

## Supplemental Materials

Supplemental Text 1: Definition and treatment of experimental variables.

### Dataset 1

*Independent variables*

Manipulated:

- Reduction intensity – defined as the total percentage of original nodule mass lost at the end of a particular reduction episode.
- Original nodule size – defined in terms of mass.

Nuisance variables – (un)controlled or randomized:

- Knapper: one knapper with moderate knapping skill.
- Raw material type: Texas Pedernales River flint.
- Raw material consistency: fine-grained and uniform from visual inspection.
- Raw material shape: spherical to cylindrical.
- Reduction technique: allowed to freely vary in order to randomize the variable's effect across different test groups. Knapping was done primarily through simple flake removal as well as bifacial and single-surface flaking (Sandgathe 2004).
- Percussor: alluvial hard hammer cobbles.

*Dependent variable – documented*

- Maximum artifact length measured with calipers on all flake debris with maximum dimension equal to or larger than 25 mm. A dimensional measure is used here as opposed to weight is because artifacts of small sizes can have very similar weight while sharing different dimensions.

### Dataset 2

*Independent variables*

Manipulated:

- Reduction intensity – defined as the total percentage of original nodule mass lost at the end of a particular reduction episode.
- Original nodule size – defined in terms of mass.

Nuisance variables – (un)controlled or randomized:

- Knapper: six knappers of varying skill levels (two have minimal experience; two have moderate skill; two have extensive skill; the latter two groups share knapping knowledge that fall within the general tradition common in Old World Paleolithic researchers).
- Raw material type: Coniacian and Santonian flint from the Dordogne region, southwest France. Ten are from a subsurface outcrop exposed near the Middle Paleolithic site of Combe-Capelle Bas (Dibble and Lenoir 1995) in the Couze River valley, a tributary of the Dordogne; the other four are from the limestone plateau adjacent to the Middle Paleolithic site of Roc de Marsal (Turq et al. 2008).
- Raw material consistency: relatively uniform, except for three nodules that exhibit clear heterogeneity with coarse-grained matrices and irregularities. These nodules were included for the purpose of assessing the effect of material homogeneity on flake debris characteristics.
- Raw material shape: regularized into a general blocky morphology due to cutting away the cortex.

- Reduction technique: Allowed to freely vary in order to randomize the variable's effect across different test groups. Knapping was done primarily through simple flake removal as well as bifacial and single-surface flaking. In order to capture the most conservative production pattern of microdebris, knappers were told to not trim or facet platforms during knapping and not to retouch.
- Percussor: alluvial hard hammer cobbles.

*Dependent variable – documented*

- Maximum artifact length of all flake debris ( $\geq 25$  mm) and microdebris ( $< 25$  mm  $\geq 7$  mm) - flake debris were measured with calipers; microdebris were measured automatically based on scaled photographs using CALiA. A dimensional measure is used here as opposed to weight is because artifacts of small sizes can have very similar weight while sharing different dimensions. This issue is particularly of concern for microdebris where the weights for some of the specimens are actually undetectable by our weight scale.

Supplemental Table 1. Summary of Dataset 2 in terms of flake debris and microdebris count.

Nodule	Episode	Knapper	Microdebris	Flake debris	Flake debris	Flake debris total count
ID		ID	count	count	platform count	: platform count
1	1	1	17	15	12	1.25
1	2	1	54	23	19	1.21
1	3	1	71	31	26	1.19
2	1	1	38	19	10	1.90
2	2	1	70	28	17	1.65
2	3	1	93	53	38	1.39
3	1	1	38	25	7	3.57
3	2	1	87	52	21	2.48
3	3	1	160	70	30	2.33
4	1	2	82	16	12	1.33
4	2	2	146	40	27	1.48
4	3	2	241	66	45	1.47
5	1	2	33	8	6	1.33
5	2	2	91	21	16	1.31
5	3	2	130	30	24	1.25
6	1	2	28	5	5	1.00
6	2	2	83	21	17	1.24
6	3	2	185	40	32	1.25
7 <sup>a</sup>	1	3	127	38	17	2.24
7 <sup>a</sup>	2	3	217	69	34	2.03
7 <sup>a</sup>	3	3	336	109	62	1.76
8 <sup>a</sup>	1	4	42	25	18	1.39
8 <sup>a</sup>	2	4	148	45	34	1.32
8 <sup>a</sup>	3	4	258	72	51	1.41
9	1	5	87	11	8	1.38

9	2	5	134	20	14	1.43
9	3	5	175	27	20	1.35
10	1	5	95	15	11	1.36
10	2	5	179	34	24	1.42
10	3	5	271	57	42	1.36
11	1	5	82	19	12	1.58
11	2	5	178	38	26	1.46
11	3	5	348	66	39	1.69
12	1	6	94	15	9	1.67
12	2	6	169	41	33	1.24
12	3	6	222	62	48	1.29
13 <sup>a</sup>	1	6	54	9	8	1.13
13 <sup>a</sup>	2	6	83	22	18	1.22
13 <sup>a</sup>	3	6	194	38	24	1.58
14	1	6	61	14	9	1.56
14	2	6	86	21	16	1.31
14	3	6	203	49	39	1.26

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<sup>a</sup>Coarse-grain nodule with heterogeneous material consistency.

Supplemental Table 2. Artifact Quantities (all artifacts  $\geq 7$  mm) from Dataset 2.

Nod. ID	Red. Epi.	Ori. Mass (g)	% mass lost	Flake debris maximum length intervals (mm)																					
				7.07-	10-	15-	20-	25-	30-	35-	40-	45-	50-	55-	60-	65-	70-	75-	80-	85-	90-	95-	100-	105-	110-
				10	15	20	25	30	35	40	45	50	55	60	65	70	75	80	85	90	95	100	105	110	115
1	1	659	70	4	8	2	3	3	1	0	2	2	1	0	2	1	0	1	1	0	1	0	0	0	0
1	2	659	88	26	19	5	4	3	2	1	4	3	2	2	2	1	0	1	1	0	1	0	0	0	0
1	3	659	96	36	26	5	4	4	6	2	5	4	2	2	2	1	0	1	1	0	1	0	0	0	0
2	1	1811	20	9	15	6	8	2	4	0	4	2	0	2	0	1	0	1	0	0	1	0	0	2	0
2	2	1811	70	21	26	14	9	3	5	0	5	2	0	2	0	1	0	2	1	0	2	0	2	3	0
2	3	1811	95	24	36	22	11	8	8	4	8	4	2	3	0	3	1	2	2	0	4	0	2	3	0
3	1	1307	45	8	17	10	3	7	3	3	2	1	2	4	0	1	0	0	1	0	0	0	0	0	1
3	2	1307	74	28	32	14	13	14	6	9	4	3	4	5	0	2	2	1	1	0	0	0	0	0	1
3	3	1307	94	57	57	29	17	19	8	11	6	6	5	6	1	3	2	1	1	0	0	0	0	0	1
4	1	2081	73	37	27	10	8	2	2	0	1	1	1	4	0	1	1	2	0	0	1	0	0	0	0
4	2	2081	84	59	48	22	17	5	6	5	4	3	1	5	0	3	2	3	0	1	2	0	0	0	0
4	3	2081	89	89	84	42	26	11	9	10	4	6	1	8	2	3	2	4	1	2	2	1	0	0	0
5	1	609	52	19	11	1	2	2	0	0	1	1	2	0	0	1	0	0	0	0	0	0	0	1	0
5	2	609	76	40	32	11	8	8	1	2	2	2	3	0	1	1	0	0	0	0	0	0	0	1	0
5	3	609	91	56	47	16	11	12	1	2	5	3	3	1	1	1	0	0	0	0	0	0	0	1	0
6	1	1297	21	12	7	5	4	0	0	0	0	0	0	1	0	1	0	1	1	0	0	1	0	0	0
6	2	1297	56	28	32	10	13	3	2	1	0	2	1	3	2	1	0	2	2	0	0	1	0	1	0
6	3	1297	81	68	74	26	17	8	2	5	0	2	2	9	3	2	0	2	3	0	0	1	0	1	0
7	1	2700	22	51	42	25	9	12	5	5	4	4	0	1	1	1	0	2	2	1	0	0	0	0	0
7	2	2700	36	81	73	51	12	20	9	12	9	4	2	3	1	2	2	2	2	1	0	0	0	0	0
7	3	2700	68	121	116	68	31	29	14	17	15	6	5	4	1	5	5	3	2	2	0	1	0	0	0

8	1	1396	20	23	12	7	0	5	4	5	6	0	2	2	0	0	1	0	0	0	0	0	0	0	
8	2	1396	53	69	46	27	6	10	6	6	9	2	4	2	2	0	3	1	0	0	0	0	0	0	
8	3	1396	83	101	91	48	18	20	10	7	11	4	6	4	5	1	3	1	0	0	0	0	0	0	
9	1	692	21	38	32	9	8	5	0	1	1	1	3	0	0	0	0	0	0	0	0	0	0	0	
9	2	692	53	50	54	20	10	7	2	4	1	1	3	1	0	0	0	1	0	0	0	0	0	0	
9	3	692	86	62	71	30	12	7	2	4	1	2	4	3	0	1	1	1	1	0	0	0	0	0	
10	1	910	21	35	39	13	8	3	2	2	1	3	0	1	1	2	0	0	0	0	0	0	0	0	
10	2	910	41	66	72	30	11	8	4	4	5	6	2	1	1	3	0	0	0	0	0	0	0	0	
10	3	910	79	103	100	43	25	10	6	7	10	9	4	2	3	4	1	1	0	0	0	0	0	0	
11	1	1335	40	41	21	9	11	4	2	5	1	0	0	0	1	3	0	1	1	0	0	0	0	1	0
11	2	1335	56	68	63	24	23	8	3	10	2	1	4	0	2	5	0	1	1	0	0	0	0	1	0
11	3	1335	78	120	133	49	46	14	10	16	5	2	5	1	3	6	1	1	1	0	0	0	0	1	0
12	1	866	-	35	34	14	11	3	2	2	3	1	1	1	2	0	0	0	0	0	0	0	0	0	0
12	2	866	-	63	66	25	15	10	6	5	8	6	1	1	3	1	0	0	0	0	0	0	0	0	0
12	3	866	73	86	87	33	16	17	7	8	10	7	3	1	5	3	0	0	1	0	0	0	0	0	0
13	1	1065	-	17	17	16	4	3	4	0	0	0	0	0	1	0	0	0	0	0	0	0	1	0	0
13	2	1065	45	37	26	16	4	8	6	1	1	2	0	0	2	0	0	1	0	0	0	0	1	0	0
13	3	1065	66	81	69	30	14	14	9	3	1	3	2	2	2	0	0	1	0	0	0	0	1	0	0
14	1	767	32	13	28	14	6	5	4	1	1	0	0	0	1	0	0	1	0	0	0	0	0	1	0
14	2	767	57	29	36	15	6	5	5	2	1	2	0	1	2	0	0	1	1	0	0	0	0	1	0
14	3	767	91	45	83	51	24	17	9	5	3	4	0	3	4	0	0	1	1	0	1	0	0	1	0

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Supplemental Table 3. Dataset 2 microdebris count by 5mm sieve versus individual measurements (through CALiA).

Core ID	Event	Microdebris		
		5mm sieve	CALiA	CALiA / 5 mm sieve
1	1	17	17	1.00
1	2	30	54	1.80
1	3	36	71	1.97
2	1	25	38	1.52
2	2	46	70	1.52
2	3	62	93	1.50
3	1	40	38	0.95
3	2	73	87	1.19
3	3	99	160	1.62
4	1	34	82	2.41
4	2	63	146	2.32
4	3	104	241	2.32
5	1	18	33	1.83
5	2	37	91	2.46
5	3	53	130	2.45
6	1	14	28	2.00
6	2	43	83	1.93
6	3	84	185	2.20
7	1	62	127	2.05
7	2	104	217	2.09
7	3	158	336	2.13
8	1	26	42	1.62
8	2	69	148	2.14
8	3	132	258	1.95
9	1	29	87	3.00
9	2	54	134	2.48
9	3	70	175	2.50
10	1	46	95	2.07
10	2	89	179	2.01
10	3	132	271	2.05
11	1	36	82	2.28
11	2	90	178	1.98
11	3	159	348	2.19
12	1	34	94	2.76
12	2	55	169	3.07
12	3	72	222	3.08
13	1	25	54	2.16
13	2	39	83	2.13
13	3	85	194	2.28
14	1	24	61	2.54
14	2	39	86	2.21
14	3	96	203	2.11

Supplemental Figure 1: Cumulative proportions of flake debris by groups of reduction intensity (a) and original nodule size (b).

Supplemental Figure 2: Artifact weight distribution of Layer 7, Pech de l'Azé IV compared to the distribution of the flint assemblages of Cagny l'Épinette and Fontéchevade.



### Supplemental References Cited

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