraction and has become well known for the large quantities of handaxes recovered (Wymer 1999). Flas (2008: 16) described this medial fragment as a surface find and in his archival notes Jacobi stated how the staining links this piece to other artefacts from Warren Hill. The edges of this piece are heavily notched, the ridges worn and it was illustrated in Jacobi (2007: 276, Fig.41.1).

w. Windmill Hill Cave (aka Brixham Cave)

Brixham, Devonshire (SX 924559).

Holding institution
Franks House
POA 180/66

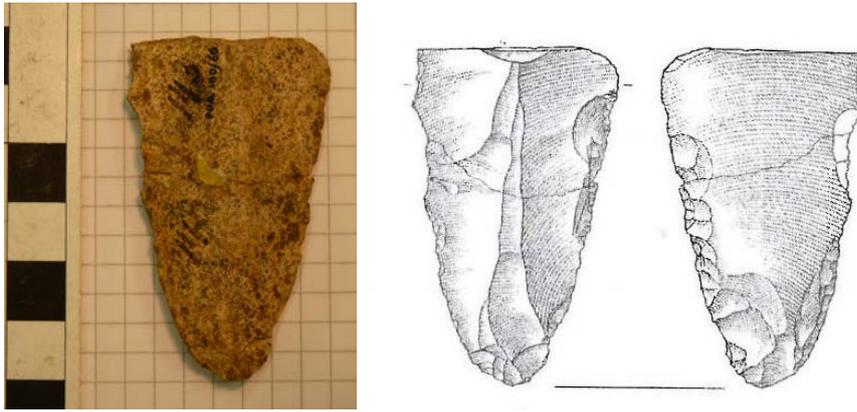


Fig.A1.17 Windmill Hill Cave blade-point (photograph: author; Berridge and Roberts 1990: 27).

Windmill Hill Cave is situated on the southern face of the valley that divides the town of Brixham and the cavern is now situated in the cellar of 107 Mount Pleasant Road. In 1858 quarrying revealed a series of large fissures within the Devonian limestone that together formed the Windmill Hill Cave (Pengelly 1873: 533). The proximal end of a blade-point (Fig.A1.17) was recovered along with the proximal end of a blade that may be the remains of an unfinished blade-point (Berridge and Roberts 1990: 26). The cave was excavated by William Pengelly in 1858 (Pengelly 1873: 476) and his systematic excavation recovered a small number of flint tools in association with the remains of extinct mammoth, hyaena, horse and rhinoceros (Pengelly 1873: 558). It was agreed that the recovered flints would be housed at the British Museum and the report was published in 1873 (Pengelly 1873: 475). It presented a complex history with cave inclusions arising from carnivore action, water inundation and entry through fissures from above. In 1989 Peter Berridge and Alison Roberts reviewed the lithic collections recovered from caves in the Torbay area held within the British Museum. In relation to Windmill Hill they identified a discrepancy between the number of pieces recorded within the original reports (thirty six pieces) and the quantity catalogued by the British Museum (thirty four) (Berridge and Roberts 1990: 24).

At the same time they recognised three pieces within the Kent's Cavern collection that were marked in the same manner as the Windmill Hill artefacts. One of these was the proximal end of a blade-point, and the other the proximal end of a blade that could be an unfinished blade-point. Berridge and Roberts (1990: 28) have explained the refitting of spatially disparate artefacts by the objects being washed into the fissure from at least two entrances. The blade-point fragment is made from a local Greensand chert and its main characteristic is the coarseness of the material making a reading of the ripples difficult. The second artefact described by Berridge and Roberts (1990: 26) as a possible blade-point (Fig.A1.18) broken during manufacture is in two parts and only the proximal base has been seen and is presented here.



Fig.A1.18 Windmill Hill Cave possible blade-point fragment (photograph: author).

1.2.1 Single blade-point summary

Of the fifteen pieces recorded, four were classed as complete whilst eleven were fragments. Ten of these artefacts were recorded directly whilst the remaining five had metrics and descriptions taken from either illustrations, archives or both. An important aspect to recognise is that five of the fifteen were from cave sites however, of these five artefacts, three were apparently intrusive and entered these environments either through the roof (Ffynnon Beuno, Pin Hole

Cave) or via debris flow (Windmill Hill Cave). Pieces such as those from Drayton Wood Rd and Hainey Hill illustrate how formal variability within the corpus needs consideration and both the Earl of Dysart's Pit and Town Pit fragments indicate the potentially large size of some pieces. Having dealt with the single finds it is assemblages which form the bulk of the available materials. They are discussed next.

1.3 Artefact assemblages

When Damien Flas discussed and listed materials from collections he amalgamated leaf and blade-points together in his totals. In contrast both Campbell and Jacobi differentiated between the two types within their tables. Furthermore, because of their differing data gathering strategies (Campbell pers. comm.) researcher totals could differ based upon what they had been able to locate and record. My approach has had to deal with these same issues. Consequently I have used the literature from Campbell, Jacobi and Flas to assess what is probably available. Their general agreement on totals and artefacts has formed a useful core. However, this unequivocal core is surrounded by a penumbra of artefacts that can be discussed with less confidence. Therefore variance within previous researcher totals has been explored and pertinent aspects are discussed within the relevant site summary. My table presents amalgamated type fossil totals but the discussion differentiates between leaf-points and blade-points.

Collections	Not recorded	Recorded	Total
Badger Hole	0	4	4
Beedings	1	42	43
Bramford Road	0	7	7(+)
Glaston	0	2	2
Hyaena Den	0	2	2
Kent's Cavern	1	10	11(?)
Paviland Cave	0	9	9
Robin Hood's Cave	3	11	14
Soldier's Hole	0	3	3
Sutton Courtney	1	1	2
Uphill Cave 8	0	4	4
Totals	6	95	101

Table.A1.5 Sites, type fossils and numbers recorded. (+) means there are probably more artefacts present than recognised and recorded. (?) indicates possible duplication within the literature.

a. Badger Hole

Wookey Hole Ravine, Somerset (ST 532479).

Holding institutions
Wells and Mendip Museum
Cambridge University Museum of Archaeology and Anthropology

Artefacts	Qty
Blade-points	4
Debitage	17

Badger Hole is a cave situated on the east side of the Wookey Hole ravine and above a second blade-point cave, the Hyaena Den. It is ~20m above the floor of the present valley and ~70m ASL (Campbell 1977: 49; Somerset HER). The cave was excavated by Herbert Balch between 1938 and 1956 and he recovered four blade-points (Ashworth 1971: 1, 17). Campbell used Balch's diaries to map their recovery positions to within the cave entrance (Campbell 1977: 49).

However, the inner cave had a hole in the roof opening onto the plateau above. Below this opening a cone of (water borne) detritus had formed (Ashworth, 1971: 3) and edge damage on the artefacts suggests that at least some of the blade-points may have entered the cave through the roof (McBurney 1959: 265; Jacobi 2000: 47). To further complicate matters, much of the cave deposits had been disturbed by badgers (Jacobi and Carrant 2011: 57). Altogether Campbell (1977 Vol.2: 98-99) presented a total of 54 EUP artefacts. However Jacobi (2000: 47) reviewed the collection and distilled this figure down to twenty one spread between two institutions. This site and its artefacts are discussed in detail in chapters five, six and seven.

b. Beedings

Pulborough, Sussex (TQ 075205).

Holding institution
Franks House

Artefacts	Qty
Blade-points	43
<i>Cores and debitage</i>	~100

The site of Beedings is located on the northern scarp of an east-west Greensand ridge. At 90m ASL there are good views over the surrounding landscape (Jacobi 1986: 62). In the late 1890s foundations were constructed for the physician John Harley's house. In the process 2300 flints were recovered from sand pockets within the plateau (Curwen 1949: 192). These artefacts were curated and displayed by Harley, however the site itself now languishes below the footprint of the house. After his death Harley's collection was donated to the Museum of Sussex Archaeology. The assemblage was culled by local archaeologist Elliot Curwen sometime between 1939 and 1949. This left a remnant collection comprising 199 retouched pieces. The presence of blade-points within this remnant collection was recognised by Roger Jacobi in the mid 1970s (Jacobi 1980) and altogether he identified thirty six largely fragmented blade-points along with a further seven transformed into other tools (Jacobi 2007: 229, 274). In addition, the collection contained end-scrapers, burins, cores and *debitage* presenting a rare opportunity to understand blade-points within a technological context. This became a focus for Jacobi and his growing understanding is reflected in a series of publications from 1980 onwards. In 2007 he presented a comprehensive review of the Beedings materials based

upon analysis over three decades. Beedings is the site with the largest number of blade-points in Britain and one of the largest LRJ sites overall. Flas (2008: 16) in his review of the collection recognised 140 elements that he could confidently ascribe to the Lincombian. The particular value of the Beedings lithics lies not just in their quantity but in the inter-relationships between the different elements within the collection. It is this aspect that provides an insight into the technology. This was the focus of Jacobi's 2007 paper and some of those inter-relationships are reviewed here.

b(i) Raw material

The majority of blade-points from Beedings were made from a black grey flint and whilst there was some variety a significant portion of the remainder were formed from a grey mottled flint (Fig.A1.19). Jacobi (1986: 66) initially observed that at the Arun Gap chalk beds contained large seams of flint (Jacobi 1986: 66) and lay only ~15km to the south. At that point he presumably thought the flint used to produce the blade-points was local. However, after having a selection of the artefact's microstructure examined Jacobi presented the possibility of a material link with Belgium (Jacobi 2007: 234).



Fig.A1.19 Examples of the predominant materials from the original Beedings collection (photographs: author).

A defining characteristic of the materials from Beedings is their excellent condition, presumably because they were rapidly preserved within the gulls. Gulls are susceptible to widening under periglacial conditions (Jacobi 2007: 232) and as they widen can become filled with overlying material. Jacobi pointed out the development of one sided patination on a small number of artefacts (Fig.A1.20) indicating they had been exposed on the plateau surface for some time before burial within the gulls. On some pieces this manifests as a white dendritic patina (ibid).



Fig.A1.20 Example of single sided white dendritic patination within the original Beedings collection (photographs: author).

Whilst no faunal remains were preserved, Jacobi posited that the view would have made it an ideal location for EUP hunters to observe the surrounding landscape and monitor prey (Jacobi 2007: 232, 273).

b(ii) EUP tools

Jacobi identified 80 EUP retouched tools (Jacobi 2007: 245) of which 36 were blade-points or fragments thereof. He also discussed the transformation of seven further blade-points into other tools (Jacobi 2007: 243). This provided a strong linkage between the blade-points and the other tools made on blades and from similar materials. However the seven transformed blade-points also created categorical problems when organising the materials. Jacobi ultimately resolved this by categorising a transformed blade-point under its new tool form heading.

Burins	11
End-scrapers	7
Piercer	1
Retouched truncations	2
Blade-points	36
Pieces with lateral retouch	9
Kostenki knives	5
Denticulate	1
Composite tools	7
Other	1
Total	80

Table.A1.6 Beedings EUP tool categories as organised by Jacobi (2007: 245, Table 4).

The issue of blade-points being transformed into other tools such as burins, end-scrapers and Kostenki Knives is addressed within subsequent chapters.

However, as well as blade-points and tools the collection contained both cores and *debitage*. *Debitage* can be broken down into blades and flakes with blades discussed first. As well as raw material and condition the use of opposed platform production linked the blade-points to four large unbroken blades present at the site (see Jacobi 2007: 236, Fig.4). As Jacobi (2007: 235) observed, the size and form of these blades would have made them ideal for transformation into blade-points. Complete blade-points tend to be heavily reduced at the proximal end however these un-worked blades had their proximal

sections intact. Three of the four complete blades retained faceted platform remnants and lips indicative of production using a soft percussor (ibid). There were 15 flakes within the collection and one large flake also had a faceted platform remnant and lip (Jacobi 2007: 234), apparently produced in a similar manner to the blades. Both this piece and a broken cortical blade (Jacobi 2007: 237, Fig.5.1) seem to be indicative of an earlier phase of core manufacture. Jacobi also identified five small opposed platform cores with faceted platforms. An interesting contrast observed by Flas (2006: 76) was that although the cores were of a similar material and technology they were universally small in contrast to the large size of the blades. This observation is explored within chapter seven.

B(iii) Micro-*debitage*

Because this early collection has been fundamental to providing a typological and technological understanding of the industry (Jacobi 2007), when proposals to plant a vineyard on the Beedings plateau were submitted, English Heritage funded the excavation of seven trenches in a field to the north of the original site. Excavations in 2007 and 2008 targeted one fissure which proved to contain EUP artefacts (Pope 2008: 34). One result was to provide a stratigraphic context to better understand the original collection (Pope et al. 2013). However, both macro and micro-*debitage* was recovered and made available for analysis within this project. This material is discussed in detail in chapters six and seven.

c. Bramford Road (aka Warren Livingstone Pit)

Ipswich, Suffolk (TM 138455).

Holding institution

Ipswich Museum

Artefacts	Qty
Leaf-points	4
Pre-forms	3
Blade-points	3

During the 1930s the Warren Livingstone gravel pit was located at Bramford Road in Ipswich, on the north bank of the River Gipping. Gravels were raised using a suction pump and size sorted using rotary sieves (Moir 1931: 187). It was from within these size-sorted heaps that James Reid Moir (collecting between 1931 and 1938) found a range of artefacts including handaxes, leaf-points, blade-points and one EUP Font Robert tanged point (Moir 1931; Flas 2008: 142). Recent edge damage evidenced on some artefacts (Fig.A1.21) was very likely a result of this mechanical extraction process.



Fig.A1.21 Bramford Road blade-point 1 bearing modern edge damage (photograph: author).

However, other pieces within the collection emerged from this same process relatively unscathed. Bramford Road blade-point 2 (Fig.A1.22) had significant ancient edge notching but was relatively free from modern damage. It would seem that at least some pieces experienced significant movement in antiquity.



Fig.A1.22 Bramford Road blade-point 2 bearing ancient edge notching (photograph: author).

Fauna from the site included mammoth, reindeer, woolly rhinoceros and horse (Campbell 1977: 149, Vol.2: 108) and Moir (1931: 187) believed the quantity of artefacts recovered was indicative of a large site. Jacobi and Higham (2011: 186, Figs.11.3–11.4) tentatively listed nine leaf-points and four blade-points, whilst Campbell (1977, Vol. 2: 108) discussed 21 EUP artefacts. The Ipswich Museum had 21 boxes labelled Bramford Road and on my visit I was able to review the artefacts from only two of these. Some selection had already occurred as much of the material noted by Jacobi was together within boxes 144 and 145. A cursory appraisal of the other boxes, as well as the totals presented by previous authors suggests more material is probably present. The importance of Bramford Road to this thesis is twofold: firstly it contained leaf-point pre-forms, something apparently unique to this collection; secondly this material was not reviewed by Flas for his 2006 thesis. These artefacts are more fully discussed in chapter five.

d. Glaston (aka Grange Farm)

Leicestershire (SK 896005).

Artefacts	Qty
Blade-points	2

<i>Cores and debitage</i>	~80
---------------------------	-----

Holding institutions

University of Leicester Archaeological Services
--

The site of Glaston sits upon an east west ridge ~122m ASL and ~80 km from the east coast. This open air site was excavated by ULAS in 2000. Whilst excavated using modern methods it became clear that the stratigraphy was complicated by the plateau having collapsed in upon itself (Collcut 2001). Furthermore, the site had also been a hyaena den (Cooper et al. 2012). As well as a complete and a fragmented blade-point significant amounts of micro-*debitage* were recovered. No other periods were present. Damien Flas (2006: 70) recognised how a number of pieces may have been the result of the application of flat invasive retouch to a blade edge. Fauna was also present at Glaston including spirally smashed horse long-bones interpreted as the result of human action. This site is discussed in more detail in chapter six and seven.

e. Hyaena Den

Wookey Hole Ravine, Somerset (ST 532479).

Holding institutions

Oxford University Museum Brighton Museum and Art Gallery

The Hyaena Den is a cave situated on the floor of the east side of the Wookey Hole ravine (Jacobi and Hawkes 1993: 369) and below the Badger Hole. It was revealed by accident in 1852 by workmen cutting a mill leat, and 12 feet of the cave entrance was removed by this cutting (Dawkins 1874: 295-6). The cave remaining comprised an entrance chamber with a roof opening at the back, and

two further passages leading north and south respectively (Jacobi and Hawkes 1993: 369). It was excavated by William Boyd Dawkins from 1859 probably until 1864 (Tratman et al. 1971: 246, 247) and famously he found stone tools sandwiched between trampled hyaena coprolites. The cave was emptied by his workmen (by candle-light) and Dawkins examined the material as it came out (Tratman et al. 1971: 248). Consequently there is no real archaeological context for the ~35 artefacts recovered from what was a hyaena den (Dawkins 1874: 310). These artefacts included two flint blade-points and two handaxes (Campbell 1977: 99). Dorothy Garrod (1926: 101, Fig.21.1) illustrated one of the blade-points that was housed in the Oxford University Museum but highlighted how most of the implements listed by Boyd Dawkins were by then missing (Garrod 1926: 100). Tratman and colleagues (et al. 1971: 262, Fig.44a) provided an illustration of the Oxford University Museum artefact, along with a tracing of the second missing blade-point taken from a photograph in the James Parker collection from the same museum. According to Tratman and colleagues (et al. 1971: 248) James Parker and Henry Catt of Brighton assisted Boyd Dawkins in 1861. The PaMeLA database listed the missing blade-point as being housed at Brighton Museum and Art Gallery. This proved to be correct and the artefact is discussed in detail in chapter five. The blade-point at Brighton was donated by Henry Willets (Maxstead pers. comm.). Henry Catt changed his name to Willets at some point after 1861 (Tratman et al. 1971: 248) and so the photo at Oxford University Museum would seem then to have been taken by James Parker of Henry Catt / Willets' blade-point (Fig.A1.23).

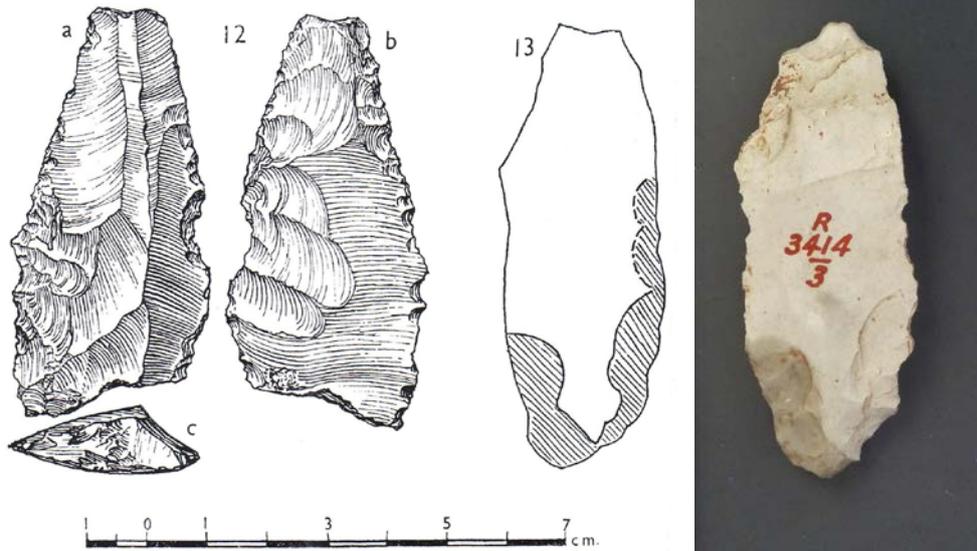


Fig.A1.23 Hyaena Den blade-points (Tratman et al. 1971: 262, Fig.44a, photograph: author).

Tratman and colleagues (et al. 1971: 257) discussing their subsequent excavation at Hyaena Den explained how at least some of the infilling was probably the result of climate change leading to rapid erosion due to cold conditions. They stated "*The stratification implies that the main source of infilling of the cave was weathering products from the hillside and that these entered the cave through what was then, and again is now an extensive roof opening*" (Tratman et al. 1971: 254). Certainly the blade-point recorded at Brighton Museum has notched edges indicating it had experienced movement through sediment. It would seem from the artefact condition and finds context that at least one of the blade-points may have entered the cave through the roof. The second blade-point has not been examined directly although when Flas reviewed it he thought the notch and the edge chipping were probably due to taphonomic causes (Flas 2006: 52). This is in contrast to Tratman and colleagues (et al. 1971: 261) who interpreted it as humanly notched and utilised. In relation to associated fauna Boyd Dawkins stated: "*The remains of Equus by far predominate over the rest*" (Boyd Dawkins 1862: 122). The same was found to

be true within fallen material examined during the later excavation (Tratman et al. 1971: 253).

f. Kent's Cavern

Torquay, Devonshire (SX 934641).

Holding institutions
Bolton Museum and Art Gallery
Franks House
Natural History Museum
Torquay Museum

Artefacts	Qty
Leaf-points	1
Blade-points	10 (?)

Kent's Cavern is the third largest cave in Devon and located in Lincombe Hill, formed from Devonian limestone. Lincombe Hill is about one mile east of Torquay harbour and forms part of the west side of the steep and winding Ilsham valley (Pengelly 1867: 1). Kent's Cavern is also geographically close to two other Lincombian sites, Bench Quarry Tunnel and Windmill Hill Cave, making it a part of a rich EUP landscape context (Campbell 1977: 141). Within this landscape, Lincombe Hill is approximately half way between the Teign and Dart valleys which Campbell has argued may have been used in the Palaeolithic past as animal migration routes from the English Channel plain to the Dartmoor uplands approximately 12 miles west (ibid). As already discussed the single leaf-point fragment from South Hams was found higher up the Dart Valley.

Jacobi stated in his summary that there were nine blade-points and one "*slightly unusual*" leaf-point from Kent's Cavern (Jacobi 2007: 281) and Flas reiterated

that total (Flas 2008: 16). Jacobi broke this total down to: one blade-point recorded in print, in MacEnery's plate T no.5. in *Cavern Researches* (Garrod 1926: 27; Jacobi 2007: 277). Its location is now unknown although there is a cast at Torquay Museum; William Pengelly recovered seven blade-points and the unusual leaf-point between 1865 and 1869 (Jacobi 2007: 281). Finally, one blade-point was sold to the Bolton Museum and Art Gallery by William Else in 1903 (ibid). This blade-point is significant because whilst relatively un-discussed, it has been made from a local Cretaceous Upper Greensand chert (Fig.A1.24; Swainston 2000: 96; Jacobi 2007: 281).

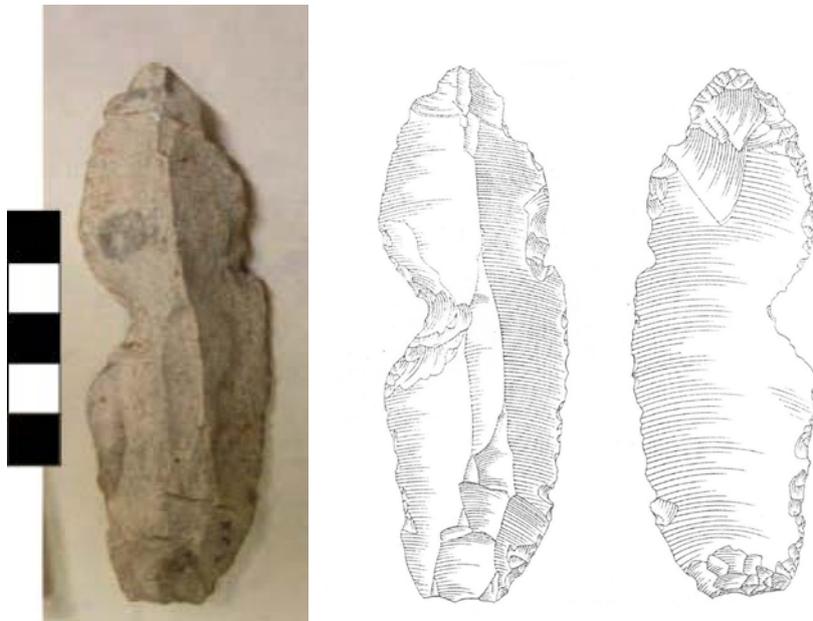


Fig.A1.24 Kent's Cavern Cretaceous Upper Greensand chert blade-point (photograph: author; illustration: Martingell, n.d.).

However, whilst Jacobi and Flas's totals match, they contrast with Campbell's summary. Campbell (1977 Vol.2: 97) lists one extra blade-point recovered by Ogilvie between 1926 and 1940 in addition to nine blade-points and one leaf-point recovered by Pengelly. If we set aside Ogilvie's find, Jacobi and Campbell's

totals are the same. However, Jacobi's total included MacEnery's blade-point whereas Campbell's was made up only of Pengelly's finds. Campbell illustrated a distal tip along with three other artefacts recovered by Pengelly from spits 2-4, layer BA/2 in the southern sector of the cave (Campbell 1977 Vol.2: 236, Fig.86.3). This was apparently the same layer worked by Ogilvie (Campbell 1977 Vol.2: 97). Ogilvie's blade-point tip is at the Torquay Museum and is clearly labelled as such (Fig.A1.25). This artefact has been recorded and is unequivocal.

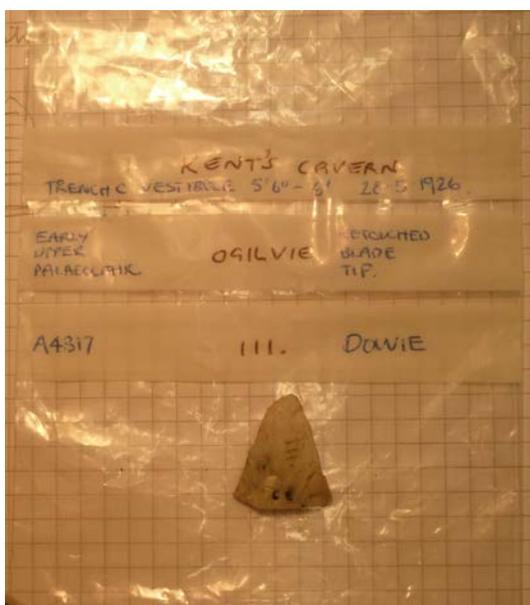


Fig.A1.25 Blade-point tip recovered by Ogilvie (photograph: author).

However it is different in shape and size to the illustration presented by Campbell and so it is feasible that he has in fact illustrated a further blade-point fragment recovered by Pengelly. Alternatively, the illustration is an inaccurate representation of Ogilvie's find. Because of this potential duplication Campbell's total figure of eleven type fossils is tentatively accepted but only the ten unequivocal artefacts have been used within the analysis.

Virtually all the blade-points were recovered from the cave earth in the southern section of the cavern (Jacobi 2007: 281). Pengelly could recognize no internal

stratification and stated "*Nowhere has there been the least approach to stratification or a symmetrical arrangement of materials*" (Pengelly, 1867: 6).

Flas (2008: 16) classed the context as mixed and many of the blade-points show edge damage consistent with movement (Jacobi and Higham 2011: 181-2). At the north eastern end of the cavern the cave earth was several metres thick (Proctor et al. 2005) and Jacobi has argued that material is likely to have entered the cave through the current north and south entrances via water action from the valley floor (Jacobi 2007: 281).

g. Paviland Cave (aka. Goat's Hole)

Rhossili, Glamorganshire (SS 437859).

Holding institutions	
Franks House	
National Museum of Wales	
Oxford University Museum	
Royal Institution of South Wales Museum	

Artefacts	Qty
Leaf-points	1
Blade-points	8

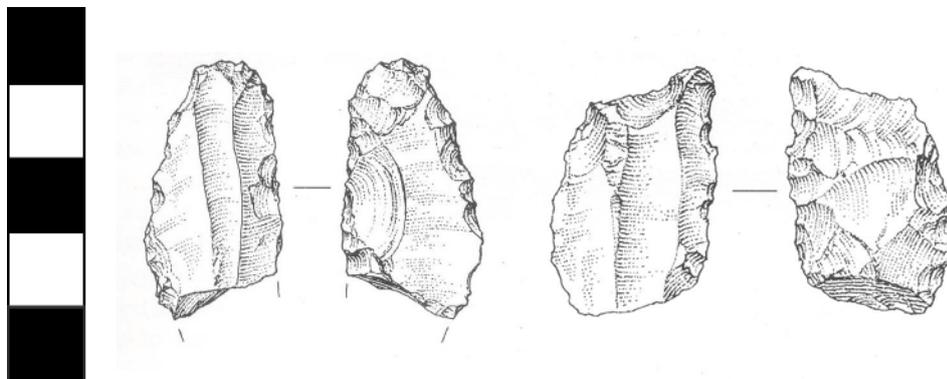


Fig.A1.26 Rhyolite and Carboniferous chert blade-point fragments from Paviland Cave (Swainston 2000: 101, Fig.6.3).

Paviland Cave is one of the most westerly sites discussed within this thesis. It is situated on the tip of the Gower peninsula facing south west and overlooking what would have been the Bristol Channel Plain. Whilst the current entrance sits ~15m ASL, like many of the other sites already discussed, the views from above the cave are impressive. At 70m ASL Campbell (1977: 144) observed how it was possible to see as far as Lundy (~47km to the SW) and Exmoor (~50km to the SE). During a period with lowered sea levels, less pollution and clear skies this line of sight would have been significantly improved. The cave sits next to Foxhole Slade, a steep and narrow ravine that would have provided access to the Gower plateau from the plain below.

Informal collecting began at Paviland in the 1820s but the excavation by William Sollas in 1912 recovered the majority of materials and at least some (Sollas 1913: 352, Fig.17.118) if not all of the type fossils discussed here. A more complete excavation history is discussed in Stephen Aldhouse-Green's (2000) 'definitive' report, however Sollas (1913: 336) described the cave context as '*much disturbed*' and without stratigraphic coherence. In his review Flas (2008: 16) recognised nine type fossils comprising seven blade-points, one leaf-point fragment, plus one further bifacially worked fragment (cf. Jacobi 2007: 274 Fig. 39, 289 Fig.49). Because of its small size this bifacial piece could be attributable to either category. Within this thesis it has been classed as a blade-point although it is recognised that this is equivocal. The blade-points from the site are important within this discussion being generally small, fragmented and made from a variety of materials. Five of the blade-points are made from an opaque black fine grained local Carboniferous chert (Fig.A1.26; Swainston 2000: 96). Both the leaf-point and the bifacial fragment have been made from an imported

good quality flint (Swainston 2000: 95). One of the blade-points is also made from this imported flint and the final blade-point from Rhyolite, a semi opaque grey green to black material (Fig.A1.26). Jacobi (1980: 30) has discussed how *"The edges of the leaf-points from Paviland...are considerably notched and abraded (concasse) as a result of movement within the deposit during a phase of cryoturbation"*.

Campbell (1977 Vol.2: 103) listed around 4400 pieces of EUP stone waste from Paviland. However Stephanie Swainston (2000: 95-113) made a comprehensive review of the lithics and one of the problems she encountered was that of artefacts being spread between at least four (1977 Vol.2: 102), but probably seven institutions (Swainston 2000: 95). Perhaps because of this she found it difficult to link any other artefacts to the leaf and blade-points (Swainston 2000: 100). Although Campbell's total illustrates the possibility of more materials being available, his amalgamated EUP categorising system, as well as the number of holding institutions involved makes their revue an unrealistic enterprise for this project.

h. Robin Hood's Cave

Creswell Crags, Derbyshire (SK 534742).

Holding institutions
Bolton Museum
Brewhouse Yard Museum
Creswell Crags Visitor Centre
Derby Museum
Franks House
Harris Museum and Art Gallery
Manchester Museum
Natural History Museum
Sheffield City Museum

Artefacts	Qty
Leaf-points	1
Blade-points	13

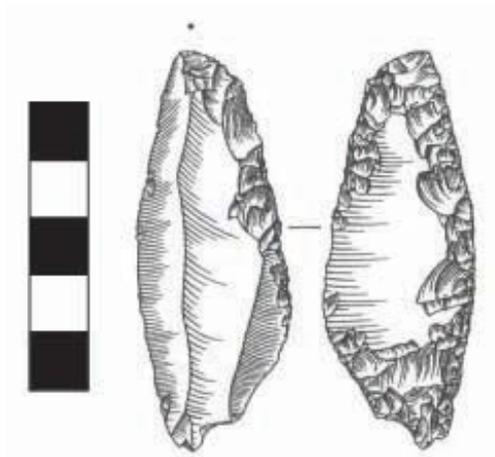


Fig.A1.27 Robin Hood's Cave blade-point 2 (Jacobi 2007: 292, Fig.50.2). If correctly orientated the point has been made on the bulbar end of the blade.

Like its neighbour Pin Hole, Robin Hood's Cave is one of twenty four caverns and small shelters located within a ravine of Lower Permian Limestone known as Creswell Crags. It is south facing and has four entrances into the cliff face and one blocked entrance on the terrain above. The cave extends about 50m into the cliff and the front of the cave comprises both an Eastern and Western Chamber (Jacobi 2007: 291). Both Robin Hood's Cave and Pin Hole sit directly below a highest point on the crest of the new Crags Road.

Reverend Magens Mello and Thomas Heath first excavated the cave and were later joined by William Boyd Dawkins. The stratigraphy of Robin Hood's Cave was interpreted as comprising three Pleistocene layers: an upper breccia containing the blade-points; this overlay a cave earth that contained rude quartzite implements; below this a lower red sand and clay (Dawkins 1876: 247). However further excavation proved the stratigraphy to be more complex. In his second report Dawkins (1877: 590) combined the breccia that contained the

blade-points and cave earth into one stratum. Flas (2008: 16) within his own review classed the context as mixed. Dawkins recorded seven type fossils recovered between 1875-6 from the Western Chamber. This total probably comprised six blade-points and the fragmented leaf-point (Jenkinson 1984: 36). However a subsequent review of the materials by Roger Jacobi (2007: 290) found a number of previously unrecognised refits and fragments. Jacobi's conclusion was that Robin Hood's Cave has given up ten blade-points of definite provenance with a further three probably coming from that cave (e.g Fig.A1.27). Additionally, two pieces of one bifacial leaf-point were also recovered (Garrod 1926: 127). In his 1877 report Dawkins summarised the fauna as totals of jaws, teeth bone and antler from the blended breccia and cave earth layers. Hyaena remains dominated, followed by horse, reindeer and woolly rhinoceros. Jenkinson (1984: 46) made a reassessment of all the cave's reported stratigraphies and emphasised roof rupture, sediment in-wash and drainage when considering the archaeology from the cave. In relation to the Western Chamber he described a rupture of the cave roof over the western section which introduced the possibility that the blade-points may have entered the cave from above. The broken nature and presence of transport damage on some artefacts supports the idea that they are intrusive. The material from Creswell is significant to this study because of the variety of artefacts including a blade-point made into a scraper (Campbell 1977: 255, Fig.105.3) as well as blade-points transformed into burins (Fig.5.47).

i. Soldier's Hole

Cheddar Gorge, Somerset (ST 468540).

Holding institutions

Cheddar Man Museum
Artefacts now lost

Artefacts	Qty
Leaf-points	3

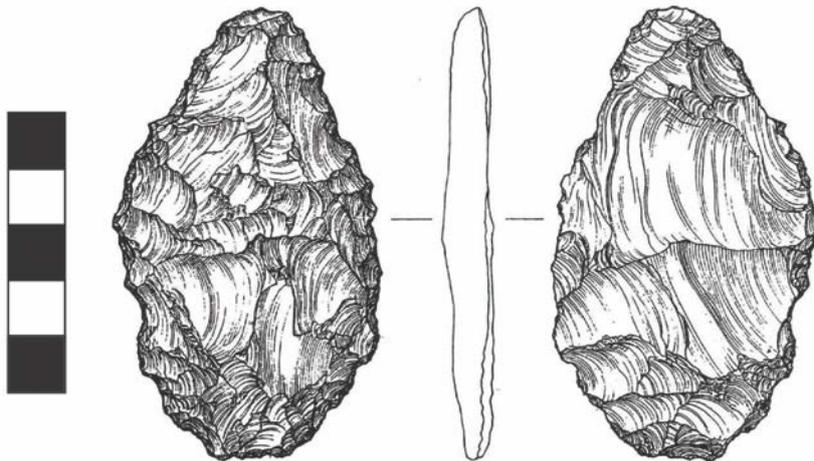


Fig.A1.28 Soldier's Hole leaf-point 2 with rounded base (Jacobi 2007: 288, Fig.48.2).

Soldier's Hole is a large rock shelter that sits some 46m above the current road on the southern side of the Carboniferous Limestone Cheddar Gorge. The site was excavated by R.F. Parry between 1928 and 1930. He recognised four layers and within the lowest found three leaf-points in association with large mammal fauna (Jacobi 2007: 286). Jacobi (ibid) noted the natural damage present on the leaf-points (e.g. Fig.A1.28) and the many of the fragments of bone indicating the possibility of movement. Campbell (1980: 49) suggested that the presence of only leaf-points at this site may be interpreted as indicating they predated blade-points. Damien Flas (2006: 47) drew attention to the rounded base of the above leaf-point and likened it to those from Paviland Cave and Kent's Cavern. These artefacts have now been lost.

j. Sutton Courtnay

Abingdon, Oxfordshire (SU 500939).

Holding institutions

Abingdon County Hall Museum

Artefacts	Qty
Leaf-points	1
Blade-points	1



Fig.A1.29 Sutton Courtnay leaf-point (Abingdon Area Archaeological and Historical Society, n.d.).

This complete leaf-point (Fig.A1.29) was excavated from floodplain gravels and found in association with mammoth and woolly rhinoceros (Flas 2006: 80). The artifact was on temporary loan to the above museum by the excavator Bob Eeles and recently (~2014) it was illustrated by Jeff Wallis (pers. comm.). No

publications have been found by the excavator, and the associated blade-point has not been traced.

k. Uphill Cave 8

Weston-super-mare, Somerset (ST 316548).

Holding institutions
Bristol City Museum
Franks House

Artefacts	Qty.
Blade-points	4

The cave at Uphill is approximately 23km WNW of the Wookey Hole ravine and linked to it by the Axe valley. This location is now at the mouth of the River Axe, however during the Early Upper Palaeolithic lowered sea levels would have meant that the site was located at the point where the Axe entered the Bristol Channel Plain (Jacobi and Higham 2011: 195). 13 caves were recorded at Uphill that came to light in 1898 during quarrying of the Carboniferous Limestone. They were explored by Edward Wilson on behalf of the Bristol Museum and only Cave 8 contained Palaeolithic implements (Harrison 1977: 242). The context was mixed and Wilson recovered four blade-points along with Mousterian bifaces, scrapers and flakes (Harrison 1977: 239, 242; Jacobi and Pettitt 2000: 514). More recently an Aurignacian point was recognised by Roger Jacobi within a faunal collection from the site (Higham 2010: 218). Caves 7 and 8 were probably connected, with the smaller Cave 7 sitting above the larger Cave 8 (Harrison 1977: 239-240). The main chamber and fissure of Cave 8 contained a cave earth and it was within this that the blade-points were recovered (ibid).

The cave has now been quarried away and three of the four blade-points were destroyed in 1944, however their metrics are preserved in the form of illustrations (Garrod 1926: 103, Fig.22). The extant blade-point has an ancient break and the two parts are held at different institutions. Both components have been viewed and Jacobi (2007: 303, Fig.59.1) presented an illustration of both parts rejoined. The extant artefact has both modern and ancient edge damage indicative of movement within sediment. The blade-point and its breaks are patinated white however a modern chip on the proximal piece has revealed a black flint. Transverse removals on the dorsal right of the blade indicate it was taken from the edge of a blade producing core face.

Ron Harrison (1977) reviewed the faunal and lithic collections and observed that the bones and teeth from the cave earth of Uphill Cave 8 were in a generally more broken condition than those recovered from Cave 7 above, perhaps suggesting transport damage, and arrival via Cave 7. He also found horse and Hyaena remains to be the most common fauna represented (Harrison 1977: 241). The apparent structure of the caves as well of the extant artefact's broken and edge damaged condition make it entirely possible that the blade-point entered the cave system from the plateau above. Indeed Jacobi and Pettitt (2000: 514) came to a similar conclusion in relation to the Middle Palaeolithic material. If so it is probable that it is the area above the cave that was significant in the Palaeolithic past.

1.3.1 Artefact assemblage summary

Beedings, being the site with the largest quantity and range of artefacts has already offered a valuable, but incomplete technological insight. Recent excavations have produced micro-*debitage* suggesting this understanding can be

developed further. However, whilst Beedings is an open air site, of the eleven sites with collections seven came from caves. Of these seven cave sites the artefacts very probably entered via the roof at four (Badger Hole; Hyaena Den; Robin Hood's Cave; Uphill Cave 8) or debris flow at one (Kent's Cavern). The artefacts from the remaining two (Soldier's Hole and Paviland Cave) also have edge damage indicative of movement. It would appear as though the areas above and around these caves need consideration. Furthermore six of these eleven sites (Badger Hole; Hyaena Den; Kent's Cavern; Paviland Cave; Robin Hood's Cave; and Soldier's Hole) although classed as cave sites are all associated with gorges, narrow valleys or ravines. As Campbell highlighted it is these kinds of narrow, steep and sometimes winding interfaces between lowland and upland would be an ideal if the aim was to disadvantage large migrating fauna (Campbell 1977: 171).

A2: Definitions

Whilst the methodology and methods were outlined in chapter two, it was also necessary to clarify some of the terminology used within this thesis. The definitions used are presented here for reference purposes.

Type fossils and their characteristics were defined within the first chapter. However it was also necessary to establish the terms used for the materials generated during the production of these type fossils. Cortex describes the outer surface of a flint nodule. The term 'core' describes a component of raw material such as flint from which flakes have been struck (Banning 2000: 297). Cores that have had flakes struck from only one end are termed 'single platform' whilst those that have had flakes taken from opposite ends are 'opposed platform'. Cores at the end of their productive life are described as 'exhausted' (Banning 2000: 146).

The term *debitage* refers to all the materials removed from a core (Banning 2000: 298) and material within this thesis has been organised within three *debitage* categories: flakes; blades; and shatter. Flakes are deliberate, relatively thin removals that are rounded with a low edge angles (Banning 2000: 300). Complete flakes tend to have a recognizable bulb of percussion and feathered edges. Blade is the term used for flakes that are twice as long as they are wide (Banning 2000: 294) and with approximately parallel edges. Fragment refers to parts of accidentally broken flakes and blades (Banning 2000: 300). Shatter is the term used to categorise all other removals. Shatter generally describes angular and thick removals with steep edge angles and no obvious bulb of percussion. These criteria have been used to sort both experimental and archaeological

materials above 30mm in length. This larger material has been termed 'macro-debitage'. In contrast 'micro-debitage' describes the smaller removals above 4mm resulting from blade-point manufacture. The only addition within the micro-debitage category was the use of the term bladelet replacing blade. Regarding methods of percussion 'soft hammer' refers to a percussor made from antler, bone, wood or soft stone whilst 'hard hammer' refers to a percussor made from a rounded hard stone pebble (Banning 2000: 144).

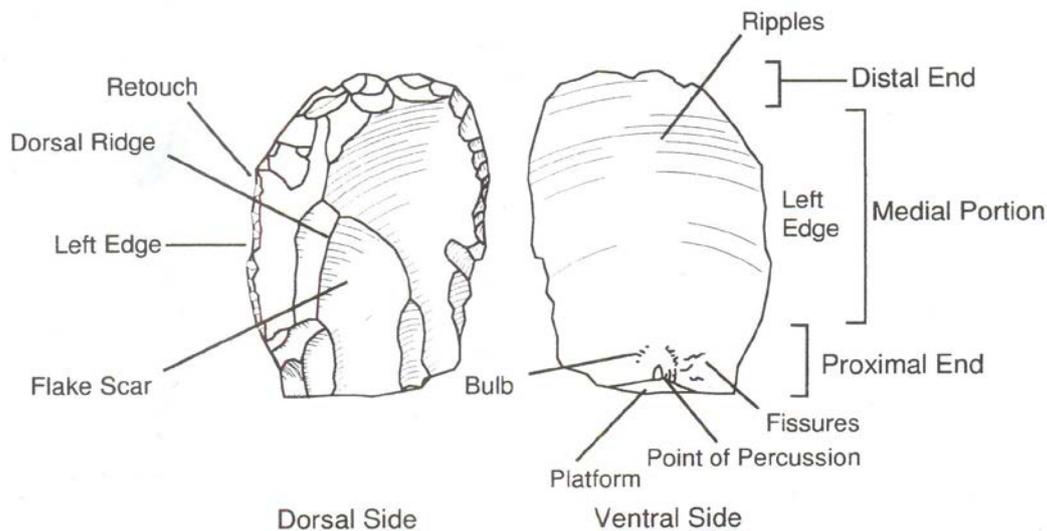


Fig.A2.1. Flake topography terminology (Banning 2000: 145, Fig.8.5).

Discussion of a flake's topography follows the terms outlined by Banning (Fig.A2.1). The flake platform categories follow six types as defined in Barton (1992) and have been listed in chapter two. When a platform is produced using a hard hammer sometimes a ring crack is present. A ring crack is a small round crack at the point of impact on the platform (Whittaker 2007: 14). These are the key definitions that apply to the methods used within the thesis.

A3: Blade-point refitting

Within chapter three the results from the refitting of three experimental blade-points with associated micro-*debitage* was discussed. For reference purposes the details of this process are outlined here.

3.1 Blade-point 4.2

Blade-point 4.2 had seven refitting units including one conjoin (Tables A3.1 and A3.2).

Ventral	5
Dorsal	2
Total	7

Table A3.1. Blade-point 4.2 refits to face.

Proximal	6
Distal	1
Total	7

Table A3.2. Blade-point 4.2 refits to section.

The majority of refits came from the proximal end (86%) and ventral face (71%). Refitting allowed a relative order of removal to be recognised which began with a series of ventral removals and bladelet v2a.

a. Bladelet v2a

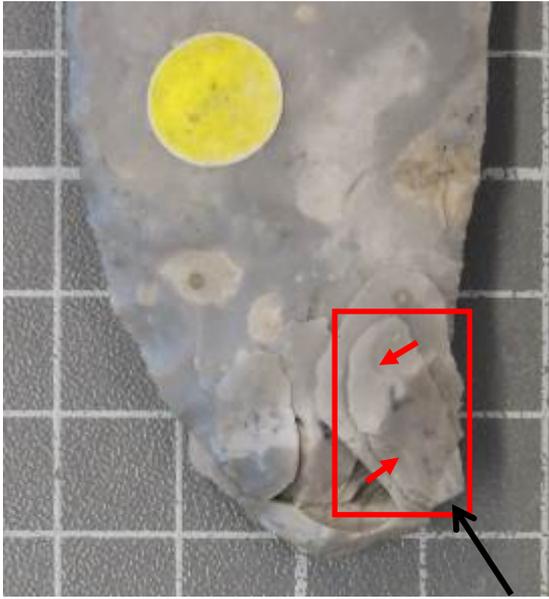


Fig.A3.1 Blade-point 4.2, bladelet v2a with red arrows indicate direction of dorsal scars and black arrow indicating direction of removal blow (photograph: author).

This bladelet was complete and measured 15x7x1mm. Refitting showed it to be a ventral removal from the right hand side of the proximal end (Fig.A3.1). It had an intermediate External Platform Angle (EPA) of $\sim 70^\circ$. In plan section it was asymmetrical with a slightly larger left side. In relation to the platform it had a twisted transverse profile with the left hand side lower than right. Refitting showed that the bladelet platform was angled in relation to the blade's transverse section. The bladelet's twisted transverse profile was seen to be due to having travelled up and around the rear of original blade's bulb of percussion. The bladelet's dorsal surface appeared to be the ventral surface of the mother blade with two scars (red arrows) cutting into this original surface.

b. Flake v2d

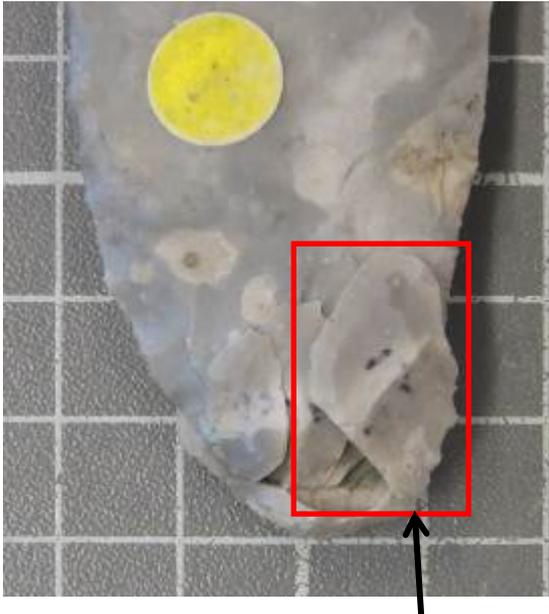


Fig.A3.2 Blade-point 4.2, flake v2d with the black arrow indicating direction of removal blow (photograph: author).

V2d underlay v2a and was the second refitted piece to have been removed (Fig.A3.2). This complete flake measured 20x13x2mm and was again from the ventral surface, proximal end and right hand side. It had a high EPA ($\sim 90^\circ$) and in plan view was asymmetrical with a relatively straight and narrow right hand dorsal surface, and an expansive lunate left. The characteristic feature of this flake was a pronounced transverse twist with the dorsal left hand edge much lower than the right. Refitting indicated that this was again due to the flake accomodating the bulbar prominence. The dorsal surface showed the central removal scar from flake v2a and highlighted how this flake was one component in a removal sequence from a single point on the blade. After this bulbar thinning episode the knapper seems to have turned the blade over to begin a sequence of dorsal reduction.

c. Dorsal reduction sequence

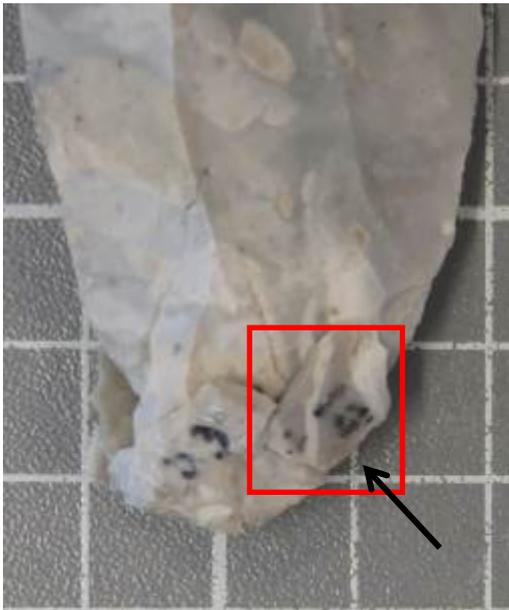


Fig.A3.3. Blade-point 4.2, broken flake D1+ and the direction of the removal blow (photograph: author).

The first refitted piece to be removed from the dorsal surface was D1+, a broken flake measuring 7x12x1mm and taken from the proximal right hand side of the blade (Fig.A3.3). The flake's platform had been removed and it was asymmetrical in plan with more surface area on the dorsal right hand side and only a slight transverse twist. The flake's dorsal surface had two parallel removals scars travelling in approximately the same direction as the ventral rippling. These factors indicate this to be one removal in a series from the same point on the blade.

d. Conjoined shatter d3c + d1



Fig.A3.4 Blade-point 4.2, two conjoining pieces of shatter d3c and d1 (photograph: author).

The next removal created two pieces that could be conjoined. D3c fits with d1 and in doing so reforms a striking platform (Fig.A3.4). This suggests they were both removed by the same blow. The platform had a high EPA ($\sim 85^\circ$) and the conjoined piece measured 25x16x6mm and had been struck from the central section of the proximal end of the dorsal surface. It was asymmetrical in that the dorsal surface veered slightly to the left of the striking platform. In doing so the longitudinal axis followed the dorsal ridge of the blade from which it was removed. This conjoin has only a slight transverse twist. The dorsal scar pattern was complex but could be divided into two parts. The proximal section was heavily worked whilst the distal end indicated removals trending in the same direction as the blades dorsal surface. A characteristic of d1 was a longitudinal curved ventral surface which gave it overall depth. This depth may be one factor signalling how this conjoin overhung the completed blade-point showing it to be part of an initial shaping process. With the removal of this overhanging piece the

knapper seems to have turned over the blade and begun a reduction of the ventral face again.

e. Flake v3

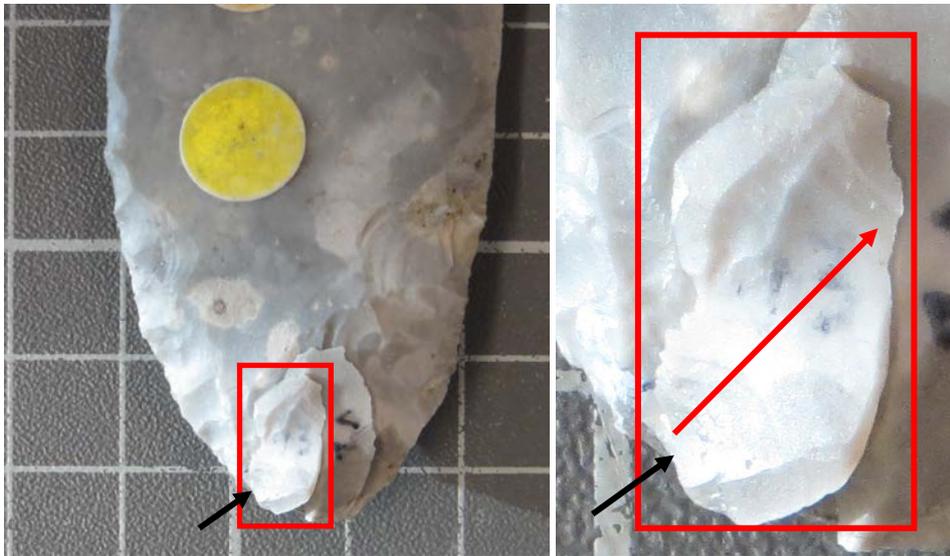


Fig.A3.5. Blade-point 4.2, flake v3 showing direction of the removal blow and dorsal scar pattern (photograph: author).

This was an almost complete flake (distal tip missing) that measured 10x10x2mm and had been removed from the proximal ventral surface (Fig.A3.5). The EPA was difficult to read but appeared to be high ($\sim 90^\circ$) and the flake was markedly asymmetrical. When the dorsal surface was viewed in plan section the main body of the flake veered to the left. This piece also had a dramatic transverse twist. Viewed from the platform the dominant left hand side was high whilst the right seemed flat. Using the platform as an indicator of direction of strike showed how this piece had started off headed towards the bulb, but veered around the bulbar mass resulting in its marked asymmetry. The flake's dorsal surface had scarring showing evidence of earlier removals from the same point and there also seemed to be evidence of the blades original ventral surface remaining on the distal left hand edge of the flake.

f. Flake v2c



Fig.A3.6 Blade-point 4.2, flake v2c showing direction of removal blow and its dorsal scar pattern (photograph: author).

Flake v2c underlay the previous twisted removal and in many ways was more straight forward (Fig.A3.6). This was a complete flake measuring 15x8x2mm. It was from the proximal end of the ventral surface and the EPA was high ($\sim 90^\circ$). In relation to the platform the flake was asymmetrical, trending to the left when the dorsal surface was viewed in plan. It had only a slight transverse twist and dorsal scarring was on both sides of a central ridge, trending in the same direction as the flake's ventral rippling. This indicated it to be one element in a vertical reduction sequence on the same point of the blade.

g. Flake v1

It is not a simple matter to discern at which point this ventral removal was struck. However the knapper did have an explicit method, dealing with the proximal mass first and then the distal. If this protocol was followed flake v1 would have been the last of the refits to be struck.



Fig.A3.7. Blade-point 4.2, flake v1 direction of removal blow and dorsal scar pattern (photograph: author).

Prominence from the edge (Fig.A3.7) suggests it was perhaps early in a series of removals from this section and therefore used to shape the point. This complete flake measured 11x7x1mm and was from the ventral distal left hand edge. The EPA was high ($\sim 85^\circ$) and the flake relatively asymmetrical with more material on the dorsal right hand surface. The complete flake was relatively flat with no observable twist. On its dorsal face there are indications that the blade's original surface has been cut by a removal on the left hand side, showing it to be one in a series of linear sequential left to right removals. This 'cutting' also explained the flake's asymmetry.

3.2 Blade-point 5.19

Seven pieces were able to be refitted to blade-point 5.19 and four of these pieces conjoined making a total of five refitting units (Table A3.3).

Ventral	3
Dorsal	2
Total	5

Table A3.3. Blade-point 5.19, quantity of refits to each face.

Of these a majority (60%) were from the ventral face and all were from the proximal section. Refitting suggested that for this blade the dorsal surface was reduced first. This is because two of these flakes extend beyond the finished blade-point and seem to have been initiated directly from the mother blade.

a. Flake d2

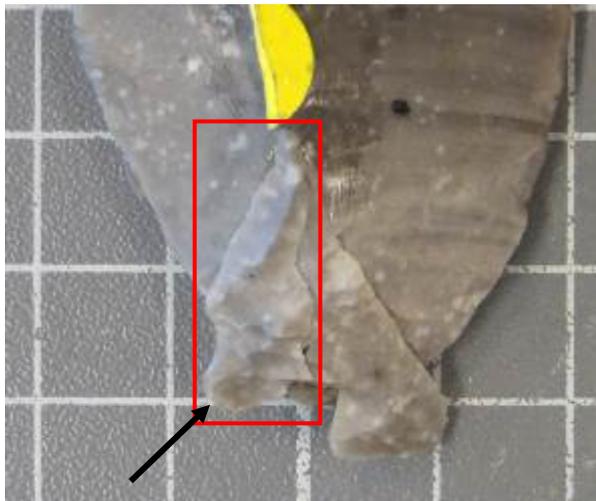


Fig.A3.8. Blade-point 5.19, flake d2 and the direction of the blow of removal (photograph: author).

This first removal was a long complete flake measuring 19x16x1mm. It overhung the blade-point and had been struck from the left hand edge removing it from the dorsal surface (Fig.A3.8). The EPA was low ($\sim 45^\circ$) supporting the idea that this was struck from a blade edge. The flake was asymmetrical in plan with the dorsal surface veering to the left. Refitting indicated that this asymmetry was caused by the flake following the main line of the dorsal ridge. This flake had only a vaguely discernible transverse twist. The dorsal scar pattern was confused but could be divided into two parts. The proximal end had removals trending in the same direction as the flake's ventral ripples indicating it was one removal in a series from the same point. In this respect it was also

similar to the conjoined shatter from 4.2 (d3c+d1) showing intense working on the proximal section. The flake's distal section comprised the beginning of the original blade's dorsal ridge showing clearly how the change in direction followed the trend of the original blade.

b. Conjoin flake d6+d4

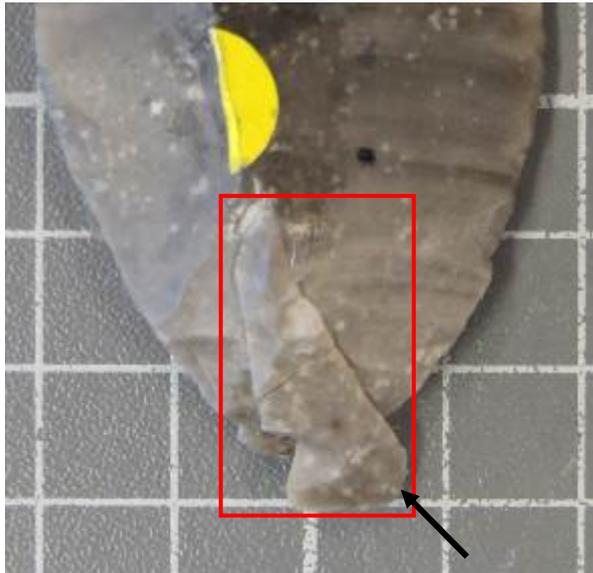


Fig.A3.9. Blade-point 5.19, flake d4 and d6 and direction of removal (photograph: author)..

Broken pieces d4+d6 conjoined to form one complete flake and so have been discussed as one unit. This unit measured 20x20x2mm and underlay d2 but was from the dorsal proximal right hand side (Fig.A3.9). This flake extended beyond the finished margin and comparison with the recorded shape of the original blade showed it was struck from the edge. This was supported by the low EPA (~45°). The flake was asymmetrical as the distal section veered to the right when viewed in plan. Asymmetry with both this and its overlying piece seemed to be related to the dorsal ridge acting as a barrier to direct progression of the removal. This piece had only a marginal transverse twist. The dorsal surface bore a flake scar trending in the same longitudinal direction as the mother blade.

After these removals the blade seems to have been flipped over and worked on the ventral surface.

c. Flake v2



Fig.A3.10. Blade-point 5.19, flake v2 (photograph: author).

The next removal appears to have been flake v2, a complete flake measuring 10x7x1mm. Refitting showed it to be struck from the proximal ventral right hand edge of the blade (Fig.A3.10). This was supported by its low EPA ($\sim 45^\circ$). It was approximately symmetrical with no transverse twist apparent. The left hand proximal section of the dorsal surface had a dipped area and bore a scar showing an earlier removal trending in the same direction as the ventral surface. This indicated it to be one removal in a linear sequence moving from left to right along the right hand edge of the ventral face. The underlying scar pattern on the edge of the blade-point itself confirmed this sequence.

d. Flake v1

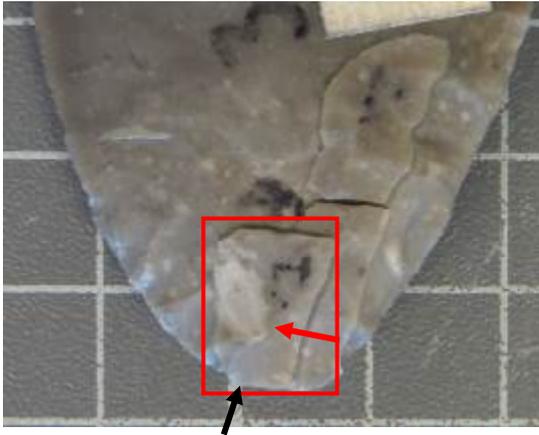


Fig.A3.11. Blade-point 5.19, flake v1 with direction of removal and dorsal scarring direction (photograph: author).

Flake v1 was probably the second removal from this group and had snapped off at the distal end. Refitting and the underlying scar pattern indicated it may have originally been twice as long (Fig.A3.11). The extant piece measured 12x9x1mm and had been struck from the centre of the proximal ventral surface. The EPA was high ($\sim 90^\circ$) and the flake relatively symmetrical with no apparent twist. The dorsal surface was difficult to read but the right hand side had the scar from an overlying invasive transverse removal travelling in from right to left. This scar was presumably made by a flake similar in form to v2 and from the same sequence.

e. Bladelet v3



Fig.A3.12. Blade-point 5.19, bladelet v3 (photograph: author).

Bladelet v3 was conjoined and measured 28x13x2mm. Struck from the proximal ventral surface it extended slightly beyond the finished point indicating that it was removed before final ventral shaping occurred (Fig.A3.12). The EPA was low (~45°) and the bladelet asymmetrical veering to the right in plan view. This piece had a twist and refitting showed how the side of the bladelet closest to the mother blade's bulb was higher than the side that was further away. Both the asymmetry and twist were caused by the bladelet circumventing the central bulbar prominence of the mother blade. The right hand dorsal face of this flake bore scars from invasive removals coming in from right to left. This reflected the overlying sequence of invasive thinning from the right hand edge. The next blade-point to be discussed here is number 4.3.

3.3 Blade-point 4.3

Of the fourteen pieces known to come from this blade-point only two definite refits were found. Both of these were from the distal end, one from the dorsal and one from the ventral surfaces.

a. Flake d5.

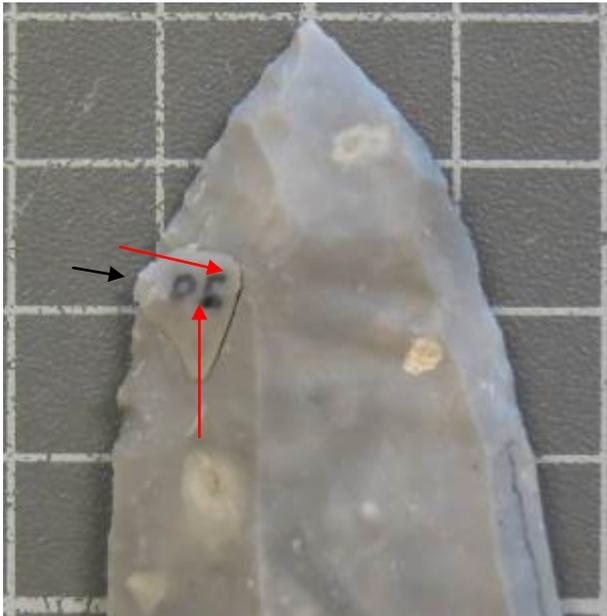


Fig.A3.13. Blade-point 4.2, flake d5 (photograph: author).

Flake d5 was a complete removal measuring 8x9x2mm from the left hand distal dorsal section (Fig.A3.13). The low EPA (45°) is consistent with it having been removed from a bladed edge. It was asymmetrical with the right hand dorsal surface running off to the right. This was one of the pieces that showed a pronounced transverse twist in relation to the platform with the left hand side higher and the right hand side lower. This piece was useful in that the twist could be understood only in relation to the dorsal scar pattern. In this instance a dorsal arête split the face in two travelling at 90° away from the platform. Refitting showed the surface on the right hand side of the arête to be the mother blade's original dorsal face. On the left of the ridge was an invasive scar

travelling in the same direction as the flake's ventral rippling. This flake was one removal in a left to right series travelling away from the tip along the left hand dorsal distal edge. Importantly, the right hand dorsal surface was flat, whilst the left hand surface was chiselled out and therefore concave. The platform was not horizontal but angled between the flat right hand surface and the concave left. Discussing the twist in relation to the platform was useful to ascertain its degree, but was not for explaining the phenomenon. Examining the twist in relation to the dorsal scar pattern was certainly much more useful approach. The twist on this piece illustrated the transition between the lower concave face and the upper original flatter surface. Longitudinally there was a slight curve at the proximal end.

b. Flake v7

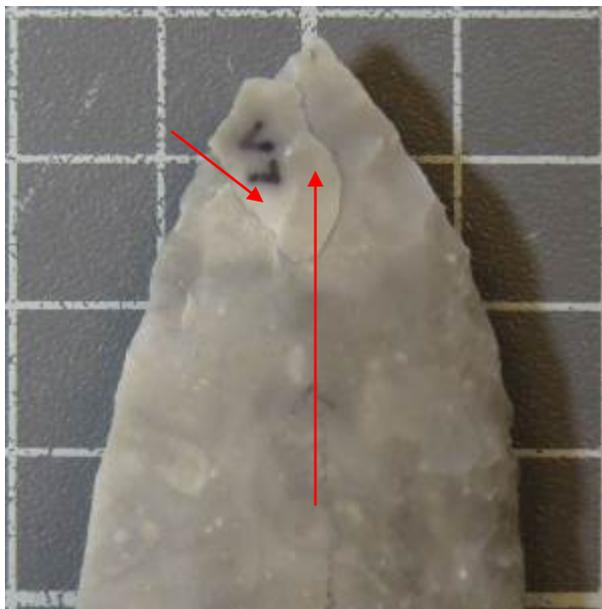


Fig.A3.14. Blade-point 4.5, flake v7 direction of removal and dorsal scar pattern (photograph: author).

Flake v7 was a complete flake measuring 10x13x1mm. Struck from the distal ventral left hand tip of the blade it had a low EPA (45°) (Fig.A3.14). The flake's

dorsal surface veered to the right when viewed in plan. There was no apparent twist. The dorsal surface was hard to read but refitting showed part of the mother blade's original ventral surface extant at the distal end of the flake. The proximal end showed a scar from a previous and partly overlying removal that trended in the same direction as the flake's ventral rippling. This showed it to be one in a series of removals travelling from right to left along the blade-point's ventral left hand edge towards the tip.

3.4 Key discussion points with the knapper

All five days experimental production was filmed and was in fact a useful adjunct to the refitting process. However, most significant was the discussions regarding the flint knapper's aims, objectives and understandings. Key points have been edited into a short 20 minute film: <https://vimeo.com/50690712>.

A4: Badger Hole flakes

Within chapter five a series of four flakes were discussed as indicative of core correction at the site of Badger Hole. To avoid repetition only one was discussed. For reference purposes the further three are presented here.

a. BHD5

This core maintenance flake (see Fig.5.1) has a small faceted platform and prominent lip indicating removal with a soft hammer. It is perhaps 75% present with staining on the broken distal section. The high width to depth ratio indicates relative flatness and supports the idea of removal during a later phase of core reduction. That the blade is relatively complete, with no further attempt made to straighten its uneven edges, suggests again: removal aimed at maintaining the face of a core. A further example flake is BHD12.

b. BHD12



Fig.A4.1. Badger Hole core maintenance flake flake BHD12 (43x17x4mm, photograph: author).

This piece (Fig.A4.1) is again almost complete and with an uneven dorsal topography. Although heavily notched the margins are uncorrected. It is relatively small with a high width to depth ratio indicating flatness, and a later

stage of production. All of the above factors suggest its function was to maintain or correct the face of a well used core. A fourth flake with some similar characteristics is BHD10.

c. BHD10



Fig.A4.2. Badger Hole core maintenance flake BHD10 (35x18x6mm, Photograph: author).

This fragment (Fig.A4.2) was broken at both ends and had heavily notched margins. It is included here for two reasons: firstly because the uneven edges have apparently remained uncorrected; secondly because the dorsal topography is similar to experimental pieces designed to remove a 'lump'. The presence of these four fragments is consistent with the maintenance of at least one small and well used core, close to the site. However, a further aspect worthy of discussion is the atypical size of a further artefact.

A5: Beedings new collection

5.1 Analytical method and data

Chapters five and six included a discussion of the newly recovered materials from Beedings. In contrast to the collections from Badger Hole and Glaston, I was able to review, organise and analyse these artefacts within the laboratory at the University of Manchester over a number of weeks. This allowed a more detailed investigation, and this is reflected within the discussion here.

Recognition of EUP *debitage* was complicated by the range of technologies present and the depositional processes that affected them. The selection of materials discussed included the five EUP, four LMP, and two Mesolithic artefacts illustrated by Jeff Wallis and previously published (Pope et. al. 2013: 7-8).

Furthermore, in January 2015 Matt Pope sent me a package of smaller material, both above and below 10mm, coming from five of the seven trenches. Pope also directed me to a cluster of flints from Trench A coming from the lower part of Unit 3 that he believed to represent a knapping event (Pope 2015, pers. comm.).

My recording process was phased in order to deal with both the macro and micro-*debitage* components. The first phase involved identifying how many pieces had been received and how many pieces were >4mm and therefore useful for analysis. The complete corpus of material received was laid out, separated by trench, and ordered by finds bag numbers. A unique identifier (e.g. MP1) was allocated to each finds bag. A few finds bags had more than one

element inside, and in such cases each element was also allocated an individual letter (e.g. MP1a, MP1b). Material below 4mm was removed.

5.2 Identifying and recording EUP macro-*debitage*

The second phase involved identifying the EUP material. Macro-*debitage* was approached first, as a number of pieces had been already identified as EUP, published and described (Pope et. al. 2013). These pieces provided 'landmarks' against which other pieces could be assessed. Primary characteristics such as colour, patina, condition and unit were used to identify potential *debitage* components. This allowed otherwise un-diagnostic material to be linked with artefacts confidently known to have EUP provenance.

a. Material colour and patina

Material colour was useful for linking together groups of artefacts spatially and recognising clusters potentially indicative of knapping events. Within the clusters themselves more than one formally recognisable piece would support the inference of production or maintenance of a technology formally similar to that of blade-points. Pope (et. al. 2013: 7) described the EUP material as generally very dark grey to black. Based upon my own review, the EUP macro-*debitage* was made from flint of at least two colours, a mottled grey, and Pope's very dark grey to black. On some of the smaller artefacts patina obliterated material colour altogether and this will be discussed separately. My own observation saw patina on the larger EUP material fall into three categories (Table A5.1). Firstly a transparent gloss was present on the mottled grey flint artefacts. This smooth, shiny and reflective surface has been argued to be caused by the slow dissolution of silica by humic acid. This dissolves prominent dorsal ridges and

thin edges and redistributes the silica over the surface, effectively sealing the artefact, and protecting it from further patination (Rottlander 1975: 108; Glauberman and Thorson 2012: 24). On the typologically EUP material, this gloss overlay a blue-white dendritic patina. This kind of surface modification has been argued to be related to flint contact with decaying root matter. Decaying materials provide an acid micro-environment which relatively rapidly creates a patterned dissolution at points of flint/root contact. This idea would seem to be supported by the 'root-like' or dendritic patterning as well as its presence usually on one surface only (Glauberman and Thorson 2012: 24). The mottled grey material from Beedings therefore would seem then to have experienced relatively rapid root patination followed by a slower surface glossing from humic acid which sealed the original patterning. In contrast the very dark grey black flint seemed to be un-glossed and retained sharp edges although some pieces had small spots of an emergent white patina. These material and patina types all find analogues within the original collection.

Clear gloss resulting in dulled arêtes and edges on the mottled grey flint.
Blue-white dendritic patina mainly on one face of the mottled grey flint.
Emergent white patina in spots on dark grey black flint with sharp edges.

Table A5.1. Patina types based on the larger EUP artefacts.

b. Stratigraphic unit

Pope went to great pains to establish the stratigraphy at Beedings, and the unit a piece was recovered from went some way to indicating if it was more or less likely to be Palaeolithic. According to the 2013 publication, the majority of larger EUP material came from Unit 3a.

c. Weathering and red colouring

Weathering was seen as a key difference between the EUP and LMP materials (Pope et al. 2013: 8) with the earlier period being represented by more weathered and more deeply patinated artefacts. In contrast the EUP material tended to be in good condition with edges still sharp. A final factor that was taken as potentially significant was a red colour present on the dark grey black flint. This again was present on both the EUP artefacts from this excavation as well as blade-points within the original collection. It was a point of discussion as to whether this red colouration was inherent within the material or a staining from its depositional context. David Gelsthorpe, the curator of the Earth Sciences collections at the Manchester Museum examined the material and observed "*the red colour probably comes from a patch of the flint where the iron has converted to its oxidised state rather than a structural change. There is no change in grain size or structure either side of the colour change*" (pers. comm. March 2015). The red colouring was almost exclusively present on only the dark grey black flint, however because it was likely to be staining it was used here as a only a 'weak' indicator of EUP provenance. The red colour was noted as either present or absent.

5.3 Identifying and recording EUP micro-*debitage*

In relation to the micro-*debitage*, a formal approach was primary and relied heavily on the experimental models. The basic forms defined by experimental production of blade-points were used as 'landmarks'. Consequently if an archaeological element formally corresponded with a landmark experimental piece a number of inferences were able to be made. Firstly it was possible to

infer the *probable* intention of the knapper (e.g. reducing a bulb versus thinning an edge). Secondly, within the range of technologies present it was possible to recognise evidence of production or maintenance of a technology at least formally similar to that of a blade-point. However because of the technological diversity at the site, formal identification of EUP provenance again needed the support of a contextual matrix of further factors such as colour, condition, unit and /or presence of diagnostic macro-*debitage*. All significant pieces had attributes recorded using the above method and were drawn and photographed. Discussion has been ordered by Trench with macro-*debitage* examined first followed by micro-*debitage*. Artefact numbering follows that on finds bags, thus giving an approximate understanding of the order of recovery within each trench.

A6: contributors to the content

The word limit meant it has not been possible to acknowledge within the main body of the thesis all the people who have contributed to the content and process of this research. However, it is possible within the appendix and I would like to do so. A number of people were good enough to make artefacts available, and make me feel welcome on my recording visits: Jane Desborough, Marianne Eve and Nick Ashton at Franks House; Barry Lane at the Wells and Mendip Museum; Rob Kruszynski at the Natural History Museum; Philip Wise and Debbie Barnes at the Ipswich Museum; Andy Maxstead at the Brighton Museum; Ian Trumble at Bolton Museum; Livia Roschdi and then Tim Pestell at the Norwich Castle Museum; Andrew Rogerson at the Historic Environment Service in Norfolk; Elizabeth Walker at the National Cardiff Museum; Elie Hughes and Sara Brown at the Ely Museum; Bryan Sitch at the Manchester Museum; Tom Gloynes; Barry Chandler at the Torquay Museum; Gail Boyle at the Bristol Museum and Art Gallery; Philip Hendy at the Cheddar Man Museum.

A number of people also kindly gave access to documentation and information or shared their knowledge: I have learned a lot about both stone tools and technology through discussion at Franks House with both Dirk Leder and Lawrence Billington. Fiona Marsden and Chris Milburn formerly of the Museum of Sussex Archaeology shared their detailed knowledge of the Beedings materials; Emma O'Connor of the Museum of Sussex Archaeology provided access to their cellar; Claire Harris at Franks House facilitated access to the Jacobi Archive; Stephanie Swainston sent me copies of her Paviland data; Chris Mycock formerly of Moyse's Hall Museum provided the recent history of the Baldings Hill blade-

point. Martin Hemingway shared his memories relating to the Beedings collection; Alex Pryor informed me about meat drying; Robert Turner provided comments on the recent Beedings excavations; Jeremy Cootes chased up the data on the Osney Lock leaf-point; Mark Bennet at the Lincolnshire HER and Joanne Richards provided information on the Wallow Camp artefact; Richard Dabb and Caroline McDonald at the Museum of London allowed use of their photographs; Gina Muskett at the Liverpool Museum chased up the Temple Mills leaf-point; Corina Westwood provided details of the Brighstone leaf-point; Giles Guthrie chased up the Igtham artefact; and Becky Wragg Sykes provided access to her thesis. John Cooper spent the day showing me around Paviland and its environs; Bob Kowalski did the same on the Beedings Plateau; Brian Mckeown joined me on the Norfolk and Torquay site visits; Rob Dinnis provided Andy Needham and myself the chance to excavate the fissure at Ffynnon Beuno.

When it came to the writing up process Siân Jones; Simon Denham and Katja Steurzenhofeker all provided critical comments on the content. A number of people proof read chapters for me: Eammon Kirk, Mary Begley, Helen Pendry, Miriam Lorkins, and Phil Boast. Three people were able to give some practical guidance in relation to more modern technologies: Nick Overton and Yosef Williams with Illustrator and Isabella Lorkins with Excel scatter-plots. And for moral support in the end phase I thank: Horace Jonas; Stephen Gordon and John Fitzgerald. My apologies to those who have contributed but I have missed from this list.